



PM Planetary Drive Maintenance and Rotation Model 51A3 and Model 57

Section 02-01-06

Komatsu has made every effort to make this manual as accurate as possible based on the information available at the time of publication and printing. Continuous improvement and advancement of product design may cause changes to machines which may not have been included in this publication. Komatsu reserves the right to make changes and improvements at any time. To ensure the most current information, please contact your service center.

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Scope of This Publication

PLANETARY DRIVE MAINTENANCE AND ROTATION provides instructions on the lubrication, filtration system service requirements (if applicable), and rotation of the 51A3 and 57 planetary drives.

It is **ESSENTIAL** for all personnel associated with the machine to become familiar with this information and the instructions contained in the other publications in this manual **BEFORE** operating or working on the machine.

Safety

This publication contains special instructions that pertain to safety, operation, maintenance, and repair of the machine. Listed below are the signal words and symbols that precede these instructions and their meanings:


DANGER

- The danger label indicates a hazardous situation which, if not avoided, **will** result in death or serious injury.

WARNING

- The warning label indicates a hazardous situation which, if not avoided, **could** result in death or serious injury.

CAUTION

- The caution label, used with the safety alert symbol indicates a hazardous situation which, if not avoided, could result in minor or moderate injury (includes the safety alert symbol ).

CAUTION

- The caution label (without safety alert symbol) is used to address practices not related to personal injury – only equipment damage.

NOTICE

The **NOTICE** graphic is to indicate areas of importance to the reader that are not related to personal injury or machine damage.

Safety, Warnings and Cautions

WARNING

CRUSH HAZARD

- Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine's SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.
- Crush hazards exist in machine pivot area and area between the tires. Do not enter these areas unless it is verified that the operator has control over the steering and that personnel locking the frame lock have good communication with the operator. Entering the pivot area and area between the tires while the machine is moving or pivoting (articulating) could cause crush hazards resulting in serious injury or death.

CRUSH, SHOCK, OR OTHER HAZARDS

- Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

ELECTRICAL SHOCK HAZARD

- Risk of fatal electrical shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINC'S software indicates voltage on the bus, or the red bus LED's in the electrical cabinet are illuminated. All Generation II SR equipment has the ability to produce voltage at low throttle. Even with the engine off, there may be a residual of 12-15VDC on the bus. Do not enter the electrical cabinet or touch any components in the electrical cabinet without performing the Bus Discharge Verification Procedure. Failure to do so may result in fatal electrical shock or other injury.
- High voltage may be present. Risk of shock or equipment damage by use of an improperly rated meter is possible. Use a CAT III 1000V rated volt meter to take voltage readings.

CAUTION

CRUSH HAZARD

- Crush hazard exists when removing and replacing the middle pinion. The middle pinion weighs approximately 200 lbs (91 kgs). Wear all necessary personal protective equipment including steel-toed work boots, and use caution when removing and replacing the middle pinion. The removal arm will provide a balancing point when hoisting the pinion to and from the planetary drive, if the lifting sling is positioned against the mounting face of the removal arm, as shown in illustration "Middle Pinion Removal and Replacement". Maintain a firm grasp on the removal arm at all times while hoisting the pinion. Failure to wear proper PPE and use caution when removing and replacing the middle pinion can cause crush hazard resulting in serious injury.

EYE INJURY AND BURN HAZARDS

- Eye injury and burn hazard exists when removing the oil fill plug from the planetary drive. Lubricant can be very hot. Remove the planetary drive oil fill plug (1) slowly to vent internal pressure before removing the oil level plug (2) Failure to remove the plug slowly could result in sudden pressure release. Debris can be blown into the eyes or skin if pressure is not released slowly. Failure to release pressure from the planetary drive slowly can cause an eye injury or burn hazard resulting in serious injury.

ENVIRONMENTAL HAZARD

- Environmental hazard exists as an oil filter canister housing is raised onto the filter element. The oil level in the canister will rise and possibly spill oil. Monitor the oil level as the cartridge is raised. Use proper spill control methods and personal safety equipment when replacing the filter elements. Be prepared to catch any oil that might spill from the cartridge housing. Failure to monitor oil level as the cartridge housing is raised can cause oil to spill out resulting in an environmental chemical spill.
- Environmental hazard exists when draining or filling component fluids. Spills are possible. Follow all appropriate environmental regulations for containing and disposing of fluids during any procedure that involves component fluids. Failure to follow all appropriate regulations for containing and disposing of fluids can cause an environmental hazard resulting in an environmental chemical spill.

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Theory of Operation

Daily	Initial 500 hours (break-in period)	Every 500 hours	Every 2,000 hours	Every 5,000 hours	Every 10,000 hours ¹	Every 20,000 hours ¹
<ul style="list-style-type: none"> Check for leaks inside and outside of wheel (including planetary drive filtration system filters, hoses and fittings). 	<ul style="list-style-type: none"> Clean strainers. Replace filters 	<ul style="list-style-type: none"> Collect oil samples for analysis 	<ul style="list-style-type: none"> Clean strainers. Replace filters Verify condition of oil – drain, flush and replace when oil analysis indicates the need*. 	<p>Machines with Model 51A3</p> <ul style="list-style-type: none"> Rotate per rotation patterns shown on illustration PLANETARY DRIVE ROTATION PATTERNS*. 	<p>Machines with Model 51A3/57</p> <ul style="list-style-type: none"> Rotate per rotation patterns shown on illustration PLANETARY DRIVE ROTATION PATTERNS*. <p>Model 51A3</p> <ul style="list-style-type: none"> Drain Remove cover structure Inspect counter-shaft gears and middle pinion. Remove drive motor Inspect primary gears Rotate. 	<p>Machines with Model 51A3</p> <ul style="list-style-type: none"> Drain Remove cover structure Inspect counter-shaft gears and middle pinion. Remove drive motor Inspect primary gears Rotate. <p>Machines with Model 57</p> <ul style="list-style-type: none"> Remove inspection plate Inspect middle pinion and countershaft gears Rotate

NOTICE

*Field research indicates synthetic oil can often be run in excess of 5000 hours before draining and flushing is required. Due to limited accessibility of primary gear side drain plug on models-with Model 57 planetary drive, draining and flushing is recommended at the 10,000-hour rotation interval, if the need to drain and flush is indicated by oil analysis.

Note 1: Operational data on the Models 51A2 and 57 planetary drives should be used to determine hours of operation before rotation is necessary. Hourly recommendations for rotation are suggested based on typical operation, under typical conditions. The decision to rotate should be made by considering:

- Oil analysis wear data
- Work load
- Tramming distances
- Operating conditions
- Examining middle pinion when possible

Other situations or conditions

Table 1. Service reference chart for planetary drive models 51A3 and 57

Recommended Lubricant

Lubricants used in Komatsu wheel loader planetary drives (drivers) must be synthetic gear oils with EP additive packages.

ISO Viscosity Grade

ISO viscosity grade of lubricant must be as follows for individual drivers: (see exception in endnote #3)

Planetary Drive	Conditions	
	Standard	Arctic*
51A3	460	220
57	460	220

* Arctic conditions are defined as an ambient temperature consistently below 0°F (-18°C).

Table 2. Planetary drive lubricant viscosity grade

Lubricant properties

Properties of lubricant must comply with the following table: (see exception in endnote #3)

Property	Value	
	ISO 220 Grade	ISO 460 Grade
Kinematic Viscosity at 40°C (cSt)	198-242	414-506
Kinematic Viscosity at 100°C, minimum (cSt)	25	45
Viscosity Index, minimum	150	
Pour point, maximum ¹	-36°C	
4-Ball EP Test (ASTM D2783): Weld load (kg) ²	250	
Timken OK Load (lb.) ²	60	
FZG Gear Scuffing (ISO 14635-1) Pass Stage	12 or greater	
Copper Corrosion (ASTM D130 – 3 hrs@100°C)	1B	
Foaming (ASTM D892, Sequence I, II, III) maximum values (ml/ml)	5/0, 10/0, 5/0	
Rust protection (ASTM D665 – Method B)	Pass	

Endnotes

- ¹ Lubricant with higher pour point may be used, provided the pour point is 5°C lower than the minimum ambient temperature.
- ² Oil manufacturer may report either 4-Ball EP test or Timken OK load. However, if both results are reported, fluid must meet requirements of both tests.
- ³ **Mobil SHC Gear OH** is available in a lowest viscosity grade of 320. However, this upgraded lubricant will outperform the older-technology MobilGear SHC 220 in arctic temperatures due to its higher viscosity index and lower pour point.

Table 3. Planetary drive lubrication properties

Solid Particle Content Limit

The solid particle content must be monitored (refer to cleanliness targets shown in Table “Planetary drive recommended cleanliness targets”, below. Should the cleanliness target limit be reached, drain and flush the planetary drive as described in this section.

NOTICE

Any noticeable increase in the amount of iron or chromium content between routine 500-hour samples warrants examination of the countershaft gears and middle pinion, followed by flushing. Drain planetary drive and remove cover structure.

Following draining and flushing the planetary drive due to excessive metal content, an oil sample should be taken at 250 hours of operation. Planetary drive removal is recommended should the iron or chromium limit of 100 ppm or greater be reached in the initial 250 hour interval or if there is a noticeable increase in iron or chromium content on subsequent 500 hour oil samples.

Field Operations	
Hydraulic Systems	ISO 18/15 minimum
PTO Gearbox	ISO 19/16 minimum
Planetary Drive	ISO 19/16 minimum
Silicon	<25 ppm
Water	<200 ppm
Viscosity	+15%/-10%
TAN	+2 over base oil

Table 4. Planetary drive recommended cleanliness targets

ISO 16/13 minimum

Table 5. Fill oils

PLANETARY DRIVE DAMAGE

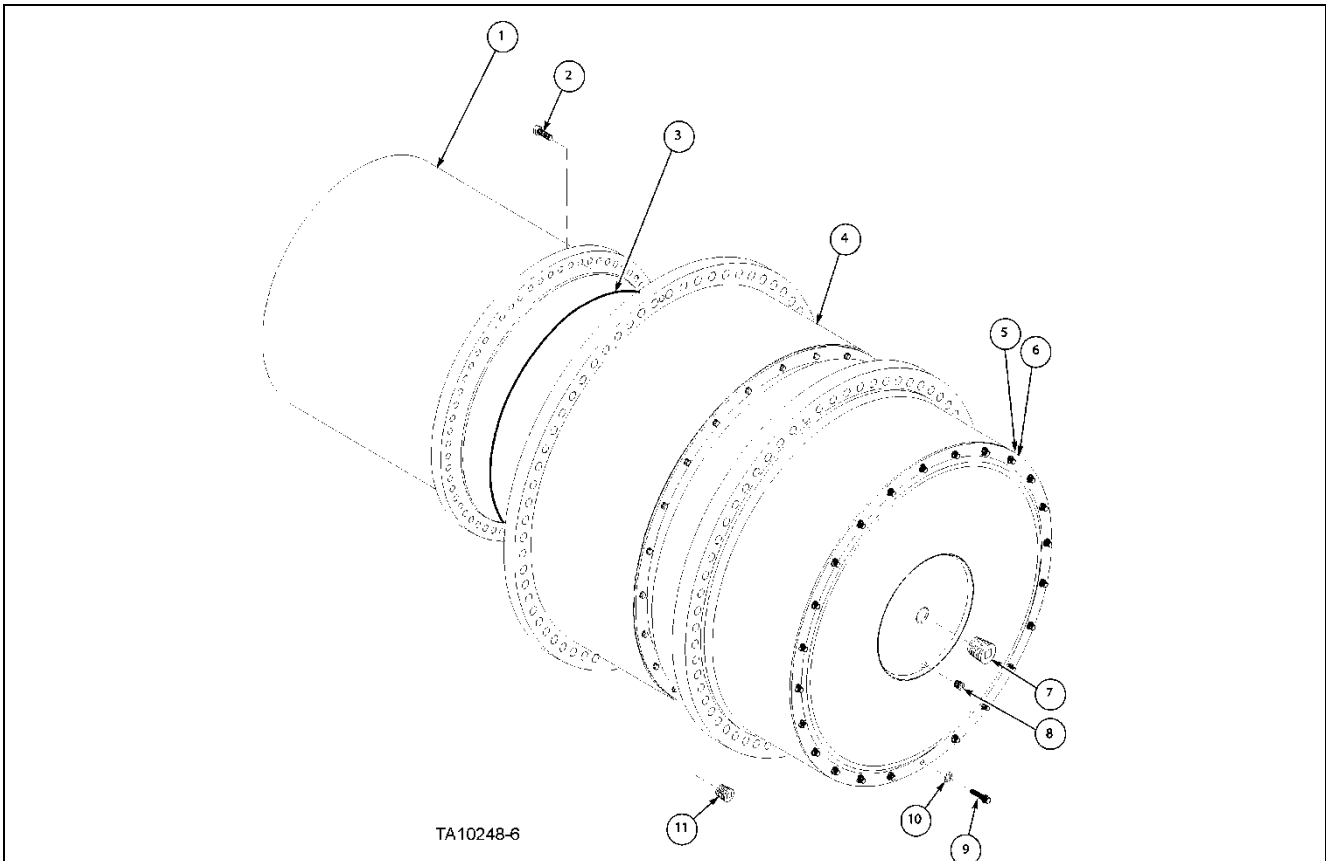
- It is very important that the oil trapped in the primary gear side be drained in addition to the oil in the outer section of the planetary drive. A separate drain plug is provided for the primary gear side. Failure to drain the primary gear side will leave contaminants in the oil, result in inaccurate oil analysis reports, and ultimately affect overall planetary drive life.

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Component Descriptions

Planetary Drive Service Parts

Service parts, as shown in illustrations "Service parts for planetary drive – model 51A3" and "Service parts for planetary drive – model 57." are provided through your distributor or the Komatsu Parts Department. The service parts provided are for routine servicing of the planetary drive and removal and reinstallation of the drive motor. The Model 57 planetary drive middle pinion is offered as a service part. Refer to the Parts Manual for ordering service parts.

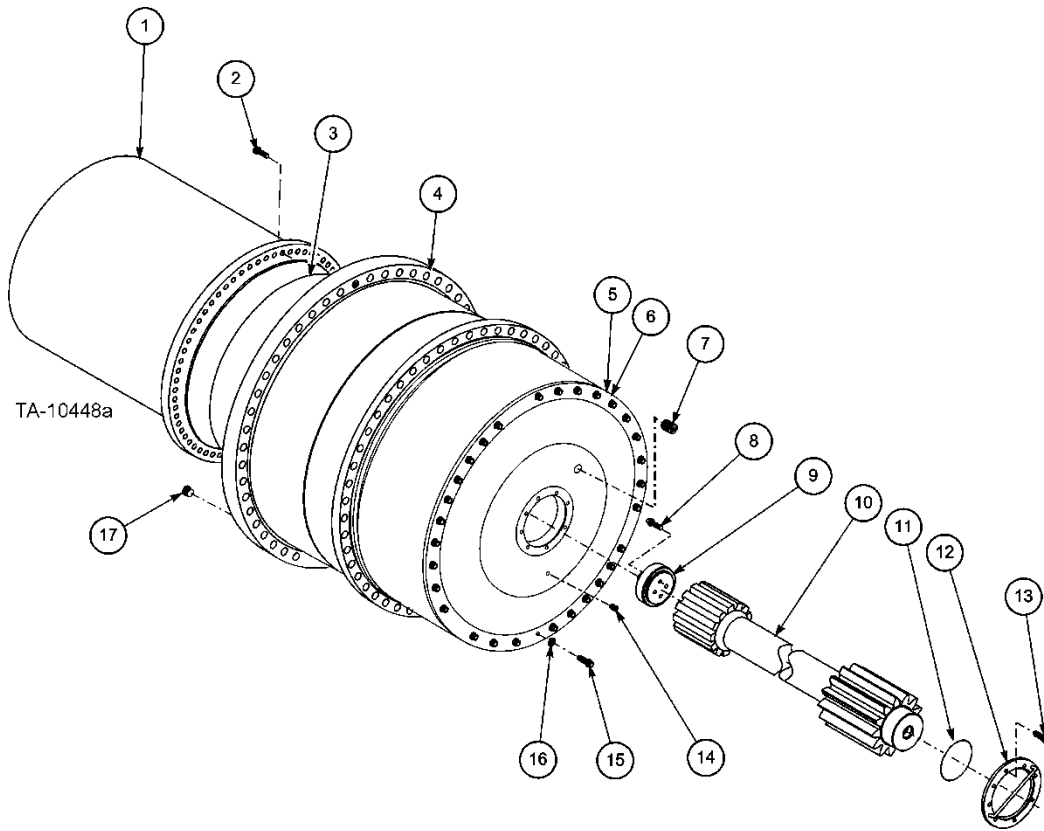


NOTICE

Planetary drive filtration system filters and strainers not shown. Refer to Parts Manual

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Drive motor 2. Drive motor retaining bolt 3. Drive motor to planetary drive o-ring 4. Planetary drive 5. O-ring and silicone sealant 6. Cover structure | <ul style="list-style-type: none"> 7. Pipe plug 8. Pipe plug 9. Capscrew 10. Flatwasher 11. Pipe plug |
|---|--|

Figure 1. Service parts for planetary drive – model 51A3



NOTICE

Planetary drive filtration system filters and strainers not shown. Refer to Parts Manual

- | | |
|--|--|
| <ul style="list-style-type: none"> 1. Drive motor 2. Drive motor retaining bolt 3. Drive motor to planetary drive o-ring 4. Planetary drive 5. O-ring and silicone sealant 6. Cover structure 7. Pipe plug 8. Capscrew 9. Pinion thrust face retainer plate | <ul style="list-style-type: none"> 10. Middle pinion 11. O-ring 12. Inspection plate 13. Capscrew 14. Pipe plug 15. Capscrew 16. Washer 17. Plug with o-ring |
|--|--|

Figure 2. Service parts for planetary drive – model 57

Planetary Drive Oil Filtration System

Each of the four planetary drives (drivers) has its own closed loop oil filtration system. Each filtration system is comprised of the following components:

- Strainer
- Pump
- Check Valve
- Filter
- Flow Sensor

A single hydraulic motor is used to power two (2) pumps (one pump per planetary drive) for each axle. The motor and pumps are arranged in such a way that hydraulic oil and driver oil cross contamination cannot occur.

