

OEM Engine Accessories

TECHNICAL MANUAL OEM Engine Accessories

CTM67 09DEC05 (ENGLISH)

Introduction

Foreword

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.



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

This Component Technical Manual (CTM) contains the latest available instructions necessary to repair OEM engine accessories. It includes theory of operation, and diagnostic and testing procedures to help troubleshoot and understand potential failure modes.

The information is organized in groups for the various components requiring service instruction. At the beginning of each repair group are summary listings of all applicable essential tools, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torque values.

Component Technical Manuals are concise service guides for specific components. Component technical manuals are written as stand-alone manuals covering multiple machine applications.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic types of failures and their causes.

RG,CTM67,IFC -19-02FEB94-1/1

John Deere Dealers

The changes listed below make your CTM obsolete. **Discard CTM 67 dated 24Sep02 and replace with this new manual 09Dec05.** Also, copy this page and route through your Service Department.

GROUP 20—REVISED

- Added **Engine Wiring Diagrams** for the PowerTech 2.4 and 3.0 L engines and the PowerTech Plus 4.5, 6.8, 9.0, and 13.5 L engines.

GROUP 21—REVISED

- Added **Instrument Panels** for the 2.4, 3.0, and 4.5 L (Later 270) engines without ECU and the PowerTech Plus 4.5, 6.8, 9.0, and 13.5 L engines.

GROUP 22—REVISED

- Added **Cinch™ Connector Repair** procedures.
- Added **Replace Instrumentation** procedures for 2.4, 3.0, and 4.5 L (Later 270) engines without ECU and engines with a John Deere ECU.

GROUP 25—REVISED

- Added **Coolant Heater- Block Type (2.4 and 3.0 L Engines)** remove and install information.

GROUP 40—REVISED

- Added **Check Automatic Belt Tensioner** information.

GROUP 46—REVISED

- Added **Theory of Operation** for John Deere rear PTO.

GROUP 54—NEW

- Added new **Auxiliary Drive (9.0 L)** group.

GROUP 55—REVISED

- Moved existing **Auxiliary Drive (10.5 and 12.5 L)** information from Group 54 to this new group, and added information for the 13.5 L engine.

GROUP 70—REVISED

- Added new **Air Conditioning Compressor** hardware for 4045HF475 and 6068HF475 engines.

OTHER GROUPS—MISCELLANEOUS REVISIONS

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INDX

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

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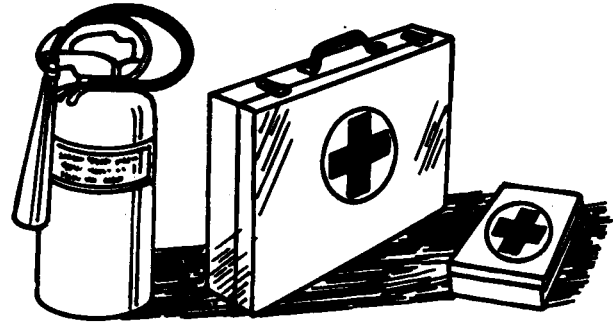
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Prepare for Emergencies

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.



TS291 -JUN-23AUG88

DX,FIRE2 -19-03MAR93-1/1

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).



TS204 -JUN-23AUG88

DX,SPARKS -19-03MAR93-1/1

Handling Batteries Safely

! **CAUTION:** Battery gas can explode. Keep sparks and flames away from batteries. Use a flashlight to check battery electrolyte level.

Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.

Always remove grounded (—) battery clamp first and replace it last.

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

Avoid the hazard by:

1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Using 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 15—30 minutes. Get medical attention immediately.

If acid is swallowed:

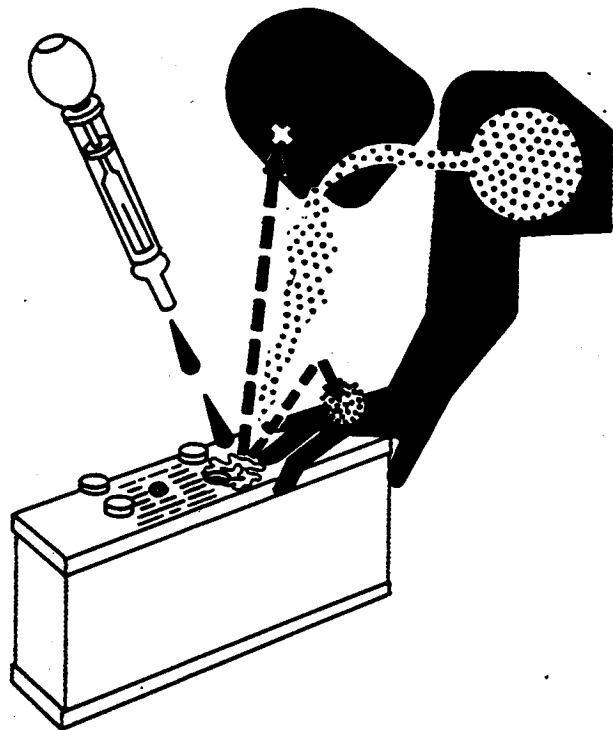
1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 qt.).
3. Get medical attention immediately.

WARNING: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. **Wash hands after handling.**



Explosion

TS204 -UN-23AUG88



Acid

TS203 -UN-23AUG88

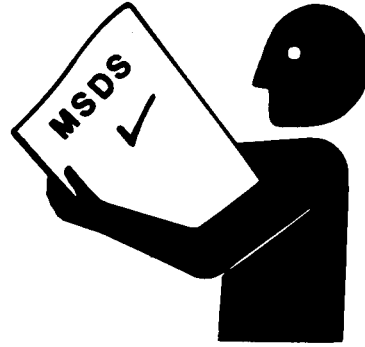
Handle Chemical Products Safely

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

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)



TSS1132 -UN-26NOV90

DX,MSDS,NA -19-03MAR93-1/1

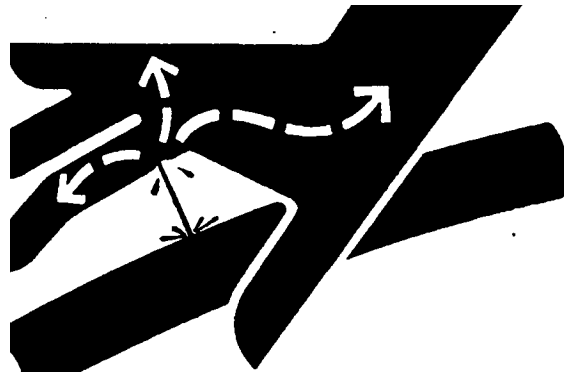
Avoid High-Pressure Fluids

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 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.



X9811 -UN-23AUG88

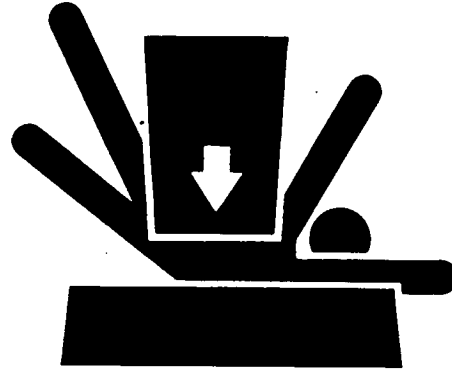
DX,FLUID -19-03MAR93-1/1

Support Machine Properly

Always lower the attachment or implement to the ground before you work on the machine. If the work requires that the machine or attachment be lifted, provide secure support for them. If left in a raised position, hydraulically supported devices can settle or leak down.

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.

When implements or attachments are used with a machine, always follow safety precautions listed in the implement or attachment operator's manual.



TS229 -UN-23AUG88

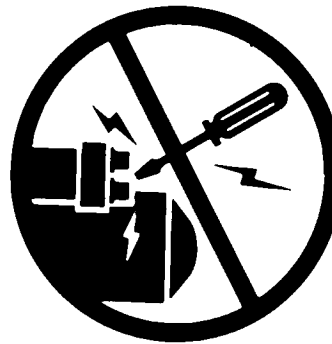
DX,LOWER -19-24FEB00-1/1

Prevent Machine Runaway

Avoid possible injury or death from machinery runaway.

Do not start engine by shorting across starter terminals. Machine will start in gear if normal circuitry is bypassed.

NEVER start engine while standing on ground. Start engine only from operator's seat, with transmission in neutral or park.



TS177 -UN-11JAN89

DX,BYPAS1 -19-29SEP98-1/1

Stay Clear of Rotating Drivelines

Entanglement in rotating driveline can cause serious injury or death.

Keep master shield and driveline shields in place at all times. Make sure rotating shields turn freely.

Wear close-fitting clothing. Stop the engine and be sure PTO driveline is stopped before making adjustments, connections, or performing any type of service on the engine or PTO-driven equipment.



Rotating Drivelines

TS1644 -UN-22AUG95

OUO1004,0000BD8 -19-03NOV00-1/1

Handle Starting Fluid Safely

Starting fluid is highly flammable.

Keep all sparks and flame away when using it. Keep starting fluid away from batteries and cables.

To prevent accidental discharge when storing the pressurized can, keep the cap on the container, and store in a cool, protected location.

Do not incinerate or puncture a starting fluid container.



T51356 -JUN-18MAR92

DX,FIRE3 -19-16APR92-1/1

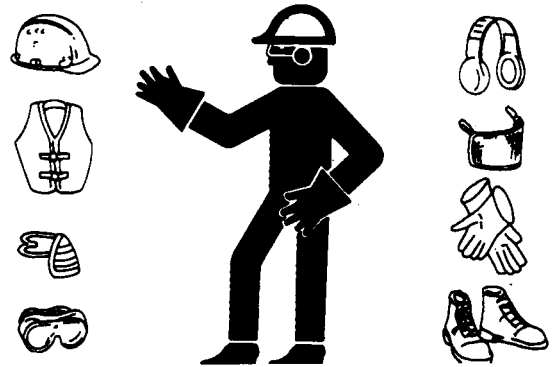
Wear Protective Clothing

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

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

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



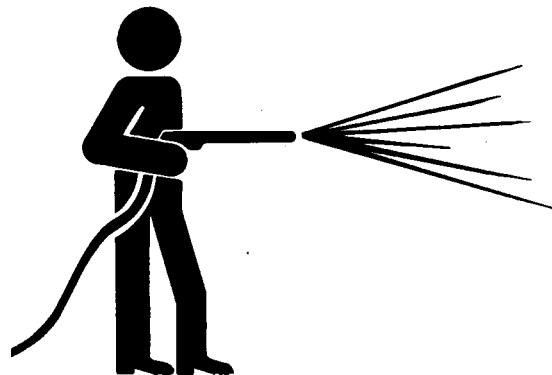
TS206 -JUN-23AUG88

DX,WEAR -19-10SEP90-1/1

Work in Clean Area

Before starting a job:

- Clean work area and machine.
- Make sure you have all necessary tools to do your job.
- Have the right parts on hand.
- Read all instructions thoroughly; do not attempt shortcuts.



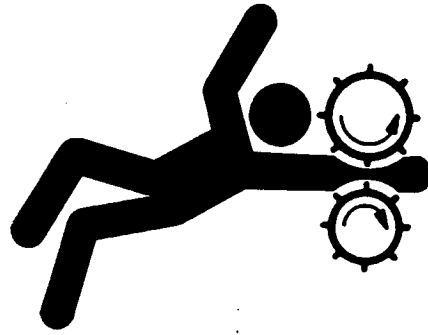
T6642EJ -JUN-18OCT88

DX,CLEAN -19-04JUN90-1/1

Service Machines Safely

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

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



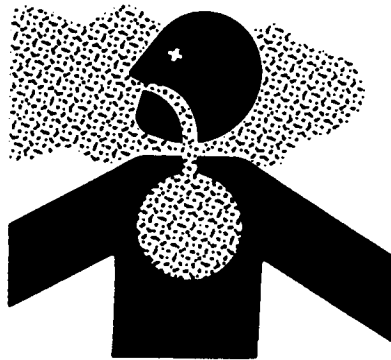
TS228 -UN-23AUG88

DX,LOOSE -19-04JUN90-1/1

Work In Ventilated Area

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

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

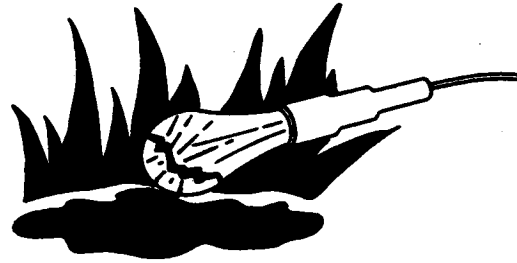


TS220 -UN-23AUG88

DX,AIR -19-17FEB99-1/1

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.



TS223 -UN-23AUG88

DX,LIGHT -19-04JUN90-1/1

Replace Safety Signs

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



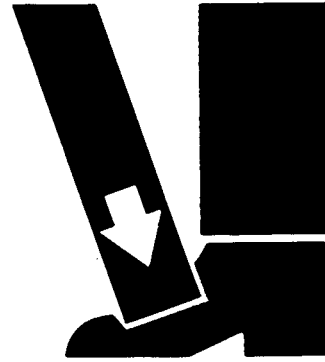
TS201 -UN-23AUG88

DX,SIGNS1 -19-04JUN90-1/1

Use Proper Lifting Equipment

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.



TS226 -JUN-23AUG88

DX,LIFT -19-04JUN90-1/1

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.

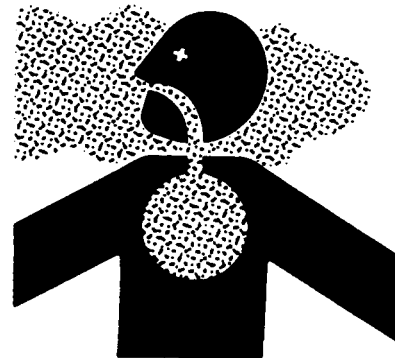
Remove paint before heating:

- Remove paint a minimum of 101 mm (4 in.) from area to be affected by heating. If paint cannot be removed, wear an approved respirator before heating or welding.
- 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.

Do not use a chlorinated solvent in areas where welding will take place.

Do all work in an area that is well ventilated to carry toxic fumes and dust away.

Dispose of paint and solvent properly.



TS220 -JUN-23AUG88

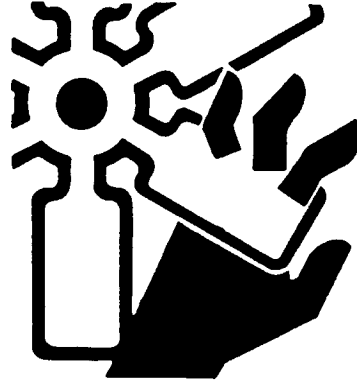
DX,PAINT -19-24JUL02-1/1

05
8

Install Fan Guards

Rotating cooling system fans can cause serious injury.

Keep fan guards in place at all times during engine operation. Wear close fitting clothes. Stop the engine and be sure fan is stopped before making adjustments or connections, or cleaning near the front of the engine.



Rotating Fan

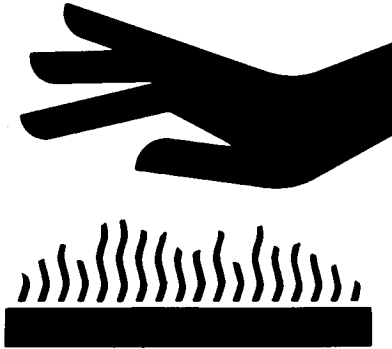
TS677 -UN-21SEP89

OUD006,000009D -19-04DEC02-1/1

Avoid Hot Parts

Avoid skin contact with exhaust manifolds, turbochargers and mufflers. Keep flammable materials clear of the turbocharger.

External dry exhaust parts become very hot during operation. Turbochargers and exhaust manifolds may reach temperatures as high as 600°C (1112°F) under full load. This may ignite paper, cloth or wooden materials. Parts on engines that have been at full load and reduced to no load idle will maintain approximately 150°C (302°F).



Hot Surface

TS271 -UN-23AUG88

OURGP12,0000135 -19-19JUL05-1/1

Avoid Heating Near Pressurized Fluid Lines

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 accidentally burst when heat goes beyond the immediate flame area.



TS953 -UN-15MAY90

DX,TORCH -19-10DEC04-1/1

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.



Practice Safe Maintenance

Understand service procedure before doing work. Keep area clean and dry.

Never lubricate, service, or adjust machine while it is moving. Keep hands, feet, and clothing from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.

On self-propelled equipment, disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

On towed implements, disconnect wiring harnesses from tractor before servicing electrical system components or welding on machine.



TS218 -UN-23AUG88

DX,SERV -19-17FEB99-1/1

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.



TS779 -UN-08NOV89

DX,REPAIR -19-17FEB99-1/1

Dispose of Waste Properly

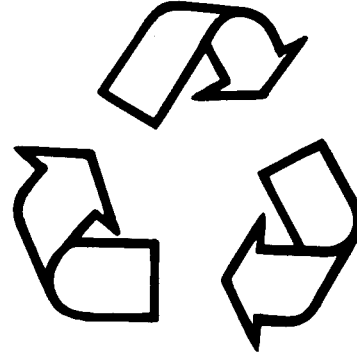
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

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.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.



TS1133 -UN-26NOV90

DX,DRAIN -19-03MAR93-1/1

Live With Safety

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



TS231 -19-07OCT88

DX,LIVE -19-25SEP92-1/1

About This Manual

This component technical manual covers necessary diagnostics and repair procedures for **accessories** used on Series 300, 400, 500 and 700 OEM Engines and PowerTech^{TM1} and PowerTech Plus^{TM2} 2.4 L, 2.9 L, 3.0 L, 4.5 L, 6.8 L, 8.1 L, 9.0 L, 10.5 L, 12.5 L, and 13.5 L OEM Engines.

Measurements given in this manual are given in both metric and the U.S. unit equivalent. Use only correct replacement parts and fasteners. Metric and inch fasteners may require a specific metric or inch wrench.

Right-hand and left-hand side of engine is determined by standing at the flywheel end (rear of the engine), facing towards front of engine.

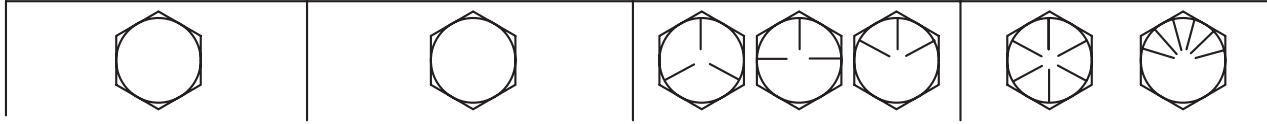
Read each module completely, that pertains to the particular job at hand, before performing any service.

¹PowerTech is a trademark of Deere & Company

²PowerTech Plus is a trademark of Deere & Company

Unified Inch Bolt and Screw Torque Values

TS1671 -UN-01MAY03



Bolt or Screw	SAE Grade 1				SAE Grade 2 ^a				SAE Grade 5, 5.1 or 5.2				SAE Grade 8 or 8.2			
	Lubricated ^b		Dry ^c		Lubricated ^b		Dry ^c		Lubricated ^b		Dry ^c		Lubricated ^b		Dry ^c	
Size	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in
1/4	3.7	33	4.7	42	6	53	7.5	66	9.5	84	12	106	13.5	120	17	150
													N•m	lb-ft	N•m	lb-ft
5/16	7.7	68	9.8	86	12	106	15.5	137	19.5	172	25	221	28	20.5	35	26
									N•m	lb-ft	N•m	lb-ft				
3/8	13.5	120	17.5	155	22	194	27	240	35	26	44	32.5	49	36	63	46
			N•m	lb-ft	N•m	lb-ft	N•m	lb-ft								
7/16	22	194	28	20.5	35	26	44	32.5	56	41	70	52	80	59	100	74
	N•m	lb-ft														
1/2	34	25	42	31	53	39	67	49	85	63	110	80	120	88	155	115
9/16	48	35.5	60	45	76	56	95	70	125	92	155	115	175	130	220	165
5/8	67	49	85	63	105	77	135	100	170	125	215	160	240	175	305	225
3/4	120	88	150	110	190	140	240	175	300	220	380	280	425	315	540	400
7/8	190	140	240	175	190	140	240	175	490	360	615	455	690	510	870	640
1	285	210	360	265	285	210	360	265	730	540	920	680	1030	760	1300	960
1-1/8	400	300	510	375	400	300	510	375	910	670	1150	850	1450	1075	1850	1350
1-1/4	570	420	725	535	570	420	725	535	1280	945	1630	1200	2050	1500	2600	1920
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2140	1580	2700	2000	3400	2500
1-1/2	990	730	1250	930	990	730	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

Torque values listed are for general use only, based on the strength of the bolt or screw. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For plastic insert or crimped steel type lock nuts, for stainless steel fasteners, or for nuts on U-bolts, see the tightening instructions for the specific application. Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

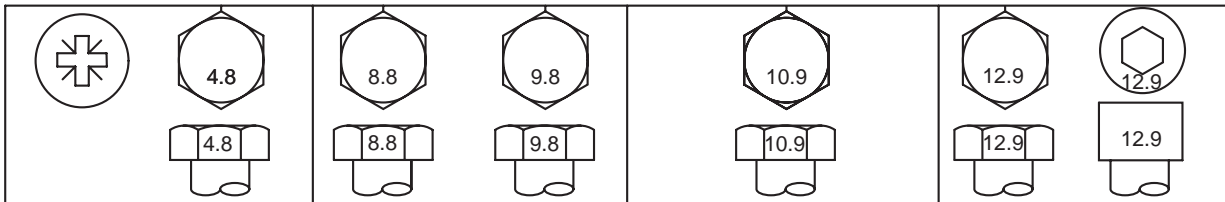
Replace fasteners with the same or higher grade. If higher grade fasteners are used, tighten these to the strength of the original. Make sure fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

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

^b“Lubricated” means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or 7/8 in. and larger fasteners with JDM F13C zinc flake coating.

^c“Dry” means plain or zinc plated without any lubrication, or 1/4 to 3/4 in. fasteners with JDM F13B zinc flake coating.

Metric Bolt and Screw Torque Values



Bolt or Screw	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated ^a		Dry ^b		Lubricated ^a		Dry ^b		Lubricated ^a		Dry ^b		Lubricated ^a		Dry ^b	
Size	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in	N•m	lb-in
M6	4.7	42	6	53	8.9	79	11.3	100	13	115	16.5	146	15.5	137	19.5	172
									N•m	lb-ft	N•m	lb-ft	N•m	lb-ft	N•m	lb-ft
M8	11.5	102	14.5	128	22	194	27.5	243	32	23.5	40	29.5	37	27.5	47	35
			N•m	lb-ft	N•m	lb-ft	N•m	lb-ft								
M10	23	204	29	21	43	32	55	40	63	46	80	59	75	55	95	70
	N•m	lb-ft														
M12	40	29.5	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	46	80	59	120	88	150	110	175	130	220	165	205	150	260	190
M16	100	74	125	92	190	140	240	175	275	200	350	255	320	235	400	300
M18	135	100	170	125	265	195	330	245	375	275	475	350	440	325	560	410
M20	190	140	245	180	375	275	475	350	530	390	675	500	625	460	790	580
M22	265	195	330	245	510	375	650	480	725	535	920	680	850	625	1080	800
M24	330	245	425	315	650	480	820	600	920	680	1150	850	1080	800	1350	1000
M27	490	360	625	460	950	700	1200	885	1350	1000	1700	1250	1580	1160	2000	1475
M30	660	490	850	625	1290	950	1630	1200	1850	1350	2300	1700	2140	1580	2700	2000
M33	900	665	1150	850	1750	1300	2200	1625	2500	1850	3150	2325	2900	2150	3700	2730
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2770	4750	3500

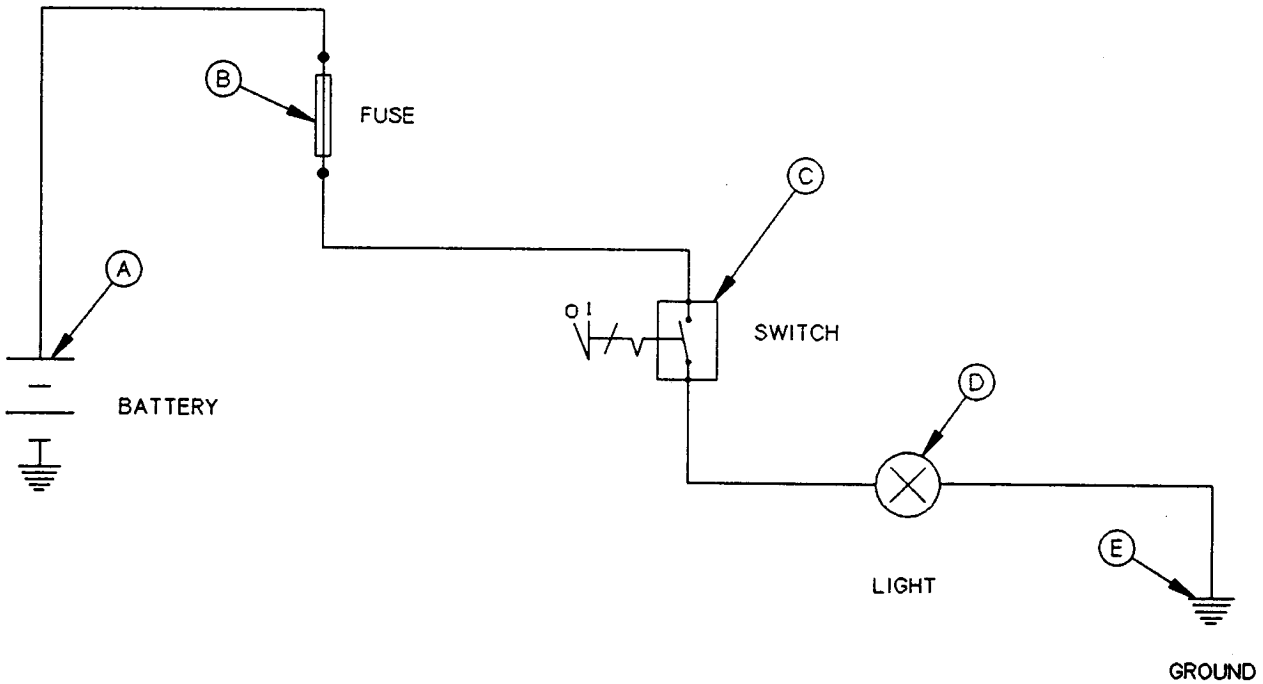
Torque values listed are for general use only, based on the strength of the bolt or screw. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For stainless steel fasteners or for nuts on U-bolts, see the tightening instructions for the specific application. Tighten plastic insert or crimped steel type lock nuts by turning the nut to the dry torque shown in the chart, unless different instructions are given for the specific application.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class. Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original. Make sure fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

^a"Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or M20 and larger fasteners with JDM F13C zinc flake coating.

^b"Dry" means plain or zinc plated without any lubrication, or M6 to M18 fasteners with JDM F13B zinc flake coating.

Electrical Circuit Malfunctions



T7713AD (CV)

A—Battery
B—Fuse

C—Switch

D—Light

E—Ground

1. There are four common circuit malfunctions.

- High-Resistance Circuit
- Open Circuit
- Grounded Circuit
- Shorted Circuit

2. Three sections in a simple circuit where these malfunctions can occur:

- Before the controlling switch (C).
- Between the controlling switch and before the component, light (D).

- After the component.

Component malfunctions can easily be confused with circuit malfunctions. Therefore, care must be exercised when isolating the cause of a problem.

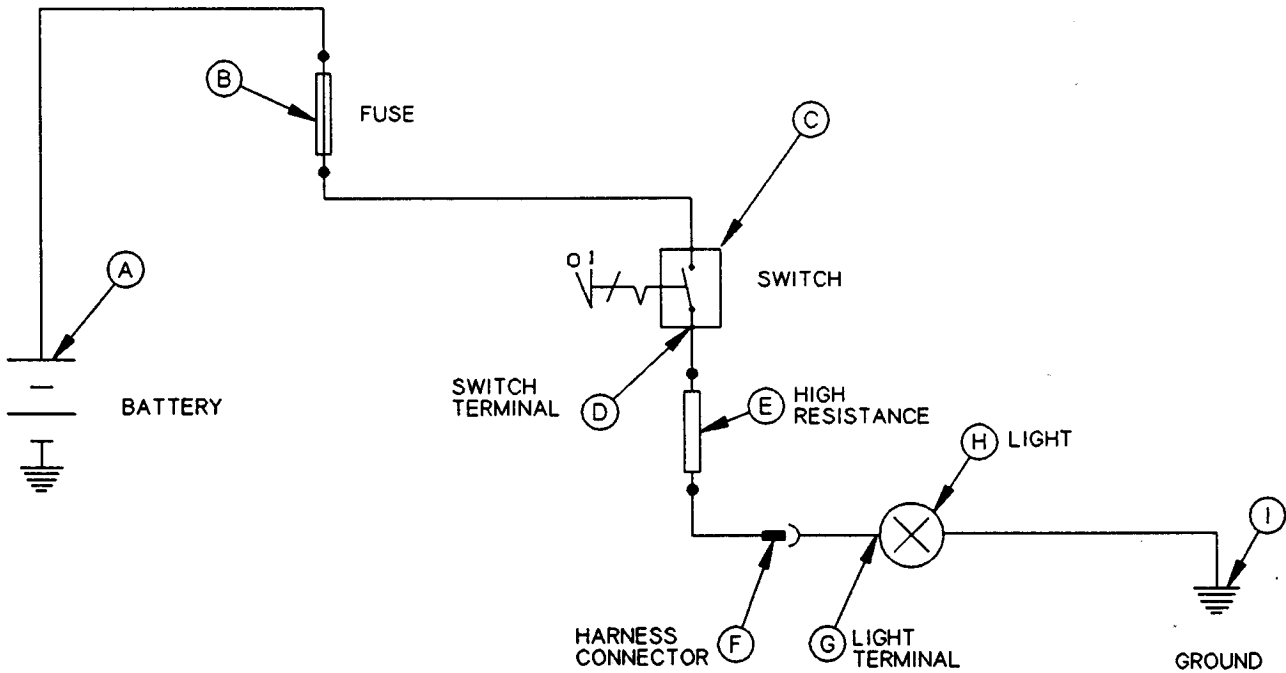
Example: Light does not operate or is dim when switch is turned ON, until switch connector is disconnected and reconnected.

Reason: High resistance caused by a dirty switch connector, caused a voltage drop which prevented the proper amount of current from flowing to the light.

T7713AD -19-27FEB92

DPSG.OU01004,785 -19-19APR99-1/1

High Resistance Circuit



T7713AG (CV)

A—Battery
B—Fuse
C—Switch

D—Switch Terminal
E—High Resistance

F—Harness Connector
G—Light Terminal

H—Light
I—Ground

A high resistance circuit can result in slow, dim or no component operation.

Examples: Loose, corroded, dirty or oily terminals.
Wire size too small. Strands broken inside the wire.
Poor ground connection to frame.

To locate the cause of high resistance:

With switch (C) ON, check for battery voltage between switch and ground (I) at an easily accessible location, like harness connector (F).

If less than battery voltage is indicated, check again closer to switch.

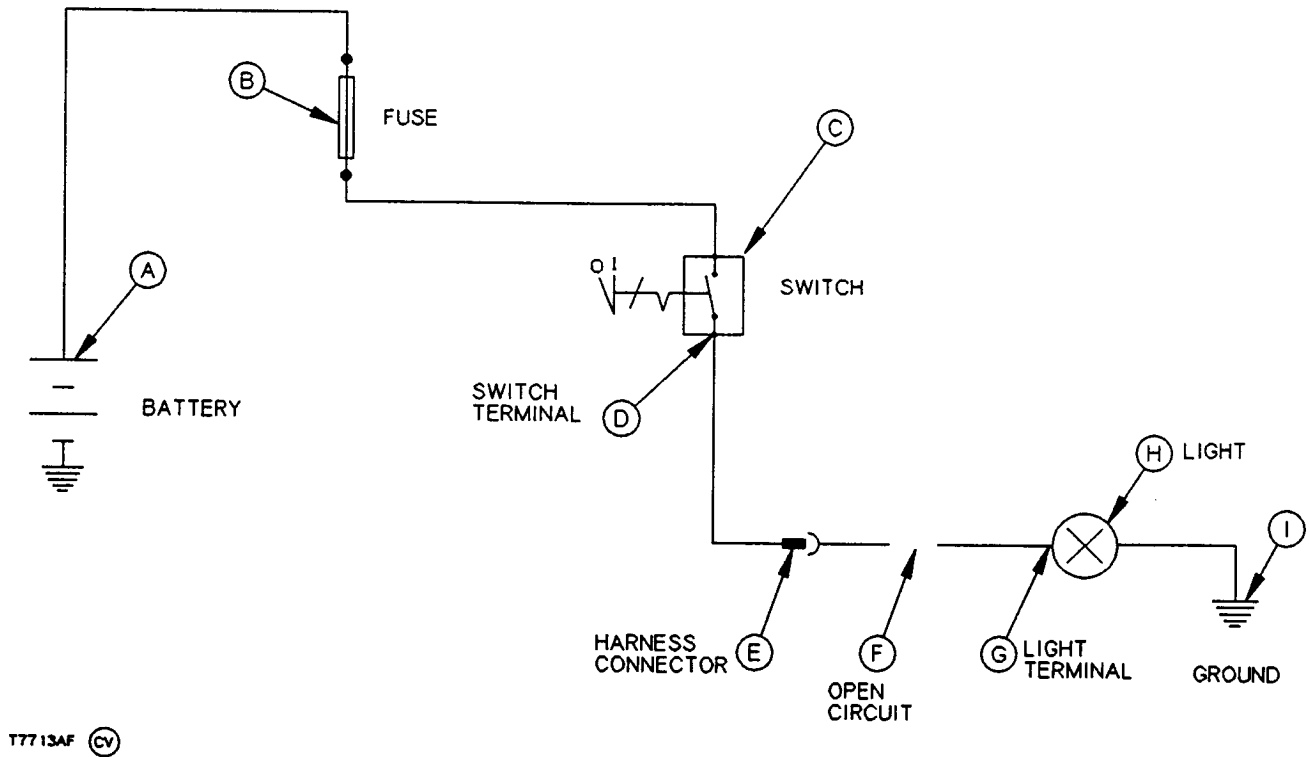
If battery voltage is indicated, check closer to ground to locate point of voltage drop. The example shows high resistance (E) between switch and harness connector.

Repair circuit as required. In the example, strands were broken inside the wire. Replace that section of wire.

Repeat check-out procedure after repair.

T7713AG -19-26FEB92

Open Circuit



T7713AF (CV)

A—Battery
B—Fuse
C—Switch

D—Switch Terminal
E—Harness Connector

F—Open Circuit
G—Light Terminal

H—Light
I—Ground

An open circuit will result in no components operating. Fuse may or may not be blown.

Example: Broken wire, disconnected component terminal, pins inside a connector not making contact, blown fuse, open circuit breaker, failed switch or component, or a disconnected ground wire.

To locate an open circuit:

Check fuse. If blown, replace and operate circuit. If fuse blows a second time, continue check.

With switch (C) ON, check for battery voltage at switch terminal (D).

If no voltage is indicated, check switch, fuse and wiring to battery.

If battery voltage is indicated, check for voltage closer to ground at harness connector (E).

If no voltage is indicated, wire may be broken between switch and connector.

If battery voltage is indicated, inspect connector pins. If pins are OK check for voltage at light terminal (G).

In the example, zero voltage will be indicated at light terminal, indicating a broken wire between harness connector and light terminal.

If battery voltage had been indicated, the next check for voltage would be at ground connection (I).

Normal indicated voltage at a ground connection should be 0.0 to 0.5 volts.

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DPSG,UO01004,661 -19-15MAR99-1/2

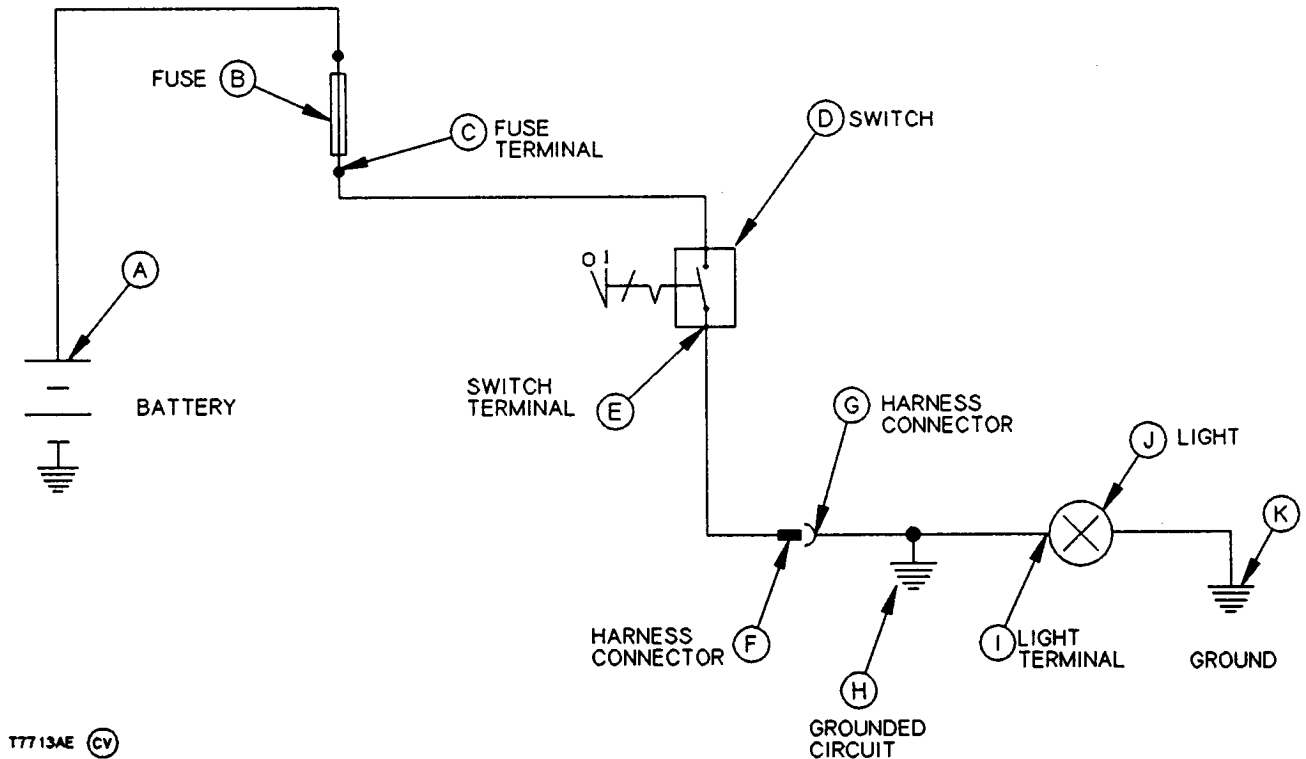
T7713AF -19-27FEB92

If battery voltage is indicated, poor connection to frame or broken wire is indicated.

When problem is located, repair as needed, then repeat last check.

DPSG,OUO1004,661 -19-15MAR99-2/2

Grounded Circuit



T7713AE (CV)

T7713AE -19-27FEB92

A—Battery
B—Fuse
C—Fuse Terminal

D—Switch
E—Switch Terminal
F—Harness Connector

G—Harness Connector
H—Grounded Circuit
I—Light (Component) Terminal

J—Light
K—Ground

If no component operates, the fuse is blown and replacement fuses blow immediately or the circuit breaker is open and reopens when reset, a grounded circuit exists. (Example: power wire contacting frame or other metal component). A wire may be pinched or insulation may be worn from a wire.

To isolate the location of a grounded circuit:

If circuit is grounded between battery and fuse, wire will be burned and circuit will be open. Fuse will not be blown.

If fuse is blown, remove fuse from circuit, disconnect circuit near its center, such as harness connector (F). Turn switch (D) ON and check for continuity to ground at harness connector (F). This will check harness from harness connector to fuse.

If continuity to ground is indicated, there is a pinched or bare wire between fuse terminal (C) and harness connector (F).

If continuity to ground does not exist, disconnect ground (K) from frame. Measure continuity to ground at harness connector (G). This checks harness from harness connector to ground terminal. In the example continuity to ground will exist because circuit is grounded (wire is pinched) at (H).

If continuity exists, disconnect circuit at light terminal (I) and measure continuity to ground on light terminal. This checks harness from light to ground terminal. In the example, continuity will not exist, indicating a grounded circuit between the light and harness connector (G).

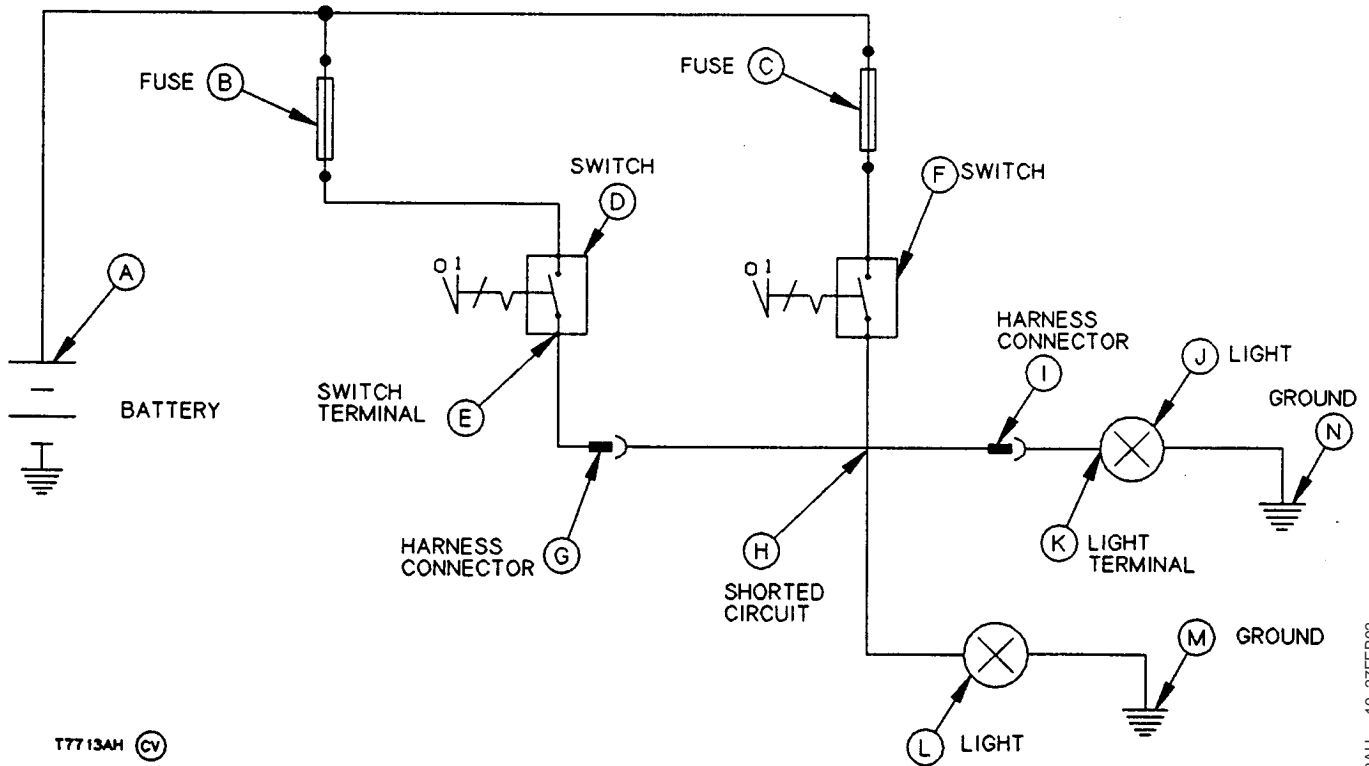
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DPSG,UOU1004,662 -19-15MAR99-1/2

20
6 Repeat check-out procedure after repair.

DPSG,OUO1004,662 -19-15MAR99-2/2

Shorted Circuit



T7713AH (CV)

T7713AH -19-27FEB92

A—Battery
B—Fuse
C—Fuse
D—Switch

E—Switch Terminal
F—Switch
G—Harness Connector
H—Shorted Circuit

I—Harness Connector
J—Light
K—Light Terminal

L—Light
M—Ground
N—Ground

A shorted circuit causes components in separate circuits to operate when a switch in either circuit is turned ON. (Example: two harnesses rubbing together until insulation is worn through allowing bare wires to touch). Components can also become shorted. However, shorted components will usually blow the fuse.

To locate a shorted circuit:

Turn switch (F) ON then OFF. Turn switch (D) ON then OFF. Both lights (J and L) will be ON when either switch (D or F) is ON.

Turn switch (F) ON. Both lights (J and L) will be ON; only light (L) should be ON.

Disconnect wire from switch of component that should not be ON. In the example, disconnect wire from terminal (E) at switch (D). Light (J) remains ON.

Disconnect circuit at convenient places like harness connectors (G) and (I) and light terminal (K) until light (J) goes OFF.

The short circuit will be between the last two places the circuit was disconnected. In the example, it is between harness connectors (G and I). Light (J) will go OFF when harness connector (I) is disconnected. Inspect harness between connectors (G and I).

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DPSG,UOU1004,664 -19-15MAR99-1/2

Repair or replace wires and harnesses as needed.
Install tie bands and clamps on harnesses as required to prevent future problems.

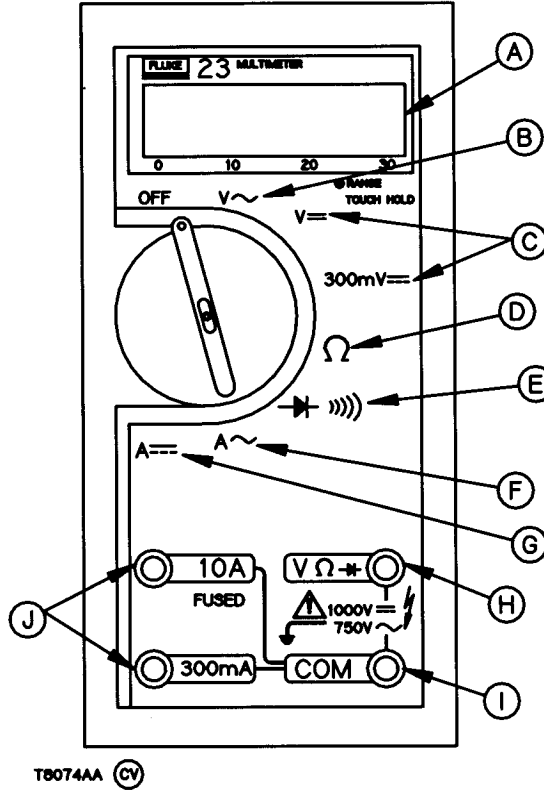
Repeat check-out procedure after repair.

DPSG.OUO1004.664 -19-15MAR99-2/2

Multimeter

The multimeter is an autoranging digital display that allows very accurate readings to be taken.

- A—Display
- B—Voltage AC (Alternating Current)
- C—Voltage DC (Direct Current)
- D—Resistance
- E—Diode Test/Continuity
- F—Current AC (Alternating Current)
- G—Current DC (Direct Current)
- H—Voltage, Resistance, Diode/Continuity (Red Lead Input)
- I—Ground (Black Lead Input)
- J—Current/Amps (Red Lead Input)

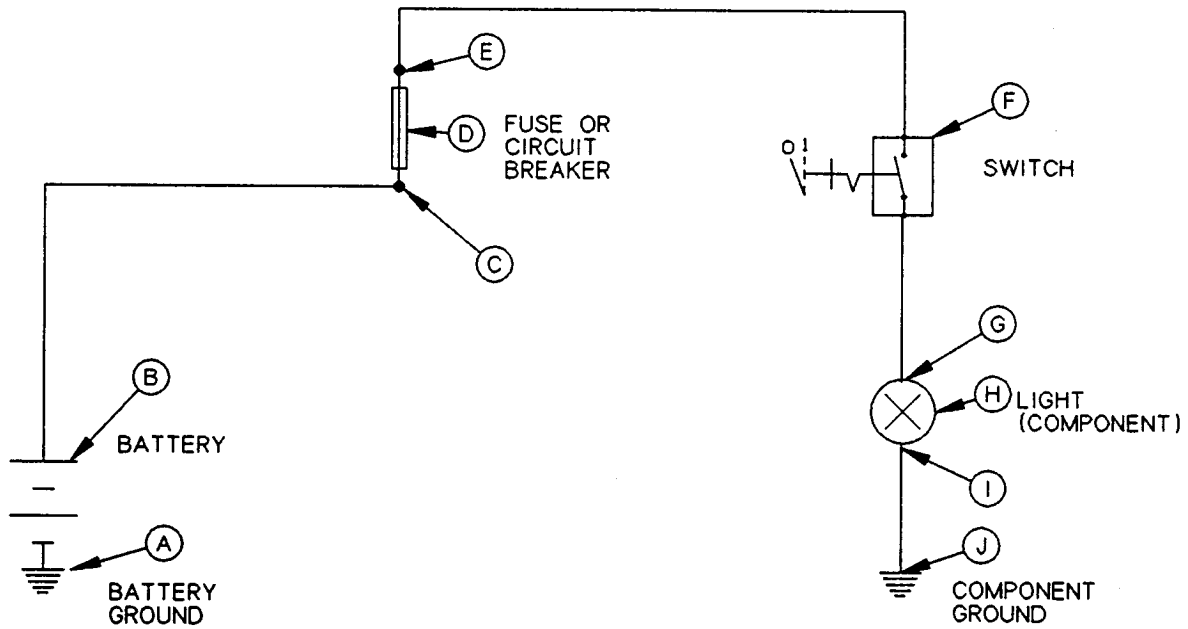


T8074AA (CV)

T8074AA -19-03SEP93

DPSG.OUO1004.665 -19-15MAR99-1/1

Seven Step Electrical Test Procedure



T7719AA (CV)

- | | | | |
|-------------------------------------------|---------------------------------------------|--------------------------------------|-------------------------------------|
| A—Battery Ground | D—Fuse or Circuit Breaker | G—Battery Side of Component Terminal | I—Ground Side of Component Terminal |
| B—Battery | E—Component Side of Fuse or Circuit Breaker | H—Light (Component) | J—Component Ground |
| C—Battery Side of Fuse or Circuit Breaker | F—Switch | | |

Step 1—Switch ON	
Check battery side of circuit breaker (C) for battery voltage.	Battery voltage normal, go to Step 2. Low voltage, repair high resistance. Open circuit from battery.
Step 2—Switch OFF	
Check component side of circuit breaker (E) for battery voltage.	Battery voltage normal, go to Step 4. Low voltage, repair high resistance. No voltage, go to Step 3.

Continued on next page

DPSG,OUO1004,666 -19-15MAR99-1/2

T7719AA -19-05MAR92

Electrical System Information and Wiring Diagrams

20
10

Step 3—Switch OFF	
Check component side of circuit breaker (E) for continuity to ground.	Continuity to ground, repair grounded circuit at or before switch. No continuity to ground, replace circuit breaker.
Step 4—Switch ON	
Check component side of circuit breaker (E) for battery voltage.	Battery voltage normal, go to Step 6. Low voltage, repair high resistance. No voltage, go to Step 5.
Step 5 ^a	
Disconnect wire at battery side of component (G). Switch ON. Check wire at (G) for battery voltage.	Battery voltage, repair component. No voltage, repair grounded or open circuit at or after switch.
Step 6—Switch ON	
Check lead to component at (G) for battery voltage.	Battery voltage normal, go to Step 7. Low voltage, repair high resistance in circuit between fuse and component. No voltage, repair high resistance or open circuit between fuse and component.
Step 7—Switch ON	
Check ground wire of component at (I) for voltage.	No voltage, good continuity to ground, repair component. Voltage, poor continuity to ground, repair high resistance or open ground circuit.
^a A multimeter will not apply a load to the circuit at Step 5. The multimeter result is tested as a voltage condition in the result column.	

DPSG.OUO1004.666 -19-15MAR99-2/2

Wiring Diagram and Schematic Information

System Functional Schematic Diagram

The System Functional Schematic is a schematic diagram of the complete machine. All harnesses are identified by letter/number designation and description (W1 Engine Harness, W2 Dash Harness, etc.). Each wire is identified by number and/or color (G01 BLK, R02 RED, RED/WHT, BLU/GRN, etc.). All components are identified by letter/number designation, description and are represented by a schematic symbol. Component letter/number designation (K1 Start Relay, S1 Key Switch, B9 Horn, etc.) will indicate that component throughout the manual. The System Functional Schematic Diagram is divided into Sections. Each section contains one or more electrical circuits. Each section is indicated by a number and circuit (SE1 CHARGING CIRCUIT, SE2 STARTING CIRCUIT, etc.).

Wiring Diagram

The Wiring Diagram shows each wiring harness, wire color, wire destination, harness connectors and schematic symbols for each electrical component connected to that harness. Harnesses are identified by the same letter/number designation and description used in the System Functional Schematic Diagram (W1 Engine Harness, W2 Dash Harness, etc.). Each component schematic symbol will be identified by the same letter/number designation used in the System Functional Schematic Diagram. Harness connectors will be identified by a letter/number designation and description (X1 CAB HARNESS TO ENGINE HARNESS CONNECTOR, X3 DASH HARNESS TO HEATER BLOWER HARNESS CONNECTOR, etc.).

Component Location Diagram

The Component Location Diagram is a pictorial view by harness showing location of all electrical components, connectors, harness main ground locations and harness band and clamp location. Each component will be identified by the same identification letter/number and description used in the System Functional Schematic Diagram.

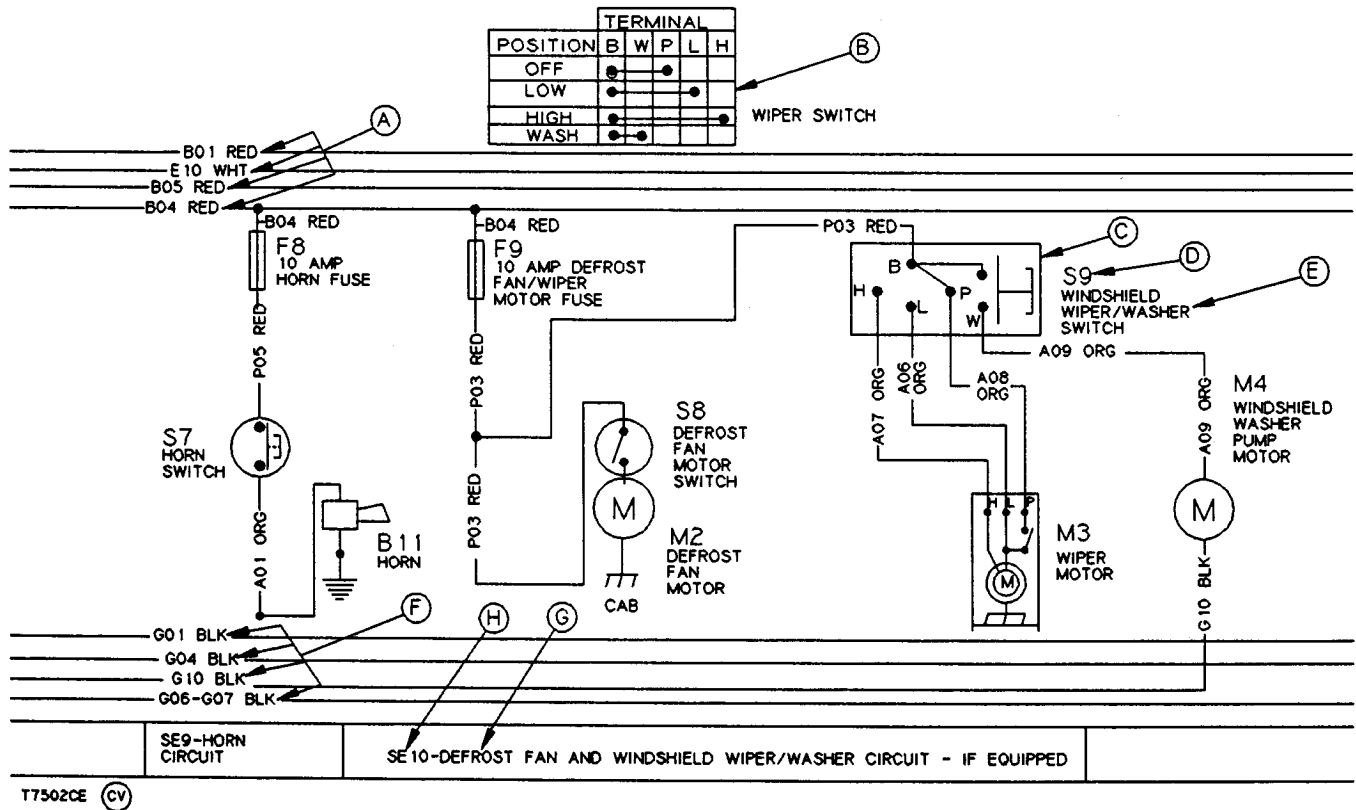


T85968 -UN-27FEB90

NOTE: All System Functional Schematics, Circuit Schematics and Wiring Diagrams are shown with key switch in the off position.

DPSG,OUO1004,667 -19-15MAR99-2/2

Reading a System Functional Schematic



- A—Power Wires
- B—Continuity Chart
- C—Component Schematic Symbol
- D—Component Identification Code
- E—Component Name
- F—Ground Wires
- G—Circuit Name
- H—Section Number

The System Functional Schematic is made up of sections which contain one or more Subsystem Functional Schematics laid out side by side in a logical sequence of related functions. Each Subsystem is a major group of components like starting components or charging components (H). Sections are named to reflect that group of components (G). The System Functional Schematic is formatted with power supply wires (A) shown across the top of the drawing and ground wires (F) across the bottom. The diagram contains no harness or connector information.

Each electrical component is shown by a schematic symbol (C), the component name (E), and a

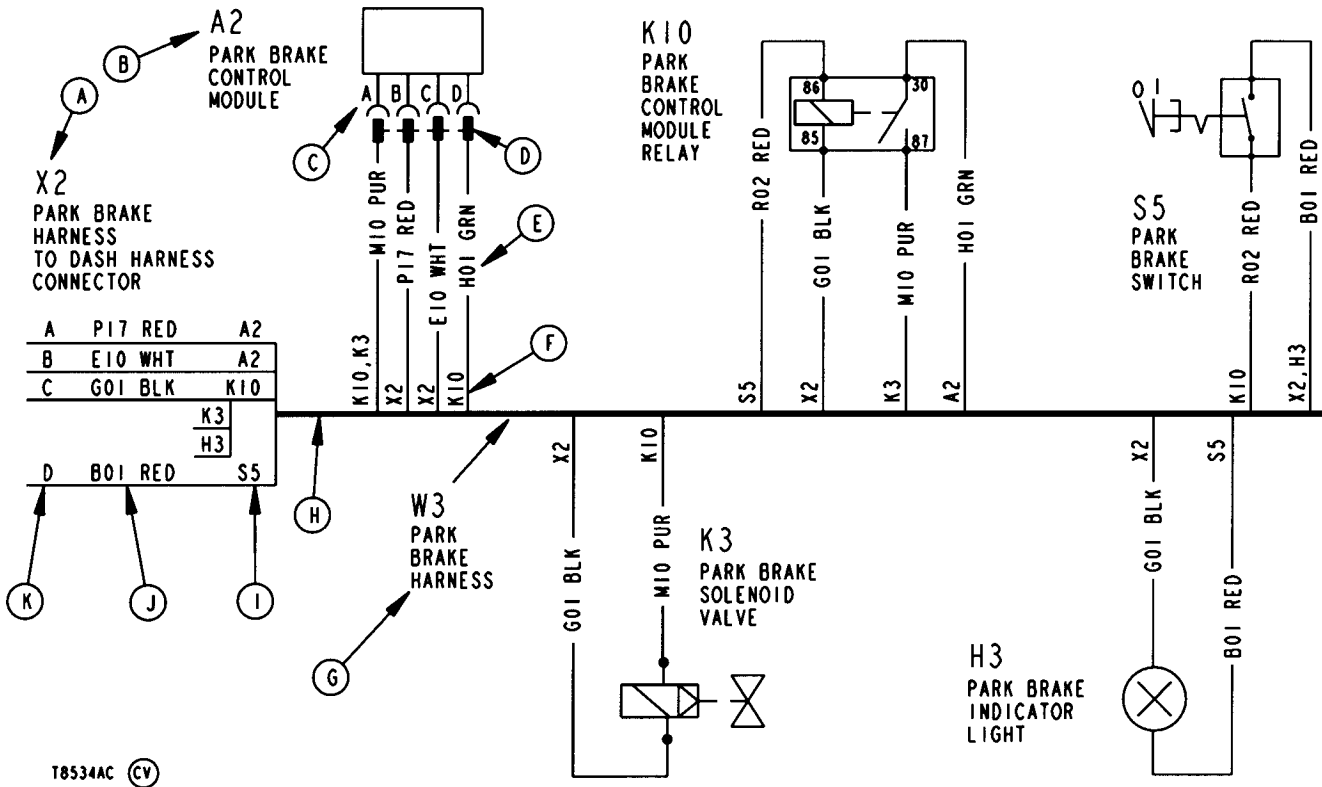
component identification code (D). A continuity chart (B) is included for each multi-terminal switch.

The same names and identification letter codes are used on all machine drawings—the System Functional Schematic, System Wiring and Harness Diagram, and the System Component Location Drawing. Components and connectors can easily be cross-referenced from one drawing to another.

See the following pages for Electrical Schematic Symbols and the Component Identification Table.

T7502CE -19-29MAY91

Reading a Wiring Diagram



T8534AC -19-10AUG95

Each harness on the machine is drawn showing components, connectors and wires. Harnesses (G) are identified by a letter/number designation and description (W3 PARK BRAKE HARNESS, etc.).

Each component (B) is represented by a schematic symbol and is identified by the same letter/number designation and description used in the System Functional Schematic. Components with integral connectors (D) have pin number/letters indicated (C). Wires from harness to components are identified by number and/or color designation (E). Component identification letter/number (F) indicates component wire is routed to.

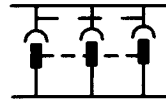
Main harness connectors (A) are identified by a letter/number designation and description (X2 PARK BRAKE HARNESS TO DASH HARNESS CONNECTOR, etc.). Harness connector description indicates which harnesses connect together. Connector pin numbers or letters (K) are indicated as they are marked on the connector. Wires attached to each connector pin are identified by number and/or color designation (J). Component identification number/letter (I) indicates destination of each wire.

Harness, harness connector and component identification letter/numbers and description are the same as used on the System Functional Schematic.

Electrical Schematic Symbols



STARTER MOTOR



MULTI-PIN CONNECTOR



ALTERNATOR



SINGLE PIN CONNECTOR



AIR CONDITIONER COMPRESSOR



SINGLE ELEMENT BULB



COMPRESSOR



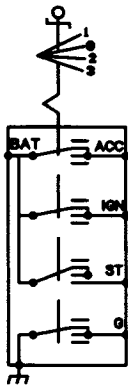
DUAL ELEMENT BULB



LIQUID PUMP



INTERNAL GROUND



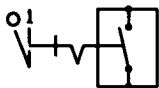
KEY SWITCH



SINGLE POINT GROUND



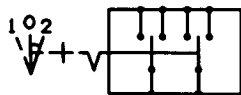
EXTERNAL GROUND



NORMALLY OPEN SWITCH

SWITCH OPERATION

- | MANUAL
- [PUSH
-] PULL
- ┌ TURN
- └ TOGGLE
- / PEDAL
- () KEY
- ∨ DETENT



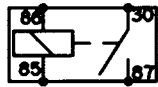
NORMALLY OPEN TWO WAY SWITCH

T77198A (CV)

T77198A -19-11OCT93

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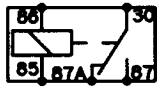
DPSG.OUO1004,670 -19-15MAR99-1/3



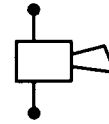
RELAY



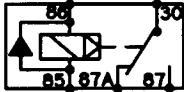
BUZZER



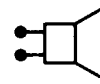
RELAY



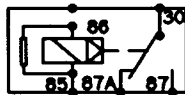
HORN



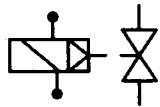
RELAY



ALARM



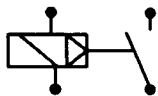
RELAY



ELECTRICALLY OPERATED HYDRAULIC VALVE



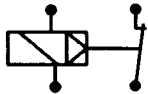
CLOCK



SOLENOID NORMALLY OPENED



HOURMETER



SOLENOID NORMALLY CLOSED



SPEEDOMETER GAUGE



DC MOTOR



TACHOMETER GAUGE



DC STEPPING MOTOR



TEMPERATURE GAUGE



WIPER MOTOR



LIQUID LEVEL GAUGE



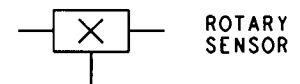
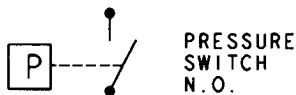
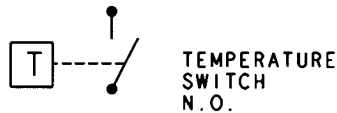
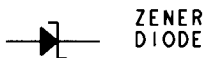
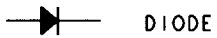
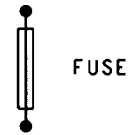
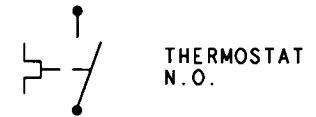
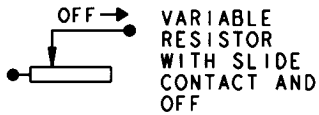
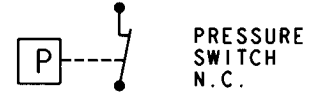
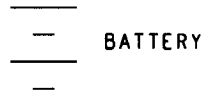
BLOWER MOTOR

T771988 (CV)

T771988 -19-11OCT93

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DPSG.OUO1004,670 -19-15MAR99-2/3



T8295B1 (CV)

T8295B1 -19-04DEC94

DPSG.OUO1004,670 -19-15MAR99-3/3

Component Identification Table

Each component (electrical device) and main connector will have an identification letter assigned to it. A number is added to the letter to separate and indicate the total components within that letter group.

Identification Letter	Type	Examples
A	System, subassembly, parts group	Control units, trigger boxes, two-way radios, logic module, FNR logic module
B	Transducer for conversion of non-electrical variables to electrical and vice versa	Speed sensors, pressure sensors, pressure switches horns, sensors, pickups, limit-value sensors, pulse generators, loudspeakers, inductive pickups, probes, air-flow sensors, oil-pressure switches, temperature sensors, ignition-voltage pickups
C	Condenser, capacitor	Condensers and capacitors, general
D	Binary device, memory	Digital devices, integrated circuits, pulse counters, magnetic tape recorders
E	Various devices and equipment	Heating devices, air conditioners, light, headlights, spark plugs, ignition distributors
F	Protection device	Release mechanisms, polarity protection devices, fuses, current protection circuits
G	Power supply, generator	Batteries, generators, alternators, charging units
H	Monitor, alarm, signalling device	Audible alarms, indicator lights, turn-signal lights, brake lights, alarms, warning lights, buzzers
K	Relay	Battery relays, turn-signal relays, solenoid switches, starting relays, warning flashers
L	Inductor	Choke coils, coils, windings
M	Motor	Blower motors, fan motors, starter motors
N	Regulator, amplifier	Regulators (electronic or electromechanical), voltage stabilizers
P	Measuring instrument	Ammeter, diagnostic connectors, tachometers, fuel gauge, pressure gauges, measuring points, test points, speedometers
R	Resistor	Flame glow plugs, sheathed-element flame glow plugs, glow plugs, heating resistors, NTC resistors, PTC resistors, potentiometers, regulating resistors

Continued on next page

DPSG,OUO1004.671 -19-13SEP02-1/2

Identification Letter	Type	Examples
S	Switch	Switches and push-button, general key switch, light switch, horn switch, flasher switch
T	Transformer	Ignition coil, ignition transformer
U	Modulator, converter	DC transformers
V	Semiconductor, electron tubes	Transistors, diodes, electron tubes, rectifiers, semiconductors, thyristors, zener diodes
W	Transmission path, conductor, antenna	Antennas, shielding components, shielded conductors, cable harnesses, conductors, ground conductors
X	Terminal, plug, plug and socket connection	Terminal studs, electrical connections, connectors electrical line couplers, line connectors, sockets, plugs, terminals, plug-and-socket connections
Y	Electrically actuated mechanical device	Permanent magnets, (solenoid-operated) injection valves, electromagnetic clutches and brakes, air valves, fuel pumps, solenoids, switching valves, start valves, locking systems
Z	Electrical filter	Interference suppression filters

DPSG.OUO1004,671 -19-13SEP02-2/2

Engine Wiring Diagram Legend—North American Series 300, 400, 500 and 700 Engines and Early Model European (Saran) Series 300 Engines

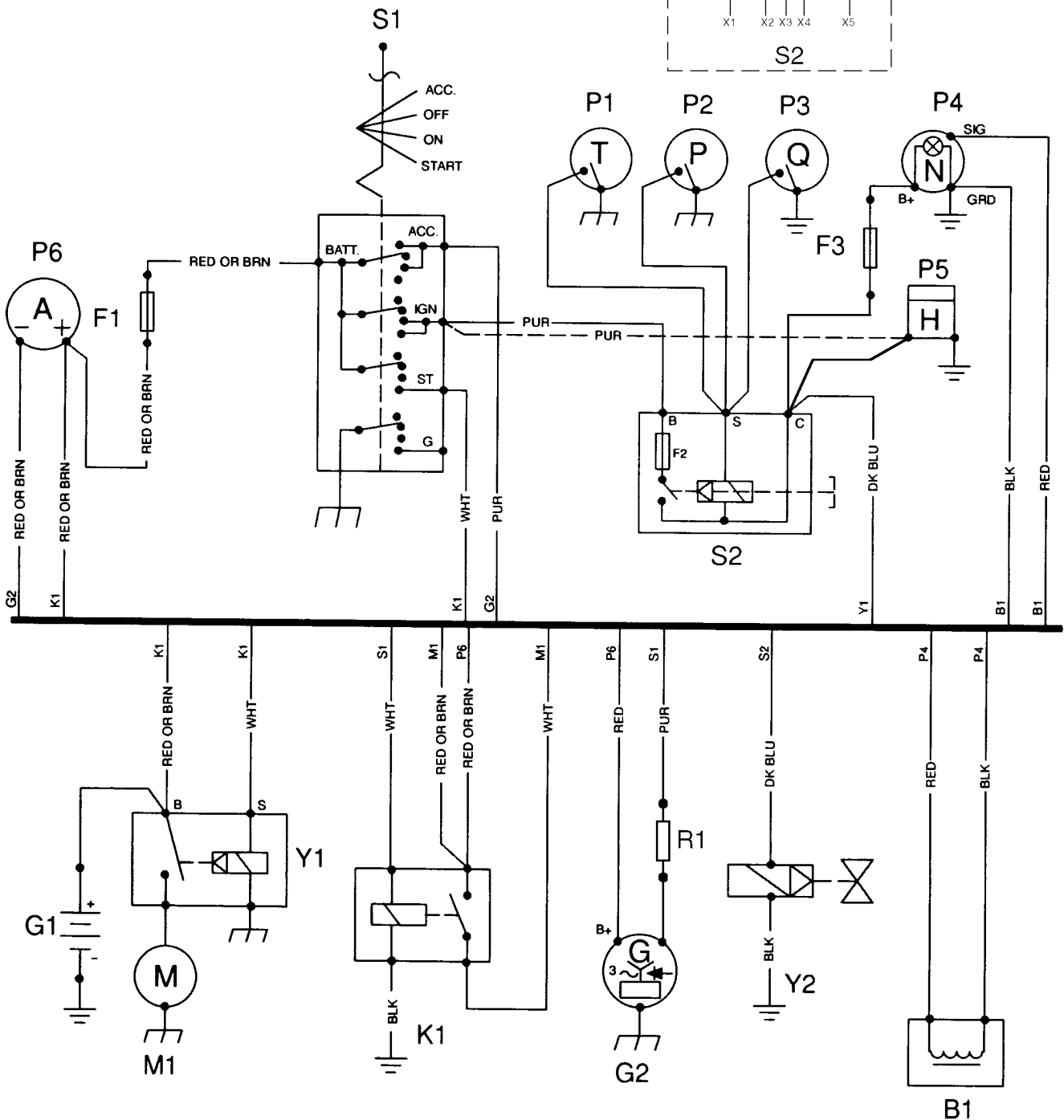
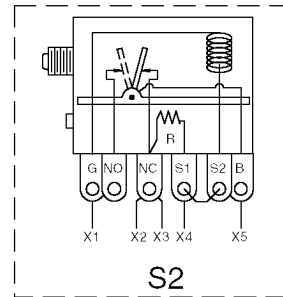
A1 — Speed Control Unit	P2 — Oil Pressure Gauge
B1 — Magnetic Speed Sensor	P3 — Crankcase Oil Level Switch/Gauge
B2 — Coolant Temperature Sensor	P4 — Tachometer
B3 — Oil Pressure Sensor	P5 — Hourmeter ¹
F1 — Starting Circuit Fuse (25 amp)	P6 — Ammeter
F2 — Safety Switch Fuse (14 amp)	R1 — Resistor (48 ohm)
F3 — Tachometer Fuse (3 amp)	S1 — Key Switch
G1 — Battery	S2 — Magnetic Safety Switch—North American Auto Override Module—European (Saran)
G2 — Alternator	X1 — To Meter Ground
H1 — Coolant Temperature Indicator Lamp	X2 — To Y2 Fuel Shut-Off Solenoid
H2 — Oil Pressure Indicator Lamp	X3 — —
H3 — Alternator Indicator Lamp	X4 — Power to Meters
K1 — Starter Relay	X5 — To Ignition Switch (IGN)
K2 — Fuel Shut-off Relay	Y1 — Starter Solenoid
M1 — Starter Motor	Y2 — Fuel Shut-off Solenoid
P1 — Coolant Temperature Gauge	

¹ On North American Series 300 engines without electronic tachometer: Early Units —A purple wire (shown as a dashed line in wiring diagram) connects between hourmeter "P5" and key switch "S1". Later Units And All Other North American Series 400 And 500 Engines—The wire (shown as a solid line) connects between the hourmeter and magnetic safety switch "S2" (C terminal).

DPSG.OUO1004.672 -19-15MAR99-1/1

Wiring Diagram—North American Series 300, 400 and 500 Engines

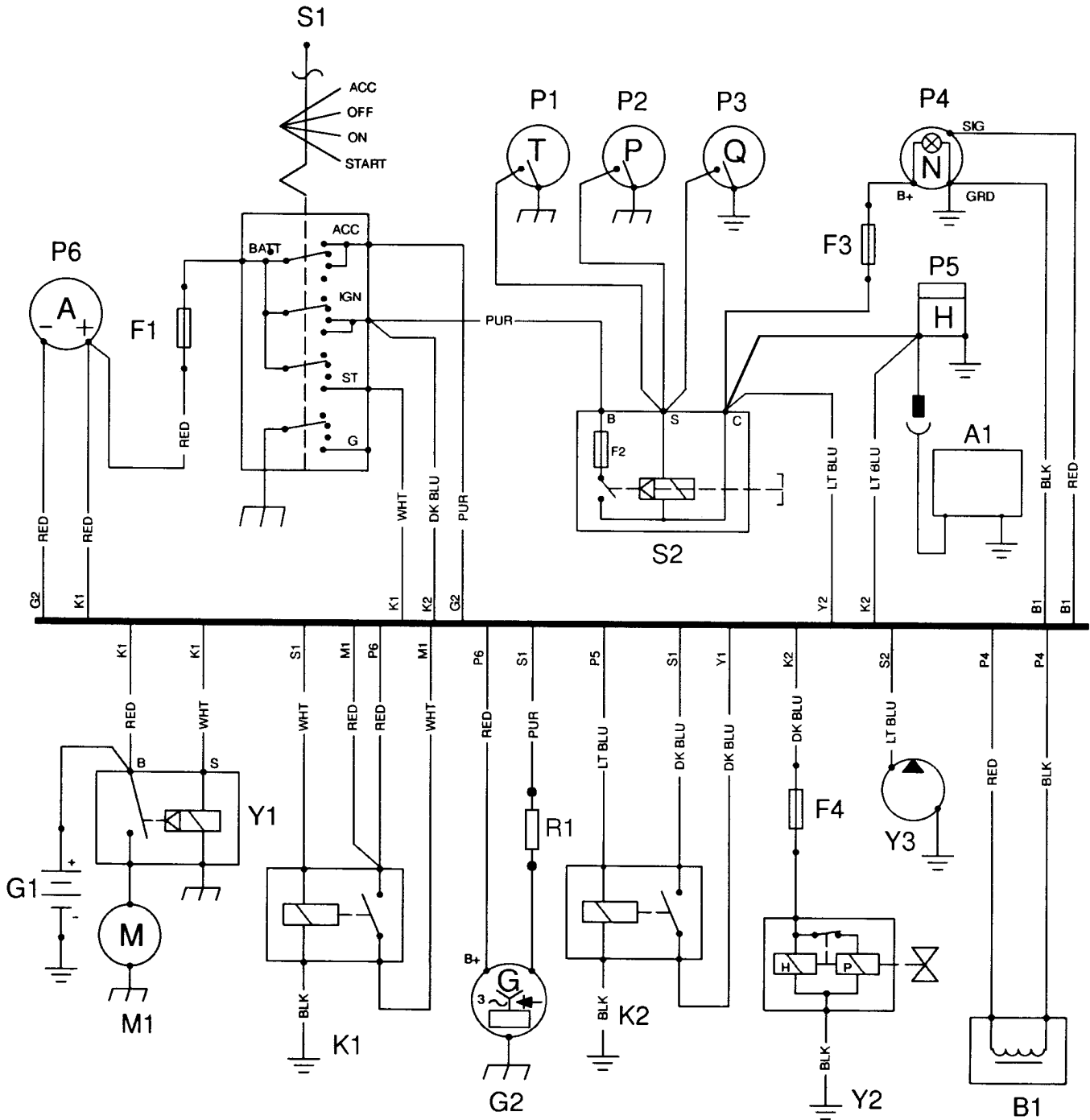
S1 KEY SWITCH					
	B	G	ACC.	ON	ST.
OFF					
ACC.	•		•		
ON	•		•	•	
START	•	•	•	•	•



RG9538 -UN-08A PR99

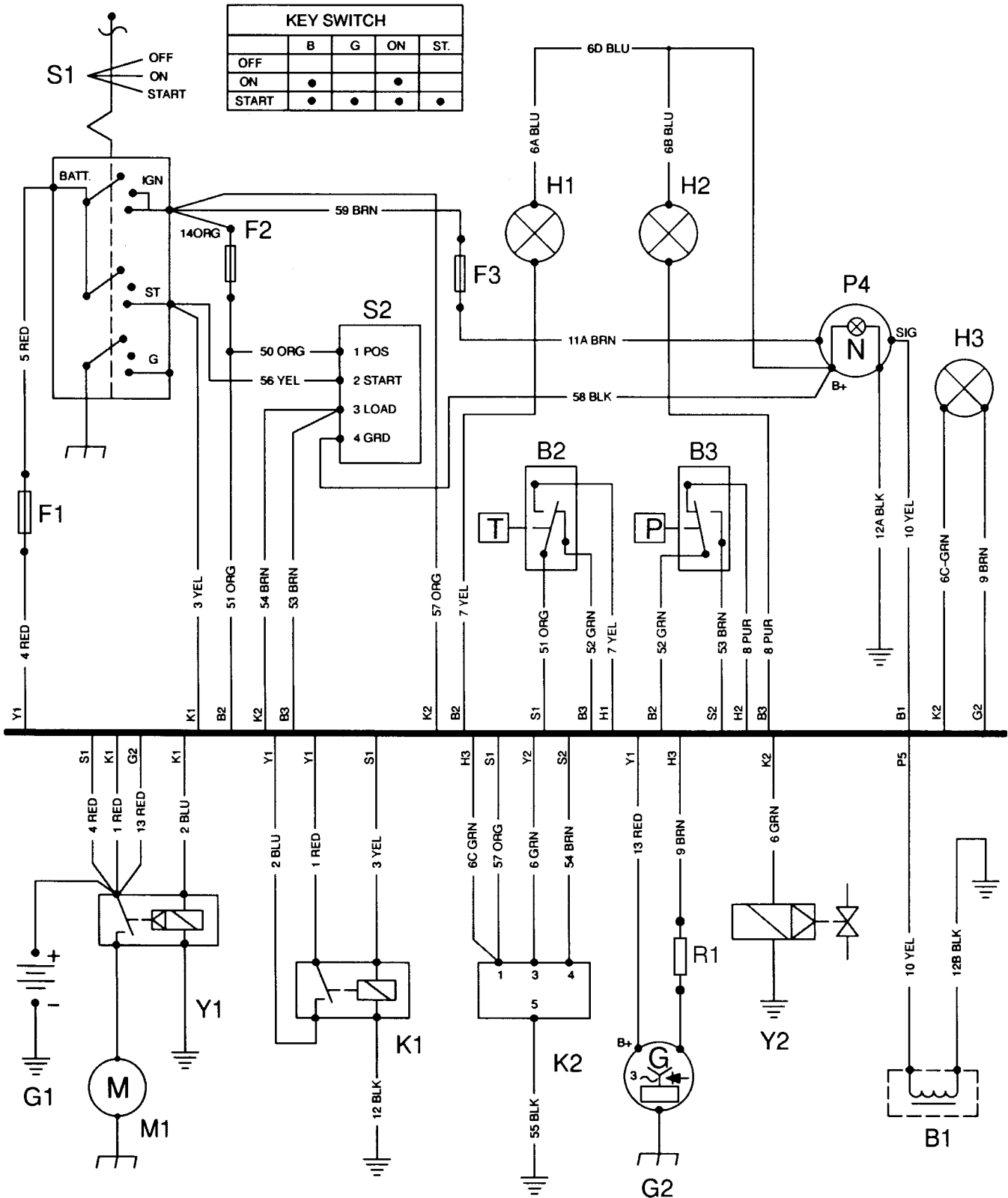
Wiring Diagram—North American Series 700 (8955) Engines

KEY SWITCH					
	B	G	ACC.	ON	ST.
OFF					
ACC.	•		•		
ON	•		•	•	
START	•	•		•	•



RG9536 -UN-08APR99

Wiring Diagram—European (Saran) Series 300 Engines (Early Model)



RG9535 -UN-08A PR99

RG.CTM67,G20,4 -19-19NOV93-1/1

Engine Wiring Diagram Legend— *POWERTECH*[®] 2.9 L, 4.5 L, 6.8 L and 8.1 L Engines (Without ECU)

A1 — Speed Control Unit	P1 — Coolant Temperature Gauge
B1 — Magnetic Speed Sensor	P2 — Oil Pressure Gauge
B2 — Coolant Temperature Sensor	P3 — Crankcase Oil Level Switch/Gauge
B3 — Oil Pressure Sensor	P4 — Tachometer ¹
F1 — Starting Circuit Fuse (14 amp)	P5 — Hourmeter (Early Models) ²
F3 — Fuse (Early Models) ¹	P6 — Ammeter
G1 — Battery	R1 — Resistor (48 ohm) ³
G2 — Alternator	S1 — Key Switch
H1 — Coolant Temperature Indicator Lamp	S2 — Magnetic Safety Switch—North American Auto Override Module—European (Saran)
H2 — Oil Pressure Indicator Lamp	W1 — Ground on K1 Starter Relay Mounting Stud
H3 — Alternator Indicator Lamp	Y1 — Starter Solenoid
K1 — Starter Relay	Y2 — Fuel Shut-off Solenoid ⁴
K2 — Fuel Shut-off Relay	
M1 — Starter Motor	

POWERTECH is a registered trademark of Deere & Company

¹ P4 tachometer has a built-in hourmeter. On some earlier engines, a separate hourmeter (P5) and fuse (F3) were used.

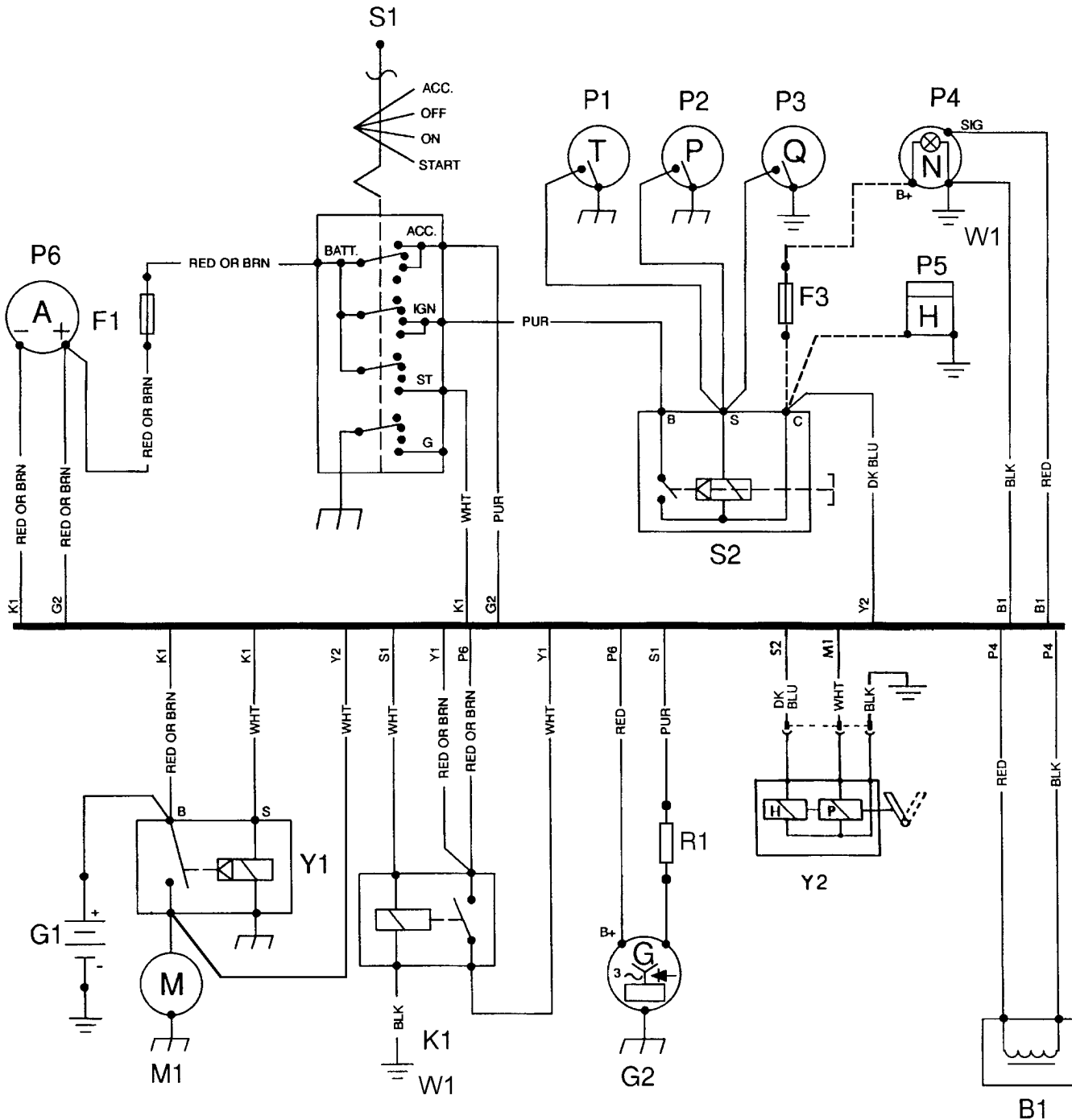
² P4 tachometer has a built-in hourmeter. On some engines, a separate hourmeter (P5) and fuse (F3) are used.

³ Later harnesses have two parallel 100 ohm resistors for the alternator.

⁴ Y2 Fuel Shut-Off Solenoid shown is for 3-wire in-line fuel injection pump. Single connection rotary pumps will have one dark blue wire for power and one black wire for ground.

Engine Wiring Diagram— POWERTECH® 2.9 L, 4.5 L, 6.8 L and 8.1 L Engines (Without ECU)

S1 KEY SWITCH					
	B	G	ACC.	ON	ST.
OFF					
ACC.	•		•		
ON	•		•	•	
START	•	•		•	•



POWERTECH is a registered trademark of Deere & Company

DPSG,UOU1004,627 -19-09MAR99-1/1

Engine Wiring Diagram Legend— *POWERTECH*[®] 10.5 L and 12.5 L Engines (With Lucas ECU)¹

F1 — Starting Circuit Fuse (30 amp)

G1 — Alternator

K1 — Alternator Field Relay

K2 — Starter Relay

K3 — Analog Tachometer Display

M1 — Starter Motor

P1 — Coolant Temperature Gauge

P2 — Engine Oil Pressure Gauge

R1 — Resistor 47 ohm

S1 — Key Switch

S2 — Shut-Off Switch

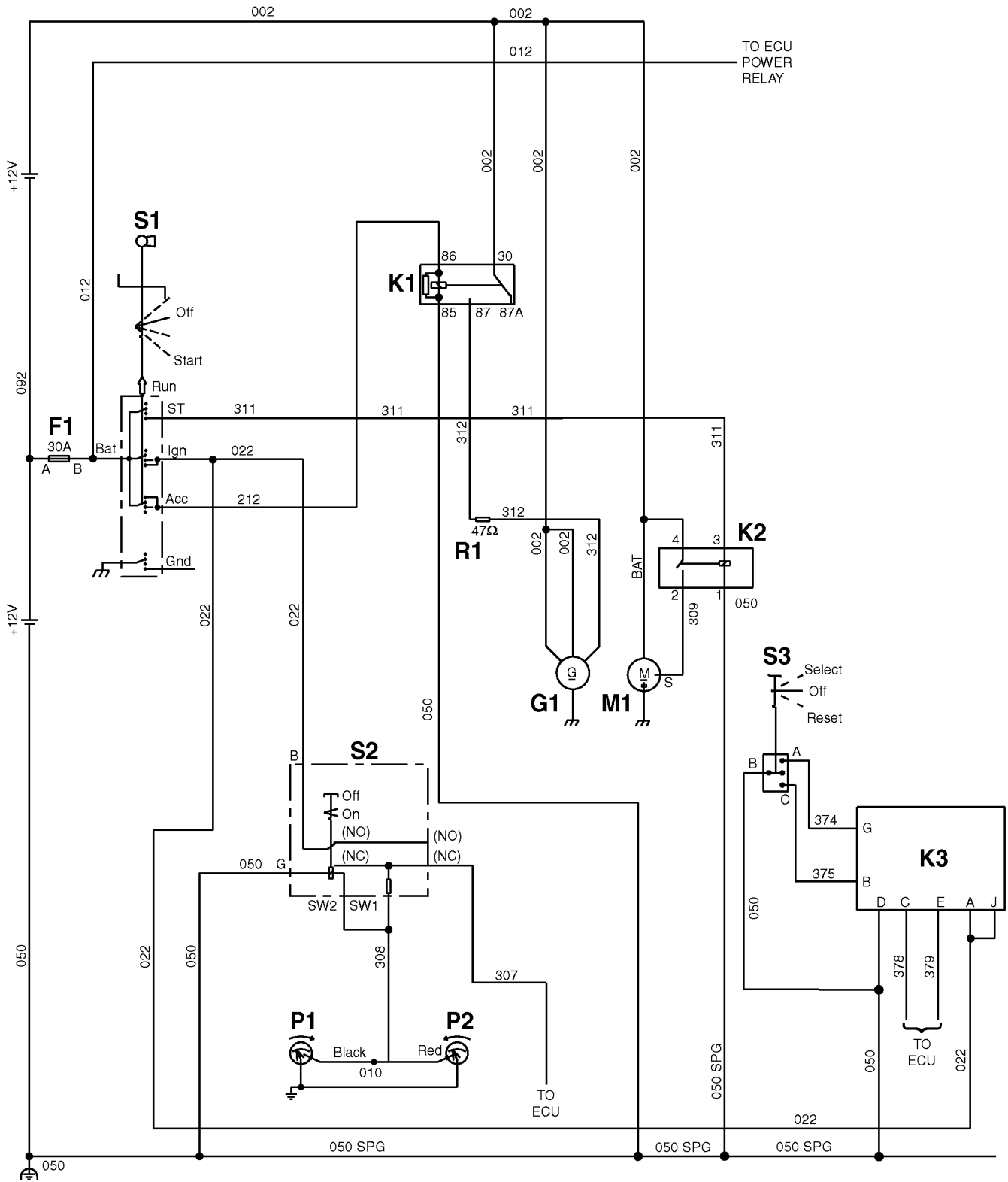
S3 — Tachometer Toggle Switch

POWERTECH is a registered trademark of Deere & Company

¹*Wiring diagram shown does not show ECU (Engine Control Unit) components. See engine Operation and Diagnostics Manual CTM115 for ECU components and wiring diagrams.*

DPSG,OUO1004,731 -19-22MAR99-1/1

Engine Wiring Diagram— POWERTECH® 10.5 L and 12.5 L Engines (With Lucas ECU)

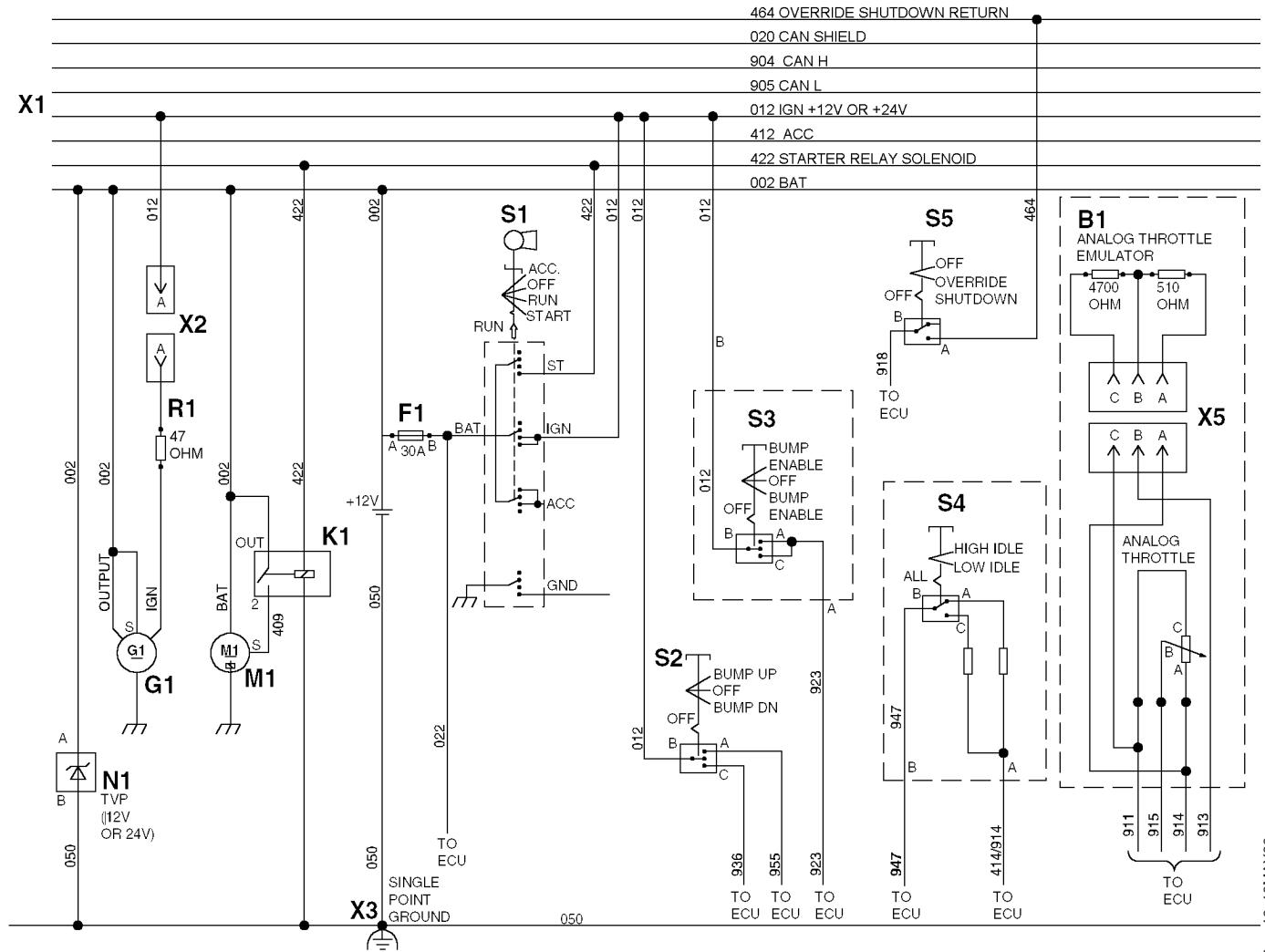


RG9502 -UN-24MAR99

POWERTECH is a registered trademark of Deere & Company

DPSG,UO01004,732 -19-22MAR99-1/1

Engine Wiring Diagram— POWERTECH® 8.1 L, 10.5 L and 12.5 L Engines (With John Deere ECU)



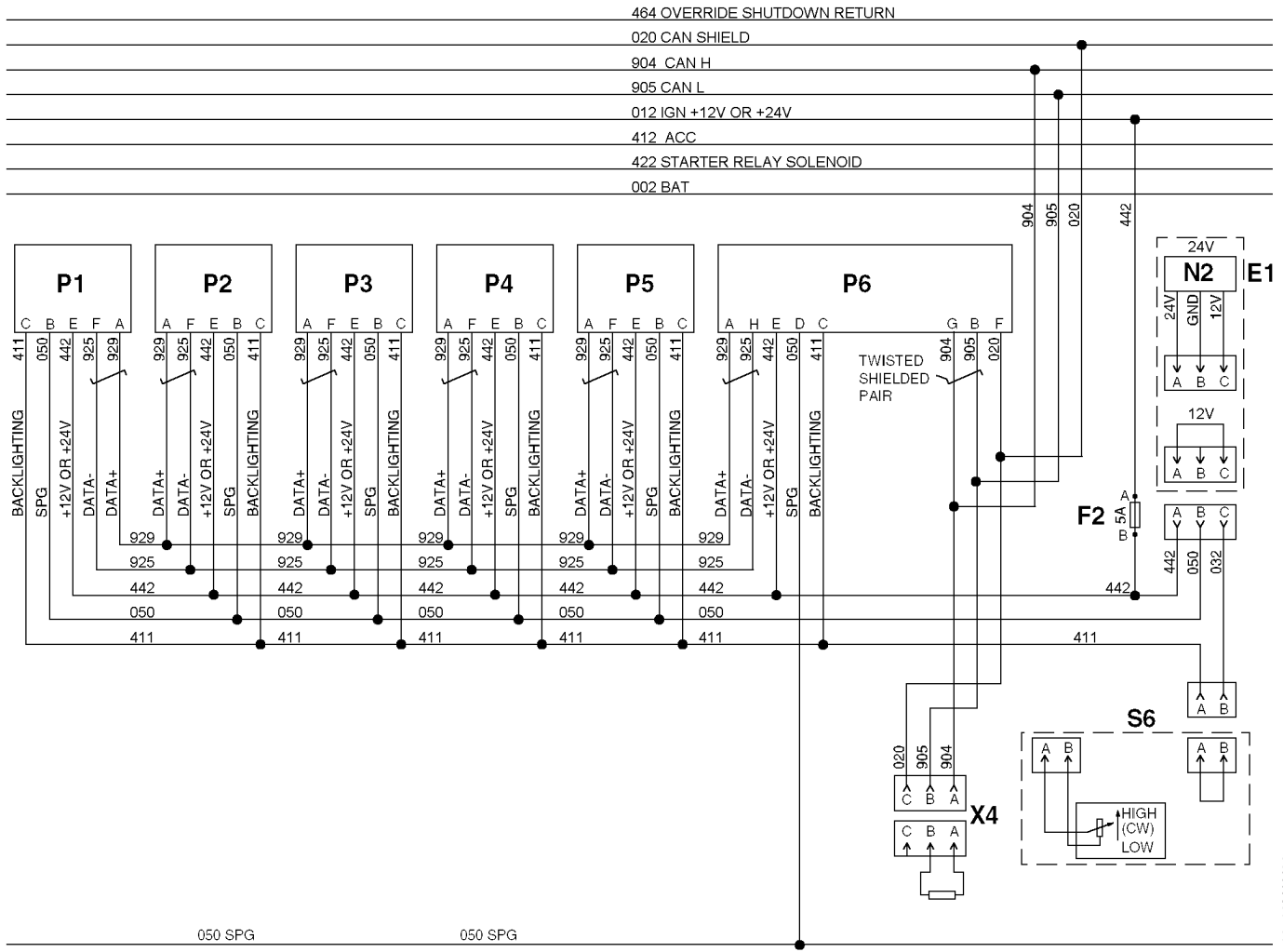
SE-1 ENGINE START COMPONENTS

SE-2 INSTRUMENT PANEL (CONTINUED NEXT PAGE)

- | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>B1—Analog Throttle or Emulator
 E1—Back Light Regulator (24V) or Plug (12V)
 F1—Fuse (30 Amp)
 F2—Fuse (5 amp)
 G1—Alternator
 K1—Starter Relay
 M1—Starter Motor
 N1—Transient Voltage Protector</p> | <p>N2—Voltage Regulator (for 24V Operation)
 P1—Optional Gauge
 P2—Optional Gauge
 P3—Oil Pressure Gauge
 P4—Coolant Temperature Gauge
 P5—Tachometer Display
 P6—Hourmeter/Diagnostic Meter</p> | <p>R1—Resistor
 S1—Ignition Key Switch
 S2—Speed Select Switch (Momentary)
 S3—Bump Enable Switch (Momentary)
 S4—High-Low Speed Switch
 S5—Override Shutdown Switch (Momentary)
 S6—Dimmer Control or Jumper Plug</p> | <p>X1—Vehicle Harness Connector
 X2—Alternator Harness Connector
 X3—Single Point Ground
 X4—CAN Terminator
 X5—Analog Throttle Connector</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

RG10039 -19-18MAY99

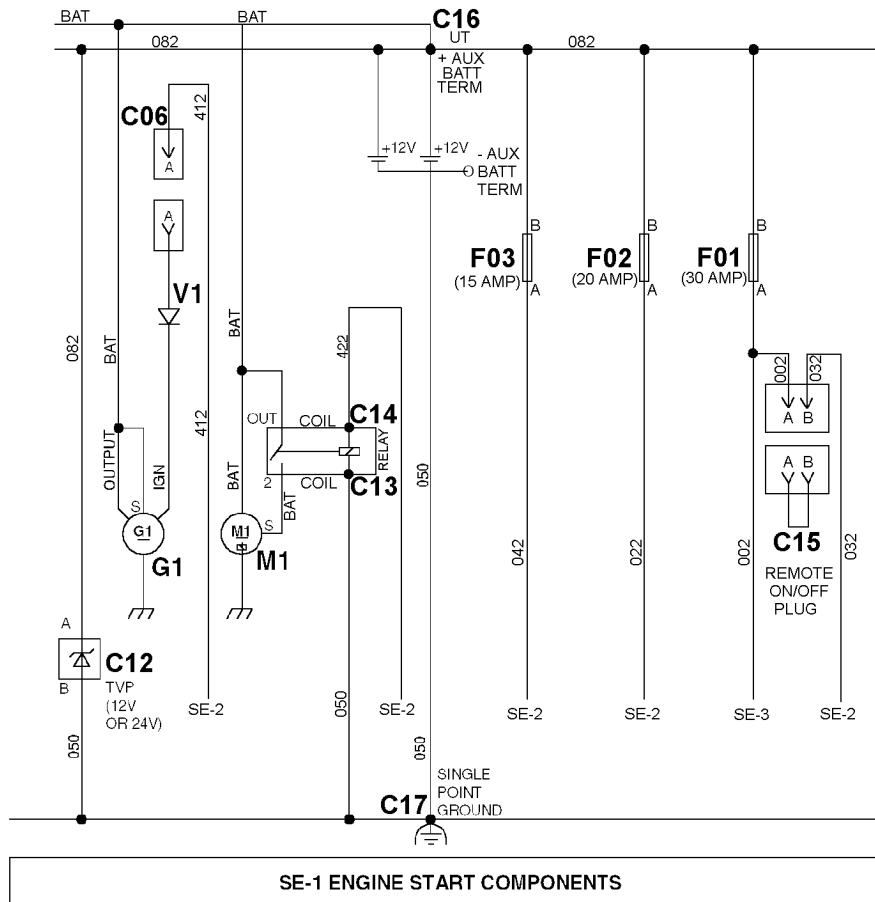
Engine Wiring Diagram— POWERTECH® 8.1 L, 10.5 L and 12.5 L Engines (With John Deere ECU) (Continued)



SE-2 INSTRUMENT PANEL (CONTINUED)

- | | | | |
|---------------------------------------------|------------------------------------------|-----------------------------------------|---------------------------------|
| B1—Analog Throttle or Emulator | N2—Voltage Regulator (for 24V Operation) | R1—Resistor | X1—Vehicle Harness Connector |
| E1—Back Light Regulator (24V) or Plug (12V) | P1—Optional Gauge | S1—Ignition Key Switch | X2—Alternator Harness Connector |
| F1—Fuse (30 Amp) | P2—Optional Gauge | S2—Speed Select Switch (Momentary) | X3—Single Point Ground |
| F2—Fuse (5 amp) | P3—Oil Pressure Gauge | S3—Bump Enable Switch (Momentary) | X4—CAN Terminator |
| G1—Alternator | P4—Coolant Temperature Gauge | S4—High-Low Speed Switch | X5—Analog Throttle Connector |
| K1—Starter Relay | P5—Tachometer Display | S5—Override Shutdown Switch (Momentary) | |
| M1—Starter Motor | P6—Hourmeter/Diagnostic Meter | S6—Dimmer Control or Jumper Plug | |
| N1—Transient Voltage Protector | | | |

Engine Wiring Diagram—PowerTech Plus 4.5 L, 6.8 L, 9.0 L and 13.5 L Engines

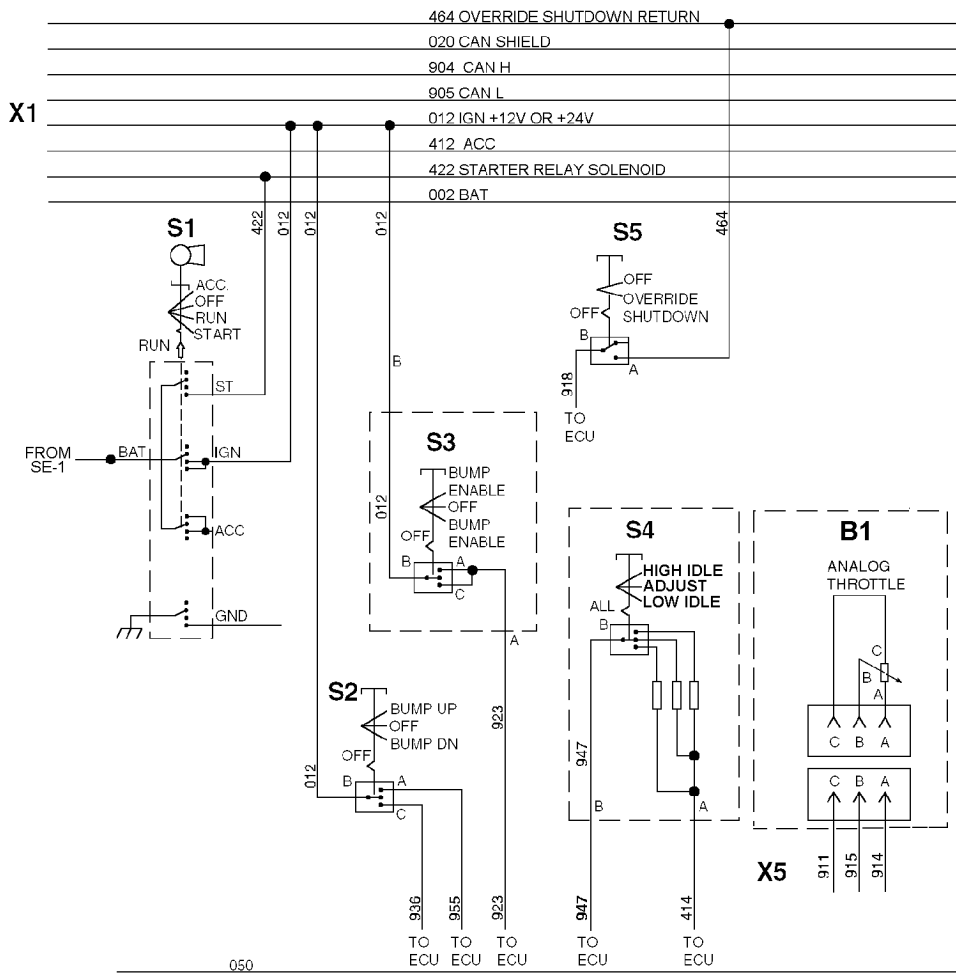


RG13874 -UN-08APR05

- | | | | |
|----------------------------------|--------------------------------|------------------------------------|-----------------------------------------|
| B1—Analog Throttle | F01—Fuse (30 Amp)(System) | P5—Tachometer Display | S5—Override Shutdown Switch (Momentary) |
| C06—Alternator Harness Connector | F02—Fuse (20 Amp)(ECU) | P6—Hour Meter/Diagnostic Gauge | V1—Diode |
| C12—Transient Voltage Protector | F03—Fuse (15 Amp)(Fuel Filter) | S1—Ignition Key Switch | X1—Vehicle Harness Connector |
| C13—Starter Relay | G1—Alternator | S2—Speed Select Switch (Momentary) | X4—CAN Terminator |
| C14—Starter Relay | M1—Starter Motor | S3—Bump Enable Switch (Momentary) | X5—Analog Throttle Connector |
| C15—Remote On/Off | P1—Optional Gauge | S4—High-Low Speed Select Switch | |
| C16—Battery | P2—Optional Gauge | | |
| C17—Single Point Ground | P3—Oil Pressure Gauge | | |
| | P4—Coolant Temperature Gauge | | |

OURGP12,0000145 -19-25AUG05-1/1

**Engine Wiring Diagram—PowerTech Plus 4.5 L, 6.8 L, 9.0 L and 13.5 L Engines
(Continued)**



SE-2 INSTRUMENT PANEL (CONTINUED NEXT PAGE)

RG13873 -JUN-08APR05

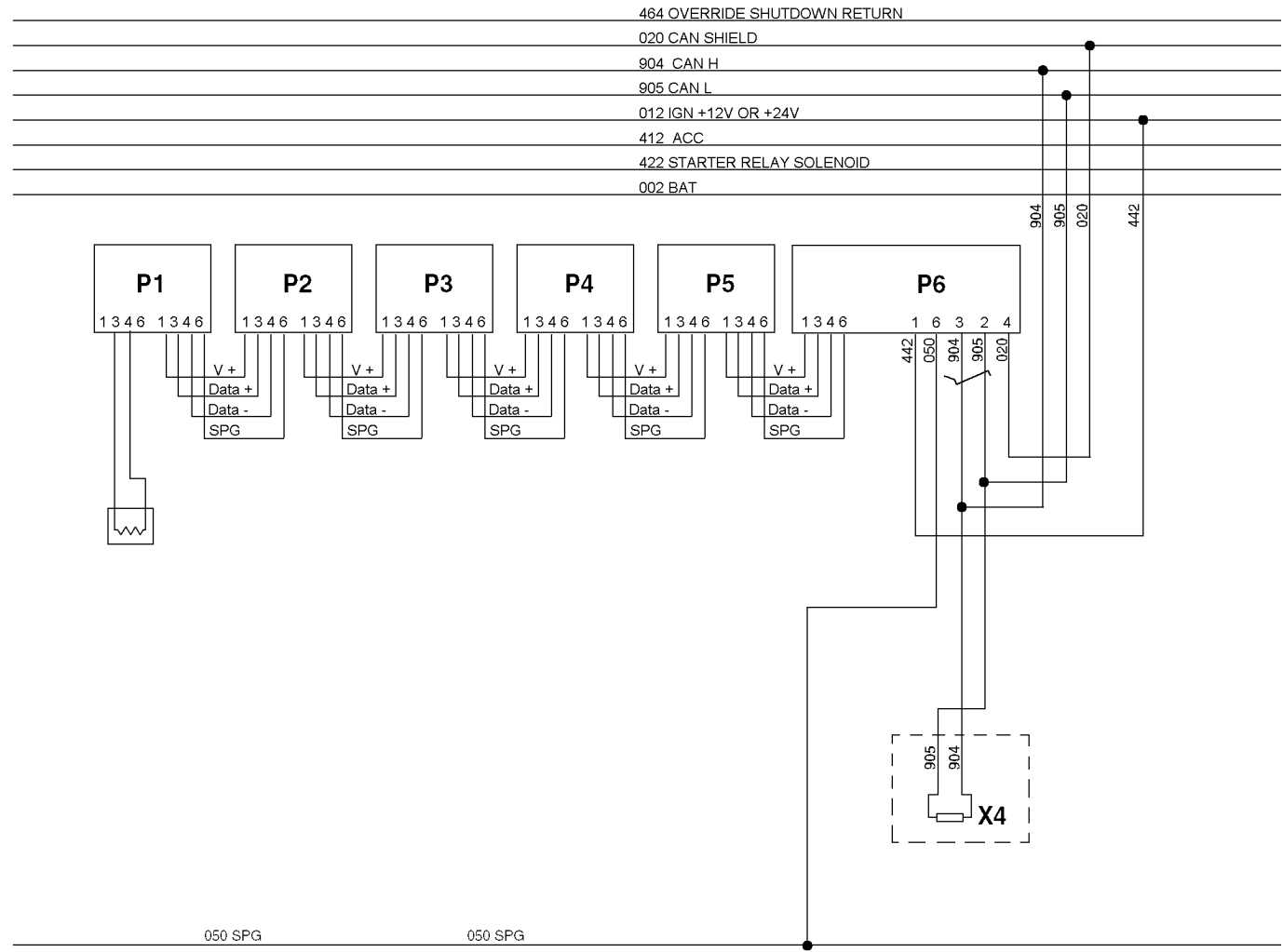
- B1—Analog Throttle
- C06—Alternator Harness Connector
- C12—Transient Voltage Protector
- C13—Starter Relay
- C14—Starter Relay
- C15—Remote On/Off
- C16—Battery
- C17—Single Point Ground

- F01—Fuse (30 Amp)(System)
- F02—Fuse (20 Amp)(ECU)
- F03—Fuse (15 Amp)(Fuel Filter)
- G1—Alternator
- M1—Starter Motor
- P1—Optional Gauge
- P2—Optional Gauge
- P3—Oil Pressure Gauge
- P4—Coolant Temperature Gauge

- P5—Tachometer Display Gauge
- P6—Hour Meter/Diagnostic Gauge
- S1—Ignition Key Switch
- S2—Speed Select Switch (Momentary)
- S3—Bump Enable Switch (Momentary)
- S4—High-Low Speed Select Switch

- S5—Override Shutdown Switch (Momentary)
- V1—Diode
- X1—Vehicle Harness Connector
- X4—CAN Terminator
- X5—Analog Throttle Connector

Engine Wiring Diagram—PowerTech Plus 4.5 L, 6.8 L, 9.0 L and 13.5 L Engines (Continued)

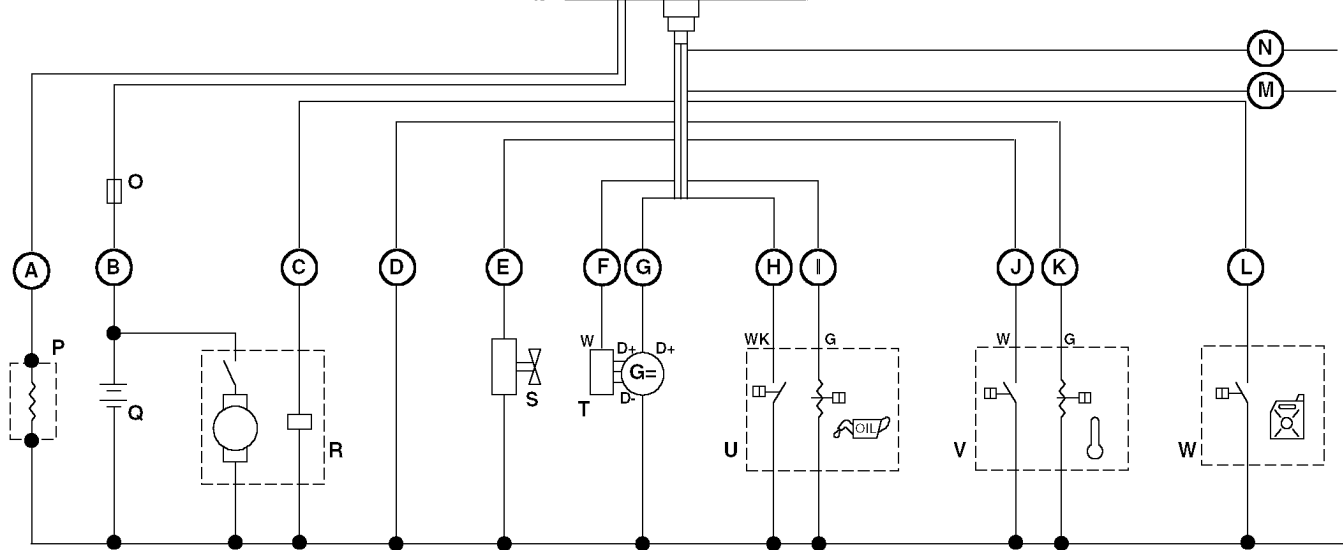
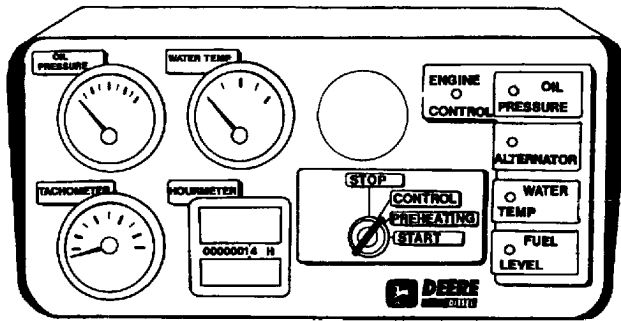


SE-2 INSTRUMENT PANEL (CONTINUED)

- | | | | |
|--------------------------------|----------------------------------|---------------------------------|-----------------------------|
| B1—Analog Throttle | F01—Fuse (30 Amp)(System) | P5—Tachometer Display | S5—Override Shutdown |
| C06—Alternator Harness | F02—Fuse (20 Amp)(ECU) | P6—Hour Meter/Diagnostic | Switch (Momentary) |
| C12—Transient Voltage | F03—Fuse (15 Amp)(Fuel | S1—Ignition Key Switch | V1—Diode |
| Protector | Filter) | S2—Speed Select Switch | X1—Vehicle Harness |
| C13—Starter Relay | G1—Alternator | (Momentary) | Connector |
| C14—Starter Relay | M1—Starter Motor | S3—Bump Enable Switch | X4—CAN Terminator |
| C15—Remote On/Off | P1—Optional Gauge | (Momentary) | X5—Analog Throttle |
| C16—Battery | P2—Optional Gauge | S4—High-Low Speed Select | Connector |
| C17—Single Point Ground | P3—Oil Pressure Gauge | Switch | |
| | P4—Coolant Temperature | | |
| | Gauge | | |

RG13272 - UN-26/JAN04

Engine Wiring Diagram—Saran AEZ Instrument Panel



A—Blue
B—Red
C—Grey
D—Black
E—Orange
F—Green

G—Blue
H—Brown
I—Grey
J—Pink
K—Yellow
L—White

M—Sky Blue
N—Red
O—Fuse (16 amp)
P—Preheater
Q—Battery
R—Starting Motor

S—Electrical Shut-Off
T—Alternator
U—Oil Pressure Sensor
V—Coolant Temperature Sensor
W—Fuel Tank Sending Unit

RG9539 -UN-19APR99

DPSG.OU01004,779 -19-07APR99-1/1

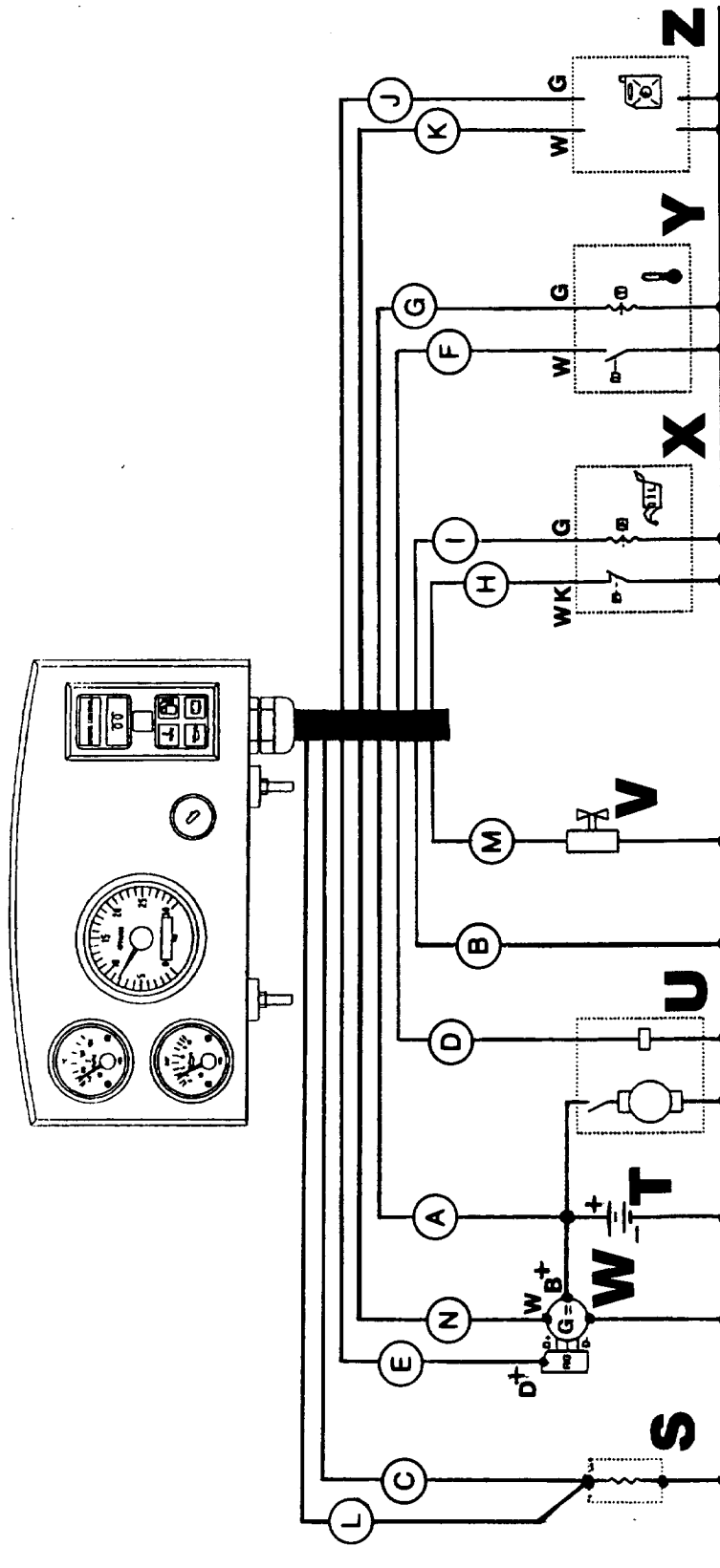
Engine Wiring Diagram Legend—Saran VDO Instrument Panel

A —6 mm ² , Red	M —0.75 mm ² , Green/Yellow
B —1.5 mm ² , Black	N —0.75 mm ² , Red
C —6 mm ² , Blue	O—R —Not Used
D —4 mm ² , Black	S —Preheater
E —0.75 mm ² , Orange	T —Battery
F —0.75 mm ² , White	U —Starting Motor
G —0.75 mm ² , Blue	V —Electrical Shut-Off
H —0.75 mm ² , Purple	W —Alternator
I —0.75 mm ² , Grey	X —Oil Pressure Sensor
J —0.75 mm ² , Brown	Y —Coolant Temperature Sensor
K —0.75 mm ² , Dark Blue	Z —Fuel Tank Gauge
L —0.75 mm ² , Black	

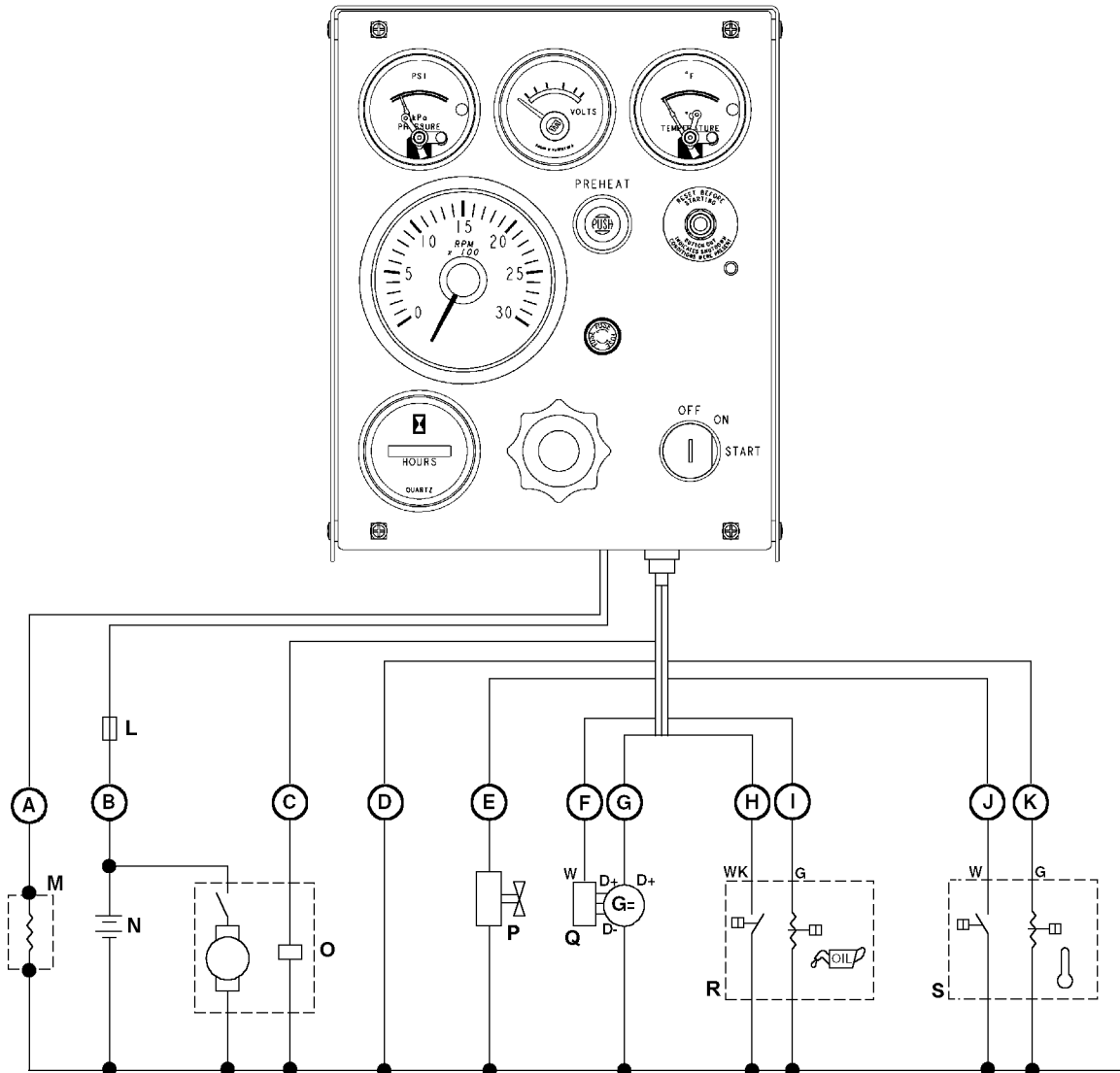
DPSG,OUO1004,628 -19-09MAR99-1/1

Engine Wiring Diagram—Saran VDO Instrument Panel

20
35



Engine Wiring Diagram—PowerTech™ 2.4L and 3.0L Engines



- | | | | |
|-----------------------------|---------------------------------|-----------------------|------------------------------|
| A—To Preheater | G—To Alternator | L—Fuse (10 amp) | Q—Alternator |
| B—To Battery/Starting Motor | H—To Oil Pressure Switch | M—Preheater | R—Oil Pressure Sensor |
| C—To Solenoid | I—To Oil Pressure Sensor | N—Battery | S—Coolant Temperature Sensor |
| D—To Ground | J—To Coolant Temperature Switch | O—Starting Motor | |
| E—To Electrical Shut-Off | K—To Coolant Temperature Sensor | P—Electrical Shut-Off | |
| F—To Alternator | | | |

RG14353 -JUN-07DEC05

OURGP12,000016E -19-14OCT05-1/1

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

DPSG,OUO1004,644 -19-10MAR99-1/2

Digital Multimeter JT05791

Used to make the required measurements in the diagnostic procedures.

