



Hydraulic System Safety

Section 04-01-01

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

HYDRAULIC SAFETY contains safety warnings and cautions information for owners, maintenance personnel, and operators. It is ESSENTIAL for all personnel associated with the machine to become familiar with this information and the instructions contained in the other publications in this manual BEFORE operating or working on or around the machine. This section does NOT contain all safety information about every hazard that might exist when operating or working on this equipment. All local safety rules should be followed when working on or around this equipment.

Customer Responsibilities and Warranty Advisories

P&H wheel loaders are warranted in accordance with the warranty policy provided with the machine. The recommended operating and maintenance procedures set forth shall be followed to ensure warranty coverage is not jeopardized. Failure to comply with recommended operating and maintenance procedures may void machine warranty.

Any questions or problems relating to warranty policy or administration should be directed to Komatsu Service Center. Include the model and serial number, in-service date of the machine, and hour meter reading. **We especially draw your attention to the following safety advisories.**

1. The use of non-recommended lubricants or the mixing of incompatible lubricants may damage components and void the warranty. Refer to LUBRICATION AND FLUID SPECIFICATIONS for recommended lubricants.
2. Modifications to, cutting, drilling or welding on the roll over protective structure (ROPS) can reduce its effectiveness in a roll over situation and may void its certification. Contact your authorized Komatsu distributor before performing any of the above operations to the ROPS.
3. Welding procedures can damage the solid-state electronic controls for the engine, machine, and fire suppression system (optional), and also the bearings in mechanical components unless pre-cautions are taken. Before conducting any welding repair, refer to FIELD WELDING PROCEDURES and contact your authorized Komatsu distributor for assistance.
4. Under no circumstances should the owner attempt to disassemble a driver past the instructions contained in this Service Manual. Unauthorized disassembly of components may void the warranty.
5. All driver, traction motor and generator repairs are to be made by a Komatsu authorized repair facility. Unauthorized disassembly or repair may void the warranty.

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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

NOTICE

Handling and disposal of used oils may be subject to federal, state and local laws and regulations. Use authorized waste disposal facilities; for example, local collection sites and garages providing authorized facilities for receipt of used oil. If in doubt, contact your state and local environmental authorities or the Environmental Protection Agency (USA only) for direction on proper handling and disposal of used oil.

WARNING

FIRE HAZARD

- Fire hazard exists when cutting, welding, grinding or performing other spark producing processes. Have qualified fire watch personnel present, and keep a fire extinguisher that meets all statutory regulations nearby during all cutting and welding operations. cutting, welding, grinding or performing other spark producing processes can cause a fire hazard resulting in serious injury or death.

CRUSH HAZARD

- 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. Assembly must be used only when the engine is NOT running. Before using the Manual Bleed Valve Assembly, refer to “HYDRAULIC AND GREASE SYSTEMS”, “MANUAL BLEED VALVE ASSEMBLY”, in Section 04 of the Service Manual for additional operational and safety information. Operating the manual bleed valve may cause the lift arms and bucket to descend rapidly. All personnel around the bucket and lift arms area shall be removed from the area before operating hydraulic hoist and bucket hydraulic pressure bleed down valves. Using the hydraulic bleed down valves could result in movement of the lift arms and bucket which could cause a crush hazard resulting 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. 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 standing under, or placing any body part under hoisted/suspended components. Never stand under hoisted/suspended components. Ensure appropriate lifting devices are used, and blocking is adequate to prevent the component from unexpectedly moving during transportation. Failure to stay out from under hoisted/suspended components can cause crush 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.

FALL HAZARD

- Fall hazard exists when working at heights. Be sure to take appropriate safety precautions when working at heights on the rear and front frames. Follow all required statutory regulations for working at height including wearing fall arrests personal protective equipment (PPE). Failure to wear fall arrest PPE can cause a fall hazard resulting in serious injury or death.

