

# Modular PM Schedules (Post Break in Period)

## Section 02-01-03

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

A program of on-the-job preventive maintenance is necessary to ensure maximum performance and availability of the equipment. If inspections and services are regularly performed, Komatsu equipment will serve its owners efficiently throughout a long and active service life.

The following suggested preventive maintenance program is intended as a guide for maintenance personnel and operators assigned to the machine. Vary the suggested intervals more frequently, as required, when the machine is subjected to extremes of temperature, prolonged operation, sandy or dusty conditions, or exposure to moisture.

BREAK-IN PERIOD SERVICE instructions are provided in Section 02-01-02 in the Service Manual. A BREAK-IN PERIOD SERVICE CHECKLIST is provided with those instructions. The OPERATOR'S DAILY OR PRE-SHIFT WALK-AROUND INSPECTION should be completed from the first day the machine is put in service. The BREAK-IN PERIOD SERVICE CHECKLIST should be used for the 10 hour non-material handling break-in period, and the initial 100, 250, 500, and 1000 hour service intervals. Copies of these completed documents should be kept in the machine's permanent file to verify customer responsibilities for meeting warranty requirements.

Following the break-in period service intervals, the applicable MODULAR PREVENTIVE MAINTENANCE SCHEDULES provided herein should be used. Copy the schedules for use in your PM program. The PM schedules can be printed on 8 1/2" x 11" or A4-size paper.

## NOTICE

**ANYONE** performing inspections or service procedures to the machine should pay special attention to the safety advisories contained within this publication.

The left or right side of the machine is determined as when sitting in the operator seat, **NOT** standing in front of the machine and facing it.

The left or right side of the engine is determined as when standing in front of the generator, looking toward the radiator.

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# 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 hazards exist if all personnel are not cleared from the bucket and lift arm area before using the hydraulic hoist and bucket hydraulic pressure bleed down valves to relieve pressure from the hoist and bucket circuit. Clear all personnel from the area around the bucket and lift arms before operating hydraulic hoist and bucket hydraulic pressure bleed down valves. Using the hydraulic bleed down valves could result in some movement of the lift arms and bucket which could cause a crush hazard resulting serious injury or death.
- Crush hazards exist when a load is suspended. Suspended loads can fall. Never work under suspended loads. Working under suspended loads could cause a crushing hazard which might result in serious injury or death.
- 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. 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 if non-essential personnel are not alerted to stay clear of machine during operational/energized inspections. Alert non-essential personnel to stay clear of the machine while it is being inspected or serviced. Alert all personnel in the area that the machine is going to be moved during the inspection or service procedure. When conducting energized or operational tests, place barriers and signs to alert non-essential personnel to keep clear of the area. Failure to alert all personnel in the area that the machine is going to be moved could result in crush hazards, resulting in serious injury or death.
- Crush hazards exist under rear of machine. Counter weight mounted under the rear frame. Do not enter this area unless the counterweights have been externally supported to prevent falling. Do not loosen the bolts for the counterweight structure unless the counter weights are externally supported. Entering the area under the counterweights or loosening the counterweight bolts without externally supporting the counterweights could cause a crush hazard resulting in serious injury or death.
- Crush hazards exist when installing counter weights, if the machined mating surfaces are not clean and free of foreign debris such as rust, dirt, or paint. Check the machined surfaces before installing the counterweights. Clean the surfaces of any foreign debris before installing the counterweights. Failure to check (and clean) the machined surfaces for dirt, paint, rust or other foreign debris before installing the counterweights could cause crush hazard resulting in serious injury or death.
- Crush hazards exist when inspecting, repairing, or replacing counter weights. When inspecting, repairing, or replacing counterweights, appropriate procedures and instructions shall be followed. Failure to follow appropriate procedures and instructions could cause crushing hazards resulting in serious injury or death.
- The counterweight bolts must be inspected at no longer interval than the 2000 hour PM.
- Counterweight bolts that are found to be loose or damaged during the PM inspection shall be removed and inspected to ensure they are not defective.
- Counterweight bolts that are found defective shall be replaced with only original OEM bolts that are grade 8 or better.
- Correct washers should be used between the bolt/nut and the counterweight. Reference Parts Manual.
- Crush hazards exist if loosening counterweight bolts. Before loosening counter weight bolts, check the machine Parts Manual for counter weight part number; to ensure the weight of the counter weight listed in this document is accurate. Some machines might have counter weights not listed in this document. Failure to determine accurate counterweight weight can cause crush hazards resulting in serious injury or death.

- Crush hazards exist when lifting and when supporting the weight of a machine on jack stands. Be sure to provide adequate jacks for support, and hoists when lifting the machine or any of its components. Be sure the machine is on an adequate surface to support its weight when jacked up. NEVER jack up the machine with the bucket/blade or lift arms/supporting members (as applicable). Refer to JACKING INSTRUCTIONS, located in Section 03 of the Service Manual. Failure to provide adequate lifting equipment and procedures and to provide adequate jack stands for support can cause a crush hazard resulting in serious injury or death.

#### **CRUSH HAZARD AND PINCH POINT HAZARD**

- Crush hazard and pinch point hazard exists when procedures are being performed on the brake cylinders. Brake cylinders are under compressed spring force. Sudden spring release is possible. Maintenance and repairs should be performed in full accordance with safe working procedures. Use of a suitable press is required for servicing, disassembly, and reassembly of the brake caliper assemblies. Failure to follow safe work procedures could cause crush hazard or pinch point hazard 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.
- Crush, shock, or other hazards exist if personnel do not follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Always follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Failure to follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures can cause crush, shock, or other hazards resulting in severe injury or death.

#### **STRUCK-BY OR STRUCK AGAINST HAZARDS**

- Struck-by or struck against hazards exist when opening the sound abatement panels. If the loader is on a slight incline or in high wind, the panel could quickly swing wide open when unlatched. Do not stand in front of the panel when releasing the handle or internal latches. Standing in front of the panel when opening it could cause a struck-by or struck against hazard, resulting result in serious injury or damage to the panel and hinges.

#### **FALL HAZARD**

- Fall hazard exists when working at elevated locations. Take appropriate "fall arrest" safety precautions as required by local rules, regulations, and procedures when working at heights on the machine, as example, on the rear and front frames. Follow all required statutory regulations for working at height. Failure to follow all locally required "fall arrest" procedures can cause a fall hazard, resulting in serious injury or death.

#### **ELECTRICAL SHOCK AND CRUSH HAZARDS**

- Electrical shock and Crush hazards exist when inspecting components or performing maintenance inspections without verifying all electrical components are de-energized. Before performing the following maintenance inspections, make sure the appropriate safety procedures have been followed and all electrical connections are de-energized to prevent electrical shock or uncontrolled movement of the machine. Also refer to "WARNINGS AND CAUTIONS" before attempting to follow these checks. Failure to follow maintenance safety procedures before and during maintenance inspections can cause electrical shock hazards and crush hazards resulting in serious injury or death.

**ELECTRICAL SHOCK HAZARD**

- Electrical shock hazard exists while conducting operational or energized tests on the machine. Most PM checks must be conducted with the engine shut off. This is especially significant when removing access covers to gain access to electrical components such as the drive motors or opening the SR converter cabinet. **UNDER NO CIRCUMSTANCES SHOULD THE AXLE ACCESS COVERS BE REMOVED WHILE THE MACHINE IS ENERGIZED.** Accidental contact with exposed high voltage terminals in the interior may cause an electrical shock hazard resulting in serious injury or death.
- Risk of fatal electrical shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINCOS 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.
- Electrical shock hazard exists if accessing the axles while the engine is started. **UNDER NO CIRCUMSTANCES** is the engine to be started while accessing the axles when checking the brakes and traction motors. Contact with energized terminals inside the axles could cause electrical shock hazard resulting in serious injury or death.
- Electrical shock hazards exist. It is strongly recommended that persons actually accessing component interiors, such as the axles or electrical cabinets, or braking grids ascertain for themselves that all safety procedures are in place. Failure to determine safe working conditions could cause electrical shock hazard resulting in serious injury or death.
- Electrical shock hazard exists when high voltage is present on the dynamic braking grids. High voltage is present when the generator is primed and operating and up to five minutes after the machine ignition key is switched off. Do NOT touch the braking grids when the generator is primed or until five minutes after the engine has been shut down and only after the absence of bus voltage is verified. Contact with the braking grid could cause an electrical shock hazard, resulting in serious injury or loss of life.

**ENTANGLEMENT HAZARD**

- Entanglement hazard exists if attempting to work on rotating equipment. Do not work on the machine with the engine running unless specifically stated within a specified work procedure. **KEEP CLEAR OF ROTATING SHAFTS.** The shaft between the Hydraulic Pump Drive (HPD) and the generator rotates any time the engine is rotating, even while the engine is being cranked. Wrapping, entanglement, or contact of clothing, hair or extremities may cause an entanglement hazard that results in serious injury or death.
- Entanglement hazard exists when testing the auto lubrication system. Testing requires starting the engine. The drive shaft between the engine and generator rotates once the engine begins to turn from cranking. Follow all engine starting procedures before starting the engine. Ensure all personnel are clear of the area before starting the machine. Failure to follow starting procedures and clear the area of all personnel could cause an entanglement hazard on rotating components such as the drive shaft between the engine and generator, or engine fan, resulting in serious injury or death.

**SICKNESS OR ASPHYXIATION HAZARDS**

- Sickness or asphyxiation or Inhalation hazards exist if the washable cab air filter is cleaned with toxic cleaning solvents. Replace with new filter or wash with warm soapy water, thoroughly rinse, and dry thoroughly before returning it to service. Using cleaning solvents can introduce toxic fumes into the cab area. Using cleaning solvents to wash filters can cause sickness, asphyxiation, or inhalation hazard, resulting in serious injury or death.

## CAUTION

### **BRAKE INSPECTION**

- The brakes will set automatically if the air pressure drops below operating pressure. This could occur suddenly and unexpectedly, causing serious injury. During brake inspection, a technician should be stationed in the operator's cab to monitor the air pressure gauge and be in direct radio or telephone contact with the person accessing the axles.

### **ELECTRICAL SHOCK HAZARD**

- Unless conducting operational or energized tests on the machine, the PM program must be conducted with the engine shut off. This is especially significant when removing access covers to gain access to electrical components such as the drive motors or opening the SR converter cabinet. **UNDER NO CIRCUMSTANCES SHOULD THE AXLE ACCESS COVERS BE REMOVED WHILE THE MACHINE IS ENERGIZED.** Accidental contact with exposed high voltage terminals in the interior may cause death or serious injury.

## CAUTION

### **SAFETY LABELS/PLACARDS**

- When washing the machine, be careful not to damage safety or instructional placards. Use a cloth and soap and water to clean them. **DO NOT** use a steam cleaner, solvent or high-pressure washer to clean safety placards. The possibility of the labels being hidden under dirt or grease may make inadvertent damage possible. Replace any labels that are damaged, deteriorated or illegible as soon as possible. Refer to the **PARTS MANUAL** to order replacement placards.

### **FRAME LOCK**

- Following completion of maintenance or repair operations, it is critically important that the frame lock be removed from the locked position and properly stowed. Turn **KLENZ™ Enable Switch** to **ON** position and close manual air release valve on the hydraulic reservoir or machine damage could result.
- Serious damage is possible if machine is moved with frame lock in locked position.

### **COUNTER WEIGHTS**

| Machine Model | Location                                             | CW PN    | Weight                 |
|---------------|------------------------------------------------------|----------|------------------------|
| L-1350        | Under rear of rear frame, in middle, under radiator. | R4182851 | 5,000 lbs. (2,268 kgs) |
| L-1850        | Under rear of rear frame, in middle, under radiator  | R4273984 | 7,200 lbs. (3,266 kgs) |
| L-2350        | Under rear of rear frame, in middle, under radiator. | R4246005 | 9,500 lbs (4,310 kgs)  |
| L-2350        | Under steps, left and right side of machine          | R4246037 | 1,800 lbs (817 kgs)    |
|               |                                                      | R4246241 | 2,400 lbs (1,089 kgs)  |
| L-2350        | On rear bumper                                       | R4272461 | 13,000 lbs (5,897 kgs) |

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# Procedure Preparations

It is essential that the following preparations be made prior to performing non-operational inspections to ensure a safe and productive working environment.

## 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 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. 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.**

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).

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.

#### **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.**

## Safety Preparations

#### **WARNING**

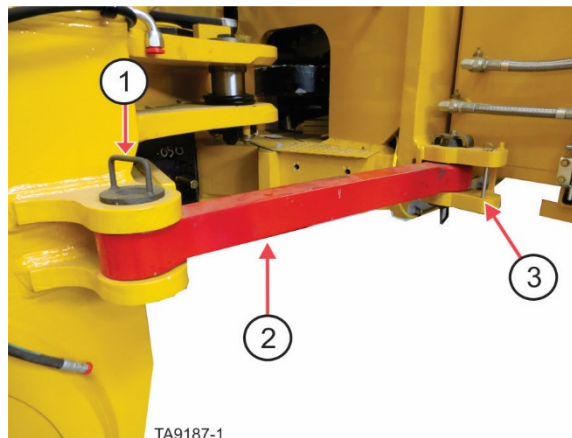
**Crush hazards are possible if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable 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.
- c. Place wheel chocks in front and behind each wheel.

## **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.



- 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 1. Frame Lock**

- d. Set bucket flat and level on the ground.
- e. Set the parking brakes.

## KESS Discharge Procedure

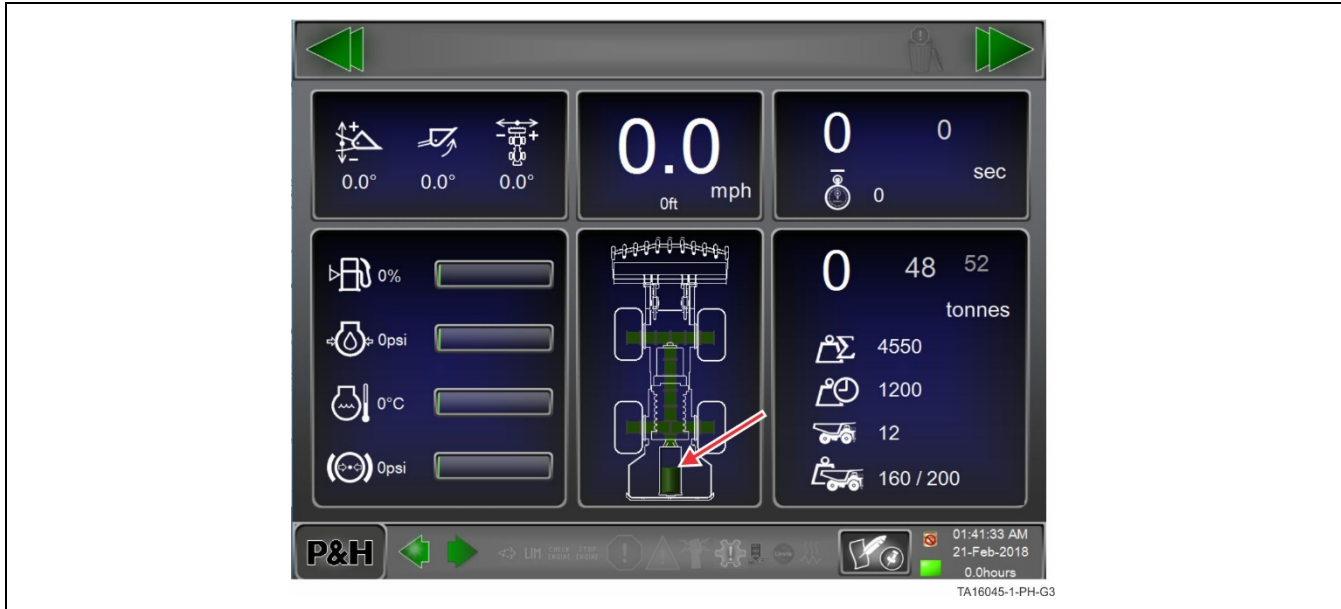


**Figure 2. Operators Screen – KESS at 60%**

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

1. Ensure Park Brake is SET
2. Place machine at LO Throttle
3. LINC'S II Screen
  - a. Select Main Menu button
  - b. Select Data Logging
  - c. Select Logging/Monitoring
  - d. Select Energy Storage Data Link
  - e. Move ESD 1 Mst:Motor (RPM) and ESD 2 Mst:Motor (RPM) to right column by clicking and dragging

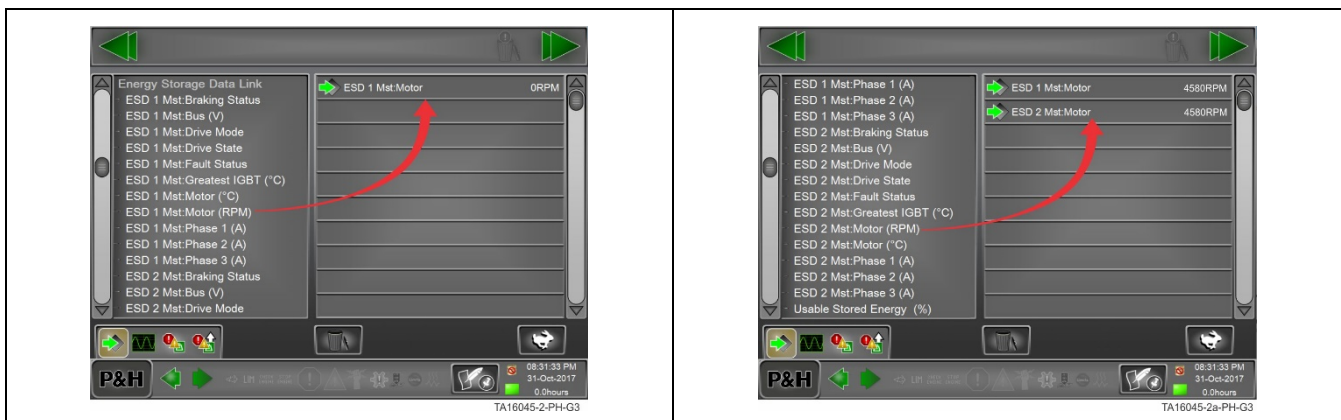


**Figure 3. ESD Motor Channel Select**

4. Press the Drive Enable Switch



**Figure 4. Drive Enable Switch**

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

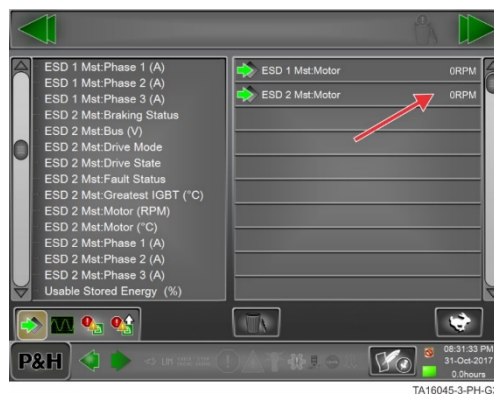


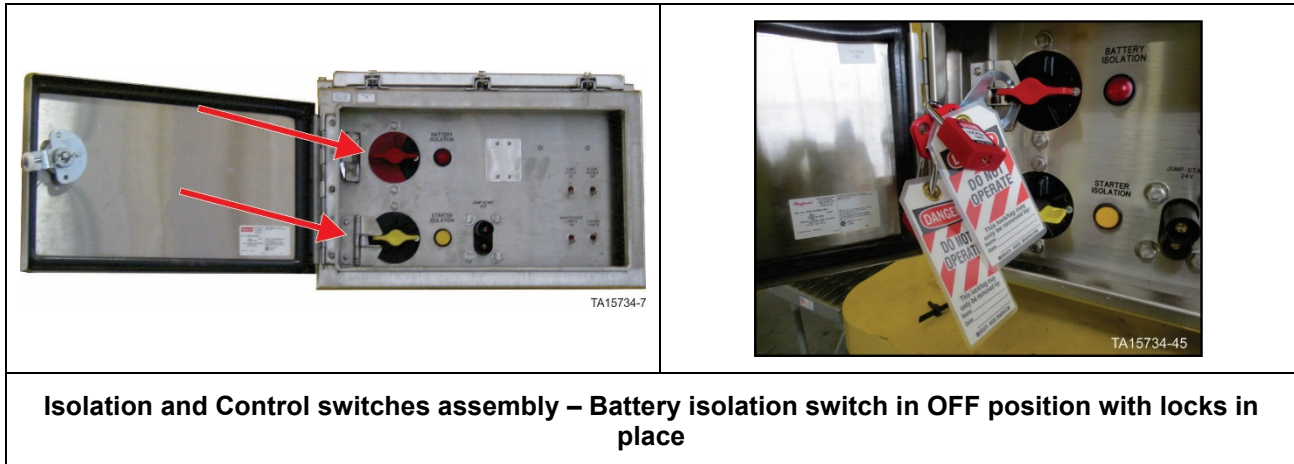
**Figure 5. ESD Motor RPM**

6. Shut down the machine as normal.
  - a. Shut off the engine.

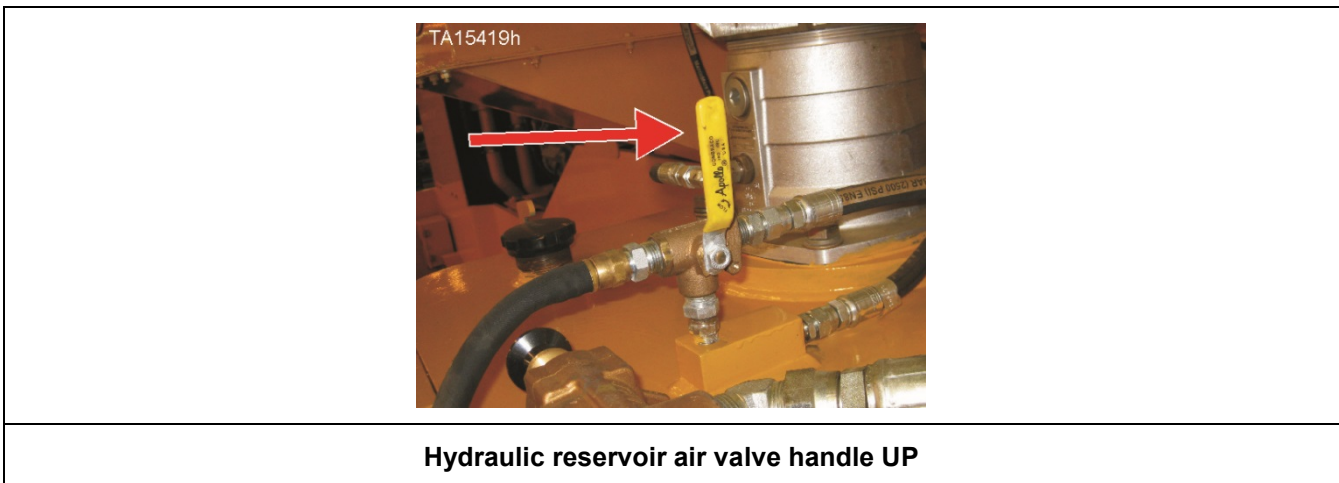
## **WARNING**

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.

- b. 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.



- c. 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.
- d. Turn the handle to the up position as shown.



- e. 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

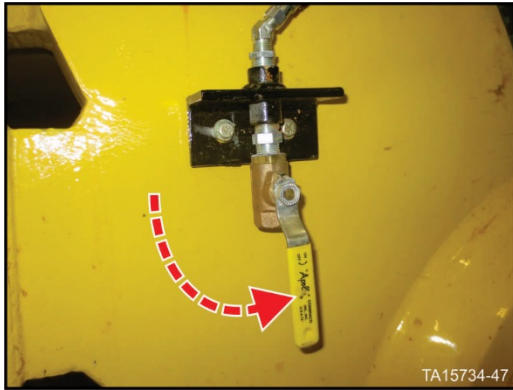


Figure 6. Open air reservoir bleed valves

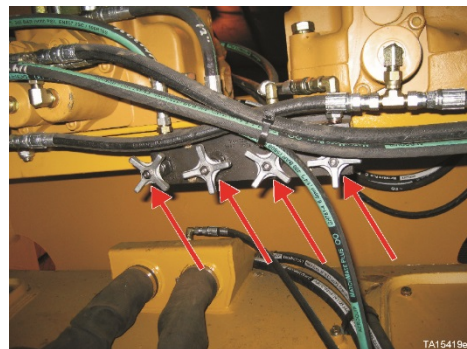
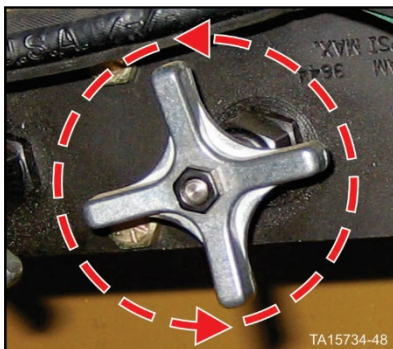
## WARNING

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.

- f. 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.



- g. 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 LINCOS 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.

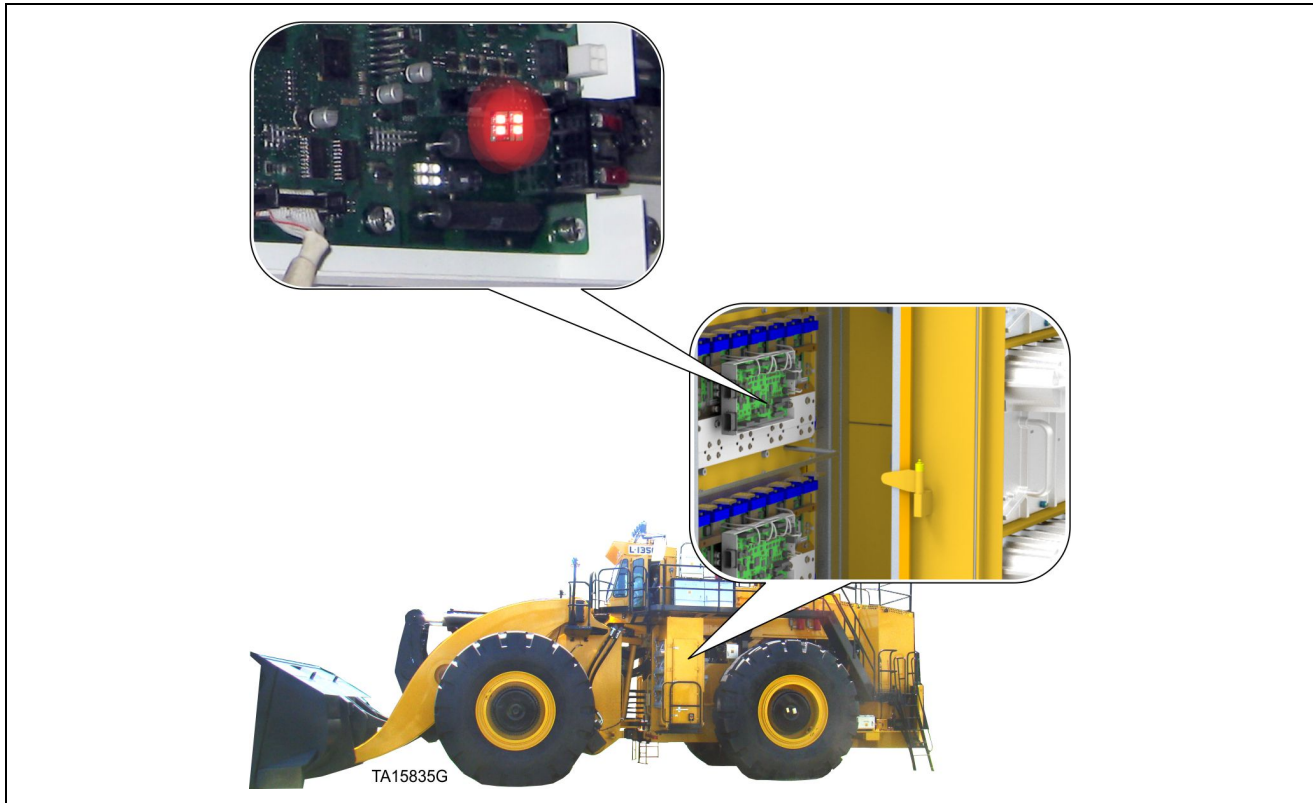


**Figure 7. Converter assembly bus LED's**

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

1. LINCOS II display in cab.
2. Visual indication in electrical cabinet
3. 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

- Make sure that the LINCS II system is booted (key switch ON) with the engine NOT running and the park brake SET.
- 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 8. LINCS logging/monitoring menu access**

- 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).

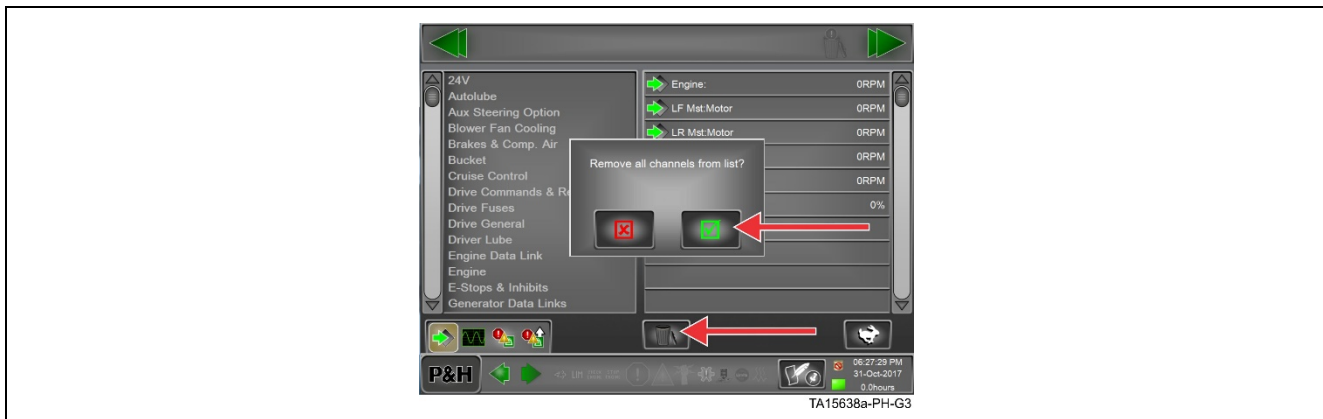


**Figure 9. Remove channels**

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



**Figure 10. 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.

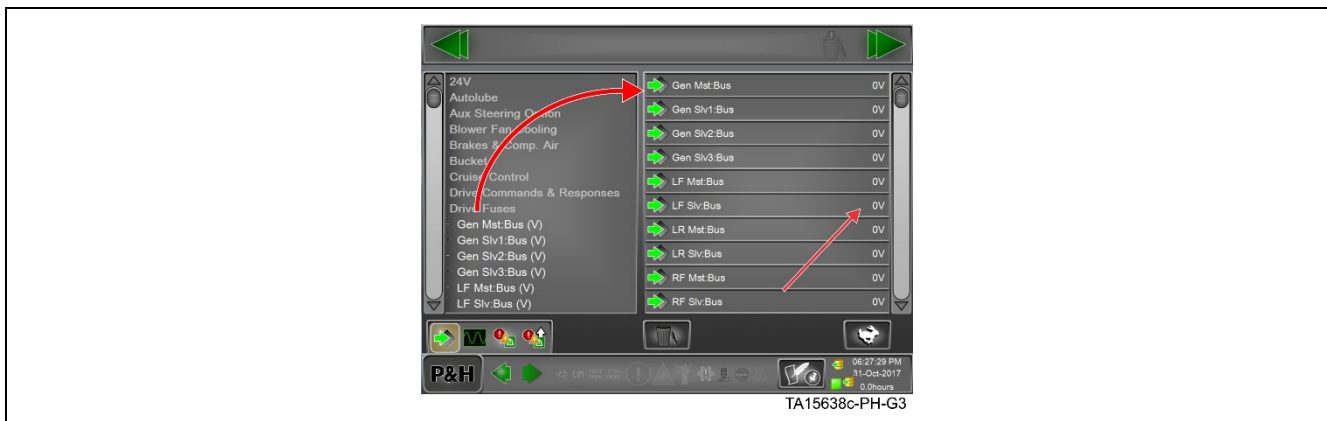


**Figure 11. Bus voltage indication**

- 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.

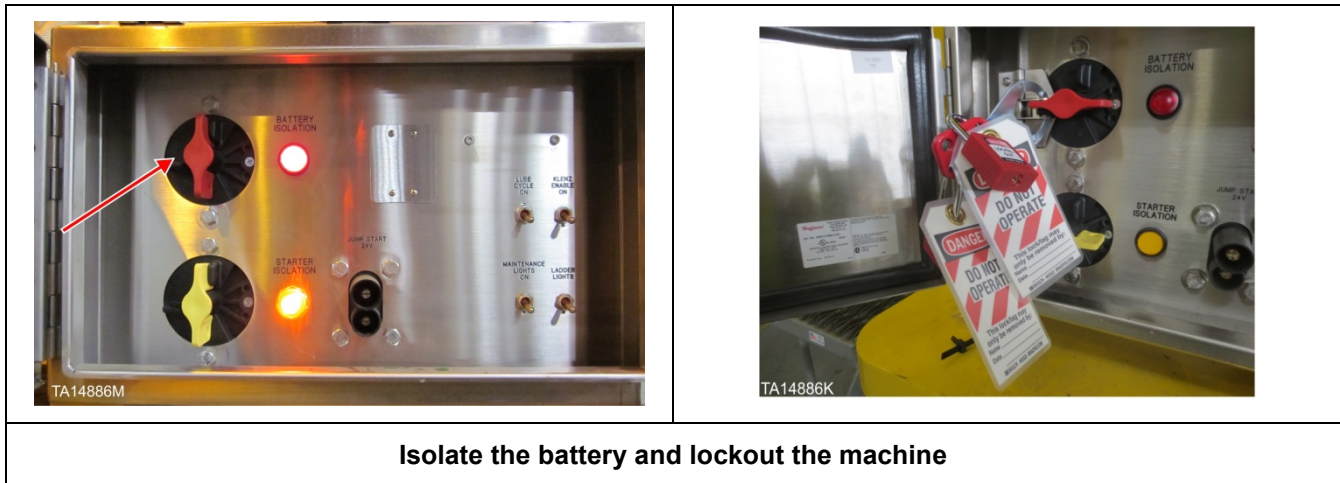


**Figure 12. Isolation and control switch assembly**

- 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.

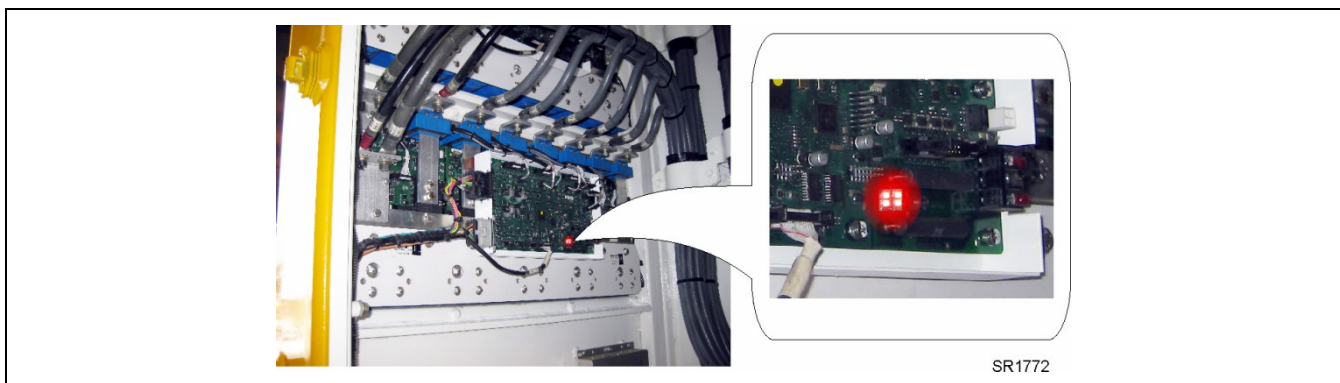


**Figure 13. Bus voltage LED array on SR control board**

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

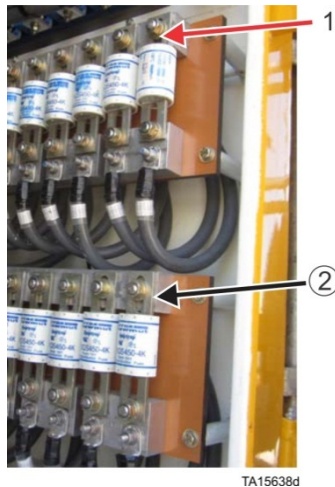
Once the visual indicators have been verified, the bus voltage should be physically measured. The bus voltage should be fully discharged based on the previous checks.

- 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 LINC 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 14. 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

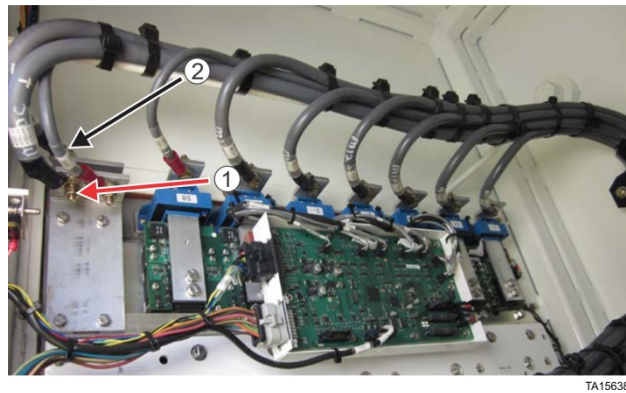
**The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.**

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 15. Converter assembly bus connections (rear of cabinet)**



1) Positive bus bar, 2) Negative bus bar

**Figure 16. 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.

## Sound Abatement Panels

Machines may be fitted with sound abatement panels (optional) designed to lower the sound emitted by the power unit components. One panel is opened by using a locking handle latch on the outside of the panel. The companion panel can be opened by releasing the latch inside the panel by simultaneously pulling up on the bottom latch and pulling down on the top latch and pulling it open.

The panels should be lubricated with grease as needed to ensure free operation.



### WARNING

**Struck-by or struck against hazards exist when opening the sound abatement panels. If the loader is on a slight incline or in high wind, the panel could quickly swing wide open when unlatched. Do not stand in front of the panel when releasing the handle or internal latches. Standing in front of the panel when opening it could cause a struck-by or struck against hazard, resulting result in serious injury or damage to the panel and hinges.**

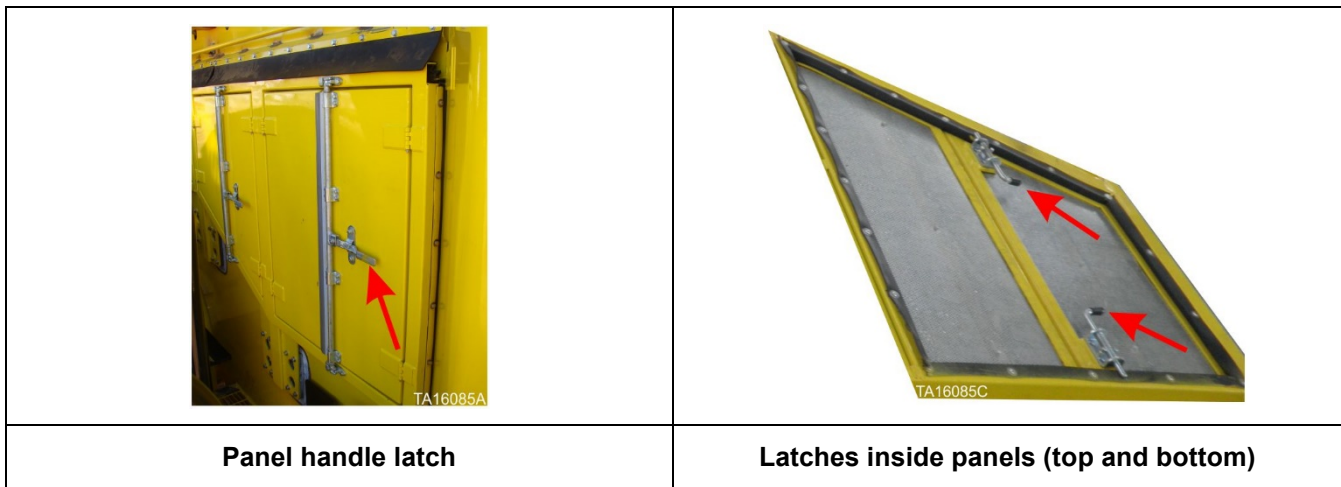


**Figure 17. Typical sound abatement panel handle latch and inside latches**

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# Modular Preventive Maintenance Schedule Frequency Chart

The following table indicates the preventive maintenance procedures for each hourly usage interval as specified in the modular preventive maintenance schedules. The hourly usage intervals repeat as shown past the 15,000-hour interval.

| PM Sheet Title                 | Machine Hours |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |        |        |  |  |
|--------------------------------|---------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|--------|--------|--|--|
|                                | 500           | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 | 5500 | 6000 | 6500 | 7000 | 7500 | 8000 | 8500 | 9000 | 9500 | 10000 | 10500 | 11000 | 11500 | 12000 | 15,000 | 20,000 |  |  |
| 500 Operational                | X             | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X     | X     | X     | X     | X     | X      | X      |  |  |
| 500 Electronic                 | X             | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X     | X     | X     | X     | X     | X      | X      |  |  |
| 500 Non-Operational            | X             | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X     | X     | X     | X     | X     | X      | X      |  |  |
| 500 Torque                     | X             | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X     | X     | X     | X     | X     | X      | X      |  |  |
| 500 Non-Operational Electrical | X             | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X    | X     | X     | X     | X     | X     | X      | X      |  |  |
| 1,000 Operational              |               | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X     |       | X     |       | X     | X      | X      |  |  |
| 1,000 Non-operational          |               | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X     |       | X     |       | X     | X      | X      |  |  |
| 1,000 Structural               |               | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X    |      | X     |       | X     |       | X     | X      | X      |  |  |
| 1,500 Hydraulic                |               |      | X    |      |      | X    |      |      | X    |      |      | X    |      |      | X    |      |      | X    |      |       | X     |       |       | X     | X      | X      |  |  |
| 2,000 Operational              |               |      |      | X    |      |      |      | X    |      |      |      | X    |      |      |      | X    |      |      |      | X     |       |       |       | X     |        | X      |  |  |
| 2,000 Non-Operational          |               |      |      | X    |      |      |      | X    |      |      |      | X    |      |      |      | X    |      |      |      | X     |       |       |       | X     |        | X      |  |  |
| 3,000 Non-Operational          |               |      |      |      |      | X    |      |      |      |      |      | X    |      |      |      |      |      | X    |      |       |       |       |       | X     | X      | X      |  |  |
| 5,000 Non-Operational          |               |      |      |      |      |      |      |      |      | X    |      |      |      |      |      |      |      |      |      | X     |       |       |       |       | X      | X      |  |  |
| 10,000 Non-Operational         |               |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      | X     |       |       |       |       |        | X      |  |  |
| 20,000 Non-Operational         |               |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |        | X      |  |  |

## NOTICE

100 hour/weekly requirements are not listed in this table.

The chart skips from 15,000 hours to 20,000 hours. The schedules between those two hourly schedules should also be determined and followed.

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# Preventive Maintenance Program

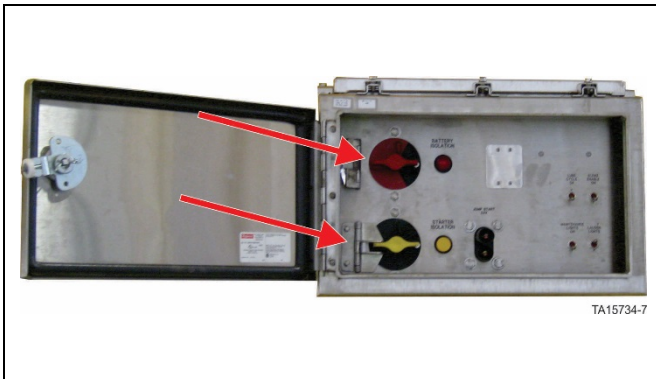
## 100 Hour Non-Operational Inspections and Service

### 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. 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. Place bucket flat and on level ground.
- c. Set the parking brakes.
- d. Shut off the engine.
- e. Turn on maintenance light switch located at left rear of machine in Control Switch Box Assembly.
- f. Lock out the machine's starting capability before performing any inspections.
- g. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.



**Isolation and Control switches assembly – Battery isolation switch in OFF position with locks in place**

|                                                                                                    | Checked         | Service Required   |
|----------------------------------------------------------------------------------------------------|-----------------|--------------------|
| 1. Check tire pressures (refer to tire pressure plate on right side of front frame at pivot area). |                 |                    |
|                                                                                                    | <u>Pressure</u> | <u>Cuts/Damage</u> |
| left front                                                                                         | _____           | _____              |
| right front                                                                                        | _____           | _____              |
| left rear                                                                                          | _____           | _____              |
| right rear                                                                                         | _____           | _____              |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Checked | Service Required |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------|
| 2. Check air conditioner fresh air inlet filters. Clean and or replace as necessary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |                  |
| <div style="text-align: center;">  <b>WARNING</b> </div> <p>Sickness or asphyxiation or Inhalation hazards exist if the washable cab air filter is cleaned with toxic cleaning solvents. Replace with new filter or wash with warm soapy water, thoroughly rinse, and dry thoroughly before returning it to service. Using cleaning solvents can introduce toxic fumes into the cab area. Using cleaning solvents to wash filters can cause sickness, asphyxiation, or inhalation hazard, resulting in serious injury or death.</p> |         |                  |
| 3. Check oil level in auto lube grease pump housing (check with dipstick located on top of lube pump oil reservoir). (Refer to Section 04 in the Service Manual for more information).                                                                                                                                                                                                                                                                                                                                                                                                                                 |         |                  |
| 4 Check machine for cleanliness – especially any flammable material.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |                  |
| <ul style="list-style-type: none"> <li>Inspect entire machine for flammable materials, buildup of flammable materials, leaks of any type, spillage of hydraulic fluid, fuel, or grease. If so, repair leaks and clean machine before operating.</li> </ul>                                                                                                                                                                                                                                                                                                                                                             |         |                  |

# 500 Hour Operational Inspections and Service

## 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. 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. Place bucket flat and level on ground.
- c. Set the parking brakes.
- d. Turn on maintenance light switch located at left rear of machine in Control Switch Box Assembly.



### WARNING

Crush hazards exist if non-essential personnel are not alerted to stay clear of machine during operational/energized inspections. Alert non-essential personnel to stay clear of the machine while it is being inspected or serviced. Alert all personnel in the area that the machine is going to be moved during the inspection or service procedure. When conducting energized or operational tests, place barriers and signs to alert non-essential personnel to keep clear of the area. Failure to alert all personnel in the area that the machine is going to be moved could result in crush hazards, resulting in serious injury or death.

|                                                                                                                                                                                                                                                                                                                |                                                                                                             | Checked | Service Required |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------|------------------|
| <p>Hydraulic pressures and fan motor speed can be read on the display screen using LINC<sup>®</sup>S (Refer to Section 06 in the Service Manual for more information). This is good for initial checks. Pressure settings and adjustments should be made at the respective locations with external gauges.</p> |                                                                                                             |         |                  |
| <p><b>1. Hydraulic System:</b> Running engine at high throttle, hoist the empty bucket and time the hoist and float down functions.</p>                                                                                                                                                                        |                                                                                                             |         |                  |
| Refer to spec sheet for times                                                                                                                                                                                                                                                                                  | Hoist up _____ seconds                                                                                      |         |                  |
|                                                                                                                                                                                                                                                                                                                | Hoist down time _____ seconds                                                                               |         |                  |
|                                                                                                                                                                                                                                                                                                                | Float time _____ seconds                                                                                    |         |                  |
|                                                                                                                                                                                                                                                                                                                | Bucket Rollback time _____ seconds                                                                          |         |                  |
|                                                                                                                                                                                                                                                                                                                | Bucket dump time _____ seconds)                                                                             |         |                  |
|                                                                                                                                                                                                                                                                                                                | Steer (lock to lock) time _____seconds)                                                                     |         |                  |
| a.                                                                                                                                                                                                                                                                                                             | Check and adjust, as necessary, the following hydraulic system pressures (with oil at min. 140° F) (60° C). |         |                  |
| Refer to spec sheet                                                                                                                                                                                                                                                                                            | 1) Main pumps (Bucket and Hoist & Hoist )                                                                   |         |                  |
|                                                                                                                                                                                                                                                                                                                | 2) Bucket dump above horizontal                                                                             |         |                  |
|                                                                                                                                                                                                                                                                                                                | 3) Bucket dump below horizontal                                                                             |         |                  |
|                                                                                                                                                                                                                                                                                                                | 4) Blower pump                                                                                              |         |                  |
|                                                                                                                                                                                                                                                                                                                | 5) Steering left                                                                                            |         |                  |
|                                                                                                                                                                                                                                                                                                                | 6) Steering right                                                                                           |         |                  |
|                                                                                                                                                                                                                                                                                                                | 7) Fan motor RPM                                                                                            |         |                  |
| <h2 style="margin: 0;">NOTICE</h2>                                                                                                                                                                                                                                                                             |                                                                                                             |         |                  |
| <p><b>Fan speed is more important than pressure. Set fan speed, so 1 Hz = 1 rpm. This must be set using a multi-meter that measures hertz or meter that measures AC frequency.</b></p>                                                                                                                         |                                                                                                             |         |                  |
| b.                                                                                                                                                                                                                                                                                                             | Hydraulic Reservoir Air Pressure (4-6 regulator psi)<br><br>(0.27-0.41 bar) (with lift arms in UP position) |         |                  |

| Preventive Maintenance Program 500 Hour Operational Inspections and Service (Continued)                                                                                                                                                                      |                                       |      |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------|----|
| Ball cap location                                                                                                                                                                                                                                            | Visual inspection hour meter reading: |      |    |
|                                                                                                                                                                                                                                                              | Movement detected                     |      |    |
|                                                                                                                                                                                                                                                              |                                       | YES* | NO |
| Lift arm                                                                                                                                                                                                                                                     | RHS                                   |      |    |
|                                                                                                                                                                                                                                                              | LHS                                   |      |    |
| Hoist cylinder                                                                                                                                                                                                                                               | RHS                                   |      |    |
|                                                                                                                                                                                                                                                              | LHS                                   |      |    |
| Middle pivot                                                                                                                                                                                                                                                 | Upper                                 |      |    |
|                                                                                                                                                                                                                                                              | Lower                                 |      |    |
| Rear axle**                                                                                                                                                                                                                                                  | Front                                 |      |    |
|                                                                                                                                                                                                                                                              | Rear                                  |      |    |
| Inspection test conducted                                                                                                                                                                                                                                    | By:                                   |      |    |
|                                                                                                                                                                                                                                                              | Date:                                 |      |    |
| <p>*If any movement is detected, refer to 2000 hour inspection interval.</p> <p>**WARNING! Do not visually inspect rear axle ball cap on operating machine. Use a jack to lift machine (Refer to Section 03 in the Service Manual for more information).</p> |                                       |      |    |

|                          |                                                                                                                                        |                                    | Checked | Service Required |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------|------------------|
| 2. Brakes                |                                                                                                                                        |                                    |         |                  |
| a.                       | Check braking operations:                                                                                                              |                                    |         |                  |
|                          | 1)                                                                                                                                     | Parking brake switch               |         |                  |
|                          | 2)                                                                                                                                     | Parking brake function             |         |                  |
|                          | 3)                                                                                                                                     | Service brake function             |         |                  |
| 3. Compressed Air System |                                                                                                                                        |                                    |         |                  |
|                          | Apply shop air to the distribution reservoir (L1350/1850--130-135 psi) (8.9 – 9.3 bar) (L2350--140-145 psi) (9.65 – 9.99 bar)          |                                    |         |                  |
|                          | Check air system (distribution reservoir, brake reservoirs, brakes, KLENZ™ reservoir) for leaks with ultrasonic leak detector          |                                    |         |                  |
| Boot<br>LINCS            | Check KLENZ™ diaphragm valves for air leaks                                                                                            |                                    |         |                  |
|                          | Check the KLENZ™ solenoids and hosing for air leaks with ultrasonic leak detector                                                      |                                    |         |                  |
|                          | Check Hydraulic reservoir for air leaks with ultrasonic leak detector                                                                  |                                    |         |                  |
|                          | Drain air from hydraulic reservoir and verify the air pressure regulator setting.                                                      |                                    |         |                  |
|                          | Air Bleed down test<br><br>Refer to Section 05 “COMPRESSED AIR SYSTEM, TROUBLESHOOTING, SYSTEM AIR PRESSURE LOW” for more information. |                                    |         |                  |
| 4. Cooling Air System    |                                                                                                                                        |                                    |         |                  |
| a.                       | Verify blower speed (Refer to specification sheet)                                                                                     |                                    |         |                  |
| b.                       | Check airflow at generator exhaust (make sure screens are clear).                                                                      |                                    |         |                  |
| c.                       | Check airflow exhaust from front and rear axle.                                                                                        |                                    |         |                  |
| 5. Cab Electrics         |                                                                                                                                        |                                    |         |                  |
| a.                       | Heater/air conditioner                                                                                                                 |                                    |         |                  |
|                          | 1)                                                                                                                                     | Check blower speeds and operation. |         |                  |

|           |                                                                       |                                          |  |  |
|-----------|-----------------------------------------------------------------------|------------------------------------------|--|--|
|           | <b>2)</b>                                                             | Check vent operation.                    |  |  |
|           | <b>3)</b>                                                             | Check air conditioner control operation. |  |  |
| <b>b.</b> | Check operation of all lights (driving, working and interior).        |                                          |  |  |
| <b>c.</b> | Check direction control switch (FNR) operation (on joystick).         |                                          |  |  |
| <b>d.</b> | Check windshield/window wipers operation (front and rear).            |                                          |  |  |
| <b>e</b>  | Check windshield/window washer operation (optional) (front and rear). |                                          |  |  |
| <b>6.</b> | <b>Power Unit</b>                                                     |                                          |  |  |
| <b>a.</b> | Conduct power unit vibration testing.                                 |                                          |  |  |

## Generator Vibration Testing

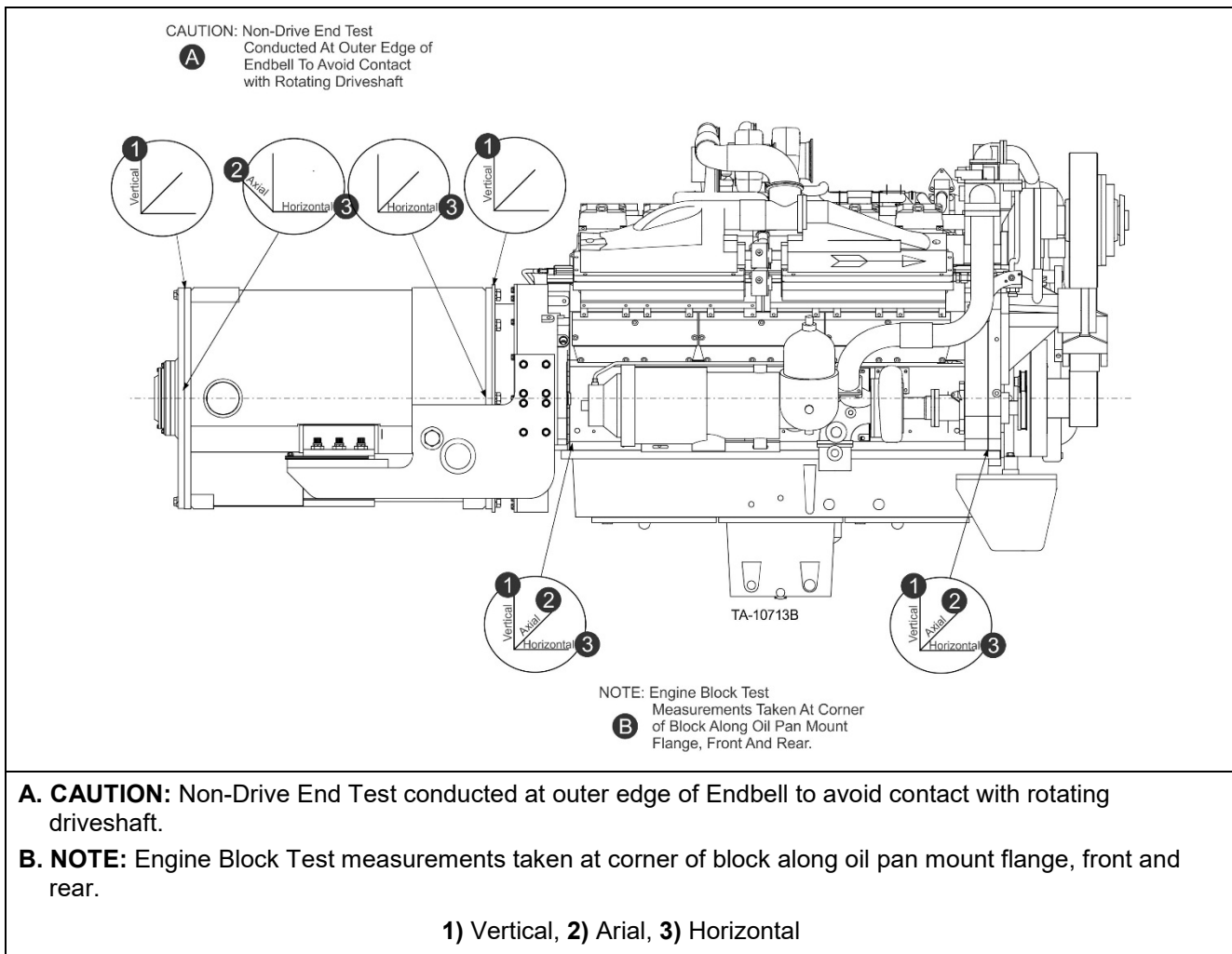


**Figure 18. Typical loader power unit vibration test locations**

Vibration testing of the power unit should be conducted every 500 hours of operation and compared to previous results. A baseline figure should be established at the initial 500-hour interval as part of break-in service procedures. A sharp increase in vibration as compared to the trend should warrant further investigation.

