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Safety, Specification and Systems Operation

Dozer Maintenance Safety

Safety Instructions

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments repairs or service. Untrained operators and failure to follow instructions can cause death or serious injury.

General

Safe Operation is Operator's Responsibility

Only trained and authorized personnel should operate and maintain the machine.

Follow all safety rules, regulations and instructions when operating or performing maintenance on machine.

- Do not operate machine if you are under the influence of drugs or alcohol. An operator who is taking prescription drugs must get medical advice to determine if he or she can safely operate a machine.
- When working with other personnel on a work site, be sure that all personnel know nature of work and understand all hand signals that are to be used.
- Be sure that all guards and shields are installed in their proper location. Have guards and shields repaired or replaced immediately if damaged.
- Be sure that you understand the use and maintenance of all safety features such as safety lever and seat belt. Use them properly.
- Never remove, modify or disable any safety features. Always keep them in good operating condition.
- Always check for and know the location of underground and overhead utility lines before excavating.
- Failure to use and maintain safety features according to instructions in this manual, Safety Manual and Shop Manual can result in death or serious injury.

Know Your Machine

Know how to operate your machine. Know the purpose of all controls, gauges, signals, indicators and monitor displays. Know the rated load capacity, speed range, braking and steering characteristics, turning radius and operating clearances. Keep in mind that rain, snow, ice, loose gravel, soft ground, slopes etc., can change operating capabilities of your machine.

Proper Work Tools and Attachments

Only use work tools and attachments that are recommended be dealer for use on machines. When installing and using optional attachments, read instruction manual for attachment, and general information related to attachments in this manual. Because HD HYUNDAI CONSTRUCTION EQUIPMENT cannot anticipate, identify or test all attachments that owners may want to install

on their machines, contact HD HYUNDAI CONSTRUCTION EQUIPMENT for written authorization and approval of attachments, and their compatibility with optional kits.

Attachments and attachment control systems that are compatible with the machine are required for safe and reliable machine operation. Do not exceed maximum operating weight.

Make sure that all guards and shields are in place on machine and on work tool. Depending on type or combination of work equipment, there is a potential that work equipment could interfere with the cabin or other parts of machine. Before using unfamiliar work equipment, check if there is any potential of interference, and operate with caution.

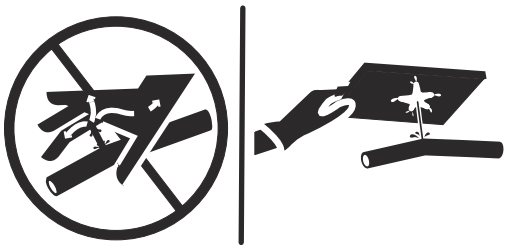
While you are performing any maintenance, testing, or adjustments to attachments, stay clear of the following areas: cutting edges, pinch points, and crushing surfaces.

Never use attachment as a work platform or man-lift.

Contact your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor about auxiliary hydraulic kits for attachments installation. If you are in doubt about compatibility of a particular attachment with a machine, consult your distributor.

Pressurized Fluids

Figure 1



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Pressurized air or fluids can cause debris and/or fluids to be blown out. This could result in death or serious injury.

Immediately after operations are stopped, coolant, engine oil, and hydraulic oil are at their highest temperatures and the radiator and hydraulic tank are still under pressure. Always wait for temperature to cool down. Follow specified procedures when attempting to remove caps, drain oil or coolant, or replacing filters. Always wait for temperature to cool down, and follow specified procedures when performing these operations. Failure to do so can result in death or serious injury.

When pressurized air and/or pressurized water is used for cleaning, wear protective clothing, protective shoes, and eye protection. Eye protection includes goggles or a protective face shield.

Pressure can be trapped in a hydraulic system and must be relieved before maintenance is started.

Releasing trapped pressure can cause sudden machine movement or attachment movement. Use caution if you disconnect hydraulic lines or fittings.

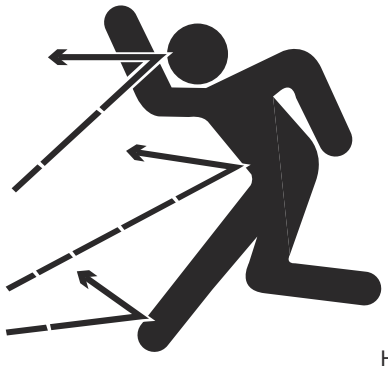
High-pressure oil that is released can cause a hose to whip or oil to spray. Fluid penetration can result in death or serious injury. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

Obey all local laws and regulations for disposal of liquids.

To prevent hot coolant from spraying out, stop engine and wait for coolant to cool. Using gloves, slowly loosen cap to relieve pressure.

Flying or Falling Objects

Figure 2



HAOA110L

On work sites where there is a potential hazard that flying or falling objects can hit operator's cabin, select and use a guard to match operating conditions for additional operator protection.

Working in mines, tunnels, deep pits, and loose or wet surfaces, could produce hazard of falling rocks or flying objects. Contact your distributor for information on available protective guards.

To prevent personnel from being struck by flying objects, keep personnel out of work area.

Figure 3

HAOA100L

Personal Protective Equipment (PPE)

Figure 4

HAOA020L

Do not wear loose clothing and accessories. Secure long hair. These items can snag on controls or on other parts of equipment.

Do not wear oily clothes. They are highly flammable.

Do not forget that some risks to your health may not be immediately apparent. Exhaust gases and noise pollution may not be visible, but these hazards can cause disabling or permanent injuries. Breathing masks and/or ear protection may be required.

Wear a hard hat, safety shoes, safety goggles, mask, leather gloves, earplugs and other protective equipment, as required.

While working on machine, never use inadequate tools. They could break or slip, or they may not adequately perform intended functions.

Correction of Machine Problems

If any machine problems are found during operation and maintenance (noise, vibration, smell, incorrect gauges, smoke, oil leakage, etc.), or if any abnormal warning alerts are displayed on display monitor, stop the machine and take the necessary corrective actions. Do not operate machine until problem has been corrected.

Crushing and Cutting

Figure 5

HDO1010L

Keep objects away from moving fan blades. Fan blades can throw and cut objects.

Do not use a wire rope that is kinked or frayed, or a wire rope with any loss of diameter. Wear leather gloves when handling a wire rope.

When striking a loose retainer pin, it can fly out and can cause a serious injury. Make sure that area is clear of personnel when striking a retainer pin. To avoid injury to your eyes, wear safety goggles when striking a retainer pin.

Do not put your hand, arm or any other part of your body between movable parts. If going between movable parts is necessary, always position and secure work equipment so it cannot move. Properly support equipment before performing any work or maintenance under raised equipment.

If control levers are operated, clearance between machine and work equipment will change and this may lead to serious damage or can result in death or serious injury. Stay clear of areas that may have a sudden change in clearance with machine movement or equipment movement. Stay clear of all rotating and moving parts. Unless instructed, never attempt adjustments while machine is moving or while engine is running.

Do not depend on hydraulic cylinders to support raised equipment. Equipment can fall if a control is moved, or if a hydraulic line breaks, is loosened or disconnected.

If it is necessary to remove guards to perform maintenance, always install guards after maintenance is completed.

Hot Coolant and Oils - Burn Prevention

Figure 6

FG019095

Do not touch any part of an operating engine. Immediately after operations are stopped, coolant, engine oil, and hydraulic oil are at their highest temperatures. The radiator and hydraulic tank are still under pressure. Always wait for temperature to cool down. Attempting to remove caps, drain oil or coolant, or replacing filters may lead to serious burns, if done when hot. Relieve all pressure in air system, hydraulic oil system, lubrication system, fuel system, and cooling system, before any lines, fittings or related items are disconnected.

To prevent hot oil or coolant from spraying out, stop engine, wait for oil and coolant to cool. Using gloves, slowly loosen cap to relieve pressure.

Figure 7

FG019096

Fire and Explosion Prevention

Figure 8

H D O 1 0

All fuels, most lubricants and some coolant mixtures are flammable and can cause a fire resulting in death or serious injury, and property damage. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause fire.

Inspect for and remove all flammable materials such as spilled fuel and oil, and debris from machine. Do not allow any flammable materials to accumulate on machine.

Always observe the following:

- Add fuel, oil, antifreeze and hydraulic fluid to machine only in a well ventilated area. Machine must be parked with controls, lights and switches turned "OFF". Engine must be "OFF" and any flames, glowing embers, auxiliary heating units or spark causing equipment must be extinguished, or turned "OFF" and kept well clear of machine.
- Dust that is generated from repairing or grinding nonmetallic hoods or nonmetallic fenders can be toxic, flammable and explosive. Repair these components in a well ventilated area away from flames or sparks and wear dust mask when grinding painted parts.
  Figure 9

FG018458

Maintenance

The machine and some attachments have components that are at high temperatures under normal operating conditions. The primary source of high temperatures are the engine and exhaust system. If damaged or incorrectly maintained, the electrical system can be a source of arcs or sparks.

Flammable debris (leaves, straw, etc.) must be removed regularly. If flammable debris is allowed to accumulate, it can cause a fire hazard. Clean machine often to avoid this accumulation. Flammable debris in an engine compartment is a potential fire hazard.

The operator's area, engine compartment and engine cooling system must be inspected every day and cleaned. This is necessary to prevent fire hazards and overheating.

Operation

Do not use machine where exhaust, arcs, sparks or hot components can contact flammable material, explosive dust or gases.

Do not operate machine near any flame.

Exhaust shields (if equipped) protect hot exhaust components from oil spray or fuel spray in case of a break in a line, hose, or seal. Exhaust shields must be correctly installed.

Electrical

Check all electrical wiring and connections for damage daily.

Keep battery terminals clean and tight. Repair or replace any damaged part or wires that are loose or frayed. Clean all electrical connections and tighten all electrical connections.

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

Battery gas can explode and can result in death or serious injury. Follow procedures in this manual for connecting battery and for jump-starting. Do not jump-start or charge a frozen or damaged battery. Keep any flames or sparks away from batteries. Do not smoke in battery charging area.

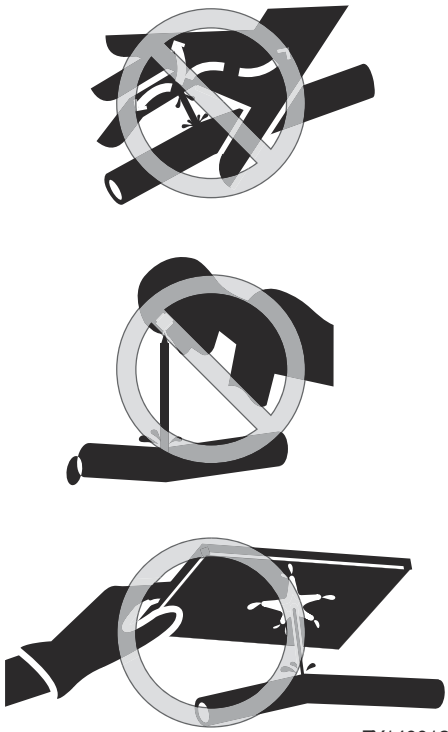
Improper jumper cable connections can cause an explosion that can result in death or serious injury. Refer to Operation and Maintenance Manual.

Do not charge a frozen battery. This can cause an explosion.

After market radios or other electric operated equipment in cabin must have a fuse in the electrical circuit.

Hydraulic System

Figure 10



EX1400129

Check hydraulic tubes, hoses and fittings for damage, wear or for leaks. Hydraulic lines and hoses must be properly routed and have adequate support and secure clamps. Leaks can cause fires. Never use a flame or bare skin to check for leaks.

Tighten or replace any parts that show leakage.

Check that all hose and tube clamps, guards, and cushions are securely attached. If they are loose, they can vibrate during operation and rub against other parts. This can cause damage to hoses and cause high-pressure oil to spray on hot surfaces, causing a fire and death or serious injury.

Always clean fluid spills. Do not use gasoline or diesel fuel for cleaning parts. Use commercial nonflammable solvents.

Fueling

Figure 11

EX1400130

Use caution when you are refueling a machine.

Fuel is flammable and can catch fire if it is brought close to a flame.

Stop engine and let it cool before adding fuel. Do not smoke while you are refueling a machine. Do not refuel a machine near flames or sparks. Fill fuel tank outdoors.

Keep fuel and other fluid reservoir caps tight and do not start engine until caps have been secured.

Store fuels and lubricants in properly marked containers away from unauthorized personnel. Store oily rags and any flammable materials in protective containers.

Static electricity can produce dangerous sparks at fuel filling nozzle. In very cold, dry weather or other conditions that could produce a static discharge, keep tip of fuel nozzle in constant contact with neck of fuel filling nozzle, to provide a ground.

Always place plastic fuel containers on the ground before filling.

Never Use Ether Starting Aids

Figure 12

FG018458

Do not use ether or starting fluids on any engine that has glow plugs, or an electric grid type manifold heater. These starting aids can cause an explosion and result in death or serious injury.

Use procedures in this manual for connecting battery and for jump-starting.

Welding and Grinding

Always clean machine and attachment, set battery disconnect switch to "OFF" position, and disconnect wiring from electronic controllers before welding. Cover rubber hoses, battery and all other flammable parts. Keep a fire extinguisher near machine when welding.

Toxic dust or gas can be produced when grinding or welding painted parts. Grinding or welding painted parts must be done in a well ventilated area. Wear dust mask when grinding painted parts.

Dust generated from repairing nonmetallic parts such as hoods, fenders or covers can be flammable or explosive.

Repair such components in a well ventilated area away from flames or sparks.

Do not weld on lines or on tanks that contain flammable fluids. Do not flame cut lines or tanks that contain flammable fluid. Clean any such lines or tanks thoroughly with a nonflammable solvent before welding or flame cutting.

If a Fire Occurs

Figure 13

FG018459

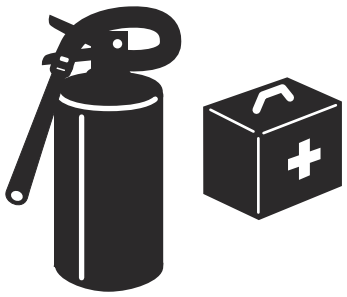
If a fire occurs:

- Do not attempt to move machine or continue operations.
- Turn starter switch to "O" (OFF) position to stop engine.
- Use handrails, guardrails and steps to get off machine.
- Immediately call for help or fire station.
- When using a fire extinguisher, always aim extinguisher at base of fire.
- If an optional fire extinguishing system is in place, be familiar with its operating procedures.

NOTE: *Depending on job conditions, other procedures could be necessary if a fire occurs.*

Fire Extinguisher and First-aid Kit (Emergency Medical Kit)

Figure 14



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To be prepared in the event of a fire:

- Make sure fire extinguishers are always available and read labels to know how to use them. It is recommended that an appropriately sized (2.27 kg [5 lb) or larger) multipurpose A/B/C fire extinguisher be mounted in cabin. Check and service fire extinguisher at regular intervals and make sure that all work site crew members are adequately trained in its use.
- Inspect fire extinguisher and service fire extinguisher regularly.
- Follow instructions on extinguisher instruction plate.
- Keep a first aid kit in storage compartment and keep another kit at work site. Check kit periodically and keep it properly supplied.
- Keep emergency numbers for doctor, ambulance service, hospital and fire department readily available.

Electrical System and Electrical Shock

Never short across starter terminals or across batteries. Shorting could damage electrical system and engine neutral start system.

When engine is running or immediately after it has stopped, high voltage is generated at injector terminal and inside engine controller, so there is a potential for an electrical shock. Never touch injector terminal or inside of engine controller.

NOTE: *If it is necessary to touch injector terminal or inside engine controller, contact your distributor.*

Roll-over Protective Structure (ROPS)

The operator's cabin is a ROPS certified structure for protecting the seat-belted operator. It absorbs the impact energy of a roll-over impact. Do not allow machine weight (mass) to exceed certified

value on certification plate. If weight is exceeded, the ROPS structure will not be able to fulfill its safety function.

Do not increase machine weight beyond certified value by modifying machine or by installing attachments on machine. If weight limit of protective equipment is exceeded, protective equipment will not be able to protect operator, and this can result in death or serious injury. Always observe the following:

- This machine is equipped with a protective structure. Do not remove protective structure and perform operations without it.
- Never modify the operator's cabin by welding, grinding, drilling holes or adding attachments without the dealer's approval. Changes to the cabin can cause loss of operator protection from roll-over and falling objects, and result in death or serious injury.
- When protective structure is damaged or deformed by falling objects or by rolling over, its strength will be reduced and it will not be able to adequately protect the operator. Contact your distributor if you have any questions about the ROPS. Never repair a damaged ROPS cabin.
- Always wear your seat belt when operating machine.

ROPS Certification

This HD HYUNDAI CONSTRUCTION EQUIPMENT dozer has an operator's cabin that meets ROPS requirements. The seat belt must be worn for roll-over protection.

The ROPS certification plate is found on the left side of the cabin on most models. It may vary slightly in its location on some models.

Check the ROPS cabin, mounting, and hardware for damage.

Never modify the ROPS cabin. Replace the cabin and hardware if damaged. See your HD HYUNDAI CONSTRUCTION EQUIPMENT distributor for parts.

ROPS – Roll-over Protective Structure complies with

ISO 12117-2:2008, EN13531:2001.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Never modify the operator cabin by welding, grinding, drilling holes or adding attachments unless instructed in writing by HD HYUNDAI CONSTRUCTION EQUIPMENT. Changes to the cabin can cause loss of operator protection from rollover and falling objects, and can result in death or serious injury.

Long Term Storage

When a machine is taken out of service and stored for a time exceeding 30 days, steps must be taken to protect the machine. Leaving equipment outdoors exposed to the elements will shorten its life.

An enclosure will protect the machine from rapid temperature changes and lessen the amount of condensation that forms in hydraulic components, engine, fuel tank, etc. If it is not possible to put the machine in an enclosure, cover it with a tarpaulin.

Check that storage site is not subject to flooding or other natural disasters.

After the machine has been positioned for storage and the engine stopped, perform the following operations:

Before Storage

Keep the dozer in the position shown in #id20CLGOTD0UI/id20CSB100C5Z to prevent rust of the hydraulic piston rods.

- Inspect for damaged, loose or missing parts.
- Repaint necessary areas to prevent oxidation.
- Wash and clean all parts of machine.
- Store the machine in an indoor, stable place. If stored outside, cover with a waterproof tarp.
- Perform lubrication procedures on all grease points.
- Apply a coating of light oil to the exposed plated metal surfaces (such as hydraulic cylinder rods, etc.) and to all the control linkage and control cylinders. (Control valve spools, etc.)
- Remove battery from the dozer to be fully charged and stored.
- Inspect the coolant recovery tank and radiator to make sure the antifreeze level in the system is correct. Make sure that antifreeze concentration is enough for the lowest temperature anticipated during storage.
- Seal all external openings (i.e. engine exhaust outlet, crankcase and hydraulic breather, fuel vent line, etc.) with tape wide enough to cover the opening, regardless of size.

  NOTE: *When sealing with tape, be sure to extend tape approximately one inch (25 mm) beyond opening to insure a good seal.*

  NOTE: *Keep in mind that theft and burglary risk can be minimized by:*

  - Removing starter key when the machine is left unattended.
  - Locking doors and covers after working hours.
  - Turning off electrical current with battery disconnect switch.
  - Park machine where risk of theft, burglary and damage is minimized.
  - Removing valuables from cabin such as cellular phone, computer, radio and bags.

During Storage

- Once a month, start the engine and follow the “Hydraulic Oil Warm-up” procedures listed in this manual.
- Operate hydraulic functions for traveling, swing and digging two or three times for lubrication after “Hydraulic Oil Warm-up”. Coat all the moving parts and surfaces of the components with a new oil film after operating. At the same time, charge the battery. Rotate track to prevent track seizing”.
- Every 90 days, use a hydrometer to measure the protection of the coolant. Refer to the antifreeze/coolant protection chart to determine protection of the cooling system. Add coolant as required.

After Storage

- Before operating the work equipment, remove all grease from the hydraulic cylinder rods.
- Add grease and oil at all lubrication points.
- Adjust fan and alternator belt tension.
- Connect the charged battery.
- Check condition of all hoses and connections.
- Check the levels of engine oil, fuel, coolant and hydraulic circuit oil. If there is water in the oil, change all the oil.
- Change all filters.

- Inspect for signs of nests. (i.e. birds, rodents, etc.)
- When starting the engine after long-term storage, follow the “Hydraulic Oil Warm-up” procedures listed in this manual.

Maintenance

Improper operation and maintenance can result in death or serious injury. Read manual and safety decals before operating or maintaining the machine. Follow all instructions and safety messages.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

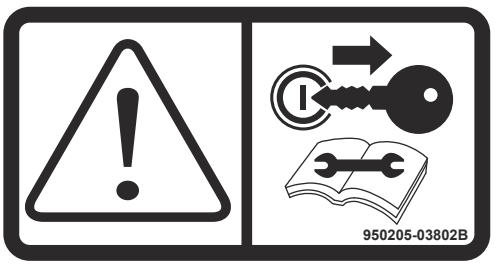
Follow instructions before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments, repairs or service. Untrained operators and failure to follow instructions can result in death or serious injury.

- Never service equipment without instructions.
- Always lower bucket and blade to ground before doing any maintenance.
- Use correct procedure to lift and support dozer.
- Cleaning and maintenance are required daily.
- Welding or grinding painted parts must be done in well ventilated areas.
- Wear a dust mask when grinding painted parts. Toxic dust and gas can be produced.
- Vent exhaust to outside when engine must be running for service.
- Exhaust system must be tightly sealed. Exhaust fumes are hazardous and can cause death or serious injury.
- Stop and allow engine to cool and clean engine of flammable materials before checking fluids.
- Never service or adjust machine with engine running unless instructed to do so in this manual.
- Avoid contact with leaking hydraulic fluid or diesel fuel under pressure. It can penetrate skin or eyes.
- Never fill fuel tank while engine running, while smoking, or when near open flame.
- Keep body, jewelry and clothing away from moving parts, electrical contact, hot parts and exhaust.
- Wear eye protection to guard from battery acid, compressed springs, fluids under pressure and flying debris when engines are running or tools are used. Use eye protection approved for welding.
- Lead-acid batteries produce flammable and explosive gases.
- Keep arcs, sparks, flames and lighted tobacco away from batteries.
- Batteries contain acid which burns eyes or skin on contact.
- Wear protective clothing. If acid contacts body, flush well with water. For eye contact flush well and get immediate medical attention from a physician familiar with this injury.
- The maintenance procedures which are given in this manual can be performed by the owner or operator without any specific technical training. Maintenance procedures which are not in this manual must be performed ONLY BY QUALIFIED SERVICE PERSONNEL. Always use genuine genuine parts.

- Only authorized personnel should service and repair the machine. Do not allow unauthorized personnel into work area.
- Lower work equipment and stop engine before performing maintenance.
- Park machine on firm and level ground.
- Turn starter switch to "ON' position and keep safety lever in "UNLOCK" position. Cycle work levers (joysticks) back and forth, left and right at full stroke 2 to 3 times to eliminate remaining internal pressure in hydraulic circuit. Then move safety lever to "LOCK" position.
- Check that battery relay is "OFF" and main power is shut off. (Wait for approximately one minute after turning "OFF" engine starter switch key and press horn switch. If horn does not sound, the main power is shut off.)
- Put blocks under track to prevent the machine from moving.
- To prevent injury, do not perform maintenance with engine running. If maintenance must be done with engine running, perform maintenance with at least two workers and do the following:
  - One worker must always sit in the operator's seat and be ready to stop engine at any time. All workers must maintain contact with other workers.
  - When maintenance operations are near fan, fan belt, or other rotating parts, there is a potential hazard of being caught in rotating parts. Keep hands and tools away.
- Never drop or insert tools or other objects into rotating fan or fan belt. Parts can break off and hit someone.
- Do not touch any control levers or control pedals. If any control levers or control pedals must be operated, always give a signal to other workers and instruct them to move away.
- When performing maintenance of engine and you are exposed to engine noise for long periods of time, wear hearing protection while working.
- If noise from the machine is too loud, it can cause temporary or permanent hearing problems.
- Do not smoke when you service an air conditioner or if refrigerant gas is present.
- Inhaling fumes either from a flame or gas from a cigarette that has contacted air conditioner refrigerant can cause death or serious injury.
- Never put maintenance fluids into glass containers. Drain all liquids into a suitable containers.
- Unless instructed otherwise, perform maintenance with equipment in servicing position. Refer to this manual for procedure for placing equipment in servicing position.

Warning Tag

Figure 15



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Alert others that service or maintenance is being performed by attaching a "DO NOT OPERATE" warning tag to the operator's cabin controls – and other machine areas, if required. Use of a chain or cable to keep the safety lever in the fully lowered "LOCK" position, complies with OSHA's lockout requirements.

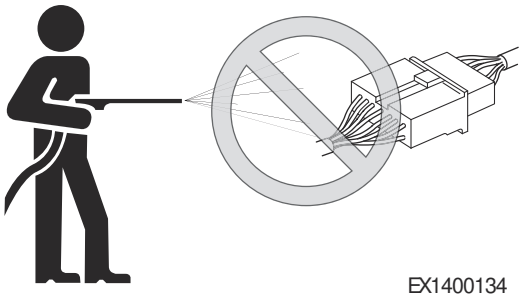
"DO NOT OPERATE" warning tags, are available from your distributor.

- Always attach "DO NOT OPERATE" warning tag to work equipment control lever in the operator's cabin to alert others that you are performing service or maintenance on the machine. Attach additional warning tags on the machine, if necessary.
- Keep warning tags in tool box while it is not used. If there is not tool box or in the owner manual storage pocket.
- If any other person starts engine, and operates control levers or control pedals while you are performing service or maintenance, it can result in death or serious injury.

Attach a "DO NOT OPERATE" warning tag to starter switch or to controls before servicing or repairing equipment. Warning tags are available from your distributor.

Cleaning

Figure 16



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Clean machine before performing inspection and maintenance.

If inspection and maintenance are done when machine is dirty, it will become more difficult to locate problems, and you could slip on steps and work platform areas and injure yourself.

When washing machine, do the following:

- Wear shoes with nonslip soles to prevent slipping and falling.
- Wear safety goggles and protective clothing when washing machine with high-pressure steam or water.
- Do not spray water directly on electrical components (sensors, connectors). If water gets into electrical system, it can cause operation problems.
- Pick up any tools or hammers that are laying in workplace. Wipe up any grease or oil to prevent slippery substances, that can cause tripping or slipping.
- When cleaning cabin top window which is made of polycarbonate material, use tap water. Avoid use of organic solvents for cleaning, such as benzene, toluene or methanol. These solvents can cause a chemical reaction that will dissolve and damage the window.

Proper Tools and Clothing

Only use tools that are intended for the type of service to be done. Metal pieces from low quality or damaged tools, such as chisels or hammers, can break off and hit a service person in the eyes or face causing serious injury.

Disassembling Precautions

When using a hammer to remove pins, pins can fly out or metal particles may break off. Always do the following:

- Hitting hard metal pins, bucket teeth, cutting edges or bearings with a hammer, can cause metal pieces to break or fly off resulting in serious injury. Always wear safety goggles and leather gloves. Keep other personnel away.

Use of Lighting

When checking fuel, oil, battery electrolyte, window washer fluid, or coolant, always use proper lighting equipment to prevent arcs or sparks that could cause a fire or explosion resulting in death or serious injury.

Fire and Explosion Prevention

Figure 17

HDO1C

Fuels, most lubricants and some coolant mixtures are flammable. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire resulting in property damage or death or serious injury.

Store all fuels and all lubricants in properly marked and approved containers and keep away from all unauthorized personnel.

Store oily rags and other flammable material in a protective container.

Tighten all fuel and oil caps.

Figure 18

FG018458

Do not smoke while you refuel machine or while you are in a refueling area.

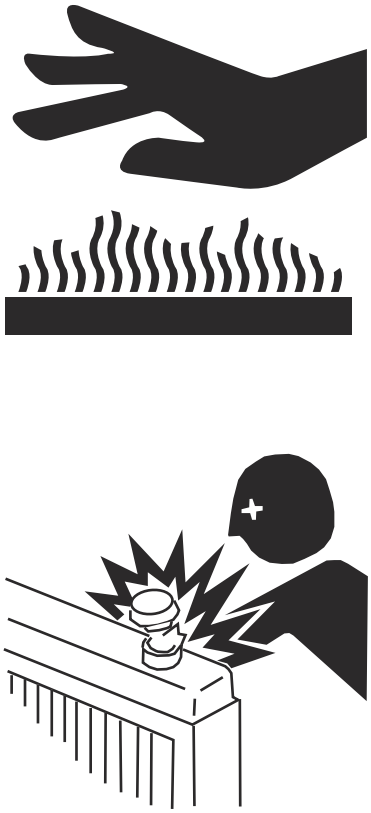
Do not smoke in battery charging areas or in areas that contain flammable material.

Clean all electrical connections and tighten all electrical connections. Check electrical wires daily for wires that are loose or frayed. Tighten all loose, and repair or replace all frayed, electrical wires before operating machine.

Remove all flammable materials and debris from the engine compartment, exhaust system components and hydraulic lines.

Burn Prevention

Figure 19



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When checking radiator coolant level, stop engine, let engine and radiator cool down, then check coolant recovery tank. If coolant level in coolant recovery tank is near upper limit, there is enough coolant in radiator.

Using gloves, loosen radiator cap slowly to release internal pressure before removing radiator cap.

If coolant level in coolant recovery tank is below lower limit, add coolant.

Cooling system conditioner contains alkali which can cause personal injury. Do not allow alkali to contact skin, eyes, or mouth.

Allow cooling system components to cool before draining cooling system.

Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact skin.

Vent hydraulic tank only after engine has been stopped and hydraulic tank is cool. Using gloves, slowly tilt hydraulic tank air breather to relieve pressure.

Relieve all pressure in hydraulic oil system, in fuel system, or in cooling system before disconnecting any lines, hoses, fittings, or related components.

Batteries give off flammable fumes that can explode and start a fire.

Do not smoke while you are checking battery electrolyte level.

Electrolyte is an acid. Electrolyte can cause personal injury. Do not allow electrolyte to contact skin or eyes.

Always wear safety goggles and face protection when working with batteries.

Rubber That Contains Fluorides

Observe extra great care when it is suspected that you may have to handle rubber that contains fluorides.

Certain seals which have to withstand high operating temperatures (e.g. in engines, transmissions, axles, hydraulic motors and pumps) may be made from rubber that contains fluorides, which, when exposed to high heat (fire), forms hydrogen fluoride and hydrofluoric acid. This acid is very corrosive and cannot be rinsed or washed off from the skin. It causes very severe burns which take a long time to heal.

It usually means that damaged tissue must be surgically removed. Several hours may pass after contact with the acid, before any symptoms appear and therefore one is not given any immediate warning. The acid may remain on the machine parts for several years after a fire.

If swelling, redness or a stinging feeling appears and one suspects that cause may be contact with heated rubber that contains fluorides, contact a medical doctor immediately. If a machine, or part of a machine, has been exposed to fire or severe heat, it must be handled by specially trained personnel. In all handling of machines after a fire, thick rubber gloves and protective goggles must be used.

The area around a part which has been very hot and which may be made of rubber that contains fluorides must be decontaminated by thorough and ample washing with lime water (a solution or suspension of calcium hydroxide, i.e. slaked lime in water). After the work has been completed, the gloves must be washed in lime water and then discarded.

Rubber and Plastics

Polymer materials when heated, can form compounds that create a health hazard and can harm the environment. Scrapped rubber and plastics must never be burned. Extra precautions must be taken when servicing machines that have been in a fire or exposed to extreme heat.

If gas cutting or welding is to be done near such materials, the following safety instructions must be followed:

- Protect the material from heat.
- Use protective gloves, protective goggles and an approved respirator.

Waste Hazardous to the Environment

Painted parts or parts made of plastic or rubber which are to be scrapped must never be burned, but must be taken care of by an approved refuse handling plant.

Batteries, plastic objects and anything else which is suspected of being dangerous to the environment must be taken care of in an environmentally safe way.

Check List After Fire

When handling a machine which has been damaged by fire or been exposed to intense heat, the following protective measures must under all circumstances be followed:

Use thick, gloves made of rubber and wear goggles which are certain to protect your eyes.

Never touch burned components with your bare hands, as there is a risk that you may come into contact with melted polymer materials. First wash thoroughly with plenty of lime water (a solution or suspension of calcium hydroxide, i.e. slaked lime in water).

As a precaution, seals (O-rings and other oil seals) should always be handled as if they were made of rubber that contains fluorides.

Treat skin, which is suspected of having touched burned rubber that contains fluorides, with Hydrofluoric Acid Burn Jelly or something similar. Seek medical advice. Symptom may not appear until several hours afterwards.

Discard gloves, rags etc. which are suspected of having touched burned rubber that contains fluorides.

Welding Repairs

NOTICE

When disconnecting or connecting connectors between ECU and engine, or connector between ECU and the machine, always disconnect the battery to prevent damage to ECU.
If you do not follow this procedure, the ECU will be damaged and/or the engine will not operate properly.

NOTE: *Disconnect battery only when LED light is OFF after engine is turned OFF.*

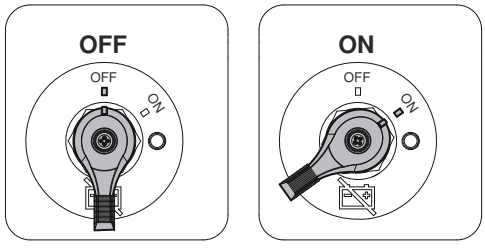
When performing welding repairs, perform welding in a properly equipped place.Repairs must be performed by a qualified welder. Welding operations, can create potential hazards, including generation of gas, fire, or electric shock. Never let an unqualified welder do welding.

A qualified welder must do the following:

- To prevent battery explosion, turn battery disconnect switch to "OFF" position.
- Disconnect the connector between ECU and machine, and the connector between ECU and engine.
- Disconnect the negative (-) cable of battery.
- To prevent generation of gas, remove paint from location of the weld.
- If hydraulic equipment, piping or component ports close to them are heated, a flammable gas or mist could result in an explosion or fire. To prevent this, protect and insulate components from excessive heat.
- Do not weld on pipes or on tubes that contain flammable fluids. Do not flame cut pipes or tubes that contain flammable fluids. Before welding on pipes or tubes, or before flaming cut pipes or tubes, clean them thoroughly with a nonflammable solvent. Make sure pressure inside pipes or tubes does not cause a rupture of the component parts.
- If heat is applied directly to rubber hoses or piping under pressure, they may suddenly break, so cover and insulate them with a fireproof covering.
- Wear protective clothing.
- Make sure there is good ventilation.
- Remove all flammable objects and make sure a fire extinguisher is available.

Preparation for Electrical Welding On Body Structure

Figure 20



EX1500481

To prevent damage to ECU by electrical welding, observe the following procedures:

1. Turn battery disconnect switch to "OFF" position.
2. Disconnect the connector between ECU and machine, and the connector between ECU and engine.

3. Disconnect the negative (-) cable of battery.
4. Proceed with welding.
5. After welding, connect the connector between ECU and machine, and the connector between ECU and engine.
6. Connect the negative (-) cable of battery.
7. Clean battery compartment.
8. Turn battery disconnect switch to "ON" position.
9. Close battery compartment door.

Lock Inspection Covers

When performing maintenance with inspection cover open, use lock bar to secure cover and prevent accidental lowering of the cover caused by wind or movement of the machine.

Working on Machine

Figure 21

ARO1380L

When performing maintenance operations on machine, prevent tripping and falling by keeping area around your feet clean and free of objects and debris. Always do the following:

- Do not spill oil or grease.
- Do not leave tools laying around.
- Watch your step when walking.
- Never jump down from machine. When getting on or off machine, use steps and handrails, and maintain a three-point contact (both feet and one hand or both hands and one foot) to support yourself.
- If job requires it, wear protective clothing.
- To prevent injury from slipping or falling, when working on hood or covers, never stand or walk on areas except areas equipped with nonslip pads.
- If it is necessary to work under raised equipment or the machine, support work equipment and machine securely with blocks and stands strong enough to support weight of work equipment and machine.
- Do not work under the machine if track shoes are lifted off ground and the machine is supported only with work equipment. If any control levers are moved, or there is damage to hydraulic system, work equipment or the machine will suddenly drop causing death or serious injury.

Accumulator

Figure 22

EX1400135

The pilot control system is equipped with an accumulator. For a short period of time after engine has been stopped, accumulator will store a pressure charge that allow hydraulic controls to be activated. Activation of any controls will allow selected functions to operate under force of gravity.

When performing maintenance on pilot control system, release hydraulic pressure in system as described in Operation and Maintenance Manual.

The accumulator is charged with high-pressure nitrogen gas. If it is improperly handled it can explode causing death or serious injury. Always observe the following precautions:

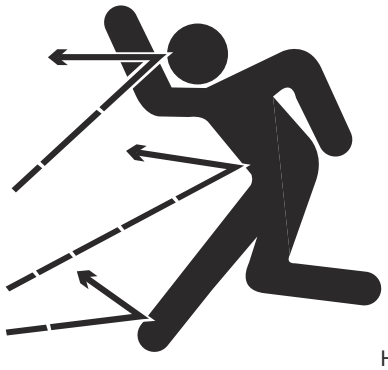
- Do not drill or punch holes in accumulator or expose it to any flames, fire or external heat source.
- Do not weld on accumulator.
- When performing disassembly or maintenance of accumulator, or when disposing of accumulator, charged nitrogen gas must be properly released. Contact your distributor for assistance.
- Wear safety goggles and leather gloves when working on an accumulator. Hydraulic oil under pressure can penetrate skin and result in death or serious injury. If fluid enters skin or eyes, get immediate medical attention from a physician familiar with this injury.

Compressed Air

- When cleaning filters, radiator or other components with compressed air, there is a hazard of flying particles that can result in serious injury.
- Always wear safety goggles, dust mask, leather gloves, and other protective devices.

Track Tension Adjustments

Figure 23



HAOA110L

Track adjusting systems use grease under high-pressure to keep track under tension. Grease under high-pressure can penetrate body and result in death or serious injury. Watch track or track spring to see if track is being loosened.

NEVER LOOSEN track tension grease valve. To release pressure from crawler frame track tension assembly, you should NEVER attempt to disassemble track adjuster or attempt to remove track tension grease valve assembly.

Keep your face and body away from grease valve. Refer to Operation or Shop Manual.

Supports and Blocking for Work Equipment

Figure 24

HDO1042L

Do not allow weight or equipment loads to remain suspended and unsupported.

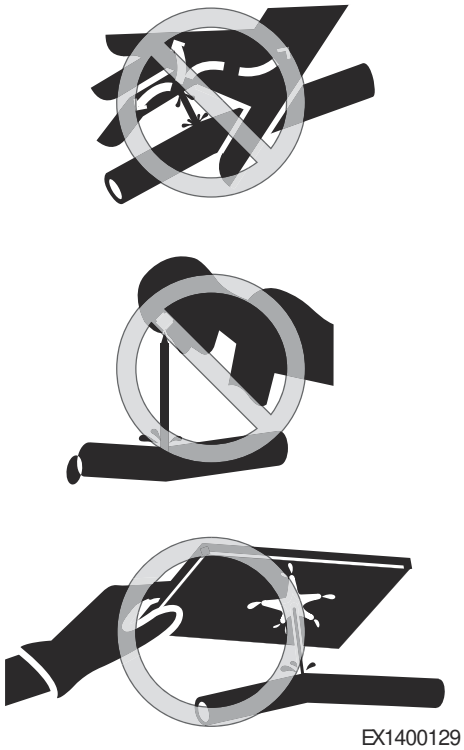
Lower work group to ground before leaving operator's seat.

Do not use hollow, cracked or unsteady wobbling supports.

Do not work under any equipment supported only by a lifting jack.

High-pressure Lines, Tubes and Hoses

Figure 25



EX1400129

When inspecting or replacing high-pressure piping or hoses, check to verify that pressure has been released from circuit. Failure to release pressure can result in death or serious injury. Release pressure as described in Operation and Maintenance Manual. Always do the following:

- Wear eye protection and leather gloves.
- Fluid leaks from hydraulic hoses or pressurized components can be difficult to see but has enough force to pierce skin and can result in death or serious injury. Always use a piece of wood or cardboard to check for suspected hydraulic leaks. Never use your hands or expose your fingers. Wear safety goggles.
- Do not bend high-pressure lines. Do not strike high-pressure lines. Do not install lines, tubes or hoses that are bent or damaged.
- Make sure that all clamps, guards and heat shields are correctly installed to prevent vibration, rubbing against other parts, and excessive heat during operation.
- Replace hose or components if any of the following problems are found:
  - Damage or leakage from hose end fitting.
  - Wear, damage, cutting of hose covering, or wire braiding is exposed on any hose.
  - Cover portion is swollen in any section.
  - The hose is twisted or crushed.
  - Foreign material is embedded in hose covering.
  - Hose end is deformed.
  - Connection fittings are damaged or leaking.

NOTE: *Refer to Operation and Maintenance Manual, for additional European regulations.*

High-pressure is generated inside engine fuel lines when engine is running. Before performing inspection or maintenance of fuel line system, wait for at least thirty seconds after stopping engine to let internal pressure drop and tip breather cap up to release residual pressure.

Oil or fuel leaks from high-pressure hoses can cause fire or improper operation, which can result in death or serious injury. If any loose bolts are found, stop work and tighten to specified torque. If any damaged hoses are found, stop operations immediately and contact your distributor for replacement parts.

Battery

Battery Hazard Prevention

Figure 26

EX1400136

Battery electrolyte contains diluted sulfuric acid and generates hydrogen gas. Hydrogen gas is highly explosive, and improper handling can cause death or serious injury, or fire. Always observe the following precautions.

- Do not smoke or bring any flame near battery.
- When cleaning top surface of battery, wipe it with a clean, damp cloth. Never use gasoline, thinner, or any other organic solvent or detergent.
- Tighten battery caps.
- If battery electrolyte is frozen, do not charge battery or start engine with power from another source. This could cause the battery to explode and start a fire.
- When charging battery or starting with power from another source, let battery electrolyte thaw and check that there is no leakage of battery electrolyte before starting operation.
- Always remove battery from machine before charging.
- Before maintaining or working with batteries, turn starter switch to "O" (OFF) position.

Since there is a potential hazard that sparks could be generated, always do the following:

- Do not let tools, rings or other metal objects make any contact between battery terminals. Do not leave tools or other metal objects lying near battery.
- When disconnecting battery terminals, wait for approximately one minute after turning engine starter switch key to "O" (OFF) position, and be sure to disconnect grounding terminal; negative (-) terminal first. Conversely, when connecting them, begin with positive (+) terminal and then grounding (-) terminal, Make sure that all terminals are connected securely.
- Flammable hydrogen gas is generated when battery is charged. Remove battery from machine, take it to a well ventilated place, and remove battery caps, before charging it.
- After charging, tighten battery caps securely.
- After charging, secure battery back in machine.

When repairing or welding electrical system, wait for approximately one minute after turning engine starter switch key "OFF". Then disconnect negative (-) terminal of battery to stop flow of electricity.

Environment and Circumstances

Work Site Areas Requiring Extra Caution

- Do not operate too close to edge of a quay, ramp, etc.
- Do not operate too close to edge of a steep slope or drop-off. Take care when working in a place where machine may tip over.
- Do not operate on soft ground or near riverbanks that could collapse or where ground may not support weight of dozer.
- Observe changes in ground and traction conditions after a rain or other changes in weather.

Digging Under an Overhang

Do not dig work face under an overhang. This can cause overhang to collapse and fall on top of the machine.

- Do not perform overhead demolition work. This can cause broken objects and debris to fall on top of machine causing death or serious injury, or property damage.

Deep Digging

Do not perform deep digging under front of machine. The ground under machine may collapse and cause machine to fall resulting in death or serious injury.

Working heavy loads on loose, soft or uneven ground, can cause side load conditions resulting in a tip over and injury. Traveling without a load or a balanced load may also be hazardous.

Never rely on lift jacks or other inadequate supports when work is being done. Block tracks fore and aft to prevent any movement.

Use machine only for its intended purpose. Using it for other purposes will cause failures.

- Do not perform demolition work under machine. There is a hazard that the machine may become unstable and tip over.
- When working on or from top of buildings or other structures, check if structure can support weight of machine and attachment. If a building structure collapses, this can cause death or serious injury.

Drop-off or Edge

When working at edge of an excavation or near a drop-off, the machine could tip over, which can result in death or serious injury. Always fasten your seat belt. Check ground conditions of work site before operating to prevent the machine from falling or roll-over, and to prevent ground, stockpiles, or banks from collapsing.

Do not travel too close to edge of a drop-off.

Poor Visibility

For good visibility, always do the following:

- When working in dark areas, attach working lights and front lights to the machine. If necessary, set up additional lighting at work site.
- Stop operations when visibility is poor, such as in fog, mist, snow, and rain. Wait for visibility to improve before starting operation.

To avoid hitting work equipment and damaging other property, always do the following:

- When working in tunnels, on bridges, under electrical wires, or when parking the machine or performing other operations in places with limited height, be careful not to hit and damage other equipment or property.
- To prevent hitting objects, operate machine at a slow speed when working in confined spaces, indoors, or in crowded areas.
- Do not swing bucket over the top of personnel or over operator's cabin of dump truck.

Loose or Soft Ground

Do not operate on soft ground or near edge of drop-offs, overhangs, and deep ditches. The ground can collapse because of the weight of the machine causing the machine to fall or roll-over.

Check ground conditions before beginning work with the machine. If ground is soft, reposition the machine before operating.

The excavated material must not be dumped too close to edge. How far away from edge of trench excavated material must be dumped depends on soil type and moisture content. If loose clay is being excavated, place it at least 5 m (16 ft) away from edge.

If excavated material is dumped too close to edge, its weight can cause a landslide.

Thawing of frozen ground, rain, traffic, piling and blasting are other factors which increase risk of landslide. The risk also increases on sloping ground. If it is not possible to dig a trench and adequately slope its sides, always install shoring equipment.

Loose ground may easily give way under weight of the machine.

When working on loose or unstable ground, it is important not to dig too deep and to carefully reposition the machine. Do not panic and do not raise bucket, if ground should begin to collapse. Lower work equipment to improve stability of machine.

Never dig under machine, if there is a potential of causing a landslide.

High-voltage Cables

Do not travel or operate machine near electrical cables or overhead power lines. There is a hazard of electric shock, which can cause property damage and result in death or serious injury. The bucket or other attachment does not have to make physical contact with power lines for current to cause an electrocution.

Use a spotter and hand signals to stay away from power lines not clearly visible to operator. On work sites where machine may operate close to electrical cables, always do the following:

- Remember that electrical voltage determines what the minimum distance is to stay away from the power line. See the following table for minimum distances when working near electrical power lines. Electrical flash over can occur and damage machine and cause death or serious injury.

Voltage	Minimum Distance
6.6 kV	3 m (9' 10")
33.0 kV	4 m (13' 1")

Voltage	Minimum Distance
66.0 kV	5 m (16' 5")
154.0 kV	8 m (26' 3")
275.0 kV	10 m (32' 10")

- Always contact the power company responsible before beginning work near high voltage power lines.

Underground Operation

If excavation is in an underground location or in a building, make sure there is adequate overhead clearance, and adequate ventilation.

Special equipment and engines may be required in some countries. Contact your distributor for more information.

Check that there is sufficient room for machine and load.

Move slowly.

Make sure that authorities or companies responsible for underground cables, utilities, and electrical lines have been contacted and that their instructions are followed. Also check which rules apply to ground personnel regarding exposing cables, utilities and electrical lines.

Consider all electrical cables as live.

Working in Water

NOTICE

Do not exceed maximum permissible water depth. The water level must not reach higher than centerline of upper track roller(s) (1).

After working in water, lubricate all lubrication points on undercarriage, which have been underwater so water is removed. Check that no water has entered travel gearboxes and undercarriage components.

Working in Contaminated Environment

When working within area which is contaminated or where there is a health risk, check local regulations and contact your distributor for assistance with identifying what additional safety precautions need to be taken.

Operation in Extreme Conditions

Operation In Extreme Cold

In extremely cold weather, avoid sudden travel movements and stay away from even slight slopes. The machine could slide down the slope.

Snow accumulation could hide potential hazards and slippery surfaces.

Warming up engine for a short period may be necessary to avoid operating with sluggish or reduced working capacity. The jolting shocks and impact loads caused by bumping or bottoming boom or attachment could cause severe stress in very cold temperatures. Reducing work cycle rate and workload may be necessary.

If machine is to be operated in extremely cold weather temperatures, certain precautions must be taken. The following paragraphs detail checks to be made to be certain machine is capable of operating at these temperatures.

1. Keep batteries fully charged to prevent freezing. If distilled water is added to batteries, run engine at least one hour to mix electrolyte solution. When temperature drops below -10°C, efficacy of the battery is reduced accordingly. Insulation of the battery prevents reduction of efficacy, and supports improvement of starting power of the starter.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Explosion of the battery can cause death or serious injury.Never attempt to directly heat the battery with open fire.

2. Keep engine in good mechanical condition for easy starting and good performance during adverse weather.
3. Use engine oil with proper specifications for expected temperatures. Refer to Operation and Shop Manual for details.
4. Always keep the fuel tank fully filled after completion of the operation. Always drain water from the fuel tank before and after the operation. In addition, check the water separator, and drain it if required. The fuel filter, if frozen, may interrupt the flow of fuel. Periodically remove water from the fuel tank, drain water from the filter, and replace the filter upon regular basis. To prevent fuel from being clogged because of formation of wax in fuel, make sure that wax formation point of fuel is lower than atmospheric temperature.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Explosion of the battery can cause death or serious injury.Never attempt to directly heat the battery with open fire.

5. Lubricate entire machine according to Operation and Maintenance Manual or lubrication chart on machine.
6. Start engine and allow it to reach normal operating temperature before operating.
   - If mud and ice collects and freezes on any of moving parts while machine is idle, apply heat to thaw frozen material before attempting to operate machine.
   - Operate hydraulic units with care until they have reached a temperature which enable them to operate normally.
   - Check all machine controls and functions to be sure they are operating correctly.
7. An extra outer air filter must be kept in operator's cabin to replace element that could become iced and cause restricted airflow to engine.
8. Clean off all mud, snow and ice to prevent freezing. Cover machine with a tarp if possible, keep ends of tarp from freezing to ground.

Operation in Extreme Heat

Continuous operation of machine in high temperatures can cause machine to overheat. Monitor engine and hydraulic system temperatures and stop machine to let it cool, when necessary.

1. Make frequent inspections and services of fan and radiator. Check coolant level in radiator. Check grilles and radiator fins for accumulation of dirt, debris and insects which could block cooling passages.

- Formation of scale and rust in cooling system occurs more rapidly in extremely high temperatures. Change antifreeze each year to keep corrosion inhibitor at full strength.
- If necessary, flush cooling system periodically to keep passages clear. Avoid use of water with a high alkali content which increases scale and rust formation.

2. Batteries self-discharge at a higher rate if left standing for long periods at high temperatures. If machine is to stand for several days, remove batteries and store in a cool place.

NOTICE

Do not store acid type storage batteries near stacks of tires. Acid fumes can damage rubber.

3. Service fuel system as directed in Operation and Maintenance Manual. Check for water content before filling fuel tank. High temperatures and cooling off cause condensation in storage drums.
4. Lubricate as specified in Operation and Maintenance Manual or Lubrication Decal on machine.
5. Do not park machine in sun for long periods of time. If possible, park machine under cover to protect it from sun, dirt and dust.
   A. Cover machine if no suitable shelter is available. Protect engine compartment and hydraulics from dirt and debris.
   B. In hot, damp climates, corrosion will occur on all parts of machine and will be accelerated during rainy season. Rust and paint blisters will appear on metal surfaces and fungus growth on other surfaces.
   C. Protect all unfinished, exposed surfaces with a film of preservative lubricating oil. Protect cables and terminals with ignition insulation compound. Apply paint or suitable rust preventive to damaged surfaces to protect them from rust and corrosion.

Operation In Dusty and Sandy Areas

Operation of machine can cause dust in almost any area. However, when in predominantly dusty or sandy areas, additional precautions must be taken.

1. Keep cooling system fins and cooling areas clean. Blow out with compressed air, if possible, as often as necessary.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Wear goggles when using compressed air to prevent face or eye injury.

2. Use care when servicing fuel system to prevent dust and sand from entering tank.
3. Service air cleaner at frequent intervals, check air restriction indicator daily and keep dust cup and dust valve clean. Prevent dust and sand from entering engine parts and compartments as much as possible.
4. Lubricate and perform services outlined on current lubrication chart on machine and Operation and Maintenance Manual. Clean all lubrication fittings before applying lubricant. Sand mixed with lubricant becomes very abrasive and accelerates wear on parts.
5. Protect machine from dust and sand as much as possible. Park machine under cover to keep dust and sand from damaging unit.

Operation in Rainy or Humid Conditions

Operation under rainy or humid conditions is similar to that as in extreme heat procedures previously listed.

1. Keep all exposed surfaces coated with preservative lubricating oil. Pay particular attention to damaged or unpainted surfaces. Cover all paint cracks and chip marks as soon as possible to prevent corrosive effects.

Operation in Saltwater Areas

Saltwater and saltwater spray is very corrosive. When operating in saltwater areas, or in or around snow, observe the following precautions:

1. When exposed to saltwater, dry machine thoroughly and rinse with freshwater, as soon as possible.
2. Keep all exposed surfaces coated with preservative lubricating oil. Pay attention to damaged paint surfaces.
3. Keep all painted surfaces in good repair.
4. Lubricate machine as prescribed on lubrication chart on machine or Operation and Maintenance Manual. Shorten lubricating intervals for parts exposed to salt water.
5. Check operating controls to ensure proper functionality and that they return to “NEUTRAL” when released.

Operation at High Altitudes

Operation instructions at high altitudes are the same as those provided for extreme cold. Before operating at high altitudes, engine fuel and air mixture may have to be adjusted according to appropriate engine manual.

1. Check engine operating temperature for evidence of overheating. The radiator cap must make a perfect seal to maintain coolant pressure in cooling system.
    - Perform warming-up operation thoroughly. If machine is not thoroughly warmed up before control levers or control pedals are operated, reaction of machine will be slow.
    - If battery electrolyte is frozen, do not charge battery or start engine with a different power source. There is a potential hazard that could cause a battery explosion or fire.
    - Before charging or starting engine with a different power source, thaw battery electrolyte and check for any leakage of electrolyte before starting.

Operation During Electrical Storms

During electrical storms, do not enter or exit machine.

- If you are off machine, keep away from machine until storm passes.
- If you are in cabin, remain seated with machine stationary until storm passes. Do not touch controls or anything metal.

Exhaust Ventilation

Figure 27

ARO1770L

Engine exhaust gases can cause unconsciousness, loss of alertness, judgment and motor control. This can result in death or serious injury.

Make sure there is adequate ventilation before starting engine in any enclosed area.

Check for and be aware of any open windows, doors or ductwork where exhaust may be carried, or blown by wind, exposing others to hazardous exhaust gases.

Ventilation for Enclosed Area

If it is necessary to start engine within an enclosed area, or when handling fuel, flushing oil, or paint; open doors and windows to ensure that adequate ventilation is provided to prevent gas poisoning.

Diesel engine exhaust contains products of combustion which can be harmful to your health.

Always run engine in a well ventilated area. If you are in an enclosed area, vent exhaust to outside.

Asbestos Information

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Avoid exposure to dust containing asbestos as it can cause death or serious injury to the lungs and other organs (mesothelioma, lung and other cancers, and asbestoses).

Asbestos dust can be HAZARDOUS to your health if it is inhaled. Materials containing asbestos fiber can be present on work sites. Breathing air that contains asbestos fiber can ultimately cause serious or fatal lung damage or diseases such as mesothelioma, lung and other cancers, and asbestoses. To prevent lung damage from asbestos fiber, observe the following precautions:

- Use an approved respirator that is approved for use in an asbestos-laden atmosphere.
- Use water for cleaning to keep down dust.
- Always observe any regulations related to work site and working environment.
- Avoid brushing or grinding materials that contain asbestos.
- A vacuum cleaner that is equipped with a high efficiency particulate air filter can also be used.
- Comply with applicable laws and regulations for workplace.
- Stay away from areas that might have asbestos particles in air.

Silica Dust Information

⚠ WARNING

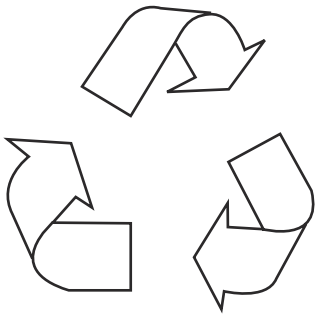
AVOID DEATH OR SERIOUS INJURY

Avoid exposure to dust containing crystalline silica particles as it can cause serious injury to the lungs (silicosis).

Cutting or drilling concrete containing sand or rock containing quartz can result in exposure to silica dust. Do not exceed Permissible Exposure Limits (PEL) to silica dust as determined by OSHA or other work site rules, laws and regulations. Use a respirator, water spray or other means to control dust. Silica dust can cause lung disease and is known to the state of California to cause cancer.

Disposal of Hazardous Materials

Figure 28



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Physical contact with used motor oil or gear oil could create a health risk. Wipe oil from your hands promptly and wash off any remaining residue.

Used motor oil or gear oil is an environmental contaminant and should only be disposed of at approved collection facilities. To prevent pollution of environment, always do the following:

- Never dump waste oil in a sewer system, rivers, etc.
- Always put drained oil from your machine in approved, leak proof containers. Never drain oil directly onto ground.
- Obey appropriate laws and regulations when disposing of harmful materials such as oil, fuel, solvent, filters, and batteries.

Improperly disposing of waste can threaten environment. Potentially harmful fluids must be disposed of according to local regulations.

Use all cleaning solutions with care. Report all necessary repairs.

Sound

Sound Level Information: Hearing protection may be required when machine is operated with an open operator station for extended periods or in a noisy environment.

Vibration Information

NOTE: *The level of vibration is influenced by many different parameters such as operator training, job site organization, weather, material, environment, machine type, machine and seat suspension system, attachments, and condition of the machine.*

Measurements are obtained on a representative machine, using measuring procedures as described in the following standards: ISO 2631/1, ISO 5349, and SAE J1166.

Vibration levels were given consideration in accordance with uncertainty (K) determined to manufacturer.

Hand/Arm Vibration Level

The vibration total value to which the hand-arm system is subjected, is less than 2.5 m/s^2.

Whole Body Vibration Level

The highest root mean square value of weighted acceleration to which the whole body is subjected, is more than 0.5 m/s^2 (less than 1.15 m/s^2).

Guidelines for Use and Working Conditions of Earth-moving Machinery to Reduce Vibration Levels (ISO/TR 25398 Annex E)

Properly adjusting and maintaining machines, operating machines smoothly, and maintaining the terrain conditions can reduce whole-body vibrations. The following can help the users of earth-moving machinery reduce whole-body vibration levels.

1. Use the right type and size of machine, equipment, and attachments.
2. Maintain machines according to the manufacturer's recommendations: (for wheeled machine)
   - Tire pressure;
   - Brake and steering systems;
   - Controls, hydraulic system and linkages.
3. Keep the terrain where the machine is working and traveling in good condition:
   - Remove any large rocks or obstacles;
   - Fill any ditches and holes;
   - Provide machines and schedule time to maintain terrain conditions.
4. Use a seat in conformance with ISO 7096 and keep the seat maintained and adjusted:
   - Adjust the seat and suspension for the weight and size of the operator;
   - Inspect and maintain the seat suspension and adjustment mechanisms.
5. Steer, brake, accelerate, shift gears, and move the attachments smoothly. (for wheeled machine)
6. Adjust the machine speed and travel path to minimize the vibration level:
   - Drive around obstacles and rough terrain conditions;
   - Slow down when it is necessary to go over rough terrain.
7. Minimize vibrations for long work cycle or long distance traveling: (for wheeled machine)
   - Use machines equipped with suspension systems;
   - Use lift arm suspensions;
   - If no suspension system is available, reduce speed to prevent bouncing;
   - Haul machines long distances between work sites.
8. Back pain associated with whole-body vibrations can be caused by other risk factors. To minimize the risk of back pain:
   - Adjust the seat and controls to achieve good posture;
   - Adjust the mirrors to minimize twisted posture;
   - Provide breaks to reduce long periods of sitting;
   - Avoid jumping down from the cab or access system;
   - Minimize repeated handling and lifting of loads;

- Minimize any shocks and jolts during sports and leisure activities.

General Specifications

Safety Instructions

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

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General

The dozer has three main component sections:

- The Upper Structure
- The Lower Undercarriage and Track Frames
- The Front-end Attachment

Standard Specification

ITEMS		UNIT	STD.	OPT. 1	OPT. 2
OPERATING WEIGHT		ton	10.9	10.3	11.6
ENGINE	RATED POWER (Gross)	kW/rpm	91/2200		
	MAX. TORQUE	N.m/rpm	530/1400		
SYSTEM PRESSURE		bar	250		
TRAVEL SPEED		km/h	9		
GROUND PRESSURE		kg/cm 2	0.29	0.38	0.31
TRANSPORTATION DIMENSION	OVERALL LENGTH	mm	4740	4740	5600
	OVERALL WIDTH	mm	3280	2900	2900
	OVERALL HEIGHT	mm	2892	2892	2892
	GROUND CLEARANCE (W/O Grouser)	mm	200		
	TRACK LENGTH (With Grouser)	mm	3570		
	GROUSER HEIGHT	mm	50		
	TRACK GAUGE	mm	1890		
	BLADE HEIGHT	mm	1085		
OPTION ATTACHMENT	Blade	mm	LGP, XL		

	Rear Attachment	mm	RIPPER, TOWING DRAWBAR
	SHOE	mm	700(LGP), 510(XL)
Spec. Combination Criteria	STD	LGP BLADE, LGP SHOE, NON-REAR ATTACHMENT	
	OPTION 1	XL BLADE, XL SHOE, NON-REAR ATTACHMENT	
	OPTION 2	LGP BLADE, LGP SHOE, RIPPER	

Performance Tests

Use operational performance test procedure to quantitatively check all system and functions on the machine.

Purpose of Performance Tests

1. To comprehensively evaluate each operational function by comparing the performance test data with the standard values.
2. According to the evaluation results, repair, adjust, or replace parts or components as necessary to restore the machine's performance to the desired standard.
3. To economically operate the machine under optimal conditions.

Kinds of Tests

1. Base machine performance test is to check the operational performance of each system such as engine, travel, swing, and hydraulic cylinders.
2. Hydraulic component unit test is to check the operational performance of each component such as hydraulic pump, motor, and various kinds of valves.

Performance Standards

"Performance Standard" is shown in tables to evaluate the performance test data.

Precautions for Evaluation of Test Data

1. To evaluate not only that test data is correct, but also in what range the test data is.
2. Be sure to evaluate the test data based on the machine operation hours, kinds and state of work loads, and machine maintenance conditions.

The machine performance does not always deteriorate as the working hours increase. However, the machine performance is normally considered to reduce in proportion to the increase of the operation hours. Accordingly, restoring the machine performance by repair, adjustment, or replacement shall consider the number of the machine's working hours.

Definition of "Performance Standard"

1. Operation speed values and dimensions of the new machine.
2. Operational performance of new components adjusted to specifications. Allowable errors will be indicated as necessary.

Preparation for Performance Tests

Observe the following rules to perform performance tests accurately and safely.

The Machine

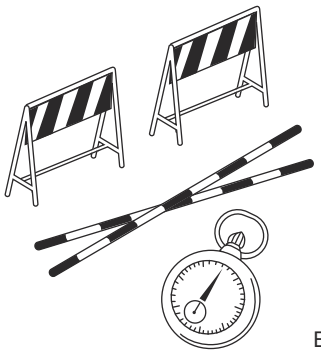
1. Repair any defects and damage found, such as oil or water leaks, loose bolts, cracks etc, before starting to test.

Test Area

1. Select a hard and flat surface.
2. Secure enough space to allow the machine to run straight more than 20 m (65 ft 7 in), and to make a full swing with the front attachment extended.
3. If required, rope off the test area and provide signboards to keep unauthorized personnel away.

Precautions

1. Before starting to test, agree upon the signals to be employed for communication among coworkers.
   Figure 29



   Once the test is started, be sure to communicate with each other using these signals, and to follow them without fail.
2. Operate the machine carefully and always give first priority to safety.
3. While testing, always take care to avoid accidents because of landslides or contact with high voltage power lines. Always confirm there is sufficient space for full swings.
4. Avoid polluting the machine and the ground with leaking oil. Use oil pans to catch escaping oil. Pay special attention to this when removing hydraulic pipings.

Make Precise Measurement

1. Accurately calibrate test instruments in advance to obtain correct data.
2. Perform tests under the exact test conditions prescribed for each test item.
3. Repeat the same test and confirm that test data obtained can be produced repeatedly. Use mean values of measurements if necessary.

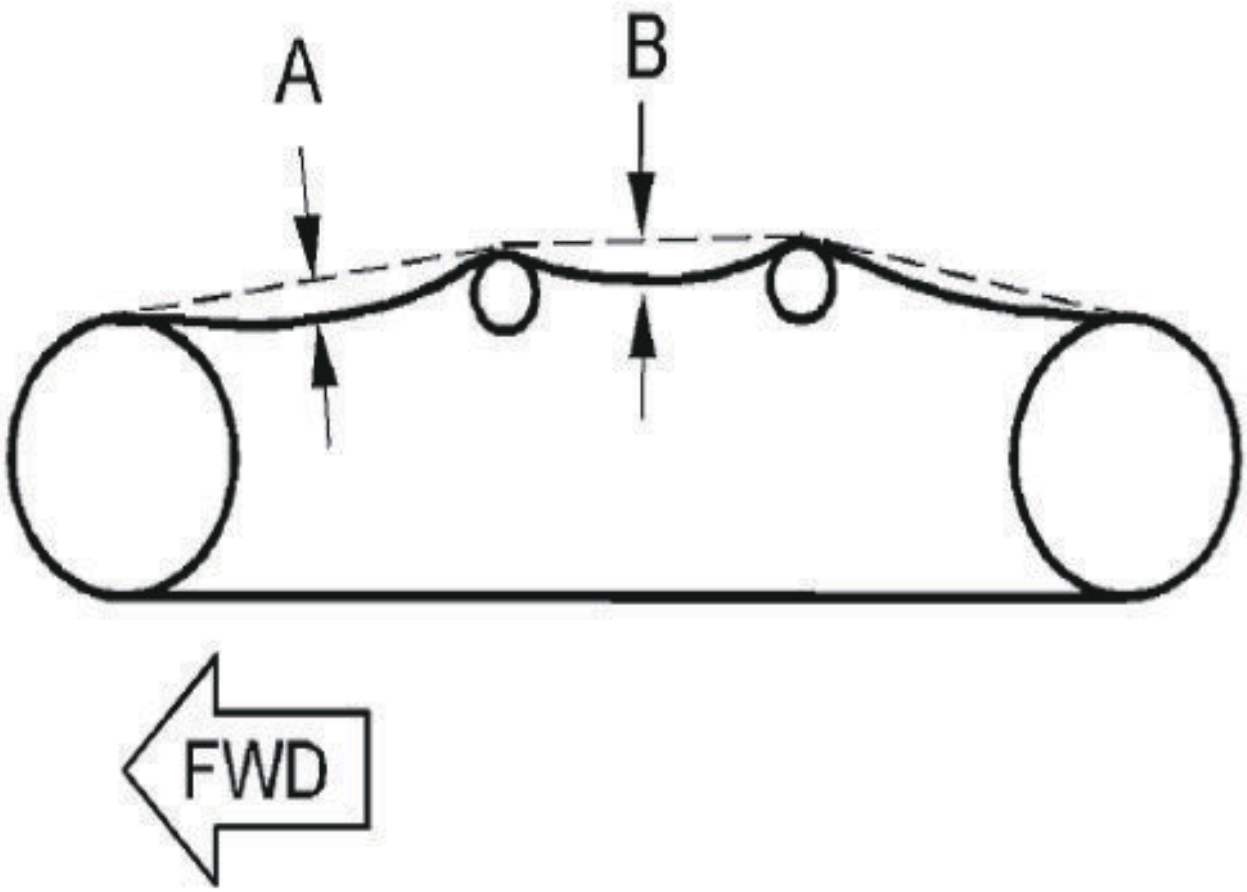
Operational Performance Standard Table

Item			Unit	Performance Standard	Value	Clearance
Engine	Non Load	Low Idle	rpm	Dial Max.	900	±20
		Auto Idle	rpm	Dial Min.	900	±20
		High Idle	rpm	Auto Idle activated	2.300	±50

Item			Unit	Performance Standard	Value	Clearance
	Load	Front Relief	rpm	-	2.300	±50
	Engine Stops	Front Relief + Blade Up	-	Blade Angle Relief, Blade Up Sudden Command	Not Stop Engine	-100 Above
Pressure Set	Main Pump	Pump Relief Pressure	bar	-	-	±10
		LS Relief Pressure	bar	Front Relief Status	236	±10
	Pilot Supply Valve	Parking Brake Release	bar	-	32	-0 +2
Cylinder Speed	Lift Cylinder	Up	sec	*Standard, Sudden Command. * Max. Stroke	1.8	±0.2
		Down	sec		1.5	±0.2
	Tilt Cylinder	Right	sec	* Sudden Command, Max. Blade Lift Up	0.8	±0.1
		Left	sec		0.7	±0.1
	Angle Cylinder	Right	sec		2.2	±0.2
		Left	sec		2.2	±0.2
	Ripper Cylinder	Up	sec	*Standard, Sudden Command.	1.5	±0.2
		Down	sec		2.0	±0.2
Travel Speed	Forward	0.5	km/hr	Power Mode, Dial Max, Operating Joystick Forward	1.0	±0.5
		2nd			3.5	±0.5
		3rd			4.9	±0.5
		4th			6.3	±0.5
		5th			8.0	±0.5
	Backward	0.5		Power Mode, Dial Max, Operating Joystick Backward	1.0	±0.5
		3rd			4.9	±0.5
		5th			8.0	±0.5
	ECO Mode	Engine Speed	rpm		2,000	±50
		0.5	km/hr	Power Mode, Dial Max.	0.9	±0.5
		5th			7.0	±0.5
	Inching Pedal	-	-	Inching Pedal Max.	Do Not Operate Machine	
Cooling Fan	Max. Performance	Min. Current	mA	Dial Min., Forced Drive	260	-
		Max. Fan Speed	rpm		2,000	±50
	Min. Performance	Max. Current	mA	Forced Drive	360	-
		Min. Fan Speed	rpm		550	Above

Item			Unit	Performance Standard	Value	Clearance
Cylinder Creeping	Lift Cylinder	Creeping	mm/5 min	Max. Blade Lift Up	5	Below
	Ripper Cylinder	Creeping	mm/5 min	Max. Ripper Up	5	Below
Track Sag			mm	A. Sagging between idler and No. 1 carrier roller	35-47	
			mm	B. Sagging between No. 1 Carrier roller and No. 2 Carrier roller	32-45	

Figure 30



DS2300981

* Conditions: P mode, Engine Dial Max., A/C Off, Hydraulic oil 45±5°C, Coolant 80 +5°C

Engine Specifications

Safety Instructions

⚠ WARNING

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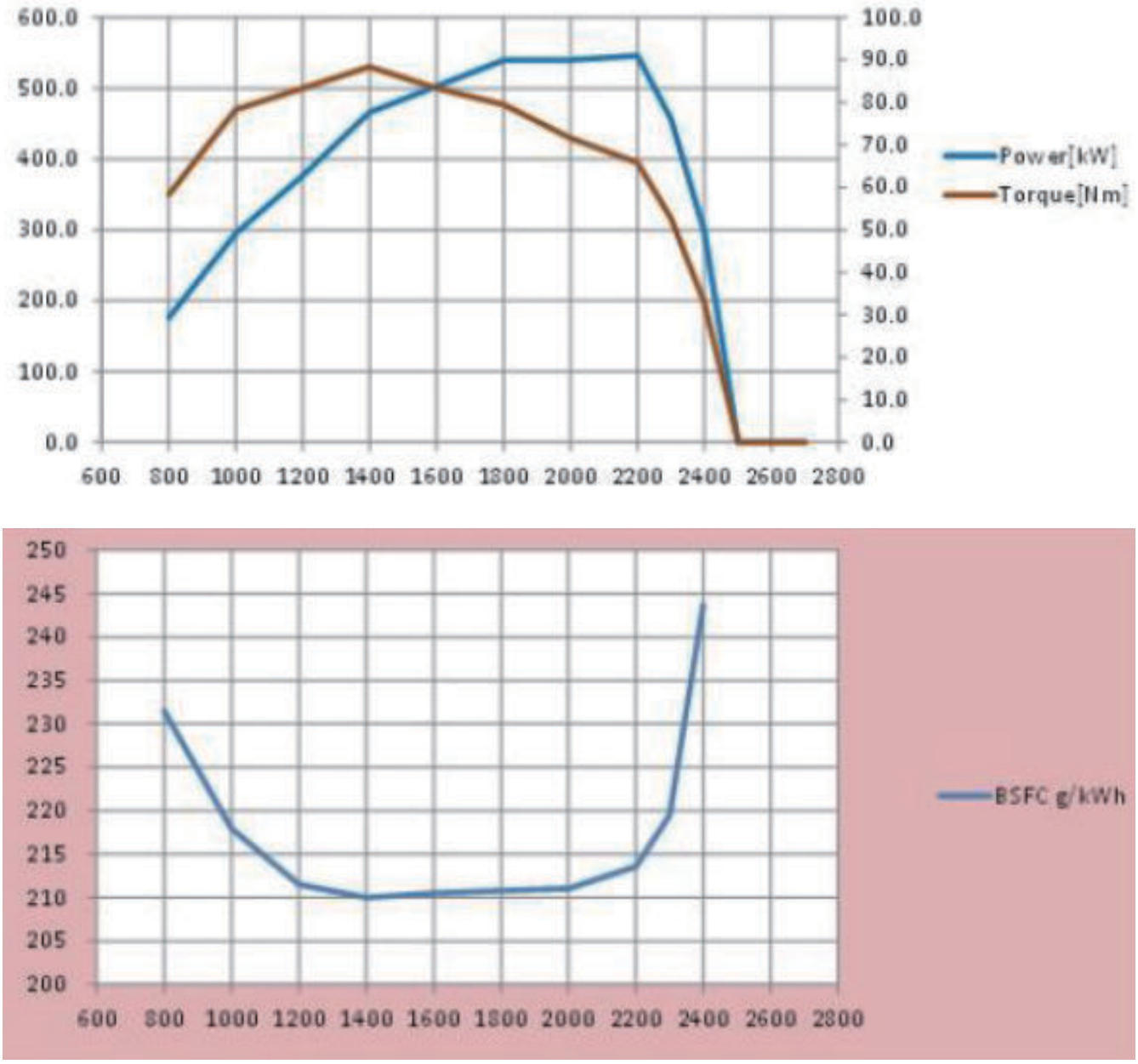
Engine Specification

Items		Specification
Engine	Type	4-Cycle water-cooled, Variable Geometry Turbocharged, Common Rail Direct Injection
	Emission	Tier4F
	Model	D34
	Gross Power	91 kW (122 HP) @ 2,200 rpm (SAE J1995)
Number of Cylinders		4
Aftertreatment		DOC + SCR
Displacement		3,409 cc
Compression Ratio		18 : 1
Low Idle Speed		900 ± 10 rpm
High Idle Speed		2,300 ± 25 rpm
Weight, without Coolant and Oil		365 kg (804 lb)
Alternator		24 V, 80 A
Battery		12 V * 2, 150 AH
Start Motor		24 V, 5 kW

Engine Performance Curves

Figure 31



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Performance Condition	SAE J 1995
Emission	Tier4F
Power Output (Rated)	91 kW @ 2,200 rpm
Max. Torque	530 N.m @ 1,400 rpm
Fuel Consumption (Rated)	214 g/kW.hr

NOTE: *Barometric Pressure: 760 mm (30") Mercury*
Temperature: 20°C (68°F)
W/O Cooling Fan
Alternator: Not Installed

Exhaust System: Complete, Installed

Air Cleaner, Installed

Tightening Torques

Normal Tightening Torque

The specifications in the tables below show the normal tightening torque for screws, nuts and unions. The values are to be used unless other values are specified in the inspection information. Always check whether there are special tightening torques given in the descriptions for the respective areas in the inspection information before using the general values for normal and special tightening torques respectively.

The following conditions apply:

- A tolerance of ±15 % applies to all values unless otherwise specified.
- All contact surfaces are to be clean and free of paint.
- Bolts and nuts are normally not lubricated regardless of surface treatment. All exceptions are specified in the inspection information.

Union Assemblies

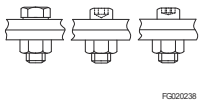
The specified values apply with a tolerance of ±5 %. The values apply to tightening with a counter hold.

Thread Inserts

The specified tightening torques also apply to bolted joints with a thread insert (Heli-Coil).

Thread inserts often provide greater strength compared to a directly screwed thread. This generates a stronger bolted joint in aluminum or the like.

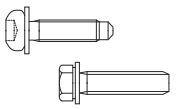
NOTE: *When a damaged thread is repaired with a thread insert, the normal screw and prescribed tightening torque are to be maintained. Install the thread insert as instructed in the inspection information.*

Hexagonal Screws, Hexagon Socket Screws, Six-point Socket Screws, Hexagon Nuts (Metric Thread, Course Pitch)		
Thread	Strength Class 8.8/8 Tightening Torque (Nm)	 FG020238
M4	2.4	
M5	5	
M6	8	
M8	20	
M10	39	
M12	70	
M14	112	
M16	180	
M18	240	
M20	350	
M22	490	
M24	600	
Flange Screws with Hexagonal Head and Hexagonal Flange Nuts (Metric Thread, Course Pitch)		

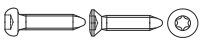
Thread	Strength Class 8.8/8 Tightening Torque (Nm)	
M5	5.4	
M6	8.6	
M8	22	
M10	42	
M12	77	
M14	123	
M16	184	


FG020239

Thread Forming Six-point Socket Screws and Hexagon Screws with Captive Washer (Modified Metric Thread, Course Pitch)			
Thread	Class 8	Class 10	
	Tightening Torque (Nm)		
M4	2.9	-	
M6	9.4	11	
M8	24	26	
M10	47	49	
M12	80	85	


FG020240

Thread Forming Six-point Socket Screws ST Thread	
Thread	Tightening Torque (Nm)
ST2.9	1.1
ST3.5	1.9
ST4.2	3.1
ST4.8	4.5
ST5.5	7.1
ST6.3	9.7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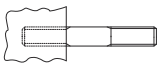
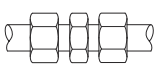
Stud Tap End in Threaded Hole, Strength Class 8.8/8 (Metric Thread, Course Pitch)
Tightening the stud tap end in the threaded hole must be done so the stud does not come loose when undoing the nut. To tighten the stud in the threaded hole, the torque must just overcome the friction in the thread and generate a preload. The torque for locking is 50% of the normal torque for hexagonal screws, hexagon socket screws, six-point socket screws, hexagon nuts.


FG020242

Union Nuts for Ferrule				
Thread	Thread Tighteninue (±15% Nm)			
	For Pipe Diameter	Steel Pipe with Greased Steel Nut	Plastic Pipe with Steel Ferrule and Brass or Steel Nut	Plastic Pipe with Brass Ferrule and Nut with Rubber Seal
M10x1	5	15	10	-
M12x1.5	6	20	10	-
M14x1.5	8	30	20	-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M16x1.5	10	40	25	15
M18x1.5	12	50	30	20
M20x1.5	12	55	35	-
M24x1.5	16	60	50	40
M130x2	22	120	-	-

Nuts for Lead-in Union

Thread	Thread Tightening Torque (±15% Nm)
M12x1.5	20
M14x1.5	25
M16x1.5	35
M18x1.5	50
M24x1.5	70
M130x2	80

Unions with Tapered Thread for Port Connection

Thread	Thread Tightening Torque (±15% Nm)	Tightening Torque (Nm)
	Straight Unions	Elbow Unions
M10x1k	10	8
M12x1.5k	10	8
M14x1.5k	15	10
M16x1.5k	15	10
M18x1.5k	20	15
M20x1.5k	25	20
M22x1.5k	25	20
M26x1.5k	45	40

Unions, Plugs and Banjo Screws with Cylindrical Threads for Seal with Flat Copper Gasket

Thread	Thread Tightening Torque (±15% Nm)
M8x1	10
M10x1	20
M12x1.5	20
M14x1.5	25
M16x1.5	30
M18x1.5	35
M20x1.5	45
M22x1.5	50
M24x1.5	60
M26x1.5	70
M28x1.5	80

M30x1.5	110	
M30x2	115	
M32x1.5	115	
M36x1.5	160	
M38x1.5	170	
M45x1.5	270	
Plugs with Tapered Thread		
Thread	Thread Tightening Torque (±15% Nm)	 FG020247
M10x1k	15	
M12x1.5k	20	
M14x1.5k	20	
M16x1.5k	25	
M18x1.5k	40	
M20x1.5k	40	
M22x1.5k	40	
M26x1.5k	60	
Insert Connections for Port Connection		
Thread	Thread Tightening Torque (±15% Nm)	 FG020248
M10x1k	18	
M12x1.5k	24	
M14x1.5k	28	
M16x1.5k	35	
M22x1.5k	40	
Insert Connections for Union Connection		
Thread	For pipe Diameter / Thread Tightening Torque (±15% Nm)	 FG020249
M14x1.5k	4-8 / 10	
M18x1.5k	12 / 15	
M24x1.5k	16 / 25	

Hydraulic Systems And Structure Specifications

Safety Instructions

⚠ WARNING

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Hydraulic System

Main Pump

Type	Variable Displacement Axial Piston Pump
Displacement	45 cc/rev (2.7 cu.in/rev)
Pump Cut-Off Pressure	250 bar
Max. Flow Rate	103.5 L/min (27.3 gal/min)

Fan Pump

Type	Gear
Max. Flow	61.4 liter/min (16.2 gal/min)
Displacement	26.7 cc/rev (1.6 cu.in/rev)

Main Control Valve

Control Type	Closed-Center (LS) Hydraulic System, Electric Control with Float Spool
Spool Arrangement	Lift, Tilt, Angle, Ripper
Relief Valve Pressure	250 bar (LS)
Port Relief Pressure	270 bar (Lift), 350 bar (Angle, Ripper)

Fan Motor (Oil Cooler Fan)

Control Type	Gear
Displacement	19 cc/rev (1.2 cu.in/rev)
Max. Operating Pressure	205 bar
Direction of Rotation	Reversible

Solenoid Valve

Type	DC 24 V, 4 Solenoid Valve
Function	Safety Cut Off, HST Cut Off L/R, Parking

Accumulator

Charge Pressure	Volume
10 bar (142 psi) (10 kg/cm^2)	0.32 Liter (0.08 gal)

By Pass Valve, C1

Size	Cracking Pressure
1 inch	4.5 bar (4.5 kgf/cm2) @ 105 Liter/min

By Pass Valve, C2

Size	Cracking Pressure
3/4 inch	1.5 bar (1.5 kgf/cm2) @ 5 Liter/min

Travel System

HST Pump

Type	Swash Plate, Axial Piston
Displacement	2 * 67.6 cc/rev
Max. Flow Rate	2 * 149 Liter/min (2 * 39.4 gal/min)

HST Motor

Type	Swash Plate, Axial Piston
Displacement	2 * 107 cc/rev
Max. Flow Rate	2 * 288 Liter/min (2 * 76.1 gal/min)

Reduction Gear

Drive Type	2-Stage Planetary Gear
Reduction Ratio	46.12
Max. Output Speed	21.8 / 39.3 rpm
Max. Output Torque	6,398 / 3,543 kgf.m (62.7 / 34.7 kN.m)
Weight (Included Motor)	406 kg (895 lb)

Sprocket

Sprocket P.C.D.	Ø 732.81 mm (28.8 inches)
Track Link Pitch	216 mm (8.5 inches)
No. Of Teeth	21
Weight	82 kg (181 lb)

Traveling Performance

Traveling Speed (Theoretical)	9 km/hr (5.6 mile/hr)
Max. Traction Force	16.0 ton

Parking Brake

Control Type	Main Pressure, Mechanical
Brake Torque	87 kg.m (853 N.m)
Brake Release Pressure	8 bar (8.2 ±1.5 kg/cm^2)

Figure 32

General Maintenance Instructions

Safety Instructions

⚠ WARNING

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Welding Precautions and Instructions

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

To avoid accidents, personal injury and the possibility of causing damage to the machine or to components, welding must only be performed by properly trained and qualified personnel, who possess the correct certification (when required) for the specific welding fabrication or specialized repair being performed.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Structural elements of the machine may be built from a variety of steels. These could contain unique alloys or may have been heat-treated to obtain particular strength characteristics. It is extremely important that welding repairs on these types of steel are performed with the proper procedures and equipment. If repairs are performed incorrectly, structural weakening or other damage to the machine (that is not always readily visible) could result. Always consult with your dealer before welding on integral components of the machine. It is possible that some types of structurally critical repairs may require Magnetic Particle or Liquid Penetrant testing, to make sure there are no hidden cracks or damage before the machine can be returned to service.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always perform welding procedures with proper safety equipment and adequate ventilation in a dry work area. Keep a fire extinguisher near and wear personal protective equipment.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Observe the following safety instructions:

1. Use adequate safety shielding and keep away from fuel and oil tanks, batteries, hydraulic piping lines or other fire hazards when welding.
2. Never weld when the engine is running. Battery cables must be disconnected before the welding procedure is started.
3. Never weld on a wet or damp surface. The presence of moisture causes hydrogen embrittlement and structural weakening of the weld.
4. If welding procedures are being performed near cylinder rods then, operator's cabin window areas or any other assemblies could be damaged by weld spatters. Use adequate shielding protection in front of the assembly.
5. During welding equipment setup, always attach ground cables directly to the area or component being welded to prevent arcing through bearings, bushings, or spacers.
6. Always use correct welding rods for the type of weld being performed and observe recommended precautions and time constraints. AWS Class E7018 welding rods for low alloy to medium carbon steel must be used within two hours after removal from a freshly opened container. Class E11018G welding rods for T-1 and other higher strength steel must be used within 1/2 hour of removal from a freshly opened container.

Hydraulic System - General Precautions

Always maintain oil level in the system at recommended levels. Assemblies that operate under heavy loads, at high-speed, with extremely precise tolerances between moving parts (e.g. pistons and cylinders, or shoes and swash plates), can be severely damaged if oil supply runs dry.

Assemblies can be run dry and damaged severely in a very short time when piping or hoses are disconnected to repair leaks and/or replace damaged components. Hoses that are inadvertently switched during disassembly (inlet for outlet and vice versa), air introduced into the system or assemblies that are low on oil because of neglect or careless maintenance, could all produce sufficient fluid loss to cause damage or improper operation.

When starting the engine (particularly after long layoff or storage intervals), make sure that all hydraulic controls and operating circuits are in neutral, or “OFF”. That will prevent pumps or other components that may be temporarily oil starved from being run under a load.

Replacement of any hydraulic system component could require thorough cleaning, flushing, and some amount of refilling with fresh, clean oil if the protective seal on replacement parts has obviously been broken or if seal integrity may have been compromised. When protective seals are removed before installation and reassembly, inspect all replacement parts carefully before they are installed. If the replacement part shows no trace of factory pre-lube or has been contaminated by dirt or by questionable oils, flushing and refilling with clean hydraulic fluid is recommended.

Vibration, irregular or difficult movement or unusual noise from any part of the hydraulic system could be an indication of air in the system (and many other types of problems). As a general precaution (and to help lessen the risk of potential long-term damage), allow the engine to run at no-load idle speed immediately after initial start-up. Hydraulic fluid will circulate, releasing any air that may have been trapped in the system before load demands are imposed.

Before starting the machine, a daily walk-around safety inspection, including a quick visual inspection for any exterior evidence of leaking hydraulic fluid, can help extend the service life of system components.

NOTICE

Hydraulic system operating conditions (repetitive cycling, heavy workloads, fluid circulating under high-pressure) make it extremely critical that dust, grit or any other contamination be kept out of the system. Observe fluid and filter change maintenance interval recommendations and always pre-clean any exterior surface of the system before it is exposed to air. For example, the reservoir fill cap and neck area, hoses that have to be disassembled, and the covers and external surfaces of filter canisters should all be cleaned before disassembly.

Maintenance Service and Repair Procedure

General Precautions

Fluid level and condition should always be checked whenever any other maintenance service or repair is being performed.

NOTE: *If the unit is being used in an extreme temperature environment (in subfreezing climates or in high temperature, high humidity tropical conditions), frequent purging of moisture condensation from the hydraulic reservoir drain tap must be a regular and frequent part of the operating routine. In more moderate, temperate climates, draining reservoir sediment and moisture may not be required more than once or twice every few months.*

Inspect drained oil and used filters for signs of abnormal coloring or visible fluid contamination at every oil change. Abrasive grit or dust particles will cause discoloration and darkening of the fluid. Visible accumulations of dirt or grit could be an indication that filters are overloaded (and will require more frequent replacement) or that disintegrating bearings or other component failures in the hydraulic circuit may be imminent or have already occurred. Open the drain plugs on the main pump casings and check and compare drain oil in the pumps. Look for evidence of grit or metallic particles.

Vibration or unusual noise during operation could be an indication of air leaking into the circuit (Refer to the appropriate Troubleshooting section for component or unit for procedures.), or it may be evidence of a defective pump. The gear type pilot pump could be defective, causing low pilot pressure, or a main pump broken shoe or piston could be responsible.

NOTE: *If equipped, indicated operating pressure, as shown on the multi-display digital gauge on the Instrument Panel ("F-Pump" and "R-Pump") will be reduced because of a mechanical problem inside the pump. However, pressure loss could also be because of cavitation or air leakage, or other faults in the hydraulic system.*

Check the outer case's oil drain line in the main pumps. If no metallic particles are found, make sure there is no air in the system. Unbolt and remove the tank return drain line from the top part of the swing motor, both travel motors, and each main pump. If there is air in any one of the drain lines, carefully prefill the assembly before bolting together the drain line piping connections. Run the system at low rpm.

Hydraulic System Cleanliness and Oil Leaks

Maintenance Precautions for Hydraulic System Service

Whenever maintenance, repairs or any other troubleshooting or service is being performed, it's important to remember that hydraulic system - including both the interior and exterior surfaces of assemblies, and every drop of operating fluid - must be protected from contamination.

Dust and other foreign contaminants are major contributors to premature wear in hydraulic circuits. The narrow tolerances, rapidly moving parts and high operating pressures of the system require that fluid be kept as clean as possible. The performance and dependability of the machine (and the service life of individual components) can be noticeably reduced if proper precautions are not observed:

- Use a noncombustible, evaporative type, low residue solvent and thoroughly clean exterior surfaces of assemblies before any part of the circuit is opened or disassembled.

  NOTE: *It's just as important to clean the cap and reservoir top before routine fluid changes or quick checks as it is before major repairs. (Accumulated dirt attracts moisture, oil and other fluids - and more dirt.)*

- Keep dismantled parts covered during disassembly. Use clean caps, plugs or tape to protect the disconnected openings of flanges, manifolds and piping.
- Do not allow cleaning solvents or other fluids to mix with the oil in the system. Use clean oil to flush any traces of solvent or other residue before reassembly.
- If metal or rubber fragments are found in the system, flush and replace all fluid in the system and troubleshoot the circuit to identify the source of contamination.

NOTICE

Make sure that cleaning solvents will be compatible with rubber materials used in the hydraulic system. Many petroleum based compounds can cause swelling, softening, or other deterioration of system sealing elements, such as O-rings, caps and other seals.

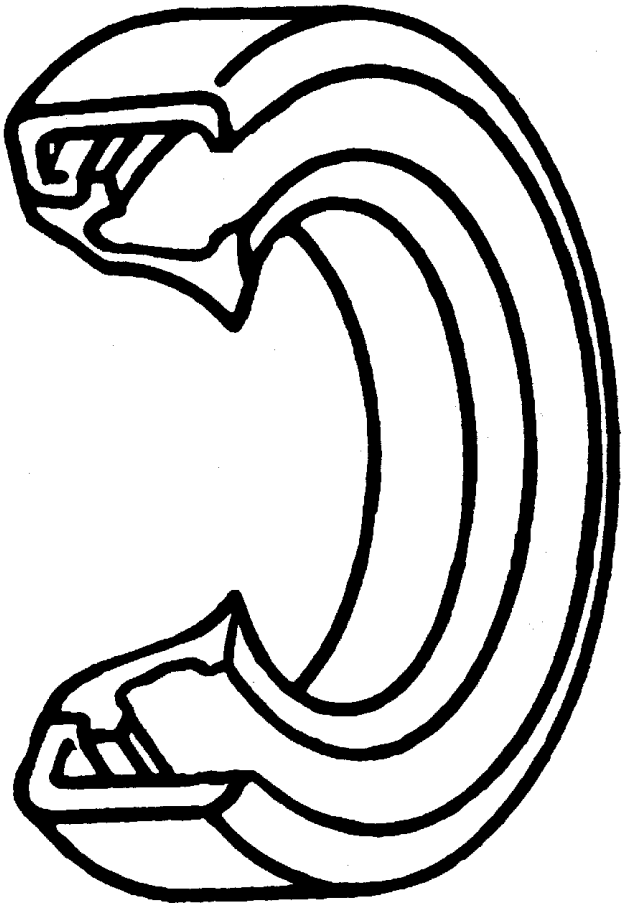
Oil Leakage Precautions

Oil that is visibly seeping from joints or seals should always serve as a "red flag" alarm.

Leaks must alert the machine operator and maintenance crew that air, water and dirt have an open, free passageway through which to enter the circuit. Corrosive salt air, freezing and thawing condensation cycles and working environments that are full of fine dust are especially hazardous. Clogging of valve spools or external piping (especially pilot circuit piping) can gradually diminish or suddenly put a stop to normal hydraulic function. You can prevent having to make these types of repairs by the following recommended assembly procedures:

1. Use new O-rings and oil seals whenever hydraulic assemblies are rebuilt.
2. Prepare joint surfaces before assembly by checking alignment and flatness. Clean and repair corrosion or any other damage.

3. Follow bolt torque recommendations and all other assembly requirements.
   Figure 33



0565A

NOTE: *Grease lip seals before assembly.*

Cleaning and Inspection

General Instructions

All parts must be clean to permit an effective inspection. During assembly, it is very important that no dirt or foreign material enters unit being assembled. Even minute particles can cause malfunction of close installed parts such as thrust bearing, matched parts, etc.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Do not inhale vapors or allow solvent type cleaners to contact skin. Keep solvent away from open flame, arcs or sparks or other sources of ignition that could start a fire.

1. Clean all metal parts thoroughly using a suitable cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all oils, lubricants, and/or foreign materials are dissolved and parts are thoroughly clean.
2. For bearings that can be removed, soak them in a suitable cleaning fluid for a minute or two, then remove bearings from cleaning fluid and strike flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. To dry bearings, use moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning bearings that are not lubricated.

DO NOT SPIN BEARINGS WHEN DRYING; bearings may be rotated slowly by hand to facilitate drying process.

3. Carefully inspect all bearing rollers, cages, and cups for wear, chipping, or nicks to determine condition. Do not replace a bearing cone or cup individually without replacing the mating cup or cone simultaneously. After inspection, dip bearings in lightweight oil and wrap them in clean lintless cloth or paper to protect them until installation.
   For those bearings that are to be inspected in place; inspect bearings for roughness of rotation, scoring, pitting, cracked or chipped races. If any of these defects are found, replace bearings. Also, inspect defective bearing housing and/or shaft for grooved, galled or burred conditions that indicate bearing has been turning in its housing or on its shaft.
4. It is more economical to replace oil seals, O-rings, sealing rings, gaskets and retaining rings when unit is disassembled than waiting for premature failures; refer to latest Micro Fiche and/or Parts Book for replacement items. Be careful when installing sealing members, to avoid cutting or scratching. Curling under of any seal lip will seriously impair its efficiency. Apply a thin coat of Loctite #120 to outer diameter of metal casing and on oil seals to assure an oil tight install into retainer. Use extreme care not to get Loctite on lips of oil seals. If this happens, that portion of the seal will become brittle and allow leakage.

   When replacing lip type seals, make sure spring loaded side is towards oil to be sealed.
5. If available, use Magna-flux or a similar process for checking for cracks that are not visible. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks, or scores. Replace all gears showing cracks or spots where case-hardening has worn through. Minor nicks may be removed with suitable hone. Inspect shafts and quills to make certain they have not been sprung, bent, or no twisted splines, and that shafts are in normal condition.

   NOTE: *Spline wear is not considered detrimental except where it affects tightness of splined parts.*

   Inspect thrust washers for distortion, scores, burs, and wear. Replace thrust washer if defective or worn.
6. Inspect bores and bearing surfaces of cast parts and machined surfaces for scratches, wear, grooves and dirt. Remove any scratches and burrs with crocus cloth. Remove foreign material. Replace any parts that are deeply grooved or scratched which would affect their operation.

Bearing Inspection

The conditions of the bearing are vital to the smooth and efficient operation of the machinery. When any component containing bearings is disassembled, always carefully examine the condition of the bearings and all of its components for wear and damage.

Once the bearing is removed, clean all parts thoroughly using a suitable cleaning solution. If the bearing is excessively dirty, soak the bearing assembly in a light solution and move the bearing around until all lubricants and/or foreign materials are dissolved and the parts are thoroughly clean.

When drying bearings, moisture free compressed air can be used. Be careful not to direct the air in a direction which will force the bearing to dry spin while not being properly lubricated.

After the bearings have been cleaned and dried, carefully inspect all bearing rollers, cages and cups for wear, chipping or nicks. If the bearing cannot be removed and is to be inspected in place, check for roughness of rotation, scoring, pitting, cracked or chipped races. If any of these defects are found replace the whole bearing assembly. NEVER replace the bearing alone without replacing the mating cup or the cone at the same time.

After inspection lightly coat the bearing and related parts with oil and wrap in a clean lintless cloth or paper and protect them from moisture and other foreign materials until installation.

It is also important to inspect the bearing housing and/or shaft for grooved, galled or burred conditions that indicate the bearing has been turning in its housing or on its shaft.

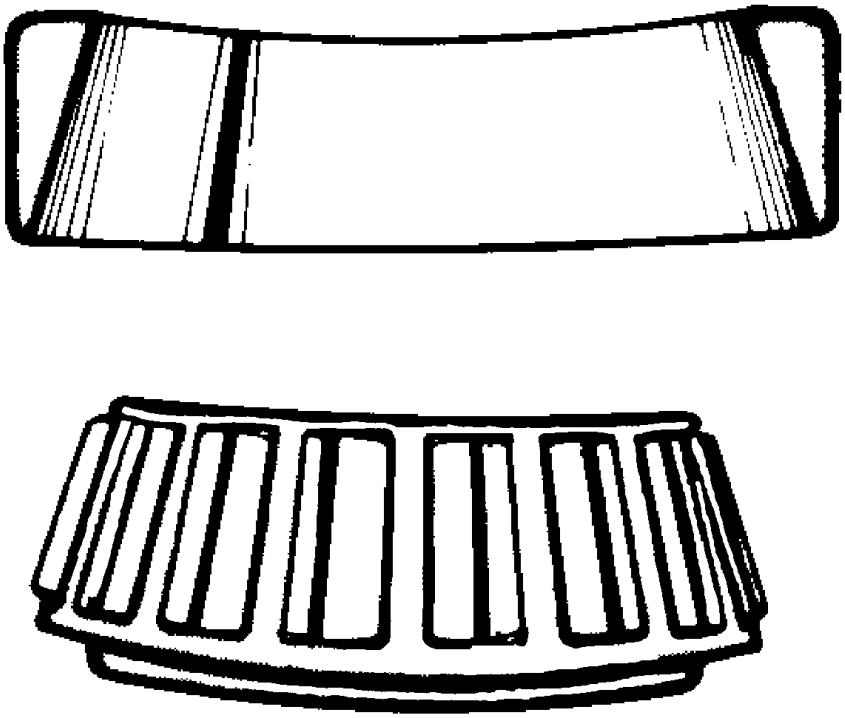
If available, use Magna-flux or similar process for checking for cracks that are not visible.

The following illustrations will aid in identifying and diagnosing some of the bearing related problems.

NOTE: *The illustrations will only show tapered roller bearings, but the principles of identifying, diagnosing and remedying the defects are common to all styles and types of bearings.*

Normal Bearing

Figure 34

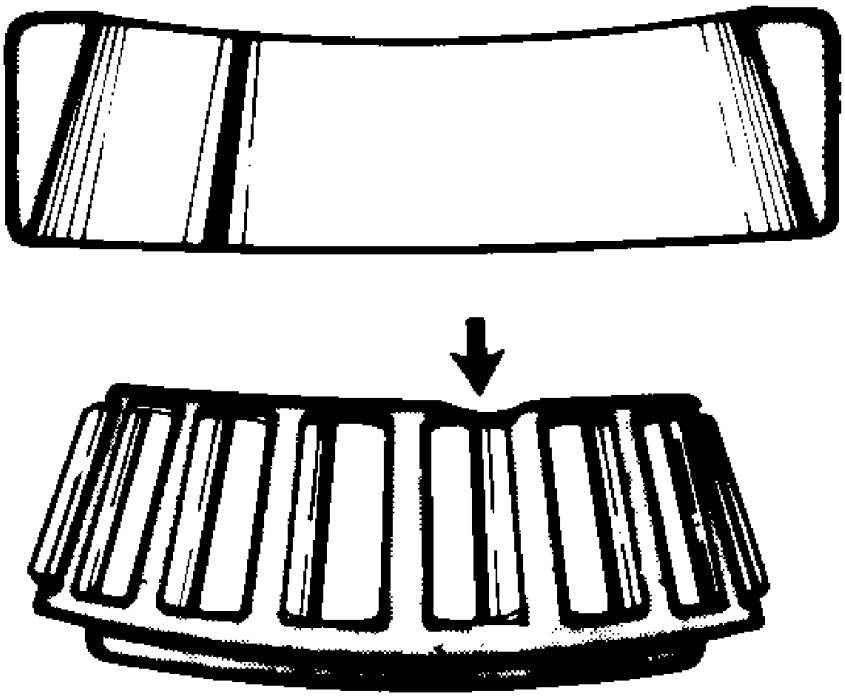


HASA620S

Smooth even surfaces with no discoloration or marks.

Bent Cage

Figure 35



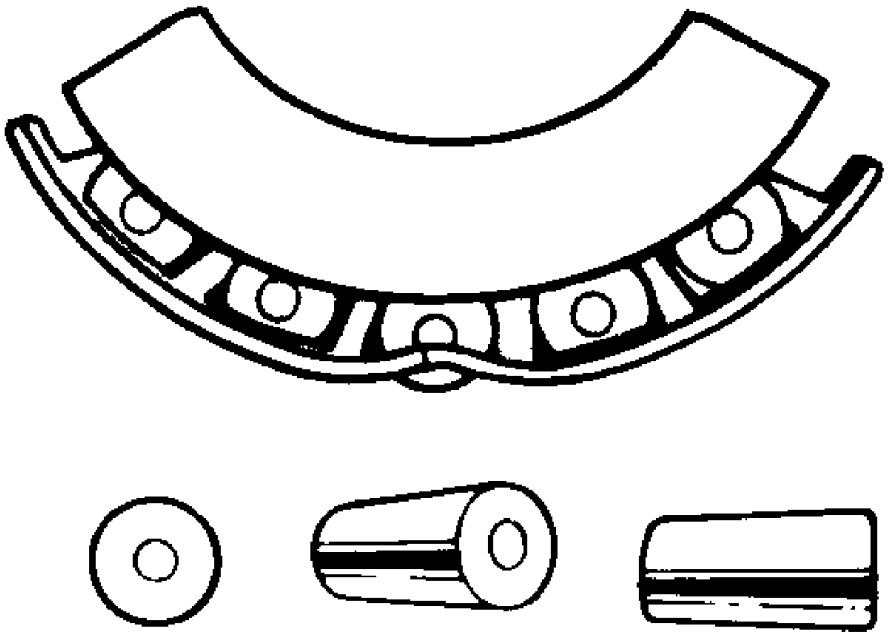
HASA460S

Cage damage because of improper handling or tool usage.

Replace bearing.

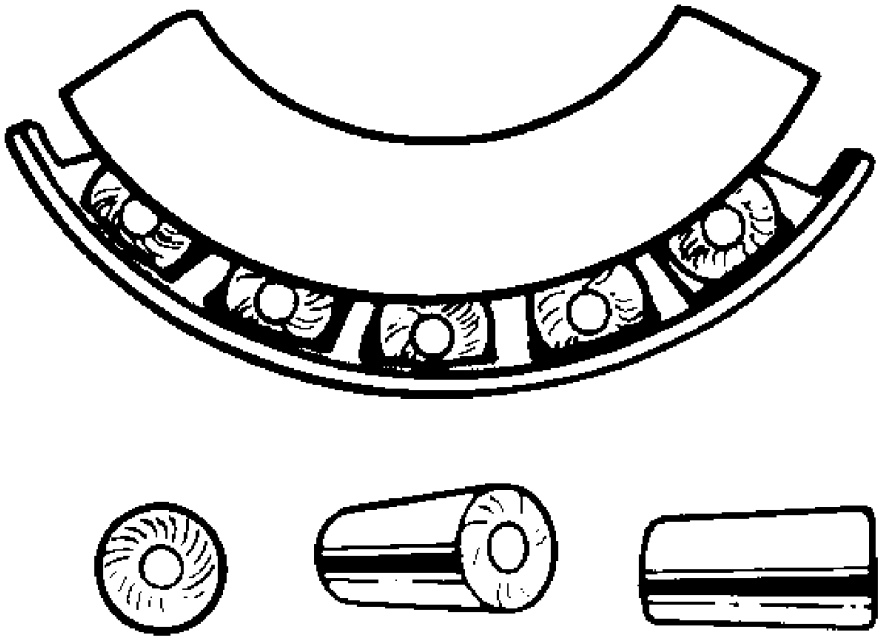
Galling

Figure 36



HASA470S

Figure 37



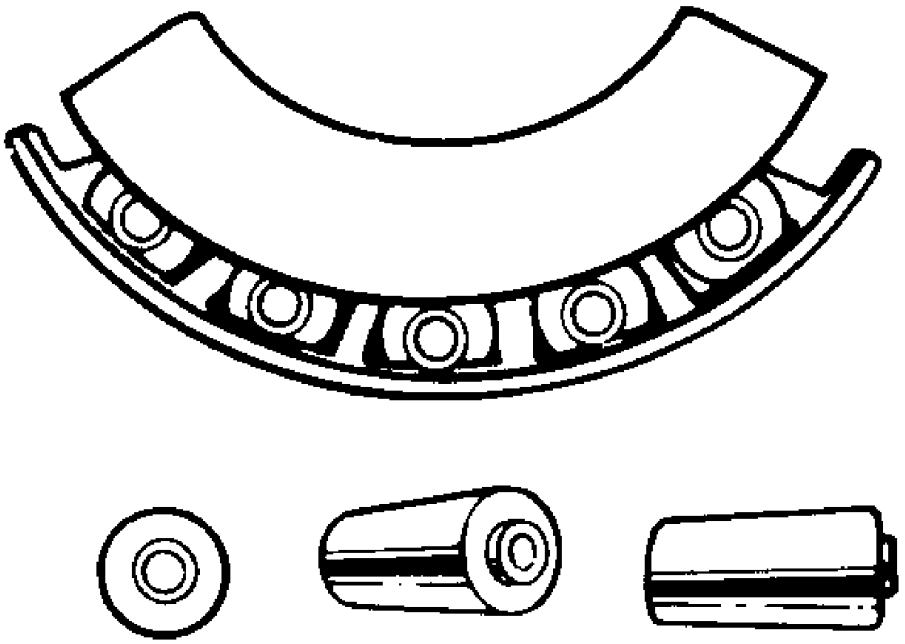
HASA480S

Metal smears on roller ends because of overheat, lubricant failure or overload.

Replace bearing - check seals and check for proper lubrication.

Abrasive Step Wear

Figure 38



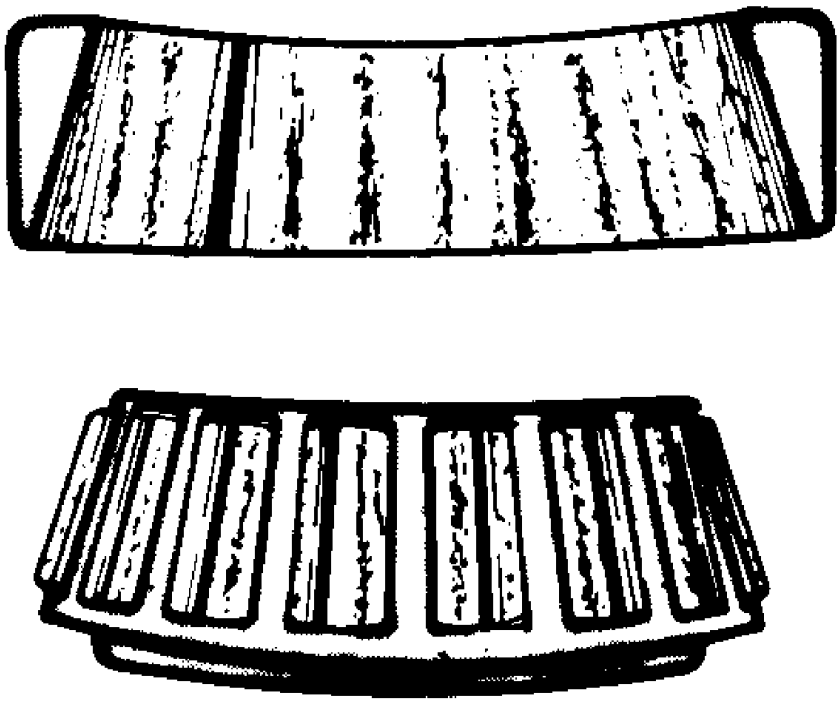
HASA490S

Pattern on roller ends caused by fine abrasives.

Clean all parts and housings, check all parts and housings, check seals and bearings and replace if leaking, rough or noisy.

Etching

Figure 39



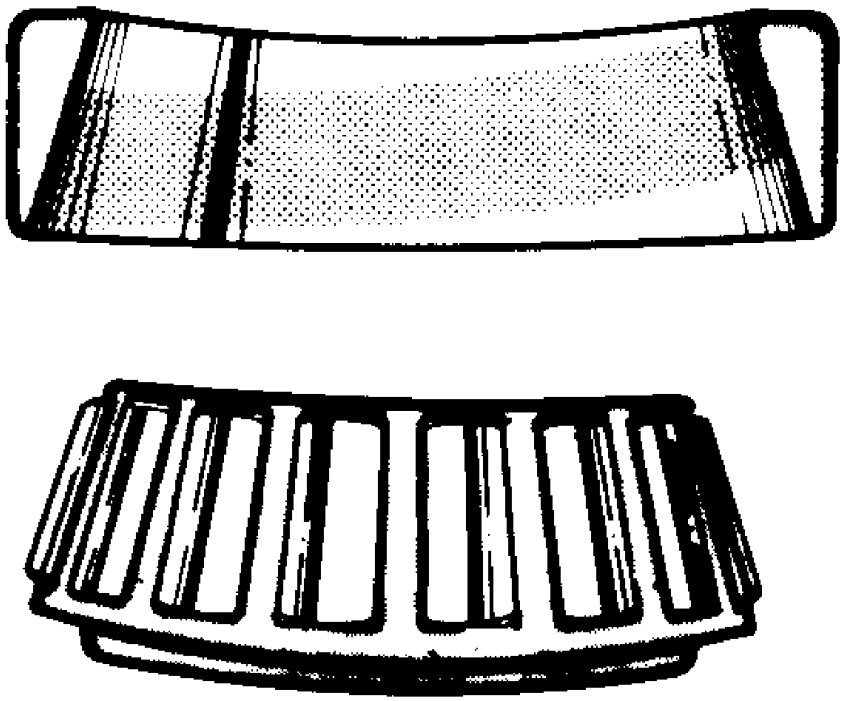
HASA500S

Bearing surfaces appear gray or grayish black in color with related etching away of material usually at roller spacing.

Replace bearings - check seals and check for proper lubrication.

Misalignment

Figure 40



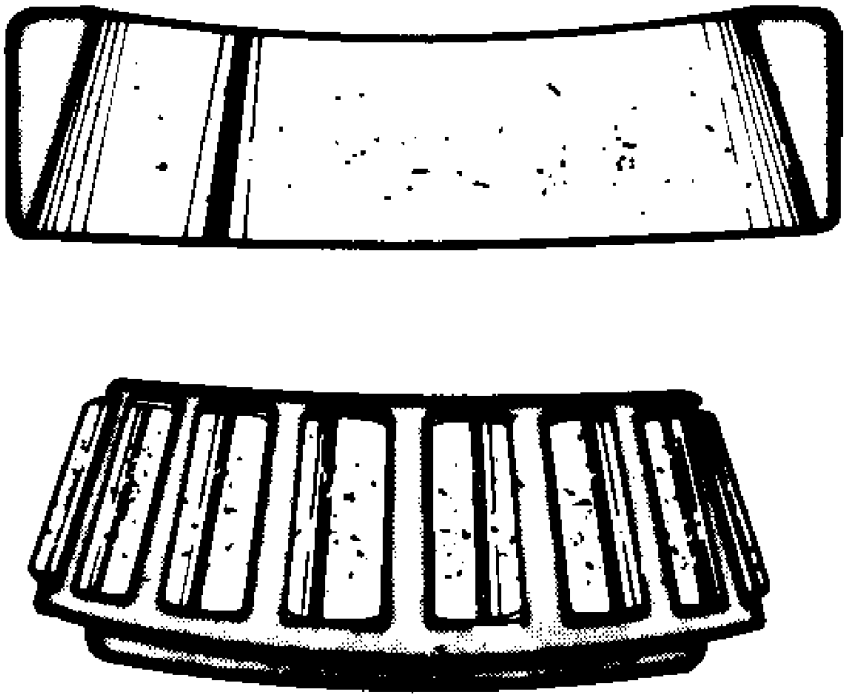
HASA510S

Outer race misalignment because of foreign object.

Clean related parts and replace bearing. Make sure races are properly seated.

Indentations

Figure 41

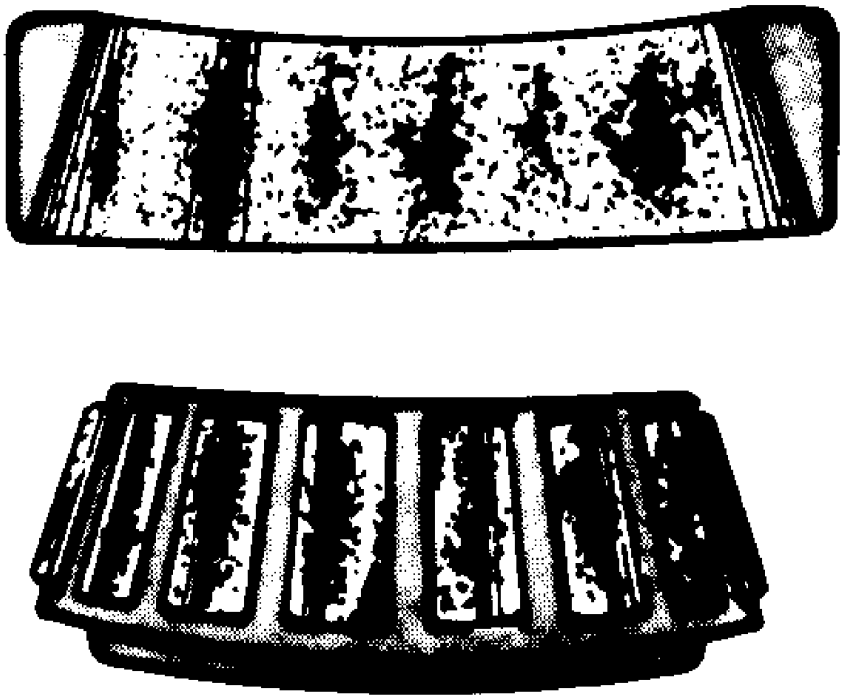


HASA520S

Surface depressions on race and rollers caused by hard particles of foreign materials.
Clean all parts and housings, check seals and replace bearings if rough or noisy.

Fatigue Spalling

Figure 42



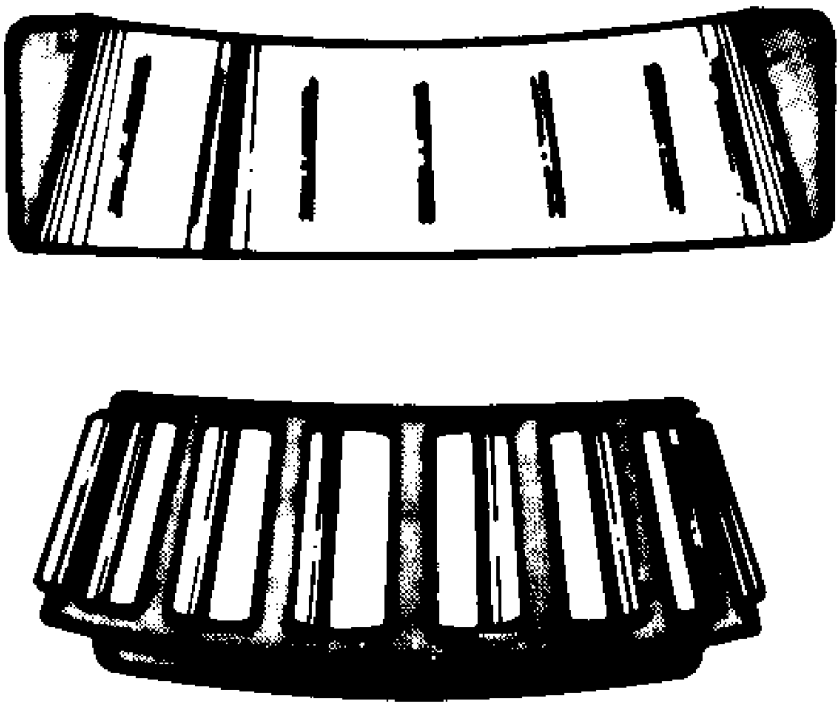
HASA530S

Flaking of surface metal resulting from fatigue.

Replace bearing - clean all related parts.

Brinelling

Figure 43



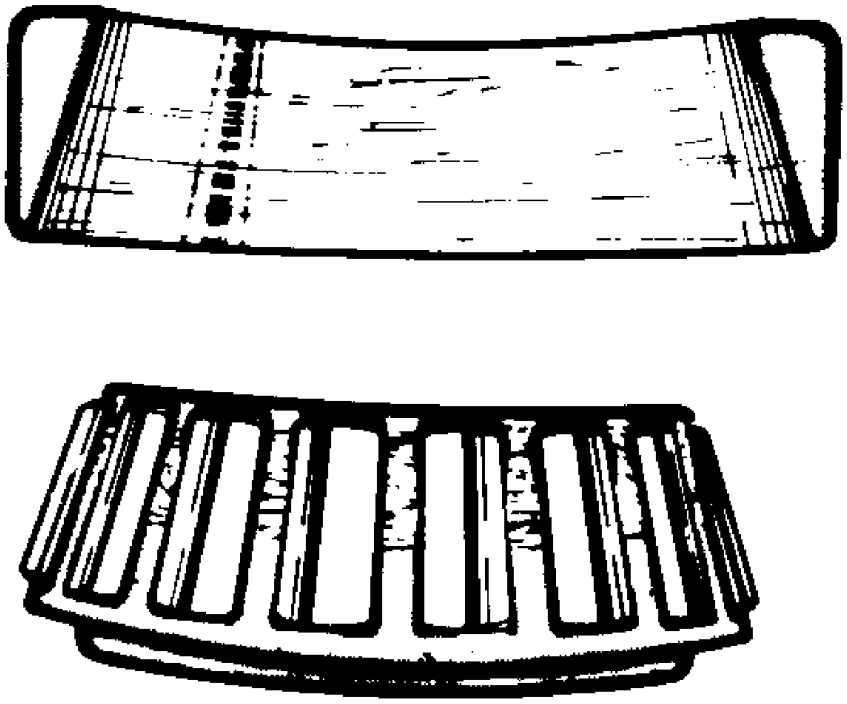
HASA540S

Surface indentations in raceway caused by rollers either under impact loading or vibration while the bearing is not rotating.

Replace bearing if rough or noisy.

Cage Wear

Figure 44



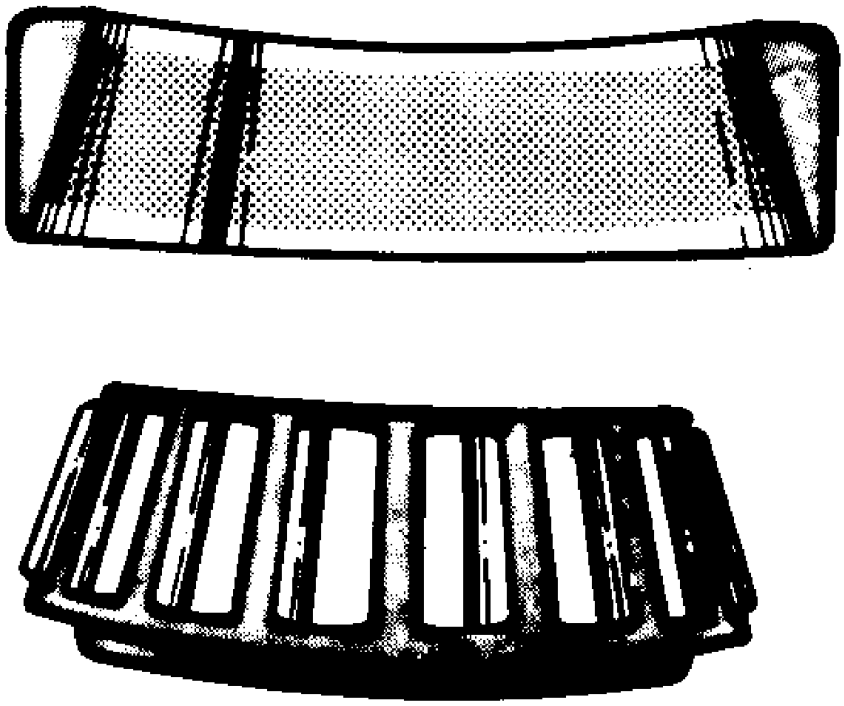
HASA550S

Wear around outside diameter of cage and roller pockets caused by abrasive material and inefficient lubrication.

Replace bearings - check seals.

Abrasive Roller Wear

Figure 45



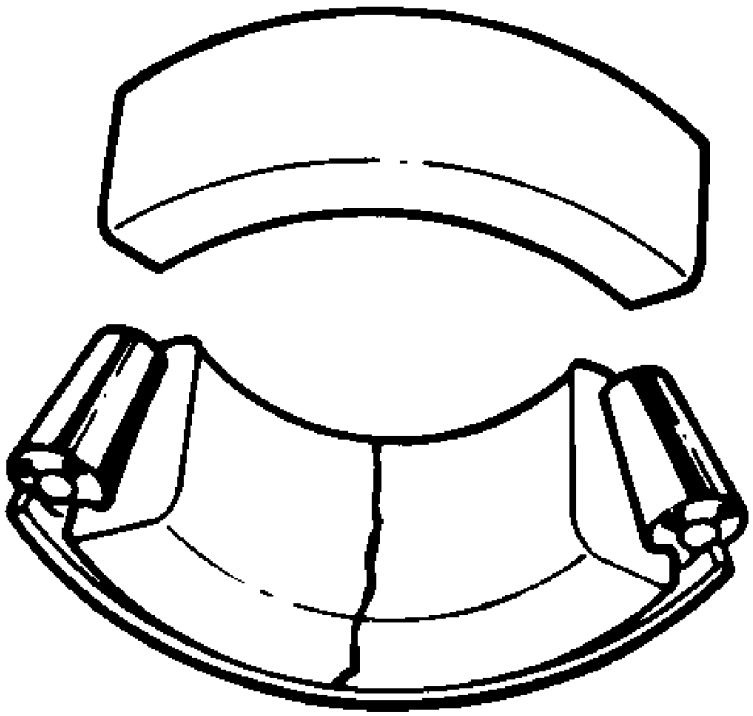
HASA560S

Pattern on races and rollers caused by fine abrasives.

Clean all parts and housings, check seals and bearings and replace if leaking, rough or noisy.

Cracked Inner Race

Figure 46

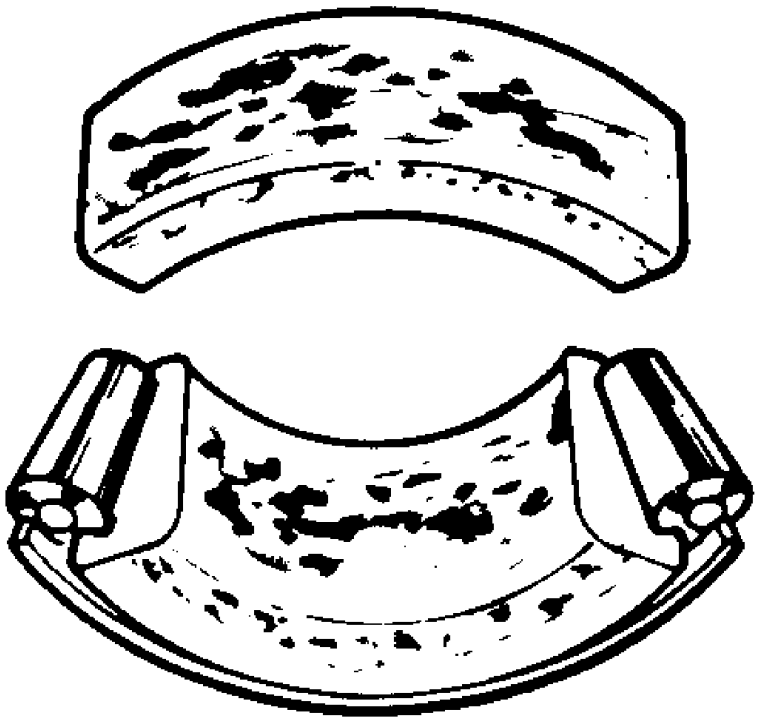


HASA570S

Race cracked because of improper installation, cocking or poor bearing seat.
Replace all parts and housings, check seals and bearings and replace if leaking.

Smears

Figure 47



HASA580S

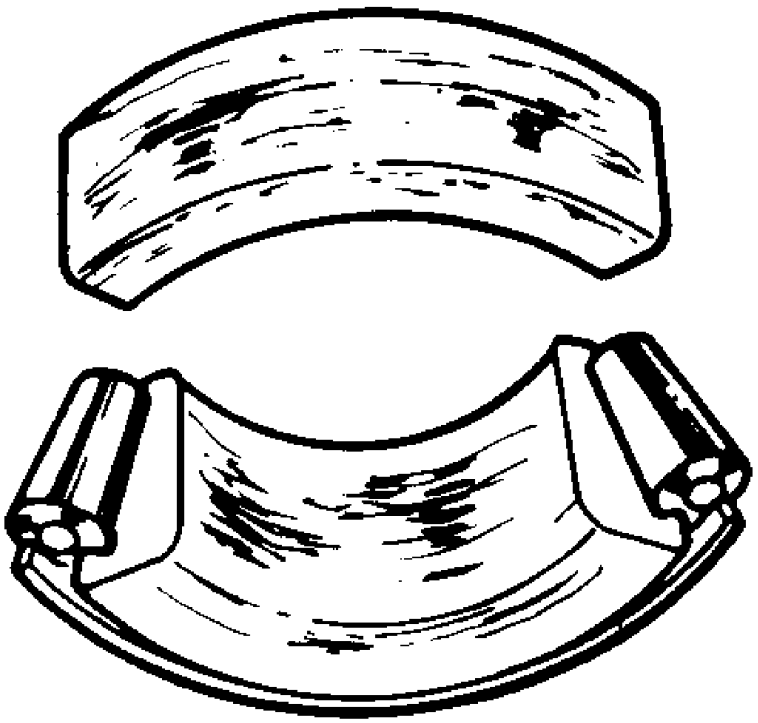
Smearing of metal because of slippage caused by poor installation, lubrication, overheating, overloads or handling damage.

