JOHN DEERE
WORLDWIDE COMMERCIAL & CONSUMER EQUIPMENT DIVISION

Aercore Aerator
800, 1000, 1500, and 2000

TM1631 DEC05

TECHNICAL MANUAL

JOHN DEERE

North American Version
Litho in U.S.A.

INTRODUCTION

Manual Description

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

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

- Table of Contents
- Specifications and Information
- Identification Numbers
- Tools and Materials
- Component Location
- Schematics and Harnesses
- Theory of Operation
- Operation and Diagnostics
- Diagnostics
- Tests and Adjustments
- Repair
- Other

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

The bleed tabs for the pages of each section will align with the sections listed on this page. Page numbering is consecutive from the beginning of the Safety section through the last section.

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

Safety

Specifications and Information

Engine

Electrical

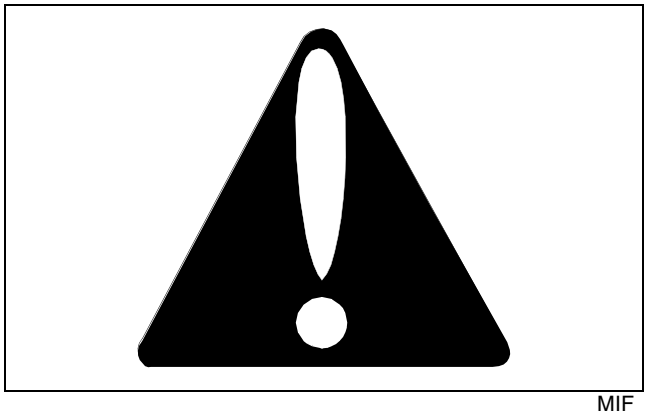
Power Train

Hydraulics

Miscellaneous

INTRODUCTION

Recognize Safety Information



MIF

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.

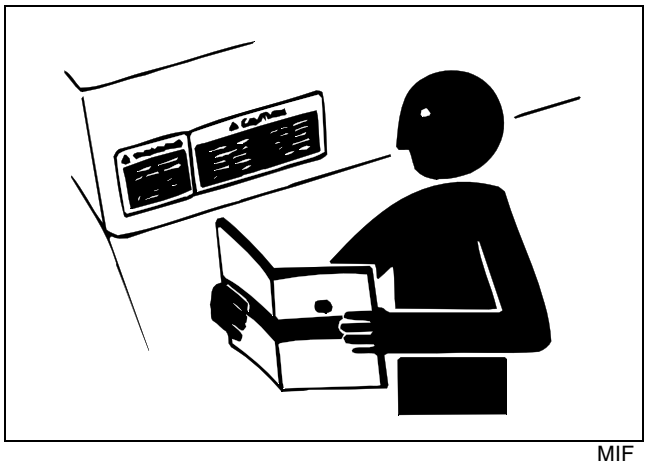
Follow recommended precautions and safe servicing practices.

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



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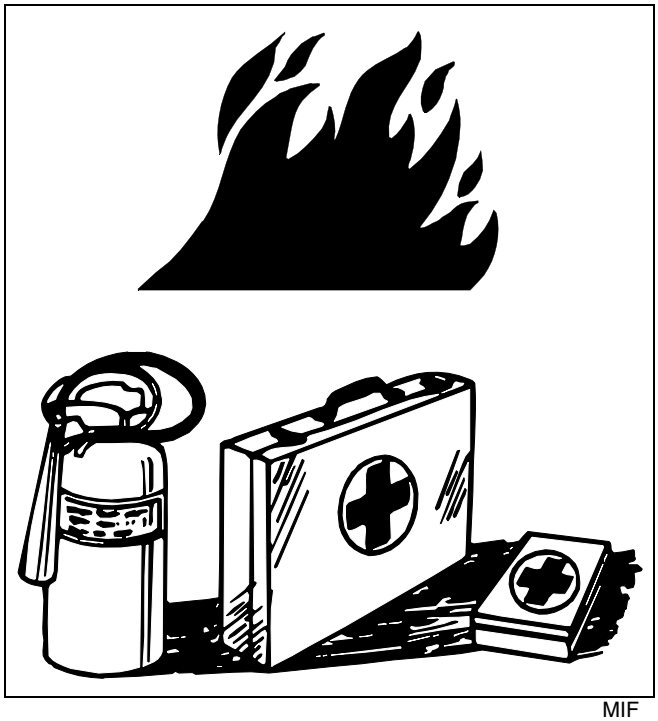
Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

Handle Fluids Safely - Avoid Fires

Be Prepared For Emergencies



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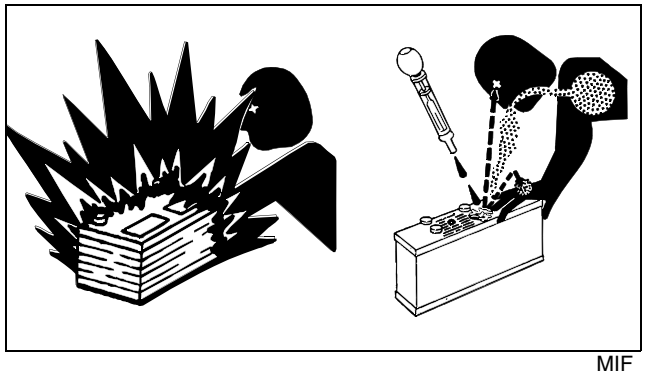
- When you work around fuel, do not smoke or work near heaters or other fire hazards.
- Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.
- Make sure machine is clean of trash, grease, and debris.
- Do not store oily rags; they can ignite and burn spontaneously.
- 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



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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.

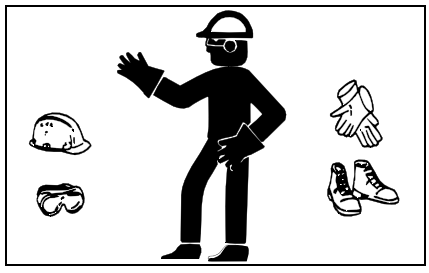
If you spill acid on yourself:

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.

Wear Protective Clothing



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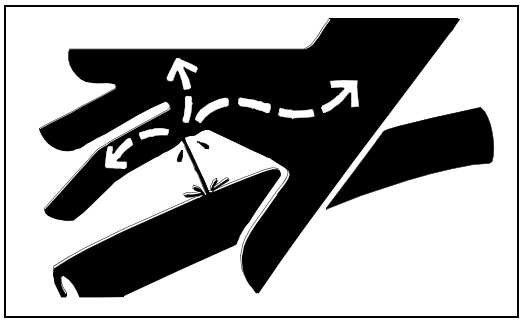
Wear close fitting clothing and safety equipment appropriate to the job.

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.

Use Care Around High-pressure Fluid Lines

Avoid High-Pressure Fluids



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Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid injury from escaping fluid under pressure by stopping the engine and relieving pressure in the system before disconnecting or connecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.

Avoid Heating Near Pressurized Fluid Lines

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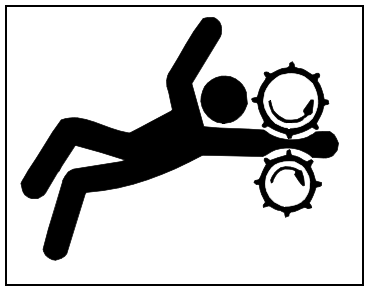
Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area.

Service Machines Safely



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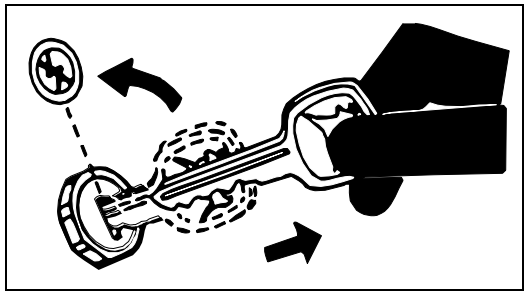
Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

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



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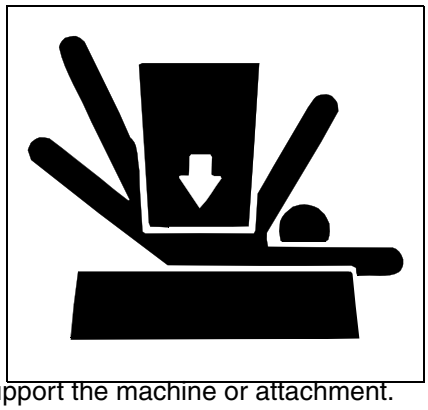
Before working on the machine:

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



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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.

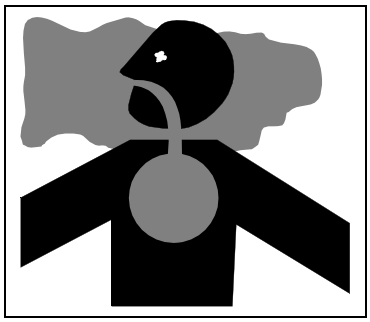
Using High Pressure Washers

Directing pressurized water at electronic/electrical components or connectors, bearings, hydraulic seals, fuel injection pumps or other sensitive parts and components may cause product malfunctions. Reduce pressure and spray at a 45 to 90 degree angle.

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



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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.

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

MIF

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

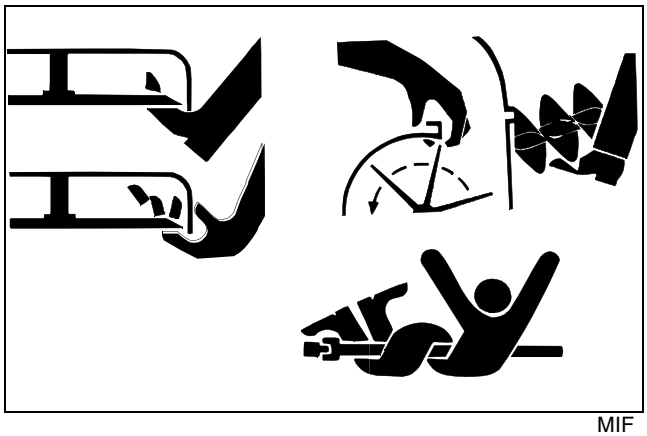
Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job.

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



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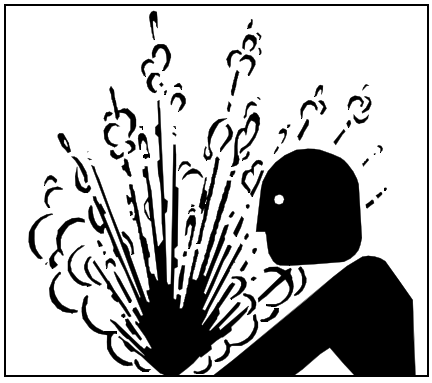
Keep hands and feet away while machine is running. Shut off power to service, lubricate or remove mower blades, augers or PTO shafts.

Service Cooling System Safely



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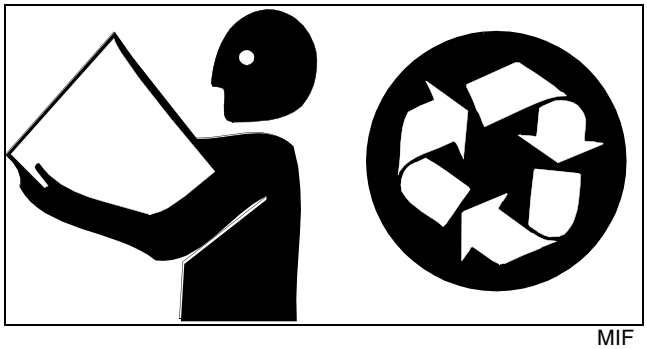
Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off machine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

Handle Chemical Products Safely



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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

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

Table Of Contents

Specifications

Aercore 800

Engine

Make	Kohler
Type	OHV, horizontal shaft, 4-cycle, V-twin
Engine Model Number	CH730S
Aspiration	Natural
Bore	83 mm (3.27 in.)
Stroke	67 mm (2.64 in.)
Displacement	725 cm3 (44 cu in.)
Cylinders	2
Ignition	Electronic
High Idle Setting	3000 rpm
Low Idle Setting	1200 rpm
Compression Ratio	9.0:1
Lubrication	Full Pressure with Full Flow Filter
Cooling System	Air Cooled
Oil Capacity (with filter)	2.0 L (2.1 qt)
Hydraulic Pump Capacity	1.9 L (2.0 qt)
Air Cleaner	Dual-stage, dry, replaceable
Oil Filter	Replaceable, full flow

Electrical System

Battery Specifications

Voltage	12 VDC
BCI Group	45
CCA Ratings (Amps at -18°C (0°F)	480
Reserve Capacity (minutes at 25 Amps)	80
Specific Gravity (minimum)	1.265 points
Load Test (minimum)	480 amp for 5 seconds
John Deere Battery Group	B

Ignition

Capacitive Discharge Air Gap	0.28 - 0.33 mm (0.011 - 0.013 in.)

Spark Plug

Gap	0.76 mm (0.030 in.)
Torque	24.4 - 29.8 N•m (18 - 22 lb-ft)

Starting Motor

Type (SN -035000)	Nippondenso Solenoid Shift
Type (SN 035001-)	Delco-Remy Bendix drive

Stator

Stator Size	25 amp
Resistance	0.064 - 0.20 ohms

Regulated Voltage at High Idle (minimum)	**13.8 - 14.7 volts**
Unregulated Voltage at 3600 rpm	**28 VAC**

Fuel/Air System

Carburetor Slow Idle Mixture Screw Initial Setting	**Lightly Seat, Then 1 Turn Out**
Slow Idle Speed	**1200 ± 75 rpm**
Fast Idle Speed	**2950 ± 100 rpm**
Fuel Tank Location	**Right side of operator**
Fuel Tank Capacity	**18.9 L (5 gal)**
Fuel (Minimum Octane)	**Unleaded gasoline, 87 octane**
Fuel Delivery	**Pulse**
Carburetor	**Float-type, fixed main jet, one barrel**
Fuel Filter	**Replaceable, in-line**
Fuel Shutoff Solenoid	**In carburetor float bowl**

Powertrain

Transaxle Gear Teeth

Bevel Pinion Gear (input shaft)	**13**

Drive Shaft

Bevel Drive Gear	**42**
Reverse Sprocket Gear	**14**
1st Gear	**41**
2nd Gear	**37**
3rd Gear	**35**
4th Gear	**34**
Spur Gear	**15**

Counter Shaft

Drive Sprocket Gear	**14**
1st Gear	**9**
2nd Gear	**12**
3rd Gear	**15**
4th Gear	**16**
Output Gear	**35**
Bevel Gear	**33**

Differential Ring Gear	**31**
Differential Miter Bevel Gears (axle shafts)	**16**
Differential Pinion Gears (cross shaft)	**14**

Lubrication

Capacity (grease)	**1.0 L (30 oz)**
Input Shaft Needle Bearings Grease	**Unirex® N3 Grease Only**
Transaxle Housing Grease	**Bentonite Grease Only**

Hydraulic System

Pump Type . . . . . **Parker 165AYS65-GLL-1H-25-15-Y**
System Capacity . . . . . **1.9 L (2.0 qt)**
Fill Level . . . . . **12.7 - 19 mm (1/2” - 3/4” below fill plug)**

Brakes

Park Brake . . . . . **Disc, hand lever actuated**

Wheels and Tires

Tire Pressure . . . . . **62 kPa (9 psi)**

Dimensions

Weight . . . . . **575 kg (1267 lb)**
Height . . . . . **1067 mm (42 in.)**
Width . . . . . **1470 mm (60 in.)**
Length . . . . . **2134 mm (84 in.)**
Coring Width . . . . . **800 mm (31.5 in.)**

Tine Hole Pattern

1st Gear
(using mini tines) . . . . . **35.6 mm x 35.6 mm (1.4 in. x 1.4 in.)**
2nd Gear* . . . . . **50.8 mm x 50.8 mm (2.0 in. x 2.0 in.)**
3rd Gear* . . . . . **66 mm x 50.8 mm (2.6 in. x 2.0 in.)**
4th Gear* . . . . . **73.6 mm x 50.8 mm (2.9 in. x 2.0 in.)**

Tine Sizes

Tubular . . . . . **10 mm (3/8 in.), 12.7 mm (1/2 in.), 16 mm (5/8 in.)**
Solid . . . . . **6.4 mm (1/4 in.), 16 mm (5/8 in.)**
Mini-Tine (open side) . . . . . **6.4 mm (1/4 in.)**

Aercore 1000

Weight . . . . . **392 kg (865 lb)**
Height . . . . . **990 mm (39 in.)**
Width . . . . . **1.2 m (45.7 in.)**
Coring Width . . . . . **952 mm (37.5 in.)**
Coring Depth (Maximum) . . . . . **100 mm (4.0 in.)**
Tine Hole Pattern (dependent on machine speed) . . . . . **30 mm x 50 mm to 127 mm**

Tine Sizes

Tubular . . . . . **10 mm (3/8 in.), 12.7 mm (1/2 in.), 16 mm (5/8 in.), 19 mm (3/4 in.)**
Solid . . . . . **6.4 mm (1/4 in.), 16 mm (5/8 in.)**
Mini-Tine (open side) . . . . . **6.4 mm (1/4 in.), 19 mm (3/4 in.)**

Machine Requirements

Speed (in gear - working) . . . . . **2 - 4.8 km/h (1.2 - 3 mph)**
Speed (transport) . . . . . **24 km/h (15 mph)**
PTO Speed @ Machine WOT . . . . . **540 rpm**

Aercore 1500

Weight . . . . . 499 kg (1100 lb)
Height . . . . . 990 mm (39 in.)
Width . . . . . 1.7 m (65.5 in.)
Coring Width . . . . . 1.5 m (57.5 in.)
Coring Depth (Maximum) . . . . . 100 mm (4.0 in.)
Tine Hole Pattern (dependent on Machine speed) . . . . . 30 mm x 50 mm to 127 mm

Tine Sizes

Tubular . . . . . 10 mm (3/8 in.), 12.7 mm (1/2 in.), 16 mm (5/8 in.), 19 mm (3/4 in.)
Solid . . . . . 6.4 mm (1/4 in.), 16 mm (5/8 in.)
Mini-Tine (open side) . . . . . 6.4 mm (1/4 in.), 19 mm (3/4 in.)

Machine Requirements

Speed (in gear - working) . . . . . 2 - 4.8 km/h (1.2 - 3 mph)
Speed (transport) . . . . . 24 km/h (15 mph)
PTO Speed @ Machine WOT . . . . . 540 rpm

Aercore 2000

Weight . . . . . 772 kg (1728 lb)
Height . . . . . 990 mm (39 in.)
Width . . . . . 2.2 m (85.7 in.)
Coring Width . . . . . 2.0 m (77.5 in.)
Coring Depth (Maximum) . . . . . 100 mm (4.0 in.)
Tine Hole Pattern (dependent on Machine speed) . . . . . 30 mm x 50 mm to 127 mm

Tine Sizes

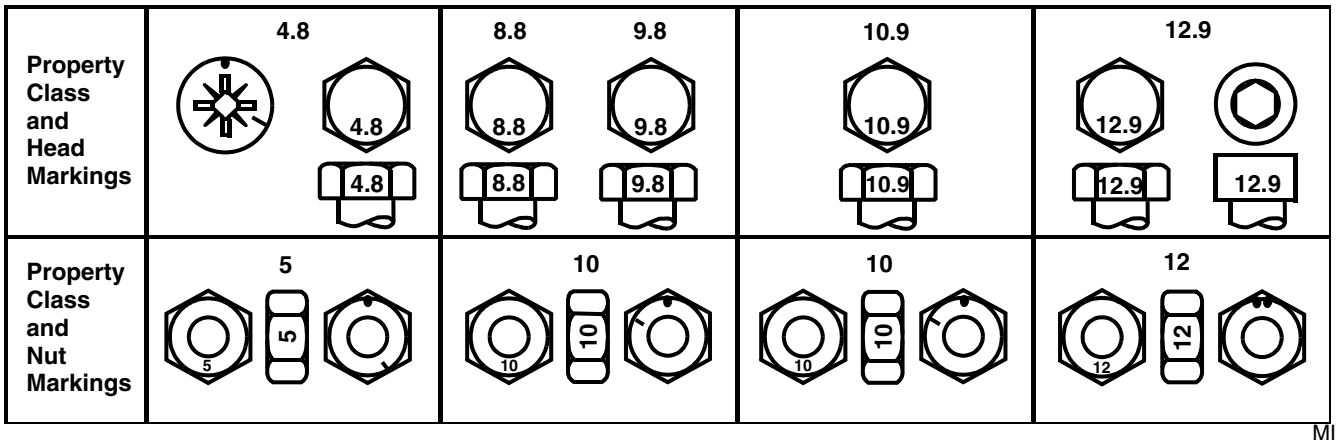
Tubular . . . . . 10 mm (3/8 in.), 12.7 mm (1/2 in.), 16 mm (5/8 in.), 19 mm (3/4 in.)
Solid . . . . . 6.4 mm (1/4 in.), 16 mm (5/8 in.)
Mini-Tine (open side) . . . . . 6.4 mm (1/4 in.), 19 mm (3/4 in.)

Machine Requirements

Speed (in gear - working) . . . . . 2 - 4.8 km/h (1.2 - 3 mph)
Speed (transport) . . . . . 24 km/h (15 mph)
PTO Speed @ Machine WOT . . . . . 540 rpm

Fastener Torques

Metric Fastener Torque Values



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	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	109
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 grade. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

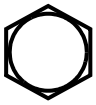
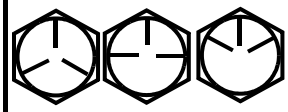
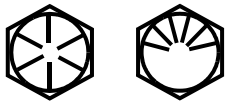
When bolt and nut combination fasteners are used, torque values should be applied to the NUT instead of the bolt head.

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.*

Reference: JDS - G200.

Inch Fastener Torque Values

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

MIF

	Grade 1				Grade 2b				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.

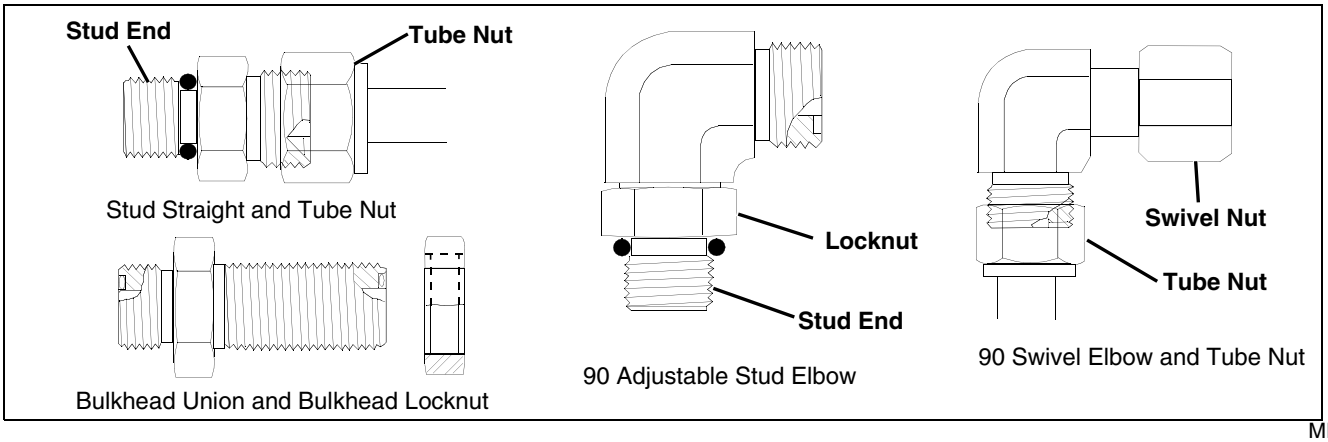
a *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated (yellow dichromate - Specification JDS117) without any lubrication.*

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

O-Ring Seal Service Recommendations

Face Seal Fittings With Inch Stud Ends Torque



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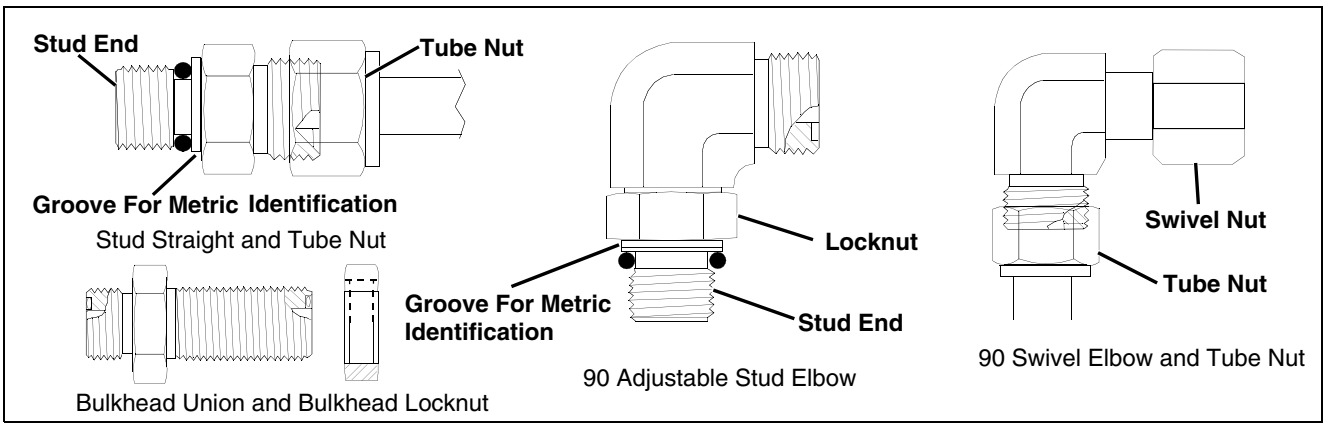
Nominal Tube OD/Hose ID				Face Seal Tube/Hose End					O-Ring Stud Ends		
Metric Tube OD	Inch Tube OD			Thread Size	Tube Nut/ Swivel Nut Torque		Bulkhead Lock Nut Torque		Thread Size	Straight Fitting or Lock Nut Torque	
mm	Dash Size	in.	mm	in.	N•m	lb-ft	N•m	lb-ft	in.	N•m	lb-ft
5	-3	0.188	4.76						3/8-24	8	6
6	-4	0.250	6.35	9/16-18	16	12	12	9	7/16-20	12	9
8	-5	0.312	7.94						1/2-20	16	12
10	-6	0.375	9.52	11/16-16	24	18	24	18	9/16-18	24	18
12	-8	0.500	12.70	13/16-16	50	37	46	34	3/4-16	46	34
16	-10	0.625	15.88	1-14	69	51	62	46	7/8-14	62	46
19	-12	0.750	19.05	1-3/16-12	102	75	102	75	1-1/16-12	102	75
22	-14	0.875	22.22	1-3/16-12	102	75	102	75	1-3/16-12	122	90
25	-16	1.000	25.40	1-7/16-12	142	105	142	105	1-5/16-12	142	105
32	-20	1.25	31.75	1-11/16-12	190	140	190	140	1-5/8-12	190	140
38	-24	1.50	38.10	2-12	217	160	217	160	1-7/8-12	217	160

NOTE: Torque tolerance is +15%, -20%

Face Seal Fittings With Metric Stud Ends Torque



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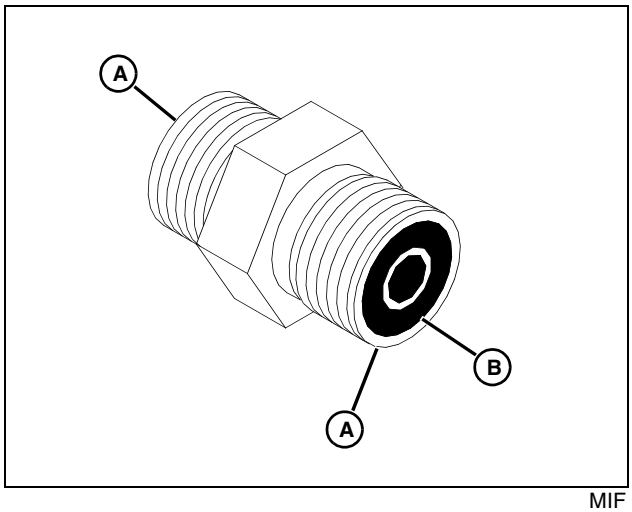
Nominal Tube OD/Hose ID				Face Seal Tube/Hose End						O-Ring Stud Ends, Straight Fitting or Lock Nut					
Metric Tube OD	Inch Tube OD			Thread Size	Hex Size	Tube Nut/ Swivel Nut Torque		Bulkhead Lock Nut Torque		Thread Size	Hex Size	Steel or Gray Iron Torque		Aluminum Torque	
mm	Dash Size	in.	mm	in.	mm	N•m	lb-ft	N•m	lb-ft	mm	mm	N•m	lb-ft	N•m	lb-ft
6	-4	0.250	6.35	9/16-18	17	16	12	12	9	M12X1.5	17	21	15.5	9	6.6
8	-5	0.312	7.94												
										M14X1.5	19	33	24	15	11
10	-6	0.375	9.52	11/16-16	22	24	18	24	18	M16X1.5	22	41	30	18	13
12	-8	0.500	12.70	13/16-16	24	50	37	46	34	M18X1.5	24	50	37	21	15
16	-10	0.625	15.88	1-14	30	69	51	62	46	M22X1.5	27	69	51	28	21
	-12	0.750	19.05	1-3/16-12	36	102	75	102	75	M27X2	32	102	75	46	34
22	-14	0.875	22.22	1-3/16-12	36	102	75	102	75	M30X2	36				
25	-16	1.000	25.40	1-7/16-12	41	142	105	142	105	M33X2	41	158	116	71	52
28										M38X2	46	176	130	79	58
32	-20	1.25	31.75	1-11/16-12	50	190	140	190	140	M42X2	50	190	140	85	63
38	-24	1.50	38.10	2-12	60	217	160	217	160	M48X2	55	217	160	98	72

NOTE: Torque tolerance is +15%, -20%

O-Ring Face Seal Fittings



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1. Inspect the fitting sealing surfaces (A). They must be free of dirt or defects.

2. Inspect the O-ring (B). It must be free of damage or defects.

3. Lubricate O-rings and install into groove using petroleum jelly to hold in place during assembly.

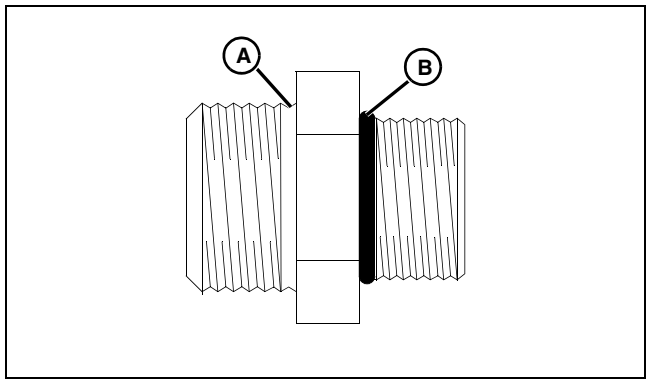
4. Index angle fittings and tighten by hand pressing joint together to insure O-ring remains in place.

IMPORTANT: Avoid damage! DO NOT allow hoses to twist when tightening fittings. Use two wrenches to tighten hose connections; one to hold the hose, and the other to tighten the swivel fitting.

5. Tighten fitting or nut to torque value shown on the chart per dash size stamped on the fitting.

O-Ring Boss Fittings

1. Inspect boss O-ring boss seat. It must be free of dirt and defects. If repeated leaks occur, inspect for defects with a magnifying glass. Some raised defects can be removed with a slip stone.



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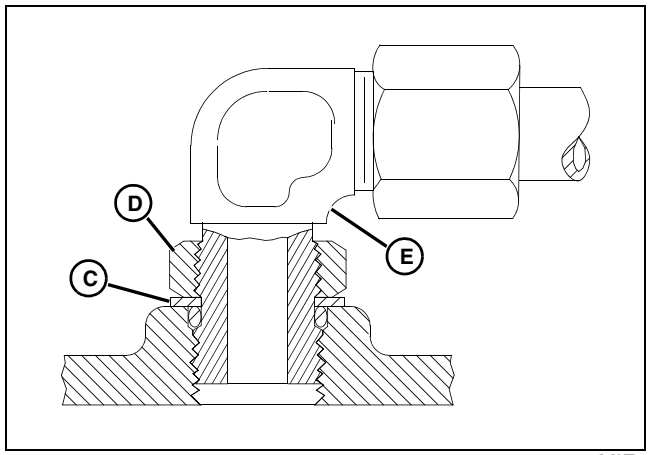
2. Put hydraulic oil or petroleum jelly on the O-ring (B). Place electrical tape over the threads to protect O-ring from nicks. Slide O-ring over the tape and into the groove (A) of fitting. Remove tape.



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3. For angle fittings, loosen special nut (D) and push special washer (C) against threads so O-ring can be installed into the groove of fitting.

4. Turn fitting into the boss by hand until special washer or washer face (straight fitting) contacts boss face and O-ring is squeezed into its seat.

5. To position angle fittings (E), turn the fitting counter-clockwise a maximum of one turn.

6. Tighten straight fittings to torque value shown on chart. For angle fittings, tighten the special nut to value shown in the chart while holding body of fitting with a wrench.

Straight Fitting or Special Nut Torques

Thread Size	Torque[a]		Number of Flats[b]
	N•m	lb-ft	
3/8-24 UNF	8	6	2
7/16-20 UNF	12	9	2
1/2-20 UNF	16	12	2
9/16-18 UNF	24	18	2
3/4-16 UNF	46	34	2
7/8-14 UNF	62	46	1-1/2
1-1/16-12 UN	102	75	1
1-3/16-12 UN	122	90	1
1-5/16-12 UN	142	105	3/4
1-5/8-12 UN	190	140	3/4
1-7/8-12 UN	217	160	1/2

[a]Torque tolerance is ± 10 percent.

[b]To be used if a torque wrench cannot be used. After tightening fitting by hand, put a mark on nut or boss; then tighten special nut or straight fitting the number of flats shown.

Metric Fastener Torque Value - Grade 7 (Special)

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)

General Information

Using Proper Fuel

Use regular grade unleaded fuel with an octane rating of 87 octane or higher. Fuel blends containing up to 10% ethanol or up to 15% MTBE reformulated fuel are acceptable. Do not use fuel or additives containing methanol as engine damage can occur.

Always use fresh, clean fuel that is purchased in a quantity that can be used within approximately 30 days, or add fuel stabilizer.

Fuel is blended to give best seasonal performance. To avoid engine performance problems such as hard starting or vapor lock, use in-season fuel. Use fuel during warm weather that was purchased during that season, and use fuel during cold weather that was purchased during that season.

Fuel can become stale in machines with engines that are used seasonally or infrequently during a season. Stale fuel can produce varnish and plug carburetor or injector components which can affect engine performance.

Keep fuel storage container tightly covered and in a cool area out of direct sunlight. Fuel can break down and degrade if not sealed properly or exposed to sun and heat.

Condensation may collect in the fuel tank because of a variety of operating or environmental conditions and, over time, may affect your machine's operation. Fill fuel tank at the end of daily use and store fuel in plastic containers to reduce condensation.

For best year-round performance and fuel-handling, add stabilizer to fuel immediately after fuel purchase. Such practice helps prevent engine performance problems and allows fuel storage in the machine all year without draining.

4 - Cycle Gasoline Engine Oil

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:

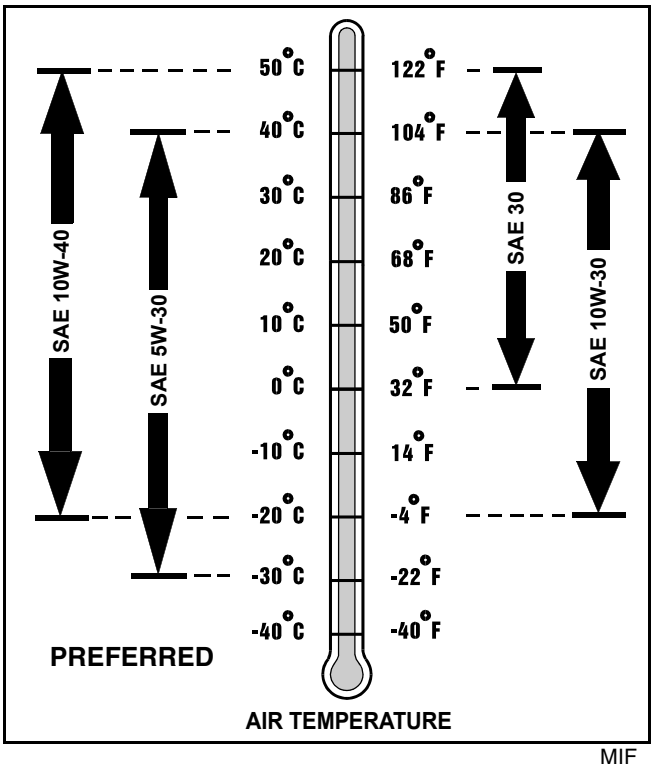
- **PLUS - 4® - SAE 10W-40**;
- **TORQ - GARD SUPREME® - SAE 5W-30**.

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



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Gear Case Oil

Use the appropriate oil viscosity based on the air temperature ranges. Operating outside of these recommended oil air temperature ranges may cause premature gear case failure.

IMPORTANT: Avoid damage! ONLY use a quality oil in this gear case. DO NOT mix any other oils in this gear case. DO NOT use BIO-HY-GARD® in this gear case.

The following John Deere gear case oil is PREFERRED:

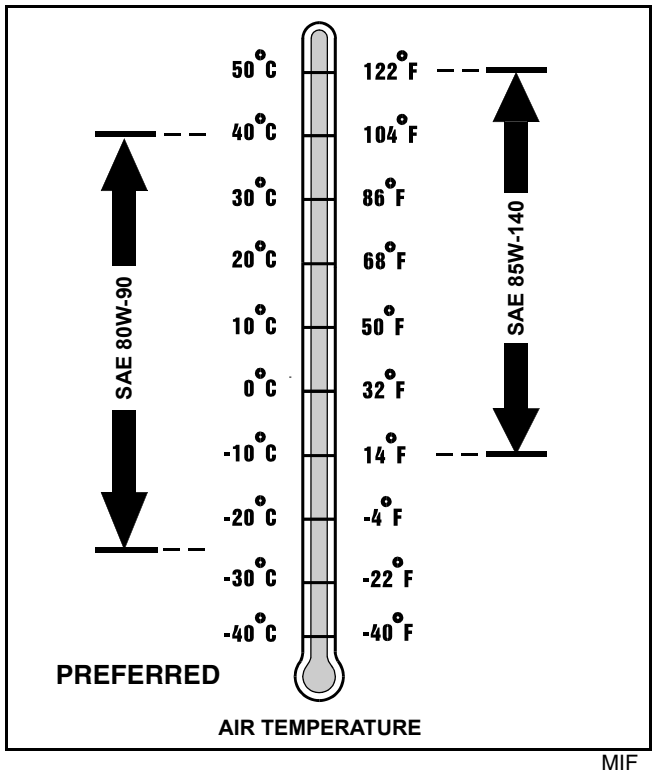
- **GL-5 GEAR LUBRICANT® - SAE 80W-90.**

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

- **GL-5 GEAR LUBRICANT® - SAE 85W-140.**

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

- API Service Classification GL - 5.



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Hydraulic Pump Oil

The following John Deere oil is PREFERRED:

- Bio-Hygard™

Transaxle Housing Grease

The following grease is PREFERRED:

- Bentonite grease

Gear Transmission Grease

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

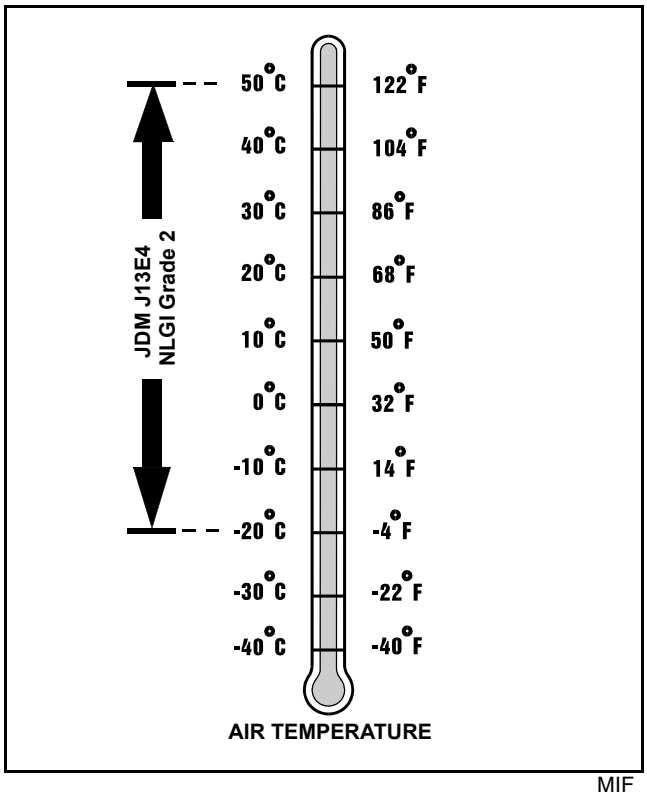
IMPORTANT: Avoid damage! ONLY use a quality gear grease in this transmission. DO NOT mix any other greases in this transmission. DO NOT use any BIO - GREASE in this transmission.

The following John Deere gear 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.



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Alternative Lubricants

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. Do not use other than factory approved alternative/synthetic lubricants.

The recommended air temperature limits and service or lubricant change intervals should be maintained as shown in the operator's manual, unless otherwise stated on lubricant label.

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: Avoid damage! 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.

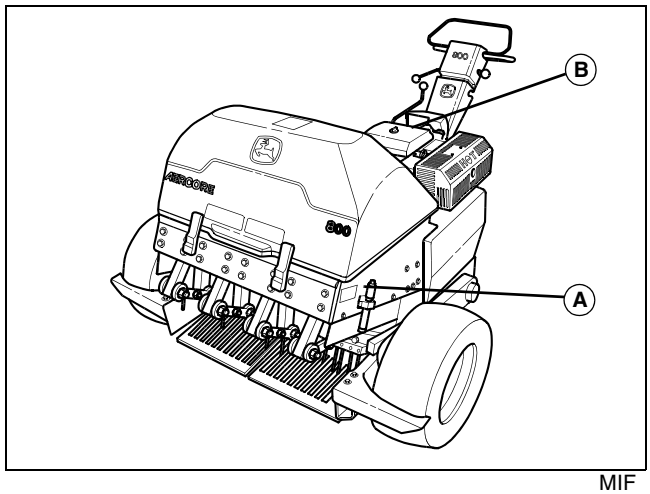
Most John Deere filters contain pressure relief and anti-drainback valves for better engine protection.

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 Locations

Product Serial Number (800)



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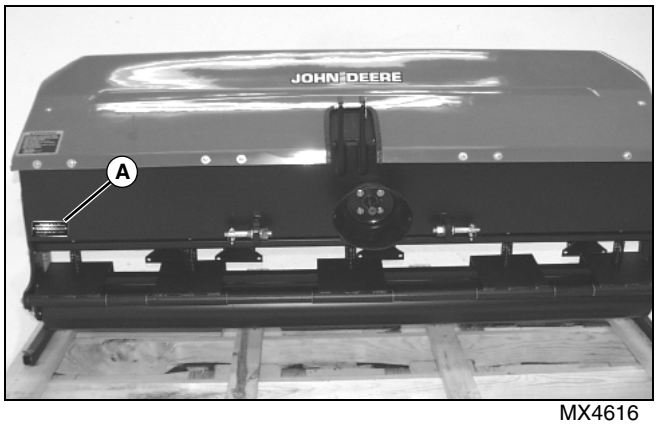
The product identification number (A) is located on the left side. The engine number (B) is on the top of the engine.

Product Serial Number (1000, 1500 and 2000)



MX4616

The product identification number (A) is located on the front.

ENGINE - GAS TABLE OF CONTENTS

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ENGINE - GAS SPECIFICATIONS

Specifications

General Engine Specifications

Make	Kohler
Type	OHV, horizontal shaft, 4-cycle, V-twin
Engine Model Number	CH730S
Aspiration	Natural
Bore	83 mm (3.27 in.)
Stroke	67 mm (2.64 in.)
Displacement	725 cm3 (44 cu in.)
Cylinders	2
Ignition	Electronic
High Idle Setting	3000 rpm
Low Idle Setting	1200 rpm
Compression Ratio	9.0:1
Lubrication	Full Pressure with Full Flow Filter
Cooling System	Air Cooled
Oil Capacity (with filter)	2.0 L (2.1 qt)
Hydraulic Pump Capacity	1.9 L (2.0 qt)
Air Cleaner	Dual-stage, dry, replaceable
Oil Filter	Replaceable, full flow

Test and Adjustment Specifications

Engine

Spark Plug Gap	0.76 mm (0.030 in.)
Valve Adjustment	None (hydraulic lifters)
Oil Pressure (Minimum at 1250 rpm)	124 kPa (18 psi)
Crankcase Vacuum (Minimum At Operating Temperature)	10.2 cm (4 in.) Water Movement

Fuel/Air System

Carburetor Slow Idle Mixture Screw Initial Setting	Lightly Seat, Then 1 Turn Out
Slow Idle Speed	1200 ± 75 rpm
Fast Idle Speed	2950 ± 100 rpm

Repair Specifications

Cylinder Head

Cylinder Head Flatness (Maximum Warping)	0.076 mm (0.003 in.)

Push Rod

Maximum Bend	0.76 mm (0.030 in.)

Valves and Valve Lifters

Hydraulic Lifter-to-Crankcase Running Clearance	0.0124 - 0.0501 mm (0.0005 - 0.0020 in.)
Intake Valve Stem-to-Valve Guide Running Clearance	0.038 - 0.076 mm (0.0015 - 0.0030 in.)
Exhaust Valve Stem-to-Valve Guide Running Clearance	0.050 - 0.088 mm (0.0020 - 0.0035 in.)

Intake Valve Guide ID
New . . . . . 7.038 - 7.058 mm (0.2771 - 0.2779 in.)
Maximum Wear Limit . . . . . 7.134 mm (0.2809 in.)
Exhaust Valve Guide ID
New . . . . . 7.038 - 7.058 mm (0.2771 - 0.2779 in.)
Maximum Wear Limit . . . . . 7.159 mm (0.2819 in.)
Valve Guide Reamer
Standard . . . . . 7.048 mm (0.2775 in.)
Oversize (0.25 mm). . . . . 7.298 mm (0.2873 in.)
Intake Valve Lift (Minimum - Engine Cold) . . . . . 8.07 mm (0.3177 in.)
Exhaust Valve Lift (Minimum - Engine Cold) . . . . . 8.07 mm (0.3177 in.)
Valve Seat Angle. . . . . 45°

Crankshaft

End Play (Free) . . . . . 0.070 - 0.480 mm (0.0028 - 0.0189 in.)
Crankshaft Sleeve Bearing (Crankcase) - New . . . . . 0.03 - 0.09 mm (0.0012 - 0.0035 in.)
Crankshaft Sleeve Bearing ID (Crankcase) - New . . . . . 40.965 - 41.003 mm (1.6128 - 1.6143 in.)
Maximum Wear Limit . . . . . 41.016 mm (1.6148 in.)
Crankshaft Bore (In Closure Plate) - New . . . . . 40.974 - 41.003 mm (1.6128 - 1.6143 in.)
Crankshaft Bore (In Closure Plate)-to-Crankshaft
Running Clearance (New) . . . . . 0.039 - 0.074 mm (0.0015 - 0.0029 in.)

Main Bearing Journal OD (Flywheel End)

New . . . . . 40.913 - 40.935 mm (1.6107 - 1.6116 in.)
Maximum Wear Limit . . . . . 40.84 mm (1.608 in.)
Maximum Taper. . . . . 0.022 mm (0.0009 in.)
Maximum Out-of-Round. . . . . 0.025 mm (0.0010 in.)

Main Bearing Journal OD (Closure Plate End)

New . . . . . 40.913 - 40.935 mm (1.6107 - 1.6116 in.)
Maximum Wear Limit . . . . . 40.84 mm (1.608 in.)
Maximum Taper. . . . . 0.022 mm (0.0009 in.)
Maximum Out-of-Round. . . . . 0.025 mm (0.0010 in.)

Crankshaft Total Indicated Runout (TIR)

PTO End (Crankshaft in Engine) . . . . . 0.15 mm (0.0059 in.)
Entire Crankshaft (In Bench V-Blocks) . . . . . 0.10 mm (0.0039 in.)

Camshaft

End Play (With Shim) . . . . . 0.076 - 0.127 mm (0.003 - 0.005 in.)
Clearance . . . . . 0.025 - 0.063 mm (0.0010 - 0.0025 in.)
Bore ID
New . . . . . 20.000 - 20.025 mm (0.7874 - 0.7884 in.)
Maximum Wear Limit . . . . . 20.038 mm (0.7889 in.)
Bearing Surface OD
New . . . . . 19.962 - 19.975 mm (0.7859 - 0.7864 in.)
Maximum Wear Limit . . . . . 19.959 mm (0.7858 in.)

Cylinder Bore, Piston and Rings

Cylinder Bore ID

New . . . . . 77.000 - 77.025 mm (3.0315 - 3.0325 in.)
Maximum Wear Limit . . . . . 77.063 mm (3.0340 in.)
Maximum Out-of-Round. . . . . 0.12 mm (0.0047 in.)
Maximum Taper. . . . . 0.05 mm (0.0020 in.)

Piston-To-Pin Clearance . . . . . 0.006 - 0.017 mm (0.0002 - 0.0007 in.)
Piston Pin Bore ID
New . . . . . 17.006 - 17.012 mm (0.6695 - 0.6698 in.)
Maximum Wear Limit . . . . . 17.025 mm (0.6703 in.)
Piston Pin OD
New . . . . . 16.995 - 17.000 mm (0.6691 - 0.6693 in.)
Maximum Wear Limit . . . . . 16.994 mm (0.6691 in.)
Top Compression Ring-To-Groove Side Clearance. . . . . 0.040 - 0.080 mm (0.0016 - 0.0031 in.)
Middle Compression Ring-To- Groove Side Clearance . . . . . 0.040 - 0.072 mm (0.0016 - 0.0028 in.)
Oil Control Ring-To-Groove Side Clearance . . . . . 0.060 - 0.202 mm (0.0024 - 0.0080 in.)
Top and Center Compression Ring End Gap
New Bore. . . . . 0.25 - 0.45 mm (0.0098 - 0.0177 in.)
Used Bore (Maximum Wear Limit) . . . . . 0.77 mm (0.030 in.)
Piston Thrust Face OD
New . . . . . 76.967 - 76.985 mm (3.0302 - 3.0309 in.)
Maximum Wear Limit . . . . . 76.840 mm (3.0252 in.)
Piston Thrust Face-To-Cylinder Bore Clearance (New) . . . . . 0.015 - 0.058 mm (0.0006 - 0.0023 in.)

Connecting Rod Journal

Connecting Rod Journal OD

New . . . . . 35.955 - 35.973 mm (1.4156 - 1.4163 in.)
Maximum Wear Limit . . . . . 35.94 mm (1.415 in.)
Maximum Taper. . . . . 0.018 mm (0.0007 in.)
Maximum Out-of-Round. . . . . 0.025 mm (0.0010 in.)

Connecting Rod-to-Crankpin Running Clearance
New . . . . . 0.030 - 0.055 mm (0.0012 - 0.0022 in.)
Maximum Wear Limit . . . . . 0.07 mm (0.0028 in.)
Connecting Rod-to-Crankpin Side Clearance . . . . . 0.26 - 0.63 mm (0.0102 - 0.0248 in.)
Connecting Rod-to-Piston Pin Running Clearance. . . . . 0.015 - 0.028 mm (0.0006 - 0.0011 in.)
Piston Pin End ID
New . . . . . 17.015 - 17.023 mm (0.6699 - 0.6702 in.)
Maximum Wear Limit . . . . . 17.036 mm (0.6707 in.)

Governor

Cross Shaft OD
New . . . . . 5.975 - 6.012 mm (0.2352 - 0.2367 in.)
Maximum Wear Limit . . . . . 5.962 mm (0.2347 in.)
Crankcase -To-Cross Shaft Running Clearance . . . . . 0.013 - 0.075 mm (0.0005 - 0.0030 in.)
Gear Shaft OD
New . . . . . 5.990 - 6.000 mm (0.2358 - 0.2362 in.)
Maximum Wear Limit . . . . . 5.977 mm (0.2353 in.)
Gear Shaft-To-Governor Gear Running Clearance . . . . . 0.015 - 0.140 mm (0.0006 - 0.0055 in.)

Torque Specifications

Air Cleaner Bracket Screws. . . . . 9.9 N•m (88 lb-in.)

Blower Housing and Sheet Metal Fasteners

M5 Fasteners. . . . . 4.7 N•m (35 lb-in.)
M6 Fasteners. . . . . 8.6 N•m (65 lb-in.)
Rectifier Fasteners . . . . . 4.7 N•m (35 lb-in.)

Breather Cover Cap Screws . . . . . 8.6 N•m (65 lb-in.)
Closure Plate Faster. . . . . 24.4 N•m (216 lb-in.)
Cylinder Head Cap Screw . . . . . 40.7 N•m (30 lb-ft)
Connecting Rod Cap Screws . . . . . 17.3 N•m (130 lb-in.)
Carburetor Air Horn Cap Screws . . . . . 1.7 N•m (15 lb-in.)
Carburetor and Intake Manifold
Carburetor Mounting Fasteners Torque. . . . . 9.9 N•m (88 lb-in.)
Intake Manifold Mounting Fasteners Torque . . . . . 9.9 N•m (88 lb-in.)
Engine Mounting Cap Screws (Bracket to Frame) . . . . . 32 N•m (24 lb-ft)
Fan Cap Screw . . . . . 9.9 N•m (88 lb-in.)
Flywheel Retaining Screw . . . . . 66.4 N•m (49 lb-ft)
Fuel Pump Cap Screw . . . . . 2.3 N•m (20 lb-in.)
Governor Control Lever. . . . . 9.9 N•m (88 lb-in.)
Intake Manifold Bolts . . . . . 9.9 N•m (88 lb-in.)
Ignition Module Screw . . . . . 4.0 N•m (35 lb-in.)
Muffler Cap Screws . . . . . 9.9 N•m (88 lb-in.)
Muffler Nuts. . . . . 24.4 N•m (216 lb-in.)
Oil Filter. . . . . 7.5 ± 1.5 N•m (65 ± 15 lb-in.)
Oil Drain Plugs . . . . . 13.6 N•m (10 lb-ft)
Oil Pump Screws
First Time . . . . . 10.7 N•m (95 lb-in.)
Reinstallation . . . . . 6.7 N•m (60 lb-in.)
Closure Plate Cap Screw. . . . . 24.4 N•m (216 lb-in.)
Rectifier Cap Torque. . . . . 4.7 N•m (35 lb-in.)
Rocker Arm Pivot Cap Screw . . . . . 14 N•m (124 lb-in.)
Spark Plug. . . . . 27.5 ± 2.5 N•m (20 ± 2 lb-ft)
Throttle Control Bracket . . . . . 9.0 ± 1.5 N•m (80 ± 15 lb-in.)
Screen - Flywheel. . . . . 9.9 N•m (88 lb-in.)
Starter Mounting Faster . . . . . 15.3 N•m (135 lb-in.)
Stator Cap Screw . . . . . 4.0 N•m (35 lb-in.)
Valve Cover Cap Screw . . . . . 7.9 N•m (70 lb-in.)

Tools and Materials

Service Equipment and Tools

Order tools from your SERVICEGARDTM Catalog. Some tools may be available from a local supplier.

Special or Required Tools

Tool Name	Tool No.	Tool Use
Valve Spring Compressor	- - -	Remove and install valve springs.
Telescoping Gauge	- - -	Measure valve guides. Measure inside diameter of parts.
Outside Micrometer	- - -	Measure valve stem. Measure outside diameter of parts. Measure camshaft journals & lobes.
Valve Guide Reamer	- - -	Ream valve guides.
Valve Seat Cutter	- - -	Cut valve seats.
Dial Indicator	- - -	Check push rods and valves for bend. Measure crankshaft end play.
Vacuum Cup Tool	- - -	Lap valve.
Strap Wrench	- - -	Hold flywheel.
Telescoping Gauge	- - -	Measure camshaft bearing surface. Measure cylinder ID.
Ridge Reamer	- - -	Clean cylinder bore.
Piston Ring Expander	- - -	Remove and install piston rings.
Ring Compressor	- - -	Install piston.
Ring Groove Cleaner	- - -	Clean piston ring grooves.
Seal Driver	- - -	Install oil seals.
Cylinder Hone	- - -	Bore cylinder block.
Flex Hone	- - -	Deglaze/crosshatch cylinder.
Oil Pressure Test Kit	- - -	Perform Oil Pressure Test.

Essential Tools

Special or Required Tools

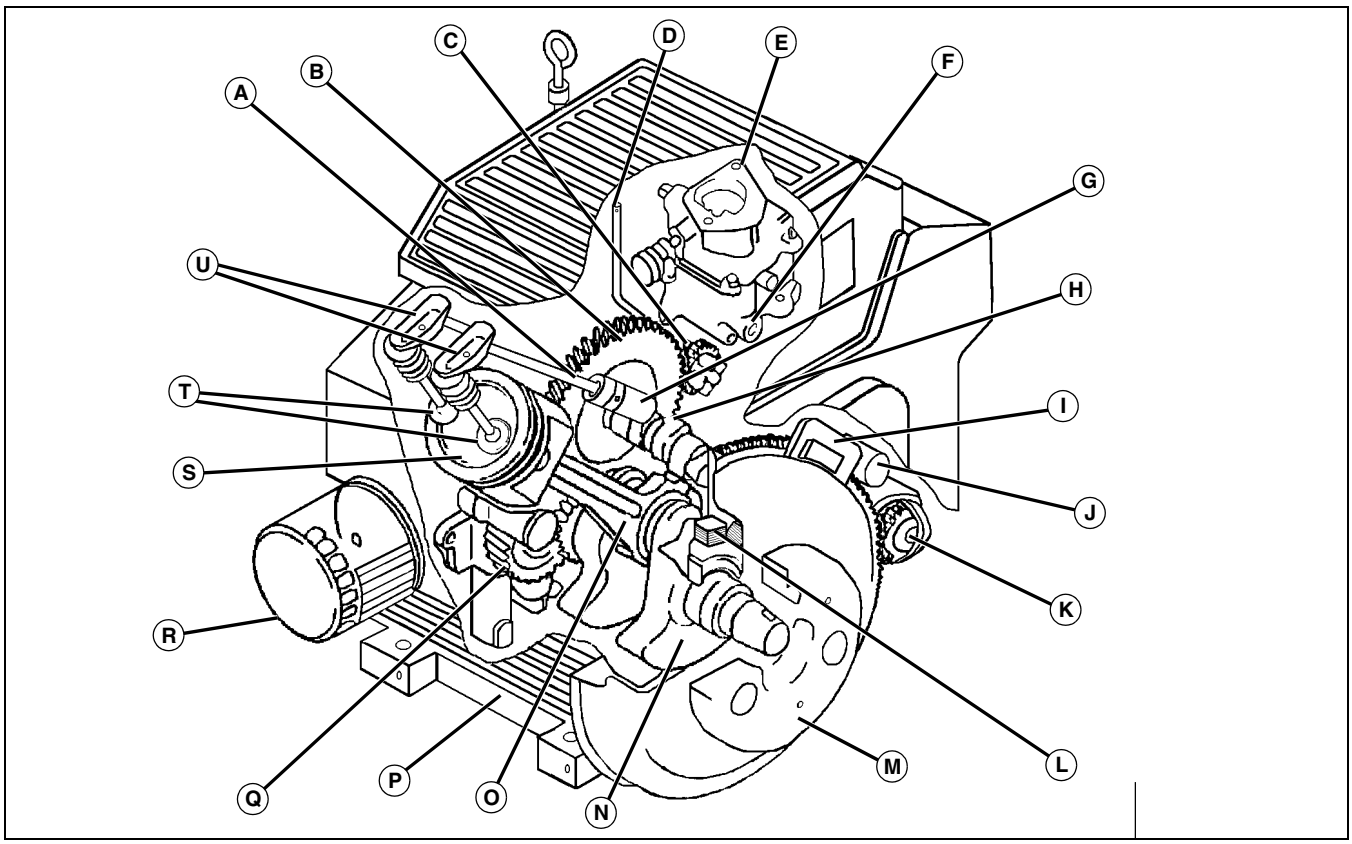
Tool Name	Tool No.	Tool Use
Standard Size Valve Guide Reamer (7.05 mm)	D20020WI	Clean or size valve guide to original size.
Spark Tester	D05351ST	Tests spark plug.
Oversize Valve Guide Reamer (7.25 mm)	JDG705	Bores valve guide to proper size for oversize valve.

Other Materials

Other Material

Part No.	Part Name	Part Use
- - -	RTV Silicone Sealant	Seal valve cover.
- - -	Prussian Blue Compound	Check valve seat contact.
- - -	Valve Lap Compound	Lap valves.
- - -	Abrasive Pad	Clean cylinder head.
- - -	Zinc Oxide/Wood Alcohol	Check block for cracks.

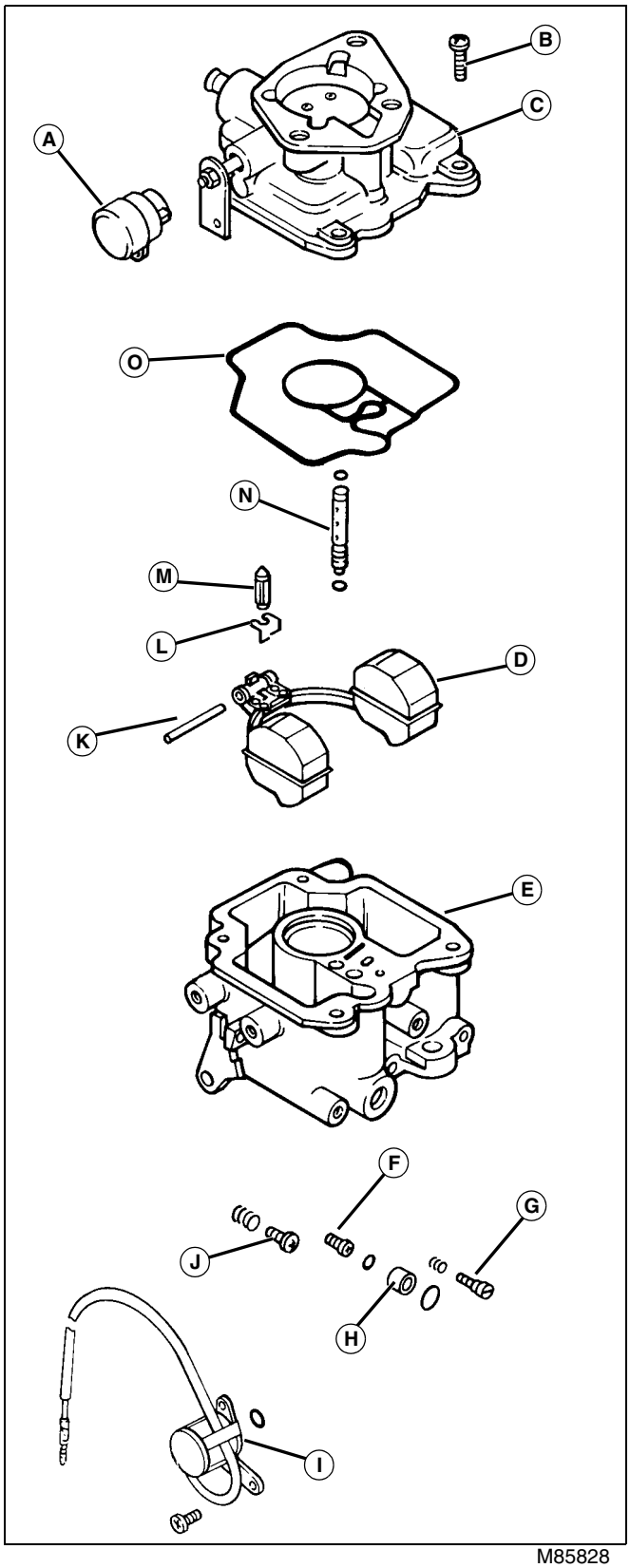
Component Location **Engine**



M85939

A - Push Rods
B - Camshaft Gear
C - Governor Drive Gear
D - Governor Cross Shaft
E - Carburetor
F - Fuel Shut-Off Solenoid
G - Hydraulic Lifters
H - Camshaft
I - Ignition Module
J - Solenoid
K - Starter
L - Stator
M - Flywheel
N - Crankshaft
O - Connecting Rod
P - Cylinder Block
Q - Oil Pump Gear
R - Oil Filter
S - Pistons
T - Valves
U - Rocker Arms

Carburetor



M85828

Picture Note: Main jet is set at the factory and cannot be adjusted.

A - Automatic Choke
B - Air Horn Screws (4 used)
C - Upper Body (Air Horn Assembly)
D - Float Assembly
E - Lower Body
F - Main Jet
G - Slow Idle Mixture Screw
H - Solenoid Seat
I - Fuel Shut-off Solenoid
J - Slow Idle Stop Screw
K - Float Pin
L - Clip
M - Inlet Needle Valve
N - Slow Speed Jet
O - Body Gasket

Diagnostics

Main Components

Test Conditions:

- Machine PARKED on level surface
- Park brake LOCKED
- Key switch OFF
- Transaxle in NEUTRAL

Symptom: Engine Main Components

(1) Is the engine oil level between "L" and "H" marks?

Yes - Go to next step.

No - Add proper amount of oil to bring level to "F" mark.

(2) Is oil burnt or contaminated with metal particles or fuel?

No - Go to next step.

Yes - Change oil and filter and inspect for cause of contamination.

(3) Is the minimum crankcase vacuum 10.2 (4 in.) water movement?

Yes - Go to next step.

No - Check the crankcase breather.

No - Check gaskets and seals for leaks.

No - Possible blowby, leaky valves, or restricted exhaust.

(4) Is there external oil leakage and/or dirty oil filter?

No - Go to next step.

Yes - Replace leaky gaskets, seals, oil filter, or drain plug.

(5) Does the cylinder head hold 50 psi or greater during cylinder leakdown test?

Yes - Go to next step.

No - Check condition of valves, pistons, rings, and cylinders.

(6) Is the carburetor float chamber full of clean, fresh fuel?

Yes - Go to next step.

No - Check for fuel in fuel tank.

Symptom: Engine Main Components

No - Check the fuel filter.

No - Check for plugged, damaged, or pinched fuel lines.

No - Check the fuel tank vent.

(7) Are the carburetor passages, needle valve, and jets free from varnish and debris?

Yes - Go to next step?

No - Replace fuel in tank.

(8) Is the carburetor float assembly functioning properly?

Yes - Go to next step.

No - Adjust float height. Replace components as necessary.

(9) Does the carburetor have the correct jet for the operating elevation?

Yes - Go to next step.

No - Replace main jet with the correct size for the elevation.

(10) Is the slow idle set to 1200 ± 75 rpm?

Yes - Go to next step.

No - Check linkage and adjust carburetor.

(11) Are the choke, throttle, and governor set and functioning properly?

Yes - Go to next step.

No - Check linkage and adjust.

(12) Is the air filter element clean and undamaged?

Yes - Go to net step.

No - Replace paper filter.

No - Repair or replace foam filter.

(13) Is the air filter hardware tight?

Yes - Go to next step.

No - Tighten or replace hardware.

(14) Are the cylinder head fins and cooling fan shroud clean?

Yes - Go to next step.

No - Clean thoroughly.

(15) Are the fins cracked or broken?

No - Go to next step.

Yes - Replace fan or cylinder head.

Symptom: Engine Main Components

(16) Are all of the internal engine components within wear limits, all hardware tight, and no excessive vibrations apparent?

Yes - Go to next step.

No - Inspect, repair, or replace components as necessary.

Engine Hard To Start and/or Engine Starter Kicks Out

Test Conditions:

- Operator lever in full throttle position.
- Crank engine for 5 seconds. If engine does not start, pause for 60 seconds, then crank for 5 more seconds. Continue this 5 seconds on, 60 seconds off cycle until engine starts. Do not crank engine continuously for more than 10 seconds at a time. If starter kicks out see step 6. When engine tries to start, continue cranking beyond the 5 seconds of that cycle until it starts.

Symptom: Engine Hard to Start and/or Engine Starter Kicks Out

(1) Is the cranking speed at least 300 rpm?

Yes - Go to next step.

No - Load test battery for correct amperage output.

No - Battery or starter terminals corroded.

No - Engine oil weight is too heavy - only multi-viscosity oil is recommended.

No - Starter failure. See “Repair and Replace Starting Motor Brushes S.N. (-035000)” on page 174.

(2) Is the choke plate completely closed when choke lever is in full choke position?

Yes - Go to next step.

No - Adjust throttle and choke cable, governor, and idle speeds.

(3) Is the spark plug clean, undamaged, and gapped correctly 0.76 mm (0.030 in.)? The spark plug should provide a strong blue spark.

Yes - Go to next step.

No - Repair or replace spark plug.

(4) Are the air cleaner elements clean and undamaged?

Yes - Go to next step.

Symptom: Engine Hard to Start and/or Engine Starter Kicks Out

No - Clean or replace foam precleaner and air filter paper element as needed.

(5) Does the air pressure remains constant during the cylinder leakdown test?

Yes - Go to next step.

No - Check for stuck valve or lifter.

No - Repair or replace valves, piston rings, intake or cylinder head gasket.

(6) Does the starter kick out during cranking?

Yes - Engine oil weight may be too heavy. Only multi-viscosity oil is recommended.

Tests and Adjustments

Cylinder Leakdown Test

Reason

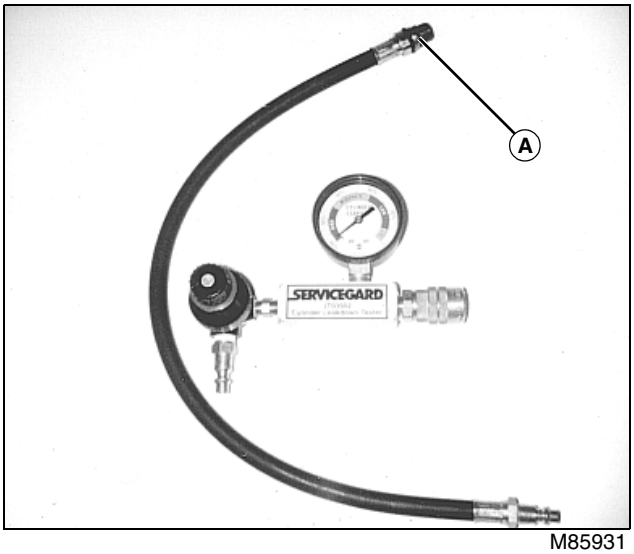
By pressurizing the combustion chamber from an external air source you can determine if the valves or rings are leaking.

Equipment

- JT03502 Cylinder Leakdown Test Kit

Procedure

1. Move transaxle shift lever to neutral. Lock park brake.
2. Run engine for 3 - 5 minutes then turn it off.
3. Remove spark plugs and air filter from engine.
4. Rotate crankshaft until piston (of cylinder being tested) is at top dead center of compression stroke. This position must be maintained while testing.



M85931

5. Remove spark plug and install JT03502 Cylinder Leakdown test fitting (A).
6. Connect air source of at least 50 psi to the tester.
7. Turn the regulator knob in the increase (clockwise) direction until the gauge needle is in the yellow “set” area at the low end of the scale.
8. Connect tester quick-disconnect to the adapter hose while firmly holding the engine at TDC. Record the gauge reading and listen for escaping air at the carburetor intake, exhaust outlet, and crankcase breather.

Results

- Air escaping from crankcase breather - Defective rings or worn cylinder walls
- Air escaping from exhaust system - Defective exhaust valve
- Air escaping from carburetor - Defective intake valve
- Gauge reading in “low” (green) zone - Piston rings and cylinder in good condition
- Gauge reading in “moderate” (yellow) zone - Engine is still usable, but there is some wear present. Customer should start planning for overhaul or replacement.
- Gauge reading in “high” (red) zone - Rings and/or cylinder have considerable wear. Engine should be reconditioned or replaced.

Crankcase Vacuum Test

Reason

To measure the amount of crankcase vacuum, which ensures the crankcase is not pressurized. A pressurized crankcase will force oil leakage past the seals. A normal crankcase has negative pressure.

Equipment

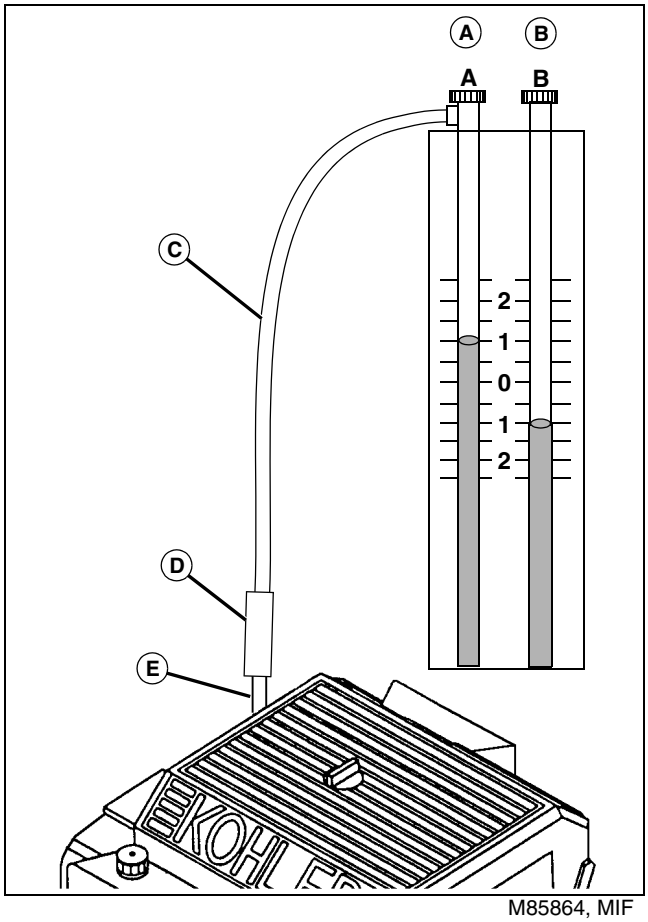
- JT05697 U-Tube Manometer Kit

Connections

CAUTION: Avoid Injury! Engine components are HOT. DO NOT touch with bare skin, especially the exhaust pipe or muffler while making test. Wear protective eye glasses and clothing.

1. Attach manometer magnets to solid metal surface.

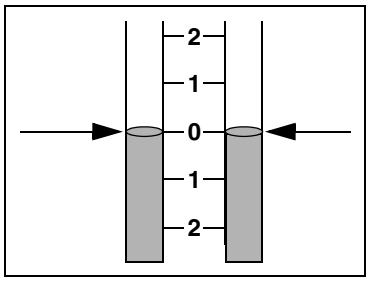
IMPORTANT: Avoid damage! Attaching manometer to engine before starting engine will cause all of the water in the manometer to be drawn into the engine crankcase. Do not use more than 3 feet of manometer tubing. If a longer hose is used the manometer readings will be inaccurate. Some units require a rubber hose (adapter) using clamps to fit the dipstick opening.



M85864, MIF

A - Top Valve
B - Top Valve
C - Manometer Tubing
D - Rubber Hose or Adapter
E - Dipstick Tube

2. Open top valves (A) and (B) one turn.

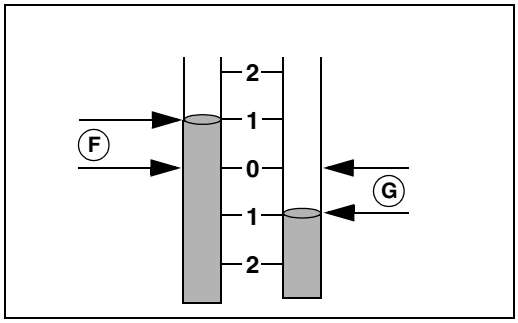


MIF

3. Zero out the manometer by sliding the ruled scale up or down so “0” mark is located where water level on both sides is even.

Procedure

1. Start and run engine at FAST idle (2950 ± 50 rpm).
2. Allow engine to reach operating temperature.
3. Quickly remove engine dipstick and attach hose (C) from manometer to dipstick opening.



MIF

4. Record vacuum reading. The reading is obtained by adding (F) and (G) water movement from “0”. In this case reading should be 2 inches of vacuum (1 inches + 1 inch - F + G). Reading from (F) should always be above the “0” mark. If reading from (F) (actual crankcase vacuum) is below the “0” mark then crankcase is pressurized causing seals to leak oil.

5. Repeat test at least three times for accuracy. Do not shut off engine. To repeat test, remove the manometer tube from top of manometer at valve (A). Do not remove manometer tube from engine. Reset manometer at zero - see step 3. Reattach manometer tube (C) to valve (A) and record reading.

6. Remove line from manometer (valve “A”) before stopping engine. Then remove dipstick hose connection and install dipstick.

Results

If crankcase vacuum reading is greater than 10.2 cm (4 in.) of water movement check the following:

- Crankcase breather clogged or inoperative
- Seals and gaskets for leakage, including rocker arm cover gasket (loose or improperly torqued fasteners)
- Valve and valve seats for wear or damage
- Rings, piston, and cylinder bore for wear or damage

Fuel Flow Test

Reason

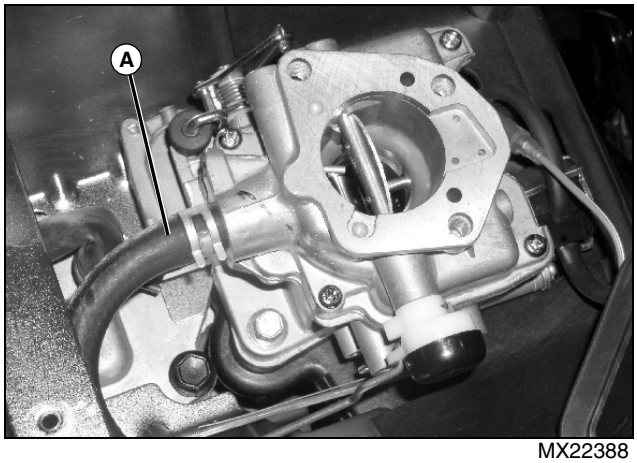
To determine fuel availability to the carburetor.

Equipment

- Proper Fuel Container

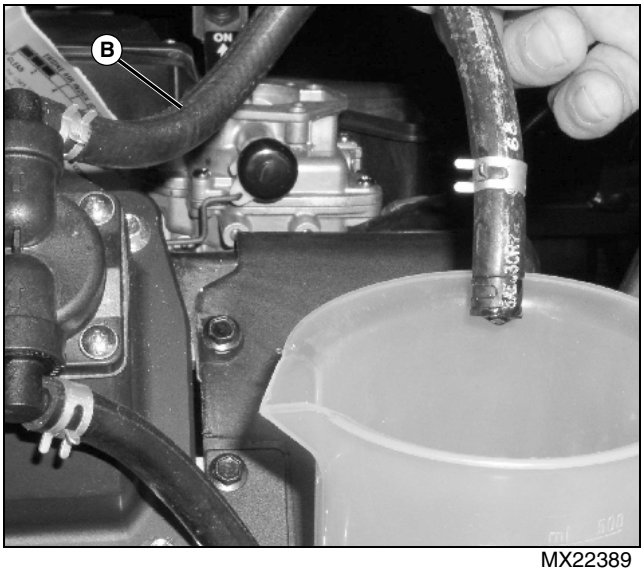
CAUTION: Avoid Injury! Gasoline is present in the carburetor and fuel line. Gasoline is extremely flammable and its vapors can explode if ignited. Keep sparks and other sources of ignition away from the engine.

Procedure



MX22388

1. Place clean rag underneath fuel line (A) to catch fuel already in the line.



MX22389

2. Disconnect fuel line (B) from carburetor and place in measured container.

3. Disconnect and ground both spark plug wires from spark plugs. Place the ends of the wires away from the container.

NOTE: Crank engine 5 seconds at a time. Vacuum needs to build before fuel will flow. When fuel starts to flow, stop cranking, empty container, then time test for 10 seconds. Do not crank more than 10 seconds continuously.

4. Crank engine (it should not start) and catch fuel in measured container. Measure amount of fuel. Minimum fuel delivery rate must be 10.4 mL (0.35 oz) in 10 seconds.

5. Pour captured fuel into tank.

Results

If fuel flow is slow, check the following:

- Replace fuel filter and/or fuel pump
- Check fuel lines, shut-off valve, fuel tank outlet, and fuel tank cap for restrictions

Oil Pressure Test

Reason

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

Test Equipment

- Oil Pressure Test Kit JT07262
- Fitting JT05487
- Gauge JT07034
- Coupler JT03262
- Hose JT03017

Procedure

1. Park machine on level surface, turn key switch OFF, and allow engine to cool.

2. Check engine oil level, bring level to full mark.

CAUTION: Avoid Injury! Engine components are HOT. DO NOT touch with bare skin, especially the exhaust pipe or muffler while making test. Wear protective eye glasses and clothing.

3. Remove oil filter. (Plastic bag may be used to protect paint and channel oil to drain pan.)

M85932

4. Install pressure tester to oil filter flange.

5. Check oil pressure when oil is both cold and hot, and at both idle and full throttle.

6. Start engine and run until hot. (Be sure to maintain full crankcase oil level during testing.)

Results

- Oil pressure on a cold engine at start-up, as a minimum 414 kPa (60 psi). (Pressure relief valve will open beyond this pressure.)
- Oil pressure at operating temperature (warm engine at idle) may be as low as 124 kPa (18 psi).

Throttle Solenoid Adjustment

Reason

To insure optimum hole quality under different terrain conditions.

IMPORTANT: Avoid damage! Do not adjust throttle solenoid more than 100 RPM or move bracket more than 1.6 mm (0.0625 in.) before testing on turf. See Electrical section for solenoid test.

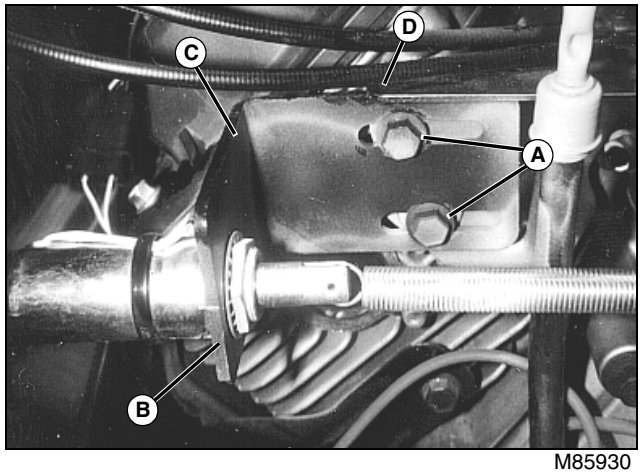
Equipment

- JT07270 Pulse Tachometer

CAUTION: Avoid Injury! Engine and muffler shield may be hot. Wear gloves to avoid burning hands or wait for engine to cool.

Procedure (SN -030000)

1. Park on flat surface. Lock park brake.



M85930

2. Loosen two bolts (A) securing solenoid bracket (B) to engine block.

3. Move bracket toward aerating head 1.6 mm (0.0625 in.) to decrease RPM.

4. Move bracket toward steering handle 1.6 mm (0.0625 in.) to increase RPM.

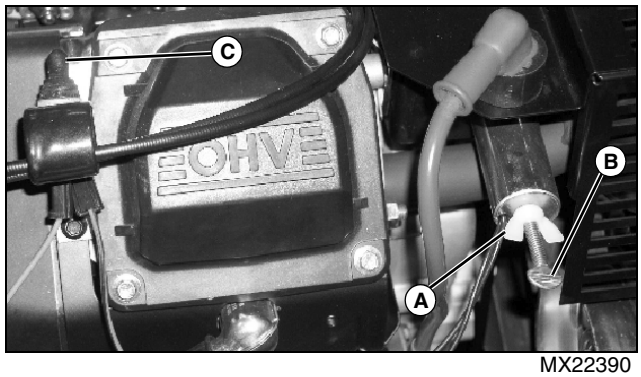
5. Tighten bolts.

IMPORTANT: Avoid damage! Remove tines or tine holders before testing machine on hard surface. Machine head must be raised and lowered to test adjustment, and tines may be damaged on hard surface. Operate machine in practice area before using on "green" to determine if solenoid is set correctly. Continue adjustment procedure until reaching optimum hole quality. Make sure solenoid switch is in ON (up) position.

Procedure S.N. (030001-)

1. Park on flat surface. Lock park brake.

2. Start engine.



MX22390

3. Loosen wing nut (A) and turn adjustment screw (B) clockwise to increase engine RPMs and counterclockwise to decrease RPMs. TIghten wing nut.

IMPORTANT: Avoid damage! Remove tines or tine holders before testing machine on hard surface. Machine head must be raised and lowered to test adjustment, and tines may be damaged on hard surface. Operate machine in practice area before using on "green" to determine if solenoid is set correctly. Continue adjustment procedure until reaching optimum hole quality. Make sure solenoid switch is in ON (up) position.

NOTE: Make sure solenoid switch (C) is in ON (up) position.

4. Operate the machine in a practice area before using on a green to determine if solenoid is set correctly. Continue adjustment procedure until reaching optimum hole quality.

Results

- Best hole quality is achieved by maintaining the slowest throttle solenoid RPM adjustment possible.
- For soft turf conditions such as after irrigation, the best hole quality is achieved at slower solenoid RPM. Hard turf conditions may require an increased solenoid RPM adjustment to prevent engine overload at lower RPM.
- S.N. (-030000): The throttle solenoid is set at 2500 RPM. The solenoid may be adjusted if certain conditions cause hole elongation as aeration head lowers or raises at beginning or end of pass.
- S.N. (-030000): To return to original setting (2500 RPM), loosen bolts (A) and move edge of solenoid bracket (C) 31.75 mm (1.25 in.) from rear edge of throttle plate (D).
- S.N. (060001-): The throttle solenoid is set at 1200 RPM. The solenoid should not require adjustment. Hard turf conditions may require an increased solenoid RPM adjustment to prevent engine overload at lower RPM.

Governor Adjustment

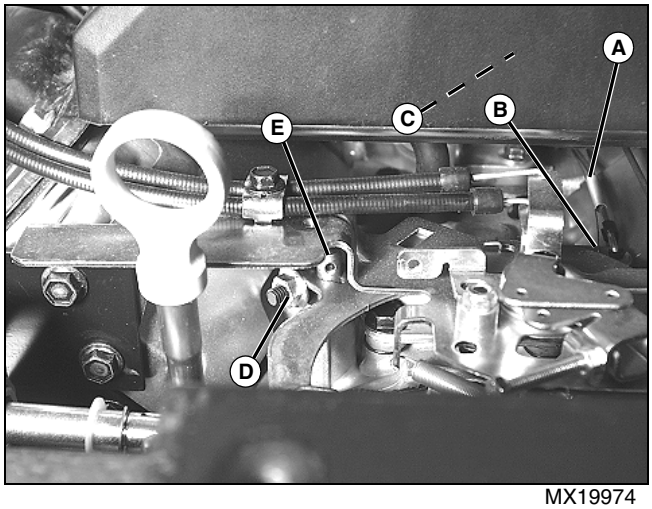
CAUTION: Avoid Injury! Engine and muffler shield may be hot. Wear gloves to avoid burning hands or wait for engine to cool.

Reason

To make sure the governor works properly after the governor arm is loosened or removed from the cross shaft.

NOTE: Adjust throttle cable before adjusting governor linkage.

Initial Adjustment

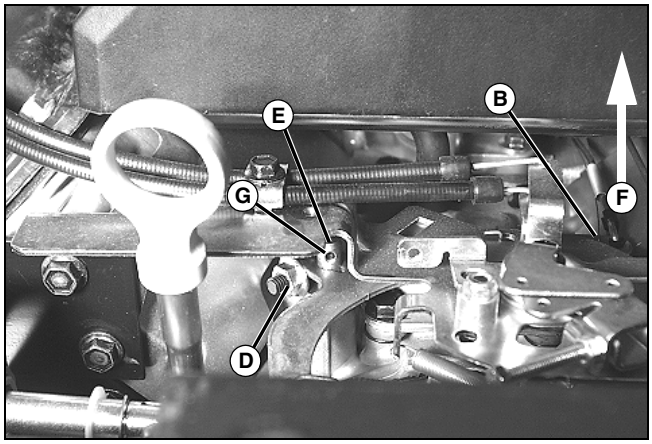


MX19974

Picture Note: Muffler guard show removed for photo clarity.

1. Make sure the throttle linkage (A) is connected to the governor arm (B) and the throttle lever (C) on the carburetor.

2. Loosen the hex nut (D) holding the governor arm to the cross shaft (E).



MX19974

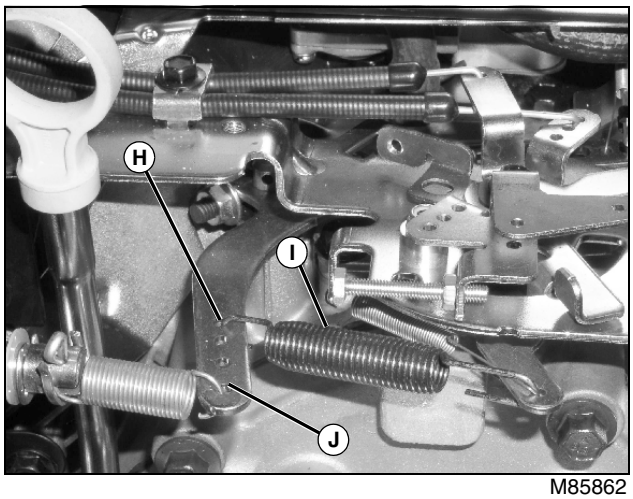
Picture Note: Muffler guard shown removed for photo clarity.

3. Move the governor arm (B) towards the carburetor (F) as far as it will move (wide open throttle) and hold in position.

4. Insert a nail into the hole (G) on the cross shaft (E) and rotate the shaft counterclockwise as far as it will turn, then tighten hex nut (D) securely.

Sensitivity Adjustment

NOTE: Governor sensitivity is adjusted by repositioning the governor spring in the holes on the governor lever. If speed surging occurs with a change in engine load, the governor is set too sensitive. If a big drop in speed occurs when normal load is applied, the governor should be set for greater sensitivity.



M85862

1. To increase (H) the sensitivity, move the spring (I) closer to the governor lever pivot point.

2. To decrease (J) the sensitivity, move the spring (I) away from the governor lever pivot point.

Carburetor Float Adjustment

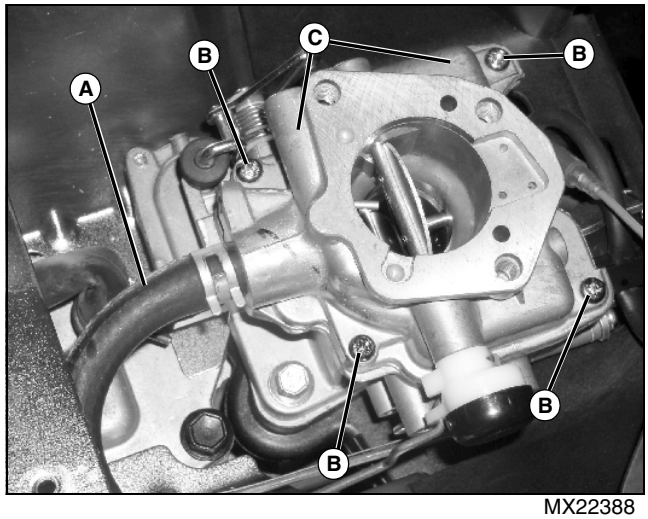
Reason

To check and adjust carburetor float.

NOTE: It is not necessary to remove the carburetor from the engine to check and adjust the float.

Procedure

1. Remove the air cleaner and breather hose.



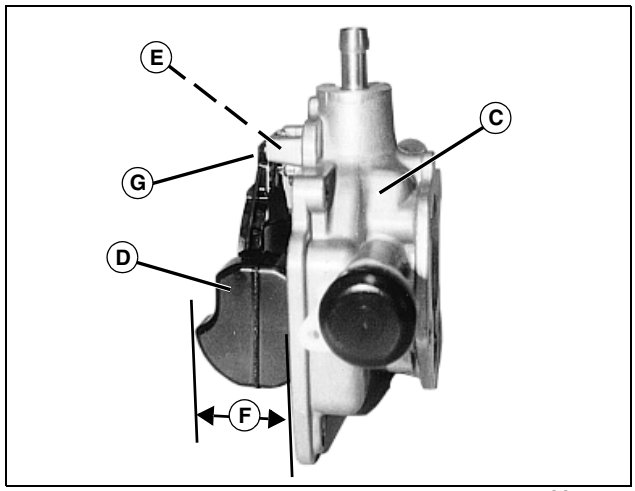
MX22388

2. Disconnect the fuel line (A) from the carburetor.

3. Clean dirt and debris from exterior of carburetor.

4. Remove the four screws (B) holding the two carburetor halves together. Carefully lift the carburetor air horn assembly (C) off the carburetor body and disconnect choke linkage.

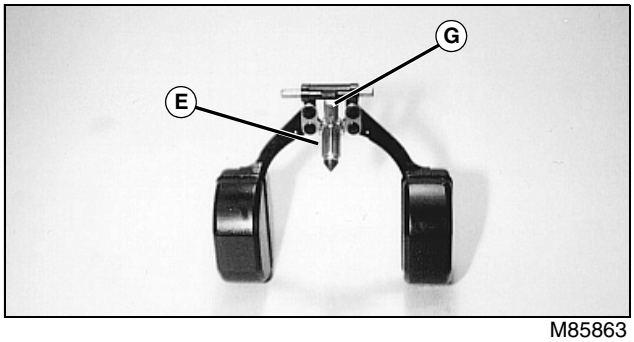
NOTE: The fuel inlet needle tip is spring loaded. Make sure float assembly resets against the fuel inlet needle without depressing the tip.



M85856

5. Hold the carburetor air horn (C) so that the float assembly (D) hangs vertically and rests lightly against the fuel inlet needle (E). The fuel inlet needle should be fully seated but the needle tip should not be depressed.

6. The correct float height adjustment is 22 mm (0.86 in.) (F) measured from the float bottom to the air horn casting. Be sure to measure from the casting surface, not the rubber gasket surface. Adjust the float height by carefully bending the tab (G).



M85863

7. If proper float height adjustment cannot be achieved, check to see if the fuel inlet needle (E) is dirty, obstructed or worn. Remove the brass screw and float assembly to remove the fuel inlet needle.

8. Once proper float height is obtained, carefully lower the carburetor air horn assembly onto the carburetor body connecting choke linkage. Install the four screws.

9. Connect the fuel line.

10. Install the breather hose and air cleaner.

Specifications

Carburetor Air Horn Cap Screws . . . 1.7 N•m (15 lb-in.)
Float Height Adjustment . . . . . 22 mm (0.86 in.)

Slow Idle Speed Adjustment

CAUTION: Avoid Injury! DO NOT attempt to adjust carburetors that meet California Air Resource Board/Environmental Protection Agency (CARB/EPA) restrictions unless you are a factory trained technician with authorization to service CARB/EPA Emissions Carburetors. These carburetors have no fast idle adjustment - the main jet is set at the factory.

Reason

To set engine slow idle mixture and rpm.

IMPORTANT: Avoid damage! 1500 and 3000 meter high altitude jet kits are available. These jets must be installed by an authorized repair facility.

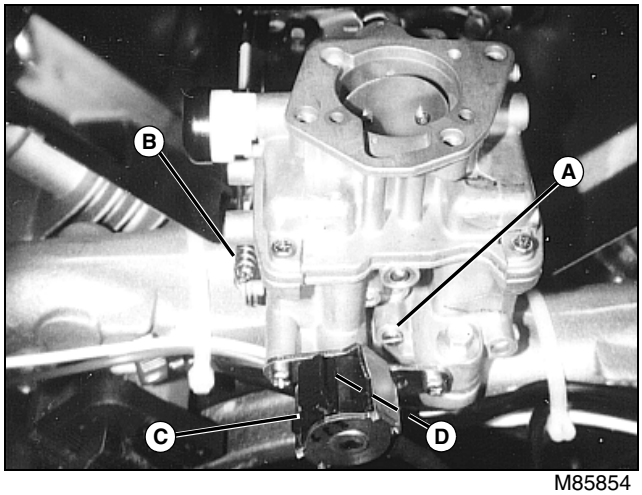
Equipment

- JT07270 Pulse Tachometer

Procedure

1. Move transaxle to neutral. Lock park brake.
2. Connect pulse tachometer.

IMPORTANT: Avoid damage! DO NOT force the SLOW idle mixture screw tight; this will damage the needle and seat. Air cleaner removed for photo; do not remove for adjustment.



M85854

A - Slow Idle Mixture Screw
B - Slow Idle Stop Screw
C - Fuel Shut-off Solenoid
D - Main Jet

3. Turn SLOW idle mixture screw (A) clockwise until lightly seated, then turn counter-clockwise 1 turn.

4. Start and run engine at MEDIUM idle for 5 minutes to obtain operating temperature. The carburetor has a self-relieving choke. Choke plate and shaft assembly is spring loaded. Check to make sure plate moves freely and is not binding and affecting idle fuel delivery.

5. Move throttle lever to SLOW idle position.

6. Use a pulse tachometer to check engine rpm.

7. Turn SLOW idle stop screw (B) in either direction until specified SLOW idle speed of 1200 ± 75 rpm is reached.

8. Turn SLOW idle mixture screw in (slowly) until engine speed drops. Note the position of screw when rpm drops. Back out screw approximately 3/4 turn.

9. Recheck slow idle and adjust slow idle stop screw again if necessary.

Specifications

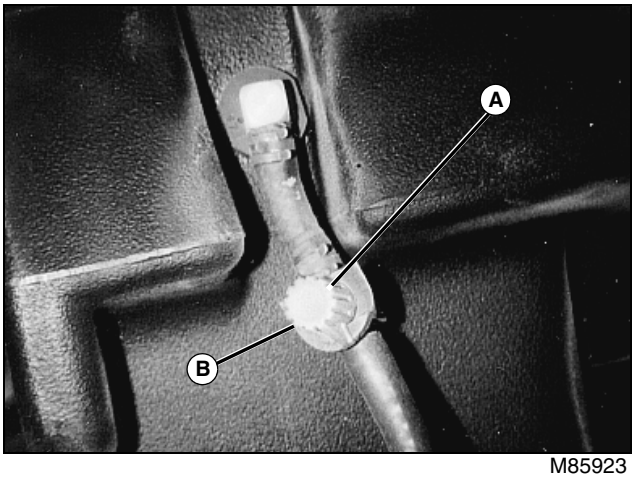
SLOW idle stop screw setting. . . . . .1200 ± 75 rpm

Repair

Fuel Tank Removal and Installation

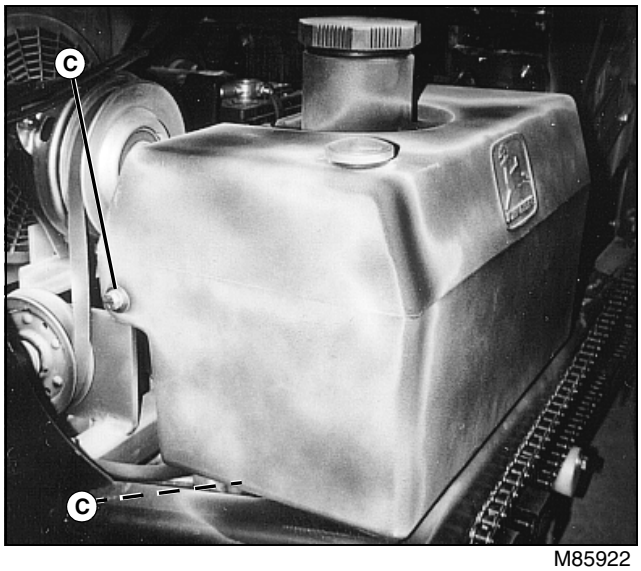
CAUTION: Avoid Injury! Gasoline is explosive. Do not expose to flame or spark. Serious injury can result. Catch or wipe up any spilled fuel immediately.

NOTE: Fuel tank can be removed first, then fuel shut-off turned off.



M85923

1. Turn fuel shut-off valve (A) off (B) (rotate valve to “up” position).



M85922

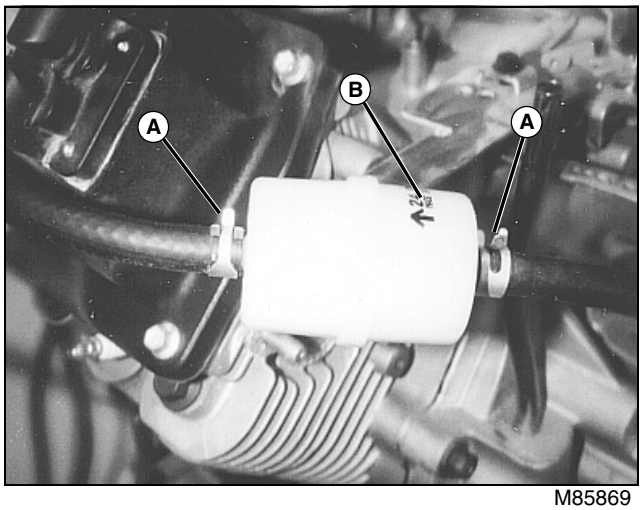
2. Remove both fuel tank bolts (C).

NOTE: Gas line does not have to be disconnected unless replacing it or fuel tank.

3. Lift fuel tank from frame.

Fuel Filter Removal and Installation

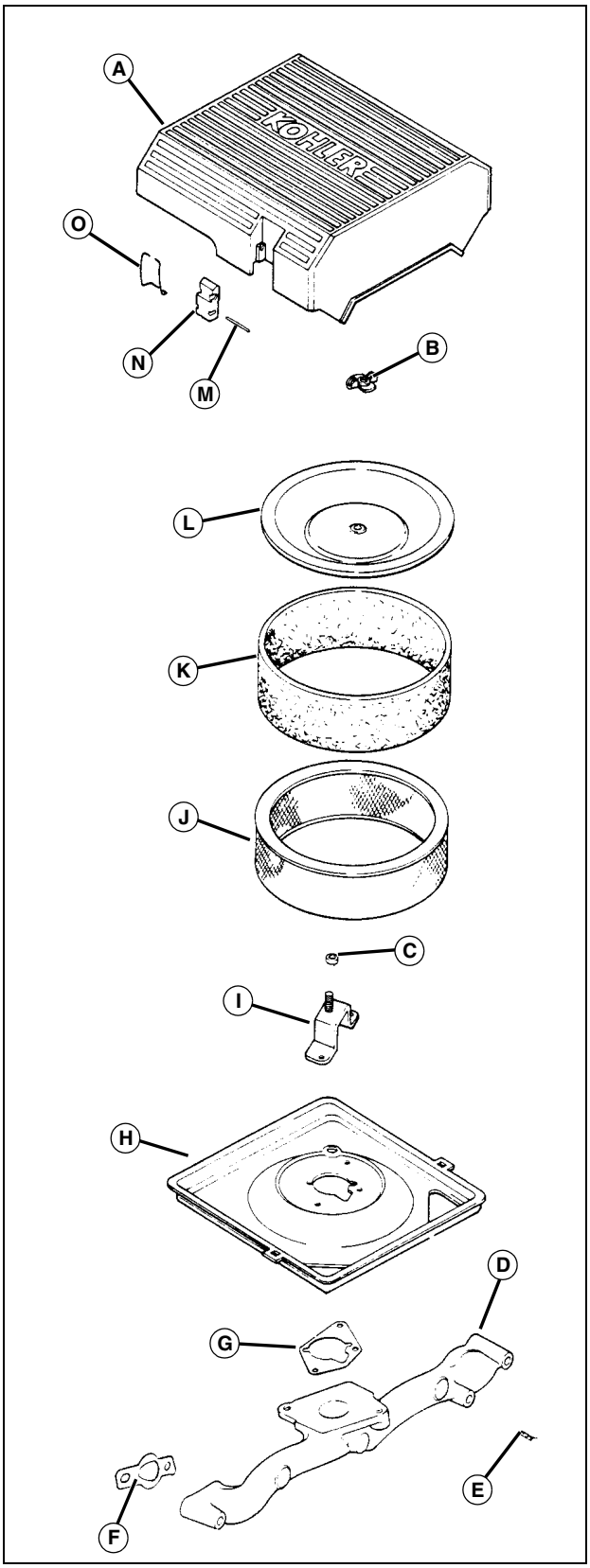
CAUTION: Avoid Injury! Keep cigarettes, sparks, and flames away from fuel system. Make sure engine is cool to touch.



M85869

1. Turn fuel shut-off valve to OFF position.
2. Slide filter clamps (A) back to disconnect hoses from filter.
3. Install new filter with arrow (B) pointing towards carburetor.
4. Clamp filter in place with two clamps.
5. Turn fuel shut-off valve to ON position.
6. Fill tank. Check for and fix any leaks.

Air Intake System Removal, Servicing, and Installation



M85842

A - Air Cleaner Cover
B - Wing Nut
C - Seal
D - Intake Manifold
E - Screw
F - Intake Manifold Gasket
G - Air Cleaner Base Gasket
H - Air Cleaner Base
I - Air Cleaner Bracket
J - Air Cleaner Element
K - Precleaner Element
L - Inner Air Cleaner Cover
M - Latch Lever Pin
N - Lever Latch
O - Latch Spring

IMPORTANT: Avoid damage! Wash and oil foam precleaner every 25 hours of operation or seasonal (more often under dusty conditions). Check paper element every 100 hours of operation or seasonal (more often under dusty conditions). DO NOT WASH OR USE PRESSURIZED AIR to clean paper element or damage may occur. Replace element when dirty.

Procedure

1. Remove cover.
2. Remove foam precleaner from paper element.
3. Wash precleaner in warm water with detergent. Rinse precleaner thoroughly until all traces of detergent are gone. Squeeze out excess water (do not wring). Allow to air dry.
4. Saturate foam precleaner with new engine oil. Squeeze out all excess oil.
5. Replace paper element if dirty.
6. Reinstall in reverse order of disassembly.

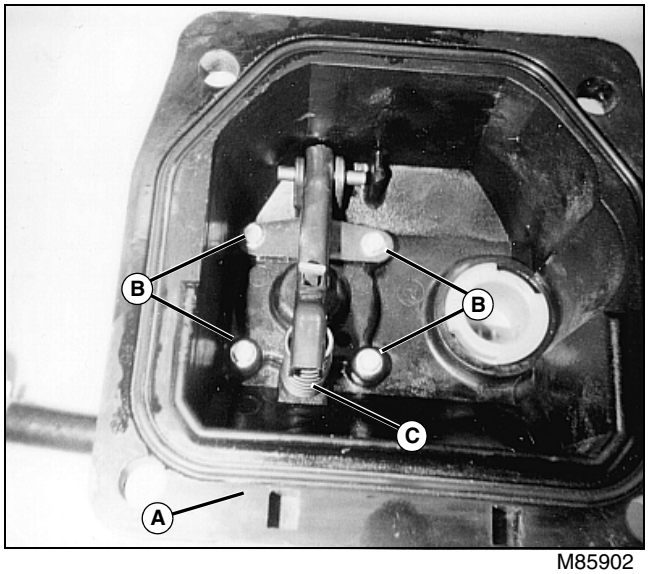
Specifications

Air Cleaner Bracket Screws . . . . . 9.9 N•m (88 lb-in.)

Fuel Pump Removal and Installation

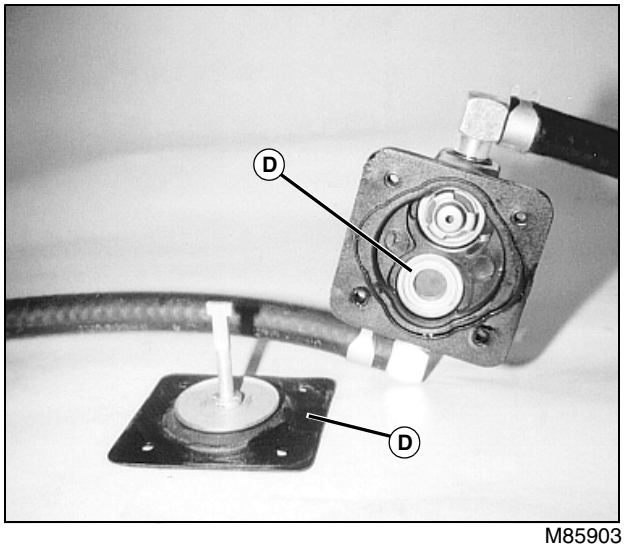
CAUTION: Avoid Injury! Gasoline is explosive. Do not expose to flame or spark. Serious injury can result. Store in a properly marked, safe container. Wipe-up any spills IMMEDIATELY.

1. Remove key from ignition.
2. Turn fuel shut-off valve off.



M85902

3. Remove valve cover (A).
4. Remove four fuel pump cap screws (B).
5. Remove fuel pump. Inspect springs (C) - should not bind.



M85903

6. Inspect gaskets (D). If gaskets are worn or leak - replace.
7. Reinstall fuel pump.
8. Install remaining components in reverse order of removal.