## 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. 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. Place bucket flat and level on ground.
- c. Set the parking brakes.

### WARNING

Entanglement hazard exists if attempting to work on rotating equipment. Do not work on the machine with the engine running unless specifically stated within a specified work procedure. **KEEP CLEAR OF ROTATING SHAFTS.** The shaft between the Hydraulic Pump Drive (HPD) and the generator rotates any time the engine is rotating, even while the engine is being cranked. Wrapping, entanglement, or contact of clothing, hair or extremities may cause an entanglement hazard that results in serious injury or death.

## Testing

Measure and record the vibration levels at the following measurement points.

- The vibration levels at the following measurement points should be measured and recorded. All measurements should be taken as close to the rotational centerline as possible with the engine at high throttle and no load and with the machine on tires and bucket (loaders) one to three feet off of the ground. Refer to illustration "TYPICAL LOADER POWER UNIT VIBRATION TEST LOCATIONS" for vibration testing locations.
- a. Generator "non drive end" vertical on the endbell.
  - b. Generator "non drive end" horizontal on the endbell.
  - c. Generator "non drive end" axial on the endbell.
  - d. Generator drive end vertical on the endbell.
  - e. Generator drive end horizontal on the endbell.
  - f. Rear engine vertical on engine block.
  - g. Rear engine horizontal on engine block.
  - h. Rear engine axial on engine block.
  - i. Front engine vertical on engine block.
  - j. Front engine horizontal on engine block.
  - k. Front engine axial on engine block.

## NOTICE

1. Horizontal and vertical readings, only, will be taken at the "non drive end" of the generator. The reading taken on endbell must avoid contact with rotating driveshaft.

2. Vibration tests, as described herein, must be conducted following generator or power unit reinstalled.
3. Significant increases in vibration readings, compared to baseline readings at the time of commissioning or component change-out, should be further analyzed to aid in the elimination of the cause of the excessive vibration (i.e. unbalance, misalignment, etc.)
4. Record vibration results on the vibration Test Record Sheet.

| Generator Vibration Test Record Sheet |              |         |         |         |         |         |
|---------------------------------------|--------------|---------|---------|---------|---------|---------|
| Item                                  |              | Test #1 | Test #2 | Test #3 | Test #4 | Test #5 |
| Date of test                          |              |         |         |         |         |         |
| Machine s/n                           |              |         |         |         |         |         |
| Hour meter reading                    |              |         |         |         |         |         |
| Generator axial vibration             | NDE          |         |         |         |         |         |
| Generator horiz. Vibration            | NDE          |         |         |         |         |         |
| Generator vert. Vibration             | NDE          |         |         |         |         |         |
| Generator horiz. Vibration            | DE           |         |         |         |         |         |
| Generator vert. Vibration             | DE           |         |         |         |         |         |
| Engine rear vert.                     | Engine block |         |         |         |         |         |
| Engine rear horiz.                    | Engine block |         |         |         |         |         |
| Engine rear axial                     | Engine block |         |         |         |         |         |
| Engine front vert.                    | Engine block |         |         |         |         |         |
| Engine front horiz.                   | Engine block |         |         |         |         |         |
| Engine front axial                    | Engine block |         |         |         |         |         |
| Test conducted by:                    |              | By:     | By:     | By:     | By:     | By:     |
| Date:                                 |              | Date:   | Date:   | Date:   | Date:   | Date:   |
| NDE = Non Drive End<br>DE = Drive End |              |         |         |         |         |         |

Figure 19. Vibration test record

## NOTICE

Use this sheet as a template & make copies for recording actual data.

- The readings should be within 5 mil displacement at all locations.
- Any high readings indicate a problem which should be corrected.
- Excessive vibration on the non drive end could be indicating a bearing problem or incorrectly balanced rotor.
- Vibration on the engine end may be due to misalignment between engine and generator or engine problem.

## Generator Bearing Temperature Testing

Checking the temperature of the outer bearing retainer of the SR generator is one method for determining the condition of the bearing and grease. By taking bearing temperature measurements, on a consistent periodic basis, under consistent conditions, a temperature history can be generated, which is advantageous in developing a bearing temperature baseline. As a result, future readings will be conclusively indicative of bearing condition. The recommended test interval is every 500 hours as part of the 500 hour electrical P.M.

Temperature monitoring can be done during normal material handling operations, and should not require the machine to be out of service for more than a few minutes. A standard contact pyrometer is required to conduct bearing temperature monitoring.

To conduct temperature monitoring of the generator's bearing, perform the following procedure:



### WARNING

Entanglement hazard exists if attempting to work on rotating equipment. Do not work on the machine with the engine running unless specifically stated within a specified work procedure. **KEEP CLEAR OF ROTATING SHAFTS.** The shaft between the Hydraulic Pump Drive (HPD) and the generator rotates any time the engine is rotating, even while the engine is being cranked. Wrapping, entanglement, or contact of clothing, hair or extremities may cause an entanglement hazard that results in serious injury or death.

## 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. 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. Operate the machine for 2 to 3 hours.
- b. Record ambient temperature.
- c. Ensure the bucket is empty and clear of debris.
- d. Park the machine with the bucket flat and level on the ground.
- e. Set the parking brakes.
- 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.



**Battery Isolation Box – Battery isolation switch in OFF position with locks in place**

- h. Place the pyrometer probe against the bearing retainer
  - Perform this as quickly as possible following machine shutdown.
- i. Allow reading to stabilize and record temperature on Generator Bearing Temperature Record Sheet.

## NOTICE

The maximum allowable temperature rise over ambient of the outer bearing carrier should never exceed 100° F (56° C), under any operating condition. Contact your distributor, if bearing shows sustained temperatures outside this range.

Following bearing replacement, it is essential to perform the above bearing temperature check, after one hour of operation.

| Generator Bearing Temperature   |         |         |         |         |         |
|---------------------------------|---------|---------|---------|---------|---------|
| Item                            | Test #1 | Test #2 | Test #3 | Test #4 | Test #5 |
| Date of test                    |         |         |         |         |         |
| Machine S/N                     |         |         |         |         |         |
| Hour meter reading              |         |         |         |         |         |
| Ambient temperature °F          |         |         |         |         |         |
| Bearing retainer temperature °F |         |         |         |         |         |
| Comments:                       |         |         |         |         |         |
| Test conducted by:              |         |         |         |         |         |

NOTE! Maximum allowable temperature rise over ambient is 100°F (37.7°C).  
 To convert °F to °C, (°F – 32) x 5/9 e.g., 100° F would calculate as: (100 – 32) X 5/9 = 37.78°C.

**Figure 20. Bearing temperature test data record**

## NOTICE

Use this sheet as a template & make copies for recording actual data.

## 500 Hour Non-Operational Inspections and Service

### 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.

### Machine Shutdown and lockout

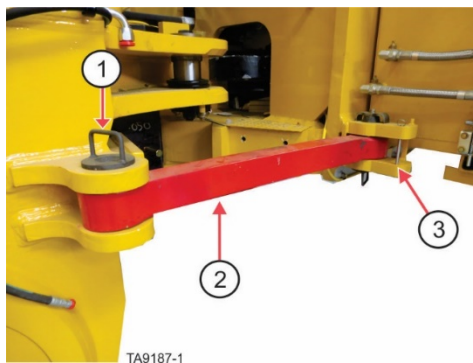
#### **WARNING**

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.

#### **WARNING**

Electrical shock hazard exists while conducting operational or energized tests on the machine. Most PM checks must be conducted with the engine shut off. This is especially significant when removing access covers to gain access to electrical components such as the drive motors or opening the SR converter cabinet. **UNDER NO CIRCUMSTANCES SHOULD THE AXLE ACCESS COVERS BE REMOVED WHILE THE MACHINE IS ENERGIZED.** Accidental contact with exposed high voltage terminals in the interior may cause an electrical shock hazard resulting in serious injury or death.

- 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 unlocked position

### Frame Lock

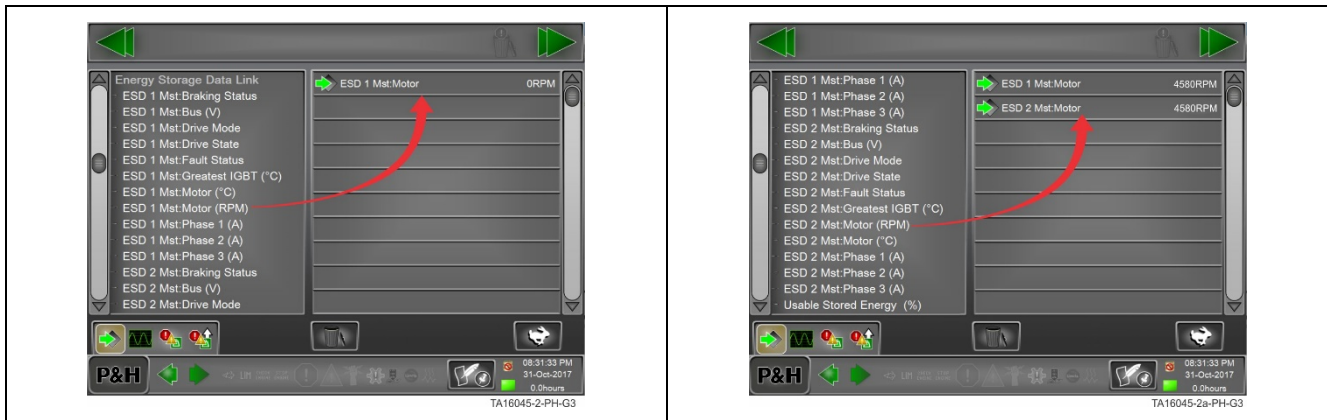
- c. Set bucket flat and level on the ground.
- d. Place wheel chocks in front and behind each wheel.
  - Chocking against motion must be done using chocks rated for the equipment being chocked. Heavy mobile equipment must be chocked with appropriate chocks. Factors such as machine weight, size, wheel diameter, ground grade and others must be considered when selecting chocks
- e. Set the parking brakes.
- f. Discharging the KESS should be done before shutting the machine down by performing the following steps:



### Operators Screen – KESS at 60%

- g. Ensure Park Brake is SET
- h. Place machine at LO Throttle
- i. Select Main Menu button

- j. Select Data Logging
- k. Select Logging/Monitoring
- l. Select Energy Storage Data Link
- m. Move ESD 1 Mst:Motor (RPM) and ESD 2 Mst:Motor (RPM) to right column by clicking and dragging



ESD Motor Channel Select

- n. Press the Drive Enable Switch



Drive Enable Switch

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



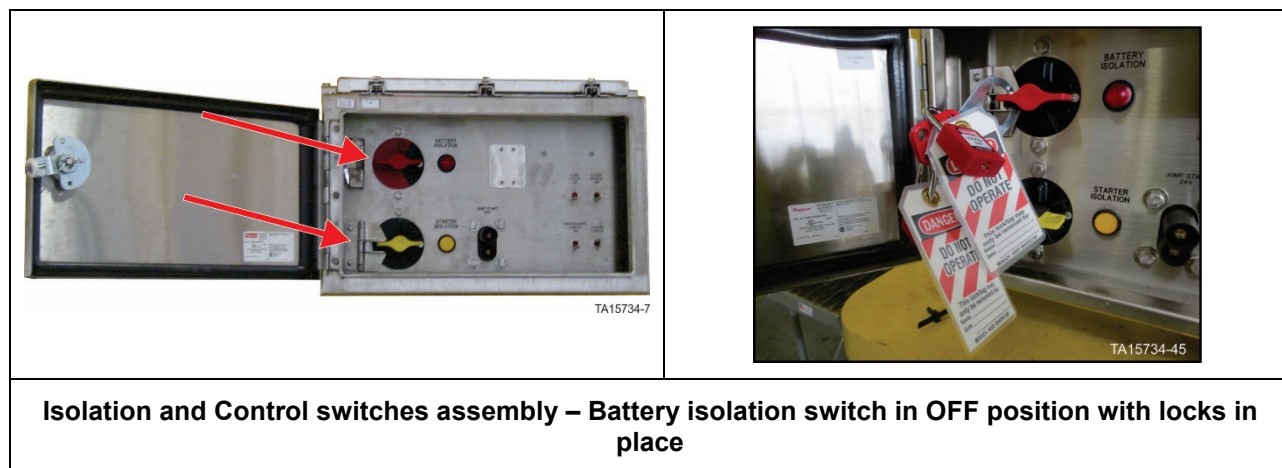
ESD Motor RPM

- p. 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.

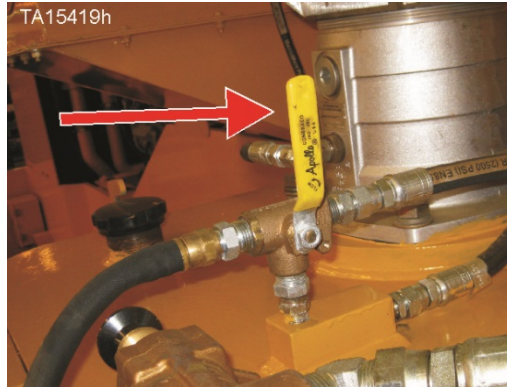
- q. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch. Lock out the machine's starting capability before performing any cleaning, inspections, or installation and repair procedure.



Isolation and Control switches assembly – Battery isolation switch in OFF position with locks in place

- r. 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.

- s. Turn the handle to the up position as shown.

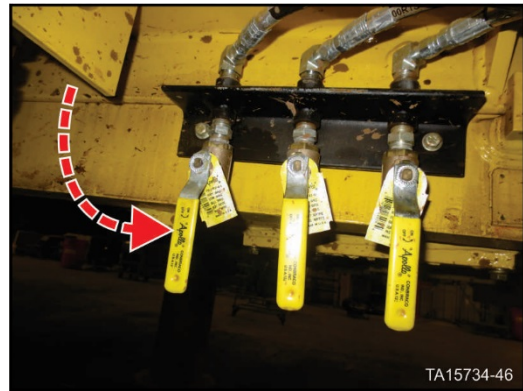
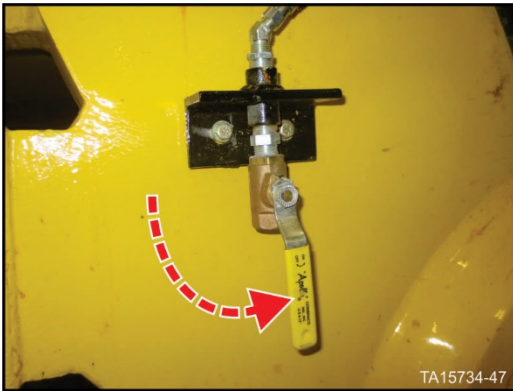


**Hydraulic reservoir air valve handle UP**

- t. 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

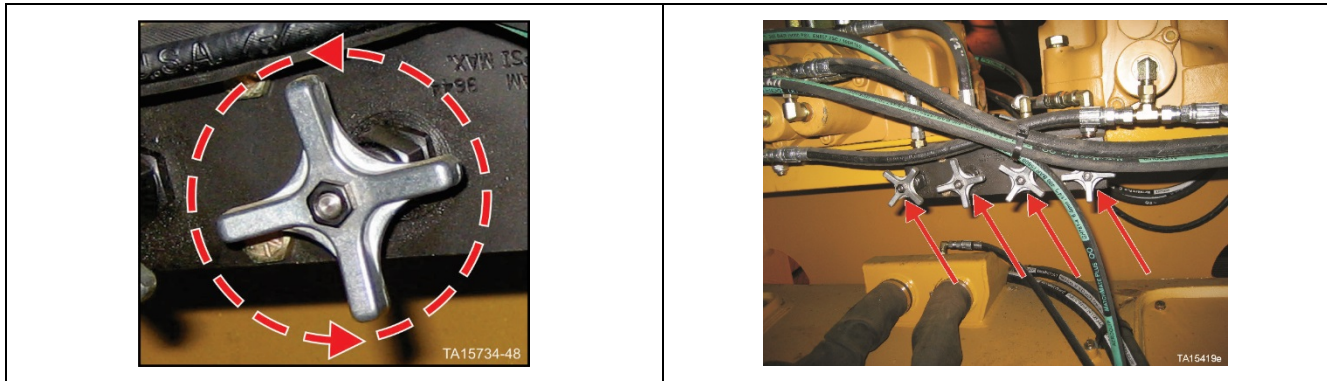


**Open air reservoir bleed valves**

## **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.

- u. 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.



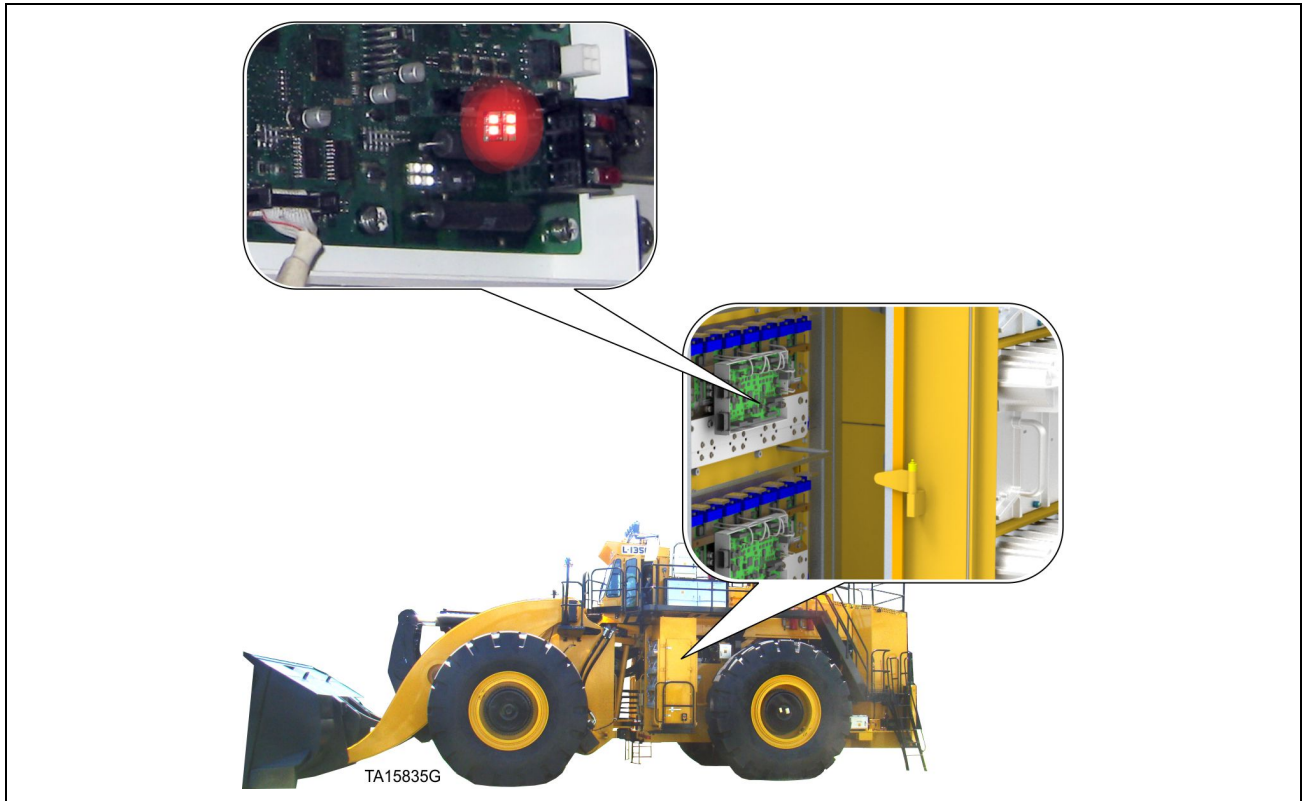
- v. Drain the hydraulic reservoir if applicable to the procedure being performed.

## 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.



**Converter assembly bus LED's**

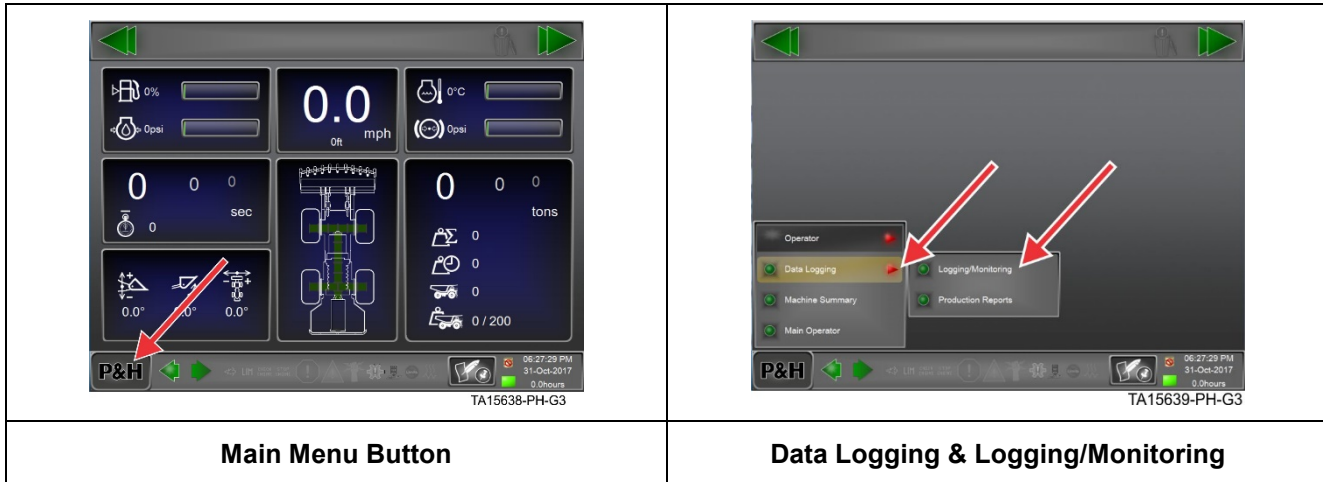
There are three different methods that are combined to verify when it is safe to enter the electrical cabinet.

1. LINC'S II display in cab
2. Visual indication in electrical cabinet
3. Physical measurement

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

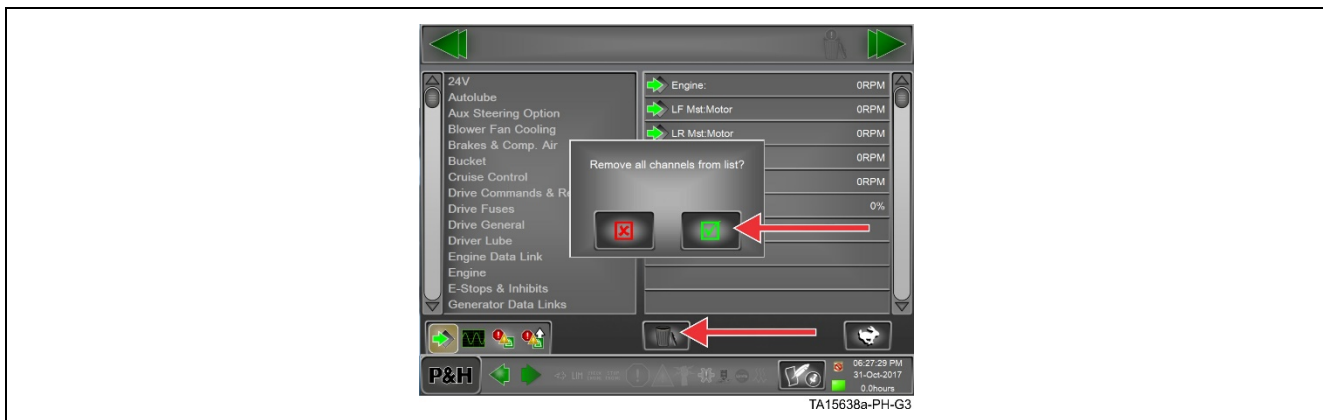
## In Cab Verification Using LINCS II Display

1. Make sure that the LINCS II system is booted (key switch ON) with the engine NOT running and the park brake SET.
2. 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.



**LINCS logging/monitoring menu access**

3. 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).



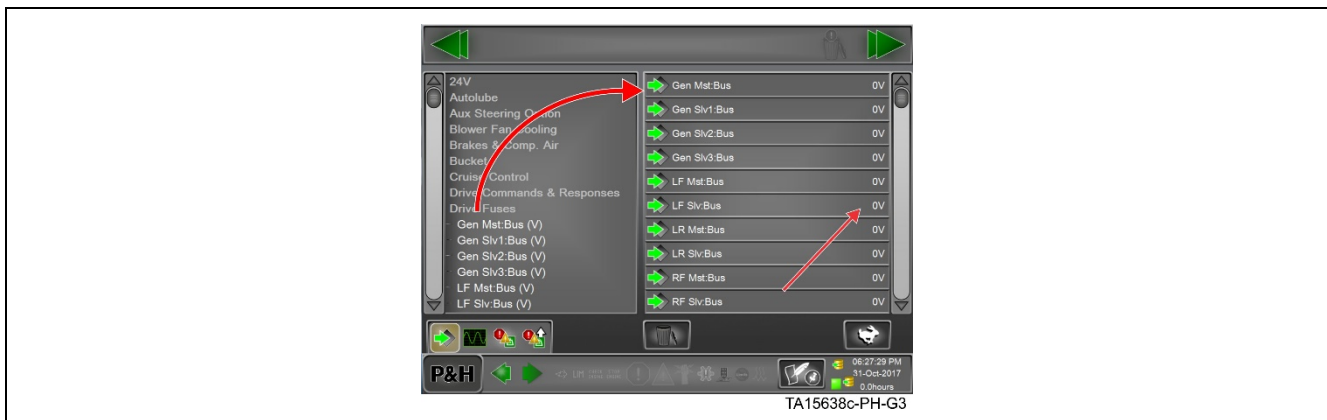
**Remove channels**

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



Left hand scroll

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



Bus voltage indication

6. 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.

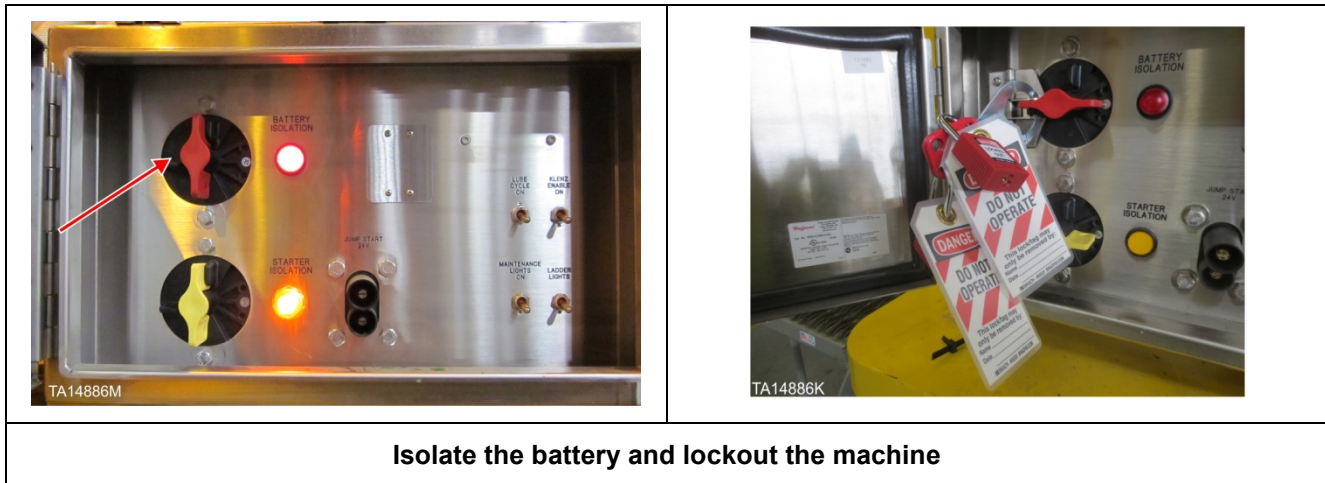
7. Turn the key switch to the OFF position and proceed to the next step in the verification process.

## 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:

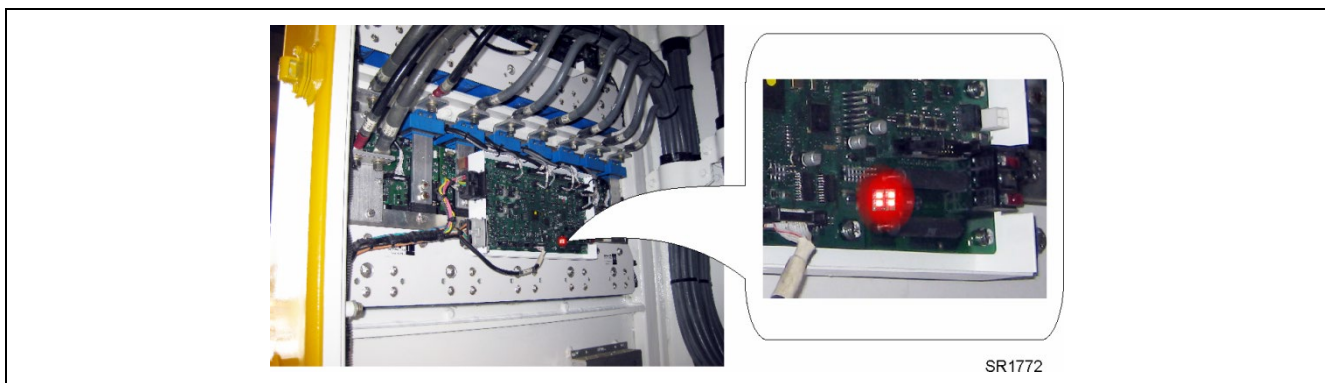
- The 24V DC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



**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.



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

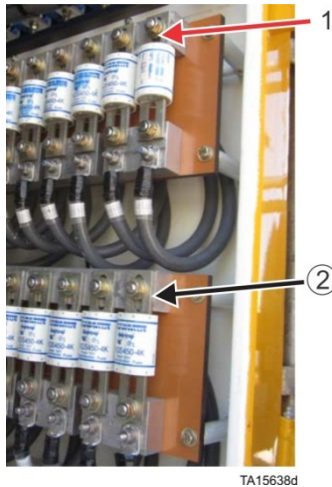
## Verification by Physical Measurement Main Bus Bars

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

#### **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

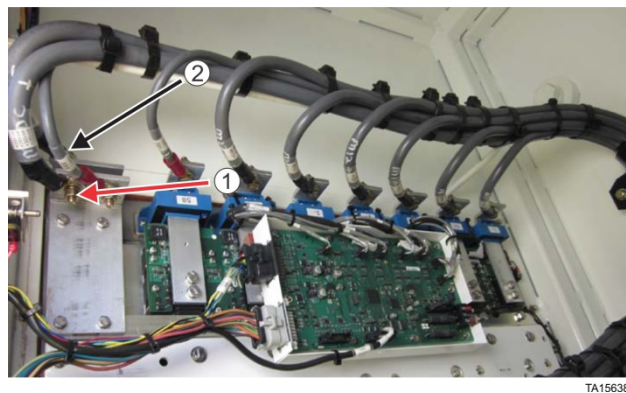
**The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.**

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

**assembly bus connections (rear of cabinet)**



1) Positive bus bar, 2) Negative bus bar

**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.

 **WARNING**

Fall hazard exists when working at elevated locations. Take appropriate “fall arrest” safety precautions as required by local rules, regulations, and procedures when working at heights on the machine, as example, on the rear and front frames. Follow all required statutory regulations for working at height. Failure to follow all locally required “fall arrest” procedures can cause a fall hazard, resulting in serious injury or death.

 **WARNING**

Crush hazards exist when a load is suspended. Suspended loads can fall. Never work under suspended loads. Working under suspended loads could cause a crushing hazard which might result in serious injury or death.

**Inspection****NOTICE**

**BRAKE INSPECTION:** Air pressure is required to keep the brakes from setting. Connect shop air to the quick connection fitting on the distribution reservoir, located in the front of the rear frame. Pressurize the system to operating pressure of 135 psi (9.3 bar). **BE SURE** the shop air is an uninterruptible source.

 **CAUTION**

Crush hazards or pinch point hazards exists if air pressure drops below operating pressure while inspecting the brakes. The brakes will set automatically if the air pressure drops below operating pressure. This could occur suddenly and unexpectedly. During brake inspection, a technician should be stationed in the operator’s cab to monitor the air pressure and be in direct communication with the person accessing the axles. Inspecting the brakes while the air pressure is not at operating pressure could cause crush hazards or pinch point hazards resulting in serious injury.

 **WARNING**

Electrical shock hazard exists if accessing the axles while the engine is started. **UNDER NO CIRCUMSTANCES** is the engine to be started while accessing the axles when checking the brakes and traction motors. Contact with energized terminals inside the axles could cause electrical shock hazard resulting in serious injury or death.

 **WARNING**

Entanglement hazard exists when testing the auto lubrication system. Testing requires starting the engine. The drive shaft between the engine and generator rotates once the engine begins to turn from cranking. Follow all engine starting procedures before starting the engine. Ensure all personnel are clear of the area before starting the machine. Failure to follow starting procedures and clear the area of all personnel could cause an entanglement hazard on rotating components such as the drive shaft between the engine and generator, or engine fan, resulting in serious injury or death.

## Checklist

|                            |                                                                                                                                     | Checked | Service Required |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------|------------------|
| <b>1. Auto-Lube System</b> |                                                                                                                                     |         |                  |
| a.                         | Check grease pump motor for leaks and check level.                                                                                  |         |                  |
| b.                         | Actuate auto lube switch (in cab or in front frame). Verify lube system operates properly.                                          |         |                  |
| c.                         | Check grease injector banks for operation for leaks (look at all injectors while system is cycling).                                |         |                  |
| 1)                         | Lift arm crossmember                                                                                                                |         |                  |
| 2)                         | Left bellcrank                                                                                                                      |         |                  |
| 3)                         | Right bellcrank                                                                                                                     |         |                  |
| 4)                         | Steering pivot areas                                                                                                                |         |                  |
| 5)                         | Rear frame                                                                                                                          |         |                  |
| 6)                         | Front frame upper crossover tube                                                                                                    |         |                  |
| d.                         | Check all grease lines for leaks or rubbing and damage.                                                                             |         |                  |
| e.                         | Clean or replace inline filters (2)                                                                                                 |         |                  |
| <b>2. Brake Inspection</b> |                                                                                                                                     |         |                  |
| a.                         | Check for air leaks (by foot pedal/brake valve).                                                                                    |         |                  |
| b.                         | Check pads for wear thickness (minimum, .250").                                                                                     |         |                  |
| c.                         | With loader parked on level ground and wheels blocked, release the brakes and check the pad to disc clearance on both sides (.060") |         |                  |
| d.                         | Check brake disc for wear (1/8" maximum grooving).                                                                                  |         |                  |
| e.                         | Check actuation and release of all brakes.                                                                                          |         |                  |
| f.                         | Check rear brake lights.                                                                                                            |         |                  |
| <b>3. Hydraulic System</b> |                                                                                                                                     |         |                  |

|                             |                                                                | Checked | Service Required |
|-----------------------------|----------------------------------------------------------------|---------|------------------|
| a.                          | Check for leaks                                                |         |                  |
| 1)                          | Blower motor                                                   |         |                  |
| 2)                          | Hoist and bucket control main valve                            |         |                  |
| 3)                          | Hoses, filter housing, valves, fitting, junction blocks        |         |                  |
| 4)                          | Hoist cylinders                                                |         |                  |
| 5)                          | Bucket cylinders                                               |         |                  |
| 6)                          | Manifolds                                                      |         |                  |
| 7)                          | HPD gearbox                                                    |         |                  |
| 8)                          | Steering cylinders                                             |         |                  |
| 9)                          | Pumps                                                          |         |                  |
| 10)                         | Pump suction hoses                                             |         |                  |
| 11)                         | Fan motor, oil cooler                                          |         |                  |
| 12)                         | Hydraulic reservoir                                            |         |                  |
| b.                          | Check hoist and bucket control main valves for tight mounting. |         |                  |
| c.                          | Check for rubbing hoses (watch hoses during hoist).            |         |                  |
| d.                          | Check bucket dump relief (Refer to Section 04).                |         |                  |
| e.                          | Collect hydraulic oil sample for analysis.                     |         |                  |
| <b>4. Hydraulic Gearbox</b> |                                                                |         |                  |
| a.                          | Check gearbox mounting bolts.                                  |         |                  |
| b.                          | Collect gearbox oil sample for analysis using a suction pump.  |         |                  |
| <b>5. Fuel Reservoir</b>    |                                                                |         |                  |
| a.                          | Check hoses for leaks or rubbing.                              |         |                  |

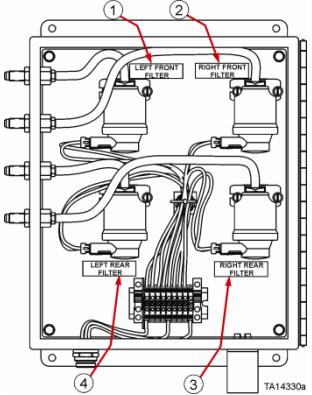
|                                 |                                                                                     | Checked | Service Required |
|---------------------------------|-------------------------------------------------------------------------------------|---------|------------------|
| b.                              | Check condition of breathers.                                                       |         |                  |
| c.                              | Drain condensate from bottom of fuel filters.                                       |         |                  |
| <b>6. Compressed Air System</b> |                                                                                     |         |                  |
| a.                              | Check compressor mounting on HPD Gearbox.                                           |         |                  |
| b.                              | Check and drain all air reservoirs.                                                 |         |                  |
| c.                              | Check air dryer mounting                                                            |         |                  |
| d.                              | Check hoses and connections for leaks/clamps for tightness                          |         |                  |
| <b>7. Cooling Air System</b>    |                                                                                     |         |                  |
| a.                              | Check hose connections for loose clamps.                                            |         |                  |
| b.                              | Check all cooling air hoses for, wear and damage and possible leaks.                |         |                  |
|                                 | 1) Pivot hose                                                                       |         |                  |
|                                 | 2) Front frame hose                                                                 |         |                  |
|                                 | 3 )Blower to frame/frame to rear axle                                               |         |                  |
|                                 | 4) Blower to pivot                                                                  |         |                  |
|                                 | 5) Blower to electric High Voltage cabinet                                          |         |                  |
|                                 | 6) Blower to generator                                                              |         |                  |
|                                 | 7) KLENZ™ box to blower fan structure                                               |         |                  |
| <b>8. Planetary Drive</b>       |                                                                                     |         |                  |
| a.                              | Planetary drive oil level.                                                          |         |                  |
| b.                              | Check for leaks:                                                                    |         |                  |
|                                 | 1) Main seal (shows on the inside of the wheel rim).                                |         |                  |
|                                 | 2) Motor pinion seal or planetary drive breather (shows on the bottom of the axle). |         |                  |

|            |                                                                                                                     | Checked | Service Required |
|------------|---------------------------------------------------------------------------------------------------------------------|---------|------------------|
|            | <b>3)</b> Cover assembly (shows on the inside of the wheel rim).                                                    |         |                  |
| <b>c.</b>  | Collect oil samples for analysis.                                                                                   |         |                  |
| <b>9.</b>  | <b>Engine</b> (refer to engine manufacturer for exact intervals)                                                    |         |                  |
| <b>a.</b>  | Change engine oil (oil viscosity as per manufacturer's recommendations).                                            |         |                  |
| <b>b.</b>  | Change primary oil filters (as per manufacturer's recommendations).                                                 |         |                  |
| <b>c.</b>  | Change bypass oil filters (as per manufacturer's recommendations).                                                  |         |                  |
| <b>d.</b>  | Change fuel filters (as per manufacturer's recommendations).                                                        |         |                  |
| <b>e.</b>  | Service fuel processor (Detroit Diesel equipped machines).                                                          |         |                  |
| <b>f.</b>  | Cummins engines: Check coolant concentration.                                                                       |         |                  |
| <b>g.</b>  | Check air filter restriction indicators and change air filters as required (refer to Section 05 in Service Manual). |         |                  |
| <b>h.</b>  | Check for oil or coolant leaks at engine.                                                                           |         |                  |
| <b>i.</b>  | Inspect rubber connections on the air intake lines for loose clamps and possible leaks.                             |         |                  |
| <b>j.</b>  | Check engine wiring harness for rubbing areas.                                                                      |         |                  |
| <b>k.</b>  | Inspect radiator and oil cooler assembly for leaks, damage and cleanliness.                                         |         |                  |
| <b>l.</b>  | Check antifreeze concentration.                                                                                     |         |                  |
| <b>m.</b>  | Clean crankcase breather.                                                                                           |         |                  |
| <b>n.</b>  | Check exhaust lines for leaks/loose clamps.                                                                         |         |                  |
| <b>o.</b>  | Grease front harmonic balancer bearing (Cummins only).                                                              |         |                  |
| <b>10.</b> | <b>"KLENZ™" air filtration system</b>                                                                               |         |                  |
| <b>a.</b>  | Inspect filter elements for buildup of contamination.                                                               |         |                  |
| <b>b.</b>  | Check compressed air KLENZ™ reservoir for contamination.                                                            |         |                  |
| <b>c.</b>  | Check pulse valves, solenoid valves, and tubing for leakage.                                                        |         |                  |

|     |                                                                                                                                                                                              | Checked | Service Required |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------|
| d.  | Clean moisture eliminator screen (requires removal from machine - <u>DO NOT</u> clean while installed). (Refer to Section 05 in Service Manual).                                             |         |                  |
| 11. | Check ROPS torque nuts [114 ft.-lbs. (154.6 N•m) lubed per bolt]. (lubricated with lubricant from Super Bolt Company -- (JL-G) Komatsu P/N 427-3753). <u>DO NOT</u> use any other lubricant. |         |                  |
| 12. | <b>Check taper pin retaining bolt torque on:</b>                                                                                                                                             |         |                  |
|     | • Bucket cylinder to frame                                                                                                                                                                   |         |                  |
|     | • Bucket cylinder to bellcrank                                                                                                                                                               |         |                  |
|     | • Hoist cylinder to lift arm (L-1350)                                                                                                                                                        |         |                  |
|     | • Hoist cylinder to lift arm (Super Nut on L-1850, L-2350)<br>(Torque bolts on Super Nut Multi-Jack Tensioner)                                                                               |         |                  |
|     | • Bell crank to level link                                                                                                                                                                   |         |                  |
|     | • Level link to bucket (L-1350, L-1850, L-2350 only)                                                                                                                                         |         |                  |
|     | • Steering cylinder to frame (4 locations) (special torque value required, refer to Section 4, "HYDRAULIC SYSTEMS", "HYDRAULIC REMOVAL AND INSTALLATION" in the Service Manual).             |         |                  |
| 13. | <b>Ball Caps</b> – check for proper torque values.                                                                                                                                           |         |                  |
| a.  | Check bolt torque:                                                                                                                                                                           |         |                  |
|     | 1) Lift arms                                                                                                                                                                                 |         |                  |
|     | 2) Hoist cylinders                                                                                                                                                                           |         |                  |
|     | 3) Steering pivot - upper and lower                                                                                                                                                          |         |                  |
|     | 4) Oscillating axle                                                                                                                                                                          |         |                  |
| 14. | Check torque on wheel attachment capscrews. Refer to "TIRE AND RIM", in Section 03 of the Service Manual, for torque pattern.                                                                |         |                  |
| 15. | Check torque on engine mount bolts.                                                                                                                                                          |         |                  |
| 16. | Hood mount bolts                                                                                                                                                                             |         |                  |

|            |                                                                                                                                                                                        | Checked | Service Required |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------|
| <b>17.</b> | Machines with “contactless” encoders (Gen3 only) (bucket, lift arm, steering), apply one shot of grease to each encoder. Contactless encoders have a grease Zerk on the mount housing. |         |                  |
| <b>18.</b> | LPRC Unit (Mine Air AC unit) Reference Section 05-04                                                                                                                                   |         |                  |
| <b>a.</b>  | Check and record the standing pressure.                                                                                                                                                |         |                  |
| <b>b.</b>  | Blow out dust from condenser coil and unit case.                                                                                                                                       |         |                  |
| <b>c.</b>  | Check the lid gasket. It should be pliable and properly sealed against the lip                                                                                                         |         |                  |
| <b>d.</b>  | Tighten electrical connections.                                                                                                                                                        |         |                  |
| <b>e.</b>  | Check and record the standing pressure.                                                                                                                                                |         |                  |
| <b>f.</b>  | Ensure condenser fans are both working                                                                                                                                                 |         |                  |
| <b>g.</b>  | Soap all test refrigeration fittings.                                                                                                                                                  |         |                  |
| <b>h.</b>  | Tighten refrigerant fittings 18-25 ft/lbs (24.4-33.9 N•m) max.                                                                                                                         |         |                  |
| <b>i.</b>  | Visually inspect the LPRC hoses and fittings for signs of refrigerant oil.                                                                                                             |         |                  |
| <b>j.</b>  | View the receiver sight glass to ensure it is clear.                                                                                                                                   |         |                  |
| <b>k.</b>  | With unit running, confirm a heat transfer is taking place.                                                                                                                            |         |                  |
| <b>l.</b>  | With the unit running, check the current draw on the main power cable.                                                                                                                 |         |                  |
| <b>m.</b>  | With the unit running, check and record the low and high side refrigerant pressures.                                                                                                   |         |                  |

# KLENZ™ System Inspection and Service Record Sheet

| Date                                                                                   |                                                                                                                                       | Time      |              | Model         |                                          | Serial No.     |              | Hours                                                                                                           |                                                                                                                                                                                |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|---------------|------------------------------------------|----------------|--------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Before & after Filter Change                                                           | Engine running checks - before & after any filter changes<br>(if not changing filter, record "before" box only) (in H <sub>2</sub> O) |           |              |               |                                          |                |              |                                                                                                                 |  <p>1) Left Front Filter 2) Right Front Filter 3) Right Rear Filter 4) Left Rear Filter</p> |
|                                                                                        | KLENZ™ restriction                                                                                                                    |           | Blower RPM   |               | Inlet restriction indicators (High idle) |                |              |                                                                                                                 |                                                                                                                                                                                |
|                                                                                        | Low Idle                                                                                                                              | High Idle | Low Idle     | High Idle     | #1 Left Front                            | #2 Right Front | #3 Left Rear | #4 Right Rear                                                                                                   |                                                                                                                                                                                |
| Before                                                                                 |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| After                                                                                  |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Some machines have only two (2) filter restriction gauges                              |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| KLENZ™ Pulse Valves and Solenoids                                                      |                                                                                                                                       |           |              |               |                                          |                |              | Pulse Timing                                                                                                    |                                                                                                                                                                                |
| KLENZ™ Pulse Valve Operational Checks - Do Pulse Valves Function Correctly? (YES / NO) |                                                                                                                                       |           |              |               |                                          |                |              | LINC® Time In Seconds                                                                                           |                                                                                                                                                                                |
| Top Front                                                                              | Top Middle                                                                                                                            | Top Rear  | Center Front | Center Middle | Center Rear                              | Lower          | Low Idle     | High Idle                                                                                                       |                                                                                                                                                                                |
|                                                                                        |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| PRIMARY FILTER INSPECTION & CHANGES                                                    |                                                                                                                                       |           |              |               |                                          |                |              | <i>The KLENZ™ Pulse Valves should emit a clearly audible "BOOM" whenever the LINC® energizes the Solenoids.</i> |                                                                                                                                                                                |
| KLENZ™ PRIMARY FILTER CONDITION - WAS FILTER CHANGED (OK / CHANGED)                    |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Top Front                                                                              | Top Middle                                                                                                                            | Top Rear  | Center Front | Center Middle | Center Rear                              | Lower          |              |                                                                                                                 |                                                                                                                                                                                |
|                                                                                        |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Engine Safety Filter Inspection & Changes                                              |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Do Not Remove Any Engine Safety Filter Cover Unless Indicated By Lincs                 |                                                                                                                                       |           |              |               | #1 Top                                   | #2 Mid Upper   | #3 Mid Lower | #4 Bottom                                                                                                       |                                                                                                                                                                                |
| Filter Indicator Flag in Filter Retainer Nut Color (Red / Green)                       |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Safety Filter Nut Cotter Pins Installed (Yes / No)                                     |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Safety Filter Changes                                                                  |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Check Air Induction System Ducting and Mounts                                          |                                                                                                                                       |           |              |               | Left Front                               | Left Rear      | Right Front  | Right Rear                                                                                                      |                                                                                                                                                                                |
| KLENZ™ End - Hose and Clamp Check (OK / Damaged / Repaired)                            |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Turbo End - Hose and Clamp Check (OK / Damaged / Repaired)                             |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Air Inlet Ducting and Supports Check (OK / Damaged / Repaired)                         |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Parts required, action required, repairs completed:                                    |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Comments:                                                                              |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |
| Inspector's name (print)                                                               |                                                                                                                                       |           |              |               | Inspector's signature                    |                |              |                                                                                                                 |                                                                                                                                                                                |
|                                                                                        |                                                                                                                                       |           |              |               |                                          |                |              |                                                                                                                 |                                                                                                                                                                                |

## 500 Hour Inspections and Service

### Oil Analysis

## NOTICE

Drive the machine for five minutes to circulate oil. Collect samples within 10 minutes following shutdown.

|                                                     | Hyd.<br>Reservoir | Hyd. Pump<br>gearbox | Engine |
|-----------------------------------------------------|-------------------|----------------------|--------|
| Date of sample                                      |                   |                      |        |
| S/N of machine                                      |                   |                      |        |
| Hour meter reading                                  |                   |                      |        |
| Hours of operation on machine since last oil change |                   |                      |        |
| Results of magnetic oil plug samples                |                   |                      |        |
| Oil sample drawn                                    |                   |                      |        |
| Type of oil                                         |                   |                      |        |
| Oil sample analysis completed - date                |                   |                      |        |
| Spectrographic analysis*                            |                   |                      |        |
| Viscosity test*                                     |                   |                      |        |
| Insoluble material test*                            |                   |                      |        |
| Total acid number test*                             |                   |                      |        |
| Water content*                                      |                   |                      |        |
| Action taken                                        |                   |                      |        |

|                                 |  |  |  |
|---------------------------------|--|--|--|
| Sampling done by                |  |  |  |
| Oil analysis done by            |  |  |  |
| Mag. Plug analysis done by      |  |  |  |
| *Record laboratory test results |  |  |  |

## 500 Hour Non-Operational Electrical PM

### 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.

### Machine Shutdown and lockout

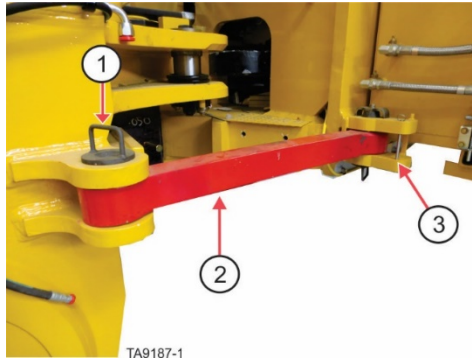
#### **WARNING**

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.

#### **WARNING**

Electrical shock hazard exists while conducting operational or energized tests on the machine. Most PM checks must be conducted with the engine shut off. This is especially significant when removing access covers to gain access to electrical components such as the drive motors or opening the SR converter cabinet. **UNDER NO CIRCUMSTANCES SHOULD THE AXLE ACCESS COVERS BE REMOVED WHILE THE MACHINE IS ENERGIZED.** Accidental contact with exposed high voltage terminals in the interior may cause an electrical shock hazard resulting in serious injury or death.

- 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 unlocked position

### 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
- e. Set the parking brakes.

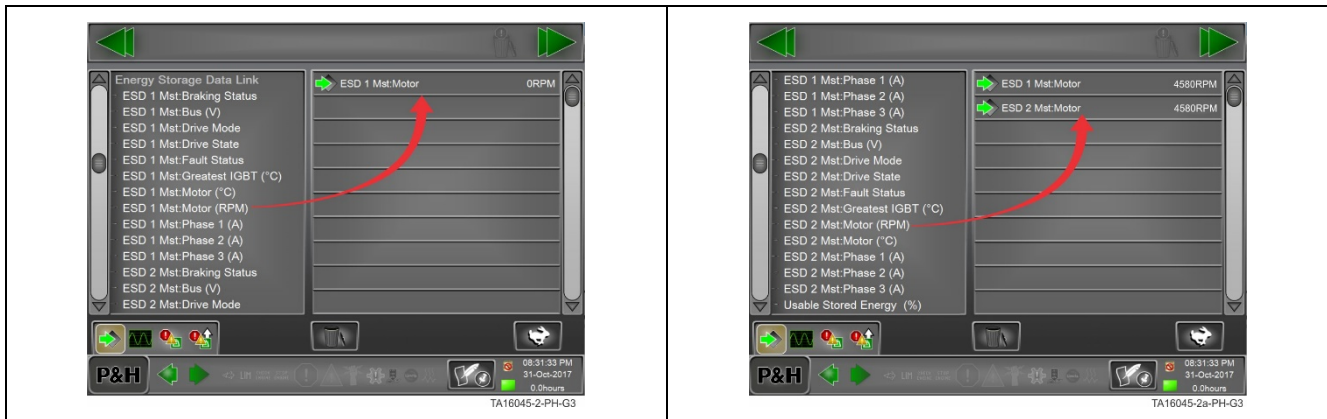
Discharging the KESS should be done before shutting the machine down by performing the following steps:



### 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



ESD Motor Channel Select

- m. Press the Drive Enable Switch



Drive Enable Switch

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



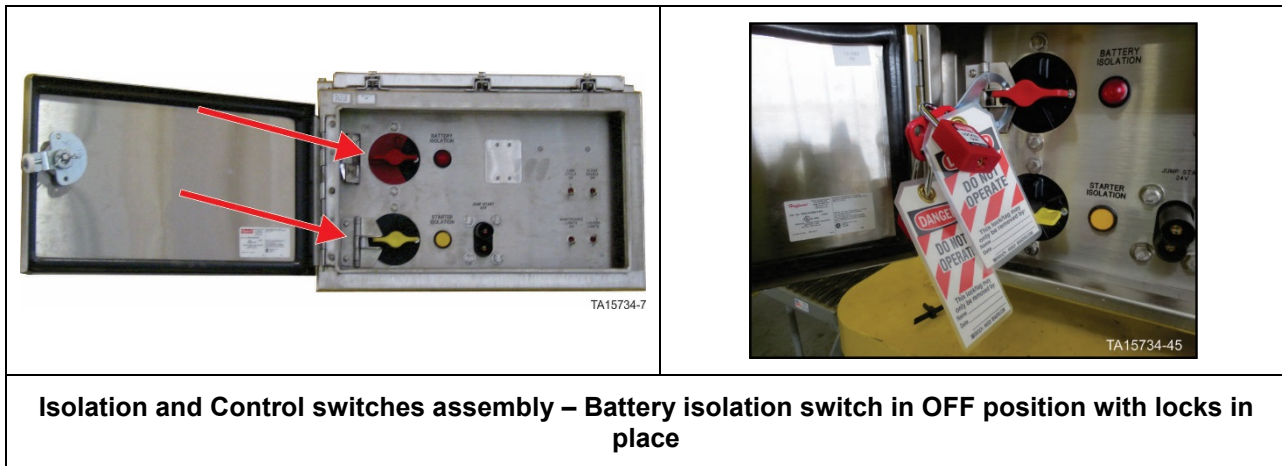
ESD Motor RPM

- o. Shut off the engine.

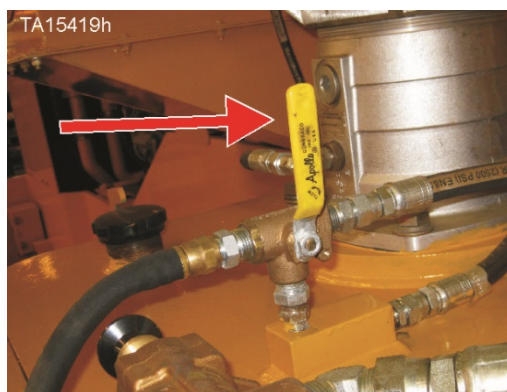
## ⚠ WARNING

**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.**

- 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.