DPSG,OUO1004,644 -19-10MAR99-2/2

Electrical System Specifications

Item	Measurement	Specification
Oil Pressure Gauge Switch		
Engines with Distributor Type Injection Pump	Pressure	Closes at 100 kPa (1 bar) (15 psi)
Series 400 and 500 Engines	Pressure	Closes at 69 kPa (0.69 bar) (10 psi)
Series 700 Engines	Pressure	Closes at 140 kPa (1.4 bar) (20 psi)
Coolant Temperature Gauge Switch	Temperature	Contacts close at 104°C (220°F)
Magnetic Safety Switch Coil	Approximate Current Draw	0.7 amps at 12 volts 1.4 amps at 24 volts

DPSG,OUO1004,646 -19-10MAR99-1/1

General Information

NOTE: This group covers optional electrical controls and instruments that are available on John Deere OEM Engines. They may be provided by the equipment manufacturer instead of the John Deere factory. The following information applies only to those controls and instruments provided by the John Deere factory.

The electrical system has a negative ground and is either a 12-volt or 24-volt system. Fuses are strategically placed in the system to protect related circuits and components.

NOTE: Location and sizes of system fuses vary by application.

System Fuses:

- 25-amp MDL — Located between the ammeter and the key switch.
- 14-amp SFE — Located on the magnetic safety switch.
- 3-amp MDX — Located between the tachometer and safety switch.
- 3-amp — Located between the fuel shut-off and safety switch.
- 5, 14 or 30-amp — Located in fuse holder on front of instrument panel.
- 10-amp — Located on control circuit card of Saran VDO instrument panel.
- 16-amp — In-line fuse located behind instrument panel on Saran AEZ panel.

Component Function—Instrument Panel (Without ECU)

IMPORTANT: Any time an electric gauge or meter does not register correctly, replace with a new one. Do not attempt to repair it.

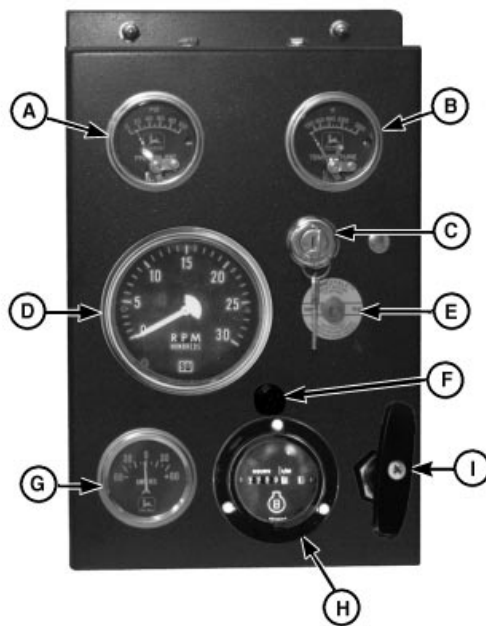
The instrument panel may consist of the following components:

- Hand throttle (if equipped)
- Hour meter
- Ammeter
- Oil pressure gauge
- Coolant temperature gauge
- Key switch
- Safety switch (reset button)
- Tachometer
- Fuse holder

Hand Throttle

NOTE: Engines equipped with electronic fuel injection or an electric governor do not use a hand throttle.

The hand throttle is used to manually control engine speed. Turning the handle, either clockwise or counterclockwise, will lock the throttle position. Turn the handle half way between the two lock positions to unlock the throttle.



RG11527 -JUN-01DEC00

PowerTech™ 2.9 L- 8.1 L (W/O ECU) Panel Shown

- A—Oil Pressure Gauge
- B—Coolant Temperature Gauge
- C—Key Switch
- D—Tachometer
- E—Reset Safety Switch
- F—Fuse Holder (14 Amp Fuse)
- G—Ammeter
- H—Hour Meter
- I—Hand Throttle

Continued on next page

OURGP12,0000169 -19-08SEP05-1/3

Hour Meter

NOTE: On some instrument panels, the hour meter may be an integral part of the tachometer. The electric hour meter shows the accumulated hours of engine service. The hour meter operates when the engine is operating, or when the reset button is manually held in while the key switch is in the ON Position. The accumulated hours are displayed in hours and tenths of hours.

Ammeter

The ammeter indicates the rate of charge (+) or discharge (—) of the battery. When the engine is first started, the ammeter will usually indicate a charge rate of approximately 30 amps. After a short period of operation, the ammeter needle will point slightly to the right of “0”, indicating the charging system is operating normally. A problem with the charging system is indicated if the ammeter needle points to the left of “0” during engine operation.

Oil Pressure Gauge

This gauge indicates engine oil pressure. It also has an adjustable electrical contact which activates the safety switch when oil pressure goes below the pressure set point. This will automatically stop the engine.

Oil Pressure Gauge Switch—Specification

Engines with Distributor Type	
Injection Pump—Pressure.....	Closes at 100 kPa (1 bar) (15 psi)
Series 400 and 500 Engines and 8.1 L Engines—Pressure	Closes at 69 kPa (0.69 bar) (10 psi)
Series 700, 10.5 L and 12.5 L Engines—Pressure.....	Closes at 140 kPa (1.4 bar) (20 psi)

Coolant Temperature Gauge

This gauge indicates coolant temperature. It also has an electrical contact which activates the safety switch when coolant temperature goes above the temperature set point specified below. This will automatically stop the engine.

Specification

Coolant Temperature Gauge
Switch—Temperature Contacts close at 104°C (220°F)

Key Switch

The key switch is used to start and stop the engine. A key is required to operate the switch so as to prevent unauthorized operation of the engine.

Safety Switch (Reset Button)

The safety switch de-energizes the fuel shut-off solenoid or rack puller, to stop the engine, if one or more conditions are met:

- Low or no oil pressure
- High coolant temperature
- Low crankcase oil level (If equipped with engine oil level switch.)
- High crankcase oil level (If equipped with engine oil level switch.)

The reset button has to be held when starting the engine. The button allows the safety switch to override the shut-down circuits until safe engine oil pressure is maintained. Once engine oil pressure is within specifications, the safety switch will latch and the reset button can be released.

Tachometer

The tachometer indicates engine speed in hundreds of revolutions per minute (rpm).

OURGP12,0000169 -19-08SEP05-3/3

Component Function—Instrument Panel (2.4L, 3.0L, and 4.5L (Later “270”)-Without ECU)

IMPORTANT: Any time an electric gauge or meter does not register correctly, replace it with a new one. Do not attempt to repair it.

A—Tachometer with Hourmeter (Optional) - The tachometer with hourmeter indicates engine speed in revolutions per minute (rpm) and shows the operating hours of the engine while key switch is in the “ON” position. The hour meter should be used as a guide for scheduling periodic service.

B—Oil Pressure Gauge - The oil pressure gauge indicates engine oil pressure. If the engine oil pressure falls below a safe operating pressure, the engine will shut down.

C—Voltmeter Gauge - The voltmeter indicates system battery voltage.

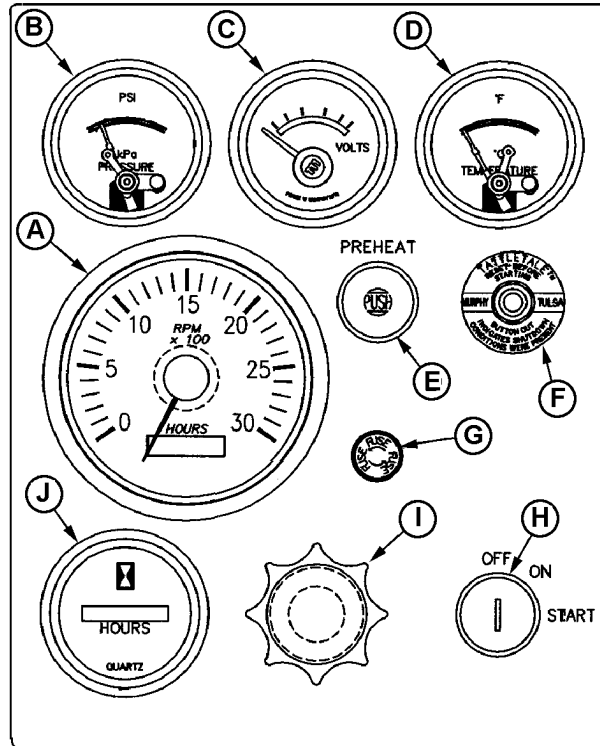
D—Coolant Temperature Gauge - The coolant temperature gauge indicates the engine coolant temperature. If coolant temperature rises above the preset, safe operating temperature, the engine will shut down.

E—Pre-Heat Button - Press button to activate the glow plugs for cold weather starting.

F—Reset (Safety) Switch- Reset button will pop out and shut down the engine if the coolant temperature is too high or oil pressure is too low. Press in and hold while starting engine until oil pressure is at a safe operating level.

G—Fuse Holder - Contains 14 amp fuse.

H—Key Switch - The key switch controls the electrical system. Positions of key switch are marked as follows: OFF, ON, and START.



Instrument Panel and Gauges

- A—Tachometer with Hourmeter (Optional)
- B—Oil Pressure Gauge
- C—Voltmeter Gauge
- D—Coolant Temperature Gauge
- E—Preheat Button
- F—Reset (Safety) Button
- G—Fuse Holder
- H—Key Switch
- I—Throttle with Locking Knob (Optional)
- J—Hourmeter (Optional)

RG13360 -UN-06FEB04

I—Throttle with Locking Knob (Optional) - The throttle control is used to control engine speed. The throttle locking knob can be used to lock the throttle at a set speed.

J—Hourmeter (Optional) - The hourmeter indicates the operating hours of the engine while key switch is in the “ON” position. The hour meter should be used as a guide for scheduling periodic service.

OURGP12,0000166 -19-02SEP05-2/2

Component Function—Instrument Panel (With Lucas ECU)

IMPORTANT: Any time an electric gauge or meter does not register correctly, replace with a new one. Do not attempt to repair it.

Oil Pressure Gauge

Indicates engine oil pressure.

Coolant Temperature Gauge

Indicates engine coolant temperature.

Key Switch

The four position key switch controls the engine electrical system.

Automatic Shut-Off Switch

Switch will automatically shut off power to engine control unit (ECU) whenever oil pressure drops below or coolant temperature rises above a preset safe operating range. Switch also has a shut-off override button that is depressed and held in during engine start-up until oil pressure rises to preset range.

Fuse Holder

Contains 30 amp fuse.

Analog Throttle Potentiometer

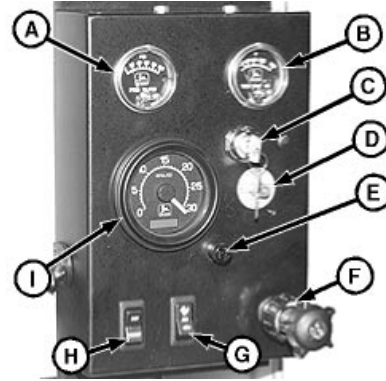
Used to manually adjust engine speeds.

Throttle Switch

Three position switch that changes between adjustable and preset (slow/fast/rated) engine speeds.

Tachometer Toggle Switch

Three position (momentary) switch used to selectively access the various functions available on the tachometer digital display, by toggling on "SELECT" position. Toggle to "RESET" position to clear diagnostic trouble codes.



- A—Oil Pressure Gauge
- B—Coolant Temperature Gauge
- C—Key Switch
- D—Shut-Off Switch
- E—Fuse (30 amp)
- F—Tachometer Potentiometer
- G—Throttle Switch
- H—Tachometer Toggle Switch
- I—Tachometer

RG9529 -JUN-24MAR99

Analog Tachometer with Digital Display

Analog tachometer measures engine speed in revolutions per minute (rpm). The digital display on tachometer, when used with tachometer switch (H), is capable of providing engine diagnostic trouble codes, digital engine rpm, battery voltage, coolant temperature and hour meter display. Display defaults to hour meter function when selective functions are not requested.

Key Switch

The key switch is used to start and stop the engine. A key is required to operate the switch so as to prevent unauthorized operation of the engine.

Safety Switch (Reset Button)

The safety switch de-energizes the fuel shut-off solenoid or rack puller, to stop the engine, if one or more conditions are met:

- Low or no oil pressure
- High coolant temperature
- Low crankcase oil level (If equipped with engine oil level switch.)
- High crankcase oil level (If equipped with engine oil level switch.)

The reset button has to be held when starting the engine. The button allows the safety switch to override the shut-down circuits until safe engine oil pressure is maintained. Once engine oil pressure is within specifications, the safety switch will latch and the reset button can be released.

Tachometer

The tachometer indicates engine speed in hundreds of revolutions per minute (rpm).

Component Function—Instrument Panel (With Early Deere ECU)

This instrument panel for PowerTech™ 8.1 L, 10.5 L and 12.5 L engines was introduced in 1999. It was added for Tier II 4.5 L and 6.8 L engines in 2001. The panel is electronically linked to the John Deere engine control unit (ECU). This allows the operator to monitor engine performance as well as to diagnose any trouble during engine operation.

IMPORTANT: Any time an electric gauge or meter does not register correctly, replace with a new one. Do not attempt to repair it. All gauges are plug-in type.

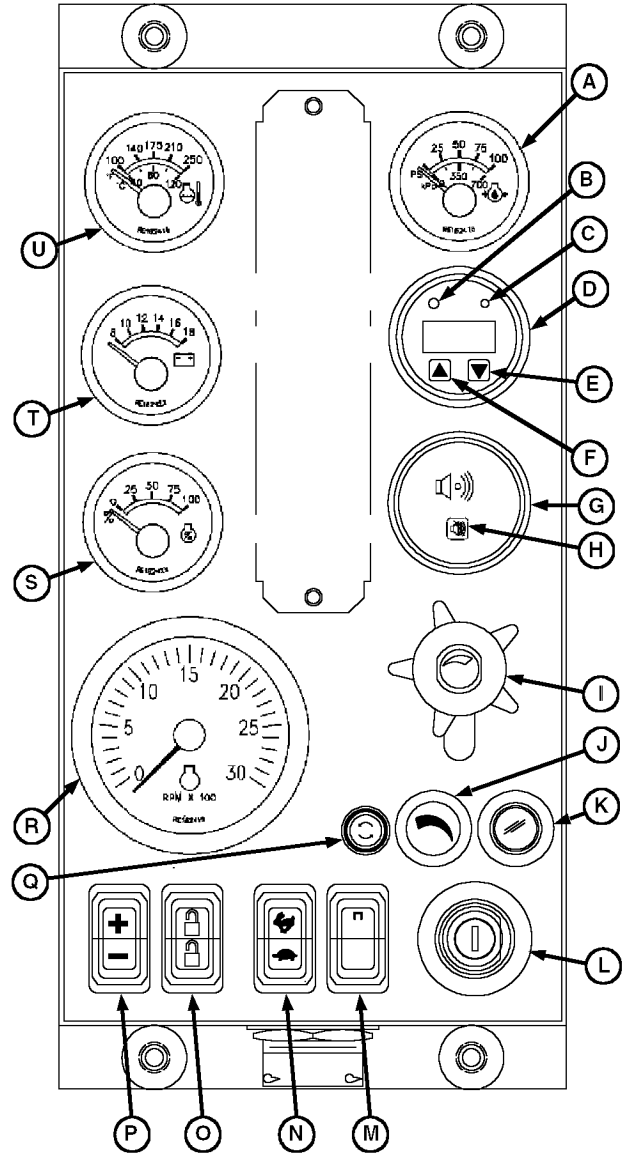
Engine Oil Pressure Gauge

The engine oil pressure gauge (A) indicates engine oil pressure in pounds per square inch (psi).

Amber “WARNING” Indicator

The amber “WARNING” indicator (B) signals an abnormal condition such as low oil pressure, high coolant temperature, water in fuel, low battery voltage, etc. Observe displayed code in window of diagnostic gauge (D) for diagnostic trouble code (DTC).

- A—Engine Oil Pressure Gauge
- B—Amber “WARNING” Indicator
- C—Red “STOP ENGINE” Indicator
- D—Diagnostic Gauge/Hour Meter
- E—Touch Switch
- F—Touch Switch
- G—Audible Alarm (Optional)
- H—Audible Alarm Override Switch (Optional)
- I—Throttle Control (Optional)
- J—Dimmer Control (Optional)
- K—Engine Preheater Indicator (Optional)
- L—Key Start Switch
- M—Override Shutdown Rocker Switch (Optional)
- N—Idle Select Rocker Switch (Optional)
- O—Bump Speed Enable Rocker Switch (Optional)
- P—Speed Select Rocker Switch (Optional)
- Q—Fuse Holder (5-Amp Fuse)
- R—Tachometer (Optional)
- S—Power Meter (Percent Load) (Optional)
- T—Voltmeter (Optional)
- U—Engine Coolant Temperature Gauge (Optional)



PowerTech™ 4.5 L, 6.8 L Tier II, 8.1 L, 10.5 L, 12.5 L (With Early Deere ECU) Panel Shown

RG9547 -UN-14AUG00

Red “STOP ENGINE” Indicator

The red “STOP ENGINE” indicator (C) signals operator to stop engine immediately or as soon as safely possible. A condition exists that could cause damage to engine.

Diagnostic Gauge/Hour meter

The diagnostic gauge (D) displays diagnostic trouble codes (DTCs) as they occur. Other information on the engine can be accessed using the touch switches (E and F). The hour meter shows the operating hours of the engine. Normally, the gauge will display engine hours. If a DTC is present, the gauge will alternately flash from hour meter reading to DTCs. (See engine operator’s manual for a list of DTC’s and corresponding engine problems.)

Touch Switches

The touch switches are used to change the display on the window of the diagnostic gauge to access engine performance data. Pressing the DOWN switch (E) or UP switch (F) scrolls through various engine parameters and diagnostic trouble codes. (See engine operator’s manual for instructions.)

Audible Alarm (Optional)

The audible alarm (G) sounds whenever a low oil pressure, high coolant temperature or water-in-fuel condition exists.

Audible Alarm Override Switch (Optional)

The audible alarm override switch (H) can be pressed to silence the alarm for approximately 2-1/2 minutes.

Throttle Control (Optional)

The throttle control (I) is used to control engine speed. This control is available only on engines with analog throttle.

Dimmer Control (Optional)

The dimmer control (J) is used to control illumination of the instrument panel.

21
12 **Engine Preheater Indicator (Optional)**

The engine preheater indicator (K) lights up while the engine is being preheated for cold weather starting. When the engine is warmed up, the light goes off, indicating the engine can now be started.

Key Start Switch

The three-position key switch (L) controls the engine electrical system. When the key switch is turned clockwise to "START", the engine will crank. When the engine starts, the key is released and returns to the "ON" (Run) position.

Override Shutdown Rocker Switch (Optional)

Pressing the upper half of the override shutdown switch (M) will override an engine shutdown signal. The switch must be pressed within 30 seconds to prevent undesired shutdown of engine.

Idle Select Rocker Switch (Optional)

The idle select switch (N) is used to set the engine at slow idle (turtle) or fast idle (rabbit).

Bump Speed Enable Rocker Switch (Optional)

Pressing upper or lower half of bump speed enable switch (O) allows bump speed to take effect, when activated by speed select switch (P).

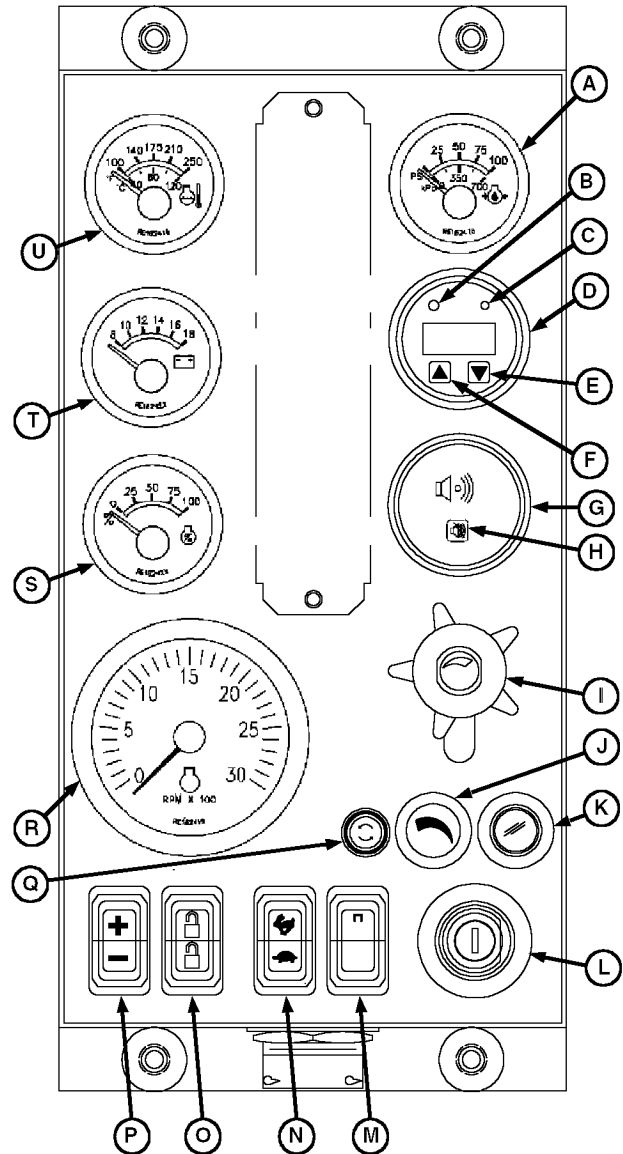
NOTE: For details on use of bump speed and cruise control options, see engine Operation and Maintenance Manual.

Speed Select Rocker Switch (Optional)

The speed select switch (P) is used to bump engine speed up (+) or down (-) in small increments during operation. This switch must be used with the bump speed enable switch (O).

Fuse Holder

The fuse holder (Q) contains a 5-amp fuse for power to the instrument panel.



RG9547 -UN-14AUG00

PowerTech™ 4.5 L, 6.8 L Tier II, 8.1 L, 10.5 L, 12.5 L (W/ Early Deere ECU) Panel Shown

Continued on next page

OURGP12,0000168 -19-06SEP05-3/4

Tachometer (Optional)

The tachometer (R) indicates engine speed in hundreds of revolutions per minute (rpm).

Power (Percent Load) Meter (Optional)

The power meter (S) shows percent of available power being used by the engine.

Voltmeter

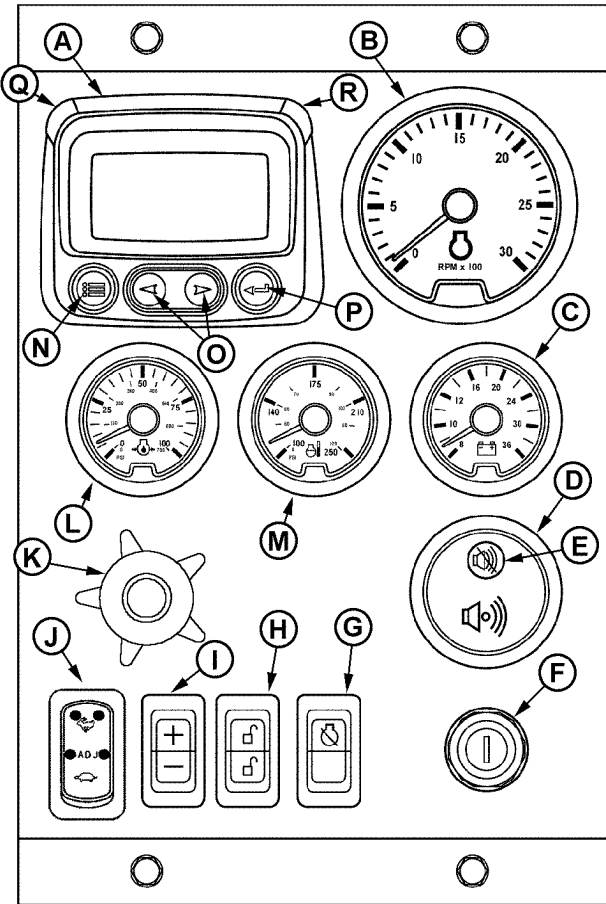
The voltmeter (T) indicates system battery voltage. The amber "WARNING" light (B) will illuminate when battery voltage is too low for proper operation of the fuel injection system.

Engine Coolant Temperature Gauge (Optional)

The coolant temperature gauge (U) indicates engine coolant temperature in degrees centigrade or fahrenheit.

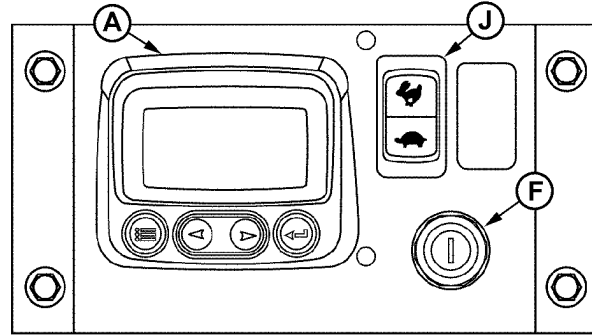
OURGP12,0000168 -19-06SEP05-4/4

Component Function—Instrument Panel (PowerTech Plus 4.5 L, 6.8 L, 9.0 L, 13.5 L and Later PowerTech 4.5L, 6.8L, 8.1L and 12.5L)



Full-Featured Instrument Panel

RG13276 -UN-28OCT03



Basic Instrument Panel

RG13277 -UN-22OCT03

- | | | | |
|---------------------------------|---------------------------------------|--------------------------------------|-------------------------------------|
| A—Diagnostic Gauge/Hour Meter | F—Key Switch | K—Analog Throttle Control (Optional) | O—Arrow Keys |
| B—Tachometer | G—Override Shutdown Rocker Switch | L—Oil Pressure Gauge | P—Enter Key |
| C—Voltmeter (Optional) | H—Bump Enable Rocker Switch | M—Coolant Temperature Gauge | Q—Amber “WARNING” Indicator Light |
| D—Audible Alarm (Optional) | I—Speed Select Rocker Switch | N—Menu Key | R—Red “STOP ENGINE” Indicator Light |
| E—Audible Alarm Override Button | J—High-Low Speed Select Rocker Switch | | |

Later PowerTech and Tier 3 John Deere PowerTech Plus™ OEM Engines (introduced in 2005), have an electronic control system which has a choice of the two instrument panels shown above. Either panel is

electronically linked to the John Deere engine control unit (ECU). This allows the operator to monitor engine performance as well as to diagnose any trouble during engine operation.

Instrument Panel (Continued)

IMPORTANT: Any time an electric gauge or meter does not register correctly, replace with a new one. Do not attempt to repair it. All gauges are plug-in type.

A—Diagnostic Gauge/Hour Meter

The diagnostic gauge (A) displays diagnostic trouble codes (DTCs) as they are accessed. Other information on the engine can be accessed using the touch keys (N, O and P). The hour meter feature shows the operating hours of the engine and should be used as a guide for scheduling periodic maintenance. If the diagnostic gauge receives a trouble code from an engine control unit, the current display will switch to a warning or shutdown (depending on the severity of the code) screen that will display the trouble code number, the description of the code and the corrective action needed.

B—Tachometer

The tachometer (B) indicates engine speed in hundreds of revolutions per minute (rpm).

C—Voltmeter (Optional)

The voltmeter (C) indicates system battery voltage. The amber "Warning" light (Q) will illuminate when battery voltage is too low for proper operation of the fuel injection system.

D—Audible Alarm (Optional)

The audible alarm (D) will sound whenever any of these abnormal conditions exist: low oil pressure, high coolant temperature, water-in-fuel, high fuel temperature, or high manifold temperatures. This includes all signals that light up the amber "warning" indicator (intermittent alarm) or the red "stop engine" indicator (steady alarm).

E—Audible Alarm Override Button

The optional audible alarm has an override button (E) that silences the audible alarm for approximately two minutes when pressed.

F—Key Start Switch

The three-position key start switch (F) controls the engine electrical system. When the key switch is turned clockwise to "START", the engine will crank. When the engine starts, the key is released and returns to the "ON" (RUN) position.

G—Override Shutdown Rocker Switch

Switch will be present, but may not be active, depending on engine controller (ECU) options originally selected. If switch is active, pressing the upper half of the override shutdown switch (G) will override an engine shutdown signal. The switch must be pressed within 30 seconds to prevent undesired shutdown of engine. Pressing this switch will override the engine shutdown for 30 seconds at a time to move vehicle to a safe location.

H—Bump Speed Enable Rocker Switch

This is a three-position switch (H) with the center position as "OFF" (locked). With this switch in the "OFF" position, the speed select switch (I) is also locked, to prevent accidental changes in operating speed. Pressing upper or lower half of switch (H) will unlock or enable the bump speed switch to take effect using speed select switch (I).

I—Speed Select Rocker Switch

The speed select switch (I) is used to bump engine speed up (+) or down (-) in small increments during operation. This switch must be used with the bump speed enable switch (H) in the unlocked position (top or bottom half of button depressed).

J—High-Low Speed Select Rocker Switch

The high-low speed select switch (J) is used to set the engine operating speeds at slow (turtle) or fast (rabbit). Factory preset idle speeds can also be adjusted using bump speed enable switch (H) with speed select switch (I).

The basic instrument panel will have the high-low speed select switch only. Press and hold up (+) or down (-) to adjust engine speed as desired. The engine speed selected will not be held in the memory.

How To Select Preset Operating Speeds (Bump Speeds)

First select Turtle (Slow) or Adj by pressing speed select switch (J) to "Turtle" (slow) or "Adj"(center). Then you can press either the upper or lower portion of the bump speed enable switch (H) to unlock the setting. The bump speed enable must be held down as the speed select switch (J) is used to change the setting by pressing (+) to increase speed or (-) to decrease speed.

Once the slow idle speed has been set, the bump speed enable **switch must be pressed and released three times within two seconds to commit the new operating speed to memory.** If not done, the engine's new speed will only be effective until the key switch is shut off. Then the speed will revert back to the previous setting.

The fast idle speed is not adjustable. It will always go back to the factory preset fast idle speed.

K—Analog Throttle Control (Optional)

The throttle control (K) is used to control engine speed. This control is available only on engines with analog throttle.

L—Engine Oil Pressure Gauge

The oil pressure gauge (L) indicates engine oil pressure. An audible alarm (D) warns the operator if engine oil pressure falls below a safe operating pressure.

M—Engine Coolant Temperature Gauge

The engine coolant temperature gauge (M) indicates engine coolant temperature. An audible alarm (D) warns the operator if coolant temperature rises above the preset safe operating temperature.

N—Menu Key

The menu key is pressed to either enter or exit the menu screens on the diagnostic gauge.

O—Arrow Keys

Use the arrow keys (O) to change the display on the window of the diagnostic gauge and to access engine performance data.

Pressing the left arrow to scroll to the left or upward or the right arrow to scroll to the right or downward. This will allow you to view various engine parameters and any diagnostic trouble codes that occur.

Refer to the following story for accessing engine information on the diagnostic gauge using the touch keys.

P—Enter Key

The enter key is pressed to select the parameter that is highlighted on the screen.

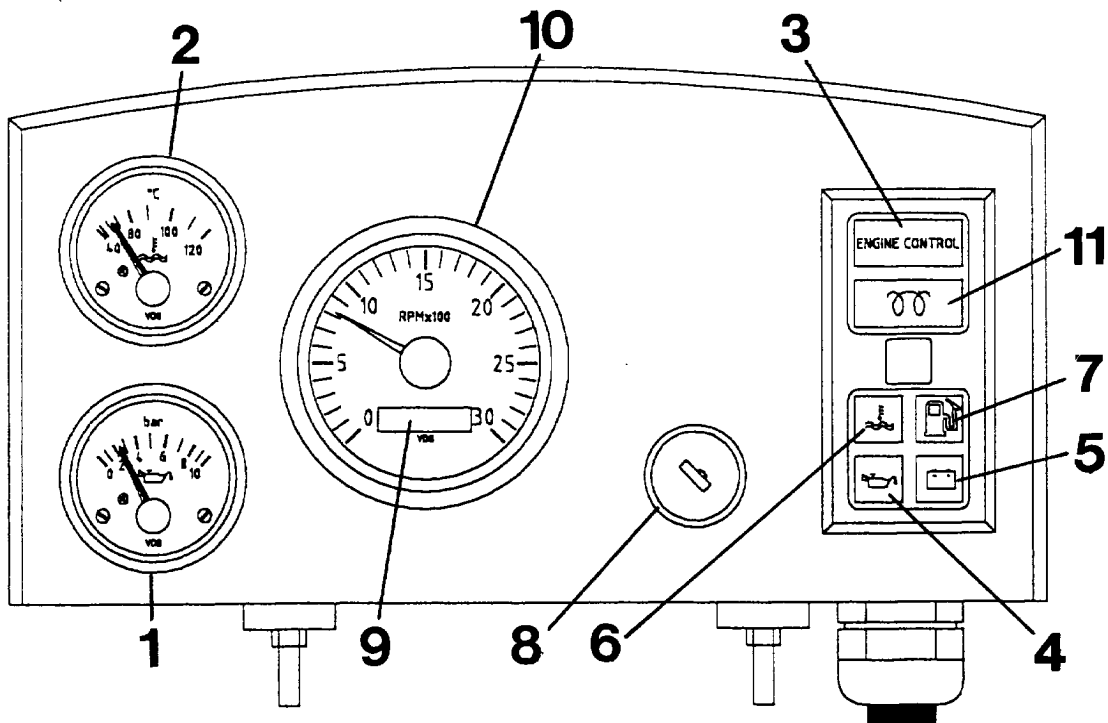
Q—Amber "WARNING" Indicator Light

When light comes on, an abnormal condition exists. It is not necessary to shutdown engine immediately, but problem should be corrected as soon as possible. Screen on diagnostic gauge will display the problem and the solution needed.

R—Red "STOP ENGINE" Indicator Light

When light comes on, stop engine immediately or as soon as safely possible to prevent engine damage. Correct problem before restarting.

Component Function—Saran VDO Instrument Panel



1—Oil Pressure Gauge
2—Coolant Temperature Gauge

3—Engine Control Light
4—Oil Pressure Light
5—Battery Light

6—Coolant Temperature Light
7—Fuel Level Light
8—Key Switch

9—Hourmeter
10—Tachometer
11—Preheater Light

Hourmeter

The hourmeter is an integral part of the tachometer. It shows the accumulated hours of engine service. The hourmeter operates when the engine is operating and accumulated hours are displayed in hours and tenths of hours.

Oil Pressure Gauge

The oil pressure gauge indicates engine oil pressure.

Coolant Temperature Gauge

The coolant temperature gauge indicates coolant temperature.

Tachometer

The tachometer indicates engine speed in hundreds of revolutions per minute (rpm).

Key Switch

The four position key switch controls the electrical system.

Engine Control

The engine control consists of the following:

- The engine control light (3) illuminates after the engine has started and oil pressure is up to specification. The light indicates that the engine protection circuitry is activated.

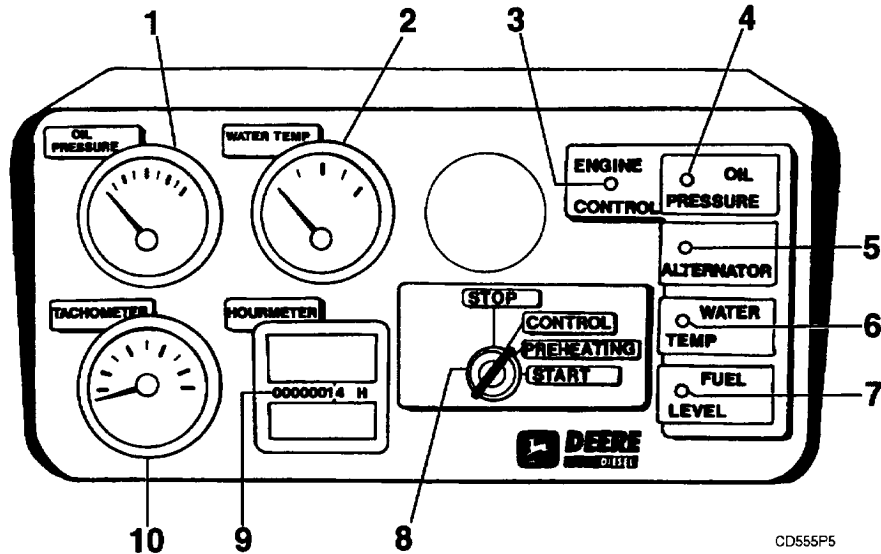
CD623P2 -JUN-19MAY98

- The oil pressure light (4) illuminates when the key switch is turned to the bulb test position (position I). The light will remain on until the engine is started and the specified oil pressure is reached. If oil pressure is lost during engine operation, the light will illuminate and protection circuitry will stop the engine. The oil pressure light will remain on, indicating that the engine was stopped due to a low oil pressure condition.
- The battery light (5) illuminates when the key is turned to the bulb test position (position I). It should go off after approximately five seconds. After the engine is running, if the alternator stops charging, the light will illuminate and protection circuitry will stop the engine. The battery light will remain on indicating the engine was stopped due to the alternator not charging.
- The coolant temperature light (6) illuminates when the key is turned to the bulb test position (position I).

It should go off after approximately five seconds. After the engine is running, if the engine overheats, the light will illuminate and protection circuitry will stop the engine. The coolant temperature light will remain on indicating the engine was stopped due to the engine overheating.

- The fuel level light (7) illuminates when the key is turned to the bulb test position (position I). It should go off after approximately five seconds. After the engine is running, if the engine runs out of fuel, the light will illuminate and protection circuitry will stop the engine. The fuel level light will remain on indicating the engine was stopped due to the fuel tank being empty.
- The preheater light (11) illuminates when the key is turned to the bulb test position (position I). It should go off after approximately five seconds. When the key switch is held in position II, the engine preheater is energized and the preheater light illuminates.

Component Function—Saran AEZ Instrument Panel



- | | | | |
|-----------------------------|------------------------|-----------------------------|---------------|
| 1—Oil Pressure Gauge | 3—Engine Control Light | 6—Coolant Temperature Light | 9—Hourmeter |
| 2—Coolant Temperature Gauge | 4—Oil Pressure Light | 7—Fuel Level Light | 10—Tachometer |
| | 5—Alternator Light | 8—Key Switch | |

Hourmeter

The hourmeter shows the accumulated hours of engine service. The hourmeter operates when the engine is operating and accumulated hours are displayed in hours and tenths of hours.

Oil Pressure Gauge

The oil pressure gauge indicates engine oil pressure.

Coolant Temperature Gauge

The coolant temperature gauge indicates coolant temperature.

Tachometer

The tachometer indicates engine speed in hundreds of revolutions per minute (rpm).

Key Switch

The four position key switch controls the electrical system. The "PREHEAT" position on the switch is for engines equipped with cold weather starting aid.

Engine Control

The engine control consists of the following:

- The engine control light (3) illuminates after the engine has started and oil pressure is up to specification. The light indicates that the engine protection circuitry is activated.

- The oil pressure light (4) illuminates when the key switch is turned to the “CONTROL” position. The light will remain on until the engine is started and the specified oil pressure is reached. If oil pressure is lost during engine operation, the light will illuminate and protection circuitry will stop the engine. The oil pressure light will remain on, indicating that the engine was stopped due to a low oil pressure condition.
- The alternator light (5) illuminates when the key is turned to the “CONTROL” position. It should go off shortly after the engine has started. While the engine is running, if the alternator stops charging, the light will illuminate and protection circuitry will stop the engine. The alternator light will remain on indicating the engine was stopped due to the alternator not charging.
- After the engine is running, if the engine overheats, the coolant temperature light (6) will illuminate and protection circuitry will stop the engine. The coolant temperature light will remain on indicating the engine was stopped due to the engine overheating.
- After the engine is running, if the engine runs out of fuel, the fuel level light (7) will illuminate and protection circuitry will stop the engine. The fuel level light will remain on indicating the engine was stopped due to the fuel tank being empty.

NOTE: Engine protection can be tested by connecting sensor wire to ground. Engine should stop and corresponding sensor light should come on.

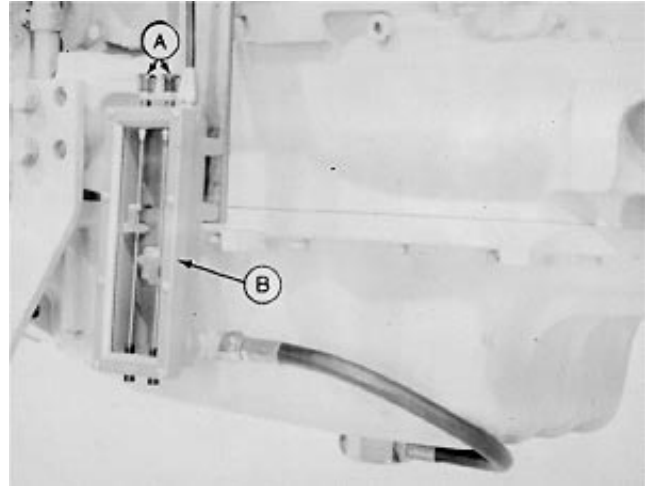
DPSG,OUO1004,777 -19-07APR99-2/2

Component Function—Crankcase Oil Level Switch/Gauge

The oil level switch (B) utilizes a float, and two adjustable pointers that also act as electrical contacts. One pointer is used for low level setpoint and the other for high level setpoint. Because it's metal and grounded through the case, the float provides an electrical path to ground. When the float contacts the adjustable pointers, a path to ground is provided for the Magnetic Safety Switch coil. The completed circuit energizes the coil, which opens the safety switch contacts, stopping the engine.

When crankcase oil level drops to the "low" set point, the float will make contact with the pointer and complete the circuit to ground. This activates the safety switch, automatically stopping the engine. Also, if coolant gets into the crankcase and increases the oil level to the point where the float contacts the upper set point, the circuit again will be complete and the safety switch will activate, automatically stopping the engine.

The high/low set points can be adjusted by turning two knobs (A) located on switch housing.



RG6943 -UN-01OCT93

A—Knobs
B—Oil Level Switch

DPSG.OUO1004.638 -19-10MAR99-1/1

Before You Start Diagnostics

Apply logic when diagnosing any problem. Make sure you know exactly what is wrong before making any repairs. Always follow the seven basic diagnostic steps:

1. Know the system.
2. Ask the operator.
3. Inspect the system.
4. Operate the engine (if possible).
5. List possible causes.
6. Reach a conclusion.
7. Test the conclusion.

An understanding of the following concepts is required when diagnosing the electrical system:

- Voltage (volts)
- Current (amps)
- Resistance (ohms)

It is recommended that a digital multimeter (JT05791 or equivalent multimeter with analog display) be used to make the required measurements in the diagnostic procedures. A knowledge of the operation of the particular meter used is assumed.

Isolate the circuits to be measured by disconnecting the appropriate connectors. Turn the key switch to the ON or OFF position as required.



T7199A1 -19-17JAN90

DPSG,OUO1004,639 -19-10MAR99-1/1

Visually Inspect Electrical System

1. Before starting engine.

Check for:

- Bare wires that could ground a component or short across another component
- Worn or damaged wire conduit
- Loose or broken connectors and wires
- Loose or broken alternator belt

Inspect batteries for:

- Corroded terminals
- Loose battery terminals or posts
- Dirty condition
- Cracked case
- Proper electrolyte level

2. Turn key switch to the ON position.

Check operation of:

- Accessory circuits
- Indicator lamps
- Gauge lamps

Look for sparks or smoke which might indicate a short or unwanted ground.

If, at this point, the visual inspection does not indicate a malfunction, and the engine can be started, continue to step three.

3. Start engine.

Check for:

- Proper operation of gauges
- System charging or discharging
- Anything unusual

4. Stop engine.

After engine has been shut down for five minutes, inspect for overheated components. Overheated components will often smell like burned insulation. Check if the alternator is hot to the touch. A hot alternator, if engine has run only a short time, is a sure indication there is a problem in the charging system.

NOTE: Many electrical failures cannot be detected even with the engine operating. A systematic and complete inspection of the electrical system may be necessary.

Diagnose Electrical System Malfunctions

Symptom	Problem	Solution
Undercharged Battery	Loose or defective alternator belt	Adjust or replace belt(s) as necessary. (See Check and Adjust Fan and Alternator Belts in Group 40.)
	Excessive engine idle time	Increase engine rpm when electrical power requirements increase.
	Loose or corroded wire connections on battery, ground strap, starter or alternator	Clean and tighten connections as necessary.
	Excessive electrical load from added accessories	Remove accessories or install higher output alternator.
	Defective regulator	Test charging system. Replace regulator as necessary.
	Defective battery	Test and/or replace battery.
Battery Uses Excessive Amounts of Water	Cracked battery case	Replace battery.
	Charging rate too high	Test charging system.
Starter Inoperative	PTO engaged	Disengage PTO.
	Blown fuse	Replace fuse. (See Check Fuses in this group.)
	Dead or defective battery	Test battery and charging system. Replace battery as necessary.
	Defective or misadjusted starter safety switch	Replace or adjust safety switch as necessary.
	Defective starter solenoid or starter	Repair or replace solenoid or starter as necessary.
Starter Cranks Engine Slowly	Undercharged battery	Test battery and charging system.
	Loose or corroded wire connections	Clean and tighten connections.
	Viscosity of Engine oil too high	Use proper viscosity oil.

Continued on next page

RG,CTM67,G21,8 -19-19NOV93-1/2

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26

Symptom	Problem	Solution
Starter Operative; Rest of Electrical System Inoperative	Blown fuse	Replace fuse. (See Check Fuses in this group.)
	Defective magnetic safety switch	Test safety switch. (See Test Magnetic Switch in this group.)

RG,CTM67,G21.8 -19-19NOV93-2/2

Checking Fuses In Instrument Panels

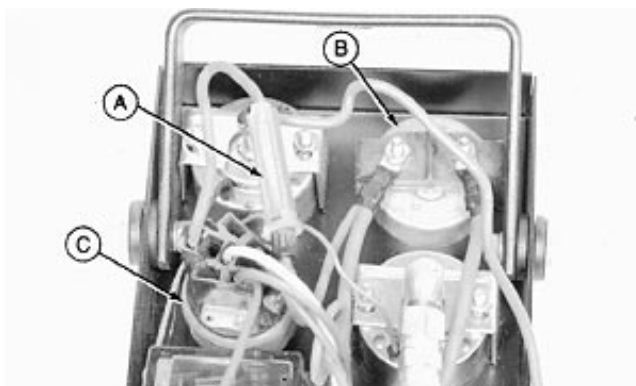
The following instructions apply to engines equipped with John Deere instrument panels.

1. **On Engines With The North American Standard Instrument Panel (—1998)**, check the fuse (A) between the ammeter (B) and key switch (C) located on back side of instrument panel. If defective, replace with an equivalent 25-amp fuse.

Also check the fuse (D) mounted on the bottom of the magnetic safety switch. If defective, install an equivalent 14-amp fuse.

2. **On later (1999—) North American Standard Instrument Panels**, check the fuse in fuse holder (E) on front face of instrument panel. Replace as necessary with an equivalent 14-amp fuse.
3. **For VDO Instrument Panels**, the fuse is located on the electronic control card inside the panel's rear access cover. Remove cover and check fuse (F). If defective, replace with a 10-amp fuse. There is a spare fuse (G) available on the card in the "SPARE" terminal.

- A—25 Amp Fuse
- B—Ammeter
- C—Key Switch
- D—14 Amp Fuse
- E—Fuse Holder
- F—10 Amp Fuse
- G—Spare Fuse



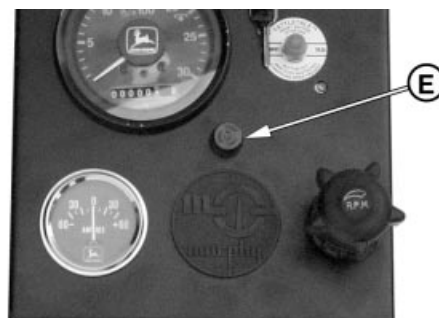
North American (—1998) Standard Instrument Panel Shown

RG4483 —UN-14DEC88



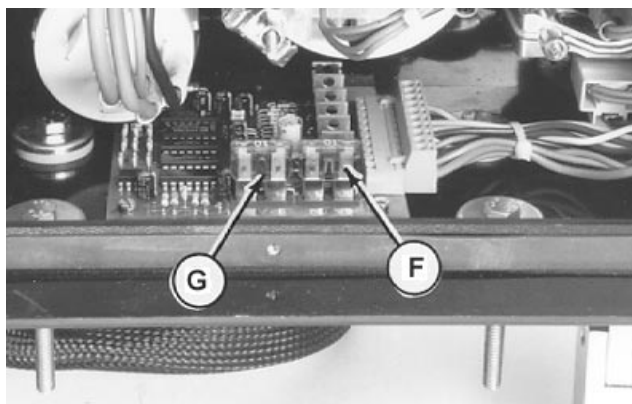
North American (—1998) Standard Instrument Panel Shown

RG4486A —UN-01JUN01



North American (1999—) Instrument Panel Shown

RG11937 —UN-17OCT01



VDO Instrument Panel

RG12087 —UN-29JAN02

Continued on next page

OURGP12.000014A —19-25AUG05-1/4

4. For Earlier Electronic Instrument Panel (with John Deere ECU)

Check the fuse (A) located in the fuse holder on the face of the instrument panel. If defective, replace with a 5-amp fuse.

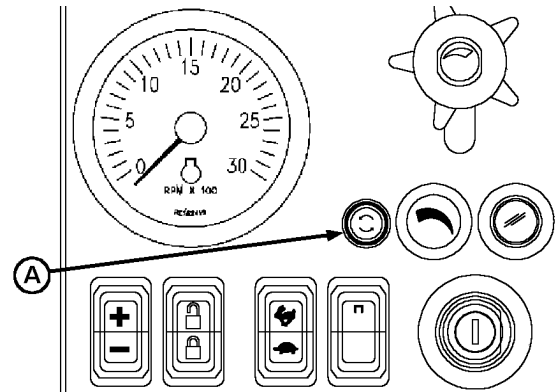
A separate wiring harness fuse (10-amp) is shown in the wiring diagrams.

5. For Later Electronic Instrument Panel (PowerTech Plus Engines)

Check the following fuses located in instrument panel and wiring harness. Replace defective fuses.

- Instrument panel fuse-5 amp
- Main system fuse-30 amp.
- ECU fuse-20 amp
- Fuel filter fuse (13.5 L only)-15 amp

Refer to ENGINE WIRING DIAGRAM in earlier section.



Electronic Instrument Panel Fuse

A—5 Amp Fuse

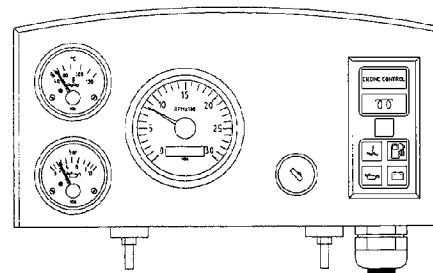
RG11938 -UN-06NOV01

OURGP12,000014A -19-25AUG05-2/4

NOTE: For main electrical system fuses, see engine wiring diagrams later in this manual in Troubleshooting Section.

Checking Fuses On VDO Instrument Panels (Except North America):

5. The fuse is located on the electronic control card inside the panel's rear access cover. Remove cover and check fuse. If defective, replace with a 10 amp fuse. There is a spare fuse available on the card in the "SPARE" terminal.



VDO Instrument Panel (Except North America)

RG10606A -UN-19JUN00

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OURGP12,000014A -19-25AUG05-3/4

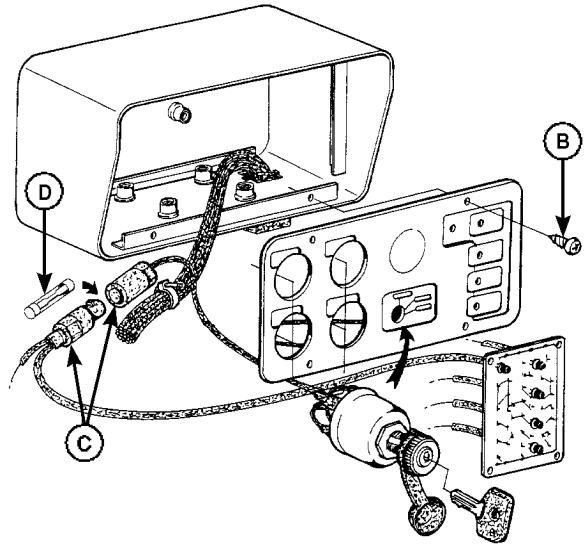
Checking Fuses On AEZ Instrument Panels (Except North America):

1. Remove the four cap screws (B) holding the instrument panel board.
2. Open fuse holder (C).
3. Replace as necessary with an equivalent 16-amp fuse (D).

IMPORTANT: Always replace a blown fuse with a fuse of the same amperage.

4. Reinstall the instrument panel board.

- B—Cap Screws
- C—Fuse Holder
- D—16-Amp Fuse



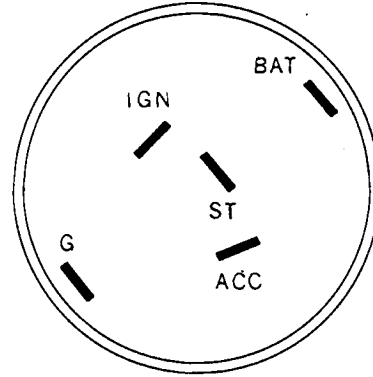
AEZ Instrument Panel (Except North America)

RG8149 -JUN-01DEC00

OURGP12,000014A -19-25AUG05-4/4

Test Key Switch

To test the key switch, disconnect the wiring connector from the key switch. Use an ohmmeter or continuity tester to check continuity between the designated switch terminals as follows:



KEY SWITCH CONTINUITY

Switch Position	Continuity Between Terminals
ACCESSORY	BAT - ACC
OFF	None
ON	BAT - ACC - IGN
START	BAT - IGN - ST
	"G" (not used) - Case Ground

Replace key switch if:

- Continuity is not present between terminals listed for each switch position
- Continuity is present between terminals not listed for each switch position.

NOTE: Lubricate the key switch tumblers periodically with powdered graphite.

R26543 -JUN-11APR89

DPSG.OUO1004.641 -19-10MAR99-1/1

Test Magnetic Safety Switch

NOTE: Make sure fuse (B) is OK before performing test.
(See Check Fuses in this group.)

1. Turn key switch to OFF position.
2. Disconnect wiring from terminals "S" and "C". Tag all wires for assembly.
3. Connect red lead (A) of ammeter (D) to terminal "S" of safety switch (C).
4. Connect the black lead (not shown) to engine ground.
5. Turn key switch to ON position.
6. Push and hold-in the reset button to close the switch contact.
7. Check ammeter reading. Switch coil should draw current as specified below.



RG6885 -UN-23SEP93

Specification

Magnetic Safety Switch Coil—	
Approximate Current Draw.....	0.7 amps at 12 volts 1.4 amps at 24 volts

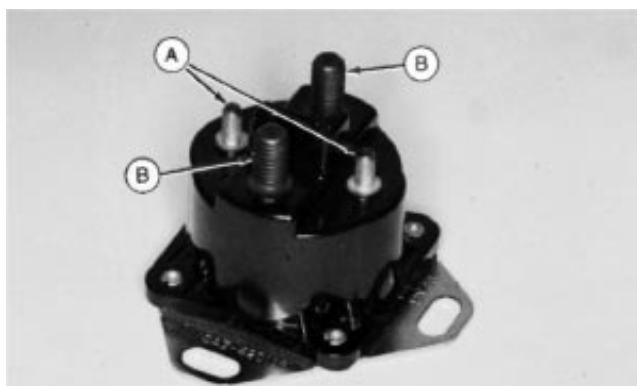
- A—Red Lead
- B—Fuse
- C—Safety Switch
- D—Ammeter

If reading does not meet specifications, replace safety switch.

DPSG,OUO1004,642 -19-10MAR99-1/1

Test Starter Relay

1. Disconnect wires from relay.
2. Check for continuity between the two small terminals (A).
3. Check for no continuity between the two large terminals (B).
4. Using jumper wires, connect one of the small terminals to the battery positive (+) post and the other small terminal to the battery negative (—) post. An audible click should be heard.
5. Continuity should now exist between the two large terminals. If there's no continuity, replace starter relay.



LV068 -UN-24FEB92

- A—Small Terminals
- B—Large Terminals

RG,CTM67,G21,13 -19-19NOV93-1/1

Essential Tools

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

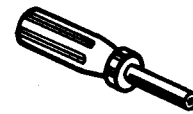
SERVICEGARD is a trademark of Deere & Company

DPSG,OUO1047,11 -19-23FEB99-1/4

Weatherpack Extraction Tool JDG364

T6606AC -UN-23AUG88

Used to remove contacts from Weatherpack electrical connectors.

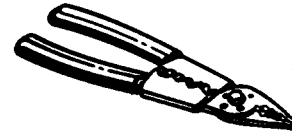


DPSG,OUO1047,11 -19-23FEB99-2/4

Electrician's Plier JDG145

T6606AA -UN-23AUG88

Used to cut and strip wire, and crimp closed-barrel connectors.



DPSG,OUO1047,11 -19-23FEB99-3/4

Electrical Repair Tool Kit JDG155

H41104 -UN-05SEP89

Used to repair and install wires in electrical connectors.



DPSG,OUO1047,11 -19-23FEB99-4/4

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

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DPSG,OUO1004,783 -19-12APR99-1/2

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2

TIME TRAC® Kit JT07158 (FKM10429A)

Used to check engine speed.

TIME TRAC is a registered trademark of Stanadyne Automotive Corp.

DPSG,OUO1004,783 -19-12APR99-2/2

Other Material

Number	Name	Use
TY9375 (U.S.) TY9480 (Canadian) 592 (LOCTITE®)	Pipe Sealant With TEFLON®	Apply to threads of coolant temperature gauge capillary tube fitting. Apply to threads of oil pressure gauge hose fitting. Apply to threads of crankcase oil level switch/gauge fittings.

*LOCTITE is a registered trademark of Loctite Corp.
TEFLON is a registered trademark of Du Pont Co.*

DPSG,OUO1047,12 -19-23FEB99-1/1

Instrument Panel Specifications

Item	Measurement	Specification
Instrument Panel Bracket to Cylinder Head Mounting Cap Screws (Saran AEZ Panel)	Torque	50 N•m (37 lb-ft)
Instrument Panel to Mounting Bracket Nuts (Saran AEZ Panel)	Torque	40 N•m (30 lb-ft)

DPSG,OUO1004,781 -19-12APR99-1/1

Repair WEATHERPACK™ Connector

1. Disconnect WEATHERPACK™ connector. Remove the tie bands and tape.
2. Open the secondary lock on the back of the connector.
3. Identify wire color/number to the connector cavity. Make sure each wire goes back to the correct cavity location.
4. Insert JDG364 Extraction Tool¹ over terminal contact in connector body. Extraction tool needs to be fully seated to unlock terminal tangs from the connector body. When tool is seated, gently pull the wire from the back of the connector. If the wire(s) or terminal(s) are being repaired, go to step 5. If the wires and terminals are OK and only the connector is being replaced, go to step 9.
5. Using JDG145 Universal Electrical Pliers², cut off wire directly behind the terminal seal crimp. If any part of the seal is still on the wire, dispose of it.
6. Using JDG145 Universal Electrical Pliers², strip 6 mm (1/4 in.) insulation from end of wire.



TS0128 -UN-23AUG88

WEATHERPACK is a trademark of Packard Electric

¹ Included in JT07195B Electrical Repair Kit

²Included in JDG155 Electrical Repair Tool Kit

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RG40854,00000CF -19-20MAY02-1/4

7. Select correct size of seal. Slide the seal over the wire insulation with the smaller diameter side facing the end of the wire. Small diameter side of seal should line up with the outer edge of the insulation.

IMPORTANT: The seal must fit snug over the cable insulation without a gap between the cable seal and the insulation.

NOTE: Cable seals are color coded for three sizes of wire:

- Green - 18—20 Gauge Wire
- Gray - 14—16 Gauge Wire
- Blue - 10—12 Gauge Wire



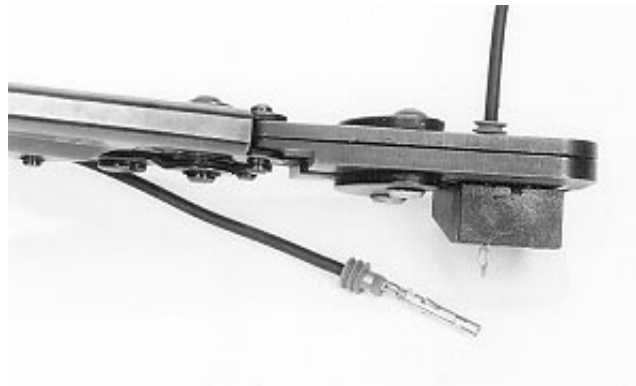
TS0136 -JUN-23AUG88

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8. Select correct size terminal on wire and crimp in position with a W-type crimp using a JDG783 WEATHER PACK™ Crimping Tool.

NOTE: Terminals have numbered identification for two sizes of wire:

- #15 - 14—16 Gauge Wire
- #19 - 18—20 Gauge Wire



TS1623 -JUN-02NOV94

WEATHER PACK is a trademark of Packard Electric

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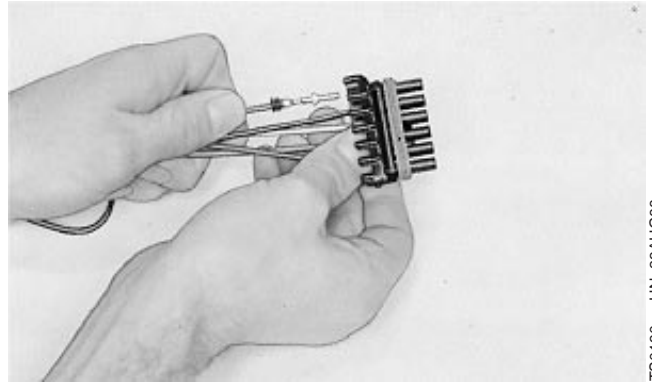
9. Insert terminal into connector. Terminal should click when it is fully seated. Make sure the wire is inserted into the correct connector cavity.

IMPORTANT: Terminal tangs must be carefully spread to ensure good seating on connector body. If terminal is being reused in a new connector, make sure tangs are spread.

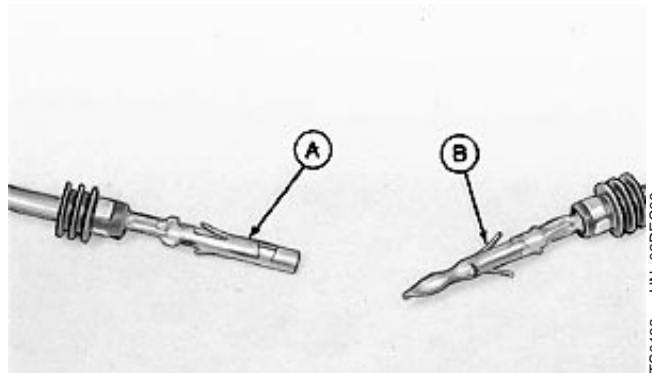
NOTE: Connector bodies are "keyed" for correct terminals. Be sure terminals are correctly aligned.

Correct terminal installation for sleeve (A) and pin (B) is illustrated.

10. Gently pull on wire to insure that the terminal is locked in position.
11. Repair or transfer remaining wires.
12. Close the secondary lock on the back of the connector.
13. Retape wires and add the required tie bands to the harness.



TS0130 -UN-23AUG88



TS0139 -UN-02DEC88

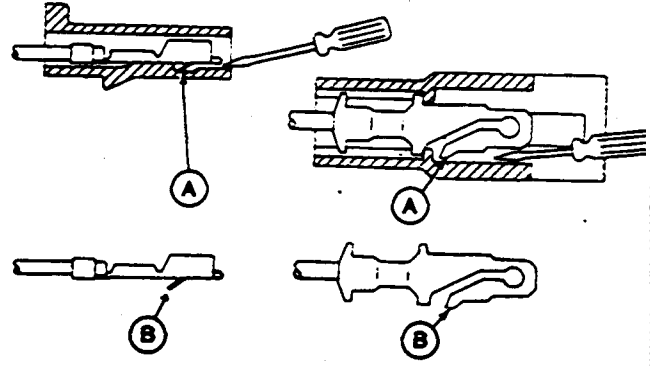
A—Sleeve
B—Pin

RG40854.00000CF -19-20MAY02-4/4

Remove Blade Terminals from Connector Body

NOTE: Use JDG776 Extraction Tool with 56, 280, and 630 Series METRI-PACK terminals. Use JDG777 Extraction Tool with 150 Series METRI-PACK terminals.

1. Insert JDG776 or JDG777 Terminal Extraction Tool¹ into connector body pushing the terminal locking tang inward.
2. Gently pull wire and remove terminal from connector.
3. Adjust the locking tang on the terminal to it's original position before installing into a connector.



A—Locking Tang
B—Original Position

RW4218 -UN-23AUG88

¹Included in JT07195B Electrical Repair Kit

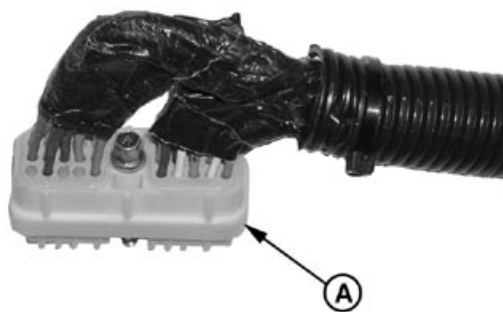
Repair (Pull Type) METRI-PACK™ Connectors

1. Disconnect the METRI-PACK connector (A) from the ECU.
2. Remove tie bands and tape from the wiring harness behind the connector.
3. Identify wire color/number to the connector cavity. Make sure each wire goes back to the correct cavity location.
4. Using JDG776 Terminal Extraction Tool (C)¹, carefully remove the connector seal (B) from the back of the connector.

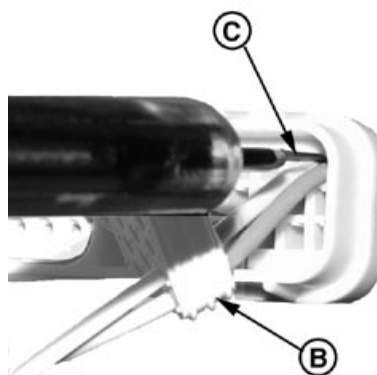
IMPORTANT: Make sure no damage to the seal occurs or water and contaminants will corrode terminals.

NOTE: Extraction tool must be used from the back of the connector.

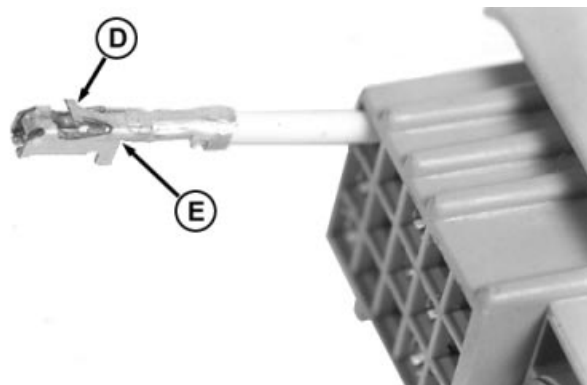
5. Using JDG776 Terminal Extraction Tool (C), angle the tip so it slides along the top edge of the connector. Make sure the extraction tool is centered in the connector cavity and push the tool in until resistance is felt.
6. With extraction tool inserted into the connector, gently rotate tool clockwise and counter-clockwise (no more than 1/8 turn each direction) to depress the terminal locking tang (D).
7. Remove extraction tool from back of connector.
8. Push wire until terminal has extracted from the front of the connector. If terminal does not extract, repeat steps 4-6.



RG12231A -UN-13MAR02



RG12232A -UN-13MAR02



RW16935A -UN-05AUG98

- A—Connector
- B—Connector Seal
- C—JDG777 Terminal Extraction Tool
- D—Terminal Locking Tang
- E—Terminal

METRI-PACK is a trademark of Delphi Packard Electric Systems

¹ Included JT07195B Electrical Repair Kit

- Using JDG145 Universal Electrical Pliers¹, cut off wire directly behind the terminal.

IMPORTANT: Save as much wire as possible. If only a couple of wires are shorter than the rest, all of the strain will be placed on them. Damage to the harness may occur.

- Using JDG145 Universal Electrical Pliers¹, strip 6 mm (1/4 in.) insulation from end of wire.

- If wire has been removed from the connector, make sure the wire is fed through the connector (F) and in the correct cavity.

- Using either JDG783 (G) or JDG707 (H) Crimping Pliers, crimp a new terminal on the wire.

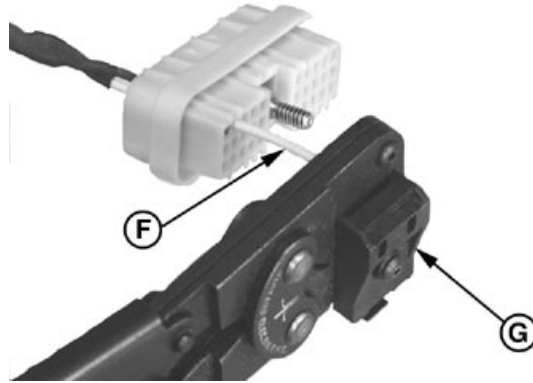
- Make sure terminal locking tang (D) on new terminal is in outward position. Pull wire back into connector cavity until terminal locks.

NOTE: Terminal will seat only one way. If terminal does not pull into the connector body socket, check for correct terminal alignment (E).

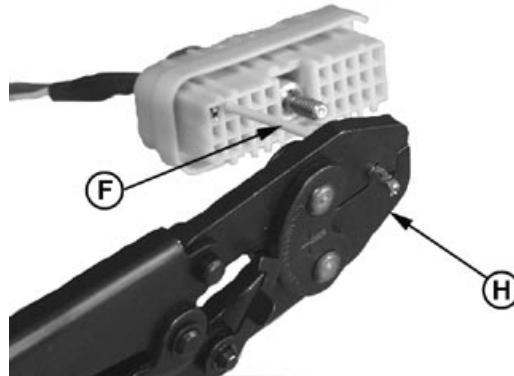
- Push on the wire to make sure terminal is locked into the connector.

- Slide the connector seal back into the connector. Make sure seal is in its original position.

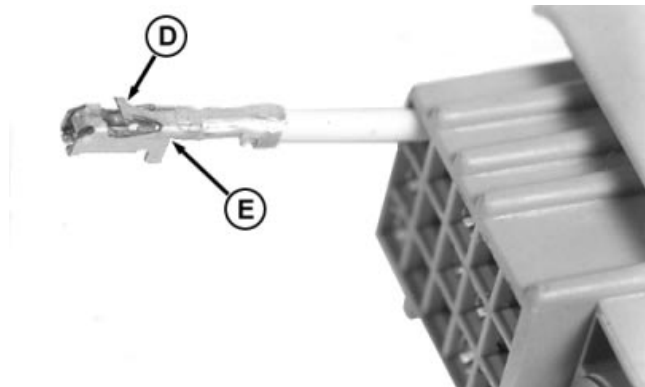
- Retape the wires and add the required tie bands to the harness.



RG12234A -UN-13MAR02



RG12233A -UN-13MAR02



RW16935A -UN-05AUG98

- D—Terminal Locking Tang
- E—Correct Terminal Orientation
- F—Wire
- G—JDG783 Terminal Crimping Tool
- H—JDG707 Terminal Crimping Tool

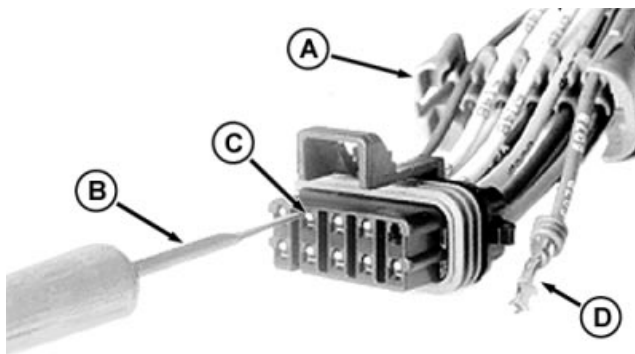
¹Included in JDG155 Electrical Repair Tool Kit

Repair (Push Type) METRI-PACK™ Connectors

1. Disconnect the METRI-PACK connector. Remove the tie bands and tape.
2. Remove secondary lock (A).
3. Identify wire color/number to the connector cavity. Make sure each wire goes back to the correct cavity location.
4. Insert JDG776 or JDG777 Terminal Extraction Tool¹ (B) into connector cavity (C) pushing the terminal locking tab inward.

NOTE: Use JDG776 Extraction Tool with 56, 280, and 630 Series METRI-PACK terminals. Use JDG777 Extraction Tool with 150 Series METRI-PACK terminals.

5. Remove extraction tool and pull wire from the back of the connector.
6. Using JDG145 Universal Electrical Pliers², cut off wire directly behind the terminal.
7. Using JDG145 Universal Electrical Pliers² strip 6 mm (1/4 in.) insulation from end of wire.
8. Select correct size of seal. Slide the seal over the wire insulation with the smaller diameter side facing the end of the wire. Small diameter side of seal should line up with the outer edge of the insulation.



A—Connector Secondary Lock
B—Extraction Tool
C—Connector Body Socket
D—Terminal

RW77137 -UN-08DEC98

TS0136 -UN-23AUG88

METRI-PACK is a trademark of Delphi Packard Electric Systems

¹Included in JT07195B Electrical Repair Kit

²Included in JDG155 Electrical Repair Tool Kit

Continued on next page

RG40854,00000CC -19-20MAY02-1/3

IMPORTANT: The seal must fit snug over the cable insulation, without a gap between the cable seal and the insulation.

NOTE: Cable seals are color coded for three sizes of wire:

- Green - 18—20 Gauge Wire
- Gray - 14—16 Gauge Wire
- Blue - 10—12 Gauge Wire

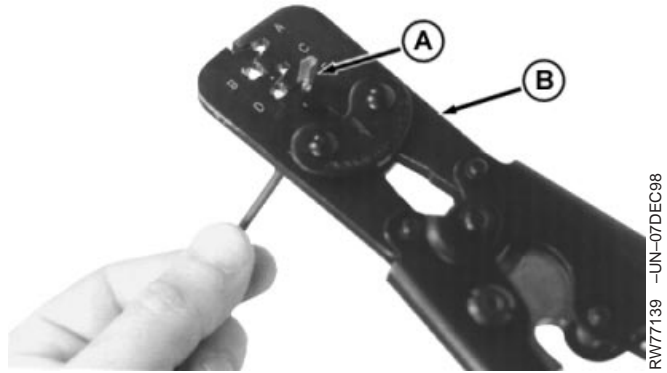
9. Select correct size contact for wire.

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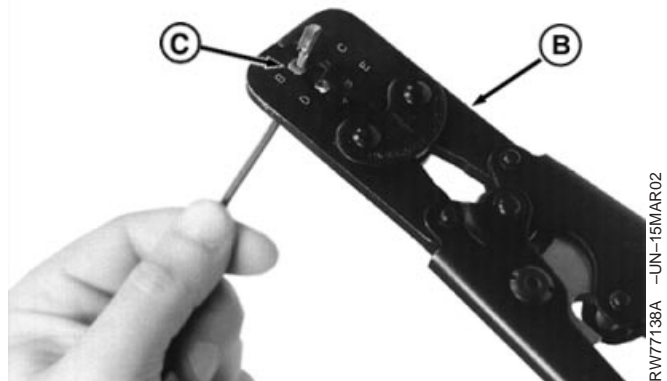
RG40854,00000CC -19-20MAY02-2/3

10. Crimp contact (A) on wire with a “W” type crimp using JDG865 Crimping Tool (B).
11. Crimp cable seal (C) on contact using JDG865 Crimping Tool (B).
12. Make sure locking tang (D) on the new terminal is in the outward position.
13. Push terminal into the correct connector cavity until terminal locks.
14. Gently pull on wire to verify terminal is locked into the connector.
15. Place the secondary lock back on the connector.
16. Retape the wires and add the required tie bands to the harness.

- A—Contact
- B—Tool
- C—Cable Seal
- D—Terminal Locking Tang



RW77139 -UN-07DEC98



RW77138A -UN-15MAR02



RW77140A -UN-15MAR02

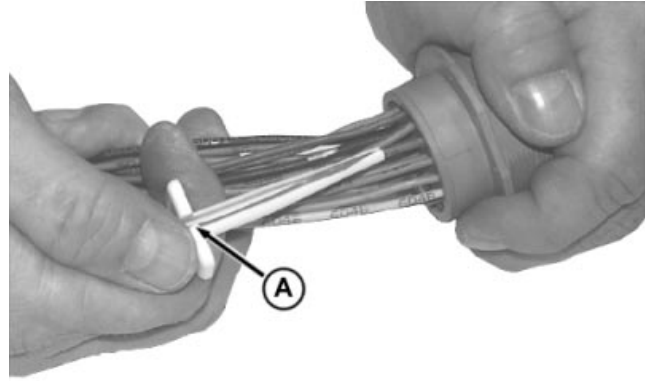
RG40854.00000CC -19-20MAY02-3/3

Repair DEUTSCH™ Connectors

1. Disconnect the Deutsch connector. Remove the tie bands and tape.
2. Identify wire color/number to the connector cavity. Make sure each wire goes back to the correct cavity location.
3. Select correct size extractor tool for size of wire to be removed:
 - JDG361 Extractor Tool - 12—14 Gauge Wire¹
 - JDG362 Extractor Tool - 16—18 Gauge Wire¹
 - JDG363 Extractor Tool - 20 Gauge Wire²
 - JDG785 Extractor Tool - 6-8 Gauge Wire³
4. Start inserting the wire into the handle end (A) of the correct size extraction tool.
5. Slide extraction tool rearward along wire until tool tip snaps onto wire.

IMPORTANT: DO NOT twist tool when inserting in connector.

6. Slide extraction tool along wire into connector body until tool is positioned over terminal contact.
7. Pull wire from connector body using extraction tool.
8. Using JDG145 Universal Electrical Pliers⁴ cut off wire directly behind the terminal.
9. Using JDG145 Universal Electrical Pliers⁴, strip 6 mm (1/4 in.) insulation from end of wire.



A—Handle

RW77142 -UN-07DEC98

DEUTSCH is a trademark of Deutsch Company

¹Included in JT07195B Electrical Repair Tool Kit and JDG359 DEUTSCH Electrical Repair Kit

²Included in JDG359 DEUTSCH Electrical Repair Kit

³Included in JT07195B Electrical Repair Tool Kit

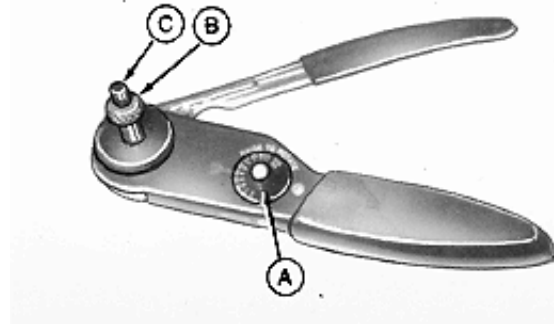
⁴Included in JDG155 Electrical Repair Tool Kit

Continued on next page

RG40854,00000CB -19-20MAY02-1/4

10. Adjust selector (A) on JDG360 Crimping Tool¹ for correct wire size .
11. Loosen lock nut (B) and turn adjusting screw (C) in until screw stops.

A—Selector
B—Lock Nut
C—Adjusting Screw



TS117 -JUN-23AUG88

¹Included in JDG359 Electrical Repair Kit

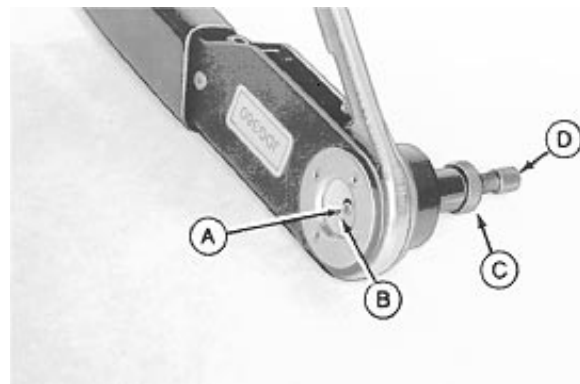
RG40854.00000CB -19-20MAY02-2/4

12. Insert terminal (A) and turn adjusting screw (D) until terminal is flush with cover (B).

IMPORTANT: Select correct size terminal to fit connector body.

13. Tighten lock nut (C).

A—Terminal
B—Cover
C—Lock Nut
D—Adjusting Screw



TS0134 -JUN-23AUG88

Continued on next page

RG40854.00000CB -19-20MAY02-3/4

14. Insert wire in terminal and crimp until handle contacts stop.

IMPORTANT: Terminal must remain centered between indenters while crimping.

15. Release handle and remove terminal.

16. Inspect terminals to ensure all wires are in crimped barrel.

IMPORTANT: If all wire strands are not crimped into terminal, cut off wire at terminal and repeat terminal installation procedures.

NOTE: Readjust crimping tool for each crimping procedure.

17. Push terminal straight into correct connector cavity until positive stop is felt.

IMPORTANT: Install terminal in correct connector cavity using correct size grommet.

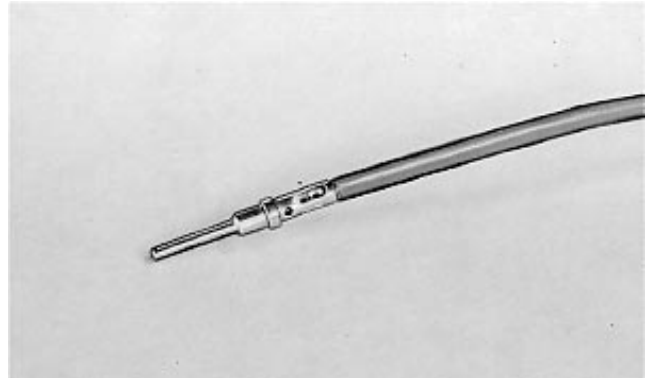
18. Gently pull on wire to verify terminal is locked into the connector.

19. Transfer remaining wires to correct cavity in new connector.

20. Retape the wires and add the required tie bands to the harness.



TS118 -UN-23AUG88

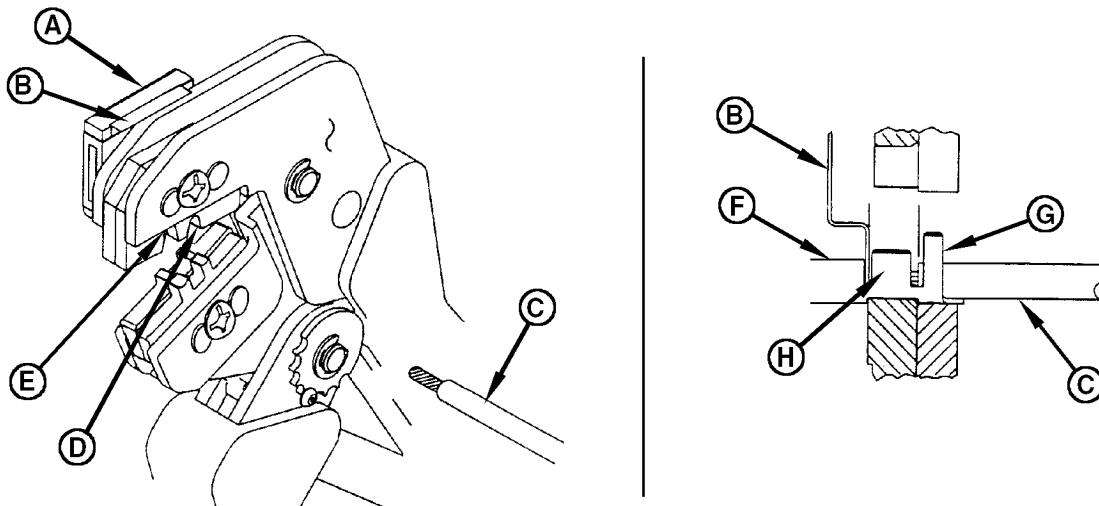


TS0135 -UN-23AUG88



RW77141 -UN-07DEC98

Repair AMP Connector



Using AMP Crimping Tool

A—Locator Assembly
B—Locator

C—Wire
D—Crimping Slot

E—Crimping Slot
F—Terminal

G—Insulation Barrel
H—Wire Barrel

1. Disconnect AMP connector. Remove the tie bands and tape.
2. Identify wire color/number to the connector cavity. Make sure the each wire goes back into the correct cavity location.
3. Press JDG1369 Terminal Extraction Tool into face of connector and remove wire and terminal from back of connector.

NOTE: Verify wire stripping length and crimp height before using AMP crimping tool. See instructions provided with tool.

4. Strip new wire to length indicated in tool instructions. Do not nick or cut wire strands.
5. Hold JDG708 AMP Crimping Tool so that the back (wire side) is facing you. Squeeze tool handles together and allow them to open fully.

NOTE: See instructions provided with tool to determine which crimping slot (D or E) to use.

6. Holding the terminal (F) by the mating end, insert the insulation barrel (G) first, through the front of the tool and into the appropriate crimp slot (D or E).

IMPORTANT: Make sure that both sides of the insulation barrel (G) are started evenly into the crimping section. Do NOT attempt to crimp an improperly positioned terminal.

7. Position the terminal so that the open “U” of the wire and insulation barrels (H and G) face the top of the tool. Place the terminal up into the nest so that the movable locator (B) drops into the slot in the terminal as shown. Butt the front end of the wire barrel (H) against the movable locator.
8. Hold the terminal (F) in position and squeeze the tool handles together until ratchet engages sufficiently to hold the terminal in position. DO NOT deform insulation barrel or wire barrel.
9. Insert stripped wire (C) into terminal insulation and wire barrels until it is butted against the wire stop.

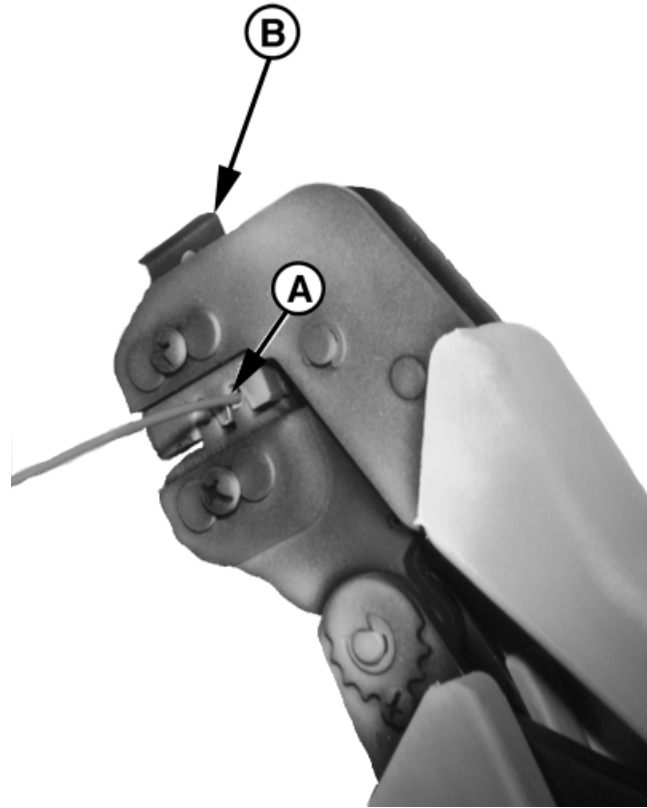
RG10742 -UN-31MAY00

10. Hold the wire and terminal (A) in place. Squeeze tool handles together until ratchet releases. Allow tool handles to open and remove crimped terminal.

NOTE: The crimped terminal may stick in the crimping area. It can be easily removed by pushing downward on the top of the locator (B).

11. Install wire in correct connector cavity.
12. Retape the wires and add the required tie bands to the harness.

A—Wire and Terminal
B—Locator

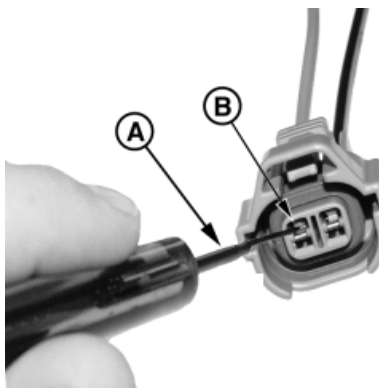


T112335E -UN-15MAR02

RG40854,00000CA -19-20MAY02-2/2

Repair SUMITOMO™ Connectors

1. Disconnect the SUMITOMO™ connector. Remove the tie bands and tape.
2. Identify wire color/number location with the connector cavity. Make sure each wire goes back to the correct cavity location.
3. Insert JDG777 Terminal Extraction Tool¹ (A) into connector body socket pushing the terminal locking tab upward (B).
4. Gently pull wire from the back of the connector. Then remove the extraction tool.
5. Remove old contact from wire using JDG145 Universal Electrical Pliers².
6. Using JDG145 Universal Electrical Pliers², strip 6 mm (1/4 in.) insulation from end of wire.
7. Select the correct seal. Slide the seal over the wire insulation with the smaller diameter side facing the end of the wire. Small diameter side of seal should line up with the outer edge of the insulation.



RG11676 -JUN-05FEB01

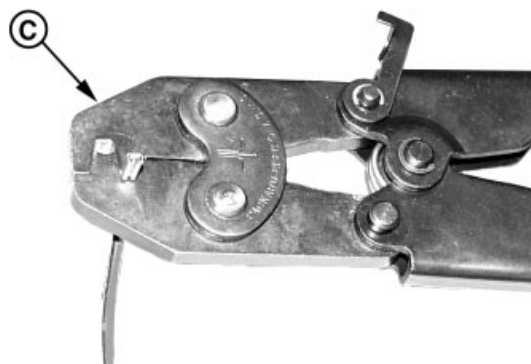


TS0136 -JUN-23AUG88

IMPORTANT: The seal must fit snug over the cable insulation, without a gap between the cable seal and the insulation.

8. Crimp contact on cable seal (D) using JDG707 Crimping Tool (C).

- A—Terminal Extraction Tool
- B—Connector Locking Tang
- C—Terminal Crimping Tool
- D—Crimped Cable Seal



RG11678 -JUN-05FEB01

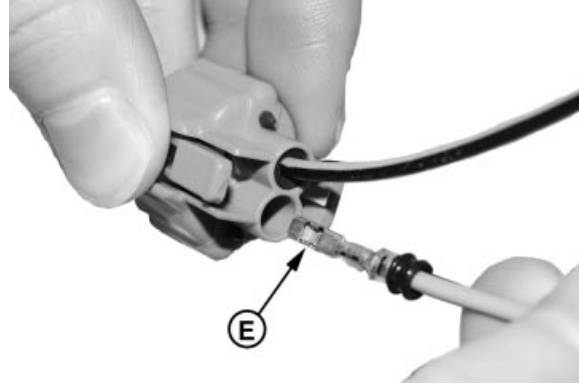


RG11680 -JUN-05FEB01

¹Included in JT07195B Electrical Repair Tool Kit.

²Included in JDG155 Electrical Repair Tool Kit.

9. Make sure the terminal is positioned correctly (E) for the locking tang inside the connector.
10. Push terminal into correct connector cavity until terminal locks.
11. Gently pull on wire to verify terminal is locked into the connector.
12. Retape the wires and add the required tie bands to the harness.



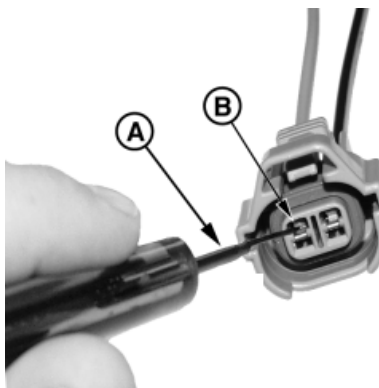
RG11681 -UN-05FEB01

E—Terminal Orientation

RG40854,00000C9 -19-20MAY02-2/2

Repair YAZAKI™ Connectors

1. Disconnect the YAZAKI™ connector. Remove the tie bands and tape.
2. Identify wire color/number location with the connector cavity. Make sure each wire goes back to the correct cavity location.
3. Insert JDG777 Terminal Extraction Tool¹ (A) into connector body socket pushing the terminal locking tab upward (B).
4. Gently pull wire from the back of the connector. Then remove the extraction tool.
5. Remove old contact from wire using JDG145 Universal Electrical Pliers².
6. Using JDG145 Universal Electrical Pliers², strip 6 mm (1/4 in.) insulation from end of wire.
7. Select the correct seal. Slide the seal over the wire insulation with the smaller diameter side facing the end of the wire. Small diameter side of seal should line up with the outer edge of the insulation.



RG11676 -JUN-05FEB01

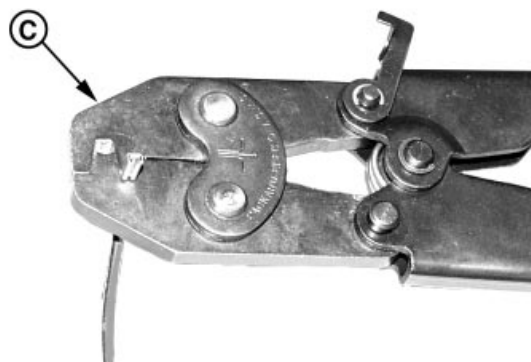


TS0136 -JUN-23AUG88

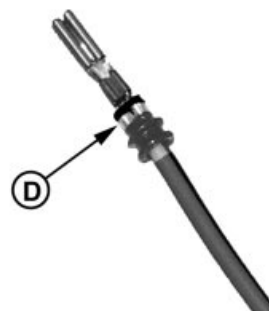
IMPORTANT: The seal must fit snug over the cable insulation, without a gap between the cable seal and the insulation.

8. Crimp contact on cable seal (D) using JDG707 Crimping Tool (C).

- A—Terminal Extraction Tool
- B—Connector Locking Tang
- C—Terminal Crimping Tool
- D—Crimped Cable Seal



RG11678 -JUN-05FEB01

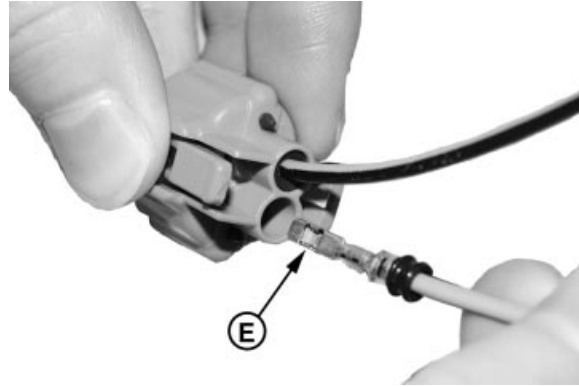


RG11680 -JUN-05FEB01

¹Included in JT07195B Electrical Repair Tool Kit.

²Included in JDG155 Electrical Repair Tool Kit.

9. Make sure the terminal is positioned correctly (E) for the locking tang inside the connector.
10. Push terminal into correct connector cavity until terminal locks.
11. Gently pull on wire to verify terminal is locked into the connector.
12. Retape the wires and add the required tie bands to the harness.



RG11681 -UN-05FEB01

E—Terminal Orientation

RG40854,00000C8 -19-20MAY02-2/2

Repair CINCH™ Flex Box Connector

Tools Required For Repair

- CINCH Crimper Tool JDG1727



RG14578 -UN-21NOV05

CINCH Crimper Tool

RG41183,00000E9 -19-06DEC05-1/15

- CINCH Terminal Remover Tool JDG 1725
- Wire Stripper JDG145
- Jeweler's screwdriver (or equivalent, narrow, flat-bladed tool)

RG14579 -UN-21NOV05



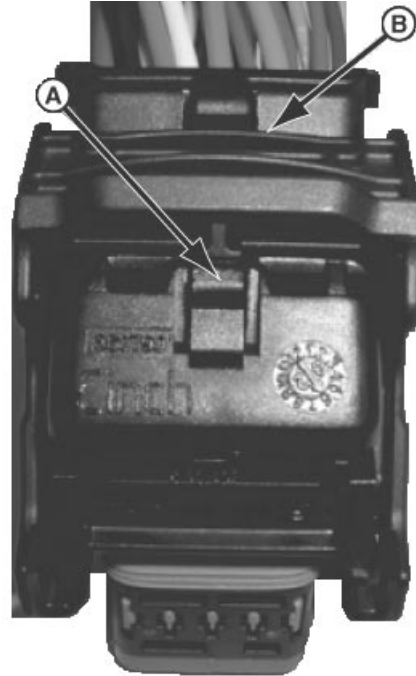
CINCH Terminal Remover Tool

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RG41183,00000E9 -19-06DEC05-2/15

Repair CINCH Connector by Replacing Terminal (0.6 or 1.5 mm)

1. To unlock CINCH connector from ECU connector, press on tab (A), and push on connector lock (B) behind tab, allowing Lock rotation.



RG14580 -JUN-21NOV05

Tab and Connector Lock

RG41183,00000E9 -19-06DEC05-3/15

2. Continue pushing on connector lock, until it has been rotated 90° clockwise (clicked into place).
3. Remove CINCH connector from ECU connector.



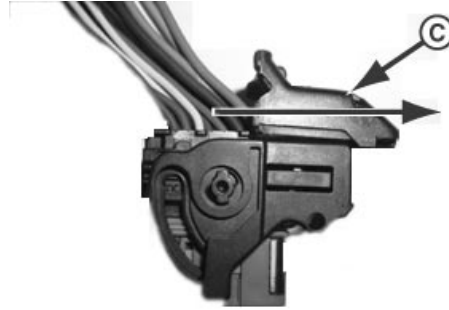
RG14592 -JUN-01DEC05

Rotate lock 90 Degrees

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RG41183,00000E9 -19-06DEC05-4/15

4. From wire side of connector, push on wire guard (C), and remove from connector.

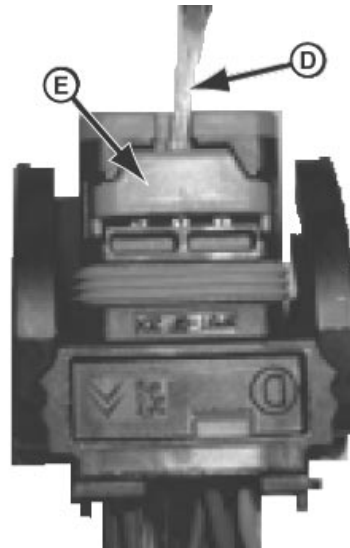


Slide Guard Forward

RG14581 -UN-21NOV05

RG41183.00000E9 -19-06DEC05-5/15

5. Insert thinly bladed tool (D) in the slot at the mating end of the connector and under the green tab (E), as shown.



Insert Thin-Bladed Tool Under Tab

RG14582 -UN-21NOV05

RG41183.00000E9 -19-06DEC05-6/15

6. Gently pry tab out, and pull terminal retainer (F) out, until it can be moved no farther.



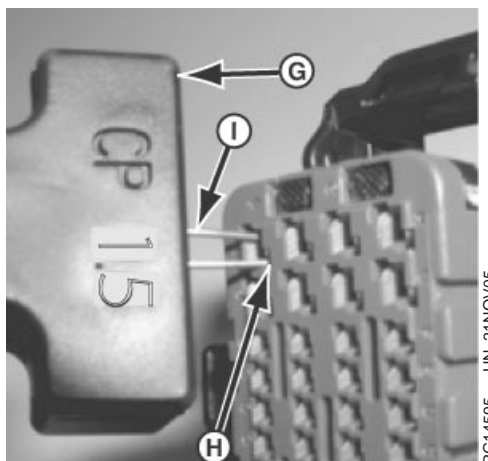
Slide Terminal Retainer Out

RG14583 -UN-01DEC05

Continued on next page

RG41183.00000E9 -19-06DEC05-7/15

7. Insert CINCH Terminal extraction tool (G), as shown, into offset holes (H) on either side of the terminal to be extracted, tool wire sizes 1.5 mm end for larger wire size, and 0.6 mm end for smaller wire size (I). Press in until tool surface meets with connector surface.



Insert Terminal Extraction Tool

RG41183,00000E9 -19-06DEC05-8/15

8. With one hand, grasp connector, and with the other, grasp wire of terminal to be extracted (J), firmly pull on wire, until Terminal has been removed from connector.