SKIN INJECTION HAZARD

Skin injection hazard exists when around diesel fuel, air, hydraulic fluid, or grease that is under pressure. Fluids under pressure can penetrate the skin and cause serious personal injury, blindness, or death. If any fluid is injected into the skin, it must be removed as soon as possible by a doctor familiar with treating this type of injury. Fluid or air leaks under pressure may not be visible. When searching for leaks, NEVER use your hand; use a piece of metal. Wear work gloves and keep your hand well away from the possible source of leakage. DO NOT tighten or loosen fuel, hydraulic, air, or grease lines without first relieving the pressure. Wear safety goggles for eye protection and wear all other locally required personal protective equipment (PPE) when working around possibly pressurized liquids or air. Failure to use proper PPE can cause a skin injection hazard resulting in serious injury or death.

ADDITIONAL HAZARDS

STRUCK-BY HAZARDS

- Struck-by hazards exist when around hydraulic fluid, air, fuel, or grease that is under pressure. Hoses under pressure can blow out or come loose from connections, causing a struck-by hazard with deadly force. **DO NOT** tighten or loosen hydraulic, air, fuel, or grease lines without first relieving the pressure. **DO NOT** make adjustments to any fluid pressures while the machine is running. Shut down the machine, make the adjustment, then restart the machine to check the adjustment. Wear safety goggles for eye protection and wear all other locally required personal protective equipment (PPE) when working around possibly pressurized liquids or air. Failure to use proper PPE or to shut down the machine before making adjustments can cause a struck-by hazard resulting in serious injury or death.

BURN HAZARDS

- Burn hazards exist when around hot hydraulic fluid that is under pressure. Hoses under pressure can blow out or come loose from connections, causing a burn hazard from leaks or spraying. **DO NOT** tighten or loosen hydraulic fluid hoses without first relieving the pressure. **DO NOT** make adjustments to any fluid pressures or flow while the machine is running. Shut down the machine, make the adjustment, then restart the machine to check the adjustment. Wear safety goggles for eye protection and wear all other locally required personal protective equipment (PPE) when working around possibly hot pressurized liquids. Failure to use proper PPE or to shut down the machine before making adjustments can cause a burn hazard resulting in serious injury or death.

FIRE HAZARD

- Fire hazard exists if when loose or damaged hydraulic lines, tubes and hoses are present on the machine. Do not bend or strike high-pressure lines or install hoses, which have been bent or damaged. Check lines, tubes and hoses carefully. Installing damaged hydraulic hoses, lines, or tubes can cause a fire hazard resulting in injury.

FIRE HAZARD

- Fire hazard exists if when loose or damaged hydraulic lines, tubes and hoses are present on the machine. Do not bend or strike high-pressure lines or install hoses, which have been bent or damaged. Check lines, tubes and hoses carefully. Installing damaged hydraulic hoses, lines, or tubes can cause a fire hazard resulting in injury.

CRUSH HAZARD

- Crush hazard exists when removing and installing the hoist and bucket pumps. They require the use of a suitable hoisting device of adequate capacity to handle their weight. **DO NOT** attempt to remove the pumps by hand They are heavy (approx. 300 lbs. [136 kgs.]). Failure to use adequate lifting devices can cause a crush hazard resulting in component damage, serious injury, or death.
- Crush hazards exist in machine pivot area and area between the tires when purging air from the steering cylinders. The frame lock must be in the **UNLOCKED** position when pruging air from the steering cylinders. **DO NOT** allow personnel in the area between the tires or in the pivot area of the machine. Allowing personnel in the area between the tires or in the pivot area can cause crush hazards resulting in serious injury or death.
- Crush hazard exists when performing operational tests. Place signs to alert other personnel to keep a safe distance from the machine while operational tests or adjustments are being conducted. Failure to warn personnel of operational tests being performed can cause a crush hazard resulting in serious injury or death.
- Crush hazard exists when performing operational tests. Always station an operator in the cab. Personnel conducting the tests should be in direct telephone or radio contact with the operator. Failure to communicate during operational tests, and to control the movement of the machine can cause crush hazards resulting in serious injury or death.