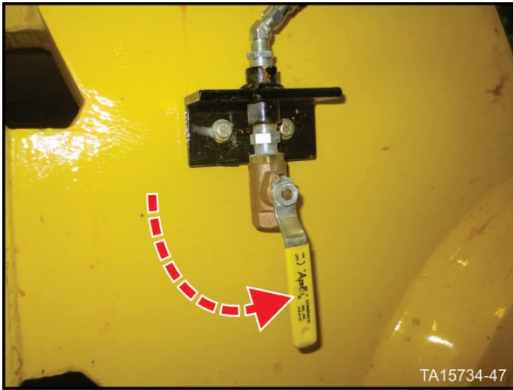
- q.** Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.
- r.** Turn the handle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

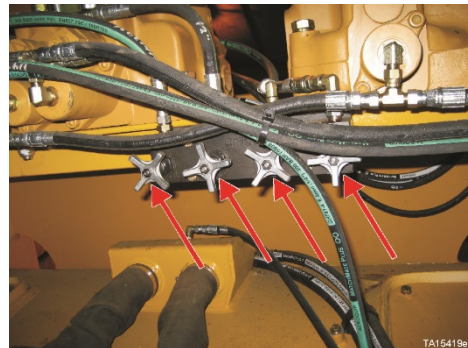
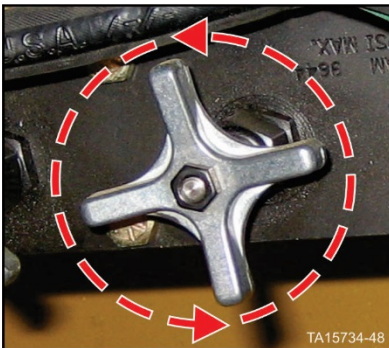


Open air reservoir bleed valves

## 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.
- 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.



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

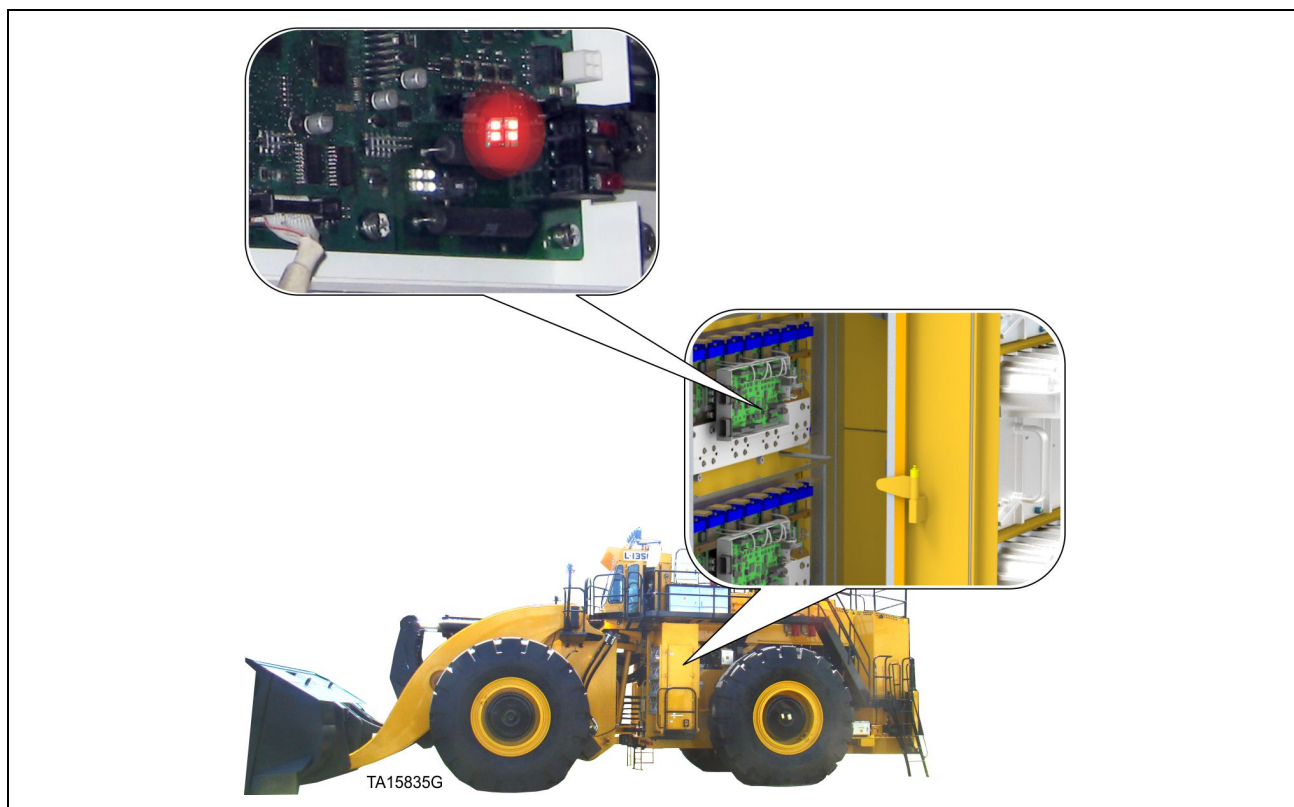
## Converter Bus Voltage



### 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.



**Converter assembly bus LED's**

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

1. LINC S II display in cab
2. Visual indication in electrical cabinet
3. Physical measurement

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

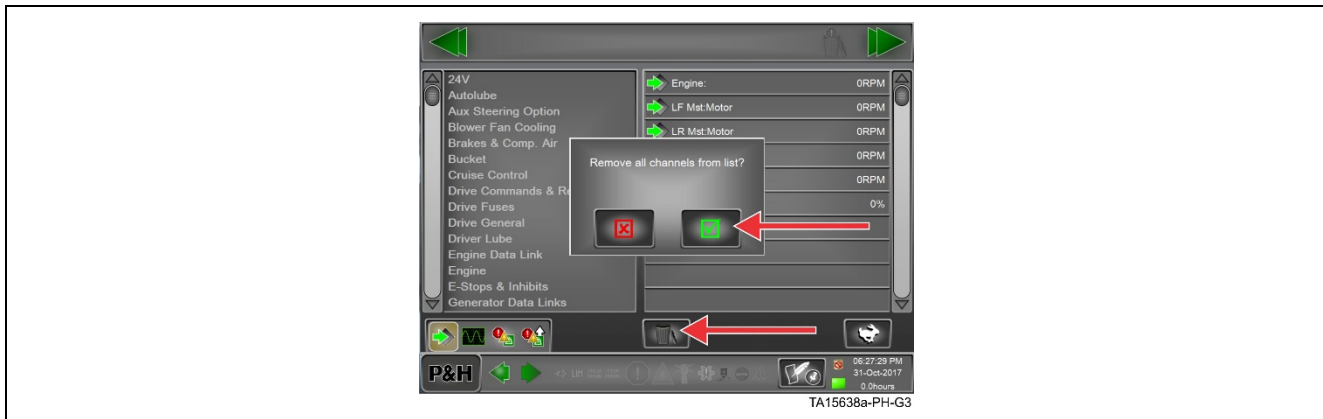
## In Cab Verification Using LINCS II Display

- Make sure that the LINCS II system is booted (key switch ON) with the engine NOT running and the park brake SET.
- 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.



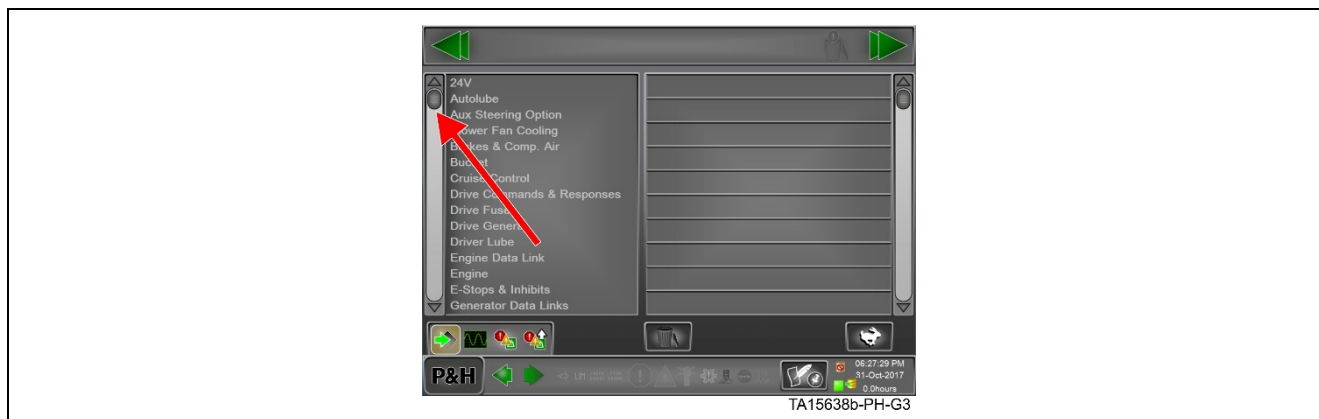
### LINCS logging/monitoring menu access

- 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).



### Remove channels

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



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.



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.

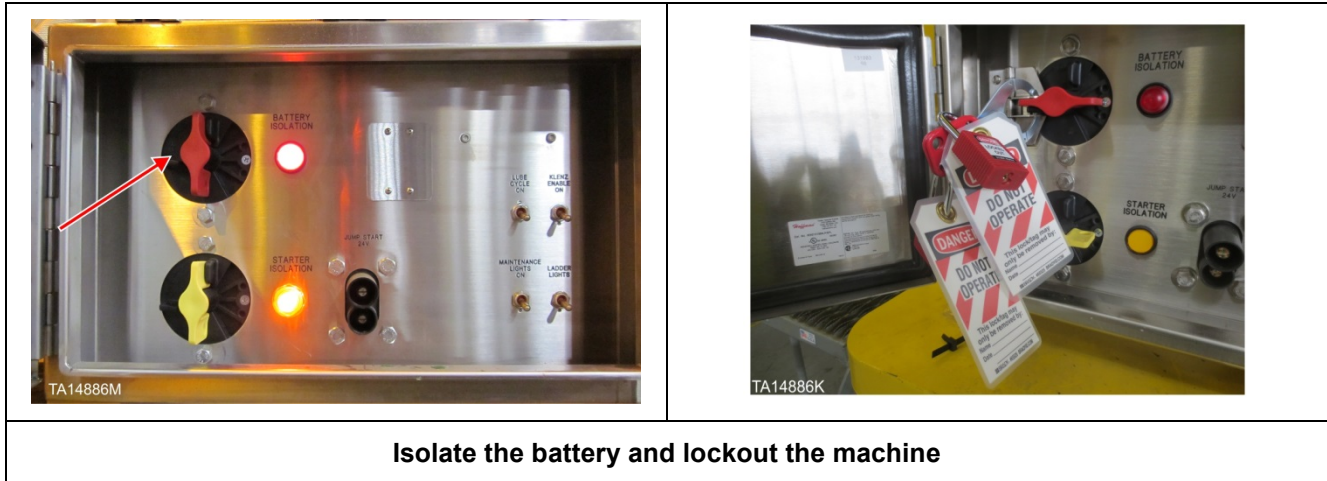
- g. Turn the key switch to the OFF position and proceed to the next step in the verification process.

## 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:

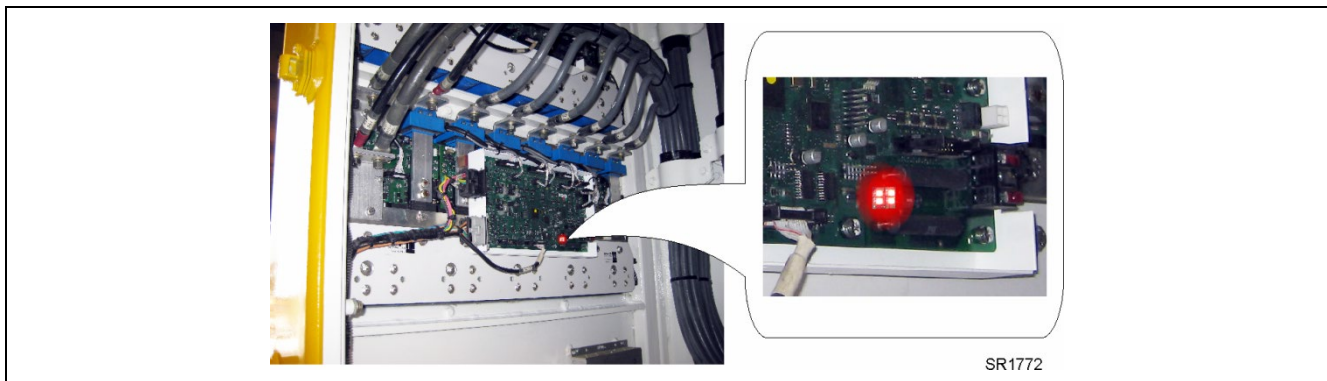
- The 24V DC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



**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.



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

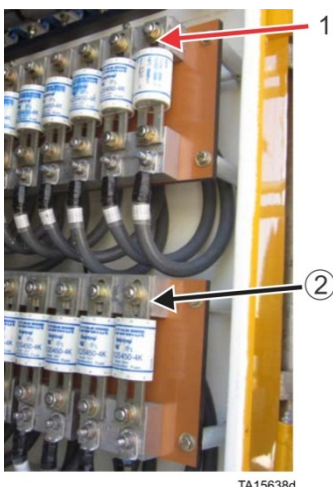
Once the visual indicators have been verified, the bus voltage should be physically measured. The bus voltage should be fully discharged based on the previous checks.

- 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 LINC 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

### Main bus bars

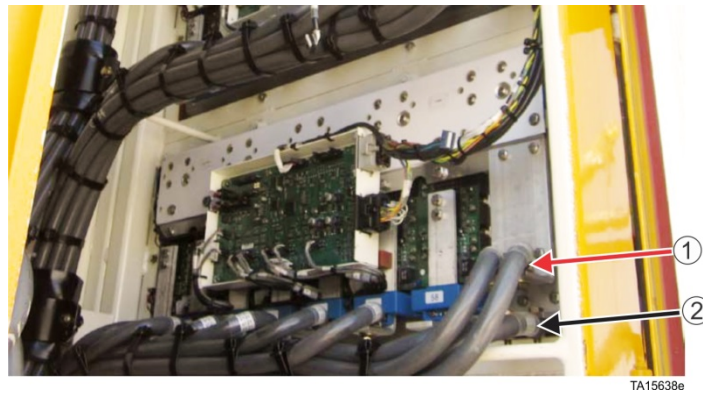
## Converter Assembly Bus Connections

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

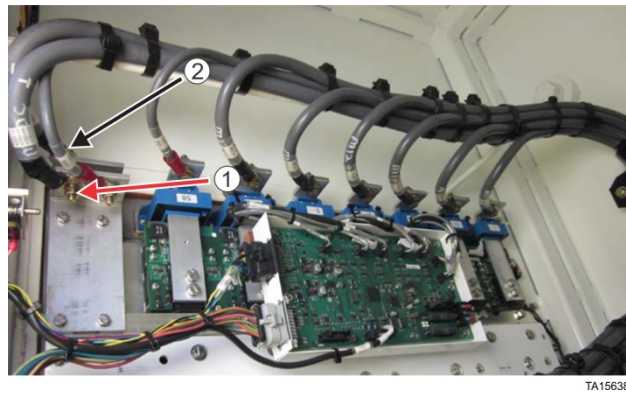
**The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.**

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

**Converter assembly bus connections (rear of cabinet)**



1) Positive bus bar, 2) Negative bus bar

**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.



## WARNING

Fall hazard exists when working at elevated locations. Take appropriate “fall arrest” safety precautions as required by local rules, regulations, and procedures when working at heights on the machine, as example, on the rear and front frames. Follow all required statutory regulations for working at height. Failure to follow all locally required “fall arrest” procedures can cause a fall hazard, resulting in serious injury or death.



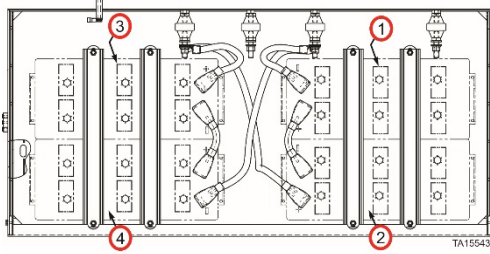
## WARNING

Crush hazards exist when a load is suspended. Suspended loads can fall. Never work under suspended loads. Working under suspended loads could cause a crushing hazard which might result in serious injury or death.



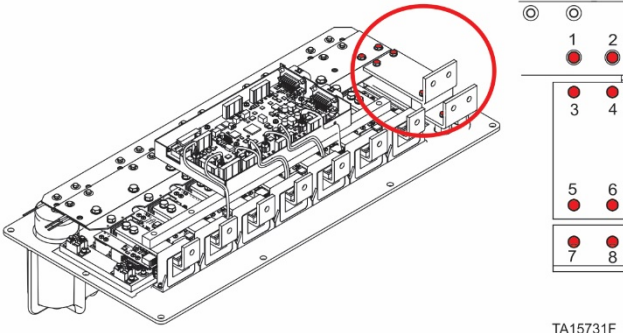
## WARNING

Electrical shock and Crush hazards exist when inspecting components or performing maintenance inspections without verifying all electrical components are de-energized. Before performing the following maintenance inspections, make sure the appropriate safety procedures have been followed and all electrical connections are de-energized to prevent electrical shock or uncontrolled movement of the machine. Also refer to “WARNINGS AND CAUTIONS” before attempting to follow these checks. Failure to follow maintenance safety procedures before and during maintenance inspections can cause electrical shock hazards and crush hazards resulting in serious injury or death.

|                                                                                 |                                                                                                                                                                                                                                                                                                     | Checked | Service Required |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------|
| <b>1. Check Batteries:</b>                                                      |                                                                                                                                                                                                                                                                                                     |         |                  |
| <b>a.</b>                                                                       | Check terminal posts and clamps                                                                                                                                                                                                                                                                     |         |                  |
| <b>b.</b>                                                                       | Check wires for rubbing.                                                                                                                                                                                                                                                                            |         |                  |
| <b>c.</b>                                                                       | Check electrolyte level. (4 batteries)                                                                                                                                                                                                                                                              |         |                  |
| 1) Battery #1                                                                   |                                                                                                                                                                                                                   |         |                  |
| 2) Battery #2                                                                   |                                                                                                                                                                                                                                                                                                     |         |                  |
| 3) Battery #3                                                                   |                                                                                                                                                                                                                                                                                                     |         |                  |
| 4) Battery #4                                                                   |                                                                                                                                                                                                                                                                                                     |         |                  |
| <b>d.</b>                                                                       | Clean battery tops.                                                                                                                                                                                                                                                                                 |         |                  |
| <b>2. High Voltage Cabinet Assembly:</b>                                        |                                                                                                                                                                                                                                                                                                     |         |                  |
| <b>a.</b>                                                                       | Clean inside the cabinet (with clean dry air or powerful vacuum cleaner).                                                                                                                                                                                                                           |         |                  |
| <b>b.</b>                                                                       | Inspect for loose wires, loose connections, or deterioration of insulation.                                                                                                                                                                                                                         |         |                  |
| <b>3. Generator: FILL OUT “GENERATOR PM SHEET” LOCATED AFTER THIS CHECKLIST</b> |                                                                                                                                                                                                                                                                                                     |         |                  |
| <b>4. Wheel Motors/Axles:</b>                                                   |                                                                                                                                                                                                                                                                                                     |         |                  |
| Perform the following visual and mechanical checks of the motor condition:      |                                                                                                                                                                                                                                                                                                     |         |                  |
| <b>a.</b>                                                                       | Remove dust, dirt or other debris from the interior of the axle housing and motor interior as much as possible with a vacuum cleaner or other means. DO NOT USE HIGH PRESSURE SHOP AIR as this tends only to drive the particles into crevices and does not remove the dust and debris effectively. |         |                  |
| <b>b.</b>                                                                       | Check that all wiring and cabling, is securely anchored.                                                                                                                                                                                                                                            |         |                  |
| <b>c.</b>                                                                       | Check that bolting, screws, etc., are all tight.                                                                                                                                                                                                                                                    |         |                  |
| <b>5. Power Cables:</b>                                                         |                                                                                                                                                                                                                                                                                                     |         |                  |

|    |                                                              | Checked | Service Required |
|----|--------------------------------------------------------------|---------|------------------|
| a. | Check cables from back of High Voltage cabinet to generator. |         |                  |
| b. | Check battery cable to starter.                              |         |                  |

**500 Hour Non-Operational Electrical PM (Continued)**

|                                                     |                                                                                                  |                                                                                     | Checked | Service Required |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------|------------------|
| <b>6. Braking Grid Resistors:</b>                   |                                                                                                  |                                                                                     |         |                  |
| a.                                                  | Clean. If steam cleaning or using air to clean, be careful not to damage the mica on the mounts. |                                                                                     |         |                  |
| b.                                                  | Check the resistors to ensure they are secure and not warped or burned.                          |                                                                                     |         |                  |
| c.                                                  | Check the mounting structure to ensure the bolts are secure.                                     |                                                                                     |         |                  |
| d.                                                  | Check the wiring harness and connections.                                                        |                                                                                     |         |                  |
| <b>7. Converter panel Bus bar attachment bolts.</b> |                                                                                                  |                                                                                     |         |                  |
| a.                                                  | Torque $\frac{1}{4}$ "-20 hex bolts (8 each) to 89 in lbs. (10 N m)                              |  |         |                  |

**G100/G200 Generator PM Sheet**

|                                                                                |                        |                                         |                                       |                                          |
|--------------------------------------------------------------------------------|------------------------|-----------------------------------------|---------------------------------------|------------------------------------------|
| Machine type                                                                   | Machine S/N            |                                         | Generator Type                        | Generator S/N                            |
| Date                                                                           | Hour meter             | Air covers in place<br>Yes ____ No ____ | Connections tight<br>Yes ____ No ____ | Lead covers in place<br>Yes ____ No ____ |
| RTD resistance/temperature                                                     | <b>1</b>               |                                         | <b>2</b>                              | <b>3</b>                                 |
| Vibration                                                                      | Non Drive End Vertical |                                         | Non Drive End Horizontal              | Non Drive End Axial                      |
|                                                                                | Engine End Vertical    |                                         | Engine End Horizontal                 | Engine End Axial                         |
| Check to ensure external wiring to the generator is secure.                    |                        |                                         | Needs Attention:                      | OK                                       |
| Check cables going to High Voltage cabinet for proper insulation and retention |                        |                                         | Needs Attention:                      | OK                                       |

## 500 Hour Non-Operational Inspections and Service

| Returning Machine To Service                                                                                                                                                                    |         |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------|
|                                                                                                                                                                                                 | Checked | Service Required |
| <b>1. Returning machine to service</b>                                                                                                                                                          |         |                  |
| <b>a)</b> Close manual air release valve on top of the hydraulic reservoir.                                                                                                                     |         |                  |
| <b>b)</b> Connect shop air to quick connect fitting on air distribution reservoir and pressurize compressed air system to operating pressure.                                                   |         |                  |
| <b>c)</b> Check compressed air system for air leaks.                                                                                                                                            |         |                  |
| <b>d)</b> Replace axle access covers.                                                                                                                                                           |         |                  |
| <b>e)</b> Move battery isolation switch or starter isolation switch to ON position.                                                                                                             |         |                  |
| <b>f)</b> Move KLENZ™ Enable switch to the ON position.                                                                                                                                         |         |                  |
| <b>g)</b> Unblock wheels.                                                                                                                                                                       |         |                  |
| <b>h)</b> Start engine per appropriate start up procedures. Verify proper oil level and pressure.                                                                                               |         |                  |
| <div style="background-color: yellow; text-align: center; padding: 10px;"><b>CAUTION</b></div> <p><b>Serious damage is possible if machine is moved with frame lock in locked position.</b></p> |         |                  |
| <b>i)</b> Move frame lock to unlocked position.                                                                                                                                                 |         |                  |

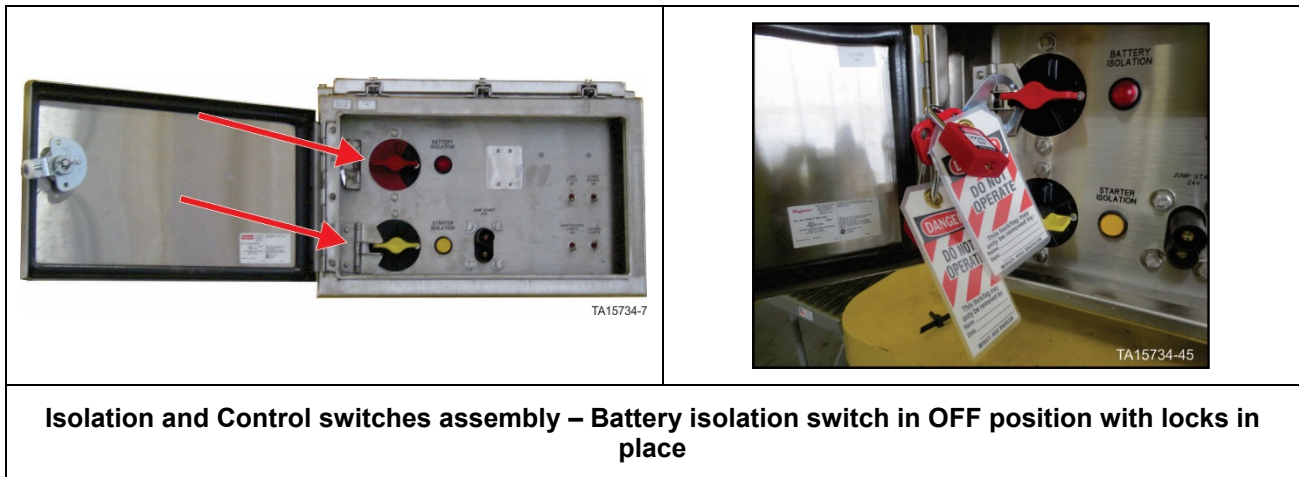
# 1000 Hour Non-Operational Inspections and Service

## Safety Preparations



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. 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. Place bucket flat and level on ground.
- c. Set the parking brakes.
- d. Shut off the engine.
- e. Turn on maintenance light switch located at left rear of machine in Control Switch Box Assembly.
- f. Lock out the machine's starting capability before performing any inspections.
- g. Turn the battery and engine isolation switches to the off position and install locks on the battery isolation switch.

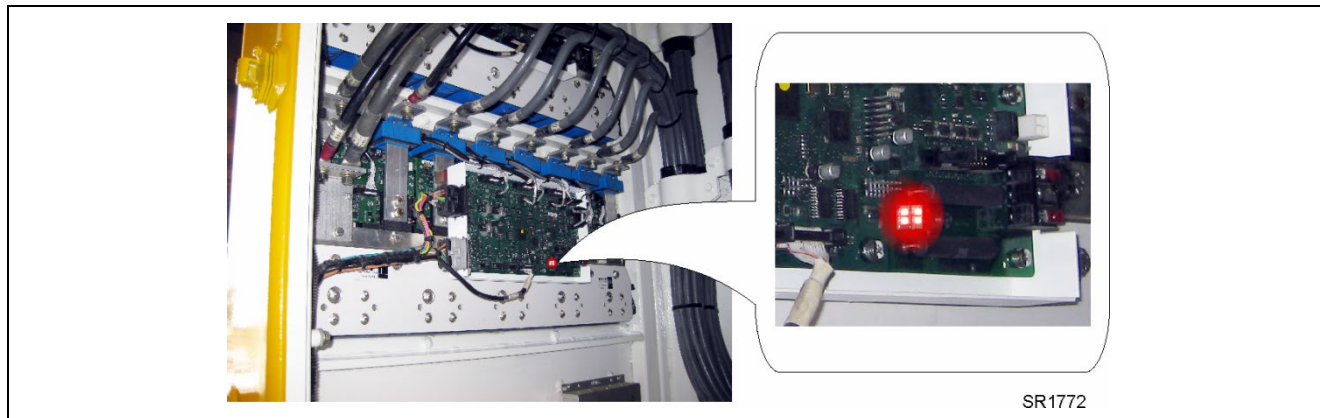


## Converter Bus Voltage

### WARNING



Risk of fatal electrical shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINCOS 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.



SR1772

**Converter assembly bus LED's**

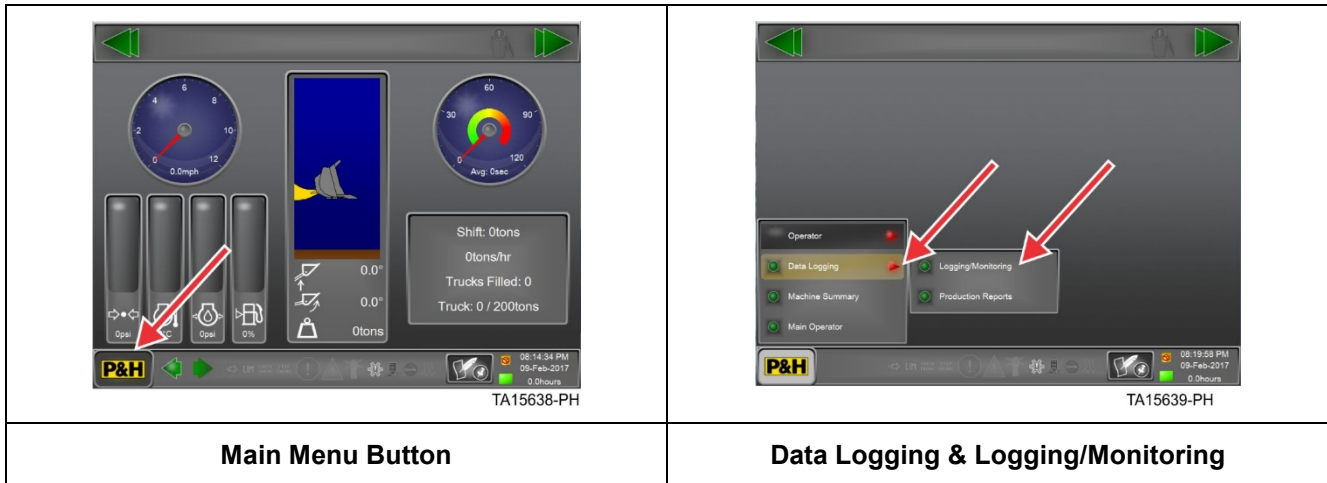
There are three different methods that are combined to verify when it is safe to enter the electrical cabinet.

1. LINCOS II display in cab
2. Visual indication in electrical cabinet
3. Physical measurement

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

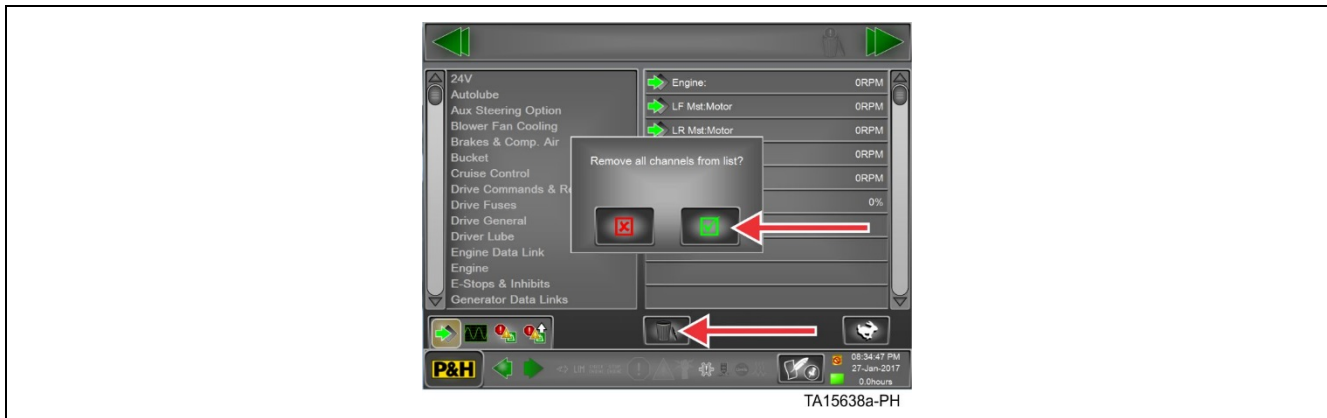
## In Cab Verification Using LINCS II Display

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



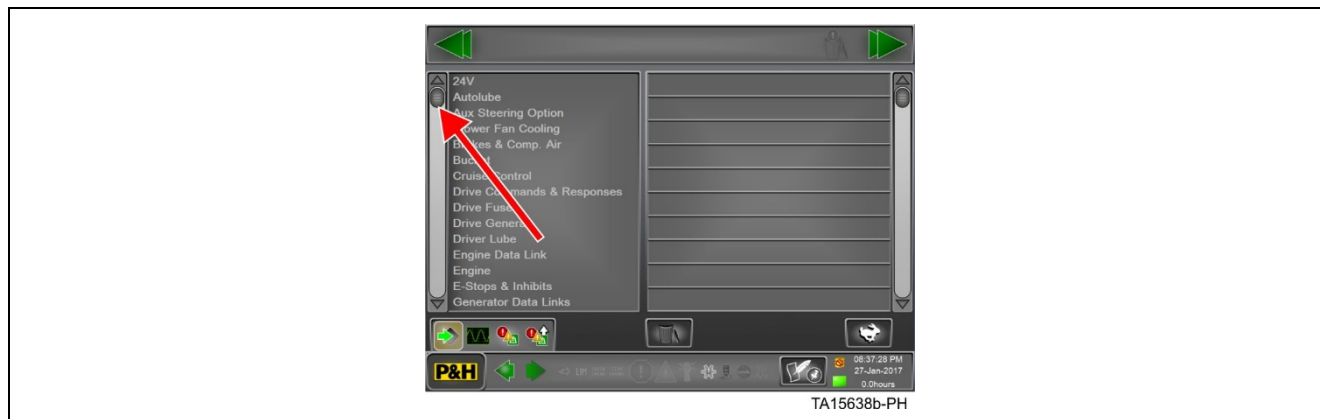
### LINCS logging/monitoring menu access

3. 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).



### Remove channels

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



Left hand scroll

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



Bus voltage indication

6. 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.**

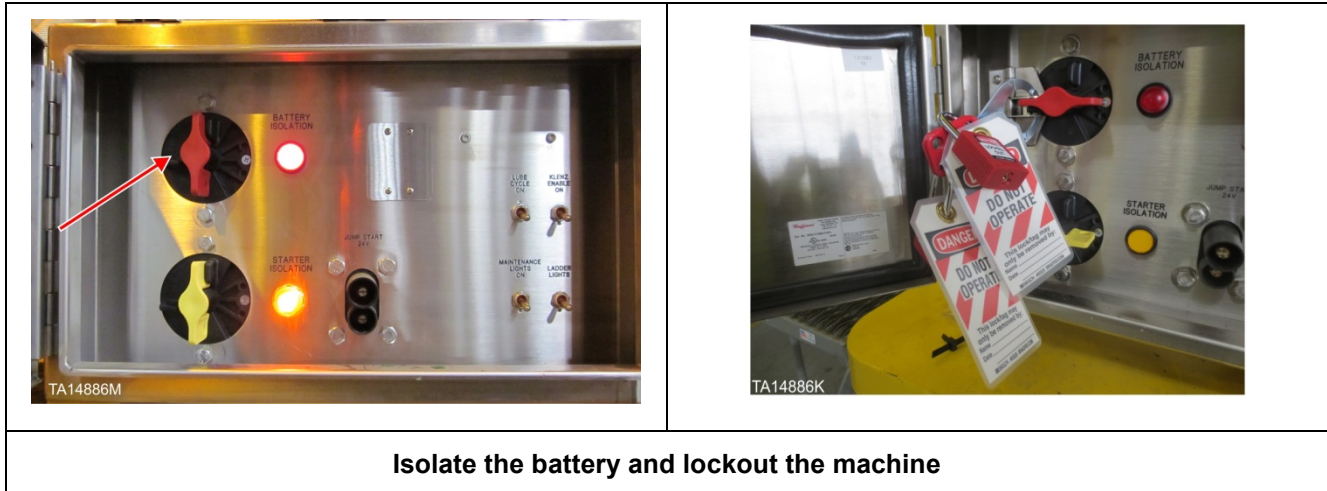
7. Turn the key switch to the OFF position and proceed to the next step in the verification process.

## 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:

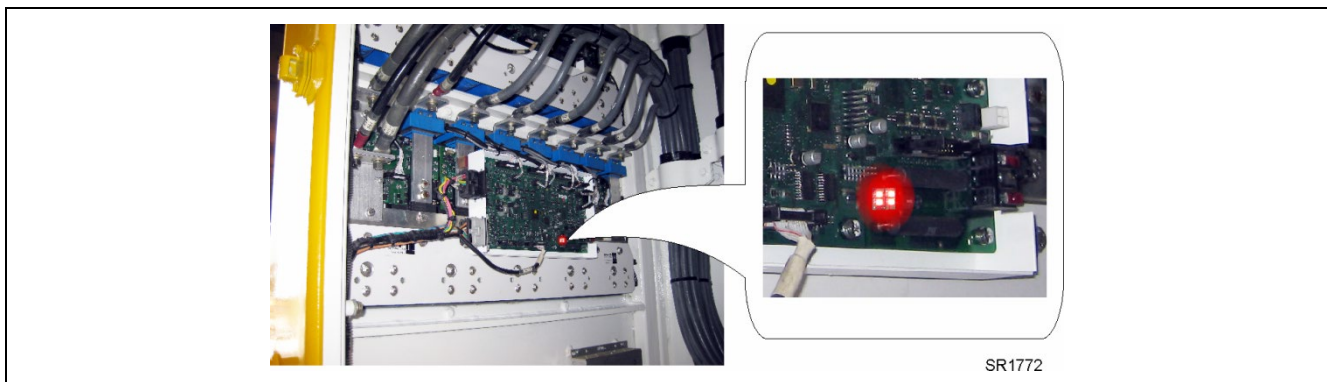
- The 24VDC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



### 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.



## Verification By Physical Measurement Main Bus Bars

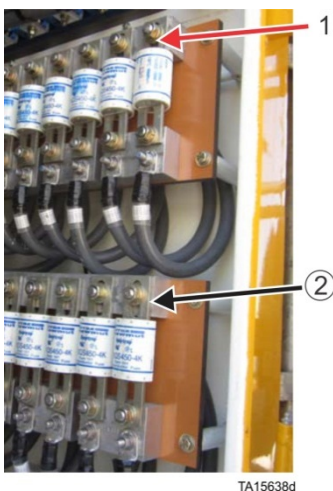
Once the visual indicators have been verified, the bus voltage should be physically measured. The bus voltage should be fully discharged based on the previous checks.

- 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

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.



1) Positive bus bar, 2) Negative bus bar

**Main bus bars**

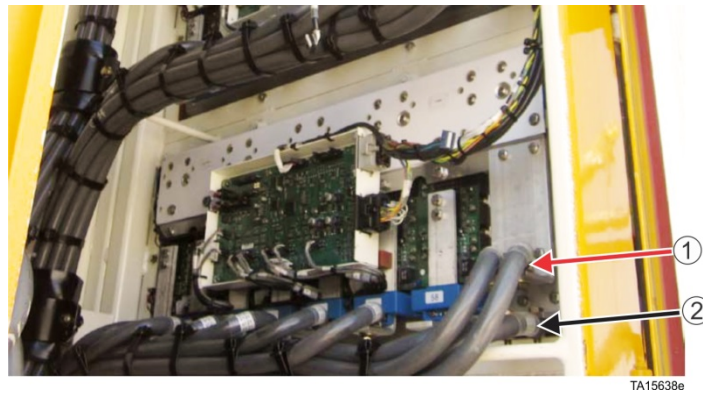
## Converter Assembly Bus Connections

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

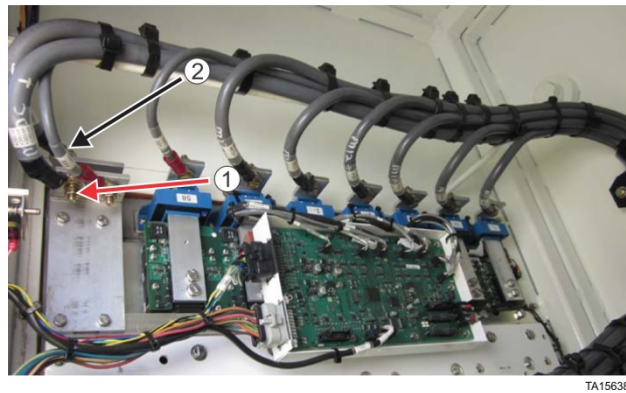
**The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.**

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

**Converter assembly bus connections (rear of cabinet)**



1) Positive bus bar, 2) Negative bus bar

**Converter assembly bus connections (front of cabinet)**

## Procedure



### WARNING

Crush hazards exist if non-essential personnel are not alerted to stay clear of machine during operational/energized inspections. Alert non-essential personnel to stay clear of the machine while it is being inspected or serviced. Alert all personnel in the area that the machine is going to be moved during the inspection or service procedure. When conducting energized or operational tests, place barriers and signs to alert non-essential personnel to keep clear of the area. Failure to alert all personnel in the area that the machine is going to be moved could result in crush hazards, resulting in serious injury or death.



### WARNING

Electrical shock hazard exists when high voltage is present on the dynamic braking grids. High voltage is present when the generator is primed and operating and up to five minutes after the machine ignition key is switched off. Do NOT touch the braking grids when the generator is primed or until five minutes after the engine has been shut down and only after the absence of bus voltage is verified. Contact with the braking grid could cause an electrical shock hazard, resulting in serious injury or loss of life.

## NOTICE

When checking the bearing clearance of the SR motors, a trend analysis should be used to determine the condition of the bearing assembly. A change in trend could indicate a problem that should be further investigated. A new motor will typically have the following clearances:

- Non-Drive end (.001-.004") [.0254-.1016 mm]

|                                                                |                                                                                                                                                                                              | Checked | Service Required |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------|
| <b>1. Engine Maintenance</b>                                   |                                                                                                                                                                                              |         |                  |
| a.                                                             | Check engine air restriction gauges. <b>(DO NOT REMOVE FILTERS TO CLEAN OR INSPECT – REPLACE ONLY IF RESTRICTION GAUGES INDICATE THE NEED.)</b>                                              |         |                  |
| b.                                                             | Inspect and clean fuel check valve(s) - Cummins (2) Detroit (1)                                                                                                                              |         |                  |
| <b>2. Compressed Air System</b>                                |                                                                                                                                                                                              |         |                  |
| a.                                                             | Change air dryer desiccant cartridge                                                                                                                                                         |         |                  |
| <b>3. Cleaning</b>                                             |                                                                                                                                                                                              |         |                  |
| a.                                                             | Steam clean (or physically wipe clean, when steam may damage components) the entire machine to remove all buildup of dirt, grease, combustible material or electrically conductive material. |         |                  |
| <b>4. SR Motor (mechanical)</b>                                |                                                                                                                                                                                              |         |                  |
| a.                                                             | Check non drive end motor bearing radial clearance.                                                                                                                                          |         |                  |
| <b>5. Braking Grids</b>                                        |                                                                                                                                                                                              |         |                  |
| a.                                                             | <b>L-1350</b> Resistance (6 circuits; 2.2 Ohms each)                                                                                                                                         |         |                  |
|                                                                | <b>L-1850</b> Resistance (8 circuits; 2.2 Ohms each)                                                                                                                                         |         |                  |
|                                                                | <b>L-2350</b> Resistance (8 circuits; 2.2 Ohms each)                                                                                                                                         |         |                  |
| <b>6. Cab Structure Drains</b>                                 |                                                                                                                                                                                              |         |                  |
| a.                                                             | Drain holes/tubes on outside, rear, bottom of cab. (Refer to section “PM-Cleaning and Component Inspection”).                                                                                |         |                  |
| <b>7. Sound abatement panels (if applicable) and cab doors</b> |                                                                                                                                                                                              |         |                  |
| a.                                                             | Grease panel hinge grease zerks (1,000 hours or as necessary)                                                                                                                                |         |                  |
| b.                                                             | Grease cab door hinge grease zerks (1,000 hours or as necessary)                                                                                                                             |         |                  |

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# 1000 Hour Structural and Weld Inspection Report - L-1350

## Safety Preparations



### WARNING

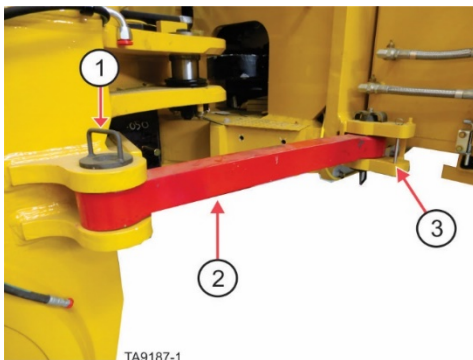
Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. 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, shock, or other hazards exist if personnel do not follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Always follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Failure to follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures can cause crush, shock, or other hazards resulting in severe injury or death.

- 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 unlocked position

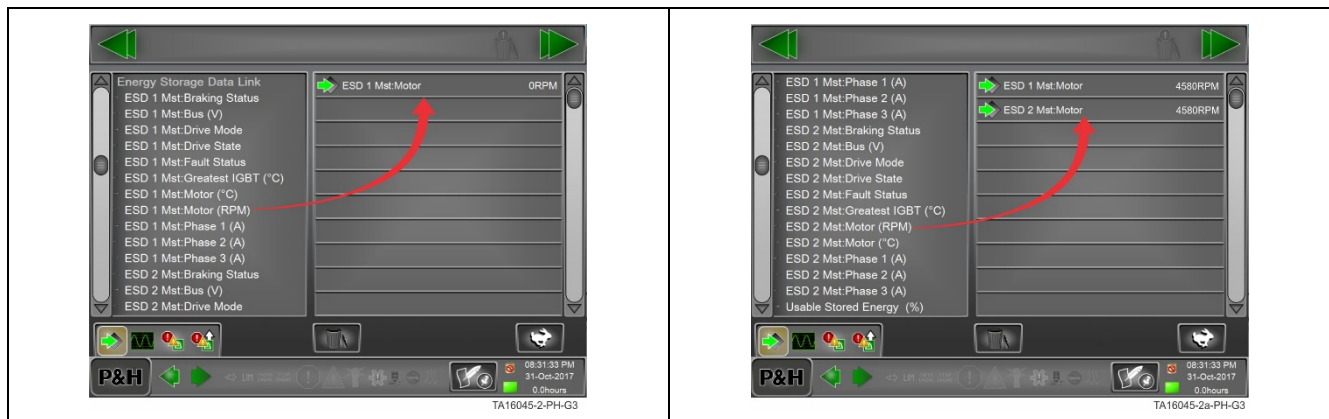
#### Frame Lock

- 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
- e. Set the parking brakes.
- f. Discharging the KESS should be done before shutting the machine down by performing the following steps:



Operators Screen – KESS at 60%

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



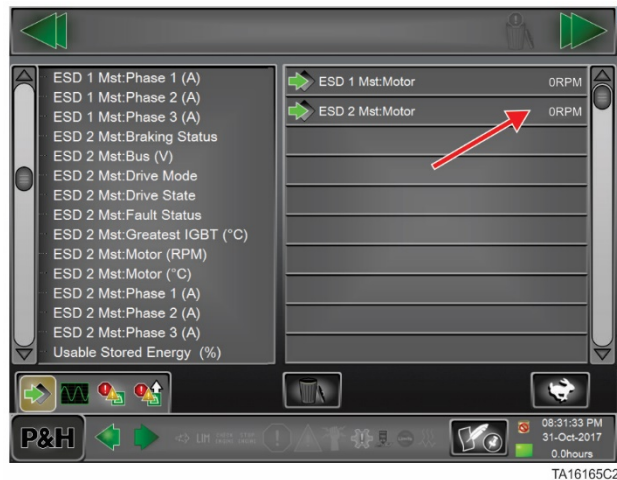
ESD Motor Channel Select

- n. Press the Drive Enable Switch



Drive Enable Switch

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



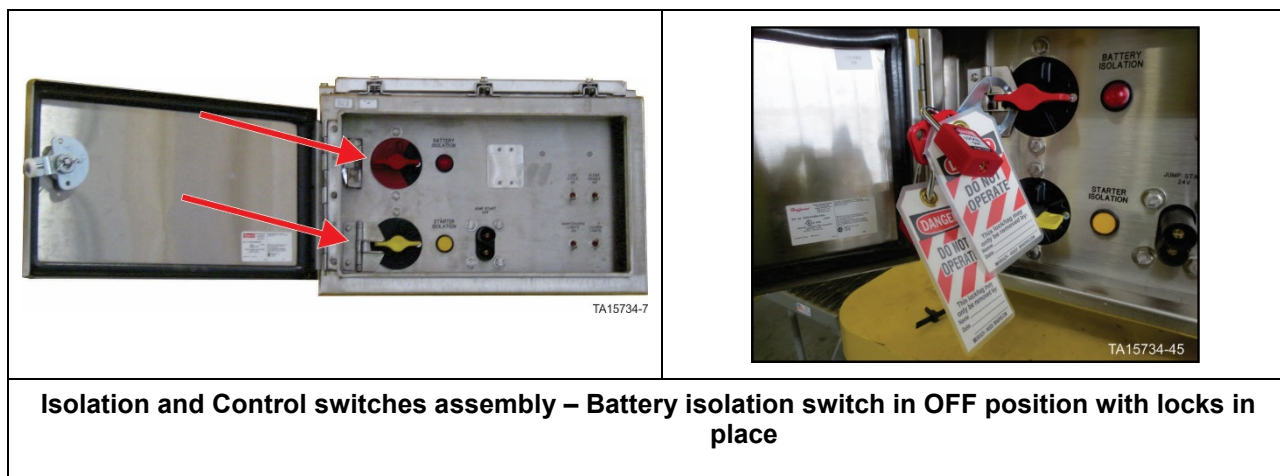
ESD Motor RPM

- p. Shut off the engine.

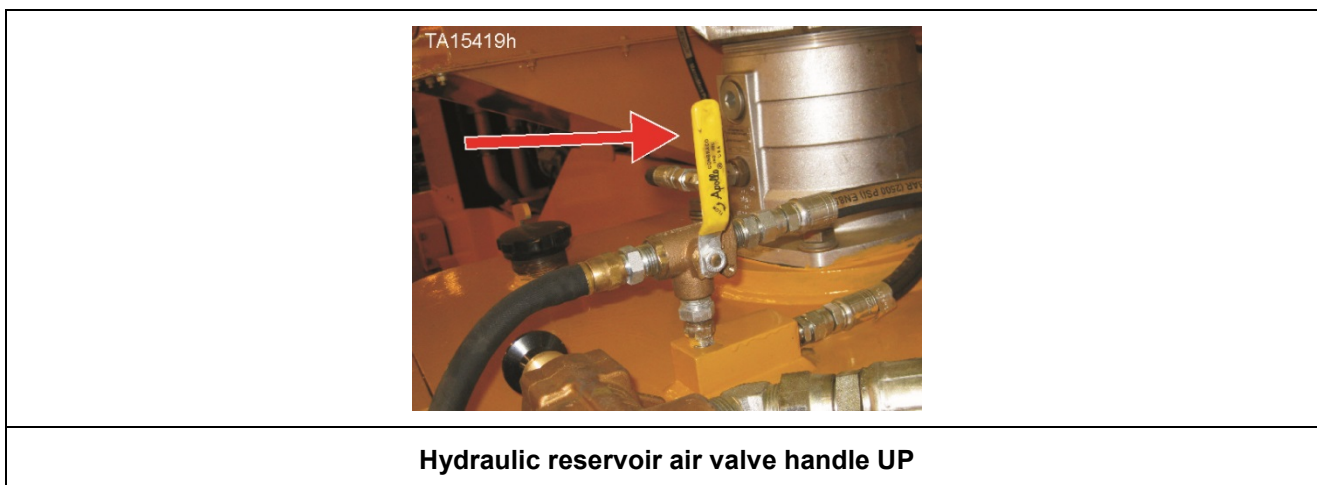
## ⚠ WARNING

**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.**

- q. 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.



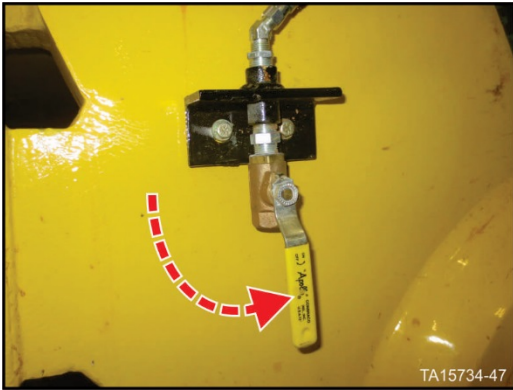
- r. Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.
- s. Turn the handle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



- t. 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



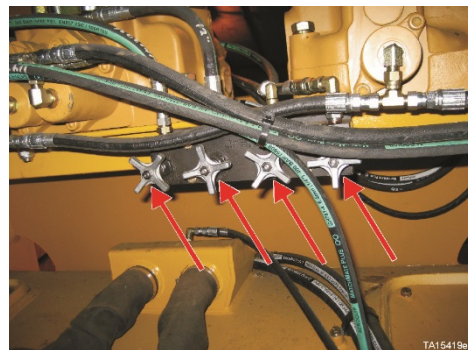
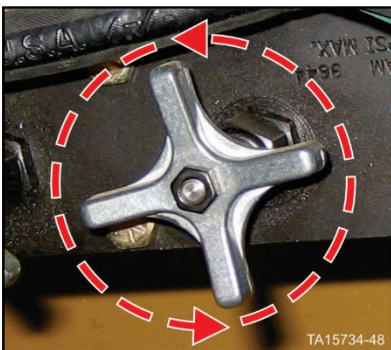
Open air reservoir bleed valves



## 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.

- u. 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.



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

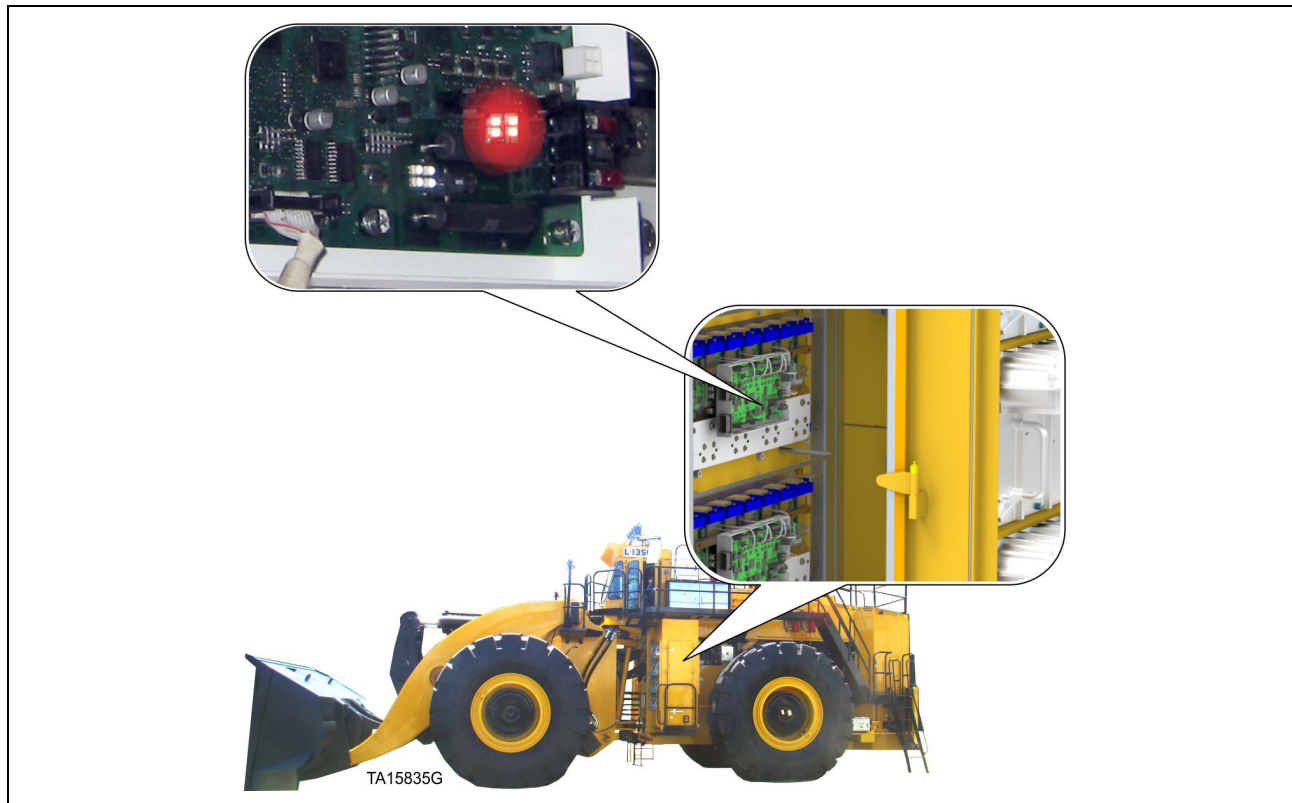
## Converter Bus Voltage



### WARNING



Risk of fatal shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINCOS 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.



**Converter assembly bus LED's**

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

1. LINCOS II display in cab
2. Visual indication in electrical cabinet
3. Physical measurement

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

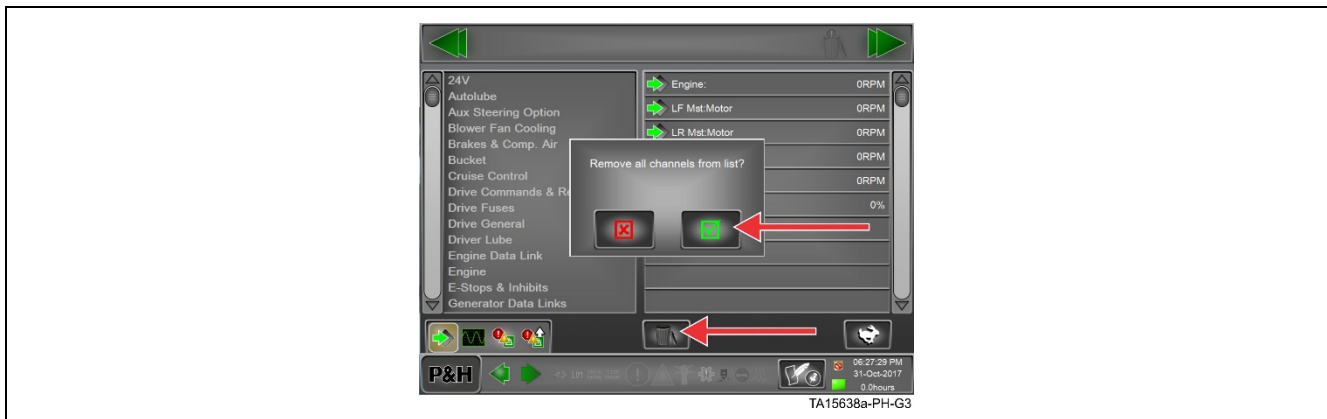
## In Cab Verification Using LINCS II Display

- Make sure that the LINCS II system is booted (key switch ON) with the engine NOT running and the park brake SET.
- 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.