9. Remove terminal extraction tool from connector. If wire was pulled out during step 8, or if wire was already broken off, leaving terminal inside the connector, do the following:

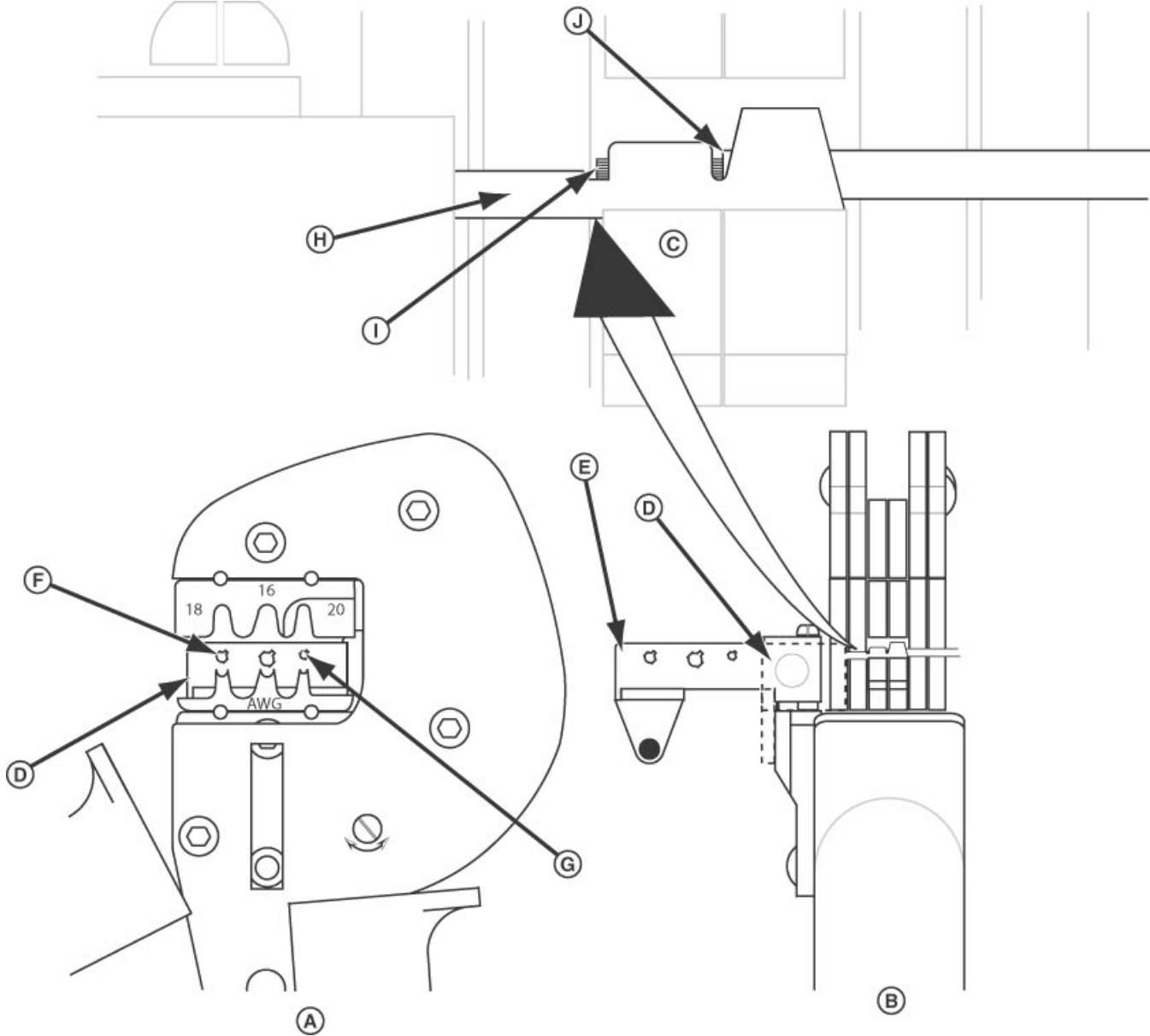


Remove Terminal and Wire

- a. Insert a 0.813-0.643 mm (20-22 AWG) diameter, single-strand piece of stiff wire into mating-side (opposite wire-side) of connector.
 - b. Continue to push on terminal with wire, until terminal is completely ejected from connector, or until terminal is exposed at wire side of connector.
 - c. If terminal is only exposed, use long-nose pliers to pull it from the connector.
10. Cut back on insulated portion of wire, close to terminal-end of wire, but beyond any damage to either wire or insulation.

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RG41183,00000E9 -19-06DEC05-9/15



CINCH Crimper Elements

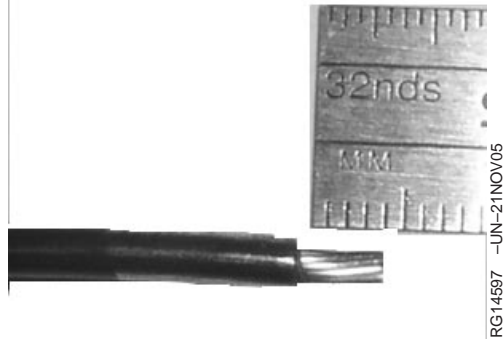
- | | | | |
|---------------------------|--------------------------|-------------------------------------------------|-------------------------------------|
| A—Crimper Side View | E—Terminal Block (Open) | H—Terminal Seated in Block Recess | J—Wire in Terminal (insulation end) |
| B—Crimper Front View | F—1.5 mm Terminal Recess | I—Wire in Terminal (4.0 mm Insulation Stripped) | |
| C—Wire-in-Terminal Blowup | G—0.6 mm Terminal Recess | | |
| D—Terminal Block (Closed) | | | |

NOTE: The above figure is intended to only illustrate crimper and wire-loading elements. Its callouts relate only to its own legend, and not to the callouts in the procedural steps.

11.

RG14613 -UN-01DEC05

Using wire strippers, strip insulation from wire to expose approximately 4.0 mm (0.16 in.) length of wire, as shown.



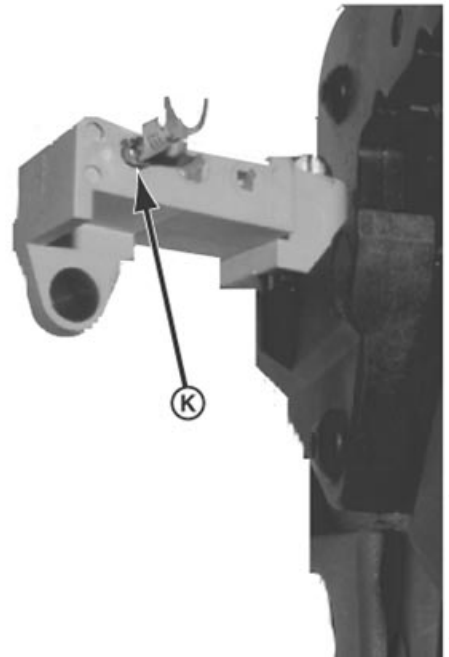
Strip 4.0 mm of Wire Insulation

RG41183,00000E9 -19-06DEC05-11/15



CAUTION: Use only JDG1727 Crimper. Use of another can result in an improper crimp. Attempting to insert an improperly crimped terminal can result in inability to fully seat, and to jam, the terminal inside the connector. This condition requires replacement of the entire connector.

12. Place female terminal in the matching recess (K) in crimper terminal block, as shown.



Terminal in Matching Recess of Crimper Terminal Block

Continued on next page

RG41183,00000E9 -19-06DEC05-12/15

13. Lay stripped end of wire onto end of terminal to be crimped, with insulation overlapping, as shown (L).
14. Squeeze crimper handles, until they automatically unlock. Remove wire and terminal from crimper.

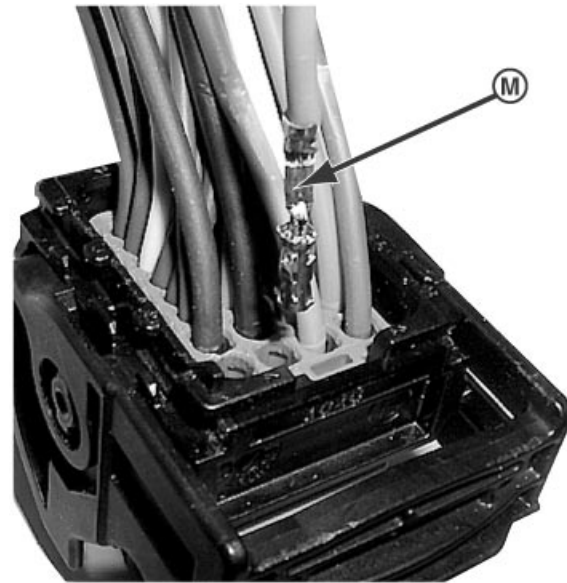


RG14588 -UN-01DEC05

Wire Onto Terminal in Crimping Pliers

RG41183,00000E9 -19-06DEC05-13/15

15. Fully insert terminal into connector (M), with crimped side of terminal facing away from the terminal retainer side of the connector and tabs on terminal aligned with offsets in connector, terminal hole, as shown.



RG14589 -UN-02DEC05

Correct Position For Terminal Insertion

Continued on next page

RG41183,00000E9 -19-06DEC05-14/15

NOTE: If retainer does not slide fully into position, terminal has not been completely seated. Check seating again. Do not force retainer. Retainer slides closed only when all connector terminals are fully seated

16. Close green terminal retainer, until its tab (N) is flush with connector surface.
17. Slide wire guard back onto connector, until it clicks into place.
18. Reconnect CINCH connector to ECU connector.
19. Push on lock toward wire side of connector, and continue rotating it 90 degrees, counter-clockwise, until it clicks into place, behind tab.

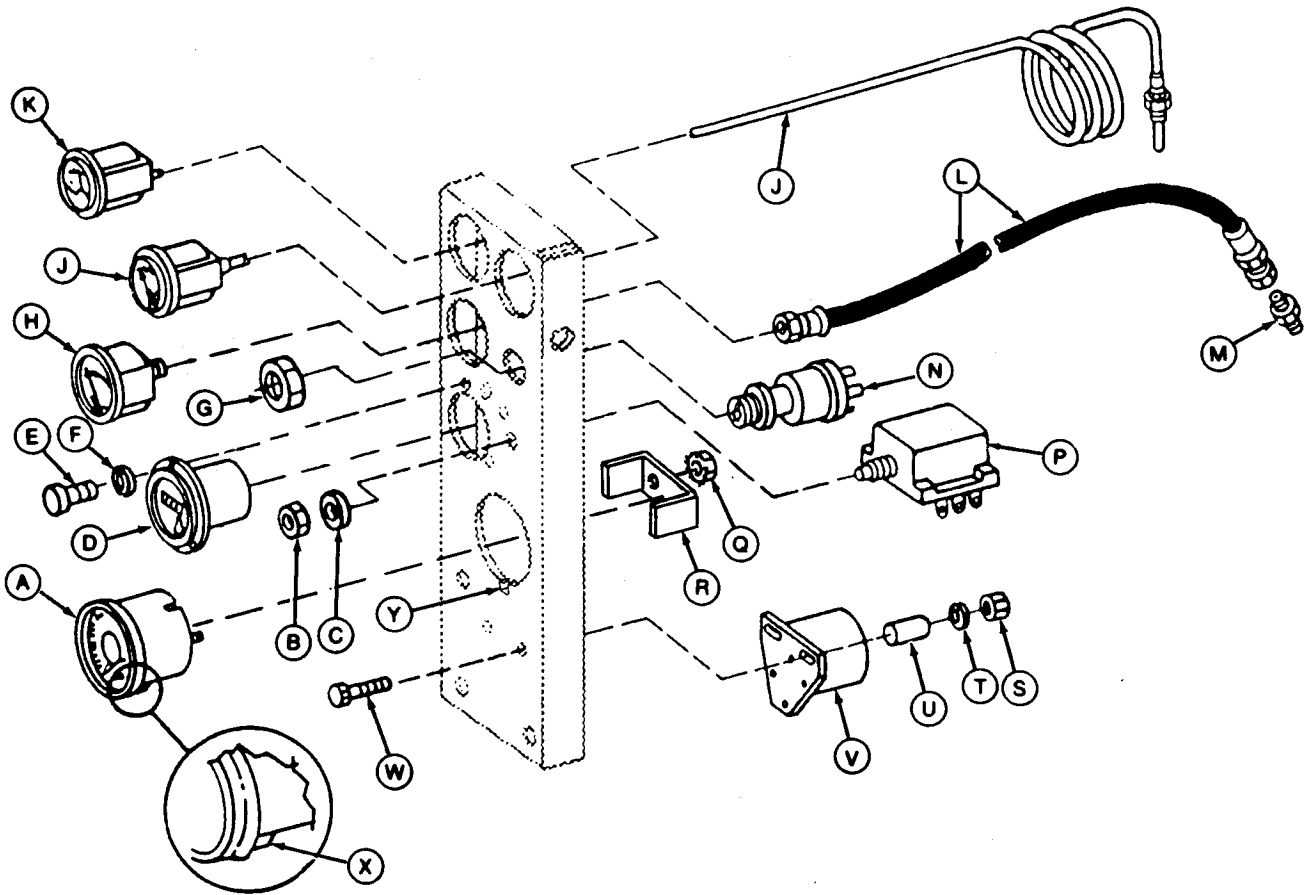


Push Tab Flush With Connector

RG14599 -UN-01DEC05

RG41183,00000E9 -19-06DEC05-15/15

Replace Instrumentation—North American Instrument Panel (Early Model Instrument Panels)



- | | | | |
|---------------------------------|-------------------------------------------------|--------------------------|------------------------|
| A—Tachometer (electronic shown) | G—Nut | M—Fitting | T—Lock Washer (2 used) |
| B—Nut | H—Oil Pressure Gauge | N—Key Switch | U—Bushing (2 used) |
| C—Washer | J—Coolant Temperature Gauge With Capillary Tube | P—Magnetic Safety Switch | V—Starter Relay |
| D—Hourmeter | K—Ammeter | Q—Nut (2 used) | W—Cap Screw (2 used) |
| E—Screw (3 used) | L—Hydraulic Hose | R—Bracket | X—Tab |
| F—Washer (3 used) | | S—Nut (2 used) | Y—Notch |

1. Remove and replace parts (A—W), as necessary.
2. Disconnect battery ground cable before removing key switch (N) or starter relay (V).
3. Make sure tab (X) aligns with slot (Y) when installing tachometer (A).
4. Tag all wires for reassembly.

Continued on next page

DPSG.OUO1004,648 -19-11MAR99-1/2

5. Apply pipe thread sealant with TEFLON® on threads of the capillary tube fitting and threads of fitting (M) before installing.

TEFLON is a registered trademark of Du Pont Co.

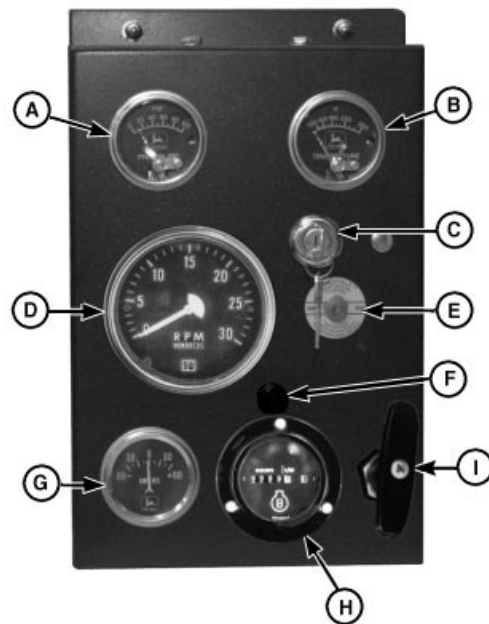
DPSG.OUO1004,648 -19-11MAR99-2/2

Replace Instrumentation—North American Instrument Panel (Late Model Instrument Panels W/O ECU)

NOTE: On some instrument panels, hour meter may be an integral part of the tachometer.

1. Disconnect battery ground cable.
2. Remove and replace parts (A—I), as necessary.
3. Tag all wires for reassembly.
4. Apply pipe thread sealant with TEFLON® on threads of the capillary tube fitting and threads of fitting for coolant temperature sensor before installing.
5. Install bulb of temperature sensor into water jacket until it bottoms. Lift bulb off bottom 1/8 in. to 1/4 in. and tighten fitting.

- A—Oil Pressure Gauge
- B—Coolant Temperature Gauge
- C—Key Switch
- D—Tachometer
- E—Reset Safety Switch
- F—Fuse Holder
- G—Ammeter
- H—Hour Meter
- I—Hand Throttle



RG11627 -UN-01DEC00

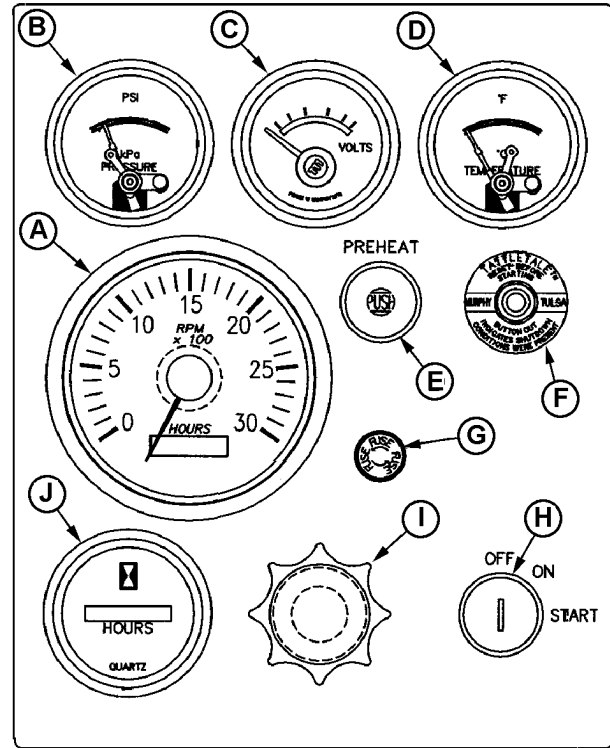
TEFLON is a registered trademark of Du Pont Co.

OURGP12,000016A -19-08SEP05-1/1

Replace Instrumentation—North American Instrument Panel (2.4L, 3.0L, and 4.5L (Later “270”)—W/O ECU)

1. Disconnect battery ground cable.
2. Tag all wires for reassembly.
3. Remove and replace parts (A—J), as necessary.

- A—Tachometer with Hourmeter (Optional)
- B—Oil Pressure Gauge
- C—Voltmeter Gauge
- D—Coolant Temperature Gauge
- E—Preheat Button
- F—Reset (Safety) Button
- G—Fuse Holder
- H—Key Switch
- I—Throttle with Locking Knob (Optional)
- J—Hourmeter (Optional)

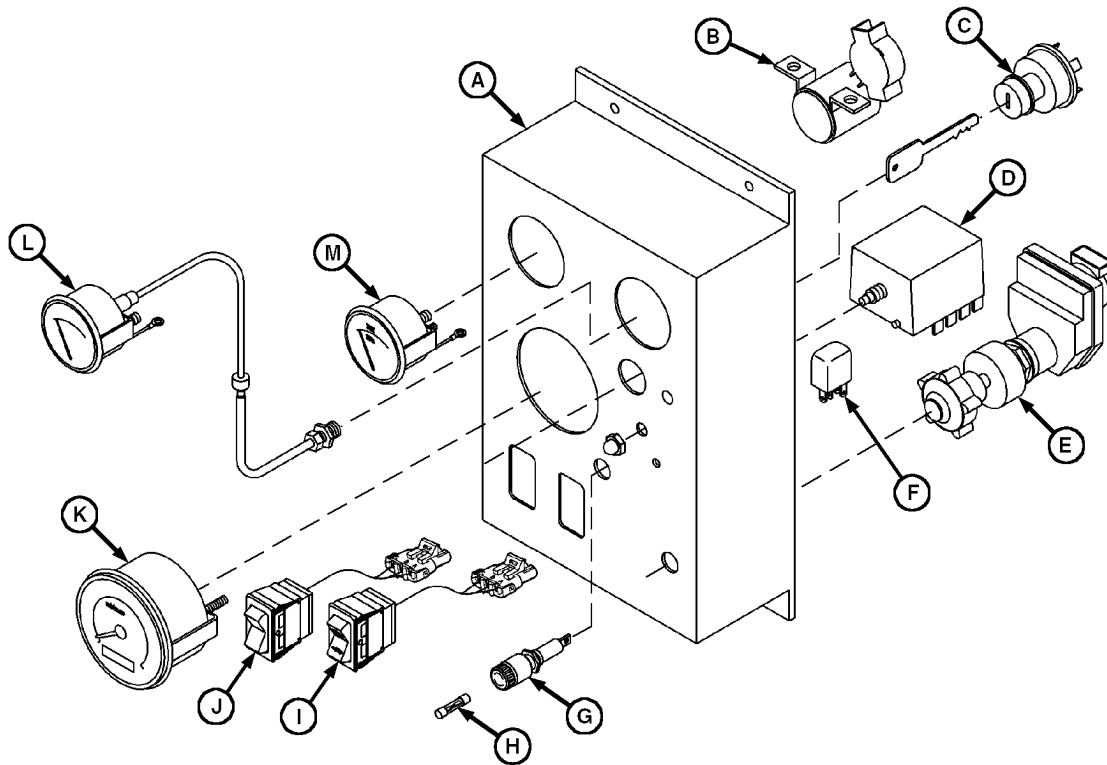


RG13360 -UN-06FEB04

Instrument Panel and Gauges

OURGP12,0000167 -19-02SEP05-1/1

Replace Instrumentation—Instrument Panel with Lucas ECU



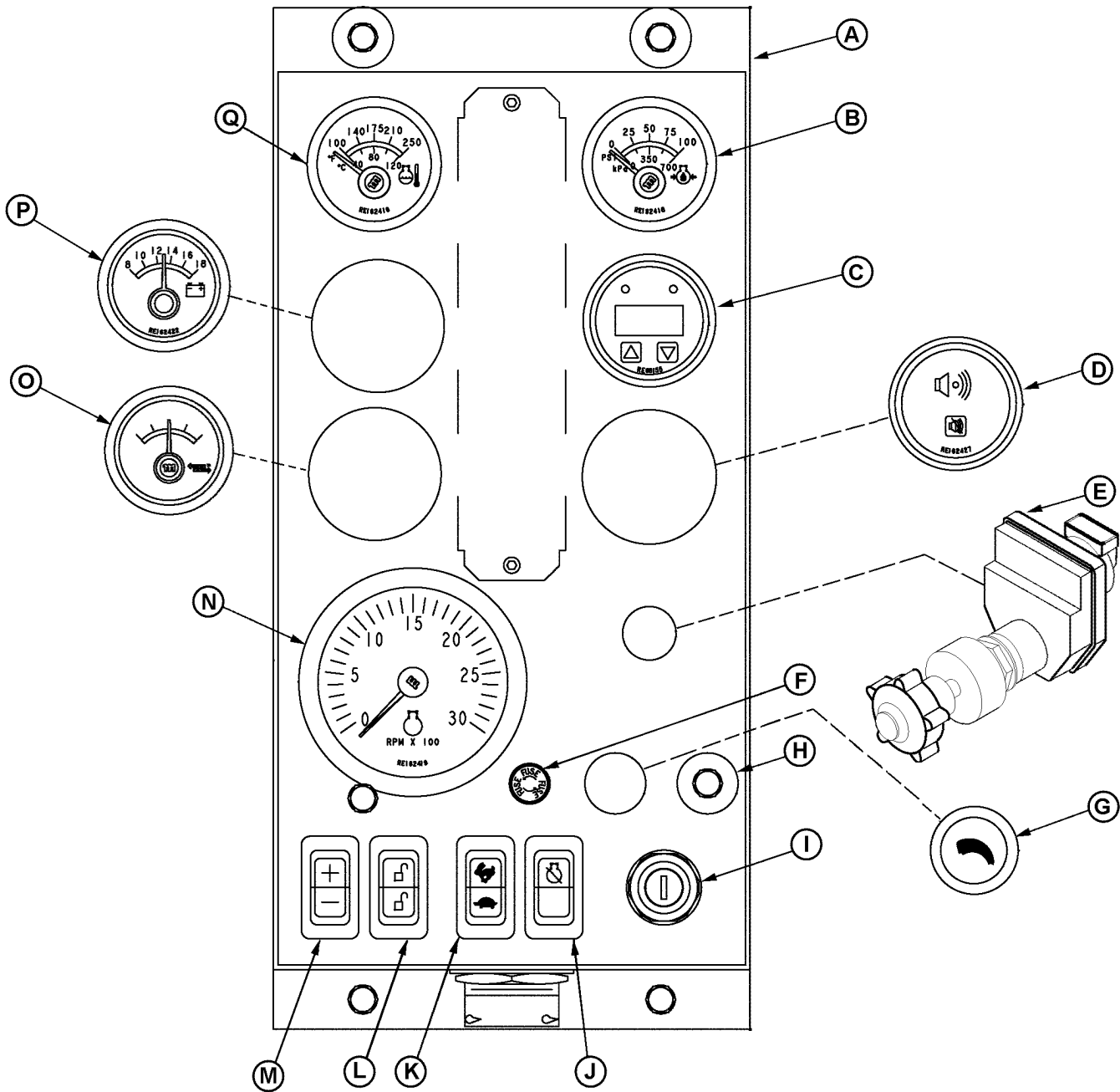
- | | | | |
|------------------|--------------------------|----------------------------|-----------------------------|
| A—Panel | E—Throttle Potentiometer | I—Throttle Switch | L—Coolant Temperature Gauge |
| B—Starter Relay | F—Alternator Field Relay | J—Tachometer Toggle Switch | M—Oil Pressure Gauge |
| C—Key Switch | G—Fuse Holder | K—Tachometer | |
| D—Shutoff Switch | H—Fuse (30 amp) | | |

1. Disconnect battery ground cable.
2. Remove and replace parts (A—M), as necessary.
3. Tag all wires for reassembly.

RG9526 -JUN-24MAR99

OURGP12,000014C -19-26AUG05-1/1

Replace Instrumentation—Earlier Model Instrument Panels with John Deere ECU



- | | | | |
|---------------------------|------------------------------------------|--------------------------------------|--------------------------------|
| A—Panel | G—Dimmer Control | L—Bump Speed Enable
Rocker Switch | O—Power Meter (% Load) |
| B—Oil Pressure Gauge | H—Preheater Indicator | M—Speed Select Rocker
Switch | P—Voltmeter |
| C—Diagnostic Gauge | I—Key Switch | N—Tachometer | Q—Coolant Temperature
Gauge |
| D—Audible Alarm | J—Override Shutdown Rocker
Switch | | |
| E—Analog Throttle Control | K—High-Low Speed Select
Rocker Switch | | |
| F—Fuse Holder/Fuse | | | |

1. Disconnect battery ground cable.

2. Tag all wires for reassembly.

RG14349 -JUN-01SEP05

Continued on next page

OURGP12,000014D -19-26AUG05-1/2

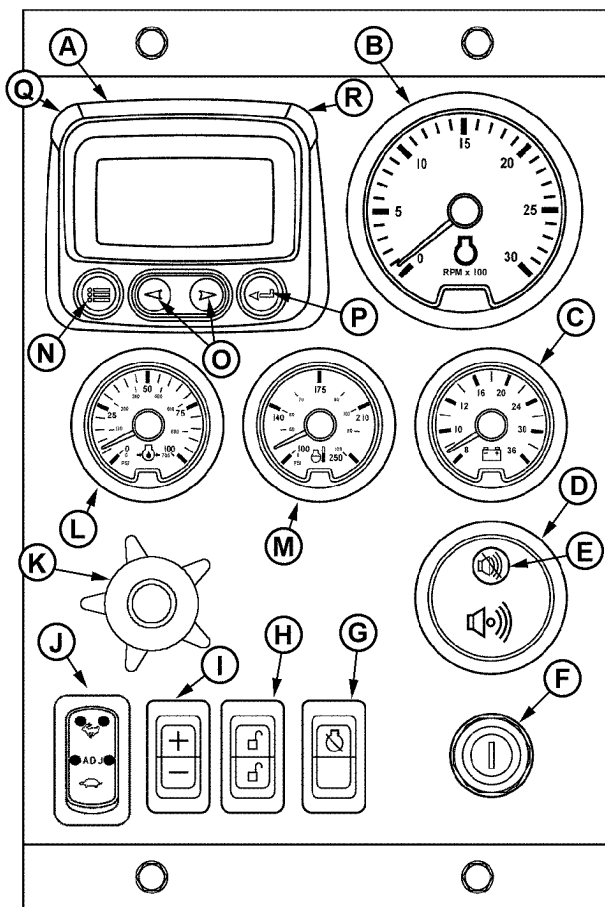
3. Remove and replace parts (A—Q), as necessary.

OURGP12.000014D -19-26AUG05-2/2

Replace Instrumentation—Later Model Instrument Panels with John Deere ECU

1. Disconnect battery ground cable.
2. Tag all wires for reassembly.
3. Remove and replace parts (A—R), as necessary.

- A—Diagnostic Gauge/Hour Meter
- B—Tachometer
- C—Voltmeter (Optional)
- D—Audible Alarm (Optional)
- E—Audible Alarm Override Button
- F—Key Switch
- G—Override Shutdown Rocker Switch
- H—Bump Enable Rocker Switch
- I—Speed Select Rocker Switch
- J—High-Low Speed Select Rocker Switch
- K—Analog Throttle Control (Optional)
- L—Oil Pressure Gauge
- M—Coolant Temperature Gauge
- N—Menu Key
- O—Arrow Keys
- P—Enter Key
- Q—Amber “WARNING” Indicator Light
- R—Red “STOP ENGINE” Indicator Light



Full-Featured Instrument Panel

RG13276 -UN-28OCT03

OURGP12.000014E -19-26AUG05-1/1

Replace Instrumentation—European (Saran) Instrument Panel (Early Model)



- | | | | |
|-----------------------------|--------------------------|--------------------------|----------------------------------|
| A—Instrument Panel | G—Bracket | M—Tachometer W/Hourmeter | S—Nut |
| B—Starter Relay | H—Washer (2 used) | N—Washer | T—Cap Screw (2 used) |
| C—Lock Washer (2 used) | J—Nut (2 used) | P—Nut | U—Washer (2 used) |
| D—Nut (2 used) | K—Nut (2 used) | Q—Washer | V—Warning Lamp Assembly (3 used) |
| E—Automatic Override Module | L—Fuse Assembly (2 used) | R—Screw | |
| F—Key Switch | | | |

NOTE: Instrument panel (A) does not have to be removed to replace warning lamp assembly (V).

1. Disconnect battery ground cable.
2. Remove instrument panel (A) from panel enclosure.
3. Remove and replace parts (B—V), as necessary.
4. Tag all wires for reassembly.
5. Make sure tab on tachometer (M) aligns with slot in the instrument panel when installing tachometer.

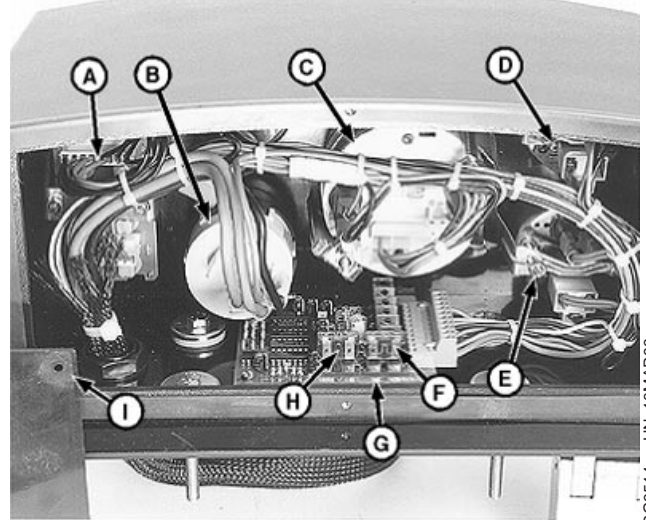
RG6892 -UN-23SEP93

Replace Instrumentation—Saran VDO Instrument Panel

NOTE: On some instrument panels, circuit card (G) may be attached to cover (I).

1. Disconnect battery ground cable.
2. Remove cover (I) from back of instrument panel.
3. Remove and replace parts (A—H), as necessary.
4. Tag all wires for reassembly.

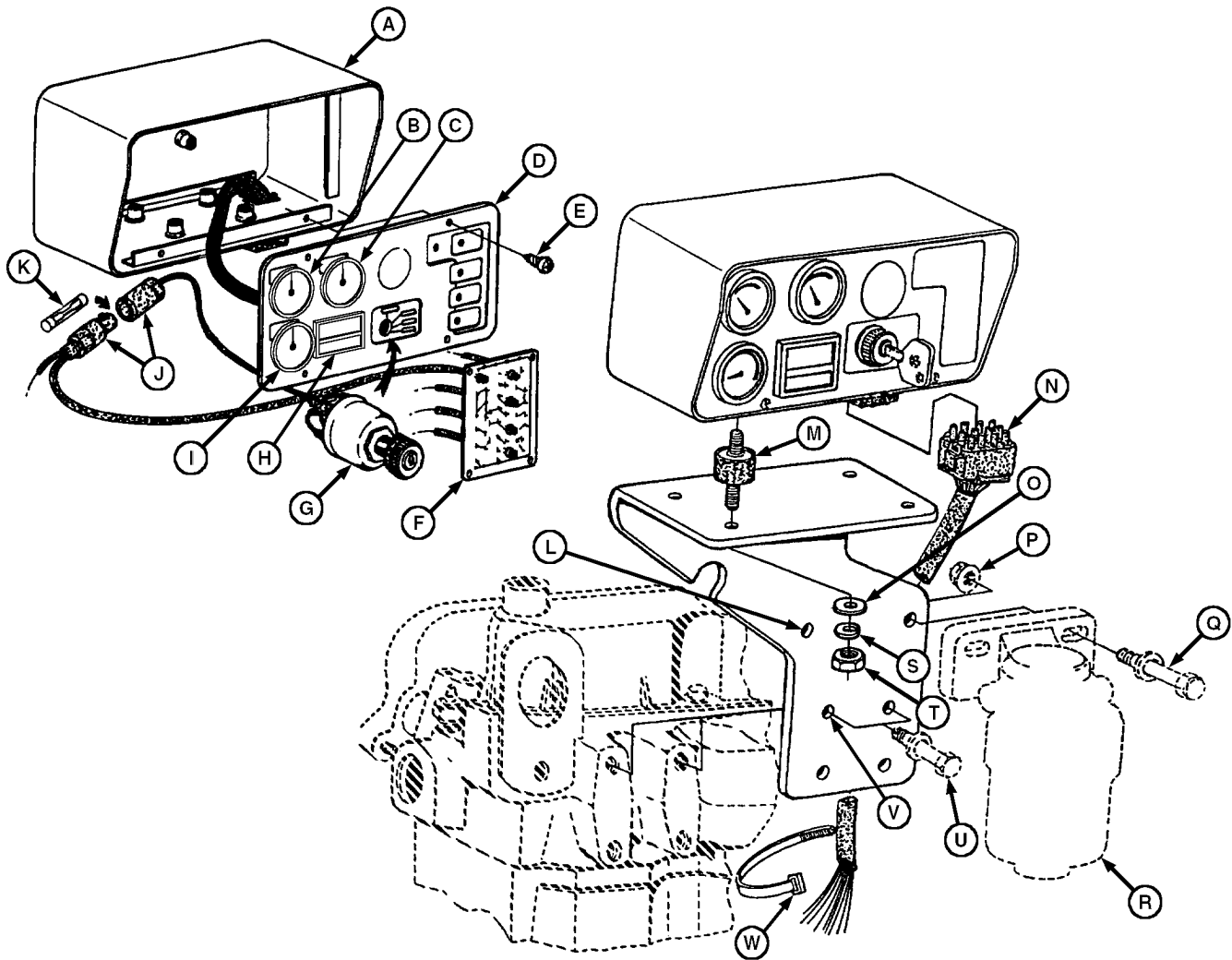
- A—Engine Control Display Unit
- B—Key Switch
- C—Tachometer
- D—Coolant Temperature Gauge
- E—Oil Pressure Gauge
- F—Fuse
- G—Engine Control Circuit Card
- H—Spare Fuse
- I—Cover



RG9514 -UN-18MAR99

DPSG,OUO1004,650 -19-11MAR99-1/1

Replace Instrumentation—Saran AEZ Instrument Panel



A—Control Panel
B—Oil Pressure Gauge
C—Coolant Temperature Gauge
D—Cover
E—Cap Screw (4 used)
F—Indicator Light Panel

G—Key Switch
H—Hourmeter
I—Tachometer
J—Fuse Holder
K—Fuse (16 amp)
L—Fuel Filter (High Mount Position)

M—Rubber Mount (4 used)
N—Wiring Harness
O—Washer (4 used)
P—Nut (2 used)
Q—Cap Screw (2 used)
R—Fuel Filter (if equipped)

S—Lock Washer (4 used)
T—Lock Nut (4 used)
U—Cap Screw (2 used)
V—Fuel Filter (Low Mount Position)
W—Tie Band (as needed)

1. Disconnect battery ground cable.
2. Remove cover (D) from instrument panel.
3. Remove and replace instrumentation as necessary.
4. Tag all wires for reassembly.
5. If instrument panel mounting bracket was removed, install rubber mounts (M) hand tight into instrument panel.
6. Install bracket with fuel filter (if equipped) on engine and tighten cap screws (Q or U) to the following specifications.

RC9540 -JUN-14APR99

Continued on next page

DPSG.OUO1004,780 -19-12APR99-1/2

Specification

Instrument Panel Bracket to
Cylinder Head Mounting Cap
Screws (Saran AEZ Panel)—
Torque..... 50 N•m (37 lb-ft)

Specification

Instrument Panel to Mounting
Bracket Nuts (Saran AEZ
Panel)—Torque..... 40 N•m (30 lb-ft)

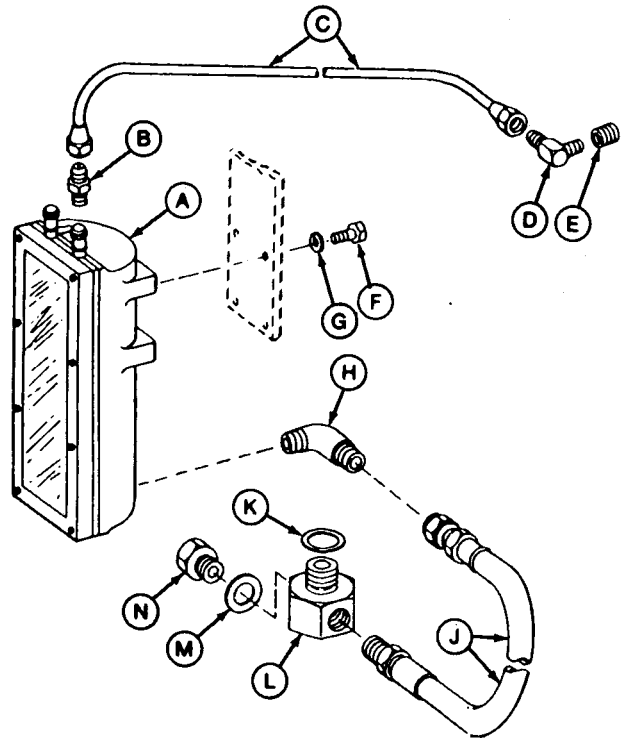
7. Install panel with rubber mounts on bracket and tighten nuts (T) to specifications.

DPSG.OUO1004.780 -19-12APR99-2/2

Remove and Install Crankcase Oil Level Switch/Gauge

1. Drain engine oil.
2. Disconnect wire(s) from the switch terminals.
3. Remove parts (A—N) as necessary:
4. Install parts:
 - Apply pipe thread sealant with TEFLON® to fittings using pipe thread.
 - Adjust the high/low level settings, as necessary.
5. Connect wire(s).
6. Fill crankcase to specifications with recommended engine oil.

- A—Gauge
- B—Fitting
- C—Oil Line
- D—Elbow Fitting
- E—Pipe Bushing
- F—Cap Screw (4 used)
- G—Lock Washer (4 used)
- H—Elbow fitting
- J—Hydraulic Hose
- K—Washer
- L—Fitting
- M—Washer
- N—Plug

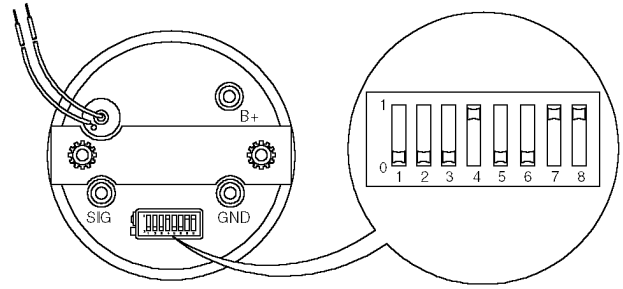


RG6888 -UN-01OCT93

TEFLON is a registered trademark of Du Pont Co.

Calibrate Adjustable Electronic Tachometer

TACHOMETER CALIBRATION CHART		
Number of Teeth	Binary Code	Frequency (HZ) @ 1000 rpm
6	11100000	100
7	11010100	117
8	10100010	133
9	01011010	150
10	11010110	167
11	00011110	183
12	11000001	200
13	10110001	217
14	10101001	233
15	00111001	250
16	11000101	267
17	00010101	283
18	10110101	300
19	10001101	317
20	10101101	333
21	10011101	350
22	11011101	367
23	11111101	383
24	10000011	400
25	11000011	417
26	10100011	433
27	00010011	450
28	01010011	467
29	11010011	483
30	10110011	500



Binary Code 00010011 (27 Teeth) Shown

RG9524 -UN-17MAR99

1. Determine number of gear teeth to be read by tachometer.
2. Locate the gear teeth number in the left column of the calibration chart.

Immediately to the right, in the middle column, is an eight digit, binary code for that particular number of teeth.
3. Remove dip switch cover (not shown) located on backside of tachometer.

4. Enter the binary number selected, by sliding the eight individual switches on dip switch (A) to the appropriate positions:

- To enter a ONE; push switch towards the side labeled "1".
- To enter a ZERO; push switch towards the side labeled "0".

5. Install dip switch cover.

DPSG.OUO1004,651 -19-11MAR99-2/2

22
40
**Adjust Saran VDO Instrument Panel
Tachometer**

1. Press and hold button (A) on back of housing. Then turn on the main switch. The display shows "SELECT", "PULSE" AND "ADJUST", alternating every 2 seconds. A function is selected by releasing the button when its name appears on the display.

Select function "PULSE".

2. When the function "PULSE" is selected, a number (example: "P 14.50" for 14.50 pulses per revolution) appears on the display after 3 seconds and the last digit (right) flashes.

NOTE: If the pulse count is unknown, it can be calculated as follows:

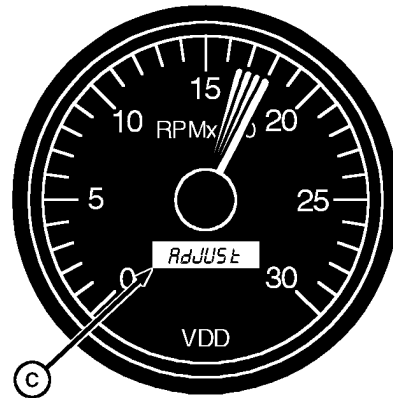
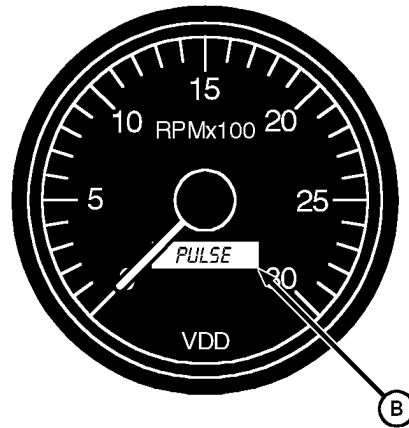
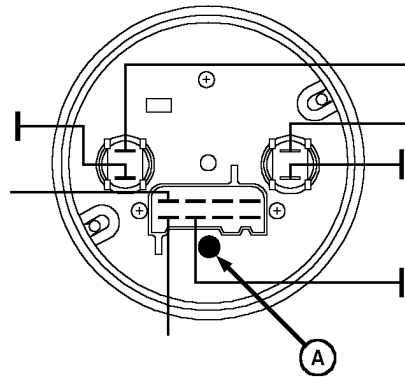
Multiply alternator pole pair number (generally 6) by crankshaft pulley diameter, then divide product by alternator pulley diameter.

Enter the pulse count corresponding to the engine pulse count specification by pressing button (A) until the last number on the display corresponds to engine number. Enter last number of specified engine pulse count. After 3 seconds, without action on the button, the second number will begin flashing, and so on up to the first digit (left).

When pulse count is set, stop operating the button and the display will change over to operating hours. To verify pulse count, select "PULSE" function again.

3. Start the engine then, using a reference rpm indicator (rpm meter or TIME-TRAC), compare specified engine rpm to rpm displayed.

Select "ADJUST" function (C) for fine adjustment. When "ADJUST" is selected, "UP" or "dn" (up or down) is displayed, alternating every 3 seconds. If the button (A) is depressed when "UP" is displayed, the rpm shown will increase. Select "dn" and the rpm decreases. The pointer will move very slowly when initially depressed, then more rapidly as button is held in. When correct rpm is obtained, release button.



A—Button
B—Pulse Function
C—Adjust Function

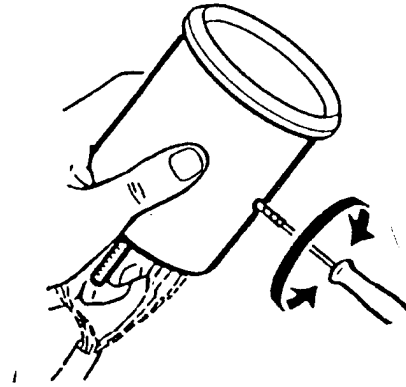
RG9515 —UN—16MAR99

The display will change over to operating hours after adjustment is complete.

DPSG,OUO1004,652 -19-11MAR99-2/2

Adjust Saran AEZ Instrument Panel Tachometer

1. Check engine speed using TIME TRAC® or other appropriate device.
2. Using an insulated screwdriver, rotate screw as shown until proper rpm is obtained.



CD555P8 -UN-20APR99

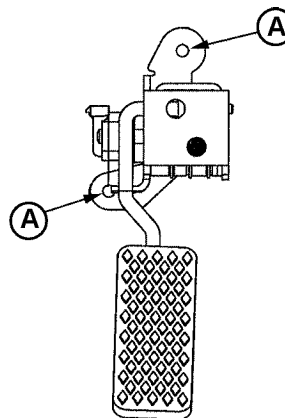
TIME TRAC is a registered trademark of Stanadyne Automotive Corp.

DPSG,OUO1004,782 -19-12APR99-1/1

Replace Electronic Foot Throttle (Later Engines with ECU)

Suspended Throttle

1. Disconnect wiring harness connector for foot throttle.
2. Remove mounting screws (A) and remove foot throttle assembly.
3. Align new foot throttle assembly with mounting holes and install mounting screws.
4. Connect wiring harness connectors.



Suspended Throttle

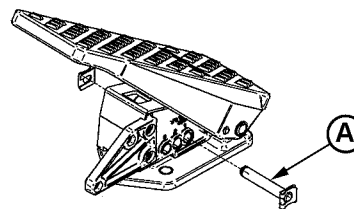
RG14346 -UN-01SEP05

OURGP12,000014B -19-26AUG05-1/3

Floor-Mounted Throttle

1. Disconnect wiring harness connector for foot throttle.
2. Remove clevis pin (A).

A—Clevis Pin



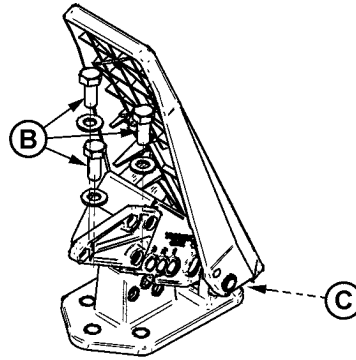
Floor-Mounted Throttle

RG14347 -UN-01SEP05

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OURGP12,000014B -19-26AUG05-2/3

3. Remove three forward M8 mounting bolts (B) and washers.
4. Loosen, but do not remove, rear-most mounting bolt (C).
5. Slide pedal assembly forward to remove.
6. Position rear fixing slot of new pedal assembly under washer of rear-most mounting bolt, and slide assembly fully rearward.
7. Install three forward mounting bolts with washers.
8. Tighten all four mounting bolts.
9. Connect wiring harness connectors.



Floor-Mounted Throttle

B—Three Forward M8 Mounting Bolts
C—Rear-most Mounting Bolt

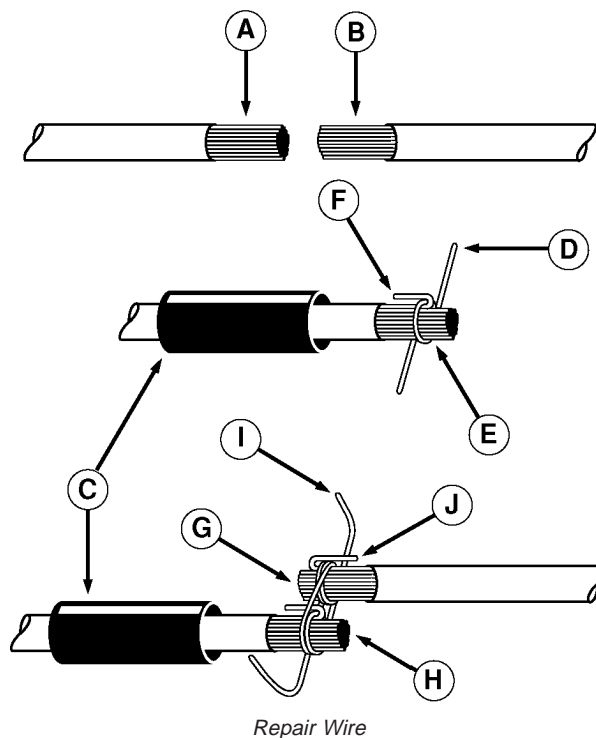
RG14348 -UN-01SEP05

OURGP12,000014B -19-26AUG05-3/3

Harness Repair (Splice Broken or Cut Wire)

NOTE: When the wire length is critical and there is no extra length of wire to twist ends together or a solder type 16-22 gage splice connector is not available, do the following:

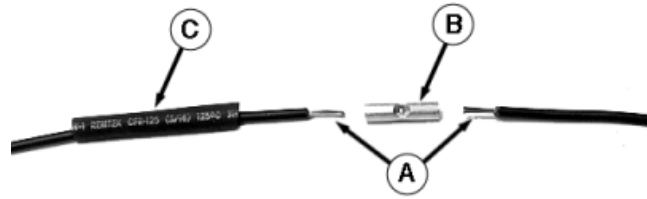
1. Strip 7 mm (3/8 in.) of insulation from both ends of wires to be spliced (A) and (B).
2. Remove a single strand of wire, 101 mm (4 in.) long from a piece of scrap 16 or 18 gauge wire.
3. Wrap the single strand of wire (D) 1-1/2 turns around the middle (E) of one stripped end.
4. Bend one strand (F) of stripped end over the single strand of wire (D) wrapped around the middle of stripped end. This will hold the single strand of wire (D) in place.
5. Place the end (G) to be spliced over the first stripped end (H) and wrap the single strand of wire (I) around the second stripped end two times.
6. Bend one strand (J) of the second stripped end (G) over the single strand of wire (I) wrapped around the stripped ends. This will hold the second stripped end in place.
7. Finish wrapping both ends of the single strand of wire (I) tightly around the splice.
8. Solder the splice.
9. Center the shrink wrap (C) over the splice and use a heat gun or hair dryer to heat the shrink wrap forming a good seal.



DPSG,OUO1004,1133 -19-15NOV99-1/1

Harness Repair (Splice Connector)

1. Strip 7 mm (3/8 in.) of insulation from both ends of wires to be spliced (A).
2. Install connector (B) to both ends of stripped wire (A) and crimp connector.
3. Solder both ends of the connector.
4. Center the shrink wrap (C) over the splice and use a heat gun or hair dryer to heat the shrink wrap forming a good seal.



Splice Connector

A—Wire Ends
B—Connector
C—Shrink Wrap

RW60322 -UN-13AUG96

DPSG,OUO1004,1134 -19-15NOV99-1/1

Other Material

Number	Name	Use
TY15969 (U.S.) TY9479 (Canadian) 680 (LOCTITE®)	Retaining Compound (Maximum Strength)	Apply to heater element and conical adapter of Saran block coolant heater.
TY9375 (U.S.) TY9480 (Canadian) 592 (LOCTITE®)	Pipe Sealant	Apply to air heater threads.

LOCTITE is a registered trademark of Loctite Corp.


DPSG,OUO1004,682 -19-15MAR99-1/1

Cold Weather Starting Aids Specifications

Item	Measurement	Specification
Block Type Coolant Heater Flange Nut (Except 2.4 L, 3.0 L)	Torque	68 N•m (50 lb-ft)
Block Type Coolant Heater Lock Nut (Except 2.4 L, 3.0 L)	Torque	34 N•m (25 lb-ft)
Block Type Coolant Heater to Adapter (2.4 L, 3.0 L)	Torque	60 N•m (44 lb-ft)
Coolant Heater Clamp Cap Screw (2.4 L, 3.0 L)	Torque	16 N•m (12 lb-ft)
Fuel Heater	Torque	9 N•m (7 lb-ft)
Glow Plug (2.4 L, 3.0 L)	Torque	13 N•m (9 lb-ft)
Glow Plug Wire Harness Nut (2.4 L, 3.0 L)	Torque	3.5 N•m (31 lb-in.)
Cylinder Head /Glow Plug Wire Harness Cap Screw (2.4 L, 3.0 L)	Torque	28 N•m (21 lb-ft)
Glow Plug (4.5 L, 6.8 L)	Torque	15 N•m (11 lb-ft)
Heat Shield Cylinder Head Cap Screws (4.5 L, 6.8 L)	Torque	60 N•m (44 lb-ft)
Heat Shield Rocker Arm Carrier Cap Screws (4.5 L, 6.8 L)	Torque	10 N•m (7.4 lb-ft)

OURGP12,0000151 -19-30AUG05-1/1

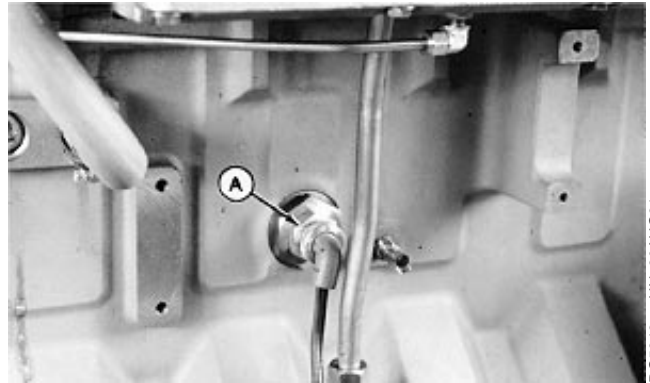
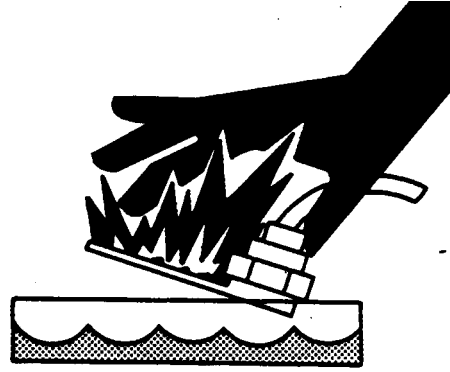
Remove Coolant Heater—Block Type (Except 2.4 L and 3.0 L Engines)

 **CAUTION:** DO NOT plug coolant heater into electrical power unless element is completely immersed in water or coolant. Heater element sheath could burst and result in personal injury.

NOTE: The heater element cannot be repaired. If defective, replace with a new one.

1. Unplug heater (A) from electrical power source.
2. Drain cooling system.
3. Remove electrical cord, loosen nut, and pull heater element out of block.

A—Heater



TSS210 -JUN-23AUG88

RG5948 -JUN-30AUG91

OURGP12,0000156 -19-30AUG05-1/1

Install Coolant Heater—Block Type (Except 2.4 L and 3.0 L Engines)

CAUTION: To prevent electrical shock, always use a three-wire heavy-duty electrical cord equipped with three-wire connectors. If a three prong-to-two prong adapter is used at the wall socket, always connect the adapter's external (green) wire to a good ground.

Make sure electrical connectors are free of dirt and corrosion before plugging heater into electrical power. This will prevent arcing between terminals.

1. Lubricate O-ring (B) with clean engine oil and install onto groove of flange nut (D).
2. Install gasket (C) onto heater element (A) and install element into flange nut.
3. Install nut (E) onto threads of heater element, finger tight only.

IMPORTANT: Heater element must remain in the upright, vertical position, after installation. Heater element may be damaged if it touches internal walls of block.

4. Install assembly into threaded heater hole in block. While holding heater element in the upward, vertical position, tighten flange nut to specifications.

Specification

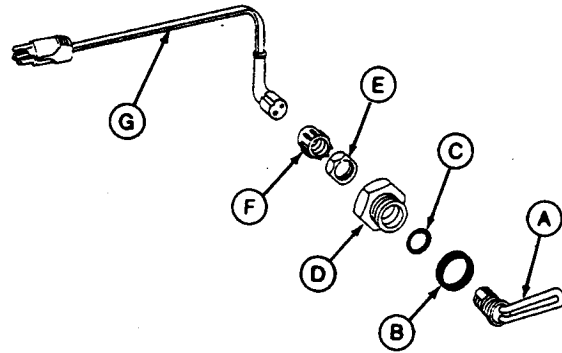
Block Type Coolant Heater
Flange Nut—Torque 68 N•m (50 lb-ft)

Make sure O-ring seals against block.

5. Hold assembly so that flats on threaded end of heater element are vertical. Tighten nut (E) to specifications.

Specification

Block Type Coolant Heater Lock
Nut—Torque 34 N•m (25 lb-ft)



- A—Heating Element
- B—O-Ring
- C—Gasket
- D—Flange Nut Adapter
- E—Lock Nut
- F—Cap
- G—Wiring Lead

TS278 -UN-23AUG88

RG5275 -UN-14DEC88

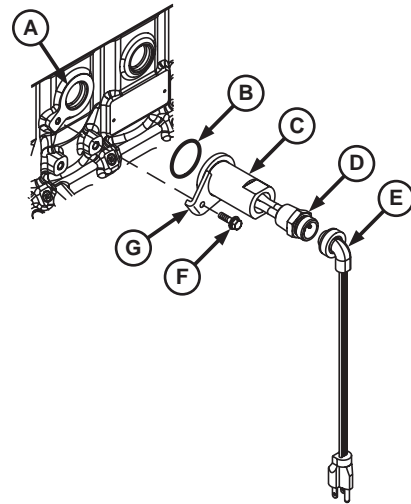
6. Install wiring lead (G). Install dust cap (F) if wiring lead is not being used.
7. Fill cooling system with recommended coolant.

OURGP12,0000157 -19-30AUG05-2/2

Remove Coolant Heater—Block Type (2.4 L and 3.0 L Engines)

1. Unplug heater from electrical power source.
2. Drain cooling system.
3. Disconnect power cord (E) from heater assembly.
4. Remove cap screw (F) and remove clamp (G), adapter (C) and heater (D) from cylinder block mounting surface (A).
5. Remove O-ring (B) from adapter (C).
6. Unscrew heater (D) from adapter (C).

NOTE: The heater element cannot be repaired. Replace if defective.



Coolant Heater

- A—Cylinder Block Mounting Surface
- B—O-Ring
- C—Adapter
- D—Coolant Heater
- E—Cord
- F—Cap Screw
- G—Clamp

RG12428 -UN-26NOV03

OURGP12,000014F -19-30AUG05-1/1

Install Coolant Heater—Block Type (2.4 L and 3.0 L Engines)

1. Apply TY9375 Pipe Sealant below the first two threads of heater (D) and assemble to adapter (C). Tighten to specification.

Specification

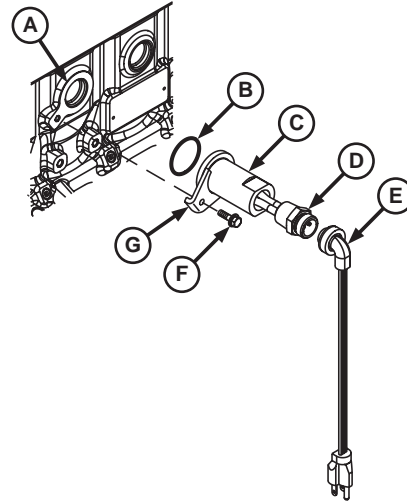
Coolant Heater to Adapter—
Torque 60 N•m (44 lb-ft)

2. Ensure cylinder block mounting surface (A) and surface in mounting hole are clean and free from defects.
3. Install adapter (C) and heater assembly in cylinder block mounting surface (A) using new O-ring (B).
4. Install clamp (G) using cap screw (F). Tighten to specification.

Specification

Coolant Heater Clamp Cap
Screw—Torque..... 16 N•m (12 lb-ft)

5. Install cord.
6. Fill engine with coolant.



Coolant Heater

- A—Cylinder Block Mounting Surface
- B—O-Ring
- C—Adapter
- D—Coolant Heater
- E—Cord
- F—Cap Screw
- G—Clamp

RG-12428 -UN-26NOV/03

OURGP12,0000150 -19-30AUG05-1/1

Remove Coolant Heater—Block Type (Saran Engines)

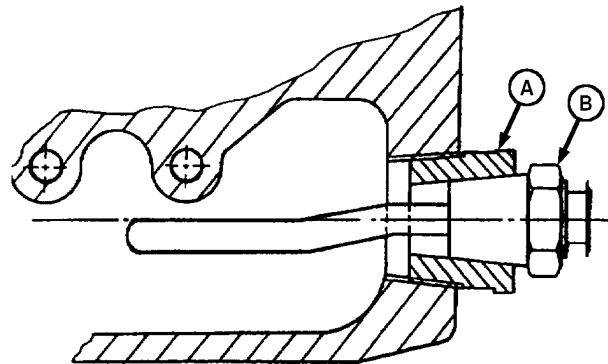
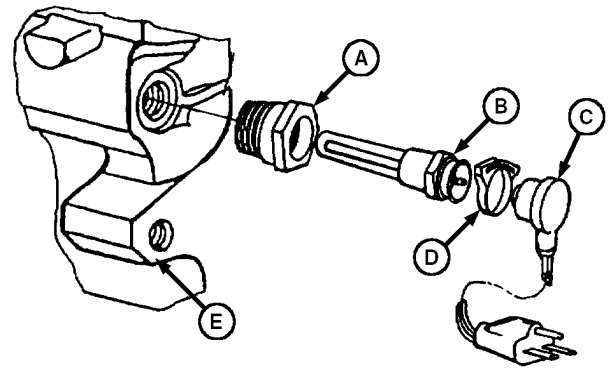
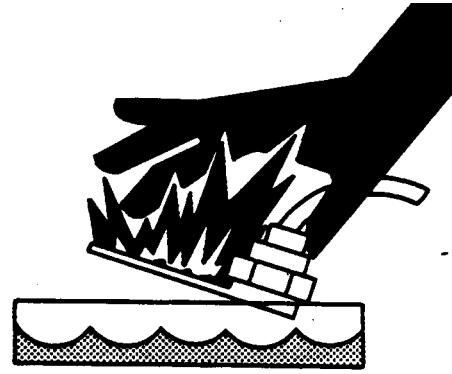
⚠ CAUTION: DO NOT plug coolant heater into electrical power unless element is completely immersed in water or coolant. Heater element sheath could burst and result in personal injury.

NOTE: The heater element cannot be repaired. If defective, replace with a new one.

IMPORTANT: Heater element (B) is bent to avoid interference with cylinder block walls. For removal, DO NOT TURN the heater element or the conical adapter (A) or damage to the heater element will occur.

1. Unplug cord (C) from electrical power source.
2. Drain cooling system.
3. Loosen clamp (D) and remove electrical cord (C).
4. Apply a pulling motion between heater element (B) and conical adapter (A) to remove heater element. Remove adapter from block if required.

A—Conical Adapter
 B—Coolant Heater Element
 C—Electrical Cord
 D—Clamp
 E—Cylinder Block



TSS210 -UN-23AUG88

RG9522 -UN-17MAR99

RG9523 -UN-17MAR99

DPSG,OUO1004,675 -19-15MAR99-1/1

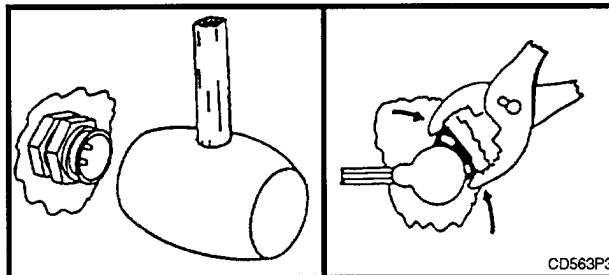
Install Coolant Heater—Block Type (Saran Engines)



CAUTION: To prevent electrical shock, always use a three-wire heavy-duty electrical cord equipped with three-wire connectors. If a three prong-to-two prong adapter is used at the wall socket, always connect the adapter's external (green) wire to a good ground.

Make sure electrical connectors are free of dirt and corrosion before plugging heater into electrical power. This will prevent arcing between terminals.

1. Apply LOCTITE® 609 (TY15969) or equivalent to heater element tapered surface and to threads of conical adapter.
2. Install conical adapter in block.
3. Install heater element into adapter, making sure that element does not touch internal walls of cylinder block.
4. When heater element is properly positioned, tap into place with a rubber mallet as shown.
5. Connect electrical cord and tighten clamp using pliers as shown.



CD563P3 -UN-31OCT96

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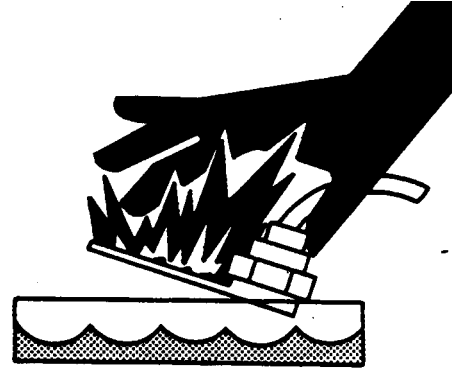
DPSG.OUO1004,677 -19-15MAR99-1/1

Remove Coolant Heater—Tank Type

CAUTION: DO NOT plug coolant heater into electrical power unless element is completely immersed in water or coolant. Heater element sheath could burst and result in personal injury.

NOTE: The heater element cannot be repaired. If defective, replace heater with a new one.

1. Unplug heater from electrical power source.
2. Drain cooling system.
3. Loosen hose clamps and remove coolant heater.



TSS210 -UN-23AUG88

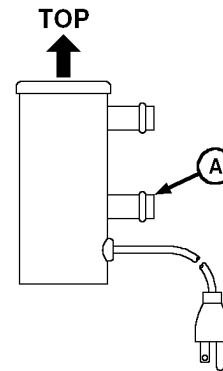
RG,CTM67,G25.3 -19-19NOV93-1/1

Install Coolant Heater—Tank Type

CAUTION: To prevent electrical shock, always use a three-wire heavy-duty electrical cord equipped with three-wire connectors. If a three prong-to-two prong adapter is used at the wall socket, always connect the adapter's external (green) wire to a good ground.

Make sure electrical connectors are free of dirt and corrosion before plugging heater into electrical power. This will prevent arcing between terminals.

1. Install coolant heater in a vertical position with inlet (A) towards bottom, as shown.
2. Install hoses and fill cooling system with recommended coolant.



A—Inlet

RG9513 -UN-18MAR99

RG,CTM67,G25.4 -19-02FEB94-1/1

25
10 **Remove and Install Fuel Heater**

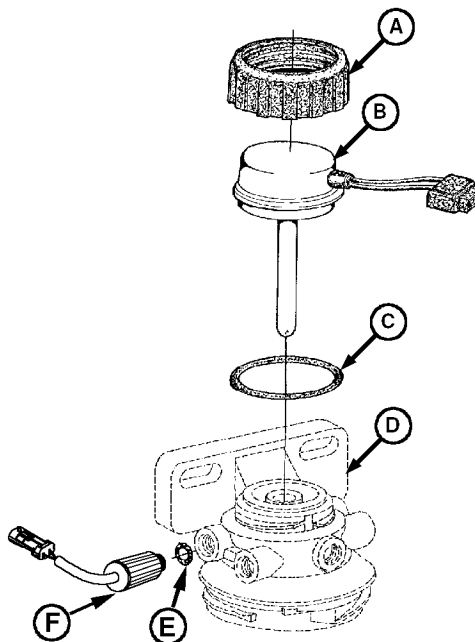
NOTE: Two types of fuel heaters shown.

1. Disconnect electrical connector from heater.
2. Remove fuel heater (B) or (F).
3. Replace parts as required.
4. Install new O-ring (C) or (E).
5. Install fuel heater (B) or (F). Tighten fuel heater (F) to specification.

Specification

Fuel Heater—Torque..... 9 N•m (7 lb-ft)

- A—Retaining Ring
- B—Fuel Heater
- C—O-Ring
- D—Filter Base
- E—O-Ring
- F—Fuel Heater



RG12591 -JUN-04SEP02

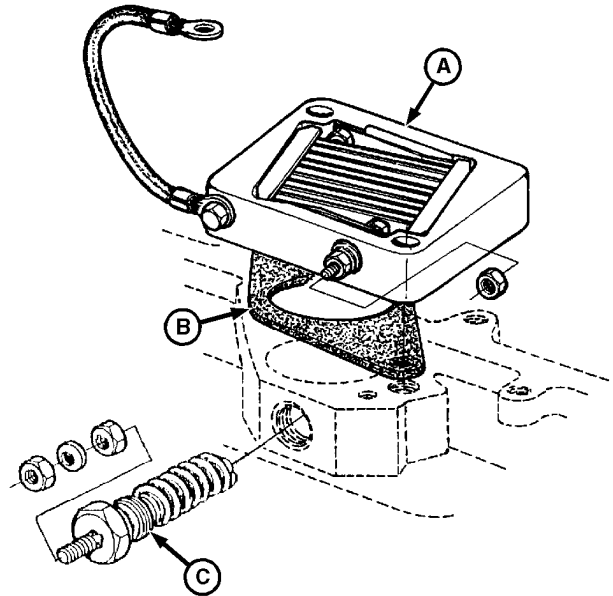
DPSG.OUO1004,678 -19-15MAR99-1/1

Remove and Install Air Heater

NOTE: Two types of air heaters shown.

1. Disconnect wiring.
2. If machine is equipped with air heater (A), remove air intake pipe if required.
3. Remove air heater (A) or (C).
4. Replace parts as required.
5. Install air heater (A) with new gasket (B). Coat threads of air heater (C) with LOCTITE® 592 Thread Sealant With TEFLON® and install.
6. Install air intake pipe if required.

A—Air Heater
B—Gasket
C—Air Heater



RG9081 -UN-16MAR98

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TEFLON is a registered trademark of Du Pont Co.

DPSG.OUO1004.679 -19-15MAR99-1/1

Remove and Install Glow Plugs (2.4 L and 3.0 L Engines)

1. Disconnect connector from glow plug wire harness (A) (shown removed).
2. Disconnect connectors (B) from glow plugs.
3. Remove clamp cap screws (C) and nut (D). Remove wire harness from cylinder head.
4. Inspect the O-ring for cuts and the wire harness for broken or cracked connections. Replace if necessary.
5. Remove glow plugs (E) from cylinder head.
6. Install glow plugs and tighten to specification.

Specification

Glow Plug—Torque 13 N•m (9 lb-ft)

7. Lubricate O-ring with clean engine oil and install wire harness into rear of cylinder head

8. Install nut (D) and tighten to specification.

Specification

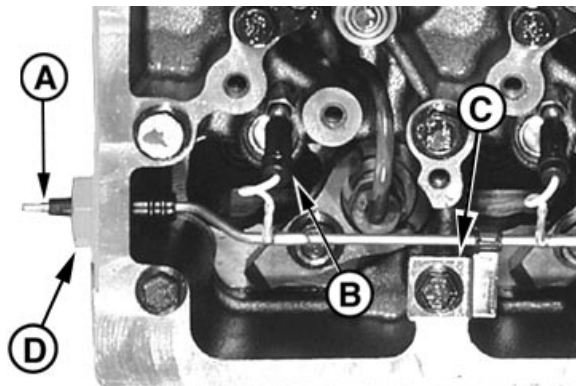
Glow Plug Wire Harness Nut—
Torque 3.5 N•m (31 lb-in.)

9. Dip clamp cap screws (C) in clean engine oil and install into cylinder head to fasten wire harness. Tighten cap screws to specification.

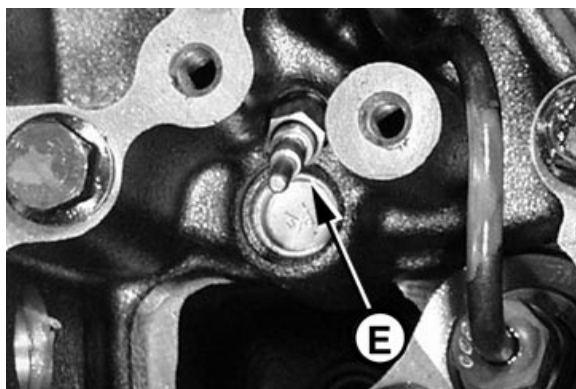
Specification

Cylinder Head /Glow Plug Wire
Harness Cap Screw—Torque 28 N•m (21 lb-ft)

10. Install connectors (B) onto glow plugs.
11. Install connector onto glow plug wire harness (A).



RG12810 -JUN-09FEB03



RG12811 -JUN-09FEB03

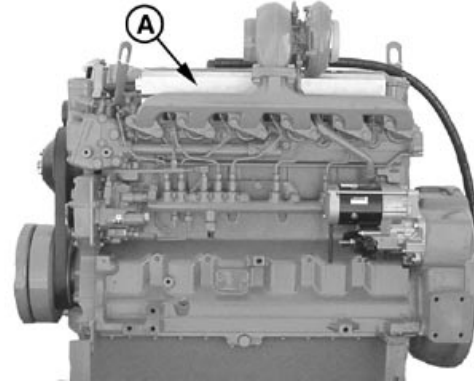
Glow Plugs

- A—Glow Plug Wire Harness
- B—Connectors
- C—Clamp Cap Screws
- D—Nut
- E—Glow Plug

Remove and Install Glow Plugs (4.5L and 6.8L Engines)

Remove Glow Plugs

1. Remove heat shield (A) from rocker arm cover.
2. Disconnect glow plug (C) from glow plug harness rail (B).
3. Remove glow plug.



Heat Shield

RG12471C -UN-14/JUN02

Install Glow Plugs

1. Install glow plug (C). Torque to specification.

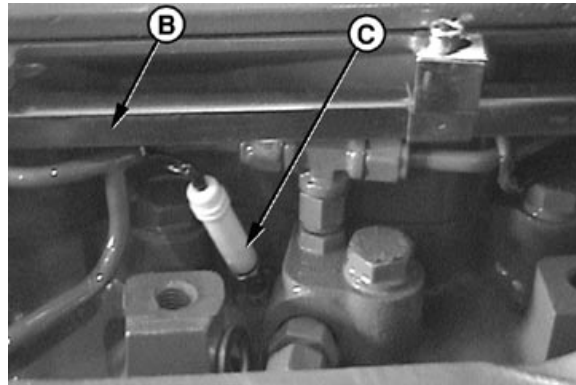
Specification

Glow Plug—Torque 15 N•m (11 lb-ft)

2. Disconnect glow plug harness connector to glow plug.
3. Install heat shield (A). Torque cap screws to specification.

Specification

Heat Shield Cylinder Head Cap
Screws—Torque 60 N•m (44 lb-ft)
Heat Shield Rocker Arm Carrier
Cap Screws—Torque 10 N•m (7.4 lb-ft)



Glow Plug

RG12456B -UN-14/JUN02

- A—Heat Shield
- B—Glow Plug Harness Rail
- C—Glow Plug

OURGP12,000015F -19-31AUG05-1/1

Service Ether Starting Aid

! **CAUTION:** Starting fluid is highly flammable. **DO NOT** use near fire or sparks. Read the cautionary information on the container. Protect container against damage.

DO NOT use starting fluid on engines equipped with glow plugs.

Never use starting fluid with air heaters.



A—Starting Fluid Can

1. Test ether starting aid:

- Operate engine at slow idle.
- Hold start aid switch in for 3—5 seconds.

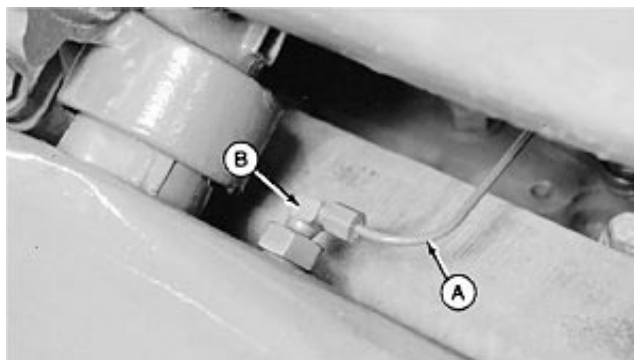
Engine speed should increase slightly, then decrease below original speed while operating on starting fluid.

2. If starting aid does not operate properly, loosen canister to remove starting fluid can (A).

3. Disconnect supply line (A) and remove spray nozzle (B) from manifold.

4. Use compressed air to clear nozzle of any obstructions.

IMPORTANT: Make sure nozzle is tight in adapter when installing nozzle. Serious damage to engine may occur should nozzle come loose. However, care should be taken when tightening nozzle. Too much force will cause nozzle to break off just above threads.



A—Supply Line
B—Spray Nozzle

5. Install spray nozzle and connect supply line.

OURGP12,0000152 -19-30AUG05-1/3

Continued on next page

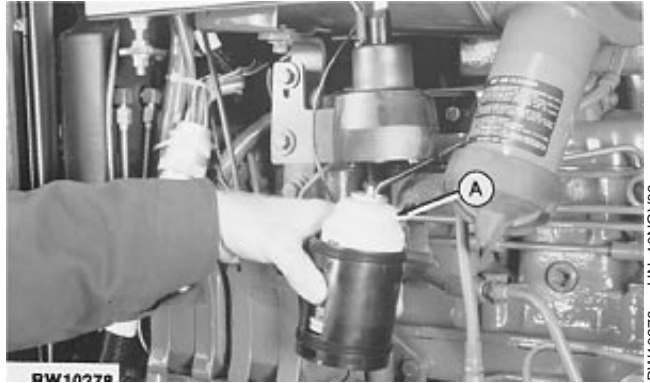
OURGP12,0000152 -19-30AUG05-2/3

IMPORTANT: To avoid drawing dust into engine, always keep a starting fluid can in position, or clean the bottom of canister (B) and install bottom side up, as shown.

NOTE: If installing a new can of starting fluid, remove safety cap and plastic spray nozzle from the new can.

6. Install starting fluid can (A) and tighten canister.

A—Starting Fluid Can
B—Canister



OURGP12,0000152 -19-30AUG05-3/3

Fuel System Accessories Specifications

Item	Measurement	Specification
Injection Pump Solenoid (“D” Engines)	Current Draw	2.5 amps at 12 volts
Rack Puller (RP-20 Stationary Engines)	Current Draw	2.4 amps at 12 volts
Rack Puller (RP-75 Stationary Engines)	Current Draw	0.4 amps at 12 volts
Rack Puller Coil (RP-75 Stationary Engines)	Resistance	30 ohms

DPSG,OUO1004,756 -19-26MAR99-1/1

Check Injection Pump Solenoid—“D” Engines

If a “D” engine will not start and all other systems are operating correctly, check the solenoid on the fuel injection pump.

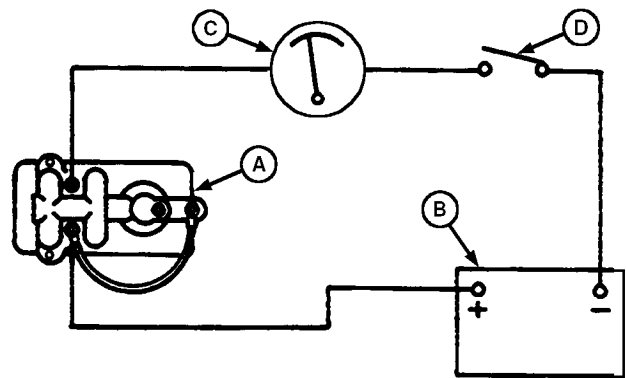
Close switch (D) and observe ammeter. Current draw should be as follows:

Specification

Injection Pump Solenoid (“D” Engines)—Current Draw 2.5 amps at 12 volts

High current draw indicates shorted solenoid windings.

Low or no current draw indicates a high resistance connection, either internal or external or open windings in the solenoid.



- A—Injection Pump Cover
- B—12 Volt Battery
- C—Ammeter
- D—Switch

RG9548 -JUN-06MAY99

DPSG,OUO1004,684 -19-15MAR99-1/1

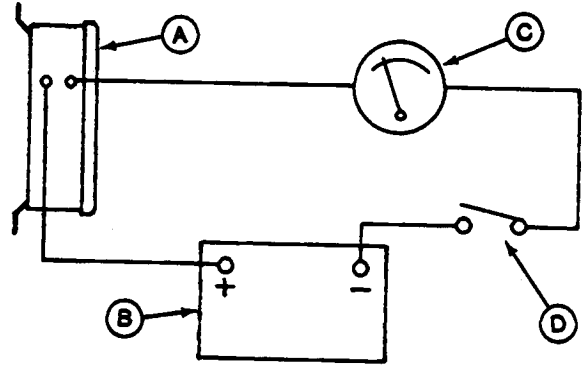
Check Rack Puller—RP-20 (Stationary Engines)

1. If a "T", "A" or "H" engine with an RP-20 Rack Puller will not start, and all other systems are operating properly, check the rack puller.
2. Disconnect wiring at rack puller and make connections shown.
3. Close switch (D) and observe ammeter (C).
4. If rack puller has been reset (handle pulled down to locked position), current draw should be as follows:

Specification

Rack Puller (RP-20 Stationary Engines)—Current Draw 2.4 amps at 12 volts

5. If rack puller has not been reset, there should be no current draw.
6. If rack puller fails either test, either switch or solenoid inside rack puller is defective.



A—Rack Puller Terminals
 B—12 Volt Battery
 C—Ammeter
 D—Switch

RG1319 -UN-20APR89

DPSG.OUO1004.685 -19-15MAR99-1/1

Check RP-75 Rack Puller—Stationary Engines

1. If a "T", "A" or "H" engine with an RP-75 Rack Puller will not start, and all other systems are operating properly, check the rack puller.
2. Disconnect wiring at rack puller and make connections shown.
3. Close switch (D) and observe ammeter (C).
4. Rack puller current draw should be as follows:

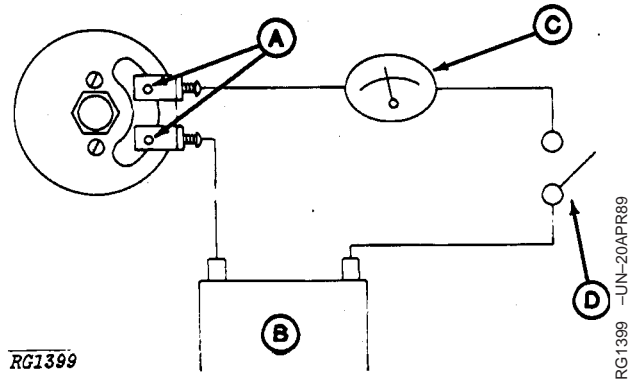
Specification

Rack Puller (RP-75 Stationary Engines)—Current Draw 0.4 amps at 12 volts

As an additional test, check resistance of the solenoid with an ohmmeter. A good coil should have about 30 ohms resistance.

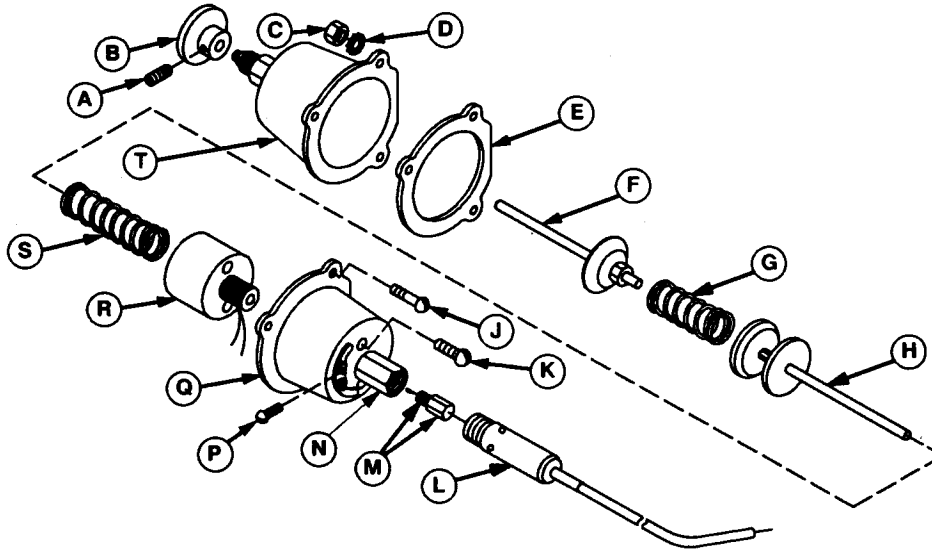
Specification

Rack Puller Coil (RP-75 Stationary Engines)—Resistance 30 ohms



- A—Rack Puller Terminals
- B—12-Volt Battery
- C—Ammeter
- D—Switch

Disassemble and Assemble RP-75 Rack Puller



- | | | | |
|------------------------|------------------|-------------------|-----------|
| A—Knob Set Screw | F—Rod | L—Cable Housing | Q—Housing |
| B—Knob | G—Spring | M—Cable | R—Coil |
| C—Nut (3 used) | H—Shaft | N—Nut (with seal) | S—Spring |
| D—Lock Washer (3 used) | J—Screw (3 used) | P—Screw (2 used) | T—Housing |
| E—Gasket | K—Screw (2 used) | | |

RG,CTM67,G30,2 -19-19NOV93-1/2

RG6937 -UN-01OCT93

IMPORTANT: Remove solder from connections (A) to remove rack puller coil. If this is not done first, damage to coil may occur.

1. Disassemble rack puller.
2. Clean and inspect parts for wear and damage.
3. Assemble rack puller using new gasket and tighten screws and nuts.

A—Connections

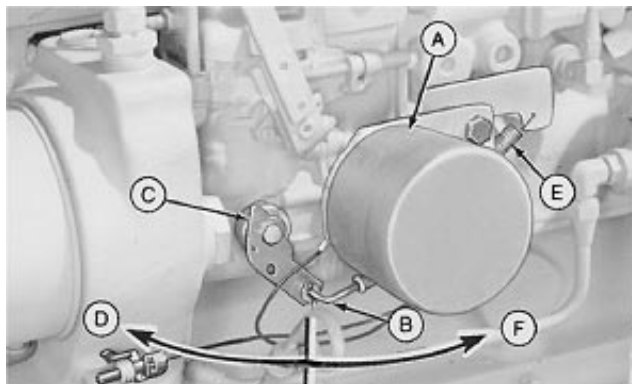


RG6938 -UN-23SEP93

RG,CTM67,G30,2 -19-19NOV93-2/2

Check Rotary Fuel Shut-Off Solenoid

1. Turn key switch to ON position:
 - Solenoid (A) should be energized.
 - Shut-off lever (C) should move to RUN position (D).
2. Turn key switch to OFF position:
 - Solenoid (A) should be de-energized.
 - Return spring (E) moves shut-off lever to STOP position (F).



6466AF Engine Shown

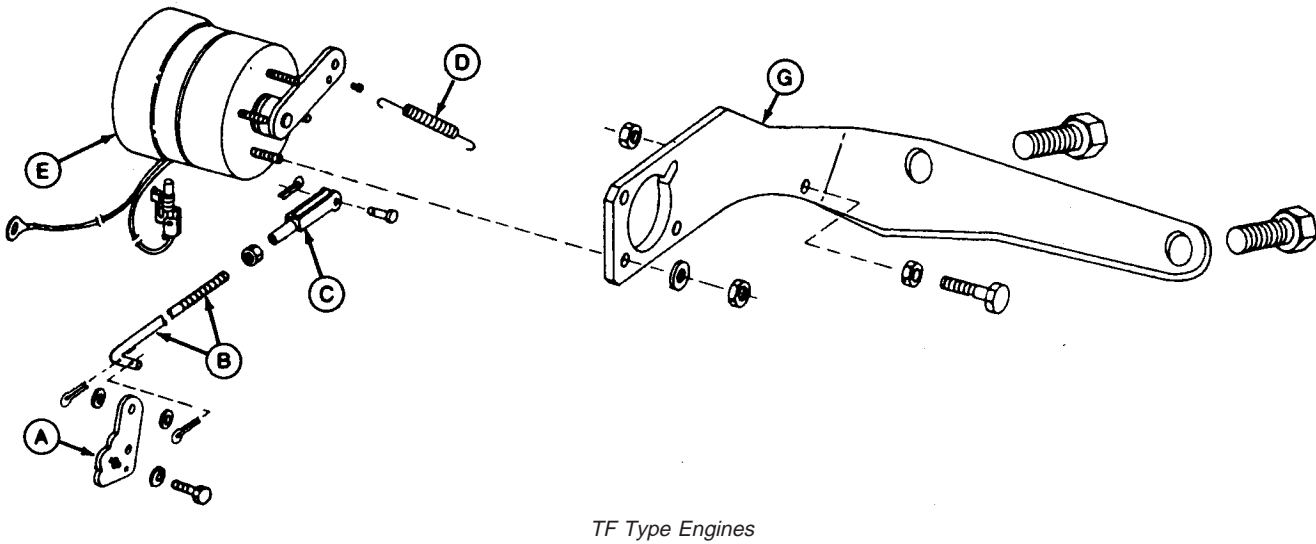
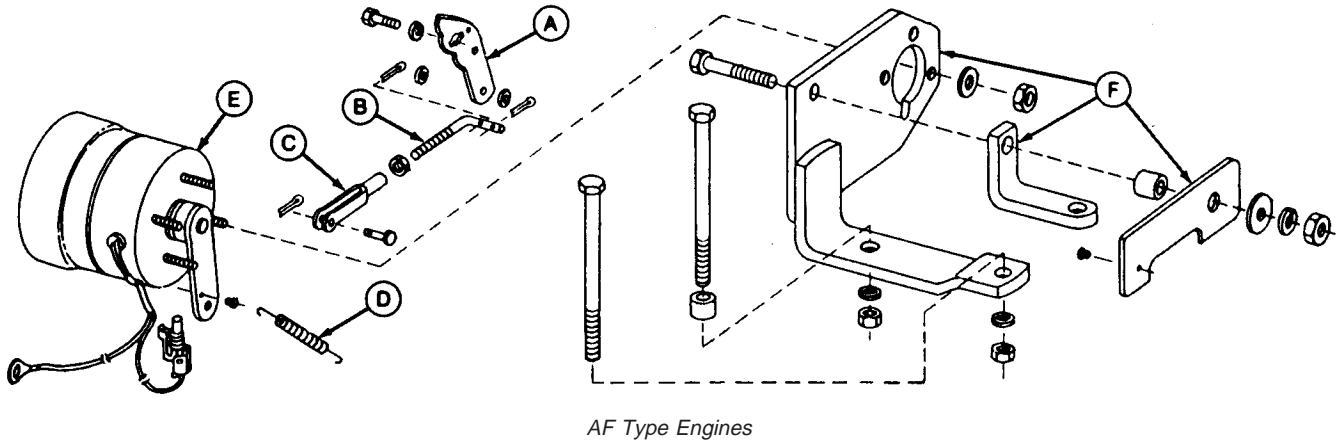
RG-4689 -UN-26JAN90

- A—Solenoid
- B—Control Rod
- C—Lever
- D—“Run” Position
- E—Return Spring
- F—“Stop” Position

RG,CTM67,G30,3 -19-19NOV93-1/1

Remove and Install Rotary Fuel Shut-Off Solenoid

J



- | | | | |
|---------|--------------------|--------------------|-----------|
| A—Lever | C—Yoke | E—Solenoid | G—Bracket |
| B—Rod | D—Extension Spring | F—Bracket Assembly | |

1. Disconnect wire connector.
2. Remove parts (A—E) and (F) or (G), as necessary.
3. Install parts and connect wiring connector.
4. Adjust fuel shut-off control rod. (See Adjust Rotary Fuel Shut-Off Solenoid in this group.)

RG,CTM67,G30,4 -19-19NOV93-1/1

RG6889 -UN-01OCT93

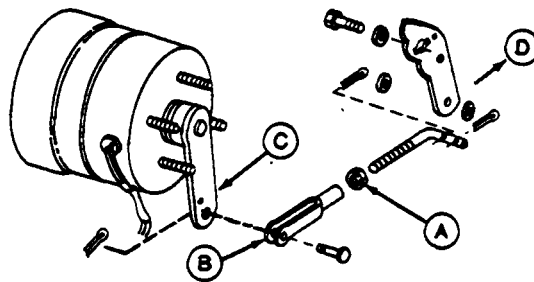
1 RG6890 -UN-01OCT93

Adjust Rotary Fuel Shut-Off Solenoid

IMPORTANT: A misadjusted fuel shut-off control rod may result in engine not stopping when key switch is turned to the OFF position or when the emergency shut-down circuit is activated.

Stop engine before adjusting control rod.

1. Turn key switch to OFF position.
2. Check position of pump shut-off lever. If properly adjusted, the shut-off lever will be in the STOP position (D), contacting or nearly contacting stop on injection pump.
3. If shut-off lever does not contact or nearly contact stop on injection pump, loosen lock nut (A) and disconnect yoke (B) from solenoid arm (C)
4. Lengthen or shorten control rod, as necessary.
5. Connect control rod yoke to solenoid arm. Use new cotter pin.
6. Tighten lock nut against yoke.



A—Lock Nut
B—Yoke
C—Solenoid Arm
D—"Stop" Position

RG4670 -UN-06APR89

RG,CTM67,G30.5 -19-19NOV93-1/1

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

DPSG,OUO1004,699 -19-16MAR99-1/2

Volt-Ohm-Amp Multimeter D27501BM

Used to test speed control unit.

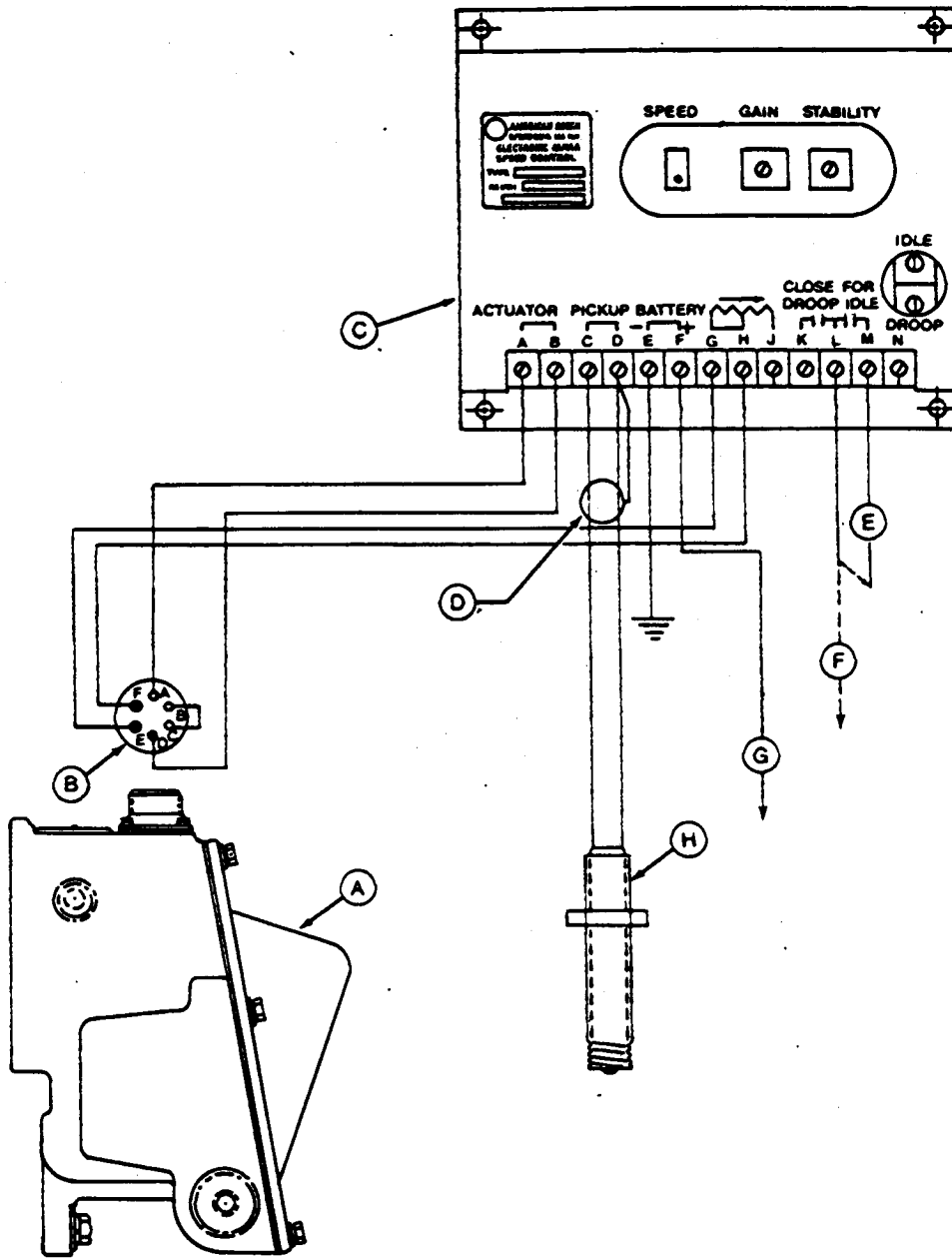
DPSG,OUO1004,699 -19-16MAR99-2/2

Governor Specifications

Item	Measurement	Specification
Magnetic Pickup Signal	Minimum Voltage While Cranking Engine	0.5 Volts A.C.
	Voltage During Normal Operation	5—9 Volts A.C.
	Maximum Voltage	10 Volts A.C.
Engine	Idle Speed	800 rpm
	Rated Speed	1800 rpm
	Fast Idle Speed	1850 rpm
	Rated Speed-Droop Mode	1900 rpm
Generator	Maximum Power	300 kW (402hp)
Crankcase Vent Hose	Minimum O.D.	50.8 mm (2 in.)
Crankcase	Maximum Pressure	5 kPa (0.05 bar) (0.72 psi)
Actuator (Voltage Between Terminals A and B on Control Unit)	Maximum Voltage at Full Load	17 Volts D.C.
Magnetic Pickup Plate-to-Flywheel Housing Cap Screws	Torque	30 N•m (22 lb-ft)
Magnetic Pickup-to-Flywheel Gap	Turns	1-1/4 ± 1/4 turn from ring gear tooth

DPSG,OUO1004,757 -19-26MAR99-1/1

How the System Works



RG4438 -19-05DEC89

Electric (Isochronous) Governor System

- | | | | |
|--------------------------------|-------------------------------------------------|-------------|----------------------|
| A—Electric Actuator (Governor) | C—Speed Control Unit | E—Idle Mode | G—To Ignition Switch |
| B—Wiring Harness Connector | D—Shield Cable (Must be Grounded To Terminal—D) | F—Run Mode | H—Magnetic Pickup |

The engine speed signal is obtained from the magnetic pick-up (H) mounted in close proximity to the ferrous flywheel ring gear teeth. The frequency of the pick-up

signal (AC current) is directly proportional to the engine speed.

Continued on next page

S11,24020,H -19-02FEB94-1/2

The magnetic pick-up is connected to terminals "C and D" of the speed control unit (C). The pick-up signal is amplified and shaped by the circuit to form constant area pulses. These pulses form the speed sensor for the speed control unit (C). The speed control unit has an input impedance of 10 000 ohms between terminals "C and D". Terminal "D" is connected internally to the battery negative.

After the pick-up signal is amplified a pick-up monitor circuit in the speed control unit detects the pulses and compares them with the speed control speed set point. The appropriate current output (DC current) is then sent to the dynamic control section of the electric governor (A) through terminals "A and B" of the speed control unit. The dynamic control sections function is to provide an isochronous and stable engine speed regardless of the engine load rate.

The fuel control rack in the fuel injection pump is then positioned by the proportional amount of governor coil current (from the speed control unit) and is counterbalanced by internal springs. If the pick-up signal pulses disappear for longer than 0.1 seconds, the control unit will turn off the output circuit (current to electric governor) which eliminates fuel to the engine.

NOTE: A mechanical override on the fuel rack is provided. This then can be connected to an external electric, pneumatic solenoid, or manually operated shut down device. These devices would move the fuel rack to a no-fuel position and hence shut down the engine.

S11,24020,H -19-02FEB94-2/2

Diagnosing Electric Governor Malfunctions

Symptom	Problem	Solution
Engine Won't Start: Voltage between terminals "A" and "B" equals 0 volts and voltage between terminals "A" and "E" equals battery voltage.	Incorrect wiring	Check governor system wiring. (See Engine Electrical System Wiring Diagram in Group 20.)
	Defective magnetic pickup	Replace magnetic pickup. (See Service Magnetic Pickup in this group.)
	Magnetic pickup-to-flywheel gap too wide	Adjust gap to specifications. (See Service Magnetic Pickup in this group.)
	Control unit speed setting too low	Adjust speed setting. (See Adjust Engine Speeds in this group.)
	Defective actuator	Replace actuator.
	Defective control unit	Replace control unit. (See Electric Governor Installation Information in this group.)
Engine Won't Start: Voltage between terminals "E" and "F" equals 0 or less than rated battery voltage.	Low or dead battery	Recharge or replace battery.
	Defective wiring to control unit	Repair or replace wiring as necessary.

Continued on next page

RG,CTM67,G31,2 -19-02FEB94-1/4

Symptom	Problem	Solution
Engine Won't Start: Voltage between terminals "A" and "B" near battery voltage while cranking engine.	Shut-off lever stuck in the OFF position	Lubricate or repair shut-off linkage as necessary.
	Injection pump not getting fuel	Check fuel filters, transfer pump, etc.
	Air in fuel system	Bleed fuel system.
	Binding injection pump control rack or actuator	Repair injection pump/actuator assembly.
Engine Operation Unstable: Engine speed fluctuates at one second intervals or faster.	Temperature below 5°C (40°F)	Use starting aids when temperature is below 5°C (40°F).
	Misadjusted gain and stability settings	Adjust gain and stability as necessary. (See Adjust Gain and Stability in this group.)
	Radio interference caused by nearby electrical devices.	Provide necessary shielding. (See Electric Governor Installation Information in this group.)
		<i>NOTE: If problem still exists, remove the jumper wire above the stability potentiometer. Readjust gain and stability. (See Adjust Gain and Stability in this group.)</i>
	Defective control unit	Replace control unit. (See Electric Governor Installation information in this group.)

Continued on next page

RG,CTM67,G31,2 -19-02FEB94-2/4

Symptom	Problem	Solution
Engine Operation Unstable: • Engine speed fluctuates at approximately 10-20 second intervals between rated engine speed and several hundred rpm below rated speed, but does not go over rated speed. • Full voltage between terminals “A” and “B” until engine reaches rated speed, then voltage decreases again. (Full voltage is approximately 2-3 volts less than battery voltage.)	Fuel starvation	Check fuel filters, fuel transfer pump, air in the fuel system, etc.
	Actuator full of oil	Repair injection pump/actuator assembly as necessary.
	Basic engine problem	See CTM-10, 8955 Engines.
Engine Operation Unstable: • Engine speed fluctuates erratically at full load, but always below rated engine speed • Full voltage between terminals “A” and “B”. (Full voltage is approximately 2-3 volts less than battery voltage.)	Restriction in crankcase vent system	Clean vent tube assembly or use larger diameter pipe.
	Fuel limiting screw in actuator set too low	Adjust limiting screw to specifications.
Engine Operation Unstable: Engine speed fluctuates between several hundred rpm above rated engine speed and several hundred rpm below rated speed.	Binding injection pump control rack or actuator	Repair injection pump actuator assembly as necessary.

Continued on next page

RG,CTM67,G31,2 -19-02FEB94-3/4

Symptom	Problem	Solution
Engine Overspeeds: Voltage between terminals "A" and "E" is less than 2.5 volts during engine operation.	Frequency is set too high	Turn Speed Adjust Screw counterclockwise. (See Adjust Engine Speeds in this group.)
	Incorrect or defective wiring to governor	Repair or replace wiring as necessary.
	Defective speed control unit	Replace speed control unit.
Engine Overspeeds: Voltage between terminals "A" and "E" is more than 2.5 volts during engine operation.	Sticking fuel control rack	Repair injection pump as necessary.
	Sticking linkage	Repair linkage as necessary.
Engine Operates at Below Rated Speed: Fuel rack does not move to full fuel position when terminal "A" is grounded	Incorrect or defective wiring to governor	Check governor system wiring. Repair or replace wiring as necessary. (See Engine Electrical System Wiring Diagram in Group 20.)
	Sticking fuel control rack or linkage	Repair injection pump or linkage as necessary.
	Defective actuator	Replace actuator.
Engine Stays on Idle	Sticking fuel control rack or linkage	Repair injection pump or linkage as necessary.
	Incorrect or defective wiring to the governor	Check governor system wiring. Repair or replace wiring as necessary. (See Engine Electrical System Wiring Diagram in Group 20.)
	Defective actuator	Replace actuator.

RG,CTM67,G31,2 -19-02FEB94-4/4

Safety Guidelines when Testing Electronic Governor



CAUTION: When testing electric governor observe the following rules for your safety and prevention of damage to the engine.

Safety

Keep all sparks and flames away from batteries. Gas from battery electrolyte is highly flammable. Also avoid spilling electrolyte on yourself or on anything which could be damaged by the sulfuric acid.

Avoid sparks when connecting booster batteries or battery chargers. When possible, make last connection at a point away from batteries. Battery charger should be turned off before connecting or disconnecting.

When connecting batteries, always connect ground cable last. Disconnect it first.

When possible, disconnect battery ground cable before working on electrical system.

Prevention of Damage

Before connecting battery cables, be sure that battery and alternator connections are correct. Reverse polarity can cause permanent damage.

When connecting a booster battery, connect positive terminal of booster battery to positive terminal of engine battery. Then connect negative terminal of booster battery to negative terminal of engine battery. Reverse polarity can cause permanent damage.

Never run engine with alternator or battery cables disconnected. Doing so might damage alternator or regulator.

S11,24020,I -19-02FEB94-1/1

Electric Governor System Tests

NOTE: *If an electric governor problem can't be identified using the previous diagnostic procedures, perform the following tests.*

If the problem cannot be diagnosed or the defect is not corrected, remove complete electric governor system with governor assembled to injection pump. Return system to a qualified repair station.

For each of the following tests, always connect the black NEG lead from the D27501BM multimeter or equivalent to terminal "E" of the governor control unit and the red POS lead to the corresponding terminal of that given test.

Test No. 1

1. Connect terminals "C" and "E" using the D27501BM Digital Volt-Ohm-Amp Multimeter.
2. Check voltage while cranking engine and during normal operation. Compare readings to following specifications.

Specification

Magnetic Pickup Signal—	
Minimum Voltage While	
Cranking Engine	0.5 Volts A.C.
Voltage During Normal	
Operation	5—9 Volts A.C.
Maximum Voltage	10 Volts A.C.

3. If an abnormal reading occurs check the following probable causes:
 - Defective magnetic pick-up.
 - Gap between magnetic pick-up and flywheel ring gear teeth too large.
 - Defective wiring to the magnetic pick-up.

Test No. 2

1. Connect terminals "B" and "E" using the D27501BM Digital Volt-Ohm-Amp Multimeter.
2. Turn key switch to "ON" and record reading. The normal value should be 24.0 volts D.C. (battery voltage).
3. If an abnormal reading occurs check the following probable causes:
 - D.C. power not connected
 - Low battery voltage
 - Wiring error
 - Defective speed control.

Test No. 3

1. Connect terminals "A" and "E" using the D27501BM Volt-Ohm-Amp Multimeter.
2. Crank the engine and record reading. The normal value should be 2.5 volts D.C. maximum while cranking the engine.
3. If an abnormal reading occurs check the following probable causes:
 - "Speed Adjust" set too low. Turn clockwise.
 - Error or defective wiring to electric governor.
 - Defective speed control.
 - Defective electric governor.

Test Engine Speeds

NOTE: Use either a dynamometer, generator set, or tachometer on instrument panel (if equipped) to check engine speeds. DO NOT use a generator set rated over 300 kW (402 Hp) on 8955AF engines.

Specification

Engine—Idle Speed.....	800 rpm
Rated Speed.....	1800 rpm
Fast Idle Speed.....	1850 rpm
Rated Speed-Droop Mode.....	1900 rpm
Generator—Maximum Power	300 kW (402hp)

1. Jump terminals L and M on the governor control unit for initial starting in the “idle” mode.
2. Disengage clutch and start engine as described in Section 10. Check idle speed should be 800 rpm.
3. Remove jumper wire. Engine should run at 1800 rpm rated speed. If speeds are not within specifications, refer to Adjust Engine Speeds—Electric Governor as described later in this group.

DPSG,OUO1004,692 -19-16MAR99-1/1

Adjust Engine Speeds

1. With the engine stopped, remove the protective rubber window (A) and protective button (B) from governor control unit (C).
2. Set the stability and gain controls (D) at their midpoint (12:00 high or vertical position).

NOTE: The governor control unit adjusting screws are very sensitive, especially the idle adjusting screw.

3. Turn key switch to "ON" position.

IMPORTANT: DO NOT connect governor control unit to a battery charger or alternator. DO NOT leave specified terminals connected for more than a few seconds. Failure to do so may result in damage to control unit.

4. Momentarily contact the specified terminals with a jumper wire. The injection pump fuel control rack should "snap" into the full-fuel position and return when jumper is removed.

Contact Terminals	GCU Serial No.
A and E	(-2L22999)
A and F	(2L23000-)

IMPORTANT: Connecting terminals A and E on newer units will damage governor control unit.

NOTE: Check for wiring defects if "snap" did not occur.

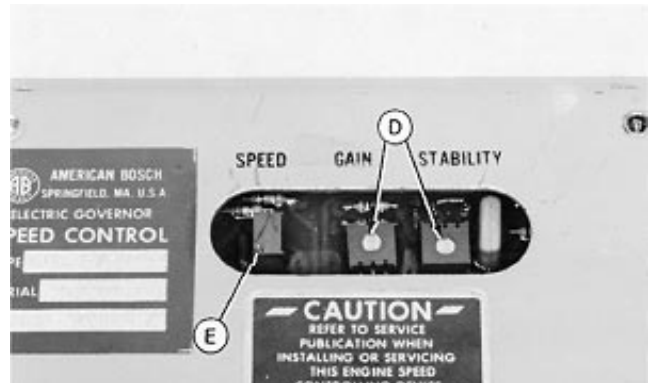
5. Connect terminals L and M with a jumper wire for initial starting in the idle mode.
6. Disengage clutch, start engine, and check idle speed. Idle speed should be 800 rpm.

NOTE: If engine will not start, turn main speed adjusting screw (E) seven turns clockwise while cranking engine until engine starts, then adjust to desired speed. DO NOT turn more than 10 turns.

If engine idle speed is not within specification, correct idle speed by one of the following procedures:



RG-4509 -UN-08NOV89



RG-4511 -UN-08NOV89

- A—Protective Rubber Window
- B—Protective Button
- C—Governor Control Unit
- D—Stability and Gain Controls
- E—Main Speed Adjusting Screw

Idle Speed Between 700—900 rpm

1. Very carefully adjust idle control screw to 800 rpm.
2. Switch to run mode by disconnecting jumper wire between terminals L and M on governor control unit. Engine should now run at 1800 rpm, rated speed. If required, reset rated speed to 1800 rpm with main speed adjustment screw.
3. Adjust gain and stability if engine speed is unstable. (See Adjust Gain and Stability in this group.)
4. Reconnect jumper wire between terminals L and M to return to idle mode. Reset idle speed (if needed) to 800 rpm with idle adjustment screw.

Idle Speed Below 700 rpm or Above 900 rpm

1. Turn idle control screw full clockwise, then set idle speed between 1000—1100 rpm with main speed adjustment screw (turn clockwise).
2. Switch to run mode by disconnecting jumper wire between terminals L and M on governor control unit. Engine should now run at approximately 1700 rpm. Set to 1800 rpm rated speed with main speed adjustment screw.
3. Adjust gain and stability if engine speed is unstable. (See Adjust Gain and Stability in this group.)
4. Reconnect jumper wire between terminals L and M on governor control unit to return to idle mode. Reset idle speed (if needed) to 800 rpm with idle adjustment screw.
5. Return to run mode, speed should still be 1800 rpm. Reset main adjustment screw as required.

S11,24020,T -19-02FEB94-2/2

Adjust Gain and Stability

NOTE: Once the engine is at the correct governed speed, adjust gain and stability as follows.

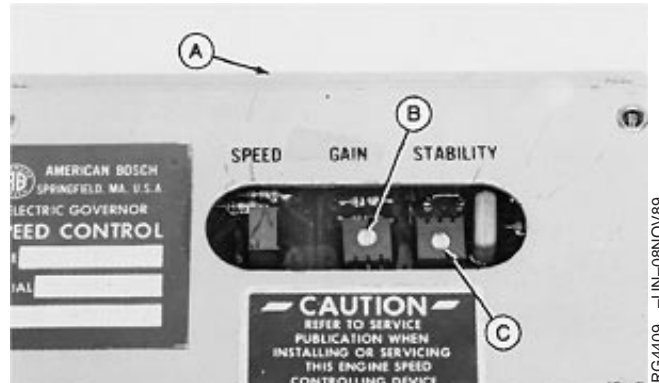
1. Remove rubber cover on speed control unit (A).
2. With engine at normal operating temperature and no load, but with clutch engaged, turn the gain adjustment control (B) clockwise until the system becomes unstable.
3. Back off slightly (approximately 30°) beyond the point where stability returns.

NOTE: Backing off slightly from the normal first setting will allow for changing conditions that may affect the dynamic response of the engine. If a load bank and recorder are available, use them to verify performance.

4. Turn the stability adjustment control (C) clockwise until instability results.
5. Back off slightly (approximately 30°) beyond the point where stability returns.
6. Load may now be applied. If necessary repeat gain and stability adjustments until optimum performance is obtained.

NOTE: Normally the critical condition for gain and stability adjustment is at no load.

7. Reinstall protective rubber window and bottom on governor control unit when adjustments are completed.



A—Speed Control Unit
B—Gain Adjustment Control
C—Stability Adjustment Control

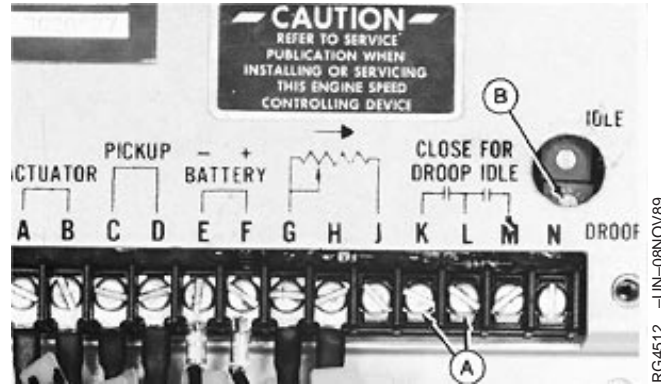
Engine Operation in Droop Mode

If droop (some change in speed with a change in load) rather than isochronous (same speed at all loads) governing is desired, complete the following steps:

1. Connect terminals K and L (A) on the control unit with a separate switch.

NOTE: Rated speed is still controlled by the main speed control adjustment screw while governor regulation is controlled by the droop adjustment screw (B).

2. Since the speed control and droop adjustments affect each other, make adjustments in the following order:
 - a. Set desired rated speed, under full load, with the main speed control adjustment screw.
 - b. Set desired high idle speed, at no load, with the droop adjustment screw. To increase turn clockwise. To decrease turn counterclockwise.
3. When the desired droop is achieved, reinstall protective window and button on control unit.