STRUCK BY AND CRUSH HAZARDS

- Struck-by or crush hazards exist if standing under, or placing any body part under hoisted/suspended components. Never stand under hoisted/suspended components. Ensure appropriate lifting devices are used, and blocking is adequate to prevent the component from unexpectedly moving during transportation. Failure to stay out from under hoisted/suspended components can cause Struck-by or crush hazards resulting in serious injury or death.

ENTANGLEMENT HAZARD

- Entanglement hazard exists in the drive shaft or engine belts, burns if working on the engine exhaust or around hydraulic fluid or engine fluid, cuts/dismemberment if working on the radiator fan, electrical shock if working on the electrical system, skin injection from hydraulic fluid if working on high pressure side of hydraulic system, hearing loss from sonic sounds if working inside KLENZ system and other hazards exist. ALWAYS sound the horn for 2-3 seconds prior to starting the engine to alert personnel on the machine or in close proximity to it that the engine is about to start. Allow at least 30 seconds for them to clear the area before starting the engine. Check wing mirrors and all sides of machine from a seated position. If the horn is inoperable (see the following NOTICE), and if allowed by local rules and regulations, dismount the machine, and walk around it to be sure no one is on the machine or in close proximity to it before starting the engine. Always follow all local startup procedures before starting the machine. Failure to allow ample time for personnel to leave the area before starting the engine could cause entanglement, burns, cuts/dismemberment, electrical shock, hearing loss, skin injection, and other hazards resulting in serious injury or death.
- Entanglement hazard exists when working around the steering pump if the engine is running. Long unconfined hair or loose clothing can get wrapped around the drive shaft. The pump is adjacent to the drive line shaft. Do not make pressure adjustments while the engine is running. Stop the engine and make adjustments. Failure to stop the engine before making adjustments to the steering pump can cause entanglement hazards around the drive shaft resulting in serious injury or death.
- Entanglement hazard exists when working around the auxiliary oil cooler while the engine is running. Long unconfined hair or loose clothing can get pulled into the fan. Do not work on the fan or make adjustments to the pressure relief valve while the engine is running. Stop the engine before performing procedures. Failure to stop the engine before performing procedures on the fan can cause entanglement hazards resulting in serious injury or death.

SKIN INJECTION HAZARD

- Skin injection hazard exists when priming pumps. Hydraulic pressure is present when priming pumps. Use all necessary Personal Protective Equipment (PPE), such as face shield, eye protection, long sleeves, etc., to avoid injury when priming pumps. Failure to use proper PPE can result in serious injury or death.

ENVIRONMENTAL HAZARD

- Environmental hazard exists if tightening or loosening hydraulic lines without first relieving system pressure. Hydraulic system pressure can cause fittings to leak when being loosened or tightened. Always relieve hydraulic system pressure before tightening or loosening hydraulic fittings. Failure to relieve hydraulic system pressure can cause environmental hazards resulting in environmental contamination.



INHALATION HAZARD

- Inhalation hazard exists if the fire suppression system discharges while personnel are working on the machine. If local procedures allow deactivating the fire suppression system, it should be deactivated while performing heat generating procedures such as welding, grinding, cutting, etc. External fire suppression system adequate to extinguish any fire on the machine should be made

available. Failure to deactivate the system while performing heat producing procedures can cause an inhalation hazard resulting in injury.

CRUSH HAZARD

- Crush hazard exists when lifting components. The weights in this manual are only approximate as a guide for determining proper lifting procedures and equipment. These weights do not include liquids or external hardware in or on the components. Always allow a safety margin above these weights. Failure to allow a safety margin could cause a crush hazard resulting in injury.