- The filtration strainers, filters, and pump for the front planetary drives are mounted inside the front frame.
- The filtration strainers, filters, and pump for the rear planetary drives are mounted behind the rear axle (under the machine against the fuel reservoir), on each side of the machine.

FLUID FLOW THROUGH A DRIVER FILTRATION SYSTEM

- When the engine goes to high throttle, the pump motors receive hydraulic oil.
- The motor turns the pump, causing oil to be drawn from the primary gear side through a fitting in the motor end bell.
- The oil is pulled through a strainer.
- Oil then flows through the pump.
- Oil flows through a check valve that prevents accumulated particles from back flowing into the pump while the machine is off.
- From the check valve the oil flows through a 10 micron absolute media oil filter.
- After being filtered, the oil flows through a flow sensor. The flow sensor detects oil flow is occurring. The switch state of the flow sensor is monitored by LINCS.
- From the oil filter, the oil is returned to the internal gear area of the planetary drive through another fitting in the motor end bell.

NOTICE

During the warranty period, notify your distributor immediately should large chips or an unusual amount of metallic residue accumulate in the strainers and filters or on the magnetic fill plug.

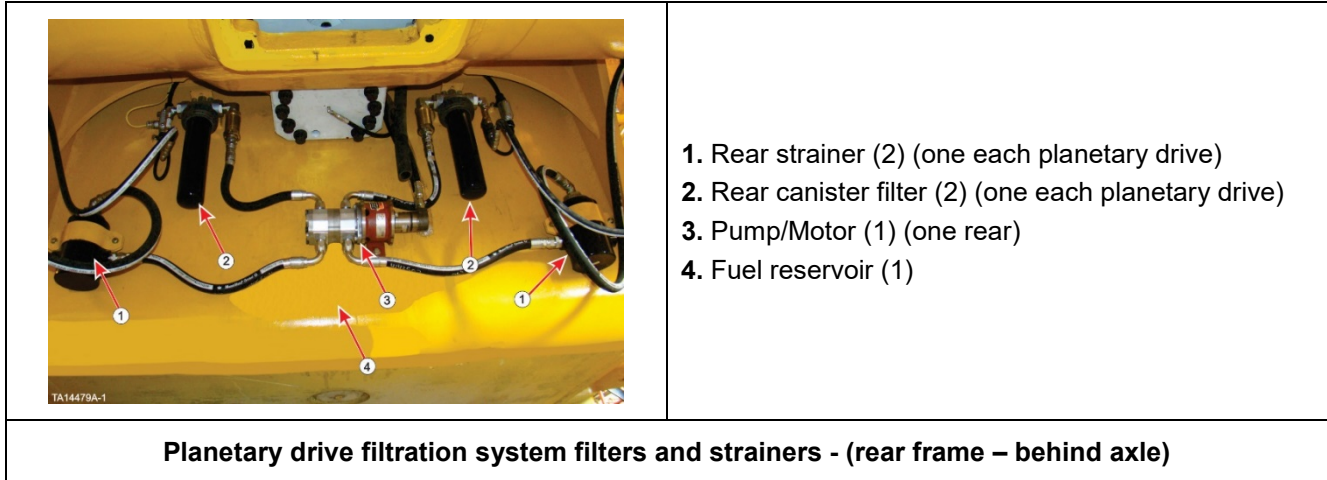


Figure 3. Filtration system component mounting locations for planetary drives

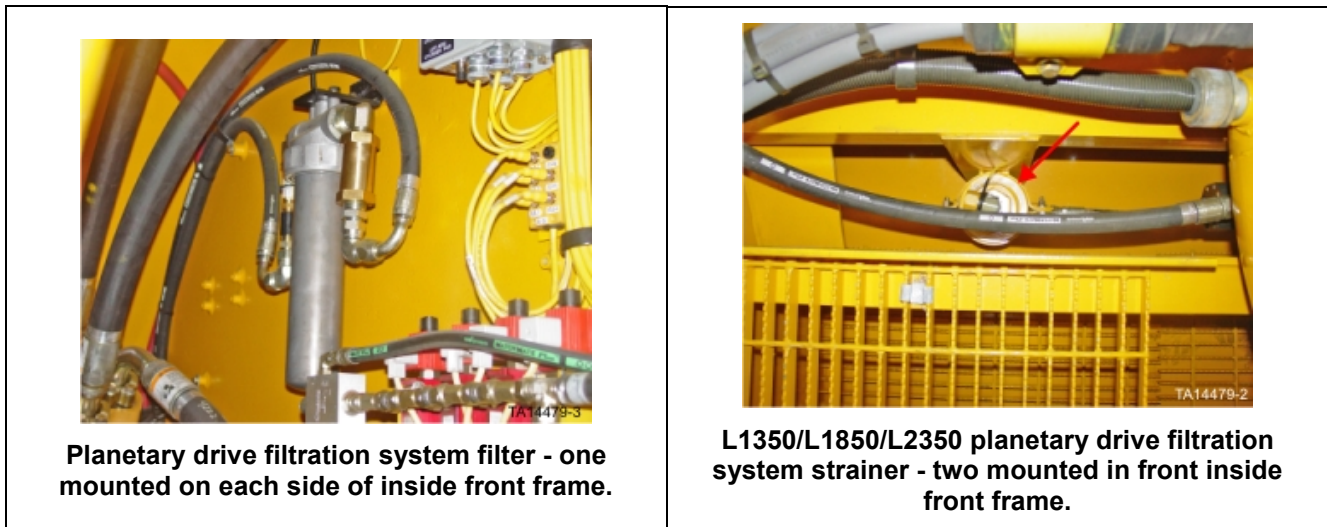


Figure 4. Filter and strainer for planetary drive filtration system

Planetary Drive Seals

The planetary drive has a “Mechanical Face” seal. It is normal for these seals to “weep” some oil for a period of time during the early stages of new machine operation. This period will vary from one planetary drive unit to another. The weeping will stop as the seal faces mate to each other to form a perfect seal. A small amount of oil may later be visible on the outer diameter of the seal when it is working. This is not a leak, but only the seal faces being properly lubricated.

Settings and Adjustments

Oil Replacement

Field research has indicated synthetic oil can often be run in excess of 5000 hours in normal service before draining, flushing, and replacement is required. Refer to lubricating oil analysis data to verify the optimum replacement interval for your application listed under text "LUBRICATING OIL ANALYSIS" in this document.

CAUTION

It is **CRITICAL** that the loader be as level as possible (in all directions) before draining and **ESPECIALLY** filling the planetary drives. If the machine is not level, improper draining and fill levels might occur which could cause component damage.

Correct oil levels are essential, as low oil levels will cause internal damage to gears and bearings. High oil levels may cause an external leak through the breather, or through the motor resulting in higher operating temperatures as well as resulting in a loss of lubrication between gears and bearing rolling elements and races.

If cover capscrews are removed during procedure, do not reuse the copper washer. The copper washer serves as a seal and should be replaced. Failure to do so could result in leaks, causing planetary drive damage.

Strainer Cleaning and Filter Replacement

The planetary drive oil filtration system strainers should be cleaned and the filters replaced after the initial 500 hours of operation and every 1500 hours thereafter.

NOTICE

Some machine models require a special wrench for filter replacement. **DO NOT** over torque the filter housing retaining nut on the filter assembly. 30 lb-ft (40.6 N•m) is recommended. Refer to the Parts Manual-Fluid Power page for a part number.

- It is recommended that the replacement filter housing be filled about 1/2 (or slightly more) full with oil prior to installation.



CAUTION

Environmental hazard exists as an oil filter canister housing is raised onto the filter element. The oil level in the canister will rise and possibly spill oil. Monitor the oil level as the cartridge is raised. Use proper spill control methods and personal safety equipment when replacing the filter elements. Be prepared to catch any oil that might spill from the cartridge housing. Failure to monitor oil level as the cartridge housing is raised can cause oil to spill out resulting in an environmental chemical spill.

CAUTION

Environmental hazard exists when draining or filling component fluids. Spills are possible. Follow all appropriate environmental regulations for containing and disposing of fluids during any procedure that involves component fluids. Failure to follow all appropriate regulations for containing and disposing of fluids can cause an environmental hazard resulting in an environmental chemical spill.

If the filters are not filled prior to installation, start the engine and allow it to run for approximately one minute. This will fill the filters and strainers. Recheck the planetary drive's oil level and refill to the proper level (refer to text titled "DRAINING, FLUSHING AND REFILLING").

Lubricating Oil Analysis

An on-going oil analysis program with samples collected every 500 hours of operation is mandatory to meet Komatsu warranty requirements. Contact your Komatsu authorized distributor for assistance in establishing an oil analysis program.

Solid particle content limit: The solid particle content must be monitored. Refer to cleanliness targets in this document. Should the cleanliness target limit be reached, drain and flush the planetary drive as described in text titled "DRAINING, FLUSHING, AND REFILLING" in this document.

NOTICE

Any noticeable increase in the amount of iron or chromium content between routine 500-hour samples warrants examination of the countershaft gears and middle pinion, followed by flushing. Model 51A3: Drain planetary drive and remove cover structure. Model 57: Drain planetary drive and remove inspection plate on cover structure.

Following draining and flushing the planetary drive due to excessive metal content, an oil sample should be taken at 250 hours of operation. Planetary drive removal is recommended should the iron or chromium limit of 100 ppm or greater be reached in the initial 250 hour interval or if there is a noticeable increase in iron or chromium content on subsequent 500 hour oil samples.

CAUTION

Under no circumstances should the owner attempt to disassemble a planetary drive past the instructions contained in the SERVICE MANUAL. This is especially important if the planetary drive is within the warranty period. Unauthorized disassembly will void the warranty.

Motors with Labyrinth Seal

B40A and B60 motors have labyrinth seals. The following is intended to only show a typical labyrinth seal set-up and possible problems caused by overfilling a typical planetary drive with a labyrinth seal.

NOTICE

The following illustrations show a typical 45 planetary drive set-up with a labyrinth seal.

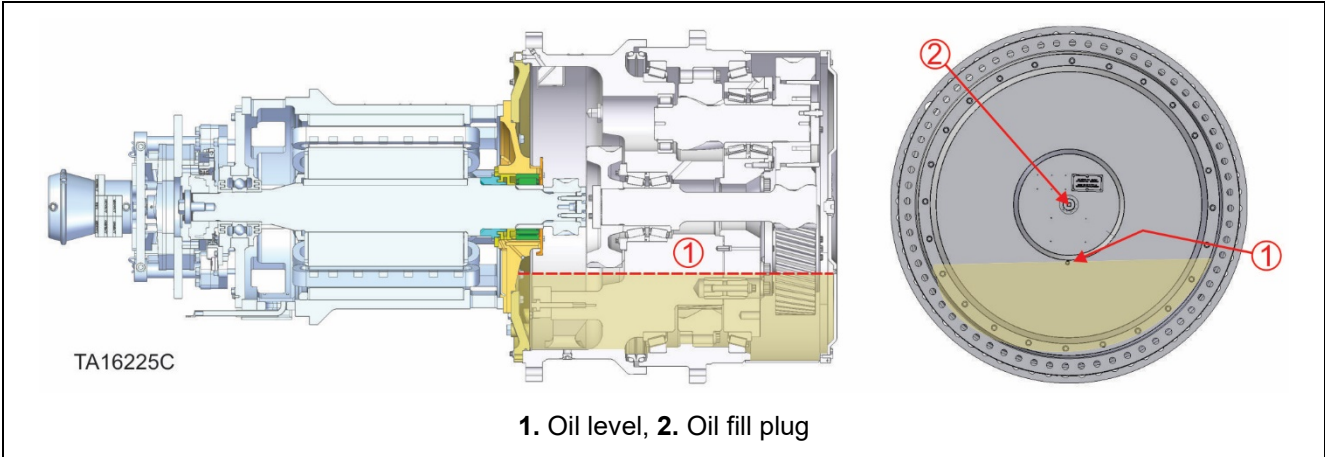


Figure 5. Verify correct lubricant level (45 planetary drive shown)

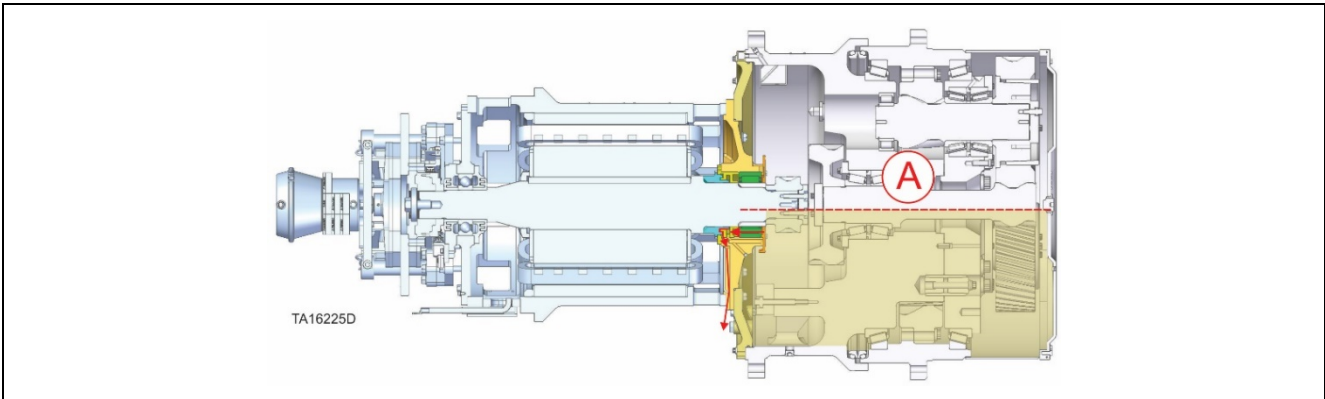


Figure 6. Incorrect Oil level (too high) (45 planetary drive shown)

NOTICE

Oil level above labyrinth seal will seep through labyrinth when motor not rotating

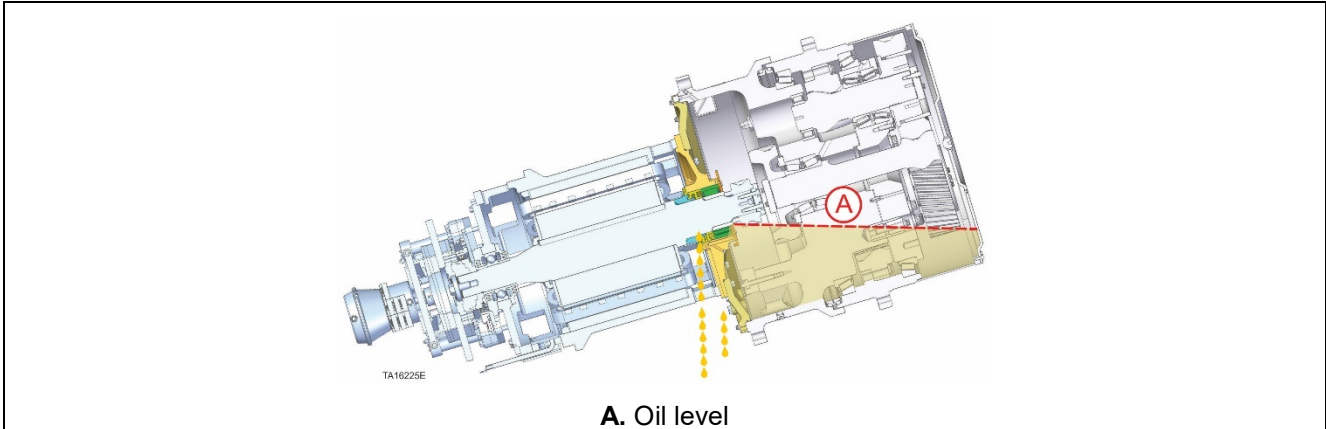


Figure 7. Machine stationary on very steep side slope with oil over labyrinth seal (45 planetary drive shown)

NOTICE

When Oil is over labyrinth seal, it can leak through the stationary seal and leak oil into axle.