Specifications

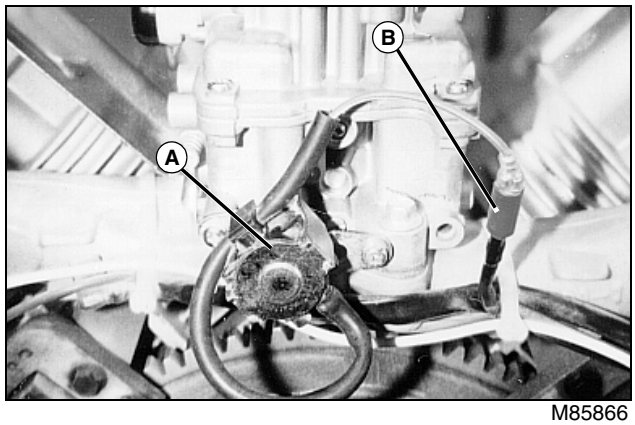
Fuel Pump Cap Screws . . . . . 2.3 N•m (20 lb-in.)
Valve Cover Cap Screws . . . . . 7.9 N•m (70 lb-in.)

Carburetor Removal and Installation

CAUTION: Avoid Injury! Gasoline is explosive. Do not expose to flame or spark. Serious injury can result.

Procedure

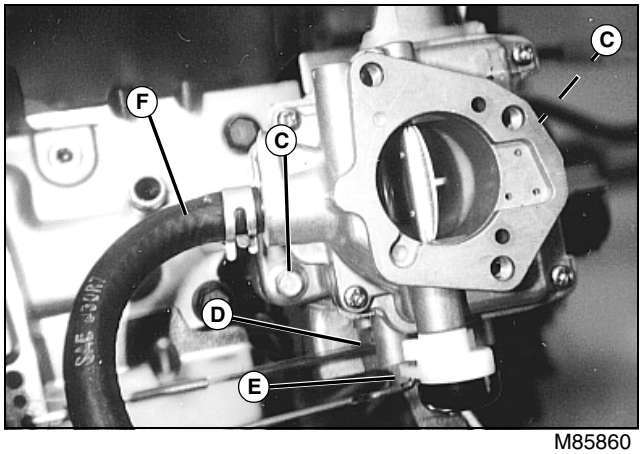
1. Turn key switch OFF and disconnect battery negative (-) ground cable.



M85866

2. Turn fuel shut-off valve (A) to OFF position, then disconnect fuel line and solenoid wire (B).

NOTE: Place a clean rag underneath the fuel line to catch any fuel remaining in the carburetor or line.



M85860

3. Remove air filter assembly (not shown) and two carburetor cap screws (C).

4. Disconnect throttle (D) and choke (E) linkage rods from carburetor levers.

5. Remove and install new gaskets.

6. Connect throttle and choke linkage rods and install carburetor with two bolts.

7. Connect solenoid wire, and fuel line (F).

8. Install air cleaner bracket and air cleaner assembly.

9. Turn fuel shut-off valve to ON position.

10. Adjust carburetor, see Test and Adjustments earlier in this section.

Specifications

Carburetor Cap Screws . . . . . 9.9 N•m (88 lb-in.)
Air Cleaner Bracket Cap Screws . . . 9.9 N•m (88 lb-in.)

Carburetor Disassembly and Assembly

CAUTION: Avoid Injury! Gasoline and carburetor cleaners are extremely flammable. DO NOT expose them to flame or spark. Follow the cleaner manufacture's warning and instructions on its proper and safe use. Never use gasoline as a cleaning agent.

DO NOT attempt to adjust the main jet (fast idle) on carburetors that meet California Air Resource Board/Environmental Protection Agency (CARB/EPA) restrictions unless you are a factory trained technician with authorization to service CARB/EPA Emissions Carburetors. These carburetors have no fast idle adjustment - the main jet is set at the factory.

IMPORTANT: Avoid damage! 1500 and 3000 meter high altitude jet kits are available. These must be installed by an authorized repair facility.

Procedure

1. Remove air horn assembly.

2. Remove float pin, float, inlet needle, slow speed jet and spring from carburetor air horn.

3. Remove fuel shut-off solenoid, O-rings, solenoid seat and main jet from carburetor lower body.

NOTE: Do not soak carburetor in cleaning solvent with gaskets or O-rings installed. Cleaning solvent may damage these components. Always install new O-rings and gaskets.

4. Clean carburetor using cleaning solvent and compressed air.

5. Install fuel inlet needle in float tab. Install float, float pin and inlet needle in air horn assembly. Tighten screw. Check float height. See "Carburetor Float Adjustment" on page 40.

6. Install slow speed jet with stepped end facing out. Make sure jet is fully seated.

7. Install slow idle mixture screw and spring in carburetor lower body. Set preliminary adjustment for mixture screw. Turn clockwise until LIGHTLY seated and back out one turn.

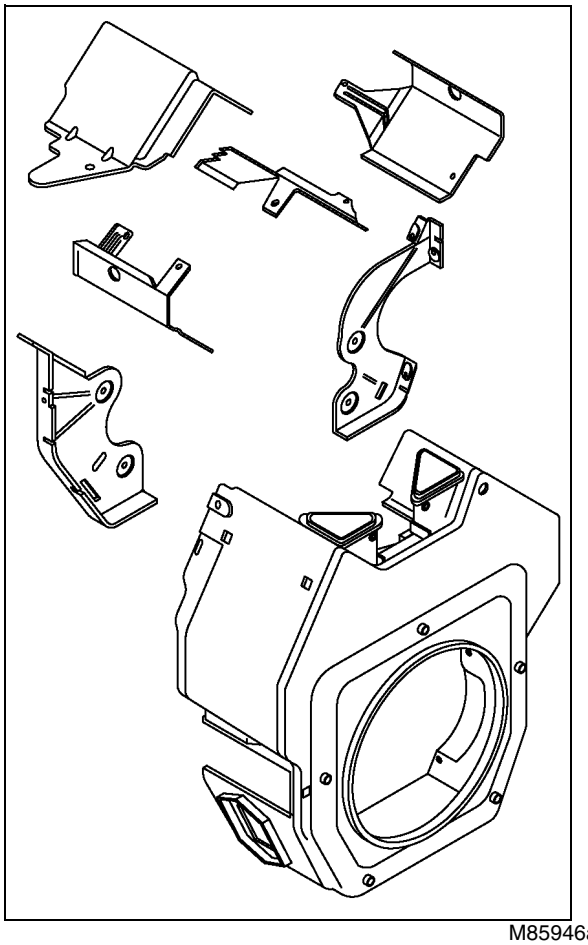
8. Install air horn on lower body with four screws. Tighten four screws to 1.7 N•m (15 lb-in.).

9. Install throttle control bracket screws and air cleaner assembly. See slow idle adjustment.

Specifications

Air Horn Screws . . . . . 1.7 N•m (15 lb-in.)
Carburetor Mounting Screws . . . . . 9.9 N•m (88 lb-in.)
Throttle
Control Bracket . . . . . 9.0 ± 1.5 N•m (80 ± 15 lb-in.)

Blower Housing and Shields Removal and Installation



M85946a

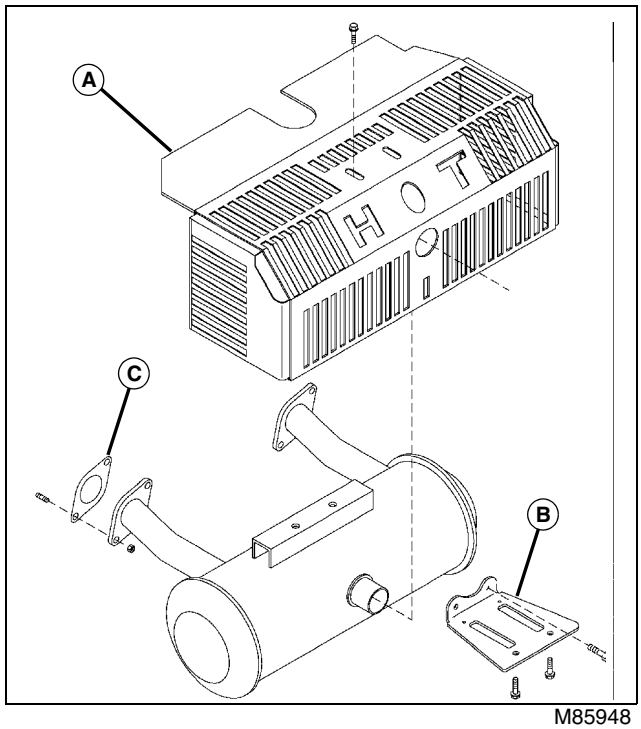
1. Remove cap screws to remove blower housing and shield.

2. When installing cap screws always tighten evenly to prevent pinching shields or blower housing.

Specifications

Blower Housing Cap Screws . . . . . 8.6 N•m (65 lb-in.)
Shield Cap Screws (short screws for lower front mounting holes - M5. . . . . 4.7 N•m (35 lb-in.)
Shield Cap Screws - M6 . . . . . 8.6 N•m (65 lb-in.)

Muffler and Intake Manifold Removal and Installation

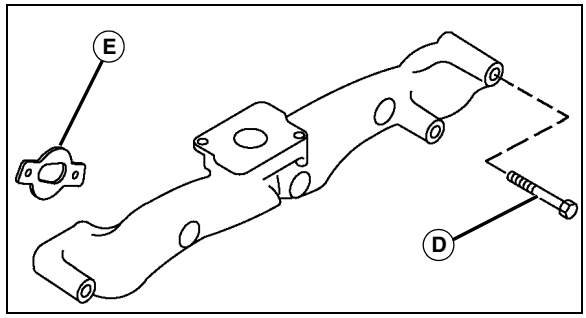


M85948

1. Remove muffler shield (A).

2. Remove bracket (B) and hex flange nuts to remove muffler. Replace gaskets (C) if necessary.

3. Reinstall in reverse order of disassembly.



M85947

4. Remove intake manifold bolts (D). Replace gaskets (E) if necessary.

5. Reinstall in reverse order of disassembly.

Specifications

Muffler Cap Screws . . . . . 9.9 N•m (88 lb-in.)
Muffler Hex Flange Nuts . . . . . 24.4 N•m (216 lb-in.)
Intake Manifold Bolts . . . . . 9.9 N•m (88 lb-in.)

Engine Removal and Installation

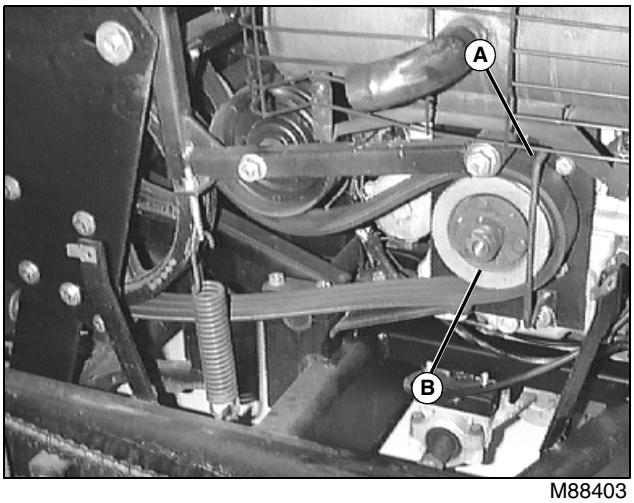
1. Turn all switches OFF and disconnect battery negative (-) cable.

2. Disconnect wiring harness from engine, starter, fuel shut-off solenoid and throttle solenoid.

3. Disconnect throttle and choke cables.

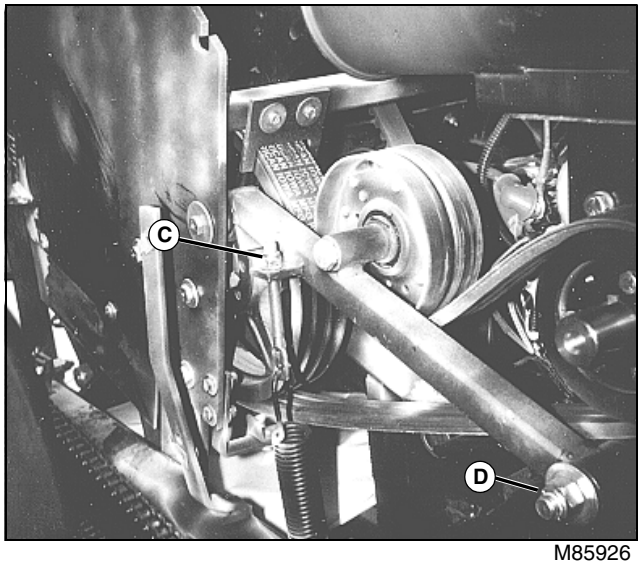
4. Remove fuel tank. See “Fuel Tank Removal and Installation” on page 42.

Machine Drive Belt



M88403

1. Remove belt guide (A) from front sheave (B).



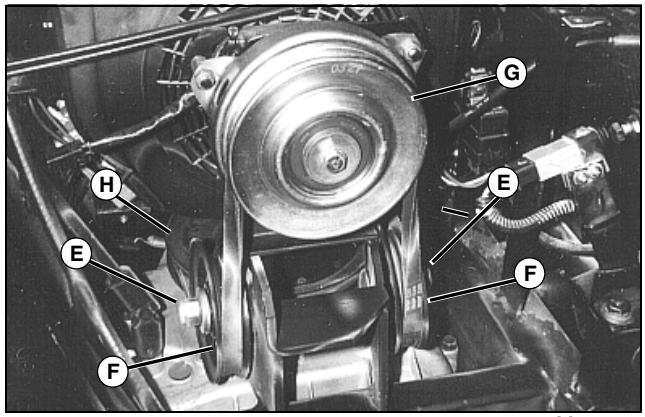
M85926

2. Remove belt tension adjustment nut (C).

3. Remove bracket bolt (D) to provide clearance for belt removal.

4. Repeat for transaxle drive belt.

Transaxle Drive Belt

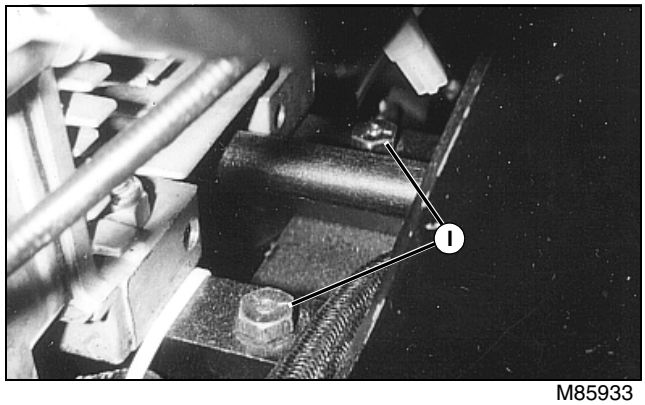


M88399

1. Loosen nut (E) securing either idler pulley (F) to allow slack in belt.

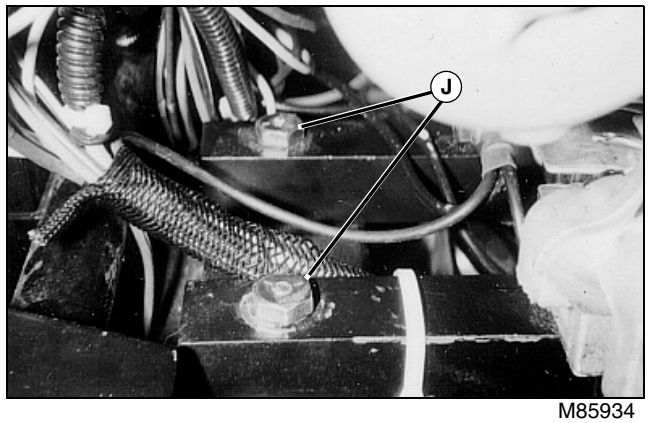
2. Remove belt from the traction drive clutch (G) and at the two directional sheaves.

3. Remove the belt from the transaxle drive sheave (H) by lifting up and pulling away.



M85933

4. Remove two bracket mounting bolts (I) (underneath oil filter).



M85934

5. Remove two bracket mounting bolts (J) from opposite side (underneath starter).

6. Remove engine.

Installation

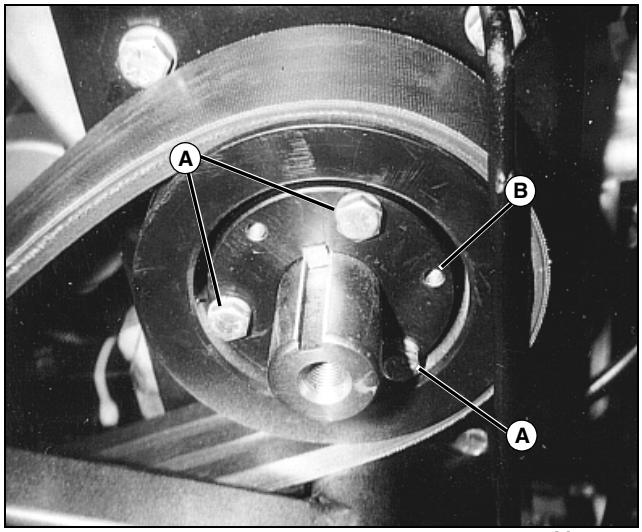
Install in reverse order of disassembly. See “Drive Belt Removal, Installation and Adjustment - Aercore 800” on page 247 in the Miscellaneous section for machine drive belt adjustment, and “Transaxle Drive Belt Removal and Adjustment - Aercore 800” on page 200 in the Gear Power Train section for transaxle drive belt adjustment.

Specifications

Bracket to Frame Bolts . . . . . 32 N•m (24 lb-ft)

Engine Drive Sheave Removal and Installation

1. Remove belt. See “Drive Belt Removal, Installation and Adjustment - Aercore 800” on page 247 in the Miscellaneous section.



M85935

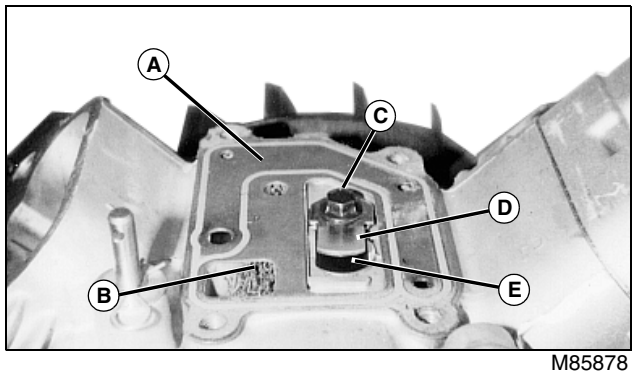
2. Remove three drive sheave bolts (A). Insert bolts in threaded holes (B). Tighten equally to remove sheave.

3. Install in reverse order of disassembly. See “Drive Belt Removal, Installation and Adjustment - Aercore 800” on page 247 in the Miscellaneous section.

Breather Removal and Installation

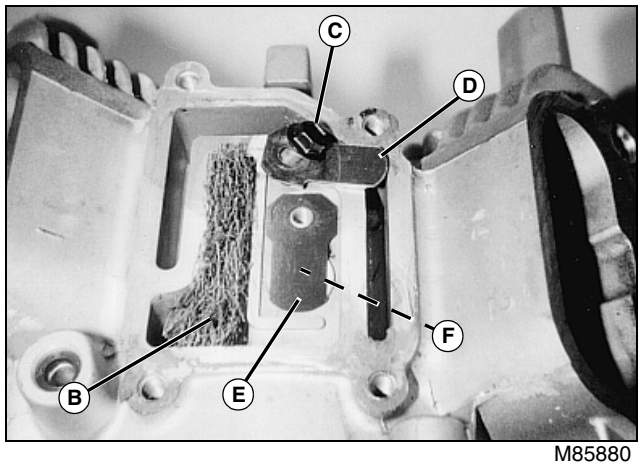
1. Remove governor arm.

2. Remove breather cover cap screws.



M85878

3. Remove breather cover, gasket (A), air breather filter (B), cap screw (C), breather reed retainer (D), and breather reed (E).



M85880

4. Check that breather opening (F) is clear.

5. Replace breather reed (E) if it does not lie flat on casting.

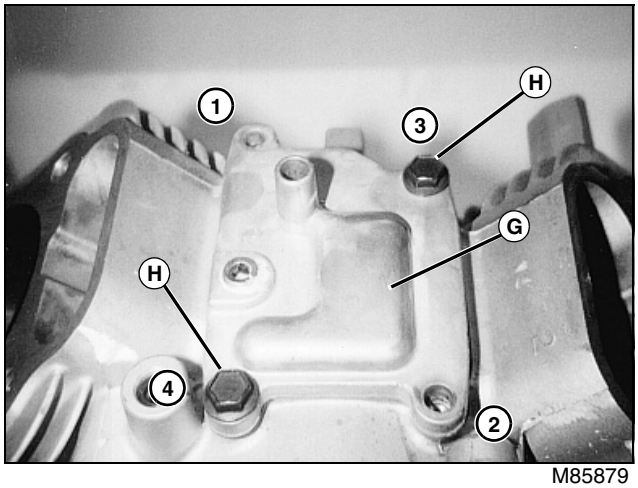
IMPORTANT: Avoid damage! Clean mating surface of any sealant residue. Prepare the sealing surfaces of the crankcase and breather cover by using gasket removing solvent. DO NOT scrape surfaces as this could result in leakage.

6. Check to make sure there are no nicks or burrs on sealing surfaces.

7. Install cap screw (C), breather reed retainer (D) and breather reed into crankcase.

8. Insert new air breather filter (B) into crankcase.

9. Install new gasket.



M85879

10.Carefully position breather cover (G) on crankcase. Make sure filter hairs are not in cover seating surface.

11.Install two cap screws depicted (H) - finger tight.

12.Install inner shields and remaining two cap screws finger tight. DO NOT tighten cap screws at this time.

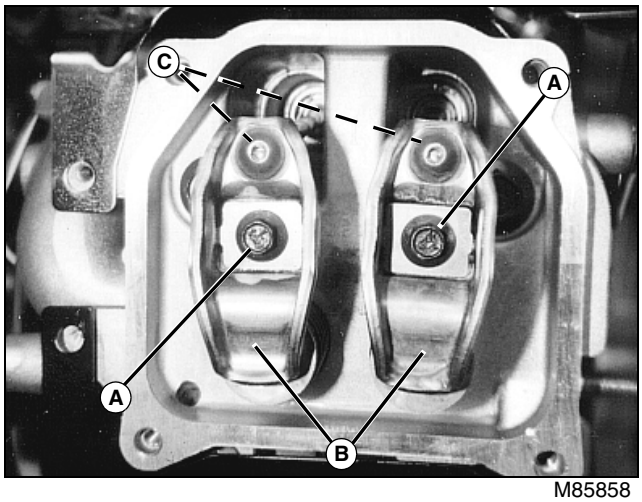
13.After blower housing and remaining shields are installed tighten four breather cap screws in torque sequence depicted.

Specifications

Breather Cap Screws . . . . . 8.6 N•m (65 lb-in.)

Rocker Arms and Push Rods Removal and Installation

1. Remove valve cover.



M85858

2. Remove rocker arm bolts (A).

3. Remove rocker arms (B).

4. Remove push rods (C). Push rods must go in exact location as removed. Mark cylinder head and push rods to aid in reassemble.

5. Inspect and replace components as necessary.

6. Install components in reverse order of removal. Do not interchange parts from one cylinder head with parts from the other cylinder head.

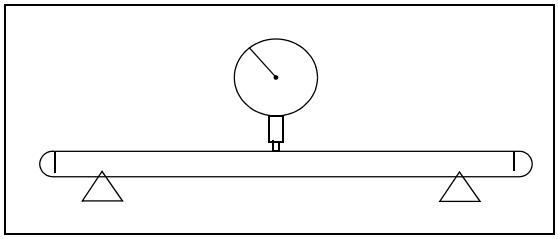
IMPORTANT: Avoid damage! If engine is started with valve spring completely compressed (no gap between coils), engine valve train will be damaged.

7. Rotate engine to check for free operation of the valve train. Check the clearance between valve spring coils at full camshaft lift. If valve spring is compressed to the point of binding (no free space between spring coils) lifter is overextended. Allow 10 - 15 minutes for lifter to bleed down. Recheck. If still no clearance between spring coils repair or replace overextended lifter.

Specifications

Rocker Pivot Bolts . . . . . 14 N•m (124 lb-in.)

Push Rod Inspection


MIF

Specifications

Push Rod Bend (maximum) . . . . . 0.76 mm (0.030 in.)

Cylinder Heads Removal and Installation

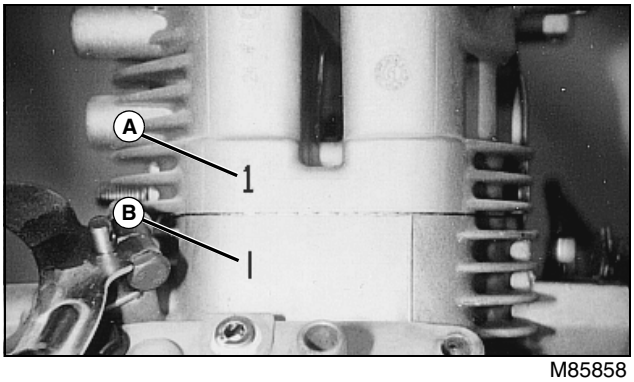
IMPORTANT: Avoid damage! Engine must be cold before removing cylinder head bolts to avoid warping aluminum cylinder head.

1. Engine must be removed from machine to provide room to remove cylinder heads.

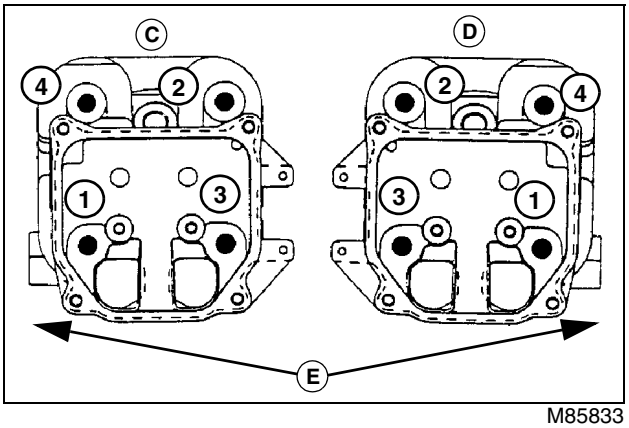
2. Remove intake manifold, muffler, and blower housing shield.

3. Remove head bolts and cylinder head. Discard head gasket. Clean cylinder head and engine block surface. Check to make sure there are no nicks or burrs on the sealing surfaces of the cylinder head or crankcase.

4. Install new cylinder head gasket.



M85858



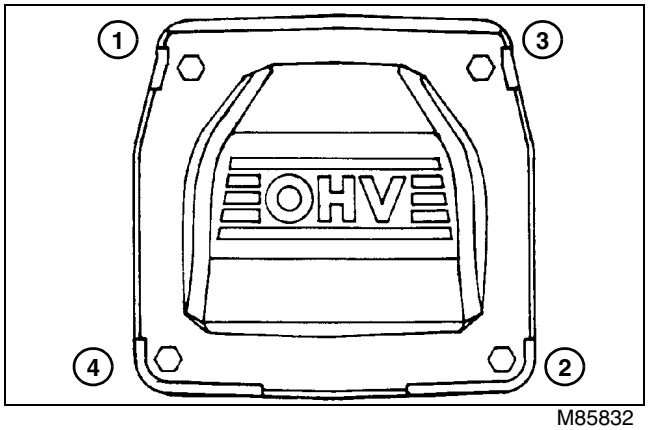
M85833

Picture Note: Exhaust port side (E) shown.

5. Align cylinder head mark (A) with crankcase mark (B). Both cylinder heads and crankcase are marked either 1 (C) or 2 (D).

6. Tighten cylinder head bolts in 20 N•m (15 lb-ft) increments in sequence illustrated. Repeat procedure, tightening cylinder head bolts to a final value of 40.7 N•m (30 lb-ft).

7. Install push rods (reinstall push rods in same position as before disassembly) and rocker arms. See “Rocker Arms and Push Rods Removal and Installation” on page 49.



M85832

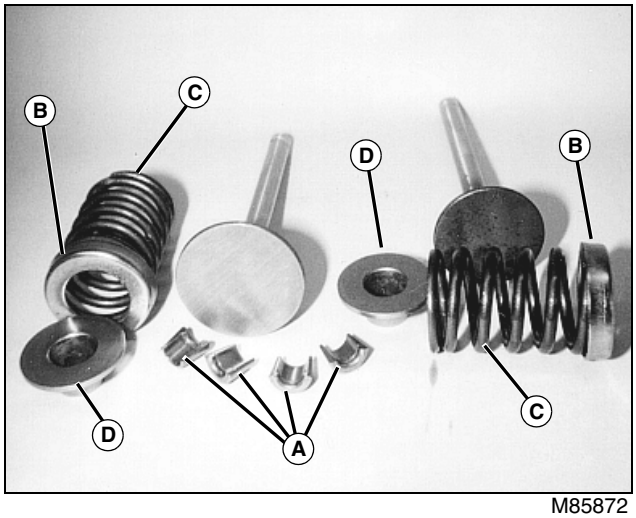
8. Clean valve cover and install new valve cover O-ring gasket. Tighten valve cover cap screws, in sequence illustrated.

Specifications

Cylinder Head Bolts . . . . . 40.7 N•m (30 lb-ft)
Valve Cover Cap Screws . . . . . 7.9 N•m (70 lb-in.)

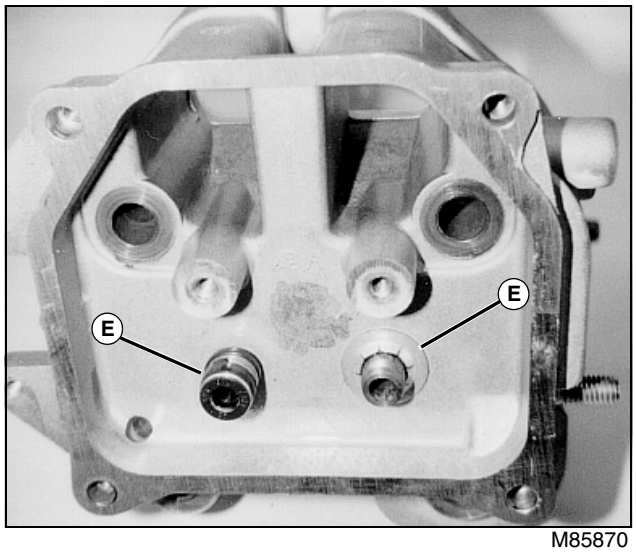
Valves and Springs Removal and Installation

1. Compress intake and exhaust springs using valve spring compressor.



M85872

2. Remove valve keepers (A), valve spring caps (B), valve springs (C), valve spring retainers (D) and valves.



M85870

3. Replace valve stem seals (E). Always use a new seal when valves are installed in the cylinder head. Also, replace the seals if they are deteriorated or damaged in any way. Never reuse an old seal.

4. See “Valve Inspection” on page 51.

5. Install valve components.

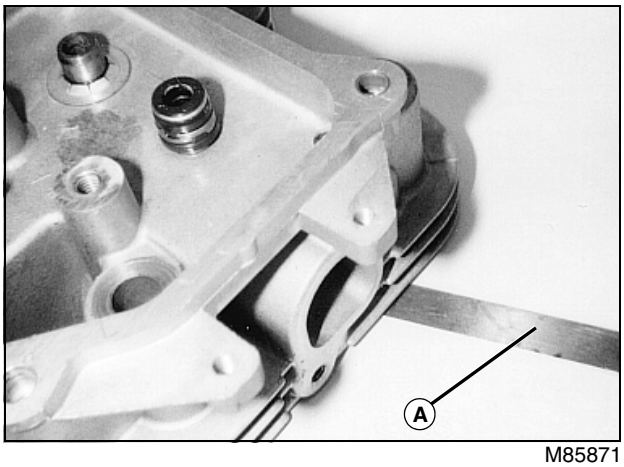
6. Compress spring and install keepers in grooves.

7. Install rocker arm assembly and cylinder head in reverse order of disassembly. See “Rocker Arms and Push Rods Removal and Installation” on page 49 and “Cylinder Heads Removal and Installation” on page 49.

Cylinder Head Inspection

1. Remove carbon deposits and clean gasket surface with abrasive pad.

2. Inspect head for cracks or damage. Make sure oil drain port is open.



M85871

3. Put head on a flat surface plate. Check for distortion at several points with a feeler gauge (A). Replace head if distorted beyond specification.

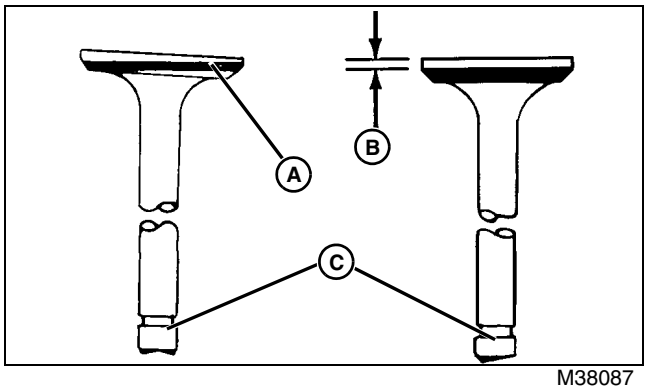
Specifications

Cylinder Head Distortion (maximum) . . . . . 0.076 mm (0.003 in.)

Valve Inspection

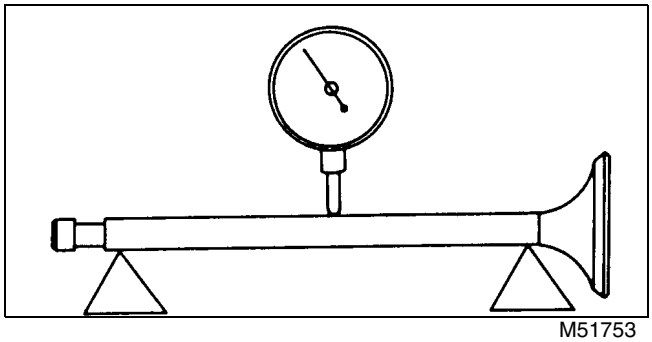
1. Remove carbon from valve head, face, and stem.

2. Check valve for cracks or damage.



M38087

3. Replace warped valves (A) or valves with less than serviceable margin (B). Valve stem ends (C) should be square, not worn uneven as shown.



M51753

4. Inspect valve stems for bends using V-blocks and dial indicator. Turn valve slowly and read variation. Replace if variation is greater than specification.

Specifications

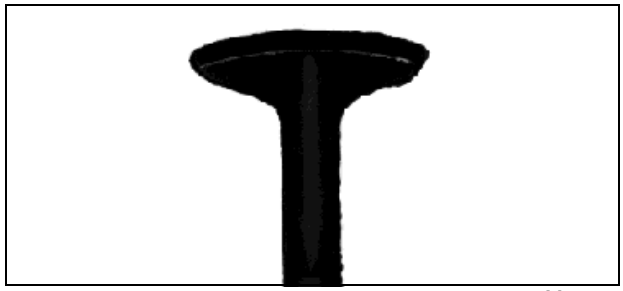
Valve Stem Bend (maximum) . . . . 0.076 mm (0.003 in.)

Analyze Valves

M29934

Lead deposits on the intake valve are caused by exhaust gas leakage past the valve when using leaded gasoline. Grind intake valve and reface valve seat to correct this condition.

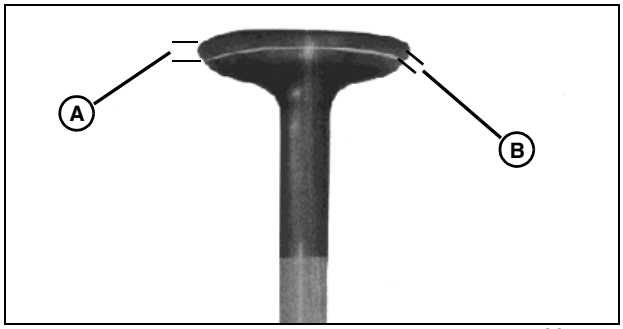
Use unleaded fuel to prevent lead deposits.



M55630

Valve stem corrosion is caused by moisture in the engine which occurs during hot engine cool-down periods or during storage.

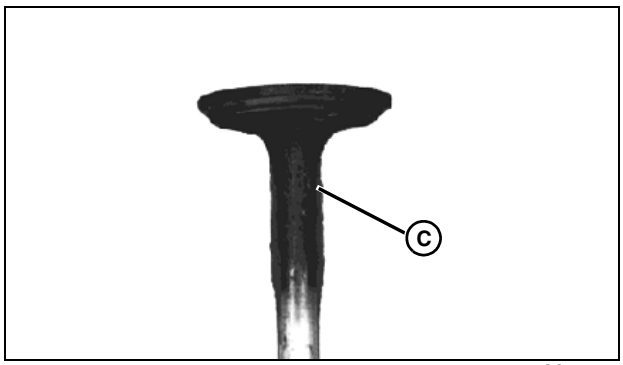
Fogging of combustion chamber with oil before storage helps prevent corrosion. Replace badly corroded valves.



M30024

Operating at high temperatures for long periods of time can cause exhaust valve burning. Burned valve will show dark discoloration into the area protected by the valve guide. Another indication is distortion of the margin (A) and face angle (B). The valve seat may also show erosion.

An overheated engine can also cause valve burning. Check for clogged engine cooling fins. Do not run engine with blower housing removed. Also check for worn valve guides, springs or hydraulic lifters, lean fuel-air mixture, or incorrect spark plug.



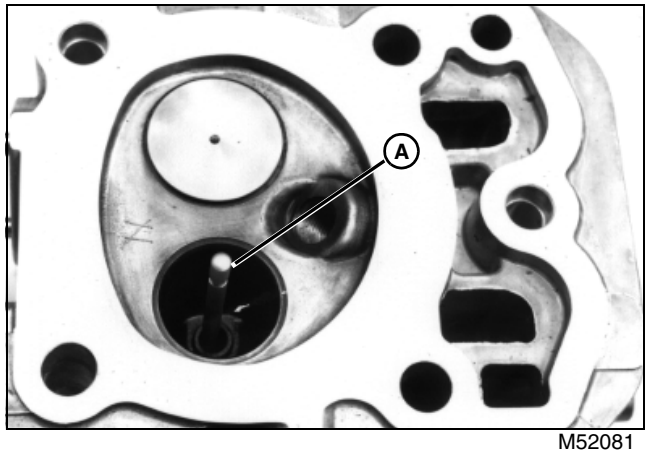
M29936

Use of old or stale gasoline can cause valves to stick.

Gummy deposits (C) can build up on valve and can also gum carburetor, requiring cleaning. Always use fresh gasoline of 87 octane rating or higher. Drain fuel tank, lines, and carburetor before storage.

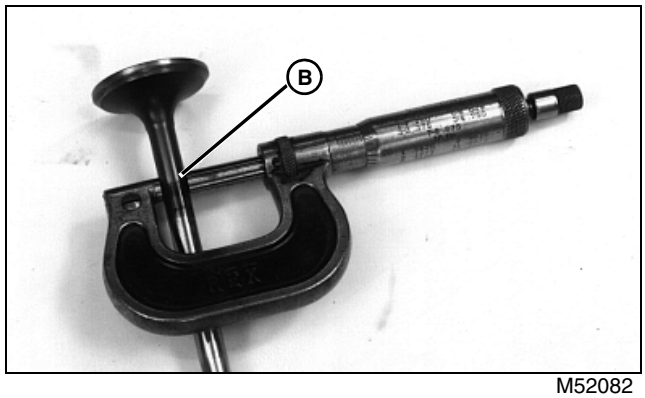
Valve Guides Inspection

1. Clean inside of valve guide. Standard valve guide reamer (D20020WI) can be used.



M52081

2. Measure inside diameter of guide with gauge (A).



M52082

3. Measure outside diameter of valve stem (B).

4. An oversize valve is available. Replace valve if stem-to-guide clearance is too great.

IMPORTANT: Avoid damage! Valve guide can be reamed 0.25 mm (0.010 in.) oversized 0.25 mm (0.010 in.) oversize valve must be installed.

5. Use oversize reaming tool (JDG705) to ream guide, if necessary.

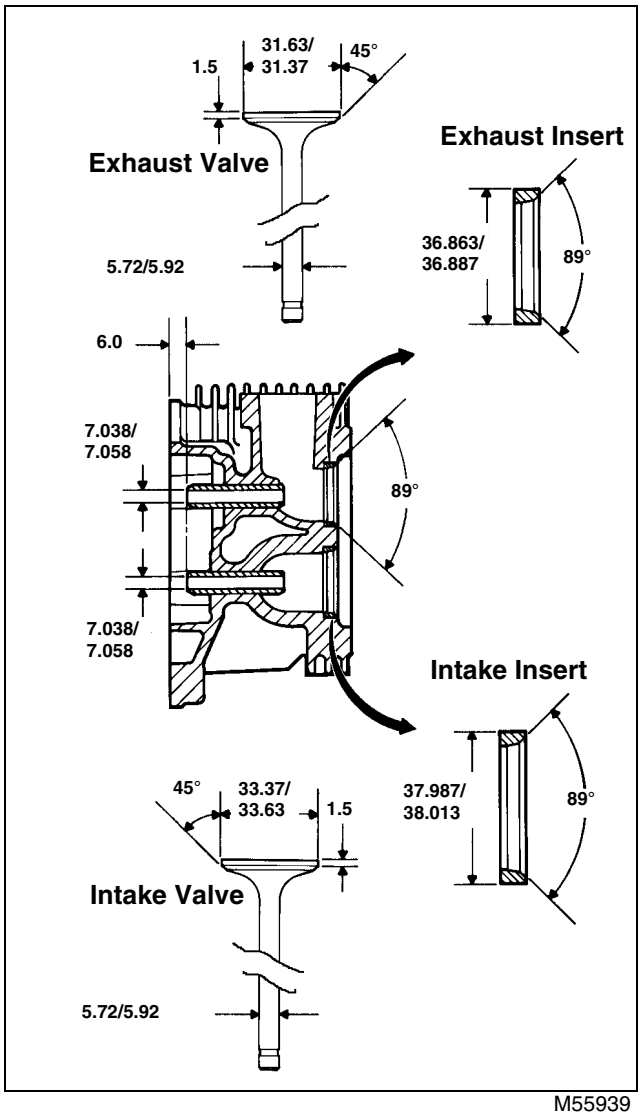
6. Replace cylinder head if inside diameter of guide is greater than oversize specification.

Specifications

Valve Guide Ream (standard) . . . 7.048 mm (0.2775 in.)
Valve Guide Ream (oversize) . . . 7.298 mm (0.2873 in.)
Intake Stem-to-Guide
Clearance . . . . . 0.38 - 0.076 mm (0.0015 - 0.0030 in.)
Intake Guide (Maximum Wear) . . 7.134 mm (0.2809 in.)
Exhaust Stem-to-Guide
Clearance . . . . . 0.050 - 0.088 mm (0.002 - 0.0035 in.)
Exhaust Guide
(Maximum Wear). . . . . 7.159 mm (0.2819 in.)

Recondition Valve Seats

IMPORTANT: Avoid damage! Hardened steel alloy intake and exhaust valve seat inserts are press fitted into the cylinder head. The inserts are not replace able on the engines but can be reconditioned if not too badly pitted or distorted. If cracked or badly warped, the cylinder head should be replaced. With the proper 45° valve face angle and valve seat cut properly (44.5° as measured from centerline when cut 89°) the result would be an 0.5° (1.0° full cut) interference angle where the maximum pressure occurs on the outside diameters of valve face and seat.



M55939

1. Inspect valve seats.

2. Replace cylinder head if seats are warped or distorted beyond reconditioning.

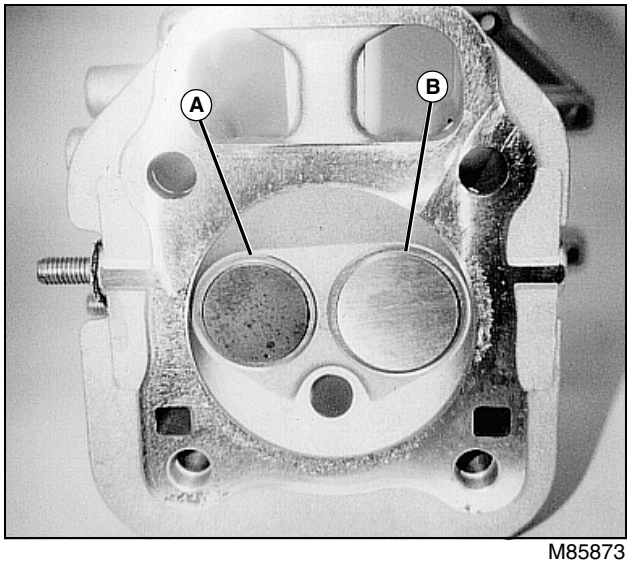
3. Reface pitted or worn seats as shown in drawing.

4. Lap valves after refacing.

5. Check seat for good contact using Prussian Blue Compound.

Lap Valves

IMPORTANT: Avoid damage! Valves and seats should be lapped if they do not make good contact.



M85873

1. Apply light coat of lapping compound to exhaust (A) and intake (B) valve face, then turn valve in seat using vacuum cup tool.

2. Check valve every 8 strokes until a uniform ring appears around surface of valve face.

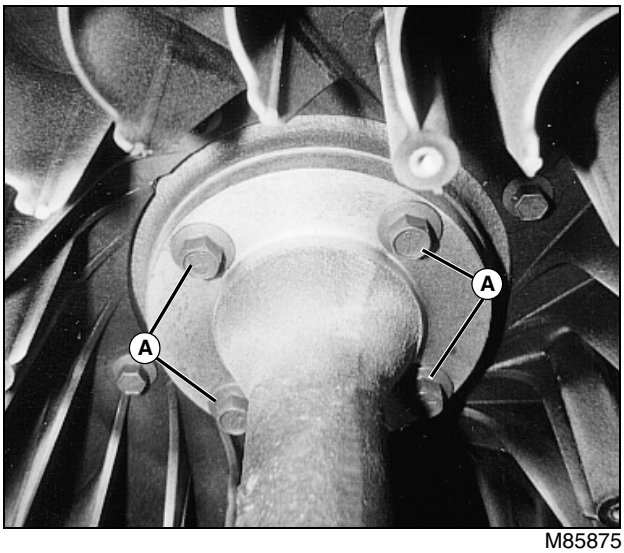
3. Wash parts in solvent to remove lapping compound.

4. Check position of lap mark on face - lap mark must be on or near center of valve face.

Flywheel and Stator Removal and Installation

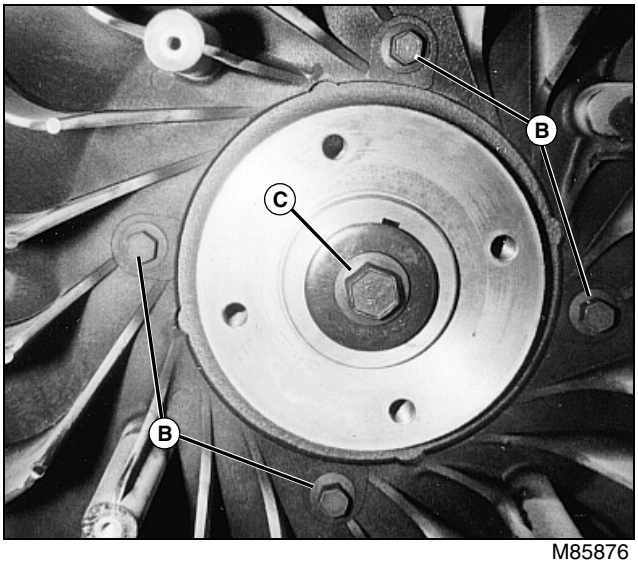
1. Remove blower housing sheet metal.

CAUTION: Avoid Injury! Wear gloves to protect hands. Flywheel and fan could rotate during disassembly and assembly.



M85875

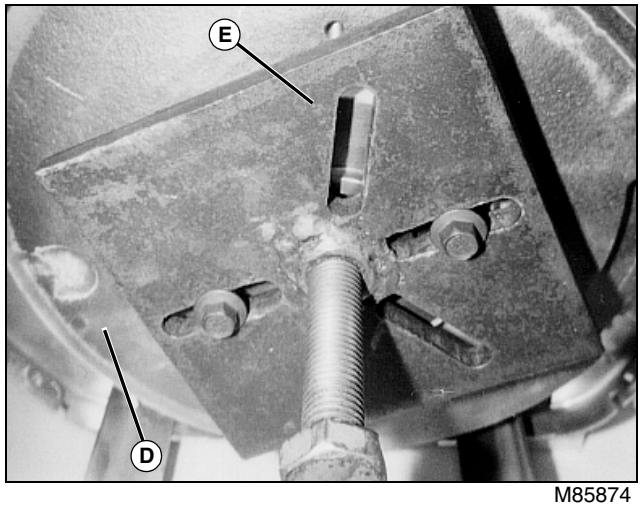
2. Remove four extension shaft cap screws (A). Remove extension shaft.



M85876

3. Remove four fan cap screws (B) and crankshaft cap screw (C) to remove fan.

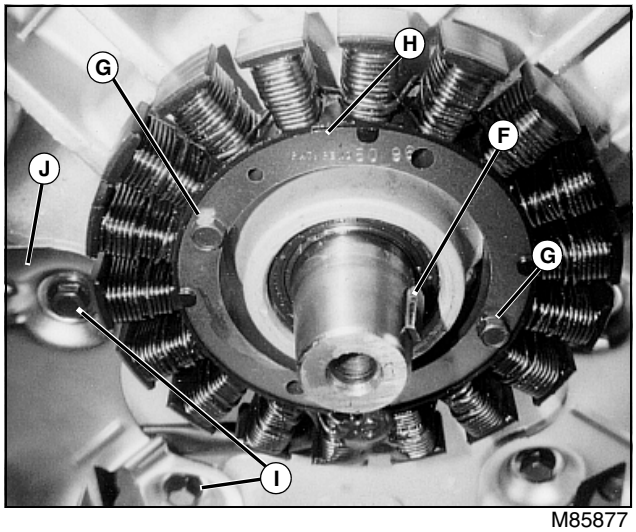
IMPORTANT: Avoid damage! Check that crankshaft end and flywheel hub are clean and free of lubricant, and flywheel key is installed properly in keyway. Improperly installed flywheel can cause machine damage and serious personal injury.



M85874

4. Remove flywheel (D) using a puller (E).

5. Inspect flywheel for cracks, chips, and broken teeth. Replace as necessary. See Electrical section to test magnets.



M85877

6. Inspect for sheared or partially sheared key (F). Remove key.

7. Remove cap screws (G) to remove stator (H) and cap screws (I) to remove left side bracket (J) (right side optional).

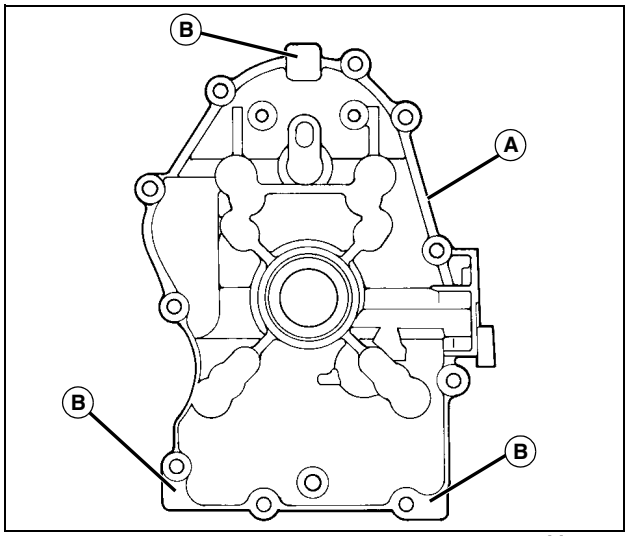
8. Install all components in reverse order of disassemble.

9. Check ignition module air gap. See “Flywheel Magnets Test” on page 170 and “Ignition Module Air Gap Adjustment” on page 165 in the Electrical section.

Specifications

Stator Cap Screws . . . . . 4 N•m (35 lb-in.)
Crankshaft Cap Screw . . . . . 66.4 N•m (49 lb-ft)
Extension Shaft Cap Screws . . . . . 66.4 N•m (49 lb-ft)
Fan Cap Screws . . . . . 9.9 N•m (88 lb-in.)

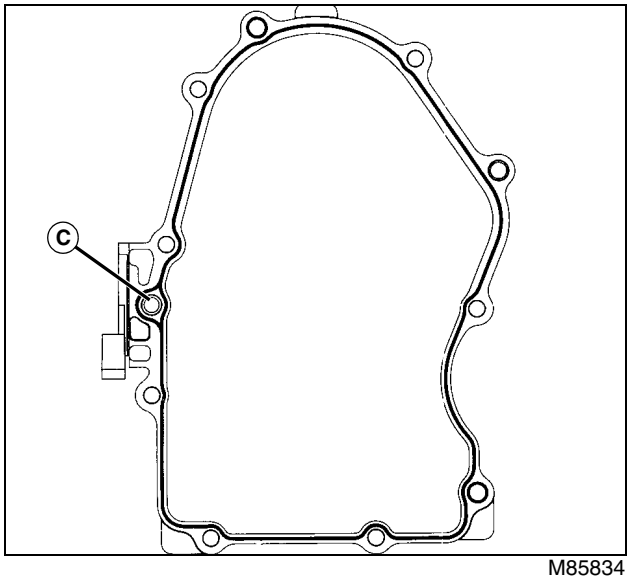
Closure Plate Removal and Installation



M85835

1. Remove ten cap screws.
2. Pry closure plate (A) from crankcase using flat blade screwdriver on splitting tabs (B).
3. Clean mating surfaces of crankcase and closure plate.
4. Replace closure plate seal. See “Engine Block and Closure Plate Seals Removal and Installation” on page 68.

IMPORTANT: Avoid damage! DO NOT get sealant in oil passage. Apply just enough to seal both sides of oil passage when case halves are fastened together.



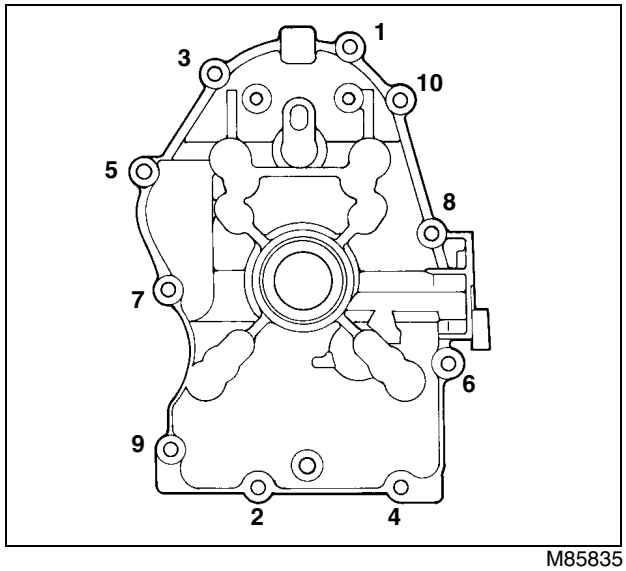
M85834

5. Install new O-ring in oil passage (C).
6. Apply 1.6 mm (1/16 in.) bead of RTV silicone sealant to closure plate flange. DO NOT block oil passage.
7. Apply grease to inside lip of closure plate seal.

NOTE: Be sure to align flats of governor cross shaft before installing closure plate. See “Governor Removal and Installation” on page 56.

Install closure plate over crankshaft carefully to avoid damaging closure plate seal.

8. Install closure plate onto crankcase.



M85835

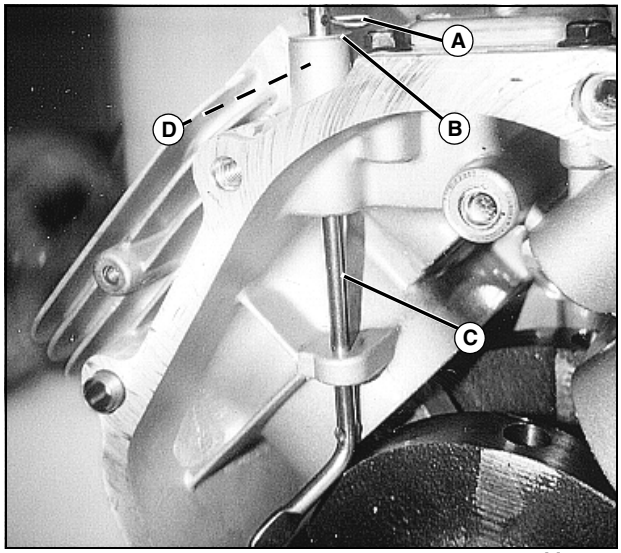
9. In sequence shown, tighten closure plate cap screws.

Specifications

Closure Plate Cap Screws . . . . . 24.4 N•m (216 lb-in.)

Governor Removal and Installation

1. Remove governor arm (not shown) from end of governor cross shaft.

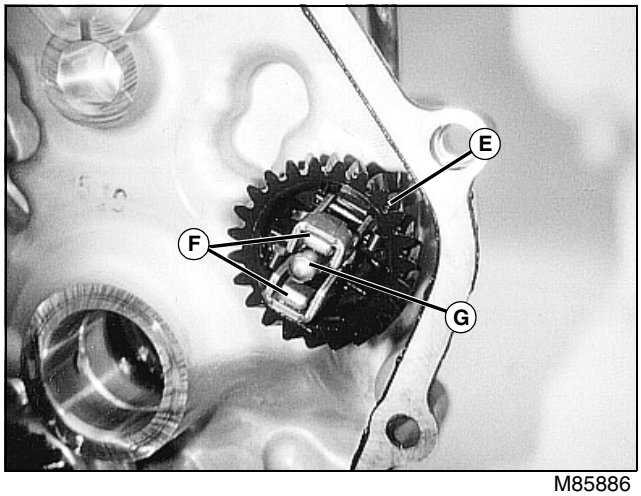


M85885

2. Remove spring clip (A), washers (B), and governor cross shaft (C) from inside of crankcase. Replace damaged parts.

3. If governor cross shaft seal (D) is damaged or leaks, install new seal using suitable driver.

NOTE: The governor gear is held onto the shaft (G) by small molded tabs in the gear. When the gear is removed from the shaft, these tabs are destroyed and the gear must be replaced. Therefore, remove the gear only if absolutely necessary.

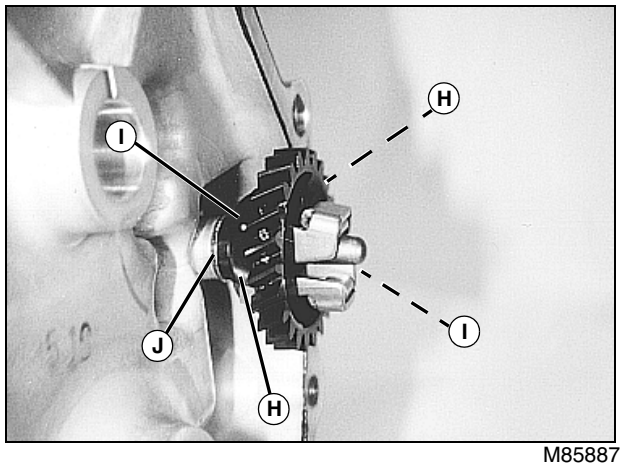


M85886

4. Inspect the governor gear (E) teeth. Replace the gear if it is worn, chipped, or if any teeth are missing.

5. Inspect the governor flyweights (F) for proper operation and movement. They should move freely in the governor gear.

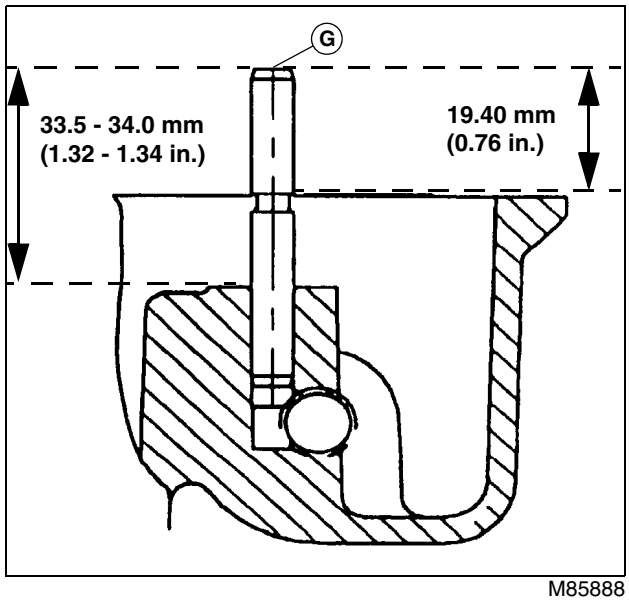
IMPORTANT: Avoid damage! The governor gear must be replaced once it is removed from the closure plate.



M85887

6. Remove clips (H) and regulating pins (I) from governor gear assembly.

7. Remove thrust washer (J) located under gear assembly.



M85888

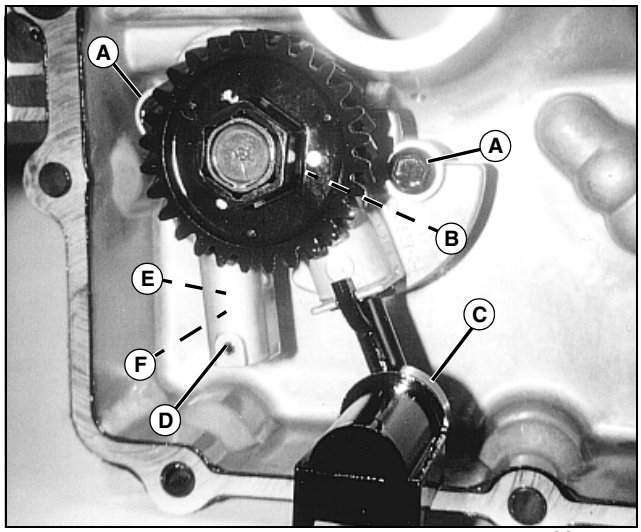
8. Carefully inspect the governor gear shaft (G) and replace it only if damaged.

9. Install cross shaft, washer, and clip.

10. Install governor arm (not shown).

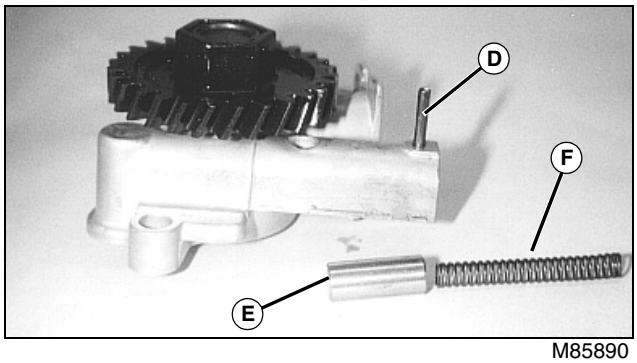
11. See “Governor Adjustment” on page 39.

Oil Pump Removal and Installation



M85889

1. Remove two cap screws (A).
2. Remove the oil pump assembly from the closure plate.
3. Remove oil pump rotors (B).
4. Remove oil pickup (C) by pulling it free from oil pump body.



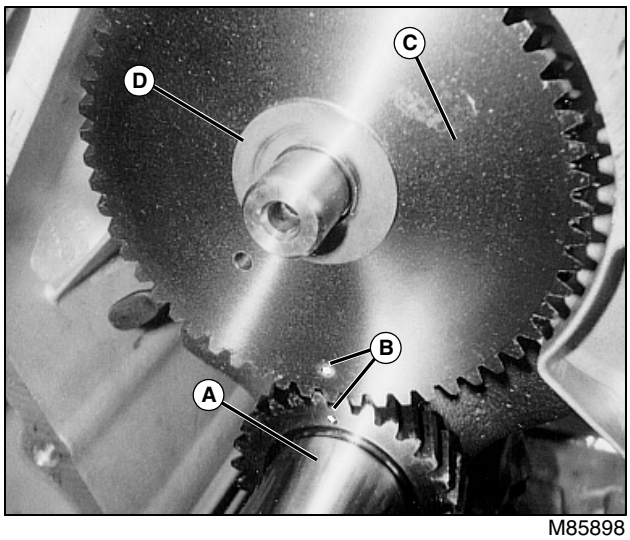
M85890

5. Gently drive out pin (D) to remove oil pressure relief valve piston (E) and spring (F).
6. Inspect oil pressure relief valve piston. It should be free of nicks or burrs.
7. Check spring for wear or distortion. Spring free length should be 47.4 mm (1.8 in.). Replace spring if it is distorted or worn.
8. Inspect oil pickup screen. It should be free of debris.
9. Reassemble oil pump. Turn rotors to align marks. Install oil pump on closure plate. Tighten cap screws.
10. Rotate oil pump gear. Make sure there is no binding of pump. If binding occurs, loosen cap screws, reposition pump, retighten, and recheck movement.

Specifications

Cap Screws
(First Time Installation) . . . . . 10.7 N•m (95 lb-in.)
Cap Screws
(All Reinstallations) . . . . . 6.7 N•m (60 lb-in.)
Oil Pressure
Relief Valve Spring. . . . . 47.4 mm (1.8 in.)

Camshaft Removal and Installation

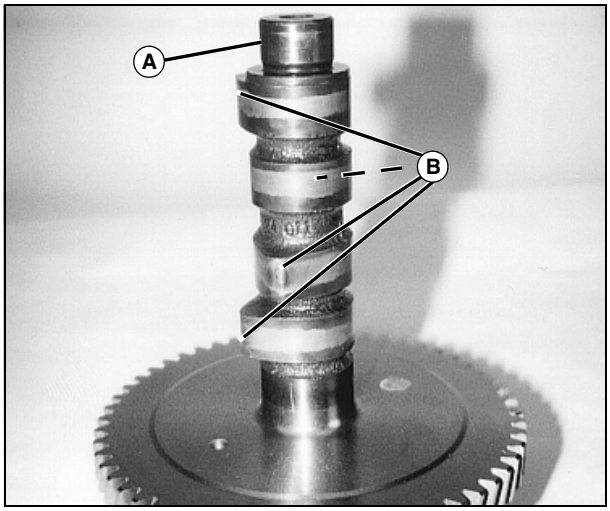


M85898

1. Rotate crankshaft (A) to align two sets of alignment marks (B).
2. Remove camshaft (C) and shim (D).
3. Inspect camshaft. See “Camshaft Inspection” on page 58.
4. Coat entire camshaft with engine oil.
5. Install camshaft with “marks” aligned.
6. Check camshaft end play. See “Camshaft End Play” on page 58. Make sure shim is in place.
7. If not within specification, add, remove or replace shims as necessary. Reinstall camshaft.

Camshaft Inspection

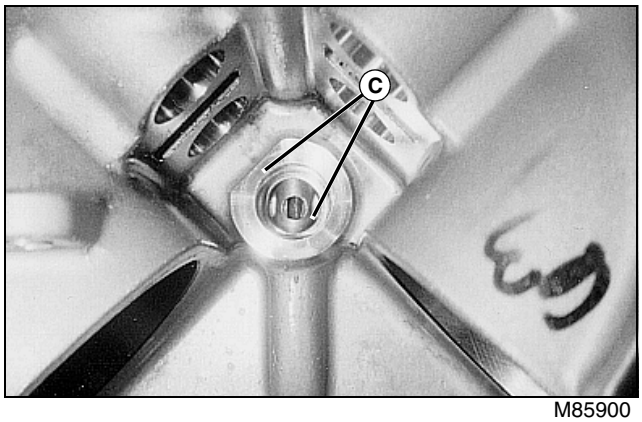
1. Inspect camshaft for worn or broken teeth.



M85899

2. Measure camshaft journal (A). Replace camshaft if measurements do not meet specifications.

3. Inspect lobes (B). Replace camshaft if lobes show excessive wear.



M85900

4. Measure camshaft bore (C) in engine block.

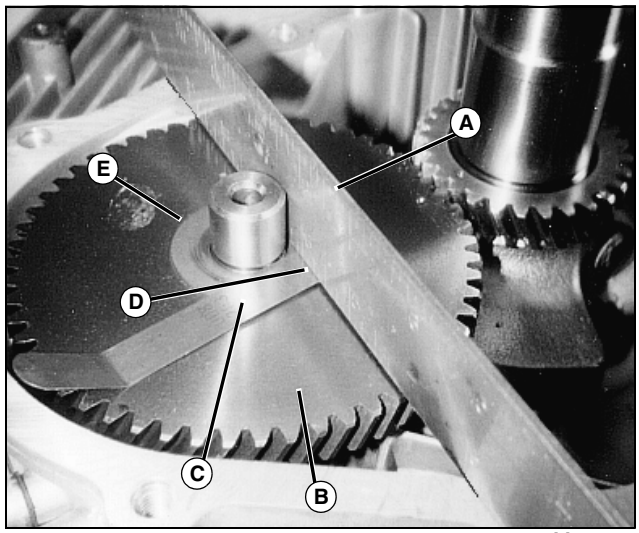
5. Subtract journal OD from bore ID to determine clearance with camshaft journal. Replace if not within specification.

Specifications

Camshaft OD
(New) . . . . . 19.962 - 19.975 mm (0.7874 - 0.7884 in.)
Camshaft OD
(Maximum Wear Limit) . . . . . 19.959 mm (0.7858 in.)
Crankcase Camshaft Bore
(New) . . . . . 20.000 - 20.025 mm (0.7874 - 0.7844 in.)
(Maximum Wear Limit) . . . . . 20.038 mm (0.7889 in.)
Camshaft to Bore
Clearance . . . . . 0.025 - 0.063 mm (0.0010 - 0.0025 in.)

Camshaft End Play

1. Check that camshaft is seated in crankcase bore.



M85884

2. Place straight edge (A) across crankcase flats. Make sure straight edge is flush on crankcase flats.

3. Measure end play between camshaft (B) and straight edge (spanning crankcase) using flat feeler gauge (C).

4. If the camshaft end play (D) is not snug within specified range, add or remove shims (E) from Shim Kit as necessary until end play is within specification.

Specifications

Camshaft End Play Specification (with shims)

Maximum. . . . . 0.076 - 0.127 mm (0.003 - 0.005 in.)

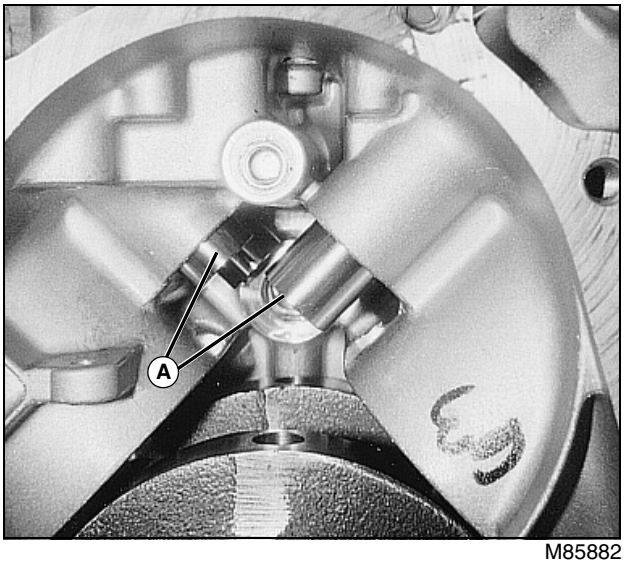
Camshaft Shims

White . . . . . 0.69215/0.73025 mm (0.02725/0.02875 in.)
Blue . . . . . 0.74295/0.78105 mm (0.02925/0.03075 in.)
Red . . . . . 0.79375/0.83185 mm (0.03125/0.03275 in.)
Yellow . . . . . 0.84455/0.88265 mm (0.03325/0.03475 in.)
Green. . . . . 0.89535/0.99345 mm (0.03525/0.03675 in.)
Gray . . . . . 0.94615/0.98425 mm (0.03725/0.03875 in.)
Black . . . . . 0.99695/1.03505 mm (0.03925/0.04075 in.)

Hydraulic Lifters Removal and Installation

1. Remove camshaft.

IMPORTANT: Avoid damage! Used lifters are mated to their camshaft lobes. Mark them for installation in the correct bore if they are not already marked. The exhaust lifters are located on the output shaft side of the engine while the intake lifters are located on the fan side of the engine. The cylinder head number is bossed on the outside of each cylinder head.



M85882

2. Remove hydraulic lifters (A). Lifters must be installed in same bore as removed.

3. See Hydraulic Lifters Inspection, Priming Hydraulic Lifters, and Bleeding Hydraulic Lifters in this section (below).

4. Inspect lifters for wear, replace as necessary.

5. Coat lifters with engine oil and install in correct bore.

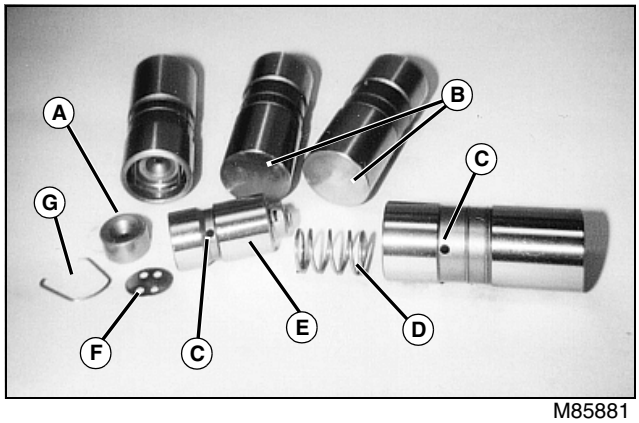
6. Install camshaft.

Hydraulic Lifters Inspection

Reasons

- If lifter noise continues after 20 minutes of running, it is probably an indication of contamination or dirt in the lifter preventing the inner piston from seating. Replace lifter.
- A lifter which suddenly gets noisy while engine is running would probably be caused by trapped air. If noise is caused by contamination, replace lifter. If noise is caused by trapped air see lifter bleeding and priming procedures.
- Lifter noise which appears or worsens as the engine heats up is usually due to wear in the lifters and other engine components, especially if engine has considerable running hours or has not had regular oil changes. Replaces lifters and other internal engine components that do not meet wear limit specifications.
- A situation where the lifter seems to pump up too much, holds a valve open, causes loss of compression or hard starting, indicates insufficient clearance between the plunger and body. Replace lifter.

IMPORTANT: Avoid damage! Damaged or worn lifters usually indicate a damaged camshaft. Check camshaft before replacing lifters.



M85881

A - Plunger
B - Lifter Face
C - Oil Hole
D - Spring
E - Inner Piston
F - Seal
G - Clip

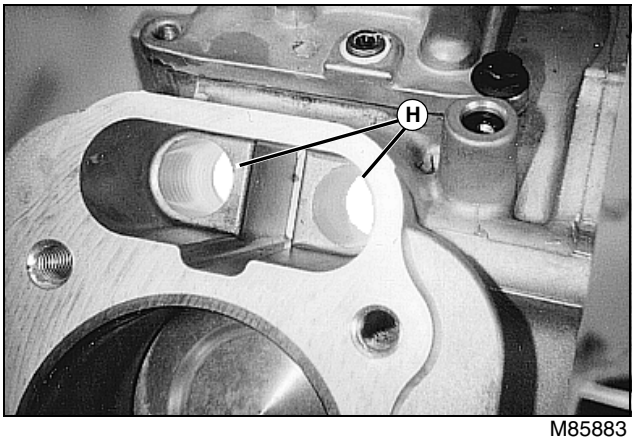
1. Inspect lifter face (B) for wear. Face should be flat and smooth.

2. Use push rod to depress plunger (A). Plunger should offer resistance but move smoothly.

3. Check that oil hole (C) is clear to inner piston (E).

4. Measure outside diameter of lifter.

NOTE: Make sure lifters are "PRIMED" before installation and "BLED" before start up to prevent damage to push rods or rocker arms. See "Priming Hydraulic Lifters" on page 60 and "Bleeding Hydraulic Lifters" on page 60.



M85883

5. Measure inside diameter of crankcase lifter bore (H).

6. Subtract lifter OD from bore ID to determine if clearance is within specification.

Specifications

Valve Lifter To Bore Clearance (maximum) . . . 0.0124 - 0.0501 mm (0.0005 - 0.0020 in.)

Priming Hydraulic Lifters

1. Place lifter in small container.

2. Pour 10W30 oil into container until oil is level with top of lifter.

3. Place the end of one of the push rods into the socket on top of the lifter and “pump” the lifter with push rod until it feels solid.

4. Remove lifter from oil, let it drip off for a moment, and install into appropriate bore in engine.

Bleeding Hydraulic Lifters

1. After installing cylinder head, rotate flywheel so the rocker arms will move alternately if the flywheel is rocked. This allows for maximum pressure on the lifters.

2. Leave engine in this position and re-assemble remaining engine parts.

3. After engine has been in this position for 10 minutes (can include assembly time) turn engine over slowly by hand.

4. If engine turns over completely, fill the crankcase to proper level with recommended oil and test run.

5. If engine does not turn over completely (locks up at some point), stop turning at the point of lockup and allow 10 more minutes for the lifters to bleed down. Then try rotating by hand again.

Results

- Lifter noise immediately after start-up is usually due to contraction and/or leakdown. There will be some noise when engine is first started but should last only a few seconds, but no more than a few minutes.
- If lifter is still noisy after 5 minutes of running, air could be trapped in the lifter. Stop engine and check oil level. Adjust as necessary and run engine for an additional 20 minutes at half throttle.

Piston Assembly Removal and Disassembly

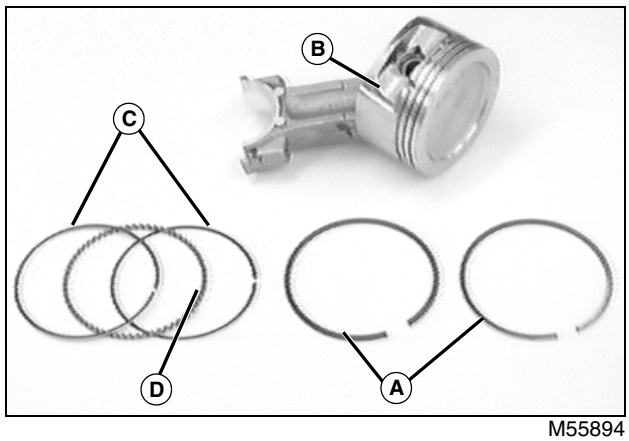
IMPORTANT: Avoid damage! Remove carbon ridge, if present, from top of cylinder using a ridge reamer before removing piston.

1. Remove camshaft (if applicable).

2. Remove connecting rod bolts to remove rod caps from connecting rods.

NOTE: The cylinders are numbered on the crankcase. Use the numbers to mark each end cap, connecting rod and piston for reassembly. DO NOT mix end caps, connecting rods and pistons.

3. Remove piston assemblies through top of cylinder.

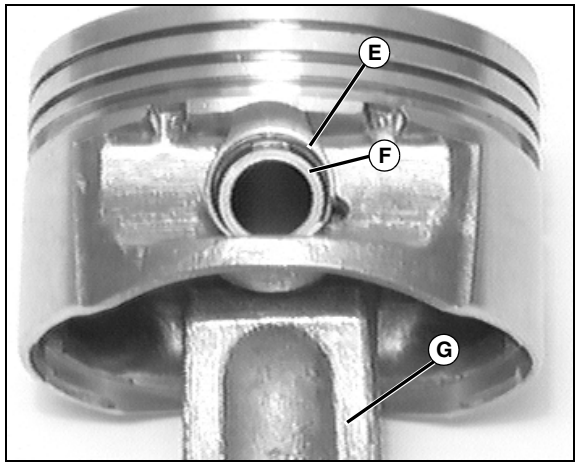


M55894

4. Remove compression rings (A) from piston (B) using ring expander.

5. Remove rails (C).

6. Remove oil control ring (D).

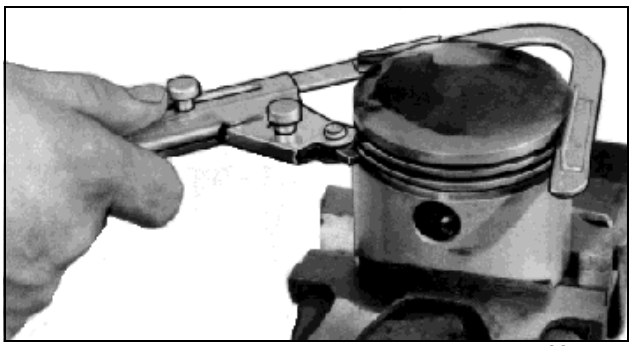


M55879

7. Remove retaining rings (E) by prying at indent. See “Piston Pin Removal, Inspection, and Installation” on page 61.

8. Use wooden dowel to remove pin (F) from piston and connecting rod (G).

IMPORTANT: Avoid damage! Do not use caustic cleaners or wire brush to clean aluminum piston. Piston damage can result.


M29946

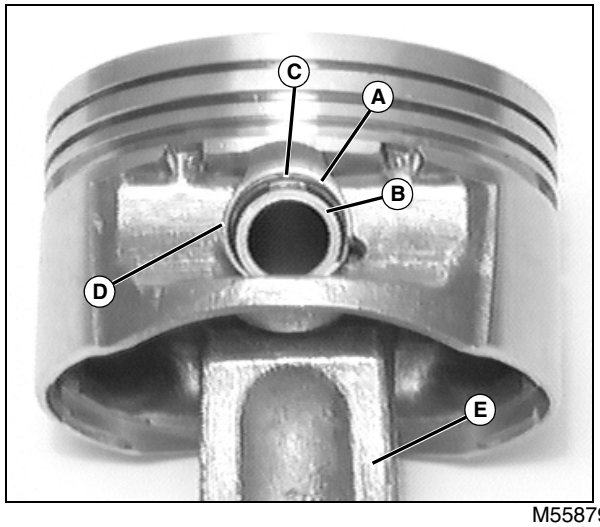
9. Inspect piston assembly. (See Piston Measurement, Cylinder Bore Measurement, Analyze Piston Ring Wear, Analyze Piston Wear, Piston Ring End Gap, and Piston Ring Side Clearance this section.)

10.Clean piston. Inspect for scoring or fractures.

11.Clean carbon from grooves using ring groove tool.

Piston Pin Removal, Inspection, and Installation

NOTE: Install piston pin before retaining ring to prevent possible scoring of bore.



M55879

1. Remove retaining rings (A) to remove piston pin (B).

2. Measure pin end ID and OD. If pin does not meet specifications replace it.

IMPORTANT: Avoid damage! Retaining rings should be installed with end gap (C) pointing up.

3. Install one piston pin (B) retaining ring in groove of piston pin bore (D).

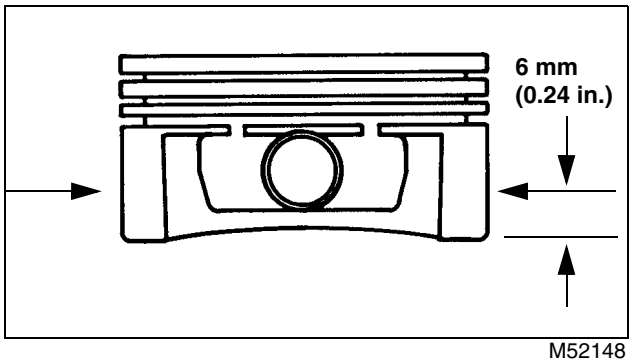
4. Install pin through piston bore and connecting rod (E). Pin should install easily with thumb pressure.

5. Install remaining retaining ring in opposite side.

Specifications

Piston Pin End ID
New . . . . . 17.015 - 17.023 mm (0.6699 - 0.6702 in.)
Max Wear Limit. . . . . 17.036 mm (0.6707 in.)
Piston Pin OD
New . . . . . 16.995 - 17.000 mm (0.6691 - 0.6693 in.)
Wear Limit. . . . . 16.994 mm (0.6691 in.)

Piston Measurement



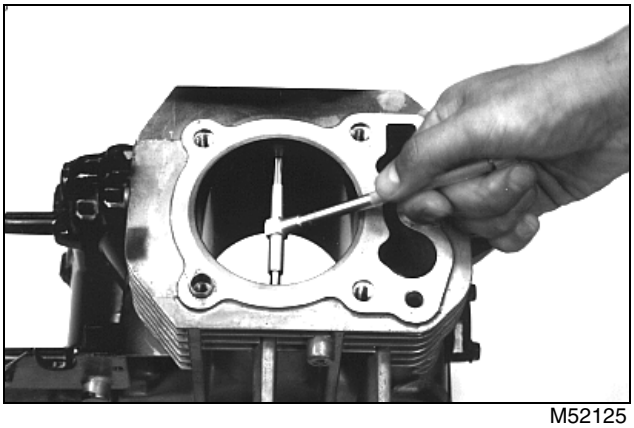
M52148

1. Measure diameter of piston 6 mm (0.24 in.) from skirt bottom and perpendicular to piston pin.
2. Measure piston pin bore ID.
3. If specifications are exceeded, replace piston.

Specifications

Piston Thrust Face
OD . . . . . 76.967 - 76.985 mm (3.0302 - 3.0309 in.)
Max Wear Limit . . . . . 76.840 mm (3.0252 in.)
Piston Pin Bore ID
New . . . . . 17.006 - 17.012 mm (0.6695 - 0.6698 in.)
Wear Limit . . . . . 17.025 mm (0.6703 in.)

Cylinder Bore Measurement



M52125

1. Measure cylinder bore. Take measurement approximately 63.5 mm (2.5 in.) below top of bore and perpendicular to piston pin.
2. Rebore cylinder block if not within specifications.

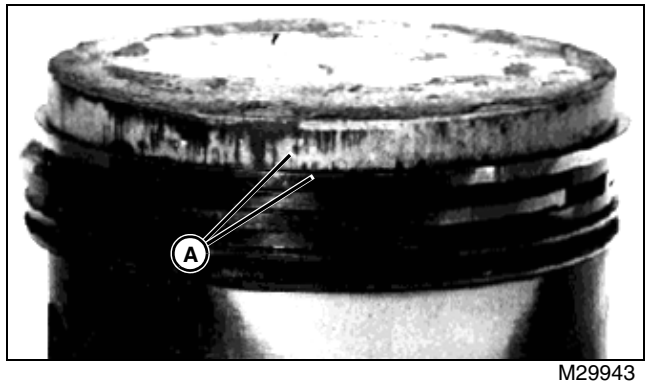
Piston Specifications

Thrust Face to Cylinder Bore Clearance
(New) . . . . . 0.015 - 0.058 mm (0.0006 - 0.0023 in.)

Analyze Piston Ring Wear

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

Ring end gaps should be staggered on the piston during installation. End gaps in alignment can also cause oil consumption and blowby.

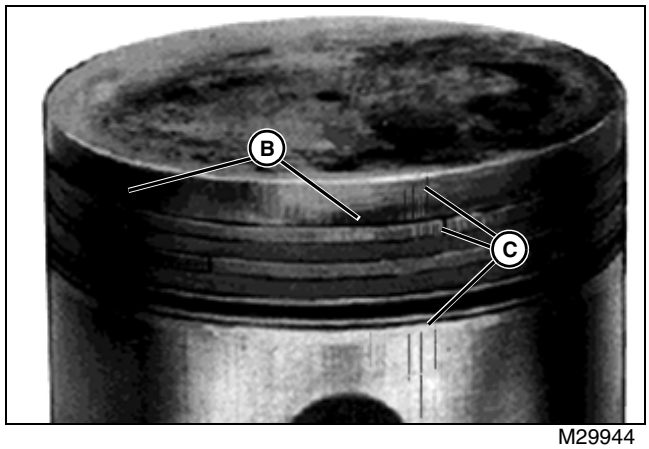


M29943

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

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

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



M29944

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

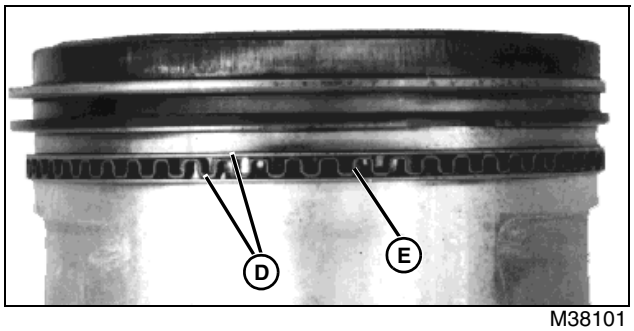
Engine overheating and ring sticking is usually caused by one or more of the following:

1. Overloading.
2. Incorrect ignition timing.
3. Lean fuel mixture.
4. Dirty cooling fins.
5. Incorrect oil.
6. Low oil supply.
7. Stale fuel.

Vertical scratches (C) across the piston and 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 and carbon deposits.

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

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



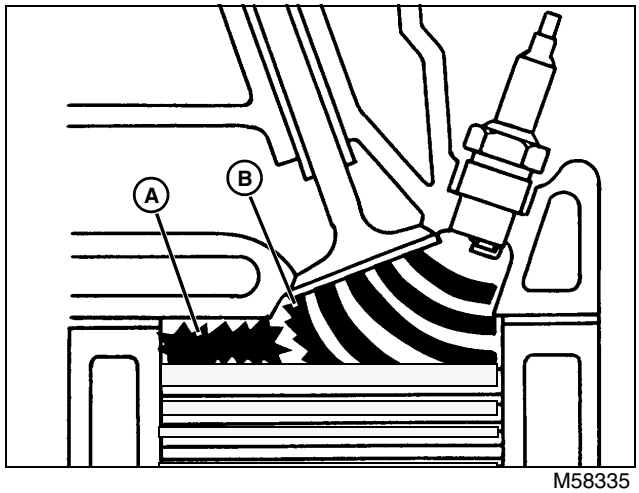
M38101

Abrasive particles in engine oil cause scratches on side rails (D) of oil control ring. If inner spacer (E) of oil control ring is worn or distorted it may cause:

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

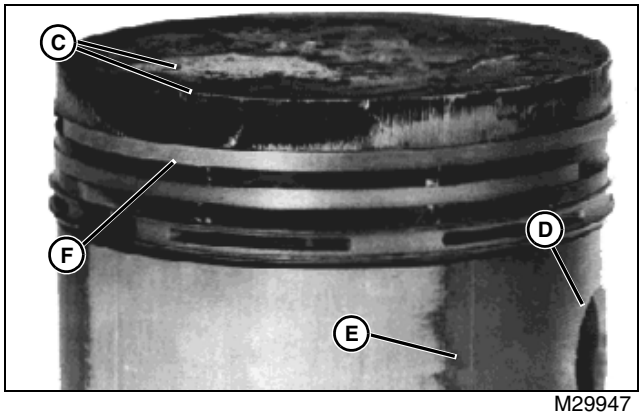
Analyze Piston Wear

Detonation



M58335

Detonation is uncontrolled combustion (A) caused by excessive temperature and pressure in the combustion chamber. Commonly called carbon knock, spark knock, or timing knock; detonation occurs when the extremely hot, over-compressed, fuel-air mixture ignites spontaneously - causing a second burn point during the normal ignition cycle. This second burn then collides with the spark plug induced burn (B), causing a loud explosion and extreme shockwave.



M29947

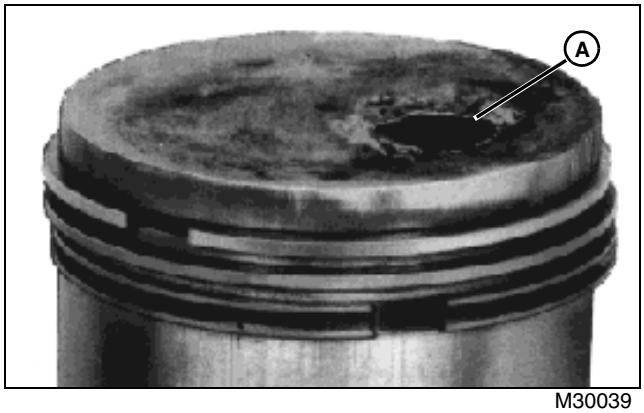
This detonation shockwave (“hammering”) of the piston inside the cylinder causes damage to piston crown (C), top ring and groove (F), piston side skirts (E), and pin locks (D).

The following is a list of possible causes for detonation:

1. Lean fuel mixture.
2. Low octane fuel.
3. Advanced ignition timing.
4. Engine lugging.
5. Buildup of carbon deposits on piston or cylinder head, causing excessive compression.

6. Wrong cylinder head or excessive milling of head increasing compression ratio.

Pre-ignition



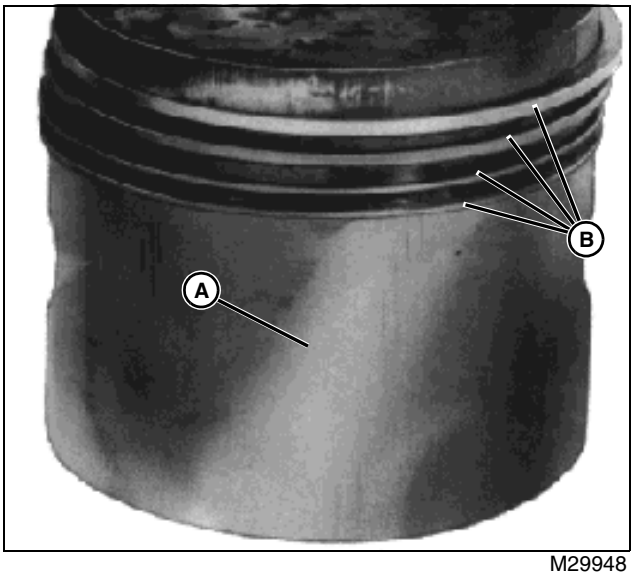
M30039

Pre-ignition is the igniting of the fuel-air mixture prior to proper ignition spark. Pre-ignition causes internal shock, resulting in pangs, vibration, and power loss. Severe damage is caused to the piston crown (A), rings, and valves results from pre-ignition.

Check the following for causes of pre-ignition:

1. Hot internal carbon deposits.
2. Incorrect spark plug (high heat range).
3. Broken ceramic insulation of spark plug.
4. Hot sharp edges on valves.

Improper Rod and Piston Alignment



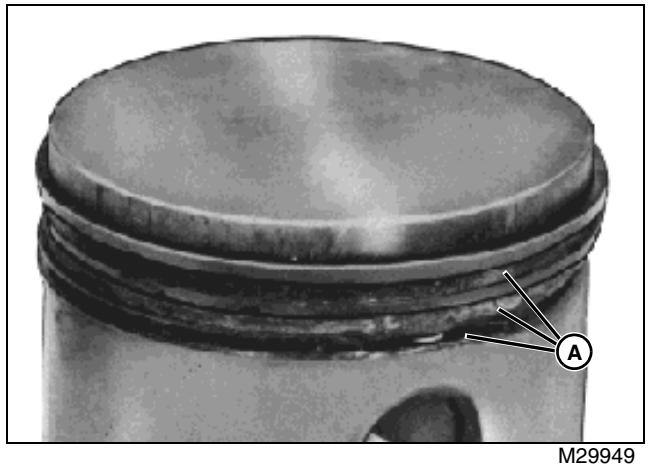
M29948

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

Cylinder Bored Improperly

A cylinder bored at an angle to the crankshaft may result in improper ring contact with the cylinder which may cause the following:

1. Rapid and uneven piston ring wear.
2. Rapid and uneven piston wear.
3. Loose or broken piston pin retaining ring.
4. Excessive oil consumption.



M29949

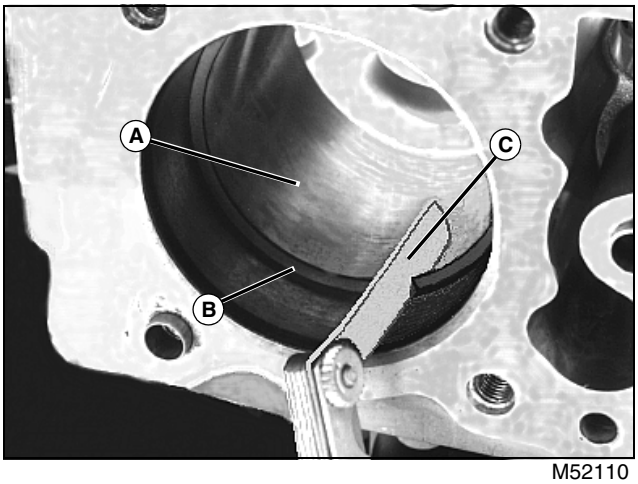
A broken piston pin retaining ring caused the damage (A) shown. Piston pin retaining rings loosen or break due to:

1. Rod misalignment.
2. Excessive crankshaft end play.
3. Crankshaft journal taper.
4. Weak piston pin retaining rings.
5. Incorrectly installed piston pin retaining rings.

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

Piston Ring End Gap Measurement

IMPORTANT: Avoid damage! If new rings are to be installed, deglaze cylinder wall so rings will seat properly. ***See "Cylinder Bore Deglazing" on page 69*.**



M52110

1. Use a clean or new piston (A) to push piston compression ring (B) squarely into bore, to a point where it normally runs. Do this for both top and center ring.

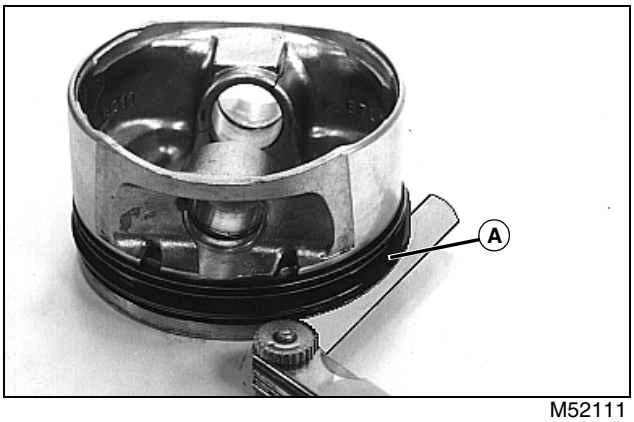
2. Measure end gap with a feeler gauge (C).

3. Rings with too large a gap must be replaced. If one piston ring needs replaced, all must be replaced as a set.

Specifications

Top and Center Piston Ring End Gap (New Bore). . . . . 0.30 - 0.50 mm (0.012 - 0.02 in.)
Piston Ring End Gap (Used Bore) (Maximum). . . . . 0.75 mm (0.030 in.)

Piston Ring Side Clearance



M52111

1. Measure piston ring side clearance (A) (top and center rings) at several points around piston (use new rings).

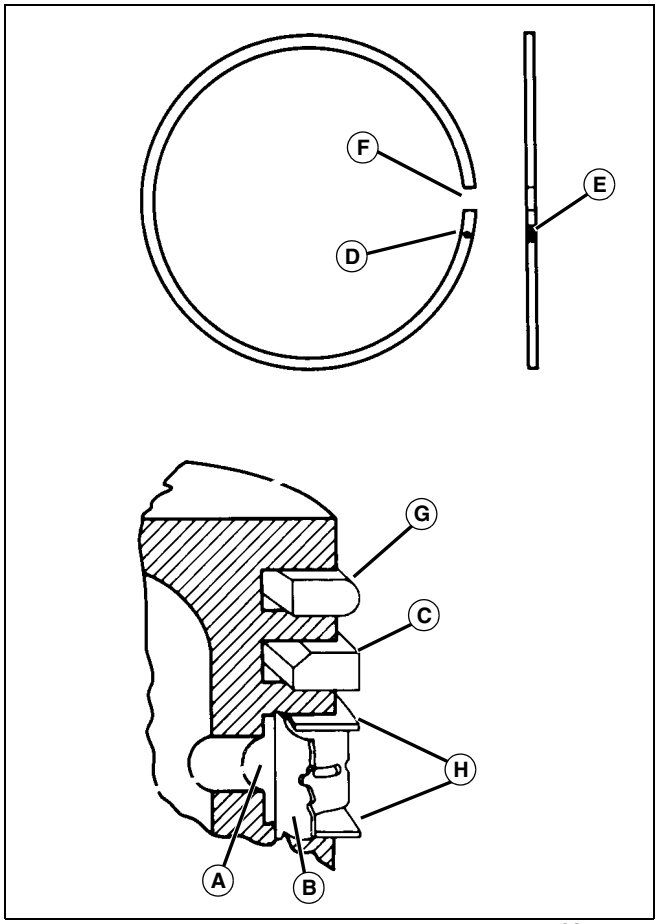
2. Replace piston if measurements exceed clearance specifications.

Specifications

Piston Ring-To-Groove Side Clearance

Top Compression Ring . . . . . 0.040 - 0.105 mm (0.0016 - 0.0041 in.)
Center Compression Ring . . . . . 0.040 - 0.105 mm (0.0016 - 0.0041 in.)

Piston Rings Installation



M85893

1. Oil Control Ring (A) (Three Piece) (Bottom Groove): Install expander then rails. Make sure the ends of expander (B) do not overlap.

2. Compression Ring (C) (Center Groove): Install center ring using piston ring installation tool. Make sure "pip" mark (D) is up and pink dykem stripe (E) is left of end gap (F). Stagger 120° apart.

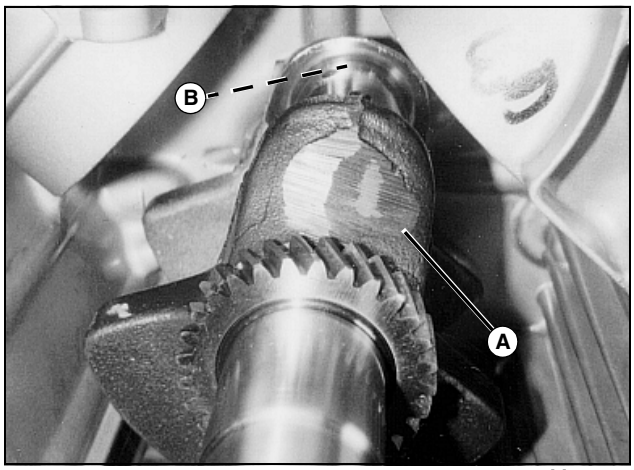
3. Compression Ring (G) (Top Groove): Install top ring using piston ring installation tool. Make sure "pip" mark is up and blue dykem stripe is left of end gap.

- Compression ring gaps should be staggered 120°.
- Note shape of compression rings and install as shown.

- Compression rings should be installed with “pip” mark up and Dykem strip to left of ring gap.
- Install oil ring spacer first. Make sure that its ends do not overlap.
- Stagger end gap of oil rails (H) 180° apart.
- Rings should turn freely in grooves.

Crankshaft Removal and Installation

1. Remove camshaft.



M85901

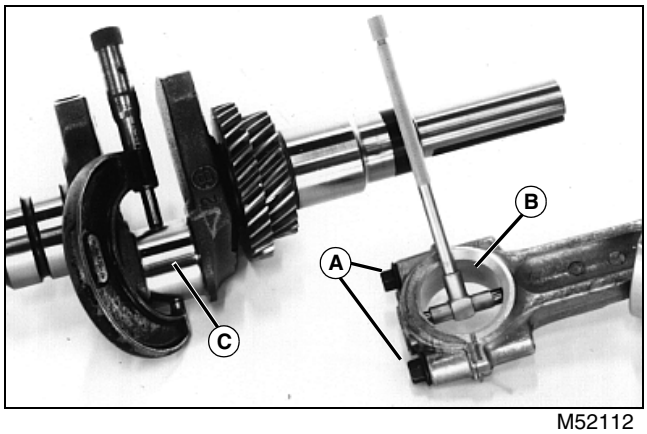
2. Remove and inspect crankshaft (A). See “Crankshaft Journal Measurement” on page 66.

3. Install new seals (B) in crankcase and closure plate. See “Engine Block and Closure Plate Seals Removal and Installation” on page 68.

4. Install crankshaft carefully, DO NOT damage seals.

Crankshaft Journal Measurement

NOTE: Connecting rod is available 0.25 mm (0.010 in.) undersize.



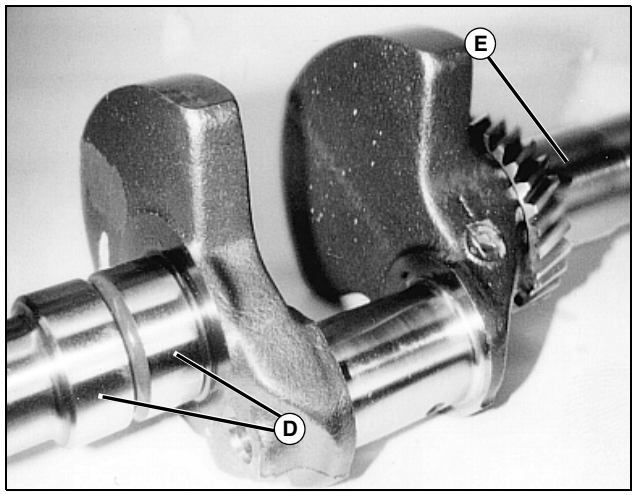
M52112

1. Tighten connecting rod bolts (A) to specification.

2. Measure inside diameter (B) of connecting rod.

3. Measure outside diameter (C) of crankshaft journal.

4. Determine connecting rod-to-crankshaft clearance. If clearance is exceeded, crankshaft journal can be ground undersize to 0.25 mm (0.010 in.).



M85894

5. Measure flywheel end main bearing journal (D) and closure plate end main bearing journal (E). Flywheel end main bearing journal can be ground undersize 0.25 mm (0.010 in.) or 0.50 mm (0.020 in.) if required. Closure plate end main bearing journal cannot be ground undersize. If closure plate end main bearing journal exceeds specification - replace crankshaft.

6. See “Crankshaft Alignment” on page 67.

Specifications

Crankshaft Journal

OD New . . . . . 35.955 - 35.973 mm (1.4156 - 1.4163 in.)
OD Max Wear Limit . . . . . 35.94 mm (1.415 in.)
Max Taper . . . . . 0.018 mm (0.0007 in.)
Max Out-of-Round . . . . . 0.025 mm (0.0010 in.)

Crankshaft-to-Connecting Rod

Side Clearance . . . . 0.26 - 0.63 mm (0.0102 - 0.0248 in.)
Running Clearance
New . . . . . 0.030 - 0.055 mm (0.0012 - 0.0022 in.)
Max Wear Limit. . . . . 0.07 mm (0.0028 in.)

Flywheel End Main Bearing Journal

OD New . . . . . 40.913 - 40.935 mm (1.6107 - 1.6116 in.)
OD Max Wear Limit . . . . . 40.84 mm (1.608 in.)
Max Taper . . . . . 0.022 mm (0.0009 in.)
Max Out-of-Round . . . . . 0.025 mm (0.0010 in.)

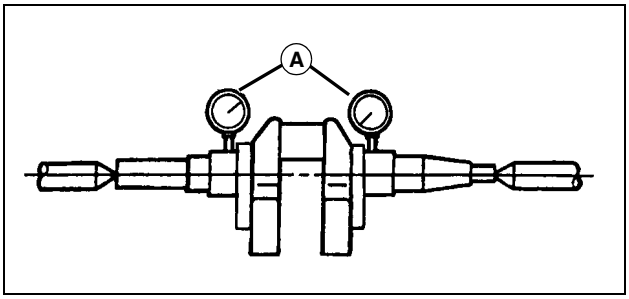
Closure Plate End Main Bearing Journal

OD New . . . . . 40.913 - 40.935 mm (1.6107 - 1.6116 in.)
OD Max Wear Limit. . . . . 40.84 mm (1.608 in.)
Max Taper . . . . . 0.022 mm (0.0009 in.)
Max Out-of-Round . . . . . 0.025 mm (0.0010 in.)

Connecting Rod

Connecting Rod
Cap Screws Torque . . . . . 17.3 N•m (130 lb-in.)

Crankshaft Alignment



M80432

In alignment jig:

- Rotate crankshaft slowly. Dial indicators (A) measure maximum Total Indicated Runout (TIR).

In engine:

- Rotate crankshaft slowly. Measure TIR at oil pan end of crankshaft using dial indicator.

Replace crankshaft if not within specification.

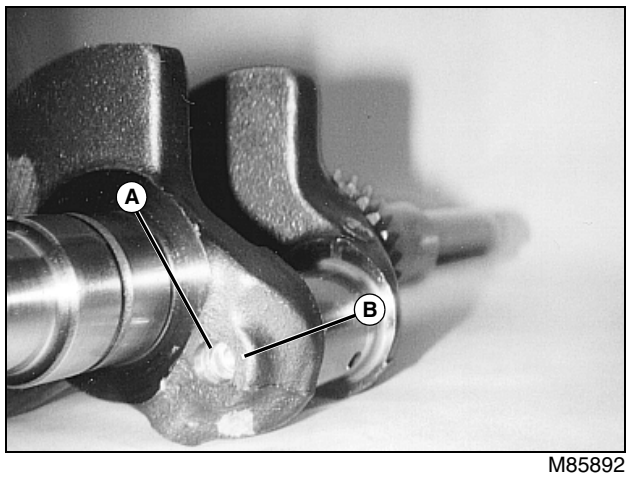
Specifications

Crankshaft Maximum TIR

Crank In Alignment Jig . . . . . 0.10 mm (0.0039 in.)
Power End, Crank In Engine . . . . . 0.15 mm (0.0059 in.)

Regrind Crankshaft (Optional)

IMPORTANT: Avoid damage! Grinding stone deposits can get caught in oil passages which could cause severe engine damage. Removing the plug each time crankshaft is ground provides easy access for cleaning any grinding deposits that collect in oil passages.



M85892

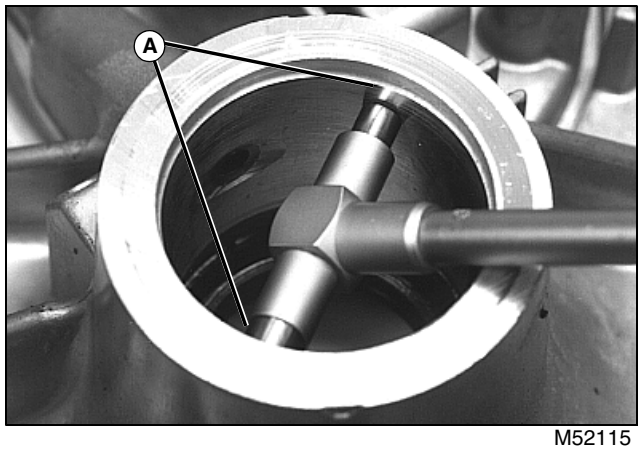
1. Drill a 3/16” hole through plug (A) in crankshaft.