BURN HAZARD

- Burn hazard exists if air pressure in the hydraulic oil reservoir is not released before servicing or repairing the hydraulic system. Always release the air pressure from the hydraulic reservoir by using the relief handle located on top of the hydraulic reservoir. Wear all locally required personal protective equipment (PPE), including eye protection, when working around the hydraulic system. Failure to relieve pressure can cause burn hazards resulting in injury.
- Burn hazard exists during procedure to work on the Husco valves when the oil is hot. Escaping hot oil can cause serious burns. Use the manual bleed valve assembly located in the front frame to bleed any stored pressure in the hoist and bucket cylinders. Back out each bleed valve and allow time for the pressure to bleed down. Close the valves after the procedure is completed. Failure to bleed down the hydraulic system hoist and bucket circuit can cause burn hazards resulting in serious injury.

EYE INJURY HAZARD

- Eye injury hazard exists if air pressure in the hydraulic oil reservoir is not released before servicing or repairing the hydraulic system. Always release the air pressure from the hydraulic reservoir by using the relief handle located on top of the hydraulic reservoir. Wear all locally required personal protective equipment (PPE), including eye protection, when working around the hydraulic system. Failure to relieve pressure can cause burn hazards resulting in injury.

CAUTION

COMPONENT DAMAGE

- NEVER, under any circumstances, operate the loader with the amber warning light illuminated and a warning message on the LINCS computer monitor indicating a hydraulic system problem. Damage to hydraulic components could occur.
- When the hydraulic system is opened for service or repair, the hydraulic pumps must be primed (release of air entrapped in oil) to prevent aeration or cavitation.

OIL SPECIFICATIONS

- Be sure all oil is suitable for the climate at your location. See your oil vendor to assure the oil will flow at minimum temperature experienced. Using lubricants other than what is specified by the manufacturer (including viscosity differences) can cause severe damage to components.

AMBER WARNING LIGHT

- NEVER, under any circumstances, operate the loader with the amber warning light illuminated and a warning message on the LINCS computer monitor indicating a hydraulic system problem. Damage to hydraulic components and fire could occur.

RESETTING THE HYDRAULIC RESERVOIR AUTOMATIC AIR RELEASE VALVE

- When the emergency stop or fire suppression systems are actuated, the Automatic Air Release Valve, located on top of the hydraulic reservoir, will automatically release air pressure from the hydraulic reservoir. Once tripped, the valve must be manually reset by pushing the button IN to the closed position.

STEERING PUMPS

- The electric steering pumps are not designed for continuous operation for long periods of time. Monitor the temperature of the motors on the pumps. If the motors become hot, discontinue testing until the motors have cooled off.

HYDRAULIC FLUID LEVEL IN HYDRAULIC RESERVOIR

- While purging air from the steering system, have a person monitor the hydraulic reservoir fluid level sight glass. Shut the machine down immediately if the level drops below the sight glass.

HYDRAULIC OIL CONTAMINATION

- Use caution to not allow contamination to enter the hydraulic reservoir when collecting oil samples.

PUMP PRIMING

- Failure to properly prime EACH PUMP every time the system is opened for service or repair, or if the hydraulic reservoir is drained and filled, may result in a pump failure due to a dry start condition during machine start-up. Always drain fluid until air bubbles cease. This situation may also adversely affect the warranty.
- DO NOT operate the loader until all hydraulic pumps have been primed and air is purged from the steering system.
- If removing and replacing hydraulic pump drive (HPD - gearbox) lube pump, make special note of seal orientation. The seal is reversed to prevent cross-contamination of hydraulic pump drive lubricant and hydraulic oil.
- Should a LINCS warning situation occur, remove the machine from service, and correct the problem immediately, or serious damage could result.
- Where “normal” operation consists of occasional, short excursions over the rated ambient temperature, the loader must have all other possible system faults eliminated. The duty cycle of the loader should be reduced to such a level that the cooling system maintains hydraulic oil temperature at a constant level, preferably at or below 158° F (70° C). It is paramount that all other system components are clean and correctly adjusted to help offset the increased ambient temperature. Operation of the loader under these conditions, with other defects in the hydraulic cooling system, will quickly cause rapid temperature rise and may result in catastrophic temperature related failures.
- Be sure all oil is suitable for climate at your location. See your oil vendor to assure the oil will flow at minimum temperature experienced. Using lubricants other than what is specified by the manufacturer (including viscosity differences) can cause severe damage to components.