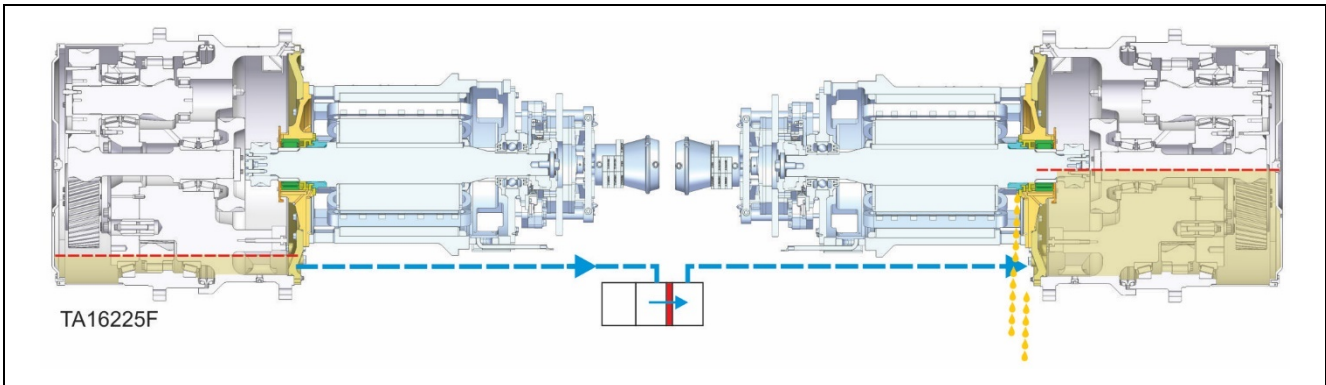


Figure 8. Defective filtration pump (45 planetary drive shown)

NOTICE

Defective filtration pump can cause overfilled driver on one side and low oil level on the other side.

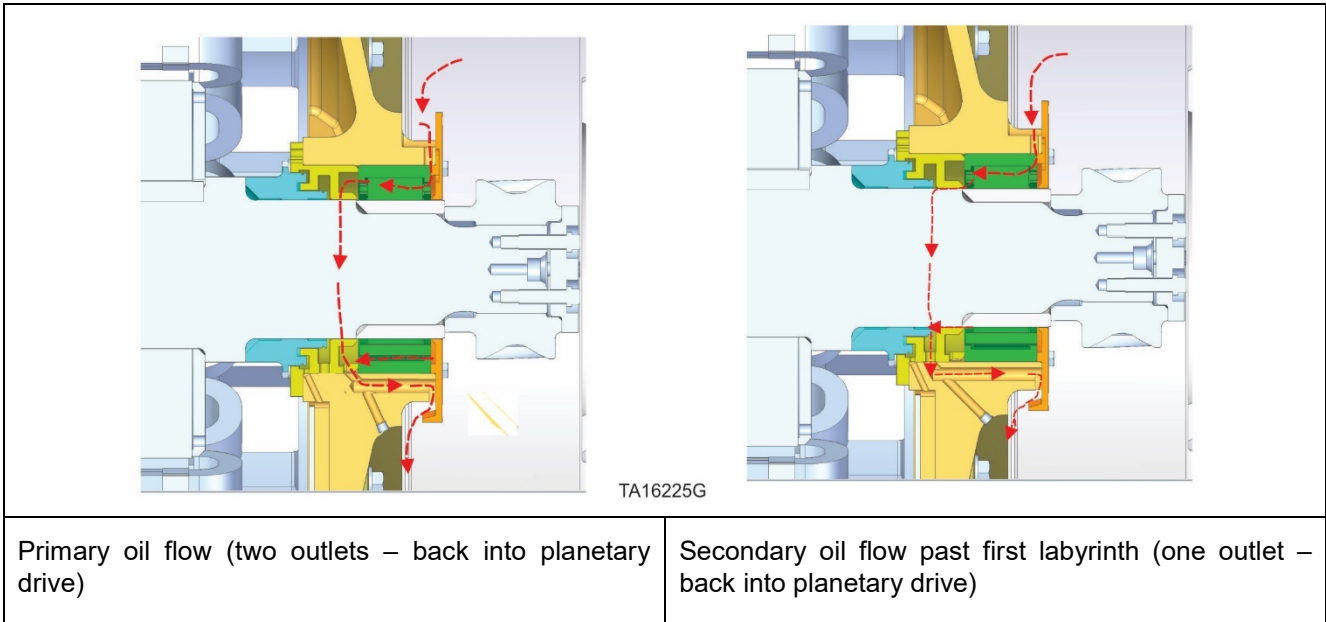


Figure 9. Normal oil movement through labyrinth (45 planetary drive shown)

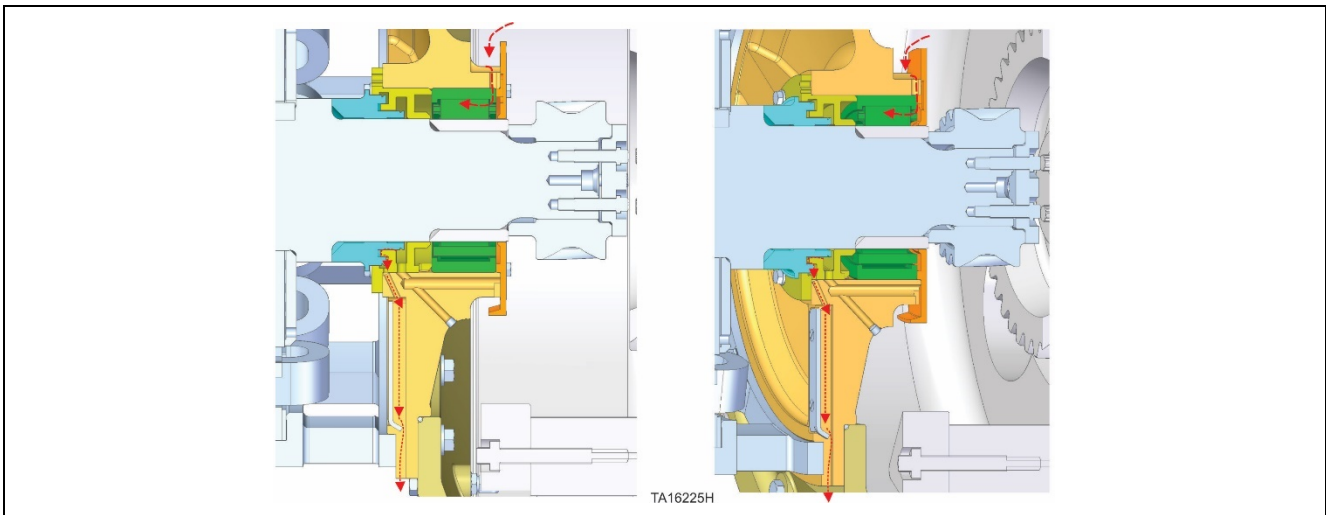


Figure 10. One outlet – on outside of endbell (45 planetary drive shown)

NOTICE

Oil seepage that gets past first and second labyrinth typically only occurs when stopped on a slope or during shipping.

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Oil Level Check, Draining, and Filling Procedures - Planetary Drive Model 51A3

Always use recommended lubricant. Refer to table “Planetary drive lubrication” in text titled “Recommended Lubricant”, previously provided in this document.

OIL CAPACITY: Model 51A3 approximately 36 gallons (136 liters).

CAUTION

If cover capscrews are removed during any procedure, do not reuse the copper washer. The copper washer serves as a seal and should be replaced. Failure to do so could result in leaks, causing planetary drive damage.

NOTICE

Current production models have a ¼” NPT plug in the cover that can be used as a fill level indicator, if it is rotated to the bottom position and removed. If this plug is used, verify it is 7-3/4” (196.85 mm) below the centerline of the planetary drive. Older model covers have the same plug that is only 6-1/4” (158.75 mm) below centerline and should not be used as an oil level indicator.

NOTICE

When filling, draining, or checking oil levels of planetary drives, always be prepared to catch any excess oil that might run out of the planetary drive or be spilled during the draining or filling process. Dispose of all oil in a manner consistent with all local laws, rules, regulations or requirements. Do not allow oil to be put into streams or waterways. Failure to properly dispose of oil can cause an environmental spill.

Safety Preparations

WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine’s starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine’s SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.

WARNING

Crush hazards exist in machine pivot area and area between the tires. Do not enter these areas unless it is verified that the operator has control over the steering and that personnel locking the frame lock have good communication with the operator. Entering the pivot area and area between the tires while the machine is moving or pivoting (articulating) could cause crush hazards resulting in serious injury or death.

- a. Stop the wheel loader on flat level ground.
- b. Position the oil level plug.

- Rotate the “Oil Level” plug on the planetary drive to its lowest possible position.
- c. Place bucket flat and on level ground.
- d. Set the parking brakes.
- e. Shut off the engine.

WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- f. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.



Battery isolation switch in OFF position with locks in place

Checking for Correct Oil Level in the 51A3 Planetary Drive

NOTICE

When filling, draining, or checking oil levels of planetary drives, always be prepared to catch any excess oil that might run out of the planetary drive or be spilled during the draining or filling process. Dispose of all oil in a manner consistent with all local laws, rules, regulations or requirements. Do not allow oil to be put into streams or waterways. Failure to properly dispose of oil can cause an environmental spill.

Current Production Models

- a. Remove the "Oil Level" plug (2) on the planetary drive.
 - The plug position should be at the lowest level possible.
 - It should be 7-3/4" (196.85 mm) below the planetary drive's centerline.
 - Oil should run from the hole if the planetary drive is full.

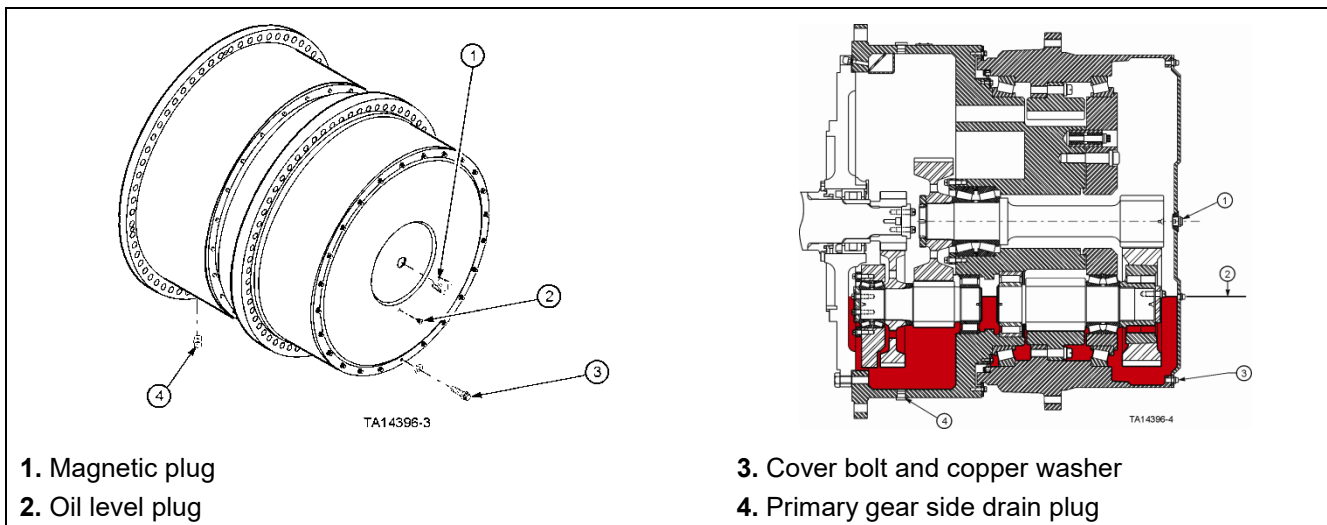


Figure 11. Oil servicing points and oil level - 51A3 planetary drive current production machines

- b. Should oil be needed, remove the magnetic fill plug (1).
 - Fill until oil just begins to drip from the "Oil Level" plug hole (2).
 - **DO NOT** overfill.
- c. Reinstall the "Oil Level" plug.
- d. Wait approximately 15 minutes for the oil to reach the correct level in the primary gear side (the levels will eventually equalize).
- e. Remove the "Oil Level" plug (2) and recheck the oil level and refill until oil just begins to drip from the "Oil Level" plug hole (2).
- f. Reinstall the plugs (1 & 2).

Draining and Refilling the 51A3 Planetary Drive

NOTICE

When filling, draining, or checking oil levels of planetary drives, always be prepared to catch any excess oil that might run out of the planetary drive or be spilled during the draining or filling process. Dispose of all oil in a manner consistent with all local laws, rules, regulations or requirements. Do not allow oil to be put into streams or waterways. Failure to properly dispose of oil can cause an environmental spill.

Current Production Models

- a. Remove the "Oil Level" plug (2) from the planetary drive.
 - It should be 7-3/4" (196.85 mm) below the planetary drive's centerline.
 - Oil should drip from the oil level hole (2).

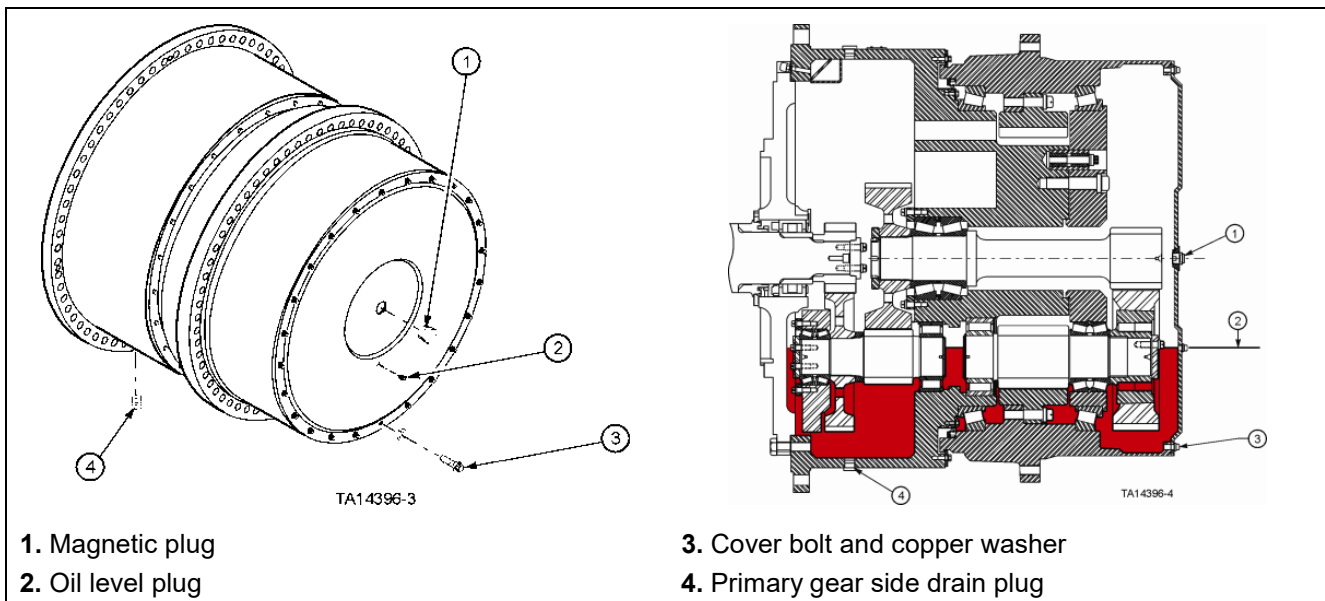


Figure 12. Oil servicing points and oil level - 51A3 planetary drive current production machines

- g. Remove the bottom capscrew (3) from the cover structure. Catch oil in a suitable container and dispose of properly.
- h. Remove primary gear side drain plug (4). Catch oil in a suitable container and dispose of properly.

CAUTION

It is very important that the oil trapped in the primary gear side be drained in addition to the oil in the outer section of the planetary drive. A separate drain plug is provided for the primary gear side. Failure to drain the primary gear side will leave contaminants in the oil, result in inaccurate oil analysis reports, and ultimately affect overall planetary drive life.

- i. Once oil is drained, replace primary gear side drain plug (4) and bottom cover structure capscrew and washer (3).
- j. Install the cover structure capscrew (3) with a copper washer. (The copper washer is used as the oil seal and should not be reused. A new copper washer should be installed before torquing the bolt.)

- k. Torque the cover structure capscrew to 50 ft. lb. (lubed with engine oil on the threads and under the head). This torque value is important as over torquing will damage the copper sealing washer.
- l. Remove the oil fill plug (1) in the center of the cover and fill with recommended lubricant until oil barely drips from the “Oil Level” plug hole (2).
- m. Wait approximately 15 minutes for the oil to fill the primary gear side (the levels will eventually equalize).
- n. Recheck the oil level and refill as necessary to achieve the proper oil level (oil drips from the “Oil Level” plug hole (2)).

CAUTION

Correct oil level for models 51A3 is 7.75” (197 mm) below the planetary drive centerline.

DO NOT fill the planetary drive until oil RUNS from the oil fill plug (1). Overfilling the planetary drive can result in damage to the traction motor.

- o. Replace the plugs (1 & 2).

NOTICE

Correct oil levels are essential, as low oil levels will cause internal damage to gears and bearings. High oil levels may cause an external leak through the breather, or through the motor, resulting in higher operating temperatures as well as resulting in a loss of lubrication between gears and bearing rolling elements and races.

- p. Replace the plugs (1 & 2).

Oil Level Check, Draining, and Filling Procedures for Planetary Drive Model 57

Always use recommended lubricant. Refer to table “Planetary drive lubricant” in text titled “Recommended Lubricant”, previously provided in this document.