2. Thread a 3/4” or 1” long self-tapping screw with a flat washer into drilled hole. Flat washer must be large enough to seat against shoulder (B) of plug bore.

3. Tighten self-tapping screw until it draws plug out of crankshaft.

4. Install new plug. Gently tap plug into place using suitable driver. Plug must seat evenly at bottom of bore.

Engine Block and Closure Plate Crankshaft Bore Measurement



M52115

1. Measure engine block crankshaft bore ID (A) (flywheel end) - repeat for closure plate crankshaft bore (not depicted).

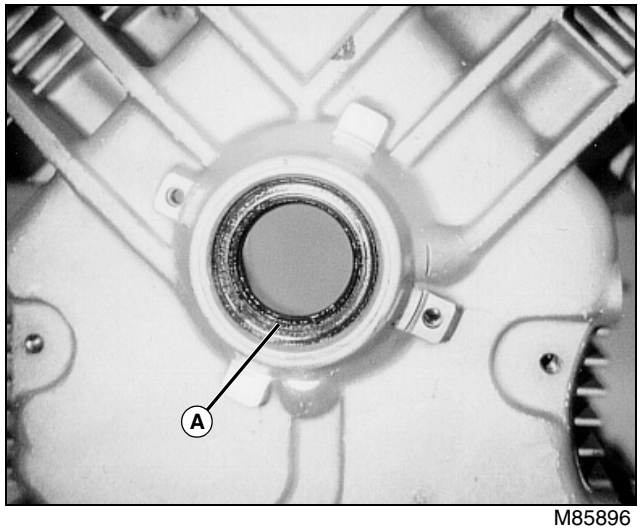
2. Check bore for nicks or cracks.

3. If measurement exceeds specification - engine block can be ground undersize 0.25 mm (0.010 in.) or 0.50 mm (0.020 in.) (requires oversize bearing). Closure plate cannot be ground - requires new closure plate.

Engine Block and Closure Plate Seals Removal and Installation

Crankcase Seal

1. Gently remove seals. Do not score block or closure plate.

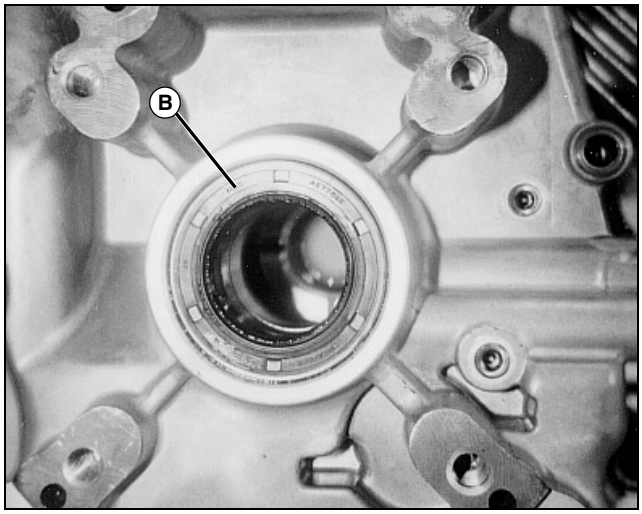


M85896

2. Apply light coat of oil to outside diameter of crankcase oil seal (A).

3. Install oil seal into crankcase (flush) using appropriate driver.

Closure Plate Seal



M85897

1. Apply light coat of oil to outside diameter of closure plate oil seal (B).

2. Drive oil seal into crankcase 2.03 mm (0.08 in.) using appropriate driver.

Specification

Oil Seal Depth . . . . . 2.03 mm (0.08 in.)

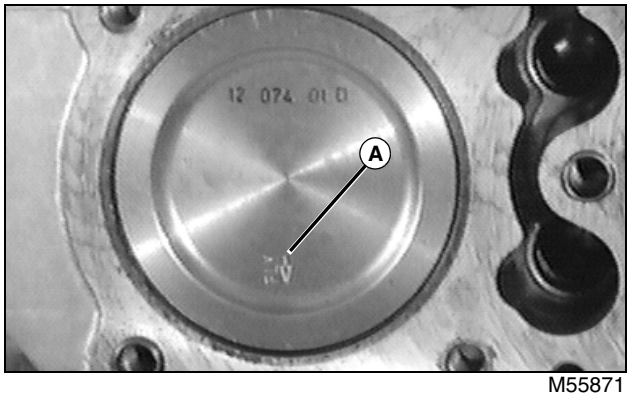
Piston Assembly Installation

1. Install piston rings. See “Piston Rings Installation” on page 65.

2. Compress rings with ring compressor tool.

3. Coat cylinder, piston skirt, rod, and cap bearing surfaces with oil.

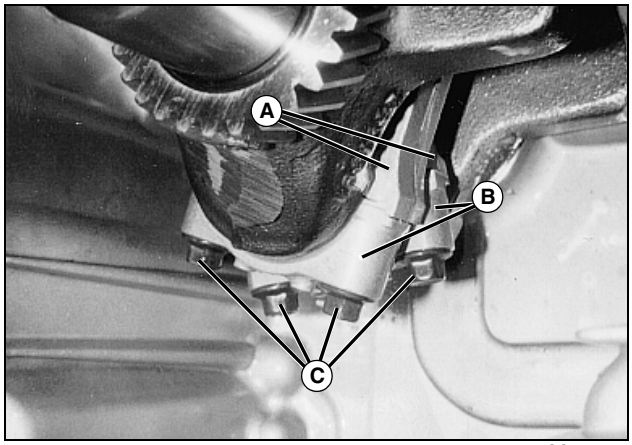
NOTE: Gently tap piston with wood dowel; do not force.



M55871

4. Install piston with FLY mark (A) toward flywheel side of crankcase. Use wooden dowel to push piston into bore.

Connecting Rod Installation



M85891

1. Fasten connecting rod (A) and cap (B) to crankshaft. Make sure to align chamfer of connecting rod with chamfer of mating end cap. When installed, flat faces of connecting rods should face each other. Faces with raised rib should be toward the outside.

2. Tighten connecting rod bolts (C).

3. Install camshaft, closure plate, and cylinder head. See appropriate procedures in this section.

Specification

Connecting Rod Bolts . . . . . 17.3 N•m (130 lb-in.)

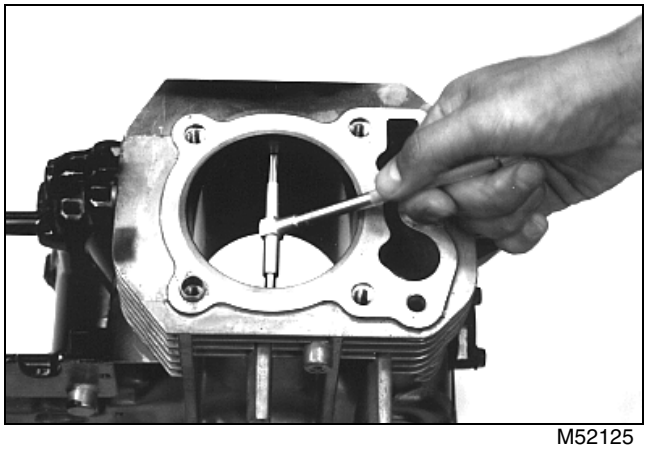
Cylinder Block Inspection

1. Clean and check block for cracks.

2. Cracks not visible to the eye may be detected by coating the suspected area with mixture of 25 percent kerosene and 75 percent light engine oil.

3. 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.

4. Replace block if any cracks are found.



M52125

5. Measure cylinder bore inside diameter at six places; two measurements 90° apart at top, middle, and bottom of ring travel.

6. Measure piston outside diameter perpendicular to piston pin bore.

NOTE: Pistons and rings are available 0.25 and 0.50 mm (0.010 and 0.020 in.) oversize.

Replace block or bore cylinder to accept larger piston if clearance exceeds specification.

Specifications

Cylinder Bore Specifications

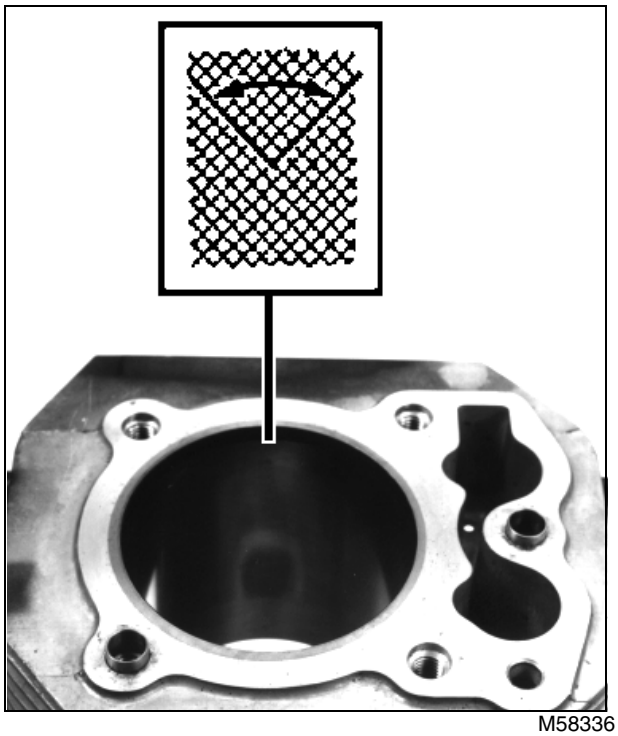
New . . . . . 77.000 - 77.025 mm (3.0315 - 3.0325 in.)
Maximum Wear Limit . . . . . 77.063 mm (3.0340 in.)
Out-of-Round (maximum) . . . . . 0.12 mm (0.0047 in.)
Taper (maximum) . . . . . 0.05 mm (0.0020 in.)

Piston Thrust Face-to-Cylinder Bore Running Clearance . . . . . 0.015 - 0.058 mm (0.0006 - 0.0023 in.)
Measure 6 mm (0.236 in.) above the bottom of the piston skirt at right angles to the piston pin.

Cylinder Bore Deglazing

IMPORTANT: Avoid damage! Remove crankshaft and internal engine components when deglazing cylinder. Abrasives can cause engine damage.

1. Use the appropriate size flex-hone to deglaze cylinder bore.



M58336

2. Deglaze cylinder bore using flex-hone to obtain 23 - 33° crosshatch pattern.

3. Clean abrasive residue from cylinder using warm soapy water until clean white rags show no discoloration.

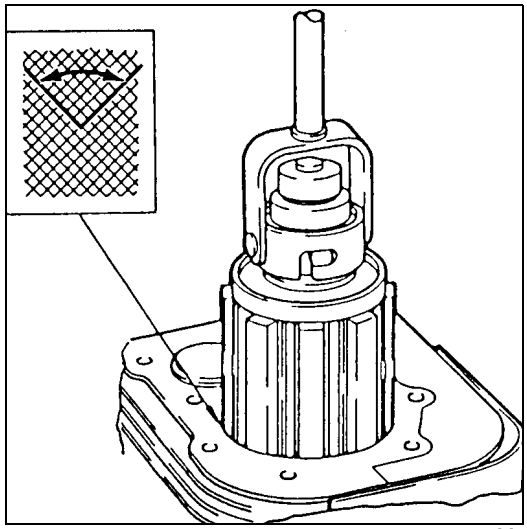
4. Dry cylinder and apply engine oil.

Specification

Deglaze Crosshatch Pattern . . . . . 23 - 33°

Cylinder Block Rebore

IMPORTANT: Avoid damage! Check stone for wear or damage. Use correct stone.



M85811

NOTE: The cylinder block can only be rebored to use 0.25 and 0.50 mm (0.010 and 0.020 in.) oversize pistons and rings.

1. Align center of bore to drill press center.

2. Adjust hone so lower end is even with lower end of cylinder bore.

3. Adjust coarse hone stones until they contact narrowest point of cylinder.

4. Coat cylinder with honing oil. Hone should turn by hand. Adjust if too tight.

5. Run drill press at about 250 rpm. Move hone up and down about 60 times per minute.

6. Stop press and check cylinder diameter several times during honing.

NOTE: Finish should not be smooth. It should have a 23 - 33° crosshatch pattern.

7. Remove hone when cylinder is within 0.064 mm (0.0025 in.) of desired size.

8. Hone with burnishing stones until within 0.013 mm (0.0005 in.) of desired size.

9. Hone with finish stones (220 - 280 grit) to final size.

10.Allow cylinder to cool completely; then, measure for new piston-to-cylinder bore running clearance, taper, and out-of-round.

IMPORTANT: Avoid damage! Do not use solvents to clean cylinder bore. Solvents will not remove metal particles produced during honing.

11.Clean cylinder thoroughly using warm soapy water until clean white cloths show no discoloration.

12.Dry cylinder completely and apply thin coat of engine oil to appropriate mating surfaces.

Specifications

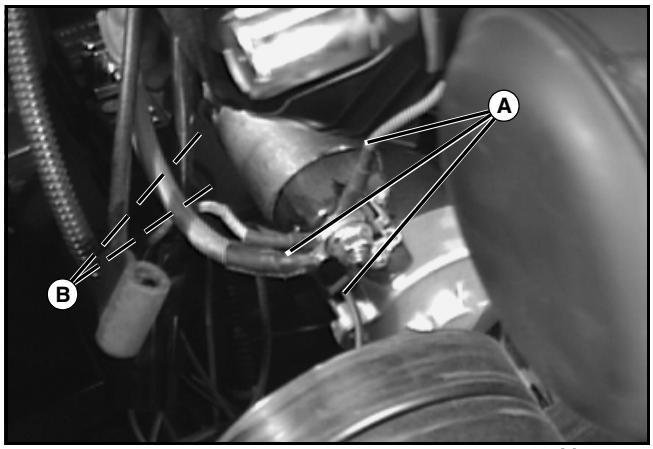
Oversize Limits

Initial . . . . . 0.25 mm (0.010 in.)
Final. . . . . 0.50 mm (0.020 in.)

Drill Speed . . . . . .250 rpm
Hone Cycles . . . . . 60 per minute
Bore Crosshatch Pattern. . . . . 23 - 33°
Initial Bore Size
(Coarse Stone) . . . . . Until within 0.06 mm (0.0025 in.)
. . . . . .of desired bore size
Secondary Bore Size
(Burnish Stone) . . . . Until within 0.013 mm (0.0005 in.)
. . . . . .of desired bore size
Final Bore Size
(Finish Stone) . . . Using 220 - 280 grit finishing stones,
. . . . . .bore to desired size

Remove and Install Starting Motor

1. Disconnect negative (-) battery cable.
2. Remove shrouds.



M89031

3. Disconnect all wires (A) from starting motor solenoid and starting motor.
4. Remove two bolts (B) and pull starting motor out.
5. Install in reverse order of removal.

Specifications

Starting Motor Cap Screw Torque. 15.3 N•m (135 lb-in.)
Starting Motor Solenoid Positive Battery Cable Mounting Nut . . . . . 8-11 N•m (71-97 lb-in.)

Starting Motor Disassembly and Assembly (SN -035000)

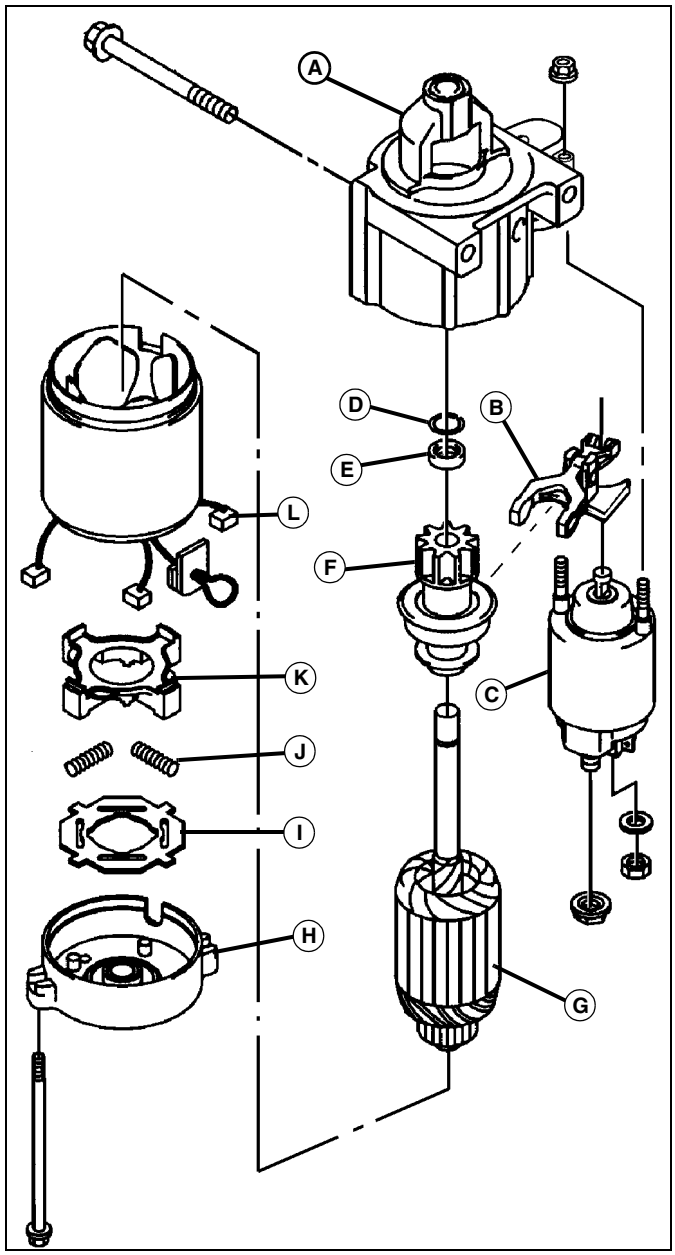
Procedure

1. Remove long cap screws and commutator end cap.
2. Remove insulator and brush springs from brush spring holder.
3. Remove armature from frame.
4. Clean commutator of armature with a coarse, lint free cloth. DO NOT use emery cloth. If commutator is badly grooved, replace it.

NOTE: When removing the drive lever and armature be careful not to lose thrust washer.

5. Remove drive lever and armature from drive end cap.
6. Remove retaining ring and discard.
7. Drive stop collar off shaft.
8. Remove drive pinion from shaft. Inspect pinion gear and shaft for cracks, damage or missing teeth. Replace as needed.
9. Reassemble in reverse order of disassembly. Use a new retaining ring.

Starting Motor Disassembly and Assembly (SN 035001-)



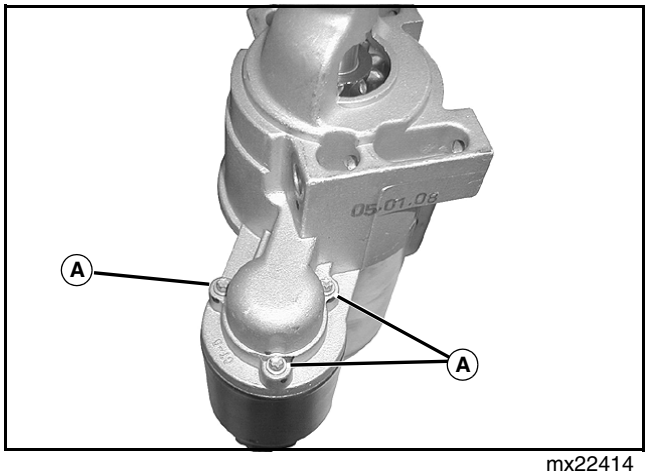
mx22451

A - Drive End Cap
B - Shift Lever
C - Solenoid
D - Retaining Clip
E - Pinion Stopper
F - Pinion
G - Armature
H - Commutator End Cap

I - Insulator
J - Brush Springs
K - Brush Holder
L - Brush

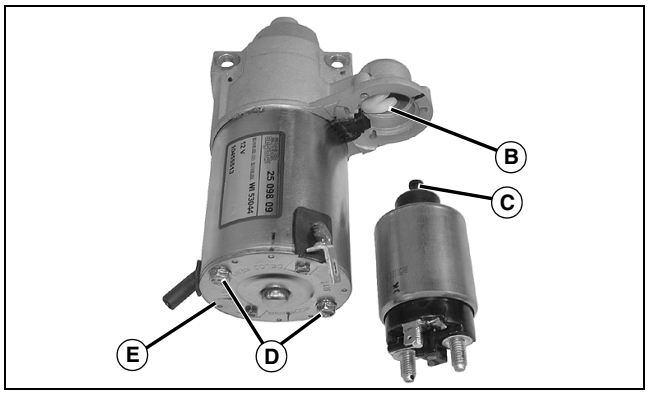
Disassembly

NOTE: Starting motor repair is limited to replacement of brushes, solenoid, and pinion only. If housing or armature are damaged, starting motor assembly must be replaced.



mx22414

1. Remove three Torx head screws (A) that secure the solenoid to the starting motor.

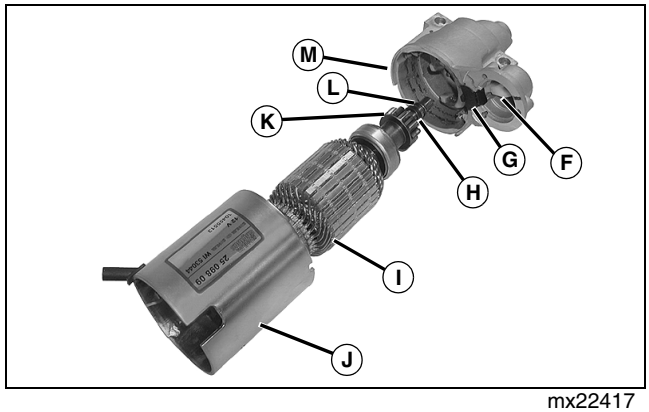


mx22415

2. Unhook solenoid plunger pin (C) from drive lever (B) and remove solenoid.

NOTE: When removing commutator end plate be careful not to lose thrust washer.

3. Remove the two large bolts (D) securing the commutator end plate assembly (E) to the starting motor and remove commutator end plate.



mx22417

4. Remove frame (J) from armature (I).

5. Remove drive lever pivot bushing (G) and backing plate from drive end cap (M).

6. Remove drive lever (F) and armature from drive end cap.

NOTE: When removing drive lever and armature from end cap be careful not to lose the thrust washer and/or pivot bushing backing plate.

7. Push stop collar (H) down to expose retaining ring (L) and remove ring.

8. Remove drive pinion (K) from shaft.

Assembly

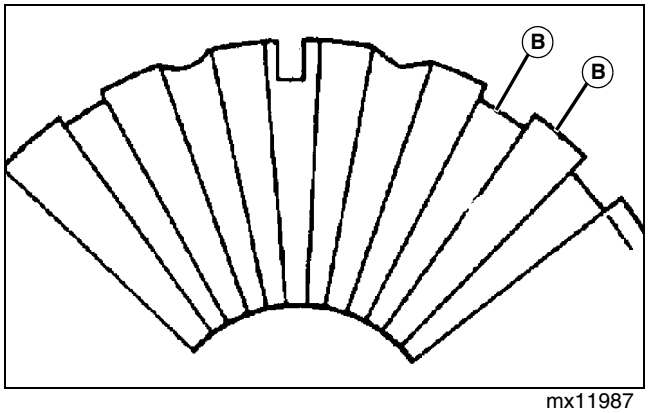
Assembly is done in reverse order of disassembly.

- Apply multipurpose grease to following areas:
  - Armature shaft splines
  - Both drive fork ends and center pivot section
  - Drive end cap bearing
  - Commutator end plate bearing
- Use new retaining ring on armature shaft. Do not reuse old retainers.
- Install small offset thrust washer in drive end cap with small diameter end facing armature.

Inspection

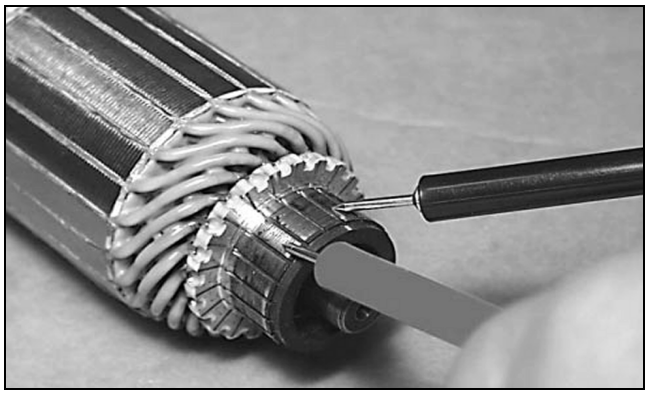
1. Measure brush length. If any single brush is shorter than the specification, replace entire set.

2. Inspect surface of commutator. If surface is scratched or dirty, clean with coarse, lint free cloth.

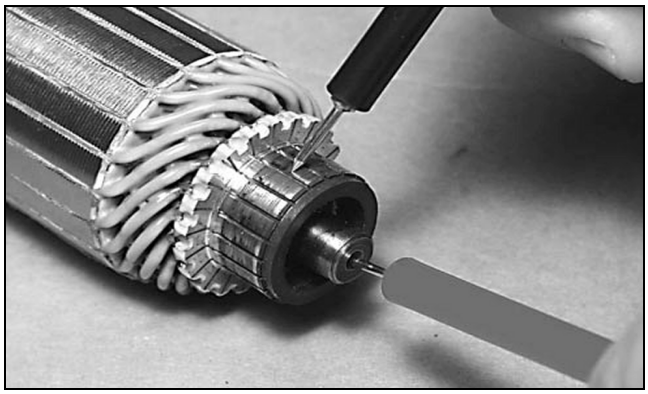


mx11987

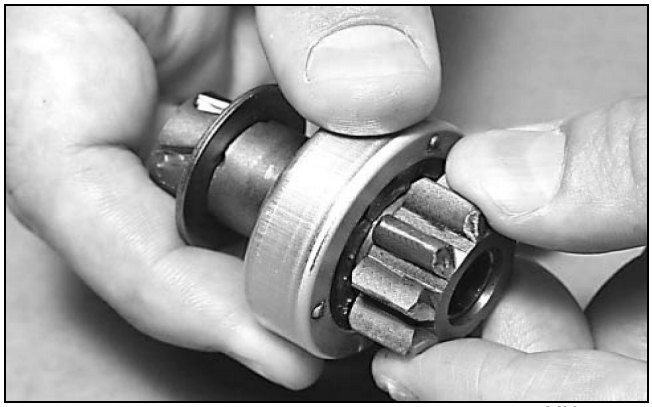
3. Inspect commutator mica insulation (X). Insulation must be lower than the commutator bars (X) for proper operation. If insulation is not lower than commutator bars, replace starting motor assembly.


mx11990

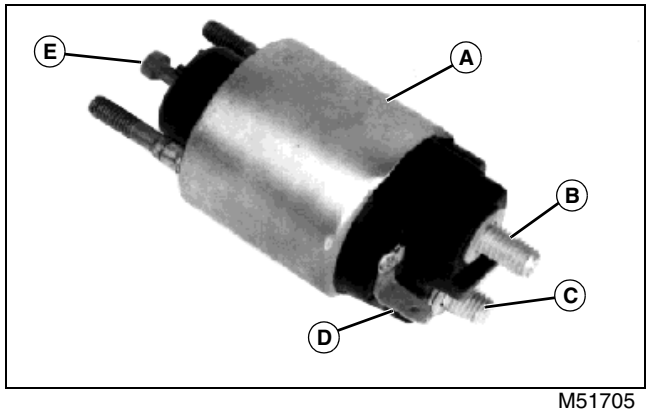
4. Check for continuity between differing segments of commutator bars. If no continuity between any two segments, armature is bad and starting motor assembly must be replaced.



5. Check for continuity between commutator segments and armature shaft end. If continuity exists, armature is shorted and starting motor assembly must be replaced.


MX14440

6. Remove the pinion clutch and turn it by hand. The clutch should turn freely counterclockwise, and lock up and not turn in a clockwise direction. If the clutch does not operate correctly or is noisy when freewheeling, replace it.



M51705

7. Test solenoid posts (B and C) for continuity. There should be no continuity.

8. Depress switch arm (E). There should be continuity between (B) and (C) when arm is fully depressed.

9. Test for open circuits between post (C) and tang (D). There should be continuity.

10. Test for open circuits between tang (D) and body (A). There should be continuity.

11. Test for short between post (B) and body (A). There should be no continuity.

12. If solenoid fails any test, it is defective and must be replaced.

Specifications

Brush Length (Minimum). . . . . 7.6mm (0.30 in.)

Commutator End Cap Long Screws. 5.6-9.0 N•m (49-79 lb-in.)

Brush Holder Mounting Screws . 2.5-3.3 N•m (22-29 lb-in.)

Solenoid Brush Lead Nut . . . . . 8-11 N•m (71-97 lb-in.)

ELECTRICAL TABLE OF CONTENTS

Table of Contents

Specifications

General Specifications

Battery Specifications

Voltage	12 VDC
BCI Group	45
CCA Ratings (Amps at -18°C (0°F))	480
Reserve Capacity (Minutes at 25 Amps)	80
Specific Gravity (Minimum)	1.265 points
Load Test (Minimum)	480 amp for 5 seconds
John Deere Battery Group	B

Ignition

Capacitive Discharge Air Gap	0.28 - 0.33 mm (0.011-0.013 in.)

Spark Plug

Gap	0.76 mm (0.030 in.)
Torque	24.4 - 29.8 N•m (18-22 lb-ft)

Starting Motor

Type S.N. (-035000)	Nippondenso Solenoid Shift
Type S.N. (035001-)	Delco-Remy Bendix drive

Stator

Stator Size	25 amp
Resistance	0.064-0.20 ohms
Regulated Voltage at High Idle (Minimum)	13.8-14.7 volts
Unregulated Voltage at 3600 RPM	28 VAC

General Information

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.

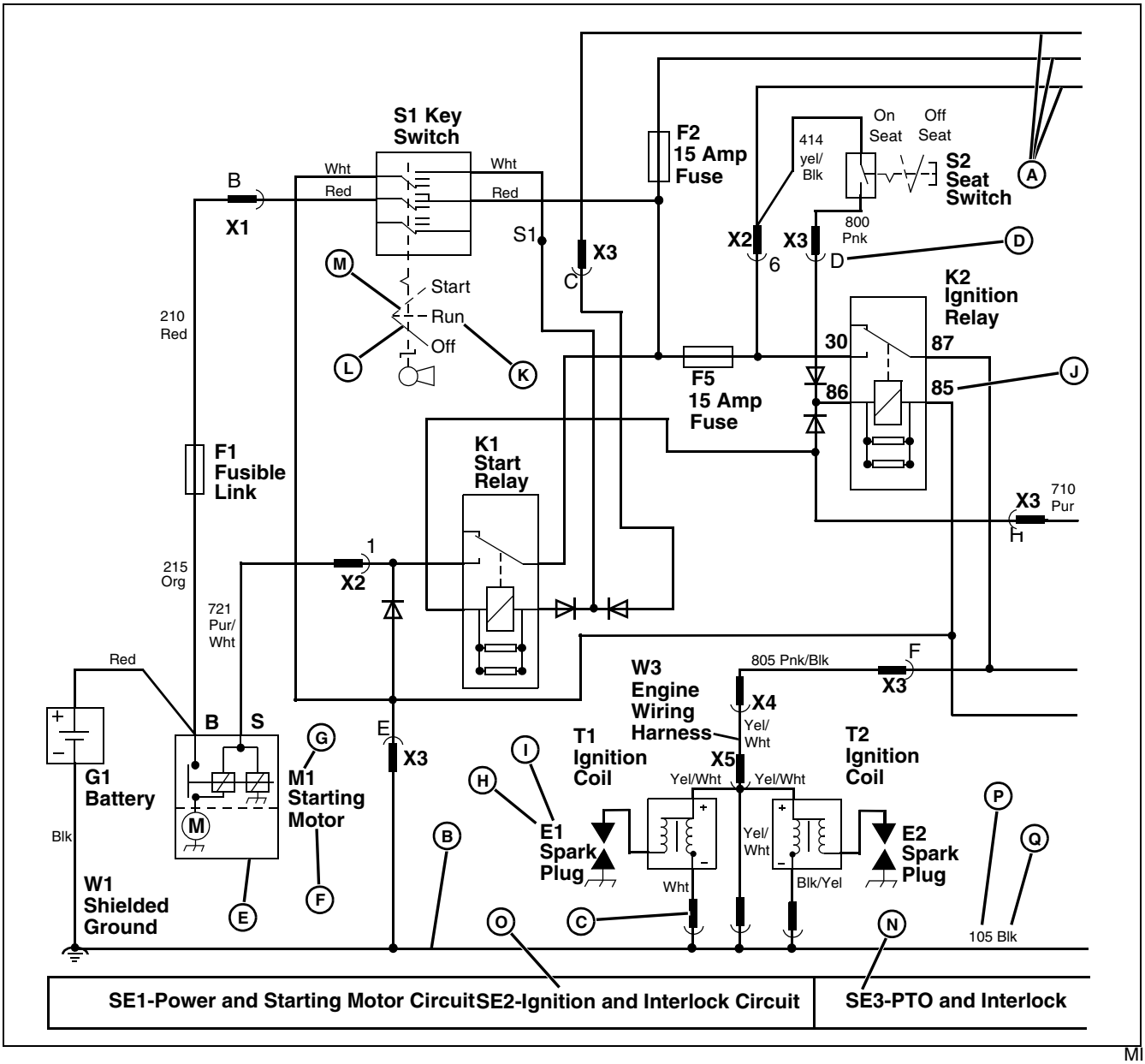
Each component is shown by a symbol (E), its name (F), and an identification code (G). The identification code contains a device identifying letter (H) and number (I).

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.



MIF

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 shows only 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 procedure 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

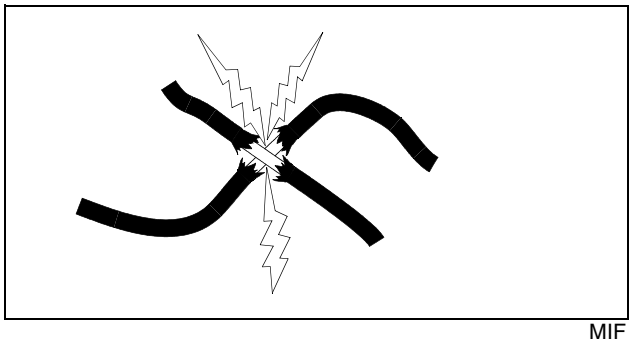
When performing the test or check, be sure to set your machine up to the TEST POINT/PROCEDURES listed in the first column and follow the sequence carefully. The middle RESULTS column gives the reading or condition that should be obtained in **BOLD** print. If the results of the test or check are not normal, perform the test, check, or adjustment listed below the **BOLD** print. The system diagram that accompanies each test procedure is drawn to resemble machine components. The leader line points to the exact point where 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 Blu	**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**

Common Circuit Tests

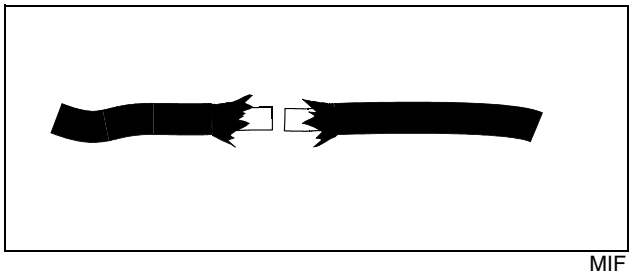
Shorted Circuit


MIF

A shorted circuit may result in the wrong component operating (i.e., improper wire-to-wire contact). 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 the component stops operating.
4. Shorted or improper connections will be the last two wires disconnected.

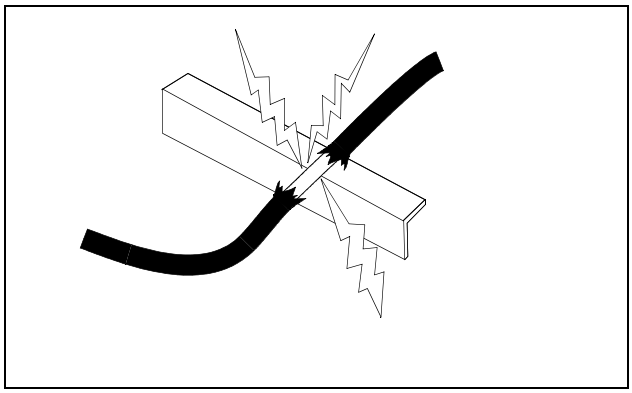
High Resistance or Open Circuit


MIF

High resistance or open circuits usually result in slow, dim, or no component operation (i.e., poor, corroded, or disconnected 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 grounds of the circuit for corrosion.
2. If terminals are not corroded or loose, the problem is in the component or wiring.

Grounded Circuit


MIF

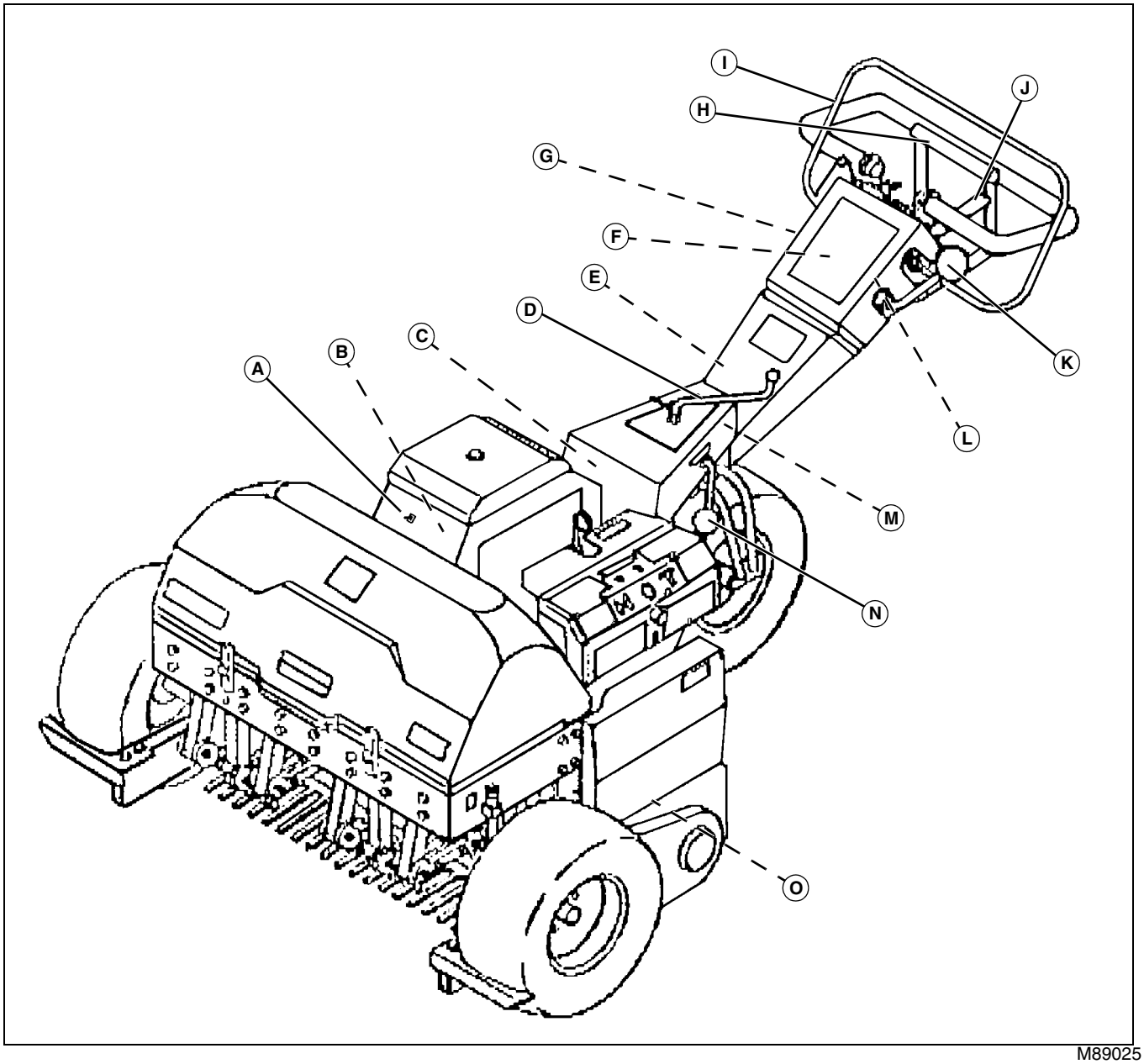
Grounded circuits usually result in no component operation or a blown fuse.

Conductors for 12-Volt Circuits

Stranded Conductors For 12-Volt Circuits						
SAE Wire Size (Gage)	20	18	16	14	12	10
Metric Wire Size (mm)	0.5	0.8	1.0	2.0	3.0	5.0
Typical Stranding	7 x 28	16 x 30	19 x 29	19 x 27	19 x 25	19 x 23
Minimum Conductor Area in Circular Mils	1072	1537	2336	3702	5833	9343

Component Location

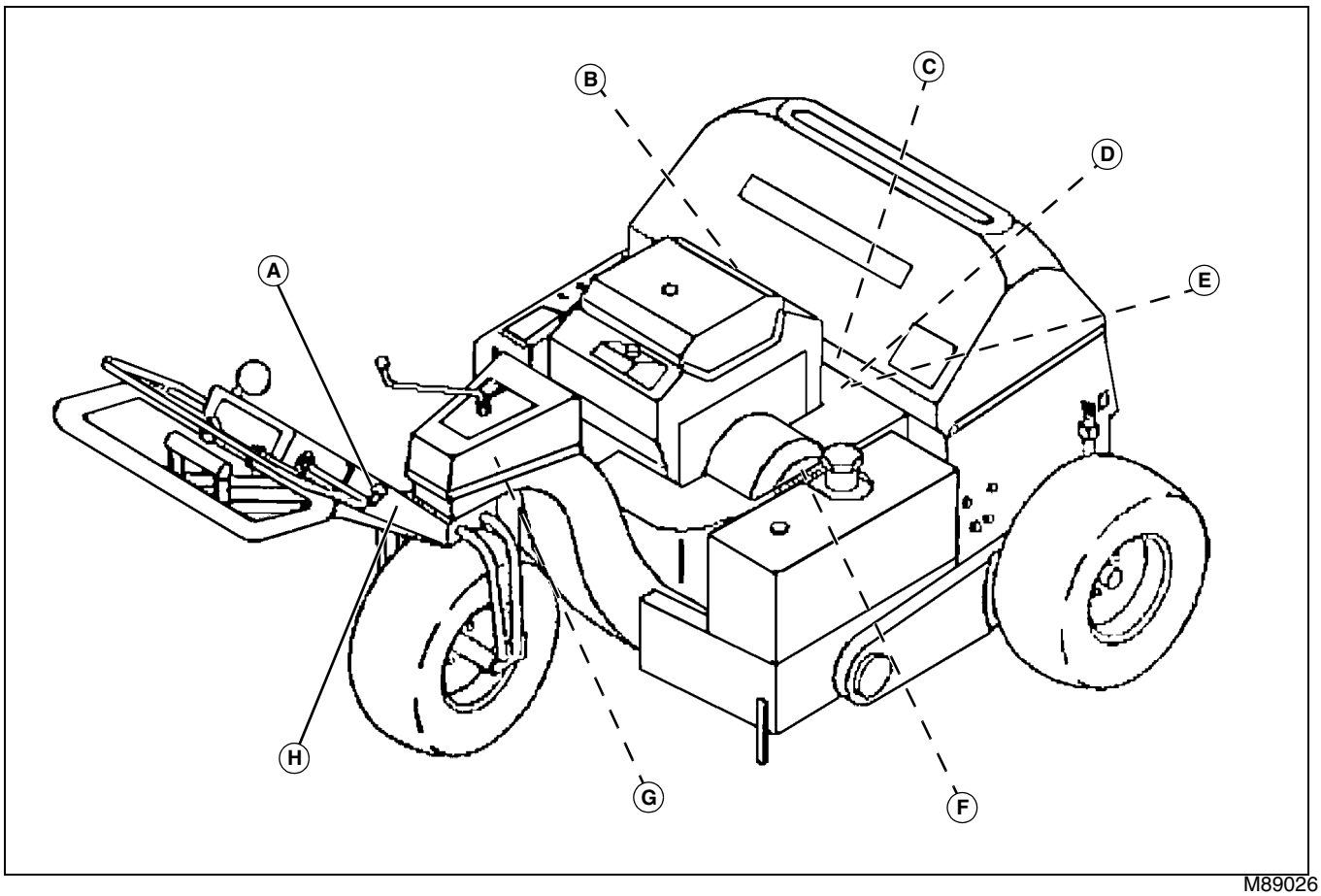
800 Aerator S.N. (-030000)



M89025

A - Throttle Back Switch (S5)
B - Throttle Back Solenoid (Y4)
C - Relays (K1-K5)
D - Transaxle Lever
E - Fuse Block (F5-F8)
F - Diodes (V1-V3)
G - Lift and Lower Switches (S2 and S3)
H - Lift and Lower Lever
I - Operator Presence Bar
J - Throttle Lever
K - Traction Clutch Lever
L - Traction Clutch Switch (B2)
M - Park Brake Switch (B1)
N - Park Brake
O - Lower Limit Switch (B3)

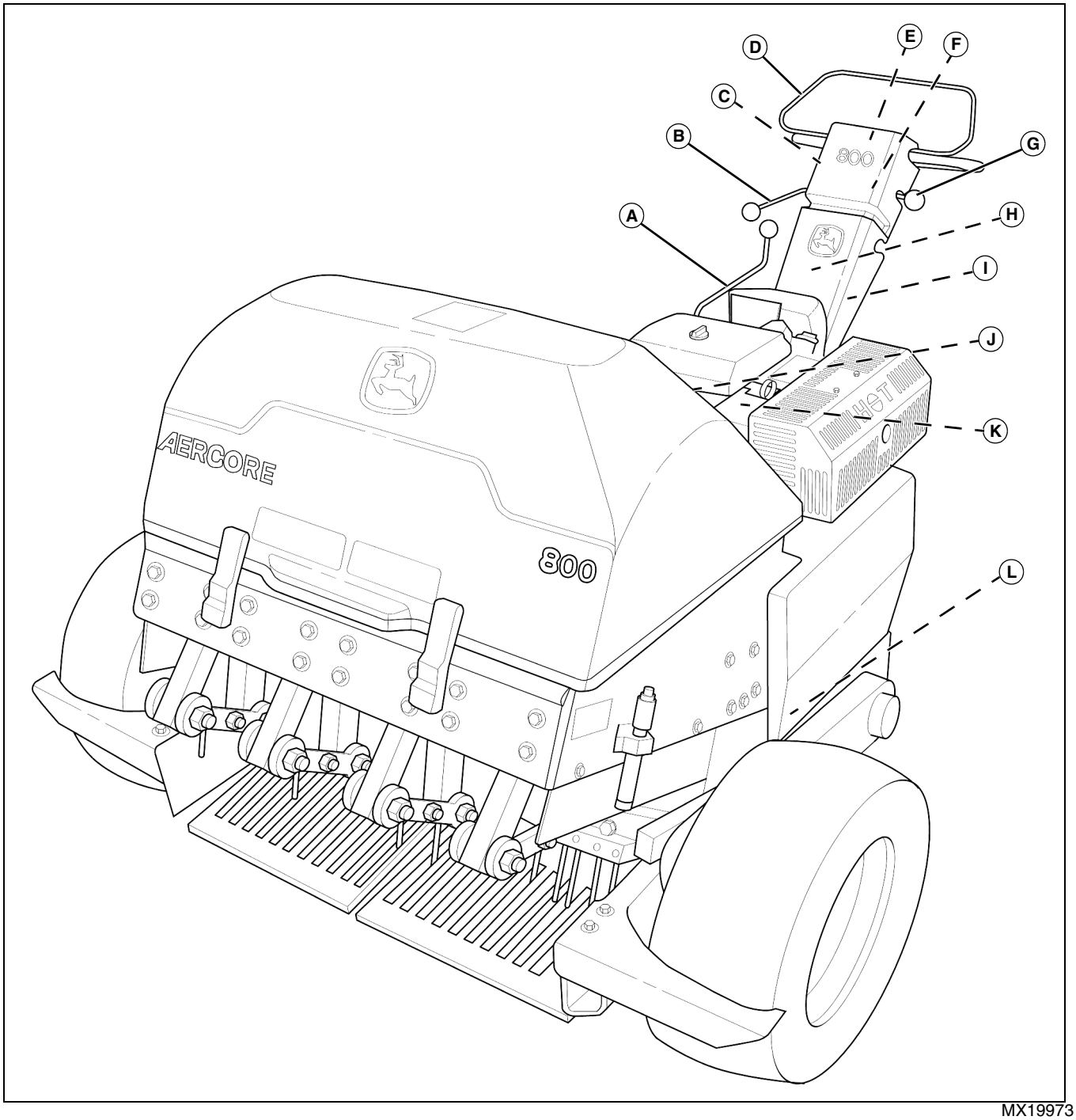
800 Aerator S.N. (-030000)



M89026

A - Key Switch (S1)
B - Lift Motors (M2 and M3)
C - Battery (G1)
D - Lift limit Switch (S6)
E - Lift and Lower Relays (K6 and K7)
F - Traction Clutch (Y3)
G - Buzzer (H1)
H - Automatic/Manual Switch (S4)

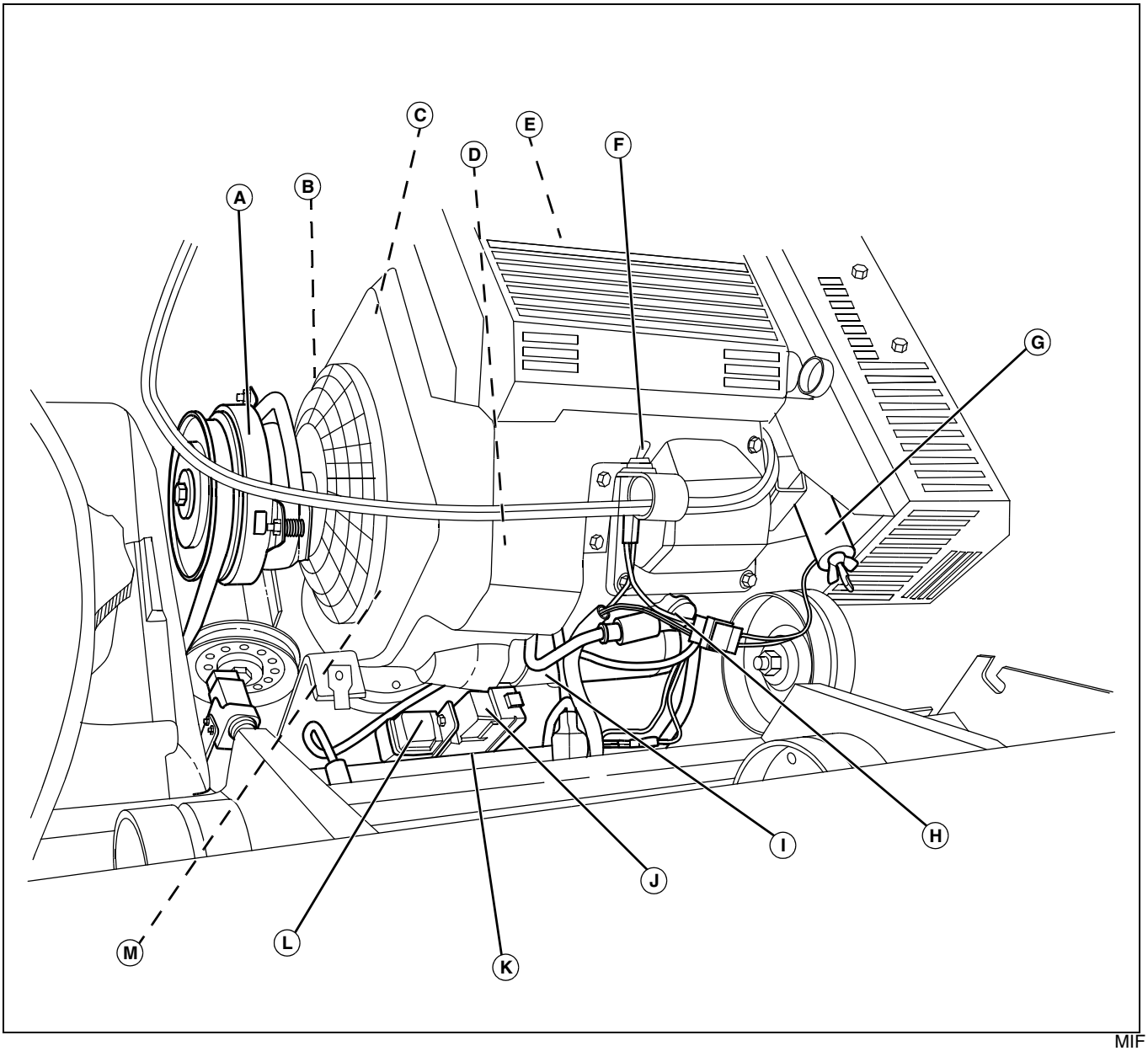
800 Aerator S.N. (030001-060000)



MX19973

A - Transaxle Lever
B - Park Brake Lever
C - Park Brake Switch (B1)
D - Operator Presence Bar
E - Actuator Switch
F - Traction Clutch Switch (B2)
G - Traction Clutch Lever
H - Diodes (V1-V4)
I - Fuse Block (F5-F8)
J - Throttle Back Switch (S5)
K - Throttle Back Solenoid (Y4)
L - Lower Limit Switch (B3)

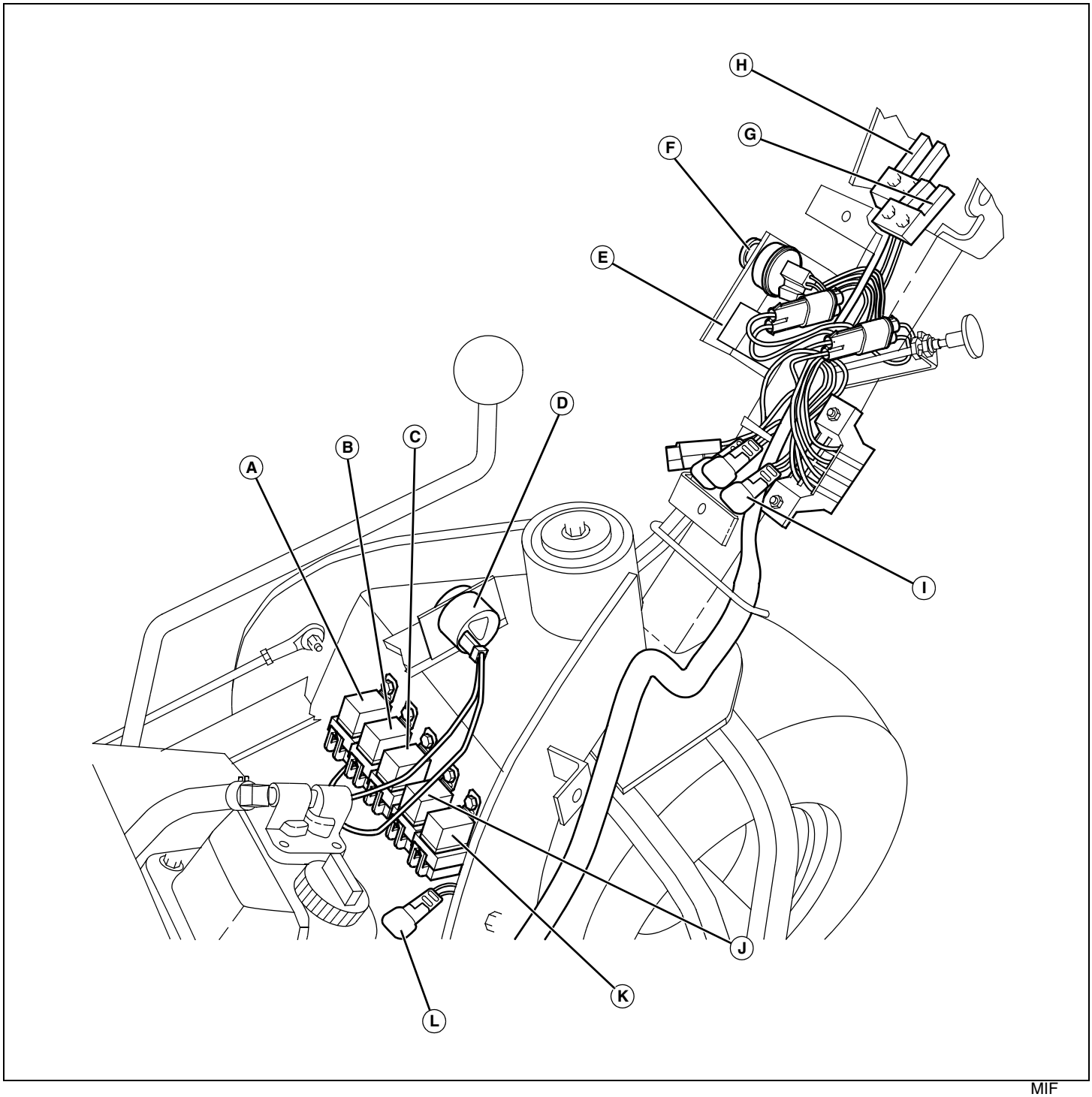
800 Aerator S.N. (030001-060000)



MIF

A - Traction Clutch (Y3)
B - Voltage Regulator/Rectifier (N1)
C - Ignition Module (T1)
D - Ignition Module (T2)
E - Spark Plug (E1)
F - Throttle Back Switch (S5)
G - Throttle Back Solenoid (Y4)
H - Spark Plug (E2)
I - Starting Motor (M1)
J - Lift Relay (K6)
K - Lower Relay (K7)
L - Raise-on-Stop Relay (K8)
M - Stator (G2)

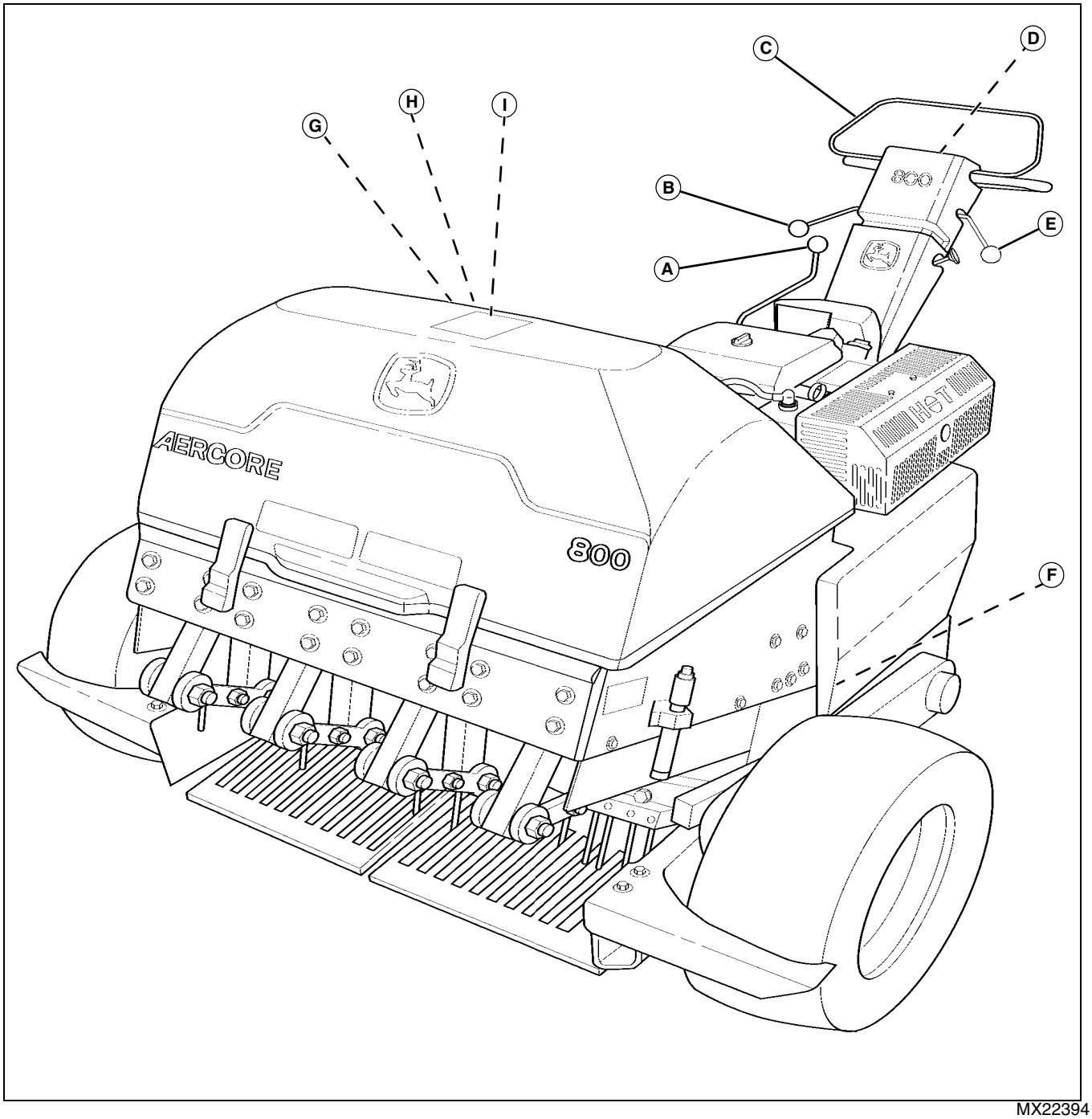
800 Aerator S.N. (030001-060000)



MIF

A - Lift/Start Relay (K1)
B - Lift Limit Relay (K2)
C - Buzzer Relay (K3)
D - Buzzer (H1)
E - Automatic/Manual Switch (S4)
F - Key Switch (S1)
G - Traction Clutch Switch (B2)
H - Park Brake Switch (B1)
I - Diodes (V1-V3)
J - Traction/Start Relay (K4)
K - Actuator Enable Relay (K5)
L - Raise-on-Stop Diode (V4)

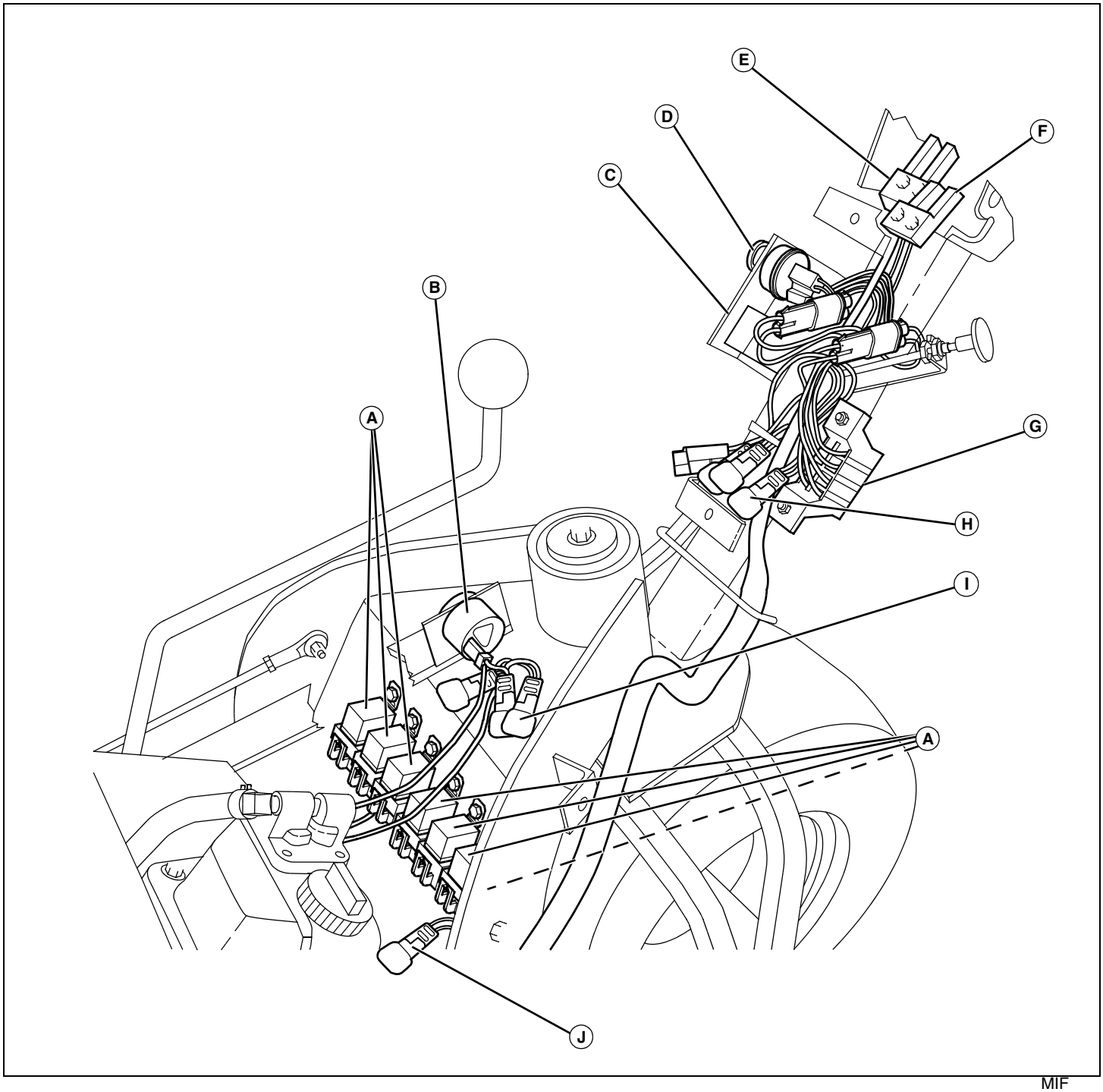
800 Aerator S.N. (060001-)



MX22394

A - Transaxle Lever
B - Park Brake Lever
C - Operator Presence Bar
D - Lift and Lower Switches (S2 and S3)
E - Travel Lever
F - Lower Limit Switch (B3)
G - Hydraulic Pump (M4)
H - Lower Solenoid (Y5)
I - Lift Solenoid (Y6)

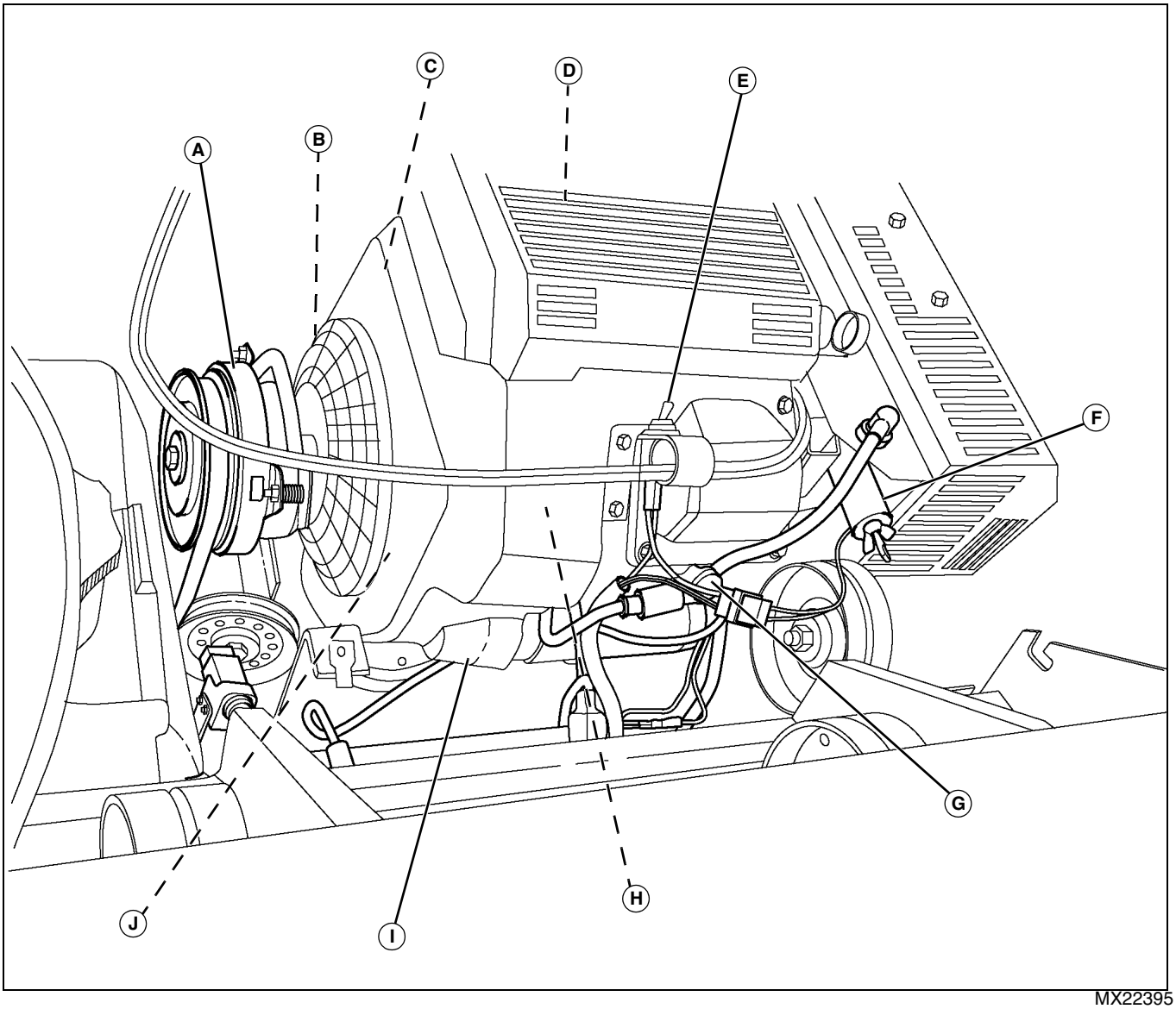
800 Aerator S.N. (060001-)



MIF

A - Relays (K1-K4 and K8-K10)
B - Buzzer (H1)
C - Automatic/Manual Switch (S4)
D - Key Switch (S1)
E - Park Brake Switch (B1)
F - Traction Clutch Switch (B2)
G - Fuse Block
H - Diodes (V1-V3)
I - Buzzer Diodes (V5-V7)
J - Raise-on-Stop Diode (V4)

800 Aerator S.N. (060001-)



MX22395

A - Traction Clutch (Y3)
B - Voltage Regulator/Rectifier (N1)
C - Ignition Module (T1)
D - Spark Plug (E1)
E - Throttle Back Switch (S5)
F - Throttle Back Solenoid (Y4)
G - Spark Plug (E2)
H - Ignition Module (T2)
I - Starting Motor (M1)
J - Stator (G2)

Schematics and Harnesses

Schematic and Wiring Harness Legend

Components

B1 - Park Brake Switch

B2 - Traction Clutch Switch

B3 - Lower Limit Switch

E1 - Spark Plug

E2 - Spark Plug

E3 - Headlight (Optional)

E4 - Headlight (Optional)

F1 - Fusible Link S.N. (-060000)

F2 - Fusible Link

F3 - Fusible Link S.N. (060001-)

F4 - Fusible Link S.N. (060001-)

F5 - Fuse

F6 - Fuse

F7 - Fuse

F8 - Fuse

G1 - Battery

G2 - Stator

H1 - Buzzer

K1 - Lift/Start Relay

K2 - Lift Limit Relay

K3 - Buzzer Relay

K4 - Traction/Start Relay

K5 - Actuator Enable Relay S.N. (-060000)

K6 - Lift Relay S.N. (-060000)

K7 - Lower Relay S.N. (-060000)

K8 - Raise-on-Stop Relay S.N. (030001-)

K9 - Lower Enable Relay S.N. (060001-)

K10 - Lift Enable Relay S.N. (060001-)

K11 - Lower Solenoid S.N. (060001-)

K12 - Lift Solenoid S.N. (060001-)

M1 - Starting Motor

M2 - Lift Actuator 1 S.N. (-060000)

M3 - Lift Actuator 2 S.N. (-060000)

M4 - Hydraulic Pump S.N. (060001-)

N1 - Voltage Regulator/Rectifier

S1 - Key Switch

S2 - Lift Switch

S3 - Lower Switch

S4 - Automatic/Manual Switch

S5 - Throttle Back Switch

S6 - Lift Limit Switch

S7 - Headlight Switch (Optional)

T1 - Ignition Module

T2 - Ignition Module

V1 - Backfeed Diode

V2 - Lift Latch Diode

V3 - Lower Latch Diode

V4 - Raise-on-Stop Diode S.N. (030001-)

V5 - Traction Clutch Buzzer Diode S.N. (060001-)

V6 - Lower Buzzer Diode S.N. (060001-)

V7 - Lift Buzzer Diode S.N. (060001-)

W1 - Main Ground

W2 - Wire Splice

W3 - Wire Splice

W4 - Wire Splice

W5 - Wire Splice

W6 - Wire Splice

W7 - Wire Splice

W8 - Wire Splice

X1 - Engine Connector

Y1 - Starting Motor Solenoid

Y2 - Fuel Shutoff Solenoid

Y3 - Traction Clutch Solenoid

Y4 - Throttle Back Solenoid

Y5 - Lower Solenoid S.N. (060001-)

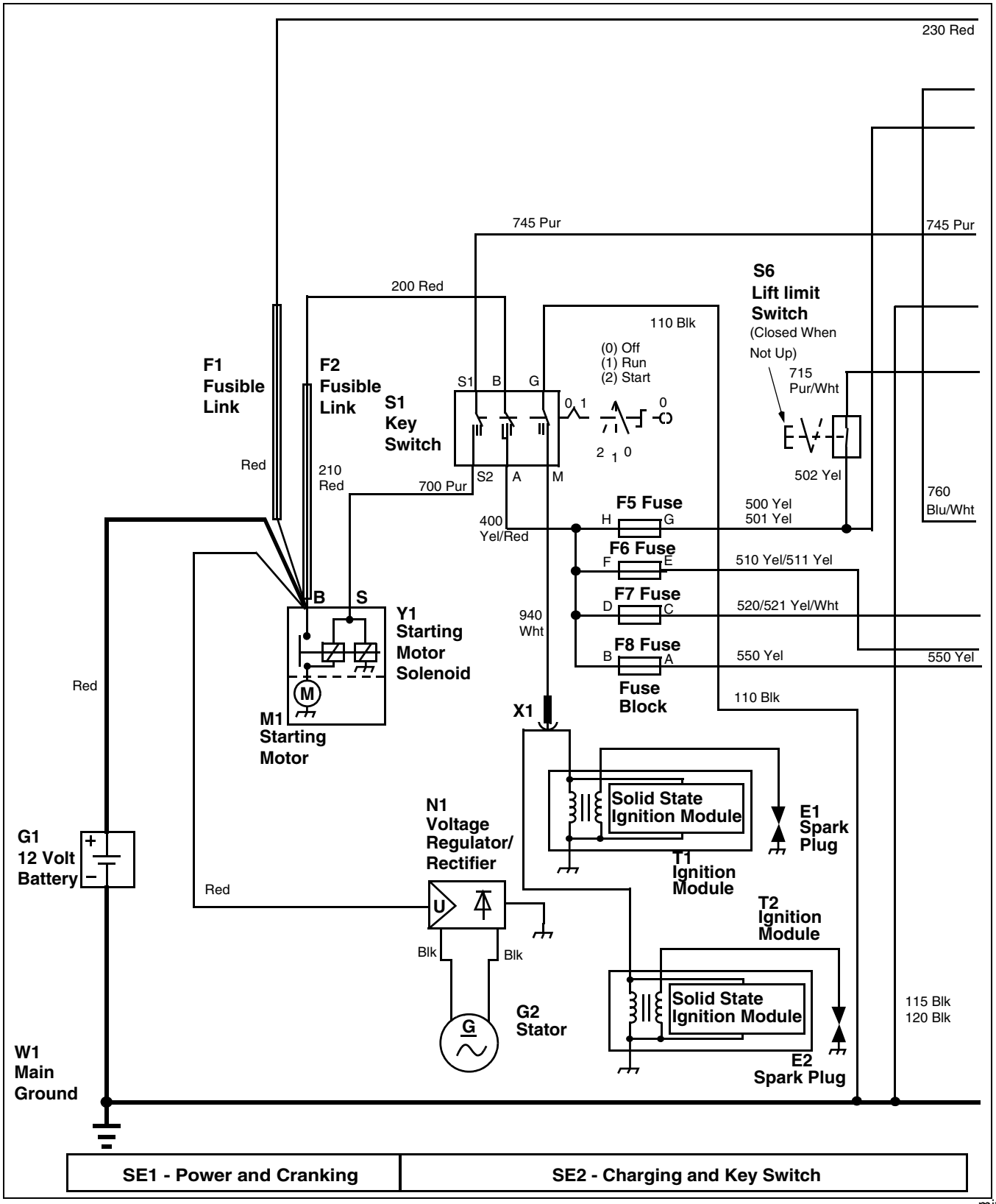
Y6 - Lift Solenoid S.N. (060001-)

Wire Code Table - 800 Aerator S.N. (-030000)

Circuit Number	Wire Size (mm^2)	Wire Color	Termination Points
100	3.0	Blk	K7, W1
101	0.8	Blk	K7, W3
105	3.0	Blk	K6, W1
106	0.8	Blk	K6, W3
107	0.8	Blk	K5, W3
110	0.5	Blk	S1, W2
115	0.8	Blk	K1, W2
120	0.8	Blk	K1, K2
125	0.8	Blk	K2, K3
130	0.8	Blk	K3, K4
135	0.8	Blk	K4, K5
140	0.8	Blk	K5, W2
145	0.8	Blk	H1, K5
150	2.0	Blk	W1, W2
155	1.0	Blk	W2, Y2
160	2.0	Blk	W2, S7
200	2.0	Red	F2, S1
210	0.8	Fusible Link	M1, 200
220	2.0	Red	K7, W4
221	2.0	Red	K6, W4
230	2.0	Red	F1, W4
400	2.0	Yel/Red	F5, S1
500	0.8	Yel	F5, V1
501	0.8	Yel	F5, K5
502	0.8	Yel	K5, S6
505	0.5	Yel	S3, V1
506	0.8	Yel	S2, S3
510	0.5	Yel	F6, B1
511	0.8	Yel	F6, B2
520	0.8	Yel/Wht	F7, X1, Y1
521	1.0	Yel/Blk	F7, K4
550	2.0	Yel	F8, S7
650	0.8	Pur	S2, S3

Circuit Number	Wire Size (mm^2)	Wire Color	Termination Points
651	0.8	Pur/Wht	S3, S4
660	0.8	Pur	B3, S2
670	0.8	Yel/Wht	B2, K7
675	0.8	Yel/Blk	K2, K6
700	0.8	Pur	Y1, S1
705	0.8	Pur	K4, B2
710	0.8	Pur/Blk	B1, K3
715	0.8	Pur/Wht	K2, S6
716	0.8	Pur	K1, K2
720	1.0	Pur	Y3, K4
730	1.0	Pur/Blk	K3, K4
740	1.0	Pur	K1, K4
745	1.0	Pur	K1, S1
750	0.8	Blu	S2, S3
751	0.8	Blu	S2, S4
760	0.8	Blu/Wht	K2, S3
780	0.8	Lt Blu	H1, K3
800	3.0	Org	K6, W6
801	3.0	Org	W6, M2
802	3.0	Org	W6, M3
803	0.8	Org	V3, W6
804	0.5	Org	S5, W6
805	0.8	Org	S4, V3
806	0.5	Org/Blk	S5, Y4
850	3.0	Blk	K7, W5
851	3.0	Blk	W5, M2
852	3.0	Blk	W5, M3
853	0.8	Blk/Wht	V2, W5
854	0.5	Blk/Wht	W5, Y4
855	0.8	Blk/Wht	S4, V2
940	0.5	Wht	S1, X1

Schematic - 800 Aerator S.N. (-030000) (1 of 3)



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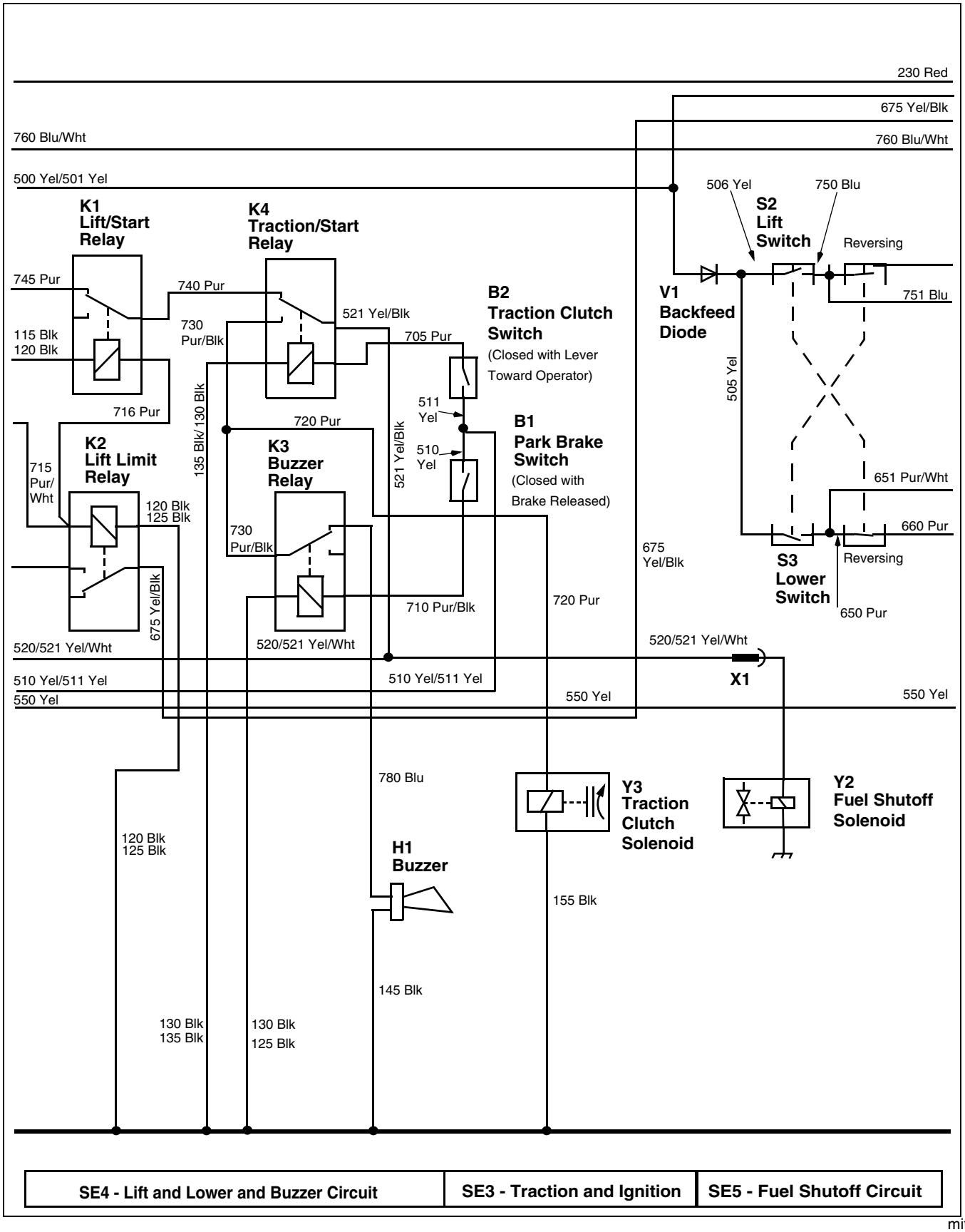
Schematic - 800 Aerator S.N. (-030000) (2 of 3)



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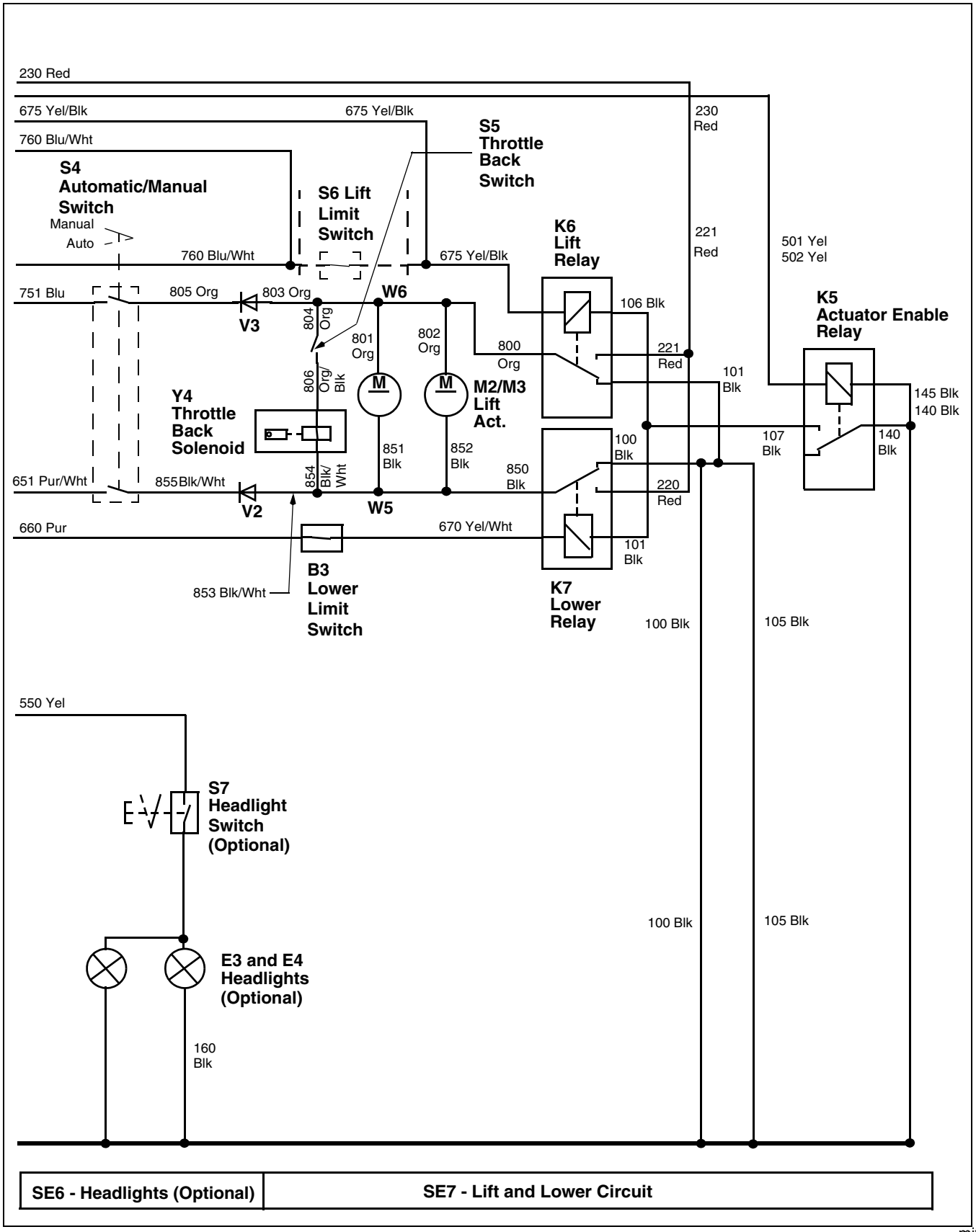
Schematic - 800 Aerator S.N. (-030000) (3 of 3)



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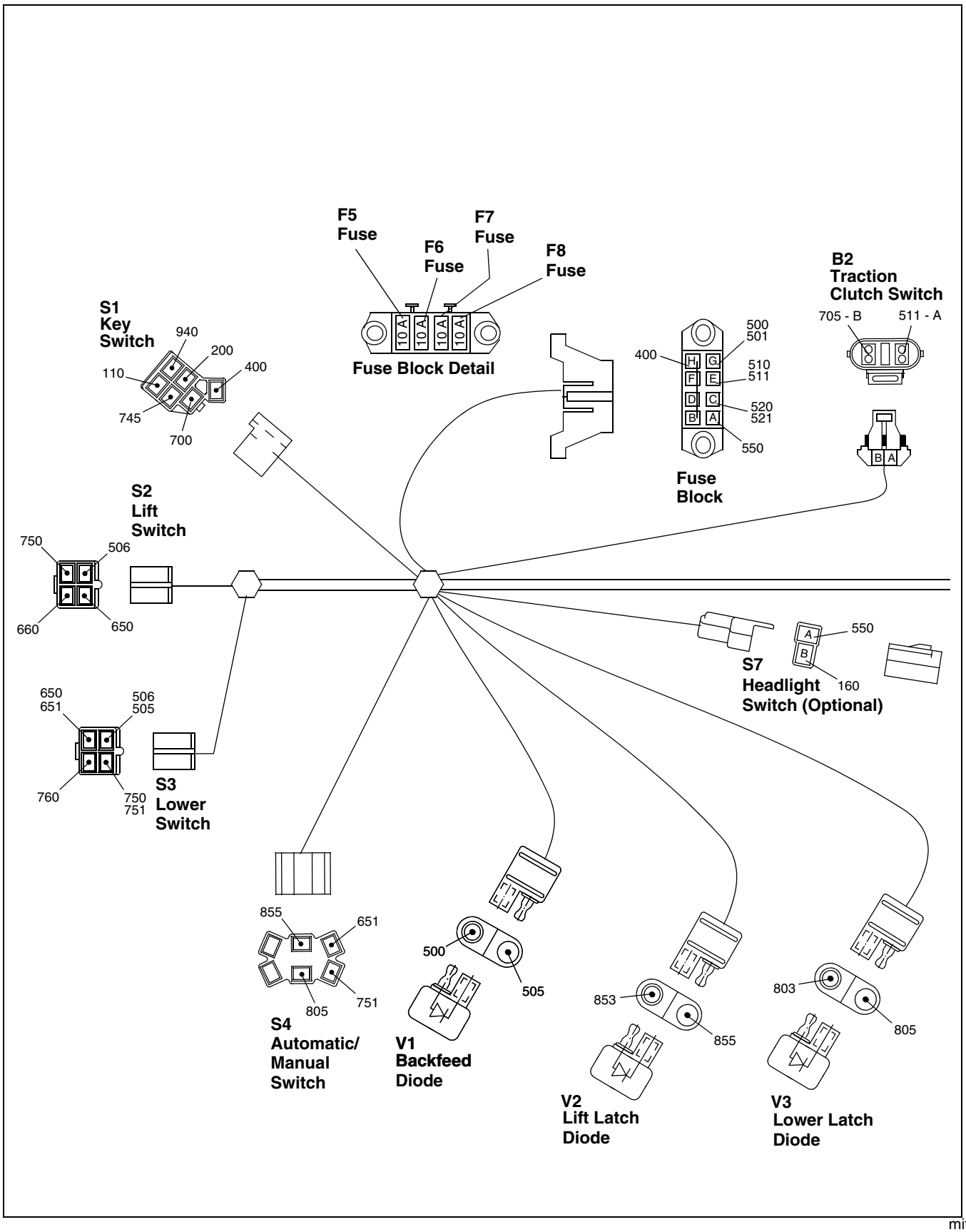
Wiring Harness - 800 Aerator S.N. (-030000) (1 of 3)



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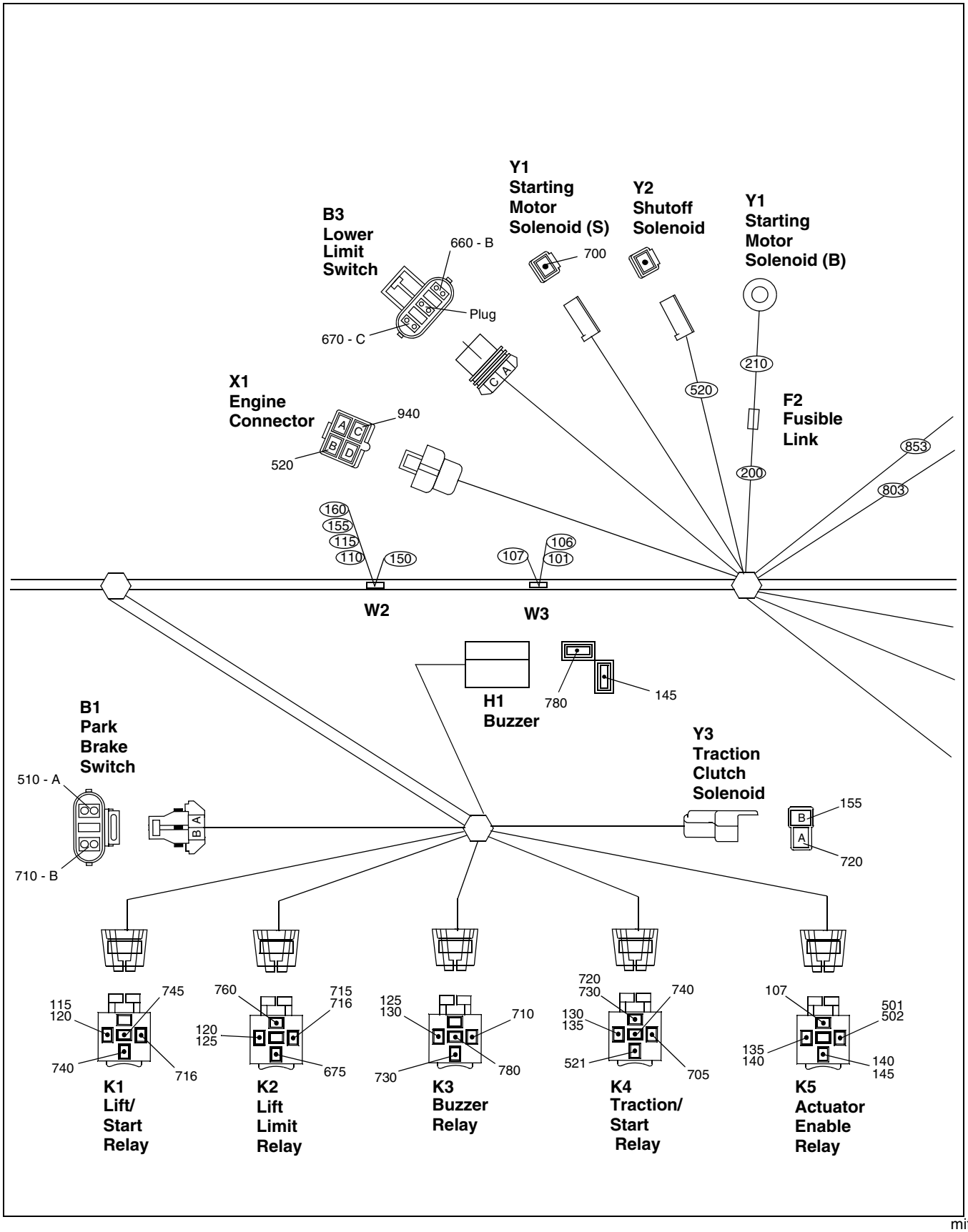
Wiring Harness - 800 Aerator S.N. (-030000) (2 of 3)



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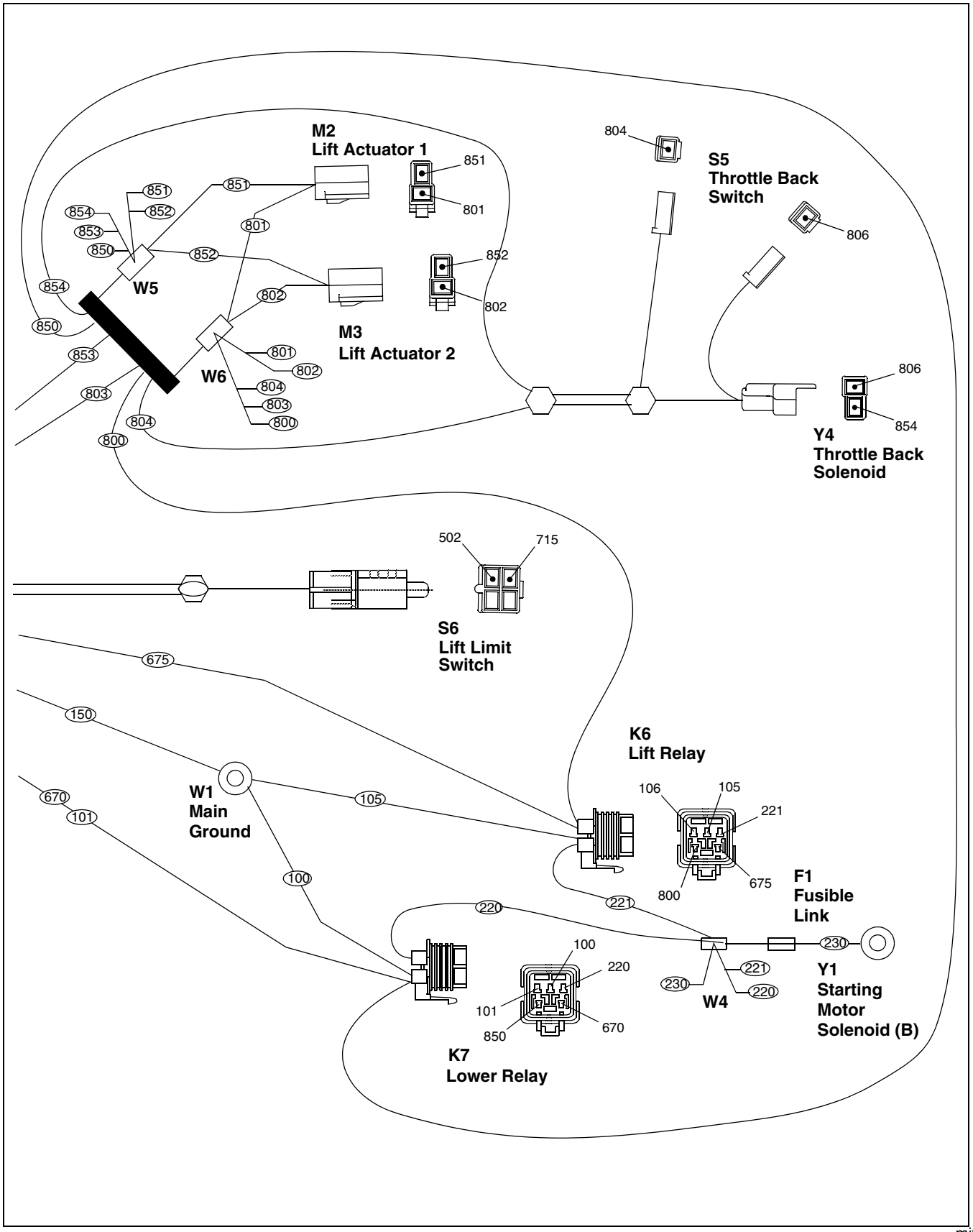
Wiring Harness - 800 Aerator S.N. (-030000) (3 of 3)



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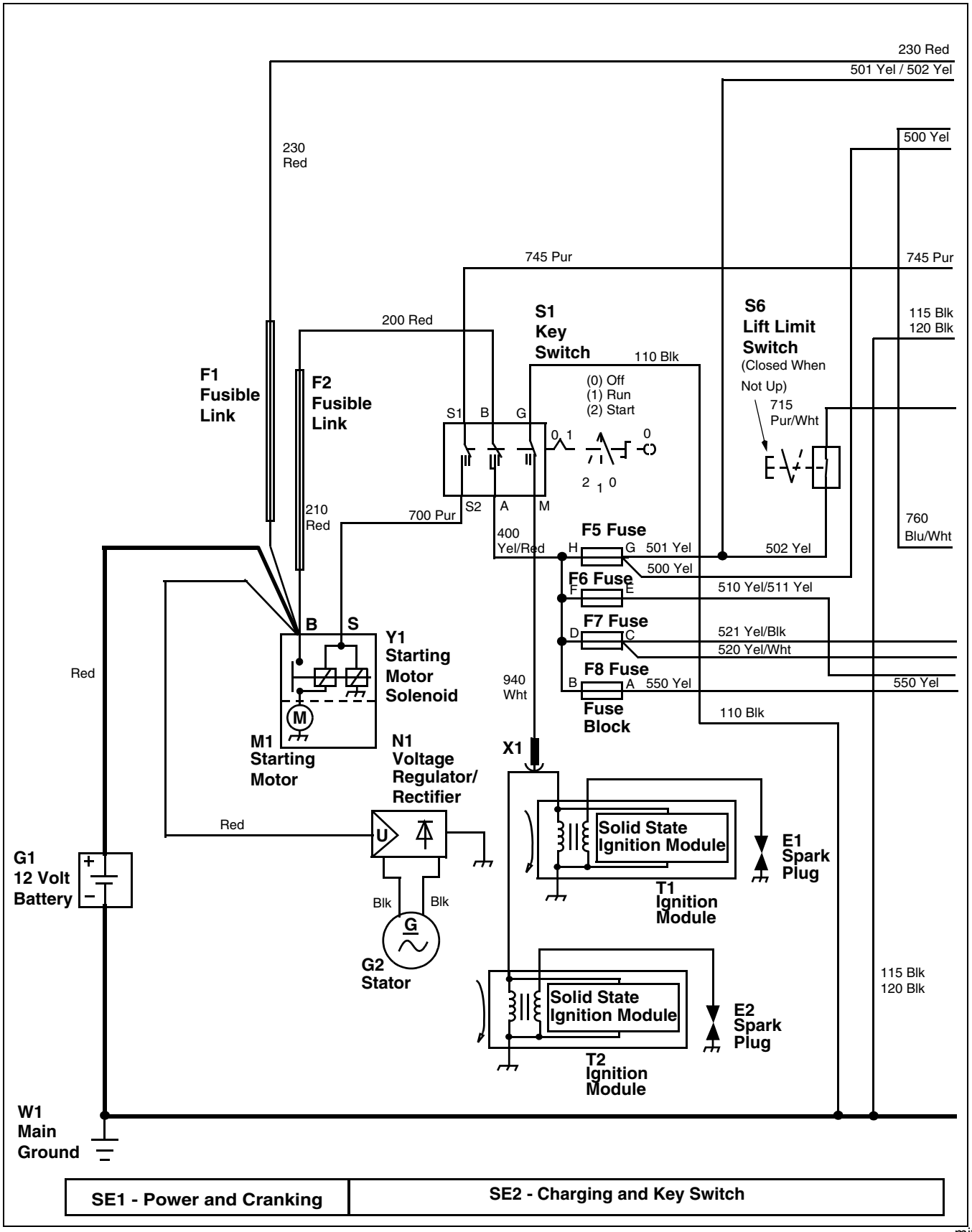
Wire Code Table - 800 Aerator S.N. (030001-060000)

Circuit Number	Wire Size (mm^2)	Wire Color	Termination Points
100	3.0	Blk	K7, W1
101	0.8	Blk	K7, Splice
105	3.0	Blk	K6, W1
106	0.8	Blk	K6, Splice
107	0.8	Blk	K5, Splice
110	0.5	Blk	S1, W1
112	0.8	Blk	K8, W1
115	0.8	Blk	K1, W1
120	0.8	Blk	K1, K2
125	0.8	Blk	K2, K3
130	0.8	Blk	K3, K4
135	0.8	Blk	K4, K5
140	0.8	Blk	K5, K5
145	0.8	Blk	H1, K5
150	2.0	Blk	W1, W2
155	1.0	Blk	W1, Y3
160	2.0	Blk	W2, S7
200	2.0	Red	F2, S1
210	0.8	Fusible Link	M1, 200
219	3.0	Red	K7, K8
220	3.0	Red	K8, W4
221	3.0	Red	K6, W4
230	2.0	Red	F1, W4
400	2.0	Yel/Red	F5, S1
500	0.8	Yel	F5, V1
501	0.8	Yel	F5, K5
502	0.5	Yel	K5, S6
505	0.8	Yel	S3, V1
506	0.8	Yel	S2, S3
510	0.5	Yel	B1, F6
511	0.8	Yel	F6, B2
520	0.8	Yel/Wht	F7, X1, Y2
521	1.0	Yel/Blk	F7, K4
550	2.0	Yel	F8, S7
650	0.8	Pur	S2, S3
651	0.8	Pur/Wht	S3, S4
660	0.8	Pur	B3, S3
670	0.8	Yel/Wht	B3, K7

Circuit Number	Wire Size (mm^2)	Wire Color	Termination Points
675	0.8	Yel/Blk	K2, K6
700	1.0	Pur	Y1, S1
705	0.8	Pur	K4, B2
710	0.8	Pur/Blk	B1, K3
715	0.8	Pur/Wht	K2, S6
716	0.8	Pur	K1, K2
720	1.0	Pur	K4, Y3
730	1.0	Pur/Blk	K3, K4
740	1.0	Pur	K1, K4
741	0.8	Pur	K4, K8
745	1.0	Pur	K1, S1
750	0.8	Blu	S2, S3
751	0.8	Blu	S2, S4
760	0.8	Blu/Wht	K2, S3
761	0.8	Blu	V4, K2
765	0.8	Pur	K8, V4
780	0.8	Blu	H1, K3
800	3.0	Org	K6, W6
801	0.8	Org	W6, M2
802	3.0	Org	W6, M3
803	0.8	Org	V3, W6
804	0.5	Org	S5, W6
805	0.8	Org	S4, V3
806	0.5	Org/Blk	S5, Y4
850	3.0	Blk	K7, W5
851	3.0	Blk	W5, M2
852	3.0	Blk	W5, M3
853	0.8	Blk/Wht	V2, W5
854	0.5	Blk/Wht	W5, Y3
855	0.8	Blk/Wht	S4, V2
940	0.5	Wht	S1, X1

Schematic - 800 Aerator S.N. (030001-060000) (1 of 3)



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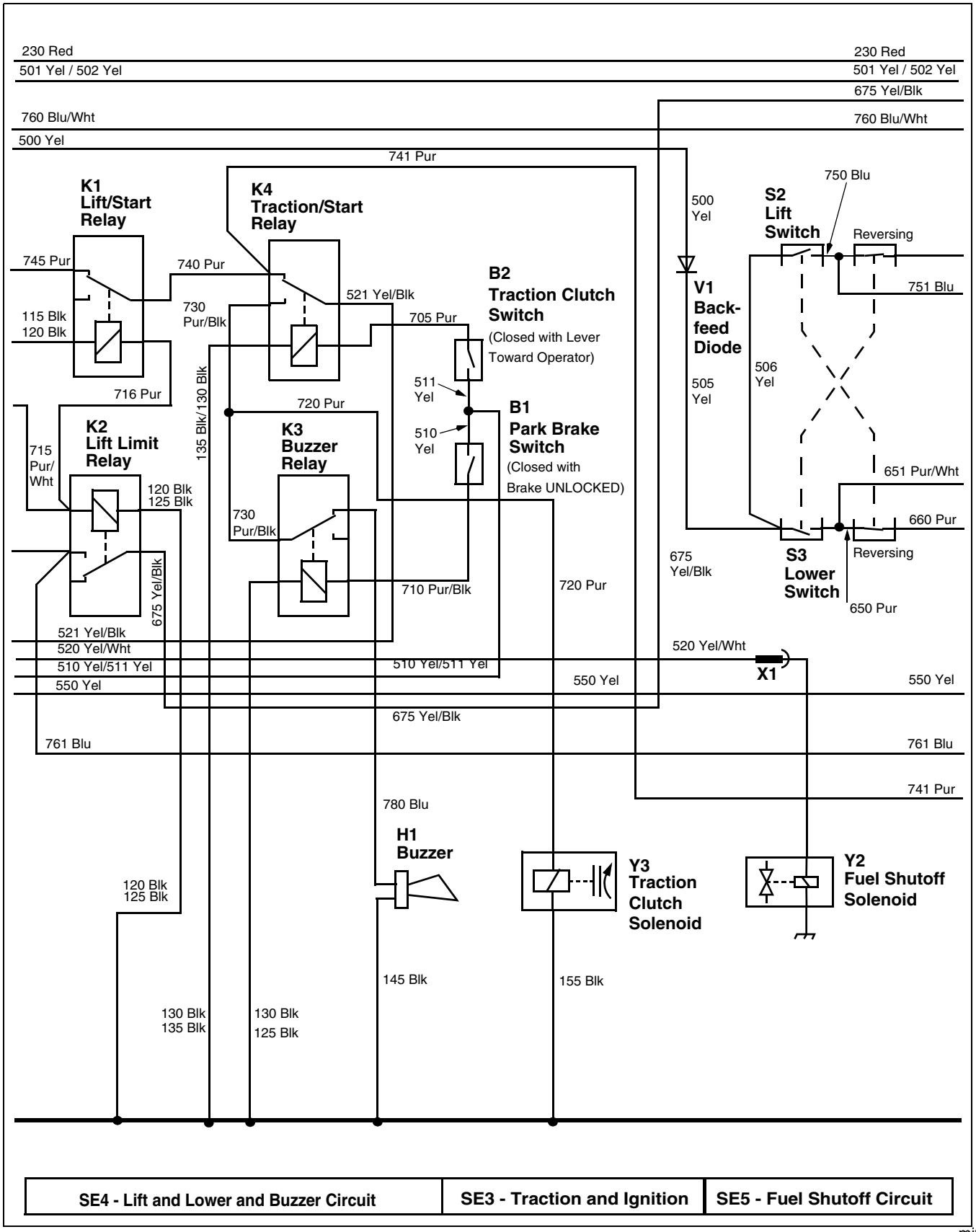
Schematic - 800 Aerator S.N. (030001-060000) (2 of 3)