Replace bearings, clean related parts and check for proper installation and lubrication.

Replace shaft if damaged.

Frettage

Figure 48



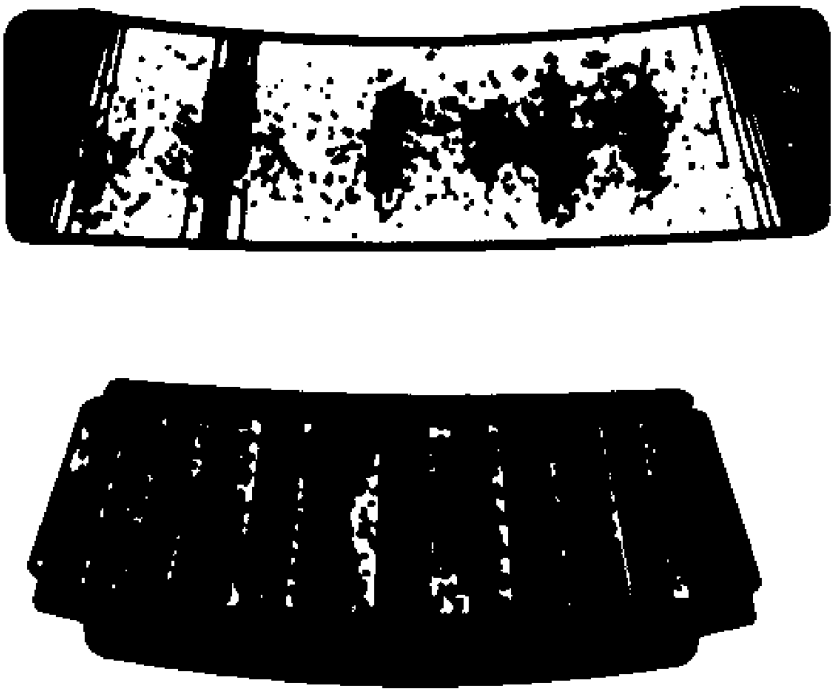
HASA590S

Corrosion set up by small relative movement of parts with no lubrication.

Replace bearing. Clean all related parts. Check seals and check for proper lubrication.

Heat Discoloration

Figure 49



HASA600S

Heat discoloration can range from faint yellow to dark blue resulting from overload or incorrect lubrication.

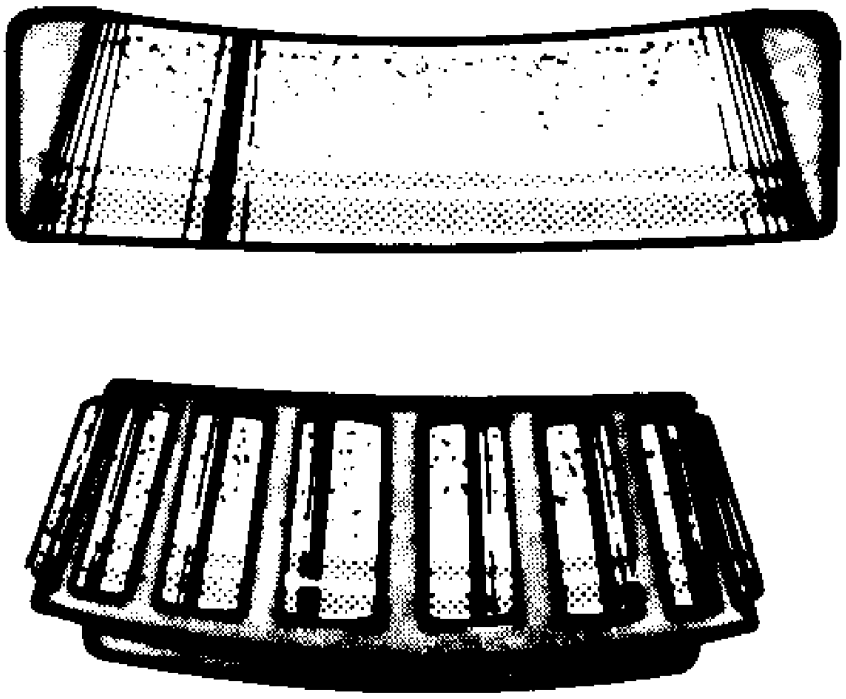
Excessive heat can cause softening of races or rollers.

To check for loss of temper on races or rollers, a simple file test may be made. A file drawn over a tempered part will grab and cut metal, whereas a file drawn over a hard part will glide readily with no metal cutting.

Replace bearing if overheating damage is indicated. Check seals and other related parts for damage.

Stain Discoloration

Figure 50



HASA610S

Discoloration can range from light brown to black caused by incorrect lubrication or moisture.

If the stain can be removed by light polishing or if no evidence of overheating is visible, the bearing can be reused.

Check seals and other related parts for damage.

Standard Torques

Safety Instructions

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments repairs or service. Untrained operators and failure to follow instructions can cause death or serious injury.

Torque Values for Standard U.S. Fasteners

Type	SAE Grade	Description	Bolt Head Marking
1	1 or 2	WILL HAVE NO MARKINGS IN THE CENTER OF THE HEAD. Low or Medium Carbon Steel Not Heat-treated.	
5	5	WILL HAVE THREE RADIAL LINES. Quenched and Tempered Medium Carbon Steel.	
8	8	WILL HAVE 6 RADIAL LINES. Quenched and Tempered Special Carbon or Alloy Steel.	

Recommended torque, in foot-pounds, for all Standard Application Nuts and Bolts, provided:

1. All thread surfaces are clean and lubricated with SAE-30 engine oil. (See Note.)
2. Joints are rigid, that is, no gaskets or compressible materials are used.
3. When reusing nuts or bolts, use minimum torque values.

   NOTE: *Multiply the standard torque by:*

   0.65 When finished jam nuts are used.

   0.70 When Molykote, white lead or similar mixtures are used as lubricants.

   0.75 When Parkerized bolts or nuts are used.

   0.85 When cadmium plated bolts or nuts and zinc bolts w/waxed zinc nuts are used.

   0.9 When hardened surfaces are used under the nut or bolt head.

   NOTE: *When reusing bolts and nuts in service, use minimum torque values.*

The following General Torque Values must be used where SPECIAL TORQUE VALUES are not given.

NOTE: *Torque values listed throughout this manual are lubricated (wet) threads; values must be increased 1/3 for non lubricated (dry) threads.*				
Thread Size	Heat-treated Material Grade 5 and Grade 8			
	Grade 5 (3 Radial Dashes on Head)		Grade 8 (6 Radial Dashes on Head)	
	Foot pounds (ft lb)	Newton Meter (Nm)	Foot pounds (ft lb)	Newton Meter (Nm)
1/4" - 20	6	8	9	12

NOTE: *Torque values listed throughout this manual are lubricated (wet) threads; values must be increased 1/3 for non lubricated (dry) threads.*				
Thread Size	Heat-treated Material Grade 5 and Grade 8			
	Grade 5 (3 Radial Dashes on Head)		Grade 8 (6 Radial Dashes on Head)	
	Foot pounds (ft lb)	Newton Meter (Nm)	Foot pounds (ft lb)	Newton Meter (Nm)
1/4" - 28	7	9	11	15
5/16" - 18	13	18	18	24
5/16" - 24	15	20	21	28
3/8" - 16	24	33	34	46
3/8" - 24	27	37	38	52
7/16" - 14	38	52	54	73
7/16" - 20	42	57	60	81
1/2" - 13	58	79	82	111
1/2" - 20	65	88	90	122
9/16" - 12	84	114	120	163
9/16" - 18	93	126	132	179
5/8" - 11	115	156	165	224
5/8" - 18	130	176	185	251
3/4" - 10	205	278	290	393
3/4" - 16	240	312	320	434
7/8" - 9	305	414	455	617
7/8" - 14	334	454	515	698
1" - 8	455	617	695	942
1" - 14	510	691	785	1064
1 1/8" - 7	610	827	990	1342
1 1/8" - 12	685	929	1110	1505
1 1/4" - 7	860	1166	1400	1898
1 1/4" - 12	955	1295	1550	2102
1 3/8" - 6	1130	1532	1830	2481
1 3/8" - 12	1290	1749	2085	2827
1 1/2" - 6	1400	2034	2430	3295
1 1/2" - 12	1690	2291	2730	3701
1 3/4" - 5	2370	3213	3810	5166
2" - 4 1/2	3550	4813	5760	7810

NOTE: *If any bolts and nuts are found loose or at values less than what the chart states, it is recommended that loose bolt and/or nut be replaced with a new one.*

Type 8 Phosphate Coated Hardware

This chart provides tightening torque for general purpose applications using original equipment standard hardware as listed in the Parts Manual for the machine involved. DO NOT SUBSTITUTE. In most cases, original equipment standard hardware is defined as Type 8, coarse thread bolts, nuts and through hardened flat washers (Rockwell "C" 38 - 45), all phosphate coated and assembled without supplemental lubrication (as received) condition.

The torques shown below also apply to the following:

1. Phosphate coated bolts used in tapped holes in steel or gray iron.
2. Phosphate coated bolts used with phosphate coated prevailing torque nuts. (nuts with distorted threads or plastic inserts).
3. Phosphate coated bolts used with copper plated weld nuts.

Markings on bolt heads or nuts indicate material grade ONLY and are NOT to be used to determine required torque.

Nominal Thread Diameter	Standard Torque ±10%	
	Kilogram.meter (kg.m)	Foot pounds (ft lb)
1/4"	1.1	8
5/16"	2.2	16
3/8"	3.9	28
7/16"	6.2	45
1/2"	9.7	70
9/16"	13.8	100
5/8"	19.4	140
3/4"	33.2	240
7/8"	53.9	390
1"	80.2	580
1 - 1/8"	113.4	820
1 - 1/4"	160.4	1160
1 - 3/8"	210.2	1520
1 - 1/2"	279.4	2020
1 - 3/4"	347.1	2510
2"	522.8	3780

Torque Values for Hose Clamps

The following chart provides the tightening torques for hose clamps used in all rubber applications (radiator, air cleaner, operating lever boots, hydraulic system, etc.).

Clamp Type and Size	Torque			
	Radiator, Air Cleaner, Boots, Etc.		Hydraulic System	
	Kilogram.meter (kg.m)	Inch Pounds (in lb)	Kilogram.meter (kg.m)	Inch Pounds (in lb)
"T" Bolt (Any Diameter)	0.68 - 0.72	59 - 63	-------	-------
Worm Drive - Under 44 mm (1-3/4 in) Open Diameter	0.2 - 0.3	20 - 30	0.5 - 0.6	40 - 50
Worm Drive - Over 44 mm (1-3/4 in) Open Diameter	0.5 - 0.6	40 - 50	-------	-------
Worm Drive - All "Ultra-Tite"	0.6 - 0.7	50 - 60	0.5 - 0.6	40 - 50

ORFS Swivel Nut Recommended Torque

Dash Size	Hose I.D.	Thread Size	Torque (kg.m) Recommended
4	1/4"	9/16"	2.4 - 2.6
6	3/8"	11/16"	3.3 - 3.9
8	1/2"	13/16"	5.1 - 5.7
12	3/4"	1 3/16"	11.7 - 12.7
16	1"	1 7/16"	15.3 - 17.3
20	1 1/4"	1 11/16"	18.0 - 20.0

Torque Values for Split Flanges

The following chart provides the tightening torques for split flange connections used in hydraulic systems. Split flanges and shoulders should install squarely. Install all bolts, finger tight and then torque evenly.

NOTE: *Over torquing bolts will damage the flanges and/or bolts, which can cause leakage.*

Flange Size (*)	Bolt Size	Bolt Torque	
		Kilogram.meter (kg.m)	Foot-pounds (ft lb)
1/2"	5/16"	2.1 - 2.5	15 - 18
3/4"	3/8"	3.0 - 3.7	22 - 27
1"	3/8"	3.7 - 4.8	27 - 35
1 - 1/4"	7/16"	4.8 - 6.2	35 - 45
1 - 1/2"	1/2"	6.4 - 8.0	46 - 58
2"	1/2"	7.6 - 9.0	55 - 65
2 - 1/2"	1/2"	10.9 - 12.6	79 - 91
3"	5/8"	19.1 - 20.7	138 - 150
3 - 1/2"	5/8"	16.2 - 18.4	117 - 133

(*) - Inside diameter of flange on end of hydraulic tube or hose fitting.

NOTE: *Values stated in chart are for Standard Pressure Series (Code 61) Split Flanges.*

Torque Wrench Extension Tools

Very large diameter, high-grade fasteners (nuts, bolts, cap screws, etc.) require a great deal of turning force to achieve recommended tightening torque values.

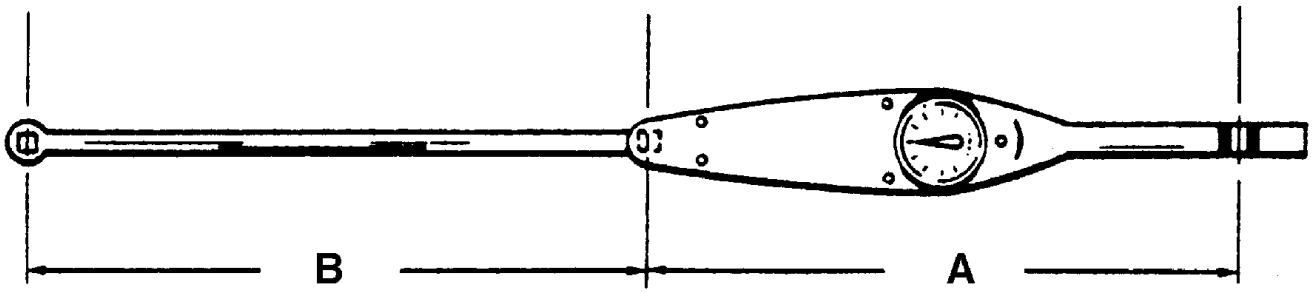
Common problems that could occur as a result are:

- Recommended torque exceeds the measuring capacity of the torque wrench.
- Specialized sockets do not fit the adapter on the front end (nose) of the torque wrench.
- Generating adequate force on the back end (handle) of the wrench is difficult or impossible.
- Restricted access or an obstruction may make use of the torque wrench impossible.
- A unique application requires fabrication of an adapter or other special extension.

Most standard torque wrenches can be adapted to suit any one of the proceeding needs or situations, if the right extension tool is used or fabricated.

Torque Multiplication

Figure 51



0552A

A wrench extension tool can be used to increase the tightening force on a high capacity nut or bolt.

For example, doubling the distance between the bolt and the back (handle) end of the torque wrench doubles the tightening force on the bolt. It also halves the indicated reading on the scale or dial of the torque wrench. To accurately adjust or convert indicated scale or dial readings, use the following formula:

I = A x T/A + B where:

I = Indicated force shown on the torque wrench scale or dial.

T = Tightening force applied to the nut or bolt (actual Torque).

A = Length of the torque wrench (between the center of the nut or bolt and the center of the handle).

B = Length of the extension.

As an example, if a 12" extension is added to a 12" torque wrench, and the indicated torque on the dial reads “150 ft lb”, the real force applied to the bolt is 300 ft lb:

I =	A x T A + B	=	12 x 300 12 + 12	=	3600 24	=	150

NOTE: *The formula assumes there is no added deflection or “give” in the joint between the extension and torque wrench. Readings may also be inaccurate:*

- If the extension itself absorbs some of the tightening force and starts to bend or bow out.
- If an extension has to be fabricated that is not perfectly straight (for example, an extension made to go around an obstruction, to allow access to a difficult to tighten fastener), the materials and methods used must be solid enough to transmit full tightening torque.

Other Uses for Torque Wrench Extension Tools

Torque wrench extensions are sometimes made up for reasons other than increasing leverage on a fastener.

For example, a torque wrench and extension can be used to measure adjustment “tightness” of a linkage or assembly. Specially fabricated extensions can be used to make very precise checks of the force required to engage or disengage a clutch mechanism, release a spring-applied brake assembly, or “take up” free play in most any movable linkage.

Once the value of the adjustment force is established, repeated checks at regular intervals can help to monitor and maintain peak operating efficiency. These types of adjustment checks are especially useful if physical measurements of linkage travel are difficult to make or will not provide the needed degree of precision and accuracy.

To allow the assembly or mechanism to accept a torque wrench, welding a nut or other adapter on the end of a linkage shaft or other leverage point will allow turning the shaft or assembly manually.

Loctite Applications

Tightening Torque Specifications (Metric)

(For coated threads, pre-lubricated assemblies.)

NOTICE

Disassembly, overhaul and replacement of components on the machine, installation of new or replacement parts and/or other service-related maintenance may require the use of thread or flange sealing assembly compound.
Use the information on this page as a general guide in selecting specific formulas that will meet the particular requirements of individual assembly installations. We, Machine Producer, do not specifically approve a specific manufacturer or brand name, but the following table of "Loctite" applications is included for which cross-references to other manufacturer's products should also be widely available.

NOTICE

Use primer "T" or "N" for all cold weather assembly of fastener adhesives, with Thread locker sealers 222, 242/243,262, 271, 272, or 277.

I. "Loctite" Fastener Adhesives

Product	Application	Color	Removal	Breakaway Cure Strength (in lb) of Sealer Alone
222	Low strength for 6 mm (1/4") or smaller fasteners.	Purple	Hand tools	45
242 or 243	Medium strength for 6 mm (1/4") and larger fasteners.	Blue	Hand tools	80
262	High strength for high-grade fasteners subject to shock, stress and vibration.	Red	Heat/260°C (500°F) Remove HOT (NO solvent)	160
271	Extra high strength for fine thread fasteners up to 25 mm (1") diameter.	Red	Heat/260°C (500°F) Remove HOT	160
272	High temperature/high strength for hostile environments to 232°C (450°F).	Red	Heat/316°C (600°F) Remove HOT	180
277	Extra high strength for coarse thread fasteners 25 mm (1") diameter and larger.	Red	Heat/260°C (500°F) Remove HOT	210

II. "Loctite" Pipe Thread Sealant

Product	Application	Color	Removal	Required Setup
545	"No filler/non clog" formula for high-pressure hydraulic systems. Over application will not restrict or foul system components.	Purple	Hand tools	4 Hours (or 1/2 hour with Locquic "T" Primer)
656	Solvent resistant, higher viscosity tapered thread sealer.	White	Hand tools	4 Hours (or 1/2 hour with Locquic "T" Primer)

III. "Loctite" gasket/flange sealer

Product	Application	Color	Notes
518	Gasket eliminator specifically made for aluminum flanges/ surfaces. For hydraulic systems to 34,475 kPa (5,000 psi).	Red	Use Locquic "N" primer for fast (1/2 - 4 hours) setup. Unprimed setup 4 - 24 hours.
504	Low-pressure/wide-gap gasket eliminator compound. Fills gaps to 0.762 mm (0.030"), cures to rigid seal.	Orange	Use Locquic "N" primer for faster (1/2 - 4 hours) setup. Unprimed setup 4 - 24 hours.
515	General purpose, fast setup, flexible-cure gasket eliminator. For	Purple	Use Locquic "N" primer for faster (1/4 - 2 hours) setup. Unprimed setup 1 - 12 hours.

Product	Application	Color	Notes
	nonrigid assemblies subject to shock, vibration or deflection.		

IV. "Loctite" retaining compounds

Product	Application	Color	Notes
609	For bushings, sleeves, press fit bearings, splines and collars. For gaps to 0.0002 mm (0.005"), temperatures to 121°C (250°F).	Green	Use Locquic "N" primer for increased bond strength and all cold temperature applications.
620	For high temperatures to 232°C (450°F).	Green	Same as 609, above.
680	For high strength bonds and tight clearance gaps, to 0.00008 mm (0.002").	Green	Same as 609, above.

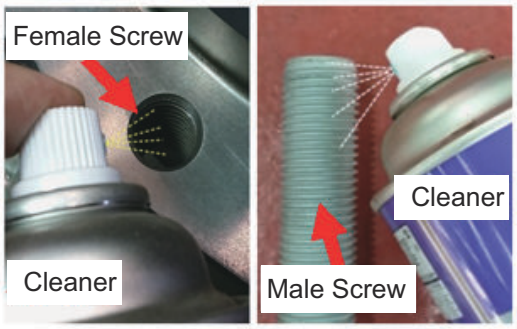
V. "Loctite" Adhesives

Product	Application	Color	Notes
380	Black Max instant adhesive for shock and vibration-resistant bonds.	Black	May take 120 hours to reach full cure strength.
454	Adhesive for porous surfaces.	Clear	Full strength in 24 hours.
480	Increased strength (+50%), shock and vibration-resistant.	Black	Full strength in 24 hours.

Tips for using thread locker

Instructions for use

1. Figure 52



DS2301334

Removal of foreign substances in the fastening area

If there is oil or foreign matter on the screw thread, clean it off with a cleaning solution.

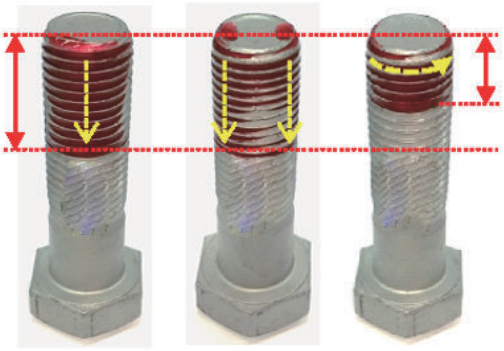
2. Figure 53

DS2301335

Application of screw locking agent

Apply evenly from the tip of the bolt to the screw thread.

3. Figure 54



DS2301336

Appearance of finished application

One line: bolted length = spread length

Double row or round: at least half the bolted length

If you do not know the length of your physique, apply about 1/3 or more of the bolt part.

The application form is less than M20 => one application, more than w22 => two lines or circular application.

If the bolts are assembled, completely remove them within 30 minutes.

NOTE: *Fastening Depth: The total length of engagement between the female thread and the male thread when tightening*

Precautions

1. To manage the cleanliness of the screw locker, keep it sealed when not in use, and do not apply it to the bolt in advance, but apply it before the bolt installation work.
2. The bolts must be fully torqued within 30 minutes after temporary assembly.

   However, if the work cannot be done within 30 minutes, do not do the temporary assembly, and proceed with the assembly when the complete torque work is possible within 30 minutes.
3. If more than 30 minutes have elapsed after the provisional fastening, unscrew the bolts, cleanly remove the screw fixing agent, reapply and then fasten.

   At this time, the hardened screw fixing agent on the female screw is cleaned with a cleaning solution.

4. If it is difficult to remove the bolts coated with the screw fixing agent, heat them over 260 degrees in Celsius to melt the screw fixing agent before removing it.

   The thread locker does not harden even when left in the air. (It hardens when it is blocked from air and comes into contact with metal - anaerobic property)

Engine

Safety Instructions

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments repairs or service. Untrained operators and failure to follow instructions can cause death or serious injury.

Due to the high fuel pressure, leakage can cause jets of fuel that penetrates through the skin! Always consider the high pressure part of the system (accumulator and high pressure lines) as pressurized. The pressure could be as high as 30,450 psi (2,100 bar). This applies also to an engine that is not running!

Before working on any of the fuel system components: Depressurized the system with SDP3 and then loosen the cylinder high pressure line nut at the accumulator of the cylinder you are going to work on. Cover the nut with a cloth during the operation. Use safety glasses and gloves.

Avoid standing closer than 3 feet (1 m) to an engine at first start up after fuel system work has been conducted. Fuel jets will diverge within this distance from the source and become less harmful.

General Information

General Description

This manual provides the most efficient methods for engine maintenance as well as quick, efficient methods to determine the cause of engine faults to ensure that any actions taken by professionally certified maintenance technicians are done in the most efficient and efficient way possible. If maintenance is performed by unskilled technicians, or maintenance without the specified tools and facilities, serious bodily injury or critical faults in engine performance may occur. Regular inspection and maintenance are required to maintain long-term optimal engine conditions and best performance. In the event that a part must be replaced, only genuine parts as defined by the parts the list (Parts Book) should be used. It shall not be held liable for any critical damage or faults which may be caused by the use of unauthorized or remanufactured parts. The maintenance methods stated in this Operation and Maintenance Manual are the most efficient and safest work procedures. Some work procedures require special tools.

For questions about genuine parts and special tools, please contact us.

This manual includes 'Danger', 'Warning', and 'Caution' in order to reduce possible injuries and engine faults which may occur while performing maintenance. If workers do not follow the instructions, critical faults in engine performance and operation or serious bodily injury may occurred. 'Danger', 'Warning', and 'Caution' instructions must be followed. However, we inform you that it is not possible to describe all possible and unexpected dangers which may arise while performing engine maintenance.

Cautions for Starting the Engine

1. Before starting the engine, please read this manual carefully and fully understand 'Danger', 'Warning', and 'Caution'. If you cannot fully understand it or have any question, please contact us.
2. For safety reasons, attach “Warning” signs around engines in operation to keep people other than workers from accessing the engines. Let engine operators know that they are responsible for the safety of the engine room.

3. Only authorized people may start and operate engines. Unauthorized people should not be allowed to handle engines.
4. Do not access running or rotating parts while the engine is in operation.
5. Be careful not to touch or contact the engine during operation since it becomes hot during operation.
6. Exhaust gas is poisonous. Fully ventilate before starting engine. If the space is airtight, ensure that it is well ventilated.

Cautions for Inspection and Repair

1. Inspection and repair of engine should be performed only when the engine is stopped. Otherwise, burns or safety accidents may occur, so do not perform inspection or repair while the engine is running.
2. If it is absolutely necessary to perform inspection or repair on the operating engine, do not get close to the rotating parts.

⚠ DANGER

AVOID DEATH
When accessories such as necklaces, rings, watches, or gloves become stuck in rotating parts while the engine is running, serious bodily injury may occur.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY
Do not exchange or disassemble a pipe or horse (from the engine fuel circuit, engine oil circuit, coolant circuit, or compressed air circuit) while the engine is running. The leaked liquid may cause bodily injuries.

3. Use an engine oil drain container that is large enough to prevent the overflow of engine oil while draining engine oil.
4. Open the engine coolant cap after fully cooling the engine to exchange or replenish coolant.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY
If the coolant cap is opened while the engine is still hot, hot water will spurt out and may cause burns. Open the engine coolant cap after fully cooling the engine.

5. Fuel is highly flammable. Smoking or use of fire around an engine may cause fire.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY
Only refuel when the engine is stopped.

6. Mark and separately manage the containers for storing coolant from beverage containers for avoiding confusion. See a doctor immediately in case of drinking coolant.
7. Follow the instructions provided by the battery manufacturer when checking or handling batteries.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Battery fluid is corrosive and dangerous because of its explosiveness and toxicity. Therefore, it should only be handled by a skilled technician who specializes in battery fluid.

8. Only certified professional technicians should repair and maintain engines.
9. Only appropriate tools should be used. If the jaws of a wrench are worn out, the wrench might slip during use, causing safety accidents.
10. Do not allow other persons to stay or pass under an engine when lifting the engine with a crane. Before lifting the engine, ensure that there is no one around the engine and reserve enough safety space.
11. Before inspecting or replacing the electrical apparatus, disconnect the battery ground wire first. Connect the battery ground wire after completing all required work for checking or replacing the electrical apparatus in order to prevent a short circuit.
12. Before performing electric welding works, turn off engine, block the power supply to the engine, and remove the wire harness connector connected to the engine control unit (ECU).
13. Do not give any electric or mechanical shocks or perform welding works on the electrical apparatus or the ECU.

General Repair

1. Wait until the engine is properly cooled down before starting work, since you may get burned by the heated engine.

   Before performing fuel line work, check the common rail pressure and engine temperature by using the failure diagnosis device.
2. Disconnect the battery ground wire from to prevent damage of wires and sensors caused by a short circuit.
3. Engine oil and coolant may damage paint and should be stored in a separate container and marked for safe management.
4. Store the disassembled parts in a specified space to avoid damage or pollution.
5. Use specified and special tools for efficient and safe repair.
6. If parts need to be replaced, use only genuine parts for replacement. Using unauthorized or remanufactured parts may cause critical damage and faults in engine performance.
7. Replace parts such as cotter pins, gaskets, O-rings, seal rings, oil seals, and washers with new ones during repairs. Reuse of parts may be the cause of engine faults and engine may not operate properly.
8. Group and store disassembled parts in disassembling order. The strength, shape, and screw torque of bolts and nuts are different according to their assembly position. Please divide and store them accordingly to these characteristics.
9. Clean disassembled parts to remove foreign substances before inspecting or reassembling parts. Use compressed air to clean the oil holes or holes.
10. Thinly spread oil or grease on rotating parts or parts requiring lubrication, before assembling them.
11. If required, use a specified adhesive to assemble gaskets to prevent water or oil from leaking.

12. Assemble bolts and nuts with the specified tightening torque.
13. After completing repairs, conduct a final inspection and perform a test operation to check if all works have been successfully completed.

Other Safety Instructions and Environmental Pollution

Observe the following instructions to protect workers from danger and to prevent the environmental pollution while performing engine repairs.

1. Good ventilation and low humidity should be maintained in the work space.
2. The workspace should be clean, in good order, and no flammables are allowed in the workshop.
3. Smoking is strictly forbidden in the workshop.
4. Workers should wear working clothes, protective goggles, and safety shoes.
5. Workers are not allowed to wear accessories such as necklaces, rings, watches, and earrings.
6. Start the engine in a well-ventilated space and fully ventilate the space before starting engine to prevent carbon monoxide poisoning.
7. Wait until the engine is properly cooled down before starting work, since you may get burned by the heated engine.
8. Do Not work on rotating or running parts once the engine has been started.
9. Discard oil according to the regulations set forth by the relevant authorities.
10. If engine oil or fuel leaks on the floor or is improperly discharged, serious environmental pollution of sea, river or underground water may occur.
11. Discard the undiluted anticorrosive agent, antifreeze, filter elements, and cartridges as special wastes.
12. Discard coolant and special waste according to the regulations of the appropriate authorities.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Failure to observe the regulations of the relevant authorities violates environmental pollution regulations and may be subject to legal penalties.

Use of Genuine Parts

An engine consists of many parts which are mechanically harmonized. To prevent engine faults in advance and use engines with best performance for a long period, maintenance and replacement of expendable parts should be conducted regularly.

Use of genuine parts is recommended. Using unauthorized or remanufactured parts may cause critical damage and faults to engine for which HD HYUNDAI CONSTRUCTION EQUIPMENT shall not be held liable.

Engine Maintenance

Prevention of Damage and Abrasion

Using an engine for any purposes other than the designed purpose may cause critical faults in engine performance for which HD HYUNDAI CONSTRUCTION EQUIPMENT shall not be held liable. For details concerning the usage and purpose of the engine, please direct questions to our Sales Team. Do not adjust, convert, or change the ECU without our authorization.

If a problem is found in an engine, figure out and solve the cause to prevent the critical faults in advance. Use of genuine parts is recommended. Using unauthorized or remanufactured parts may

cause critical damage and faults to engine for which HD HYUNDAI CONSTRUCTION EQUIPMENT shall not be held liable.

Consider the following while managing engines.

1. Use clean, specified, and qualified fuel only. Use fuel recommended in this Operation and Maintenance Manual.

⚠ CAUTION

AVOID INJURY

Using inappropriate or unspecified fuel may cause critical damage and faults in engine performance.

2. Do not operate an engine without lubrication oil or coolant. Use only the products (engine oil, cooling water, anticorrosive agent, and etc) recommended by HD HYUNDAI CONSTRUCTION EQUIPMENT.
3. Always keep surroundings of the engine clean.
4. Use fuel recommended in this Operation and Maintenance manual.
5. Conduct inspections and exchanges regularly according to the regular inspection table.
6. If the engine is overheated, do not stop it immediately, but operate it at idle status for five minutes or more to lower the engine temperature to the proper level.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

If the radiator cap is opened while the engine is still hot, hot water will spurt out and may cause burns.

7. Check the engine oil level on a flat surface. Do not exceed the maximum on the oil level gauge.

⚠ CAUTION

AVOID INJURY

Immediately replenish engine oil when the engine oil level is below the lower limit of the engine oil gauge.

8. If there are gauges for battery, oil pressure and coolant and temperature, check if they indicate a normal status.
9. Do not operate engine without coolant.

⚠ CAUTION

AVOID INJURY

Always use coolant mixed with antifreeze. If coolant without antifreeze is used, the coolant may freeze causing the coolant passage in the cylinder block to freeze and damaging the engine.

Prevention of Pollution

Consider the following to manage engine without causing environmental pollution.

1. Discharge oil and coolant using collection containers.
2. Discard oil and coolant according to the regulations of the relevant authorities.

3. Be careful not to let discharged oil and cooling water flow into the ground or the sewer. Otherwise, serious pollution of the drinking water source may occur.
4. Classify the oil, filters, and filter cartridges as environmental pollution wastes and discards them according to regulations.
5. Classify the antifreeze, cooling water, and anticorrosive agent as hazardous wastes and discards them according to the regulations.

Handling of Engine Oil

Prolonged and repeated contact of skin with engine oil may cause skin to dry out and contract, causing dermatitis. Engine oil includes substances toxic to the human body. Handle engine oil by observing the following safety rules:

1. Do not expose skin to new engine oil for a long time.
2. Always wear working clothes and gloves.
3. If skin comes in contact with engine oil, immediately wipe it off with water, soap or hand cleaners.
4. Do not clean skin with gasoline, fuel, thinner, or solvent.
5. Apply a skin protective cream after cleaning from oil.
6. Do not put oil-stained gloves or cloth in ones pocket.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Discard oil according to the regulations set forth by the relevant authorities. Disposing of discharged oil into the ground, sewers, drains, rivers, or the sea will cause serious environmental pollution. Violation of regulations regarding discard of engine oil without observing the handling regulations, will be punished.

Inspection and Repair of the Engine

Checking Engine Parts after Prolonged Operation

Wear, corrosion, or degradation of engine elements and assemblies may occur, causing lowered performance of engine parts. To maintain high engine performance, check the engine after prolonged operation to enhance the durability of the engine.

Unexpected faults may occur in some weak engine parts after normal operation of the engine, when operation time is prolonged. In this case, it is difficult to maintain high engine performance by simply repairing some parts. We recommend the entire part be replaced or repaired in order to find out the causes more accurately and maintain high engine performance.

To prevent engine failure in advance and use the engine safely for a long period, perform periodic replacements and inspections.

It is recommended to perform engine adjustments and preventive inspections during spring after the engine was exposed to winter or cold weather. This allows economic, long-term use of the engine without faults. As the following parts affect the engine output and performance, these parts should be regularly checked and inspected.

1. Parts affecting intake and exhaust
   - Air filter
   - Intercooler
   - Turbocharger, muffler
   - Other parts
2. Parts affecting lubrication and cooling

- Air filter
- Oil filter
- Antifreeze
- Other parts

Inspection and Repair of Turbocharger

As performance of supercharger significantly affects the engine performance, regular inspections and repairs should be performed and inspection and maintenance regulations should be observed.

Intake Unit

Be careful when handling the air filter in the intake unit. If oil level of the wet air filter is below the specified level, filtering performance is degraded. On the other hand, if the oil level is higher, oil may flow into the case, and it may become polluted. In regards to the dry air filter, intake resistance should be small to ensure the smooth intake of air.

Exhaust Unit

If exhaust emission is leaked from the part connecting the exhaust tube and the turbocharger, the supercharger efficiency is lowered, causing degraded engine output and, if serious, burning of related parts. As parts related to exhaust and turbocharger are used at high temperature, be careful not to mix the bolts and nuts with other parts when performing repair.

Lubrication System

Inspection and replacement of the lubrication system should be performed according to the replacement schedule of oil and oil filter. Overheated engine oil can affect not only the engine itself, but also the engine performance.

Tightening Torque

Tightening Torque of Main Parts

Major parts		Screw (Diameter x pitch)	Strength (Grade)	Tightening torque (kgf.m)
Cylinder block & Bed plate	Main bearing cap bolt (D18, D24)	M12 x 1.5	10.9T	Initial 5.5 ±0.28 + angle 90° ±4° + angle 90° ±4°
	Main bearing cap bolt (D34)	M12 x 1.5	12.9T	Initial 5.5 ±0.28 + angle 90° ±4° + angle 90° ±4°
	Bed plate bolt	M8 x 1.25	8.8T	2.2 ±0.22
	Plug, screw (PT)	PT 3/8	-	6.5 ±0.5
	Plug, screw Water drain plug (D18, D24)	M12 x 1.5	-	3.0 ±0.3
	Plug, screw Water drain plug (D34)	M12 x 1.5	-	5.0 ±0.5
Oil spray nozzle valve		M10 x 1.25	-	2 ±0.2
Flywheel housing, bolt		M10 x 1.5	10.9T	6.2 ±0.62
CRS V pulley, bolt		M14 x 1.5	10.9T	26 ±1
Connecting rod bolt (for		M8 x 1.0	10.9T	1st: 2.0 ±0.1 / 2nd: 90° ±4°

D18, D24)			
Connecting rod bolt (for D34)	M9 x 1.0	10.9T	1st: 3.0 ±0.15 / 2nd: 90° ±4°
MBS bolt (for D34, option)	M10 x 1.5	10.9T	Initial 6.0 ±0.3 + angle 90° ±4°
			+ angle 90° ±4°
Flywheel bolt (25 mm, option) for flat type flywheel	M12 x 1.5	12.9T	17 ±0.85
Flywheel bolt (43 mm, option)	M12 x 1.5	10.9T	1st: 7 ±0.35 / 2nd: 45° ±4°
Head bolt (D18, D24)	M11 x 1.25	9T	Initial 4.0 ±0.2 + angle 90° ±4° + angle 90° ±4° + angle 90° ±4°
Head bolt (D34)	M12 x 1.25	9T	Initial 4.5 ±0.23 + angle 90° ±4° + angle 90° ±4°
Head cover bolt (LH, RH)	M6 x 1.0	8.8T	1 ±0.1
Head cover bolt (Main)	M6 x 1.0	8.8T	1 ±0.1
EX manifold bolts	M8 x 1.25 (60mm)	10.9T	3.4 ±0.3
Injector fixture bolts	M8 x 1.25	12.9T	4.4 ±0.4
HP pump drive gear nut	M18 x 1.5	-	8.2 ±0.5
HP pump MTG nut	M8 x 1.25	-	2.2 ±0.22
HP pipe nut - injector to rail	Union nut	-	3.0 ±0.3
HP pipe nut - rail to pump	Union nut	-	3.0 ±0.3
Thermostat MTG space bolt	M8 x 1.25	8.8T	2.2 ±0.22
Thermostat plug	UNF 3/4 - 16	-	1.75 ±0.25
Oil pan drain plug	UNF 3/4 - 16	-	3 ±0.3
Glow plug body	M8 x 1.0	-	1.05 ±0.15
Glow plug terminal	M4 x 0.7	-	0.165 ±0.035
Turbocharger hollow screw	M10 x 1.0	-	1.9 ±0.1
Turbocharger MTG nut	M8 x 1.25	-	2.2 ±0.22
Water pump MTG nut	M8 x 1.25	-	2.2 ±0.22
Rocker arm adjusting hex nut	M8 x 1.0	-	1.5 ±0.15
Camshaft thrust washer bolt	M8 x 1.25	8.8T	2.2 ±0.22
Idle gear shaft bolt	M10 x 1.5	8.8T	4.4 ±0.44
Rocker arm bracket bolt	M8 x 1.25	8.8T	2.2 ±0.22
PTO housing bolt	M10 x 1.5	12.9T	4.4 ±0.44
PTO (D34)	M10 x 1.5	12.9T	1st: 4.4 ±0.44
Alternator nut	M8 x 1.25	-	2.2 ±0.22
Alternator bolt	M8 x 1.25	8.8T	2.2 ±0.22

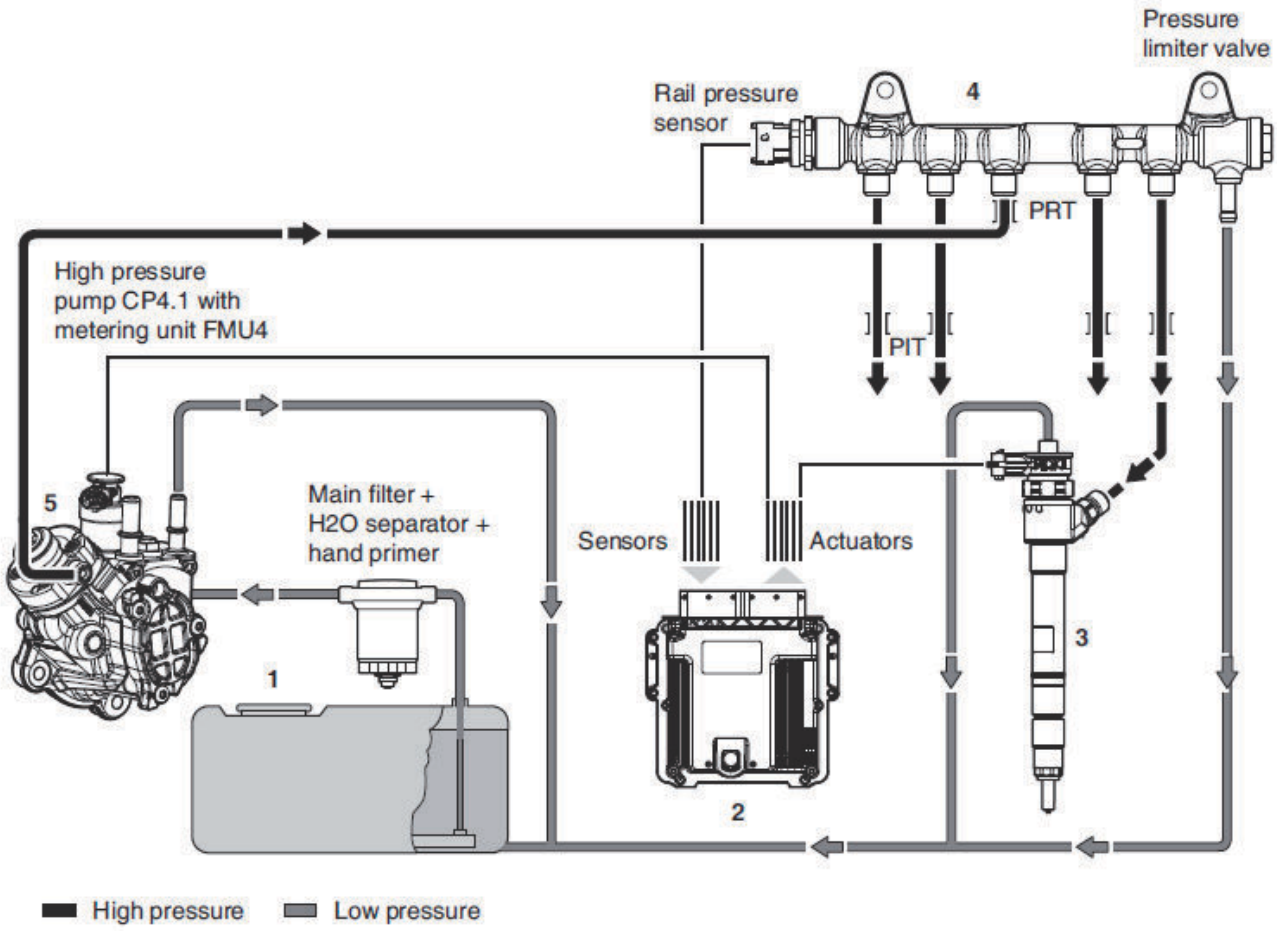
Starter nut	M10 x 1.5	-	4.4 ±0.44
Idle pulley assembly bolt	M10 x 1.5	-	4.5 ±0.5
Extension hose bracket bolt (Fuel)	M12 x 1.75	8.8T	5.5 ±0.55
Worm drive type clamp	-	-	0.525 ±0.03
Band clamp (DOC & SCR)	-	-	1.4 ±0.1
V-clamp (Exhaust pipe)	-	-	1.0 ±0.1
Oil pressure sensor	M14 x 1.5	-	1.0 ±0.1
EGT sensor*	M14 x 1.5	-	4.0 ±0.5
Water temp. sensor	M12 x 1.5	-	2.5 ±0.3

Fuel System

General Information

Diesel engines compress air drawn into the cylinders, creating compression heat, then when fuel is injected through the injection nozzles, combustion arises due to the compression heat. The high-pressure fuel created by the high-pressure fuel pump is stored in the common rail, and the injection timing and injection amount are determined by the electronic control unit (ECU). The electronic control unit activates the solenoid valve on the injectors installed in each cylinder and causes them to inject fuel.HD HYUNDAI CONSTRUCTION EQUIPMENT's common rail fuel injection system is divided into a pressurizing device and a fuel injection device. In order to provide optimal performance based on the engine operating conditions, fuel is injected into the cylinders after the amount of fuel, injection timing and injection pressure are determined by the electronic control unit. The common rail fuel injection system is composed of a low-pressure stage for the low-pressure delivery of fuel, a high-pressure stage for high-pressure delivery, and an electronic control unit. The fuel tank must be made of a non-corrosive material and there must be no leaks at twice the operating pressure of the low-pressure fuel pump. The pressure inside the tank must not exceed 0.3 bar.

Figure 55



DS2103716

1	Tank with prefilter	4	Common rail
2	Electronic Control Unit (ECU)	5	Fuel injector pump
3	Injector		

Injector

In the nozzle of the injector, a solenoid valve activates to enable fuel to flow, then the injector injects fuel directly into the combustion chamber of the engine.When the injector nozzle opens, the required fuel is delivered and the remaining fuel returns to the tank via the return line. In addition, the fuel returned from the fuel pressure adjustment valve and low-pressure stage, and the fuel used to lubricate the high-pressure pump return to the fuel tank together via the return line. The start of fuel injection and the amount of injection area adjusted by the solenoid valve installed in the injector. The injector replaces the function of the nozzle and nozzle holder in previous engines. Fuel is delivered to the injector through the high-pressure connector installed in the cylinder head, and then delivered to the valve control chamber through the delivery hole. The valve control chamber is opened by the solenoid valve, passes through the discharge hole and then connected to the fuel return line. The force of the hydraulic pressure applied to the valve control plunger while the discharge hole is closed exceeds the pressure value of the nozzle needle. As a result, the fuel supply to the combustion chamber is shutoff by the force applied to the contact surface of the nozzleneedle.When the solenoid valve of the injector is pulled, the discharge hole is opened. This lowers the pressure in the control chamber and the force of the hydraulic pressure acting on the plunger also drops. If the force of the hydraulic pressure drops below the force acting on the nozzle needle pressure, the nozzle needle opens. Then fuel is injected into the combustion chamber via the injection nozzle hole. This is because in controlling the nozzle needle using the force of hydraulic pressure, the force needed to open the valve quickly is not generated directly by the solenoid valve. The fuel control amount required for opening the nozzle needle is added to the amount of fuel actually injected. And

the used fuel is discharged to the fuel return line through the hole in the valve control chamber. Fuel loss occurs not only in the control but also in the nozzle needle and valve plunger guide. The control leakage fuel and the fuel gathered from the line which connects the overflow valve, the high-pressure pump, and the pressure control valve, is returned to the fuel tank through the fuel return line.

Injector Operating Principles

The operation of the injector is divided into four actions of engine operation and the high-pressure pump which generates pressure. These operating stages are determined by the distribution of the force acting on the components of the injector, and if the engine is stopped or there is no pressure on the common rail, the injector nozzle does not work.1. Injector closed (resting) During the resting state where no power is provided to the solenoid valve of the injector, the injector does not operate. The valve ball is pressed against the discharge hole seat surface of the injector by the force of the valve spring and a magnetic force. The high pressure within the common rail is maintained by the fuel control valve and formed in the nozzle chamber of the injector by the same pressure. The common rail fuel pressure acting on the end of the valve control chamber in the injector and the force acting on the nozzle spring in the injector are greater than the force of the nozzle attempting to open, so the closed state is maintained.2. Injector open (fuel injection begins) When power is supplied while the injector solenoid valve is closed, the fuel discharge hole is opened by the pulling force of the solenoid valve. At this time, the high current applied to the solenoid almost simultaneously decreases to a low current. This is possible because the air gap in the electromagnetic circuit decreased. The fuel in the valve control chamber flows through the discharge valve hole, and from there, it passes through the fuel return line into the fuel tank. The discharge hole completely disrupts the pressure balance and drops the pressure in the valve control chamber. This further drops the chamber pressure in the nozzle which is at the same pressure as the common rail and the pressure in the valve control chamber. This pressure reduced in the valve control chamber causes a decrease in the force acting on the control plunger and as a result, the nozzle needle opens and fuel injection begins.3. Injector fully open (fuel injection) The valve control plunger stops in the upper position due to the fuel buffer created when fuel flows between the discharge and delivery hole. At this time, the injector nozzle opens completely and fuel is injected into the combustion chamber at the same pressure as the common rail.4. Injector closed (end of injection) When the power supply to the injector solenoid valve is shut off, the valve spring immediately applies a downward force to the armature and the valve ball closes the discharge hole. The armature is composed of two parts. The armature plate is guided by the driving shoulder and pressed downward. However, an over spring with a return spring is used so that the force acting on the armature and valve ball is not applied downwards. The closing of the discharge hole causes fuel to enter from the delivery hole and form pressure in the control chamber. This fuel pressure, identical to the pressure in the common rail, applies pressure to the valve control plunger through the end of the valve control plunger. This and the force of the spring exceed the pressure formed in the nozzle chamber and close the nozzle needle. The closing speed of the nozzle needle is determined by the flow rate passing through the delivery hole, and as soon as the nozzle needle reaches the stop position, fuel injection is shut off.

1. Injector closed (fuel is pressurized)
2. Injector open (fuel injection begins)
3. Injector fully open (fuel injection)
4. Injector closed (end of fuel injection)

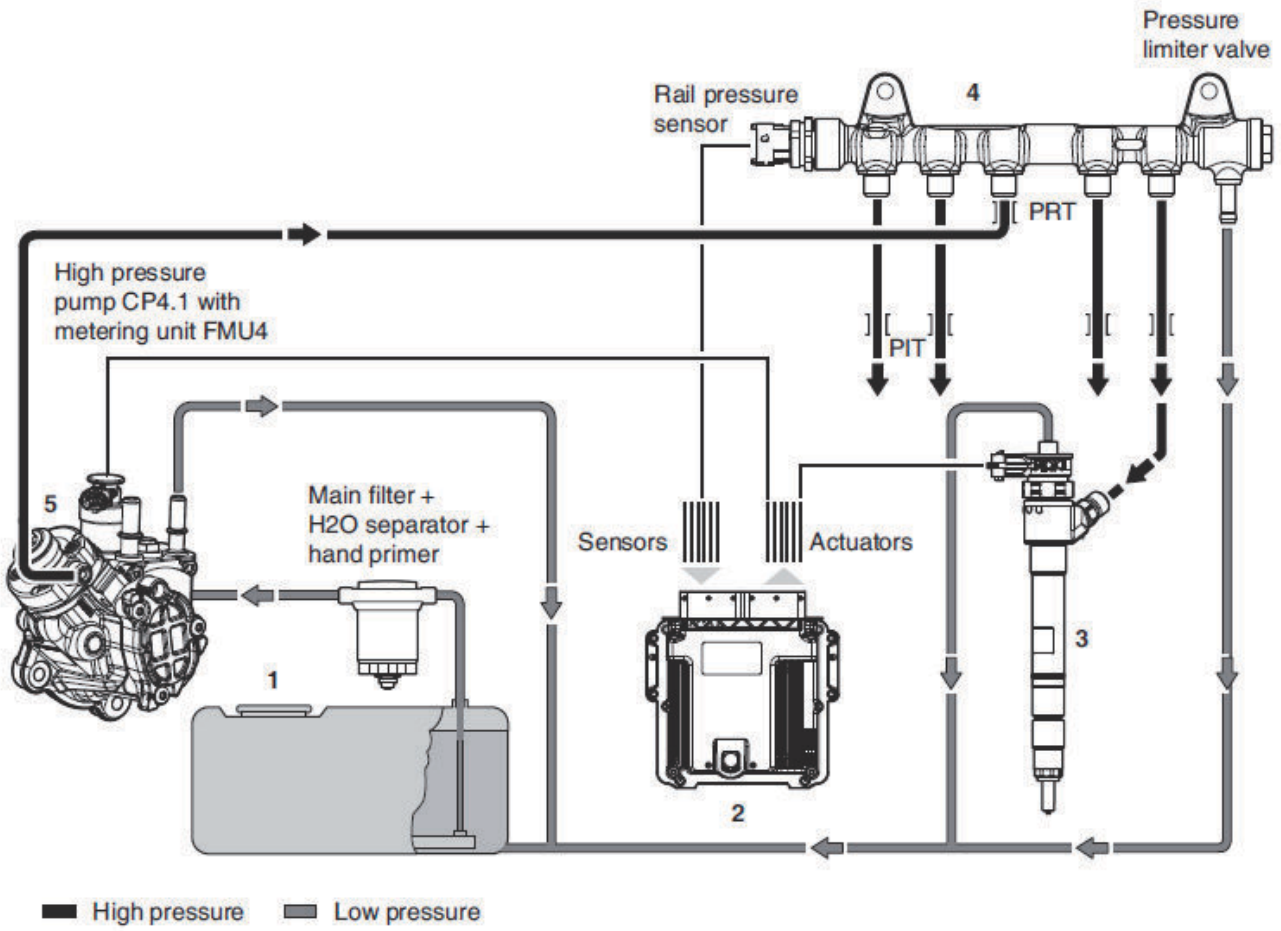
Common Rail

General Description

The common rail fuel injection system is divided into a pressurizing device and a fuel injection device. In order to provide optimal performance based on the engine operating conditions, fuel is injected into the cylinders after the amount of fuel, injection timing and injection pressure are determined by the electronic control unit. The high-pressure fuel created by the high-pressure fuel pump is stored in the common rail, and when the driver operates the machinery, the optimal amount of fuel and fuel injection timing are determined based on the data set in the electronic control unit (ECU) according

to the vehicle speed and driving conditions. The solenoid valves in the injectors installed on each engine cylinder are then activated and the fuel is injected into the cylinders.

Figure 56



DS2103716

1	Tank with pre-filter	4	Common rail
2	Electronic Control Unit (ECU)	5	Fuel injector pump
3	Injector		

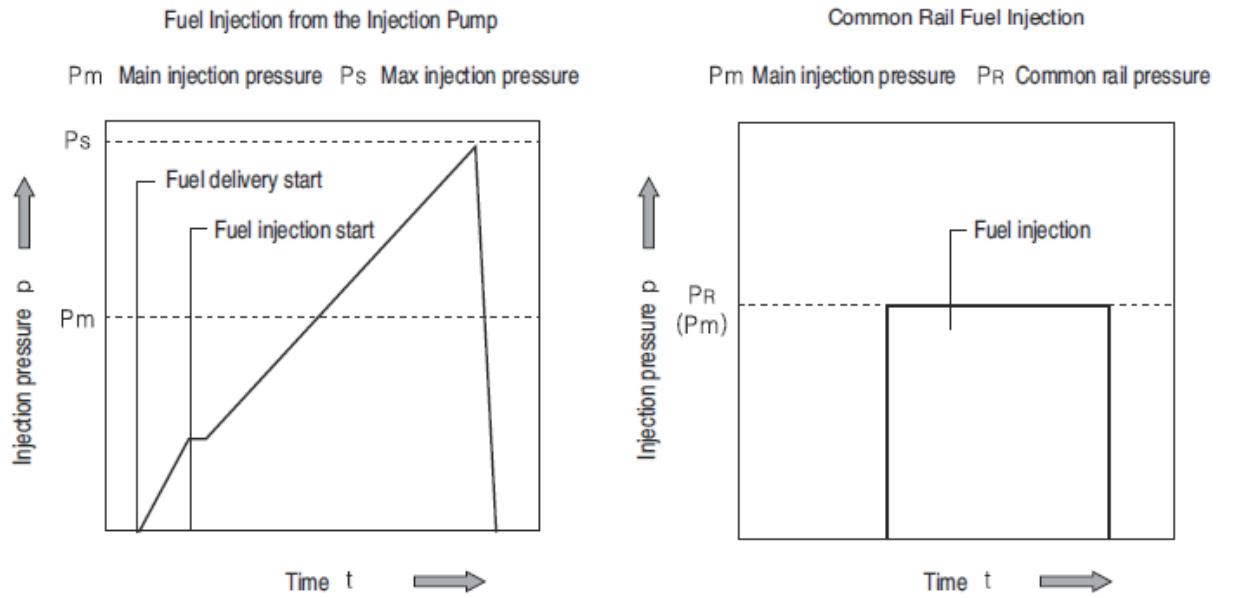
The main components of the common rail fuel injection system are as follows.

1. Electronic control unit (ECU)
   - The electronic control unit (ECU) receives an input signal from the sensor above based on the operator's accelerator reaction and momentarily adjusts the engine and vehicle to the operating performance. The electronic control unit also uses this information to activate the open/ close circuit and circulation circuit of the vehicle and engine.
   - The engine speed is measured by the crankshaft rpm sensor, and the camshaft rpm sensor is used to determine the firing order. The electrical signal created in the potentiometer of the accelerator pedal sensor lets the electronic control unit know how far down the operator has pushed the pedal. In addition, there are turbocharger and intake pressure sensors installed. The intake pressure sensor measures the intake pressure.
   - In cold outside weather and when the engine is cold, the electronic control unit receives data from the coolant temperature sensor and air temperature sensor and enables the vehicle to run under conditions suitable to the engine operation.
2. Crankshaft RPM sensor

- The positions of pistons in the combustion chamber play a very important role in injecting fuel. All engine pistons are connected to the crankshaft by means of connecting rods. The crankshaft rpm sensor installed in the flywheel housing provides information about the position of every piston. The rotation speed is defined as the number of rotations of the crankshaft per minute, and the main input variables are calculated by the electronic control unit (ECU) using signals from the crankshaft rpm sensor.

3. Camshaft RPM Sensor
    - The camshaft rpm sensor controls the engine intake and exhaust valves. This rotates at half the speed of the crankshaft and determines whether the camshaft position is in the compression stage or the exhaust stage when the piston moves in the TDC direction. This information cannot be detected by the crankshaft rpm sensor. On the other hand, while the engine is running normally, the data generated by the crankshaft ramp sensor is sufficient for defining the state of the engine. This means that the electronic control unit receives the state of the engine from the crankshaft rpm sensor if the camshaft rpm sensor is not responding while the vehicle is in operation.
4. Accelerator Pedal Sensor
    - The accelerator pedal sensor delivers the data generated when the operator steps on the accelerator to the electronic control unit (ECU). The voltage value is created by the potentiometer in the accelerator pedal sensor, and the programmed characteristic curve is used to calculate the position of the pedal.
5. Fuel Temperature Sensor
    - A sensor that measures the fuel temperature in the fuel pump.
6. Boost Pressure and Temperature Sensor
    - The boost pressure and temperature sensor is connected to the intake manifold with an O-ring and measures the absolute pressure and temperature inside the intake manifold. The output signal is inputted in the electronic control unit, and here, the boost pressure is calculated based on the programmed characteristic curve.
7. Oil Pressure Sensor
    - The engine oil press sensor detects the pressure and temperature and conveys them to the electronic control unit (ECU).
8. Common Rail Pressure Sensor
    - A sensor installed on the end of the common rail which measures the instantaneous internal pressure in the common rail.
9. Engine Coolant Temperature Sensor
    - The engine coolant temperature sensor detects the temperature of the engine coolant and conveys it to the electronic control unit (ECU).

Figure 57



DS2103717

The injection characteristics of the common rail are as follows.

1. Common rail fuel injection requires the following ideal fuel injection in comparison with previous injection characteristics. The common rail fuel injection amount and injection pressure operate independently of one another and satisfy all engine conditions.
2. At the start of the fuel injection process, the amount of injection during the ignition delay time between the start of fuel injection and the start of combustion needs to be adjustable to a low level.
3. The common rail system is a modular system and the following components play a fundamentally important role in the injection characteristics.
   - Injector solenoid valve installed on the cylinder head
   - Common Rail
   - High-pressure fuel pump
   - Electronic control unit (ECU)
   - Crankshaft RPM sensor

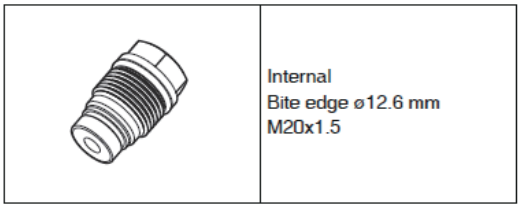
Pressure Limit Valve & Rail Pressure Sensor

Before working on the common rail high pressure fuel system, a minimum waiting time of 30second after engine shut-down is mandatory. Any work at the common rail high pressure fuel system (rail, function-block, pressure control valve, pressure limiting valve, rail pressure sensor, pipe connection, high pressure pipes (pump/rail or /function block, function block/rail, rail/injectors)) is not permitted when the engine is running.

- Cutting fuel jets: injury-risk at eyes and skin.
- When opening the high pressure fuel system, fuel jets can ignite on hot engine surfaces.

The first high pressure component has to loosened slowly, so that the pressure inside the fuel system can adjust to ambient pressure.

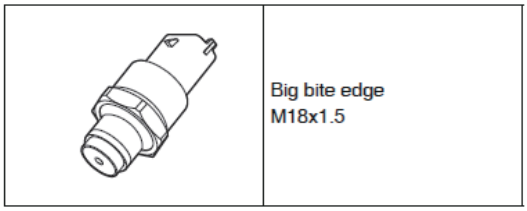
Figure 58



DS2103718

Pressure Limit Valve (PLV)

Figure 59



DS2103719

Rail Pressure Sensor (RPS)

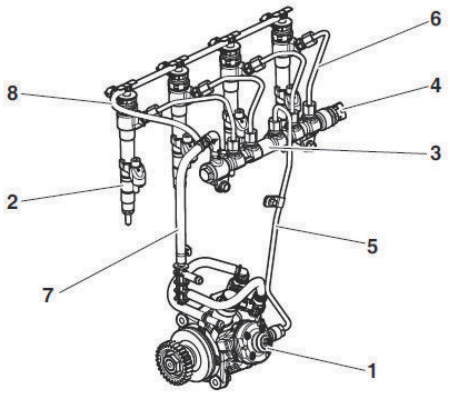
Injection Pipe

High-pressure fuel pipe

The high-pressure fuel pipe delivers 1,800 bar high-pressure fuel. Hence, the pipe of the fuel line is made of a special material which is able to withstand even the maximum pressure of the system and the fluctuations in high pressure arising during fuel injection. The high-pressure pipe has an outside diameter of Ø6.35 and an inside diameter of Ø3.0. In addition, the length of the high-pressure fuel pipes installed between the common rail and injectors must be identical and as short as possible.

Common Rail

Figure 60



DS2103720

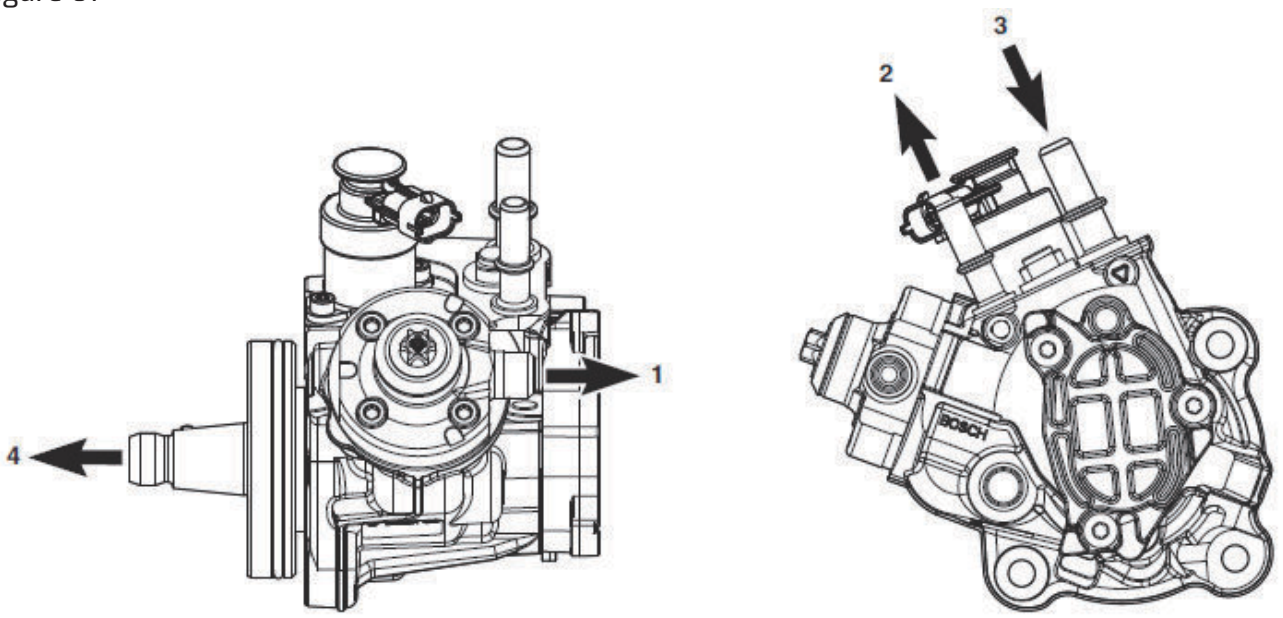
1	Fuel Injection pump	5	Fuel injection pipe (Fuel injection pump - Common rail)
2	Injector	6	F uel injection pipe (Common rail - Injector)
3	Common rail	7	Fuel return hose (Common rail - Fuel injection pump)
4	Pressure sensor	8	Fuel return hose (Injector - Fuel injection pump)

Fuel Injection Pump

The high pressure in the high-pressure fuel pump is generated using a radial piston pump. The pressure is generated independently in the fuel injection process. The rpm of the high-pressure fuel pump is related directly to the engine rpm, regardless of the transmission speed. In comparison with previous injection systems, the amount of fuel delivery in the common rail injection system is consistent. The injector is connected to the common rail with a high-pressure pipe and is composed of a nozzle and solenoid valve. When the key switch is activated, operating power is supplied to the solenoid valve by the electronic control unit. When the key switch is turned off, the solenoid valve ceases injection.

The solenoid valve switch (ON/ OFF) on the injector is activated by high voltage and current. This causes the injector solenoid valve to operate sequentially based on the value set in the electronic control unit. The crankshaft sensor and camshaft sensor are used to detect the engine rpm for adjusting the start of fuel injection and injection timing. The high-pressure fuel pump pressurizes fuel to a pressure of around 1,800 bar, and this pressurized fuel is sent through the high-pressure line to the pipe-shaped common rail.

Figure 61



DS2103721

1	High pressure fuel line outlet	3	Low pressure fuel line inlet
2	Low pressure fuel line outlet	4	Drive shaft

Lubrication system

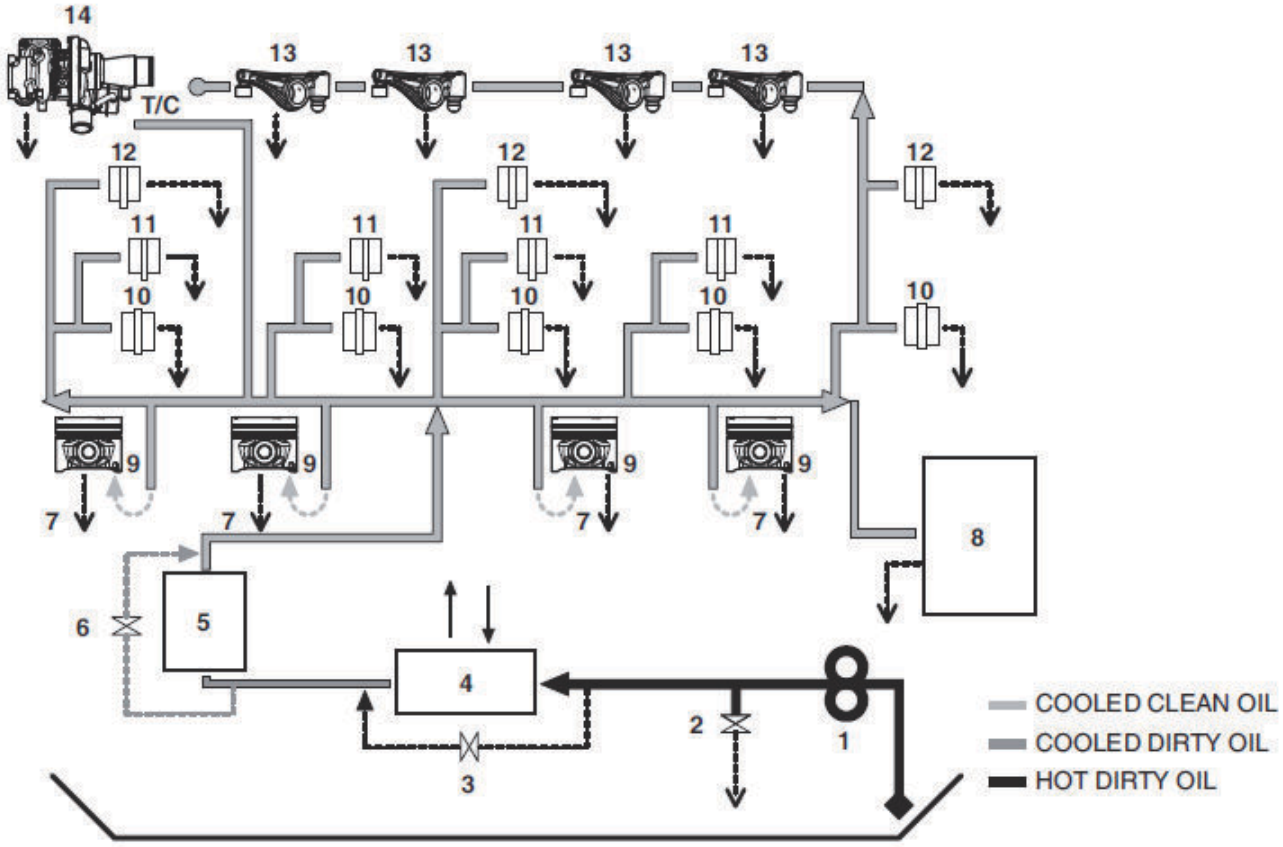
General Information

General Description

This engine is a forced lubrication type. Oil pressure is generated and supplied by rotation of the oil pump gear which is engaged with the crankshaft gear on the back of the cylinder block. After the oil pump sucks in oil from the oil pan through the suction pipe, this oil is sent to the main gallery of the cylinder block through the oil cooler and oil filter. Then, it is distributed to the crankshaft bearings, camshaft bearings and rocker arms in order to lubricate them. In addition, the turbocharger is connected to the engine lubrication circuit. Oil is sprayed around the cylinder block and timing gear for proper lubrication. Each cylinder has an oil injection nozzle for cooling the bottom of the piston. Foreign matter is removed from engine oil by the oil filter.

Overview

Figure 62



DS2103723

1	Oil pump	6	Bypass valve	11	Connecting rod bearings
2	Relief valve	7	Piston cooling jets	12	Camshaft bearings
3	Bypass valve	8	Idle gear	13	Rocker arms
4	Oil cooler	9	Piston	14	Turbocharger
5	Oil filter	10	Crankshaft main bearings		

Purpose of Lubrication by Oil

1. Reduction of friction (Prevention of abrasion)

   Lubrication maintains the least possible level of friction, and forms a stronger oil film in a critical state to prevent the surface friction on the perturbed section and subsequent defacement.

2. Sealing function

   Prevents the leak of gas under a high-pressure in concurrence with the piston ring, just as in the cylinder lubrication.

3. Cooling function

   Regionally absorbs the heat from parts located on higher spots, and discharge the heat again in a proper temperature through the oil cooler and other units

4. Stress dispersing function

Provides momentarily and regionally a great pressure to lubricated parts to destroy the oil film and raise adherence. At this point, the lubricant disperses the local pressure across the entire oil

5. Anti-rust function

   Forms a lubricant film to keep any moisture from infiltrating into the lubricated surface to produce rust.

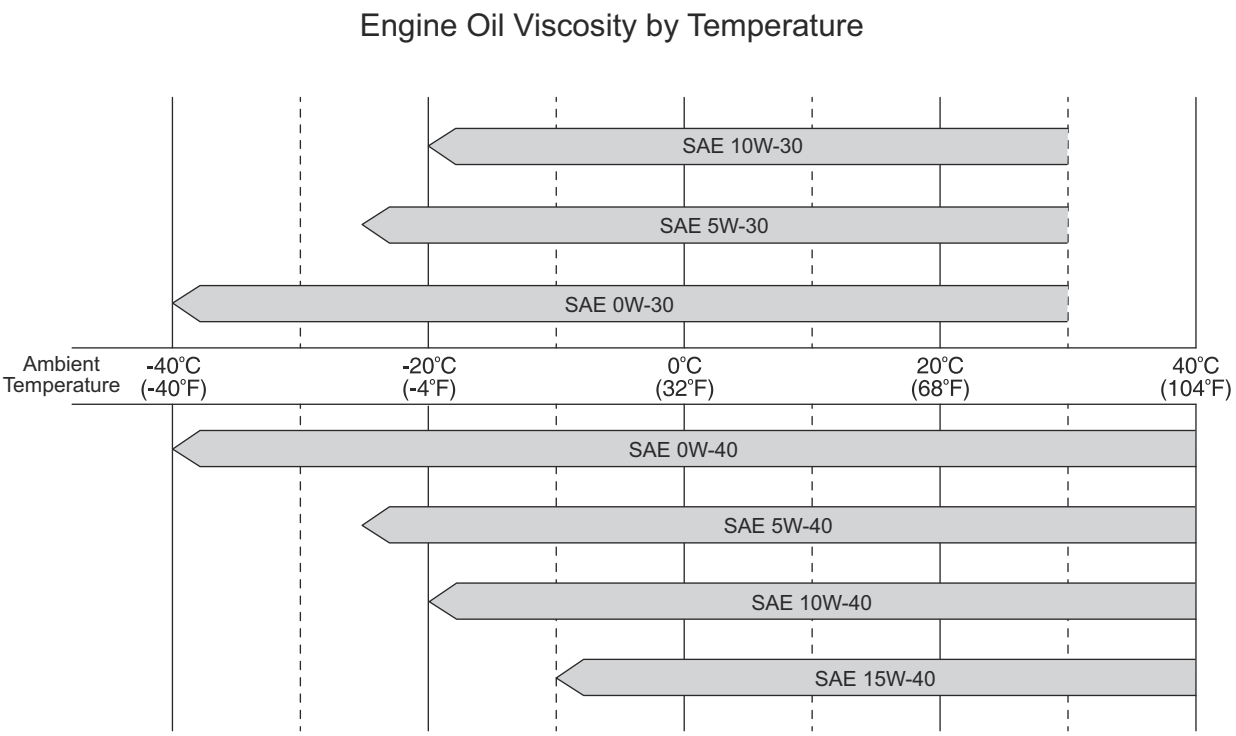
6. Oil purifying function

   This absorbs alien materials such as carbon or metals produced at lubricated parts and store them in the oil filter

Applicable Oil

Use only specified engine oil according to the environment and condition of the area.

Figure 63



DS2100122

Make sure to use proper engine oil according to the following recommendation.

Oil Classification	Oil Grade	Capacity (L(U.S.gal.)		
		Maximum	Minimum	Total
SAE 10W40	API CJ-4 or Higher	24.5(6.5)	17.5(4.6)	26.5(7)

NOTE: *Make sure to use the recommended genuine oil. Total capacity of engine oil includes 2.0 liter in engine.*

Oil Pump

General Description

Engine oil is sucked from the oil pan by the gear type oil pump and then all of the oil is forcibly delivered to the oil cooler and filter for filtering. The filtered oil passes through the main oil path of the cylinder block and lubricates bearing parts and the turbocharger of the engine in order to maintain normal engine performance.

Cooling System

General information

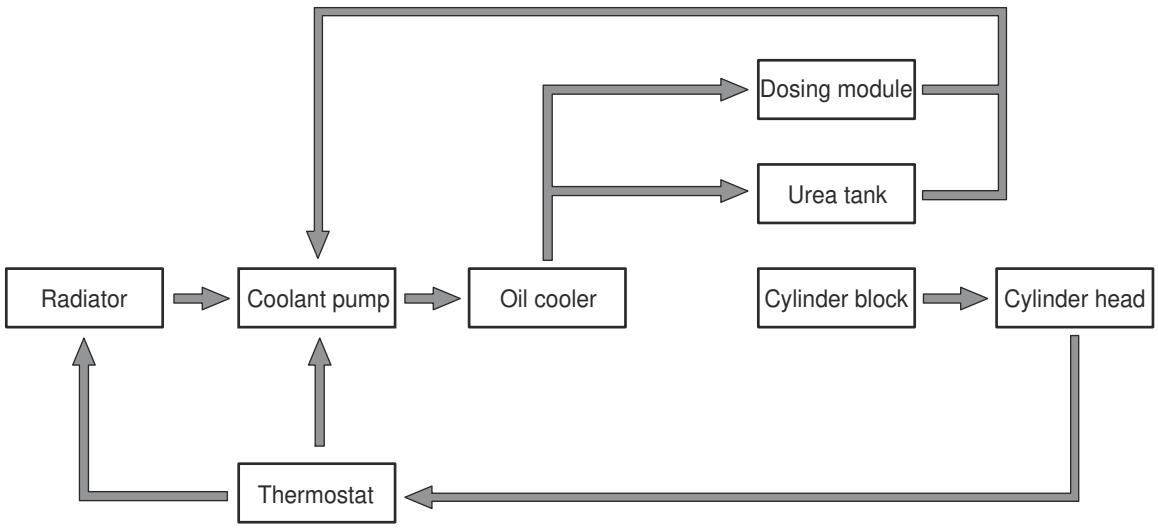
General Description

This engine is a water-cooled type. Combustion heat from the combustion chamber and heat from engine oil are absorbed by coolant and dissipating them to the outside air to ensure optimum engine operation.

In the cooling system, coolant supplied from the coolant pump is sent to the oil cooler through the coolant pipe to absorb heat from oil before it passes through the coolant jacket of the cylinder block and through the cooling passage of the cylinder head to absorb combustion heat.

After this coolant absorbs oil heat and combustion heat, it is led to the thermostat through the coolant pipe. If the coolant temperature is below the valve opening temperature of the thermostat, the coolant flows into the coolant pump. If the temperature is over the opening temperature, it flows into the radiator. In the radiator, it releases heat and returns back to the coolant pump in a low temperature condition again.

Figure 64



DS1901799

Thermostat

General Description

The thermostat maintains water temperature in the engine consistently and prevents heat loss to improve heat efficiency of the engine.

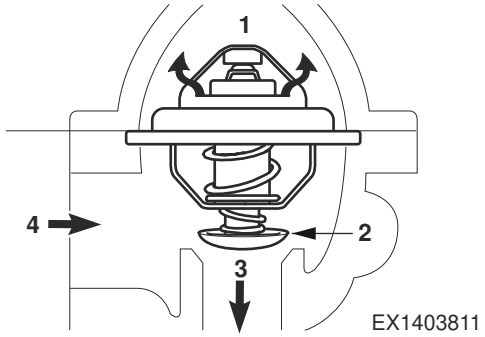
When the coolant temperature is below the normal temperature, the thermostat is closed and the coolant is bypassed and directly flows into the water pump. When the coolant temperature reaches the normal temperature or is higher than the temperature, the thermostat is fully open and the bypass circuit is closed. So the coolant flows into the radiator.

⚠ CAUTION

AVOID INJURY

- The wax pellet type thermostat shows slower response to the change of cooling water than the bellows type thermostat. This happens because the heat capacity of the wax pellet type thermostat is larger than that of the bellows type thermostat. Therefore, to prevent a rapid increase in the engine coolant's temperature, you must first operate the engine at idle until the engine is fully warmed up. When the weather is very cold, do not operate the engine in an overloaded condition or at a high speed after starting the engine.
- When draining water from the engine cooler or injecting water to the engine cooler, work slowly to ensure that all air inside the cooler is expelled.
- When a defect is found in the thermostat, replace it with a new one.

Figure 65



Reference Number	Description
1	Heat Exchanger
2	Bypass Valve
3	Water Pump
4	Coolant Pipe

Cautions for Replacement and Handling of Thermostat

1. Cautions for handling

   A wax pellet type thermostat features relatively slow response for change in coolant temperature compared to a bellows type. This is because the wax pellet type has larger thermal capacity. Therefore, it needs to idle the engine sufficiently before running it in order to prevent surge of engine coolant temperature. In cold weather, never overload the engine or speed drive.

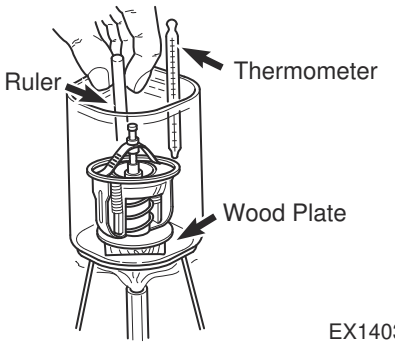
2. When adding or draining coolant to/from the engine cooling system, do it slowly to let air in the system escape.

3. Thermostat replacement

   If any defect is found on the thermostat, replace it with a new one.

Thermostat inspection

1. Check if the wax pellet and spring are damaged.
   Figure 66



2. Put the thermostat into water and heat the water gradually to check for operation of the thermostat.

   If the thermostat starts to open at 83°C (water temperature) and it is fully open at 95°C, it is normal.

3. Check if there is any foreign material in the thermostat.

   NOTE: *Clean the inside of the thermostat using a air gun.*

4. Check the hose for internal or external damage or foreign materials.

Cooling fan

General Description

The speed of the cooling fan is controlled by the electronic fan clutch in order to maintain its optimum speed. The electronic fan clutch adjusts the cooling fan speed electrically according to the coolant temperature, hydraulic oil temperature, CAC (Charge Air Cooler) temperature and engine speed to reduce cooling fan noise and obtain superior efficiency.

Troubleshooting

Phenomenon	Causes	Troubleshooting
Overheated Engine	Not enough coolant	Replenish the coolant
	Defective radiator cap	Replace it
	Contaminated radiator	Clean the exterior of the radiator
	Defective V-belt offset	Adjust or replace it
	Contaminated or damaged V-belt	Replace it
	Damaged impeller	Replace the water pump
	Defective impeller fix	Replace the water pump
	Bad water pump operation	Replace it
	Bad thermostat operation	Replace it
	Bad coolant flow	Clean the coolant path
	Improper injection time	Check it with the failure diagnosis unit
	Damaged cylinder head gasket	Replace it
Overcooled Engine	Bad thermostat operation	Replace it

Phenomenon	Causes	Troubleshooting
	Too low ambient temperature	Heat the block
Leaking Coolant	Damaged radiator	Repair or replace it
	Loosened or damaged radiator connection	Repair or replace the connection
	Defective radiator cap	Replace it
	Badly mounted water pump	Repair or replace it
	Bad or damaged water pump gasket	Replace the gasket
	Badly mounted thermostat	Repair or replace it
	Bad or damaged thermostat gasket	Replace the gasket
	Damaged cylinder head gasket	Replace the gasket
	Damaged cylinder head or block	Replace it
Noise	Bad water pump bearing	Replace the bearing
	Bad or damaged cooling fan	Repair or replace it
	Bad rotation of the cooling fan	Replace it
	Defective V-belt offset	Adjust or replace it

Exhaust System

Turbocharger

General Description

The turbocharger uses heat energy of exhaust gas in the engine to draw in high density air into the cylinders to increase the engine power.

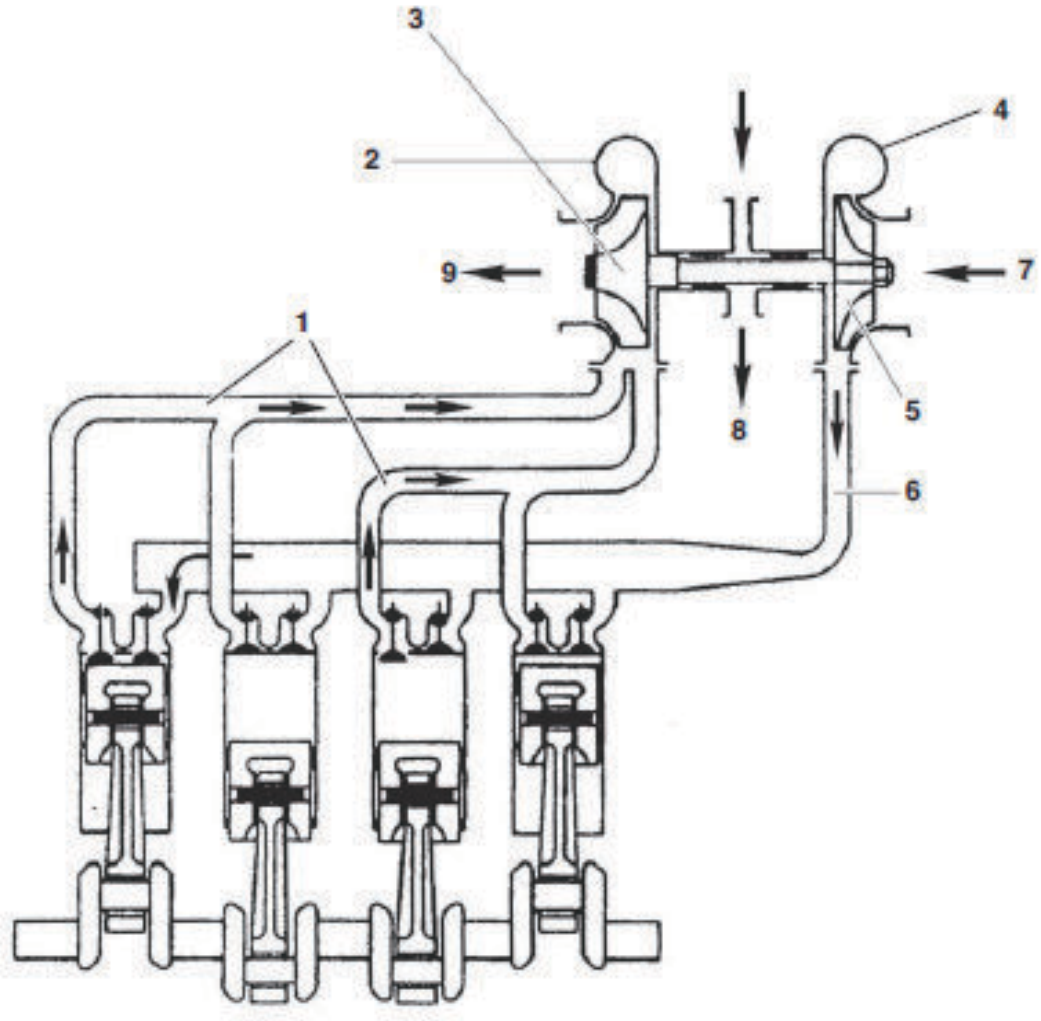
Power of the engine is determined by the amount of fuel supply and the engine's efficiency.

A sufficient amount of air should be supplied to the cylinders to burn fuel completely and convert this energy to effective work.

Power of the engine is actually determined by the size of the cylinders. The larger the cylinders are, the more the air is delivered to burn more fuel, resulting in increase of engine power.

Supercharging is a process to compress and supply air into the engine's cylinders. The turbocharger is a device to supply extra air for combustion with energy of exhaust gas in the combustion chamber which is usually released and disappeared into the air.

Figure 67



DS2103722

1	Exhaust manifold	4	Compressor housing	7	Air inlet
2	Turbine housing	5	Compressor wheel	8	Oil outlet
3	Turbine wheel and shaft assembly	6	Intake manifold	9	Exhaust outlet

Function

1. Turbine: As exhaust gas discharged from the combustion chamber passes through the turbine housing, its energy is transferred to the turbine blades to deliver the rotating force to the turbine shaft. These series of motions are occurred in a component called turbine. The turbine is equipped with the seal ring and heat shield to prevent exhaust gas from affecting its bearing.
2. Compressor: As it is connected to the same shaft with the turbine, it rotates together to receive rotating force from the turbine shaft in order to receive, compress and send air to the intake manifold. This is the basic principle of a compressor.
3. Bearings: Thrust bearing: The turbine wheel is applied with axial force. This axial force keeps the shaft from moving.
4. Seal ring of compressor shaft: The shaft is equipped with the seal plate and seal ring in a dual structure to prevent leakage of compressed intake air and lubricant.

Troubleshooting

Phenomenon	Causes	Troubleshooting
Noise or Vibration	Rotating part is contacted	Repair or replace it
	Unbalanced rotation of a rotor	Repair or replace it
	Burn	Repair or replace it
	Loose joint	Check or repair it
	Deformed or damaged intake unit hose	Replace it
	Poor clamping state	Adjust and tighten the clamp
	Contaminated or damaged air filter	Replace and check if the impeller of the turbocharger is damaged
	Leakage of coolant from the turbocharger or oil from the oil hose	Replace the hose and the gasket
	Leakage of gas from the exhaust manifold	Replace the gasket or tighten the fixing nut
	Poor turbo actuator operation	Replace the turbocharger
	Leakage from the engine block and the exhaust manifold	Check the engine
	Contaminated blowby gas and abnormal oil amount	Check the turbo impeller and the turbo intake and outlet
	Large gap of the turbocharger wheel, causing interference with the wall	Check if there is any sand or metallic foreign substance
	Damaged turbocharger wheel	Check if there is any sand or metallic foreign substance
	Damaged wheel and shaft of the turbocharger	Check if there is any sand or metallic foreign substance
	Poor rotating force of the turbocharger wheel	Check if there is any sand or metallic foreign substance
Lowered Output	Leakage of gas from each part of the exhaust system	Check or repair it
	Clogged air filter element	Replace or clean it
	Contaminated or damaged turbocharger	Repair or replace it
	Leakage of air from the discharging part of the compressor shaft	Check or repair it
	Deformed or damaged intake unit hose	Replace it
	Poor clamping state	Adjust and tighten the clamp
	Contaminated or damaged air filter	Replace and check if the impeller of the turbocharger is damaged
	Poor turbo actuator operation	Replace the turbocharger
	Leakage from the engine block and the exhaust manifold	Check the engine
	Contaminated blowby gas and abnormal oil amount	Check the turbo impeller and the turbo intake outlet

Phenomenon	Causes	Troubleshooting
	Large gap of the turbocharger wheel, causing interference with the wall	Check if there is any sand or metallic foreign substance
	Damaged turbocharger wheel	Check if there is any sand or metallic foreign substance
	Damaged wheel and shaft of the turbocharger	Check if there is any sand or metallic foreign substance
	Poor rotating force of the turbocharger wheel	Check if there is any sand or metallic foreign substance
Oil Leakage	Deformed or damaged intake unit hose	Replace it
	Poor clamping state	Adjust and tighten the clamp
	Contaminated or damaged air filter	Replace and check if the impeller of the turbocharger is damaged
	Leakage of coolant from the turbocharger or oil from the oil hose	Replace the hose and the gasket
	Poor turbo actuator operation	Replace the turbocharger
Oil Leakage	Leakage from the engine block and the exhaust manifold	Check the engine
	Contaminated blowby gas and abnormal oil amount	Check the turbo impeller and the turbo intake outlet
	Large gap of the turbocharger wheel, causing interference with the wall	Check if there is any sand or metallic foreign substance
	Damaged turbocharger wheel	Check if there is any sand or metallic foreign substance
	Damaged wheel and shaft of the turbocharger	Check if there is any sand or metallic foreign substance
	Poor rotating force of the turbocharger wheel	Check if there is any sand or metallic foreign substance
Oil Consumption	Poor clamping state	Adjust and tighten the clamp
	Leakage of coolant from the turbocharger or oil from the oil hose	Replace the hose and the gasket
	Leakage from the engine block and the exhaust manifold	Check the engine
	Contaminated blowby gas and abnormal oil amount	Check the turbo impeller and the turbo intake outlet
	Large gap of the turbocharger wheel, causing interference with the wall	Check if there is any sand or metallic foreign substance
	Damaged turbocharger wheel	Check if there is any sand or metallic foreign substance
	Damaged wheel and shaft of the turbocharger	Check if there is any sand or metallic foreign substance
	Poor rotating force of the turbocharger wheel	Check if there is any sand or metallic foreign substance

Phenomenon	Causes	Troubleshooting
Black and White Emissions	Deformed or damaged intake unit hose	Replace it
	Contaminated or damaged air filter	Replace and check if the impeller of the turbocharger is damaged
	Leakage of coolant from the turbocharger or oil from the oil hose	Replace the hose and the gasket
	Poor turbo actuator operation	Replace the turbocharger
	Contaminated blowby gas and abnormal oil amount	Check the turbo impeller and the turbo intake outlet
	Large gap of the turbocharger wheel, causing interference with the wall	Check if there is any sand or metallic foreign substance
	Damaged turbocharger wheel	Check if there is any sand or metallic foreign substance
	Damaged wheel and shaft of the turbocharger	Check if there is any sand or metallic foreign substance
	Poor rotating force of the turbocharger wheel	Check if there is any sand or metallic foreign substance
Blue Emissions	Leakage from the engine block and the exhaust manifold	Check the engine
Too much Fog	Oil leakage to the turbine or compressor	Repair or replace it
	Worn or damaged seal ring due to worn bearing	Repair or replace it
Too much Exhaust Emissions	Clogged air filter element	Replace or clean it
	Clogged air duct	Check or repair it
	Air leakage from the intake system	Check or repair it
	The turbocharger cannot rotate because of burning	Repair or replace it
	A turbine blade or compression wing contacts with the other one or is damaged	Repair or replace it
	Deformed or clogged exhaust system pipe	Check or repair it

How to Maintain Turbocharger

Cautions for Engine Operation

Observe the followings when starting, operating, and stopping an engine.

Item	Cautions	Reasons
Starting an Engine	Check the oil amount	
	Therefore, start the engine with the starter motor to check the rise of oil pressure (until the gradation of the oil pressure gauge moves or the pressure indicator lamp is turned on).	Overhasty start of engine leads to engine rotation without lubricating turbocharger and other engine parts, causing abnormal wear or burning of bearings.

Item	Cautions	Reasons
	If you replace oil, oil filter cartridge, or lubrication system parts or use an engine in cold areas, or the engine has stopped for a long period, loosen the oil pipe joint at the inlet of the turbocharger and run the starter motor until oil flows out. After completing the work, tighten the oil pipe joint again and start the engine.	When an engine has stopped or kept cold for a long period, circulation of oil in the pipe gets poor.
After Starting an Engine	Operate the engine at idle for five minutes from starting it.	When the engine is suddenly loaded while the engine and the turbocharger have not been smoothly rotated after starting the engine, parts with insufficient oil may be burnt.
	Check if oil, gas, or air is leaked from each part. If so, take proper action.	Leakage of oil, gas, or air (especially oil) reduces oil pressure and loss of oil cause burning of bearings.
During Operation	check the following.	
	Oil pressure At idle: 1.5 ~ 3.0 kg/cm2 (1.5 ~ 3.0 bar, 21.3 ~ 42.7 psi) Fully loaded: 3.0 ~ 5.5 kg/cm2 (3.0 ~ 5.5 bar, 42.7 ~ 78.2 psi)	Too low oil pressure causes abnormal wearing or burning of bearings. Too high oil pressure causes oil leakage.
	When abnormal noise or vibration occurs, slowly reduce the rotate count until the engine stops and then figure out the causes.	Operating an engine with noise or vibration may cause irreversible damage of the engine.
Stopping an Engine	Operate the engine at idle for five minutes before stopping it.	Sudden engine stop after operating the engine under high load allows the heat from the red-heated turbine blade to be delivered to the bearing system. Then oil burns and the bearing metal and rotation shaft are burnt.

Cautions for Maintenance

1. When the rpm is rapidly increased after starting the engine, the journal bearings in the crankshaft is excessively rotated, the crankshaft is rotated at excessive speed before the journal bearing of the crankshaft is lubricated fully. If the turbocharger rotates in this situation, bearings are not smoothly cooled and lubricated, causing bearing burn and damage of the related parts.
2. Please operate the engine for two minutes or more in order to lubricate the turbocharger fully after replacing the engine oil or oil filter.
3. If an engine has been operated at high speed for a long period, fully operate the engine at idle and then stop the engine. Otherwise, the turbine wheel continuously runs without oil pressure in the turbocharger. Therefore, no oil film is created on the center bearings and the journal bearings of the turbocharger, causing bearing, wearing out and shortening of the turbocharger lifetime.
4. If an engine is not operated for a long period during cold weather or in areas with cold climate, operate the engine at idle after starting the engine until the engine oil pressure is normal.

5. The turbocharger turbine spins at high speed of 50,000 ~ 200,000 rpm. Therefore, lubrication of bearings may determine the turbocharger lifetime. Please use only recommended genuine engine oil and check and replace the engine oil periodically.
6. Prolonged usage of contaminated air cleaner may cause a critical damage of the turbocharger. Regularly check and replace the air cleaner.
7. A turbocharger is a very complex and precise part. Only certified and skilled technicians should work on it.
8. If a turbocharger is operated without intake and exhaust pipe, serious human injury may occur and critical faults of the engine performance may occur. Please operate a turbocharger only when all of parts are exactly mounted on the specified position.
9. Do not lift up a turbocharger by grabbing the actuator. The actuator may be damaged because of the weight of the turbocharger.
10. The weight of a turbocharger is about 4.0 kg or more. To lift up a turbocharger for installing or removing it, the worker should lower the center of gravity or press his body close to the turbocharger. Otherwise, worker may drop the turbocharger, causing damage of the part and injury.

Inspection

Daily Inspection and Service

It is important to handle the engine and maintain its optimum condition according to the instructions as the performance of the turbocharger is highly affected by the maintenance condition of the engine.

1. Intake system

   In the intake system, the air filter should be maintained with care. For a wet type air filter, if the oil level is below the specified level, its filtering performance is deteriorated. On the other hand, if the oil level is too high, it sucks in oil and contaminates the case. Especially, if the rotor is contaminated, the precisely adjusted balance is destroyed and the bearing is applied with large force, resulting in vibration, seizure and abnormal wear. Therefore, the air filter should be well-maintained and handled with care. A dry air filter should feature low possible intake air restriction.

2. Exhaust system

   If exhaust gas is leaked from the exhaust pipe or turbocharger connection in the exhaust system, the turbocharger's performance is deteriorated. Extra care is needed to prevent a gas leak and seizure. A heat resisting steel nut is used for parts, which can become hot during driving, such as the turbine housing. Make sure not to mix it with a general nut, and apply screw's anti-seize compound to the specified mounting nut.

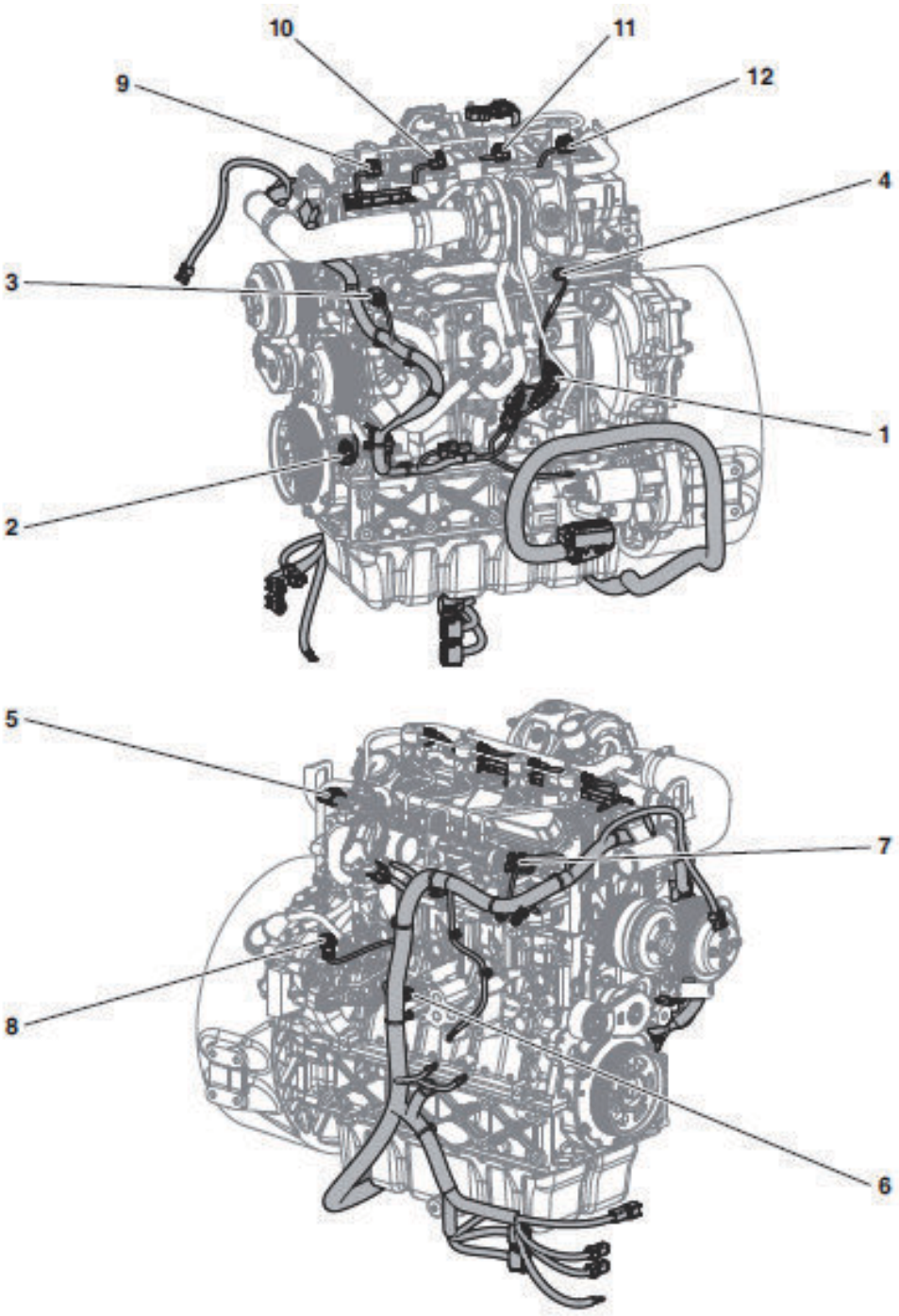
3. Lubrication system

   In the lubrication system, the oil quality and the cartridge replacement interval of the oil filter should be monitored with care. Degraded engine oil can affect not only the engine body, but also the turbocharger negatively.

Electrical System

Electric Parts

Figure 68



DS2103799

1	CAM: CAM shaft position sensor	5	T-MAP sensor	9	INJ: Injector 1
2	CRK: Crank shaft position sensor	6	OPS: Oil pressure sensor	10	INJ: Injector 2
3	WTS: Water temperature sensor	7	RPS: Rail pressure sensor	11	INJ: Injector 3
4	EGT: Exhaust gas temperature sensor	8	IMV: Inlet metering valve	12	INJ: Injector 4

- It is possible to identify the circuit number for the connector and engine wire harness information.

The ECU pin No. means each pin number of an engine connector.

The sensor pin No. means each pin number of a sensor connector.

Switches and Sensors

Engine Oil Pressure and Temperature Sensor

The engine oil pressure and temperature sensor detects the pressure and temperature of engine oil and sends these information to the ECU (Electronic Control Unit).

Engine Coolant Temperature Sensor

The engine coolant temperature sensor detects the temperature of engine coolant and sends this information to the ECU (Electronic Control Unit).

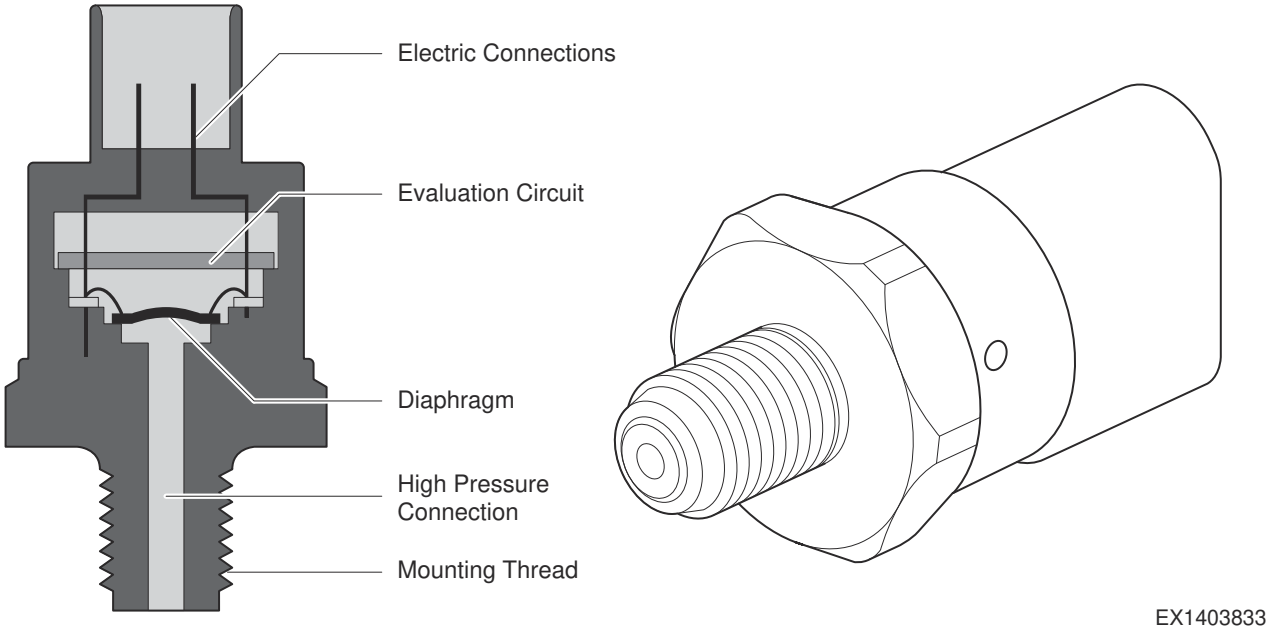
Common Rail Pressure Sensor

Fuel passes through the passage in the common rail before it heads to the common rail pressure sensor.

The tip of this pressure sensor is sealed with the diaphragm. After fuel is pressurized, it reaches the diaphragm of the sensor through the hole.

A sensor to convert a fuel pressure value into an electric signal is connected to this diaphragm. This sensor produces a signal by amplifying the detected value before it delivers the signal to the ECU (Electronic Control Unit) and evaluation circuit.

Figure 69



Crankshaft Speed Sensor

The position of the pistons in the combustion chamber has a major role in the fuel injection process.

All pistons in the engine are connected to the crankshaft by the connecting rod.

The flywheel housing is equipped with the crankshaft speed sensor to supply information for the position of all pistons.

This speed sensor detects the rotation per minute of the crankshaft, and this information is used by the ECU (Electronic Control Unit) for calculation as an important factor.

Camshaft Speed Sensor

The camshaft speed sensor is used to control the intake and exhaust valves of the engine.

This rotates at half speed of the crankshaft. When the piston is moving toward T.D.C., it determines whether the camshaft position is in the compression stage or in the exhaust stage.

This information cannot be detected by the crankshaft speed sensor.

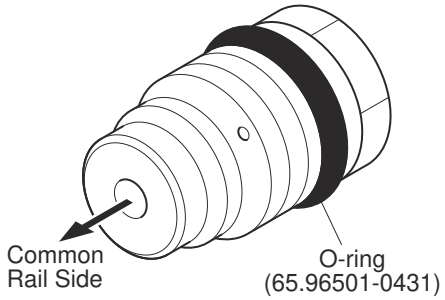
On the other hand, during normal operation, information supplied by the crankshaft speed sensor is enough to tell the condition of the engine.

In other words, if the camshaft speed sensor cannot detect the camshaft position while the engine is running, the ECU (Electronic Control Unit) receives engine condition information from the crankshaft speed sensor.

Pressure Limiter Valve

1. The pressure limiter valve is connected to the end of the common rail, and its body houses a conical plunger valve in it. This valve is normally closed by force of the spring at a normal operating pressure (1,800 bar (1,835.5 kg/cm^2, 26,106.8 psi)) to keep the pressure in the common rain.

   Figure 70



EX1404193

2. As soon as the pressure exceeds the operating pressure limit, load is applied to the spring of the valve to keep the fuel pressure at a normal level. After fuel passes through the valve, it is returned to the fuel tank through the return pipe.

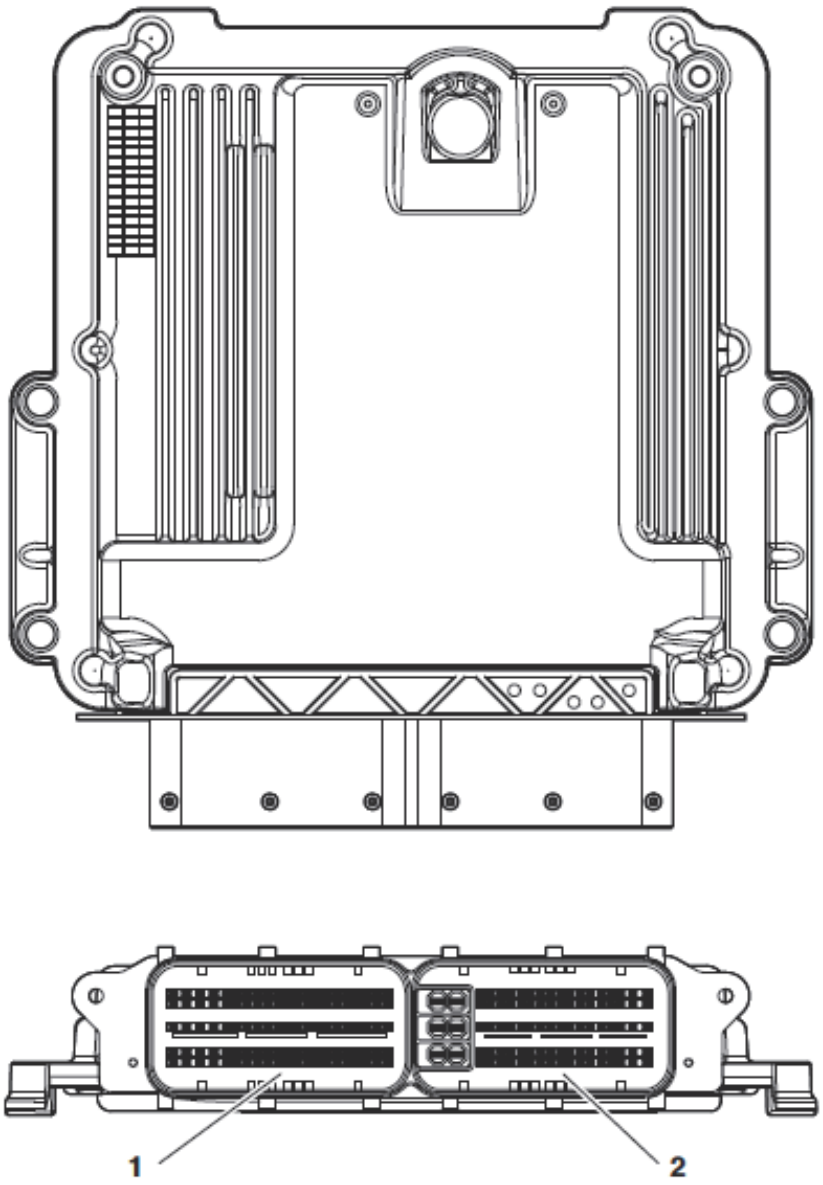
Fuel Metering Unit

A valve mounted on the high-pressure pump. It adjusts the fuel volume pumped from the pump to the rail to control the fuel pressure on the rail.

ECU (Electronic Control Unit)

The engine control unit (ECU) is used to control fuel delivery. The engine control unit is connected to various types of sensors and provides control based on the values received from these sensors to enable the engine to run in an optimal state. In cases where the connectors of the engine control unit must be disconnected, be sure to disconnect the negative (ground) terminal of the battery cable first. Do not disassemble the inside of the engine control unit (ECU).

Figure 71

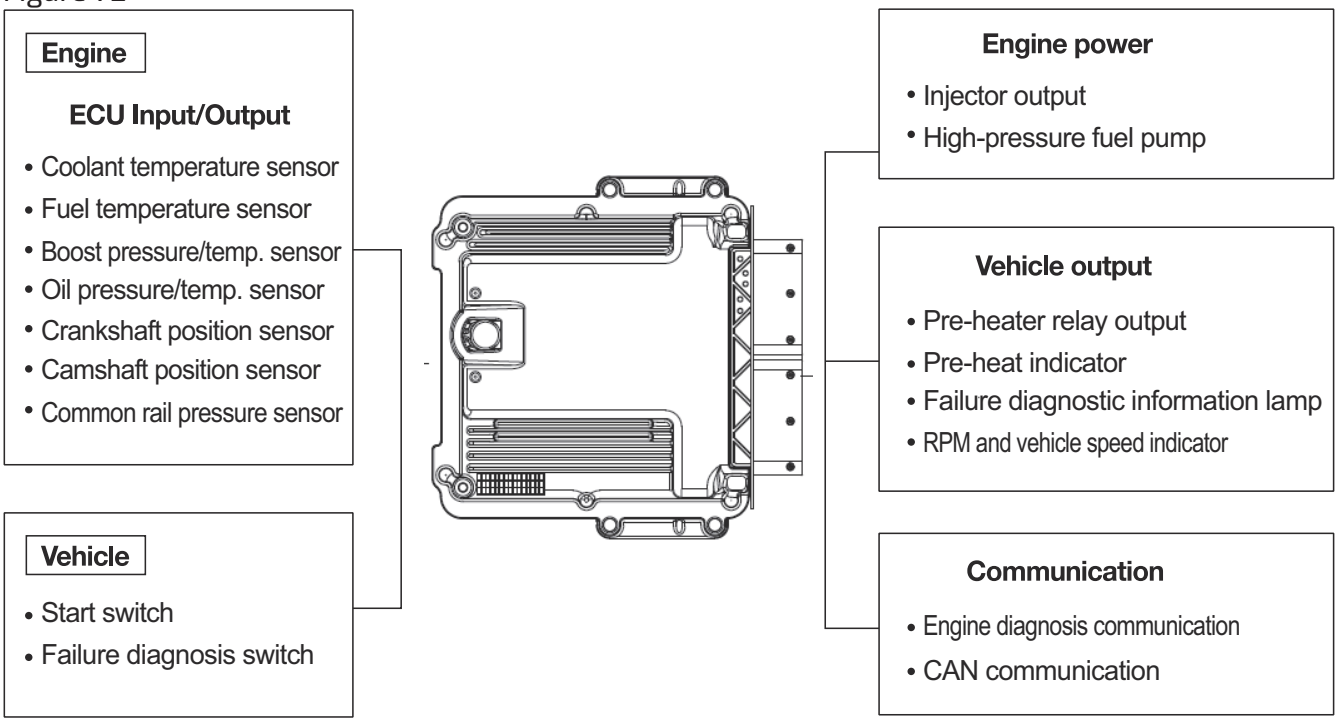


DS2103801

1	Connectors for Connections on the Engine	2	Connectors for Connections on the Vehicle

ECU (Electronic Control Unit) input/output

Figure 72



Operational Conditions of Electronic Control Unit (ECU)

Engine Start

1. Sets the lowest value among the coolant temperature, fuel temperature, intake air temperature and oil temperature as the reference temperature in order to set the reference temperature for determining whether to preheat the engine.
2. Sets the reference temperature based on the engine coolant temperature in order to set the reference temperature for determining the amount of fuel.
3. Delivers fuel to the engine after determining a suitable amount of fuel for starting the engine, then uses the crankshaft rotation sensor to measure the engine rpm signal.

Vehicle Driving

Calculates the required data for driving a vehicle, such as CAN data and the rpm transferred from the vehicle control unit.

Driver-requested Adjustment of rpm

Controls the rpm based on request from the driver and controls the engine based on the rpm requested by the vehicle control unit.

Limp Home

1. A function that allows drivers to drive their vehicle to the repair center safely with the minimum conditions for driving the vehicle when a fault code occurs.
2. Limp Home function is applied under the following conditions.
   - Accelerator pedal has failed: Regardless of pressing the accelerator pedal, the vehicle is driven at a consistent RPM.
   - Sensor has failed: When sensors have failed, the vehicle is driven with the consistent alternative values.

- Output is limited: According to the fault type, the fuel volume delivered to the engine is limited. The limit is classified into four levels. The fuel volume is limited according to the severity of the fault.
- Diagnosis Information display lamp: Provides information of fault state to drivers for safe driving.

Failure Diagnosis

1. When a fault occurs, the failure diagnosis information display lamp on the gauge board is turned on.
2. With the failure diagnosis information display lamp, drivers can see the fault code.

   NOTE: *It can be checked from the failure diagnosis information on the gauge board.*
3. It can be diagnosed by connecting the diagnosis unit to the check connector at the back of the driver's seat.

Driving Record

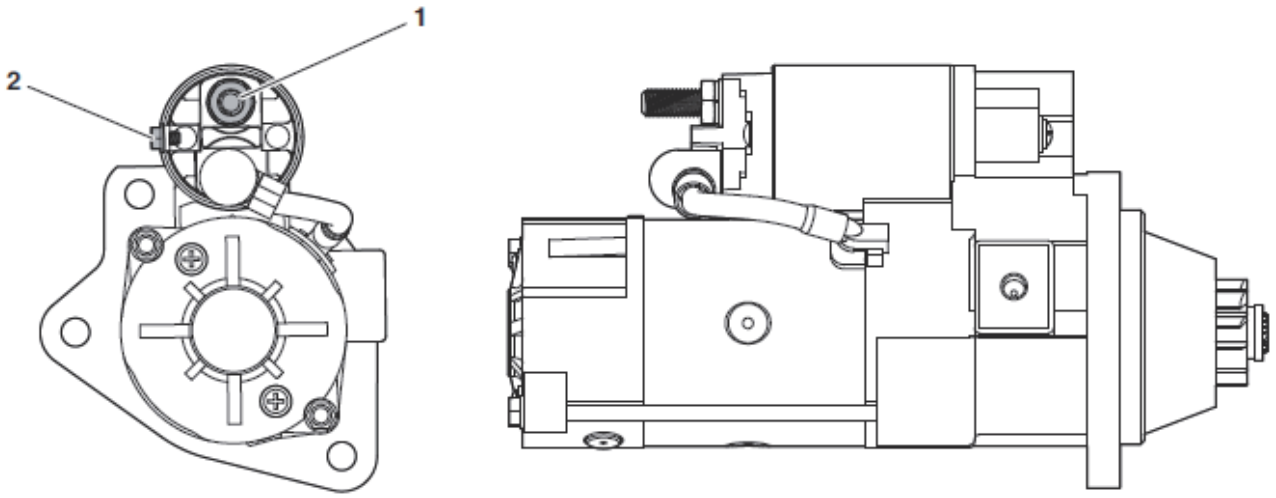
1. Writes the information related driving to the ECU.
2. The information on fuel consumption, engine use time, and ECU use time is written in the ECU.
3. The information can be monitored with the ECU diagnosis device.

Starter

General Description

The start motor is installed behind the flywheel housing. When disassembling the engine, soak the start motor's pinion gear and ring gear into fuel and clean them with a brush thoroughly. Then, apply grease to them prevent their corrosion.

Figure 73



DS2103802

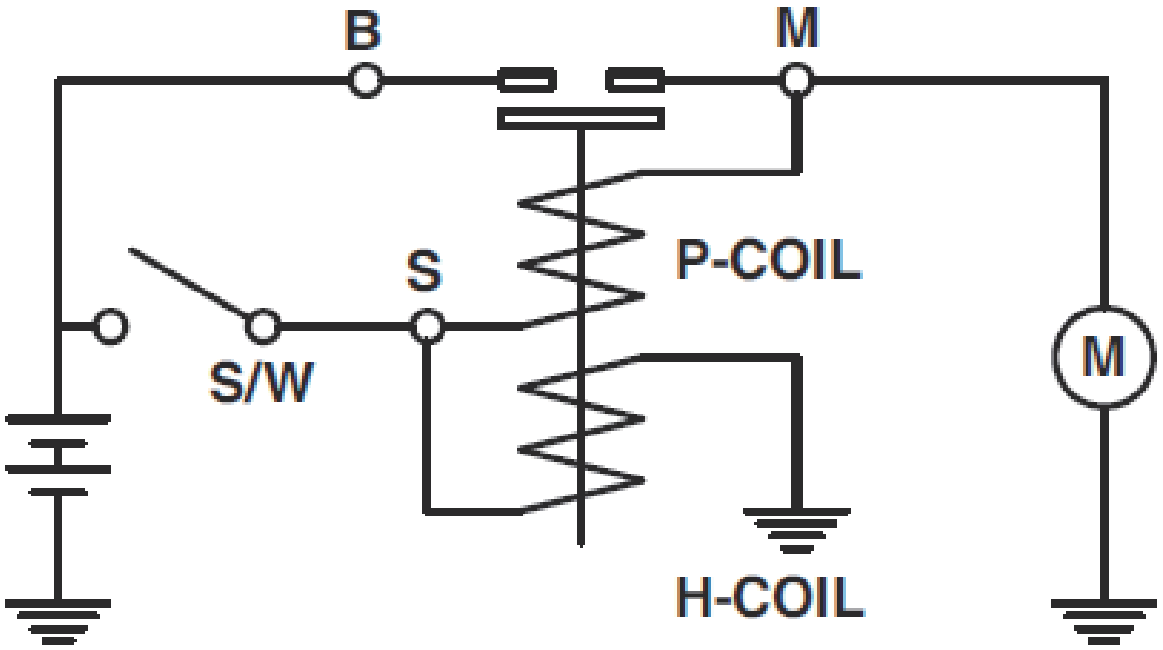
1	B terminal: M10 * 1.5P	2	S/W terminal: M5 * 0.8P

NOTICE

The start motor should always be protected from moisture and humid condition.

Circuit Diagram

Figure 74



DS2103803

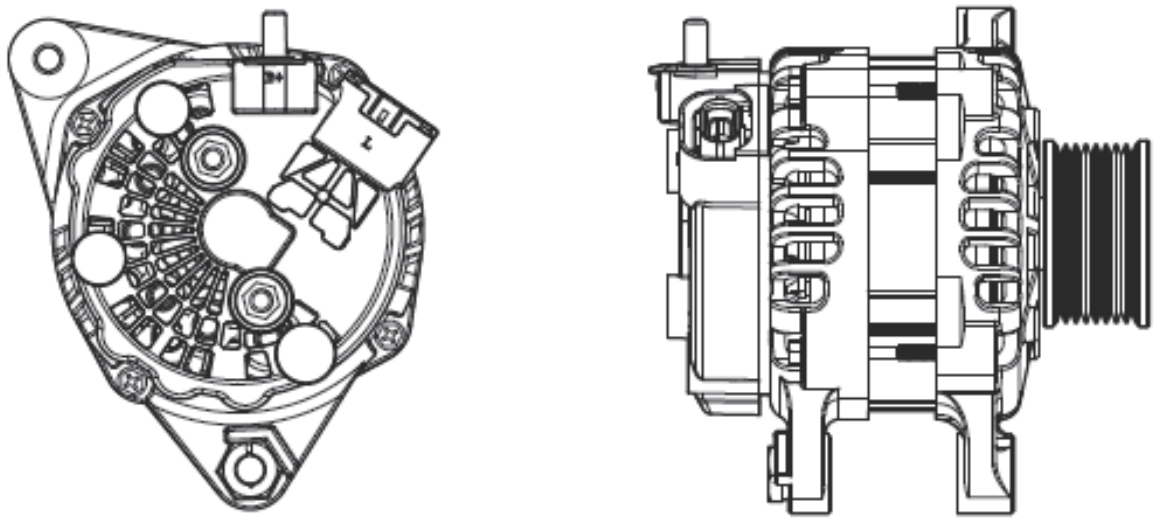
NOTICE

Before working on any electric system, make sure to disconnect the negative battery cable in advance. Connect the ground cable last after work to avoid a short circuit during work.

Alternator

The alternator is fitted with integral silicon rectifiers. A transistorized regulator mounted on the alternator body interior limits the alternator voltage. The alternator should not be operated except with the regulator and battery connected in circuit to avoid damage to the rectifier and regulator.

Figure 75



DS2103804

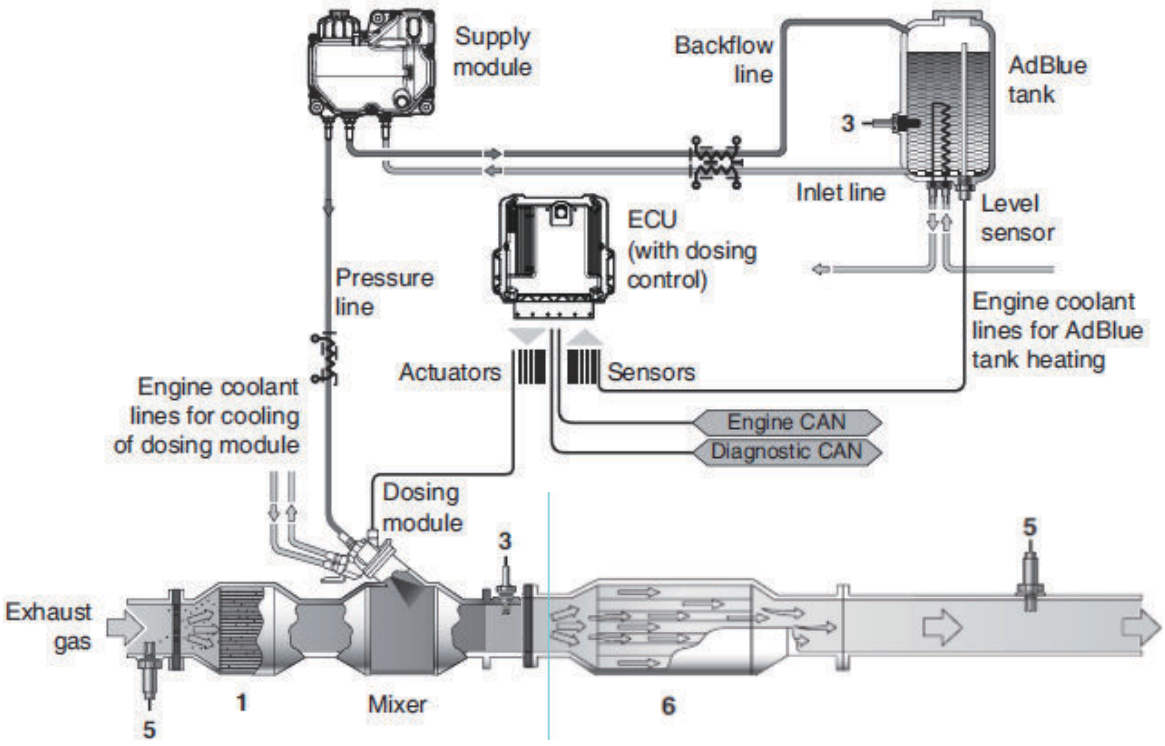
After Treatment System

Exhaust gas reduction system (Tier4F)

General instructions

The engine is designed to satisfy Tier4F emissions standards through the use of DOC (Diesel Oxidation Catalyst), and SCR (Selective Catalytic Reduction) systems. The SCR system consists of a dosing module, supply module, ECU (engine control unit) and various other parts.DEF (Diesel Exhaust Fluid, urea solution) — necessary for the operation of the SCR system — is stored in the DEF tank before being pressurized by the supply module and supplied to the dosing module at a certain pressure. Installed on the muffler of the aftertreatment system, the dosing module injects DEF into the compact mixer located upstream of the SCR.