FOREIGN DEBRIS IN HYDRAULIC SYSTEM

- It is important that the steering system be kept free of dirt or foreign matter; therefore, cleanliness in servicing the Danfoss Flow Amplifier is absolutely necessary.



WARNING

CRUSH HAZARD

- NEVER stand or allow others to stand or place body parts under hoisted components of the loader. The following weights are approximate. Always allow an adequate safety factor when lifting any components.

Component Weights

Item/Equipment	LBS.	KGS.
Hoist Cylinder	4,200	1,905
Bucket Cylinder	3,000	1,361
Steering Cylinder	800	363
Hydraulic Reservoir	2,300	1,043
Hydraulic Pump Gearbox	3,000	1,361
Husco Valve	300	136

Table 1. Weights of major components (L-1350)

Item/Equipment	Standard Lift		High Lift	
	LBS.	KGS.	LBS.	KGS.
Hoist Cylinder	5,600	2,540	5,600	2,540
Bucket Cylinder	3,300	1,496	3,700	1,678
Steering Cylinder	800	363	800	363
Hydraulic Reservoir	2,300	1,678	2,300	1,678
Hydraulic Pump Gearbox	3,000	1,361	3,000	1,361
Hoist And Bucket Control Valve	300	136	300	136

Table 2. Weights of major components (L-1850)

Item/Equipment	Standard Lift	
	LBS.	KGS.
Hoist Cylinder	5,600	2,540
Bucket Cylinder	3,000	1,361
Steering Cylinder	800	363
Hydraulic Reservoir	2,300	1,043
Hydraulic Pump Gearbox	3,000	1,361
Husco Valve	300	136

Table 3. Weights of major components (L-2350)

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Service Advisories and Precautions

The following service advisories and precautions should be observed in the maintenance of the loader's hydraulic system:

WARNING

Skin injection hazard exists when around diesel fuel, hydraulic fluid, or grease that is under pressure. Fluids under pressure can penetrate the skin and cause serious personal injury, blindness, or death. If any fluid is injected into the skin, it must be removed as soon as possible by a doctor familiar with treating this type of injury. Fluid leaks under pressure may not be visible. When searching for leaks, NEVER use your hand; use a piece of metal. Wear work gloves and keep your hand well away from the possible source of leakage. DO NOT tighten or loosen fuel, hydraulic, or grease lines without first relieving the pressure. Wear safety goggles for eye protection and wear all other locally required personal protective equipment (PPE) when working around possibly pressurized liquids. Failure to use proper PPE can cause a skin injection hazard resulting in serious injury or death.



WRONG



RIGHT

Hydraulic Reservoir Air Release Valves

ALWAYS release air pressure in the hydraulic oil reservoir before servicing or repairing anything requiring removal of the reservoir filler cap or the return filter assemblies.

⚠ CAUTION

Burn hazard exists if air pressure in the hydraulic oil reservoir is not released before servicing or repairing the hydraulic system. Always release the air pressure from the hydraulic reservoir by using the relief handle located on top of the hydraulic reservoir. Wear all locally required personal protective equipment (PPE), including eye protection, when working around the hydraulic system. Failure to relieve pressure can cause burn hazards resulting in injury.

⚠ CAUTION

Eye injury hazard exists if air pressure in the hydraulic oil reservoir is not released before servicing or repairing the hydraulic system. Always release the air pressure from the hydraulic reservoir by using the relief handle located on top of the hydraulic reservoir. Wear all locally required personal protective equipment (PPE), including eye protection, when working around the hydraulic system. Failure to relieve pressure can cause burn hazards resulting in injury.