CAUTION

If cover capscrews are removed during any procedure, do not reuse the copper washer. The copper washer serves as a seal and should be replaced. Failure to do so could result in leaks, causing planetary drive damage.

NOTICE

It is very important that the oil trapped in the primary gear side be drained in addition to the oil in the outer section of the planetary drive. A separate drain plug is provided for the primary gear side. Failure to drain the primary gear side will leave contaminants in the oil, result in inaccurate oil analysis reports, and ultimately affect overall planetary drive life.

NOTICE

When filling, draining, or checking oil levels of planetary drives, always be prepared to catch any excess oil that might run out of the planetary drive or be spilled during the draining or filling process. Dispose of all oil in a manner consistent with all local laws, rules, regulations or requirements. Do not allow oil to be put into streams or waterways. Failure to properly dispose of oil can cause an environmental spill.

Safety Preparations

WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine's SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.

WARNING

Crush hazards exist in machine pivot area and area between the tires. Do not enter these areas unless it is verified that the operator has control over the steering and that personnel locking the frame lock have good communication with the operator. Entering the pivot area and area between the tires while the machine is moving or pivoting (articulating) could cause crush hazards resulting in serious injury or death.

- a. Stop the wheel loader on flat level ground.
- b. Rotate the "Oil Level" plug on the planetary drive to its lowest possible position.
- c. Place bucket flat and on level ground.
- d. Set the parking brakes.
- e. Shut off the engine.

WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- f. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.



Battery isolation switch in OFF position with locks in place

Checking for Proper Oil Level in the 57 Planetary Drive

The Model 57 planetary drive holds approximately 40 gallons (151 liters).

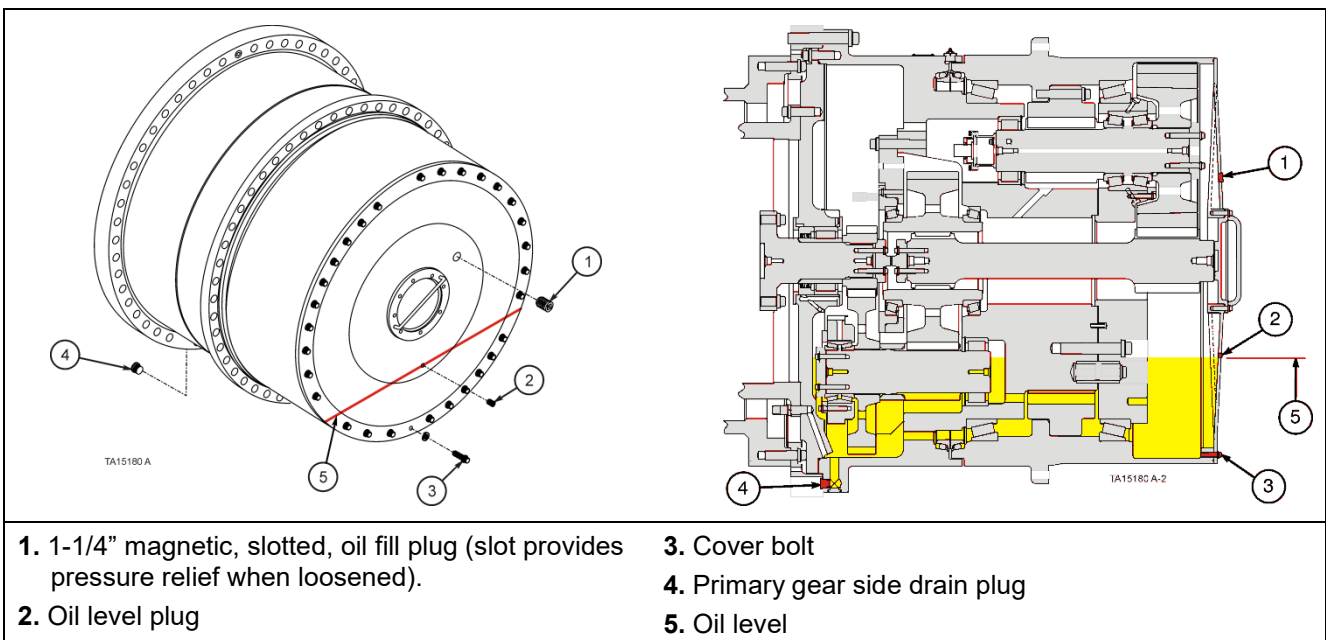


Figure 13. Oil servicing points for model 57 planetary drive-current production

- a. Turn the 1-1/4", magnetic, slotted oil fill plug until the slots are exposed and air begins to escape.
- b. Once air begins to flow from the slots - stop turning the slotted oil fill plug (1) and allow all of the air to release.

⚠ CAUTION

Eye injury and burn hazard exists when removing the oil fill plug from the planetary drive. Lubricant can be very hot. Remove the planetary drive oil fill plug (1) slowly to vent internal pressure before removing the oil level plug (2) Failure to remove the plug slowly could result in sudden pressure release. Debris can be blown into the eyes or skin if pressure is not released slowly. Failure to release pressure from the planetary drive slowly can cause an eye injury or burn hazard resulting in serious injury.

- c. Remove the oil level plug (2). Oil should barely drip from the hole or be touchable just below the oil level plug hole.
- d. Should oil be needed, fill with recommended lubricant until oil drips from the oil level plug hole (2). DO NOT fill until oil RUNS from fill plug hole (1).
- e. Wait 15 minutes for oil to equalize into the primary gear side, recheck level and fill until oil drips from oil level plug hole (2).
- f. Reinstall the plugs (1 & 2).

Draining and Filling the 57 Planetary Drive

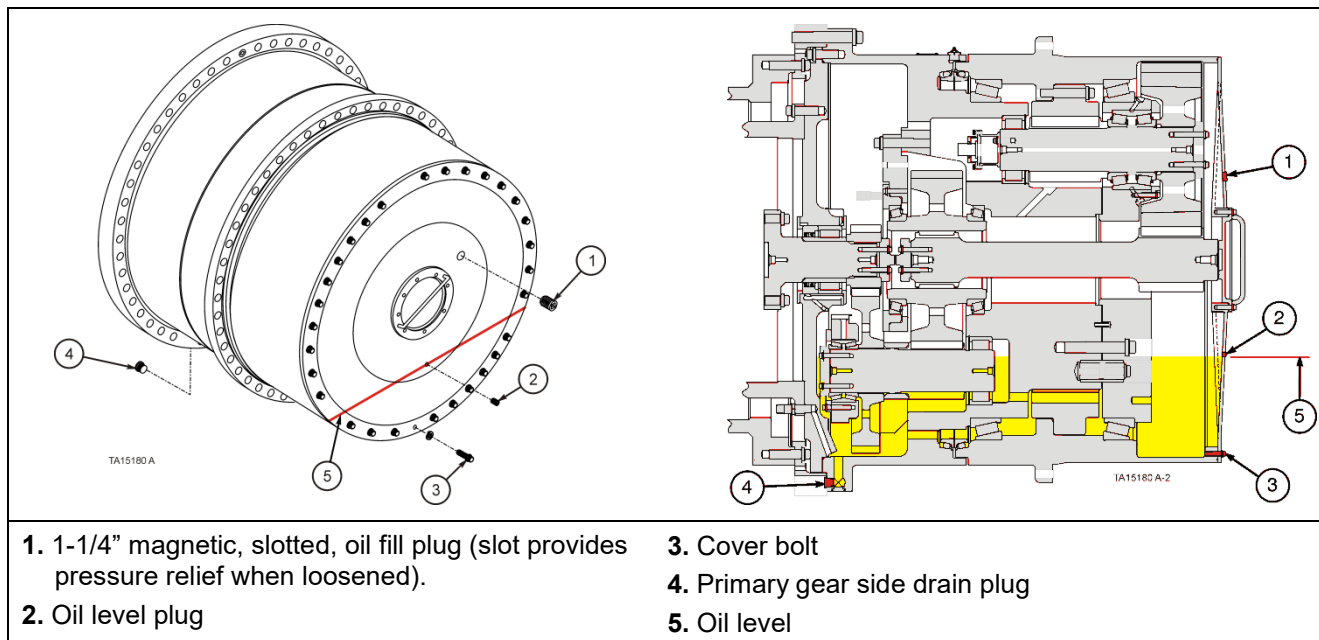


Figure 14. Oil servicing points for model 57 planetary drive

- a. Place oil capture containers underneath driver before removing plugs or capscrews.
- b. Catch all oil in suitable containers and dispose of properly.
- c. Turn the 1-1/4", magnetic, slotted oil fill plug until the slots are exposed and air begins to escape from the driver.
- d. Once air begins to flow from the slots - stop turning the slotted oil fill plug (1) and allow all the air to release.

CAUTION

Failure to remove the planetary drive oil fill plug (1) slowly to vent internal pressure before removing the oil level plug (2) could result in oil spraying from the planetary drive. This could result in personal injury or an environmental hazard.

- e. Once the air has been released – remove the slotted oil fill plug (1).
- f. Remove the cover structure capscrew (3) positioned at the bottom of the driver cover structure.

- g. Remove primary gear side drain plug (4). This plug is located on the bottom of the driver in a cutout on the axle as shown in the following photograph.

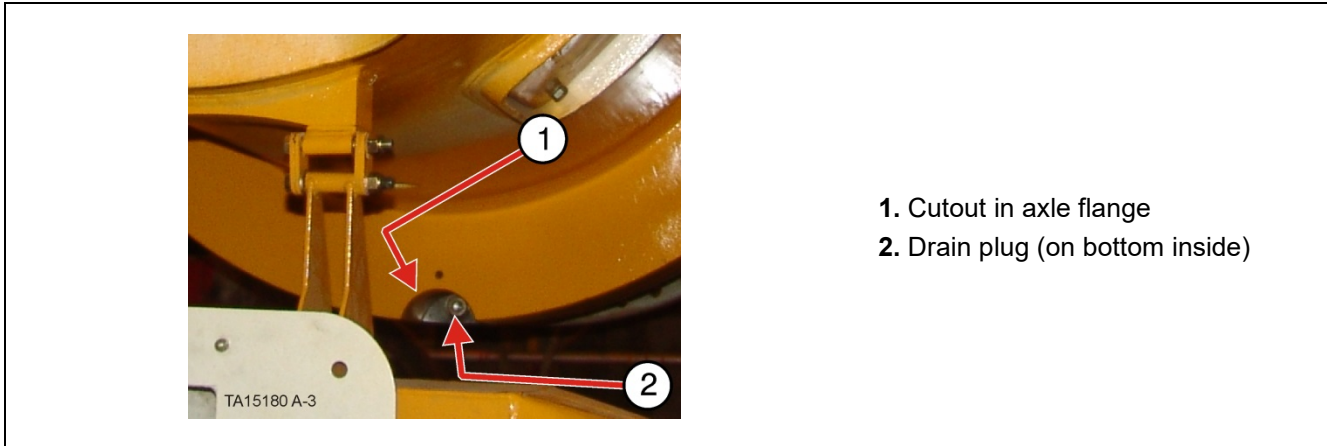


Figure 15. Primary gear side drain point – 57 planetary drive

1. Cutout in axle flange
2. Drain plug (on bottom inside)

- h. Drain all oil.
- i. Reinstall the primary gear side drain plug (4).
- j. Install the cover structure capscrew (3) with a copper washer. (The copper washer is used as the oil seal and should not be reused. A new copper washer should be installed before torquing the bolt.)
- k. Torque the cover structure capscrew to 50 ft. lb. (lubed with engine oil on the threads and under the head). This torque value is important as over torquing will damage the copper sealing washer.
- l. Fill the driver with recommended lubricant until oil barely drips from the oil level plug hole (2). DO NOT fill until oil RUNS from the fill plug (1).

CAUTION

Correct oil level is: 57 Model: 11.44" (291 mm) below the planetary drive centerline.

- g. Wait 15 minutes for oil to fill primary gear side, recheck level and fill until oil begins to drip from the oil level plug hole.
- h. Reinstall the oil level plug (2) and the slotted oil fill plug (1).

Flushing Models 51A3, and 57 Planetary Drives

To drain and flush a planetary drive, perform the following procedure. The following procedure should be performed per specific planetary drive model procedures as previously explained in this document.

NOTICE

When filling, draining, or checking oil levels of planetary drives, always be prepared to catch any excess oil that might run out of the planetary drive or be spilled during the draining or filling process. Dispose of all oil in a manner consistent with all local laws, rules, regulations or requirements. Do not allow oil to be put into streams or waterways. Failure to properly dispose of oil can cause an environmental spill.

Safety Preparations

WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine's SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.

- a. Stop the wheel loader on flat level ground.
- b. Rotate the "Oil Level" plug on the planetary drive to the bottom position.
- c. Place bucket flat and on level ground.
- d. Set the parking brakes.
- e. Shut off the engine.

WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- f. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.



Battery isolation switch in OFF position with locks in place

CAUTION

If cover capscrews are removed during procedure, do not reuse the copper washer. The copper washer serves as a seal and should be replaced. Failure to do so could result in leaks, causing planetary drive damage.

Flushing

- a. Drain per the specific planetary drive model instructions. BE SURE to drain the primary gear side.
- b. Replace capscrew, cover drain plug, and pipe plug (as applicable).
- c. Position and fill planetary drive with 30W motor oil (per proper filling procedure as applicable).
- d. Wait 15 minutes for oil to drain into primary gear side and recheck level. Add additional oil as required.
- e. Replace drain plug, filler plug, and capscrew (as applicable).
- f. Follow all lockout tag out rules, local rules, and local regulations to return the machine back to service.
- g. Propel the loader in non-material handling operations (non-loaded) for no more than two minutes.
- h. Follow all steps previously explained in “Machine Shutdown and Lockout” step.
- i. Drain planetary drive outside section side and primary gear side.
- j. Repeat process until oil is clean when drained out.
- k. Clean filtration system strainers and replace filters.
- l. Fill replacement filters before installation.
- m. Refill planetary drive with recommended lubricant, as previously described in this document.
- n. Wait 15 minutes for oil level to equalize into primary gear side.
- o. Recheck oil level and add additional oil as required.
- p. Replace fill plug, oil level plug, and capscrew (as applicable).

Internal Inspection Models 51A3 and 57

NOTICE

When filling, draining, or checking oil levels of planetary drives, always be prepared to catch any excess oil that might run out of the planetary drive or be spilled during the draining or filling process. Dispose of all oil in a manner consistent with all local laws, rules, regulations or requirements. Do not allow oil to be put into streams or waterways. Failure to properly dispose of oil can cause an environmental spill.

Safety Preparations

WARNING

Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine’s starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. ANYONE performing inspections or service procedures to the machine should be familiar with ALL instructions and procedures contained in the machine’s SERVICE MANUAL. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.

NOTICE

When filling, draining, or checking oil levels of planetary drives, always be prepared to catch any excess oil that might run out of the planetary drive or be spilled during the draining or filling process.

Dispose of all oil in a manner consistent with all local laws, rules, regulations or requirements. Do not allow oil to be put into streams or waterways. Failure to properly dispose of oil can cause an environmental spill.

Machine Shutdown and lockout

- a. Stop the wheel loader on flat level ground.
- b. Rotate the "Oil Level" plug on the planetary drive to its lowest possible position.
- c. Place bucket flat and on level ground.
- d. Set the parking brakes.
- e. Shut off the engine.

⚠ WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- f. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.



Battery isolation switch in OFF position with locks in place

Model 51A3

CAUTION

If cover capscrews are removed during any procedure, do not reuse the copper washer. The copper washer serves as a seal and should be replaced. Failure to do so could result in leaks, causing planetary drive damage.

Internal inspection: It is recommended that the middle pinion, countershaft gears, primary gears, and electric traction motor pinion be inspected for wear at each 5,000- hour rotation interval.

The Model 51A3 planetary drives must be drained and the cover structure removed to inspect the middle pinion and countershaft gears. Inspection of the primary gears and drive motor pinion requires removing the

drive motor from the planetary drive. Refer to “PLANETARY DRIVE”, section 03 in the Service Manual for planetary drive and drive motor assembly removal and installation instructions.

Model 57

Internal inspection: It is recommended that the middle pinion and countershaft gears be inspected for wear at each 20,000-hour rotation interval.

The Model 57 planetary drive middle pinion and countershaft gears can be inspected by removing the inspection plate on the cover structure. Draining the planetary drive is not required for inspection of the middle pinion and countershaft gears.

The Model 57 planetary drive middle pinion can be replaced if the other planetary drive gears are in good condition. This procedure can be performed without removing the planetary drive from the vehicle (refer to “Middle Pinion Removal and Replacement”). Any other repairs requiring additional disassembly of the planetary drive should be referred to a Komatsu authorized rebuild center.

Middle Pinion Removal and Replacement - Model 57 Planetary Drive

In the Model 57 planetary drive, the second reduction gear is center-hung between two bearings with a splined interface between this gear and the middle pinion. The splined interface enables the middle pinion to be removed so that the loader can continue to run if a planetary drive motor is disabled. In addition, the middle pinion can be replaced if the other planetary drive gearing is in good condition. Both operations can be accomplished without removing the planetary drive from the vehicle.

NOTICE

Operation of the planetary drive with the middle pinion removed should be on an emergency basis only. The planetary drive should be repaired as soon as possible and the middle pinion replaced before operating the loader in prolonged material handling operations.

