21F
121F
221F
321F
Tier 4B (final)
Compact Wheel Loader

SERVICE MANUAL

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CASE CONSTRUCTION

SERVICE MANUAL

121F XT , 121F ZB , 21F XT , 21F ZB , 221F HS , 221F STD , 321F HS , 321F STD

Contents

INTRODUCTION

Contents

INTRODUCTION

Basic instructions - Important notice regarding equipment servicing

All repair and maintenance work listed in this manual must be carried out only by qualified dealership personnel, strictly complying with the instructions given, and using, whenever possible, the special tools.

Anyone who performs repair and maintenance operations without complying with the procedures provided herein shall be responsible for any subsequent damages.

The manufacturer and all the organizations of its distribution chain, including - without limitation - national, regional, or local dealers, reject any responsibility for damages caused by parts and/or components not approved by the manufacturer, including those used for the servicing or repair of the product manufactured or marketed by the manufacturer. In any case, no warranty is given or attributed on the product manufactured or marketed by the manufacturer in case of damages caused by parts and/or components not approved by the manufacturer.

The information in this manual is up-to-date at the date of the publication. It is the policy of the manufacturer for continuous improvement. Some information could not be updated due to modifications of a technical or commercial type, or changes to the laws and regulations of different countries.

In case of questions, refer to your CASE CONSTRUCTION Sales and Service Networks.

Basic instructions - Shop and assembly

Shimming

For each adjustment operation, select adjusting shims and measure the adjusting shims individually using a micrometer, then add up the recorded values. Do not rely on measuring the entire shimming set, which may be incorrect, or the rated value shown on each shim.

Rotating shaft seals

For correct rotating shaft seal installation, proceed as follows:

1. Before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes.
2. Thoroughly clean the shaft and check that the working surface on the shaft is not damaged.
3. Position the sealing lip facing the fluid.

   NOTE: *With hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will move the fluid towards the inner side of the seal.*
4. Coat the sealing lip with a thin layer of lubricant (use oil rather than grease). Fill the gap between the sealing lip and the dust lip on double lip seals with grease.
5. Insert the seal in its seat and press down using a flat punch or seal installation tool. Do not tap the seal with a hammer or mallet.
6. While you insert the seal, check that the seal is perpendicular to the seat. When the seal settles, make sure that the seal makes contact with the thrust element, if required.
7. To prevent damage to the seal lip on the shaft, position a protective guard during installation operations.

O-ring seals

Lubricate the O-ring seals before you insert them in the seats. This will prevent the O-ring seals from overturning and twisting, which would jeopardize sealing efficiency.

Sealing compounds

Apply a sealing compound on the mating surfaces when specified by the procedure. Before you apply the sealing compound, prepare the surfaces as directed by the product container.

Spare parts

Only use CNH Original Parts or CASE CONSTRUCTION Original Parts.

Only genuine spare parts guarantee the same quality, duration, and safety as original parts, as they are the same parts that are assembled during standard production. Only CNH Original Parts or CASE CONSTRUCTION Original Parts can offer this guarantee.

When ordering spare parts, always provide the following information:

- Machine model (commercial name) and Product Identification Number (PIN)
- Part number of the ordered part, which can be found in the parts catalog

Protecting the electronic and/or electrical systems during charging and welding

To avoid damage to the electronic and/or electrical systems, always observe the following practices:

1. Never make or break any of the charging circuit connections when the engine is running, including the battery connections.
2. Never short any of the charging components to ground.
3. Always disconnect the ground cable from the battery before arc welding on the machine or on any machine attachment.
   - Position the welder ground clamp as close to the welding area as possible.
   - If you weld in close proximity to a computer module, then you should remove the module from the machine.
   - Never allow welding cables to lie on, near, or across any electrical wiring or electronic component while you weld.
4. Always disconnect the negative cable from the battery when charging the battery in the machine with a battery charger.

   NOTICE: *If you must weld on the unit, you must disconnect the battery ground cable from the machine battery. The electronic monitoring system and charging system will be damaged if this is not done.*
5. Remove the battery ground cable. Reconnect the cable when you complete welding.

Special tools

⚠ WARNING

Battery acid causes burns. Batteries contain sulfuric acid.
Avoid contact with skin, eyes or clothing. Antidote (external): Flush with water. Antidote (eyes): flush with water for 15 minutes and seek medical attention immediately. Antidote (internal): Drink large quantities of water or milk. Do not induce vomiting. Seek medical attention immediately.
Failure to comply could result in death or serious injury.

W0111A

The special tools that CASE CONSTRUCTION suggests and illustrate in this manual have been specifically researched and designed for use with CASE CONSTRUCTION machines. The special tools are essential for reliable repair operations. The special tools are accurately built and rigorously tested to offer efficient and long-lasting operation.

By using these tools, repair personnel will benefit from:

- Operating in optimal technical conditions
- Obtaining the best results
- Saving time and effort
- Working in safe conditions

Safety rules

Personal safety

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual you will find the signal words DANGER, WARNING, and CAUTION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: *Notice indicates a situation which, if not avoided, could result in machine or property damage.*

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

Information

NOTE: *Note indicates additional information which clarifies steps, procedures, or other information in this manual.*

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

Personal safety

Carefully read this Manual before proceeding with maintenance, repairs, refuelling or other machine operations.

Repairs have to be carried out only by authorized and instructed staff; specific precautions have to be taken when grinding, welding or when using mallets or heavy hammers.

Not authorized persons are not allowed to repair or carry out maintenance on this machine. Do not carry out any work on the equipment without prior authorization.

Ask your employer about the safety instructions in force and safety equipment.

Nobody should be allowed in the cab during machine maintenance unless he is a qualified operator helping with the maintenance work.

If it is necessary to move the equipment to carry out repairs or maintenance, do not lift or lower the equipment from any other position than the operator's seat.

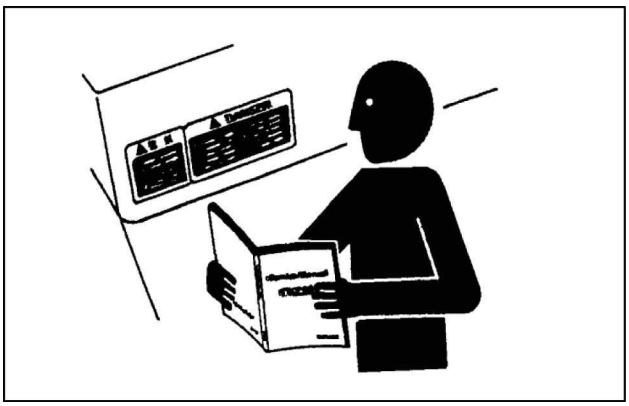
Never carry out any operation on the machine when the engine is running, except when specifically indicated.

Stop the engine and ensure that all pressure is relieved from hydraulic circuits before removing caps, covers, valves, etc.

All repair and maintenance operations should be carried out with the greatest care and attention.

Service stairs and platforms used in a workshop or in the field should be built in compliance with the safety rules in force.

Any functional disorders, especially those affecting the safety of the machine, should therefore be rectified immediately.



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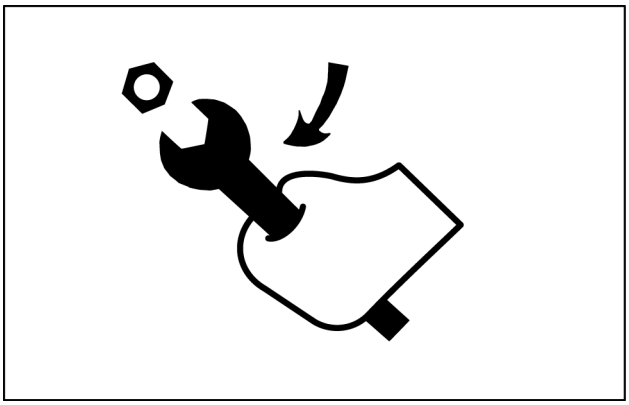


TULI12WEX2005AA 2

⚠ DANGER

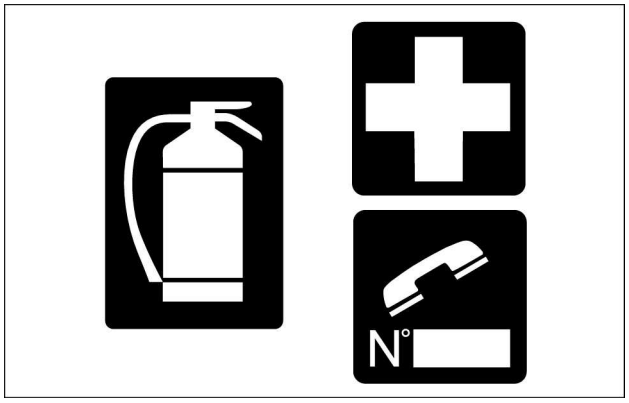
Unexpected movement!
Make sure parking brake is applied. Secure machine with wheel chocks.
Failure to comply will result in death or serious injury.

D0013A

Before performing any work on the machine, attach a maintenance in progress tag. This tag can be applied on the left-hand control lever, safety lever or cab door.

Emergency

Be prepared for emergencies. Always keep a fire extinguisher and first aid kit readily available. Ensure that the fire extinguisher is serviced in accordance with the manufacturer's instructions.



SMIL12WEX0174AA 3

Equipment

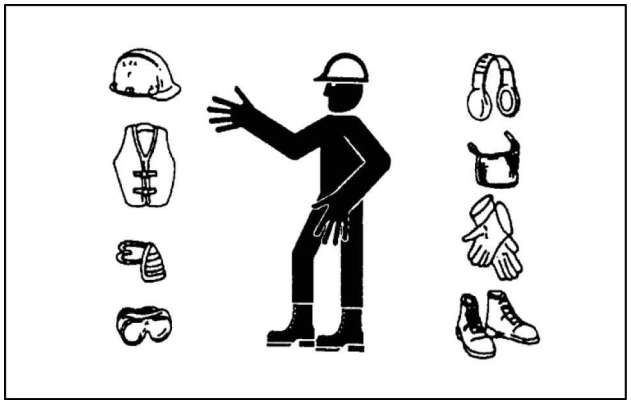
Wear close fitting clothing and safety equipment appropriate for the job:

- Safety helmet
- Safety shoes
- Heavy gloves
- Reflective clothing
- Wet weather clothing

If working conditions require, the following personal safety equipment should be on hand:

- Respirators (or dust proof masks)
- Ear plugs or acoustic ears protections
- Goggles with lateral shield or masks for eyes protection

Do not wear rings, wristwatches, jewels, unbuttoned or flapping clothing such as ties, torn clothes, scarves, open jackets or shirts with open zips which could get caught into moving parts.



TULI12WEX2008AA 4

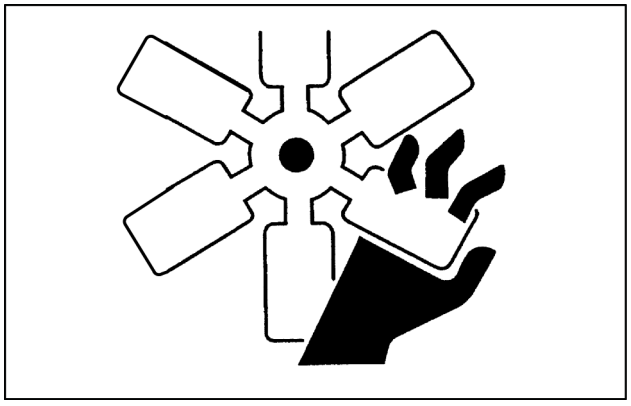
Engine - Radiator

Never leave the engine running in enclosed spaces without proper ventilation which is able to evacuate toxic exhaust gases. Keep the exhaust manifold and tube free from combustible materials.