A—Terminals K and L
B—Droop Adjustment Screw

Electric Governor Installation Instruction

IMPORTANT: DO NOT remove the RG14980 Tag attached to the engine. This tag states the power limitations for that engine.

The tag states:

“The fuel injection pump on this engine is equipped with an electric governor. It is intended for generator set usage only. It does not have a maximum fuel flow stop or maximum power stop. Therefore, to avoid damaging the engine, connected generator size is limited to 300 kW.”

DO NOT wire governor control unit directly to alternator. A load dump may occur which can damage the engine. Use only the John Deere alternator that is designed for that engine.

NOTE: When installing an electric governor, always follow the installation guidelines given here.

Mount the governor control unit in an environmentally protected enclosure. The ambient temperature range for the control unit is —22 to 85°C (—30 to 185°F).

Use proper shielding in applications where excessive radio frequency interference (RFI) is encountered and electromagnetic emissions are critical:

Mount the governor control unit on a grounded steel plate.

Shield the actuator harness with the shield cable grounded at terminal “E” on the governor control unit.

Position a metal shield around the source of the RFI emission.

NOTE: If an idle mode is desired, connect a switch between terminals “L” and “M” on the control

unit. When disconnected, engine will be in run mode.

To supply voltage to the system, connect a wire between the key switch (IGN terminal) and the governor control unit (“F” terminal). To prevent damage and provide safety, install an external fuse or circuit breaker in series with this wire. Also, the fuel transfer pump or any safety or overspeed shut-down equipment used should be connected to this circuit to provide positive engine shut down.

NOTE: Crankcase vent system back pressure works against the actuator and can cause loss of engine speed at full load.

Make sure crankcase vent hose is installed from the engine to outside of the building and that the O.D. of hose is as follows:

Specification

Crankcase Vent Hose—
Minimum O.D. 50.8 mm (2 in.)

Maximum crankcase pressure at full load is as follows:

Specification

Crankcase—Maximum
Pressure..... 5 kPa (0.05 bar) (0.72 psi)

Crankcase vent system back pressure should be limited so that maximum actuator voltage at full load is as follows:

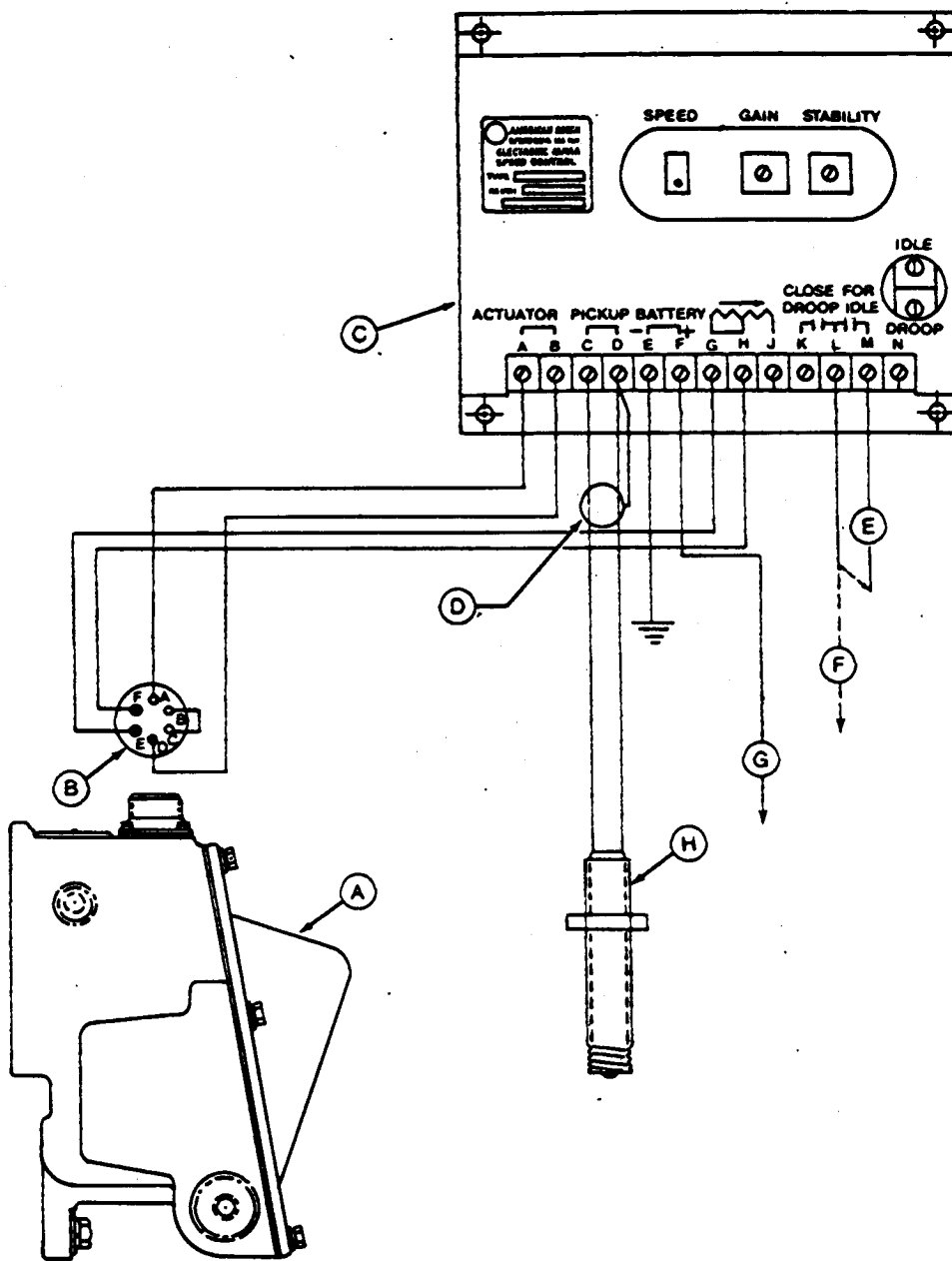
Specification

Actuator (Voltage Between
Terminals A and B on Control
Unit)—Maximum Voltage at Full
Load..... 17 Volts D.C.

Actuator voltage is measured between terminals “A” and “B” on the control unit.

Provide a proper outlet for exhaust ventilation for engines operated inside a confined building or basement.

Connect Electric Governor Wiring Harness



Electric Governor Wiring Harness

- A—Electric Actuator
- B—Wiring Harness Connector
- C—Speed Control Unit
- D—Shield Cable (must be grounded to terminal D)
- E—Idle Mode
- F—Run Mode
- G—To Ignition Switch
- H—Magnetic Pickup

IMPORTANT: Safety shutdown equipment should be installed in the power line to the control unit.

Connect wiring harness as shown. Connections shown are for 24-volt operation.

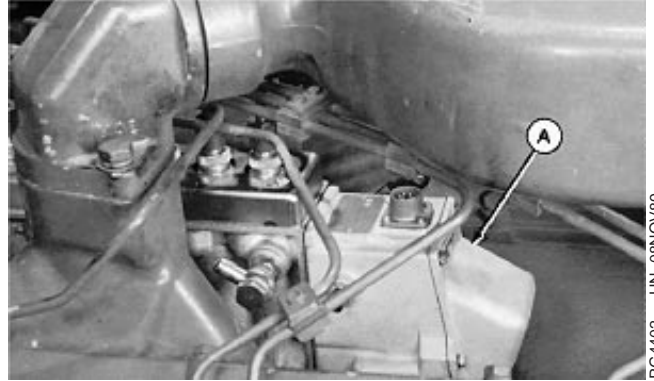
RG4438 -19-05DEC89

Remove Electric Governor

IMPORTANT: DO NOT service electric governor or control unit separately. DO NOT remove electric governor from injection pump. If repairs are to be made, the assembled components must be sent to a qualified repair station.

NOTE: To diagnose and test the electric governor system, refer to procedures in this group.

To remove electric governor (A) from engine, the injection pump and governor must be removed as an assembly. (See CTM-10, 8955 Engines, Group 35, Fuel System.)



A—Electric Governor

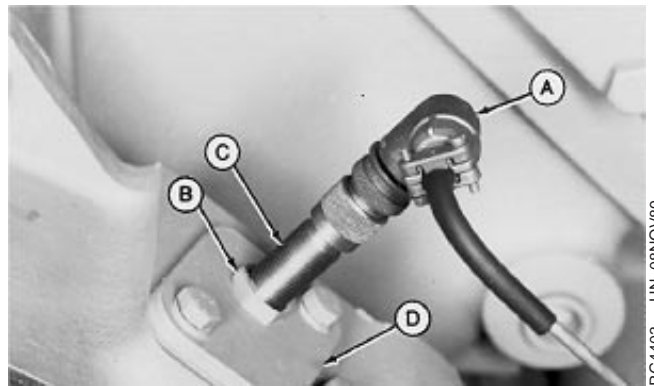
RG4402 -UN-08NOV89

DPSG,OUO1004,696 -19-16MAR99-1/1

Service Magnetic Pickup

1. Remove wiring harness (A).
2. Loosen lock nut (B) and remove magnetic pickup (C).
3. If necessary, remove magnetic pickup plate (D) and gasket from flywheel housing. Discard gasket.

A—Wiring Harness
B—Lock Nut
C—Magnetic Pickup
D—Magnetic Pickup Plate



RG4403 -UN-08NOV89

DPSG,OUO1004,697 -19-16MAR99-1/4

4. Inspect magnetic pickup tip (A) for severe scratches, scoring, or damage. Replace as necessary.

A—Magnetic Pickup Tip



RG4404 -UN-08NOV89

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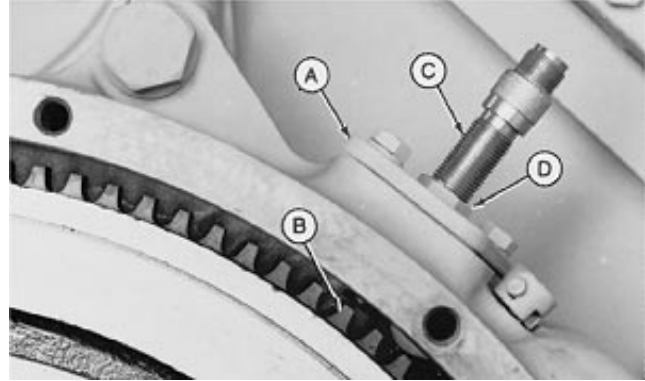
DPSG,OUO1004,697 -19-16MAR99-2/4

- If magnetic pickup plate (A) was removed, use a new gasket and install plate with magnetic pickup window towards front of engine. Tighten cap screws to specifications.

Specification

Magnetic Pickup
 Plate-to-Flywheel Housing Cap
 Screws—Torque 30 N•m (22 lb-ft)

- Center a flywheel ring gear tooth (B) beneath magnetic pickup window.
- Install magnetic pickup (C) with lock nut.



RG4435 -UN-08NOV89

A—Magnetic Pickup Plate
 B—Flywheel Ring Gear Tooth
 C—Magnetic Pickup
 D—Lock Nut

DPSG,OUO1004,697 -19-16MAR99-3/4

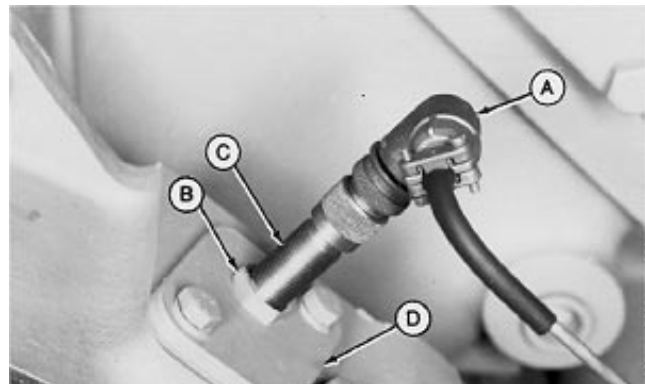
IMPORTANT: DO NOT adjust magnetic pickup with engine running. Doing so may damage magnetic pickup.

- Screw in magnetic pickup (C) until its tip contacts tip of the flywheel ring gear tooth.
- Back out magnetic pickup specified amount and tighten lock nut (B) against magnetic pickup plate (D).

Specification

Magnetic Pickup-to-Flywheel
 Gap—Turns 1-1/4 ± 1/4 turn from ring gear tooth

- Install wiring harness (A) and tighten coupling.



RG4403 -UN-08NOV89

A—Wiring Harness
 B—Lock Nut
 C—Magnetic Pickup
 D—Magnetic Pickup Plate

DPSG,OUO1004,697 -19-16MAR99-4/4

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

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DPSG,OUO1004,711 -19-16MAR99-1/5

Spring Compression Tester D01168AA

Test John Barnes pump pressure regulating valve spring.

DPSG,OUO1004,711 -19-16MAR99-2/5

Bushing, Bearing, and Seal Driver Set. D01045AA

Install seal on John Barnes pump.

DPSG,OUO1004,711 -19-16MAR99-3/5

Digital Volt-Ohm-Amp Multimeter D27501BM

Test John Barnes pump armature for grounded windings.

DPSG,OUO1004,711 -19-16MAR99-4/5

Universal Pressure Test Kit JT05412

Check fuel supply pump pressure.

DPSG,OUO1004,711 -19-16MAR99-5/5

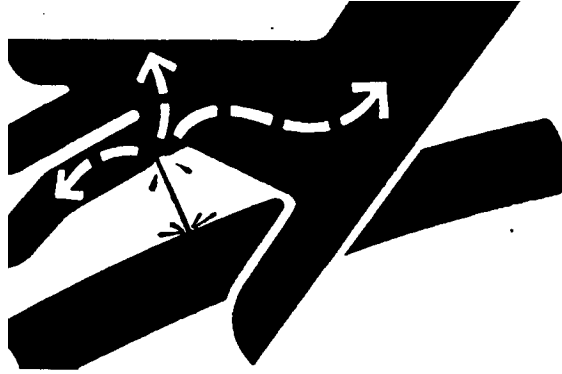
Fuel Supply Pump Specifications

Item	Measurement	Specification
John Barnes Fuel Supply Pump 8955 Engine S. N. (—3076)	Pressure (Key On, Engine Not Running)	100—210 kPa (1.0—2.1 bar) (15—30 psi)
John Barnes Fuel Supply Pump 8955 Engine S. N. (—3076)	Operating Pressure	210—230 kPa (2.1—2.3 bar) (30—34 psi)
Pressure Regulating Valve Spring John Barnes Fuel Supply Pump 8955 Engine S. N. (—3067)	Compressed Height/Force	12.7 mm @ 36—44 N (0.5 in. @ 8.0—9.8 lb)
Fuel Supply Pump Brushes (New)	Length	9.5 mm (3/8 in.)
John Barnes Fuel Supply Pump Mounting Cap Screws	Torque	55 N•m (40 lb-ft)
Bosch Fuel Supply Pump 8955 Engine S. N. (3077—)	Pressure (Key On, Engine not Running)	100—210 kPa (1.0-2.1 bar) (15-30 psi)
Bosch Fuel Supply Pump 8955 Engine S. N. (3077—)	Operating Pressure	300—400 kPa (3—4 bar) (43—58 psi)
Bosch Fuel Supply Pump Mounting Cap Screws	Torque	55 N•m (40 lb-ft)

DPSG.OUO1004.758 -19-26MAR99-1/1

Relieve System Pressure

! **CAUTION:** 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 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.

X9811 -UN-23AUG88

S11,3010,OZ -19-02MAR94-1/1

Test John Barnes Fuel Supply Pump Pressure—8955T, A Engine Serial No. (— 3076)

! **CAUTION:** Sparks, smoking or fire of any nature must not be permitted when testing the fuel system.

1. Disconnect hose (A) from supply pump.

A—Hose



RG4489 -UN-08NOV89

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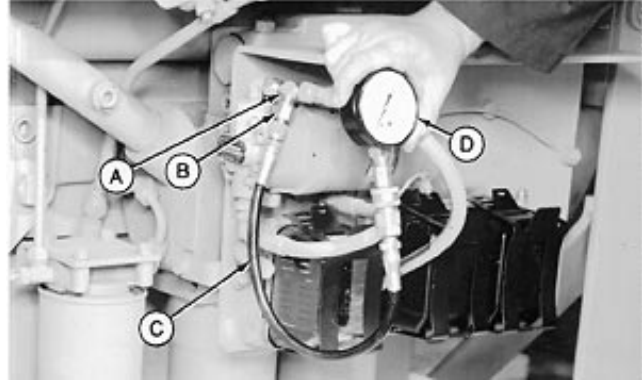
DPSG,OUO1004,702 -19-16MAR99-1/2

NOTE: Parts (A—D) are from JT05412 Universal Pressure Test Kit.

2.

Connect between hose and supply pump:

- Tee Fitting (A)
- Fitting (B)
- Hose (C)
- Gauge (D)



RG-4488 -JUN-08NOV89

3. Turn key switch to ON position but do not start engine. Fuel system pressure must be as follows:

Specification

John Barnes Fuel Supply Pump
8955 Engine S. N. (—3076)—
Pressure (Key On, Engine Not
Running) 100—210 kPa (1.0—2.1 bar)
(15—30 psi)

- A—(JT03001) Tee Fitting
- B—(JT05481) Fitting
- C—(JT03017) Hose
- D—(JT03115) Gauge

4. If fuel pressure is low, check for:

- Partially closed shut-off valve
- Loose electrical connections
- Pinched or kinked fuel hose
- Plugged water separator
- Plugged supply pump inlet filter
- Plugged fill cap vent

5. If fuel pressure is still low or if reading is high, adjust supply pump pressure relief valve. (See procedure in this group.)

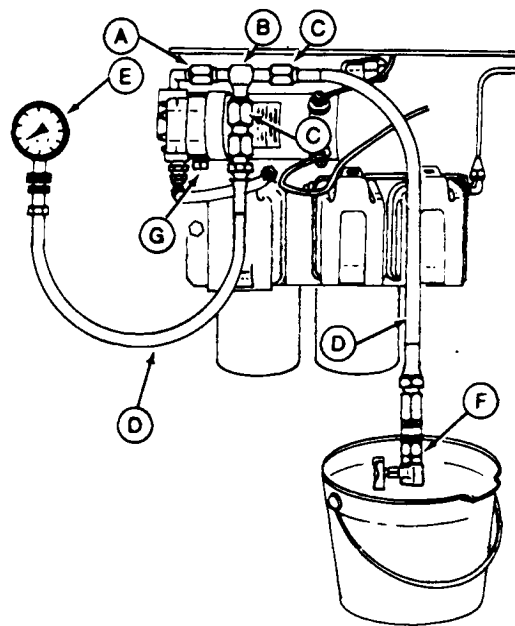
Adjust John Barnes Fuel Supply Pump Relief Valve—8955T, A Engines Serial No. (— 3076)

CAUTION: Sparks, smoking or fire of any nature must not be permitted when testing the fuel system.

1. Remove fuel outlet hose (A).
2. Connect JT03001 Tee Fitting (B), two JT05481 Fittings (C), two JT03017 Hoses (D), JT03115 Gauge (E), and JT03087 Quick Disconnect Snubber Valve Assembly (F) (remove female quick disconnect coupler) to supply pump outlet.
3. Close snubber valve.
4. Turn key switch to “ON”.
5. Open snubber valve to remove air from pump then close the valve.
6. Read pressure and compare to following specification.

Specification

John Barnes Fuel Supply Pump
8955 Engine S. N. (—3076)—
Operating Pressure 210—230 kPa (2.1—2.3 bar)
(30—34 psi)



- A—Fuel Outlet Hose¹
- B—JT03001 Tee Fitting¹
- C—JT05481 Fittings (2 used)¹
- D—JT03017 Hoses (2 used)¹
- E—JT03115 Gauge¹
- F—JT03087 Snubber Valve Assembly¹
- G—Relief Valve Cap

RG3483 —UN—06APR89

¹ From JT05412 Universal Pressure Test Kit.

Continued on next page

DPSG,OUO1004,704 —19—16MAR99—1/2

IMPORTANT: DO NOT adjust the fuel pressure over 340 kPa (3.4 bar) (50 psi).

7. If pressure is not within specifications:
 - Remove adjusting screw cap.
 - Turn adjusting screw (A) clockwise to increase fuel pressure.
 - Turn adjusting screw (A) counterclockwise to decrease fuel pressure.
 - Install adjusting screw cap.
8. Open snubber valve to remove air from pump. Close valve.
9. Read gauge:
 - If pressure is within specifications, remove gauge, valve, hoses and fittings. Connect fuel hose to fuel outlet fitting.
 - If pressure is not within specifications, repeat step 7 until pressure is within specifications.



RG4416 -UN-08NOV89

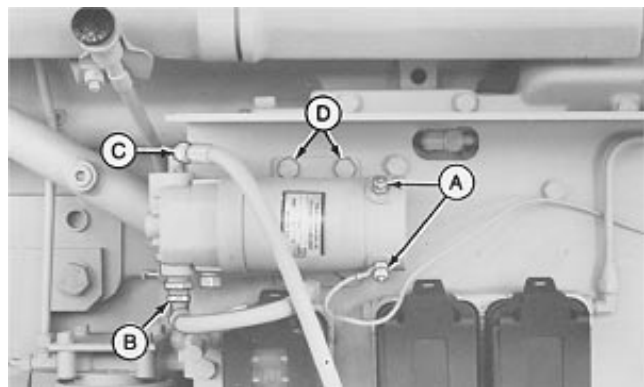
A—Adjusting Screw

DPSG,OUO1004,704 -19-16MAR99-2/2

Remove John Barnes Electric Fuel Supply Pump—8955 Engine Serial No. (—3076)

1. Disconnect negative (—) battery strap.
2. Remove wires (A).
3. Disconnect fuel inlet (B) and outlet (C) hoses.
4. Remove mounting cap screws (D).

- A—Wires
- B—Fuel Inlet
- C—Fuel Outlet
- D—Mounting Cap Screw (4 used)

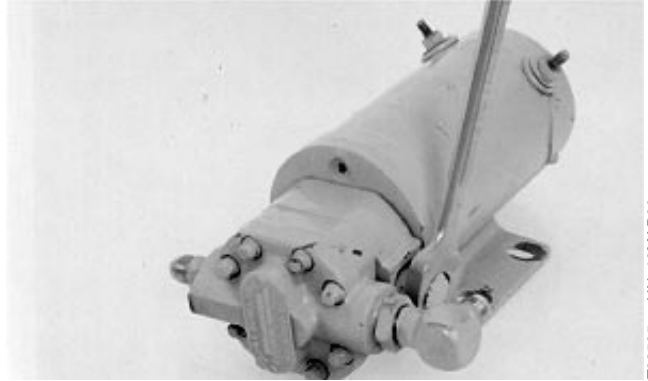


RG3472 -UN-31JUL89

DPSG,OUO1004,705 -19-16MAR99-1/1

Remove Pressure Regulating Valve

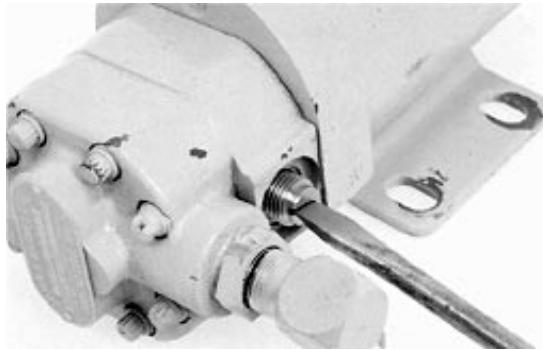
1. Remove cap and gasket.



T82535 -UN-13MAR90

DPSG,OUO1004,706 -19-16MAR99-1/4

2. Remove adjusting screw.



T82536 -UN-13MAR90

DPSG,OUO1004,706 -19-16MAR99-2/4

3. Remove spring and valve.
4. Inspect O-ring and valve seat for damage.



T83097 -UN-08MAR90

DPSG,OUO1004,706 -19-16MAR99-3/4

5. Test spring with D01168AA Spring Compression Tester. Test length must be as follows:

Specification

Pressure Regulating Valve Spring
John Barnes Fuel Supply Pump
8955 Engine S. N. (—3067)—
Compressed Height/Force..... 12.7 mm @ 36—44 N
(0.5 in. @ 8.0—9.8 lb)



T82538 -UN-13MAR90

DPSG,OUO1004,706 -19-16MAR99-4/4

Install Pressure Regulating Valve

1. Install valve and spring.

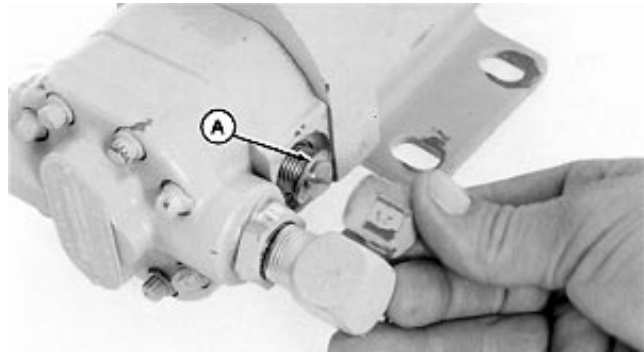


T83097 -UN-06MAR90

S55,4015,DU -19-02FEB94-1/2

2. Install adjusting screw, gasket (A), and cap.

A—Gasket



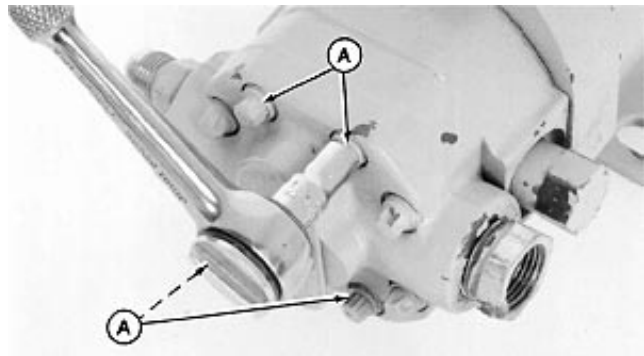
T82539 -UN-13MAR90

S55,4015,DU -19-02FEB94-2/2

Repair Fuel Pump

1. Remove four cap screws (A) to separate pump from motor.

A—Cap Screws



T82540 -UN-13MAR90

S55,4015,EN -19-02FEB94-1/19

2. Remove seal from pump.



T82541 -UN-11APR90

Continued on next page

S55,4015,EN -19-02FEB94-2/19

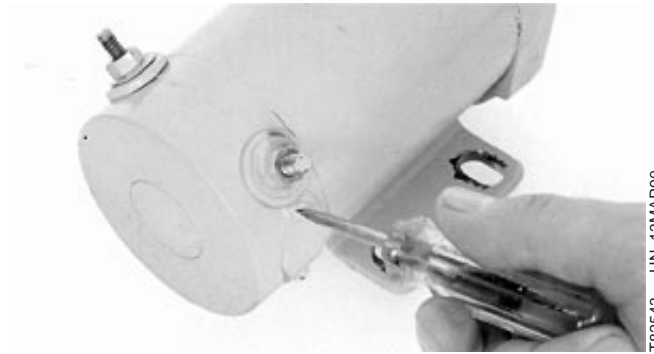
3. Install a new seal using 27502 1-3/16 inch Driver from D01045AA Bushing, Bearing and Seal Driver Set. Install seal even with edge of bore.



T82542 -UN-13MAR90

S55,4015,EN -19-02FEB94-3/19

4. Remove brush screw cover and gasket.



T82543 -UN-13MAR90

S55,4015,EN -19-02FEB94-4/19

5. Remove brush screw and brush (both sides).



T82544 -UN-13MAR90

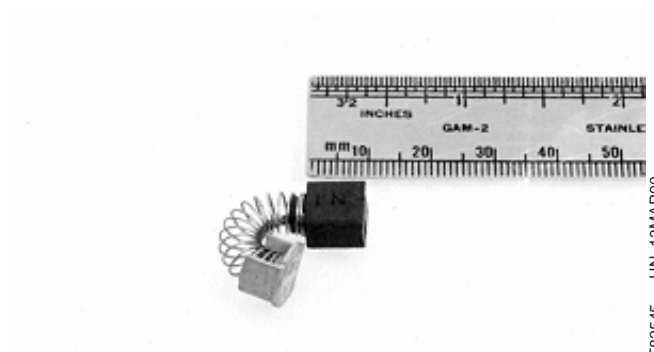
S55,4015,EN -19-02FEB94-5/19

6. Measure length of brushes and compare to following specifications.

Specification

Fuel Supply Pump Brushes
(New)—Length..... 9.5 mm (3/8 in.)

Install new brushes, if they are excessively worn.

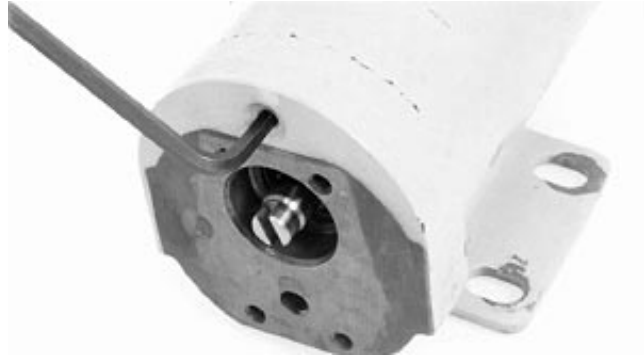


T82545 -UN-13MAR90

Continued on next page

S55,4015,EN -19-02FEB94-6/19

7. Remove plug.

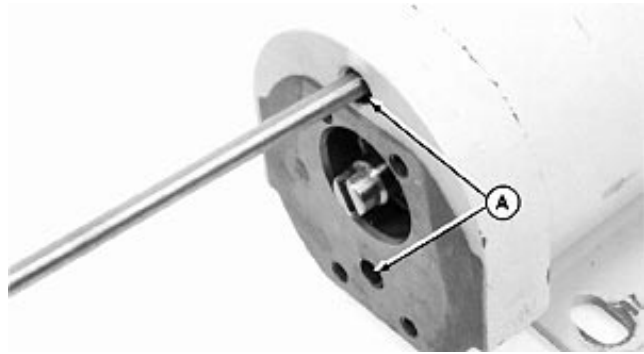


T82546 -UN-13MAR90

S55,4015,EN -19-02FEB94-7/19

8. Remove two screws (A) to remove armature from housing.

A—Screws



T82547 -UN-13MAR90

S55,4015,EN -19-02FEB94-8/19

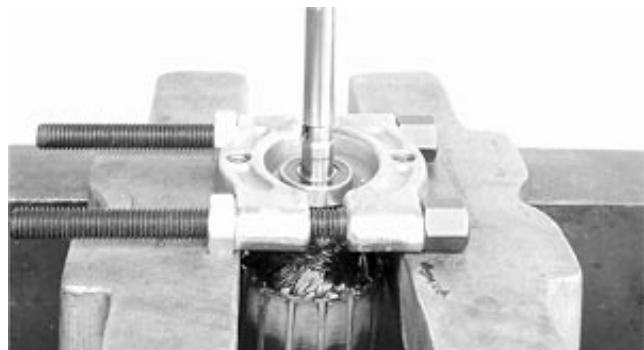
9. Check armature for grounded windings with D27501BM Volt-Ohm-Amp Multimeter.



T82548 -UN-13MAR90

S55,4015,EN -19-02FEB94-9/19

10. Press bearings from armature using an 11 mm (7/16 in.) shaft against the armature shaft.



T82549 -UN-13MAR90

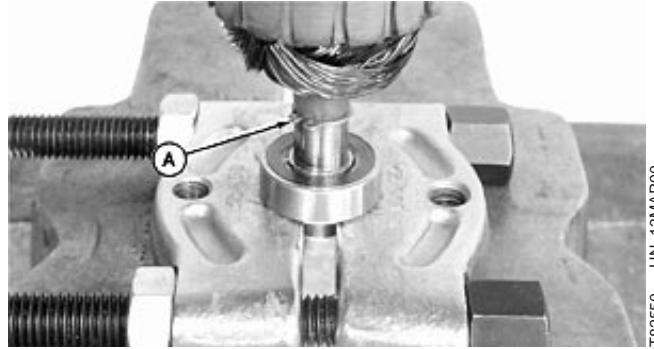
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S55,4015,EN -19-02FEB94-10/19

11. Install bearings on armature. Make sure bearings are supported on the inner race.

Make sure retaining ring (A) is installed.

A—Retaining Ring

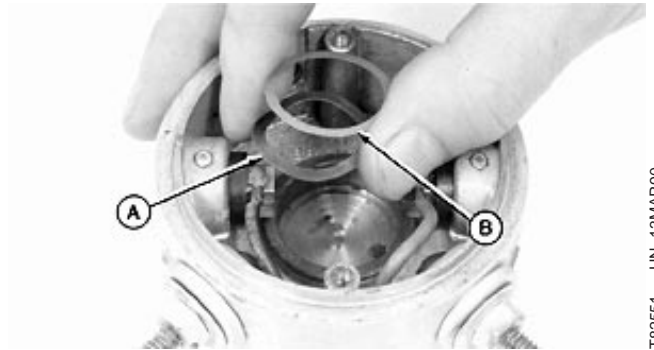


T82550 -UN-13MAR90

S55,4015,EN -19-02FEB94-11/19

12. Install wavy washer (A) and flat washer (B).

A—Wavy Washer
B—Flat Washer

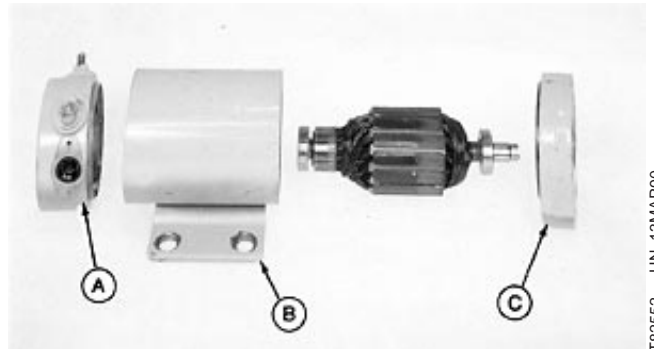


T82551 -UN-13MAR90

S55,4015,EN -19-02FEB94-12/19

13. Install armature in motor housing. Make sure the motor housing bracket (B) is closer to the adapter (C) than the brush housing (A).

A—Brush Housing
B—Motor Housing Bracket
C—Adapter

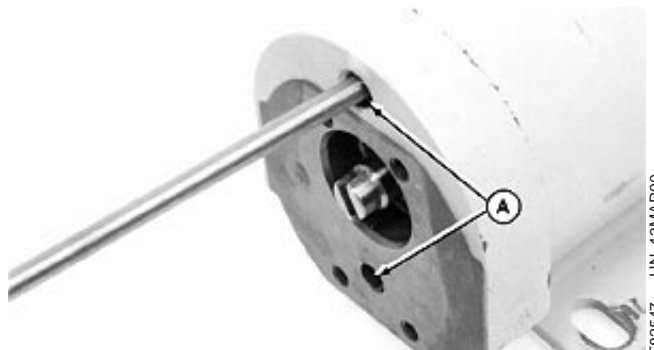


T82552 -UN-13MAR90

S55,4015,EN -19-02FEB94-13/19

14. Install motor housing screws (A).

A—Motor Housing Screws

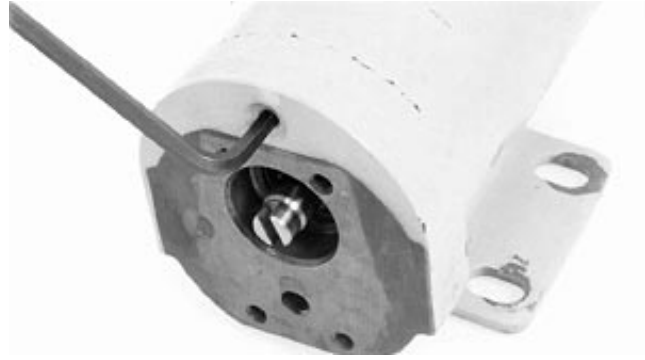


T82547 -UN-13MAR90

Continued on next page

S55,4015,EN -19-02FEB94-14/19

15. Install plug.



T82546 -UN-13MAR90

S55,4015,EN -19-02FEB94-15/19

16. Install brush (both sides).

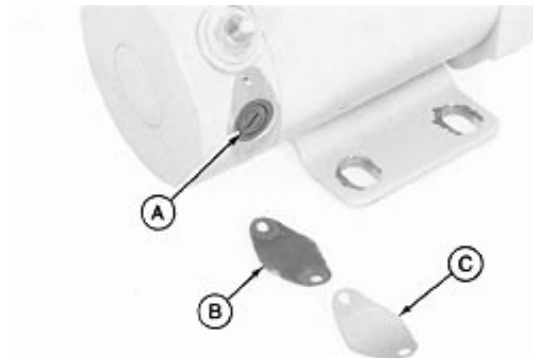


T82553 -UN-13MAR90

S55,4015,EN -19-02FEB94-16/19

17. Install brush screw (A), gasket (B) and cover (C).

- A—Brush Screw
- B—Gasket
- C—Cover



T82554 -UN-13MAR90

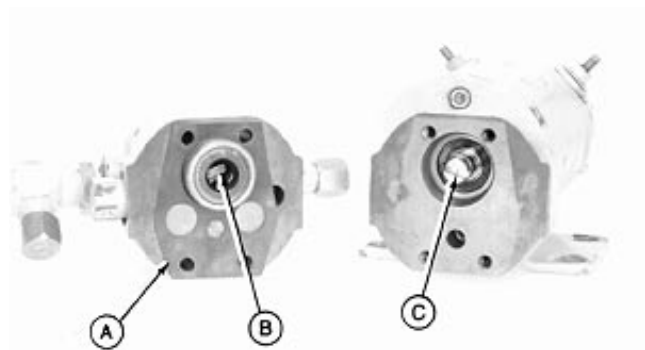
S55,4015,EN -19-02FEB94-17/19

18. Put gasket (A) on pump.

19. Make sure tang (B) aligns with slot (C).

20. Install pump on motor.

- A—Gasket
- B—Tang
- C—Slot



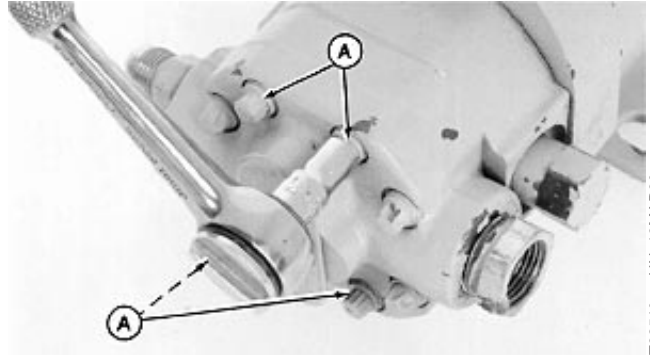
T82555 -UN-13MAR90

Continued on next page

S55,4015,EN -19-02FEB94-18/19

21. Install and tighten four cap screws (A).

A—Cap Screws



T82540 -UN-13MAR90

S55,4015,EN -19-02FEB94-19/19

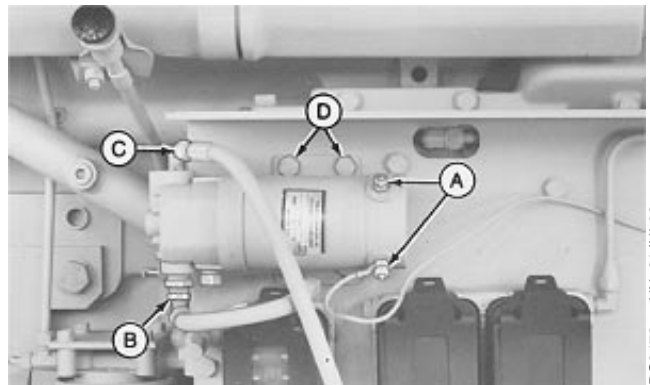
Install John Barnes Fuel Supply Pump—8955 Engine Serial No. (—3076)

1. Install fuel supply pump and tighten mounting cap screws (D) to specifications.

Specification

John Barnes Fuel Supply Pump
Mounting Cap Screws—Torque 55 N•m (40 lb-ft)

2. Connect wires (A).
3. Connect fuel inlet (B) and outlet (C) hoses.
4. Connect negative (-) battery strap.



RG3472 -UN-31JUL89

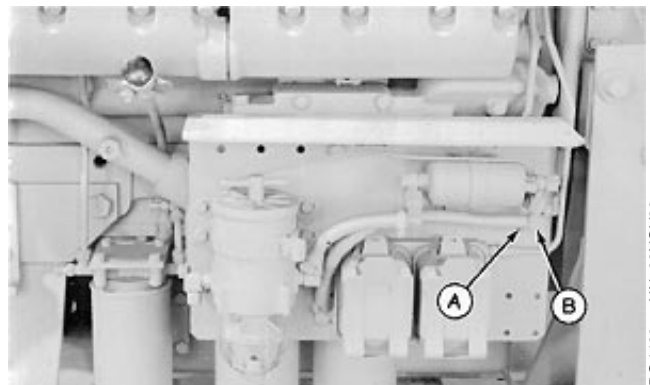
A—Wires
B—Fuel Inlet
C—Fuel Outlet
D—Mounting Cap Screws (4 used)

S11,4020,BA -19-02FEB94-1/1

Test Bosch Fuel Supply Pump Pressure—8955T, A Engine Serial No. (3077—)

CAUTION: Sparks, smoking or fire of any nature must not be permitted when testing the fuel system.

1. Loosen hose clamp (A) and remove hose from fuel outlet connection.
2. Plug hose so fuel does not drain from filters.
3. Remove elbow (B).



RG4490 -UN-08NOV89

A—Hose Clamp
B—Elbow

Continued on next page

DPSG,OUO1004,707 -19-16MAR99-1/2

4. Connect JT05486 Fitting (A), JT03017 Hose Assembly (B), and JT03115 Gauge (C) from JT05412 Universal Pressure Test Kit to supply pump outlet fitting.
5. Turn key switch to “ON” but do not start engine. Fuel system pressure must be as follows:.

Specification

Bosch Fuel Supply Pump
 8955 Engine S. N. (3077—)—
 Pressure (Key On, Engine not
 Running) 100—210 kPa (1.0—2.1 bar)
 (15—30 psi)

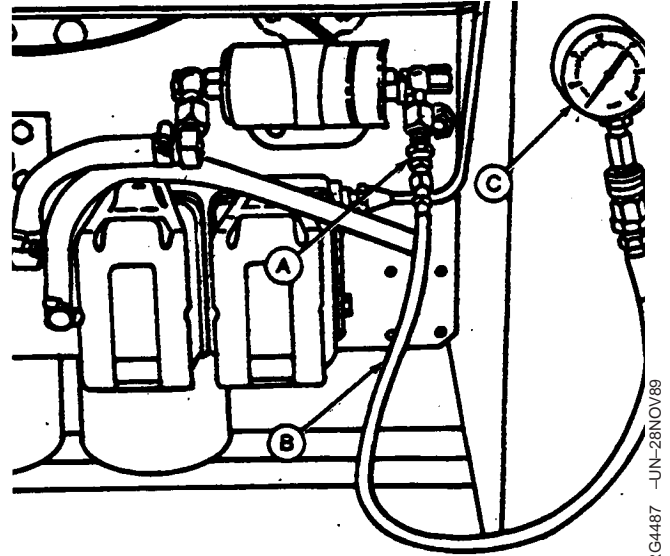
If fuel pressure is low, check for:

- a. Loose electrical connections
 - b. Partially closed shut-off valve
 - c. Pinched or kinked fuel hoses
 - d. Plugged water separator or restricted separator filter
 - e. Plugged fill cap vent
6. To check operating pressure, install tee fitting between gauge and pump outlet. Operating pressure should be within the following range:

Specification

Bosch Fuel Supply Pump
 8955 Engine S. N. (3077—)—
 Operating Pressure 300—400 kPa (3—4 bar)
 (43—58 psi)

7. If fuel pressure is still low, replace supply pump. There is no adjustment nor repair procedure for the Bosch supply pump.



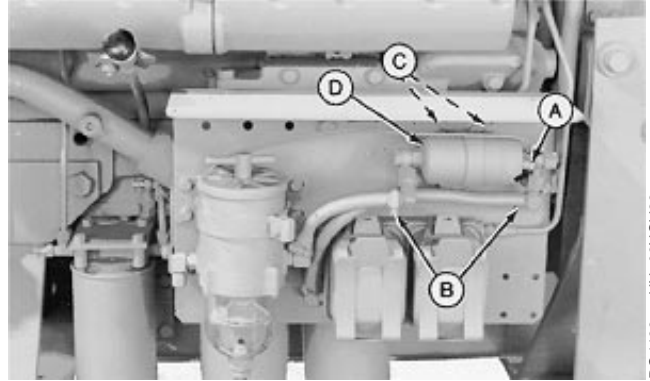
A—Fitting
 B—Hose Assembly
 C—Gauge

RG4487 -UN-28NOV89

Replace Bosch Fuel Supply Pump—8955T, A Engines Serial No. (3077—)

NOTE: The electric fuel supply pump must be replaced when it fails, there is no repair procedure for it.

1. Disconnect electrical connection (A). Loosen hose clamps (B) and remove hoses from both inlet and outlet connections.
2. Remove four mounting cap screws (C) and remove fuel supply pump (D).
3. Reverse removal steps to install fuel supply pump. Tighten hose clamps securely.
4. Tighten mounting cap screws to specifications.



RG4439 -UN-08NOV89

- A—Electrical Connection
- B—Hose Clamps
- C—Mounting Cap Screws (4 used)
- D—Fuel Supply Pump

Specification

Bosch Fuel Supply Pump
Mounting Cap Screws—Torque 55 N•m (40 lb-ft)

DPSG,OUO1004,708 -19-16MAR99-1/1

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

DPSG,OUO1004,722 -19-17MAR99-1/4

Radiator Pressure Tester D05104ST

Pressure test radiator and radiator cap.

DPSG,OUO1004,722 -19-17MAR99-2/4

Belt Tension Gauge JDG529

Check fan belt tension on standard V-belts.

DPSG,OUO1004,722 -19-17MAR99-3/4

Belt Tension Gauge JDST28

Use with a straightedge to check fan belt tension.

DPSG,OUO1004,722 -19-17MAR99-4/4

Other Material

Number	Name	Use
TY9375 (U.S.) TY9480 (Canadian) 592 (LOCTITE®)	Pipe Sealant	Apply to threads of coolant temperature sensor w/o O-ring.

Number	Name	Use
JDT404 (U.S.)	High Temperature Grease	Apply to O-ring of coolant temperature sensor.

LOCTITE is a registered trademark of Loctite Corp.

DPSG,OUO1004,723 -19-17MAR99-1/1

Engine Cooling System Specifications

Item	Measurement	Specification
Series 400 Engine Air Cooler Test Plugs	OD	64 mm (2.5 in.)
	Approx. Width	38 mm (1.5 in.)
Series 500 Engine Air Cooler Test Plugs	OD	76 mm (3.0 in.)
	Approx. Width	38 mm (1.5 in.)
4.5 L and 6.8 L Engine Air Cooler Test Plugs	OD	57 mm (2.2 in.)
	Approx. Width	38 mm (1.5 in.)
10.5 L and 12.5 L Engine Air Cooler Test Plugs	OD	101 mm (4.0 in.)
	Approx. Width	38 mm (1.5 in.)
Air Cooler	Maximum Test Pressure Drop	34.5 kPa (0.35 bar) (5 psi) in 60 Seconds
Coolant Temperature Sensor (w/o O-Ring)	Torque	25 N•m (18 lb-ft)
Coolant Temperature Sensor (w/O-Ring)	Torque	15 N•m (11 lb-ft)
Radiator Cap/Cooling System(Earlier Engines)	Test Pressure	50 kPa (0.5 bar) (7 psi)
Radiator Cap/Cooling System (Later Engines)	Test Pressure	70 kPa (0.7 bar) (10 psi)
Radiator Cap/Cooling System (6068HF275 and 6090HF485 Engines)	Test Pressure	100 kPa (1.0 bar) (14.5 psi)
Radiator Cap/Cooling System (6135HF485 Engines)	Test Pressure	103 kPa (1.03 bar) (15 psi)
Fan Mounting Cap Screws		
5/16 in. Cap Screws	Torque	30 N•m (22 lb-ft)
3/8 in. Cap Screws	Torque	50 N•m (35 lb-ft)
M8 Cap Screws	Torque	35 N•m (26 lb-ft)
M10 Cap Screws	Torque	70 N•m (52 lb-ft)

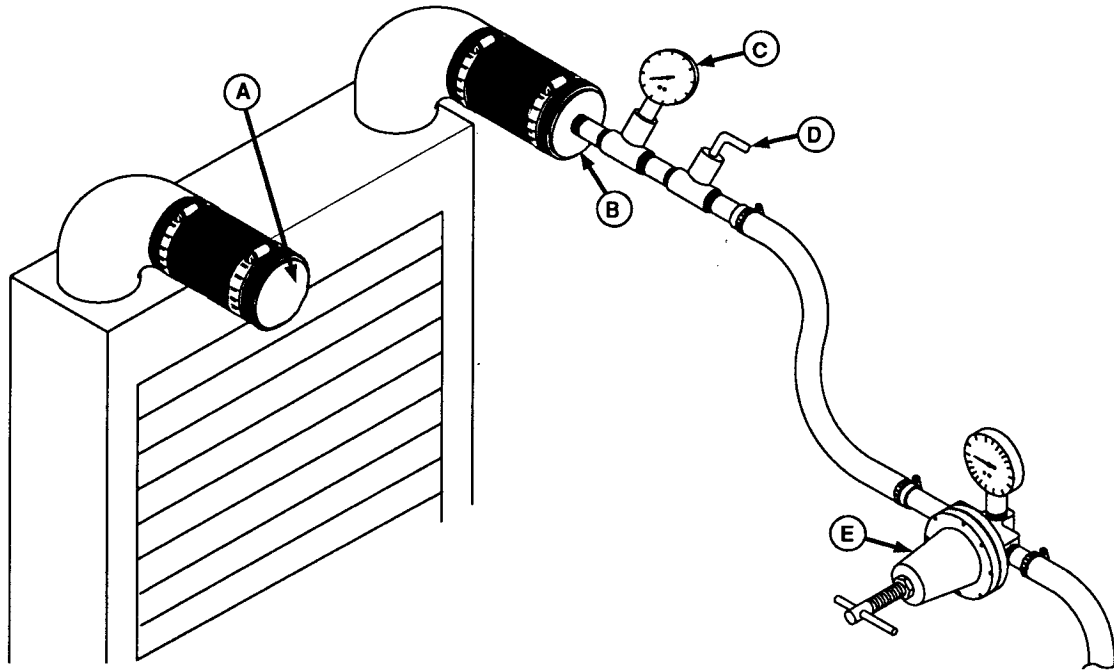
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OURGP12.0000161 -19-31AUG05-1/2

Item	Measurement	Specification
Fan Belt Tension (Standard V-Belts) (Using JDG529 Gauge)		
Single Belt (New)	Tension	578—622 N (130—140 lb-force)
Single Belt (Used) ¹	Tension	378—423 N (85—94 lb-force)
Dual Belt (New)	Tension	423—467 N (95—104 lb-force)
Dual Belt (Used) ¹	Tension	378—423 N (85—94 lb-force)
Fan Belt Tension (Standard V-Belts) (Using JDST28 Gauge and Straightedge)		
Fan Belt	Tension	19 mm (3/4 in.) deflection with an 89 N (20 lb-force) halfway between pulleys
Fan Belt Tension (Single Poly V-Belts) (Using JDST28 Gauge and Straightedge) ²		
Fan Belt	Tension	13 mm (1/2 in.) deflection with a 130 N (30 lb-force) halfway between pulleys
¹ Belts are considered used after 10 minutes of operation.		
² Specification applies to both new and used belts.		

OURGP12,0000161 -19-31AUG05-2/2

Test Charge Air Cooler



- A—Plug
- B—Plug with Drilled Passage
- C—Pressure Gauge
- D—Shut-Off Valve
- E—Regulator W/Gauge

1. Disconnect the air charge inlet and outlet tubes from the cooler stub hoses.

NOTE: Plugs (A and B) must have dimensions listed below.

2. Insert a metal plug (A) into open end of one of the stub hoses. Tighten hose clamp to secure plug.

Specification

400 Series Engine Air Cooler	
Test Plugs—OD.....	64 mm (2.5 in.)
Approx. Width	38 mm (1.5 in.)
Series 500 Engine Air Cooler	
Test Plugs—OD.....	76 mm (3.0 in.)
Approx. Width	38 mm (1.5 in.)
4.5 L and 6.8 L Engine Air	
Cooler Test Plugs—OD.....	57 mm (2.2 in.)
Approx. Width	38 mm (1.5 in.)
10.5 L and 12.5 L Engine Air	
Cooler Test Plugs—OD.....	101 mm (4.0 in.)
Approx. Width	38 mm (1.5 in.)

NOTE: Plug (B) requires an air passage drilled through it. One end of the passage should be

threaded to except a male NPT pipe fitting of appropriate size.

3. Attach a pressure gauge (C) and shut-off valve (D) to a metal plug (B).

4. Insert the gauge/valve/plug assembly into the open end of the other cooler stub hose and secure with hose clamp.

5. Connect a regulated air supply to the shut-off valve.

CAUTION: Do Not exceed specified air pressure. Serious personal injury could result from a plug or hose blow out.

6. Apply 172 kPa (1.7 bar) (25 psi) to cooler, then close shut-off valve. Observe reading on pressure gauge (C) and compare to following specifications.

RG6840 -UN-10DEC93

Specification

Air Cooler—Maximum Test
Pressure Drop..... 34.5 kPa (0.35 bar) (5 psi) in
60 Seconds

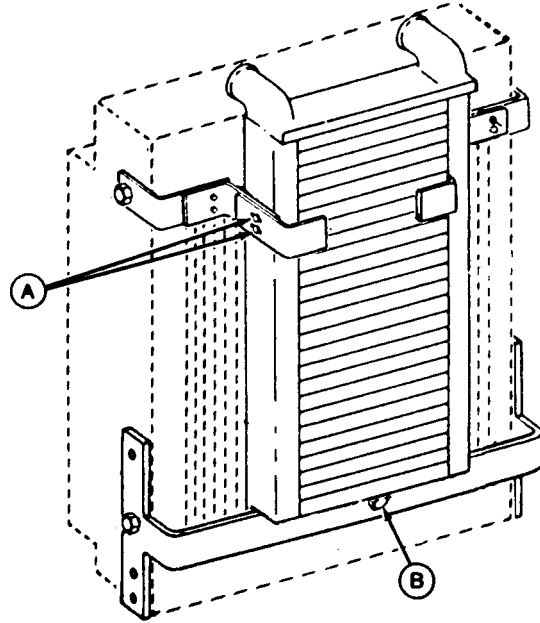
7. If reading is not within specification, use soapy water to check for leaks. Make repairs or replace cooler if necessary.

DPSG,OUO1004,713 -19-17MAR99-2/2

Remove and Install Charge Air Cooler

NOTE: Air cooler mounting configurations vary. Some are mounted to the side of radiator.

1. Disconnect hoses from air cooler.
2. Loosen cap screws (A) and remove cap screw (B).
3. Remove air cooler by lifting cooler straight up until it clears upper mounting brackets.
4. Inspect rubber isolators for wear or damage. Replace as necessary.
5. Install air cooler by lowering cooler through the upper brackets. Make sure isolators stay in position during installation.
6. Install cap screw (B). Adjust upper brackets to secure air cooler. Tighten cap screws (A)
7. Connect hoses and tighten clamps.



A—Cap Screws
B—Cap Screws

RG6891 -UN-01OCT93

DPSG,OUO1004,714 -19-17MAR99-1/1

Remove and Install Coolant Temperature Sensor

NOTE: Two types of coolant temperature sensors shown (A and C). Sensor is typically mounted on cylinder head but can also be mounted in block.

1. Disconnect sensor wiring connector.
2. Remove temperature sensor (A) or parts (B—D).
3. For sensors without O-ring, apply sealing compound to threads of temperature sensor (A) or housing (D) and install sensor (A) or parts (B—D). Tighten sensor to the following specification.

Specification

Coolant Temperature Sensor (w/o O-Ring)—Torque 25 N•m (18 lb-ft)

For sensors with O-ring, apply JDT404 High Temperature Grease to O-ring. Install sensor and tighten to the following specification.

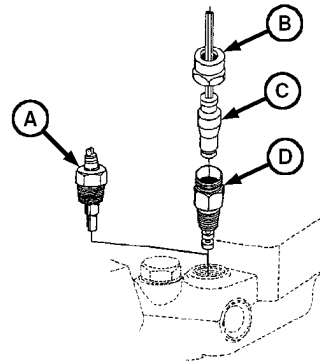
Specification

Coolant Temperature Sensor (w/O-Ring)—Torque 15 N•m (11 lb-ft)

4. Service engine with coolant.

NOTE: Air must be expelled from the cooling system when refilling. Loosen coolant temperature sensor (or plug) at rear of cylinder head to allow air to escape.

5. Operate engine to expel air from cooling system, then tighten sensor or plug.
6. Connect sensor wiring connector.

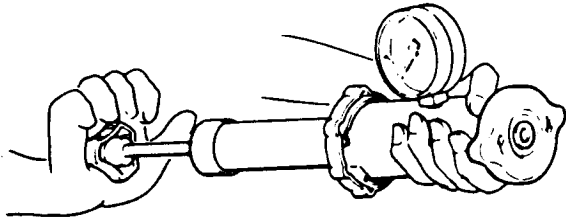


A—Coolant Temperature Sensor
B—Hex Cap
C—Coolant Sensing Unit
D—Housing

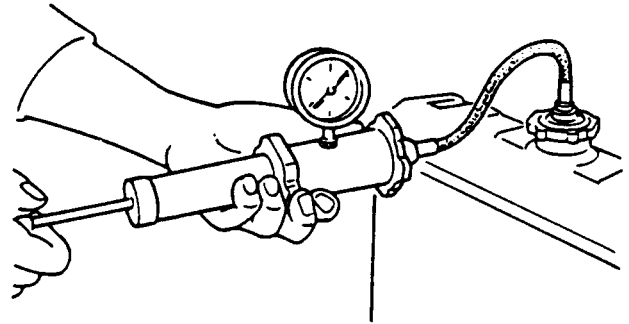
RG9520 -UN-17MAR99

DPSG,OUO1004,715 -19-17MAR99-1/1

Pressure Test Cooling System and Radiator Cap



RG6657 -JUN-20JAN93



RG6658 -JUN-20JAN93

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

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

Test Radiator Cap

1. Remove radiator cap. Attach cap to Cooling System Pressure Tester, D05104ST or equivalent.
2. Pressurize cap to following specifications:

Specification

Radiator Cap—Test Pressure	
(Earlier Engines)	50 kPa (0.5 bar) (7 psi)
Test Pressure (Later Engines)	70 kPa (0.7 bar) (10 psi)
Test Pressure (6068HF275, 6090HF485)	100 kPa (1.00 bar) (14.5 psi)
Test Pressure (6135HF485)	103 kPa (1.03 bar) (15 psi)

The cap should hold pressure for 10 seconds within the “normal range”. Replace cap if it does not hold pressure.

Test Cooling System

1. Operate engine to warm up cooling system. Allow engine to cool, then carefully remove radiator cap.

2. Fill radiator with coolant to the normal operating level.

IMPORTANT: DO NOT apply excessive pressure to cooling system, doing so may damage expansion tank and hoses.

3. Attach Cooling System Pressure Tester to expansion tank filler neck. Pressurize cooling system to specification listed for the radiator cap.
4. With cooling system pressurized, check cooling system hose connections, radiator and engine for leaks.

NOTE: If no leak is detected, but the system does not hold pressure, coolant may be leaking inside the engine. A bad cylinder head gasket, cracked head or block may be the problem. (Refer to the Engine CTM for these repairs.)

5. Repair any leak detected and pressure test system again.

Radiator and Hoses

IMPORTANT: Make sure there is a spring inside the lower radiator hose before installing it. The spring is there to prevent hose from collapsing during engine operation. A collapsed hose will prevent coolant from reaching the water pump, resulting in pump cavitation. Engine overheating and/or damage to water pump and engine may result.



RG6936 -UN-23SEP93

When servicing radiator, inspect the isolator pads for excessive compression set, wear or damage. Replace if necessary.

Make sure isolator pads are in the proper position when installing radiator.

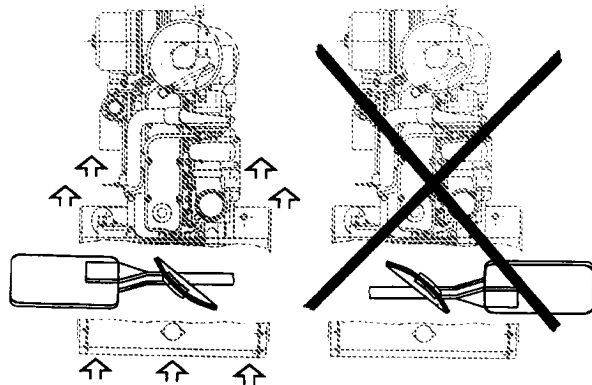
Refer to manufacturer literature or machine technical manual for radiator service and repair.

DPSG.OUO1004,717 -19-17MAR99-1/1

Install Radiator Fan—Blower and Suction Types

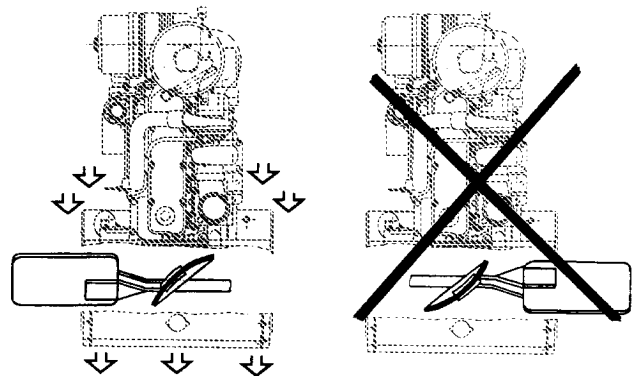
NOTE: A blower fan *PUSHES* air through the radiator. A suction fan *DRAWS* air through the radiator. See illustration.

1. Install blower type fan with concave side of blade towards radiator.
2. Install suction type fan with concave side of blade towards engine.



Suction Fan (Top View)

CD30648 -UN-16JUN98



Blower Fan (Top View)

CD30649 -UN-16JUN98

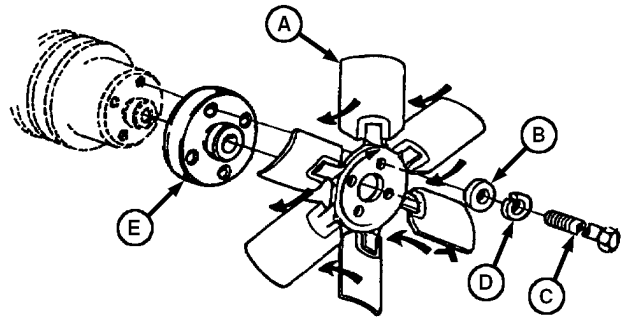
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RG.CTM67.G40,5 -19-02FEB94-1/2

3. Install fan (A) with spacer (E), if required.
4. Install cap screws with new lock washers (D) and flat washers (B), if required. Tighten cap screws to specifications.

Fan Mounting Cap Screws—Specification

5/16 in. Cap Screws—Torque	30 N•m (22 lb-ft)
3/8 in. Cap Screws—Torque	50 N•m (35 lb-ft)
M8 Cap Screws—Torque	35 N•m (26 lb-ft)
M10 Cap Screws—Torque	70 N•m (52 lb-ft)



RG9512 -UN-18MAR99

- A—Fan
- B—Flat Washers
- C—Cap Screws
- D—Lock Washers
- E—Spacer

RG,CTM67,G40,5 -19-02FEB94-2/2

Check Fan and Alternator Belts

1. Inspect belts for cracks, fraying or stretched out areas. Replace if necessary.

IMPORTANT: Make sure sheaves are in alignment. Misaligned sheaves can cause premature belt failure from heat buildup and side wear. Misalignment can also cause bearing failure.

2. Operate engine for 5 minutes if belt is cold. Let engine cool for 10—15 minutes if belt is hot.

NOTE: Engine having dual belts, check tension of front belt only. Measure belt tension on the longest part of the belt between sheaves.

Poly V-belt tension is measured by deflection method with a tension tester and straight edge.

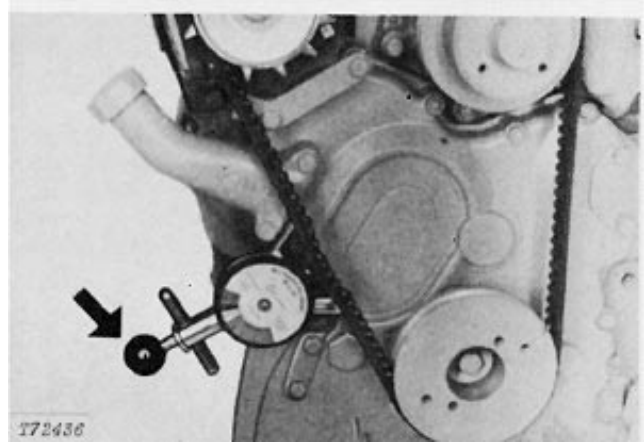
STANDARD V-BELTS

Check and adjust fan belt tension on standard V-belts using JDG529 Gauge or equivalent gauge capable of measuring 667 N (150 lb force) and compare to following specifications.

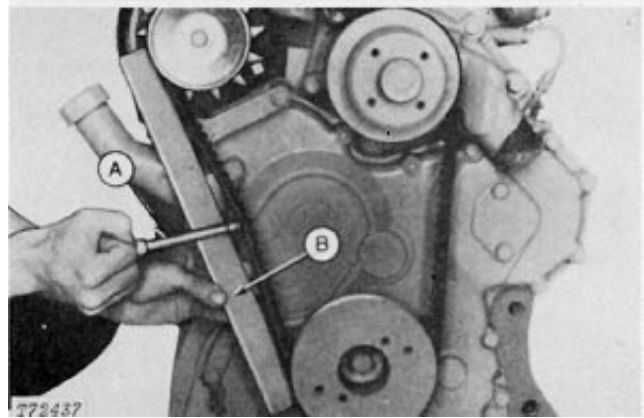
Fan Belt Tension (Standard V-Belts) (Using JDG529 Gauge)— Specification

Single Belt (New)—Tension	578—622 N (130—140 lb-force)
Single Belt (Used) ¹ —Tension	378—423 N (85—94 lb-force)
Dual Belt (New)—Tension	423—467 N (95—104 lb-force)
Dual Belt (Used) ¹ —Tension	378—423 N (85—94 lb-force)

Check and adjust fan belt tension on standard V-belts using JDST28 Gauge and straightedge, at halfway point between sheaves, and compare to following specifications.



T72436 -UN-23FEB89



T72437 -UN-23FEB89

A—Tension Tester
B—Straight Edge

¹ Belts are considered used after 10 minutes of operation.

Fan Belt Tension (Standard V-Belts) (Using JDST28 Gauge and Straightedge)—Specification

Fan Belt—Tension..... 19 mm (3/4 in.) deflection
with an 89 N (20 lb-force)
halfway between pulleys

SINGLE POLY V-BELT

Check and adjust fan belt tension on single poly V-belts using JDST28 Gauge and straightedge, at halfway point between sheaves, and compare to following specifications.

Fan Belt Tension (Single Poly V-Belts) (Using JDST28 Gauge and Straightedge)²—Specification

Fan Belt—Tension..... 13 mm (1/2 in.) deflection
with a 130 N (30 lb-force)
halfway between pulleys

²Specification applies to both new and used belts.

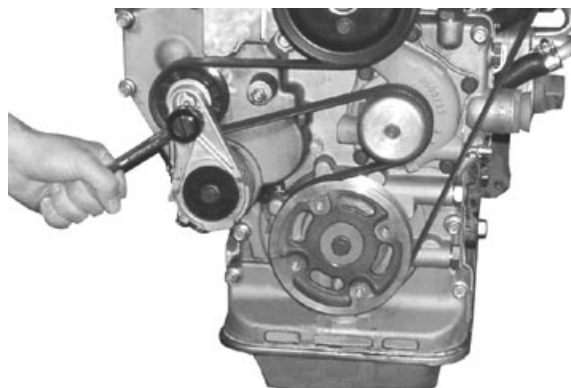
Remove and Install Fan and Alternator Belts

1. Inspect belt for cracks, fraying, or stretched out areas. Replace if necessary.
2. To remove belt, release tension on belt using a drive arm on tension arm.
3. Remove belt from pulleys and discard belt.

NOTE: Ensure belt is correctly seated in all pulley grooves. Refer to belt routing shown.

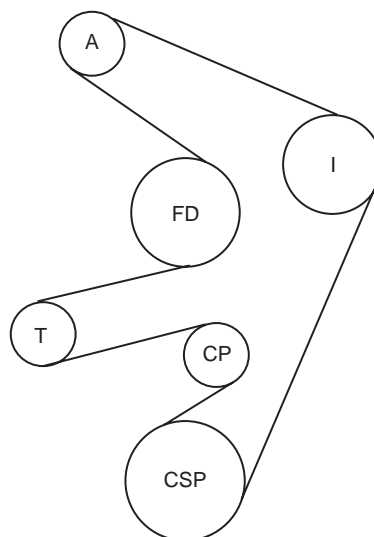
4. To install new belt, back-wrap belt around fan drive pulley (FD), route it over alternator (A), over top of idler pulley (I), then around crankshaft pulley (CSP). Finally, use a drive arm to rotate tensioner (T) to the tensioned position and slip belt (back-wrap) over coolant pump pulley (CP), then release tensioner.
5. Apply tension to belt with tensioner. Remove drive arm.
6. Start engine and check belt alignment.

A—Alternator
CSP—Crankshaft Pulley
FD—Fan Drive Pulley
I—Idler Pulley
T—Tensioner
CP—Coolant Pump



Replacing Belt

RG14351 -UN-01SEP05



Typical Belt Routing

RG12799 -UN-21JAN03

OURGP12,0000155 -19-30AUG05-1/1

Manual Belt Tensioner Adjustment

NOTE: Two types of manual tensioners shown.

NOTE: Inspect belts for cracks, fraying, or stretched-out areas. Replace if necessary.

As a reference check, twist belt in the middle of a 254—305 mm (10—12 in.) span with two fingers. A properly tensioned belt will turn 75—85 degrees. If belt turns more, it needs to be tightened. If belt turns less, it needs to be loosened.

NOTE: If timing gear cover or alternator bracket interfere with installation/centering of belt tension gauge (A), install gauge with face toward engine.

1. Install JDG1341 Belt Tension Gauge (A) on belt, halfway between pulleys as shown. (JDG1341 Belt Tension Gauge available from local John Deere Dealer or Distributor.)
2. Loosen cap screws (B) and (C).
3. Slide alternator or tensioner bracket (D) in slot by hand to remove all excess slack in belt.

IMPORTANT: Do not pry against alternator rear frame.

4. Stretch belt by prying outward on alternator front frame or tensioner bracket. Observing tension gauge, stretch the belt until specified tension is achieved.

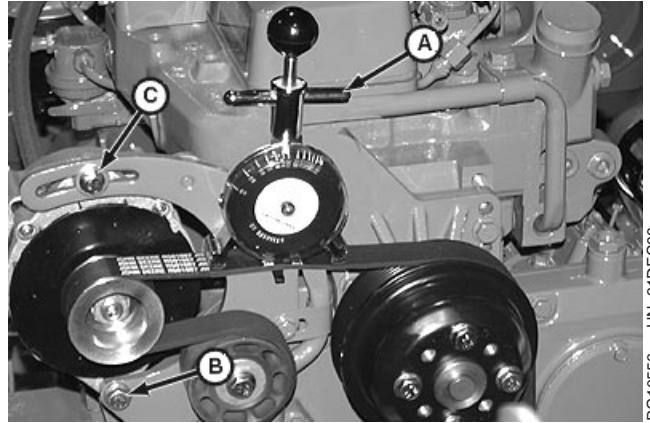
Specification

New Belt—Tension..... 470—650 N (105—145 lb-force)
Used Belt—Tension..... 400—580 N (90—130 lb-force)

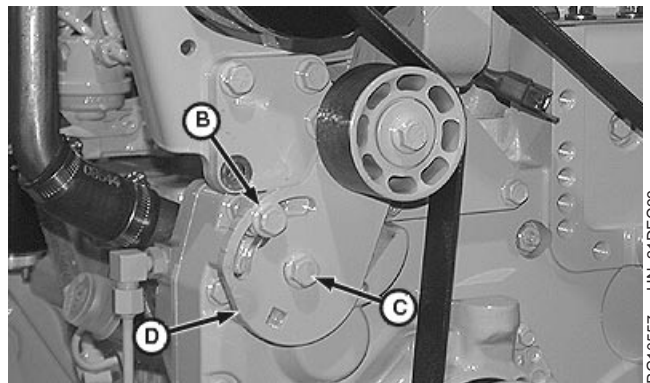
5. Tighten cap screws (B) and (C).

NOTE: After ten minutes run-in, new belts are considered used. Belt tension must then be rechecked per used belt specifications.

6. Run engine for ten minutes and immediately re-check belt tension per used belt specification above.
7. Reset belt tension as necessary.



Check Belt Tension



Adjust Belt Tension

- A—Belt Tension Gauge
- B—Cap Screw
- C—Cap Screw
- D—Tensioner Bracket

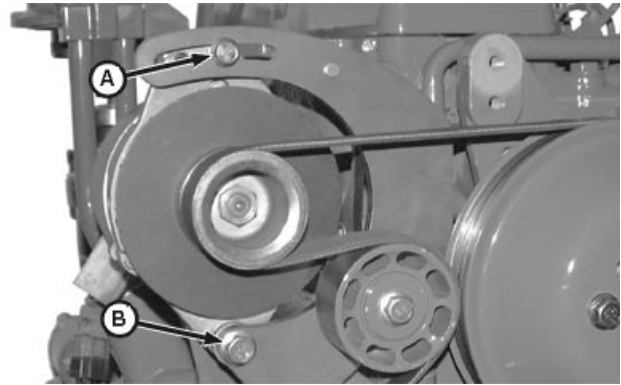
Manual Belt Tensioner Adjustment Using Belt Tension Tool (Alternate Method For Engines Without Auxiliary Drive)

NOTE: The JD1520 Belt Tension Tool may not be compatible with all alternators. In that case, use the preceding method for belt tensioning.

NOTE: Inspect belts for cracks, fraying, or stretched-out areas. Replace if necessary.

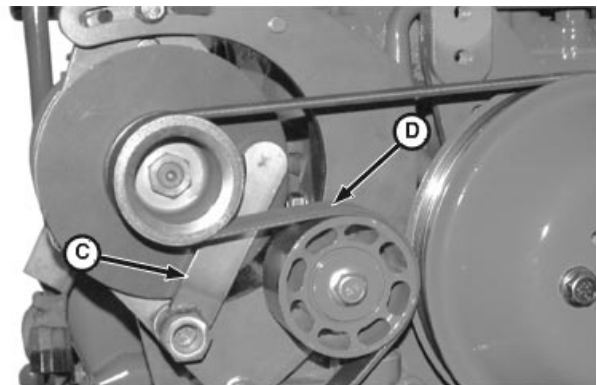
As a reference check, twist belt in the middle of a 254—305 mm (10—12 in.) span with two fingers. A properly tensioned belt will turn 75—85 degrees. If belt turns more, it needs to be tightened. If belt turns less, it needs to be loosened.

1. Loosen upper (A) and lower (B) alternator bracket cap screws. Lower cap screw must remain tight enough to prevent excessive alternator play but allow alternator to pivot by hand.
2. Insert JDG1520 Belt Tension Tool (C) behind belt (D) and over alternator mounting screw.



Alternator Bracket and Cap Screws

RG11812 -UN-31OCT01



Belt Tension Tool

RG11813 -UN-31OCT01

- A—Upper Alternator Bracket Cap Screw
- B—Lower Alternator Bracket Cap Screw
- C—JDG1520 Belt Tension Tool
- D—Belt

Continued on next page

OUOD002,000016D -19-05JUN02-1/2

- Place torque wrench (C) on belt tensioning tool (B) at 90° to tool. Pivot alternator (A) until desired torque is achieved according to specification using the following table.

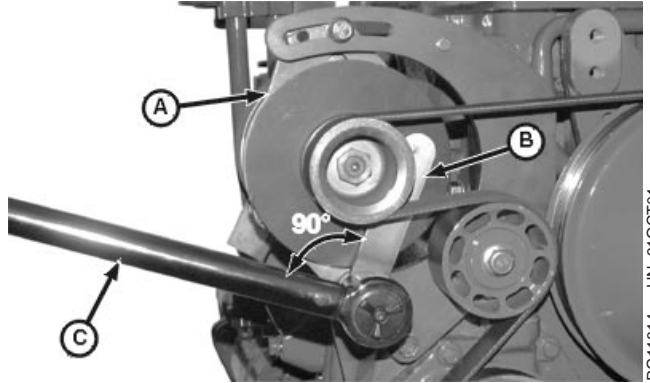
Specification

New Belt—Tension..... 470—650 N (105—145 lb-force)
Used Belt—Tension..... 400—580 N (90—130 lb-force)

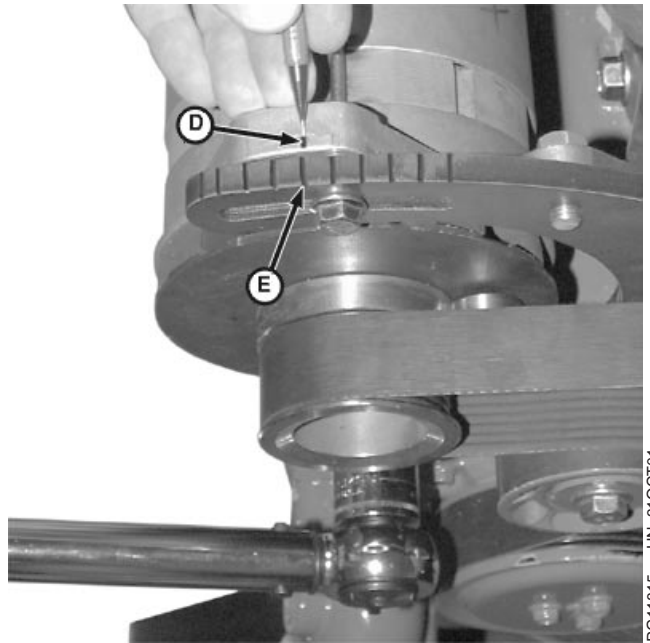
JDG1520 Belt Tensioning Tool Torque Table	
Desired Belt Tension N (lb-force)	Applied Torque N•m (lb-ft)
445 (100)	108 (90)
489 (110)	115 (85)
534 (120)	122 (90)
623 (140)	135 (100)

- While holding tension with torque wrench (B), scribe a reference mark (D) on alternator in line with notch (E) on upper alternator bracket.
- Continue to hold tension with torque wrench and tighten upper alternator bracket cap screw.
- Check position of reference mark to see if alternator moved while tightening. If alternator moved, loosen upper alternator bracket cap screw and repeat the tension adjustment procedure.
- Remove belt tension tool and tighten lower alternator bracket cap screw.

- A—Alternator
- B—Belt Tensioning Tool
- C—Torque Wrench
- D—Reference Mark
- E—Alternator Upper Bracket Notch



Belt Tension Tool and Torque Wrench



Scribe Reference Mark

RG11814 -UN-31OCT01

RG11815 -UN-31OCT01

OUOD002,000016D -19-05JUN02-2/2

Check Automatic Belt Tensioner Spring Tension and Belt Wear

Belt drive systems equipped with automatic (spring) belt tensioners cannot be adjusted or repaired. The automatic belt tensioners are designed to maintain proper belt tension over the life of the belt. If tensioner spring tension is not within specification, replace tensioner assembly.

OURGP12,0000158 -19-30AUG05-1/4

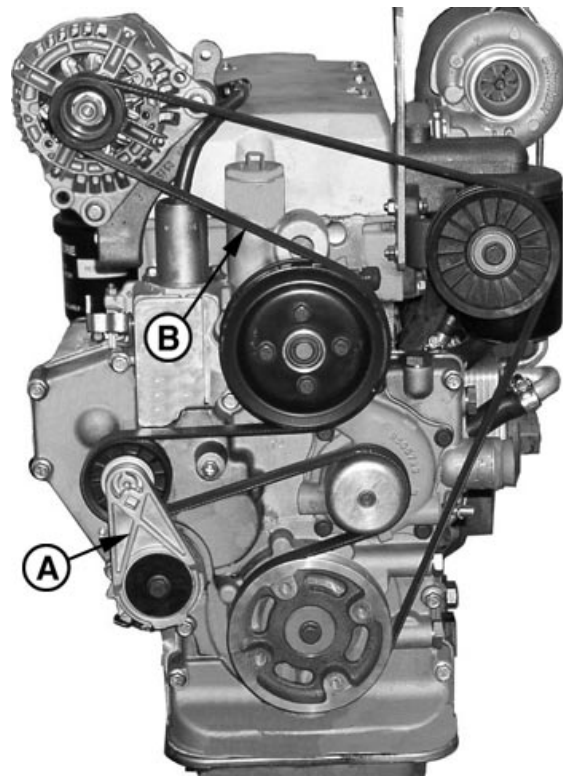
Check Belt Wear

The belt tensioner (A) is designed to operate within the limit of arm movement when correct belt length and geometry is used.

Visually inspect belt (B) for excessive wear and cracks. Replace belt as needed. (See Remove and Install Fan and Alternator Belts earlier in this section.)

NOTE: 2.4 L/3.0 L engine shown.

- A—Belt Tensioner
- B—Belt



RG12972 -UN-05JUN03

Belt Wear Inspection

Continued on next page

OURGP12,0000158 -19-30AUG05-2/4

Check Upper Tensioner Spring Tension

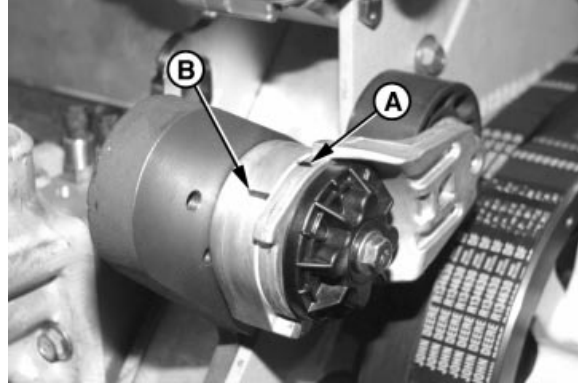
NOTE: While belt is loosened, inspect pulleys and bearings. Rotate and feel for hard turning or any unusual sounds. If pulleys or bearings need replacement, see your John Deere dealer.

A belt tension gauge will not give an accurate measure of the belt tension when automatic spring tensioner is used. Measure tensioner spring tension using a torque wrench and procedure outlined below:

1. Release tension on belt using a long-handled 1/2-inch drive tool (3/8-inch drive tool on 2.4L/3.0L engines) in square hole in end of tensioner arm. Remove belt from pulleys. (Release tension using drive tool and socket on older tensioner arms.)
2. Release tension on tensioner arm and remove drive tool.
3. Put a mark (A) on swing arm of tensioner as shown.
4. Measure 21 mm (0.83 in.) from first mark (A) and put a second mark (B) on tensioner mounting base.
5. Rotate the swing arm using a torque wrench until marks (A and B) are aligned.
6. Record torque wrench measurement and compare with specification below. Replace tensioner assembly as required.

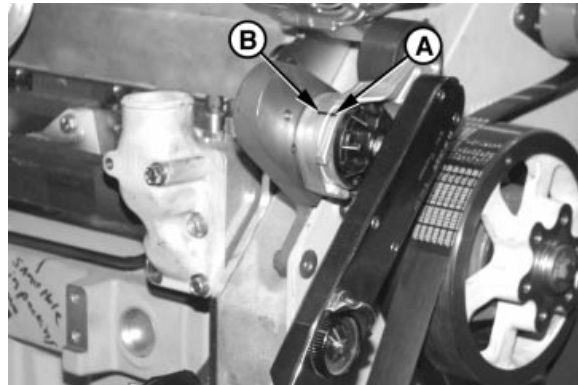
Specification

Upper Spring Tension (2.4L/3.0L and 4.5L/6.8L Engines)—Torque	18–22 N•m (13–16 lb-ft)
Upper Spring Tension (8.1L and 9.0 L Engines)—Torque	24–28 N•m (17–21 lb-ft)
Upper Spring Tension (10.5L/12.5L and 13.5L Engines)—Torque.....	18–23 N•m (13–17 lb-ft)



Marks on Tensioner

RG8727 -UN-10DEC97



Align Marks

RG8726 -UN-10DEC97

A—Mark on Swing Arm
B—Mark on Tensioner Mounting Base

Continued on next page

OURGP12,0000158 -19-30AUG05-3/4

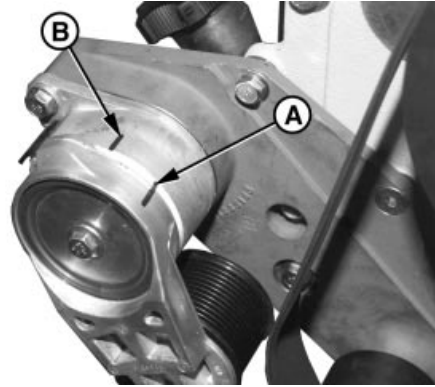
Check Lower Tensioner Spring Tension (If equipped)

A belt tension gauge will not give an accurate measure of the belt tension when automatic spring tensioner is used. Measure tensioner spring tension using a torque wrench and procedure outlined below:

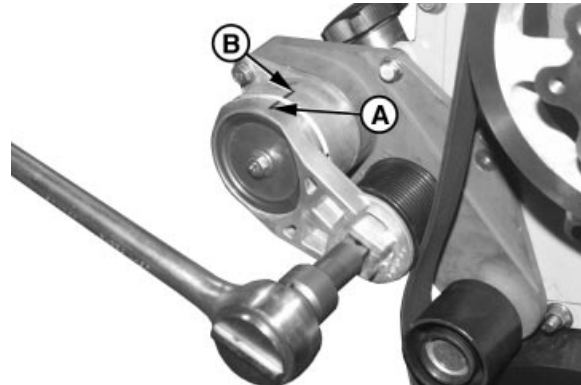
1. Release tension on belt using a long-handled 3/4-in. drive tool in tensioner arm. Remove belt from pulleys.
2. Release tension on tensioner arm and remove drive tool.
3. Put a mark (A) on swing arm of tensioner as shown.
4. Measure 25 mm (1.0 in.) from first mark (A) and put a second mark (B) on tensioner mounting base.
5. Rotate the swing arm using a torque wrench until marks (A and B) are aligned.
6. Record torque wrench measurement and compare with specification below. Replace tensioner assembly as required.

Specification

Lower Spring Tension—Torque 81–99 N•m (60–73 lb-ft)



Marks on Tensioner



Align Marks

- A—Mark on Swing Arm
- B—Mark on Tensioner Mounting Base

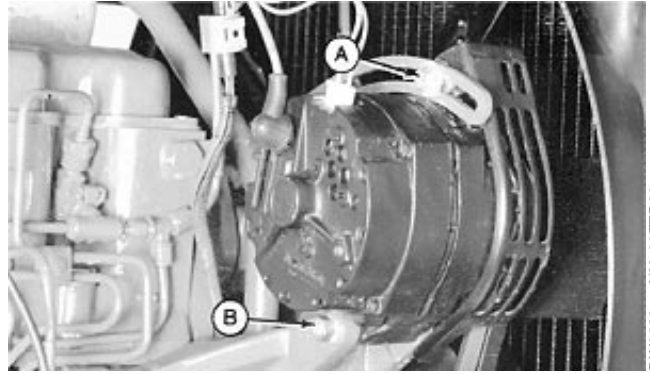
Adjust Fan and Alternator Belts

A loose belt will slip, causing excessive cover wear, burn spots and overheating. Also, a loose belt may “slip and grab”, causing the belt to break.

Too much belt tension can cause belt heating and excessive stretch. Excessive belt tightness will also put heavier loads on the drive components and bearings causing them to fail prematurely.

IMPORTANT: DO NOT tighten or loosen belts while they are hot. DO NOT pry against alternator rear frame.

1. Loosen alternator bracket cap screw (A) and nut (B) on mounting bolt.
2. Apply outward pressure to alternator front frame until correct belt tension is achieved. (See Check Fan and Alternator Belts in this group.)
3. Secure alternator by tightening alternator bracket cap screw and mounting bolt nut.
4. Operate engine for 10 minutes. Stop engine and recheck belt tension. If tension is not within specifications, wait 10 minutes and repeat belt adjust procedure.



RW6826 -UN-22FEB90

A—Alternator Bracket Cap Screw
B—Nut

DPSG,OUO1004,719 -19-17MAR99-1/1

Essential Tools

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

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DPSG,OUO1047,8 -19-22FEB99-1/2

RG6246 -UN-05DEC97

Dial Indicator D17526CI (English, in.) D17527CI
(Metric, mm)

Used to adjust drive shaft end play.



RG6246

DPSG,OUO1047,8 -19-22FEB99-2/2

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

DPSG,OUO1047,9 -19-22FEB99-1/4

Three-Jaw Puller D01251AA

For removing pilot bearing.

DPSG,OUO1047,9 -19-22FEB99-2/4

Push-Puller D01290AA

For removing clutch assembly.

Continued on next page

DPSG,OUO1047,9 -19-22FEB99-3/4

Rear PTO - Rockford/Twin Disc

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2

Ram/Pump Set D01055AA

For separating clutch assembly and drive shaft.

DPSG,OUO1047,9 -19-22FEB99-4/4

Rockford/Twin Disc Rear Power Take-Off Specifications

Item	Measurement	Specification
Series 300 Drive Disk	Maximum Thickness	7 mm (0.313 in.)
Series 400 Clutch Disk	Thickness	10.90—11.51 mm (0.424—0.453 in.)
Series 500, 6619A (-027449)	Thickness	10.89—11.51 mm (0.429—0.453 in.)
Series 500, 6619A (027450-); 6101H,A and 8.1 L, 10.5 L and 12.5 L	Thickness	15.75—16.00 mm (0.620—0.630 in.)
Series 700 Clutch Disk	Thickness	15.75—16.00 mm (0.620—0.630 in.)
Series 300 Clutch Separator Springs	Compressive Load at 67—89 N (15—20 lb)	20.06 mm (0.81 in.)
Series 400 Clutch Separator Springs		
6466D, T; 6466A (-041994)	Free Length Compressive Load at 67—84 N (15—20 lb)	26.9 mm (1.06 in.) 20.06 mm (0.81 in.)
6466A (041995—); 6076T,A,H	Free Length Compressive Load at 67—89 N (15—20 lb)	50.8 mm (2.00 in.) 30.16 mm (1.18 in.)
Series 500 Separator Springs—Early	Free Length Compressive Load at 67—89 N (15—20 lb)	26.9 mm (1.06 in.) 20.06 mm (0.81 in.)
Series 400 Pilot Bearing	ID OD	29.99—30.00 mm (1.1808—1.1811 in.) 71.99—72.00 mm (2.8342—2.8346 in.)
Series 500 Pilot Bearing—Early	ID OD	29.992—30.000 mm (1.1808—1.1811 in.) 71.998—72.000 mm (2.8342—2.8346 in.)

Continued on next page

DPSG,OUO1004,740 -19-23MAR99-1/4

Rear PTO - Rockford/Twin Disc

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4

Item	Measurement	Specification
Series 500 (Late) and 8.1 L, 10.5 L and 12.5 L Pilot Bearing	ID	34.98—35.00 mm (1.3775—1.3780 in.)
	OD	79.98—80.00 mm (3.1491—3.1496 in.)
Series 700 Pilot Bearing	ID	34.98—35.00 mm (1.3775—1.3780 in.)
	OD	79.98—80.00 mm (3.1491—3.1496 in.)
Series 400 Clutch Drive Shaft 6466D,T; 6466A (-041994)	At Pilot Bearing	29.992—30.002 mm (1.1808—1.1811 in.)
	At Bearing Surface Side-load Application	57.188—57.214 mm (2.2515—2.2525 in.)
	At Bearing Surface In-line Application	56.718—57.023 mm (2.2330—2.2450 in.)
	At Release Collar Surface	57.099—57.125 mm (2.2480—2.2490 in.)
Series 400 Clutch Drive Shaft 6466A (041995—); 6076T,A,H	At Pilot Bearing	29.992—30.002 mm (1.1808—1.1811 in.)
	At Bearing Surface Side-load Application	66.713—66.739 mm (2.6265—2.6275 in.)
	At Bearing Surface In-line Application	65.938—66.243 mm (2.5960—2.6080 in.)
	At Release Collar Sliding Surface	62.205—63.500 mm (2.4490—2.5000 in.)
Early Series 500 Clutch Drive Shaft	At Pilot Bearing	29.992—30.002 mm (1.1808—1.1812 in.)

Continued on next page

DPSG.OUO1004,740 -19-23MAR99-2/4

Item	Measurement	Specification
At Bearing Surface Side Load Applications	OD	57.188—57.214 mm (2.2515—2.2525 in.)
At Bearing Surface In-line Application	OD	56.718—57.023 mm (2.2330—2.2450 in.)
At Release Collar Sliding Surface	OD	57.099—57.125 mm (2.2480—2.2490 in.)
Late Series 500 and 8.1 L, 10.5 L and 12.5 L Clutch Drive Shaft		
At Pilot Bearing	OD	34.99—35.00 mm (1.3776—1.3781 in.)
At Bearing Surface Side Load Applications	OD	88.94—88.96 mm (3.5015—3.5025 in.)
At Bearing Surface In-line Application	OD	79.99—80.01 mm (3.1495—3.1501 in.)
At Release Collar Sliding Surface	OD	76.10—76.15 mm (2.9960—2.9980 in.)
Series 700 Clutch Drive Shaft		
At Pilot Bearing	OD	34.99—35.00 mm (1.3776—1.3781 in.)
At Bearing Surface Side-Load Application	OD	88.94—88.96 mm (3.5015—3.5025 in.)
At Bearing Surface In-Line Application	OD	79.99—80.01 mm (3.1495—3.1501 in.)
At Release Collar Sliding Surface	OD	76.10—76.15 mm (2.9960—2.9980 in.)
Yoke Cap Screws	Torque	27 N•m (20 lb-ft)
Yoke Handle Cap Screw	Torque	27 N•m (20 lb-ft)
Series 400 Drive Shaft	End Play	0.10—0.15 mm (0.004—0.006 in.)

Continued on next page

DPSG,UOU1004,740 -19-23MAR99-3/4

Rear PTO - Rockford/Twin Disc

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Item	Measurement	Specification
Series 500, 8.1 L, 10.5 L and 12.5 L Drive Shaft	End Play	0.10—0.15 mm (0.004—0.006 in.)
Series 700 Drive Shaft	End Play	0.10—0.15 mm (0.004—0.006 in.)
Side Load Clutch Shaft	Endplay	0.10—0.15 mm (0.004—0.006 in.)
Release Collar Nuts	Torque	27 N•m (20 lb-ft)
Drive Shaft Retaining Nut	Torque	230—244 N•m (170—180 lb-ft)
Flywheel Housing Face Run-Out	Maximum Variation	0.20 mm (0.008 in.)
Flywheel Face Flatness	Maximum Variation Maximum Variation per 25 mm (1.0 in.) of Travel	0.23 mm (0.009 in.) 0.013 mm (0.0005 in.)
Flywheel Pilot Bearing Bore Concentricity	Maximum Variation	0.127 mm (0.005 in.)
Clutch Drive Ring Cap Screws	Torque	47 N•m (35 lb-ft)
Clutch Housing-To-Flywheel Housing Cap Screws		
Side-Load Application	Torque	47 N•m (35 lb-ft)
In-Line Application	Torque	75 N•m (55 lb-ft)
Clutch Engagement		
Series 300	Force	267—311 N (60—70 lb)
Series 400, 6466D, T; 6466A (-01994)	Force	267—311 N (60—70 lb)
Series 400, 6466A (041995-); 6076T,A,H	Force	289—333 N (65—75 lb)
Series 500, 6619A (-027449)	Force	267—311 N (60—70 lb)
Series 500, 6619A (027450-), 6101H,A and 8.1 L, 10.5 L and 12.5 L	Force	289—333 (65—75 lb)
Series 700	Force	378—422 (85—95 lb)

DPSG.OUO1004,740 -19-23MAR99-4/4

General Information

The direct-drive power take-off unit is designed to permit engine power to gradually be transferred to any application by use of the PTO clutch unit.

The power take-off assembly may be either an in-line or side-load application. The side-load application cannot be used for in-line work and the in-line application cannot be used for side-load work.

S11,5005,AS -19-02FEB94-1/1

Diagnosing Malfunctions

Clutch Slips

- Clutch out of adjustment
- Worn or burned clutch
- Oil or grease on clutch facings

Clutch Grabs or Chatters

- Loose or worn drive ring
- Worn teeth on clutch facings

Clutch Noise

- Clutch loose on drive shaft
- Drive ring loose

Clutch Will Not Release

- Frozen pilot bearing

Clutch Drag

- Broken lever springs

- Rough clutch splines
- Clutch facings oil soaked
- Clutch parts worn
- Excessive clutch face runout

Clutch Engages Itself

- Improper adjustment
- Worn linkage
- Worn release collar

Drive Shaft Bearing Runs Hot

- Insufficient bearing end-play
- Excessive bearing lubrication
- Insufficient bearing lubrication

Defective Pilot Bearing

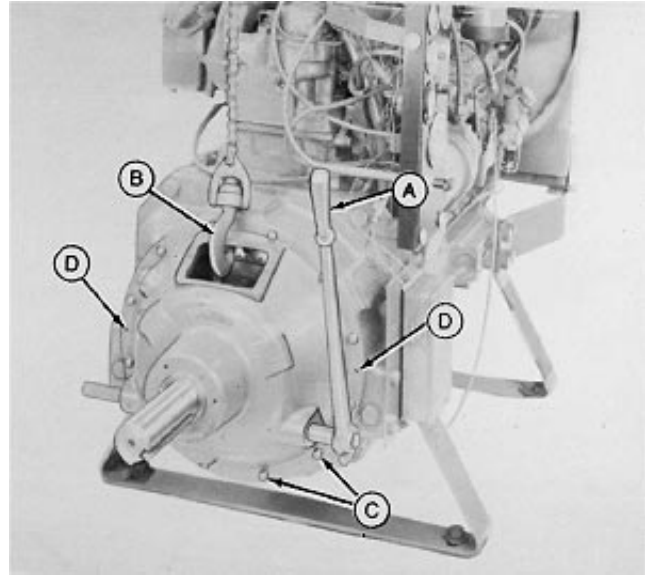
- Improper removal or installation
- Lack of lubrication.

S11,5005,A -19-02FEB94-1/1

Remove Power Take-Off

1. Engage clutch operating lever (A).
2. Remove name plate to access opening for hook (B).
3. Insert hook securely. Raise hoist to support power take-off.
4. Remove 12 cap screws (C).
5. Install two cap screws into tapped holes (D) in housing. Tighten cap screws evenly to separate PTO unit from flywheel housing.

A—Operating Lever
B—Hook
C—Cap Screws
D—Tapped Holes



RG4657 -UN-19JAN90

S11,5005,AT -19-02FEB94-1/1

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10
Power Take-Off Exploded View

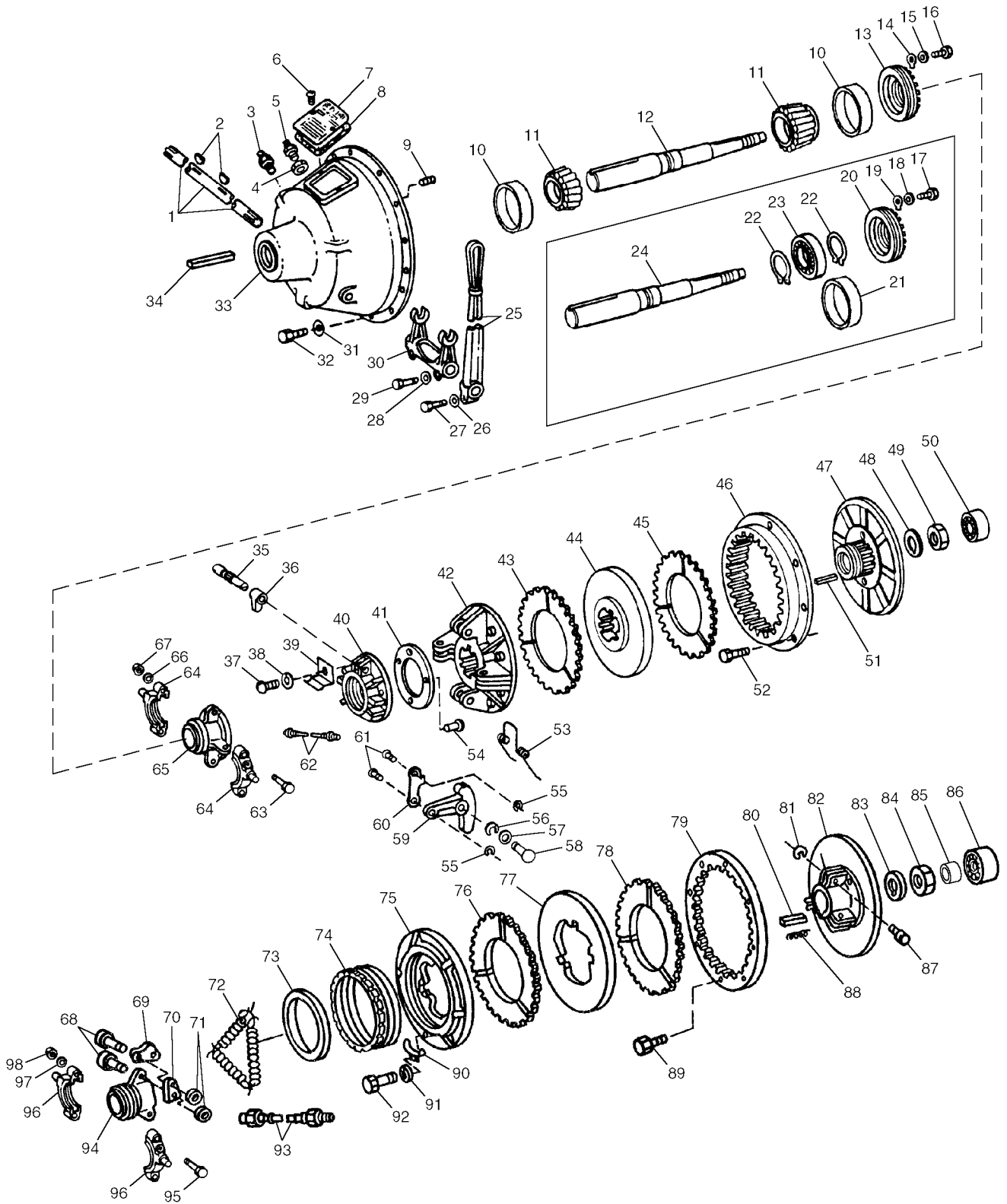


Fig. 2 - PTO Assembly

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DPSG.OUO1004,742 -19-24MAR99-1/2

RG9531 -UN-25MAR99

- | | | | |
|--------------------------|------------------------|-------------------------|-----------------------------|
| 1—Yoke Shaft | 21—Spacer ¹ | 47—Clutch Body | 73—Plate |
| 2—Woodruff Key | 22—Snap Ring (2 used) | 48—Washer | 74—Adjusting Ring |
| 3—Lubrication Fitting | 23—Bearing | 49—Nut | 75—Pressure Plate |
| 4—Nut | 24—Drive Shaft | 50—Bearing | 76—Driving Disk |
| 5—Lubrication Fitting | 25—Handle | 51—Key | 77—Center Plate (if used) |
| 6—Screw | 26—Washer | 52—Cap Screw (8 used) | 78—Driving Disk (if used) |
| 7—Plate | 27—Cap Screw | 53—Spring (4 used) | 79—Driving Ring |
| 8—Gasket | 28—Washer (2 used) | 54—Rivet | 80—Key |
| 9—Set Screw | 29—Cap Screw (2 used) | 55—Snap Ring (8 used) | 81—Snap Ring (3 used) |
| 10—Bearing Cup (2 used) | 30—Yoke | 56—Snap Ring (4 used) | 82—Clutch Body |
| 11—Bearing Cone (2 used) | 31—Washer (12 used) | 57—Washer (8 used) | 83—Lock Washer |
| 12—Drive Shaft | 32—Cap Screw (12 used) | 58—Pin (4 used) | 84—Nut |
| 13—Bearing Retainer | 33—Housing | 59—Lever (4 used) | 85—Spacer (if used) |
| 14—Lock Plate | 34—Key | 60—Link (8 used) | 86—Bearing |
| 15—Washer | 35—Pin | 61—Pin (8 used) | 87—Pin (3 used) |
| 16—Cap Screw | 36—Lock | 62—Grease Tube | 88—Spring (3 used) |
| 17—Cap Screw | 37—Cap Screw | 63—Cap Screw (2 used) | 89—Cap Screw (8 used) |
| 18—Washer | 38—Lock Washer | 64—Release Collar | 90—Lock |
| 19—Lock Plate | 39—Spring | 65—Release Sleeve | 91—Lock Washer |
| 20—Bearing Retainer | 40—Adjusting Ring | 66—Lock Washer (2 used) | 92—Cap Screw |
| | 41—Wear Plate | 67—Lock Nut (2 used) | 93—Grease Tube |
| | 42—Pressure Plate | 68—Pin (6 used) | 94—Release Sleeve |
| | 43—Driving Disk | 69—Lever (3 used) | 95—Cap Screw (2 used) |
| | 44—Center Plate | 70—Link (6 used) | 96—Release Collar |
| | 45—Driving Disk | 71—Snap Ring (6 used) | 97—Lock Washer (2, if used) |
| | 46—Driving Ring | 72—Spring | 98—Lock Nut (2 used) |

NOTE: Parts (10—16) are for side-load PTO applications.

NOTE: Parts (68—98) are for early version PTO.

NOTE: Parts (17—24) are for in-line PTO applications.

¹ On some early version in-line PTO's, spacer (21) is installed on right side of drive shaft. Bearing (23) with snap rings is then installed on left side of shaft.

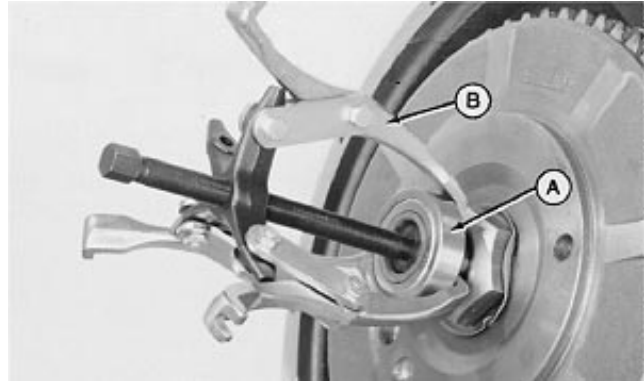
Disassemble Power Take-Off

1. Remove pilot bearing (A) using the D01251AA Bearing Puller (B).

NOTE: Some early model PTO's may have a spacer beneath bearing.

2. Remove spacer (if equipped).

A—Pilot Bearing
B—Bearing Puller

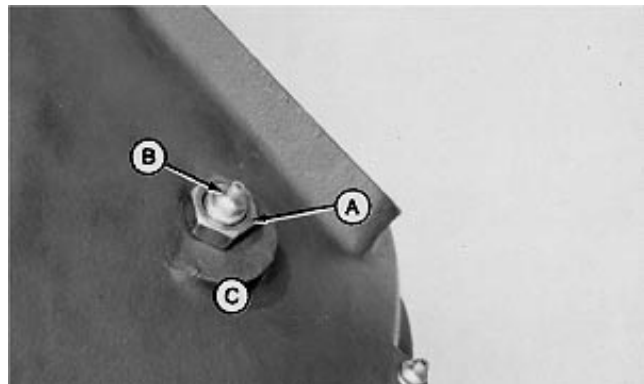


RG3715 -UN-25SEP89

DPSG,OUO1004,736 -19-23MAR99-1/6

3. Remove nut (A).
4. Disconnect grease tube (B) from housing (C).

A—Nut
B—Tube
C—Housing

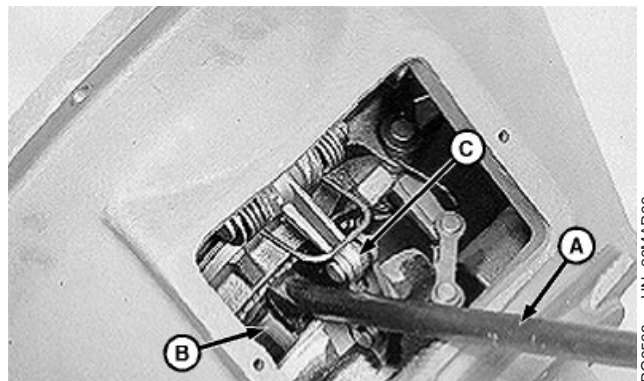


RG3716 -UN-25SEP89

DPSG,OUO1004,736 -19-23MAR99-2/6

5. Insert bar (A) between release lever (C) and drive shaft (B) through inspection hole to keep drive shaft from turning.

A—Bar
B—Drive Shaft
C—Release Lever



RG9533 -UN-26MAR99

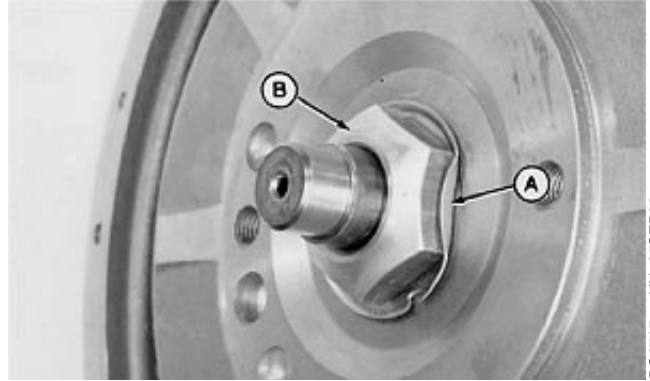
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DPSG,OUO1004,736 -19-23MAR99-3/6

6. Bend back tab on lock washer (A) from nut (B).
7. Remove nut.

NOTE: Nut has right-hand threads.

A—Washer
B—Nut



RG3717 -UN-26SEP89

Continued on next page

DPSG.OUO1004.736 -19-23MAR99-4/6

NOTE: Later model clutch assemblies do not have tapped holes to install D01290AA Puller. Use another suitable puller.

8. Install D01290AA Push Puller (D) using two 3/4—10 x 5 in. cap screws (B) and two flat washers (C) to break clutch assembly (A) loose from drive shaft.

CAUTION: Clutch unit is heavy. Use care in handling.

NOTE: For ease and convenience, it may be necessary to use D01055AA Ram/Pump Set (not shown) along with push puller to remove clutch assembly.

9. Remove puller and place clutch assembly on clean work bench with release lever up.

Remove Yoke

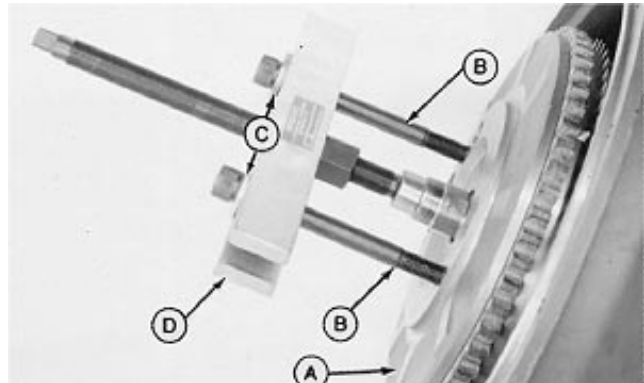
NOTE: See exploded view at the beginning of this group for illustration of parts referred to in following removal steps.

1. Loosen cap screws (29) on yoke (30) and operating lever (25). Remove lever.
2. Drive yoke either left or right to expose Woodruff keys (2). Remove keys.
3. Withdraw yoke shaft (1) from yoke and housing. Remove yoke.

Disassemble Clutch Assembly (Early Version)

NOTE: See exploded view at the beginning of this group for illustration of parts referred to in following removal steps.

1. Remove release lever spring (72) from release sleeve assembly.
2. Mark both halves of release collar (96) for reassembly.
3. Remove cap screws (95) and nuts (98) and separate collar from release sleeve (94).
4. Remove pins (87) and discard retaining rings (81).



A—Clutch Assembly
B—Cap Screw (2 used)
C—Flat Washer (2 used)
D—D01290AA Push Puller

RG3719 -UN-26SEP89

5. Remove release sleeve from clutch assembly.
6. Remove adjusting lock (90).
7. Remove adjusting ring (74) by unscrewing from pressure plate (75).
8. Lift pressure plate from clutch body.
9. Remove driving disk (76). On double-disk units, remove center plate (77) and second driving disk (78).
10. Remove separator springs (88) from body.
11. Remove clutch assembly.

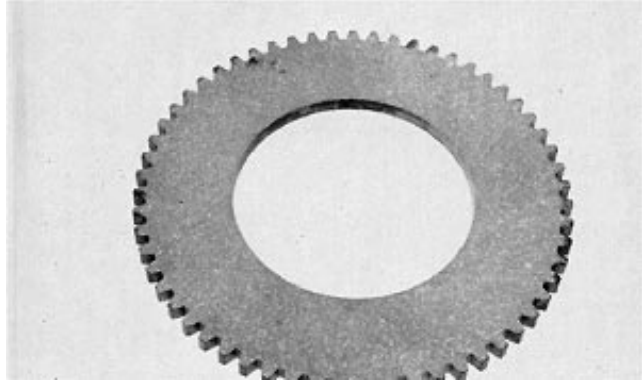
Disassemble Clutch Assembly (Later Version)

NOTE: See exploded view at the beginning of this group for illustration of parts referred to in following removal steps.

1. Remove snap rings (55) and pins (61) attaching links (60) to levers (59).
2. Remove release sleeve assembly from clutch body.
3. Remove links (60) from release sleeve.
4. Mark halves of release collar (64) for reassembly and remove from release sleeve (65).
5. Remove adjusting lock parts (35—39).
6. Remove adjusting ring assembly (40) by rotating counterclockwise.
7. Remove levers (59) from pressure plate (42).
8. Remove springs (53).
9. Remove parts (42—45) from clutch body.
10. Remove clutch assembly.

Inspect Power Take-Off Parts

1. Inspect clutch driving disks for worn driving teeth and burned or scored friction faces. Replace as necessary.
2. Check thickness of clutch driving disks.



RG3726 -UN-26SEP89

Specification

Series 300 Drive Disk—Maximum Thickness.....	7 mm (0.313 in.)
Series 400 Clutch Disk—Thickness.....	10.90—11.51 mm (0.424—0.453 in.)
Series 500, 6619A (-027449)—Thickness.....	10.89—11.51 mm (0.429—0.453 in.)
Series 500, 6619A (027450-); 6101H,A and 8.1L, 10.5L and 12.5L—Thickness.....	15.75—16.00 mm (0.620—0.630 in.)
Series 700 Clutch Disk—Thickness.....	15.75—16.00 mm (0.620—0.630 in.)

Replace as necessary.