Figure 76



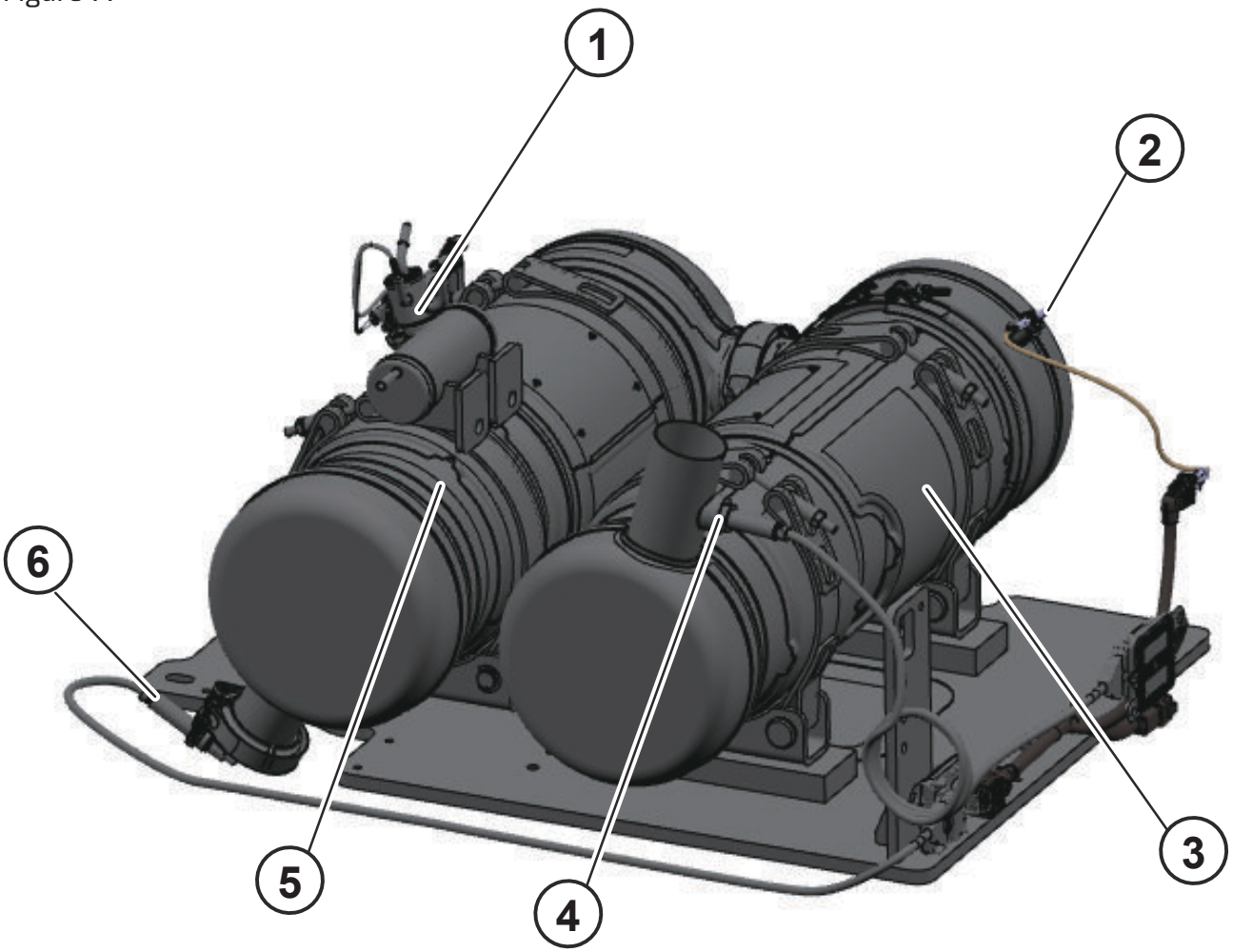
DS2201301

No.	Part Name	Quantity
1	DOC (Diesel Oxidation Catalyst)	1
3	Temperature Sensor	1
5	NOx Sensor	2
6	SCR (with AOC)	1

Aftertreatment muffler and catalyst

The aftertreatment consists of the DOC + SCR/AOC. The DOC contains a diesel oxidation catalyst, while the SCR contains selective catalytic reduction.

Figure 77

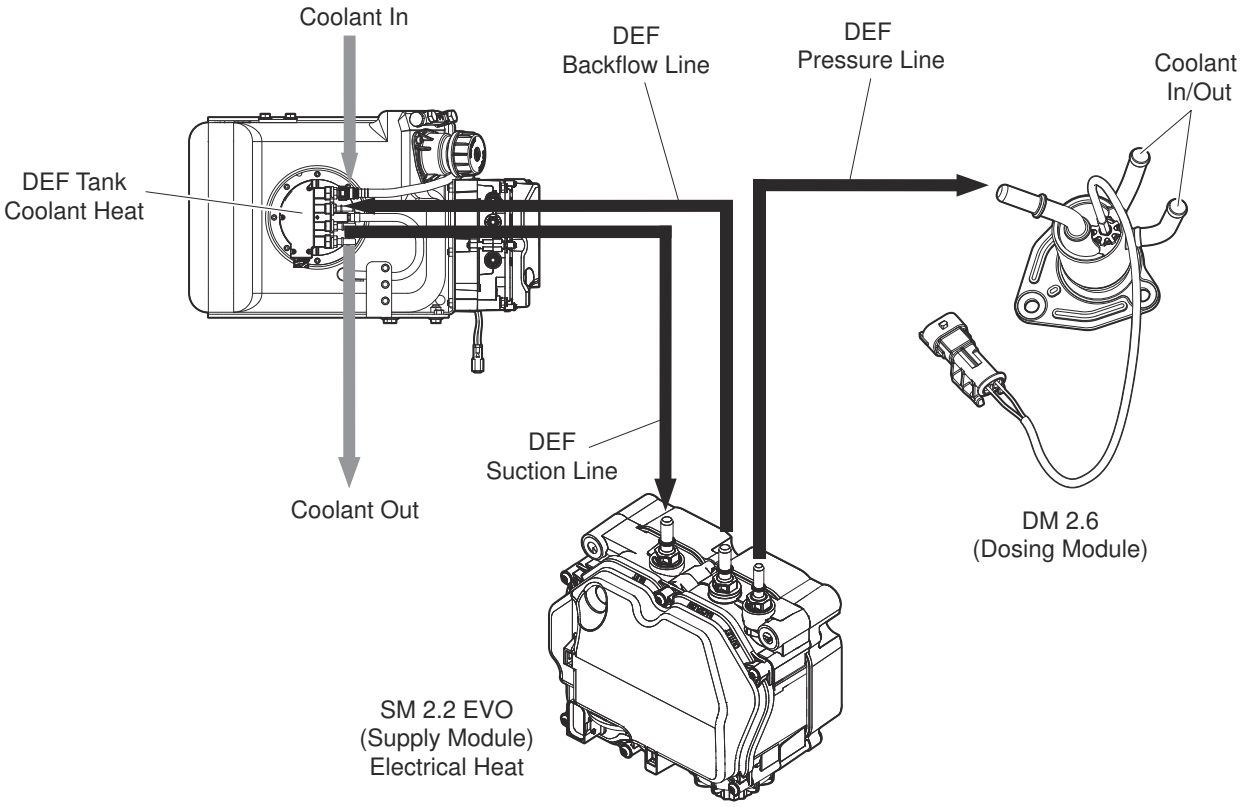


1	Dozing Module	2	Temperature Sensor	3	SCR
4	NOx Sensor	5	DOC	6	NOx Sensor

DEF Dozing System

This system injects DEF (Diesel Exhaust Fluid, urea) into the SCR catalyst to reduce NOx (nitrogen oxide) emissions. The system consists of a supply module acting as a pump, a dosing module which injects DEF, an ECU which controls the entire system, a DEF tank for storing DEF, and DEF/coolant lines.

Figure 78



DS2002219

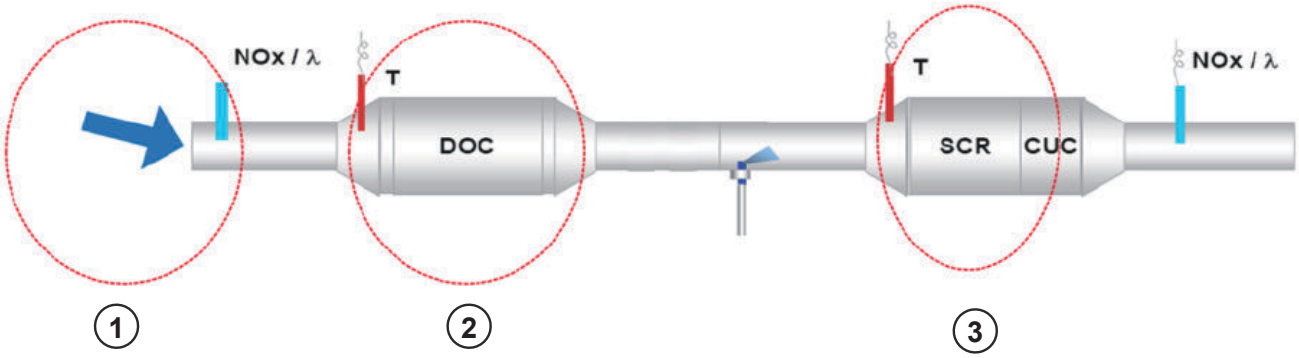
DeSOx

SCR catalyst may be deactivated by mainly thermal and sulfur (Sox) which are generated by diesel as machine operation time goes by. But deactivated sulfur can be recovered through heat regeneration over 500 °C (932 °F). So the process that heats up over 500 °C (932 °F) to remove sulfur is called " DeSOx ".

Catalyst Deactivation

Deactivation Mechanism	Occurrence	Reversible / Action	Action to Minimize
Thermal	High temperature events	No	Minimize uncontrolled regeneration events
Sulfur	Misfuelling with high sulfur fuel	Yes > 500 °C (932 °F)	Controls fuel supply

Figure 79



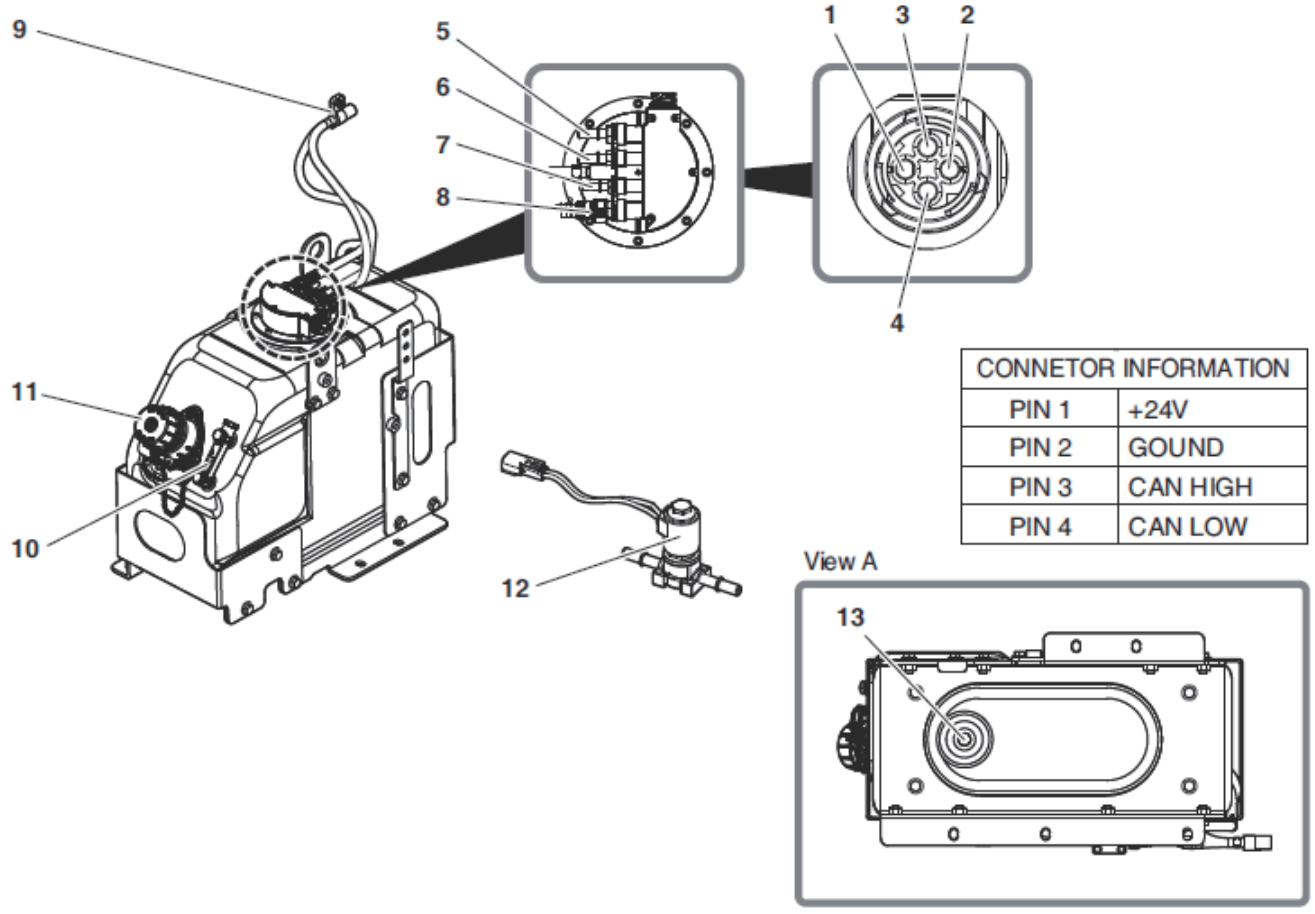
DS2201303

1	Post Injection	2	Exotherm into DOC (over 500 °C (932 °F))	3	Remove sulfur

DEF Tank

The DEF tank is used to store DEF (urea). Be sure to install connecting lines in their designated positions. Take care not to apply any excessive force or shocks to the DEF tank.

Figure 80



DS2103807

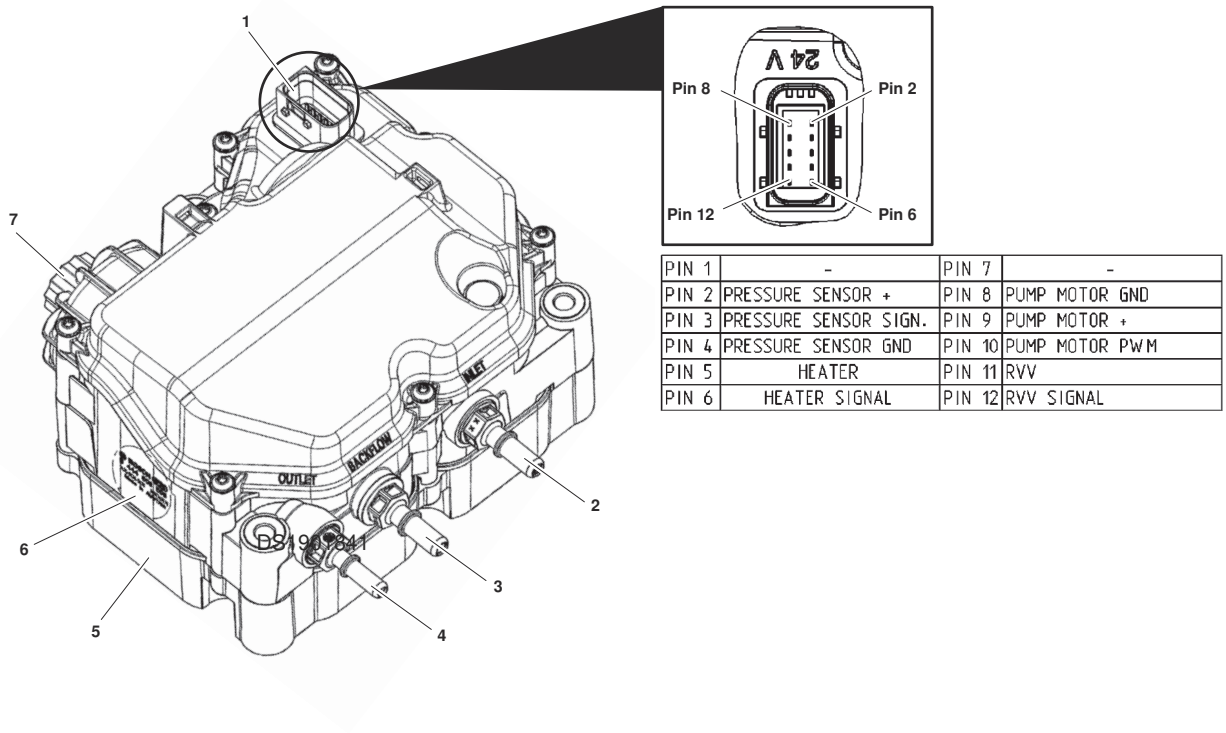
Reference Number	Description
1	+24V (Pin No.1)

Reference Number	Description
2	Ground (Pin No.2)
3	CAN HIGH (Pin No.3)
4	CAN LOW (Pin No.4)
5	Coolant outlet
6	DEF outlet
7	DEF inlet
8	Coolant inlet
9	Breather filter
10	Level indicator
11	DEF tank cap
12	Coolant valve
13	Drain Plug

Supply Module

The supply module is a device which pressurizes DEF in the DEF tank to a constant pressure and delivers it to the dosing module.

Figure 81



PIN 1	-	PIN 7	-
PIN 2	PRESSURE SENSOR +	PIN 8	PUMP MOTOR GND
PIN 3	PRESSURE SENSOR SIGN.	PIN 9	PUMP MOTOR +
PIN 4	PRESSURE SENSOR GND	PIN 10	PUMP MOTOR PWM
PIN 5	HEATER	PIN 11	RVV
PIN 6	HEATER SIGNAL	PIN 12	RVV SIGNAL

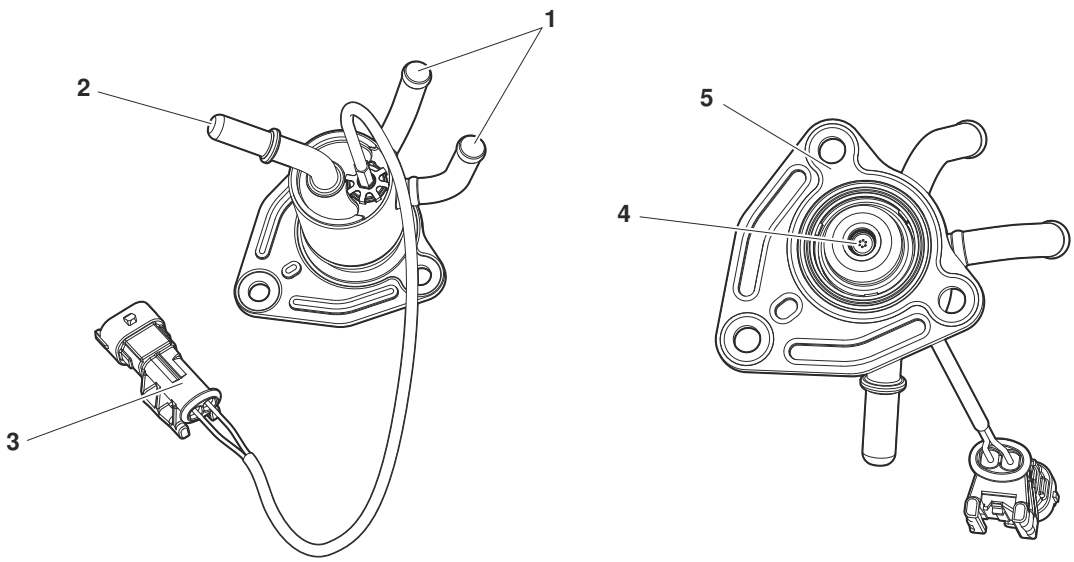
DS1901842

Reference Number	Description
1	Connector
2	DEF Outlet
3	DEF Back flow Outlet
4	DEF Outlet
5	Cover Plate
6	Detailed Display
7	Filter Cover

Dosing Module

Installed on the compact mixer located upstream of the SCR, the dosing module is a device which injects DEF supplied by the supply module into the compact mixer.

Figure 82



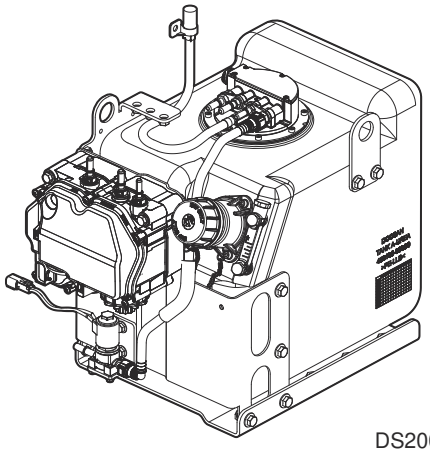
DS1901843

Reference Number	Description
1	Coolant Inlet/Outlet
2	DEF Inlet
3	Connector
4	DEF Outlet

Reference Number	Description
5	Flange

Components of the DNOX 2.2 EVO system

1. Figure 83



DS2002217

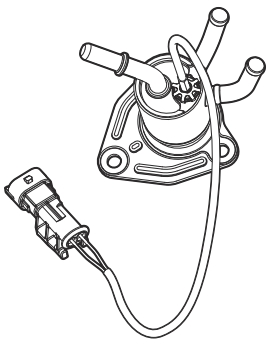
NOTE: *The DEF tank and supply module are both installed in the same cabin.*

The components of the DNOX 2.2 EVO are installed throughout the vehicle where they are most essential. Each part is designed to be protected from damage due to the surroundings.

2. The dosing module (DM) is mounted on the compact mixer between the DPF and SCR. It is connected both to a DEF line passing through the SM and an engine coolant line, as well as to the connector of pin no.2 which controls the DEF dosing valve.

Inspecting the DNOX 2.2 EVO system for faults

1. Figure 84



DS1901855

Dosing Module

Dosing module malfunctions may be caused by the tip of the DEF injection nozzle being exposed to high temperatures, a faulty connection in the electrical harness, or a damaged or improperly connected DEF hose line.

The following DM fault inspection items can be checked visually.

A. Air leak due to insufficiently tightened bolt or DM and bolt damaged due to overtightened bolt during replacement or installation of DM.

B. Improperly installed electrical connector or connector contaminated by foreign matter.

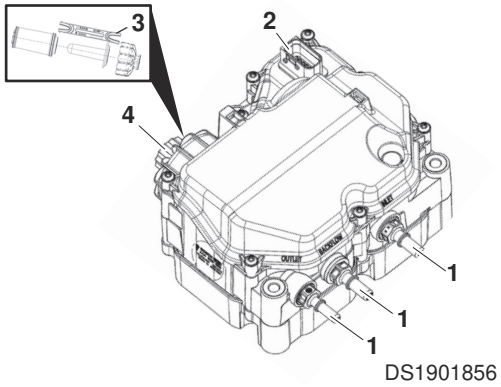
C. DEF leak due to improperly connected DEF line.

D. Coolant leak due to improperly connected coolant line or DM exposed to high temperatures due to disconnected coolant line.

E. DM exposed to high temperatures due to improperly installed gasket.

F. DEF leak due to reuse of gasket.

2. Figure 85



Supply Module

Supply module (SM) fault modes may be caused by damaged or improperly connected DEF lines and electrical connectors.

Faults may occur due to incorrect installation during regular replacements of the main urea filter.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

When replacing a filter, remove the packaging on the new filter immediately before performing the replacement.

A. Fault due to improper assembly or improperly connected line while connecting DEF lines.

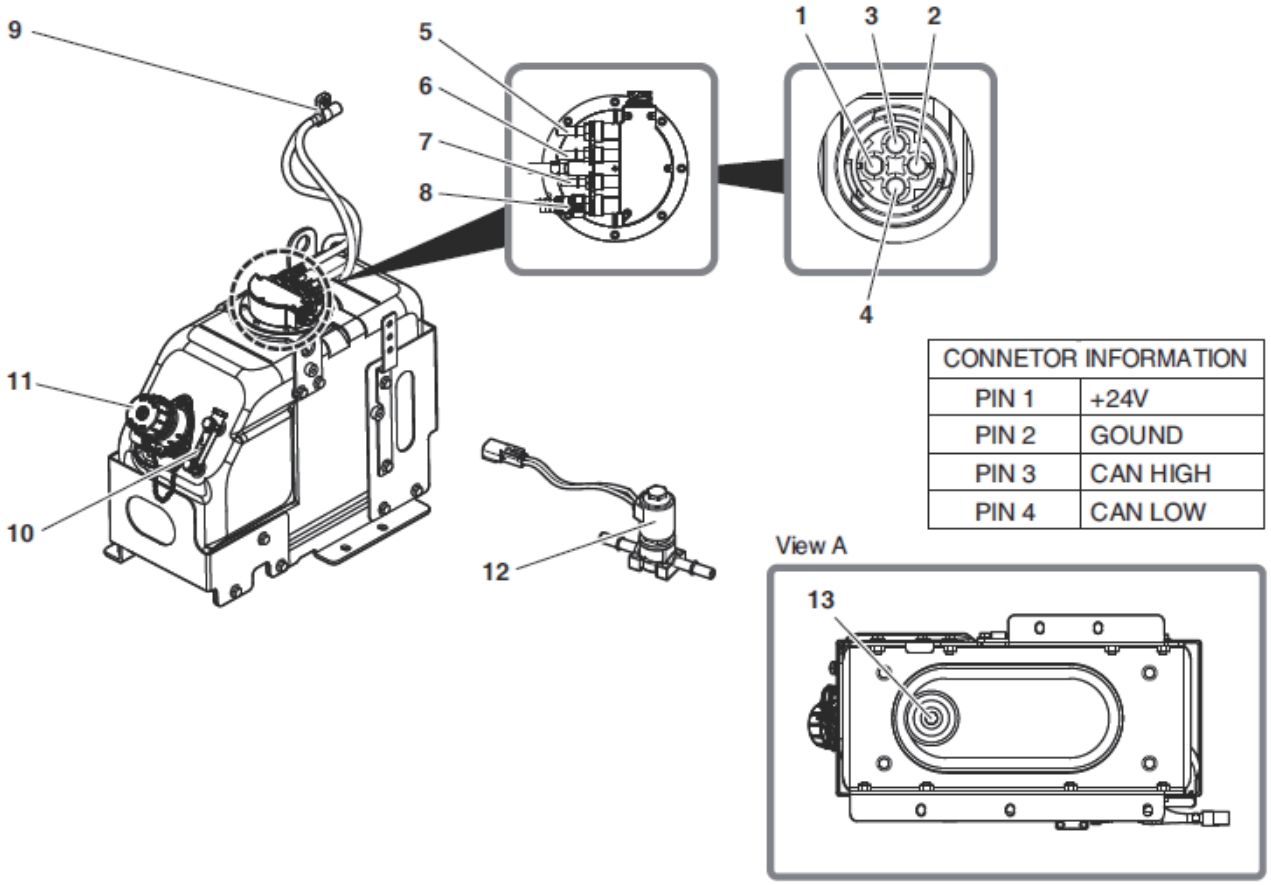
B. Improperly installed electrical connector or connector contaminated by foreign matter.

C. Filter damaged due to use of improper tools during replacement of SM filter or residue build-up in SM filter.

D. Cap damaged by over tightening of DEF cap during replacement of filter or filter loose due to incorrect installation.

3. The DEF tank is used to store DEF (urea). Be sure to install connecting lines in their designated positions. Take care not to apply any excessive force or shocks to the DEF tank.

DEF Tank
Figure 86



CONNETOR INFORMATION	
PIN 1	+24V
PIN 2	GOUND
PIN 3	CAN HIGH
PIN 4	CAN LOW

DS2103807

A. Do not mix up the DEF inlet hose and back flow hose. To install connectors, insert them until a click is heard, taking care not to damage the connectors.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

The DEF inlet hose is shown in red, whereas the back flow hose is shown in yellow.

B. Check whether the DEF tank mounting bracket has been tightened. Failing to tighten it may lead to damage due to vibrations.

C. Check the tank temperature and the connection of the level sensor connector, taking care to avoid damaging or contaminating the connector with foreign matter

D. Coolant lines must be installed in their proper positions. Failing to tighten coolant lines may cause coolant leakage.

E. Check the connection of the DEF line heater (2-PIN). There is a risk of freezing and bursting in winter if the heater is not working.

4. Muffler and other pipes

There is no need to replace, remove, or change the position of the installed muffler and various pipes except in the event of a fault or problem due to external factors.

When replacing or removing them due to a fault or problem, be sure to tighten each part to its specified tightening torque in order to prevent air leaks.

DEF (Diesel Exhaust Fluid, urea)

Component	Unit	Range		Test Method
		Minimum	max	
Urea concentrations	% (m/m)[b]	31.8	33.2	ISO 22241-2 Annex B[c]ISO 22241-2 Annex C[c]
Density (at 20°C[d])	kg/m3	-	1,093	ISO 3675 or ISO 12185
Deflection (at 20°C[e])	-	-	1.3843	ISO 22241 2 Annex C
Ammonia alkaline	% (m/m)[b]	-	0.2	ISO 22241 2 Annex D
Diuret	% (m/m)[b]	-	0.3	ISO 22241 2 Annex E
Aldehyde	mg/kg	-	5	ISO 22241 2 Annex F
Insoluble matter	mg/kg	-	20	ISO 22241 2 Annex G
Phosphate (P04)	mg/kg	-	0.5	ISO 22241 2 Annex H
Calcium	mg/kg	-	0.5	ISO 22241 2 Annex I
Iron	mg/kg	-	0.5	
Copper	mg/kg	-	0.2	
Zinc	mg/kg	-	0.2	
Chrome	mg/kg	-	0.2	
Nickel	mg/kg	-	0.2	
Aluminum	mg/kg	-	0.5	
Magnesium	mg/kg	-	0.5	
Sodium	mg/kg	-	0.5	
Potassium	mg/kg	-	0.5	
Identity	-	Identical		ISO 22241 2 Annex J

1. Reference value: 32.5% (m/m).
2. The unit "%(m/m)" is used to express the mass of matter as a fraction according to international standards.
3. Calculated without subtracting nitrogen from ammonia.
4. Reference value: 1,090 kg/m3
5. Reference value: 1.3829

AUS 32 requires the addition of a tracer element. Take care to ensure that the quality of AUS 32 indicated in the table and the tracer element do not damage the SCR system.

NOTE: *The conditions of ISO 4259 must be applied between the maximum and minimum values within the specified range. Be sure to take the minimum difference of 4 x R (R is the reproducibility of the test method) into account. However, for the sake of maintaining high quality, 4 x R is not factored into the urea concentration.*

NOTE: *The urea concentration, density and deflection are the actual values. (For the actual values, please refer to ISO 4259)*

NOTE: *The values defined in notes a, d and e are standard among AUS 32 manufacturers.*

NOTE: *Be sure to check whether the DEF (Diesel Exhaust Fluid, urea) satisfies the required specifications. Be sure to apply the conditions of ISO 4259.*

Components Operation, Description And Inspection

Safety Instructions

⚠ WARNING

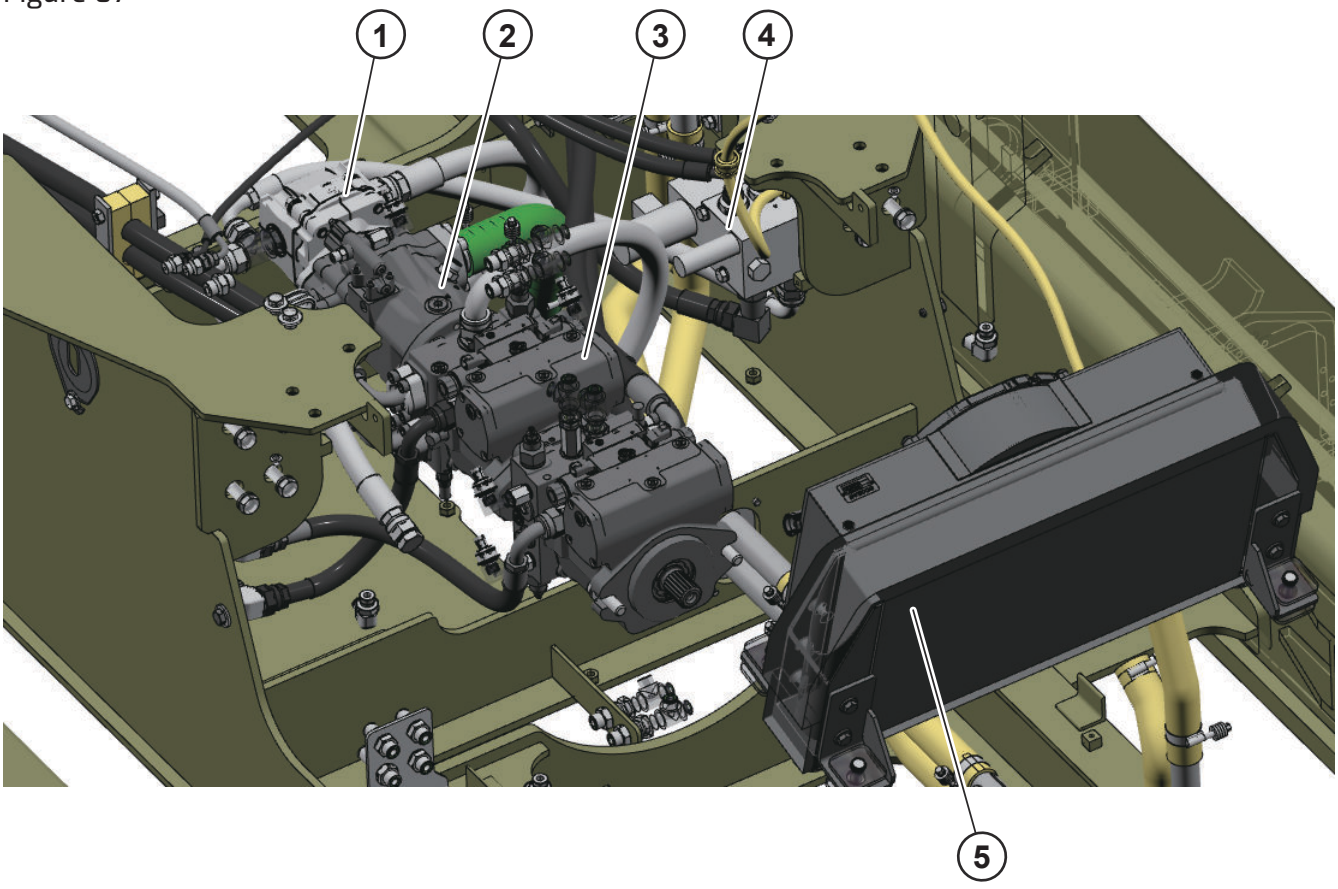
AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments repairs or service. Untrained operators and failure to follow instructions can cause death or serious injury.

Overview

Around Main Pump

Figure 87

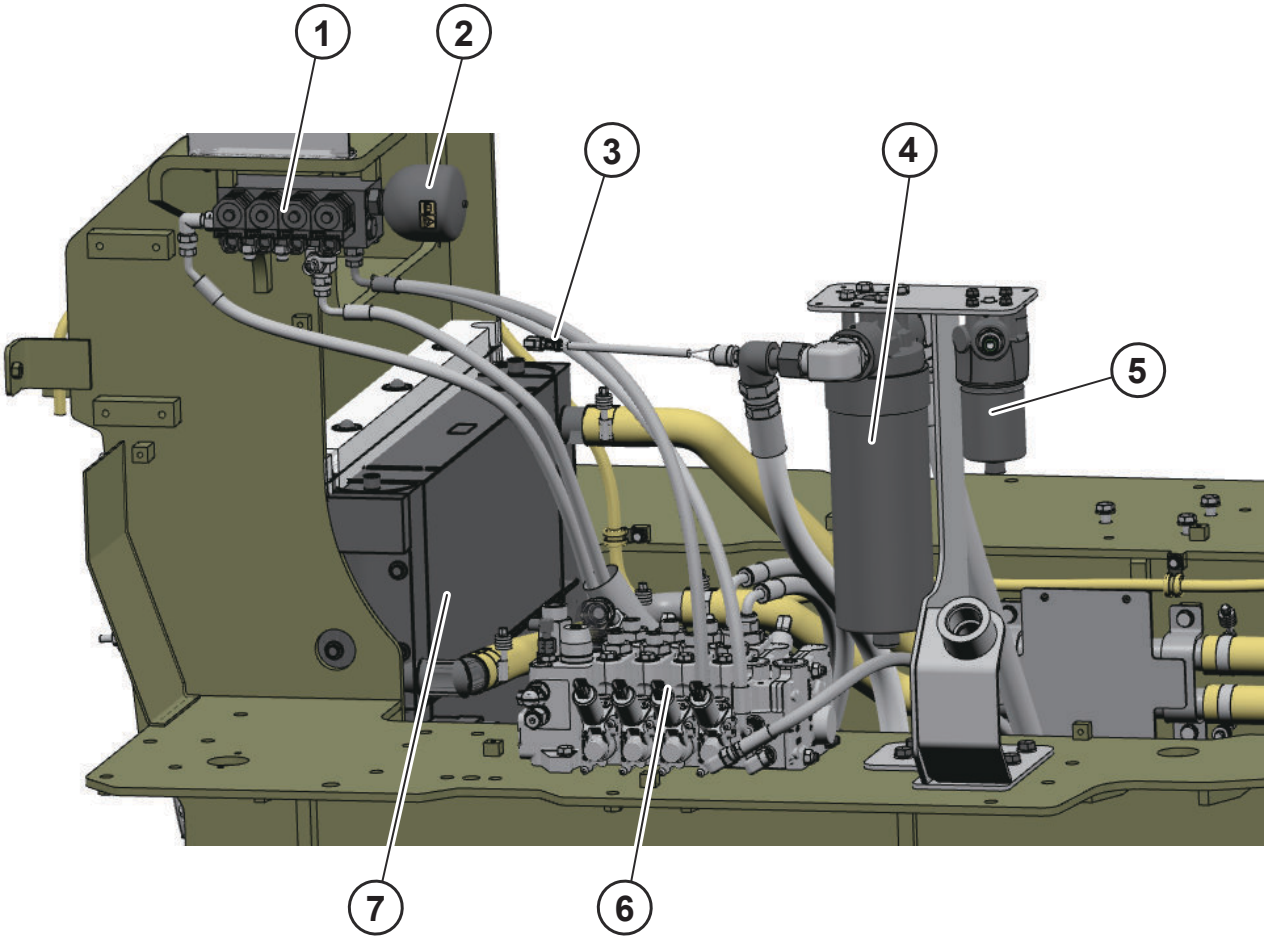


DS2201304

1	Gear Pump	4	Fan Motor Supply Valve
2	Main Pump	5	CAC (Charged Air Cooler) Assembly
3	HST Pump	-	-

Around MCV

Figure 88

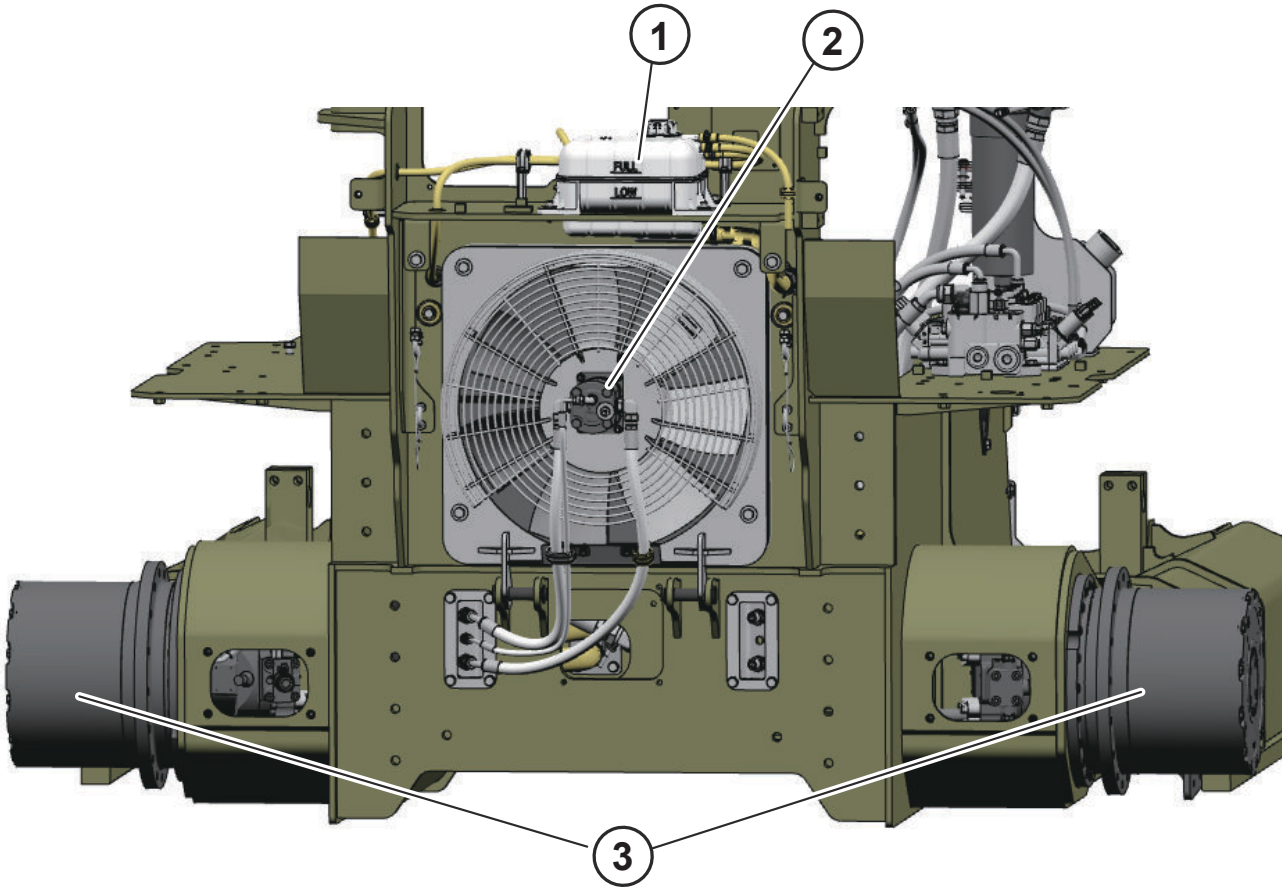


DS2201305

1	Solenoid Valves	5	Brake Filter
2	Accumulator	6	Main Control Valve
3	Oil Pressure Switch	7	Radiator Assembly
4	Return Filter	-	-

Around Fan Assembly

Figure 89



DS2201306

1	Surge Tank	3	HST Travel Device
2	Fan Motor	-	-

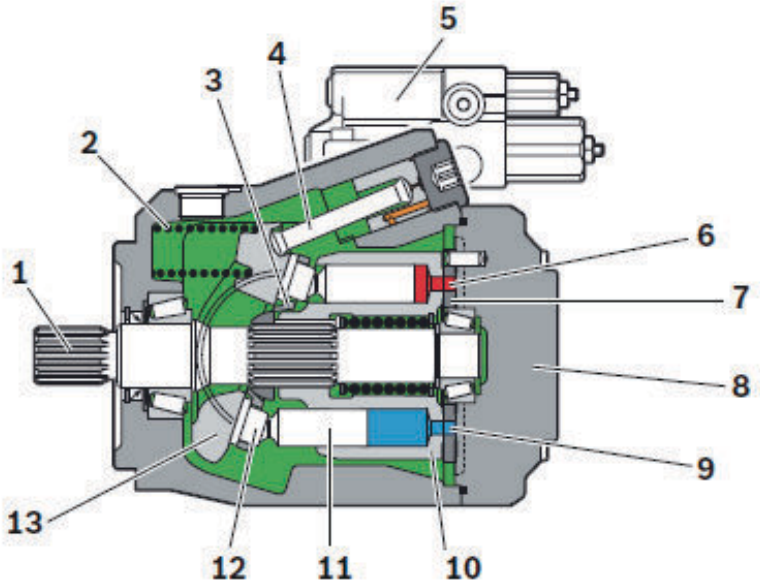
Main Pump

General Description

The axial piston variable pump generates, controls, and regulates a hydraulic-fluid flow. It is a variable pump with an axial piston rotary group in a swash-plate design for a hydrostatic drive in an open circuit. Flow is proportional to drive speed and displacement. The flow can be steplessly changed by controlling the cradle. For axial piston units with a swash plate design, the pistons are arranged axially to the drive shaft. In an open circuit, the hydraulic fluid flows from the reservoir to the hydraulic pump from where it is fed to the consumer, e.g. hydraulic motor. The hydraulic fluid flows directly back to the reservoir.

Axial Piston Layout

Figure 90



DS2201307

1	Drive Shaft	6	High-Pressure Side	11	Piston
2	Spring	7	Control Plate (Distributor Plate)	12	Slipper Pad
3	Retaining Plate	8	Connection Plate	13	Cradle
4	Stroking Piston	9	Suction Side	-	-
5	Control Valve	10	Cylinder	-	-

Pump

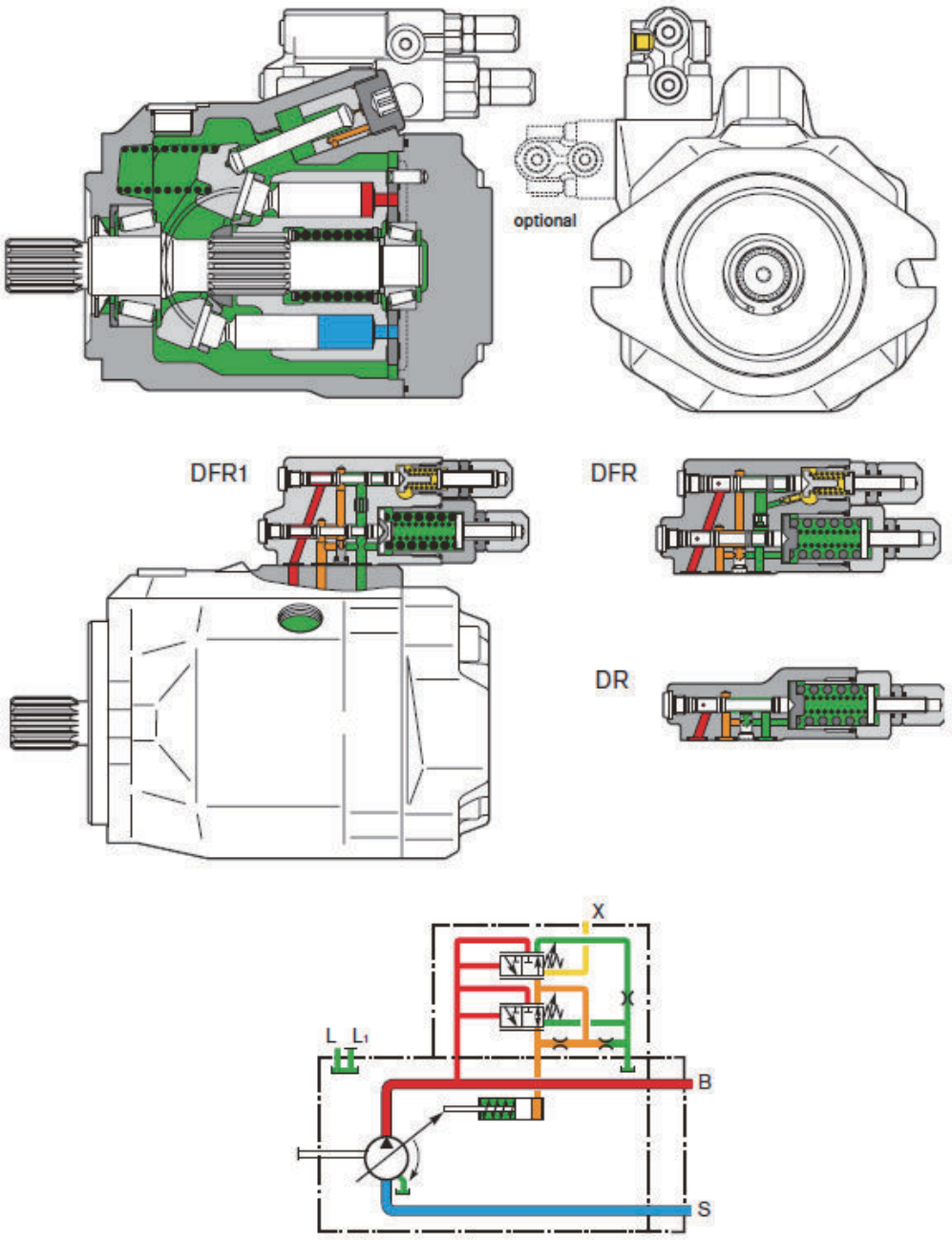
A drive motor applies torque and rotational speed to the drive shaft. The cylinder is picked up and turned by the splines of the drive shaft.With every revolution, the pistons complete a stroke in the cylinder bores, the size of which depends on the pitch of the cradle. The slipper pads are held on with the pistons and guided along the glide surface of the cradle by the retaining plate. The cradle setting during a rotation causes each piston to move over the bottom and top dead centers and back to its initial position. During this sequence, hydraulic fluid is fed in and drained out through the two control slots in the control plate according to displacement. The hydraulic fluid flows into the piston chamber as the piston recedes on the suction side. At the same time, on the high-pressure side, the hydraulic fluid is pushed out of the cylinder chamber into the hydraulic system by the pistons.

Control

The swivel angle of the cradle is continuously adjustable. Adjusting the swivel angle changes the piston stroke and, with it, the displacement. The swivel angle is controlled hydraulically by means of the stroking piston. The cradle is mounted for effortless motion in swivel bearings. When pressurized, the cradle is held in balance by the swiveling forces of the rotary group, which are generated by the eccentrically mounted swash plate and by the control pressure. When depressurized, the spring presses the cradle to a maximum swivel angle. Increasing the swivel angle increases the displacement; reducing the angle reduces displacement accordingly.

Section View

Figure 91



DS2201308

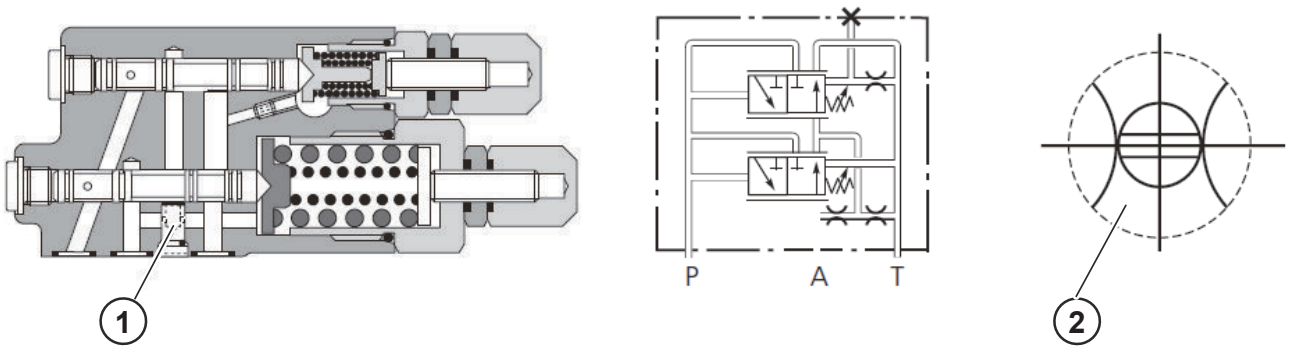
Control valve: Guidelines for DR, DFR, DFR1

All of the valves shown above have the orifice shown in its open condition.

DR control valve

Both X-ports are plugged. Flow controller is blocked.

Figure 92



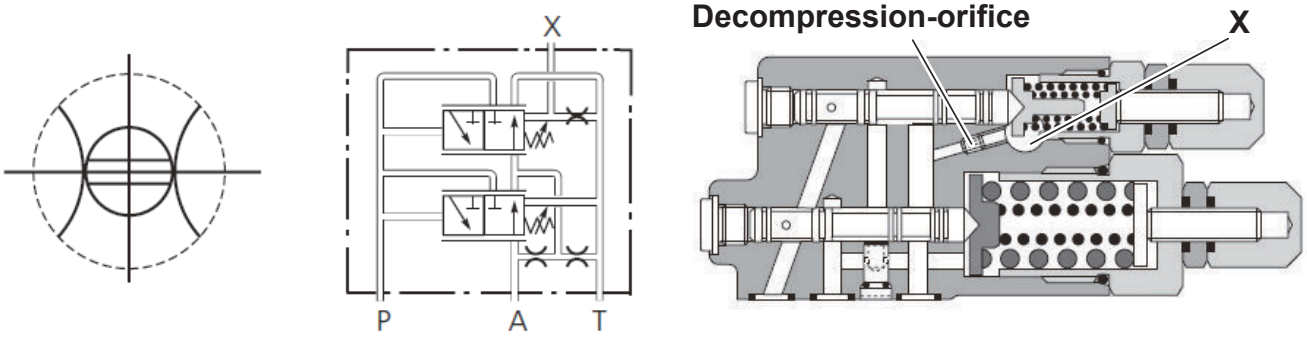
DS2201309

1	Orifice 0.6 mm	2	Position of the orifice Φ 0.6

DFR control valve

One X-port is plugged.

Figure 93

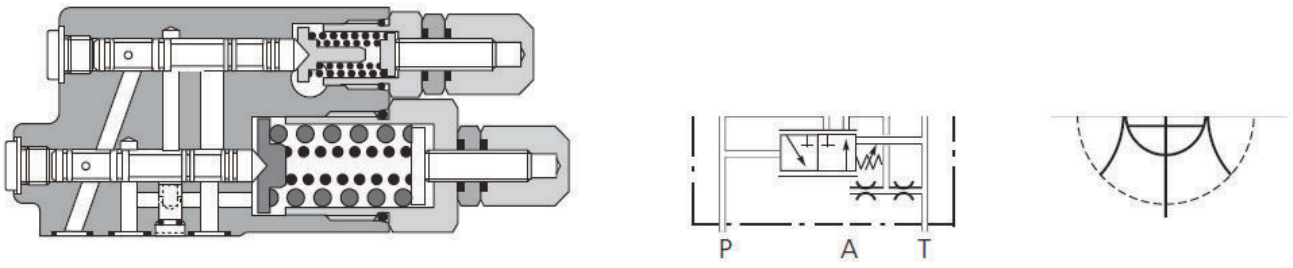


DS2201310

DFR1 control valve

One X-port is plugged.
Bypass orifice X-T is closed using a plug.

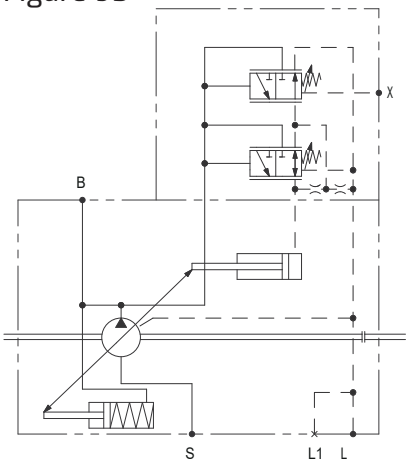
Figure 94



DS2201311

Port Connections

Figure 95



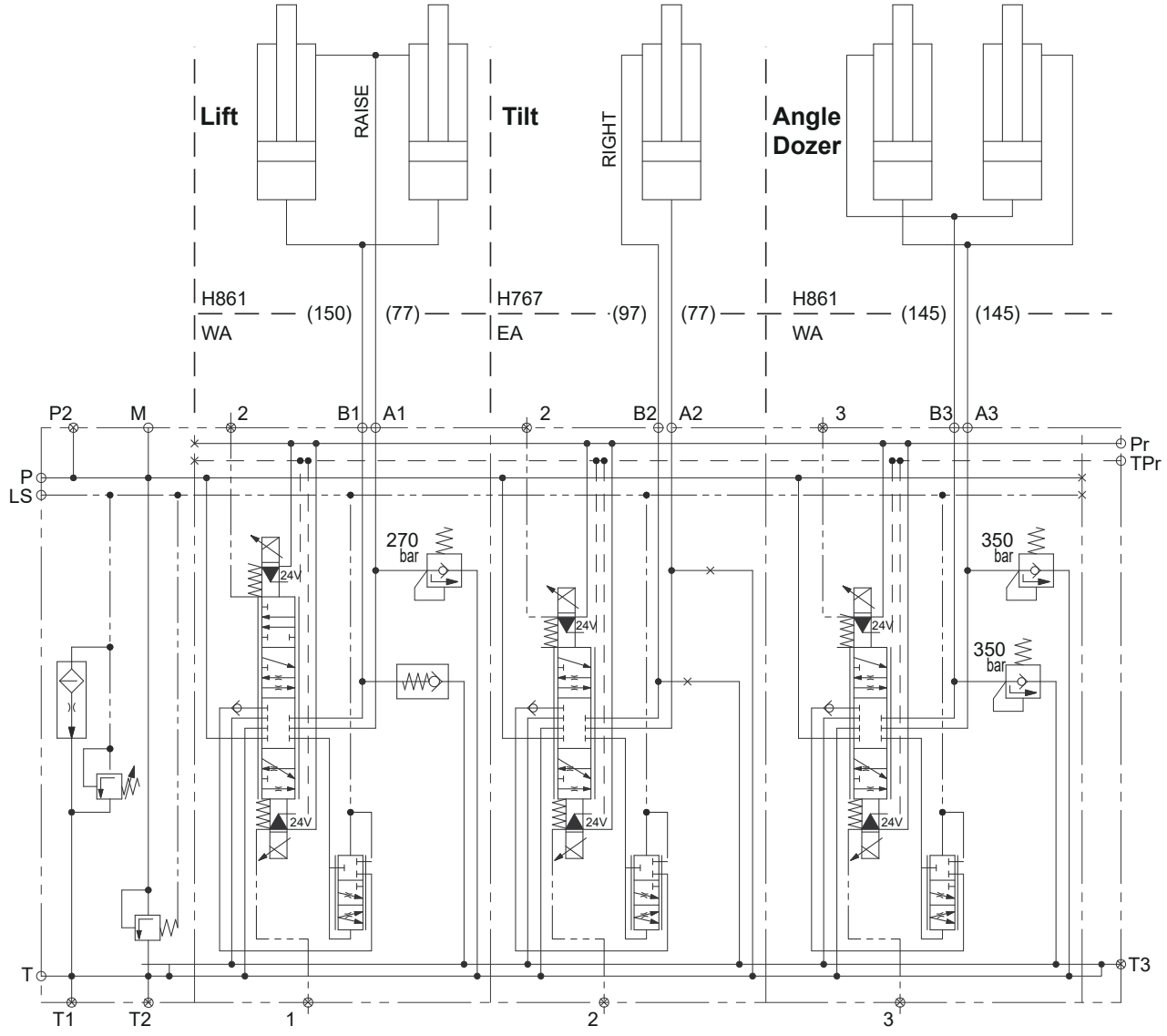
DS2201312

B	Pressure Port	SAE 1”
S	Suction Port	SAE 1 1/2”
L, L1	Case Drain Port	7/8-14 UNF-2B
X	Pilot Pressure Port	7/16-20 UNF-2B

Main Control Valve

Circuit

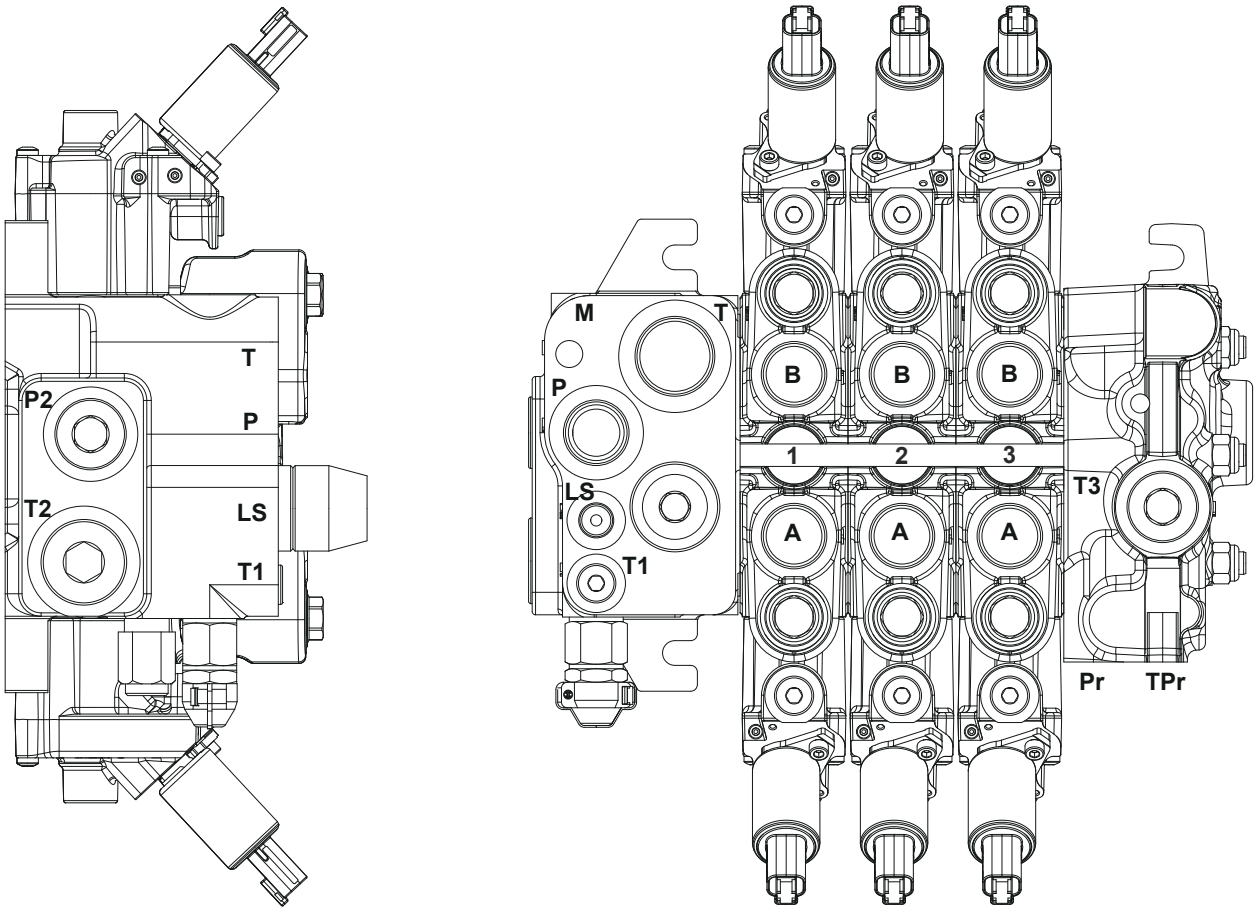
Figure 96



DS2201313

Spools

Figure 97- View from Top side



DS2201314

Port	Relief Valve Setting Pressure
A1	Lift Raise: 270 bar at 15 L/min
B1	Lift Lower: Check valve
A2	Tilt Right: N/A
B2	Tilt Left: N/A
A3	Angle: 350 bar at 15 L/min
B3	Angle: 350 bar at 15 L/min

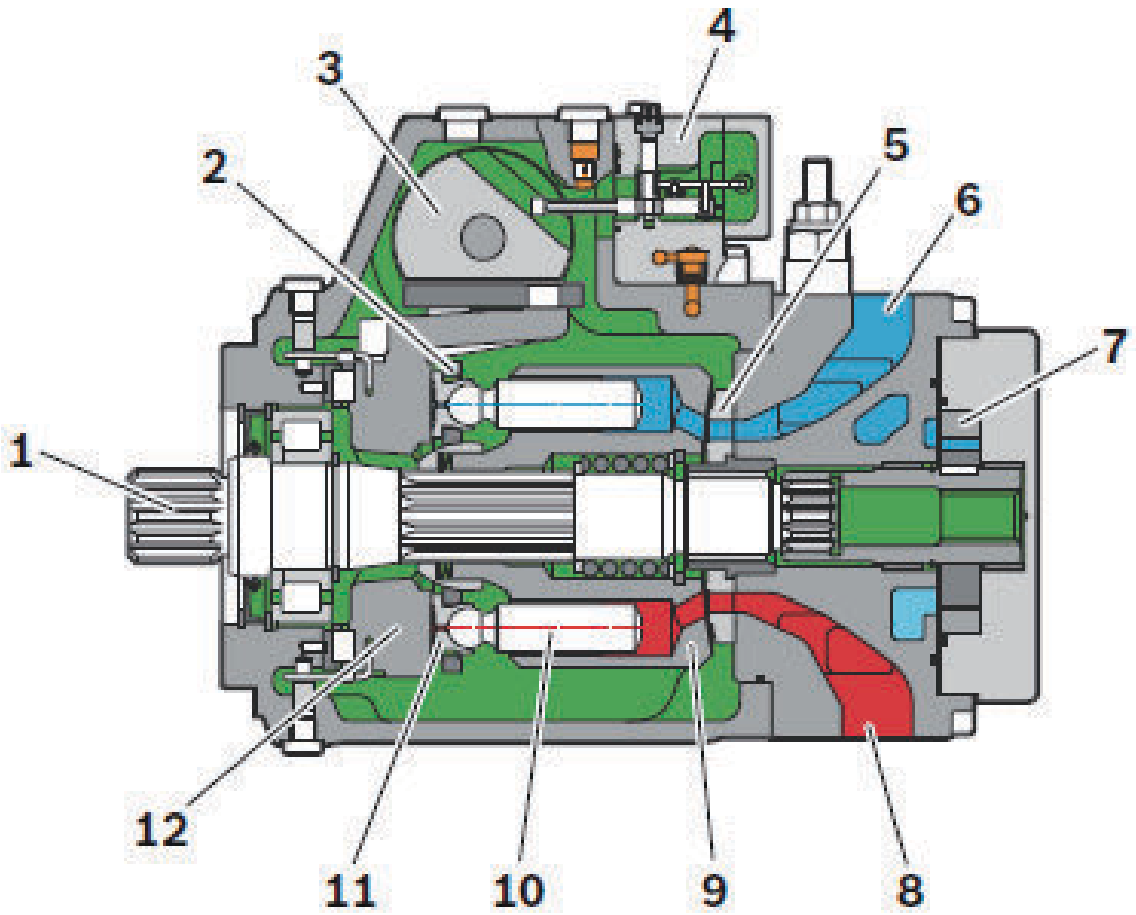
HST Pump

Overview

HST stands for Hydrostatic Transmission and is used in a travel system to connect the hydraulic pump with the motor in a closed enabling continuous speed change from forwarding to stop/Neutral and Reverse or vice versa. HST is smoother in operation and smaller than mechanical transmissions installed on the machine.

The axial piston variable pump generates, controls and regulates a hydraulic fluid flow. It is designed for mobile applications such as construction machinery.

Figure 98



DS2201431

1	Drive Shaft	2	Retainer Plate
3	Stroking Piston	4	Control Unit
5	Control Plate	6	Low-Pressure Side
7	Boost Pump	8	High-Pressure Side
9	Cylinder	10	Piston
11	Slipper Pad	12	Cradle

Figure 99

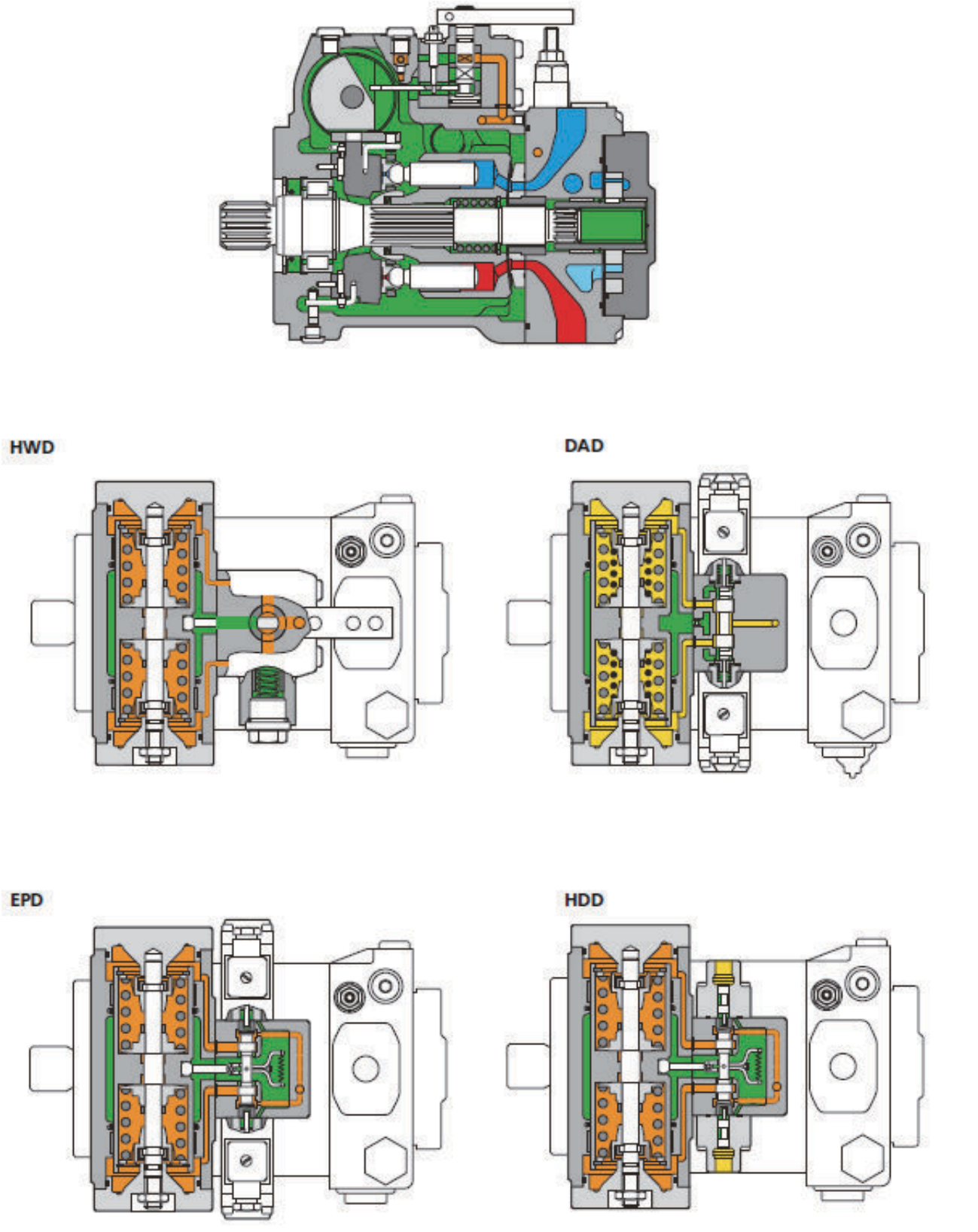
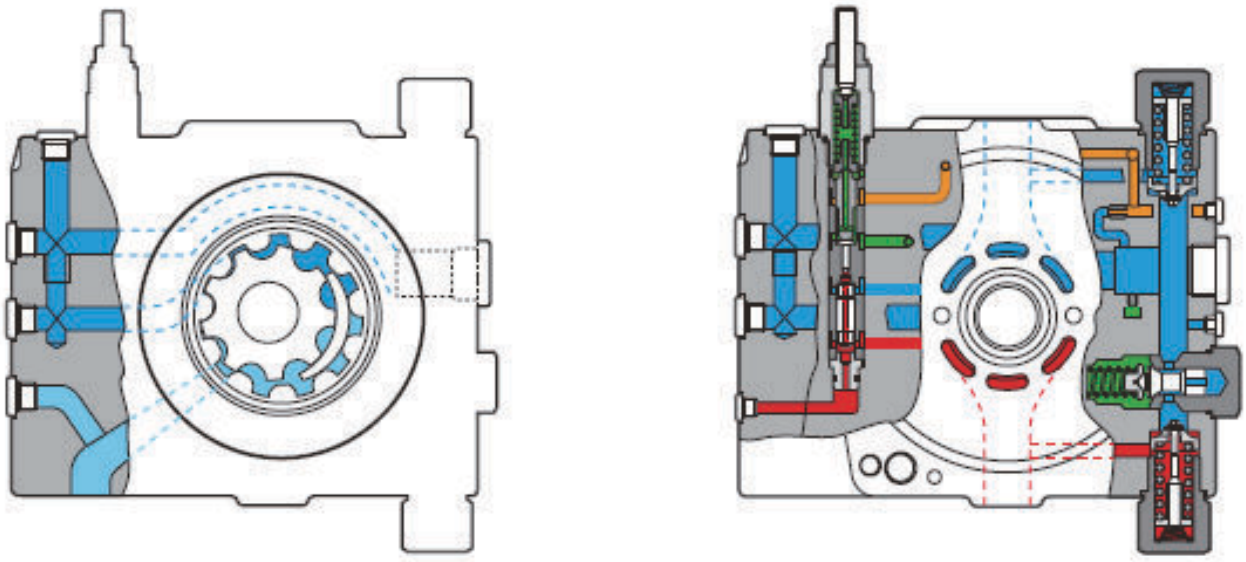
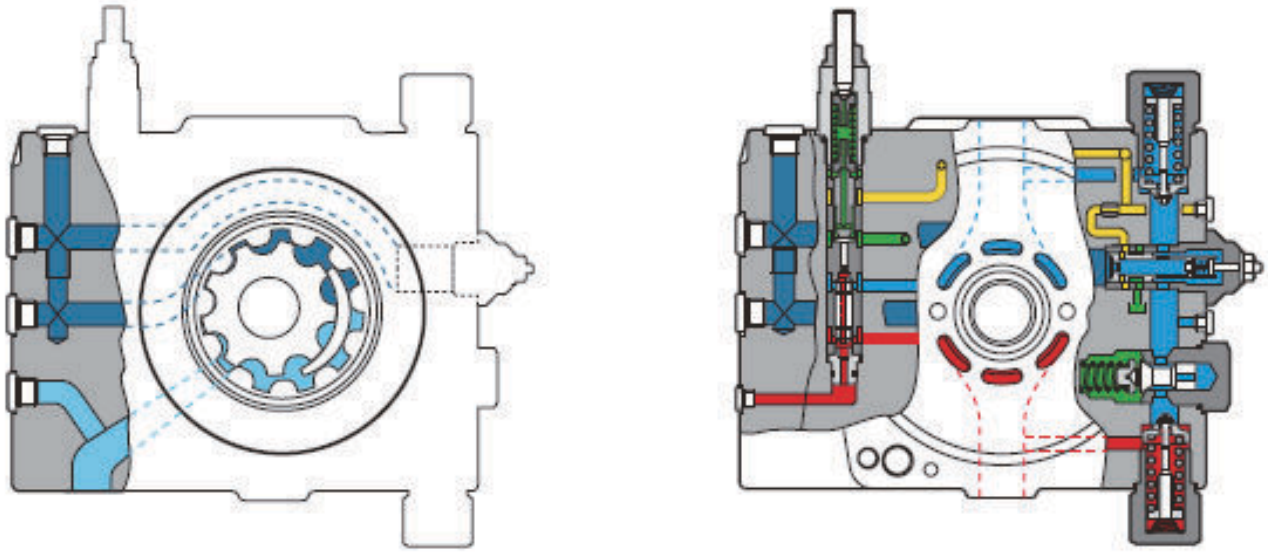


Figure 100

HWD / EPD / HDD



DAD



DS2201430

This is an axial piston variable pump with a swash plate design for hydrostatic drives in closed circuits. The flow is proportional to the drive speed and displacement. The flow can be steplessly changed by controlling the cradle. For axial piston units with a swash plate design, the pistons are arranged axially relative to the drive shaft. In the closed circuit, the hydraulic fluid flows from the hydraulic pump to the consumer, e.g. hydraulic motor, and from there directly back to the hydraulic

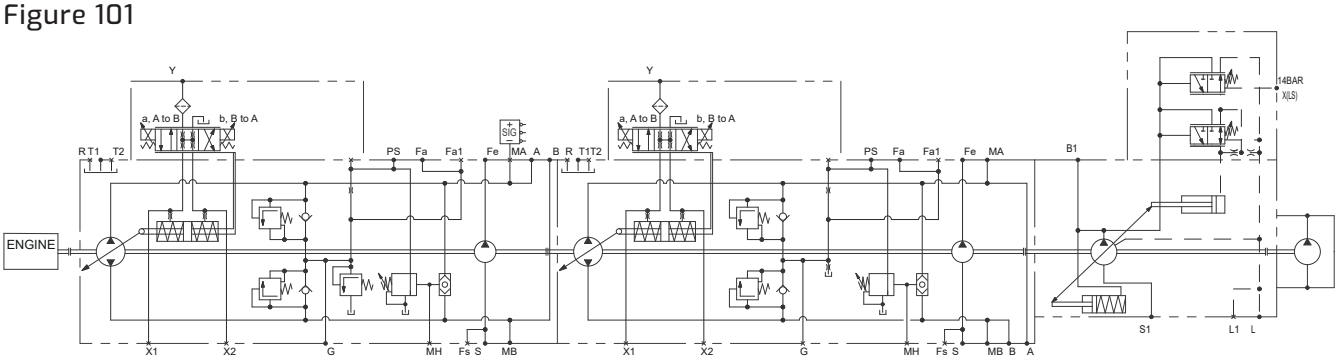
pump. There is a high-pressure side and a low-pressure side which alternate depending on which side is under load.

Function Description

- Pump Function - Torque and rotational speed are applied to the drive shaft by a drive motor. The drive shaft is connected by splines to the cylinder to set this in motion. With every revolution, the pistons execute a stroke in the cylinder bores, the size of which depends on the pitch of the cradle. The slipper pads are held on with the pistons and guided along the glide surface of the cradle by the retaining plate. The pitch of the swash plate during a rotation causes each piston to move over the bottom and top dead centers and back to its initial position.Here, hydraulic fluid is fed in and drained out through the two control slots in the control plate according to the stroke displacement. On the high-pressure side, the hydraulic fluid is pushed out of the cylinder chamber and into the hydraulic system by the pistons. On the low-pressure side, hydraulic fluid simultaneously flows into the enlarging piston chamber – in a closed circuit this is supported by the return and boost pressures.
- Pressure Cut-Off - The working pressure is limited by the pressure cut-off. The pressure cut-off corresponds to a pressure control which reduces the pump capacity once the set specified pressure command value is reached so that the set pressure is maintained but not exceeded.
- High-Pressure Safeguard - The two high-pressure relief valves protect the hydrostatic transmission (pump and motor) from overloading. They limit the maximum pressure in the respective high-pressure line and serve simultaneously as boost valves. High-pressure relief valves are not working valves and are only suitable for pressure peaks or high rates of pressure change.
- Stroking Chamber Bypass (optional) - The optional stroking chamber bypass connects both of the stroking chambers to enable pressure equalization. The springs in the stroking chambers move the stroking piston towards the central position (neutral position). The reset function is influenced by the current working pressure and speed. A bypass circuit for the two stroking chambers does not ensure that the pump goes to the central position (neutral position).
- Sequence Valve (optional) - The optional sequence valve interrupts the active control pressure. The springs in the stroking chambers move the stroking piston towards the central position (neutral position). The reset function is influenced by the current working pressure and speed.Switching off the control pressure does not ensure that the pump goes to the central position (neutral position).
- Control - The swivel angle of the cradle is infinitely variable. Adjusting the swivel angle changes the piston stroke and therefore, the displacement. Controlling the cradle through the neutral position will change the direction of flow (making reversing operation possible). The swivel angle is controlled hydraulically by means of the stroking piston. The cradle is mounted for smooth operation and the neutral position is spring-centered. Increasing the swivel angle increases the displacement; reducing the angle results in a corresponding reduction in displacement.

Hydraulic Circuit

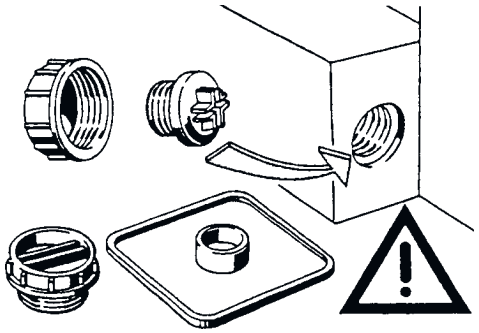
Figure 101



DS2201315

Maintenance Guidelines

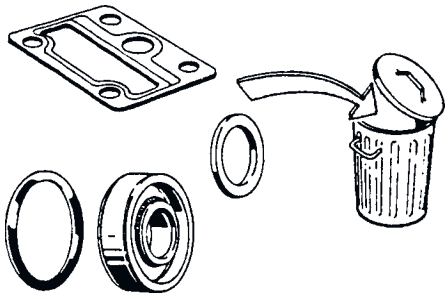
1. Figure 102



ASS0030L

Close off all openings of hydraulic unit.

2. Figure 103

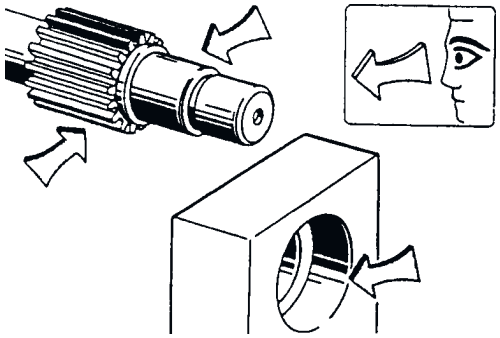


ASS0040L

Replace all seals.

Use only original replacement parts

3. Figure 104

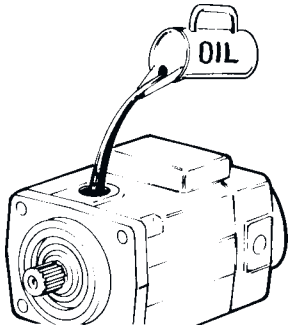


ASS0050L

Check all sealing and sliding surfaces for wear.

NOTE: *Do not rework sliding surfaces using crocus cloth or other similar materials. It can damage the surface.*

4. Figure 105



ASS0060L

Fill hydraulic unit with clean hydraulic oil before putting into operation.

HST Motor

Overview

An Axial piston variable motor converts hydrostatic flow into mechanical rotation and controls or regulates this. The A6VM is a variable motor with an axial piston rotary group of bent-axis design, for hydrostatic drives in open and closed circuits. For axial piston units with a bent-axis design, the pistons are arranged at an angle to the drive shaft. The pistons rest directly on the drive shaft where they generate torque depending on the pressure and swivel angle. The specific torque and displacement can be changed by adjusting the bent axis.

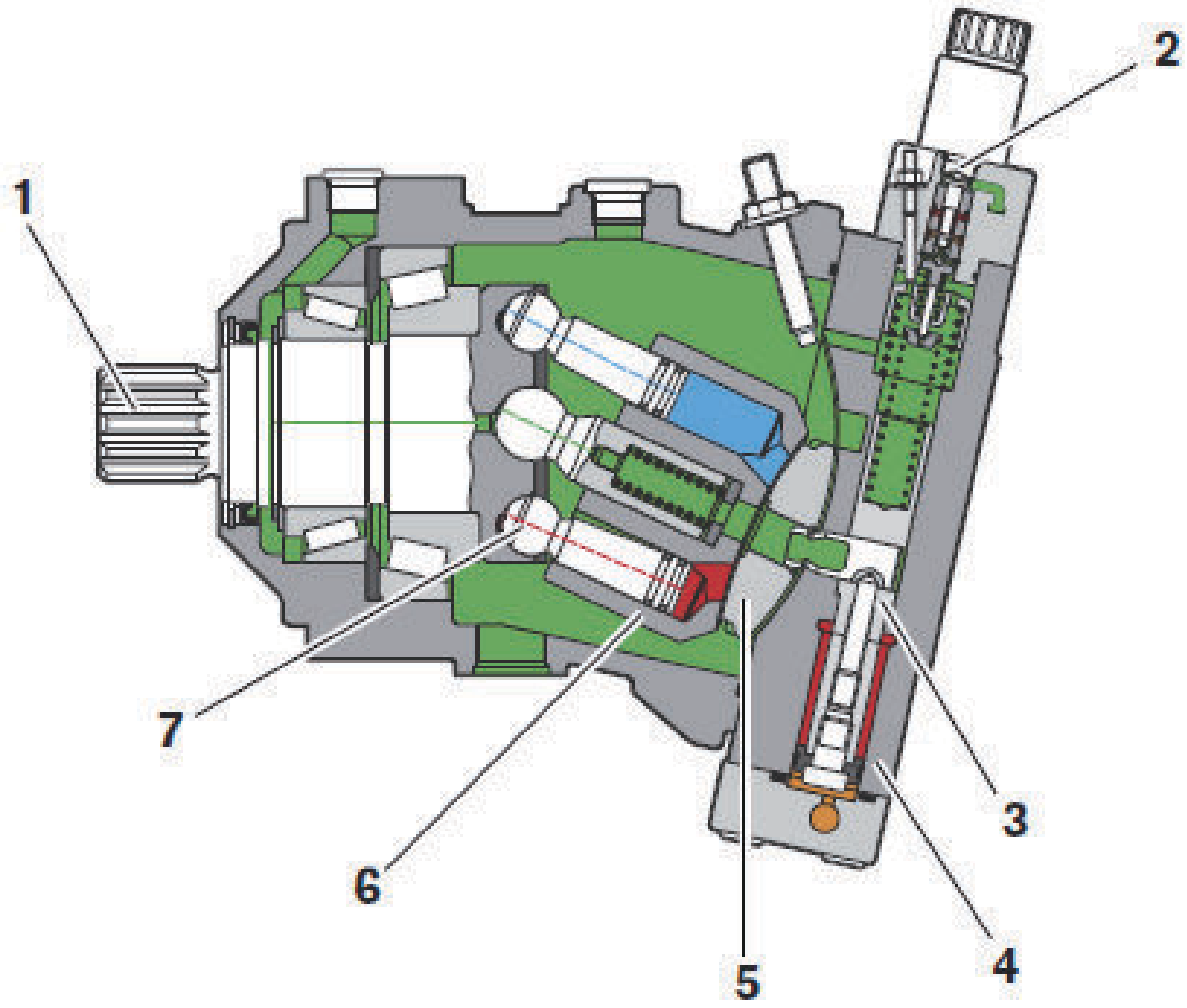
An Axial piston variable motor converts hydrostatic flow into mechanical rotation and controls or regulates this. The A6VM is a variable motor with an axial piston rotary group of bent-axis design, for hydrostatic drives in open and closed circuits. For axial piston units with a bent-axis design, the pistons are arranged at an angle to the drive shaft. The pistons rest directly on the drive shaft where they generate torque depending on the pressure and swivel angle. The specific torque and displacement can be changed by adjusting the bent axis.

- Open Circuit - In the open circuit, the hydraulic fluid flows from the reservoir to the hydraulic pump from where it is transported to the hydraulic motor. From the hydraulic motor, the hydraulic fluid flows directly back to the reservoir. The output direction of rotation of the hydraulic motor can be changed, e.g. by a directional valve.
- Closed Circuit - In the open circuit, the hydraulic fluid flows from the reservoir to the hydraulic pump from where it is transported to the hydraulic motor. From the hydraulic motor, the hydraulic

fluid flows directly back to the reservoir. The output direction of rotation of the hydraulic motor can be changed, e.g. by a directional valve.

The axial piston variable pump generates, controls and regulates a hydraulic fluid flow. It is designed for mobile applications such as construction machinery.

Figure 106



DS2201432

1	Drive Shaft	2	Control Piston
3	Stroke Piston	4	Port Plate
5	Lens Plate	6	Cylinder
7	Piston	-	-

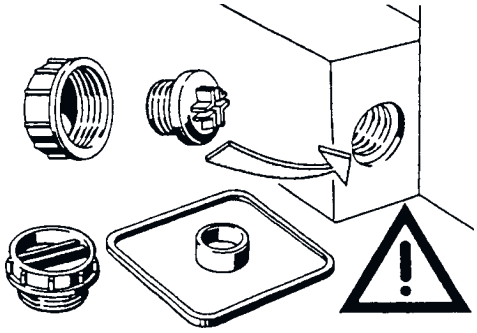
Function Description

- Motor Function - A hydraulic motor converts hydrostatic energy into mechanical energy. Hydraulic fluid is directed via the port plate and the lens plate to the cylinder bores. The pistons in the cylinder bores execute a stroke that is converted into rotary motion by the piston on the driveshaft flange. During this process, the pistons move the cylinder and generate an output torque at the drive shaft. The output torque increases with the pressure difference between the high- and low-pressure sides and increasing displacement. The output speed is proportional to the inward flow and inversely proportional to the displacement of the hydraulic motor.

- Flushing and Boost Pressure Valve (optional) - The flushing and boost pressure valve is used to remove heat from the hydraulic circuit. In an open circuit, it is used exclusively for flushing the case. In a closed circuit, it ensures a minimum boost pressure level in addition to the case flushing.Hydraulic fluid is directed from the respective low-pressure side into the motor case. This is then fed into the reservoir, together with the case drain fluid. The hydraulic fluid removed from the closed-circuit must be replaced by cooled hydraulic fluid from the boost pump.
- Control - The swivel angle of the bent-axis rotary group is steplessly variable. With two-point control (HZ, EZ), the swivel angle can be switched from maximum to minimum angle. Control of the swivel angle of the bent-axis rotary group changes the piston stroke and therefore the displacement. The swivel angle is changed hydraulically via the stroke piston. Here, the cylinder is swiveled including the pistons and lens plate. The lens plate is mounted for easy motion in a guideway. Increasing the swivel angle results in an increase in the displacement and specific torque; decreasing the swivel angle results in a corresponding decrease in these values. The output speed is dependent on the input flow and the displacement of the hydraulic motor.

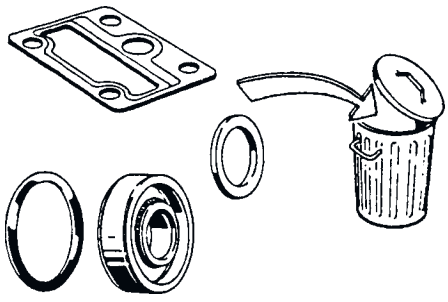
Maintenance Guidelines

1. Figure 107



   Close off all openings of hydraulic unit.

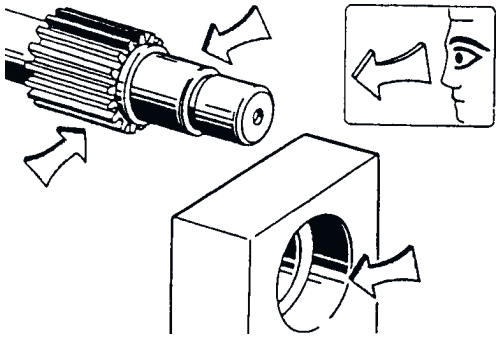
2. Figure 108



   Replace all seals.

   Use only original replacement parts

3. Figure 109

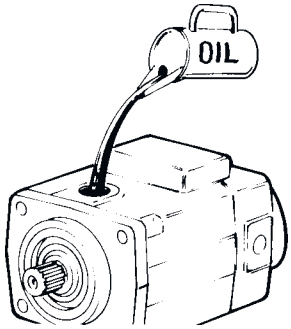


ASS0050L

Check all sealing and sliding surfaces for wear.

NOTE: *Do not rework sliding surfaces using crocus cloth or other similar materials. It can damage the surface.*

4. Figure 110



ASS0060L

Fill hydraulic unit with clean hydraulic oil before putting into operation.

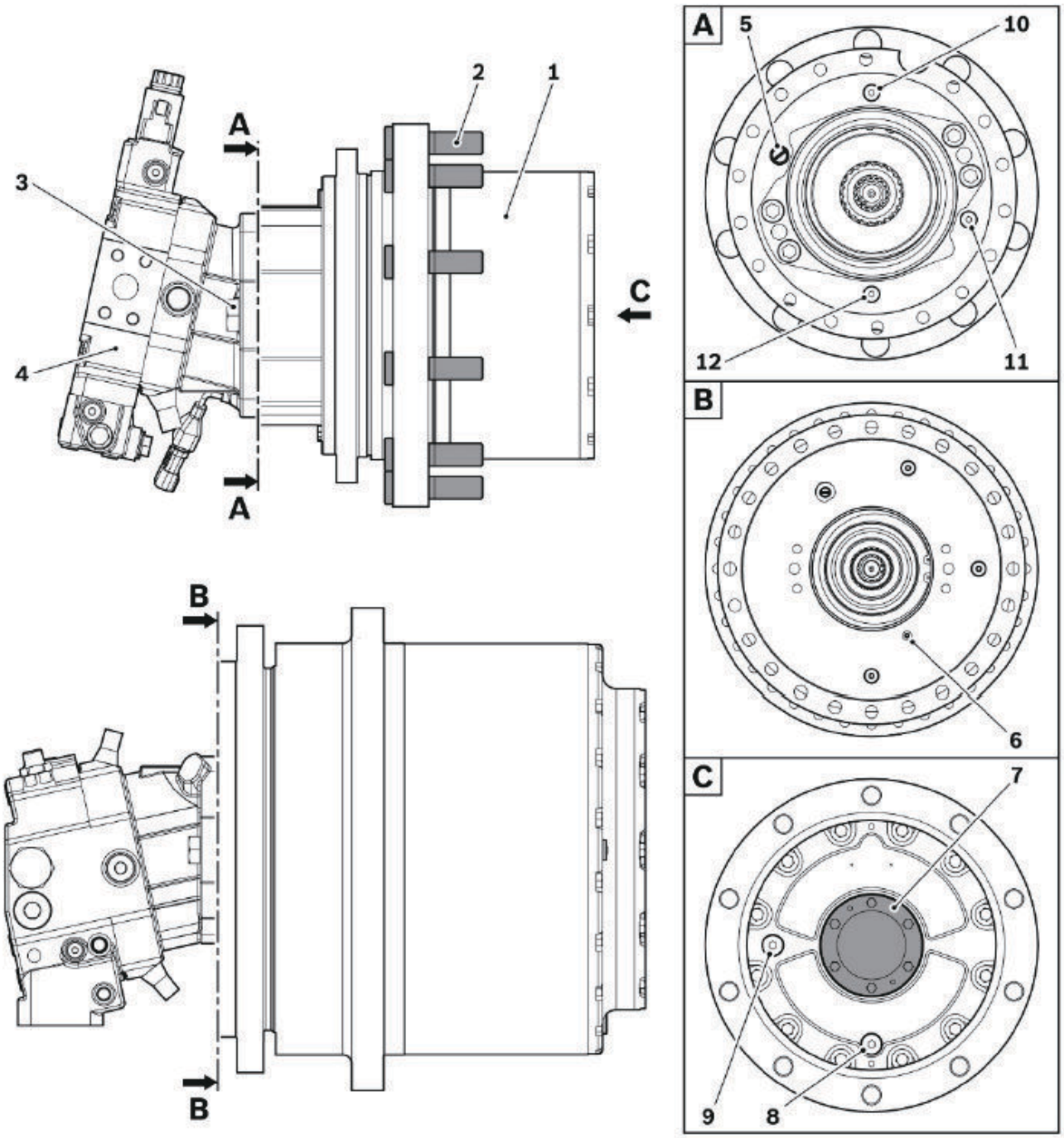
Travel Device

Overview

The hydrostatic drive is a planetary gearbox. The entire planetary gearbox, which is mounted in rolling bearings, is equipped with a splash oil lubrication. The externally toothed planet gears are case-hardened. A special output seal ensures optimum protection against dust and dirt in the output bearing.Drive and output have opposite directions of rotation.

Brake - Depending on the scope of supply, the planetary gearbox is equipped with a wet-running, integrated static multiple-disk brake (multiple-disk parking brake). The multiple-disk brake is a hydraulically released brake. The multiple-disk brake is used as a parking brake as standard. The parking brake (static multiple-disk parking brake) is applied via the brake release connection. The static multiple-disk parking brake acts negatively, i.e. it is released by means of pressure fluid and applied by spring action when pressure-less.

Figure 111



DS2201433

1	Planetary Gearbox	2	Wheel Stud (optional)
3	Motor Attachment Screws	4	Axial-Piston Motor
5	External Brake Release Connection	6	Internal Brake Release Connection
7	Disconnect Mechanism (optional)	8	for Discharging the Lubricating Oil
9	for Oil Level checking	10	for Filling the Lubricating Oil
11	for Checking the Lubricating Oil	12	for Discharging the Lubricating Oil

The indicated gear type is an example.

- Position and type of the connections

- Position of the oil filler opening
- Position of the oil level control system
- Position of the oil drain opening
- Position and type of mounting parts
- Optional wheel stud
- Optional disconnect mechanisms (deactivation)

Systems Operation And Description

Safety Instructions

⚠ WARNING

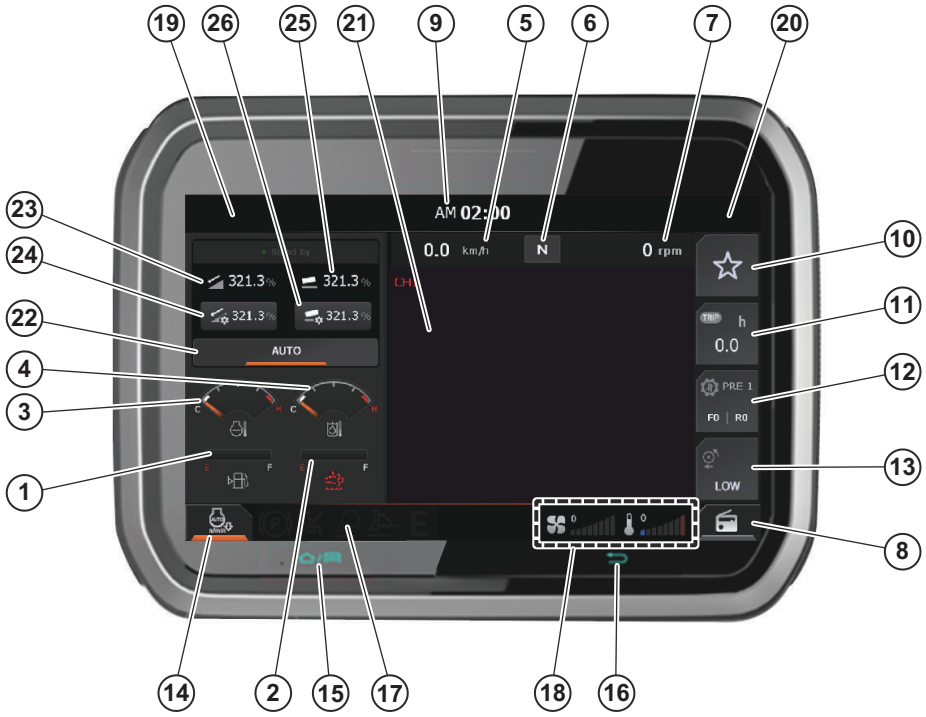
AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicing machine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Follow warnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correct function after adjustments repairs or service. Untrained operators and failure to follow instructions can cause death or serious injury.

Gauge Panel system

Display Monitor

Figure 112



DS2201227

Reference Number	Description	Reference Number	Description
1	Fuel Gauge	14	Auto Idle Selector Button
2	DEF Level Gauge	15	Menu Selector Button
3	Engine Coolant Temperature Gauge	16	Back Button
4	Hydraulic Oil Temperature Gauge	17	Mode Symbol Display
5	Travel Speed Display	18	HVAC Display
6	FNR Display	19	Display Warning Symbols

Reference Number	Description	Reference Number	Description
7	RPM Display	20	Indicator Display
8	Audio Display	21	Camera Display
9	Digital Clock	22	Dozing Assist Control Auto Button
10	Favorites Button	23	Blade Lift Angle Display
11	Main Information Selector Button	24	Blade Lift Angle Control Button
12	Travel Speed Management	25	Blade Tilt Angle Display
13	Traction Mode Selector Button	26	Blade Tilt Angle Control Button

NOTE: *The information, illustrations, and menu can change at any time without prior notice.*

Service Menu

Overview

In this menu, many types of operating conditions and functions can be accessed and displayed.

This menu is mainly used for machine testing and fault diagnostics.

Various sub menus can be selected by turning the jog switch and clicking on the jog switch to select the menu.

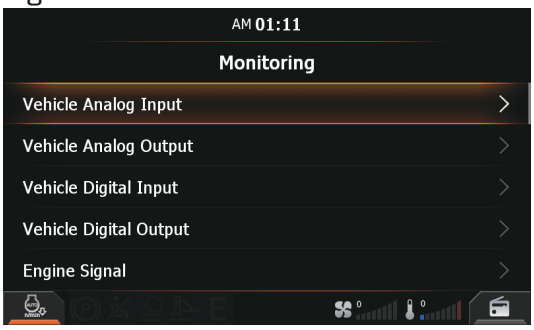
Press the ESC button to return to the previous screen.

Menu Description				
1st	2nd	3rd	4th	5th
Service Menu	Monitoring	Vehicle Analog Input		
		Vehicle Analog Output		
		Vehicle Digital Input		
		Vehicle Digital Output		
		Engine Signal		
		TCU Analog		
		TCU Digital		
		User Selection Signal		
		TMS Information	GPS Information	
			Network Information	
			Terminal Information	
	Graph	Graph Data Monitoring		
		Set Graph Data		

	Failure Information	Real Time Failure Information		
		Failure Log Information		
	Operating Hour Information			
	Machine Configuration	Option Configuration	Set Machine Option	Ripper
				Travel / Swing Alarm
				DAAC
			Set General Option	TMS
				DAB
		Calibration	Brake Pedal Calibration	
			Body Level Sensor Calibration	
			R2 Length	
			LC Length	
		Set Camera		
		SW Update		
		Enter Serial Number		
		Reset	Failure Log Reset	
			Operation Hour Reset	
			Gauge Panel Configuration Reset	
		Version Information		
		Permanent Security Unlock		
		Enter Vehicle Name		
		Gauge Panel Monitoring		

Monitoring

1. Figure 113

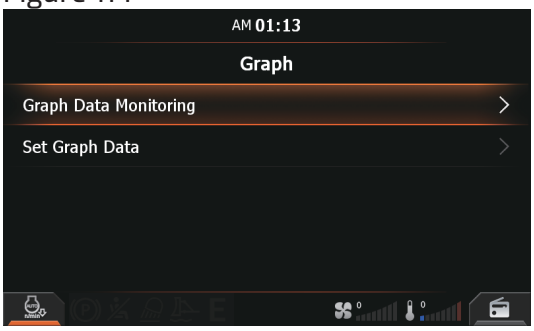


DS2201501

Entering sub-menus: When cursor is located on “Monitoring” of special menu screen, press the jog switch and the “Monitoring” will be displayed.

2. The following menus can be accessed: Vehicle Analog Input, Vehicle Analog Output, Vehicle Digital Input, Vehicle Digital Output, Engine Signal, TCU Analog, TCU Digital, User Selection Signal, and TMS Information.

Figure 114

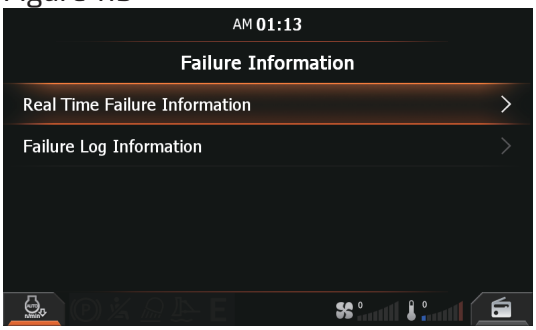


DS2201502

Graph

The following menus can be accessed: Graph Data Monitoring and Set Graph Data.

Figure 115

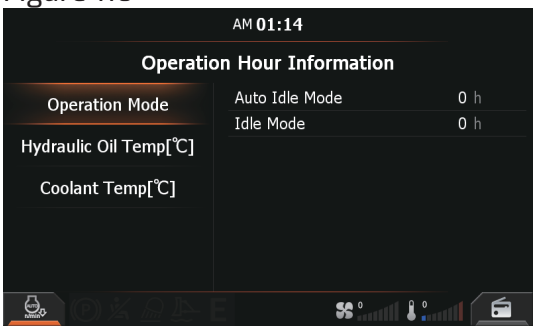


DS2201503

Failure Information

The following menus can be accessed: Real Time Failure Information and Failure Log Information.

Figure 116

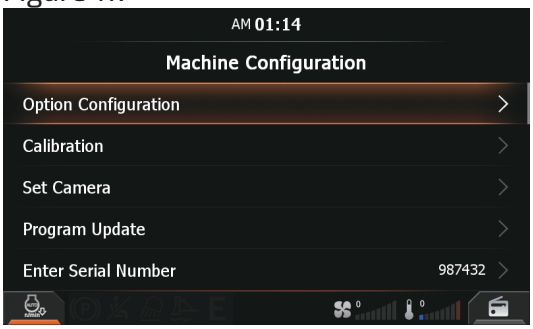


DS2201504

Operation Hour Information

In this screen, Operation Mode, Hydraulic Oil Temp and Coolant Temp can be monitored.

Figure 117



DS2201505

Machine Configuration

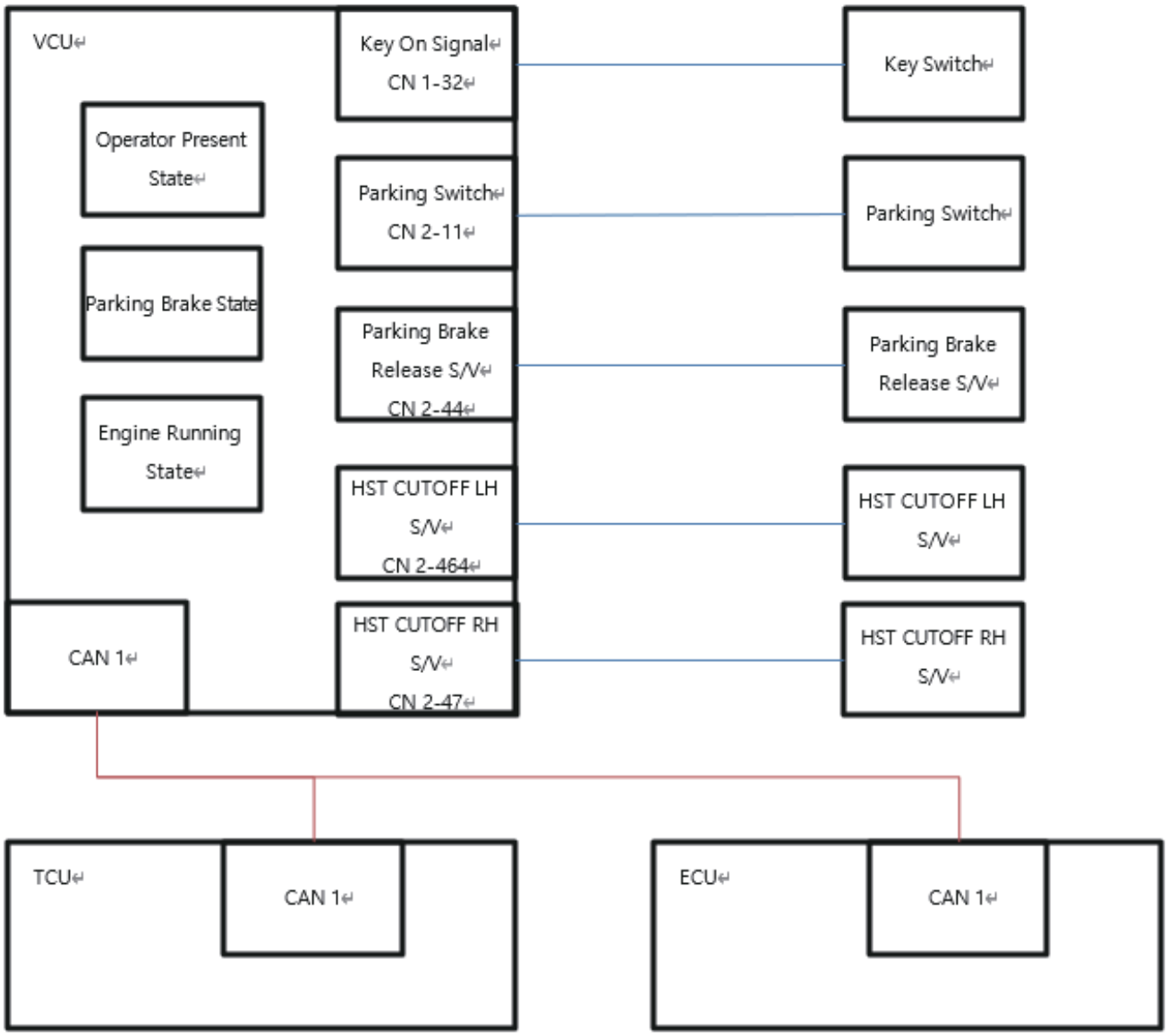
In this screen, Option Configuration, Calibration, Set Camera, Program Update, Enter Serial Number, Reset, Version Information, Permanent Security Unlock, Enter Vehicle Name, and Gauge Panel Monitoring can be monitored.

EPOS Function Description

Parking Brake Control

Purpose - To prevent unintended operation due to erroneous operation when equipment is not in operation

Figure 118

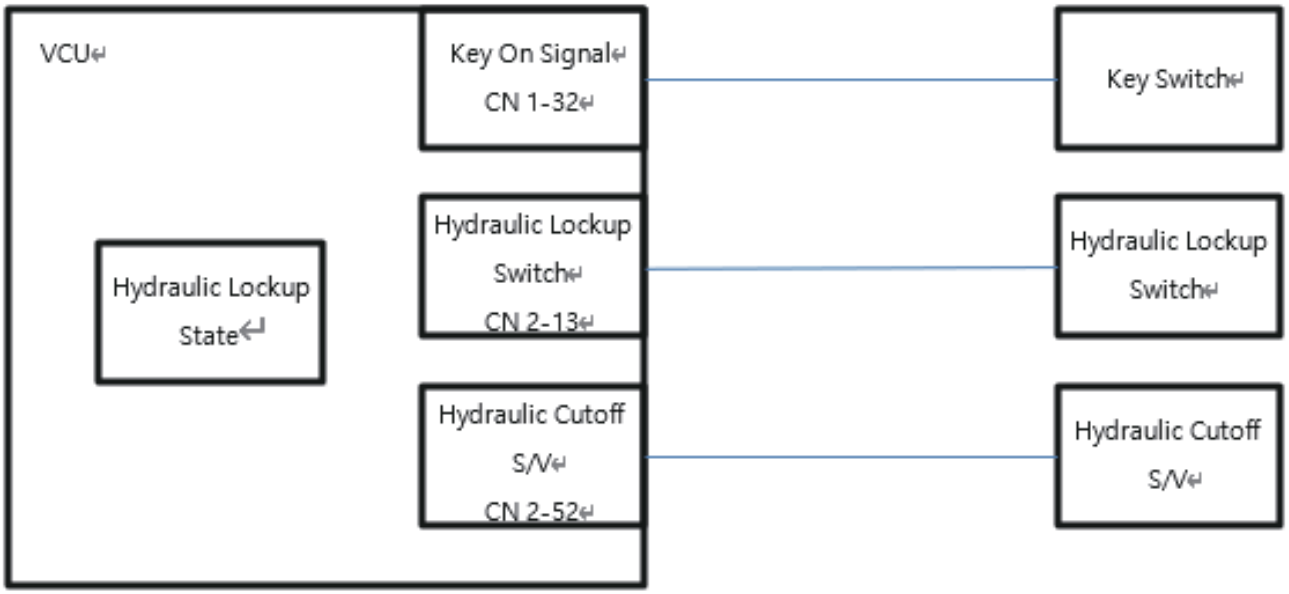


DS2201438

Hydraulic Lockup Control

Purpose - To prevent unintended operation due to erroneous operation when equipment is not in operation

Figure 119

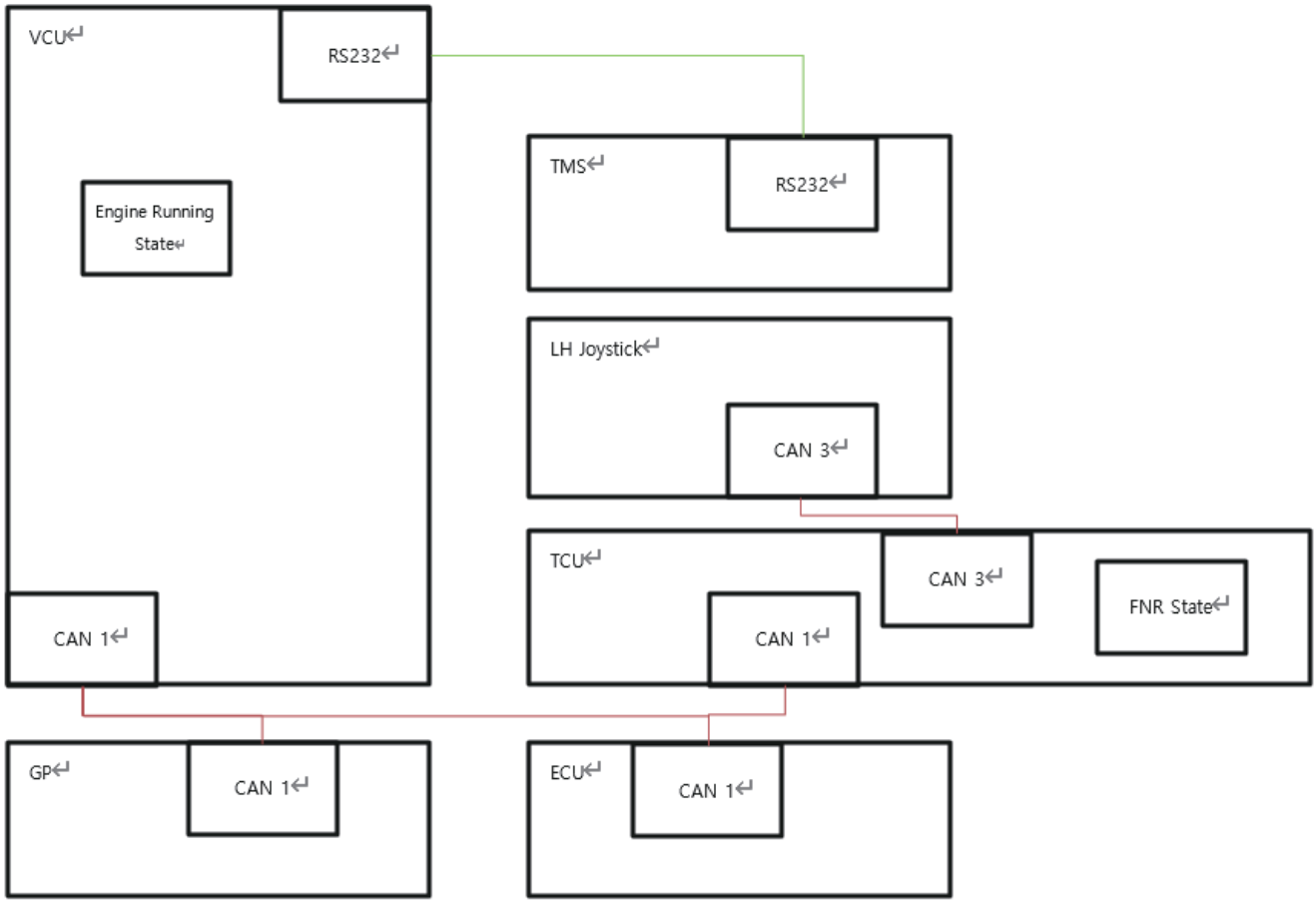


DS2201439

Starter Control

Purpose - This is to limit the use of equipment in conditions not intended by operators or equipment owners, such as unnoticeable safety risks, equipment theft, or equipment claims impossible to recover

Figure 120

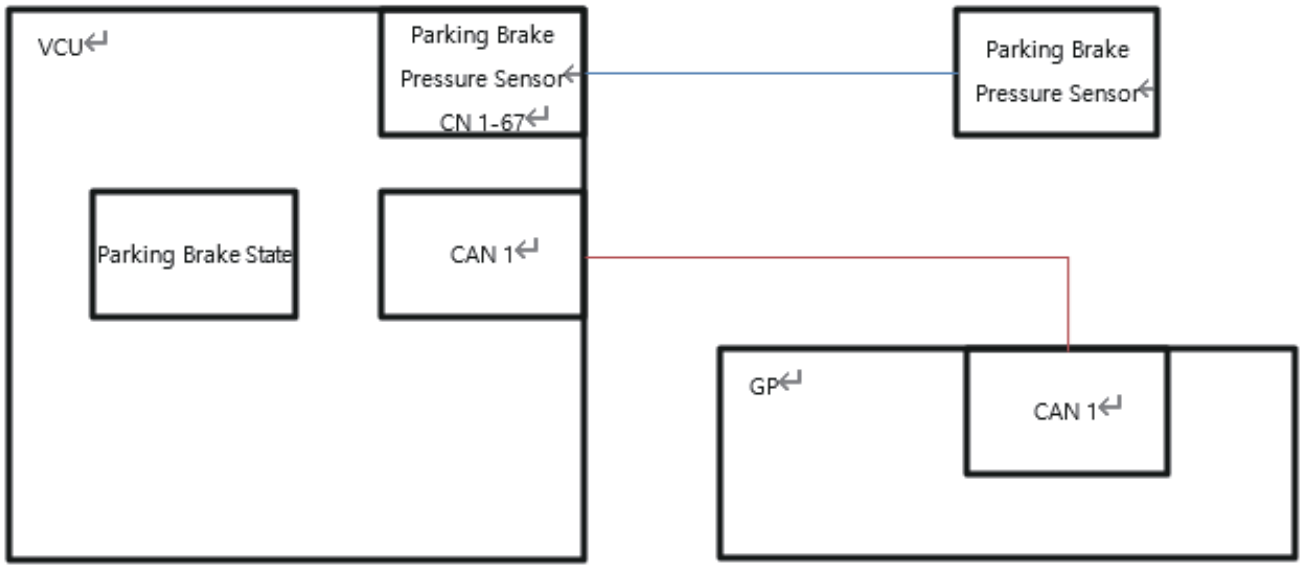


DS2201440

Parking Brake Pressure Warning

Purpose - Warns of abnormal parking brake pressure on the machine

Figure 121

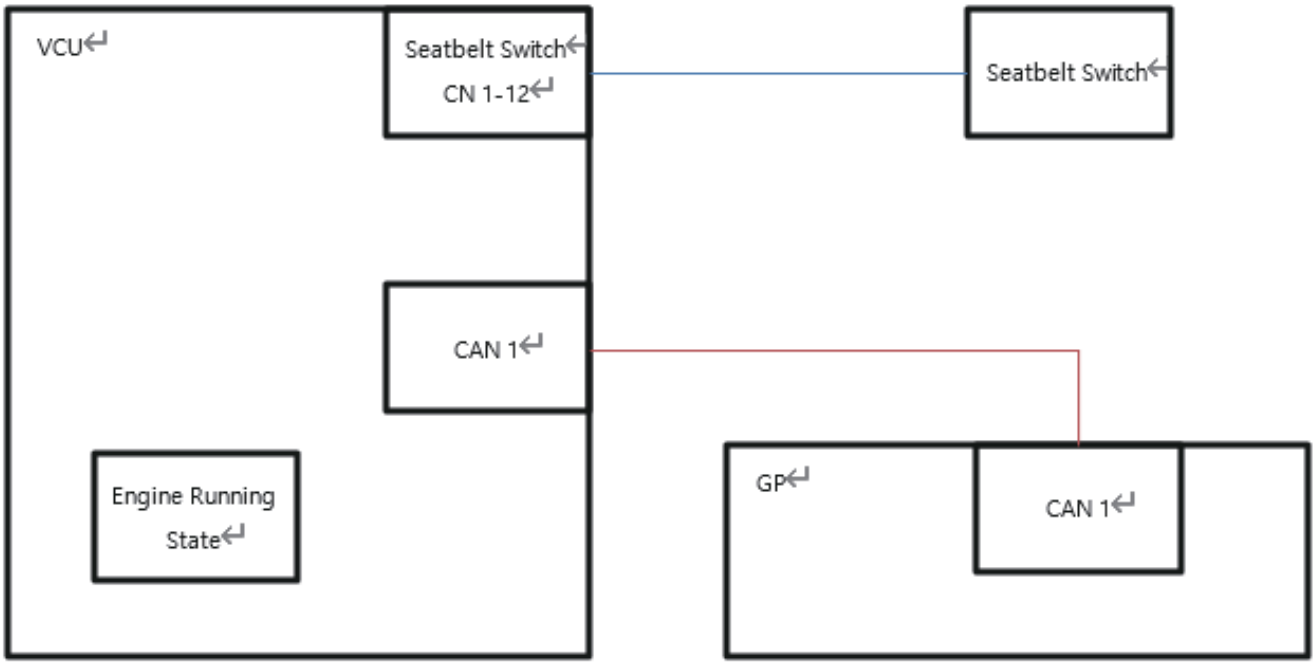


DS2201441

Seatbelt Warning

Purpose - Warns if seatbelt is not installed while engine is running

Figure 122

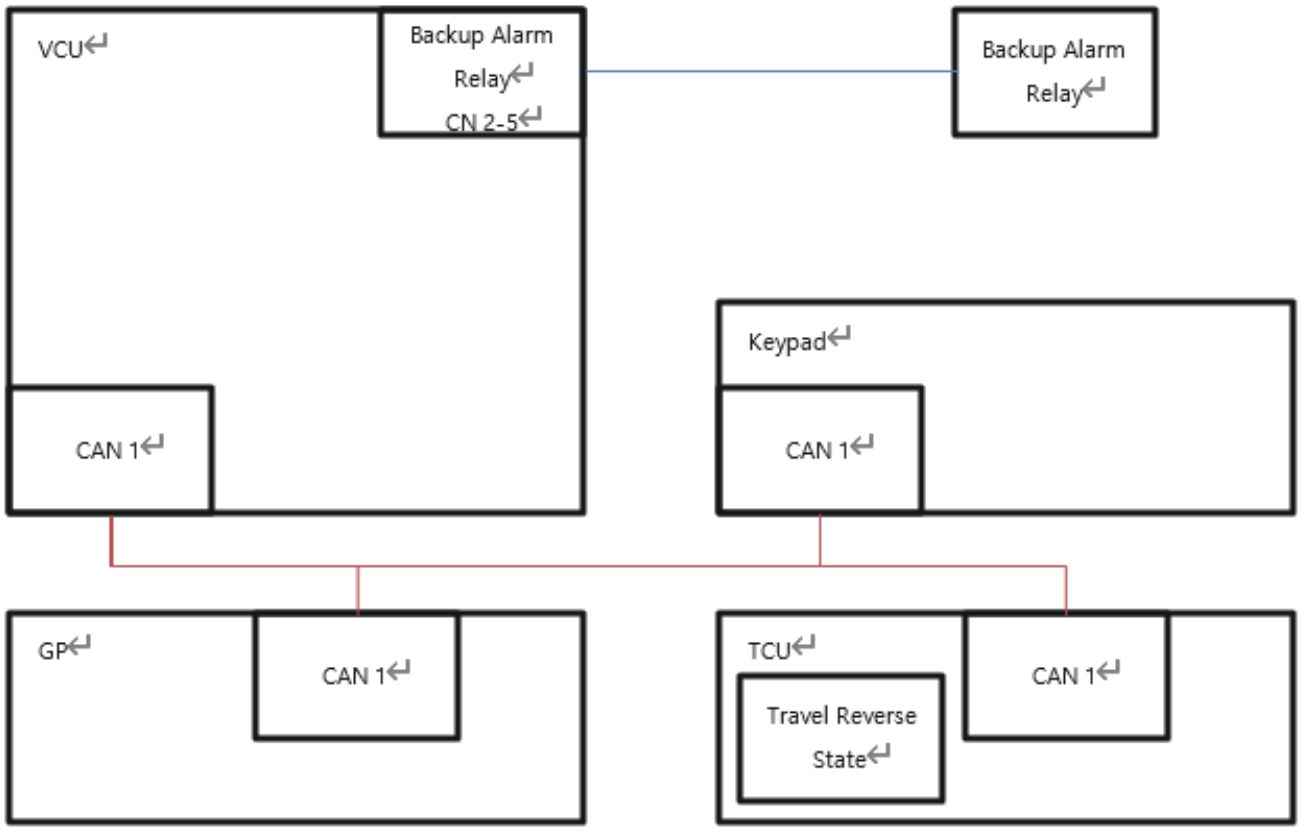


DS2201442

Reverse Warning

Purpose - When reversing the machine, warn nearby workers of reversing the machine

Figure 123

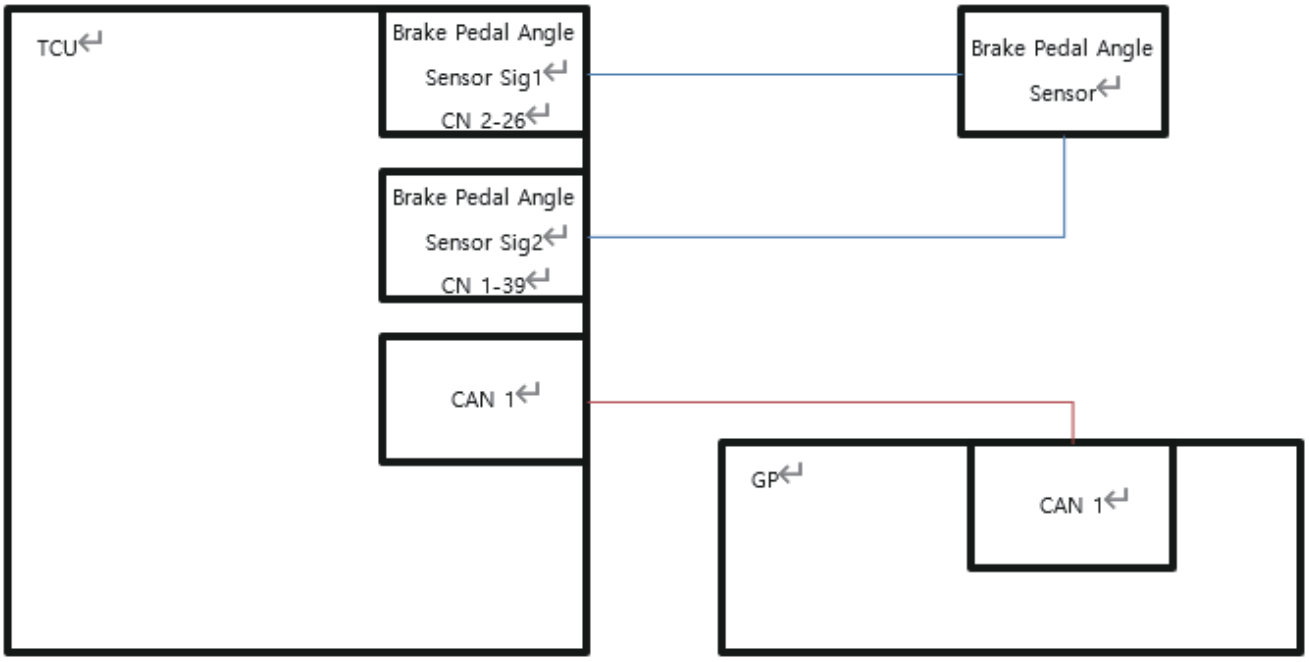


DS2201443

Brake Pedal Angle Sensor Calibration

Purpose - Calibrates the maximum and minimum values of the Brake Pedal connected to the TCU