Do not refuel with the engine running, especially if hot, as this increases fire hazard in case of fuel spillage.

Never attempt to check or adjust the belts when the engine is running.

Never lubricate the machine with the engine running.



TULI12WEX2009AA 5

Pay attention to rotating components and do not allow to anyone to approach these areas to avoid becoming entangled.

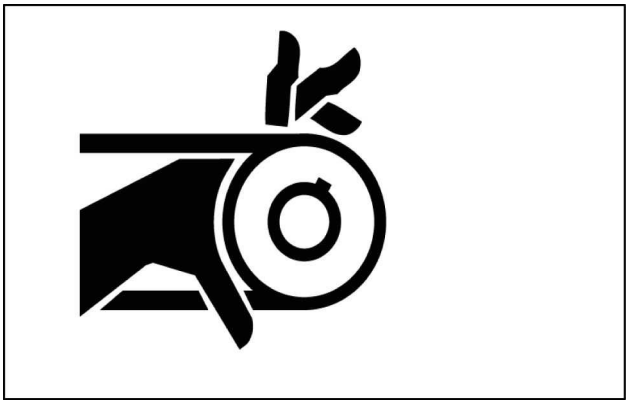
Hands, clothing or tools getting caught in the fan blades or transmission belts, can cause amputations, violent hemorrages and generate conditions of grave danger. For this reason avoid touching or approaching all rotating or moving parts.

A surging spray of the coolant from the radiator can cause serious burns and scalds.

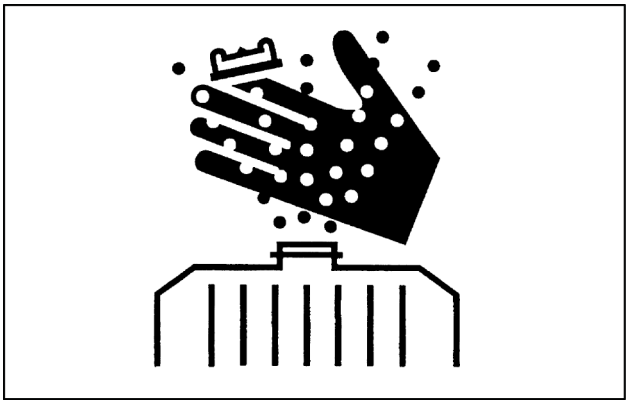
Before checking the coolant level, shut-off the engine and allow machine to cool down the radiator and hoses. Slowly unscrew the cap to release any residual pressure.

If it is necessary to remove the cap while engine is hot, wear safety clothes and equipment, then loosen the cap slowly to relieve the pressure gradually.

When checking the fuel, oil and coolant levels, use lights and lamps explicitly designated as explosion proof. If these types of lamps are not used, fires or explosions may occur.



TULI12WEX2010AA 6



TULI12WEX2011AA 7

Hydraulic systems

Jets of fluids under pressure can penetrate the skin causing serious injuries.

Avoid this hazard by relieving pressure before disconnecting hydraulic or other lines.

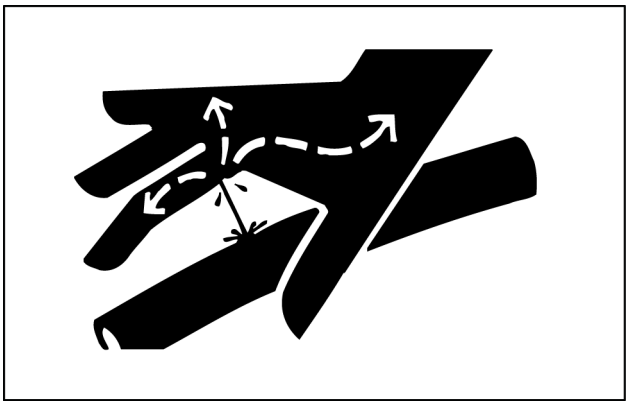
Relieve the residual pressure by moving the hydraulic control levers several times.

Tighten all connections before applying pressure.

To protect eyes wear a face shield or safety goggles.

Protect your hands and body from possible jets of fluid under pressure.

Swallowing hydraulic oil is a severe health hazard.



TULI12WEX2012AA 8

When hydraulic oil has been swallowed, avoid vomiting, but consult a doctor or go to a hospital.

If an accident occurs, see a doctor familiar with this type of injury immediately.

Any fluid penetrating the skin must be removed within few hours to avoid serious infections.

Flammable splashes may originate because of heating near lines with fluids under pressure, resulting in serious burns. Do not weld or use torches near lines containing fluids or other flammable materials.

Lines under pressure can accidentally be pierced when the heat expands beyond the area immediately heated.

Arrange for temporary fire resistant shields to protect hoses or other components during welding or torch use.

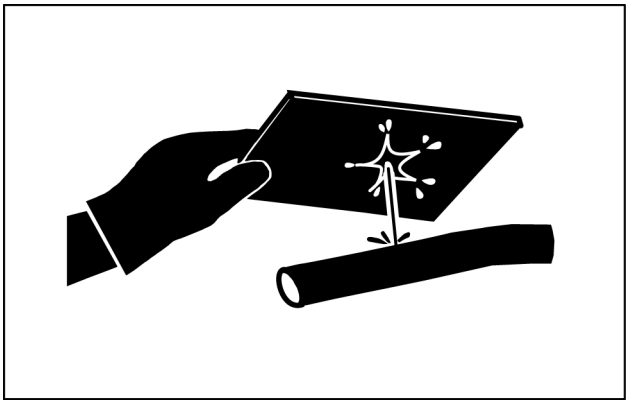
Have any visible leakage repaired immediately.

Discharged oil pollutes the environment. Soak up any oil that has spilled with a proper binding agent. Sweep up binding agent and dispose of it separately from other waste.

Never search for leakages with fingers; instead, use a piece of cardboard and always wear goggles.

Never repair a damaged line; always replace it. Replace hydraulic hoses immediately on detecting any damaged or moist areas.

Always store hydraulic oil in the original containers.



TULI12WEX2013AA 9

Hoses and tubes

Always replace hoses and tubes if the cone end or the end connections on the hose are damaged.

When installing a new hose, loosely connect each end and make sure the hose takes up the correct position before tightening the connections. Clamps should be tightened sufficiently to hold the hose without crushing and to prevent chafing.

After hose replacement to a moving component, check that the hose does not foul by moving the component through the complete range of travel. Be sure any hose which has been installed is not kinked or twisted.

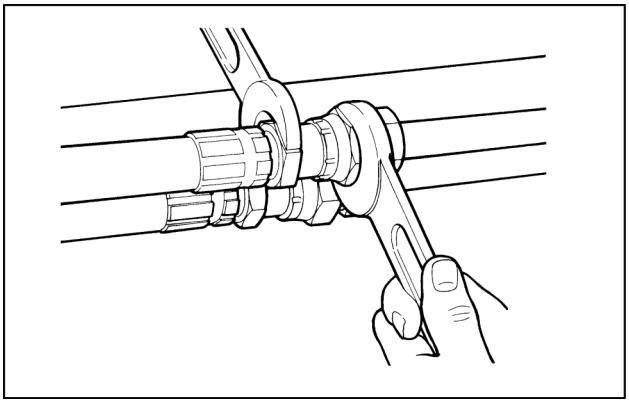
Hose connections which are damaged, dented, crushed or leaking, restrict oil flow and the productivity of the components being served. Connectors which show signs of movement from the original position have failed and will ultimately separate completely.

A hose with a frayed outer sheath will allow the water penetration. Concealed corrosion of the wire reinforcement could subsequently occur along the hose length with resultant hose failure.

Ballooning of the hose indicates an internal leakage due to structural failure. This condition rapidly deteriorates and total hose failure soon occurs.

Kinked, crushed, stretched or deformed hoses generally suffer internal structural damage which can result in oil restriction, a reduction in the speed of operation and ultimate hose failure.

Free-moving, unsupported hoses must never be allowed to touch each other or related working surfaces. This causes chafing which reduces hose life.



TULI12WEX2014AA 10

O-rings

Replace O-rings, seal rings and gaskets whenever they are disassembled.

Never mix new and old seals or O-rings, regardless of condition. Always lubricate new seal rings and O-rings with hydraulic oil before installation to relevant seats.

This will prevent the O-rings from rolling over and twisting during mounting which will jeopardize sealing.

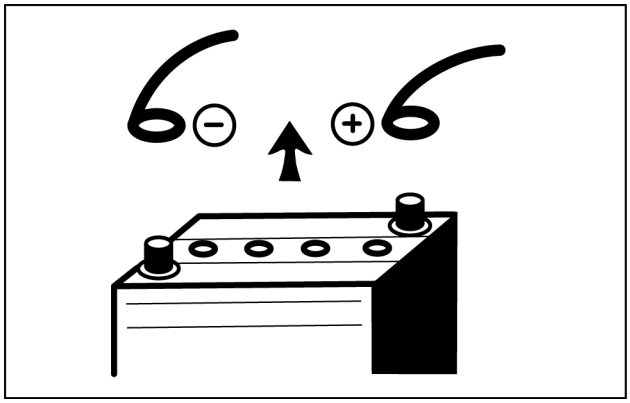
Battery

Batteries give off explosive gases.

Never handle naked flames and unshielded light sources near batteries (No smoking is addressed in next instruction).

To prevent any risk of explosion, observe the following instructions:

- When disconnecting the battery cables, always disconnect the negative (-) cable first.
- To reconnect the battery cables, always connect the negative (-) cable last.
- Never short-circuit the battery terminals with metal objects.
- Do not weld, grind or smoke near a battery.

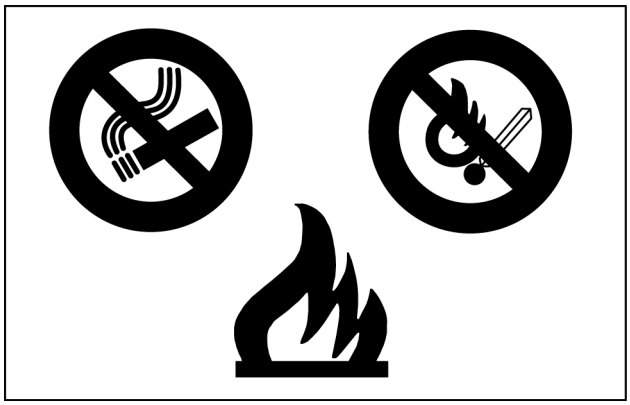


TULI12WEX2015AA 11

Battery electrolyte causes severe burns. The battery contains sulphuric acid. Avoid any contact with the skin, eyes or clothing.

Antidote:

- EXTERNAL: Rinse well with water, removing any soiled clothing.
- INTERNAL: Avoid vomiting. Drink water to rinse your mouth. Consult a doctor.
- EYES: Rinse abundantly with water for **15 min** and consult a doctor.
- When the electrolyte of a battery is frozen, it can explode if you attempt to charge the battery or if you try to start the engine using a booster battery. Always keep the battery charged to prevent the electrolyte freezing.