3. Inspect separator springs for correct tension.

Specification

Series 300 Clutch Separator Springs—Compressive Load at 67—89 N (15—20 lb).....	20.06 mm (0.81 in.)
Series 400 Clutch Separator Springs—Specification	
6466D, T; 6466A (-041994)—Free Length.....	26.9 mm (1.06 in.)
Compressive Load at 67—84 N (15—20 lb).....	20.06 mm (0.81 in.)
6466A (041995—); 6076T,A,H—Free Length.....	50.8 mm (2.00 in.)
Compressive Load at 67—89 N (15—20 lb).....	30.16 mm (1.18 in.)

Specification

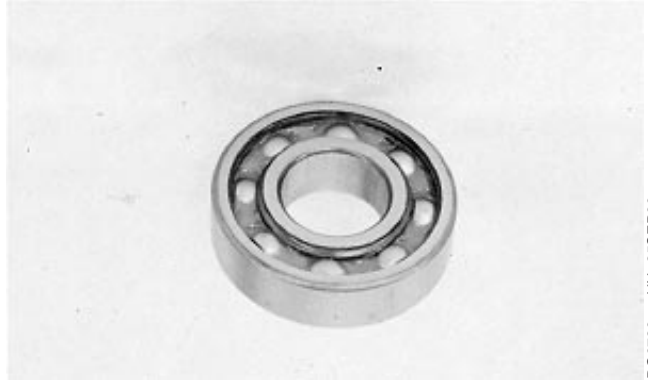
Series 500 Separator Springs—Early—Free Length.....	26.9 mm (1.06 in.)
Compressive Load at 67—89 N (15—20 lb).....	20.06 mm (0.81 in.)

Replace any spring that is rusted, bent or distorted.

4. Inspect pilot bearing for roughness and wear.

Specification

Series 400 Pilot Bearing—ID	29.99—30.00 mm (1.1808—1.1811 in.)
OD	71.99—72.00 mm (2.8342—2.8346 in.)
Series 500 Pilot Bearing—Early— ID	29.992—30.000 mm (1.1808—1.1811 in.)
OD	71.998—72.000 mm (2.8342—2.8346 in.)
Series 500 (Late) and 8.1 L, 10.5 L and 12.5 L Pilot Bearing—ID	34.98—35.00 mm (1.3775—1.3780 in.)
OD	79.98—80.00 mm (3.1491—3.1496 in.)
Series 700 Pilot Bearing—ID	34.98—35.00 mm (1.3775—1.3780 in.)
OD	79.98—80.00 mm (3.1491—3.1496 in.)



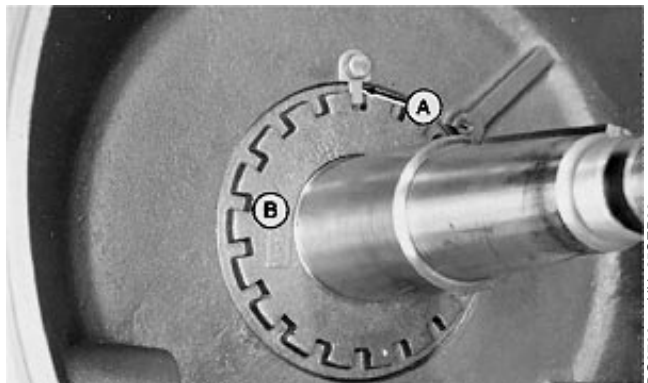
RG3729 -UN-26SEP89

Replace as necessary.

DPSG,OUO1004,725 -19-18MAR99-2/7

5. To inspect or replace bearings, remove lock plate (A).
6. Turn bearing retainer (B) counterclockwise and remove using a brass drift and hammer.
7. On in-line applications, remove grease fitting from output end of drive shaft.
8. Remove bearing from housing by striking output end of drive shaft with a soft hammer.

A—Lock Plate
B—Bearing Retainer



RG3730 -UN-25SEP89

Continued on next page

DPSG,OUO1004,725 -19-18MAR99-3/7

9. On side-load PTO application, rear bearing cup will remain in housing. Drive cup from housing by alternately driving a punch in holes at rear of housing rear drive shaft bore.
10. Press drive shaft from bearing. On in-line applications, remove snap rings (A and B) before pressing.

Inspect drive shaft and bearings for wear or damage. Replace as necessary. Clean shaft and bearings in clean solvent and blow dry.

A—Snap Ring
B—Snap Ring



RG3731 -UN-26SEP89

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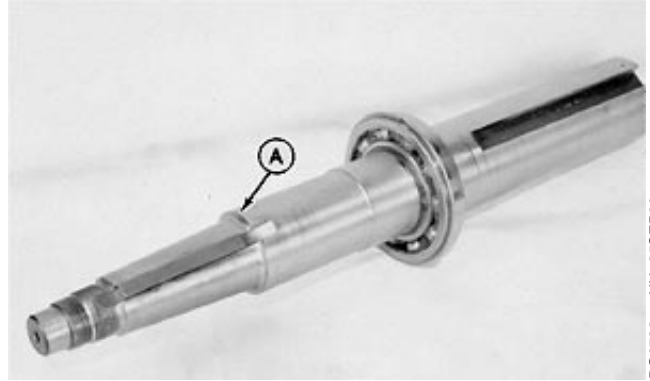
DPSG,OUO1004,725 -19-18MAR99-4/7

11. Check bearing surfaces (A) on clutch shaft for wear or roughness.

Series 400 Clutch Drive Shaft 6466D,T; 6466A (-041994):

**Series 400 Clutch Drive Shaft 6466D,T; 6466A (-041994)—
Specification**

At Pilot Bearing—OD.....	29.992—30.002 mm (1.1808—1.1811 in.)
At Bearing Surface Side-load Application—OD	57.188—57.214 mm (2.2515—2.2525 in.)
At Bearing Surface In-line Application—OD	56.718—57.023 mm (2.2330—2.2450 in.)
At Release Collar Surface—OD.....	57.099—57.125 mm (2.2480—2.2490 in.)



RG3732 -UN-26SEP89

A—Bearing Surface

**Series 400 Clutch Drive Shaft 6466A (041995—);
6076T,A,H:**

**Series 400 Clutch Drive Shaft 6466A (041995—); 6076T,A,H—
Specification**

At Pilot Bearing—OD.....	29.992—30.002 mm (1.1808—1.1811 in.)
At Bearing Surface Side-load Application—OD	66.713—66.739 mm (2.6265—2.6275 in.)
At Bearing Surface In-line Application—OD	65.938—66.243 mm (2.5960—2.6080 in.)
At Release Collar Sliding Surface—OD	62.205—63.500 mm (2.4490—2.5000 in.)

Early Series 500 Clutch Drive Shaft:

Early Series 500 Clutch Drive Shaft—Specification

At Pilot Bearing—OD.....	29.992—30.002 mm (1.1808—1.1812 in.)
At Bearing Surface Side Load Applications—OD	57.188—57.214 mm (2.2515—2.2525 in.)
At Bearing Surface In-line Application—OD	56.718—57.023 mm (2.2330—2.2450 in.)
At Release Collar Sliding Surface—OD	57.099—57.125 mm (2.2480—2.2490 in.)

**Late Series 500 and 8.1 L, 10.5 L and 12.5 L Clutch
Drive Shaft:**

**Late Series 500 and 8.1 L, 10.5 L and 12.5 L Clutch Drive Shaft—
Specification**

At Pilot Bearing—OD.....	34.99—35.00 mm (1.3776—1.3781 in.)
At Bearing Surface Side Load Applications—OD	88.94—88.96 mm (3.5015—3.5025 in.)
At Bearing Surface In-line Application—OD	79.99—80.01 mm (3.1495—3.1501 in.)
At Release Collar Sliding Surface—OD	76.10—76.15 mm (2.9960—2.9980 in.)

Series 700 Clutch Drive Shaft:

Series 700 Clutch Drive Shaft—Specification

At Pilot Bearing—OD.....	34.99—35.00 mm (1.3776—1.3781 in.)
At Bearing Surface Side-Load Application—OD	88.94—88.96 mm (3.5015—3.5025 in.)
At Bearing Surface In-Line Application—OD	79.99—80.01 mm (3.1495—3.1501 in.)
At Release Collar Sliding Surface—OD	76.10—76.15 mm (2.9960—2.9980 in.)

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DPSG.OUO1004,725 -19-18MAR99-6/7

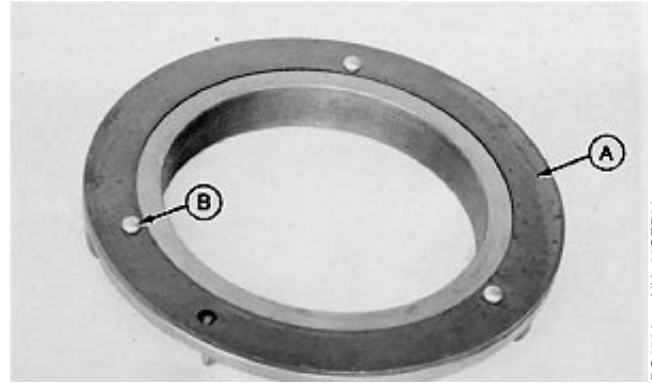
12. Inspect pressure plate, center plate (if used) and clutch body for scoring, cracks, or heat checks.

Splines on clutch body and pressure plate must be free from scratches and worn spots.

13. Check threads on adjusting ring and clutch body for wear and replace as necessary.
14. Inspect all pins, links, and levers for wear, damage, or holes out of round. Replace as necessary.
15. Inspect release sleeve, release bearing collar, and bearing retainer. Replace as necessary. Mark bearing collars for reassembly.
16. Inspect wear ring (A) on adjusting ring for wear around the O.D. of the wear face.

NOTE: *On later version PTO, wear ring is not serviceable. Replace adjusting ring assembly if worn.*

17. To replace wear ring, drive rivets (B, three used) out with a punch. Install new wear ring and secure with new rivets.



A—Wear Ring
B—Rivets

RG3728 -UN-26SEP89

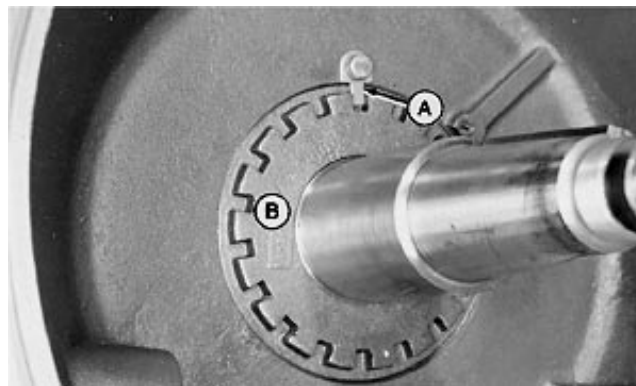
DPSG,OUO1004,725 -19-18MAR99-7/7

Assemble Drive Shaft and Bearings— Side-Load Application

(Refer to exploded view illustration at beginning of this group prior to following assembly procedure.)

⚠ CAUTION: Oil fumes or oil can ignite above 193°C (380°F). Use a thermometer and do not exceed 182°C (360°F). Do not allow a flame or heating element to be in direct contact with the oil. Heat the oil in a well-ventilated area. Plan a safe handling procedure to avoid burns.

1. Heat new bearing cones (11) in oil to no more than 149°C (300°F). (Do not heat cup.)
2. Install bearings on shaft (12) until bearing cones are flush against raised portion of shaft.
3. Remove rear bearing cup as previously directed.
4. Install new bearing cup into housing.
5. Pack bearings with grease.
6. Install shaft/bearing assembly into housing.
7. Install front bearing cup into bearing retainer.
8. Install bearing retainer by turning retainer clockwise.
9. Adjust drive shaft end play. (See Adjust Drive Shaft End Play-Side Load only as described later in this group.)
10. Install lock plate (A) and tighten securely.



A—Lock Plate
B—Bearing Retainer

RG3730 -UN-26SEP89

DPSG,OUO1004,741 -19-24MAR99-1/1

Assemble Drive Shaft and Bearings—In-Line Application



CAUTION: Oil fumes of oil can ignite above 193°C (380°F). Use a thermometer and do not exceed 182°C (360°F). Do not allow a flame or heating element to be in direct contact with the oil. Heat the oil in a well-ventilated area. Plan a safe handling procedure to avoid burns.

1. Install retaining ring (A) onto shaft.
2. Heat new bearing in oil to no more than 149°C (300°F).
3. Install new bearing on shaft until bearing is flush against snap ring.
4. Install retaining ring (B) on shaft/bearing assembly.
5. Pack bearings with grease.
6. Insert shaft with bearing into housing. If necessary, drive bearing into housing using a piece of pipe the same diameter as the bearing's outer race.
7. Install spacer.
8. Install bearing retainer, turning clockwise until retainer presses bearing to bottom of housing.
9. Install bearing retainer and lock plate.



RG3731 -UN-26SEP89

A—Retaining Ring
B—Retaining Ring

RG.CTM67,G45.3 -19-02FEB94-1/1

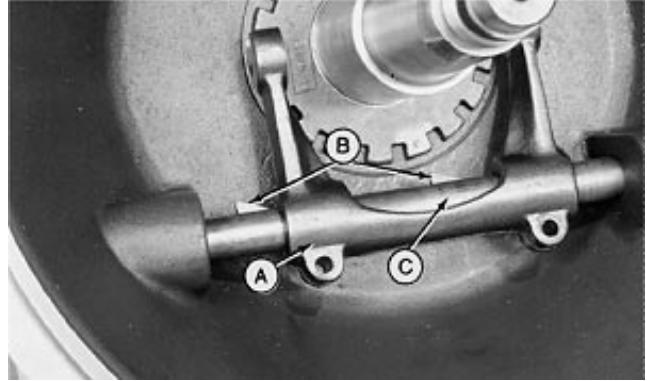
Install Yoke

1. Install yoke (A) and yoke shaft (C).

NOTE: Cap screw heads on yoke should face toward clutch.

2. Install Woodruff keys (B) into shaft.

- A—Yoke
- B—Woodruff Key
- C—Yoke Shaft



RG3725 -UN-25SEP89

S11,5005,AC -19-02FEB94-1/2

3. Center yoke onto yoke shaft (B) and tighten cap screws (C) to specifications.

Specification

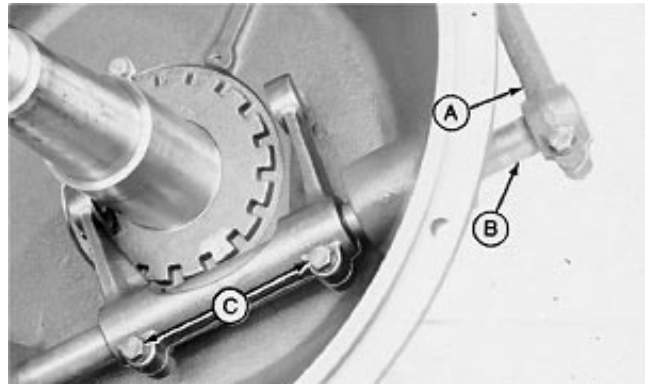
Yoke Cap Screws—Torque..... 27 N•m (20 lb-ft)

4. Install handle (A) onto shaft and tighten cap screw to specifications.

Specification

Yoke Handle Cap Screw—Torque..... 27 N•m (20 lb-ft)

- A—Handle
- B—Yoke Shaft
- C—Cap Screws



RG3724 -UN-25SEP89

S11,5005,AC -19-02FEB94-2/2

Check and Adjust Drive Shaft End Play

NOTE: End play can be adjusted on side load applications only.

1. Use a sling or similar device to cradle housing so that drive shaft is vertical.
2. Allow end of drive shaft to rest on wood block on floor.
3. Raise housing slightly and tap pilot end of shaft to seat parts.
4. Mount dial indicator on face of clutch housing and adjust pointer to rest on pilot end of drive shaft. Zero the indicator.
5. Lower housing so drive shaft rests on block.
6. For In-Line applications: measure end play and compare to the following specifications:

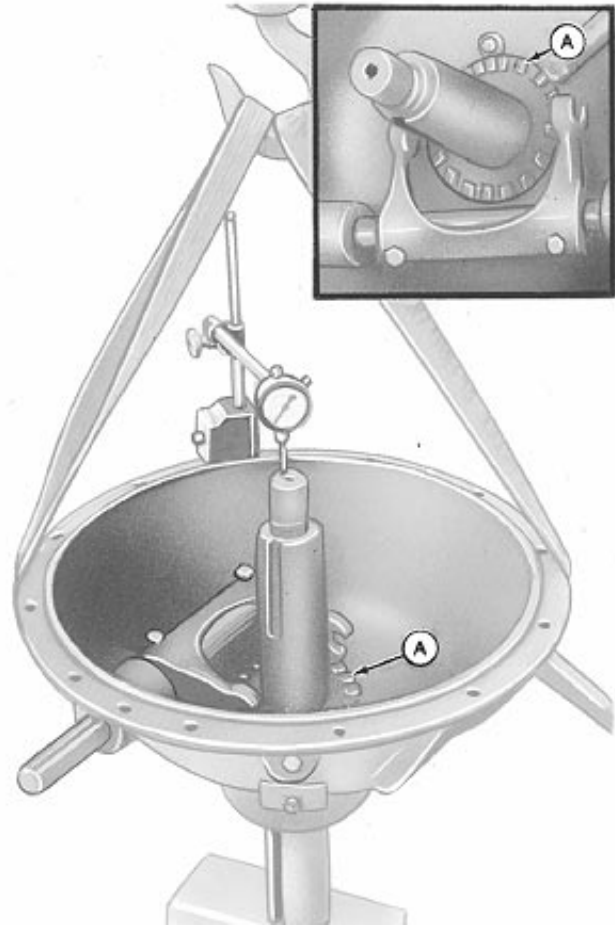
Specification

Series 400 Drive Shaft—End Play..... 0.10—0.15 mm (0.004—0.006 in.)
 Series 500, 8.1 L, 10.5 L and
 12.5 L Drive Shaft—End Play 0.10—0.15 mm (0.004—0.006 in.)
 Series 700 Drive Shaft—End Play..... 0.10—0.15 mm (0.004—0.006 in.)

7. For side load applications: Tap lightly around housing near drive shaft to seat front bearing in cup. Read indicator. Adjust drive shaft end play by turning bearing retainer (A) clockwise to decrease endplay.

Specification

Side Load Clutch Shaft—Endplay..... 0.10—0.15 mm (0.004—0.006 in.)

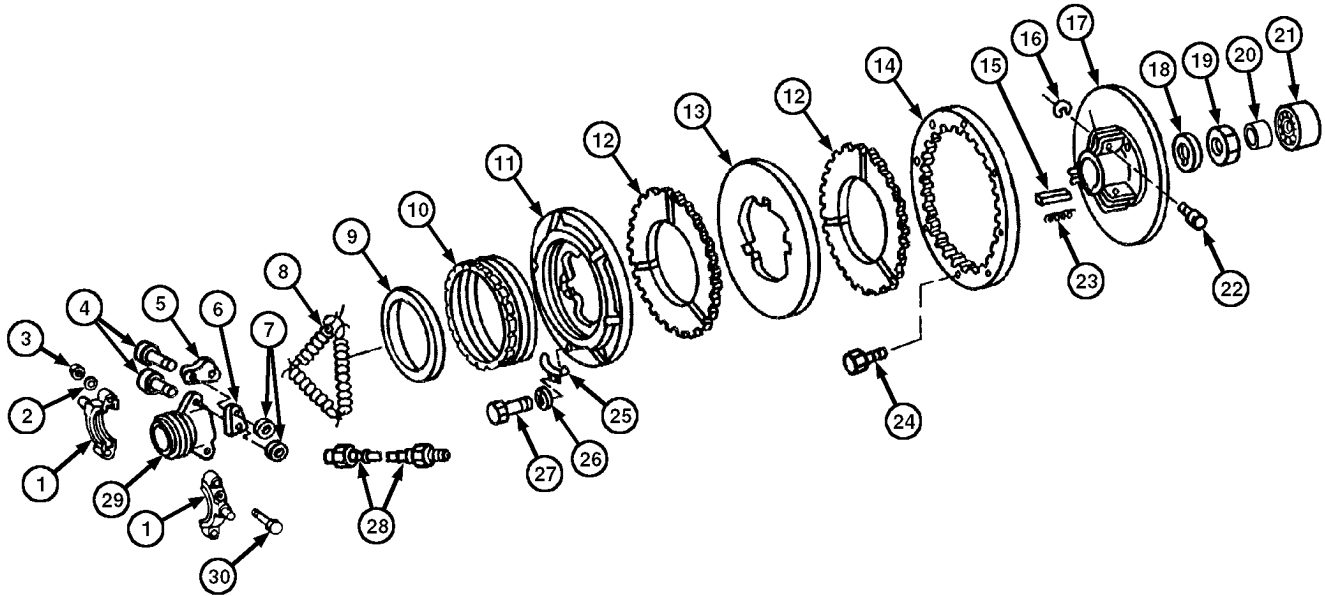


A—Bearing Retainer

RG3733 -UN-03MAR93

S11,5005,BJ -19-02FEB94-1/1

Assemble Clutch Unit (Early Version)



- | | | | |
|-------------------------|---------------------------|---------------------|-----------------------|
| 1—Release Collar | 9—Plate | 17—Clutch Body | 24—Cap Screw (8 used) |
| 2—Lock Washer (2 used) | 10—Adjusting Ring | 18—Lock Washer | 25—Lock |
| 3—Lock Nut (2, if used) | 11—Pressure Plate | 19—Nut | 26—Lock Washer |
| 4—Pin (6 used) | 12—Driving Disk (1 or 2) | 20—Spacer (if used) | 27—Cap Screw |
| 5—Lever (3 used) | 13—Center Plate (if used) | 21—Bearing | 28—Grease Tube |
| 6—Link (6 used) | 14—Driving Ring | 22—Pin (3 used) | 29—Release Sleeve |
| 7—Snap Ring (6 used) | 15—Key | 23—Spring (3 used) | 30—Cap Screw (2 used) |
| 8—Spring | 16—Snap Ring (3 used) | | |

1. Place clutch body (17) on bench with hub end up.
2. Install separator springs (23) in holes in clutch body.
3. Position clutch driving disk over hub.
4. On double-disk units, position center plate (13) and second driving disk (12) over hub.

Position pressure plate (11) over hub. Notches in I.D. of pressure plate must align with release lever bosses on clutch body. Lower pressure plate onto separator springs.

RG8534 -UN-25MAR99

Continued on next page

DPSG,OUO1004,737 -19-23MAR99-1/3

5. Screw adjusting ring (A) into pressure plate until it bottoms.
6. Install three release levers (B) with tab on lever facing out.
7. Insert pins (C) with heads facing direction of rotation. Secure pins with new retaining rings.
8. Apply grease to I.D. of clutch release sleeve collar halves.
9. Place two halves of release collar (D) together over shoulder of release sleeve, aligning scribe marks. Be sure machined side of collar faces up.
10. Install bolts (E) and nuts, tightening to specifications.

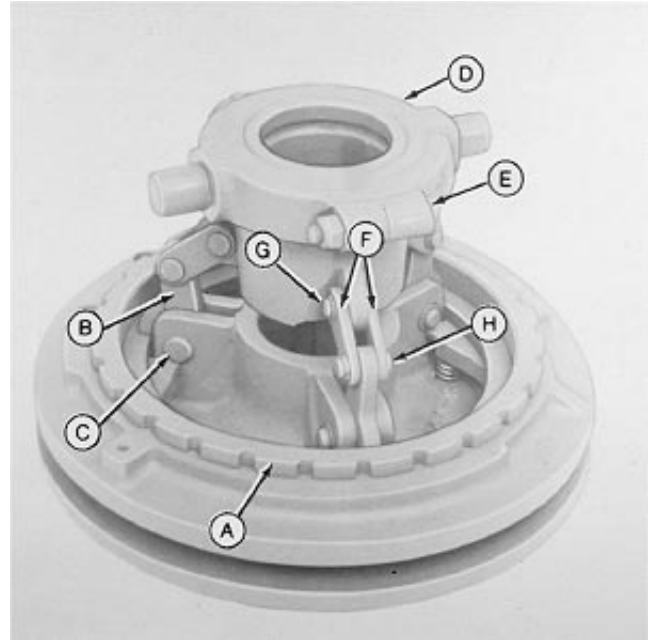
Specification

Release Collar Nuts—Torque 27 N•m (20 lb-ft)

11. Rotate collar to check for binding. If collar binds, shim between release collar halves to obtain clearance.
12. Place release lever spring (8) over release sleeve and against release collar before installing links (F).

NOTE: If links (F) were not removed from sleeve, go to Step 15.

13. Place one link on each side of ear on release sleeve with triangular tab on link at release sleeve and point of triangle facing center of sleeve.
14. Install pins (G) with heads facing direction of rotation. Secure pins with new retaining rings.
15. Install release sleeve assembly on clutch with each pair of links astride release lever. Install pins (H) and retaining rings.
16. Slide release lever spring (8) into place over release levers.
17. Remove driving ring (14) from flywheel.
18. Center clutch driving disk(s) between clutch body and pressure plate using driving ring (14).

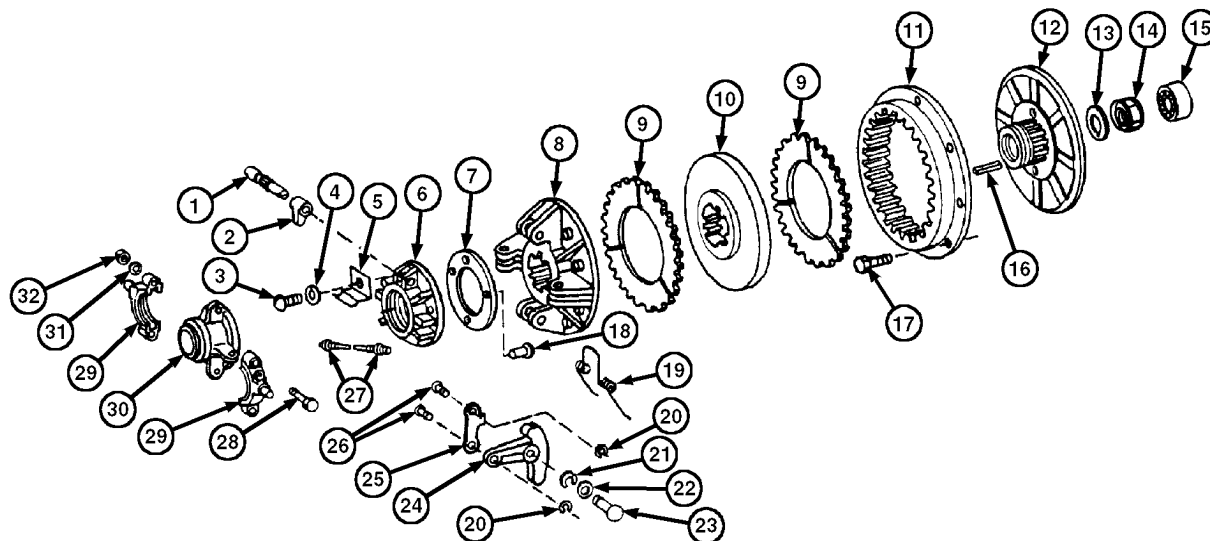


RG4656 -UN-19/JAN90

- A—Adjusting Ring
- B—Release Lever
- C—Pin
- D—release Collar
- E—Bolt
- F—Links
- G—Pin
- H—Pin

19. Turn adjusting ring (10) counterclockwise until pressure plate almost contacts driving disk.
20. Engage clutch by applying pressure to release sleeve. If driving disk can be moved, adjust ring counterclockwise enough to lock driving disk in place.

Assemble Clutch Unit (Late Version)



- | | | | |
|------------------|-------------------------|-----------------------|-------------------------|
| 1—Pin | 9—Driving Disk (2 used) | 17—Cap Screw (8 used) | 25—Link (8 used) |
| 2—Lock | 10—Center Plate | 18—Rivet | 26—Pin (8 used) |
| 3—Cap Screw | 11—Driving Ring | 19—Spring (4 used) | 27—Grease Tube |
| 4—Lock Washer | 12—Clutch Body | 20—Snap Ring (8 used) | 28—Cap Screw (2 used) |
| 5—Spring | 13—Washer | 21—Snap Ring (4 used) | 29—Release Collar |
| 6—Adjusting Ring | 14—Nut | 22—Washer (8 used) | 30—Release Sleeve |
| 7—Wear Plate | 15—Bearing | 23—Pin (4 used) | 31—Lock Washer (2 used) |
| 8—Pressure Plate | 16—Key | 24—Lever (4 used) | 32—Lock Nut (2 used) |

1. Place clutch body (12) on bench with hub end (threads) up.
2. Place driving disk (9) , center plate (10), then second driving disk (9) on clutch body.
3. Lay pressure plate (8) friction surface on clutch body with pressure plate drive splines meshing with hub splines.
4. Install levers (24) , springs (19) and pins (23) on pressure plate. Secure pins with snap rings (21).
5. Lubricate threads of adjusting ring (6) and thread into clutch body clockwise to tighten.
6. Using marks made during disassembly, attach release collar (29) to release sleeve (30) using cap screws and lock nuts. Tighten nuts to specifications.
7. Attach links (25) on each side of lug on release sleeve using pins (26), with head of pin leading direction of rotation. Secure pins with snap rings (20).
8. Place release sleeve assembly on adjusting ring (6) lining links up to attach with levers. Install pins through links and levers, with head of pins leading direction of rotation, and secure with snap rings.
9. Tighten adjusting ring (6) only enough to hold disks in place when clutch is engaged.
10. Place drive ring (11) over clutch assembly and make sure teeth of drive ring mesh with teeth of drive disks.
11. Using drive ring (11), center drive disks between clutch body (12) and pressure plate (8). Engage clutch to hold disks in place.

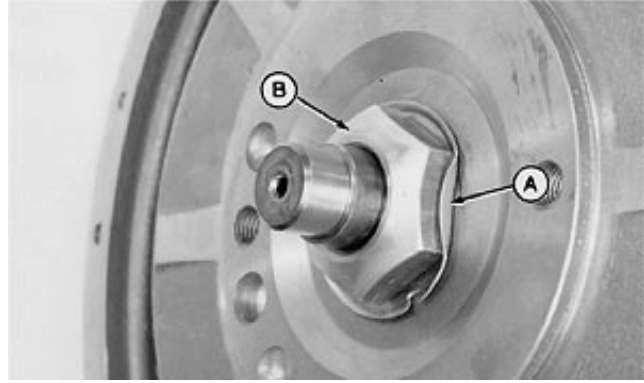
Specification

Release Collar Nuts—Torque..... 27 N*m (20 lb-ft)

RG9532 -UN-26MAR99

Install Clutch Unit

1. Be sure key is in place on drive shaft.
2. Install clutch assembly on drive shaft. Be sure pins on release collar are inserted in yoke arms and grease tube hole in release collar faces grease fitting hole in housing.
3. Install new lock washer (A) and jam nut (B). Tighten jam nut to specifications.



RG3717 -UN-26SEP89

Specification

Drive Shaft Retaining Nut—
Torque 230—244 N•m (170—180 lb-ft)

A—Lock Washer
B—Jam Nut

Bend side tab of lock washer against jam nut.

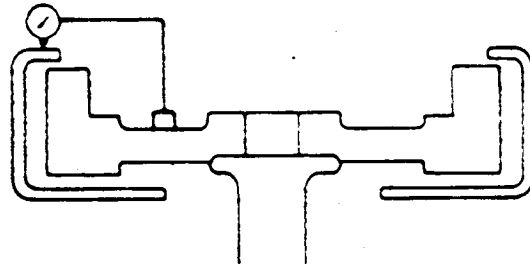
4. Connect grease tube to housing.

DPSG,OUO1004,738 -19-23MAR99-1/1

Check Flywheel Housing Face Run-Out

NOTE: When measuring flywheel face or housing face, maintain end pressure on crankshaft to hold shaft against main thrust bearings.

1. Mount dial indicator on flywheel. Set pointer to contact PTO mounting surface on flywheel housing at right angles. Pointer should not contact holes in flywheel housing.
2. Rotate flywheel by turning crankshaft. Read dial indicator.



R22212 -UN-14DEC88

Specification

Flywheel Housing Face
Run-Out—Maximum Variation..... 0.20 mm (0.008 in.)

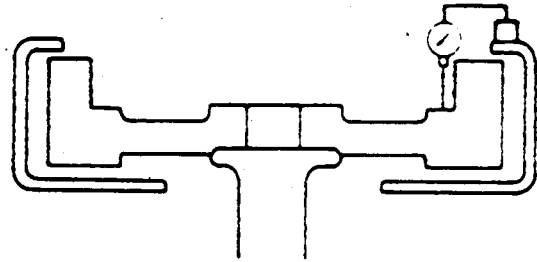
S11,5005,AL -19-02FEB94-1/1

Check Flywheel Face Flatness

1. Mount dial indicator base on flywheel housing. Position pointer to contact driving ring mounting surface. Do not allow pointer to contact driving ring mounting holes.

IMPORTANT: Maintain constant end pressure on crankshaft to hold shaft against thrust bearing when measuring flywheel face runout.

2. Rotate flywheel by turning crankshaft. Read total dial indicator movement. Resurface flywheel face or replace as required.



R22213 -UN-14DEC88

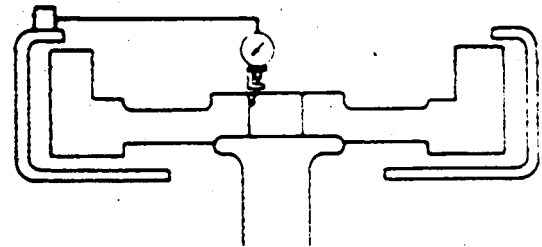
Specification

Flywheel Face Flatness—	
Maximum Variation.....	0.23 mm (0.009 in.)
Maximum Variation per 25 mm (1.0 in.) of Travel.....	0.013 mm (0.0005 in.)

S11,5005,AM -19-02FEB94-1/1

Check Pilot Bearing Bore

1. Mount dial indicator on flywheel housing face and position pointer to contact I.D. of pilot bearing bore in flywheel.
2. Rotate flywheel by turning crankshaft. Read dial indicator.



R22214 -UN-14DEC88

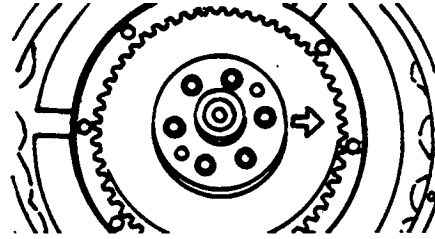
Specification

Flywheel Pilot Bearing Bore	
Concentricity—Maximum	
Variation.....	0.127 mm (0.005 in.)

S11,5005,AN -19-02FEB94-1/1

Inspect Drive Ring

1. Inspect clutch drive ring (arrow) for broken teeth, cracks, or distortion. Replace as necessary.
2. If replaced, tighten cap screws to specifications.



RG4652 -UN-06APR89

Specification

Clutch Drive Ring Cap Screws—
 Torque 47 N•m (35 lb-ft)

S11,5005,BO -19-02FEB94-1/1

Install Power Take-Off

If driving ring was removed, install at this time as described earlier.

1. Install spacer (if equipped) and pilot bearing on drive shaft. Sealed side of bearing must be installed facing clutch pack.
2. Insert hook from chain hoist securely in inspection hole.
3. Install PTO on engine. (Using two guide studs installed in flywheel housing will make PTO installation easier.)

IMPORTANT: Be sure pilot bearing enters flywheel bore and driving disk teeth engage driving ring.

4. Install PTO to flywheel housing cap screws, and tighten to specifications.

Clutch Housing-To-Flywheel Housing Cap Screws—Specification
 Side-Load Application—Torque..... 47 N•m (35 lb-ft)
 In-Line Application—Torque..... 75 N•m (55 lb-ft)

5. Install handle, if not previously installed. Tighten cap screw securely.

S11,5005,BP -19-02FEB94-1/1

Check PTO Clutch Adjustment—Early Version

CAUTION: Entanglement in rotation driveline can cause serious injury or death. Wear close fitting clothing. Stop the engine and be sure PTO driveline is stopped before servicing.

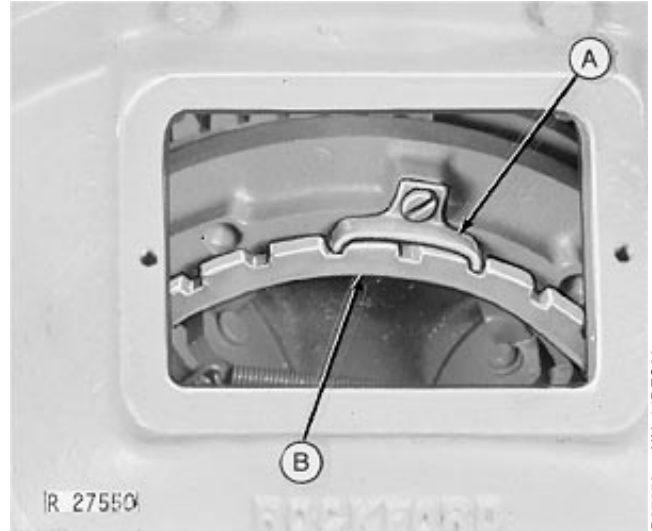
1. Measure clutch engagement force at handle grip with a spring scale. The engagement force should be as follows:

Clutch Engagement—Specification

Series 300—Force.....	267—311 N (60—70 lb)
Series 400, 6466D, T; 6466A (-01994)—Force.....	267—311 N (60—70 lb)
Series 400, 6466A (041995-); 6076T,A,H—Force.....	289—333 N (65—75 lb)
Series 500, 6619A (-027449)— Force	267—311 N (60—70 lb)
Series 500, 6619A (027450-), 6101H,A and 8.1 L, 10.5 L and 12.5 L—Force.....	289—333 (65—75 lb)
Series 700—Force.....	378—422 (85—95 lb)

IMPORTANT: Improper adjustment of the PTO clutch might shorten clutch life. Make sure adjustments are made properly.

2. If adjustments are needed, disengage clutch and remove cover plate from clutch housing (shown removed).
3. Remove cap screw and remove adjusting lock (A).
4. Turn adjusting ring (B) to adjust clutch engagement pressure. Check engagement pressure at clutch handle with spring scale.
5. Install adjusting lock when specified engagement pressure is achieved. Tighten cap screw securely.
6. Recheck clutch engagement force with spring scale. Install cover plate. Disengage clutch.



R27550 -UN-14DEC88

Check PTO Clutch Adjustment—Late Version

CAUTION: Entanglement in rotation driveline can cause serious injury or death. Wear close fitting clothing. Stop the engine and be sure PTO driveline is stopped before servicing.

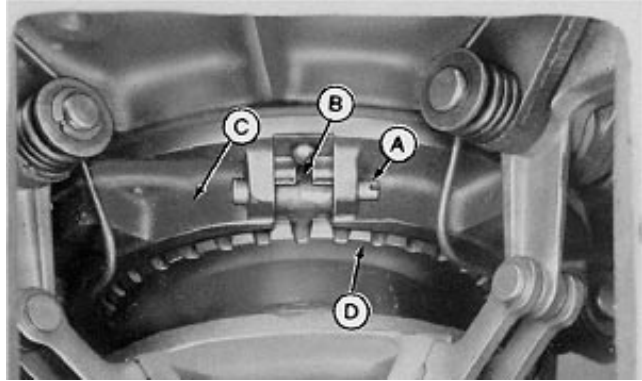
1. Measure clutch engagement force at handle grip with a spring scale. The engagement force should be 289—333 N (65—75 lb-force).

Clutch Engagement—Specification

Series 300—Force.....	267—311 N (60—70 lb)
Series 400, 6466D, T; 6466A (-01994)—Force.....	267—311 N (60—70 lb)
Series 400, 6466A (041995-); 6076T,A,H—Force.....	289—333 N (65—75 lb)
Series 500, 6619A (-027449)— Force	267—311 N (60—70 lb)
Series 500, 6619A (027450-) 6101H,A and 8.1 L, 10.5 L and 12.5 L—Force.....	289—333 (65—75 lb)
Series 700—Force.....	378—422 (85—95 lb)

IMPORTANT: Improper adjustment of the PTO clutch might shorten clutch life. Make sure adjustments are made properly.

2. If adjustments are needed, disengage clutch and remove cover plate from clutch housing (shown removed).
3. Turn adjusting lock screw (A) to disengage locking cam (B) from clutch body splines (C).
4. Turn adjusting ring (D) to adjust clutch engagement pressure. Check engagement pressure at clutch handle with spring scale.
5. Turn adjusting lock screw to engage locking cam with clutch body hub splines when specified engagement pressure is achieved.
6. Recheck clutch engagement force with spring scale. Install cover plate. Disengage clutch.



A—Lock Screw
B—Locking Cam
C—Body Splines
D—Adjusting Ring

RG78255Q1 -UN-15DEC88

Special Or Essential Tools

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

SERVICEGARD is a trademark of Deere & Company

DPSG,YZ01324,25 -19-13SEP02-1/11

Bearing Drivers (DO1045AA Master Set) . . . 27535 - Disc

Press on outer race of idler bearing into idler gear.

DPSG,YZ01324,25 -19-13SEP02-2/11

Bearing Drivers (DO1045AA Master Set) . . . 27529 - Disc

Press on outer race of idler bearing into idler gear and press on inner race of pump drive bearing onto pump drive gear.

DPSG,YZ01324,25 -19-13SEP02-3/11

Bearing Drivers (DO1045AA Master Set) 27489 -
Handle

Press on outer race of idler bearing into idler gear.

DPSG,YZ01324,25 -19-13SEP02-4/11

Bearing Drivers (DO1045AA Master Set) . . . 27522 - Disc

Press on inner race of pump drive bearing onto pump drive gear.

Continued on next page

DPSG,YZ01324,25 -19-13SEP02-5/11

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2

Bearing Drivers (DO1045AA Master Set) 27489 -
Handle

Press on inner race of pump drive bearing onto pump
drive gear.

DPSG,YZ01324,25 -19-13SEP02-6/11

Bearing Driver 7 1/2 inch Disc

Press on outer race of bearing in seal retainer.

DPSG,YZ01324,25 -19-13SEP02-7/11

Idler Shaft Puller JDG1664

Remove primary and auxiliary idler shafts from rear PTO
housing

YZ2038 -UN-24JUN02



DPSG,YZ01324,25 -19-13SEP02-8/11

Idler Shaft Press JDG1663

Press primary and auxiliary idler shafts into rear PTO
housing

YZ2026 -UN-25JUN02



DPSG,YZ01324,25 -19-13SEP02-9/11

Seal and Wear Sleeve Installer JDG974A

Simultaneously install seal and wear sleeve onto 8.1 L or
12.5 L rear PTO drive gear.

DPSG,YZ01324,25 -19-13SEP02-10/11

Flywheel Turning Tool JDE81-1

Rotate engine flywheel one full revolution to center
bearing in seal retainer and release any preload off ball
bearing.

DPSG,YZ01324,25 -19-13SEP02-11/11

Other Material

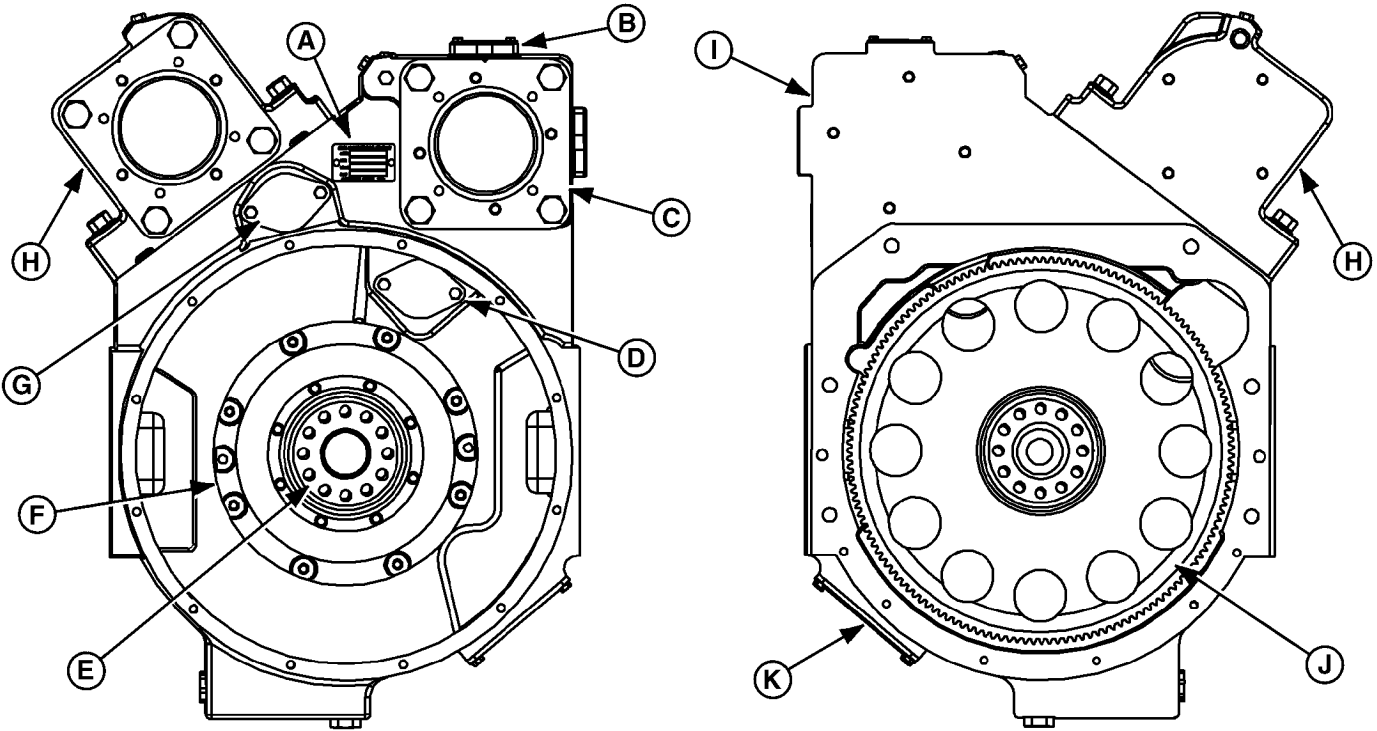
Number	Name	Use
TY16285 (U.S.)	John Deere Clean and Cure Primer	Cleans parts and speeds cure of sealant
	Engine Oil	Lubricates Idler Shaft, Bearing Outer Races, and O-Rings.
	Acetone	Cleans Mate Surfaces on Rear Power Take-Off Housing and Auxiliary Housing Cover.
TY9370 (U.S.)	Medium Strength Thread Lock and Sealer	Locks and seals dowel pins and cap screws that will require removal.
Loctite #5699 (U.S.)	Grey High Performance RTV Silicone Gasket	Seals Auxiliary Pump Drive Cover to Power Take-Off Housing, and Cover Plates to Power Take-Off Housing.
Loctite #680 (U.S.)	Sealant	Apply to starter flywheel and input gear before installing seals
T43512 (U.S.) TY9473 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to threads of seal-to-starter flywheel cap screws.

LOCTITE is a trademark of Loctite Corp.

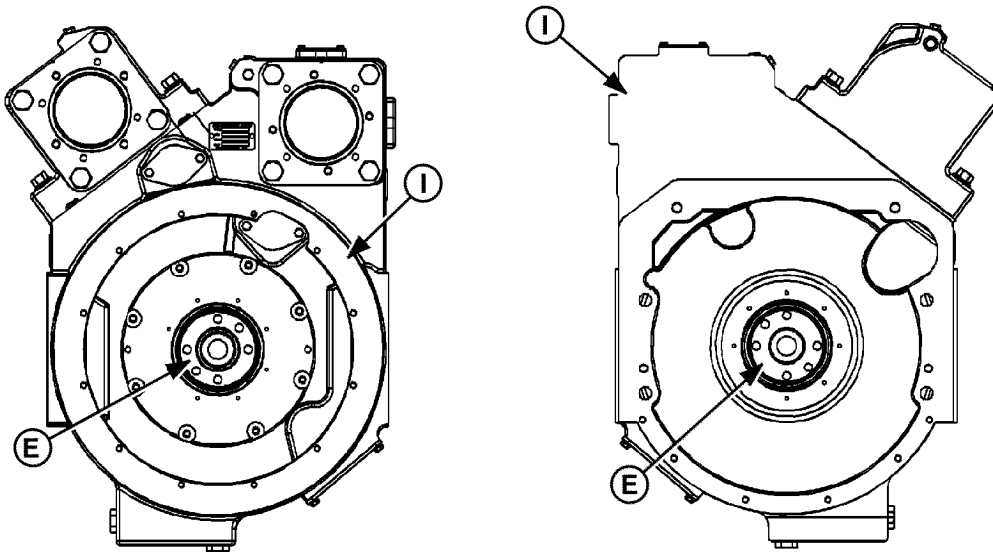
LOCTITE is a registered trademark of Loctite Corp.

OURGP12.0000159 -19-30AUG05-1/1

Rear Power Take-Off Specifications For 8.1L/9.0L and 12.5L/13.5L Engines With Primary and Auxiliary Pump Drives (Double Pump)



Power Take-Off (SAE #1 Housing With 12.5 L Engine Input Gear)



Power Take-Off (SAE #2 Housing With 8.1 L Engine Input Gear)

- | | | | |
|--------------------------|-----------------------------|-------------------------------|-------------------|
| A—Identification Plate | D—Primary Idler Shaft Group | G—Auxiliary Idler Shaft Group | J—Starter Ring |
| B—Magnetic Pickup Access | E—52 Tooth Input Gear | H—Auxiliary Pump Group | K—Flywheel Access |
| C—Primary Pump Group | F—Seal Retainer | I—PTO Housing | |

YZ2074 -UN-06MAR02

YZ2065 -UN-24JUN02

Continued on next page

OURGP12.000016F -19-21OCT05-1/3

PUMP DRIVE OUTPUT		
	PRIMARY PUMP	AUXILIARY PUMP
Type	Gear type, continuous rotation, no internal disconnect	Gear type, continuous rotation, no internal disconnect
Rotation Direction	Counterclockwise (Viewed from pump end)	Clockwise (Viewed from pump end)
PTO Shaft Speed	1.3:1 Speedup	1.3:1 Speedup
PTO Output Power (Max)	224 kW (300 hp)	112 kW (150 hp)
NOTE: Total Maximum PTO Output Power when both outputs are used is 300 hp.		

Item	Measurement	Specification
Weight Values: ¹		
PTO SAE #1 Housing For 8.1L/9.0L and 12.5L/13.5L Engine w/ Auxiliary Pump Pad	Weight*	527 lbs (239 kg)
PTO SAE #2 Housing For 8.1L/9.0L Engine w/ Auxiliary Pump Pad	Weight*	557 lbs (253 kg)
Torque Values:		
Plugs (1/2-20 UNF) to Primary & Auxiliary Pump Housings (5)	Torque	16 N•m (12 lb-ft)
Plugs (3/8-24 UNF) to Primary & Auxiliary Pump Housings (7)	Torque	8 N•m (6 lb-ft)
Drain Plug to Power Take-Off Housing	Torque	102 N•m (75 lb-ft)
Cap Screws to Flywheel Access Cover Plate (4)	Torque	28 N•m (20 lb-ft)
Cap Screws to Primary Idler Shaft Cover Plate (2)	Torque	28 N•m (20 lb-ft)
Cap Screws to Auxiliary Idler Shaft Cover Plate (2)	Torque	28 N•m (20 lb-ft)
Cap Screws to Primary & Auxiliary Pump SAE 'C' Adapters (8)	Torque	390 N•m (285 lb-ft)

¹Weight values do not include flywheel assembly or cap screws used to hold flywheel to input gear, as they vary with the application.

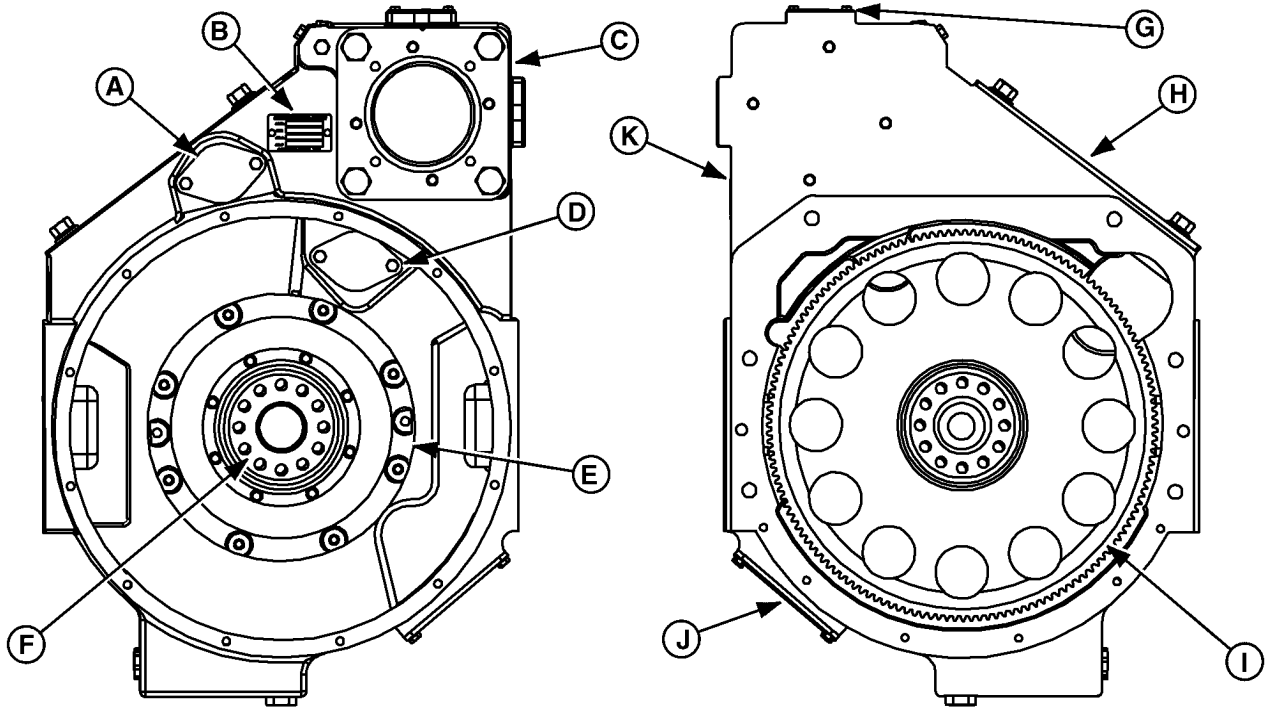
Rear PTO - John Deere

46
6

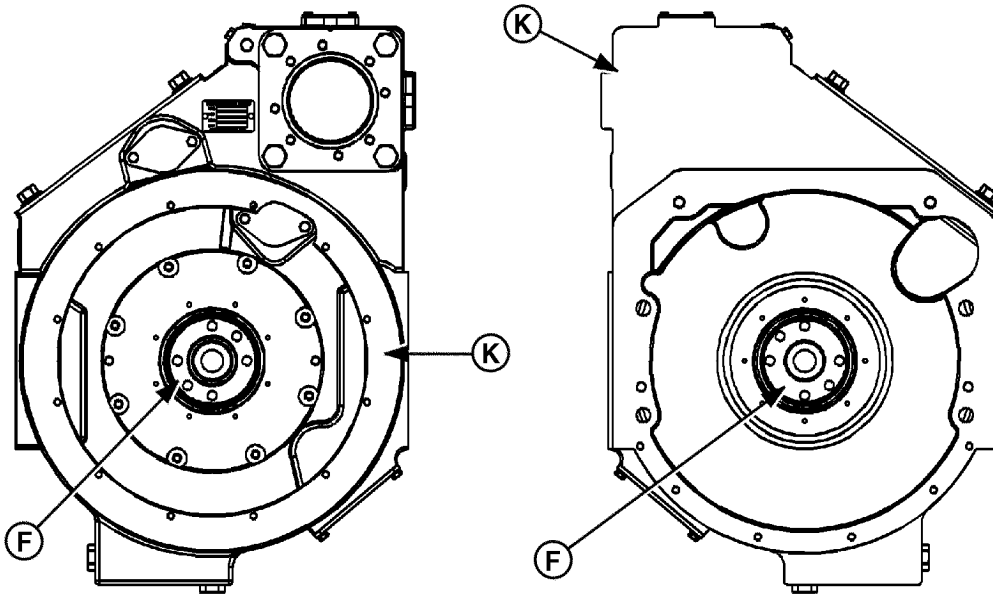
Item	Measurement	Specification
Cap Screws to Auxiliary Pump Housing (4)	Torque	270 N•m (200 lb-ft)
Cap Screws to SAE 'C' Adapter Caps (4)	Torque	103 N•m (76 lb-ft)
Cap Screws to Mag Pickup Cover Plate (2)	Torque	11 N•m (8 lb-ft)
Cap Screws to Rear PTO Housing Mounting (6)	Torque	365 N•m (270 lb-ft)
Cap Screws to Lower Front Rear PTO Housing Cover (6)	Torque	50 N•m (37 lb-ft)
Cap Screws to Starter Flywheel Seal (8)	Torque	15 N•m (11 lb-ft)
Cap Screws to Drive Gear Seal (2)	Torque	50 N•m (37 lb-ft)
Cap Screws to Flywheel (12)	Torque	170 N•m (125 lb-ft)
Idler Shaft Diameter Measurements:		
Primary Idler Shaft	Diameter	45mm (1.77 in.)
Auxiliary Idler Shaft	Diameter	40mm (1.57 in.)

OURGP12,000016F -19-21OCT05-3/3

Rear Power Take-Off Specifications For 8.1L/9.0L and 12.5L/13.5L Engines With Primary Pump Drive (Single Pump)



Power Take-Off (SAE #1 Housing With 12.5 L Engine Input Gear)



Power Take-Off (SAE #2 Housing With 8.1 L Engine Input Gear)

- | | | | |
|-------------------------------|-----------------------------|--------------------------|-------------------|
| A—Auxiliary Idler Shaft Group | D—Primary Idler Shaft Group | G—Magnetic Pickup Access | J—Flywheel Access |
| B—Identification Plate | E—Seal Retainer | H—Auxiliary Pump Access | K—PTO Housing |
| C—Primary Pump Group | F—52 Tooth Input Gear | I—Starter Ring | |

YZ2075 -UN-06MAR02

YZ2076 -UN-24JUN02

Continued on next page

OURGP12,0000170 -19-21OCT05-1/3

Rear PTO - John Deere

46
8

PRIMARY PUMP DRIVE OUTPUT	
Type	Gear type, continuous rotation, no internal disconnect
Rotation Direction	Counterclockwise (Viewed from pump end)
PTO Shaft Speed	1.3:1 Speedup
PTO Output Power (Max)	224 kW (300 hp)

Item	Measurement	Specification
Weight Values: ¹		
PTO SAE #1 Housing For 8.1L/9.0L and 12.5L/13.5L Engine	Weight*	444 lbs (202 kg)
PTO SAE #2 Housing For 8.1L/9.0L Engine	Weight*	474 lbs (215 kg)
Torque Values:		
Plugs (1/2-20 UNF) to Primary Pump Housing (3)	Torque	16 N•m (12 lb-ft)
Plugs (3/8-24 UNF) to Primary Pump Housing (3)	Torque	8 N•m (6 lb-ft)
Drain Plug to Power Take-Off Housing	Torque	102 N•m (75 lb-ft)
Cap Screws to Flywheel Access Cover Plate (4)	Torque	28 N•m (20 lb-ft)
Cap Screws to Primary idler shaft cover plate (2)	Torque	28 N•m (20 lb-ft)
Cap Screws to Auxiliary Idler Shaft Access Cap (4)	Torque	28 N•m (20 lb-ft)
Cap Screws to Primary Pump SAE 'C' Adapter (4)	Torque	390 N•m (285 lb-ft)
Cap Screws to SAE 'C' Adapter Caps (4)	Torque	103 N•m (76 lb-ft)

¹Weight values do not include flywheel assembly or cap screws used to hold flywheel to input gear, as they vary with the application.

Continued on next page

OURGP12.0000170 -19-21OCT05-2/3

Item	Measurement	Specification
Cover Plate to Power Take-Off Housing Cap Screws (4)	Torque	270 N•m (200 lb-ft)
Setscrew/Plug to Auxiliary Pump	Torque	12 N•m (9 lb-ft)
Cap Screws to Mag Pickup Cover Plate (2)	Torque	11 N•m (8 lb-ft)
Cap Screws to Rear PTO Housing Mounting (6) ²	Torque	365 N•m (270 lb-ft)
Cap Screws to Lower Front Rear PTO Housing Cover (6)	Torque	50 N•m (37 lb-ft)
Cap Screws to Starter Flywheel Seal (8)	Torque	15 N•m (11 lb-ft)
Cap Screws to Drive Gear Seal (2)	Torque	50 N•m (37 lb-ft)
Cap Screws to Flywheel (12)	Torque	170 N•m (125 lb-ft)

²Note: 8.1 L units use a 5/8 in. bolt for two of the rear PTO mounting holes. Use 210 N•m (155 lb-ft) torque for these bolts.

OURGP12.0000170 -19-21OCT05-3/3

General Information

The engine rear power take-off transfers engine power to auxiliary equipment or moving components which may be mounted on the vehicle or trailed behind. It is an engine-driven PTO which operates when the engine is running.

The primary pump drive output located on the right side (looking at the back of the engine) rotates counterclockwise, same as engine rotation. The speedup ratio over engine rpm is 1.3:1.

The auxiliary pump drive output located on the left side (looking at the back of the engine) rotates clockwise,

opposite engine rotation. The speedup ratio over engine rpm is 1.3:1.

The pump drive outputs run independently of the machine's forward or rearward motion, or rate of travel. They are directly tied to engine crankshaft output.

This rear PTO is an option for PowerTech 8.1 L, 9.0L, 12.5L and 13.5 L engines.

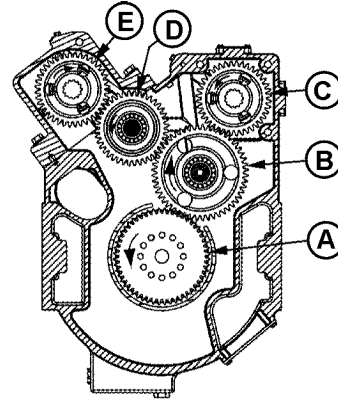
OURGP12.000016D -19-14OCT05-1/1

Theory of Operation

The rear engine Power Take-Off (PTO) transmits power from the engine crankshaft to the rear engine PTO output pad(s). To do this, power is transmitted from the engine crankshaft to rear PTO input gear (A). The input gear rotates counterclockwise (when viewed from the rear) and turns counter gear (B) the opposite direction. The counter gear is in constant mesh with primary output gear (C), and rotates it counterclockwise (same direction as engine rotation).

On rear PTO units equipped with an auxiliary output, power flows from input gear (A) through counter gear (B) and idler gear (D), and rotates auxiliary output gear (E) clockwise (opposite of engine rotation).

The rear engine PTO output pad(s) are rotating at all times while the engine is in operation.



Rear PTO Viewed From Rear

- A—Input Gear
- B—Counter Gear
- C—Primary Output Gear
- D—Idler Gear
- E—Auxiliary Output Gear

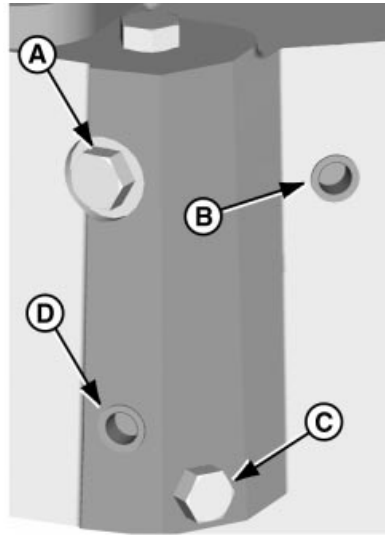
RG14352 -JUN-11NOV05

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Lubrication Passages

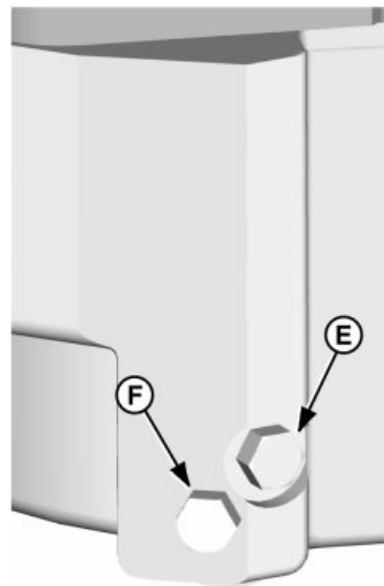
There is an orifice passage installed in the center hole of the primary pump housing where oil flows to lubricate the crankshaft gear bearing.

- A—Input Gear Bearing Lube
- B—Pressure Relief Back To Engine
- C—Lube Passage To Primary Pump Bearing (Engine Side)
- D—Lube Inlet From Engine
- E—Internal Lube Into Auxiliary Pump
- F—Lube Passage To Auxiliary Pump Bearing (Engine Side)



RG12568 -UN-04SEP02

Primary Pump Lube Passages



RG12569 -UN-04SEP02

Auxiliary Pump Lube Passages

DPSG,YZ01324,50 -19-28JUN99-1/1

Photo Disclosure

Model 4312125 was photographed for the assembly and disassembly portions of this group. This model is an engine rear power takeoff with an SAE #1 housing for wet or dry use. It has a primary and auxiliary pump drive. It is used on the 12.5 L (6125 series) engine. Model 4311125 is the same as Model 4312125 without the auxiliary pump drive.

Model 4322081 (not shown) is an engine rear power take-off with an SAE #2 housing for dry use only. It has a primary and auxiliary pump drive. It is used on the 8.1 L (6081 series) engine. Model 4321081 is the

same as Model 4322081 without the auxiliary pump drive.

Model 4312081 (not shown) is an engine rear power take-off with an SAE #1 housing. It has a primary and auxiliary pump drive. It is also used on the 8.1 L engine. Model 4311081 is the same as Model 4312081 without the auxiliary pump drive.

Differences between the rear PTO for 12.5L/13.5L engines and the rear PTO for 8.1L/9.0L engines will be noted.

OURGP12,0000171 -19-21OCT05-1/1

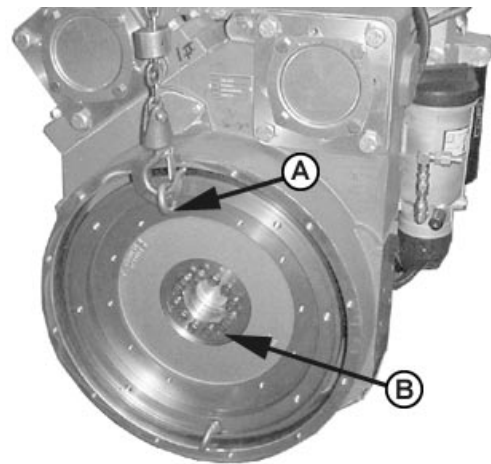
Remove Rear PTO

1. Install JDG19 Lifting Eye (A) into upper most hole in flywheel.
2. Connect hoist to lifting eye.
3. Remove two cap screws, 180° apart, from engine flywheel and install pilot studs.

CAUTION: Use proper lifting procedures when removing engine flywheel. Weight of flywheel exceeds the recommended weight limit for lifting without the aid of proper lift equipment.

4. Remove remaining ten cap screws (B) and remove flywheel from power take-off.

A—JDG19 Lifting Eye
B—Cap Screws



Remove Flywheel (12.5 L Engine Shown)

RG12202 -UN-14AUG02

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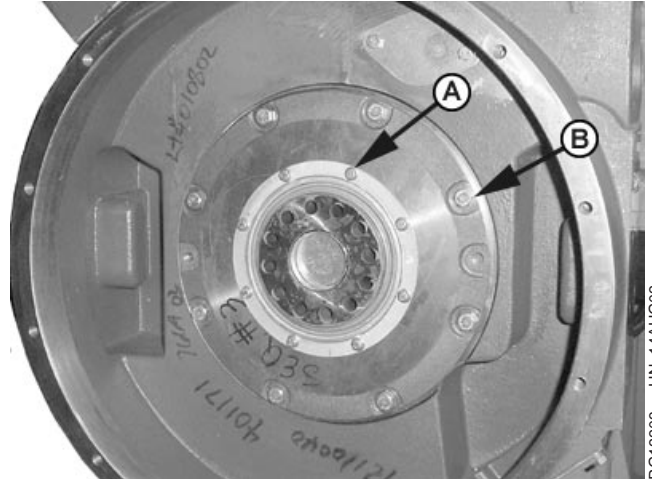
OUOD005,0000181 -19-21MAY02-1/10

5. Remove eight cap screws (A) and remove and discard seal and wear sleeve.

! **CAUTION: Make sure pilot studs are installed.**

6. Remove eight cap screws (B) and remove seal retainer.

- A—Cap Screws (8)
- B—Cap Screws (8)



RG12203 -JUN-14AUG02

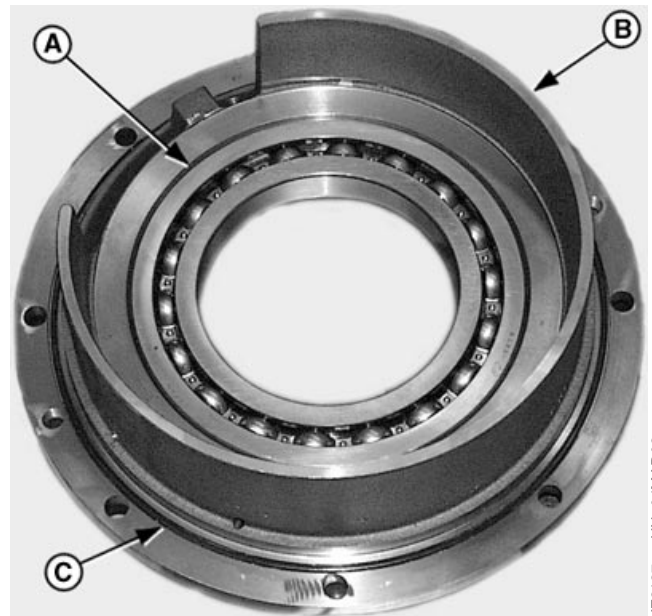
Remove Seal And Bearing Support

OUID005,0000181 -19-21MAY02-2/10

7. Inspect ball bearing (A) in seal retainer (B) for wear or damage. Replace if needed, using suitable press tool.

NOTE: Press on outer race of bearing.

- A—Ball Bearing
- B—Seal Retainer
- C—O-Ring



YZ2127 -JUN-04MAR02

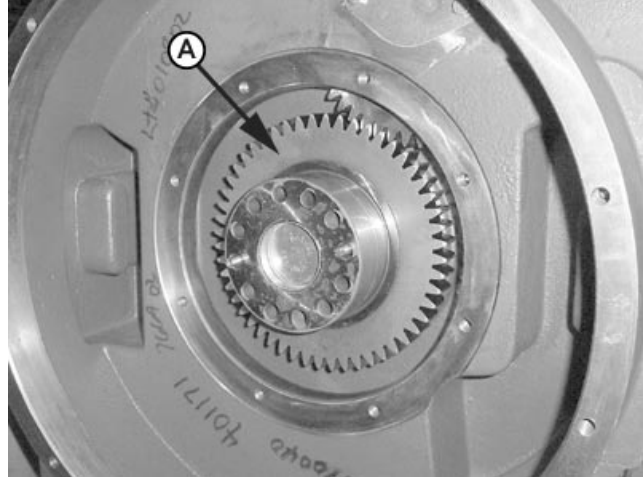
Inspect Bearing - Replace If Needed

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OUID005,0000181 -19-21MAY02-3/10

8. Remove input gear assembly (A).

A—Input Gear Assembly



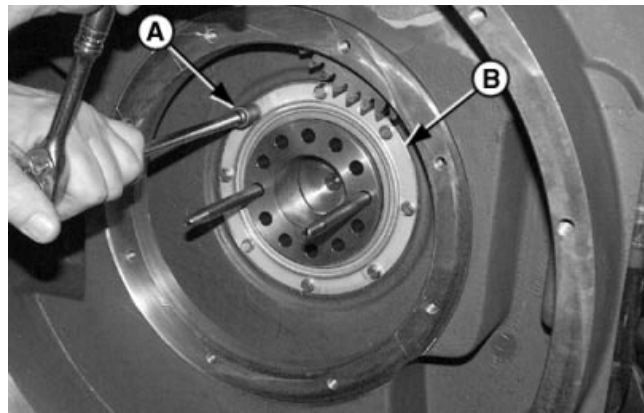
RG12204 -UN-14AUG02

Remove Input Gear Assembly

OUOD005,0000181 -19-21MAY02-4/10

9. Remove eight cap screws (A), remove and discard seal and wear sleeve (B).

A—Cap Screws (8)
B—Seal And Wear Sleeve



YZ2108 -UN-20FEB02

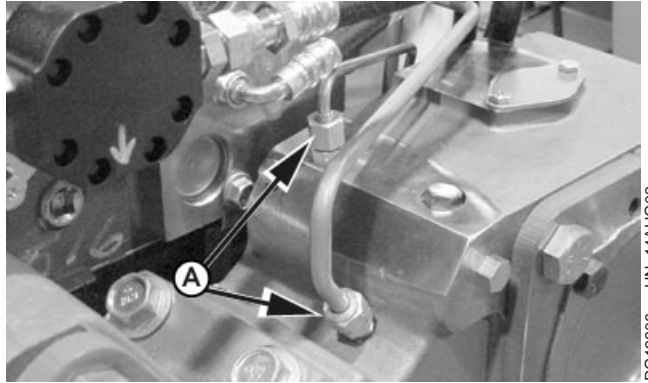
Remove Seal And Wear Sleeve

Continued on next page

OUOD005,0000181 -19-21MAY02-5/10

10. Disconnect oil lines (A).

A—Oil Lines (2)



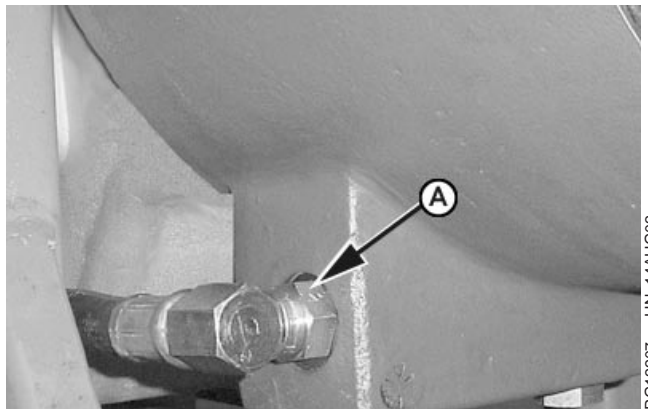
RG12206 -JUN-14AUG02

Disconnect Oil Lines

OUD005,0000181 -19-21MAY02-6/10

11. Drain oil from engine crankcase oil pan and disconnect return oil line (A).

A—Return Oil Line



RG12207 -JUN-14AUG02

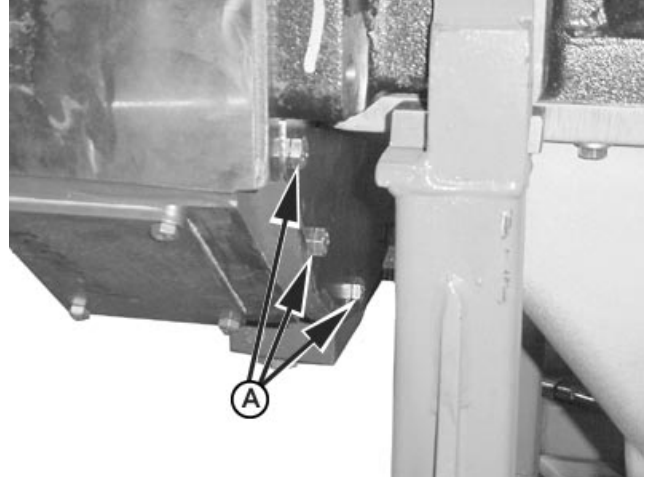
Disconnect Return Oil Line

Continued on next page

OUD005,0000181 -19-21MAY02-7/10

12. Remove cap screws (A) and remove cover plate from engine side of rear power take off housing.

A—Cover Cap Screws (6)



RG12211 -UN-14AUG02

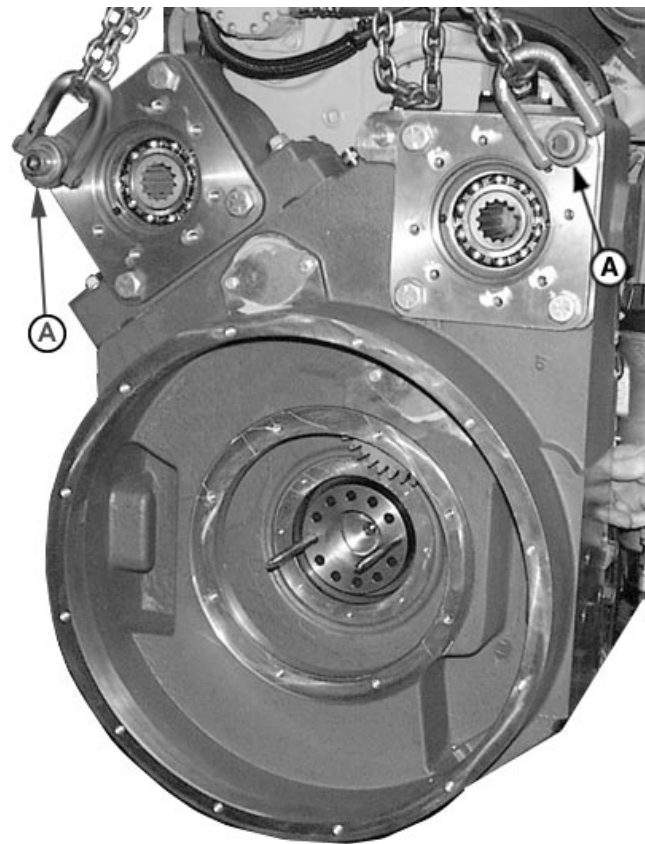
Remove Cover Cap Screws

OUOD005,0000181 -19-21MAY02-8/10

CAUTION: Use proper safety equipment and lifting procedures when removing rear power take-off. Weight of unit exceeds 500 lbs.

13. Remove cap screws and attach eye bolts (A) to SAE 'C' adapters of power take-off. Remove power take-off, using proper lifting equipment and procedures.

A—Eye Bolts



RG12564 -UN-22AUG02

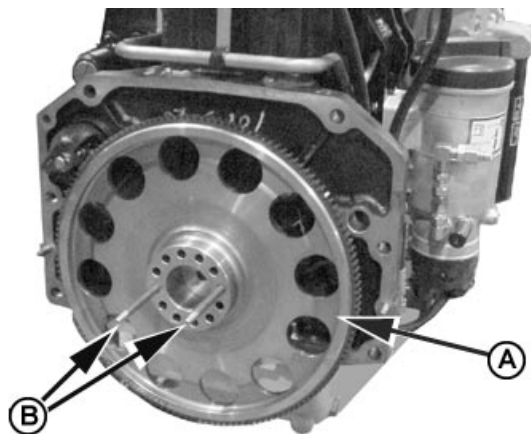
Remove Rear Power Take-Off

Continued on next page

OUOD005,0000181 -19-21MAY02-9/10

14. Remove starter flywheel (A) and pilot studs (B).

A—Starter Flywheel
B—Pilot Studs



Remove Starter Flywheel And Pilot Studs

RG12209 -JUN-14AUG02

OUOD005,0000181 -19-21MAY02-10/10

Disassemble Auxiliary Pump Group

1. Remove cap screws (A) from auxiliary pump SAE 'C' adapter.

A—Cap Screws (4)



Auxiliary Pump Adapter Cap Screws

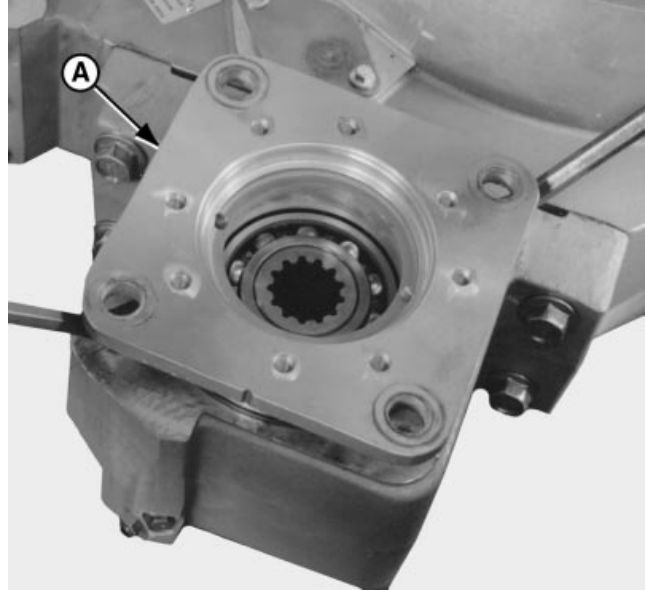
YZ2001A -JUN-17JAN02

Continued on next page

DPSG,YZ01324,44 -19-20MAY99-1/8

2. Remove auxiliary pump SAE 'C' adapter (A).

A—Auxiliary Pump Adapter



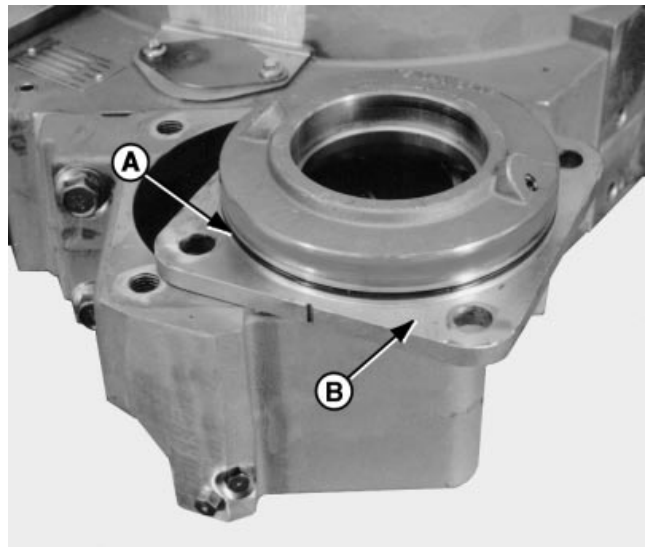
YZ2004A -UN-17JAN02

Auxiliary Pump Adapter

DPSG,YZ01324,44 -19-20MAY99-2/8

3. Remove and discard O-ring (A) from inner groove of auxiliary pump SAE 'C' adapter (B).

A—O-ring
B—Auxiliary Pump Adapter



YZ2062A -UN-21JAN02

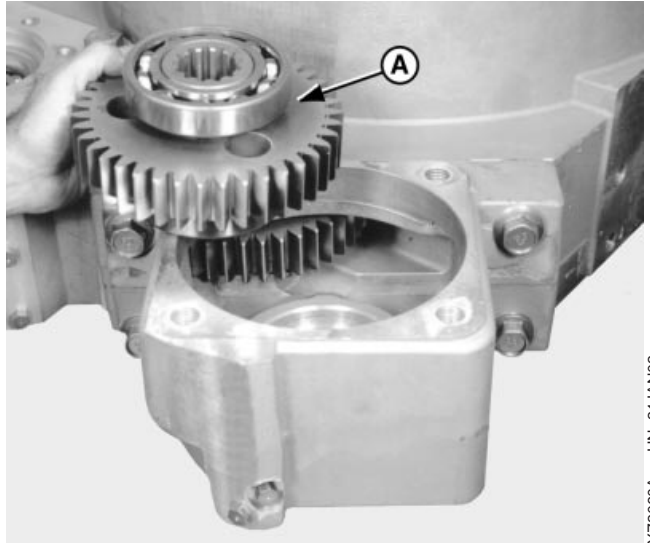
Remove O-ring

Continued on next page

DPSG,YZ01324,44 -19-20MAY99-3/8

4. Remove auxiliary pump gear assembly (A).

A—Auxiliary Pump Gear Assembly

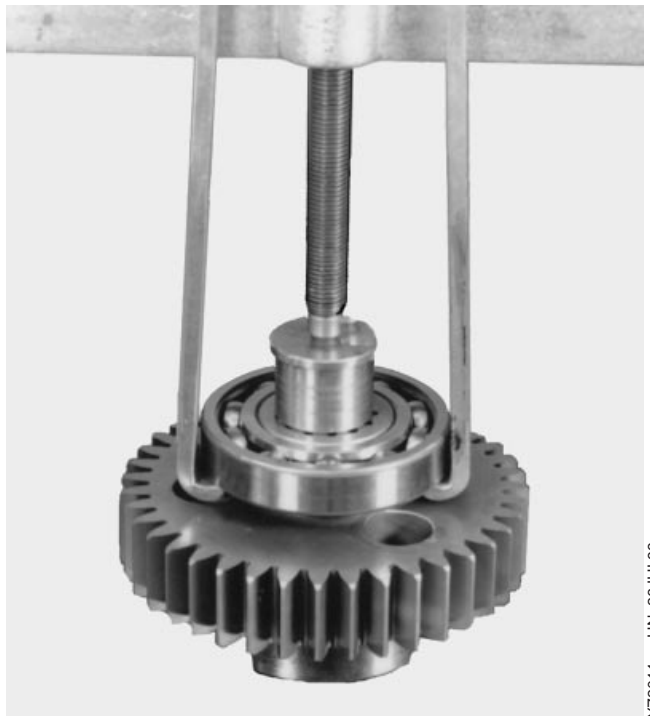


YZ2060A -JUN-21JAN02

Auxiliary Pump Gear Assembly

DPSG,YZ01324,44 -19-20MAY99-4/8

5. Remove and discard bearings on both ends of gear, using suitable gear puller.



YZ2011 -JUN-26JUL99

Remove and Discard Bearings

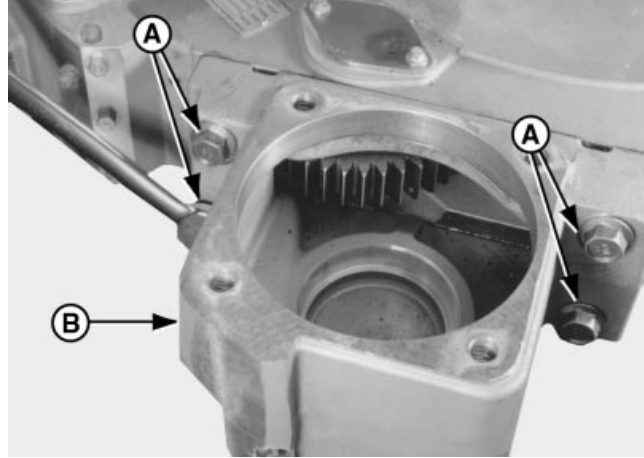
Continued on next page

DPSG,YZ01324,44 -19-20MAY99-5/8

6. Remove cap screws (A) from auxiliary pump housing (B).

7. Remove auxiliary pump housing.

A—Cap Screws (4)
B—Auxiliary Pump Housing



YZ2006A -JUN-17JAN02

Auxiliary Pump Housing Cap Screws

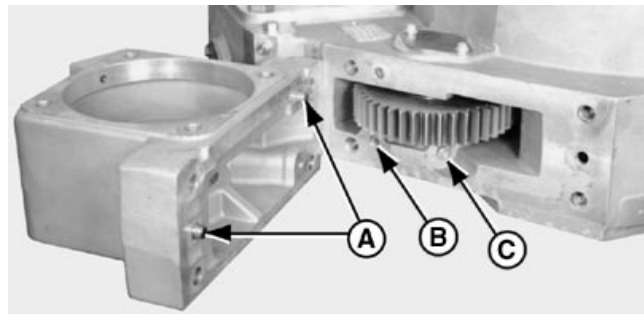
DPSG,YZ01324,44 -19-20MAY99-6/8

NOTE: Make sure dowel pins (A) are in one of the housings.

8. Remove and discard O-ring (B).

9. Remove and inspect O-ring plug (C) to lube passage hole and check for possible debris buildup. Replace as needed.

A—Dowel Pins (2)
B—O-ring
C—O-Ring Plug



YZ2058A -JUN-12JUL02

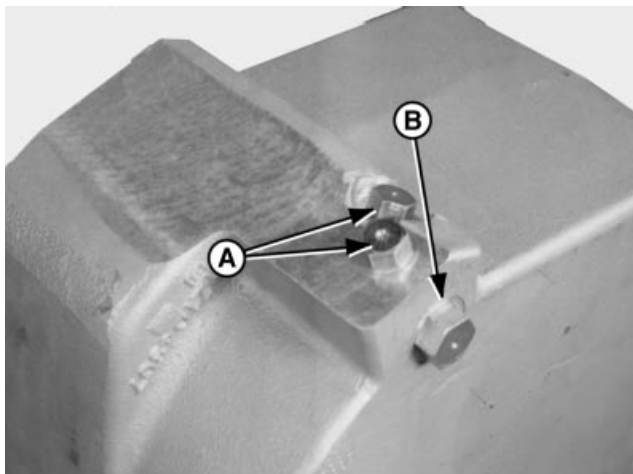
Assure Dowel Pins Are In Housing

Continued on next page

DPSG,YZ01324,44 -19-20MAY99-7/8

10. Remove and inspect O-ring plugs (A and B) to lube passage holes for damage and possible debris buildup. Replace as needed.

A—Lube Passage O-ring Plugs (2)
B—O-ring Plug



O-ring Plugs

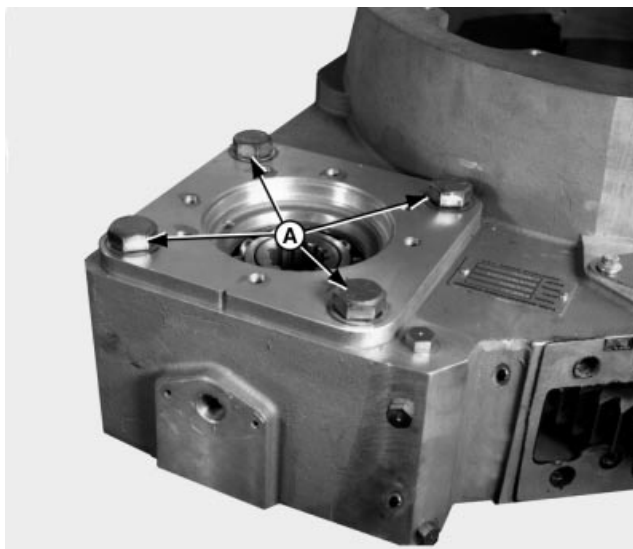
YZ2007A -UN-21JAN02

DPSG,YZ01324,44 -19-20MAY99-8/8

Disassemble Primary Pump Group

1. Remove cap screws (A) from primary pump SAE 'C' adapter.

A—Cap Screws (4)



Primary Pump Adapter Cap Screws

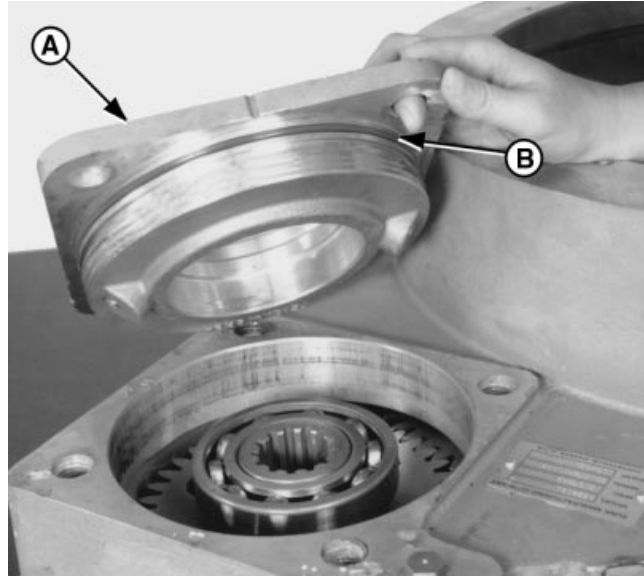
YZ2007A -UN-21JAN02

Continued on next page

DPSG,YZ01324,63 -19-23AUG99-1/5

2. Remove primary pump SAE 'C' adapter (A).
3. Remove and discard O-ring (B) from inner groove of primary pump SAE 'C' adapter.

A—Primary Pump Adapter
B—O-Ring



Discard O-Ring

DPSG,YZ01324,63 -19-23AUG99-2/5

4. Remove primary pump gear assembly (A).

A—Primary Pump Gear Assembly



Primary Pump Gear Assembly

Continued on next page

DPSG,YZ01324,63 -19-23AUG99-3/5

- Remove and discard bearings on both ends of gear, using suitable gear puller.



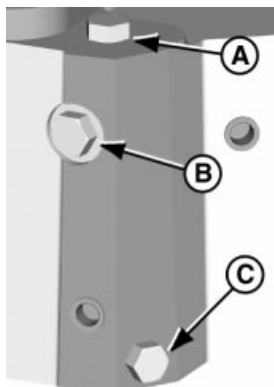
YZ2011 -UN-26JUL99

Remove and Discard Bearings

DPSG,YZ01324,63 -19-23AUG99-4/5

IMPORTANT: There is a small bore at the bottom of the input gear bearing lube passage (B). This circuit lubricates the ball bearing of the input gear. Air check orifice to make sure circuit is clean and the passage is open. It can be cleaned using a wire.

- Remove and inspect O-ring plugs (A, B and C) to lube passage holes for damage and possible debris buildup. Replace as needed.



YZ2078A -UN-17JAN02

O-Ring Plugs

- A—O-Ring Plug
- B—Lube Passage to Input Gear Bearing O-Ring Plug
- C—Lube Passage to Primary Pump Bearing O-Ring Plug

DPSG,YZ01324,63 -19-23AUG99-5/5

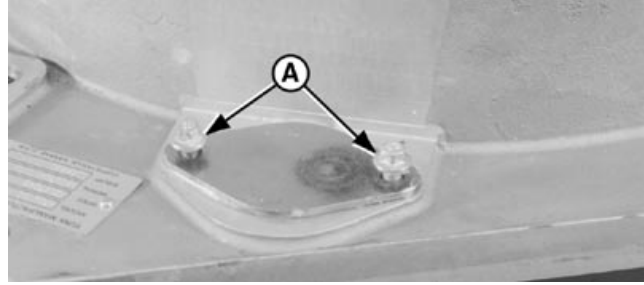
Disassemble Auxiliary Idler Shaft Group

Single Pump Application

NOTE: No gear is installed on idler shaft.

1. Remove cap screws (A).

A—Cap Screws (2)



Idler Shaft Cover Plate Cap Screws

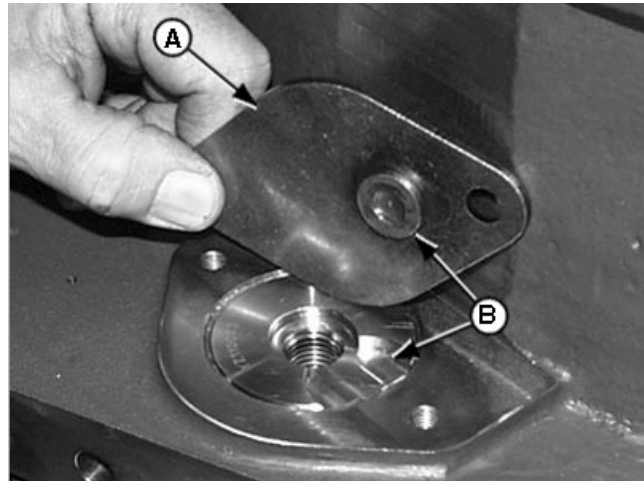
YZ2013A -UN-25JUN02

DPSG,YZ01324.62 -19-26SEP02-1/11

2. Remove idler shaft cover plate (A).

IMPORTANT: Protrusion of cover plate (B) fits in moon-shape of idler shaft (B).

A—Cover Plate
B—Cover Plate Protrusion



Idler Shaft Cover Plate

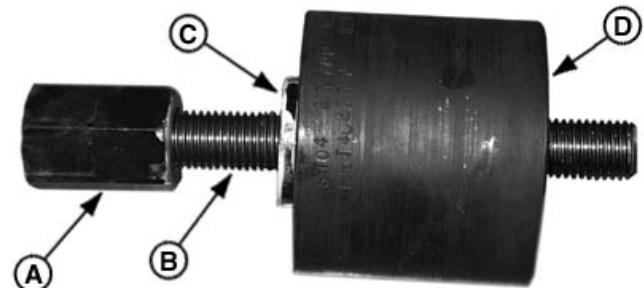
YZ2014A -UN-25JUN02

DPSG,YZ01324.62 -19-26SEP02-2/11

3. Assemble Idler Shaft Puller Tool, JDG1664.

- a. Grease washer (C) and place over small diameter hole in puller (D).
- b. Insert screw (B) through washer and small diameter hole in puller.
- c. Fasten nut (A) onto screw.

A—16 x 2 mm Hardened Coupling Nut
B—16 x 2 mm Hardened All-Thread 139.7mm Long Screw
C—5/8" Hardened Flat Washer
D—Puller



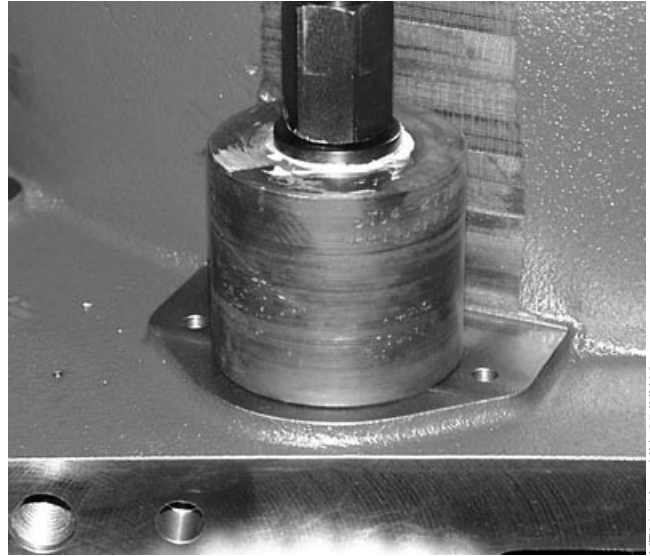
Idler Shaft Puller

YZ2142 -UN-24APR02

Continued on next page

DPSG,YZ01324.62 -19-26SEP02-3/11

4. Install idler shaft puller, JDG1664, in threaded hole of idler shaft and tighten nut to unbind idler shaft.
5. Remove idler shaft tool and auxiliary idler shaft from gear.



YZ2145A -UN-25JUN02

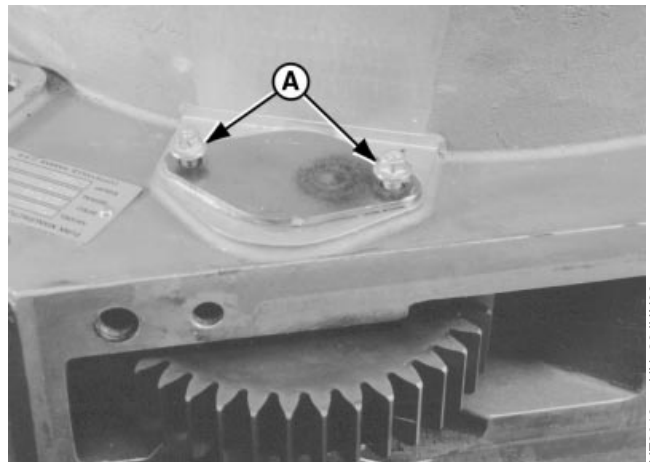
Remove Auxiliary Idler Shaft

DPSG,YZ01324,62 -19-26SEP02-4/11

Double Pump Application

1. Remove cap screws (A).

A—Cap Screws (2)



YZ2013 -UN-28JUN99

Auxiliary Idler Shaft Cover Plate Cap Screws

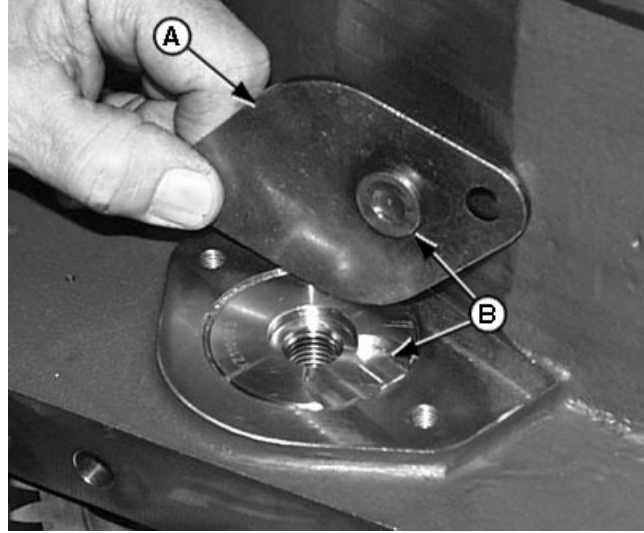
Continued on next page

DPSG,YZ01324,62 -19-26SEP02-5/11

2. Remove auxiliary idler shaft cover plate (A).

NOTE: Protrusion of cap fits into moon-shaped opening of idler shaft (B).

- A—Auxiliary Idler Shaft Cover Plate
- B—Cover Plate Protrusion Into Moon-Shape Idler Shaft Opening

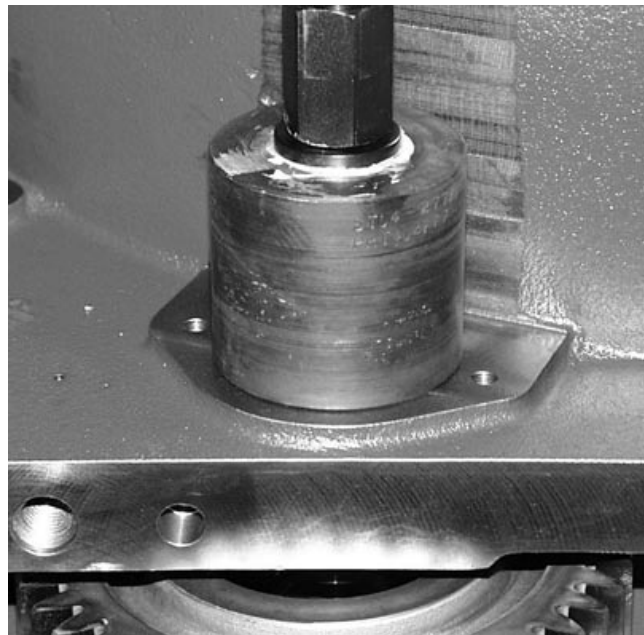


YZ2014 -UN-24JUN02

Auxiliary Idler Shaft Cover Plate

DPSG,YZ01324,62 -19-26SEP02-6/11

- 3. Install idler shaft puller, JDG1664, in threaded hole of idler shaft and tighten nut to unbind idler shaft.
- 4. Remove idler shaft tool and auxiliary idler shaft from gear.



YZ2145 -UN-23APR02

Remove Auxiliary Idler Shaft

Continued on next page

DPSG,YZ01324,62 -19-26SEP02-7/11

5. Remove auxiliary idler gear from housing.



YZ2056 -UN-29JUL99

Auxiliary Idler Gear

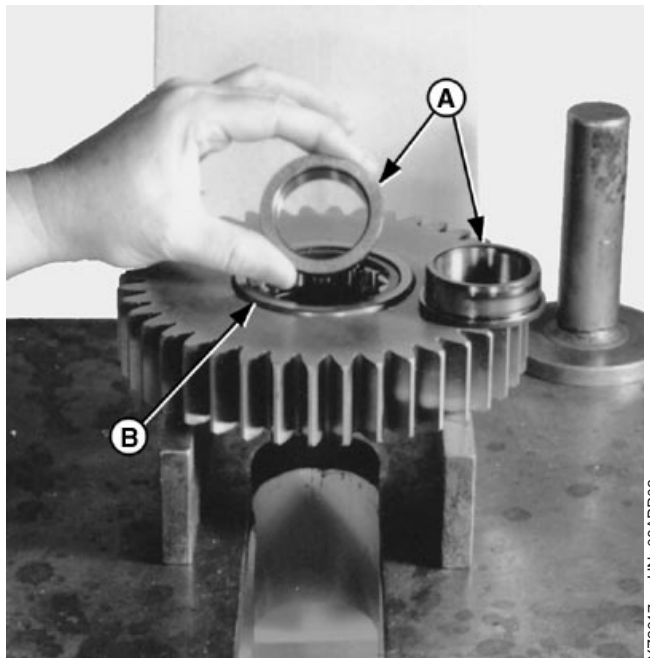
DPSG,YZ01324,62 -19-26SEP02-8/11

6. Remove inner races (A) from both sides of gear.

7. Remove and discard bearing (B).

8. Turn idler gear over.

A—Inner Races
B—Bearing



YZ2017 -UN-08APR02

Inner Races

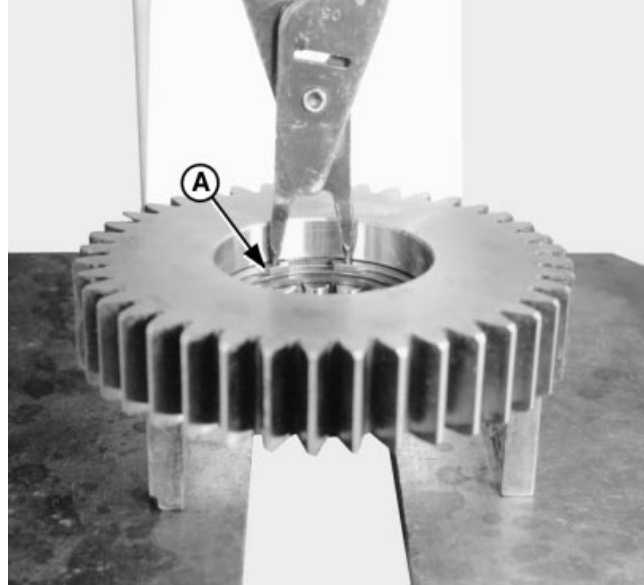
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DPSG,YZ01324,62 -19-26SEP02-9/11

9. Remove snap ring (A).

! **CAUTION: Snap ring has high spring compression. Use extreme care.**

A—Snap Ring



YZ2039 -UN-07SEP99

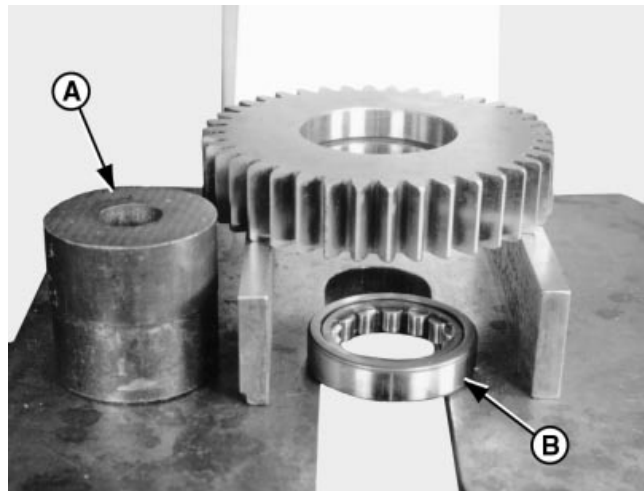
Remove Snap Ring

DPSG,YZ01324,62 -19-26SEP02-10/11

10. Remove and discard bearing (B) using suitable bearing driver (A).

NOTE: Press on OUTER race of bearing.

A—Bearing Driver
B—Bearing



YZ2040 -UN-07SEP99

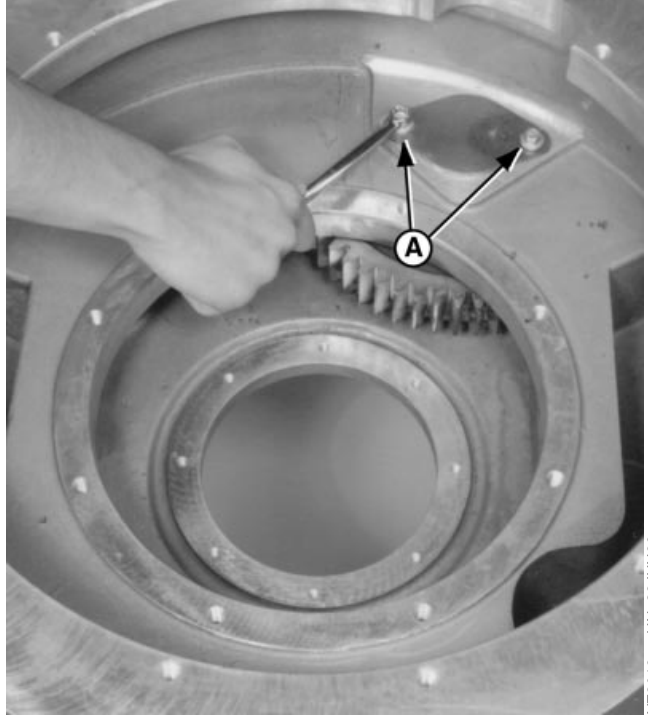
Remove and Discard Bearing

DPSG,YZ01324,62 -19-26SEP02-11/11

Disassemble Primary Idler Shaft Group

1. Remove cap screws (A).

A—Cap Screws



YZ2019 -UN-28JUN99

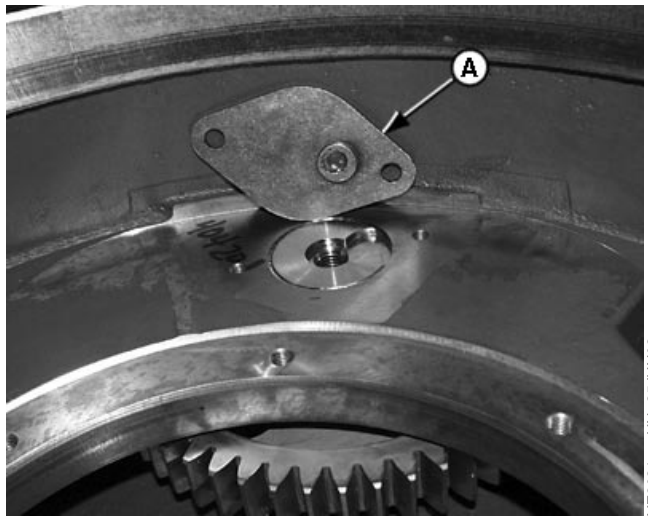
Primary Idler Shaft Cover Plate Cap Screws

DPSG,YZ01324,61 -19-23AUG99-1/8

2. Remove primary idler shaft cover plate (A).

NOTE: Protrusion of cap fits into moon-shaped opening of idler shaft.

A—Primary Idler Shaft Cover



YZ2021 -UN-25JUN02

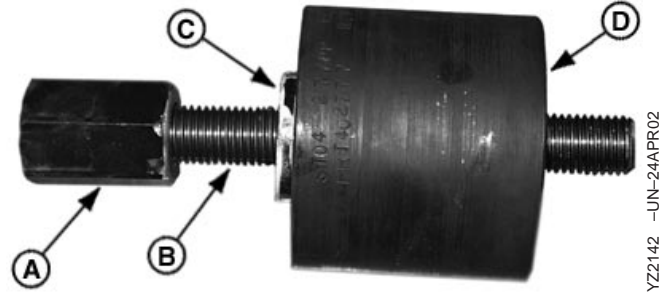
Primary Idler Shaft Cover Plate

Continued on next page

DPSG,YZ01324,61 -19-23AUG99-2/8

3. Assemble Idler Shaft Puller Tool, JDG1664.

- a. Grease washer (C) and place over small diameter hole in puller (D).
- b. Insert screw (B) through washer and small diameter hole in puller.
- c. Fasten nut (A) onto screw.



Idler Shaft Puller

YZ2142 -UN-24APR02

- A—16 x 2 mm Hardened Coupling Nut
- B—16 x 2 mm Hardened All-Thread 139.7mm Long Screw
- C—5/8" Hardened Flat Washer
- D—Puller

DPSG,YZ01324,61 -19-23AUG99-3/8

4. Install idler shaft puller, JDG1664, in threaded hole of idler shaft and tighten nut to unbind idler shaft.
5. Remove idler shaft tool and primary idler shaft from gear.



Remove Primary Idler Shaft

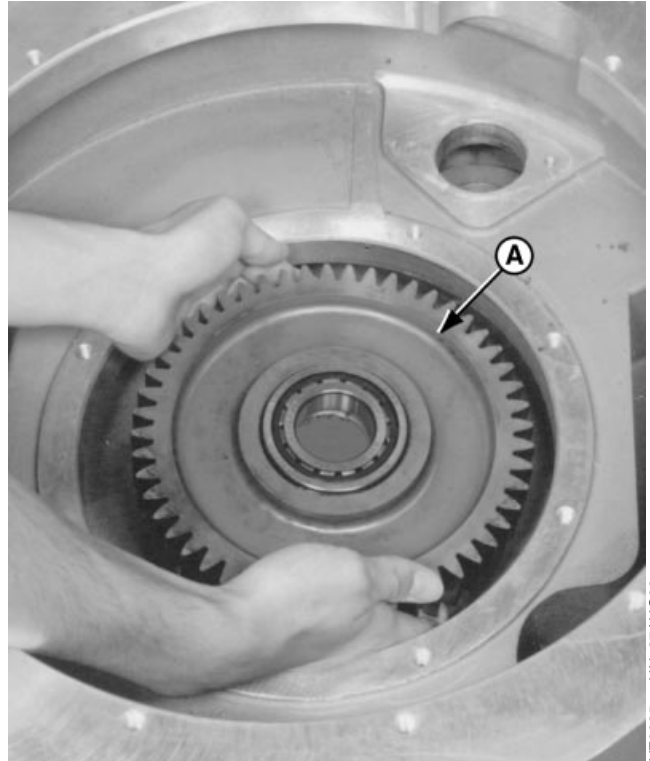
YZ2143 -UN-23APR02

Continued on next page

DPSG,YZ01324,61 -19-23AUG99-4/8

6. Remove primary idler gear (A) from housing.

A—Primary Idler Gear



YZ2025 -UN-27AUG99

Primary Idler Gear

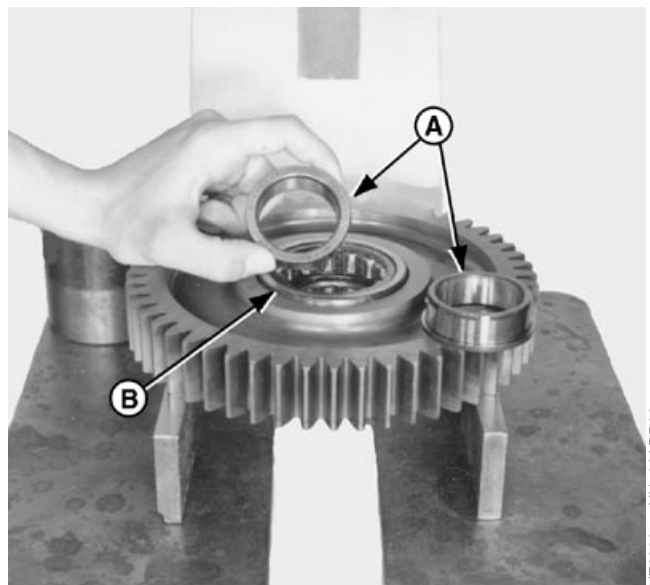
DPSG,YZ01324,61 -19-23AUG99-5/8

7. Remove inner races (A) from both sides of gear.

8. Remove and discard bearing (B).

9. Turn idler gear over.

A—Inner Races
B—Bearing



YZ2023 -UN-08APR02

Inner Races

Continued on next page

DPSG,YZ01324,61 -19-23AUG99-6/8

10. Remove snap ring (A).

! **CAUTION: Snap ring has high spring compression. Use extreme care.**

A—Snap Ring



YZ2049 -UN-26JUL99

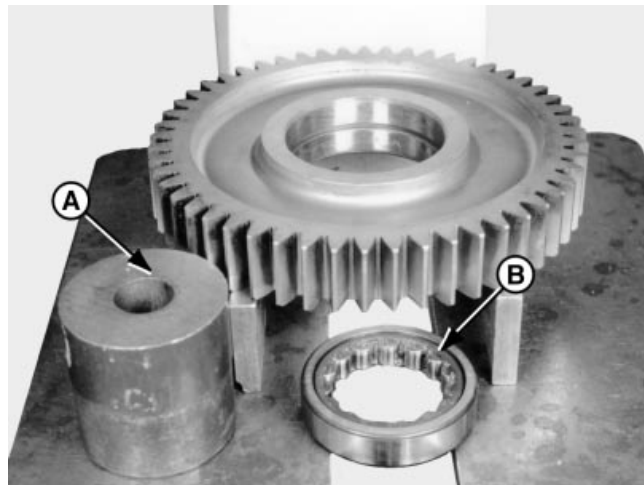
Remove Snap Ring

DPSG,YZ01324,61 -19-23AUG99-7/8

11. Remove and discard bearing (B) using suitable bearing driver (A).

NOTE: Press on OUTER race of bearing.