To remove or replace the middle pinion, perform the following procedure:

Safety Preparations

Use the following process and local rules, requirements, and regulations to remove stored energy and to reduce the possibility of crush hazards before performing any work process on or around the machine.

Machine Shutdown and lockout

WARNING

Crush hazards exists if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine’s starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.

WARNING

Crush hazard exists if the frame lock is not locked to prevent machine articulation while personnel are in the machine articulation area. Do not enter this area unless you have verified that the operator has control over the steering and that you have good communication with the operator. Crush hazard is possible if personnel are in this area while the machine is articulated, which could result in serious injury or death.

⚠ WARNING

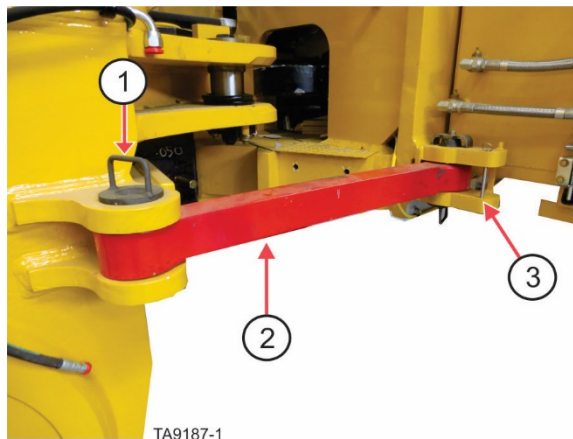


Shock hazard exists on the components of the KESS system. Perform the KESS discharge procedure to remove stored energy from the KESS system and bring the ESD to a stop. Once the ESD has stopped, perform the Bus Discharge Verification Procedure. Failure to do so may result in electrical shock or other injury.

⚠ WARNING

Crush hazards are possible if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. Serious personal injury or death could occur if the machine is started or moves while any type of work process is being conducted on the machine.

- a. Stop the wheel loader on flat level ground.
- b. Move the frame lock to the locked position so that the frame cannot be steered.



- 1) Retaining pin for locked position, 2) Frame lock – shown in locked position, 3) Retaining pin bracket for un-locked position
Shown in locked position

Figure 16. Frame Lock

- c. Set bucket flat and level on the ground.
- d. Place wheel chocks in front and behind each wheel.

Chocking against motion must be done using chocks rated for the equipment being chocked. Heavy mobile equipment must be chocked with appropriate chocks. Factors such as machine weight, size, wheel diameter, ground grade and others must be considered when selecting chocks

⚠️ WARNING

Crush hazard is possible if the frame lock is not locked to prevent machine articulation while personnel are in the machine articulation area. Do not enter this area unless you have verified that the operator has control over the steering and that you have good communication with the operator. Crush hazard is possible if personnel are in this area while the machine is articulated, which could result in serious injury or death.

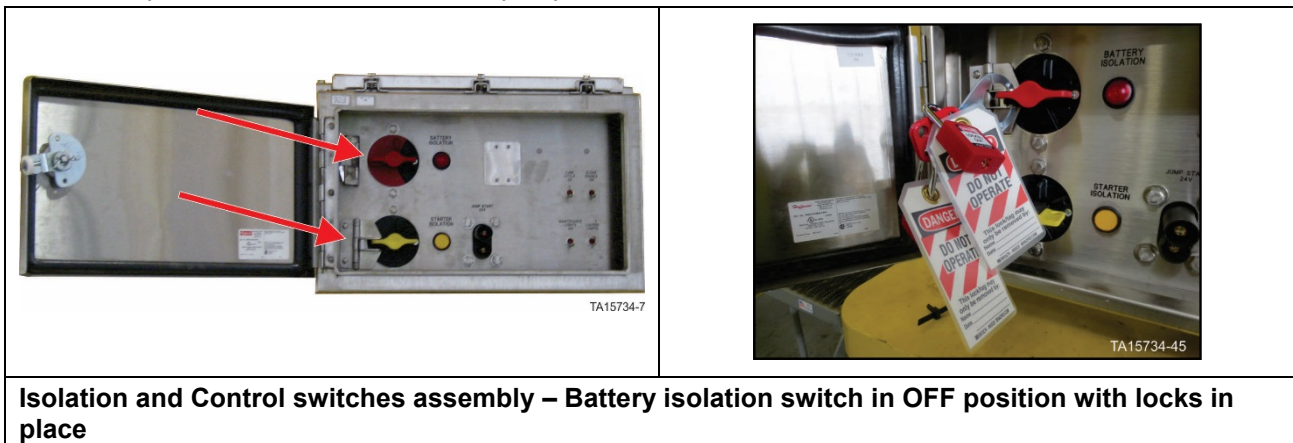
- e. Set the parking brakes.

The KESS (Kinetic Energy Storage System) is composed of one or more ESD's (Energy Storage Device), converter panels, and fuses, controlled by the Vehicle Control Unit (VCU).

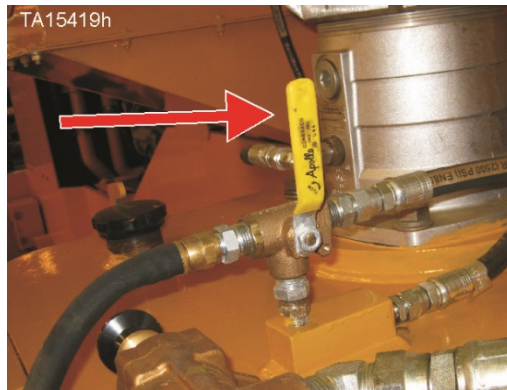
⚠️ WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- f. Shut off the engine.
- g. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch. Lock out the machine's starting capability before performing any cleaning, inspections, or installation and repair procedure.



- h. Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.
- i. Turn the handle to the up position as shown.



Hydraulic reservoir air valve handle UP

- j. Release the air from the various air storage reservoirs by opening all of the air bleed valves.

Three valves on right side of rear frame under hydraulic reservoir

One valve on right side of front frame near hoist cylinder ball cap

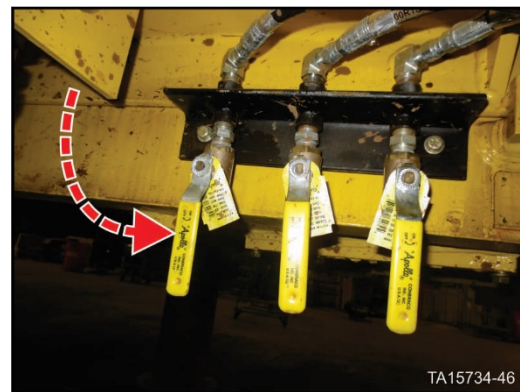
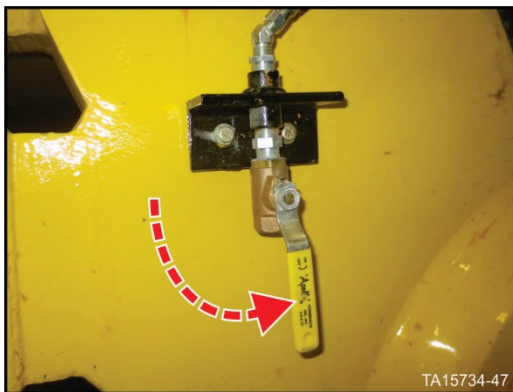
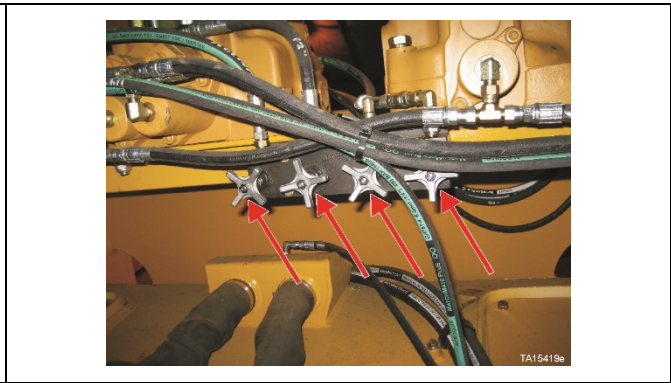
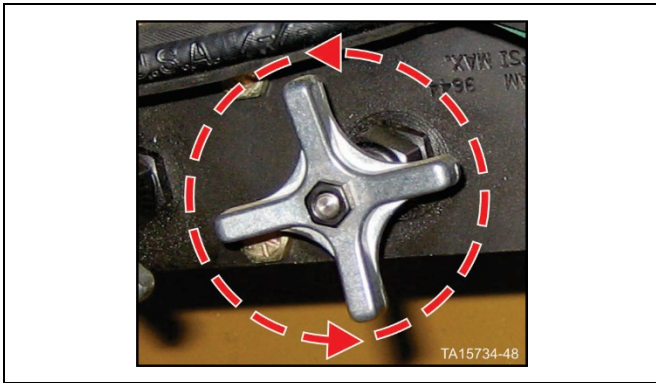


Figure 17. Open air reservoir bleed valves

WARNING

Crush hazard exists by the lift arms or bucket if all personnel are not cleared from the bucket and lift arm area before using the hydraulic hoist and bucket pilot pressure bleed down valves to relieve pressure from the hoist and bucket pilot circuit. Clear all personnel from the area around the bucket and lift arms before operating hydraulic hoist and bucket pilot pressure bleed down valves. Using the hydraulic bleed down valves could result in some movement of the lift arms and bucket which could cause injury or death.

- k. Use the hydraulic pressure bleed down valves located in the front frame underneath the Husco valves to bleed any stored pressure in the hoist and bucket circuit.
- Turn each valve slowly counterclockwise as shown below and allow the pressure to bleed down.
 - Open the valve completely and leave it open during repairs.



- I. Drain the hydraulic reservoir if applicable to the procedure being performed.

Converter Bus Voltage

WARNING



Risk of fatal shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINCS software indicates voltage on the bus, or the red bus LED's in the electrical cabinet are illuminated. All SR equipment has the ability to produce voltage at low throttle. Even with the engine off, there may be a residual of 12-15VDC on the bus. Do not enter the electrical cabinet or touch any components in the electrical cabinet without performing the Bus Discharge Verification Procedure. Failure to do so may result in fatal electrical shock or other injury.

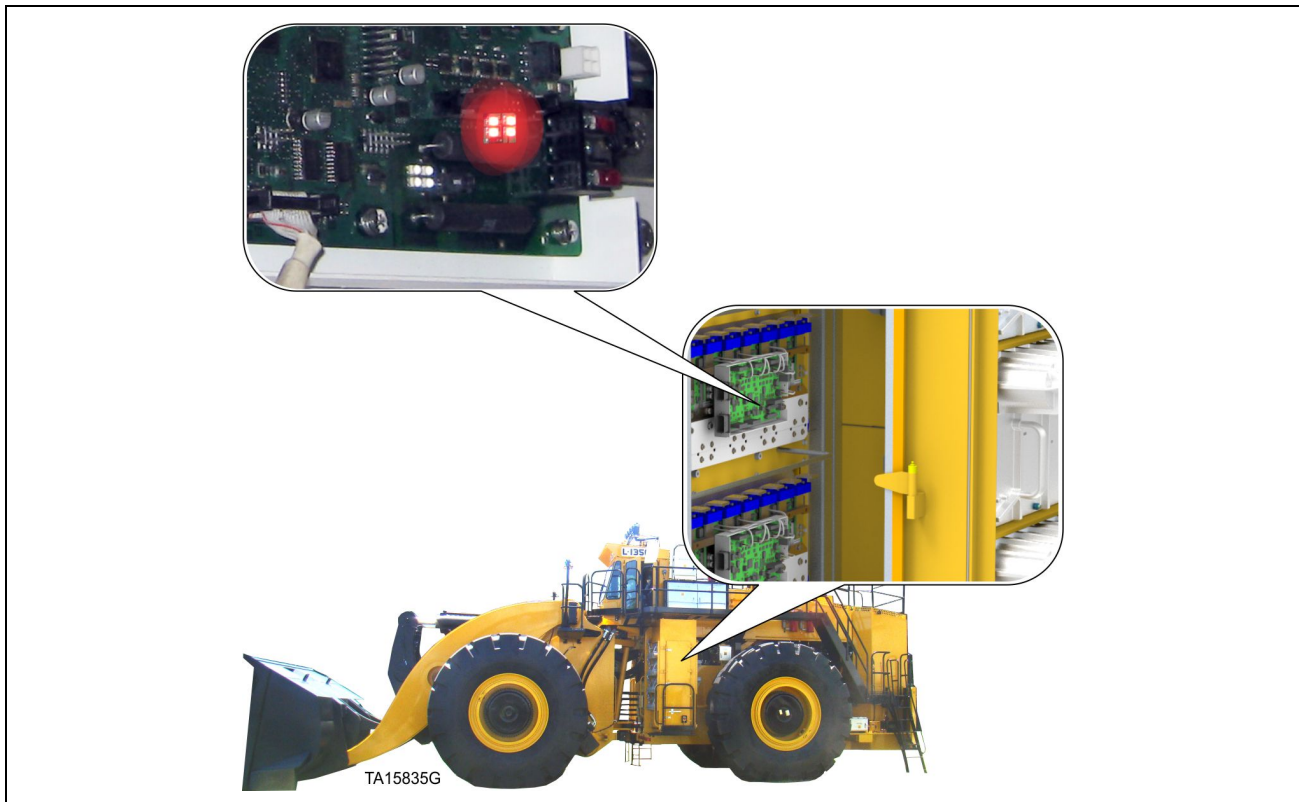


Figure 18. Converter assembly bus LED's

There are three different methods that are combined to verify when it is safe to enter the electrical cabinet.

LINCS II display in cab

visual indication in electrical cabinet

physical measurement

All of these steps are required in order to assure that the system is properly discharged.

In Cab Verification Using LINCS II Display

- a. Make sure that the LINCS II system is booted (key switch ON) with the engine NOT running and the park brake SET.
- b. As shown in the following figure, on the touch panel in the dash, press the Main Menu button in the lower left corner, then select Data Logging then Logging/Monitoring.



Figure 19. LINCS logging/monitoring menu access

- c. Select the Trash Can icon and then select the Check Mark to clear any selection on the right hand side of the screen (if applicable).

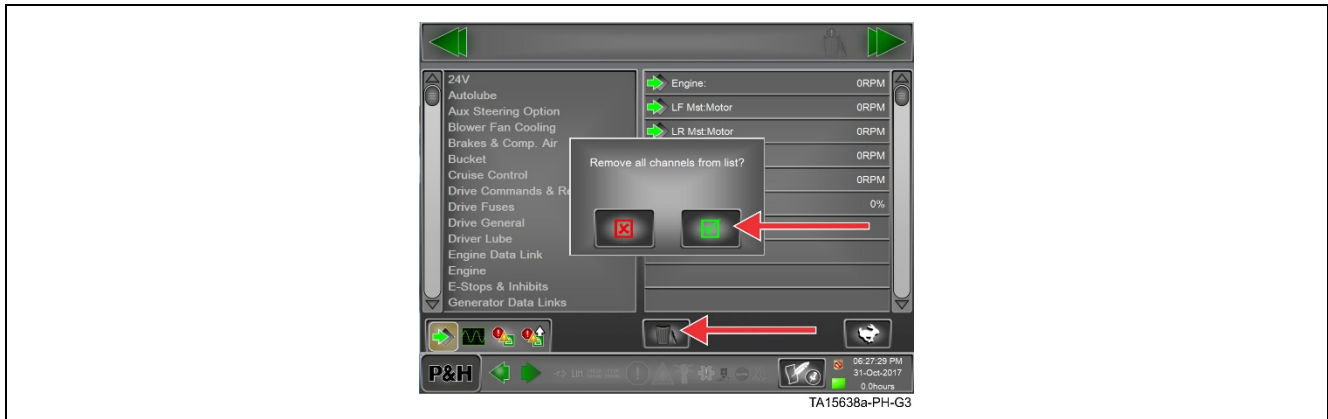


Figure 20. Remove channels

- d. Scroll down the left hand list until Drive Fuses is displayed.

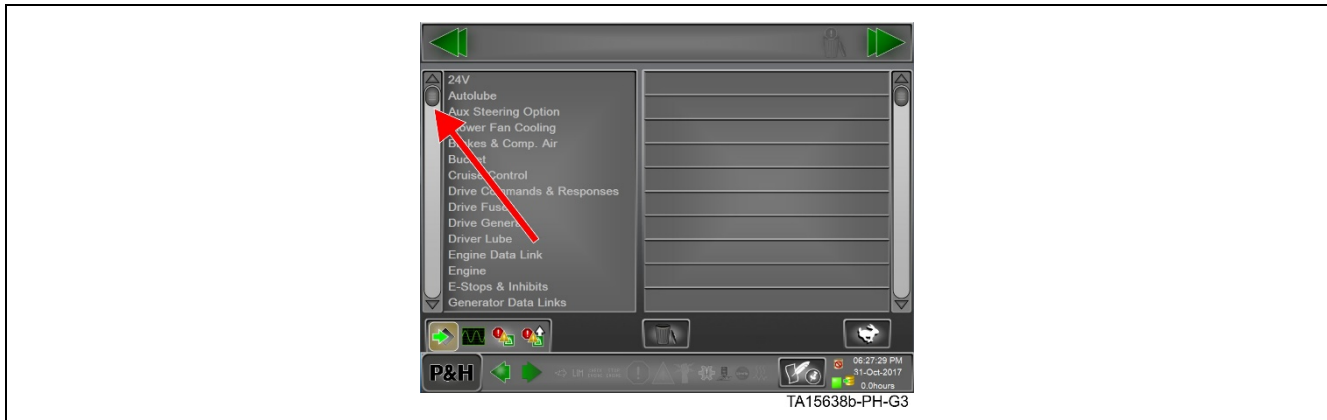


Figure 21. Left hand scroll

- e. Drag the Drive Fuses category to the right hand side of the screen, all of the bus voltage channels should now be visible.