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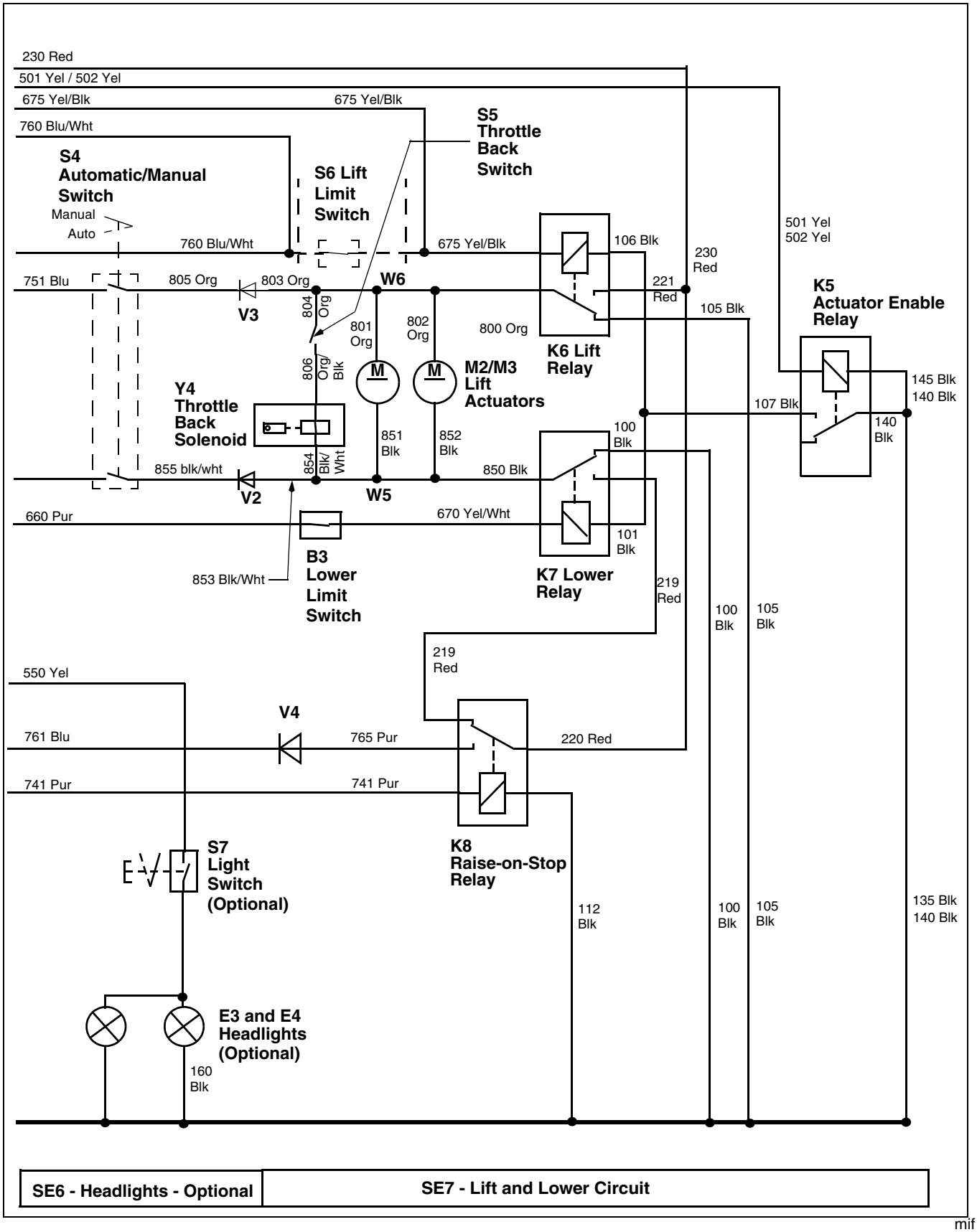
Schematic - 800 Aerator S.N. (030001-060000) (3 of 3)



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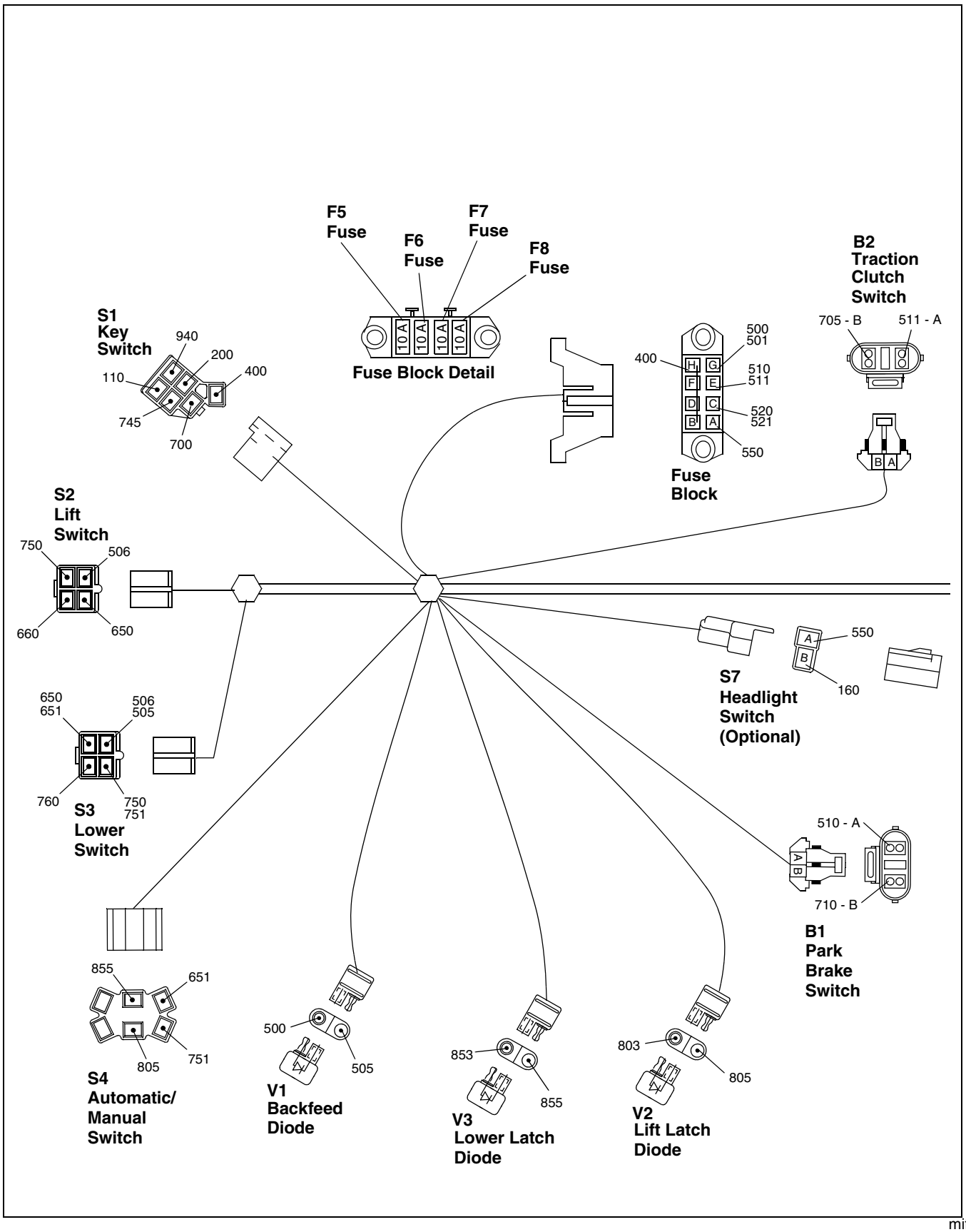
Wiring Harness - 800 Aerator S.N. (030001-060000) (1 of 3)



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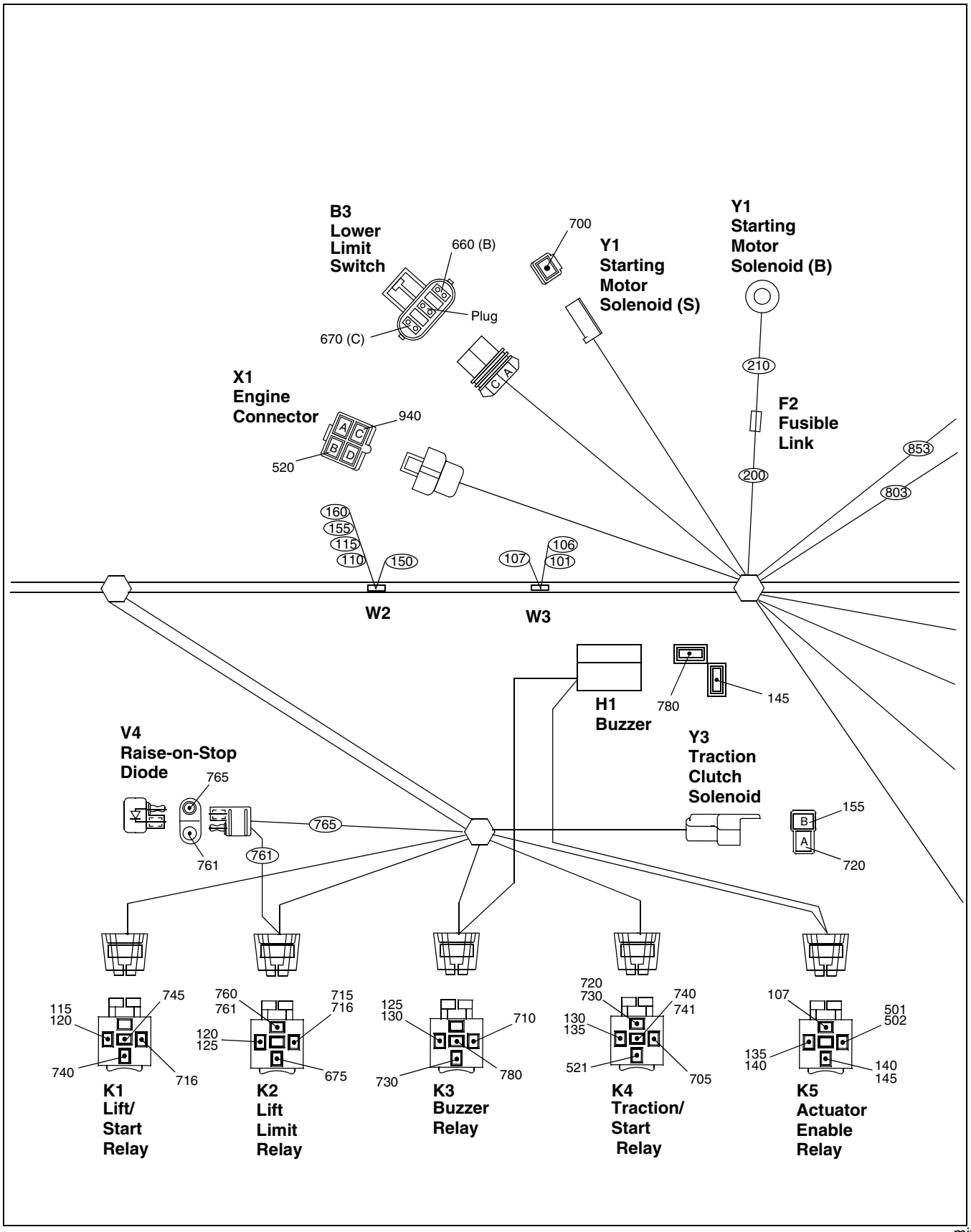
Wiring Harness - 800 Aerator S.N. (030001-060000) (2 of 3)



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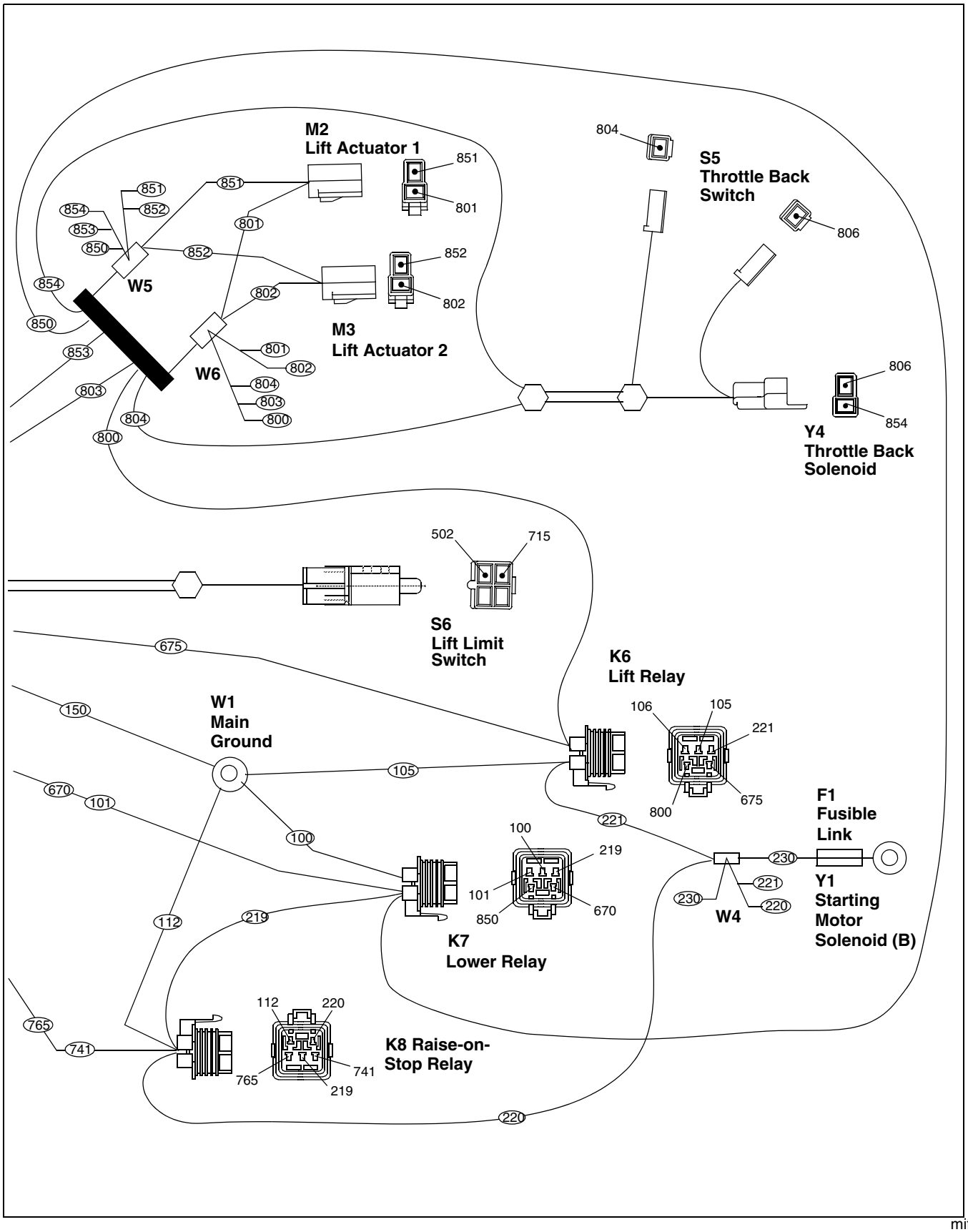
Wiring Harness - 800 Aerator S.N. (030001-060000) (3 of 3)



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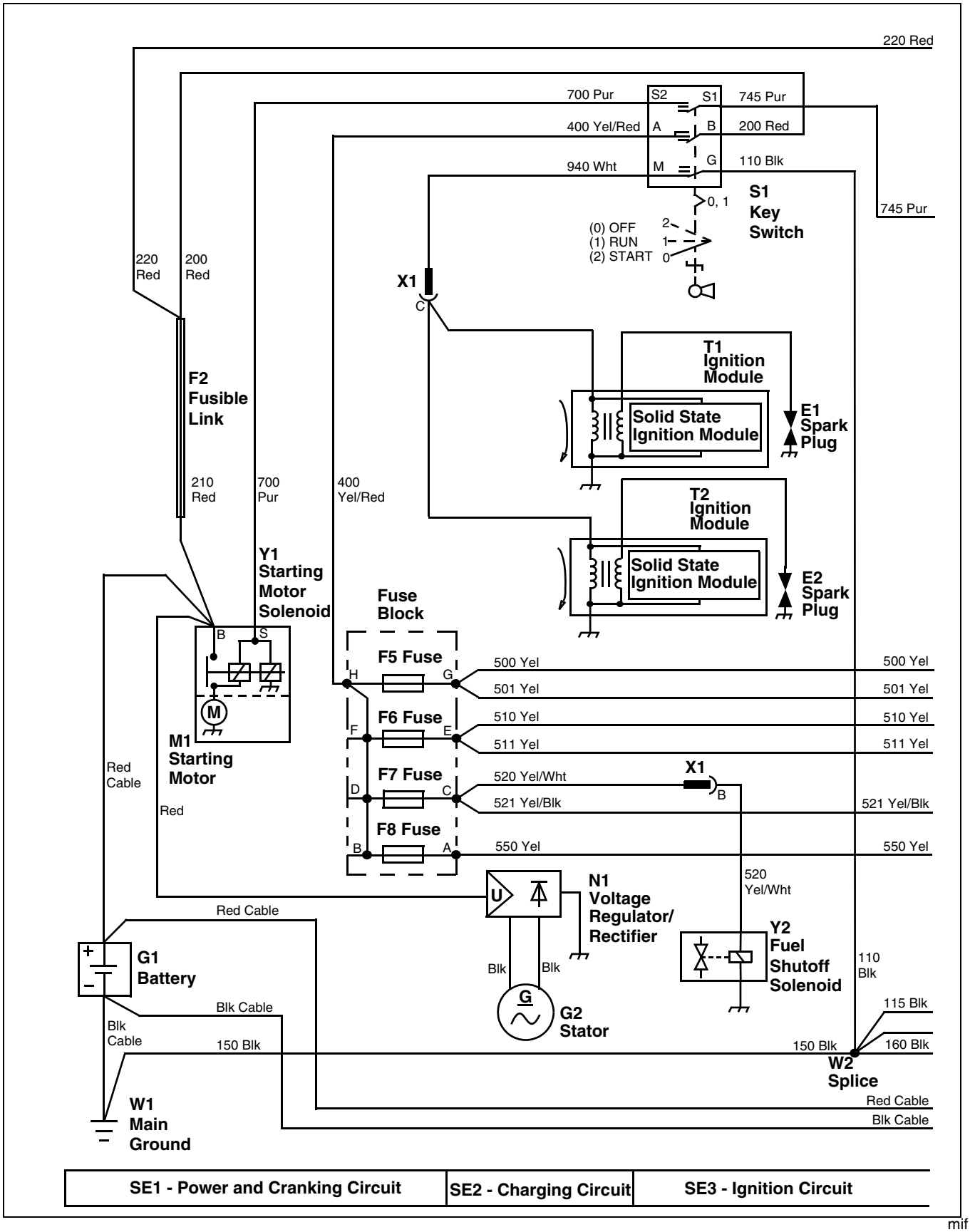
Wire Code Table - 800 Aerator S.N. (060001-)

Circuit Number	Wire Size (mm^2)	Wire Color	Termination Points
110	0.8	Blk	S1, W2
112	0.8	Blk	K8, K6
115	0.8	Blk	K1, W2
120	0.8	Blk	K1, K2
125	0.8	Blk	K2, K3
130	0.8	Blk	K3, K4
135	0.8	Blk	K4, K9
140	0.8	Blk	K9, K6
145	0.8	Blk	H1, K8
150	2.0	Blk	W1, W2
155	1.0	Blk	W2, Y3
160	2.0	Blk	W2, S7
200	2.0	Red	W3, S1
210	0.8	Fusible Link	M1, 200 and 220
220	1.0	Red	K8, W4
400	2.0	Yel/Red	F5, S1
500	0.8	Yel	F5, V1
501	0.8	Yel	F5, K9
502	0.8	Yel	K6, S6
503	0.8	Blu	K6, K9
505	0.8	Yel	S3, V1
506	0.8	Yel	S2, S3
510	0.8	Yel	B1, F6
511	0.8	Yel	F6, B2
520	0.8	Yel/Wht	F7, X1, Y2
521	1.0	Yel/Blk	F7, K4
550	2.0	Yel	F8, S7
650	0.8	Pur	S2, S3
651	0.8	Pur/Wht	S3, S4
660	0.8	Pur	B3, S3
670	1.0	Yel/Wht	B3, K9
671	1.0	Grn	K9, K10
675	1.0	Yel/Blk	K2, K6
676	1.0	Tan	K6, K11
700	1.0	Pur	Y1, S1
705	0.8	Pur	K4, B2
710	0.8	Pur/Blk	B1, K3
715	0.8	Pur/Wht	K2, S6
716	0.8	Pur	K1, K2
720	1.0	Pur	K4, Y3
730	1.0	Pur/Blk	K3, K4
740	1.0	Pur	K1, K4
741	0.8	Pur	K4, K8
745	1.0	Pur	K1, S1
750	0.8	Blu	S2, S3
751	0.8	Blu	S3, S4
760	0.8	Blu/Wht	K2, S3
761	1.0	Pnk	V4, K2
765	1.0	Pur	K8, V4
780	0.8	Pur	H1, K3
800	1.0	Org	F3, W6
803	1.0	Org	V2, W6
804	1.0	Org	S5, W6
805	0.8	Org	S4, V2
806	0.8	Org/Blk	S5, Y4
810	0.5	Fusible Link	Y6, 800
850	1.0	Blk	W8, W5
853	1.0	Blk/Wht	V3, W5
854	1.0	Blk/Wht	W5, Y4
855	0.8	Blk/Wht	S4, V3
860	0.5	Fusible Link	Y5, 850
940	0.8	Wht	S1, X1

Schematic - 800 Aerator S.N. (060001-) (1 of 3)



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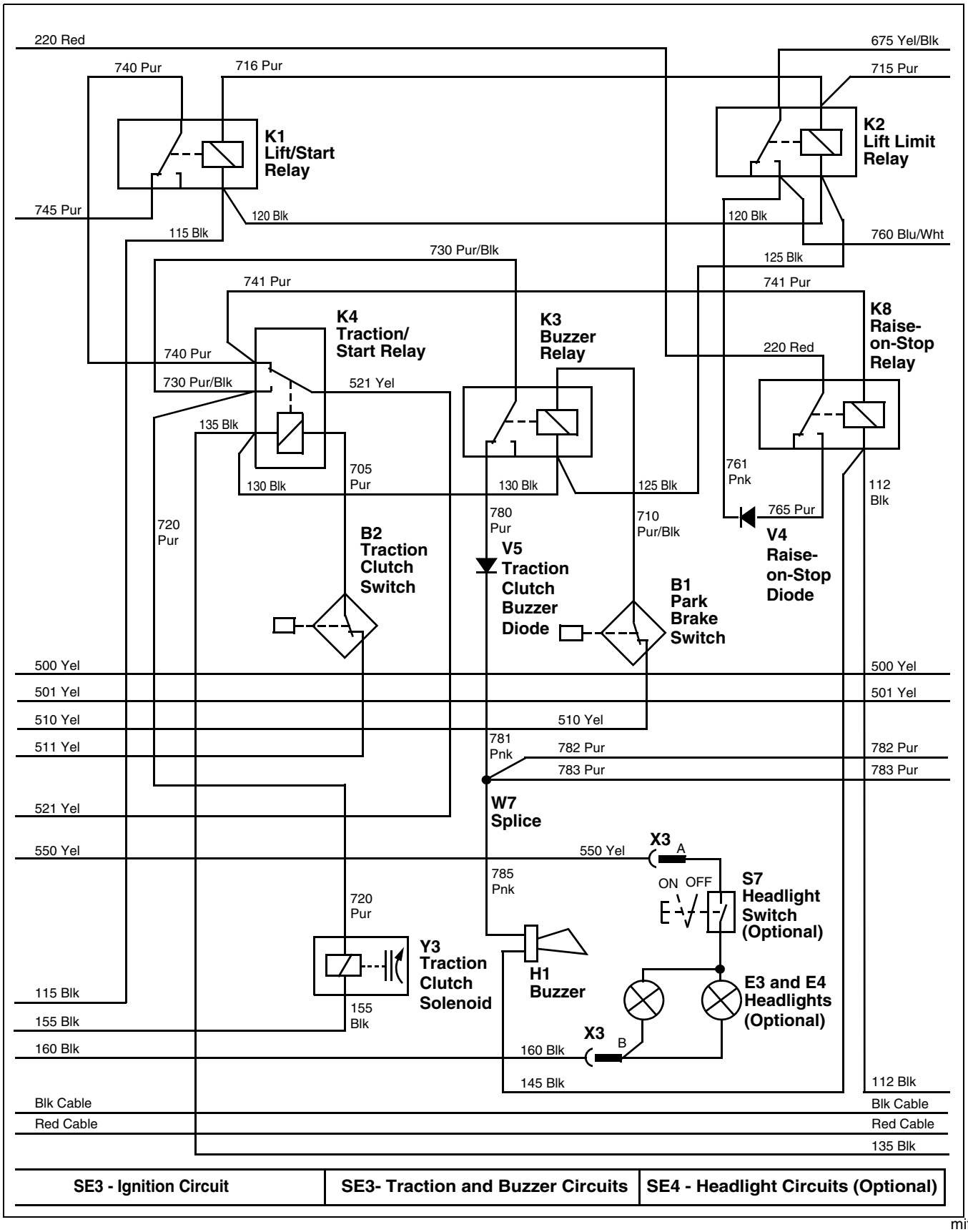
Schematic - 800 Aerator S.N. (060001-) (2 of 3)



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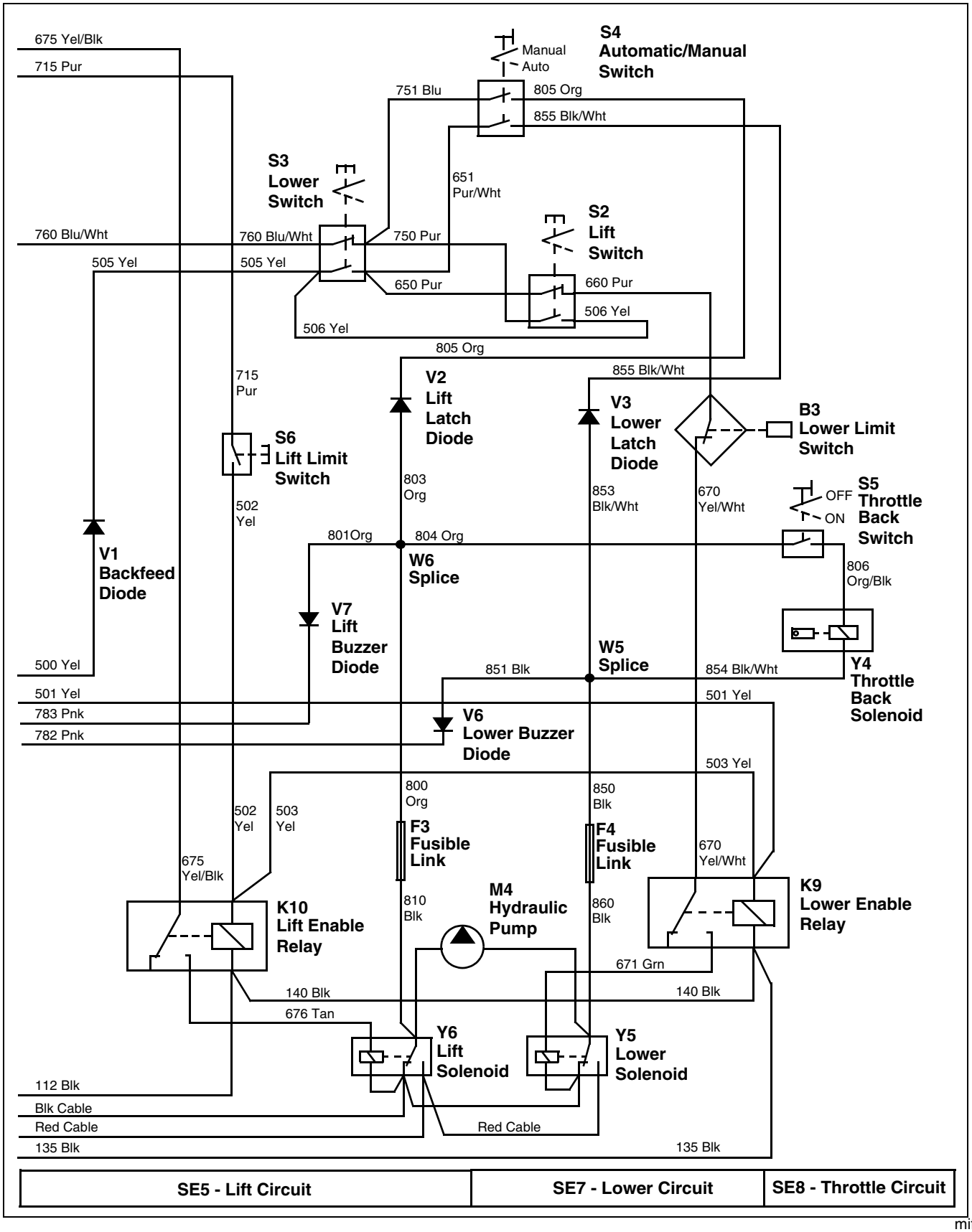
Schematic - 800 Aerator S.N. (060001-) (3 of 3)



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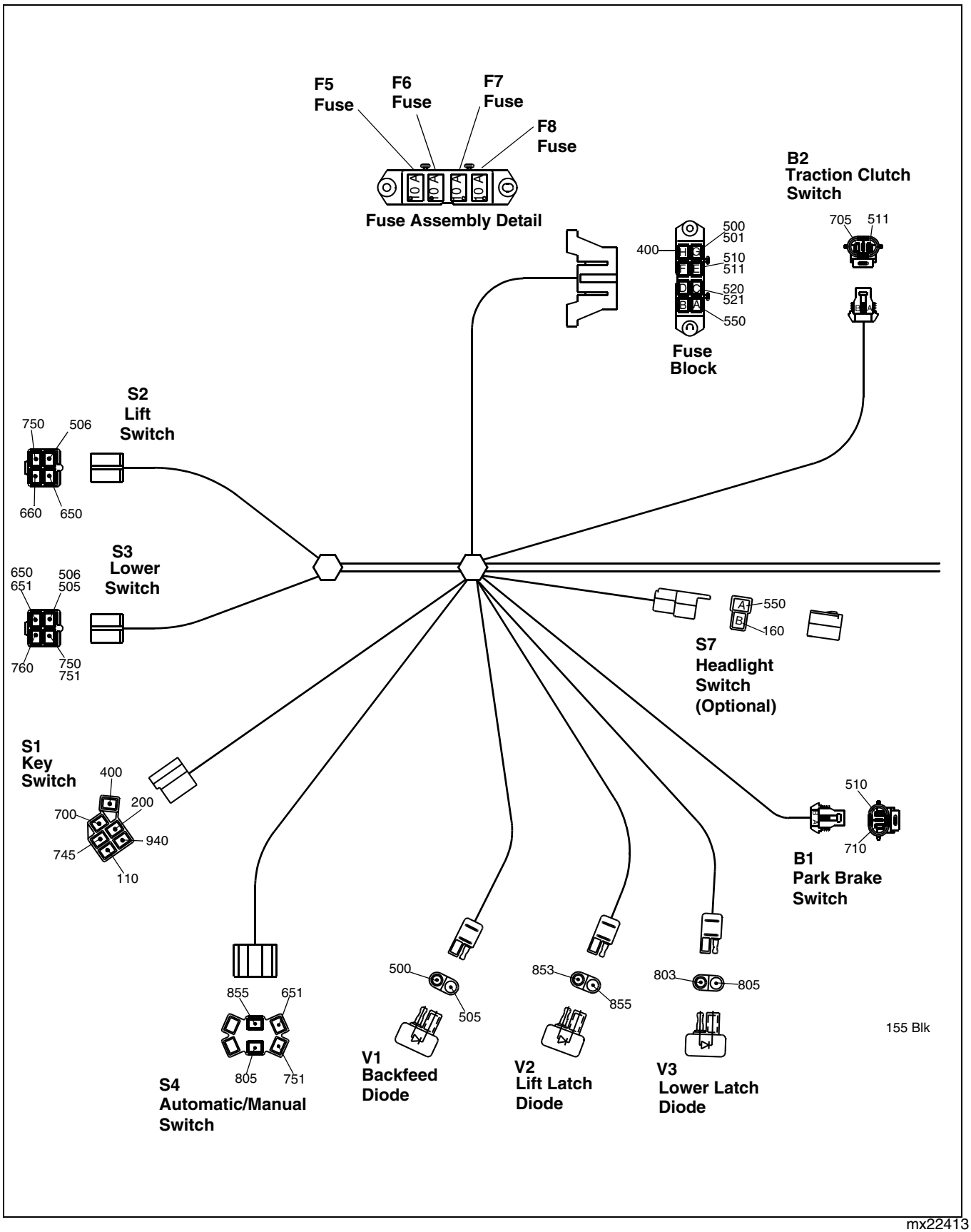
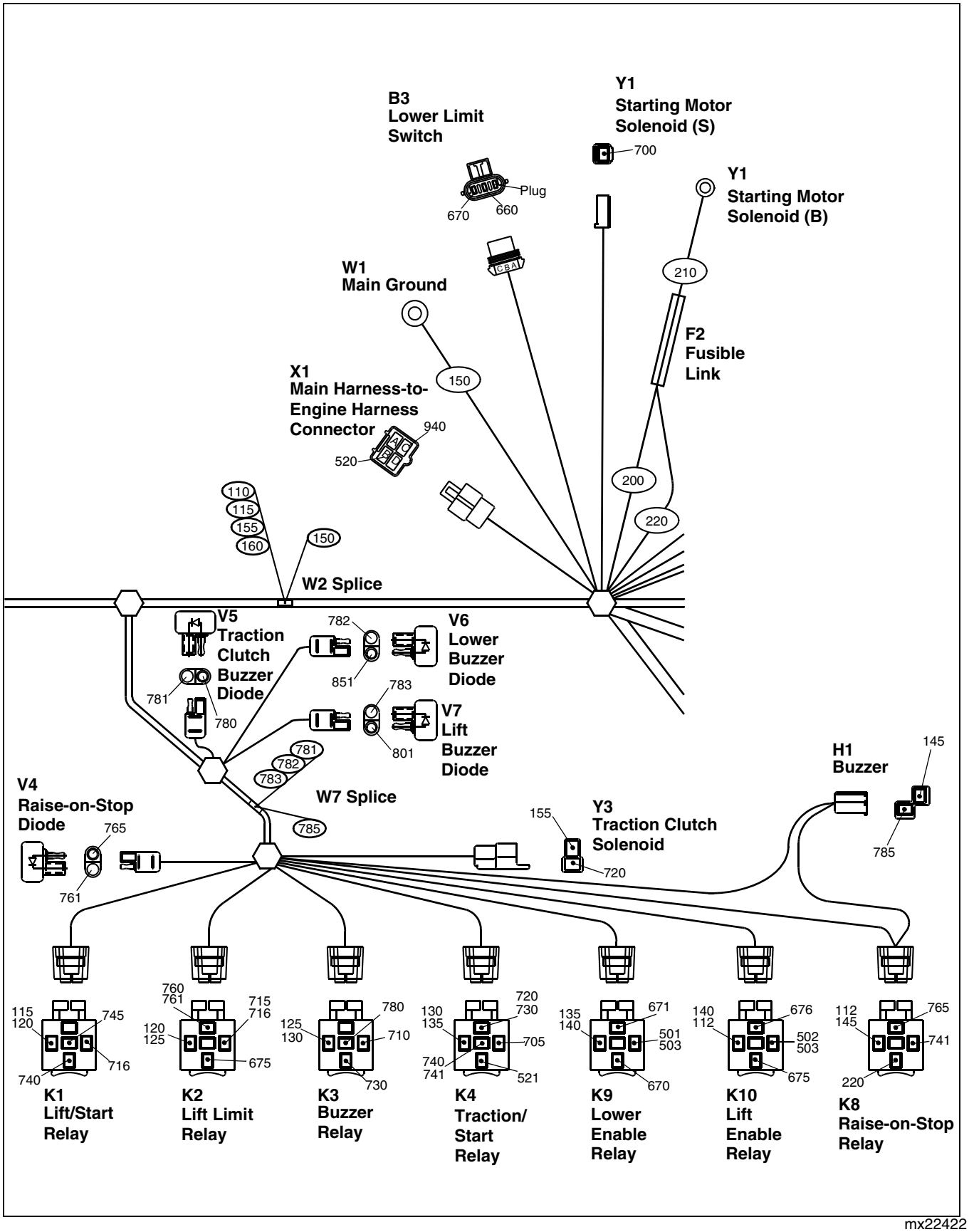
Wiring Harness - 800 Aerator S.N. (060001-) (1 of 3)



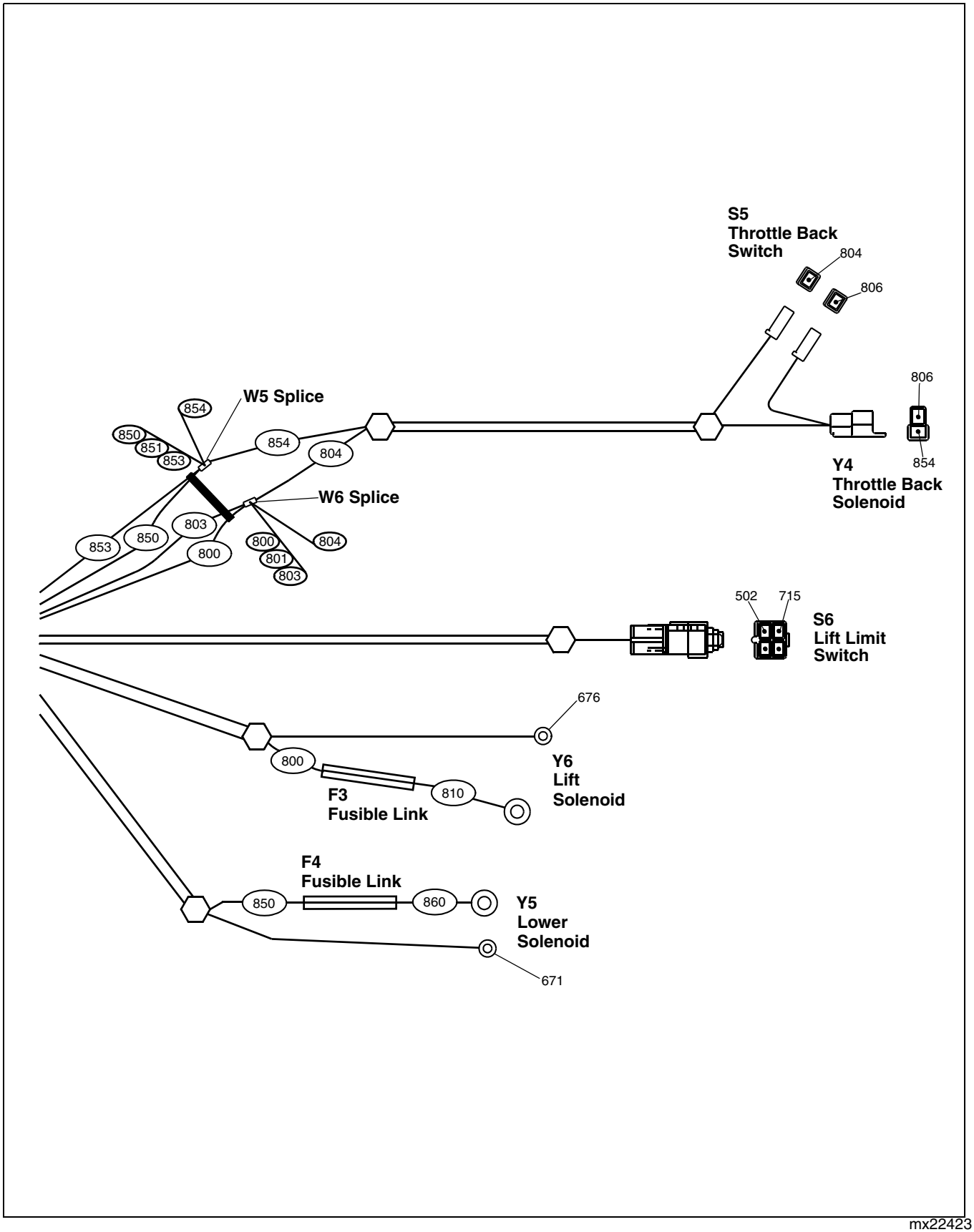
mx22413

Wiring Harness - 800 Aerator S.N. (060001-) (2 of 3)



mx22422

Wiring Harness - 800 Aerator S.N. (060001-) (3 of 3)



mx22423

Operation and Diagnosis

Cranking Circuit

Function

To energize the starting motor.

Operating Conditions

- Key switch (S1) in the START position
- Coring head in the UP position
- Travel clutch lever in the DISENGAGED position

Theory of Operation

Unswitched current flows from the positive (+) terminal of battery (G1) to terminal B of starting motor solenoid (Y1) and across Fusible Link (F2) to terminal B of Key Switch (S1).

When the key switch is in the START position, power is available at the following components:

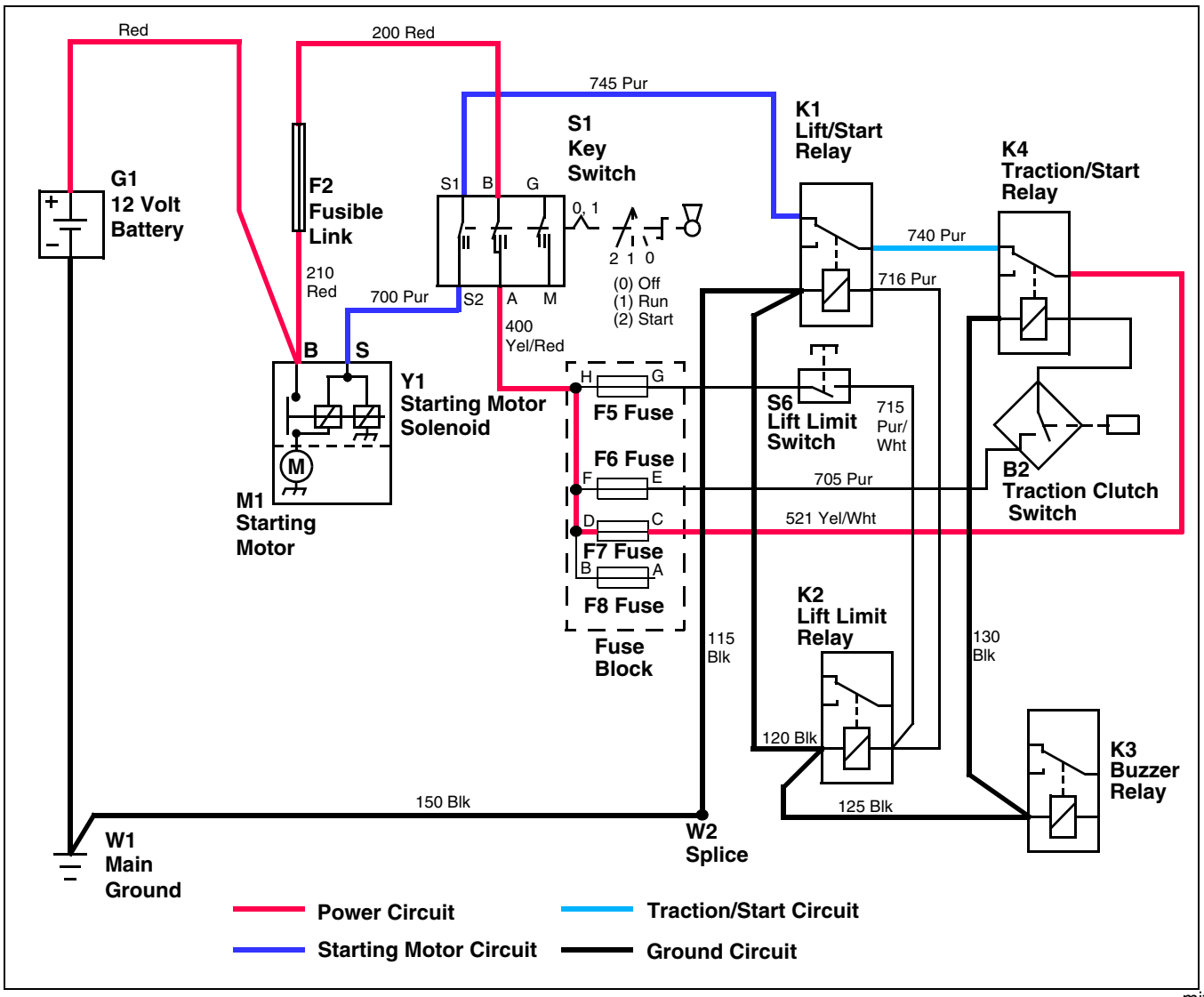
- Fuse (F7) - wire 400 yel/red
- Traction/start relay (K4) - wire 521 yel/wht
- Fuel shutoff solenoid (Y2) - wire 520 yel/wht

With the traction clutch lever in the DISENGAGED position, traction clutch switch (B2) is open. Traction/start relay (K4) remains de-energized and current flows to lift/start relay (K1) through wire 740 pur.

When the coring head is in the UP position, lift limit switch (S6) is open, preventing the lift/start relay from energizing. The de-energized lift/start relay allows current flow to the key switch (wire 745 pur) and to terminal S of the starting motor solenoid (wire 700 pur), activating the solenoid.

With the starting motor solenoid activated, current from the battery is allowed to flow across the main contacts of the solenoid to starting motor (M1). This activates the starting motor and starts the engine.

Cranking Circuit Schematic



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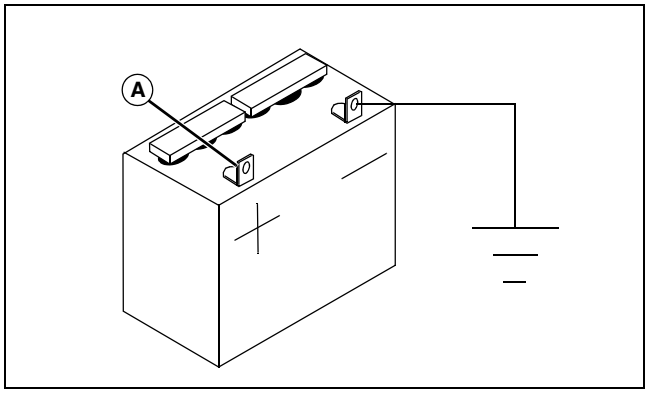
Cranking Circuit Diagnosis

Test Conditions:

- Travel lever DISENGAGED (away from operator)
- Key switch in RUN position
- Park brake LOCKED (toward operator)
- Coring head in UP position

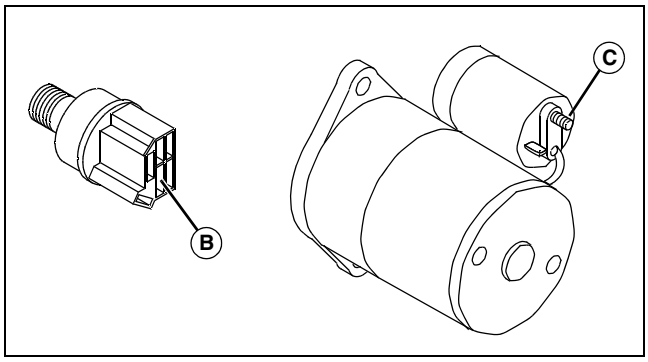
System: Cranking Circuit



(1) Is there 11.8-13.2 VDC measured at the positive (+) terminal of battery (G1)?

Yes - Go to step (2).

No - Test battery. (See “Battery Test” on page 162.)

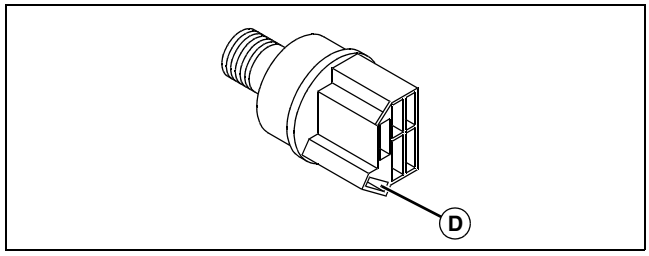


(2) Is there 11.8-13.2 VDC measured at wire 200 red (B) of the key switch and terminal (C) of the starting motor solenoid?

Yes - Go to step (3).

No - Check battery cables, fusible link (F2), wire 200 red, wire 210 red, and connections.

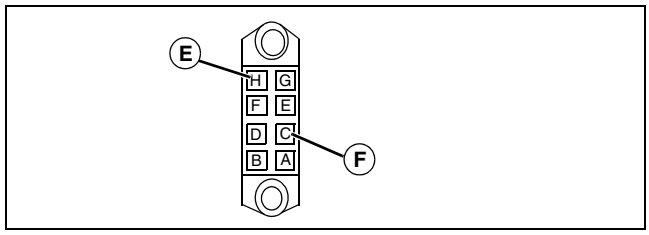
System: Cranking Circuit



(3) Is there 11.8-13.2 VDC measured at wire 400 yel/red (D) of the key switch?

Yes - Go to step (4).

No - Replace key switch. (See “Key Switch or Automatic/Manual Switch Removal and Installation” on page 175.)



(4) Is there 11.8-13.2 VDC measured at wire 400 yel/red (E) of the fuse block?

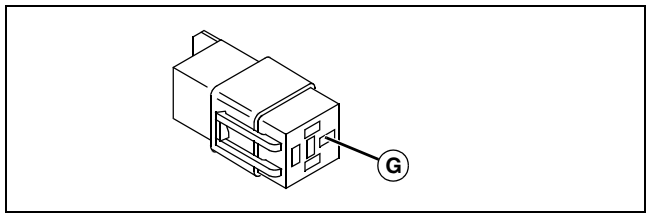
Yes - Go to step (5).

No - Repair or replace wiring harness.

(5) Is there 11.8-13.2 VDC measured at wire 520 yel/wht (F) of the fuse block?

Yes - Go to step (6).

No - Test F7 fuse. If fuse is OK, check fuse block. Repair or replace as necessary.

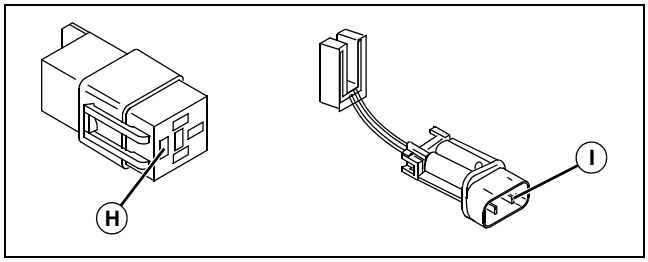


(6) Is there 11.8-13.2 VDC measured at wire 521 yel/blk (G) of the traction/start relay?

Yes - Go to step (7).

No - Check wires 520 and 521 yel/blk. Repair or replace wiring harness.

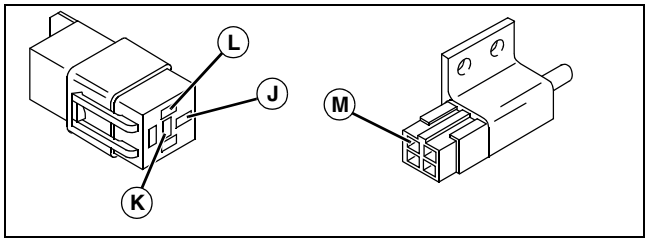
System: Cranking Circuit



(7) Is there 11.8-13.2 VDC measured at wire 740 pur (H) of the traction/start relay?

Yes - Go to step (8).

No - Test wire 705 pur (I) at the traction clutch sensor. If voltage is present, check the traction clutch sensor. (See “Traction Clutch Switch Test” on page 172.) Test the traction/start relay. (See “Relay Test” on page 167.)



(8) Is there 11.8-13.2 VDC measured at wire 740 pur (J) of the lift/start relay?

Yes - Go to step (9).

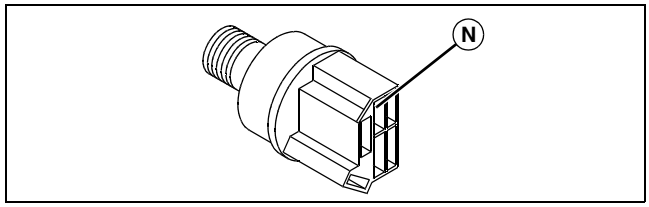
No - Repair or replace wiring harness.

(9) Is there 11.8-13.2 VDC measured at wire 745 pur (K) of the lift/start relay?

Yes - Go to step (10).

No - Test wire 716 pur (L). If voltage present, check wire 715 pur/wht (M) of the lift limit switch. If voltage is present, replace the lift limit switch. If no voltage is present, test the lift/start relay. (See “Relay Test” on page 167.)

System: Cranking Circuit



(10) Is there 11.8-13.2 VDC measured at wire 745 pur (N) of the key switch?

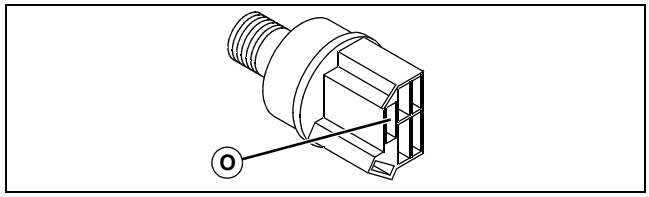
Yes - Continue to next test.

No - Repair or replace wiring harness.

Test Conditions:

- Key switch in START position.

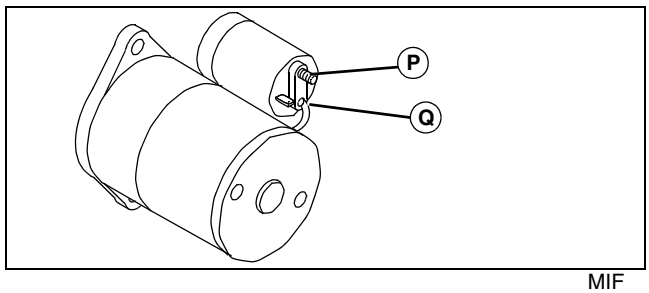
System: Cranking Circuit



(1) Is there 11.8-13.2 VDC measured at wire 700 pur (O) of the key switch?

Yes - Go to step (2).

No - Test the key switch. (See “Key Switch Test” on page 172.)



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(2) Is there 11.8-13.2 VDC measured at wire 700 pur (P) of the starting motor solenoid?

Yes - Go to step (3).

No - Repair or replace wiring harness.

System: Cranking Circuit

(3) Is there 11.8-13.2 VDC measured at terminal (Q) of the starting motor solenoid?

Yes - Test the starting motor solenoid. (See “Starting Motor Solenoid Test” on page 165.)

No - Replace starting motor solenoid.

Ignition Circuit

Function

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

Operating Conditions

- Key switch in the START or RUN position

Theory of Operation

The ignition system is an electronic magneto design. Ignition timing is controlled by Ignition modules (T1 and T2) and is not adjustable.

Unswitched power from Battery (G1) is available at the following components:

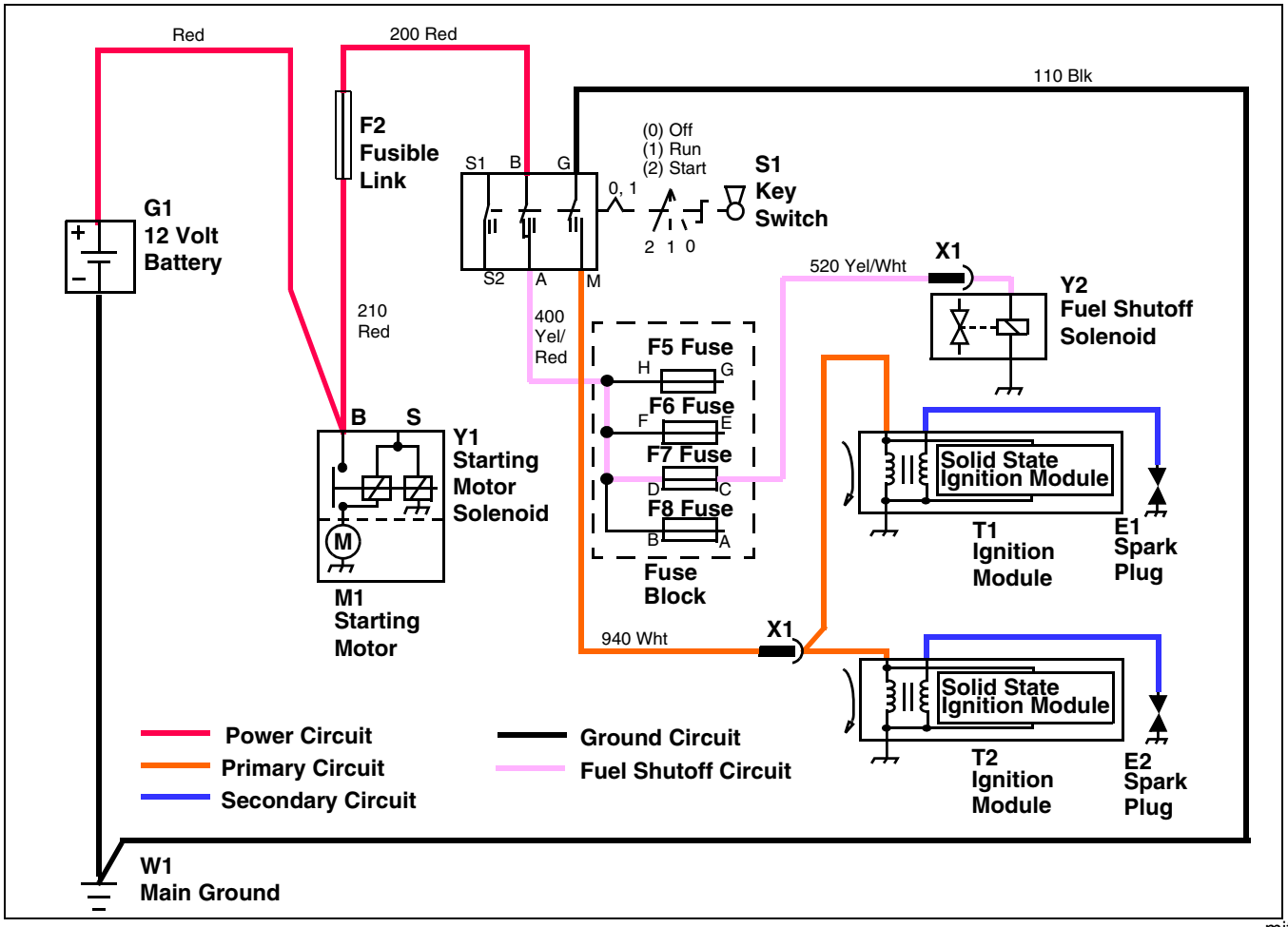
- Staring motor solenoid (Y1), terminal B
- Fusible link (F2)
- Key switch (S1), terminal B

With the key switch in the START or RUN position, current flows across fuse (F7) (wire 400 yel/red) to fuel shutoff solenoid (Y2) (wire 520 yel/wht). This energizes the solenoid, unseating the plunger and allowing fuel flow into the bowl of the carburetor.

When the flywheel turns in the cranking circuit, a magnet in the flywheel produces current in the primary coil of Ignition modules (T1 and T2) by electromagnetic induction. When the primary current builds to its highest level, the ignition modules induce high-voltage into the secondary coil. This high-voltage then flows to spark plugs (E1 and E2), jumps the spark plug gaps, and creates a spark that ignites the fuel/air mixture. This causes the engine to start and run.

Turning the key switch to the OFF position prevents current flow to the fuel shutoff solenoid, de-energizing the solenoid. The internal spring force closes the solenoid plunger, stopping fuel flow into the carburetor. With the key switch in the OFF position, the ignition modules are grounded through the switch, preventing spark generation.

Ignition Circuit Schematic



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Ignition Circuit Diagnosis

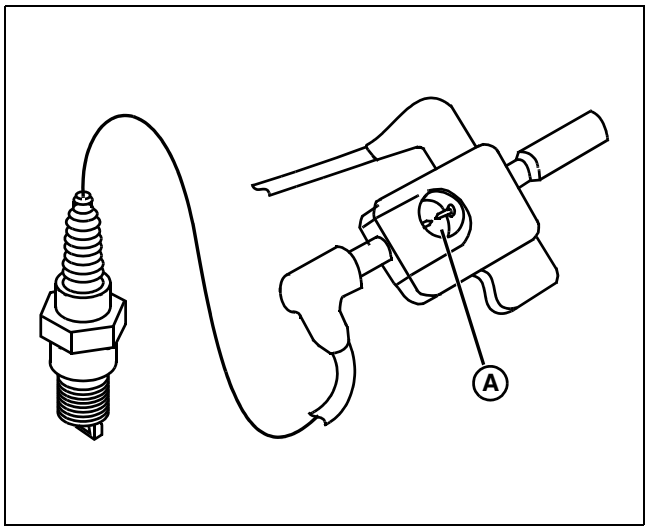
When diagnosing an ignition problem, isolate magneto circuit from ground circuit by separating engine connector.

If engine will not start, check magneto circuit first and then check ground circuit. If engine will not shut off, check ground circuit. Remember, engine is stopped by grounding ignition coil through the key switch.

Test Conditions:

- Engine connector X1 disconnected
- Key switch in START position
- One spark plug lead connected to D05351ST Tester
- Other spark plug lead disconnected and grounded
- Engine cranking
- Battery fully charged

System: Ignition Circuit



(1) Spark plug (A) indicate hot blue spark?

Yes - Repeat for second spark plug.

Yes - Go to step (1). (Key switch in RUN position and engine not running.)

No - Check condition of spark plugs.

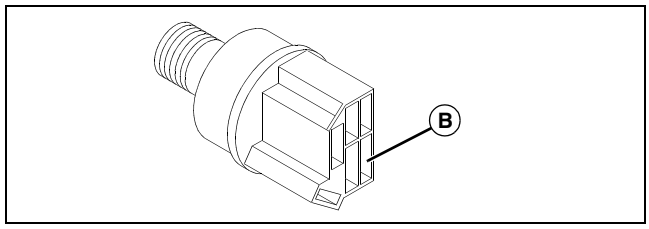
No - Check armature air gap and flywheel magnets. (See “Ignition Module Air Gap Adjustment” on page 168 and “Flywheel Magnets Test” on page 173.)

No - Test ignition module. (See “Ignition Module Test” on page 168.)

Test Conditions:

- Key switch in RUN position
- Engine not running

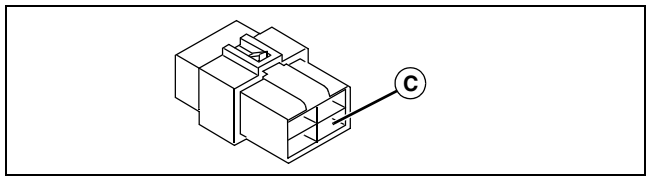
System: Ignition Circuit



(1) Does key switch wire 940 wht (B) have infinite resistance?

Yes - Go to step (2).

No - Check for shorted wire 940 wht. Test the key switch. (See “Key Switch Test” on page 172.)



(2) Does engine connector wire 940 wht (C) have infinite resistance?

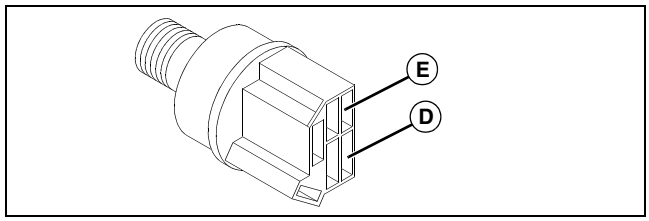
Yes - Go to step (1). (Key switch in OFF position.)

No - Repair or replace wiring harness.

Test Conditions:

- Key switch in OFF position

System: Ignition Circuit

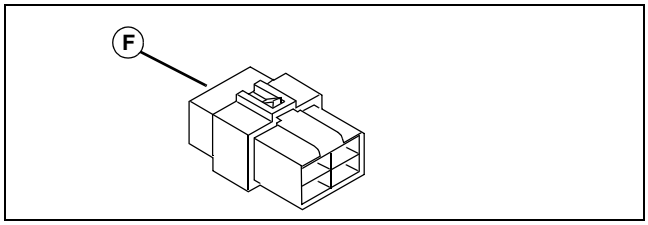


(1) Does key switch wire 940 wht (D) have maximum 0.1 ohm resistance?

Yes - Go to step (2).

No - Test the key switch. (See “Key Switch Test” on page 172.) Check for open wire 110 blk (E).

System: Ignition Circuit



(2) Does ignition module wht wire (F) at engine connector X1 have maximum 0.1 ohm resistance?

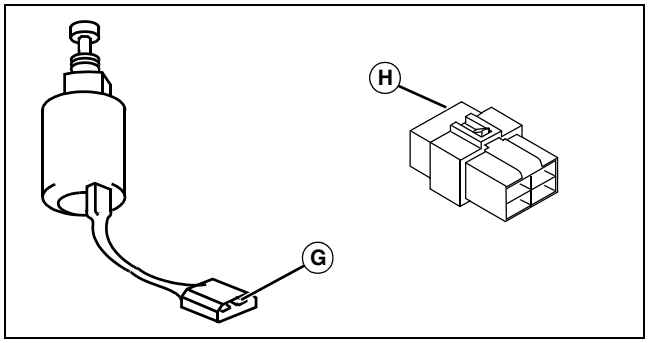
Yes - Test complete.

No - Check for open wire 940 wht. Check wht wire resistance between engine connector and ignition module. If resistance is OK, replace ignition module(s).

Test Conditions:

- Key switch in START position

System: Fuel Shutoff Solenoid



(1) Is there 11.8-13.2 VDC measured at fuel shutoff solenoid terminal (G)?

Yes - Replace solenoid as necessary.

No - Check wire 520 yel/wht (H) at engine connector X1. If OK, check wire between X1 and solenoid.

Charging Circuit

Function

To maintain battery voltage between 11.8 and 13.2 volts.

Operating Conditions

- Key switch in RUN position
- Engine operating

Theory of Operation

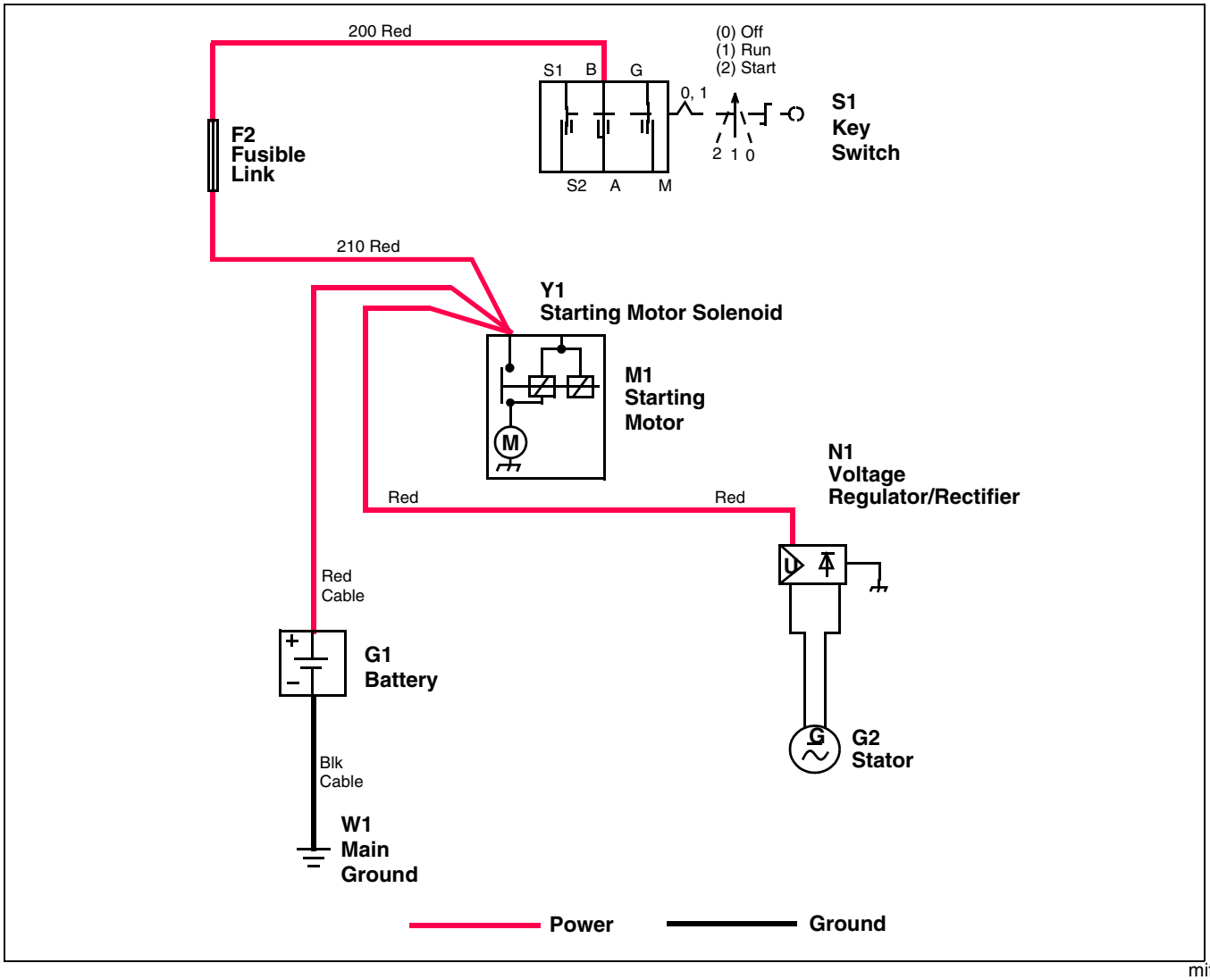
The charging system is of the permanent magnet and stator design. Charging output is controlled by Voltage regulator/rectifier (N1).

Key switch (S1) must be in the RUN position and the engine running for the charging circuit to be fully operational.

As the flywheel turns, several permanent magnets located in the flywheel induce alternating current (AC) in stator (G2) windings. The AC from the stator flows to the voltage regulator/rectifier. The voltage regulator/rectifier converts the AC to the direct current (DC) needed to charge battery (G1).

If the Battery voltage is low, the voltage regulator/rectifier allows DC to flow to the battery, charging the battery. When the battery is fully charged, the voltage regulator/rectifier stops current flow to the battery.

Charging Circuit Schematic



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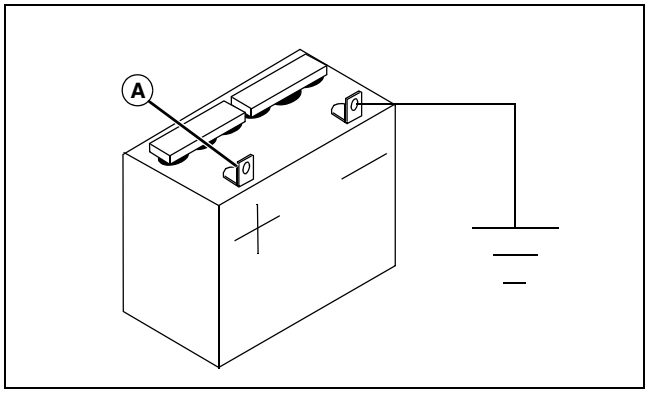
Charging Circuit Diagnosis

Test Conditions:

- Voltage regulator/rectifier connector DISCONNECTED
- Engine running at fast idle

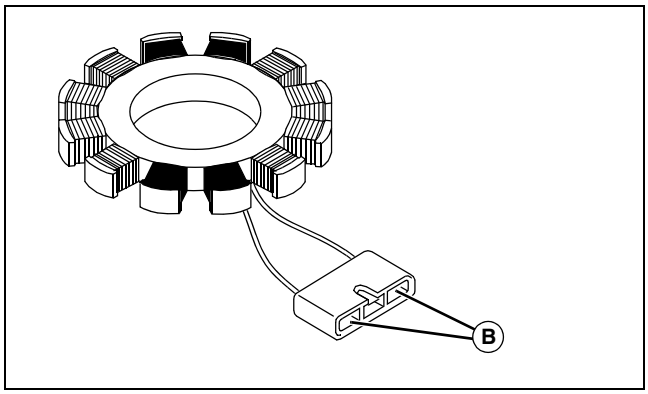
System: Charging Circuit



(1) Is there 11.8-13.2 VDC measured at positive terminal (A) of the battery?

Yes - Go to step (2).

No - Test battery. (See “Battery Test” on page 162.)



(2) Is there a minimum of 28 VAC unregulated output voltage measured between blk wires (B) of the voltage regulator/rectifier connector?

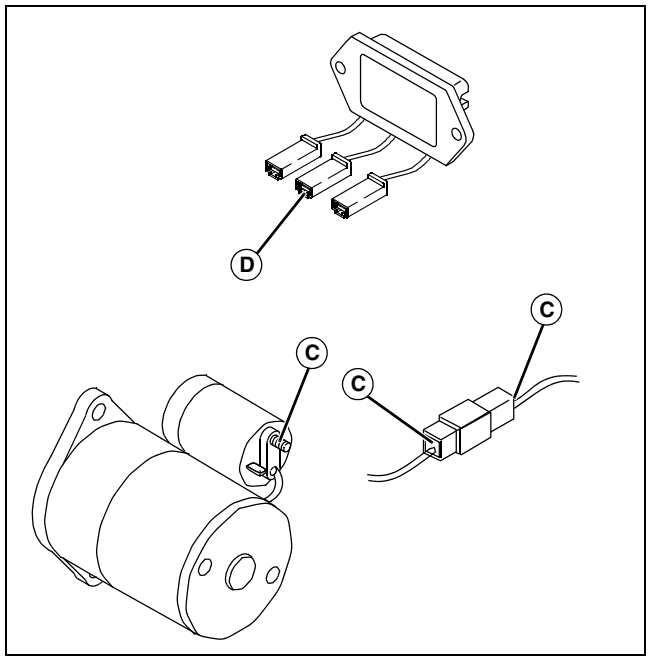
Yes - Go to step (1). (Voltage regulator/rectifier connector CONNECTED.)

No - Check flywheel magnets and connectors from stator. If OK, test stator. (See “Stator Test” on page 165.)

Test Conditions:

- Voltage regulator/rectifier connector CONNECTED
- Engine running at fast idle

System: Charging Circuit



Picture Note: Callouts (C) show alternate test locations for voltage regulator/rectifier center terminal (D).

(1) Is there 11.8-13.2 VDC measured at voltage regulator/rectifier center terminal (D)?

Yes - Go to step (2).

No - Check connector and red wire between starting motor solenoid and voltage regulator/rectifier, battery positive (+) cable, and connections.

(2) Is there a minimum regulated output of 13 amps at 12.2-14.7 VDC from voltage regulator/rectifier center terminal (D)?

Yes - Go to step (3).

No - Replace voltage regulator/rectifier.

(3) Does the voltage measured at voltage regulator/rectifier center terminal (D) stay below 14.7 VDC?

Yes - Test complete.

No - Replace voltage regulator/rectifier.

Lift and Lower Circuit S.N. (-030000)

Function

To raise or lower the coring head.

Operating Conditions

- Key switch in RUN position

Theory of Operation

The lift and lower circuit is controlled by the actuator enable relay (K5), lift limit relay (K2), lift limit switch (S6), and lower limit switch (B3).

The actuator enable relay (K5) is energized when the key switch (S1) is turned to RUN, through fuse (F5).

The lift actuators (M2 and M3) are bidirectional DC motors. Applying voltage to one side of the motors and ground to the other side will cause the motors to run in one direction. Reversing the voltage and ground to the opposite sides will cause the motors to run in the opposite direction. lower relay (K7) applies voltage to one side of the actuators, and lift relay (K6) applies ground to the other side of the actuators to lower the coring head. When raising the coring head, lift relay (K6) applies voltage while lower relay (K7) applies ground.

To lower the coring head, the operator moves the machine engagement lever away from the operator. The lower switch (S3) will be activated by the machine engagement lever, and current flows from the key switch through fuse (F5) and backfeed diode (V1), through lower switch (S3) and the “reverse” contacts of the lift switch (S2) to the lower limit switch (B3) (open only when at lower limit) and activates the lower relay (K7). Battery voltage is applied through the contacts of lower relay (K7) to one side of the lift actuators. Ground is applied to the other side of the lift actuators through the normally closed (de-energized) contacts of lift relay (K6) and actuator enable relay (K5) completing the path for current. The motors will run and the coring head will lower until the operator releases the machine engagement lever or the lower limit is reached. When the lower limit is reached, the lower limit switch (B3) will open and break the path for current flow and de-energize the lower relay (K7).

To lift the coring head, the operator moves the machine engagement lever toward the operator. The lift switch (S2) will be activated by the machine engagement lever, and current flows from the key switch through fuse (F5) and backfeed diode (V1), through lift switch (S2) and the “reverse” contacts of the lower switch (S3) to the contacts of the lift limit relay (K2).

The lift limit switch (S6) (closed when not up) will activate the lift limit relay (K2) and activate the lift relay (K6). Battery voltage is applied through the contacts of lift relay (K6) to one side of the lift actuators. Ground is applied to the other side of the lift actuators through the normally closed (de-energized) contacts of lower relay (K7) and actuator enable relay (K5), completing the path for current. The motors will run and the coring head will lift until the operator releases the machine engagement lever or the lift limit is reached. When the lift limit is reached, the lift limit switch (S6) will open and de-energize the lift limit relay (K2) and break the path for current flow and de-energize the lift relay (K6).

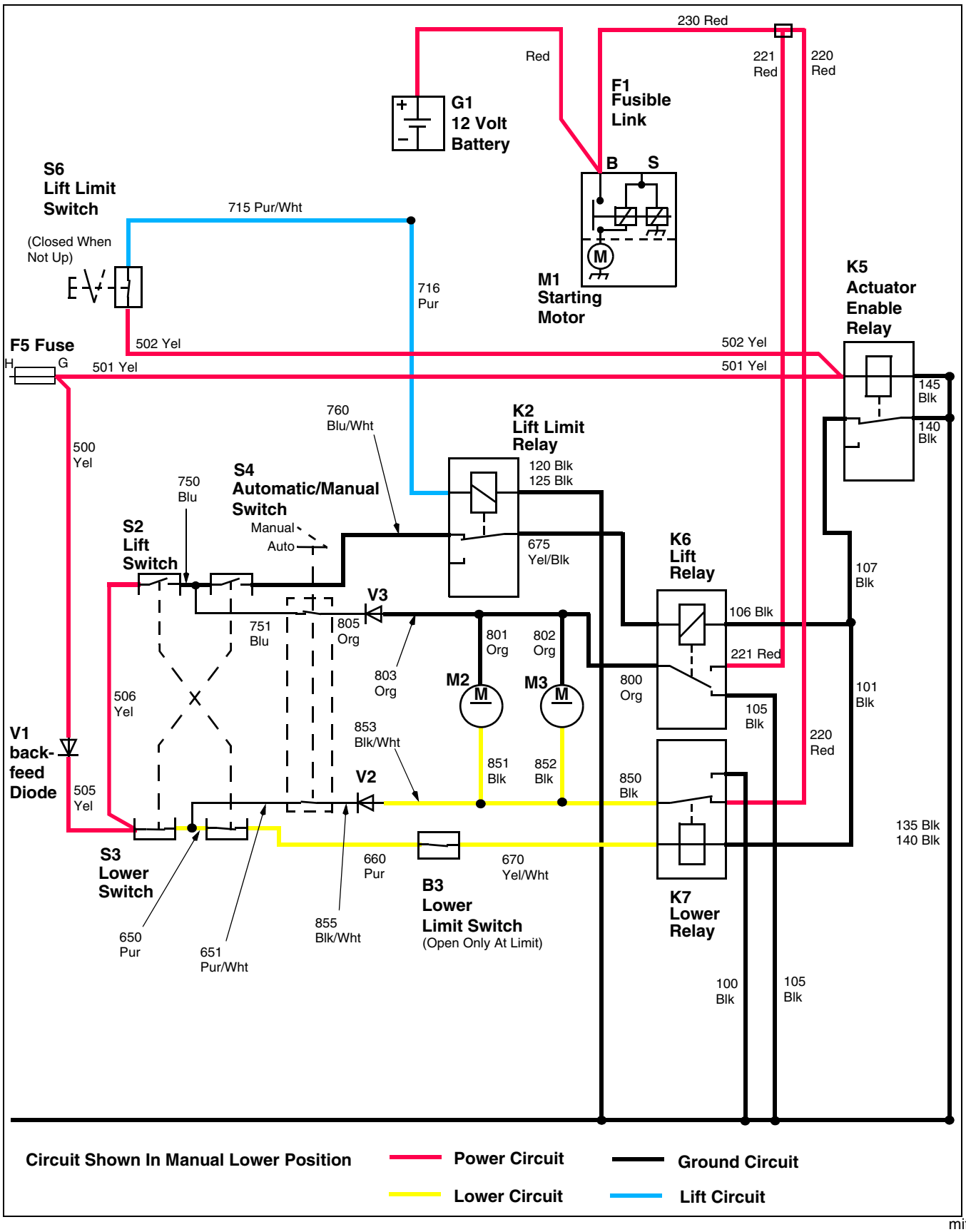
The automatic/manual switch (S4) selects automatic or manual raising or lowering of the coring head.

In the manual position the raising and lowering of the coring head works as described above.

In the automatic position when the operator momentarily moves the machine engagement lever away from the operator to lower the coring head and releases it, the automatic/manual switch (S4) being in the automatic position will keep the coring head moving down until the lower limit is reached. Battery voltage from the closed contacts of lower relay (K7) will be applied through lift latch diode (V2), automatic/manual switch (S4) contacts, therefore’ contacts of lift switch (S2), lower limit switch (B3) and keep lower relay (K7) energized until the lower limit is reached.

When the operator momentarily moves the machine engagement lever toward the operator to lift the coring head and releases it, the automatic/manual switch (S4) being in the automatic position will keep the coring head moving up until the lift limit is reached. Battery voltage from the closed contacts of lift relay (K6) will be applied through lower latch diode (V3), automatic/manual switch (S4) contacts, the ’reverse’ contacts of lower switch (S3), lift limit relay (K2) and keep lift relay (K6) energized until the lift limit is reached.

Lift and Lower Circuit Schematic S.N. (-030000)



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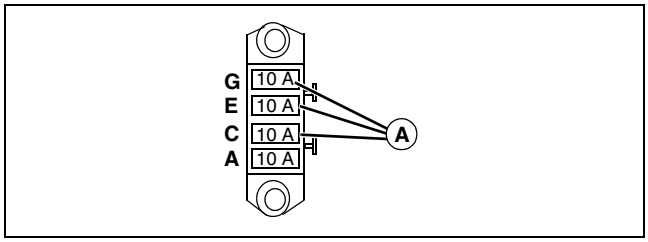
Lift and Lower Circuit Diagnosis S.N. (-030000)

NOTE: When diagnosing problems in the lift and lower circuit, make sure the first part of diagnostic checks are good because the actuator enable relay (K5) has to be functioning properly for the lift and lower relays to work.

Test Conditions:

- Key switch in RUN position (engine not running)
- Automatic/manual switch in MANUAL position

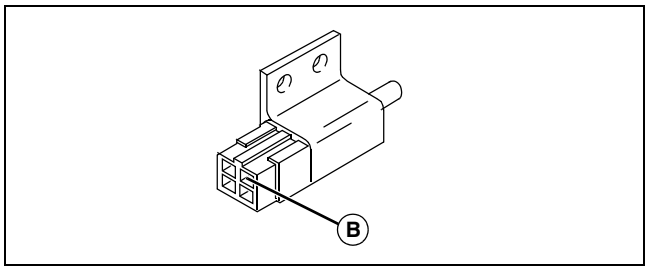
System: Lift and Lower Circuit



(1) Do fuses G, C and E (A) have battery power?

Yes - Go to step (2).

No - Test fuse(s). Test power circuit.

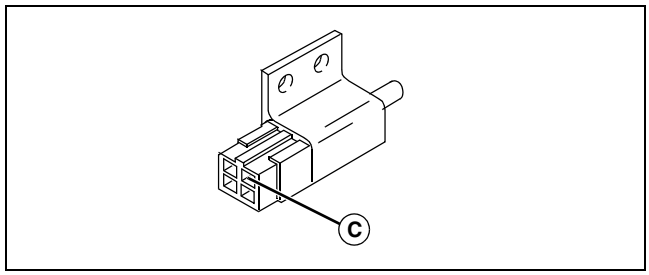


(2) Does lower switch wire 505 yel (B) have battery voltage?

Yes - Go to step (3).

No - Test diode V1. (See “Diode Test” on page 161.) Repair/replace wire harness.

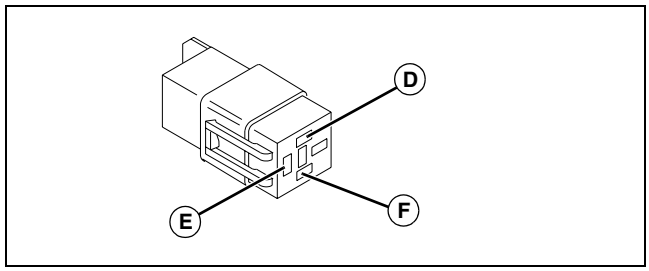
System: Lift and Lower Circuit



(3) Does lift switch wire 506 yel (C) have battery power?

Yes - Go to step (4).

No - Repair/replace wire harness.



(4) Does actuator enable relay - wire 501 yel (D) have battery power?

Yes - Go to step (5).

No - Repair/replace wire harness.

(5) Does actuator enable relay - wire 107 blk (E) have continuity to ground?

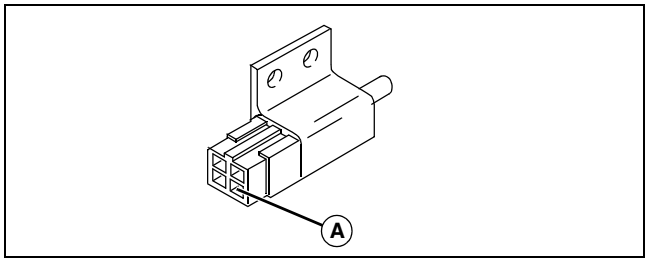
Yes - Go to step (1).

No - Check wire 135 blk. If ground is good, replace actuator enable relay.

Test Conditions:

- Key switch in RUN position (engine not running)
- Aerator engagement lever AWAY FROM operator
- Coring head not at lower limit

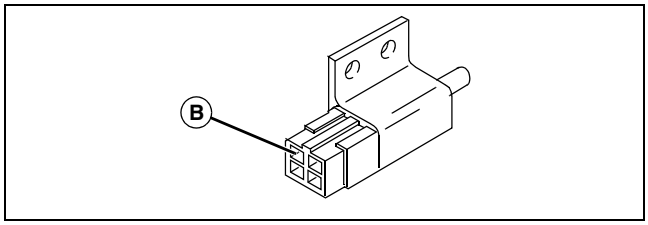
System: Lower Circuit



(1) Does lower switch wire 650 pur (A) have battery voltage?

Yes - Go to step (2).

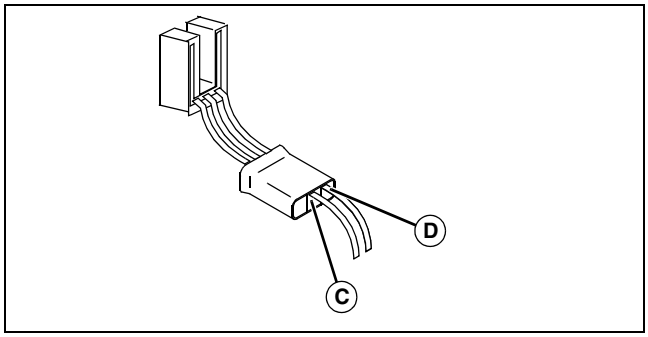
No - Test/replace lower switch.



(2) Does lift switch wire 650 pur (B) have battery voltage?

Yes - Go to step (3).

No - Test/replace lift switch.



(3) Does lower limit switch wire 660 pur (C) have battery voltage?

Yes - Go to step (4).

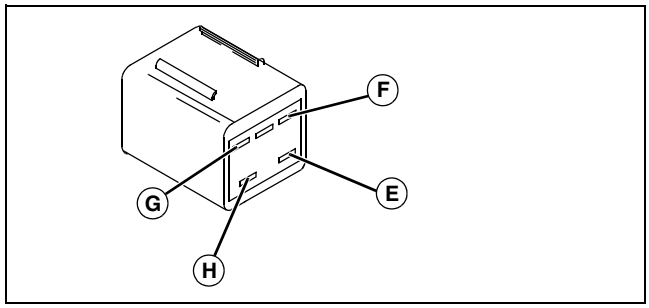
No - Repair/replace wire harness.

System: Lower Circuit

(4) Does lower limit switch wire 670 yel/wht (D) have battery voltage?

Yes - Go to step (5).

No - Ensure coring head is not at lower limit. Test lower limit switch. (See “Lower Limit Switch Test” on page 171.)



(5) Does lower relay wire 670 yel/wht (E) have battery voltage?

Yes - Go to step (6).

No - Repair/replace wire harness.

(6) Does lower relay wire 220 red (F) have battery voltage?

Yes - Go to step (7).

No - Check 230 fusible link.

(7) Does lower relay wire 101 blk (G) have continuity to ground?

Yes - Go to step (8).

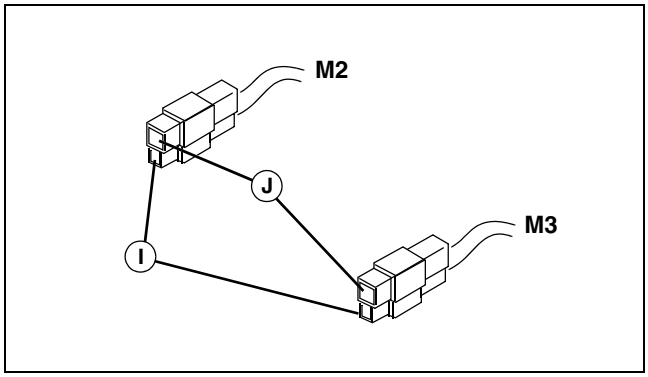
No - Repair/replace wire harness.

(8) Does lower relay wire 850 blk (H) have battery voltage?

Yes - Go to step (9).

No - Test/replace lower relay. (See “Lower, Lift, and Raise-on-Stop Relay Test S.N. (-060000)” on page 166.)

System: Lower Circuit



(9) Do lift actuator wires 851 and 852 blk (I) have battery voltage?

Yes - Go to step (10).

No - Repair/replace wire harness.

(10) Do lift actuators wires 801 and 802 org have continuity to ground?

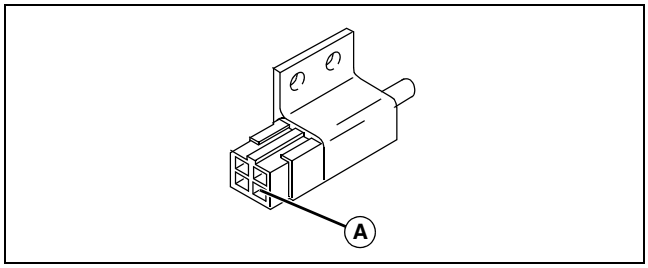
Yes - Go to step (1).

No - Check wires 800 org and 105 blk. If grounds are OK, replace lift relay K6. If all voltage checks are OK, repair/replace lift actuator(s) M2 and/or M3.

Test Conditions:

- Aerator engagement lever TOWARD operator (lift operation)
- Coring head not at upper limit

System: Lift Circuit

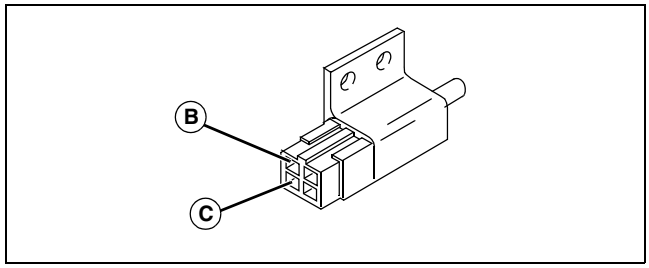


(1) Does lift switch wire 750 blu (A) have battery voltage?

Yes - Go to step (2).

No - Test/replace lift switch.

System: Lift Circuit



(2) Does lower switch wire 750 blu (B) have battery voltage?

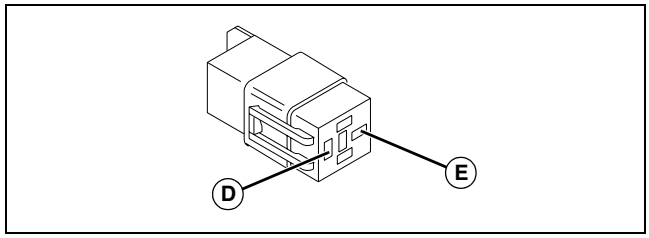
Yes - Go to step (3).

No - Repair/replace wire harness.

(3) Does lower switch wire 760 blu/wht (C) have battery power?

Yes - Go to step (4).

No - Test/replace lower switch.



(4) Does lift limit relay wire 760 blu/wht (D) have battery voltage?

Yes - Go to step (5).

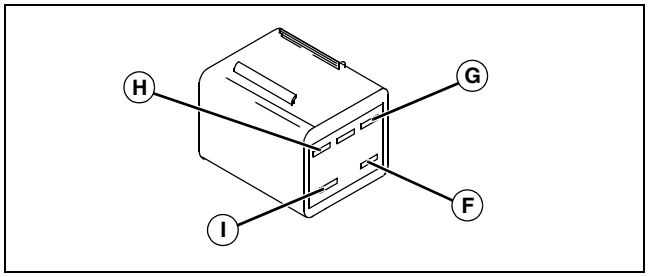
No - Repair/replace wire harness.

(5) Does lift limit relay wire 675 yel/blk (E) have battery voltage?

Yes - Go to step (6).

No - Ensure coring head is not at upper limit. Check wire 716 pur. If no voltage, check wires 715 pur/wht and 502 yel at the lift limit switch. If voltages are OK check wire 120 blk. If ground is OK replace the lift limit relay.

System: Lift Circuit



(6) Does lift relay wire 675 yel/blk (F) have battery voltage?

Yes - Go to step (7).

No - Repair/replace wire harness.

(7) Does lift relay wire 221 red (G) have battery voltage?

Yes - Go to step (8).

No - Check fusible link.

(8) Does lift relay wire 106 blk (H) have continuity to ground?

Yes - Go to step (9).

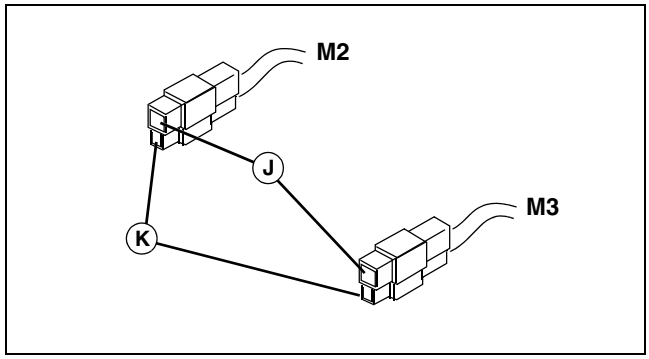
No - Check lower actuator enable relay is energized. Repair/replace wire harness.

(9) Does lift relay wire 800 org (I) have battery voltage?

Yes - Go to step (10).

No - Test/replace lift relay.

System: Lift Circuit



(10) Do lift actuator wires 801 and 802 org (J) have battery voltage?

Yes - Go to step (11).

No - Repair/replace wire harness.

(11) Do lift actuator wires 851 and 852 blk (K) have continuity to ground?

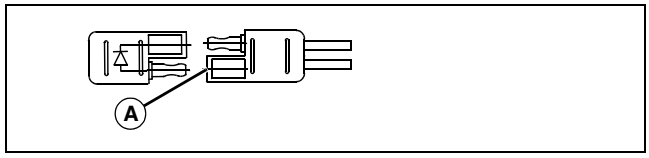
Yes - Go to step (1).

No - Check wires 850 blk and 100 blk. If grounds are OK, replace the lower relay. If all voltage checks are OK, repair/replace lift actuators.

Test Conditions:

- Coring head moves down (in manual mode) when machine engagement lever is moved AWAY FROM operator
- Place automatic/manual (run/jog) switch S4 in AUTOMATIC
- Momentarily engage the machine engagement lever AWAY FROM operator (lower operation)

System: Lower Latch Circuit

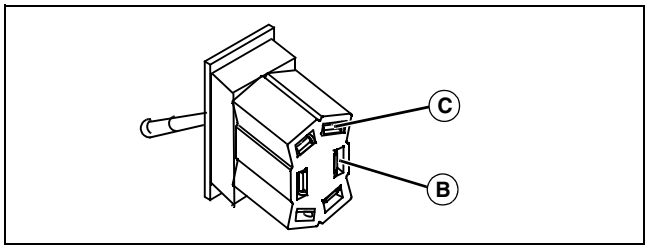


(1) Does lower latch diode wire 853 blk/wht (A) have battery voltage?

Yes - Go to step (2).

No - Check the lower relay. Repair/replace wire harness.

System: Lower Latch Circuit



(2) Does automatic/manual switch wire 855 blk/wht (B) have battery voltage?

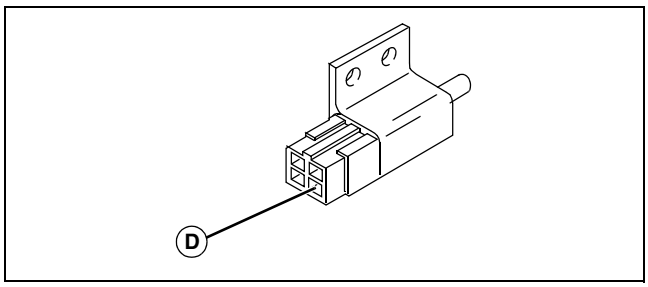
Yes - Go to step (3).

No - Test/replace the lower latch diode. If diode is good, repair/replace wire harness.

(3) Does automatic/manual switch wire 651 pur/wht (C) have battery voltage?

Yes - Go to step (4).

No - Test/replace automatic/manual switch. (See "Automatic/Manual Switch Test" on page 173. See "Key Switch or Automatic/Manual Switch Removal and Installation" on page 175.)



(4) Does lower switch wire 651 pur/wht (D) have battery voltage?

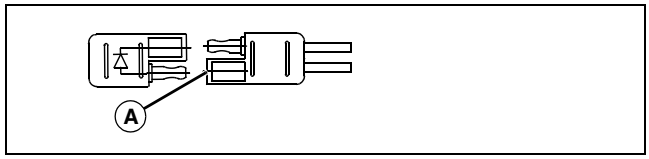
Yes - Go to step (1).

No - Repair/replace wire harness.

Test Conditions:

- Coring head moves up (in manual mode) when machine engagement lever is moved TOWARD operator
- Automatic/manual (run/jog) switch S4 in AUTOMATIC
- Momentarily engage the machine engagement lever TOWARD operator (lift operation)

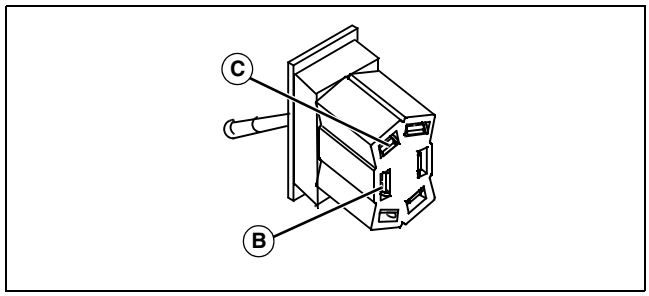
System: Lift Latch Circuit



(1) Does lift latch diode wire 803 org (A) have battery voltage?

Yes - Go to step (2).

No - Check the lift relay. Repair/replace wire harness.



(2) Does automatic/manual switch wire 805 org (B) have battery voltage?

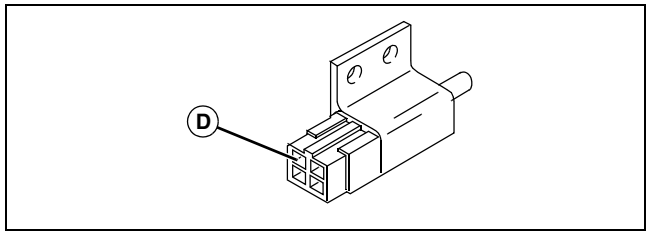
Yes - Go to step (3).

No - Test/replace the lift latch diode. If diode is good, repair/replace wire harness.

(3) Does automatic/manual switch wire 751 blu (C) have battery voltage?

Yes - Go to step (4).

No - Test/replace the automatic/manual switch. (See "Automatic/Manual Switch Test" on page 173. See "Key Switch or Automatic/Manual Switch Removal and Installation" on page 175.)



(4) Does lower switch wire 751 blu (D) have battery voltage?

Yes - Test complete.

No - Repair/replace wire harness.

Lift and Lower Circuit S.N. (030001-060000)

Function

To raise or lower the coring head.

Operating Conditions

- Key switch in RUN position
- Traction clutch ENGAGED

Theory of Operation

The lift and lower circuit is controlled by the actuator enable relay (K5), lift limit relay (K2), lift limit switch (S6), and lower limit switch (B3).

The actuator enable relay (K5) is energized when the key switch is turned to RUN, through fuse (F5).

The lift actuators (M2 and M3) are bidirectional DC motors. Applying voltage to one side of the motors and ground to the other side will cause the motors to run in one direction. Reversing the voltage and ground to the opposite sides will cause the motors to run in the opposite direction. lower relay (K7) applies voltage to one side of the actuators and lift relay (K6) applies ground to the other side of the actuators to lower the coring head. When raising the coring head, lift relay (K6) applies voltage while lower relay (K7) applies ground.

To lower the coring head, the operator presses the lower side of the raise/lower plate. The lower switch (S3) is activated, and current flows from the key switch (S1) through fuse (F5) and backfeed diode (V1), through lower switch (S3) and the “reverse” contacts of the lift switch (S2) to the lower limit switch (B3) (open only when at lower limit) and activates the lower relay (K7). When the operator places the travel lever toward the operator, the traction clutch switch (B2) will be closed, the traction/start relay (K4) is activated, and current is stopped to the raise-on-stop relay (K8). Battery voltage is applied through the contacts of the raise-on-stop relay (K8) and lower relay (K7) to one side of the lift actuators. Ground is applied to the other side of the lift actuators through the normally closed (de-energized) contacts of lift relay (K6) and actuator enable relay (K5) completing the path for current. The motors will run and the coring head will lower until the operator releases the machine engagement lever or the lower limit is reached. When the lower limit is reached, the lower limit switch (B3) will open and break the path for current flow and de-energize the lower relay (K7), stopping the motors.

To lift the coring head, the operator presses the raise side of the raise/lower plate. The lift switch (S2) will be activated by the raise/lower plate, and current flows from the key switch (S1) through fuse (F5) and backfeed diode (V1), through lift switch (S2) and the “reverse” contacts of the lower switch (S3) to the contacts of the lift limit relay (K2). The lift limit switch (S6) (closed when not up) will activate the lift limit relay (K2) and activate the lift relay (K6). Battery voltage is applied through the contacts of lift relay (K6) to one side of the lift actuators. Ground is applied to the other side of the lift actuators through the normally closed (de-energized) contacts of lower relay (K7) and actuator enable relay (K5), completing the path for current. The motors will run and the coring head will lift until the operator releases the machine raise/lower plate or the lift limit is reached. When the lift limit is reached, the lift limit switch (S6) will open and de-energize the lift limit relay (K2) and break the path for current flow and de-energize the lift relay (K6).

The automatic/manual switch (S4) selects automatic or manual raising or lowering of the coring head.

In the manual position the raising and lowering of the coring head works as described above.

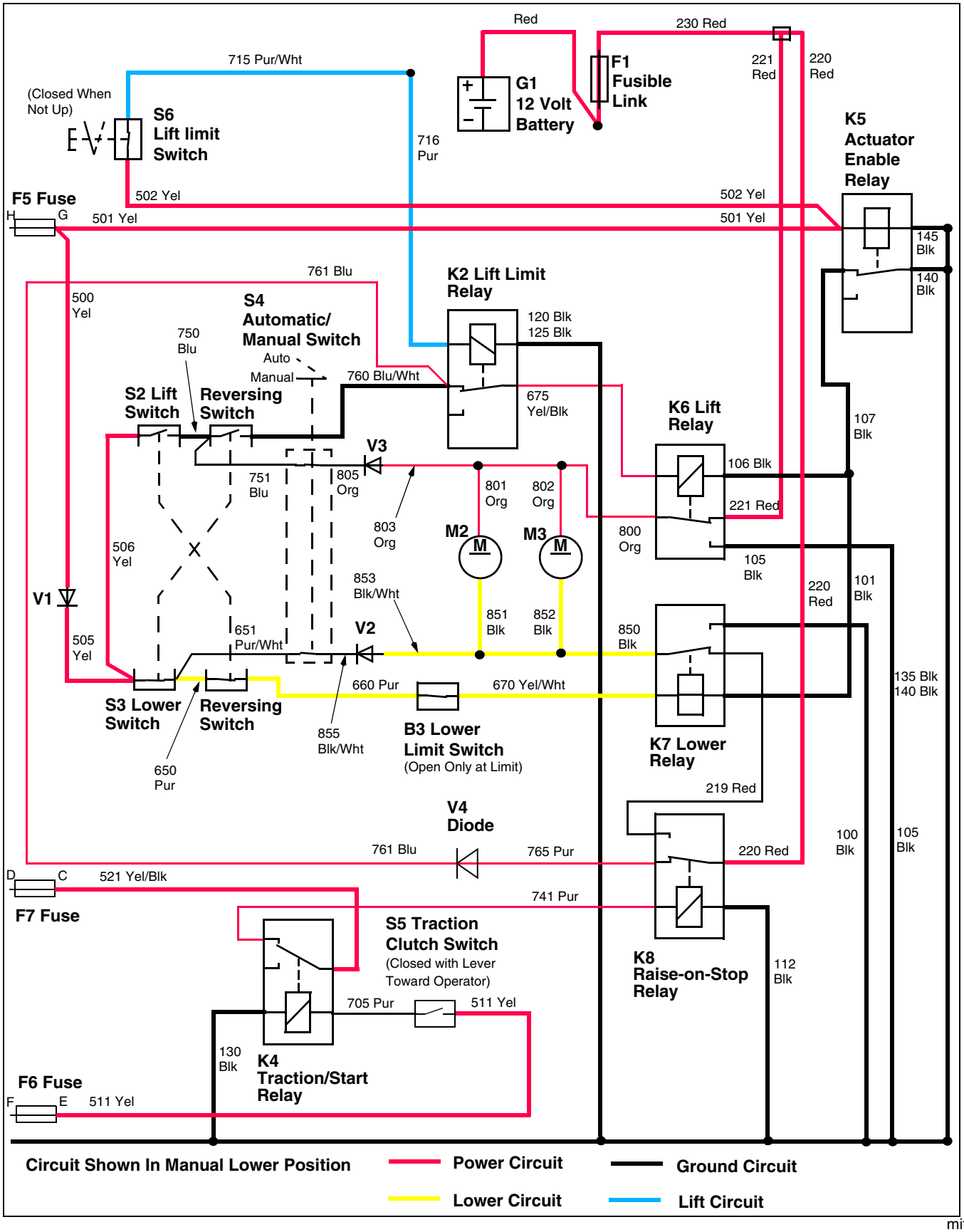
In the automatic position when the operator momentarily moves the machine engagement lever away from the operator to lower the coring head and releases it, the automatic/manual switch (S4) being in the automatic position will keep the coring head moving down until the lower limit is reached. Battery voltage from the closed contacts of lower relay (K7) will be applied through lift latch diode (V2), automatic/manual switch (S4) contacts, the ’reverse’ contacts of lift switch (S2), lower limit switch (B3) and keep lower relay (K7) energized until the lower limit is reached.

When the operator momentarily moves the machine engagement lever toward the operator to lift the coring head and releases it, the automatic/manual switch (S4) being in the automatic position will keep the coring head moving up until the lift limit is reached. Battery voltage from the closed contacts of lift relay (K6) will be applied through lower latch diode (V3), automatic/manual switch (S4) contacts, the ’reverse’ contacts of lower switch (S3), lift limit relay (K2) and keep lift relay (K6) energized until the lift limit is reached.

The raise-on-stop circuit raises the coring head when the machine is stopped. When the operator places the travel lever away from the operator, the traction clutch switch (B2) will be opened. The traction/start relay (K4) is de-energized, and current from fuse (F7) flows through the contacts to the raise-on-stop relay (K8) coil. Current flows through the relay contacts and raise-on-stop diode (V4) to the lift limit relay (K2). The lift circuit then operates exactly as it does when the operator moves the machine engagement lever toward the operator. The lift limit switch (S6) (closed when not up) will activate the lift limit relay (K2) and activate the lift relay (K6). Battery voltage is applied through the contacts of lift relay (K6) to one side of the lift actuators. Ground is applied to the other side of the lift actuators through the normally closed (de-energized) contacts of lower relay (K7) and actuator enable relay (K5), completing the path for current. The motors will run and the

coring head will lift until the operator releases the machine engagement lever or the lift limit is reached. When the lift limit is reached, the lift limit switch (S6) will open and de-energize the lift limit relay (K2) and break the path for current flow and de-energize the lift relay (K6).