A—Bearing Driver
B—Bearing



YZ2050 -UN-29JUL99

DPSG,YZ01324,61 -19-23AUG99-8/8

Inspect and Assemble Engine Rear Power Take-Off Housing Group

1. Inspect housing for possible damage. Replace, if needed.
2. Inspect and clean out all plug hole locations with air gun to clean out possible debris.
3. Inspect O-ring plugs for dirt or defects. Inspect O-rings. O-rings must be free of damage or defects. Replace if needed. Check oil passages with air and clean as needed. Lubricate and install O-rings onto plugs. Tighten plugs to proper torque value.

DPSG,YZ01324,60 -19-26SEP02-1/2

NOTE: The internal O-ring plug (A) should not have to be removed unless determined by the technician.

1. Install and tighten internal O-ring plug (A) to auxiliary pump area of power take-off housing to close hole.

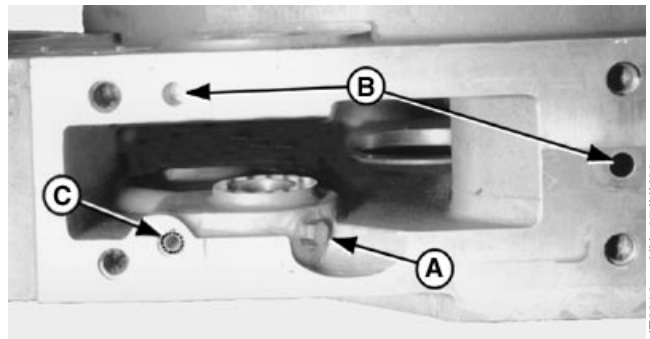
Specification

Plug—Torque..... 16 N•m (12 lb-ft)

2. Lubricate and install O-ring (C).

IMPORTANT: Dowel pins are installed in power take-off housing (B) for double pump applications.

IMPORTANT: Auxiliary pump access cover plate and four cap screws are installed on single pump applications.



Internal Plug, O-Ring And Dowel Pin Locations

- A—O-Ring Plug
- B—Dowel Pin Locations
- C—O-Ring

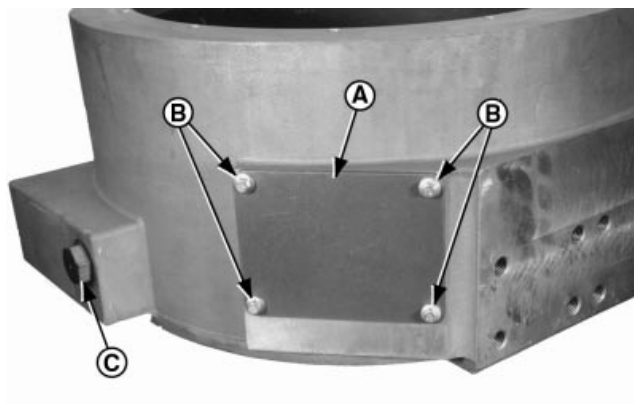
DPSG,YZ01324,60 -19-26SEP02-2/2

Flywheel Access Cover Plate

1. Clean surfaces of flywheel access cover plate and power take-off housing.

NOTE: Clean surfaces that will be joined using acetone. Wipe excess off with a clean cloth.

IMPORTANT: Apply sealant to clean surface of main housing. The application should cover the joint completely. Joining should take place within 5 minutes after sealant application. Wipe any excess from joint immediately after assembly to avoid runoff. Allow bond to cure 24-48 hours before testing.



YZ2034 -UN-30AUG99

Flywheel Access Plate

- A—Flywheel Access Cover Plate
- B—Cap Screws (4)
- C—Drain Plug

2. Apply High Performance RTV Silicone Gasket sealant to flywheel access hole on housing.
3. Install flywheel access cover (A) plate on power take-off housing.
4. Apply medium strength thread lock and sealer to four cap screws.
5. Install and tighten cap screws (B).

Specification

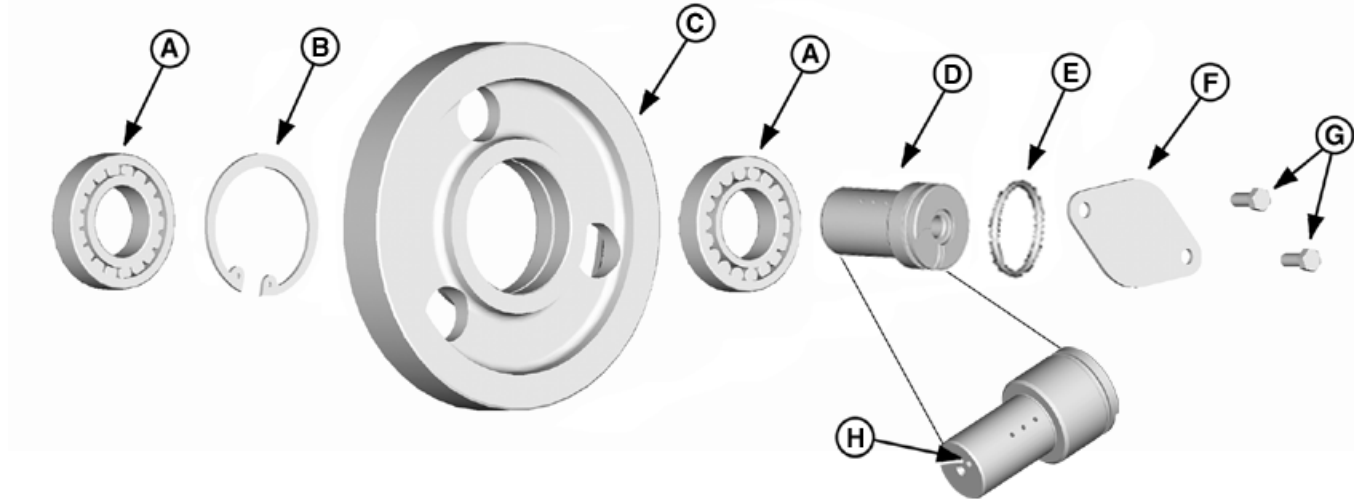
Cap Screws—Torque 28 N•m (20 lb-ft)

6. Install and tighten drain plug (C).

Specification

Drain Plug—Torque 102 N•m (75 lb-ft)

Primary Idler Shaft Group



Primary Idler Shaft Group—Exploded View

- | | | | |
|-----------------------------------|-----------------------|---------------|------------------|
| A—Cylindrical Roller Bearings (2) | C—52 Tooth Gear | E—O-ring | G—Cap Screws (2) |
| B—Snap Ring | D—Primary Idler Shaft | F—Cover Plate | H—Orifice |

YZ2067A -UN-05MAR02

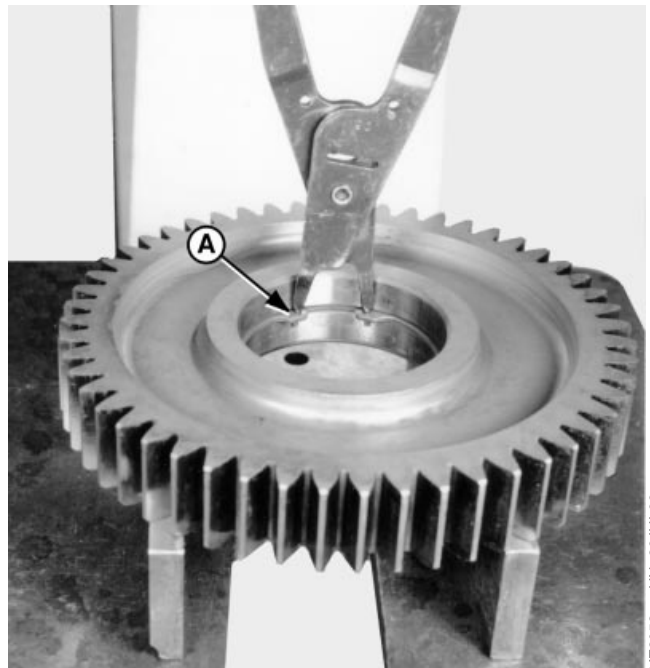
DPSG,YZ01324,69 -19-23AUG99-1/1

Assemble Primary Idler Shaft Group

1. Install snap ring (A) into idler gear.

CAUTION: Snap ring has high spring compression. Use extreme care.

A—Snap Ring



Idler Gear Snap Ring

YZ20652 -UN-29JUL99

Continued on next page

DPSG,YZ01324,74 -19-26SEP02-1/10

2. Press bearing (A) into idler gear until contact with snap ring.

NOTE: Press on OUTER race of bearing.

3. Turn idler gear over.

A—Bearing



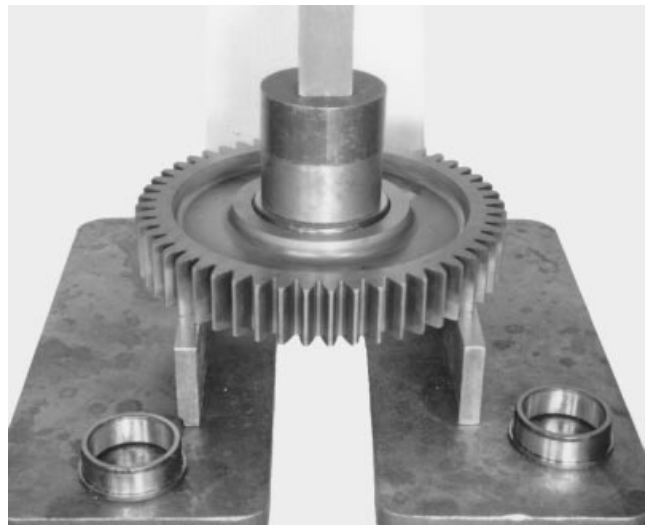
YZ2053 -UN-29JUL99

Press on Outer Race of Bearing

DPSG,YZ01324,74 -19-26SEP02-2/10

4. Press bearing into idler gear until contact with snap ring.

NOTE: Press on OUTER race of bearing.



YZ2024 -UN-28JUL99

Press on Outer Race of Bearing

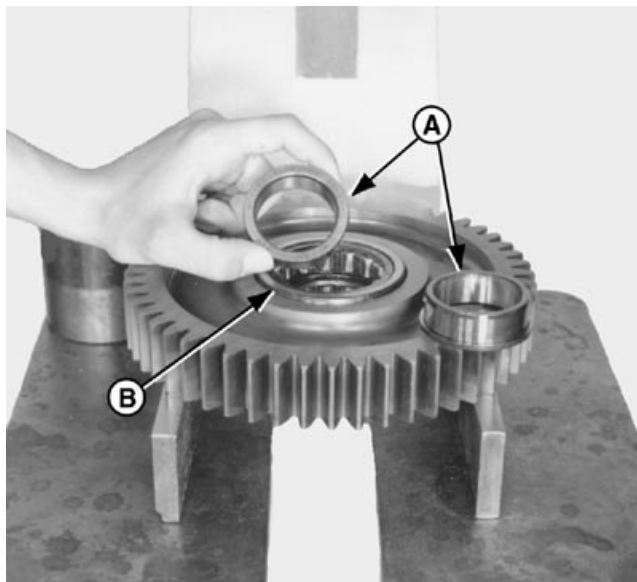
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DPSG,YZ01324,74 -19-26SEP02-3/10

5. Place inner races (A) on both sides of gear.

NOTE: Grease races with engine oil compatible grease before inserting them in gear to help hold inner races in place and prevent dry startup.

A—Inner Races (2)



Inner Races

DPSG,YZ01324,74 -19-26SEP02-4/10

YZ2023 -UN-08APR02

6. Install primary idler gear (A) into housing.

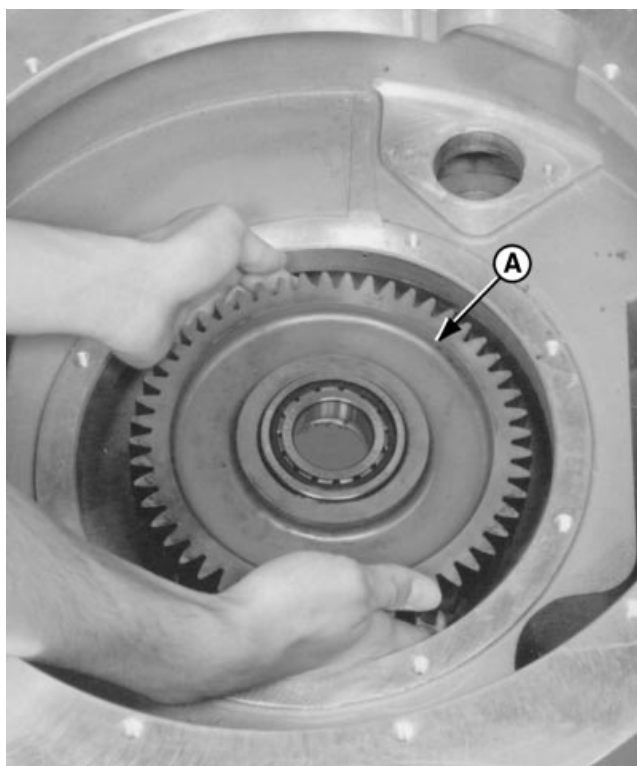
NOTE: The gear may slide into place easier by placing housing on its side.

Option: Use a thin plate under the bottom bearing to slide the gear into place while preventing the bottom bearing race from dropping out.

7. Clean surfaces of housing and idler shaft cover plate.

NOTE: Clean both surfaces that will be joined using acetone. Wipe excess off with a clean cloth.

A—Primary Idler Gear



Primary Idler Gear

Continued on next page

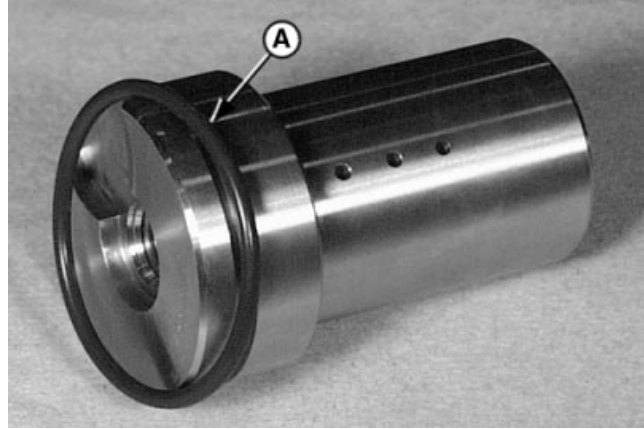
DPSG,YZ01324,74 -19-26SEP02-5/10

YZ2025 -UN-27AUG99

NOTE: Lubricate O-ring with petroleum jelly, engine oil or J20C hydraulic oil.

8. Lubricate and install O-ring (A) on primary idler shaft.

A—O-ring



YZ2089 -UN-07FEB02

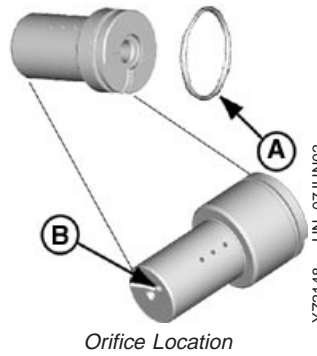
Lubricate and Install O-ring

DPSG,YZ01324,74 -19-26SEP02-6/10

IMPORTANT: Make sure orifice is installed at (B).

NOTE: If replacing orifice, apply medium strength thread lock and sealer and clear passage with air flow after installation.

A—O-Ring
B—Orifice Location



YZ2148 -UN-07JUN02

Orifice Location

Continued on next page

DPSG,YZ01324,74 -19-26SEP02-7/10

9. Press primary idler shaft (A) in housing, using idler shaft press tool JDG1663.

NOTE: Make sure power take-off housing is supported behind idler shaft location when shaft is being pressed into housing.

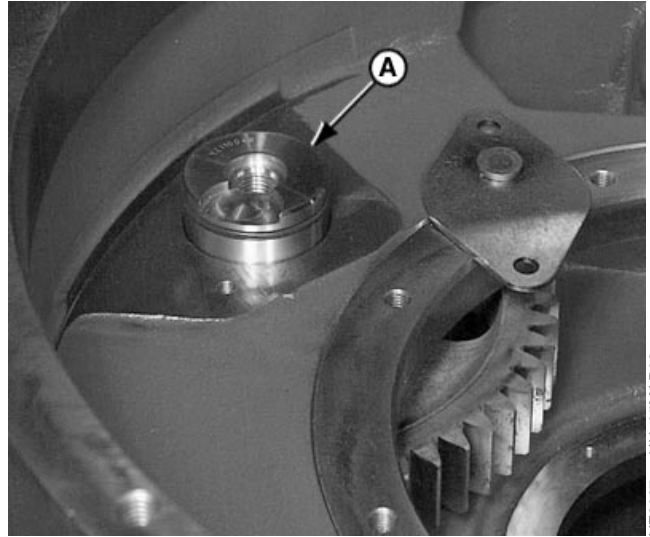
NOTE: Make sure moon-shape on shaft is aligned properly with one of the tapped holes.

Specification

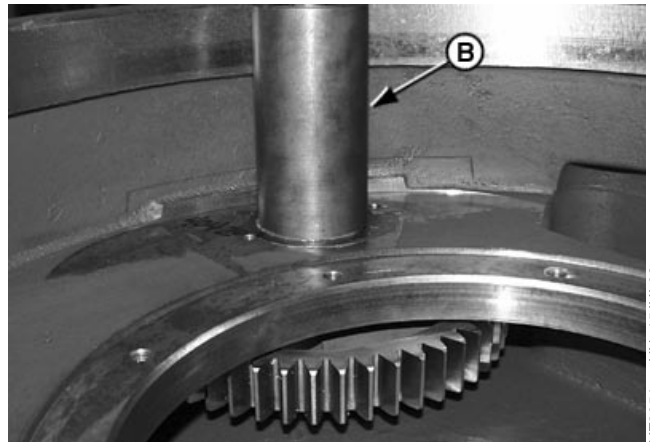
Primary Idler Shaft—Diameter 45mm (1.77 in.)

NOTE: Make sure idler shaft is flush or just below surface of housing.

- A—Primary Idler Shaft
- B—Idler Shaft Press JDG1663



YZ2087 -UN-05MAR02



YZ2051 -UN-15JUL02

Press idler shaft in housing

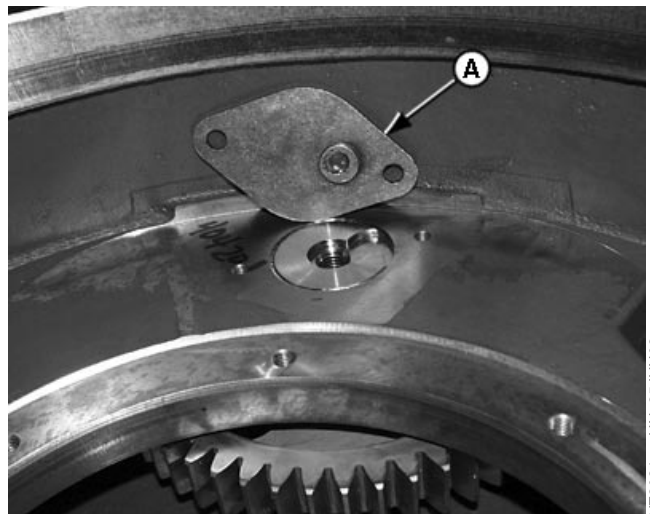
DPSG,YZ01324,74 -19-26SEP02-8/10

10. Install idler shaft cover plate (A).

IMPORTANT: Protrusion of cap fits in recessed moon-shape area of idler shaft.

11. Apply medium strength thread lock and sealer to two cap screws.

- A—Cover Plate



YZ2021 -UN-25JUN02

Idler Shaft Cover Plate

Continued on next page

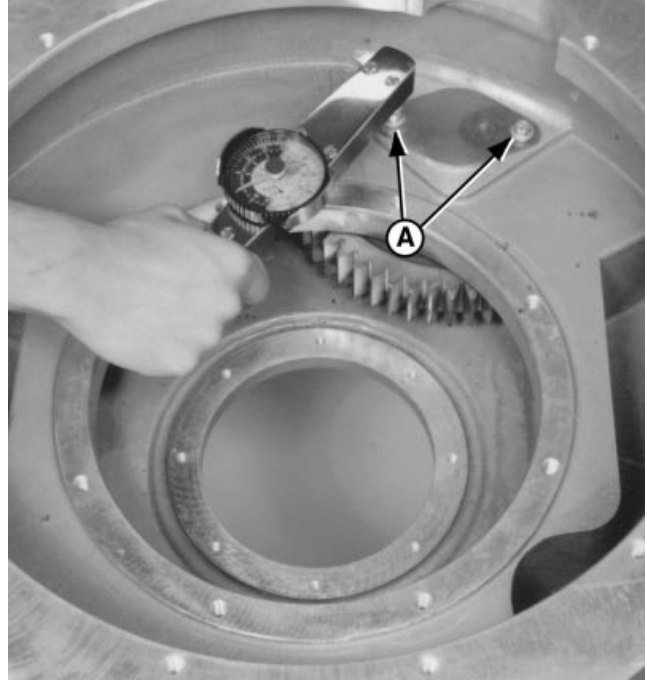
DPSG,YZ01324,74 -19-26SEP02-9/10

12. Install and tighten cap screws (A).

Specification

Cap Screws—Torque 28 N•m (20 lb-ft)

A—Cap Screws (2)

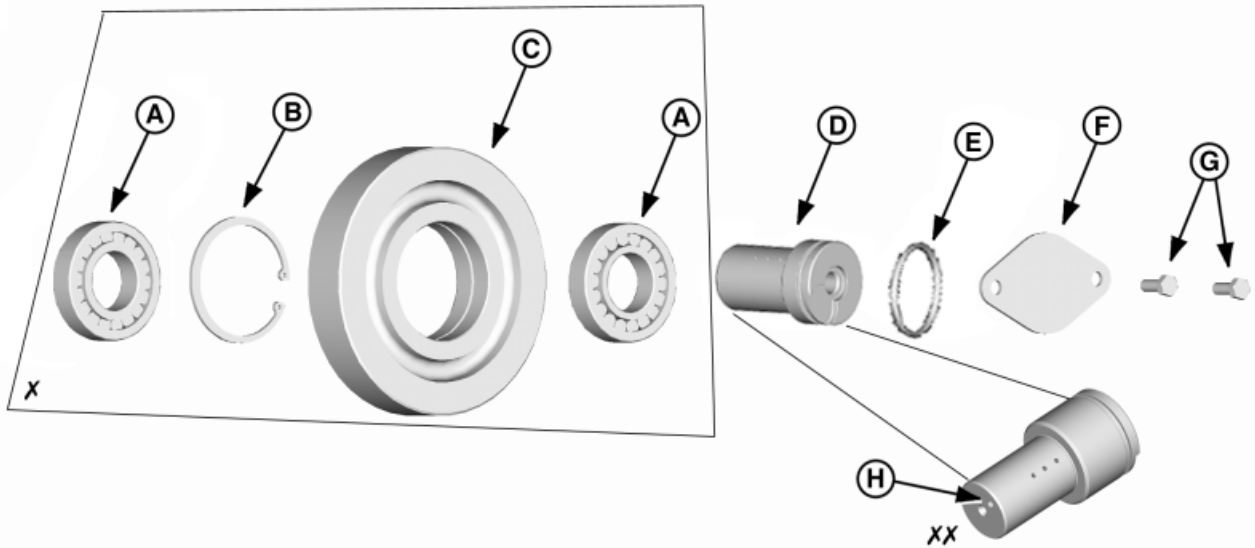


YZ2020 -UN-28JUN99

Idler Shaft Cover Plate Cap Screws

DPSG,YZ01324,74 -19-26SEP02-10/10

Auxiliary Idler Shaft Group



Auxiliary Idler shaft Group—Exploded View

A—Cylindrical Roller Bearings
(2)¹

B—Snap Ring
C—40 Tooth Idler Gear
D—Auxiliary Idler Shaft

E—O-ring
F—Cover Plate

G—Cap Screws (2)
H—Setscrew/Orifice²

¹*The Auxiliary Idler Gear Assembly (A, B, C) is not required in units that do not have the auxiliary pump drive (single pump applications).

²**A setscrew is installed in the auxiliary idler shaft in units that do not have the auxiliary pump drive (single pump applications) to stop lube flow. An orifice is installed in the auxiliary idler shaft in units that have the auxiliary pump drive (double pump applications).

YZ2068A -UN-22.JAN02

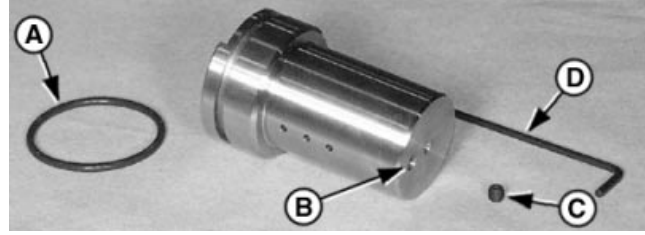
DPSG,YZ01324,68 -19-23AUG99-1/1

Assemble Auxiliary Idler Shaft Group

Single Pump Application

IMPORTANT: In all single pump applications, the auxiliary pump drive is not required; therefore, the auxiliary idler gear assembly should not be installed.

IMPORTANT: The auxiliary idler shaft is still required in single pump applications and must have a setscrew (C) installed in plug hole (B) to stop lube flow.



YZ2088 -JUN-07FEB02

Install Setscrew in Auxiliary Idler Shaft On Single Pump Applications

- A—O-ring
- B—Idler Shaft Setscrew Location
- C—Setscrew
- D—1/8" Allen Wrench

1. Lubricate and install O-ring (A) in groove of idler shaft.
2. Apply medium strength thread lock and sealer to setscrew (C).
3. Install setscrew into idler shaft plug hole (B).
4. Tighten setscrew.

Specification

Setscrew—Torque..... 12 N•m (9 lb-ft)

Continued on next page

DPSG,YZ01324,73 -19-26SEP02-1/12

NOTE: Make sure power take-off housing is supported behind idler shaft location when shaft is being pressed into housing.

Specification

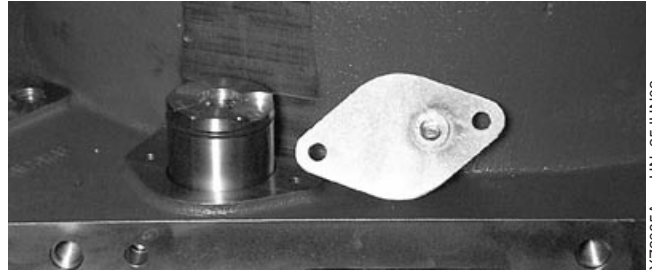
Auxiliary Idler Shaft—Diameter 40mm (1.57 in.)

NOTE: Make sure moon-shape on shaft is aligned properly with one of the tapped holes.

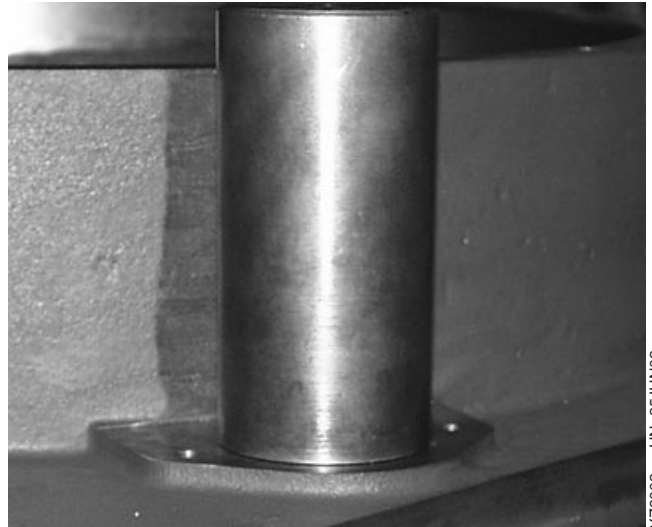
NOTE: Make sure idler shaft is flush or just below surface of housing.

- 5. Press auxiliary idler shaft in housing location, using idler shaft press JDG1663.
- 6. Clean surfaces of housing and idler shaft cover plate.

NOTE: Clean both surfaces that will be joined using acetone. Wipe excess off with a clean cloth.



YZ2085A -UN-25JUN02



YZ2002 -UN-25JUN02

Press Auxiliary Idler Shaft Into Main PTO Housing

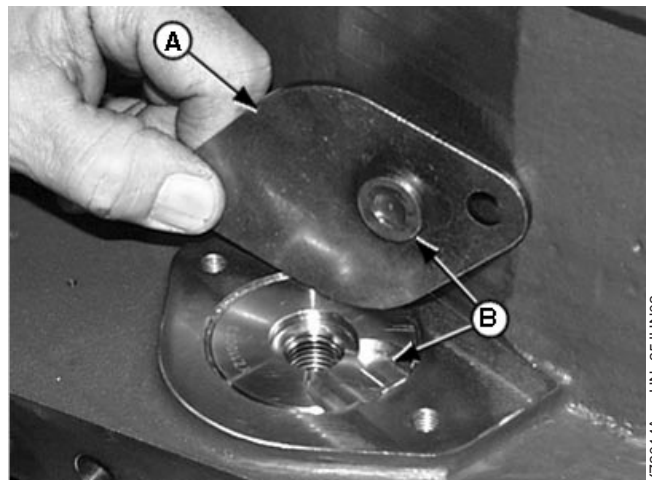
DPSG,YZ01324,73 -19-26SEP02-2/12

- 7. Install idler shaft cover plate (A).

IMPORTANT: Protrusion of cover plate (B) fits in recessed moon-shape area of idler shaft (B).

- 8. Apply medium strength thread lock and sealer to two cap screws.

- A—Cover Plate
- B—Cover Plate Protrusion and Idler Shaft Recessed Moon-Shape Area



YZ2014A -UN-25JUN02

Idler Shaft Cover Plate

Continued on next page

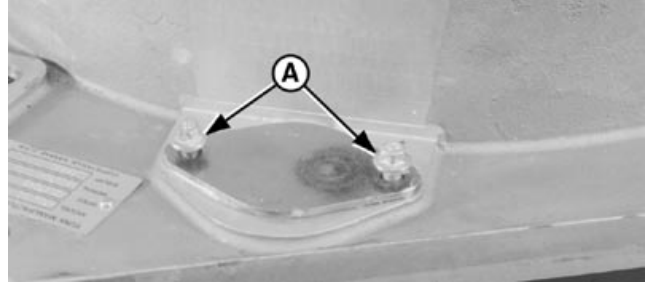
DPSG,YZ01324,73 -19-26SEP02-3/12

9. Install and tighten cap screws (A).

Specification

Cap Screws—Torque 28 N•m (20 lb-ft)

A—Cap Screws (2)



Idler Shaft Cover Plate Cap Screws

YZ2013A -UN-25JUN02

DPSG,YZ01324,73 -19-26SEP02-4/12

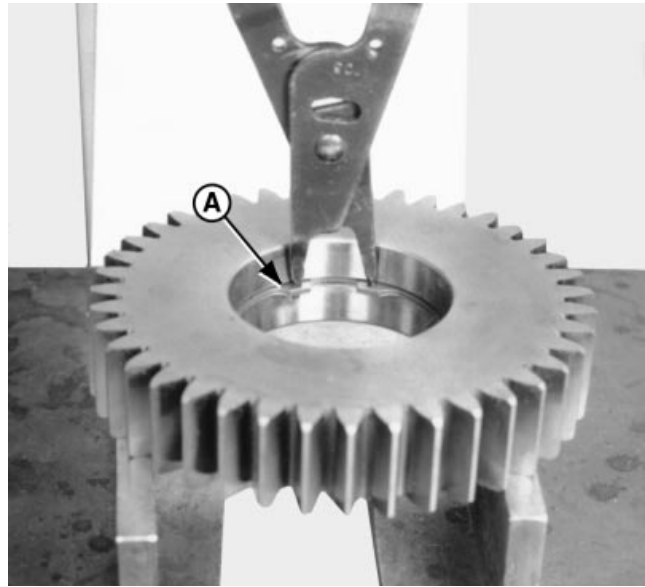
Double Pump Application

IMPORTANT: Make sure orifice in idler shaft is clean and installed.

1. Install snap ring (A) into auxiliary idler gear.

CAUTION: Snap ring has high spring compression. Use extreme care.

A—Snap Ring



Auxiliary Idler Gear Snap Ring

YZ2042 -UN-07SEP99

Continued on next page

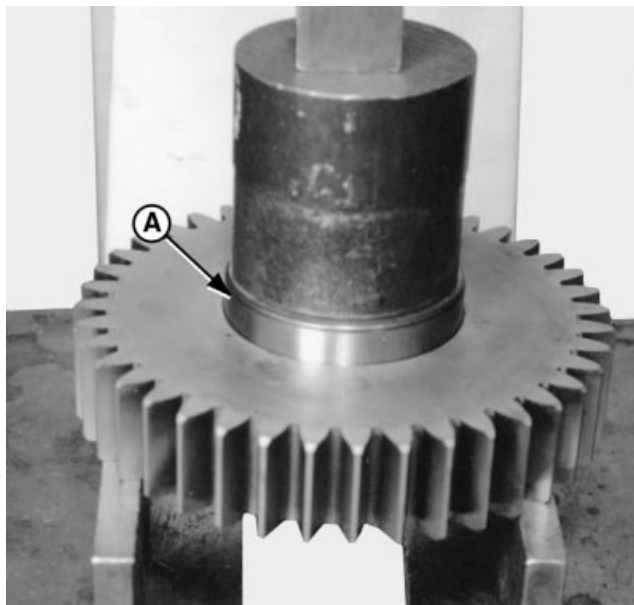
DPSG,YZ01324,73 -19-26SEP02-5/12

2. Press bearing (A) into idler gear until contact with snap ring.

NOTE: Press on OUTER race of bearing.

3. Turn idler gear over.

A—Bearing



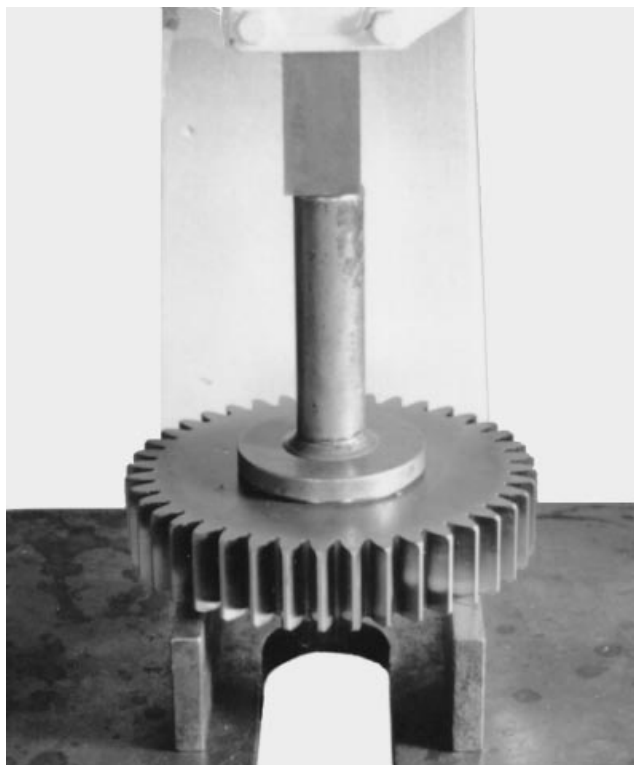
Outer Race of Bearing

YZ2043 -UN-27AUG99

DPSG,YZ01324,73 -19-26SEP02-6/12

4. Press bearing into idler gear until contact with snap ring.

NOTE: Press on OUTER race of bearing.



Outer Race of Bearing

YZ2018 -UN-28JUL99

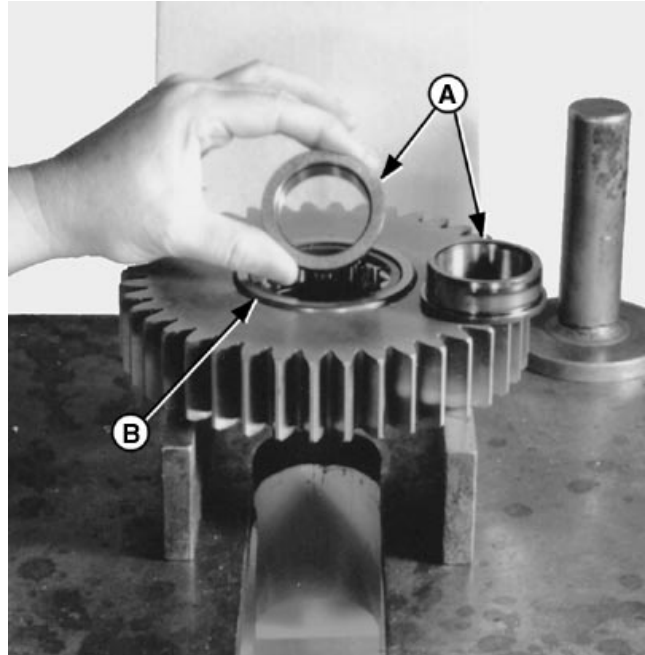
Continued on next page

DPSG,YZ01324,73 -19-26SEP02-7/12

5. Place inner races (A) on both sides of gear.

NOTE: Grease races before inserting in gear to help hold inner races in place and prevent dry startup.

A—Inner Races (2)



Inner Races

YZ2017 -UN-06APR02

DPSG,YZ01324,73 -19-26SEP02-8/12

6. Install auxiliary gear into housing.



Auxiliary Gear

YZ2056 -UN-29JUL99

Continued on next page

DPSG,YZ01324,73 -19-26SEP02-9/12

NOTE: Make sure power take-off housing is supported behind idler shaft location when shaft is being pressed into housing.

Specification

Auxiliary Idler Shaft—Diameter 40mm (1.57 in.)

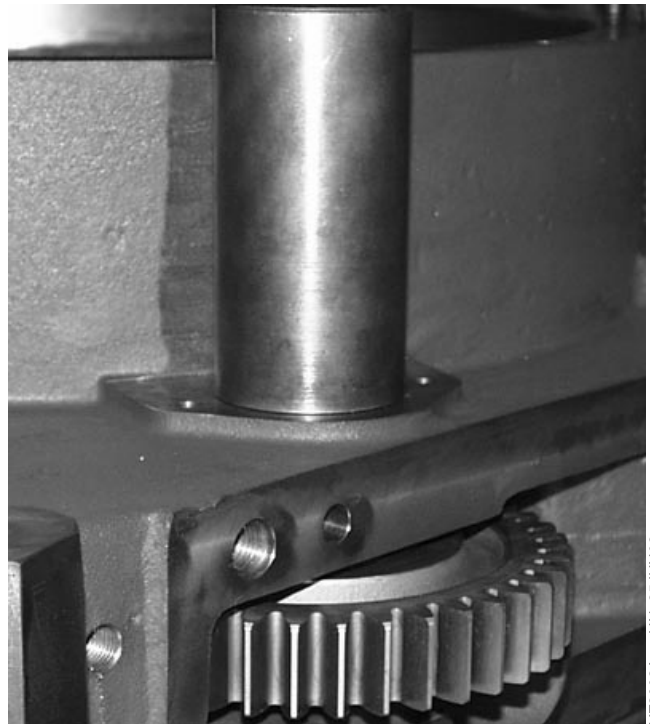
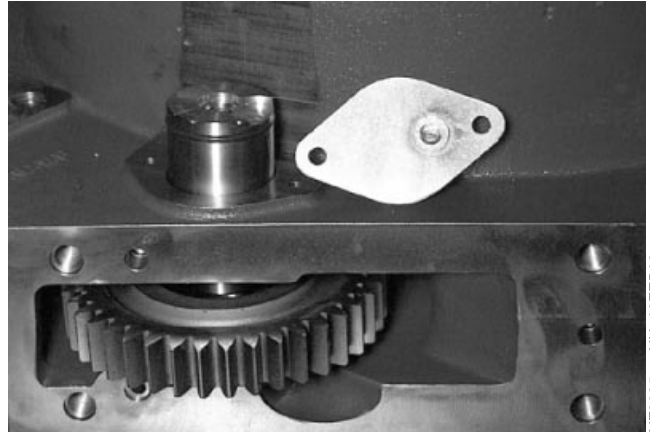
NOTE: Make sure moon-shape on shaft is aligned properly with one of the tapped holes.

NOTE: Make sure idler shaft is flush or just below surface of housing.

7. Press auxiliary idler shaft in gear in housing location, using idler shaft press JDG1663.

8. Clean surfaces of housing and idler shaft cover plate.

NOTE: Clean both surfaces that will be joined using acetone. Wipe excess off with a clean cloth.



Press Auxiliary Idler Shaft Into Auxiliary Gear

Continued on next page

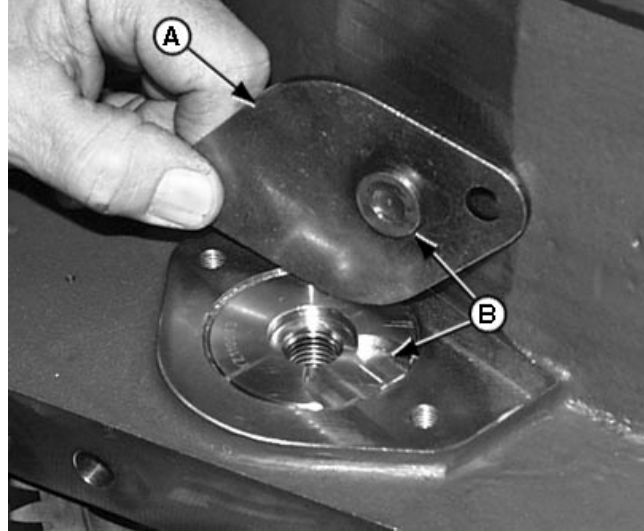
DPSG,YZ01324,73 -19-26SEP02-10/12

9. Install idler shaft cover plate (A).

IMPORTANT: Protrusion of cover plate (B) fits in recessed moon-shape area of idler shaft (B).

10. Apply medium strength thread lock and sealer to two cap screws.

A—Cover Plate
B—Cover Plate Protrusion



Idler Shaft Cover Plate

YZ2014 -UN-24JUN02

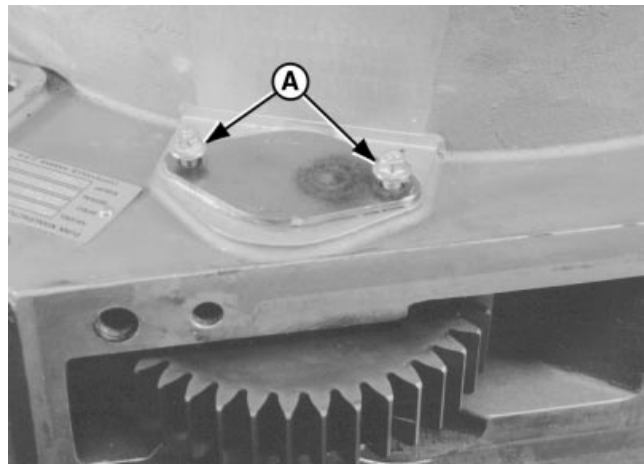
DPSG,YZ01324,73 -19-26SEP02-11/12

11. Install and tighten cap screws (A).

Specification

Cap Screws—Torque 28 N•m (20 lb-ft)

A—Cap Screws (2)



Idler Shaft Cover Plate Cap Screws

YZ2013 -UN-28JUN99

DPSG,YZ01324,73 -19-26SEP02-12/12

Auxiliary Pump Access Cover Plate (For Single Pump Application Only)

1. Clean surface of power take-off housing.

*NOTE: Clean surface that will be joined using acetone.
Wipe excess off with a clean cloth.*

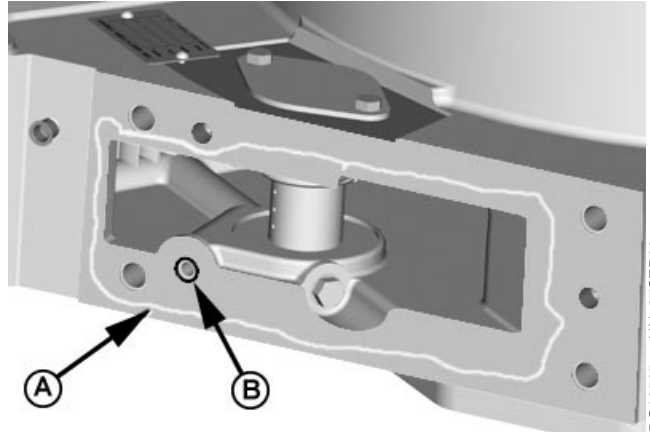
Continued on next page

DPSG,YZ01324,70 -19-26SEP02-1/3

IMPORTANT: Apply sealant to clean surface of main housing. The application should cover the joint completely. Joining should take place within 5 minutes after sealant application. Wipe any excess from joint immediately after assembly to avoid runoff. Allow bond to cure 24-48 hours before testing.

NOTE: O-ring (B) can be installed with petroleum jelly.

2. Apply High Performance RTV Silicone Gasket (A) to mounting surface on power take-off housing.



RG12595 -JUN-27SEP02

Apply RTV Silicone Gasket

- A—Grey High Performance RTV Silicone Gasket
- B—O-Ring

DPSG,YZ01324,70 -19-26SEP02-2/3

3. Install cover plate (C).

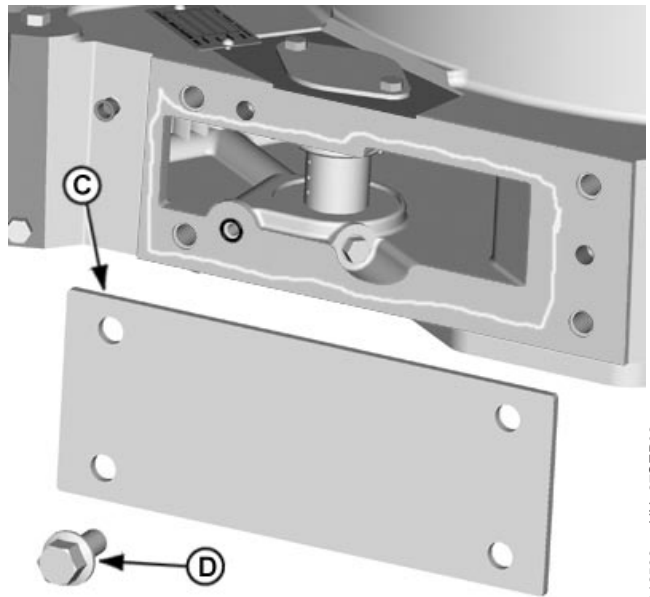
NOTE: Install plate so any "high point" is directed towards the housing and not away from it.

4. Apply medium strength thread lock and sealer to cap screws (D), install and tighten cap screws.

Specification

Cover Plate to Power Take-Off
Housing Cap Screws (4)—Torque 270 N•m (200 lb-ft)

- C—Auxiliary Pump Access Cover Plate
- D—Cap Screws (4)

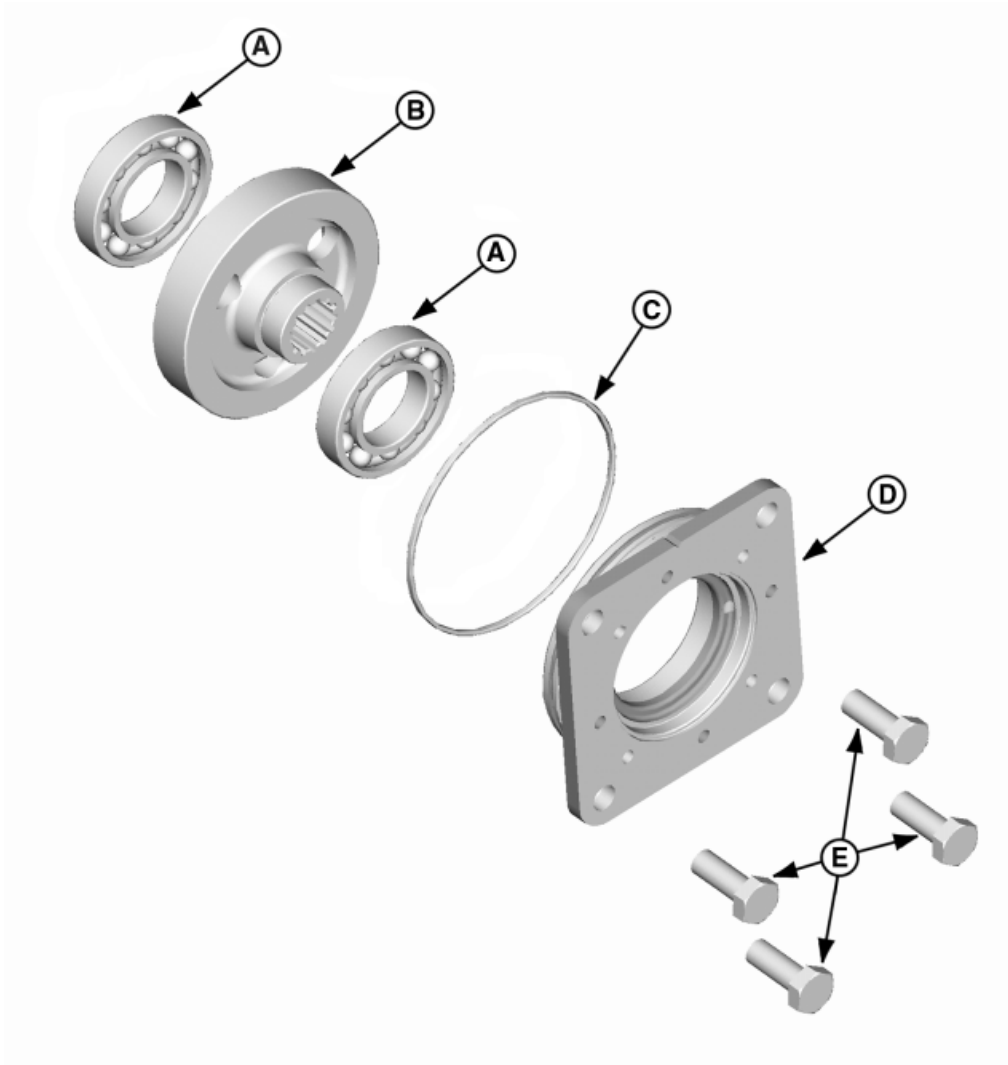


RG12596 -JUN-27SEP02

Install Cover Plate and Cap Screws

DPSG,YZ01324,70 -19-26SEP02-3/3

Primary Pump Group



YZ2069A -UN-21-JAN02

Primary Pump Group - Exploded View

A—Ball Bearings (2)
B—40 Tooth Pump Gear

C—O-Ring

D—SAE 'C' Adapter

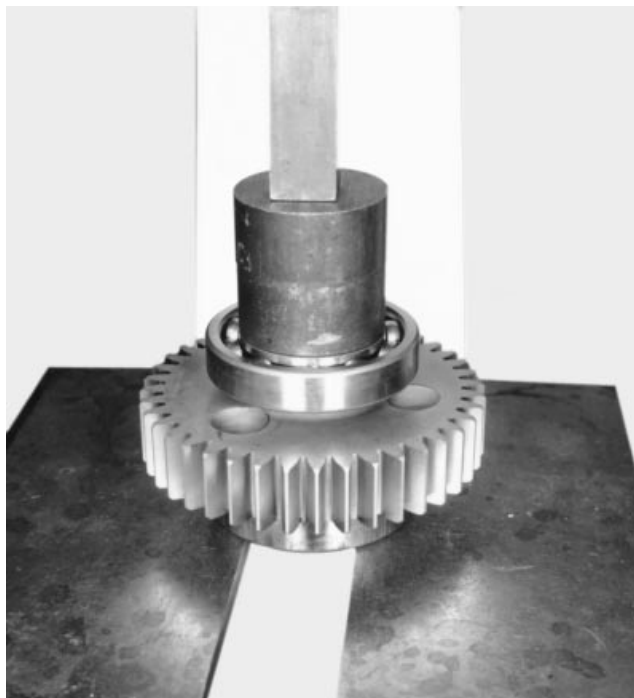
E—Cap Screws (4)

DPSG,YZ01324,67 -19-23AUG99-1/1

Assemble Primary Pump Group

1. Press bearings on both ends of gear, using suitable bearing driver.

NOTE: Press on INNER race of bearing.



YZ2012 -UN-07SEP99

Press On Inner Race of Bearing

DPSG,YZ01324,75 -19-26AUG99-1/5

2. Install gear assembly (A) into housing, mesh with primary idler gear.

NOTE: Bearing outer races are slip-fit. Spin gear to make sure all gears spin freely.

A—Gear Assembly



YZ2071 -UN-29JUL99

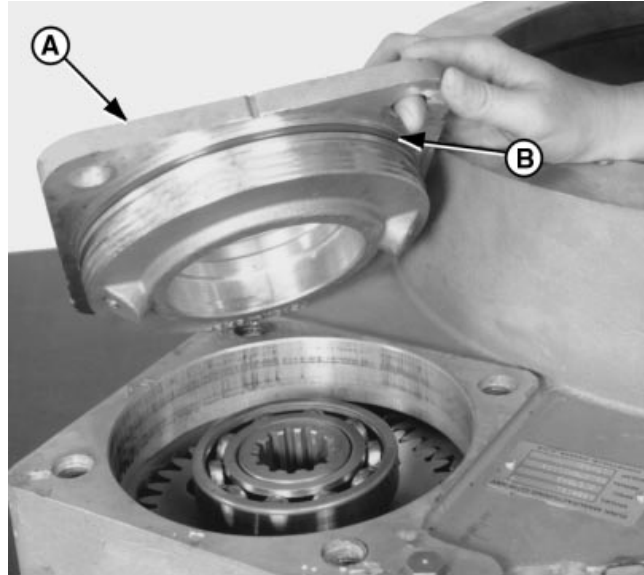
Gear Assembly

Continued on next page

DPSG,YZ01324,75 -19-26AUG99-2/5

3. Lubricate and install O-ring (B) to inside groove of primary pump SAE 'C' adapter (A).

A—SAE 'C' Adapter
B—O-ring



YZ2010A -UN-06FEB02

Lubricate O-ring And Plate With Oil Before Installing

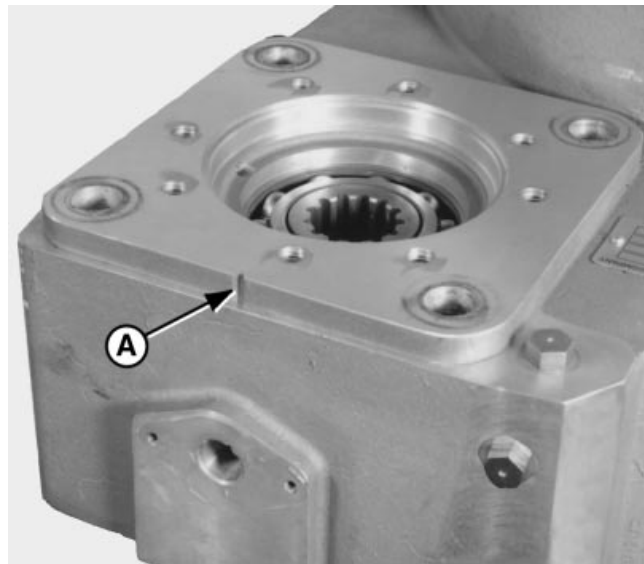
DPSG,YZ01324,75 -19-26AUG99-3/5

4. Install SAE 'C' adapter to housing with notch of cover (A) at top of housing.

IMPORTANT: Tap plate to fit. Be very careful when tapping plate onto housing to prevent damage to O-ring.

5. Apply medium strength thread lock and sealer to cap screws (4).

A—SAE 'C' Adapter Notch



YZ2009A -UN-22JAN02

Cover Plate Notch Location

Continued on next page

DPSG,YZ01324,75 -19-26AUG99-4/5

6. Install and tighten cap screws (A).

Specification

Cap Screws—Torque 390 N•m (285 lb-ft)

NOTE: Spin gear to make sure all gears spin freely.

7. Inspect O-ring plugs (B and C) to lube passage holes for damage and possible debris buildup.

NOTE: Air check orifice in input bearing lube passage (center hole) for possible clogging. Can be cleaned with wire.

8. Install and tighten O-ring plug (C).

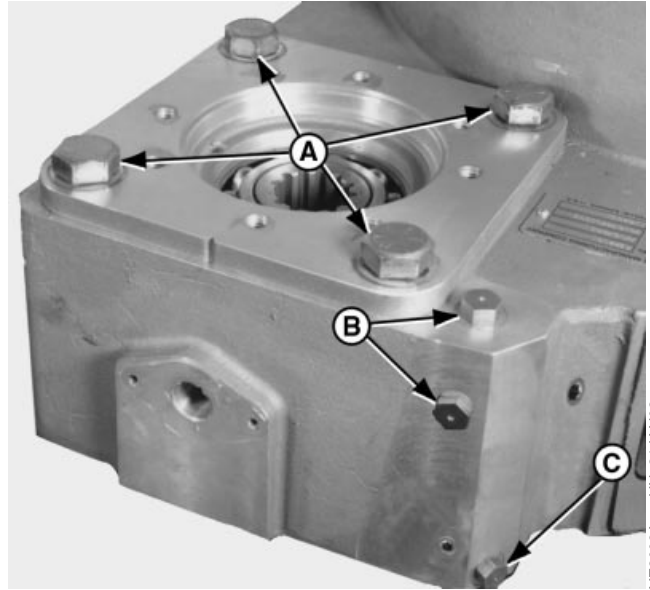
Specification

O-Ring Plug (3/8-24 UNF)—
Torque 8 N•m (6 lb-ft)

9. Install and tighten O-ring plugs (B).

Specification

O-Ring Plugs (1/2-20 UNF)—
Torque 16 N•m (12 lb-ft)

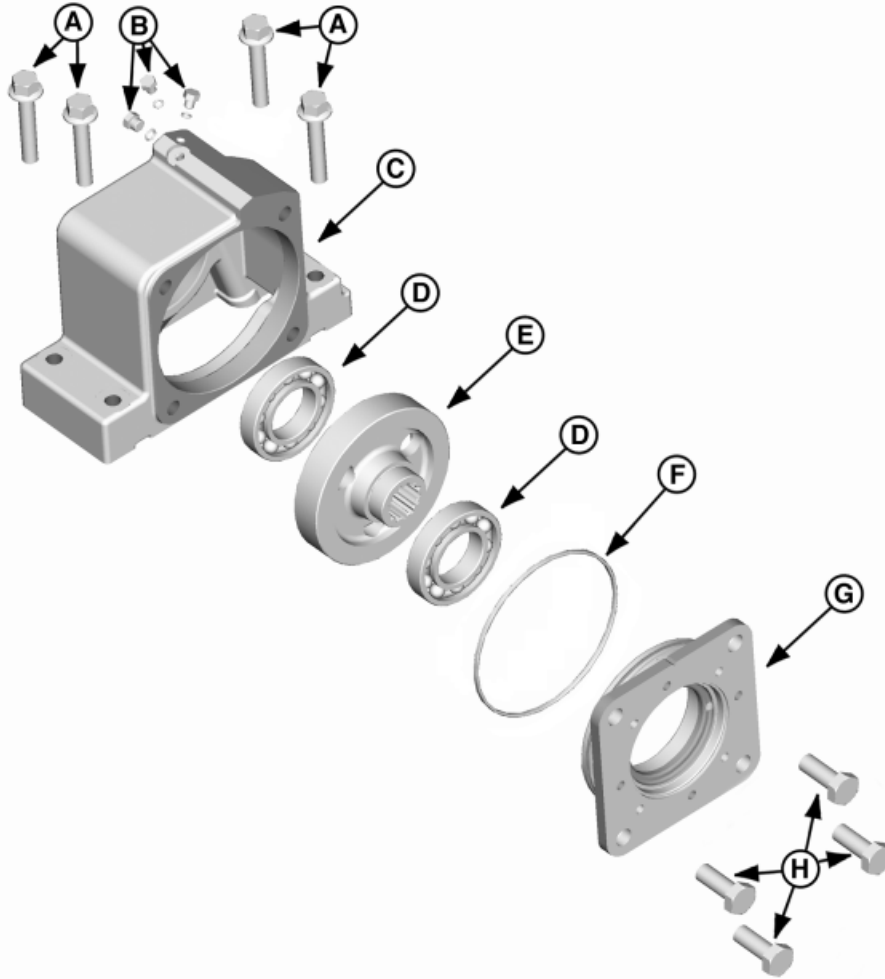


Cap Screws and Plugs

- A—Cap Screws (4)
- B—1/2-20 UNF O-Ring Plugs (2)
- C—3/8-24 UNF O-Ring Plug

DPSG,YZ01324,75 -19-26AUG99-5/5

Auxiliary Pump Group



Auxiliary Pump Group—Exploded View

A—Cap Screws (4)
B—Plugs*

C—Auxiliary Pump Housing
D—Ball Bearings (2)

E—40 Tooth Pump Gear
F—O-Ring

G—SAE 'C' Adapter
H—Cap Screws (4)

NOTE: *Auxiliary pump has 2 small plugs (3/8-24 UNF) and 1 large (1/2-20 UNF) plug. There is also a large plug located internally in the main

housing where the auxiliary pump assembly is installed.

YZ2070A -UN-21JAN02

DPSG,YZ01324,66 -19-23AUG99-1/1

Assemble Auxiliary Pump Group (Double Pump Rear Power Take-Off)

NOTE: The following procedure only applies to double pump rear power take-off's.

1. Lubricate and install O-ring (D) in main housing.

IMPORTANT: Make sure plug (C) is installed inside on power take-off housing.

Specification

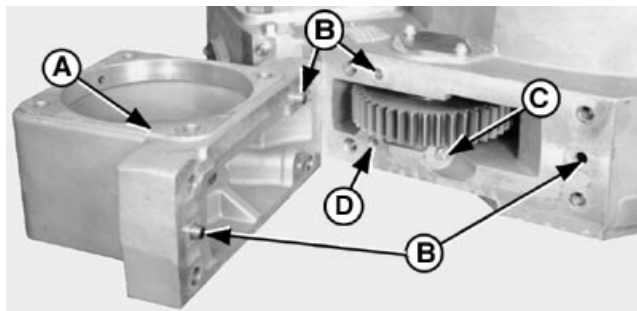
Plug—Torque..... 16 N•m (12 lb-ft)

IMPORTANT: Make sure dowel pins (B) are installed. Dowel pins may be located in auxiliary pump housing or main pto housing.

2. Clean both surfaces of power take-off housing and auxiliary housing.

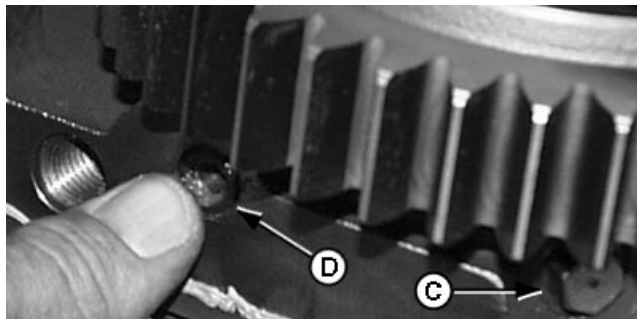
NOTE: Clean both surfaces that will be joined using acetone. Wipe excess off with a clean cloth.

- A—Auxiliary Pump Housing
- B—Dowel Pins (2) and Dowel Pin Locations
- C—Plug
- D—O-ring



Auxiliary Pump Housing

YZ2079 -JUN-04MAR02



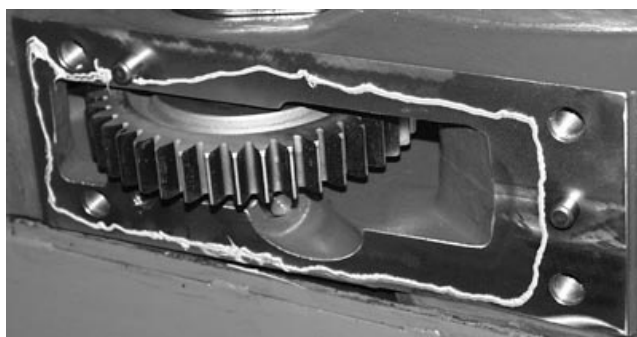
Plug and O-ring

YZ2029 -JUN-24JUN02

DPSG,YZ01324,76 -19-26SEP02-1/10

IMPORTANT: Apply sealant to clean surface of main housing. The application should cover the joint completely. Joining should take place within 5 minutes after sealant application. Wipe any excess from joint immediately after assembly to avoid runoff. Allow bond to cure 24-48 hours before testing.

3. Apply High Performance RTV Silicone Gasket (LOCTITE® 5699), as a bead, to power take-off housing.
4. Install auxiliary pump housing (A) to power take-off housing.



Apply Bead

YZ2022 -JUN-24JUN02

Continued on next page

DPSG,YZ01324,76 -19-26SEP02-2/10

- 5. Apply medium strength thread lock and sealer to cap screws (4).
- 6. Install and tighten cap screws (A).

Specification

Cap Screws—Torque 270 N•m (200 lb-ft)

NOTE: Spin gears to make sure all gears spin freely.

A—Cap Screws (4)



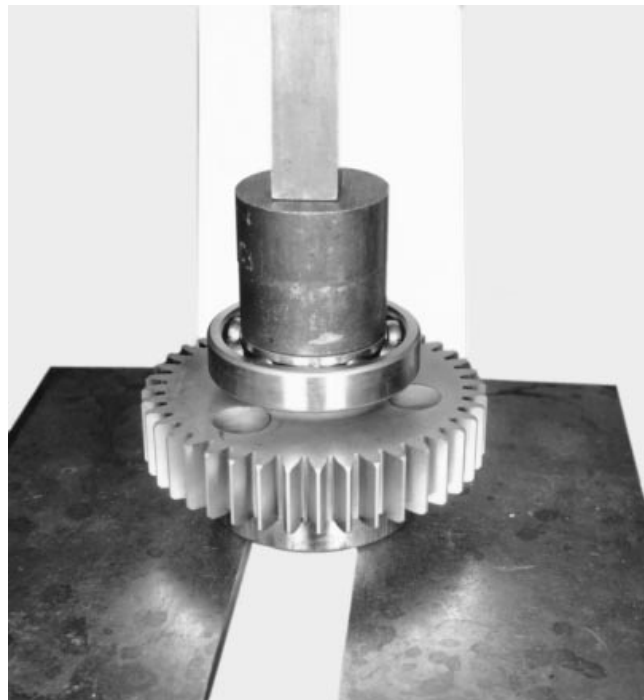
YZ2059A -UN-21JAN02

Torque Cap Screws

DPSG,YZ01324,76 -19-26SEP02-3/10

- 7. Press bearings on both ends of gear, using suitable bearing driver.

NOTE: Press on INNER race of bearing.



YZ2012 -UN-07SEP99

Inner Race of Bearing

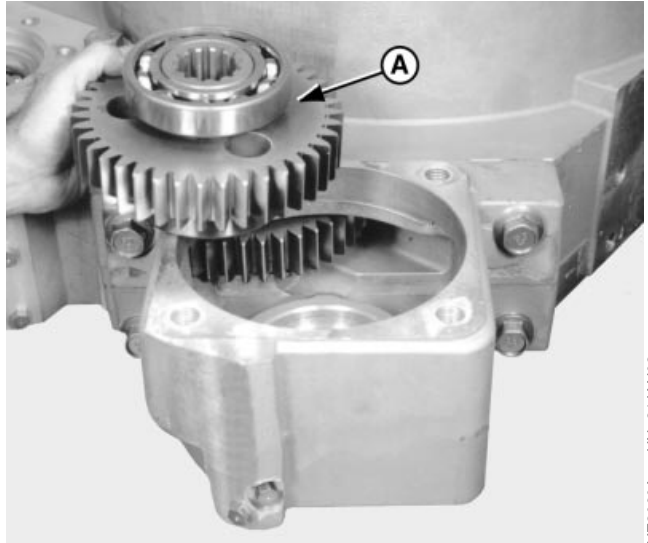
Continued on next page

DPSG,YZ01324,76 -19-26SEP02-4/10

NOTE: Bearing outer races are slip-fit.

8. Install auxiliary pump gear assembly (A) into housing mesh with auxiliary idler gear.

A—Pump Gear Assembly

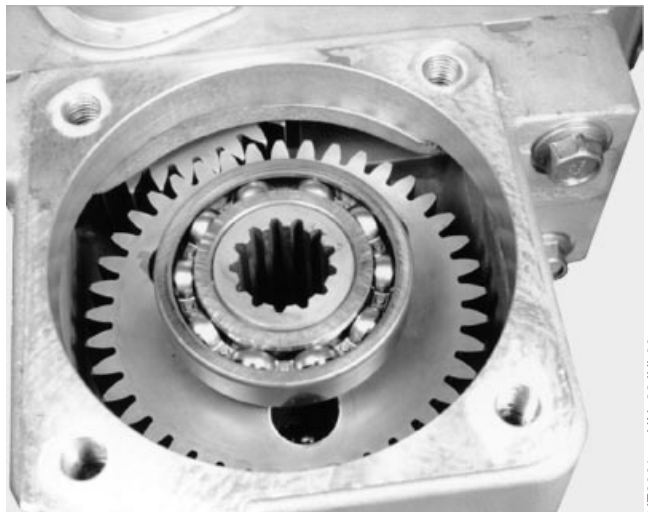


YZ2060A -UN-21JAN02

Auxiliary Pump Gear Assembly

DPSG,YZ01324,76 -19-26SEP02-5/10

NOTE: Spin gear to make sure all gears spin freely.



YZ2061 -UN-28JUL99

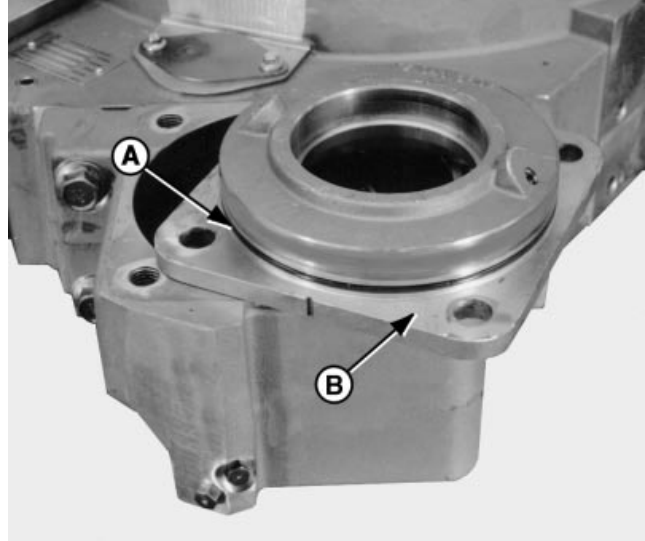
Pump and Idler Gears Mesh

Continued on next page

DPSG,YZ01324,76 -19-26SEP02-6/10

9. Lubricate and install O-ring (A) to inner groove of auxiliary pump SAE 'C' adapter (B).

A—O-Ring
B—SAE 'C' Adapter



YZ2062A -JUN-21JAN02

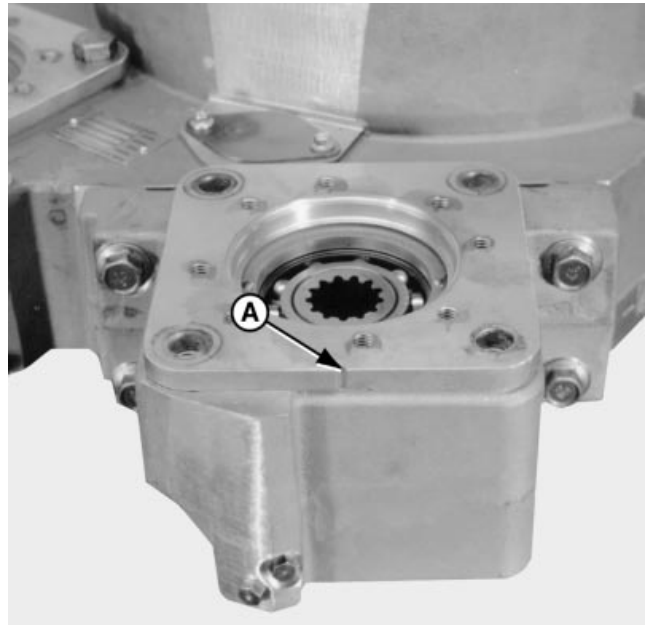
SAE 'C' Adapter O-Ring

DPSG,YZ01324,76 -19-26SEP02-7/10

10. Install SAE 'C' adapter to auxiliary pump housing with notch of cover plate (A) at top of housing.

IMPORTANT: Tap plate to fit. Watch O-rings. Be very careful when tapping plate onto housing to prevent damage to O-rings.

A—Adapter Notch



YZ2063A -JUN-22JAN02

SAE 'C' Adapter Notch Location

Continued on next page

DPSG,YZ01324,76 -19-26SEP02-8/10

11. Apply medium strength thread lock and sealer to cap screws (4).

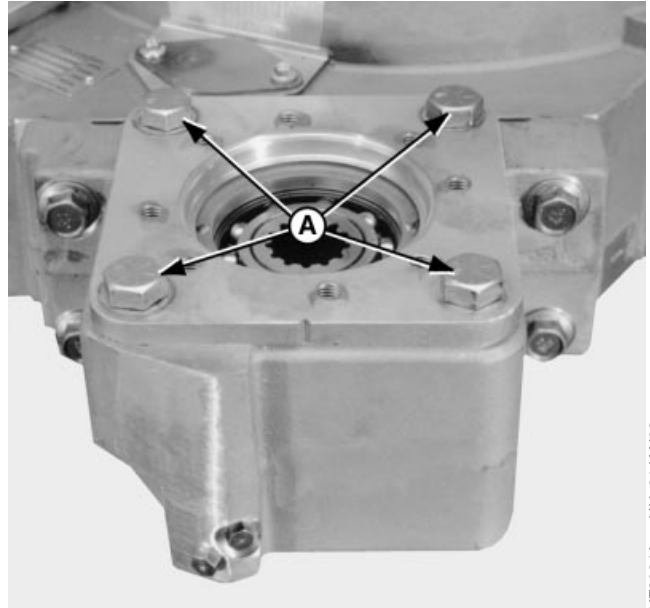
12. Install and tighten cap screws (A).

Specification

Cap Screws—Torque 390 N•m (285 lb-ft)

NOTE: Spin gear to make sure all gears spin freely.

A—Cap Screws (4)



Torque Cap Screws

YZ2064A -UN-21JAN02

DPSG,YZ01324,76 -19-26SEP02-9/10

13. Inspect O-ring plugs to lube passage holes for damage and possible debris buildup.

14. Install and tighten O-ring plugs (A).

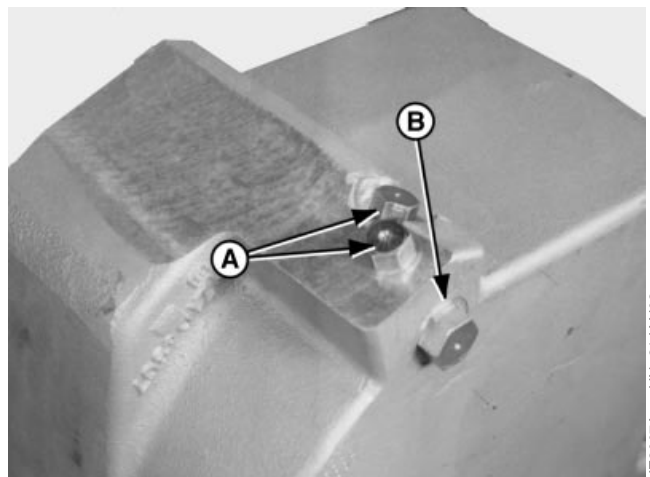
Specification

O-ring Plugs (3/8-24 UNF)—
Torque 8 N•m (6 lb-ft)

15. Install and tighten O-ring plug (B).

Specification

O-ring Plug (1/2-20 UNF)—
Torque 16 N•m (12 lb-ft)



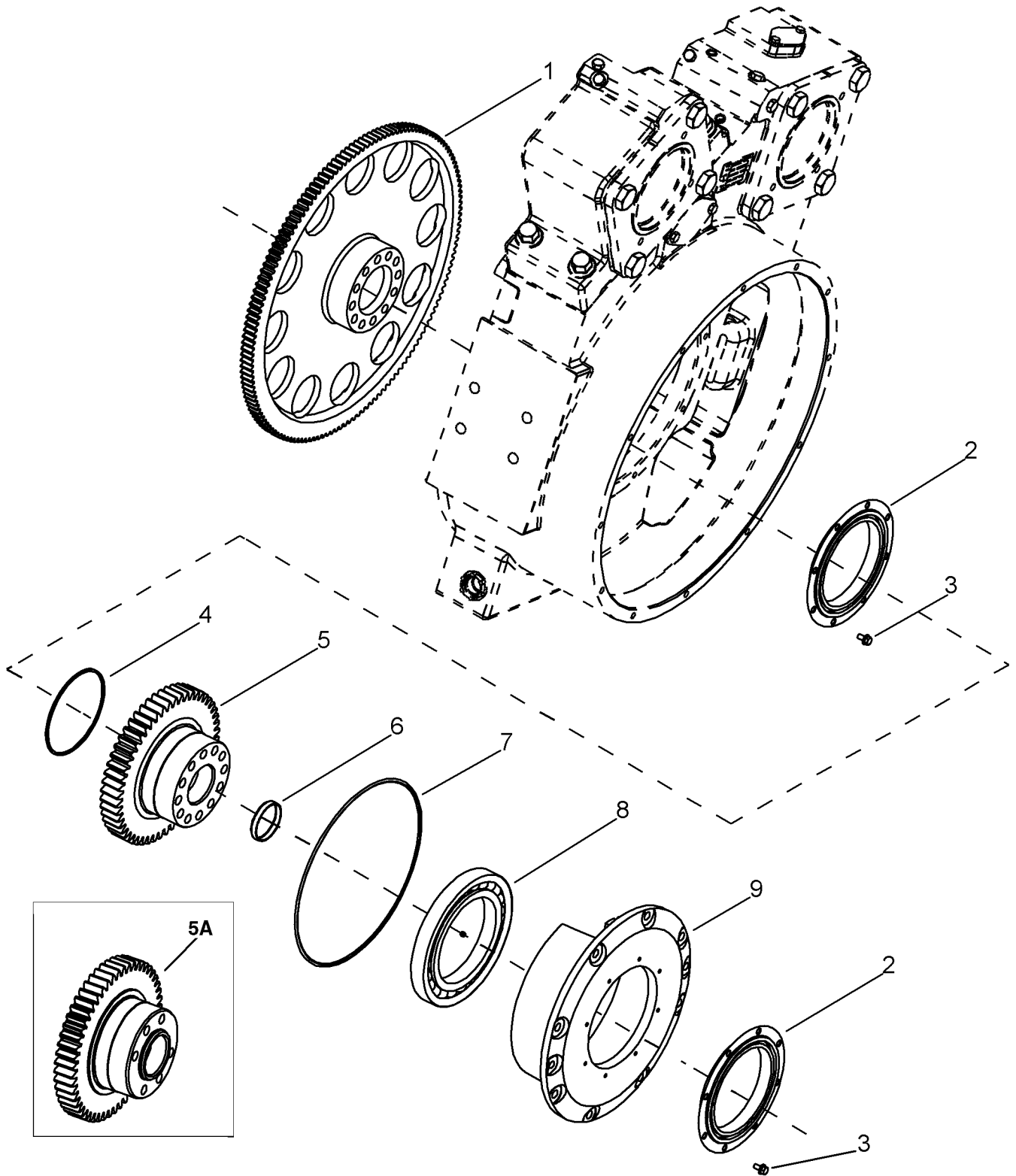
Tighten Plugs

A—3/8-24 UNF O-Ring Plugs (2)
B—1/2-20 UNF O-Ring Plug

YZ2007A -UN-21JAN02

DPSG,YZ01324,76 -19-26SEP02-10/10

Input Gear Assembly and Seal Retainer Group



Exploded View of Input Gear and Seal Retainer Group

YZ2132A -JUN-01JUL02

Continued on next page

YZ01324,0000005 -19-04MAR02-1/2

Rear PTO - John Deere

1—Starter Flywheel
2—Seal and Wear Sleeve (2)
3—Cap Screws (16)

4—Viton O-Ring
5—Input Gear (12.5 L)
5A—Input Gear (8.1 L)

6—Cup Plug
7—Viton O-Ring

8—Ball Bearing
9—Seal Retainer

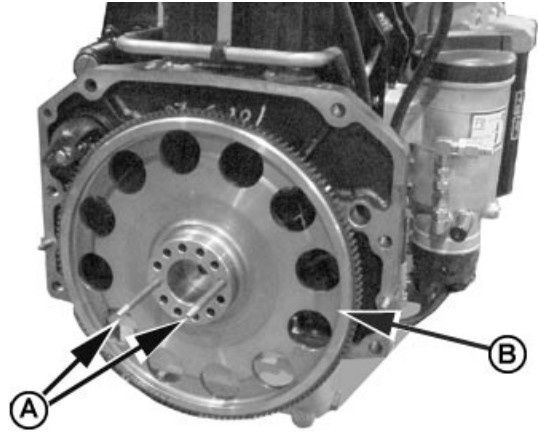
46
61

YZ01324,0000005 -19-04MAR02-2/2

Install Rear PTO

1. Install pilot studs (A) into crankshaft at the 3 and 9 o'clock positions.
2. Install starter flywheel (B) to crankshaft.

A—Pilot Studs
B—Starter Flywheel



Install Pilot Studs And Starter Flywheel (12.5 L Engine Shown)

RG12208 -JUN-14AUG02

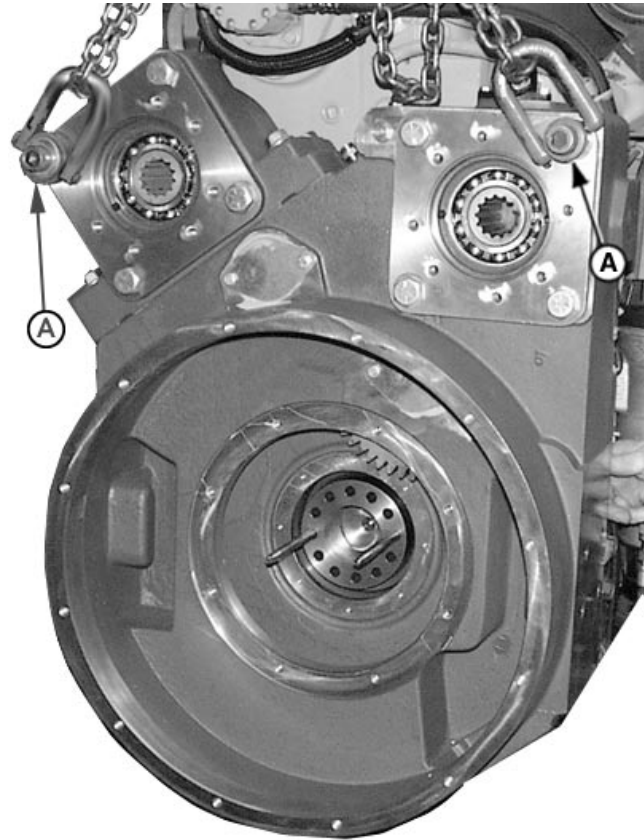
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OURGP12,000015A -19-30AUG05-1/19

⚠ CAUTION: Use proper lifting procedures when installing rear power take-off. Weight of unit exceeds 500 lbs.

3. Remove cap screws and install eye bolts (A) to power take-off. Install rear power take-off, using proper lifting equipment and procedures.

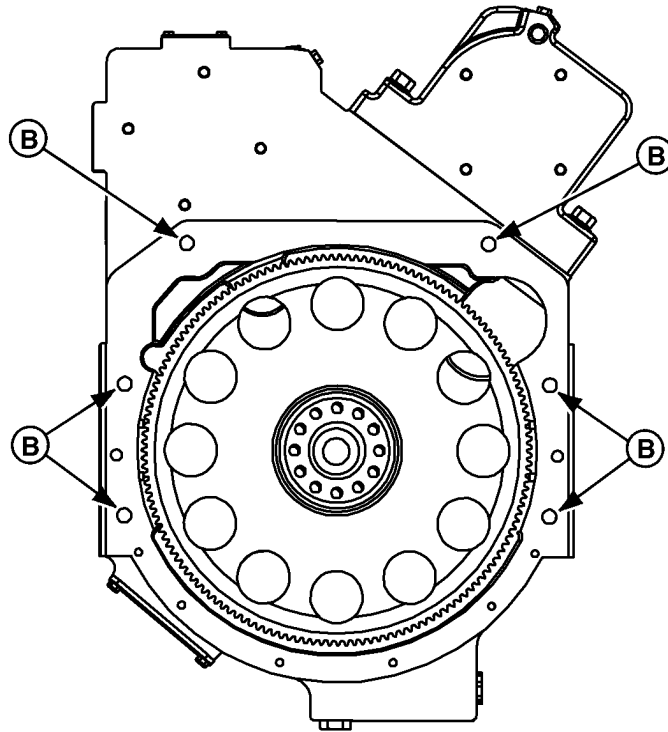
A—Eye Bolts



RG12564 -UN-22AUG02

Continued on next page

OURGP12.000015A -19-30AUG05-2/19



Cap Screw Locations

B—Cap Screws (6)

YZ2133 -UN-06MAR02

4. Install and tighten cap screws (B) to secure power take-off to engine.

Specification

Power Take-Off Cap Screws to
Engine¹—Torque..... 365 N•m (270 lb-ft)

¹Note: On 8.1 L units, use 210 N•m (155 lb-ft) torque for top two cap screws.

Continued on next page

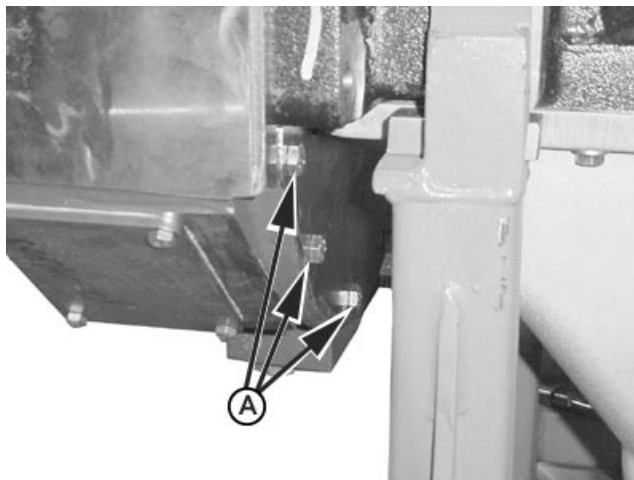
OURGP12,000015A -19-30AUG05-3/19

5. Install cover plate to front side of PTO housing. Tighten cap screws (A) to specifications.

Specification

Cover Plate Cap Screws—Torque 50 N•m (37 lb-ft)

A—Cap Screws (4)



RG12211 -UN-14AUG02

Install Cover Plate

OURGP12.000015A -19-30AUG05-4/19

6. Install JDG974A Seal Driver Guide Plate (A) with 80mm cap screws.

IMPORTANT: Installation tool must be centered on starter flywheel to avoid seal damage during seal installation.

7. Center the tool on the starter flywheel. Tighten cap screws to specification.

Specification

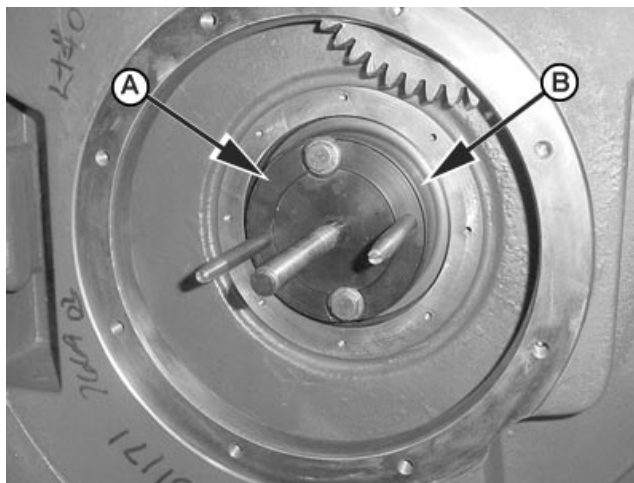
Seal Installation Tool to Starter

Flywheel Cap Screws (2)—

Torque 100 N•m (74 lb-ft)

8. Wipe the seal area clean with a dry towel. Apply LOCTITE® 680 to the OD of the carrier (B).

A—JDG974A Seal And Wear Sleeve Installation Tool
B—O.D. Of Carrier



RG12212 -UN-14AUG02

JDG974A Seal And Wear Sleeve Installation Tool

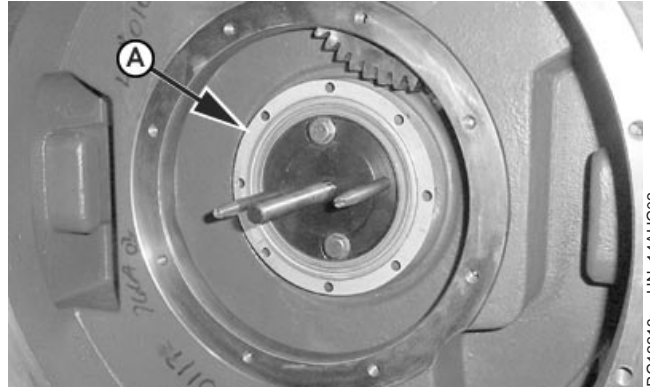
LOCTITE is a trademark of Loctite Corp.

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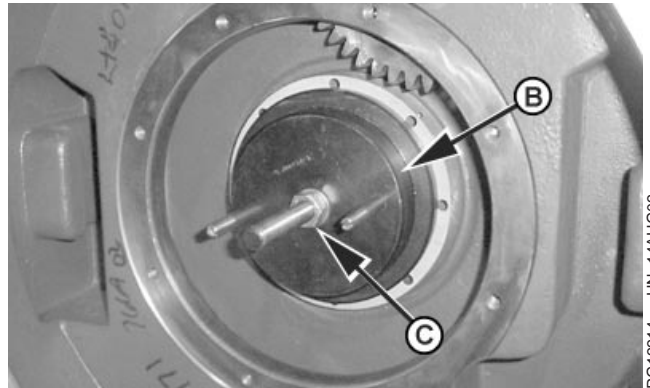
OURGP12.000015A -19-30AUG05-5/19

9. Install the seal and wear sleeve (A) over the driver guide plate and visually line up the cap screw holes.
10. Install the tool (B), washer and nut. Tighten nut (C) to drive the seal on until it bottoms on the housing. Remove nut washer and driver.

A—Seal And Wear Sleeve
 B—JDG974A Seal And Wear Sleeve Installation Tool
 C—Nut



Install Seal And Wear Sleeve



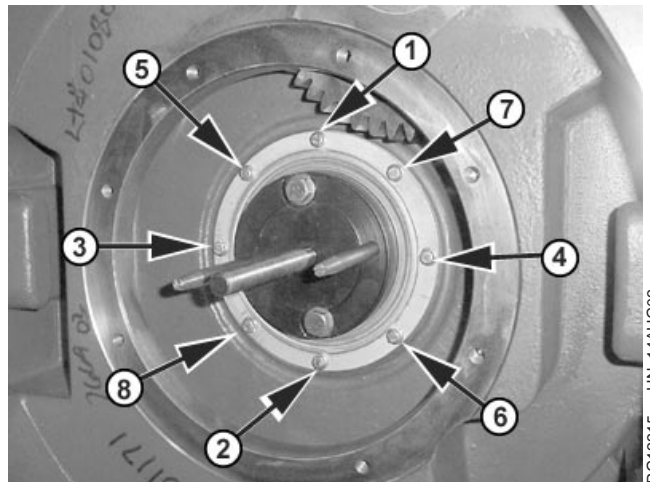
Install Tool, Washer and Nut
 OURGP12,000015A -19-30AUG05-6/19

11. Apply LOCTITE® 242 Thread Lock and Sealer to cap screw threads and install eight M6 x 12mm cap screws. Tighten to specification using the sequence shown.

Specification

Seal Cap Screws—Torque..... 15 N•m (11 lb-ft)

- 1—Top Center
- 2—Bottom Center
- 3—Left Center
- 4—Right Center
- 5—Upper Left
- 6—Lower Right
- 7—Upper Right
- 8—Lower Left

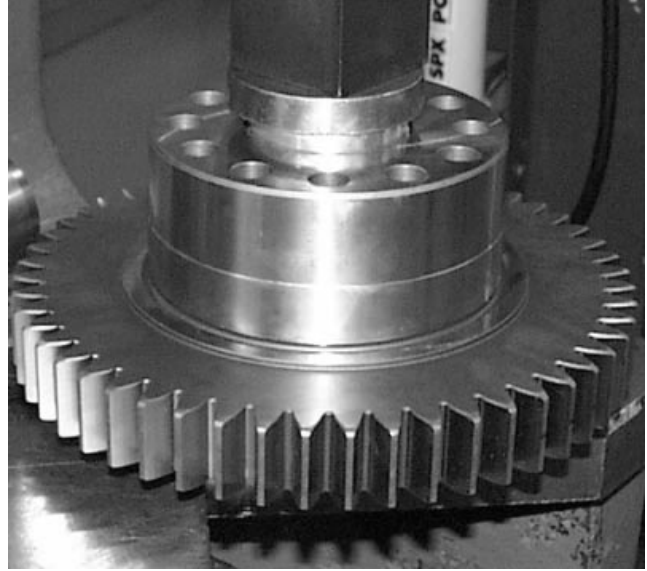


Install Seal Cap screws

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OURGP12,000015A -19-30AUG05-7/19

12. Press cup plug flush into drive gear.



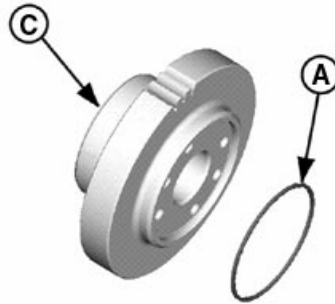
Press Plug Into Drive Gear

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OURGP12,000015A -19-30AUG05-8/19

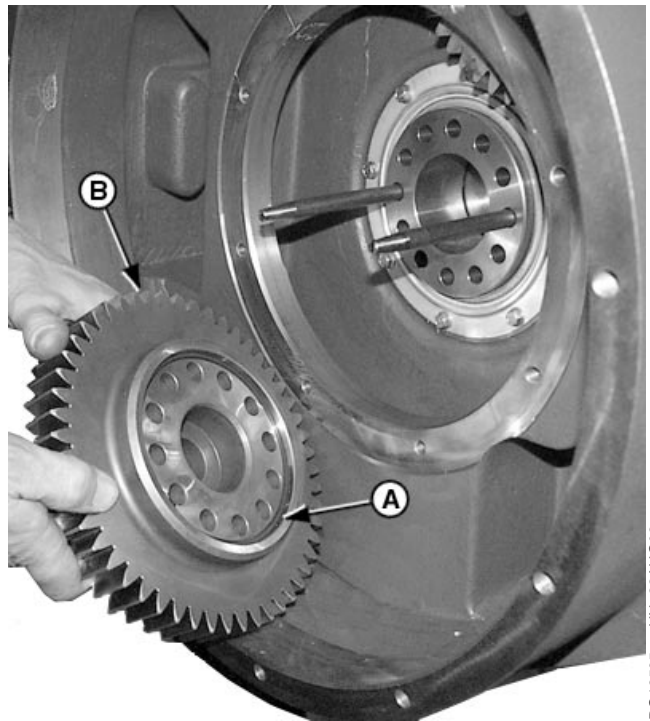
13. Lubricate and install new O-ring (A) in gear face groove.

- A—Viton O-Ring
- B—52-Tooth Input Gear (12.5 L)
- C—52-Tooth Input Gear (8.1 L)



YZ2032 -UN-27JUN02

52-Tooth Drive Gear (C) For 8.1 L Crankshaft



RG12565 -UN-22AUG02

52-Tooth Drive Gear (B) For 12.5 L Crankshaft

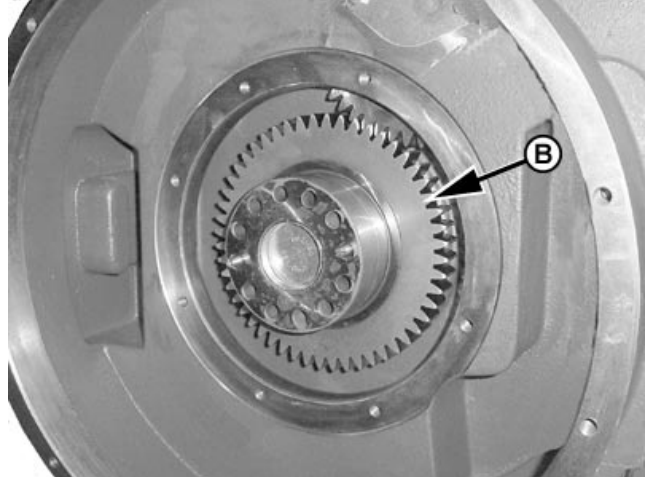
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OURGP12,000015A -19-30AUG05-9/19

IMPORTANT: Make sure drive gear meshes with primary idler gear.

14. Install drive gear (B).

B—Drive Gear



RG12560 -UN-14AUG02

Install Drive Gear Assembly

OURGP12,000015A -19-30AUG05-10/19

15. Install JDG974A Seal And Wear Sleeve Installation Tool (A) onto drive gear with 185mm cap screws.

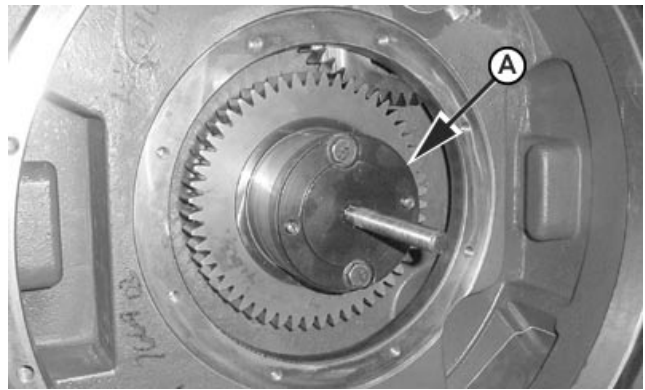
IMPORTANT: Driver plate must be centered on drive gear to avoid seal damage during seal installation.

16. Center the tool on the drive gear. Tighten cap screws to specification.

Specification

Seal Installer To Drive Gear Cap

Screws (2)—Torque 100 N•m (74 lb-ft)



RG12216 -UN-14AUG02

Install JDG974A Seal And Wear Sleeve Installation Tool

A—JDG974A Seal And Wear Sleeve Installation Tool

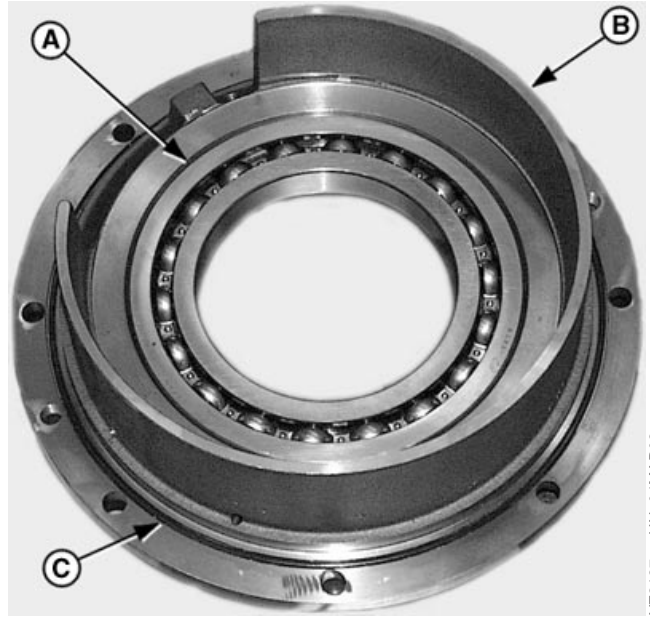
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OURGP12,000015A -19-30AUG05-11/19

NOTE: Press on outer race of bearing.

17. Press bearing (A) into seal retainer (B), using 7 1/2 inch disc.
18. Lubricate and install new O-ring (C) to seal retainer (B)

A—Ball Bearing
B—Seal Retainer
C—Viton O-Ring



YZ2127 -JUN-04MAR02

Press Bearing Into Seal Retainer

Continued on next page

OURGP12.000015A -19-30AUG05-12/19

19. Install seal retainer (A) to power take-off. Install and finger tighten eight seal retainer cap screws (B).

NOTE: Marking one of the cap screws on the seal installer will aid in determining one full revolution.

20. Mark one cap screw on seal and wear sleeve installer and note location of cap screw; install flywheel turning tool, JDE81-1; and rotate flywheel one full revolution to center bearing in seal retainer and release any preload off ball bearing.

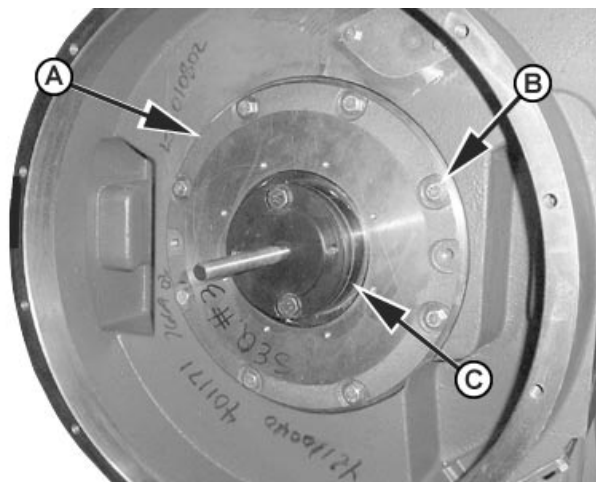
IMPORTANT: Rotating the flywheel one full revolution will center the seal retainer bearing and release any preload off the ball bearing.

21. Tighten seal retainer cap screws (B), using an alternating 180° pattern.

Specification

Seal Retainer to Rear Power
Take-Off Housing Cap Screws
(8)—Torque 50 N•m (37 lb-ft)

22. Apply LOCTITE® 680 to the OD of the carrier (C).



Install Seal Retainer and Cap Screws

- A—Seal Retainer
- B—Cap Screws (8)
- C—Input Gear

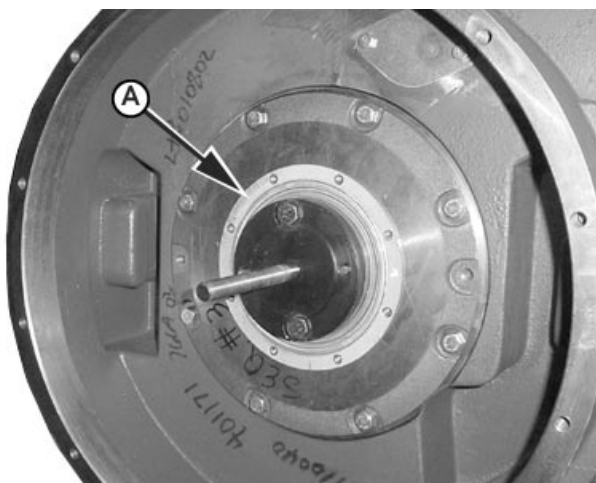
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OURGP12,000015A -19-30AUG05-13/19

23. Install the seal (A) over the driver guide plate and visually line up the cap screws holes.

24. Install the seal driver, thrust washer and nut. Drive the seal on until it bottoms out on the housing. Remove the nut, washer and driver.

A—Seal



Install Seal

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OURGP12,000015A -19-30AUG05-14/19

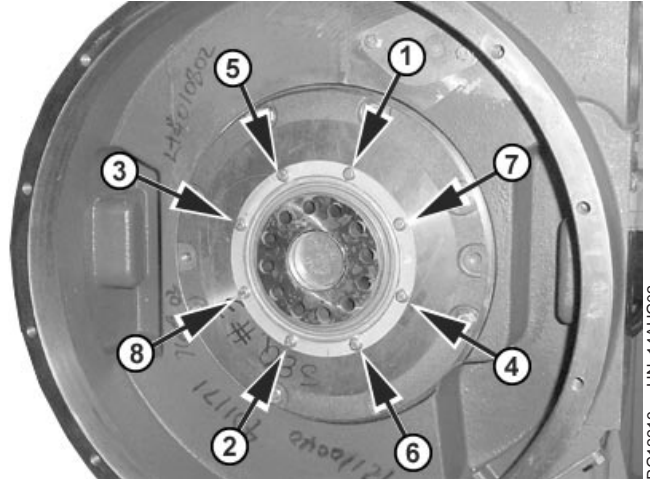
25. Apply LOCTITE® 242 Thread Lock and Sealer to cap screw threads and install eight M6 x 12mm cap screws. Tighten to specification using the sequence shown.

Specification

Seal Cap Screws (8)—Torque 15 N•m (11 lb-ft)

26. Remove seal driver, guide plate and guide pins.

- 1—Top Center
- 2—Bottom Center
- 3—Left Center
- 4—Right Center
- 5—Upper Left
- 6—Lower Right
- 7—Upper Right
- 8—Lower Left



Install Seal Cap Screws

RG12219 -JUN-14AUG02

OURGP12.000015A -19-30AUG05-15/19

CAUTION: Use proper lifting procedures when installing engine flywheel. Weight of flywheel exceeds the recommended weight limit for lifting without the aid of proper lift equipment.

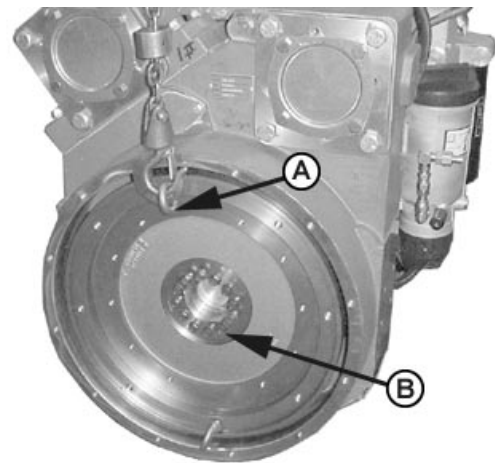
27. Install JDG19 (A) to flywheel and connect a lifting device. Install flywheel and twelve 185 or 200mm cap screws (B) (cap screw length is dependent on flywheel option) and tighten to specification.

Specification

Flywheel Cap Screws (12)—
Torque 170 N•m (125 lb-ft)

Remove lifting eye.

- A—JDG19 Lifting Eye
- B—Flywheel Cap Screws (12)



Install Flywheel

RG12202 -JUN-14AUG02

Continued on next page

OURGP12.000015A -19-30AUG05-16/19

28. Remove two eye bolts from SAE adapters on power take-off. Apply medium strength thread lock and sealer to cap screws, install and tighten cap screws (A).

Specification

SAE 'C' Adapter Cap Screws
(2)—Torque 390 N•m (285 lb-ft)

29. Install O-ring (E) to both SAE 'C' adapter caps (B).

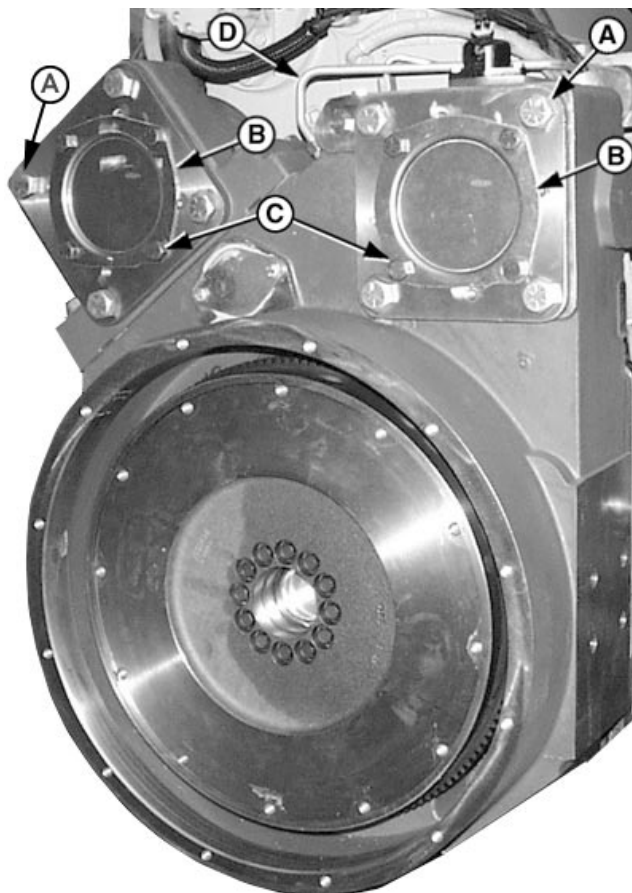
30. Install SAE 'C' adapter caps (B).

31. Install and tighten cap screws (C).

Specification

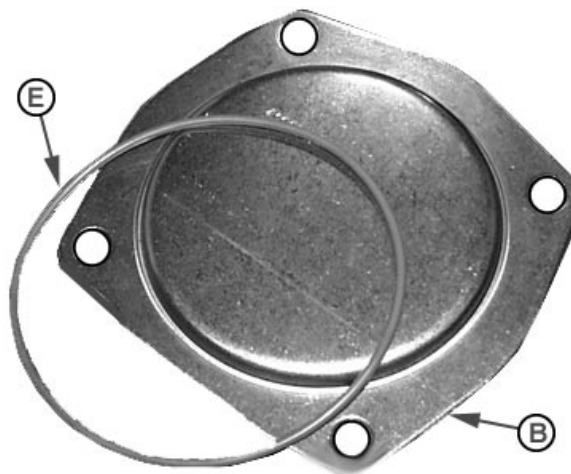
SAE 'C' Adapter to Housing Cap
Screws (8)—Torque 103 N•m (76 lb-ft)

- A—SAE 'C' Adapter Cap Screws (2)
- B—SAE 'C' Adapter Caps (2)
- C—SAE 'C' Adapter Cap Screws (8)
- D—Hydraulic Lines
- E—O-Ring



RG12566 -UN-22AUG02

Install SAE 'C' Adapter Caps and Cap Screws



RG12567 -UN-22AUG02

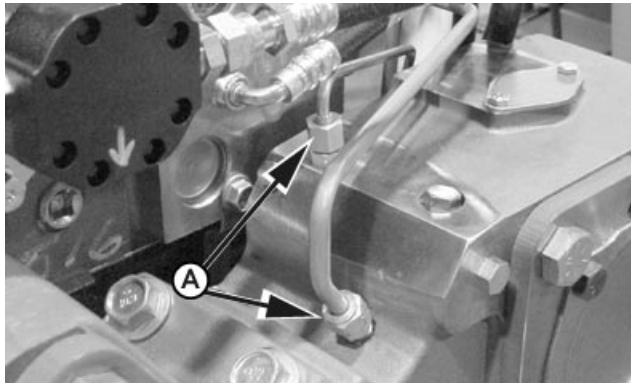
Lubricate and Install O-ring To SAE 'C' Adapter Caps

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OURGP12,000015A -19-30AUG05-17/19

32. Connect oil lines (A) to PTO housing.

A—Oil Lines



PTO Housing Oil Lines

RG12206 -JUN-14AUG02

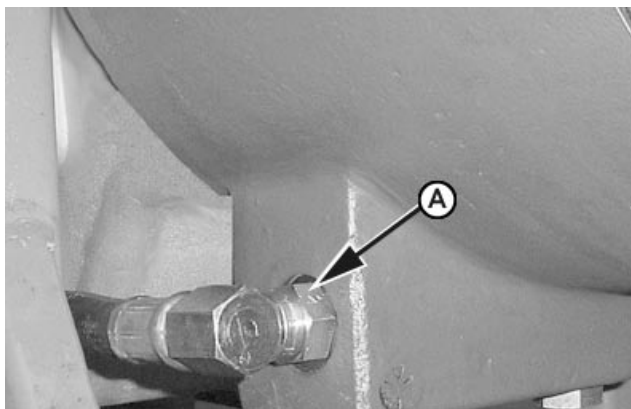
OURGP12,000015A -19-30AUG05-18/19

33. Connect oil return line (A).

34. Fill engine crankcase with proper type and amount of oil.

NOTE: Engines with rear PTO require more oil in engine crankcase to allow for PTO lubrication. Refer to engine operators manual.

A—Oil Return Line



Oil Return Line

RG12207 -JUN-14AUG02

OURGP12,000015A -19-30AUG05-19/19

Essential Tools

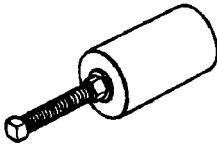
NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

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DPSG.OUO1004,753 -19-26MAR99-1/2

Crankshaft Gear Installer JDG794

Install front PTO drive gear.