Figure 124

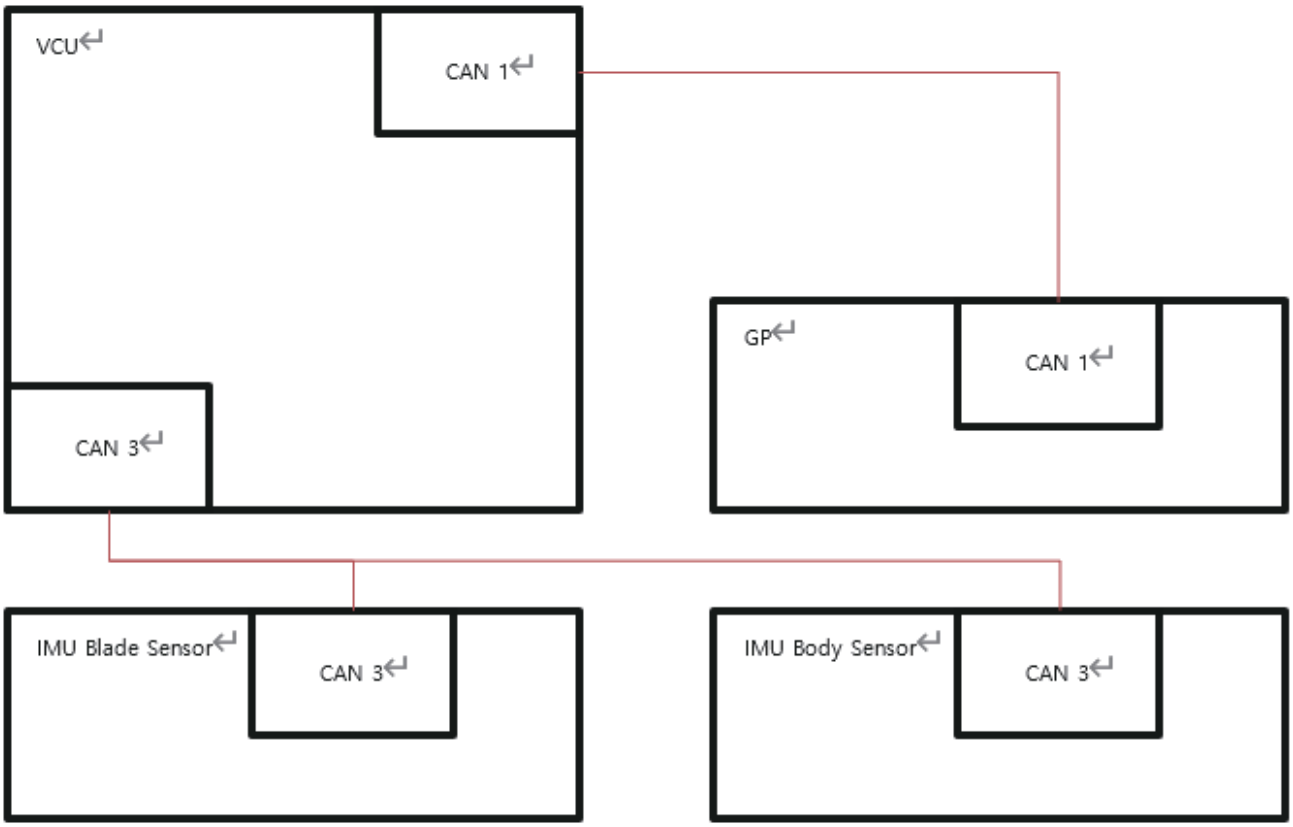


DS2201444

IMU Sensor Calibration

Purpose - Calibrate the IMU sensor connected to the VCU

Figure 125



DS2201445

Consumables Management

Purpose - To manage the replacement time of equipment filters and oil consumables

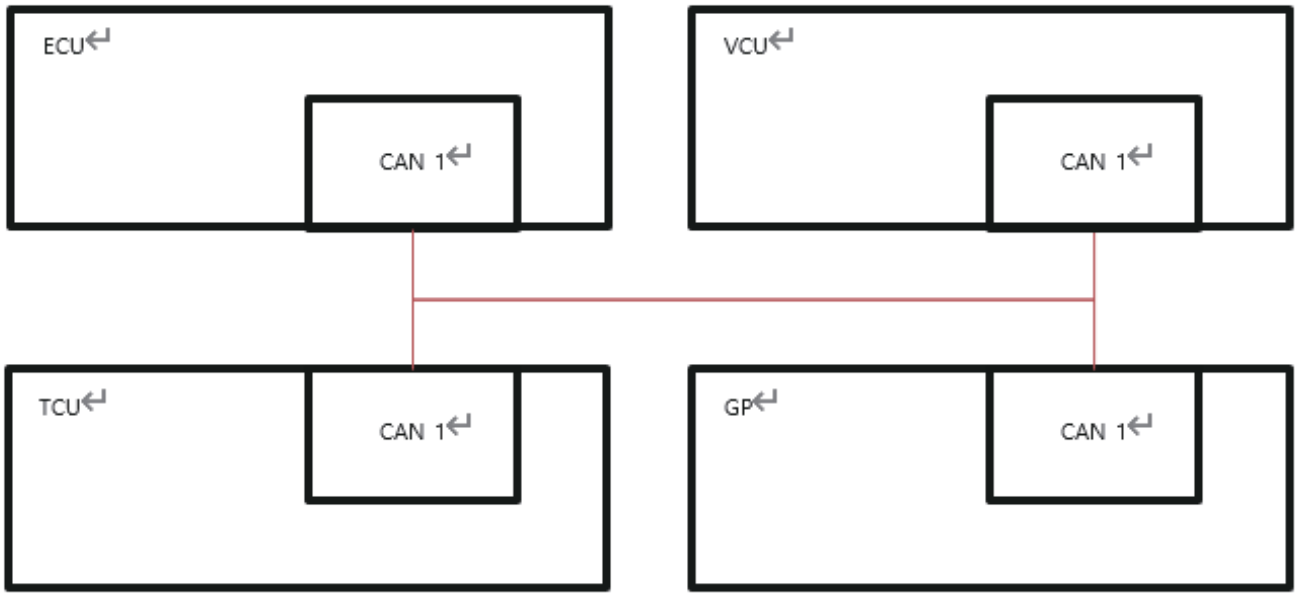
Figure 126

DS2201446

Version Information Management

Purpose - For convenience when checking the equipment by displaying the version information of the control device in the equipment on the instrument panel

Figure 127

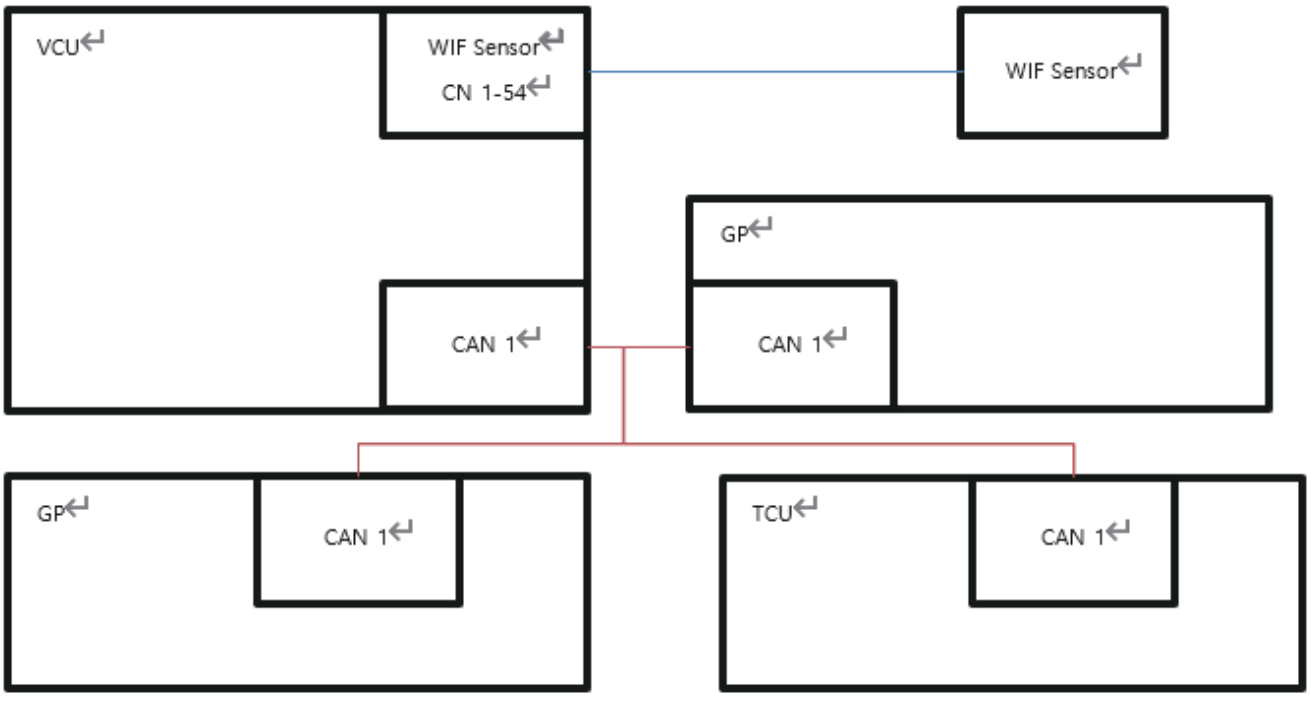


DS2201447

WIF (Water In Fuel) Warning

Purpose - To detect and warn of moisture in the fuel of the equipment

Figure 128

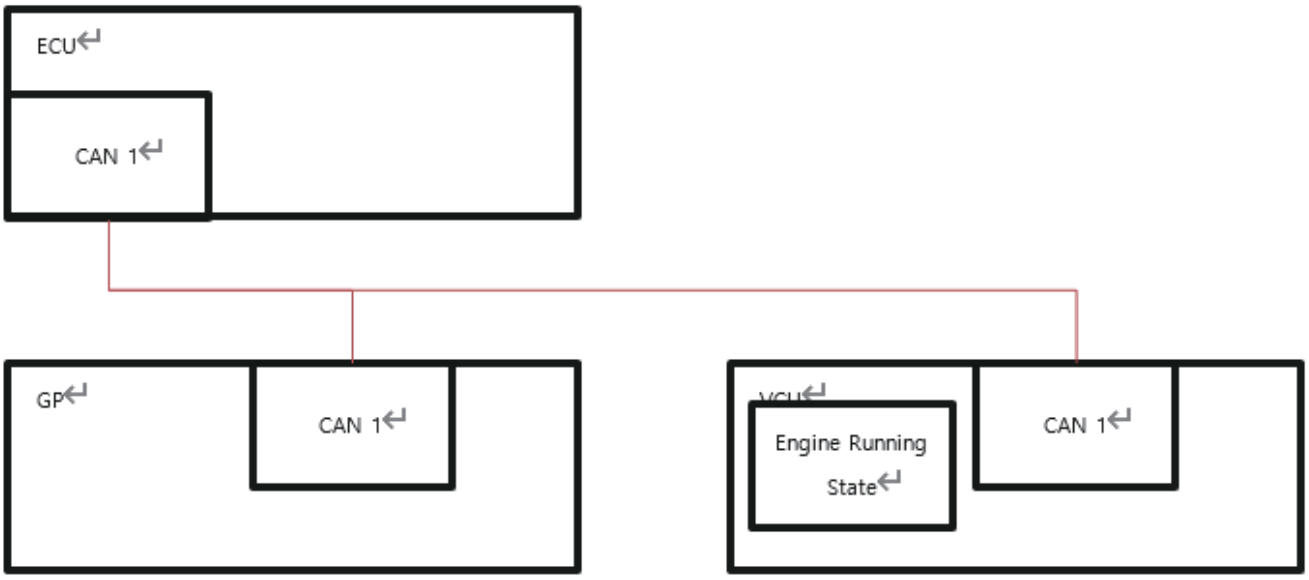


DS2201448

Engine Oil Pressure Warning

Purpose - To detect and warn of engine oil abnormalities

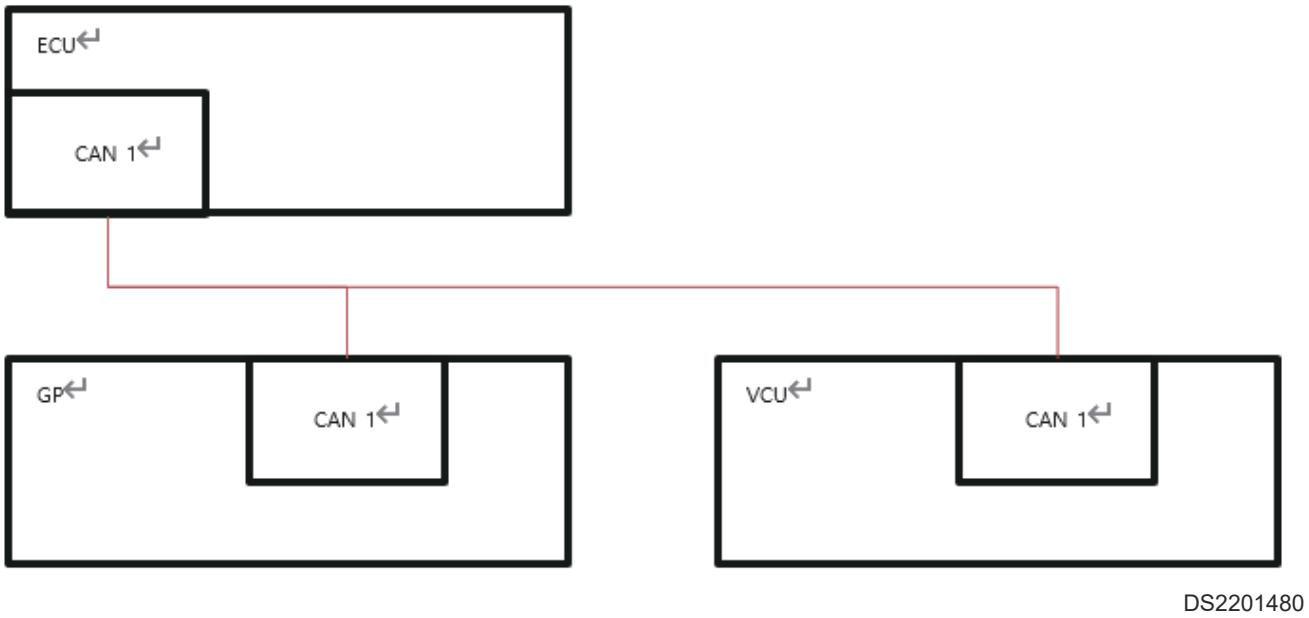
Figure 129



Coolant Overheat Warning

Purpose - To detect and warn of engine coolant overheating condition

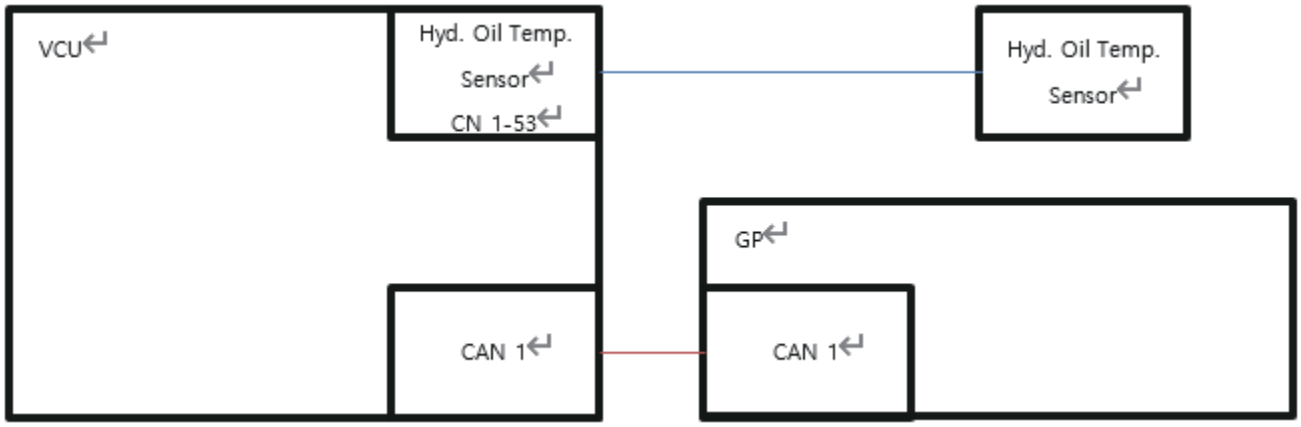
Figure 130



Hydraulic Oil Overheat Warning

Purpose - To detect and warn of overheating condition of hydraulic oil in equipment

Figure 131

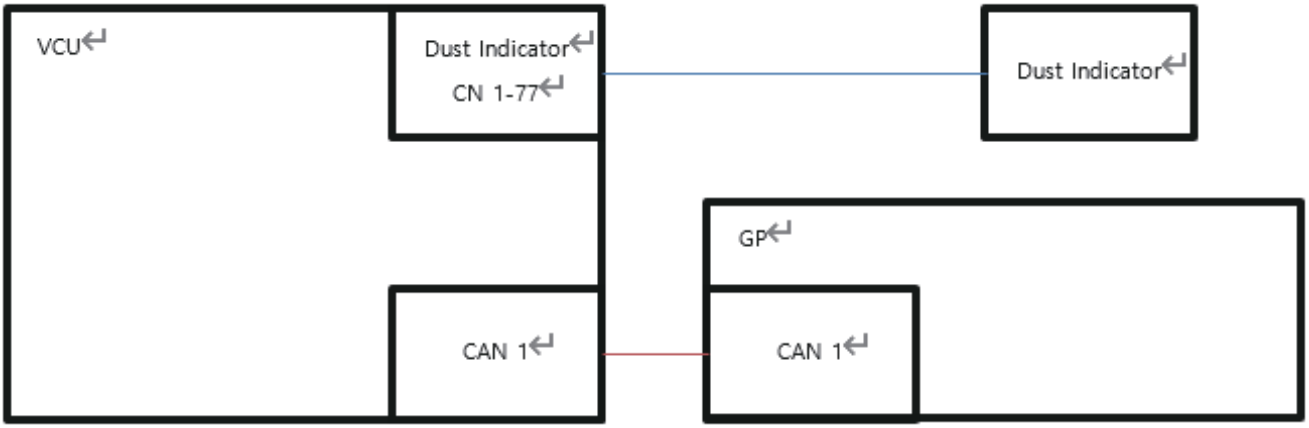


DS2201481

Air Cleaner Clogging Warning

Purpose - To warn the operator of clogged air cleaner

Figure 132

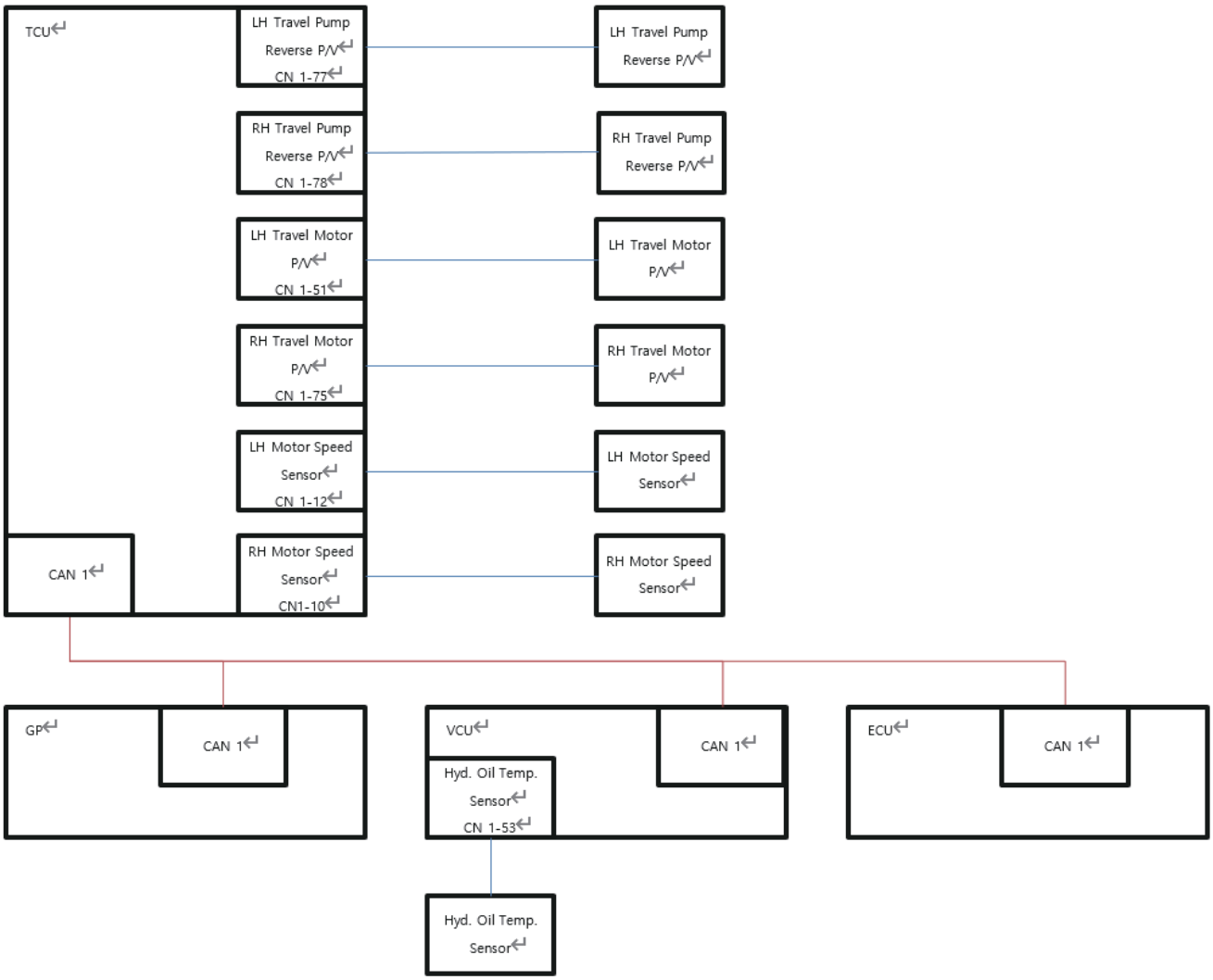


DS2201482

Overheat Protection Control

Purpose - Limits the maximum output of the travel pump to prevent overheating of the machine

Figure 133

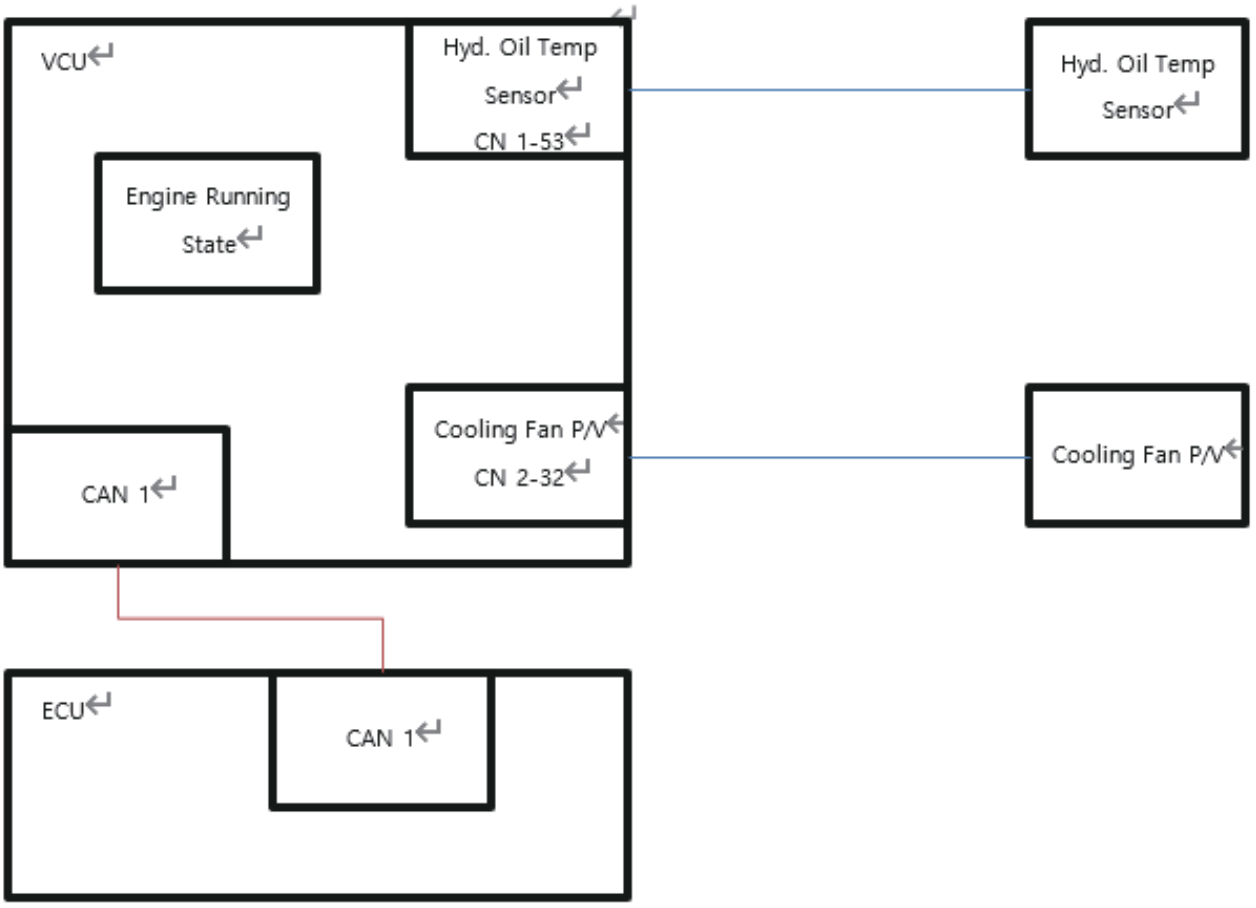


DS2201483

Cooling Fan Control

Purpose - Controls the cooling fan EPPR V/V based on the coolant and hydraulic oil temperature to prevent overheating

Figure 134

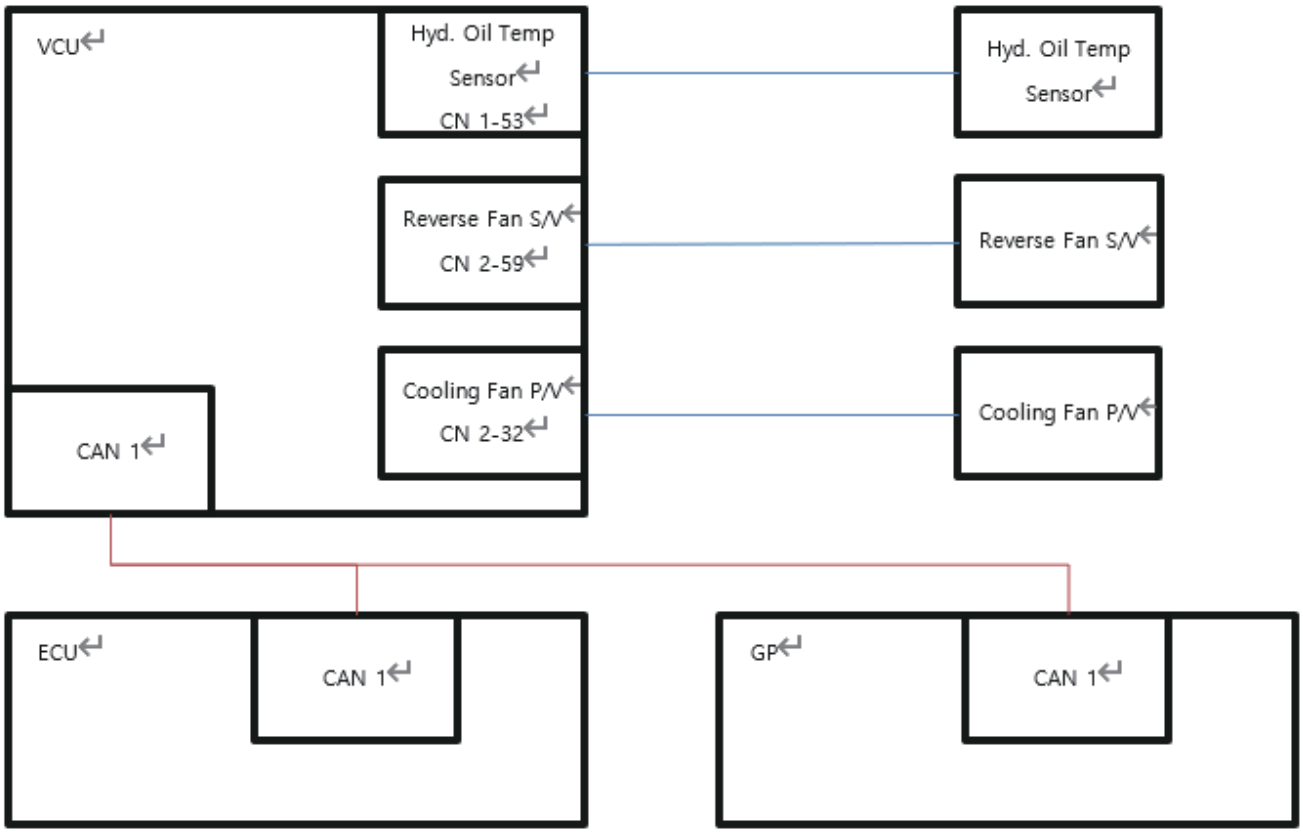


DS2201484

Cooling Fan Reverse Control

Purpose - Controls the cooling fan EPPR V/V based on the coolant and hydraulic oil temperature to prevent overheating

Figure 135

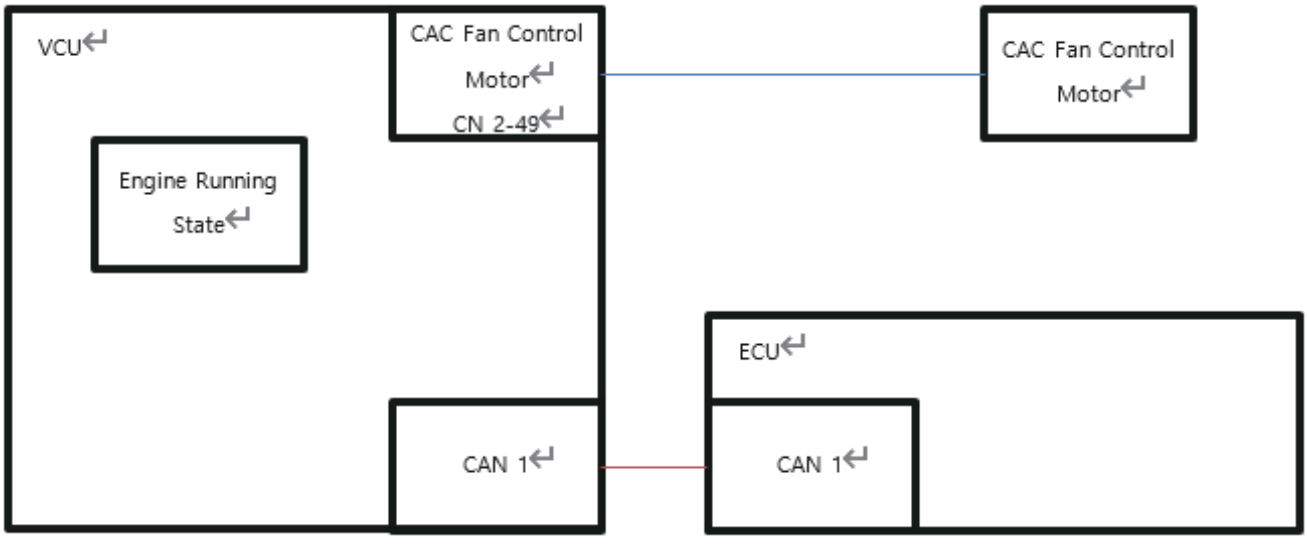


DS2201485

CAC Fan Control

Purpose - Controls CAC Fan Motor based on CAC temperature to prevent overheating

Figure 136

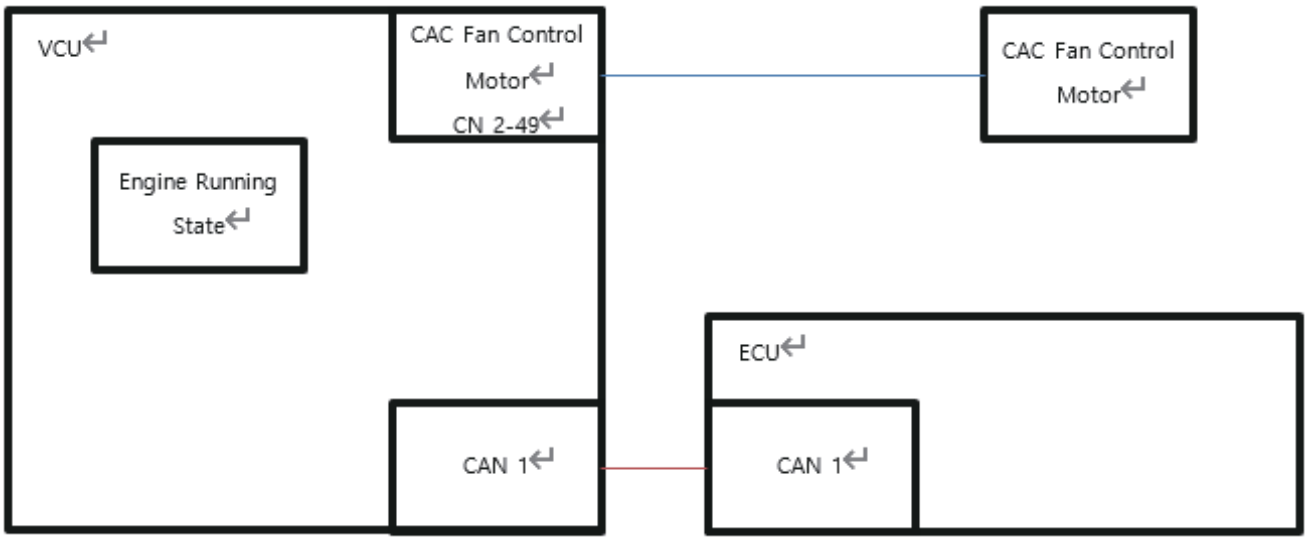


DS2201486

CAC Fan Reverse Control

Purpose - Convenience of cleaning by rotating CAC Fan Motor in reverse

Figure 137

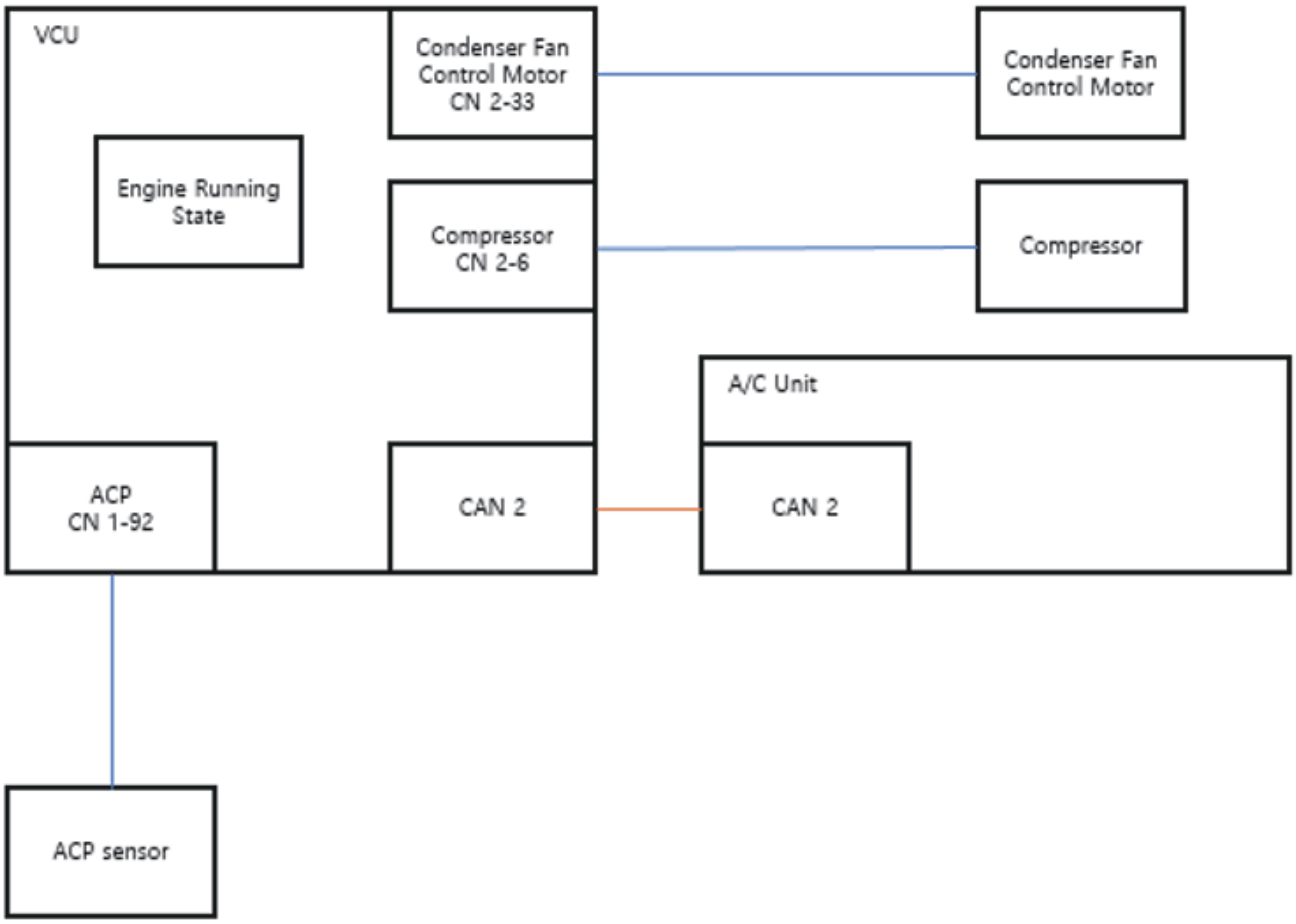


DS2201486

Condenser Fan Control

Purpose - Controls the condenser fan motor based on the compressor operation and A/C operation

Figure 138

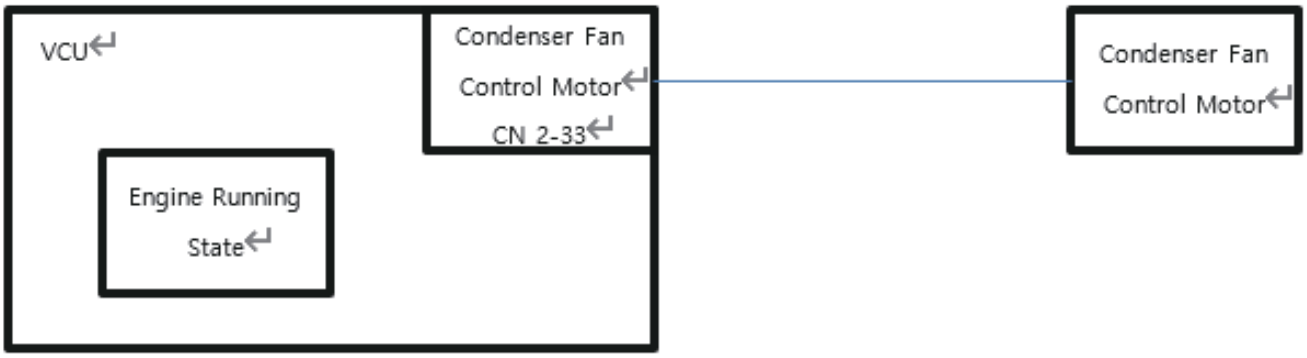


DS2201487

Condenser Fan Reverse Control

Purpose - Condenser Fan Motor is rotated in reverse to provide convenience when cleaning

Figure 139

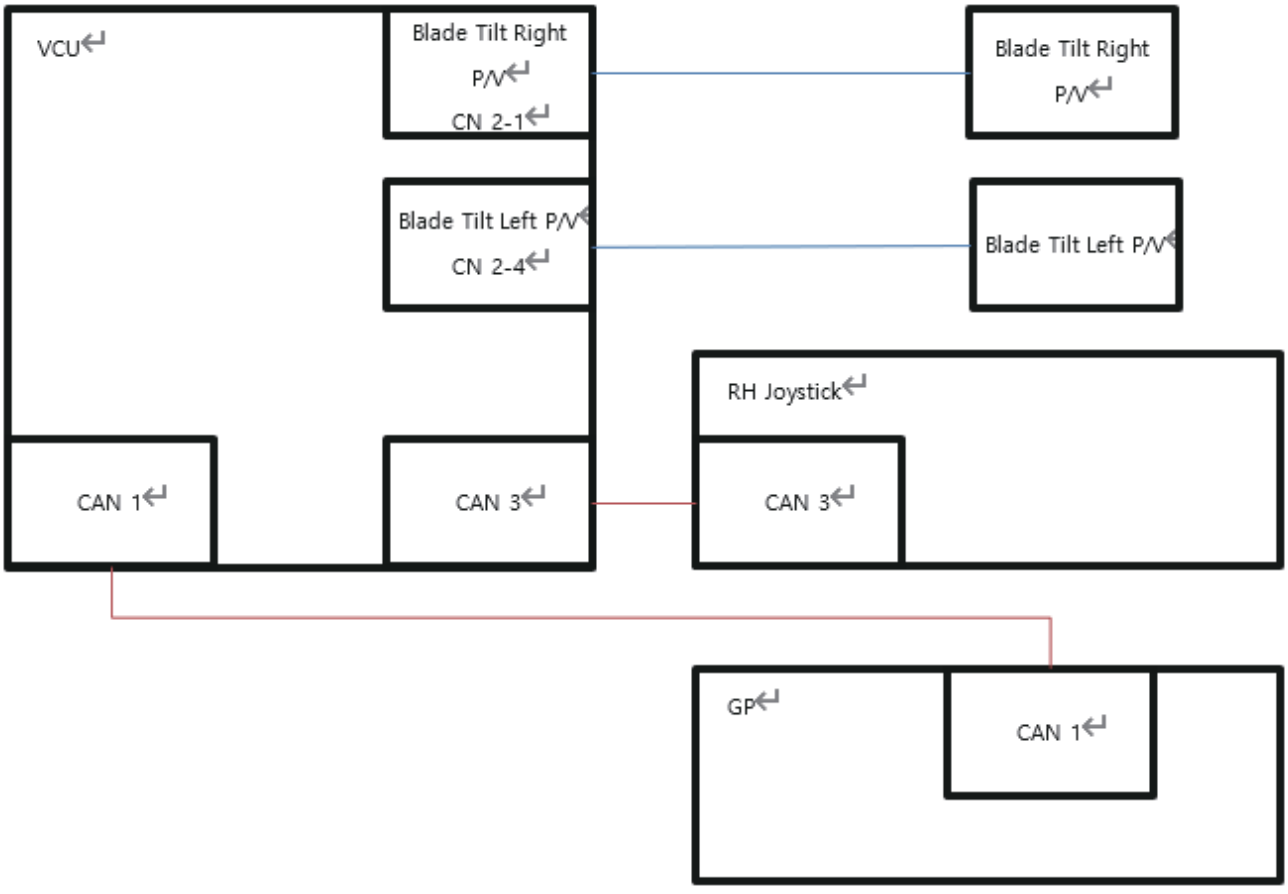


DS2201488

Blade Tilt Control

Purpose - Controls Blade Tilt operation according to joystick operation

Figure 140

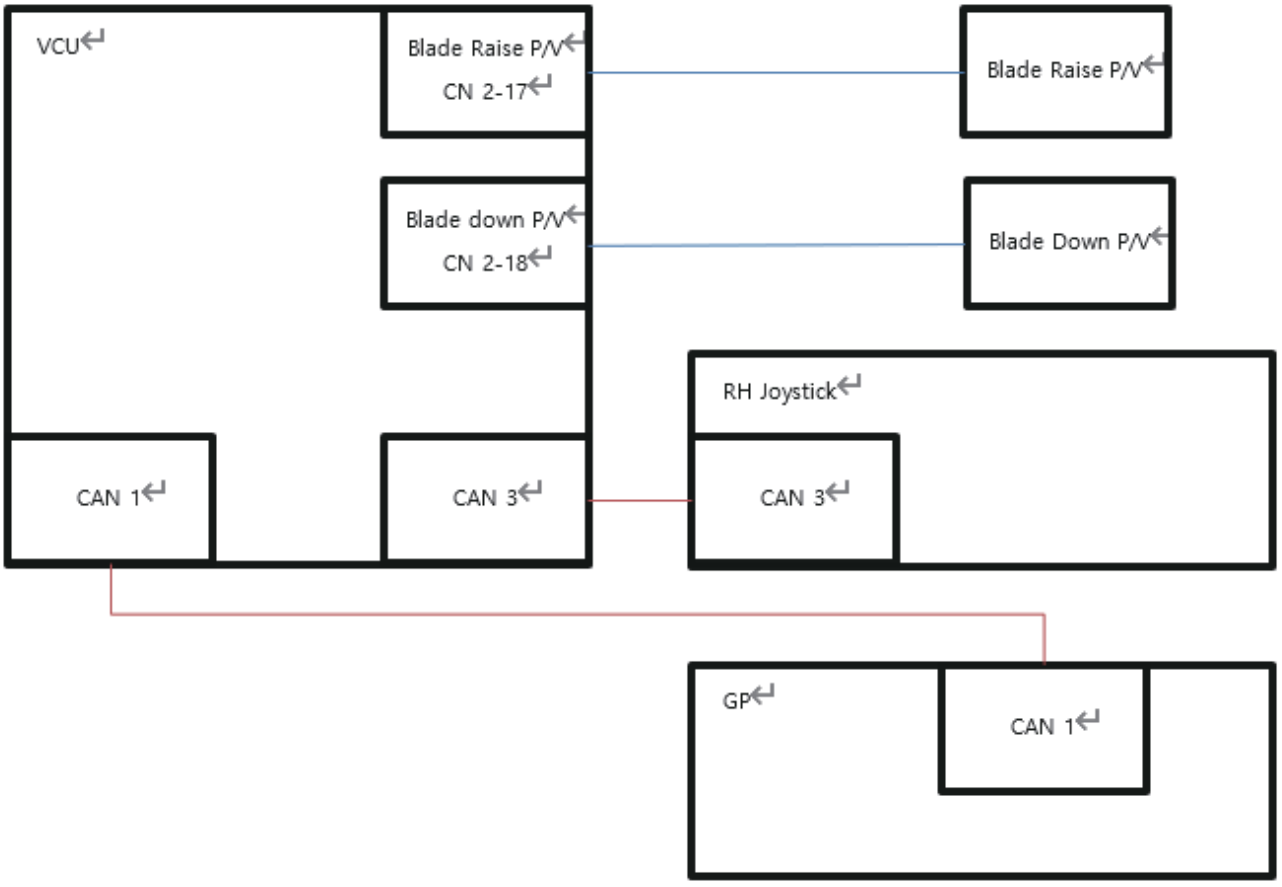


DS2201489

Blade Raise Down Control

Purpose - Controls Blade Raise Down operation according to joystick operation

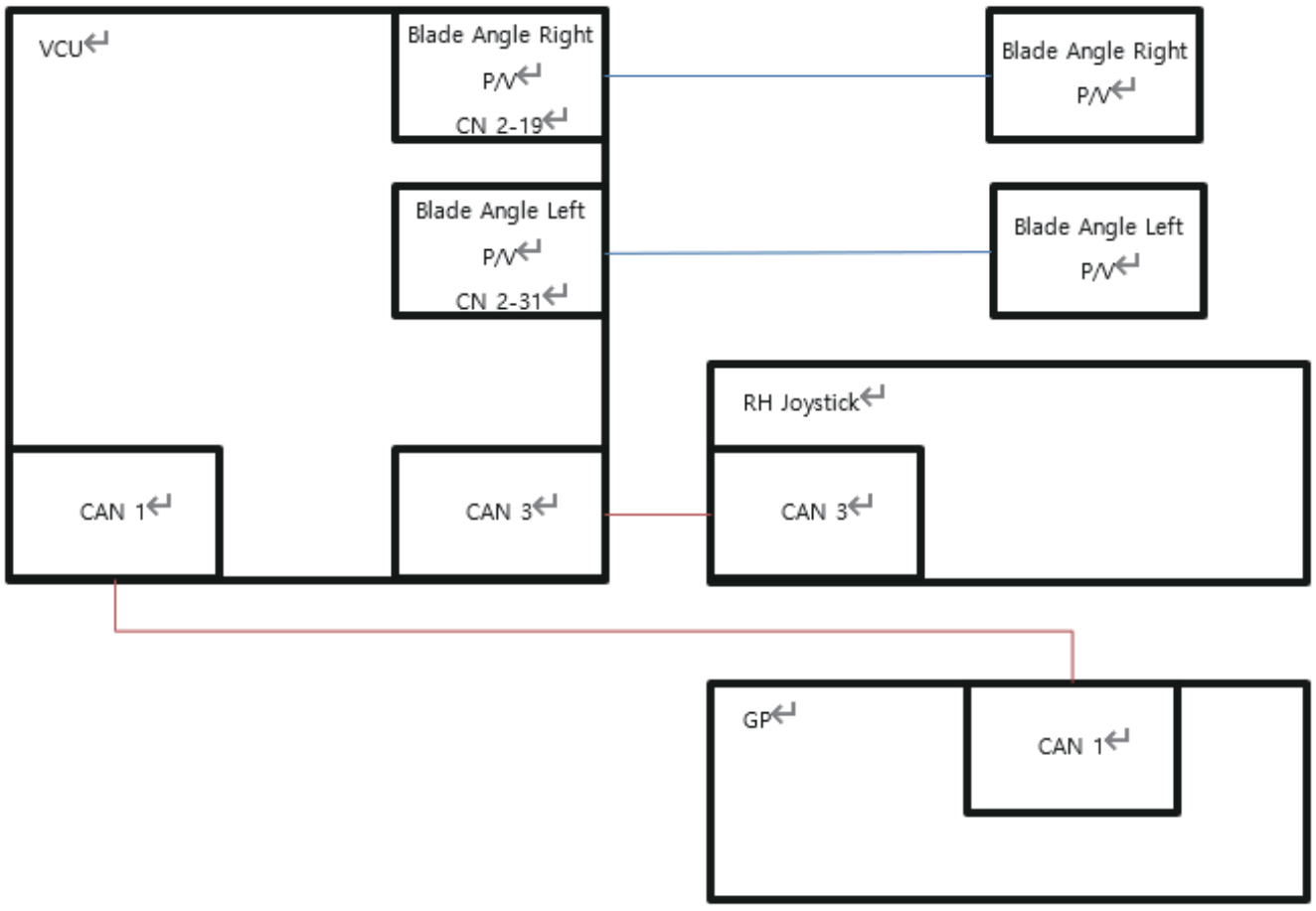
Figure 141



Blade Angle Control

Purpose - Controls Blade Angle operation according to joystick operation

Figure 142

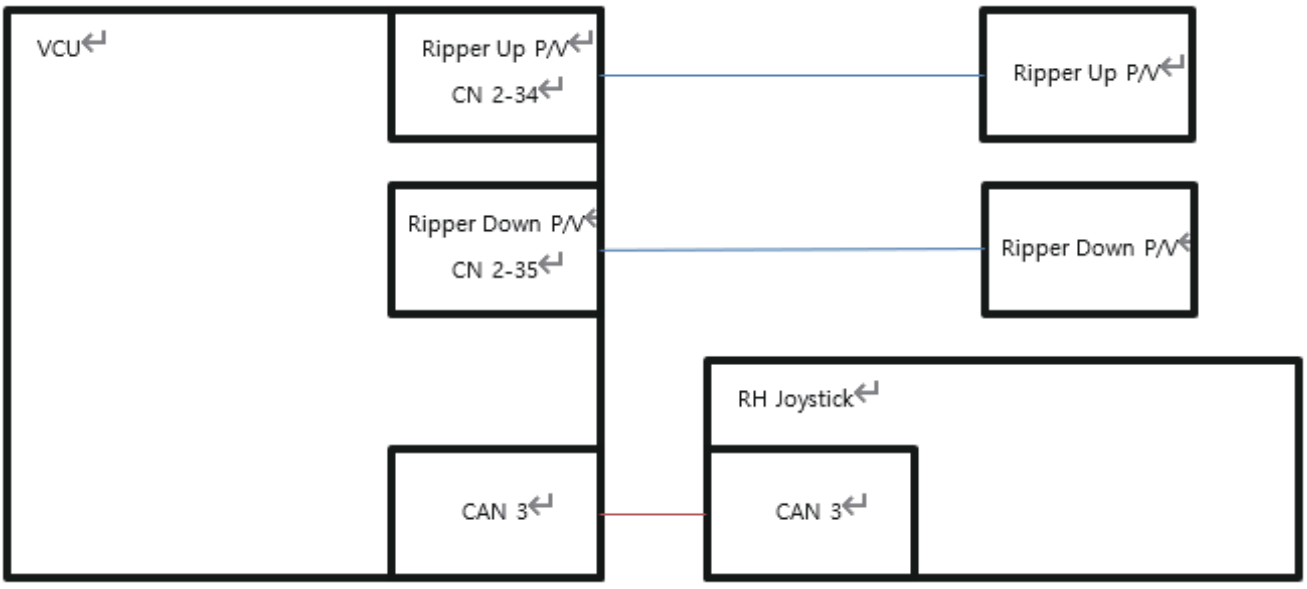


DS2201491

Blade Angle Control

Purpose - Controls Ripper operation according to Joystick operation

Figure 143

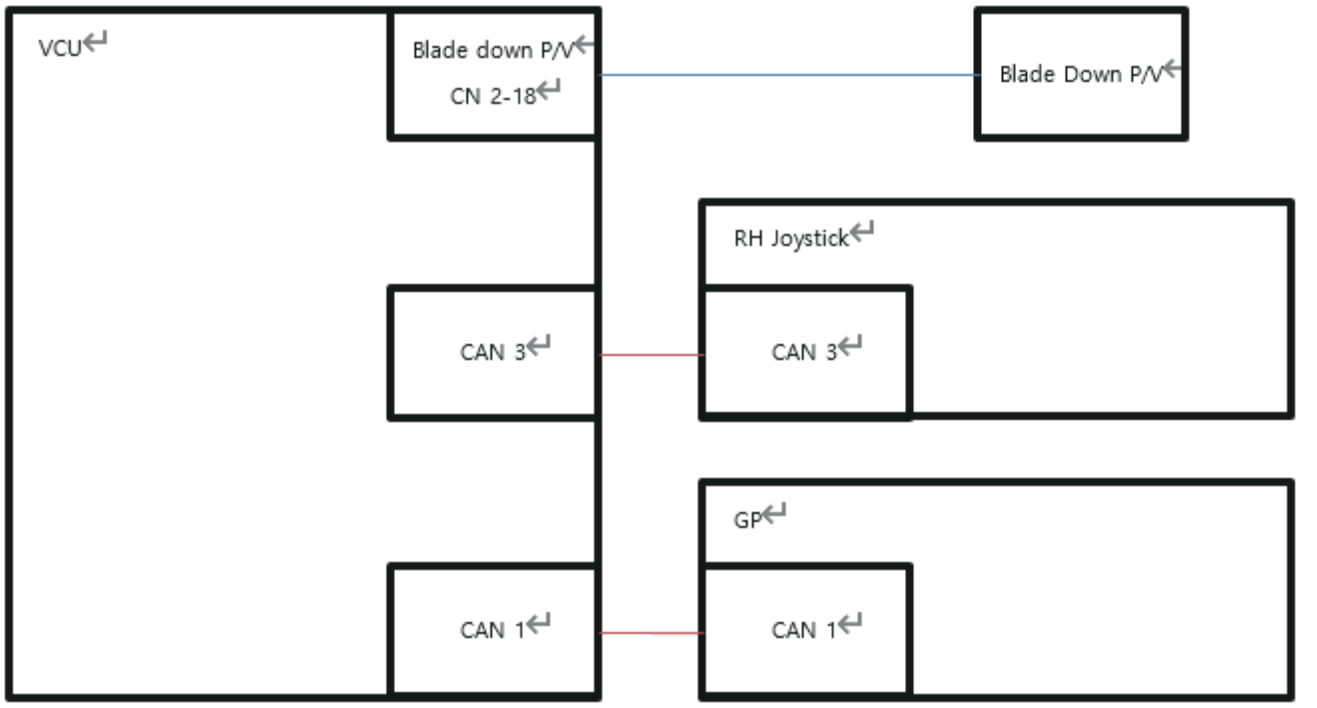


DS2201492

Blade Float Control

Purpose - Controls Blade Float operation according to Joystick operation

Figure 144

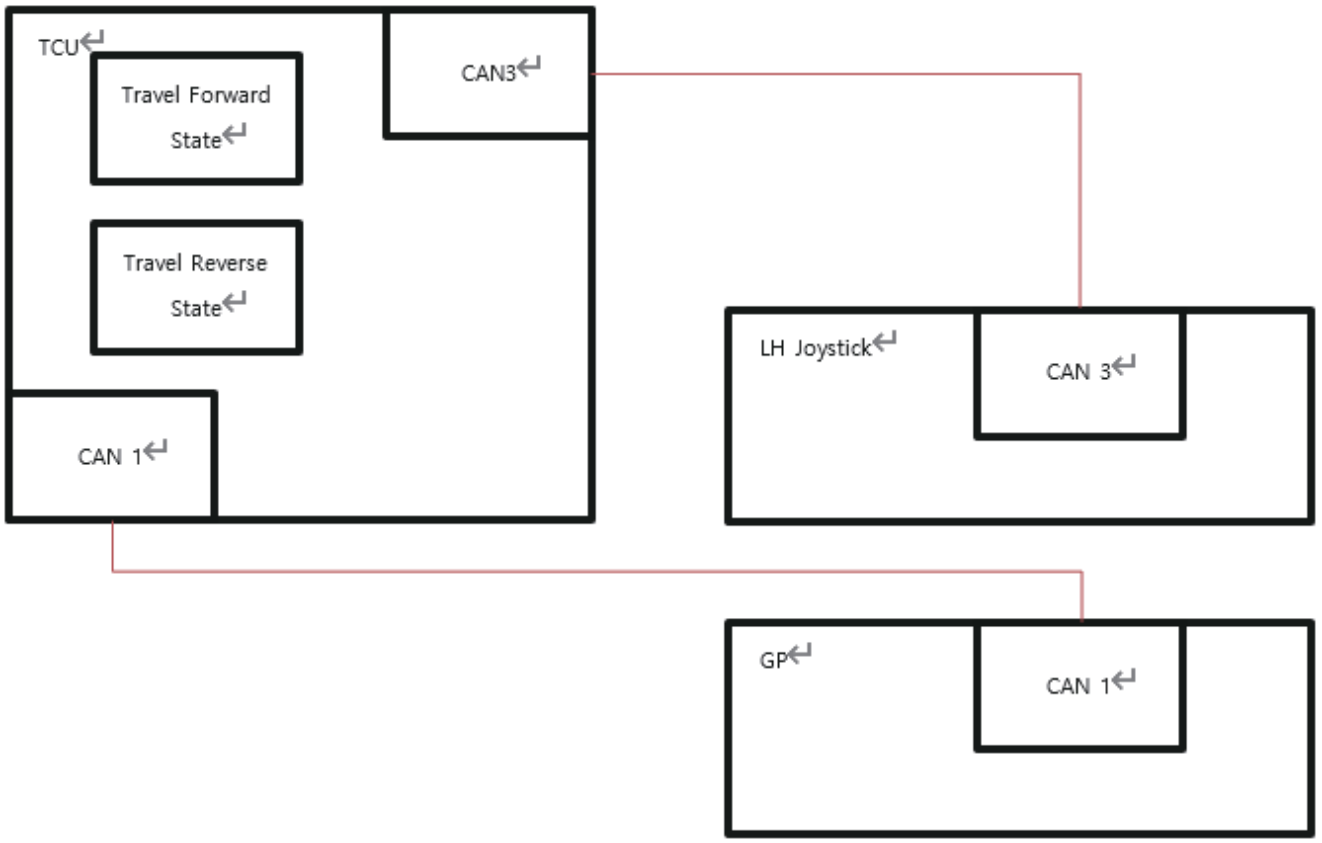


DS2201493

Travel Max. Speed Control

Purpose - Controls the maximum speed during forward and reverse according to the operator's input from the instrument panel and joystick

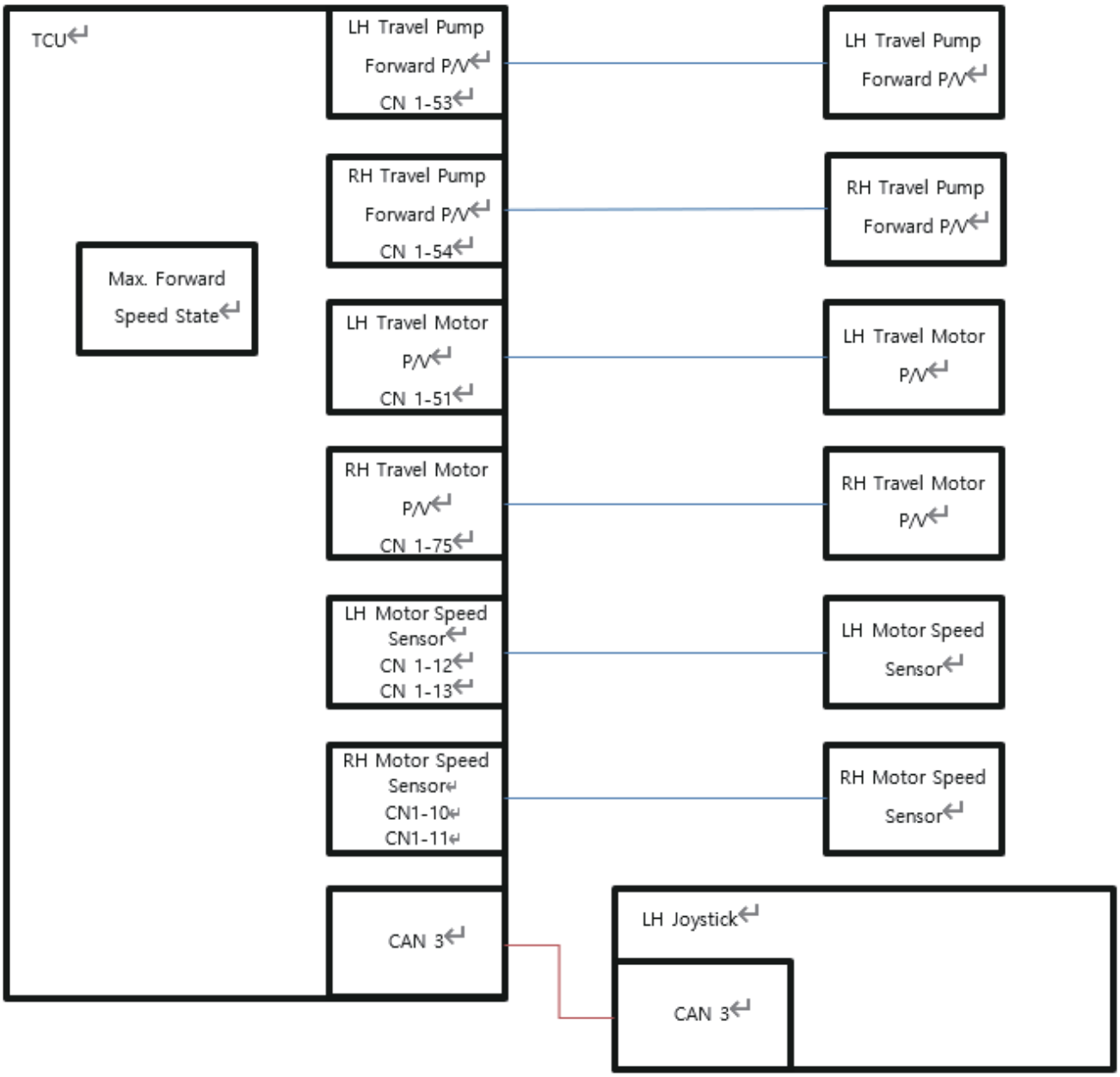
Figure 145



Travel Forward Control

Purpose - Controls the forward motion according to the joystick operation

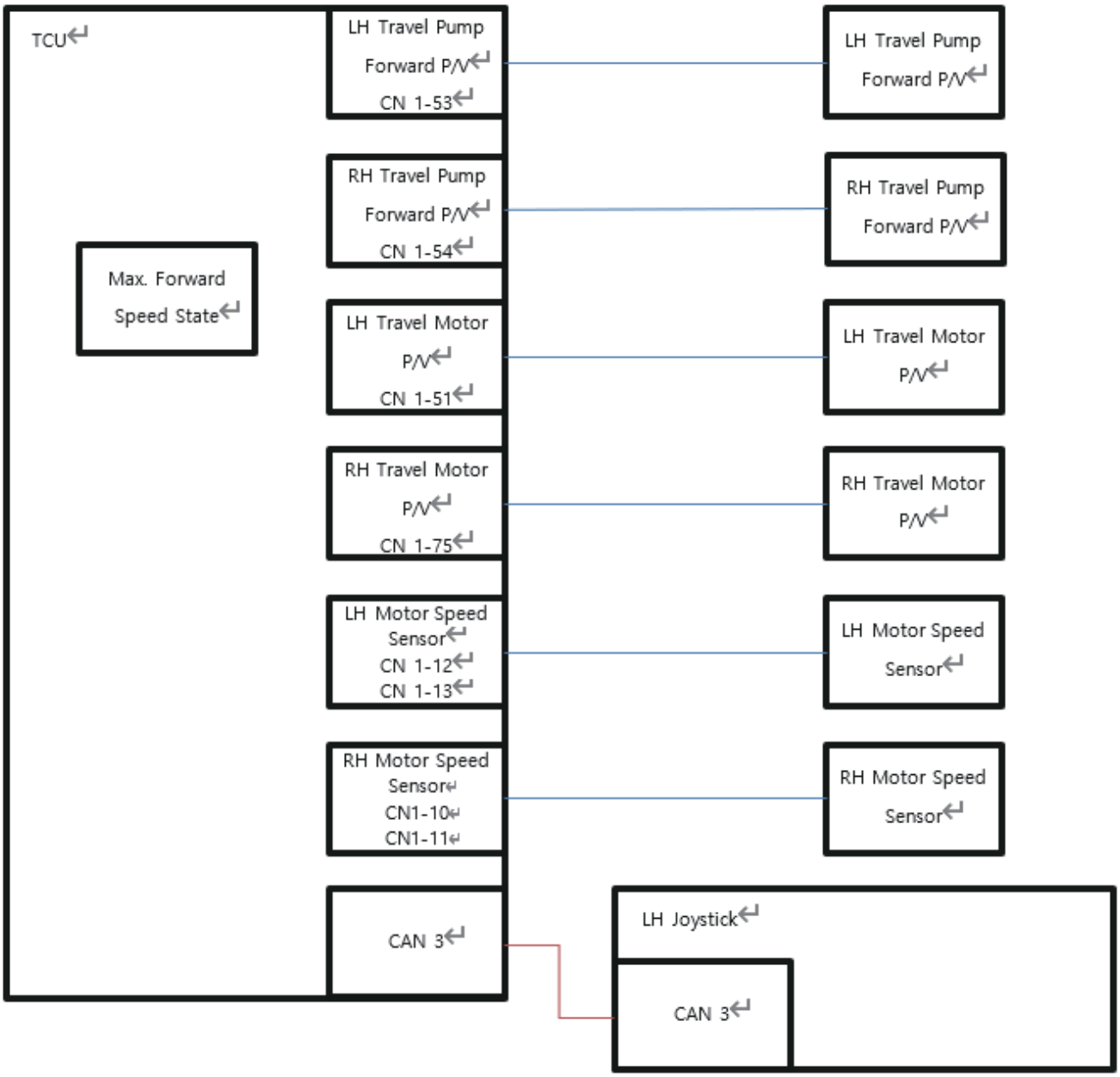
Figure 146



Travel Forward Control

Purpose - Controls the forward motion according to the joystick operation

Figure 147

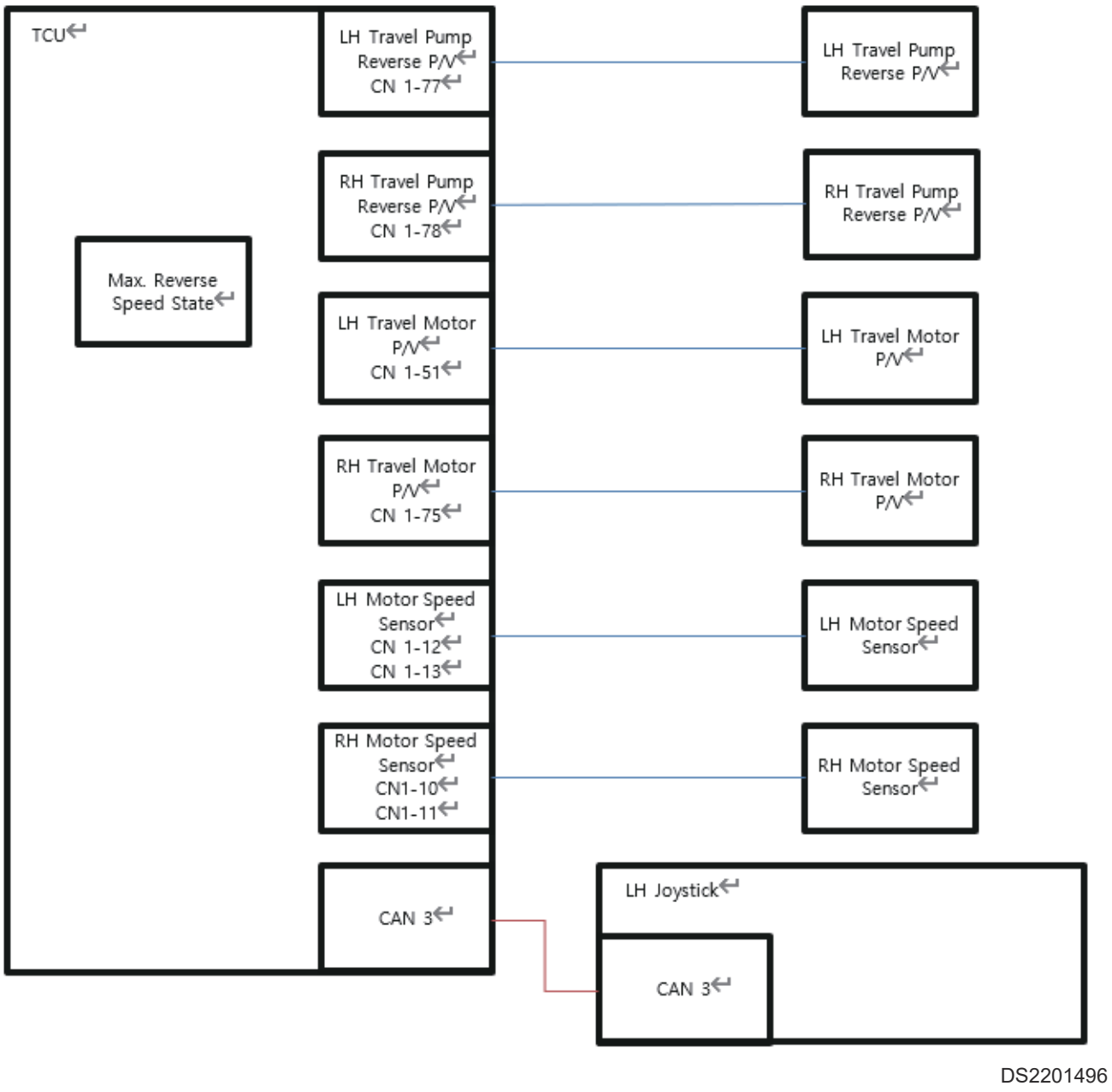


DS2201495

Travel Backward Control

Purpose - Controls the backward motion according to the joystick operation

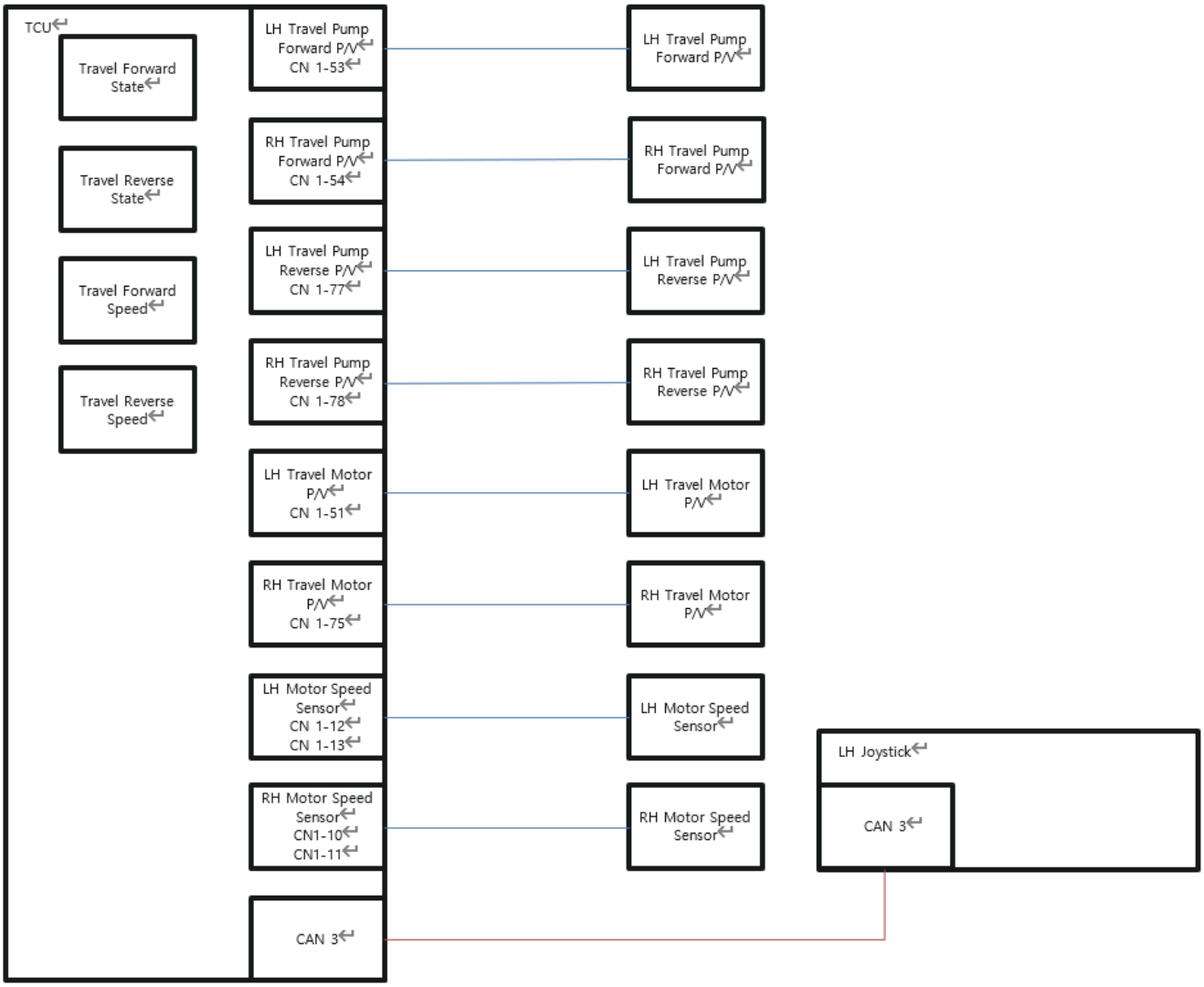
Figure 148



Left Turn Control

Purpose - Controls the Left Turn motion according to the joystick operation

Figure 149

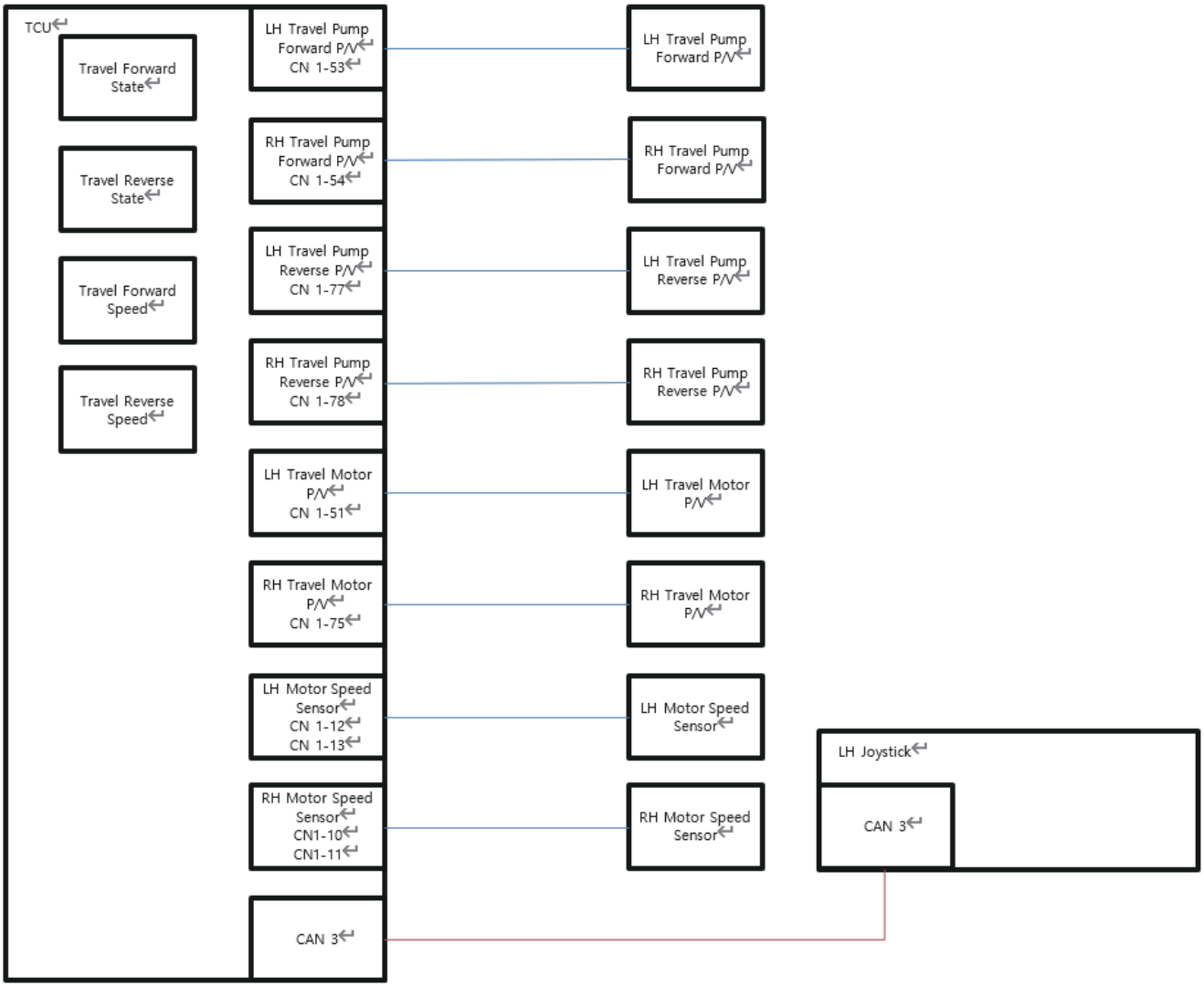


DS2201497

Right Turn Control

Purpose - Controls the Right Turn motion according to the joystick operation

Figure 150

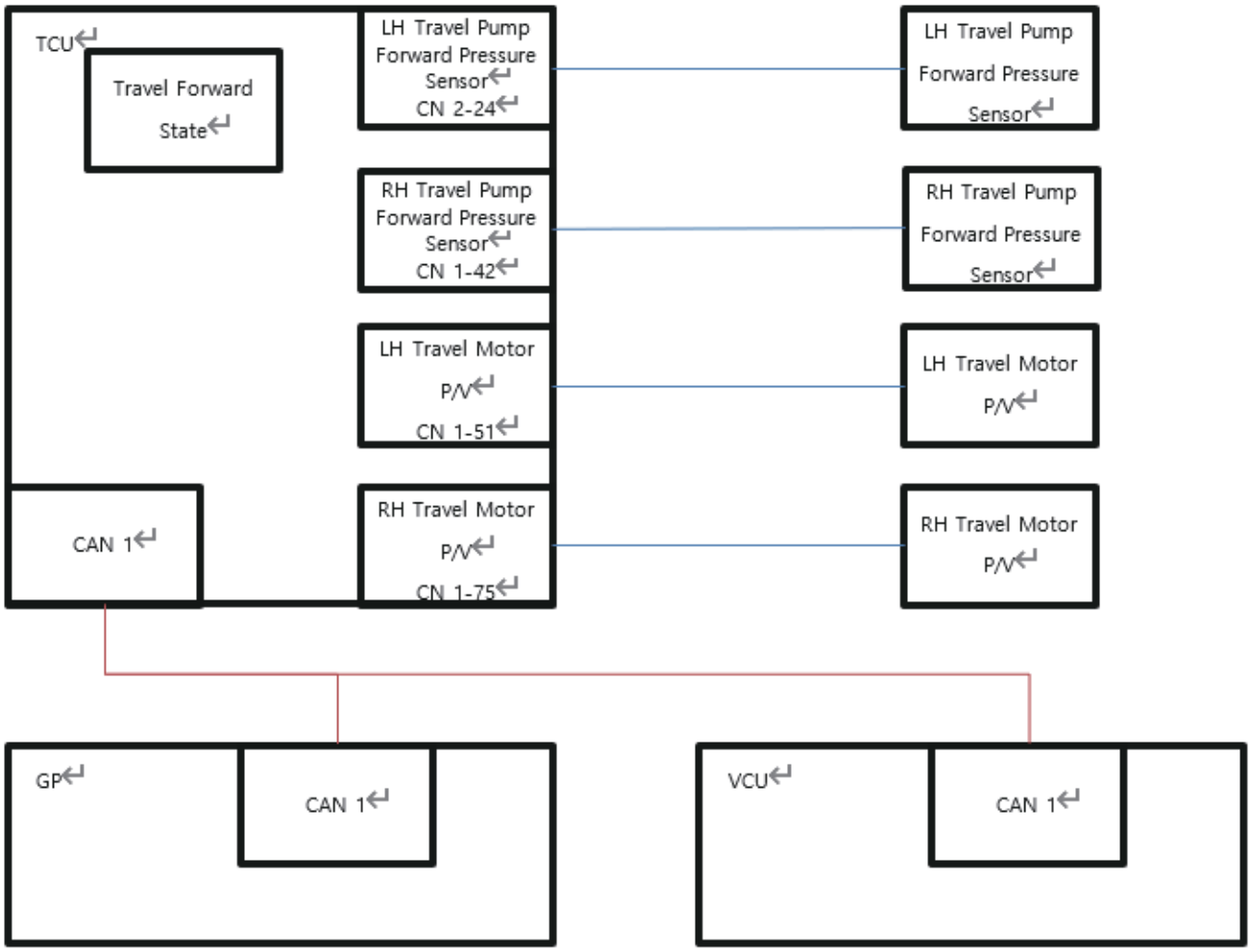


DS2201497

Traction Control

Purpose - Controls the maximum traction torque when moving forward according to the GP input

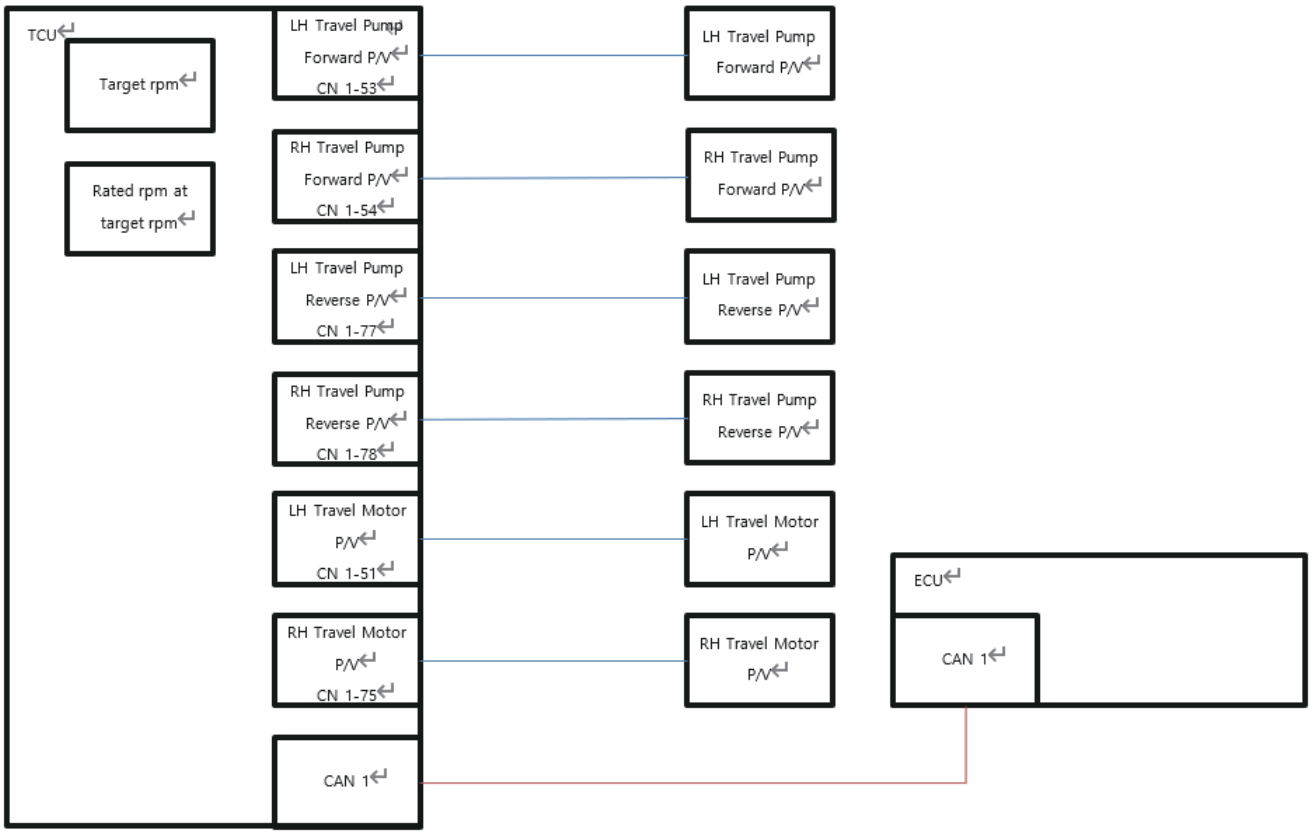
Figure 151



Travel Load Limit Control

Purpose - To prevent the engine from turning off while driving

Figure 152

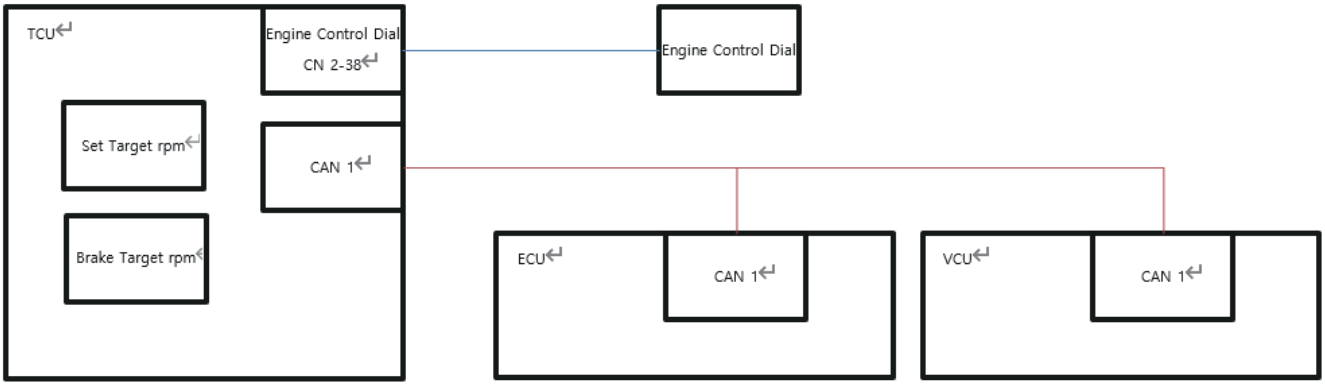


DS2201499

Engine RPM Control

Purpose - Controls engine rpm according to dial input

Figure 153



DS2201500

2D MC Calibration

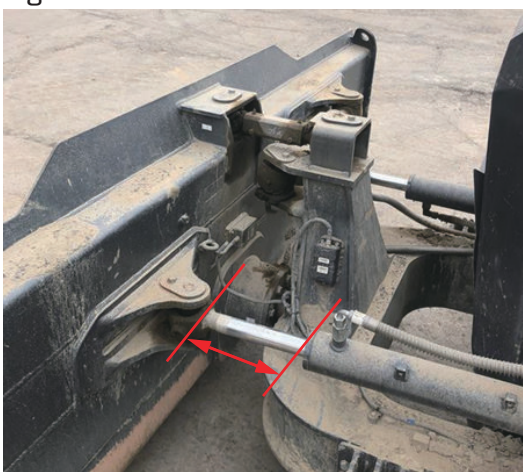
A. Equipment Posture

1. Figure 154

DS2202338

Position the machine on even, firm and level ground.

2. Figure 155



DS2202339

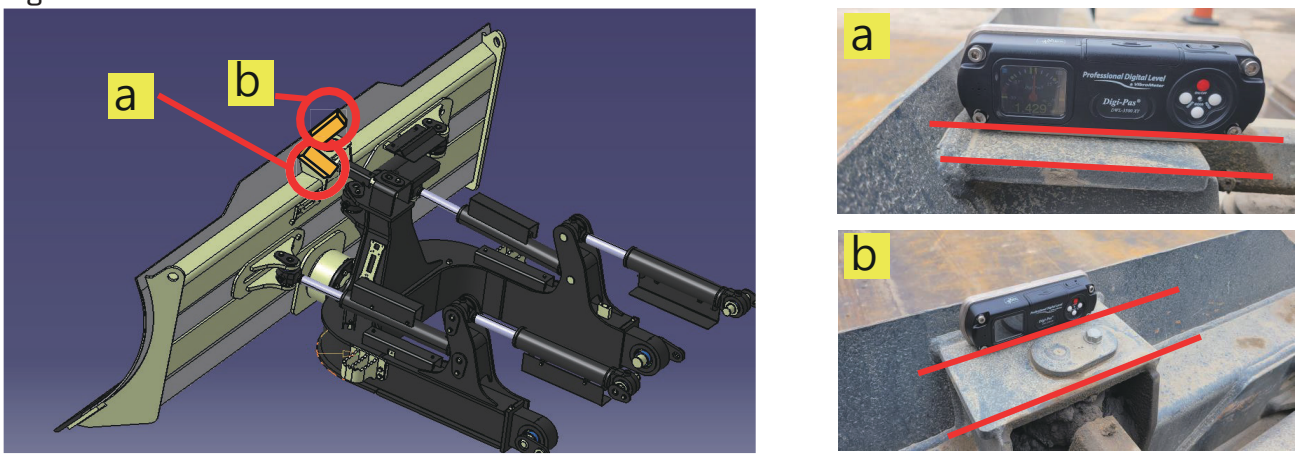
Position the left and right cylinder lengths equally. (Left and Right Horizontal)

3. Equipment posture: Engine off, Key on (No ACC), Blade touching the ground, and No jack-up
4. It must remain in the initial state until the entire calibration is completed.

B. Blade level measurement

1. Position the leveler in that position. “a” is pitch angle measurement, “b” is the position for roll angle measurement.

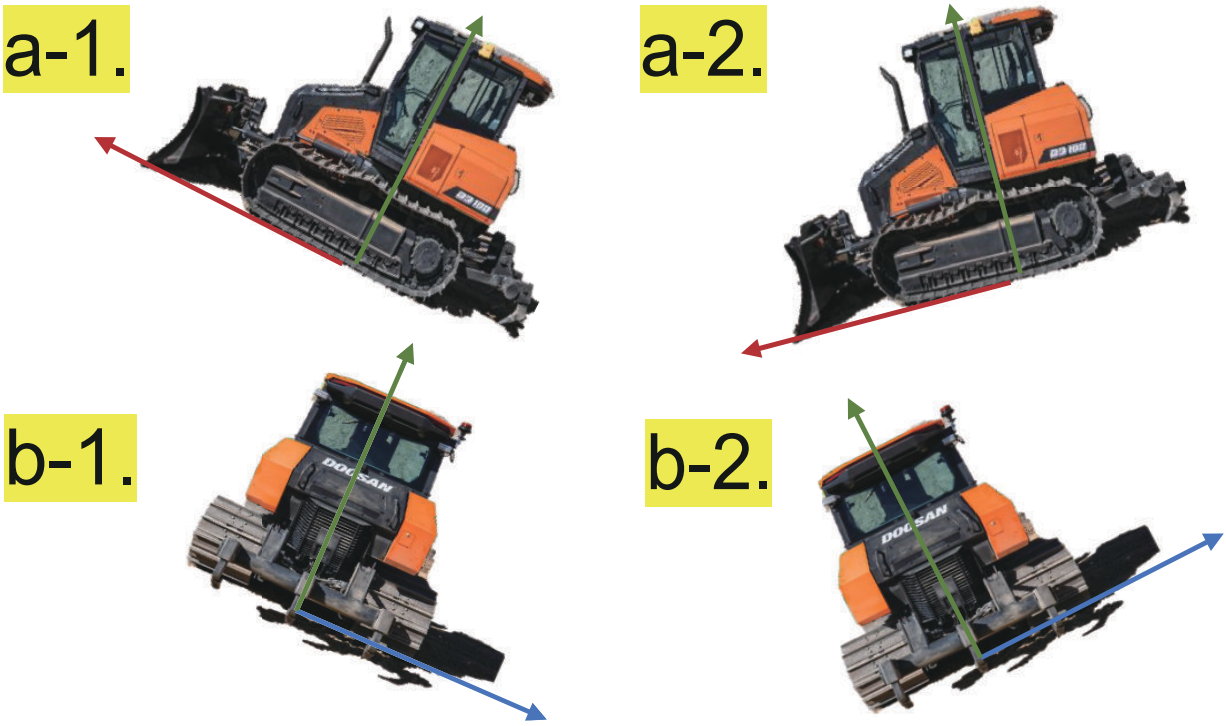
Figure 156



DS2202340

2. Position the leveler so that the leveler and the blade marking line are parallel. The unit of measurement for an electronic leveler is the deg.
3. Blade pitch angle sign
   - + sign when the horizontal display angle is in the direction of rotation as shown in the figure.
   - - sign when the horizontal display angle is in the direction of rotation as shown in the figure.

   Figure 157



DS2202341

4. Blade roll angle sign
   - + sign when the horizontal display angle is in the direction of rotation as shown in the figure.
   - - sign when the horizontal display angle is in the direction of rotation as shown in the figure.

C. Enter measured values of Blade level

1. When the leveler is placed like “a”, if the direction of the arrow is the same as “a-1”, write the angle value of the + sign in the memo. If the direction of the arrow is the same as "a-2", write the angle value of the - sign in the memo.

   Figure 158

DS2202342

2. When the leveler is set as “b”, if the direction of the arrow is the same as “b-1”, the angle value of the + sign is written in the memo. If the direction of the arrow is the same as “b-2”, write the angle value of the - sign in the memo.

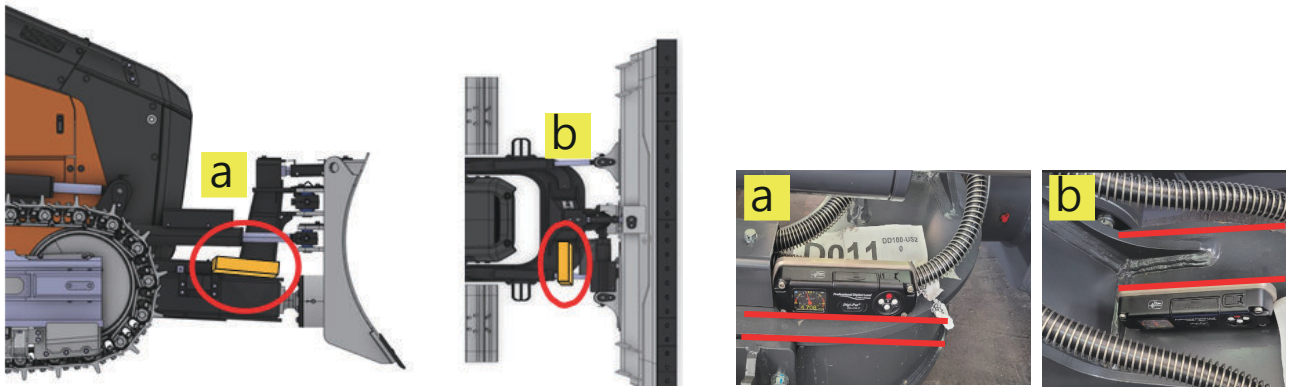
Figure 159

DS2202343

D. CFrame level measurement

1. Position the leveler in that position. “a” is pitch angle measurement, “b” is the position for roll angle measurement.

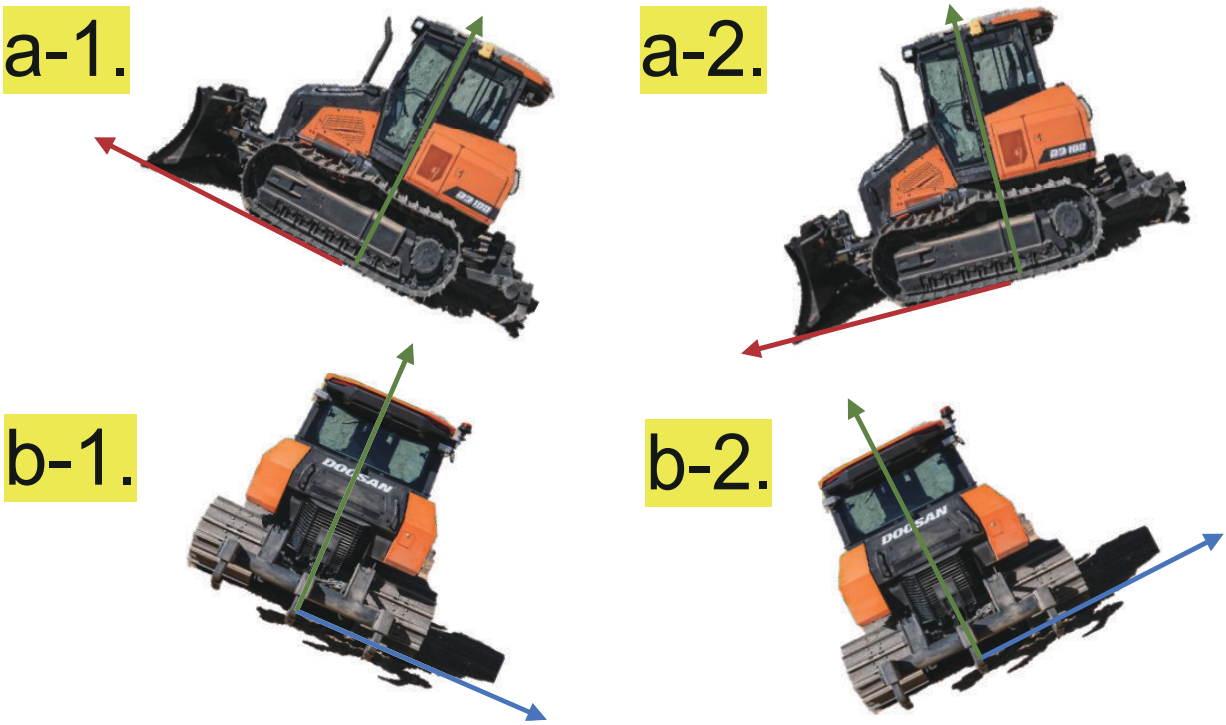
Figure 160



DS2202344

2. Position the leveler so that the leveler and the CFrame marking line are parallel. The unit of measurement for an electronic leveler is the deg.
3. CFrame pitch angle sign
   - + sign when the horizontal display angle is in the direction of rotation as shown in the figure.
   - - sign when the horizontal display angle is in the direction of rotation as shown in the figure.

Figure 161



DS2202341

4. CFrame roll angle sign
   - + sign when the horizontal display angle is in the direction of rotation as shown in the figure.
   - - sign when the horizontal display angle is in the direction of rotation as shown in the figure.

E. Enter measured values of CFrame level

1. When the leveler is placed like “a”, if the direction of the arrow is the same as “a-1”, write the angle value of the + sign in the memo. If the direction of the arrow is the same as "a-2", write the angle value of the - sign in the memo.

   NOTE: *Note the pitch direction*

   Figure 162

DS2202345

2. When the leveler is set as “b”, if the direction of the arrow is the same as “b-1”, the angle value of the + sign is written in the memo. If the direction of the arrow is the same as “b-2”, write the angle value of the - sign in the memo.

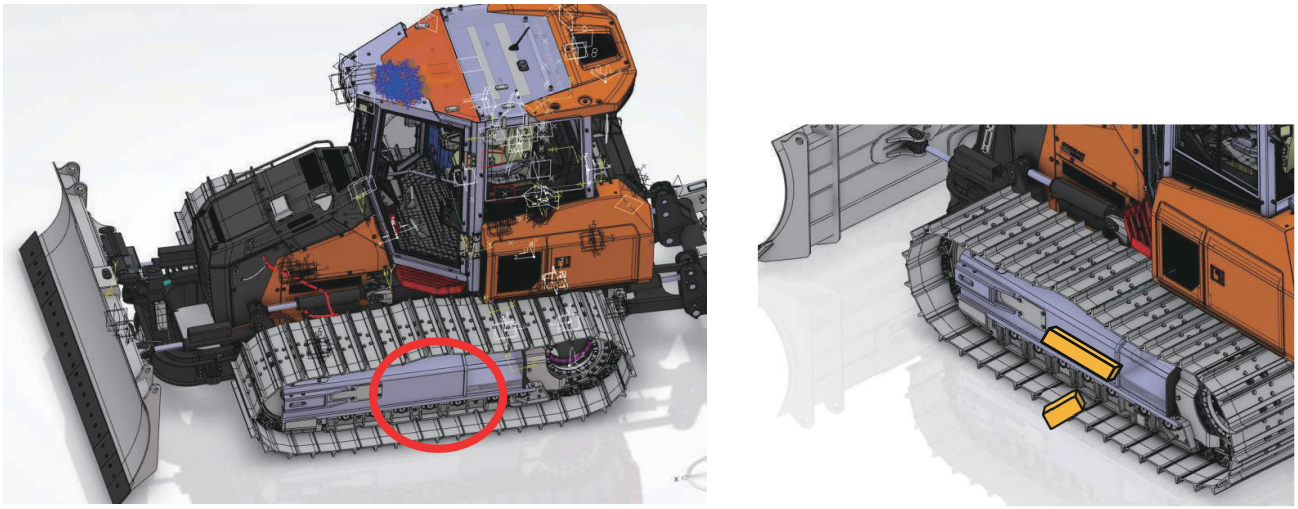
Figure 163

DS2202346

F. Body level measurement

1. Position the leveler in the appropriate position. Place it on the left track cover (Pitch) and the top of the track (Roll). Proceed in the same way for the right side.

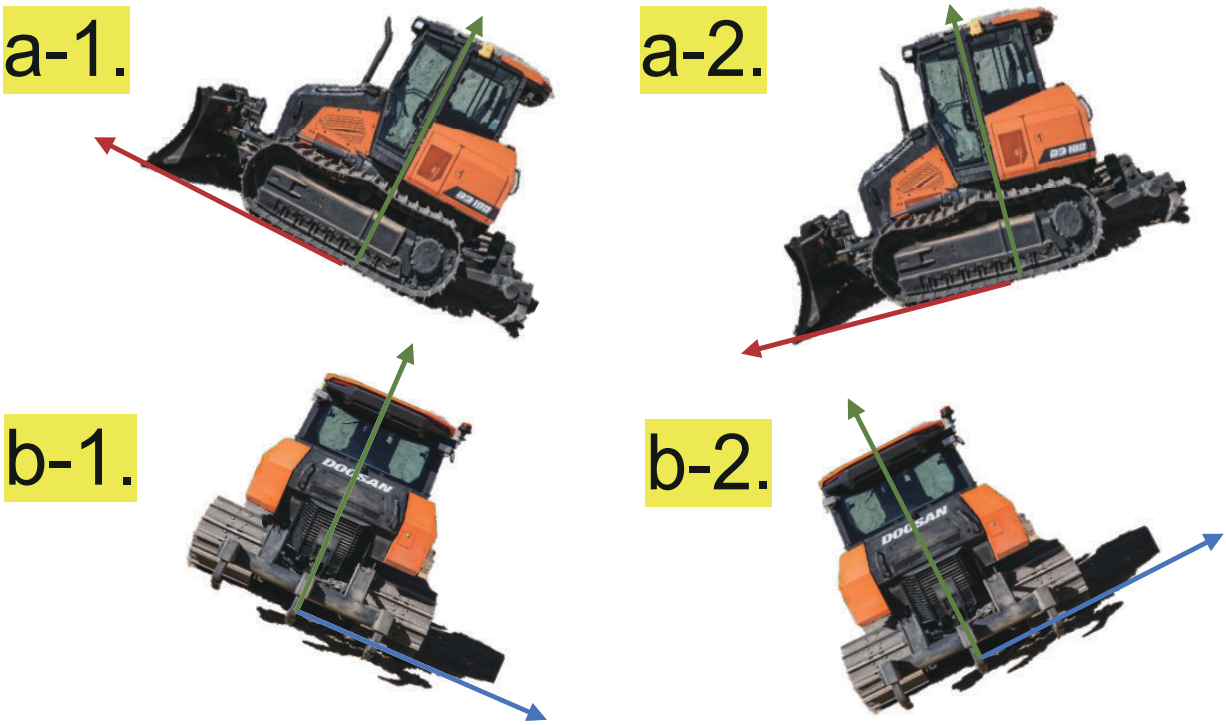
Figure 164



DS2202348

2. Position the leveler so that the leveler and the body marking line are paralle. The unit of measurement for an electronic leveler is the deg.
3. Body pitch angle sign
   - + sign when the horizontal display angle is in the direction of rotation as shown in the figure.
   - - sign when the horizontal display angle is in the direction of rotation as shown in the figure.

Figure 165



DS2202341

4. Body roll angle sign
   - + sign when the horizontal display angle is in the direction of rotation as shown in the figure.
   - - sign when the horizontal display angle is in the direction of rotation as shown in the figure.

G. Enter measured values of Body level for left & right side each

1. When the leveler is placed like “a”, if the direction of the arrow is the same as “a-1”, write the angle value of the + sign in the memo. If the direction of the arrow is the same as "a-2", write the angle value of the - sign in the memo.

Figure 166

DS2202349

2. When the leveler is set as “b”, if the direction of the arrow is the same as “b-1”, the angle value of the + sign is written in the memo. If the direction of the arrow is the same as “b-2”, write the angle value of the - sign in the memo.

Figure 167

DS2202346

3. Proceed the same for another side.

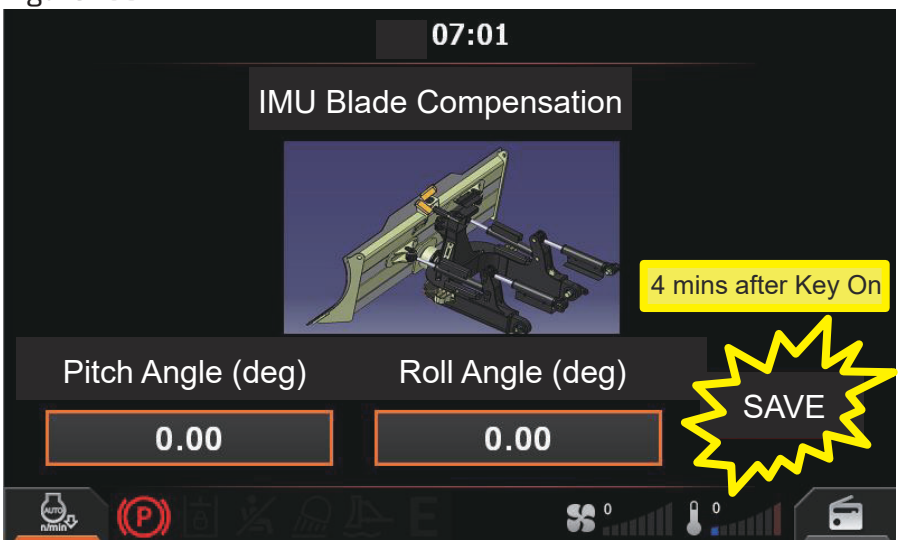
H. Please refer to the Operation & Maintenance Manual for Blade tip length compensation, Blade angle compensation, and Crawler tip calibration.

I. Enter the lever values in the Gauge Panel.

NOTE: *Be sure to enter the angle value after 4 minutes of Key On.*

1. The angle value entered in Memo is rounded to two decimal places. (ex. 3.056 -> 3.06)

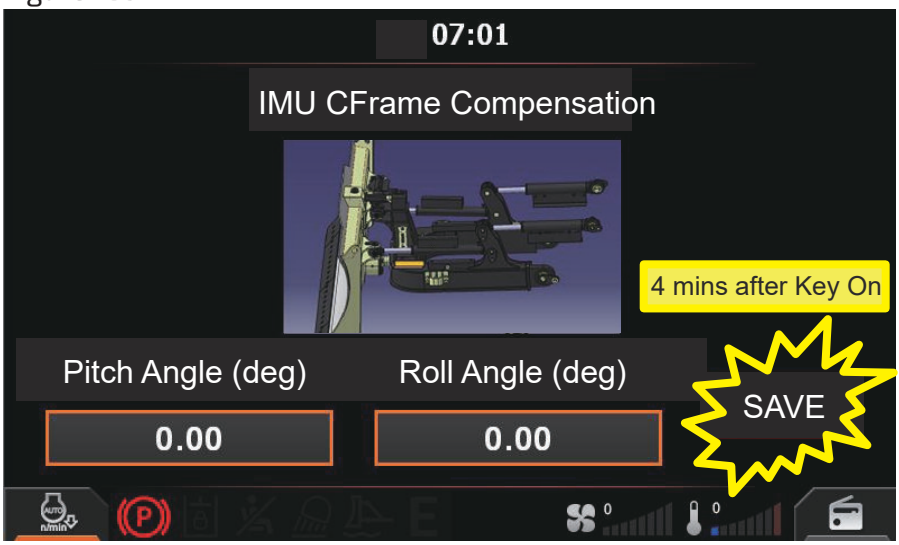
Figure 168



DS2202350

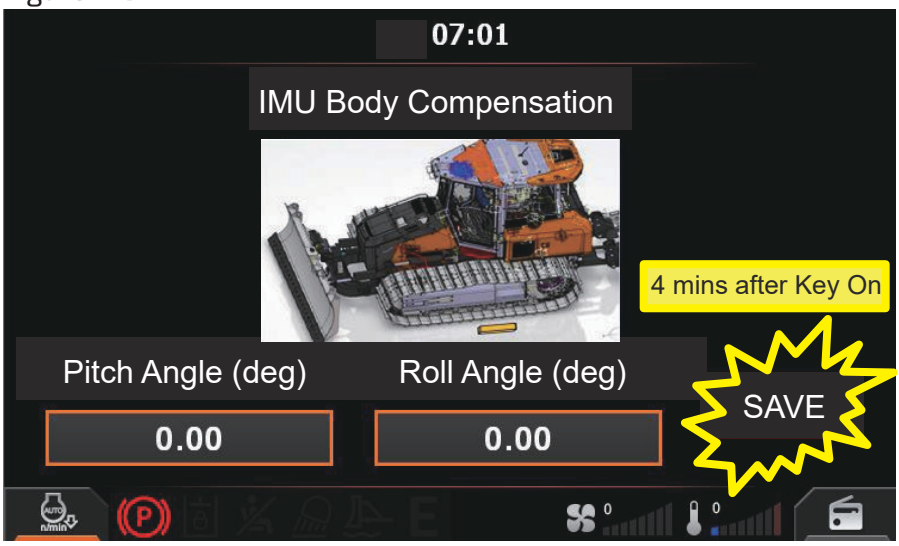
2. After inputting the Blade pitch and Blade roll angle rounded to two decimal places, save it.

3. The angle value entered in Memo is rounded to two decimal places. (ex. 3.056 -> 3.06)
   Figure 169



DS2202351

4. After inputting the CFrame pitch and CFrame roll angle rounded to two decimal places, save it.
5. The angle value entered in Memo is rounded to two decimal places. (ex. 3.056 -> 3.06)
   Figure 170



DS2202352

6. After inputting the Body pitch and Body roll angle rounded to two decimal places, save it.

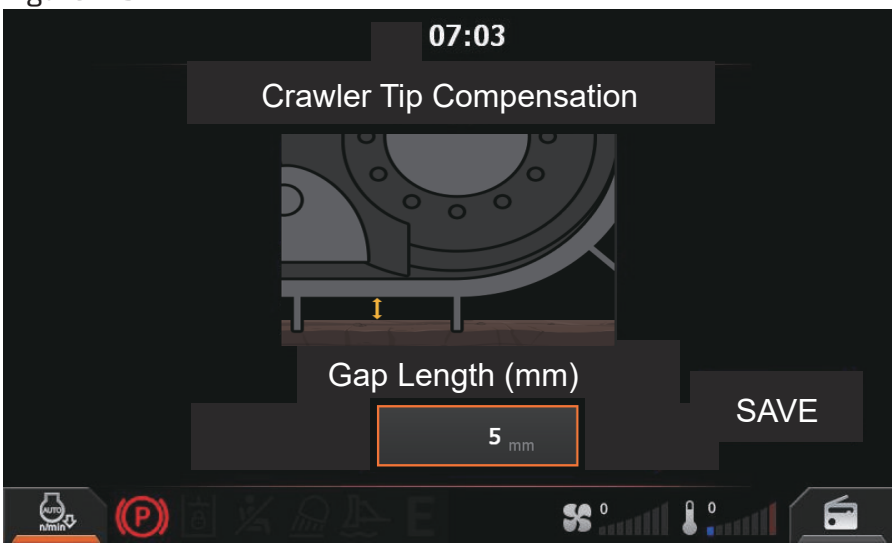
7. After inputting the Blade tip measurement length written in Memo, save it.
Figure 171

DS2202353

8. After inputting the Blade Joint measurement length written in Memo, save it.
Figure 172

DS2202354

9. After inputting the Crawler Tip measurement length written in Memo, save it.
   Figure 173

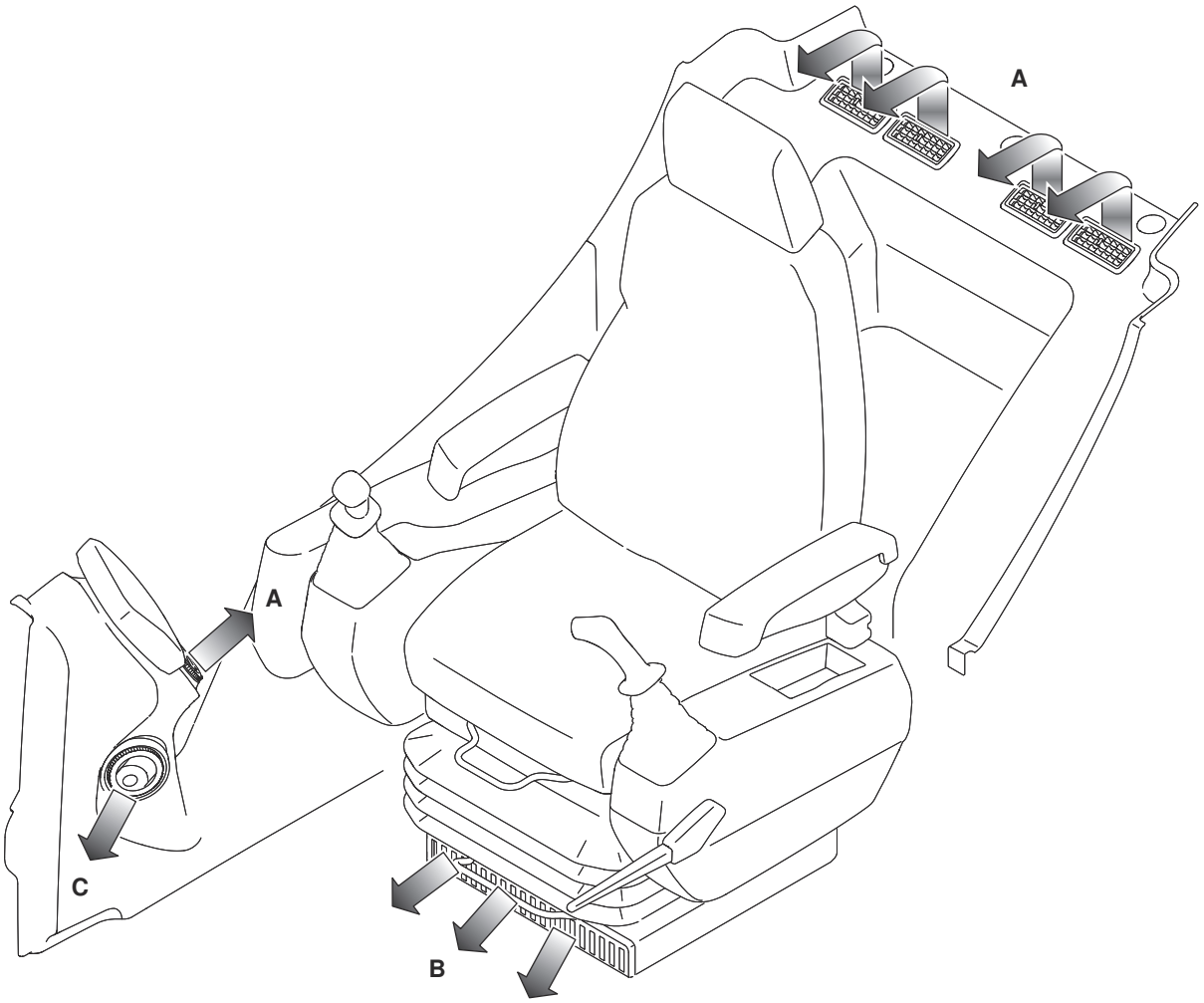


DS2202355

Air Conditioner System

Outline

Figure 174



EX1301100

Solid-type heater and air conditioner are installed in the cover behind the operator's seat.

Temperature of the operator's cabin is adjusted automatically to the temperature set by operator.

(Please refer to the Operation & Maintenance Manual for detailed full automatic control.

Vent mode selects the direction of discharged air.

Outlets by vent modes

Modes				
Outlets	A	A+B	B	B+C

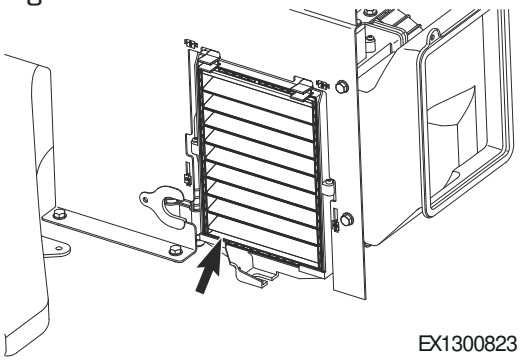
Internal and External Filters

Internal and external air purification filters are installed for the operator's room.

If machine operates in an excessively contaminated environment, filters must be cleaned more frequently and if necessary, replaced with new ones.

How to Check Internal Air Filter

1. Figure 175



EX1300823

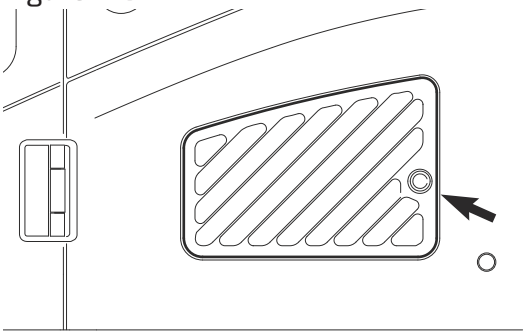
Remove cover by pulling knob outward on top of the left and right of the filter which is inside the left rear part of the cabin.

2. Remove inner filter by pulling knob outward while pressing the upper part and lower part of the filter handle.
3. Replace with new one.
4. Reassemble filter in reverse order.

How to Check External Air Filter

NOTE: *All right and left call outs are based on the operator being seated in the operator's seat facing the front.*

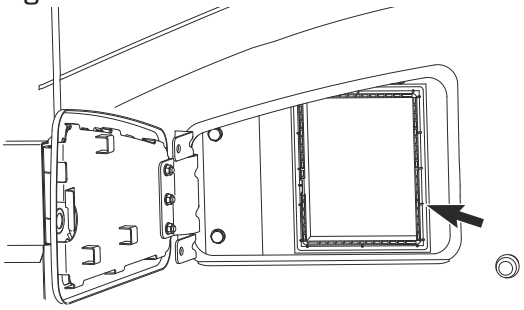
1. Figure 176



EX1300825

Open the cover by using the starter KEY in the left side of the cabin.

2. Figure 177



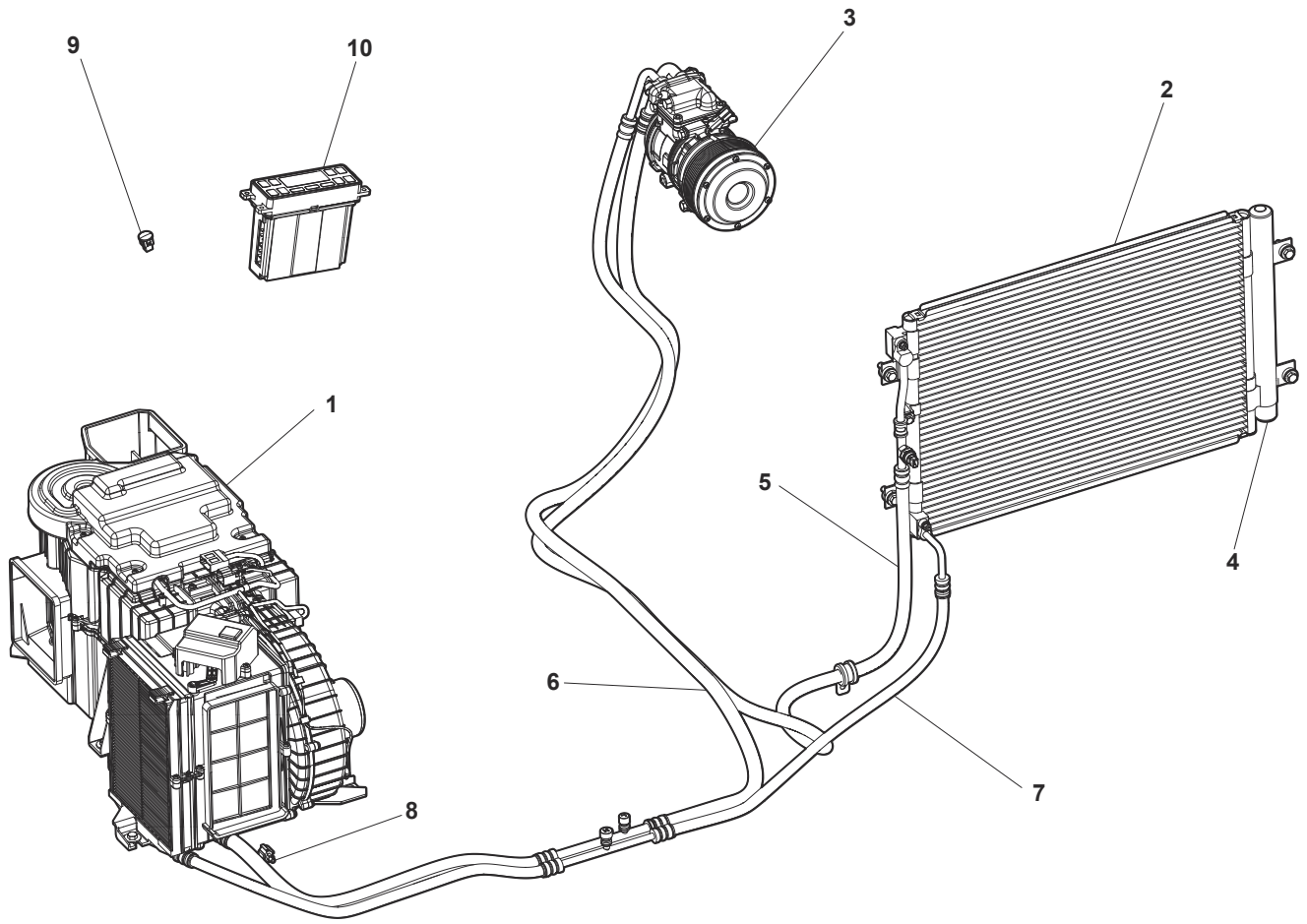
EX1403389

Remove filter and replace with new one.

3. Reassemble in reverse order.

Air-Conditioning System Layout

Figure 178

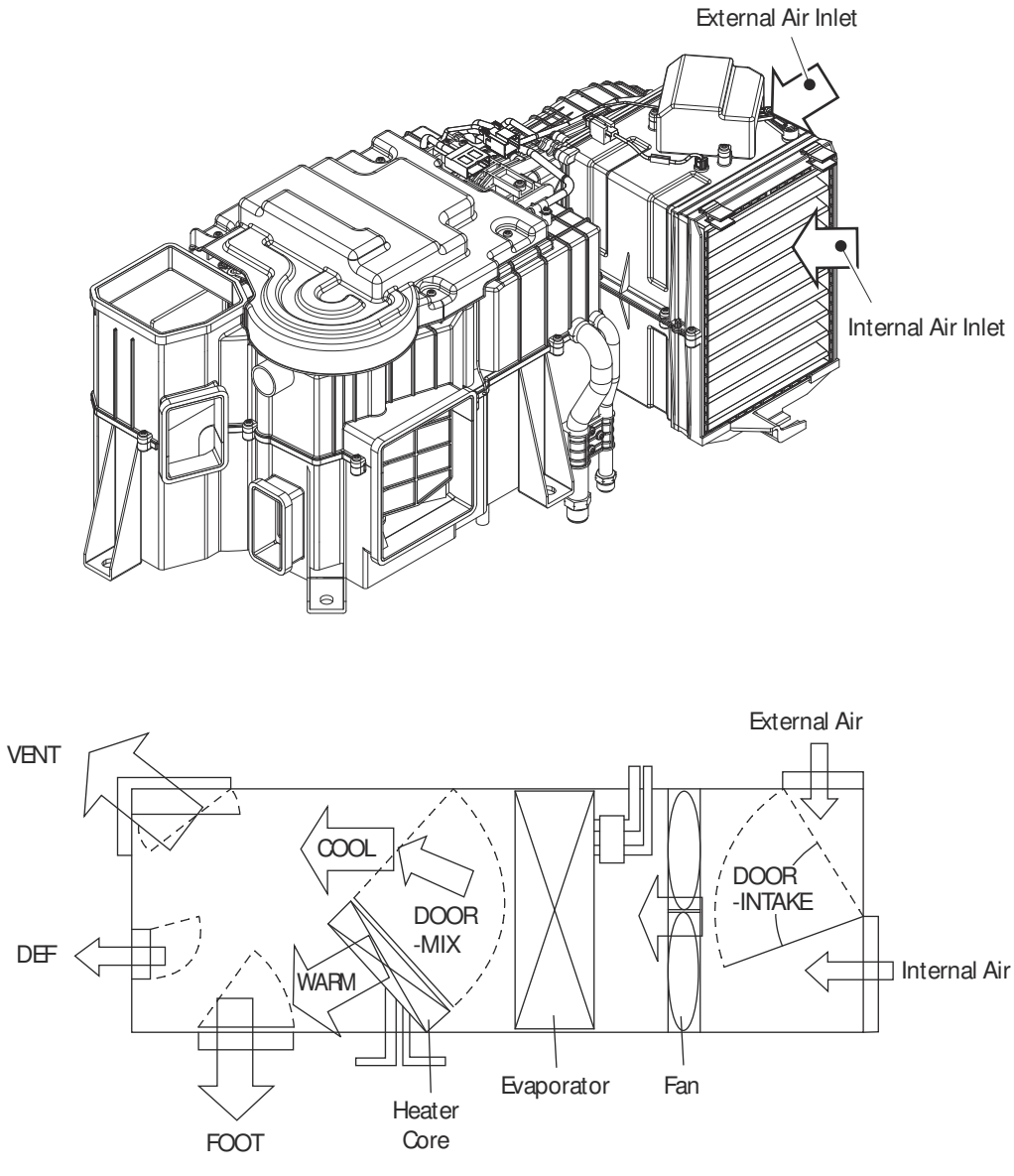


Reference Number	Description
1	Air Conditioner/heater Unit
2	Condenser
3	Compressor
4	Receiver Dryer
5	Discharge Hose
6	Suction Hose
7	Liquid Hose
8	In-car Sensor
9	Photo Sensor
10	Control Panel

Air Conditioner/Heater Unit

Airflow Diagram

Figure 179

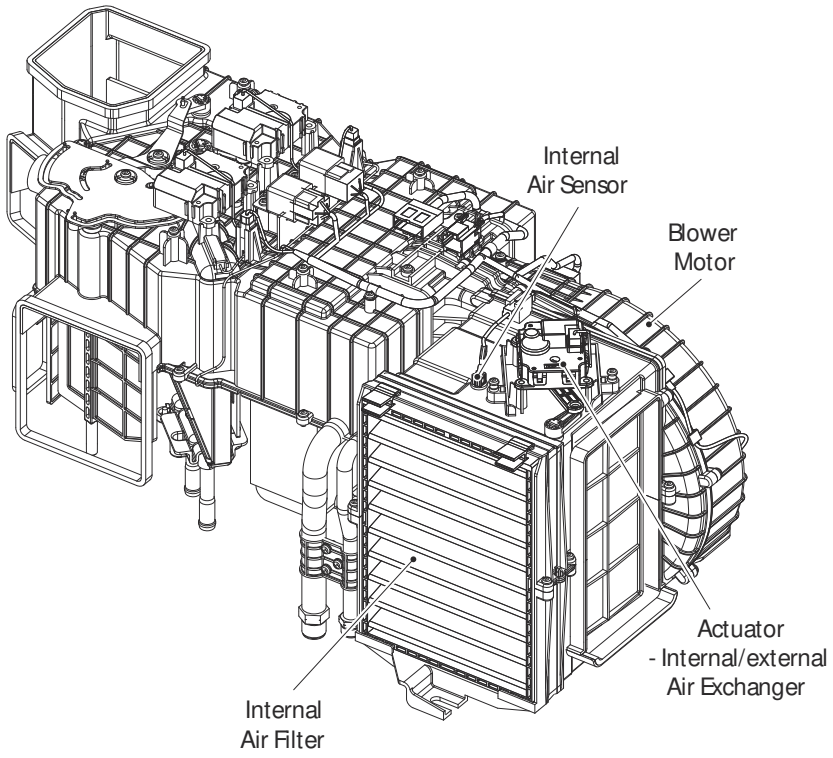


Door Open by Vent Modes

Door	Mode				
	Vent	Bi-level	Foot	Def/foot	Def
Vent	100	70	0	0	0
Foot	0	30	100	85	65
Def	0	0	0	15	35

Main Components

Figure 180



FG016943

Actuator - Airflow Direction Control

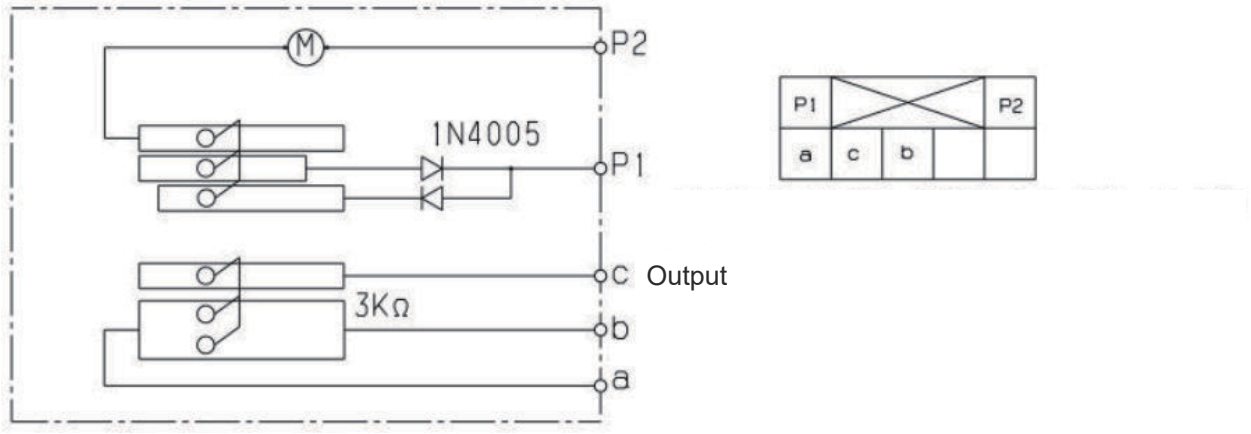
Change of discharged airflow according to selected airflow direction mode

Change of airflow direction: Direction changes in the order of VENT→ BI-LEVEL → FOOT → FOOT/DEF → VENT.