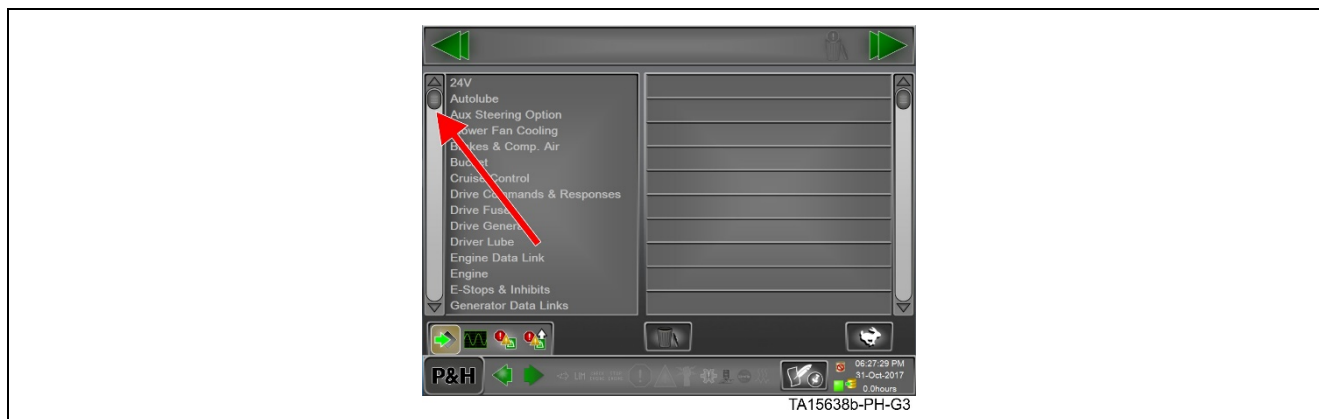


LINCS logging/monitoring menu access

- 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.



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.



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.**

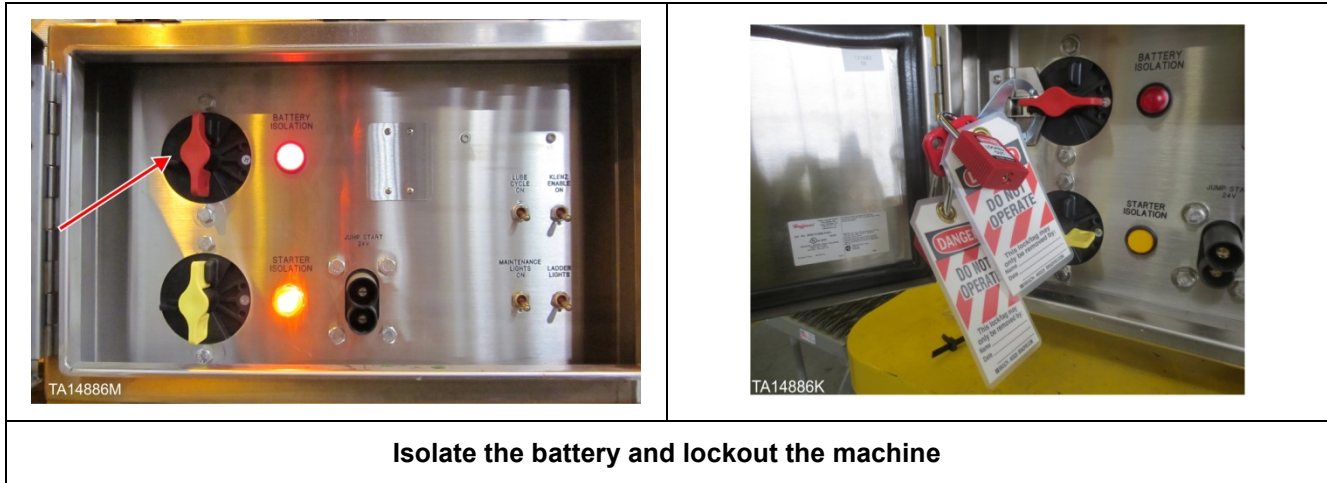
- g. Turn the key switch to the OFF position and proceed to the next step in the verification process.

## 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:

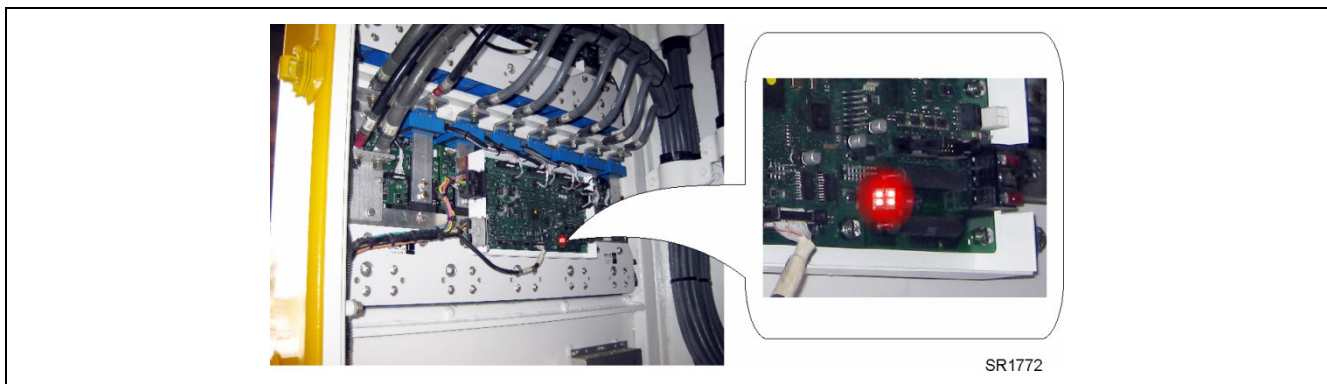
- The 24V DC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



### 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.



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

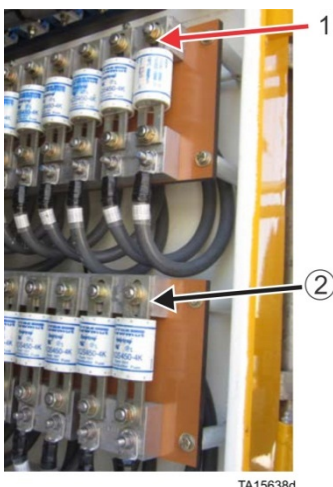
Once the visual indicators have been verified, the bus voltage should be physically measured. The bus voltage should be fully discharged based on the previous checks.

- 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

**Main bus bars**

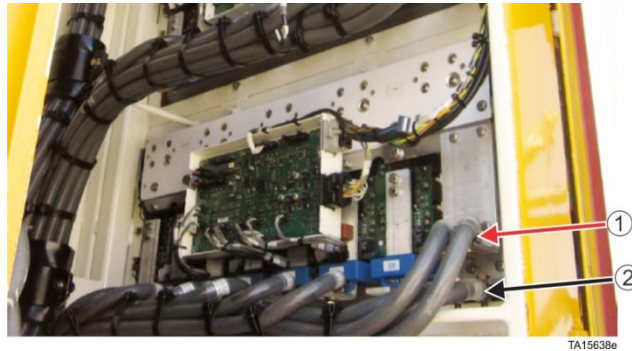
## Converter Assembly Bus Connections

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

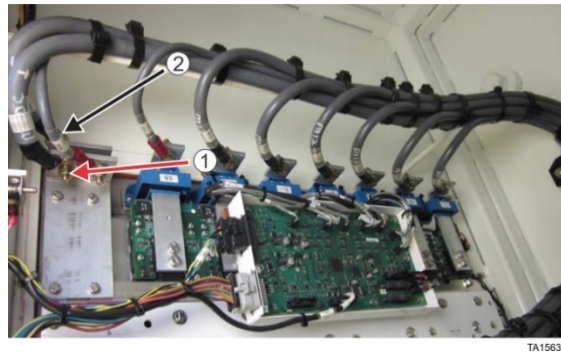
**The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.**

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

**Converter assembly bus connections (rear of cabinet)**



1) Positive bus bar, 2) Negative bus bar

**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.



### WARNING

Fall hazard exists when working at elevated locations. Take appropriate 'fall arrest' safety precautions as required by local rules, regulations, and procedures when working at heights on the machine, as example, on the rear and front frames. Follow all required statutory regulations for

working at height. Failure to follow all locally required “fall arrest” procedures can cause a fall hazard, resulting in serious injury or death.

## WARNING

Crush hazards exist when a load is suspended. Suspended loads can fall. Never work under suspended loads. Working under suspended loads could cause a crushing hazard which might result in serious injury or death.

- Every 1000 hours of operation, use a hot water high-pressure washer or steam cleaner to remove build ups of dirt, grease, and grime from machine components.

## CAUTION

When washing the machine, be careful not to damage safety or instructional placards. Use a cloth and soap and water to clean them. DO NOT use a steam cleaner, solvent, or high-pressure washer to clean safety placards. The possibility of the labels being hidden under dirt or grease may make inadvertent damage possible. Replace any labels that are damaged, deteriorated or illegible as soon as possible. Refer to the **PARTS MANUAL** to order replacement placards.

- Use the illustrations provided herein for each structural member as a guide to the location and manner of joint construction. If necessary, use a wire brush to remove rust or paint to make the weld or area suspected of being cracked clearly visible. Closely inspect all welds and load bearing components for cracks. Special attention should be paid to the ends of welds, corners and bends. Particular attention should be paid to load bearing attachments such as the lift arms and ball joints. The entire assembly and the mounting location should be thoroughly inspected.
- Indicate on the STRUCTURAL AND WELD INSPECTION LOG SHEET, the number of the inspection location as “OK” if no crack is found or “Crack” for each location that a crack is found and describe the crack (length/width etc.).
- If cracks are found in any structural members, discontinue use of the machine until the cracks are repaired.
- Perform a dye penetrant test per ASTM E165 standards on any welds that are suspected of being cracked.
- Fax or mail a copy of the STRUCTURAL AND WELD INSPECTION LOG SHEET to the applicable Komatsu Service Center and the Komatsu Product Support Department, in Longview, Texas, U.S.A.
- Instructions regarding the welding of Komatsu structural steel are available in the machine’s service manual or through the Komatsu Product Support Department.

## NOTICE

It is recommended that consultation be held with the Komatsu Product Support Group before making major structural repairs. Repair recommendations provided by the Komatsu Product Support Department will be based on the latest engineering design data and field experience.

## NOTICE

Inspection locations shown on illustrations depict typical left and right sides.

## Inspection List L-1350

The following list provides detailed descriptions of the areas to be checked. See the pictures that follow for each item that shows the joint or area being described:

### L-1350 lift arms and bellcranks

1. Joint of torque tube to lift arm side plates.
  - a. Inspect inside joint right side.
  - b. Inspect outside joint right side.
  - c. Inspect inside joint left side.
  - d. Inspect inside joint left side.
2. Joint between the lift arm side plate and the torque tube.
  - a. Inspect the entire circumference of the weld joint on inside of left side arm
  - b. Inspect the entire circumference of the weld joint on outside of left side arm
  - c. Inspect the entire circumference of the weld joint on inside of right side arm
  - d. Inspect the entire circumference of the weld joint on outside of right side arm
3. Joint between the bucket pivot boss and lift arm side plates.
  - a. Inspect Left Hand top, bottom and sides
  - b. Inspect Right Hand top, bottom and sides
4. Bell crank support boss
  - a. Inspect left
  - b. Inspect right
5. Joint between lift arm side plates.
  - a. Inspect top joint full length of lift arms
  - b. Inspect bottom joint full length of lift arms
6. Boss on hoist ears
  - a. Inspect outside left
  - b. Inspect inside left
  - c. Inspect inside right
  - d. Inspect outside right
7. Joint between lift arm ball socket and lift arm side plates
  - a. Inspect Left Hand ball socket – top, bottom and both sides
  - b. Inspect Right Hand ball socket – top, bottom and both sides
8. Joint between bellcrank side plates and wrapper plate
  - a. LH bellcrank - all welds
  - b. RH bellcrank - all welds
9. Joint between bellcrank side plates and pivot bosses.
  - a. LH bellcrank – both bosses
  - b. RH bellcrank – both bosses
10. Joint between bellcrank side plate and boss
  - a. LH bellcrank. Bucket cylinder end – both bosses. Entire weld circumference.
  - b. LH bellcrank. Level link end – both bosses. Entire weld circumference.
  - c. RH bellcrank. Bucket cylinder end – both bosses. Entire weld circumference.
  - d. RH bellcrank. Level link end – both bosses. Entire weld circumference.
11. Bellcrank slabs on inside as shown
  - a. LH outside
  - b. LH inside
  - c. RH outside
  - d. RH inside

### L-1350 front frame - 1 of 4 - side view

12. Joint between plate and tube or articulation slab.
  - a. Top
  - b. Bottom
  - c. Corners
13. Articulation Slab
  - a. Top
  - b. Bottom
14. Joint between top articulation ball and slab
  - a. Inspect the circumference of the weld with a focus on the front side.

- b. Inspect neck of ball
- 15. Weld between hoist cylinder support plate to front frame side plates
  - a. Inspect entire length of weld RHS
  - b. Inspect entire length of weld LHS
- 16. Joint between bottom articulation ball and slab
  - a. Inspect the circumference of the weld with a focus on the front side.
  - b. Inspect neck of ball
- 17. Articulation Slab
  - a. Top
  - b. Bottom
- 18. Joint of bottom plate to the hoist ball tube
  - a. Check full length and focus on corners
  - b. Top
  - c. Bottom
- 19. Joint of bottom plate to the front axle
  - a. Check full length and focus on corners
  - b. Top
  - c. Bottom
  - d. Inspect both left and right sides from front to rear
- 20. Joint of hoist ball sub structure to the side plate
  - a. LH side – full length
  - b. RH side – full length

#### **L-1350 front frame - 2 of 4 – front view**

- 21. Joint between front plate and the lift arm ball tube
  - a. Inspect the weld
  - b. Inspect left corner
  - c. Inspect right corner
- 22. Access holes in front plate for bucket cylinder hoses.
  - a. Inspect left hole – all 4 corners
  - b. Inspect right hole – all 4 corners
- 23. Husco access hole in front plate
  - a. Inspect all 4 corners
- 24. Joint between front plate, axle and side plate.
  - a. Inspect upper and lower ends of the left cutout
  - b. Inspect upper and lower ends of the right cutout
- 25. Inspect front axle access hole
  - a. Inspect 4 bolt holes
  - b. Inspect weld between access structure and axle
    - i. Inside
    - ii. Outside
  - c. Inspect upper and lower ends of the right cutout
- 26. Joint of side plate to front axle
  - a. Inspect left side – inside and outside – focus on the front top
  - b. Inspect right side – inside and outside – focus on the front top
- 27. Joint between lift arm and bucket cylinder casting to front plate
  - a. RHS
  - b. LHS

**L-1350 front frame - 3 of 4 - rear view**

- 28. Joint of lift arm ball to tube
  - a. Inspect the circumference of the weld on the Left Hand ball
  - b. Inspect the circumference of the weld on the Right Hand ball
- 29. Joint between bulkhead and side plates
  - a. LH inside and outside
  - b. RH inside and outside
  - c. Focus on top and bottom corners
- 29.1. Support tubes
  - a. Left top
  - b. Left bottom
  - c. Right top
  - d. Right bottom
- 30. Joint of hoist ball to tube
  - a. Inspect the circumference of the weld on the Left Hand ball
  - b. Inspect the circumference of the weld on the Right Hand ball
- 31. Joint between hoist ball tube and frame
  - a. Inspect Left Hand circumference of weld
  - b. Inspect Right Hand circumference of weld
  - c. Inspect neck of left ball
  - d. Inspect neck of right ball
- 32. Joint between plate and hoist ball tube
  - a. Left
  - b. Right
- 33. Joint between side plate and front axle
  - a. Inside
  - b. Outside
  - c. Full length
- 34. Joint between bulkhead and lift arm tube
  - a. RHS
  - b. LHS

**L-1350 front frame - 4 of 4 - rear view**

- 35. Joint of lifting eye to upper ball tube
  - a. Inspect left
  - b. Inspect right
- 36. Joint between side plate and lift arm casting
  - a. LH
  - b. RH
- 37. Joint along bulkhead and side plates
  - a. RHS
  - b. LHS
- 38. Joint between side plate and hoist cylinder ball tube structure
  - a. RHS
  - b. LHS
- 39. Joint of articulation slab to side plate
  - a. RHS
  - b. LHS
- 40. Joint between the steer cylinder ears and bottom slab
  - a. Inspect Left Hand - top and bottom ears
  - b. Inspect Right Hand – top and bottom ears
  - c. Inspect top and bottom of slab
- 41. Joint between upper slab and side plates
  - a. RHS
  - b. LHS

**L-1350 rear frame - side view**

- 42. Access hole hydraulic reservoir
  - a. Check corners
- 43. Upper side frame area – inside
  - a. Inspect the weld on the gusset for the ROPS structure – left side
  - b. Inspect the weld on the gusset for the ROPS structure – right side
  - c. Inspect the holes for the hydraulic reservoir on right side
- 43A. Upper side frame area – left side machine, outside
  - a. Inspect the circumference of the weld that is inside the circular cut outs in the support plate that is welded to the frame.
- 44. Frame area over the rear axle
  - a. Inspect the top edge of the side plate – left side
  - b. Inspect welds around any structural mounts located in this area – left side
  - c. Inspect welds around any bolt blocks or mounting structures - left side.
  - d. Inspect the top edge of the side plate – right side
  - e. Inspect welds around any structural mounts located in this area – right side
  - f. Inspect welds around any bolt blocks or mounting structures - right side.
- 45. Tow point
  - a. Inspect welds where tow point pieces are attached to bumper.
- 46. Radiator mount plate
  - a. Inspect where welded to left side plate
  - b. Inspect weld to rear bumper
  - c. Inspect where welded to right side plate
- 47. Fuel mount
  - a. Inspect left side mount where welded to side plate
  - b. Inspect right side mount where welded to side plate
- 48. Catwalk plate
  - a. Inspect top and bottom weld where left catwalk plate attaches to side plate
  - b. Inspect top and bottom weld where right catwalk plate attaches to the side plate.
- 49. Joint of rear axle articulation socket to rear axle crossmember - rear
  - a. Inspect circumference of weld
- 50. Joint of rear axle articulation socket to rear axle crossmember – front
  - a. Inspect circumference of weld
- 51. Catwalk plate
  - a. Inspect top and bottom weld where left catwalk plate attaches to side plate
  - b. Inspect top and bottom weld where right catwalk plate attaches to the side plate.
- 52. Steering crossmember structure
  - a. Inspect top and bottom welds to left side plate
  - b. Inspect top and bottom welds to right side plate
  - c. Inspect welds on bottom to the side plate brace
  - d. Inspect welds on the steering crossmember – top and bottom across the length – both front and rear sides.
- 53. Joint between steering brace and side plate.
  - a. Inspect top and bottom of left side weld
  - b. Inspect top and bottom of right side weld
- 54. Joint between side plate brace and bottom articulation slab
  - a. Inspect top and bottom of left side weld
  - b. Inspect top and bottom of right side weld
- 55. Joint of lower articulation socket to slab
  - a. Inspect circumference of weld
- 56. Joint of upper articulation socket to upper slab
  - a. Inspect circumference of weld
- 56A. Hole through frame Left side machine frame,
  - a. Inspect entire perimeter of hole, inside frame

**L-1350 rear frame - top view**

57. Slab on frame side plate over axle
  - a. Inspect left slab and welds
  - b. Inspect right slab and welds
58. Joint between engine mount and side plate
59. Joint between side plate and transition plate
  - a. Inspect left side (inside and outside)
  - b. Inspect right side (inside and outside)
60. Stiffener to side plate
  - a. Inspect weld top and bottom of the left stiffener plate
  - b. Inspect weld top and bottom of the left stiffener plates – front and rear.
  - c. Inspect weld top and bottom of the right stiffener plates – front and rear.
61. Engine trunnion mount structure
  - a. All around left side
  - b. All around right side

**L-1350 rear axle**

62. Joint between axle rollup and bolt flange.
  - a. Inspect weld circumference of left side.
  - b. Inspect weld circumference of right side.
63. Top of axle over the pivots.
  - a. Inspect the area between front ball and top of axle.
  - b. Inspect the area between the rear ball and top of axle.
  - c. Inspect any through pieces.
64. Joint between the wire/cable inlet cover and the axle
  - a. Sides
  - b. Front.
  - c. Rear.
  - d. Check the axle cutout under this cover – from inside the axle-through bottom access hole (especially 4 corners).
65. Joint between ball and transition plate.
  - a. Inspect circumference of weld between front ball base and the transition casting.
  - b. Inspect circumference of weld between rear ball base and the transition casting.
66. Joint between transition plate and axle roll up.
  - a. Inspect circumference of weld between the front transition casting and the axle.
  - b. Inspect circumference of weld between the rear transition casting and the axle.
67. Air outlets.
  - a. Inspect weld on all four sides of cover (four covers)-including corners.
    - Right rear
    - Right front
    - Left Rear
    - Left front
68. Inspect bottom access hole.
  - a. Inspect the bolt holes.
  - b. Inspect the circumference of the external weld.
  - c. Inspect the circumference of the internal weld.
  - d. Inspect all 4 corners.
69. Bottom of axle.
  - a. Inspect inside and outside of axle between the front and rear weldments.
70. Inspect air inlet tube connection hole.

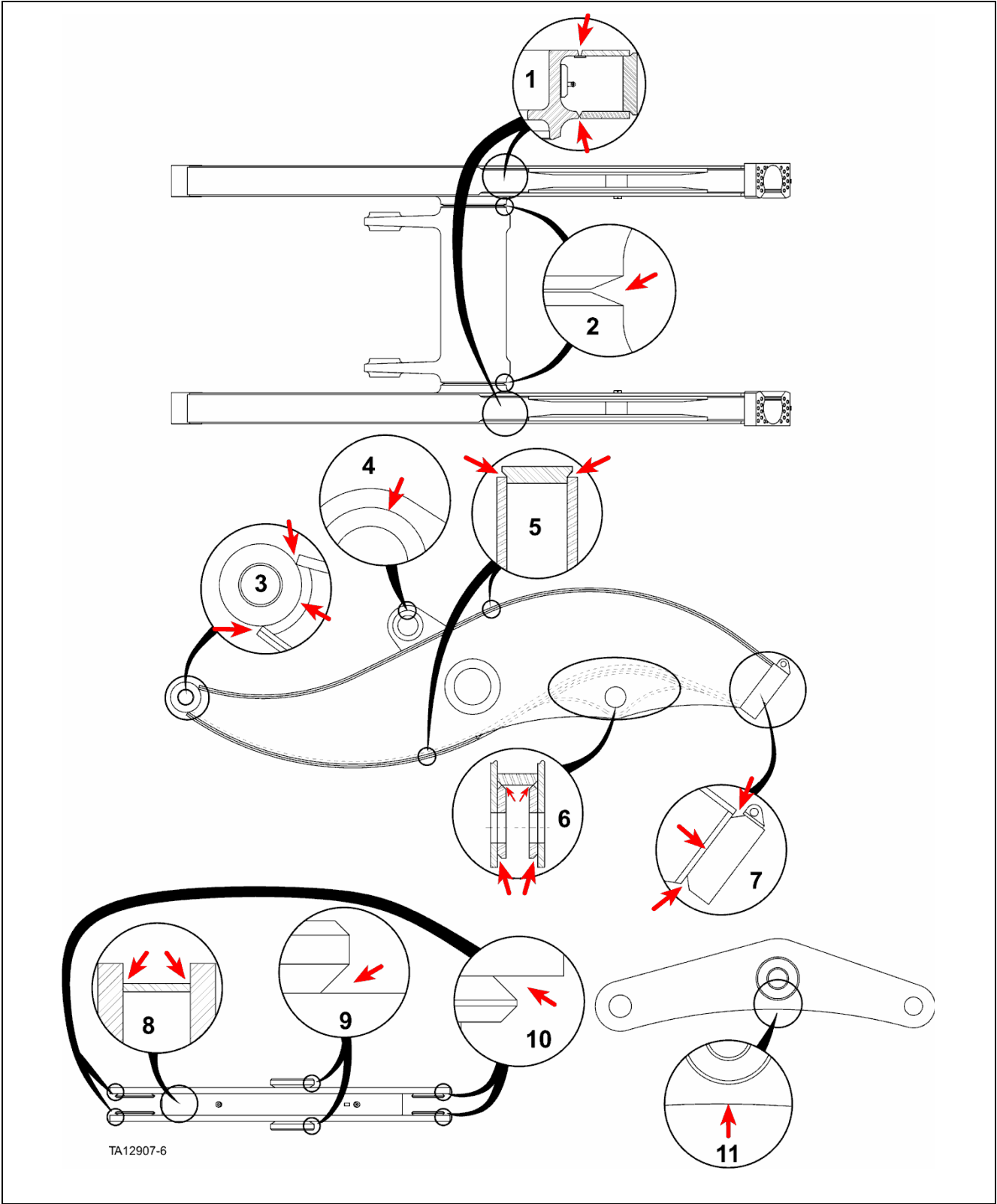


Figure 21. L-1350 lift arms and bellcranks

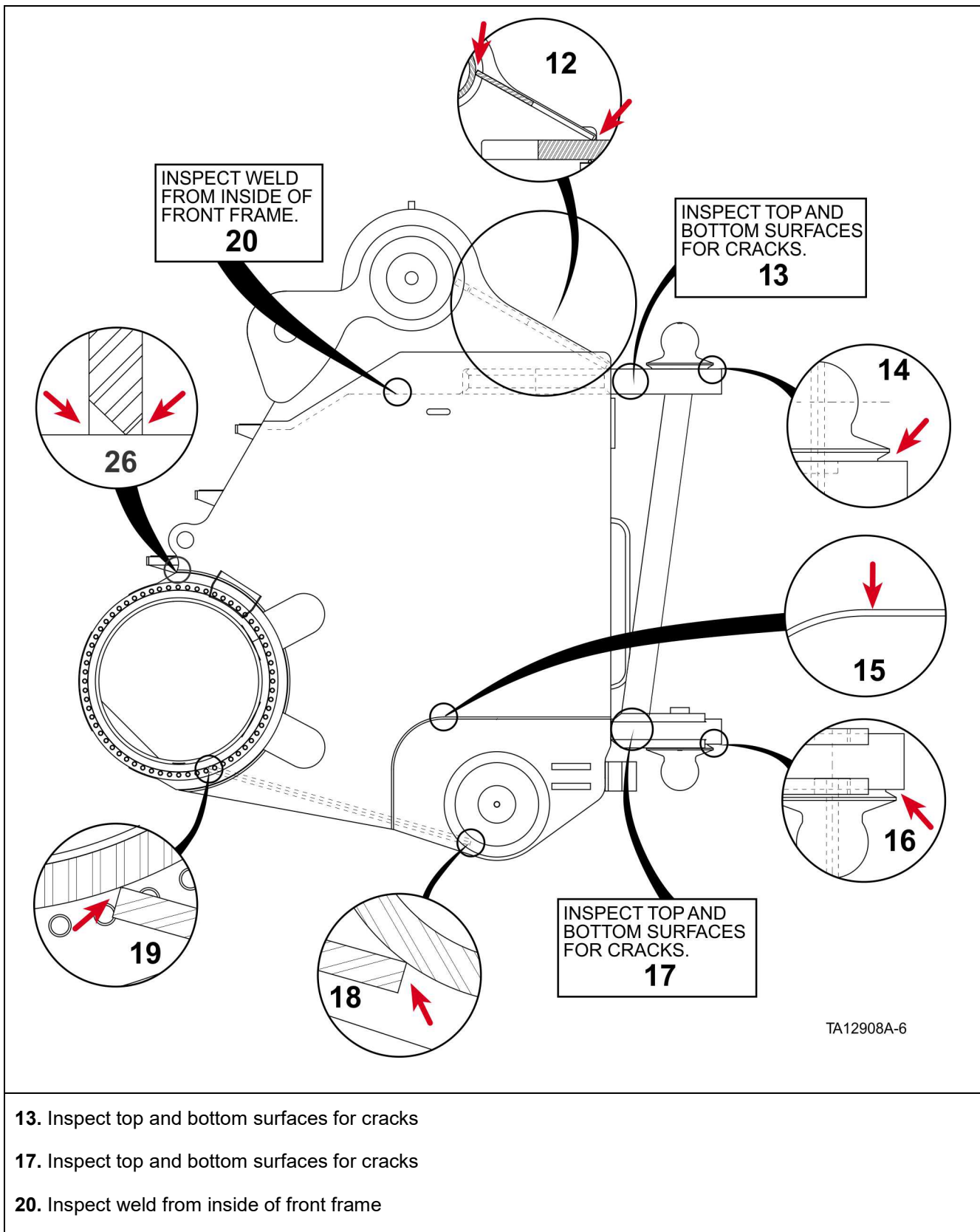


**Figure 22. L-1350 front frame – 1 of 4 – side view**

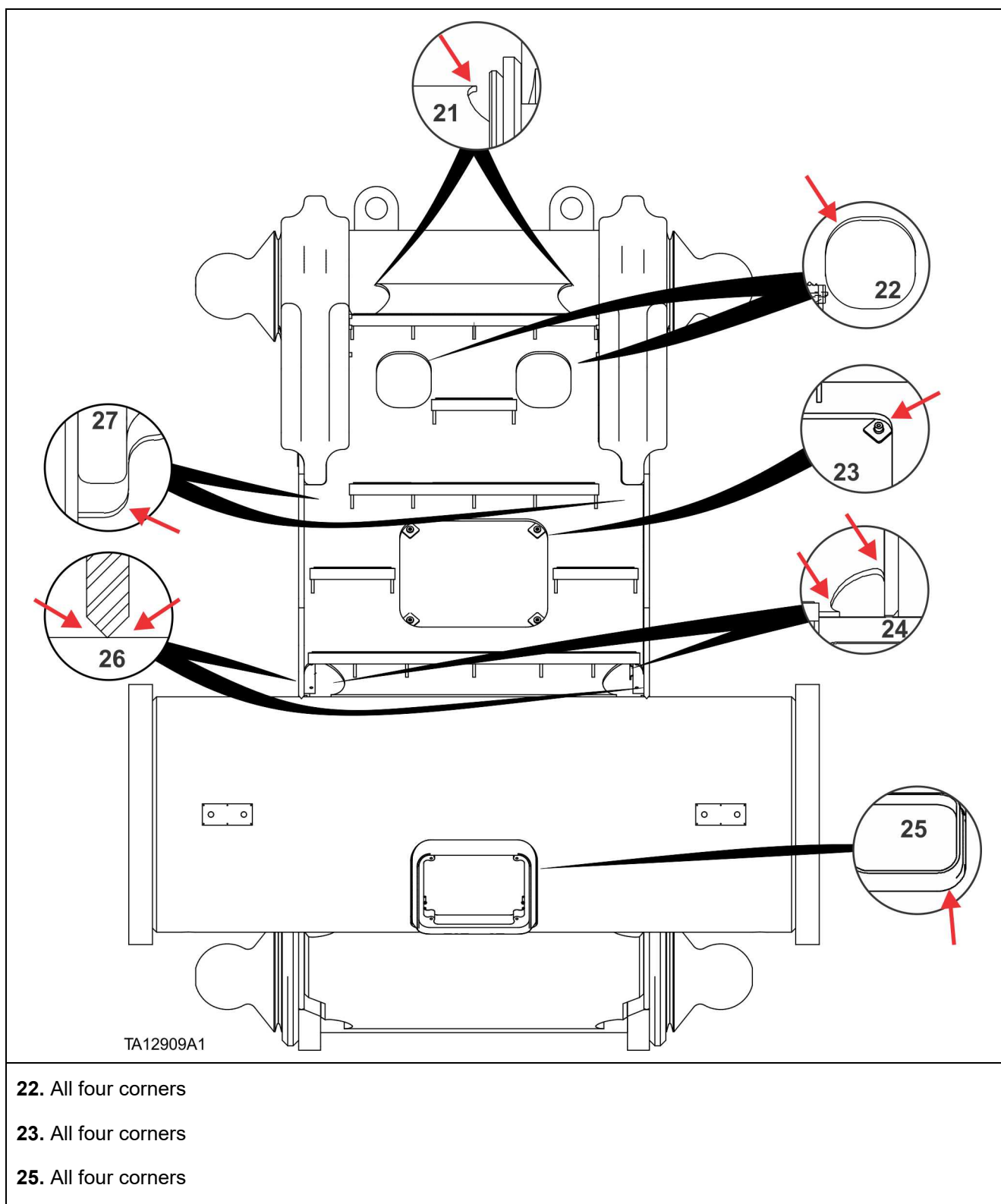


**Figure 23. L-1350 front frame – 2 of 4 – front view**

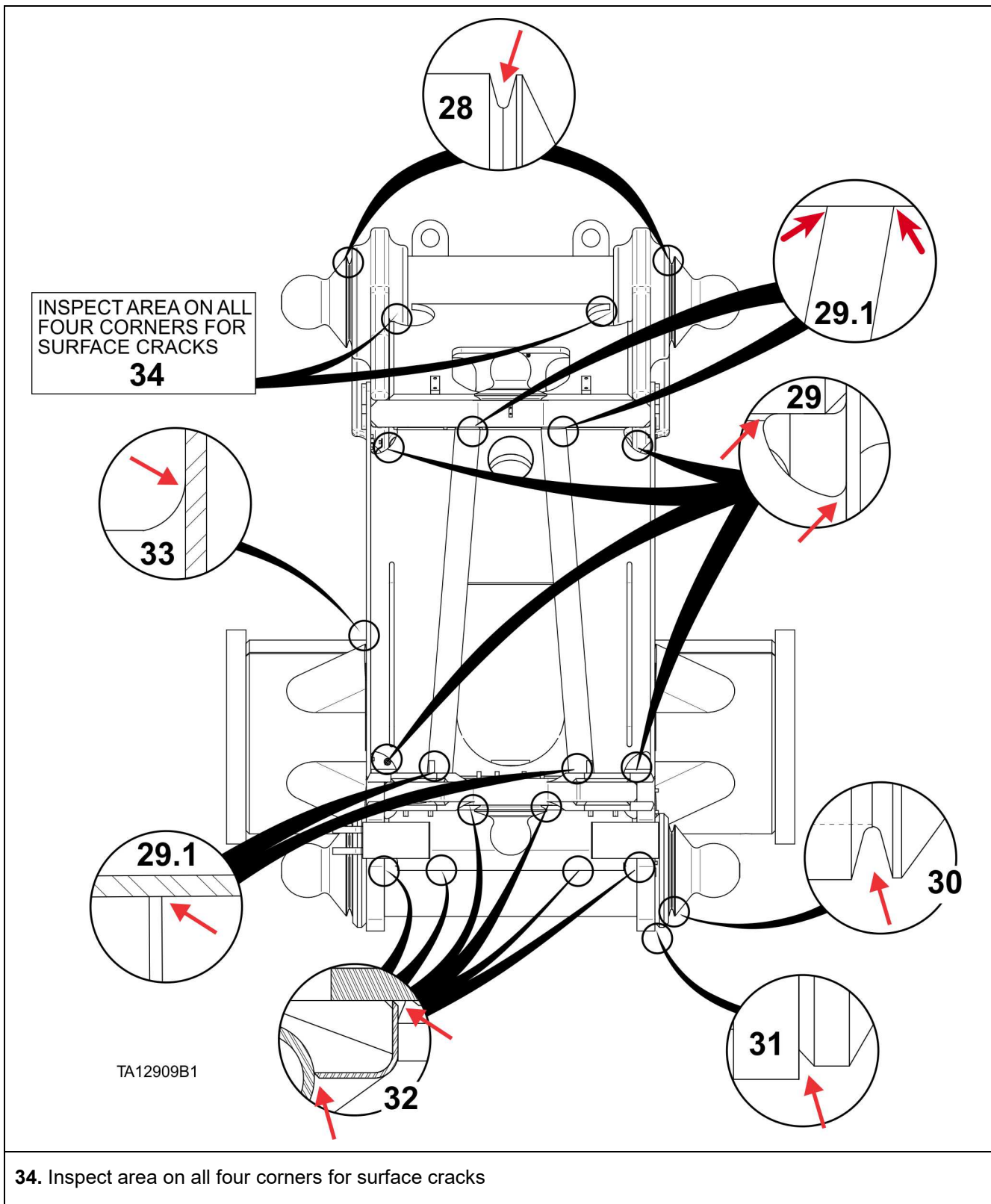


Figure 24. L-1350 front frame – 3 of 4 – rear view

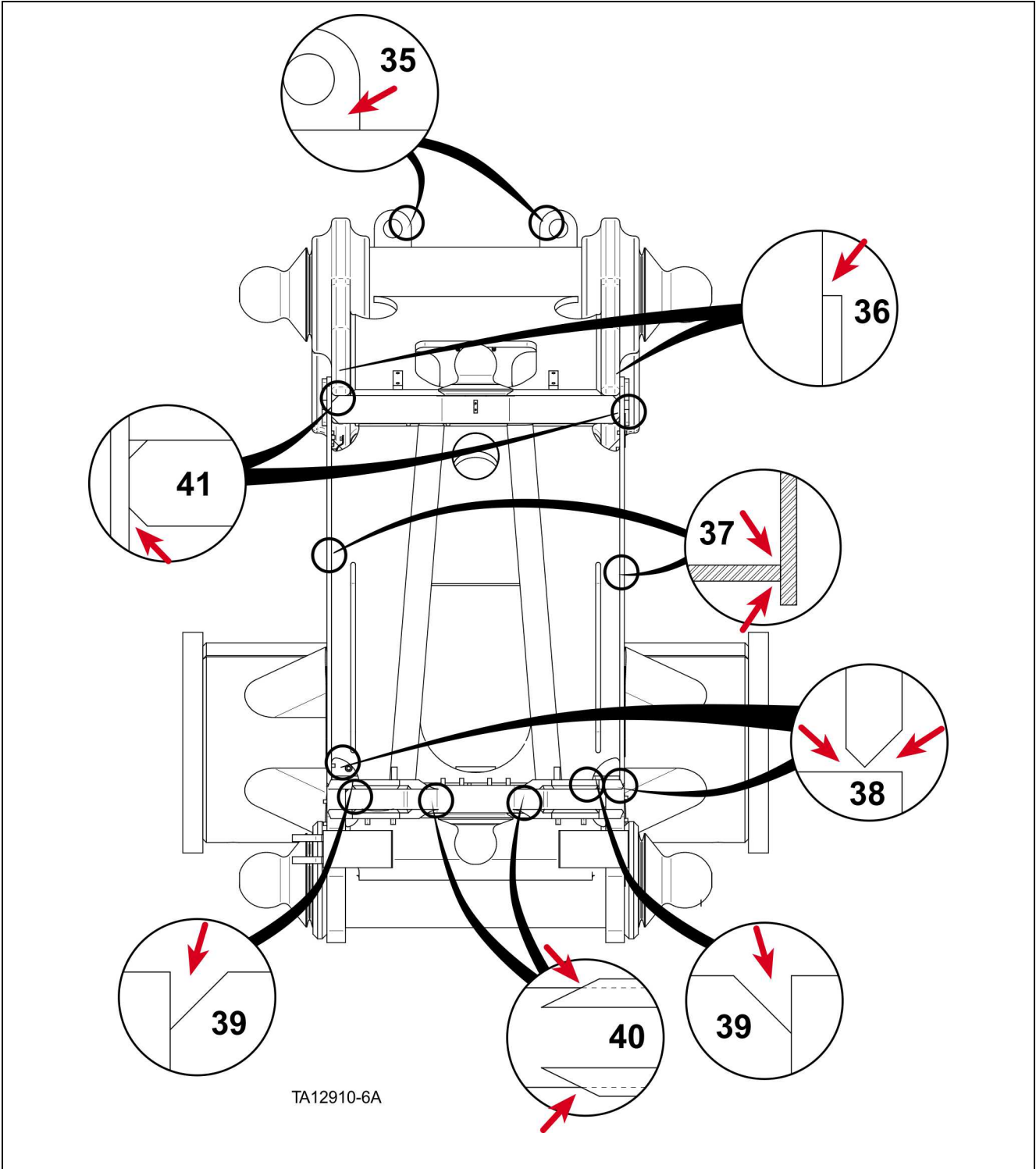


Figure 25. L-1350 front frame – 4 of 4 – rear view

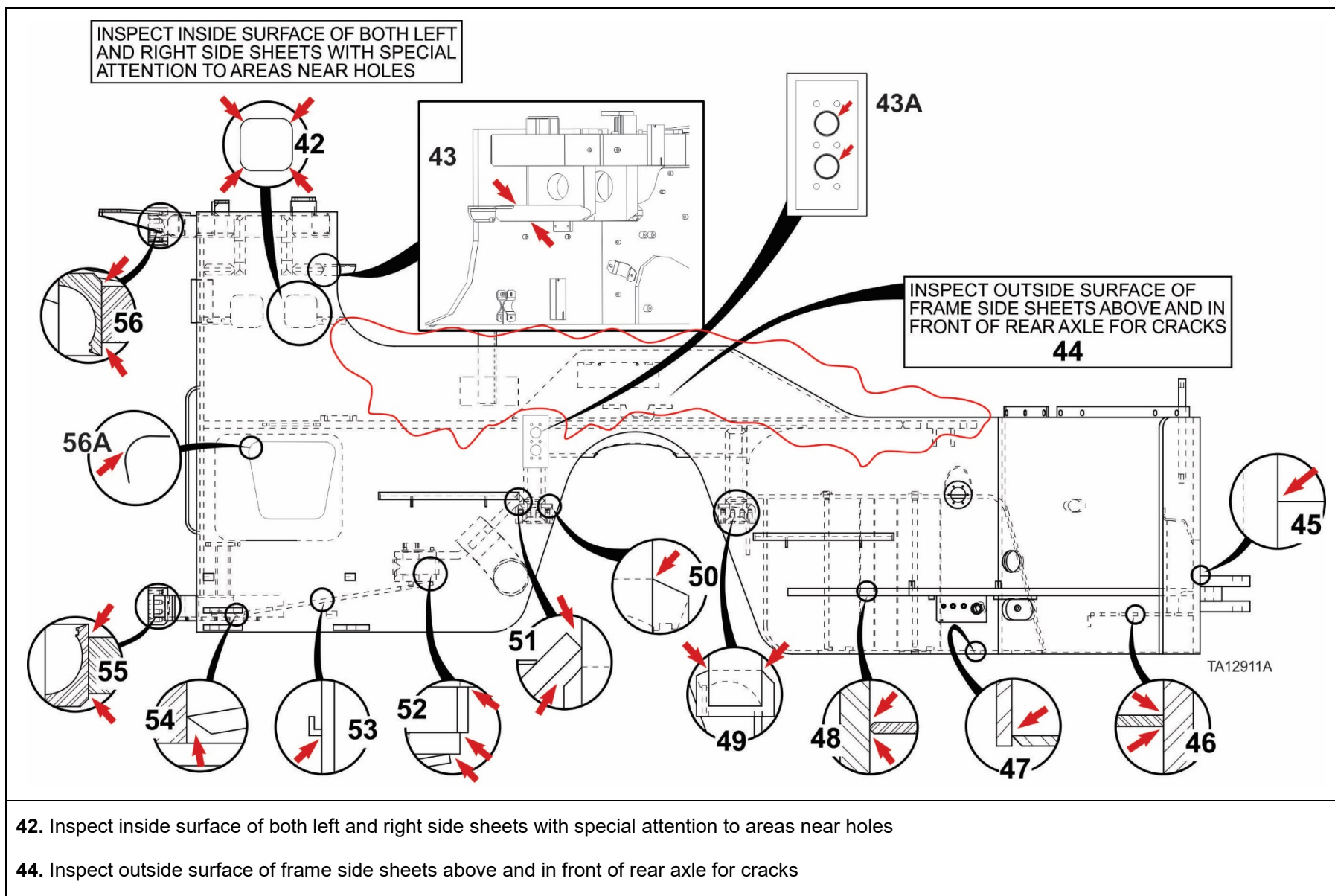


Figure 26. L-1350 rear frame – side view

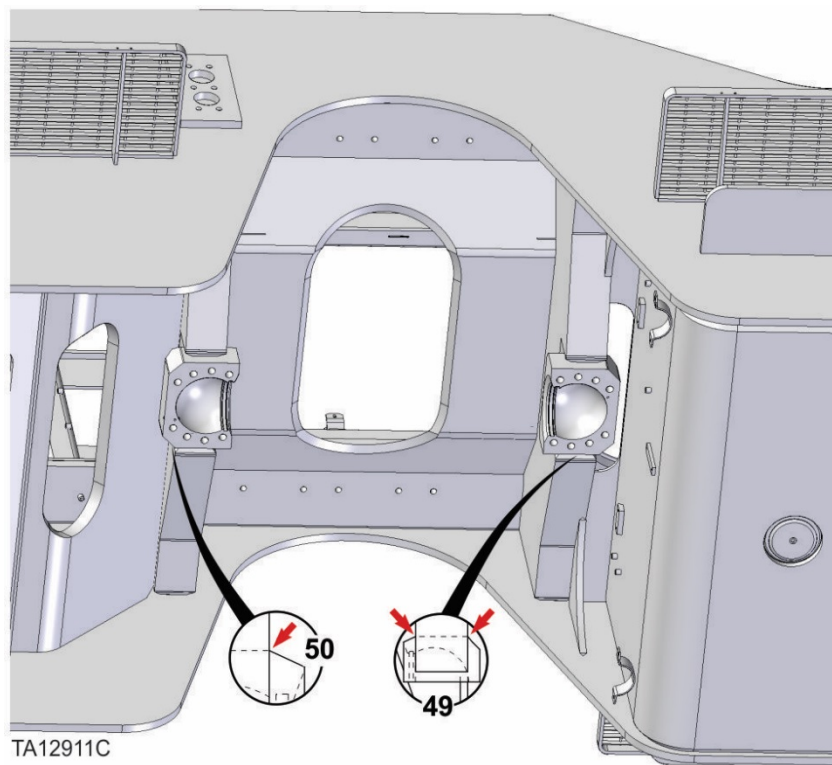


Figure 27. L-1350 - rear frame articulation joint – bottom view

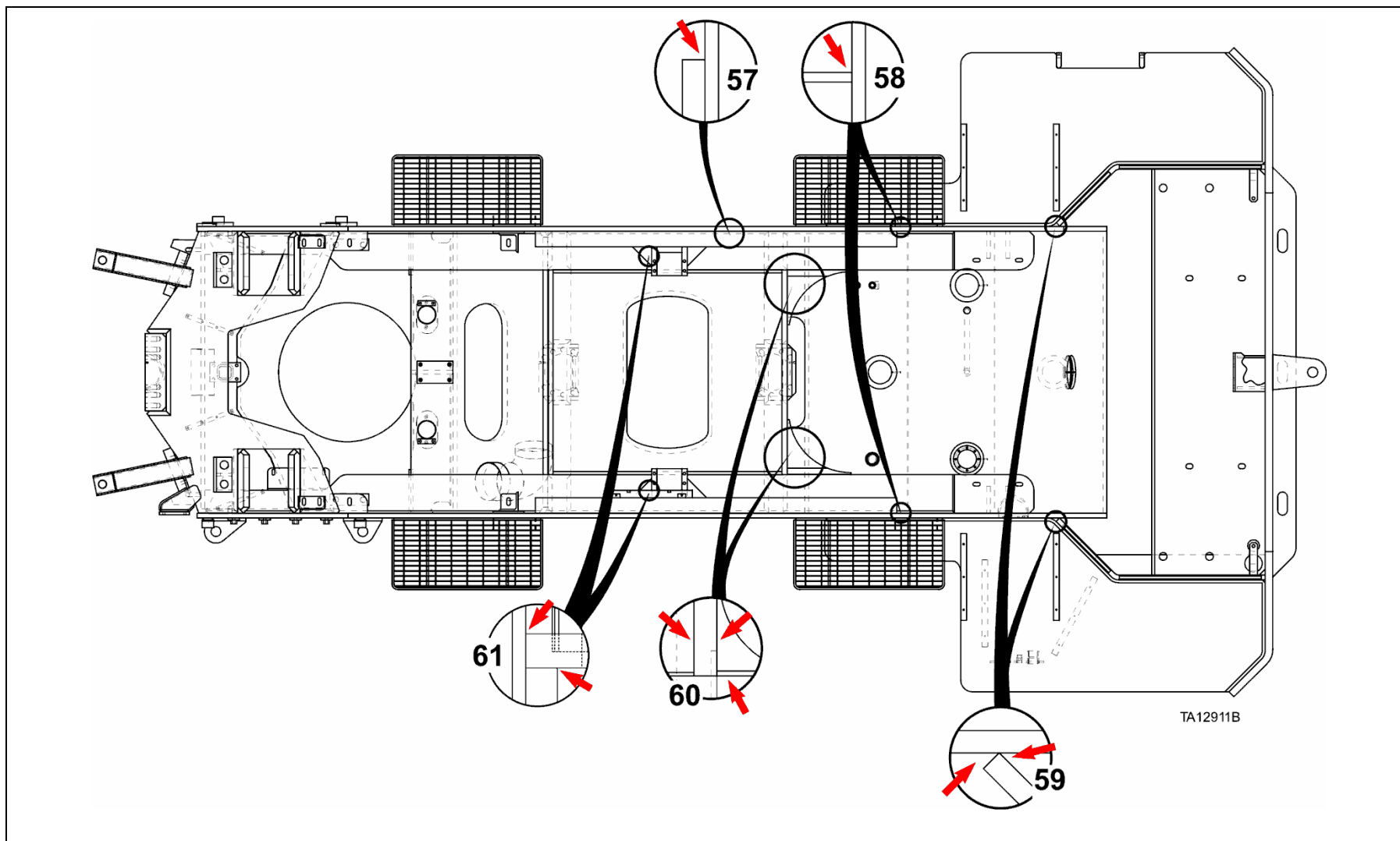
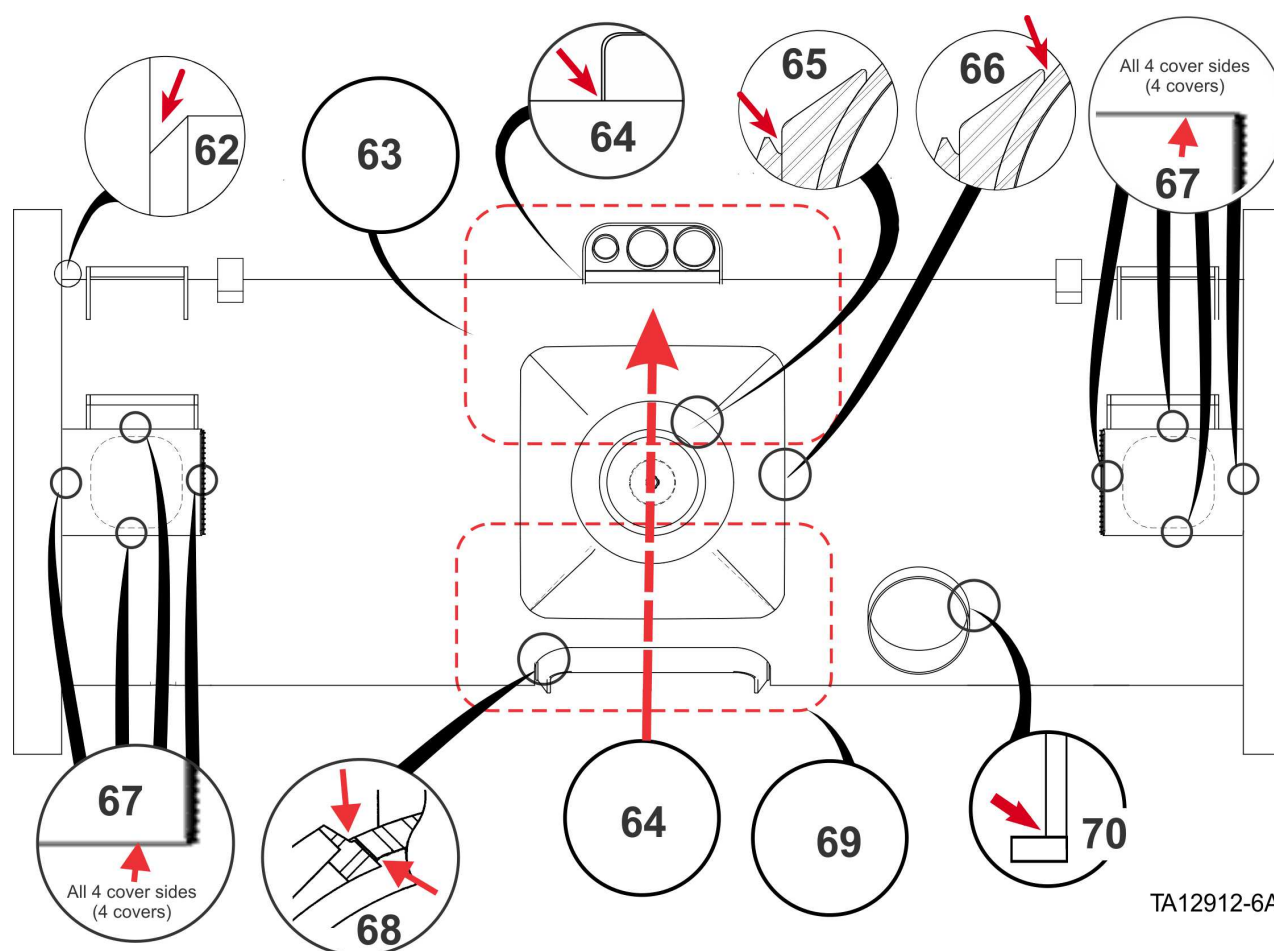


Figure 28. L-1350 - rear frame – top view



TA12912-6A

- 60.** Check the axle cutout under this cover – from inside the axle-through access hole (especially 4 corners).
- 63.** Inspect area inside and outside of housing from front and back ball weldments to top of axle for surface cracks
- 65.** Inspect area inside and outside of housing from front and back ball weldments to bottom of axle for surface cracks
- 66.** Welds on all four sides of cover, including corners (4 covers).
- 67.** Welds on all four sides of access hole, including corners.

Figure 29. L-1350 -rear axle

## L-1350 Structural and Weld Inspection Log Sheet

|                     |                           |
|---------------------|---------------------------|
| Model No.: _____    | Serial No.: _____         |
| Location: _____     | Customer Name: _____      |
| Inspected By: _____ | Hour meter Reading: _____ |
|                     | Date: _____               |

| Component/<br>Location                      | Ok | Crack | Description of Crack at all Locations, Note Left/Right and<br>Front/Back of Component |
|---------------------------------------------|----|-------|---------------------------------------------------------------------------------------|
| <b>Lift Arm and<br/>Bellcranks</b>          |    |       |                                                                                       |
| 1                                           |    |       |                                                                                       |
| 2                                           |    |       |                                                                                       |
| 3                                           |    |       |                                                                                       |
| 4                                           |    |       |                                                                                       |
| 5                                           |    |       |                                                                                       |
| 6                                           |    |       |                                                                                       |
| 7                                           |    |       |                                                                                       |
| 8                                           |    |       |                                                                                       |
| 9                                           |    |       |                                                                                       |
| 10                                          |    |       |                                                                                       |
| 11                                          |    |       |                                                                                       |
| <b>Front Frame<br/>Side View<br/>1 of 4</b> |    |       |                                                                                       |
| 12                                          |    |       |                                                                                       |
| 13                                          |    |       |                                                                                       |
| 14                                          |    |       |                                                                                       |
| 15                                          |    |       |                                                                                       |
| 16                                          |    |       |                                                                                       |
| 17                                          |    |       |                                                                                       |
| 18                                          |    |       |                                                                                       |
| 19                                          |    |       |                                                                                       |
| 20                                          |    |       |                                                                                       |

| Component/<br>Location                      | Ok | Crack | Description Of Crack at all Locations, Note Left/Right<br>and Front/Back of Component |
|---------------------------------------------|----|-------|---------------------------------------------------------------------------------------|
| <b>Front Frame<br/>Rear View<br/>2 of 4</b> |    |       |                                                                                       |
| 21                                          |    |       |                                                                                       |
| 22                                          |    |       |                                                                                       |
| 23                                          |    |       |                                                                                       |
| 24                                          |    |       |                                                                                       |
| 25<br>(If Present)                          |    |       |                                                                                       |
| 26                                          |    |       |                                                                                       |
| 27                                          |    |       |                                                                                       |
| <b>Front Frame<br/>Rear View<br/>3 of 4</b> |    |       |                                                                                       |
| 28                                          |    |       |                                                                                       |
| 29                                          |    |       |                                                                                       |
| 29.1                                        |    |       |                                                                                       |
| 30                                          |    |       |                                                                                       |
| 31                                          |    |       |                                                                                       |
| 32                                          |    |       |                                                                                       |
| 33                                          |    |       |                                                                                       |
| 34                                          |    |       |                                                                                       |
| <b>Front Frame<br/>Rear View<br/>4 of 4</b> |    |       |                                                                                       |
| 35                                          |    |       |                                                                                       |
| 36                                          |    |       |                                                                                       |
| 37                                          |    |       |                                                                                       |
| 38                                          |    |       |                                                                                       |
| 39                                          |    |       |                                                                                       |
| 40                                          |    |       |                                                                                       |
| 41                                          |    |       |                                                                                       |

| Component/<br>Location                     | Ok | Crack | Description Of Crack at all Locations, Note Left/Right<br>and Front/Back of Component |
|--------------------------------------------|----|-------|---------------------------------------------------------------------------------------|
| <b>Rear Frame<br/>Side View<br/>1 of 2</b> |    |       |                                                                                       |
| 42                                         |    |       |                                                                                       |
| 43                                         |    |       |                                                                                       |
| 44                                         |    |       |                                                                                       |
| 45                                         |    |       |                                                                                       |
| 46                                         |    |       |                                                                                       |
| 47                                         |    |       |                                                                                       |
| 48                                         |    |       |                                                                                       |
| 49                                         |    |       |                                                                                       |
| 50                                         |    |       |                                                                                       |
| 51                                         |    |       |                                                                                       |
| 52                                         |    |       |                                                                                       |
| 53                                         |    |       |                                                                                       |
| 54                                         |    |       |                                                                                       |
| 55                                         |    |       |                                                                                       |
| 56                                         |    |       |                                                                                       |
| <b>Rear Frame<br/>Top View<br/>2 of 2</b>  |    |       |                                                                                       |
| 57                                         |    |       |                                                                                       |
| 58                                         |    |       |                                                                                       |
| 59                                         |    |       |                                                                                       |
| 60                                         |    |       |                                                                                       |
| 61                                         |    |       |                                                                                       |
| <b>Rear Axle</b>                           |    |       |                                                                                       |
| 62                                         |    |       |                                                                                       |
| 63                                         |    |       |                                                                                       |
| 64                                         |    |       |                                                                                       |
| 65                                         |    |       |                                                                                       |
| 66                                         |    |       |                                                                                       |
| 67                                         |    |       |                                                                                       |
| 68                                         |    |       |                                                                                       |
| 69                                         |    |       |                                                                                       |
| 70                                         |    |       |                                                                                       |

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# 1000 Hour Structural and Weld Inspection Report - L-1850

## 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. 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.

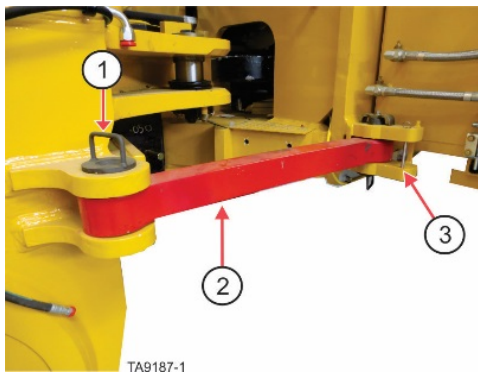
### WARNING

Crush, shock, or other hazards exist if personnel do not follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Always follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Failure to follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures can cause crush, shock, or other hazards resulting in severe injury or death.