Release of the reservoir air pressure is done by moving the manual air release valve handle, located on top of the hydraulic reservoir, to the VENTED position see "Hydraulic reservoir air release valves". The air pressure in the reservoir will be released, and at the same time, the valve will lock in the air pressure in the rest of the system. After servicing, repairing, or inspecting the hydraulic oil reservoir, make certain to move the air release valve handle to the "pressurized" position to allow the reservoir to pressurize.

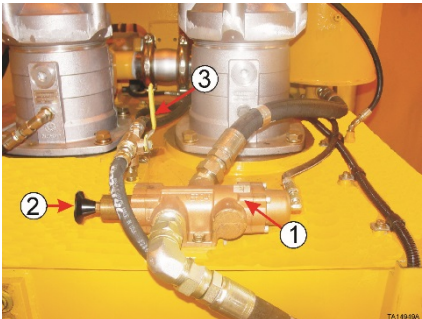
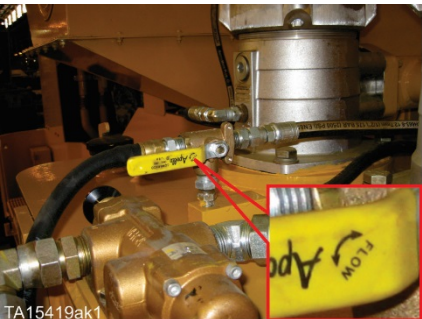
	<p>1) Automatic Air Release Valve 2) Reset Button 3) Manual Air Release Valve</p> <p style="text-align: center;">(valve shown in "vented" position-reservoir vented).</p>
	<div style="background-color: #0056b3; color: white; text-align: center; padding: 5px; font-weight: bold; font-size: 1.2em;">NOTICE</div> <p>There is a small "arc arrow" on the handle of the valve that shows the air path direction when the handle is moved in either position.</p> <p>(Valve shown in "pressurized" position-Reservoir pressurized).</p>

Figure 1. Hydraulic reservoir air release valves

CAUTION

When the hydraulic system is opened for service or repair, the hydraulic pumps must be primed (release of air entrapped in oil) to prevent aeration or cavitation.

When the emergency stop or fire suppression systems are actuated, the automatic air release valve, located on top of the hydraulic reservoir, will automatically release air pressure from the hydraulic reservoir. Once tripped, the valve must be manually “reset” by pushing the button IN to the closed position (refer to illustration “Hydraulic reservoir air release valves”).

Handling and disposal of used oils may be subject to federal, state and local laws and regulations. Use authorized waste disposal facilities; for example, local collection sites, and garages providing authorized facilities for receipt of used oil. If in doubt, contact the controlling environmental authorities for direction on proper handling and disposal of used oil.

Manual Bleed Valve Assembly

NOTICE

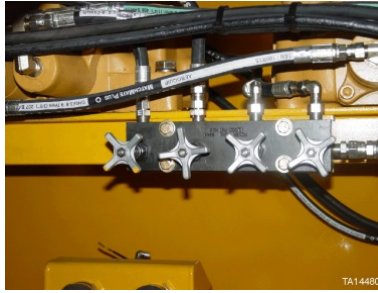
Using the Manual Bleed Valve Assembly is the only acceptable way to lower the lift arms or relieve residual circuit pressure (engine not running) from the hoist and bucket circuits. See WARNINGS below.

CAUTION

Burn hazard exists during procedure to work on the Husco valves when the oil is hot. Escaping hot oil can cause serious burns. Use the manual bleed valve assembly located in the front frame to bleed any stored pressure in the hoist and bucket cylinders. Back out each bleed valve and allow time for the pressure to bleed down. Close the valves after the procedure is completed. Failure to bleed down the hydraulic system hoist and bucket circuit can cause burn hazards resulting in serious injury.