Figure 22. Bus voltage indication

- f. Verify bus voltage is less than 24VDC.

NOTICE

Should any voltage (greater than 24VDC) be present on any of the DC busses, allow the system to discharge for a period of no less than 10 minutes. Re-test the bus voltages prior to continuing.

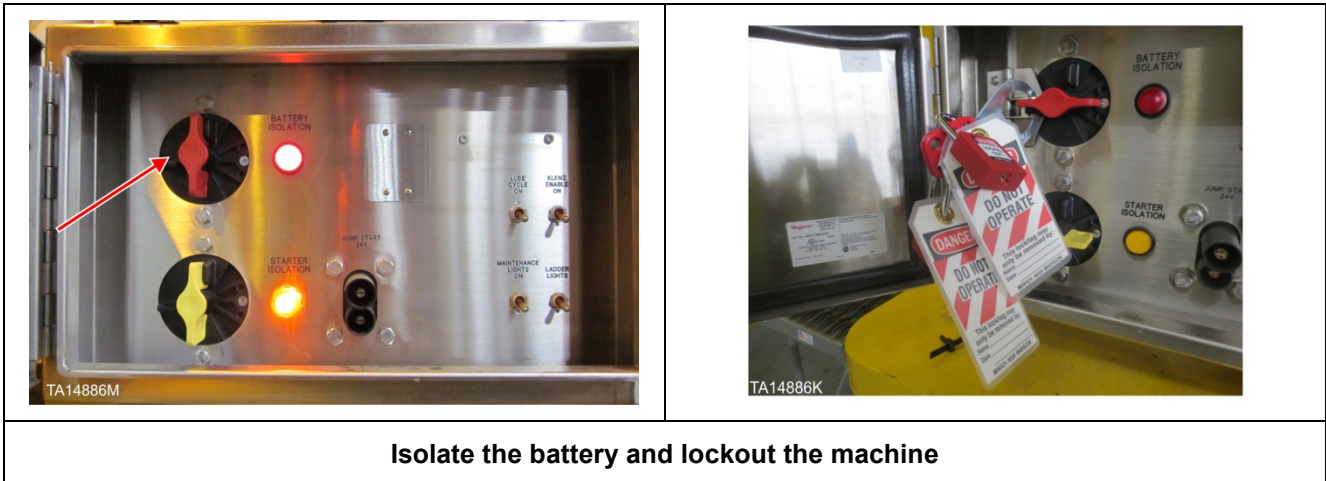
- g. Turn the key switch to the OFF position and proceed to the next step in the verification process.

Verification by Visual Indication

Following the verification by LINCS II software, the next step is to verify the existence of bus voltage by the array of four LED indicators located on the main SR control board on each converter assembly.

To conduct this test, ensure that:

- The 24V DC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



Isolate the battery and lockout the machine

Figure 23. Isolation and control switch assembly

- The SR electrical converter cabinet door should now be opened.
- DO NOT enter the cabinet at this time.

View the LED arrays on each of the converter assemblies and verify the LED's are not illuminated. The LED's will be illuminated when a potential of greater than approximately 35VDC is present on the DC bus connections on the converter assemblies. The light intensity varies with voltage and a greater intensity indicates a higher bus voltage.

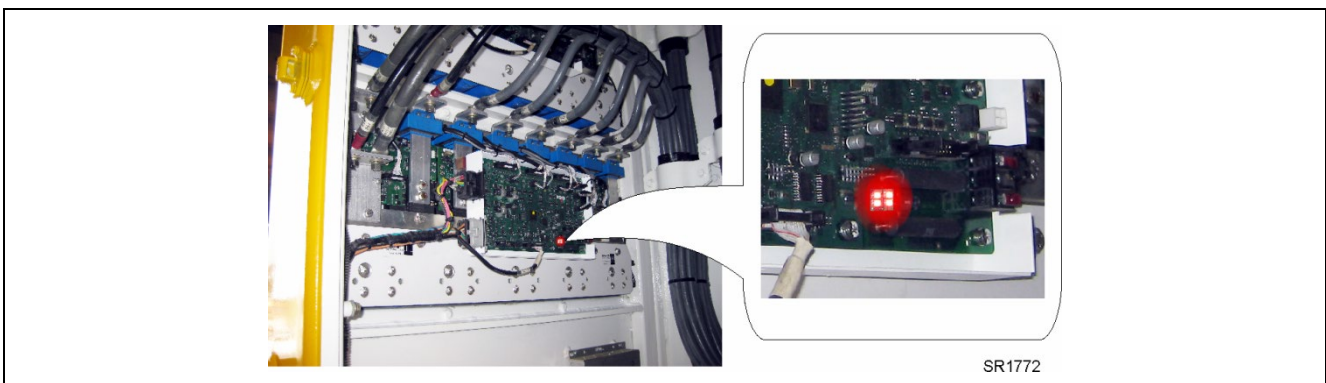


Figure 24. Bus voltage LED array on SR control board

Once verified that the LED's are NOT illuminated, proceed with Verification by Physical Measurement of the main bus bars.

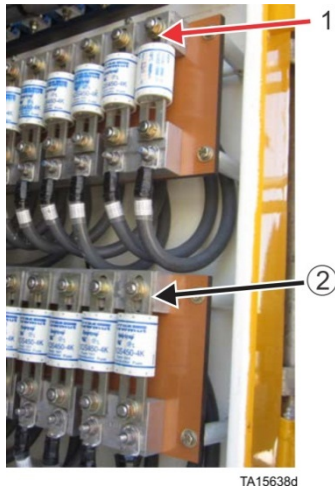
Verification by Physical Measurement Main Bus Bars

Once the visual indicators have been verified, the bus voltage should be physically measured. The bus voltage should be fully discharged based on the previous checks.

- a. Measure between the positive and negative bus bars using a voltmeter rated for 1000V. The potential voltage on a bus that has not discharged could be over 700VDC. A properly discharged bus should be less than 24VDC as verified by the completion of LINCS system verification.

WARNING

Risk of shock or equipment damage by use of an improperly rated meter is possible. Use a CAT III 1000V rated volt meter to take voltage readings. Shock or other injury may result from using improperly rated test equipment.



1) Positive bus bar, 2) Negative bus bar

Figure 25. Main bus bars

Converter Assembly Bus Connections

The final point of verification is the bus connections to each individual converter assembly. The bus voltage can be measured at the two bus tabs located adjacent to the electrical converter cabinet door.

NOTICE

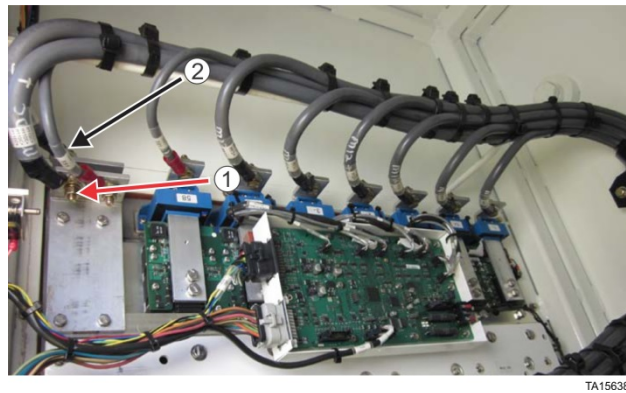
The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.

Connect a voltmeter across the two bus connection points. Bus voltage should be less than 24VDC following the completion of the previous checks. Once the check has been completed, the entire drive system has been verified as discharged.



1) Positive bus bar, 2) Negative bus bar

Figure 26. Converter assembly bus connections (rear of cabinet)



1) Positive bus bar, 2) Negative bus bar

Figure 27. Converter assembly bus connections (front of cabinet)

Once verified that bus voltage does not exist, entry into the electrical cabinet, axels, and grid area are permissible.

- a. Remove axle access covers.
- b. Release brake on the electric traction motor. Releasing the brake will enable the planetary drive to be turned, as needed, to free the meshing teeth of the middle pinion from those of the countershaft gears.

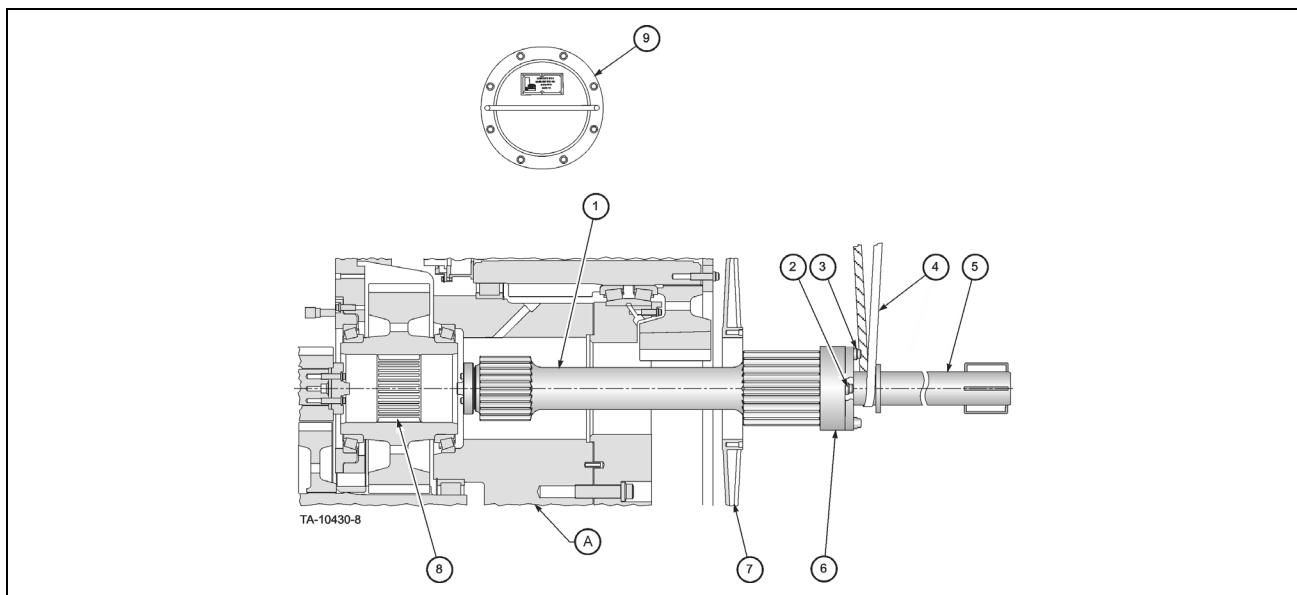
NOTICE

Use jack bolt, attached to top of brake caliper, to release brake. Refer to “BRAKES” in Section 05 in the service manual for additional information.

NOTICE

When filling, draining, or checking oil levels of planetary drives, always be prepared to catch any excess oil that might run out of the planetary drive or be spilled during the draining or filling process. Dispose of all oil in a manner consistent with all local laws, rules, regulations or requirements. Do not allow oil to be put into streams or waterways. Failure to properly dispose of oil can cause an environmental spill.

- c. Drain planetary drive.
 - Follow all local rules and regulations to catch and dispose of the oil drained from the drive.
- d. Remove the inspection plate located in the center of the planetary drive’s cover structure.
- e. Attach middle pinion removal hub P/N 423-4752 to the middle pinion with one 3/4” - 10 x 2.75” (3/4” - 10 x 69.85 mm) UNC bolt (refer to illustration “Middle Pinion Removal and Replacement”).



- | | |
|-------------------------------|--|
| 1. Middle pinion | |
| 2. 3/4” bolt – 10 x 2.75” UNC | 7. Cover structure |
| 3. 1” bolt – 8 x 3.5” UNC | 8. Splined interface second reduction gear |
| 4. Fiber lifting sling | 9. Inspection plate (removed from access) |
| 5. Removal arm | A. Partial view of drive |
| 6. Removal hub | |

Figure 28. Middle pinion removal/replacement model 57

- f. Attach middle pinion removal arm P/N 423-4753 to the removal hub with eight 1” - 8 x 3.5” UNC bolts.
- g. Attach a fiber-lifting sling securely around the pinion removal arm as shown in illustration below “Middle Pinion Removal and Replacement” and hoist the pinion from the planetary drive with a suitable hoist.

 **CAUTION**

Crush hazard exists when removing and replacing the middle pinion. The middle pinion weighs approximately 200 lbs (91 kgs). Wear all necessary personal protective equipment including steel-toed work boots, and use caution when removing and replacing the middle pinion. The removal arm will provide a balancing point when hoisting the pinion to and from the planetary drive, if the lifting sling is positioned against the mounting face of the removal arm, as shown in illustration “Middle Pinion Removal and Replacement”. Maintain a firm grasp on the removal arm at all times while hoisting the pinion. Failure to wear proper PPE and use caution when removing and replacing the middle pinion can cause crush hazard resulting in serious injury.

- h. If pinion is to be reused, secure it to a sturdy pallet and transport it to a clean, dust-free storage facility. Protect it with a rust inhibitor such as SHAFFER #802 (P/N 414-3841) until reinstallation.
- i. If the machine is to be operated without the middle pinion, replace inspection plate, and place frame lock in the unlocked position.

Planetary Drive Model 57 Middle Pinion Replacement

The middle pinion is reinstalled into the planetary drive by reversing the removal instructions.

- a. Be sure the pinion is clean and free of rust prior to installation.
- b. Attach removal hub and removal arm as described above.
- c. Lubricate the splines and gear teeth with NLGI #2 lithium based grease.
- d. Attach fiber-lifting sling to removal arm and hoist pinion into position in the planetary drive. It may be necessary to reposition the pinion until the teeth on the splined end match the countershaft gear teeth until the pinion slides into place in the splined interface of the second reduction gear. The pinion has approximately 1/8" (3.175 mm) endplay between the pinion thrust face retainer plate and the motor pinion thrust face retainer plate and the inspection plate.
- e. Remove hub and arm and replace inspection plate.
- f. Refill planetary drive with oil.
- g. Reset brake on electric traction motor.
- h. Move frame lock to unlocked position.
- i. Follow all lockout tag out rules, local rules, and local regulations to return the machine back to service.

Planetary Drive Rebuild (Models 51A3 and 57)

Operational data on the Models 51A3 and 57 planetary drives indicates extended hours of operation before rebuild is necessary, however, no exact hourly recommendations for rebuild can be made. The decision to rebuild should be made by examining the middle pinion, countershaft gears, primary gears, and oil analysis wear trend data. Contact your service center should any abnormal or excessive wear patterns be noted at each multi-hour inspection or should oil analysis indicate component failure is imminent.

The planetary drive should be rebuilt by a Komatsu authorized rebuild center. Contact your service center for the appropriate rebuild center to handle requirements.

Planetary Drive Rotation Patterns for Models 51A3 and 57

It is recommended that the model 51A3 planetary drives be rotated every 5,000 hours to reverse the wear on individual gear teeth.

It is recommended that the model 57 planetary drives be rotated every 10,000 hours to reverse the wear on individual gear teeth.

Model 51A3: The correct rotation patterns are shown in illustration " Planetary drive rotation patterns for L-1350 with 51A3 planetary drive". Alternate between the 5,000 and 10,000-hour rotation patterns and repeat every 5,000 hours of operation for the life of the machine.

Model 57: The correct rotation patterns are shown in illustration " Planetary drive rotation patterns for L-1850/2350 with 57 planetary drive". Alternate between the 10,000 and 20,000-hour rotation patterns and repeat every 10,000 hours of operation for the life of the machine.

Planetary Drive Rotation for Model 51A3

Safety Preparations

Use the following process and local rules, requirements, and regulations to remove stored energy and to reduce the possibility of crush hazards before performing any work process on or around the machine.

Machine Shutdown and lockout

WARNING

Crush hazards exists if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. Crush hazard could occur if the machine is started or moves while any type of work process is being conducted on the machine, resulting in serious injury or death.

WARNING

Crush hazard exists if the frame lock is not locked to prevent machine articulation while personnel are in the machine articulation area. Do not enter this area unless you have verified that the operator has control over the steering and that you have good communication with the operator. Crush hazard is possible if personnel are in this area while the machine is articulated, which could result in serious injury or death.

⚠️ WARNING

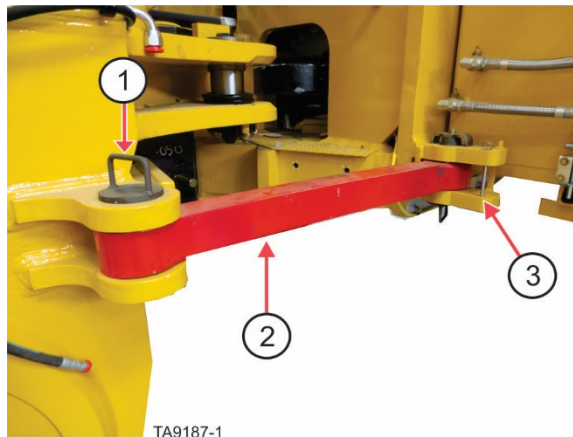


Shock hazard exists on the components of the KESS system. Perform the KESS discharge procedure to remove stored energy from the KESS system and bring the ESD to a stop. Once the ESD has stopped, perform the Bus Discharge Verification Procedure. Failure to do so may result in electrical shock or other injury.