- 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.

### 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.



**Frame lock in locked position**

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

**Frame Lock**

- c. Place wheel chocks in front and behind each wheel.
- d. Set bucket flat and level on the ground.
- e. Set the parking brakes.
- f. Shut off the engine.

## ⚠ WARNING

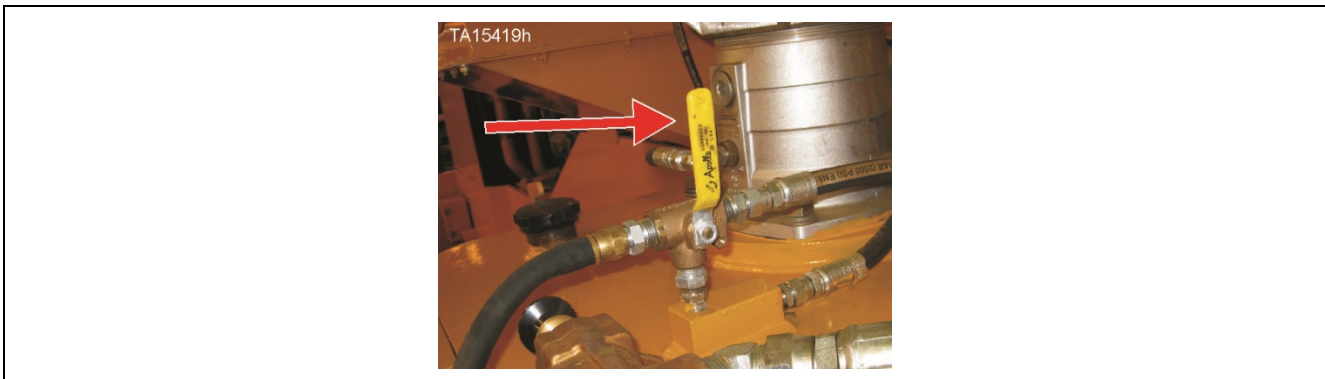
Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing 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.

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



**Battery Isolation Box – Battery isolation switch in OFF position with locks in place**

- 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.
  - Turn the handle to the up position as shown



**Hydraulic reservoir air valve handle UP**

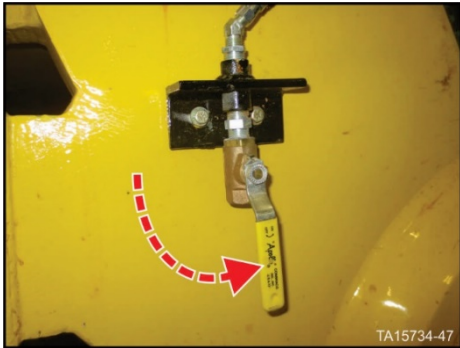
- i. Release the air from the various air storage reservoirs by opening all of the air bleed valves.
- j. Ensure all air from the air system is bled to 0 psig.

# NOTICE

The KLENZ™ should also be drained. It has a manual drain valve on the bottom of the reservoir.

Three valves on right side of rear frame under hydraulic reservoir

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

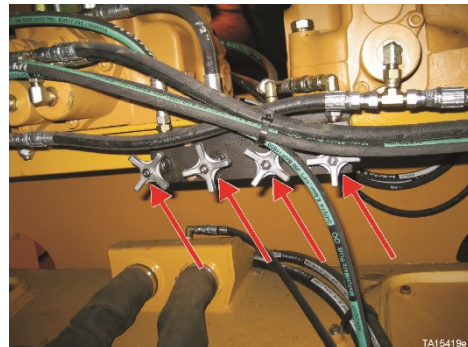
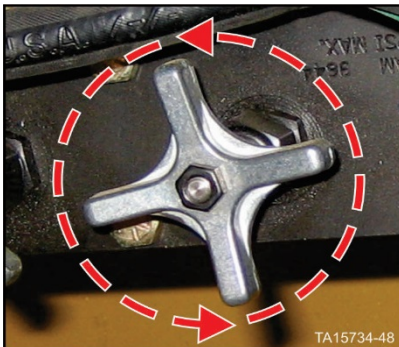


Open air reservoir bleed valves

## ⚠ WARNING

Crush hazards exist if all personnel are not cleared from the bucket and lift arm area before using the hydraulic hoist and bucket hydraulic pressure bleed down valves to relieve pressure from the hoist and bucket circuit. Clear all personnel from the area around the bucket and lift arms before operating hydraulic hoist and bucket hydraulic pressure bleed down valves. Using the hydraulic bleed down valves could result in some movement of the lift arms and bucket which could cause a crush hazard resulting serious 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 cylinders.
- l. Turn each valve slowly counterclockwise as shown below and allow the pressure to bleed down.
- m. Open the valve completely and leave it open during repairs.



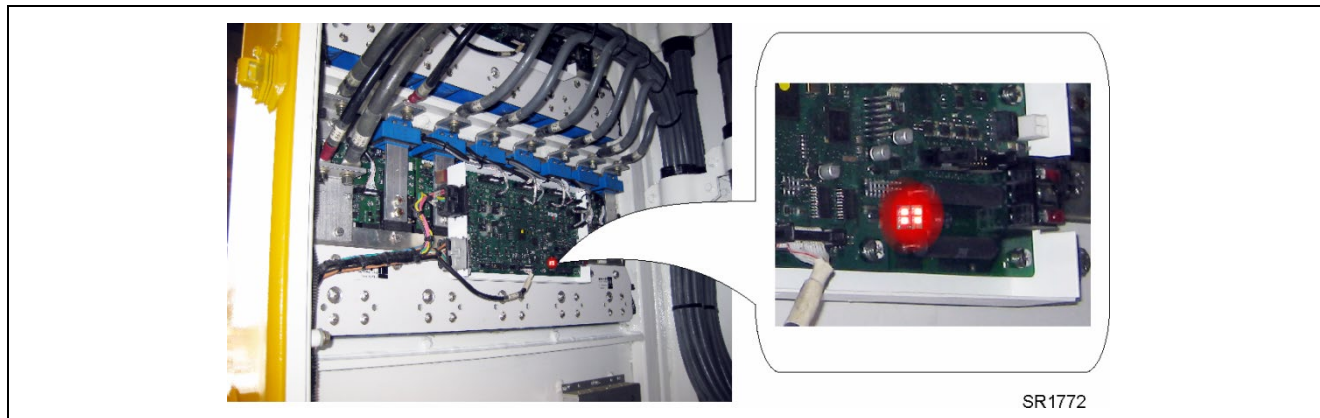
Hoist and bucket circuit hydraulic bleed down valves

## Converter Bus Voltage

### WARNING



Risk of fatal electrical shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINCOS 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.



SR1772

**Converter assembly bus LED's**

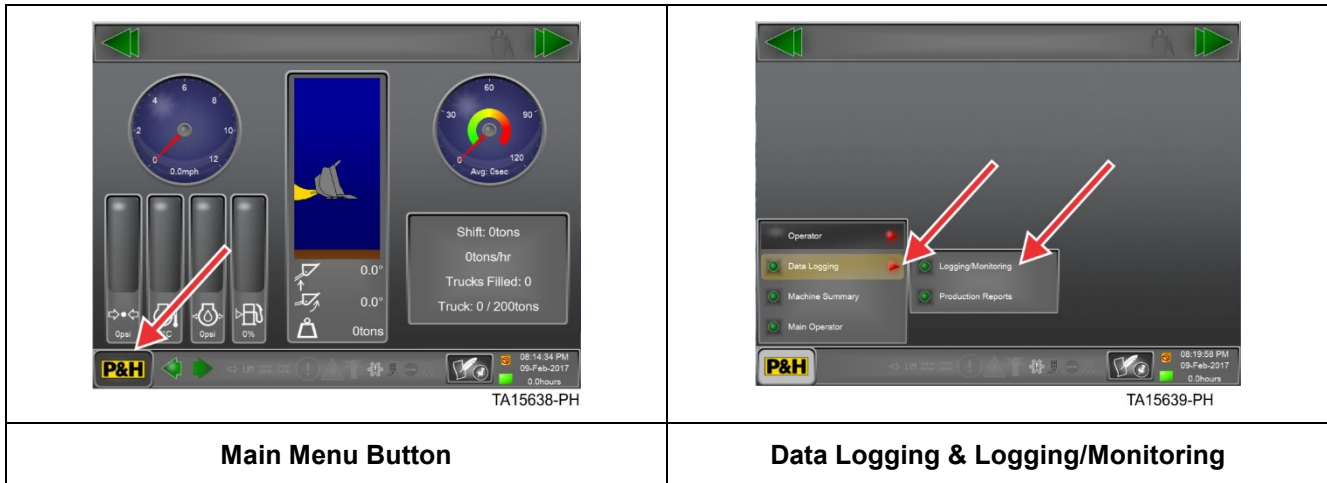
There are three different methods that are combined to verify when it is safe to enter the electrical cabinet.

1. LINCOS II display in cab
2. Visual indication in electrical cabinet
3. Physical measurement

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

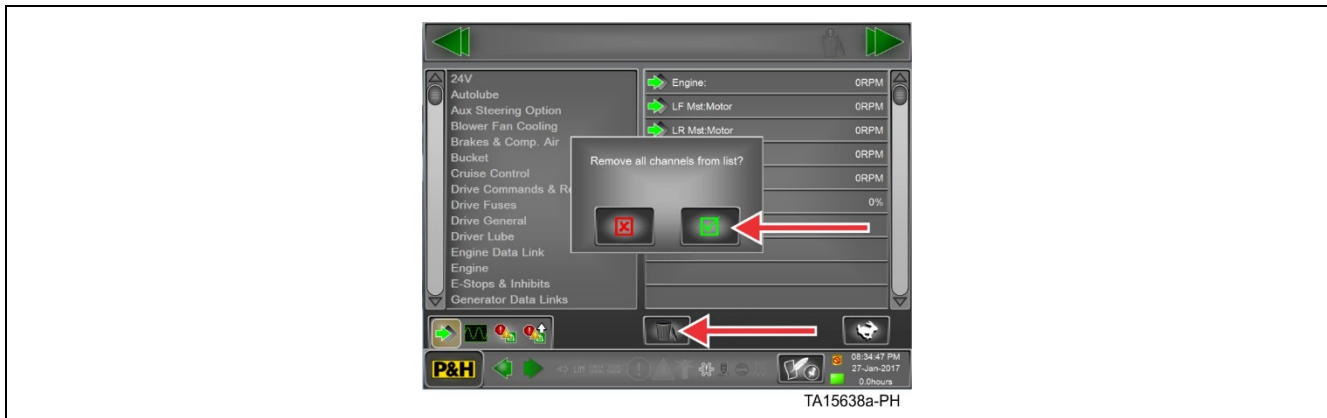
## In Cab Verification Using LINCS II Display

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

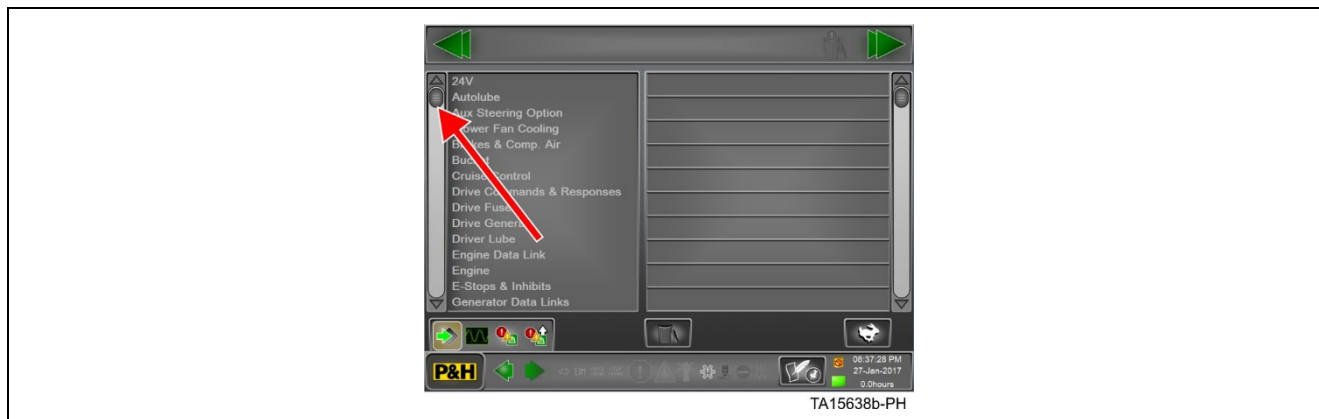


**LINCS logging/monitoring menu access**

3. 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).



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



Left hand scroll

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



Bus voltage indication

6. 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.**

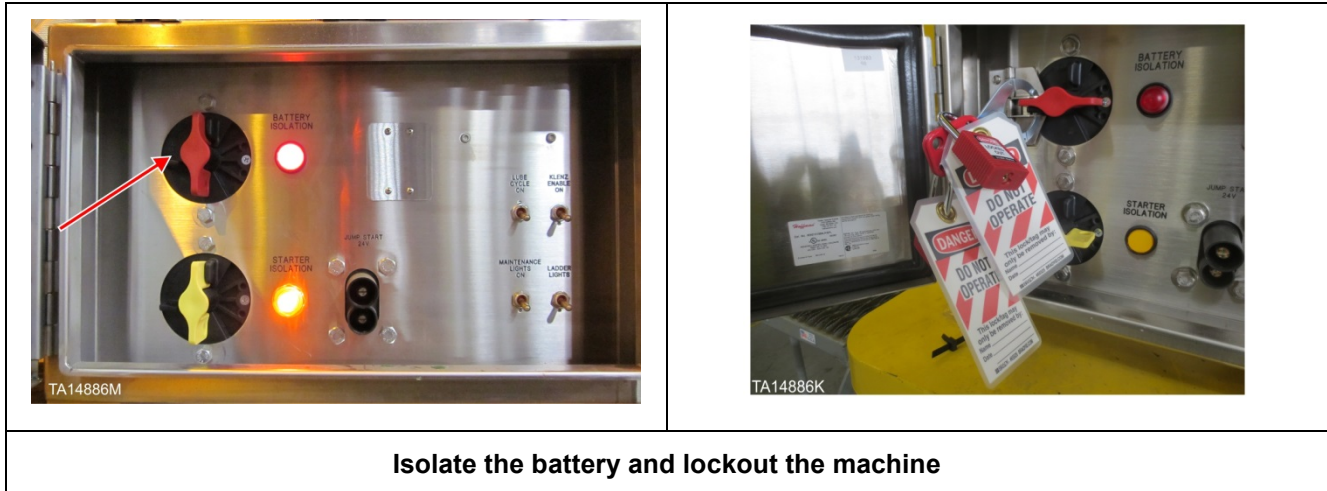
7. Turn the key switch to the OFF position and proceed to the next step in the verification process.

## Verification By Visual Indication

Following the verification by LINC'S 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:

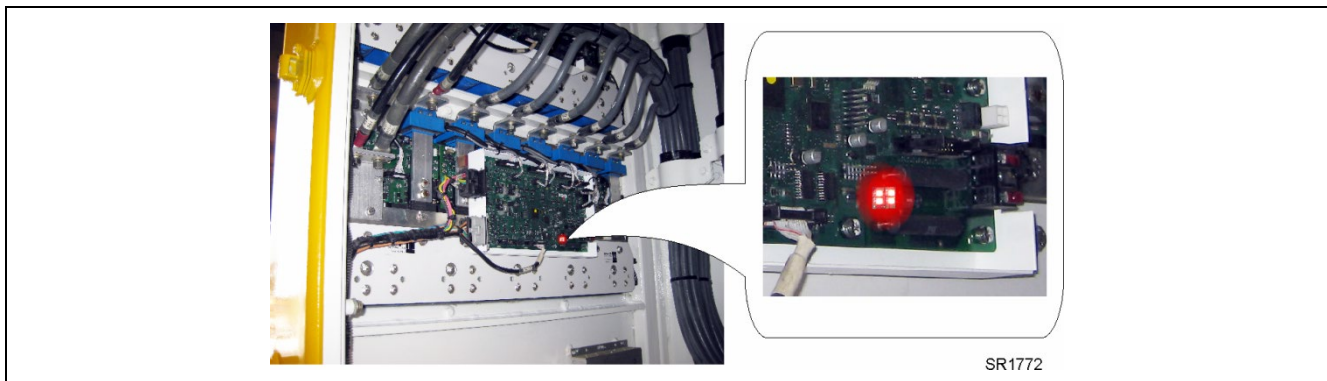
- The 24VDC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



### 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.



## Verification By Physical Measurement Main Bus Bars

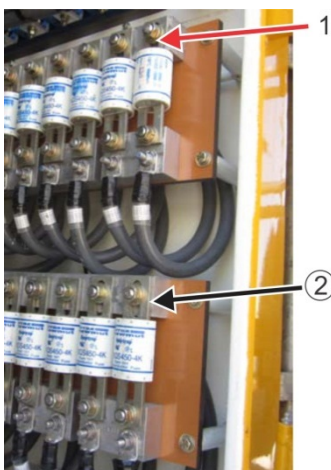
Once the visual indicators have been verified, the bus voltage should be physically measured. The bus voltage should be fully discharged based on the previous checks.

- 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 LINCOS system verification.



### WARNING

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.



1) Positive bus bar, 2) Negative bus bar

**Main bus bars**

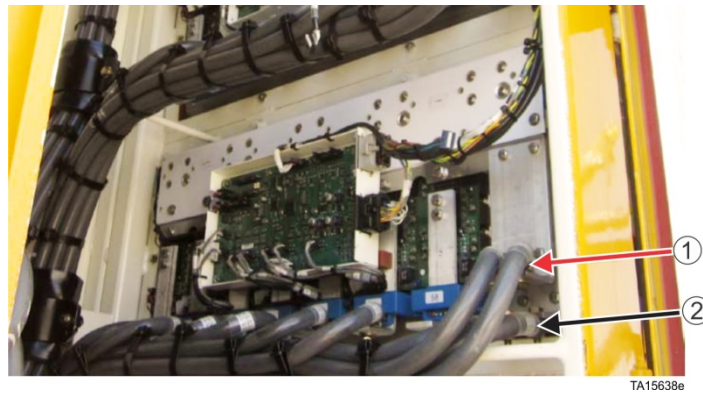
## Converter Assembly Bus Connections

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

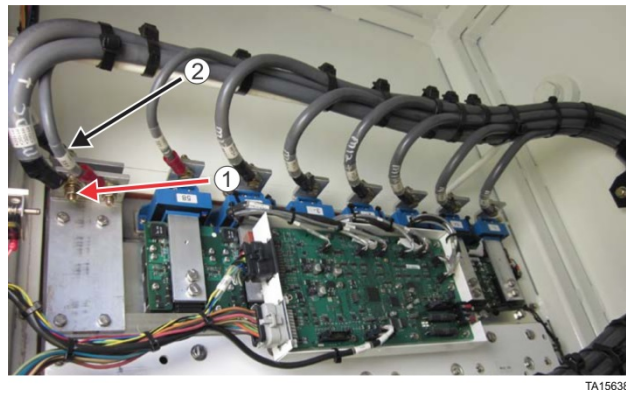
**The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.**

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

**Converter assembly bus connections (rear of cabinet)**



1) Positive bus bar, 2) Negative bus bar

**Converter assembly bus connections (front of cabinet)**

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## Inspection List L-1850

The following list provides detailed descriptions of the areas to be checked. See the pictures that follow for each item that shows the joint or area being described:

### L-1850 lift arms and bellcranks

1. Joint between the lift arm side plate and the torque tube.
  - a. Inspect the entire circumference of the weld joint on left side arm
  - b. Inspect the entire circumference of the weld joint on right side arm
2. Joint between lifting eye and torque tube
3. Joint between the torque tube and the bellcrank mount ears
  - a. Inspect weld on the inside of Right Hand ear
  - b. Inspect weld on the outside of Right Hand ear
  - c. Inspect weld on the inside of Left Hand ear
  - d. Inspect weld on the outside of Left Hand ear
4. Joint between lift arm wrapper plate and side plates.
  - a. Inspect top wrapper plate Left Hand arm – both welds – full length of arm.
  - b. Inspect bottom wrapper plate Left Hand arm – both welds – full length of arm.
    - i. Note any damage to bottom plate.
    - ii. Inspect the wrapper plate in the area of the hoist cylinder eye.
  - c. Inspect top wrapper plate Right Hand arm – both welds – full length of arm.
  - d. Inspect bottom wrapper plate Right Hand arm – both welds – full length of arm.
    - i. Note any damage to bottom plate.
    - ii. Inspect the wrapper plate in the area of the hoist cylinder eye.
5. Joint between the bucket boss and lift arm plates
  - a. Inspect Left Hand top, bottom and sides
  - b. Inspect Right Hand top, bottom and sides
6. Joint between side plate and boss for hoist cylinder eye.
  - a. Inspect Left Hand arm – Right Hand boss
  - b. Inspect Left Hand arm – Left Hand boss
  - c. Inspect Right Hand arm – Right Hand boss
  - d. Inspect Right Hand arm – Left Hand boss
7. Joint between lift arm ball socket and lift arm beam
  - a. Inspect Left Hand ball socket – top, bottom and both sides
  - b. Inspect Right Hand ball socket – top, bottom and both sides
8. Joint between bellcrank side plate and boss
  - a. LH bellcrank. Bucket cylinder end – both bosses. Entire weld circumference.
  - b. LH bellcrank. Level link end – both bosses. Entire weld circumference.
  - c. RH bellcrank. Bucket cylinder end – both bosses. Entire weld circumference.
  - d. RH bellcrank. Level link end – both bosses. Entire weld circumference.
9. Joint between bellcrank side plates and pivot bosses.
  - a. LH bellcrank – both bosses
  - b. RH bellcrank – both bosses
10. Joint between bellcrank side plates and wrapper plate
  - a. LH bellcrank - all welds
  - b. RH bellcrank - all welds

### L-1850 front frame – 1 of 4 - side view

11. Joint between stiffener plates and slab.
12. Slab
13. Joint between top articulation ball and slab
  - a. Inspect the circumference of the weld with a focus on the front side.
  - b. Inspect neck of ball
14. Joint between bottom articulation ball and slab
  - a. Inspect the circumference of the weld with a focus on the front side
  - b. Inspect neck of ball

- 15. Joint between the steer cylinder ears and bottom slab
  - a. Inspect Left Hand - top and bottom ears
  - b. Inspect Right Hand – top and bottom ears
  - c. Inspect top and bottom of slab
- 16. Joint between hoist ball tube and frame
  - a. Inspect Left Hand circumference of weld
  - b. Inspect Right Hand circumference of weld
  - c. Inspect neck of left ball
  - d. Inspect neck of right ball
- 16.1. Weld between hoist cylinder support plate to front frame side plates
  - a. Inspect entire length of weld RHS
  - b. Inspect entire length of weld LHS
- 17. Joint between bottom plate and axle
  - a. Inspect from left to right across bottom of axle
- 18. Joint between side plate and upper crossmember structure side plate
  - a. Inspect weld on left inside of frame from front to rear
  - b. Inspect weld on right inside of frame from front to rear
- 19. Joint between bucket cylinder base mount ears and crossmember structure
  - a. Inspect the left ears top and bottom where connected to frame
  - b. Inspect the weld around the bosses on left ears
  - c. Inspect the right ears top and bottom where connected to frame
  - d. Inspect the weld around the bosses on right ears

#### **L-1850 front frame – 2 of 4 – rear view**

- 20. Joint between upper side plate slab structure and boss
  - a. Inspect circumference of the weld on Left Hand side plate.
  - b. Inspect circumference of the weld on Right Hand side plate
- 21. Joint of lift arm ball to tube
  - a. Inspect the circumference of the weld on the Left Hand ball
  - b. Inspect the circumference of the weld on the Right Hand ball
- 21.1. Support tubes
  - a. Left top
  - b. Left bottom
  - c. Right top
  - d. Right bottom
- 22. Joint of hoist cylinder ball to tube
  - a. Inspect the circumference of the weld on the Left Hand ball
  - b. Inspect the circumference of the weld on the Right Hand ball
- 23. Joint of hoist cylinder tube to frame side plate
  - a. Inspect the circumference of the weld on the Left Hand side plate
  - b. Inspect the circumference of the weld on the Right Hand side plate
- 24. Joints of stiffener plate to bottom articulation slab and hoist cylinder tube sideplates.
  - a. Inspect left
  - b. Inspect bottom
  - c. Inspect top
  - d. Inspect right.
- 25. Joint between stiffener plates and slab.
  - a. Inspect left top corner hole
  - b. Inspect left bottom corner hole
  - c. Inspect right top corner hole
  - d. Inspect right bottom corner hole

**L-1850 front frame – 3 of 4 – front view**

26. Joint of side plate to front axle
  - a. Inspect left side – inside and outside – focus on the front top
  - b. Inspect right side – inside and outside – focus on the front top
27. Joint between front plate and the lift arm ball tube
  - a. Inspect the weld
  - b. Inspect left corner
  - c. Inspect right corner
28. Access holes in front plate for bucket cylinder hoses.
  - a. Inspect left hole – all 4 corners
  - b. Inspect right hole – all 4 corners
29. Husco access hole in front plate
  - a. Inspect all 4 corners
30. Joint between front plate, axle and side plate.
  - a. Inspect upper and lower ends of the left cutout
  - b. Inspect upper and lower ends of the right cutout
31. Inspect front axle access hole
  - a. Inspect all bolt holes
  - b. Inspect weld between access structure and axle
    - i. Inside
    - ii. Outside

**L-1850 front frame – 4 of 4 – rear view**

32. Joint between axle roll up and driver bolt flange
  - a. Inspect circumference of left side
  - b. Inspect circumference of right side
33. Joint of upper articulation slab to frame side plate
  - a. Inspect top and bottom weld on left side
  - b. Inspect top and bottom weld on right side
34. Joint of lifting eye to upper ball tube (for lift arms)
  - a. Inspect left
  - b. Inspect right
35. Joint of frame side plate to the upper crossmember side plate.
  - a. Inspect left side
  - b. Inspect right side
36. Joint of bulkhead to side plate
  - a. Inspect left side – inside and outside
  - b. Inspect right side – inside and outside
37. Joint of side plate to the hoist cylinder tube side plates
  - a. Inspect left weld inside and outside.
  - b. Inspect right weld inside and outside.
38. Joint of steer cylinder eyes to the bottom articulation slab
  - a. Check left eyes – lower and upper
  - b. Check right eyes – lower and upper
39. Joint of lower articulation slab to the hoist cylinder tube side plates.
  - a. Check left side
  - b. Check right side

**L-1850 - rear frame – side view**

40. Joint of upper articulation socket to upper slab
  - a. Inspect circumference of weld
41. Upper side frame area – inside
  - a. Inspect the weld on the gusset for the ROPS structure – left side
  - b. Inspect the weld on the gusset for the ROPS structure – right side
  - c. Inspect the holes for the hydraulic reservoir on right side

42. Frame area over the rear axle
  - a. Inspect the top edge of the side plate – left side
  - b. Inspect welds around any structural mounts located in this area – left side
  - c. Inspect welds around any bolt blocks or mounting structures - left side.
  - d. Inspect the top edge of the side plate – right side
  - e. Inspect welds around any structural mounts located in this area – right side
  - f. Inspect welds around any bolt blocks or mounting structures - right side.
43. Joint of lower articulation socket to upper slab
  - a. Inspect circumference of weld
44. Joint between side plate brace and bottom articulation slab
  - a. Inspect top and bottom of left side weld
  - b. Inspect top and bottom of right side weld
45. Joint between steering brace and side plate.
  - a. Inspect top and bottom of left side weld
  - b. Inspect top and bottom of right side weld
46. Steering crossmember structure
  - a. Inspect top and bottom welds to left side plate
  - b. Inspect top and bottom welds to right side plate
  - c. Inspect welds on bottom to the side plate brace
  - d. Inspect welds on the steering crossmember – top and bottom across the length – both front and rear sides.
47. Joint where top plate on steering crossmember structure attaches to the front axle crossmember.
  - a. Inspect weld top and bottom from left to right and sides
48. Joint of front axle articulation socket to front axle crossmember
  - a. Inspect circumference of weld
49. Joint of rear axle articulation socket to rear axle crossmember
  - a. Inspect circumference of weld
50. Catwalk plate
  - a. Inspect top and bottom weld where left catwalk plate attaches to side plate
  - b. Inspect top and bottom weld where right catwalk plate attaches to the side plate.
51. Fuel reservoir mount
  - a. Inspect left side mount where welded to side plate
  - b. Inspect right side mount where welded to side plate
52. Radiator mount plate
  - a. Inspect where welded to left side plate
  - b. Inspect weld to rear bumper
  - c. Inspect where welded to right side plate
53. Tow point
  - a. Inspect welds where tow point pieces are attached to bumper.

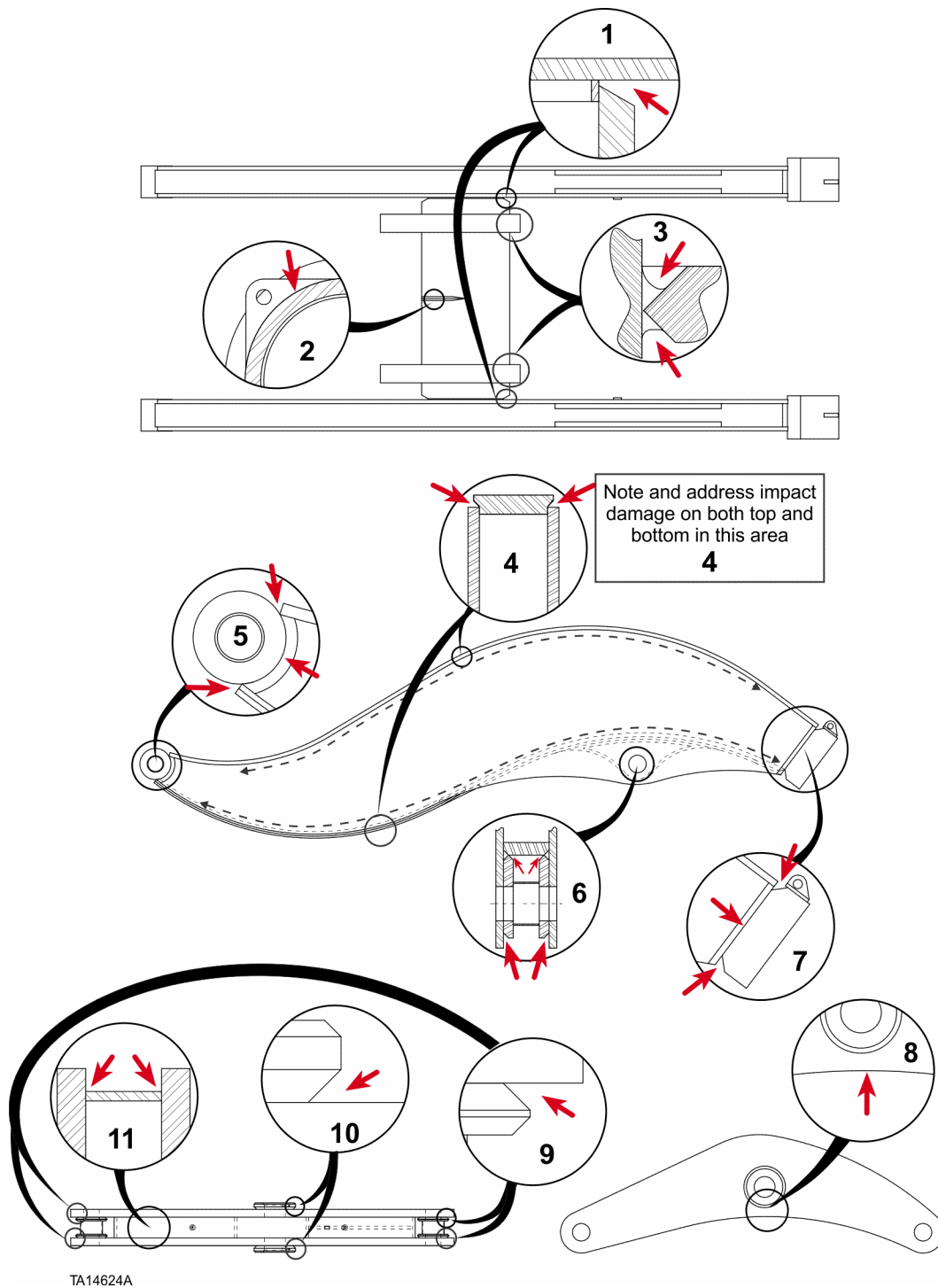
#### **L-1850 rear frame – top view**

54. Slab on frame side plate over axle
  - a. Inspect left slab and welds
  - b. Inspect right slab and welds
55. Stiffener to side plate
  - a. Inspect weld top and bottom of the left stiffener plate
  - b. Inspect weld top and bottom of the right stiffener plate
56. Joint between side plate and transition plate
  - a. Inspect left side (inside and outside)
  - b. Inspect right side (inside and outside)
57. Rear axle crossmember
  - a. Inspect welds between left side plate and crossmember
  - b. Inspect welds between right side plate and crossmember
  - c. Inspect welds between crossmember and gussets
  - d. Inspect welds between crossmember and stiffener plate over axle.

**L-1850-rear axle**

58. Joint between axle rollup and bolt flange.
  - a. Inspect weld circumference of left side.
  - b. Inspect weld circumference of right side.
59. Top of axle over the pivots.
  - a. Inspect the area between front ball and top of axle.
  - b. Inspect the area between the rear ball and top of axle.
  - c. Inspect any through pieces.
60. Joint between the wire/cable inlet cover and the axle
  - a. Sides
  - b. Front.
  - c. Rear.
  - d. Check the axle cutout under this cover – from inside the axle-through bottom access hole (especially 4 corners).
61. Joint between ball and transition plate.
  - a. Inspect circumference of weld between front ball base and the transition casting.
  - b. Inspect circumference of weld between rear ball base and the transition casting.
62. Joint between transition plate and axle roll up.
  - a. Inspect circumference of weld between the front transition casting and the axle.
  - b. Inspect circumference of weld between the rear transition casting and the axle.
63. Air outlets.
  - a. Inspect weld on all four sides of cover (four covers)-including corners.
    - Right rear
    - Right front
    - Left Rear
    - Left front
64. Inspect bottom access hole.
  - a. Inspect the bolt holes.
  - b. Inspect the circumference of the external weld.
  - c. Inspect the circumference of the internal weld.
  - d. Inspect all 4 corners.
65. Bottom of axle.
  - a. Inspect inside and outside of axle between the front and rear weldments.
66. Inspect air inlet tube connection hole.

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4. Note and address impact damage on both top and bottom in this area

**Figure 30. L-1850-lift arms and bellcranks**

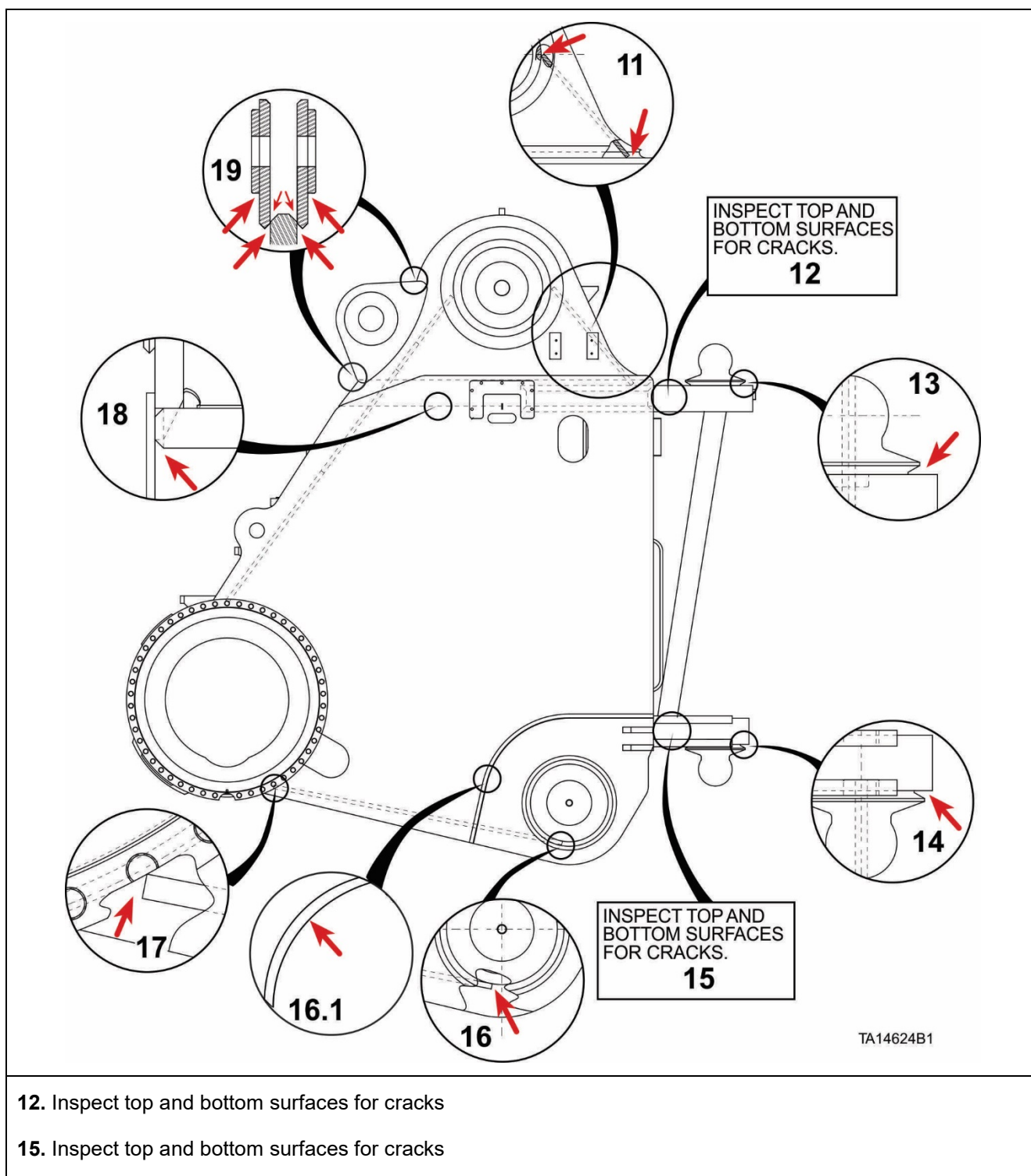


**Figure 31. L-1850-front frame – 1 of 4 – side view**

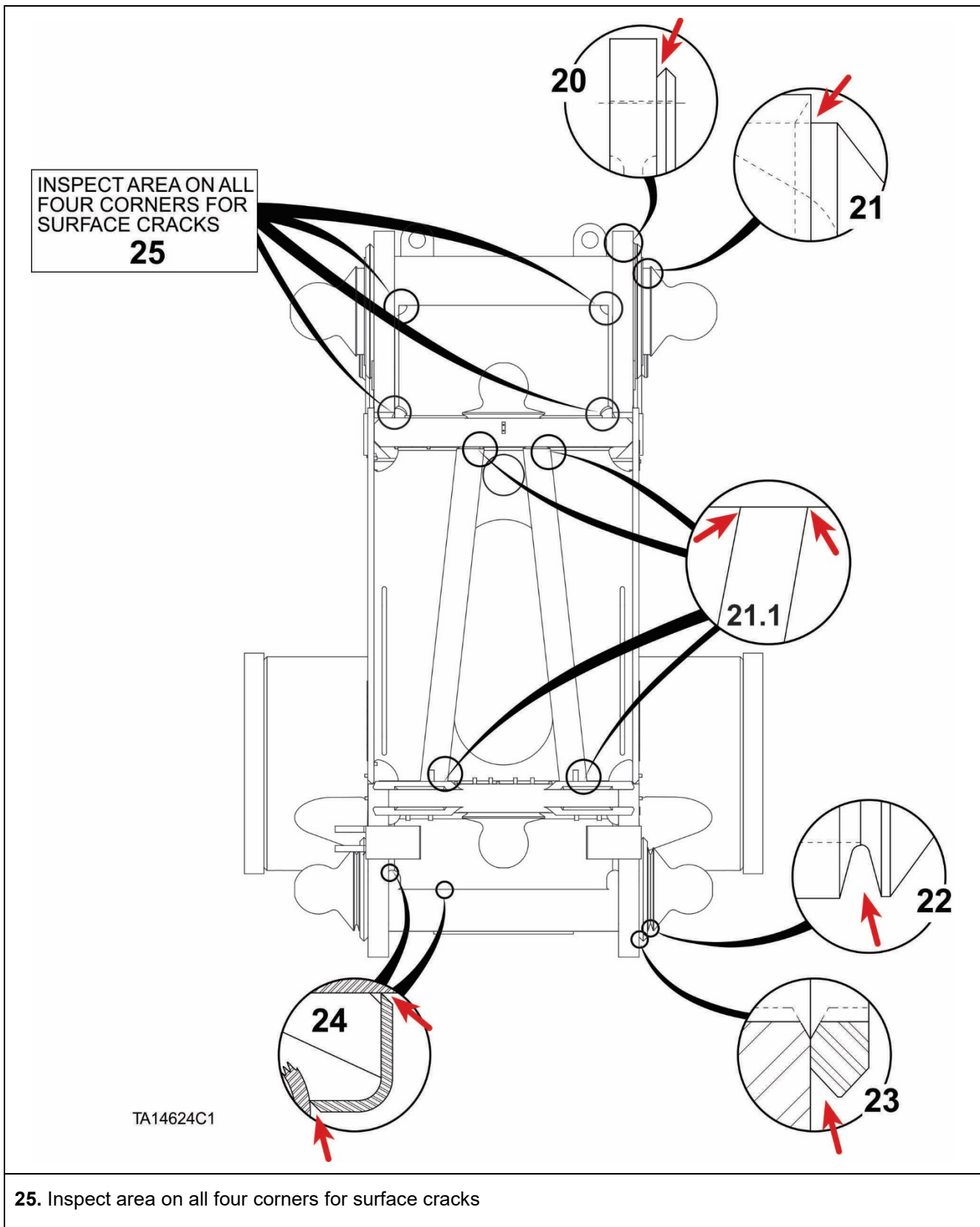


**Figure 32. L-1850-front frame – 2 of 4 – rear view**

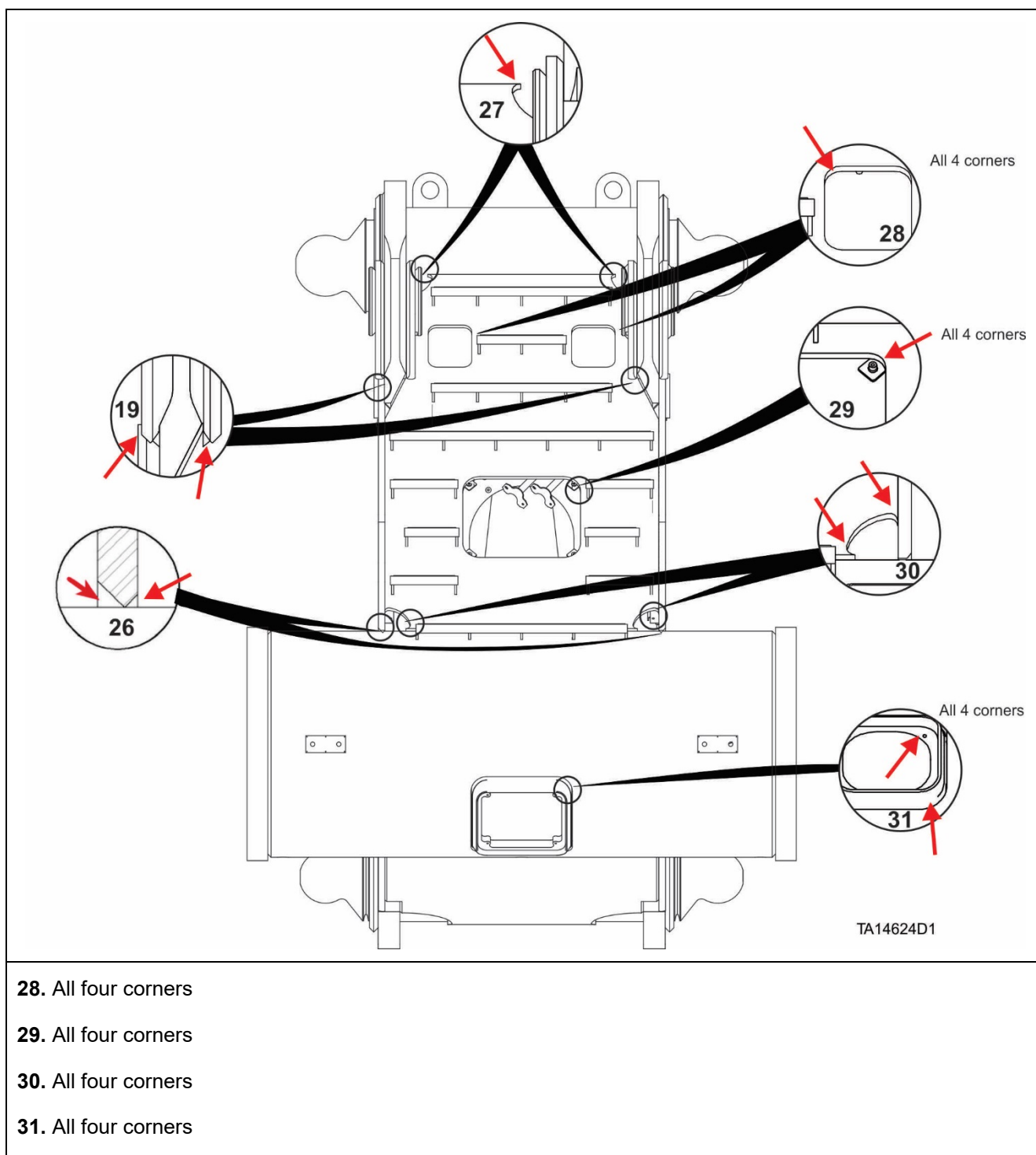


**Figure 33. L-1850-front frame – 3 of 4 – front view**

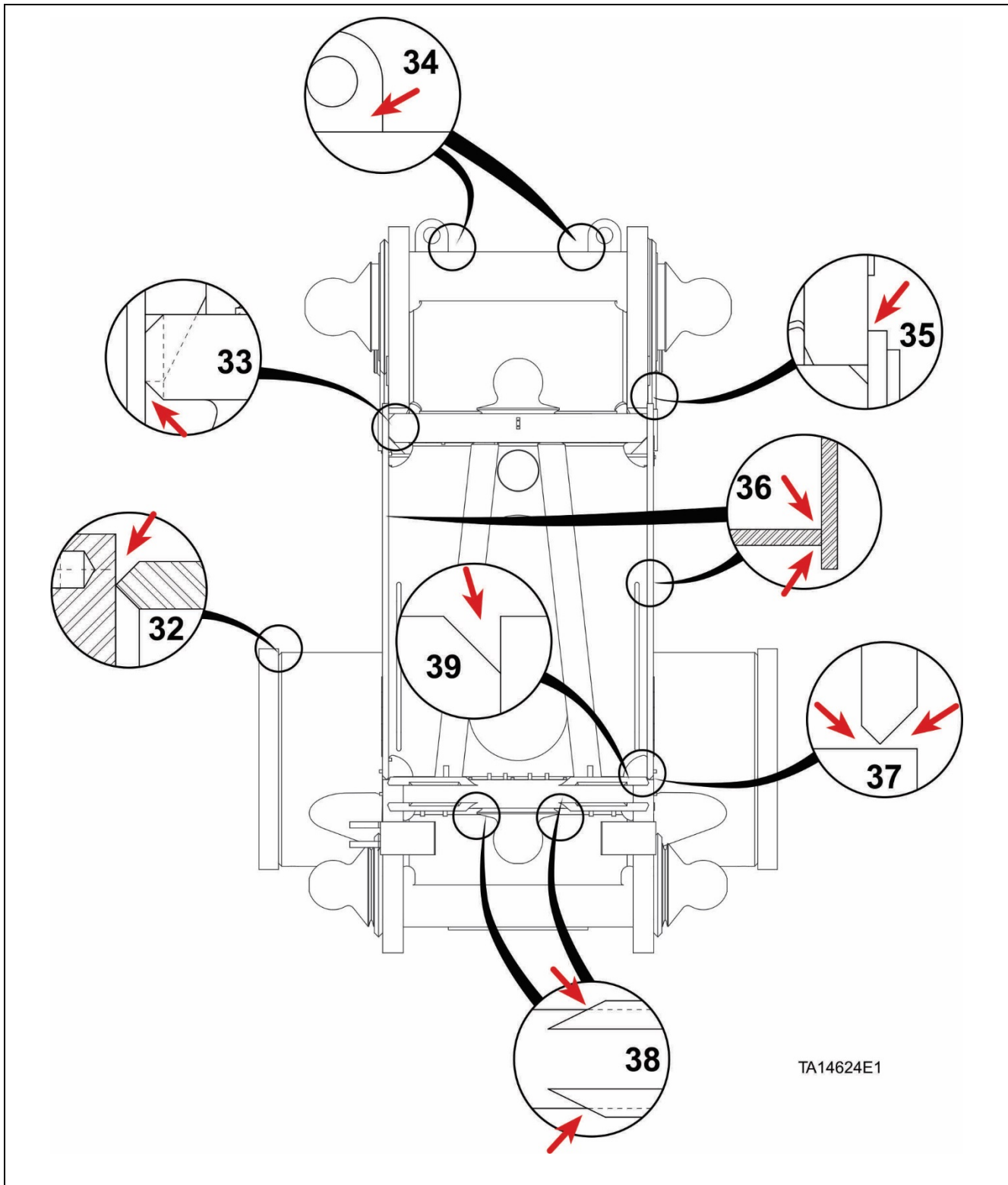


Figure 34. L-1850-front frame 4 of 4 – rear view

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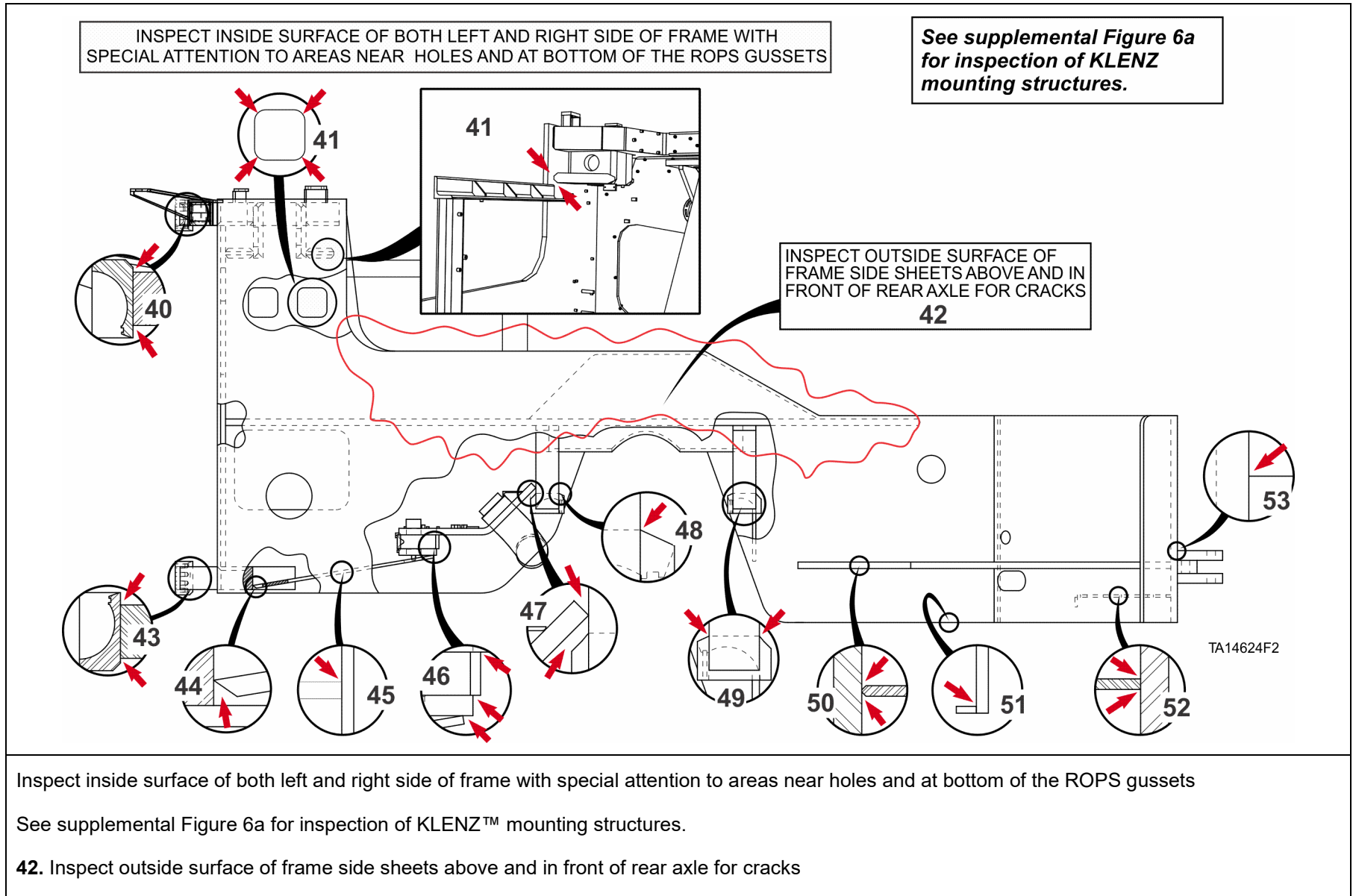