Lift and Lower Circuit Schematic S.N. (030001-060000)



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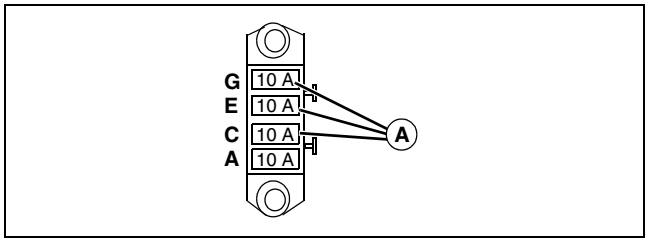
Lift and Lower Circuit Diagnosis S.N. (030001-060000)

NOTE: When diagnosing problems in the lift and lower circuit, make sure the first part of diagnostic checks are good because the actuator enable relay (K5) has to be functioning properly for the lift and lower relays to work.

Test Conditions:

- Automatic/manual switch in MANUAL position
- Engine not running
- Key switch in RUN position

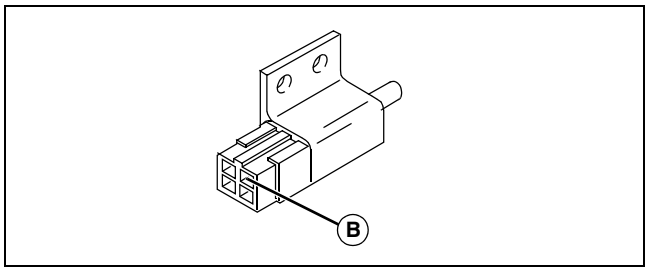
System: Lift and Lower Circuit



(1) Do fuses G, C and E (A) have battery voltage?

Yes - Go to step (2).

No - Test fuse(s). Test power circuit.

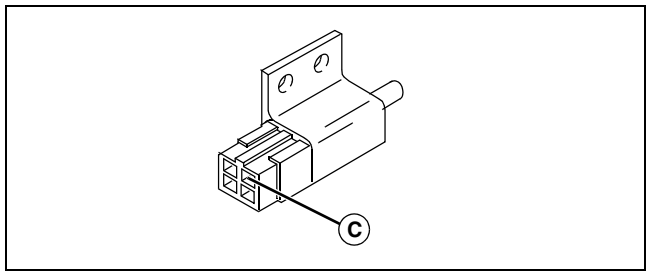


(2) Does lower switch wire 505 yel (B) have battery voltage?

Yes - Go to step (3).

No - Test diode V1. Repair/replace wire harness.

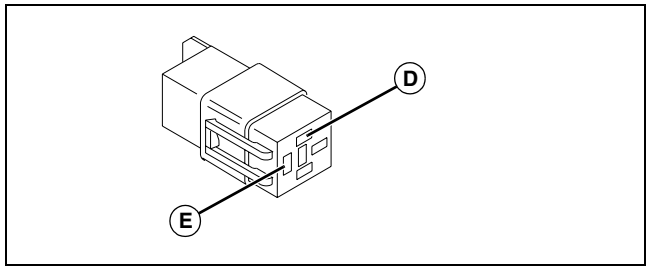
System: Lift and Lower Circuit



(3) Does lift switch wire 506 yel (C) have battery voltage?

Yes - Go to step (4).

No - Repair/replace wire harness.



(4) Does actuator enable relay wire 501 yel (D) have battery voltage?

Yes - Go to step (5).

No - Repair/replace wire harness.

(5) Does actuator enable relay wire 107 blk (E) have continuity to ground?

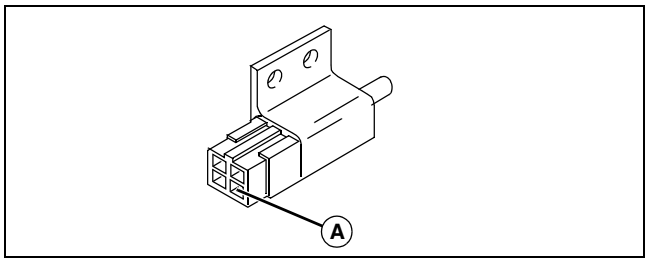
Yes - Go to step (1).

No - Check wires 135, 140, 145, and 160 blk. If ground is good, replace actuator enable relay.

Test Conditions:

- Coring head not at lower limit
- Key switch in RUN position (engine not running)

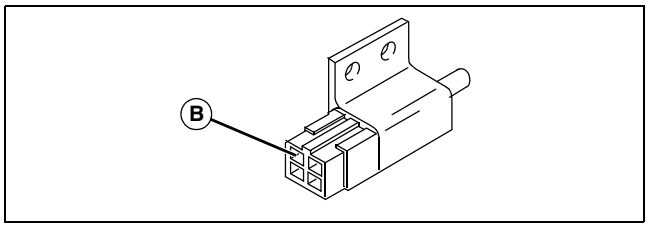
System: Lower Circuit



(1) Does lower switch wire 650 pur (A) have battery voltage?

Yes - Go to step (2).

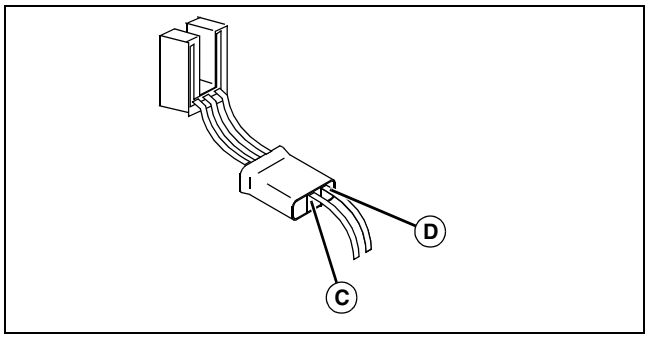
No - Test/replace lower switch.



(2) Does lift switch wire 650 pur (B) have battery voltage?

Yes - Go to step (3).

No - Test/replace lift switch.



(3) Does lower limit sensor wire 660 pur (C) have battery voltage?

Yes - Go to step (4).

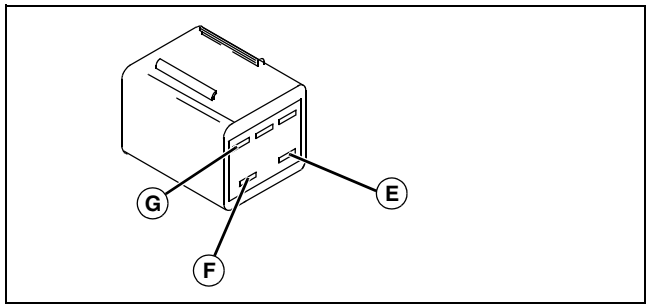
No - Repair/replace wire harness.

System: Lower Circuit

(4) Does lower limit sensor wire 670 yel/wht (D) have battery voltage?

Yes - Go to step (5).

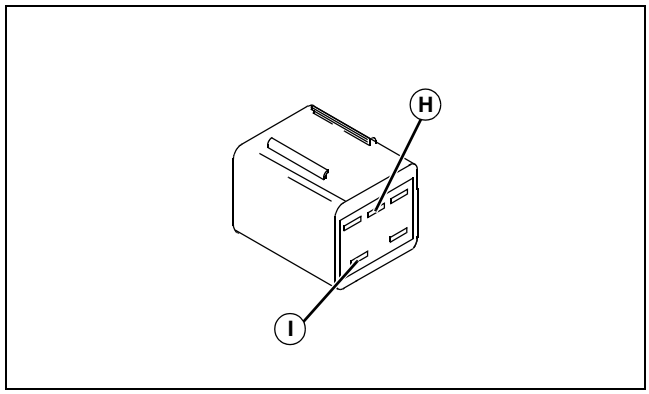
No - Ensure coring head is not at lower limit. If no voltage replace lower limit sensor.



(5) Does lower relay wire 670 yel/wht (E) have battery voltage?

Yes - Go to step (6).

No - Repair/replace wire harness.



(6) Does raise-on-stop relay wire 220 red (I) have battery voltage?

Yes - Go to step (7).

No - Check 230 fusible link.

(7) Does raise-on-stop relay wire 219 red (H) have battery voltage?

Yes - Go to step (8).

No - Test/replace relay.

(8) Does lower relay wire 101 blk (G) have continuity to ground?

Yes - Go to step (9).

No - Check wire 107 blk.

System: Lower Circuit

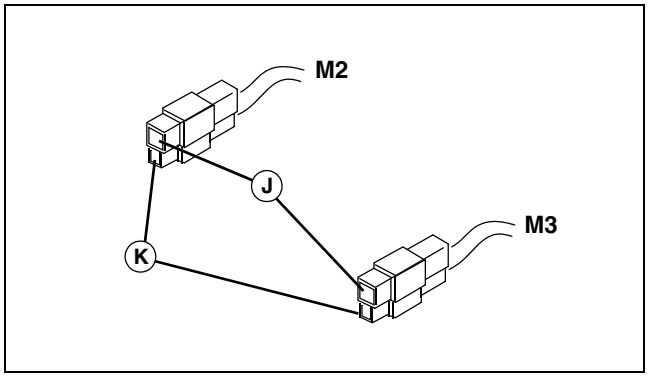
No - Test K9 lower actuator enable relay1 for continuity to wire 140 blk.

No - Repair/replace wire harness.

(9) Does lower relay wire 850 blk (F) have battery voltage?

Yes - Go to step (10).

No - Test/replace lower relay.



(10) Do lift actuator wires 851 and 852 blk (K) have battery voltage?

Yes - Go to step (11).

No - Repair/replace wire harness.

(11) Do lift actuator wires 801 and 802 org (J) have continuity to ground?

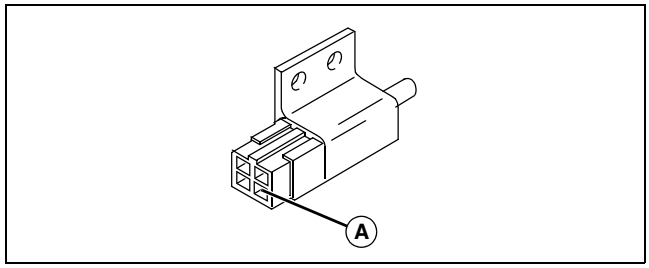
Yes - Go to step (1).

No - Check ground circuits wires 800 org and 105 blk. If grounds are OK, replace lift relay K6. If all voltage checks are OK, repair/replace lift actuators M2 and/or M3.

Test Conditions:

- Key switch in the RUN position (engine not running)
- Aerator Raise/Lower plate raise side depressed (lift operation)
- Traction clutch lever in REVERSE
- Coring head not at upper limit

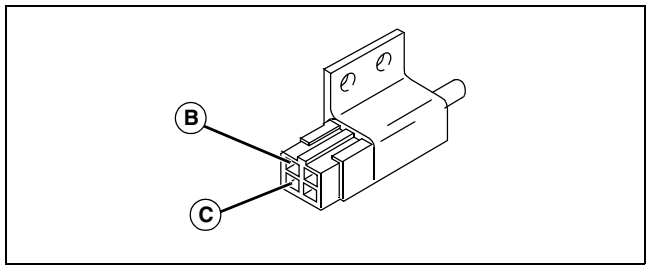
System: Lift Circuit



(1) Does lift switch wire 750 blu (A) have battery voltage?

Yes - Go to step (2).

No - Test/replace lift switch.



(2) Does lower switch wire 750 blu (B) have battery voltage?

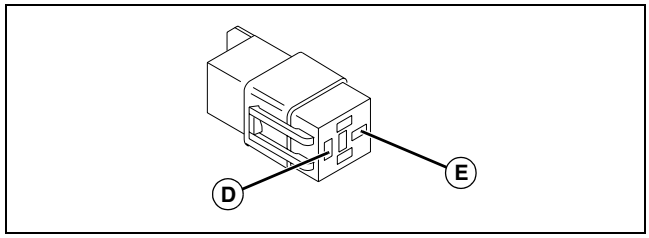
Yes - Go to step (3).

No - Repair/replace wire harness.

(3) Does lower switch wire 760 blu/wht (C) have battery voltage?

Yes - Go to step (4).

No - Test/replace lower switch.



(4) Does lift limit relay wire 760 blu/wht (D) have battery voltage?

Yes - Go to step (5).

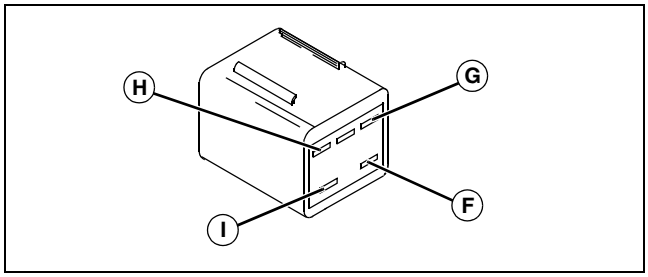
No - Repair/replace wire harness.

System: Lift Circuit

(5) Does lift limit relay wire 675 yel/blk (E) have battery voltage?

Yes - Go to step (6).

No - Ensure coring head is not at upper limit. Check wire 716 pur. If no voltage, check wires 715 pur/wht and 502 yel at the lift limit switch. If voltages are OK, check wire 120 blk. If ground is OK, replace the lift limit relay.



(6) Does lift relay wire 675 yel/blk (F) have battery voltage?

Yes - Go to step (7).

No - Repair/replace wire harness.

(7) Does lift relay wire 221 red (G) have battery voltage?

Yes - Go to step (8).

No - Check fusible link.

(8) Does lift relay wire 106 blk (H) have continuity to ground?

Yes - Go to step (9).

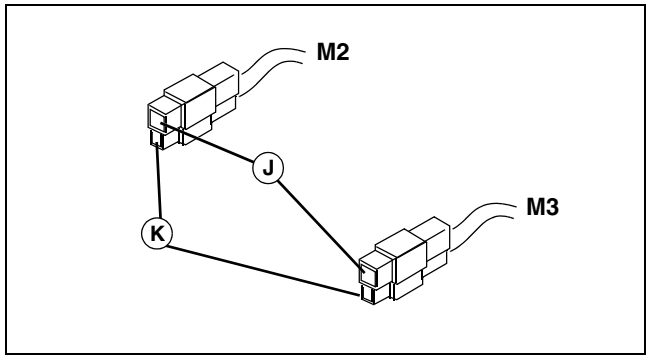
No - Check K9 actuator lower enable relay is energized. Repair or replace wiring harness.

(9) Does lift relay wire 800 org (I) have battery voltage?

Yes - Go to step (10).

No - Test/replace lift relay.

System: Lift Circuit



(10) Do lift actuator wires 801 and 802 org (J) have battery voltage?

Yes - Go to step (11).

No - Repair/replace wire harness.

(11) Do lift actuator wires 851 and 852 blk (K) have continuity to ground?

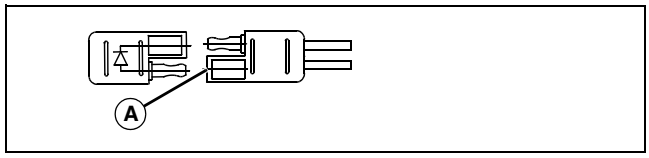
Yes - Go to step (1).

No - Check wires 850 and 100 blk. If grounds are OK, replace lower relay K7. If all voltage checks are OK, repair/replace lift actuator(s) M2 and/or M3.

Test Conditions:

- Key switch in RUN position (engine not running)
- Coring head moves down (in manual mode) when machine raise/lower plate lower side depressed
- Place automatic/manual (Run/Jog) switch S4 in AUTOMATIC
- Momentarily press the Raise/Lower plate lower side (lower operation)

System: Lower Latch Circuit

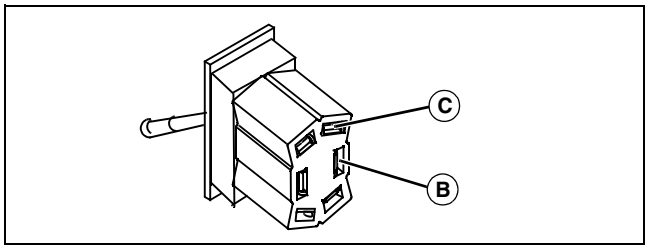


(1) Does lower latch diode wire 853 blk/wht (A) have battery voltage?

Yes - Go to step (2).

No - Check lower relay K7. Repair or replace wiring harness.

System: Lower Latch Circuit



(2) Does automatic/manual switch wire 855 blk/wht (B) have battery voltage?

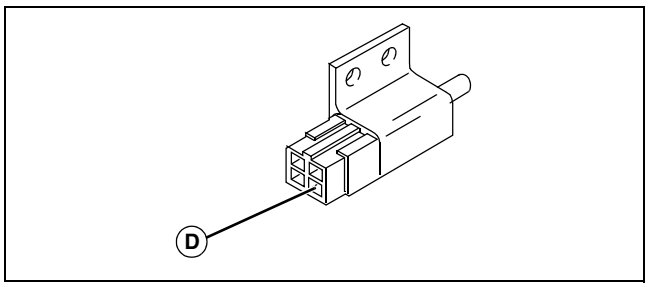
Yes - Go to step (3).

No - Test/replace lower latch diode V3. If diode is good, repair/replace wire harness.

(3) Does automatic/manual switch wire 651 pur/wht (C) have battery voltage?

Yes - Go to step (4).

No - Test/replace automatic/manual switch. (See "Automatic/Manual Switch Test" on page 173. See "Key Switch or Automatic/Manual Switch Removal and Installation" on page 175.)



(4) Does lower switch wire 651 pur/wht (D) have battery voltage?

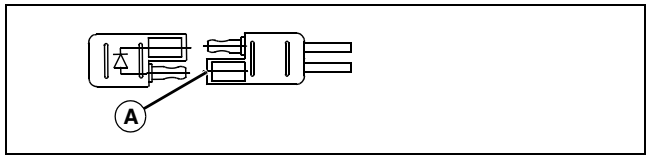
Yes - Go to step (1).

No - Repair/replace wire harness.

Test Conditions:

- Key switch in the RUN position (engine not running)
- Coring head moves up (in manual mode) when machine engagement lever is moved toward operator
- Place automatic/manual (run/jog) switch S4 in AUTOMATIC
- Momentarily engage the machine engagement lever TOWARD operator (lift operation)

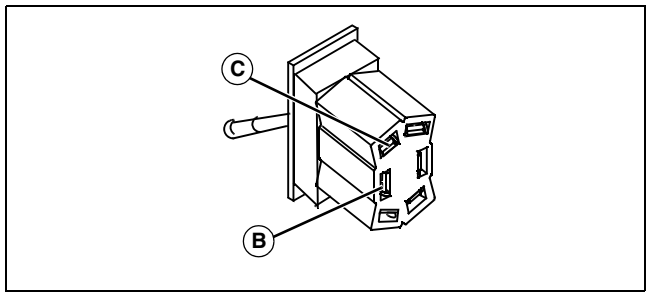
System: Lift Latch Circuit



(1) Does lift latch diode wire 803 org (A) have battery voltage?

Yes - Go to step (2).

No - Check lift relay K6. Repair/replace wire harness.



(2) Does automatic/manual switch wire 805 org (B) have battery voltage?

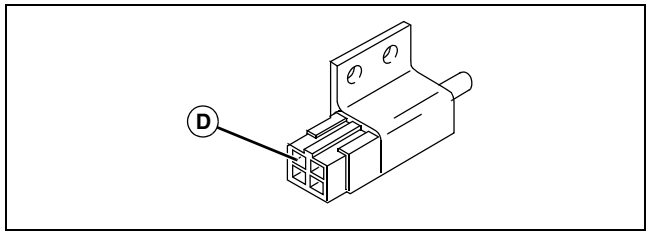
Yes - Go to step (3).

No - Test/replace lift latch diode V2. If diode is good, repair/replace wire harness.

(3) Does automatic/manual switch wire 751 blu (C) have battery voltage?

Yes - Go to step (4).

No - Test/replace automatic/manual switch. (See "Automatic/Manual Switch Test" on page 173. See "Key Switch or Automatic/Manual Switch Removal and Installation" on page 175.)



(4) Does lift switch wire 751 blu (D) have battery voltage?

No - Repair/replace wire harness.

Raise-on-Stop Circuit Diagnosis

Test Conditions:

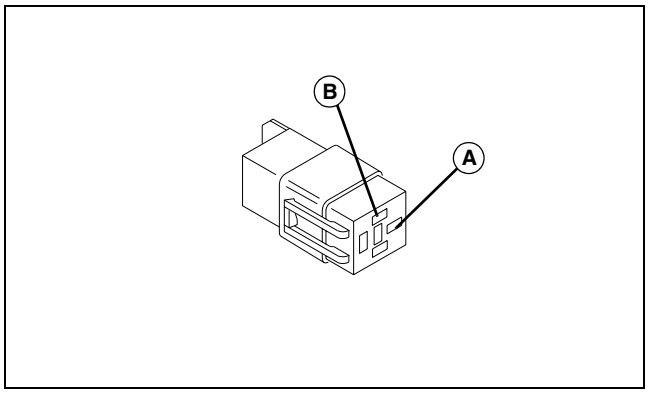
- Key switch in RUN position (engine not running)
- Travel lever AWAY FROM operator

System: Raise-on-Stop Circuit

(1) Does fuse (F7) have battery voltage?

Yes - Go to step (2).

No - Test fuse. Test power circuit.



(2) Does wire 521 yel/blk (A) at the traction/start relay have battery voltage?

Yes - Go to step (3).

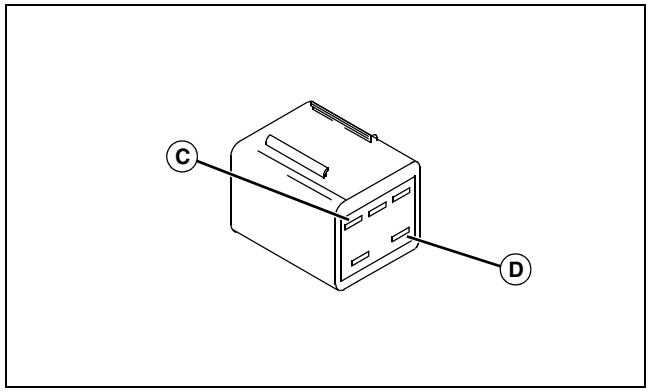
No - Repair or replace wiring harness.

(3) Does wire 741 pur (B) at the traction/start relay have battery voltage?

Yes - Go to step (4).

No - Test/replace relay.

System: Raise-on-Stop Circuit



(4) Is battery voltage present at wire 741 pur (D) at the raise-on-stop relay?

Yes - Go to step (4).

No - Repair/replace wiring harness.

(5) Does wire 112 blk (C) at the raise-on-stop relay have continuity to ground?

No - Repair/replace wiring harness.

Yes - Test/replace relay.

Lift and Lower Circuit S.N. (060001-)

Function

To lift or lower the coring head.

Operating Conditions

- Key switch in RUN position

Theory of Operation

Unswitched power from Battery (G1) is available at the following components:

- Starting motor solenoid (Y1) - terminal B
- Fusible link (F2)
- Key switch (S1) - terminal B
- Raise-on-stop relay (K8) - wire 220 red
- Lower solenoid (Y5) - red cable
- Lift solenoid (Y6) - red cable

When the key switch is in the RUN position, switched power is available at the following components:

- Fuse block (F5-F8) - wire 400 yel/red
- Park brake switch (B1) - wire 510 yel
- Traction clutch switch (B2) - wire 511 yel
- Traction/start relay (K4) - wire 521 yel
- Lower enable relay (K9) - wire 501 yel
- Lift enable relay (K10) - wire 503 yel
- Lift switch (S2) - wire 506 yel
- Lower switch (S3) - wire 505 yel
- Lift limit switch (S6) - wire 502 yel
- Backfeed diode (V1) - wire 500 yel

Raise-on-Stop Circuit

The raise-on-stop circuit raises the coring head when the travel lever is in the DISENGAGED position (machine stopped).

When the travel lever is in the DISENGAGED position (machine stopped), traction clutch switch (B2) is open, preventing traction/start relay (K4) from energizing. The de-energized traction/start relay allows current to flow to the coil of raise-on-stop relay (K8) (wire 741 pur). This energizes the raise-on-stop relay allowing current to flow to lift limit relay (K2) (wire 765 pur and wire 761 pnk).

When the coring head is not at the lift limit position, lift limit switch (S6) is closed. This allows current to flow to the coil of the lift limit relay (wire 715 pur), energizing the relay. With the lift limit relay energized, current flows to lift enable relay (K10) (wire 675 yel/blk).

The energized lift enable relay (energized from switched power, wire 503 yel) allows current to flow to the coil of lift solenoid (Y6), energizing the solenoid. The energized lift solenoid allows unswitched current to flow to hydraulic pump (M4). With the ground path provided across the normally closed contacts of lower solenoid (Y5), the hydraulic pump activates, lifting the coring head.

The energized lift solenoid also allows unswitched current to flow to the following components:

- Fusible Link (F3), wire 810 blk
- Splice (W6), wire 800 org
- Lift buzzer diode (V7), wire 801 org
- Splice (W7), wire 783 pnk
- Buzzer (H1), wire 785 pnk

With unswitched current allowed to flow to the buzzer, the buzzer activates. The buzzer remains activated until the coring head stops moving.

The coring head will raise until the lift limit position is reached, opening the lift limit switch. This causes the lift limit relay to de-energize. Current can no longer flow to the coil of the lift solenoid, causing the solenoid to de-energize. This prevents the unswitched current from flowing to the hydraulic pump, causing the pump to deactivate.

Lower Circuit

The lower circuit lowers the coring head when lower switch (S3) is pressed and the travel lever is in the ENGAGED position.

When the travel lever is in the ENGAGED position, traction clutch switch (B2) is closed. This allows current to flow to the coil of traction/start relay (K4) (wire 705 pur), energizing the relay.

With the traction/start relay energized, current is prevented from flowing to the coil of raise-on-stop relay (K8) (wire 741 pur), de-energizing the relay. This prevents current from flowing to Raise-on-Stop Diode (V4) (wire 765 pur) and lift limit relay (K2) (wire 761 pnk).

When lower switch (S3) is pressed, switched current (wire 505 yel) flows to the following components:

- Lift switch (S2), wire 650 pur
- Automatic/manual switch (S4), wire 651 pur/wht
- Lower limit switch (B3), wire 660 pur

When the coring head is not at the lower limit position, the lower limit switch is closed. This allows current to flow to lower enable relay (K9) (wire 670 yel/wht).

The energized lower enable relay (energized from switched power, wire 501 yel) allows current to flow to the coil of lower solenoid (Y5), energizing the solenoid. The energized lower solenoid allows unswitched current to flow to hydraulic pump (M4). With the ground path provided across the normally closed contacts of lift solenoid (Y5), the hydraulic pump activates, lowering the coring head.

The energized lower solenoid also allows unswitched current to flow to the following components:

- Fusible link (F4) - wire 860 blk
- Splice (W5) - wire 850 blk
- Lower buzzer diode (V6) - wire 851 blk
- Splice (W7) - wire 782 pnk
- Buzzer (H1) - wire 785 pnk

With unswitched current allowed to flow to the buzzer, the buzzer activates. The buzzer remains activated until the coring head stops moving.

The coring head will lower until one of the following conditions occur:

- Lower switch is released
- Travel lever is in the DISENGAGE position
- Lower limit position is reached

When the lower limit is reached, the lower limit switch opens. Current can no longer flow to the coil of the lower solenoid, causing the solenoid to de-energize. This prevents unswitched current from flowing to the hydraulic pump, causing the pump to deactivate.

Lift Circuit

The lift circuit raises the coring head when lift switch (S2) is pressed and the travel lever is in the ENGAGED position.

When the travel lever is in the ENGAGED position, traction clutch switch (B2) is closed. This allows current to flow to the coil of traction/start relay (K4) (wire 705 pur), energizing the relay.

With the traction/start relay energized, current is prevented from flowing to the coil of raise-on-stop relay (K8) (wire 741 pur), de-energizing the relay. This prevents current from flowing to raise-on-stop diode (V4) (wire 765 pur) and lift limit relay (K2) (wire 761 pnk).

When lift switch (S2) is pressed, switched current (wire 506 yel) flows to the following components:

- Lower switch (S3), wire 750 pur
- Automatic/manual switch (S4), wire 751 blu
- Lift limit relay (K2), wire 760 blu/wht

When the coring head is not at the lift limit position, lift limit switch (S6) is closed. This allows current to flow to the coil of the lift limit relay (wire 715 pur), energizing the relay. With the lift limit relay energized, current flows to lift enable relay (K10) (wire 675 yel/blk).

The energized lift enable relay (energized from switched power, wire 503 yel) allows current to flow to the coil of lift solenoid (Y6), energizing the solenoid. The energized lift solenoid allows unswitched current to flow to hydraulic pump (M4). With the ground path provided across the normally closed contacts of lower solenoid (Y5), the hydraulic pump activates, lifting the coring head.

The activated lift solenoid also allows unswitched current to flow to the following components:

- Fusible link (F3) - wire 810 blk
- Splice (W6) - wire 800 org
- Lift buzzer diode (V7) - wire 801 org
- Splice (W7) - wire 783 pnk
- Buzzer (H1) - wire 785 pnk

With unswitched current allowed to flow to the buzzer, the buzzer activates. The buzzer remains activated until the coring head stops moving.

The coring head will raise until one of the following conditions occur:

- Lift switch is released
- Lift limit position is reached

When the lift limit position is reached, the lift limit switch opens. This causes the lift limit relay to de-energize. Current can no longer flow to the coil of the lift solenoid, causing the solenoid to de-energize. This prevents the unswitched current from flowing to the hydraulic pump, causing the pump to deactivate.

Automatic Circuit

The automatic circuit moves the coring head to the lift or lower limit position when lift switch (S2) or lower switch (S3) is momentarily pressed.

When automatic/manual switch (S4) is in the MANUAL position, the coring head will lift and lower as described in the Lift Circuit and Lower Circuit.

When the automatic/manual switch is in the AUTOMATIC position and the lower switch is momentarily pressed, the hydraulic pump is activated as described in the Lower Circuit.

When lower solenoid (Y5) is energized, unswitched current is allowed to flow to the following components:

- Fusible link (F4) - wire 860 blk
- Splice (W5) - wire 850 blk
- Lower latch diode (V3) - wire 853 blk/wht
- Automatic/manual switch (S4) - wire 855 blk/wht

With the automatic/manual switch in the AUTOMATIC position, current is allowed to flow across the switch contacts to the remaining lower circuit (wire 651 pur/wht).

The coring head will lower until the lower limit position is reached.

When the automatic/manual switch is in the AUTOMATIC position and the Lift Switch is momentarily pressed, the hydraulic pump is activated as described in the Lift Circuit.

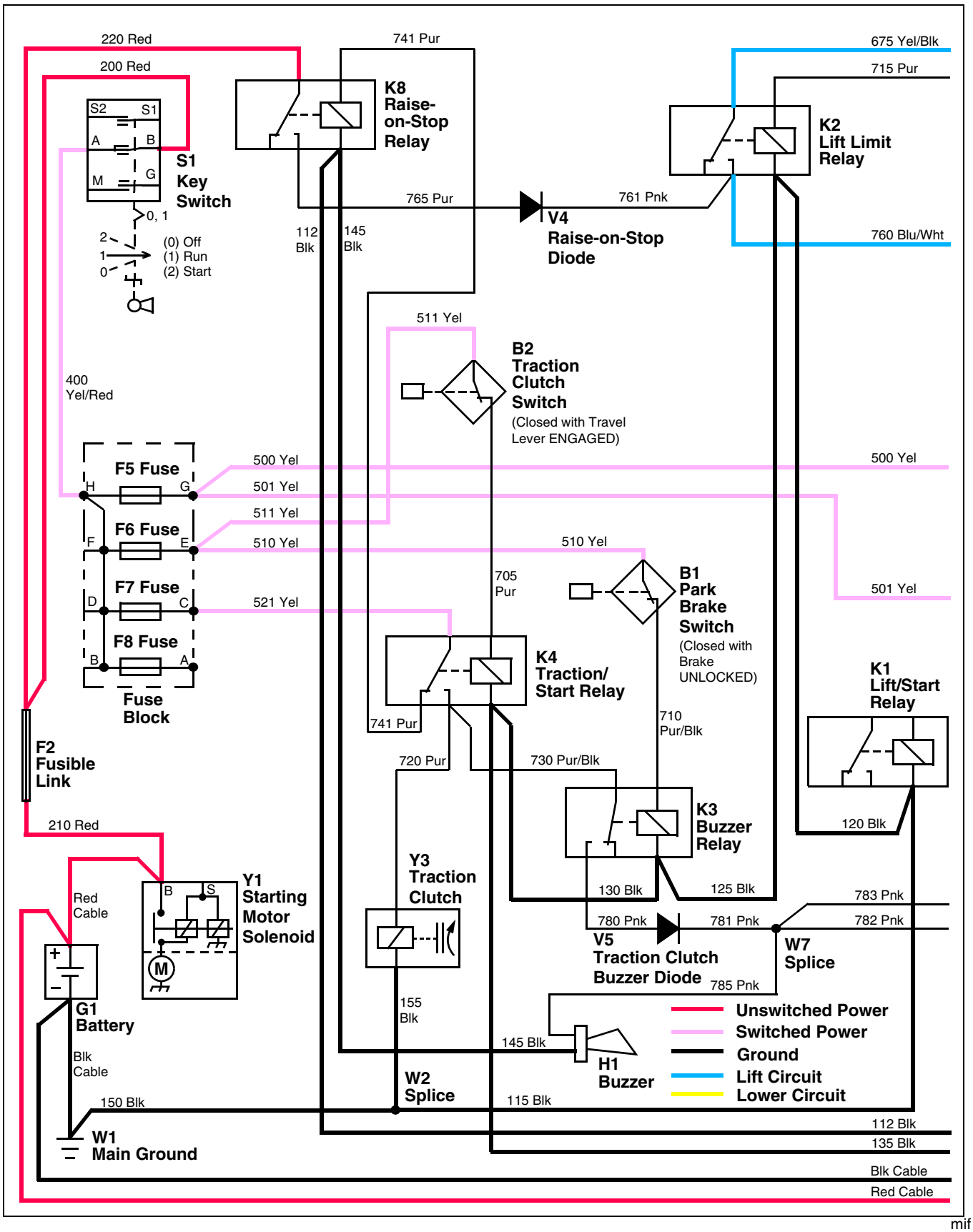
When lift solenoid (Y6) is energized, unswitched current is allowed to flow to the following components:

- Fusible Link (F3), wire 810 blk
- Splice (W6), wire 800 org
- Lift Latch Diode (V2), wire 803 org
- Automatic/manual switch (S4), wire 805 org

With the automatic/manual switch in the AUTOMATIC position, current is allowed to flow across the switch contacts to the remaining Lift Circuit (wire 751 blu).

The coring head will rise until the lift limit position is reached.

Lift and Lower Circuit Schematic S.N. (060001-) (1 of 2)



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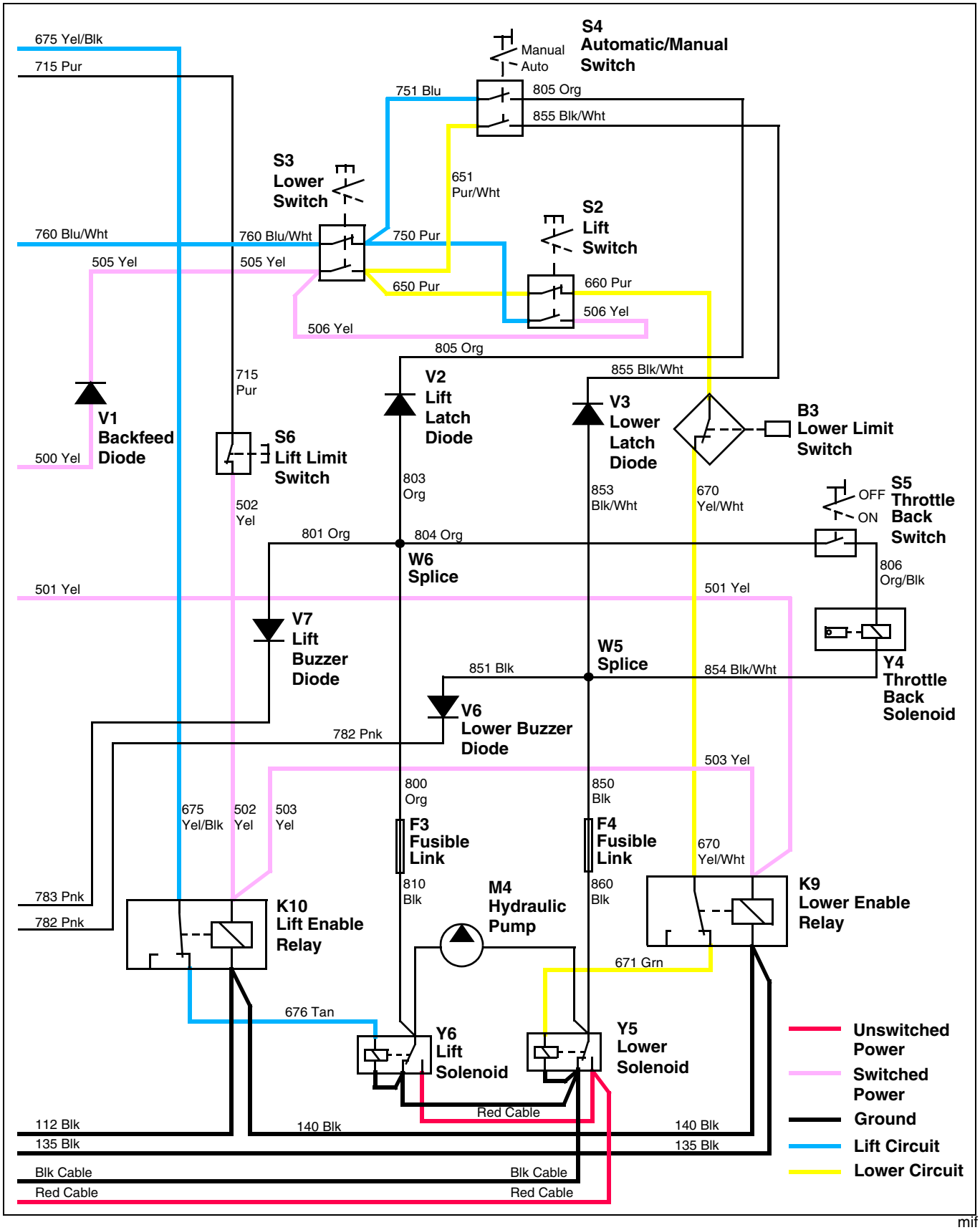
Lift and Lower Circuit Schematic S.N. (060001-) (2 of 2)

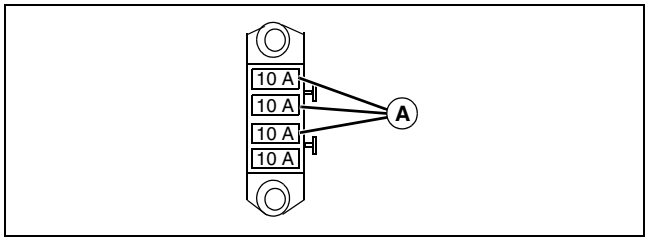


Lift and Lower Circuit Diagnosis S.N. (060001-)

Test Conditions:

- Automatic/manual switch in MANUAL position
- Engine not running
- Key switch in RUN position

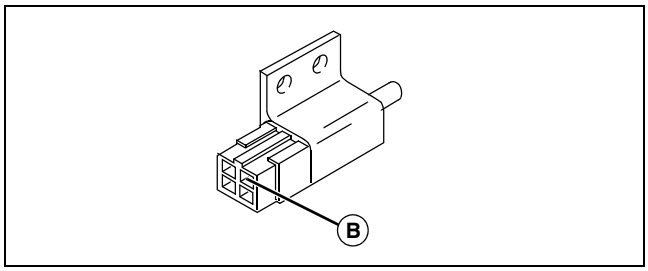
System: Lift and Lower Circuit



(1) Is there 11.8-13.2 VDC measured at fuses (A) of the fuse block?

Yes - Go to step (2).

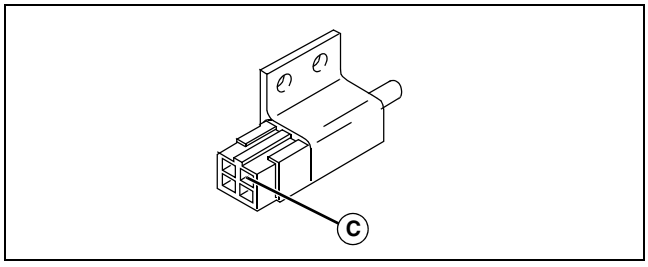
No - Test fuses, key switch (see “Key Switch Test” on page 172), and battery (see “Battery Test” on page 162).



(2) Is there 11.8-13.2 VDC measured at wire 505 yel (B) of the lower switch?

Yes - Go to step (3).

No - Check wires 505 and 500 yel, backfeed diode, and connections. (See “Diode Test” on page 161.)

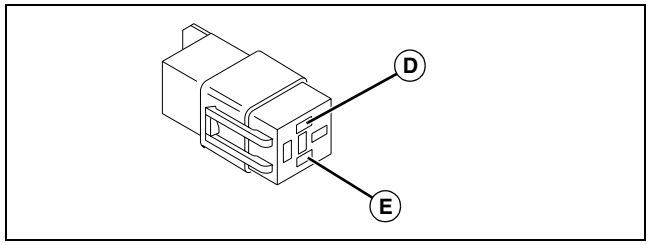


(3) Is there 11.8-13.2 VDC measured at wire 506 yel (C) of the lift switch?

System: Lift and Lower Circuit

Yes - Go to step (4).

No - Check wire 506 yel and connections.



(4) Is there 11.8-13.2 VDC measured at wire 501 yel (D) of lower enable relay?

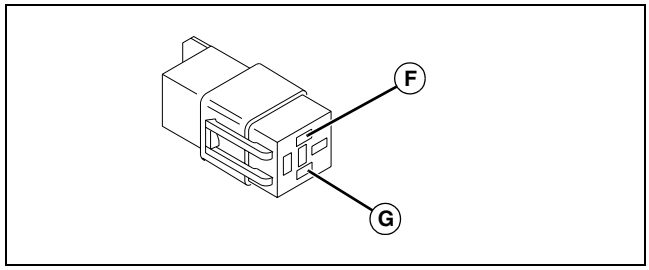
Yes - Go to step (5).

No - Check wire 501 yel and connections.

(5) Is there less than 0.1 ohm of resistance measured between wire 135 blk (E) of the lower enable relay and ground?

Yes - Go to step (6).

No - Check wires 135, 130, 125, 120 blk, and 115 blk. Check splice (W2), wire 150 blk, main ground (W1), and connections.



(6) Is there 11.8-13.2 VDC measured at wire 503 blu (F) of the lift enable relay?

Yes - Go to step (7).

No - Check wire 503 blu and connections.

(7) Is there less than 0.1 ohm of resistance measured between wire 140 blk (G) of the lift enable relay and ground?

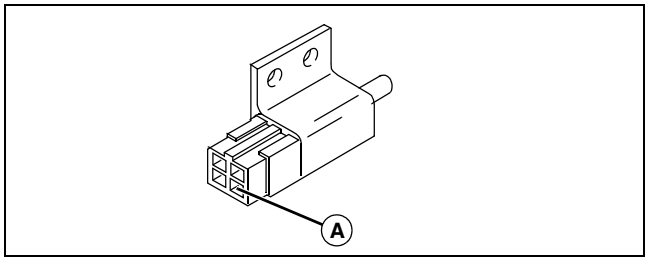
Yes - Go to step (1). (Lower switch pressed.)

No - Check wire 140 blk and connections.

Test Conditions:

- Machine parked on level surface
- Key switch in RUN position
- Engine not running
- Lower switch pressed
- Coring head not at lower limit position
- Travel lever in ENGAGED position

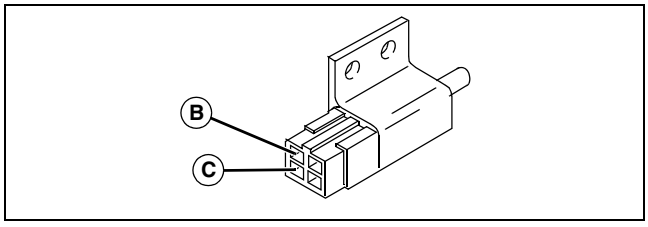
System: Lower Circuit



(1) Is there 11.8-13.2 VDC measured at wire 650 pur (A) of the lower switch?

Yes - Go to step (2).

No - Test the lower switch. (See “Lift and Lower Switch Test” on page 169.)



(2) Is there 11.8-13.2 VDC measured at wire 650 pur (B) of the lift switch?

Yes - Go to step (3).

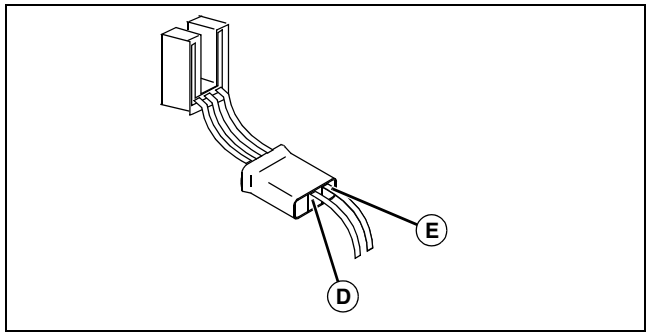
No - Check wire 650 pur and connections.

(3) Is there 11.8-13.2 VDC measured at wire 660 pur (C) of the lift switch?

Yes - Go to step (4).

No - Test the lift switch. (See “Lift and Lower Switch Test” on page 169.)

System: Lower Circuit



(4) Is there 11.8-13.2 VDC measured at wire 660 pur (D) of the lower limit switch?

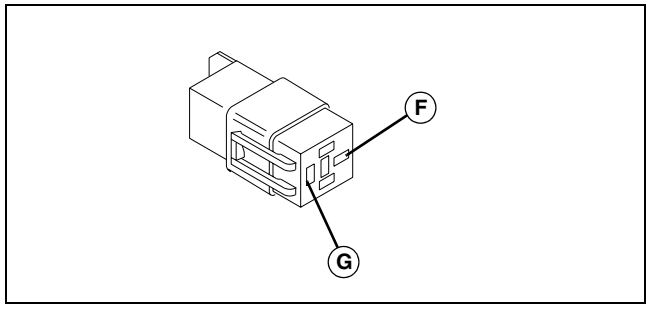
Yes - Go to step (5).

No - Check wire 660 pur and connections.

(5) Is there 11.8-13.2 VDC measured at wire 670 yel/wht (E) of the lower limit switch?

Yes - Go to step (6).

No - Verify coring head is not at lower limit position. Test lower limit switch. (See “Lower Limit Switch Test” on page 171.)



(6) Is there 11.8-13.2 VDC measured at wire 670 yel/wht (F) of the lower enable relay?

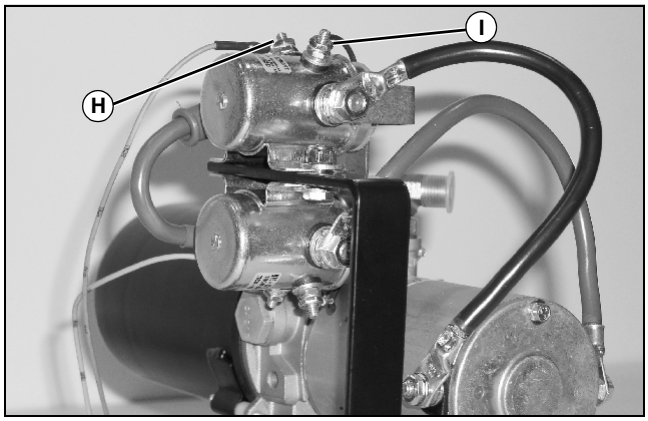
Yes - Go to step (7).

No - Check wire 670 yel/wht and connections.

(7) Is there 11.8-13.2 VDC measured at wire 671 grn (G) of the lower enable relay?

Yes - Go to step (8).

No - Test lower enable relay. (See “Relay Test” on page 167.)



(8) Is there 11.8-13.2 VDC measured at wire 671 grn (H) of the lower solenoid?

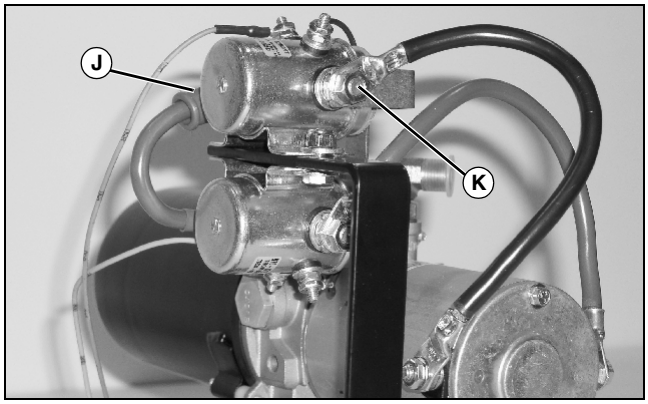
Yes - Go to step (9).

No - Check wire 671 grn and connections.

(9) Is there less than 0.1 ohm of resistance measured between terminal (I) of the lower solenoid and ground?

Yes - Go to step (10).

No - Check black wire, black cable, and connections.



(10) Is there 11.8-13.2 VDC measured at terminal (J) of the lower solenoid?

Yes - Go to step (11).

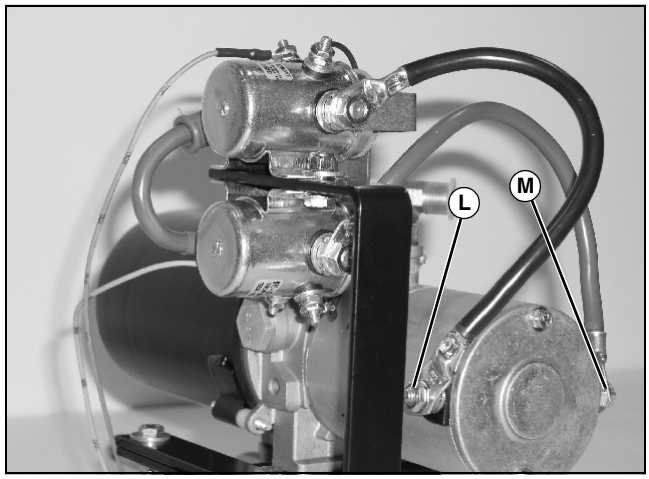
No - Check red cable, positive (+) battery cable, and connections.

(11) Is there 11.8-13.2 VDC measured at terminal (K) of the lower solenoid?

Yes - Go to step (12).

No - Replace the lower solenoid. (See “Lift and Lower Solenoid Removal and Installation S.N. (060001-)” on page 181.)

System: Lower Circuit



(12) Is there 11.8-13.2 VDC measured at terminal (L) of the hydraulic pump?

Yes - Go to step (13).

No - Check cable (from the lower solenoid) and connections.

(13) Is there less than 0.1 ohm of resistance measured between terminal (M) of the hydraulic pump and ground?

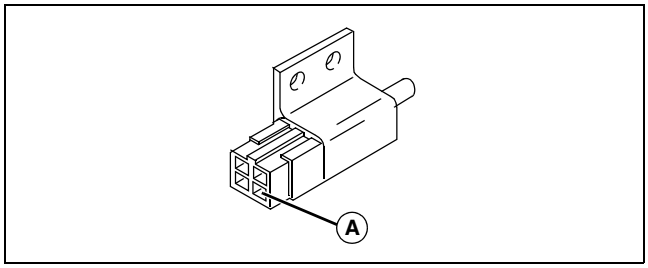
Yes - Replace the hydraulic pump. (See “Hydraulic Pump Removal and Installation” on page 224.)

No - Check ground cables and connections.

Test Conditions:

- Machine parked on level surface
- Key switch in RUN position
- Engine not running
- Lift switch pressed
- Coring head not at lift limit position
- Travel lever in ENGAGED position

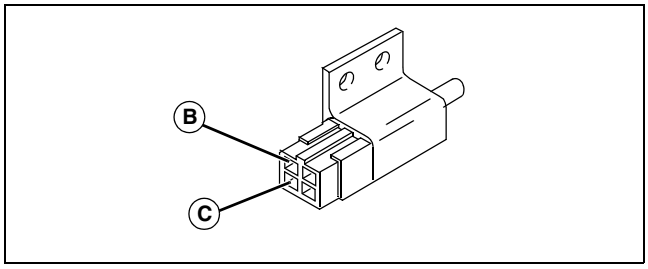
System: Lift Circuit



(1) Is there 11.8-13.2 VDC measured at wire 750 blu (A) of the lift switch?

Yes - Go to step (2).

No - Test the lift switch. (See “Lift and Lower Switch Test” on page 169.)



(2) Is there 11.8-13.2 VDC measured at wire 750 blu (B) of the lower switch?

Yes - Go to step (3).

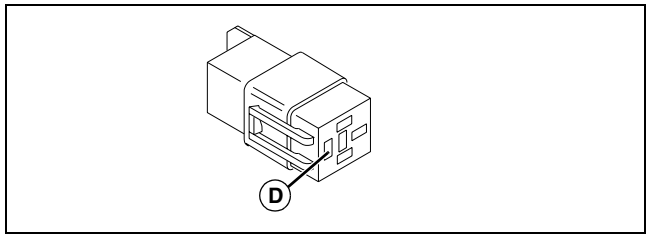
No - Check wire 750 blu and connections.

(3) Is there 11.8-13.2 VDC measured at wire 760 blu/wht (C) of the lower switch?

Yes - Go to step (4).

No - Test the lower switch. (See “Lift and Lower Switch Test” on page 169.)

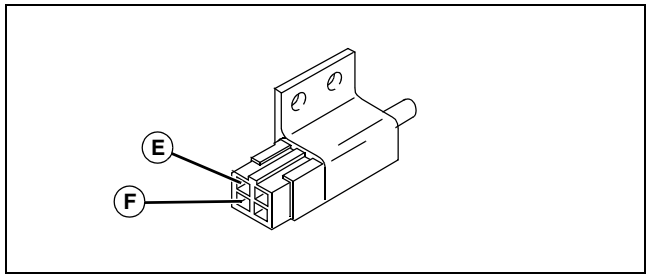
System: Lift Circuit



(4) Is there 11.8-13.2 VDC measured at wire 760 blu/wht (D) of the lift limit relay?

Yes - Go to step (5).

No - Check wire 760 blu/wht and connections.



(5) Is there 11.8-13.2 VDC measured at wire 502 yel (E) of the lift limit switch?

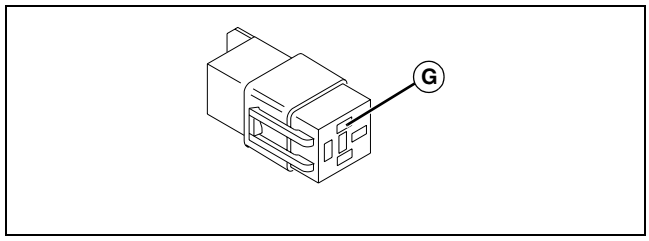
Yes - Go to step (6).

No - Check wire 502 yel and connections.

(6) Is there 11.8-13.2 VDC measured at wire 715 pur/wht (F) of the lift limit switch?

Yes - Go to step (7).

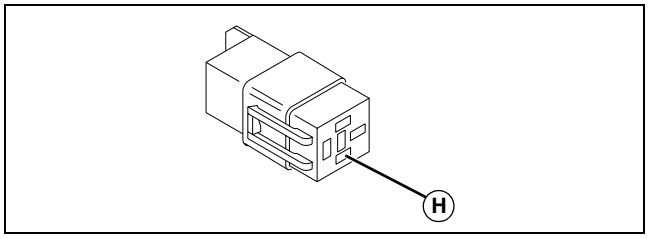
No - Test the lift limit switch. (See “Lift Limit Switch Test” on page 170.)



(7) Is there 11.8-13.2 VDC measured at wire 715 pur/wht (G) of the lift limit relay?

Yes - Go to step (8).

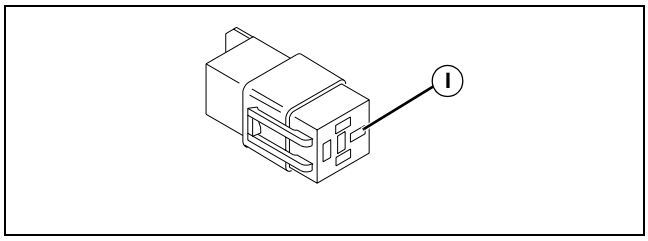
No - Check wire 715 pur/wht and connections.



(8) Is there less than 0.1 ohm of resistance measured between wire 120 blk (H) of the lift limit relay and ground?

Yes - Go to step (9).

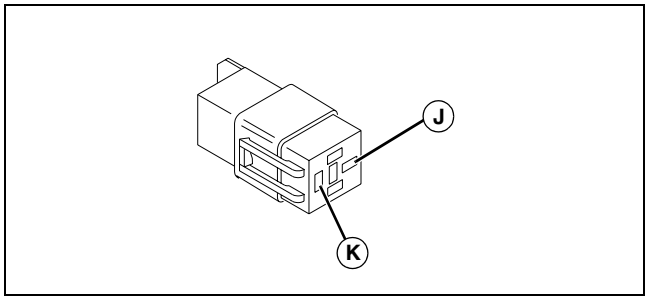
No - Check wires 120, and 115 blk. Check splice (W2), wire 150 blk, main ground (W1), and connections.



(9) Is there 11.8-13.2 VDC measured at wire 675 yel/blk (I) of the lift limit relay?

Yes - Go to step (10).

No - Test the lift limit relay. (See “Relay Test” on page 167.)



(10) Is there 11.8-13.2 VDC measured at wire 675 yel/blk (J) of the lift enable relay?

Yes - Go to step (11).

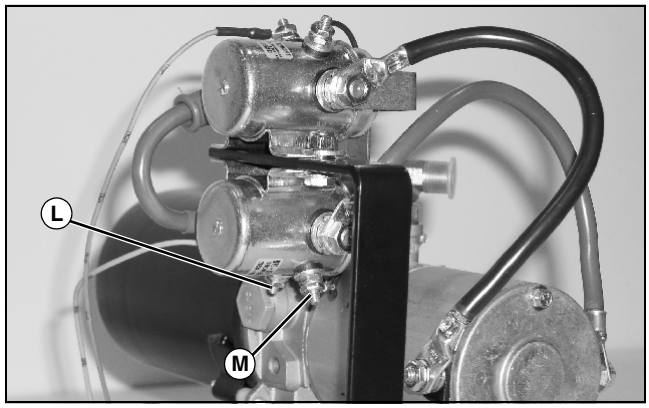
No - Check wire 675 yel/blk and connections.

(11) Is there 11.8-13.2 VDC measured at wire 676 tan (K) of the lift enable relay?

Yes - Go to step (12).

System: Lift Circuit

No - Test the lift enable relay. (See “Relay Test” on page 167.)



(12) Is there 11.8-13.2 VDC measured at wire 676 tan (L) of the lift solenoid?

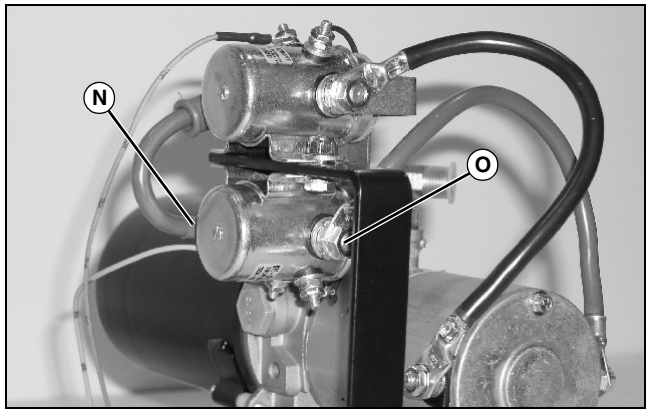
Yes - Go to step (13).

No - Check wire 676 tan and connections.

(13) Is there less than 0.1 ohm of resistance measured between terminal (M) of the lift solenoid and ground?

Yes - Go to step (14).

No - Check blk wire, blk cable, and connections.



(14) Is there 11.8-13.2 VDC measured at terminal (N) of the lift solenoid?

Yes - Go to step (15).

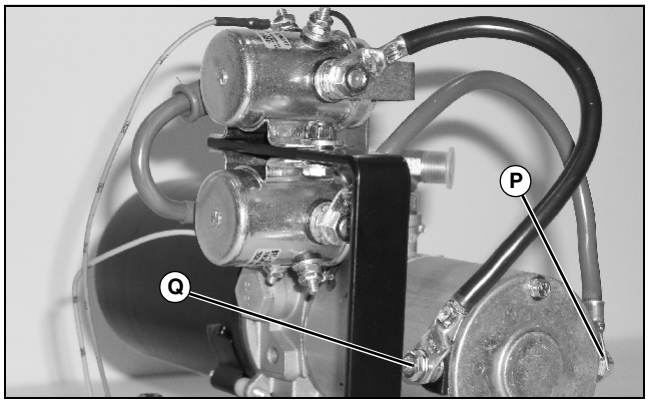
No - Check red cable, positive (+) battery cable, and connections.

System: Lift Circuit

(15) Is there 11.8-13.2 VDC measured at wire 810 blk (O) of the lower solenoid?

Yes - Go to step (16).

No - Replace the lift solenoid. (See “Lift and Lower Solenoid Removal and Installation S.N. (060001-)” on page 181.)



(16) Is there 11.8-13.2 VDC measured at terminal (P) of the hydraulic pump?

Yes - Go to step (17).

No - Check cable (from the lower solenoid) and connections.

(17) Is there less than 0.1 ohm of resistance measured between terminal (Q) of the hydraulic pump and ground?

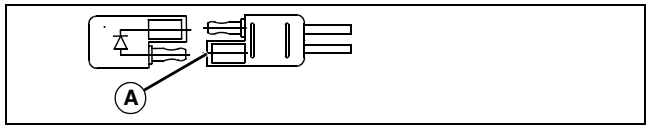
Yes - Replace the hydraulic pump. (See “Hydraulic Pump Removal and Installation” on page 224.)

No - Check ground cables and connections.

Test Conditions:

- Machine parked on level surface
- Key switch in RUN position
- Engine running
- Lower switch momentarily pressed
- Automatic/manual switch in the AUTOMATIC position
- Coring head not at lower limit position
- Travel lever in ENGAGED position

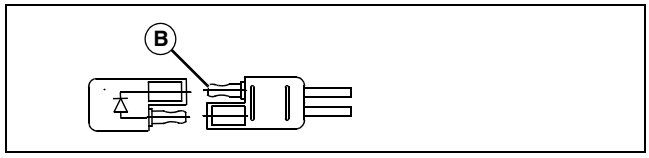
System: Lower Latch Circuit



(1) Is there 11.8-13.2 VDC measured at wire 853 blk/wht (A) of the lower latch diode?

Yes - Go to step (2).

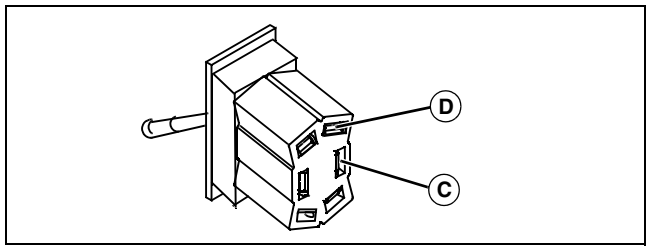
No - Check wire 853 blk/wht, splice (W5), wire 850 blk, fusible link (F4), wire 860 blk, and connections.



(2) Is there 11.8-13.2 VDC measured at wire 855 blk/wht (B) of the lower latch diode?

Yes - Go to step (3).

No - Test the lower latch diode. (See “Diode Test” on page 161.)



(3) Is there 11.8-13.2 VDC measured at wire 855 blk/wht (C) of the automatic/manual switch?

Yes - Go to step (4).

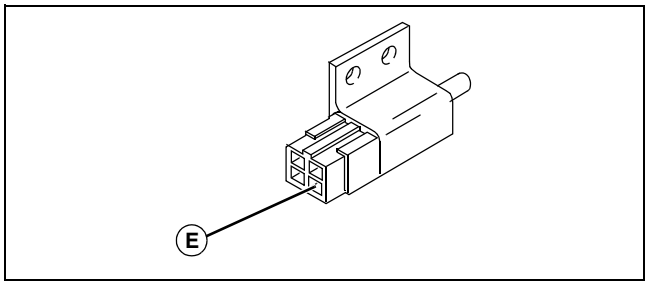
No - Check wire 855 blk/wht and connections.

(4) Is there 11.8-13.2 VDC measured at wire 651 pur/wht (D) of the automatic/manual switch?

Yes - Go to step (5).

No - Test the automatic/manual switch. (See “Automatic/Manual Switch Test” on page 173.)

System: Lower Latch Circuit



(5) Is there 11.8-13.2 VDC measured at wire 651 pur/wht (E) of the lower switch?

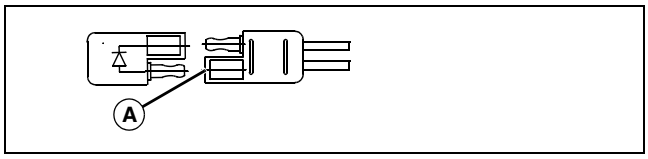
Yes - Test complete.

No - Check wire 651 pur/Wht and connections.

Test Conditions:

- Machine parked on level surface
- Key switch in RUN position
- Engine not running
- Lift switch momentarily pressed
- Automatic/manual switch in the AUTOMATIC position
- Coring head not at lift limit position
- Travel lever in ENGAGED position

System: Lift Latch Circuit

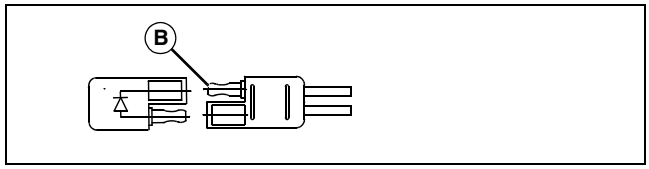


(1) Is there 11.8-13.2 VDC measured at wire 803 org (A) of the lift latch diode?

Yes - Go to step (2).

No - Check wire 803 org, splice (W6), wire 800 org, fusible link (F3), wire 810 blk, and connections.

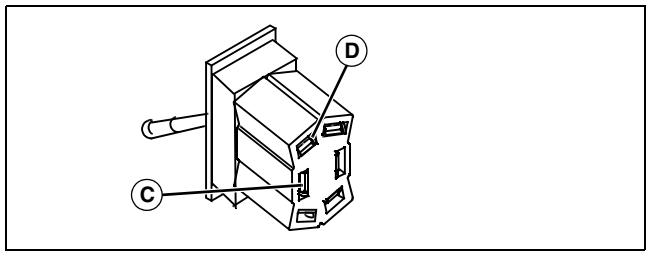
System: Lift Latch Circuit



(2) Is there 11.8-13.2 VDC measured at wire 805 org (B) of the lift latch diode?

Yes - Go to step (3).

No - Test the lift latch diode. (See “Diode Test” on page 161.)



(3) Is there 11.8-13.2 VDC measured at wire 805 org (C) of the automatic/manual switch?

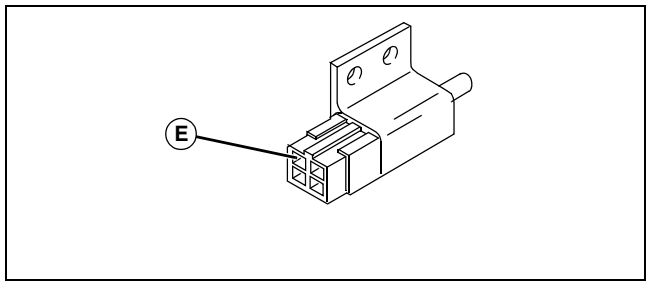
Yes - Go to step (4).

No - Check wire 805 org and connections.

(4) Is there 11.8-13.2 VDC measured at wire 751 blu (D) of the automatic/manual switch?

Yes - Go to step (5).

No - Test the automatic/manual switch. (See “Automatic/Manual Switch Test” on page 173.)



(5) Is there 11.8-13.2 VDC measured at wire 751 blu (E) of the lower switch?

Yes - Test complete.

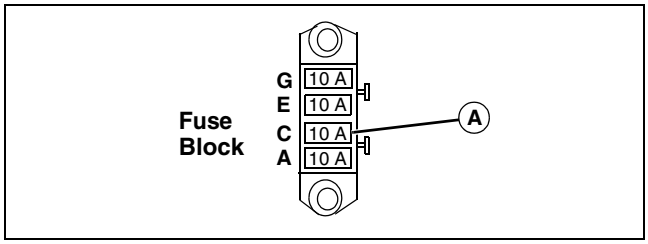
No - Check wire 751 blu and connections.

Raise-on-Stop Circuit Diagnosis

Test Conditions:

- Machine parked on level surface
- Key switch in RUN position
- Engine not running
- Coring head not at lift limit position
- Travel lever in DISENGAGED position

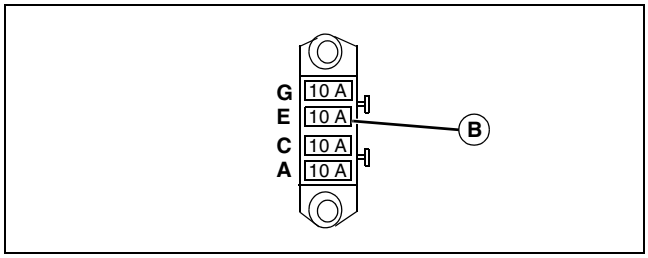
System: Raise-on-Stop Circuit



(1) Is there 11.8-13.2 VDC measured at wire 521 yel/blk (A) of the fuse block?

Yes - Go to step (2).

No - Check fuse (F7), wire 400 yel/red, wire 200 red, fusible link (F2), wire 210 red, positive (+) battery cable, and connections. Test the key switch. (See "Key Switch Test" on page 172.)

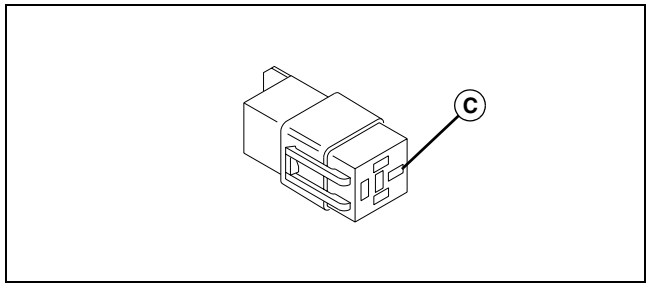


(2) Is there 11.8-13.2 VDC measured at wire 511 yel (B) of the fuse block?

Yes - Go to step (3).

No - Check fuse (F6), wire 400 yel/red, wire 200 red, fusible link (F2), wire 210 red, positive (+) battery cable, and connections. Test the key switch. (See "Key Switch Test" on page 172.)

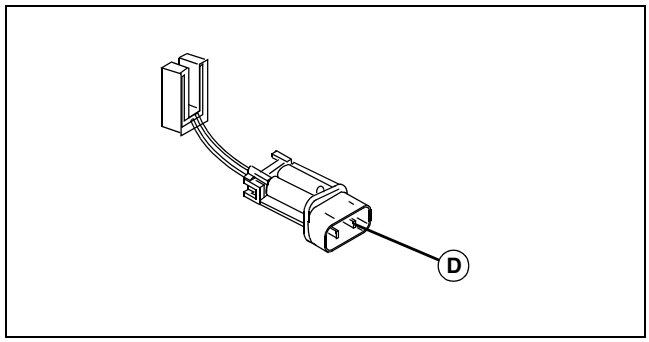
System: Raise-on-Stop Circuit



(3) Is there 11.8-13.2 VDC measured at wire 521 yel/blk (C) of the traction/start relay?

Yes - Go to step (4).

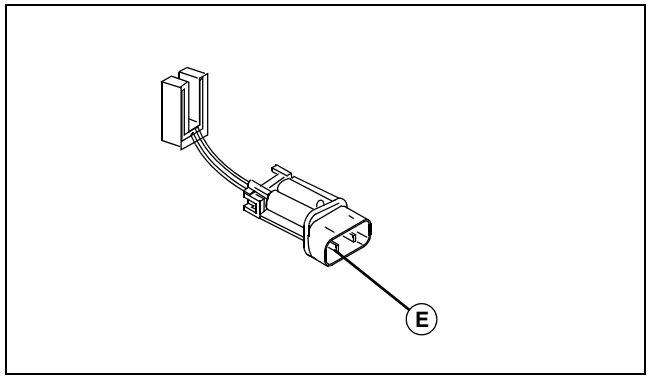
No - Check wire 521 yel/blk and connections.



(4) Is there 11.8-13.2 VDC measured at wire 511 yel (C) of the traction clutch switch?

Yes - Go to step (5).

No - Check wire 511 yel and connections.

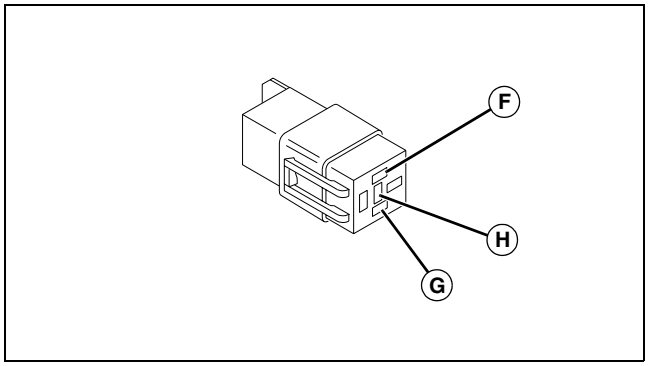


(5) With the travel lever in the ENGAGED position, is there 11.8-13.2 VDC measured at wire 705 pur (E) of the traction clutch switch?

Yes - Go to step (6).

No - Test the traction clutch switch. (See "Traction Clutch Switch Test" on page 172.)

System: Raise-on-Stop Circuit



(6) Is there 11.8-13.2 VDC measured at wire 705 pur (F) of the traction/start relay?

Yes - Go to step (7).

No - Check wire 705 pur and connections.

(7) Is there less than 0.1 ohm of resistance measured between wire 130 blk (G) of the traction/start relay and ground?

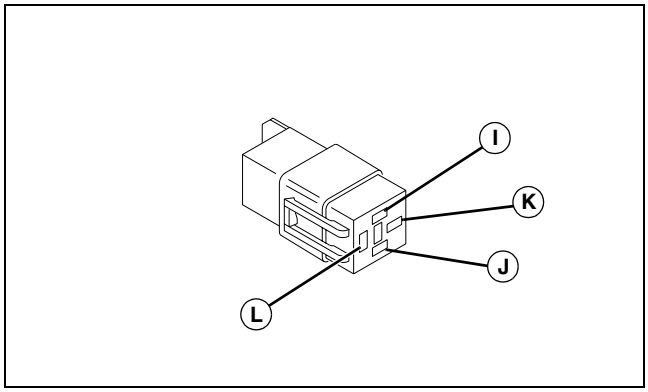
Yes - Go to step (8).

No - Check wires 130, 125, 120, and 115 blk. Check splice (W2), wire 150 blk, main ground (W1), and connections.

(8) With travel lever in the DISENGAGED position, is there 11.8-13.2 VDC measured at wire 741 pur (H) of the traction/start relay?

Yes - Go to step (9).

No - Test the traction/start relay. (See “Relay Test” on page 167.)



(9) Is there 11.8-13.2 VDC measured at wire 741 pur (I) of the raise-on-stop relay?

Yes - Go to step (10).

No - Check wire 741 pur and connections.

System: Raise-on-Stop Circuit

(10) Is there less than 0.1 ohm of resistance measured between wire 112 blk (J) of the raise-on-stop relay and ground?

Yes - Go to step (11).

No - Check wires 112, 140, 135, 130, 125, 120, and 115 blk. Check splice (W2), wire 150 blk, main ground (W1), and connections.

(11) Is there 11.8-13.2 VDC measured at wire 220 red (K) of the raise-on-stop relay?

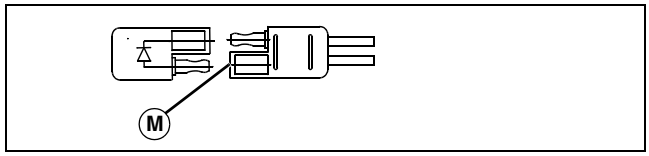
Yes - Go to step (12).

No - Check wire 220 red, fusible link (F1), wire 210 red, positive (+) battery cable, and connections.

(12) Is there 11.8-13.2 VDC measured at wire 765 pur (L) of the raise-on-stop relay?

Yes - Go to step (13).

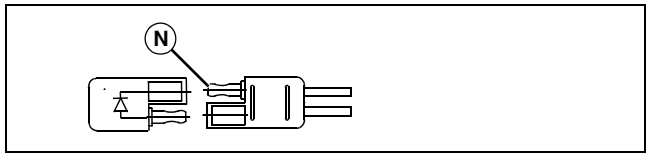
No - Test the raise-on-stop relay. (See “Relay Test” on page 167.)



(13) Is there 11.8-13.2 VDC measured at wire 765 pur (M) of the raise-on-stop diode?

Yes - Go to step (14).

No - Check wire 765 pur and connections.

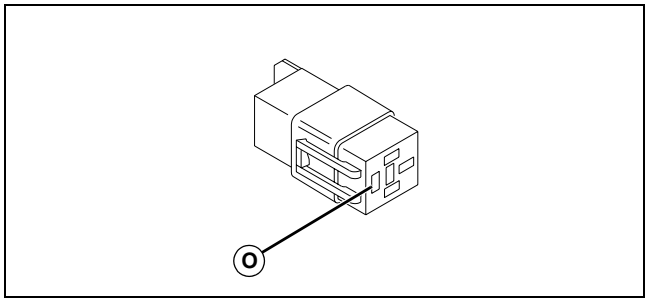


(14) Is there 11.8-13.2 VDC measured at wire 761 pnk (N) of the raise-on-stop diode?

Yes - Go to step (15).

No - Test the raise-on-stop diode. (See “Diode Test” on page 161.)

System: Raise-on-Stop Circuit



(15) Is there 11.8-13.2 VDC measured at wire 761 pnk (O) of the lift limit relay?

Yes - Go to step (1). (Lift Circuit Test)

No - Check wire 765 pur and connections.

Traction Clutch Circuit

Function

To supply operating power to the gear box through a V-belt and pulleys.

Operating Conditions

- Key switch in RUN position
- Engine running

Theory of Operation

Unswitched power from Battery (G1) is available at the following components:

- Starting motor solenoid (Y1) - battery positive (+) cable
- Fusible link (F2) - wire 210 red
- Key switch (S1) - wire 200 red

When the key switch is in the RUN position, switched power is available at the following components:

- Fuse block (F5-F8) - wire 400 yel/red
- Park brake switch (B1) - wire 510 yel
- Traction clutch switch (B2) - wire 511 yel
- Traction/start relay (K4) - wire 521 yel

When the travel lever is in the ENGAGED position, the traction clutch switch will be closed. This allows current to flow to the coil of the traction/start relay (wire 705 pur), energizing the relay.

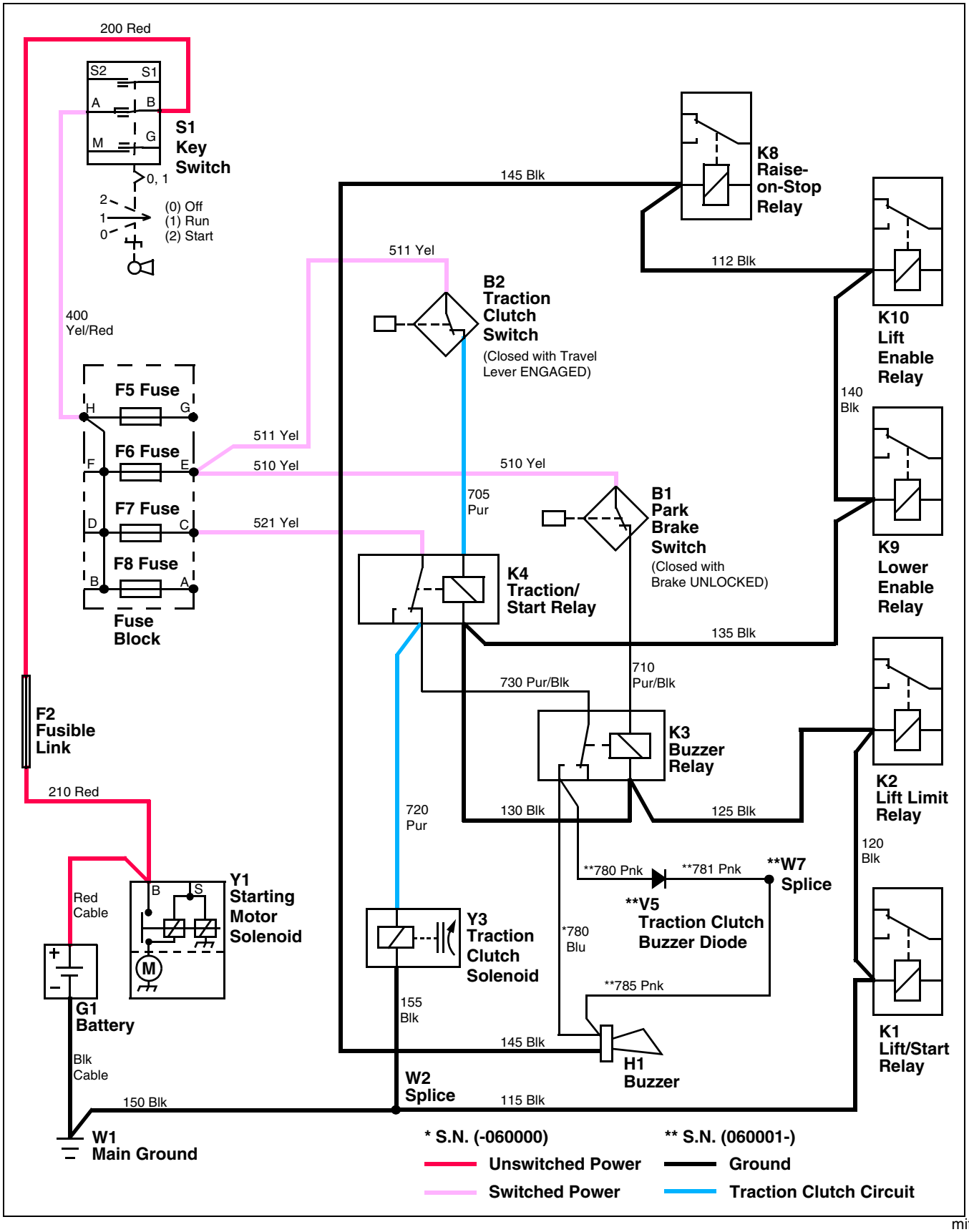
With the traction/start relay energized, current flows to traction clutch solenoid (Y3) (wire 720 pur), engaging the clutch.

When the park brake is in the UNLOCKED position, the park brake switch is closed. This allows current to flow to the coil of buzzer relay (K3) (wire 675 yel/blk), energizing the relay. Current from the traction/start relay (wire 730 pur/blk) is prevented from flowing to buzzer (H1) by the energized buzzer relay. The buzzer does not activate.

When the park brake is in the LOCKED position, the park brake switch is open. Current is prevented from flowing to the coil of the buzzer relay (wire 675 yel/blk). The buzzer relay remains de-energized.

When the traction/start relay is energized, current flows to the buzzer relay (wire 730 pur/blk), across the normally closed contacts of the buzzer relay, and to the buzzer. This activates the buzzer, sounding an audible alarm.

Traction Clutch Circuit Schematic



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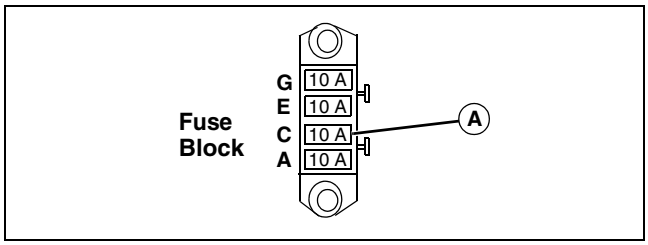
Traction Clutch Circuit Diagnosis

NOTE: When diagnosing a traction clutch problem, if the park brake is engaged, an audible alarm will sound.

Test Conditions:

- Battery fully charged
- Park brake in UNLOCKED position
- Key switch in RUN position
- Engine not running
- Travel lever in the ENGAGED position

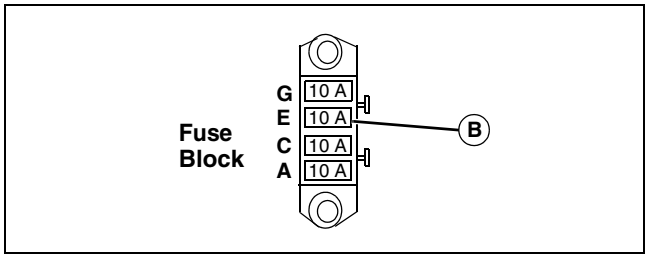
System: Traction Clutch Circuit



(1) Is there 11.8-13.2 VDC measured at wire 521 yel/blk (A) of the fuse block?

Yes - Go to step (2).

No - Check fuse (F7), wire 400 yel/red, wire 200 red, fusible link (F2), wire 210 red, positive (+) battery cable, and connections. Test the key switch. (See “Key Switch Test” on page 172.)

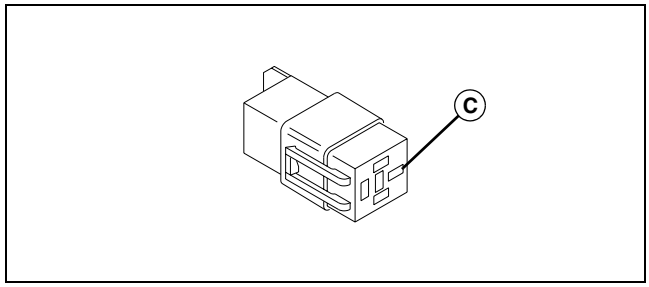


(2) Is there 11.8-13.2 VDC measured at wire 511 yel (B) of the fuse block?

Yes - Go to step (3).

No - Check fuse (F6), wire 400 yel/red, wire 200 red, fusible link (F2), wire 210 red, positive (+) battery cable, and connections. Test the key switch. (See “Key Switch Test” on page 172.)

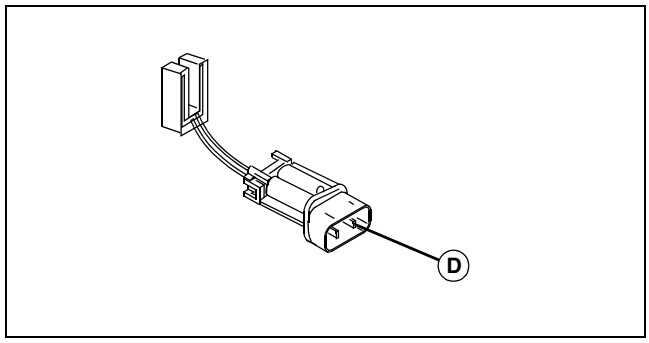
System: Traction Clutch Circuit



(3) Is there 11.8-13.2 VDC measured at wire 521 yel/blk (C) of the traction/start relay?

Yes - Go to step (4).

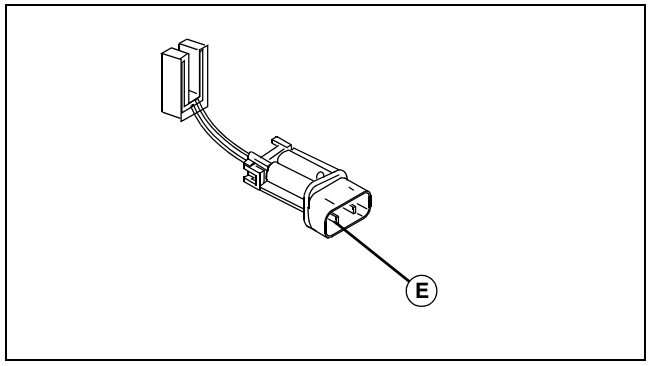
No - Check wire 521 yel/blk and connections.



(4) Is there 11.8-13.2 VDC measured at wire 511 yel (C) of the traction clutch switch?

Yes - Go to step (5).

No - Check wire 511 yel and connections.

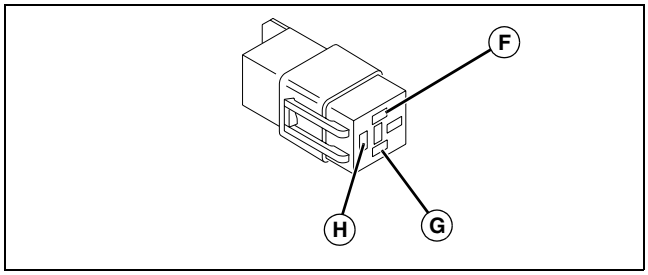


(5) Is there 11.8-13.2 VDC measured at wire 705 pur (E) of the traction clutch switch?

Yes - Go to step (6).

No - Test the traction clutch switch. (See “Traction Clutch Switch Test” on page 172.)

System: Traction Clutch Circuit



(6) Is there 11.8-13.2 VDC measured at wire 705 pur (F) of the traction/Start relay?

Yes - Go to step (7).

No - Check wire 705 pur and connections.

(7) Is there less than 0.1 ohm of resistance measured between wire 130 blk (G) of the traction/start relay and ground?

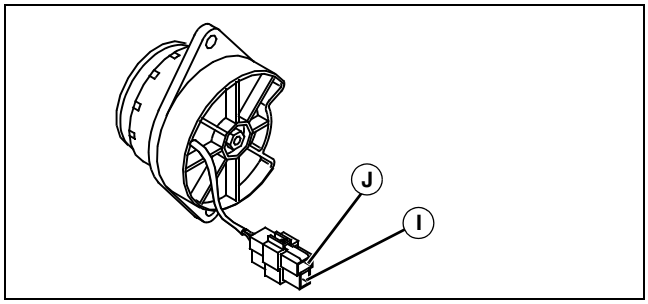
Yes - Go to step (8).

No - Check wires 130, 125, 120, and 115 blk. Check splice (W2), wire 150 blk, main ground (W1), and connections.

(8) Is there 11.8-13.2 VDC measured at wire 720 pur (H) of the traction/start relay?

Yes - Go to step (9).

No - Test the traction/start relay. (See “Relay Test” on page 167.)



(9) Is there 11.8-13.2 VDC measured at wire 720 pur (I) of the traction clutch?

Yes - Go to step (10).

No - Check wire 720 pur and connections.

(10) Is there less than 0.1 ohm of resistance between wire 155 blk (J) of the traction clutch and ground?

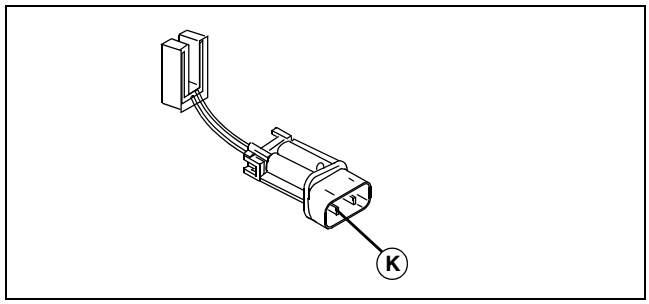
Yes - Test complete.

No - Replace the traction clutch. (See “Traction Clutch Removal and Installation” on page 175.)

Test Conditions:

- Key switch in RUN position
- Park brake in LOCKED position
- Travel lever in the ENGAGED position

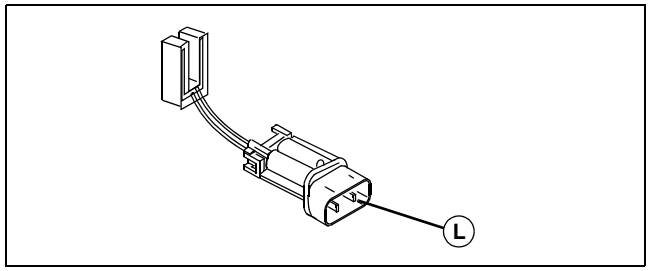
System: Park Brake Alarm



(1) Is there 11.8-13.2 VDC measured at wire 510 yel (K) of the park brake switch?

Yes - Go to step (3).

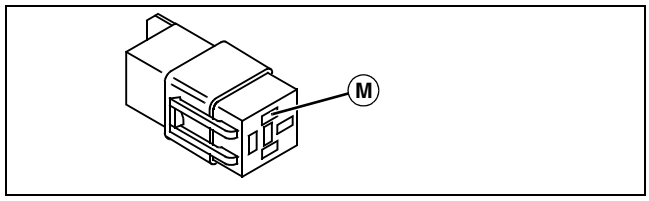
No - Check wire 510 yel and connections.



(2) Is there 11.8-13.2 VDC measured at wire 710 pur/blk (L) of the park brake switch?

Yes - Go to step (3).

No - Test the park brake switch. (See “Park Brake Switch Test” on page 171.)

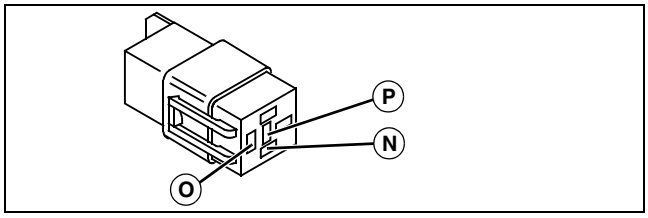


(3) Is there 11.8-13.2 VDC measured at wire 710 pur/blk (M) of the buzzer relay?

Yes - Go to step (6).

No - Check wire 710 pur/blk and connections.

System: Park Brake Alarm



(4) Is there less than 0.1 ohm of resistance between wire 125 blk (N) of the buzzer relay and ground?

Yes - Go to step (6).

No - Check wires 125, 120, and 115 blk. Check splice (W2), wire 150 blk, main ground (W1), and connections.

(5) Is there 11.8-13.2 VDC measured at wire 730 pur/blk (O) of the buzzer relay?

Yes - Go to step (6).

No - Check wire 730 pur/blk and connections.

(6) For S.N. (-060000): Is there 11.8-13.2 VDC measured at wire 780 blu (P) of the buzzer relay?

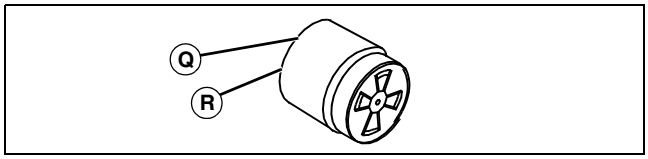
Yes - Go to step (8).

No - Test the buzzer relay. (See “Relay Test” on page 167.)

(7) For S.N. (060001-): Is there 11.8-13.2 VDC measured at wire 780 pnk (P) of the buzzer relay?

Yes - Go to step (10).

No - Test the buzzer relay. (See “Relay Test” on page 167.)



(8) For S.N. (-060000): Is there 11.8-13.2 VDC measured at wire 780 blu (Q) of the buzzer?

Yes - Go to step (9).

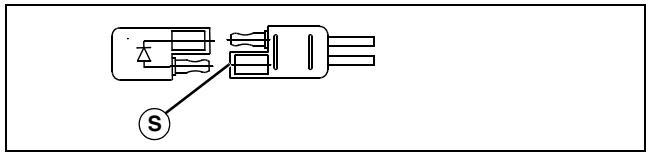
No - Check wire 780 blu and connections.

(9) For S.N. (-060000): Is there less than 0.1 ohm of resistance between wire 145 blk (R) of the buzzer and ground?

Yes - Replace buzzer.

No - Check wires 145, 112, 140, 135, 130, 125, 120, and 115 blk. Check splice (W2), wire 150 blk, main ground (W1), and connections.

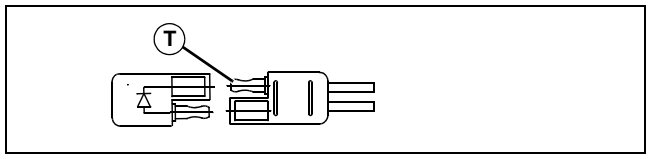
System: Park Brake Alarm



(10) For S.N. (060001-) - Is there 11.8-13.2 VDC measured at wire 780 pnk (S) of the traction clutch diode?

Yes - Go to step (11).

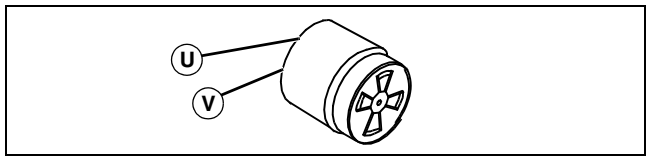
No - Check wire 765 pur and connections.



(11) For S.N. (060001-): Is there 11.8-13.2 VDC measured at wire 781 pnk (T) of the traction clutch diode?

Yes - Go to step (11).

No - Test the traction clutch diode. (See “Diode Test” on page 161.)



(12) For S.N. (060001-): Is there 11.8-13.2 VDC measured at wire 785 pnk (U) of the buzzer?

Yes - Go to step (9).

No - Check wire 785 pnk, splice (W7), wire 781 pnk, and connections.

(13) For S.N. (060001-): Is there less than 0.1 ohm of resistance between wire 145 blk (V) of the buzzer and ground?

Yes - Replace buzzer.

No - Check wires 145, 112, 140, 135, 130, 125, 120, 115 blk. Check splice (W2), wire 150 blk, main ground (W1), and connections.

Throttle Back Solenoid Circuit S.N. (-060000)

Function

To reduce engine rpm as the aerating head is raised or lowered.

Operating Conditions

- Engine running
- Throttle back switch in ON position
- Coring head moving up or down

Theory of Operation

Throttle back solenoid (Y4) modifies engine rpm as the coring head is raised or lowered to maintain optimum hole quality in certain soil conditions. The solenoid may be adjusted or shut off with a toggle switch if desired for certain applications.

Engine rpm returns to normal when the coring head is completely up or down.

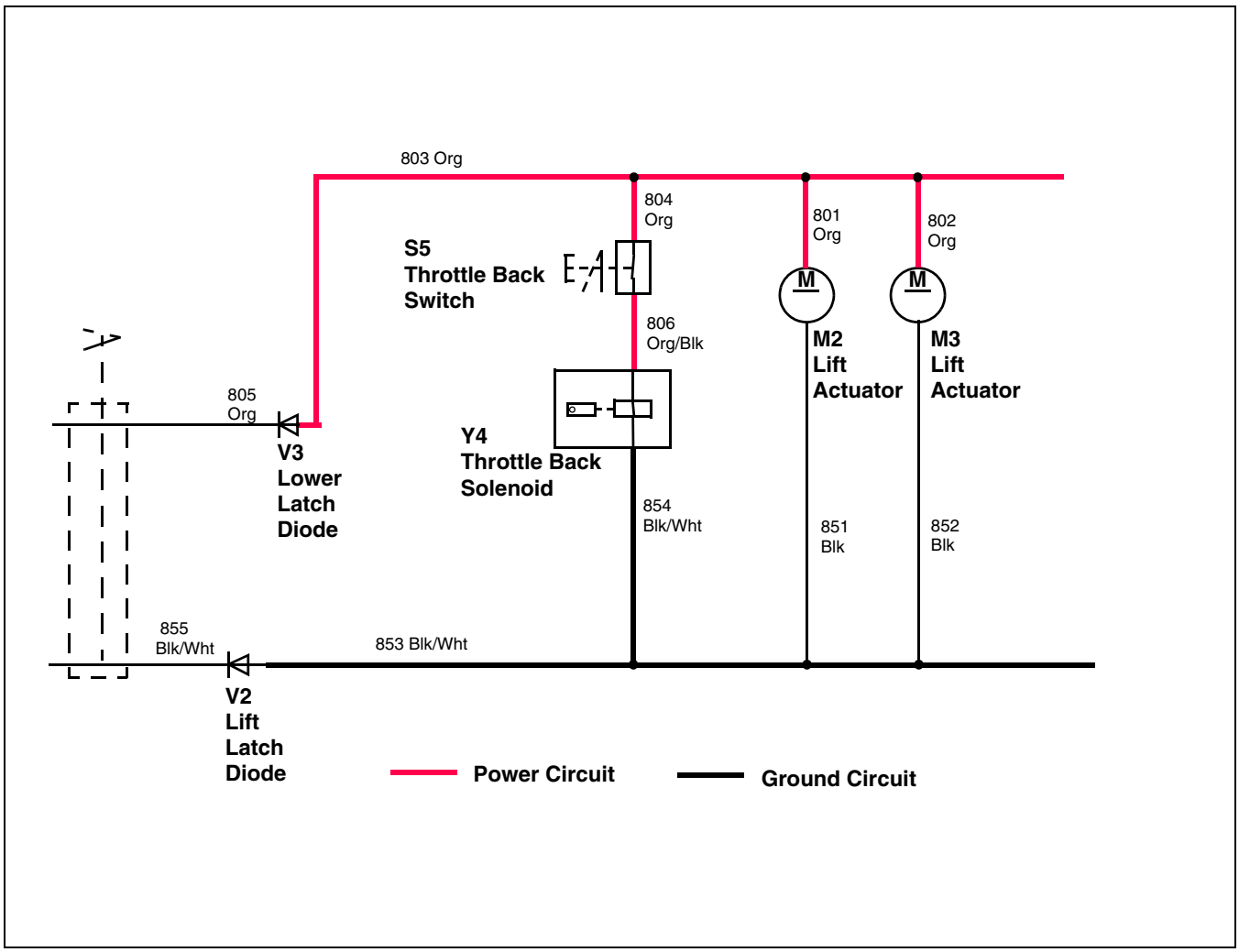
Soft turf conditions, such as after irrigating, require slower engine rpm. Hard turf conditions may require increased engine rpm to prevent engine overload.

The throttle back solenoid is set for 2500 rpm and may be adjusted if conditions cause hole elongation as the coring head is raised or lowered.

The throttle back solenoid (Y4) is controlled by the throttle back switch (S5). When the switch is in the ON (up) position the solenoid will activate and reduce engine rpm whenever the coring head is raised or lowered.

When the throttle back switch (S5) is in the OFF (down) position, the throttle back solenoid (Y4) has no effect on engine rpm.

Throttle Back Solenoid Circuit Schematic S.N. (-060000)

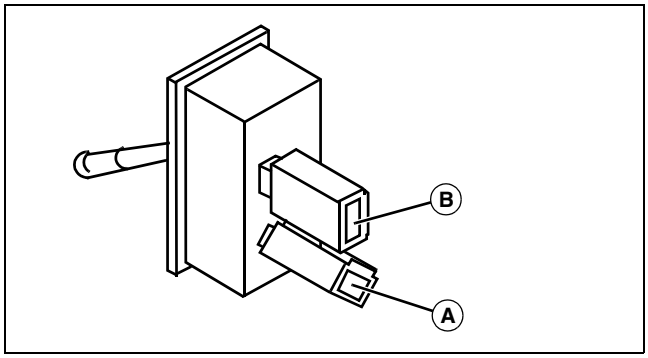


Throttle Back Solenoid Circuit Diagnosis S.N. (-060000)

Test Conditions:

- Engine running
- Coring head moving UP or DOWN
- Throttle back switch ON

System: Throttle Back Solenoid



(1) Does throttle back switch wire 804 org (A) have battery voltage when head is moving up? Ground when head is moving down?

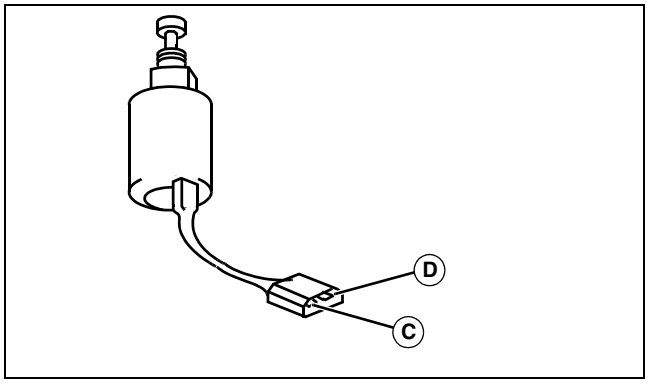
Yes - Go to step (2).

No - Repair/replace wire harness.

(2) Does throttle back switch wire 806 org/blk (B) have battery voltage when head is moving up? Ground when head is moving down?

Yes - Go to step (3).

No - Test/replace switch.



(3) Does throttle back solenoid wire 854 blk/wht (C) have battery voltage when head is moving up? Ground when head is moving down?

Yes - Go to step (4).

No - Repair/replace wire harness.

System: Throttle Back Solenoid

(4) Does throttle back solenoid wire 854 blk/wht (D) have battery voltage when head is moving down? Ground when head is moving up?

Yes - Test complete.

No - Repair/replace wire harness. If ground and voltages are OK, replace throttle back solenoid.

Throttle Back Solenoid Circuit S.N. (060001-)

Function

To adjust engine rpm as the coring head is raised or lowered.

Operating Conditions

- Throttle Back Switch (S5) in the ON position
- Engine running
- Coring head moving up or down

Theory of Operation

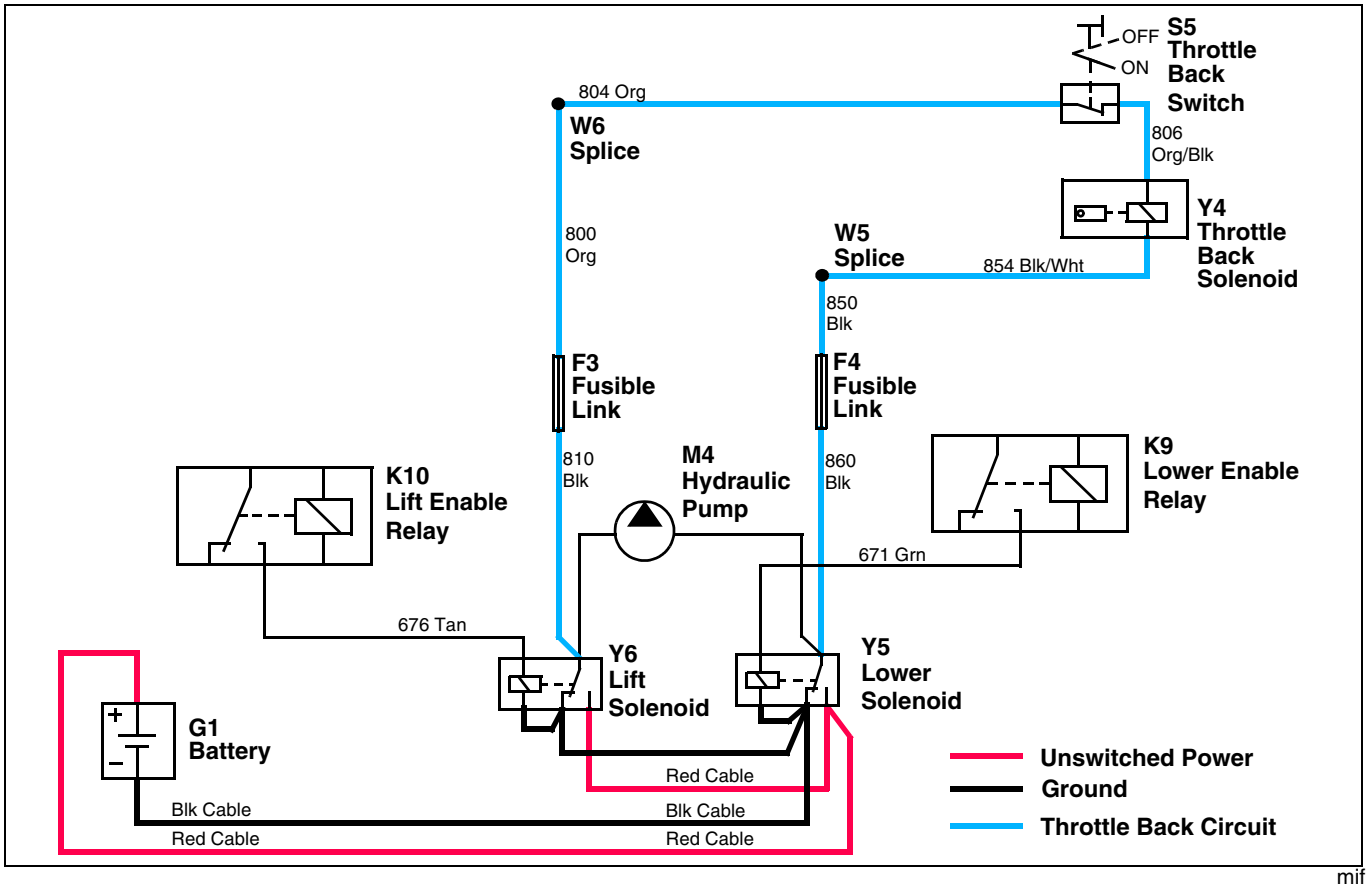
When the coring head is raised or lowered and throttle back switch in the ON position, throttle back solenoid (Y4) adjusts engine rpm to maintain optimum hole quality in certain soil conditions. The throttle back solenoid is set for 2500 rpm and may be adjusted if necessary. For soft turf conditions, such as after irrigating, the throttle back solenoid may be adjusted to reduce engine rpm. Hard turf conditions may require adjusting the throttle back solenoid to increase engine rpm, preventing engine overload.

Unswitched power from Battery (G1) is available at lift solenoid (Y6) and lower solenoid (Y5).