⚠️ WARNING

Crush hazards are possible if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. Serious personal injury or death could occur if the machine is started or moves while any type of work process is being conducted on the machine.

- a. Stop the wheel loader on flat level ground.
- b. Move the frame lock to the locked position so that the frame cannot be steered.



- 1) Retaining pin for locked position, 2) Frame lock – shown in locked position,
- 3) Retaining pin bracket for un-locked position

Shown in locked position

Figure 29. Frame Lock

- c. Set bucket flat and level on the ground.
- d. Place wheel chocks in front and behind each wheel.
 - Chocking against motion must be done using chocks rated for the equipment being chocked. Heavy mobile equipment must be chocked with appropriate chocks. Factors such as machine weight, size, wheel diameter, ground grade and others must be considered when selecting chocks

⚠️ WARNING

Crush hazard is possible if the frame lock is not locked to prevent machine articulation while personnel are in the machine articulation area. Do not enter this area unless you have verified that the operator has control over the steering and that you have good communication with the operator.

Crush hazard is possible if personnel are in this area while the machine is articulated, which could result in serious injury or death.

- e. Set the parking brakes.

The KESS (Kinetic Energy Storage System) is composed of one or more ESD's (Energy Storage Device), converter panels, and fuses, controlled by the Vehicle Control Unit (VCU).

The ESD operates in a range of 1,600 to 6,000 RPM when the machine is at high throttle and the park brake is released. If the KESS is not discharged, the ESD can continue to rotate for two hours once the machine has been shut down.

Before performing any work procedures on the KESS system, verify the ESD is not rotating. Verification can be accomplished by using the LINC'S II software to view the ESD RPM.

The purpose of the KESS discharge procedure is to dissipate potential energy so that the KESS system components may be serviced or repaired. If for any reason, the KESS cannot be discharged, service on the machine must be delayed for two hours, giving the ESD time to come to a complete stop.

Discharging the KESS should be done before shutting the machine down by performing the following steps:



Figure 30. Operators Screen – KESS at 60%

- f. Ensure Park Brake is SET
- g. Place machine at LO Throttle
- h. Select Main Menu button
- i. Select Data Logging
- j. Select Logging/Monitoring
- k. Select Energy Storage Data Link
- l. Move ESD 1 Mst:Motor (RPM) and ESD 2 Mst:Motor (RPM) to right column by clicking and dragging



Figure 31. ESD Motor Channel Select

m. Press the Drive Enable Switch



Figure 32. Drive Enable Switch

n. The ESD Mst:Motor RPM will start to decline and will reach 0 RPM in approximately 35 seconds.

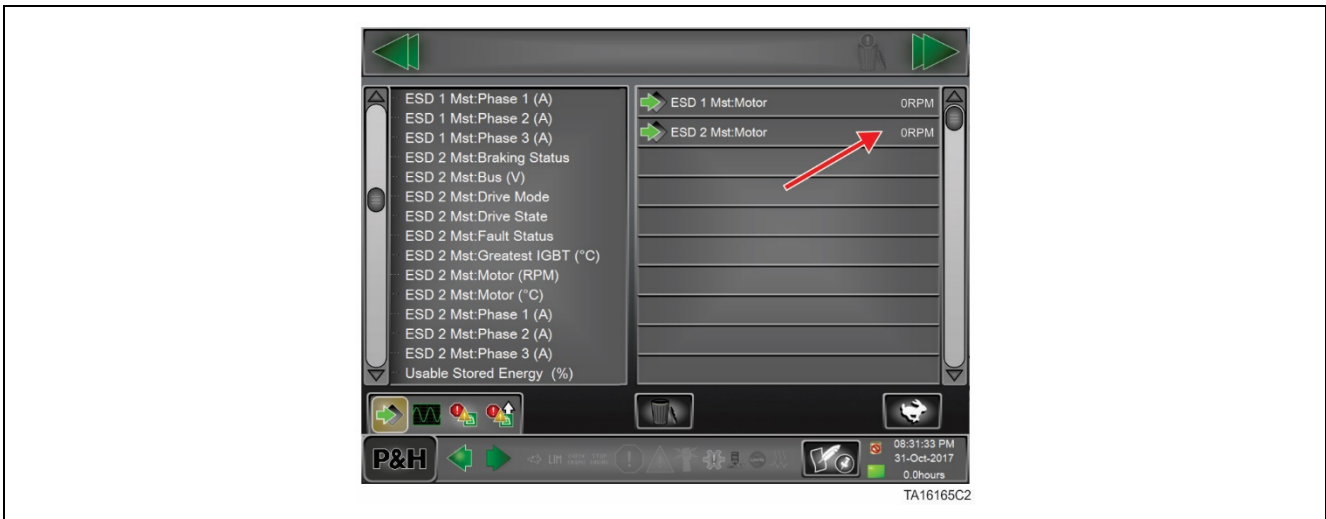
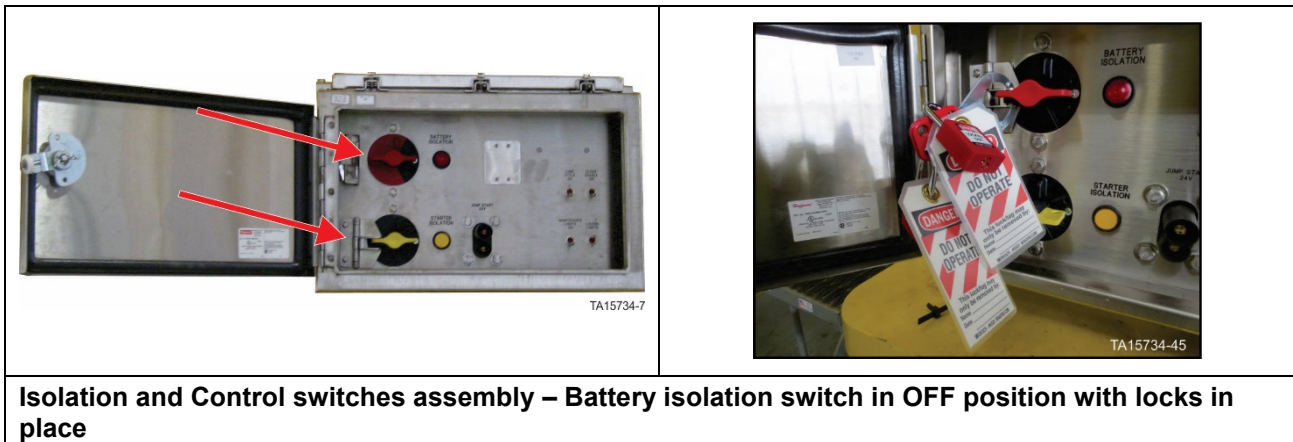


Figure 33. ESD Motor RPM

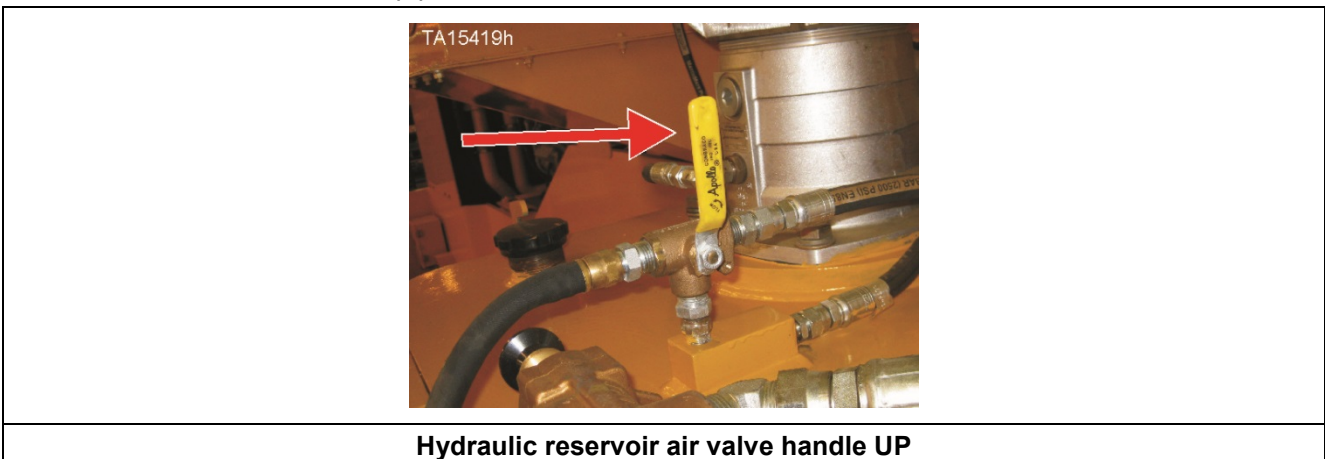
⚠ WARNING

Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing this stored energy (suspended loads, electrical power, air pressure, etc.). Risk of crushing, shock, or other physical injury exists if stored energy is not removed or isolated prior to working on the machine which could result in serious injury or death.

- o. Shut off the engine.
- p. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch. Lock out the machine's starting capability before performing any cleaning, inspections, or installation and repair procedure.



- q. Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.
- r. Turn the handle to the up position as shown.



- s. Release the air from the various air storage reservoirs by opening all of the air bleed valves.

Three valves on right side of rear frame under hydraulic reservoir

One valve on right side of front frame near hoist cylinder ball cap

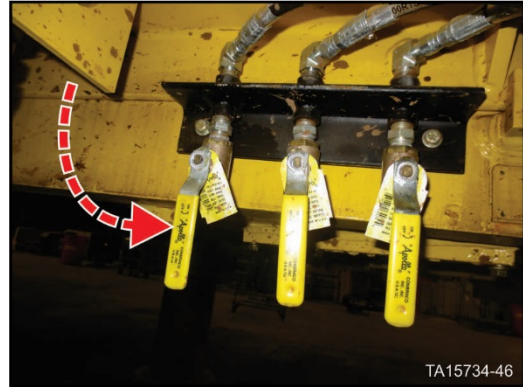
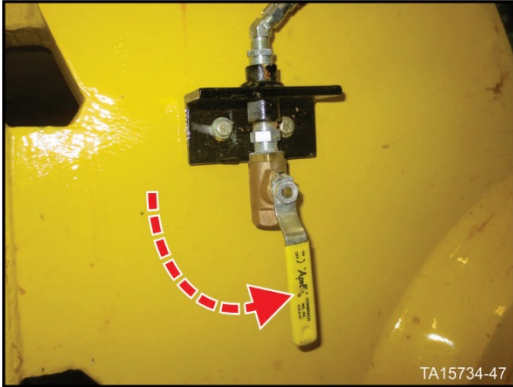
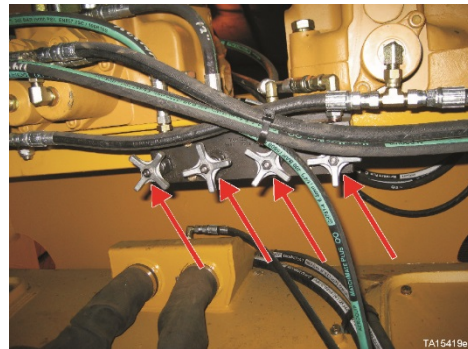
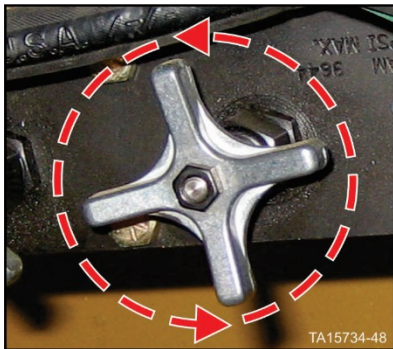


Figure 34. Open air reservoir bleed valves

⚠ WARNING

Crush hazard exists by the lift arms or bucket if all personnel are not cleared from the bucket and lift arm area before using the hydraulic hoist and bucket pilot pressure bleed down valves to relieve pressure from the hoist and bucket pilot circuit. Clear all personnel from the area around the bucket and lift arms before operating hydraulic hoist and bucket pilot pressure bleed down valves. Using the hydraulic bleed down valves could result in some movement of the lift arms and bucket which could cause injury or death.

- t. Use the hydraulic pressure bleed down valves located in the front frame underneath the Husco valves to bleed any stored pressure in the hoist and bucket circuit.
 - o Turn each valve slowly counterclockwise as shown below and allow the pressure to bleed down.
 - o Open the valve completely and leave it open during repairs.



- u. Drain the hydraulic reservoir if applicable to the procedure being performed.

Converter Bus Voltage

WARNING



Risk of fatal shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINC'S software indicates voltage on the bus, or the red bus LED's in the electrical cabinet are illuminated. All SR equipment has the ability to produce voltage at low throttle. Even with the engine off, there may be a residual of 12-15VDC on the bus. Do not enter the electrical cabinet or touch any components in the electrical cabinet without performing the Bus Discharge Verification Procedure. Failure to do so may result in fatal electrical shock or other injury.

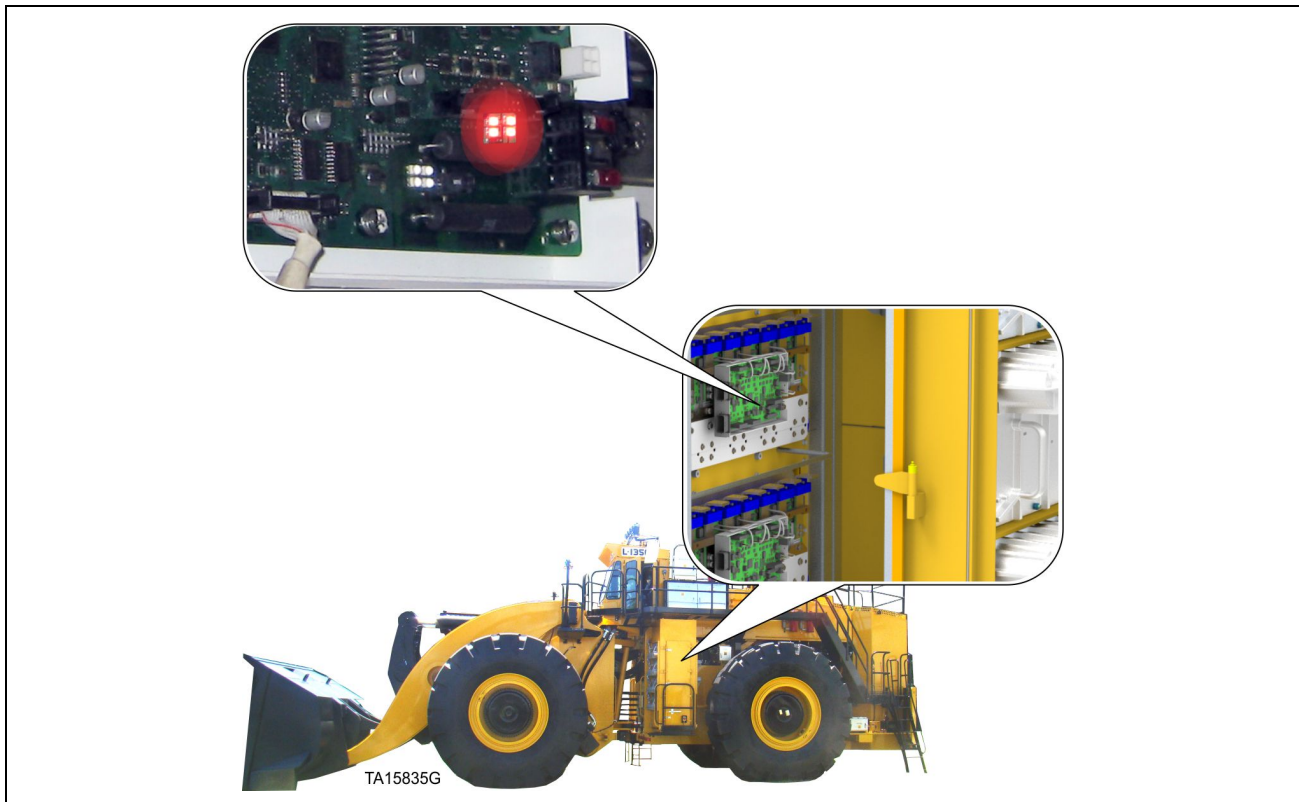


Figure 35. Converter assembly bus LED's

There are three different methods that are combined to verify when it is safe to enter the electrical cabinet.

- LINC'S II display in cab
- visual indication in electrical cabinet
- physical measurement

All of these steps are required in order to assure that the system is properly discharged.