Figure 35. L-1850-rear frame – side view

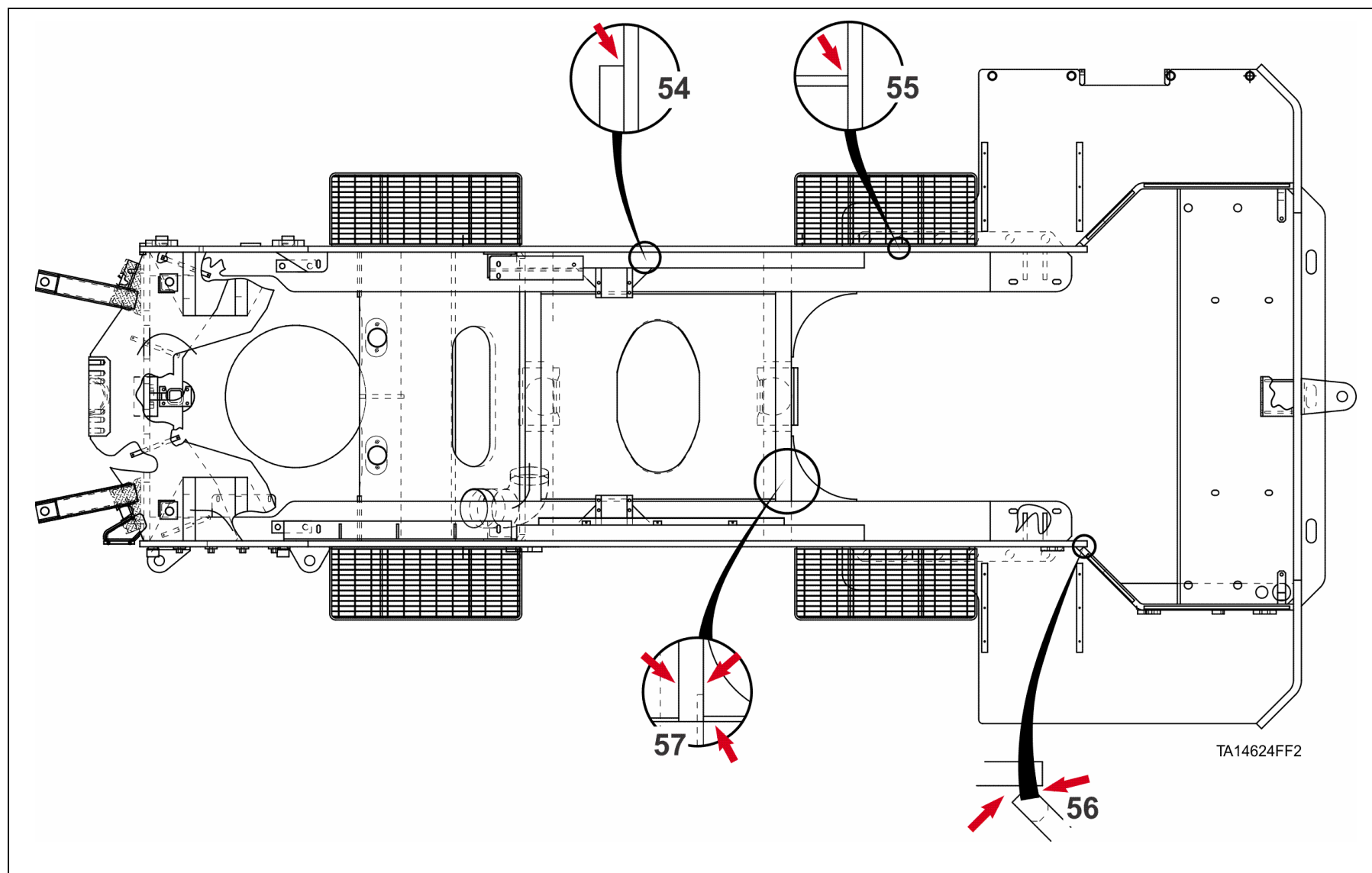
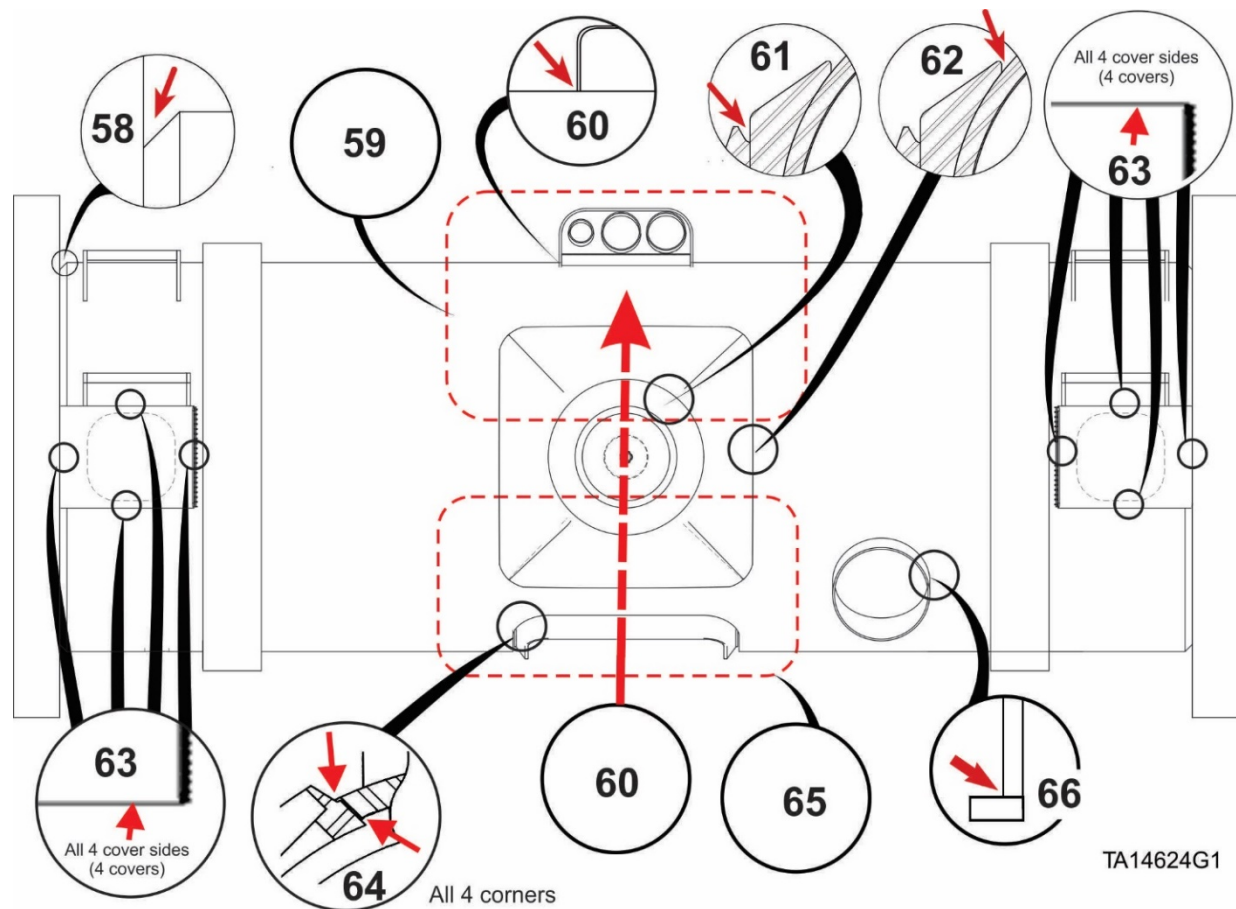


Figure 36. L-1850-rear frame – top view



- 59.** Check the axle cutout under this cover – from inside the axle-through access hole (especially 4 corners).
- 60.** Inspect area inside and outside of housing from front and back ball weldments to top of axle for surface cracks
- 63.** Welds on all four sides of cover, including corners (4 covers).
- 64.** Welds on all four sides of access hole, including corners.
- 65.** Inspect area inside and outside of housing from front and back ball weldments to bottom of axle for surface cracks

**Figure 37. L-1850-rear axle**

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## L-1850 Structural and Weld Inspection Log Sheet

|                      |                            |
|----------------------|----------------------------|
| <b>Model No.:</b>    | <b>Serial No.:</b>         |
| <b>Location:</b>     | <b>Customer Name:</b>      |
| <b>Inspected By:</b> | <b>Hour meter Reading:</b> |
|                      | <b>Date:</b>               |

| Component/<br>Location                      | Ok | Crack | Description of Crack at all Locations, Note Left/Right<br>and Front/Back of Component |
|---------------------------------------------|----|-------|---------------------------------------------------------------------------------------|
| <b>Lift Arm and<br/>Bellcranks</b>          |    |       |                                                                                       |
| 1                                           |    |       |                                                                                       |
| 2                                           |    |       |                                                                                       |
| 3                                           |    |       |                                                                                       |
| 4                                           |    |       |                                                                                       |
| 5                                           |    |       |                                                                                       |
| 6                                           |    |       |                                                                                       |
| 7                                           |    |       |                                                                                       |
| 8                                           |    |       |                                                                                       |
| 9                                           |    |       |                                                                                       |
| 10                                          |    |       |                                                                                       |
| <b>Front Frame<br/>1 of 4<br/>Side View</b> |    |       |                                                                                       |
| 11                                          |    |       |                                                                                       |
| 12                                          |    |       |                                                                                       |
| 13                                          |    |       |                                                                                       |
| 14                                          |    |       |                                                                                       |
| 15                                          |    |       |                                                                                       |
| 16                                          |    |       |                                                                                       |
| 16.1                                        |    |       |                                                                                       |
| 17                                          |    |       |                                                                                       |
| 18                                          |    |       |                                                                                       |
| 19                                          |    |       |                                                                                       |
| <b>Front Frame<br/>2 of 4<br/>Rear View</b> |    |       |                                                                                       |
| 20                                          |    |       |                                                                                       |

| Component/<br>Location                      | Ok | Crack | Description of Crack at all Locations, Note Left/Right<br>and Front/Back of Component |
|---------------------------------------------|----|-------|---------------------------------------------------------------------------------------|
| 21                                          |    |       |                                                                                       |
| 21.1                                        |    |       |                                                                                       |
| 22                                          |    |       |                                                                                       |
| 23                                          |    |       |                                                                                       |
| 24                                          |    |       |                                                                                       |
| 25                                          |    |       |                                                                                       |
| <b>Front Frame<br/>3 of 4<br/>Rear View</b> |    |       |                                                                                       |
| 26                                          |    |       |                                                                                       |
| 27                                          |    |       |                                                                                       |
| 28                                          |    |       |                                                                                       |
| 29                                          |    |       |                                                                                       |
| 30                                          |    |       |                                                                                       |
| 31<br>(If Present)                          |    |       |                                                                                       |
| <b>Front Frame<br/>4 of 4<br/>Rear View</b> |    |       |                                                                                       |
| 32                                          |    |       |                                                                                       |
| 33                                          |    |       |                                                                                       |
| 34                                          |    |       |                                                                                       |
| 35                                          |    |       |                                                                                       |
| 36                                          |    |       |                                                                                       |
| 37                                          |    |       |                                                                                       |
| 38                                          |    |       |                                                                                       |
| 39                                          |    |       |                                                                                       |
| <b>Rear Frame</b>                           |    |       |                                                                                       |
| 40                                          |    |       |                                                                                       |
| 41                                          |    |       |                                                                                       |
| 42                                          |    |       |                                                                                       |
| 43                                          |    |       |                                                                                       |
| 44                                          |    |       |                                                                                       |
| 45                                          |    |       |                                                                                       |
| 46                                          |    |       |                                                                                       |
| 47                                          |    |       |                                                                                       |
| 48                                          |    |       |                                                                                       |
| 49                                          |    |       |                                                                                       |
| 50                                          |    |       |                                                                                       |

| Component/<br>Location | Ok | Crack | Description of Crack at all Locations, Note Left/Right<br>and Front/Back of Component |
|------------------------|----|-------|---------------------------------------------------------------------------------------|
| 51                     |    |       |                                                                                       |
| 52                     |    |       |                                                                                       |
| 53                     |    |       |                                                                                       |
| 54                     |    |       |                                                                                       |
| 55                     |    |       |                                                                                       |
| 56                     |    |       |                                                                                       |
| 57                     |    |       |                                                                                       |
|                        |    |       |                                                                                       |
|                        |    |       |                                                                                       |
| <b>Rear Axle</b>       |    |       |                                                                                       |
| 58                     |    |       |                                                                                       |
| 59                     |    |       |                                                                                       |
| 60                     |    |       |                                                                                       |
| 61                     |    |       |                                                                                       |
| 62                     |    |       |                                                                                       |
| 63                     |    |       |                                                                                       |
| 64                     |    |       |                                                                                       |
| 65                     |    |       |                                                                                       |
| 66                     |    |       |                                                                                       |

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## 1000 Hour Structural and Weld Inspection Report - L-2350

The following list provides detailed descriptions of the areas to be checked. See the pictures that follow for each item that shows the joint or area being described:

### Safety Preparations

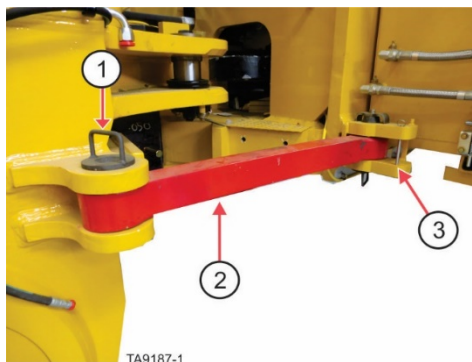
#### WARNING

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. 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, shock, or other hazards exist if personnel do not follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Always follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Failure to follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures can cause crush, shock, or other hazards resulting in severe injury or death.

- 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

#### 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
- e. Set the parking brakes.
- f. Discharging the KESS should be done before shutting the machine down by performing the following steps:



Operators Screen – KESS at 60%

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



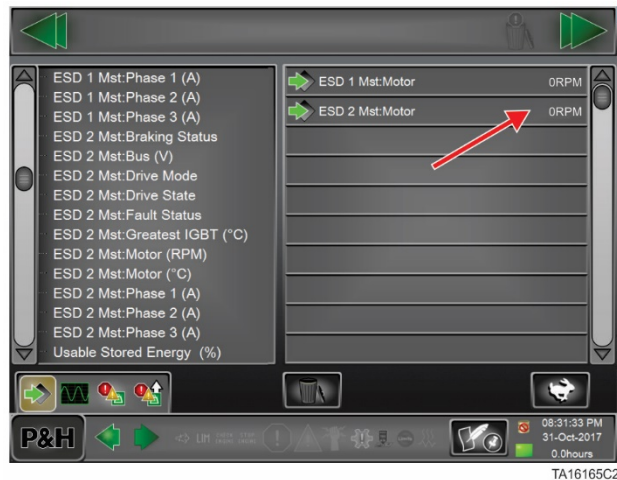
ESD Motor Channel Select

- n. Press the Drive Enable Switch



Drive Enable Switch

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



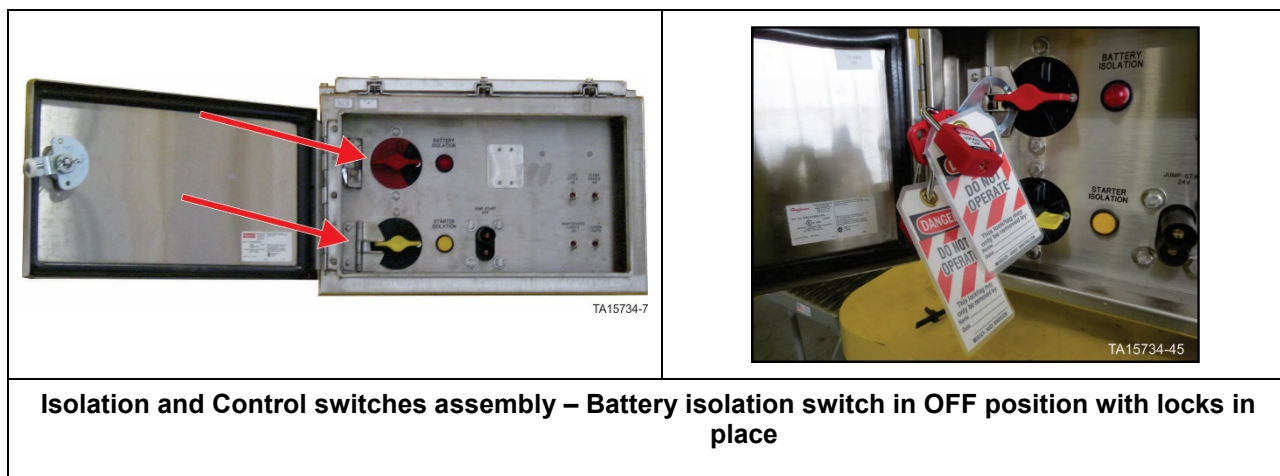
ESD Motor RPM

- p. Shut off the engine.

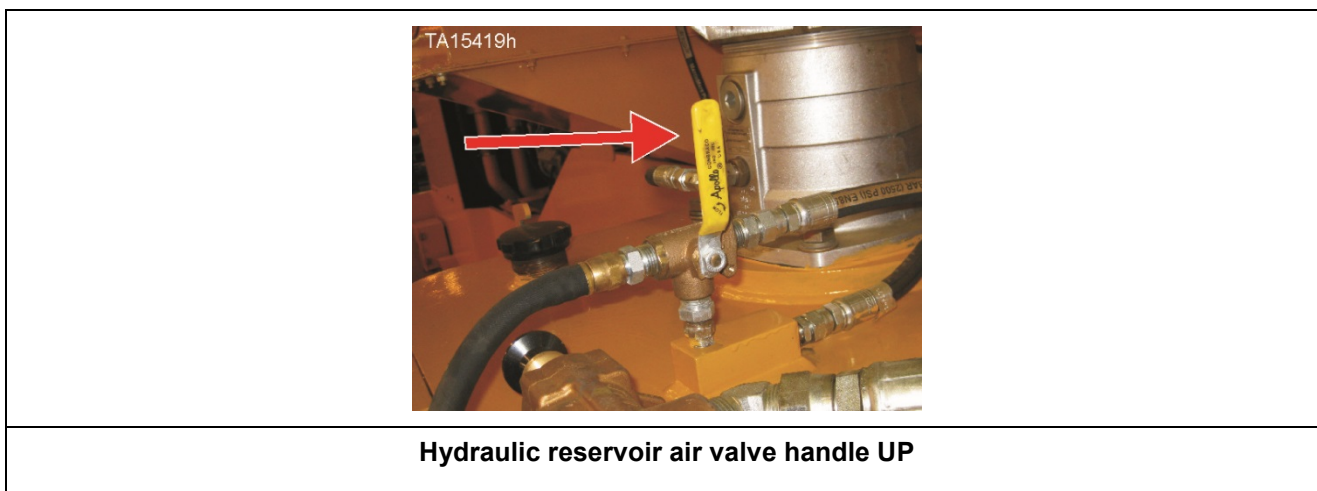
## ⚠ WARNING

**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.**

- q. 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.



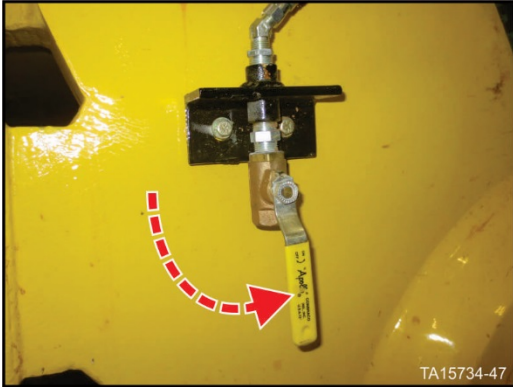
- r. Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.
- s. Turn the handle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



- t. 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

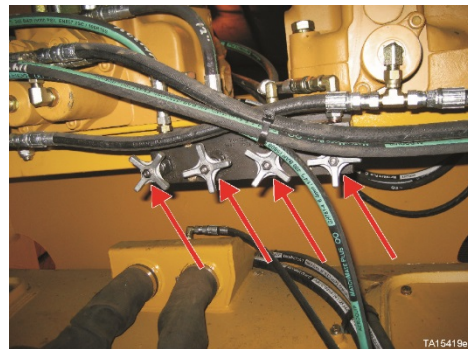
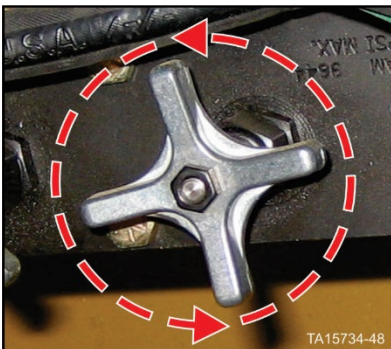


Open air reservoir bleed valves

## ⚠ 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.

- u. 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.



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

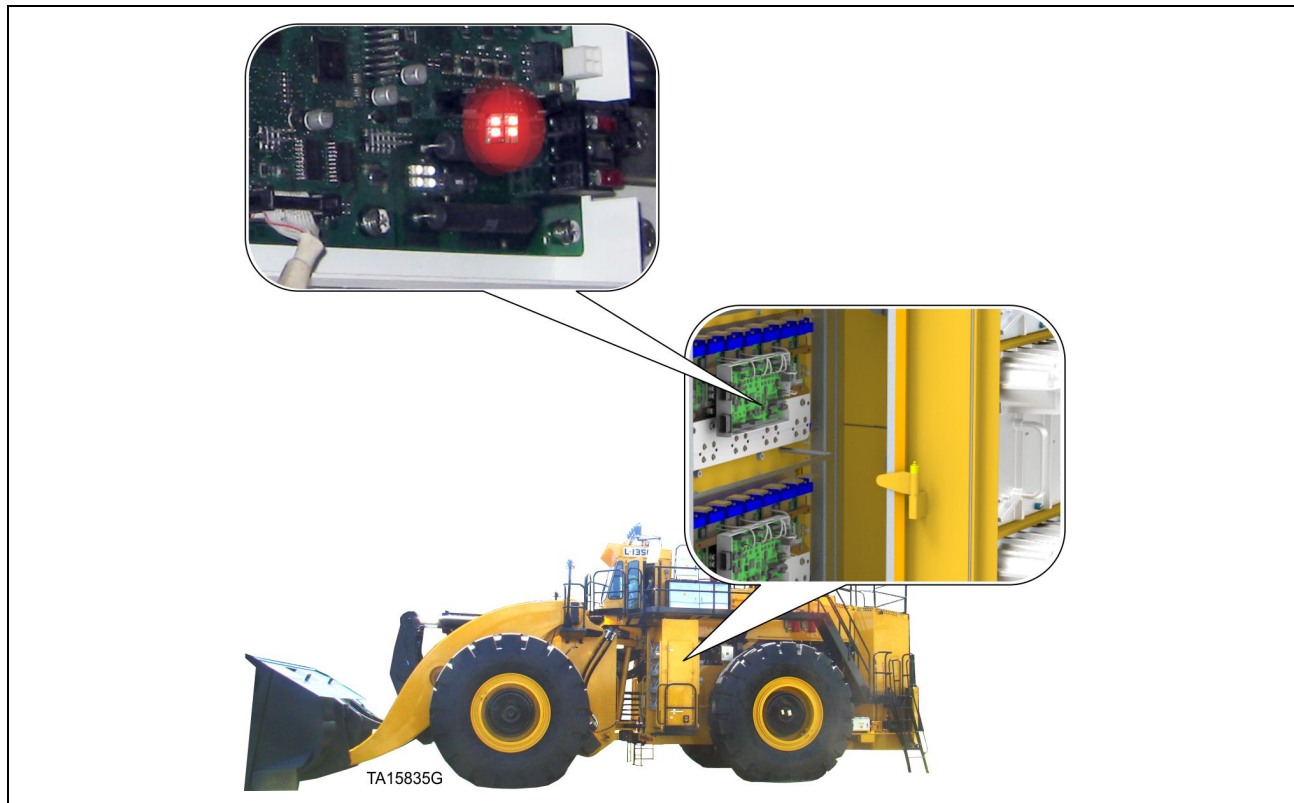
## Converter Bus Voltage



### WARNING



Risk of fatal shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINCOS 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.



**Converter assembly bus LED's**

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

1. LINCOS II display in cab
2. Visual indication in electrical cabinet
3. Physical measurement

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

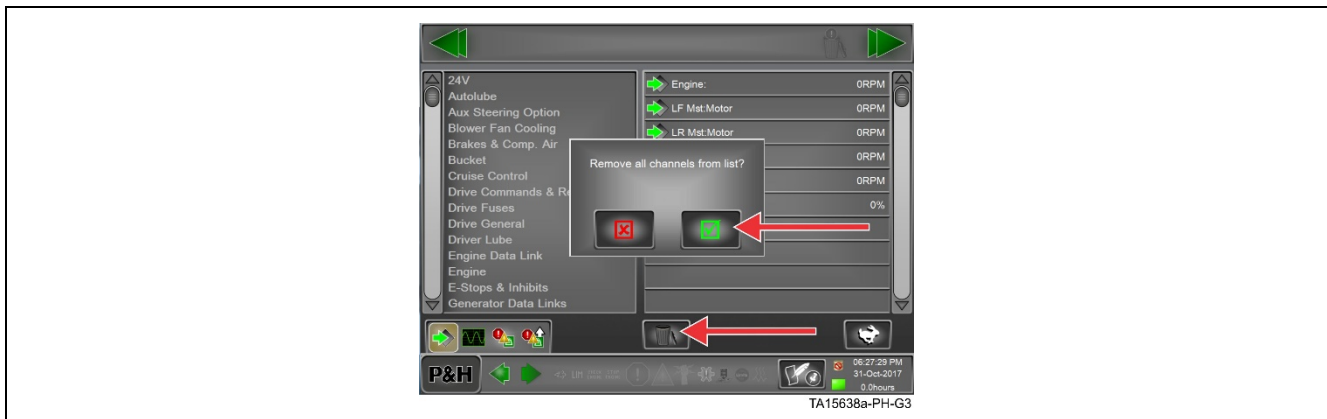
## In Cab Verification Using LINCS II Display

- Make sure that the LINCS II system is booted (key switch ON) with the engine NOT running and the park brake SET.
- 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.

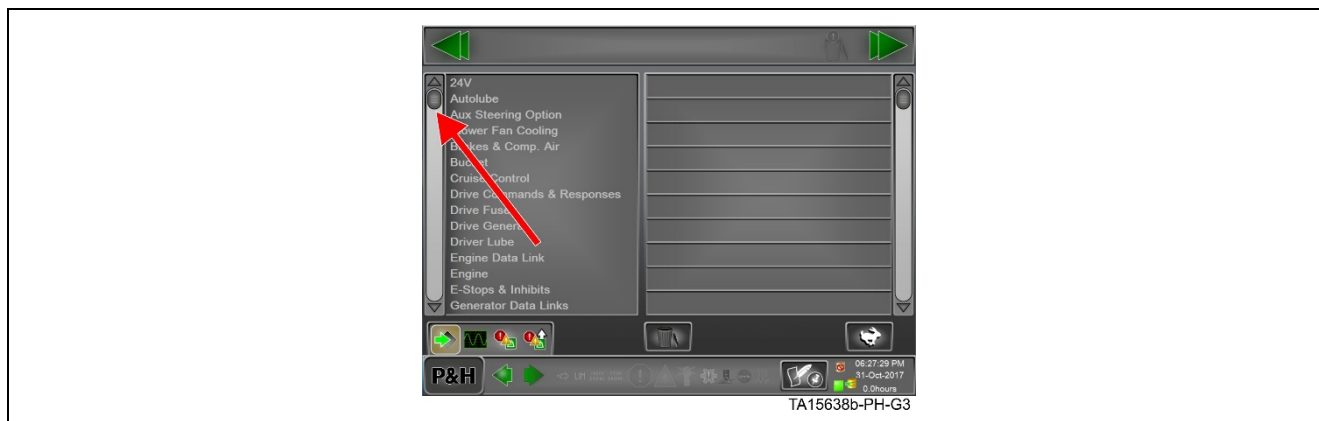


**LINCS logging/monitoring menu access**

- 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.



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.



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.**

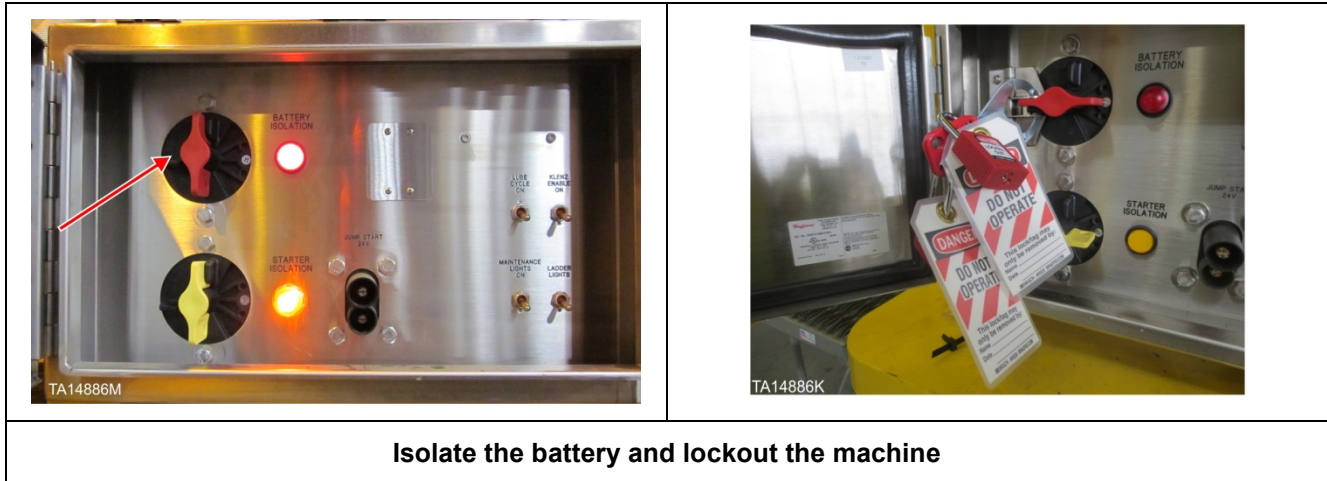
- g. Turn the key switch to the OFF position and proceed to the next step in the verification process.

## 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:

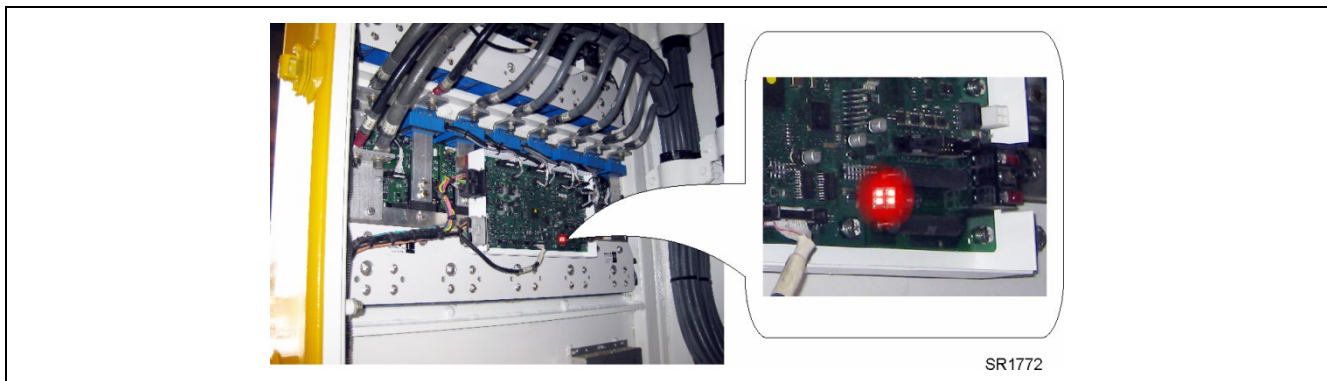
- The 24V DC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



**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.



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

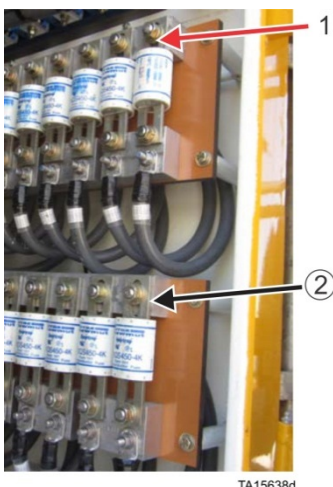
Once the visual indicators have been verified, the bus voltage should be physically measured. The bus voltage should be fully discharged based on the previous checks.

- 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 LINC 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

### Main bus bars

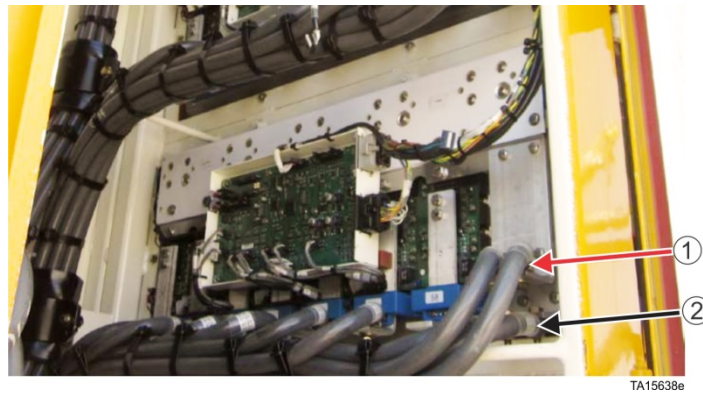
## Converter Assembly Bus Connections

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

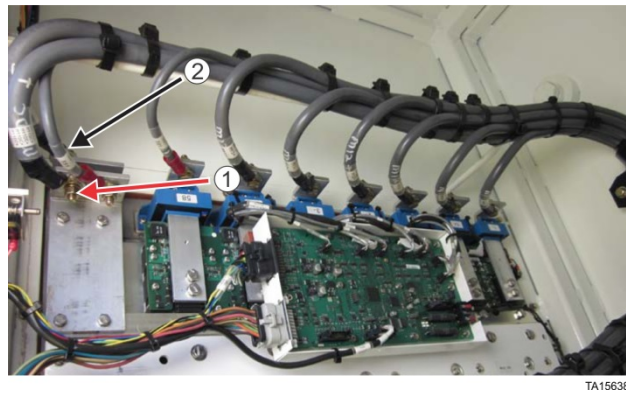
**The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.**

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

**Converter assembly bus connections (rear of cabinet)**



1) Positive bus bar, 2) Negative bus bar

**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.



## WARNING

Fall hazard exists when working at elevated locations. Take appropriate “fall arrest” safety precautions as required by local rules, regulations, and procedures when working at heights on the machine, as example, on the rear and front frames. Follow all required statutory regulations for working at height. Failure to follow all locally required “fall arrest” procedures can cause a fall hazard, resulting in serious injury or death.



## WARNING

Crush hazards exist when a load is suspended. Suspended loads can fall. Never work under suspended loads. Working under suspended loads could cause a crushing hazard which might result in serious injury or death.

## Inspection List L-2350

The following list provides detailed descriptions of the areas to be checked. See the pictures that follow for each item that shows the joint or area being described:

### L-2350 lift arm and bellcranks

1. Joint between the lift arm side plate and the spool piece.
  - a. Inspect the entire circumference of the weld joint on left side arm
    - i. Inside of left arm
    - ii. Outside of left arm
  - b. Inspect the entire circumference of the weld joint on right side arm
    - i. Inside of right arm
    - ii. Outside of right arm
2. Grease block and bolt blocks
  - a. Right arm
  - b. Left arm
3. Joint between the torque tube and the spool piece
  - a. Inspect weld on the left side (all around the torque tube)
    - i. Check weld outside the torque tube
    - ii. Check weld inside the torque tube
  - b. Inspect weld on the right side (all around the torque tube)
    - i. Check weld outside the torque tube
    - ii. Check weld inside the torque tube
4. Torque tube and bell crank support assembly
  - a. Inspect all surfaces for cracks.
  - b. Inspect transitions from bell crank support ears and torque tube
  - c. Inspect the stop pad mount area – front of stop pad mount and sides underneath stop pad
  - d. Inspect torque tube to see if there has been any bell crank contact
5. Joint between the bucket boss and lift arm plates
  - a. Inspect left arm - top, bottom and sides
  - b. Inspect right arm - bottom and sides
6. Joint between lift arm wrapper plate and side plates
  - a. Inspect top wrapper plate on left arm – welds on both inside and outside of wrapper plate – full length of arm
  - b. Inspect bottom wrapper plate on left arm – welds on both inside and outside of wrapper plate – full length of arm
    - i. Note any damage to bottom plate from contacting truck or rocks.
    - ii. Inspect the welds closely where the bottom wrapper plate transitions from outside of the side plates to between the side plates in the area of the hoist cylinder eye.
  - c. Inspect top wrapper plate on right arm – welds on both inside and outside of wrapper plate – full length of arm
  - d. Inspect bottom wrapper plate Right Hand arm – welds on both inside and outside of wrapper plate – full length of arm

- i. Note any damage to bottom plate from contacting truck or rocks.
  - ii. Inspect the welds closely where the bottom wrapper plate transitions from outside of the side plates to between the side plates in the area of the hoist cylinder eye.
- 7. Joint between lift arm ball socket and lift arm side and wrapper plates
  - a. Inspect left ball socket – top, bottom and both sides
  - b. Inspect right ball socket – top, bottom and both sides
- 8. Joint between side plate and bosses for hoist cylinder eye
  - a. Inspect left arm – outside plate
    - i. Inside boss
    - ii. Outside boss
  - b. Inspect left arm – inside plate
    - i. Inside boss
    - ii. Outside boss
  - c. Inspect right arm – outside plate
    - i. Inside boss
    - ii. Outside boss
  - d. Inspect right arm – inside plate
    - i. Inside boss
    - ii. Outside boss
- 9. Joint between bellcrank side plates and wrapper plate
  - a. LH bell crank - all welds
  - b. RH bell crank - all welds
- 10. Joint between bellcrank side plates and pivot bosses
  - a. LH bellcrank – both bosses
  - b. RH bellcrank – both bosses
- 11. Joint between bellcrank side plate and bosses. (Inspect carefully as typical crack initiation area is on the side of weld on the side toward the pivot pin – between the side plates.)
  - a. Left bellcrank. Bucket cylinder end – both bosses. Entire weld circumference
  - b. Left bellcrank. Level link end – both bosses. Entire weld circumference
  - c. Right bellcrank. Bucket cylinder end – both bosses. Entire weld circumference
  - d. Right bellcrank. Level link end – both bosses. Entire weld circumference
- 12. Bellcrank slabs near pivot pin and near the grease injector covers
  - a. Left bellcrank outside
  - b. Left bellcrank inside
  - c. Right bellcrank outside
  - d. Right bellcrank outside
  - e. Right bellcrank grease injector cover, bolt blocks and hose protector bars.
  - f. Left bellcrank grease injector cover, bolt blocks and hose protector bars.

**L-2350 - front frame - 1 of 4 – side view****13. Joint between rear bulkhead stiffener plate and castings**

- a. Left side
- b. Right side
- c. Top side
- d. Bottom side
- e. 4 corners

**14. Slab – inspect top and bottom.**

- a. Inspect top of slab near the front side of the weld for articulation ball.
- b. Inspect top of slab near the bulkhead plate
- c. Inspect bottom of slab near the bulkhead plate with door.

**15. Joint between top articulation ball and slab**

- a. Inspect the circumference of the weld with a focus on the front side
- b. Inspect neck of ball

**16. Joint of front frame side plate to hoist ball substructure side plate**

- a. Left side
  - i. Inside weld end to end
  - ii. Outside weld end to end
- b. Right side
  - i. Inside weld end to end
  - ii. Outside weld end to end

**17. Joint between bottom articulation ball and slab**

- a. Inspect the circumference of the weld with a focus on the front side
- b. Inspect neck of ball

**18. Slab – inspect top and bottom.**

- a. Inspect top of slab near the front side of the weld for articulation ball.
- b. Inspect top of slab near the bulkhead plate
- c. Inspect bottom of slab near the bulkhead plate with door.

**19. Joint between bottom plate and frame – check both top and bottom of plate**

- a. Weld plate to hoist ball tube
- b. Weld plate to Left Hand side plate
- c. Weld plate to Right Hand side plate

**20. Joint between bottom plate and frame – check both top and bottom of plate**

- a. Weld joint for plate to front axle

**21. Inside joint between side plate and upper cross member structure side plate**

- a. Inspect weld on left inside of frame from front to rear – top and bottom
- b. Inspect weld on right inside of frame from front to rear– top and bottom

**22. Inspect the bucket cylinder base casting joints**

- a. Inspect the left casting
- b. Inspect the left ears top and bottom where connected to frame
- c. Inspect the right casting
- d. Inspect the right ears top and bottom where connected to frame

**L-2350 - front frame - 2 of 4 – front view****23. Joint between front bulk head plate and the lift arm ball tube**

- a. Inspect the weld across the tube
- b. Inspect left corner
- c. Inspect left side where plate ties to the casting ear
- d. Inspect right corner
- e. Inspect right side where plate ties to the casting ear

**24. Access holes in front plate for bucket cylinder hoses**

- a. Inspect left hole – all 4 corners
- b. Inspect right hole – all 4 corners

**25. Front frame access hole in front plate**

- a. Inspect all 4 corners

**26. Joint between front plate, axle and side plate**

- a. Inspect upper and lower ends of the left cutout
- b. Inspect upper and lower ends of the right cutout

**27. Inspect front axle access hole**

- a. Inspect all bolt holes
- b. Inspect weld between access structure and axle
  - i. Inside
  - ii. Outside

**28. Joint of side plate to front axle**

- a. Inspect left side – inside and outside – focus on the front top
- b. Inspect right side – inside and outside – focus on the front top

**L2350 front frame – 3 of 4 – rear view****29. Joint between upper sub structure side plate slab and boss**

- a. Inspect circumference of the weld on left side plate
- b. Inspect circumference of the weld on right side plate

**30. Joint of lift arm ball to tube**

- a. Inspect the circumference of the weld on the left ball
- b. Inspect the circumference of the weld on the right ball

**31. Support tubes**

- a. Left top
- b. Left bottom
- c. Right top
- d. Right bottom

**32. Joints of rear bulkhead, top and bottom slabs and side plate - inspect all four corners**

- a. Corners of bulkhead plate
  - i. Top right corner
  - ii. Top left corner
  - iii. Bottom right corner
  - iv. Bottom left corner

**33. Joint of hoist cylinder ball to tube**

- a. Inspect the circumference of the weld on the left hoist ball
- b. Inspect the circumference of the weld on the right hoist ball

**34. Joint of hoist cylinder tube to frame side plate**

- a. Inspect the circumference of the weld on the left side plate
- b. Inspect the circumference of the weld on the right side plate

**35. Joints between bottom stiffener plate, hoist cylinder tube plate and bottom slab - inspect all four corners**

- a. Inspect left top corner hole
- b. Inspect left bottom corner hole
- c. Inspect right top corner hole
- d. Inspect right bottom corner hole

**36. Joint between stiffener plate and slab/tube/side slabs**

- a. Top right
- b. Top left
- c. Bottom right
- d. Bottom left

**37. Joint of side plate to front axle**

- a. Inspect left side – inside and outside – focus on the front top
- b. Inspect right side – inside and outside – focus on the front top

**L-2350 front frame – 4 of 4 – rear view****38. Joint of lifting eye to upper ball tube**

- a. Inspect left
- b. Inspect right

**39. Joint of frame side plate to the upper substructure side plate**

- a. Inspect left side
- b. Inspect right side

**40. Joint of bulkhead to side plate**

- a. Inspect left side – inside and outside
- b. Inspect right side – inside and outside
- c. Inspect top side – inside and outside
- d. Inspect bottom side – inside and outside

**41. Joint of steering cylinder pin bosses to lower slab**

- a. Inspect entire length of weld inside and outside
- b. Right Side
- c. Left Side

**42. Joint of lower articulation slab to the hoist cylinder tube side plates**

- a. Check left side
- b. Check right side

**43. Joint between axle roll up and driver bolt flange**

- a. Inspect complete circumference of left side
- b. Inspect complete circumference of right side

**L-2350 rear frame – side view****44. Check KLENZ™ box support angle or mount plate to frame**

- a. Left side
- b. Right side

**45. Check R.O.P.S. mount gussets to side plate**

- a. Left side
- b. Right side

**46. KLENZ™ box support mount where welded to frame**

- a. Left side
- b. Right side

**47. Frame area over the rear axle**

- a. Left side
  - i. Inspect the top edge of the side plate
  - ii. Inspect welds around any structural mounts
  - iii. Inspect welds around any bolt blocks or mounting structures
- b. Right side
  - i. Inspect the top edge of the side plate
  - ii. Inspect welds around any structural mounts
  - iii. Inspect welds around any bolt blocks or mounting structures

**48. Tow point (see Figure 7 also)**

- a. Inspect welds where tow bar is attached to bumper

**49. Radiator mount plate (see Figure 7 also)**

- a. Inspect where welded to left side plate

- b. Inspect weld to rear bumper
- c. Inspect where welded to right side plate

**50. Fuel reservoir mount**

- a. Inspect left side mount where welded to side plate
- b. Inspect right side mount where welded to side plate

**51. Catwalk/stairway mount plate**

- a. Inspect top and bottom weld where left catwalk plate attaches to side plate
- b. Inspect top and bottom weld where right catwalk plate attaches to the side plate

**52. Joint of rear axle articulation socket to rear axle cross member**

- a. Inspect circumference of weld
- b. Front
- c. Back

**53. Mount brackets on top of front axle cross member.**

- a. Inspect welds at edge
- b. Inspect welds on top
- c. Inspect welds around any bolt blocks mounted near the edges of the front axle cross member

**54. Joint of front axle articulation socket to front axle cross member**

- a. Inspect circumference of weld
- b. Front
- c. Back

**55. Joint where stiffener plate attaches to the front axle cross member**

- a. Inspect weld top and bottom from left to right and sides

**56. Check weld on catwalk support mount block (no weld around perimeter of block)**

- a. Top hole
- b. Bottom hole

**57. Steering cross member structure**

- a. Inspect top and bottom welds to left side plate
- b. Inspect top and bottom welds to right side plate
- c. Inspect welds on bottom to the stiffener plate
- d. Inspect welds on the steering cross member – top and bottom across the length – both front and rear sides

**58. Joint between steering support plate and side plate**

- a. Inspect top and bottom of left side weld
- b. Inspect top and bottom of right side weld

**59. Joint between steering support plate and bottom articulation slab**

- a. Inspect top and bottom of left side weld
- b. Inspect top and bottom of right side weld

**60. Joint of lower articulation socket to bottom slab**

- a. Inspect circumference of weld

**61. Holes in right side plate for hydraulic lines (behind hydraulic reservoir)**

- a. Inspect all four corners
- b. Upper holes for the lines going to filter

**61A Hole in left side plate for electrical cables (into electrical converter cabinet)**

- a. Inspect all four corners

**62. Joint of upper articulation socket to upper slab**

- a. Inspect circumference of weld

**L-2350 rear frame – top view****63. Articulation slab**

- a. Upper
  - i. All edges and corners
  - ii. All locations where brackets or bolt blocks have been welded near the edges
- b. Lower
  - i. All edges and corners
  - ii. All locations where brackets or bolt blocks have been welded near the edges

**64. Front axle cross member**

- a. Stiffener plate on side plate that is above the cross member.
  - i. Left side (top and bottom of stiffener plate)
  - ii. Right side (top and bottom of stiffener plate)
- b. Where steering side stiffener plate welds to front
- c. Where the stiffener plate above axle welds to top

**65. Slab on frame side plate over axle**

- a. Inspect left slab and welds
- b. Inspect right slab and welds

**66. Stiffener to side plate**

- a. Inspect welds top and bottom of the left stiffener plate
- b. Inspect welds top and bottom of the right stiffener plate

**67. Joint between side plate and transition wing plate**

- a. Inspect left side (inside and outside)
  - i. Focus on the top of the weld
  - ii. Brackets welded to the top of the transition wing plate
- b. Inspect right side (inside and outside)
  - i. Focus on the top of the weld
  - ii. Brackets welded to the top of the transition wing plate

**68. Bend in the transition wing plate**

- a. Top of left transition wing plate

- i. Welds on brackets or mounts close to the bend
- b. Top of right transition wing plate
  - i. Welds on brackets or mounts close to the bend

**69. Rear axle cross member**

- a. Stiffener plate on side plate that is above the cross member.
  - i. Left side (top and bottom of stiffener plate)
  - ii. Right side (top and bottom of stiffener plate)
- b. Welds where the stiffener plate above axle welds to top
- c. Welds between cross member and gussets
- d. All bolt blocks or brackets welded near the edges of the cross member.

**L-2350 rear axle**

**70. Joint between axle rollup and bolt flange**

- a. Inspect weld circumference of left side
- b. Inspect weld circumference of right side

**71. Top of axle over the pivots**

- a. Inspect the area between front ball and top of axle
- b. Inspect the area between the rear ball and top of axle
- c. Inspect any through pieces

**72. Joint between the wire inlet cover and the axle**

- a. Sides
- b. Front
- c. Rear
- d. Check the axle cutout under this cover – from inside the axle

**73. Joint between ball and transition plate**

- a. Inspect circumference of weld between front ball base and the transition casting
- b. Inspect circumference of weld between rear ball base and the transition casting

**74. Joint between transition plate and axle roll up**

- a. Inspect circumference of weld between the front transition casting and the axle
- b. Inspect circumference of weld between the rear transition casting and the axle

**75. Air outlets.**

- a. Inspect weld on all four sides of cover (four covers)-including corners.
  - Right rear
  - Right front
  - Left Rear
  - Left front

**76. Bottom of axle**

- a. Inspect inside and outside of axle between the front and rear weldments

**77. Inspect the access hole**

- a. Inspect the bolt holes

- b. Inspect the circumference of the external weld
- c. Inspect the circumference of the internal weld
- d. Inspect all 4 corners.