Actuator - Temperature Control

Change of discharged air temperature by controlling the position of temperature control door.

Figure 181



DS2301082

Actuator - Airflow Direction Control

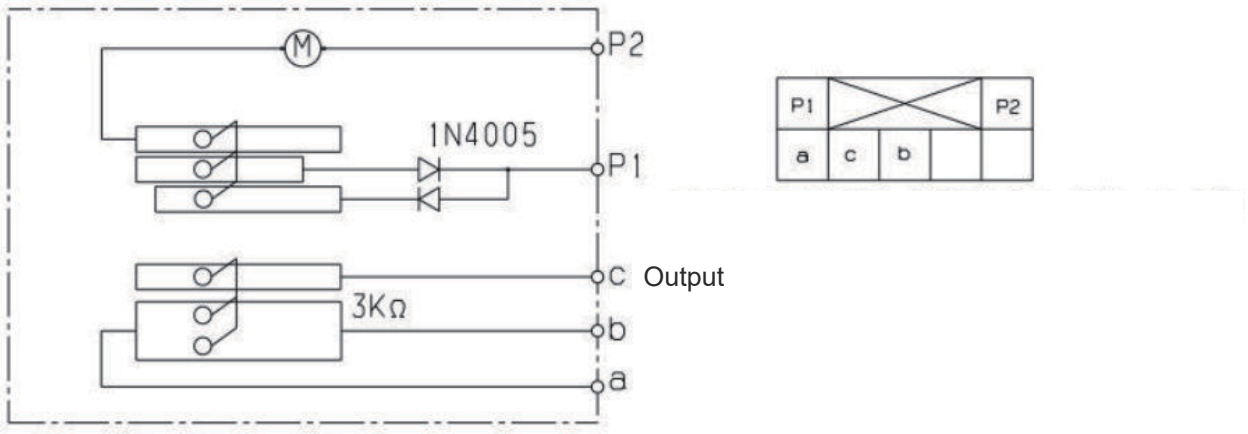
Position	Feedback (V)
Vent/Recirculation	0.53
Vent/Recirculation/Foot	1.2

Position	Feedback (V)
Foot	2.4
Mix	3.5
Defrost	4.6

When Vent/Rear mode is converted to Vent/Rear/Foot mode, after controlling the motor as much as the target feedback +0.5 V, the target feedback voltage is restored.

Actuator - Internal/External Air Exchange

Figure 182



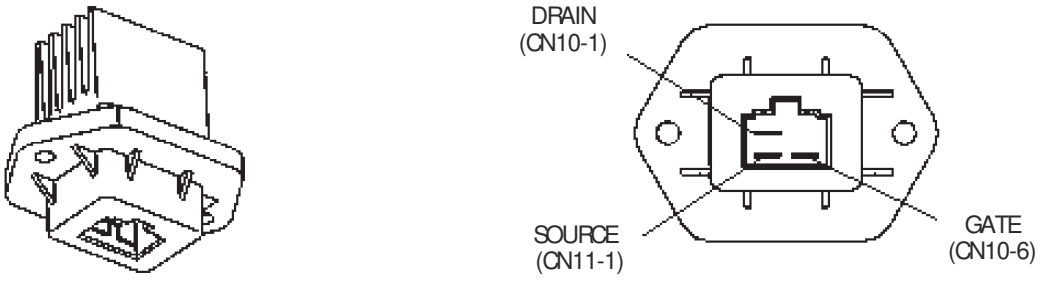
DS2301082

Mode	Output Terminal	Output
Intake	P1 (+), P2 (-)	Moving of exchange door by selecting intake.
Recirculate	P1 (-), P2 (+)	Moving of exchange door by selecting recirculate.

Airflow Control Module

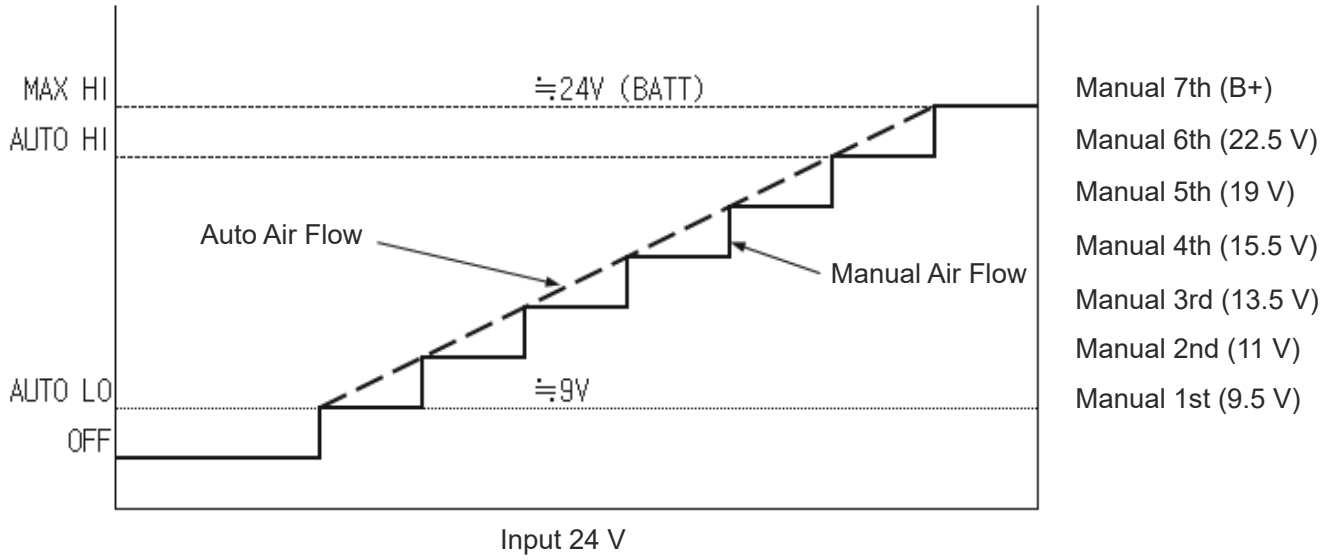
Airflow is controlled through the control of voltage between GATE and SOURCE.

Figure 183



FG001056

Figure 184

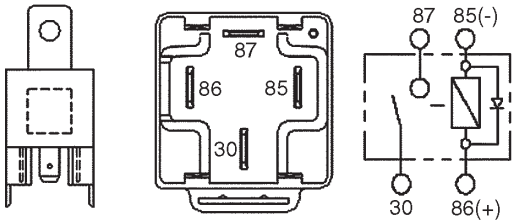


DS2301083

The airflow is based on manual set.

Relay - Blower: Power is supplied to the blower motor when the system is turned "ON".

Figure 185

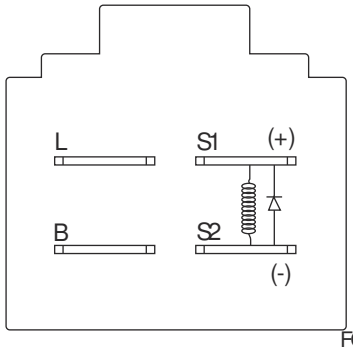


FG001057

Specifications	
Rated voltage	24V
Rated current	20A

Relay - A/C: Power is supplied to the magnetic clutch of the compressor.

Figure 186



FG001058

Specifications	
Rated voltage	24V
Rated current	10A

Duct Sensor: It is inserted in the core of the evaporator to prevent freezing of the evaporator.

Figure 187

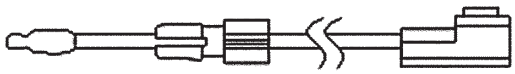
FG001059

The sensor consist of negative characteristic thermistor that resistant value increases and decreases when the temperature rises and falls, respectively.

Temperature (°C)	Resistance (KΩ)
0	11.36 ±0.1
2	10.39 ±0.2
2.5	10.17 ±0.2
3	9.95 ±0.2
3.5	9.73 ±0.2
4	9.52 ±0.2
5	9.12 ±0.2
10	7.36 ±0.15
25	4.02 ±0.08
30	3.33 ±0.07

Internal Air Temperature Sensor:Built in the internal air filter, it senses the internal temperature.

Figure 188

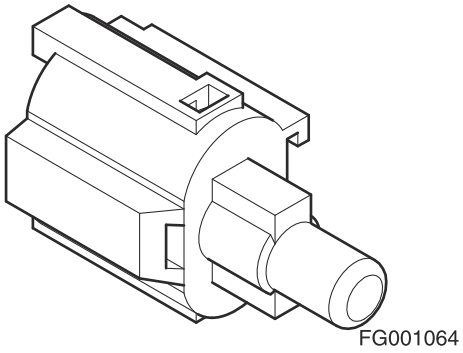


FG001061

Temperature (°C)	Resistance (KΩ)
-15	218.2 ±7.5

Temperature (°C)	Resistance (KΩ)
0	97.83 ±0.9
15	47.12 ±0.7
25	30.0 ±0.36
35	19.60 ±0.3

Figure 189



Ambient Air Temperature Sensor

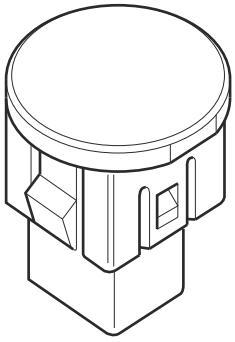
Built at the bottom of the cockpit, it senses the temperature of external air.

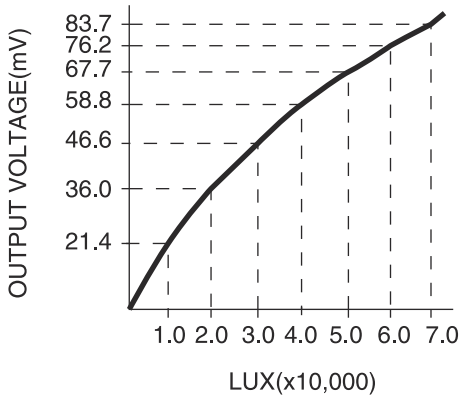
Temperature (°C)	Resistance (KΩ)
-10	163 ±4.9
0	96.9 ±2.9
10	59.4 ± 1.8
20	37.4 ±1.1
25	30 ±0.9
30	24.2 ±0.7

Photo Sensor

Built beside the socket of spare power, it senses the quantity of the sun radiation to regulate discharge temperature and airflow as set by operator.

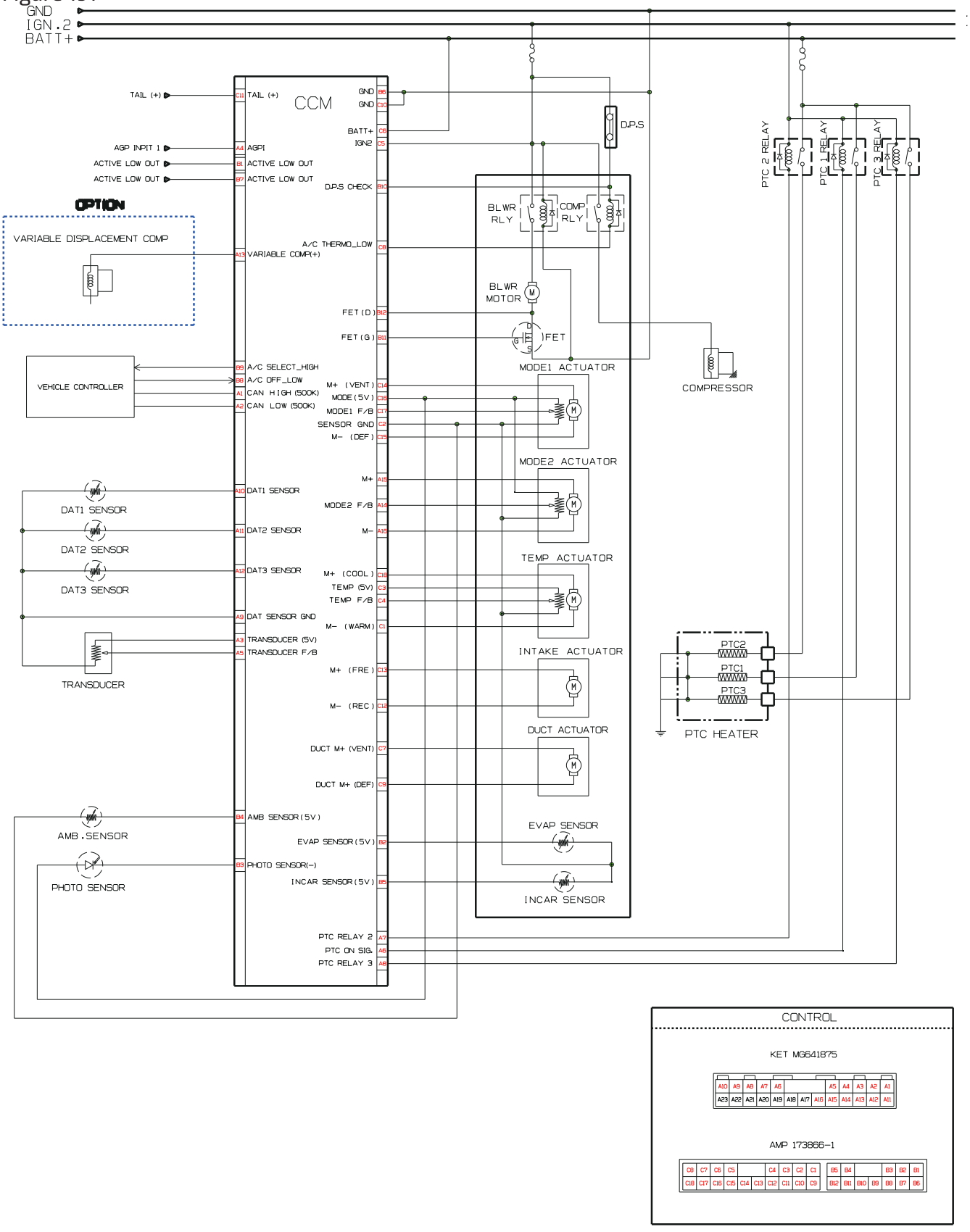
Figure 190





Air Conditioner/Heater Circuit Diagram

Figure 191

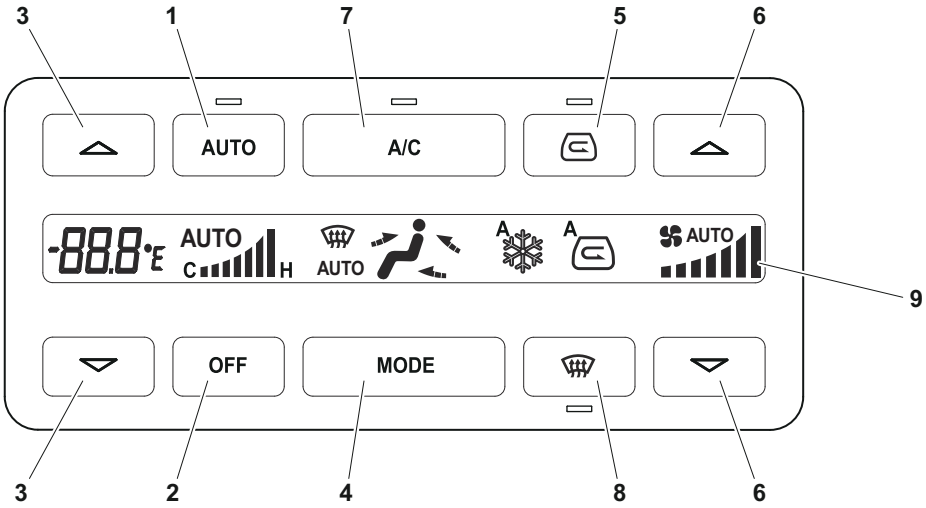


DS2301081

Control Panel

Appearance and Terminal Arrangement

Figure 192



DS2104888

1	Automatic Temperature Control Button	6	Fan Speed Selector Button
2	Off Button	7	Air Conditioner Button
3	Temperature Control Button	8	Defroster Button
4	Air Outlet Selector Button	9	LCD Display
5	Air Inlet Selector Button	-	-

Refer to "Air Conditioner and Heater" of operation manual.

Control Connector

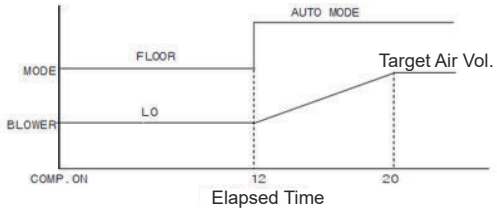
	Pin No.	Description		Pin No.	Description
Connector A	1	CAN High	Connector B	1	Active Low Out
	2	CAN Low		2	Evaporator Sensor
	3	Transducer 5V Out		3	Photo Sensor
	4	AGP Input 1		4	Ambient Sensor
	5	Transducer Feedback		5	In-car Sensor
	6	PTC 1 (Active Low Out)		6	GND
	7	PTC 2 (Active Low Out)		7	Active Low Out
	8	PTC 3 (Active Low Out)		8	Compressor Off Signal_Low
	9	DAT Sensor GND		9	A/C Select Signal_High
	10	DAT Sensor 1		10	DPS Check
	11	DAT Sensor 2		11	FET (G)_Blower Control
	12	DAT Sensor 3		12	FET (D)_Blower Feedback
	13	Variable Compressor (+)		-	-
	14	Mode 2 Feedback		-	-
	15	Mode 2 Actuator (+)		-	-

	16	Mode 2 Actuator (-)	-	-

Connector C	Pin No.	Description
	1	Temperature Actuator (Warm)
	2	Sensor GND
	3	Temperature 5V Out
	4	Temperature Feedback
	5	IGN +
	6	B +
	7	Duct Actuator (Vent)
	8	A/C Thermo Signal_Low
	9	Duct Actuator (Vent)
	10	GDN
	11	ILL +
	12	Intake Actuator (-)
	13	Intake Actuator (+)
	14	Mode Actuator (Vent)
	15	Mode Actuator (Defrost)
	16	Mode 5V Out
	17	Mode Feedback
	18	Temperature Actuator (Cool)

Control Logic

Categories	Inputs	System Operation
Auto	Set temperature Internal air temperature sensor Ambient air temperature sensor Sun sensor	1. Automatically adjust room temperature as set and then next items. 2. Auto mode is released when manually setting any switch except, Temperature Control switch in Auto mode. 3. Upon the releasing of Auto mode, all of functions except selected switch are controlled automatically.
Sensor compensation	Set temperature Internal air temperature sensor Ambient air temperature sensor	1. In case of sensor fault, the following defaults are applied: Temperature control actuator: - Set Temperature 17 - 24.5°C: Max cooling, Set Temperature 25 - 32°C: Max heating Airflow direction mode actuator - VENT: VENT fix, modes other than VENT: Fixed to DEF

<table>
<tr><th>Categories</th><th>Inputs</th><th>System Operation</th></tr>
<tr><td></td><td></td><td>* Sun sensor is not compensated.</td></tr>
<tr><td>Max cooling/ heating control</td><td>Auto Setting</td><td>1.
<table>
<tr><td></td><td colspan="2">Temperature</td></tr>
<tr><td>System</td><td>Low (Max. Cool)</td><td>High (Max. Hot)</td></tr>
<tr><td>Mode</td><td>Vent/Rear</td><td>Foot</td></tr>
<tr><td>Temp.</td><td>Max. Cool</td><td>Max. Warm</td></tr>
<tr><td>Intake</td><td>Recirculation</td><td>Fresh Air</td></tr>
<tr><td>Blower Speed</td><td>7th</td><td>6th</td></tr>
<tr><td>A/C</td><td>On</td><td>Off</td></tr>
</table>
DS2301085
When the set temperature is set to the maximum (Low or High), the automatically controlled functions are forcibly fixed and controlled as follows.
2. Returns to the previous mode when the function is canceled due to the change in the set temperature.</td></tr>
<tr><td>Starting Control of Cooling</td><td>Auto mode
Duct sensor</td><td>When Ignition Switch is ON, blower speed and wind direction are controlled to prevent unpleasant feeling due to rapid discharge of hot air right before A/C is turned on.
1. Start condition (AND condition): Ignition Off → On & A/C On, Blower Auto, Evaporator senses over 30°C
2. Control condition
 

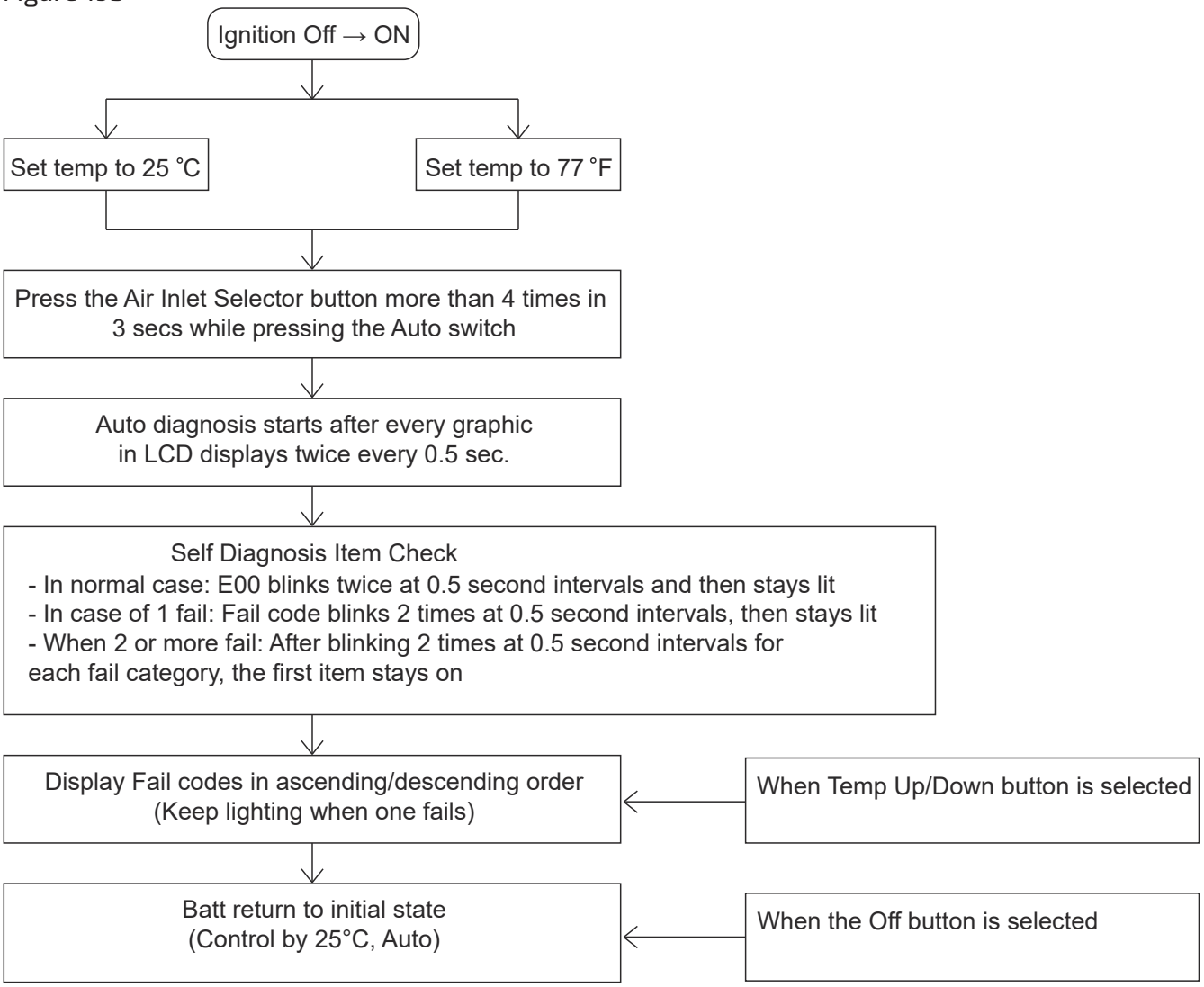
DS2301086
3. Release Conditions (OR condition): Blower Manual Selection, A/C Off, Pressing Defrost switch
4. Priority is given to starting air volume control over the maximum cooling control function based on the set temperature.</td></tr>
<tr><td>Starting control of heating</td><td>Internal air temperature sensor
Auto mode
Set Temperature</td><td>1. Start condition (AND condition for A, B, and C), (OR condition for D and E)
A. Ignition Off (After 1 hour later) → Ignition On
B. Outdoor Temperature: Below 5°C
C. System On
D. When Mode is Floor by Auto
E. For Blower Auto</td></tr>
</table>

<table>
<tr><th>Categories</th><th>Inputs</th><th>System Operation</th></tr>
<tr><td></td><td></td><td>2.
<table>
<tr><th>Outdoor Temperature (℃)</th><th>Control Time (min.)</th></tr>
<tr><td>Below -15</td><td>8</td></tr>
<tr><td>-15 ~ -10</td><td>6</td></tr>
<tr><td>-9.5 ~ -1</td><td>4</td></tr>
<tr><td>-0.5 ~ 5</td><td>2</td></tr>
</table>
DS2301087
Control condition
• During manual selection during heating control, the selected function is manually controlled and heating control is maintained.
• When Auto is selected in the manual control state, it operates as a heating control.
• When defrost on heating control, the switch indicator turns off.
• Max. Priority is given to heating control over the hot function.
• Max. Heating control is performed when the heating control entry condition is reached when cool is released.</td></tr>
<tr><td rowspan="2">Compressor control</td><td>Evaporator sensor</td><td>1. Function: Magnetic clutch of compressor is turned "ON/OFF" depending on temperature of the duct sensor to prevent the freezing of the evaporator with A/C being "ON".
2. Control pattern.  </td></tr>
<tr><td>External temperature sensor</td><td>1. Function: Prevention of compressor in winter.
2. Control pattern.  </td></tr>
</table>

Self-diagnosis

How to start self-diagnosis

Figure 193



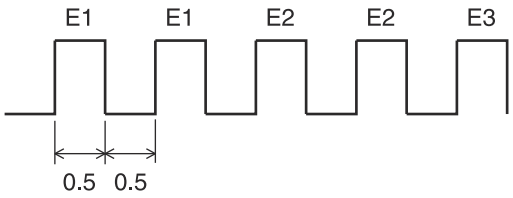
DS2301090

Error codes

Code	Description	Failure Judgment Condition
E0	Normal	-
E1	In-car sensor short	When In-car Feedback ≤ 0.1 V
E2	In-car sensor open	When In-car Feedback ≥ 4.9 V
E3	Ambient air temperature sensor short	When Ambient air temp. sensor Feedback ≤ 0.1 V
E4	Ambient air temperature sensor open	When Ambient air temp. sensor Feedback ≥ 4.9 V
E5	Evaporator sensor short	Evaporator sensor Feedback ≤ 0.1 V
E6	Evaporator sensor open	Evaporator sensor Feedback ≥ 4.9 V
E7	-	-
E8	Photo sensor open	Photo sensor Feedback ≤ 0.05 V
E9	-	-

Code	Description	Failure Judgment Condition
E10	-	-
E11	D.P.S open	D.P.S input is open
E12	Bad Mode actuator drive system	When the actuator does not reach the target position within 10 seconds
E13	Bad Temp. actuator drive system	When the actuator does not reach the target position within 10 seconds
E14	Mode actuator open or short	When Mode Feedback ≤ 0.1 V or Mode Feedback ≥ 4.9 V
E15	Temp. actuator open or short	When Temp. Feedback ≤ 0.1 V or Mode Feedback ≥ 4.9 V

Figure 194



FG001067

NOTE: *The position error means that it fails to move to designated place in 40 seconds.*

NOTE: *Sun sensor displays E8 in case of no sunlight.*

NOTE: *2 and more fails: Codes concerned blinks twice at a time.*

Ambient Temperature Display

Selection of both the SEL and MODE switch for more than 3 seconds indicates the ambient temperature in the set temperature display department.

- Range of temperature display: -40 - +60°C

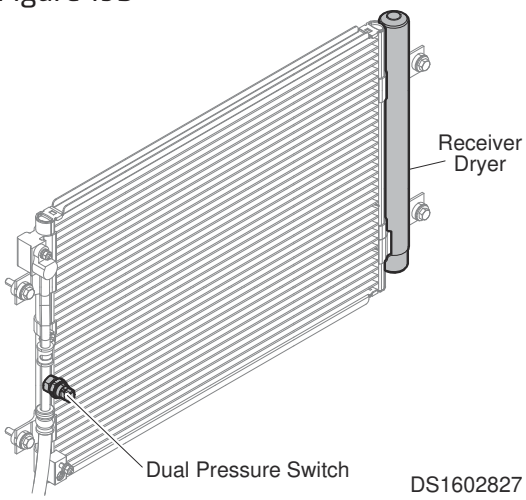
NOTE: *Display of ambient temperature may be released in the same way for its entry way.*

NOTE: *It returns automatically to default mode 5 seconds after entering the ambient air temperature display mode.*

Receiver Dryer

The receiver dryer reserves refrigerant enough to ensure smooth freezing cycle responding immediately to the change of level in the freezing cycle.

Figure 195

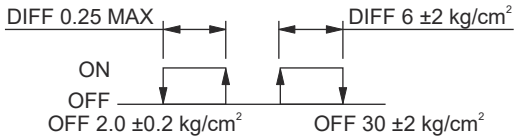


As liquid refrigerant from the condenser may contain refrigerant gas with bubbles whose presence in the expansion valve decreases the freezing power excessively, it separates liquid and gas and sends liquid only to the expansion valve.

Water in refrigerant shall be eliminated with dryer and through filter.

During refrigerant recovery and refilling, the desiccant and filter must be replaced.

- Figure 196



Refrigerant System Repairs

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always wear safety goggles and gloves when handling refrigerant. If refrigerant comes in contact with the skin or eyes, immediately flush with clean, running water and consult a physician.
Select a clean and well ventilated area to work.
The refrigerant container is under high-pressure and must be stored below 40°C (104°F). Be careful not to drop the container from a high location.
The contents are under high-pressure and should not be used with compressed air or near an open flame.

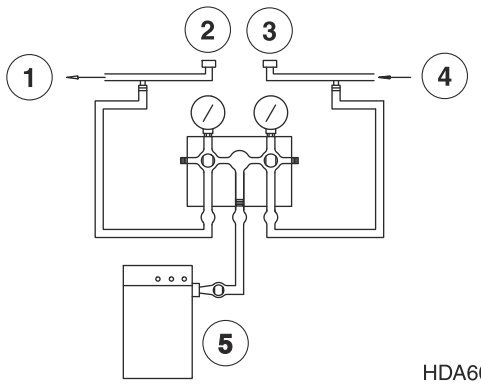
The "vacuum operation" consists of eliminating moisture in the air conditioner circuit.
If there is any moisture left inside the air conditioner circuit, various problems may occur during operation such as freezing in the small hole of the expansion valve causing the circuit to clog and rust developing in the circuit.

Refrigerant Safe Handling Procedures

The following procedures must be observed for safe handling of refrigerant during vacuum and charging process.

1. Use an approved recovery/charging device which can safely perform vacuum and charge work simultaneously.
2. When charging the refrigerant, be careful to ensure that the prescribed amount of refrigerant is filled.
3. Do not over tighten connections when working on refrigerant system.
4. The new refrigerant system standards require new tools, equipment and parts. DO NOT attempt to use equipment use in servicing the old refrigerant system.
5. The new refrigerant oil (PAG type) has a high moisture absorption characteristic. When the refrigerant system vacuum seal has been broken, immediately plug up all openings to prevent moisture from entering the system.
6. When installing flanges that use O-ring seals, apply refrigerant oil lightly to the O-ring. Be careful not to get refrigerant oil on the threaded part of the nut.
7. Be certain the O-rings are seated properly on the refrigerant line lip. Always use new O-rings when reassembling parts. Do not reuse old O-rings.
8. Refer to the refrigerant recovery and filling method for repair and replacement procedures.

Figure 197



HDA6067L

Refrigerant Recovery

Reference Number	Description
1	To Compressor
2	Low-pressure Side
3	High-pressure Side
4	To Receiver drier

Reference Number	Description
5	Refrigerant Recovery Tank

1. Attach the manifold gauge and the refrigerant recovery unit to the refrigerant lines as shown.

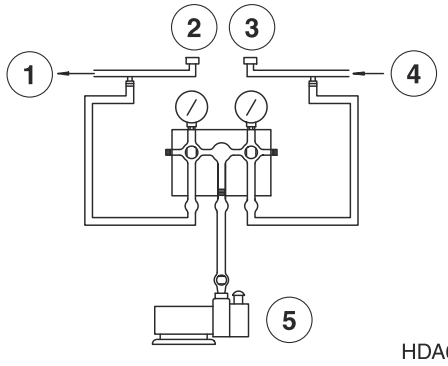
   NOTE: *Be careful not to switch the connections for the low and high-pressure valves.*

2. Open the high-pressure valve slowly to release the refrigerant to the recovery unit.

   NOTE: *Open the valve slowly, while checking to see that refrigerant is not leaking out.*

3. When the manifold gauge dial falls below 3.5 bar (50 psi), slowly open the low-pressure valve.
4. Open both the high and low-pressure valves slowly until manifold gauge dials indicates 0 bar (0 psi).

Figure 198



HDA6068L

Vacuuming Refrigerant System

Reference Number	Description
1	To Compressor
2	Low-pressure Side
3	High-pressure Side
4	From Receiver drier
5	Vacuum Pump

1. Vacuuming Procedure

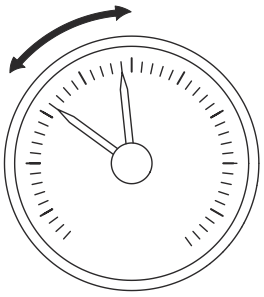
   NOTE: *When the A/C system has been exposed to the air, it must be vacuumed out. Perform vacuum process for 30 minutes for complete moisture and air evacuation.*

   A. Attach the manifold gauge and vacuum pump to the refrigerant system as shown.

   B. Turn on the vacuum pump and open both valves.

   C. After running the vacuum pump for 5 minutes, when the low pressure side gauge indicates -712~-750 mmHg (-0.95~-1 bar, -13.8~-14.5 psi), close both valves and stop the vacuum pump.

2. Figure 199



HDA6069L

Check system for vacuum leak.

Allow system to sit for 10 minutes and check whether the system is holding the pressure. If the pressure has dropped, it must be repaired before proceeding to the next step.

3. Vacuuming Procedure

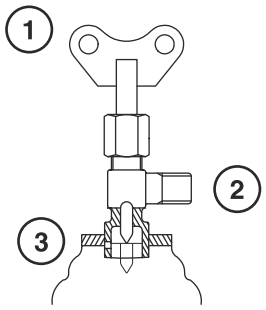
If the pressure in the unit does not fall below -675 mmHg (-0.9 bar, -13.1 psi) in 10 minutes, vacuum the system for 20 minutes.

A. Turn on the vacuum pump and slowly open both valves.

B. Run the vacuum pump for additional 20 minutes.

C. Close both valves and stop the vacuum pump.

4. Figure 200



HDA6070L

Installation of Refrigerant Container

Reference Number	Description
1	Handle
2	Hose Connection
3	Mounting Disk

A. Before mounting valve on the container, make sure the handle is in the counterclockwise most position, with the puncture pin retracted and the mounting disk is in the raised position.

B. Attach the manifold gauge center hose to the valve assembly.

C. Turn the disk in the clockwise direction and securely mount valve onto refrigerant container.

D. Turn the valve handle in the clockwise direction and puncture the container seal with the pin.

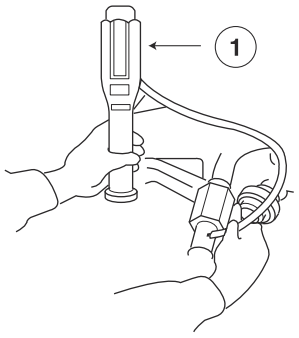
E. Once the can has been punctured, turn the handle in the counterclockwise direction so the refrigerant can flow into the manifold gauge center hose. Now, do not open the low and high-pressure valves of the manifold gauge.

F. Press the manifold gauge low side valve to eliminate the trapped air in the hose.

Leakage Check

NOTE: *Perform the leakage check after completing vacuuming process.*

1. After attaching the manifold gauge, open the high side valve.
2. Charge system until low side gauge dial indicates a pressure of 1 bar (14 psi) and close the high side valve.
3. Figure 201



HDA6071L

Using a refrigerant leak detector or soapy water check each joint for leakage.

Reference Number	Description
1	Refrigerant Leak Detection Device

4. If a leak is detected, check for O-ring damage or correct tightening torque and replace or repair as necessary.
5. If no leaks are detected, proceed with the charging process.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

For accurate refrigerant leak detection, perform leak detection procedure in a well ventilated area.

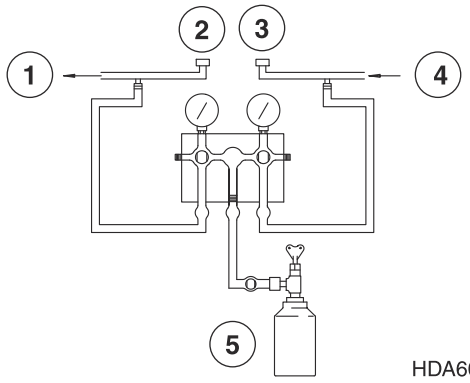
Refrigerant Charging

1. Perform the vacuuming procedure, vacuum holding and leaking tests as described in the proceeding headings.

   NOTE: *First charge the refrigerant system with 100g (3.5 ounces) of refrigerant with the engine off. Then using the manifold gauge as a guide fully charge the system with the engine running.*

NOTE: *When exchanging refrigerant containers, press the manifold gauge low side valve to eliminate air from the charging hose.*

Figure 202



HDA6072L

Reference Number	Description
1	To Compressor
2	Low-pressure Side
3	High-pressure Side
4	To Receiver drier
5	Refrigerant Supply Container

2. Charge the system by opening the manifold gauge low side valve.

   Initial charge amount: 100 g (3.5 ounces).

3. If the refrigerant does not enter well, turn the refrigerant container upside down to inject the refrigerant.While the refrigerant is being injected, measure the weight of the refrigerant container using a scale to check if the proper amount is entered.

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

When charging refrigerant system with the engine running:

- **Always keep refrigerant supply container in the upright position.**
- **Never open the high side pressure valve.**

4. Open the manifold gauge low side valve and charge system to standard capacity.

   NOTE: *Appropriate pressure at an outside temperature of 30 - 35 °C is at High pressure: about 15 - 17 kg/cm^2, Low pressure: about 1.3 - 2.0 kg/cm^2*

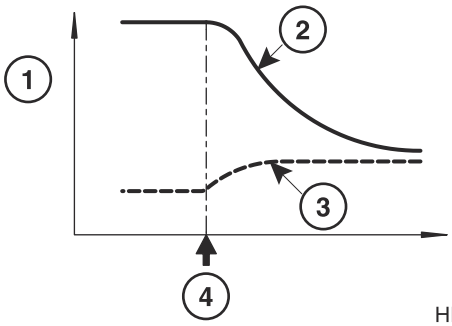
Ambient Temp. (°C)	High Pressure (PSI)	High Pressure (kg/cm^2)	Low Pressure (PSI)	Low Pressure (kg/cm^2)
21	120 - 190	8.4 - 13.3	7 - 15	0.5 - 1
27	140 - 210	9.8 - 14.7	7 - 20	0.5 - 1.4
32	170 - 240	12 - 16.8	7 - 20	0.5 - 1.4
38	190 - 270	13.3 - 19	10 - 30	0.7 - 2.1
43	210 - 300	14.7 - 21.1	10 - 30	0.7 - 2.1

NOTICE

- When outside temperature is low, warm the refrigerant supply container with warm water not exceeding 40°C (104°F). Do not allow water to come in contact with the charging adapter valve handle.
- When outside temperature is high, cool off refrigerant supply container and condenser to aid the refrigerant charging process.

5. Close low-pressure side valve.
6. Shut off engine and close refrigerant supply container adapter valve. Disconnect manifold gauge hoses from machine.

Figure 203



HDA6073L

Inspecting System For Leakage

After completing charging procedures, clean all joints and connections with a clean dry cloth. Using a refrigerant leak detecting device or soapy water, inspect system for leaks starting from the high-pressure side.

NOTE: *When the refrigerant circulation has been stopped the high-pressure will start to decrease and the low-pressure will start to increase until they are equalized. Starting the inspection from the high side will result in an accurate test.*

Reference Number	Description
1	Pressure
2	High-pressure
3	Low-pressure
4	Compressor Stop

Inspection Procedure

1. High-pressure Side

   Compressor outlet → condenser inlet → receiver dryer inlet → air conditioner unit inlet.

2. Low-pressure side

   Compressor inlet → air conditioner unit outlet.

3. Compressor

   Compressor shaft area, bolt hole area and magnetic clutch area.

4. Receiver dryer

   Pressure switch and plug area.

5. Connection valve area

   Inspect all valve areas.

   Verify all valves are capped to prevent leaking.

   Check for foreign material inside of valve cap.

6. Interior of air-conditioning unit.

   After stopping engine, insert detector probe into drain hose. (Leave inserted for 10 seconds minimum.)

   NOTE: *When inspecting leakage from the air-conditioning unit, perform the inspection in a well ventilated area.*

Approximate Refill Capacities

When removing and installing the parts of Air Conditioning, check the each component's refrigerant oil quantity.

Each component contains the appropriate oil.The oil quantity being low will cause compressor seizing and a reduction in durability. The oil quantity being high will cause a reduction in cooling capabilities.Make sure to check the oil quantity and adjust if needed.Measure the oil quantity of the removed parts. Only this oil quantity is necessary, so subtract this quantity to determine the amount by which the oil quantity of the new parts should be reduced.Example)If the remaining oil quantity of the removed compressor is 40 g: Remove 150 g - 40 g = 110 g from the new compressor to be installed.

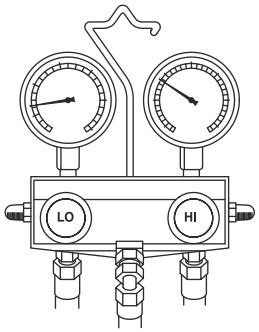
- Volume of refrigerant: R-134a, 650 g
- Refrigerant Oil: PAG 30, Refer to the below table for specific oil quantity.

Containing Refrigerant Oil Quantity					
Compressor	Condenser	HVAC (EVA)	Discharge Hose	Suction Hose	Liquid Hose
150 g	37 g	88 g	28 g	40 g	26 g

Troubleshooting

Refrigerant Pressure Check

1. Figure 204



HDA6074L

   Open all doors and windows.

2. Install manifold gauge set.
3. Start engine and maintain engine speed at 1,800 - 2,000 rpm.
4. Check high/low-pressure of refrigerant.

1	High-pressure: 8.0 - 10.0 bar (114 - 142 psi) Low-pressure: Approximately 1.0 bar(14 psi)		
Possible Cause: Low Refrigerant Level			
Step	Inspection Item		Remedy
1	Check for traces of refrigerant oil.	Yes	Reassemble using correct tightening torque.
		No	Go to next step.
2	Using a leak detection device or soapy water check for refrigerant leakage at all major components and joints.	Yes	Repair leaking component.
		No	Recharge system to correct pressure.

2	High-pressure: Over 23 bar (327 psi) Low-pressure: Approximately 2.5 - 3.0 bar(36 - 43 psi)		
Possible Cause: Overcharge, Frost on condenser			
Step	Inspection Item		Remedy
1	Check for condenser pin damage or contamination.	Yes	Clean, repair or replace condenser.
		No	Refrigerant overcharge.

3	High-pressure: Approximately 20 - 25 bar (285 - 356 psi) Low-pressure: Approximately 2.5 - 3.5 bar (36 - 50 psi)
Possible Cause: Air in system.	
A. Recover any remaining refrigerant. B. Vacuum out system. C. Recharge system. **NOTE:** *During refrigerant recovery and refilling, the desiccant and filter must be replaced.*	

4	High-pressure: Over 6 bar (85 psi) Low-pressure: Approximately 760 mmHg (Negative Pressure)		
Possible Cause: Refrigerant does not circulate			
Step	Inspection Item		Remedy
1	A. Connect manifold gauge and start engine. B. Turn on air conditioner. C. Set blower switch to HIGH position. D. Turn air conditioner OFF and wait 10 minutes.	Yes	Moisture in system, replace receiver dryer.
		No	Contaminated system, replace expansion valve. (Replace evaporator core assembly.)

4	High-pressure: Over 6 bar (85 psi) Low-pressure: Approximately 760 mmHg (Negative Pressure)		
	E. Recheck high/ low-pressure readings. Low-pressure: 1.5 - 3.3 bar (21.3 - 46.9 psi)		

5	High-pressure: Over 6 - 18 bar (85 - 256 psi) Low-pressure: 500 mmHg (Negative Pressure) - Dial indicator needle unstable.
Possible Cause: Moisture in system has iced up the expansion valve. NOTE: *When the absorbed moisture freezes the pressure readings may look normal. Careful readings must be made to determine whether pressure is in normal range.*	
A. Recover any remaining refrigerant. B. Vacuum out system. C. Recharge system. NOTE: *During refrigerant recovery and refilling, the desiccant and filter must be replaced.*	

6	High-pressure: Over 22.0 - 23 bar (313 - 327 psi) Low-pressure: 2.5 bar(36 psi)		
Possible Cause: Refrigerant pressure problem because of defective expansion valve or temperature sensor.			
Step	Inspection Item		Remedy
1	Inspect whether the temperature sensor is installed properly.	Yes	Replace expansion valve.
		No	Exchange duct sensor.

7	High-pressure: Over 7.0 - 11.0 bar (100 - 156 psi) Low-pressure: 4.0 - 6.0 bar(57 - 85 psi)
Possible Cause: Low refrigerant pressure because of poor compressor compression.	
Inspect and replace compressor if necessary.	

Removal and Installation

Engine

Safety Instructions

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicingmachine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Followwarnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correctfunction after adjustments repairs or service. Untrainedoperators and failure to follow instructions can cause deathor serious injury.

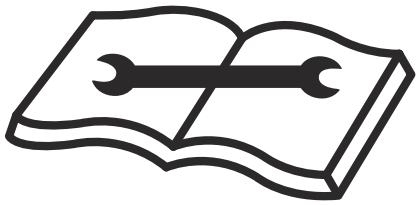
Before Removing and Installing

Preparatory Work

1. Park the machine on level ground. And lower front attachment to the ground.
2. Set parking brake switch to the parking position and then stop the engine.
3. Turn battery disconnect switch to "OFF" position.
4. Release the remaining pressure in the hydraulic circuit.
5. Cool down the hydraulic system and engine.
6. Attach a maintenance warning tag on controls.

General Precaution

1. Always read the safety section before removing and Installing.
   Figure 1



DS1901903

2. Mark the location of the bolts before removing.
3. Keep in the mind the order for tightening bolts.
4. Tighten bolts by hands, then using the tool.
5. If reusing the bolts, clean threads and apply thread locker to threads prior to installation.
6. Mark the location of wire harness connectors and hoses before disconnecting.
7. Be careful not to damage all components.
8. Do not reused gaskets, O-ring and adhesive bolts.

Completing Work

1. Check oil, coolant and fuel leak from the machine.
2. Check all oil level and if necessary, add oil.
3. Fill up the fuel tank to the standard level.
4. Apply grease to all lubrication points.
5. When fuel component has been disconnected, air must be bled from circuit.
   For details, see the Operation and Maintenance Manual.
6. When hydraulic component has been disconnected, air must be bled from circuit.
   For details, see the Operation and Maintenance Manual.
7. Start the engine and run at low idle for about 5 minutes.
8. Perform the machine performance test.

ECU (Engine Control Unit)

Repair Procedure Quick Guide

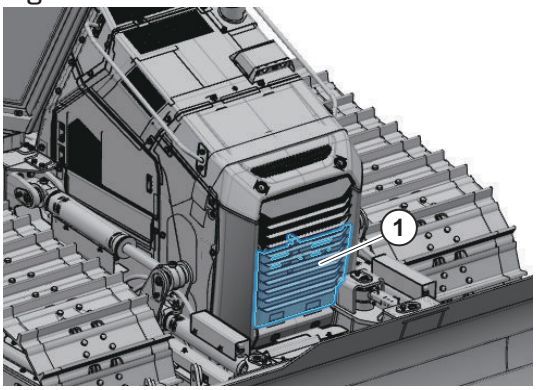
Step-A. Open front access door
Step-B. Disconnect wiring harness
Step-C. Remove ECU assembly

Removal

1. Turn OFF the battery disconnect switch.

Rear Engine Hood

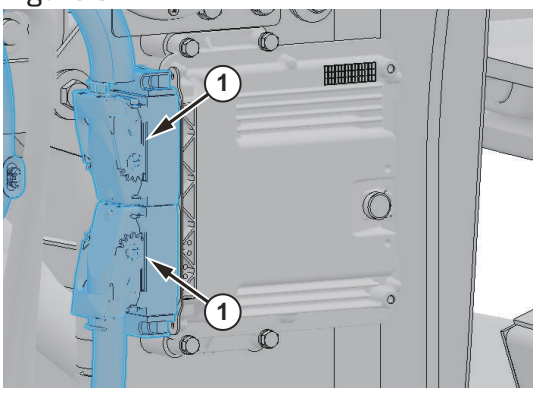
1. Open the front access door (1).
   Figure 2



DS2201117

Wiring Harness

1. Disconnect harness connectors (1) from ECU.
   Figure 3

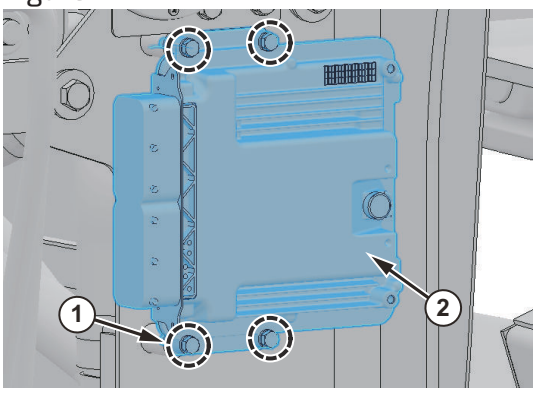


DS2200865

NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

ECU Assembly

1. Remove mounting bolts (1) and ECU assembly (2) from bracket.
   Figure 4



DS2200866

NOTE: *Do not tighten the fasteners too hard when installing.*

Installation

1. Perform installation in the reverse order to removal.

V-Belt

Repair Procedure Quick Guide

Step-A. Remove engine side cover

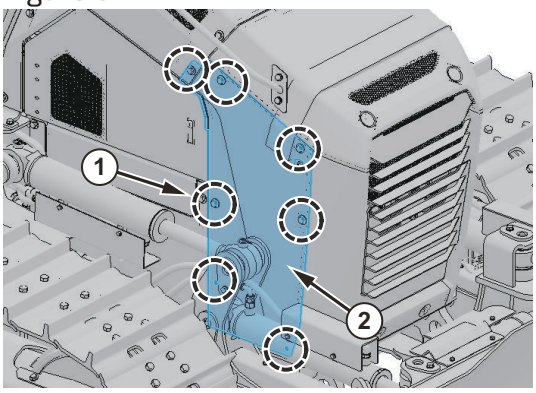
Step-B. Remove V-belt

Removal

1. Open the left side door.
2. Turn OFF the battery disconnect switch.

Engine Side Cover

1. Remove bolts (1) from engine side cover (2).
   Figure 5



DS2200867

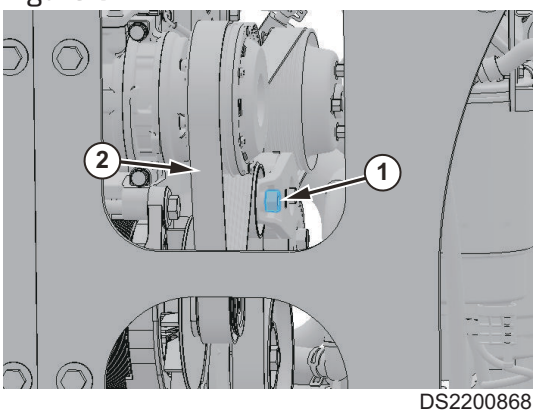
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)

2. Remove engine side cover.

V-belt

1. Insert the tool into the auto tensioner service hole (1).

   NOTE: *Before removing the belt, check the belt layout.*
   Figure 6



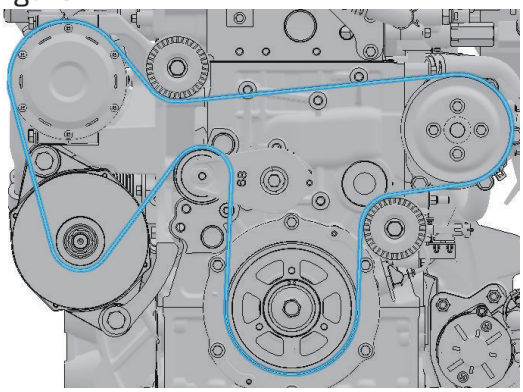
DS2200868

2. Turn the auto tensioner with tool clockwise to loosen and put away the V-belt (2).

   NOTE: *If reusing V-belt, mark the rotation direction on the belt.*

3. Carefully release the tension.

4. Remove tool from auto tensioner service hole.
   Figure 7



DS2200869

NOTE: *If equipped air conditioner compressor, please refer to V-belts layout.*

Installation

1. Perform installation in the reverse order to removal.
2. Check that V-belt is installed to the all pulley grooves.
3. Start engine.

Alternator

Repair Procedure Quick Guide

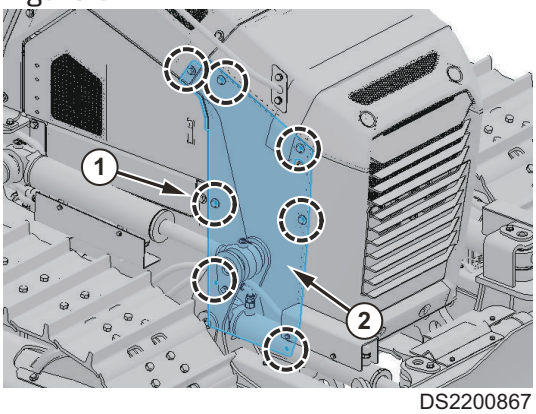
Step-A. Remove engine side cover
Step-B. Remove V-belt
Step-C. Open right side covers
Step-D. Disconnect wiring harness
Step-E. Remove alternator assembly

Removal

1. Open the left side door.
2. Turn OFF the battery disconnect switch.

Engine Side Cover

1. Remove bolts (1) from engine side cover (2).
   Figure 8



DS2200867

- Tool: 19 mm ( )
- Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)

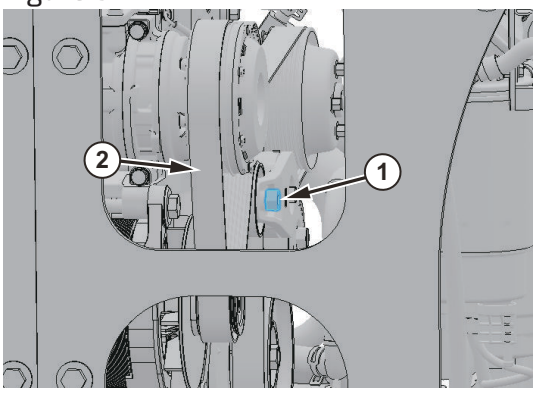
2. Remove engine side cover.

V-belt

1. Insert the tool into the auto tensioner service hole (1).

   NOTE: *Before removing the belt, check the belt layout.*

   Figure 9



DS2200868

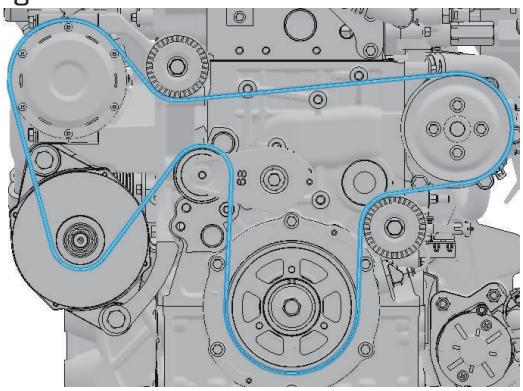
2. Turn the auto tensioner with tool clockwise to loosen and put away the V-belt (2).

   NOTE: *If reusing V-belt, mark the rotation direction on the belt.*

3. Carefully release the tension.

4. Remove tool from auto tensioner service hole.

   Figure 10

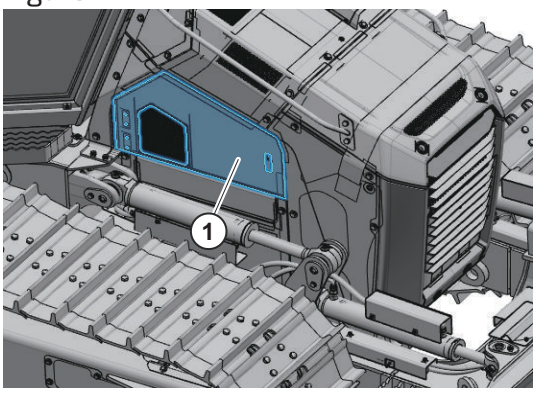


DS2200869

NOTE: *If equipped air conditioner compressor, please refer to V-belts layout.*

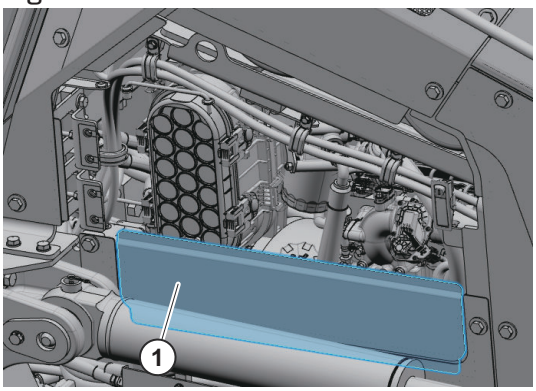
Right Side Covers

1. Open right side cover (1).
   Figure 11



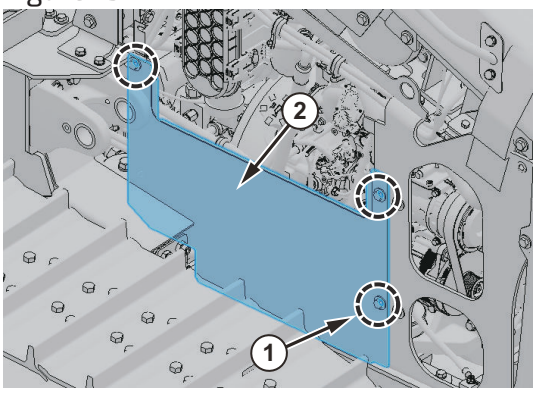
DS2201155

2. Remove side cover (1).
   Figure 12



DS2201136

3. Remove bolts (1) from side cover (2).
   Figure 13

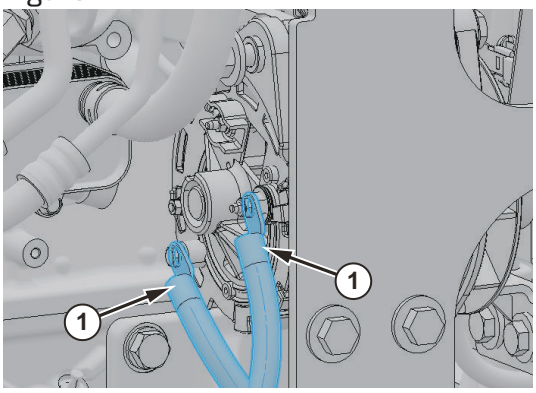


DS2200870

4. Remove side cover.

Wiring Harness

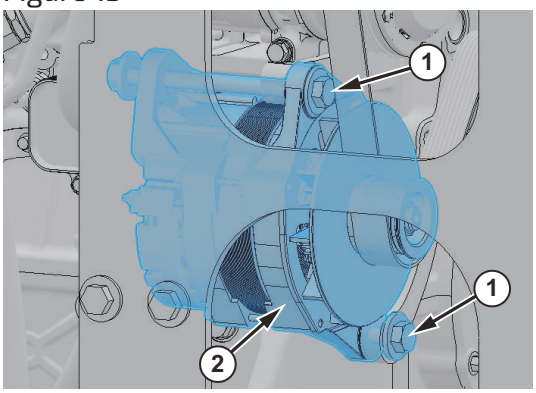
1. Disconnect wire harnesses (1) from alternator.
   Figure 14



DS2200871

Alternator Assembly

1. Remove the mounting bolts (1) from alternator.
   Figure 15



DS2200872

2. Remove the alternator (2) from engine.

Installation

1. Perform installation in the reverse order to removal.
2. Start engine.

Starter Motor

Repair Procedure Quick Guide

Step-A. Remove left side cover

Step-B. Disconnect cable

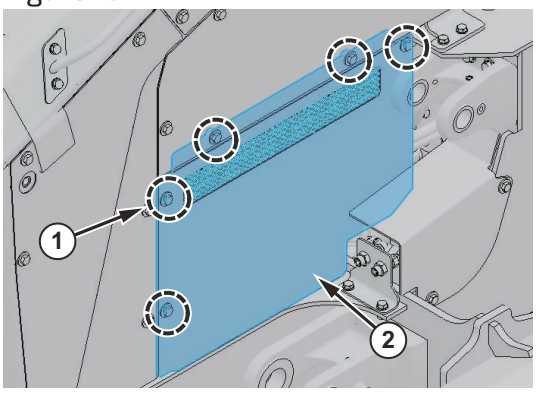
Step-C. Remove starter motor

Removal

1. Turn OFF the battery disconnect switch.

Left Side Cover

1. Remove bolts (1) from left side cover (2).
   Figure 16

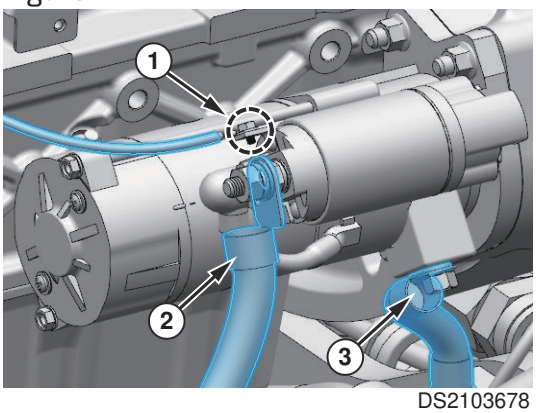


DS2200873

2. Remove left side cover.

Cable

1. Remove bolt (1) from starter motor.
   Figure 17

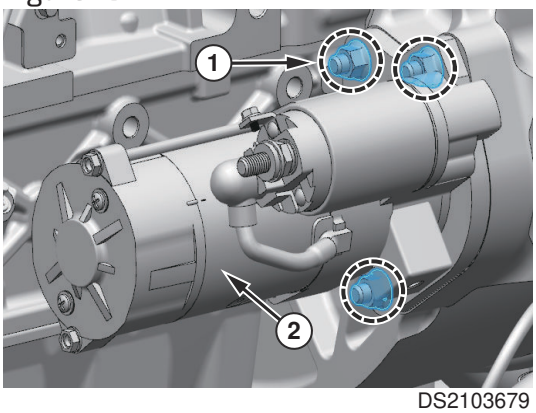


DS2103678

   - Tool: 8 mm ( )
2. Disconnect the positive cable (2) from starter motor.
   - Tool: 17 mm ( )
3. Remove mounting bolt and ground cable (3).
   - Tool: 14 mm ( )

Starter Motor

1. Remove upper mounting bolts (1) from starter motor.
   Figure 18



DS2103679

2. Remove lower mounting bolts (1) from starter motor.
3. Remove starter motor (2).
   - Tool: 14 mm ( )

Installation

1. Perform installation in the reverse order to removal.
2. Start engine.

DEF (adblue®) Quality Sensor

Repair Procedure Quick Guide

Step-A. Drain of DEF (AdBlue®)

Step-B. Open the right side doors

Step-C. Disconnect wiring harness and quick connector

Step-D. Remove DEF (AdBlue®) tank

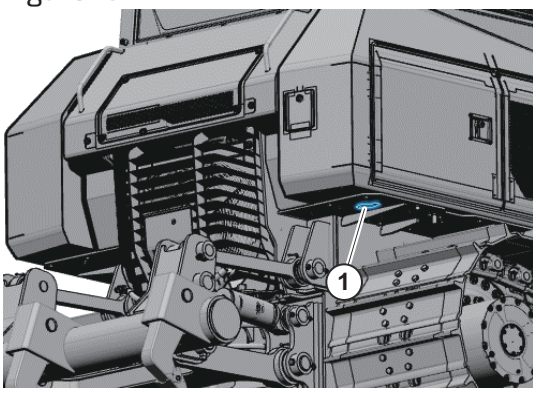
Step-D. Remove engine sensors - DEF (AdBlue®) quality sensor

Removal

1. Open the left side door.
2. Turn OFF the battery disconnect switch.

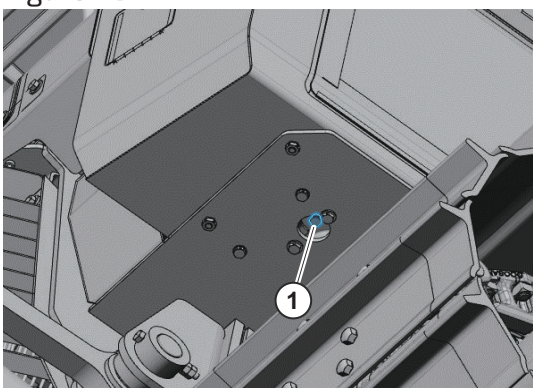
Draining of DEF (AdBlue®)

1. Remove the mounting bolts and tank under cover (1).
   Figure 19



DS2201133

2. Position a small container under drain port.
3. Remove DEF (AdBlue®) drain plug (1) from tank.
   Figure 20



DS2201134

   - DEF (AdBlue®) Tank: 27L

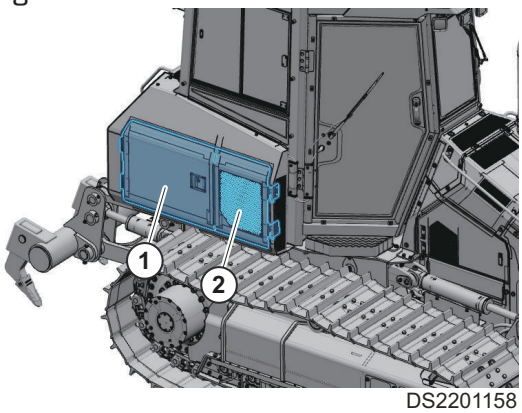
     NOTE: *The drain plug is located under the tank.*

     NOTE: *Be sure to use vinyl gloves.*

4. Drain the DEF (AdBlue®).

Right Side Doors

1. Open the right side doors (1, 2).
   Figure 21



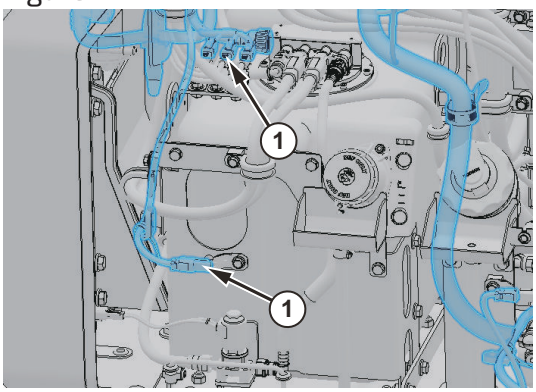
DS2201158

Remove DEF (AdBlue®) Tank

1. Disconnect wire harness connectors (1) from DEF (AdBlue®) quality sensor.

   NOTE: *Check the location of the connectors before disconnecting.*

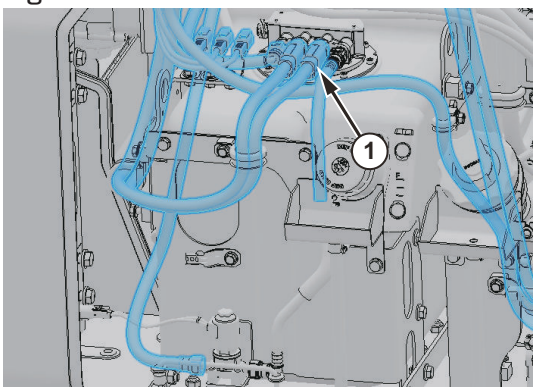
   Figure 22



DS2200881

2. Remove hoses (1) from DEF (AdBlue®) quality sensor.

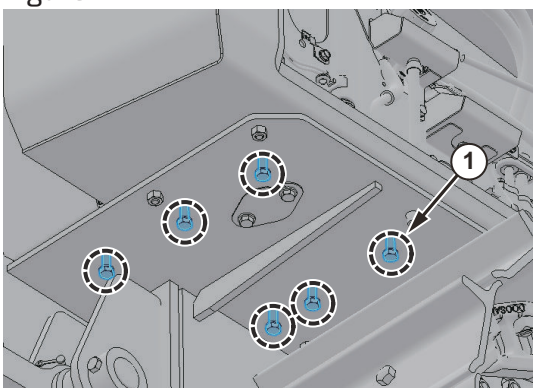
   Figure 23



DS2200882

3. Remove bolts (1) from frame.

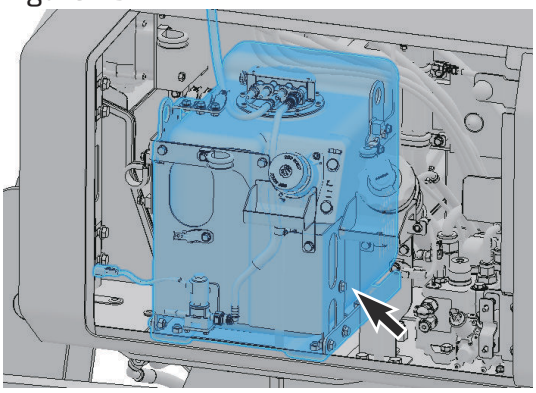
   Figure 24



DS2200883

   - Tool: 17 mm ( )
   - Torque: 63.7 N.m (6.5 kg.m, 47.0 ft lb)

4. Remove DEF (AdBlue®) tank from frame.
   Figure 25



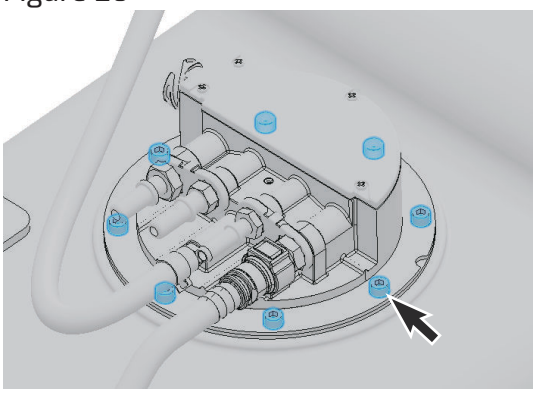
DS2200884

- DEF (AdBlue®) tank weight: about 20 kg (44.1 lb)

  NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

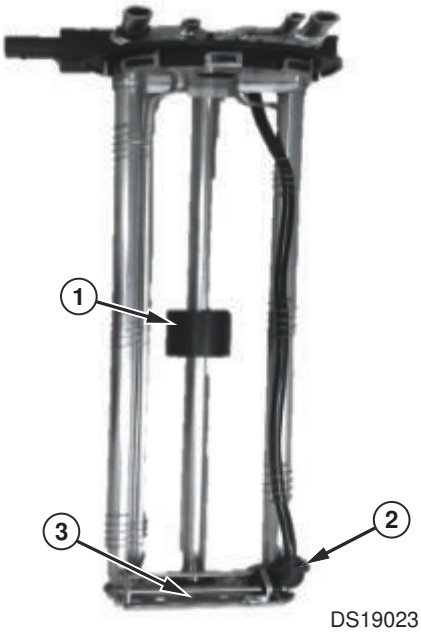
DEF (AdBlue®) Quality Sensor

1. Remove the bolts (1).
   Figure 26



DS2200885

2. Remove DEF (AdBlue®) quality sensor from tank.
   Figure 27



DS1902317

NOTE: *Quality sensor includes Level, concentration, and temperature.*

NOTE: *Be sure to use vinyl gloves.*

Installation

1. Perform installation in the reverse order to removal.

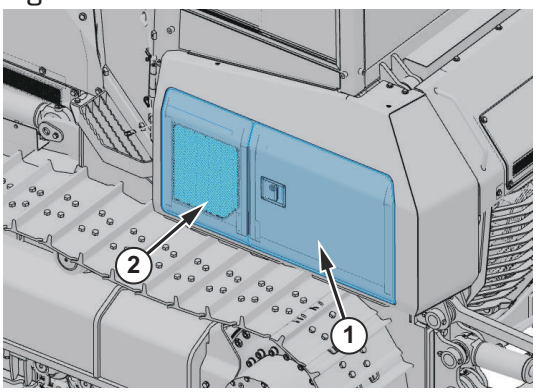
Engine Assembly

Repair Procedure Quick Guide

Step-A. Tilt the cabin
Step-B. Remove hoses under the cabin
Step-C. Remove window washer tank
Step-D. Remove cabin tilting cylinder
Step-E. Disconnect wiring harness connectors
Step-F. Remove the cabin
Step-G. Drain coolant
Step-H. Drain hydraulic oil
Step-I. Remove fan pump
Step-J. Remove main pump
Step-K. Remove support
Step-L. Remove HST pump
Step-M. Remove front cover
Step-N. Remove front radiator
Step-O. Remove muffler assembly
Step-P. Remove oil filter
Step-Q. Remove air cleaner and support
Step-R. Remove V-belt
Step-S. Remove alternator assembly
Step-T. Remove start motor
Step-U. Disconnect wiring connectors and cables
Step-V. Separate air conditioner compressor
Step-W. Remove engine mount
Step-X. Remove engine assembly

Removal

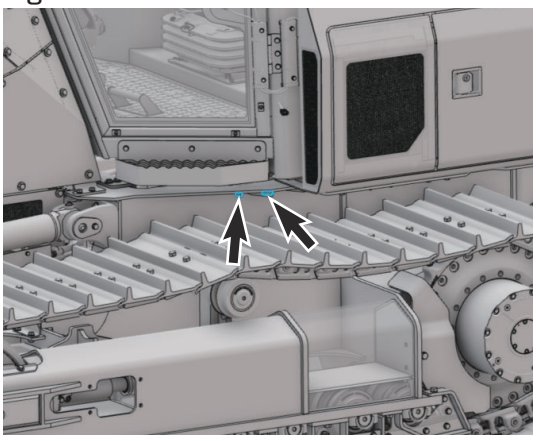
1. Open the left side door (1, 2).
   Figure 28



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 29

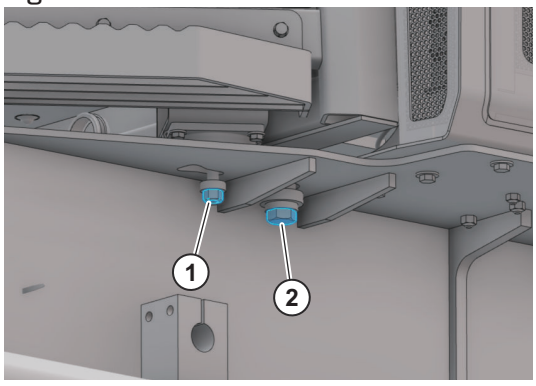


DS2201285

NOTE: *Both the left/right bolts of the cabin must be removed.*

NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 30



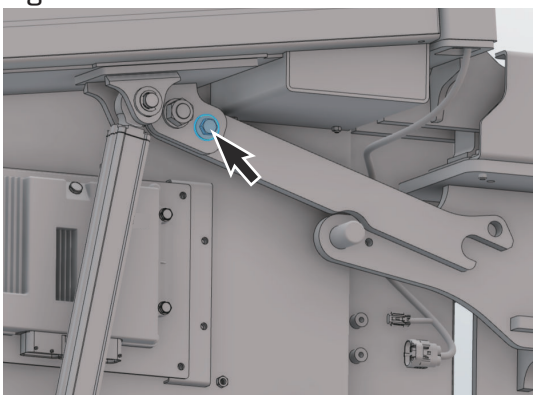
DS2201286

- Tool: 24 mm ( )
- Torque: 215.7 N.m (22 kg.m, 159 ft lb)

3. Remove bolts (2).

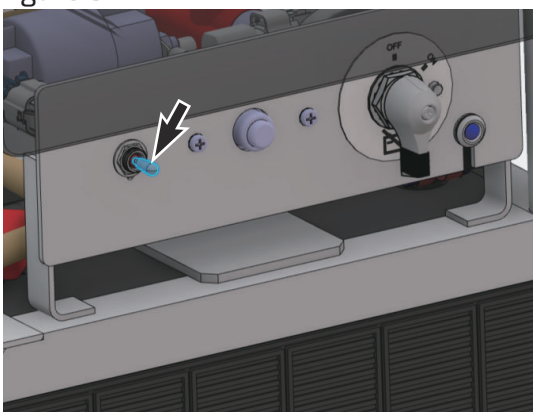
- Tool: 36mm ( )
- Torque: 127.4 N.m (13 kg.m, 94 ft lb)

4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 31



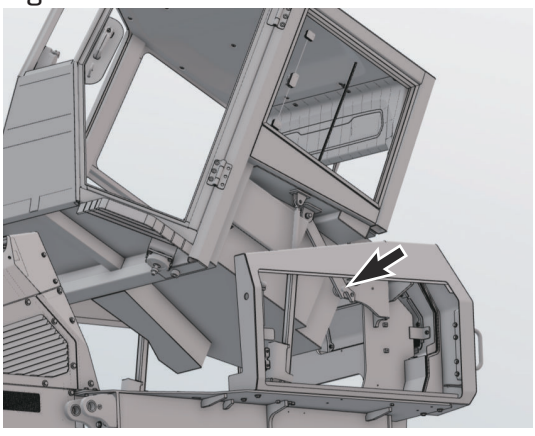
DS2201290

5. Turn cabin tilting switch to "ON" position.
   Figure 32



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.
   Figure 33



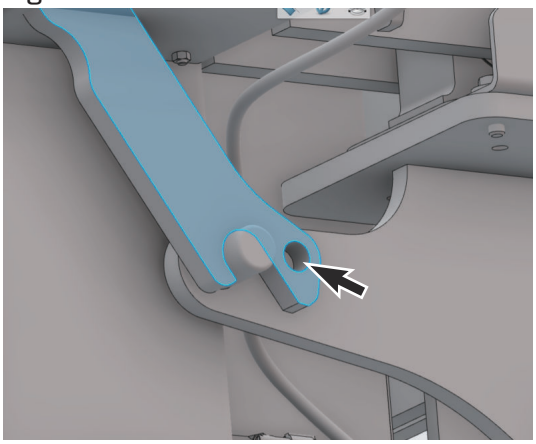
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation.
It can cause death or serious injury.

Figure 34

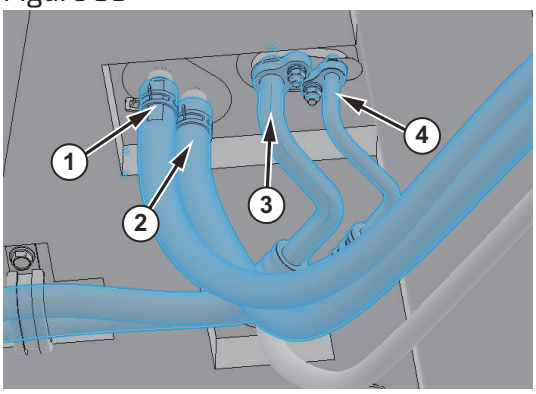


DS2201289

Hoses

1. Remove the heater hose (1).

Figure 35

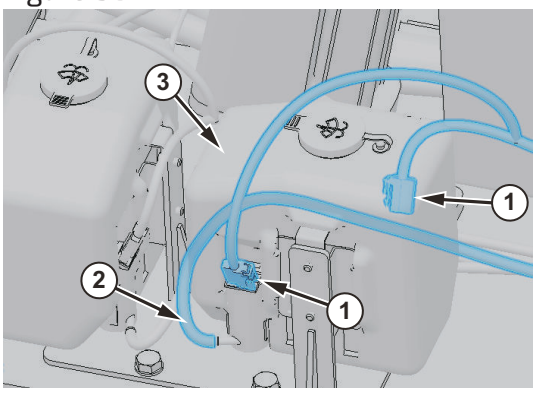


DS2200907

2. Remove the water hose (2).
3. Remove the air conditioner suction hose (3).
4. Remove the air conditioner liquid hose (4).
5. Return the tilted cabin to its original position.
6. Turn OFF the battery disconnect switch.

Window Washer Tank

1. Disconnect wiring harness (1) from window washer tank.
   Figure 36

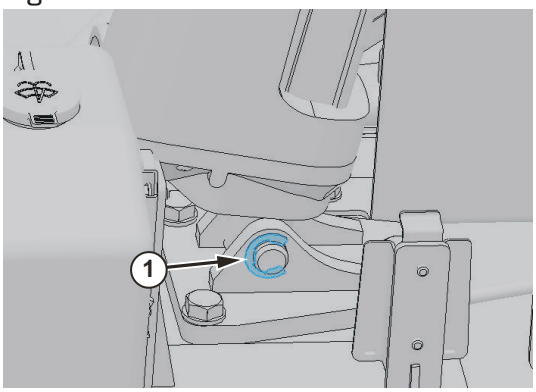


DS2200886

2. Remove water hose (2) from window washer tank.
3. Remove window washer tank (3).

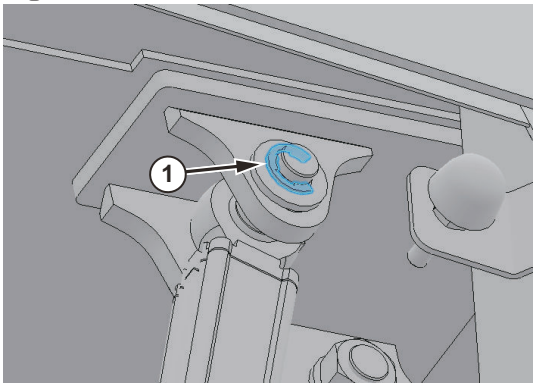
Cabin Tilting Cylinder

1. Remove the retaining ring (1) at the bottom of the cylinder.
   Figure 37



DS2200887

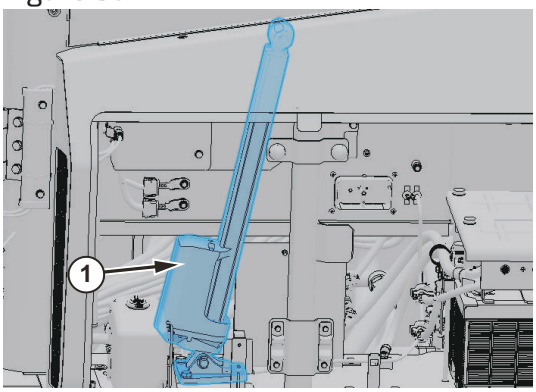
2. Remove the cylinder pin.
3. Remove the retaining ring (1) at the top of the cylinder.
   Figure 38



DS2200888

4. Remove the cylinder pin.

5. Remove the cabin tilting cylinder (1).
   Figure 39

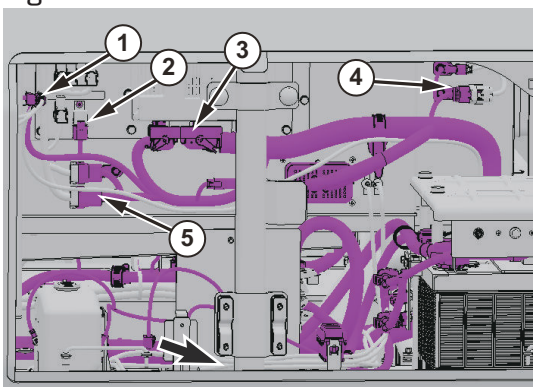


DS2200889

- Cabin tilting cylinder weight: about 10 kg (22.0 lb)

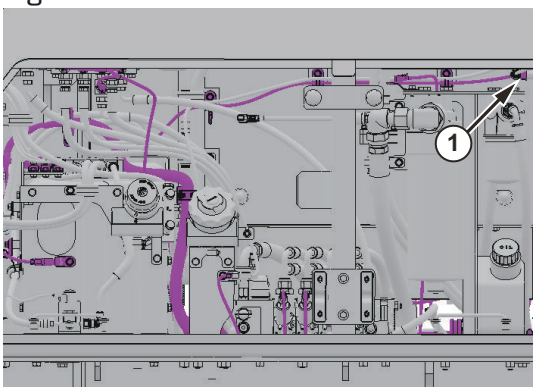
Wiring Harness Connectors

1. Disconnect wiper motor connector (1).
   Figure 40



DS2200905

2. Disconnect relay connector (2).
3. Disconnect EPOS connector (3).
4. Disconnect fan motor connector (4).
5. Disconnect wiper motor connector (1).
   Figure 41

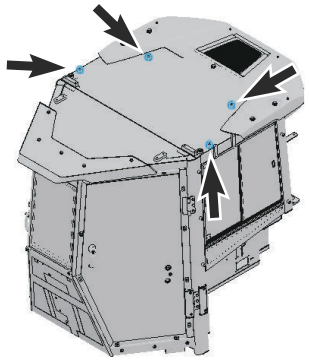


DS2200906

6. Disconnect any additional electrical connections as necessary.

Cabin

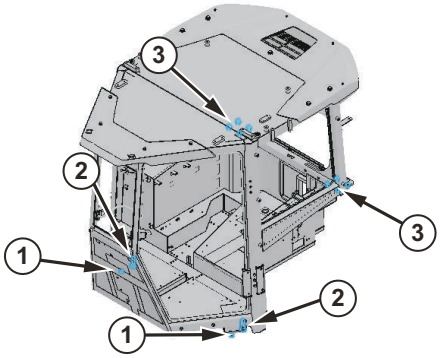
1. Using a suitable lifting device, attach slings to four lift points on top of cabin.
   Figure 42



DS2200908

   - Cabin weight: about 700 kg (1,543 lb)

2. Remove mounting nuts (1) (2 ea).
   Figure 43



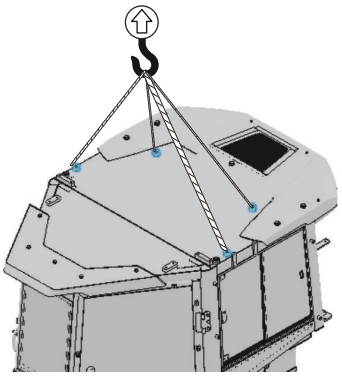
DS2200909

   - Tool: 24 mm ( )
   - Torque: 205.9 N.m (21 kg.m, 151.9 ft lb)

3. Remove mounting bolts (2) (2 ea) from cabin floor.
   - Tool: 36 mm ( )
   - Torque: 127.5 N.m (13 kg.m, 94.0 ft lb))

4. Remove hinge bolts (3) (8 ea).
   - Tool: 19 mm ( )
   - Torque: 88.3 N.m (9 kg.m, 65.1 ft lb)

5. Lift cabin approximately 25 - 50 mm (1" - 2") above deck.
   Figure 44



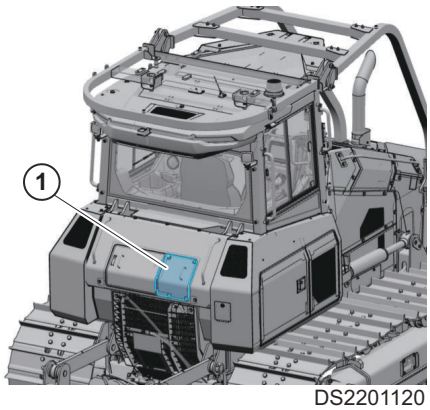
DS2200910

6. Check that all electrical connections have been disconnected and all other items unbolted.

   NOTE: *Lift operator's cabin slowly to prevent damaging.*

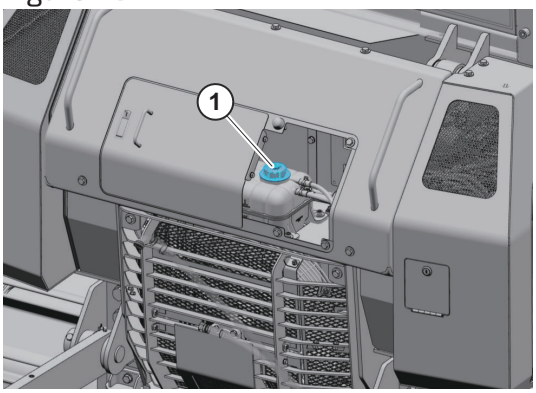
Coolant

1. Remove mounting bolts and rear cover (1).
   Figure 45



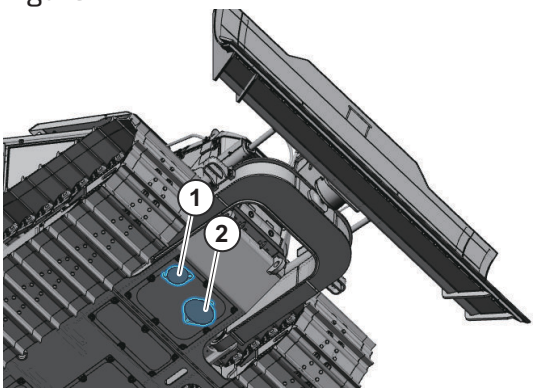
DS2201120

2. Slowly open surge tank cap (1) to allow any pressure to escape.
   Figure 46



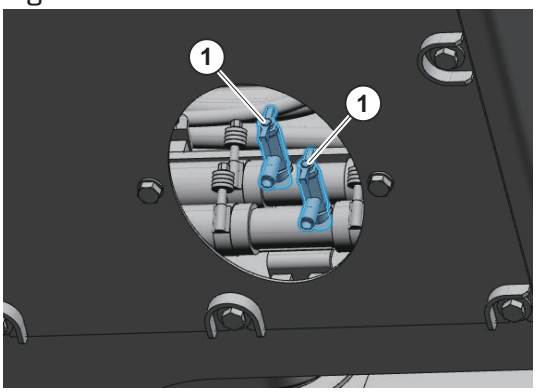
DS2201121

3. Remove mounting bolts and under cover (2) from frame.
   Figure 47



DS2201146

4. Place a container under valve and open the drain valve (1).
   Figure 48



DS2201122

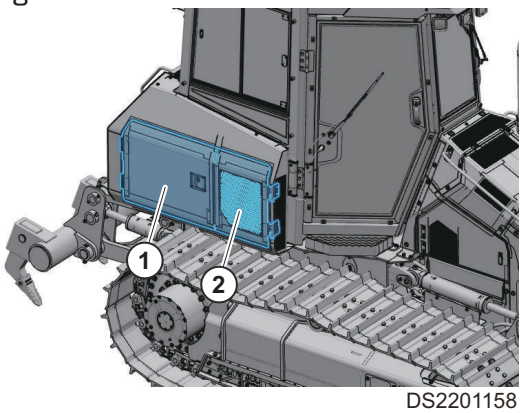
- Coolant volume: 23.5 L (6.2 U.S. gal)

  NOTE: *Dispose of drained fluids according to local applicable environmental laws and regulations.*

  For details, refer to Change Radiator Coolant of Operation Manual

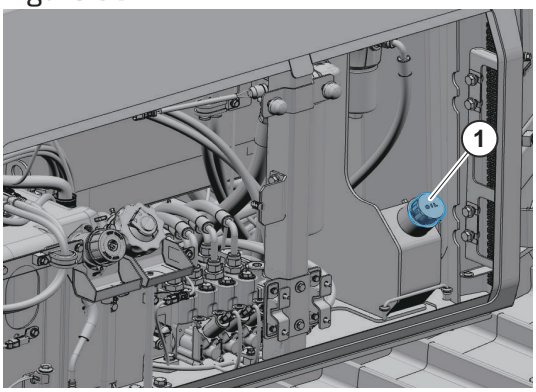
Hydraulic Oil

1. Open right side doors (1, 2).
   Figure 49



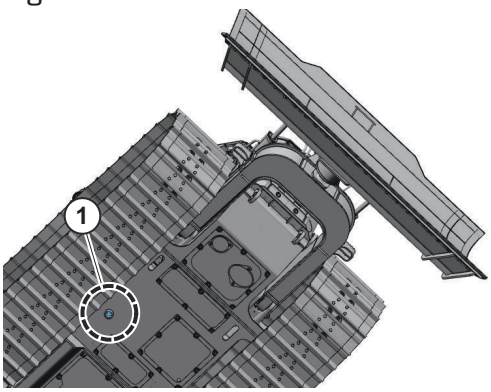
DS2201158

2. Remove hydraulic oil fill cap (1) from tank.
   Figure 50



DS2201127

3. Position a container under hydraulic tank drain plug.
   Figure 51



DS2201128

4. Remove hydraulic oil drain plug (1) from oil tank.
5. Drain hydraulic oil.
   - Hydraulic tank level: 74 L (19.5 U.S. gal)

     NOTE: *Dispose of drained fluids according to local applicable environmental laws and regulations.*

     For details, refer to Hydraulic Oil Tank - Removal and Installation.

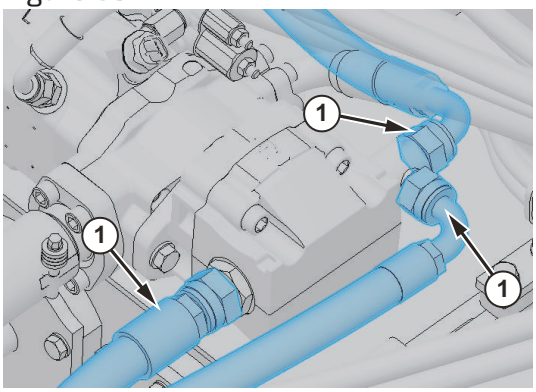
Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 52

EX1504170

2. Disconnect the hoses and adapters from fan pump.

Figure 53



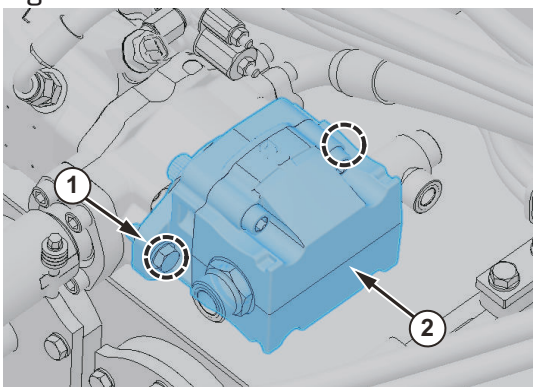
DS2200890

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from fan pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of fan pump.*

Fan Pump

1. Tie pump with rope to lift it.

Figure 54

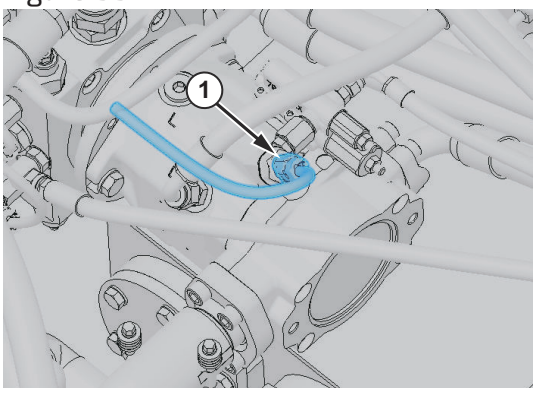


DS2200891

2. Remove mounting bolts (1) and fan pump (2) from main pump.
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
   - Fan pump weight: about 15 kg (33 lb)

Wiring Harness

1. Turn Off the battery disconnect switch.
   Figure 55



DS2200911

2. Disconnect harness connectors (1) from main pump.

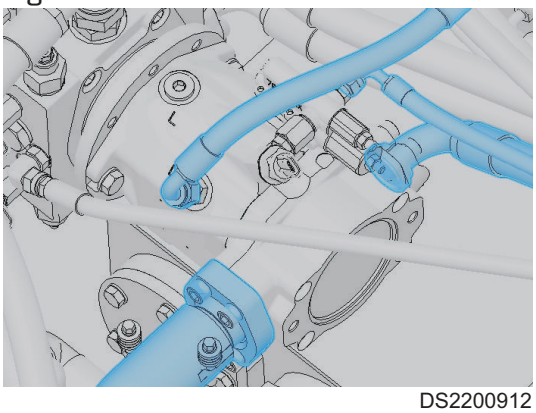
   NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 56

EX1504170

2. Disconnect the hoses and adapters from main pump.
   Figure 57

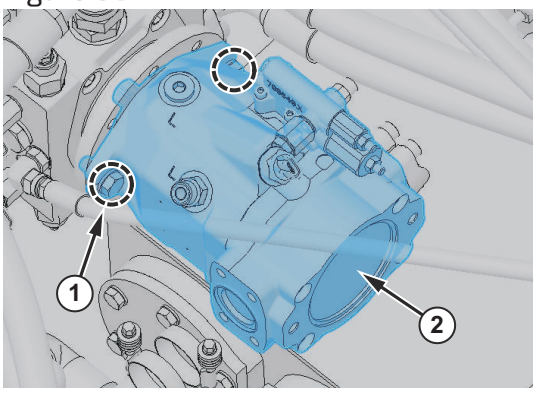


DS2200912

   NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from main pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of main pump.*

Main Pump

1. Tie pump with rope to lift it.
   Figure 58

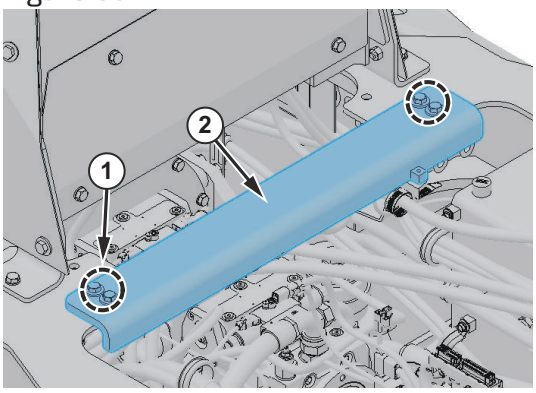


DS2200913

2. Remove mounting bolts (1) and main pump (2) from HST pump.
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
   - Fan pump weight: about 20 kg (44.1 lb)

Support

1. Remove bolts (1) from support (2).
   Figure 59

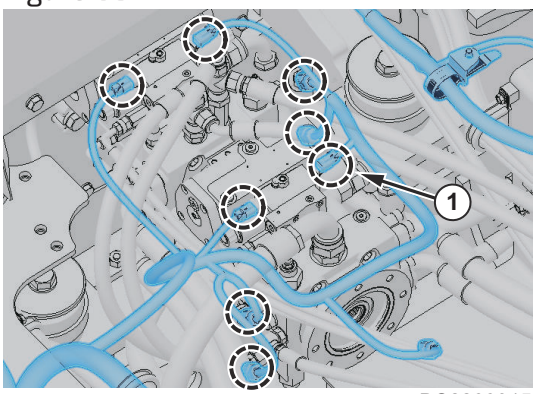


DS2200914

   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
2. Remove support (2).

Wiring Harness

1. Disconnect harness connectors (1) from HST pump.
   Figure 60



DS2200915

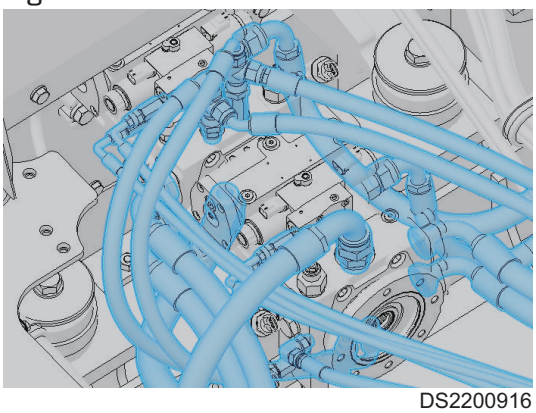
NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 61

EX1504170

2. Disconnect the hoses and adapters from HST pump.
   Figure 62

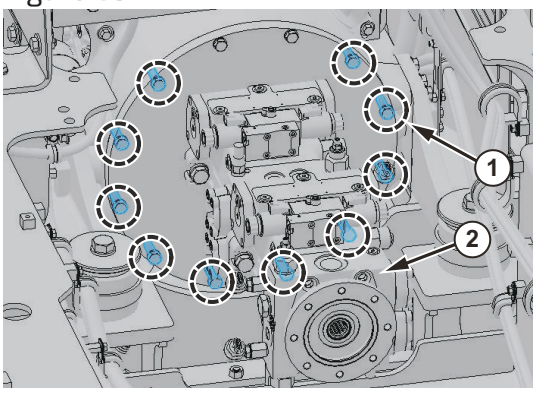


DS2200916

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from HST pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of HST pump.*

HST Pump

1. Remove bolts (1) (10 ea) of pump without top bolts (2) (2 ea).
   Figure 63

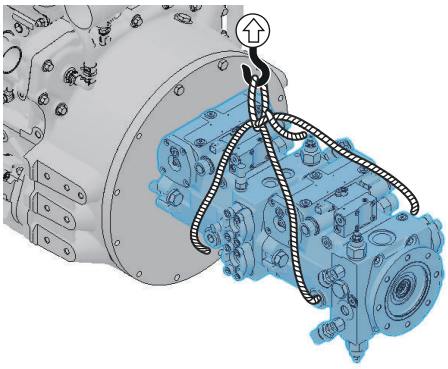


DS2200917

   - Tool: 17 mm ( )
   - Torque: 63.7 N.m (6.5 kg.m, 47 ft lb)

     NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

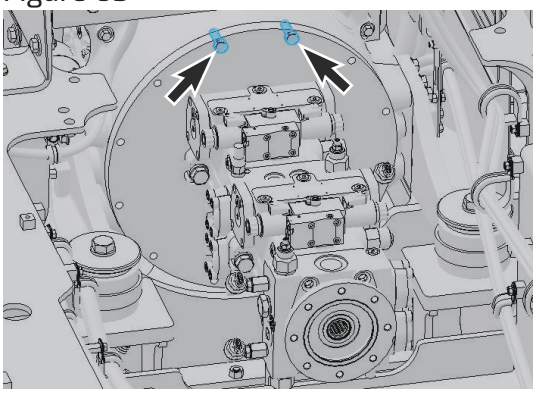
2. Attach a lifting device around pump. Raise the lifting device until the pump is supported prior to removing remaining bolts (2 ea).
   Figure 64



DS2200919

   - Weight: about 90 kg (198.4 lb)

3. Remove remaining bolts (2 ea).
   Figure 65



DS2200918

   - Tool: 17 mm ( )

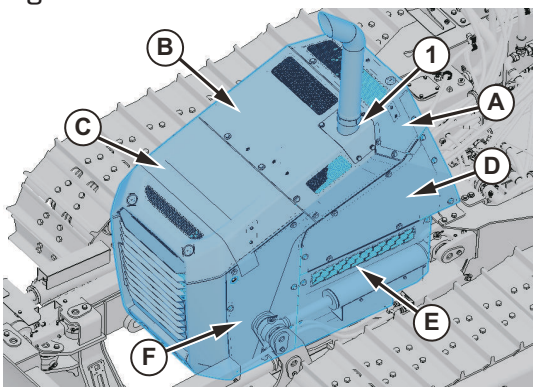
- Torque: 63.7 N.m (6.5 kg.m, 47 ft lb)

  NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

4. Lift the pump from engine slowly and carefully.

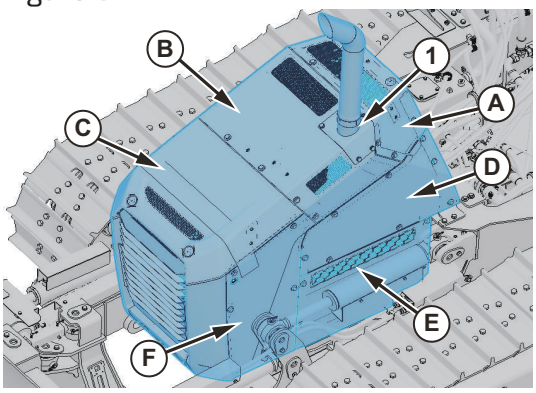
Front Cover

1. Remove V-clamp and muffler pipe.
   Figure 66



DS2200937

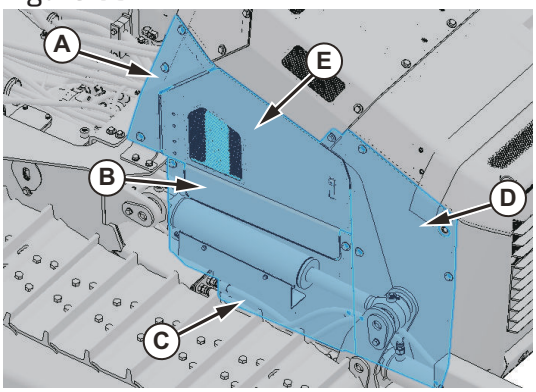
2. Remove the muffler cover (1).
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
   - Weight: about 4 kg (8.8 lb)
3. Remove bolts from all left side front cover.
   Figure 67



DS2200937

   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
   - (A) Cover Weight: about 7 kg (15.4 lb)
   - (B) Cover Weight: about 17 kg (37.5 lb)
   - (C) Cover Weight: about 35 kg (77.2 lb)
   - (D) Cover Weight: about 7 kg (15.4 lb)
   - (E) Cover Weight: about 8 kg (17.6 lb)
   - (F) Cover Weight: about 7 kg (15.4 lb)

4. Remove bolts from all right side front cover.
   Figure 68

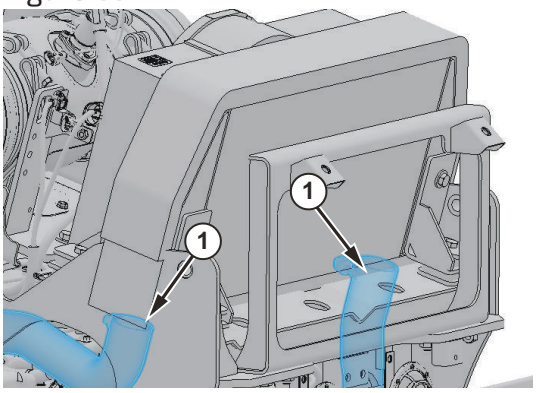


DS2200938

- Tool: 19 mm ( )
- Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
- (A) Cover Weight: about 2 kg (4.4 lb)
- (B) Cover Weight: about 2 kg (4.4 lb)
- (C) Cover Weight: about 6 kg (13.2 lb)
- (D) Cover Weight: about 7 kg (15.4 lb)
- (E) Cover Weight: about 8 kg (17.6 lb)

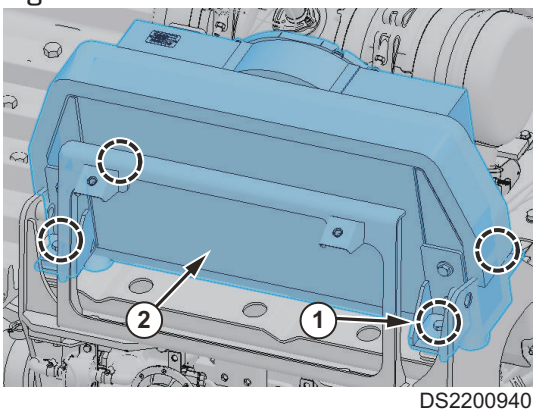
Front Radiator

1. Remove V-clamp and CAC hose (1).
   Figure 69



DS2200939

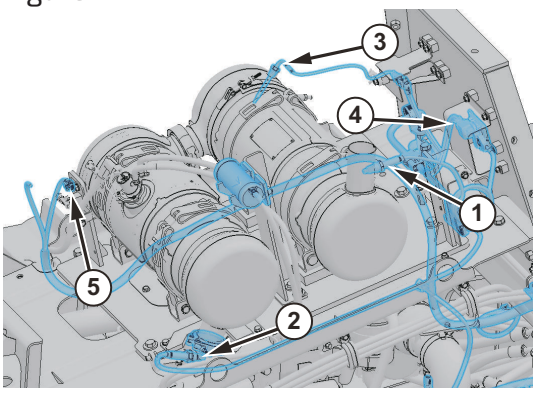
2. Remove bolts (1) and front radiator (2).
   Figure 70



DS2200940

Muffler Assembly

1. Disconnect NOx upstream sensor (1).
   Figure 71

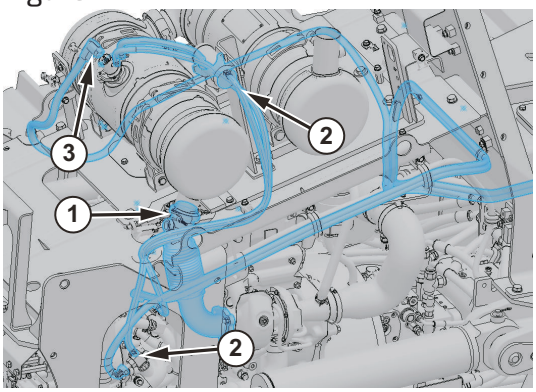


DS2200941

2. Disconnect NOx downstream sensor (2).
3. Disconnect temperature sensor (3).
4. Disconnect wiring harness (4, 5).
5. Disconnect any additional electrical connections as necessary.

   NOTE: *Be careful not to let water get into electrical components (sensor, connectors). If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

6. Remove V-clamp and exhaust hose (1).
   Figure 72



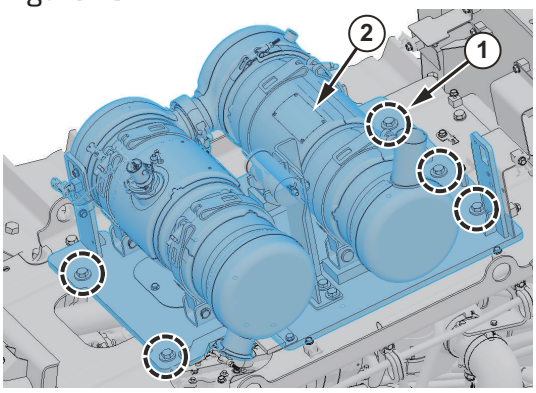
DS2200942

7. Remove water hose (2).
8. Remove DEF (AdBlue) hose (3).

   NOTE: *Be sure to use vinyl gloves disconnect DEF (AdBlue) hose.*

9. Disconnect any additional hoses as necessary.

10. Remove bolts (1) and muffler assembly (2).
Figure 73

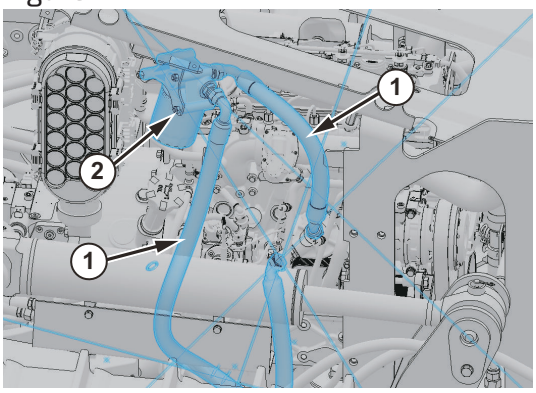


DS2200943

- Tool: 19 mm ( )
- Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
- Fan pump weight: about 30 kg (66.1 lb)

Oil Filter

1. Remove oil cooler hoses (1) and oil filter mounting bolts (4ea, 2).
Figure 74



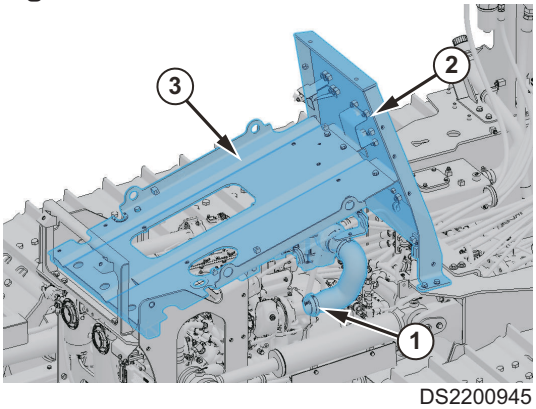
DS2200944

- Tool: 13 mm ( )
- Torque: 29.4 N.m (3 kg.m, 21.7 ft lb)

2. Remove oil filter.

Air Cleaner and Support

1. Remove clamp (1) from air cleaner hose.
Figure 75



DS2200945

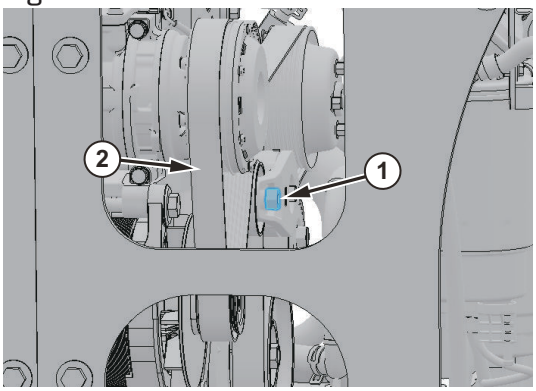
2. Remove mounting bolts from side support (1) and middle support (2).
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
3. Remove side support and middle support.
   - Side support weight: about 40 kg (88.2 lb)
   - Middle support weight: about 35 kg (77.2 lb)

V-belt

1. Insert the tool into the auto tensioner service hole (1).

   NOTE: *Before removing the belt, check the belt layout.*

   Figure 76



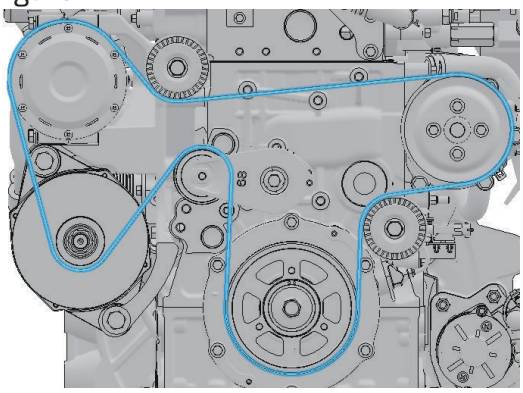
DS2200868

2. Turn the auto tensioner with tool clockwise to loosen and put away the V-belt (2).

   NOTE: *If reusing V-belt, mark the rotation direction on the belt.*

3. Carefully release the tension.
4. Remove tool from auto tensioner service hole.

   Figure 77

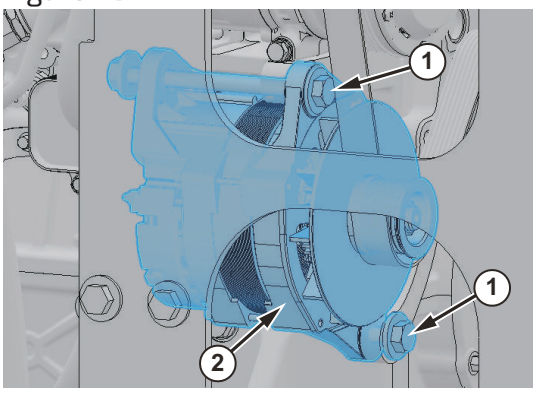


DS2200869

NOTE: *If equipped air conditioner compressor, please refer to V-belts layout.*

Alternator Assembly

1. Remove the mounting bolts (1) from alternator.
   Figure 78

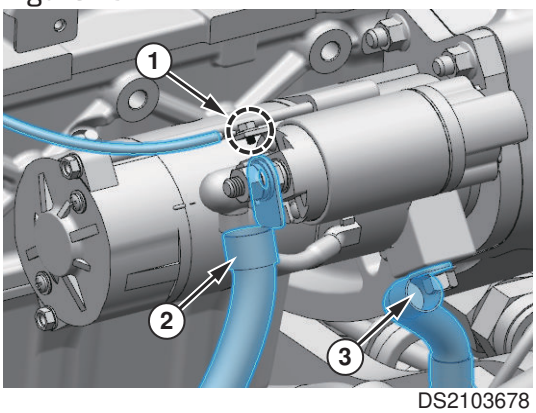


DS2200872

2. Remove the alternator (2) from engine.

Cable

1. Remove bolt (1) from starter motor.
   Figure 79



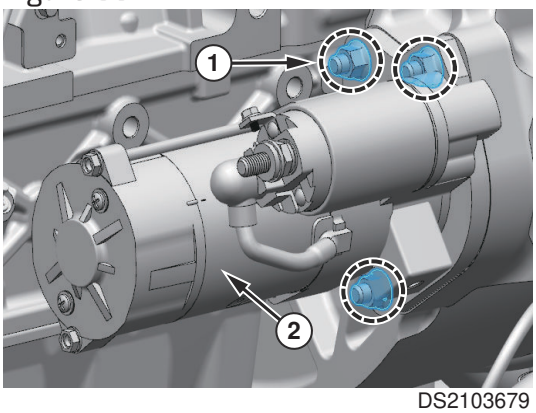
DS2103678

   - Tool: 8 mm ( )

2. Disconnect the positive cable (2) from starter motor.
   - Tool: 17 mm ( )
3. Remove mounting bolt and ground cable (3).
   - Tool: 14 mm ( )

Starter Motor

1. Remove upper mounting bolts (1) from starter motor.
   Figure 80

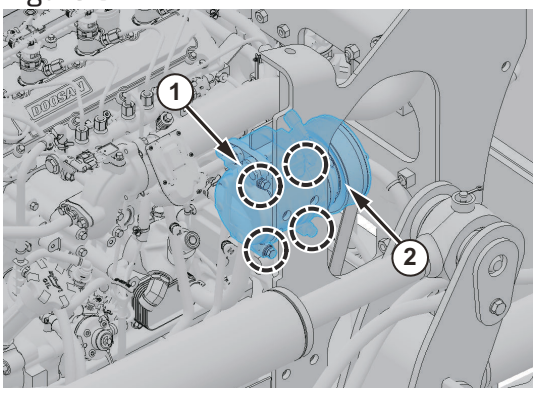


DS2103679

2. Remove lower mounting bolts (1) from starter motor.
3. Remove starter motor (2).
   - Tool: 14 mm ( )

Air Conditioner Compressor

1. Remove mounting bolts (4ea, 1) from air conditioner compressor.
   Figure 81



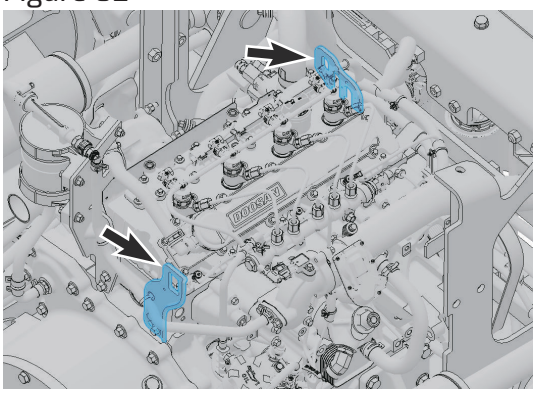
DS2200946

2. Separate air conditioner compressor (2) from engine.

   NOTE: *Do not disconnect air conditioner hoses from compressor.*

Engine Mount

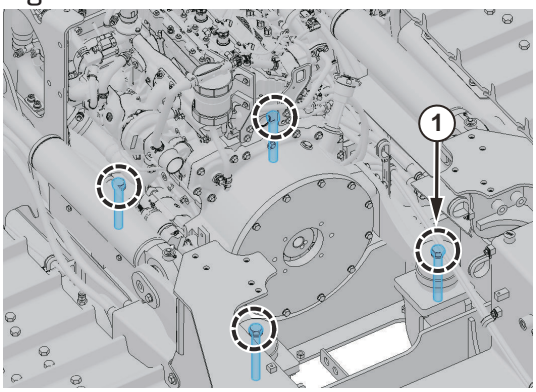
1. Attach a lifting device at lifting point.
   Figure 82



DS2200947

- Engine weight: about 370 kg (815.7 lb)

2. Remove the engine mounting bolts (1).
   Figure 83



DS2200948

   - Tool: 30 mm ( )
   - Torque: 451 N.m (46 kg.m, 333 ft lb)

   NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

   NOTE: *Mark the location of the bolts before removing.*

   NOTE: *Check the location of the engine mounting rubbers before removing.*

3. Lift the engine assembly from machine slowly and carefully.

Engine Assembly

1. Disconnect engine wire harness from engine.
2. Install the engine to the engine stand.
3. Transfer parts as needed.

Installation

1. Perform installation in the reverse order to removal.

Hydraulic Systems And Structure

Safety Instructions

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicingmachine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Followwarnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correctfunction after adjustments repairs or service. Untrainedoperators and failure to follow instructions can cause deathor serious injury.

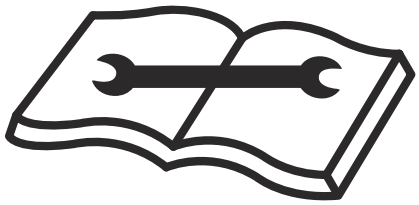
Before Removing and Installing

Preparatory Work

1. Park the machine on level ground. And lower front attachment to the ground.
2. Set parking brake switch to the parking position and then stop the engine.
3. Turn battery disconnect switch to "OFF" position.
4. Release the remaining pressure in the hydraulic circuit.
5. Cool down the hydraulic system and engine.
6. Attach a maintenance warning tag on controls.

General Precaution

1. Always read the safety section before removing and Installing.
   Figure 84



DS1901903

2. Mark the location of the bolts before removing.
3. Keep in the mind the order for tightening bolts.
4. Tighten bolts by hands, then using the tool.
5. If reusing the bolts, clean threads and apply thread locker to threads prior to installation.
6. Mark the location of wire harness connectors and hoses before disconnecting.
7. Be careful not to damage all components.
8. Do not reused gaskets, O-ring and adhesive bolts.

Completing Work

1. Check oil, coolant and fuel leak from the machine.
2. Check all oil level and if necessary, add oil.
3. Fill up the fuel tank to the standard level.
4. Apply grease to all lubrication points.
5. When fuel component has been disconnected, air must be bled from circuit.
   For details, see the Operation and Maintenance Manual.
6. When hydraulic component has been disconnected, air must be bled from circuit.
   For details, see the Operation and Maintenance Manual.
7. Start the engine and run at low idle for about 5 minutes.
8. Perform the machine performance test.

Drive Coupling

Repair Procedure Quick Guide

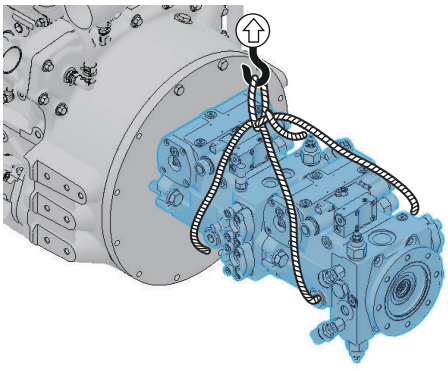
Step-A. Remove HST pump

Step-B. Remove drive coupling

Removal

HST Pump

1. Remove the HST pump.
   Figure 85



DS2200919

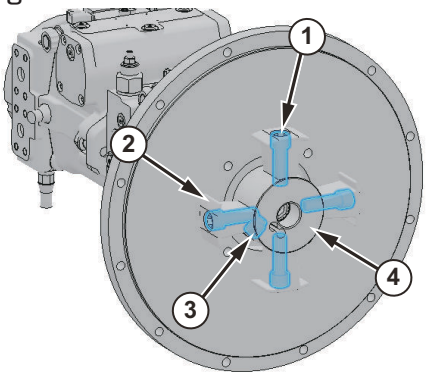
   For details, refer to HST pump - Removal and Installation.

   When the pump is removed from an engine, the hub and insert would be attached on the pump.