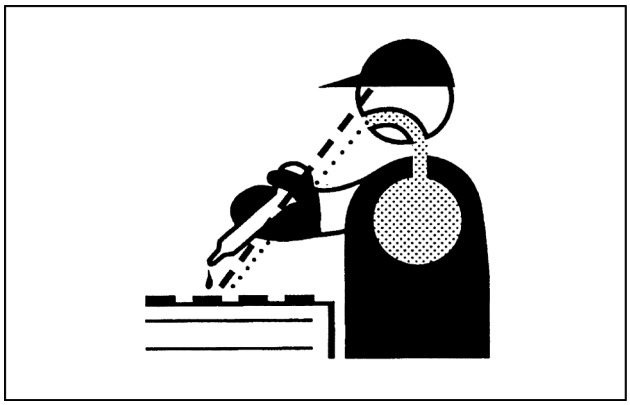
TULI12WEX2016AA 12

Provide good ventilation when changing a battery or using a battery in an enclosed space. Always protect your eyes when working near a battery.

Never set tools down on the battery. They may induce a short circuit, causing irreparable damage to the battery and injuring persons.

Never wear metal necklaces, bracelets or watch straps when working on the battery. The metal parts may induce a short circuit resulting in burns.

Dispose of used batteries separately from other waste in the interests of environmental protection.



TULI12WEX2017AA 13

Flammable liquids

When handling flammable liquids:

- Do not smoke.
- Keep away from unshielded light sources and naked flames.

Fuels often have a low flash point and are readily ignited.

Never attempt to extinguish burning liquids with water. Use:

- Dry powder
- Carbon dioxide
- Foam

TULI12WEX2016AA 14

Water used for extinguishing purposes would vaporize instantaneously on contact with burning substances and spread burning oil, for example, over a wide area. Water generates short circuits in the electrical system, possibly producing new hazards.

Stay away from open flames during refilling of hydraulic oil or fuel.

Fuel or oil spills can cause slipping hazards; thoroughly contain and clean affected areas.

Always tighten the safety plugs of fuel tank and hydraulic oil tank firmly.

Never use fuel to clean machine parts that will be exposed to dirt or debris.

Use a non-flammable product for cleaning parts.

TULI12WEX2018AA 15

Always perform fuel or oil refilling in well aired and ventilated areas.

During refuelling hold the pistol firmly and always keep it always in contact with the filler neck until the end of the refuelling, to avoid arcing due to static electricity.

Do not overfill the tank but leave a space for fuel expansion.

Never refuel when the engine is running.

Take all the necessary safety measures when welding, grinding or when working near a naked flame.

TULI12WEX2019AA 16

Tires

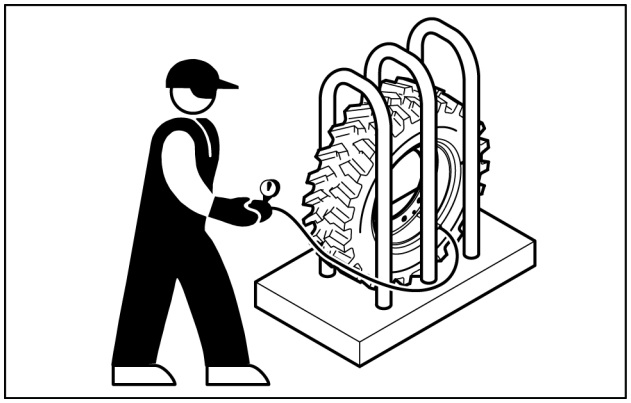
Before inflating the tires, always check the condition of rims and the outer condition of tires to find out the presence of dents, cuts, tears of reinforcement plies or other faults. Before inflating a tyre, make sure that there are no nearby persons, then position yourself at tread side.

When inflating tires, ensure tire pressure does not exceed that prescribed by the tire manufacturer. Ensure that the pressure of the right tire corresponds to the pressure of the left tire.

NOTE: *The front and rear tire pressures may be different.*

Never use reconditioned rims because possible welds, heat treatments or brazings not performed correctly can weaken the wheels and cause following damages or failures. Deflate the tires before their disassembly.

Before taking out possible jammed objects from the rims, it is necessary to deflate the tires. Inflate tires by means of an inflation pistol complete with extension and pressure control valve.



TULI12WEX2020AA 17

Cleaning

Clean the exterior of all components before carrying out any form of repair. Dirt and dust can reduce the efficient working life of a component and lead to costly replacement.

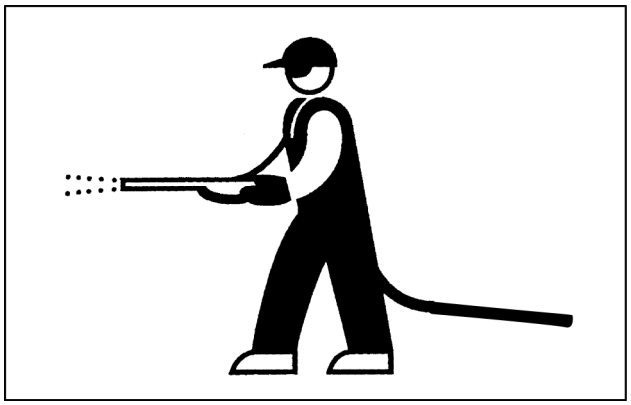
Solvents should be checked that they are suitable for the cleaning of components and also that they do not risk the personal safety of the user.

Dirt, oil, grease and scattered tools are dangerous for people because they can create slipping or tripping hazards

For machine cleaning, use a jet of warm water or steam under pressure and commercial detergents. Never use fuel, petroleum or solvents, because they can leave an oily residue that attracts dust, and solvents (even if weak) damage the paint and can lead to the formation of rust.

Never use water jets or steam on sensors, connectors or other electric components.

Avoid direct spray of seals and seams to prevent water penetration inside the cab.



TULI12WEX2021AA 18

Waste disposal

Improperly disposing of waste can threaten the environment.

Each country has its own Regulations on this subject. It is therefore advisable to prepare suitable containers to collect and store momentarily all solid and fluid materials that must not be scattered in the environment to avoid pollution.

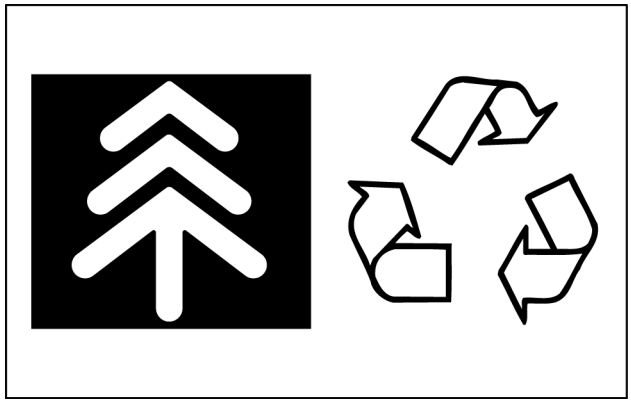
At preset intervals these products will be delivered to disposal stations legally recognized and present in this Country.

Hereunder are listed some products of the machine requiring disposal:

- Lubricating oil
- Brake system oil
- Coolant mixture, condensation rests and pure antifreeze
- Fuel
- Filter elements, oil and fuel filters
- Filter elements, air filters
- Battery

Also polluting rags, paper, sawdust and gloves must be disposed in compliance with the same procedures.

Do not use food or beverage containers that may mislead someone into drinking from them. Do not pour waste onto the ground, down a drain, or into any water source. Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service centre to recover and recycle used air conditioning refrigerants. Obtain information on the proper way to recycle or dispose of waste from your local environmental or recycling centre, or from your Dealer.



TULI12WEX2022AA 19

Foreword - Ecology and the environment

Soil, air, and water are vital factors of agriculture and life in general. When legislation does not yet rule the treatment of some of the substances required by advanced technology, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

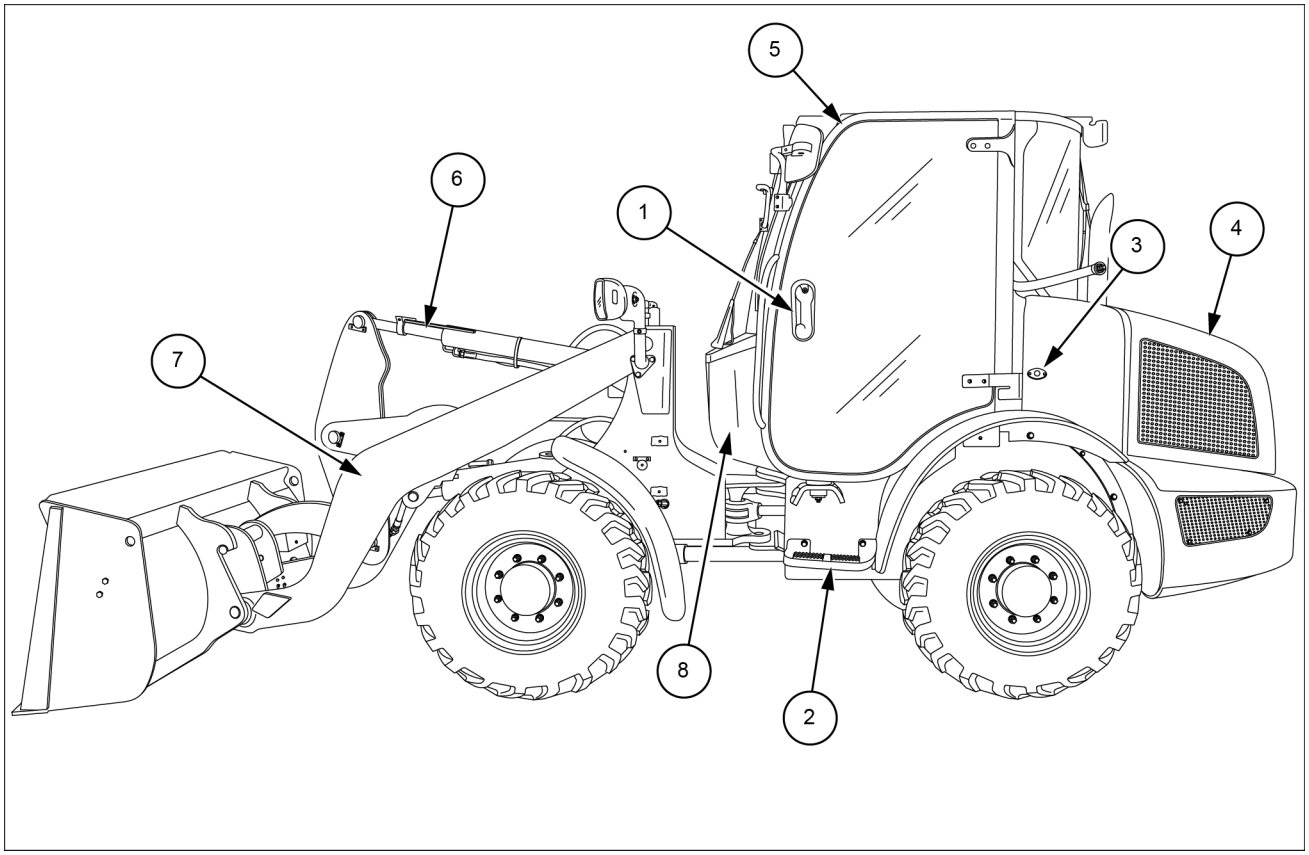
NOTE: *The following are recommendations that may be of assistance:*

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use, and dispose of these substances.
- Agricultural consultants will, in many cases, be able to help you as well.