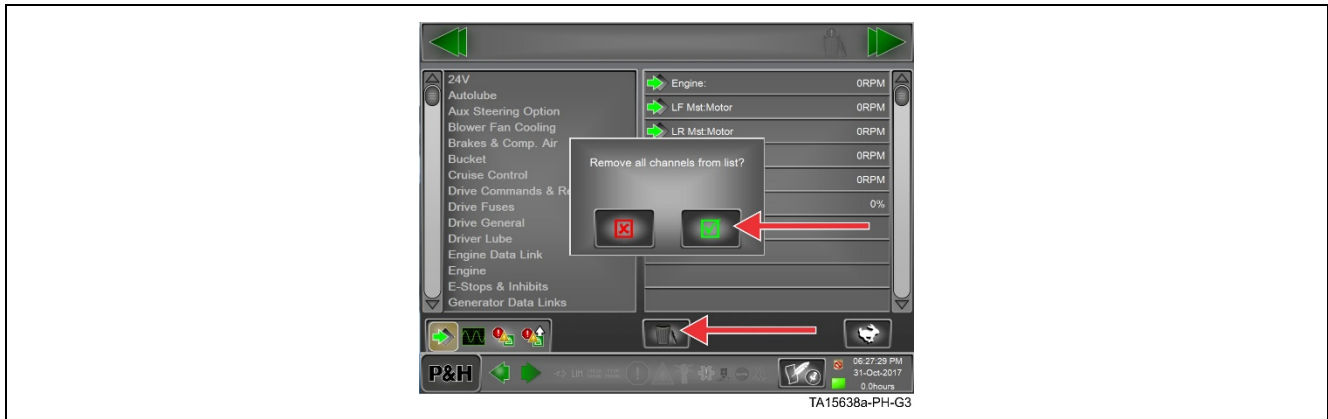
In Cab Verification Using LINCS II Display

- a. Make sure that the LINCS II system is booted (key switch ON) with the engine NOT running and the park brake SET.
- b. As shown in the following figure, on the touch panel in the dash, press the Main Menu button in the lower left corner, then select Data Logging then Logging/Monitoring.



Figure 36. LINCS logging/monitoring menu access

- c. Select the Trash Can icon and then select the Check Mark to clear any selection on the right hand side of the screen (if applicable).



- d. Scroll down the left hand list until Drive Fuses is displayed.



Figure 38. Left hand scroll

- e. Drag the Drive Fuses category to the right hand side of the screen, all of the bus voltage channels should now be visible.

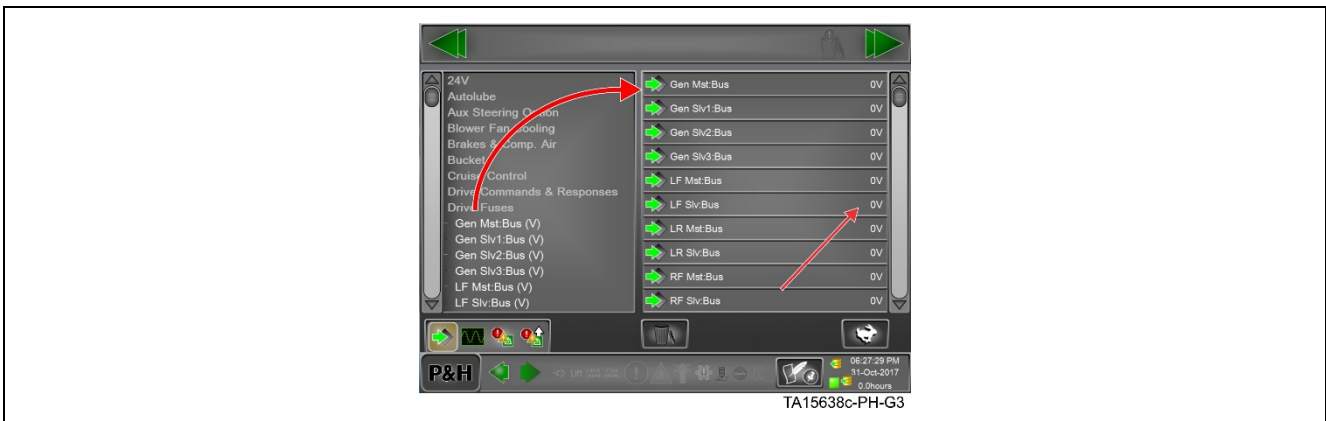


Figure 39. Bus voltage indication

- f. Verify bus voltage is less than 24VDC.

NOTICE

Should any voltage (greater than 24VDC) be present on any of the DC busses, allow the system to discharge for a period of no less than 10 minutes. Re-test the bus voltages prior to continuing.

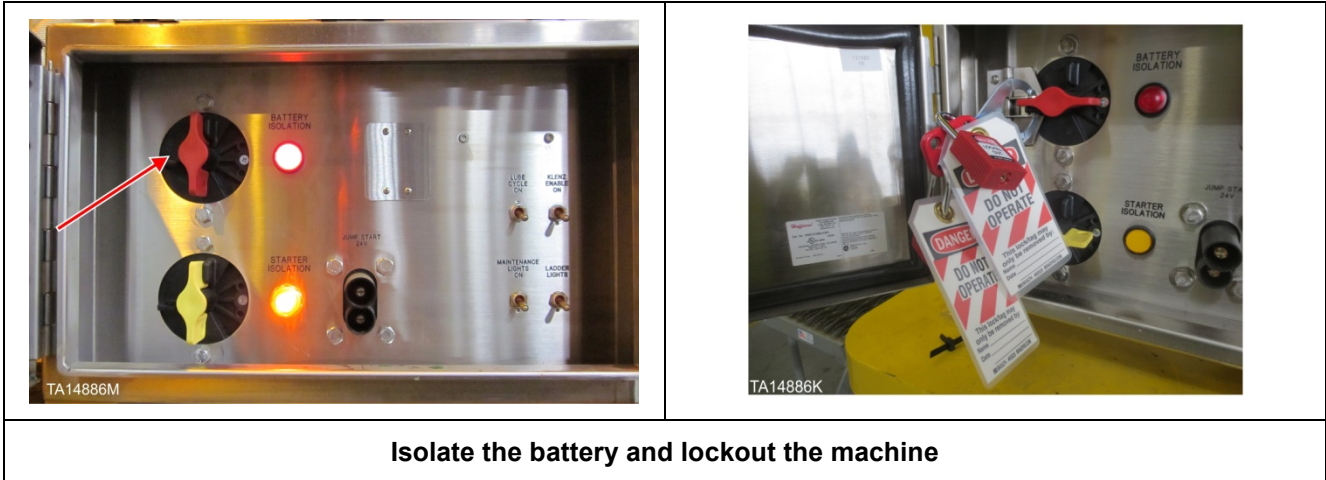
- g. Turn the key switch to the OFF position and proceed to the next step in the verification process.

Verification by Visual Indication

Following the verification by LINCS II software, the next step is to verify the existence of bus voltage by the array of four LED indicators located on the main SR control board on each converter assembly.

To conduct this test, ensure that:

- The 24V DC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



Isolate the battery and lockout the machine

Figure 40. Isolation and control switch assembly

- The SR electrical converter cabinet door should now be opened.
- DO NOT enter the cabinet at this time.

View the LED arrays on each of the converter assemblies and verify the LED's are not illuminated. The LED's will be illuminated when a potential of greater than approximately 35VDC is present on the DC bus connections on the converter assemblies. The light intensity varies with voltage and a greater intensity indicates a higher bus voltage.

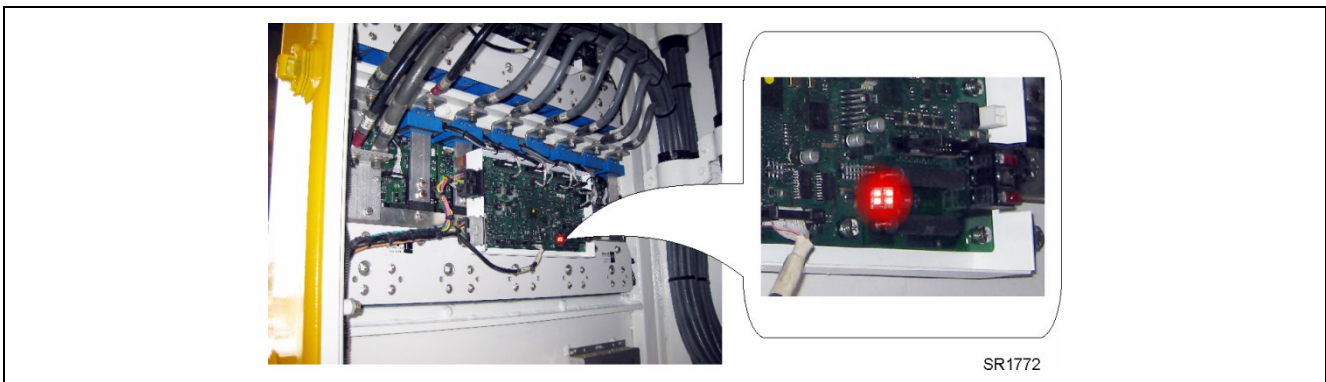


Figure 41. Bus voltage LED array on SR control board

Once verified that the LED's are NOT illuminated, proceed with Verification by Physical Measurement of the main bus bars.

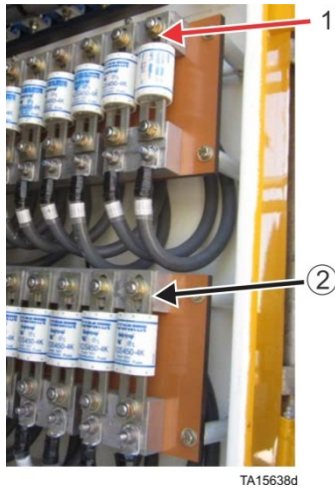
Verification by Physical Measurement Main Bus Bars

Once the visual indicators have been verified, the bus voltage should be physically measured. The bus voltage should be fully discharged based on the previous checks.

- a. Measure between the positive and negative bus bars using a voltmeter rated for 1000V. The potential voltage on a bus that has not discharged could be over 700VDC. A properly discharged bus should be less than 24VDC as verified by the completion of LINCS system verification.

WARNING

Risk of shock or equipment damage by use of an improperly rated meter is possible. Use a CAT III 1000V rated volt meter to take voltage readings. Shock or other injury may result from using improperly rated test equipment.



1) Positive bus bar, 2) Negative bus bar

Figure 42. Main bus bars

Converter Assembly Bus Connections

The final point of verification is the bus connections to each individual converter assembly. The bus voltage can be measured at the two bus tabs located adjacent to the electrical converter cabinet door.

NOTICE

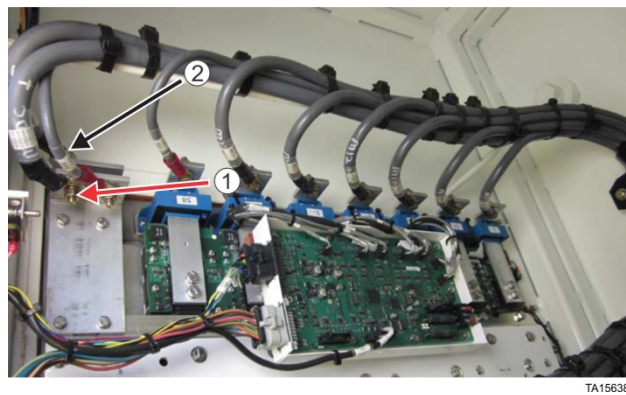
The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.

Connect a voltmeter across the two bus connection points. Bus voltage should be less than 24VDC following the completion of the previous checks. Once the check has been completed, the entire drive system has been verified as discharged.



1) Positive bus bar, 2) Negative bus bar

Figure 43. Converter assembly bus connections (rear of cabinet)



1) Positive bus bar, 2) Negative bus bar

Figure 44. Converter assembly bus connections (front of cabinet)

Once verified that bus voltage does not exist, entry into the electrical cabinet, axels, and grid area are permissible.

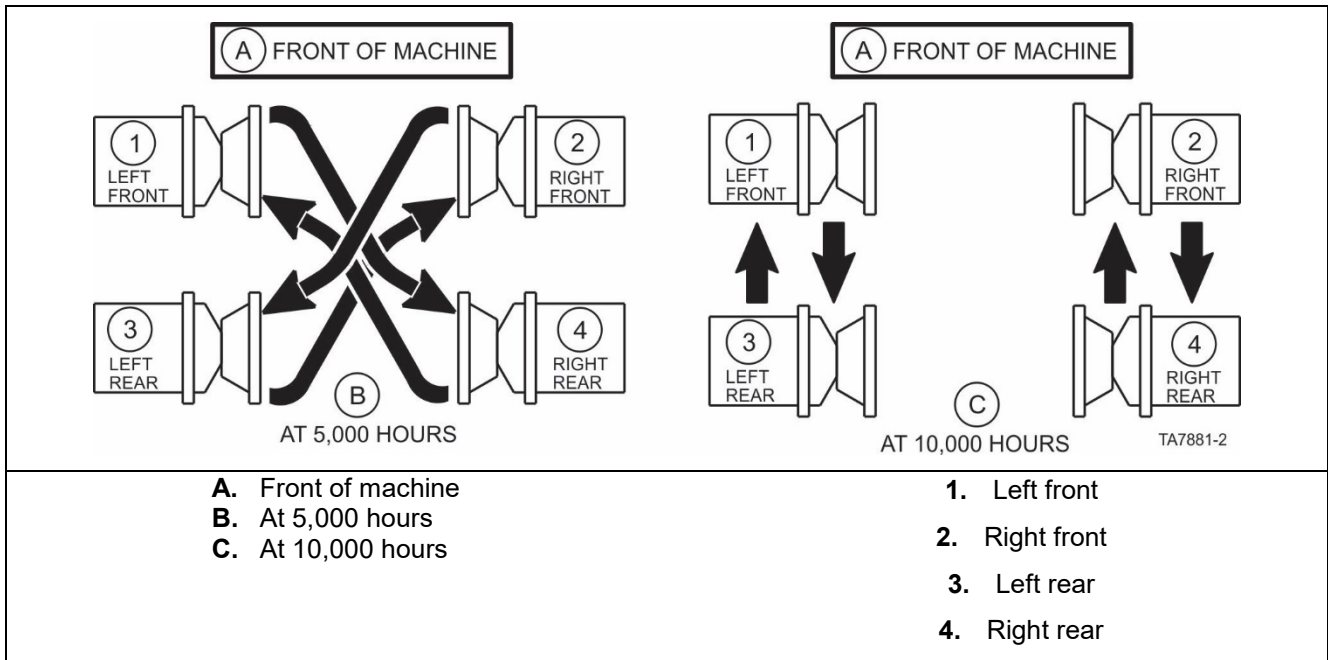


Figure 45. Planetary drive rotation patterns for L-1350 with 51A3 planetary drive

Planetary Drive Rotation Patterns for Model 57

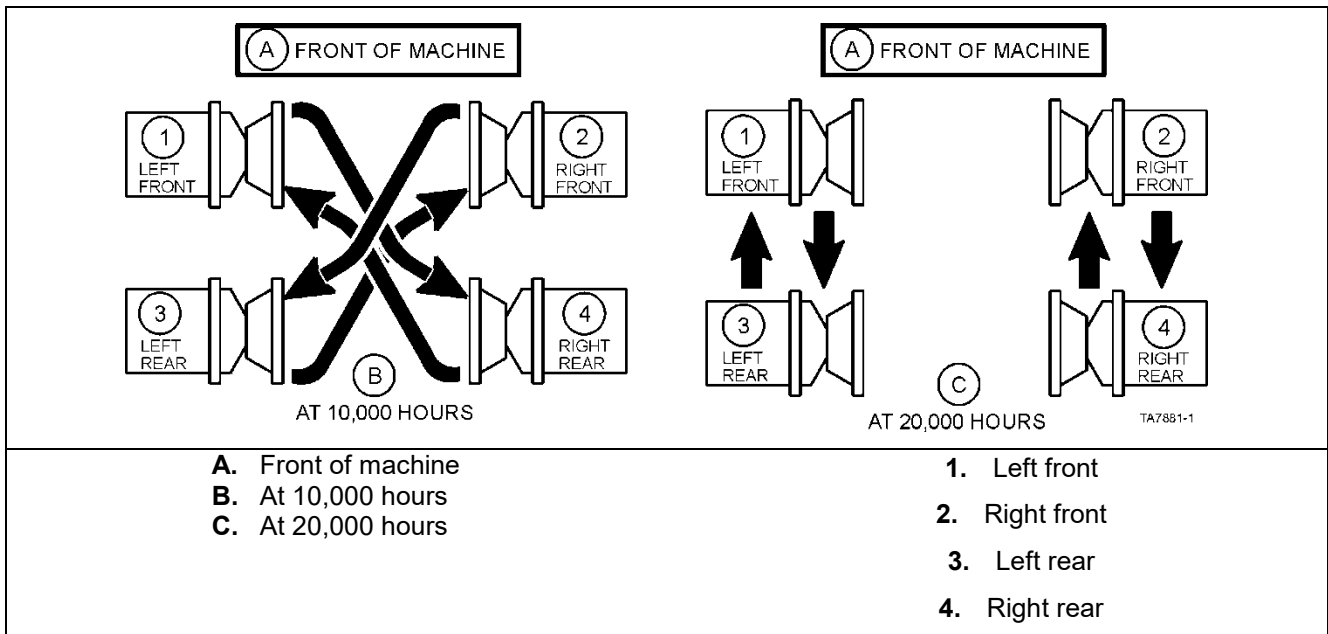


Figure 46. Planetary drive rotation patterns for L-1850/2350 with 57 planetary drive

Refer to "TRACTION MOTOR AND PLANETARY DRIVE" for planetary drive and traction motor assembly removal and installation instructions.