Drive Coupling Assembly

Main Pump Side

1. Remove bolts (1) and inserts (2) from the hub (4).
   Figure 86

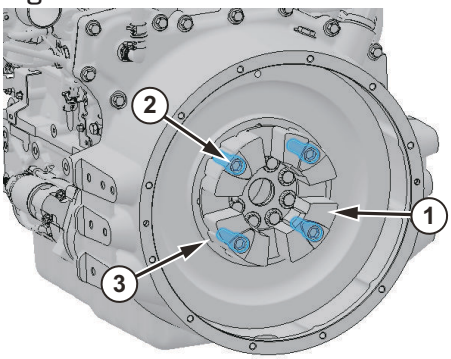


DS2200921

   - Torque: 215.7 N.m (22 kg.m, 159.1 ft lb)
2. Remove clamp screws (3) and hub (4) from the main pump shaft.
   - Torque: 107.8 N.m (11 kg.m, 79.5 ft lb)

Engine Side

1. Remove element (1) and bolts (2) with inserts (3) and spring pins from flywheel.
   Figure 87



DS2200920

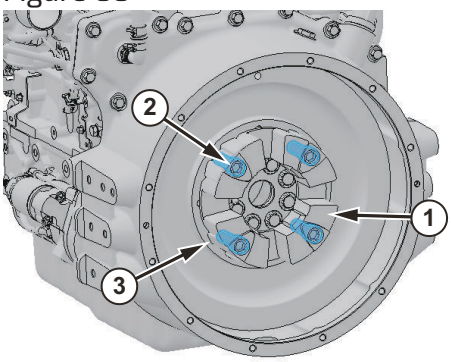
   - Tool: 14 mm ( )
   - Torque: 215.7 N.m (22 kg.m, 159.1 ft lb)

Installation

Drive Coupling

Engine Side

1. Install bolts (2) and inserts (3) with element (1) to flywheel.
   Figure 88

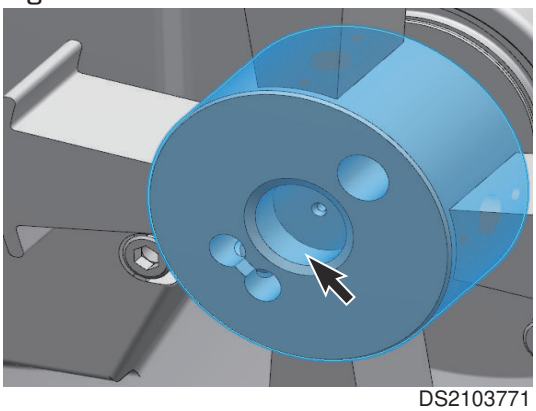


DS2200920

   - Tool: 14 mm ( )
   - Torque: 215.7 N.m (22 kg.m, 159.1 ft lb)

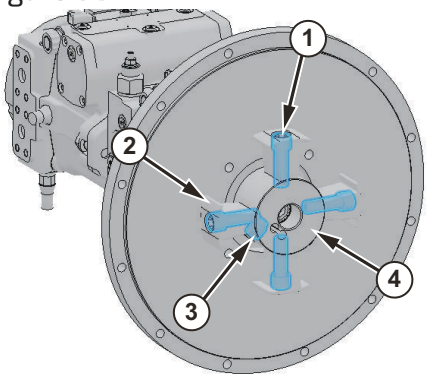
Main Pump Side

1. Check the “E” mark on the hub, it is must install toward engine side.
   Figure 89



DS2103771

2. Clearance between from pump shaft to coupling hub must be 1.85 mm.
3. Install clamp screws (3) and hub (4) to the main pump shaft.
   Figure 90



DS2200921

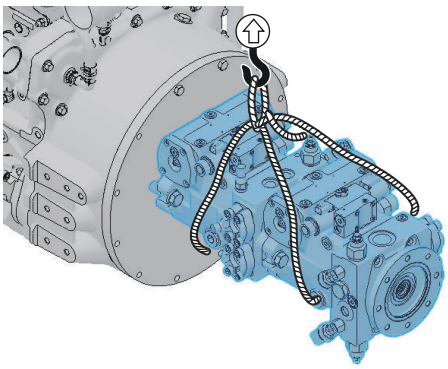
   - Torque: 107.8 N.m (11 kg.m, 79.5 ft lb)

NOTE: *Apply adhesive (Loctite #262) to the clamp screws*

4. Install bolts (1) and inserts (2) to the hub (4).
   - Torque: 215.7 N.m (22 kg.m, 159.1 ft lb)

HST Pump Assembly

1. Install the HST pump assembly.
   Figure 91



DS2200919

For details, refer to HST Pump - Removal and Installation.

NOTICE

Element is not resistant to bonding compounds, oil or grease.
Be careful not to expose them to it.

Remove oil or dirt from flywheel cover and pump shaft before assembly.

Undercovers

Repair Procedure Quick Guide

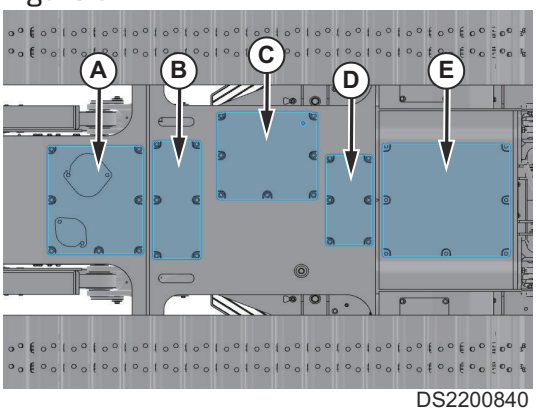
Step-A. Place the machine in the suitable service position

Step-B. Removel Undercovers

Removal

Undercovers

1. Position the machine on even, firm and level ground.
   Figure 92



DS2200840

2. Put attachment on ground.

   NOTE: *Place the machine in the suitable service position*

3. Remove undercovers.
   - Undercover (A)
     - Tool: 19 mm ( )
     - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
     - Weight: about 8 kg (17.6 lb)
   - Undercover (B)
     - Tool: 19 mm ( )
     - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
     - Weight: about 5 kg (11.0 lb)
   - Undercover (C)
     - Tool: 19 mm ( )
     - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
     - Weight: about 8 kg (17.6 lb)
   - Undercover (D)
     - Tool: 19 mm ( )
     - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
     - Weight: about 4 kg (8.8 lb)
   - Undercover (E)
     - Tool: 19 mm ( )
     - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
     - Weight: about 13 kg (28.7 lb)

Installation

1. Perform installation in the reverse order to removal.

Joystick Valve(Work Lever)

Repair Procedure Quick Guide

Step-A. Remove armrest

Step-B. Remove left stand covers

Step-C. Remove left joystick

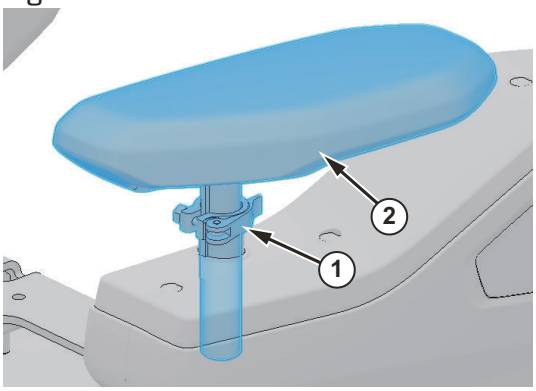
Step-D. Remove right stand covers

Step-E. Remove right joystick

Removal

Armrest

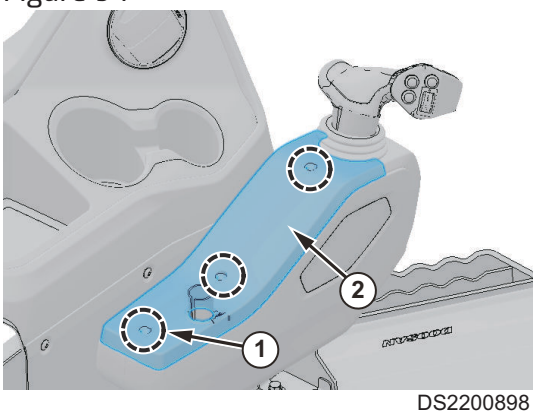
1. Remove the arm rest (2) by pulling the lever (1) of the arm rest.
   Figure 93



DS2200897

Stand Cover - Left Side

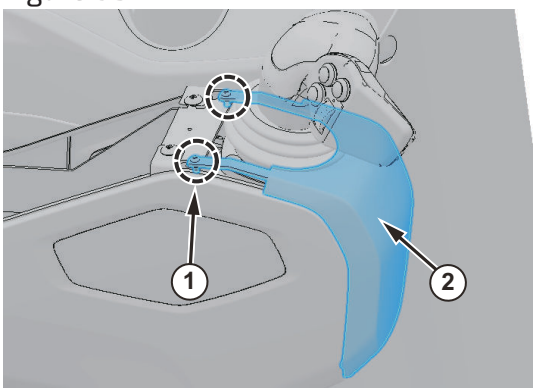
1. Remove the cap and bolts (1) from armrest bracket.
   Figure 94



DS2200898

2. Remove left stand cover (2).

3. Remove the bolts (1) from armrest bracket.
   Figure 95

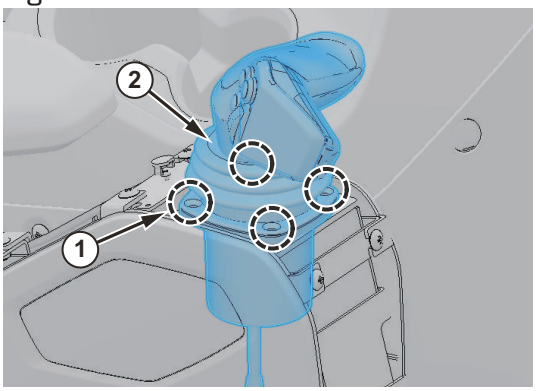


DS2200899

4. Remove left stand cover (2).

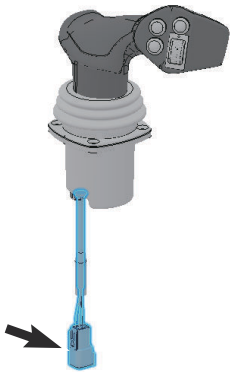
Left Joystick

1. Remove the bolts (1) from armrest bracket.
   Figure 96



DS2200900

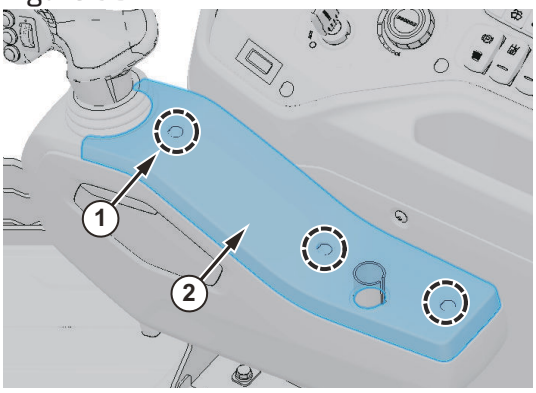
2. Remove left joystick (2).
3. Disconnect harness connector.
   Figure 97



DS2200904

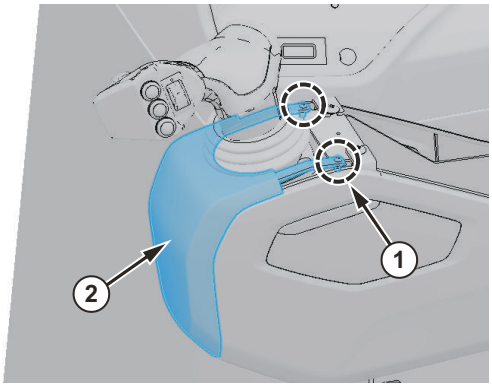
Stand Cover - Right Side

1. Remove the cap and bolts (1) from armrest bracket.
   Figure 98



DS2200901

2. Remove right stand cover (2).
3. Remove the bolts (1) from armrest bracket.
   Figure 99

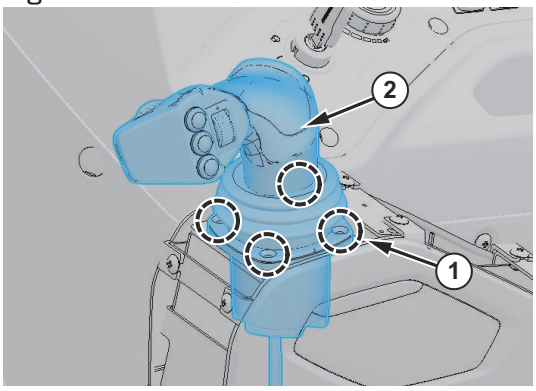


DS2200902

4. Remove right stand cover (2).

Right Joystick

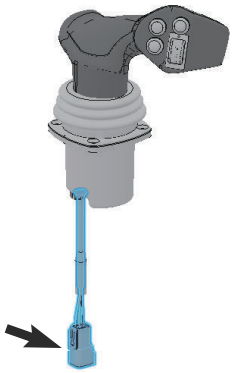
1. Remove the bolts (1) from armrest bracket.
   Figure 100



DS2200903

2. Remove right joystick (2).

3. Disconnect harness connector.
   Figure 101



DS2200904

Installation

⚠ WARNING

INCORRECT INSTALLATION CAN CAUSE DEATH OR SERIOUS INJURY

Any change in the connections will lead to malfunctions.

- When connecting hydraulic components, observe the specified piping according to the hydraulic schematic diagram of the machine.

1. Perform installation in the reverse order to remove.
2. Keep the assembly angle when installing the hoses to joystick valve.

Main Control Valve

Repair Procedure Quick Guide

Step-A. Open right side doors

Step-B. Disconnect wiring harness

Step-C. Disconnect hydraulic hoses and fittings

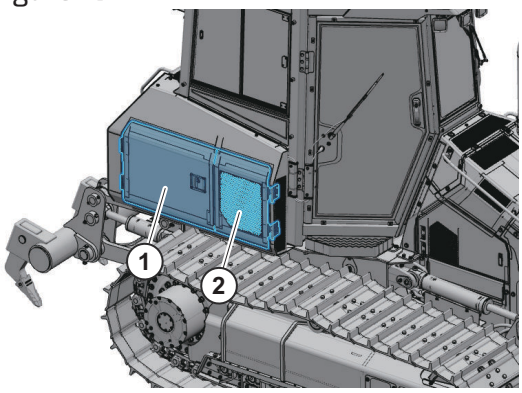
Step-D. Remove main control valve

Removal

1. Turn OFF the battery disconnect switch.

Right Side Doors

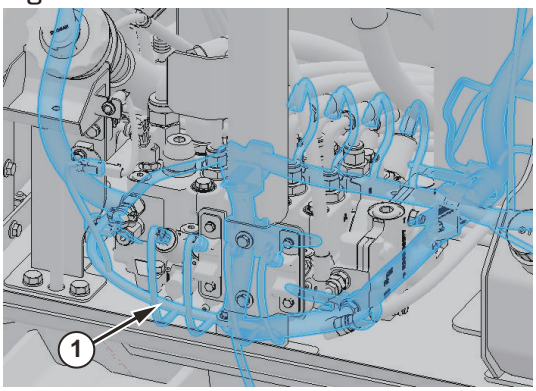
1. Open the right side doors (1, 2).
   Figure 102



DS2201158

Wiring Harness

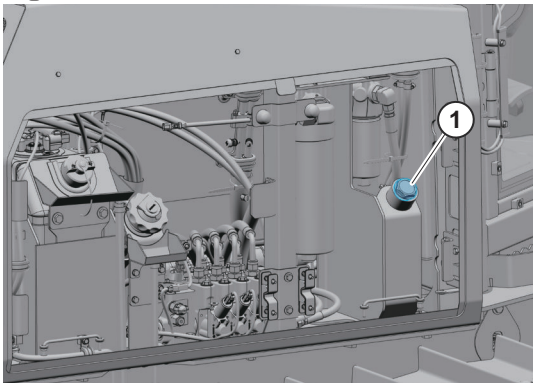
1. Disconnect wiring harnesses (1) from MCV assembly.
   Figure 103



DS2200877

Hydraulic Hoses and Fittings

1. Loosen the oil tank cap (1) slowly to release the pressure inside the hydraulic oil tank. Opening the oil tank cap the air is discharged to the atmosphere from the top of the hydraulic oil tank.
   Figure 104

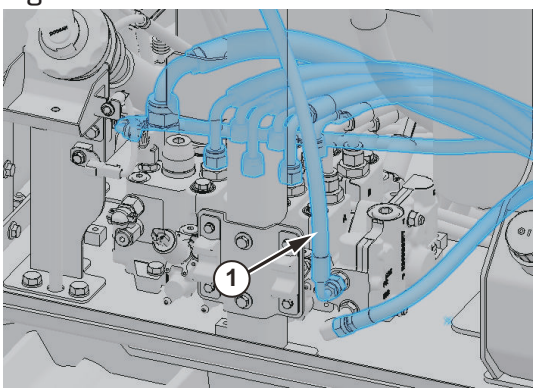


DS2300784

2. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 105

EX1504170

3. Remove hose and adapters (1) from main control valve.
   Figure 106

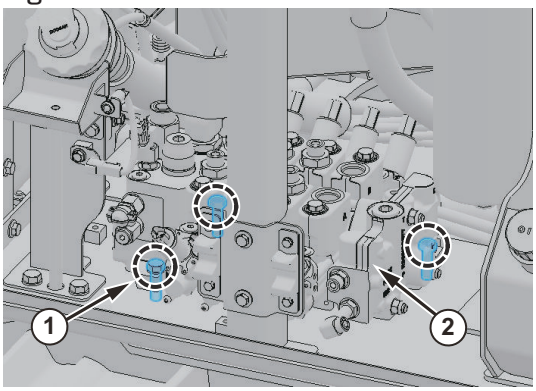


DS2200878

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from main control valve, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of control valve.*

Main Control Valve

1. Remove mounting bolts (1) from frame.
   Figure 107



DS2200879

- Tool: 17 mm ( )
- Torque: 63.7 N.m (6.5 kg.m, 47.0 ft lb)
- Main control valve weight: about 40.8 kg (90 lb)

NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

2. Remove the main control valve (2) from frame.

Installation

1. Perform installation in the reverse order to removal.
2. After completing the work, check the oil level.
3. Start the engine and check for any oil leaks.

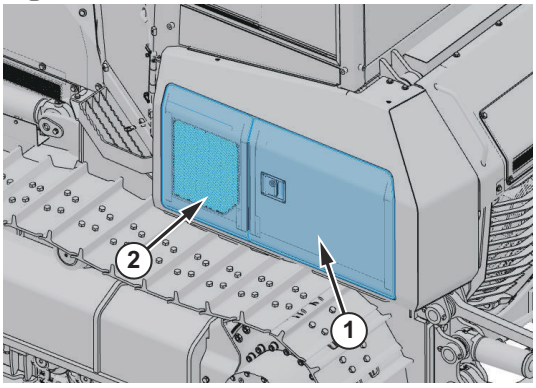
Main Pump

Repair Procedure Quick Guide

Step-A. Tilt the cabin
Step-B. Remove hoses under the cabin
Step-C. Remove window washer tank
Step-D. Remove cabin tilting cylinder
Step-E. Disconnect wiring harness connectors
Step-F. Remove the cabin
Step-G. Disconnect hydraulic hoses and fittings
Step-H. Remove fan pump
Step-I. Disconnect wiring harness
Step-J. Disconnect hydraulic hoses and fittings
Step-K. Remove main pump

Removal

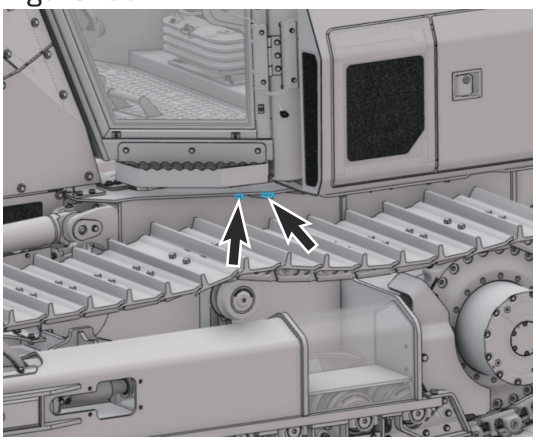
1. Open the left side door (1, 2).
   Figure 108



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 109

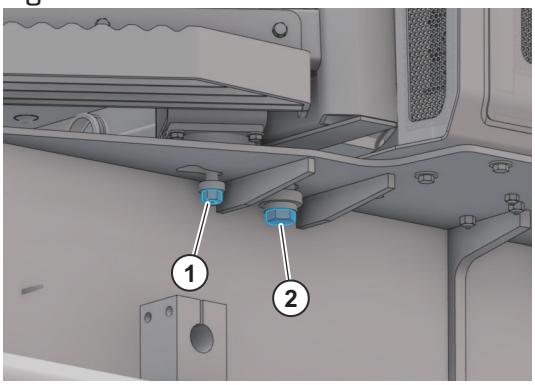


DS2201285

   NOTE: *Both the left/right bolts of the cabin must be removed.*

   NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 110

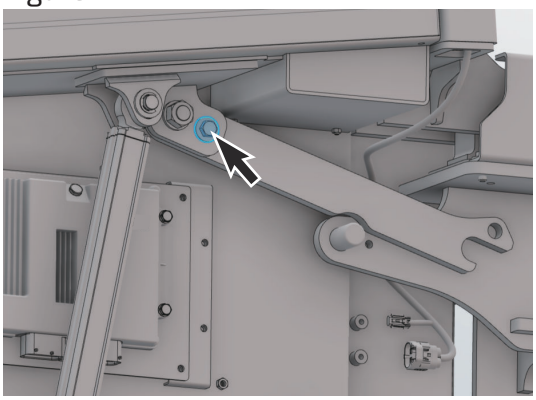


DS2201286

   - Tool: 24 mm ( )
   - Torque: 215.7 N.m (22 kg.m, 159 ft lb)

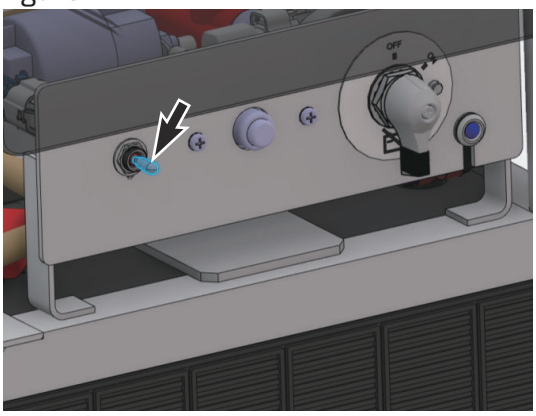
3. Remove bolts (2).
   - Tool: 36mm ( )
   - Torque: 127.4 N.m (13 kg.m, 94 ft lb)

4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 111



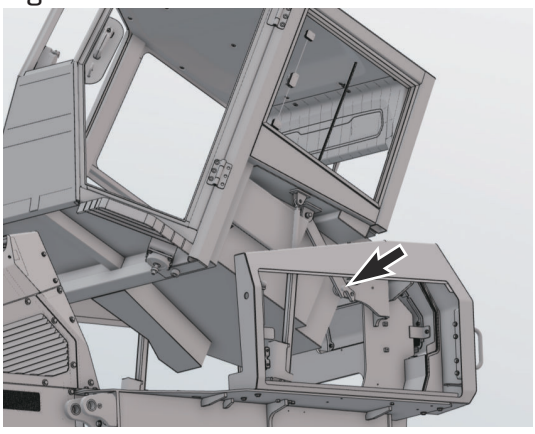
DS2201290

5. Turn cabin tilting switch to “ON” position.
   Figure 112



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.
   Figure 113



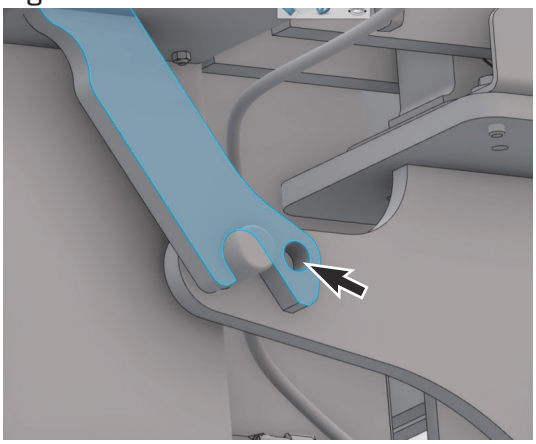
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation.
It can cause death or serious injury.

Figure 114

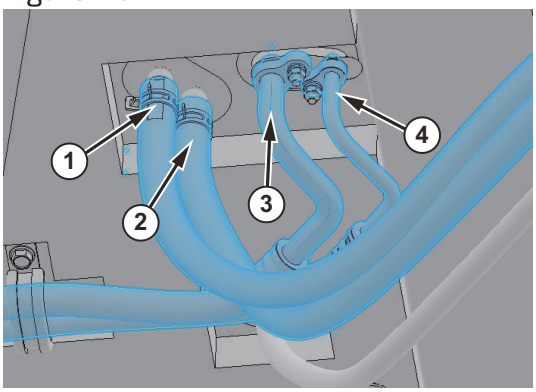


DS2201289

Hoses

1. Remove the heater hose (1).

Figure 115



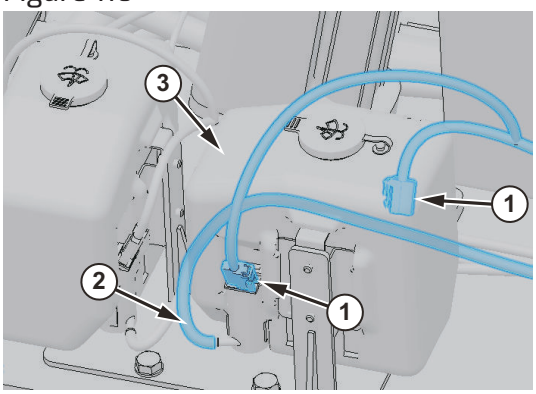
DS2200907

2. Remove the water hose (2).
3. Remove the air conditioner suction hose (3).
4. Remove the air conditioner liquid hose (4).
5. Return the tilted cabin to its original position.
6. Turn OFF the battery disconnect switch.

Window Washer Tank

1. Disconnect wiring harness (1) from window washer tank.

Figure 116

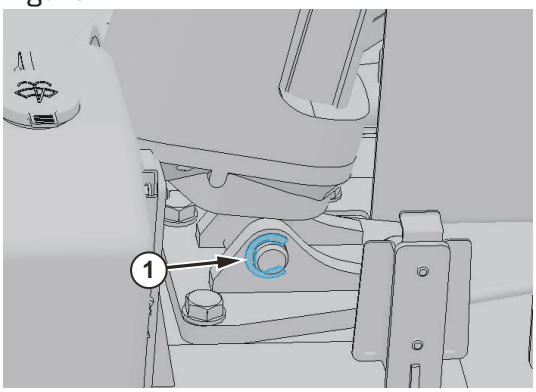


DS2200886

2. Remove water hose (2) from window washer tank.
3. Remove window washer tank (3).

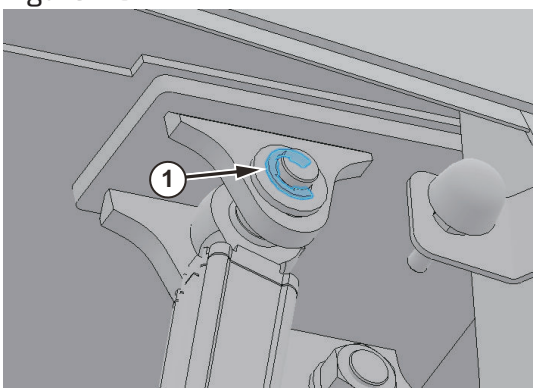
Cabin Tilting Cylinder

1. Remove the retaining ring (1) at the bottom of the cylinder.
   Figure 117



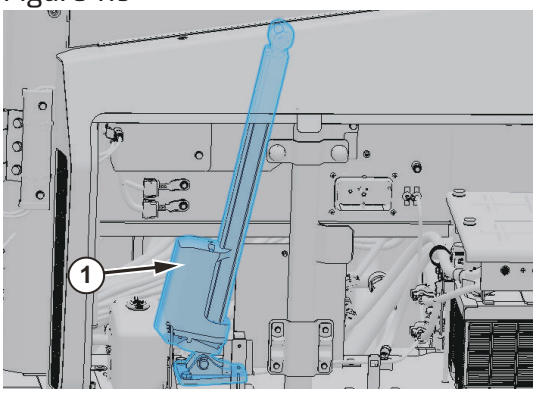
DS2200887

2. Remove the cylinder pin.
3. Remove the retaining ring (1) at the top of the cylinder.
   Figure 118



DS2200888

4. Remove the cylinder pin.
5. Remove the cabin tilting cylinder (1).
   Figure 119

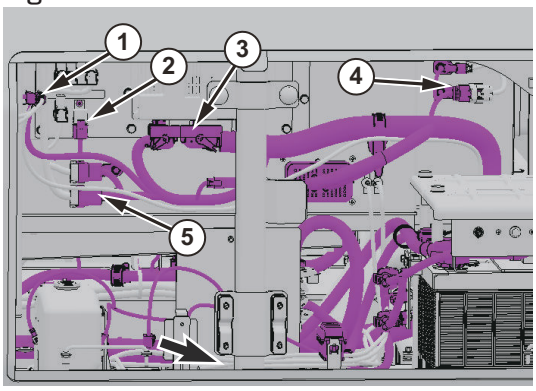


DS2200889

- Cabin tilting cylinder weight: about 10 kg (22.0 lb)

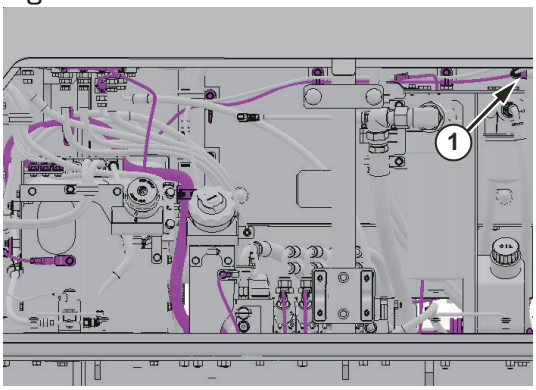
Wiring Harness Connectors

1. Disconnect wiper motor connector (1).
   Figure 120



DS2200905

2. Disconnect relay connector (2).
3. Disconnect EPOS connector (3).
4. Disconnect fan motor connector (4).
5. Disconnect wiper motor connector (1).
   Figure 121

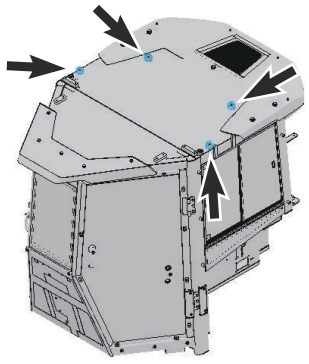


DS2200906

6. Disconnect any additional electrical connections as necessary.

Cabin

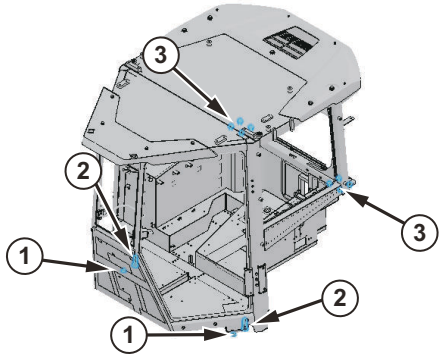
1. Using a suitable lifting device, attach slings to four lift points on top of cabin.
   Figure 122



DS2200908

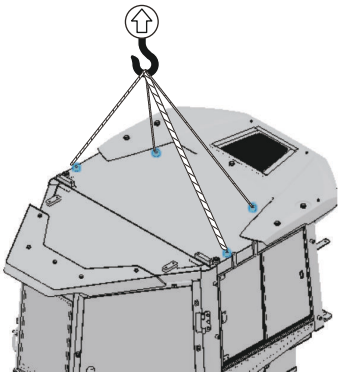
- Cabin weight: about 700 kg (1,543 lb)

2. Remove mounting nuts (1) (2 ea).
   Figure 123



DS2200909

   - Tool: 24 mm ( )
   - Torque: 205.9 N.m (21 kg.m, 151.9 ft lb)
3. Remove mounting bolts (2) (2 ea) from cabin floor.
   - Tool: 36 mm ( )
   - Torque: 127.5 N.m (13 kg.m, 94.0 ft lb))
4. Remove hinge bolts (3) (8 ea).
   - Tool: 19 mm ( )
   - Torque: 88.3 N.m (9 kg.m, 65.1 ft lb)
5. Lift cabin approximately 25 - 50 mm (1" - 2") above deck.
   Figure 124


DS2200910

6. Check that all electrical connections have been disconnected and all other items unbolted.

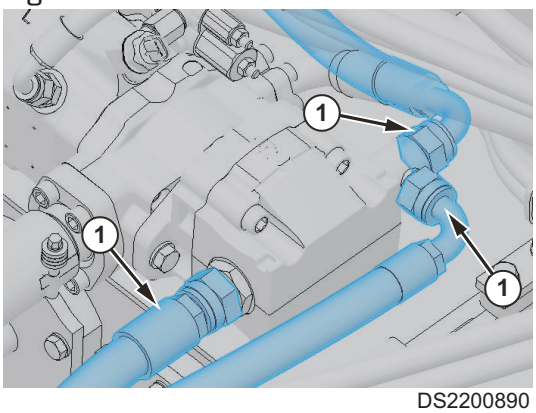
   NOTE: *Lift operator's cabin slowly to prevent damaging.*

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 125

EX1504170

2. Disconnect the hoses and adapters from fan pump.
   Figure 126

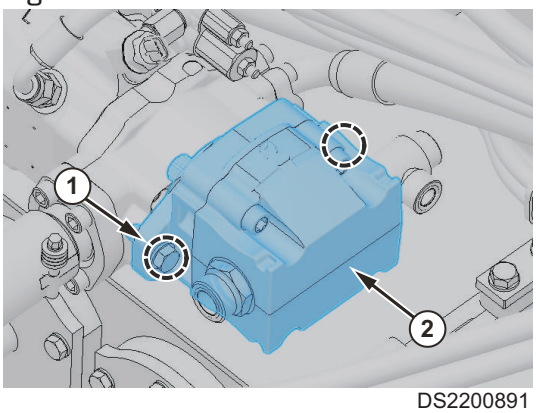


DS2200890

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from fan pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of fan pump.*

Fan Pump

1. Tie pump with rope to lift it.
   Figure 127



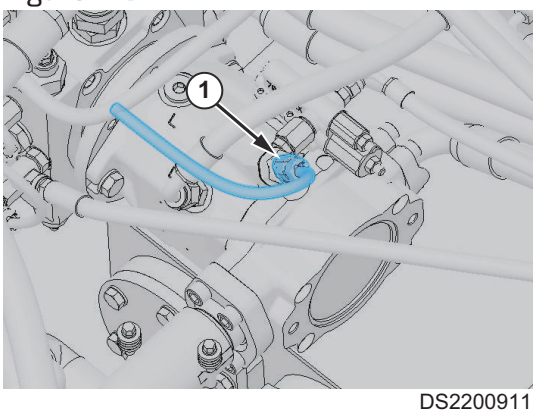
DS2200891

2. Remove mounting bolts (1) and fan pump (2) from main pump.
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)

- Fan pump weight: about 15 kg (33 lb)

Wiring Harness

1. Turn Off the battery disconnect switch.
   Figure 128



DS2200911

2. Disconnect harness connectors (1) from main pump.

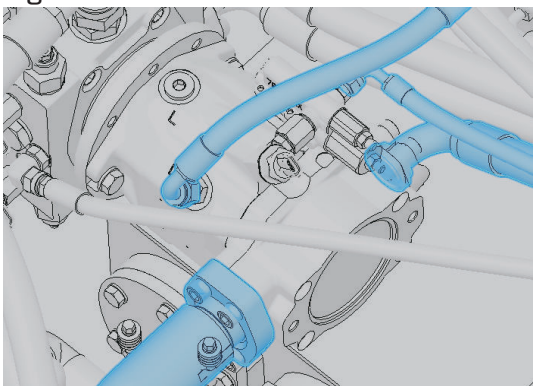
   NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 129

EX1504170

2. Disconnect the hoses and adapters from main pump.
   Figure 130

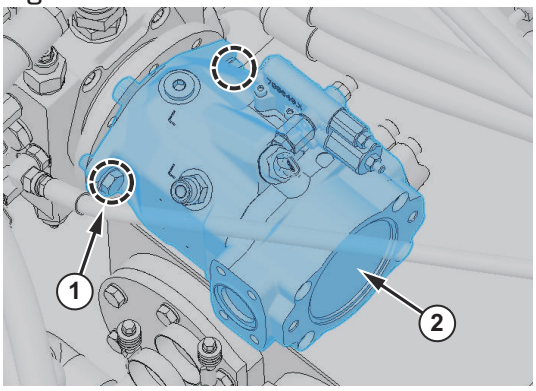


DS2200912

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from main pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of main pump.*

Main Pump

1. Tie pump with rope to lift it.
   Figure 131



DS2200913

2. Remove mounting bolts (1) and main pump (2) from HST pump.
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
   - Fan pump weight: about 20 kg (44.1 lb)

Installation

1. Perform installation in the reverse order to removal.
2. When installing the pump to engine, be careful assembling pump shaft and drive coupling. Refer to drive coupling installation.

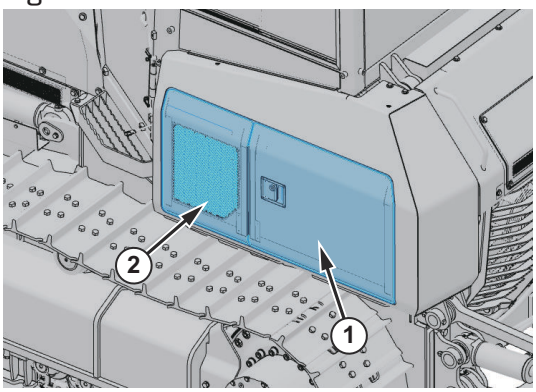
HST Pump

Repair Procedure Quick Guide

Step-A. Tilt the cabin
Step-B. Disconnect hydraulic hoses and fittings
Step-C. Remove fan pump
Step-D. Disconnect wiring harness
Step-E. Disconnect hydraulic hoses and fittings
Step-F. Remove main pump
Step-G. Remove support
Step-H. Disconnect wiring harness
Step-I. Disconnect hydraulic hoses and fittings
Step-J. Remove HST pump

Removal

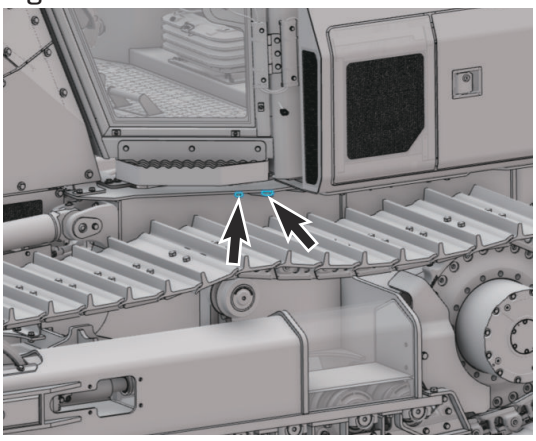
1. Open the left side door (1, 2).
   Figure 132



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 133

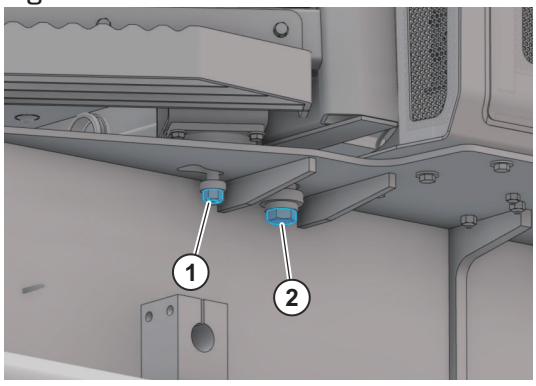


DS2201285

NOTE: *Both the left/right bolts of the cabin must be removed.*

NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 134



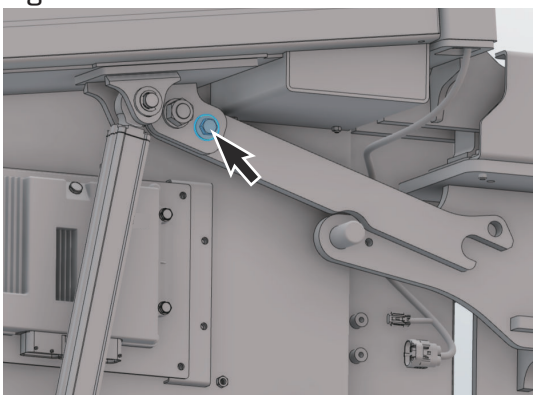
DS2201286

- Tool: 24 mm ( )
- Torque: 215.7 N.m (22 kg.m, 159 ft lb)

3. Remove bolts (2).

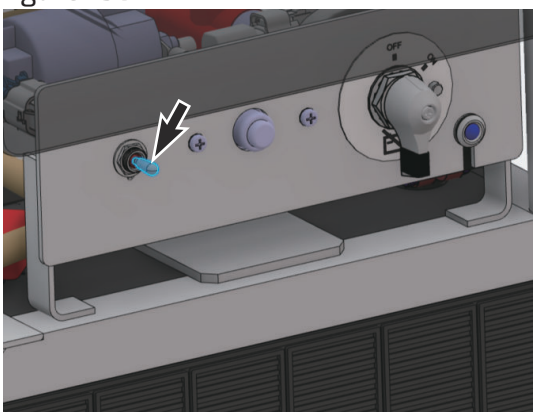
- Tool: 36mm ( )
- Torque: 127.4 N.m (13 kg.m, 94 ft lb)

4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 135



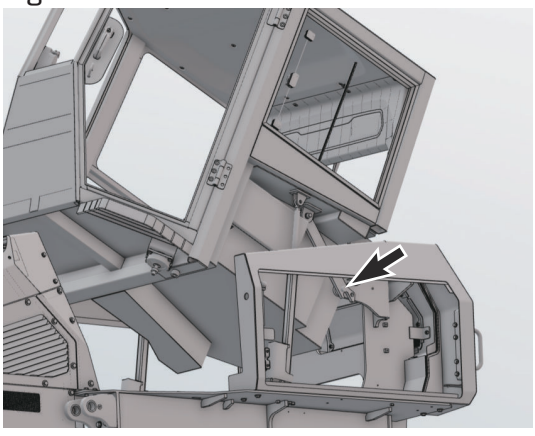
DS2201290

5. Turn cabin tilting switch to "ON" position.
   Figure 136



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.
   Figure 137



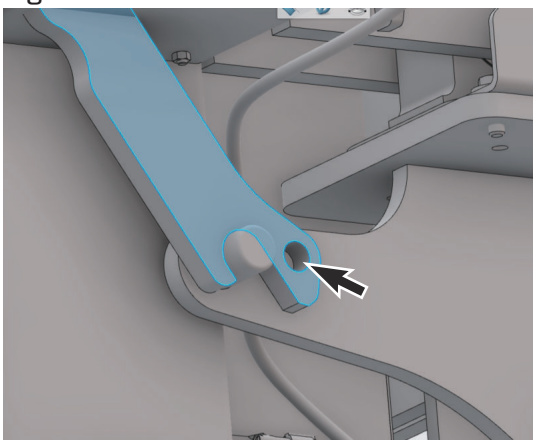
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation. It can cause death or serious injury.

Figure 138



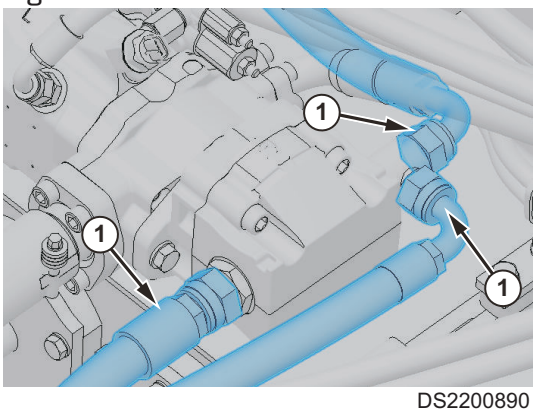
DS2201289

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 139

EX1504170

2. Disconnect the hoses and adapters from fan pump.
   Figure 140

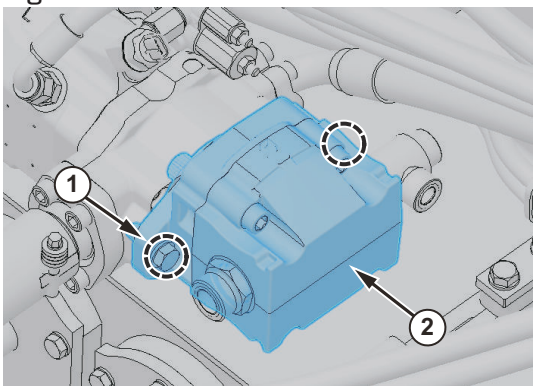


DS2200890

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from fan pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of fan pump.*

Fan Pump

1. Tie pump with rope to lift it.
   Figure 141

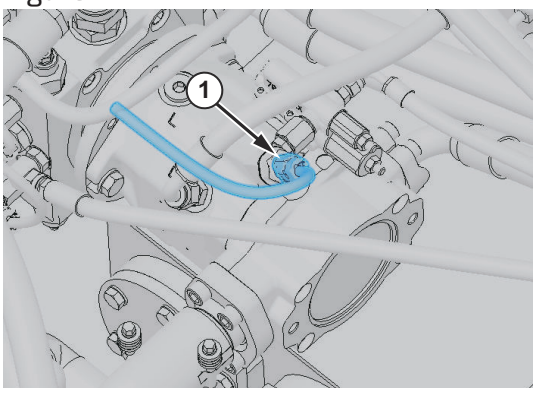


DS2200891

2. Remove mounting bolts (1) and fan pump (2) from main pump.
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
   - Fan pump weight: about 15 kg (33 lb)

Wiring Harness

1. Turn Off the battery disconnect switch.
   Figure 142



DS2200911

2. Disconnect harness connectors (1) from main pump.

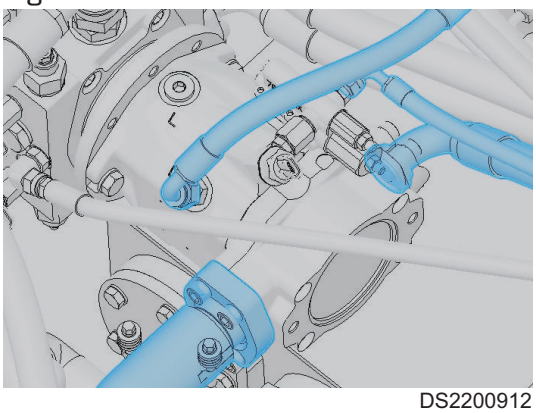
   NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 143

EX1504170

2. Disconnect the hoses and adapters from main pump.
   Figure 144

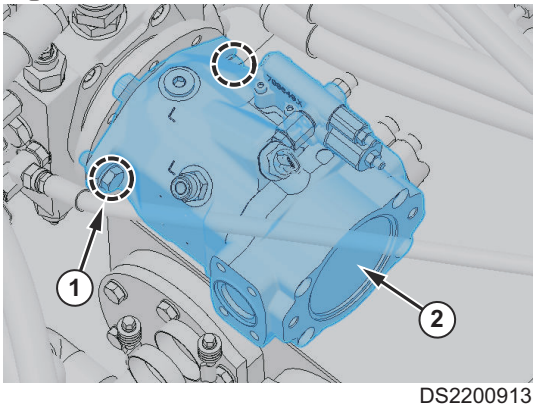


DS2200912

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from main pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of main pump.*

Main Pump

1. Tie pump with rope to lift it.
   Figure 145



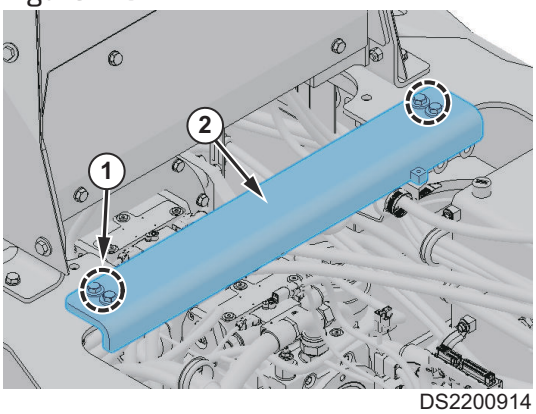
DS2200913

2. Remove mounting bolts (1) and main pump (2) from HST pump.
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)

- Fan pump weight: about 20 kg (44.1 lb)

Support

1. Remove bolts (1) from support (2).
   Figure 146

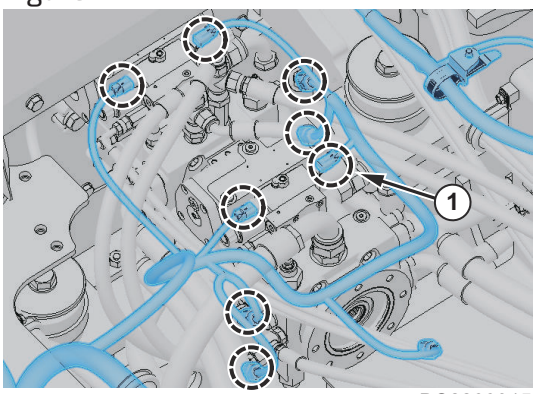


DS2200914

   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
2. Remove support (2).

Wiring Harness

1. Disconnect harness connectors (1) from HST pump.
   Figure 147



DS2200915

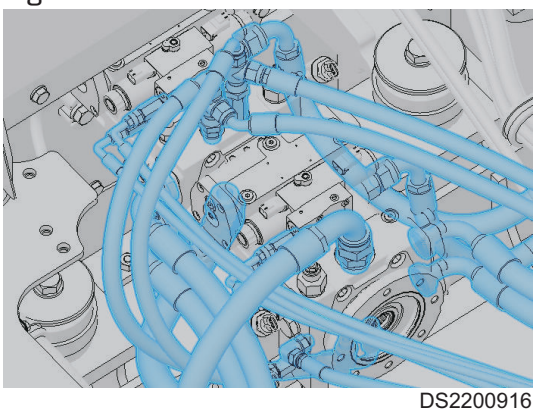
   NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 148

EX1504170

2. Disconnect the hoses and adapters from HST pump.
   Figure 149

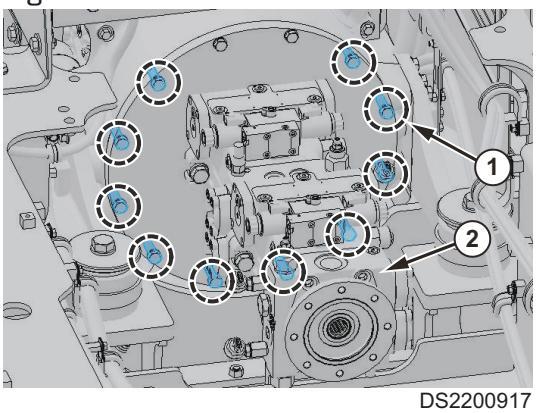


DS2200916

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from HST pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of HST pump.*

HST Pump

1. Remove bolts (1) (10 ea) of pump without top bolts (2) (2 ea).
   Figure 150

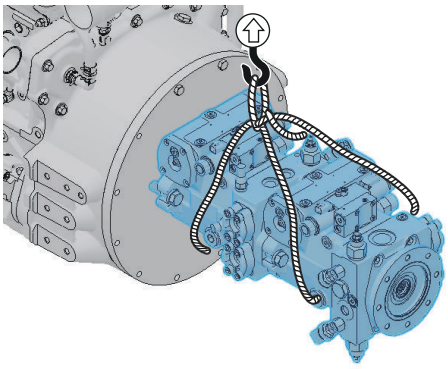


DS2200917

- Tool: 17 mm ( )
- Torque: 63.7 N.m (6.5 kg.m, 47 ft lb)

  NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

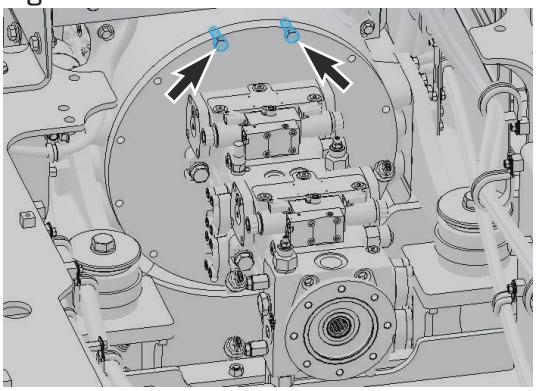
2. Attach a lifting device around pump. Raise the lifting device until the pump is supported prior to removing remaining bolts (2 ea).
   Figure 151



DS2200919

   - Weight: about 90 kg (198.4 lb)

3. Remove remaining bolts (2 ea).
   Figure 152



DS2200918

   - Tool: 17 mm ( )
   - Torque: 63.7 N.m (6.5 kg.m, 47 ft lb)

     NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

4. Lift the pump from engine slowly and carefully.

Installation

1. Perform installation in the reverse order to removal.
2. When installing the pump to engine, be careful assembling pump shaft and drive coupling. Refer to drive coupling installation.

Hydraulic Oil Tank

Repair Procedure Quick Guide

Step-A. Tilt the cabin

Step-B. Remove hoses under the cabin

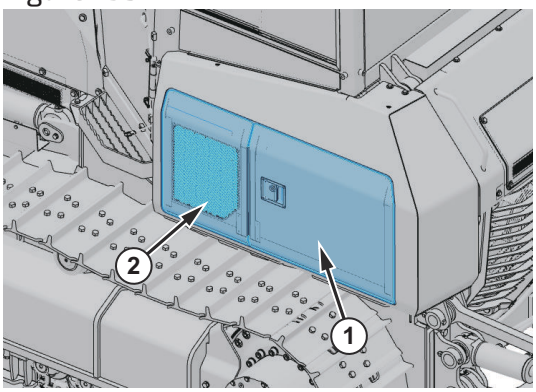
Step-C. Remove window washer tank

Step-D. Remove cabin tilting cylinder

Step-E. Disconnect wiring harness connectors
Step-F. Remove the cabin
Step-G. Disconnect hydraulic hoses and fittings
Step-H. Remove fan pump
Step-I. Disconnect wiring harness
Step-J. Disconnect hydraulic hoses and fittings
Step-K. Remove main pump
Step-L. Remove support
Step-M. Disconnect wiring harness
Step-N. Disconnect hydraulic hoses and fittings
Step-O. Remove HST pump
Step-P. Disconnect wiring harness
Step-Q. Disconnect hydraulic hoses and fittings
Step-R. Remove Hydraulic oil tank

Removal

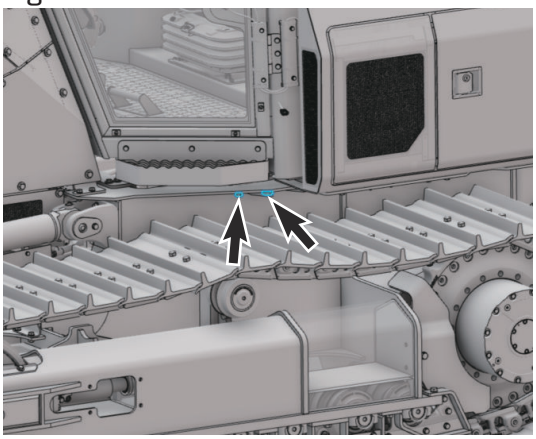
1. Open the left side door (1, 2).
   Figure 153



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 154

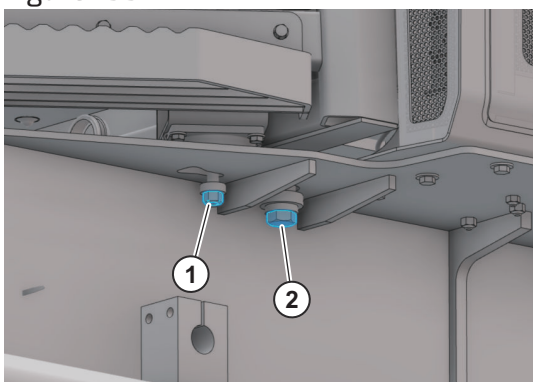


DS2201285

NOTE: *Both the left/right bolts of the cabin must be removed.*

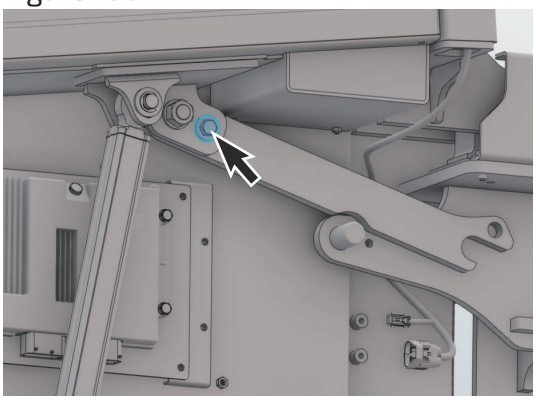
NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 155



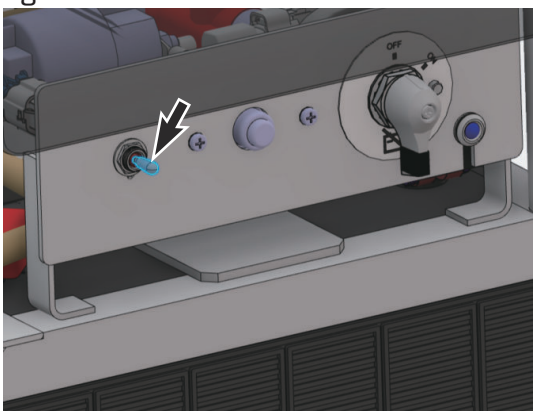
DS2201286

   - Tool: 24 mm ( )
   - Torque: 215.7 N.m (22 kg.m, 159 ft lb)
3. Remove bolts (2).
   - Tool: 36mm ( )
   - Torque: 127.4 N.m (13 kg.m, 94 ft lb)
4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 156



DS2201290

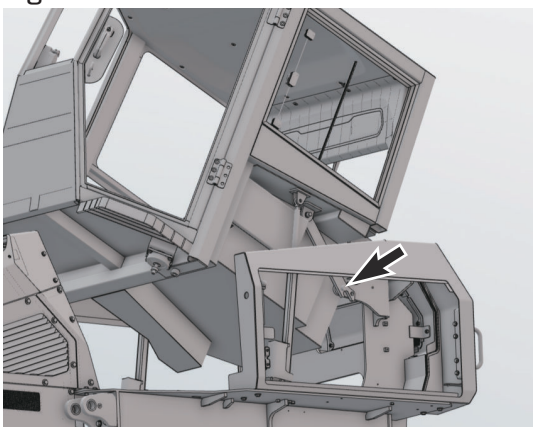
5. Turn cabin tilting switch to “ON” position.
   Figure 157



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.

Figure 158



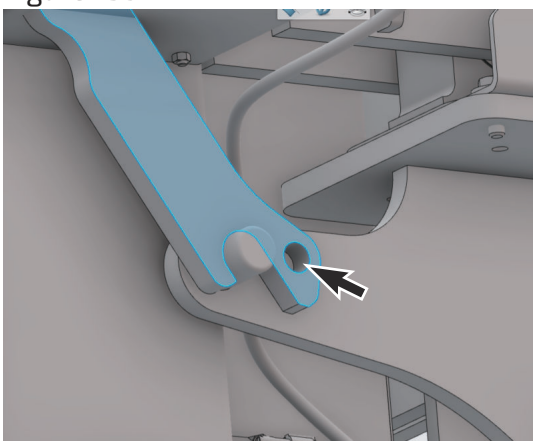
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation.
It can cause death or serious injury.

Figure 159

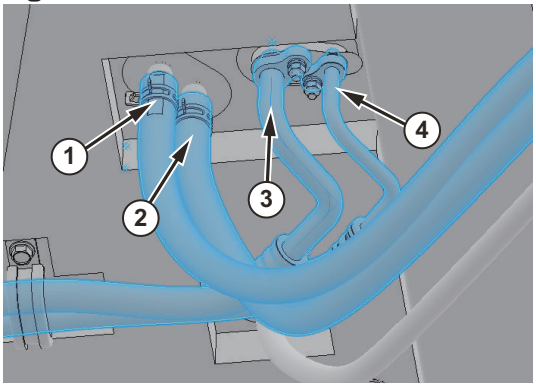


DS2201289

Hoses

1. Remove the heater hose (1).

Figure 160

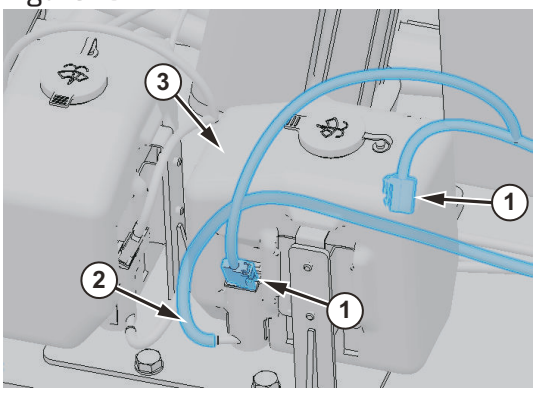


DS2200907

2. Remove the water hose (2).
3. Remove the air conditioner suction hose (3).
4. Remove the air conditioner liquid hose (4).
5. Return the tilted cabin to its original position.
6. Turn OFF the battery disconnect switch.

Window Washer Tank

1. Disconnect wiring harness (1) from window washer tank.
   Figure 161

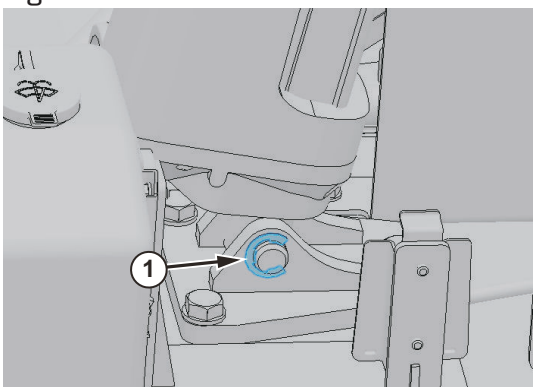


DS2200886

2. Remove water hose (2) from window washer tank.
3. Remove window washer tank (3).

Cabin Tilting Cylinder

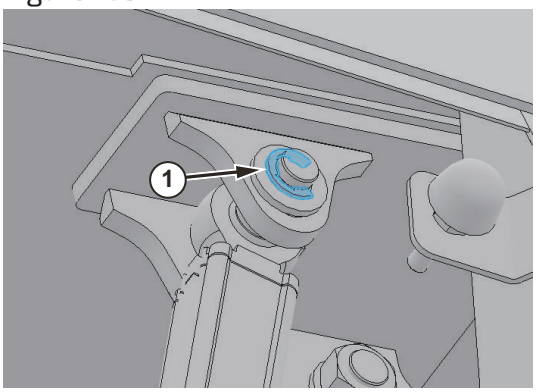
1. Remove the retaining ring (1) at the bottom of the cylinder.
   Figure 162



DS2200887

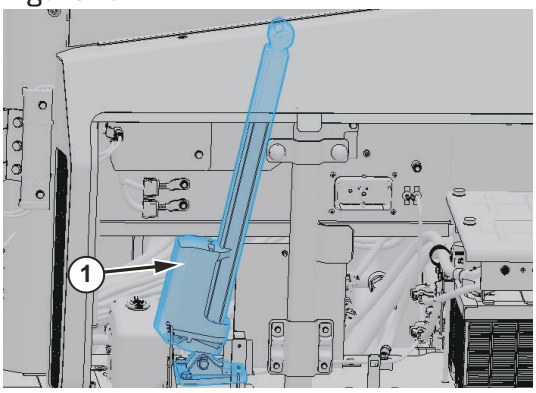
2. Remove the cylinder pin.

3. Remove the retaining ring (1) at the top of the cylinder.
   Figure 163



DS2200888

4. Remove the cylinder pin.
5. Remove the cabin tilting cylinder (1).
   Figure 164

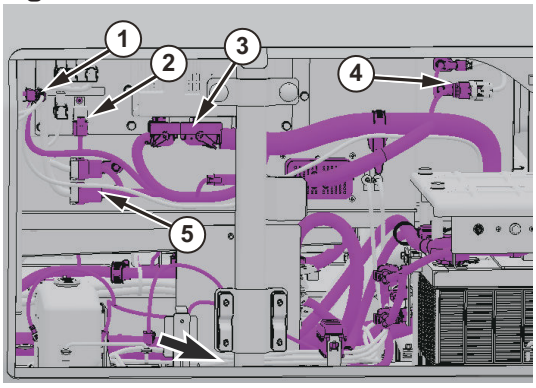


DS2200889

- Cabin tilting cylinder weight: about 10 kg (22.0 lb)

Wiring Harness Connectors

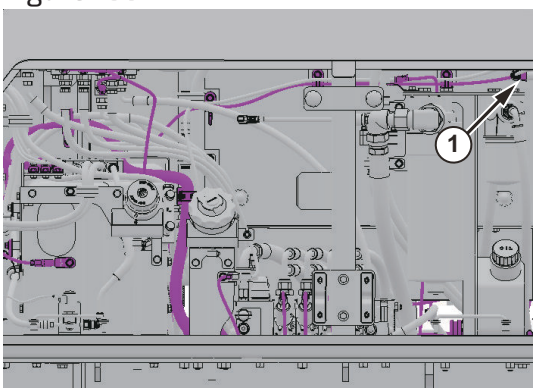
1. Disconnect wiper motor connector (1).
   Figure 165



DS2200905

2. Disconnect relay connector (2).
3. Disconnect EPOS connector (3).
4. Disconnect fan motor connector (4).

5. Disconnect wiper motor connector (1).
   Figure 166

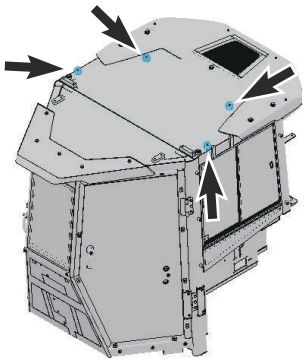


DS2200906

6. Disconnect any additional electrical connections as necessary.

Cabin

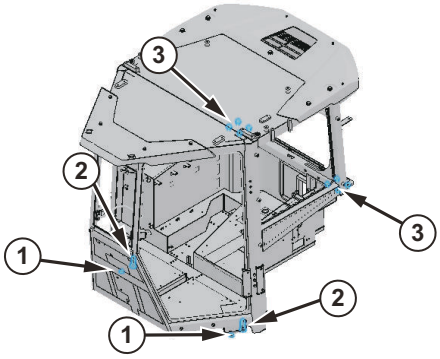
1. Using a suitable lifting device, attach slings to four lift points on top of cabin.
   Figure 167



DS2200908

   - Cabin weight: about 700 kg (1,543 lb)

2. Remove mounting nuts (1) (2 ea).
   Figure 168

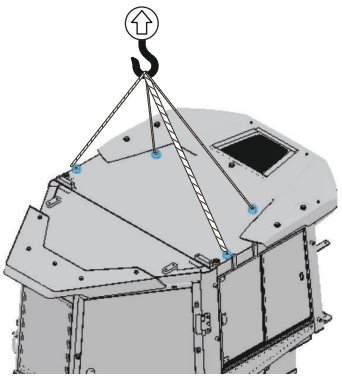


DS2200909

   - Tool: 24 mm ( )
   - Torque: 205.9 N.m (21 kg.m, 151.9 ft lb)

3. Remove mounting bolts (2) (2 ea) from cabin floor.
   - Tool: 36 mm ( )
   - Torque: 127.5 N.m (13 kg.m, 94.0 ft lb))

4. Remove hinge bolts (3) (8 ea).
   - Tool: 19 mm ( )
   - Torque: 88.3 N.m (9 kg.m, 65.1 ft lb)
5. Lift cabin approximately 25 - 50 mm (1" - 2") above deck.
   Figure 169



DS2200910

6. Check that all electrical connections have been disconnected and all other items unbolted.

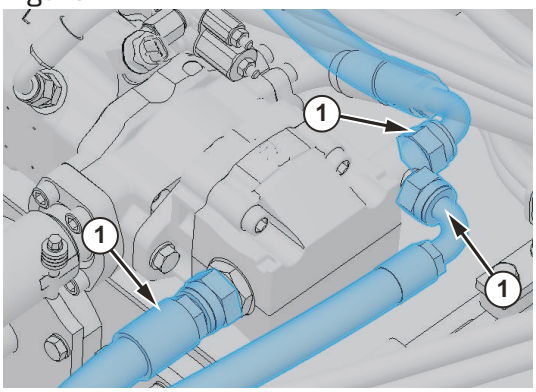
   NOTE: *Lift operator's cabin slowly to prevent damaging.*

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 170

EX1504170

2. Disconnect the hoses and adapters from fan pump.
   Figure 171

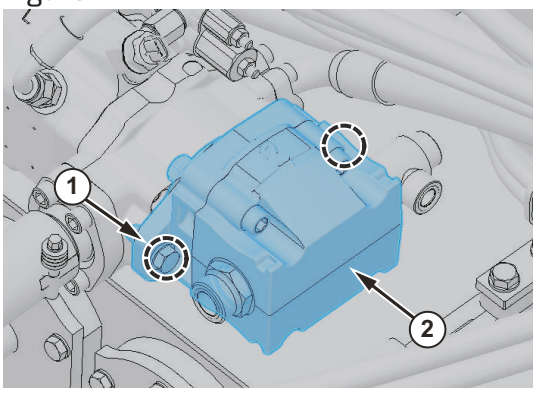


DS2200890

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from fan pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of fan pump.*

Fan Pump

1. Tie pump with rope to lift it.
   Figure 172

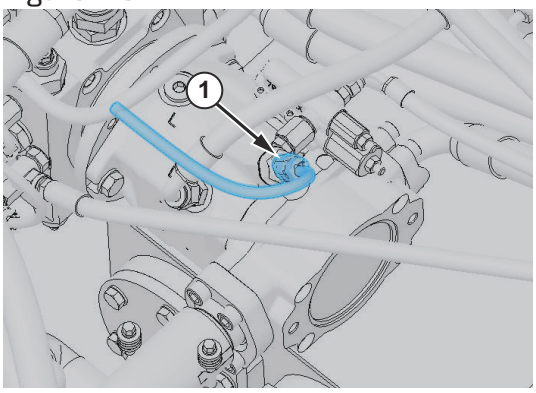


DS2200891

2. Remove mounting bolts (1) and fan pump (2) from main pump.
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
   - Fan pump weight: about 15 kg (33 lb)

Wiring Harness

1. Turn Off the battery disconnect switch.
   Figure 173



DS2200911

2. Disconnect harness connectors (1) from main pump.

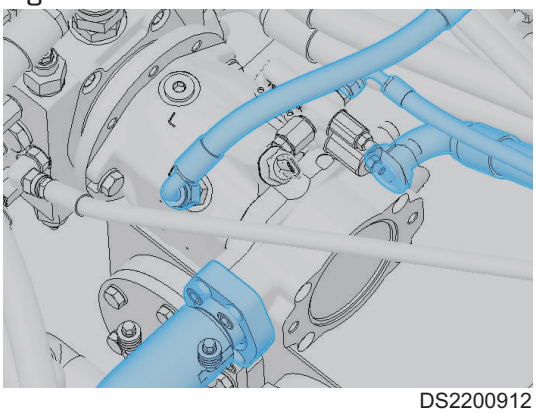
   NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 174

EX1504170

2. Disconnect the hoses and adapters from main pump.
   Figure 175

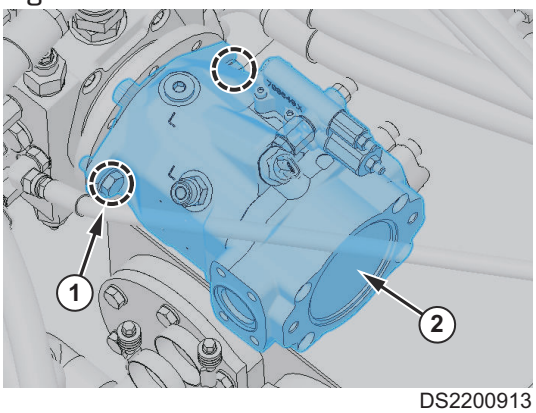


DS2200912

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from main pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of main pump.*

Main Pump

1. Tie pump with rope to lift it.
   Figure 176



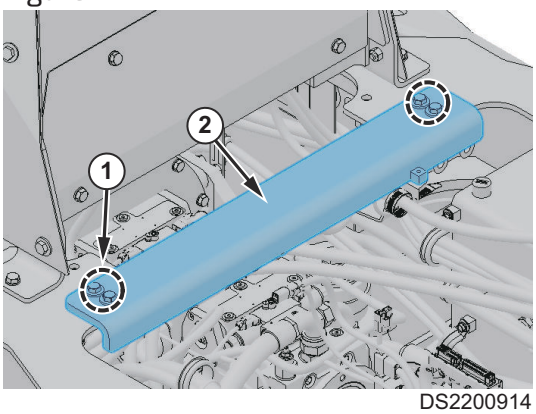
DS2200913

2. Remove mounting bolts (1) and main pump (2) from HST pump.
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)

- Fan pump weight: about 20 kg (44.1 lb)

Support

1. Remove bolts (1) from support (2).
   Figure 177



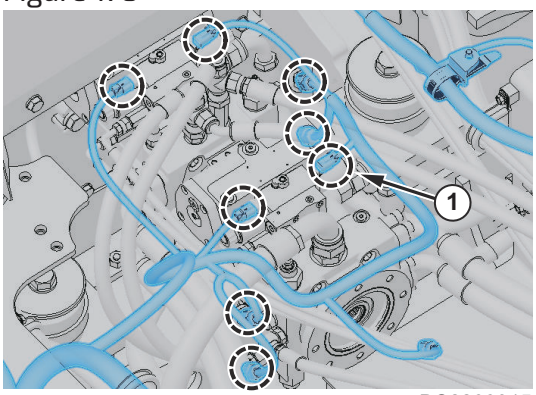
DS2200914

   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
2. Remove support (2).

Wiring Harness

1. Disconnect harness connectors (1) from HST pump.

   NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*
   Figure 178



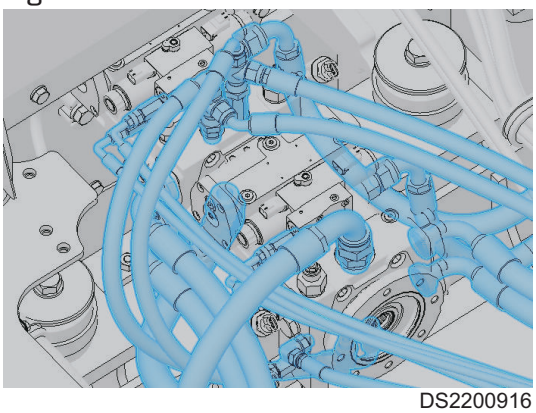
DS2200915

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 179

EX1504170

2. Disconnect the hoses and adapters from HST pump.
   Figure 180

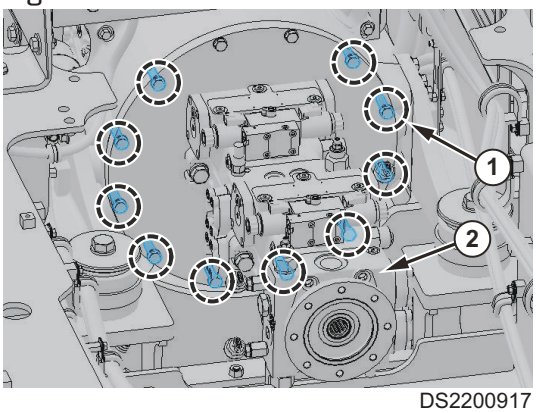


DS2200916

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from HST pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of HST pump.*

HST Pump

1. Remove bolts (1) (10 ea) of pump without top bolts (2) (2 ea).
   Figure 181

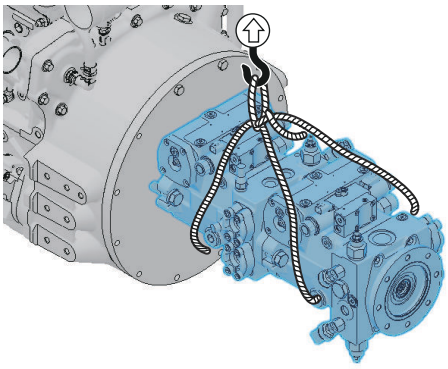


DS2200917

- Tool: 17 mm ( )
- Torque: 63.7 N.m (6.5 kg.m, 47 ft lb)

  NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

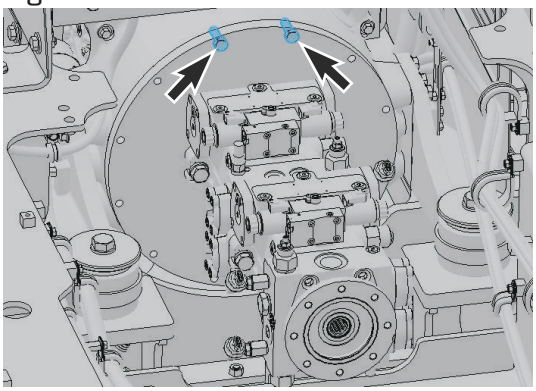
2. Attach a lifting device around pump. Raise the lifting device until the pump is supported prior to removing remaining bolts (2 ea).
   Figure 182



DS2200919

   - Weight: about 90 kg (198.4 lb)

3. Remove remaining bolts (2 ea).
   Figure 183



DS2200918

   - Tool: 17 mm ( )
   - Torque: 63.7 N.m (6.5 kg.m, 47 ft lb)

     NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

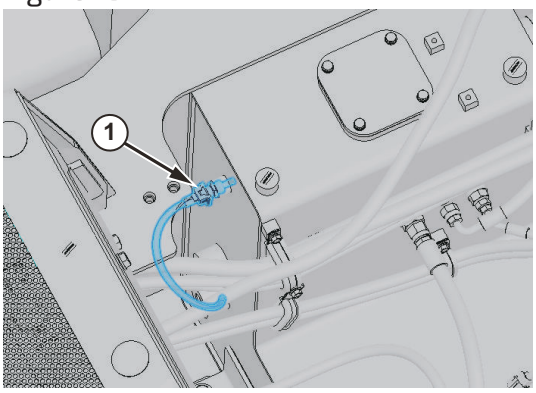
4. Lift the pump from engine slowly and carefully.

Wiring Harness

1. Disconnect harness connectors (1) from hydraulic oil tank.

NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

Figure 184



DS2200922

Hydraulic Hoses and Fittings

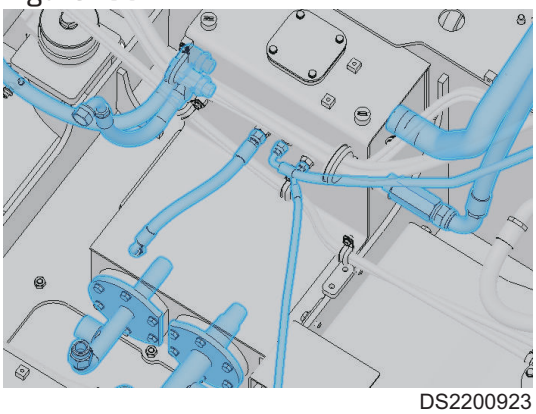
1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.

   Figure 185

EX1504170

2. Disconnect the hoses and adapters from hydraulic oil tank.

   Figure 186



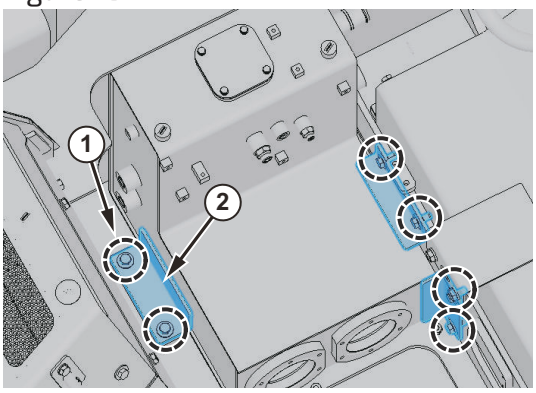
DS2200923

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from hydraulic oil tank, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of hydraulic oil tank.*

3. Remove hose clips from hydraulic oil tank.

Hydraulic Oil Tank

1. Remove bolts (1) and bracket (2) from frame.
   Figure 187



DS2200924

   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
2. Install eyebolts (2 ea) on the oil tank.

   And tie the rope to the bolts to lift oil tank.
3. Lift the oil tank by crane from frame slowly and carefully.
   - Oil tank weight: about 70 kg (154.3 lb)

Installation

1. Perform installation in the reverse order of removal.

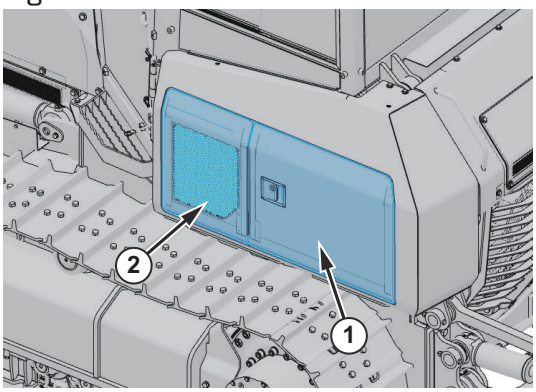
Fuel Tank

Repair Procedure Quick Guide

Step-A. Tilt the cabin
Step-B. Remove hoses under the cabin
Step-C. Remove window washer tank
Step-D. Remove cabin tilting cylinder
Step-E. Disconnect wiring harness connectors
Step-F. Remove the cabin
Step-G. Remove undercover
Step-H. Drain fuel
Step-I. Remove guardrail assembly and covers
Step-J. Disconnect wiring harness connector
Step-K. Disconnect fuel hoses and fittings
Step-L. Remove fuel tank assembly

Removal

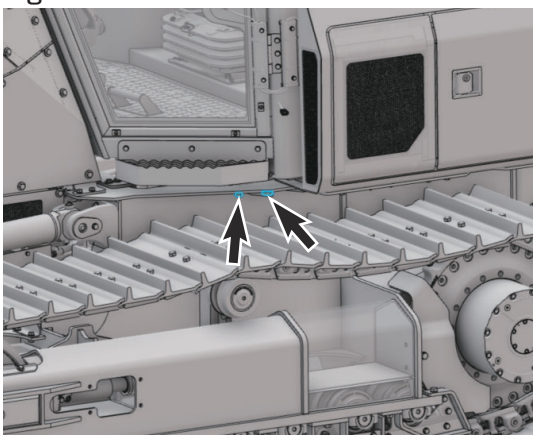
1. Open the left side door (1, 2).
   Figure 188



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 189

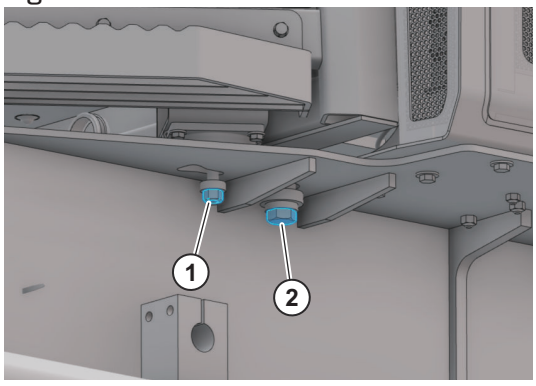


DS2201285

NOTE: *Both the left/right bolts of the cabin must be removed.*

NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 190



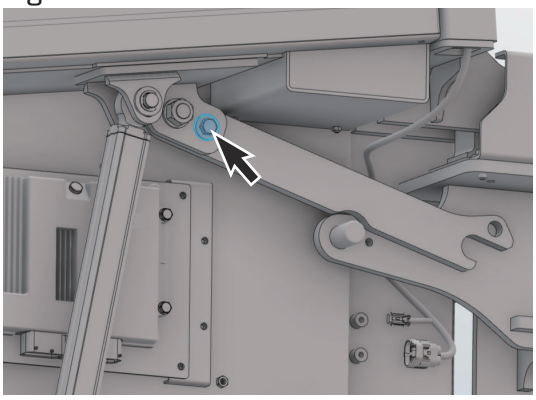
DS2201286

- Tool: 24 mm ( )
- Torque: 215.7 N.m (22 kg.m, 159 ft lb)

3. Remove bolts (2).

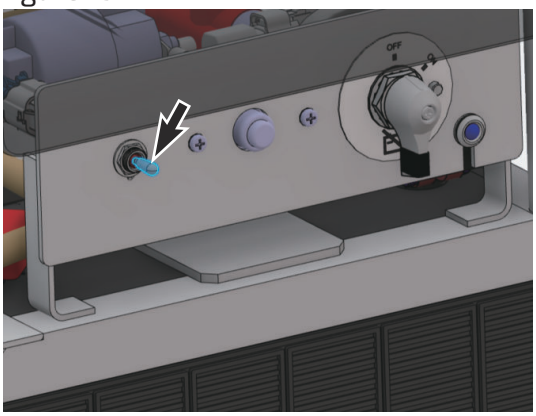
- Tool: 36mm ( )
- Torque: 127.4 N.m (13 kg.m, 94 ft lb)

4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 191



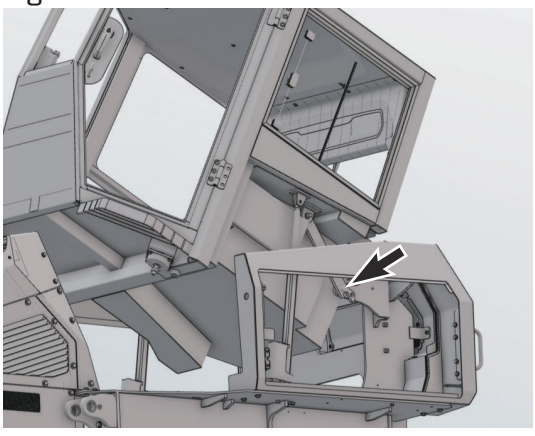
DS2201290

5. Turn cabin tilting switch to "ON" position.
   Figure 192



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.
   Figure 193



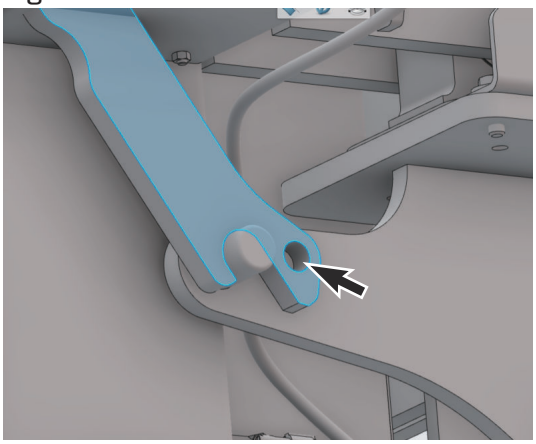
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation.
It can cause death or serious injury.

Figure 194

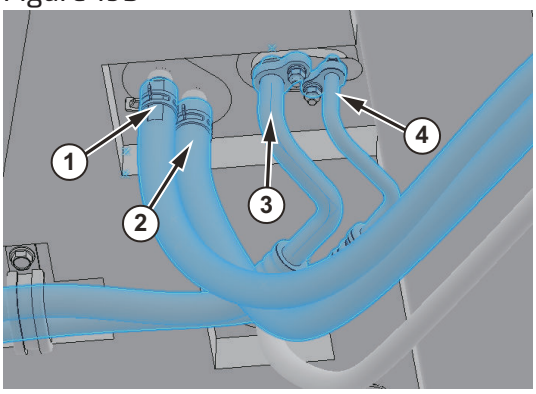


DS2201289

Hoses

1. Remove the heater hose (1).

Figure 195

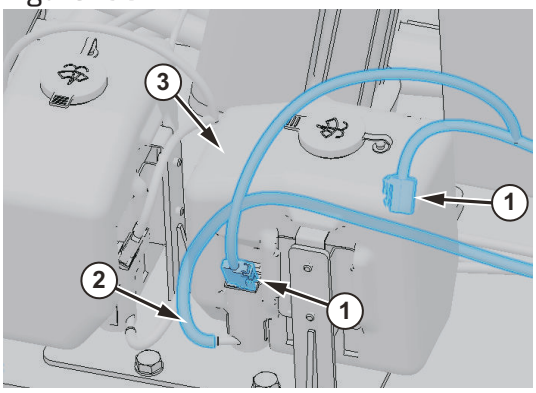


DS2200907

2. Remove the water hose (2).
3. Remove the air conditioner suction hose (3).
4. Remove the air conditioner liquid hose (4).
5. Return the tilted cabin to its original position.
6. Turn OFF the battery disconnect switch.

Window Washer Tank

1. Disconnect wiring harness (1) from window washer tank.
   Figure 196

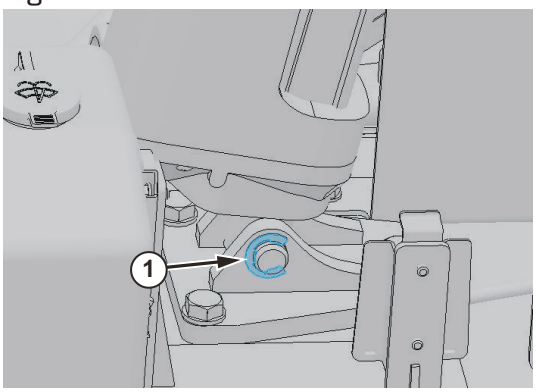


DS2200886

2. Remove water hose (2) from window washer tank.
3. Remove window washer tank (3).

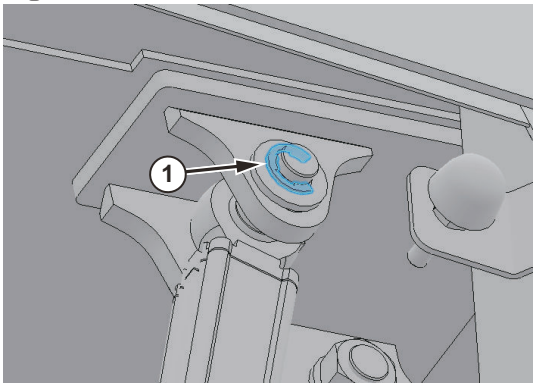
Cabin Tilting Cylinder

1. Remove the retaining ring (1) at the bottom of the cylinder.
   Figure 197



DS2200887

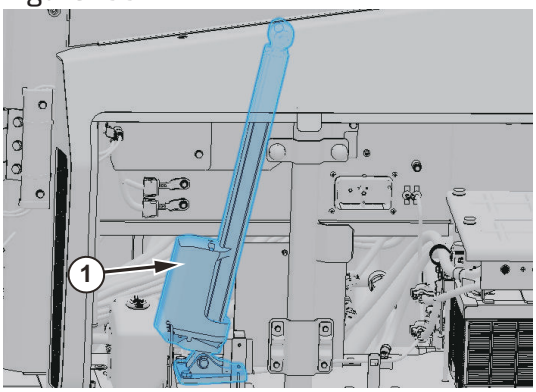
2. Remove the cylinder pin.
3. Remove the retaining ring (1) at the top of the cylinder.
   Figure 198



DS2200888

4. Remove the cylinder pin.

5. Remove the cabin tilting cylinder (1).
   Figure 199

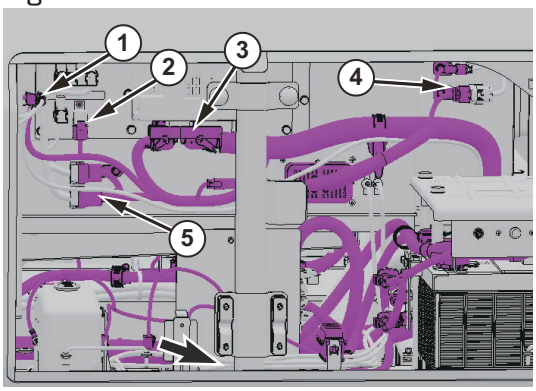


DS2200889

- Cabin tilting cylinder weight: about 10 kg (22.0 lb)

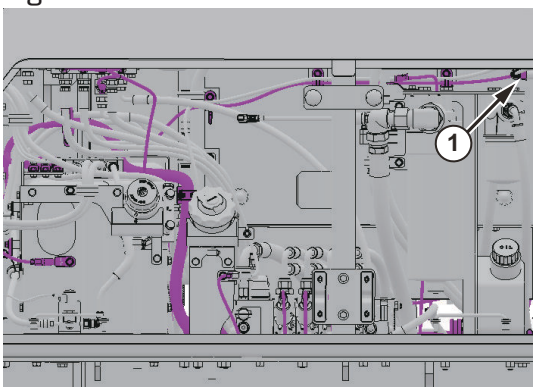
Wiring Harness Connectors

1. Disconnect wiper motor connector (1).
   Figure 200



DS2200905

2. Disconnect relay connector (2).
3. Disconnect EPOS connector (3).
4. Disconnect fan motor connector (4).
5. Disconnect wiper motor connector (1).
   Figure 201

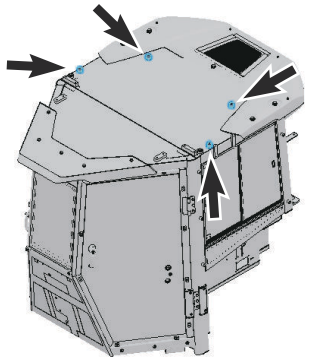


DS2200906

6. Disconnect any additional electrical connections as necessary.

Cabin

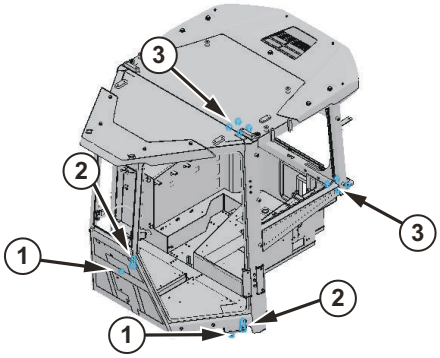
1. Using a suitable lifting device, attach slings to four lift points on top of cabin.
   Figure 202



DS2200908

   - Cabin weight: about 700 kg (1,543 lb)

2. Remove mounting nuts (1) (2 ea).
   Figure 203



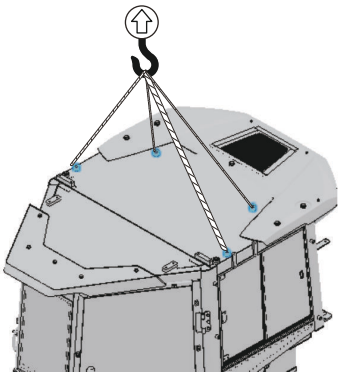
DS2200909

   - Tool: 24 mm ( )
   - Torque: 205.9 N.m (21 kg.m, 151.9 ft lb)

3. Remove mounting bolts (2) (2 ea) from cabin floor.
   - Tool: 36 mm ( )
   - Torque: 127.5 N.m (13 kg.m, 94.0 ft lb))

4. Remove hinge bolts (3) (8 ea).
   - Tool: 19 mm ( )
   - Torque: 88.3 N.m (9 kg.m, 65.1 ft lb)

5. Lift cabin approximately 25 - 50 mm (1" - 2") above deck.
   Figure 204



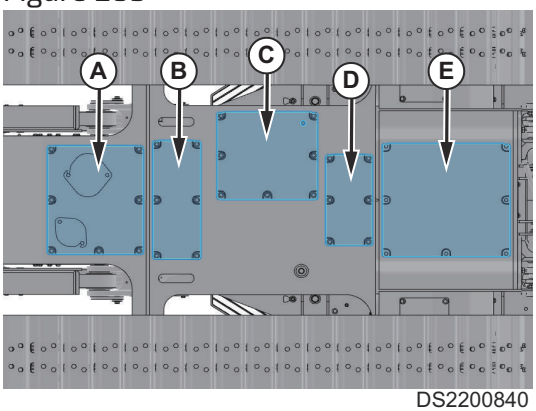
DS2200910

6. Check that all electrical connections have been disconnected and all other items unbolted.

   NOTE: *Lift operator's cabin slowly to prevent damaging.*

Undercover

1. Remove the undercover (E).
   Figure 205

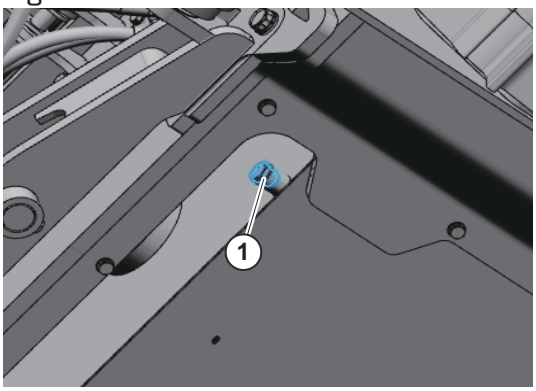


DS2200840

   For details, refer to Undercovers - Removal and Installation.

Fuel

1. Remove drain plug from fuel tank.
   Figure 206

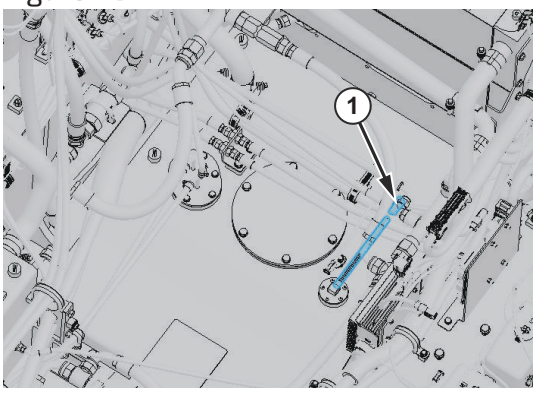


DS2201131

   - Fuel tank capacity: 190 L (50.2 U.S. gal)

Harness Connector

1. Disconnect wire harness (1) from fuel senser.
   Figure 207



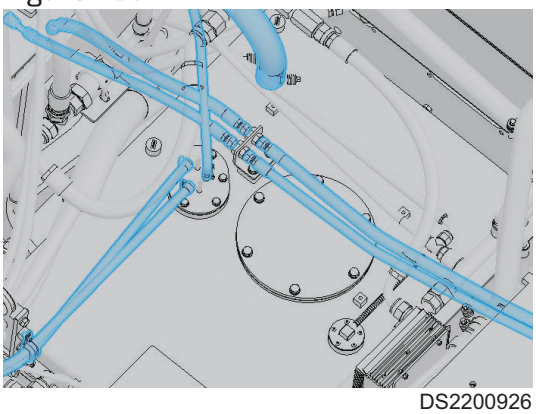
DS2200925

Hydraulic Hoses and Fittings

1. When disconnecting the hose, fuel left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 208

EX1504170

2. Remove hose from fuel tank.
   Figure 209



DS2200926

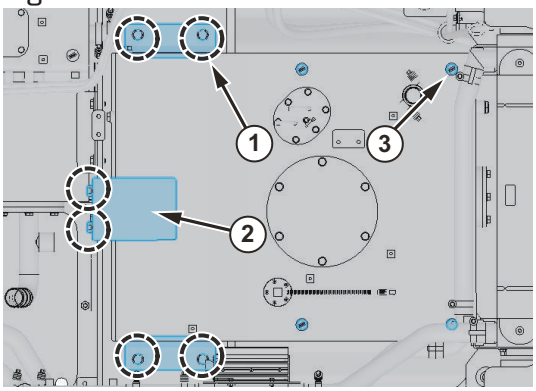
   NOTE: *Cap the open ends of hose with plug.*

3. Disconnect any additional hydraulic hose connections as necessary.

Fuel Tank Assembly

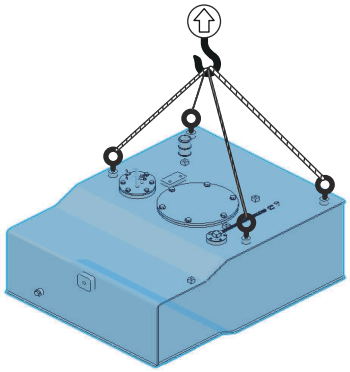
1. Remove bolts (1) and bracket (2) from fuel tank.
   - Tool: 22 mm ( )
   - Torque: 176.5 N.m (18 kg.m, 130.2 ft lb)

Figure 210



DS2200927

2. Remove lifting hole cap (3) from tank.
3. Install eyebolts (4 ea) on the fuel tank.
   Figure 211



DS2200928

   And tie the rope to the bolts to lift tank.
4. Completely remove tank after inspection.
   - Fuel tank weight: about 110 kg (242.5 lb)

Installation

1. Perform installation in the reverse order to remove.
2. Fill fuel tank and check for signs of leaks. Correct any problems found.

Fan Pump

Repair Procedure Quick Guide

Step-A. Tilt the cabin
Step-B. Remove hoses under the cabin
Step-C. Remove window washer tank
Step-D. Remove cabin tilting cylinder
Step-E. Disconnect wiring harness connectors
Step-F. Remove the cabin
Step-G. Remove hoses under the cabin
Step-H. Remove window washer tank
Step-I. Remove cabin tilting cylinder

Step-J. Disconnect wiring harness connectors

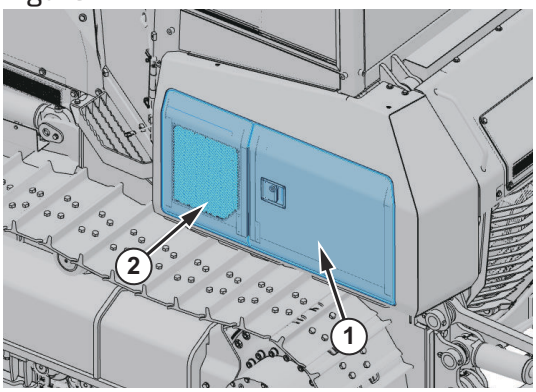
Step-K. Remove the cabin

Step-L. Disconnect hydraulic hoses and fittings

Step-M. Remove fan pump

Removal

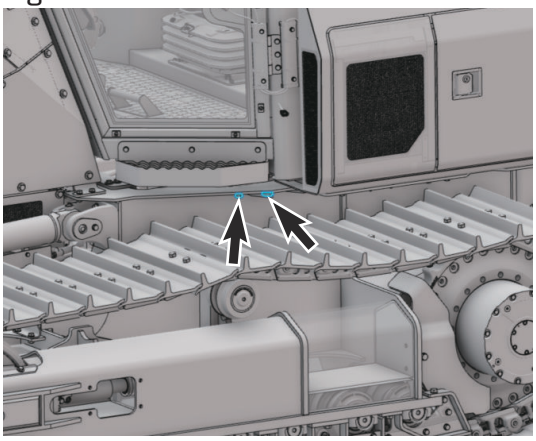
1. Open the left side door (1, 2).
   Figure 212



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 213

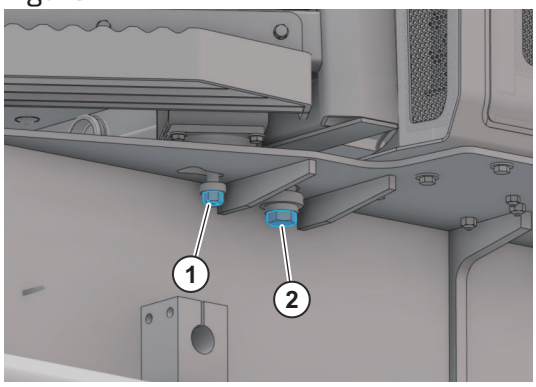


DS2201285

NOTE: *Both the left/right bolts of the cabin must be removed.*

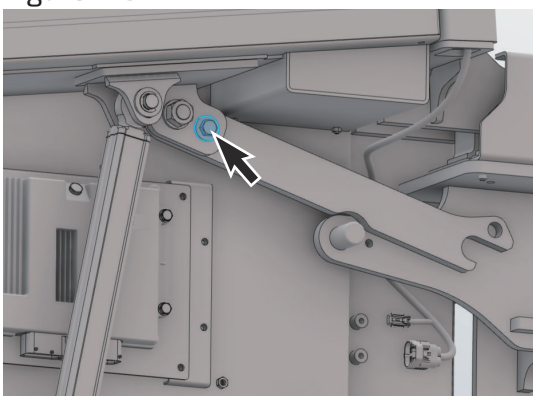
NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 214



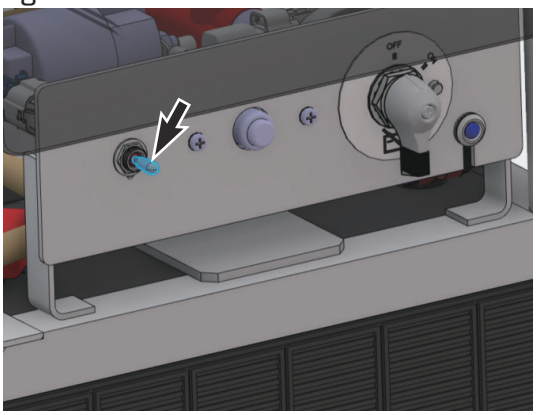
DS2201286

   - Tool: 24 mm ( )
   - Torque: 215.7 N.m (22 kg.m, 159 ft lb)
3. Remove bolts (2).
   - Tool: 36mm ( )
   - Torque: 127.4 N.m (13 kg.m, 94 ft lb)
4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 215



DS2201290

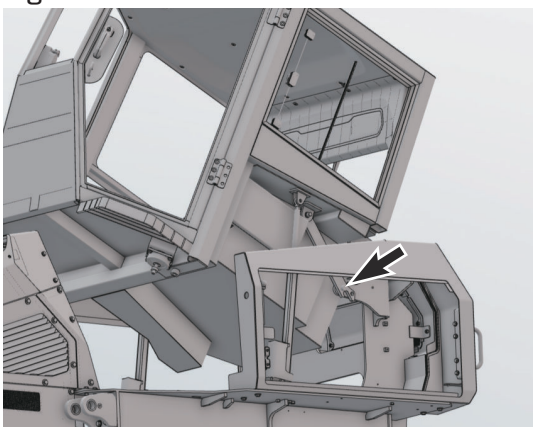
5. Turn cabin tilting switch to “ON” position.
   Figure 216



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.

Figure 217



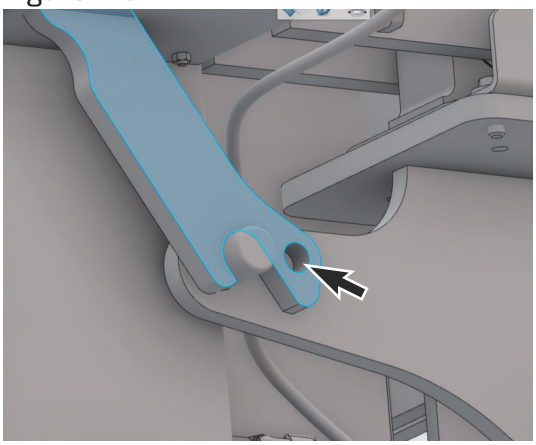
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation.
It can cause death or serious injury.

Figure 218

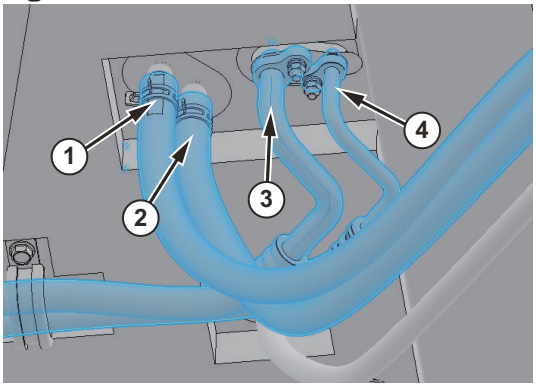


DS2201289

Hoses

1. Remove the heater hose (1).

Figure 219

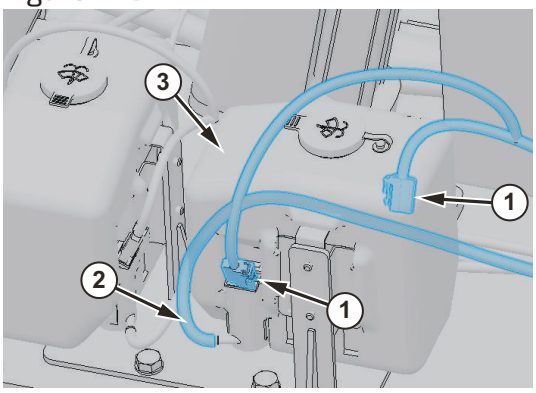


DS2200907

2. Remove the water hose (2).
3. Remove the air conditioner suction hose (3).
4. Remove the air conditioner liquid hose (4).
5. Return the tilted cabin to its original position.
6. Turn OFF the battery disconnect switch.

Window Washer Tank

1. Disconnect wiring harness (1) from window washer tank.
   Figure 220

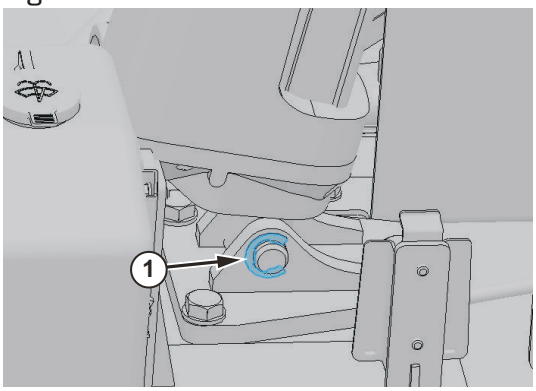


DS2200886

2. Remove water hose (2) from window washer tank.
3. Remove window washer tank (3).

Cabin Tilting Cylinder

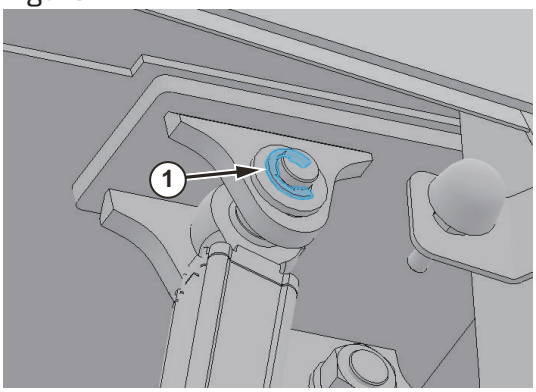
1. Remove the retaining ring (1) at the bottom of the cylinder.
   Figure 221



DS2200887

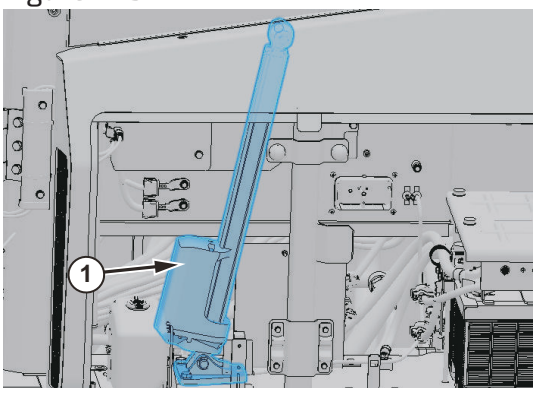
2. Remove the cylinder pin.

3. Remove the retaining ring (1) at the top of the cylinder.
   Figure 222



DS2200888

4. Remove the cylinder pin.
5. Remove the cabin tilting cylinder (1).
   Figure 223

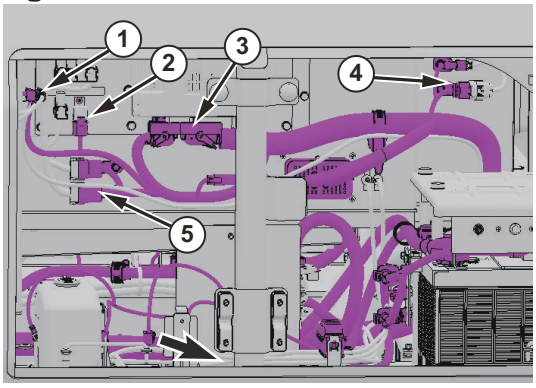


DS2200889

- Cabin tilting cylinder weight: about 10 kg (22.0 lb)

Wiring Harness Connectors

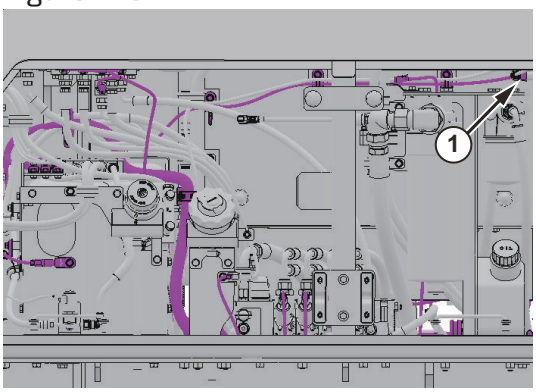
1. Disconnect wiper motor connector (1).
   Figure 224



DS2200905

2. Disconnect relay connector (2).
3. Disconnect EPOS connector (3).
4. Disconnect fan motor connector (4).

5. Disconnect wiper motor connector (1).
   Figure 225

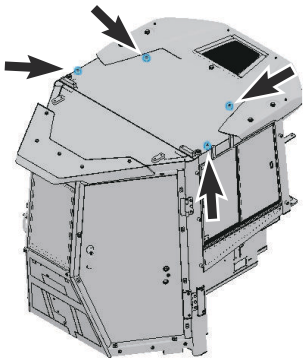


DS2200906

6. Disconnect any additional electrical connections as necessary.

Cabin

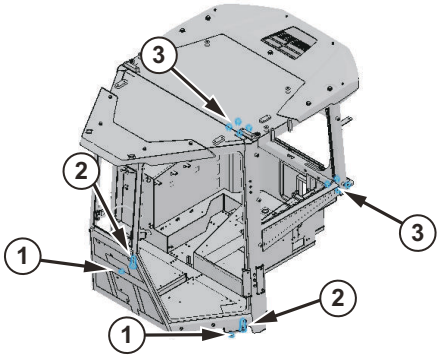
1. Using a suitable lifting device, attach slings to four lift points on top of cabin.
   Figure 226



DS2200908

   - Cabin weight: about 700 kg (1,543 lb)

2. Remove mounting nuts (1) (2 ea).
   Figure 227

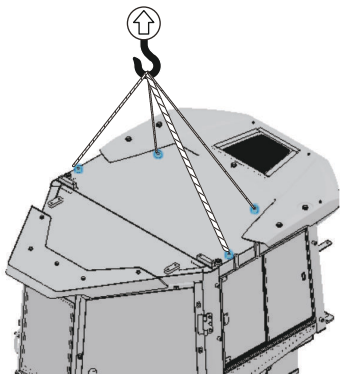


DS2200909

   - Tool: 24 mm ( )
   - Torque: 205.9 N.m (21 kg.m, 151.9 ft lb)

3. Remove mounting bolts (2) (2 ea) from cabin floor.
   - Tool: 36 mm ( )
   - Torque: 127.5 N.m (13 kg.m, 94.0 ft lb))

4. Remove hinge bolts (3) (8 ea).
   - Tool: 19 mm ( )
   - Torque: 88.3 N.m (9 kg.m, 65.1 ft lb)
5. Lift cabin approximately 25 - 50 mm (1" - 2") above deck.
   Figure 228



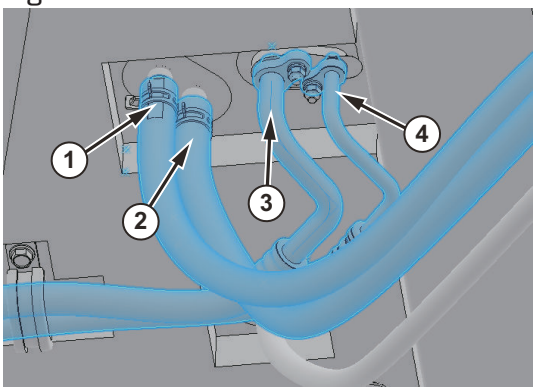
DS2200910

6. Check that all electrical connections have been disconnected and all other items unbolted.

   NOTE: *Lift operator's cabin slowly to prevent damaging.*

Hoses

1. Remove the heater hose (1).
   Figure 229

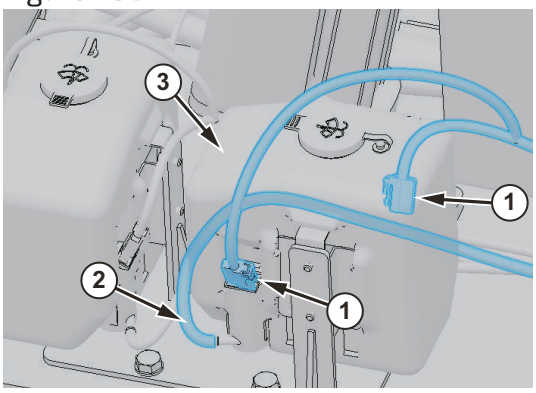


DS2200907

2. Remove the water hose (2).
3. Remove the air conditioner suction hose (3).
4. Remove the air conditioner liquid hose (4).
5. Return the tilted cabin to its original position.
6. Turn OFF the battery disconnect switch.

Window Washer Tank

1. Disconnect wiring harness (1) from window washer tank.
   Figure 230

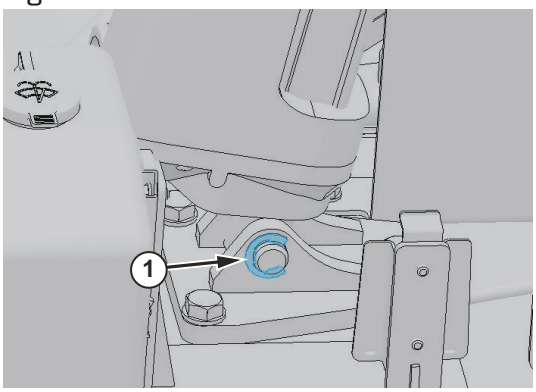


DS2200886

2. Remove water hose (2) from window washer tank.
3. Remove window washer tank (3).

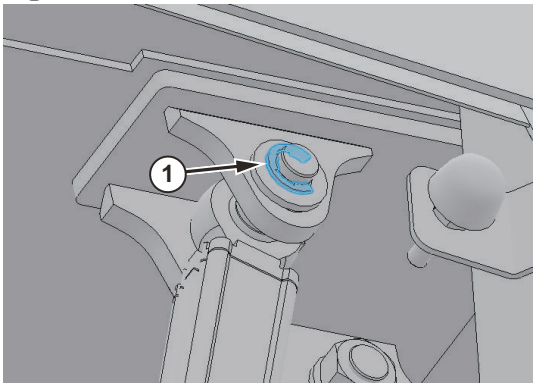
Cabin Tilting Cylinder

1. Remove the retaining ring (1) at the bottom of the cylinder.
   Figure 231



DS2200887

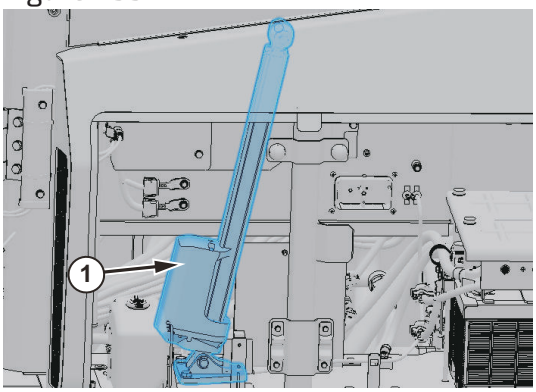
2. Remove the cylinder pin.
3. Remove the retaining ring (1) at the top of the cylinder.
   Figure 232



DS2200888

4. Remove the cylinder pin.

5. Remove the cabin tilting cylinder (1).
   Figure 233

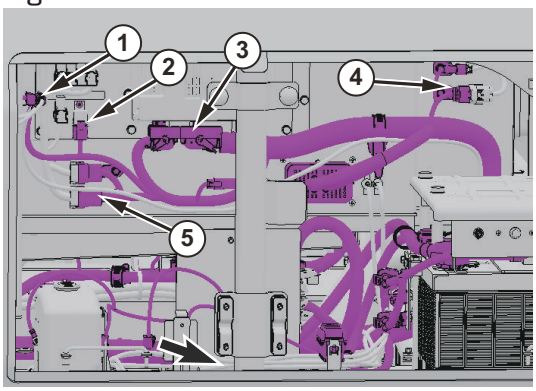


DS2200889

- Cabin tilting cylinder weight: about 10 kg (22.0 lb)

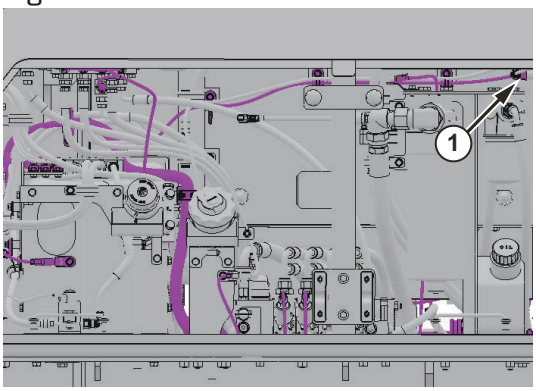
Wiring Harness Connectors

1. Disconnect wiper motor connector (1).
   Figure 234



DS2200905

2. Disconnect relay connector (2).
3. Disconnect EPOS connector (3).
4. Disconnect fan motor connector (4).
5. Disconnect wiper motor connector (1).
   Figure 235

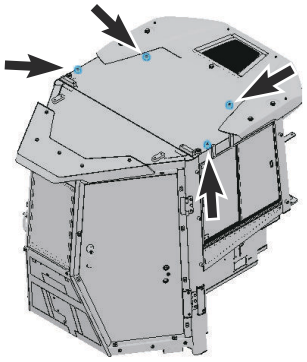


DS2200906

6. Disconnect any additional electrical connections as necessary.

Cabin

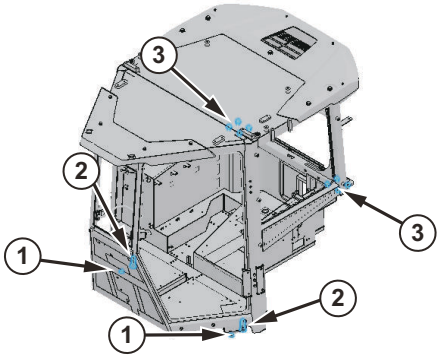
1. Using a suitable lifting device, attach slings to four lift points on top of cabin.
   Figure 236



DS2200908

   - Cabin weight: about 700 kg (1,543 lb)

2. Remove mounting nuts (1) (2 ea).
   Figure 237



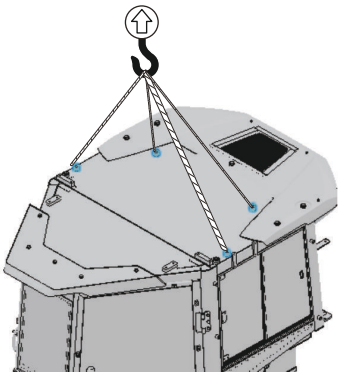
DS2200909

   - Tool: 24 mm ( )
   - Torque: 205.9 N.m (21 kg.m, 151.9 ft lb)

3. Remove mounting bolts (2) (2 ea) from cabin floor.
   - Tool: 36 mm ( )
   - Torque: 127.5 N.m (13 kg.m, 94.0 ft lb))

4. Remove hinge bolts (3) (8 ea).
   - Tool: 19 mm ( )
   - Torque: 88.3 N.m (9 kg.m, 65.1 ft lb)

5. Lift cabin approximately 25 - 50 mm (1" - 2") above deck.
   Figure 238



DS2200910

6. Check that all electrical connections have been disconnected and all other items unbolted.

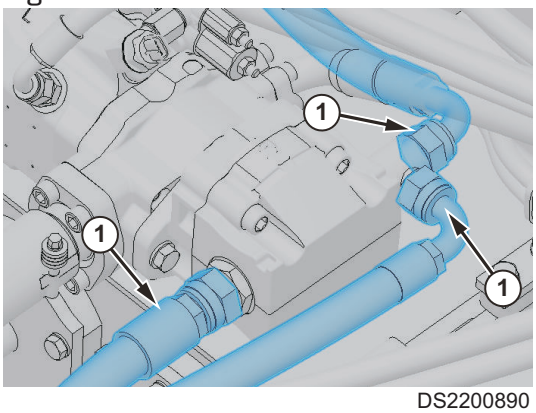
   NOTE: *Lift operator's cabin slowly to prevent damaging.*

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 239

EX1504170

2. Disconnect the hoses and adapters from fan pump.
   Figure 240

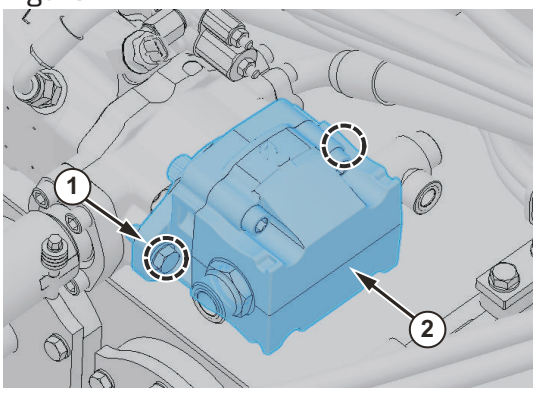


DS2200890

   NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from fan pump, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of fan pump.*

Fan Pump

1. Tie pump with rope to lift it.
   Figure 241



DS2200891

2. Remove mounting bolts (1) and fan pump (2) from main pump.
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
   - Fan pump weight: about 15 kg (33 lb)

Installation

1. Perform installation in the reverse order to remove.

Oil Cooler Fan Motor

Repair Procedure Quick Guide

Step-A. Remove rear cover

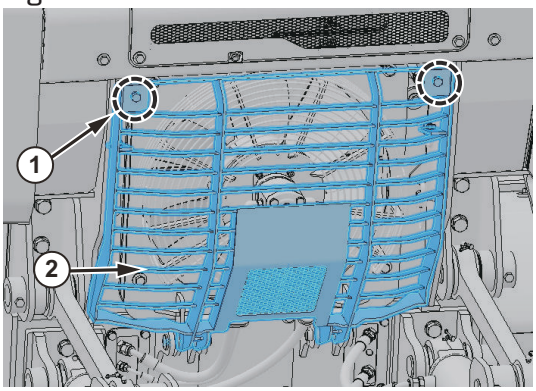
Step-B. Disconnect hydraulic hoses and fittings

Step-C. Remove fan motor

Removal

Rear Covers

1. Remove bolts and washers (1) (2 ea) from rear cover (2).
   Figure 242



DS2200892

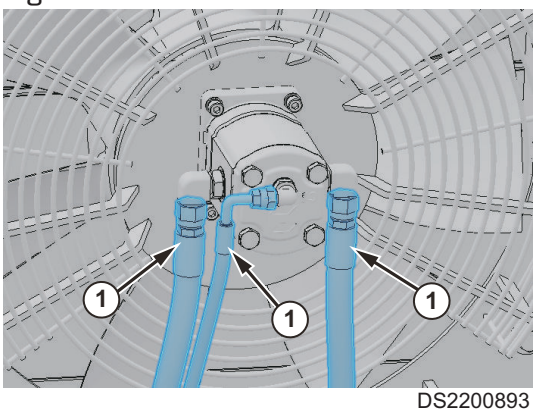
   - Tool: 19 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 243

EX1504170

2. Remove hoses and adapters from the fan motor.
   Figure 244

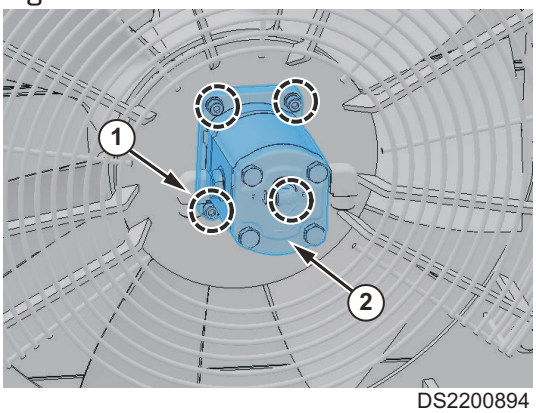


DS2200893

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses from fan motor, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of fan motor.*

Fan Motor

1. Remove bolts and washers (1) from fan motor (2).
   Figure 245



DS2200894

   - Tool: 6 mm ( )

2. Remove fan motor (2).
   - Motor weight: about 5 kg (11.0 lb)

Installation

⚠ WARNING

INCORRECT INSTALLATION CAN CAUSE DEATH OR SERIOUS INJURY

Any change in the connections will lead to malfunctions.

- When connecting hydraulic components, observe the specified piping according to the hydraulic schematic diagram of the machine.

1. Perform installation in the reverse order to remove normally.
2. The direction of plane of hub must be assembled towards fan motor direction.