Helpful hints

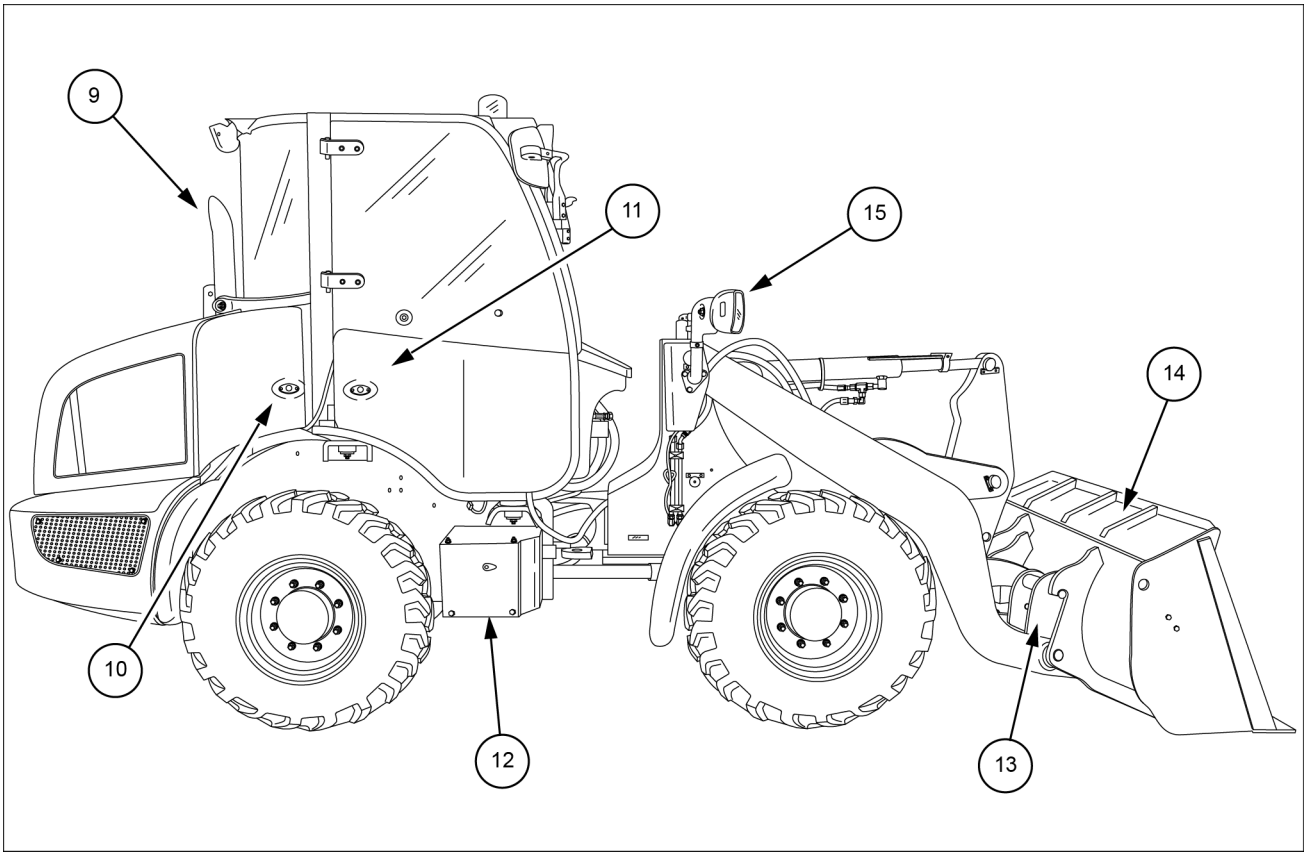
- Avoid filling tanks using cans or inappropriate pressurized fuel delivery systems that may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances that may be harmful to your health.
- Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
- Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
- Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil, but should be collected and disposed of properly.
- Do not open the air-conditioning system yourself. It contains gases that should not be released into the atmosphere. Your CASE CONSTRUCTION dealer or air conditioning specialist has a special extractor for this purpose and will have to recharge the system properly.
- Repair any leaks or defects in the engine cooling or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
- Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, allowing the loss of oils, coolant, etc.

Product identification - Machine components



LEIL14CWL0054FB 1

1. Cab door and hand holds
2. Steps
3. Fuel tank access)
4. Engine hood
5. Roll Over Protection Structure (ROPS) and Falling Objects Protective Structure (FOPS) cab
6. Boom cylinder
7. Loader lift arms
8. Cab air filter access



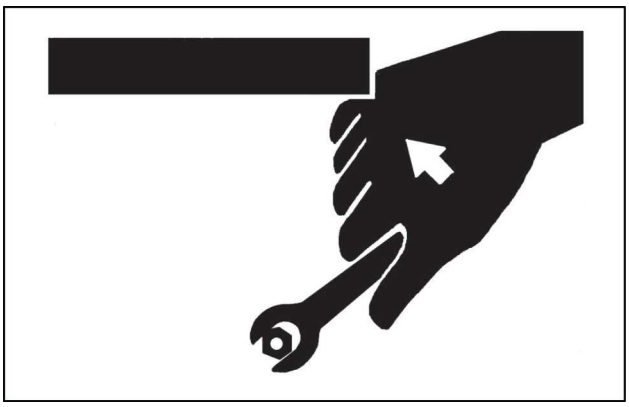
LEIL14CWL0055FB 2

9. Muffler
10. Hydraulic oil tank accessl
11. Fuse access door
12. Battery access
13. Quick Coupler (Volvo compatible version)
14. Bucket (Z-bar version)
15. Driving lights

Torque

Bolt types

NOTICE: *Use tools appropriate for the work to be done. Makeshift tools and procedures can create safety hazards. For loosening and tightening nuts and bolts, use the correct tools. Avoid bodily injury caused by slipping wrenches.*



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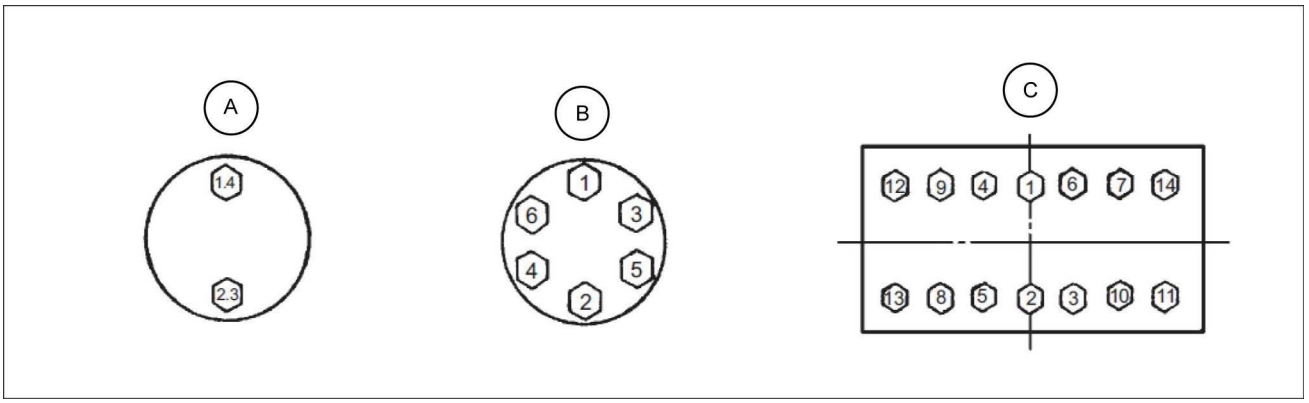
Bolt tightening order

When tightening two or more bolts, tighten them alternately, as shown, to ensure even tightening.



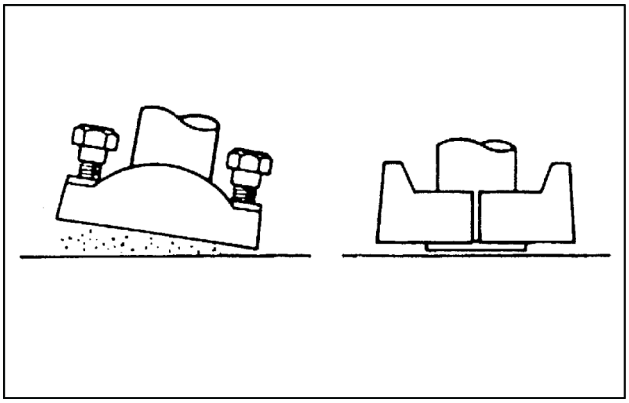
SMIL13CEX0149EA 2

A Equally tighten upper and lower alternately
B Tighten diagonally
C Tighten from center and diagonally

Service recommendations for split flange

1. Be sure to clean and inspect sealing surfaces. Scratches/roughness cause leaks and seal wear. Unevenness causes seal extrusion. If defects cannot be polished out, replace the component.
2. Be sure to use only specified O-rings. Inspect O-rings for any damage. Take care not to file O-ring surfaces. When installing an O-ring into a groove, use grease to hold it in place.
3. Loosely assemble split flange halves. Make sure that the split is centrally located and perpendicular to the port. Hand-tighten the bolts to hold the parts in place. Take care not to pinch the O-ring.
4. Tighten bolts alternately and diagonally, as shown, to ensure even tightening.
5. Do not use air wrenches. Using an air wrench often causes tightening of one bolt fully before tighten the others, resulting in damage to O-rings or uneven tightening of bolts.

A - WRONG



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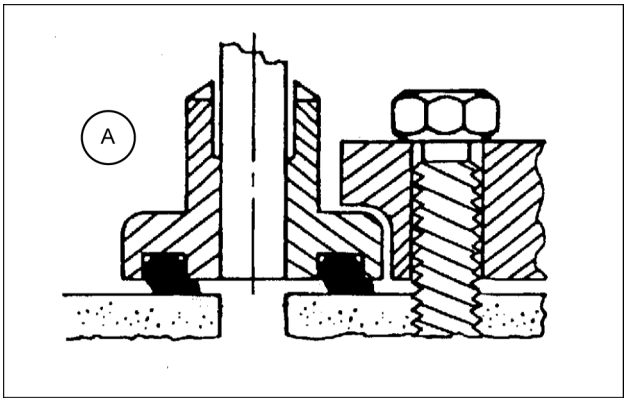

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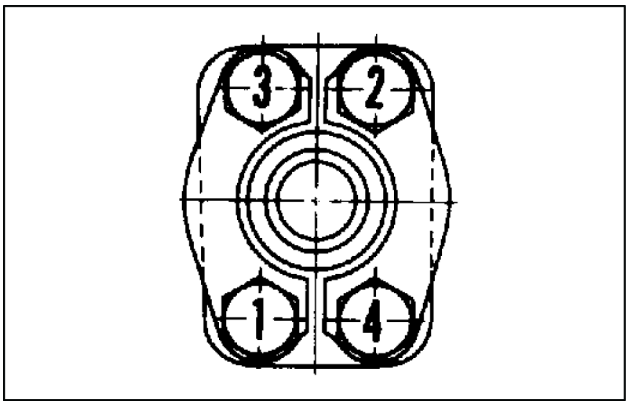

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Nut and bolt lockings

Lock plate

NOTICE: *Do not reuse lock plates. Do not try to bend the same point twice.*

Cotter pin

NOTICE: *Do not reuse cotter pins. Match the holes in the bolt and nut while tightening, not while loosening.*

Lock wire

NOTICE: *Apply wire to bolts in the bolt tightening direction, not in the bolt-loosening direction.*