RG7030 -UN-30SEP94

DPSG.OUO1004,753 -19-26MAR99-2/2

47
2 **Front Power Take-Off Specifications**

Item	Measurement	Specification
Vibration Damper Only (w/Front PTO)	Maximum radial run-out (A)	1.50 mm (0.060 in.)
	Maximum wobble (B)	1.50 mm (0.060 in.)
Vibration Damper Pulley (w/Front PTO)	Maximum wobble (C)	0.5 mm (0.02 in.)
Series 300 Crankshaft Damper Pulley w/Front PTO (1/2 x 2-1/2 in. Cap Screw Mounted)	Torque	183 N•m (135 lb-ft)
Series 300 Crankshaft Damper Pulley w/Front PTO (112 mm Cap Screw Mounted)	Initial Torque	150 N•m (110 lb-ft)
Series 300 Crankshaft Damper Pulley w/Front PTO (112 mm Cap Screw Mounted)	Torque Turn (Final Torque)	50—70°
POWERTECH® 2.9L Damper Pulley w/Front PTO	Torque	150 N•m (110 lb-ft)
Front PTO Collet Cap Screws	Torque	35 N•m (25 lb-ft)
Crankshaft Damper Pulley w/Crankshaft Gear Driven PTO (45 mm Cap Screw Mounted)	Torque	183 N•m (135 lb-ft)
Crankshaft Damper Pulley w/Crankshaft Gear Driven PTO (112 mm Cap Screw Mounted)	Initial Torque	150 N•m (110 lb-ft)
Crankshaft Damper Pulley w/Crankshaft Gear Driven PTO (112 mm Cap Screw Mounted)	Torque Turn (Final Torque)	50—70°
Damper to Crankshaft Cap Screws (Engines with Front PTO Clutch Adapter)	Torque	68 N•m (50 lb-ft)
Front PTO Clutch Drive Hub to Damper Cap Screws (Electric Clutch)	Torque	68 N•m (50 lb-ft)

Front PTO

Item	Measurement	Specification
Front PTO Clutch Drive Coupler to Drive Hub Socket Head Cap Screws (Electric Clutch)	Torque	217 N•m (160 lb-ft)
Front PTO Clutch Special Screws to Drive Plate (Electric Clutch)	Torque	320 N•m (236 lb-ft)
Front PTO Electric Clutch Assembly to Clutch Housing	Torque	68 N•m (50 lb-ft)
Front PTO Clutch Drive Plate to Electric Clutch Assembly	Torque	110 N•m (81 lb-ft)
Front PTO Clutch Adapter Housing to Engine Cap Screws	Torque	160 N•m (118 lb-ft)
Clutch Housing Assembly to PTO Housing Cap Screws (Electric Clutch)	Torque	68 N•m (50 lb-ft)
Alternator Support Brackets to Engine Cap Screws	Torque	68 N•m (50 lb-ft)
Alternator Belt Guard	Torque	68 N•m (50 lb-ft)
Pilot Bearing Quill to Damper Cap Screws (Mechanical Clutch)	Torque	68 N•m (50 lb-ft)

DPSG,OUO1004,751 -19-26MAR99-2/2

Checking Vibration Damper or Pulley (Engine With Front PTO)

IMPORTANT: If the damper came loose during engine operation, replace damper and check crankshaft for fretting. If the crankshaft shows evidence of fretting, replace crankshaft.

NOTE: When cleaning damper, never soak in a cleaning solvent. Use a steam cleaner, soap solution or water only.

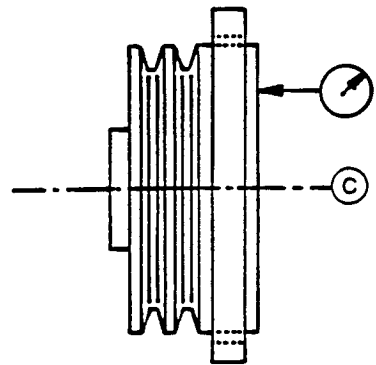
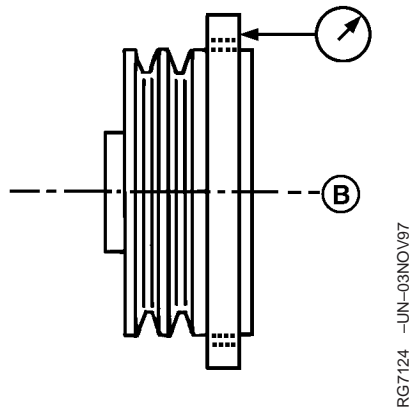
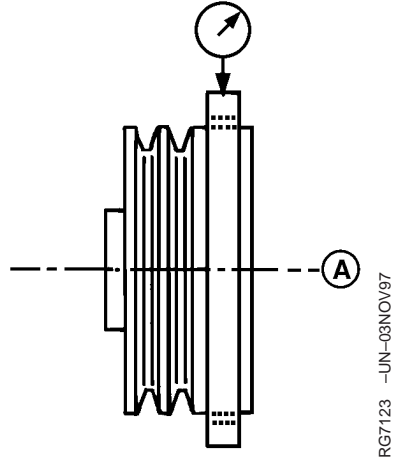
1. Prior to disassembly, check the following specifications:

Specification

Vibration Damper Only (w/Front PTO)—Maximum radial run-out	
(A)	1.50 mm (0.060 in.)
Maximum wobble (B).....	1.50 mm (0.060 in.)
Vibration Damper Pulley (w/Front PTO)—Maximum wobble (C)	
	0.5 mm (0.02 in.)

2. Replace damper if total run-out (A) or wobble (B) exceeds specifications, or if outer ring has slipped relative to rubber member or drive hub.
3. Grasp damper and attempt to turn in both directions (clockwise and counterclockwise). If rotation is felt, replace damper.
4. If wobble (C) exceeds specifications, it indicates improper mating of tapered surfaces due to uneven tightening of collet cap screws or damage to one or both the tapered surfaces.

IMPORTANT: Replace damper after 4500 hours or every five years, whichever occurs first.



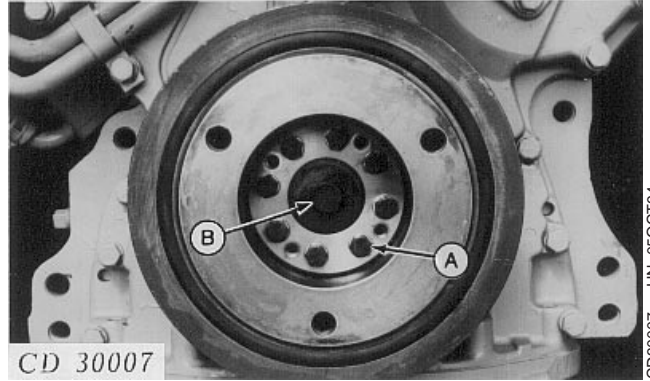
Remove Vibration Damper or Pulley (Engine With Front PTO)

1. Disconnect battery ground cable.
2. Remove cap screws (A) attaching damper or pulley to collet.

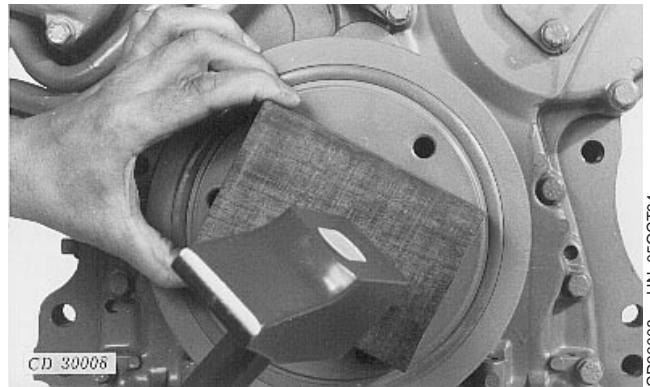
IMPORTANT: Never tap or apply thrust to outer ring of damper.

3. Using a wooden block and a hammer, tap on inner damper ring or pulley until it loosens from conical seat of collet.
4. Remove collet attaching cap screw (B).
5. Remove collet and damper or pulley.

A—Damper Cap Screws
B—Collet Cap Screw



CD30007 -UN-05OCT94



CD30008 -UN-05OCT94

DPSG,OUO1004,747 -19-25MAR99-1/1

Install Vibration Damper or Pulley (Engine With Front PTO)

1. Clean then lubricate crankshaft nose and bore of collet.
2. Position collet in damper or pulley. Install both cap screws (A) 180° apart to keep parts together.
3. Install collet/damper or collet/pulley assembly on the crankshaft with washer and cap screw (B).
4. **For 3-cylinder engines only**, put cylinder No. 1 at TDC then turn pulley/collet assembly so that external groove mark (C) on pulley is aligned with TDC reference mark on timing gear cover (D).
5. Tighten pulley retaining cap screw (B) to specifications.

Specification

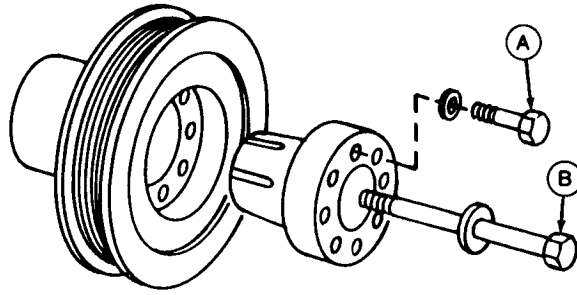
Series 300 Crankshaft Damper Pulley w/Front PTO (1/2 x 2-1/2 in. Cap Screw Mounted)—Torque.....	183 N•m (135 lb-ft)
Series 300 Crankshaft Damper Pulley w/Front PTO (112 mm Cap Screw Mounted)—Initial Torque.....	150 N•m (110 lb-ft)
Series 300 Crankshaft Damper Pulley w/Front PTO (112 mm Cap Screw Mounted)—Torque Turn (Final Torque).....	50—70°
POWERTECH® 2.9L Damper Pulley w/Front PTO—Torque	150 N•m (110 lb-ft)

6. Tighten the two collet cap screws (previously installed) alternately and evenly to the following torque specification. Then, install remaining cap screws alternately and evenly, tightening the next two cap screws 90° from the first two. Tighten remaining cap screws in opposing pairs to the following specification.

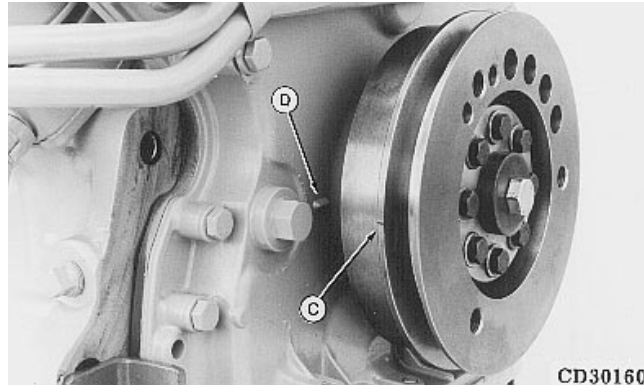
Specification

Front PTO Collet Cap Screws—	
Torque	35 N•m (25 lb-ft)

7. Check damper/pulley wobble to ensure that tapered surfaces are mated correctly.



RG7128 -UN-06OCT94



CD30160 -UN-05OCT94

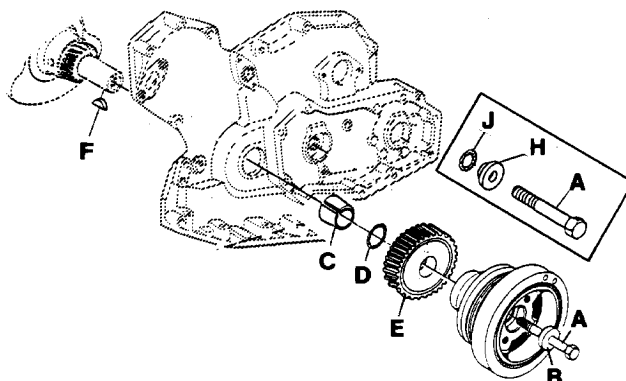
- A—Cap Screw
- B—Collet Retaining Cap Screw
- C—External Groove Mark on Pulley
- D—TDC Reference Mark on Timing Gear Cover

Installing PTO Drive Gear (Crankshaft Gear-Driven PTO)

1. Clean then lubricate crankshaft nose and bore of collet.
2. Slide collet onto nose of crankshaft with large diameter toward crankshaft gear.

NOTE: On engines equipped with special washer (H) and O-ring (J), O-ring (D) is not needed.

3. If equipped, install O-ring (D) on crankshaft and position against front edge of collet.
4. Clean and lubricate ID of auxiliary drive gear (E) with clean engine oil and place on collet.
5. Using JDG794 Gear Installer, push drive gear onto collet by tightening nut to 150 N•m (110 lb-ft). Remove tool.
6. Install woodruff key (F) in key slot of crankshaft.
7. Install damper on crankshaft. Apply clean engine oil to threads and under side of bolt head (A). Place hardened washer (B) with flat side toward threads on cap screw and install in crankshaft. Tighten cap screw to specifications.



- A—Damper Cap Screw
- B—Hardened Washer
- C—Collet
- D—O-Ring
- E—Auxiliary Drive Gear
- F—Woodruff Key
- G—Not Used
- H—Special Washer
- I—Not Used
- J—O-Ring

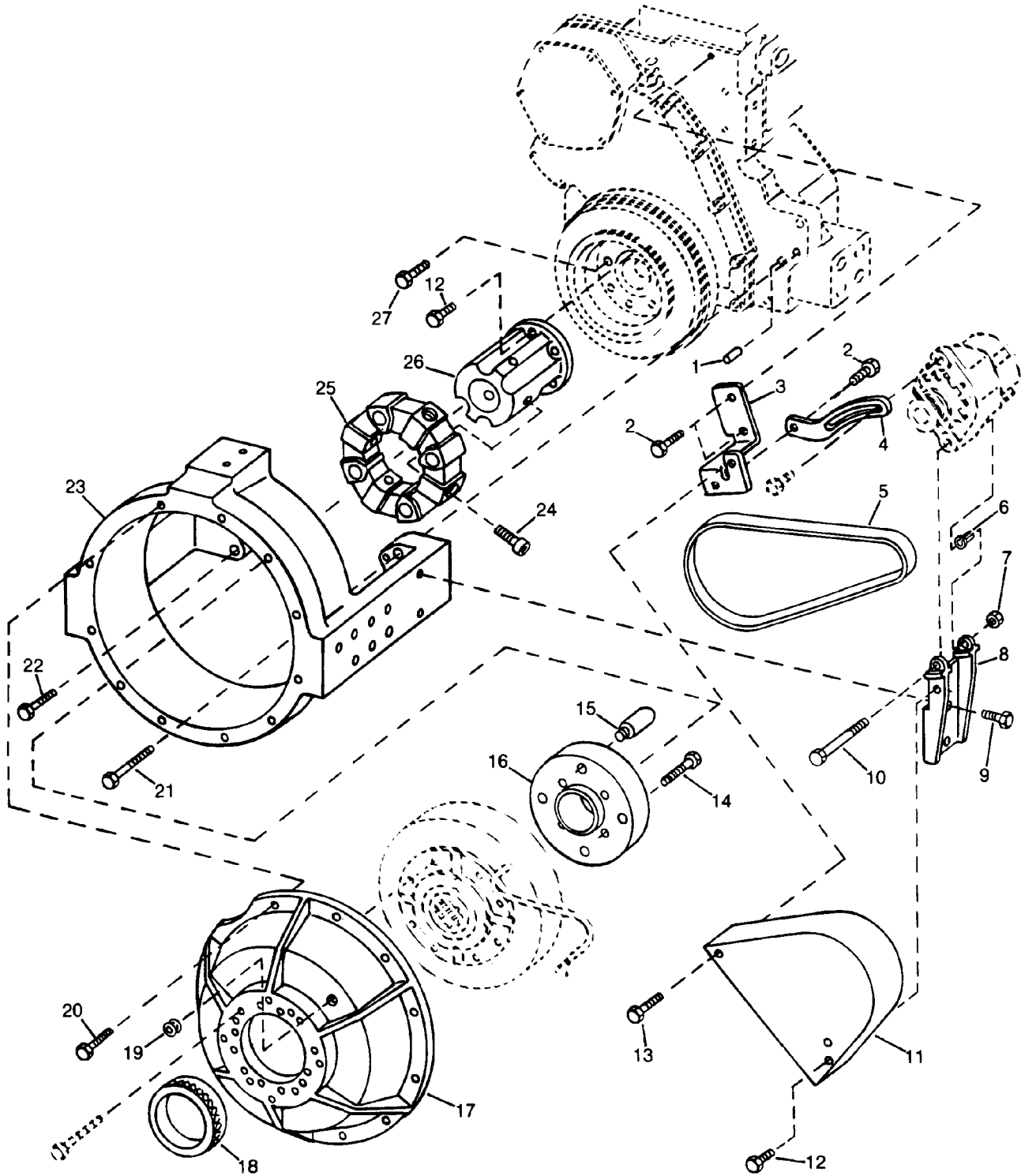
Specification

Crankshaft Damper Pulley w/Crankshaft Gear Driven PTO (45 mm Cap Screw Mounted)—	
Torque	183 N•m (135 lb-ft)
Crankshaft Damper Pulley w/Crankshaft Gear Driven PTO (112 mm Cap Screw Mounted)—	
Initial Torque.....	150 N•m (110 lb-ft)
Crankshaft Damper Pulley w/Crankshaft Gear Driven PTO (112 mm Cap Screw Mounted)—	
Torque Turn (Final Torque).....	50—70°

8. Check damper/pulley wobble to ensure that tapered surfaces are mated correctly.

CD630P3 - JUN-13MAY98

Remove and Install Front PTO Clutch Adapter (Electric)



Continued on next page

DPSG.OUO1004,749 -19-25MAR99-1/3

- | | | | |
|----------------------|-----------------------|---------------------------|-----------------------------------|
| 1—Pin (2 used) | 8—Alternator Support | 15—Special Screw (4 used) | 22—Cap Screw (2 used) |
| 2—Cap Screw | 9—Cap Screw (2 used) | 16—Drive Plate | 23—PTO Housing |
| 3—Alternator Bracket | 10—Cap Screw | 17—Clutch Housing | 24—Socket Head Cap Screw (4 used) |
| 4—Alternator Strap | 11—Belt Guard | 18—Adapter Ring | 25—Drive Coupler |
| 5—Alternator Belt | 12—Cap Screw (5 used) | 19—Grommet | 26—Drive Hub |
| 6—Bushing | 13—Cap Screw | 20—Cap Screw (11 used) | 27—Cap Screw (2 used) |
| 7—Nut | 14—Cap Screw (4 used) | 21—Cap Screw (2 used) | |

1. Disconnect battery ground cable.
2. Remove belt guard (11) and disconnect alternator belt (5).
3. Disconnect alternator wiring and remove alternator and alternator support (8).
4. Disconnect clutch wiring and remove clutch housing assembly (17) from PTO housing.
5. Remove drive plate (16) and electric clutch from clutch housing. Remove special cap screws (15) from drive plate, if required.
6. If required, remove adapter ring (18) (if equipped) from clutch housing using a press.

 **CAUTION: PTO housing is heavy. Plan a proper lifting procedure to avoid personal injury.**

7. Remove PTO housing (23) from engine.
8. Remove drive coupler (25) and drive hub (26) from crankshaft damper pulley.
9. Clean and inspect parts for wear or damage.
10. If removed, install two cap screws 180° apart into damper. Tighten to specifications.

Specification

Damper to Crankshaft Cap Screws (Engines with Front PTO Clutch Adapter)—Torque 68 N•m (50 lb-ft)

11. Install Drive Hub (26) on damper making sure two notches in base of hub are positioned over two cap screws in damper. Tighten drive hub cap screws to specifications.

Specification

Front PTO Clutch Drive Hub to Damper Cap Screws (Electric Clutch)—Torque..... 68 N•m (50 lb-ft)

12. Attach drive coupler (25), with dimples facing out, to drive hub using 4 socket head cap screws. Tighten cap screws to specifications.

Specification

Front PTO Clutch Drive Coupler to Drive Hub Socket Head Cap Screws (Electric Clutch)—Torque..... 217 N•m (160 lb-ft)

13. Attach special screws (15) to drive plate (16) and tighten to specifications.

Specification

Front PTO Clutch Special Screws to Drive Plate (Electric Clutch)—Torque..... 320 N•m (236 lb-ft)

14. If removed, apply petroleum jelly to grommet (19) and insert into clutch housing.
15. Position electric clutch assembly in clutch housing, threading clutch wiring through grommet. Attach clutch to housing and tighten cap screws to specifications.

Specification

Front PTO Electric Clutch Assembly to Clutch Housing—Torque..... 68 N•m (50 lb-ft)

16. Reverse clutch housing assembly and install drive plate (16). Tighten cap screws to specifications.

Specification

Front PTO Clutch Drive Plate to Electric Clutch Assembly—Torque..... 110 N•m (81 lb-ft)

17. Install adapter (18) in clutch housing using a press. Press adapter flush to housing.

CAUTION: PTO housing is heavy. Plan a proper lifting procedure to avoid personal injury.

NOTE: Long PTO housing mounting screws go in top holes and short screws go in lower holes of housing.

Use guide pins to aid in installation of PTO housing.

18. Install PTO housing (23) on engine. Tighten cap screws to specifications.

Specification

Front PTO Clutch Adapter
Housing to Engine Cap
Screws—Torque 160 N•m (118 lb-ft)

19. Install clutch housing assembly (17) on PTO Housing. Tighten cap screws to specifications.

Specification

Clutch Housing Assembly to
PTO Housing Cap Screws
(Electric Clutch)—Torque 68 N•m (50 lb-ft)

20. Install alternator and support. Tighten support cap screws to specifications.

Specification

Alternator Support Brackets to
Engine Cap Screws—Torque 68 N•m (50 lb-ft)

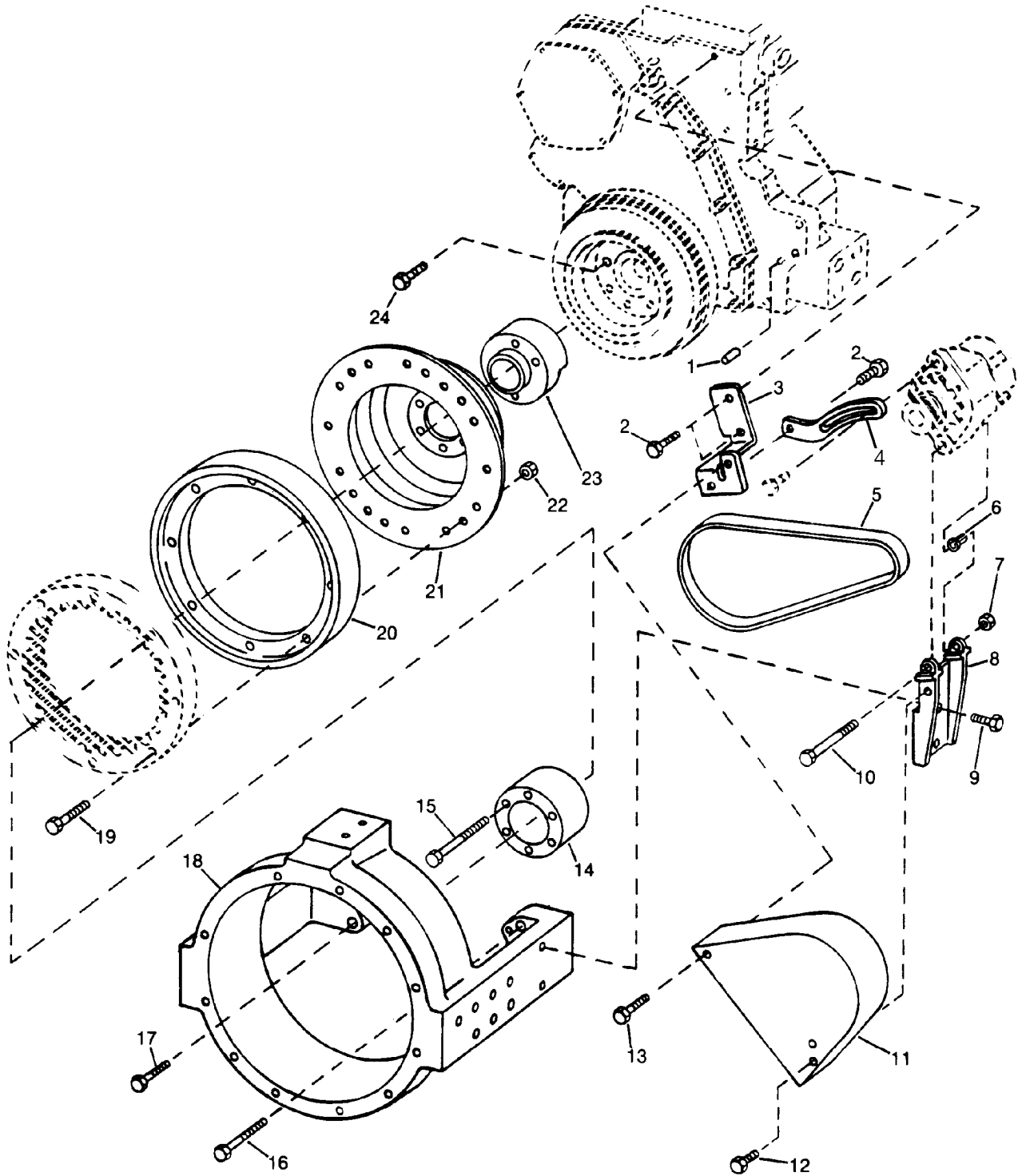
21. Install alternator belt and belt guard. Tighten belt guard cap screws to specifications.

Specification

Alternator Belt Guard—Torque 68 N•m (50 lb-ft)

22. Connect alternator and clutch wiring and battery ground cable.

Remove and Install Front PTO Clutch Adapter (Mechanical)



Continued on next page

DPSG.OUO1004,750 -19-26MAR99-1/3

RG9503 -UN-11MAR99

- | | | | |
|----------------------|----------------------|------------------------|-----------------------|
| 1—Pin (2 used) | 7—Nut | 13—Cap Screw | 19—Cap Screw (8 used) |
| 2—Cap Screw | 8—Alternator Support | 14—Pilot Bearing Quill | 20—Drive Ring |
| 3—Alternator Bracket | 9—Cap Screw (2 used) | 15—Cap Screw (4 used) | 21—Drive Coupler |
| 4—Alternator Strap | 10—Cap Screw | 16—Cap Screw (2 used) | 22—Nut (8 used) |
| 5—Alternator Belt | 11—Belt Guard | 17—Cap Screw (2 used) | 23—Drive Hub |
| 6—Bushing | 12—Cap Screw | 18—PTO Housing | 24—Cap Screw (2 used) |

1. Disconnect battery ground cable.
2. Remove belt guard (11) and disconnect alternator belt (5).
3. Disconnect alternator wiring and remove alternator and alternator support (8).

 **CAUTION: PTO housing is heavy. Plan a proper lifting procedure to avoid personal injury.**

4. Remove PTO housing (18) from engine.
5. Remove two cap screws from pilot bearing quill (14) and install two guide pins through assembly into damper.
6. Remove remaining cap screws from pilot bearing quill and remove bearing quill (14), pilot bearing, manual clutch ring gear, drive ring (20), drive coupler (21) and drive hub (23).
7. Separate clutch ring gear and drive ring (20) from coupler (21).
8. Clean and inspect parts for wear or damage.
9. If removed, install two cap screws 180° apart into damper. Tighten to specifications.

Specification

Damper to Crankshaft Cap Screws (Engines with Front PTO Clutch Adapter)—Torque 68 N•m (50 lb-ft)

10. Attach drive ring (20) and clutch ring gear to coupler (21). Tighten nuts securely.
11. Install two guide pins in damper and install drive hub (23) up to face of damper. Make sure notches in end of hub are over two cap screws in damper.

12. Install drive ring, clutch ring gear and coupler assembly onto drive hub (23).
13. Install bearing quill (14) and pilot bearing to coupler, and install cap screws through assembly into damper. Remove guide pins and install remaining cap screws. Tighten cap screws to specifications.

Specification

Pilot Bearing Quill to Damper Cap Screws (Mechanical Clutch)—Torque..... 68 N•m (50 lb-ft)

14. Install manual clutch to assembly according to manufacturers recommendations.

 **CAUTION: PTO housing is heavy. Plan a proper lifting procedure to avoid personal injury.**

NOTE: Long PTO housing mounting screws go in top holes and short screws go in lower holes of housing.

Use guide pins to aid in installation of PTO housing.

15. Install PTO housing (18) on engine. Tighten cap screws to specifications.

Specification

Front PTO Clutch Adapter Housing to Engine Cap Screws—Torque 160 N•m (118 lb-ft)

16. Install alternator and support. Tighten support cap screws to specifications.

Specification

Alternator Support Brackets to Engine Cap Screws—Torque..... 68 N•m (50 lb-ft)

17. Install alternator belt and belt guard. Tighten belt guard cap screws to specifications.

18. Connect alternator wiring and battery ground cable.

Specification

Alternator Belt Guard—Torque..... 68 N•m (50 lb-ft)

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

DPSG,OUO1004,765 -19-31MAR99-1/2

Slide Hammer and Puller D01209AA

Remove idler gear shaft.

DPSG,OUO1004,765 -19-31MAR99-2/2

Other Material

Number	Name	Use
T43512 (U.S.) TY9473 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Housing-to-bearing retainer cap screws (one cap screw only) and left-hand rear adapter mounting studs.

LOCTITE is a registered trademark of Loctite Corp.

DPSG,OUO1004,766 -19-31MAR99-1/1

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2 **Auxiliary Drive, 6076 (500000—)
Specifications**

Item	Measurement	Specification
Auxiliary Drive	Output Speed	0.964 X Crankshaft rpm
Output Housing Bore (Right-Hand or Left-Hand Drive)	ID	65.049—65.075 mm (2.5610—2.5620 in.)
Output Shaft (Right-Hand or Left-Hand Drive)	OD	34.954—34.969 mm (1.3761—1.3767 in.)
Bearing Cup	OD	65.088—65.113 mm (2.5625—2.5635 in.)
Bearing Cone	ID	34.925—34.938 mm (1.3750—1.3755 in.)
Retaining Collar	ID	34.847—34.873 mm (1.3719—1.3730 in.)
Right-Hand Output Housing-to-Timing Gear Cover (3/8 in.)	Torque	27 N•m (20 lb-ft)
Right-Hand Output Gear-to-Camshaft Gear	Backlash	0.11—0.7 mm (0.004—0.028 in.)
Idler Gear Shaft	OD	24.367—24.383 mm (0.9593—0.9600 in.)
Idler Gear	ID	114.940—114.976 mm (4.5252—4.5266 in.)
Idler Gear Bearing	OD	114.985—115.000 mm (4.5270—4.5276 in.)
	ID	74.985—75.000 mm (2.9522—2.9528 in.)
Inner Idler Bearing Support	OD	74.973—74.991 mm (2.9517—2.9524 in.)
	ID	24.402—24.418 mm (0.9607—0.9613 in.)
Idler Housing-to-Timing Gear Cover (3/8 in.):	Torque	41 N•m (30 lb-ft)

Continued on next page

DPSG.OUO1004,767 -19-31MAR99-1/2

Item	Measurement	Specification
Idler Housing-to-Cylinder Block (3/8 in.)	Torque	41 N•m (30 lb-ft)
Idler Housing-to-Cylinder Block (1/2 in.)	Torque	102 N•m (75 lb-ft)
Idler Shaft and Housing-to-Cylinder Block (5/8 in.)	Torque	150 N•m (110 lb-ft)
Timing Gear Cover-to-Block (3/8 in.)	Torque	27 N•m (20 lb-ft)
Idler Housing-to-Idler Bearing (5/16 in.)	Torque	27 N•m (20 lb-ft)
Idler Gear-to-Crankshaft Gear	Backlash	0.11—0.7 mm (0.004—0.028 in.)
Left-Hand Output Housing-to-Idler Housing (3/8 in.)	Torque	41 N•m (30 lb-ft)
Left-Hand Output Gear-to-Idler Gear	Backlash	0.08—0.74 mm (0.003—0.029 in.)
Air Compressor Drive Cover-to-Idler Housing (3/8 in.)	Torque	41 N•m (30 lb-ft)
Left-Hand Rear Adapter Housing-to-Idler Housing (1/2 in.)	Torque	102 N•m (75 lb-ft)

DPSG,OUO1004,767 -19-31MAR99-2/2

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4
Auxiliary Drive General Information

Right-hand, front auxiliary drive (A) is a 9 tooth SAE "A" drive that mounts in place of the injection pump gear access cover, and is driven off of the camshaft gear. Injection pump gear 12-point cap screws with washers are replaced by button head cap screws without washers to provide clearance for the auxiliary drive gear.

Left-hand auxiliary drive is driven off of the crankshaft gear through an idler gear. Left-hand, front auxiliary drive (B) is a 9 tooth SAE "A" drive. Left-hand, rear auxiliary drive (C) is available in a 9 tooth SAE "A", or 13 tooth SAE "B" drive. A 1:8 tapered shaft air compressor drive (D) is also available for left-hand auxiliary drive.

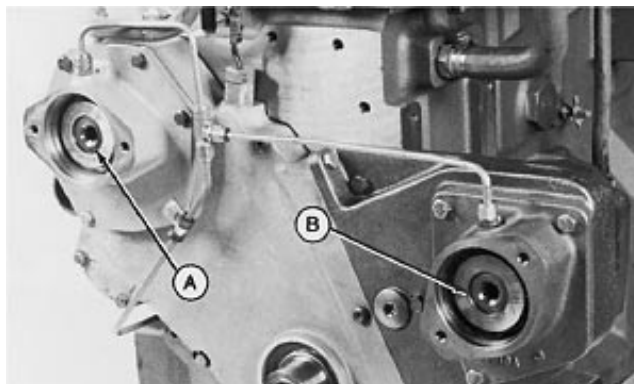
Oil is supplied to the auxiliary drive bearings, or air compressor, from the main oil rifle (E). Oil flow to auxiliary drive bearings is restricted by an orifice fitting in the top of each output housing.

Both left and right-hand drives rotate in the same direction as crankshaft rotation.

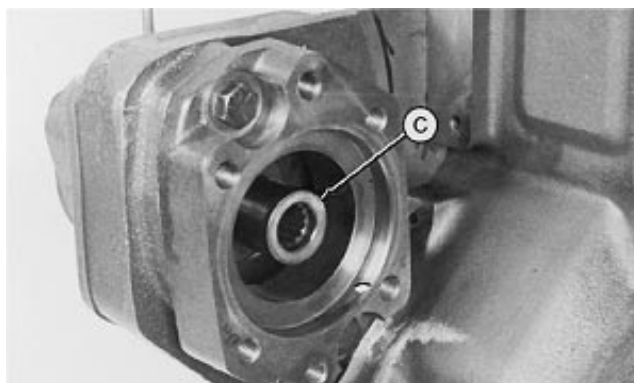
Item	Specification
Idler Gear Teeth	43
Output Gear (LH & RH) Teeth	28
Air Compressor Drive Gear Teeth	28
Crankshaft Gear Teeth	27
Camshaft Gear Teeth	54

Auxiliary drive output speed is 0.964 X Crankshaft rpm.

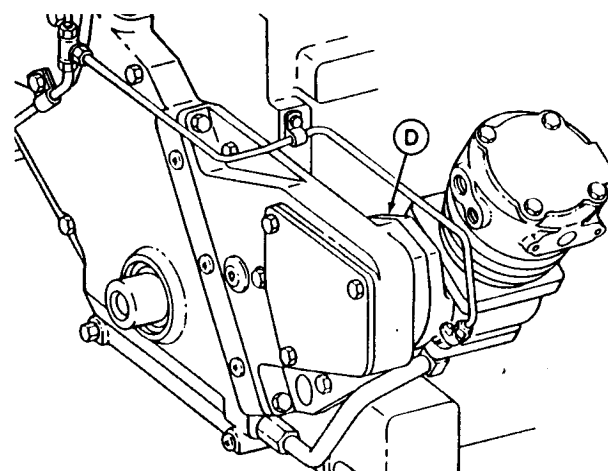
- A—Right-Hand SAE "A" Drive
- B—Left-Hand Front SAE "A" Drive
- C—Left-Hand Rear SAE "A or B" Drive
- D—Air Compressor Drive
- E—Oil Supply Location



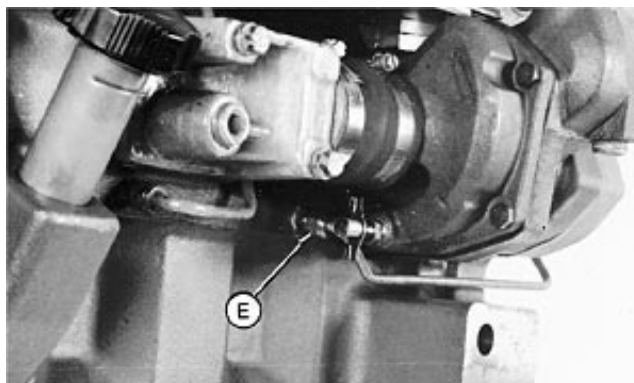
RG6786 -UN-30JUN93



RG6787 -UN-30JUN93



RG6955 -UN-14OCT93

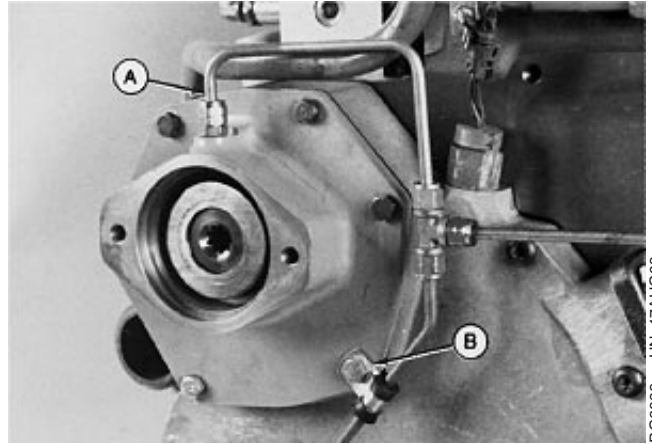


RG6895 -UN-17AUG93

Remove Right-Hand Output Gear Assembly

1. Remove oil line (A) and clamp (B).
2. Remove drive housing mounting cap screws.
3. Remove drive assembly from timing gear cover. Discard gasket.

A—Oil Line
B—Clamp



RG6896 -UN-17AUG93

RG.CTM67,G50,6 -19-27OCT93-1/1

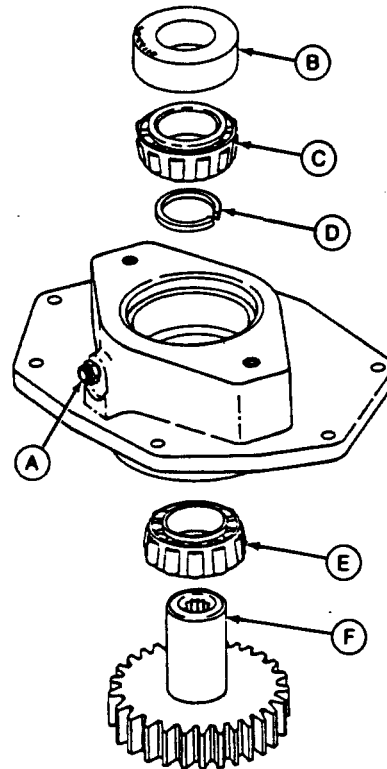
Disassemble Right-Hand Output Gear Assembly

1. Remove and inspect oil restriction orifice fitting (A).

NOTE: Bearings will be damaged during disassembly and cannot be reused.

2. Support gear side of housing in a press.
3. Push on end of shaft to remove collar (B), bearing cone (C), and gear from housing.
4. Remove other bearing cone (E) from gear (F). Discard bearings and spacer ring (D).

A—Oil Restriction Fitting
B—Retaining Collar
C—Bearing Cone
D—Spacer Ring
E—Bearing Cone
F—Output Gear



RG6908 -UN-17AUG93

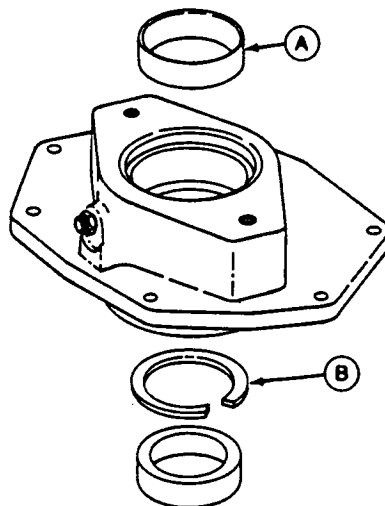
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RG.CTM67,G50,8 -19-27OCT93-1/2

5. Evenly drive one bearing cup (A) out of housing bore.
6. Remove snap ring (B) and press remaining bearing cup out of housing bore. Discard bearing cups and snap ring.
7. Clean and inspect parts and compare to the following specifications:

Specification

Output Housing Bore (Right-Hand or Left-Hand Drive)—ID.....	65.049—65.075 mm (2.5610—2.5620 in.)
Output Shaft (Right-Hand or Left-Hand Drive)—OD	34.954—34.969 mm (1.3761—1.3767 in.)
Bearing Cup—OD.....	65.088—65.113 mm (2.5625—2.5635 in.)
Bearing Cone—ID	34.925—34.938 mm (1.3750—1.3755 in.)
Retaining Collar—ID.....	34.847—34.873 mm (1.3719—1.3730 in.)



A—Bearing Cup
B—Snap Ring

RG6909 -UN-17AUG93

RG,CTM67,G50,8 -19-27OCT93-2/2

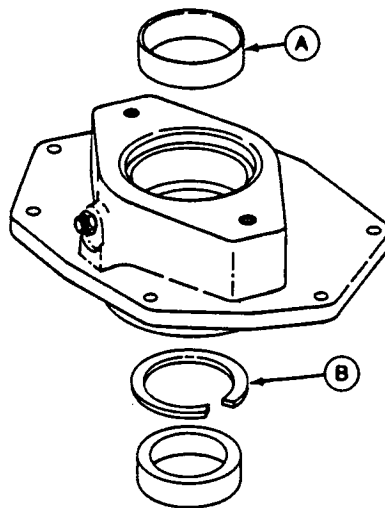
Assemble Right-Hand Output Gear Assembly

IMPORTANT: Bearings are damaged during disassembly. Always install new bearings in a matched set.

NOTE: Snap ring, spacer ring, bearing cups, and bearing cones are provided in a matched set to maintain correct bearing clearance when assembled.

1. Install snap ring (B) into housing groove.
2. Press small I.D. end of bearing cup into gear end of housing bore until seated against snap ring.
3. Support the first bearing cup. Press small I.D. end of second bearing cup (A) into opposite end of housing bore until firmly seated against snap ring.

A—Bearing Cup
B—Snap Ring



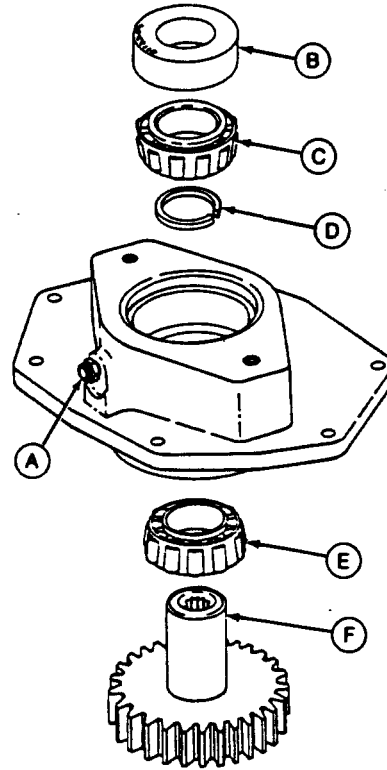
RG6909 -UN-17AUG93

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RG,CTM67,G50,10 -19-27OCT93-1/2

IMPORTANT: DO NOT press on roller bearing retainer. Press only on inner race of bearing cone.

4. Press bearing cone (E) onto output gear (F) so large end of cone is toward the gear.
5. Install gear and bearing assembly into housing. Install spacer ring (D) over shaft.
6. Support gear and housing assembly on face of gear. Press small end of second bearing cone (C) onto shaft until tight against spacer ring.
7. Press collar (B) onto shaft (part number side facing outward) until seated solid against bearings.
8. Check bearing clearance by rotating gear. Gear must rotate freely.
9. Using a new gasket, install oil restriction orifice fitting (A) in housing.



A—Oil Restriction Fitting
 B—Retaining Collar
 C—Bearing Cone
 D—Spacer Ring
 E—Bearing Cone
 F—Output Gear

RG.CTM67,G50,10 -19-27OCT93-2/2

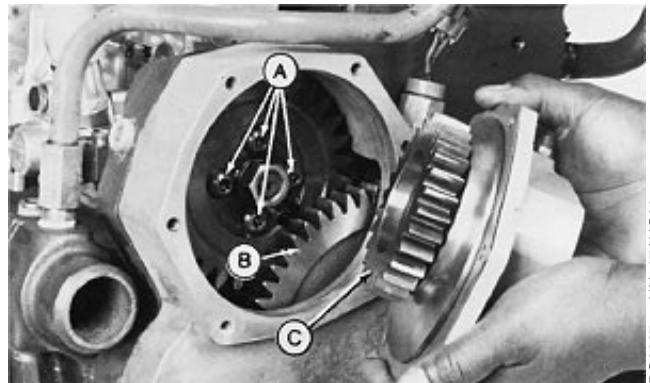
RG6698 -UN-17AUG93

Install Right-Hand Output Gear Assembly

NOTE: Four button head cap screws (A) without washers are used in place of 12-point cap screws with washers on the injection pump drive gear to provide clearance for the auxiliary drive gear.

1. Using a new gasket, install auxiliary drive assembly into timing gear cover. Auxiliary drive gear (C) must be meshed with camshaft gear (B).

A—Button Head Cap Screws
 B—Camshaft Gear
 C—Auxiliary Drive Gear



RG6697 -UN-17AUG93

Continued on next page

RG.CTM67,G50,12 -19-27OCT93-1/2

NOTE: Apply **LOCTITE 242 Thread Lock and Sealer** on threads of cap screw (A).

2. Install drive housing mounting cap screws, oil lines, and clamp. Tighten cap screws to specifications.

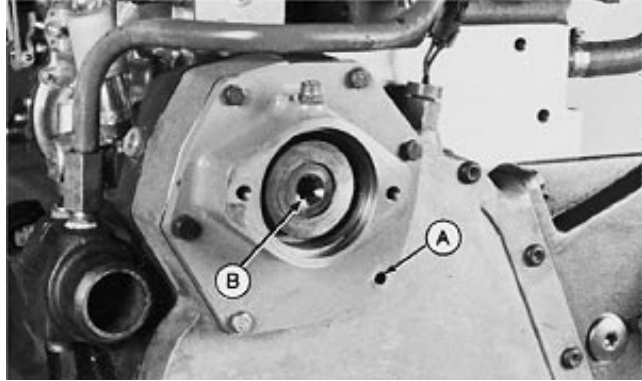
Specification

Right-Hand Output
Housing-to-Timing Gear Cover
(3/8 in.)—Torque 27 N•m (20 lb-ft)

3. Check output gear (B)-to-camshaft gear backlash and compare to following specifications.

Specification

Right-Hand Output
Gear-to-Camshaft Gear—
Backlash 0.11—0.7 mm
(0.004—0.028 in.)



RG6898 -JUN-17AUG93

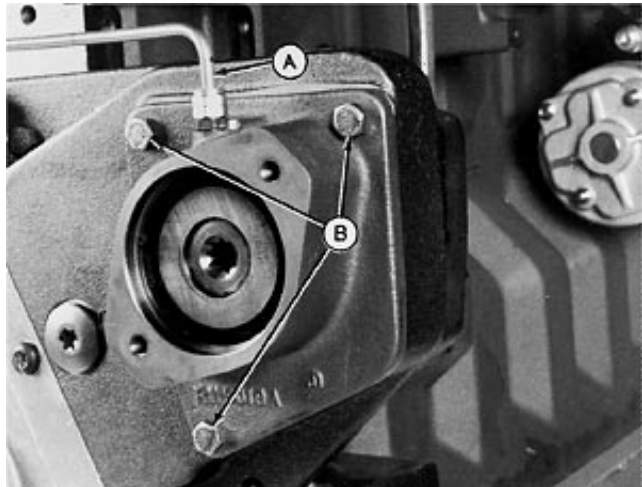
A—Cap Screw
B—Output Gear

RG,CTM67,G50,12 -19-27OCT93-2/2

Remove Left-Hand Output Gear Assembly

1. Remove oil line (A) and output housing-to-idler housing cap screws (B).
2. Remove housing and gear assembly from idler housing. Discard gasket.

A—Oil Line
B—Cap Screws



RG6899 -JUN-17AUG93

RG,CTM67,G50,13 -19-27OCT93-1/1

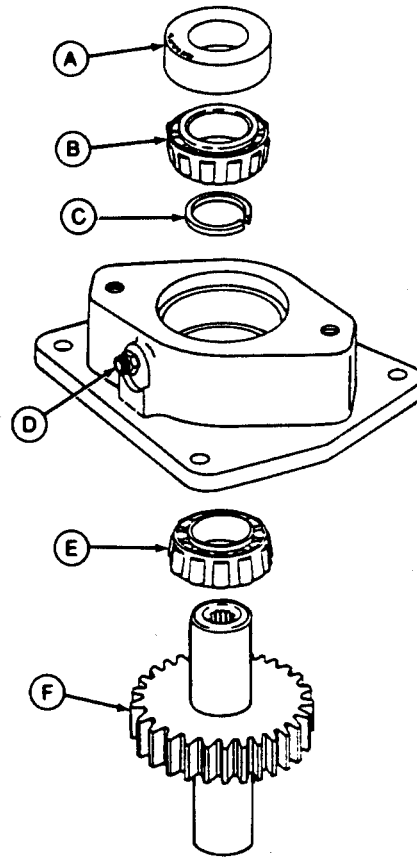
Disassemble Left-Hand Output Gear Assembly

1. Remove and inspect oil restriction orifice fitting (D).

NOTE: Bearings will be damaged during disassembly and cannot be reused.

2. Support gear side of housing in a press.
3. Push on end of shaft to remove collar (A), bearing cone (B), and gear from housing.
4. Remove other bearing cone (E) from gear (F). Discard bearings and spacer ring (C).

A—Retaining Collar
 B—Bearing Cone
 C—Spacer Ring
 D—Oil Restriction Fitting
 E—Bearing Cone
 F—Output Gear



RG6931 -JUN-23AUG93

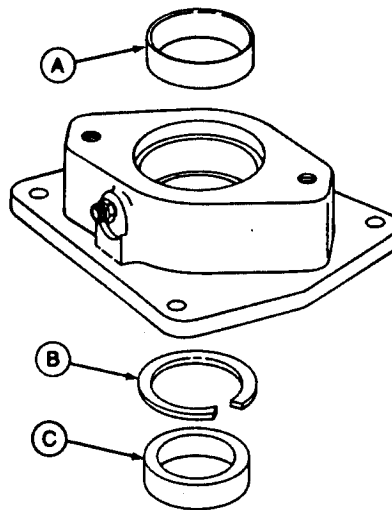
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RG.CTM67,G50,15 -19-27OCT93-1/2

5. Evenly drive one bearing cup (A) out of housing bore.
6. Remove snap ring (B) and press remaining bearing cup (C) out of housing bore. Discard bearing cups and snap ring.
7. Clean and inspect parts. Compare to the following specifications:

Specification

Output Housing Bore (Right-Hand or Left-Hand Drive)—ID.....	65.049—65.075 mm (2.5610—2.5620 in.)
Output Shaft (Right-Hand or Left-Hand Drive)—OD	34.954—34.969 mm (1.3761—1.3767 in.)
Bearing Cup—OD.....	65.088—65.113 mm (2.5625—2.5635 in.)
Bearing Cone—ID	34.925—34.938 mm (1.3750—1.3755 in.)
Retaining Collar—ID.....	34.847—34.873 mm (1.3719—1.3730 in.)



A—Bearing Cup
B—Snap Ring
C—Bearing Cup

RG6930 -JUN-23AUG93

RG,CTM67,G50,15 -19-27OCT93-2/2

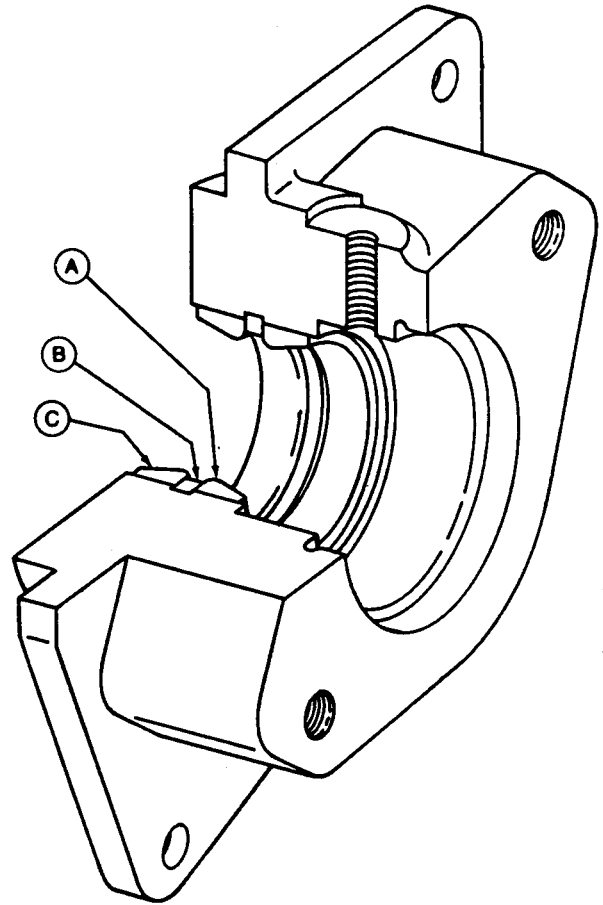
Assemble Left-Hand Output Gear Assembly

IMPORTANT: Bearings are damaged during disassembly. Always install new bearings in a matched set.

NOTE: Snap ring, spacer ring, bearing cups, and bearing cones are provided in a matched set to maintain correct bearing clearance when assembled.

1. Install snap ring (B) into housing groove.
2. Press small I.D. end of bearing cup (A) into gear end of housing bore until seated against snap ring.
3. Support the first bearing cup. Press small I.D. end of second bearing cup (C) into opposite end of housing bore until firmly seated against snap ring.

A—Bearing Cup
B—Snap Ring
C—Bearing Cup



RG6932 -JUN-23AUG93

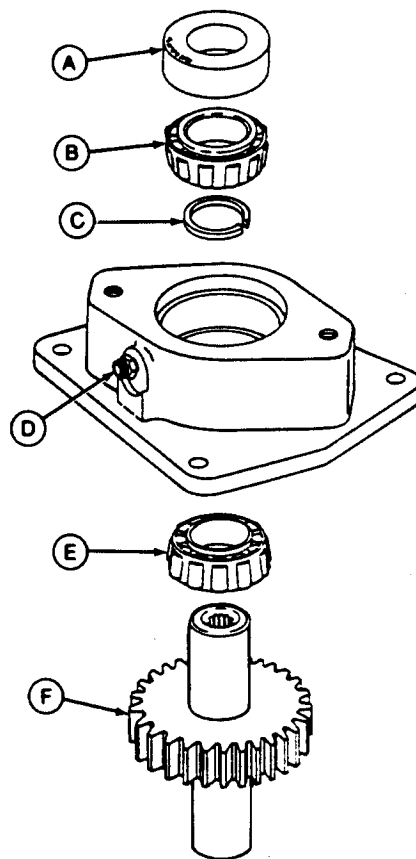
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RG.CTM67.G50.17 -19-27OCT93-1/2

IMPORTANT: Roller bearing retainer can be easily damaged. DO NOT press on retainer. Press only on inner race of bearing cone.

4. Press bearing cone (E) onto gear (F) so large end of cone is toward the gear.
5. Install gear and bearing assembly into housing. Install spacer ring (C) over shaft.
6. Support gear and housing assembly on face of gear. Press small end of second bearing cone (B) onto shaft until tight against spacer ring.
7. Press collar (A) onto shaft (part number side facing outward) until seated solid against bearings.
8. Check bearing clearance by rotating gear. Gear must rotate freely.
9. Using a new gasket, install oil restriction orifice fitting (D) in housing.

- A—Retaining Collar
- B—Bearing Cone
- C—Spacer Ring
- D—Oil Restriction Fitting
- E—Bearing Cone
- F—Output Gear



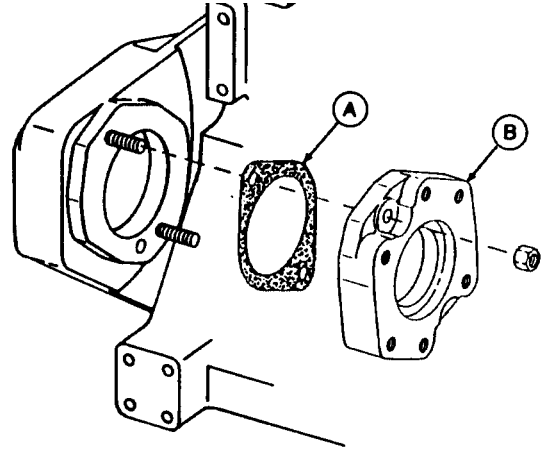
RG6931 -UN-23AUG93

RG,CTM67,G50,17 -19-27OCT93-2/2

Remove Left-Hand Rear Adapter Housing

Remove hex nuts and rear adapter housing (B). Discard gasket (A).

- A—Gasket
- B—Adapter Housing



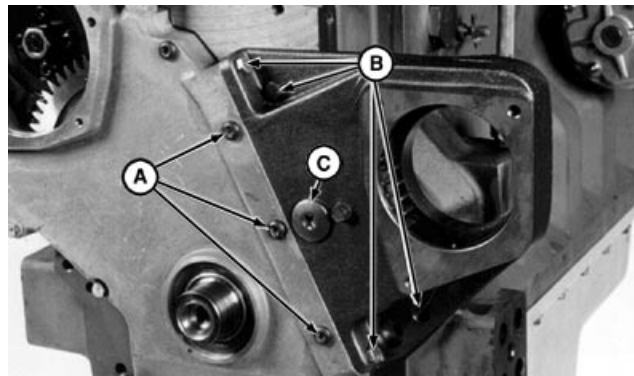
RG6934 -UN-23AUG93

RG,CTM67,G50,18 -19-27OCT93-1/1

Remove Idler Housing and Idler Gear

1. Remove vibration damper. (See engine repair manual.)
2. Loosen idler housing cap screws (B) and timing gear cover cap screws (A).
3. Remove large button head cap screw (C).

- A—Timing Cover Cap Screws
- B—Idler Housing Cap Screws
- C—Button Head Cap Screw



RG6900 -UN-05DEC97

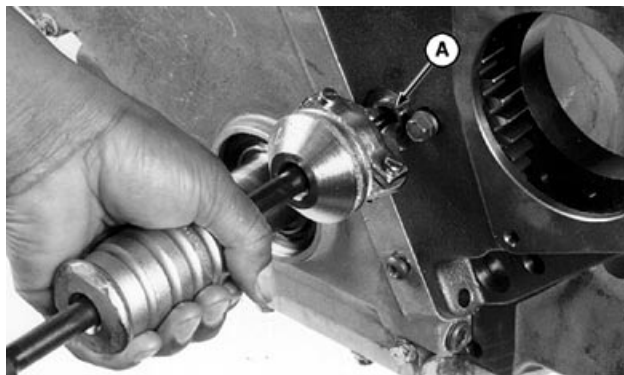
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RG,CTM67,G50,25 -19-27OCT93-1/4

4. Use D01209AA Slide Hammer and puller to pull idler shaft (A) loose from cylinder block. Remove shaft and O-ring from housing.
5. Inspect shaft and compare to the following specification:

	Specification
Idler Gear Shaft—OD.....	24.367—24.383 mm (0.9593—0.9600 in.)

A—Idler Shaft



RG6901 -UN-05DEC97

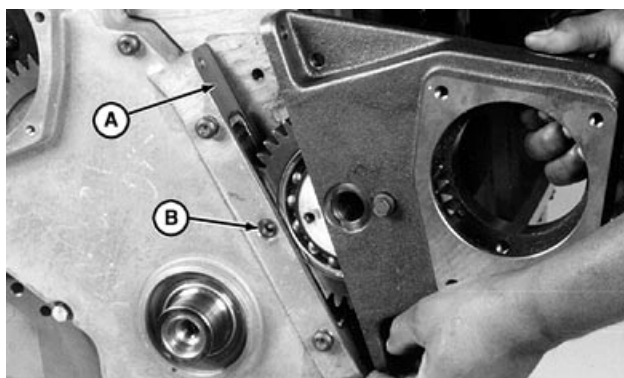
RG,CTM67,G50,25 -19-27OCT93-2/4

6. Remove idler housing cap screws and timing gear cover cap screw (B).

NOTE: Face seal (A) can be reused if not damaged. Use care when removing idler housing from timing gear cover.

7. Lift idler housing and gear out of timing gear cover opening. Remove face seal and O-ring.

A—Face Seal
B—Timing Cover Cap Screw

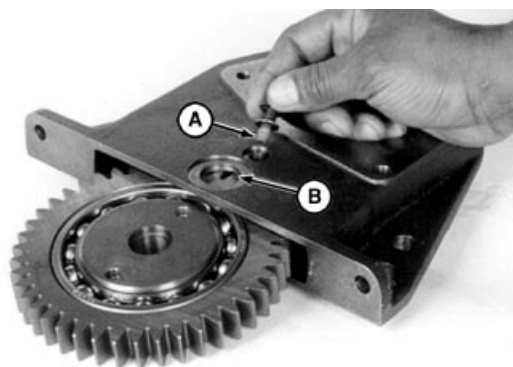


RG6902 -UN-05DEC97

RG,CTM67,G50,25 -19-27OCT93-3/4

8. Remove cap screw (A). Slide idler gear out of housing.
9. Remove O-ring from housing bore (B).

A—Cap Screw
B—Housing Bore



RG6904 -UN-05DEC97

RG,CTM67,G50,25 -19-27OCT93-4/4

Replace Idler Gear Bearing

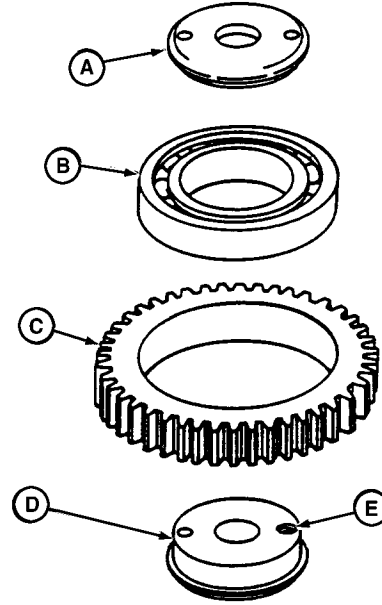
1. Remove inner (D) and outer (A) bearing supports.
2. Support gear and bearing assembly on face of gear. Press on outer race of bearing (B) to remove bearing from gear (C).
3. Clean and inspect parts and compare to the following specifications:

	Specification
Idler Gear—ID	114.940—114.976 mm (4.5252—4.5266 in.)
Idler Gear Bearing—OD	114.985—115.000 mm (4.5270—4.5276 in.)
ID	74.985—75.000 mm (2.9522—2.9528 in.)
Inner Idler Bearing Support—OD	74.973—74.991 mm (2.9517—2.9524 in.)
ID	24.402—24.418 mm (0.9607—0.9613 in.)

IMPORTANT: Press only on outer race of bearing to avoid damaging bearing.

4. Press bearing into gear until bearing is flush with face of gear.
5. Install inner and outer bearing supports so idler shaft bores and cap screw holes align.

NOTE: Inner idler bearing support has one threaded hole (E).



A—Outer Bearing Support
B—Idler Bearing
C—Idler Gear
D—Inner Bearing Support
E—Threaded Hole

RG6928
RG6928 -UN-05DEC97

RG.CTM67.G50.26 -19-27OCT93-1/1

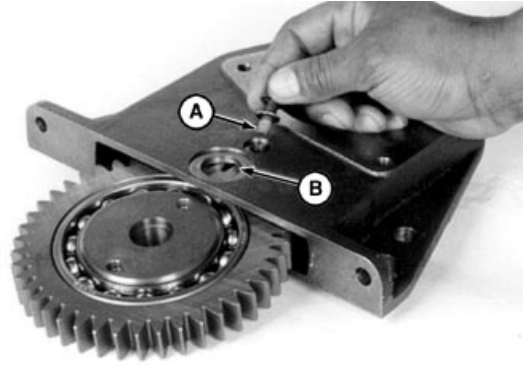
Install Idler Housing and Idler Gear

1. Grease and install O-ring in housing bore (B).

NOTE: Inner idler bearing support has one threaded hole, and is installed toward block side of housing.

2. Install idler gear into idler housing. Install cap screw with seal (A) to hold idler gear in place.

A—Cap Screw With Seal
B—Housing Bore



RG6904 -UN-05DEC97

RG,CTM67,G50,31 -19-27OCT93-1/6

3. Insert idler shaft through idler housing and idler gear until flush with block side of housing.

IMPORTANT: White dot on one end of shaft must face out toward front of engine.

4. Grease O-ring groove (A) in back side of idler housing. Insert O-ring.

A—O-Ring Groove



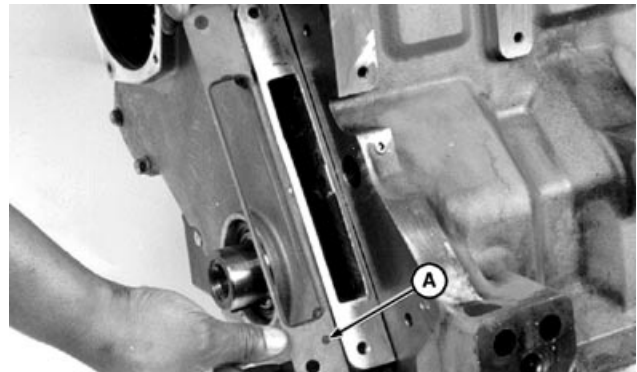
RG6903 -UN-05DEC97

RG,CTM67,G50,31 -19-27OCT93-2/6

NOTE: Face seal may be reused if it is not cut, nicked, or damaged.

5. Using a short guide stud, place face seal on timing gear cover opening. Gauge hole (A) must be positioned toward bottom of opening.

A—Gauge Hole



RG6905 -UN-05DEC97

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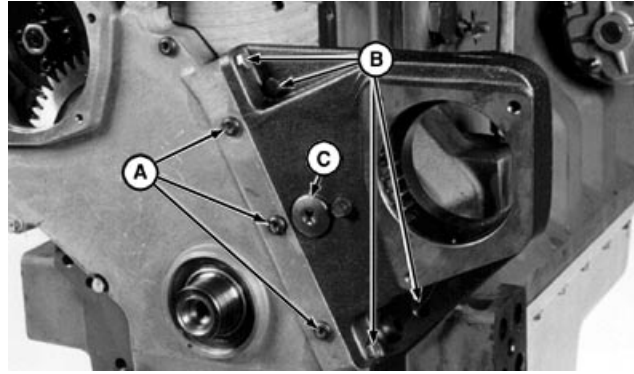
RG,CTM67,G50,31 -19-27OCT93-3/6

IMPORTANT: Be careful not to damage face seal or displace O-ring on back side of idler housing during assembly.

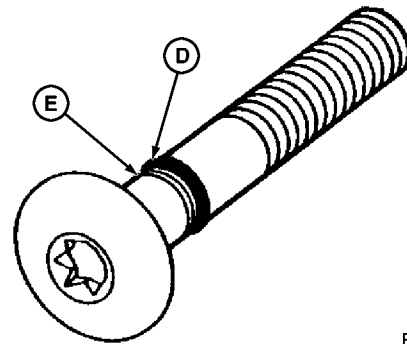
6. Carefully insert idler gear into opening of timing gear cover until idler gear meshes with crankshaft gear, and housing is seated against face seal. Push idler shaft into block.
7. Check condition of O-ring (D) and back-up ring (E) on large button head cap screw (C). Grease O-ring and install cap screw through idler shaft. Thread into block until finger tight.
8. Remove guide stud. Install timing gear cover cap screws (A) and idler housing cap screws (B) finger tight.

NOTE: Middle timing gear cover cap screw must have a seal.

- A—Timing Gear Cover Cap Screws
- B—Idler Housing Cap Screws
- C—Large Button Head Cap Screw
- D—O-Ring
- E—Back-Up Ring



RG6900 -JUN-05DEC97



RG6935

RG6935 -JUN-08DEC97

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RG.CTM67.G50.31 -19-27OCT93-4/6

9. Tighten cap screws to specifications in the following sequence:

- Idler housing-to-timing gear cover (1,2):

Specification

Idler Housing-to-Timing Gear
Cover (3/8 in.)—Torque..... 41 N•m (30 lb-ft)

- Idler housing-to-cylinder block (3): 3/8 inch cap screws:

Specification

Idler Housing-to-Cylinder Block
(3/8 in.)—Torque 41 N•m (30 lb-ft)

- Idler housing-to-cylinder block (4): 1/2 inch cap screws:

Specification

Idler Housing-to-Cylinder Block
(1/2 in.)—Torque 102 N•m (75 lb-ft)

- Idler shaft (5):

Specification

Idler Shaft and
Housing-to-Cylinder Block (5/8
in.)—Torque..... 150 N•m (110 lb-ft)

- Timing gear cover-to-cylinder block (6,7,8):

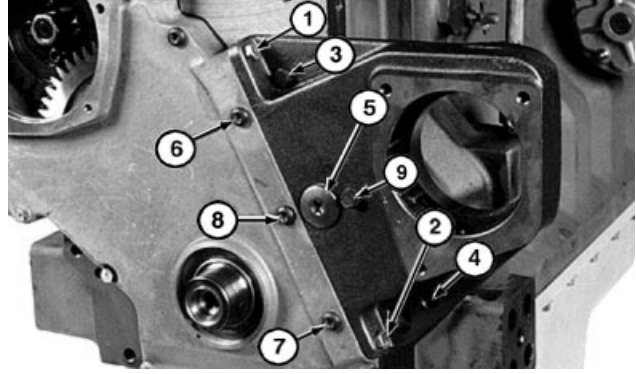
Specification

Timing Gear Cover-to-Block (3/8
in.)—Torque..... 27 N•m (20 lb-ft)

- Idler housing-to-idler bearing (9):

Specification

Idler Housing-to-Idler Bearing
(5/16 in.)—Torque 27 N•m (20 lb-ft)



RG6906 -JUN-05DEC97

10. Check idler gear-to-crankshaft gear backlash.
Backlash must be as follows:

Specification

Idler Gear-to-Crankshaft Gear—
Backlash 0.11—0.7 mm
(0.004—0.028 in.)

11. Install vibration damper. (See engine repair manual.)

RG,CTM67,G50,31 -19-27OCT93-6/6

Install Left-Hand Output Gear Assembly

1. Install new gasket onto pilot of output housing.
2. Insert output gear assembly into front opening of idler gear housing. Tighten cap screws (B) to specifications.

Specification

Left-Hand Output Housing-to-Idler
Housing (3/8 in.)—Torque 41 N•m (30 lb-ft)

3. Check output gear (C)-to-idler gear backlash. Backlash must as follows:

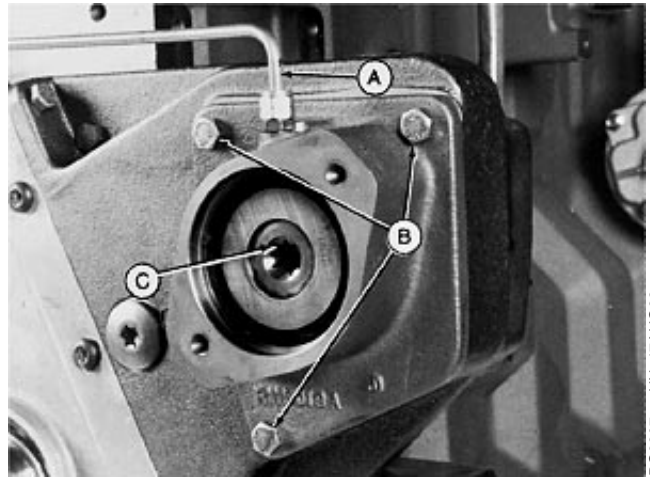
Specification

Left-Hand Output Gear-to-Idler
Gear—Backlash..... 0.08—0.74 mm
(0.003—0.029 in.)

4. Install oil supply line (A) on orifice fitting.
5. If front drive is not used, install front cover and gasket.
Tighten cap screws to specifications

Specification

Air Compressor Drive
Cover-to-Idler Housing (3/8 in.)—
Torque 41 N•m (30 lb-ft)



RG6907 -UN-17AUG93

A—Oil Supply Line
B—Output Housing Cap Screws
C—Spline Teeth

RG,CTM67,G50,32 -19-27OCT93-1/1

Install Left-Hand Rear Adapter Housing

1. Install new gasket (C) onto pilot of adapter housing (D).

NOTE: Apply LOCTITE 242 Thread Lock and Sealer to threads of studs (B).

2. Install adapter housing on rear of idler gear housing (A). Tighten cap screws to specifications.

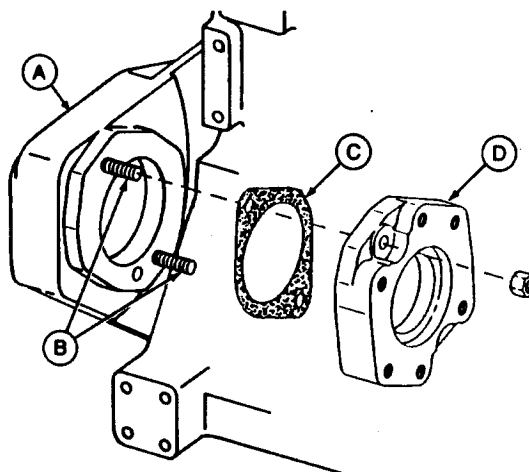
Specification

Left-Hand Rear Adapter
Housing-to-Idler Housing (1/2
in.)—Torque..... 102 N•m (75 lb-ft)

3. If rear drive is not used, install rear cover and gasket.
Tighten cap screws to specifications.

Specification

Air Compressor Drive
Cover-to-Idler Housing (3/8 in.)—
Torque 41 N•m (30 lb-ft)



A—Idler Gear Housing
B—Studs
C—Gasket
D—Adapter Housing

RG6933 -UN-23AUG93

RG,CTM67,G50,33 -19-27OCT93-1/1

Auxiliary Drive (2.9 L) Specifications

Item	Measurement	Specification
Right Hand Auxiliary Drive Gear Nut	Torque	55 N•m (41 lb-ft)
Accessory-to-Timing Gear Cover Cap Screws and Nuts	Torque	50 N•m (35 lb-ft)

DPSG,OUO1030,39 -19-19MAR99-1/1

Remove and Install Right-Hand Auxiliary Drive

NOTE: Two accessory mounting cap screws pass through timing gear cover.

1. Remove cap screws and nuts (C). Remove accessory with gear.
2. If gear replacement is necessary, remove nut (B), washer and gear (A) from accessory shaft.
3. Install gear (A), washer and nut (B) on accessory shaft. Tighten to specifications. If equipped, bend tabs of washer up against nut.

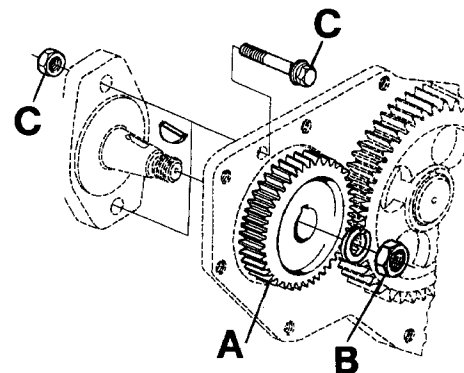
Specification

Right Hand Auxiliary Drive Gear
Nut—Torque 55 N•m (41 lb-ft)

4. Install accessory with gasket on engine (arrow).
5. Install cap screws and nuts. Tighten to specifications.

Specification

Accessory-to-Timing Gear Cover
Cap Screws and Nuts—Torque 50 N•m (35 lb-ft)



A—Gear
B—Gear Retaining Nut
C—Mounting Cap Screw and Nut

CD30613 -UN-16JUN98

CD30354 -UN-03FEB93

DPSG,OUO1030,17 -19-12MAR99-1/1

**Auxiliary Drive (4.5 L and 6.8 L)
Specifications**

Item	Measurement	Specification
Auxiliary Drive-to-Cylinder Block Plate	Torque	95 N•m (70 lb-ft)
Auxiliary Drive Cover Plate	Torque	55 N•m (41 lb-ft)
Offset Auxiliary Drive-to-Cylinder Block Plate	Torque	95 N•m (70 lb-ft)
Offset Auxiliary Drive Gear Cover Plate	Torque	55 N•m (41 lb-ft)
Offset Auxiliary Drive Cover Plate	Torque	55 N•m (41 lb-ft)

DPSG,OUO1030,40 -19-19MAR99-1/1

Remove and Install Auxiliary Drive

1. Remove lube line.
2. Remove auxiliary drive gear cover (A).
3. Remove auxiliary drive assembly (B).
4. Inspect for cracked housing, worn or damaged bearings, damaged gear or spline.
5. Install new gasket on auxiliary drive assembly and position in cylinder block plate. Install cap screws and tighten to specifications.

Specification

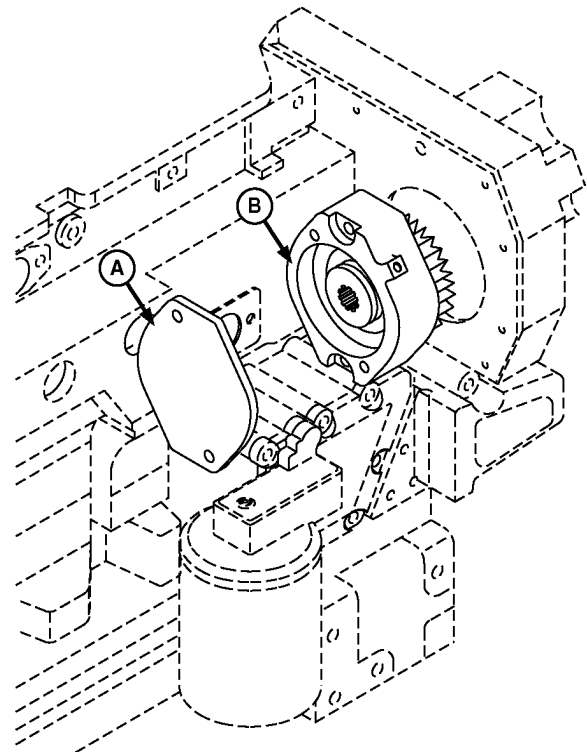
Auxiliary Drive-to-Cylinder Block Plate—Torque..... 95 N•m (70 lb-ft)

6. Install new gasket and cover. Tighten cap screws to specifications.

Specification

Auxiliary Drive Cover Plate—Torque 55 N•m (41 lb-ft)

7. Install lube line.



A—Gear Cover
B—Auxiliary Drive Assembly

RG9049 -UN-16MAR98

DPSG,OUO1030,18 -19-12MAR99-1/1

Remove and Install Offset Auxiliary Drive

1. Remove lube line.
2. Remove nuts (C) and auxiliary drive gear cover.
3. Remove cap screws (A and B) and remove offset drive and cover.
4. Inspect for cracked housing, worn or damaged gears or spline.
5. Install new gasket on auxiliary drive assembly and position on cylinder block plate.
6. Install O-ring, gear cover and cap screws (A) and (B). Tighten to specifications.

Specification

Offset Auxiliary Drive-to-Cylinder
Block Plate (B)—Torque..... 95 N•m (70 lb-ft)

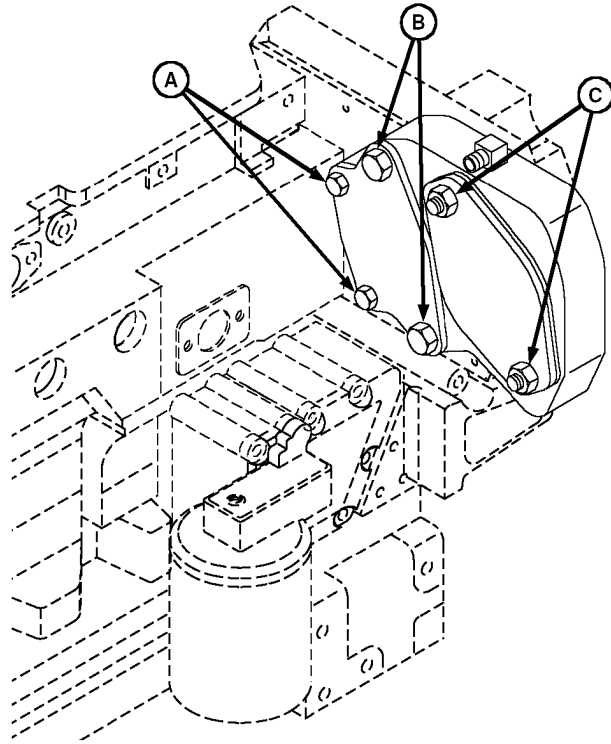
Specification

Offset Auxiliary Drive Gear Cover
Plate (A)—Torque 55 N•m (41 lb-ft)

7. Install O-ring, drive cover plate and nuts (C). Tighten to specifications.

Specification

Offset Auxiliary Drive Cover Plate
(C)—Torque..... 55 N•m (41 lb-ft)



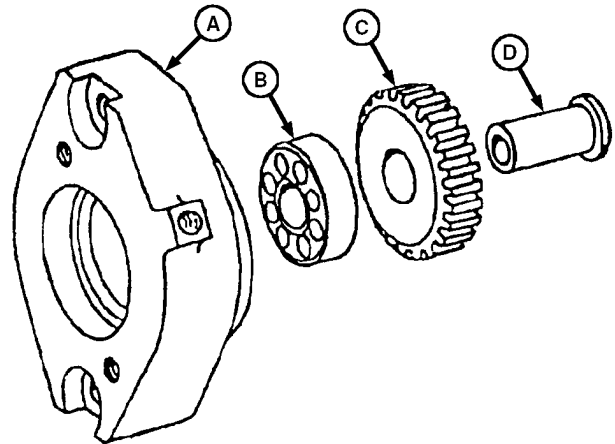
A—M10x25 Cap Screw (2 used)
B—M12x110 Cap Screw (2 used)
C—Nut (2 used)

RG9509 -JUN-17MAR99

Disassemble and Inspect Auxiliary Drive Adapter

1. Remove bearing (B), gear (C) and drive shaft (D) from housing (A).
2. Inspect for worn or damaged components. If components are worn or damaged, complete replacement of gear drive adapter is necessary.

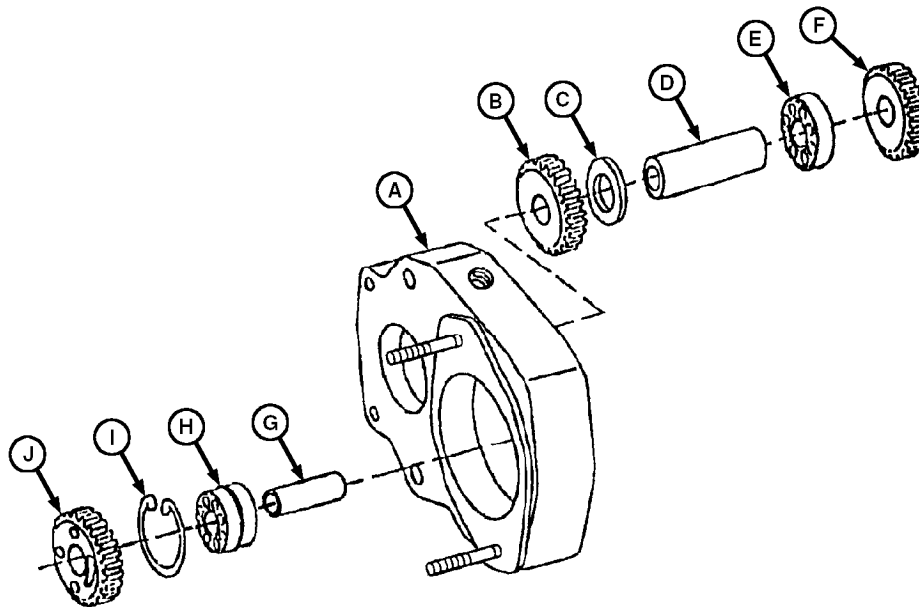
A—Housing
B—Bearing
C—Gear
D—Drive Shaft



RG9510 -UN-17MAR99

DPSG,OUO1030,20 -19-15MAR99-1/1

Disassemble and Inspect Offset Auxiliary Drive Adapter



A—Housing
B—Gear
C—Spacer

D—Drive Shaft
E—Bearing
F—Gear

G—Drive Shaft
H—Bearing

I—Snap Ring
J—Gear

NOTE: Components (G—J) are on spline drive adapters only.

1. Remove parts (G—J) from housing (A).

2. Inspect for worn or damaged components. If components are worn or damaged, complete replacement of offset drive gear adapter is necessary.

RG9511 -UN-17MAR99

DPSG,OUO1030,21 -19-15MAR99-1/1

Auxiliary Drive Specifications

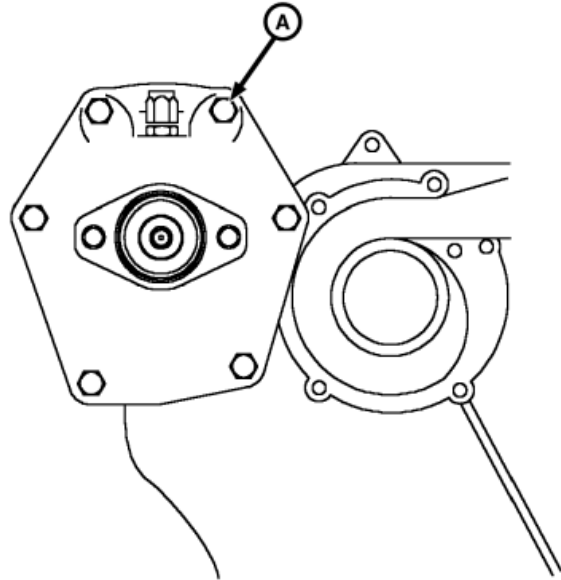
Item	Measurement	Specification
Idler Gear Housing Mounting Cap Screws	Torque	See installation procedure in this group.
Right-Hand Output Gear Assembly	Torque	28.5 ± 5.7 N•m (21 ± 4.2 lb-ft)
Right-Hand Output Gear Oil Line Nuts	Torque	13.5 ± 2.7 N•m (10 ± 2 lb-ft)
Output Gear-to-Camshaft Gear	Backlash	0.11—0.7 mm (0.004—0.028 in.)
Left-Hand Rear Adapter Housing-to-Auxiliary Drive Housing	Torque	102 N•m (75 lb-ft)
Idler Shaft	Torque	150 N•m (110 lb-ft)
Timing Gear Cover-to-Cylinder Block	Torque	27 N•m (20 lb-ft)
Idler Gear-to-Crankshaft Gear	Backlash	0.11—0.70 mm (0.004—0.028 in.)
Front Cover Cap Screws	Torque	41 N•m (30 lb-ft)
Left-Hand Output Gear Housing Cap Screws	Torque	41 N•m (30 lb-ft)
Output Gear-to-Idler Gear	Backlash	0.08—0.74 mm (0.003—0.029 in.)

OURGP12,0000162 -19-01SEP05-1/1

Remove Right-Hand Output Gear Assembly

1. Remove oil line and clamp.
2. Remove drive housing mounting cap screws (A).
3. Remove drive assembly from timing gear cover. Discard gasket.

A—Cap Screw (6 used)



RG9506 -JUN-19MAR99

DPSG,OUO1030,22 -19-15MAR99-1/1

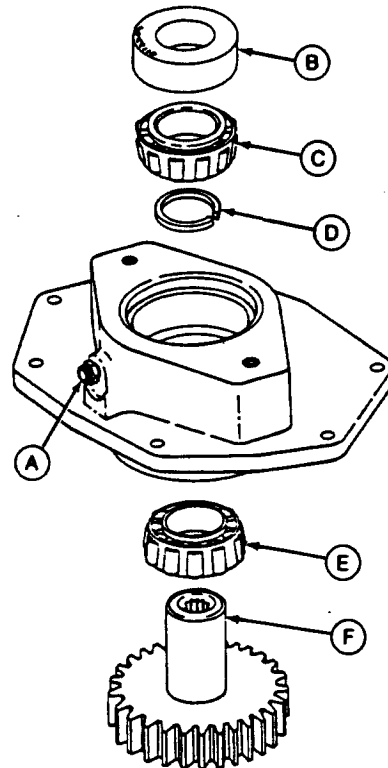
Disassemble Right-Hand Output Gear Assembly

1. Remove and inspect oil restriction orifice fitting (A).

NOTE: Bearings will be damaged during disassembly and cannot be reused.

2. Support gear side of housing in a press.
3. Push on end of shaft to remove collar (B), bearing cone (C) and gear from housing.
4. Remove other bearing cone (E) from gear (F). Discard bearings and spacer ring (D).

A—Oil Restriction Fitting
 B—Retaining Collar
 C—Bearing Cone
 D—Spacer Ring
 E—Bearing Cone
 F—Output Gear



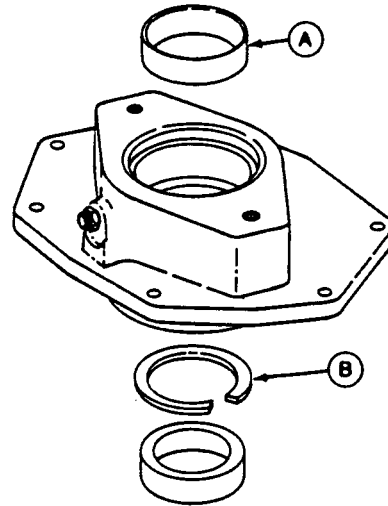
RG6908 -JUN-17AUG93

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DPSG,OUO1030,23 -19-15MAR99-1/2

5. Evenly drive one bearing cup (A) out of bore.
6. Remove snap ring (B) and press remaining bearing cup out of housing bore. Discard bearing cups and snap ring.

A—Bearing Cup
B—Snap Ring



RG6909 -UN-17AUG93

DPSG,OUO1030,23 -19-15MAR99-2/2

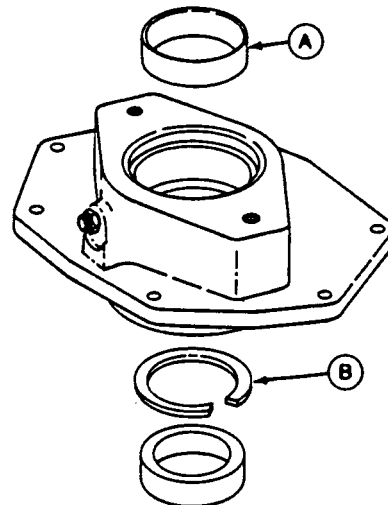
Assemble Right-Hand Output Gear Assembly

IMPORTANT: Bearings are damaged during disassembly. Always install new bearings in a matched set.

NOTE: Snap ring, spacer ring, bearing cups and bearing cones are provided in a matched set to maintain correct bearing clearance when assembled.

1. Install snap ring (B) into housing groove.
2. Press small ID end of bearing cup into gear end of housing bore until seated against snap ring.
3. Support the first bearing cup. Press small ID end of second bearing cup (A) into opposite end of housing bore until firmly seated against snap ring.

A—Bearing Cup
B—Snap Ring



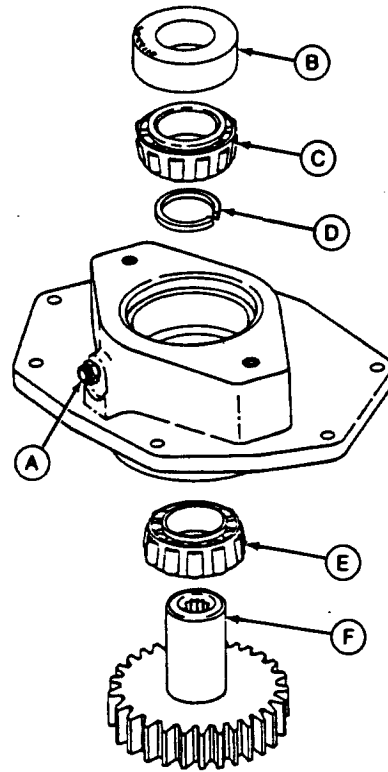
RG6909 -UN-17AUG93

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DPSG,OUO1030,24 -19-15MAR99-1/2

IMPORTANT: DO NOT press on roller bearing retainer. Press only on inner race of bearing cone.

4. Press bearing cone (E) onto output gear (F) so large end of cone is toward the gear.
5. Install gear and bearing assembly into housing. Install spacer ring (D) over shaft.
6. Support gear and housing assembly on face of gear. Press small end of second bearing cone (C) onto shaft until against spacer ring.
7. Press collar (B) onto shaft (part number side facing outward) until seated solid against bearings.
8. Check bearing clearance by rotating gear. Gear must rotate freely.
9. Using a new gasket, install oil restriction fitting (A) in housing.



A—Oil Restriction Fitting
 B—Retaining Collar
 C—Bearing Cone
 D—Spacer Ring
 E—Bearing Cone
 F—Output Gear

RG6908 -UN-17AUG93

DPSG,OUO1030,24 -19-15MAR99-2/2

Install Right-Hand Output Gear Assembly

NOTE: Four button head cap screws without washers are used in place of 12-point cap screws with washers on the injection pump drive gear to provide clearance for the auxiliary drive gear.

- Using a new gasket, install auxiliary drive assembly into timing gear cover. Auxiliary drive gear must be meshed with camshaft gear.

NOTE: Apply **LOCTITE® 242 Thread Lock and Sealer** on threads of cap screw (A).

- Install drive housing mounting cap screws, oil lines and clamp. Tighten cap screws to specifications.

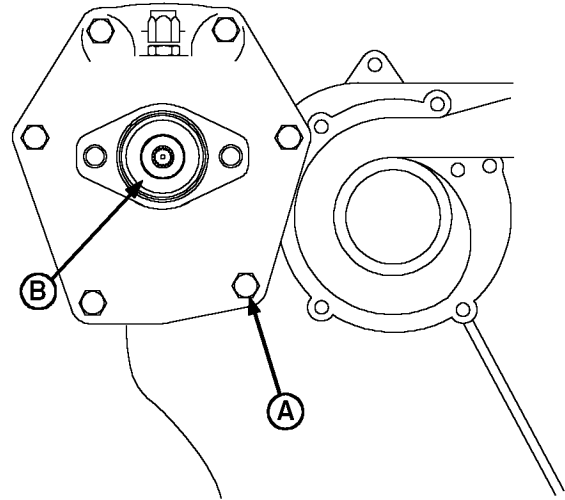
Specification

Right-Hand Output Gear	
Assembly Cap Screws—Torque	28.5 ± 5.7 N•m (21 ± 4.2 lb-ft)
Right-Hand Output Gear Oil Line	
Nuts—Torque	13.5 ± 2.7 N•m (10 ± 2 lb-ft)

- Check output gear (B)-to-camshaft gear backlash. Backlash must be as follows:

Specification

Output Gear-to-Camshaft Gear—	
Backlash	0.11—0.7 mm (0.004—0.028 in.)



A—Cap Screw
B—Output Gear

RG9527 -UN-24MAR99

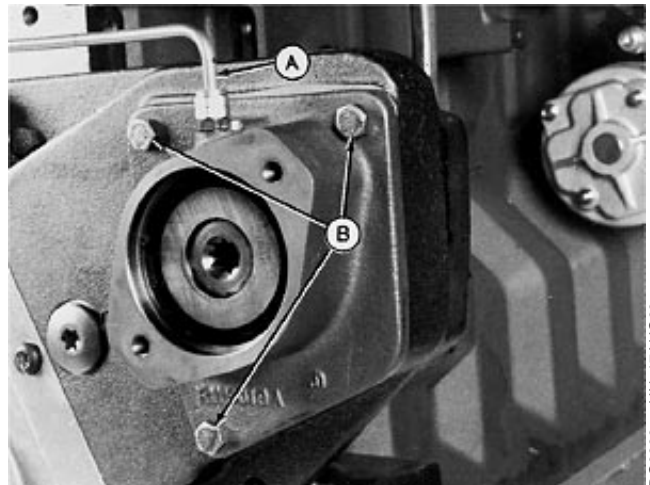
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OURGP12,0000163 -19-01SEP05-1/1

Remove Left-Hand Output Gear Assembly

- Remove oil line (A) and output housing-to-idler housing cap screws (B).
- Remove housing and gear assembly from idler housing. Discard gasket.

A—Oil Line
B—Cap Screw (3 used)



RG6899 -UN-17AUG93

DPSG,OUO1030,26 -19-15MAR99-1/1

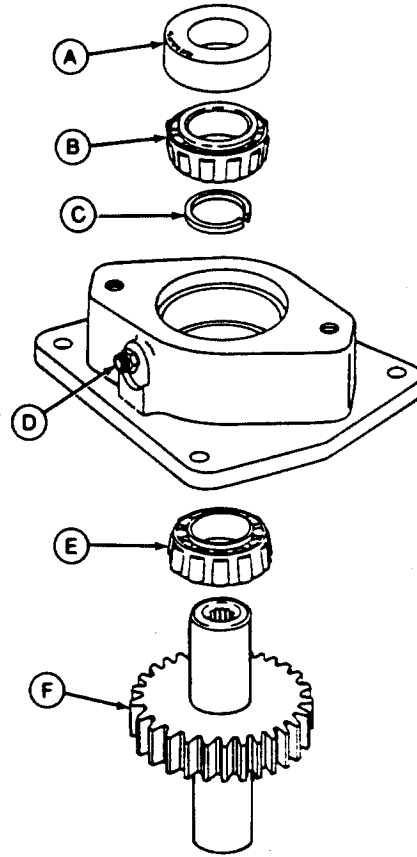
Disassemble Left-Hand Output Gear Assembly

1. Remove and inspect oil restriction orifice fitting (D).

NOTE: Bearings will be damaged during disassembly and cannot be reused.

2. Support gear side of housing in a press.
3. Push on end of shaft to remove collar (A), bearing cone (B) and gear from housing.
4. Remove other bearing cone (E) from gear (F). Discard bearings and spacer ring (C).

- A—Retaining Collar
- B—Bearing Cone
- C—Spacer Ring
- D—Oil Restriction Fitting
- E—Bearing Cone
- F—Output Gear

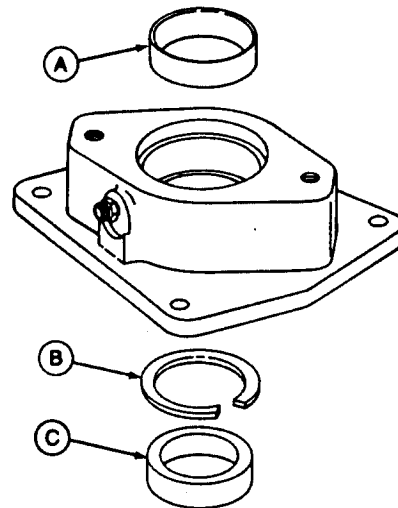


RG6931 -UN-23AUG93

DPSG,OUO1030,27 -19-15MAR99-1/2

5. Evenly drive one bearing cup (A) out of housing bore.
6. Remove snap ring (B) and press remaining bearing cup (C) out of housing bore. Discard bearing cup and snap ring.

- A—Bearing Cup
- B—Snap Ring
- C—Bearing Cup



RG6930 -UN-23AUG93

DPSG,OUO1030,27 -19-15MAR99-2/2

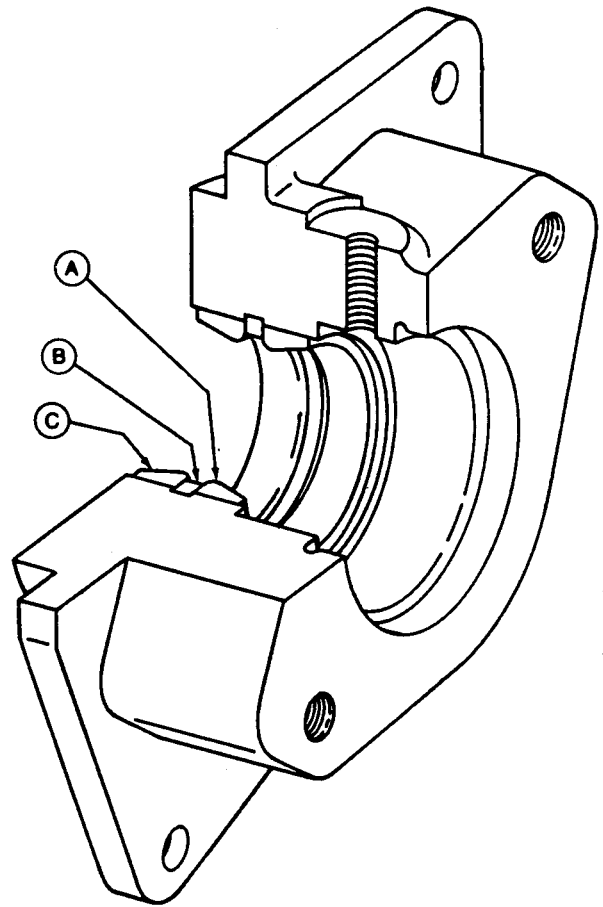
Assemble Left-Hand Output Gear Assembly

IMPORTANT: Bearings are damaged during disassembly. Always install new bearings in a matched set.

NOTE: Snap ring, spacer ring, bearing cups and bearing cones are provided in a matched set to maintain correct bearing clearance when assembled.

1. Install snap ring (B) into housing groove.
2. Press small ID end of bearing cup (A) into gear end of housing bore until seated against snap ring.
3. Support the first bearing cup. Press small ID end of second bearing cup (C) into opposite end of housing bore until firmly seated against snap ring.

A—Bearing Cup
B—Snap Ring
C—Bearing Cup



RG6932 -JUN-23AUG93

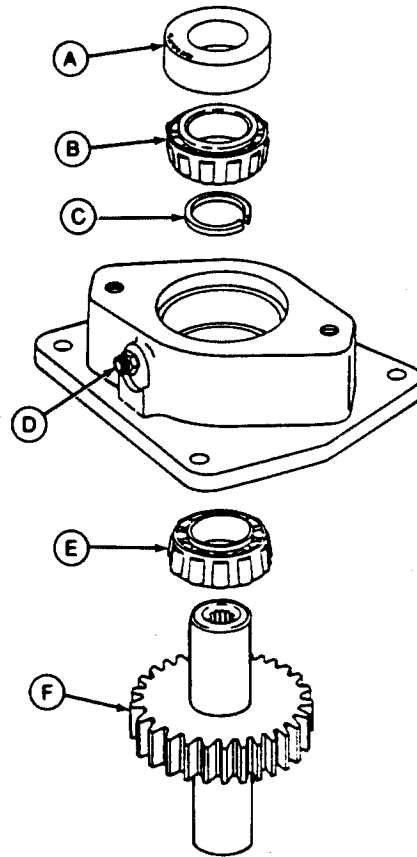
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DPSG,OUO1030,28 -19-15MAR99-1/2

IMPORTANT: Roller bearing retainer can be easily damaged. **DO NOT** press on retainer. Press only on inner race of bearing cone.

4. Press bearing cone (E) onto gear (F) so large end of cone is toward the gear.
5. Install gear and bearing assembly into housing. Install spacer ring (C) over shaft.
6. Support gear and housing assembly on face of gear. Press small end of second bearing cone (B) onto shaft until tight against spacer ring.
7. Press collar (A) onto shaft (part number side facing outward) until seated solid against bearings.
8. Check bearing clearance by rotating gear. Gear must rotate freely.
9. Using a new gasket, install oil restriction fitting (D) in housing.

- A—Retaining Collar
- B—Bearing Cone
- C—Spacer Ring
- D—Oil Restriction Fitting
- E—Bearing Cone
- F—Output Gear



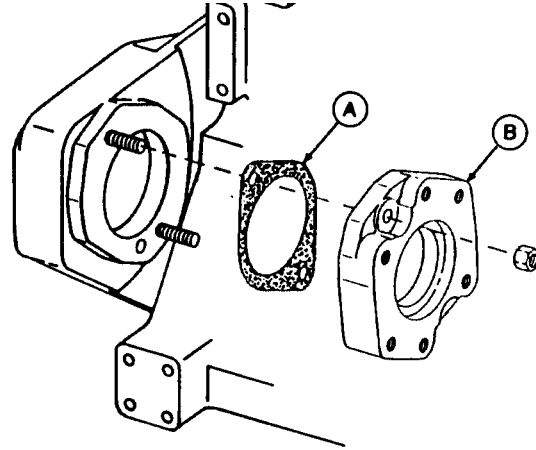
RG6931 -UN-23AUG93

Remove and Install Left-Hand Rear Adapter Housing

1. Remove hex nuts and rear adapter housing (B). Discard gasket (A).
2. Using a new gasket, install rear adapter housing. Tighten nuts to specifications.

Specification

Left-Hand Rear Adapter Housing-to-Auxiliary Drive
Housing Nuts—Torque 102 N•m (75 lb-ft)



A—Gasket
B—Housing

RG6934 -UN-23AUG93

DPSG,OUO1030,29 -19-15MAR99-1/1

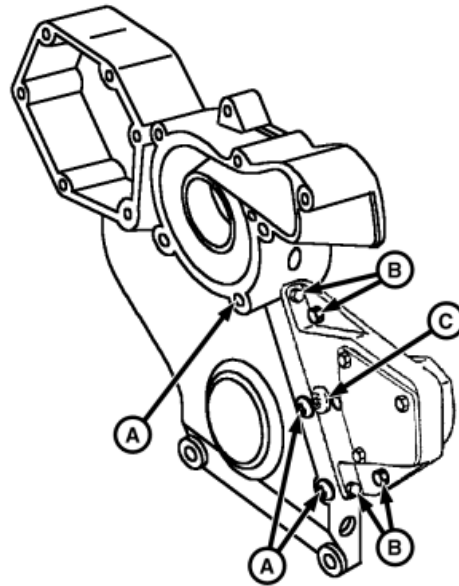
Remove Idler Housing and Idler Gear

1. Remove vibration damper. (See engine repair manual.)

NOTE: Upper timing gear cover cap screw (A) is also used to retain water pump.

2. Loosen idler housing cap screws (B) and timing gear cover cap screws (A).
3. Remove large button head cap screw (C).

A—Timing Cover Cap Screw (3 used)
B—Idler Housing Cap Screw (4 used)
C—Large Button Head Cap Screw



RG8505 -UN-19MAR99

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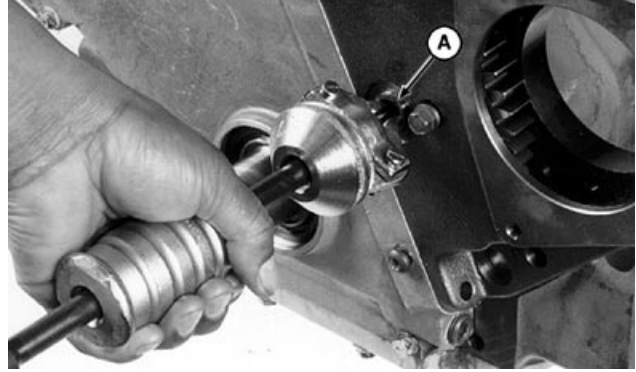
DPSG,OUO1030,30 -19-18MAR99-1/3

4. Use DO1209AA Slide Hammer and puller to pull idler shaft (A) loose from cylinder block. Remove shaft and O-ring from housing.

5. Remove idler housing cap screws and middle timing gear cover cap screw.

NOTE: Face seal can be reused if not damaged. Use care when removing idler housing from timing gear cover.

6. Lift idler housing and gear out of timing gear cover opening. Remove face seal and O-ring.



RG66901 -UN-05DEC97

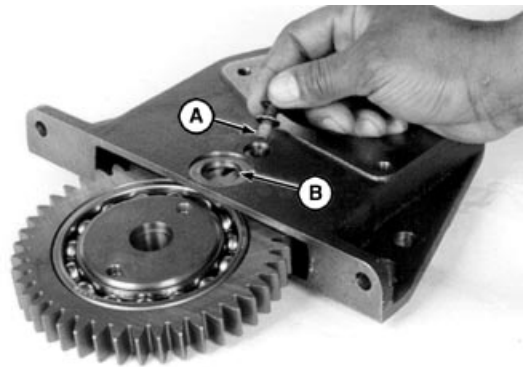
A—Idler Shaft

DPSG,OUO1030,30 -19-18MAR99-2/3

7. Remove cap screw (A). Slide idler gear out of housing.

8. Remove O-ring from housing bore (B).

A—Cap Screw
B—Housing Bore



RG66904 -UN-05DEC97

DPSG,OUO1030,30 -19-18MAR99-3/3

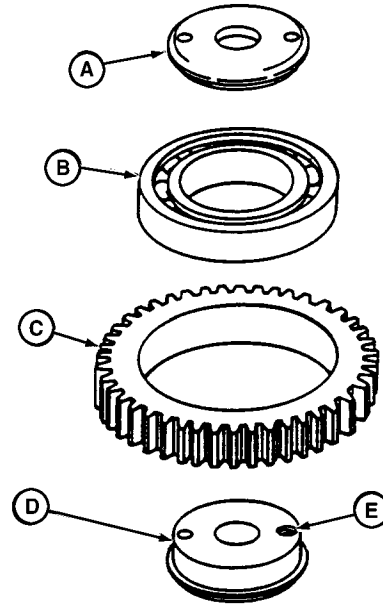
Replace Idler Gear Bearing

1. Remove inner (D) and outer (A) bearing supports.
2. Support gear and bearing assembly on face of gear. Press on outer race of bearing (B) to remove bearing from gear (C).

IMPORTANT: Press only on outer race of bearing to avoid damaging bearing.

3. Press bearing into gear until bearing is flush with face of gear.
4. Install inner and outer bearing supports so idler shaft bores and cap screw holes align.

NOTE: Inner idler bearing support has one threaded hole (E).



- A—Outer Bearing Support
- B—Idler Bearing
- C—Idler Gear
- D—Inner Bearing Support
- E—Threaded Hole

RG6928 -UN-05DEC97

DPSG,OUO1030,31 -19-18MAR99-1/1

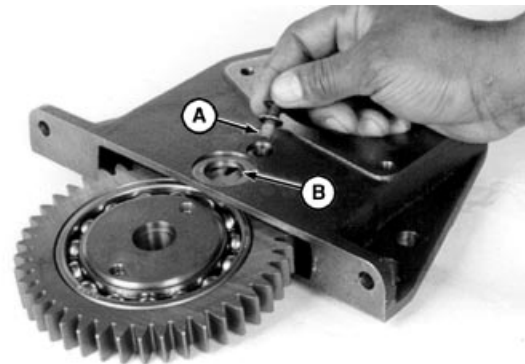
Install Idler Housing and Idler Gear

1. Grease and install O-ring in housing bore (B).

NOTE: Inner idler bearing support with one threaded hole is installed toward block side of housing.

2. Install idler gear into idler housing. Install cap screw with seal (A) to hold idler gear in place.

- A—Cap Screw With Seal
- B—Housing Bore



RG6904 -UN-05DEC97

Continued on next page

DPSG,OUO1030,32 -19-18MAR99-1/5

Auxiliary Drive (8.1 L)

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12

3. Insert idler shaft through idler housing and idler gear until flush with block side of housing.
4. Grease O-ring groove (A) in back side of idler housing. Insert O-ring.

A—O-ring Groove

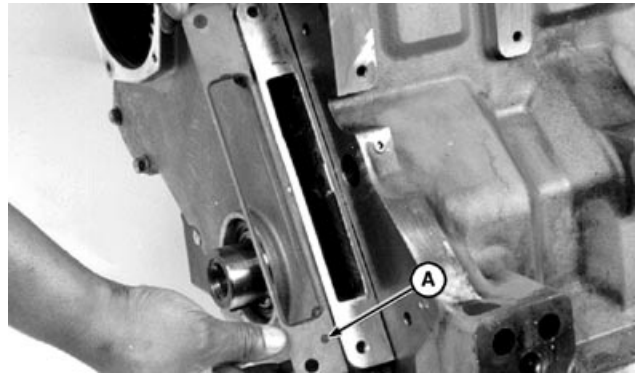


DPSG,OUO1030,32 -19-18MAR99-2/5

NOTE: Face seal may be reused if it is not cut, nicked or damaged.

5. Using a short guide stud, place face seal on timing gear cover opening. Gauge hole (A) must be positioned toward bottom of opening.

A—Gauge Hole



Continued on next page

DPSG,OUO1030,32 -19-18MAR99-3/5

IMPORTANT: Be careful not to damage face seal or displace O-ring on back side of idler housing during assembly.

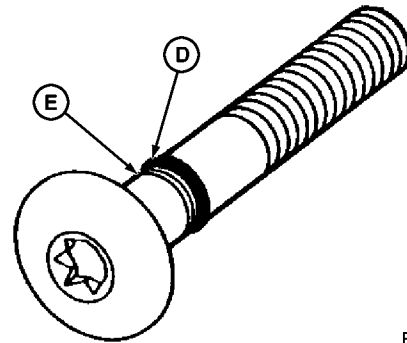
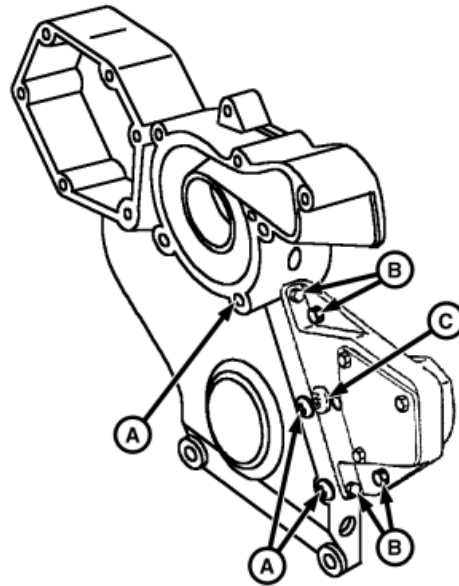
6. Carefully insert idler gear into opening of timing gear cover until idler gear meshes with crankshaft gear and housing is seated against face seal. Push idler shaft into block.
7. Check condition of O-ring (D) and back-up ring (E) on large button head cap screw (C). Grease O-ring and install cap screw through idler shaft. Thread into block until finger tight.

NOTE: Upper timing gear cover cap screw (A) is also used to retain water pump.

NOTE: Middle timing gear cover cap screw must have a seal.

8. Remove guide stud. Install timing gear cover cap screws (A) and idler housing cap screws (B) finger tight.

- A—Timing Gear Cover Cap Screw (3 used)
- B—Idler Housing Cap Screw (4 used)
- C—Large Button Head Cap Screw
- D—O-Ring
- E—Back-Up Ring



RG6935

RG9505 -UN-19MAR99

RG6935 -UN-08DEC97

Continued on next page

DPSG,OUO1030,32 -19-18MAR99-4/5

9. Tighten cap screws in the following sequence

Specification

Idler Housing-to-Timing Gear
Cover (1,2)—Torque..... 41 N•m (30 lb-ft)

Specification

Idler Housing-to-Cylinder Block
(3)—Torque 41 N•m (30 lb-ft)

Specification

Idler Housing-to-Cylinder Block
(4)—Torque 102 N•m (75 (lb-ft)

Specification

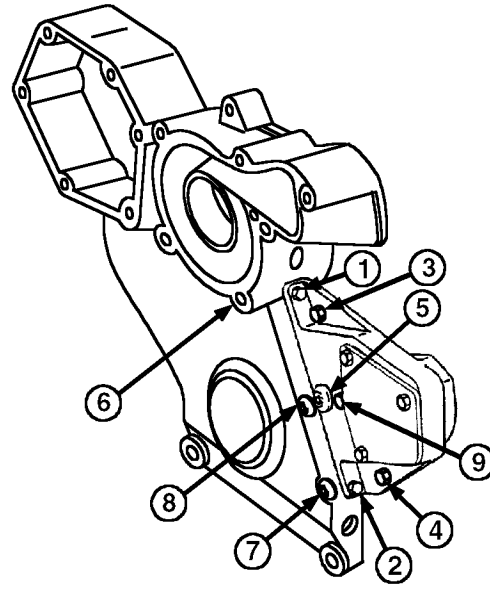
Idler Shaft (5)—Torque 150 N•m (110 lb-ft)

Specification

Timing Gear Cover-to-Cylinder
Block (6,7,8)—Torque 27 N•m (20 lb-ft)

Specification

Idler Housing-to-Idler Gear (9)—
Torque 27 N•m (20 lb-ft)



Torque Sequence

- 1,2—Idler Housing-to-Timing Gear Cover
- 3—Idler Housing-to-Cylinder Block
- 4—Idler Housing-to-Cylinder Block
- 5—Idler Shaft
- 6,7,8—Timing Gear Cover-to-Cylinder Block
- 9—Idler Housing-to-Idler Gear

RG9528 -UN-24MAR99

10. Check idler gear-to-crankshaft gear backlash.

Specification

Idler Gear-to-Crankshaft Gear—
Backlash 0.11—0.70 mm (0.004—0.028 in.)