When the coring head is raised, lower solenoid (Y5) is de-energized and lift solenoid (Y6) is energized. This allows unswitched current to flow across fusible link (F3) (wire 810 blk) to throttle back switch (S5) (wire 800 org and wire 804 org). With the throttle back switch in the ON position, current flows to throttle back solenoid (Y4) (wire 806 org/blk). With lower solenoid (Y5) de-energized, a ground path (wire 860 blk and wire 854 blk/wht) is provided to the throttle back solenoid. The throttle back solenoid energizes, adjusting engine rpm.

When the coring head is lowered, the lift solenoid is de-energized and the lower solenoid is energized. This allows unswitched current to flow across fusible link (F4) (wire 860 blk) to the throttle back solenoid (wire 850 blk and wire 854 blk/wht). With the throttle back switch in the ON position and the lift solenoid
de-energized, a ground path (wire 806 org/blk, wire 804 org, wire 800 org and wire 810 blk) is provided to the throttle back solenoid. The throttle back solenoid energizes, adjusting engine rpm.

Throttle Back Circuit Schematic S.N. (060001-)



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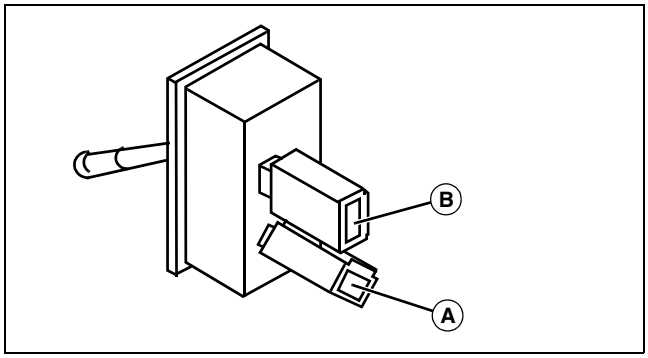
Throttle Back Solenoid Circuit Diagnosis S.N. (060001-)

Test Conditions:

- Engine running
- Coring head moving UP
- Throttle back switch in ON position

System: Throttle Back Solenoid



(1) Is there 11.8-13.2 VDC measured at wire 804 org (A) of the throttle back switch?

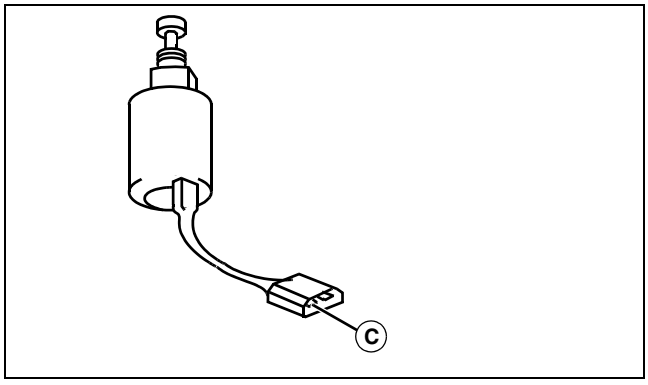
Yes - Go to step (2).

No - Check wire 804 org, splice (W6), wire 800 org, fusible link (F3), wire 810 blk, and connections.

(2) Is there 11.8-13.2 VDC measured at wire 806 org/blk (B) of the throttle back switch?

Yes - Go to step (3).

No - Replace the throttle back switch.

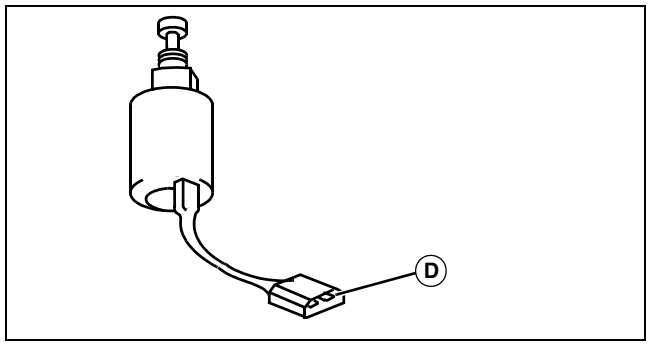


(3) Is there 11.8-13.2 VDC measured at wire 806 org/blk (C) of the throttle back solenoid?

Yes - Go to step (4).

No - Check wire 806 org/blk and connections.

System: Throttle Back Solenoid



(4) Is there less than 0.1 ohm of resistance measured between wire 854 blk/wht (D) of the throttle back solenoid and ground?

Yes - Replace the throttle back solenoid.

No - Check wire 854 blk/wht, splice (W5), wire 850 blk, fusible link (F4), wire 860 blk, and connections.

Tests and Adjustments

Ground Circuit Tests

Reason

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

Equipment

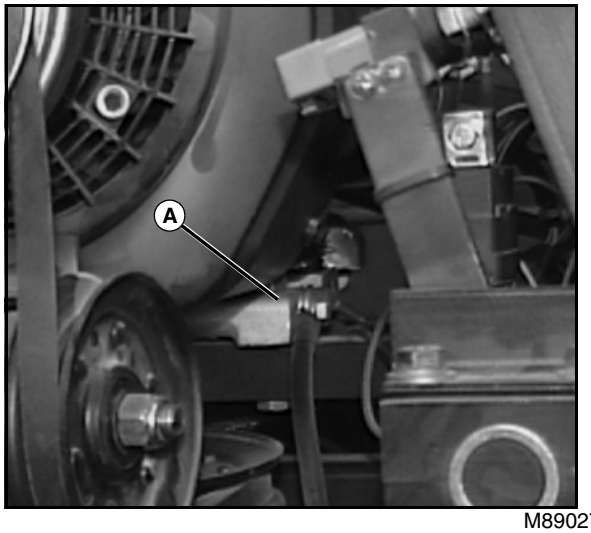
- Ohmmeter or voltmeter

Procedure

Ohmmeter Method

1. Turn key switch to OFF position. Lock park brake.

2. Connect ohmmeter negative (black) lead to negative (-) terminal of battery. Put meter positive (red) lead on negative (-) terminal of battery and record reading.



M89027

3. Put meter red lead on ground terminal (A) of circuit or component to be tested that is closest to the battery negative (-) terminal. Resistance reading must be very close to or the same as the battery negative terminal reading. Work backwards from the battery on the ground side of the problem circuit until the resistance reading increases above 0.1 ohm. 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 ohm. Check both sides of connectors closely as disconnecting and connecting may temporarily solve problem.

Voltmeter Method

1. Put transmission in neutral. Lock park brake. Put traction clutch lever in OFF position. Turn key switch to ON position.

2. Connect voltmeter negative (black) lead to negative (-) terminal of battery.

3. Put meter positive (red) lead on ground terminal of component to be tested. Be sure the component circuit is activated (key on, switches closed) so voltage will be present at the component. Record voltage. Voltage must be greater than 0 but less than 1 volt. Some components will have a very small voltage reading on the ground side and still be operating correctly.

Results

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

Diode Test

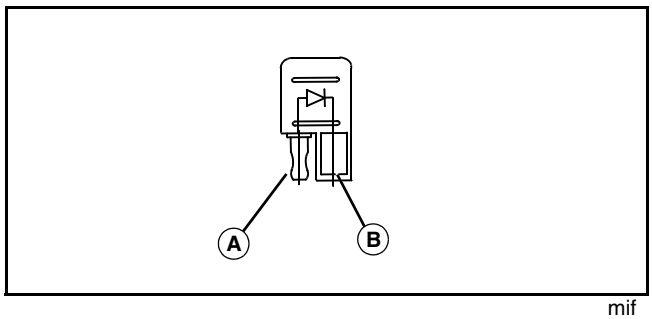
Reason

To verify that diode has proper continuity.

Equipment

- Ohmmeter or continuity tester

Procedure



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1. Remove diode from connector.

2. Connect ohmmeter red (+) lead to terminal (A) of diode. Connect ohmmeter black (-) lead to terminal (B) of diode. Check for continuity.

3. Reverse test leads. Check for continuity.

Results

- Diode must have continuity in one direction only. Replace defective diode.

Battery Test

Reason

To check condition of battery and determine battery voltage.

Special or Required Tools

Hydrometer	NA	Used to check specific gravity.
Voltmeter	NA	Used to check battery voltage.
Battery Tester	JT05685	Used to check battery voltage.

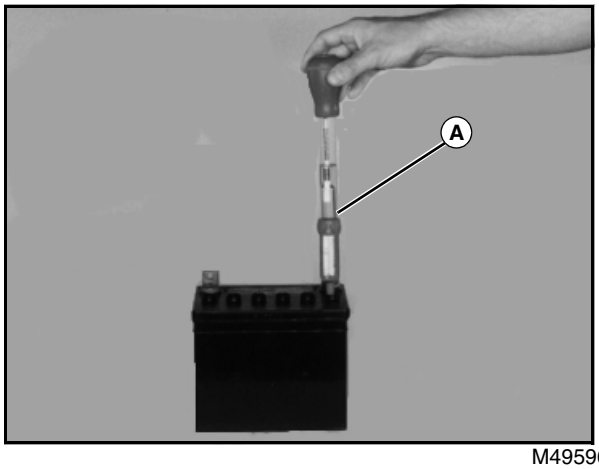
Procedure

1. Clean battery terminals and top of battery.

2. Inspect battery terminals and case for breakage or cracks.

3. Check electrolyte level in each battery cell. Add clean, soft water as needed. If water was added, charge battery for 20 minutes at 10 amps.

4. Remove surface charge by placing a small load on the battery for 15 seconds.



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5. Check specific gravity of each cell with a hydrometer (A).

6. Check battery voltage with voltmeter or JT05685 Battery Tester.

Specifications

Minimum Specific Gravity 1.265
Minimum Battery Voltage. . . . . .12.4 VDC

Results

- Battery voltage less than 12.4 VDC, charge battery.
- Battery voltage more than 12.4 VDC, test specific gravity.
- All cells less than 1.175, charge battery at 10-amp rate.
- All cells less than 1.265 with less than 50-point variation, charge battery at 10-amp rate.
- All cells more than 1.265 with less than 50-point variation, load test battery.
- More than 50-point variation: replace battery.

Charge Battery

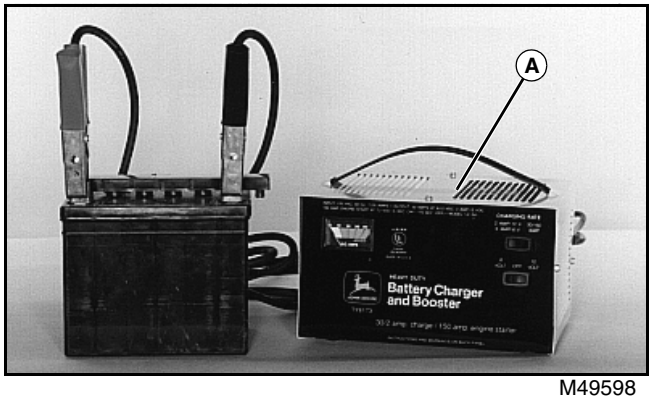
Reason

To increase battery charge after battery has been discharged.

Special or Required Tools

Battery Charger (Variable Rate)	NA	Used to charge battery.

Procedure A



M49598

1. Connect variable rate charger (A) to battery. Maximum charge time at boost setting is 10 minutes. Allow additional 5 minutes for each 10° below 21°C (70°F). Test battery before charging.

2. Start charger at slow rate. Increase charge rate one setting at a time. Check charger ammeter after 1 minute at each setting. Maintain 10-amp charge rate. Use boost setting as necessary.

3. Check if battery is accepting a 10-amp charge after 10 minutes at boost setting.

Results

- Battery will not accept 10-amp charge after 10 minutes at boost setting, replace battery.
- Battery is accepting 10-amp charge after 10 minutes at boost setting, and battery did not need water, go to Procedure C.
- 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 Procedure B.

Procedure B

1. Set charger at 15-25 amps.

IMPORTANT: Avoid damage! Decrease charge rate if battery gases or bubbles excessively or becomes too warm to touch. If battery was discharged at slow or unknown rate, charge at 10-15 amps for 6-12 hours. (Maintenance-free battery: 12-24 hours.) If battery was discharged at fast rate, charge at 20-25 amps for 2-4 hours. (Maintenance-free battery: 4-8 hours.)

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

Results

- More than 50-point variation between cells, replace battery.
- Less than 50-point variation between cells, Go to Procedure C.

Procedure C

1. Continue charging battery until specific gravity is 1.230-1.265 points.
2. Load test battery.

Battery Load Test

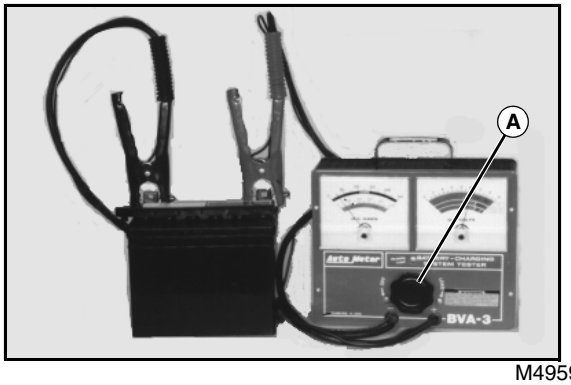
Reason

To check condition of battery under load.

Special or Required Tools

Hydrometer	NA	Used to check specific gravity.
Voltmeter	NA	Used to check battery voltage.
Battery Tester	JT05685	Used to check battery voltage.

Connections



M49597

1. Turn load knob (A) of tester counterclockwise to off.
2. Connect tester positive cable to battery positive (+) terminal.
3. Connect tester negative cable to battery negative (-) terminal.

Procedure

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

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

- or -

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

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

Results

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

Regulated Voltage Output Test

Reason

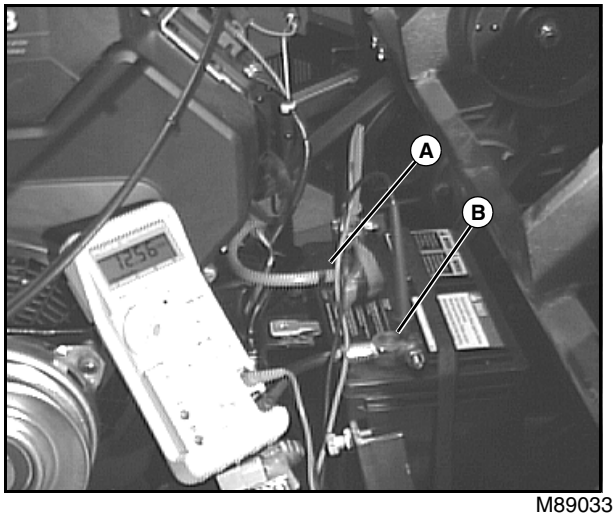
To determine regulated voltage output of the voltage regulator/rectifier.

Special or Required Tools

Digital Multimeter	JT05791	Used to check regulator voltage.

Connections

1. Set voltmeter to DC volts.
2. Remove surface charge from battery by cranking engine for 15 seconds.



M89033

3. Connect meter red lead (A) to positive (+) battery terminal.
4. Connect meter black lead (B) to negative (-) battery terminal.

Procedure

1. Start and run engine at high idle (2750 rpm).
2. Read meter several times during 5 minutes of running time.

Specifications

Regulated Voltage at High Idle . . . . . .12.2-14.7 VDC

Results

- If the DC voltage stays below the minimum specification or does not increase, test unregulated voltage output. See “Unregulated Voltage Output Test” on page 164.
- If the DC voltage goes above the maximum specification, replace the regulator.

Unregulated Voltage Output Test

Reason

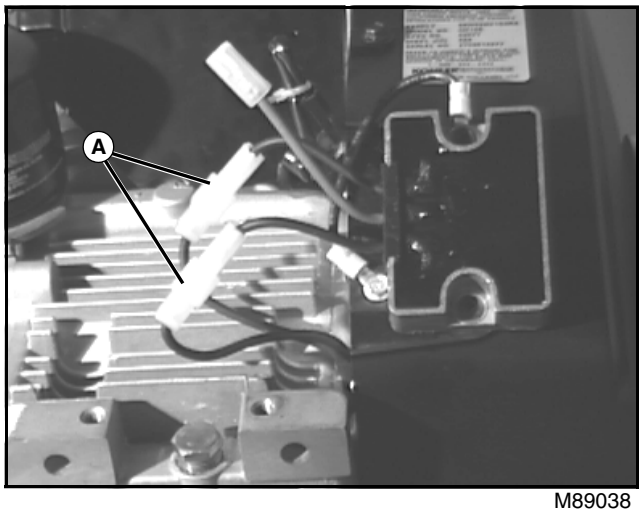
To measure stator voltage output to determine stator condition.

Special or Required Tools

Digital Multimeter	JT05791	Used to check regulator voltage.

Connections

1. Set voltmeter to AC volts.



M89038

2. Disconnect voltage regulator/rectifier connectors (A) (Black wires).
3. Set voltmeter to AC voltage.
4. Connect meter across black wires from stator.

Procedure

1. Start and run engine to specifications.
2. Measure stator voltage.

Specifications

Engine Speed . . . . . .3300 rpm
Stator Voltage (minimum) . . . . . .28 VAC

Results

- If reading is less than specifications, test flywheel magnet and then replace the stator.
- If stator voltage is OK, check charging circuit wires, then replace voltage regulator/rectifier.

Stator Test

Reason

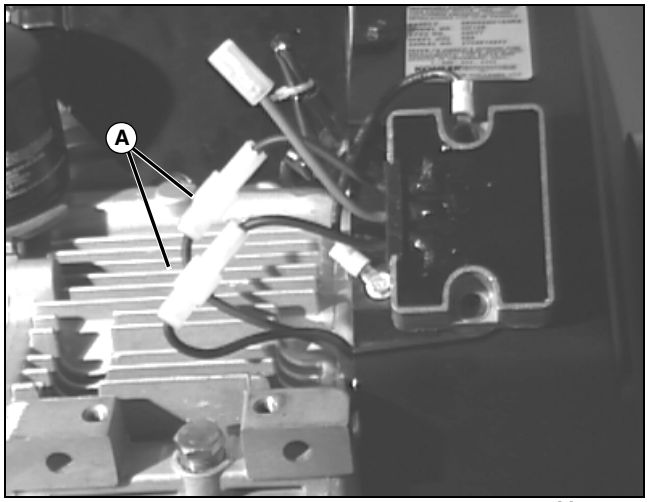
To check the stator for shorted windings or open circuits.

Special or Required Tools

Digital Multimeter	JT05791	Used to check continuity between stator windings

Procedure

1. Park machine safely with park brake locked.
2. Place key switch in OFF position (engine not running).



M89038

3. Disconnect stator connectors (A) at voltage regulator.
4. Insert a test lead into each connector at stator end and measure resistance.

Results

- If the resistance is 0.064-0.20 ohms, the stator is OK.
- If the stator is zero ohms, the stator is shorted. Replace stator.
- If the stator is infinity ohms, the stator is open. Replace stator.

Starting Motor Solenoid Test

Reason

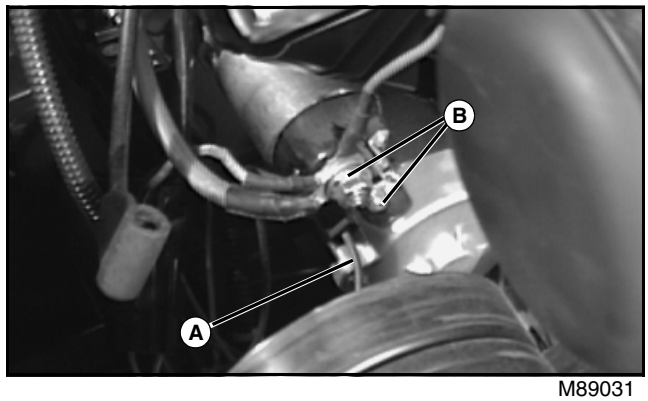
To determine if starting motor solenoid or starting motor is defective.

Special or Required Tools

Jumper Wire	NA	Used to test starting motor solenoid.

Connections

1. Put transaxle in neutral. Move key switch to OFF position.
2. Lock park brake.
3. Disconnect and ground spark plug lead.



M89031

4. Disconnect purple wire (A) from starting motor solenoid terminal.

Procedure A

1. Connect jumper wire to positive battery terminal and briefly jump to terminal that the purple wire was connected to. All solenoid terminals should be clean and free of corrosion.

Results

- If starting motor runs, solenoid is good; check circuit wiring.
- If starting motor does not run, go to Procedure B.

Procedure B

1. Connect jumper wire between starting motor solenoid large terminals (B) briefly.

Results

- If starting motor runs, replace solenoid
- If starting motor does not run, check battery cables and then replace starting motor.

Starting Motor Amperage Draw Test

Reason

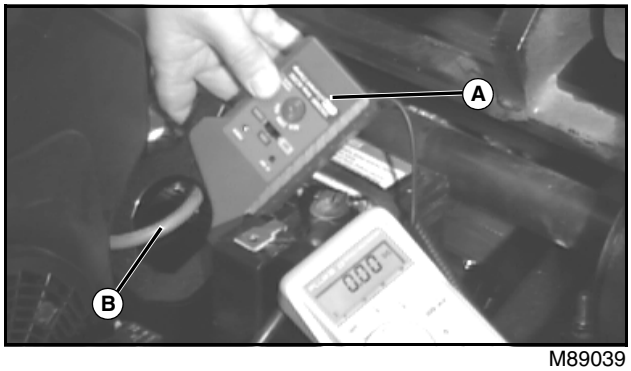
To determine the amperage required to crank the engine and check starting motor operation under load.

Special or Required Tools

Digital Multimeter	JT05791	Used with the current clamp to check the current draw of the starting motor.
Current Clamp	JT02153	Used to check the current draw of the starting motor.

Connections

1. Put transaxle in neutral.
2. Lock park brake.
3. Test system ground connections and battery.



M89039

4. Connect current clamp (A) around battery positive (+) cable (B).
5. Connect voltmeter to current clamp; set to DC amp.
6. Remove spark plug high-tension leads and ground to engine.

Procedure

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

1. Crank engine and read amperage on DC amp scale of voltmeter.
2. Turn key switch to OFF position.

Specifications

Maximum Starting Motor Amp Draw. . .180 amps at 225 rpm

Results

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

Lower, Lift, and Raise-on-Stop Relay Test S.N. (-060000)

Reason

To check relay terminal continuity in the energized and de-energized condition.

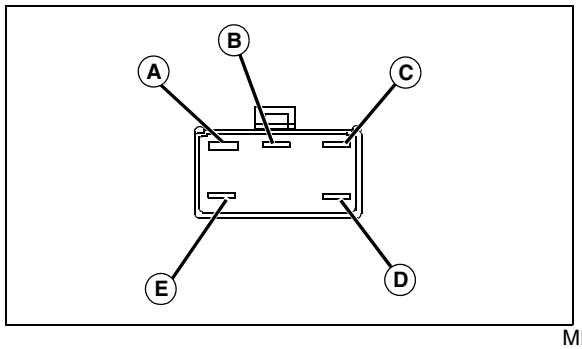
Special or Required Tools

Digital Multimeter	JT05791	Used to check relay continuity.
Jumper Wire	NA	Used to test relay.

Procedure

1. Park machine on level surface.
2. Lock park brake.
3. Turn key switch OFF.
4. Disconnect relay connector.
5. Check terminal continuity using an ohmmeter or continuity tester.

Results



MIF

1. There should be continuity between terminals (B) and (D).
2. There should be continuity between terminals (C) and (E).
3. There should not be continuity between any other terminals.

Procedure

1. Connect a jumper wire from battery positive (+) terminal to relay terminal (C). Connect a jumper wire from relay terminal (E) to ground (-).

Results

- There should be continuity between terminals (A) and (D).
- If continuity is not correct, replace relay.

Relay Test

Reason

To check relay terminal continuity in the energized and de-energized condition.

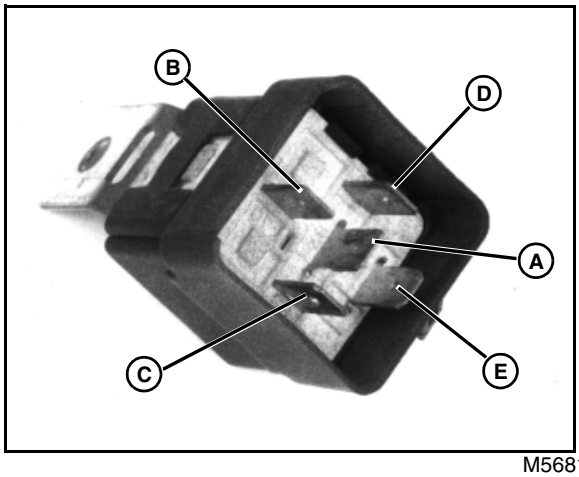
Special or Required Tools

Digital Multimeter	JT05791	Used to check relay continuity.

Procedure

1. Park machine on level surface.
2. Lock park brake.
3. Turn key switch OFF.
4. Disconnect relay connector.
5. Check terminal continuity using an ohmmeter or continuity tester.

Results



M56817

- There should be continuity between terminals (A) and (B), and between terminals (C) and (D).
- There should not be continuity between terminals (E) and (B).

Procedure

1. Connect a jumper wire from battery positive (+) terminal to relay terminal (C). Connect a jumper wire from relay terminal (D) and ground (-).

Results

- There should be continuity between terminals (E) and (B).
- If continuity is not correct, replace relay.

Ignition Spark Test

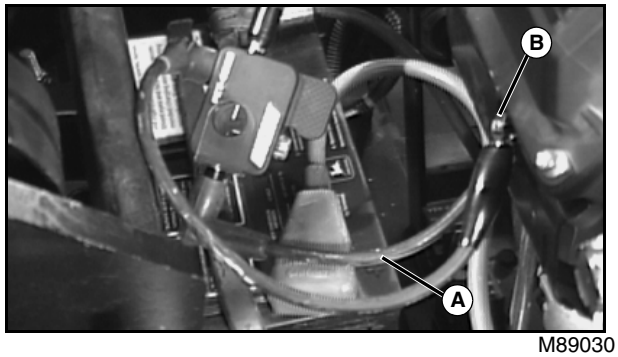
Reason

To determine condition of ignition system.

Special or Required Tools

Spark Tester	D-05351	Used to check for spark.

Connections



M89030

1. Remove ignition module high-tension lead (A) from one spark plug.
2. Connect spark tester lead to spark plug (B).
3. Disconnect and ground other spark plug lead.
4. Connect high-tension lead to tester.

IMPORTANT: Avoid damage! DO NOT adjust spark tester gap beyond 5.0 mm (0.200 in.) as damage to ignition system could occur.

5. Adjust spark tester gap to 4.2 mm (0.166 in.) with gap adjuster.

Procedure

1. Crank or start engine. Watch spark at tester gap.

Results

- If steady, strong, blue spark, ignition is good. If engine will not start, check fuel supply and engine compression.
- If spark is weak, or no spark, install a new spark plug.
- If spark is still weak or still no spark, see “Ignition Module Air Gap Adjustment” on page 168 and/or “Ignition Module Test” on page 168.
- Repeat for remaining spark plug.

Specifications

Spark Plug Gap. . . . . 0.76 mm (0.030 in.)
Spark Plug Torque . . . . . 24.4-29.8 N•m (18-22 lb-ft)

Ignition Module Air Gap Adjustment

Reason

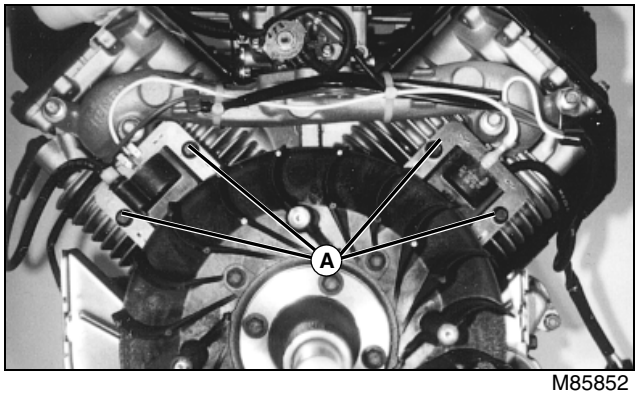
To adjust the air gap between the ignition module and the flywheel to a specific dimension needed for proper ignition timing.

Special or Required Tools

Feeler Gauge	NA	Used to measure gap between ignition module and flywheel.

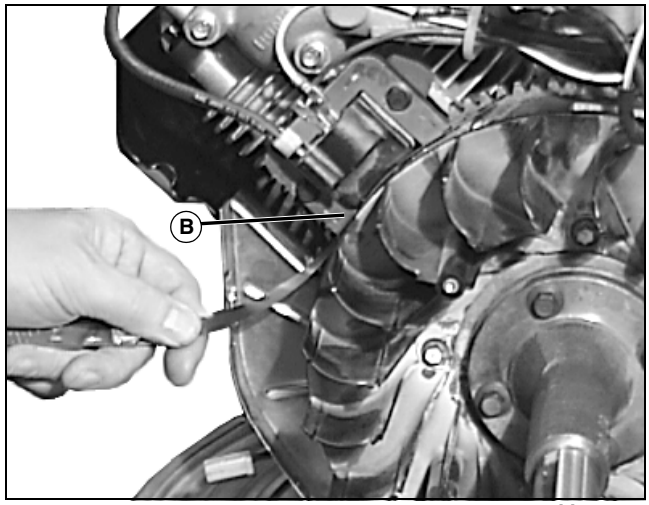
Procedure

1. Remove engine from machine.
2. Remove blower housing.
3. Turn flywheel magnet away from ignition module.



M85852

4. Loosen ignition module mounting screws (A) and hold module as far back as possible.
5. Turn flywheel magnet so it is centered on ignition module.



M89036

6. Insert 0.20-0.30 mm (0.008-0.012 in.) feeler gauge (B) between flywheel magnet and all three ignition module poles. Allow module to draw against feeler gauge (A) and flywheel magnet.
7. Hold module coil in this position and tighten mounting screws to specification.
8. Turn flywheel to remove feeler gauge.
9. Repeat for remaining ignition module.
10. Install blower housing.

Specifications

Ignition Module
Air Gap . . . . . 0.28-0.33 mm (0.011-0.013 in.)
Ignition Module
Cap Screw Torque . . . . . 4.0 N•m (35 lb-in.)

Ignition Module Test

Reason

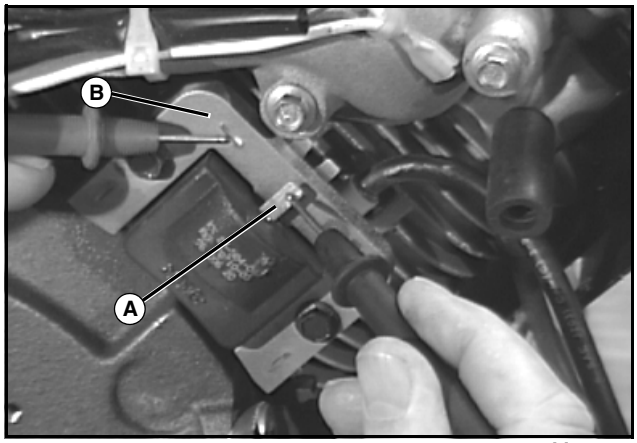
To determine condition of ignition module windings.

Special or Required Tools

Digital Multimeter	JT05791	Used to measure resistance of ignition module.

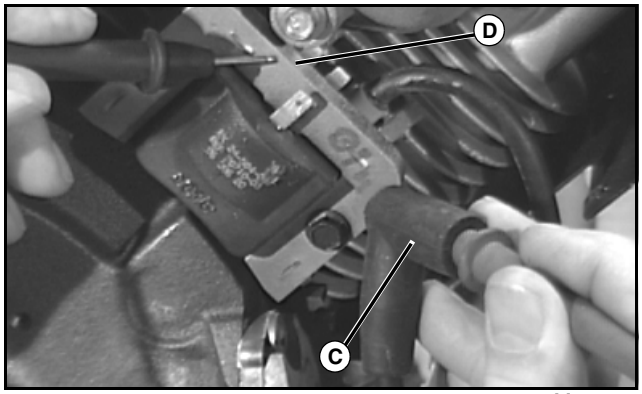
Procedure

1. Put transaxle in neutral. Turn key switch to the OFF position.
2. Remove spark plug caps from spark plug wires.
3. Disconnect primary lead white wires.



M89037

4. Measure resistance between primary lead (A) and core (B). Reverse meter leads and check resistance again.



M89054

5. Measure resistance between spark plug lead (C) and core (D).

6. Reinstall first plug and repeat procedure for second spark plug.

Results

- If resistance does not meet specifications, replace the ignition module.

Specifications - Primary Lead and Core Resistance

One Direction . . . . . .5-1000 ohms
Other Direction (minimum) . . . . . 30 K ohms
Spark Plug Lead and Core Resistance
. . . . . .7.9-10.85 K ohms

Lift and Lower Switch Test

Reason

To determine proper operation of the switch used in the lift and lower activation.

Special or Required Tools

Digital Multimeter	JT05791	Used to measure continuity of switch.

Test Connections

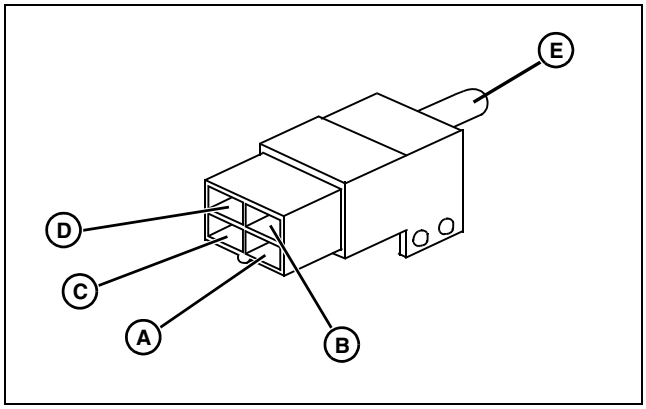
- Set ohmmeter for 1X scale.

NOTE: On analog (swing needle) ohmmeters, set zero point before each test.

Procedure

1. Park machine safely on level surface. (See “Park Machine Safely” on page 3.)

2. Remove connector from lift and lower switches.



MIF

3. Connect meter leads to pairs of switch posts and compare to specifications.

4. Press and release plunger (E) of switch.

Results

- If switch does not pass all tests, replace switch.

Specifications

Switch Plunger Not Depressed

. . . . . continuity between A and B
. . . . . no continuity between C and D

Switch plunger depressed

. . . . . no continuity between A and B
. . . . . continuity between C and D

Lift Limit Switch Test

Reason

To determine proper operation of the switch used in the lift limit circuit.

Special or Required Tools

Digital Multimeter	JT05791	Used to measure continuity of switch.

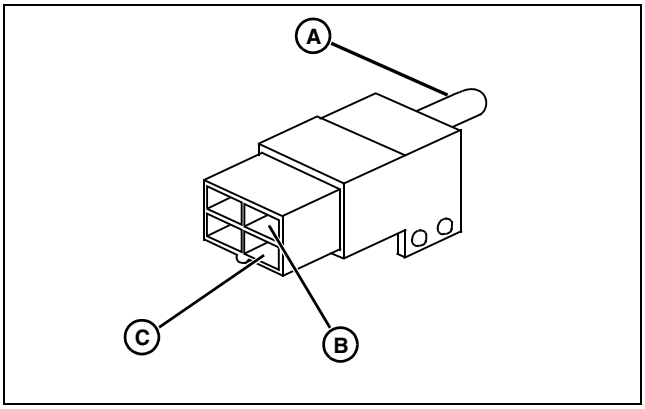
Test Connections

- Set ohmmeter for 1X scale.

NOTE: On analog (swing needle) ohmmeters, set zero point before each test.

Procedure

1. Park machine safely on level surface. (See “Park Machine Safely” on page 3.)
2. Remove connector from lift limit switch.



MIF

3. Connect meter leads to pairs of switch posts and compare to specifications.
4. Press and release plunger (A) of switch.

Results

- If switch does not pass all tests, replace switch.

Specifications

Switch Plunger Not Depressed

. . . . . continuity between B and C

Switch Plunger Depressed

. . . . . no continuity between B and C

Lift Limit Switch Adjustment

Reason

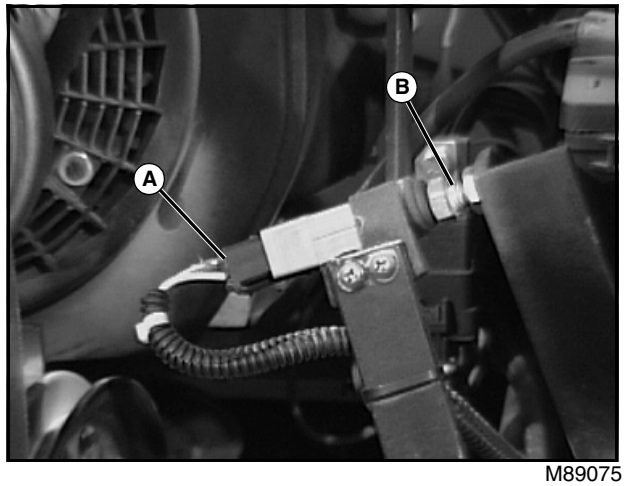
To ensure proper upper limit of travel of coring head.

Special or Required Tools

Digital Multimeter	JT05791	Used to measure continuity of switch.

Procedure

1. Raise coring head to upper limit of travel.



M89075

2. Disconnect lift limit switch cable connector (A).
3. Connect ohmmeter to switch contacts.
4. Loosen locknut on adjusting screw (B).
5. Adjust screw until meter indicates NO continuity (infinity ohms) and tighten locknut.
6. Reconnect cable and check for proper operation.

Park Brake Switch Test

Reason

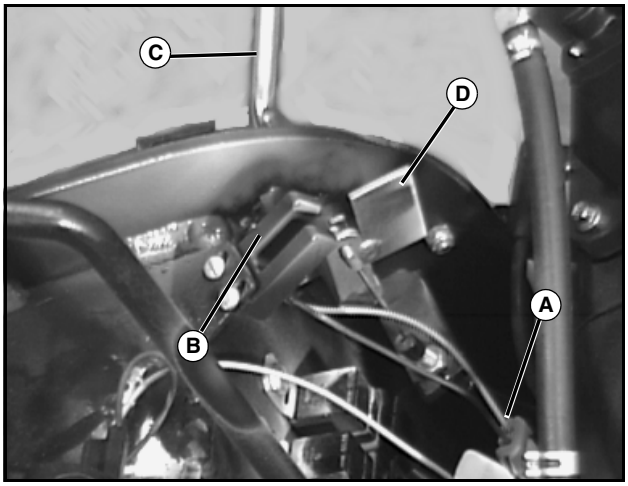
To make sure the park brake switch operates properly.

Special or Required Tools

Digital Multimeter	JT05791	Used to measure continuity of switch.

Procedure

1. Park machine on level surface and turn key switch to the OFF position.
2. Shift lever in neutral.



M89029

3. Disconnect harness connector (A) from park brake switch (B).
4. Move park brake lever (C) out of sensor.
5. Check continuity.
6. Move park brake lever into sensor.
7. Check continuity.

Results

- There should be continuity between terminals when flag (D) is out of sensor.
- There should not be continuity between terminals when flag is in sensor.
- If continuity is not correct, replace sensor.

Lower Limit Switch Test

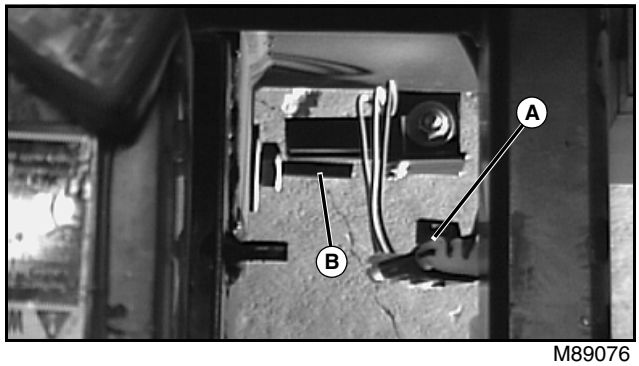
Reason

To verify the lower limit switch is functioning properly.

Special or Required Tools

Digital Multimeter	JT05791	Used to measure continuity of switch.

Procedure



M89076

1. Disconnect lower limit switch connector (A).
2. Check for continuity between black and white wires of lower limit sensor.
3. Insert a metal flag (B) (screwdriver) between sensor posts and check for continuity again.

NOTE: There is no adjustment for sensor.

Results

- Continuity with flag in.
- No continuity with flag out.
- If continuity is not correct, replace sensor.

Traction Clutch Switch Test

Reason

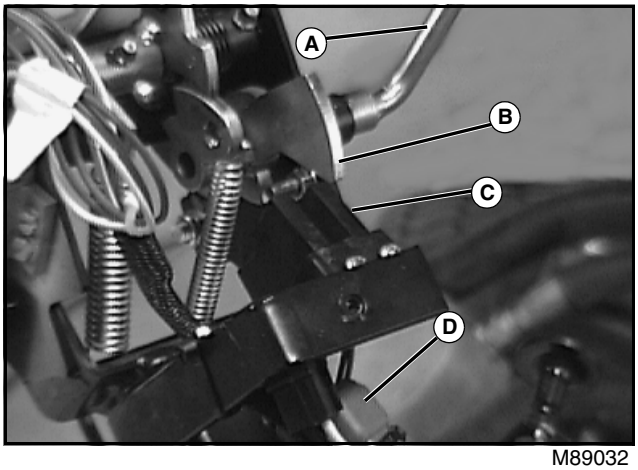
To ensure proper that engine starts only when traction clutch is not engaged.

Special or Required Tools

Digital Multimeter	JT05791	Used to measure continuity of sensor

Procedure

1. Park machine on level surface and turn the key switch to the OFF position.
2. Coring head must be fully raised.
3. Shift lever in neutral.
4. Lock park lever.



M89032

5. Turn the key switch to the START position:
   - Engine should not turn over or start when traction clutch lever (A) is toward operator [flag (B) is out of sensor (C)].
   - Engine should turn over and start when traction clutch lever is away from operator (flag is in sensor).
   - If operation is not correct, test sensor.
6. Disconnect harness connector (D) from traction clutch switch.
7. Check continuity.

Results

- There should be continuity between terminals, when flag is out of sensor.
- There should not be continuity between terminals, when flag is in sensor.
- If continuity is not correct, replace sensor.

Key Switch Test

Reason

To verify key switch functions are operating properly.

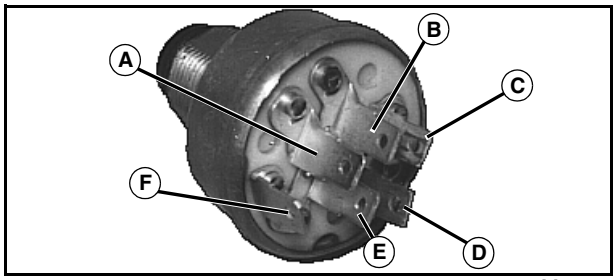
Special or Required Tools

Digital Multimeter	JT05791	Used to measure continuity of switch

Procedure

1. Park machine on level surface and turn the key switch to the OFF position.
2. Shift lever in neutral and park brake LOCKED.
3. Disconnect key switch connector.

NOTE: Key switch terminals are identified for test purposes only.



M49684

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

Key Switch Continuity Specifications

OFF . . . . . C and D
RUN . . . . . E and F
START . . . . . A and B, E and F

Results

- If any continuity is not correct, replace switch.

Automatic/Manual Switch Test

Reason

To make sure terminal continuity is correct in the ON and OFF positions.

Special or Required Tools

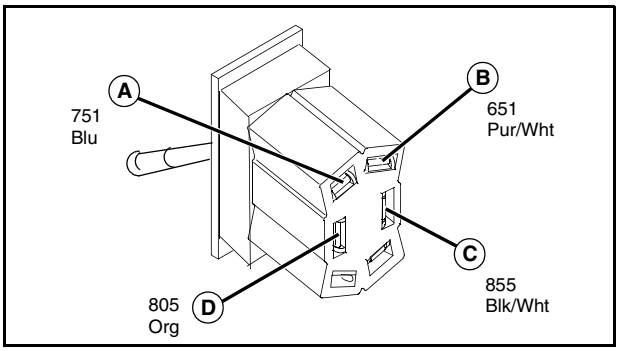
Digital Multimeter	JT05791	Used to measure continuity of switch.

Connections

1. Put transaxle in neutral.
2. Lock park brake.
3. Turn the key switch to the OFF position.
4. Disconnect automatic/manual switch from harness connector.

Procedure

1. Put switch in AUTOMATIC position.



mif

2. Check for continuity between terminals (A and D) and terminals (B and C).
3. Put switch in MANUAL position.
4. Check for continuity between terminals (A and D) and (B and C).

Automatic/Manual Switch Continuity Specifications

Automatic (continuity) . . . . . A and D, B and C
Manual (no continuity) . . . . . A and D, B and C

Results

- If continuity is not to specification, replace the Automatic/Manual switch.

Flywheel Magnets Test

Reason

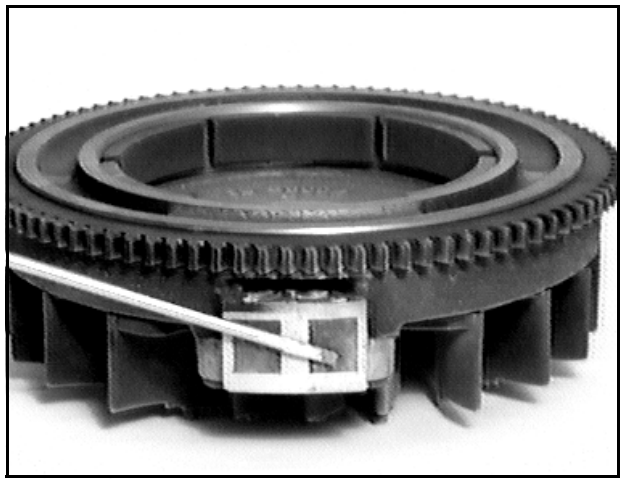
To make sure flywheel magnets have enough force to induce current in ignition coils and stator.

Special or Required Tools

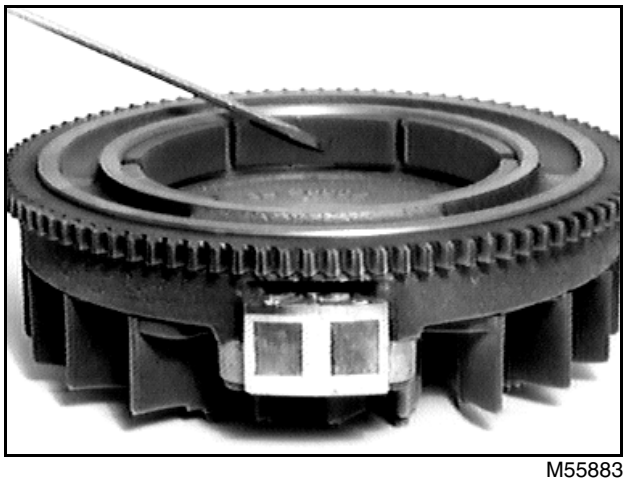
Screwdriver	NA	Used to check the condition of the flywheel magnet.

Procedure

1. Remove engine from machine. See “Engine Removal and Installation” on page 47.
2. Remove flywheel housing and flywheel from engine. See “Flywheel and Stator Removal and Installation” on page 54.



M55884



M55883

3. Place screwdriver about 25 mm (1 in.) from magnets.

Results

- If screwdriver is pulled into magnet, flywheel is good
- If screwdriver is not pulled into magnet, flywheel is bad and should be replaced

Fuel Shutoff Solenoid Test

Reason

To determine if fuel solenoid is functioning properly.

CAUTION: Avoid Injury! Gasoline is present in the carburetor and fuel line. Gasoline is extremely flammable and its vapors can explode if ignited. Keep sparks and other sources of ignition away from the engine.

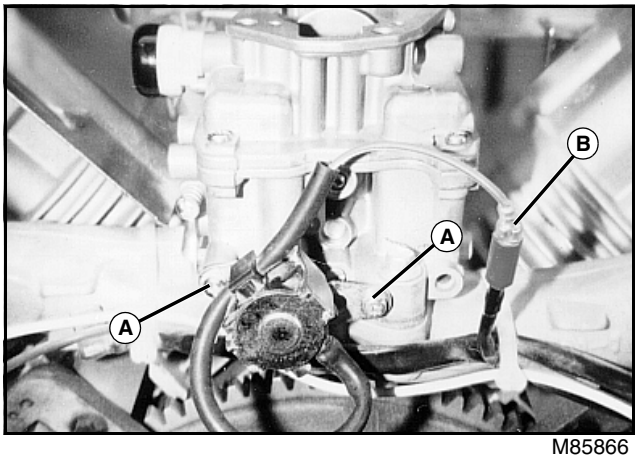
Special or Required Tools

Jumper Wire	NA	Used to provide power for the solenoid.

Procedure

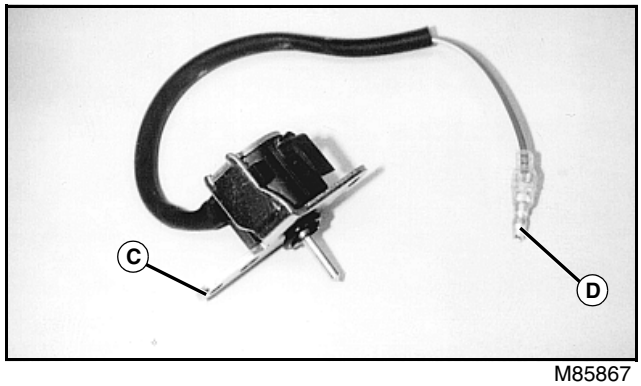
1. Shut fuel line shutoff valve.

NOTE: When solenoid is removed, gas will leak out of the carburetor. Use a rag to catch fuel already in the fuel line.
If blower housing is not removed, carburetor mounting bolts have to be loosened and the carburetor raised to remove solenoid.



M85866

2. Remove two solenoid mounting screws (A).
3. Disconnect solenoid lead (B).



M85867

4. Attach a wire between the solenoid bracket (C) and battery negative (-) terminal.
5. Touch the male terminal (D) of the solenoid lead to battery positive (+) terminal.

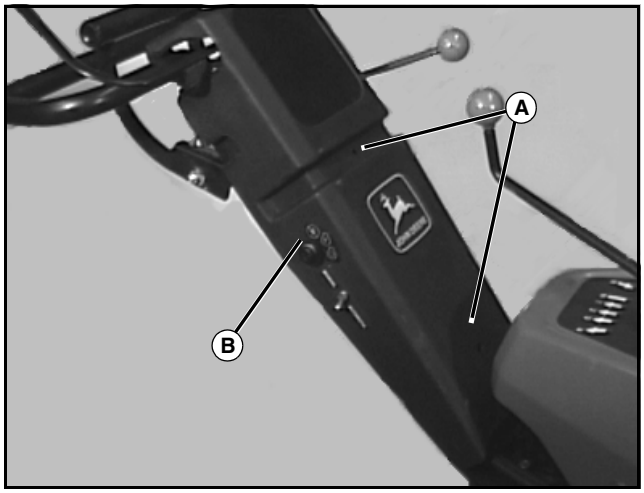
Results

- If pin retracts, the solenoid is good.
- If pin does not retract, replace the solenoid.

Repair

Key Switch or Automatic/Manual Switch Removal and Installation

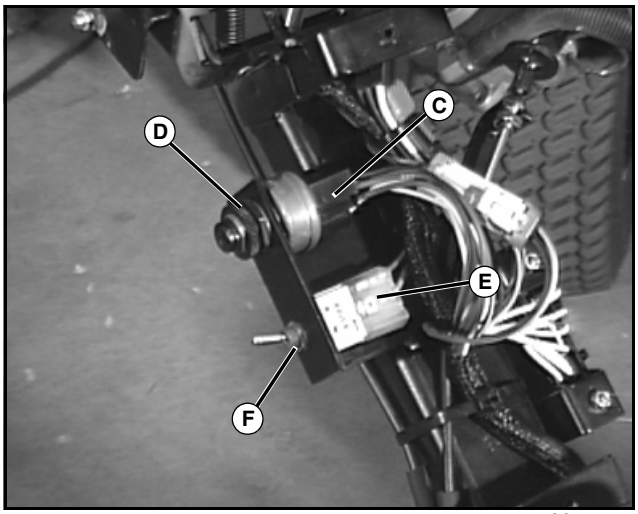
1. Disconnect negative (-) battery cable.



M89034

2. Remove two screws (A) and key switch retaining ring (B).

3. Remove cover.



M89028

4. Remove key switch connector (C) and retaining nut (D).

5. Remove automatic/manual switch connector (E) and retaining nut (F).

6. Replace auto/manual switch, retaining nut, and connector.

7. Replace key switch, retaining nut, and connector.

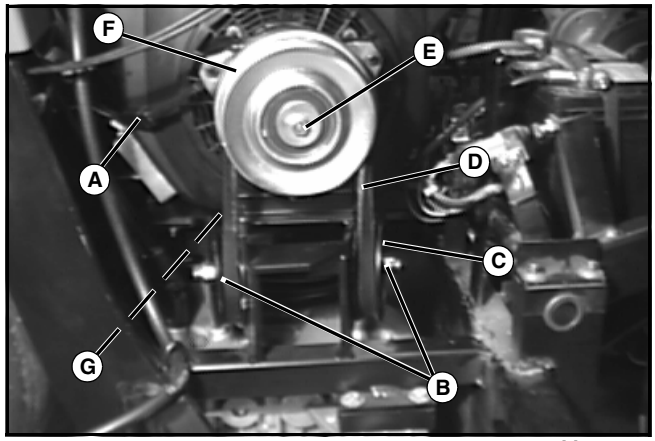
8. Install cover.

Traction Clutch Removal and Installation

1. Disconnect negative (-) battery cable.

2. Remove shrouds.

3. Remove fuel tank.



M89045

4. Disconnect wire connector (A).

5. Remove idler tension nuts (B) and remove idler (C).

6. Remove drive belt from traction clutch (D).

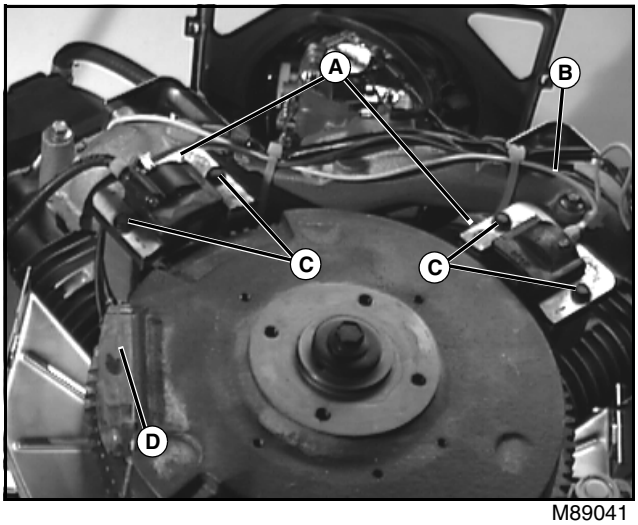
7. Remove retaining bolt (E) and slide traction clutch (F) from shaft; note position of alignment tab (G) on back of traction clutch.

8. Install in reverse order of removal.

Stator and Ignition Module Removal and Installation

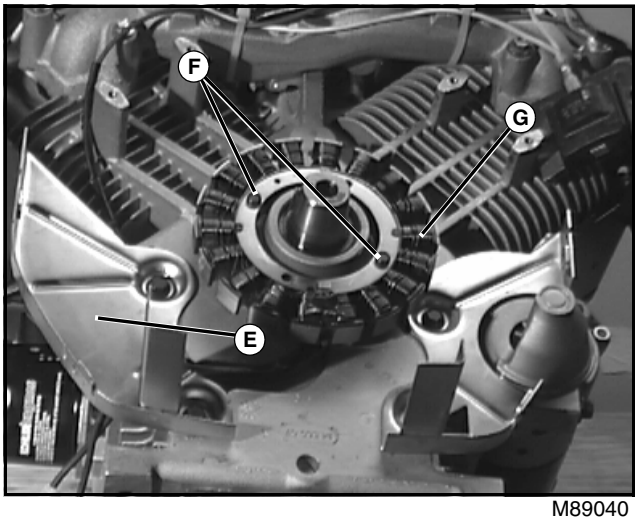
Procedure

1. Disconnect negative (-) battery cable.
2. Remove air cleaner cover and air cleaner.
3. Remove fan cover and voltage regulator/rectifier.
4. Remove engine cover and flywheel shaft.



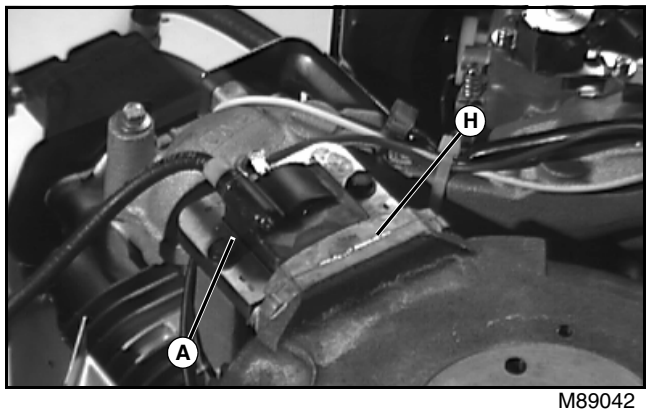
M89041

5. Turn flywheel magnet away from ignition module (A).
6. Disconnect white wire (B) from terminal on each ignition module.
7. Remove cap screws (C) and ignition modules.
8. Remove flywheel (D).



M89040

9. Remove left side guard (E).
10. Remove cap screws (F) and stator (G).
11. Inspect for damage.
12. Install stator and cap screws.
13. Install left side guard; verify voltage regulator/rectifier wire is placed in groove of crankcase.
14. Install flywheel.
15. Install ignition modules loosely. (Magnet must be rotated away from modules.)



M89042

16. Align flywheel magnet (H) with mounting posts for ignition module.
17. Perform air gap adjustment. See “Ignition Module Air Gap Adjustment” on page 168.

IMPORTANT: Avoid damage! BE SURE flywheel magnet is centered on ignition module so all three poles of the ignition module are properly gapped from the flywheel magnet.

18. Install and tighten cap screws to specification.
19. Connect white wire to terminals on each ignition module.
20. Install flywheel shaft extension and engine cover.
21. Install fan cover and voltage regulator/rectifier.
22. Install air cleaner and air cleaner cover.
23. Connect negative (-) battery cable.

Specifications

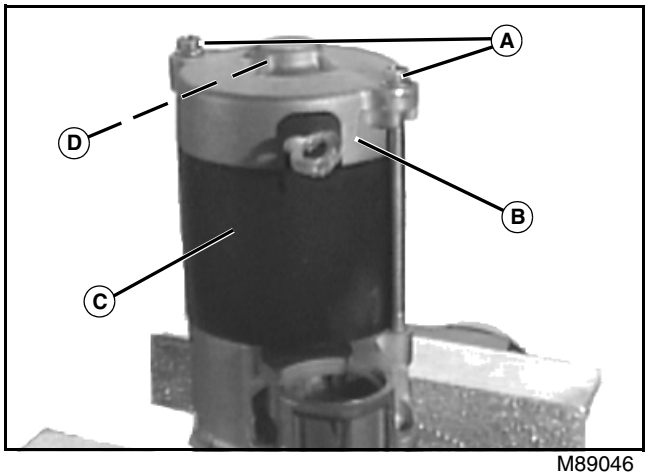
Ignition Module Air Gap. . . . . 0.28-0.33 mm (0.011-0.013 in.)

Ignition Module
Cap Screws Torque . . . . . 4.0 N•m (35 lb-in.)
Stator Cap Screws Torque. . . . . 7.3 N•m (65 lb-in.)
Flywheel Cap Screw Torque . . . . . 66.4 N•m (49 lb-ft)

Repair and Replace Starting Motor Brushes S.N. (-035000)

Procedure

1. Remove starting motor from engine; remove solenoid from starting motor. (See “Remove and Install Starting Motor” on page 71.)



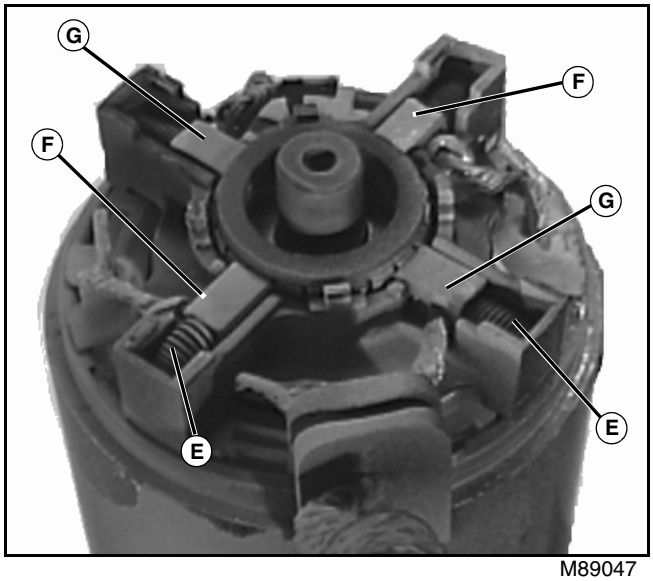
M89046

2. Carefully clamp starting motor in vise with soft jaws.

NOTE: Always test armature anytime starting motor is disassembled.

3. Remove cap screws (A) and commutator end cap (B) from frame (C).

4. Inspect commutator end cap bushing (D) and commutator shaft for wear, cracks, or dirt.



M89047

5. Remove insulator and four brush springs (E).

6. Clean contact points on negative brushes (F), and positive brushes (G).

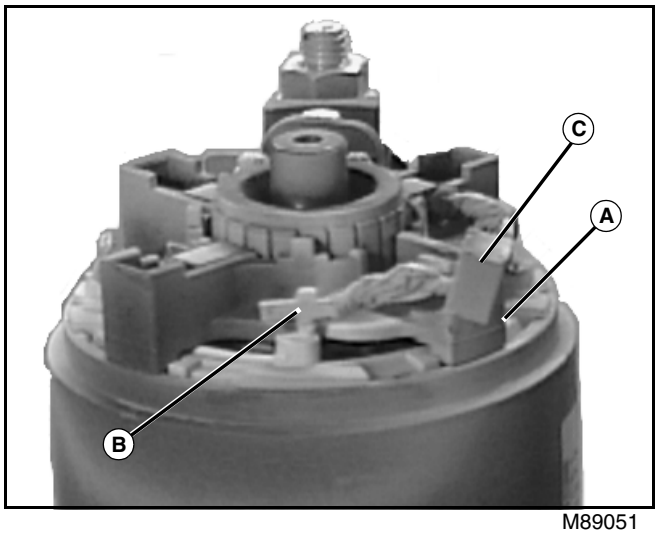
7. Using ohmmeter, check negative brushes for **continuity** with frame. Replace all four brushes if **no continuity** is indicated.

8. Check for **no continuity** between positive brushes and frame. Replace all four brushes if **continuity** is indicated.

Brush Replacement

1. Cut brush lead wires at the edge of post. Do not cut post.

NOTE: If any brush is worn, cracked, or broken, replace all four brushes as a set.



M89051

2. Remove brushes from brush holder (A).

3. File burrs off posts (B).

4. Crimp and solder new brushes (C) to posts.

5. Compress brush springs into brush holders using a thin screwdriver; place insulator over brushes and springs.

6. Carefully place commutator end cap over brush insulator.

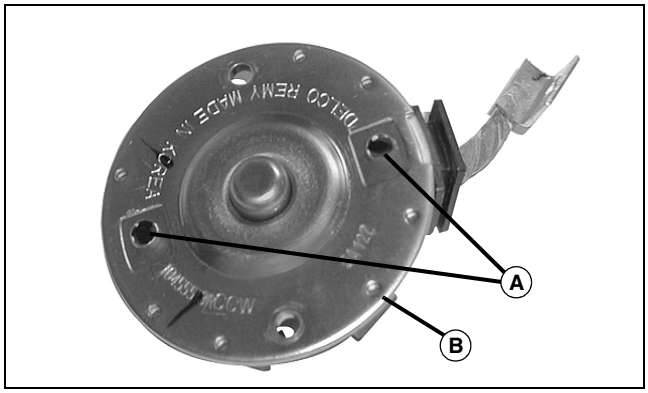
7. Install long cap screws and tighten them evenly.

Repair and Replace Starting Motor Brushes S.N. (035001-)

NOTE: Service of the brushes is limited to replacement as a set only.

Disassembly

1. Remove starting motor from engine. (See “Remove and Install Starting Motor” on page 71.)



mx22416

2. Remove two long bolts securing commutator end cap (B) to starting motor and remove end cap.

3. Remove two screws (A) securing brush holder assembly to commutator end cap. Remove brush assembly noting orientation for reassembly.

4. Install new brush assembly into starting motor being careful to match original orientation.

5. Install commutator end cap over brush assembly. Torque all bolts and screws to specification. (See “Starting Motor Disassembly and Assembly (SN 035001-)” on page 71.)

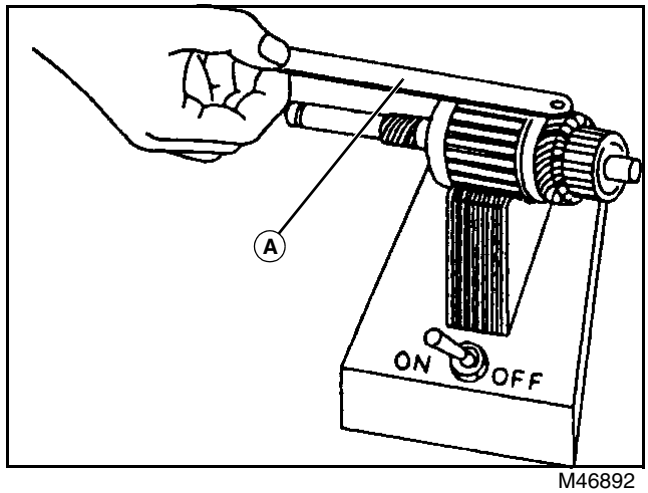
6. Install starting motor into engine. (See “Remove and Install Starting Motor” on page 71.)

Starting Motor Armature S.N. (-035000)

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

1. Clean commutator of armature with a coarse, lint-free cloth. DO NOT use emery cloth. If commutator is badly grooved, replace it.

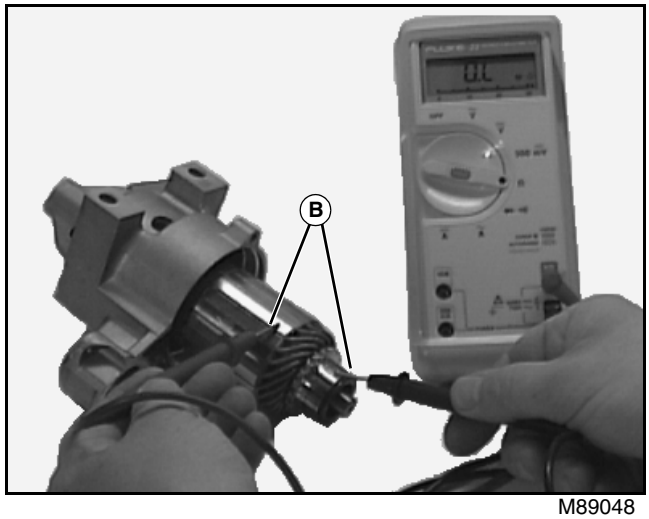
2. Check for short circuits with a growler.



M46892

3. Rotate armature on growler while holding a steel strip (A) (e.g., hacksaw blade) on armature. Strip will vibrate in area of short.

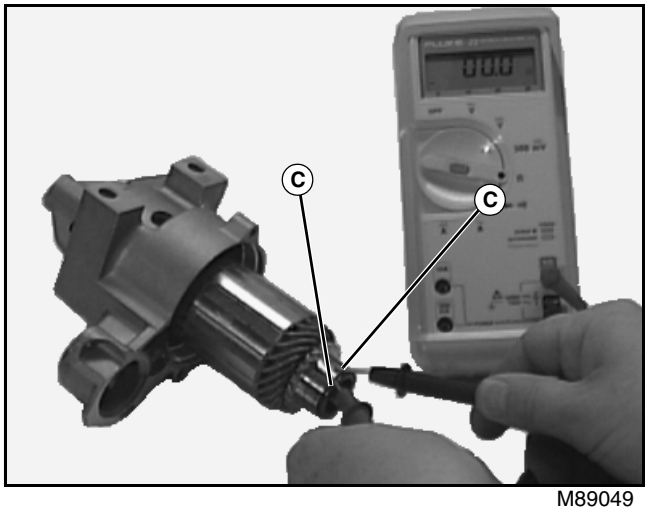
NOTE: Shorts between bars are sometimes caused by dirt or copper between bars.
If test indicates short-circuited windings, clean and recheck. If still faulty, replace armature.



M89048

4. Check for grounded windings with an ohmmeter or test light as shown (B). If any **continuity** is indicated, winding is grounded and armature must be replaced.

NOTE: Armature windings are connected in parallel; each bar must be tested.

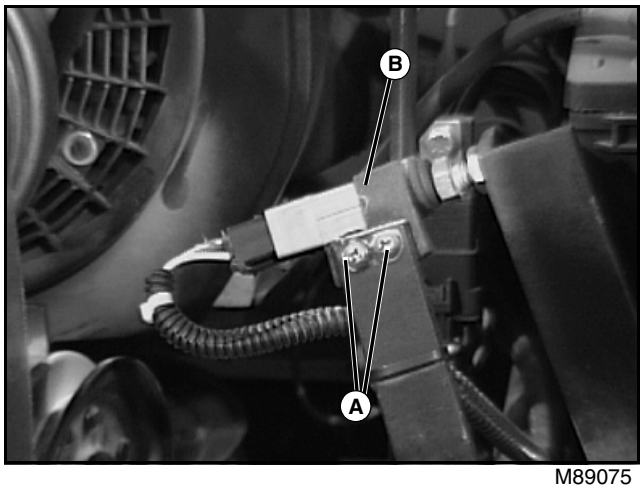


M89049

5. Check for open windings with an ohmmeter or test light as shown (C). If **no continuity** is indicated, there is an open circuit and armature must be replaced.

Lift Limit Switch Removal and Installation

1. Remove shrouds and fuel tank mounting bolts.
2. Disconnect wire cable connector.

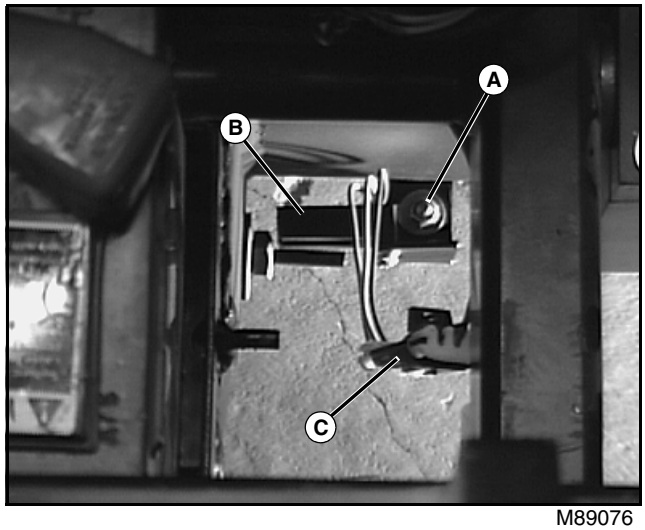


M89075

3. Remove two mounting bolts (A) and two nuts.
4. Install switch (B) and adjust. See “Lift Limit Switch Adjustment” on page 170.
5. Reconnect cable connector.
6. Reinstall fuel tank bolts and shrouds.

Lower Limit Sensor Removal and Installation

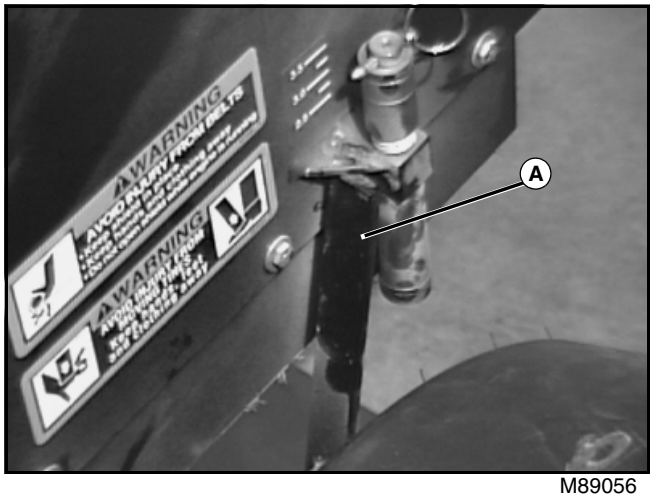
1. Disconnect wire cable connector.



M89076

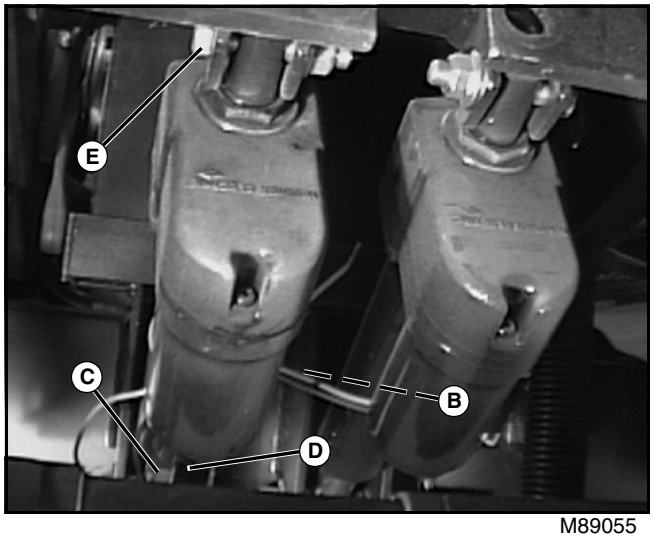
2. Remove mounting bolt (A) and sensor mounting bracket.
3. Remove sensor from bracket.
4. Install sensor (B) on mounting bracket.
5. Reinstall sensor and bracket.
6. Connect wire cable connector (C).

Linear Lift Actuator Removal and Installation S.N. (-060000)



M89056

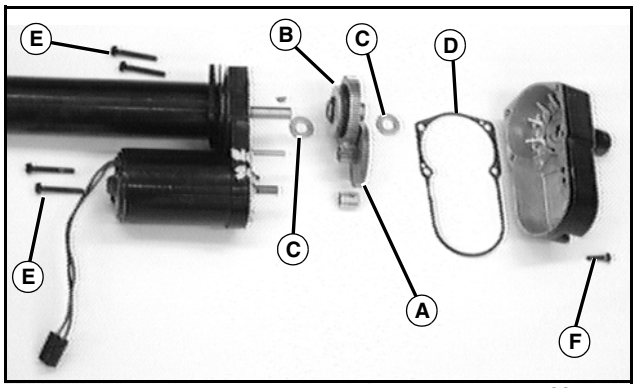
1. Position coring head on transport stops (A), located on right and left sides of coring head.
2. Disconnect battery.
3. Remove tine plates.
4. Remove rear guard.



M89055

5. Disconnect actuator electrical connector (B).
6. Remove lower actuator bolt (C), two washers, and two spacers (D).
7. Remove upper actuator bolt (E) and two washers.
8. Remove actuator.
9. Reinstall in reverse order of disassembly.

Actuator Clutch Replacement S.N. (-060000)



M56696

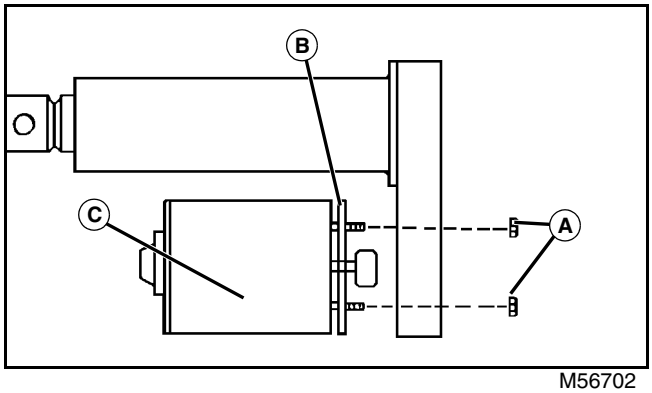
1. Remove gear case housing, intermediate gear (A), clutch (B), and thrust washers (C).
2. Install new clutch.
3. Install new gear case housing gasket (D).
4. Tighten bolts to specifications.

Specifications

Bolts (E) Torque . . . . . 8 N•m (70 lb-in.)
Bolts (F) Torque . . . . . 2.3 N•m (20 lb-in.)

Actuator Motor Replacement S.N. (-060000)

IMPORTANT: Avoid damage! When replacing motor, note direction that motor gear is installed. Intermediate gear teeth should ride close to the center of motor gear.



M56702

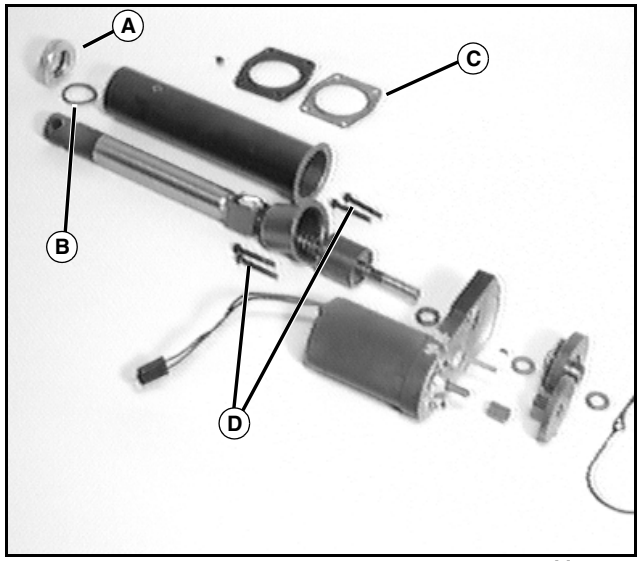
1. Remove gear case housing.
2. Remove nuts (A) from motor (B).
3. Replace motor and seal (C).
4. Tighten nuts to specifications.

Specification

Nuts Torque . . . . . 8 N•m (70 lb-in.)

Actuator Cover Tube Seal Replacement S.N. (-060000)

If tube is removed or leaking, replace the upper O-ring and lip seal. Drive seal and O-ring from end of tube use a disk and driver.



M56349

1. Install new seal (A) and O-ring (B) flush with end of tube.
2. Install new tube retaining gasket (C).
3. Install tabbed thrust washer and thicker thrust washer.
4. Tighten bolts (D) to specification.

Specification

Bolts Torque . . . . . 8 N•m (70 lb-in.)

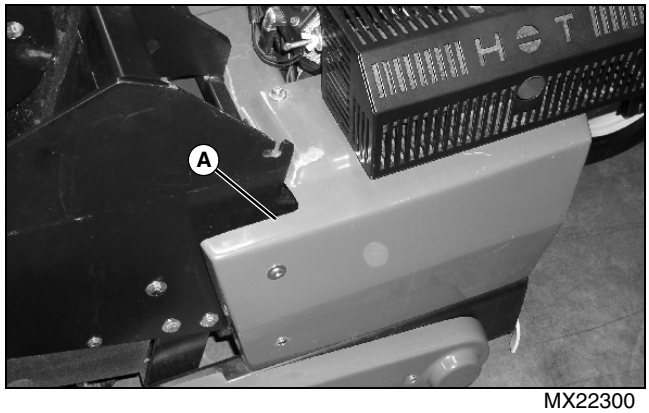
Lift and Lower Solenoid Removal and Installation S.N. (060001-)

CAUTION: Avoid injury! The vehicle must be properly supported. Do not work on a vehicle while it is suspended from a hoist or held up by a jack.

1. Park machine safely on level surface. (See “Park Machine Safely” on page 3.)
2. Move park brake to the LOCKED position.
3. Turn key switch to the OFF position.
4. Remove hood.

CAUTION: Avoid injury! When key switch is turned to the RUN position and the travel lever is in the DISENGAGED position, the coring head will raise automatically.

5. With travel lever in the ENGAGED position, turn the key switch to the RUN position and lower coring head. Turn the key switch to the OFF position.



MX22300

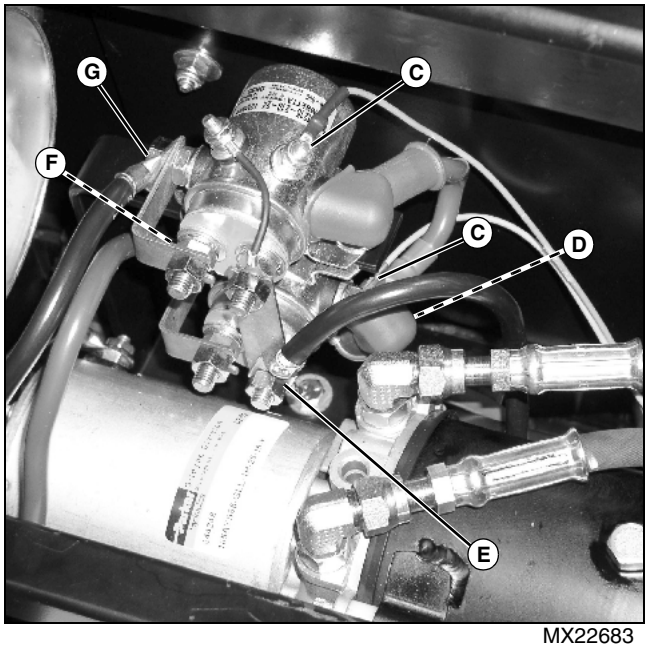
6. Remove clutch cover (A).

MX22301

7. Remove battery cover (B).
8. Turn key switch to the RUN position. Raise coring head. Engage transport stops.

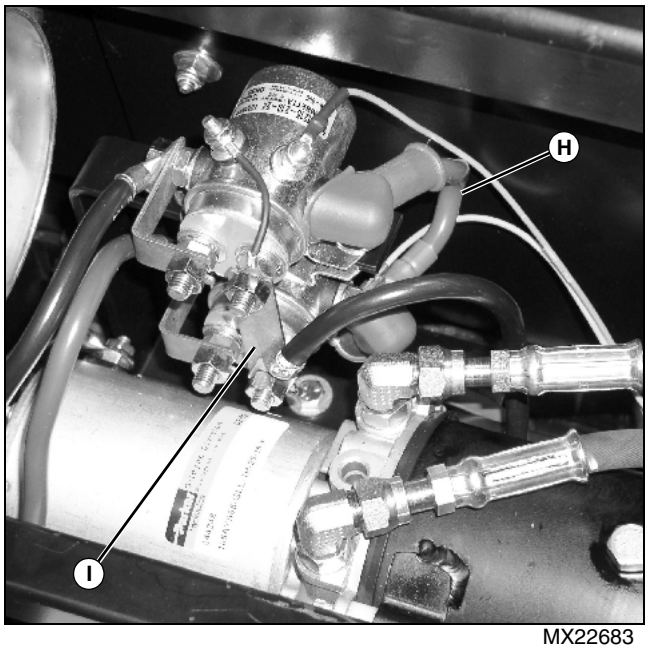
NOTE: Placing the automatic/manual switch in the AUTOMATIC position ensures that the coring head will fully lower.

9. With automatic/manual switch in the AUTOMATIC position, lower coring head on transport locks.
10. Turn key switch to the OFF position.
11. Disconnect negative (-) battery cable.



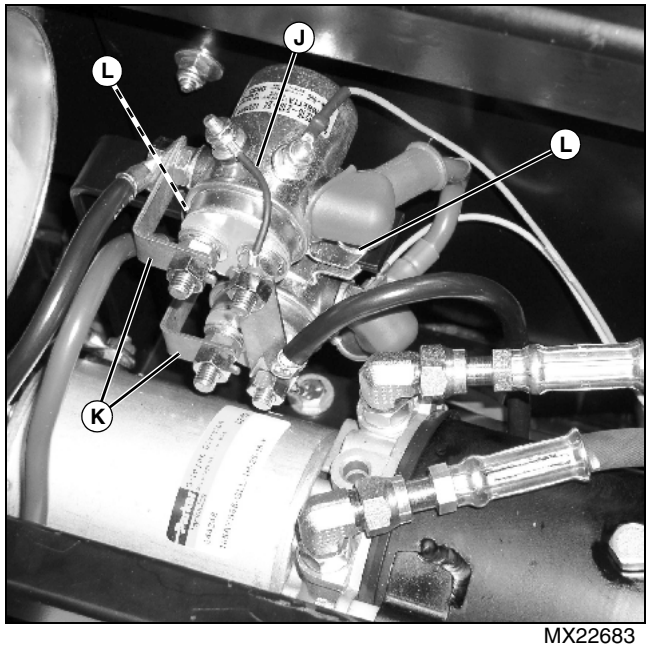
MX22683

12.Disconnect electrical connectors (C), Red cable (D), black cable (E), and hydraulic pump cables (F and G).



MX22683

13.Remove Red cable (H) and straight jumper (I).



MX22683

14.Remove black wires (J) and right angle jumpers (K).

15.Remove locknuts, flat washers, and cap screws (L).

16.Remove solenoid(s).

17.Install in reverse order of removal.

Table Of Contents

Specifications

General Specifications

Aercore 800

Transaxle Gear Teeth

Bevel Pinion Gear (input shaft) 13

Drive Shaft

Bevel Drive Gear 42
Reverse Sprocket Gear 14
1st Gear 41
2nd Gear 37
3rd Gear 35
4th Gear 34
Spur Gear 15

Counter Shaft

Drive Sprocket Gear 14
1st Gear 9
2nd Gear 12
3rd Gear 15
4th Gear 16
Output Gear 35
Bevel Gear 33

Differential Ring Gear 31
Differential Miter Bevel Gears (axle shafts) 16
Differential Pinion Gears (cross shaft) 14

Lubrication

Capacity (Grease) . . . . . 1.0 L (30 oz)
Input Shaft Needle Bearings Grease . . . . . Unirex® N3 Grease Only
Transaxle Housing Grease . . . . . Bentonite Grease Only

Aercore 1000, 1500 and 2000

Gear Case

Rated Input . . . . . 540 rpm
Rated Input Power . . . . . 22 kw (30 hp)

Lubrication

Gear Oil Type . . . . . GL-5 GEAR LUBRICANT® - SAE 80W-90
Gear Oil Capacity . . . . . 1.2 L (1.1 qt)

Repair Specifications

Aercore 800

Brake Assembly Mounting Cap Screws . . . . . 20 ± 2 N•m (180 ± 20 lb-in.)
Detent Ball and Spring Set Screw . . . . . Flush Only
Transaxle Housing Cap Screws . . . . . 11.3 N•m (100 lb-in.)

Aercore 1000, 1500 and 2000

Gear Case

Input Shaft Rolling Torque . . . . . 0.23 N•m (2 lb-in.) maximum
Input Shaft End Play . . . . . 0.05 mm (0.002 in.)
Output Shaft Backlash . . . . . 0.20 - 0.40 mm (0.01 - 0.02 in.)
Output Shaft End Play . . . . . 0.05 mm (0.002 in.)

Back Plate Bolts . . . . . 45 N•m (33 lb-ft)
Tapered Collar Gap . . . . . 17.5 mm (0.69 in.)
Hex Head Bolts . . . . . 35 N•m (26 lb-ft)
Reduction Drive Runout (Maximum) . . . . . 0.05 mm (0.002 in.)
Gear Case Mounting Bolts . . . . . 140 N•m (103.3 lb-ft)
Belt Tension . . . . . 5.1 mm (0.2 in.) with 26.2 lbs of pressure or moderate thumb pressure

Tools and Materials

Aercore 800

Other Material

Part No.	Part Name	Part Use
- - -	Unirex® N3 Grease Only	Input Shaft Needle Bearings Grease
Bentonite Part Number 788067B	Bentonite Grease Only	Transaxle Housing Grease
TY16021 (U.S.)/ TY9484 (Canada)	John Deere Form-In-Place Gasket Silicone Sealant	Transaxle Sealant

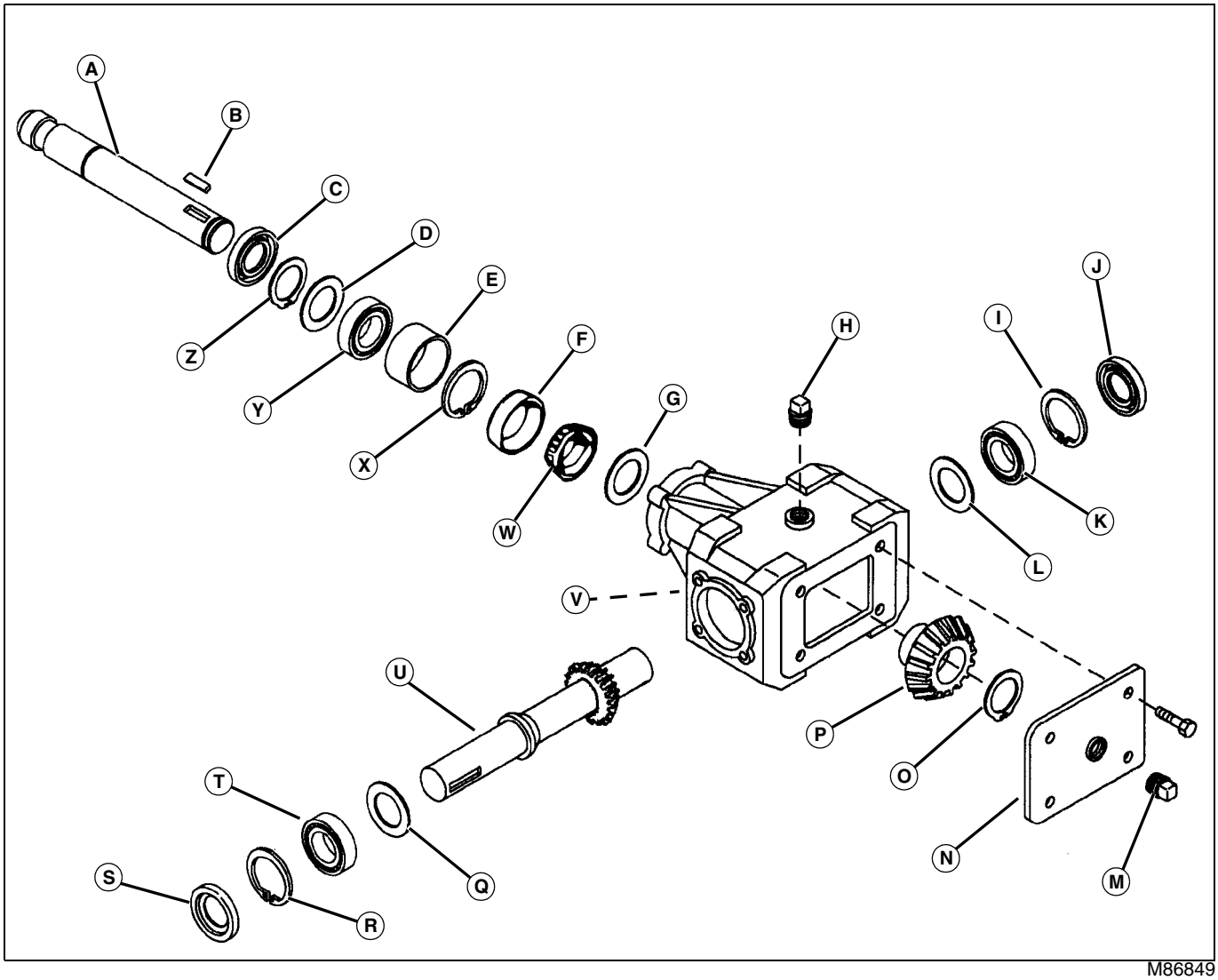
Aercore 1000 and 1500

Other Material

Part No.	Part Name	Part Use
- - -	GL-5 Gear Lubricant ® - SAE 80W-90	Gear Oil Type

Component Location

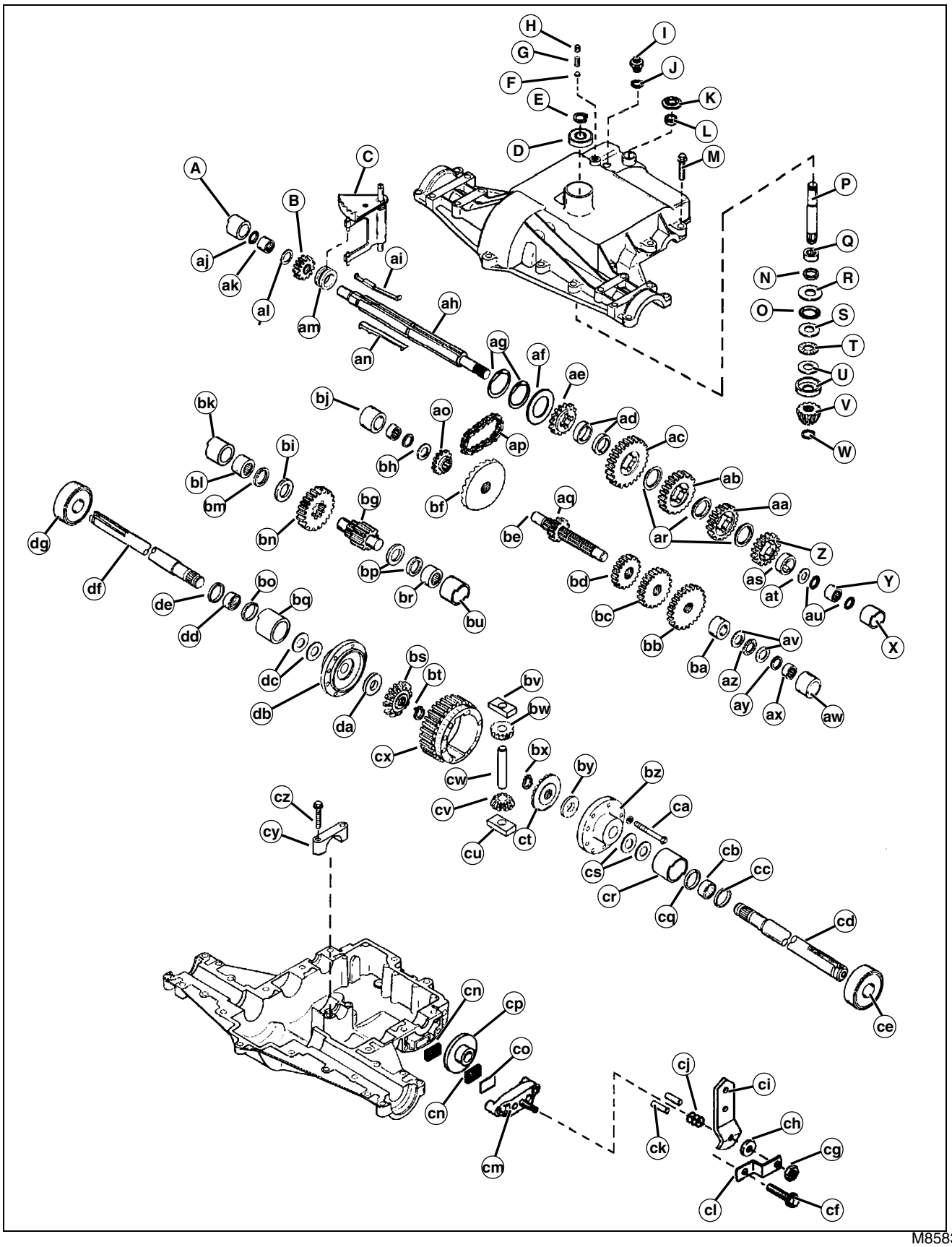
Aercore 1000, 1500 and 2000 Gear Case



M86849

A - Input Shaft
B - Key
C - Seal
D - Shim
E - Spacer
F - Bearing Cup
G - Shim
H - Fill Plug
I - Snap Ring
J - Seal
K - Bearing
L - Shim
M - Level Plug
N - Back Plate
O - Snap Ring
P - Pinion Gear
Q - Shim
R - Snap Ring
S - Seal
T - Bearing
U - Output Shaft
V - Drain Plug
W - Tapered Roller Bearing
X - Snap Ring
Y - Bearing
Z - Snap Ring

Aercore 800 Transaxle



M85836

POWER TRAIN - GEAR COMPONENT LOCATION

A - Sleeve
B - Spur Gear (15 tooth)
C - Shift Fork
D - Ball Bearing
E - Snap Ring
F - Ball
G - Spring
H - Set Screw
I - Plug
J - O-Ring
K - Push Nut
L - Ring
M - Screw
N - Oil Seal
O - O-Ring
P - Input Shaft
Q - Needle Bearing
R - Washer
S - Washer
T - Thrust Bearing
U - Washer
V - Pinion (13 tooth)
W - Snap Ring
X - Sleeve
Y - Needle Bearing
Z - 4th Gear (34 tooth)
AA- 3rd Gear (35 tooth)
AB- 2nd Gear (37 tooth)
AC- 1st Gear (41 tooth)
AD- Neutral Spacer
AE- Reverse Sprocket (14 tooth)
AF- Washer
AG- Snap Ring
AH- Shift/Brake Shaft
AI - Key
AJ- O-Ring
AK- Needle Bearing
AL- Washer
AM- Shift Collar
AN- Key
AO- Sprocket (14 tooth)
AP- Link Chain
AQ- 1st Gear (9 tooth)
AR- Washer
AS- Spacer
AT- Washer
AU- O-Ring
AV- Washer
AW- Sleeve
AX- Needle Bearing
AY- O-Ring
AZ- Thrust Bearing
BA- Spacer
BB- 4th Gear (16 tooth)
BC- 3rd Gear (15 tooth)
BD- 2nd Gear (12 tooth)
BE- Counter Shaft
BF- Gear (33 tooth)
BG- Output Shaft
BH- Washer
BI - Washer
BJ- Sleeve
BK- Sleeve
BL- Needle Bearing
BM- Ring
BN- Output Gear (35 tooth)
BO- Ring
BP- Washer
BQ- Sleeve
BR- Needle Bearing
BS- Gear (16 tooth)
BT- Snap Ring
BU- Sleeve
BV- Drive Block
BW- Pinion (14 tooth)
BX- Snap Ring
BY- Washer
BZ- Differential Carrier
CA- Screw
CB- Needle Bearing
CC- Ring
CD- Axle
CE- Ball Bearing
CF- Screw
CG- Lock Nut
CH- Washer
CI - Brake Arm
CJ- Spring
CK- Pins
CL- Bracket
CM- Holder
CN- Brake Pad
CO- Brake Pad Plate
CP- Brake Disk
CQ- Ring
CR- Sleeve

CS- Washer
CT- Gear (16 tooth)
CU- Drive Block
CV- Pinion (14 tooth)
CW- Pin
CX- Differential Ring Gear (31 tooth)
CY- Bearing Cap
CZ- Screw
DA- Washer
DB- Differential Carrier
DC- Washer
DD- Needle Bearing
DE- Ring
DF- Axle
DG- Ball Bearing

Theory of Operation

Transaxle Operation Peerless - Aercore 800

Function

The transaxle transmits power from the engine, through the machine drive belt, into the transaxle gear matrix, and out the drive axles to the chain drive, then the rear wheels. The transaxle provides a gear selection of four forward speeds and one transport speed. When a forward speed is selected, the machine moves in the direction of the operator station. When in transport gear (E), the machine moves away from the operator station. It also provides the means to interrupt the flow of power when shifted into neutral.

Major Components

- Transaxle drive sheave
- Input shaft and pinion gear
- Beveled drive gear, drive shaft with small drive chain sprocket, drive chain, and drive gears
- Intermediate shift/brake shaft with shifter fork, shift collar, shift keys, large drive chain sprocket/reverse gear, drive chain, and transfer gears
- Idler shaft and combination gear
- Differential gears and axle shafts
- Wheels and tires.

Theory of Operation

Forward

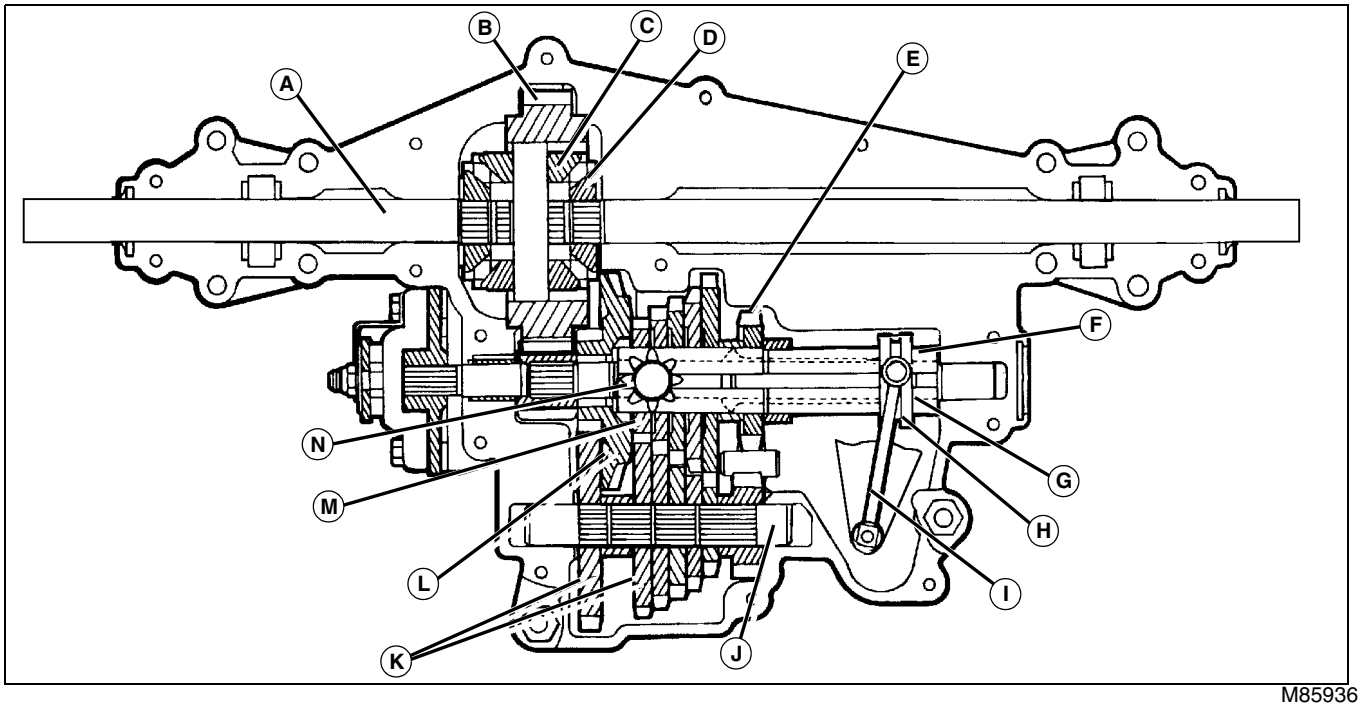
The transaxle input sheave is keyed to the 13 tooth input pinion (N). The input pinion drives the input bevel gear (33 tooth gear) (L) and forward drive gears (K). A gear is selected when the shift lever moves the shift collar (H) and shift keys (F) to lock one of the driven gears to the shift/brake shaft (G). Power is transmitted by the gears on the right-hand end of the shift/brake shaft and counter shaft (J), back to the differential ring gear (B).

Transport

When transport gear (E) is selected, power is transmitted from the 13 tooth input pinion and 33 tooth input bevel gear, through the reverse gear and drive chain sprocket (M). The chain, drives the shift/brake shaft in the opposite direction then the gear sets did, therefore, giving a reverse direction to the counter shaft and differential.

Neutral

In neutral the shift fork (I) places the shift keys in an area where there is no power transmitted to the shift/brake shaft and neutral is attained.



M85936

A - Axle
B - Differential Ring Gear
C - Pinion Gear (14 tooth)
D - Gear (16 tooth)
E - Transport Gear
F - Shift Keys
G - Shift/Brake Shaft
H - Shift Collar
I - Shift Fork
J - Counter Shaft

K - Forward Drive Gears
L - Input Bevel Gear (33 tooth)
M - Drive Chain Sprocket
N - Input Pinion (13 tooth)

Brake System Operation - Aercore 800

Function

The brake system allows the operator to stop or lock the machine into park position.

Major Components

- Transaxle Brake Assembly
- Park Brake Lever and Cable Assembly

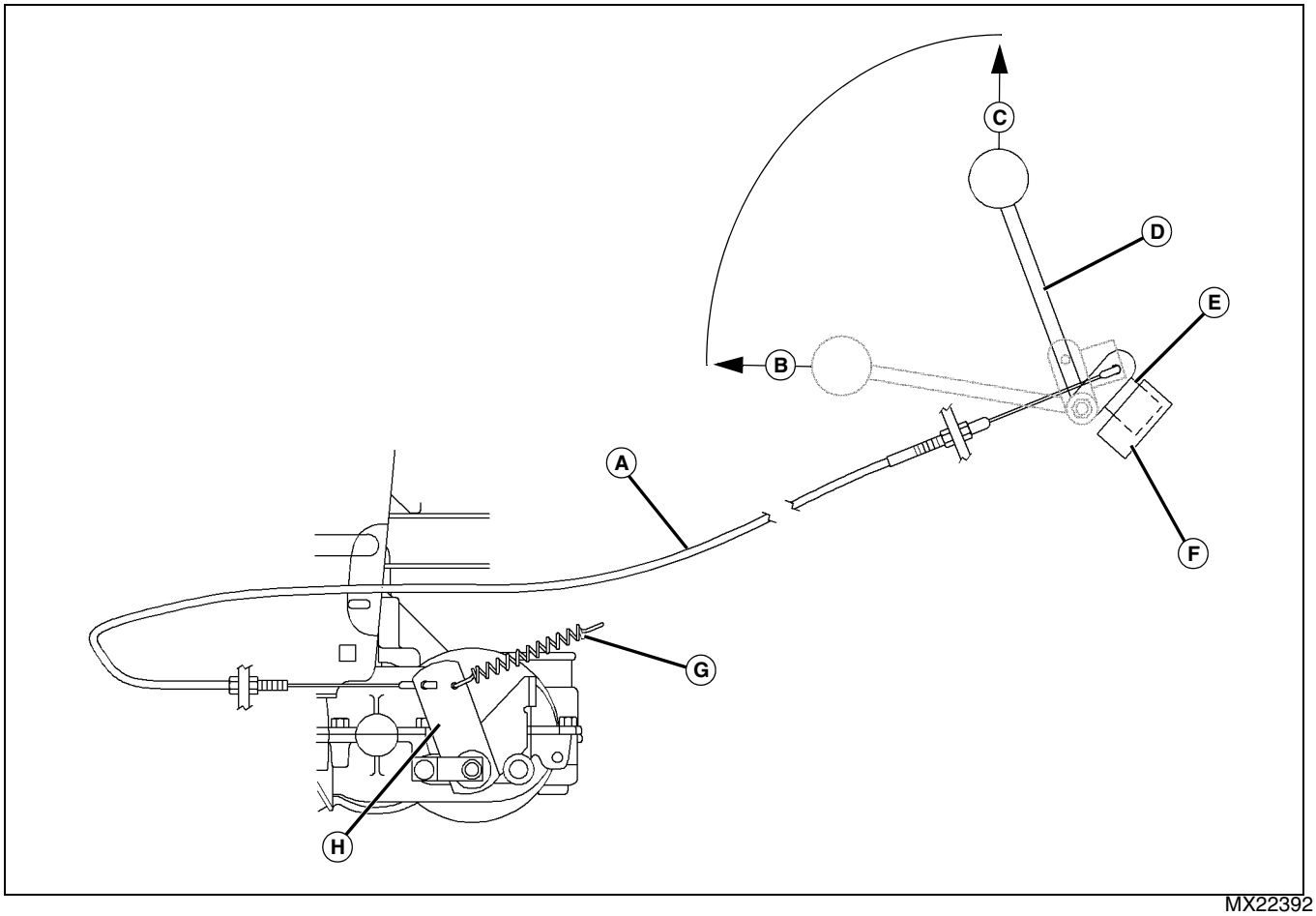
Theory of Operation

When the brake lever is rotated it extends the cable, the cable in turn forces the brake arm to rotate counter-clockwise.

The brake arm, with the bottom cam surface contour, pushes the two dowel pins against the striker plate. The striker plate forces the thicker, outer friction puck against the brake disc. The two friction pucks become compressed against both sides of the brake disc. The brake disc is keyed to the end of the intermediate shifter/brake shaft (not shown).

When the compression force of the friction pucks is great enough to stop the brake disc rotation, the transaxle and wheels stop turning. When the brake lever is rotated to the “off” position, the spring on the brake arm provides the necessary tension to remove pressure from the brake pads.

When the park brake is set the flag pivots into an electrical sensor. The sensor then de-energizes the relay allowing the buzzer to sound if the traction clutch is engaged. This prevents the unit from moving with the brakes on.



MX22392

A - Cable
B - Park Brake Off
C - Park Brake On
D - Brake Lever
E - Flag
F - Sensor
G - Spring
H - Brake Arm

Diagnostics

Power Train Troubleshooting

Symptom: Belt Jumping Off or Slapping

(1) Are belt sheaves, idlers, and guides loose, out of adjustment, worn or damaged?

Yes - Adjust or replace sheaves, idlers and guides.

No - Go to step (2) if problem continues.

(2) Is the belt worn, frayed, glazed or stretched?

Yes - Replace traction belt.

No - Go to step (3) if problem continues.

(3) Is the brake lever cable out of adjustment?

Yes - Adjust brake lever cable.

No - Go to step (4) if problem continues.

(4) Is the correct type or volume of lubricant being used?

Yes - Go to step (5).

No - Fill reservoir to correct level with specified oil.

(5) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (6) if problem continues.