A - RIGHT

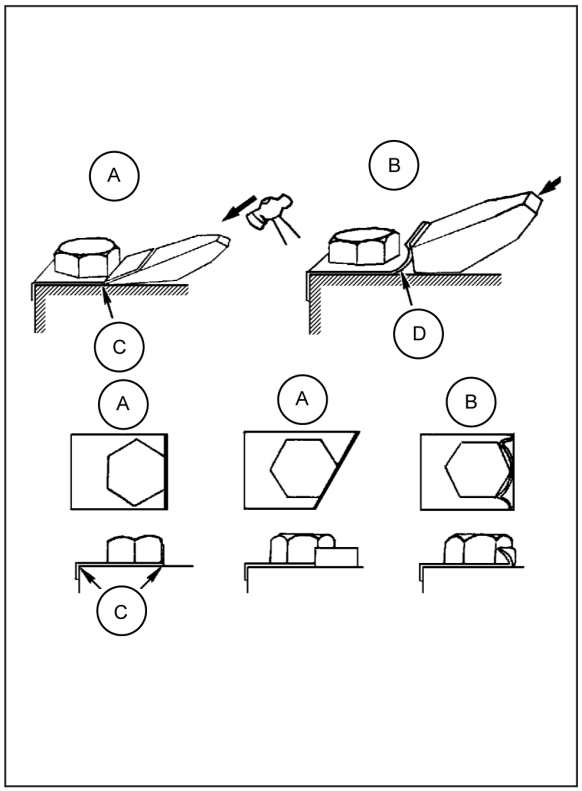
B - WRONG

C - Bend along edge sharply

D - Do not bend it round

E - Tighten

F - Loosen



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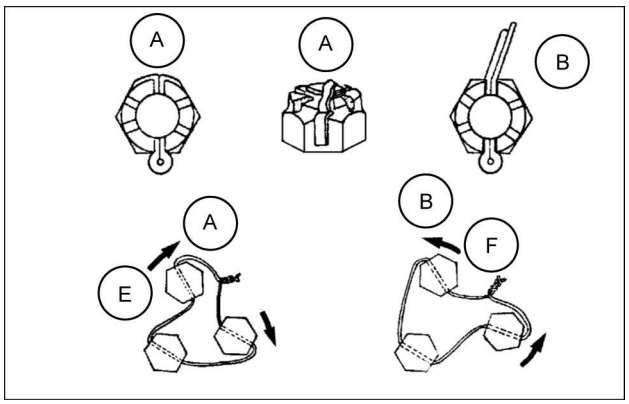


SMIL13CEX0152AA 7

Piping joint

Pipe thread connection/Union joint tightening torque specifications

Union joint

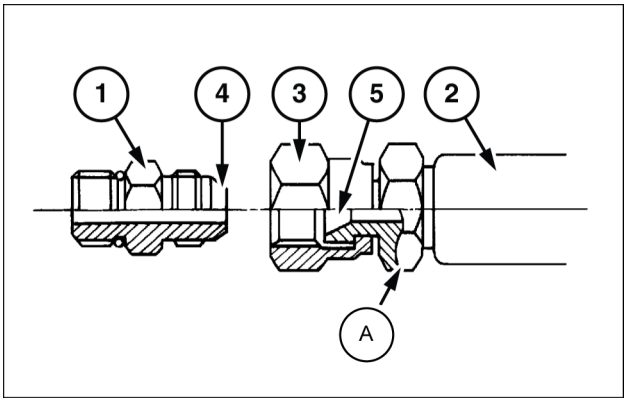
Metal sealing faces **(4)** and **(5)** of adaptor **(1)** and hose **(2)** fit together to seal pressure oil. Union joints are used to join small-diameter lines.

1. Do not over tighten union nut **(3)**. Excessive force will be applied to metal sealing surfaces **(4)** and **(5)**, possibly cracking adaptor **(1)**. Be sure to tighten union nut **(3)** to specifications.
2. Scratches or other damage to sealing surfaces **(4)** or **(5)** will cause oil leakage at the joint. Take care not to damage them when connecting/disconnecting.

A - Joint body

B - Male Union Joint

C - Female Union Joint



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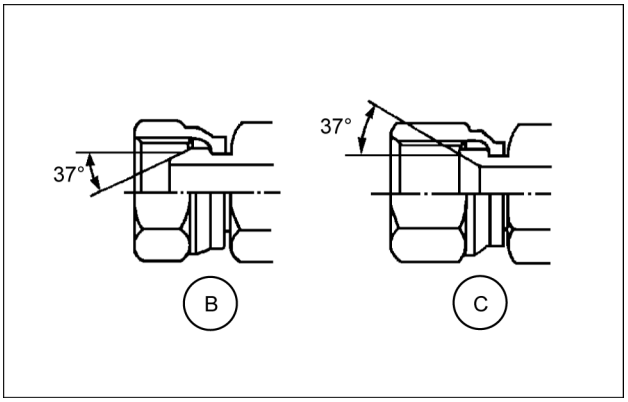

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Type	Wrench size		Tightening torque
	Union nut	Joint body	
37° Union joint	**19 mm**	**17 mm**	**29 N·m** (**21 lb ft**)
	22 mm	**19 mm**	**39 N·m** (**29 lb ft**)
	27 mm	**22 mm**	**78.5 N·m** (**58 lb ft**)
	36 mm	**30 mm**, **32 mm**	**157 N·m** (**116 lb ft**)
	41 mm	**36 mm**	**205 N·m** (**151 lb ft**)
	50 mm	**46 mm**	**323.6 N·m** (**239 lb ft**)

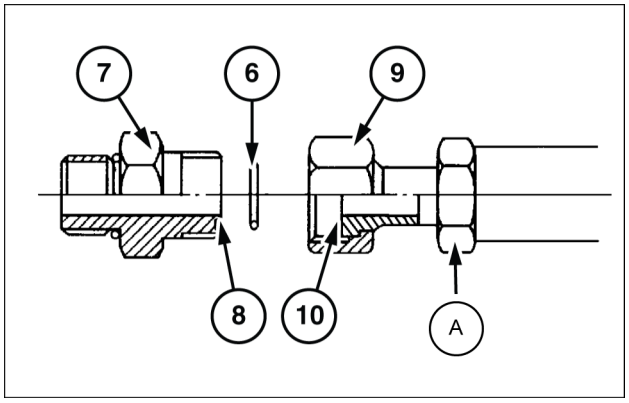
NOTE: *Tightening torque for the non union type 37° male joint is the same as the 37° female union joint.*

O-ring seal joint

O-ring **(6)** seats against the end face of adaptor **(7)** to seal pressure oil.

O-ring procedures:

1. Be sure to replace O-ring **(6)** with a new one when reconnecting.
2. Before tightening union nut **(9)**, confirm that O-ring **(6)** is seated correctly in O-ring groove **(8)**. Tightening union nut **(9)** with O-ring **(6)** displaced will damage O-ring, resulting in oil leakage.
3. Take care not to damage O-ring groove **(8)** or sealing face **(10)**. Damage to O-ring **(6)** will cause oil leakage.
4. If union nut **(9)** is found to be loose, causing oil leakage, do not tighten it to stop the leak. Instead, replace O-ring **(6)** with a new one, then tighten union nut **(9)** after confirming that O-ring **(6)** is securely seated in place.



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A Joint body

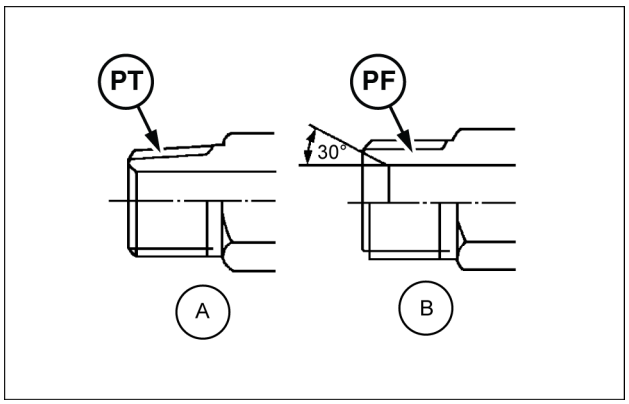
Wrench size		Tightening torque
Union nut	Joint body	
19 mm	17 mm	29.4 N·m (22 lb ft)
22 mm	19 mm	68.6 N·m (51 lb ft)
27 mm	22 mm	93 N·m (69 lb ft)
30 mm	27 mm	137.3 N·m (101 lb ft)
36 mm	30 mm	175 N·m (129 lb ft)
41 mm	36 mm	205 N·m (151 lb ft)
50 mm	46 mm	320 N·m (236 lb ft)

Screwed-in connection

NOTICE: *Many types of screwed-in connections are used for hose connections.*
Be sure to confirm that the thread pitch and thread type (tapered or straight) are the correct type before using any screw-in connection.

A - Male Tapered Thread

B - Female Straight Thread



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Male tapered thread	
Wrench joint body	Tightening torque
17 mm, 19 mm	34 N·m (25 lb ft)
22 mm	49 N·m (36 lb ft)
27 mm	93 N·m (69 lb ft)
32 mm, 36 mm	157 N·m (116 lb ft)
41 mm	205 N·m (151 lb ft)
50 mm	320 N·m (236 lb ft)
60 mm	410 N·m (302 lb ft)

Seal tape application

Seal tape is used to seal clearances between male and female threads, so as to prevent any leakage between threads.

Be sure to apply just enough seal tape to fill up thread clearances. Do not overwrap.

- Application procedure

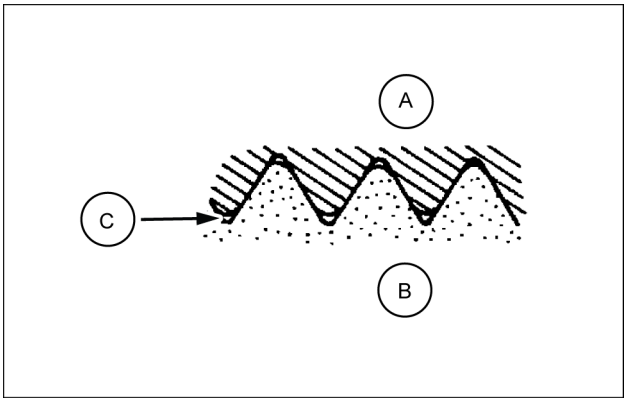
Confirm that the thread surface is clean, free of dirt or damage.

Apply seal tape around threads as shown. Wrap seal tape in the same direction as the threads.

A - Internal Thread

B - External Thread

C - Clearance



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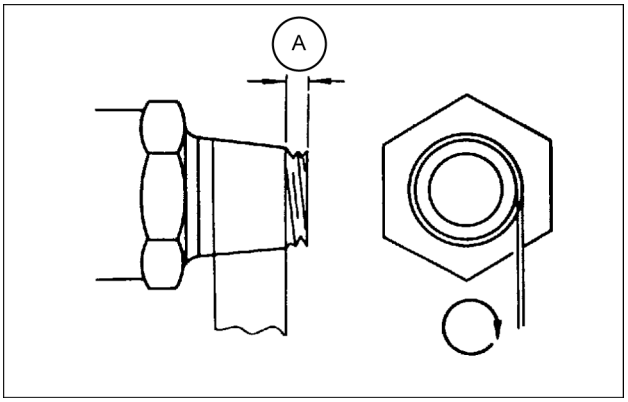

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A Leave one to two pitch threads uncovered

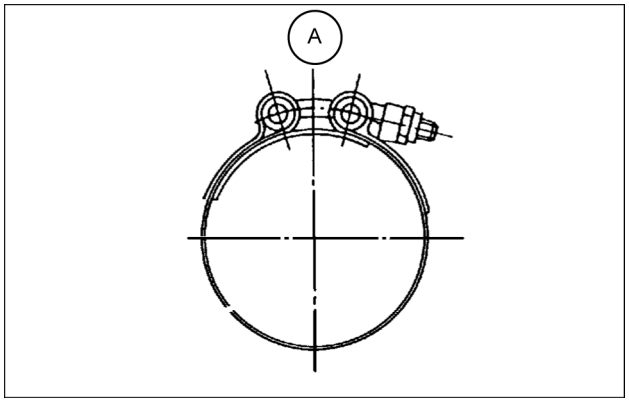
Low-pressure-hose clamp tightening torque

Low-pressure-hose clamp tightening torque differs depending on the type of clamp.