78. Inspect air inlet tube connection hole.

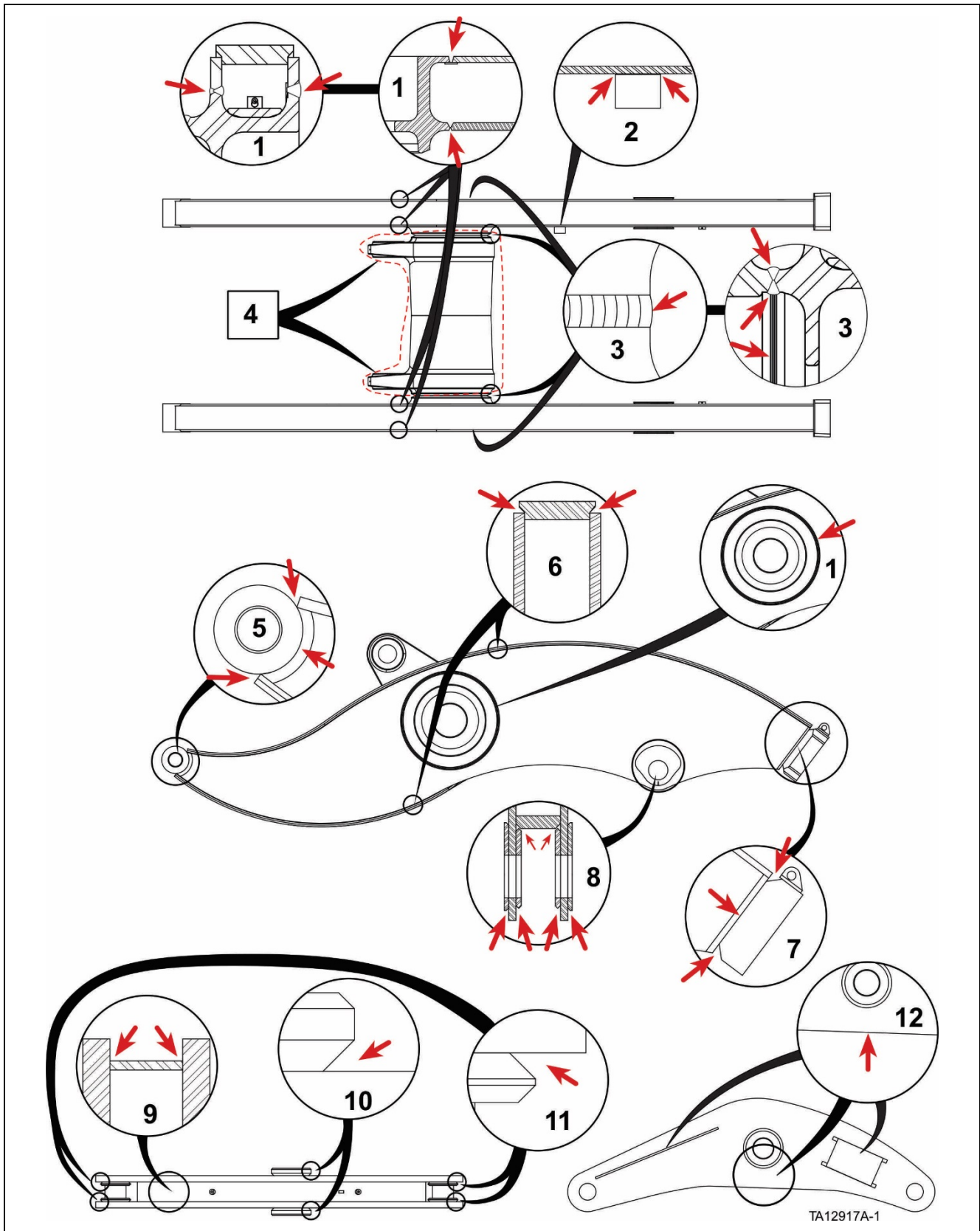


Figure 38. L-2350-lift arms and bellcranks

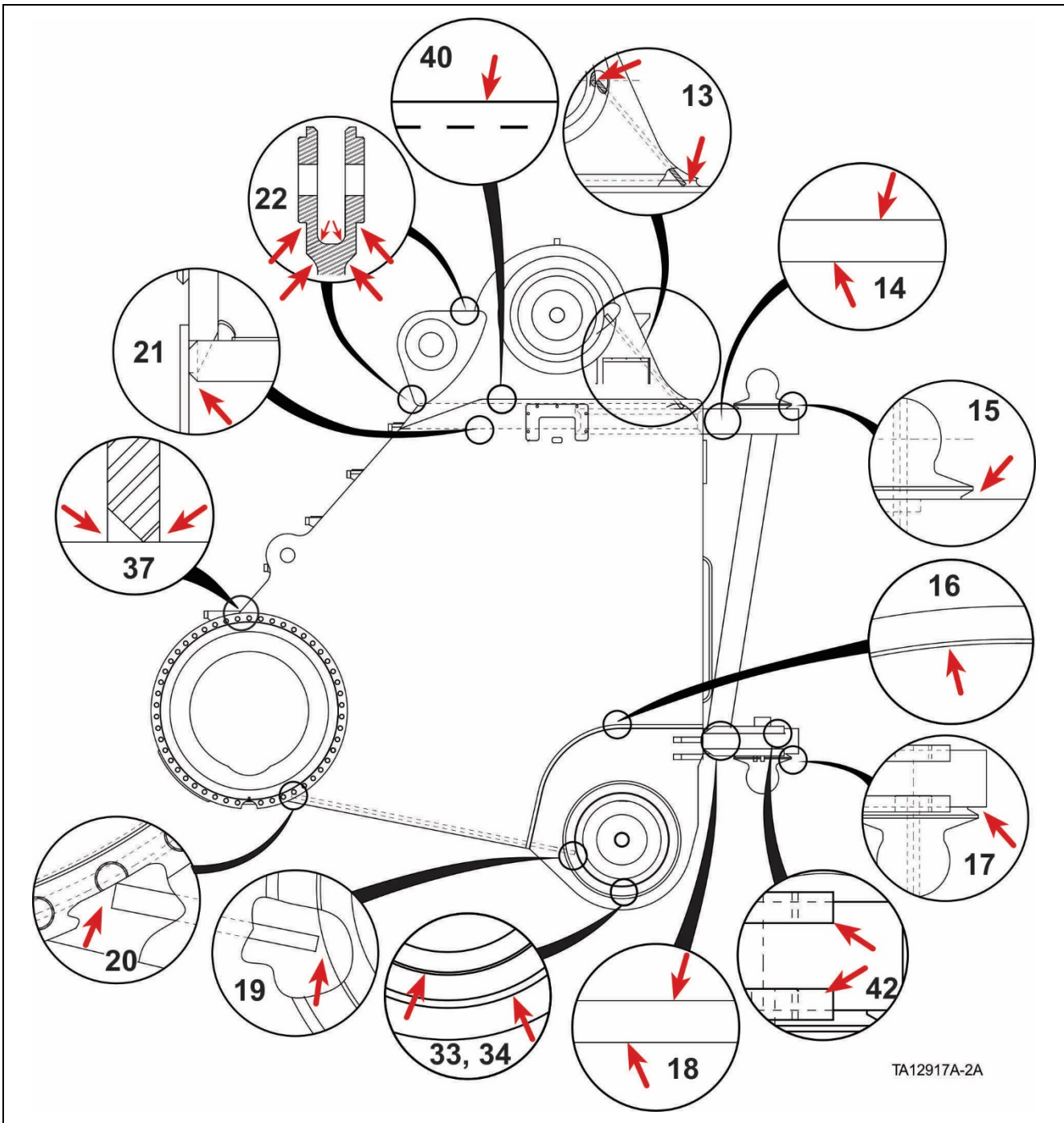


Figure 39. L-2350-front frame – 1 of 4 – side view

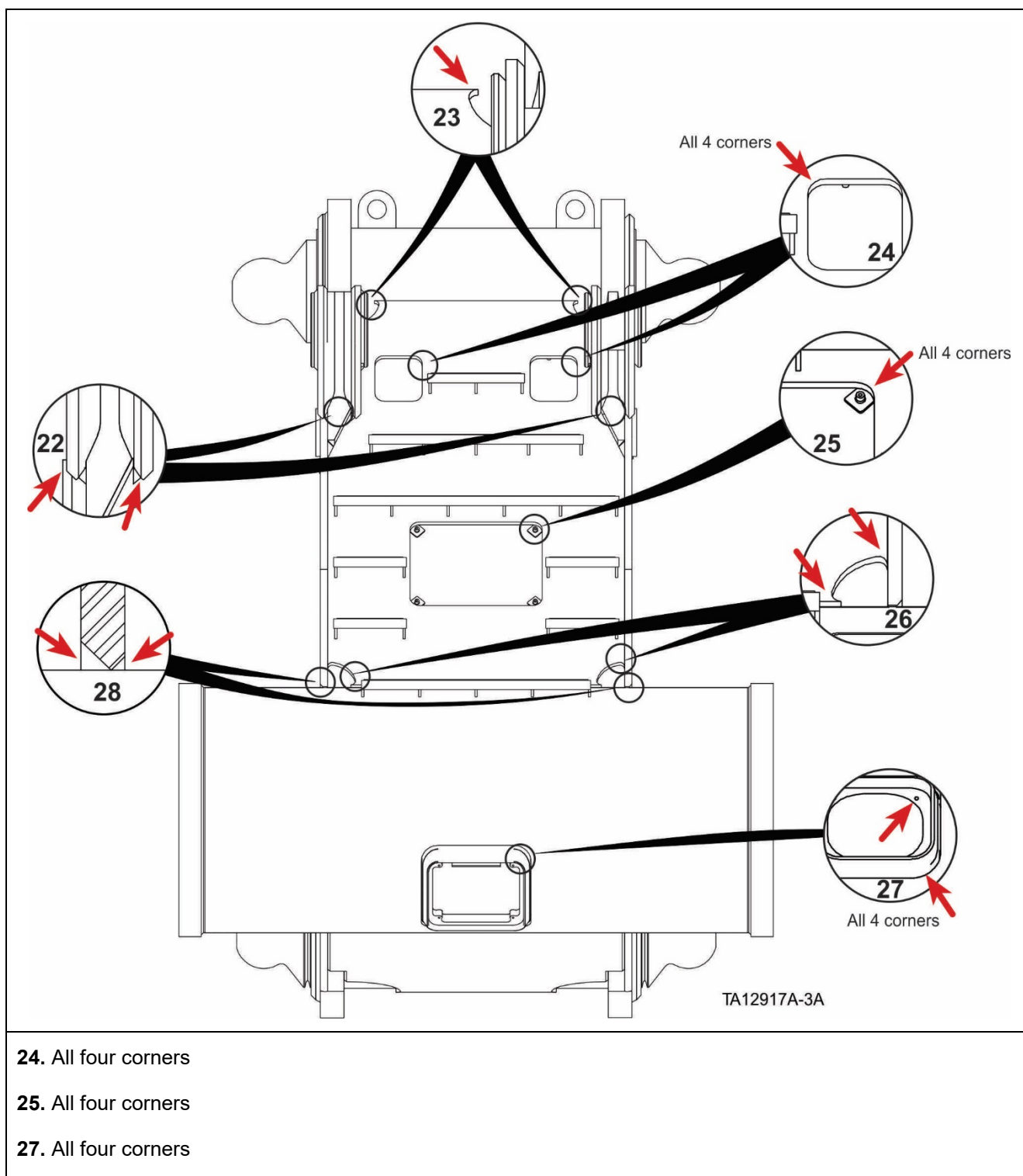


**Figure 40. L-2350-front frame – 2 of 4 – front view**

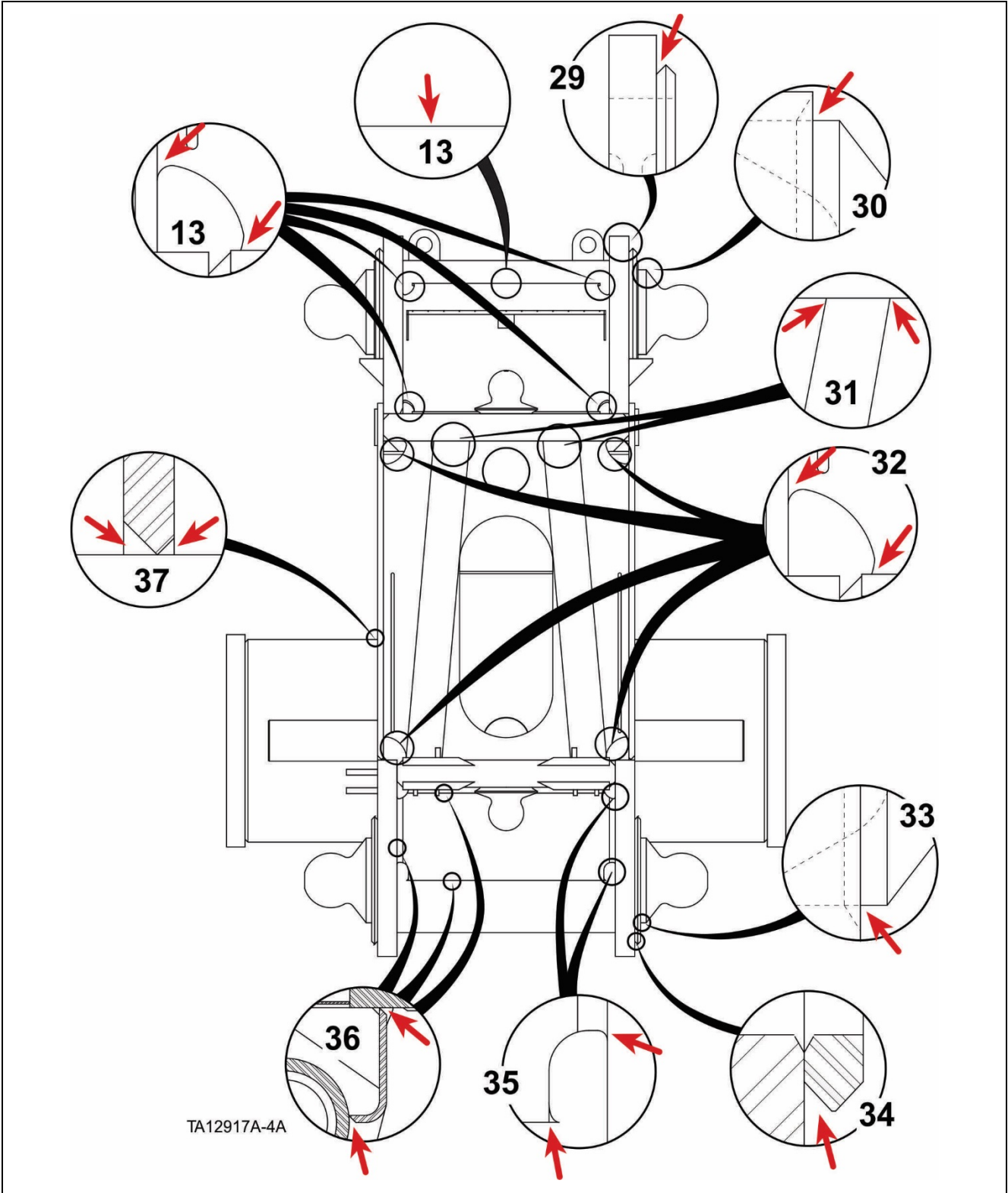


Figure 41. L-2350-front frame – 3 of 4 – rear view

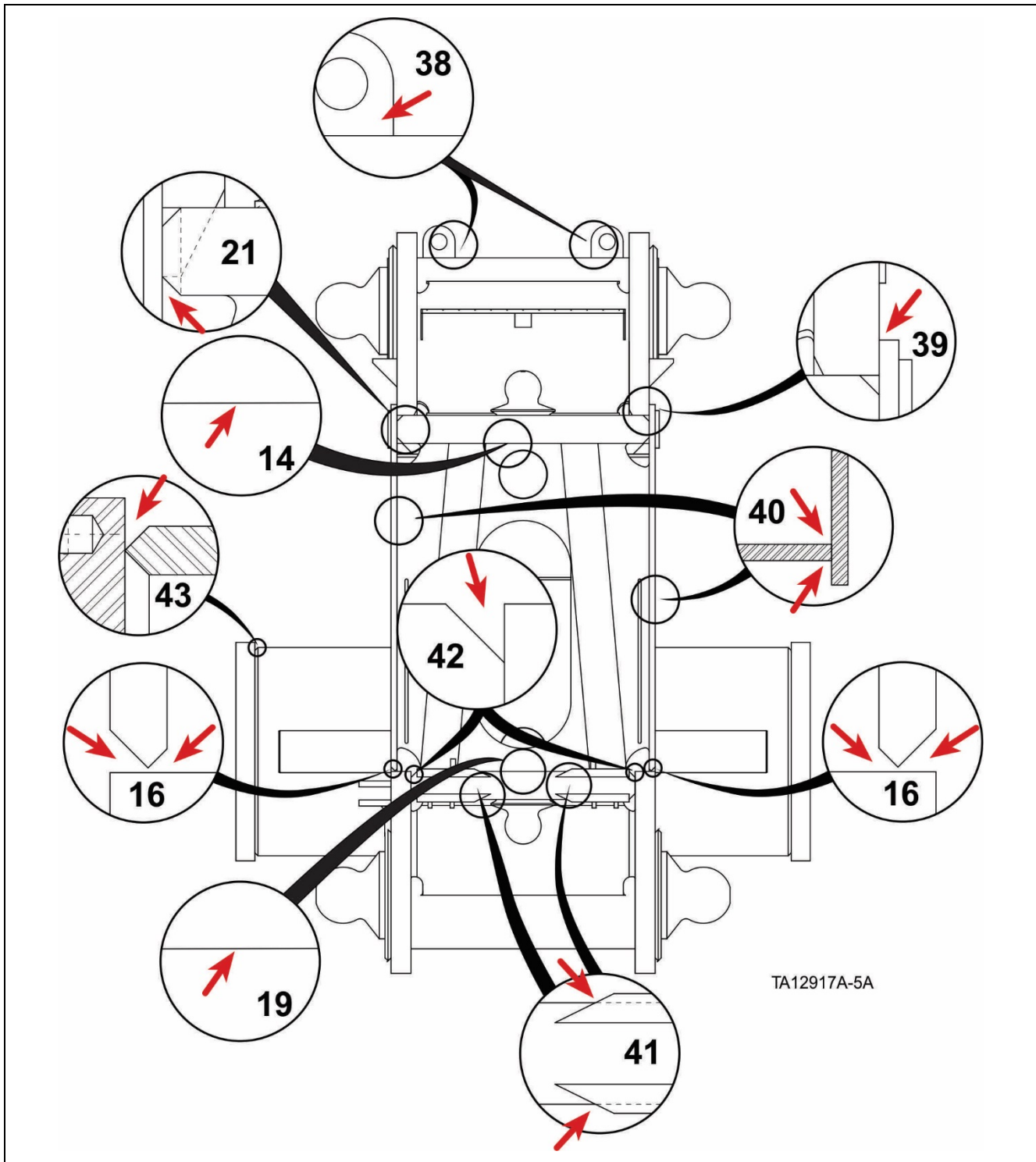


Figure 42. L-2350-front frame – 4of 4 – rear view

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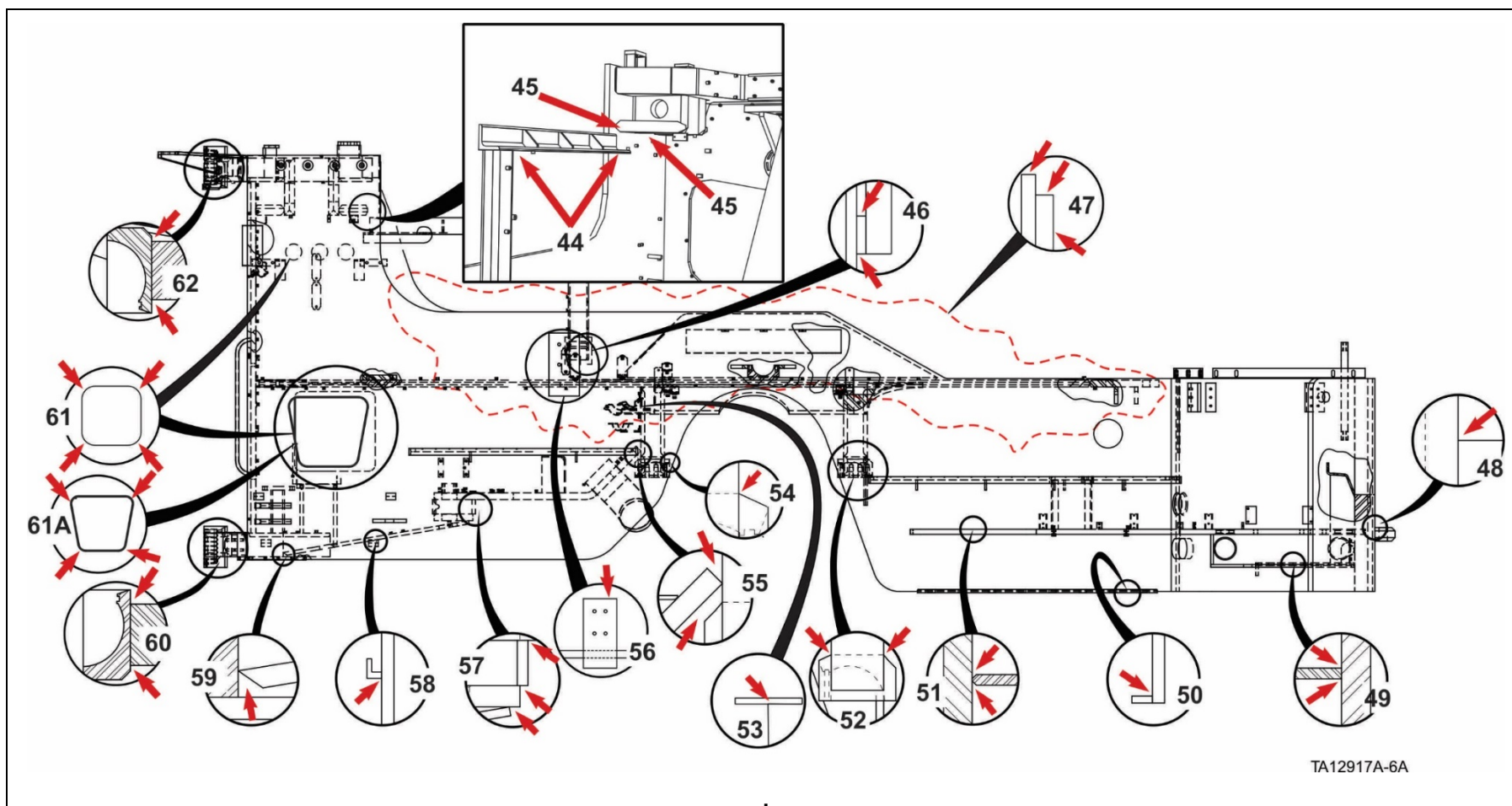


Figure 43. L-2350-rear frame – side view

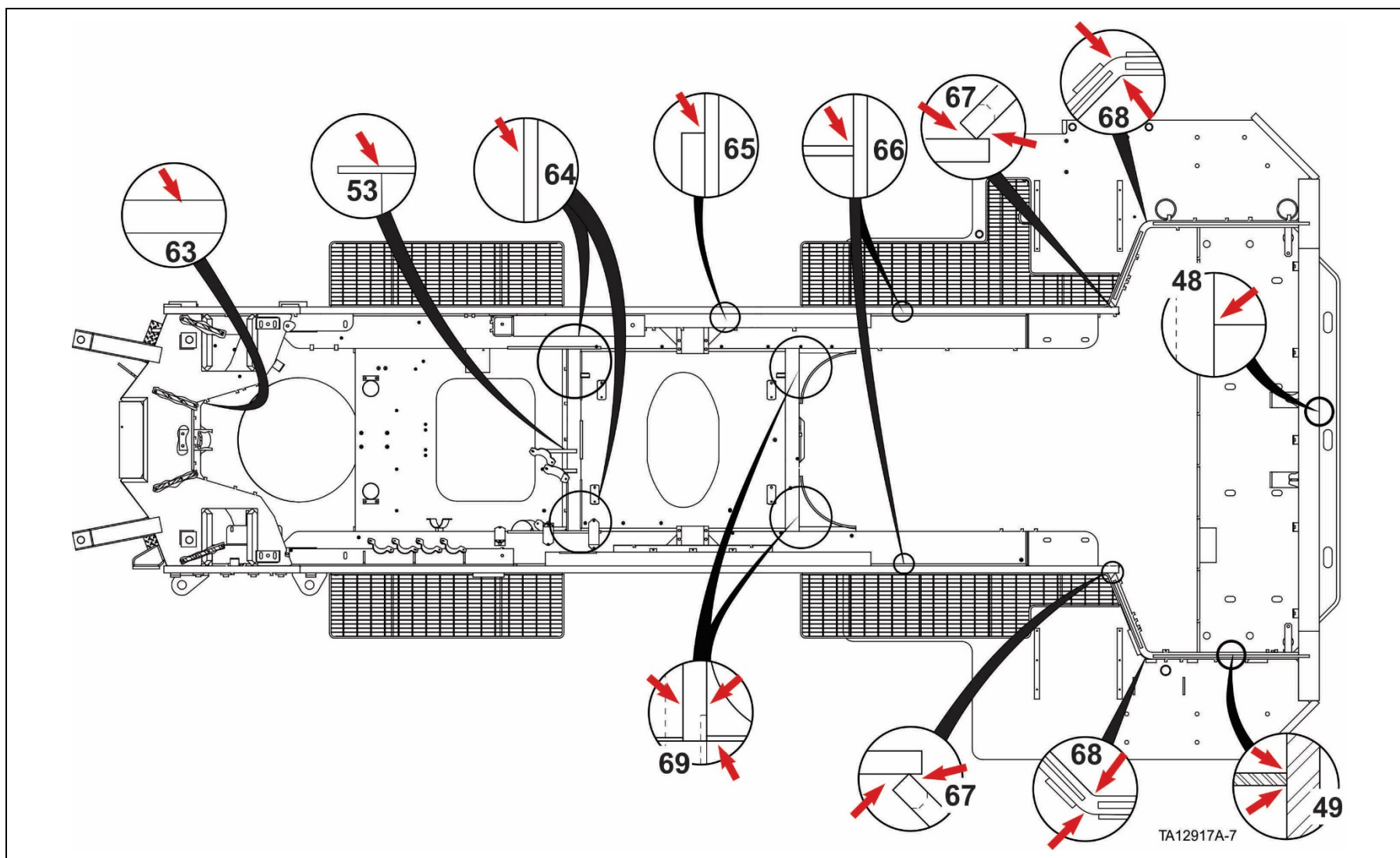
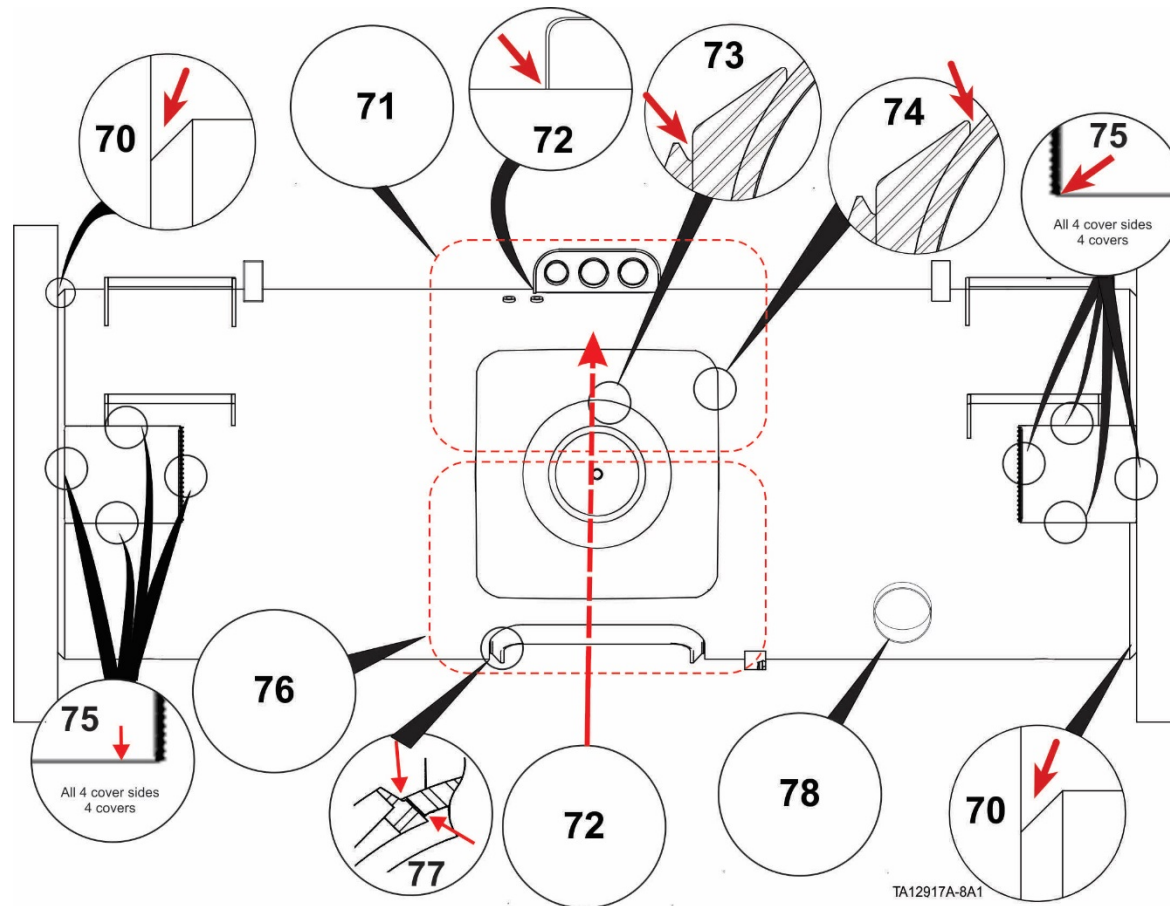


Figure 44. L-2350-rear frame – top view



**71.** Inspect area inside and outside of housing from front and back ball weldments to top of axle for surface cracks

**72.** Check the axle cutout under this cover – from inside the axle-through access hole (especially 4 corners).

**75.** Welds on all four sides of cover, including corners (4 covers).

**77.** Welds on all four sides of access hole, including corners.

**76.** Inspect area inside and outside of housing from front and back ball weldments to bottom of axle for surface cracks

**Figure 45. L-2350 rear axle**

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## L-2350 Structural and Weld Inspection Log Sheet

|                      |                            |
|----------------------|----------------------------|
| <b>Model No.:</b>    | <b>Serial No.:</b>         |
| <b>Location:</b>     | <b>Customer Name:</b>      |
| <b>Inspected By:</b> | <b>Hour meter Reading:</b> |
|                      | <b>Date:</b>               |

### NOTICE

Inspection locations listed in the table below are typical - inspect end to end, left/right, top/bottom and inside/outside of the welds.

| Component/<br>Location                      | Ok | Crack | Description of Crack Locations, Note Left/Right<br>and Front/Back of Component |
|---------------------------------------------|----|-------|--------------------------------------------------------------------------------|
| <b>Lift Arms and<br/>Bell Cranks</b>        |    |       |                                                                                |
| 1                                           |    |       |                                                                                |
| 2                                           |    |       |                                                                                |
| 3                                           |    |       |                                                                                |
| 4                                           |    |       |                                                                                |
| 5                                           |    |       |                                                                                |
| 6                                           |    |       |                                                                                |
| 7                                           |    |       |                                                                                |
| 8                                           |    |       |                                                                                |
| 9                                           |    |       |                                                                                |
| 10                                          |    |       |                                                                                |
| 11                                          |    |       |                                                                                |
| 12                                          |    |       |                                                                                |
| <b>Front Frame<br/>1 of 4<br/>Side View</b> |    |       |                                                                                |

| Component/<br>Location                      | Ok | Crack | Description of Crack Locations, Note Left/Right<br>and Front/Back of Component |
|---------------------------------------------|----|-------|--------------------------------------------------------------------------------|
| 13                                          |    |       |                                                                                |
| 14                                          |    |       |                                                                                |
| 15                                          |    |       |                                                                                |
| 16                                          |    |       |                                                                                |
| 17                                          |    |       |                                                                                |
| 18                                          |    |       |                                                                                |
| 19                                          |    |       |                                                                                |
| 20                                          |    |       |                                                                                |
| 21                                          |    |       |                                                                                |
| 22                                          |    |       |                                                                                |
| <b>Front Frame<br/>2 of 4<br/>Rear View</b> |    |       |                                                                                |
| 23                                          |    |       |                                                                                |
| 24                                          |    |       |                                                                                |
| 25                                          |    |       |                                                                                |
| 26                                          |    |       |                                                                                |
| 27 (If Present)                             |    |       |                                                                                |
| 28                                          |    |       |                                                                                |
| <b>Front Frame<br/>3 of 4<br/>Rear View</b> |    |       |                                                                                |
| 29                                          |    |       |                                                                                |
| 30                                          |    |       |                                                                                |
| 31                                          |    |       |                                                                                |
| 32                                          |    |       |                                                                                |
| 33                                          |    |       |                                                                                |
| 34                                          |    |       |                                                                                |
| 35                                          |    |       |                                                                                |
| 36                                          |    |       |                                                                                |

| Component/<br>Location                      | Ok | Crack | Description of Crack Locations, Note Left/Right<br>and Front/Back of Component |
|---------------------------------------------|----|-------|--------------------------------------------------------------------------------|
| 37                                          |    |       |                                                                                |
| <b>Front Frame<br/>4 of 4<br/>Rear View</b> |    |       |                                                                                |
| 38                                          |    |       |                                                                                |
| 39                                          |    |       |                                                                                |
| 40                                          |    |       |                                                                                |
| 41                                          |    |       |                                                                                |
| 42                                          |    |       |                                                                                |
| 43                                          |    |       |                                                                                |
| <b>Rear Frame<br/>Side View</b>             |    |       |                                                                                |
| 44                                          |    |       |                                                                                |
| 45                                          |    |       |                                                                                |
| 46                                          |    |       |                                                                                |
| 47                                          |    |       |                                                                                |
| 48                                          |    |       |                                                                                |
| 49                                          |    |       |                                                                                |
| 50                                          |    |       |                                                                                |
| 52                                          |    |       |                                                                                |
| 53                                          |    |       |                                                                                |
| 54                                          |    |       |                                                                                |
| 55                                          |    |       |                                                                                |
| 56                                          |    |       |                                                                                |
| 57                                          |    |       |                                                                                |
| 58                                          |    |       |                                                                                |
| 59                                          |    |       |                                                                                |
| 60                                          |    |       |                                                                                |
| 61                                          |    |       |                                                                                |

| Component/<br>Location         | Ok | Crack | Description of Crack Locations, Note Left/Right<br>and Front/Back of Component |
|--------------------------------|----|-------|--------------------------------------------------------------------------------|
| 61A                            |    |       |                                                                                |
| 62                             |    |       |                                                                                |
| <b>Rear Frame<br/>Top View</b> |    |       |                                                                                |
| 63                             |    |       |                                                                                |
| 64                             |    |       |                                                                                |
| 65                             |    |       |                                                                                |
| 66                             |    |       |                                                                                |
| 67                             |    |       |                                                                                |
| 68                             |    |       |                                                                                |
| 69                             |    |       |                                                                                |
| <b>Rear Axle</b>               |    |       |                                                                                |
| 70                             |    |       |                                                                                |
| 71                             |    |       |                                                                                |
| 72                             |    |       |                                                                                |
| 73                             |    |       |                                                                                |
| 74                             |    |       |                                                                                |
| 75                             |    |       |                                                                                |
| 76                             |    |       |                                                                                |
| 77                             |    |       |                                                                                |
| 78                             |    |       |                                                                                |

# 1500 Hour Non-Operational Inspections and Service

## Safety Preparations

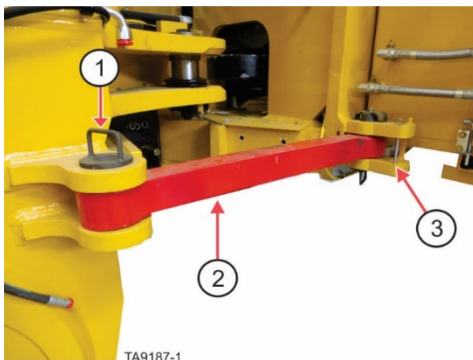
### WARNING

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. 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, shock, or other hazards exist if personnel do not follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Always follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Failure to follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures can cause crush, shock, or other hazards resulting in severe injury or death.

- 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 unlocked position

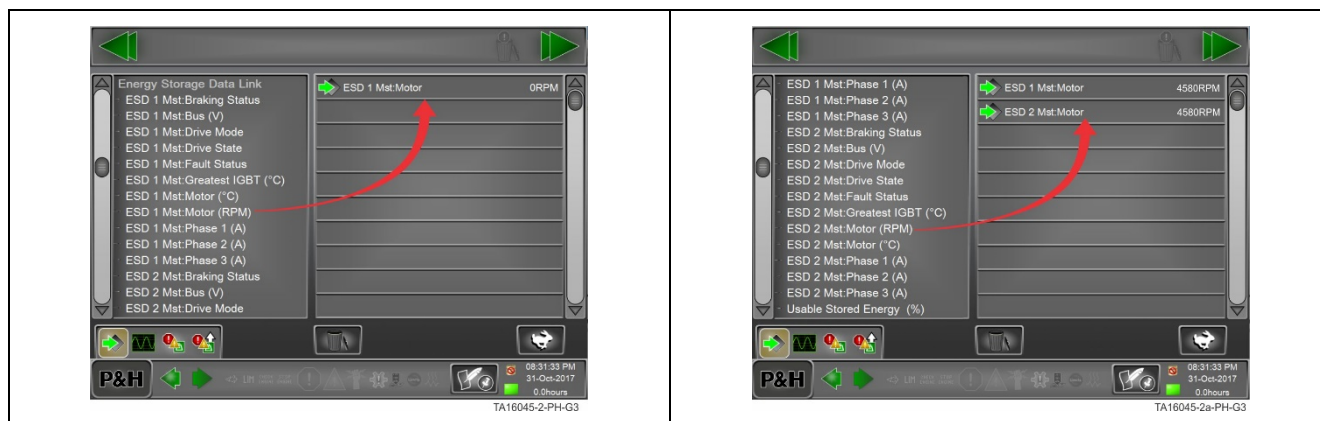
#### Frame Lock

- 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
- e. Set the parking brakes.
- f. Discharging the KESS should be done before shutting the machine down by performing the following steps:



Operators Screen – KESS at 60%

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



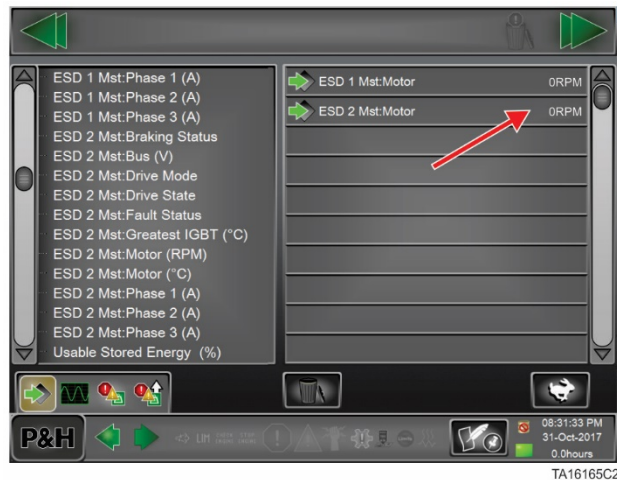
ESD Motor Channel Select

- n. Press the Drive Enable Switch



Drive Enable Switch

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



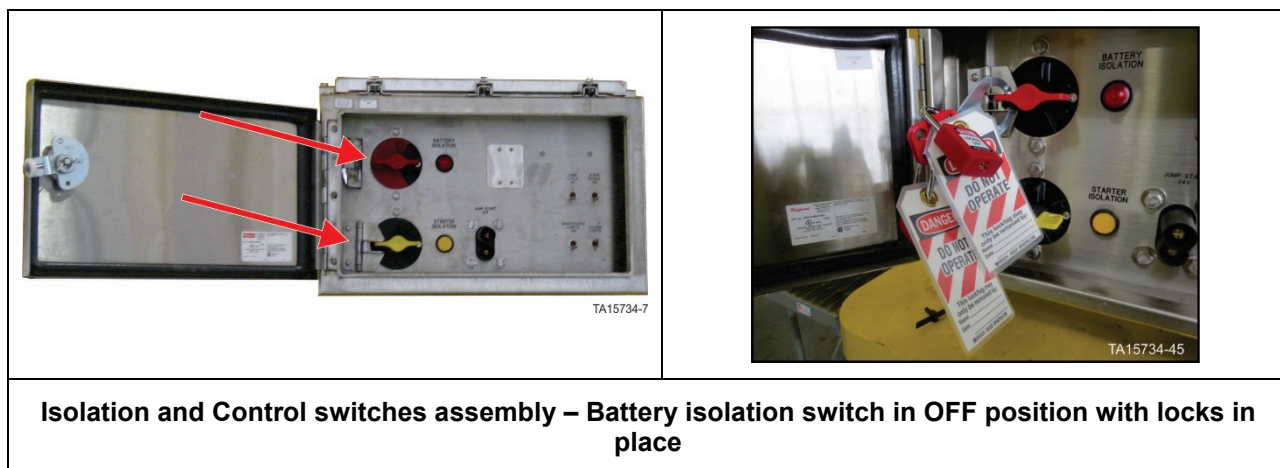
ESD Motor RPM

- p. Shut off the engine.

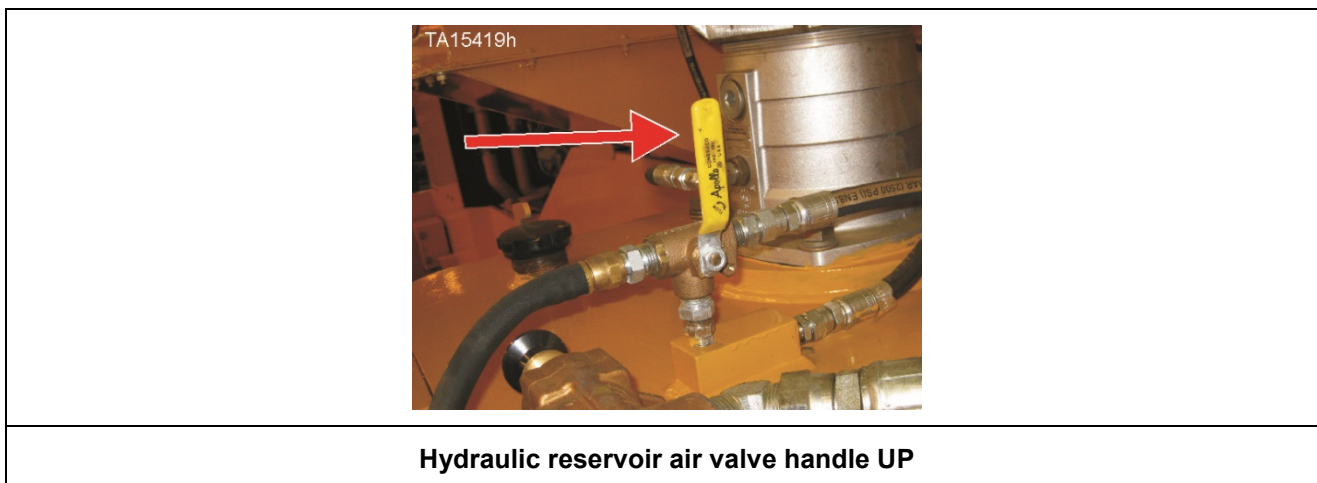
## ⚠ WARNING

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.

- q. 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.



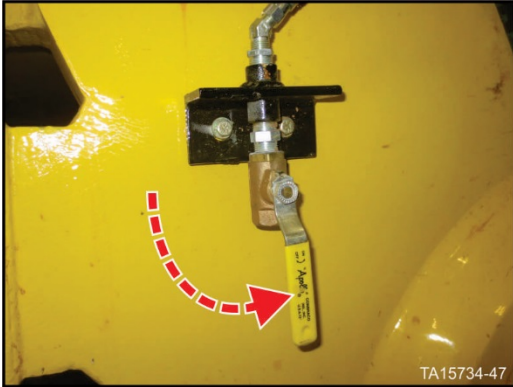
- r. Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.
- s. Turn the handle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



- t. 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



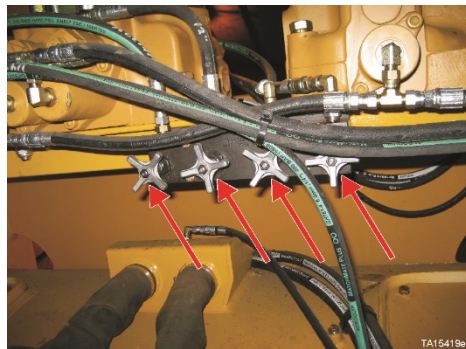
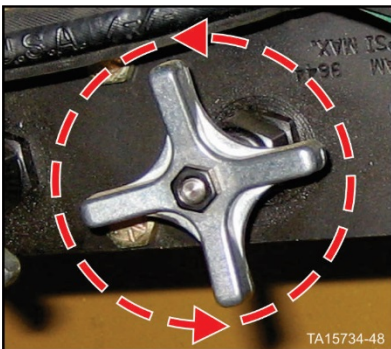
Open air reservoir bleed valves



## 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.

- u. 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.



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

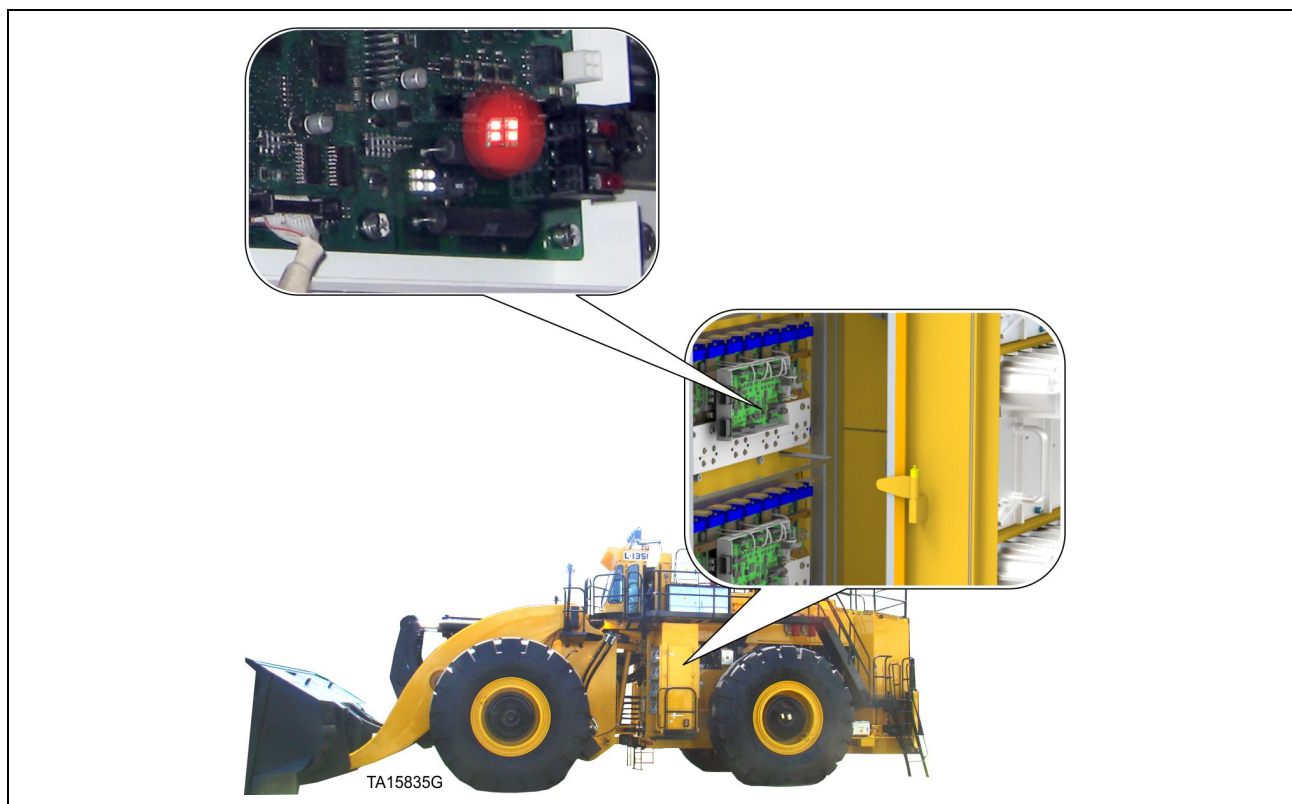
## Converter Bus Voltage



### WARNING



Risk of fatal shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINCOS 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.



**Converter assembly bus LED's**

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

1. LINCOS II display in cab
2. Visual indication in electrical cabinet
3. Physical measurement

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

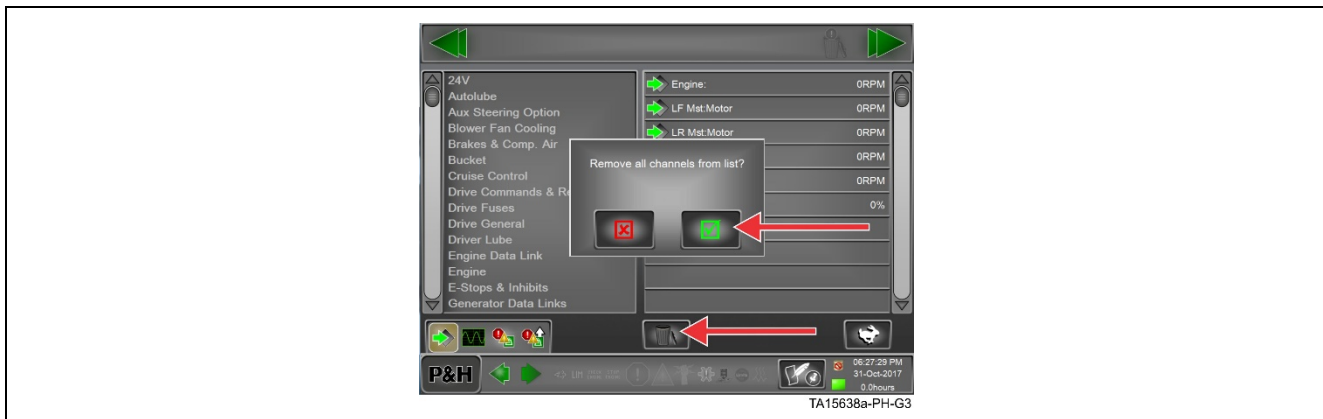
## In Cab Verification Using LINCS II Display

- Make sure that the LINCS II system is booted (key switch ON) with the engine NOT running and the park brake SET.
- 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.



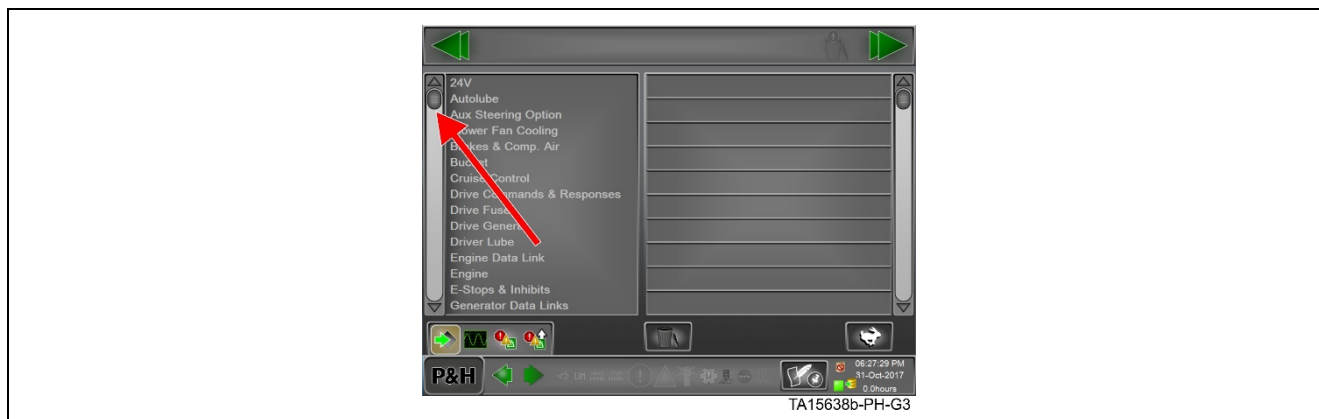
LINCS logging/monitoring menu access

- 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).



Remove channels

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



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.



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.**

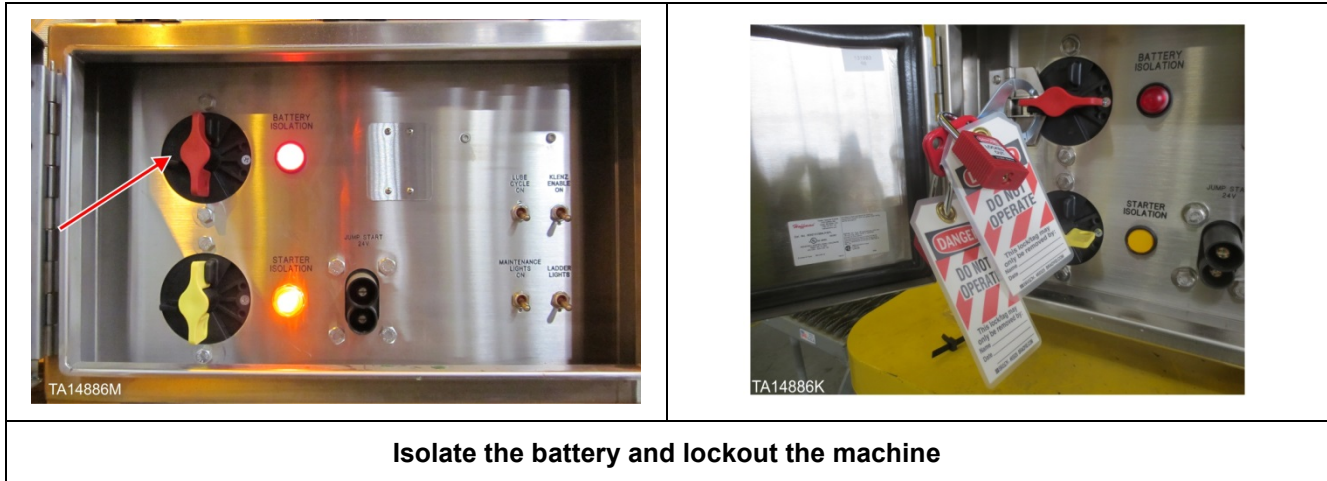
- g. Turn the key switch to the OFF position and proceed to the next step in the verification process.

## 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:

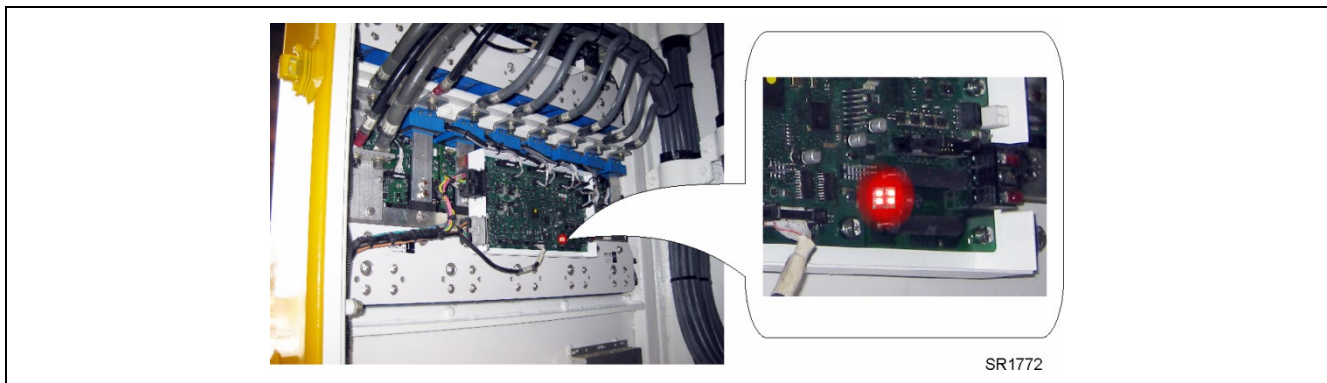
- The 24V DC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



**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.



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

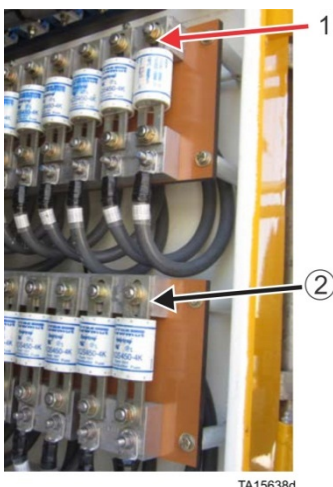
Once the visual indicators have been verified, the bus voltage should be physically measured. The bus voltage should be fully discharged based on the previous checks.

- 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 LINC 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

**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

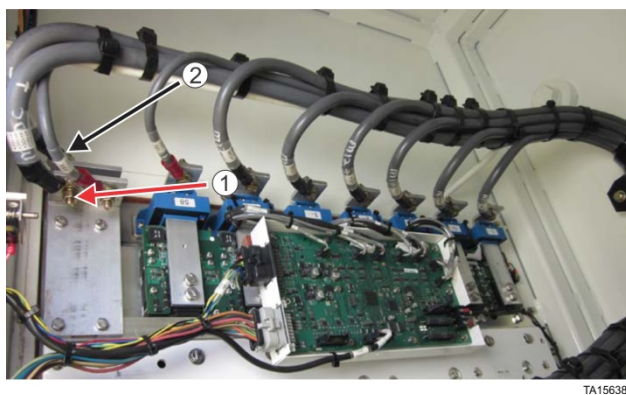
**The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.**

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

**Converter assembly bus connections (rear of cabinet)**



1) Positive bus bar, 2) Negative bus bar

**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.

**WARNING**

Fall hazard exists when working at elevated locations. Take appropriate “fall arrest” safety precautions as required by local rules, regulations, and procedures when working at heights on the machine, as example, on the rear and front frames. Follow all required statutory regulations for working at height. Failure to follow all locally required “fall arrest” procedures can cause a fall hazard, resulting in serious injury or death.

**WARNING**

Crush hazards exist when a load is suspended. Suspended loads can fall. Never work under suspended loads. Working under suspended loads could cause a crushing hazard which might result in serious injury or death.

|                                                                                                                                                                     |                                                                                                      | Checked | Service Required |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------|------------------|
| <b>1. Hydraulic Filter Replacement</b>                                                                                                                              |                                                                                                      |         |                  |
| <b>a.</b>                                                                                                                                                           | Case drain filter L-1350/L-1850/L-2350 (2)                                                           |         |                  |
| <b>b.</b>                                                                                                                                                           | Return filters – L-1350/L-1850 (2); L-2350 (3)                                                       |         |                  |
| <div style="background-color: #0056b3; color: white; text-align: center; padding: 10px;"><b>NOTICE</b></div> <p><b>Bleed hydraulic pumps prior to start-up.</b></p> |                                                                                                      |         |                  |
| <b>2. Driver Filtration Filter Change</b>                                                                                                                           |                                                                                                      |         |                  |
| <b>a.</b>                                                                                                                                                           | Clean driver filtration system strainers and replace filter element – 4 (each)                       |         |                  |
| <b>b.</b>                                                                                                                                                           | Replace driver filtration system cartridge filters – 4 (each)                                        |         |                  |
| <b>3. Drain and Refill Planetary Drive (if required by cleanliness target)</b>                                                                                      |                                                                                                      |         |                  |
| <b>4. HPD Gearbox</b>                                                                                                                                               |                                                                                                      |         |                  |
| <b>a.</b>                                                                                                                                                           | Replace gearbox oil (if required by cleanliness target)                                              |         |                  |
| <b>b.</b>                                                                                                                                                           | Replace gearbox filter - (1)                                                                         |         |                  |
| <b>c.</b>                                                                                                                                                           | Replace gearbox breather filter - (1)                                                                |         |                  |
| <b>d.</b>                                                                                                                                                           | Clean gearbox breather strainer (located between gearbox and breather filter) - (1) (see NOTE below) |         |                  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                             |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|--|--|
| 5.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Air Compressor Strainer</b>              |  |  |
| a.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Clean strainer every 3000 hours – See NOTE: |  |  |
| <div data-bbox="168 239 1451 321"><b>NOTICE</b></div> <ul style="list-style-type: none"><li data-bbox="215 331 1458 401">• The gearbox breather strainer should be cleaned at 3000 hour intervals. It can be performed on the 1500 hour schedule on a rotating basis (every other 1500 hour cycle).</li><li data-bbox="215 426 1458 520">• L-1350/L-1850/L-2350: The gearbox and air compressor strainer should be cleaned at 3000 hour intervals. It can be performed on the 1500 hour schedule on a rotating basis (every other 1500 hour cycle).</li></ul> |                                             |  |  |

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## 2000 Hour Operational Inspections and Service

### 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. 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.

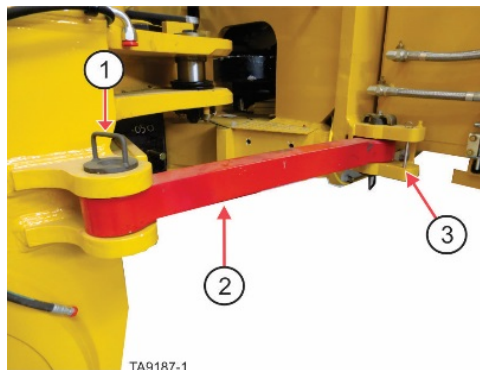
#### WARNING

Crush, shock, or other hazards exist if personnel do not follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Always follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Failure to follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures can cause crush, shock, or other hazards resulting in severe injury or death.

- 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.

#### 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.



**Frame lock in locked position**

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

**Frame Lock**

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



## WARNING

Crush hazards exist if non-essential personnel are not alerted to stay clear of machine during operational/energized inspections. Alert non-essential personnel to stay clear of the machine while it is being inspected or serviced. Alert all personnel in the area that the machine is going to be moved during the inspection or service procedure. When conducting energized or operational tests, place barriers and signs to alert non-essential personnel to keep clear of the area. Failure to alert all personnel in the area that the machine is going to be moved could result in crush hazards, resulting in serious injury or death.

| 1. Ball Cap Dial Indicator Inspection |                            |       |         |        |         |
|---------------------------------------|----------------------------|-------|---------|--------|---------|
|                                       |                            |       | Checked |        | Checked |
| a.                                    | Oscillating axle ball caps | front |         | rear   |         |
| b.                                    | Lift arm ball caps         | left  |         | right  |         |
| c.                                    | Steering pivot ball caps   | top   |         | bottom |         |
| d.                                    | Hoist cylinder ball caps   | left  |         | right  |         |

## NOTICE

It is typical that the clearance of the joint will be adjusted by removing shims, adding shims and changing brass liners. At the same time the clearance is being adjusted – the lift arm and hoist balls should be inspected for cracks in the areas noted in the Service Manual procedure “Inspection Guidelines for Hoist and Lift Arm balls” in section 03-05 Balls, Caps, and Pins. The articulation balls should be visually inspected when adjusting clearances.

## Ball Size and Location

| Machine | Lift Arm | Hoist Cylinder | Middle Pivot | Rear Axle Pivot |
|---------|----------|----------------|--------------|-----------------|
| L-1350  | 12       | 12             | 9            | 9               |
| L-1850  | 14       | 12             | 12           | 9               |
| L-2350  | 14       | 14             | 12           | 9               |

## Ball Base Specifications

| Nominal Diameter           | 7.5"           | 9"             | 12"             | 14"             |
|----------------------------|----------------|----------------|-----------------|-----------------|
| Machined diameter          | 7.500" ± .003" | 8.997" ± .003" | 12.000" ± .003" | 14.000" ± .003" |
| Ball Socket Specifications |                |                |                 |                 |
| Machined diameter          | 8.003" ± .002" | 9.503" ± .002" | 12.503" ± .002" | 14.503" ± .002" |

## Ball Base/Socket/Cap Assembly Specifications

| New Liner (or new ball/socket) Setup                                          |                                                                                      |                                                                                      |                                                                                      |                                                                 |                                                                  |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------|
|                                                                               | 7.5"                                                                                 | 9"                                                                                   | 12"                                                                                  | 14" Lift arm                                                    | 14" Hoist                                                        |
| Suggested shim pack with new liners (adjust as needed to get correct endplay) | 1 ea. 3/16" spacer plate<br>4 ea. .030" shim<br>1 ea. .018" shim<br>4 ea. .007" shim | 1 ea. 3/16" spacer plate<br>4 ea. .030" shim<br>2 ea. .018" shim<br>2 ea. .007" shim | 1 ea. 3/16" spacer plate<br>4 ea. .030" shim<br>2 ea. .018" shim<br>2 ea. .007" shim | 1 ea. 1/4" spacer plate<br>2 ea. .030" shim<br>2 ea. .018" shim | 1 ea. 3/16" spacer plate<br>2 ea. .030" shim<br>2 ea. .018" shim |
| New setup endplay reading                                                     | 0.011-0.015"                                                                         | 0.014-0.018"                                                                         | 0.018-0.024"                                                                         | 0.021-0.028"                                                    | 0.021-0.028"                                                     |

## PM Checks and Setup

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                    |                    | 14" Lift arm      | 14" Hoist          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|--------------------|-------------------|--------------------|
| Min. reading at PM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.008"             | 0.009"             | 0.012"             | 0.014" Lift arm   | 0.014" Lift arm    |
| Max. reading at PM check (if higher, then shims must be removed.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.023"             | 0.027"             | 0.036"             | 0.042"            | 0.042"             |
| Reading range after PM shim removal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | .015" ± .002       | .018" ± .002       | .024" ± .003       | .028" ± .003      | .028" ± .003       |
| Minimum shim pack before replacing liners                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 3/16" spacer plate | 3/16" spacer plate | 3/16" spacer plate | 1/4" spacer plate | 3/16" spacer plate |
| <p><b>If the ball or socket is out of round (TIR) by more than this amount, rapid wear of the brass liners may be noted. This of course depends on the severity of the application. Ball wear is typically an indication of either a lubrication problem or running the ball socket assembly at high endplay limits.</b></p> <p><b>Special shimming procedures are required when shimming a ball cap assembly when the ball is worn. This will only be temporary, as rapid liner wear will be common until the ball is replaced.</b></p> |                    |                    |                    |                   |                    |

Figure 46. Ball base socket cap specifications

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## 2000 Hour Non-Operational Inspections and Service

### Safety Preparations

#### WARNING

Crush hazards exist under rear of machine. Counter weight mounted under the rear frame. Do not enter this area unless the counterweights have been externally supported to prevent falling. Do not loosen the bolts for the counterweight structure unless the counter weights are externally supported. Entering the area under the counterweights or loosening the counterweight bolts without externally supporting the counterweights could cause a crush hazard resulting in serious injury or death.