(6) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

No - Go to step (7) if problem continues.

(7) Are the transaxle case halves worn or broken?

Yes - Replace defective components.

Symptom: Lack of Drive in One or Both Directions

(1) Are belt sheaves, idlers, and guides loose, out of adjustment, worn or damaged?

Yes - Adjust or replace sheaves, idlers and guides.

No - Go to step (2) if problem continues.

(2) Is the belt worn, frayed, glazed or stretched?

Yes - Replace traction belt.

No - Go to step (3) if problem continues.

Symptom: Lack of Drive in One or Both Directions

(3) Is the brake lever cable out of adjustment?

Yes - Adjust brake lever cable.

No - Go to step (4) if problem continues.

(4) Is the correct type or volume of lubricant being used?

Yes - Go to step (5).

No - Fill reservoir to correct level with specified oil.

(5) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (6) if problem continues.

(6) Is the input sheave, input shaft, and axle keys or keyways worn or damaged?

Yes - Repair or replace defective components.

No - Go to step (7) if problem continues.

(7) Are the transaxle cap screws loose or case holes stripped?

Yes - Replace defective components and tighten cap screws to specification.

No - Go to step (8) if problem continues.

(8) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

No - Go to step (9) if problem continues.

(9) Are the transaxle case halves worn or broken?

Yes - Replace defective components.

No - Go to step (10) if problem continues.

(10) Is the intermediate shaft/brake shaft or axle seals worn or damaged?

Yes - Replace defective components.

Symptom: Loses power under load, belt slips, or erratic drive

(1) Are belt sheaves, idlers, and guides loose, out of adjustment, worn or damaged?

Yes - Adjust or replace sheaves, idlers and guides.

No - Go to step (2) if problem continues.

(2) Is the belt worn, frayed, glazed or stretched?

Yes - Replace traction belt.

Symptom: Loses power under load, belt slips, or erratic drive

No - Go to step (3) if problem continues.

(3) Is the brake lever cable out of adjustment?

Yes - Adjust brake lever cable.

No - Go to step (4) if problem continues.

(4) Is the correct type or volume of lubricant being used?

Yes - Go to step (5).

No - Fill reservoir to correct level with specified oil.

(5) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (6) if problem continues.

(6) Is the input sheave, input shaft, and axle keys or keyways worn or damaged?

Yes - Repair or replace defective components.

No - Go to step (7) if problem continues.

(7) Are the transaxle cap screws loose or case holes stripped?

Yes - Replace defective components and tighten cap screws to specification.

No - Go to step (8) if problem continues.

(8) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

No - Go to step (9) if problem continues.

(9) Are the transaxle case halves worn or broken?

Yes - Replace defective components.

No - Go to step (10) if problem continues.

(10) Is the intermediate shaft/brake shaft or axle seals worn or damaged?

Yes - Replace defective components.

Symptom: Jerky or Aggressive Engagement

(1) Are belt sheaves, idlers, and guides loose, out of adjustment, worn or damaged?

Yes - Adjust or replace sheaves, idlers and guides.

No - Go to step (2) if problem continues.

Symptom: Jerky or Aggressive Engagement

(2) Is the belt worn, frayed, glazed or stretched?

Yes - Replace traction belt.

No - Go to step (3) if problem continues.

(3) Is the brake lever cable out of adjustment?

Yes - Adjust brake lever cable.

No - Go to step (4) if problem continues.

(4) Is the correct type or volume of lubricant being used?

Yes - Go to step (5).

No - Fill reservoir to correct level with specified oil.

(5) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (6) if problem continues.

(6) Is the input sheave, input shaft, and axle keys or keyways worn or damaged?

Yes - Repair or replace defective components.

No - Go to step (7) if problem continues.

(7) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

No - Go to step (8) if problem continues.

(8) Are the transaxle case halves worn or broken?

Yes - Replace defective components.

Symptom: Cannot Get All Forward Gears

(1) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (2) if problem continues.

(2) Is the shift lever and linkage bent, worn, or broken?

Yes - Repair or replace defective components.

No - Go to step (3) if problem continues.

(3) Is the correct type or volume of lubricant being used?

Yes - Go to step (4).

No - Fill reservoir to correct level with specified oil.

Symptom: Cannot Get All Forward Gears

(4) Are the transaxle cap screws loose or case holes stripped?

Yes - Replace defective components and tighten cap screws to specification.

No - Go to step (5) if problem continues.

(5) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

No - Go to step (6) if problem continues.

(6) Are the transaxle case halves worn or broken?

Yes - Replace defective components.

No - Go to step (7) if problem continues.

(7) Is the intermediate shaft/brake shaft or axle seals worn or damaged?

Yes - Replace defective components.

Symptom: Cannot Get Transport Gear

(1) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (2) if problem continues.

(2) Is the shift lever and linkage bent, worn, or broken?

Yes - Repair or replace defective components.

No - Go to step (3) if problem continues.

(3) Is the correct type or volume of lubricant being used?

Yes - Go to step (4).

No - Fill reservoir to correct level with specified oil.

(4) Are the transaxle cap screws loose or case holes stripped?

Yes - Replace defective components and tighten cap screws to specification.

No - Go to step (5) if problem continues.

(5) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

No - Go to step (6) if problem continues.

Symptom: Cannot Get Transport Gear

(6) Are the transaxle case halves worn or broken?

Yes - Replace defective components.

No - Go to step (7) if problem continues.

(7) Is the intermediate shaft/brake shaft or axle seals worn or damaged?

Yes - Replace defective components.

Symptom: Jumps Out of Gear or Must hold Into Gear

(1) Is the brake lever cable out of adjustment?

Yes - Adjust brake lever cable.

No - Go to step (2) if problem continues.

(2) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (3) if problem continues.

(3) Is the shift lever and linkage bent, worn, or broken?

Yes - Repair or replace defective components.

No - Go to step (4) if problem continues.

(4) Is the correct type or volume of lubricant being used?

Yes - Go to step (5).

No - Fill reservoir to correct level with specified oil.

(5) Are the transaxle cap screws loose or case holes stripped?

Yes - Replace defective components and tighten cap screws to specification.

No - Go to step (6) if problem continues.

(6) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

No - Go to step (7) if problem continues.

(7) Is the intermediate shaft/brake shaft or axle seals worn or damaged?

Yes - Replace defective components.

Symptom: Shifts Hard

(1) Is the brake lever cable out of adjustment?

Yes - Adjust brake lever cable.

No - Go to step (2) if problem continues.

(2) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (3) if problem continues.

(3) Is the shift lever and linkage bent, worn, or broken?

Yes - Repair or replace defective components.

No - Go to step (4) if problem continues.

(4) Is the correct type or volume of lubricant being used?

Yes - Go to step (5).

No - Fill reservoir to correct level with specified oil.

(5) Are the transaxle cap screws loose or case holes stripped?

Yes - Replace defective components and tighten cap screws to specification.

No - Go to step (6) if problem continues.

(6) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

No - Go to step (7) if problem continues.

(7) Are the transaxle case halves worn or broken?

Yes - Replace defective components.

No - Go to step (8) if problem continues.

(8) Is the intermediate shaft/brake shaft or axle seals worn or damaged?

Yes - Replace defective components.

Symptom: Noisy Operation

(1) Are belt sheaves, idlers, and guides loose, out of adjustment, worn or damaged?

Yes - Adjust or replace sheaves, idlers and guides.

No - Go to step (2) if problem continues.

(2) Is the belt worn, frayed, glazed or stretched?

Yes - Replace traction belt.

No - Go to step (3) if problem continues.

Symptom: Noisy Operation

(3) Is the correct type or volume of lubricant being used?

Yes - Go to step (4).

No - Fill reservoir to correct level with specified oil.

(4) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (5) if problem continues.

(5) Is the input sheave, input shaft, and axle keys or keyways worn or damaged?

Yes - Repair or replace defective components.

No - Go to step (6) if problem continues.

(6) Are the transaxle cap screws loose or case holes stripped?

Yes - Replace defective components and tighten cap screws to specification.

No - Go to step (7) if problem continues.

(7) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

No - Go to step (8) if problem continues.

(8) Are the transaxle case halves worn or broken?

Yes - Replace defective components.

No - Go to step (9) if problem continues.

(9) Is the intermediate shaft/brake shaft or axle seals worn or damaged?

Yes - Replace defective components.

Symptom: Leaking Grease

(1) Is the correct type or volume of lubricant being used?

Yes - Go to step (2).

No - Fill reservoir to correct level with specified oil.

(2) Are the transaxle cap screws loose or case holes stripped?

Yes - Replace defective components and tighten cap screws to specification.

No - Go to step (3) if problem continues.

Symptom: Leaking Grease

(3) Are the transaxle case halves worn or broken?

Yes - Replace defective components.

No - Go to step (4) if problem continues.

(4) Is there a poor application of transaxle case halves sealant or incorrect type of sealant?

Yes - Apply correct and amount of sealant to case halves, and tighten cap screws to specification.

No - Go to step (5) if problem continues.

(5) Is the intermediate shaft/brake shaft or axle seals worn or damaged?

Yes - Replace defective components.

Symptom: Park Brake Will Not Hold

(1) Is the brake lever cable out of adjustment?

Yes - Adjust brake lever cable.

No - Go to step (2) if problem continues.

(2) Are the brake components worn, bent or broken?

Yes - Repair or replace defective components.

No - Go to step (3) if problem continues.

(3) Is the input sheave, input shaft, and axle keys or keyways worn or damaged?

Yes - Repair or replace defective components.

No - Go to step (4) if problem continues.

(4) Are the internal components worn, stripped, or broken?

Yes - Repair or replace defective components.

Power Train Diagnosis

Procedure 1:

Test Conditions:

- Aerator on level surface
- Engine OFF
- Front wheels blocked
- Rear wheels raised off surface with axle housings on jack stands

Symptom: Transaxle

(1) Transaxle drive belt in good condition - not glazed, split, unraveled, or stretched?

Yes - Go to step (2).

No - Replace transaxle drive belt.

(2) Sheaves, idlers and guides in good condition?

Yes - Go to step (3).

No - Replace any loose, worn, or damaged components.

(3) Guides installed, properly adjusted, and tight?

Yes - Go to step (4).

No - Adjust and tighten.

(4) Shift linkage works properly, shifts smoothly, and obtains all gears?

Yes - Go to step (5).

No - Repair or replace as needed.

(5) Brake assembly disk and pads not worn or binding?

Yes - Go to step (6).

No - Repair or replace as needed.

(6) Internal transaxle components shift smoothly, and obtains all gears?

Yes - Go to step (7).

No - Repair or replace components as needed.

(7) No cracks, leaks or loose hardware on exterior or transaxle housing?

Yes - Go to step (8).

No - Tighten hardware, and repair or replace parts as needed.

Symptom: Transaxle

(8) Tire pressure equal?

Yes - Go to step (9).

No - Adjust air pressure.

(9) Driving tires have same radii?

Yes - Go to step (10).

No - Match tires for same radii.

(10) Wheels not bent or out of round?

Yes - Go to step (11).

No - Replace wheels.

(11) Keys, keyways and E-rings in good shape and seated correctly?

Yes - Test complete.

No - Repair or replace as needed.

Procedure 2:

Test Conditions:

- Aerator operating in test area
- Engine at operating temperature
- Tests run at engine slow idle and fast idle
- Transaxle run through all speeds in both directions

Symptom: Transaxle

(1) Engine running smoothly through out throttle range?

Yes - Go to step (2).

No - Adjust or tune engine.

(2) Belts not squealing or vibrating?

Yes - Go to step (3).

No - Check belt condition. Check adjustment and condition of idlers and guides. Replace components as needed.

(3) Shifting is smooth and all gears obtained?

Yes - Go to step (4).

No - Check gear shift linkage. Adjust, repair, or replace as needed.
Check transaxle internal components. Repair or replace as needed.
Check brake components. Repair or replace as needed.
Check belt condition.

Symptom: Transaxle

(4) Constant speed is maintained?

Yes - Go to step (5).

No - Check adjustment and condition of idlers and guides.
Check transaxle internal components.
Check brake components.
Check axles, wheels, and tires.
Replace all parts as needed.

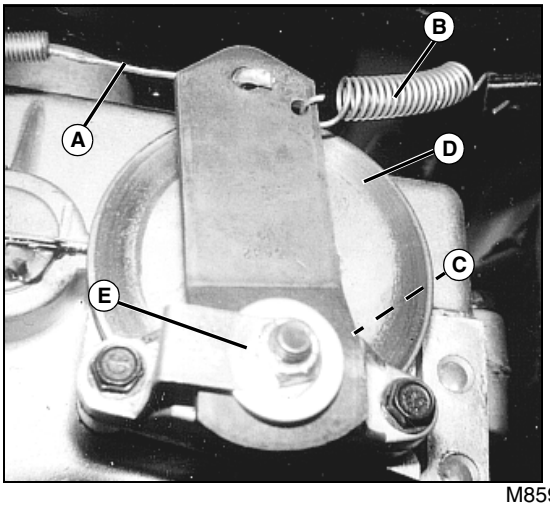
(5) Brakes hold machine?

Yes - Test complete.

No - Check brake linkage and components. Repair or replace as needed.

Tests and Adjustments

Brake Pad Adjustment - Aercore 800



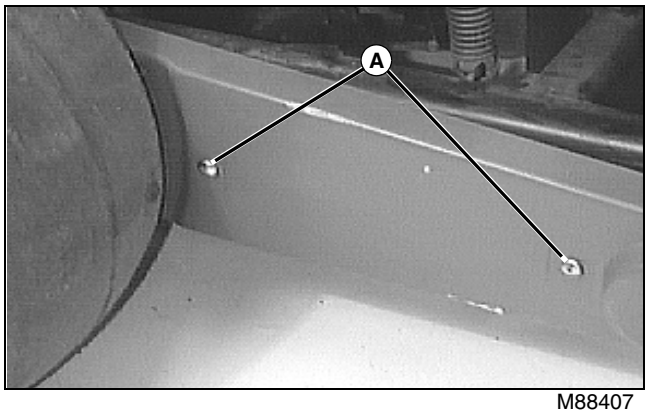
M85937

1. Check brake cable linkage (A), spring (B), pads (C) and rotor (D) for wear, binding and dirt.
2. Insert feeler gauge between rotor and front brake pad.
3. Adjust nut (E) to get specified clearance.
4. Check machine to see if brakes drag. Readjust if necessary.

Specifications

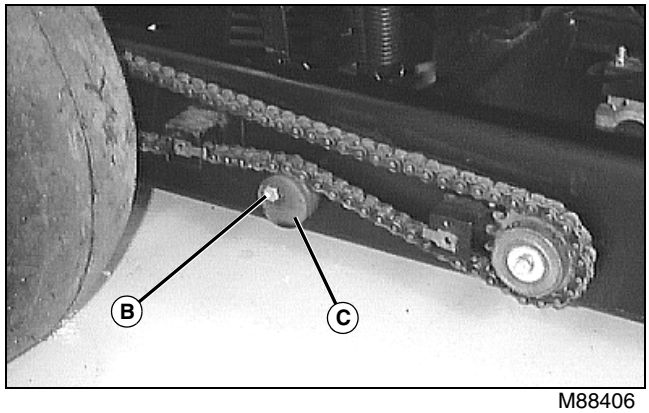
Brake Assembly Mounting Cap Screws . . . . . 20 ± 2 N•m (180 ± 20 lb-in.)
Brake Pad To Rotor Clearance . . . . . 0.5 mm (0.02 in.)

Drive Chain Adjustment S.N. (-060000)



M88407

1. Remove chain guard by removing two screws (A).



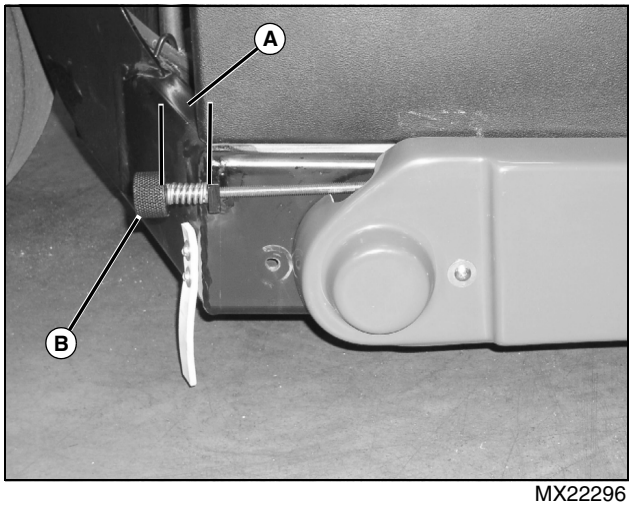
M88406

2. Loosen bolt (B) and rotate chain tensioner (C) to increase chain tension. Chain slack should be minimal; 6.4 - 9.5 mm (1/4 - 3/8 in.) deflection.
3. Tighten hardware and install guard.

Specifications

Chain Tension. . . . 6.4 - 9.5 mm (1/4 - 3/8 in.) deflection

Drive Chain Adjustment - Aercore 800 S.N. (060001-)



MX22296

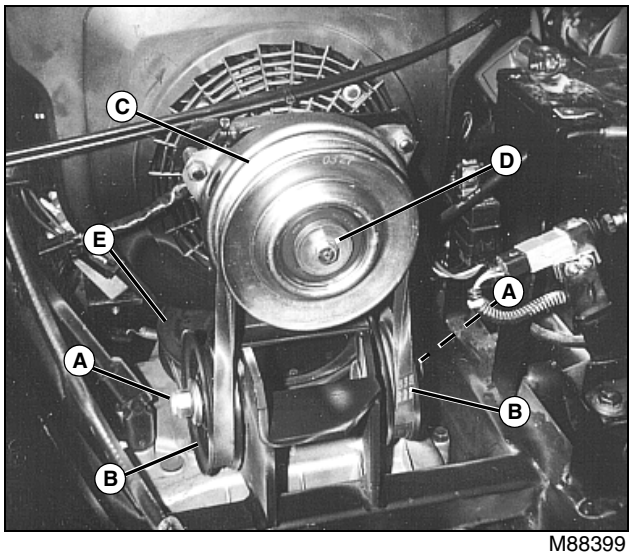
1. Adjust measurement (A) to 1-1/4 in.
   - If measurement (A) is greater than 1-1/4 in., turn knob (B) clockwise to decrease length.
   - If measurement (A) is less than 1-1/4 in., turn knob (B) counterclockwise to increase length.

Transaxle Drive Belt
Removal and Adjustment - Aercore 800

Removal

1. Remove covers on both sides of machine.

NOTE: One idler pulley should be removed and one should remain in place.



M88399

2. Remove nut (A) and idler pulley (B) (either side).

3. Remove belt from the clutch drive sheave (C) and at the two idler pulleys (B).

4. Remove clutch drive sheave bolt (D) and clutch.

5. Remove belt from transmission drive sheave (E) by lifting up and pulling away.

6. Install new belt (if applicable).

7. Install parts in reverse order of disassembly.

8. Apply pressure to idler pulley to put tension on belt. Tighten nut.

9. Install cover.

Specifications

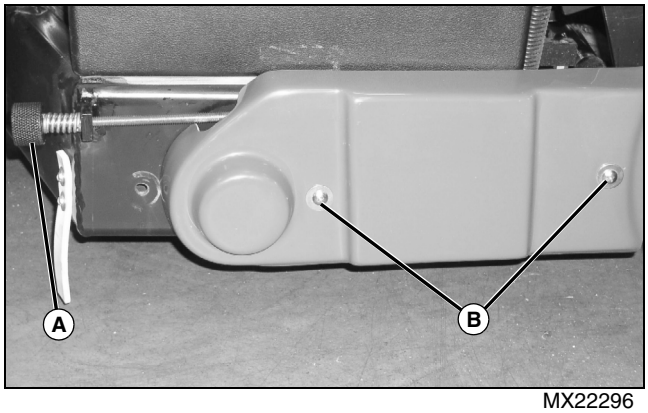
Belt Tension (deflection) . . . . . 5.1 mm (0.2 in.)

Repair

Drive Chain Removal and Installation

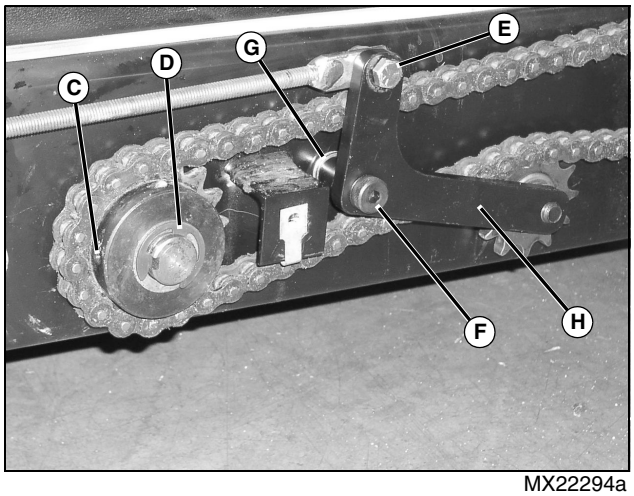
Procedure S.N. (060001-)

1. Remove both rear wheels.See “Rear Wheels and Bearings Removal and Installation - Aercore 800” on page 239



MX22296

2. Release drive chain tension by turning knob (A) counterclockwise. Remove screws (B) and remove chain guard.



MX22294a

3. Loosen set screw (C) on drive sprocket.

4. Remove E-clip (D).

5. Remove cap screw (E) and lock nut.

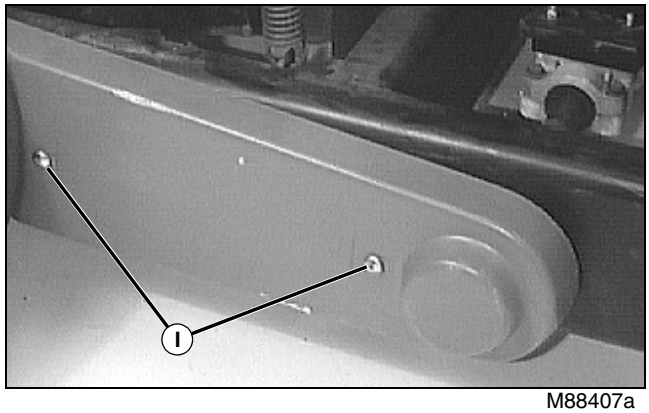
6. Remove shoulder bolt (F), washers (G), and tension arm (H).

7. Remove drive sprocket and chain. Repeat for other side.

8. Installation is done in reverse order. Adjust drive chain tension.See “Drive Chain Adjustment - Aercore 800 S.N. (060001-)” on page 199

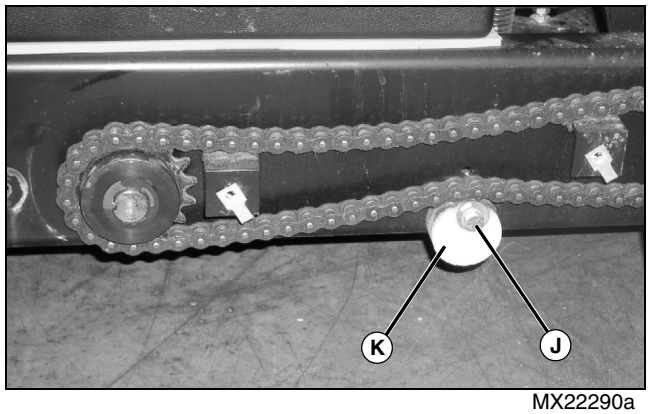
Procedure S.N. (-060000)

1. Remove both rear wheels.See “Rear Wheels and Bearings Removal and Installation - Aercore 800” on page 239



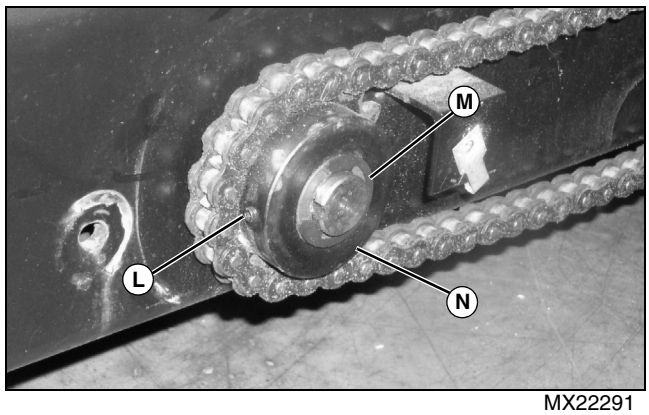
M88407a

2. Remove screws (I) and remove chain guard.



MX22290a

3. Remove cap screw (J) and tensioner block (K).



MX22291

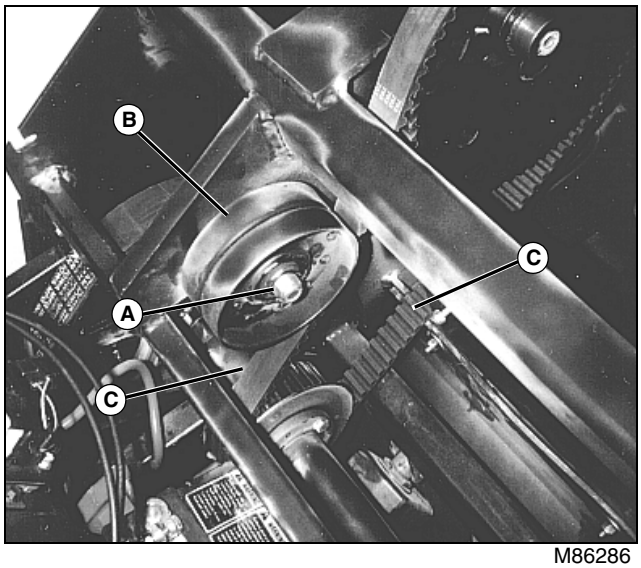
4. Loosen set screw (L), and remove E-clip (M).

5. Remove chain with drive sprocket (N) and washer.

6. Install parts in reverse order of disassembly. Adjust drive chain tension. (See “Drive Chain Adjustment S.N. (-060000)” on page 199.)

Gear Case Removal and Installation - Aercore 1000, 1500 and 2000

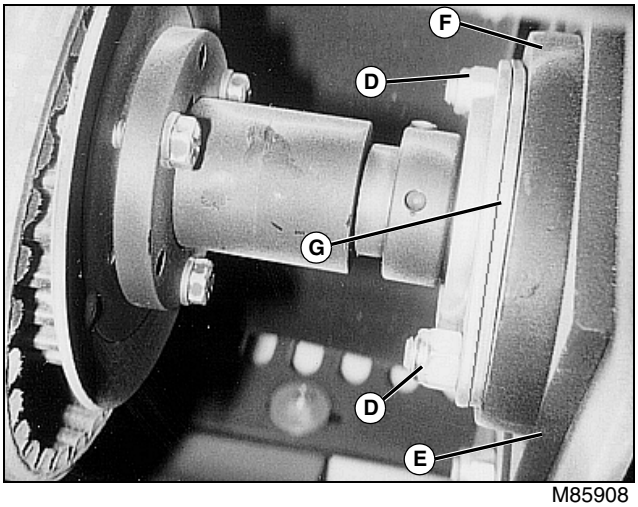
Removal



M86286

Picture Note: Aercore 800 Shown

1. Loosen nut (A) on adjusting idler (B) to remove tension on belt (C).

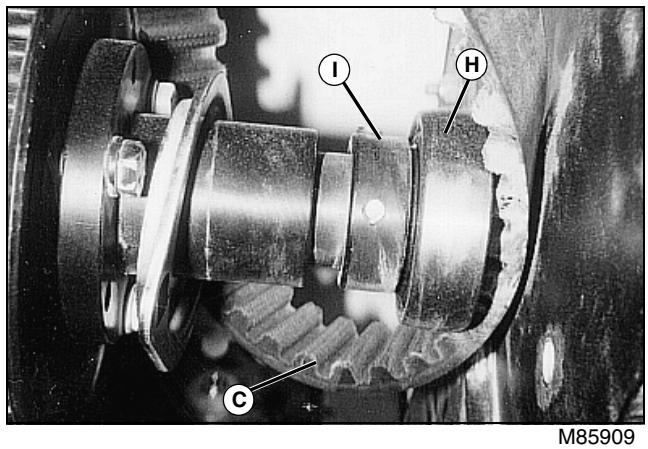


M85908

2. Belt Removal: Remove two lock nuts (D) and bolts securing reduction shaft to the LEFT side wall of the frame.

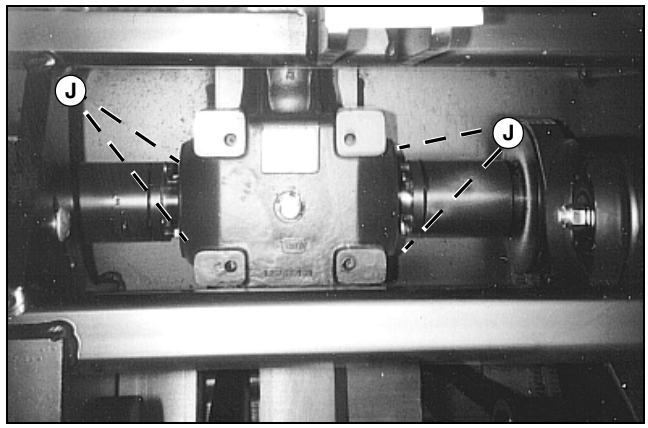
3. Remove blank spacer (E), bearing plate (F) and outer bearing cap (G).

IMPORTANT: Avoid damage! Locking collar and bearing may have to be removed to gain additional clearance. To remove locking collar (I), loosen set screw and gently drive (rotate) collar with punch and hammer. Slide locking collar and bearing towards gear case.



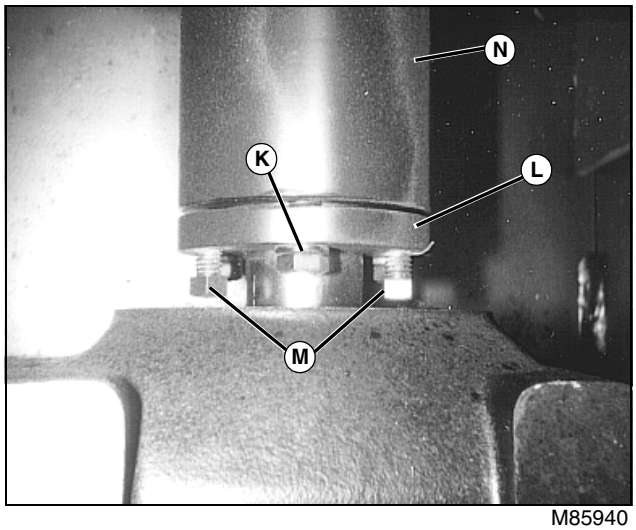
M85909

4. Slide left belt (C) between bearing (H) and side wall of frame. Repeat for right side belt.



M85941

5. Remove four bolts and washers (J) securing gear case to frame.



M85940

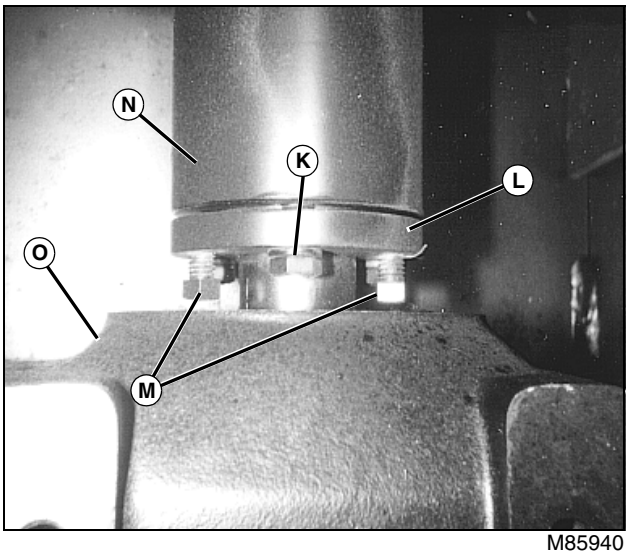
6. Remove hex head bolts (K) from tapered collar (L).

7. Tighten square head bolts (M) evenly to force reduction drive shaft (N) off tapered collar.

8. Repeat for opposite side.

Installation

IMPORTANT: Avoid damage! Ensure that the shaft and tapered collars are completely free of all grease and dirt. Failure to comply could cause the pieces to work loose causing additional maintenance at a later date.



M85940

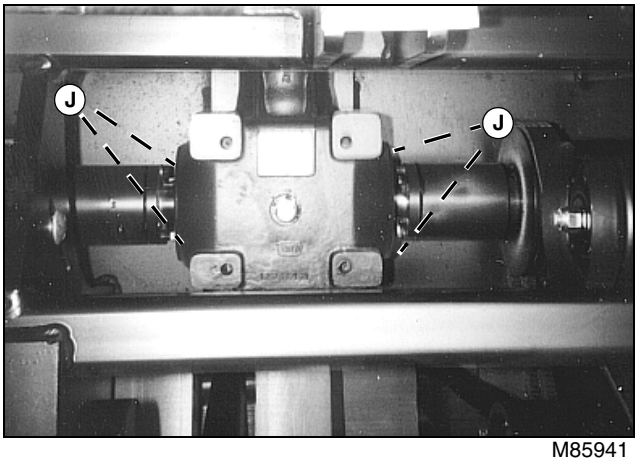
1. Back out square head bolts (M) until flush with tapered collar (L).

2. Install keys and slide tapered collars over gear case (O) output shafts.

3. Position gear case to align with reduction drive shaft (N). Slide gear case to mate with shaft.

4. Tighten hex head bolts (K) finger tight.

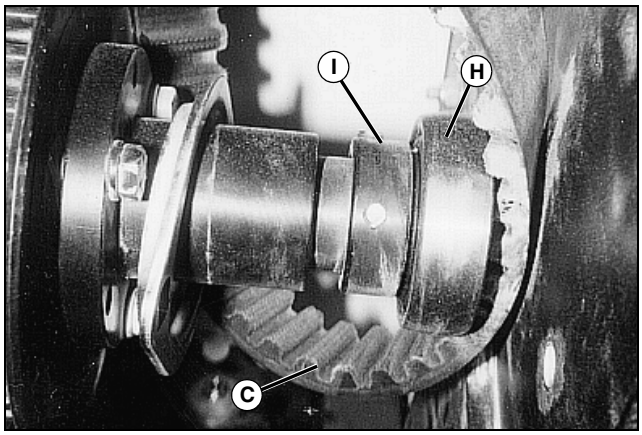
5. Repeat for opposite side.



M85941

6. Install gear case bolts and washers (J) finger tight.

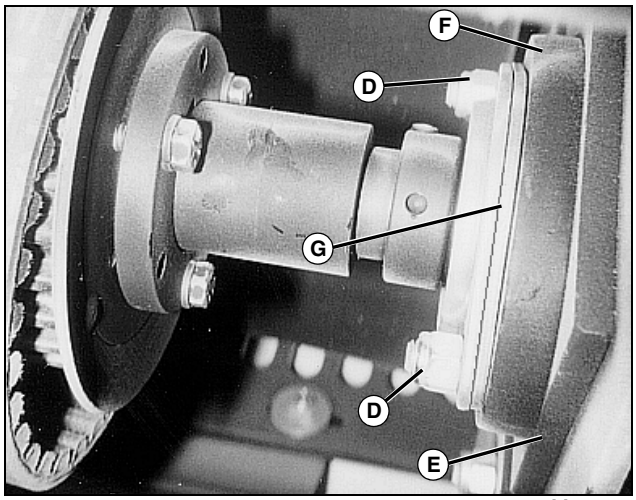
IMPORTANT: Avoid damage! Locking collar (I) and bearing have eccentric centers that have to mate when installed.



M85909

7. Slide left belt (C) between bearing (H) and side wall of frame. Repeat for right side belt.

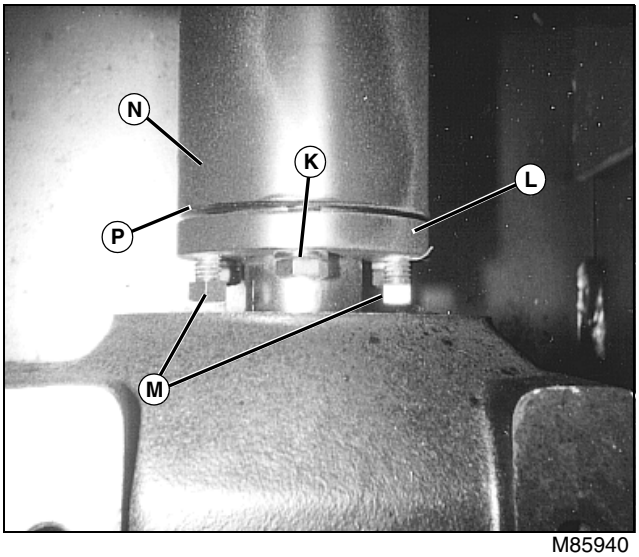
8. Install locking collar (I) and bearing (H) (if removed).



M85908

9. Install outer bearing cap (G), bearing plate (F), and blank spacer (E) first.

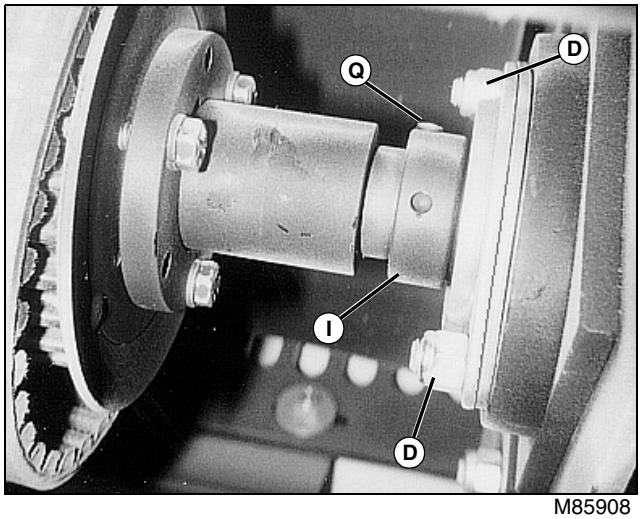
10. Install lock nuts (D) finger tight.



M85940

11.Tighten square head (M) bolts evenly until gap between tapered collar (L) and reduction drive shaft (N) is 17.5 mm (0.69 in.) (P).

12.Tighten hex head bolts (K) evenly to final torque of 35 N•m (26 lb-ft).



M85908

13.Tighten self locking nuts (D) at outside ends of reduction drive shaft. Check for maximum runout of 0.05 mm (0.002 in.) at ends of reduction drive shaft.

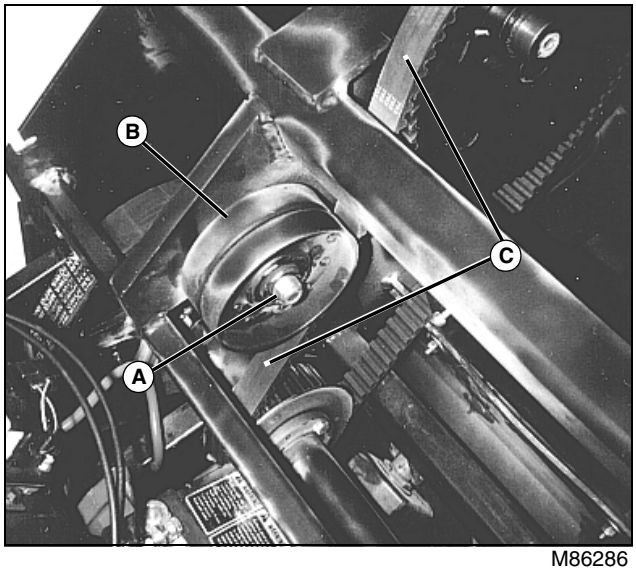
14.Slide locking collar (I) against bearing and rotate clockwise to engage (if removed). Tighten set screw (Q).

15.Tighten gear case mounting bolts to 140 N•m (103.3 lb-ft).

Specifications

Tapered Collar Gap. . . . . 17.5 mm (0.69 in.)
Hex Head Bolts . . . . . 35 N•m (26 lb-ft)
Reduction Drive Runout (Maximum). . . . . 0.05 mm (0.002 in.)
Gear Case Mounting Bolts . . . . . 140 N•m (103.3 lb-ft)

Belt Adjustment



M86286

1. Install belt (C) on adjusting idler pulley.
2. Apply downward pressure on adjusting (B) idler to provide necessary tension to belt. Belt should deflect approximately 5.1 mm (0.2 in.) with 26.2 pounds of pressure or moderate thumb pressure.
3. While maintaining pressure on adjusting idler tighten nut (A). Recheck belt tension.

Specifications

Belt Tension . . . . . 5.1 mm (0.2 in.) with 26.2 lbs. of pressure or moderate thumb pressure

Gear Case Disassembly - Aercore 1000, 1500 and 2000

NOTE: See "Aercore 1000, 1500 and 2000 Gear Case" on page 187 for a complete parts assembly.

1. Remove plug and drain lubricant.
2. Remove back plate.

NOTE: Seals will be destroyed when they are removed. Always replace used seals with new.

3. Remove output shaft seals and snap rings.
4. Remove output shaft and bearings.
5. Remove seal and snap ring from input shaft.
6. Push shaft out through case.
7. Remove bearings from input shaft and gear case.
8. Clean housing and all parts.
9. Inspect housing for cracks.

10.Inspect bearings for wear.

11.Inspect gears for chipped, worn or broken teeth.

12.Inspect shafts for wear and straitness.

13.Inspect bearing caps for wear or galling.

14.Inspect back plate for cracks or distortion.

15.Replace parts as required when assembling gear case.

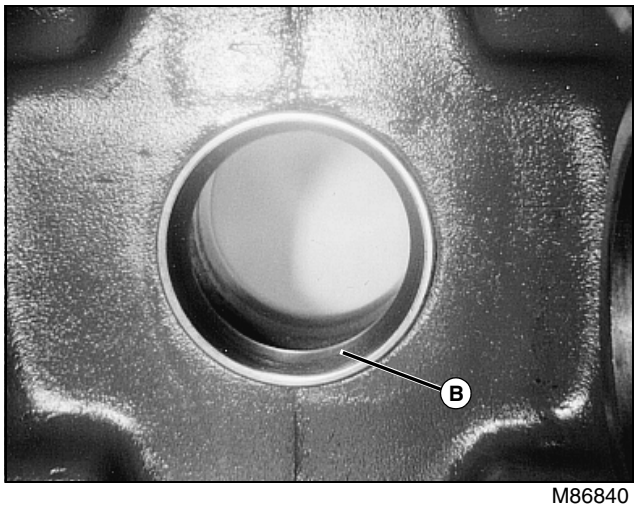
Gear Case Assembly - Aercore 1000, 1500 and 2000

1. Ensure housing and parts are clean and sealant is removed from all mating surfaces.

M86848

Picture Note: Picture note: Looking inside gear case.

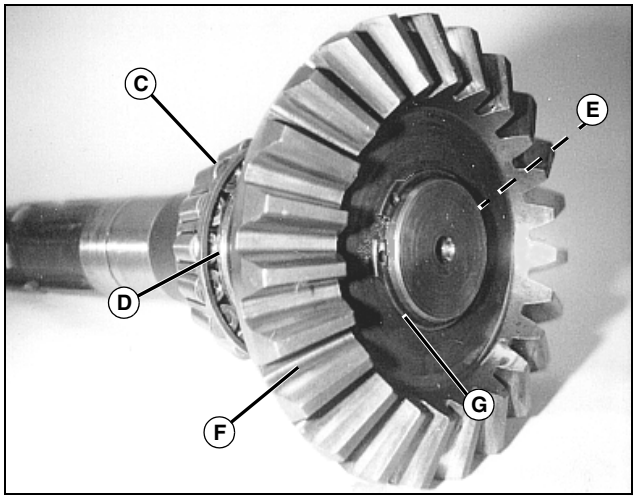
2. Install snap ring (A) into input side of housing.



M86840

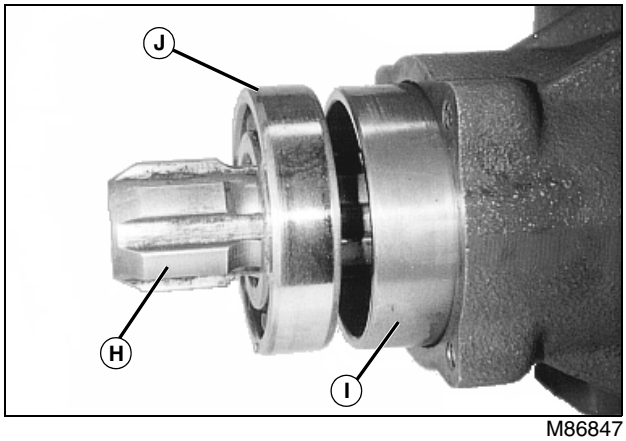
Picture Note: Picture note: Looking inside gear case.

3. Place bearing cup (B) against snap ring.



M86841

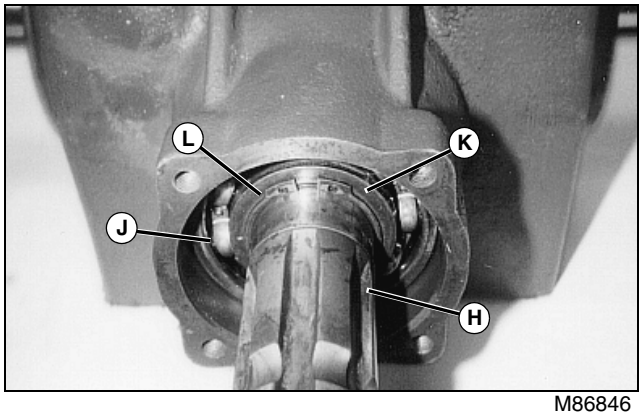
4. Install tapered roller bearing (C), shim(s) (D), key (E), pinion gear (F) and snap ring (G) on input shaft.



M86847

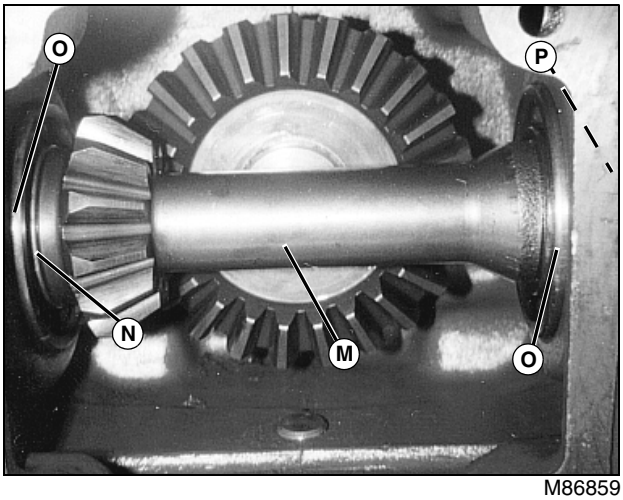
5. Insert pre-assembled input shaft (H) through the back side of the housing and install spacer (I) and ball bearing (J).

6. Ensure that the shaft does not exceed 0.23 N•m (2 lb-in.) of rolling torque with a maximum shaft end play of 0.05 mm (0.002 in.). Add or remove shims as necessary.



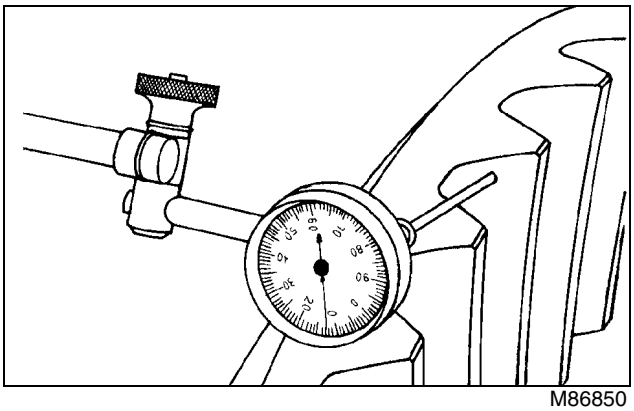
M86846

7. Install shim (K) and snap ring (L) against input shaft bearing (J).

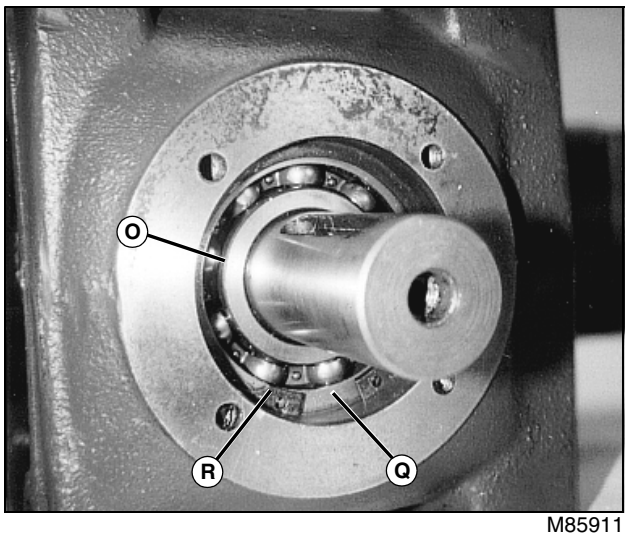


M86859

8. Install output shaft (M), shim (N), bearings (O) and snap ring (P) into gear housing case (depiction shows gear case with serial numbers at top).


M86850

9. Adjust gear contact (medium toe) and gear backlash 0.20 - 0.40 mm (0.01 - 0.02 in.) by adding or removing shims.

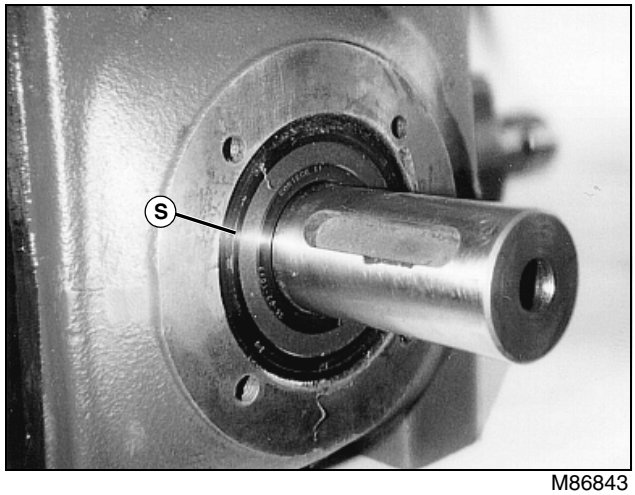


M85911

10.Install shims (Q) on opposite side and install snap ring (R). DO NOT preload bearings (O).

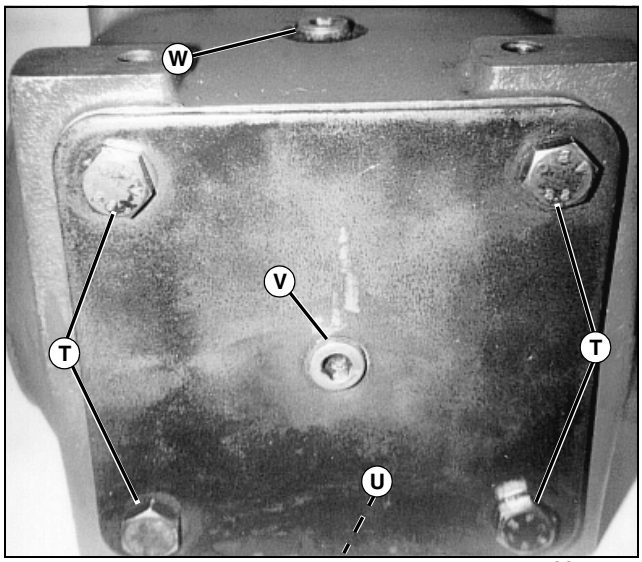
11.Ensure end play does not exceed 0.05 mm (0.002 in.).

12.Rotate gear several revolutions and check for hard points.



M86843

13.Lubricate seal lip and install seal (S) (both sides). DO NOT lubricate outer edge of seals.



M86842

14.Apply sealant to mating surface of back plate.

15.Install back plate and bolts (T). Tighten bolts to 45 N•m (33 lb-ft).

16.Install drain (U) and level plug (V).

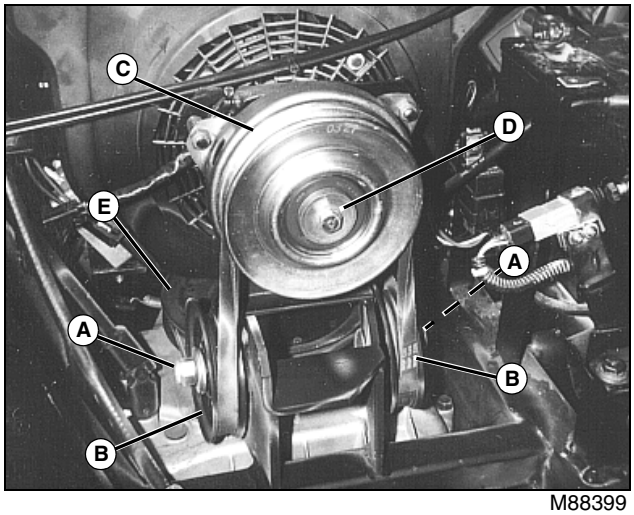
17.Fill with 1.2 L (1.3 qts) GL-5 Gear Lubricant (See Specifications and Information section), and install fill plug (W).

Specifications

End Play . . . . . 0.05 mm (0.002 in.)
Backlash . . . . . 0.20 - 0.40 mm (0.01 - 0.02 in.)
Back Plate Bolts . . . . . 45 N•m (33 lb-ft)

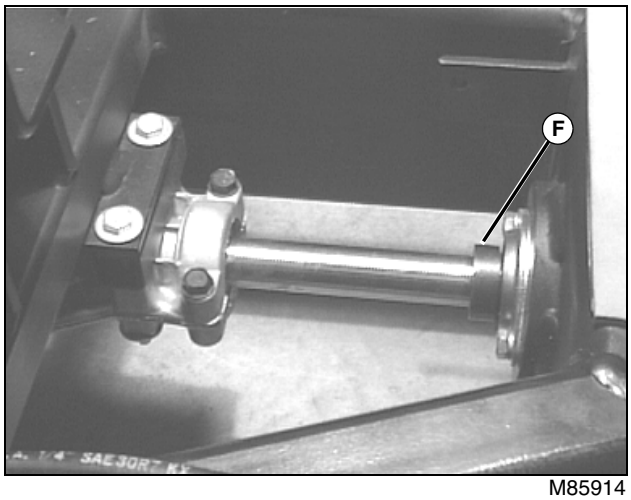
Transaxle Removal and Installation - Aercore 800

1. Remove ignition key and disconnect spark plug wires.
2. Raise unit frame (transaxle area) and support safely.



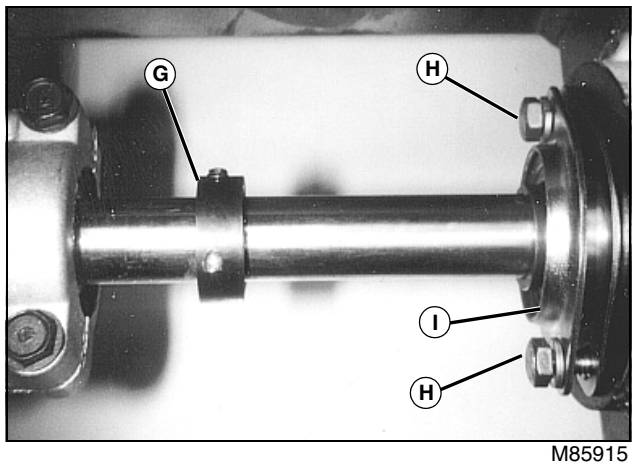
M88399

3. Remove nut (A) securing one idler pulley (B). Remove idler pulley.
4. Remove belt from the clutch drive sheave (C) and at the both idler sheaves.
5. Remove clutch sheave bolt (D) and remove traction drive clutch.
6. Remove belt from transmission drive sheave (E) by lifting up and pulling away.
7. Remove both drive chain guards and drive chains.(See “Drive Chain Removal and Installation” on page 201.)



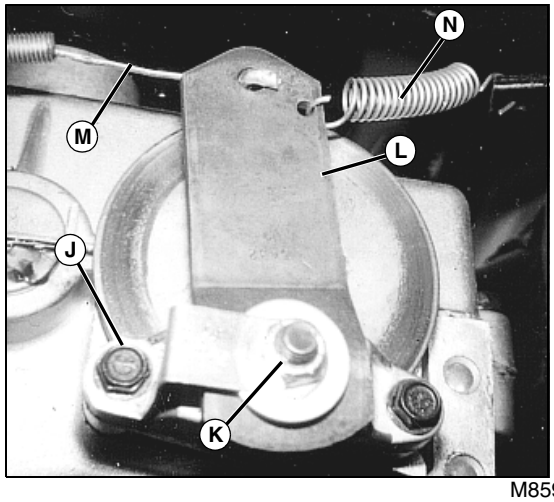
M85914

8. Loosen set screw (F) on axle shaft locking collar.



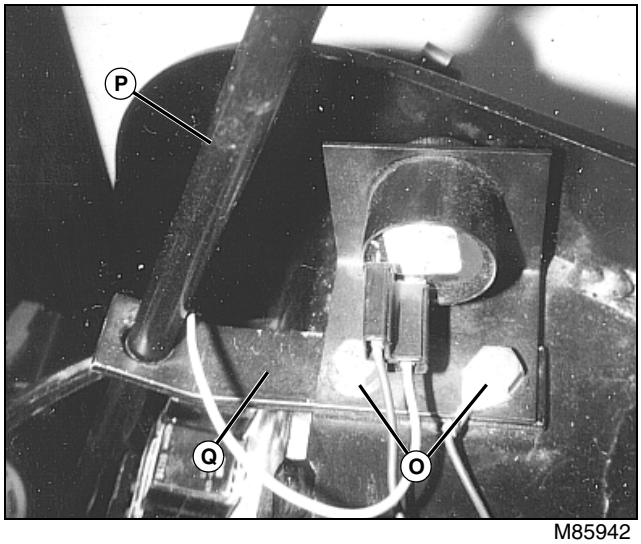
M85915

9. Using suitable punch and hammer drive locking collar (G) forward (clockwise). Repeat for other side.
10. Remove bearing cap to frame bolts (H). Slide locking collar, bearing, and inner bearing cap (I) towards transaxle. Repeat for other side.



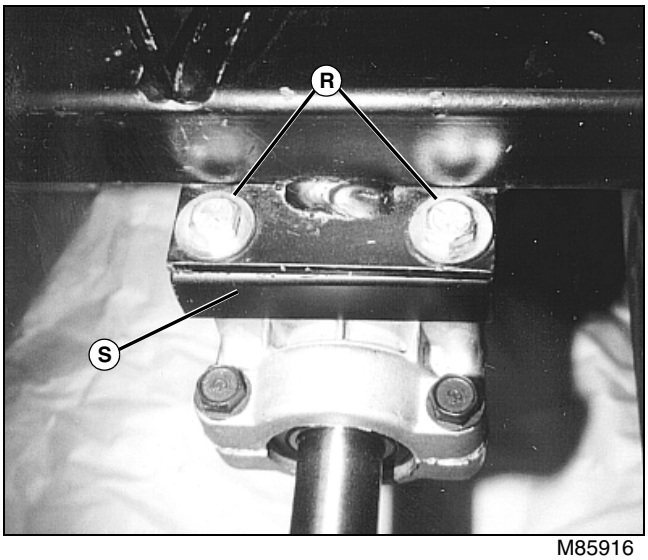
M85937

11. Remove left brake cap screw (J) and adjusting nut (K). Pull brake arm (L) off and allow to hang by brake cable (M) and spring (N).



M85942

12.Remove two bolts (O) holding shift linkage (P) guide (Q).



M85916

13.Remove four transaxle to frame bolts (R) (two per side) and spacers (S). Rear of transaxle should rotate down. This allows for removal of drive sheave and shift linkage.

14.Using suitable punch and hammer drive spring pin from shift linkage. Remove shift linkage from transaxle.

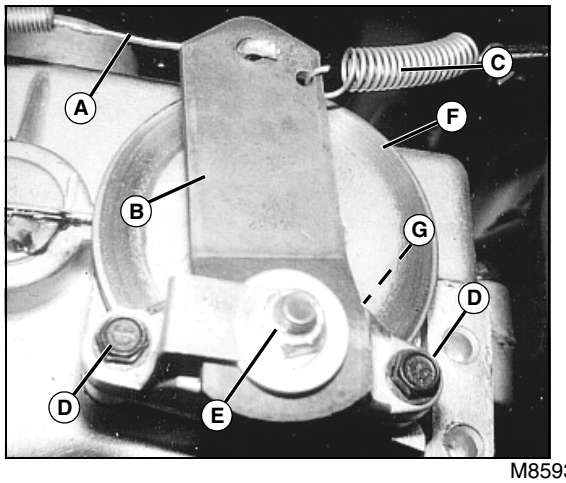
15.Loosen set screws on drive sheave. Remove drive sheave from transaxle.

16.Slide transaxle left then right to remove axles from frame.

17.Install components in reverse order of disassembly. See “Transaxle Drive Belt Removal and Adjustment - Aercore 800” on page 200.

Brakes Removal and Installation - Aercore 800

Removal

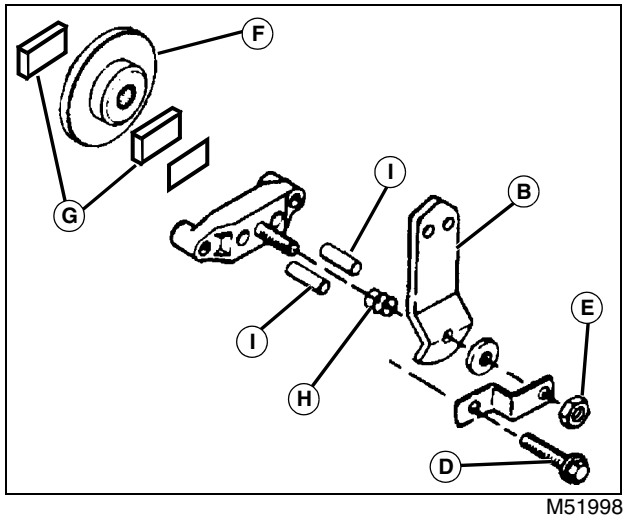


M85937

1. Loosen cable adjustment nut to provide slack in cable (A). Remove cable from brake arm (B).

2. Remove return spring (C) from brake arm.

3. Remove two cap screws (D), adjustment nut (E), rotor (F), and brake pads (G).



M51998

4. Remove spring (H) and pins (I).

5. Check brake linkage, pads (G) and rotor (F) for wear, binding and dirt.

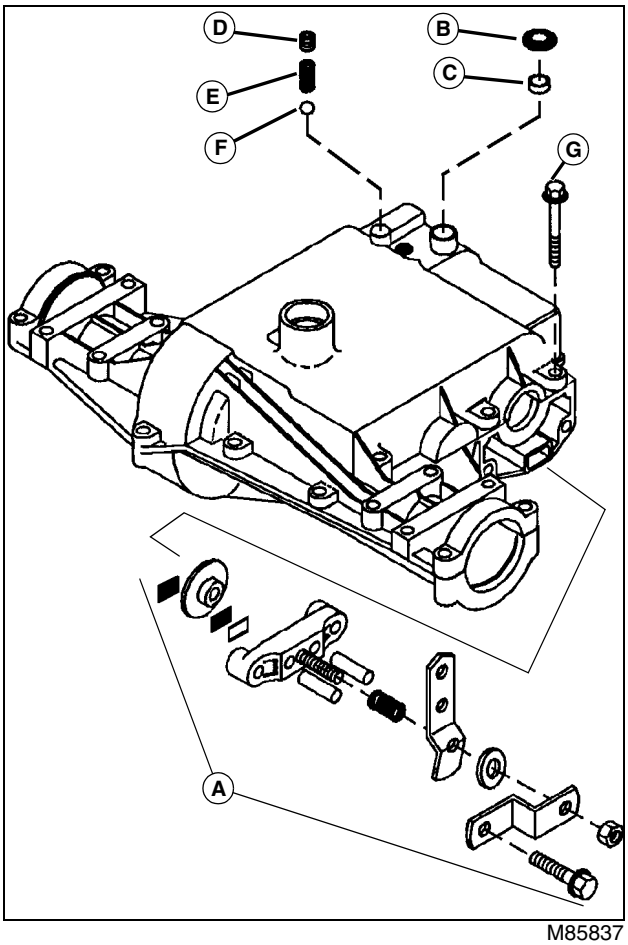
6. Install components in reverse order of disassembly. Apply LUBRIPLATE® to pins.

7. Adjust brake pads. (See “Brake Pad Adjustment - Aercore 800” on page 199.)

Specification

Brake Assembly Mounting Cap Screws. . . . . 20 ± 2 N•m (180 ± 20 lb-in.)

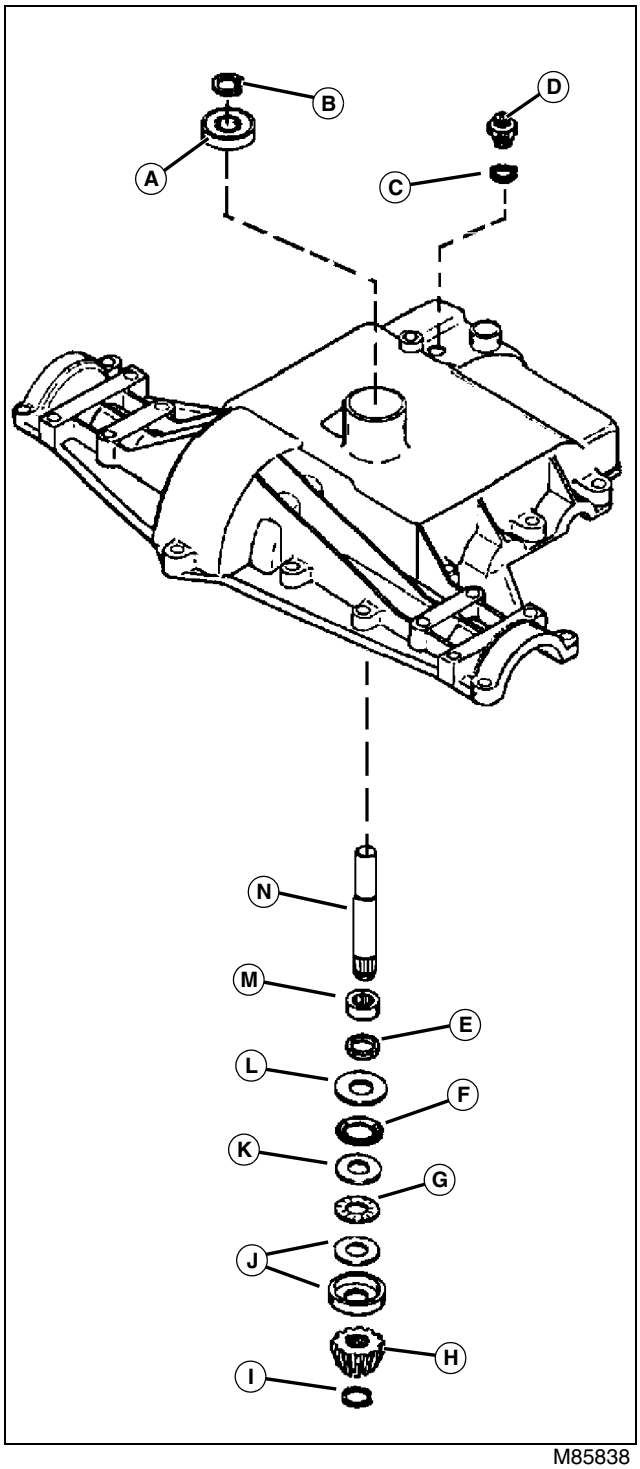
Transaxle Case Disassembly - Aercore 800



M85837

1. Remove brake components (A).
2. Remove push nut (B) and ring (C).
3. Remove set screw (D).
4. Use magnet to remove spring (E) and ball (F). Replace spring and ball if defective.
5. Remove screws (G).

Input Shaft - Disassemble



M85838

A - Bearing
B - Snap Ring
C - O-Ring
D - Plug
E - Oil Seal
F - O-Ring
G - Thrust Bearing

H - Pinion (13 tooth)
I - Snap Ring
J - Washer
K - Washer
L - Washer
M - Needle Bearing
N - Input Shaft

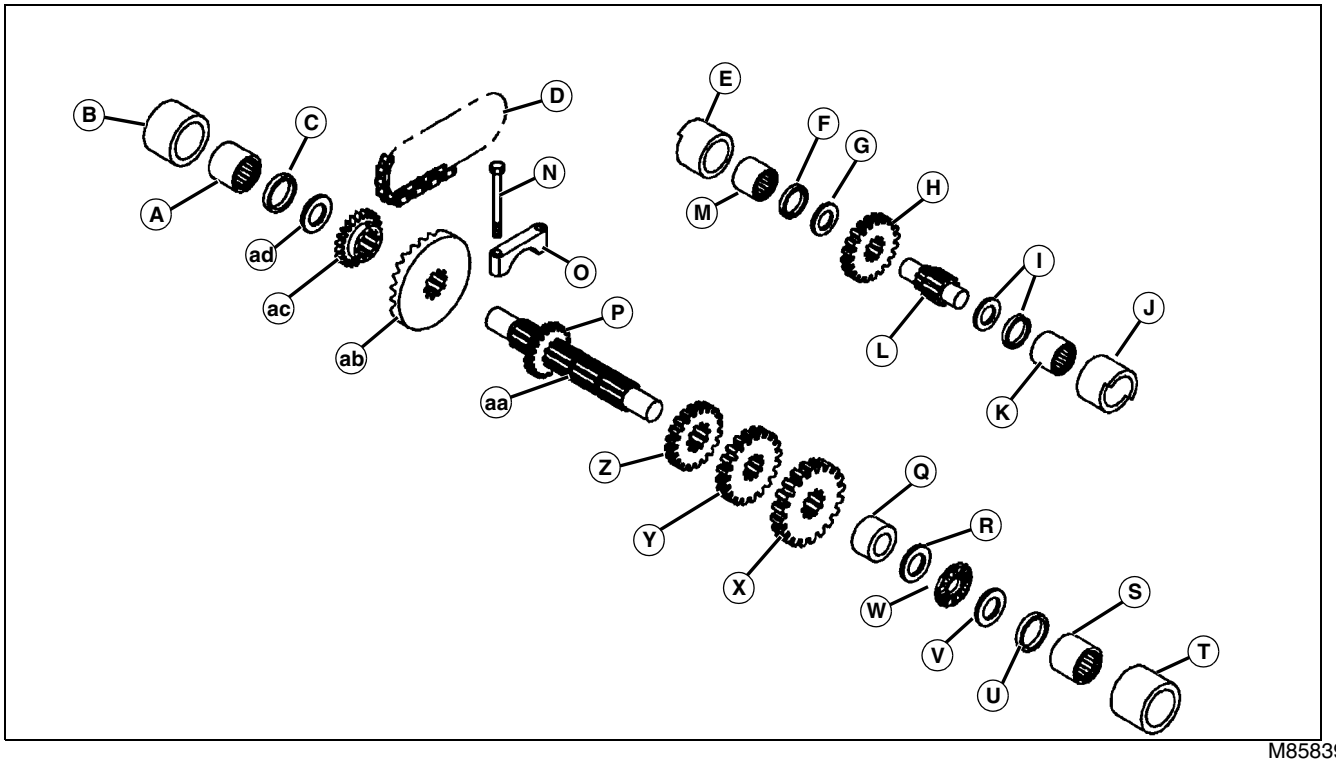
1. Remove plug and O-ring.

2. Remove snap ring and disassemble input shaft assembly.

3. Inspect bearings for roughness. Replace if necessary.

4. Inspect 13 tooth pinion gear for damage and wear. If worn or damaged, also check 33 tooth input bevel gear.

Counter Shaft - Disassemble



M85839

A - Needle Bearing
B - Sleeve
C - O-Ring
D - Link Chain
E - Sleeve
F - Ring
G - Washer
H - Output Gear (35 tooth)
I - Washer
J - Sleeve
K - Needle Bearing
L - Output Shaft
M - Needle Bearing
N - Screw
O - Bearing Cap
P - 1st Gear (9 tooth)
Q - Secondary Sleeve
R - Washer
S - Needle Bearing
T - Sleeve
U - O-Ring
V - Washer
W - Thrust Bearing
X - 4th Gear (16 tooth)
Y - 3rd Gear (15 tooth)
Z - 2nd Gear (12 tooth)
AA- Counter Shaft
AB- Gear (33 tooth)
AC- Sprocket (14 tooth)
AD- Washer

1. Remove shifter fork from shifter shaft assembly (not depicted).

2. Remove shift/brake shaft (not depicted) assembly and counter shaft assembly (AA).

3. Remove sleeve (E), needle bearing (M), ring (F), washer (G) and output gear (H) from output shaft.

4. Remove remaining washers (I), needle bearing (K) and sleeve (J) from output shaft.

5. Remove sleeve (B), needle bearing (A), O-ring (C), and washer (AD) from counter shaft (AA).

6. Slide counter shaft back to allow removal of 14 tooth sprocket (AC).

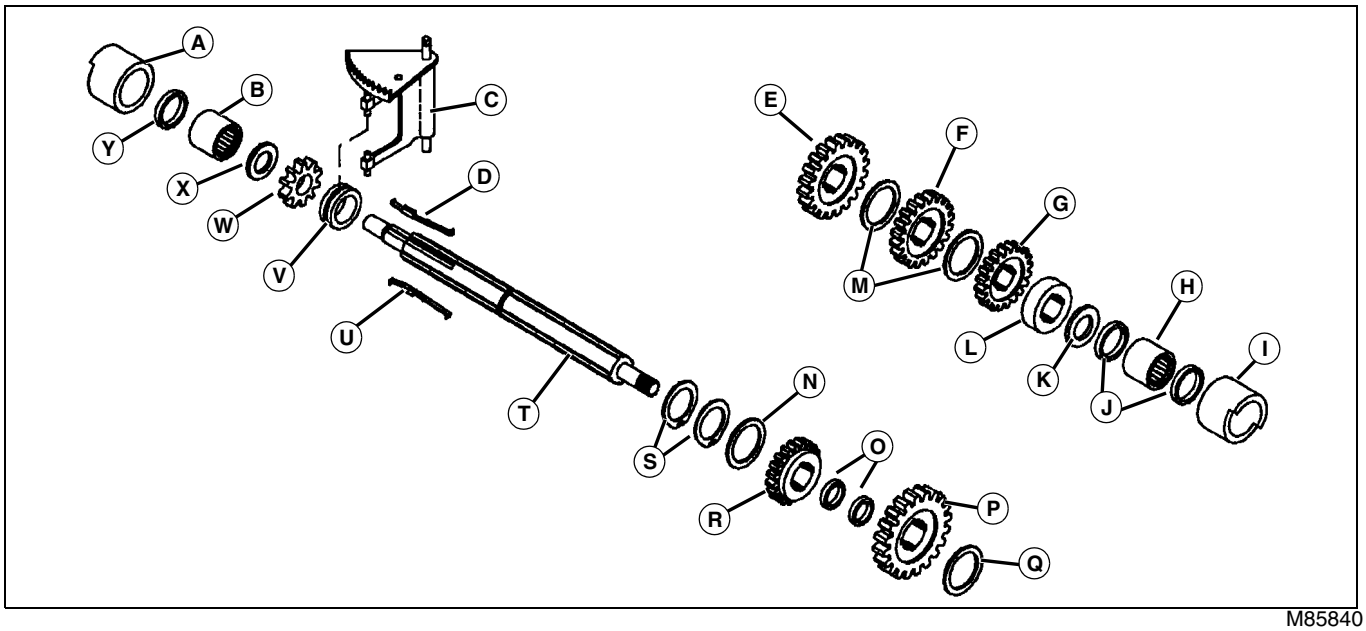
7. Remove 14 tooth sprocket and 33 tooth gear (AB) from counter shaft.

8. Remove sleeve (T), needle bearing (S), O-ring (U), thrust bearing (W), washers (V and R) and secondary sleeve (Q) from opposite end of counter shaft.

9. Alternately remove 16 tooth gear (X), 15 tooth gear (Y), 12 tooth gear (Z), and 9 tooth gear (P) from counter shaft.

10.Clean parts and replace O-rings and visibly damaged parts.

Shift/Brake Shaft - Disassemble



M85840

A - Sleeve
B - Needle Bearing
C - Shift Fork
D - Key
E - 2nd Gear (37 tooth)
F - 3rd Gear (35 tooth)
G - 4th Gear (34 tooth)
H - Needle Bearing
I - Sleeve
J - O-Ring
K - Washer
L - Spacer
M - Washer
N - Washer
O - Neutral Spacer
P - 1st Gear (41 tooth)
Q - Washer
R - Reverse Sprocket (14 tooth)
S - O-Ring
T - Shift/Brake Shaft
U - Key
V - Shift Collar
W - Spur Gear (15 tooth)
X - Washer
Y - O-Ring

1. Remove sleeve (A), needle bearing (B), washer (X) and 15 tooth spur gear (W) from shift/brake shaft (T).

2. Remove shift collar (V) and keys (D and U) from shift/brake shaft.

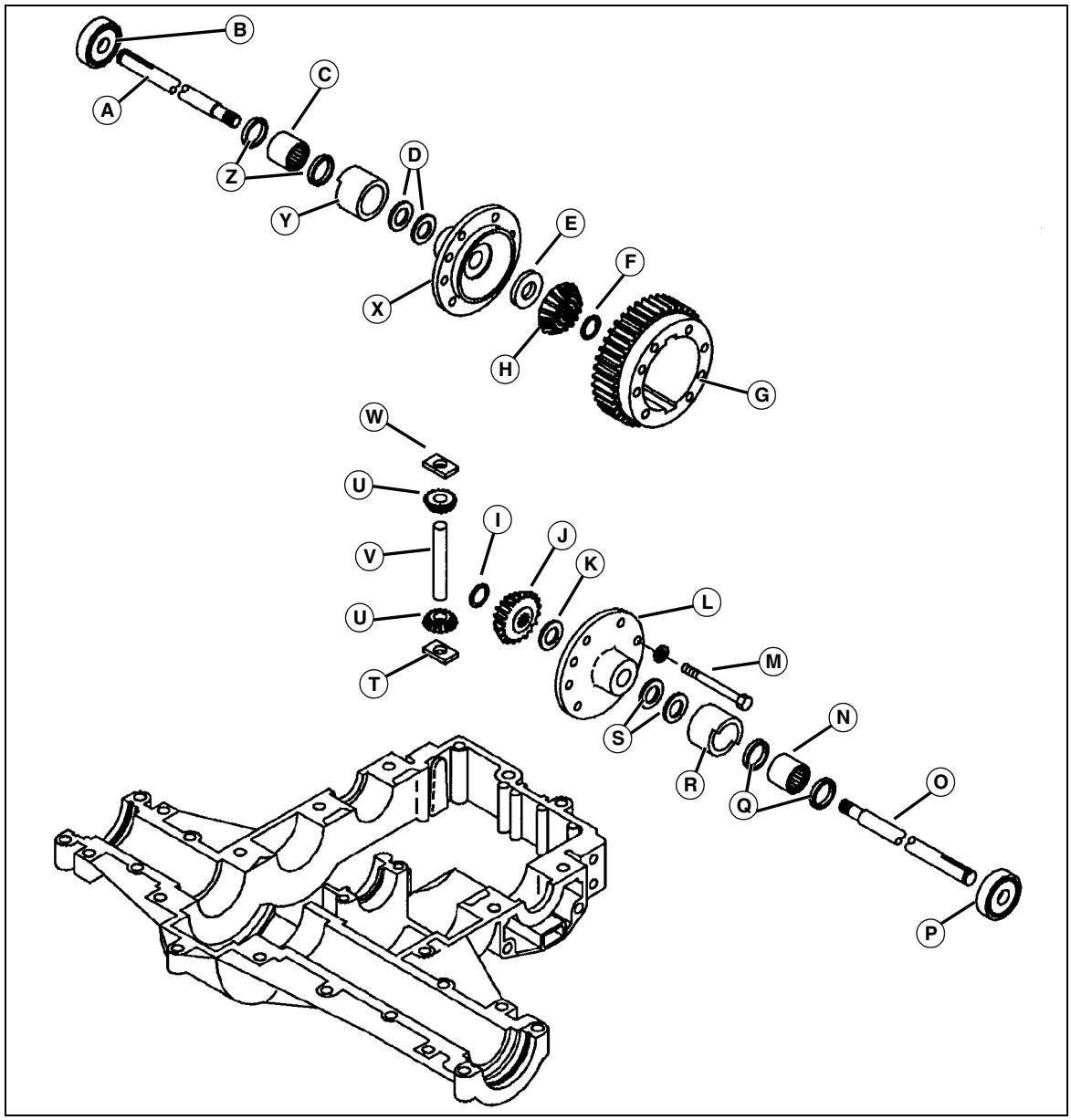
3. Remove sleeve (I), needle bearing (H), washer (K) and spacer (L) from opposite end of shift/brake shaft.

4. Alternately remove 34 tooth gear (G), 35 tooth gear (F), 37 tooth gear (E), and 41 tooth gear (P), and washers (Q and M).

5. Remove neutral spacers (O) and 14 tooth reverse sprocket (R).

6. Clean and replace damaged parts.

Differential - Disassemble



M85841

A - Axle
B - Ball Bearing
C - Needle Bearing
D - Washers
E - Washer
F - Snap Ring
G - Ring Gear (31 tooth)
H - Gear (16 tooth)
I - Snap Ring
J - Gear (16 tooth)
K - Washer
L - Differential Carrier
M - Screw
N - Needle Bearing
O - Axle
P - Ball Bearing
Q - Rings
R - Sleeve
S - Washers
T - Drive Block
U - Pinion (14 tooth)
V - Pin
W - Drive Block
X - Differential Carrier
Y - Sleeve
Z - Ring

1. Remove differential assembly from lower case.

IMPORTANT: Avoid damage! Keep components for each axle separate to aid in reassembly.

2. Remove screws from differential carrier to separate axle assembly.

3. Remove drive blocks (T and W) and 14 tooth pinion gears (U) from pin (V).

4. Remove ball bearings (B and P) from both axles.

5. Remove snap rings (F and I), 16 tooth gears (H and J) and washers (E and K) from both axles.

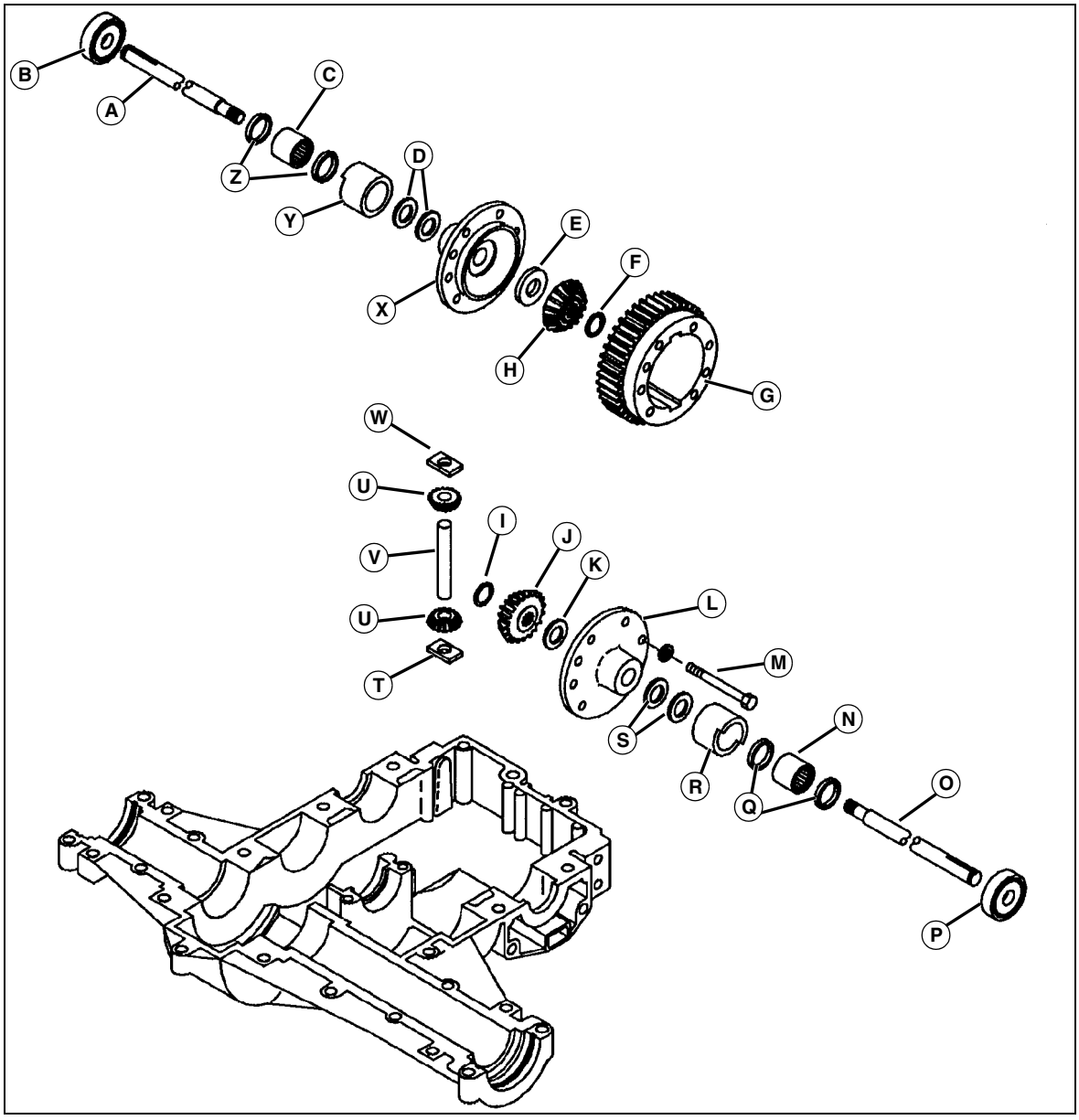
6. Slide axle shafts (A and O) from differential carriers.

7. Remove washers (D and S), sleeves (R and Y), rings (Q and Z), and needle bearings (C and N) from both axle shafts.

8. Clean and replace damaged parts.

Transaxle Case Assembly - Aercore 800

Differential - Assemble



M85841

A - Axle
B - Ball Bearing
C - Needle Bearing
D - Washers

E - Washer
F - Snap Ring
G - Ring Gear (31 tooth)
H - Gear (16 tooth)
I - Snap Ring
J - Gear (16 tooth)
K - Washer
L - Differential Carrier
M - Screw
N - Needle Bearing
O - Axle
P - Ball Bearing
Q - Rings
R - Sleeve
S - Washers
T - Drive Block
U - Pinion (14 tooth)
V - Pin
W - Drive Block
X - Differential Carrier
Y - Sleeve
Z - Ring

1. Apply 11 mL (0.40 oz) Bentonite grease to each axle case housing. This amount is subtracted from the total amount of grease used.

2. Install 14 tooth pinion gears (U) on pin (V). Install drive blocks (T and W) on pin to secure pinion gears.

3. Install ball bearings (B and P) on the end of each axle shaft (A and O).

4. Install ring (Q and Z), needle bearing (C and N), secondary ring, sleeve (R and Y) and washers (D and S) on axle. Repeat for remaining axle.

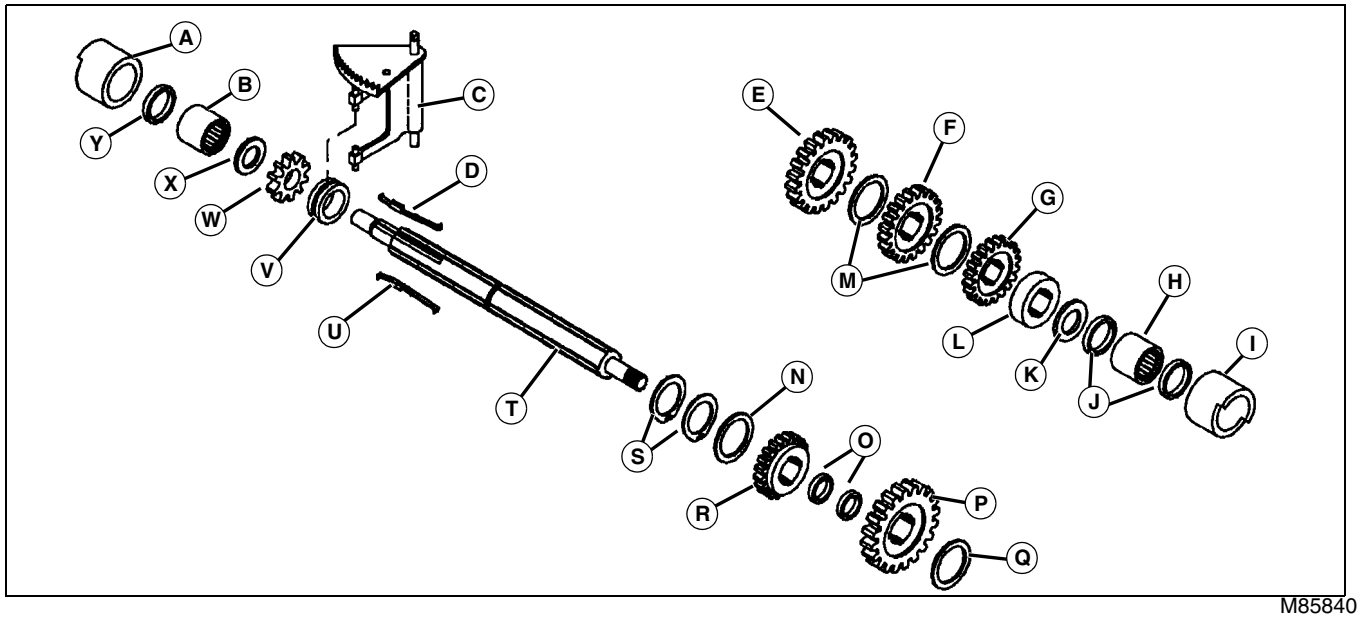
5. Insert axle in differential carrier. Install washer and 16 tooth gear (H and J). Install snap ring (F and I). Repeat for remaining axle.

6. Insert pinion gear assembly in ring gear (G).

7. Align differential carriers (L and X) on each side of ring gear.

8. Install screws.

Shift/Brake Shaft - Assemble



M85840

A - Sleeve
B - Needle Bearing
C - Shift Fork
D - Key
E - 2nd Gear (37 tooth)
F - 3rd Gear (35 tooth)
G - 4th Gear (34 tooth)
H - Needle Bearing
I - Sleeve
J - O-Ring
K - Washer
L - Spacer
M - Washer
N - Washer
O - Neutral Spacer
P - 1st Gear (41 tooth)
Q - Washer
R - Reverse Sprocket (14 tooth)

S - O-Ring
T - Shift/Brake Shaft
U - Key
V - Shift Collar
W - Spur Gear (15 tooth)
X - Washer
Y - O-Ring

1. Put LUBRIPLATE® lubricant in keyways of shift/brake shaft.

2. Insert keys in shift/brake shaft (T). Install shift collar (V) over keys (D and U) with thicker shoulder of collar towards shaft.

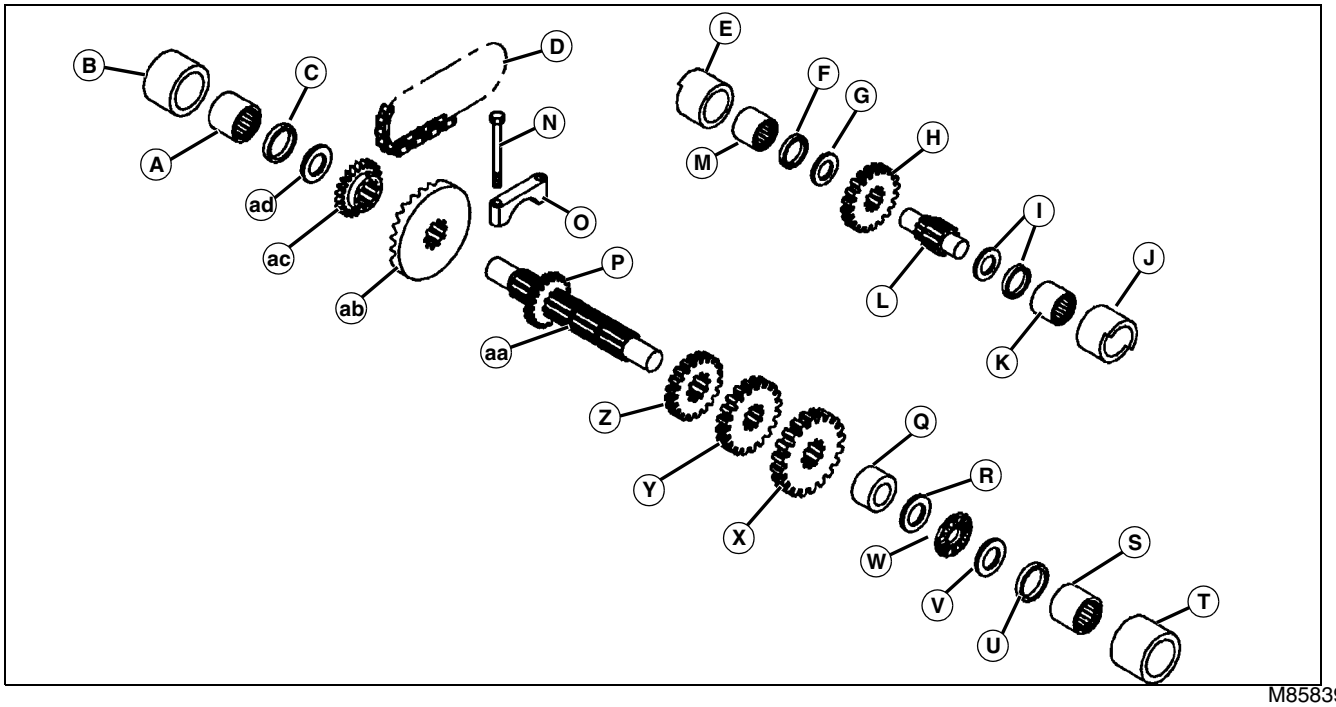
3. Install 15 tooth spur gear (W), washer (X), needle bearing (B), new O-ring (Y), and sleeve (A).

4. Install new O-rings (2), 14 tooth reverse sprocket (R), and neutral spacers (O) on opposite end of shift/brake shaft.

5. Install 41 tooth gear (P), washer (Q), 37 tooth gear (E), washer (M), 35 tooth gear (F), washer, 34 tooth gear (G), and spacer (L).

6. Install washer (K), new O-rings (2) (J), needle bearing (H) and sleeve (I).

Counter Shaft - Assemble



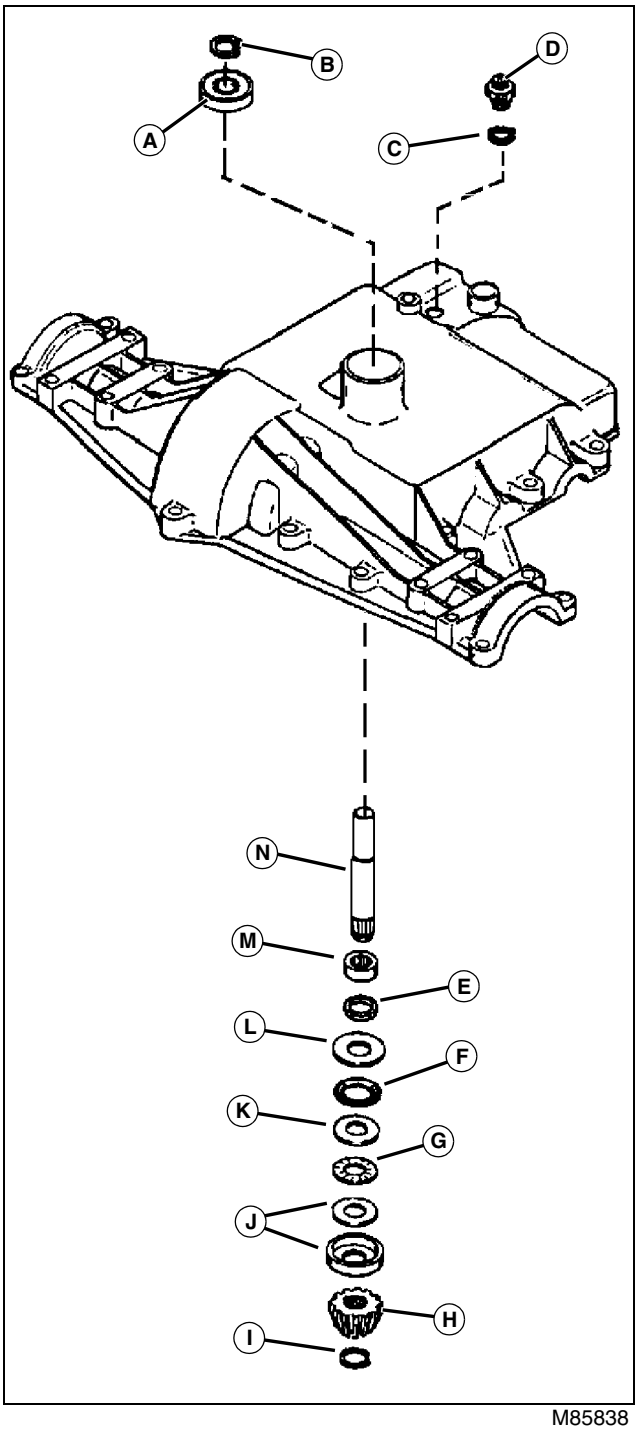
M85839

A - Needle Bearing
B - Sleeve
C - O-Ring
D - Link Chain
E - Sleeve
F - Ring
G - Washer
H - Output Gear (35 tooth)
I - Washer
J - Sleeve
K - Needle Bearing
L - Output Shaft
M - Needle Bearing
N - Screw
O - Bearing Cap
P - 1st Gear (9 tooth)
Q - Secondary Sleeve
R - Washer
S - Needle Bearing
T - Sleeve
U - O-Ring
V - Washer
W - Thrust Bearing
X - 4th Gear (16 tooth)
Y - 3rd Gear (15 tooth)
Z - 2nd Gear (12 tooth)
AA- Counter Shaft
AB- Gear (33 tooth)
AC- Sprocket (14 tooth)
AD- Washer

1. Install 33 tooth gear (AB), 14 tooth sprocket (AC), washer (AD), new O-ring (C), needle bearing (A) and sleeve (B) on short end of counter shaft (AA).

2. Install 12 tooth gear (Z), 15 tooth gear (Y), 16 tooth gear (X), and secondary sleeve (Q) on opposite end of counter shaft.

Input Shaft - Assemble



M85838

A - Bearing
B - Snap Ring
C - O-Ring
D - Plug
E - Oil Seal
F - O-Ring
G - Thrust Bearing
H - Pinion (13 tooth)
I - Snap Ring
J - Washer
K - Washer
L - Washer
M - Needle Bearing
N - Input Shaft

1. If new bearings are used, press top bearing (A) flush with cover.

2. Install washers (J and K), thrust bearing (G), and O-ring (F) on shaft.

3. Install washer (L), oil seal (E), and needle bearing (M) on shaft. Use Unirex N3 Grease® for needle bearings.

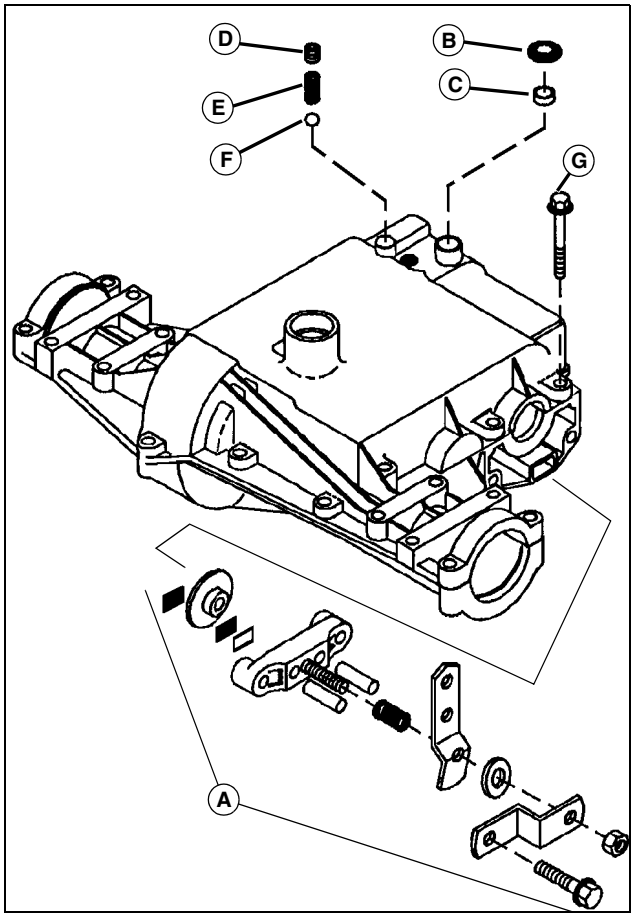
4. Install 13 tooth pinion gear (H) and snap ring (I).

NOTE: Lower bearing to top of cover depth should be 3.43 - 3.81 mm (0.135 - 0.150 in.).

5. Install input shaft from inside cover.

Case - Assemble

1. Fill case with Bentonite grease to specification.



M85837

2. Apply silicone sealant and install top cover.

3. Tighten cap screws (G) evenly to final torque of 11.3 N•m (100 lb-in.).

4. Install ball (F), spring (E), and set screw (D). Tighten screw till flush with cover.

5. Install ring (C) and push nut (B) (if removed).

IMPORTANT: Avoid damage! Install gear shift linkage and check for binding before installing transaxle in Aercore 800.

6. Turn input shaft to check for binding.

7. Install brake components (A). Use medium strength thread lock and sealer T43512 and tighten brake cap screw.

8. Install transaxle in Aercore 800. See “Transaxle Removal and Installation - Aercore 800” on page 207 and “Brake Pad Adjustment - Aercore 800” on page 199.

Specifications

Transaxle Cover
Cap Screws . . . . . 11.3 N•m (100 lb-in.)
Transaxle Case Capacity . . . . . 1.0 L (30 oz.)

Table of Contents

Specifications

Repair Specifications

Hydraulic Pump

Oil Capacity	**1.9 L (2.0 qt)**

Tests and Adjustments

Check Hydraulic Oil Level

IMPORTANT: Avoid damage! Check oil level in hydraulic pump when oil is cold. Oil will expand during operation and could overflow.

1. Park the machine safely. (See Parking Safely in the SAFETY section.)

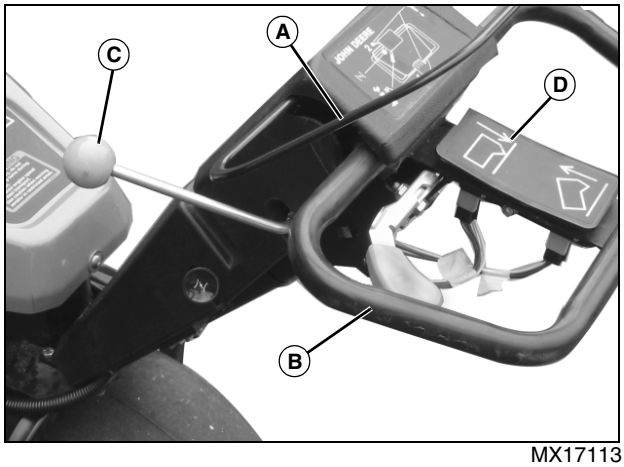
2. Aeration head must be lowered to lowest point to allow access to engine compartment.

NOTE: Put transport stops in aeration position. Aeration head must be lowered to lowest point to allow access to engine compartment.

3. Lower aeration head:

   a. Turn key to ON position.

   b. Put MANUAL/AUTOMATIC switch in MANUAL position.



MX17113

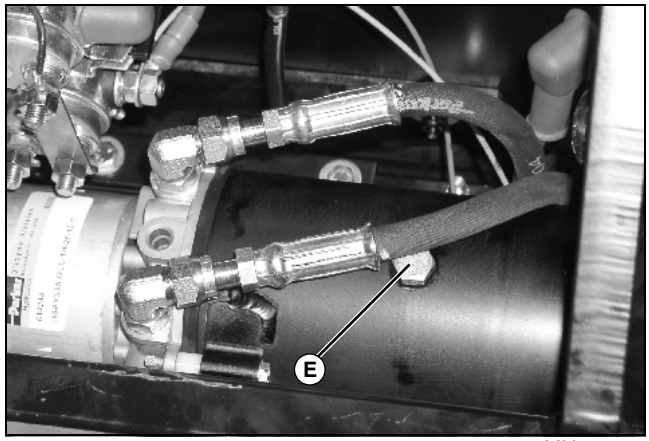
   c. Hold bail (A) to handlebar (B).

   d. Pull clutch lever (C) toward the operator to engage drive clutch.

   e. Push and hold the aerator engagement switch (D) in the direction of the aeration head to lower aeration head.

   f. Turn key to STOP position. Release bail.

4. Remove aeration head cover.



MX22681

5. Remove plug (E) from pump.

6. Fluid level should be to specifications.

   - If oil is low, add oil to bring oil level no higher than specification.
   - If oil is overfull, drain oil to proper level.

Specifications

Hydraulic Fluid Level . . . . . 12 - 19 mm (0.5 - 0.75 in.)
. . . . . Below fill plug hole

Repair

Reservoir Seal Replacement

1. Park the machine safely.

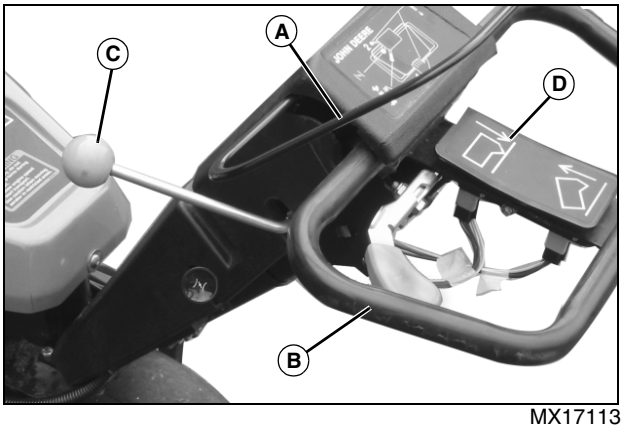
2. Aeration head must be lowered to lowest point to allow access to engine compartment.

NOTE: Put transport stops in aeration position. Aeration head must be lowered to lowest point to allow access to engine compartment.

3. Lower aeration head:

   a. Turn key to ON position.

   b. Put MANUAL/AUTOMATIC switch in MANUAL position.



MX17113

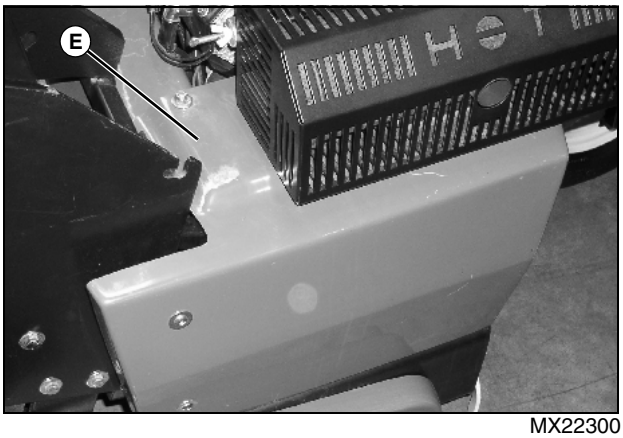
   c. Hold bail (A) to handlebar (B).

   d. Pull clutch lever (C) toward the operator to engage drive clutch.

   e. Push and hold the aerator engagement switch (D) in the direction of the aeration head to lower aeration head.

   f. Turn key to STOP position. Release bail.

4. Remove aeration head cover.



MX22300

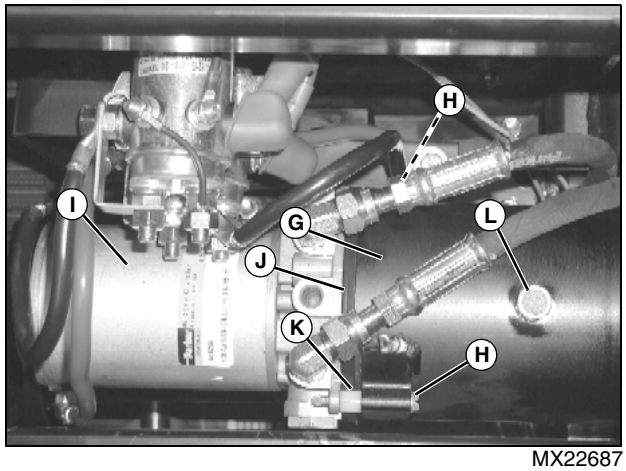
5. Remove clutch cover (E).

MX22301

6. Remove battery cover (F).

7. Disconnect negative (-) battery cable. Disconnect positive (+) battery cable.

8. Remove battery.



MX22687

9. Place drain pan under reservoir (G).

10. Remove through bolts (H) and remove reservoir by pulling away from pump (I).

11. Allow oil to drain completely. Clean reservoir with clean solvent.

12. Check reservoir seal (J) and through bolt seals (K) for any damage.

13. Lightly coat reservoir seal with grease.

14. Install reservoir with filler plug (L) towards the top and secure with through bolts.

15. Fill reservoir to specifications and install fill plug.

16. Install battery and secure battery cables.

17. Install battery cover. Install clutch cover.

18. Raise and lower coring head several times to work the air out of the system and check for hydraulic leaks.

19.Raise coring head and remove fill plug. Fluid level should be to specifications. Add oil if necessary.