See below for correct tightening torque of each type of low-pressure-hose clamp.

T-bolt type band clamp: **4.4 N·m** (**3.25 lb ft**)

Worm gear type band clamp: **5.9 - 6.9 N·m** (**4.4 - 5.1 lb ft**)



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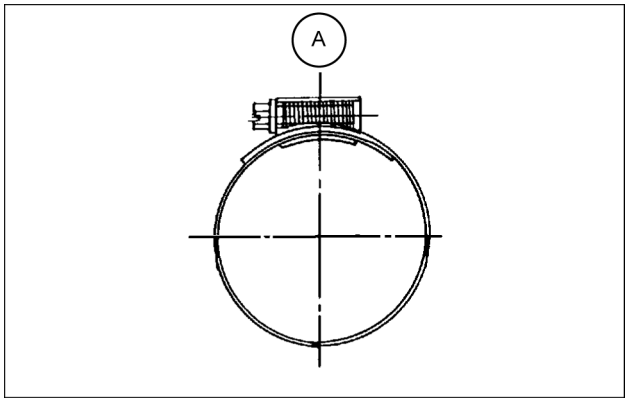
A - T-Bolt Type



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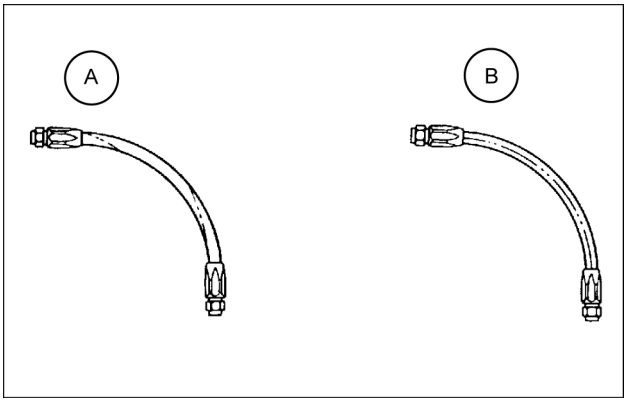
A - Worm Gear Type

Connecting hose

1. When replacing hoses, be sure to use only genuine parts. Using hoses other than genuine hoses may cause oil leakage, hose rupture or separation of fitting, possibly resulting in a fire on the machine.
2. Do not install hoses kinked. Application of high oil pressure, vibration, or an impact to a kinked hose may result in oil leakage, hose rupture or separation of fitting.
   Utilize print marks on hoses when installing hoses to prevent hose from being installed kinked.
3. If hoses rub against each other, wear to the hoses will result, leading to hose rupture. Take necessary measures to protect hoses from rubbing against each other.
   Take care that hoses do not come into contact with moving parts or sharp objects.



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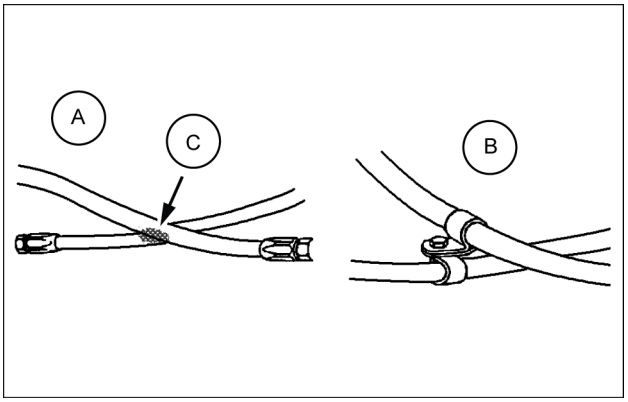
A - WRONG
B - RIGHT
C - Rubbing Against Each Other



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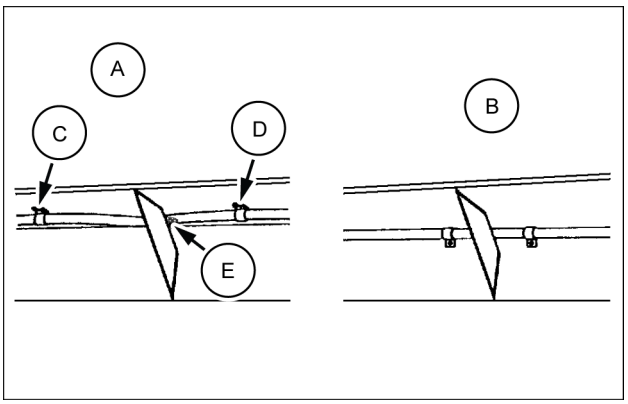
A - WRONG
B - RIGHT
C - Clamp
D - Clamp
E - Rubbing



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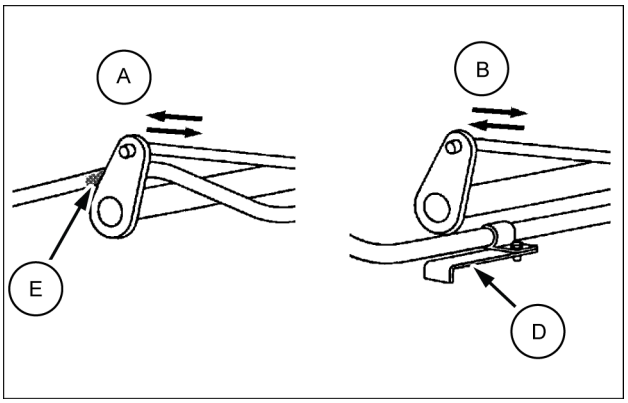

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Consumables

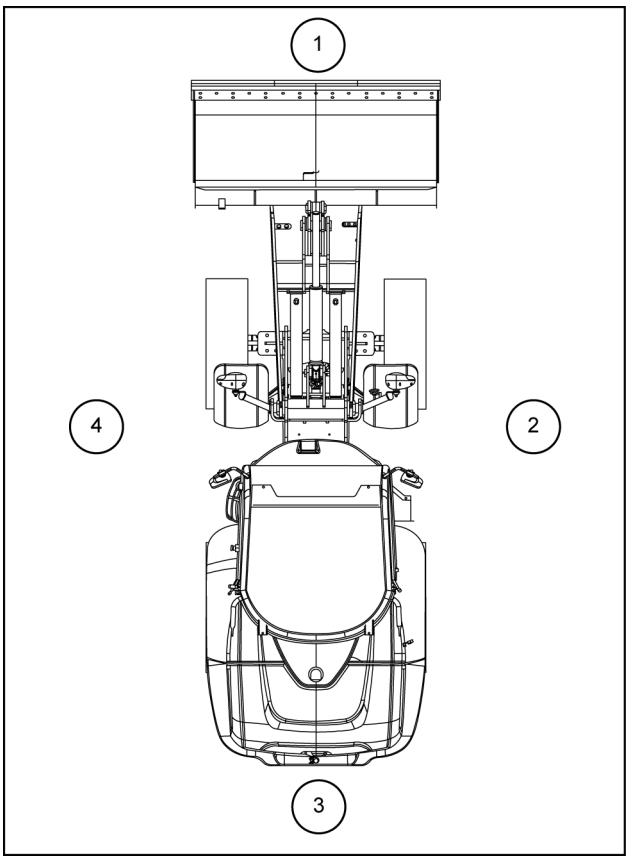
Engine		
	Type of oil	**CASE AKCELA UNITEK NO. 1™ SBL CJ-4 SAE 10W-40**
	Capacity (with filter change)	**7.0 L** (**7.4 US qt**)
Cooling system		
	Type of coolant	**CASE AKCELA PREMIUM ANTI-FREEZE** (conventional coolant) or **CASE AKCELA ACTIFULL™ OT EXTENDED LIFE COOLANT** (OAT coolant) *
	Total system capacity (50% coolant - 50% water)	**13 L** (**3.4 US gal**)
Fuel system		
	System capacity	**25.0 L** (**6.6 US gal**)
Hydraulic system and transmission		
	Type of fluid	**CASE AKCELA HYDRAULIC EXCAVATOR FLUID** (conventional fluid) **CASE AKCELA HY-TRAN® ULTRA™ SSL TRANSMISSION OIL** (low temperature fluid)
	Total system capacity	**53 L** (**14 US gal**)
	Reservoir capacity	**40.0 L** (**10.6 US gal**)
Axles		
	Type of oil	**CASE AKCELA GEAR 135 H EP 80W-90**
	Front axle	Use amount required to top off the axle
	Rear axle	Use amount required to top off the axle
Brake system		
	Type of oil	**BRAKE LHM FLUID**
	Service capacity	**1.0 L** (**1.1 US qt**)
Grease fittings, as required		
	Type of grease	**TUTELA MULTI-PURPOSE EP GREASE 251H, GR-9**

NOTE: ** see the Operator Manual for replacement of coolant.*

Product identification - Machine orientation

The terms right-hand, left-hand, front, and rear are used in this manual to indicate the sides as they are seen from the operator's seat.

1. Front
2. Right-hand
3. Rear
4. Left-hand



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Hydraulic contamination

Contamination in the hydraulic system is a major cause of the malfunction of hydraulic components. Contamination is any foreign material in the hydraulic oil.

Contamination can enter the hydraulic system in several ways:

- When you drain the oil or disconnect any line
- When you disassemble a component
- From normal wear of the hydraulic components
- From damaged seals or worn seals
- From a damaged component in the hydraulic system

All hydraulic systems operate with some contamination. The design of the components in this hydraulic system permits efficient operation with a small amount of contamination. An increase in this amount of contamination can cause problems in the hydraulic system.

The following list includes some of these problems:

- Cylinder rod seals that leak
- Control valve spools that do not return to neutral
- Movement of control valve spools is difficult
- Hydraulic oil that becomes too hot
- Pump gears, housing, and other parts that wear rapidly
- Relief valves or check valves held open by dirt
- Quick failure of components that have been repaired
- Slow cycle times are slow. The machine does not have enough power.

If your machine has any of these problems, check the hydraulic oil for contamination.

There are two types of contamination: microscopic and visible.

Microscopic contamination occurs when very fine particles of foreign material are suspended in the hydraulic oil. These particles are too small to see or feel. Microscopic contamination can be found by identification of the following problems or by testing in a laboratory.

Examples of problems caused by microscopic contamination:

- Cylinder rod seals that leak
- Control valve spools that do not return to neutral
- The hydraulic system has a high operating temperature

Visible contamination is foreign material that can be found by sight, touch, or odor. Visible contamination can cause a sudden failure of components.

Examples of problems caused by visible contamination:

- Particles of metal or dirt in the oil
- Air in the oil
- Dark or thick oil
- Oil with an odor of burned oil
- Water in the oil

If you find contamination, use a portable filter to clean the hydraulic system.

Basic instructions - How to use the maintenance standard and precautions

Application

WHEN THE MACHINE IS NEW

Confirm that the performances are in accordance with standard specifications as compared to the performance standards.

AT SPECIFIC SELF INSPECTION (RULE BY COUNTRY)

Use the data for the criterion, for the purpose of correction, adjustment and replacement.

WHEN PERFORMANCES ARE DETERIORATED

Determine whether it is caused by a fault or end of service life after long hours of operation, to be used for safety and economical considerations.

WHEN MAIN COMPONENTS ARE REPLACED

For example, use data to restore performances of pumps and others.