Travel Device

Repair Procedure Quick Guide

Step-A. Tilt the cabin

Step-B. Remove hoses under the cabin

Step-C. Remove window washer tank

Step-D. Remove cabin tilting cylinder

Step-E. Disconnect wiring harness connectors

Step-F. Remove the cabin

Step-G. Remove undercover

Step-H. Drain fuel

Step-I. Disconnect wiring harness connector

Step-J. Disconnect fuel hoses and fittings

Step-K. Remove fuel tank assembly

Step-L. Disconnect wiring harness connector

Step-M. Disconnect hydraulic hoses and fittings.

Step-N. Release the tension of track.

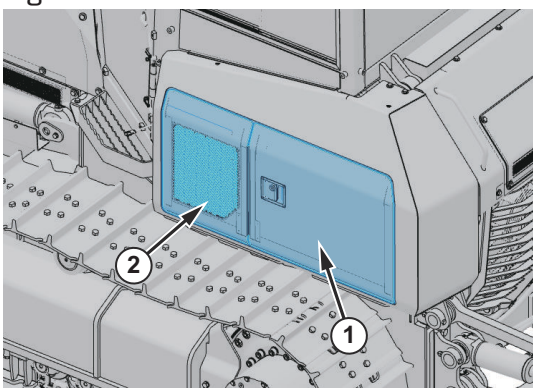
Step-O. Remove master link and shoe

Step-P. Remove track guard and sprocket

Step-Q. Remove travel device

Removal

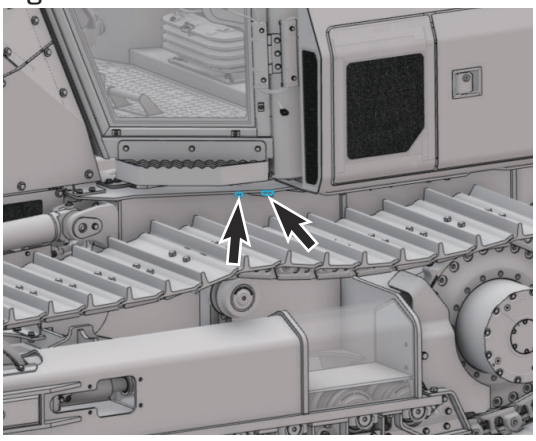
1. Open the left side door (1, 2).
   Figure 246



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 247

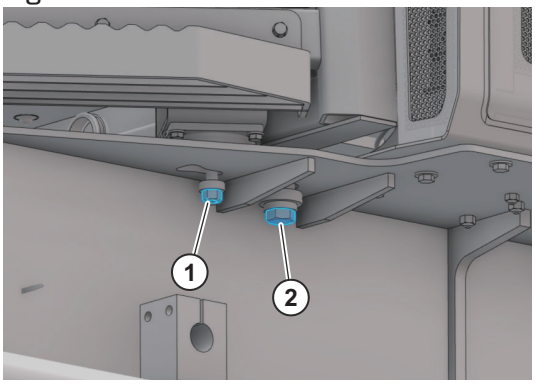


DS2201285

NOTE: *Both the left/right bolts of the cabin must be removed.*

NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 248



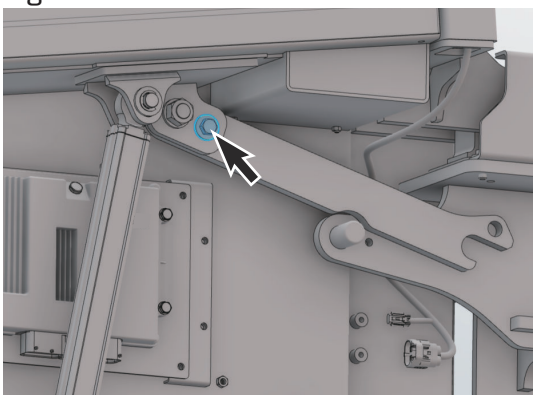
DS2201286

- Tool: 24 mm ( )
- Torque: 215.7 N.m (22 kg.m, 159 ft lb)

3. Remove bolts (2).

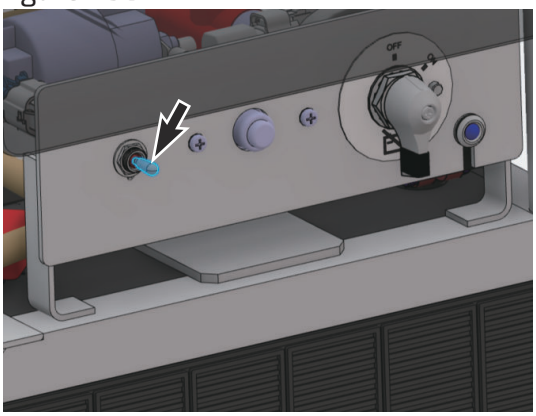
- Tool: 36mm ( )
- Torque: 127.4 N.m (13 kg.m, 94 ft lb)

4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 249



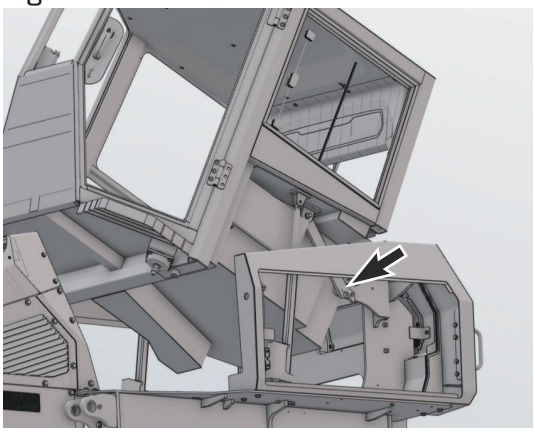
DS2201290

5. Turn cabin tilting switch to "ON" position.
   Figure 250



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.
   Figure 251



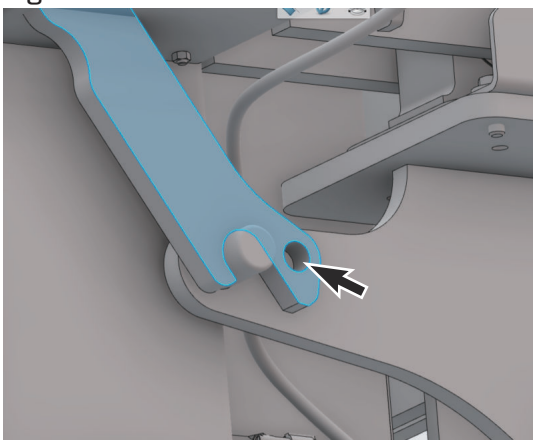
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation.
It can cause death or serious injury.

Figure 252

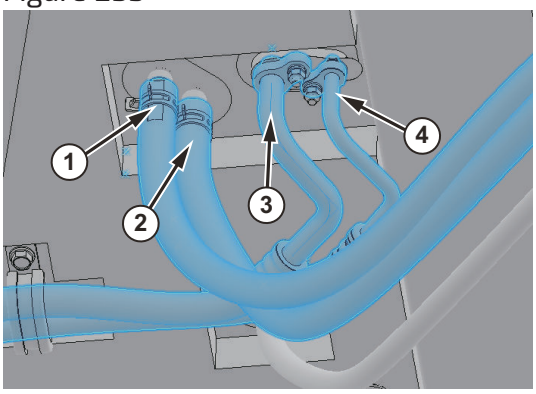


DS2201289

Hoses

1. Remove the heater hose (1).

Figure 253

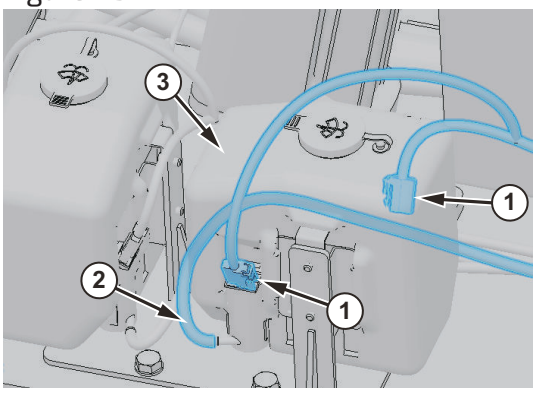


DS2200907

2. Remove the water hose (2).
3. Remove the air conditioner suction hose (3).
4. Remove the air conditioner liquid hose (4).
5. Return the tilted cabin to its original position.
6. Turn OFF the battery disconnect switch.

Window Washer Tank

1. Disconnect wiring harness (1) from window washer tank.
   Figure 254

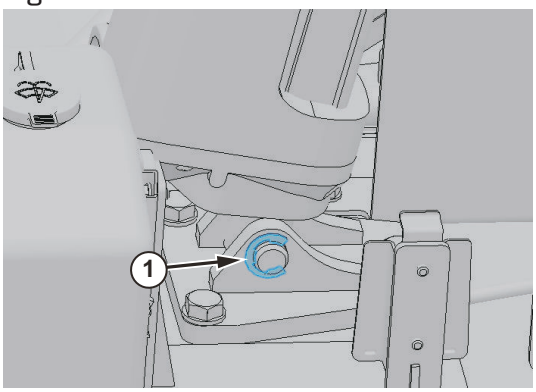


DS2200886

2. Remove water hose (2) from window washer tank.
3. Remove window washer tank (3).

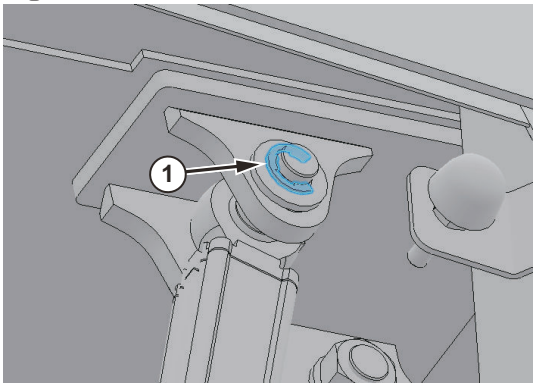
Cabin Tilting Cylinder

1. Remove the retaining ring (1) at the bottom of the cylinder.
   Figure 255



DS2200887

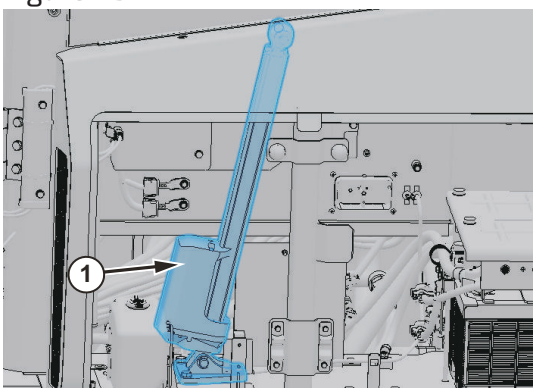
2. Remove the cylinder pin.
3. Remove the retaining ring (1) at the top of the cylinder.
   Figure 256



DS2200888

4. Remove the cylinder pin.

5. Remove the cabin tilting cylinder (1).
   Figure 257

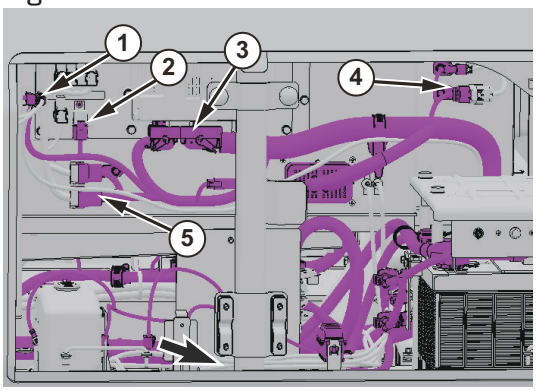


DS2200889

- Cabin tilting cylinder weight: about 10 kg (22.0 lb)

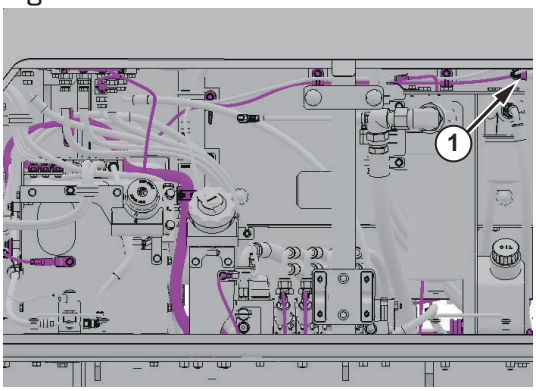
Wiring Harness Connectors

1. Disconnect wiper motor connector (1).
   Figure 258



DS2200905

2. Disconnect relay connector (2).
3. Disconnect EPOS connector (3).
4. Disconnect fan motor connector (4).
5. Disconnect wiper motor connector (1).
   Figure 259

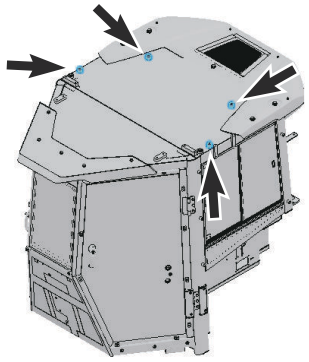


DS2200906

6. Disconnect any additional electrical connections as necessary.

Cabin

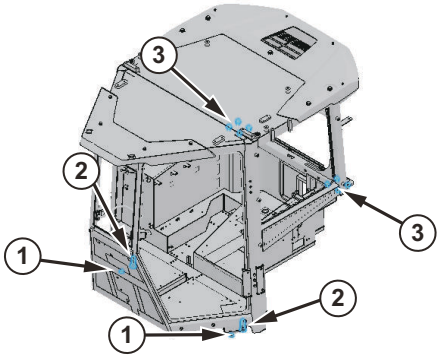
1. Using a suitable lifting device, attach slings to four lift points on top of cabin.
   Figure 260



DS2200908

   - Cabin weight: about 700 kg (1,543 lb)

2. Remove mounting nuts (1) (2 ea).
   Figure 261



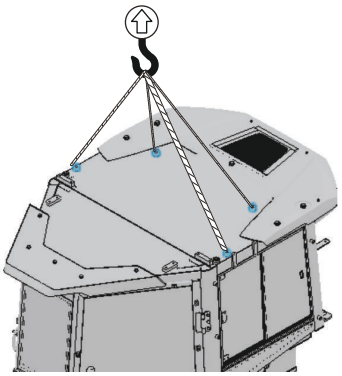
DS2200909

   - Tool: 24 mm ( )
   - Torque: 205.9 N.m (21 kg.m, 151.9 ft lb)

3. Remove mounting bolts (2) (2 ea) from cabin floor.
   - Tool: 36 mm ( )
   - Torque: 127.5 N.m (13 kg.m, 94.0 ft lb))

4. Remove hinge bolts (3) (8 ea).
   - Tool: 19 mm ( )
   - Torque: 88.3 N.m (9 kg.m, 65.1 ft lb)

5. Lift cabin approximately 25 - 50 mm (1" - 2") above deck.
   Figure 262



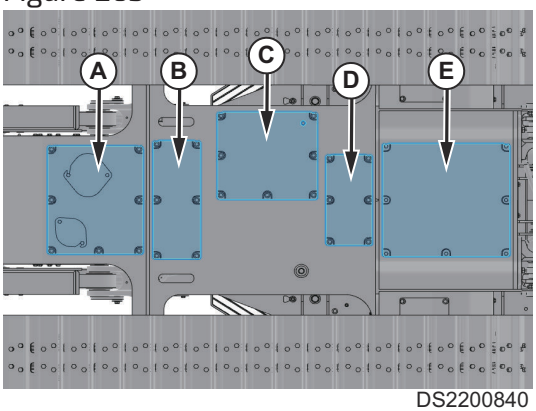
DS2200910

6. Check that all electrical connections have been disconnected and all other items unbolted.

   NOTE: *Lift operator's cabin slowly to prevent damaging.*

Undercover

1. Remove the undercover (E).
   Figure 263

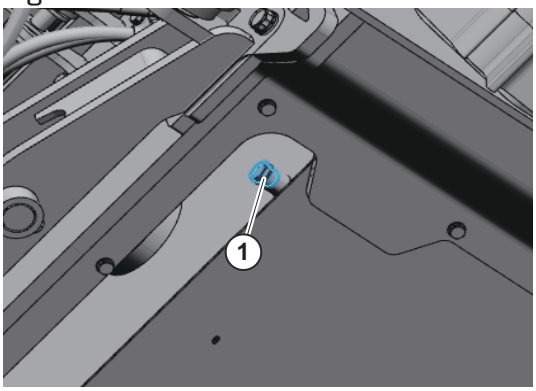


DS2200840

   For details, refer to Undercovers - Removal and Installation.

Fuel

1. Remove drain plug from fuel tank.
   Figure 264

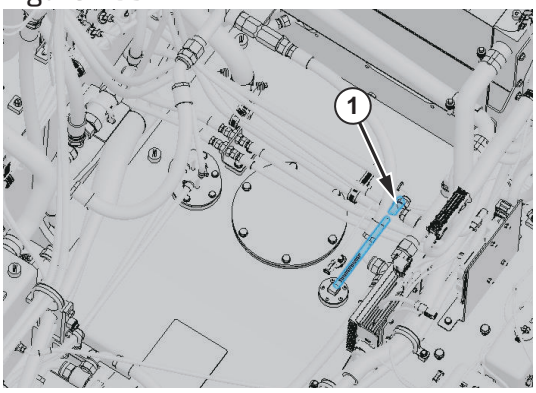


DS2201131

   - Fuel tank capacity: 190 L (50.2 U.S. gal)

Harness Connector

1. Disconnect wire harness (1) from fuel senser.
   Figure 265



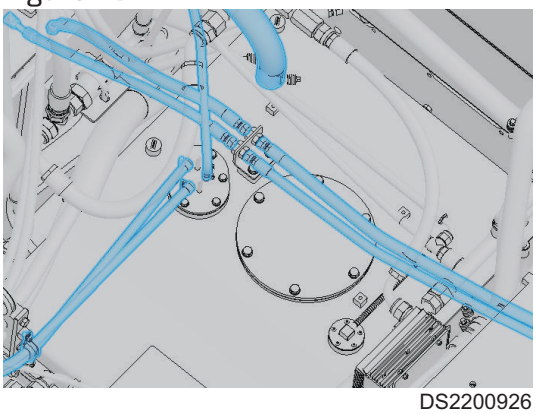
DS2200925

Hydraulic Hoses and Fittings

1. When disconnecting the hose, fuel left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 266

EX1504170

2. Remove hose from fuel tank.
   Figure 267



DS2200926

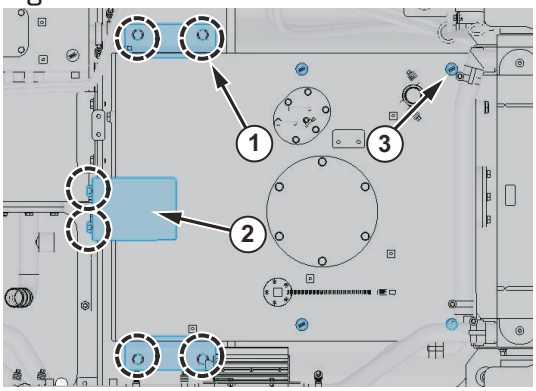
   NOTE: *Cap the open ends of hose with plug.*

3. Disconnect any additional hydraulic hose connections as necessary.

Fuel Tank Assembly

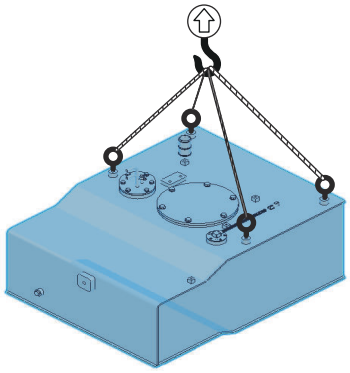
1. Remove bolts (1) and bracket (2) from fuel tank.
   - Tool: 22 mm ( )
   - Torque: 176.5 N.m (18 kg.m, 130.2 ft lb)

Figure 268



DS2200927

2. Remove lifting hole cap (3) from tank.
3. Install eyebolts (4 ea) on the fuel tank.
   Figure 269

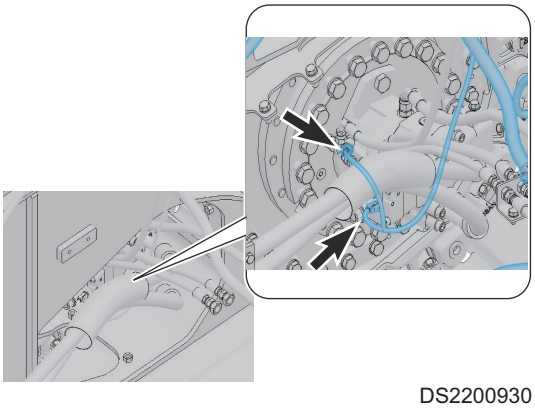


DS2200928

   And tie the rope to the bolts to lift tank.
4. Completely remove tank after inspection.
   - Fuel tank weight: about 110 kg (242.5 lb)

Wiring Harness Connectors

1. Disconnect the wiring harness connectors from inside of the frame.
   Figure 270



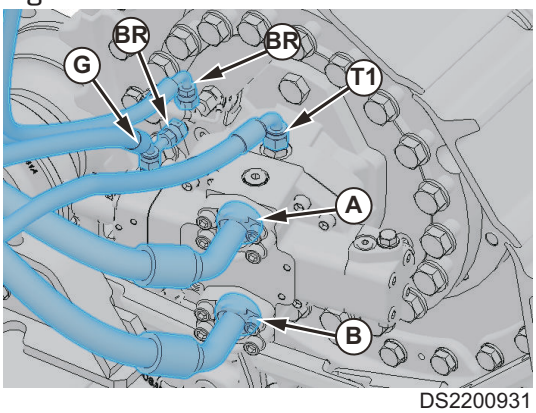
DS2200930

Hydraulic Hoses and Fittings

1. When disconnecting the hose, oil left in the hose may flow out. Therefore, place the end of the hose into a suitable container to prevent contamination of the ground and environment.
   Figure 271

EX1504170

2. Remove hoses and adapters from travel device.
   Figure 272

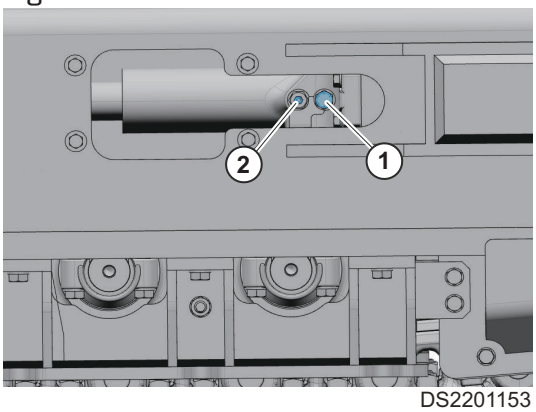


DS2200931

NOTE: *Attach identification tags to the removed hoses for reassembling. After disconnecting hoses, plug them to prevent dirt or dust from entering. Disconnect the hoses from the bottom to top of travel device.*

Tension of Track

1. Adjust the master link to be positioned at the top of the idler.
2. Loosen grease valve, and then slacken the tension of track.
   Figure 273

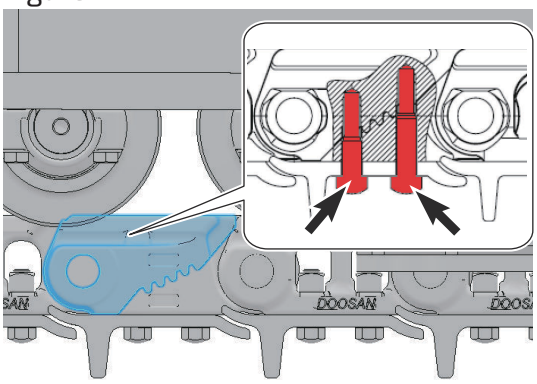


DS2201153

For details, refer to Track tension - Operation Manual.

Master Link and Shoe

1. Remove the bolts (1) from the master link.
   Figure 274



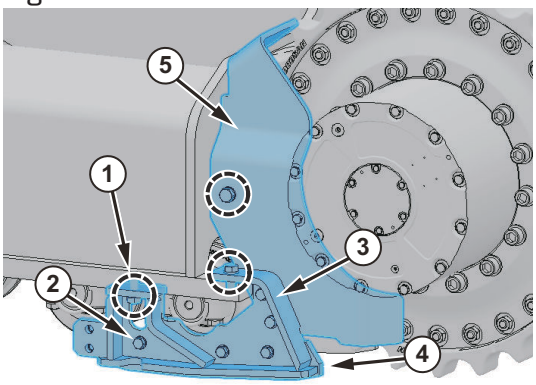
DS2200929

   - Tool: 24 mm ( )
   - Torque: 411.9 N.m (42 kg.m, 303.8 ft lb)
2. Remove the shoe pad (2) over the master link.
3. Detach the shoe by removing the master link connecting the shoe. Be carefully.

Track Guard and Sprocket

1. Remove bolts (3ea, 1) from the frame.
   - Tool: 24 mm ( )
   - Torque: 264.8 N.m (27 kg.m, 195.3 ft lb)

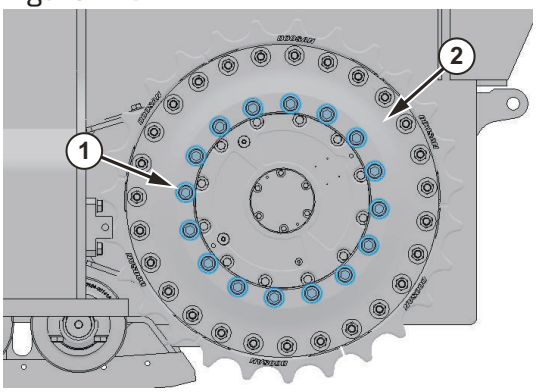
   Figure 275



DS2200932

2. Remove bolts (5ea, 2) from track guard.
   - Tool: 24 mm ( )
   - Torque: 107.9 N.m (11 kg.m, 79.6 ft lb)
3. Remove track guard (3, 5) and guard plate (4).

4. Remove bolt (1)(32 ea) with sprocket (2) from travel device.
   Figure 276



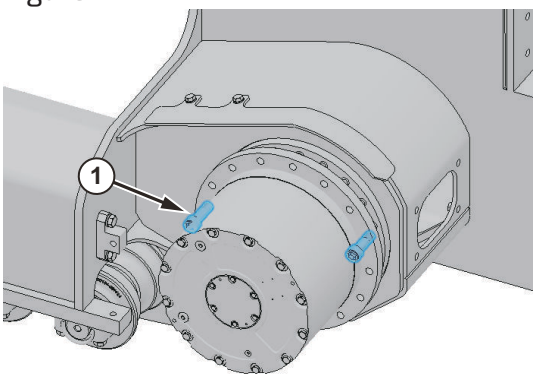
DS2200933

- Tool: 17 mm ( )
- Torque: 539.3 N.m (55 kg.m, 397.8 ft lb)
- Sprocket joint weight: about 40 kg (88.2 lb)
- Sprocket teeth (6ea) weight: about 40 kg (88.2 lb)
- Total sprocket ass'y weight: about 80 kg (176.4 lb)

  NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

Travel Device

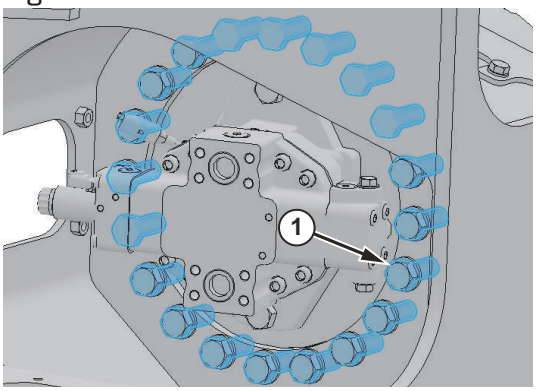
1. Install the sprocket bolts (1) to travel device, and tie the rope to the bolts to lift it.
   Figure 277



DS2200934

- Tool: 17 mm ( )

2. Remove mounting bolts (1) from track frame.
   Figure 278

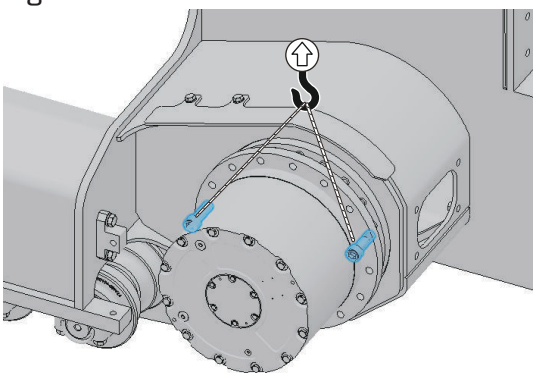


DS2200935

- Tool: 30 mm ( )
- Torque: 539.4 N.m (55 kg.m, 397.8 ft lb)

  NOTE: *Apply adhesive (Loctite #262) to the mounting bolt.*

3. Hoist and remove travel device (1) from track frame very slowly.
   Figure 279



DS2200936

- Weight: about 250 kg (551.2 lb)
- Travel device oil specification and quantity
- Replace oil: genuine oil
- Travel device oil quantity: 4.5 L x 2

  NOTE: *Remove travel device on both sides according to the procedures.*

Installation

1. Perform installation in the reverse order to remove.
2. When installing the hoses, install the drain hose first.

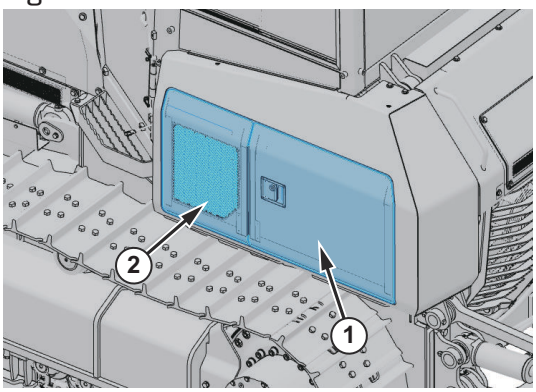
Cabin

Repair Procedure Quick Guide

Step-A. Tilt the cabin
Step-B. Remove hoses under the cabin
Step-C. Remove window washer tank
Step-D. Remove cabin tilting cylinder
Step-E. Disconnect wiring harness connectors
Step-F. Remove the cabin

Removal

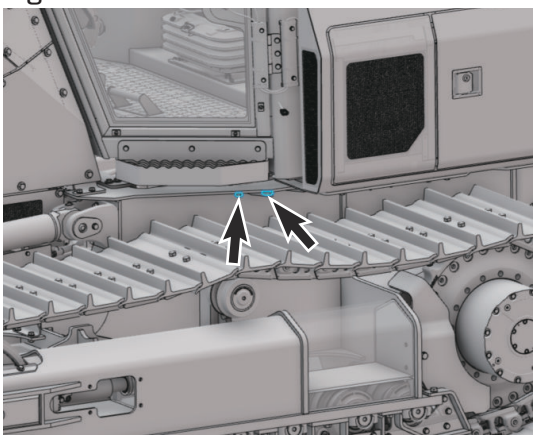
1. Open the left side door (1, 2).
   Figure 280



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 281

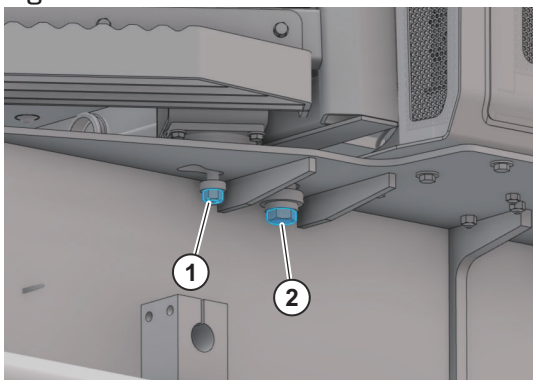


DS2201285

NOTE: *Both the left/right bolts of the cabin must be removed.*

NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 282



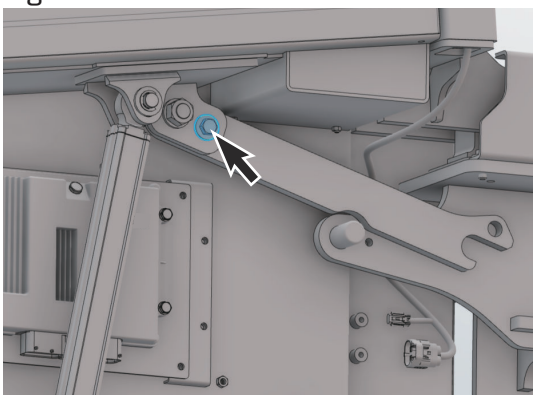
DS2201286

- Tool: 24 mm ( )
- Torque: 215.7 N.m (22 kg.m, 159 ft lb)

3. Remove bolts (2).

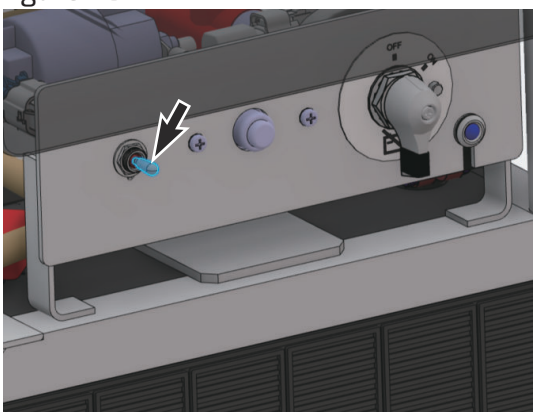
- Tool: 36mm ( )
- Torque: 127.4 N.m (13 kg.m, 94 ft lb)

4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 283



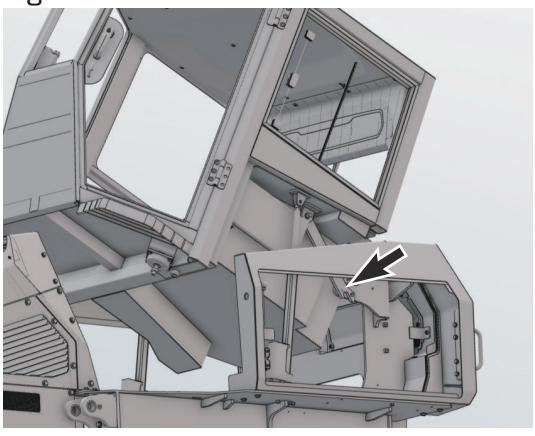
DS2201290

5. Turn cabin tilting switch to "ON" position.
   Figure 284



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.
   Figure 285



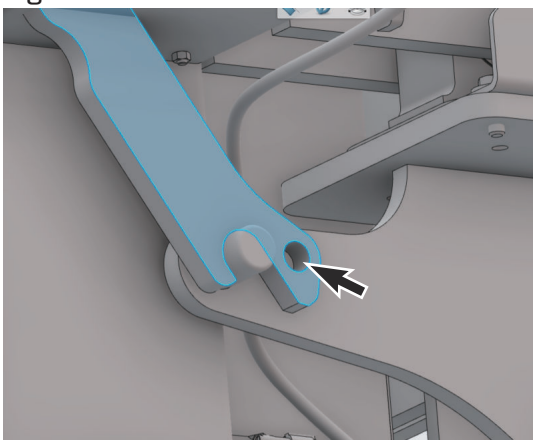
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation.
It can cause death or serious injury.

Figure 286

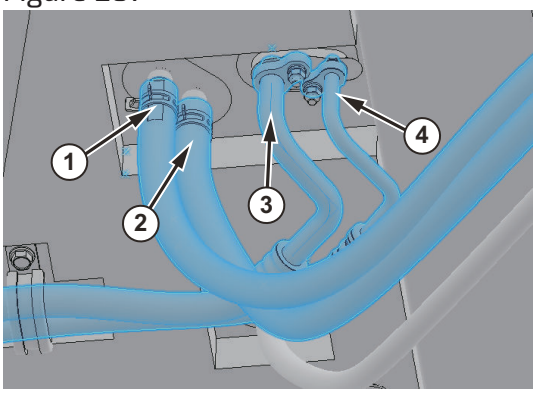


DS2201289

Hoses

1. Remove the heater hose (1).

Figure 287

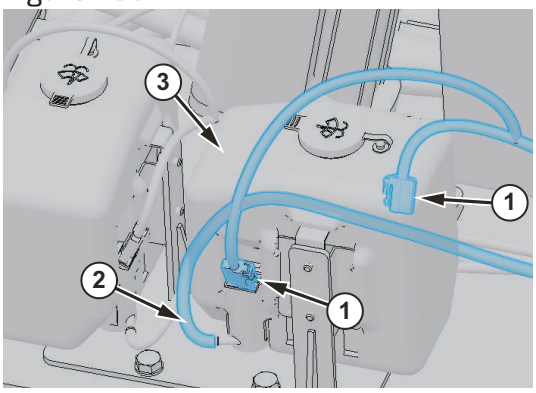


DS2200907

2. Remove the water hose (2).
3. Remove the air conditioner suction hose (3).
4. Remove the air conditioner liquid hose (4).
5. Return the tilted cabin to its original position.
6. Turn OFF the battery disconnect switch.

Window Washer Tank

1. Disconnect wiring harness (1) from window washer tank.
   Figure 288

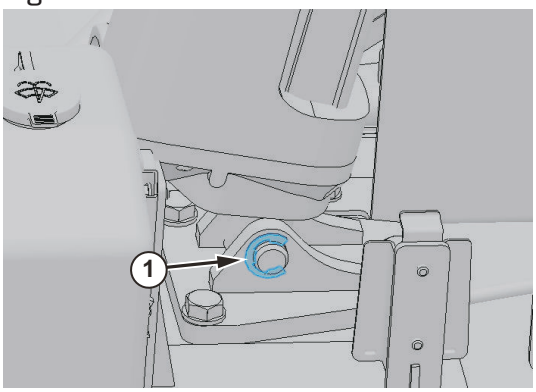


DS2200886

2. Remove water hose (2) from window washer tank.
3. Remove window washer tank (3).

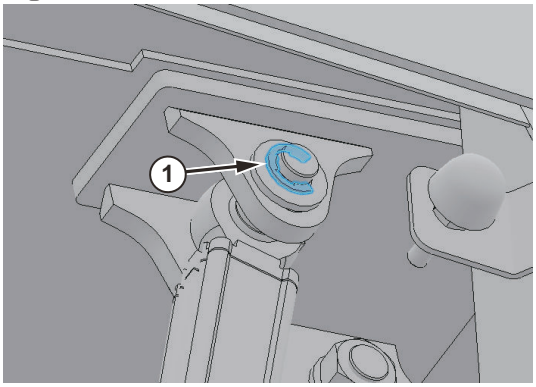
Cabin Tilting Cylinder

1. Remove the retaining ring (1) at the bottom of the cylinder.
   Figure 289



DS2200887

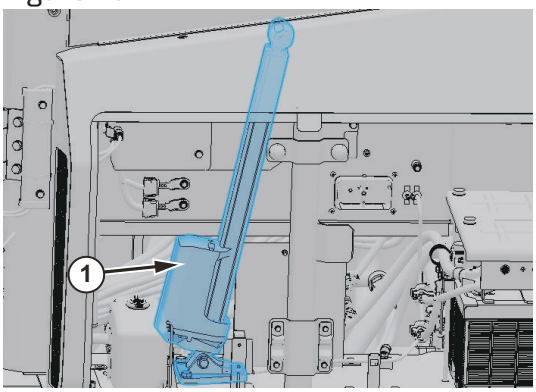
2. Remove the cylinder pin.
3. Remove the retaining ring (1) at the top of the cylinder.
   Figure 290



DS2200888

4. Remove the cylinder pin.

5. Remove the cabin tilting cylinder (1).
   Figure 291

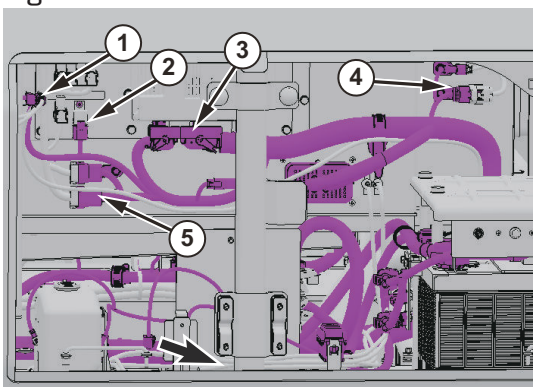


DS2200889

- Cabin tilting cylinder weight: about 10 kg (22.0 lb)

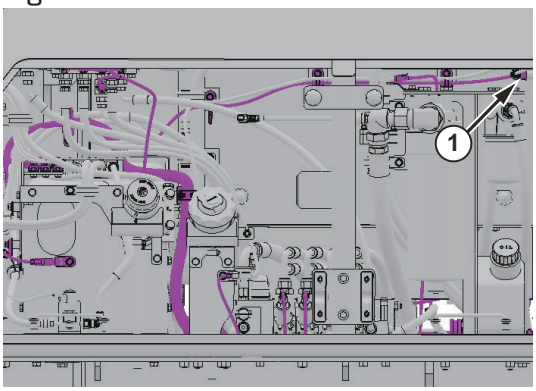
Wiring Harness Connectors

1. Disconnect wiper motor connector (1).
   Figure 292



DS2200905

2. Disconnect relay connector (2).
3. Disconnect EPOS connector (3).
4. Disconnect fan motor connector (4).
5. Disconnect wiper motor connector (1).
   Figure 293

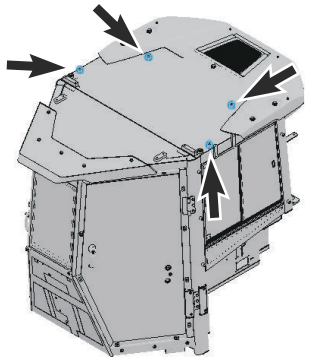


DS2200906

6. Disconnect any additional electrical connections as necessary.

Cabin

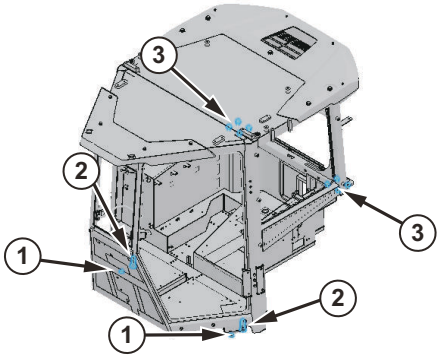
1. Using a suitable lifting device, attach slings to four lift points on top of cabin.
   Figure 294



DS2200908

   - Cabin weight: about 700 kg (1,543 lb)

2. Remove mounting nuts (1) (2 ea).
   Figure 295



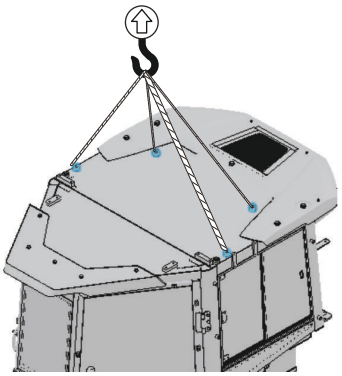
DS2200909

   - Tool: 24 mm ( )
   - Torque: 205.9 N.m (21 kg.m, 151.9 ft lb)

3. Remove mounting bolts (2) (2 ea) from cabin floor.
   - Tool: 36 mm ( )
   - Torque: 127.5 N.m (13 kg.m, 94.0 ft lb))

4. Remove hinge bolts (3) (8 ea).
   - Tool: 19 mm ( )
   - Torque: 88.3 N.m (9 kg.m, 65.1 ft lb)

5. Lift cabin approximately 25 - 50 mm (1" - 2") above deck.
   Figure 296



DS2200910

6. Check that all electrical connections have been disconnected and all other items unbolted.

   NOTE: *Lift operator's cabin slowly to prevent damaging.*

Installation

1. Perform installation in the reverse order to remove.

Cabin Tilting Cylinder

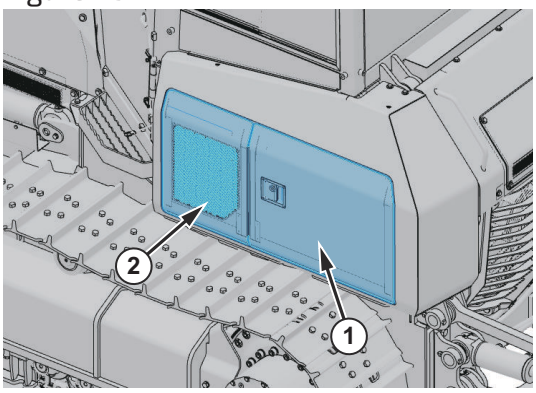
Repair Procedure Quick Guide

Step-A. Remove window washer tank.

Step-B. Remove cabin tilting cylinder

Removal

1. Open the left side door (1, 2).
   Figure 297

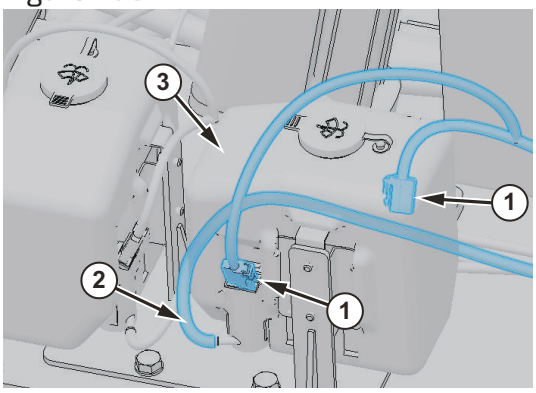


DS2200849

2. Turn OFF the battery disconnect switch.

Window Washer Tank

1. Disconnect wiring harness (1) from window washer tank.
   Figure 298

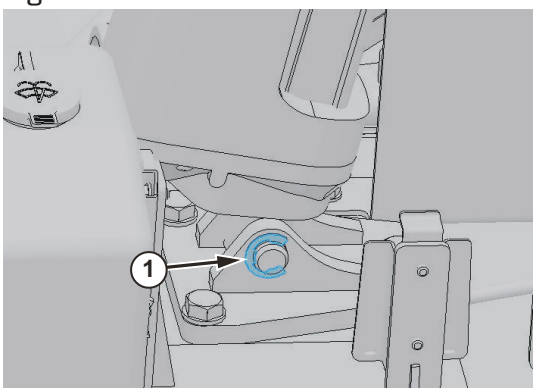


DS2200886

2. Remove water hose (2) from window washer tank.
3. Remove window washer tank (3).

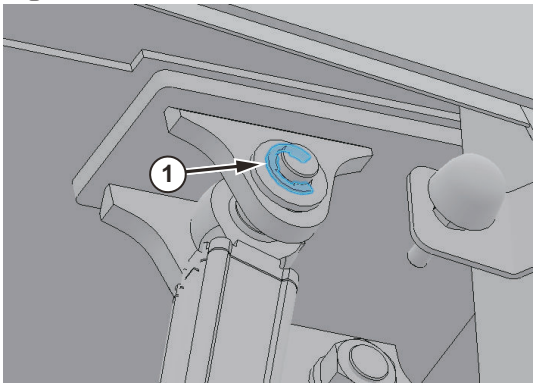
Cabin Tilting Cylinder

1. Remove the retaining ring (1) at the bottom of the cylinder.
   Figure 299



DS2200887

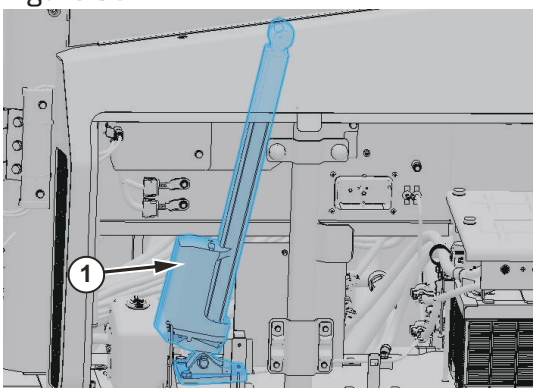
2. Remove the cylinder pin.
3. Remove the retaining ring (1) at the top of the cylinder.
   Figure 300



DS2200888

4. Remove the cylinder pin.

5. Remove the cabin tilting cylinder (1).
   Figure 301



DS2200889

- Cabin tilting cylinder weight: about 10 kg (22.0 lb)

Installation

1. Perform installation in the reverse order to remove.

Electric And Electronic

Safety Instructions

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicingmachine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Followwarnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correctfunction after adjustments repairs or service. Untrainedoperators and failure to follow instructions can cause deathor serious injury.

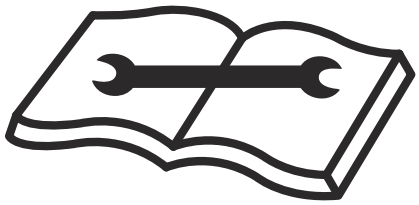
Before Removing and Installing

Preparatory Work

1. Park the machine on level ground. And lower front attachment to the ground.
2. Set parking brake switch to the parking position and then stop the engine.
3. Turn battery disconnect switch to "OFF" position.
4. Release the remaining pressure in the hydraulic circuit.
5. Cool down the hydraulic system and engine.
6. Attach a maintenance warning tag on controls.

General Precaution

1. Always read the safety section before removing and Installing.
   Figure 302



DS1901903

2. Mark the location of the bolts before removing.
3. Keep in the mind the order for tightening bolts.
4. Tighten bolts by hands, then using the tool.
5. If reusing the bolts, clean threads and apply thread locker to threads prior to installation.
6. Mark the location of wire harness connectors and hoses before disconnecting.
7. Be careful not to damage all components.
8. Do not reused gaskets, O-ring and adhesive bolts.

Completing Work

1. Check oil, coolant and fuel leak from the machine.
2. Check all oil level and if necessary, add oil.
3. Fill up the fuel tank to the standard level.
4. Apply grease to all lubrication points.
5. When fuel component has been disconnected, air must be bled from circuit.
   For details, see the Operation and Maintenance Manual.
6. When hydraulic component has been disconnected, air must be bled from circuit.
   For details, see the Operation and Maintenance Manual.
7. Start the engine and run at low idle for about 5 minutes.
8. Perform the machine performance test.

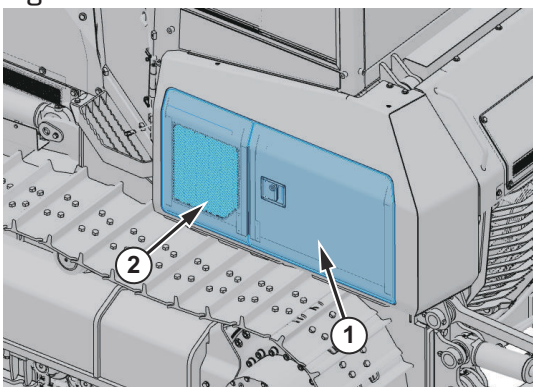
Battery Assembly

Repair Procedure Quick Guide

Step-A. Open the left side door
Step-B. Remove upper cover
Step-C. Disconnect wiring harness
Step-D. Remove battery assembly

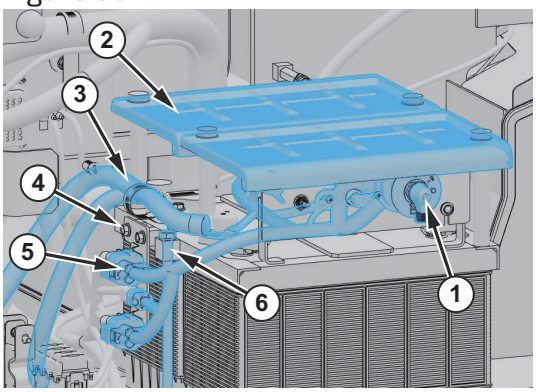
Removal

1. Open the left side door (1).
   Figure 303



DS2200849

2. Turn OFF the battery disconnect switch (1).
   Figure 304



DS2200850

3. Remove the battery upper cover (2).
4. Disconnect the negative cable and positive cable (3) from the batteries.
5. Remove the bolts (4) from bracket.
6. Disconnect any additional electrical connections as necessary (5).
7. Remove the hold down bracket and bolts (6).
   - Tool: 17 mm ( )
8. Remove batteries from frame.

Installation

1. Perform installation in the reverse order to removal.
2. Check the battery and start engine.

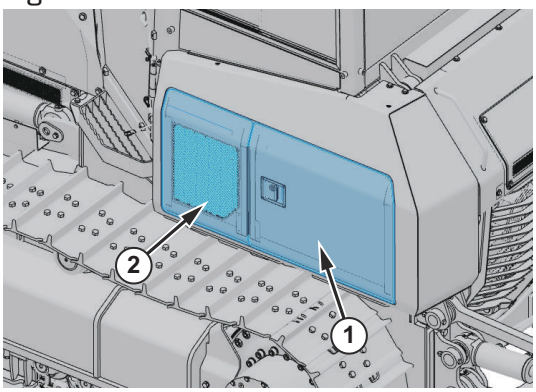
EPOS Controller

Repair Procedure Quick Guide

Step-A. Open the left side door
Step-B. Remove EPOS controller cover
Step-C. Disconnect wiring harness
Step-D. Remove EPOS controller

Removal

1. Open the left side door (1, 2).
   Figure 305

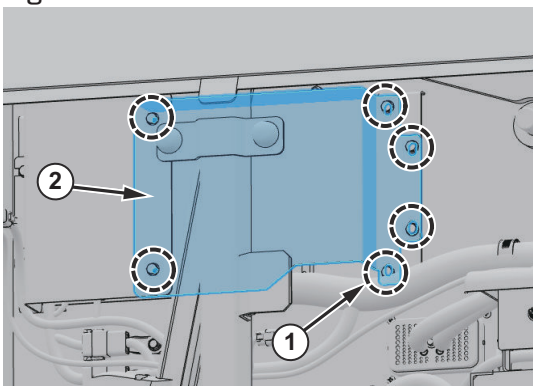


DS2200849

2. Turn OFF the battery disconnect switch.

EPOS Controller Cover

1. Remove bolts (1) from EPOS controller cover (2).
   Figure 306

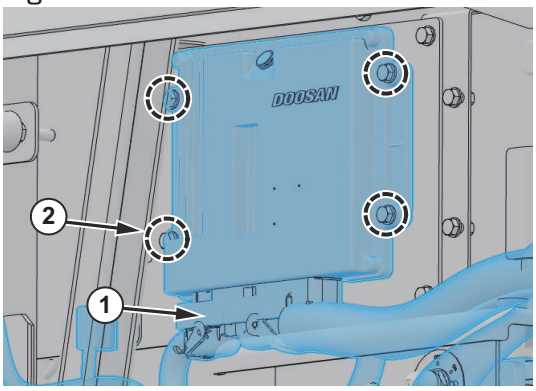


DS2200851

2. Remove EPOS controller cover.

EPOS Controller

1. Disconnect wiring harness connectors (1) from EPOS controller.
   Figure 307



DS2200852

   NOTE: *Move up connector levers when disconnect.*

2. Remove mounting bolts (2) from EPOS controller.
   - Tool: 13 mm ( )

- Torque: 19.6 N.m (2 kg.m, 14.5 ft lb)

3. Remove EPOS controller.

Installation

1. Perform installation in the reverse order to removal.

TMS Controller

Repair Procedure Quick Guide

Step-A. Open the cabin door

Step-B. Remove cabin rear cover

Step-C. Disconnect wiring harness

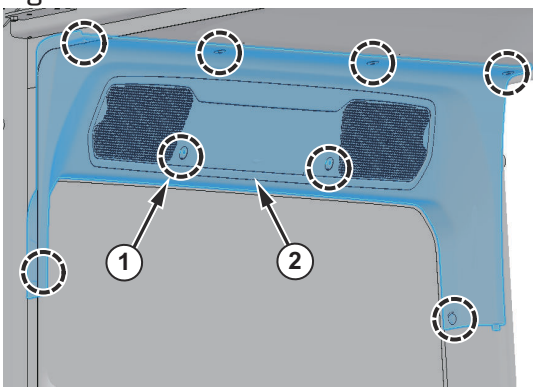
Step-D. Remove TMS controller

Removal

1. Open the left side door.
2. Turn OFF the battery disconnect switch.
3. Open the cabin door.

Cabin Rear Cover

1. Remove cap and bolts (1) from rear upper cover (2).
   Figure 308

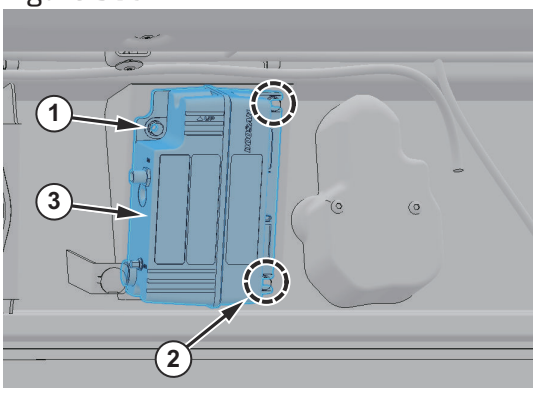


DS2200856

2. Remove rear upper cover.

TMS Controller

1. Disconnect wiring harness and cables from TMS controller.
   Figure 309



DS2200864

   NOTE: *Check the location of the connectors before disconnecting.*
2. Remove mounting bolts (1) from TMS controller (3).
3. Loosen mounting bolts (2).

   NOTE: *Do not tighten the fasteners too hard when installing.*
4. Remove TMS controller.

   NOTE: *Check the "UP" mark on the TMS controller. "UP" mark upward when TMS controller is mounted to the machine.*

Installation

1. Perform installation in the reverse order to removal.

TCU Controller

Repair Procedure Quick Guide

Step-A. Open the left side door

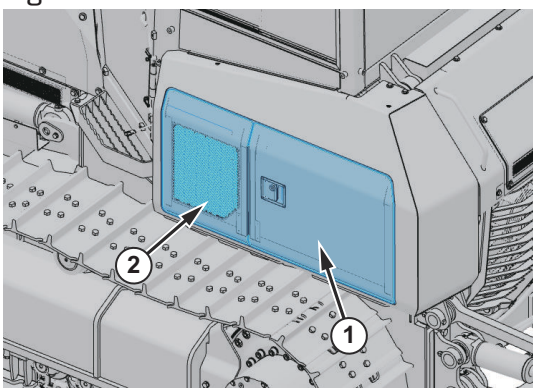
Step-B. Tilt the cabin

Step-C. Disconnect wiring harness

Step-D. Remove TCU controller

Removal

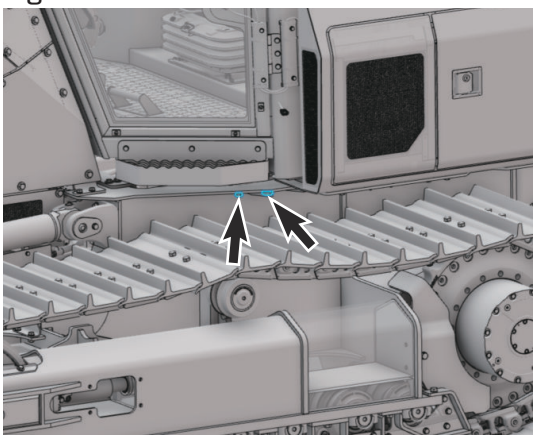
1. Open the left side door (1, 2).
   Figure 310



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 311

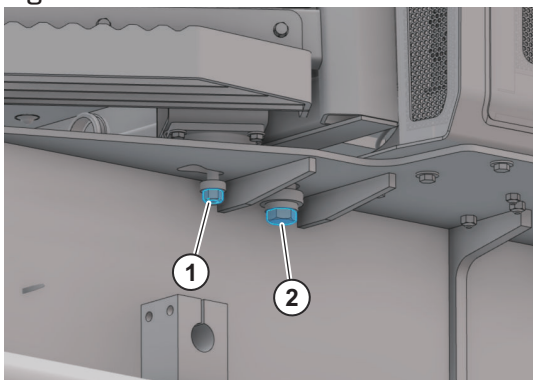


DS2201285

NOTE: *Both the left/right bolts of the cabin must be removed.*

NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 312



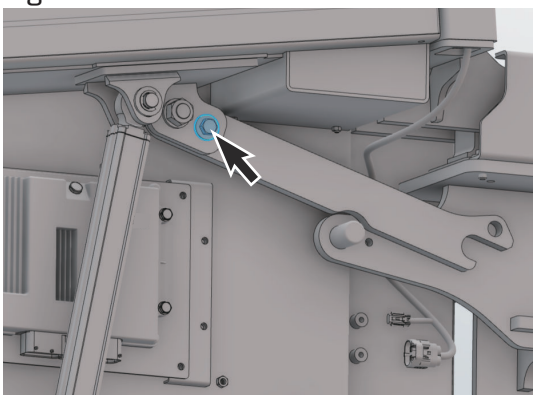
DS2201286

- Tool: 24 mm ( )
- Torque: 215.7 N.m (22 kg.m, 159 ft lb)

3. Remove bolts (2).

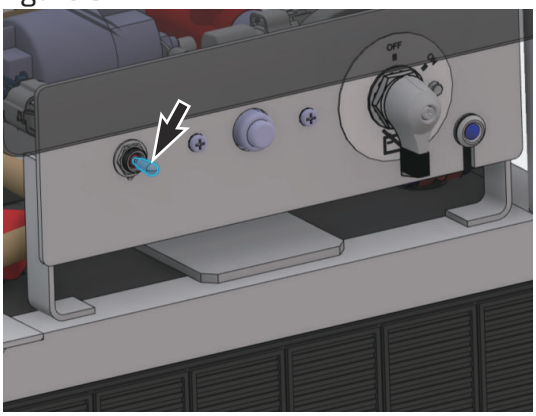
- Tool: 36mm ( )
- Torque: 127.4 N.m (13 kg.m, 94 ft lb)

4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 313



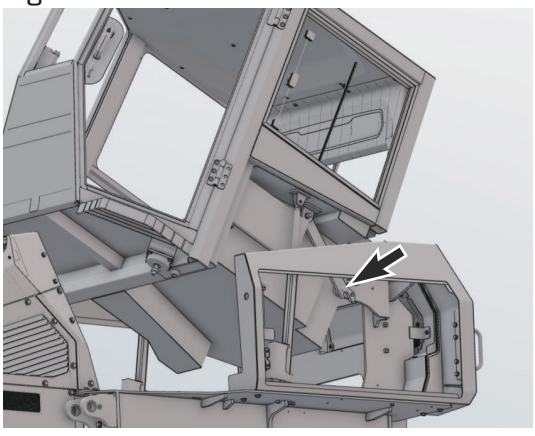
DS2201290

5. Turn cabin tilting switch to "ON" position.
   Figure 314



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.
   Figure 315



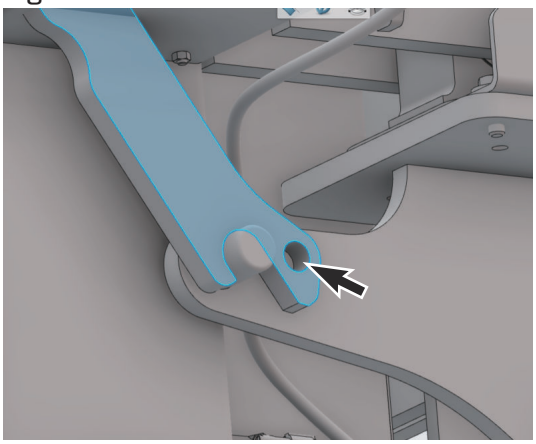
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation.
It can cause death or serious injury.

Figure 316

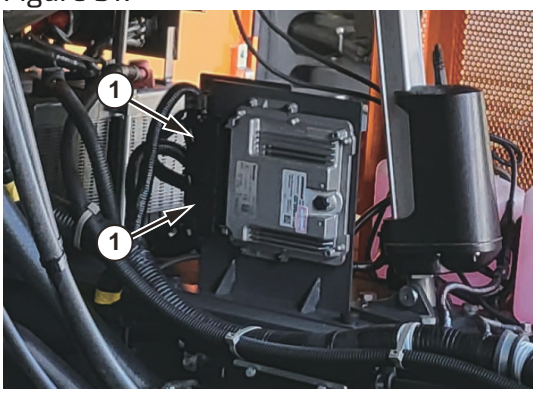


DS2201289

Wiring Harness

1. Turn Off the battery disconnect switch.

   Figure 317



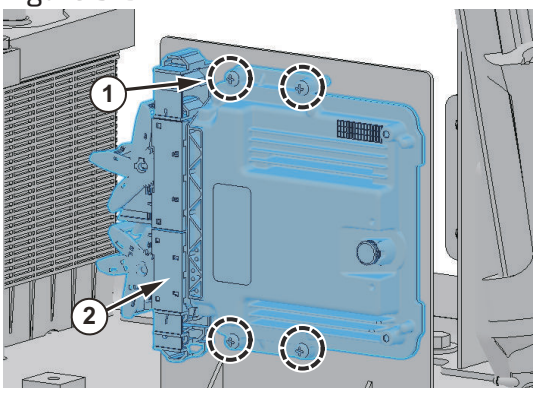
   DS2200875

2. Disconnect harness connectors (1) from TCU controller.

   NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

TCU Controller

1. Remove mounting bolts (1) from TCU controller (2).
   Figure 318



DS2200876

NOTE: *Do not tighten the fasteners too hard when installing.*

2. Remove TCU controller.

Installation

1. Perform installation in the reverse order to removal.

Electric Converter

Repair Procedure Quick Guide

Step-A. Open the left side door

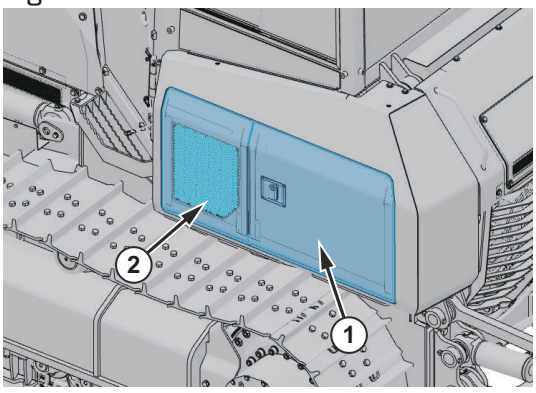
Step-B. Tilt the cabin

Step-C. Disconnect wiring harness

Step-D. Remove electric converter

Removal

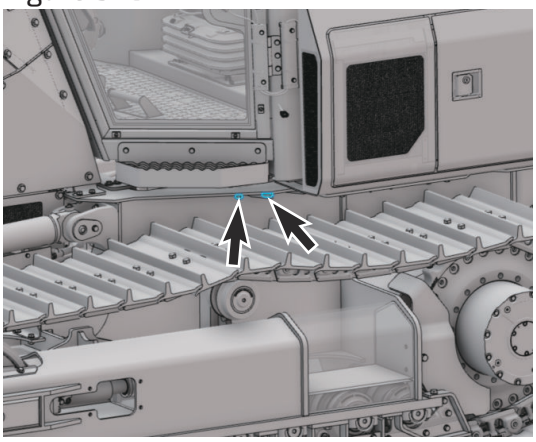
1. Open the left side door (1, 2).
   Figure 319



DS2200849

Tilt the Cabin

1. To operate cabin tilting system, remove bolts and nuts under the cabin.
   Figure 320

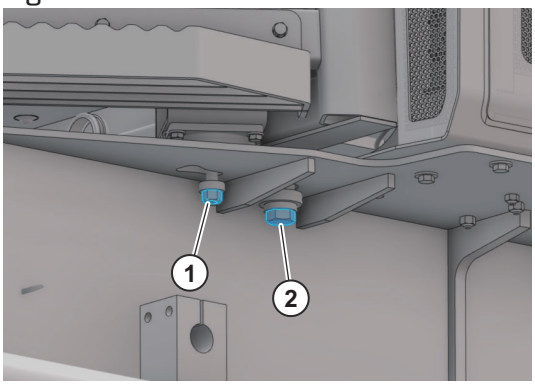


DS2201285

   NOTE: *Both the left/right bolts of the cabin must be removed.*

   NOTE: *Failure to remove bolts can cause serious damage to the machine.*

2. Remove nuts (1).
   Figure 321

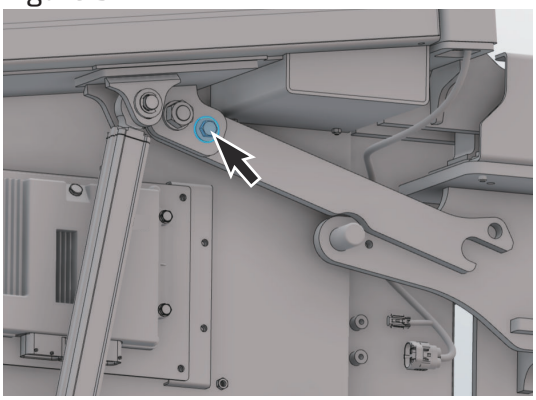


DS2201286

   - Tool: 24 mm ( )
   - Torque: 215.7 N.m (22 kg.m, 159 ft lb)

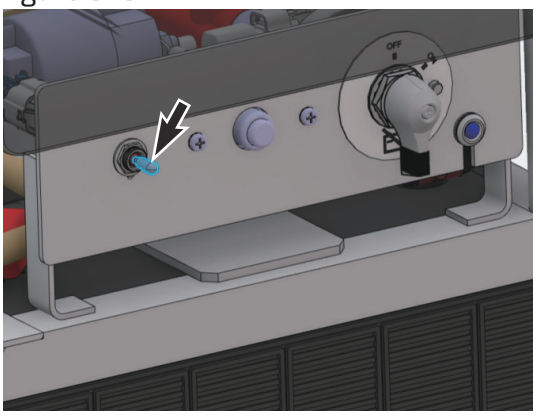
3. Remove bolts (2).
   - Tool: 36mm ( )
   - Torque: 127.4 N.m (13 kg.m, 94 ft lb)

4. Remove the bolts and washer on the safety bar. Safety bar is located in left side door.
   Figure 322



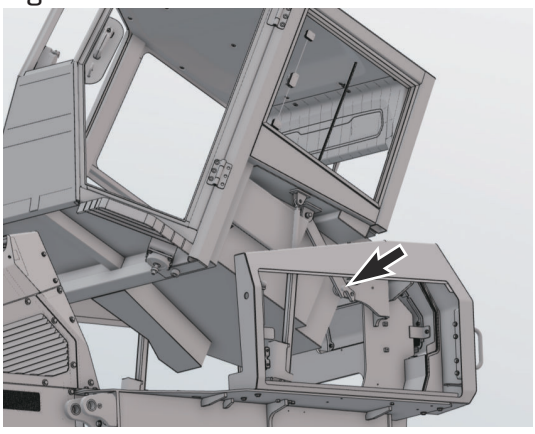
DS2201290

5. Turn cabin tilting switch to “ON” position.
   Figure 323



DS2201287

6. When the cabin tilting is completed, make sure the safety bar is fully engaged to the end and tighten the bolts and washers that were removed in step 4.
   Figure 324



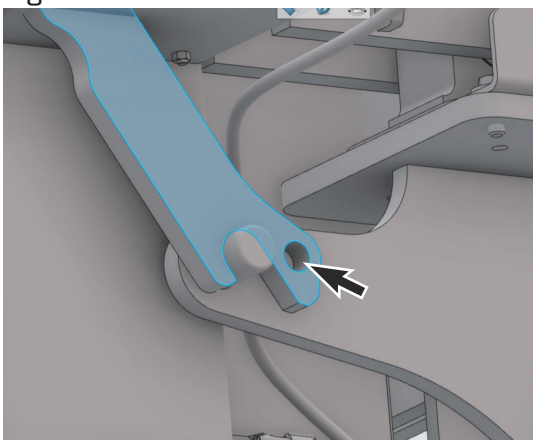
DS2201288

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Always check the installation of the safety bar during tilt operation.
It can cause death or serious injury.

Figure 325

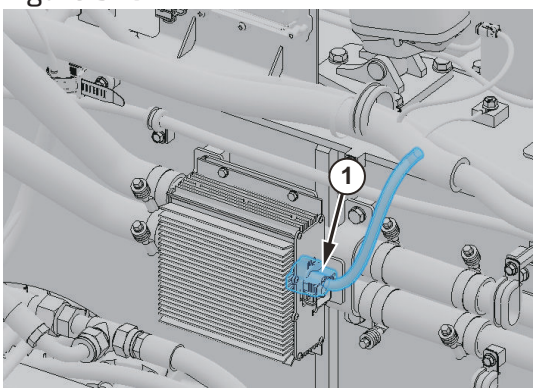


DS2201289

Wiring Harness

1. Turn Off the battery disconnect switch.

Figure 326



DS2200895

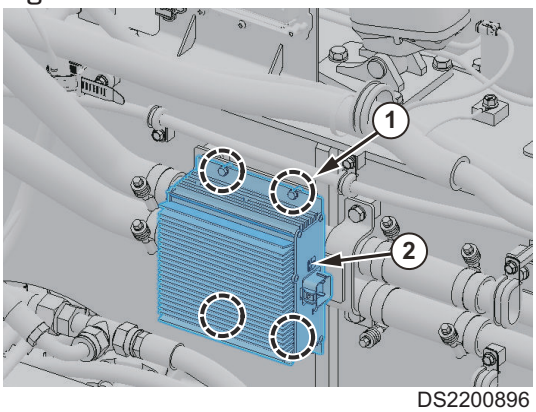
2. Disconnect harness connectors (1) from electric converter.

   NOTE: *Check the location of the connectors before disconnecting. Be careful not to let water get into electrical components. If water gets into electrical system, this will cause an electrical short circuit and result in improper machine operation.*

TCU Controller

1. Remove mounting bolts (1) from electric converter (2).

Figure 327



DS2200896

   NOTE: *Do not tighten the fasteners too hard when installing.*

2. Remove electric converter.

Installation

1. Perform installation in the reverse order to removal.

Cabin Switches

Repair Procedure Quick Guide

Step-A. Open the cabin door

Step-B. Remove stand covers

Step-C. Disconnect wiring harness

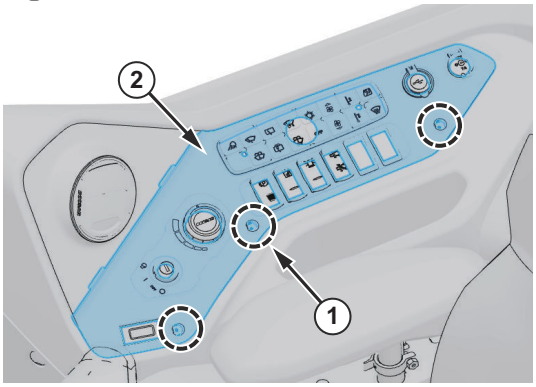
Step-D. Remove cabin switches

Removal

1. Open the left side door.
2. Turn OFF the battery disconnect switch.
3. Open the cabin door.

Stand Cover

1. Remove the plug cap and screws (1) from cabin side cover.
   Figure 328



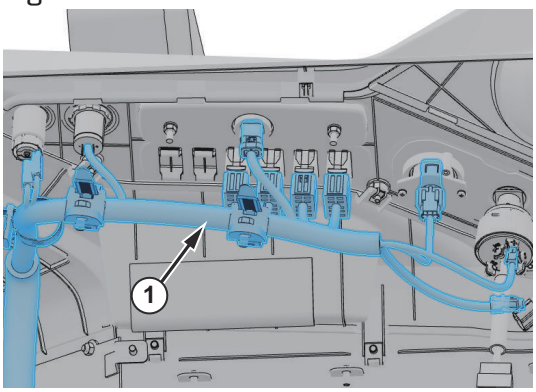
DS2200846

   NOTE: *Please find the service groove.*

2. Remove the cabin side cover (2).

Wiring Harness

1. Disconnect wiring harness connector (1) and all connector from switches.
   Figure 329

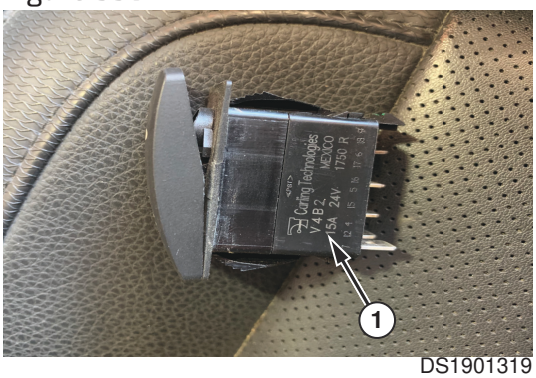


DS2200848

NOTE: *Check the location of the connectors before disconnecting.*

Cabin Switches

1. Pull up cabin switches (1) by using a flat-head screwdriver.
   Figure 330



DS1901319

NOTE: *Be careful not to break the switch assembly.*

Installation

1. Perform installation in the reverse order to removal.

Display Monitor

Repair Procedure Quick Guide

Step-A. Open the cabin door

Step-B. Remove front side cover

Step-C. Remove front upper cover

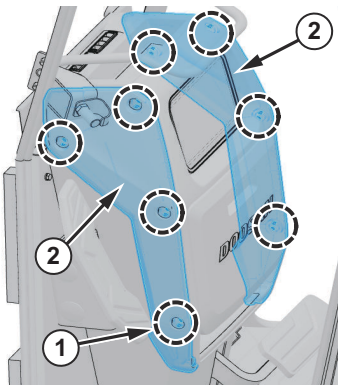
Step-D. Remove display monitor

Removal

1. Open the left side door.
2. Turn OFF the battery disconnect switch.
3. Open the cabin door.

Cabin Front Side Cover

1. Remove the plug cap and screws (1) from front side cover.
   Figure 331



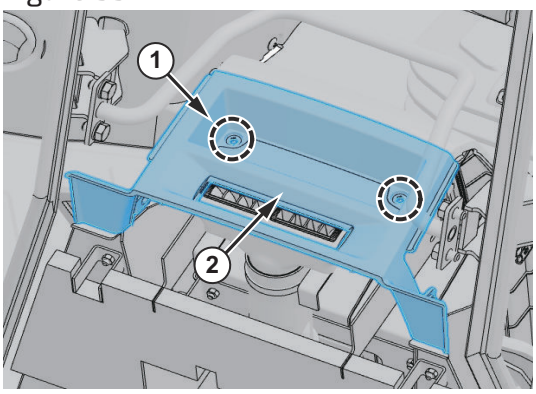
DS2200843

NOTE: *Please find the service groove.*

2. Remove the front side cover (2).

Cabin Front Upper Cover

1. Remove the plug cap and screws (1) from front upper cover.
   Figure 332

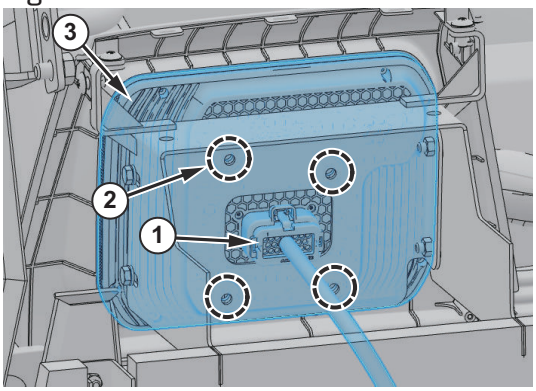


DS2200844

2. Remove the front upper cover (2).

Display Monitor

1. Disconnect wire harness (1) from display monitor (3).
   Figure 333



DS2200845

2. Remove the bolts (2) from display monitor.
   - Refer to torque values for standard.
3. Remove the display monitor from bracket.

Installation

1. Perform installation in the reverse order to removal.

Hour Meter

Repair Procedure Quick Guide

Step-A. Open the cabin door

Step-B. Remove stand cover

Step-C. Remove hour meter

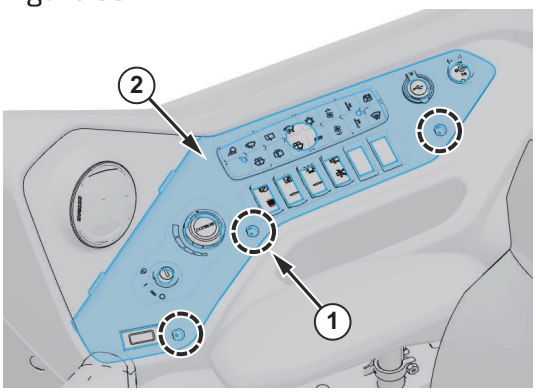
Removal

1. Open the left side door.

2. Turn OFF the battery disconnect switch.
3. Open the cabin door.

Stand Cover

1. Remove the plug cap and screws (1) from cabin side cover.
   Figure 334

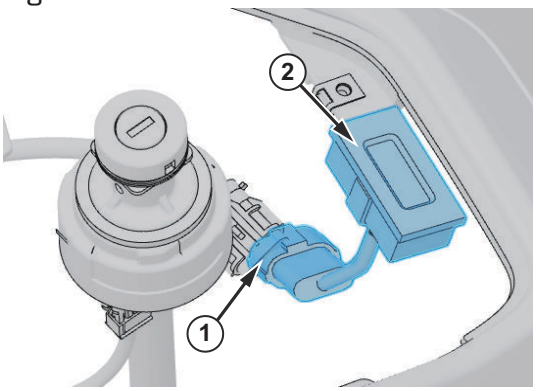


DS2200846

   NOTE: *Please find the service groove.*
2. Remove the cabin side cover (2).

Hour Meter

1. Disconnect wire harnesses (1).
   Figure 335



DS2200847

2. Remove the hour meter (2) from cabin side cover.

Installation

1. Perform installation in the reverse order to removal.

Wiper Motor

Repair Procedure Quick Guide

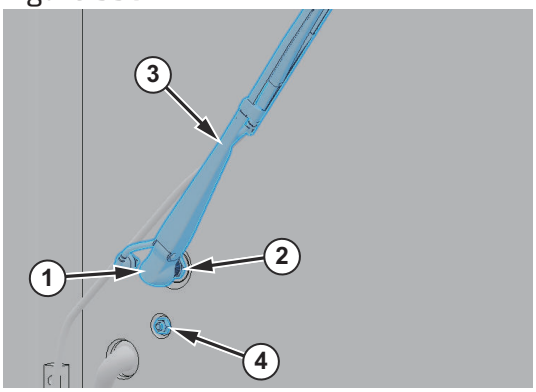
Step-A. Remove left, right door wiper arm and blade.
Step-B. Remove left, right wiper motor
Step-C. Remove rear glass wiper arm and blade.
Step-D. Remove rear wiper motor
Step-E. Remove front glass wiper arm and blade.
Step-F. Remove front wiper motor

Removal

1. Turn OFF the battery disconnect switch.

Left, Right Wiper Arm and Blade

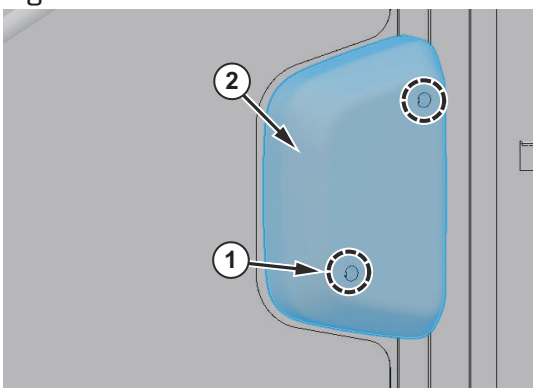
1. Open cap (1), remove nut (2, 4) and wiper arm and blade (3).
   Figure 336



DS2200853

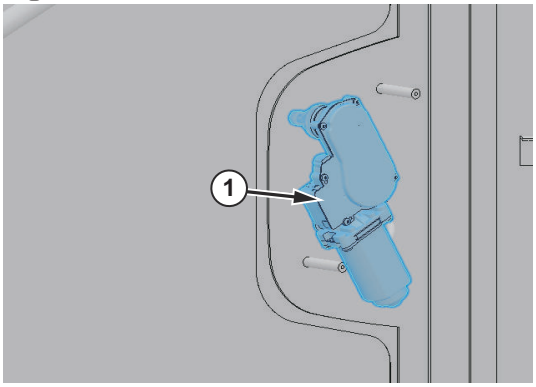
Left, Right Wiper Motor

1. Remove cap and bolts (1) from wiper motor cover (2).
   Figure 337



DS2200854

2. Remove wiper motor cover.
3. Disconnect wire harness connector from wiper motor.
   Figure 338

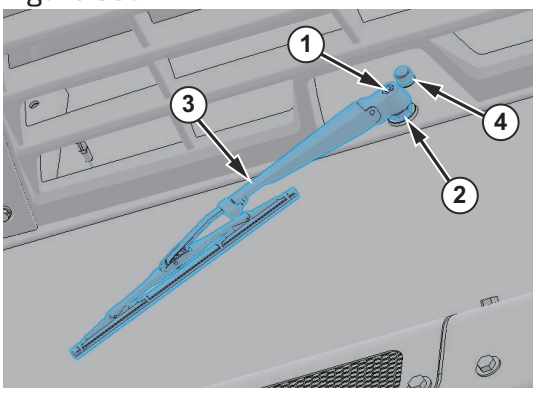


DS2200855

4. Remove wiper motor (1).

Rear Wiper Arm and Blade

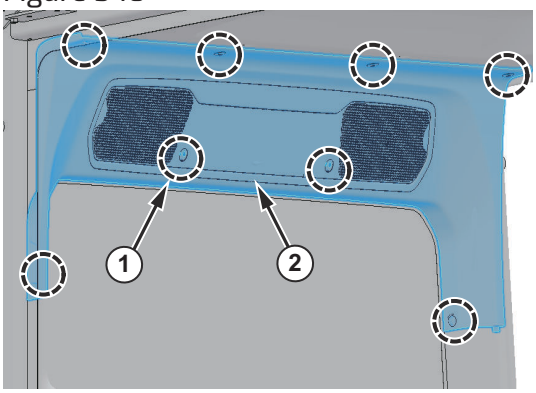
1. Open cap (1), remove nut (2, 4) and wiper arm and blade (3).
   Figure 339



DS2200859

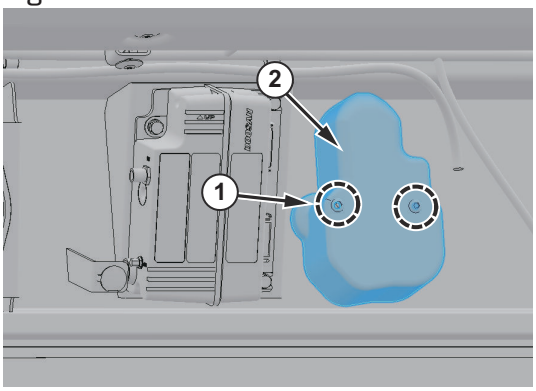
Rear Wiper Motor

1. Remove cap and bolts (1) from rear upper cover (2).
   Figure 340



DS2200856

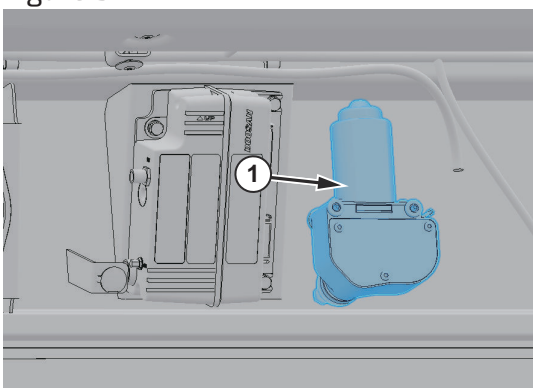
2. Remove rear upper cover.
3. Remove bolts (1) from rear wiper motor (2).
   Figure 341



DS2200857

4. Remove rear wiper cover.

5. Disconnect wire harness connector from wiper motor.
   Figure 342

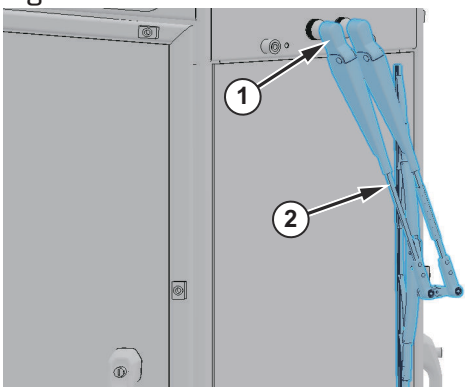


DS2200858

6. Remove wiper motor (1).

Front Wiper Arm and Blade

1. Open the cap.
   Figure 343

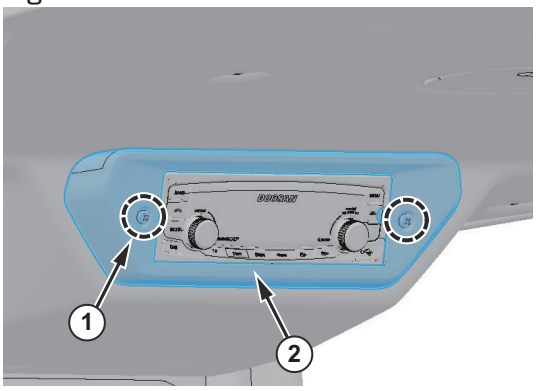


DS2200860

2. Remove nut (1) and wiper arm and blade (2).

Front Wiper Motor

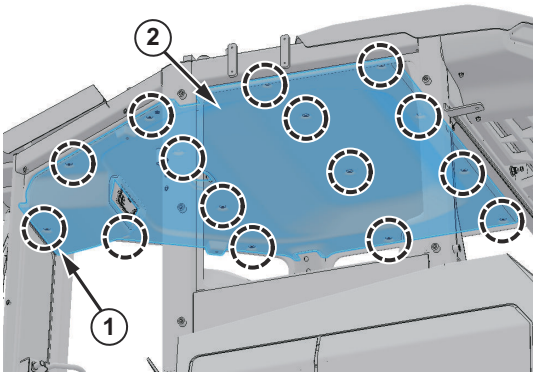
1. Remove bolts (1) from DAB audio cover (2).
   Figure 344



DS2200861

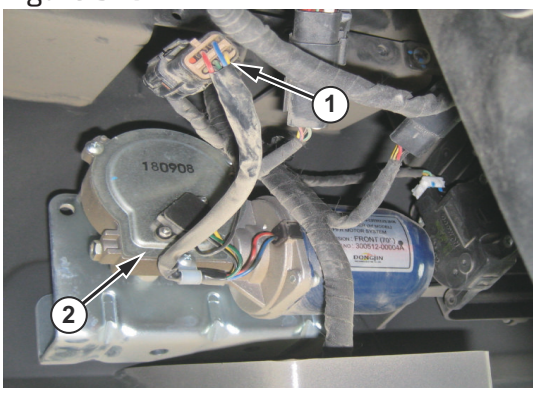
2. Remove DAB audio cover.

3. Remove bolts (1) from cabin roof cover (2).
   Figure 345



DS2200862

4. Remove cabin roof cover.
5. Disconnect wire harness (1). From front wiper motor (2).
   Figure 346



DS2200863

6. Remove front wiper motor (2) from cabin assembly.

Installation

1. Perform installation in the reverse order to removal.

Troubleshooting Guide

Wiring Harness Layout

Safety Instructions

⚠ WARNING

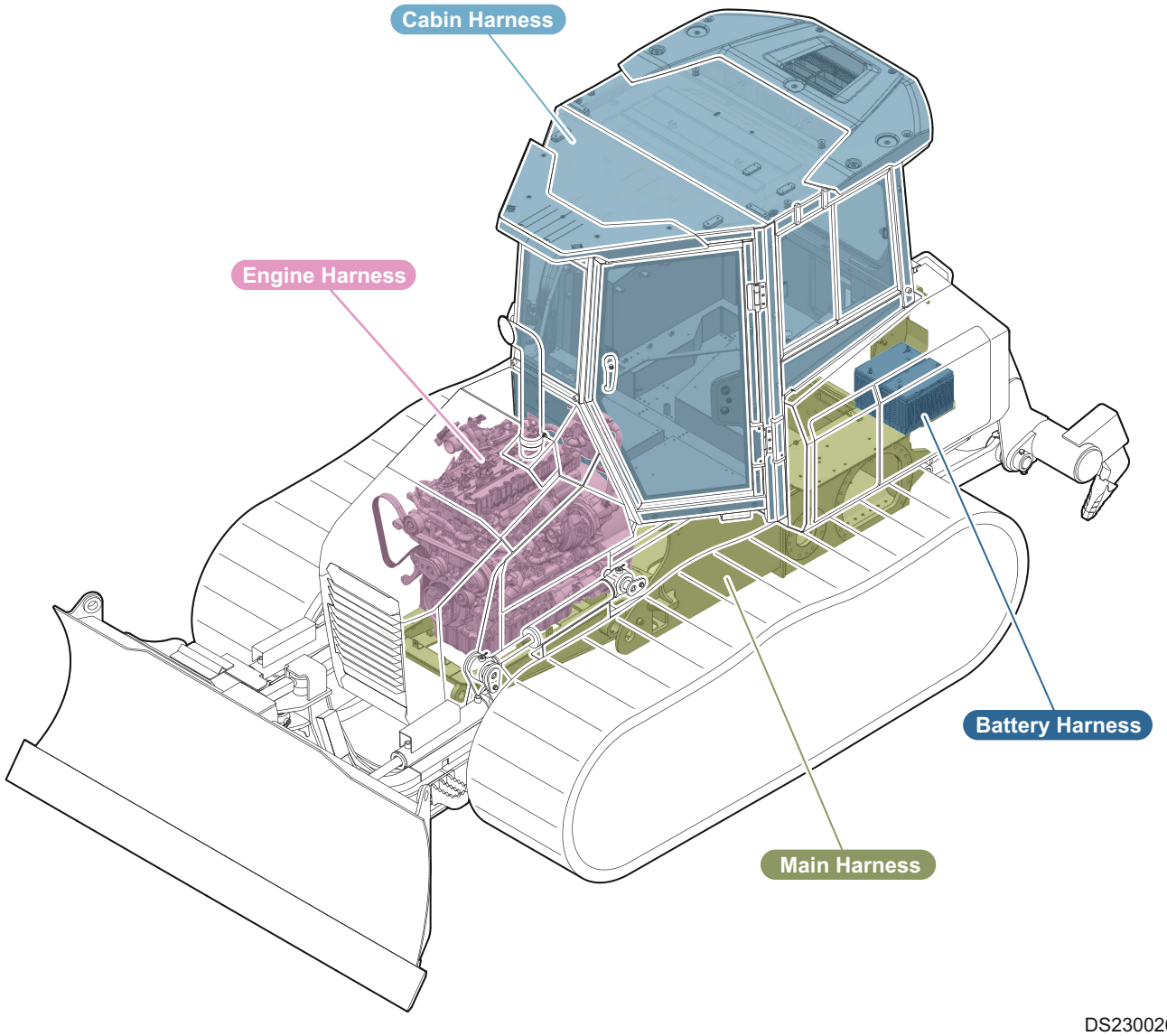
AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicingmachine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Followwarnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correctfunction after adjustments repairs or service. Untrainedoperators and failure to follow instructions can cause deathor serious injury.

Wiring Device

Wiring Harness Layout

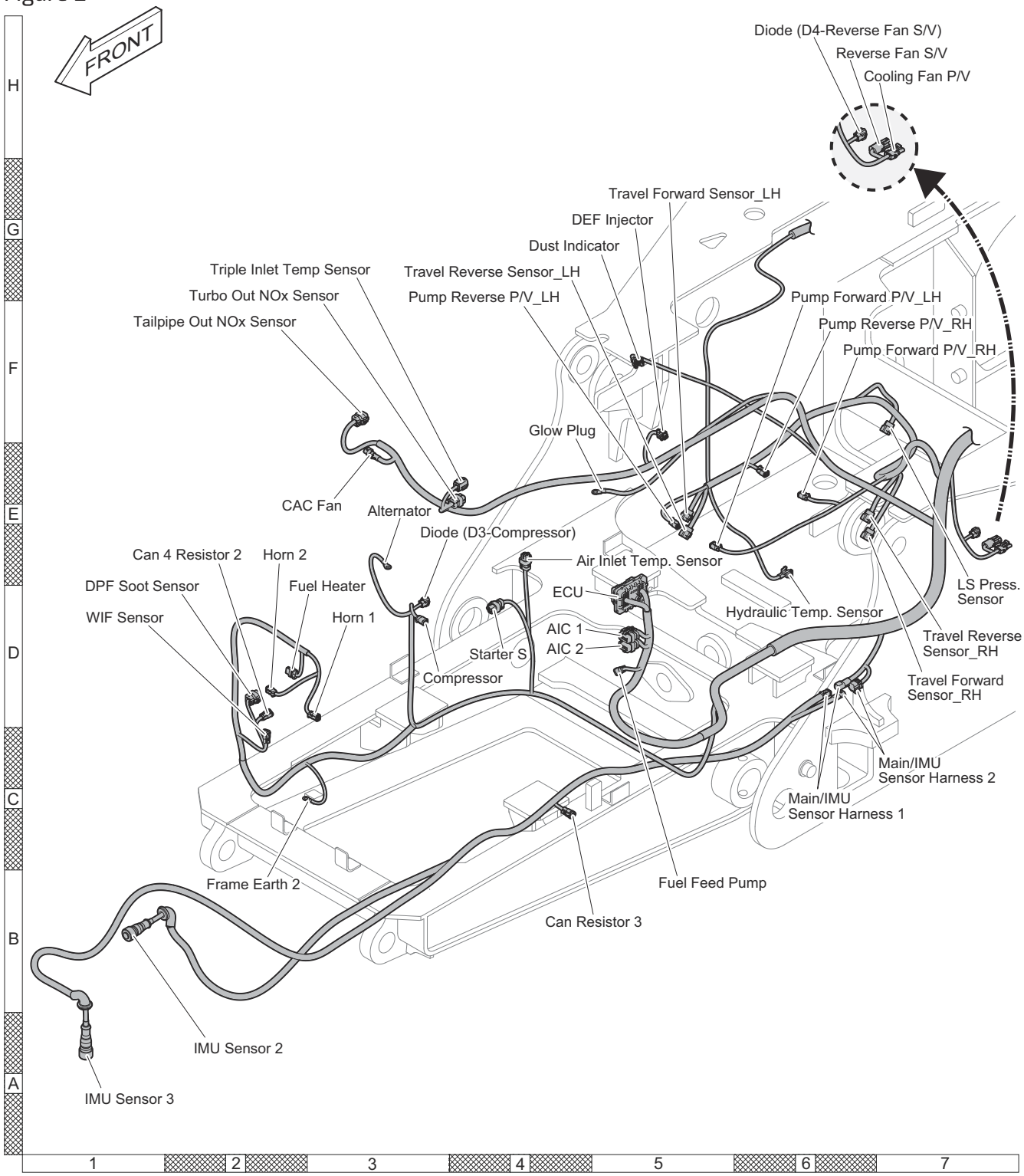
Figure 1



DS2300262

Main Harness (1/2)

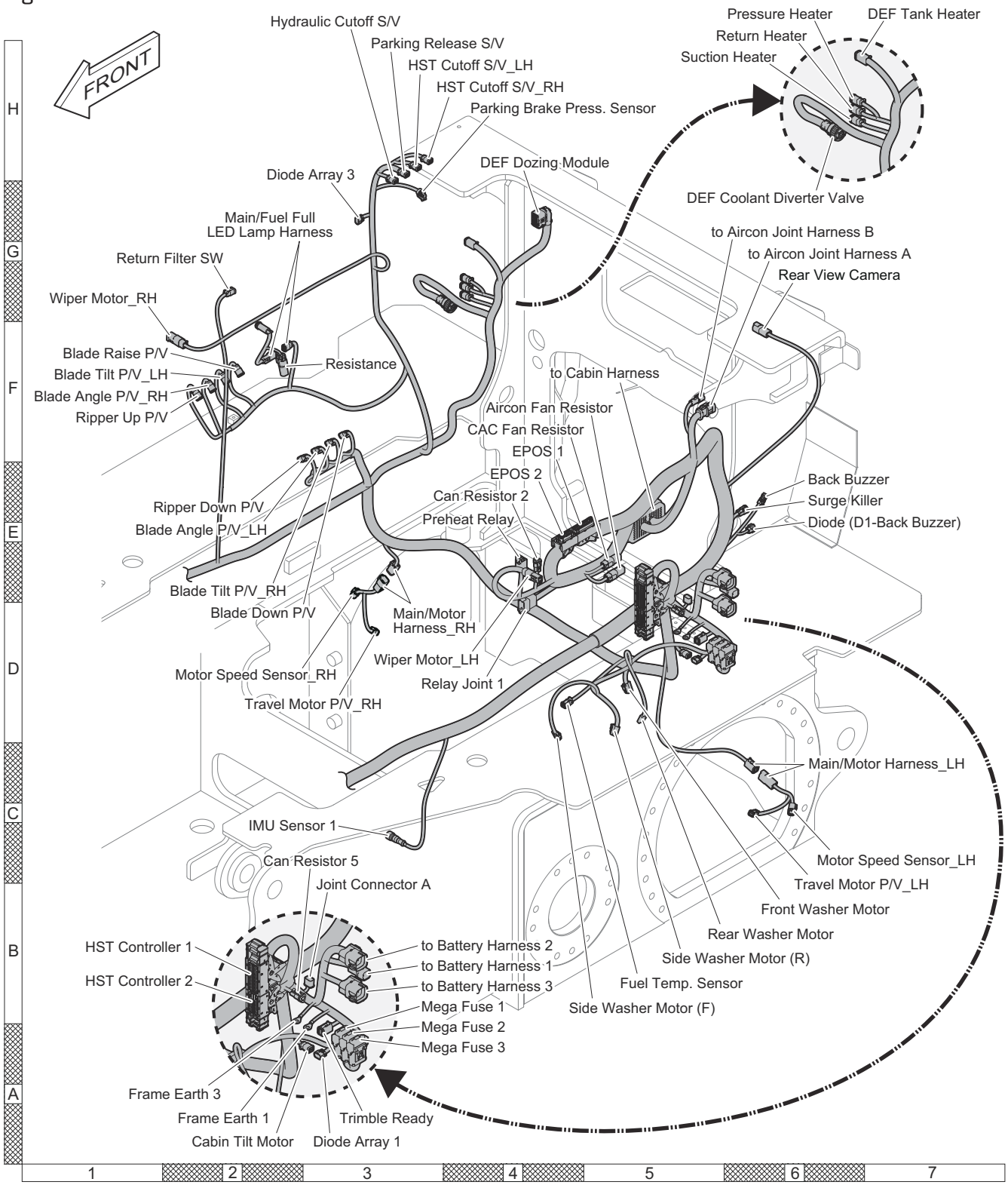
Figure 2



DS2300259

Main Harness (2/2)

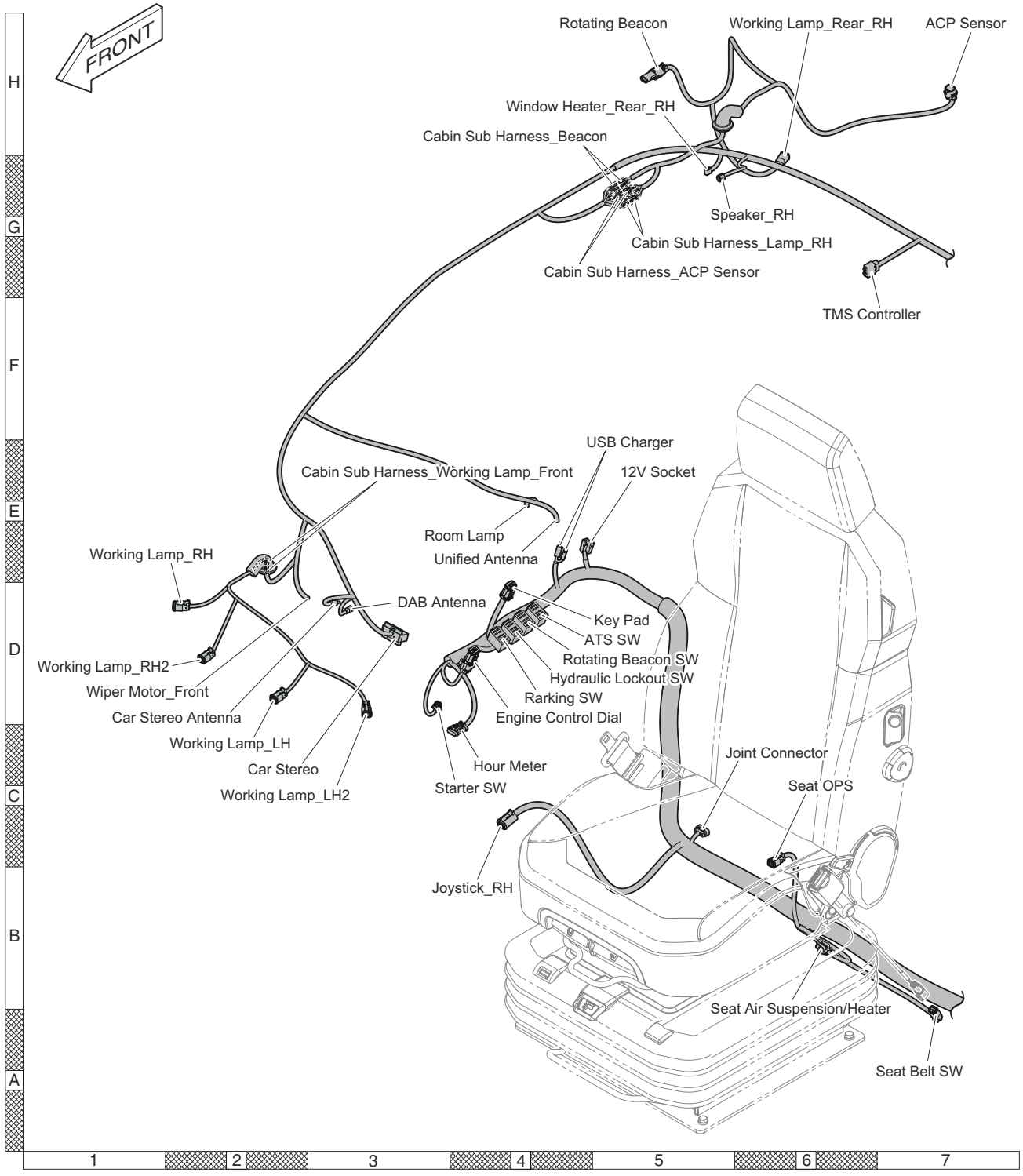
Figure 3



DS2300260

Cabin Harness (1/2)

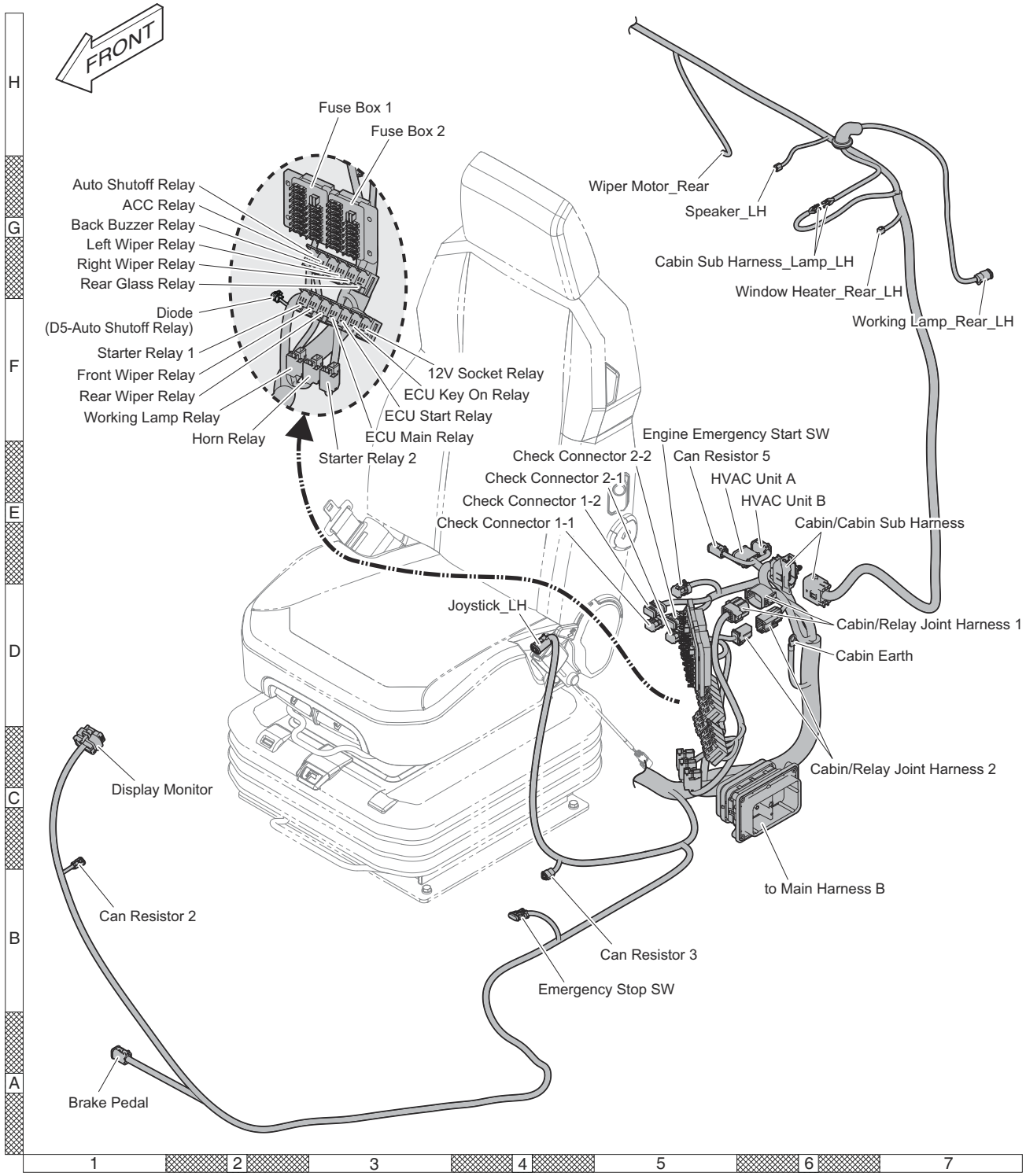
Figure 4



DS2300258

Cabin Harness (2/2)

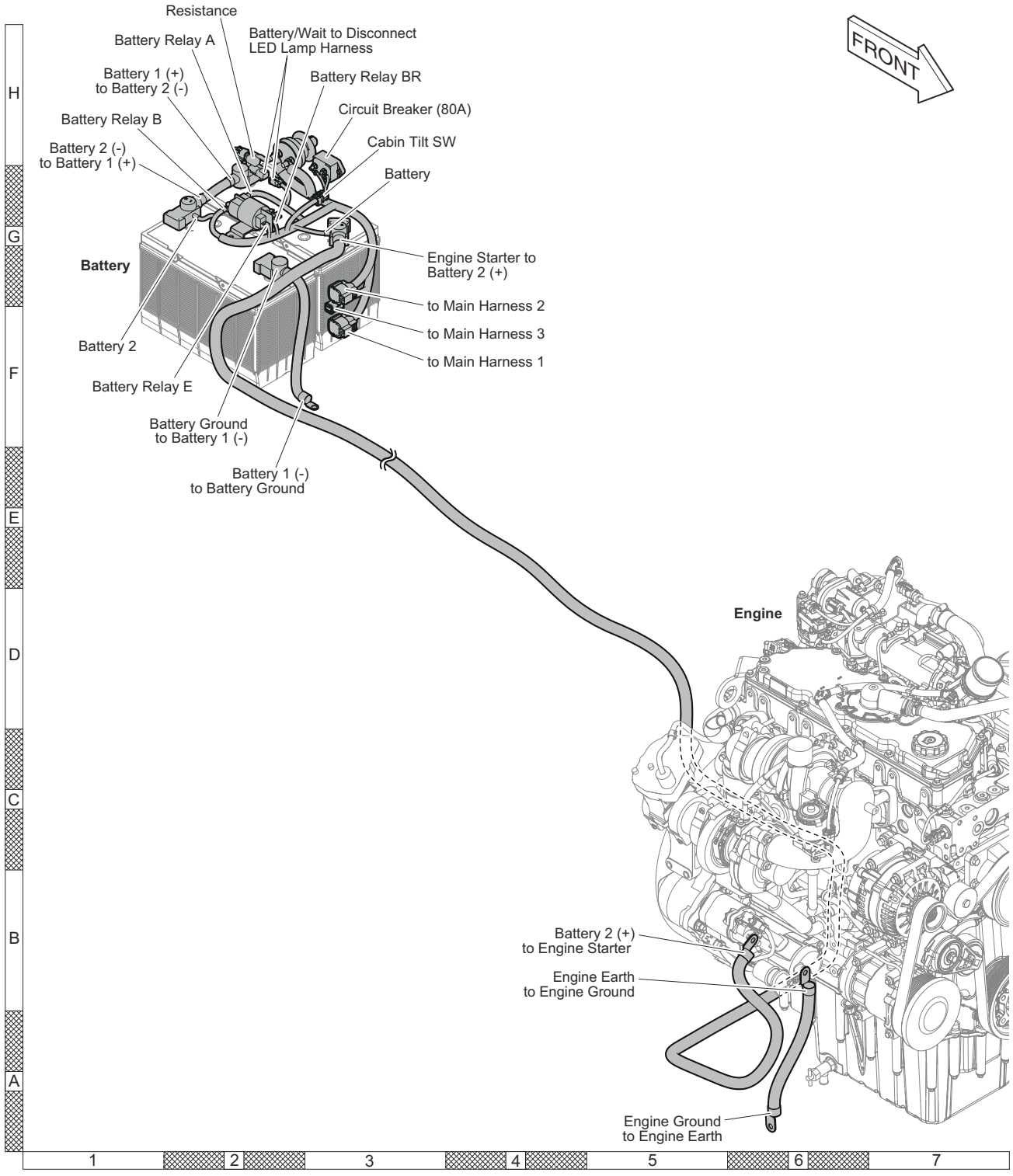
Figure 5



DS2201277

Battery Harness

Figure 6



DS2300261

Error Code

Safety Instructions

⚠ WARNING

AVOID DEATH OR SERIOUS INJURY

Instructions are necessary before operating or servicingmachine. Read and understand the Operation & Maintenance Manual and signs (decals) on machine. Followwarnings and instructions in the manuals when making repairs, adjustments or servicing. Check for correctfunction after adjustments repairs or service. Untrainedoperators and failure to follow instructions can cause deathor serious injury.

EPOS Error Code

Information Mentioned in Troubleshooting Table

Before performing troubleshooting, understand that information fully.Please refer to the DMS-5 for detailed information.