20.Install aeration head cover.

Specifications

Hydraulic Fluid Level . . . . . 12 - 19 mm (0.5 - 0.75 in.)
. . . . . Below fill plug hole
Hydraulic Fluid Type . . . . . Bio-Hygard™

Hydraulic Pump Removal and Installation

Removal

CAUTION: Avoid injury! Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury may call Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

Always lower all attachments to the ground before you work on the machine. If must work on a lifted machine or attachment, securely support the machine or attachment. Failure to do so may result in serious injury.

1. Park the machine safely.

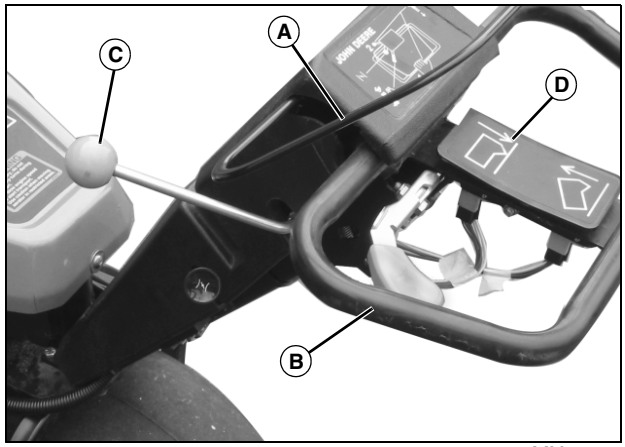
2. Aeration head must be lowered to lowest point to allow access to engine compartment.

NOTE: Put transport stops in aeration position. Aeration head must be lowered to lowest point to allow access to engine compartment.

3. Lower aeration head:

   a. Turn key to ON position.

   b. Put MANUAL/AUTOMATIC switch in MANUAL position.



MX17113

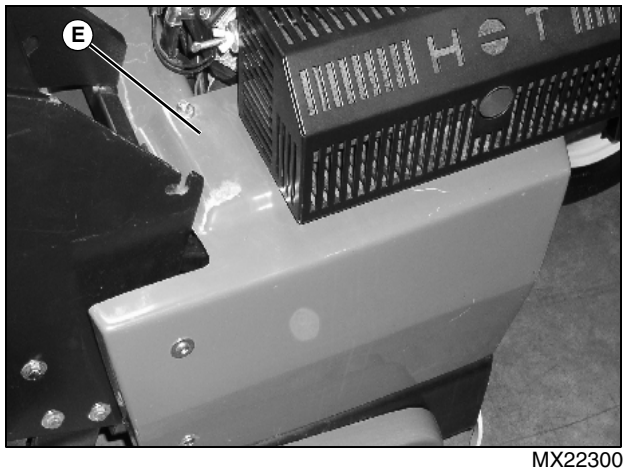
   c. Hold bail (A) to handlebar (B).

   d. Pull clutch lever (C) toward the operator to engage drive clutch.

   e. Push and hold the aerator engagement switch (D) in the direction of the aeration head to lower aeration head.

   f. Turn key to STOP position. Release bail.

4. Remove aeration head cover.



MX22300

5. Remove clutch cover (E).

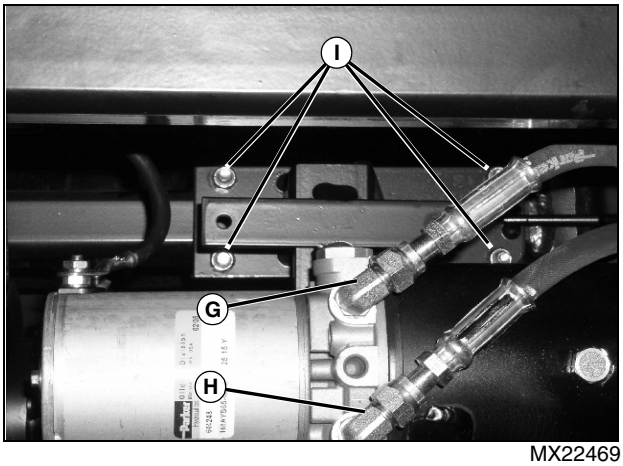
MX22301

6. Remove battery cover (F).

7. Disconnect negative (-) battery cable. Disconnect positive (+) battery cable.

NOTE: Record the location of electrical connections to aid in assembly.

8. Disconnect all electrical connections from solenoids.



MX22469

Picture Note: Solenoids removed for photo clarity.

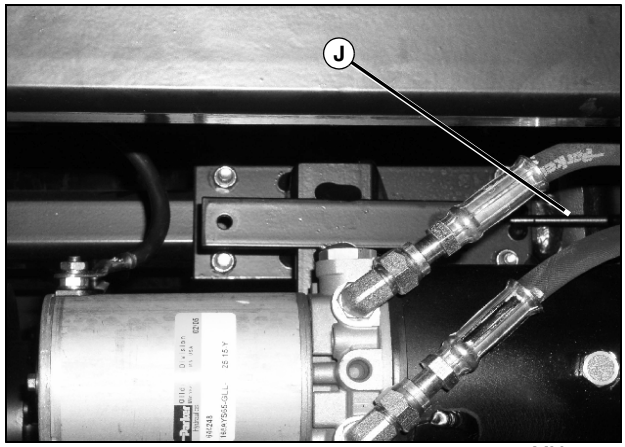
9. Disconnect hydraulic lines from down port (G) and up port (H).

10.Remove four (4) locknuts (I) from U-bolts and remove pump and bracket assembly.

Installation

1. Remove fill plug and fill reservoir with Bio-Hygard™ oil. (See “Check Hydraulic Oil Level” on page 222.)

2. Install pump assembly to coring head from top. Tilt reservoir in first and pivot assembly into place.



MX22469

Picture Note: Solenoids removed for photo clarity.

3. Position pump assembly on crossmember. Slide to the right until 1/4 in. rod (J) contacts coring head.

4. Install U-bolts and lock nuts.

NOTE: Be sure hydraulic pump fitting orientation is as shown in photo.

5. Attach hydraulic hose from base of hydraulic cylinder to the UP port and tighten fitting.

6. Attach hydraulic hose from rod end of cylinder to the DOWN port and tighten fitting.

7. Install electrical connections to solenoids.

IMPORTANT: Avoid damage! Make sure key switch is in the OFF position prior to connecting battery cables.

8. Install positive (+) battery cable. Install negative (-) battery cable.

9. Turn key to ON position.

10.Raise and lower coring head several times to work air out of the system and inspect for hydraulic leaks.

11.Raise coring head and remove fill plug and check oil level in reservoir. Level should be to specifications. (See “Check Hydraulic Oil Level” on page 222.)

12.Install battery, clutch, and aeration head covers.

MISCELLANEOUS TABLE OF CONTENTS

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MISCELLANEOUS TABLE OF CONTENTS

Specifications

General Specifications

Aercore 800

Weight	**575 kg (1267 lb)**
Height	**1067 mm (42 in.)**
Width	**1470 mm (60 in.)**
Length	**2134 mm (84 in.)**
Coring Width	**800 mm (31.5 in.)**
Coring Depth (Maximum)	**90 mm (3.5 in.)**
Tire Pressure	**62 kPa (9 psi)**

Tine Hole Pattern

1st Gear (using mini-tines)	**35.6 mm x 35.6 mm (1.4 in. x 1.4 in.) pattern**
2nd Gear	**50.8 mm x 50.8 mm (2.0 in. x 2.0 in.) pattern**
3rd Gear	**66.0 mm x 50.8 mm (2.6 in. x 2.0 in.) pattern**
4th Gear	**73.6 mm x 50.8 mm (2.9 in. x 2.0 in.) pattern**

Tine Sizes

Tubular	**10 mm (3/8 in.), 12.7 mm (1/2 in.), 16 mm (5/8 in.)**
Solid	**6.4 mm (1/4 in.), 16 mm (5/8 in.)**
Mini-Tine (open side)	**6.4 mm (1/4 in.)**

Aercore 1000

Weight	**392 kg (865 lb)**
Height	**990 mm (39 in.)**
Width	**1.2 m (45.7 in.)**
Coring Width	**952 mm (37.5 in.)**
Coring Depth (Maximum)	**100 mm (4.0 in.)**
Tine Hole Pattern (dependent on machine speed)	**30 mm x 50 mm to 127 mm**

Tine Sizes

Tubular	**10 mm (3/8 in.), 12.7 mm (1/2 in.), 16 mm (5/8 in.), 19 mm (3/4 in.)**
Solid	**6.4 mm (1/4 in.), 16 mm (5/8 in.)**
Mini-Tine (open side)	**6.4 mm (1/4 in.), 19 mm (3/4 in.)**

Machine Requirements

Speed (in gear - working)	**2 - 4.8 km/h (1.2 - 3 mph)**
Speed (transport)	**24 km/h (15 mph)**
PTO Speed @ Machine WOT	**540 rpm**

Aercore 1500

Weight	**499 kg (1100 lb)**
Height	**990 mm (39 in.)**
Width	**1.7 m (65.5 in.)**
Coring Width	**1.5 m (57.5 in.)**
Coring Depth (Maximum)	**100 mm (4.0 in.)**
Tine Hole Pattern (dependent on Machine speed)	**30 mm x 50 mm to 127 mm**

MISCELLANEOUS SPECIFICATIONS

Tine Sizes

Tubular	**10 mm (3/8 in.), 12.7 mm (1/2 in.), 16 mm (5/8 in.), 19 mm (3/4 in.)**
Solid	**6.4 mm (1/4 in.), 16 mm (5/8 in.)**
Mini-Tine (open side)	**6.4 mm (1/4 in.), 19 mm (3/4 in.)**

Machine Requirements

Speed (in gear - working)	**2 - 4.8 km/h (1.2 - 3 mph)**
Speed (transport)	**24 km/h (15 mph)**
PTO Speed @ Machine WOT	**540 rpm**

Aercore 2000

Weight	**772 kg (1728 lb)**
Height	**990 mm (39 in.)**
Width	**2.2 m (85.7 in.)**
Coring Width	**2.0 m (77.5 in.)**
Coring Depth (Maximum)	**100 mm (4.0 in.)**
Tine Hole Pattern (dependent on Machine speed)	**30 mm x 50 mm to 127 mm**

Tine Sizes

Tubular	**10 mm (3/8 in.), 12.7 mm (1/2 in.), 16 mm (5/8 in.), 19 mm (3/4 in.)**
Solid	**6.4 mm (1/4 in.), 16 mm (5/8 in.)**
Mini-Tine (open side)	**6.4 mm (1/4 in.), 19 mm (3/4 in.)**

Machine Requirements

Speed (in gear - working)	**2 - 4.8 km/h (1.2 - 3 mph)**
Speed (transport)	**24 km/h (15 mph)**
PTO Speed @ Machine WOT	**540 rpm**

Repair Specifications

Aercore 800

Tire Scraper Adjustment Gap	**3.2 mm (0.125 in.)**
Drive Chain Tension (minimal)	**6.4 - 9.5 mm (1/4 - 3/8 in.) deflection**
Tine Ram Drive Belt Tension	**5.1 mm (0.02 in.) with 26.2 lbs. of pressure or moderate thumb pressure**

Torque Values

Connecting Rod Bolt	**44 N•m (32 lb-ft)**
Tine Holder Locking Nuts	**156 N•m (115 lb-ft)**

Aercore 1000, 1500 and 2000

Roller Scraper Adjustment Gap	**1 - 2 mm (0.08 in.)**
Tine ram drive belt tension	**5.1 mm (0.02 in.) with 26.2 lbs of pressure or moderate thumb pressure**

Torque Values

Tine Coring Depth Adjustment Nut	**156 N•m (115 lb-ft)**
Connecting Rod Bolt	**44 N•m (32 lb-ft)**

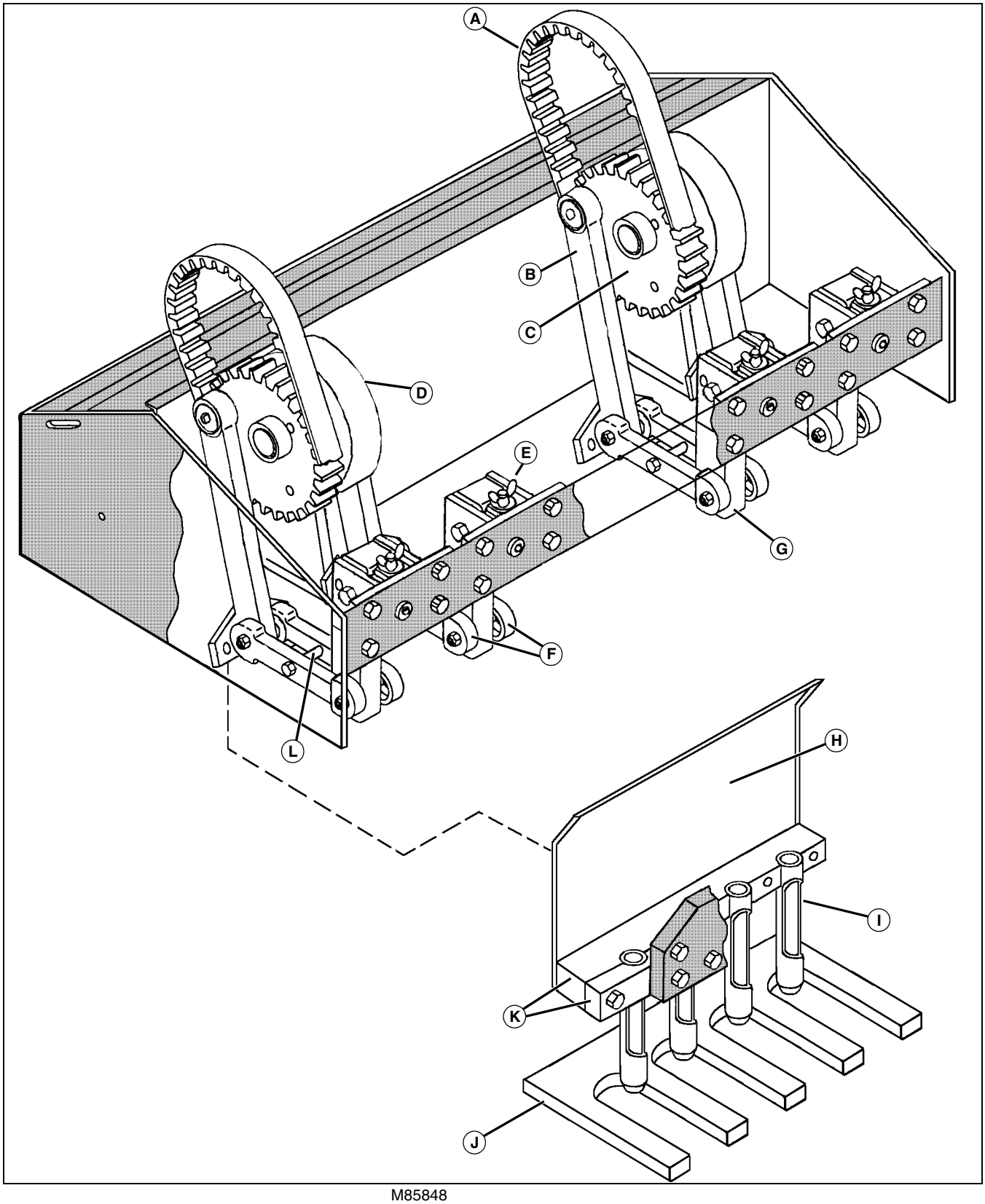
Tools and Materials

Other Materials

GREASE . . . . . John Deere MOLY HIGH TEMPERATURE EP GREASE
. . . . . .John Deere HIGH TEMPERATURE EP GREASE
. . . . . John Deere GREASE GARD®

Component Location

Turf Guard and Belts



M85848

A - Belt
B - Connecting Rod
C - Belt Pulley
D - Counter Weight Pulley
E - Wing Nut
F - Return Links
G - Flex-Link Pivot
H - Core Deflector
I - Tine
J - Turf Guard[1]
K - Tine Holder
L - Spacer

1. Note: Open finger Turf Guards shown. All new models have closed back.

Diagnostics

Troubleshooting

Symptom: Hole Spacing is wider on one side than other

(1) Is belt tension correct?

No - Adjust belt tension.

Symptom: Hole Spacing too close (front to back)

(1) Is ground speed correct?

Yes - Go to step (2).

No - Decrease ground speed. Use lower gear.

(2) Is correct gear selected?

No - Select correct gear and use correct ground speed.

Symptom: Hole Spacing too wide (front to back)

(1) Is correct gear selected?

Yes - Go to step (2).

No - Select correct gear and use correct ground speed.

(2) Is belt tension correct?

No - Adjust belt tension.

Symptom: Hole depth incorrect

(1) Are tines damaged?

No - Go to step (2) if problem continues.

Yes - Replace tines. (See “Tines Removal and Installation” on page 249.)

(2) Are correct tines installed and tine depth correct?

No - Adjust tine depth; select correct tine for application; allow break-in time for new tines. (See “Tine Coring Depth Adjustment - Aercore 800” on page 237, See “Tine Coring Depth Adjustment - Aercore 1000 and 1500 (SN -050000); 2000 (SN -020000)” on page 237, See “Tine Coring Depth Adjustment - Aercore 1000 and 1500 (SN 050001-); 2000 (SN 020001-)” on page 237.)

Symptom: Hole Quality is Poor

(1) Is engine speed correct?

Yes - Go to step (2).

No - Adjust engine speed. (See “Throttle Solenoid Adjustment” on page 38.)

(2) Is machine mounting angle correct (1000, 1500 and 2000)?

Yes - Go to step (3).

No - Adjust mounting angle.

(3) Is ground speed correct?

Yes - Go to step (4).

No - Increase ground speed. Use higher gear.

(4) Is throttle solenoid engaged (800 Aerator)?

Yes - Go to step (5).

No - Engage throttle solenoid switch to improve hole quality on entry/exit.

(5) Is turf guard making contact with ground?

Yes - Go to step (6).

No - Adjust turf guards. (See “Turf Guard Spring Tension Adjustment - Aercore 800” on page 236. See “Turf Guard Spring Tension Adjustment - Aercore 1000, 1500 and 2000” on page 236.)

(6) Are correct tines installed and tine depth correct?

No - Adjust tine depth; select correct tine for application; allow break-in time for new tines. (See “Tine Coring Depth Adjustment - Aercore 800” on page 237, See “Tine Coring Depth Adjustment - Aercore 1000 and 1500 (SN -050000); 2000 (SN -020000)” on page 237, See “Tine Coring Depth Adjustment - Aercore 1000 and 1500 (SN 050001-); 2000 (SN 020001-)” on page 237.)

Symptom: Machine bounces, tines do not penetrate to full depth

(1) Is ground speed correct?

Yes - Go to step (2).

No - Decrease ground speed. Use lower gear.

(2) Is soil hard packed?

Yes - Go to step (3).

No - If soil is hard packed or compacted, measure depth of penetration and adjust depth control to measured amount.

Symptom: Machine bounces, tines do not penetrate to full depth

(3) Is tire pressure correct (Aercore 800)?

Yes - Go to step (4).

No - Correct tire pressure.

(4) Are tine drive ram belts adjusted correctly?

No - Adjust drive ram belt(s) tension. (See “Tine Ram Drive Belts Removal, Installation, and Adjustment” on page 244.)

Symptom: Turf lifting

(1) Is turf guard spring properly adjusted?

No - Adjust turf guard spring. (See “Turf Guard Spring Tension Adjustment - Aercore 800” on page 236. See “Turf Guard Spring Tension Adjustment - Aercore 1000, 1500 and 2000” on page 236.)

Symptom: Turf marking

(1) Is turf guard spring properly adjusted?

No - Adjust turf guard spring. (See “Turf Guard Spring Tension Adjustment - Aercore 800” on page 236. See “Turf Guard Spring Tension Adjustment - Aercore 1000, 1500 and 2000” on page 236.)

Tests and Adjustments

Turf Guard Spring Tension Adjustment - Aercore 800

IMPORTANT: Avoid damage! Proper turf guard spring adjustment is critical to good hole quality. The turf guard needs to be firmly on the ground to prevent turf lifting. Excessive turf guard pressure can cause marking in soft turf. Adjusting tine depth may affect turf guard ground pressure.

1. Remove aerating head cover.

M88400

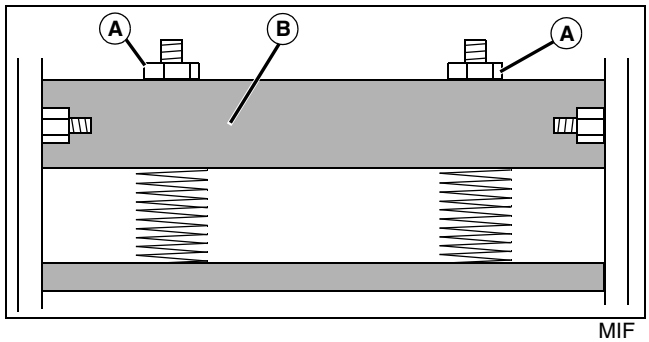
2. Locate adjustment bolt (A) and spring on either side of battery.

M88401

3. Tighten nut (B) to increase tension of turf guard on turf.
4. Loosen nut to decrease tension of the turf guard on turf.

Turf Guard Spring Tension Adjustment - Aercore 1000, 1500 and 2000

IMPORTANT: Avoid damage! Proper turf guard spring adjustment is critical to good hole quality. The turf guard needs to be firmly on the ground to prevent turf lifting. Excessive turf guard pressure can cause marking in soft turf. Adjusting tine depth may affect turf guard ground performance.



MIF

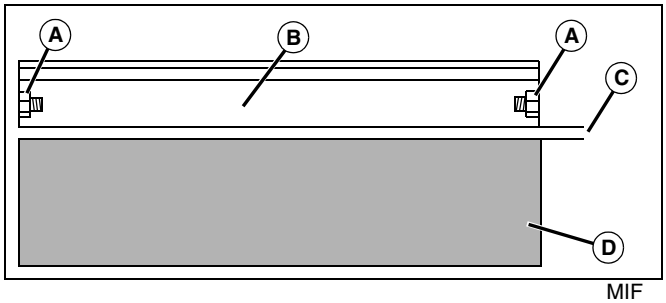
1. Loosen two nuts (A) on both ends of the adjusting bar (B).

NOTE: Make adjustments in small increments, testing hole quality after each adjustment before putting machine into service.

2. Move adjusting bar up to reduce tension.
3. Move adjusting bar down to increase tension.

Roller Scraper Adjustment - Aercore 1000, 1500 and 2000

IMPORTANT: Avoid damage! It may be necessary to adjust the turf guard spring tension after adjusting the roller scraper.



MIF

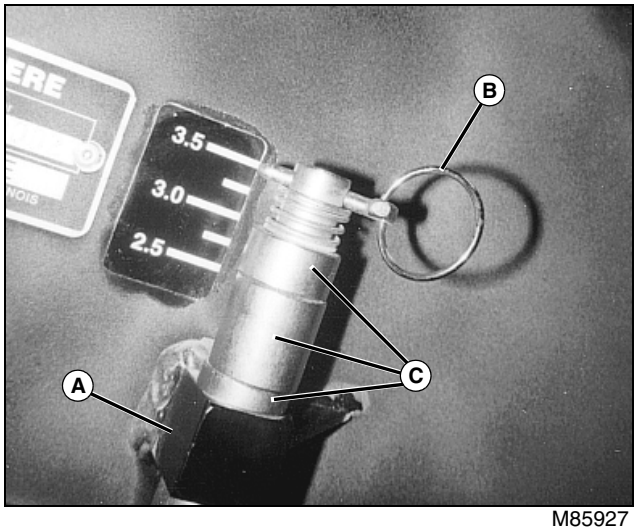
1. Loosen two nuts (A) at both ends of scraper (B) and move scraper to desired dimension (C) from roller (D).

Specification

Recommended gap between roller and scraper (C). . . . . 1 - 2 mm (0.08 in.)

Tine Coring Depth Adjustment - Aercore 800

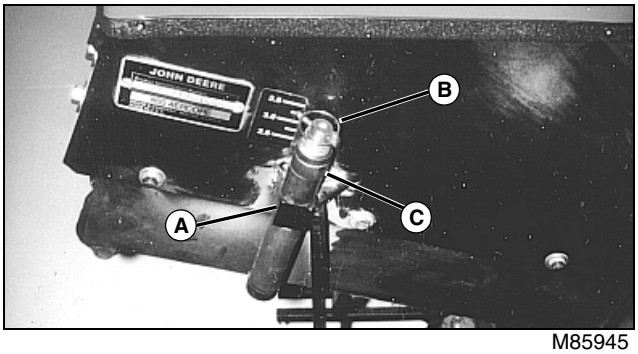
NOTE: Use three different sized spacers, 12.7 mm (0.5 in.), 6.35 mm (0.25 in.), and 25.4 mm (1.0 in.) alone or in combination to provide depth ranges 63.5 mm (2.5 in.) - 90 mm (3.5 in.).



M85927

1. Raise aeration head and place transport stops (A) into transport position. Lower aeration head onto stops.

NOTE: Spacers (C) should be rearranged above or below stop until desired depth is reached.



M85945

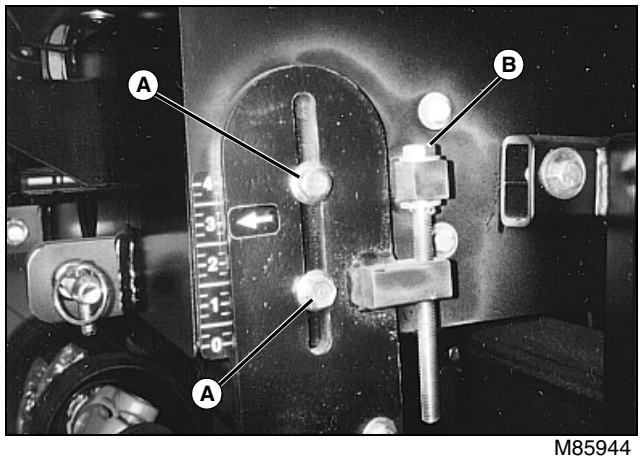
2. Add or remove spacers (C) from above and/or below stop (A) until desired depth is reached.

3. Install spring locking pin (B). Rotate ring 180° (until it touches pin) to prevent locking pin from working loose. Repeat for other side. Depth settings must be the same for each side.

Tine Coring Depth Adjustment - Aercore 1000 and 1500 (SN -050000); 2000 (SN -020000)

NOTE: Before determining tine depth adjustment is needed, make sure adjustment roller and turf guards were contacting the ground during operation of the aerator. If aerator is not lowered completely, tine depth will be less than expected.

Tine depth can be adjusted to a maximum 10 cm (4 in.). Depth adjustment must be the same on both sides of aerator.



M85944

1. On both sides of the coring head, loosen bolts (A) securing the depth adjustment plate.

2. Turn the adjusting bolts (B) up or down until desired depth is indicated. Use depth indicator decal to determine tine depth. Adjustment must be equal on both sides.

3. Tighten bolts (A) to specification to secure the adjusting bolts (B).

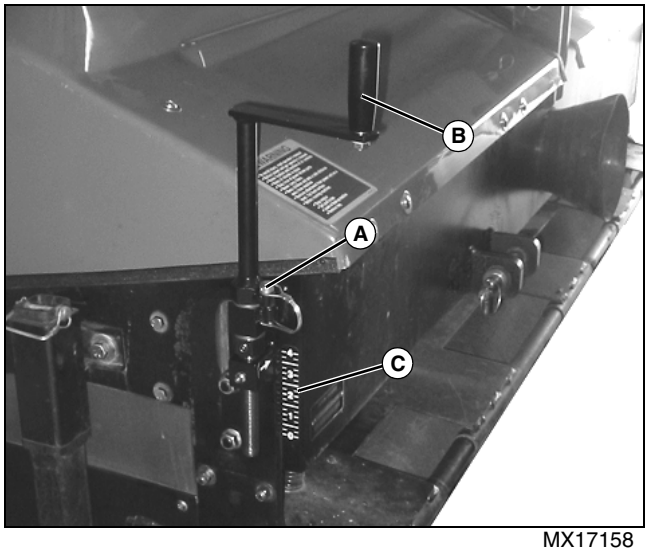
Specification

Adjustment Nuts . . . . . 156 N•m (115 lb-ft)

Tine Coring Depth Adjustment - Aercore 1000 and 1500 (SN 050001-); 2000 (SN 020001-)

NOTE: Before determining tine depth adjustment is needed, make sure adjustment roller and turf guards were contacting the ground during operation of the aerator. If aerator is not lowered completely, tine depth will be less than expected.

Tine depth can be adjusted to a maximum 10 cm (4 in.). Depth adjustment must be the same on both sides of aerator.



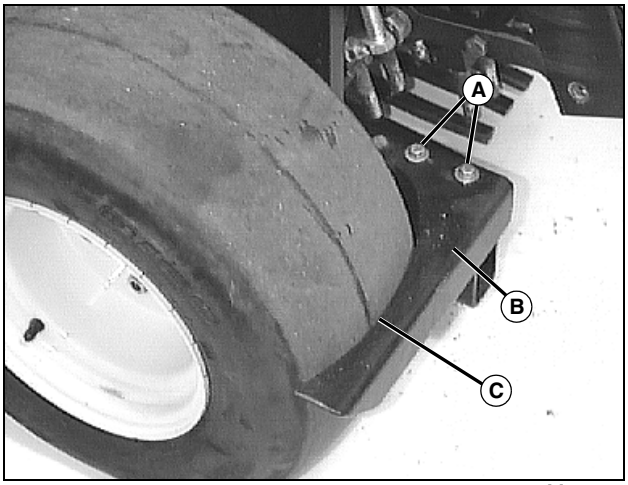
MX17158

1. Remove spring locking pin (A) securing the depth control position at both sides of aerator.

2. Turn adjusting handle (B) to adjust up or down to desired depth. Use depth indicator label (C) to determine tine depth. The adjustment must be equal on both sides.

3. Install spring locking pin (A) to secure depth control arms in position at both sides of aerator.

Tire Scraper Adjustment - Aercore 800



M88393

1. Loosen two cap screws (A) and move scraper (B) to desired gap (C).

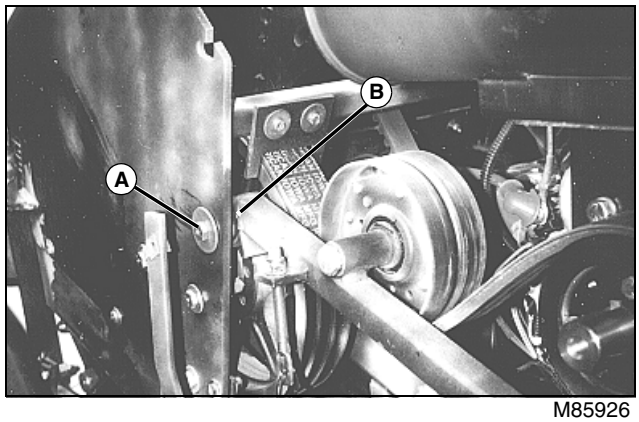
2. Repeat for other tire as needed.

Specification

Gap Between Tire And Scraper. . . . . 3.2 mm (0.125 in.)

Tining Action Adjustment - Aercore 800

IMPORTANT: Avoid damage! For best hole quality, tining action should begin as soon as coring head starts to lower to the ground, and should continue while raising, then stop at top position.



M85926

1. Remove machine head and right side cover.

2. Loosen bolt (A).

3. Move bearing (B) to rear of machine to allow tining action to start sooner.

4. Move bearing towards engine if tining action continues when aerating head reaches top position.

5. Install covers.

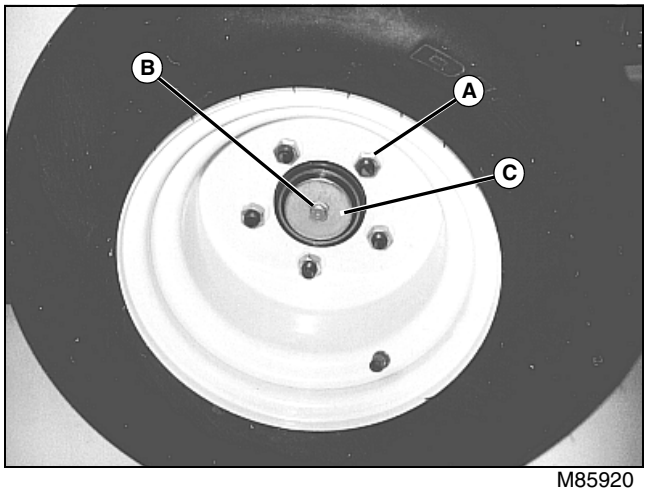
Repair

Rear Wheels and Bearings Removal and Installation - Aercore 800

NOTE: Bearings can be replaced or greased without removing wheel from axle housing.

Wheel Removal

1. Loosen lug nuts.
2. Safely lift and support rear end of machine.



M85920

3. Remove lug nuts (A).
4. Remove wheel.

Wheel Installation

1. Install wheel on axle (valve stem on outside).
2. Install lug nuts. Tighten lug nuts evenly to prevent pinching the wheel.
3. Lower machine slowly.

Bearing Removal

1. Loosen chain tensioner to provide slack in chain.
2. Disconnect chain master link and remove chain from axle sprocket.
3. Remove bearing cap bolt (B) and washer (C).
4. Remove bearings.
5. Inspect bearings for wear, replace as necessary.

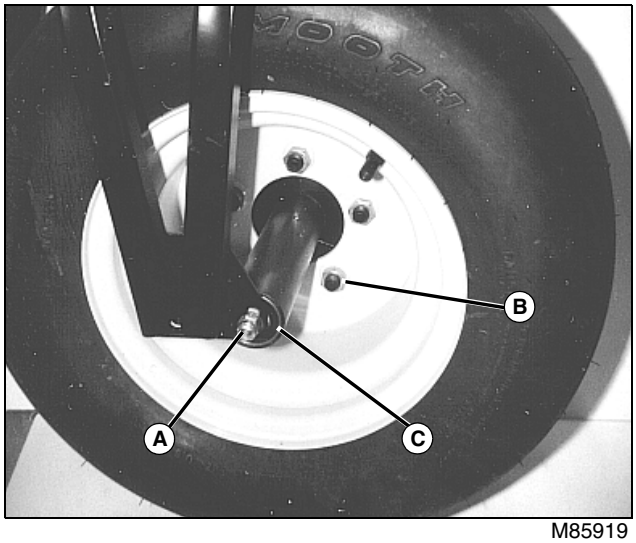
Bearing Installation

1. Repack bearings with grease.
2. Install bearings, washer, and bolt.

Front Wheel and Bearings Removal and Installation - Aercore 800

Wheel Removal

1. Safely lift and support front end of machine.



M85919

2. Remove nut (A) and bolt from axle shaft.
3. Remove axle shaft assembly from front fork.
4. Remove lug nuts (B) to remove wheel.
5. Remove wheel.

Wheel Installation

1. Install wheel on axle.
2. Install lug nuts. Tighten lug nuts evenly to prevent pinching the wheel.
3. Install axle shaft assembly on front fork using bolt and nut.
4. Lower machine slowly.

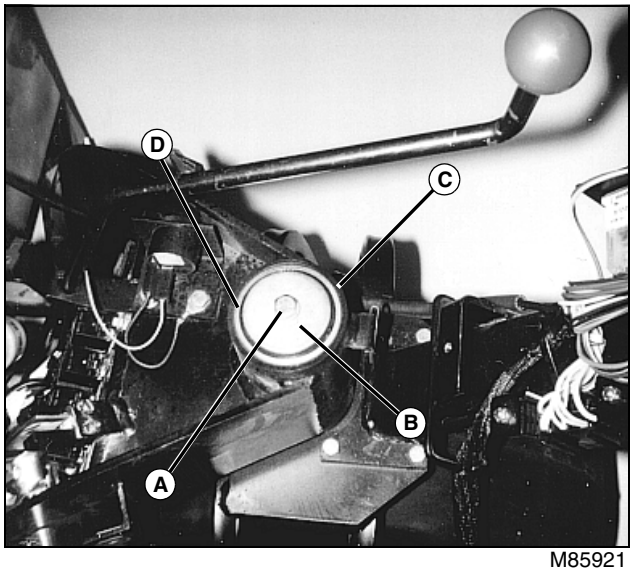
Bearing Removal

1. Remove axle shaft assembly from front fork.
2. Remove bearings (C) from axle using suitable driver.
3. Inspect bearings for wear, replace as necessary.

Bearing Installation

1. Repack bearings with grease.
2. Install bearings in axle shaft.
3. Install axle shaft assembly on front fork using bolt and nut.

Steering Pivot Bearings Removal and Installation - Aercore 800



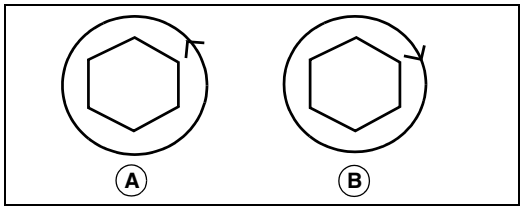
M85921

1. Remove bearing cap bolt (A) and washer (B).
2. Safely lift and support rear end of machine (directly in front of steering pivot (C) - this will allow steering assembly to drop from frame).
3. Remove bearings (D).
4. Inspect bearings for wear, replace as necessary.
5. Repack bearings with grease.
6. Install bearings, steering pivot assembly, washer, and bolt.

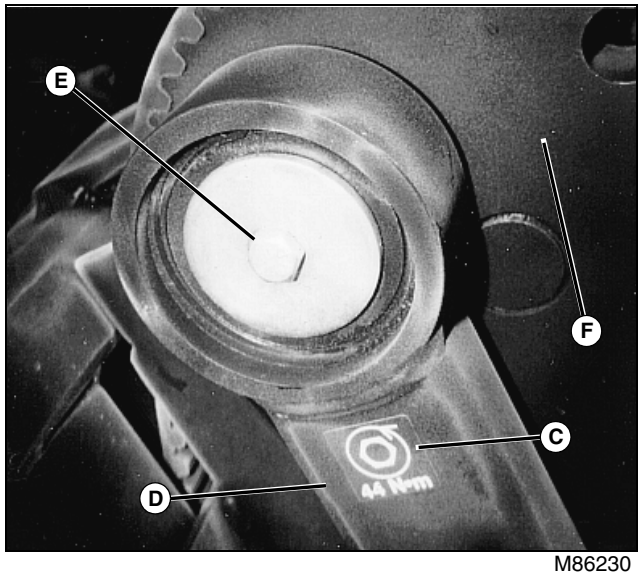
Main Pulley Removal and Installation

Removal

IMPORTANT: Avoid damage! The following decals show left (A) and right (B) thread direction at 44 N•m (32 lb-ft). Decals (C) are located on connecting rods (D).



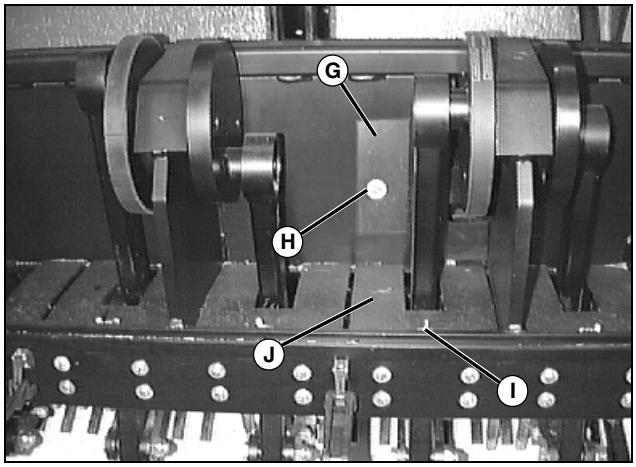
MIF



M86230

1. Remove connecting rod bolt (E) and washer that goes through belt pulley (F). Repeat for opposite side connecting rod (D).

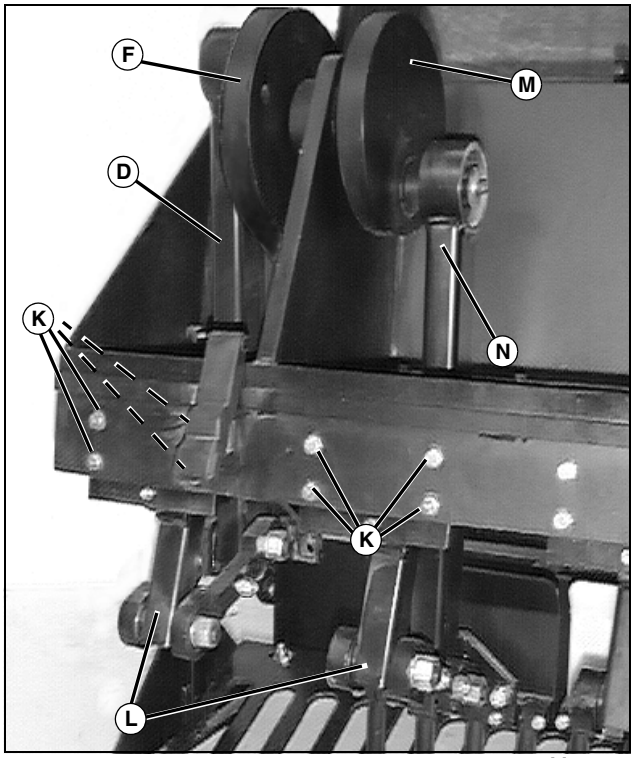
IMPORTANT: Avoid damage! Belt guide (G) for Aercore 1000, 1500 and 2000 differs slightly from Aercore 800. Remove self-tapping screw (H) to remove belt guide and opposite side dirt shield - Aercore 1000, 1500 and 2000.



M87188

2. Remove wing nut (I) to remove divider seal (J).

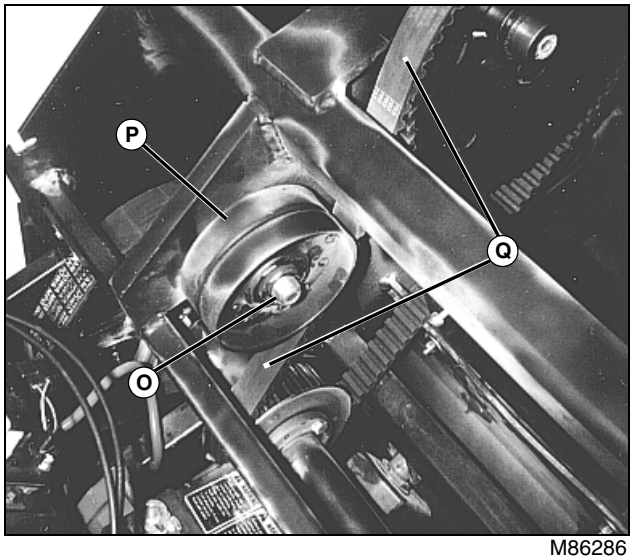
CAUTION: Avoid Injury! Flex link assembly will drop free when connecting rod and flex link cap screws are removed.



M86234

3. Remove flex link cap screws (K).

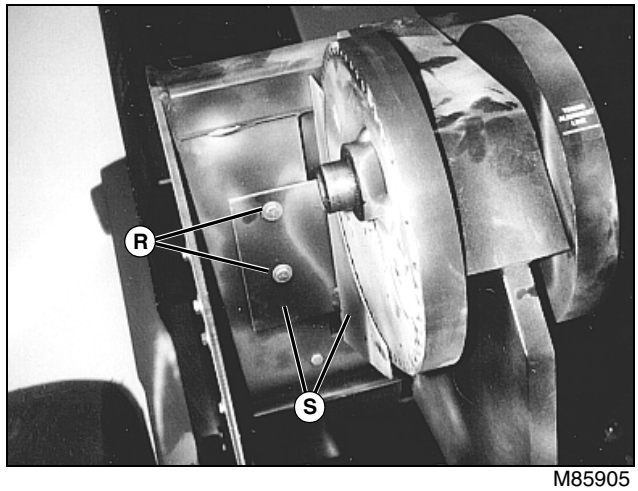
4. Pull connecting rod (D) from belt pulley (F) and remove connecting rod and flex link assembly (L). Repeat for counter weight pulley (M) and opposite side connecting rod (N).



M86286

Picture Note: Aercore 800 Shown

5. Loosen nut (O) on adjusting idler (P) to remove tension on belt (Q).



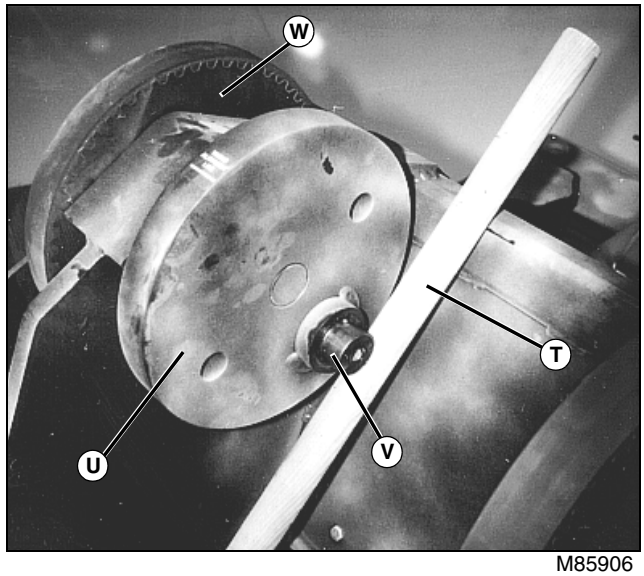
M85905

Picture Note: Aercore 800 Shown

6. **Aercore 800 Only (Belt Guide)** Remove cap screws (R) and belt guide (S).

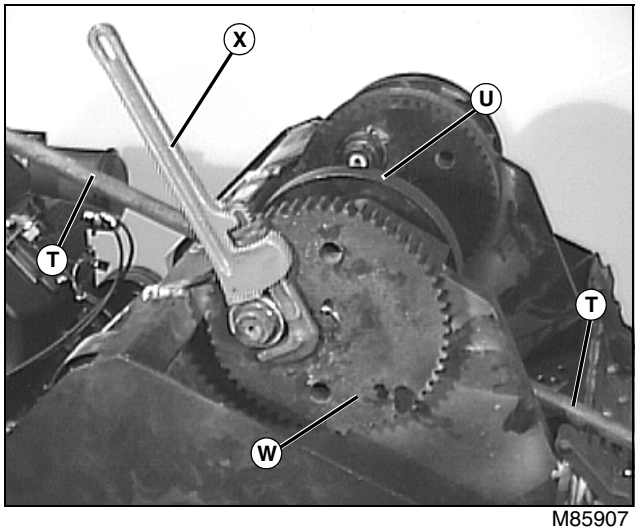
7. Slide belt off pulley.

NOTE: To remove belt pulley, counterweight pulley must be prevented from rotating.



M85906

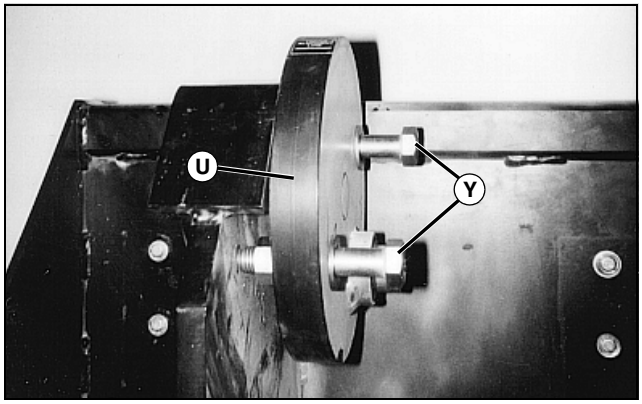
8. Place a metal pipe (T) underneath counter weight pulley (U) connecting rod mount (V). Apply pressure to pinch the pulley and prevent it from rotating. As belt pulley (W) is unscrewed, pipe should seat itself against machine edges and prevent counter weight pulley movement.



M85907

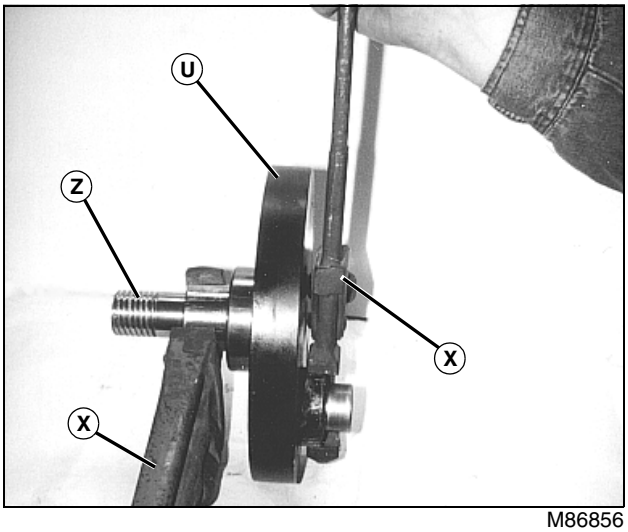
9. With metal pipe (T) in place, loosen and remove belt pulley (W) with pipe wrench (X) (DO NOT put pipe wrench around machined surface).

10.Remove washer from shaft.



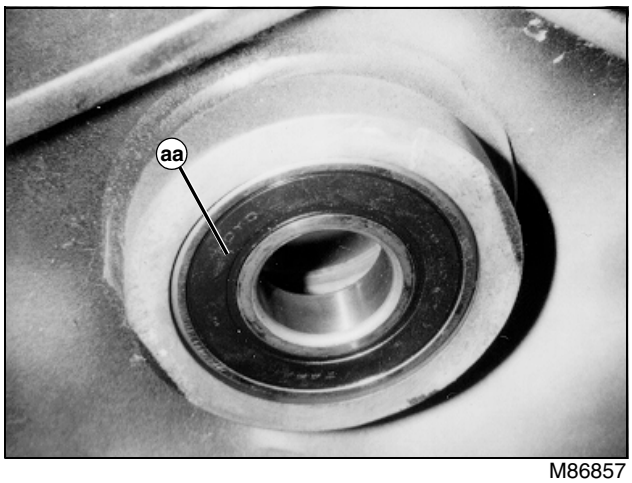
M86855

11.Install two bolts (Y) (3/4" x 3 1/2" long) with washers and nuts in counter weight pulley (U). Gradually tighten bolts equally to remove remaining pulley.



M86856

12.Position two pipe wrenches (X) as shown and unscrew counter weight pulley (U) from shaft (Z) (requires two people). Make sure pipe wrench on counter weight pulley is not around machined surface and wrench on shaft is in position shown. Replace bearing if necessary.

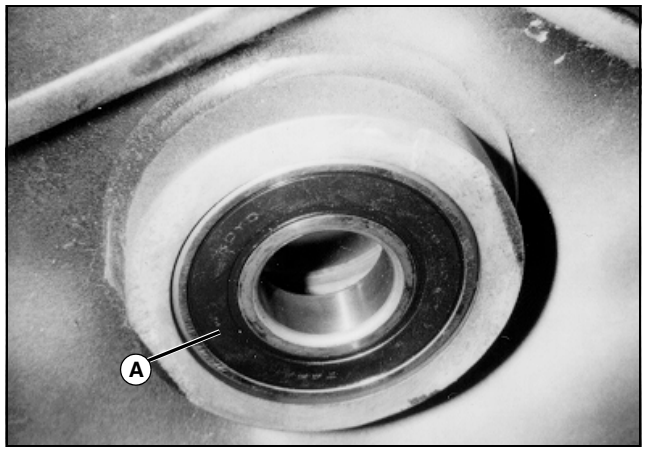


M86857

13.Gently tap bearing (aa) out. Two snap rings will remain. Do not remove snap rings unless damaged.

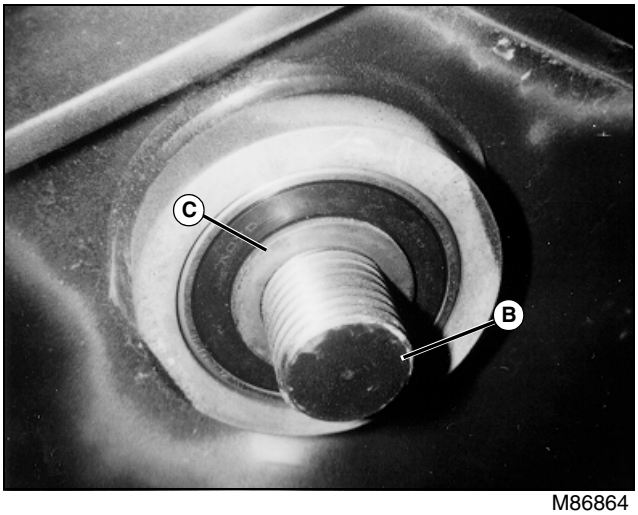
Installation

1. Both snap rings should be installed.



M86857

2. Gently tap bearing (A) in place. It should seat against snap ring.

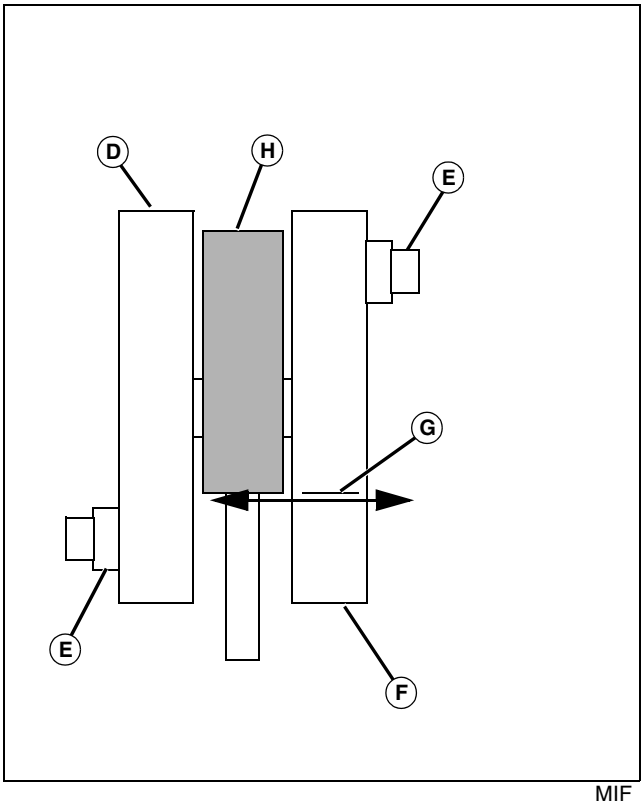


M86864

3. Install pulley shaft (B) with remaining bearing already in place on shaft. Place washer (C) on shaft.

IMPORTANT: Avoid damage! Make sure belt pulley is installed on the side that lines up with belt and adjusting idler.

4. Apply T43512 medium strength thread lock and sealer to pulley shaft to secure pulleys.



MIF

5. Install belt pulley (D).

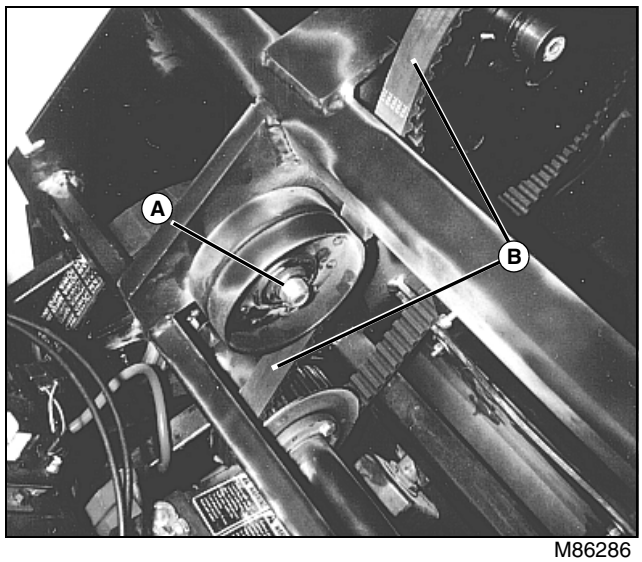
IMPORTANT: Avoid damage! Connecting rod mounting positions (E) must be located opposite (180°) each other when installed.

6. Install washer and counter weight pulley (F), ensure that the connecting rod mounting locations are positioned opposite (180°) of each other when pulleys are installed.

IMPORTANT: Avoid damage! Make sure belt timing alignment marks (G) line up as depicted before and after belt installation (align timing mark with lower edge of tower gusset (H). If timing mark decals have been removed see alternate belt timing procedure.

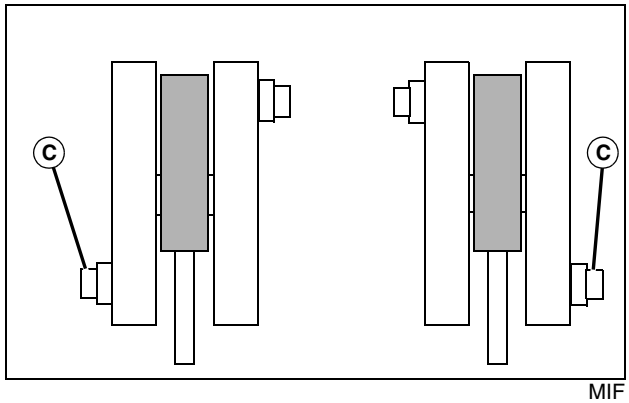
7. Install belts. Recheck belt timing.

Belt Timing Procedure - Alternate



M86286

1. Loosen idler pulley (A).
2. Remove belt guard.
3. Remove belt (B).

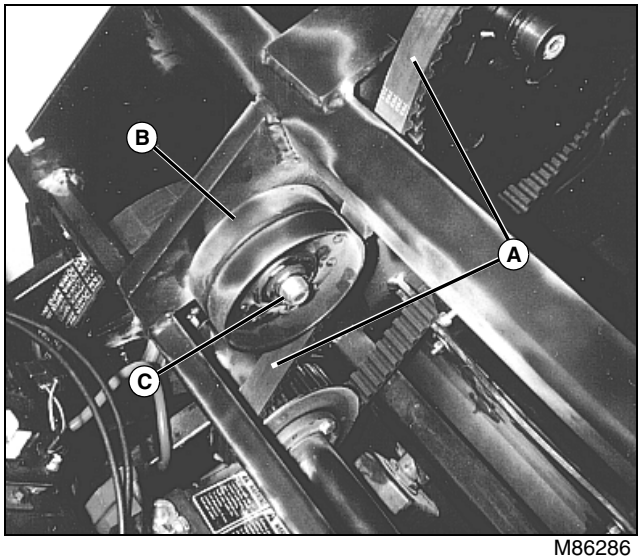


MIF

4. Align the two outside tine arms (C) so that both are at the bottom of their stroke.

5. Install belt.
6. Install belt guard.
7. Apply pressure to belt and tighten idler.

Belt Adjustment



M86286

1. Install belt (A) on adjusting idler (B) pulley.
2. Apply downward pressure on adjusting idler to provide necessary tension to belt. Belt should deflect approximately 5.1 mm (0.2 in.) with 26.2 pounds of pressure or moderate thumb pressure.
3. While maintaining pressure on adjusting idler, tighten nut (C). Recheck belt tension.

Specifications

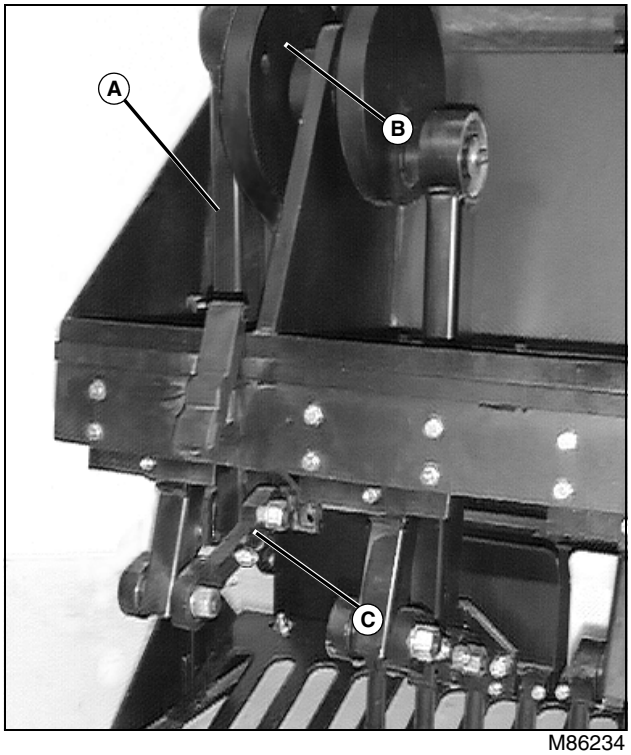
Belt Tension . . . . . 5.1 mm (0.2 in.) with 26.2 lbs. of pressure or moderate thumb pressure
Connecting Rod Bolts . . . . . 44 N•m (32 lb-ft)

Tine Ram Drive Belts Removal, Installation, and Adjustment

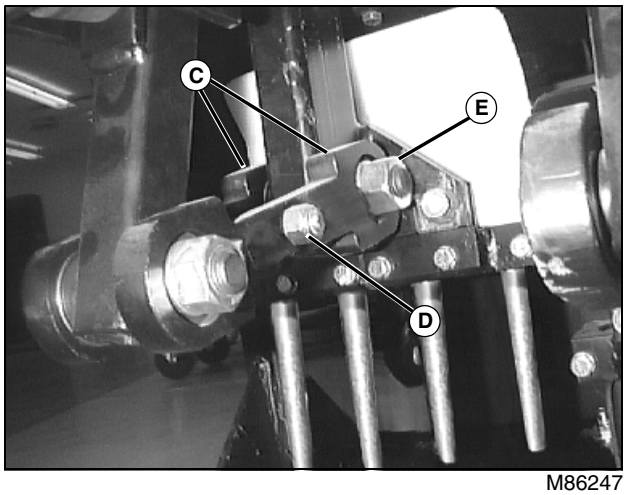
Removal

1. Lower machine.
2. Remove ignition key and disconnect spark plug wires.

NOTE: The connecting rod (A) must be removed from the belt pulley (B) and return links (C).

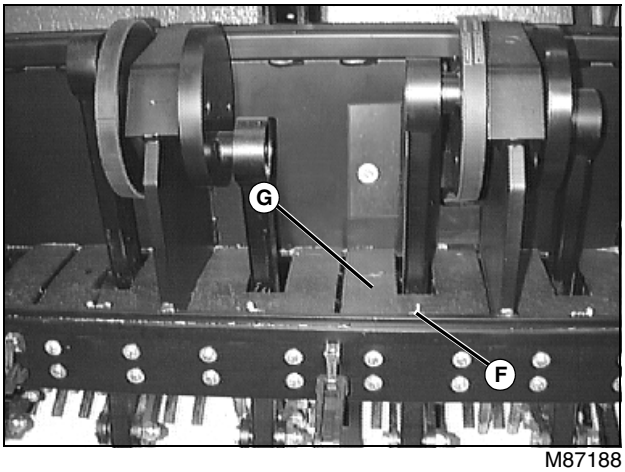


M86234



M86247

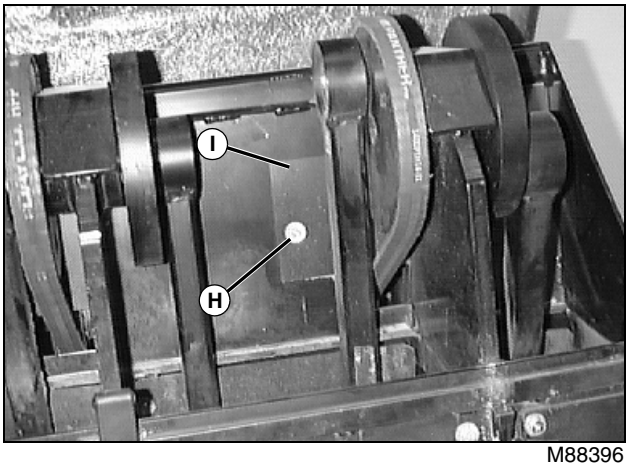
3. Loosen lock nut (D) to release pressure on return links. Remove front nut (E) and bolt (closest to tine holder) to allow return links to drop free from the connecting rod.



M87188

4. Remove wing nut (F) to remove divider seal (G).

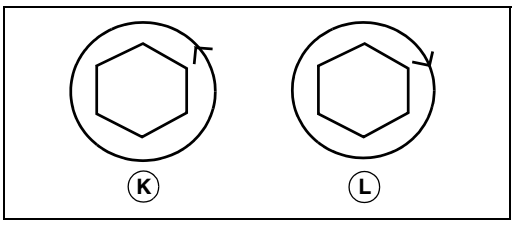
NOTE: Belt guide for Aercore 1000, 1500 and 2000 differs slightly from Aercore 800.



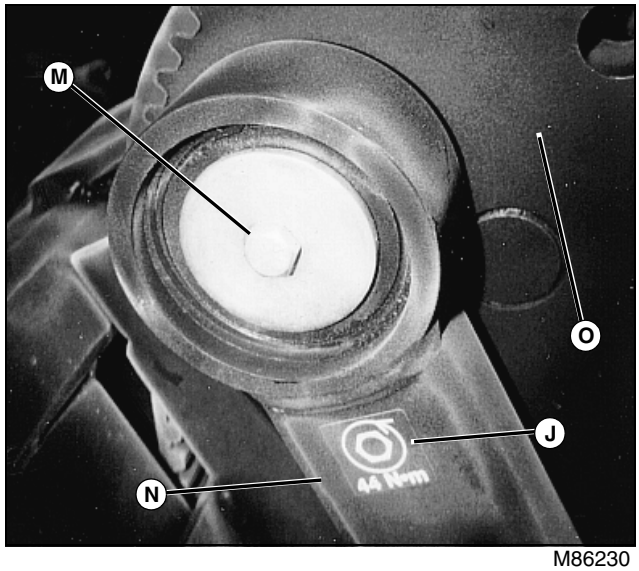
M88396

5. **Aercore 1000, 1500 and 2000 Only (Belt Guide):** Remove self-tapping screw (H) to remove belt guide (I). Self-tapping screw also holds dirt shield located on opposite side of belt guide.

IMPORTANT: Avoid damage! Bolts holding connecting rods to belt pulleys are left-hand thread direction, at 44 N•m (32 lb-ft). Refer to the decal (J) on arm indicating left (K) or right (L) hand direction of thread.

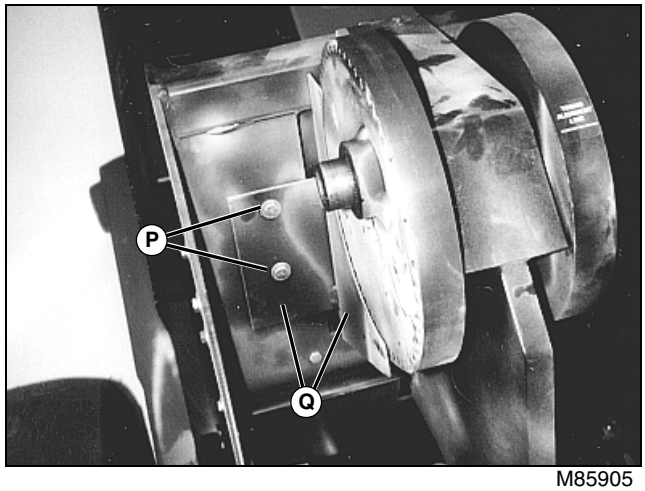


MIF



M86230

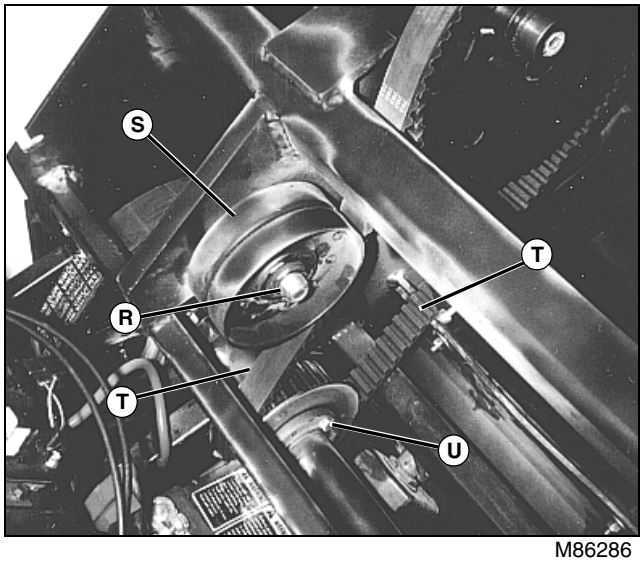
6. Remove bolt (M) and washer and pull connecting rod (N) away from belt pulley (O).



M85905

Picture Note: Aercore 800 Shown

7. **Aercore 800 Only (Belt Guide):** Remove cap screws (P) and belt guide (Q).

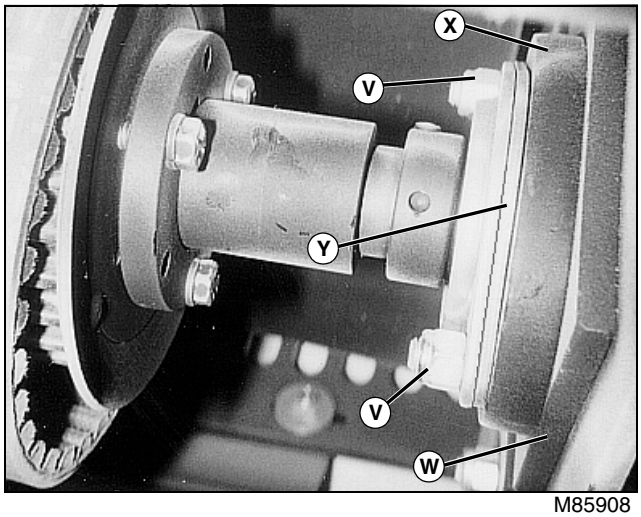


M86286

Picture Note: Aercore 800 Shown

8. Loosen nut (R) on adjusting idler (S) to remove tension on belt (T).

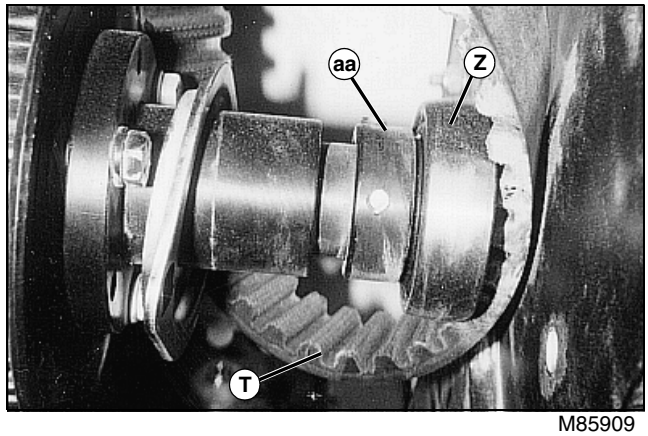
IMPORTANT: Avoid damage! Aercore 800 only—Both left and right tine ram drive belts are removed from the left side of the reduction drive shaft (U). Do not remove the right side of the reduction drive shaft.



M85908

9. Belt Removal - Remove two lock nuts (V) and bolts securing reduction shaft to the left side wall of the frame.

10.Remove blank spacer (W), bearing plate (X), and outer bearing cap (Y).



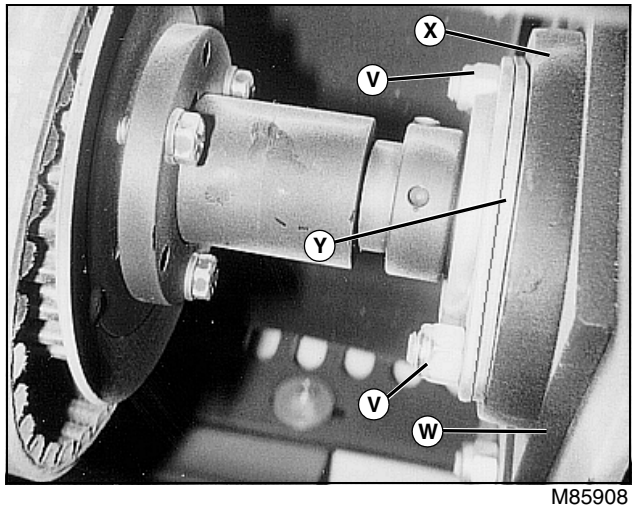
M85909

11.Slide left belt (T) around bearing (Z) and side wall of frame. Repeat for right belt. (Aercore 800 only - Tilt battery towards operator station to provide room to remove right belt from reduction shaft pulley.)

NOTE: Aercore 1000 and 1500 - Repeat procedure for right side belt removal. Exception - Loosen set screw on locking collar (aa). Rotate locking collar counter clockwise to loosen. See "Gear Case Removal and Installation - Aercore 1000, 1500 and 2000" on page 202 in the Power Train section.

Installation

IMPORTANT: Avoid damage! Install outer bearing cap (Y) and bearing plate (X) on to bearing first. While holding them in place, install blank spacer (W) and inset bolts from the outside through the spacer, bearing plate, and bearing cap. Secure with lock nuts (V).

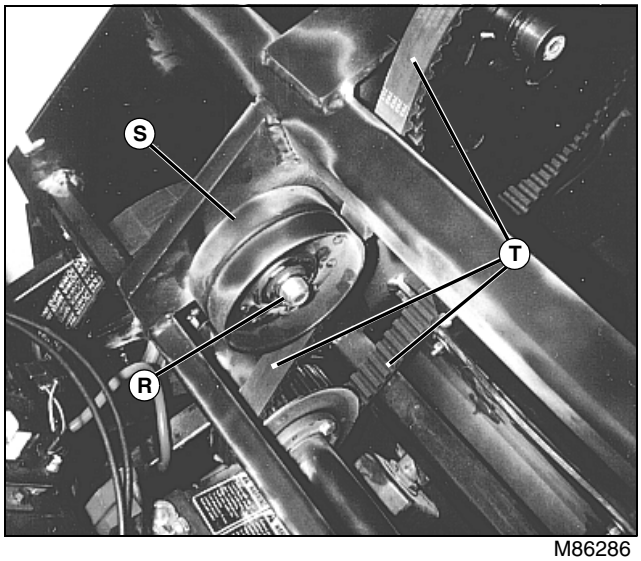


M85908

1. Install new belts (if applicable).

2. Reverse steps 12 thru 3 to install belts. See Belt Adjustment below.

Adjustment



M86286

Picture Note: Aercore 800 Shown

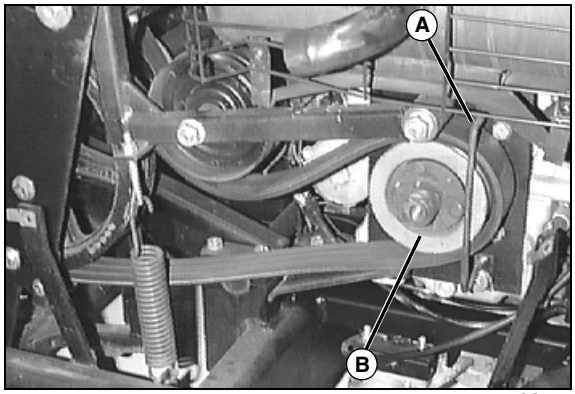
1. Remove aerating head cover (if applicable).
2. Loosen adjusting idler nut (R).
3. Apply downward pressure on adjusting idler (S) to provide necessary tension to belt (T). Belt should deflect approximately 5.1 mm (0.2 in.) with 26.2 pounds of pressure or moderate thumb pressure.
4. While maintaining pressure on adjusting idler tighten nut. Recheck belt tension.
5. Install cover.

Specification

Belt Tension . . . . . 5.1 mm (0.2 in.) with 26.2 lbs. of pressure or moderate thumb pressure

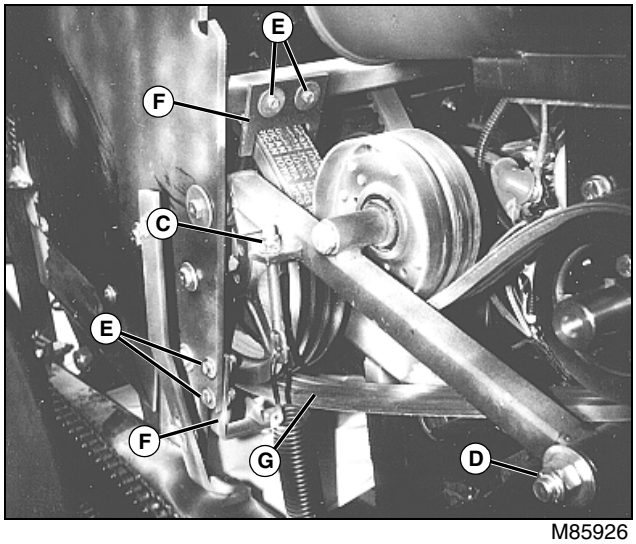
Drive Belt Removal, Installation and Adjustment - Aercore 800

1. Remove machine head and right side cover.



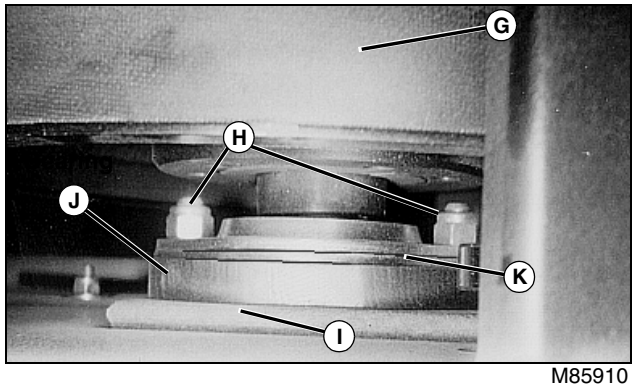
M88403

2. Remove belt guide (A) from front sheave (B).



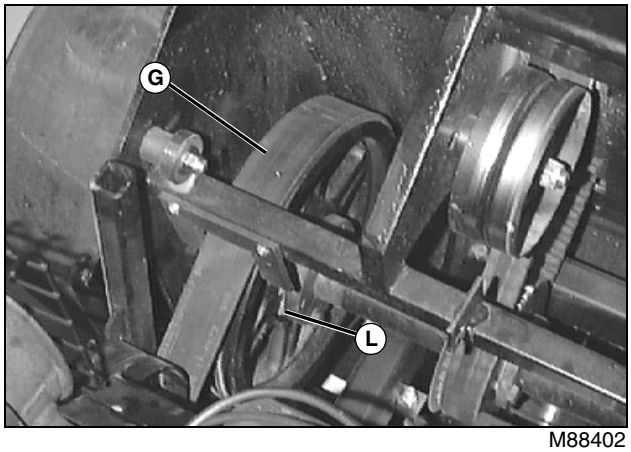
M85926

3. Remove belt tension adjustment nut (C).
4. Remove bracket bolt (D) to provide clearance for belt removal.
5. Remove cap screws (E) upper and lower belt guides (F).
6. Slide belt (G) off front sheave.



M85910

7. Remove two lock nuts (H) and bolts securing reduction drive shaft to side wall of frame.
8. Remove blank spacer (I), bearing plate (J), and outer bearing cap (K).



M88402

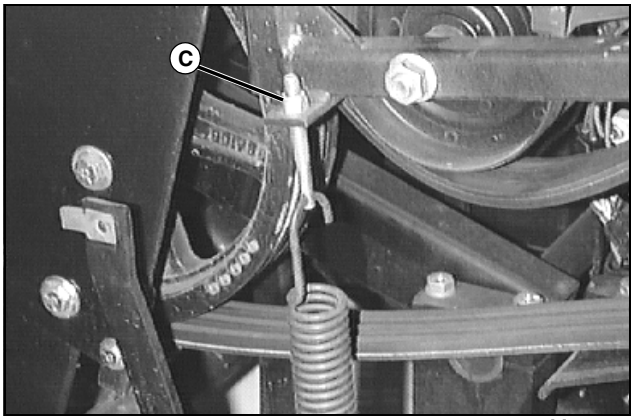
9. Slide belt off drive pulley (L) and between reduction shaft and side wall of frame.

10. Install new belt (if applicable).

11. Adjust belt. See belt adjustment next page.

12. Reinstall parts in reverse order of disassembly.

Belt Adjustment



M88404

1. Remove shield on right side of machine (if applicable). Lower machine head.

2. Tighten nut (C) to increase belt tension.

3. Loosen nut to decrease belt tension.

4. Install shields.

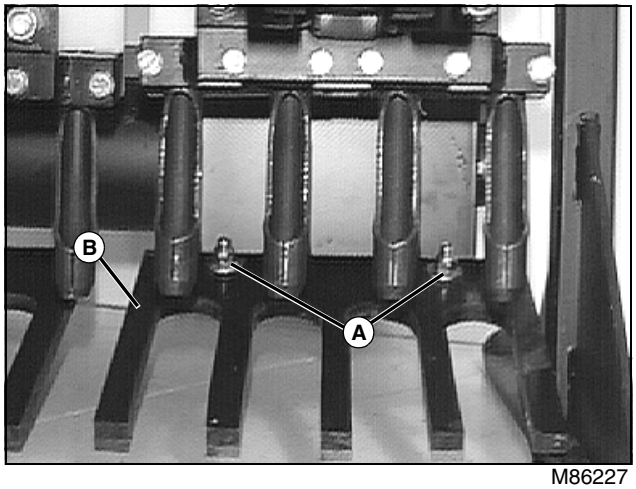
Turf Guard Removal and Installation

CAUTION: Avoid Injury! DO NOT remove or install turf guards with engine running.

1. Park machine on level surface. Raise machine to up position. Block machine safely off the ground.

2. Stop engine and remove key. Disconnect spark plug wires.

3. Lock the PARK brake.



M86227

4. Remove lock nuts (A) securing turf guards (B) to machine frame.

5. Remove turf guards and install proper guards (if applicable).

6. Center the guards to allow tines to drop between guard fingers.

7. Secure guards to brackets with round-head bolts in slotted holes through bottom of bracket and guard, flat washer, and lock nut on top. Tighten nuts.

Tine Holders Removal and Installation

NOTE: There are two sizes of tine holders (4x and mini tines) available to provide different hole spacing. Changing tine holders will also require changing the turf guards and the core deflectors.

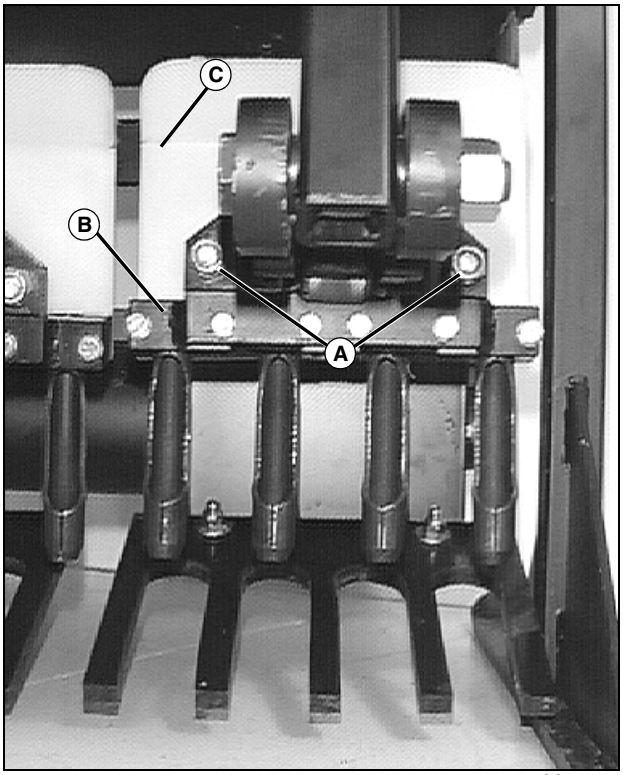
CAUTION: Avoid Injury! DO NOT remove or install tine holders with engine running.

1. Park machine on a level surface.

2. Block machine safely off the ground using transport stops.

3. Remove key and disconnect spark plug wires.

4. Lock the PARK brake.



M86227

5. Remove two lock nuts (A) on either side of pivot and remove tine holder (B) from machine.

6. Remove core deflector (C) from tine holder and install onto tine holder to be installed.

7. Install correct tines in to selected tine holder and install tine holder to machine. Install holder and bolts from the front through the bracket and attach the two locking nuts.

Specifications

Locking Nuts. . . . . 156 N•m (115 lb-ft)

Tines Removal and Installation

NOTE: Tines can be installed with the tine holder on the machine or with the holder removed. Several tine sizes and styles are available for different aerating applications. Installing different tines may require using different tine holders. The turf guard may also have to be changed.

CAUTION: Avoid Injury! DO NOT remove or install tines with engine running.

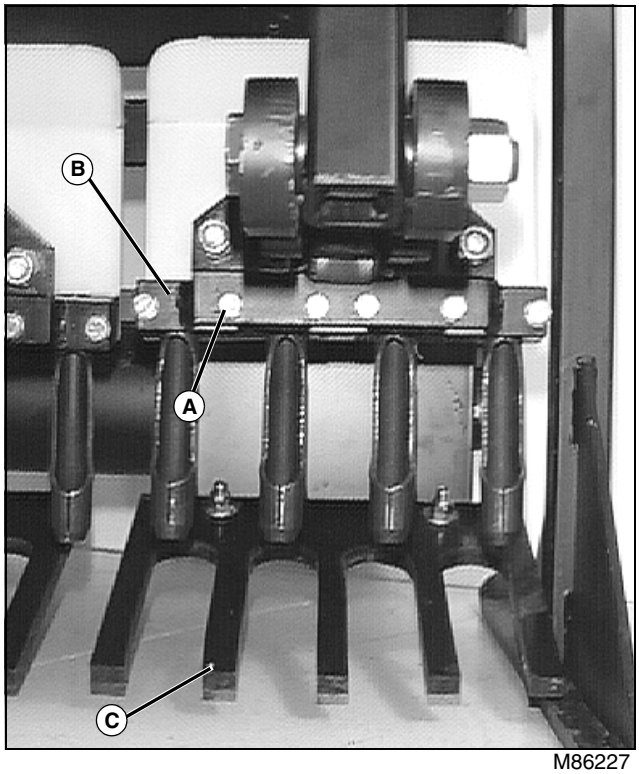
1. Park machine on level surface.

2. Block machine safely off the ground using transport stops.

3. Stop engine and remove key. Disconnect spark plug wires.

4. Lock the PARK brake.

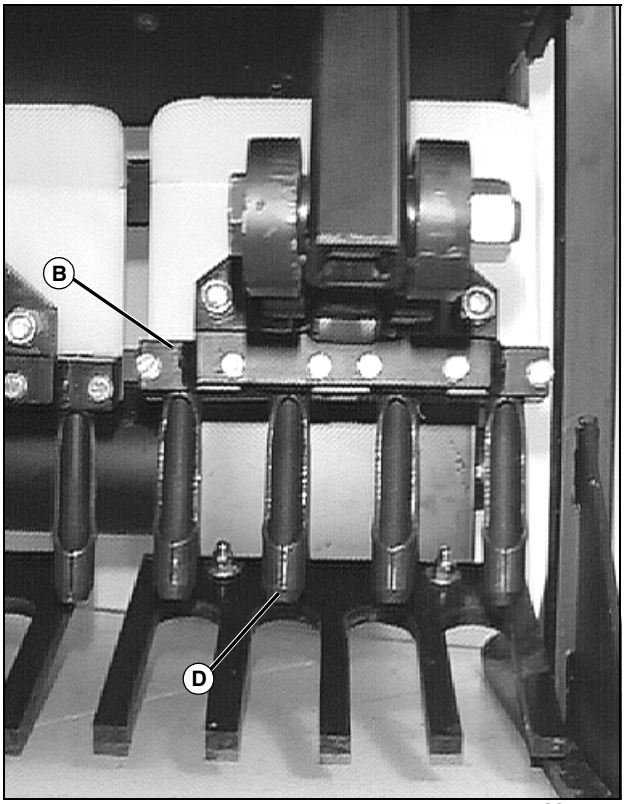
NOTE: DO NOT remove bolts to remove tines. Loosen only as much as necessary to remove tines.



M86227

5. To remove tines, loosen bolts (A) on tine holder just so that the tines become loose in the holder (B). Tines can be removed two at a time by only loosening the bolts on one side of the tine holder at a time.

IMPORTANT: Avoid damage! Before installing tines, be sure the correct tine holders and turf guards (C) are installed.

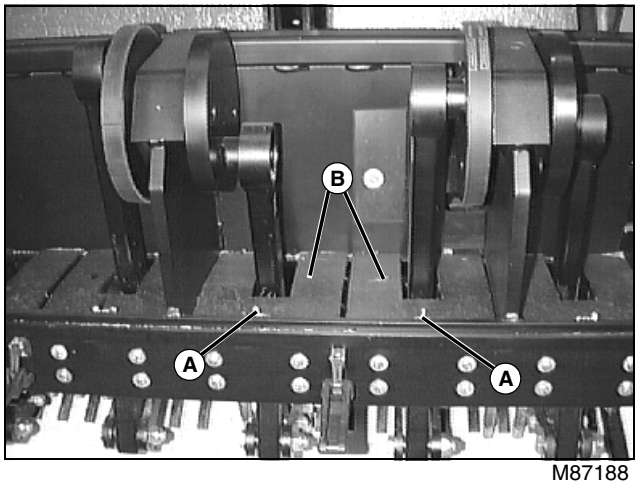


M86227

6. Install tine into tine holder (B) with beveled end (D) of tine pointing out. Install open-side tines with open side facing rearward.

7. Push tines completely inside tine holder and tighten bolts. Use a board to hold all the tines in the same place while tightening. New tines must be broken in before they aerate properly.

Divider Seal Removal and Installation



M87188

1. Remove wing nuts (A) to remove seals (B).

2. Replace seal and secure with wing nuts.

Core Deflectors Removal and Installation

NOTE: Core deflectors should be used with 4x tine holders. The mini-tine holder does not use a core deflector. Deflectors may be removed from or installed to the tine holders while the tine holder is installed on the machine or removed from the machine.

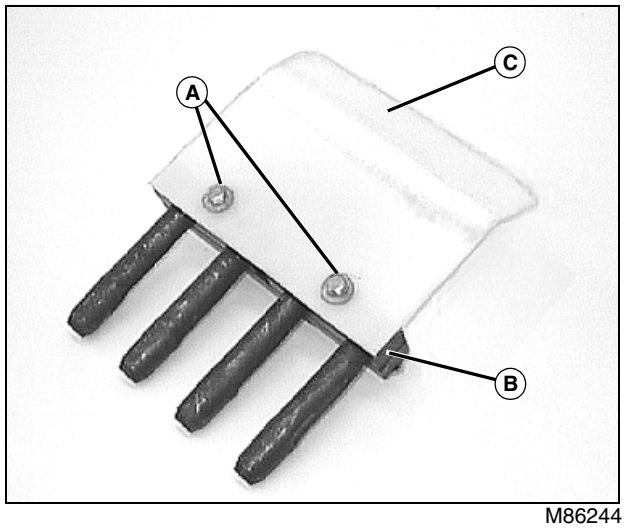
CAUTION: Avoid Injury! DO NOT remove or install core deflectors with engine running.

1. Park machine on a level surface.

2. Block machine safely off the ground using transport stops.

3. Lock the PARK brake.

4. Stop the engine and remove the key.



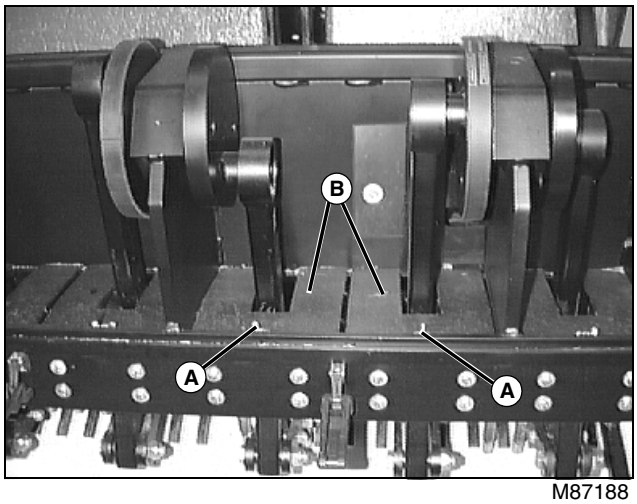
M86244

5. Remove bolts (A) from the backside of the tine holder (B).

6. Install new core deflector (C) so the curved part points rearward when installed on the machine.

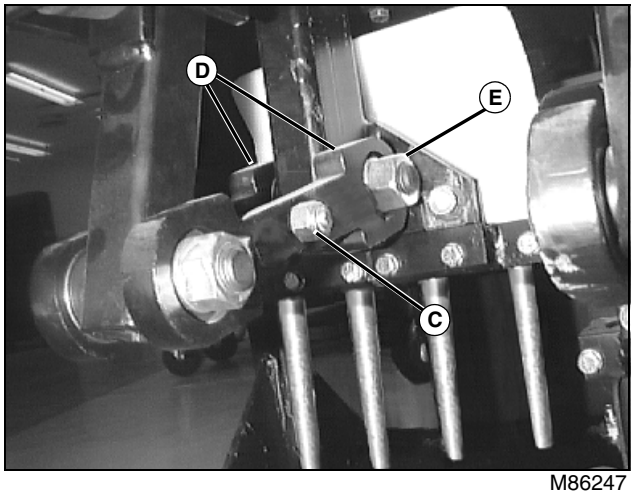
7. Secure each deflector with two flat washers, lock washers and bolts. Tighten until snug. DO NOT overtighten.

Flex-link Bumper Stop Removal and Installation



M87188

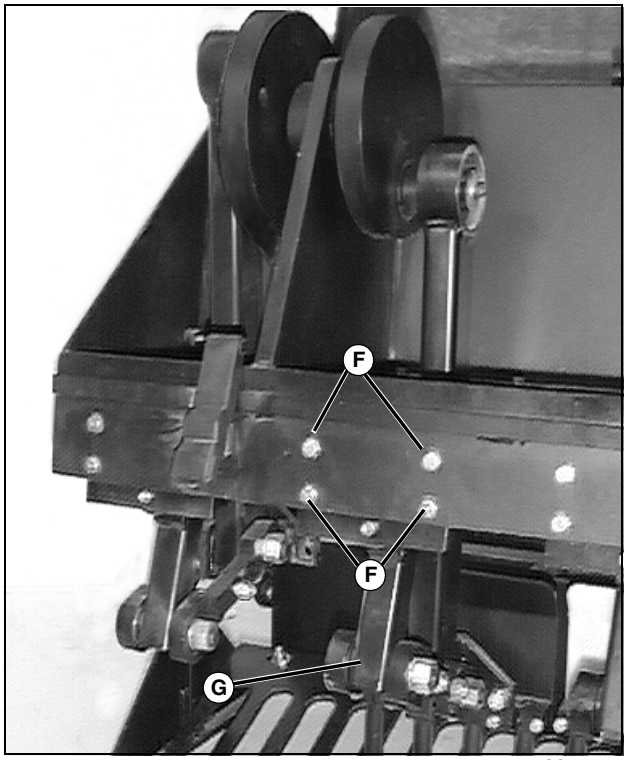
1. Remove wing nuts (A) and divider seal (B).



M86247

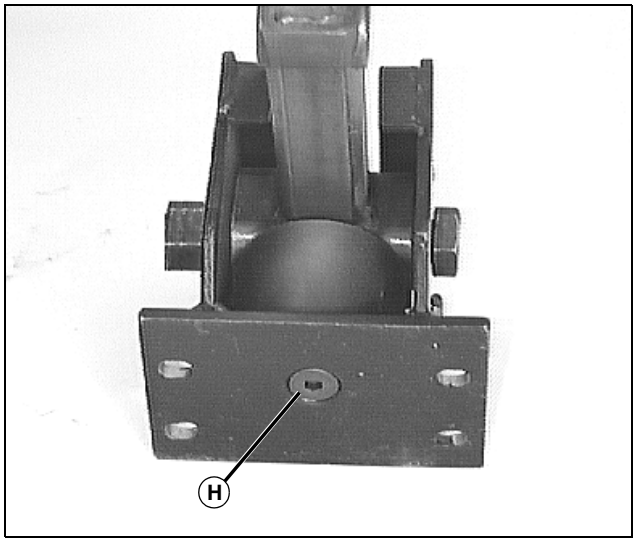
2. Loosen lock nut (C) to release pressure on return links (D).

3. Remove nut (E) and bolt at rear of return link.



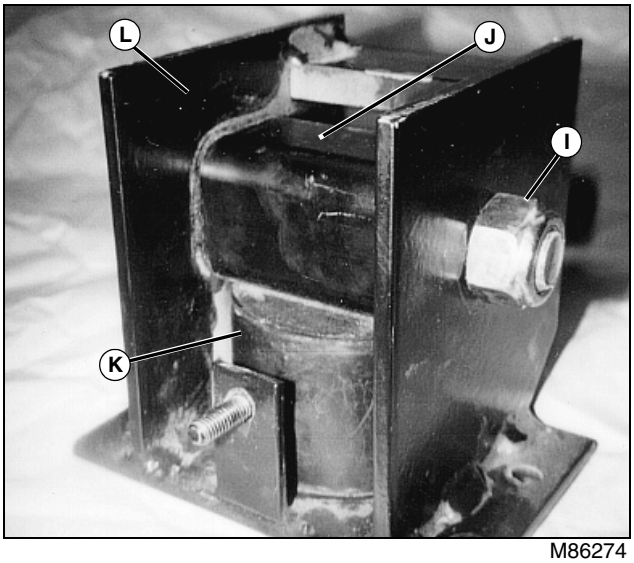
M86234

4. Remove four bolts (F) to allow flex link arm assembly (G) to drop down away from frame.



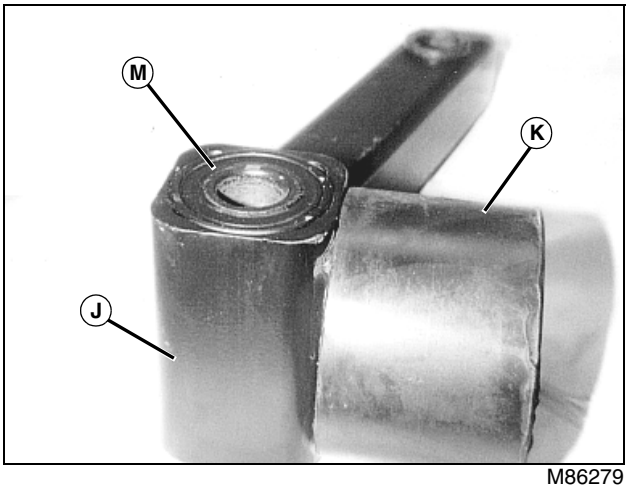
M86278

5. Remove hex head bolt (H) (5/16 in. SAE) from bracket plate.



M86274

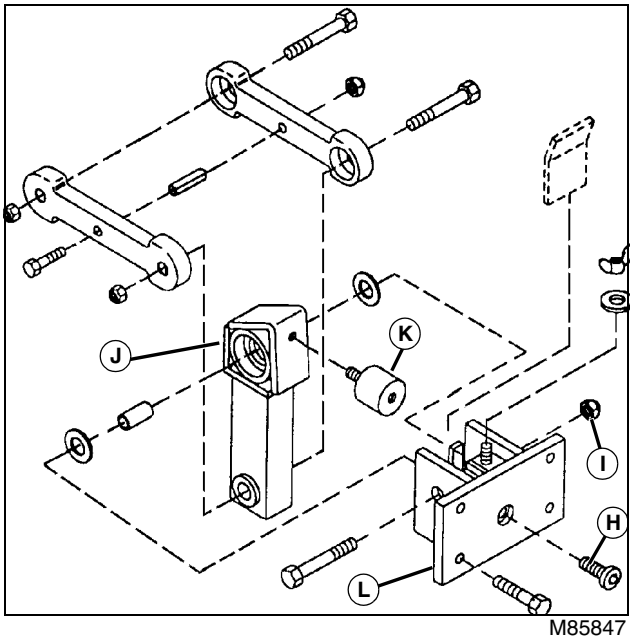
6. Remove bolt and nut (I) to remove flex-link arm (J) and rubber bumper (K) from the bracket assembly (L).



M86279

7. Unscrew rubber bumper (K) from flex-link arm (J).

8. Inspect bearing (M) for wear or damage. Replace as necessary.



M85847

9. Install new bumper (K) onto flex-link arm (J). Tighten rubber bumper securely by using a strap wrench. DO NOT overtighten.

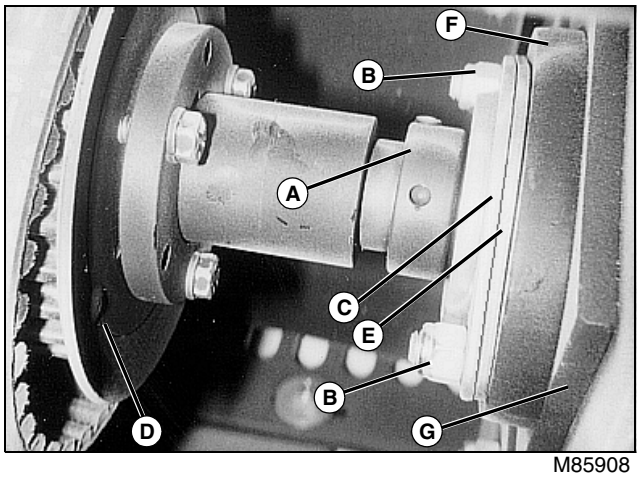
10. Install rubber bumper and flex-link arm in bracket (L) and secure with hex head bolt (H).

NOTE: Apply pressure to rubber bumper to compress it slightly - this will align flex-link arm bolt holes.

11. Install and tighten flex-link arm bolt and nut (I).

Reduction Drive Shaft Pulleys Removal and Installation

1. Remove drive belts. (See “Tine Ram Drive Belts Removal, Installation, and Adjustment” on page 244 and “Drive Belt Removal, Installation and Adjustment - Aercore 800” on page 247.)

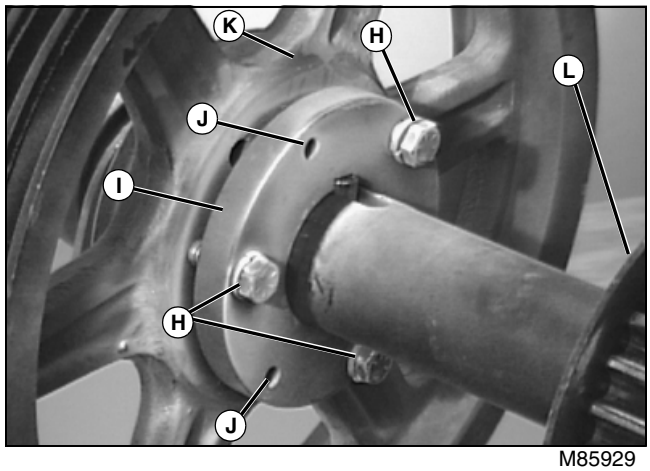


M85908

2. Loosen set screw on locking collar (A).

3. Using hammer and punch gently rotate locking collar to loosen. Remove lock nuts (B), and slide bearing, inner bearing cap (C) and locking collar towards pulley (D). Remove outer bearing cap (E), bearing plate (F), blank spacer (G), and reduction drive shaft.

NOTE: If working on Aercore 1000, 1500 or 2000, see "Gear Case Removal and Installation - Aercore 1000, 1500 and 2000" on page 202 in the Power Train section.



M85929

Picture Note: Aercore 800 Drive Pulley Shown

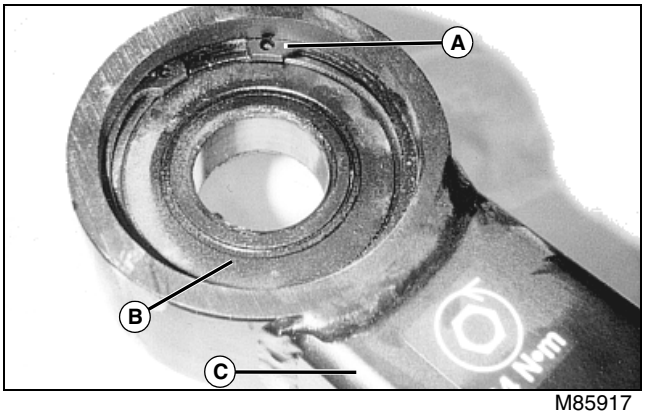
4. Remove bolts (H) holding spacer (I). Thread bolts into holes (J) provided. Tighten bolts evenly to remove drive belt pulley (K). Repeat for tine ram drive pulley's (L) if necessary.

5. Reinstall in reverse order of disassembly.

Bearings Removal and Replacement

NOTE: See "Main Pulley Removal and Installation" on page 240 or "Flex-link Bumper Stop Removal and Installation" on page 251.

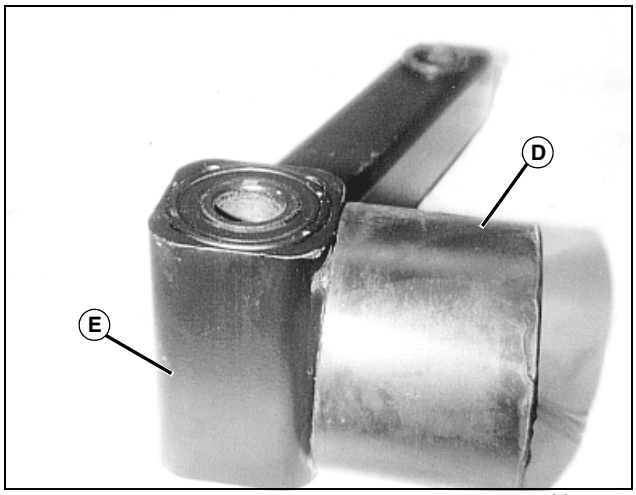
Connecting Rods



M85917

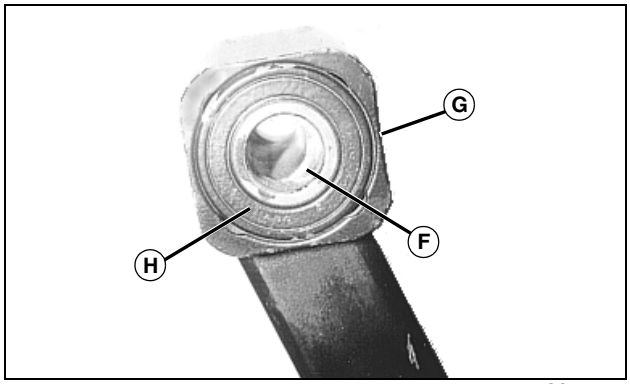
1. Remove snap ring (A) and press bearing (B) out of connecting rod (C) with suitable driver. Replace as necessary.

Flex-Link Arms



M86279

1. Remove rubber bumber (D) from flex link arm (E).



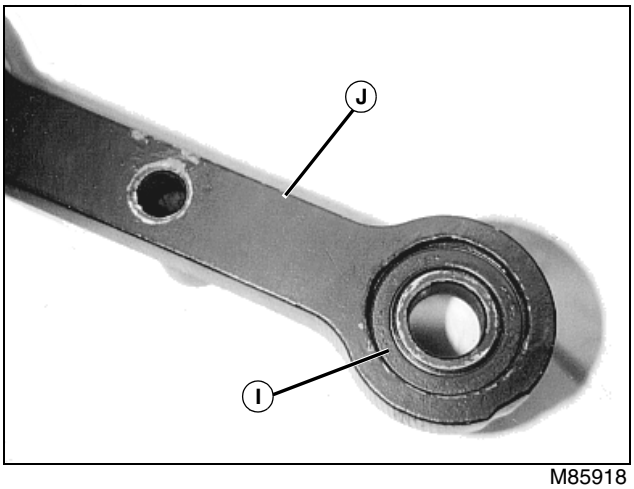
M85928

2. Using a punch gently tap bushing (F) through hex head screw fitting (G) till bushing is "off-set".

3. Place socket through bearing (H) until it seats with bushing. Gently tap socket till bearing on opposite side is removed. Repeat for other bearing.

4. Replace bearings as necessary.

Return Links

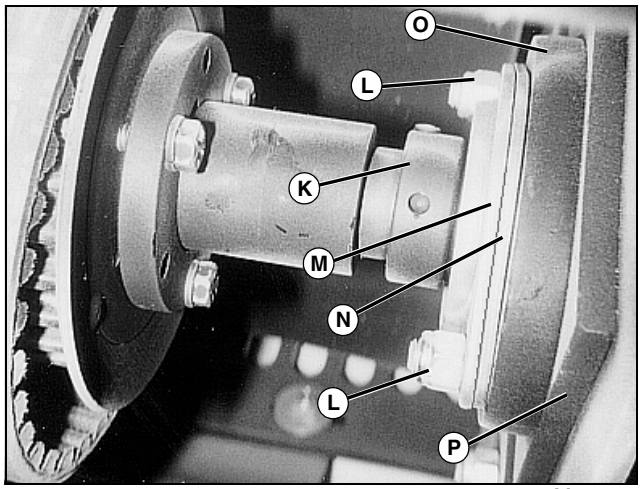


M85918

1. Press bearing (I) out of return link (J) with suitable driver. Replace as necessary.

Reduction Drive Shaft

NOTE: See "Tine Ram Drive Belts Removal, Installation, and Adjustment" on page 244 and "Drive Belt Removal, Installation and Adjustment - Aercore 800" on page 247.



M85908

1. Loosen set screw on locking collar (K).

2. Using hammer and punch gently rotate locking collar to loosen.

3. Remove lock nuts (L), and remove inner bearing cap (M), outer bearing cap (N), bearing plate (O), and blank spacer (P).

4. Remove bearing, bearing cap and locking collar. Repeat for other side. Replace bearings as necessary.

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