Terminology

STANDARD VALUES

Values to be used to condition or assemble a new machine. Where special notes are not given, these values represent standard specifications (machine with standard attachments and standard shoes).

REFERENCE VALUES FOR REMEDY

Values at which readjustment is required. In order to ensure performance and safety it is strictly prohibited to use the machine over the specified values.

SERVICE LIMIT

This is the limit value at which reconditioning is impossible without replacement of parts. If the value is expected to exceed the service limit before next inspection and correction are performed, replace the parts immediately. The operation over the specified values causes increase of damage and requires the down time of machine, and also causes safety problems.

Cautions to be exercised at judgment

EVALUATION OF MEASURED DATA

Disagreement of measuring conditions, variations of data peculiar to a new machine, and measuring errors are to be evaluated. Determine generally at what levels measured values are located, instead of determining whether or not values fall within or run out of the reference values.

DETERMINING CORRECTION, ADJUSTMENT OR REPLACEMENT

Machine performances deteriorate with time as parts wear and some deteriorated performances may be restored to new levels. Therefore, determine correction, adjustment or replacement, depending upon the operating hours, kind of work and circumstances in which the machine is placed, and condition the machine performances to its most desirable levels.

Other cautions to be exercised

PARTS LIABLE TO DEGRADE

Rubber products, such as, hydraulic hoses, O-rings, and oil seals deteriorate with time; replace them at regular intervals or at overhauls.

PARTS REQUIRING REGULAR REPLACEMENT

Out of critical hoses that are necessary to secure safety, we designate Very Important Parts (V.I.P) and recommend that they should be replaced regularly.

INSPECTION AND REPLACEMENT OF OILS AND GREASES

In performing maintenance, it is necessary for the user to familiarize himself with how to handle the machine safely, cautions to be exercised and inspection/lubrication procedures. Refer to the Operators Manuals as well.

Basic instructions - Precaution for disassembly and assembly

Preparations for disassembly

- Thoroughly wash the machine before bringing it into the shop. Bringing a dirty machine into the shop may cause machine components to be contaminated during disassembling/assembling, resulting in damage to machine components, as well as decreased efficiency in service work.
- Be sure to thoroughly understand all disassembling/assembling procedures beforehand, to help avoid incorrect disassembling of components as well as personal injury.
- Check and record the items listed below to prevent problems from occurring in the future.

1. The machine model, machine serial number, and hour meter reading.
2. Reason for disassembly (symptoms, failed parts, and causes).
3. Clogging of filters and oil, water or air leaks, if any.
4. Capacities and condition of lubricants.
5. Loose or damaged parts.

- Prepare the necessary tools to be used and the area for disassembling work.
- Wear appropriate clothing, safety shoes, safety helmet, goggles, and clothes with long sleeves.
- Confirm ready access to a first-aid kit and fire extinguisher, as well as appropriate emergency personnel contacts in the case of a medical accident or fire.
- Before performing any work on the machine, follow lockout/tagout procedures by attaching a “maintenance in progress tag”. This tag can be applied on the left-hand control lever, safety lever or cab door. Notify those with access to the machine that you will be performing the maintenance.

Disassembling and assembling hydraulic equipment

- Before removing lines, release the pressure of hydraulic oil tank, or open the cover on the return side to tank, and take out the filter.
- Drain the oil in removed lines into an appropriate container to prevent oil contamination.
- Protect open connections with plugs or caps to prevent oil from leaking and debris from contaminating the system.
- Thoroughly clean the outside of components before disassembling, and drain hydraulic oil and gear oil before disassembly.

Disassembling hydraulic equipment

- Impaired performance and function of hydraulic equipment after unauthorized service may not be covered under warranty by the manufacturer. Consult your local dealer for service.
- If it is unavoidably necessary to disassemble and modify, it should be carried out by experts or personnel qualified through service training.
- Make match mark on parts for reassembling.
- Before disassembling, read instructions in advance, and determine if the service is required to be performed by an authorized dealer.
- Use appropriate specialty tools and jigs if required.
- If parts can not be removed as specified by the procedure, never force removal. Check for other failures that may be causing binding or interference.
- Inspect parts for wear and clearance; record the measured values. Replace components if the values fall outside of the recommended range.
- If an abnormality is detected, repair or replace the parts.
- When removing parts, use appropriate markings or labels to ensure thy can be reinstalled in the correct order and location without confusion.
- For common parts, pay attention to the quantity and locations of each group of components.

Reassembling hydraulic equipment

- Clean parts in a well ventilated room.
- Remove residual oil with compressed air, and apply fresh hydraulic oil or gear oil to surfaces before reassembly.
- Replace removed o-rings, back-up rings and oil seals with new ones. Apply gear oil on them before reassembling.
- Thoroughly clean and dry surfaces on which liquid sealant must be reapplied.
- Before assembling, remove rust preventives on new parts.
- Use special tools to fit bearings, bushing and oil seal.
- Assemble parts matching to the marks.
- After completion, check that there is no omission of parts.

Basic instructions - Electrical equipment precautions

⚠ WARNING

Battery acid causes burns. Batteries contain sulfuric acid.
Avoid contact with skin, eyes or clothing. Antidote (external): Flush with water. Antidote (eyes): flush with water for 15 minutes and seek medical attention immediately. Antidote (internal): Drink large quantities of water or milk. Do not induce vomiting. Seek medical attention immediately.
Failure to comply could result in death or serious injury.

W0111A

- The disassembly of electrical equipment is not allowed.
- Handle equipment with care so as not to drop it or bump it.
- Connector should be removed by unlocking while holding the connector.
- Never disconnect electrical plugs by pulling on the wires. Always use only the electrical connectors to make the disconnection.
- Check that connector is connected and locked completely.
- Engine key off before removing and connecting connector.
- Engine key off before touching terminals of starter and alternator.
- Wash machine with care so as not to splash water on electrical equipment and connector.
- If water has entered a sealed connection, thoroughly dry both connectors before reconnecting
- Remove battery grounding terminal before beginning work close to battery and battery relay with tools.

Product identification

Model, serial number, and year of manufacture

Record the machine and part identification numbers. When ordering parts, obtaining information or assistance, always supply your dealer with the type and serial number of your machine or accessories. Keep a record of these numbers and your Manufacturer's Statement of Origin in a safe place. If the machine is stolen, report the numbers to your local law enforcement agency.

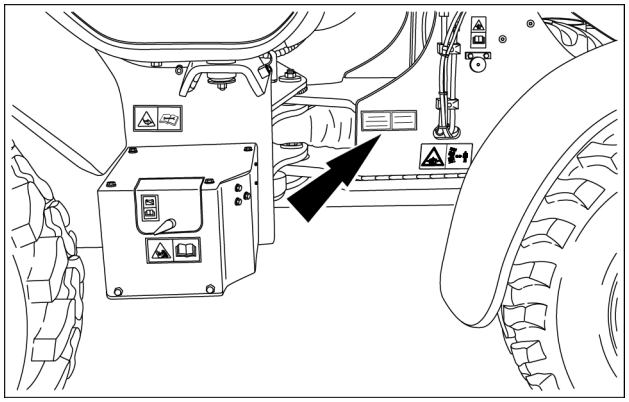
Machine identification

Model name

PIN

Model year

The Product identification number (PIN) plate is located on the right-hand side of the machine.



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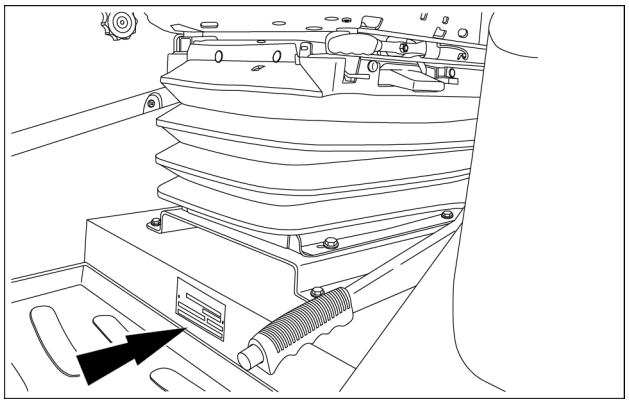
Roll-Over Protective Structure/Falling Object Protective Structure (ROPS/FOPS)

The serial number plate is under the operator's seat.



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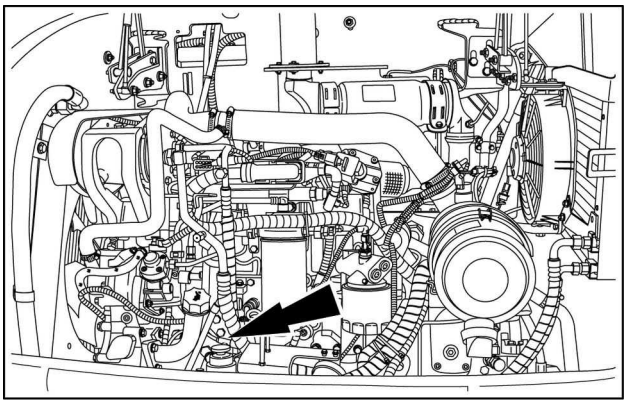
Engine make and model

Engine serial number

The serial number plate is located on the engine block, behind the fuel prefilter.



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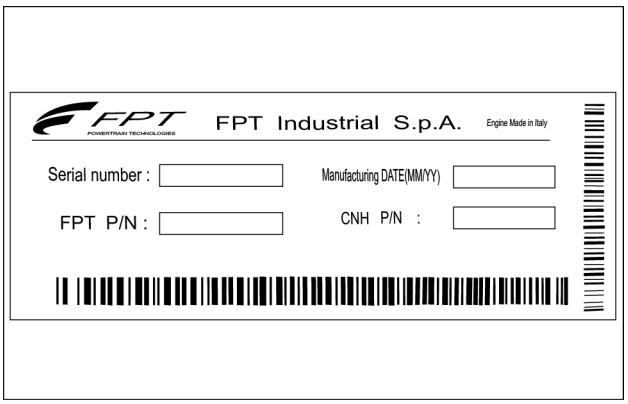
The serial number plate contains the main information of the engine.



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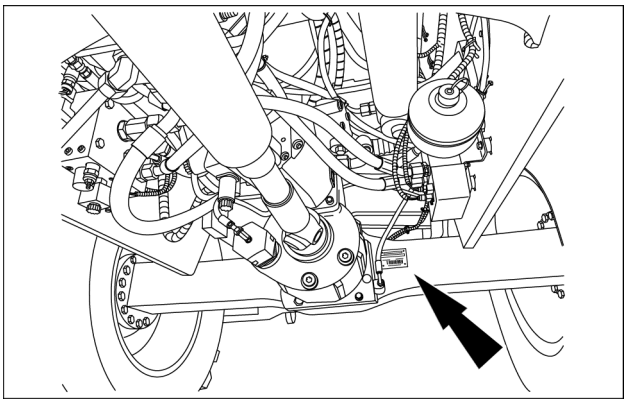
Axle

The serial number plate is on the axle cross member.