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. Assembly must be used only when the engine is NOT running. Before using the Manual Bleed Valve Assembly, refer to “HYDRAULIC AND GREASE SYSTEMS”, “MANUAL BLEED VALVE ASSEMBLY”, in Section 04 of the Service Manual for additional operational and safety information. Operating the manual bleed valve may cause the lift arms and bucket to descend rapidly. All personnel around the bucket and lift arms area shall be removed from the area before operating hydraulic hoist and bucket hydraulic pressure bleed down valves. Using the hydraulic bleed down valves could result in movement of the lift arms and bucket which could cause a crush hazard resulting serious injury or death.



Located in front frame, under hydraulic valves

Figure 2. Manual bleed valve assembly

General Safety

The following procedure provides a general guideline for isolating stored energy when performing service, maintenance, or repair procedures on the machine. Local procedures, rules and regulations may also apply.

Safety Preparations

Use the following procedure to isolate energy sources before performing any removal, replacement, or installation procedures described in this document.

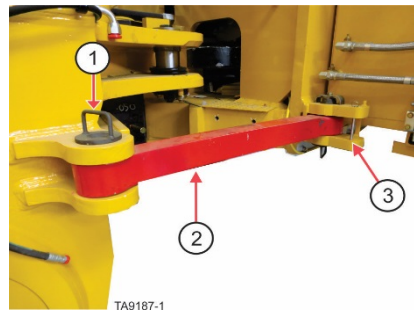
WARNING

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

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



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

Figure 3. Frame lock in locked position

- 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

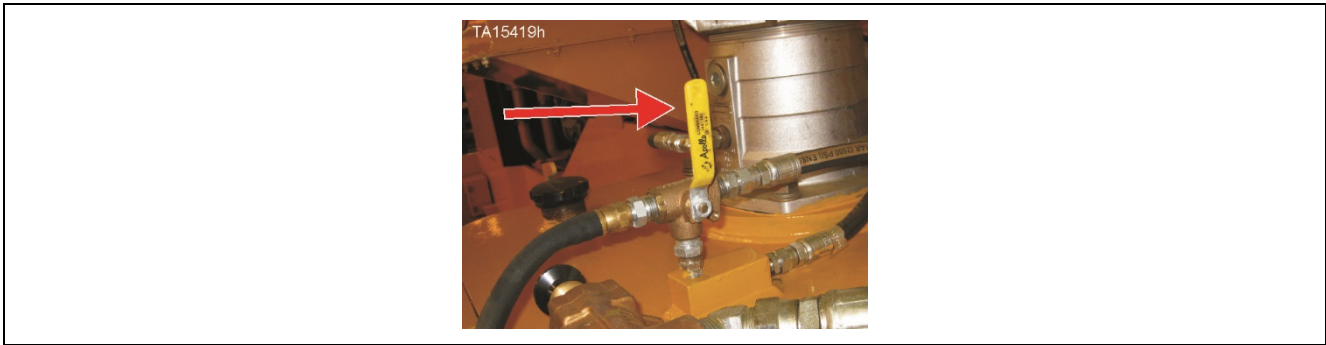
Crush, shock, or other hazards exist if stored energy is not removed or isolated prior to working on the machine. Stored energy (hydraulic, electrical, pneumatic, mechanical, etc.) may be present if not isolated or released prior to working on the machine. Do not work on the machine without removing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



Figure 4. Isolation and control switch assembly

- 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.