#### WARNING

Crush hazards exist when installing counter weights, if the machined mating surfaces are not clean and free of foreign debris such as rust, dirt, or paint. Check the machined surfaces before installing the counterweights. Clean the surfaces of any foreign debris before installing the counterweights. Failure to check (and clean) the machined surfaces for dirt, paint, rust or other foreign debris before installing the counterweights could cause crush hazard resulting in serious injury or death.

#### WARNING

Crush hazards exist under rear of machine. Counter weight mounted under the rear frame. Do not enter this area unless the counterweights have been externally supported to prevent falling. Do not loosen the bolts for the counterweight structure unless the counter weights are externally supported. Entering the area under the counterweights or loosening the counterweight bolts without externally supporting the counterweights could cause a crush hazard resulting in serious injury or death.

The counterweight bolts must be inspected at no longer interval than the 2000 hour PM.

- Inspect for external damage such as rocks scraping the counterweight and bolt head
- Check the torque to assure that the bolts are tight

Counterweight bolts that are found to be loose or damaged during the PM inspection shall be removed and inspected to ensure they are not defective.

- Counterweight bolts with damage to the head shall be replaced.
- Counterweight bolts with damage to the shoulder shall be replaced.
- Counterweight bolts that are found to be bent, shall be replaced.
- Counterweight bolts with thread damage shall be replaced.
- Counterweight bolts with corrosion of any type shall be replaced.
- Counterweight bolts that appear to be good should be crack inspected – if it cannot be inspected – it shall be replaced.

Counterweight bolts that are found defective shall be replaced with only original OEM bolts that are grade 8 or better.

- Counterweight bolts part numbers are located in the Parts Manual.

When installing counterweight bolts, there should be sufficient exposed threads for the lock nut to work properly.

Correct washers should be used between the bolt/nut and the counterweight. Reference Parts Manual.

## WARNING

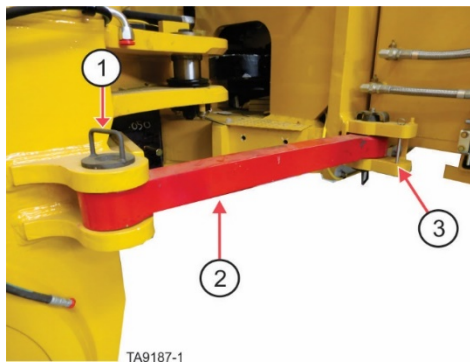
Crush hazards exist if loosening counterweight bolts. Before loosening counter weight bolts, check the machine Parts Manual for counter weight part number; to ensure the weight of the counter weight listed in this document is accurate. Some machines might have counter weights not listed in this document. Failure to determine accurate counterweight weight can cause crush hazards resulting in serious injury or death.

## 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. 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.

### Machine Shutdown and lockout

- Stop the wheel loader on flat level ground.
- 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

#### Frame Lock

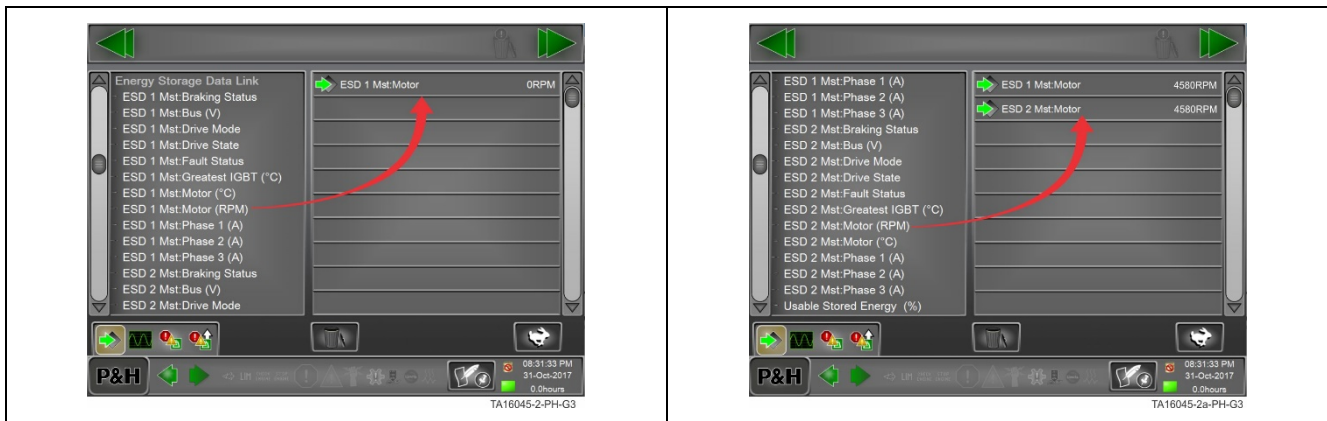
- Set bucket flat and level on the ground.
- Place wheel chocks in front and behind each wheel.
  - Chocking against motion must be done using chocks rated for the equipment being chocked. Heavy mobile equipment must be chocked with appropriate chocks. Factors such as machine weight, size, wheel diameter,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

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



Operators Screen – KESS at 60%

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



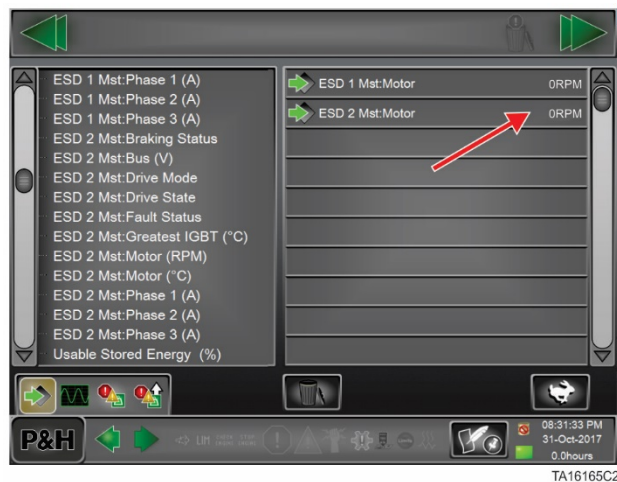
ESD Motor Channel Select

- n. Press the Drive Enable Switch



Drive Enable Switch

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



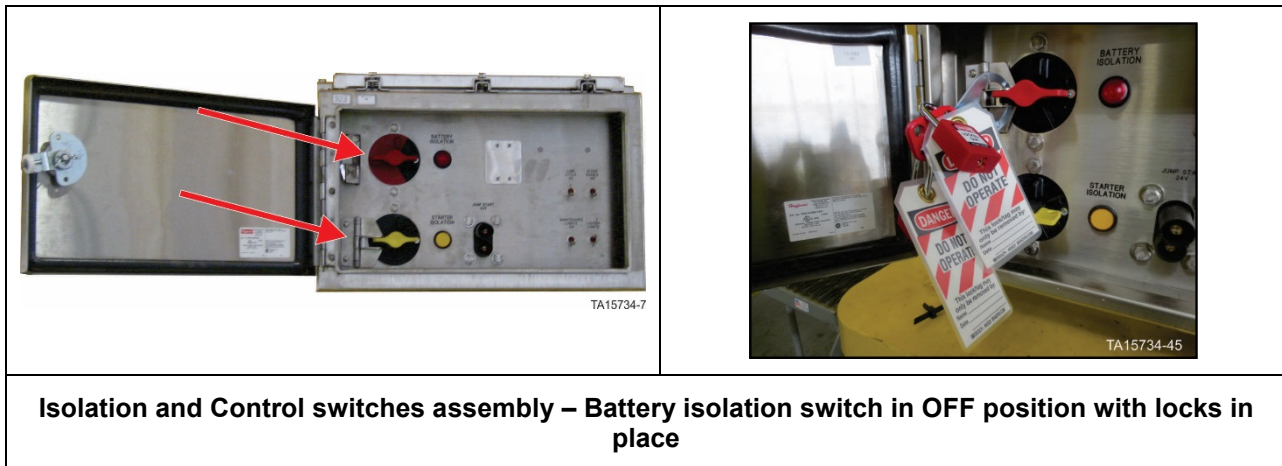
ESD Motor RPM

- p. Shut off the engine.

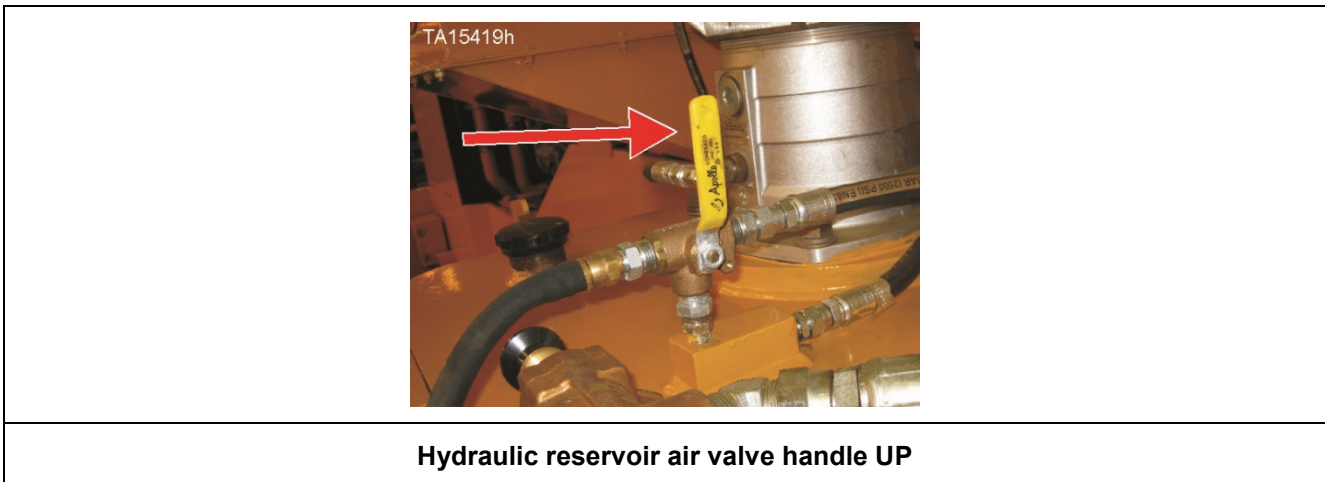
## ⚠ WARNING

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.

- q. 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.



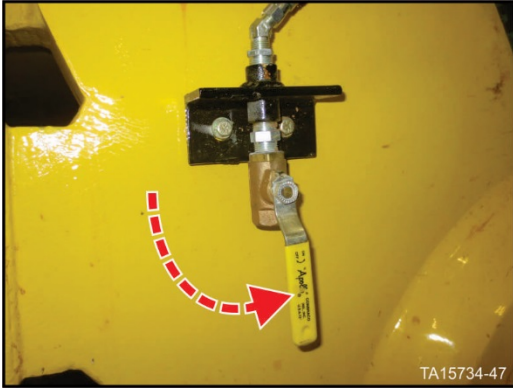
- r. Release the air from the hydraulic reservoir by using the hydraulic reservoir air valve (ball valve) on top of the reservoir. The supply line from main air system will be blocked and reservoir air will vent out the hose that runs down the outside of the hydraulic reservoir.
- s. Turn the handle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



- t. 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

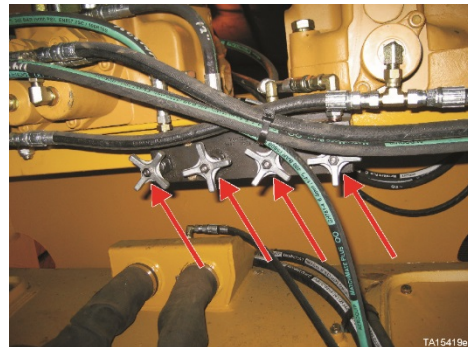
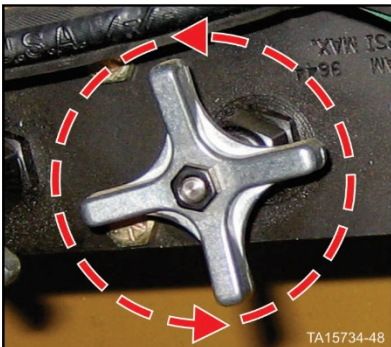


Open air reservoir bleed valves

## 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.

- u. 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.



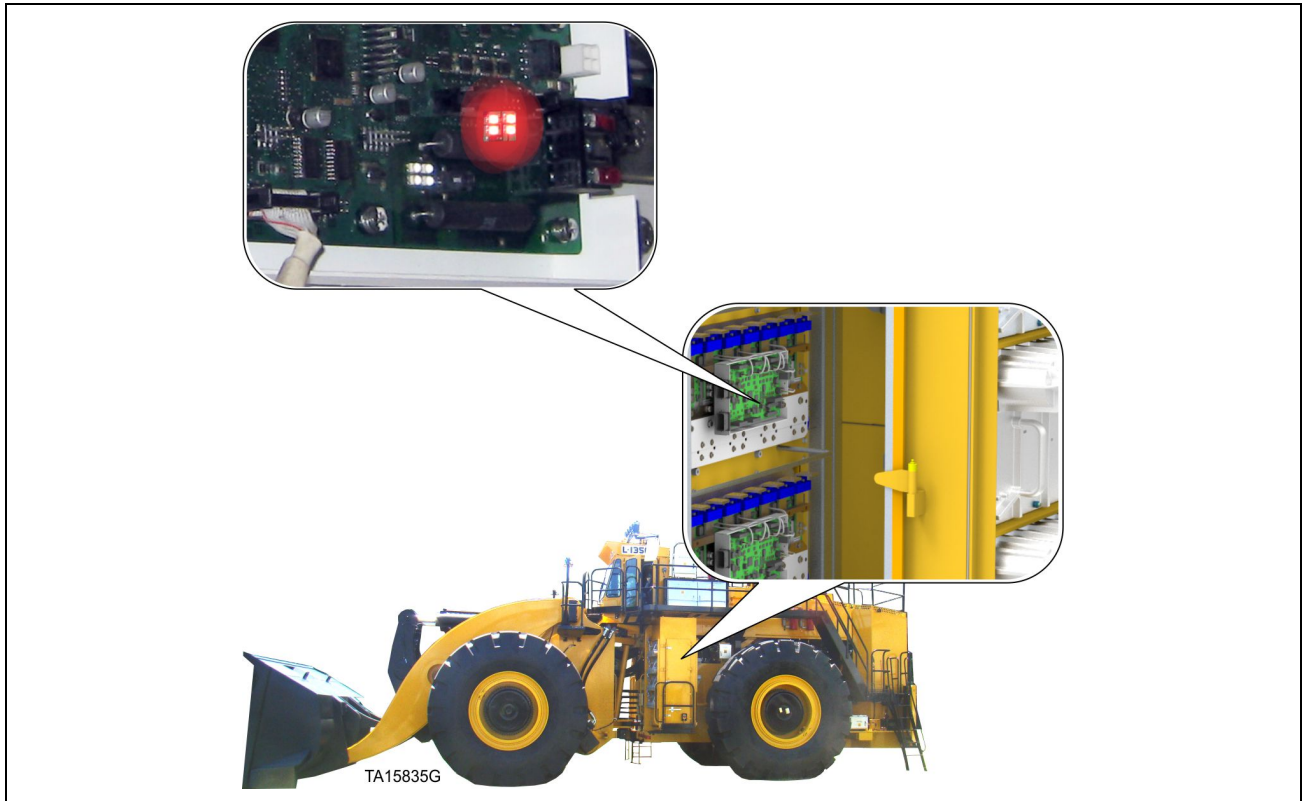
- v. Drain the hydraulic reservoir if applicable to the procedure being performed.

## Converter Bus Voltage

### WARNING



Risk of fatal shock or injury by contact in the electrical cabinet is possible if the engine is running, the LINCOS 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.



**Converter assembly bus LED's**

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

1. LINCOS II display in cab
2. Visual indication in electrical cabinet
3. Physical measurement

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

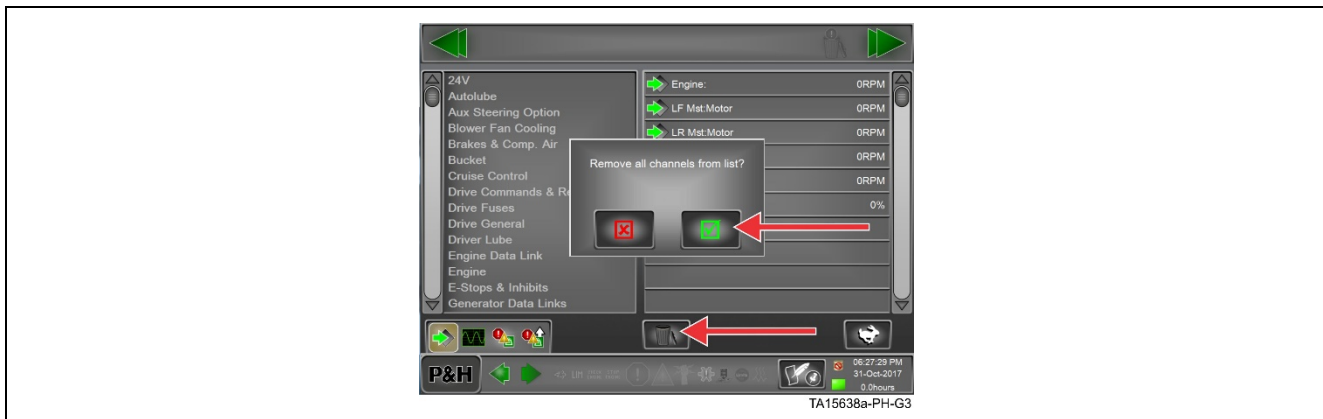
## In Cab Verification Using LINCS II Display

- Make sure that the LINCS II system is booted (key switch ON) with the engine NOT running and the park brake SET.
- 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.



**LINCS logging/monitoring menu access**

- 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).

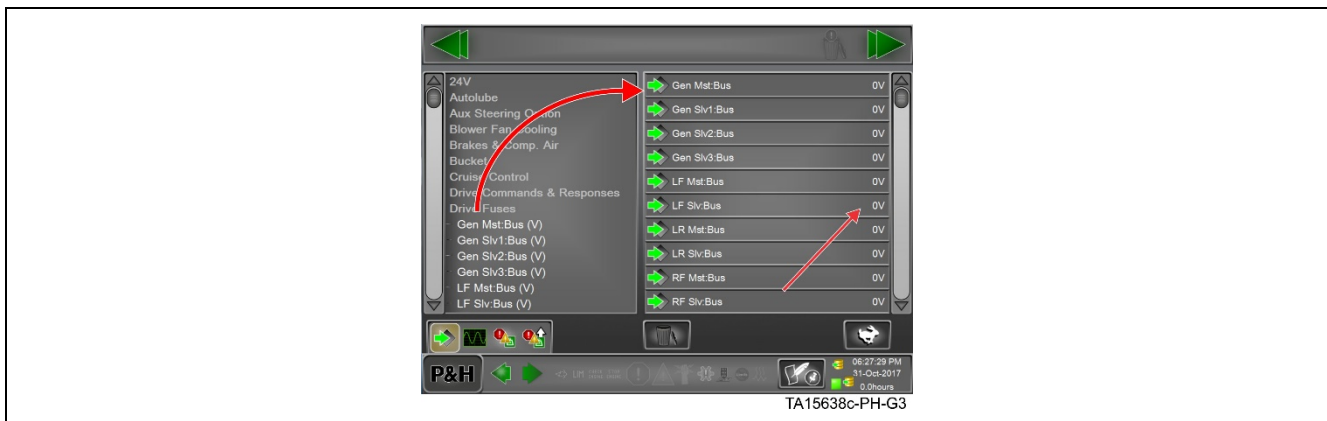


- d. Scroll down the left hand list until Drive Fuses is displayed.



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.



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.**

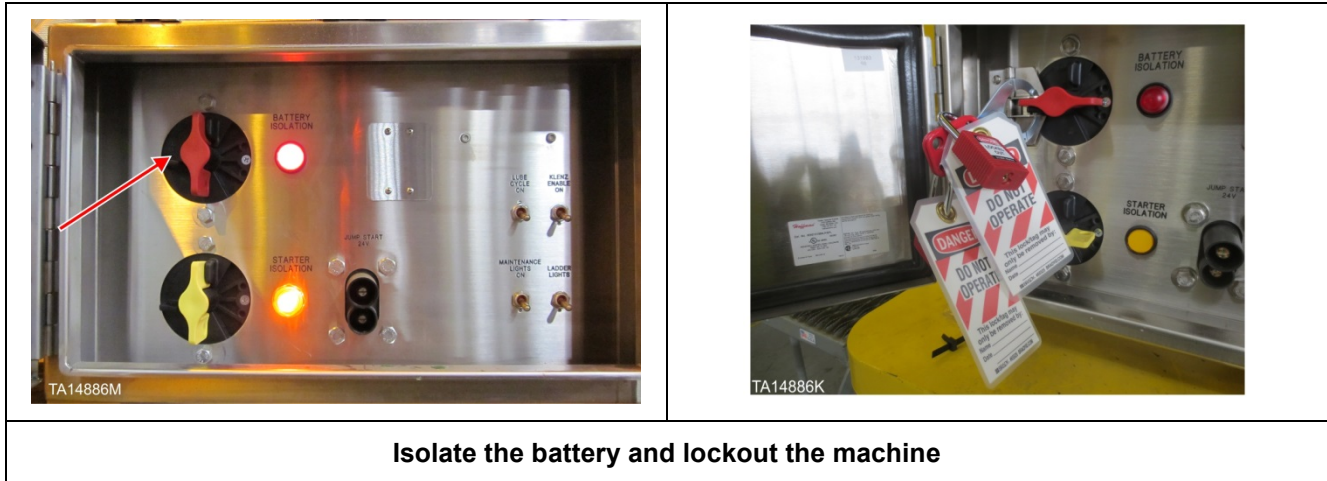
- g. Turn the key switch to the OFF position and proceed to the next step in the verification process.

## 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:

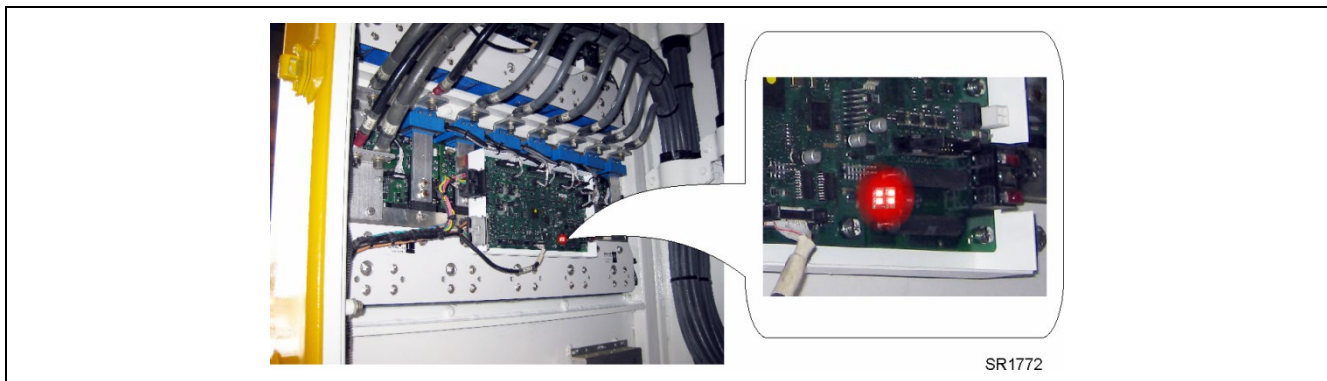
- The 24V DC power is isolated at the battery disconnect (turned off and locked out) per site requirements.



**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.



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

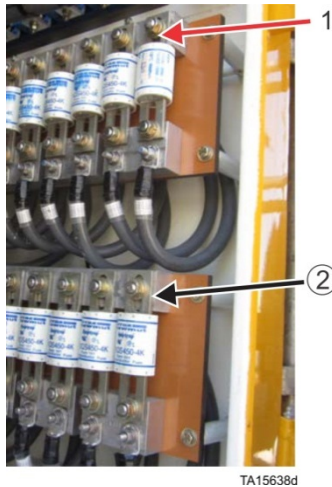
## Verification by Physical Measurement Main Bus Bars

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

#### **Main bus bars**

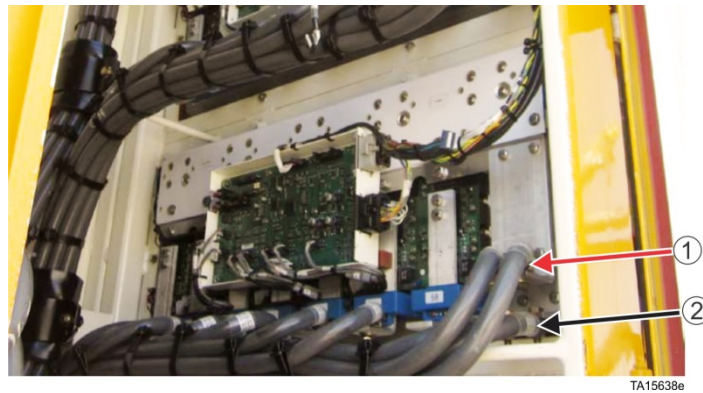
## Converter Assembly Bus Connections

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

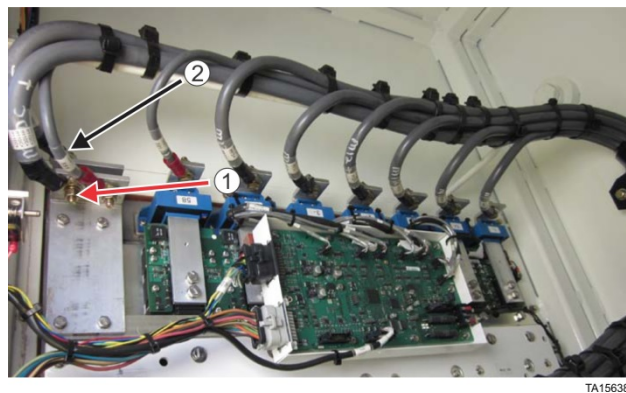
**The converter assemblies on the rear of the cabinet are inverted in comparison to those mounted on the front. Similarly, the positive and negative bus connections will be inverted.**

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

**Converter assembly bus connections (rear of cabinet)**



1) Positive bus bar, 2) Negative bus bar

**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.

**WARNING**

Fall hazard exists when working at elevated locations. Take appropriate “fall arrest” safety precautions as required by local rules, regulations, and procedures when working at heights on the machine, as example, on the rear and front frames. Follow all required statutory regulations for working at height. Failure to follow all locally required “fall arrest” procedures can cause a fall hazard, resulting in serious injury or death.

**WARNING**

Crush hazards exist when a load is suspended. Suspended loads can fall. Never work under suspended loads. Working under suspended loads could cause a crushing hazard which might result in serious injury or death.

|                                                           |                                                                                   | Checked | Service Required |
|-----------------------------------------------------------|-----------------------------------------------------------------------------------|---------|------------------|
| <b>1. Fuel Reservoir</b>                                  |                                                                                   |         |                  |
| a.                                                        | Drain and flush.                                                                  |         |                  |
| <b>2. Hydraulic System</b>                                |                                                                                   |         |                  |
| a.                                                        | Check torque on hydraulic pump housing bolts.                                     |         |                  |
| <b>NOTICE</b>                                             |                                                                                   |         |                  |
| Bleed hydraulic pumps before returning loader to service. |                                                                                   |         |                  |
| <b>3. Engine</b>                                          |                                                                                   |         |                  |
| a.                                                        | Drain, flush and refill engine coolant (as per manufacturer’s recommendations).   |         |                  |
| b.                                                        | Check DCA level (Cummins only).                                                   |         |                  |
| <b>4. Air Dryer</b>                                       |                                                                                   |         |                  |
| a.                                                        | Check desiccant for contamination and excessive moisture. (replace if necessary). |         |                  |
| <b>5. Auto Lube Pump</b>                                  |                                                                                   |         |                  |
| a.                                                        | Replace oil in auto lube grease pump housing case.                                |         |                  |

## NOTICE

The integrity of the ball structure must be checked by separating the Hoist cylinder ball joint and by retracting the cap of the Lift arm ball joint. Refer to the Service Manual procedure “Inspection Guidelines for Hoist and Lift Arm balls” in section 03-05 Balls, Caps, and Pins.

| 6. Ball Structural Inspection – Reference Section 03-05 “Balls, Caps, and Pins: General Information”. |                     |      |         |       |         |
|-------------------------------------------------------------------------------------------------------|---------------------|------|---------|-------|---------|
|                                                                                                       |                     |      | Checked |       | Checked |
| a.                                                                                                    | Lift arm ball       | left |         | right |         |
| b.                                                                                                    | Hoist cylinder ball | left |         | right |         |



## WARNING

Crush hazards exist when lifting and when supporting the weight of a machine on jack stands. Be sure to provide adequate jacks for support, and hoists when lifting the machine or any of its components. Be sure the machine is on an adequate surface to support its weight when jacked up. NEVER jack up the machine with the bucket/blade or lift arms/supporting members (as applicable). Refer to JACKING INSTRUCTIONS, located in Section 03 of the Service Manual. Failure to provide adequate lifting equipment and procedures and to provide adequate jack stands for support can cause a crush hazard resulting in serious injury or death.



## WARNING

Crush hazard exists when lifting the rear axle off the ground. Caution should be exercised when using jacks to lift the machine. If both wheels of the oscillating axle are off the ground at the same time, the axle may swivel vertically. This is a potentially hazardous situation. Both sides of the axle should be blocked to prevent swiveling. Failure to block both sides of the rear axle can cause a crush hazard resulting in serious injury or death.

| 7. Counter Weight and Counter Weight Bolt Inspection – Reference Section 03-01 “Structural: Component Descriptions, Counter Weights”. |                                                                                                            | Checked | Service Required |
|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------|------------------|
| a.                                                                                                                                    | Check weights for damage and corrosion. Replace/repair if necessary.                                       |         |                  |
| b.                                                                                                                                    | Check bolts for damage and corrosion. Replace if required.                                                 |         |                  |
| c.                                                                                                                                    | Check bolts for tightness (check torque).                                                                  |         |                  |
|                                                                                                                                       | <ul style="list-style-type: none"> <li>Remove and inspect any loose bolts. Replace if required.</li> </ul> |         |                  |
|                                                                                                                                       | <ul style="list-style-type: none"> <li>Inspect for cracks. Replace if required.</li> </ul>                 |         |                  |

## 3000 Hour Non-Operational Inspections and Service

### Safety Preparations

#### **WARNING**

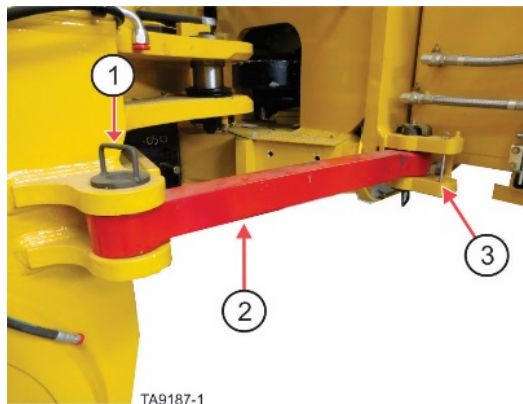
Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. 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.

### Machine Shutdown and lockout

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

#### **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.



**Frame lock in locked position**

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

#### **Frame Lock**

- d. Set the parking brakes.
- e. Shut off the engine.
- f. Place wheel chocks in front and behind each wheel.

- g. Lock out the machine's starting capability before performing any cleaning, inspections, or installation and repair procedure.

## ⚠ 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.

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



**Isolation and Control switches assembly – Battery isolation switch in OFF position with locks in place**

|                                                    |                                                                                                             | Checked | Service Required |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------|------------------|
| <b>1. Compressed Air System</b>                    |                                                                                                             |         |                  |
| a.                                                 | Check operation of DLU purge valve in Dryer                                                                 |         |                  |
| b.                                                 | Replace the diaphragm kits in the KLENZ™ diaphragm valves                                                   |         |                  |
| <b>2. HPD (Gearbox)</b>                            |                                                                                                             |         |                  |
| a.                                                 | Clean gearbox breather strainer (located between gearbox and breather filter) - (1)                         |         |                  |
| <b>3. Fire Suppression System Detection Switch</b> |                                                                                                             |         |                  |
| a.                                                 | Test the switch for proper operation (refer to procedure located in Section 3-10, Fire Suppression System). |         |                  |

# 5000 Hour Non-Operational Inspections and Service

## Safety Preparations

### **WARNING**

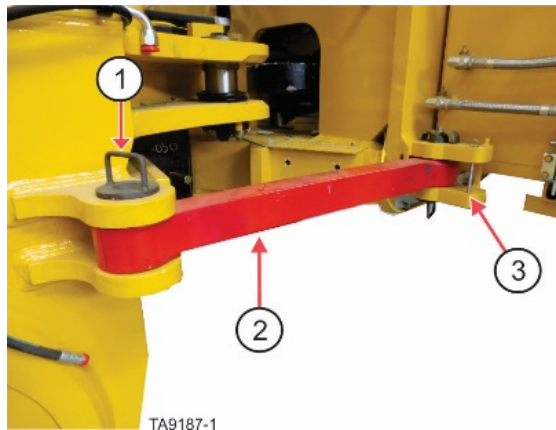
Crush hazards exist if the machine is started or moved while work processes are being performed on the machine. Place bucket flat and level on the ground. Place frame lock in the locked position and lock out the machine's starting capability before performing any work process. Follow all applicable lockout procedures and local rules and regulations for performing work processes. 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.

### Machine Shutdown and lockout

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

### **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.



**Frame lock in locked position**

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

### Frame Lock

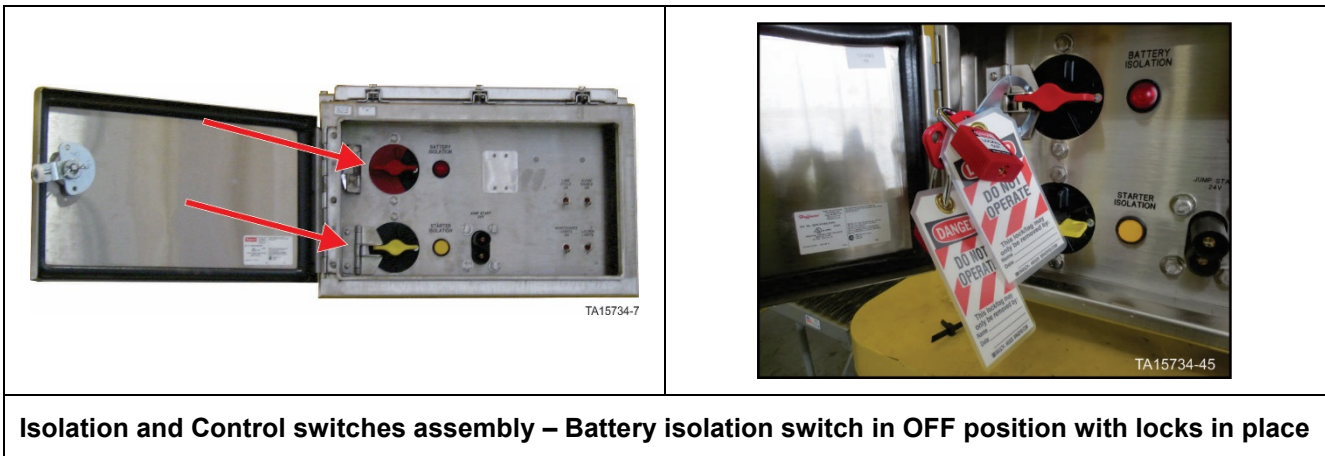
- d. Set the parking brakes.
- e. Shut off the engine.
- f. Place wheel chocks in front and behind each wheel.

- g. Lock out the machine's starting capability before performing any cleaning, inspections, or installation and repair procedure.

## 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.

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



|                                                                                    | Checked | Service Required |
|------------------------------------------------------------------------------------|---------|------------------|
| <b>1. Engine</b>                                                                   |         |                  |
| a. Drain, flush and refill engine coolant (as per manufacturer's recommendations). |         |                  |
| <b>2. Emergency Stop Switches (E-stop)</b>                                         |         |                  |
| a. Test the functionality of the system (Refer to Section "PM-24VDC System")       |         |                  |
| <b>3. Electrical enclosure boxes</b>                                               |         |                  |
| a. Clean internal area of all electrical enclosures                                |         |                  |
| • Low voltage control cabinet                                                      |         |                  |
| • Isolation and control switch enclosure                                           |         |                  |
| • Engine interface enclosure                                                       |         |                  |
| • Component heater connection enclosure                                            |         |                  |
| • Auxiliary steering electrical junction enclosure                                 |         |                  |
| <b>3. Planetary drives (51A3 drivers only)</b>                                     |         |                  |
| • Rotate Planetary Drives (Refer to "Planetary drive rotation patterns")           |         |                  |

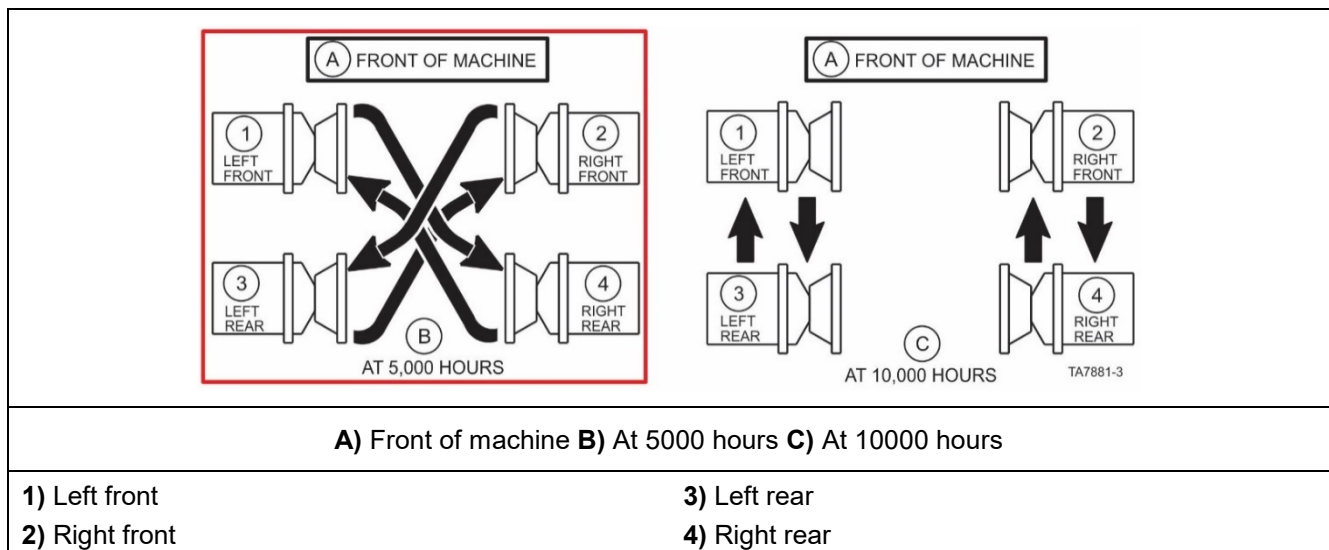


**Figure 47. Planetary drive rotation patterns (L-1350 51A3 drivers only)**

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# 10000 Hour Non-Operational Service

## Safety Preparations

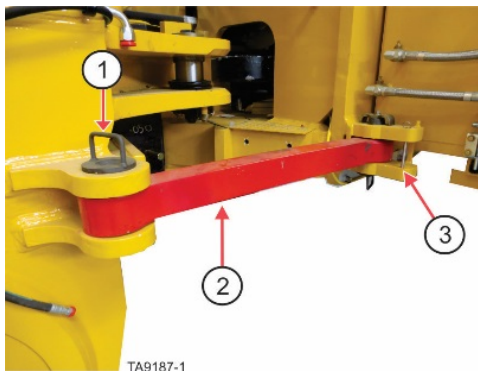
### WARNING

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. 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 and pinch point hazard exists when procedures are being performed on the brake cylinders. Brake cylinders are under compressed spring force. Sudden spring release is possible. Maintenance and repairs should be performed in full accordance with safe working procedures. Use of a suitable press is required for servicing, disassembly, and reassembly of the brake caliper assemblies. Failure to follow safe work procedures could cause crush hazard or pinch point hazard resulting in serious injury or death.

- 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.



**Frame lock in locked position**

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

**Frame Lock**

- c. Place wheel chocks in front and behind each wheel.

### 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.

- d. Set bucket flat and level on the ground.
- e. Set the parking brakes.
- f. Shut off the engine.

## ⚠ WARNING

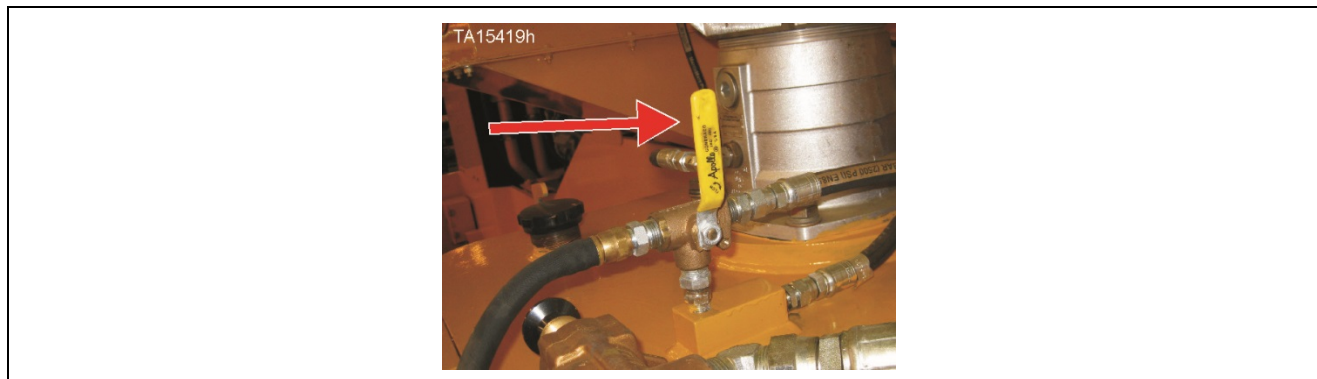
Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing 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.

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



**Battery Isolation Box – Battery isolation switch in OFF position with locks in place**

- 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.
  - Turn the handle to the up position as shown



**Hydraulic reservoir air valve handle UP**

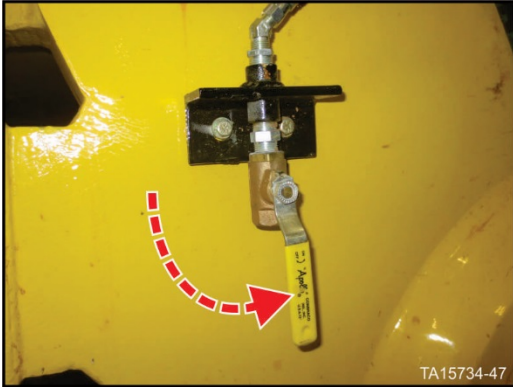
- Ensure all air from the air system is bled to 0 psig.

# NOTICE

The KLENZ™ should also be drained. It has a manual drain valve on the bottom of the reservoir.

Three valves on right side of rear frame under hydraulic reservoir

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



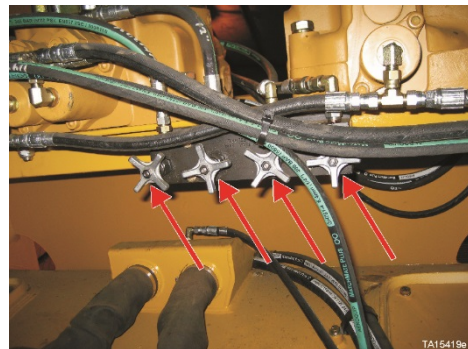
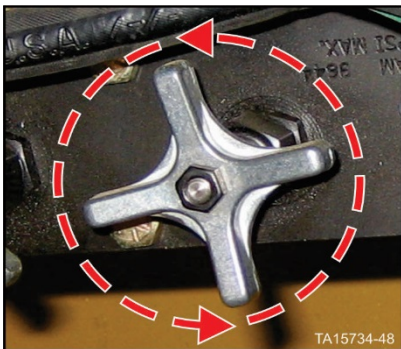
Open air reservoir bleed valves



## WARNING

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

- i. 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 cylinders.
- j. Turn each valve slowly counterclockwise as shown below and allow the pressure to bleed down.
- k. Open the valve completely and leave it open during repairs.



Hoist and bucket circuit hydraulic bleed down valves

|                                                                           | Checked | Service Required |
|---------------------------------------------------------------------------|---------|------------------|
| 1. Rotate Planetary Drives (Refer to "Planetary drive rotation patterns") |         |                  |

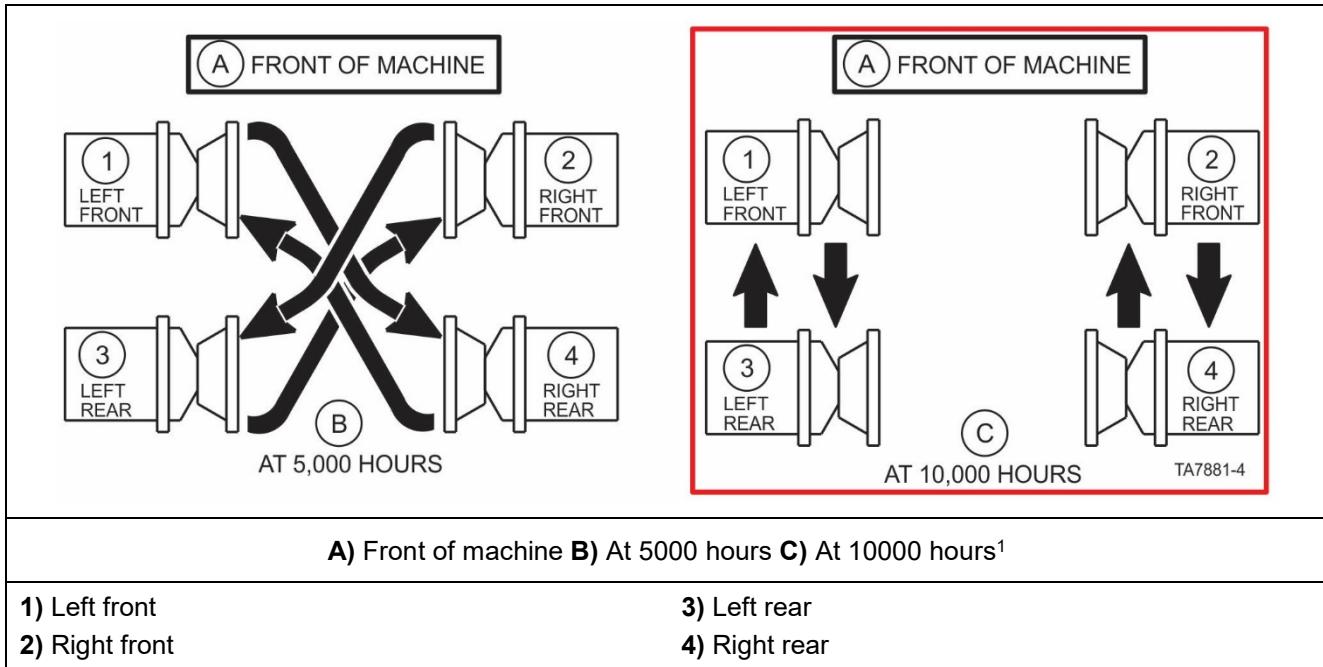


**Figure 48. Planetary drive rotation patterns (L-1350 51A3 planetary drives only)**

**10,000 hour 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

# 15,000 and 20,000 Hour Non-Operational Service

## Safety Preparations

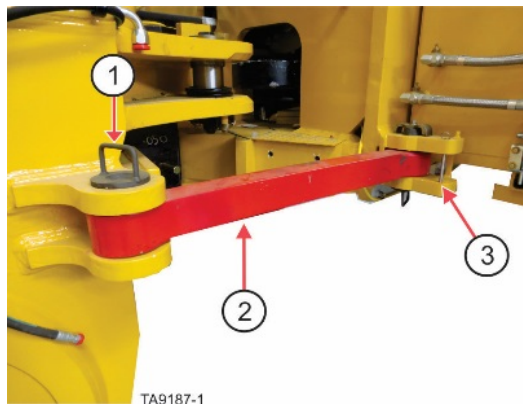
### WARNING

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. 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, shock, or other hazards exist if personnel do not follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Always follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures. Failure to follow all local rules and regulations for locking out the starting capability of the machine and for performing any maintenance or service procedures can cause crush, shock, or other hazards resulting in severe injury or death.

- 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.



**Frame lock in locked position**

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

**Frame Lock**

- c. Place wheel chocks in front and behind each wheel.



## 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.

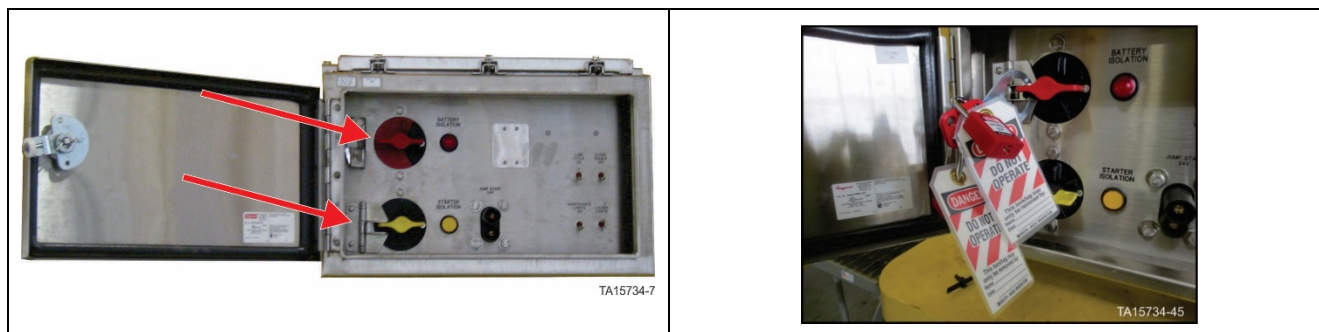
- d. Set bucket flat and level on the ground.
- e. Set the parking brakes.
- f. Shut off the engine.



## WARNING

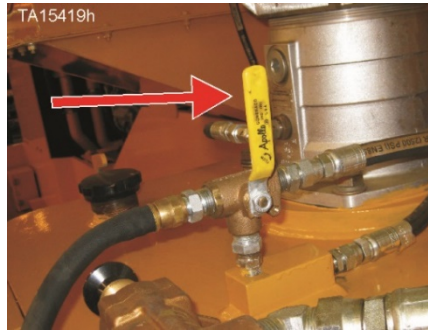
Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing 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.

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



**Battery Isolation Box – Battery isolation switch in OFF position with locks in place**

- 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.
- Turn the handle to the up position as shown



**Hydraulic reservoir air valve handle UP**

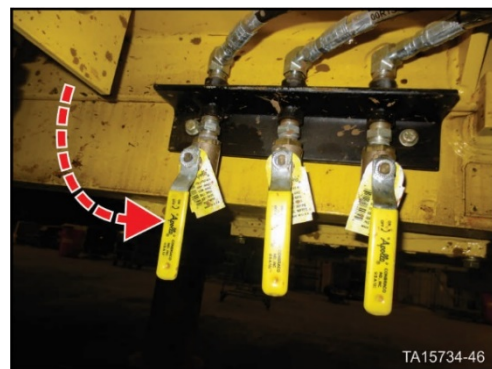
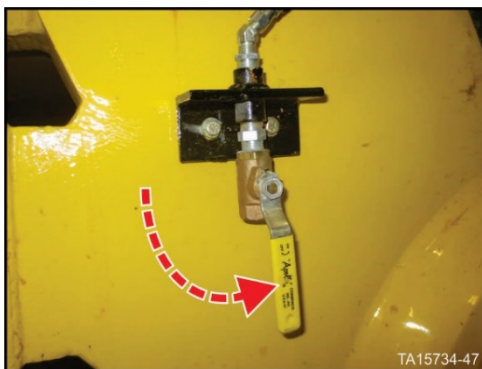
- i. Ensure all air from the air system is bled to 0 psig.

## NOTICE

The KLENZ™ should also be drained. It has a manual drain valve on the bottom of the reservoir.

Three valves on right side of rear frame under hydraulic reservoir

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



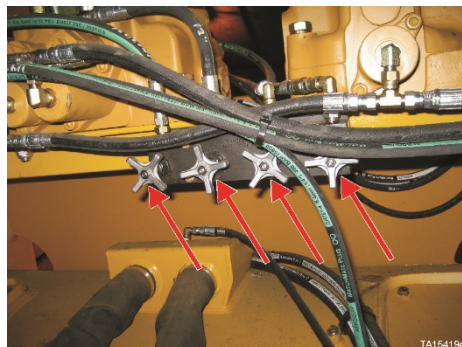
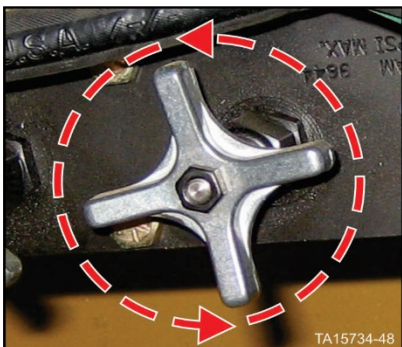
**Open air reservoir bleed valves**



## WARNING

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

- j. 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 cylinders.
- k. Turn each valve slowly counterclockwise as shown below and allow the pressure to bleed down.
- l. Open the valve completely and leave it open during repairs.



**Hoist and bucket circuit hydraulic bleed down valves**

|                            |                                                                                                                                                                                                             | Checked | Service Required |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------|
| <b>1. Planetary Drives</b> |                                                                                                                                                                                                             |         |                  |
| a.                         | Planetary Drive: Remove traction motor from planetary drive. Inspect primary gears and motor pinion. Remove outside cover. Inspect middle pinion and countershaft/planet gears. (Repair if problems noted). |         |                  |
| b.                         | Rotate Planetary Drives                                                                                                                                                                                     |         |                  |

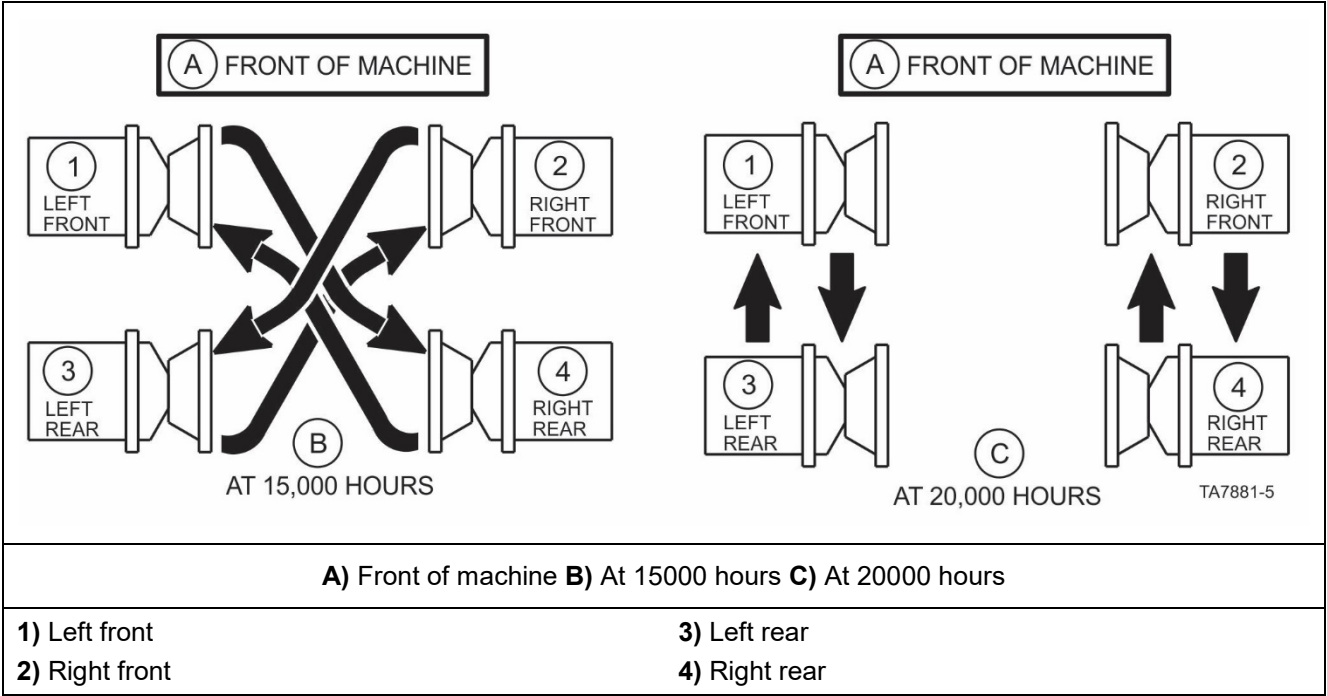


Figure 49. Planetary drive rotation patterns (L-1350 51A3 planetary drives only)

# NOTICE

L-1350 with 51A3 planetary drives reference 5,000 and 10,000 rotation patterns

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