LEIL14CWL0407AA 5

SERVICE MANUAL

Engine

121F XT , 121F ZB , 21F XT , 21F ZB , 221F HS , 221F STD , 321F HS , 321F STD

Contents

Engine - 10

Engine - 10

Engine and crankcase - 001

121F XT , 121F ZB , 21F XT , 21F ZB , 221F HS , 221F STD , 321F HS , 321F STD

Contents

Engine - 10

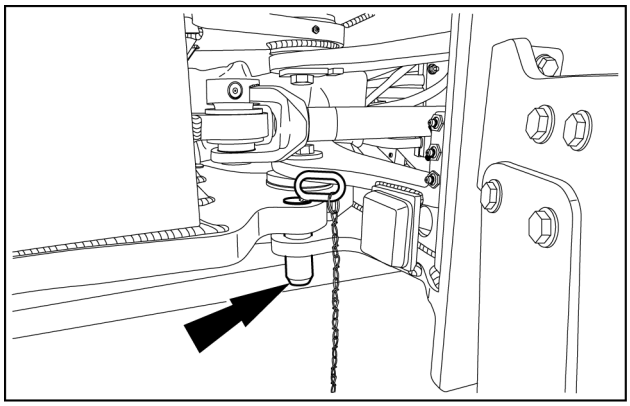
Engine and crankcase - 001

SERVICE

Engine - Remove

NOTE: *Emissions sensors mounted in the exhaust stream are sensitive to extreme vibrations. Use of tools that generate extreme vibrations, such as impact wrenches and hammers, will result in damage to emission sensors. Avoid using these tools during any service procedure in close proximity of emission sensors. If the use of these tools cannot be avoided, remove the sensors using extreme caution prior to performing any service procedure.*

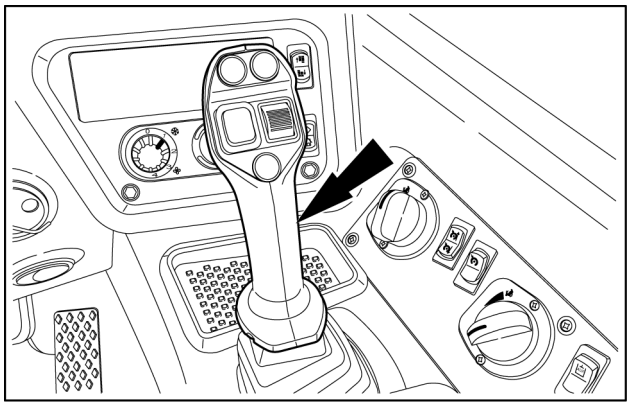
1. Park the machine on firm, level ground, lower the bucket/attachment to the ground.
   Drive the machine into such a position that the bores of the holders are aligned one above the other. Then secure with the pin (arrow). The pin is located inside the support on the frame.
   Stop the engine.



LEIL14CWL0005AB 1

2. Keep all non-authorized personnel clear of the machine. Turn the ignition switch key to the “ON” position.
3. Move the joystick slowly forward and backward and from the right-hand to the left-hand approximately a dozen times. Turn the ignition key to the OFF position. Pump brakes approximately 30 times to bleed accumulators. Bleed ride control accumulator (if equipped) with bleed screw.

NOTE: *before carrying out any service work on the hydraulic system, it is necessary to allow the system to cool: the temperature should not be more than* ***40 °C*** *(****104.0 °F****).*



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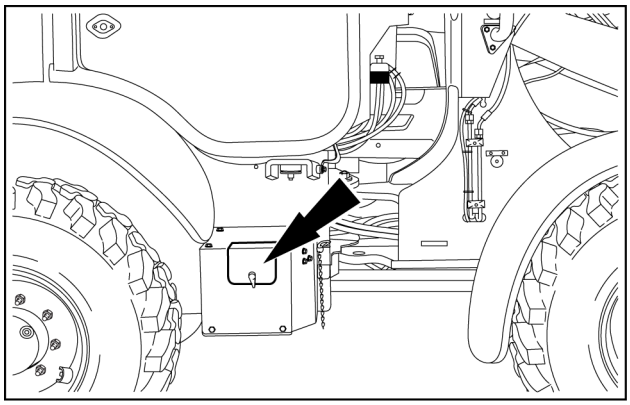
4. Open the outer panel to access the battery main switch. The battery main switch box is located on the right-hand side of the machine, below the operator’s compartment.



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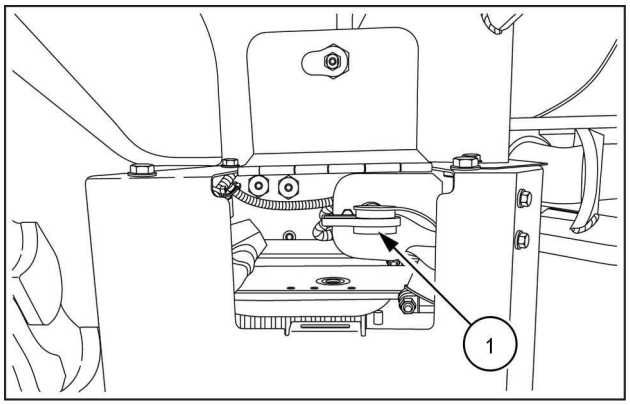
5. Put the battery main switch **(1)** in the OFF position.



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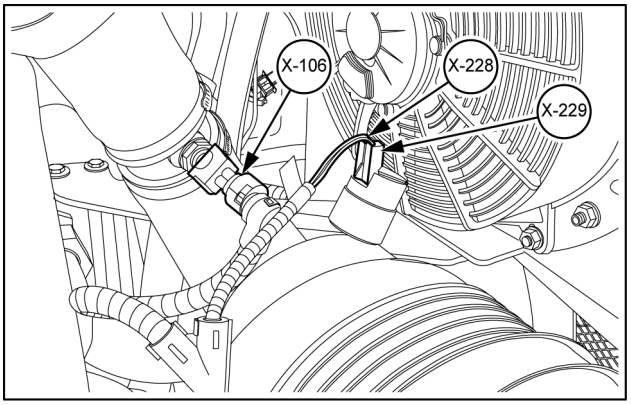
6. Disconnect the wiring harness (X-228) and (X-229) from the engine air filter.
   Disconnect the wiring harness (X-106) from the air temperature sensor.



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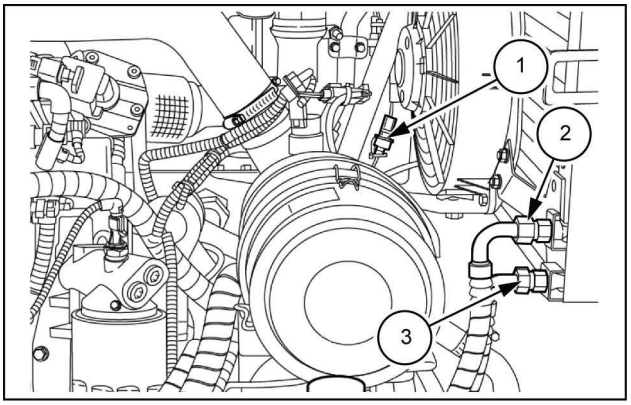
Versions with air conditioning

1. Drain the air conditioning system and disconnect the fan electrical connector **(1)**.
   Tag and disconnect the condenser hoses **(2)** and **(3)**.



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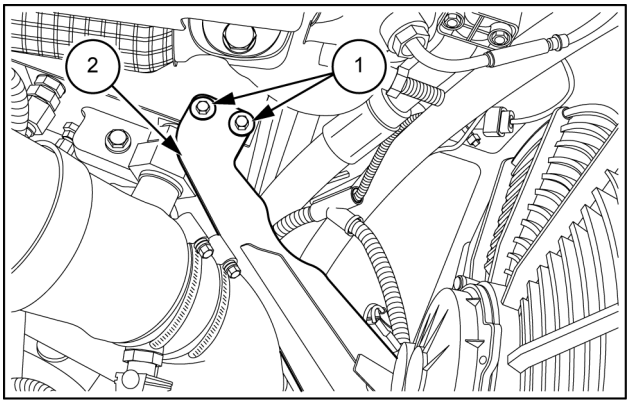
2. Remove the two lower bolts **(1)** of the condenser bracket **(2)**.



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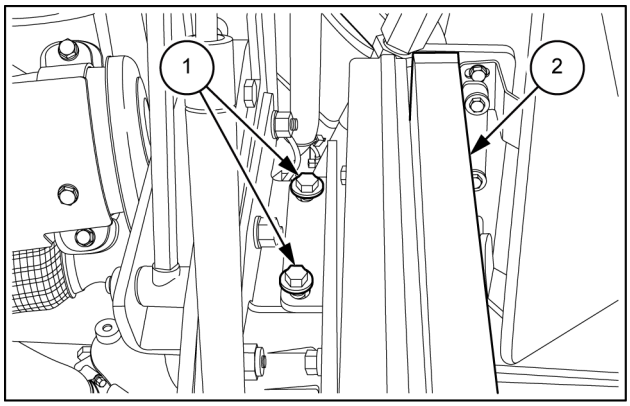
3. Remove the two upper bolts **(1)** of the condenser. Remove the condenser **(2)**.



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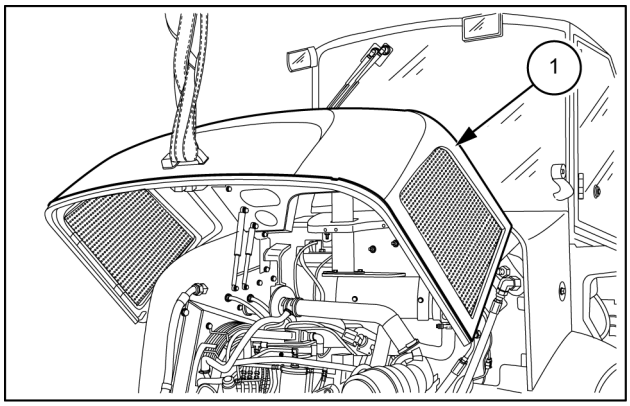
All versions

1. Secure the engine hood **(1)** with the nylon llifting strap.



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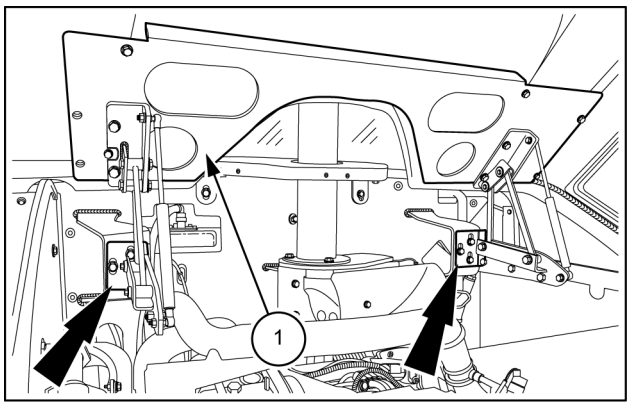
2. Have another person to balance the hood and remove the hood hinge mounting bolts (arrows) from the machine structure.
   Carefully raise and remove the engine hood **(1)** from loader. Lower the engine hood onto suitable platform and disconnect lifting equipment.



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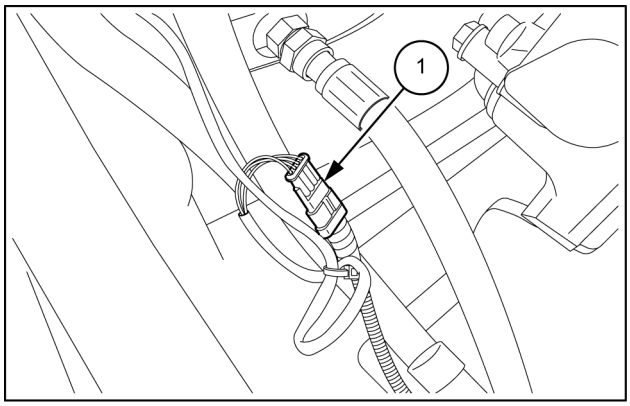
3. Tag and disconnect the left rear light connector **(1)**. Repeat this operation for the right rear light connector.



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