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

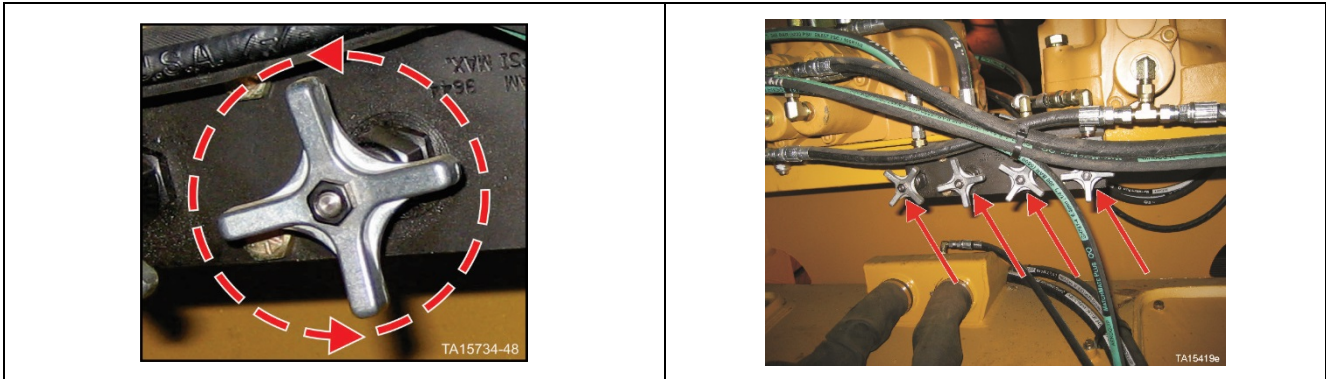
Three valves on right side of rear frame under hydraulic reservoir	
One valve on right side of front frame near hoist cylinder ball cap	

Figure 5. 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. Assembly must be used only when the engine is NOT running. Before using the Manual Bleed Valve Assembly, refer to “HYDRAULIC AND GREASE SYSTEMS”, “MANUAL BLEED VALVE ASSEMBLY”, in Section 04 of the Service Manual for additional operational and safety information. Operating the manual bleed valve may cause the lift arms and bucket to descend rapidly. All personnel around the bucket and lift arms area shall be removed from the area before operating hydraulic hoist and bucket hydraulic pressure bleed down valves. Using the hydraulic bleed down valves could result in 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.
 - Open the valve completely and leave it open during this procedure.



- l. Following all local environmental rules and regulations, drain the hydraulic reservoir and any residual fluid in the hydraulic lines.

CAUTION

Before performing heat generating processes such as grinding, cutting, or welding on a machine, the fire suppression system circuit monitors panel's in-line fuse must be removed if it is allowed by local procedures. The fuse is located in the battery box on the loader. Failure to do so may cause the system to actuate and/or damage the solid-state components of the system. Replace the in-line fuse before the machine is started.

CAUTION

Inhalation hazard exists if the fire suppression system discharges while personnel are working on the machine. If local procedures allow deactivating the fire suppression system, it should be deactivated while performing heat generating procedures such as welding, grinding, cutting, etc. External fire suppression system adequate to extinguish any fire on the machine should be made available. Failure to deactivate the system while performing heat producing procedures can cause an inhalation hazard resulting in injury.

NOTICE

Some fire suppression systems have an internal battery and are not hard wired to the machine batteries. This fuse will not exist on these machines. Before beginning any heat producing work on the machine, appropriate steps must be taken to prevent the heat producing activity from activating the fire suppression system.



Fire suppression in-line fuse located in loader battery box.

WARNING

Fall hazard exists when working at heights. Be sure to take appropriate safety precautions when working at heights on the rear and front frames. Follow all required statutory regulations for working at height including wearing fall arrests personal protective equipment (PPE). Failure to wear fall arrest PPE can cause a fall hazard resulting in serious injury or death.

WARNING

Crush hazards exist if standing under, or placing any body part under hoisted/suspended components. Never stand under hoisted/suspended components. Ensure appropriate lifting devices are used, and blocking is adequate to prevent the component from unexpectedly moving during transportation. Failure to stay out from under hoisted/suspended components can cause crush hazard resulting in serious injury or death.

WARNING

Fire hazard exists when cutting, welding, grinding or performing other spark producing processes. Have qualified fire watch personnel present, and keep a fire extinguisher that meets all statutory regulations nearby during all cutting and welding operations. cutting, welding, grinding or performing other spark producing processes can cause a fire hazard resulting in serious injury or death.

- m. When all procedures are complete, follow all lockout tag out rules, local rules, and local regulations to return the machine back to service.