11. If front drive is not used, install front cover and gasket. Tighten cap screws to specifications.

Specification

Front Cover Cap Screws—Torque..... 41 N•m (30 lb-ft)

12. Install vibration damper. (See engine repair manual.)

Install Left-Hand Output Gear Assembly

1. Install new gasket onto pilot of output housing.
2. Insert output gear assembly into front opening of idler gear housing. Tighten cap screws (B) to specifications.

Specification

Left-Hand Output Gear Housing
Cap Screws—Torque 41 N•m (30 lb-ft)

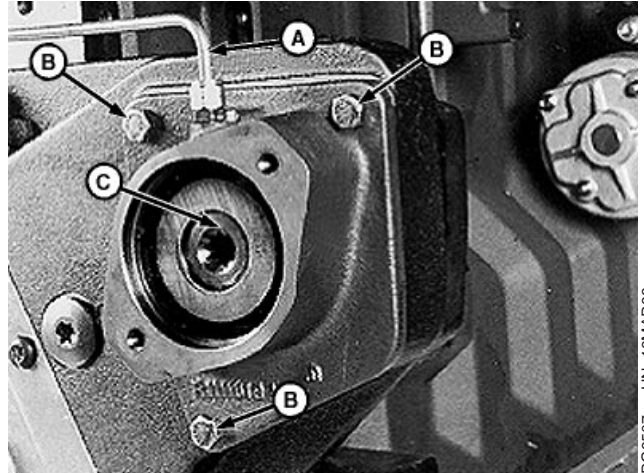
3. Check output gear (C)-to-idler gear backlash.

Specification

Output Gear-to-Idler Gear—
Backlash 0.08—0.74 mm (0.003—0.029 in.)

4. Install oil supply line (A) on orifice fitting.

- A—Oil Supply Line
- B—Output Housing Cap Screws
- C—Spline Teeth



RG9507 -UN-19MAR99

DPSG,OUO1030,33 -19-18MAR99-1/1

Auxiliary Drive (8.1 L)

53
16

Auxiliary Drive Specifications

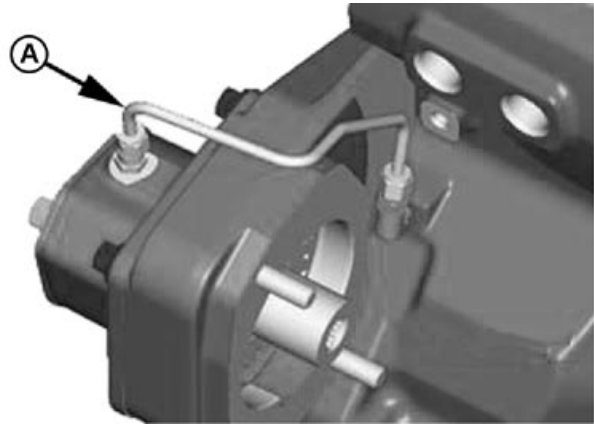
Item	Measurement	Specification
Aux Drive Idler Shaft to Cylinder Block Special Screw	Torque	200 N•m (147 lb-ft)
Aux Drive Housing to Cylinder Block Hex Head Capscrew	Torque	127 N•m (93 lb-ft)
Aux Drive Housing to Cylinder Block Button Head Capscrew	Torque	49 N•m (36 lb-ft)
Timing Gear Cover to Cylinder Block Button Head Capscrew	Torque	24.4 N•m (18 lb-ft)
Upper Aux Drive Housing to Timing Gear Cover Capscrew	Torque	49 N•m (36 lb-ft)
Lower Aux Drive Housing to Timing Gear Cover Capscrew	Torque	49 N•m (36 lb-ft)
Rear Housing to Drive Housing Nuts	Torque	101 N•m (74 lb-ft)
Cover Plate to Rear Housing Capscrews	Torque	101 N•m (74 lb-ft)
Front Housing to Drive Housing Capscrews	Torque	41 N•m (30 lb-ft)
Cover Plate to Front Housing Capscrews	Torque	41 N•m (30 lb-ft)
Block to Front Housing Oil Line	Torque	7 N•m (5 lb-ft)
Output Gear-to-Idler Gear	Backlash	0.08—0.74 mm (0.003—0.029 in.)

OURGP12,0000172 -19-09NOV05-1/1

Remove Left-Hand Output Gear Assembly

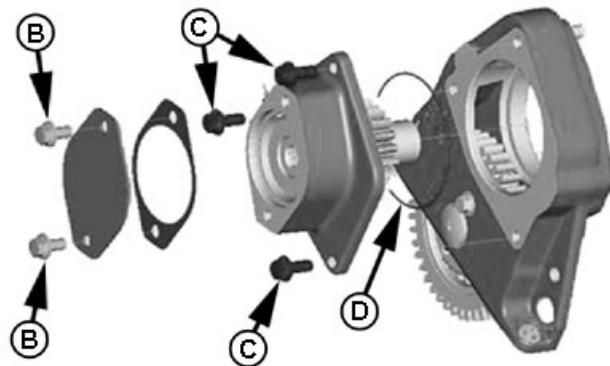
1. Remove oil line (A).
2. Remove two cover plate to front housing capscrews (B). Remove cover plate and discard gasket.
3. Remove three front housing to drive housing capscrews (C). Remove front housing and remove O-ring (D) from housing.

A—Oil Line
 B—Cover Plate to Front Housing Capscrews
 C—Front Housing to Drive Housing Capscrews
 D—O-ring



Remove Oil Line

RG14354 -UN-11NOV05



Remove Output Gear Assembly

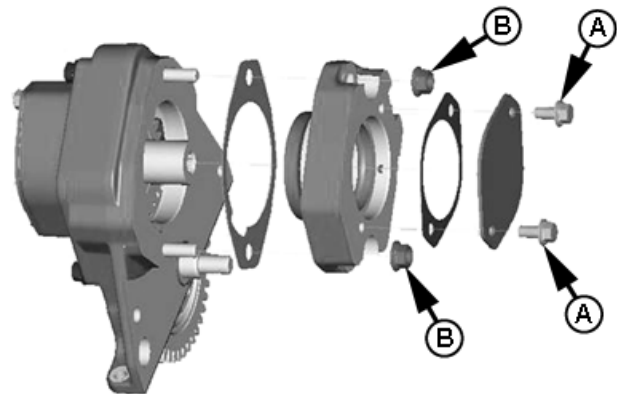
RG14355 -UN-11NOV05

OURGP12,0000174 -19-09NOV05-1/1

Remove Left-Hand Rear Housing

1. Remove two cover plate to rear housing capscrews (A). Remove cover plate and discard gasket.
2. Remove two rear housing to drive housing nuts (B). Remove rear housing. Remove and discard gasket.

A—Cover Plate to Rear Housing Capscrews
 B—Rear Housing to Drive Housing Nuts



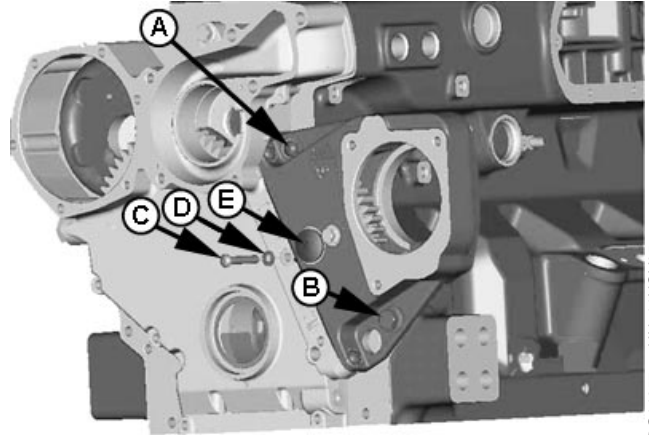
Remove Rear Housing

RG14356 -UN-11NOV05

OURGP12,0000175 -19-09NOV05-1/1

Remove Left-Hand Aux Drive Housing from Cylinder Block

1. Remove aux drive housing to cylinder block button head capscrew (A).
2. Remove aux drive housing to cylinder block hex head capscrew (B).
3. Remove timing gear cover to cylinder block button head capscrew (C). Remove special sealing washer (D) and replace if worn or damaged.
4. Remove aux drive idler shaft to cylinder block special screw (E).



RG14357 -UN-11NOV05

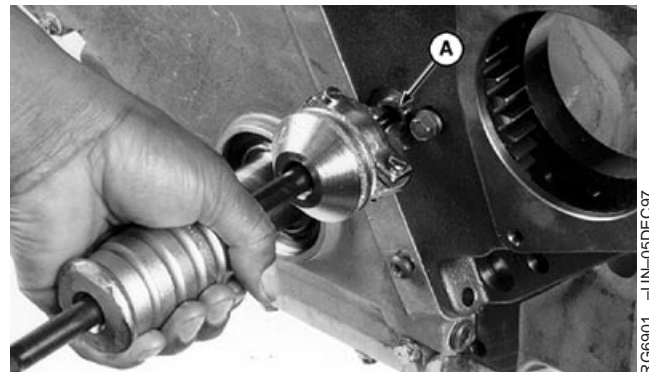
Remove Aux Drive from Cylinder Block

- A—Aux Drive Housing to Cylinder Block Button Head Capscrew
- B—Aux Drive Housing to Cylinder Block Hex Head Capscrew
- C—Timing Gear Cover to Cylinder Block Button Head Capscrew
- D—Sealing Washer
- E—Aux Drive Idler Shaft to Cylinder Block Special Screw

OURGP12,0000176 -19-09NOV05-1/2

5. Use DO1209AA Slide Hammer and puller to pull idler shaft (A) loose from cylinder block. Remove and discard shaft and O-ring.

A—Idler Shaft



RG6901 -UN-05DEC97

Pull Idler Shaft

OURGP12,0000176 -19-09NOV05-2/2

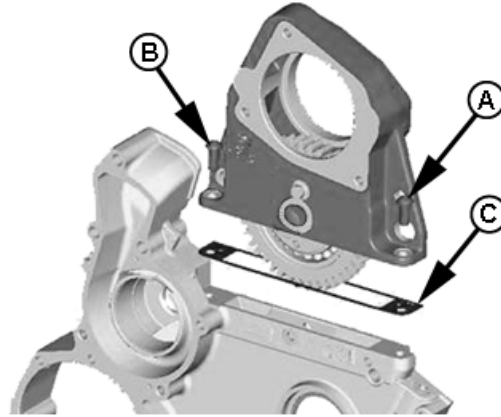
Remove Left-Hand Aux Drive Housing from Timing Gear Cover

NOTE: Timing gear cover is shown removed from cylinder block for clarity.

1. Remove lower aux drive housing to timing gear cover capscrew (A).
2. Remove upper aux drive housing to timing gear cover capscrew (B).

NOTE: Face seal can be reused if not damaged. Use care when removing aux drive housing from timing gear cover.

3. Lift aux drive housing from timing gear cover opening.
4. Remove face seal (C).



Remove Aux Drive from Timing Gear Cover

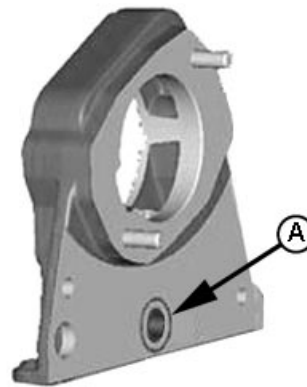
- A—Lower Aux Drive Housing to Timing Gear Cover Capscrew
- B—Upper Aux Drive Housing to Timing Gear Cover Capscrew
- C—Face Seal

RG14358 -UN-11NOV05

OURGP12,0000177 -19-09NOV05-1/2

5. Remove O-ring (A) from back side of aux drive housing.

A—O-ring



Remove O-ring

RG14359 -UN-11NOV05

OURGP12,0000177 -19-09NOV05-2/2

Remove and Install Idler Gear

Remove Idler Gear

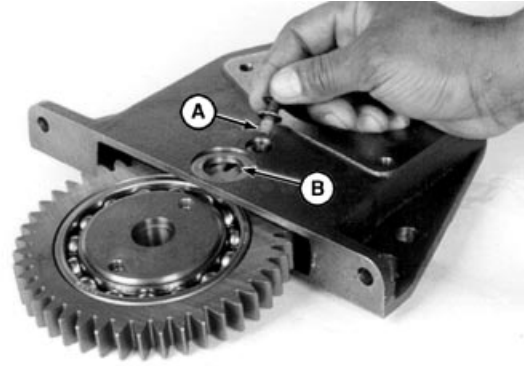
1. Remove capscrew (A). Slide idler gear out of housing.
2. Remove O-ring from housing bore (B).

Install Idler Gear

1. Grease and install O-ring in housing bore (B).

NOTE: Inner idler bearing support with one threaded hole is installed toward block side of housing.

2. Install idler gear into idler housing. Install cap screw (A) with seal to hold idler gear in place.



A—Cap Screw
B—Housing Bore

RG6904 -UN-05DEC97

OURGP12,0000179 -19-10NOV05-1/2

IMPORTANT: White dot on one end of shaft must face toward front of engine.

3. Insert idler shaft through idler housing and idler shaft until flush with block side of housing.
4. Grease O-ring groove (A) and insert O-ring.

A—O-ring Groove



Install Shaft

RG6903 -UN-05DEC97

OURGP12,0000179 -19-10NOV05-2/2

Install Left-Hand Aux Drive Housing to Timing Gear Cover

1. Install guide pins on timing gear cover.

NOTE: Face seal may be reused if it is not cut, nicked, or damaged.

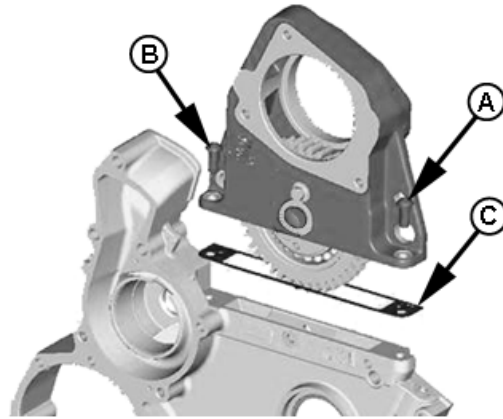
2. Install face seal (C) over guide pins with tab on seal facing forward.

3. Place aux drive housing over seal.

4. Replace lower guide pin with aux drive housing to timing gear cover capscrew (A). Hand tighten capscrew.

NOTE: Apply LOCTITE® 242 Thread Lock and Sealer on threads of capscrew (B).

5. Replace upper guide pin with aux drive housing to timing gear cover capscrew (B). Hand tighten capscrew.



Install Aux Drive from Timing Gear Cover

- A—Aux Drive Housing to Timing Gear Cover Capscrew
- B—Aux Drive Housing to Timing Gear Cover Capscrew
- C—Face Seal

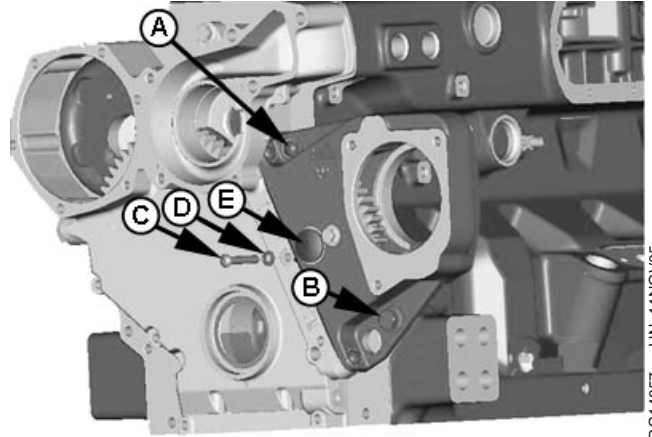
RG14358 -UN-11NOV05

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OURGP12,000017A -19-10NOV05-1/1

Install Left-Hand Aux Drive Housing to Cylinder Block

1. Install aux drive idler shaft to cylinder block special screw (E). Hand tighten screw.
2. Assemble special sealing washer (D) on timing gear cover to cylinder block button head capscrew (C). Install and hand tighten capscrew.
3. Hand tighten aux drive housing to cylinder block hex head capscrew (B) and button head capscrew (A).



RG14357 -UN-11NOV05

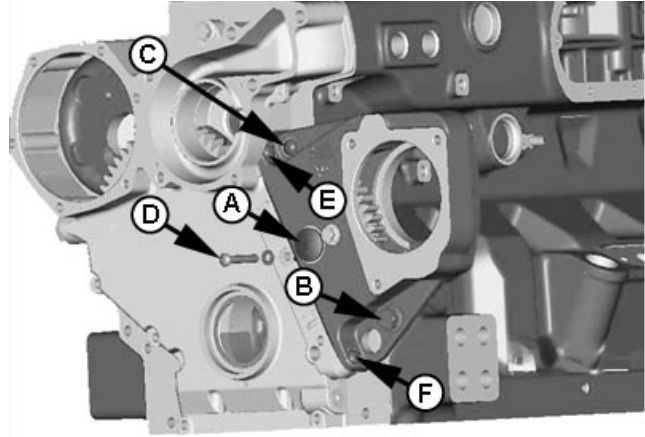
Install Aux Drive to Cylinder Block

- A—Aux Drive Housing to Cylinder Block Button Head Capscrew**
- B—Aux Drive Housing to Cylinder Block Hex Head Capscrew**
- C—Timing Gear Cover to Cylinder Block Button Head Capscrew**
- D—Sealing Washer**
- E—Aux Drive Idler Shaft to Cylinder Block Special Screw**

OURGP12,000017B -19-10NOV05-1/1

Torque Left-Hand Aux Drive Assembly

Torque hardware in the following sequence and to the following specifications.



RG14360 -JUN-11NOV05

Torque Sequence

Item	Measurement	Specification
Aux Drive Idler Shaft to Cylinder Block Special Screw (A)	Torque	200 N•m (147 lb-ft)
Aux Drive Housing to Cylinder Block Hex Head Capscrew (B)	Torque	127 N•m (93 lb-ft)
Aux Drive Housing to Cylinder Block Button Head Capscrew (C)	Torque	49 N•m (36 lb-ft)
Timing Gear Cover to Cylinder Block Button Head Capscrew (D)	Torque	24.4 N•m (18 lb-ft)
Upper Aux Drive Housing to Timing Gear Cover Capscrew (E)	Torque	49 N•m (36 lb-ft)
Lower Aux Drive Housing to Timing Gear Cover Capscrew (F)	Torque	49 N•m (36 lb-ft)

OURGP12,000017C -19-10NOV05-1/1

Install Left-Hand Rear Housing

1. Install new gasket onto drive housing studs with gasket slot aligned to aux drive housing slot.
2. Position rear housing onto drive housing over gasket and install two rear housing to drive housing nuts (B). Tighten to specification.

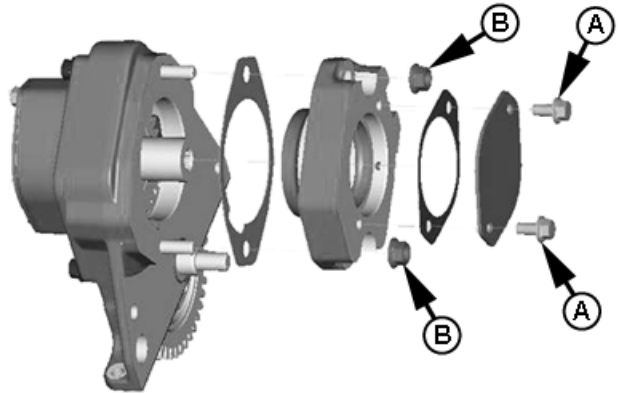
Specification

Rear Housing to Drive Housing
 Nuts—Torque 101 N•m (74 lb-ft)

3. Install new gasket and cover plate to rear housing. Tighten bolts (A) to specification.

Specification

Cover Plate to Rear Housing
 Capscrews—Torque 101 N•m (74 lb-ft)



Install Rear Housing

A—Cover Plate to Rear Housing Capscrews
B—Rear Housing to Drive Housing Nuts

RG14356 -JUN-11NOV05

OURGP12,000017D -19-10NOV05-1/1

Install Left-Hand Output Gear Assembly

1. Lubricate O-ring (D) and install to front housing.
2. Install front housing to drive housing. Tighten three capscrews (C) to specification.

Specification

Front Housing to Drive Housing
Capscrews—Torque..... 41 N•m (30 lb-ft)

3. Install new gasket and cover plate to front housing. Tighten two capscrews (B) to specification.

Specification

Cover Plate to Front Housing
Capscrews—Torque..... 41 N•m (30 lb-ft)

4. Check output gear-to-idler gear backlash.

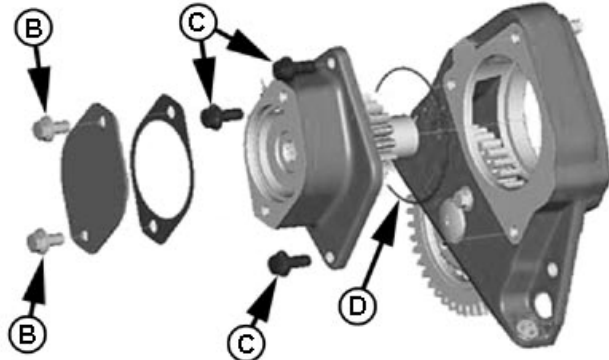
Specification

Output Gear-to-Idler Gear—
Backlash 0.08—0.74 mm (0.003—0.029 in.)

5. Install oil line (A) from cylinder block to front housing. Tighten nut at each end of oil line to specification.

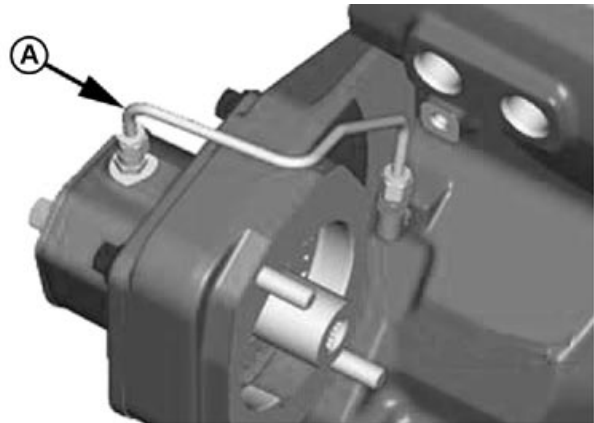
Specification

Block to Front Housing Oil Line—
Torque 7 N•m (5 lb-ft)



Install Output Gear Assembly

RG14355 -UN-11NOV05



Install Oil Line

RG14354 -UN-11NOV05

- A—Oil Line
- B—Cover Plate to Front Housing Capscrews
- C—Front Housing to Drive Housing Capscrews
- D—O-ring

OURGP12,000017F -19-10NOV05-1/1

Group 55

Auxiliary Drive (10.5L, 12.5L and 13.5L)

55
1

Essential Tools

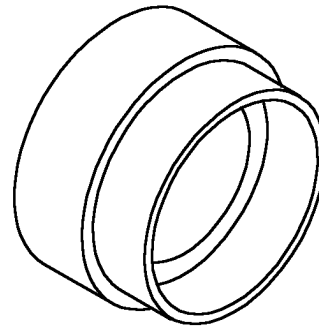
NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

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DPSG,OUO1030,42 -19-19MAR99-1/2

Alignment Tool JDG1144

Align SAE "A" front drive adapter.



RG9040 -JUN-21MAY98

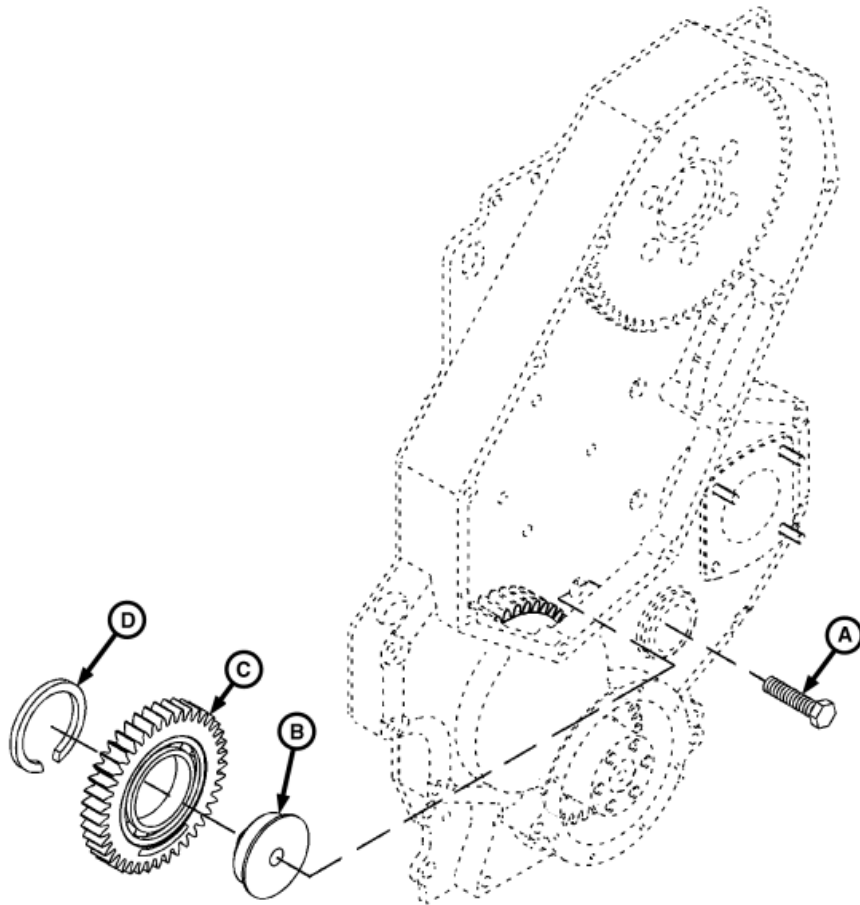
DPSG,OUO1030,42 -19-19MAR99-2/2

Auxiliary Drive (10.5 L, 12.5 L and 13.5 L) Specifications

Item	Measurement	Specification
Idler Gear Cap Screw	Torque	220 N•m (162 lb-ft)
SAE "B" Rear Auxiliary Drive Mounting Cap Screws	Torque	110 N•m (81 lb-ft)
SAE "A" Front Adapter Mounting Nuts	Torque	50 N•m (37 lb-ft)
SAE "B" Front Drive Adapter Cap Screws	Torque	55 N•m (40 lb-ft)

OURGP12,0000164 -19-01SEP05-1/1

Remove and Install Auxiliary Drive Idler Gear and Bearing



RG9508 -UN-19MAR99

A—Cap Screw

B—Support

C—Gear

D—Snap Ring

1. Remove damper, front plate and timing gear cover. (See engine repair manual.)
2. Remove plug and O-ring from timing gear cover.
3. Remove cap screw (A) and gear (C).
4. Remove snap ring (D) and support (B) from gear (C).
5. Install Support (B) into gear (C) and install snap ring (D).

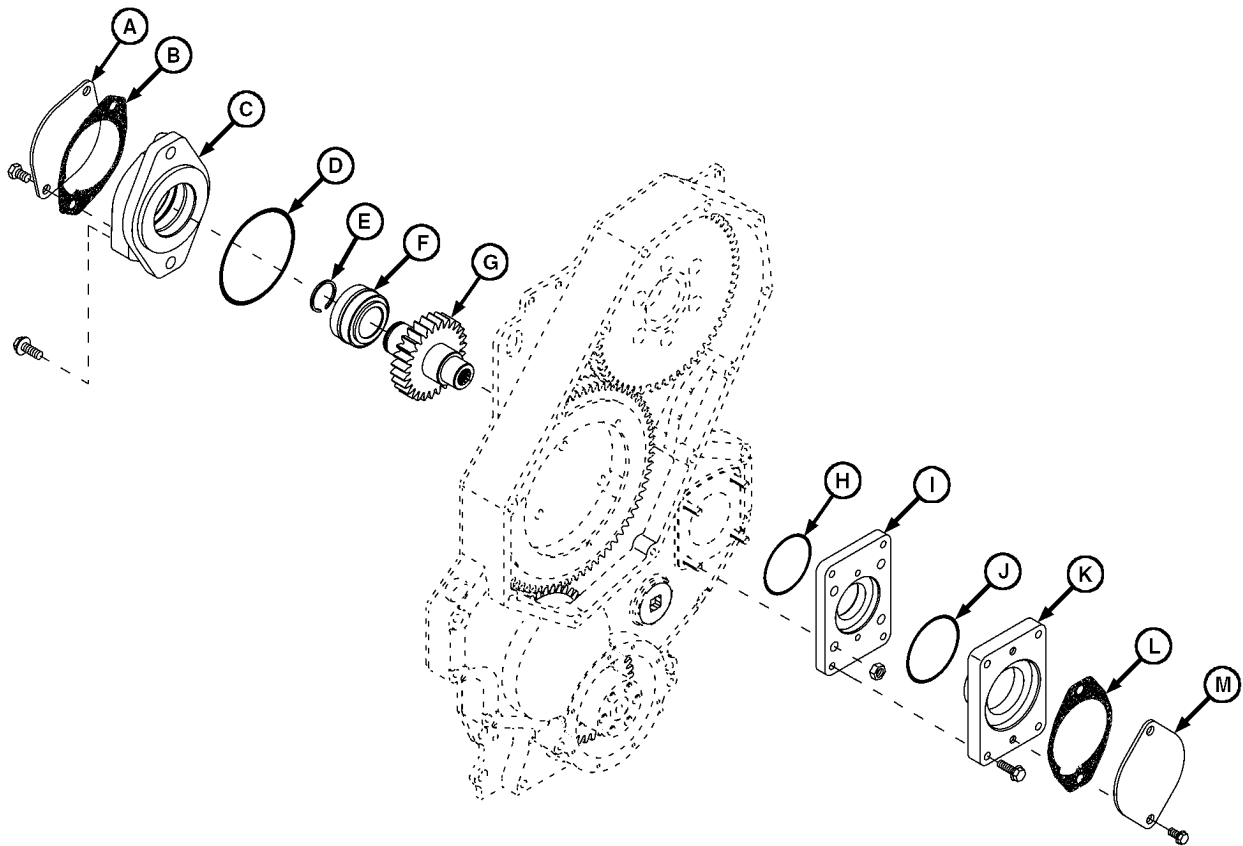
6. Install gear (C) and cap screw (A). Tighten to specifications.

Specification

Idler Gear Cap Screw—Torque..... 220 N•m (162 lb-ft)

7. Install O-ring and plug in timing gear cover.
8. Install timing gear cover, front plate and damper. (See engine repair manual.)

Remove and Install SAE "A" and "B" Front and SAE "B" Rear Auxiliary Drive Assembly



Auxiliary Drive Assembly

- | | | | |
|----------------------------|----------------|---------------------|---------------------|
| A—Cover Plate | E—Snap Ring | H—O-Ring | K—"B" Front Adapter |
| B—Gasket | F—Bearing | I—"A" Front Adapter | L—Gasket |
| C—"B" Rear Adapter Housing | G—Splined Gear | J—O-Ring | M—Cover Plate |
| D—O-Ring | | | |

1. Remove cover plate (M).
2. Remove SAE "B" front adapter (K). Discard O-ring (J).
3. Remove SAE "A" front adapter (I) from timing gear cover. Discard O-ring (H).
4. Remove cover plate (A).
5. Remove SAE "B" rear auxiliary drive assembly (C) from front plate. Discard O-ring (D).
6. Support front face of adapter housing (C). Press gear (G) and bearing (F) out of housing bore.
7. Remove snap ring (E) from gear shaft. Discard snap ring.
8. Remove bearing from gear. Discard bearing.
9. Thoroughly clean and inspect gear and housing.
10. Assemble new bearing (F) onto gear shaft (G).

Continued on next page

DPSG,OUO1030,35 -19-18MAR99-1/3

RG9516 -UN-17MAR99

11. Determine correct snap ring to achieve 0.11 mm (0.004 in.) maximum clearance between bearing cone and snap ring and install new snap ring (E).
12. Support back side of adapter housing. Press gear and bearing assembly into housing until assembly bottoms.
13. Install new O-ring (D) and SAE "B" rear auxiliary drive adapter (C) onto front plate using a new

gasket. Tighten cap screws to specifications.

Specification

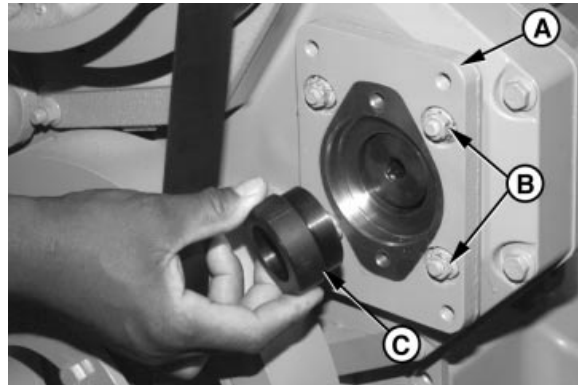
SAE "B" Rear Auxiliary Drive
Mounting Cap Screws—Torque 110 N•m (81 lb-ft)

14. Install gasket and cover plate (A).

DPSG,OUO1030,35 -19-18MAR99-2/3

IMPORTANT: Front auxiliary drive adapter (A) MUST BE properly aligned with center of gear spline whenever front or rear adapter(s) are removed. Improperly aligned adapter may damage bearing assembly.

15. Install O-ring and SAE "A" front adapter. Tighten four mounting stud nuts (B) finger tight.
16. Install JDG1144 Alignment Tool (C) onto gear flange and into adapter bore to properly center adapter with gear spline.
17. Tighten mounting stud nuts to specifications.



RG9036 -UN-25MAR99

A—SAE "A" Front Adapter
B—Nut (4 used)
C—JDG1144 Alignment Tool

Specification

SAE "A" Front Adapter Mounting
Nuts—Torque 50 N•m (37 lb-ft)

IMPORTANT: SAE "A" front drive adapter MUST BE properly aligned before installing SAE "B" front drive adapter housing.

18. Install O-ring and SAE "B" front auxiliary drive adapter. Tighten cap screws to specifications.

Specification

SAE "B" Front Drive Adapter Cap
Screws—Torque 55 N•m (40 lb-ft)

19. Install gasket and cover plate.

DPSG,OUO1030,35 -19-18MAR99-3/3

Essential Tools

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

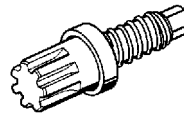
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DPSG,OUO1004,630 -19-10MAR99-1/3

Flywheel Turning Tool JDG820

Rotate flywheel on 8.1L engine.

RG7056 -UN-17JUN05



Flywheel Turning Tool JDE81-1

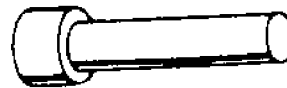
Rotate flywheel on 6076 engine.

DPSG,OUO1004,630 -19-10MAR99-2/3

Timing Pin JDE81-4

Lock engine.

RG5068 -UN-05DEC97



RG5068

DPSG,OUO1004,630 -19-10MAR99-3/3

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

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Continued on next page

DPSG,OUO1004,631 -19-10MAR99-1/2

Air Compressors

60
2

Gear Puller D01206AA

Remove air compressor drive gear.

DPSG,OUO1004,631 -19-10MAR99-2/2

Air Compressor Specifications

Item	Measurement	Specification
Air Compressor Gear Retaining Nut (4.5L and 6.8L)	Torque	149 N•m (110 lb-ft)
Air Compressor Mounting Cap Screws or Hex Nuts (4.5L and 6.8L)	Torque	95 N•m (70 lb-ft)
Air Compressor Mounting Nuts (6076)	Torque	102 N•m (75 lb-ft)
Air Compressor Mounting Cap Screws (8.1L)	Torque	44 N•m (33 lb-ft)
Air Compressor Gear Retaining Nut (6076)	Torque	122 N•m (90 lb-ft)
Air Compressor Gear Retaining Cap Screw (8.1L)	Torque	122 N•m (90 lb-ft)
Air Compressor Drive Gear-To-Idler Gear (6076 and 8.1L)	Backlash	0.08—0.74 mm (0.003—0.029 in.)
Air Compressor Rear Support Bracket (6076 and 8.1L) Cap Screws	Torque	44 N•m (33 lb-ft)
Air Compressor Gear Access Cover (6076 and 8.1L)	Torque	41 N•m (30 lb-ft)
Air Compressor Mounting Cap Screws (10.5L and 12.5L)	Torque	110 N•m (74 lb-ft)
Air Compressor Rear Support Cap Screw (4.5L and 6.8L)	Torque	37 N•m (27 lb-ft)
Air Compressor Rear Support Cap Screw (10.5L and 12.5L)	Torque	44 N•m (33 lb-ft)
Air Compressor Gear Cap Screw (10.5L and 12.5L)	Torque	102 N•m (75 lb-ft)
Air Compressor Drive Through Cover Cap Screws (10.5L and 12.5L)	Torque	20 N•m (15 lb-ft)

Air Compressor General Information

Air compressors offered with John Deere OEM engines provide compressed air to operate air-powered devices like vehicle air brakes.

Air compressors are engine-driven piston types. They are either air cooled or cooled with engine coolant. The compressors are lubricated with engine oil. The compressor runs continuously as gear or spline driven by the auxiliary drive of the engine but has “loaded” and “unloaded” operating modes. This is controlled by the vehicle’s air system (refer to vehicle technical manual for complete air system checks and services).

Troubleshooting charts for air compressors follow in this group. If diagnosis leads to an internal fault in the compressor, replace the complete compressor as a new or remanufactured unit.

Air compressors are supplied as accessories with OEM engines as follows:

4.5 L / 6.8 L Engines

- Bendix 550 model
- Midland 850 or 1300 model

8.1 L and 6076 (500,000—) Engines

- Midland 1300 model
- Holset 13 cfm model

9.0 L Engines

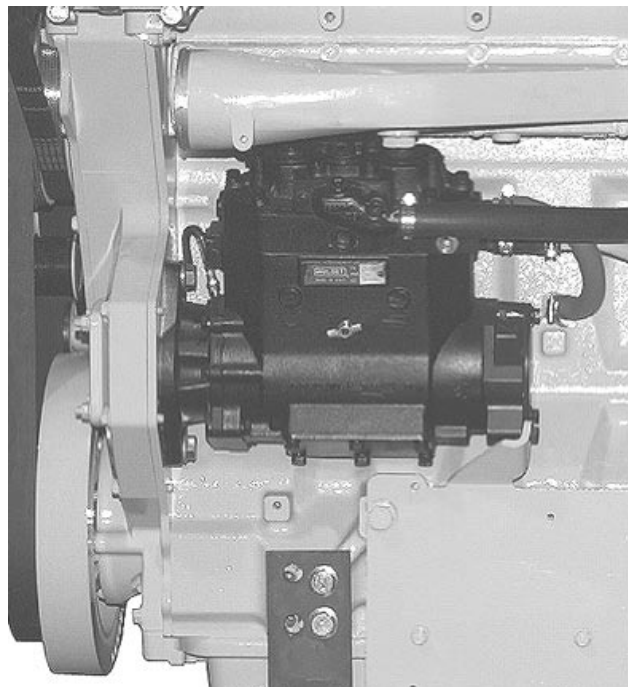
- Haldex EL1300 model

10.5 L / 12.5 L Engines

- Holset 13.2, 15 or 34 cfm models

13.5 L Engines

- No air compressor available at time of publication



RG9530 -UN-24MAR99

Air Compressor For 10.5 L and 12.5 L Engines Shown

Compressor Troubleshooting Chart

SYMPTOM	PROBLEM	SOLUTION
Compressor passes excessive oil at exhaust ports of valving or seeps oil from air filter.	Restricted air intake filter or line.	Check engine or compressor air filter and replace if necessary. Check compressor air inlet for kinks and excessive bends.
	Restricted oil return (to engine).	Check for excessive bends, kinks and restrictions in the oil return line. Check oil drain passages in the compressor and engine mating surfaces.
	Lack of compressor cooling (compressor runs hot).	For air-cooling portions of the compressor (Bendix only): Remove accumulated grease, grime or dirt from cooling fins. Check for damaged cooling fins. For water-cooled portions of the compressor: Check coolant flow through the compressor. Check water temperature: should not exceed 93°C (200°F).
	Contaminants not being regularly drained from system reservoirs.	Check reservoir drain valves for proper operation.
	Compressor runs loaded an excessive amount of time.	Check for system leaks.
	Excessive engine crankcase pressure.	Test for excessive engine crankcase pressure. (See engine technical manual.)
	Excessive engine oil pressure.	Check engine oil pressure. Reading should not exceed specifications. (See engine technical manual.)
Noisy compressor operation.	Faulty compressor.	Replace compressor only after making certain none of the preceding problems exist.
	Loose drive gear.	Inspect the fit of the drive gear on compressor crankshaft. The gear must be completely seated and the gear retaining nut must be tight. If the compressor crankshaft surface or keyway are damaged, it is an indication of a loose drive gear. If damage to the compressor crankshaft is detected, replace compressor.
	Excessively worn drive gear.	Inspect drive gear and check gear backlash for excessive wear.
	Compressor cylinder head or discharge line restrictions.	Check compressor discharge port and discharge line for carbon build-up. Check discharge line for kinks and restrictions.
	Faulty compressor.	Replace compressor only after making certain none of the preceding problems exist.

Continued on next page

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6
**Compressor Troubleshooting Chart
(Continued)**

SYMPTOM	PROBLEM	SOLUTION
Excessive build-up and recover time.	Dirty air intake filter.	Check engine or compressor air filter.
	Restricted intake line.	Check compressor air intake line for kinks and restrictions.
	Restricted discharge line or compressor discharge cavity.	Check compressor discharge port and line for restrictions and carbon build-up.
	Slipping drive components.	Check for faulty auxiliary drive gears. (See Groups 50—54 of this manual.)
	Excessive air system leakage.	Check for air system leakage. (See vehicle technical manual.)
	Sticking unloader pistons.	Check operation of the unloading mechanism. Check for proper operation of the compressor air governor.
Compressor fails to unload.	Faulty compressor.	Replace compressor only after making certain none of the preceding problems exist.
	Faulty air governor.	Check air governor for proper operation and inspect air lines to and from governor for kinks and restrictions.
Compressor constantly cycles (compressor remains unloaded for a very short time).	Faulty compressor due to faulty or worn unloader pistons or bores.	Replace compressor only after making certain none of the preceding problems exist.
	Faulty air governor.	Check air governor for proper operation.
	Faulty compressor due to leaking compressor unloader pistons.	Check for air leakage at intake air filter or fitting with the compressor unloaded (not compressing air).
	Excessive air system leakage.	Check for excessive air system leakage. (See vehicle technical manual.)
	Excessive reservoir contaminants.	Drain reservoirs.

DPSG,OUO1030,16 -19-03MAR99-1/1

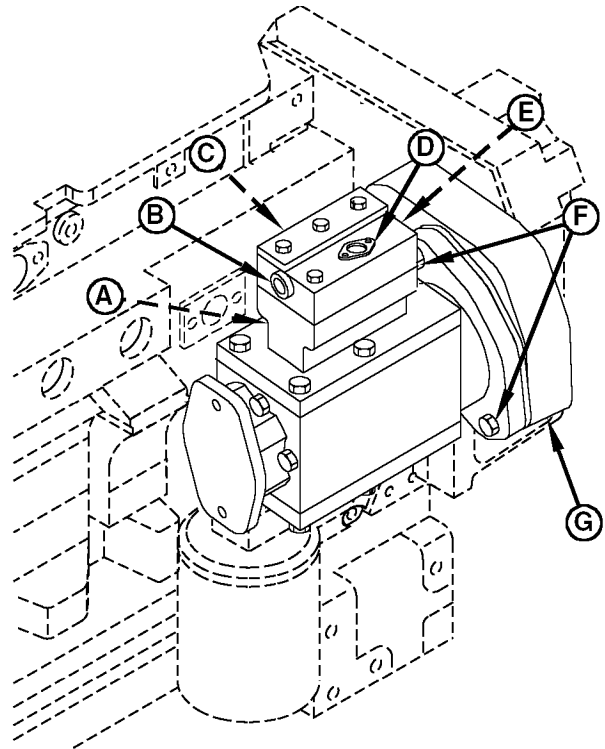
Remove And Install Air Compressor (4.5 L and 6.8 L)

1. If compressor is water cooled, drain engine cooling system.
2. Disconnect air intake line and discharge line from ports (C and D).
3. Disconnect oil lube line (A) and coolant lines from ports (B and E).

NOTE: Remove rear support from Midland 1300, Holset QE296 and Bendix 550 air compressors.

4. Remove two mounting cap screws (F) or hex nuts. Remove air compressor and gasket from off-set drive adapter (G). Discard gasket.

NOTE: Off-set adapter (G) is not used with Midland 850 compressor, which mounts directly on engine.



- A—Oil Lube Line
- B—Coolant Port (In)¹
- C—Air Intake Port
- D—Air Discharge Port
- E—Coolant Port (Out)¹
- F—Mounting Cap Screw (2 used)
- G—Off-Set Auxiliary Drive

¹ Not used on air cooled compressor.

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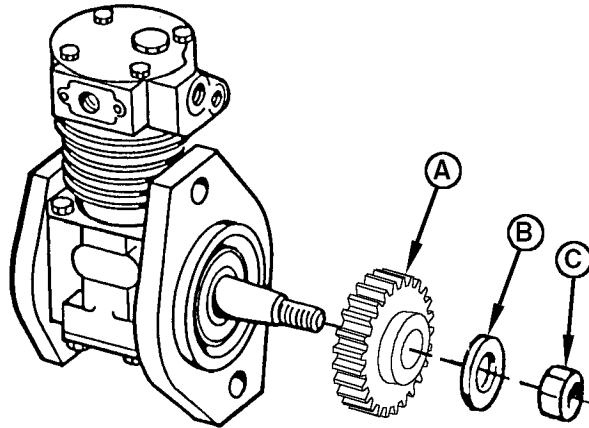
DPSG.OUO1030,4 -19-23FEB99-1/3

RG9491 -UN-03MAR99

5. If gear removal is necessary, remove hex nut (C) and washer (B) from air compressor shaft.

NOTE: Air compressor shaft is tapered and gear may be difficult to remove.

6. Using D01206AA gear puller, pull gear (A) off air compressor shaft.
7. Install gear (A) , washer (B) and hex nut (C) on air compressor shaft. Tighten hex nut to specifications.



RG9492 -UN-03MAR99

Specification

Air Compressor Gear Retaining
Nut (4.5L and 6.8L)—Torque 149 N•m (110 lb-ft)

- A—Gear
- B—Washer
- C—Hex Nut

Continued on next page

DPSG,OUO1030,4 -19-23FEB99-2/3

8. Use new gasket and install air compressor on off-set drive adapter (G). Install two mounting cap screws (F) or hex nuts and tighten to specifications.

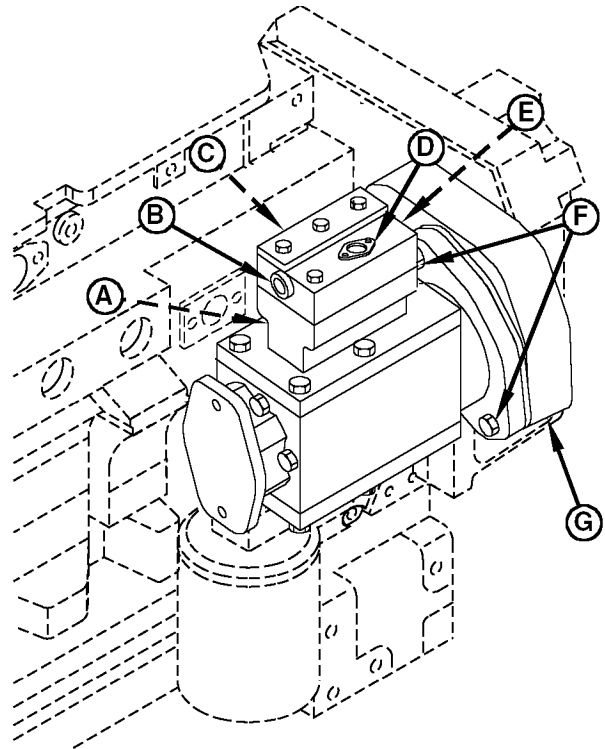
Specification

Air Compressor Mounting Cap
Screws or Hex Nuts (4.5L and
6.8L)—Torque..... 95 N•m (70 lb-ft)

*NOTE: Install rear support on Midland 1300, Holset
QE296 and Bendix 550 air compressors.*

9. Connect oil lube line (A) and coolant lines to ports (B and E).
10. Connect air intake line and discharge line to ports (C and D).
11. Fill cooling system.

- A—Oil Lube Line
- B—Coolant Port (In)¹
- C—Air Intake Port
- D—Air Discharge Port
- E—Coolant Port (Out)¹
- F—Mounting Cap Screw (2 used)
- G—Off-Set Auxiliary Drive (if used)



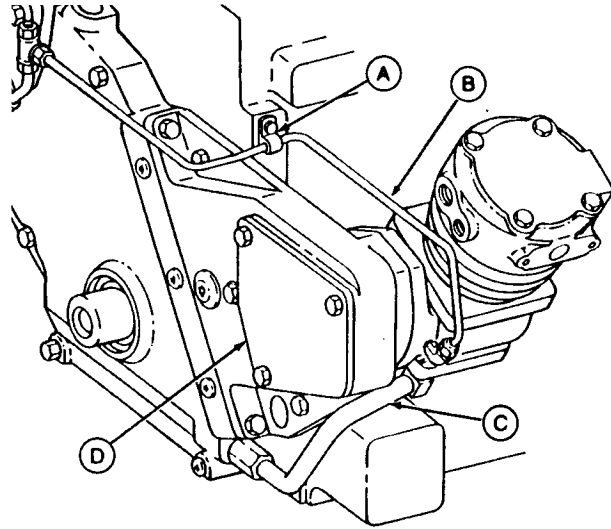
RG9491 -JUN-03/MAR99

¹ Not used on air cooled compressor.

Remove And Install Air Compressor [6076 (S.N. 500000—) and 8.1 L]

1. Drain cooling system.
2. Disconnect air and coolant lines from air compressor.
3. Remove oil line clamp (A) and oil supply line (B).
4. Remove hose clamps and oil drain hose (C) (6076 Only).
5. Remove front cover (D) and gasket. Discard gasket.

- A—Oil Line Clamp
- B—Oil Supply Line
- C—Oil Drain Hose (6076 Only)
- D—Front Cover



6076 Shown

RG6956 -UN-14OCT93

DPSG,OUO1030,2 -19-09MAY02-1/5

6. Rotate engine using JDG820 or JDE81-1 Flywheel Turning Tool and lock engine with JDE81-4 Timing Pin.

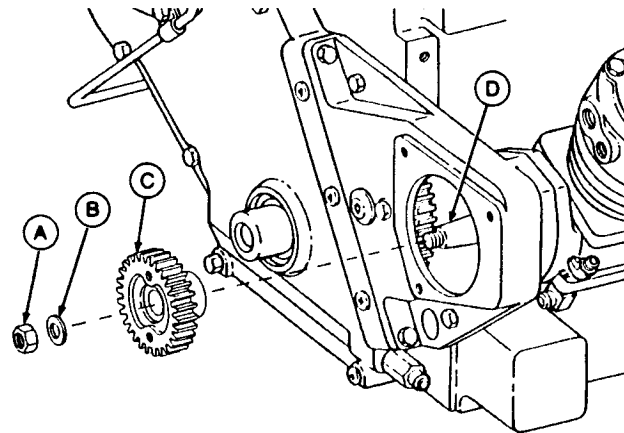
NOTE: 6081 engines with Holset air compressor use a cap screw to retain gear (C).

7. Remove gear retaining nut (A) and washer (B).

NOTE: Air compressor shaft (D) is tapered and gear may be difficult to remove. Carefully apply heat to face of gear around opening to aid in removal of gear.

8. Using D01206AA gear puller, pull gear off air compressor shaft.

- A—Gear Retaining Nut
- B—Washer
- C—Air Compressor Gear
- D—Air Compressor Shaft



6076 Shown

RG6957 -UN-14OCT93

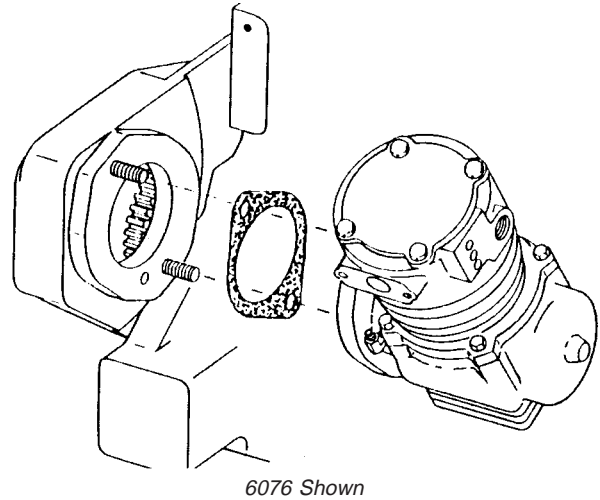
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DPSG,OUO1030,2 -19-09MAY02-2/5

9. Remove rear support bracket (if equipped).
10. Remove two hex nuts. Remove air compressor from idler housing. Discard gasket.
11. Using a new gasket, install air compressor to rear of idler housing. Install hex nuts and tighten to specifications.

Specification

Air Compressor Mounting Nuts (6076 and 8.1 L)—Torque.....	102 N•m (75 lb-ft)
Air Compressor Mounting Cap Screws (8.1 L)—Torque.....	44 N•m (33 lb-ft)



RC6959 -UN-14OCT93

Continued on next page

DPSG,OUO1030,2 -19-09MAY02-3/5

12. Clean tapered ID of gear and tapered OD of air compressor shaft.
13. Install gear (B), washer and retaining nut (A) on air compressor shaft.

NOTE: 6081 engines with Holset air compressor use a cap screw to retain gear.

14. Rotate engine using JDG820 or JDE81-1 Flywheel Turning Tool and lock engine with JDE81-4 Timing Pin. Tighten gear retaining nut or cap screw to specifications.

Specification

Air Compressor Gear Retaining Nut (6076 and 8.1 L)—Torque	122 N•m (90 lb-ft)
Air Compressor Gear Retaining Cap Screw (8.1 L)—Torque	122 N•m (90 lb-ft)

15. Check air compressor drive gear-to-idler gear backlash.

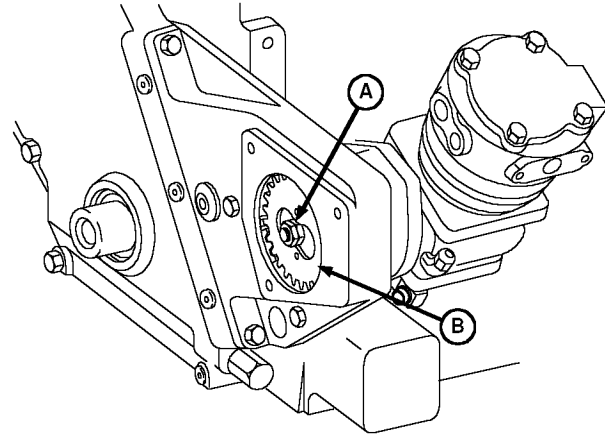
Specification

Air Compressor Drive Gear-To-Idler Gear (6076 and 8.1L)—Backlash	0.08—0.74 mm (0.003—0.029 in.)
------------------------------------------------------------------------	--------------------------------

16. Install rear support bracket (if equipped) and tighten cap screws to specifications.

Specification

Air Compressor Rear Support Bracket (6076 and 8.1L) Cap Screws—Torque	44 N•m (33 lb-ft)
-----------------------------------------------------------------------------	-------------------



6076 Shown

A—Gear Retaining Nut
B—Gear

RG9496 -JN-11MAR99

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DPSG,OUO1030,2 -19-09MAY02-4/5

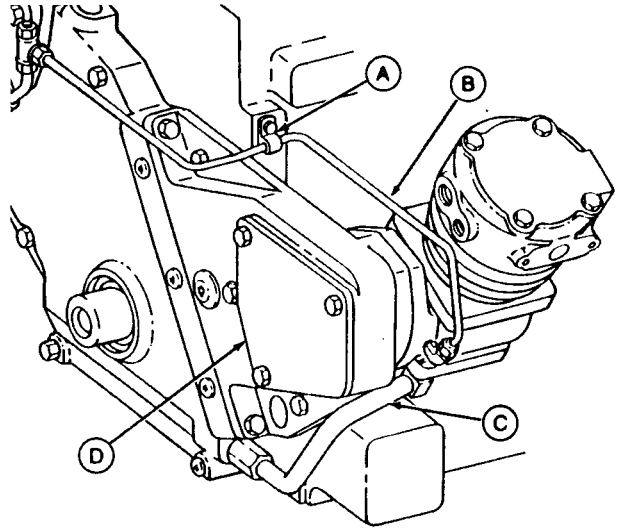
17. Using a new gasket, install front cover (D). Tighten cap screws to specifications.

Specification

Air Compressor Gear Access
Cover (6076 and 8.1L)—Torque 41 N•m (30 lb-ft)

18. Install oil supply line (B) and clamp (A).
19. Install oil drain hose (C) (6076 only). Tighten hose clamps securely.
20. Install air and coolant lines to air compressor.
21. Fill cooling system.

- A—Oil Line Clamp
- B—Oil Supply Line
- C—Oil Drain Hose (6076 Only)
- D—Front Cover



6076 Shown

RG6956 -UN-14OCT93

DPSG.OUO1030,2 -19-09MAY02-5/5

Remove and Install Air Compressor (10.5 L and 12.5 L)

1. Drain cooling system.
2. Disconnect air and coolant lines from air compressor.
3. Remove oil supply line (A).

NOTE: Later engines do not require ECU mounting plate removal to access rear support.

4. Remove ECU from mounting plate and cap screw (B) from rear of air compressor.
5. Remove ECU mounting plate (C) from engine.
6. Remove two mounting cap screws (D). Remove air compressor and gasket.
7. Install gasket and air compressor. Install two mounting cap screws (D) and tighten to specifications.

Specification

Air Compressor Mounting Cap
Screws (10.5L and 12.5L)—
Torque 110 N•m (81 lb-ft)

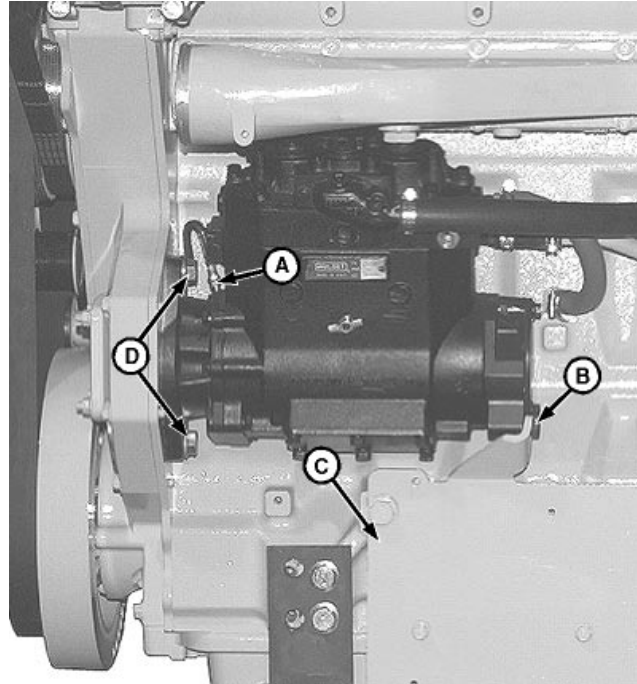
NOTE: Later engines do not require ECU mounting plate removal to access rear support.

8. Install ECU mounting plate (C) on engine. Install cap screw (B) on rear of air compressor and tighten to specifications.

Specification

Air Compressor Rear Support
Cap Screw (10.5L and 12.5L)—
Torque 44 N•m (33 lb-ft)

9. Install ECU to mounting plate.
10. Install oil supply line (A).
11. Connect air and coolant lines to air compressor.
12. Fill cooling system.



RG9493 -UN-03MAR99

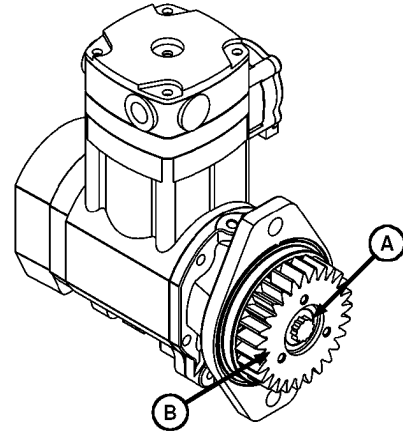
- A—Oil Supply Line
- B—Cap Screw
- C—ECU Mounting Plate
- D—Mounting Cap Screw (2 used)

Air Compressor Drive Gear, Remove and Install (10.5L and 12.5L)

1. Remove cap screw (A) and washer from air compressor.
2. Using a suitable puller, pull gear (B) off crankshaft.
3. Remove rear drive cover, if equipped.

IMPORTANT: Air compressor must be supported on rear of crankshaft while pressing gear on. Failure to do so will result in connecting rod damage.

4. Press gear (B) on crankshaft.
5. Install washer and cap screw (A). Tighten to specifications.



A—Cap Screw
B—Gear

Specification

Air Compressor Gear Cap Screw
(10.5L and 12.5L)—Torque..... 102 N•m (75 lb-ft)

6. Install rear drive cover and tighten cap screws to specifications.

Specification

Air Compressor Drive Through
Cover Cap Screws (10.5L and
12.5L)—Torque..... 20 N•m (15 lb-ft)

RG9494 -UN-11MAR99

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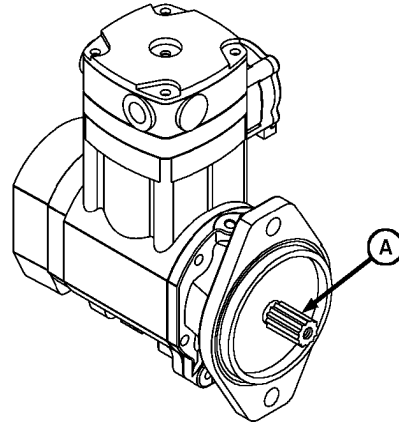
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Air Compressor Spline Drive Shaft, Remove and Install (10.5L and 12.5L)

NOTE: The spline drive shaft is retained by resistance of an O-ring on the drive shaft.

1. Remove spline drive shaft (A), pulling by hand.
2. Install O-ring and spline drive shaft.

A—Spline Drive Shaft



RG9495 -UN-11MAR99

DPSG,OUO1030,7 -19-09MAY02-3/3

Essential Tools

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

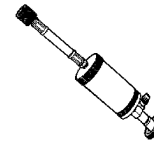
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DPSG,OUO1004,616 -19-09MAY02-1/10

RW25564 -UN-04SEP96

Air Conditioning Oil Injector JT02129

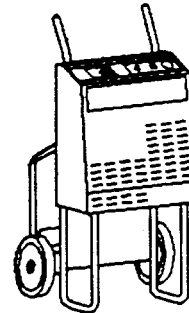
Add refrigerant oil to pressurized system



DPSG,OUO1004,616 -19-09MAY02-2/10

Recovery/Recycling, and Charging Station JT02045¹

Servicing air conditioning system using R-134a refrigerant



¹JT02046 Charging Station and JT02050 Recovery and Recycling Station can be substituted for JT02045

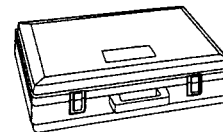
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DPSG,OUO1004,616 -19-09MAY02-3/10

RW40022 -UN-08SEP93

Air Conditioning R-12/R-134a Fitting Kit JT02098

Connect flushing, purging, and pressure equipment

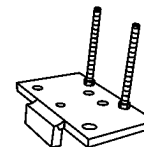


DPSG,OUO1004,616 -19-09MAY02-4/10

RW25867 -UN-22DEC97

Compressor Holding Fixture DFRW20¹

Hold A/C compressor during disassembly and assembly



¹See Section 99 for tool fabrication

Continued on next page

DPSG,OUO1004,616 -19-09MAY02-5/10

Air Conditioning Compressors

70
2

RW19932 -UN-19MAY92

A/C Compressor Clutch Spanner JDG747

Remove compressor clutch

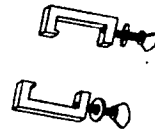


DPSG,OUO1004,616 -19-09MAY02-6/10

RW19935 -UN-19MAY92

Jaws. JDG748

Removing compressor pulley—(Used with D05277ST Puller)



DPSG,OUO1004,616 -19-09MAY02-7/10

RW21598 -UN-17AUG92

Forcing Screw Pilot JDG771

Removing compressor clutch

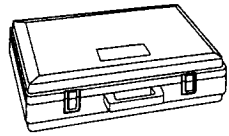


DPSG,OUO1004,616 -19-09MAY02-8/10

RW40022 -UN-08SEP93

Pulley Remover D05277ST

Remove compressor pulley

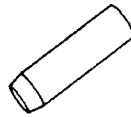


DPSG,OUO1004,616 -19-09MAY02-9/10

RW19943 -UN-19MAY92

Compressor Seal Protector JDG746

Install seal on compressor



DPSG,OUO1004,616 -19-09MAY02-10/10

Air Conditioning Specifications

Item	Measurement	Specification
Contained Refrigerant	Temperature	52°C (125°F) Maximum
Evacuating System	Required Vacuum at Sea Level	94.4 kPa (0.9 bar) (28.6 in. Hg)
Denso A/C Compressor (New)	Approximate Oil Capacity	230 mL (7.8 fl oz)
Sanden A/C Compressor (New)	Approximate Oil Capacity	299 mL (10.1 fl oz)
A/C Compressor Idler Pulley	Torque	55 N•m (40 lb-ft)
Denso Compressor Clutch Hub Cap Screw	Torque	14 N•m (10 lb-ft) (120 lb-in)
Sanden Compressor Clutch Hub Nut	Torque	17 N•m (13 lb-ft) (150 lb-in)
Denso Compressor Clutch Hub	Clearance	0.35—0.65 mm (0.014—0.026 in)
Sanden Compressor Clutch Hub	Clearance	0.40—0.80 mm (0.016—0.031 in)
Denso Compressor Manifold Cap Screw	Torque	26 N•m (19 lb-ft)
Denso Compressor Housing Through Bolts	Torque	26 N•m (19 lb-ft)
Denso Compressor (4045HF475/6068HF475) Support Bracket-to-Head Bolt	Torque	130 ± 26 N•m (96 ± 19 lb-ft)
Denso Compressor (4045HF475/6068HF475) Upper Mounting Bolt Through Support Bracket	Torque	37 ± 7 N•m (27 ± 5 lb-ft)
Denso Compressor Relief Valve	Torque	12—16 N•m (9—12 lb-ft)

OURGP12,000015D -19-31AUG05-1/1

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4 **Air Conditioning General Information**

Two types of air conditioning Freon compressors are used on OEM engines: Sanden compressors (A) and Denso compressors (B).

Both compressors are covered in this group but service varies. In general, Denso compressors are serviceable, while Sanden compressors are not.

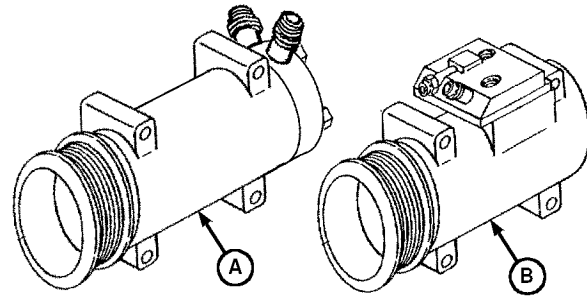
After diagnosis, use the procedures in this group to repair Denso compressors. If diagnosis of a Sanden compressor reveals a failure, replace compressor as required.

Only the Denso compressor is equipped with a test/charging port on the suction side of the compressor. When the compressor is off the machine, appropriate adapters must be installed directly in the suction inlet port of the Sanden compressor to attach test/charging equipment. When installed in the machine, there will be suction and discharge test ports in the high and low pressure lines regardless of which compressor is used.

The suction and discharge ports of compressors are easily identified. The suction port will have a larger, low pressure line connected to it. This line is typically insulated.

Operation of both compressors is the same. Low pressure gas from the evaporator flows through the expansion valve (or calibrated orifice) to the compressor. The compressor compresses the gas into a high pressure gas which is then sent to the condenser. (For operation of the complete air conditioning system, refer to machine technical manual.)

The compressor housing also serves as a reservoir for refrigerant oil.



A—Sanden Compressor
B—Denso Compressor

RG9501 -JUN-11MAR99

DPSG,OUO1004,620 -19-04MAR99-1/1

Proper Refrigerant Handling


Refrigerant used in John Deere air conditioning systems is R-134a, which replaced the commonly used R-12 refrigerant. The U.S. Environmental Protection Agency prohibits discharge of any refrigerant into the atmosphere, and requires that refrigerant be recovered using the approved recovery equipment.

IMPORTANT: Use correct refrigerant recovery, recycling and charging stations. DO NOT use refrigerant, hoses, fittings, components or refrigerant oils intended for use with R-12 refrigerant, on a system containing R-134a refrigerant.

Recovery, recycling and charging stations for R-12 and R-134a refrigerants MUST NOT be interchanged. Systems containing R-12 refrigerant use a different oil than systems using R-134a. Certain seals are not compatible with both types of refrigerants.

DPSG,OUO1004,580 -19-09MAY02-1/1

R-134a Refrigerant Cautions

 **CAUTION: DO NOT allow liquid refrigerant to contact eyes or skin. Liquid refrigerant will freeze eyes or skin on contact. Wear goggles, gloves and protective clothing.**

If liquid refrigerant contacts eyes or skin, DO NOT rub the area. Splash large amounts of COOL water on affected area. Go to a physician or hospital immediately for treatment.

DO NOT allow refrigerant to contact open flames or very hot surfaces such as electric welding arc, electric heating element and lighted smoking materials.

DO NOT heat refrigerant over specified temperature in a closed container. Heated

refrigerant will develop high pressure which can burst the container.

Specification

Contained Refrigerant—
Temperature 52°C (125°F) Maximum

Keep refrigerant containers away from heat sources. Store refrigerant in a cool place.

DO NOT handle damp refrigerant container with your bare hands. Skin may freeze to container. Wear gloves.

If skin freezes to container, pour COOL water over container to free the skin. Go to a physician or hospital immediately for treatment.

DPSG,OUO1004,581 -19-25FEB99-1/1

Air Conditioning Retrofit

Air Conditioning Retrofit Technical Manual TM1719 provides the John Deere recommended procedure to retrofit R-12 systems to R-134a.

Air Conditioning Systems R-12 to R-134a Retrofit Parts Catalog PC2449 contains service parts for every John Deere machine that has been produced with an R-12 air conditioning system.

OUOD005,00001CA -19-03SEP02-1/1

System Information

Flushing:

Flushing the compressor, another component or the complete system is a cleaning process using a liquid solvent to remove oil and debris. The compressor and/or system should be flushed if any of the following occur:

- The compressor has an internal failure
- No oil remains in used compressor
- Oil drained from compressor appears or smells overheated
- System was contaminated with a mixture of refrigerant oils
- System was left open to the atmosphere long enough for dirt, moisture, or debris to enter the tubing or components
- System has an internal blockage

Refer to machine technical manual for procedures to flush air conditioning system.

Purging:

Purging the compressor or the system is a cleaning process using a gas to force liquid from the system.

Purging alone will not remove refrigerant oil from the system.

The compressor or system should be purged if any of the following occur:

- After flushing system with solvent, to prevent oil dilution
- System was contaminated with nitrogen or two refrigerants
- System was left open to the atmosphere and flushing could not be performed
- Installation of new lines, condenser, or evaporator was required

Refer to machine technical manual for procedures to purge air conditioning system.

Evacuating:

Evacuating the system is a process to remove air and moisture from the system, by creating a vacuum.

DPSG,OUO1004,568 -19-23FEB99-1/1

Discharge Air Conditioning System

Operate air conditioning system for 10 minutes with engine at rated speed, if compressor is operable.

Set temperature control for maximum cooling and blower switch at high. This allows refrigerant oil to be circulated through system and indicates quantity of oil in compressor.

Stop engine and use the following procedure to discharge system:

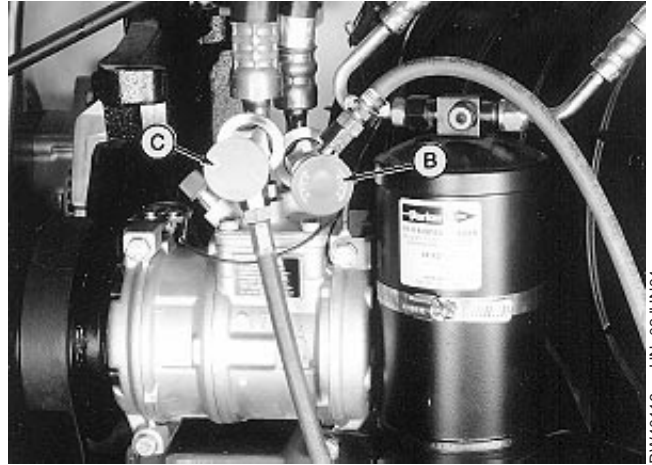
IMPORTANT: Use only R-134a Refrigerant Recovery, Recycling and Charging machines. Do not mix R-134a equipment, refrigerant, and refrigerant oils with R-12 Systems.

Connect JT02045 R-134a Refrigerant Recovery, Recycling and Charging Station.

NOTE: JT02050 R-134a Refrigerant Recovery and Recycling Unit and JT02046 Refrigerant Charging Unit may be substituted for JT02045.

Connect low-side hose (blue) to suction fitting (C) or port on suction line. Connect high-side hose (red) to discharge fitting (B) or port on suction line.

Follow the manufacturers instructions, and discharge system. Cap the fittings to prevent contamination.



RW40116 -UN-02JUN94

Flush/Clean Air Conditioning Compressor

NOTE: To flush complete air conditioning system, refer to machine technical manual.

1. Discharge system (See Discharge Air Conditioning System, this group).
2. Remove compressor and measure oil drained from both manifold ports.
3. Clean compressor as follows:
 - a. Pour 240 mL (8 fl oz) of **Genesolv 2004** flushing solvent into suction port and 120 ml (4 fl oz) into discharge port. Plug both ports in compressor manifold/cylinder head using appropriate fittings from JT02098 Fitting Kit.
 - b. Turn compressor end for end and roll compressor side to side.
 - c. Remove both plugs from manifold/cylinder head ports and drain solvent from compressor.
 - d. Connect battery power to compressor clutch coil. Rotate pulley at least five revolutions to move solvent out of cylinders.
 - e. Invert compressor, roll to all sides, and drain thoroughly.
 - f. Let compressor sit inverted for three to five minutes.
 - g. Repeat previous two steps at least three times.

DPSG,OUO1004,583 -19-01MAR99-1/1

Purge Air Conditioning System

IMPORTANT: Air compressors used for purging systems require a water separator. Purging without a separator adds moisture, creating hydrofluoric acid when combined with refrigerant oil. Acid is corrosive to metal tubing.

1. Connect dry nitrogen hose to gauge manifold center hose.
2. Connect gauge manifold suction hose to compressor suction port or port on suction line, and open valves.
3. Connect gauge manifold discharge hose to compressor discharge port or port on discharge line, and open valve. Disconnect discharge hose from gauge manifold to allow purging nitrogen to atmosphere.
4. Open nitrogen tank valve and adjust regulator to 275 kPa (2.75 bar) (40 psi). Purge system for two minutes or time specified in machine technical manual. Disconnect nitrogen supply.
5. Evacuate system. (See Evacuate Air Conditioning System, this group.)

DPSG,OUO1004,584 -19-01MAR99-1/1

Evacuate Air Conditioning System

IMPORTANT: Use only R-134a Refrigerant Recovery, Recycling, and Charging machines. Do not mix R-134a equipment, refrigerant, and refrigerant oils with R-12 systems.

1. Connect JT02045 R-134a Refrigerant Recovery, Recycling, and Charging Station.

NOTE: JT02046 HFC134a Refrigerant Charging Unit can be substituted for JT02045.

Pump must be capable of pulling at least 28.6 in. Hg vacuum (sea level). Deduct 1 in. Hg from 29.9 in. for each 300 m (1000 ft) elevation above sea level.

2. Connect low-side hose (blue) to suction fitting (C) on compressor or port on suction line. Connect high-side hose (red) to discharge fitting (B) on compressor or port on discharge line.

IMPORTANT: A decrease in vacuum of 1 in. Hg or more in five minutes indicates an excessive leak, or there is still liquid R-134a in system.

3. Follow machine technical manual and manufacturers instructions to evacuate system.

Specification

Evacuating System—Required

Vacuum at Sea Level..... 94.4 kPa (0.9 bar) (28.6 in. Hg)

- a. Evacuate system for 15 minutes if ambient temperature is below 30°C (85°F), to remove air, nitrogen, and moisture.
- b. Evacuate system for 30—45 minutes if ambient temperature is above 30°C (85°F), to remove air, nitrogen, and moisture.
- c. Charge system. (See Charge Air Conditioning System, this group.)



RW40116 -UN-02JUN94

B—Discharge Fitting
C—Suction Fitting

Check Refrigerant Oil Charge

IMPORTANT: The appropriate oil charge for an air conditioning system is based on machine/system application. See your machine technical manual for specified oil quantities.

1. Remove compressor. (See Remove Compressor, this group.)
2. Remove manifold caps and drain oil. Record amount.

NOTE: Save oil if compressor is new.

3. If more than 6 mL (0.2 fl oz) of oil was drained and appears normal, or any other components were replaced or flushed, see Determine Correct Oil Charge, this group.

If less than 6 mL (0.2 fl oz) of oil was drained or if oil appears very black, perform the following:

- a. Perform a volumetric efficiency test on compressor to determine serviceable condition. Flush with solvent to internally wash out oil if compressor is serviceable. (See Test Volumetric Efficiency, this group.)
- b. Remove and clean expansion valve, but do not disassemble valve.

- c. Remove and discard receiver-dryer. (See Replace Receiver-Dryer, this group.)
- d. Install a new receiver-dryer.
- e. Flush and clean compressor. (See Flush/Clean Air Conditioning Compressor in this group.)
- f. Flush complete system. (See machine technical manual.)
- g. Install required oil. (See Determine Correct Oil Charge, this group.)
- h. Connect all components.
- i. Purge, evacuate, and charge system. (See procedures to purge evacuate and charge air conditioning system in this group.)

NOTE: If very black oil was observed when draining compressor, look for compressor wear problems. This could mean worn internal parts like pistons and cylinders, which would require replacing the compressor.

Determine Correct Refrigerant Oil Charge

NOTE: Determine amount of system oil charge prior to installation of compressor.

IMPORTANT: The appropriate oil charge for an air conditioning system is based on machine/system application. Additionally, a number of other factors will affect the amount of oil to add (i.e. whether or not the system or individual components were flushed, components were replaced, length of hoses changed, etc.). See your machine technical manual for determining correct oil charge.

New compressors are precharged with oil. **The following capacities are for reference only. THE ACTUAL OIL CHARGE FOR YOUR SYSTEM WILL VARY BY APPLICATION.**

Specification

Denso A/C Compressor (New)—Approximate Oil Capacity	230 mL (7.8 fl oz)
Sanden A/C Compressor (New)—Approximate Oil Capacity	299 mL (10.1 fl oz)

IMPORTANT: Use care adding oil. Too much oil in the system will reduce maximum cooling capacity. Too little oil will result in poor lubrication of the compressor, leading to early compressor failure.

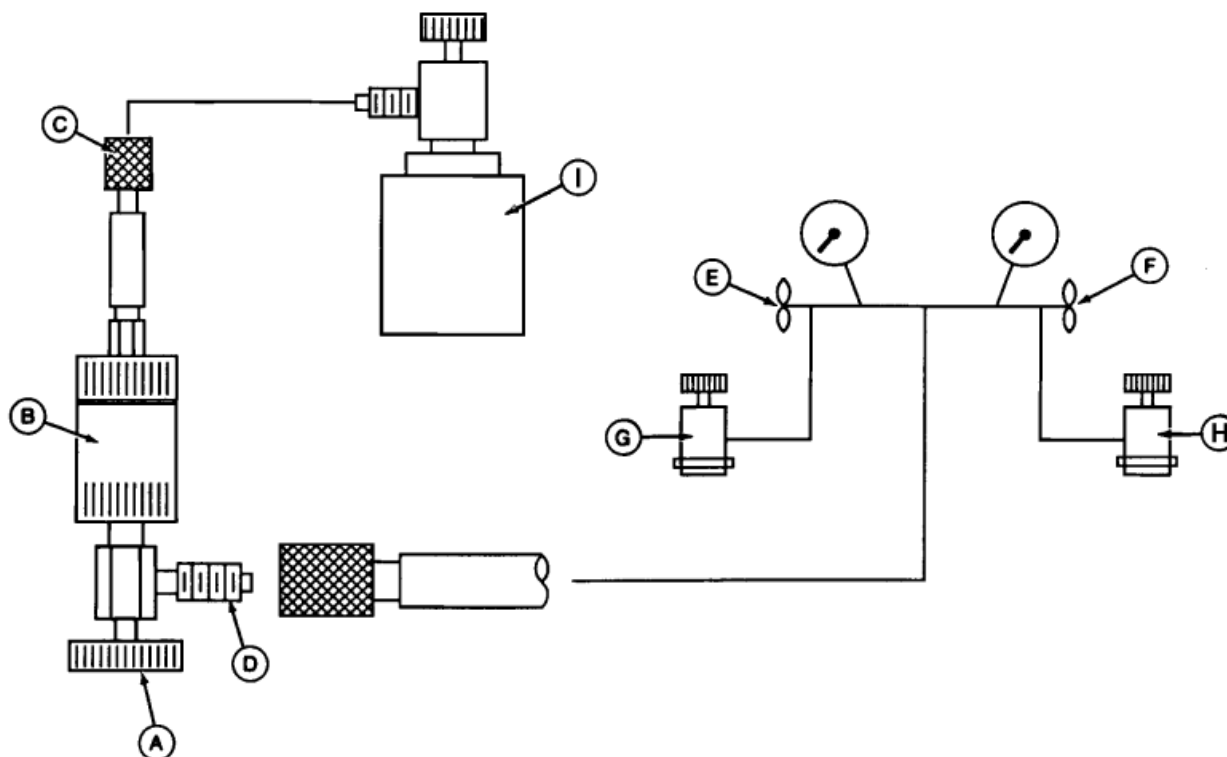
DO NOT leave the system or R-134a refrigerant oil containers open. Refrigerant oil easily absorbs moisture.

DO NOT spill R-134a refrigerant oil on acrylic or ABS plastic. Oil will deteriorate these materials rapidly.

Identify R-134a oil containers and measures to eliminate accidental mixing of different fluids.

DPSG,OUO1004,587 -19-09MAY02-1/1

Add Refrigerant Oil to Pressurized System



A—Needle Valve
B—JTO2129 Injector
C—Hose End

D—Injector End
E—Low Pressure Valve
F—High Pressure Valve

G—Low Pressure Quick
Connector
H—High Pressure Quick
Connector

I—Refrigerant Container

IMPORTANT: The appropriate oil charge for an air conditioning system is based on machine/system application. See your machine technical manual for determining correct oil charge.

NOTE: JT02129 Air Conditioning Oil Injector is designed to add up to 60 mL (2 fl oz) of refrigerant oil to a system that is already pressurized. A/C Oil Injector can also add oil if the system has no pressure or is under a vacuum.

1. Close the needle valve (A) on the oil injector JTO2129 (B).
2. Remove the hose end (C) of injector. Add up to 60 mL (2 fl oz) of refrigerant oil, and reinstall the end.
3. Connect hose end of injector to a R-134a, 360 mL (12 fl oz) refrigerant supply can.
4. Connect other end of injector (D) to the center hose of a gauge manifold set and bleed air from hoses, if necessary.
5. Connect gauge manifold connector (G) to the suction fitting on the compressor or port on suction line, and gauge manifold connector (H) to the discharge connector fitting on the compressor or port on discharge line.
6. Operate engine and turn compressor switch on.
7. Open the suction side valve (E) on the gauge set and the valve on the refrigerant supply can (I).

Continued on next page

DPSG.OUO1004,588 -19-09MAY02-1/2

8. Hold injector upright with valve at the bottom.
9. Open valve on injector for five seconds to force oil into the system.
- NOTE: Suction pressure will increase when oil enters the compressor, and decrease after oil has passed through the compressor.*
10. Open injector valve for five seconds to insure all oil has been forced into the system.
11. Repeat Steps 2—10 if additional oil is required.
12. Close gauge set and refrigerant supply valves. Slowly loosen the hoses to bleed off the pressure.
13. Remove injector and cap both ends.

DPSG,OUO1004,588 -19-09MAY02-2/2

Charge Air Conditioning System

NOTE: See machine technical for the specified amount of R-134a refrigerant to add to system.

NOTE: Bubbles may appear in sight glass (if equipped) when charging below 18°C (65°F) ambient temperature. Bubbles will disappear when temperature rises.

1. Evacuate system. (See Evacuate Air Conditioning System, this group.)

IMPORTANT: Use only R-134a Refrigerant Recovery, Recycling, and Charging machines. Prevent compressor damage. DO NOT mix R-134a equipment, refrigerant, and refrigerant oils with R-12 systems.

2. Connect JT02045 R-134a Refrigerant Recovery, Recycling, and Charging Station to charge system.

NOTE: JT02046 HFC134a Refrigerant Charging Unit can be substituted for JT02045.

3. Connect low-side hose (blue) to suction fitting on compressor or line. Connect high-side hose (red) to discharge fitting on compressor or line.

IMPORTANT: Do not run engine. System must hold a minimum vacuum of 28.6 in.

Hg. Deduct 1 in. Hg from 29.9 in. for each 300 m (1000 ft) elevation above sea level.

4. Charge the system.
5. Weigh refrigerant supply tank and invert so refrigerant enters system as a liquid.
6. Begin charging through discharge port or line first. As suction pressure nearly equals discharge pressure, open suction valve.

IMPORTANT: Close discharge valve on gauge manifold before starting engine and compressor, to prevent over pressurizing refrigerant container.

7. Continue charging system to capacity. DO NOT start engine until charging is completed.
8. Close both gauge manifold valves and perform a system operational check. See procedure in machine technical manual.

NOTE: System checkout is normally done by running engine at low idle with A/C switch ON for at least three minutes to fully circulate refrigerant and oil.

Diagnosing Air Conditioning Compressor Malfunctions

NOTE: The following diagnostic chart focuses on troubleshooting the compressor only. For complete system diagnostics, refer to machine technical manual.

NOTE: Sanden compressors have no serviceable parts. Use table as a guide to identify compressor failure and replace compressor as required.

Trouble	Cause	Indications	Remedy
System Produces No Cooling	Loose or broken drive belt.	Visual inspection.	Replace drive belt or tighten to specifications.
	Clutch coil or solenoid burned out or disconnected.	Compressor clutch or solenoid inoperative.	Check current to clutch or solenoid. Replace clutch if inoperative.
	Compressor partially or completely seized.	Belt slips on pulley or compressor does not turn when clutch is engaged.	Remove compressor for service or replacement.
	Compressor shaft seal leaking.	Clutch and front of compressor oily. System low or out of refrigerant.	Replace compressor shaft seal.
	Compressor reed valves inoperative.	Only slight variation of manifold gauge readings at any engine speed.	Remove compressor for service or replacement.
System will not produce sufficient cooling.	Compressor clutch slipping.	Visual inspection.	Remove clutch assembly for service or replacement.
	Low charge of refrigerant.	Bubbles in sight glass or high side gauge reading excessively low.	Charge system.
Compressor Noisy	Defective winding or improper connection in compressor clutch coil or solenoid.	Visual inspection; clutch or solenoid vibrates.	Repair or replace as necessary.
	Loose or excessively worn drive belt.	Belt slips and is noisy.	Tighten or replace as necessary.
	Noisy clutch.	May or may not slip. Noisy when engaged.	Remove clutch for service or replace as necessary.
	Compressor noisy.	Loose mountings or worn parts in compressor.	Check mountings and repair. Remove compressor for service or replacement.
	Compressor oil level low.	Compressor noisy.	Service compressor with oil.

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DPSG,UOU1004,597 -19-01MAR99-1/2

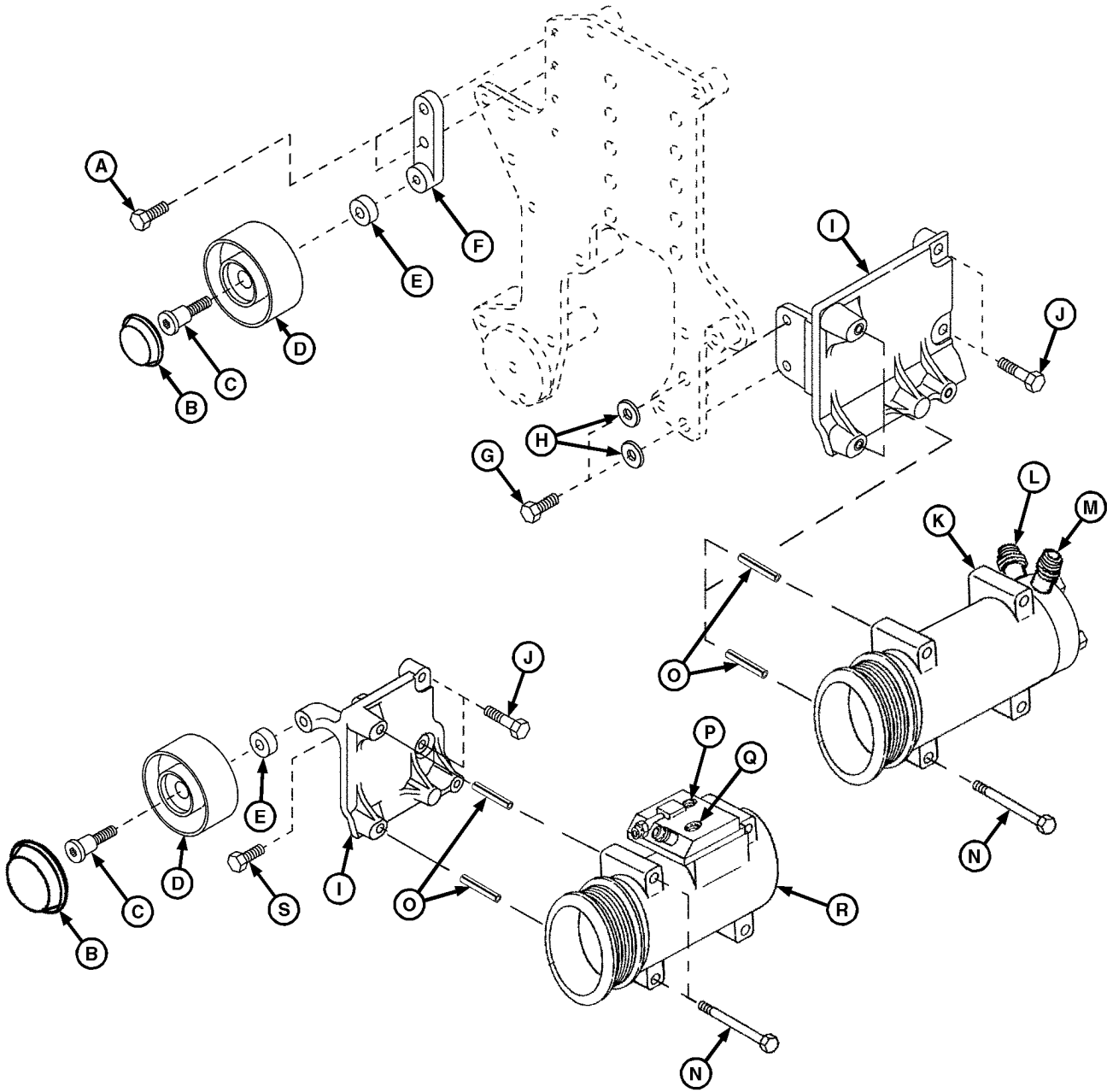
Air Conditioning Compressors

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16

Trouble	Cause	Indications	Remedy
	Excessive charge in system.	Rumbling noise or vibration in high pressure line. Thumping noise in compressor. Excessive suction and discharge pressures.	Recover excess refrigerant.
	Low charge in system.	Bubbles in sight glass or low discharge pressure.	Charge system with refrigerant.

DPSG,OUO1004,597 -19-01MAR99-2/2

Remove and Install Air Conditioning Compressor



RG9490

RG9490 -UN-25FEB99

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OURGP12,000015C -19-31AUG05-1/2

A—Cap Screw
B—Cover
C—Cap Screw
D—Idler Pulley

E—Spacer
F—Bracket¹
G—Cap Screw
H—Washers
I—Bracket

J—Cap Screw
K—Sanden Compressor
L—Discharge Port
M—Suction Port
N—Cap Screw

O—Spring Pin
P—Discharge Port
Q—Suction Port
R—Denso Compressor
S—Cap Screw

NOTE: Sanden compressors are not serviceable, while Denso compressors are serviceable. Repair procedures for Denso compressors are covered later in this group.

NOTE: Compressor mounting assemblies vary; two types shown.

1. Discharge system. (See Discharge Air Conditioning System in this group.)
2. Remove belt from compressor pulley.
3. Disconnect compressor clutch coil wire.
4. Disconnect lines from ports (L and M) or (P and Q). Cap all lines and fittings to prevent contamination.
5. Check refrigerant oil charge. (See Check Refrigerant Oil Charge in this group.)
6. Flush complete system if compressor failed internally due to damaged parts or seizure. (See Flush Air Conditioning System in this group.)
7. Add required oil to compressor and/or system. (See Determine Refrigerant Oil Charge in this group.)

IMPORTANT: Spring pins, (if equipped), must be installed in cap screw holes of compressor mounting bracket or

misalignment can occur, causing belt damage.

8. Check for spring pins (O), if equipped, in cap screw holes.
9. Install compressor and tighten cap screws.
10. If removed, install idler pulley (D) and tighten cap screws to specifications.

Specification

A/C Compressor Idler Pulley—
Torque..... 55 N•m (40 lb-ft)

11. Connect lines to ports (L and M) or (P and Q).
12. Connect clutch coil wire and install belt.
13. Purge, evacuate and recharge system. (See procedures to purge, evacuate and charge the system in this group.)

IMPORTANT: If a new compressor and clutch was installed, turn compressor on and off (engine running) in one second intervals for five seconds (cycle five times in 5 seconds). This will burnish clutch and hub drive surfaces.

¹4045HF475/6068HF475 engines use T204204 support bracket with bushings. (Not shown.)

Test Volumetric Efficiency

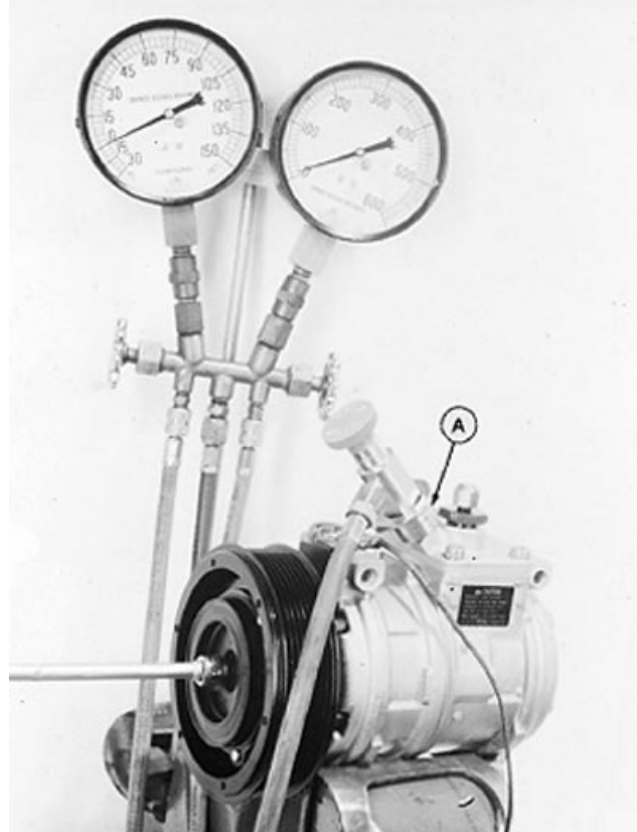
1. Drain oil from compressor and record amount.
2. Remove front cover from compressor pulley and rotate drive shaft 30 revolutions using a speed wrench and socket.
3. Drain remaining oil from compressor and record amount.

If no oil was removed, add two ounces of R-134a refrigerant oil in suction port. Slowly roll compressor in each direction at least two times. Repeat Steps 1—3.

4. Secure compressor in a vise with ports upward.
5. **On Denso compressors**, install JT02099 Adapter and JT03194 Cap from JT02098 Fitting Kit into suction port to close port of compressor. Connect suction hose coupler of gauge set to suction test port (A) on manifold.

On Sanden compressors, install JT03182 Adapter into suction port of compressor. Connect JT02108 Hose to adapter. Install JT02179 Adapter to opposite end of hose, then attach to suction hose coupler of gauge set.

6. Close gauge set suction side valve and open valve on suction hose coupler.
7. Rotate compressor drive shaft with speed wrench to obtain peak vacuum on low side gauge. Check for even suction (no pulsing) while turning wrench at a slow rate to maintain peak vacuum (25 in. Hg minimum).
8. Stop rotating shaft and check leak-down time. Compressor should hold peak vacuum for a minimum of three seconds. If compressor does not hold pressure for three seconds, inspect compressor valve plates and cylinder walls for damage. Repair or replace compressor as required.
9. Open suction port of compressor to atmosphere.



A—Suction Test Port

RG9550 -UN-10MAY99

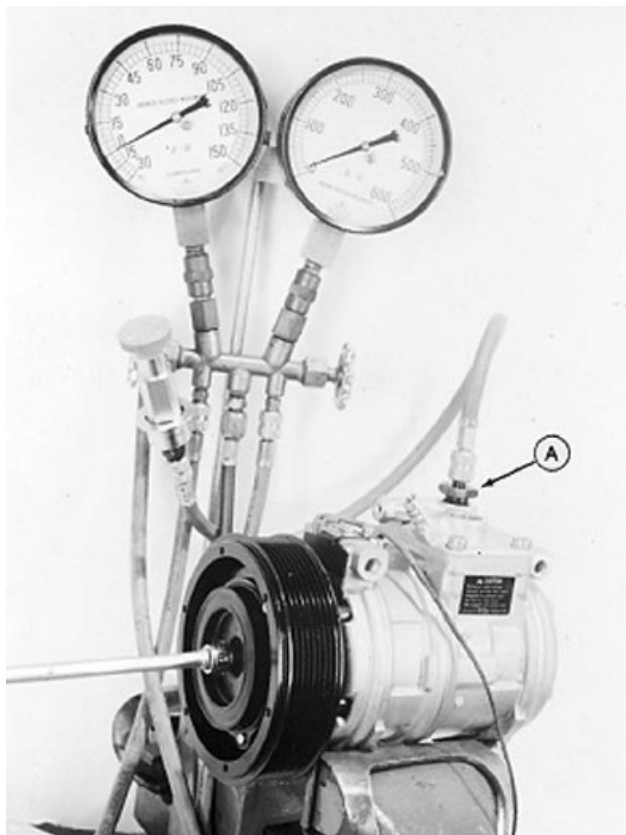
10. Install JT02100 Adapter (Denso compressors) or JT02154 (Sanden Compressors) into discharge port (A) of compressor. Install JT02108 Hose and JT02179 Adapter and connect to gauge set suction hose coupler.
11. Close gauge set suction side valve.
12. Rotate drive shaft no faster than two turns per second for six turns.
13. Record pressure after six complete turns. Pressure should be 380 kPa (3.8 bar) (55 psi) minimum.

NOTE: Pressure normally leaks down when rotation stops.

14. Continue to rotate compressor at a uniform speed to obtain peak pressure. Compression pressure should increase smoothly and should not vary more than 34 kPa (0.34 bar) (5 psi) at peak pressure. Bleed off pressure and repeat Steps 12, 13 and 14 four times.

NOTE: Pressure varying more than 34 kPa (0.34 bar) (5 psi) indicates a leaking reed-valve or piston seal in compressor. Repair or replace compressor.

15. Leak test compressor. (See Compressor Leakage Test in this group).



A—Discharge Port

RG9549 -UN-10MAY99

DPSG,OUO1004,591 -19-09MAY02-2/2

Compressor Leakage Test

1. Remove front plate from compressor pulley.
2. Remove clutch hub and screw/nut.

IMPORTANT: Do not lose inner clutch hub shims.

3. **On Denso Compressors:** Install JT02099 Adapter in suction port and JT02100 Adapter in discharge port of compressor. Cap discharge port using JT03194 Cap. Connect gauge set and/or container of R-134a to suction port (A) of compressor.

On Sanden Compressors: Install JT02137 Adapter in discharge port of compressor and cap port with JT03194 Cap. Install JT03182 Adapter in suction port and using JT02108 hose and JT02179 Adapter, connect gauge set and/or container of R-134a to suction port of compressor.

4. On Denso compressor, connect gauge set and/or container of R-134a refrigerant to suction port (A).

On Sanden compressor, use appropriate fittings from fitting kit to connect gauge set directly to suction/inlet port of compressor.

5. Open valves to pressurize compressor.

IMPORTANT: Do not exceed range of low pressure gauge.

6. Check the following for leaks using leak detector or 50-50 mixture of soap and water:
 - Shaft seal
 - Manifold seal
 - Housing seals at front, rear and midsection of compressor body
 - Relief valve (Denso compressor)
 - Suction coupler Schrader valve (Denso compressor)

Leakage should not exist. Repair or replace compressor as required, and repeat test.

7. Install clutch hub and cover. Tighten clutch hub screw/nut to specifications.



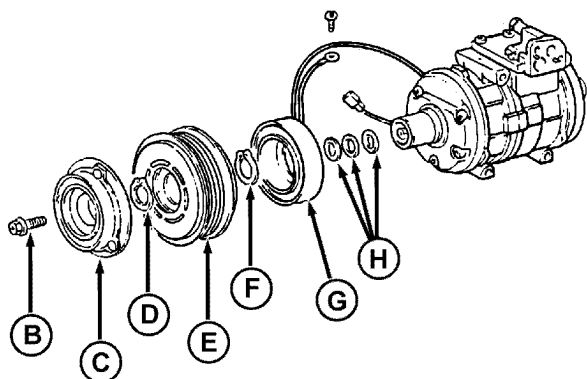
A—Suction Port

Specification

Denso Compressor Clutch Hub	
Cap Screw—Torque.....	14 N•m (10 lb-ft) (120 lb-in)
Sanden Compressor Clutch Hub	
Nut—Torque	17 N•m (13 lb-ft) (150 lb-in)

DPSG,OUO1004,582 -19-09MAY02-2/2

Disassemble and Assemble Compressor Clutch (Denso Compressor)



RW21158 -UN-29JUL98



RW21157 -UN-24JUN92

A—JDG747 Compressor
Clutch Spanner
B—Clutch Shaft Bolt

C—Clutch Hub
D—Pulley Snap Ring

E—Pulley
F—Clutch Coil Snap Ring

G—Clutch Coil
H—Shim

Mount compressor on DFRW20 Compressor Holding Fixture using two 6 in. x 1/4 in. eye bolts with nuts as illustrated.

Remove dust cover.

Hold clutch hub using JDG747 Compressor Clutch Spanner (A) or other suitable spanner wrench, and remove clutch shaft bolt (B).

Remove clutch hub (C). Remove shims (H) from clutch hub and save for installation.

Remove and discard snap ring (D). Remove pulley (E) using a plastic hammer or D05277ST Puller, JDG748 Jaws, and JDG771 Forcing Screw Pilot.

Disconnect clutch coil lead wire. Remove and discard snap ring (F) using D05327ST¹ Retaining Ring Plier, and remove the clutch coil (G).

NOTE: The bearing in the pulley is not serviceable.

Check pulley bearing operation. Replace pulley and bearing as required.

Install clutch coil (G) and new snap ring (F) with flat side of snap ring down. Connect clutch coil lead wire.

Install pulley (E) and new snap ring (D) with flat side of snap ring down. Apply grease to shims (H) and install to clutch hub (C).

Install clutch hub and shaft bolt (B) and tighten. Install dust cover.

Specification

Denso Compressor Clutch Hub
Cap Screw—Torque 14 N•m (10 lb-ft) (120 lb-in)

¹Included in JDG215

Check Clutch Hub Clearance

NOTE: The clutch coil is **NOT** polarity sensitive.

Check pulley-to-clutch hub clearance using a dial indicator. Mount the gauge to the pulley as illustrated and connect a set of jumper wires from the compressor leads to a 12V battery.

Rotate the pulley and check clearance in three equally spaced locations around the clutch hub. Add or remove shims as required.

Specification

Denso Compressor Clutch Hub—	
Clearance	0.35—0.65 mm (0.014—0.026 in)
Sanden Compressor Clutch	
Hub—Clearance	0.40—0.80 mm (0.016—0.031 in)

Tighten clutch shaft cap screw after correct clearance is obtained.

Specification

Denso Compressor Clutch Hub	
Cap Screw—Torque	14 N•m (10 lb-ft) (120 lb-in)
Sanden Compressor Clutch Hub	
Nut—Torque	17 N•m (13 lb-ft) (150 lb-in)



RW21159 -UN-24JUN92

DPSG,OUO1004,593 -19-01MAR99-1/1

Inspect Compressor Manifold (Denso Compressor)

Remove cap screws (A) and the manifold (B).

Remove and discard seal (C). Inspect porting surfaces.

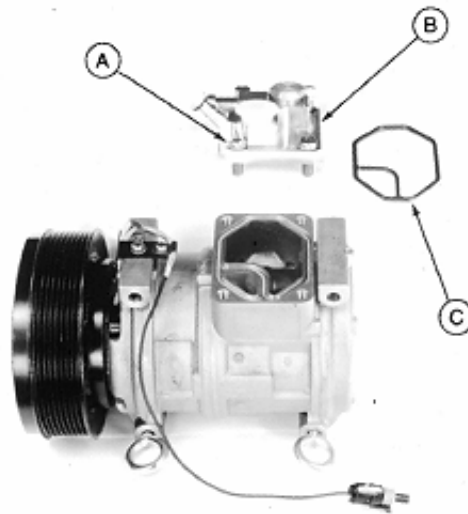
Lubricate and install a new seal (C).

Install manifold (B) and tighten cap screws (A).

Specification

Denso Compressor Manifold Cap
Screw—Torque..... 26 N•m (19 lb-ft)

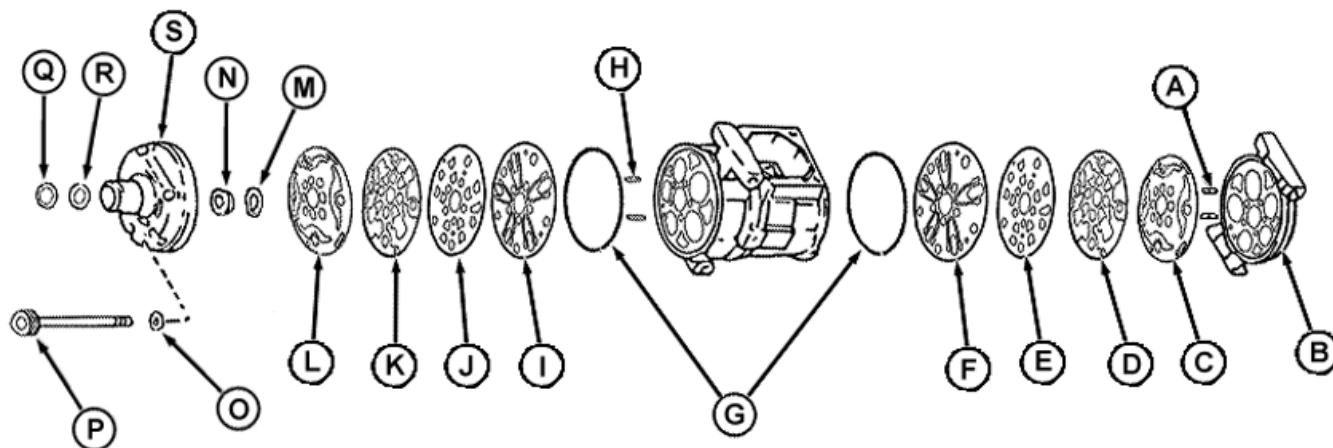
- A—Manifold Cap Screw
- B—Manifold
- C—Manifold Seal



RW21160 -UN-24JUN92

DPSG.OUO1004,594 -19-01MAR99-1/1

Disassemble, Inspect, and Assemble Compressor (Denso Compressor)



- | | | | |
|-----------------------------|------------------------------|----------------|------------------|
| A—Rear Pins | G—O-Rings | L—Front Gasket | Q—Felt Holder |
| B—Rear Housing | H—Front pins | M—Snap Ring | R—Felt |
| C—Rear Gasket | I—Front Suction Reed Valve | N—Lip Seal | S—Front Housing |
| D—Rear Discharge Reed Valve | J—Front Valve Plate | O—Washer | U—Bushing Spacer |
| E—Rear Valve Plate | K—Front Discharge Reed Valve | P—Through Bolt | |
| F—Rear Suction Reed Valve | | | |

Clean compressor using solvent before disassembly.

Mount compressor on holding fixture and remove clutch. (See Disassemble And Assemble Compressor Clutch, this group).

IMPORTANT: Be careful not to damage sealing surfaces when removing front and rear housing.

Remove compressor through-bolts using JDG226¹ Special Hex Drive.

Disassemble compressor as illustrated and discard O-rings, gaskets, lip seal, snap ring, and through-bolt washers. Replace parts.

IMPORTANT: DO NOT allow the cylinder body to separate at the middle O-ring.

NOTE: Valve plates, reed valves, cylinders, and cylinder housing are not serviceable. Some cylinder scuffing (light scratches) is normal.

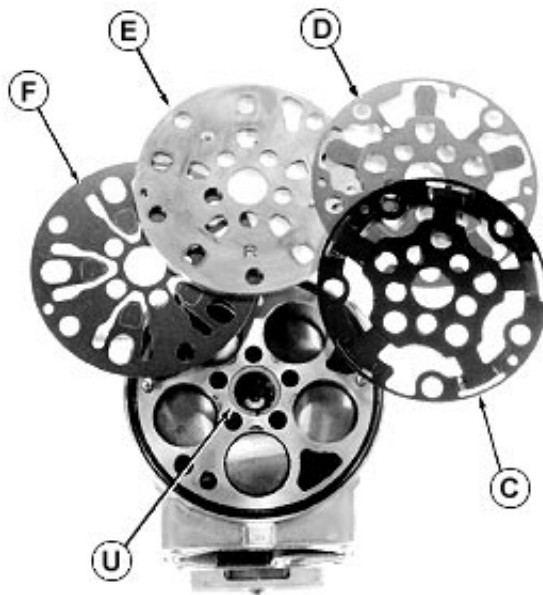
Inspect valves for even wear, and cylinders for scoring or excessive wear. Replace compressor as required.

RW78145 -UN-03AUG98

¹ Included in JDG215



RW21162 -UN-24JUN92



RW41338 -UN-16DEC97

Remove shaft seal snap ring (M). Turn housing over and remove felt holder (Q) and felt (R) from front housing (S).

Remove shaft lip seal (N) from front housing (S) using a small tool with 5/8 in. OD.

Wash all parts in clean solvent and dry using moisture-free compressed air before assembly.

CAUTION: Avoid direct refrigerant oil contact with skin.

IMPORTANT: Lubricate O-rings, gaskets, and lip seal using only TY22025 (R-134a) Refrigerant Oil during assembly. Other oils could damage the compressor.

Apply R-134a oil to the bore of the front housing and install new lip seal (N) to the bottom of the bore using a socket. Install new snap ring (M) flat side down.

IMPORTANT: Bushing spacer (U) must be in position before assembling the compressor.

Install pins (A) and new O-ring (G) in the rear cylinder.

NOTE: The rear valve plate is marked with an "R" and is installed face up.

Install parts (F—D) over the pins on the rear cylinder.

Install a new gasket (C) flat side down and the rear housing (B) on the rear cylinder. Mount the compressor onto the holding fixture.

Install pins (H) and new O-ring (G) in the front cylinder.

NOTE: The front valve plate is marked with an "F" and is installed face up.

Install parts (I—K) over the pins on the front cylinder.

Install a new gasket (L) flat side down. Put JDG746 Compressor Seal Protector on the shaft and lubricate with R-134a oil.

Install the front housing (S) on the front cylinder and remove the lip seal protector. Install through bolts (P) with new washers (O) and tighten evenly.

Specification

Denso Compressor Housing	
Through Bolts—Torque	26 N•m (19 lb-ft)

Install the felt (R) and felt holder (Q) using the clutch hub.

Install the pulley-clutch hub and check clearance. (See Disassemble and Assemble Compressor Clutch, this group.)

DPSG,OUO1004,595 -19-09MAY02-3/3

Remove and Install Compressor Relief Valve (Denso Compressor)

CAUTION: Avoid personal injury. High pressure may exist at the discharge fitting. Use proper recovery equipment to discharge system before removing relief valve.

Discharge system. (See Discharge Air Conditioning System, this group.)

Slowly remove relief valve (A) from compressor.

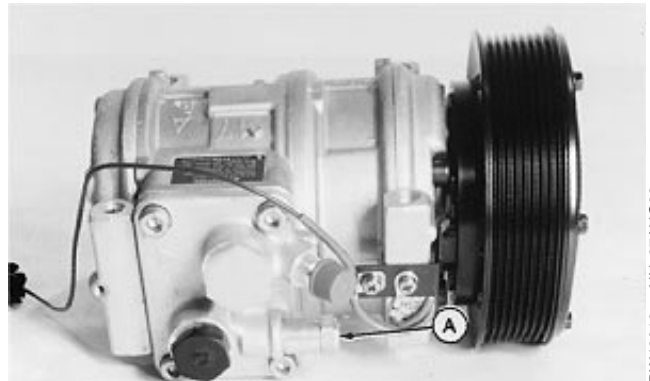
NOTE: The relief valve is not serviceable. Replace valve as required.

Install relief valve (A) and tighten.

Specification

Denso Compressor Relief Valve—Torque..... 12—16 N•m (9—12 lb-ft)

Charge system. (See Charge Air Conditioning System, this group.)



RW40019 -JUN-27AUG93

DPSG,OUO1004,596 -19-01MAR99-1/1

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