No.		Description of the Problems
1	VC0001	GAUGE PANEL Commnuication
2	VC0002	E-ECU Commnuication
3	VC0003	TCU Commnuication
4	VC0004	IMU BODY Commnuication
5	VC0005	IMU BLADE Commnuication
6	VC0006	JOYSTICK LH Commnuication
7	VC0007	JOYSTICK RH Commnuication
8	VC0008	KEYPAD Commnuication
9	VC0010	AIRCON UNIT Commnuication
10	VC0011	IMU C-FRAME Commnuication
11	VPV001	BLADE TILT RIGHT P/V
12	VPV002	BLADE TILT LEFT P/V
13	VPV003	BLADE RAISE P/V
14	VPV004	BLADE DOWN P/V
15	VPV005	BLADE ANGLE RIGHT P/V
16	VPV006	BLADE ANGLE LEFT P/V
17	VPV007	FAN CONTROL P/V (J)
18	VPV008	RIPPER UP P/V
19	VPV009	RIPPER DOWN P/V
20	VSV001	PARKING BRAKE S/V
21	VSV002	HYDRAULIC CUTOFF S/V
22	VSV003	HST CUTOFF RH S/V

23	VSV004	REVERSE FAN S/V (D)
24	VSV005	HST CUTOFF LH S/V
25	VRY001	AUTO SHUT OFF RELAY
26	VRY002	ACC RELAY
27	VRY003	CABIN LAMP RELAY
28	VRY004	BACK BUZZER RELAY
29	VRY005	HORN Relay
30	VRY006	FRONT WASHER RELAY
31	VRY007	REAR WASHER RELAY
32	VRY008	FRONT WIPER RELAY
33	VRY009	REAR WIPER RELAY
34	VRY010	SIDE WIPER RELAY
35	VRY011	SIDE WAHSER RELAY
36	VRY012	Rear Window Glass Heater Relay
37	VSP001	PARKING BRAKE PRESS. SENSOR
38	VSP002	IMPLEMENT PRESSURE SENSOR
39	VSP003	ACP SENSOR
40	VSE001	OIL TEMP. SENSOR
41	VSE002	WIF SENSOR
42	VSE003	FUEL SENSOR
43	VSE004	OPS
44	VS5001	Machine Controller +5V Output 1
45	VS5002	Machine Controller +5V Output 2,
46	VAL001	ALTERNATOR POTENTIAL
47	VGC003	ILLUMINATION
48	VGC005	CONDENSER FAN
49	VGC006	CAC FAN

1. Engine Fault Code List

Gauge Panel Fault Code	P Code	Fault Code Description
E000000-19	U0607	Timeout Error of CAN-Receive-Frame TSC1VE (Engine speed & Torque demand) - (U0607)
E000027-00	P042E	EGR Position Open jammed fault - (P042E)
E000027-01	P042F	EGR Position Closed jammed fault - (P042F)
E000027-03	P0406	EGR Position Sensor High Fault - (P0406)
E000027-04	P0407	EGR Position Sensor Low Fault - (P0407)
E000027-20	P0C17	EGR Close Position Learning Range Over Fault - (P0C17)

Gauge Panel Fault Code	P Code	Fault Code Description
E000027-22	P0C18	EGR Close Position Learning Drift Fault for long time - (P0C18)
E000027-23	P0C19	EGR Close Position Learning Drift Fault for short time - (P0C19)
E000029-03	P0223	Accel pedal position track2 sensor High fault - (P0223)
E000029-04	P0222	Accel pedal position track2 sensor Low fault - (P0222)
E000029-15	P0221	Hand pedal position track2 sensor High fault - (P0221)
E000029-17	P0224	Hand pedal position track2 sensor Low fault - (P0224)
E000051-00	P02E4	Throttle valve Position Open jammed fault - (P02E4)
E000051-01	P02E5	Throttle valve Position Closed jammed fault - (P02E5)
E000051-03	P02E9	Throttle valve Position Sensor High Fault - (P02E9)
E000051-04	P02E8	Throttle valve Position Sensor Low Fault - (P02E8)
E000051-22	P02EA	Throttle valve Close Position Learning Drift Fault for long time - (P02EA)
E000051-23	P02EB	Throttle valve Close Position Learning Drift Fault for short time - (P02EB)
E000051-30	P02E7	Throttle valve Close Position Learning Range Over Fault - (P02E7)
E000091-03	P0123	Accel pedal position track1 sensor High fault - (P0123)
E000091-04	P0122	Accel pedal position track1 sensor Low fault - (P0122)
E000091-11	P2135	Accel pedal position sensor plausibility fault (Not synchronism between track1 and track2) - (P2135)
E000091-12	P2136	Hand pedal position sensor plausibility fault (Not synchronism between track1 and track2) - (P2136)
E000091-15	P0121	Hand pedal position track1 sensor High fault - (P0121)
E000091-17	P0124	Hand pedal position track1 sensor Low fault - (P0124)
E000091-19	U0606	Timeout Error of CAN-Receive-Frame EEC2 (Pedal) - (U0606)
E000097-03	P2267	Water In Fuel Sensor signal range high fault - (P2267)
E000097-04	P2266	Water In Fuel Sensor signal range low fault - (P2266)
E000097-14	P2269	Water in fuel detected - Warning step - (P2269)
E000097-22	P2264	Water in fuel detection internal fault - (P2264)
E000097-23	P2265	Water in fuel detected - Torque de-rate step (After 20min) - (P2265)
E000098-02	P250B	Oil level out of range error of oil combination(Level and temperature) sensor - (P250B)
E000098-03	P250D	Oil combination (Level and temperature) signal output short circuit to battery error - (P250D)
E000098-04	P250C	Oil combination (Level and temperature) signal output short circuit to ground error - (P250C)
E000098-05	P250A	Oil combination (Level and temperature) sensor itself open or short circuit error - (P250A)

Gauge Panel Fault Code	P Code	Fault Code Description
E000098-18	P250F	Oil level sensor SRC error of oil combination(Level and temperature) sensor - (P250F)
E000098-22	P350D	Oil combination (Level and temperature) sensor timeout fault - (P350D)
E000098-23	P350E	Oil combination (Level and temperature) sensor itself Voltage out of range error - (P350E)
E000098-24	P350F	Engine oil level is low (Low step2) - (P350F)
E000100-01	P1522	Engine Oil Pressure Too Low Fault - (P1522)
E000100-03	P0523	Engine Oil Pressure Sensor High Fault - (P0523)
E000100-04	P0522	Engine Oil Pressure Sensor Low Fault - (P0522)
E000102-03	P0108	Intake Manifold Pressure Sensor High Fault - (P0108)
E000102-04	P0107	Intake Manifold Pressure Sensor Low Fault - (P0107)
E000105-03	P00AD	Intake manifold temperature sensor High fault - (P00AD)
E000105-04	P00AC	Intake manifold temperature sensor Low fault - (P2454)
E000105-16	P10AD	Intake manifold temperature High fault - (P10AD)
E000108-03	P2229	Atmospheric Pressure Sensor High Fault - (P2229)
E000108-04	P2228	Atmospheric Pressure Sensor Low Fault - (P02E8)
E000110-00	P1118	Coolant high temperature Fault - (P1118)
E000110-03	P0118	Coolant Temperature Sensor High Fault - (P0118)
E000110-04	P0117	Coolant Temperature Sensor Low Fault - (P0117)
E000110-10	P011E	Coolant Temperature Plausibility Fault - (P011E)
E000132-01	P00BC	Intake manifold pressure low plausibility fault (Compressor out pressure too low) - (P00BC)
E000132-03	P0103	Signal range check high error for raw value in Air mass flow sensor - (P0103)
E000132-04	P0102	Signal range check low error for raw value in Air mass flow sensor - (P0102)
E000132-05	P0101	Battery voltage error of Air mass flow sensor - (P0101)
E000132-19	P0100	Signal error of Air mass flow sensor - (P0100)
E000132-21	P00BE	Sensitivity drift error low for Air mass flow sensor - (P00BE)
E000157-10	P0087	Fuel Leakage is detected based on fuel quantity balance - (P0087)
E000157-11	P0002	Maximum positive deviation of rail pressure exceeded - (P0002)
E000157-13	P193A	Rail pressure jittering activation for injector deposit removal - (P193A)
E000157-14	P193B	Rail pressure jittering activation maximum time reached - (P193B)
E000157-26	P190C	Minimum rail pressure exceeded - (P190C)
E000157-27	P190B	Maximum rail pressure exceeded - (P190B)
E000157-28	P1934	Pressure relief valve(PRV) failure - (P1934)

Gauge Panel Fault Code	P Code	Fault Code Description
E000171-00	P1073	Environment Temperature Too High - (P1073)
E000171-03	P0073	Environment Temperature Sensor Signal High - (P0073)
E000171-04	P0072	Environment Temperature Sensor Signal Low - (P01C2)
E000172-00	P107D	Inlet air temperature High fault - (P107D)
E000172-03	P007D	Inlet air temperature sensor High fault - (P007D)
E000172-04	P007C	Inlet air temperature sensor Low fault - (P007C)
E000173-01	P0421	DOC Exothermal Efficiency Fault - (P0421)
E000174-00	P1183	Fuel temperature high fault - (P1183)
E000174-03	P0183	Fuel Temperature Sensor High Fault - (P0183)
E000174-04	P0182	Fuel Temperature Sensor Low Fault - (P0182)
E000175-00	P1198	Oil temperature too high fault - (P1198)
E000175-01	P1197	Oil temperature too low fault - (P1197)
E000175-11	P0196	Oil combination (Level and temperature) sensor itself Oil temperature out of range error - (P0196)
E000177-15	P273F	Transmission oil temperature high fault (CAN) - (P273F)
E000177-16	P274F	Transmission oil temperature high fault (H/W Switch) - (P274F)
E000190-00	P0219	Engine over speed detection fault - (P0219)
E000444-00	P1563	Battery Voltage High fault (Warning) - (P1563)
E000444-01	P1562	Battery Voltage Low fault (Warning) - (P1562)
E000444-02	P1565	Powerstage diagnosis could be disabled due to low Battery voltage - (P1565)
E000444-03	P0563	Battery Voltage Signal Range Max fault - (P0563)
E000444-04	P0562	Battery Voltage Signal Range Min fault - (P0562)
E000444-12	P1564	Powerstage diagnosis disabled due to high Battery voltage - (P1564)
E000626-12	P0512	Starter switch stuck fault (Cranking request is too long.) - (P0512)
E000636-02	P0372	Crank Signal disturbed fault - (P0372)
E000636-08	P0374	Cranks No signal error - (P0374)
E000637-02	P0344	Cam Signal disturbed fault - (P0344)
E000637-08	P0342	Cam Signal Lost fault - (P0342)
E000637-30	P0340	Cam Signal Drift Fault - (P0340)
E000639-02	U0029	CAN communication error - (U0029)
E000639-19	U0028	CAN bus off error - (U0028)
E000651-02	P268C	Injector Code(IQA) Program Missing Fault (Cylinder#1) - (P268C)
E000651-04	P02EE	Injector Short circuit Fault (Cylinder #1) - (P02EE)
E000651-05	P0201	Injector Open circuit Fault (Cylinder #1) - (P0201)
E000651-22	P32EE	Injector High Low side Short circuit Fault (Cylinder #1) - (P32EE)

Gauge Panel Fault Code	P Code	Fault Code Description
E000652-02	P268D	Injector Code(IQA) Program Missing Fault (Cylinder#2) - (P268D)
E000652-04	P02EF	Injector Short circuit Fault (Cylinder #2) - (P02EF)
E000652-05	P0202	Injector Open circuit Fault (Cylinder #2) - (P0202)
E000652-22	P32EF	Short circuit between high-side and low-side of the power stage (high-side non plausible error) for cylinder #2 - (P32EF)
E000653-02	P268E	Injector Code(IQA) Program Missing Fault (Cylinder#3) - (P268E)
E000653-04	P02F0	Injector Short circuit Fault (Cylinder #3) - (P02F0)
E000653-05	P0203	Injector Open circuit Fault (Cylinder #3) - (P0203)
E000653-22	P32F0	Injector High Low side Short circuit Fault (Cylinder #3) - (P32F0)
E000654-02	P268F	Injector Code(IQA) Program Missing Fault (Cylinder#4) - (P268F)
E000654-04	P02F1	Injector Short circuit Fault (Cylinder #4) - (P02F1)
E000654-05	P0204	Injector Open circuit Fault (Cylinder #4) - (P0204)
E000654-22	P32F1	Short circuit between high-side and low-side of the power stage (high-side non plausible error) for cylinder #4 - (P32F1)
E000676-03	P0384	Glow plug Relay driver Short circuit to Battery Fault - (P0384)
E000676-04	P0383	Glow plug Relay driver Short circuit to Ground Fault - (P0383)
E000676-05	P0380	Glow plug Relay driver Open circuit Fault - (P0380)
E000729-07	P0640	Glowplug relay plausibility fault (Not operation) - (P0640)
E000970-12	U1003	Engine shut off request through CAN (EBC1) - (U1003)
E000970-22	P0215	Engine shut off request through hardwire - (P0215)
E000975-03	P028E	PWM FAN Output short to battery circuit fault - (P028E)
E000975-04	P028D	PWM FAN Output short to ground circuit fault - (P028D)
E000975-05	P028A	PWM FAN Output open circuit fault - (P028A)
E000987-03	P1931	CE(Check engine) Lamp Short to Battery - (P1931)
E000987-04	P192F	CE(Check engine) Lamp Short to Ground - (P192F)
E000987-05	P192E	CE(Check engine) Lamp Open circuit - (P192E)
E001076-03	P0004	Fuel Metering unit plausibility error in overrun mode - (P0004)
E001076-04	P0003	Fuel Metering unit plausibility error in idle mode - (P0003)
E001076-16	P0254	Maximum negative rail pressure deviation with metering unit on lower limit is exceeded - (P0254)
E001076-20	P0252	Rail pressure too low for injection - (P0252)
E001081-03	P2381	Glow plug Lamp Short to Battery - (P2381)
E001081-04	P1904	Glow plug Lamp Short to Ground - (P1904)
E001081-05	P0381	Glow plug Lamp Open circuit - (P0381)
E001207-00	P0669	ECU temperature High fault - (P0669)
E001207-03	P06AE	ECU temperature sensor High fault (Short circuit to battery) - (P06AE)

Gauge Panel Fault Code	P Code	Fault Code Description
E001207-04	P06AD	ECU temperature sensor Low fault (Short circuit to ground) - (P06AD)
E001382-00	P018D	Fuel filter pressure high fault - (P018D)
E001382-01	P018C	Fuel filter pressure low fault - (P018C)
E001382-03	P01C6	Fuel filter pressure sensor signal high fault - (P01C6)
E001382-04	P01C2	Fuel filter pressure sensor signal low fault - (P0642)
E001382-07	P01C4	Fuel Filter Pressure low detection 1 - Warning - (P01C4)
E001382-13	P01C5	Fuel Filter Pressure low detection 2 - Torque reduction - (P01C5)
E001485-07	P0685	ECU Main relay Stuck fault - (P0685)
E001485-11	P068A	ECU Main relay Early opening fault - (P068A)
E001568-03	P2547	Multi-torque switch signal too high fault - (P2547)
E001568-04	P2546	Multi-torque switch signal too low fault - (P2546)
E001612-03	P062D	Injector bank 1st Short circuit fault - (P062D)
E001612-12	P062E	Injector bank 2nd Short circuit fault - (P062E)
E001639-03	P0528	Fan speed too high fault - (P0528)
E001639-04	P0529	Fan speed too low fault - (P0529)
E001639-11	P0527	Fan speed signal long period fault path - (P0527)
E001761-19	P1230	DEF Tank Level Signal error - (P1230)
E001867-01	P2505	ECU over temperature for SCR Monitoring - (P2505)
E001867-03	P2508	"ABE active" report due to overvoltage detection - (P2508)
E001867-04	P2507	"ABE active" report due to undervoltage detection - (P2507)
E001867-11	P2511	"WDA/ABE active" report due to unknown reason - (P2511)
E001867-19	P2509	"WDA active" report due to errors in query-response communication - (P2509)
E001867-22	P2506	ECU Software Reset 0 fault - (P2506)
E001867-23	P3506	ECU Software Reset 1 fault - (P3506)
E001867-24	P1905	ECU Software Reset 2 fault - (P1905)
E002789-00	P1546	Turbine inlet temperature High fault - (P1546)
E002789-03	P0546	Turbine inlet temperature sensor High fault - (P0546)
E002789-04	P0545	Turbine inlet temperature sensor Low fault - (P2228)
E002789-11	P0544	Turbine inlet temperature Plausibility Fault - (P0544)
E002791-03	P2145	EGR H-Bridge Driver Short circuit to battery - (P2145)
E002791-04	P2144	EGR H-Bridge Driver Short circuit to ground - (P2144)
E002791-05	P2143	EGR H-Bridge Driver Open Circuit Fault - (P2143)
E003031-14	P205E	DEF Tank temperature overheated - (P205E)
E003031-16	P1045	DEF Tank Temperature sensor High plausibility fault - (P1045)

Gauge Panel Fault Code	P Code	Fault Code Description
E003031-18	P1044	DEF Tank Temperature sensor Low plausibility fault - (P1044)
E003216-03	P2395	NOx sensor signal high fault (Upstream NOx sensor) - (P2395)
E003216-04	P2397	NOx sensor signal low fault (Upstream NOx sensor) - (P2397)
E003216-18	P225D	NOx sensor 1 (Upstream) concentration Low plausibility fault - (P225D)
E003217-03	P23A7	Linear Lambda signal high fault (Upstream NOx sensor) - (P23A7)
E003219-07	U030D	NOx sensor heating error (Upstream NOx sensor) - (U030D)
E003224-05	P2203	NOx sensor Open circuit fault (Upstream NOx sensor) - (P2203)
E003224-06	P2202	NOx sensor Short circuit fault (Upstream NOx sensor) - (P2202)
E003226-03	P2396	NOx sensor signal high fault (Downstream NOx sensor) - (P2396)
E003226-04	P2398	NOx sensor signal low fault (Downstream NOx sensor) - (P2398)
E003227-03	P23A8	Linear Lambda signal high fault (Downstream NOx sensor) - (P23A8)
E003229-07	U030E	NOx sensor heating error (Downstream NOx sensor) - (U030E)
E003234-05	P2216	NOx sensor Open circuit fault (Downstream NOx sensor) - (P2216)
E003234-06	P2215	NOx sensor Short circuit fault (Downstream NOx sensor) - (P2215)
E003236-00	P049B	EGR rate slow response positive error - (P049B)
E003236-16	P0408	Maximum EGR rate governor deviation - (P0408)
E003242-00	P1033	DPF(SCRF) inlet temperature High fault - (P1033)
E003242-03	P2033	DPF(SCRF) inlet temperature sensor High fault - (P2033)
E003242-04	P2032	DPF(SCRF) inlet temperature sensor Low fault - (P2032)
E003242-11	P2034	DPF(SCRF) inlet temperature Plausibility Fault - (P2034)
E003242-20	P2035	DPF(SCRF) inlet temperature Drift fault - (P2035)
E003251-03	P2455	DPF differential pressure sensor High fault - (P2455)
E003251-04	P2454	DPF differential pressure sensor Low fault - (P2454)
E003251-13	P3052	DPF differential pressure drift fault - (P3052)
E003251-18	P1454	DPF differential pressure too low fault - (P1454)
E003360-14	P263D	DEF pressure line heater error (Perform afterrun) - (P263D)
E003361-03	P2047	DEF dosing valve actuator Short circuit to battery Fault - (P2047)
E003361-04	P2048	DEF dosing valve actuator Short circuit to ground Fault - (P2048)
E003361-05	P2049	DEF dosing valve actuator Open Circuit Fault - (P2049)
E003361-13	P202E	DEF dosing valve actuator Over temperature Fault - (P202E)
E003361-14	P2C11	Urea dosing valve plausibility fault - (P2C11)
E003361-22	P2050	DEF dosing valve actuator HS(High side) Short circuit to battery Fault - (P2050)
E003361-23	P2051	DEF dosing valve actuator HS(High side) Short circuit to ground Fault - (P2051)

Gauge Panel Fault Code	P Code	Fault Code Description
E003361-27	P208E	DEF Dosing valve is blocked - (P208E)
E003363-03	P20B4	DEF Tank heating coolant valve output Short circuit to battery Fault - (P20B4)
E003363-04	P20B3	DEF Tank heating coolant valve output Short circuit to ground Fault - (P20B3)
E003363-05	P20B1	DEF Tank heating coolant valve output Open circuit Fault - (P20B1)
E003363-07	P30B1	DEF Tank heating coolant valve output Over temperature Fault - (P30B1)
E003509-03	P0659	ECU Sensor supply1 Over voltage fault - (P0659)
E003509-04	P0658	ECU Sensor supply1 Under voltage fault - (P0658)
E003509-05	P1657	ECU Sensor supply1 voltage fault - (P1657)
E003509-06	P0657	ECU Sensor supply1 Short circuit to ground - (P0657)
E003509-11	P0641	ECU Sensor supply Overvoltage monitoring error - (P0641)
E003510-03	P2671	ECU Sensor supply2 Over voltage fault - (P2671)
E003510-04	P2670	ECU Sensor supply2 Under voltage fault - (P2670)
E003510-05	P1669	ECU Sensor supply2 voltage fault - (P1669)
E003510-06	P2669	ECU Sensor supply2 Short circuit to ground - (P2669)
E003510-11	P0642	ECU Sensor supply Undervoltage monitoring error - (P0642)
E003511-03	P2686	ECU Sensor supply3 Over voltage fault - (P2686)
E003511-04	P2685	ECU Sensor supply3 Under voltage fault - (P2685)
E003511-05	P1684	ECU Sensor supply3 voltage fault - (P1684)
E003511-06	P2684	ECU Sensor supply3 Short circuit to ground - (P2684)
E003516-00	P106D	DEF Quality Too High fault - (P106D)
E003516-01	P106C	DEF Quality Too Low fault - (P106C)
E003516-12	P106E	DEF Quality failure status too long fault (Tampering) - (P106E)
E003517-18	P203F	DEF Tank level is empty - (P203F)
E003520-03	U1028	DEF Quality Sensor Open circuit - (U1028)
E003520-04	U1030	DEF Quality Sensor Short circuit - (U1030)
E003532-03	P203A	DEF Level Sensor Open circuit - (P203A)
E003532-04	P2041	DEF Level Sensor Short circuit - (P2041)
E003695-03	P25BC	DPF regeneration inhibit switch Short to Battery fault (Hardwire) - (P25BC)
E003696-03	P25BB	DPF regeneration enable switch Short to Battery fault (Hardwire) - (P25BB)
E003696-11	P25BA	DPF regeneration inhibit & enable switch plausibility fault (Hardwire) - (P25BA)
E003697-03	P2611	DPF lamp 1 (DPF regeneration switch enable lamp) Short to Battery - (P2611)

Gauge Panel Fault Code	P Code	Fault Code Description
E003697-04	P260F	DPF lamp 1 (DPF regeneration switch enable lamp) Short to Ground - (P260F)
E003697-05	P260E	DPF lamp 1 (DPF regeneration switch enable lamp) Open circuit - (P260E)
E003715-14	P246B	DPF regeneration failure (DPF regeneration is not performed well during machine operation mode) - (P246B)
E003720-16	P242F	DPF Ash loading High fault (Ash cleaning is needed) - (P242F)
E004082-03	P025D	Fuel metering unit Short circuit to Battery fault - (P025D)
E004082-04	P025C	Fuel metering unit Short circuit to Ground fault - (P025C)
E004082-05	P025A	Fuel metering unit Open circuit fault - (P025A)
E004082-07	P025B	Fuel metering unit Over temperature fault - (P025B)
E004335-00	P1450	DEF Overpressure error at METERINGCONTROL (DEF pump pressure is too high) - (P1450)
E004335-01	P1451	DEF Underpressure error at METERINGCONTROL (DEF pump pressure is too low) - (P1451)
E004335-02	P1457	DEF pressure build up error at PRESSUREBUILDUP (DEF pump pressure is too low) - (P1457)
E004335-07	P202D	DEF Leakage detection at METERINGCONTROL - (P202D)
E004335-12	P1452	DEF Overpressure error regardless of the state - (P1452)
E004335-15	P1459	DEF Pressure reduction error at PRESSUREREDUCTION (Detected an insufficient pressure drop) - (P1459)
E004335-16	P1460	DEF underpressure error at AFTERRUN_PRESSURECOMPENSATION - (P1460)
E004344-02	P1893	DEF backflow Line plausibility error at DETECTIONMODE (Does not detect a pressure drop) - (P1893)
E004354-05	P221D	DEF Pressure line heater circuit Open circuit Fault - (P221D)
E004354-06	P221C	DEF Pressure line heater circuit Open circuit or Short circuit to ground Fault - (P221C)
E004355-05	P221F	DEF Backflow line heater circuit Open circuit Fault - (P221F)
E004355-06	P221E	DEF Backflow line heater circuit Open circuit or Short circuit to ground Fault - (P221E)
E004356-05	P215F	DEF Suction line heater circuit Open circuit Fault - (P215F)
E004356-06	P215E	DEF Suction line heater circuit Open circuit or Short circuit to ground Fault - (P215E)
E004364-14	P20EE	SCR Efficiency Too low fault - (P20EE)
E004365-03	P2043	DEF Temperature Sensor Open circuit - (P2043)
E004365-04	P2046	DEF Temperature Sensor Short circuit - (P2046)
E004365-14	P1227	DEF Tank temperature plausibility fault (Insufficient temperature increment) - (P1227)
E004374-03	P208D	DEF Supply Pump Motor Signal output Short circuit to battery Fault - (P208D)

Gauge Panel Fault Code	P Code	Fault Code Description
E004374-04	P208C	DEF Supply Pump Motor Signal output Short circuit to ground Fault - (P208C)
E004374-05	P208A	DEF Supply Pump Motor Signal output Open circuit Fault - (P208A)
E004374-07	P208B	DEF Supply Pump Motor Signal output Over temperature Fault - (P208B)
E004374-08	P108A	DEF Supply Pump Motor Speed Deviation Fault - (P108A)
E004374-09	P108B	DEF Supply Pump Motor Speed Deviation Permanent Fault - (P108B)
E004374-12	P108C	DEF Supply Pump Motor No activation Fault - (P108C)
E004781-15	P24A3	DPF Soot mass too high status (> 120%) - (P24A3)
E004781-16	P2463	DPF Soot mass high status (> 110%) - (P2463)
E005067-03	P0593	PTO (Idle up) Lamp Short to Battery - (P0593)
E005067-04	P0592	PTO (Idle up) Lamp Short to Ground - (P0592)
E005067-05	P0591	PTO (Idle up) Lamp Open circuit - (P0591)
E005099-03	P055D	Oil Pressure Warning Lamp Short to Battery - (P055D)
E005099-04	P055C	Short circuit to ground error of oil pressure lamp - (P055C)
E005099-05	P055B	Oil Pressure Warning Lamp Open circuit - (P055B)
E005313-03	P0193	Rail pressure sensor High fault - (P0193)
E005313-04	P0192	Rail pressure sensor Low fault - (P0182)
E005419-03	P02E3	Throttle valve H-Bridge Driver Short circuit to battery - (P02E3)
E005419-04	P02E2	Throttle valve H-Bridge Driver Short circuit to ground - (P02E2)
E005419-05	P02E0	Throttle valve H-Bridge Driver Open Circuit Fault - (P02E0)
E005435-10	P1453	DEF pressure stabilization error at DETECTIONMODE (DEF pump pressure is not stable) - (P1453)
E005435-12	P204A	DEF pressure check error at DETECTIONMODE (Detected an insufficient pressure drop) - (P204A)
E005436-03	P20A3	DEF Reverting valve output Short circuit to battery Fault - (P20A3)
E005436-04	P20A2	DEF Reverting valve output Short circuit to ground Fault - (P20A2)
E005436-05	P20A0	DEF Reverting valve output Open circuit Fault - (P20A0)
E005436-07	P20A1	DEF Reverting valve output Over temperature Fault - (P20A1)
E005436-11	P20A5	DEF Reverting valve Pressure drop plausibility fault - (P20A5)
E005436-14	P1461	DEF Reverting valve is blocked (Detected an insufficient pressure drop) - (P1461)
E005491-03	P20C0	DEF Pressure line heater relay output Short circuit to battery Fault - (P20C0)
E005491-04	P20BF	DEF Pressure line heater relay output Short circuit to ground Fault - (P20BF)
E005491-05	P20BD	DEF Pressure line heater relay output Open circuit Fault - (P20BD)

Gauge Panel Fault Code	P Code	Fault Code Description
E005491-07	P30BD	DEF Pressure line heater relay output Over temperature Fault - (P30BD)
E005491-12	P20BE	DEF Pressure line heater feedback plausibility Fault - (P20BE)
E005571-22	P009B	Common rail pressure relief valve reached maximum allowed opening count - (P009B)
E005571-23	P009C	Common rail pressure relief valve Forced to open status (Pressure increase) - (P009C)
E005571-24	P009D	Common rail pressure relief valve Forced to open status (Pressure shock) - (P009D)
E005571-25	P000F	Common rail pressure relief valve is open - (P000F)
E005571-27	P009F	Averaged rail pressure is outside the expected tolerance range - (P009F)
E005571-28	P018F	Common rail pressure relief valve reached maximum allowed open time - (P018F)
E005629-14	P246C	DPF differential pressure too high fault - (P246C)
E005706-05	P214F	DEF Supply module heater circuit Open circuit Fault - (P214F)
E005706-06	P21DD	DEF Supply module heater circuit Open circuit or Short circuit to ground Fault - (P21DD)
E005706-12	P23B3	DEF Supply module heater temperature plausibility fault (Insufficient temperature increment) - (P23B3)
E005706-14	P23B4	DEF Supply module heater temperature plausibility fault at cold start (Insufficient temperature increment) - (P23B4)
E005706-22	P23B2	DEF Supply module heater plausibility fault (Insufficient temperature increment) - (P23B2)
E005746-03	P21C4	DEF Main heater relay output Short circuit to battery Fault - (P21C4)
E005746-04	P21C3	DEF Main heater relay output Short circuit to ground Fault - (P21C3)
E005746-05	P21C2	DEF Main heater relay output Open circuit Fault - (P21C2)
E005746-06	P05ED	DEF heater line circuit Short circuit to battery Fault - (P05ED)
E005746-07	P31C5	DEF Main heater relay output Over temperature Fault - (P31C5)
E005965-03	P21C9	SCR system Main relay short circuit to battery - (P21C9)
E005965-04	P21C8	SCR system Main relay short circuit to ground - (P21C8)
E005965-05	P21C7	SCR system Main relay open circuit - (P21C7)
E006323-03	P2634	Electric fuel feed pump Output short to battery circuit fault - (P2634)
E006323-04	P2633	Electric fuel feed pump Output short to ground circuit fault - (P2633)
E006323-05	P2632	Electric fuel feed pump Output open circuit fault - (P2632)
E006323-13	P2635	Electric fuel feed pump performance fault - (P2635)
E006385-19	U1033	Timeout Error of CAN-Receive-Frame EOI (Engine Starter Motor Relay Control) - (U1033)
E006875-03	P204D	DEF Supply Pump pressure sensor High fault - (P204D)

Gauge Panel Fault Code	P Code	Fault Code Description
E006875-04	P204C	DEF Supply Pump pressure sensor Low fault - (P204C)
E006875-16	P304D	DEF Supply Pump pressure sensor High plausibility fault - (P304D)
E006875-18	P304C	DEF Supply Pump pressure sensor Low plausibility fault - (P304C)
E006915-03	P3611	DPF lamp 2 (DPF Regeneration Active Lamp) Short to Battery - (P3611)
E006915-04	P360F	DPF lamp 2 (DPF Regeneration Active Lamp) Short to Ground - (P360F)
E006915-05	P360E	DPF lamp 2 (DPF Regeneration Active Lamp) Open circuit - (P360E)
E006916-03	P1908	DPF lamp 3 (DPF regeneration switch inhibit lamp) Short to Battery - (P1908)
E006916-04	P1907	DPF lamp 3 (DPF regeneration switch inhibit lamp) Short to Ground - (P1907)
E006916-05	P1906	DPF lamp 3 (DPF regeneration switch inhibit lamp) Open circuit - (P1906)
E007069-03	P20C4	DEF Backflow line heater relay output Short circuit to battery Fault - (P20C4)
E007069-04	P20C3	DEF Backflow line heater relay output Short circuit to ground Fault - (P20C3)
E007069-05	P20C1	DEF Backflow line heater relay output Open circuit Fault - (P20C1)
E007069-07	P30C1	DEF Backflow line heater relay output Over temperature Fault - (P30C1)
E007069-12	P20C2	DEF Backflow line heater feedback plausibility Fault - (P20C2)
E007107-12	P23B5	DEF Supply module temperature plausibility fault (Insufficient temperature increment) - (P23B5)
E007107-14	P23B6	DEF Supply module temperature plausibility fault at cold start (Insufficient temperature increment) - (P23B6)
E007416-03	P20BC	DEF Supply module heater relay output Short circuit to battery Fault - (P20BC)
E007416-04	P20BB	DEF Supply module heater relay output Short circuit to ground Fault - (P20BB)
E007416-05	P20B9	DEF Supply module heater relay output Open circuit Fault - (P20B9)
E007416-07	P30B9	DEF Supply module heater relay output Over temperature Fault - (P30B9)
E007416-12	P20BA	DEF Supply module heater feedback plausibility Fault - (P20BA)
E007538-12	P06F0	DEF Supply module temperature duty cycle in failure range - (P06F0)
E007538-13	P06F1	Diagnostic Fault Check for Urea supply module duty cycle in the invalid range - (P06F1)
E007538-22	P20AC	DEF Supply module heater temperature duty cycle in failure range - (P20AC)
E007538-23	P20AD	DEF Supply module heater temperature duty cycle in invalid range - (P20AD)

Gauge Panel Fault Code	P Code	Fault Code Description
E007538-24	P20B0	DEF Supply module temperature measurement non-availability fault - (P20B0)
E007538-25	P20FF	DEF Supply module time period outside specified range - (P20FF)
E007538-26	P056D	DEF Supply module PWM signal fault - (P056D)
E007540-03	P20C8	DEF Suction line heater relay output Short circuit to battery Fault - (P20C8)
E007540-04	P20C7	DEF Suction line heater relay output Short circuit to ground Fault - (P20C7)
E007540-05	P20C5	DEF Suction line heater relay output Open circuit Fault - (P20C5)
E007540-07	P30C5	DEF Suction line heater relay output Over temperature Fault - (P30C5)
E007540-12	P20C6	DEF Suction line heater feedback plausibility Fault - (P20C6)
E007748-03	P0617	Starter relay HS power stage output short circuit to battery - (P0617)
E007748-04	P0616	Starter relay HS power stage output short circuit to ground - (P0616)
E007748-05	P0615	Starter relay HS output open circuit - (P0615)
E007749-03	P26E6	Starter relay LS power stage output short circuit to battery - (P26E6)
E007749-04	P26E5	Starter relay LS power stage output short circuit to ground - (P26E5)
E007749-05	P26E4	Starter relay LS power stage output open circuit - (P26E4)
E008614-12	P213E	Injection cut off demand (ICO) for shut off coordinator - (P213E)
E055296-12	P062F	ECU EEPROM Read Error - (P062F)
E055552-12	P0630	ECU EEPROM Write Error - (P0630)
E057344-19	U01B7	Timeout Error of CAN-Receive-Frame CM1 (Status of regeneration initiate and inhibit switches) - (U01B7)
E061441-19	U01B9	Timeout Error of CAN-Receive-Frame EBC1 (Engine shut off request) - (U01B9)
E061454-19	U029D	Timeout Error of CAN-Receive-Frame AT1IG1 (NOx Upstream Concentration) - (U029D)
E061455-19	U029E	Timeout Error of CAN-Receive-Frame AT1O1 (NOx Downstream Concentration) - (U029E)
E064923-19	U02A2	Timeout Error of CAN-Receive-Frame A1DEFI (DEF Tank) - (U02A2)
E065110-19	U0619	Timeout Error of CAN-Receive-Frame AT1T1I (Urea Level, Temperature over CAN) - (U0619)
E065164-19	U1001	Timeout Error of CAN-Receive-Frame AAI (Hydraulic Oil Temperature) - (U1001)
E065241-19	U1031	Timeout Error of CAN-Receive-Frame AUXIO1 - (U1031)

Gauge Panel Fault Code	P Code	Fault Code Description
E065265-19	U1032	Timeout Error of CAN-Receive-Frame RxCCVS (PTO / Idle up) - (U1032)
E065272-19	P0218	Timeout Error of CAN-Receive-Frame TRF1 (Transmission oil temperature) - (P0218)
E065320-19	U0632	Timeout Error of CAN-Receive-Frame FanCtl (FAN Control) - (U0632)
E065320-31	U1039	DFC for error of FAN control (Fan Control) - (U1039)
E065400-19	U0608	Timeout Error of CAN-Receive-Frame RxSMVCU (Pedal & Engine speed demand from VCU) - (U0608)
E065400-22	U013C	Message Check Sum Error of CAN Receive Frame SMVCU (Pedal & Engine speed demand from VCU) - (U013C)
E065400-23	U043D	Message Counter Error of CAN Receive Frame SMVCU (Pedal & Engine speed demand from VCU) - (U043D)
E065401-19	U010F	Timeout Error of CAN-Receive-Frame DPM1 (Air Conditioning Switch Status / Oil life reset) - (U010F)
E065402-19	U01B8	Timeout Error of CAN-Receive-Frame DPM9 (Multiple torque Map select switch) - (U01B8)
E104332-09	P2383	NOx sensor Mounting Error (Upstream NOx sensor) - (P2383)
E104385-09	P2384	NOx sensor Mounting Error (Downstream NOx sensor) - (P2384)
E520601-12	P160B	CY327(Power control chipset) SPI Communication Error - (P160B)
E520618-12	P060B	ECU ADC(Analog to Digital Convertor) NTP(Null Load Test Pulse) Monitoring fault - (P060B)
E520641-12	P160F	ECU ROM Memory multiple error - (P160F)
E520642-12	P1610	ECU MM(Monitoring Module) Synchronization Loss fault during Shut-off path test - (P1610)
E520643-12	P101A	MoF(Monitoring of Function) Over Run error - (P101A)
E520696-12	P160C	ECU ADC(Analog to Digital Convertor) Test error - (P160C)
E520697-12	P160D	ECU ADC(Analog to Digital Convertor) Voltage ratio error - (P160D)
E520698-12	P060C	ECU query response-communication error - (P060C)
E520699-12	P160E	ECU SPI-communication error - (P160E)
E520700-12	P1611	ECU Shut−off path test error - (P1611)
E520701-12	P1612	ECU Wrong set response time error during shut off path test - (P1612)
E520702-12	P1613	ECU Too many SPI errors during shut off path test - (P1613)
E520703-12	P1615	ECU WDA working error during Shut-off path test - (P1615)
E520704-12	P1616	ECU OS Timeout error during Shut-off path test - (P1616)
E520705-12	P1617	ECU Positive test failure error during Shut-off path test - (P1617)
E520706-12	P1618	ECU Shut-off path test timeout fault - (P1618)
E520707-03	P1619	ECU Overvoltage error during Shut-off path test - (P1619)
E520707-04	P1614	ECU Undervoltage error during Shut-off path test - (P1614)

Gauge Panel Fault Code	P Code	Fault Code Description
E520723-12	P12E5	NCD Inducement Fault Level1 (Group1 - EGR Block) - (P12E5)
E520724-12	P12E6	NCD Inducement Fault Level2 (Group1 - EGR Block) - (P12E6)
E520725-12	P12E7	NCD Inducement Fault Level3 Final inducement (Group1 - EGR Block) - (P12E7)
E520726-12	P12E8	NCD Inducement Fault Warning (Group1 - EGR Block) - (P12E8)
E520727-12	P12E9	NCD Inducement Fault Level1 (Group2 - Dosing Interrupt) - (P12E9)
E520728-12	P12EA	NCD Inducement Fault Level2 (Group2 - Dosing Interrupt) - (P12EA)
E520729-12	P12EB	NCD Inducement Fault Level3 Final inducement (Group2 - Dosing Interrupt) - (P12EB)
E520730-12	P12EC	NCD Inducement Fault Warning (Group2 - Dosing Interrupt) - (P12EC)
E520736-12	P12F2	NCD inducement Fault Level1 (Group4 - DEF Quality) - (P12F2)
E520737-12	P12F3	NCD inducement Fault Level2 (Group4 - DEF Quality) - (P12F3)
E520738-12	P12F4	NCD inducement Fault Level3 Final inducement (Group4 - DEF Quality) - (P12F4)
E520739-12	P12F5	NCD inducement Fault Warning (Group4 - DEF Quality) - (P12F5)
E520740-12	P12F6	NCD inducement Fault Level1 (Group5 - Tampering) - (P12F6)
E520741-12	P12F7	NCD inducement Fault Level2 (Group5 - Tampering) - (P12F7)
E520742-12	P12F8	NCD inducement Fault Level3 Final inducement (Group5 - Tampering) - (P12F8)
E520743-12	P12F9	NCD inducement Fault Warning (Group5 - Tampering) - (P12F9)
E520790-12	P1303	NCD inducement Repeat offense Level1 - (P1303)
E520791-12	P1304	NCD inducement Repeat offense Level2 - (P1304)
E520792-12	P1305	NCD inducement Repeat offense Level3 Final inducement - (P1305)
E520797-12	P1013	DEF Supply Pump pressure sensor Low plausibility fault - (P1013)

HST Error Code

Information Mentioned in Troubleshooting Table

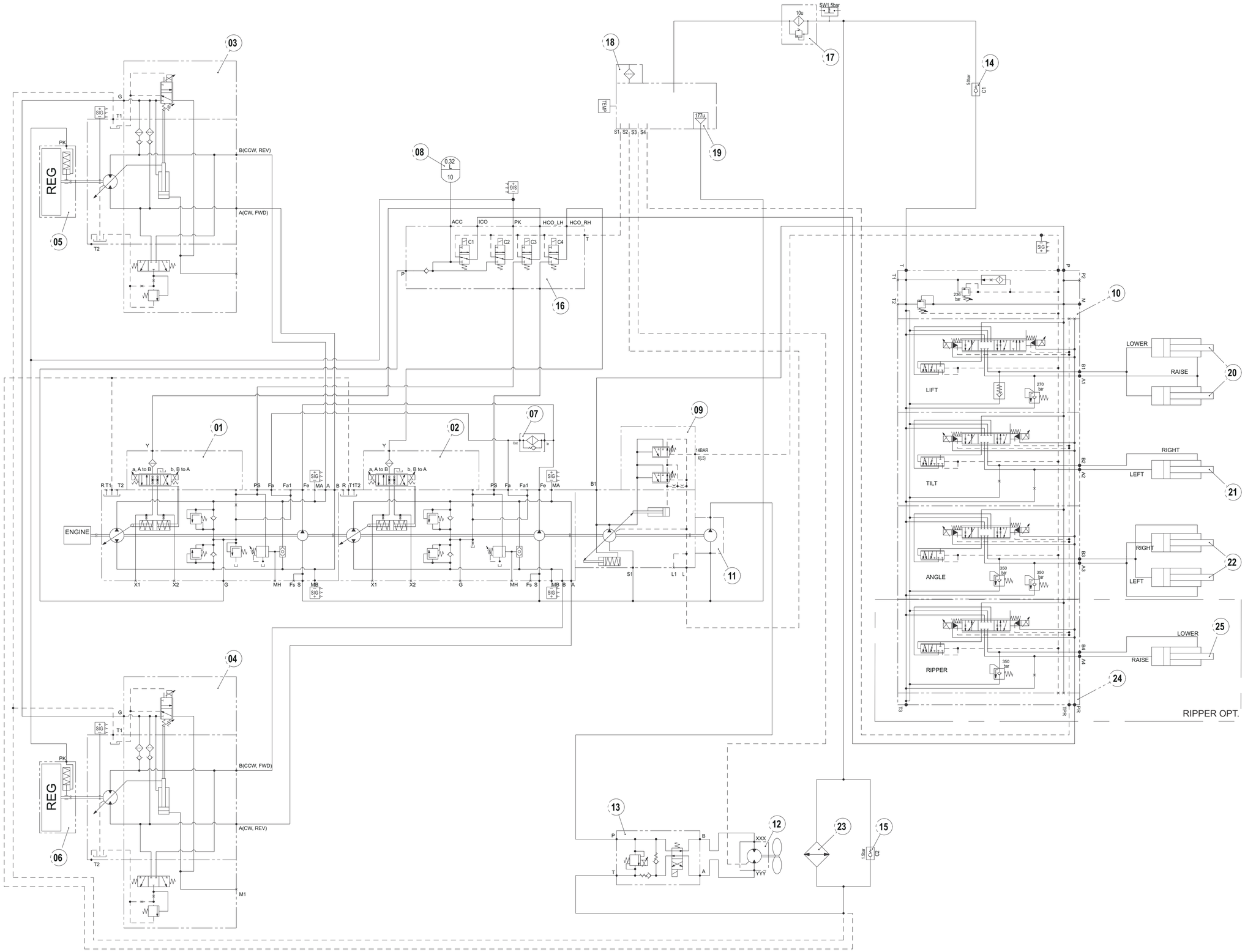
Before performing troubleshooting, understand that information fully.Please refer to the DMS-5 for detailed information.

No.		Description of the Problems
1	T520194-00	speed sensor left faulty
2	T520195-00	speed sensor right faulty
3	T520197-13	automatic calibration of minimum pump currents fault
4	T520199-04	battery voltage low fault
5	T520200-04	supply voltage low after proportional central switch
6	T520202-05	solenoid pump left forward, Current below normal
7	T520202-06	solenoid pump left forward, Current above normal
8	T520203-05	solenoid pump left backward Current below normal
9	T520203-06	solenoid pump left backward Current above normal
10	T520204-05	solenoid pump right forward, Current below normal
11	T520204-06	solenoid pump right forward, Current above normal
12	T520205-05	solenoid pump right backward Current below normal
13	T520205-06	solenoid pump right backward Current above normal
14	T520206-05	solenoid motor left, Current below normal
15	T520206-06	solenoid motor left, Current above normal
16	T520207-05	solenoid motor right, Current below normal
17	T520207-06	solenoid motor right, Current above normal
18	T520209-03	battery voltage high fault
19	T520210-04	supply voltage low after digital central switch
20	T520211-03	supply voltage high after proportional central switch
21	T520212-03	supply voltage high after digital central switch
22	T520213-04	VSS_3, 5V sensor voltage low
23	T520214-03	VSS_3, 5V sensor voltage high
24	T520215-04	VSS_2, 10V sensor voltage low
25	T520216-03	VSS_2, 10V sensor voltage high
26	T520220-19	CAN message EEC1(actual engine speed) from engine ECU not received
27	T520222-02	CAN_2 bus off, probably too many error frames
28	T520223-19	CAN message ET1(coolant temperature) from engine ECU not received
29	T520227-00	Coolant temp over
30	T520229-00	Hydr.oil Temp over
31	T520230-00	Start condition : Power supply is disabled by inhibit or output-enable input pin
32	T520231-00	Start condition : Unexpected state of power supply for power stages previous to switch-off tests.
33	T520232-00	Start condition : Power supply cannot be switched on for switch-off tests.
34	T520233-00	Start condition : No power supply(Pin 201)

35	T520234-00	Start condition : Setting VP ON is locked (because of hardware monitor error).
36	T520235-00	Start condition : joystick not neutral(driving or steering)
37	T520236-0	Start condition : Monitor sets own error 2
38	T520239-0	Start condition : Monitor sets own error 1
39	T520240-04	Start condition : VSS1 voltage low (pin219, pin232, pin255)
40	T520241-04	Start condition : battery voltage low (pin245)
41	T520244-31	solenoid pump left forward or backward faulty short circuit (hi-side pin153, pin177/Low-side: pin183)
42	T520245-31	solenoid pump right forward or backward faulty short circuit (pin154, pin178, and Low-side: pin179)
43	T520246-31	solenoid EP motor left or right faulty short circuit (pin151, solenoid pin175, and Low-side: pin185)
44	T520250-31	Travel Safety function Error
45	T520251-13	Parameter error (driving enable or safety switch 1,2 not closed)
46	T520253-31	Inhibit Switch Status Error
47	T520257-31	iching pedal pin139 redundancy error
48	T520259-31	safety switch 1, 2 fault
49	T520260-31	hardware monitor error
50	T520262-13	check throttle potentiomer calibration
51	T520264-19	left hand drive joystick : Callback_CAN_2_RX_JOYtoRC_BJM1 not received
52	T520273-19	left hand drive joystick : Callback_CAN_2_RX_JOYtoRC_EJM1 not received
53	T520274-19	left hand drive joystick : Callback_CAN_2_RX_JOYtoRC_BJM3 not received
54	T520275-19	left hand drive joystick : Callback_CAN_2_RX_JOYtoRC_EJM3 not received
55	T520276-19	CAN_3 bus off, probably too many error frames

Schematics

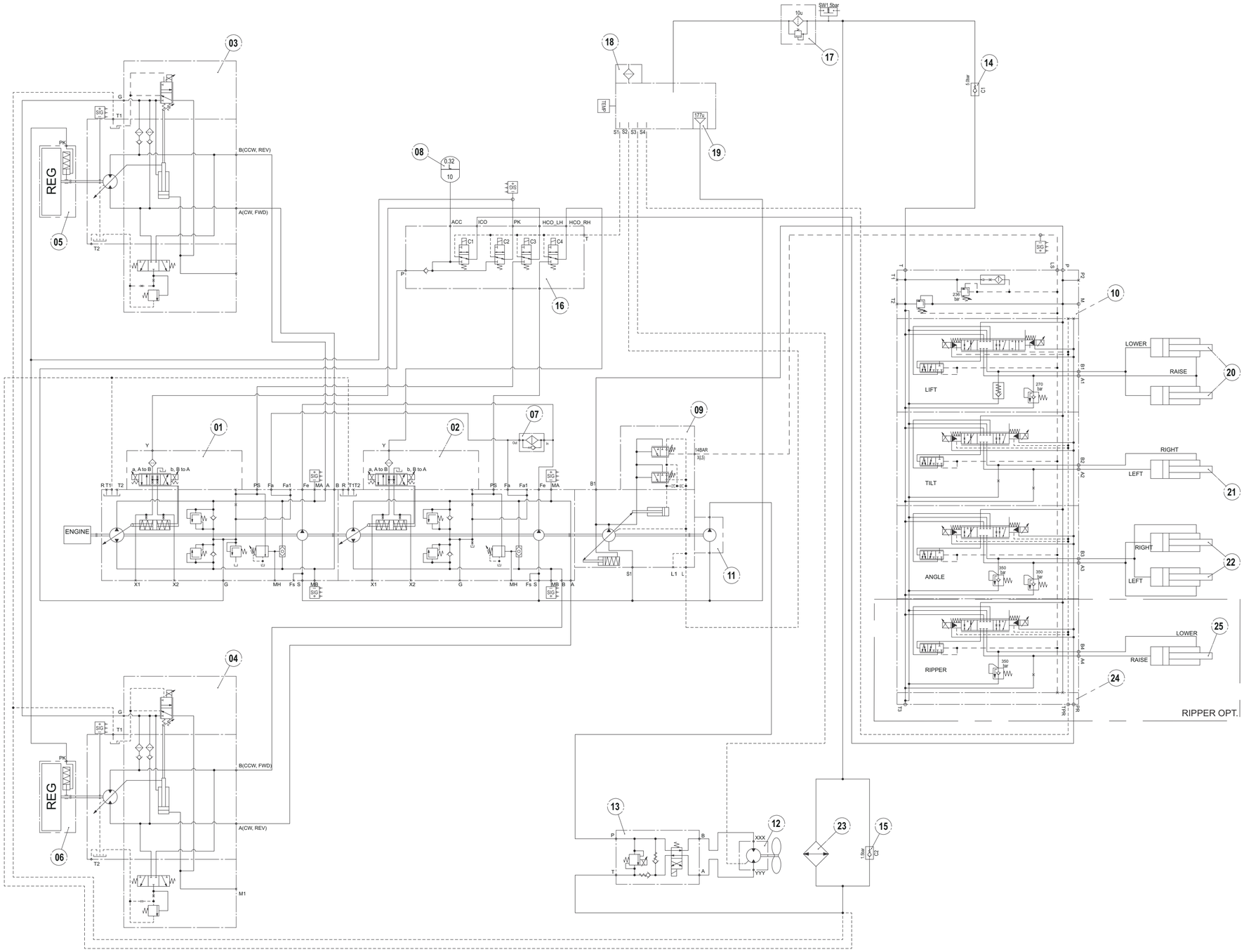
Hydraulic Schematic



STD	1. LEFT TRAVEL PUMP 2. RIGHT TRAVEL PUMP 3. LEFT TRAVEL MOTOR 4. RIGHT TRAVEL PUMP 5. LEFT REG. GEAR BOX 6. RIGHT REG. GEAR BOX 7. PILOT FILTER 8. PILOT ACCUMULATOR 9. IMPLEMENT PUMP 10. IMPLEMENT CONTROL VALVE(STD) 11. FAN PUMP 12. FAN MOTOR 13. FAN CONTROL VALVE 14. BYPASS VALVE(MAKE-UP) 15. BYPASS VALVE(COOLER) 16. SOL. PACKAGE VALVE 17. RETURN FILTER 18. AIR BREATHER 19. SUCTION STRAINER 20. LIFT CYLINDER 21. TILT CYLINDER 22. ANGLE CYLINDER 23. OIL COOLER
OPT	24. IMPLEMENT CONTROL VALVE(OPT) 25. RIPPER CYLINDER

DS2201506

Hydraulic Schematic



STD	1. LEFT TRAVEL PUMP 2. RIGHT TRAVEL PUMP 3. LEFT TRAVEL MOTOR 4. RIGHT TRAVEL PUMP 5. LEFT REG. GEAR BOX 6. RIGHT REG. GEAR BOX 7. PILOT FILTER 8. PILOT ACCUMULATOR 9. IMPLEMENT PUMP 10. IMPLEMENT CONTROL VALVE(STD) 11. FAN PUMP 12. FAN MOTOR 13. FAN CONTROL VALVE 14. BYPASS VALVE(MAKE-UP) 15. BYPASS VALVE(COOLER) 16. SOL. PACKAGE VALVE 17. RETURN FILTER 18. AIR BREATHER 19. SUCTION STRAINER 20. LIFT CYLINDER 21. TILT CYLINDER 22. ANGLE CYLINDER 23. OIL COOLER
OPT	24. IMPLEMENT CONTROL VALVE(OPT) 25. RIPPER CYLINDER

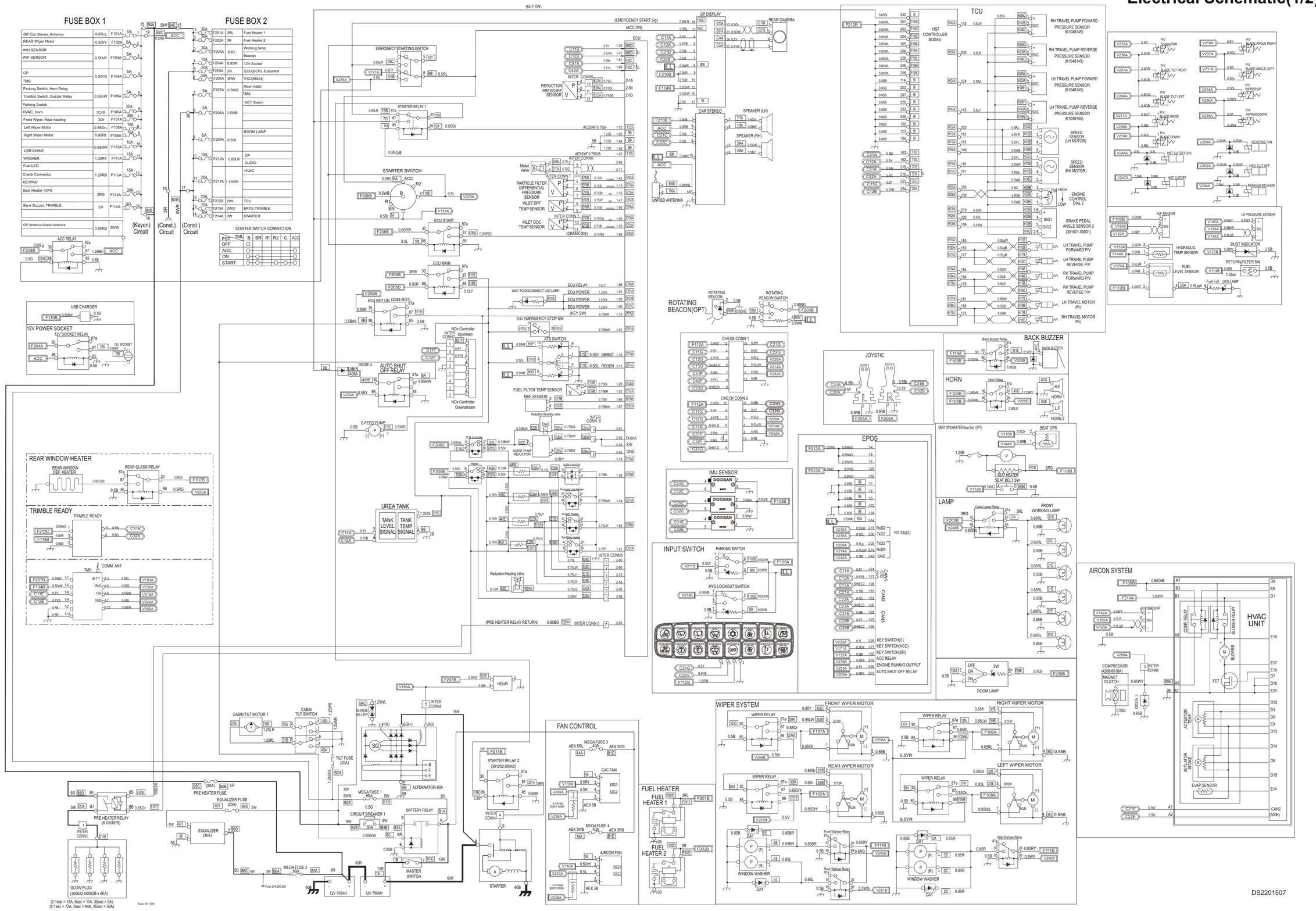
NO.	CHANGE NO	DESCRIPTION

950102-01037

DS2301216

Electric Schematic

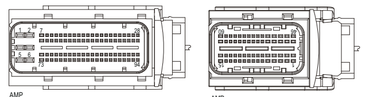
Electrical Schematic(1/2)



EPOS

1-01	2W	GND(WIF, LS Pressure sensor)
1-02	2WG	GND
1-03	0.85WL	GND
1-04	0.5WR	B+
1-05	0.85WY	B+
1-06	2WL	B+
1-07	2WR	CAN3 (LOW)
1-08	0.85WG	CAN1 (Shield)
1-09	0.85WB	CAN3 (Shield)
1-10	0.5WY	-
1-11	0.85WR	-
1-12	0.85OY	Seat belt state
1-13	2WR	-
1-14	2O/R	Return filter switch
1-15	2R	-
1-16	0.5O/Y	Condensor FAN Fail
1-17	1.25RG	-
1-18	0.5RL	-
1-19	0.5RW	-
1-20	2RY	5V(Engine Control Dial)
1-21	1.25O/	GND Output(Engine Control Dial)
1-22	2O/B	GND Output(WIF, LS Pressure sensor)
1-23	0.85O/G	-
1-24	0.5O/L	-
1-25	0.85O/Y	-
1-26	2O/	-
1-27	0.5O/W	-
1-28	0.5R	MAIN BAT +
1-29	0.5RB	CAN3 (HIGH)
1-30	0.85RG	CAN2 (SHIELD)
1-31	1.25RY	-
1-32	0.85RW	KEY SWITCH (Br)
1-33	0.5RL	CAC FAN Fail Signal
1-34	0.5RW	-
1-35	2RY	-
1-36	1.25O/	-
1-37	2O/B	-
1-38	0.85O/G	-
1-39	0.5O/L	-
1-40	0.85O/Y	-
1-41	2O/	-
1-42	0.5O/W	5V +
1-43	0.5R	GND Output
1-44	0.5RB	GND Output
1-45	0.85RG	-
1-46	1.25RY	OPS Input
1-47	0.85RW	-
1-48	0.5O/W	-
1-49	0.5R	-
1-50	0.5RB	B+
1-51	2W	CAN2 (HIGH)
1-52	2WG	CAN2 (LOW)
1-53	0.85WL	HYD OIL TEMP SENSOR
1-54	0.5WR	WIF SENSOR
1-55	0.85WY	-
1-56	2WL	-
1-57	2WR	-
1-58	0.85WG	-
1-59	0.85WB	-
1-60	0.5WY	-
1-61	0.85WR	-
1-62	0.85O/Y	-
1-63	2WR	-
1-64	2O/R	-
1-65	2R	TMS(3.5V input)
1-66	2RB	-
1-67	1.25RG	Parking Brake Pressure Sensor
1-68	0.5RL	-
1-69	0.5RW	-
1-70	2RY	-
1-71	1.25O/	Starter Switch (ACC)
1-72	2O/B	Main GND
1-73	0.85O/G	CAN1 (LOW)
1-74	0.5O/L	CAN1 (HIGH)
1-75	0.85O/Y	Fuel Sensor (SIG)
1-76	0.5O/	Seat OPS
1-77	0.5O/W	Dust Indicator
1-78	0.5R	-
1-79	0.5RB	-
1-80	0.85RG	-
1-81	1.25RY	-
1-82	0.85RW	-
1-83	0.5RL	-
1-84	0.5RW	-
1-85	2RY	-
1-86	1.25O/	-
1-87	2O/B	-
1-88	0.85O/G	-
1-89	0.5O/L	LS PRESSURE SENSOR
1-90	0.85O/Y	ENGINE CONTROL DIAL(SIG)
1-91	2O/	-
1-92	0.5O/W	ACP SENSOR
1-93	0.5R	ALTERNATER VOLTAGE
1-94	0.5RB	Main_GND

2-01	2W	P/V BLADE;TILT RIHGT
2-02	2WG	-
2-03	0.85WL	AUTO SHUT OFF RELAY
2-04	0.5WR	P/V BLADE;TILT LEFT
2-05	0.85WY	Back Up Alarm relay
2-06	2WL	COMPRESSOR
2-07	2WR	Glow Plug Check
2-08	0.85WG	-
2-09	0.85WB	-
2-10	0.5WY	-
2-11	0.85WR	PARKING SWITCH
2-12	0.85O/Y	Traction Control Switch
2-13	2WR	Hydraulic Lockout Switch
2-14	2O/R	RS232_TXD(for DMS)
2-15	2R	TxD2_TMS
2-16	2RB	ACC RELAY
2-17	1.25RG	P/V BLADE;RAISE
2-18	0.5RL	P/V BLADE;DOWN
2-19	0.5RW	P/V BLADE;ANGLE RIGHT
2-20	2RY	HORN RELAY
2-21	1.25O/	-
2-22	2O/B	-
2-23	0.85O/G	-
2-24	0.5O/L	-
2-25	0.85O/Y	Starter Switch ("C")
2-26	2O/	-
2-27	0.5O/W	-
2-28	0.5R	-
2-29	0.5RB	RS232TXD_DMS
2-30	0.85RG	RS232TXD_TMS
2-31	1.25RY	P/V BLADE;ANGLE LEFT
2-32	0.85RW	P/V COOLING FAN
2-33	0.5RL	CONDENSOR FAN CONTROL
2-34	0.5RW	P/V RIPPER;UP
2-35	2RY	P/V RIPPER;DOWN
2-36	1.25O/	GND
2-37	2O/B	GND_Output
2-38	0.85O/G	GND_Output
2-39	0.5O/L	GND_Output
2-40	0.85O/Y	GND_Output
2-41	2O/	GND_Output
2-42	0.5O/W	RS232_GND_DMS
2-43	0.5R	RS232_GND_TMS
2-44	0.5RB	PARKING BRAKE RELEASE
2-45	0.85RG	FRONT WASHER RELAY
2-46	1.25RY	HST CUTOFF(LH)
2-47	0.85RW	HST CUTOFF(RH)
2-48	0.5O/W	CABIN LAMP RELAY
2-49	0.5R	CAC FAN CONTROL
2-50	0.5RB	-
2-51	2W	REAR WASHER RELAY
2-52	2WG	HYD. CUTOFF
2-53	0.85WL	MIRROR HEATER
2-54	0.5WR	ILLUMINATION
2-55	0.85WY	Engine Running Output Signal
2-56	2WL	FRONT WIPER RELAY
2-57	2WR	REAR WIPER RELAY
2-58	0.85WG	SIDE WIPER RELAY
2-59	0.85WB	S/V REVERSE FAN
2-60	0.5WY	SIDE WASHER RELAY



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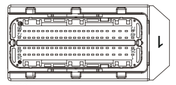
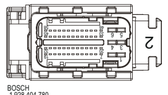
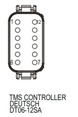
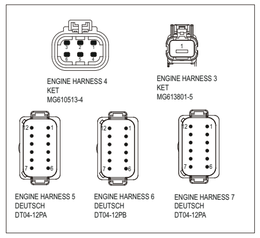


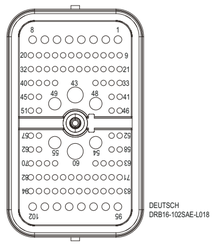


[HST CONT]

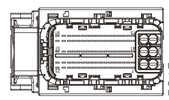




[ENGINE -MAIN]



[MAIN-CABIN]



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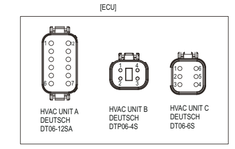
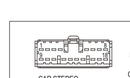
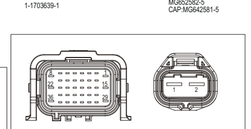
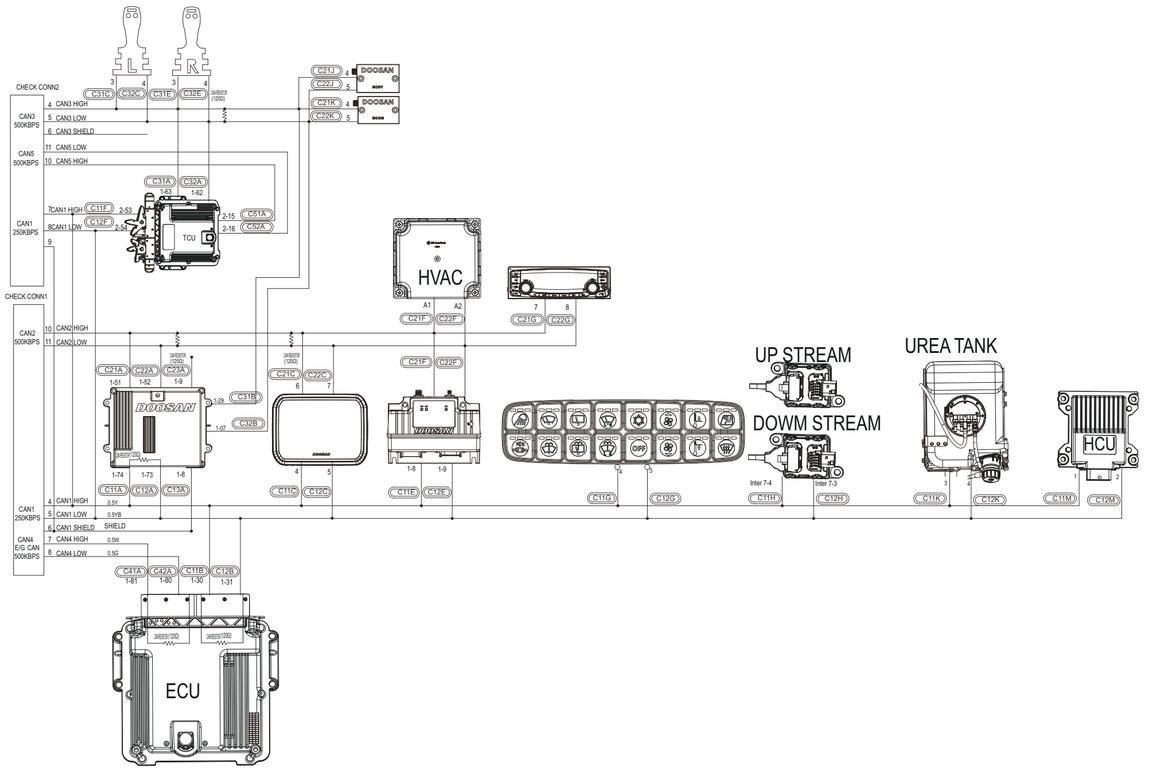


[HVAC]

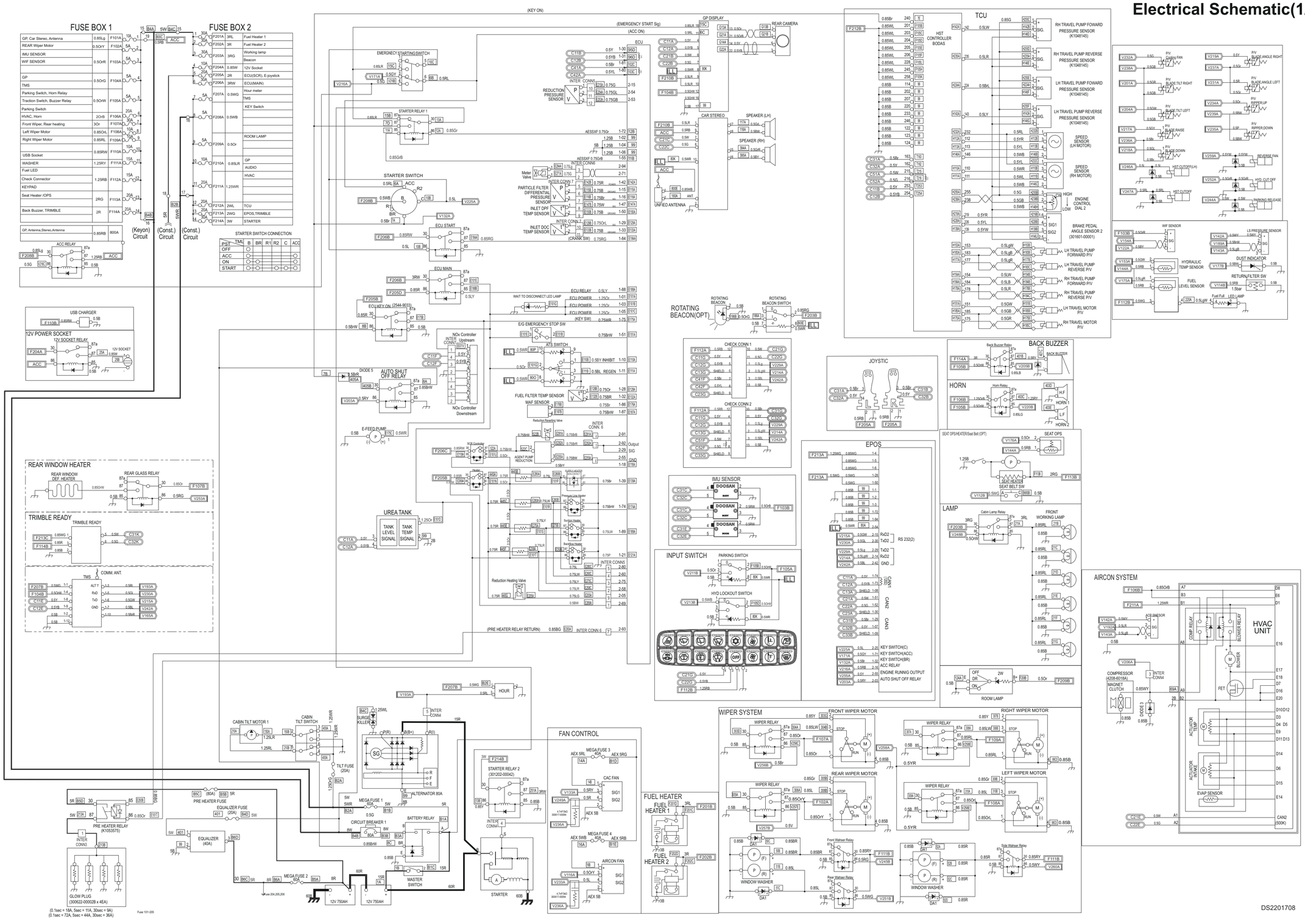
[UREA TANK]







Electrical Schematic(1/2)

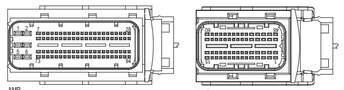


DS2201708

EPOS

1-01	2W	GND(WIF, LS Pressure sensor)
1-02	2WG	GND
1-03	0.85WL	GND
1-04	0.5WR	B+
1-05	0.85WY	B+
1-06	2WL	B+
1-07	2WR	CAN3 (LOW)
1-08	0.85WG	CAN1 (Shield)
1-09	0.85WB	CAN3 (Shield)
1-10	0.5WY	-
1-11	0.85WR	-
1-12	0.85OY	Seat belt state
1-13	2WR	-
1-14	2OR	Return filter switch
1-15	2R	-
1-16	0.5OY	Condensor FAN Fail
1-17	1.25RG	-
1-18	0.5BL	-
1-19	0.5RW	-
1-20	2RY	5V(Engine Control Dial)
1-21	1.25Or	GND Output(Engine Control Dial)
1-22	2OR	GND Output(WIF, LS Pressure sensor)
1-23	0.85OG	-
1-24	0.5OL	-
1-25	0.85OY	-
1-26	2Or	-
1-27	0.5OW	-
1-28	0.5R	MAIN BAT +
1-29	0.5RB	CAN3 (HIGH)
1-30	0.85RG	CAN2 (SHIELD)
1-31	1.25BY	-
1-32	0.85RW	KEY SWITCH (Br)
1-33	0.5RL	CAC FAN Fail Signal
1-34	0.5RW	-
1-35	2RY	-
1-36	1.25Or	
1-37	2OrB	-
1-38	0.85OG	-
1-39	0.5OL	-
1-40	0.85OY	-
1-41	2Or	-
1-42	0.5OW	5V +
1-43	0.5R	GND Output
1-44	0.5RB	GND Output
1-45	0.85RG	-
1-46	1.25BY	OPS Input
1-47	0.85RW	-
1-48	0.5OW	-
1-49	0.5R	-
1-50	0.5RB	B+
1-51	2W	CAN2 (HIGH)
1-52	2WG	CAN2 (LOW)
1-53	0.85WL	HYD OIL TEMP SENSOR
1-54	0.5WR	WIF SENSOR
1-55	0.85WY	-
1-56	2WL	-
1-57	2WR	-
1-58	0.85WG	-
1-59	0.85WB	-
1-60	0.5WY	-
1-61	0.85WR	-
1-62	0.85OY	-
1-63	2WR	-
1-64	2OrR	-
1-65	2R	TMS(3.5V input)
1-66	2RB	-
1-67	1.25RG	Parking Brake Pressure Sensor
1-68	0.5RL	-
1-69	0.5RW	-
1-70	2RY	-
1-71	1.25Or	Starter Switch (ACC)
1-72	2OrB	Main GND
1-73	0.85OG	CAN1 (LOW)
1-74	0.5OL	CAN1 (HIGH)
1-75	0.85OY	Fuel Sensor (SIG)
1-76	0.5Or	Seat OPS
1-77	0.5OW	Dust Indicator
1-78	0.5R	-
1-79	0.5RB	-
1-80	0.85RG	-
1-81	1.25RY	-
1-82	0.85RW	-
1-83	0.5RL	-
1-84	0.5RW	-
1-85	2RY	-
1-86	1.25Or	-
1-87	2OrB	-
1-88	0.85OG	-
1-89	0.5OL	LS PRESSURE SENSOR
1-90	0.85OY	ENGINE CONTROL DIAL(SIG)
1-91	2Or	-
1-92	0.5OW	ACP SENSOR
1-93	0.5R	ALTERNATER VOLTAGE
1-94	0.5RB	Main_GND

2-01	2W	P/V BLADE-TILT RIHGT
2-02	2WG	-
2-03	0.85WL	AUTO SHUT OFF RELAY
2-04	0.5WR	P/V BLADE-TILT LEFT
2-05	0.85WY	Back Up Alarm relay
2-06	2WL	COMPRESSOR
2-07	2WR	Glow Plug Check
2-08	0.85WG	-
2-09	0.85WB	-
2-10	0.5WY	-
2-11	0.85WR	PARKING SWITCH
2-12	0.85OY	Traction Control Switch
2-13	2WR	Hydraulic Lockout Switch
2-14	2OrR	RS232_TXD(for DMS)
2-15	2R	TxD2_TMS
2-16	2RB	ACC RELAY
2-17	1.25RG	P/V BLADE-RAISE
2-18	0.5RL	P/V BLADE-DOWN
2-19	0.5RW	P/V BLADE-ANGLE RIGHT
2-20	2RY	HORN RELAY
2-21	1.25Or	-
2-22	2OrB	-
2-23	0.85OG	-
2-24	0.5OL	-
2-25	0.85OY	Starter Switch ("C")
2-26	2Or	-
2-27	0.5OW	-
2-28	0.5R	-
2-29	0.5RB	RS232TXD_DMS
2-30	0.85RG	RS232TXD_TMS
2-31	1.25RY	P/V BLADE-ANGLE LEFT
2-32	0.85RW	P/V COOLING FAN
2-33	0.5RL	CONDENSOR FAN CONTROL
2-34	0.5RW	P/V RIPPER-UP
2-35	2RY	P/V RIPPER-DOWN
2-36	1.25Or	GND
2-37	2OrB	GND_Output
2-38	0.85OG	GND_Output
2-39	0.5OL	GND_Output
2-40	0.85OY	GND_Output
2-41	2Or	GND_Output
2-42	0.5OW	RS232_GND_DMS
2-43	0.5R	RS232_GND_TMS
2-44	0.5RB	PARKING BRAKE RELEASE
2-45	0.85RG	FRONT WASHER RELAY
2-46	1.25RY	HST CUTOFF(LH)
2-47	0.85RW	HST CUTOFF(RH)
2-48	0.5OW	CABIN LAMP RELAY
2-49	0.5R	CAC FAN CONTROL
2-50	0.5RB	-
2-51	2W	REAR WASHER RELAY
2-52	2WG	HYD. CUTOFF
2-53	0.85WL	MIRROR HEATER
2-54	0.5WR	ILLUMINATION
2-55	0.85WY	Engine Running Output Signal
2-56	2WL	FRONT WIPER RELAY
2-57	2WR	REAR WIPER RELAY
2-58	0.85WG	SIDE WIPER RELAY
2-59	0.85WB	S/V REVERSE FAN
2-60	0.5WY	SIDE WASHER RELAY



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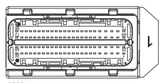
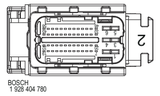
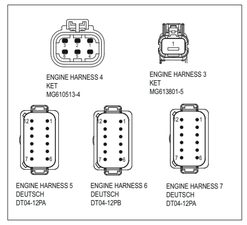
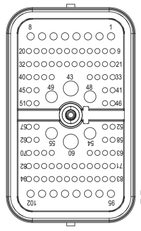




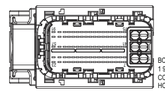
[HST CONT]



[ENGINE -MAIN]



[MAIN-CABIN]



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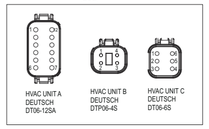

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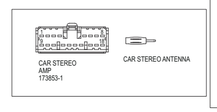
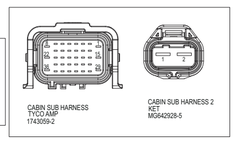
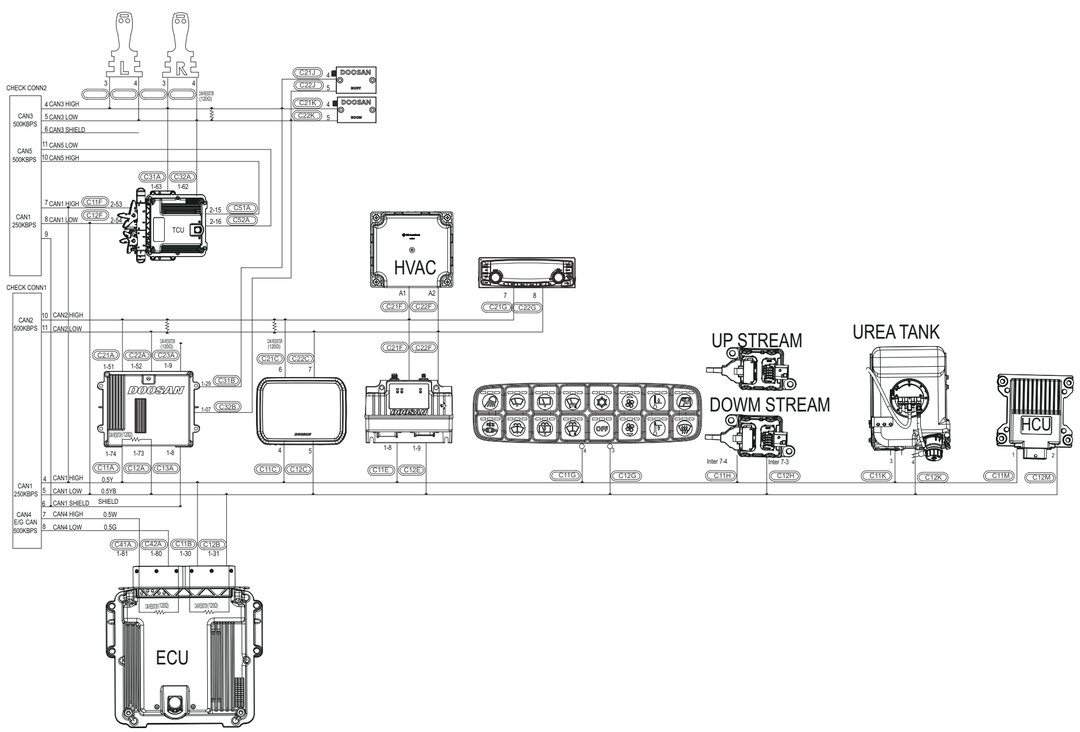


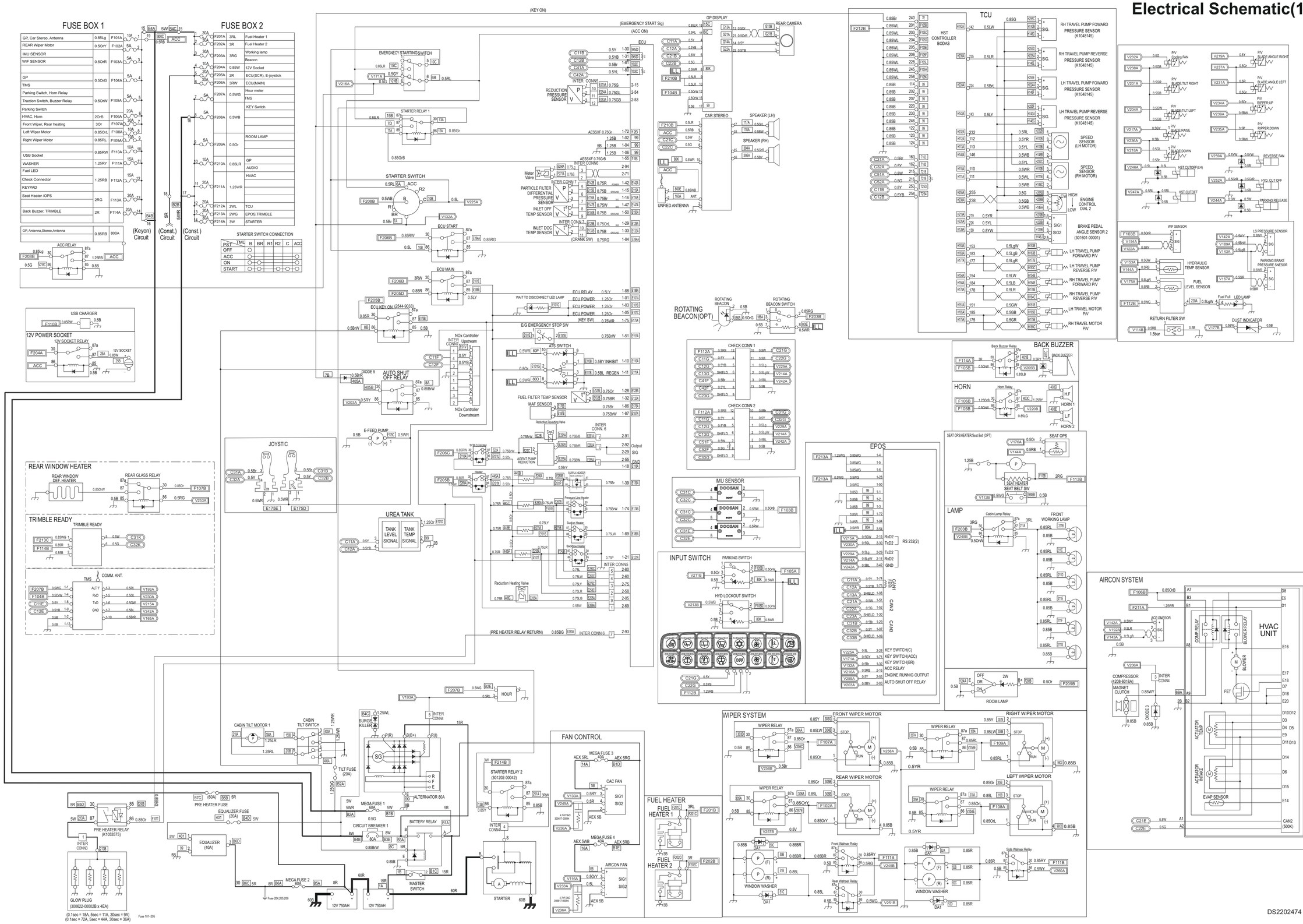
[UREA TANK]





DS2201709

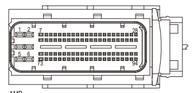
Electrical Schematic(1/2)

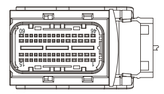


EPOS

1-01	2W	GND(WIF, LS Pressure sensor)
1-02	2WG	GND
1-03	0.85WL	GND
1-04	0.5WR	B+
1-05	0.85WY	B+
1-06	2WL	B+
1-07	2WR	CAN3 (LOW)
1-08	0.85WG	CAN1 (Shield)
1-09	0.85WB	CAN3 (Shield)
1-10	0.5WY	-
1-11	0.85WR	-
1-12	0.85GY	Seat belt state
1-13	2WR	-
1-14	2OR	Return filter switch
1-15	2R	-
1-16	0.5GY	Condensor FAN Fail
1-17	1.25RG	-
1-18	0.5RL	-
1-19	0.5RW	-
1-20	2RY	5V(Engine Control Dial)
1-21	1.25O	GND Output(Engine Control Dial)
1-22	2OB	GND Output(WIF, LS Pressure sensor)
1-23	0.85OG	-
1-24	0.5OL	-
1-25	0.85OY	-
1-26	2Or	-
1-27	0.5OW	-
1-28	0.5R	MAIN BAT +
1-29	0.5RB	CAN3 (HIGH)
1-30	0.85RG	CAN2 (SHIELD)
1-31	1.25RY	-
1-32	0.85RW	KEY SWITCH (Br)
1-33	0.5RL	CAC FAN Fail Signal
1-34	0.5RW	-
1-35	2RY	-
1-36	1.25Or	
1-37	2OB	-
1-38	0.85OG	-
1-39	0.5OL	-
1-40	0.85OY	-
1-41	2Or	-
1-42	0.5OW	5V +
1-43	0.5R	GND Output
1-44	0.5RB	GND Output
1-45	0.85RG	-
1-46	1.25RY	OPS Input
1-47	0.85RW	-
1-48	0.5OW	-
1-49	0.5R	
1-50	0.5RB	B+
1-51	2W	CAN2 (HIGH)
1-52	2WG	CAN2 (LOW)
1-53	0.85WL	HYD OIL TEMP SENSOR
1-54	0.5WR	WIF SENSOR
1-55	0.85WY	-
1-56	2WL	-
1-57	2WR	-
1-58	0.85WG	-
1-59	0.85WB	-
1-60	0.5WY	-
1-61	0.85WR	-
1-62	0.85OY	-
1-63	2WR	-
1-64	2OR	-
1-65	2R	TMS(3.5V input)
1-66	2RB	-
1-67	1.25RG	Parking Brake Pressure Sensor
1-68	0.5RL	-
1-69	0.5RW	-
1-70	2RY	-
1-71	1.25Or	Starter Switch (ACC)
1-72	2OB	Main GND
1-73	0.85OG	CAN1 (LOW)
1-74	0.5OL	CAN1 (HIGH)
1-75	0.85OY	Fuel Sensor (SIG)
1-76	0.5Or	Seat OPS
1-77	0.5OW	Dust Indicator
1-78	0.5R	-
1-79	0.5RB	-
1-80	0.85RG	-
1-81	1.25RY	-
1-82	0.85RW	-
1-83	0.5RL	-
1-84	0.5RW	-
1-85	2RY	-
1-86	1.25Or	-
1-87	2OB	-
1-88	0.85OG	-
1-89	0.5OL	LS PRESSURE SENSOR
1-90	0.85OY	ENGINE CONTROL DIAL(SIG)
1-91	2Or	-
1-92	0.5OW	ACP SENSOR
1-93	0.5R	ALTERNATER VOLTAGE
1-94	0.5RB	Main_GND

2-01	2W	P/V BLADE;TILT RIHGT
2-02	2WG	-
2-03	0.85WL	AUTO SHUT OFF RELAY
2-04	0.5WR	P/V BLADE;TILT LEFT
2-05	0.85WY	Back Up Alarm relay
2-06	2WL	COMPRESSOR
2-07	2WR	Glow Plug Check
2-08	0.85WG	-
2-09	0.85WB	-
2-10	0.5WY	-
2-11	0.85WR	PARKING SWITCH
2-12	0.85GY	Traction Control Switch
2-13	2WR	Hydraulic Lockout Switch
2-14	2OR	RS232_TXD(for DMS)
2-15	2R	TxD2_TMS
2-16	2RB	ACC RELAY
2-17	1.25RG	P/V BLADE:RAISE
2-18	0.5RL	P/V BLADE:DOWN
2-19	0.5RW	P/V BLADE:ANGLE RIGHT
2-20	2RY	HORN RELAY
2-21	1.25O	-
2-22	2OB	-
2-23	0.85OG	-
2-24	0.5OL	-
2-25	0.85OY	Starter Switch ("C")
2-26	2Or	-
2-27	0.5OW	-
2-28	0.5R	-
2-29	0.5RB	RS232TXD_DMS
2-30	0.85RG	RS232TXD_TMS
2-31	1.25RY	P/V BLADE:ANGLE LEFT
2-32	0.85RW	P/V COOLING FAN
2-33	0.5RL	CONDENSOR FAN CONTROL
2-34	0.5RW	P/V RIPPER;UP
2-35	2RY	P/V RIPPER;DOWN
2-36	1.25Or	GND
2-37	2OrB	GND_Output
2-38	0.85OrG	GND_Output
2-39	0.5OrL	GND_Output
2-40	0.85OrY	GND_Output
2-41	2Or	GND_Output
2-42	0.5OrW	RS232_GND_DMS
2-43	0.5R	RS232_GND_TMS
2-44	0.5RB	PARKING BRAKE RELEASE
2-45	0.85RG	FRONT WASHER RELAY
2-46	1.25RY	HST CUTOFF(LH)
2-47	0.85RW	HST CUTOFF(RH)
2-48	0.5OrW	CABIN LAMP RELAY
2-49	0.5R	CAC FAN CONTROL
2-50	0.5RB	-
2-51	2W	REAR WASHER RELAY
2-52	2WG	HYD. CUTOFF
2-53	0.85WL	MIRROR HEATER
2-54	0.5WR	ILLUMINATION
2-55	0.85WY	Engine Running Output Signal
2-56	2WL	FRONT WIPER RELAY
2-57	2WR	REAR WIPER RELAY
2-58	0.85WG	SIDE WIPER RELAY
2-59	0.85WB	S/V REVERSE FAN
2-60	0.5WY	SIDE WASHER RELAY





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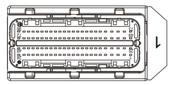
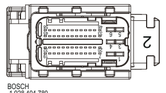
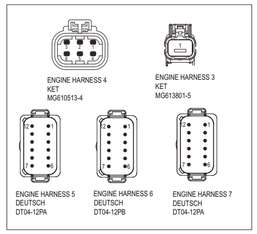
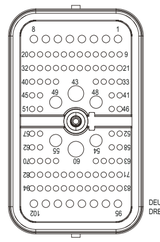




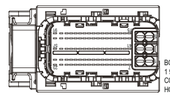
[HST CONT]



[ENGINE -MAIN]



[MAIN-CABIN]



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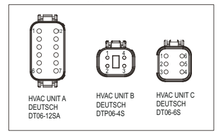
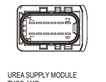
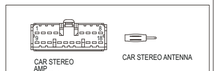
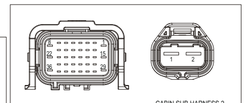


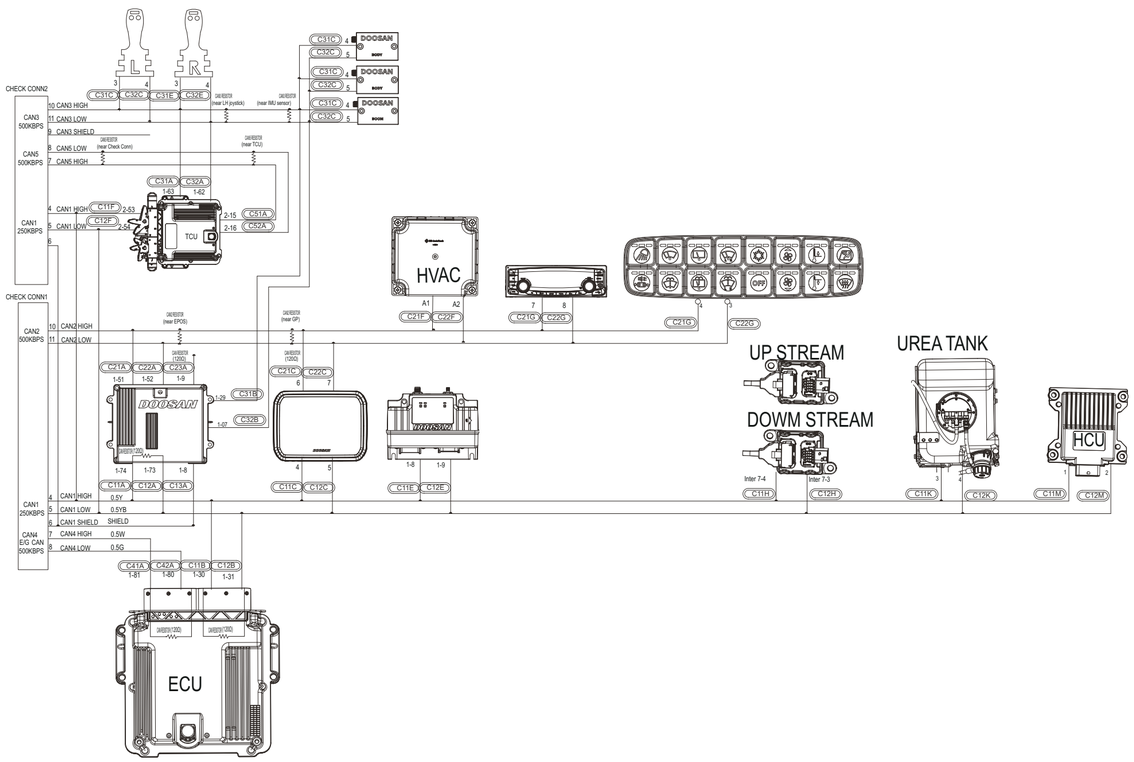
[HVAC]

[UREA TANK]

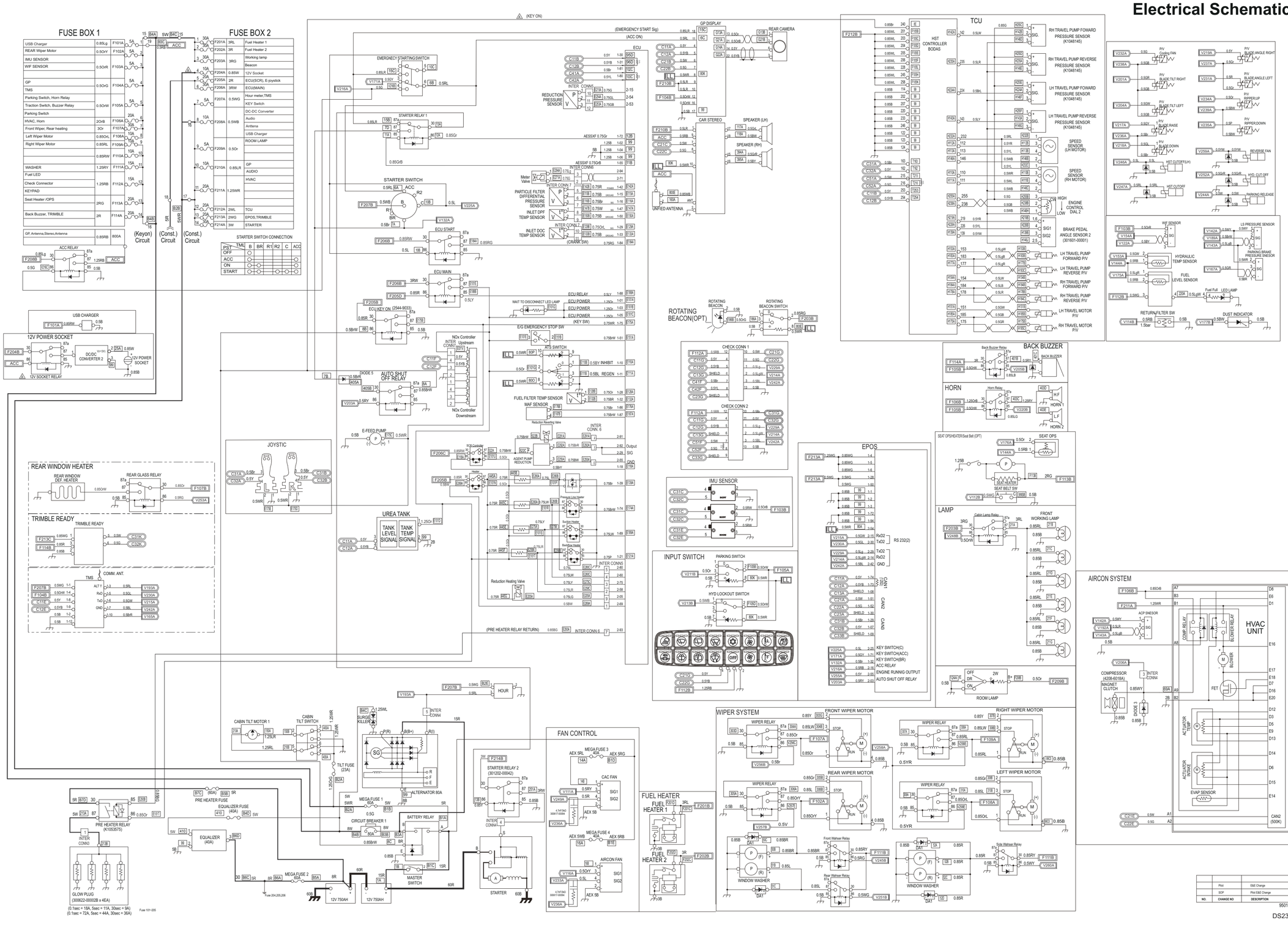








Electrical Schematic(1/2)



	Pilot	E&E Change
	SOP	Pilot E&E Change
NO.	CHANGE NO	DESCRIPTION

950102-01086A

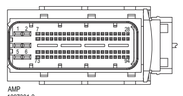
DS2301181

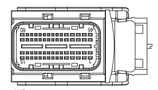
Electrical Schematic(2/2)

EPOS

1-01	2W	GND(WIF, LS Pressure sensor)
1-02	2WG	GND
1-03	0.85WL	GND
1-04	0.5WR	B+
1-05	0.85WY	B+
1-06	2WL	B+
1-07	2WR	CAN3 (LOW)
1-08	0.85WG	CAN1 (Shield)
1-09	0.85WB	CAN3 (Shield)
1-10	0.5W	-
1-11	0.85WR	-
1-12	0.85OY	Seat belt state
1-13	2WR	-
1-14	2OR	Return filter switch
1-15	2R	-
1-16	0.5OY	Condensor FAN Fail
1-17	1.25RG	-
1-18	0.5RL	-
1-19	0.5RW	-
1-20	2RY	5V(Engine Control Dial)
1-21	1.25O	GND Output(Engine Control Dial)
1-22	2OB	GND Output(WIF, LS Pressure sensor)
1-23	0.85OG	-
1-24	0.5OL	-
1-25	0.85OY	-
1-26	2O	-
1-27	0.5OW	-
1-28	0.5R	MAIN BAT +
1-29	0.5RB	CAN3 (HIGH)
1-30	0.85RG	CAN2 (SHIELD)
1-31	1.25RY	-
1-32	0.85RW	KEY SWITCH (Br)
1-33	0.5RL	CAC FAN Fail Signal
1-34	0.5RW	-
1-35	2RY	-
1-36	1.25O	-
1-37	2OB	-
1-38	0.85OG	-
1-39	0.5OL	-
1-40	0.85OY	-
1-41	2O	-
1-42	0.5OW	5V +
1-43	0.5R	GND Output
1-44	0.5RB	GND Output
1-45	0.85RG	-
1-46	1.25RY	OPS Input
1-47	0.85RW	-
1-48	0.5OW	-
1-49	0.5R	-
1-50	0.5RB	B+
1-51	2W	CAN2 (HIGH)
1-52	2WG	CAN2 (LOW)
1-53	0.85WL	HYD OIL TEMP SENSOR
1-54	0.5WR	WIF SENSOR
1-55	0.85WY	-
1-56	2WL	-
1-57	2WR	-
1-58	0.85WG	-
1-59	0.85WB	-
1-60	0.5WY	-
1-61	0.85WR	-
1-62	0.85OY	-
1-63	2WR	-
1-64	2OR	-
1-65	2R	TMS(3.5V input)
1-66	2RB	-
1-67	1.25RG	Parking Brake Pressure Sensor
1-68	0.5RL	-
1-69	0.5RW	-
1-70	2RY	-
1-71	1.25O	Starter Switch (ACC)
1-72	2OB	Main GND
1-73	0.85OG	CAN1 (LOW)
1-74	0.5OL	CAN1 (HIGH)
1-75	0.85OY	Fuel Sensor (SIG)
1-76	0.5O	Seat OPS
1-77	0.5OW	Dust Indicator
1-78	0.5R	-
1-79	0.5RB	-
1-80	0.85RG	-
1-81	1.25RY	-
1-82	0.85RW	-
1-83	0.5RL	-
1-84	0.5RW	-
1-85	2RY	-
1-86	1.25O	-
1-87	2OB	-
1-88	0.85OG	-
1-89	0.5OL	LS PRESSURE SENSOR
1-90	0.85OY	ENGINE CONTROL DIAL(SIG)
1-91	2O	-
1-92	0.5OW	ACP SENSOR
1-93	0.5R	ALTERNATER VOLTAGE
1-94	0.5RB	Main_GND

2-01	2W	P/V BLADE;TILT RIHGT
2-02	2WG	-
2-03	0.85WL	AUTO SHUT OFF RELAY
2-04	0.5WR	P/V BLADE;TILT LEFT
2-05	0.85WY	Back Up Alarm relay
2-06	2WL	COMPRESSOR
2-07	2WR	Glow Plug Check
2-08	0.85WG	-
2-09	0.85WB	-
2-10	0.5WY	-
2-11	0.85WR	PARKING SWITCH
2-12	0.85OY	Traction Control Switch
2-13	2WR	Hydraulic Lockout Switch
2-14	2OR	RS232_TXD(for DMS)
2-15	2R	TxD2_TMS
2-16	2RB	ACC RELAY
2-17	1.25RG	P/V BLADE;RAISE
2-18	0.5RL	P/V BLADE;DOWN
2-19	0.5RW	P/V BLADE;ANGLE RIGHT
2-20	2RY	HORN RELAY
2-21	1.25O	-
2-22	2OB	-
2-23	0.85OG	-
2-24	0.5OL	-
2-25	0.85OY	Starter Switch ("C")
2-26	2O	-
2-27	0.5OW	-
2-28	0.5R	-
2-29	0.5RB	RS232TXD_DMS
2-30	0.85RG	RS232TXD_TMS
2-31	1.25RY	P/V BLADE;ANGLE LEFT
2-32	0.85RW	P/V COOLING FAN
2-33	0.5RL	CONDENSOR FAN CONTROL
2-34	0.5RW	P/V RIPPER;UP
2-35	2RY	P/V RIPPER;DOWN
2-36	1.25O	GND
2-37	2OB	GND_Output
2-38	0.85OG	GND_Output
2-39	0.5OL	GND_Output
2-40	0.85OY	GND_Output
2-41	2O	GND_Output
2-42	0.5OW	RS232_GND_DMS
2-43	0.5R	RS232_GND_TMS
2-44	0.5RB	PARKING BRAKE RELEASE
2-45	0.85RG	FRONT WASHER RELAY
2-46	1.25RY	HST CUTOFF(LH)
2-47	0.85RW	HST CUTOFF(RH)
2-48	0.5OW	CABIN LAMP RELAY
2-49	0.5R	CAC FAN CONTROL
2-50	0.5RB	-
2-51	2W	REAR WASHER RELAY
2-52	2WG	HYD. CUTOFF
2-53	0.85WL	MIRROR HEATER
2-54	0.5WR	ILLUMINATION
2-55	0.85WY	Engine Running Output Signal
2-56	2WL	FRONT WIPER RELAY
2-57	2WR	REAR WIPER RELAY
2-58	0.85WG	SIDE WIPER RELAY
2-59	0.85WB	S/V REVERSE FAN
2-60	0.5WY	SIDE WASHER RELAY





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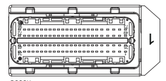
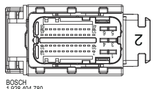
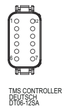
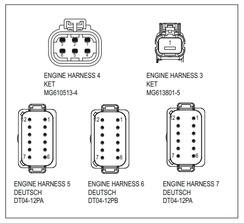


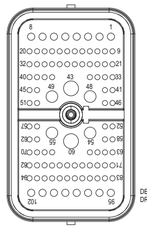


[HST CONT]

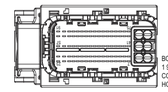




[ENGINE -MAIN]



[MAIN-CABIN]



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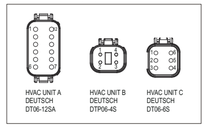

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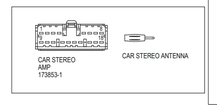
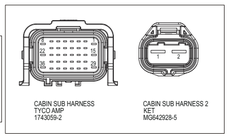
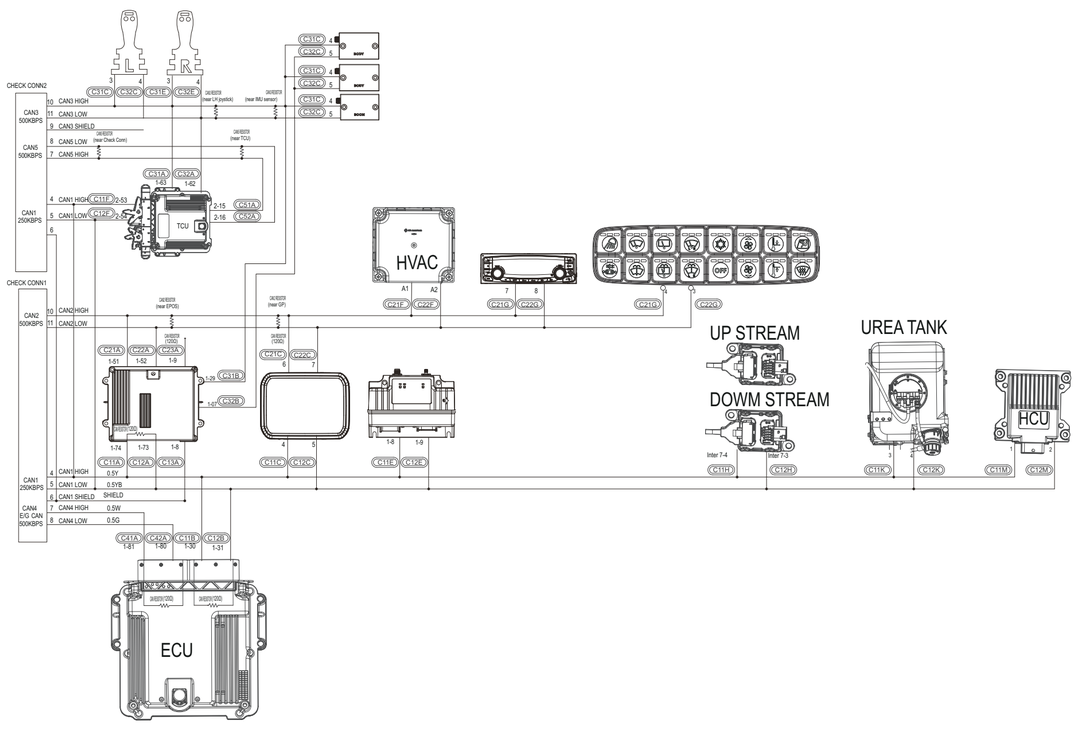


[UREA TANK]

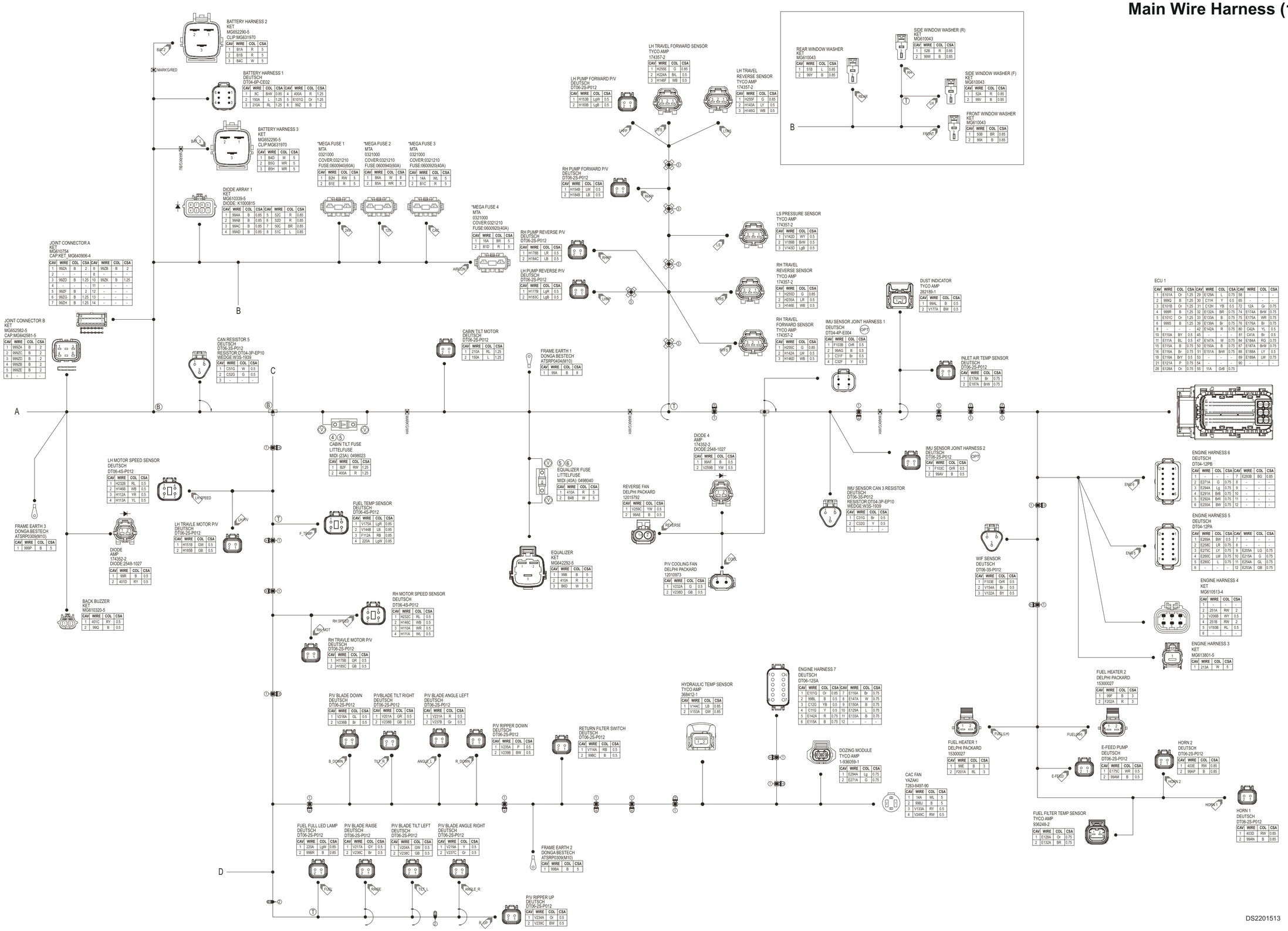




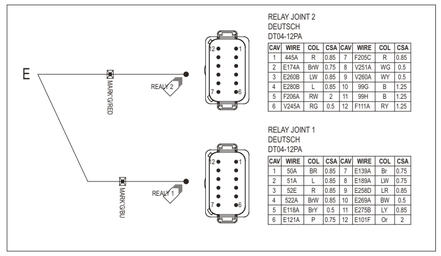
	Prior	E&E Change
	SOP	Post E&E Change
NO.	CHANGE NO	DESCRIPTION

950102-01086A

DS2301182


BATTERY HARNESS 2
KET
MG652290-5
CLIP:MG631970
BATTERY HARNESS 1
DEUTSCH
DT04-6P-CE02
BATTERY HARNESS 3
KET
MG652290-5
CLIP:MG631970
*MEGA FUSE 1
MTA
0321000
COVER:0321210
FUSE:0600940(60A)
*MEGA FUSE 2
MTA
0321000
COVER:0321210
FUSE:0600940(60A)
*MEGA FUSE 3
MTA
0321000
COVER:0321210
FUSE:0600920(40A)
DIODE ARRAY 1
KET
MG610339-5
DIODE: K1000815
*MEGA FUSE 4
MTA
0321000
COVER:0321210
FUSE:0600920(40A)
JOINT CONNECTOR A
KET
MG610754
CAP:KET_MG640906-4
JOINT CONNECTOR B
KET
MG652582-5
CAP:MG642581-5
CAN RESISTOR 5
DEUTSCH
DTO6-3S-P012
RESISTOR:DT04-3P-EP10
WEDGE:W3S-1939
CABIN TILT MOTOR
DEUTSCH
DT06-2S-P012
FRAME EARTH 1
DONGA BESTECH
ATSRP0404(M10)
CABIN TILT FUSE
LITTELFUSE
MIDI (23A): 0498023
EQUALIZER FUSE
LITTELFUSE
MIDI (40A): 0498040
EQUALIZER
KET
MG642292-5
LH MOTOR SPEED SENSOR
DEUTSCH
DT06-4S-P012
FRAME EARTH 3
DONGA BESTECH
ATSRP0309(M10)
DIODE
AMP
174352-2
DIODE:2548-1027
BACK BUZZER
KET
MG610320-5
LH TRAVLE MOTOR P/V
DEUTSCH
DT06-2S-P012
FUEL TEMP SENSOR
DEUTSCH
DT06-4S-P012
RH MOTOR SPEED SENSOR
DEUTSCH
DT06-4S-P012
RH TRAVLE MOTOR P/V
DEUTSCH
DT06-2S-P012
LH PUMP FORWARD P/V
DEUTSCH
DT06-2S-P012
LH TRAVEL FORWARD SENSOR
TYCO AMP
174357-2
RH PUMP FORWARD P/V
DEUTSCH
DT06-2S-P012
RH PUMP REVERSE P/V
DEUTSCH
DT06-2S-P012
LH PUMP REVERSE P/V
DEUTSCH
DT06-2S-P012
LH TRAVEL REVERSE SENSOR
TYCO AMP
174357-2
LS PRESSURE SENSOR
TYCO AMP
174357-2
RH TRAVEL REVERSE SENSOR
TYCO AMP
174357-2
RH TRAVEL FORWARD SENSOR
TYCO AMP
174357-2
REAR WINDOW WASHER
KET
MG610043
SIDE WINDOW WASHER (R)
KET
MG610043
SIDE WINDOW WASHER (F)
KET
MG610043
FRONT WINDOW WASHER
KET
MG610043
DUST INDICATOR
TYCO AMP
282189-1
IMU SENSOR JOINT HARNESS 1
DEUTSCH
DT04-4P-E004
IMU SENSOR JOINT HARNESS 2
DEUTSCH
DT06-2S-P012
IMU SENSOR CAN 3 RESISTOR
DEUTSCH
DT06-3S-P012
RESISTOR:DT04-3P-EP10
WEDGE:W3S-1939
INLET AIR TEMP SENSOR
DEUTSCH
DT06-2S-P012
WIF SENSOR
DEUTSCH
DT06-3S-P012
ECU 1
ENGINE HARNESS 6
DEUTSCH
DT04-12PB
ENGINE HARNESS 5
DEUTSCH
DT04-12PA
ENGINE HARNESS 4
KET
MG610513-4
ENGINE HARNESS 3
KET
MG613801-5
ENGINE HARNESS 7
DEUTSCH
DT06-12SA
HYDRAULIC TEMP SENSOR
TYCO AMP
368412-1
DOZING MODULE
TYCO AMP
1-936059-1
CAC FAN
YAZAKI
7283-8497-90
FUEL HEATER 1
DELPHI PACKARD
15300027
FUEL HEATER 2
DELPHI PACKARD
15300027
E-FEED PUMP
DEUTSCH
DT06-2S-P012
FUEL FILTER TEMP SENSOR
TYCO AMP
936248-2
HORN 2
DEUTSCH
DT06-2S-P012
HORN 1
DEUTSCH
DT06-2S-P012
DIODE 4
AMP
174352-2
DIODE:2548-1027
REVERSE FAN
DELPHI PACKARD
12015792
P/V COOLING FAN
DELPHI PACKARD
12010973
RETURN FILTER SWITCH
DEUTSCH
DT06-2S-P012
P/V BLADE DOWN
DEUTSCH
DT06-2S-P012
P/V BLADE TILT RIGHT
DEUTSCH
DT06-2S-P012
P/V BLADE ANGLE LEFT
DEUTSCH
DT06-2S-P012
P/V RIPPER DOWN
DEUTSCH
DT06-2S-P012
P/V RIPPER UP
DEUTSCH
DT06-2S-P012
FUEL FULL LED LAMP
DEUTSCH
DT06-2S-P012
P/V BLADE RAISE
DEUTSCH
DT06-2S-P012
P/V BLADE TILT LEFT
DEUTSCH
DT06-2S-P012
P/V BLADE ANGLE RIGHT
DEUTSCH
DT06-2S-P012
FRAME EARTH 2
DONGA BESTECH
ATSRP0309(M10)
MARK'G:RED
LH SPEED
LH P/V
RH SPEED
RH MOT
F_TEMP
REVERSE
COOL
AIRCON
LH/P
LT/P
LT/G
RH/P
RT/P
LS
RH/G
RH/R
RT/G
LH/R
LH/G
RT/R
B_DOWN
TILT_R
ANGLE_L
R_DOWN
FUEL
RINSE
TILT_L
ANGLE_R
R_UP
FUEL(LH)
FUEL(RH)
E-FEED
HORN 2
HORN 1
ENG 6
ENG 5
ENG 4
ENG 3
REAR
RH
LH
FRONT
HARNESS
DS2201513

Main Wire Harness (2/4)



RELAY JOINT 2
DEUTSCH
DT04-12PA

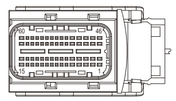
CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	445A	R	0.85	7	F205C	R	0.85
2	E174A	B/W	0.75	8	V251A	WG	0.5
3	E260B	LW	0.85	9	V260A	WY	0.5
4	E280B	L	0.85	10	99G	B	1.25
5	F206A	RW	2	11	99H	B	1.25
6	V245A	RG	0.5	12	F111A	RY	1.25

RELAY JOINT 1
DEUTSCH
DT04-12PA

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	50A	BR	0.85	7	E139A	Br	0.75
2	51A	L	0.85	8	E189A	LW	0.75
3	52E	R	0.85	9	E258D	LR	0.85
4	522A	B/W	0.85	10	E269A	BW	0.5
5	E118A	B/Y	0.5	11	E275B	LY	0.85
6	E121A	P	0.75	12	E101F	Or	2

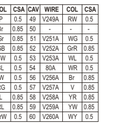
EPOS 2
AMP

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	V201A	GR	0.5	17	V217A	GY	0.5	35	V235A	P	0.5	49	V249A	R/W	0.5
3	V203A	R/Y	0.85	18	V218A	GL	0.5	36	V236A	Br	0.85	50	-	-	-
4	V204A	G/W	0.5	19	V219A	Y	0.5	37	V237A	Gr	0.85	51	V251A	WG	0.5
5	V205A	LB	0.85	20	V220A	LG	0.85	38	V238A	GB	0.85	52	V252A	G/R	0.85
6	V206A	WY	0.5	25	10A	L	0.5	39	V239A	B/W	0.5	53	V253A	WL	0.5
11	V211A	Or	0.5	29	V229A	Lg	0.5	42	V242A	BL	0.5	54	80A	W/R	0.5
12	-	-	-	30	V230A	GL	0.5	44	V244A	W	0.5	56	V256A	Br	0.85
13	V213A	WB	0.5	31	V231A	R	0.5	45	V245A	RG	0.5	57	V257A	V	0.85
14	V214A	Lg/R	0.5	32	V232A	G	0.5	46	V246A	L	0.85	58	V258A	Y/B	0.85
15	V215A	G/W	0.5	33	V233A	O/L	0.5	47	V247A	RL	0.85	59	V259A	Y/W	0.85
16	V216A	G	0.85	34	V234A	Or	0.5	48	V248A	O/W	0.5	60	V260A	WY	0.5



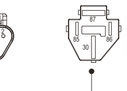
EPOS 1
AMP

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	999B	B	0.85	16	V116A	O/Y	0.5	44	V144A	LB	0.5	73	C12B	Y/B	0.5
2	999C	B	0.85	20	-	-	-	50	F213F	WG	0.5	74	C11B	Y	0.5
3	999D	B	0.85	21	-	-	-	51	C21F	W	0.5	75	V175A	Lg/R	0.85
4	F213A	WG	0.85	22	V122A	B/Y	0.5	52	C22F	G	0.5	76	V176A	Or	0.85
5	F213B	WG	0.85	28	F213D	WG	0.5	53	V153A	G/W	0.85	77	V177A	B/W	0.5
6	F213C	WG	0.85	29	C31C	Br	0.5	54	V154A	Br	0.5	88	-	-	-
7	C32C	Y	0.5	30	C23F	Shield	-	65	V165A	B/R	0.5	89	V189A	B/W	0.5
8	C13B	Shield	-	32	7A	Br	0.5	66	-	-	-	90	-	-	-
9	C33C	Shield	-	33	V133A	R/Y	0.5	67	V167A	BL	0.5	92	V192A	LR	0.5
12	V112A	WG	0.85	42	V142A	WY	0.5	71	V171A	GY	0.5	93	V193A	R/L	0.5
14	V114A	RB	0.5	43	V143A	Lg/B	0.5	72	999E	B	0.85	94	999F	B	0.85



CAN RESISTOR 2
DEUTSCH
DT06-3S-P012
RESISTOR:DT04-3P-EP10
WEDGE:WX8-1939

CAV	WIRE	COL	CSA
1	C21G	W	0.5
2	C22G	G	0.5
3	-	-	-



PREHEAT RELAY
KET
MG612017-5

CAV	WIRE	COL	CSA
30	85B	WR	5
85	E293B	BG	0.85
86	E101T	Or	0.85
87	213A	W	5

LEFT WIPER MOTOR
DEUTSCH
DT06-4S-P012

CAV	WIRE	COL	CSA
1	F108A	O/L	0.85
2	309B	Gr	0.85
3	310B	L	0.85
4	99P	B	0.85

CAC FAN RESISTOR
DEUTSCH
DT06-4S-P012
RESISTOR:300617-00094

CAV	WIRE	COL	CSA
1	-	-	-
2	V249B	R/W	0.5
3	-	-	-
4	V236D	Br	0.5

AIRCON FAN RESISTOR
DEUTSCH
DT06-4S-P012
RESISTOR:300617-00094

CAV	WIRE	COL	CSA
1	-	-	-
2	V233B	O/L	0.5
3	-	-	-
4	V236E	Br	0.5

TRIMBLE READY
DEUTSCH
DT06-6S-P012
(OPT)

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	F213G	WG	0.85	4	-	-	-
2	99AU	B	0.85	5	C31D	Br	0.5
3	F114A	Or	0.85	6	C32D	Y	0.5

SURGE KILLER
DEUTSCH
DT06-3S-P012
S-KILLER:300611-01437

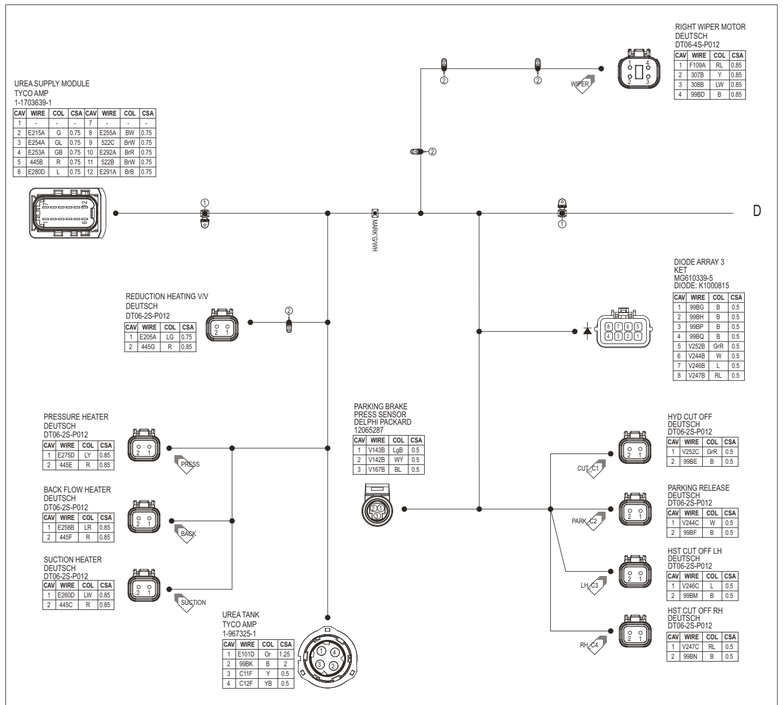
CAV	WIRE	COL	CSA
1	99C	B	1.25
2	B4A	W	1.25
3	-	-	-

REAR VIEW CAMERA
DEUTSCH
DT04-4P-E004

CAV	WIRE	COL	CSA
1	G13A	Or	0.5
2	G21A	O/B	0.5
3	G22A	YB	0.5
4	G14A	Y	0.5

CABIN HARNESS
DEUTSCH
DRB16-102SAE-L018

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	251C	R/W	3	21	C11A	Y	0.5	41	F103A	O/R	0.5	61	V143C	Lg/B	0.5	82	V248A	O/W	0.5
2	E101E	Or	2	22	C12A	YB	0.5	42	F111A	RY	1.25	62	V165A	B/R	0.5	83	V256A	Br	0.85
3	F207A	RL	3	23	C13A	Shield	-	43	-	-	-	63	V192B	LR	0.5	84	V257A	Y	0.85
4	F202A	R	3	24	C21A	W	0.5	44	-	-	-	64	V171A	GY	0.5	85	V258A	Y/R	0.85
5	F212A	WL	2	25	C22A	G	0.5	45	F205C	R	0.85	65	C11C	Y	0.5	86	F108A	O/L	0.85
6	F213E	WG	2	26	C23A	Shield	-	46	H139A	Y/W	0.5	66	C12C	Y/B	0.5	87	F109A	RL	0.85
7	-	-	-	27	C31A	Br	0.5	47	H146H	WB	0.5	67	V193C	RL	0.5	88	V253A	WL	0.5
8	F206A	RW	2	28	C32A	Y	0.5	48	-	-	-	68	V203A	R/Y	0.85	89	-	-	-
9	7C	Br	0.85	29	C33A	Shield	-	49	82A	R/W	5	69	V205A	LB	0.85	90	-	-	-
10	8C	B/W	0.85	30	C41A	Br	0.5	50	H219A	YR	0.5	70	V206C	WY	0.5	91	G13A	Or	0.5
11	10A	L	0.5	31	C42A	YL	0.5	51	H226A	YL	0.5	71	V211A	Or	0.5	92	G21A	O/B	0.5
12	11A	G/B	0.75	32	C51F	W	0.5	52	H230B	GB	0.5	72	-	-	-	93	G14A	Y	0.5
13	12A	Gr	0.75	33	C52F	G	0.5	53	H255B	G	0.5	73	V213A	WB	0.5	94	G22A	YB	0.5
14	80A	WR	0.5	34	E110A	BY	0.5	54	B4E	W	8	74	V214A	Lg/W	0.5	95	-	-	-
15	307B	Y	0.85	35	E111A	BL	0.5	55	-	-	-	75	V215A	G/W	0.5	96	-	-	-
16	308B	LW	0.85	36	E151A	B/W	0.75	56	V112A	WG	0.85	76	V216A	G	0.85	97	-	-	-
17	309B	Gr	0.85	37	E175B	WR	0.75	57	V144D	LB	0.85	77	V220A	LG	0.85	98	B6B	W	2
18	310B	L	0.85	38	E184A	RG	0.75	58	V176A	Or	0.85	78	V229A	Lg	0.5	99	B6C	W	3
19	F114A	Or	0.85	39	E188A	LY	0.5	59	V142C	WY	0.5	79	V230A	GL	0.5	100	999A	B	2
20	403C	RW	1.25	40	F112A	RB	0.85	60	-	-	-	80	401B	RY	0.5	101	99AQ	B	3
												81	V242A	BL	0.5	102	99AR	B	3



CAV	WIRE	COL	CSA
1	-	-	-
2	E215A	G	0.75
3	E254A	GL	0.75
4	E253A	GB	0.75
5	445B	R	0.75
6	E280D	L	0.75
7	-	-	-
8	E255A	LG	0.75
9	522C	B/W	0.75
10	E292A	B/R	0.75
11	522B	B/W	0.75
12	E291A	B/B	0.75

CAV	WIRE	COL	CSA
1	E275D	LY	0.85
2	445E	R	0.85

CAV	WIRE	COL	CSA
1	E258B	LR	0.85
2	445F	R	0.85

CAV	WIRE	COL	CSA
1	E260D	LW	0.85
2	445C	R	0.85

CAV	WIRE	COL	CSA
1	E101D	Or	1.25
2	998K	B	2
3	C11F	Y	0.5
4	C12F	YB	0.5

CAV	WIRE	COL	CSA
1	998G	B	0.5
2	998H	B	0.5
3	998P	B	0.5
4	998Q	B	0.5
5	V252B	G/R	0.5
6	V244B	W	0.5
7	V246B	L	0.5
8	V247B	R/L	0.5

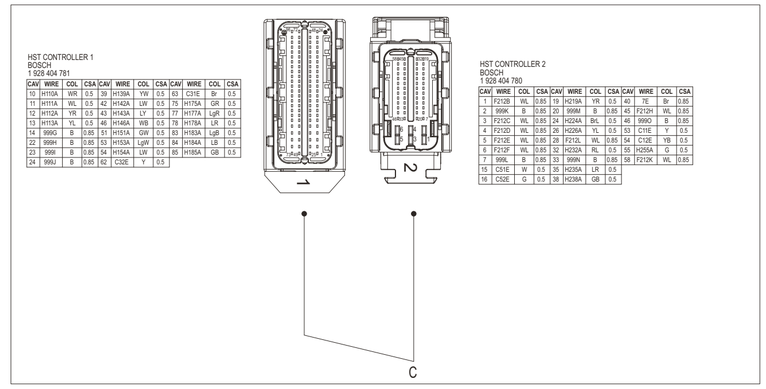
CAV	WIRE	COL	CSA
1	V143B	Lg/B	0.5
2	V142B	WY	0.5
3	V167B	BL	0.5

CAV	WIRE	COL	CSA
1	V252C	G/R	0.5
2	998E	B	0.5

CAV	WIRE	COL	CSA
1	V244C	W	0.5
2	998F	B	0.5

CAV	WIRE	COL	CSA
1	V240C	L	0.5
2	998M	B	0.5

CAV	WIRE	COL	CSA
1	V247C	R/L	0.5
2	998N	B	0.5



CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
10	H110A	WR	0.5	39	H139A	Y/W	0.5	63	C31E	Br	0.5
11	H111A	WL	0.5	42	H142A	LW	0.5	75	H175A	GR	0.5
12	H112A	YR	0.5	43	H143A	LY	0.5	77	H177A	Lg/R	0.5
13	H113A	YL	0.5	46	H146A	WB	0.5	78	H178A	LR	0.5
14	999G	B	0.85	51	H151A	G/W	0.5	83	H183A	Lg/B	0.5
22	999H	B	0.85	53	H153A	Lg/W	0.5	84	H184A	LB	0.5
23	999I	B	0.85	54	H154A	LW	0.5	85	H185A	GB	0.5
24	999J	B	0.85	62	C32E	Y	0.5				

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	F212B	WL	0.85	19	H219A	YR	0.5	40	7E	Br	0.85
2	999K	B	0.85	20	999M	B	0.85	45	F212H	WL	0.85
3	F212C	WL	0.85	24	H224A	B/L	0.5	46	999O	B	0.85
4	F212D	WL	0.85	26	H226A	YL	0.5	53	C11E	Y	0.5
5	F212E	WL	0.85	28	F212L	WL	0.85	54	C12E	YB	0.5
6	F212F	WL	0.85	32	H232A	RL	0.5	55	H235A	G	0.5
7	999L	B	0.85	33	999N	B	0.85	58	F212K	WL	0.85
15	C31E	W	0.5	35	H235A	LR	0.5				
16	C32E	G	0.5	38	H238A	GB	0.5				

DS2201514

Main Harness(1/4)

BATTERY HARNESS 2
KET
MG652290-5
CLIP:MG631970

CAV	WIRE	COL	CSA
1	B1A	R	5
2	B1B	R	5
3	B4C	W	5

BAT 2

MARK'GRED

BATTERY HARNESS 1
DEUTSCH
DT04-6P-CE02

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	8A	B/W	0.85	4	400A	R	1.25
2	150A	L	1.25	5	E101G	Or	0.5
3	210A	RL	1.25	6	99Z	B	2

BATTERY HARNESS 3
KET
MG652290-5
CLIP:MG631970

CAV	WIRE	COL	CSA
1	B4D	W	5
2	B5G	WR	5
3	B5H	WR	5

BAT 3

MARK'GRED

DIODE ARRAY 1
KET
MG610339-5
DIODE: K1000815

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	99AA	B	0.85	5	52C	R	0.85
2	99AB	B	0.85	6	52D	R	0.85
3	99AC	B	0.85	7	50C	BR	0.85
4	99AD	B	0.85	8	51C	L	0.85

*MEGA FUSE 1
MTA
0321000
COVER:0321210
FUSE:0600940(60A)

CAV	WIRE	COL	CSA
1	B2H	RW	5
2	B1E	R	5

*MEGA FUSE 2
MTA
0321000
COVER:0321210
FUSE:0600940(60A)

CAV	WIRE	COL	CSA
1	B6A	W	8
2	B5A	WR	8

*MEGA FUSE 3
MTA
0321000
COVER:0321210
FUSE:0600920(40A)

CAV	WIRE	COL	CSA
1	16A	BR	5
2	B1D	R	5

*MEGA FUSE 4
MTA
0321000
COVER:0321210
FUSE:0600920(40A)

CAV	WIRE	COL	CSA
1	14A	WL	5
2	B1C	R	5

24V
12V
280
ACC
ACC

JOINT CONNECTOR A
KET
MG610754
CAP KET :MG640906-4

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	992A	B	2	8	992B	B	2
2	-	-	-	9	-	-	-
3	992D	B	1.25	10	992K	B	1.25
4	-	-	-	11	-	-	-
5	992F	B	2	12	-	-	-
6	992G	B	1.25	13	-	-	-
7	992H	B	1.25	14	-	-	-

JOINT CONNECTOR B
KET
MG652582-5
CAP:MG642581-5

CAV	WIRE	COL	CSA
1	992A	B	2
2	992C	B	2
3	992D	B	2
4	992B	B	2
5	992E	B	2
6	-	-	-

CAN RESISTOR 5
DEUTSCH
DT06-3S-P012
RESISTOR:DT04-3P-EP10
WEDGE:WJS-1939

CAV	WIRE	COL	CSA
1	C51G	W	0.5
2	C52G	G	0.5
3	-	-	-

CABIN TILT MOTOR
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	210A	RL	1.25
2	150A	L	1.25

FRAME EARTH 1
DONGA BESTECH
ATSRP040A(M10)

CAV	WIRE	COL	CSA
1	99A	B	8

4 5
CABIN TILT FUSE
LITTELFUSE
MIDI (23A): 0498023

CAV	WIRE	COL	CSA
1	82F	RW	1.25
2	400A	R	1.25

5 6
EQUALIZER FUSE
LITTELFUSE
MIDI (40A): 0498040

CAV	WIRE	COL	CSA
1	410A	R	5
2	B4B	W	5

EQUALIZER
KET
MG642292-5

CAV	WIRE	COL	CSA
1	99B	B	5
2	410A	R	5
3	B6D	W	5

LH MOTOR JOINT HARNESS
DEUTSCH
DT06-6S-P012

CAV	WIRE	COL	CSA
1	H232B	RL	0.5
2	H146C	WB	0.5
3	H113A	YL	0.5
4	H151B	GW	0.5
5	H155B	GB	0.5
6	H185B	GB	0.5

DIODE
AMP
174352-2
DIODE:2548-1027

CAV	WIRE	COL	CSA
1	99R	B	0.5
2	401D	RY	0.5

BACK BUZZER
KET
MG610320-5

CAV	WIRE	COL	CSA
1	401C	RY	0.5
2	99Q	B	0.5

FRAME EARTH 3
DONGA BESTECH
ATSRP0309(M10)

CAV	WIRE	COL	CSA
1	999P	B	5

FUEL TEMP SENSOR
DEUTSCH
DT06-4S-P012

CAV	WIRE	COL	CSA
1	V175A	LgR	0.85
2	V144B	LB	0.85
3	F112A	RB	0.85
4	220A	LgW	0.85

F_TEMP

P/V BLADE DOWN
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	V218A	GL	0.5
2	V239B	Br	0.5

P/VBLADE TILT RIGHT
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	V201A	GR	0.5
2	V239B	GB	0.5

P/V BLADE ANGLE LEFT
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	V231A	R	0.5
2	V237B	Gr	0.5

P/V RIPPER DOWN
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	V235A	P	0.5
2	V239B	BW	0.5

B_DOWN
TILT_R
ANGLE_L
R_DOWN

RETURN FILTER SWITCH
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	V174A	RB	0.5
2	998C	B	0.5

RH MOTOR JOINT HARNESS
DEUTSCH
DT06-6S-P012

CAV	WIRE	COL	CSA
1	H232C	RL	0.5
2	H146C	WB	0.5
3	H115A	WR	0.5
4	H111A	WL	0.5
5	H175B	GR	0.5
6	H185C	GB	0.5

FUEL FULL LED LAMP
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	220A	LgW	0.85
2	998R	B	0.85

P/V BLADE RAISE
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	V217A	GY	0.5
2	V236C	Br	0.5

P/V BLADE TILT LEFT
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	V204A	GW	0.5
2	V238C	GB	0.5

P/V BLADE ANGLE RIGHT
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	V219A	Y	0.5
2	V237C	Gr	0.5

FUEL
RAISE
TILT_L
ANGLE_R

FRAME EARTH 2
DONGA BESTECH
ATSRP0309(M10)

CAV	WIRE	COL	CSA
1	998A	B	5

P/V RIPPER UP
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	V234A	Or	0.5
2	V236C	BW	0.5

R_UP

LH PUMP FORWARD P/V
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	H153B	LgW	0.5
2	H183B	LgB	0.5

LH TRAVEL FORWARD SENSOR
TYCO AMP
174357-2

CAV	WIRE	COL	CSA
1	H255E	G	0.85
2	H224A	BrL	0.5
3	H146F	WB	0.5

LH TRAVEL REVERSE SENSOR
TYCO AMP
174357-2

CAV	WIRE	COL	CSA
1	H255F	G	0.85
2	H143A	LY	0.5
3	H146G	WB	0.5

LH_FOR
LH_REV
LH_PMP

RH PUMP FORWARD P/V
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	H154B	LW	0.5
2	H184B	LB	0.5

RH_PMP

RH PUMP REVERSE P/V
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	H178B	LR	0.5
2	H184C	LB	0.5

RH_PMP
LH_PMP

LS PRESSURE SENSOR
TYCO AMP
174357-2

CAV	WIRE	COL	CSA
1	V142D	WY	0.5
2	V188B	BrW	0.5
3	V143D	LgB	0.5

LS

RH TRAVEL REVERSE SENSOR
TYCO AMP
174357-2

CAV	WIRE	COL	CSA
1	H255D	G	0.85
2	H235A	LR	0.5
3	H146E	WB	0.5

RH_REV

RH TRAVEL FORWARD SENSOR
TYCO AMP
174357-2

CAV	WIRE	COL	CSA
1	H255C	G	0.85
2	H142A	LW	0.5
3	H146D	WB	0.5

RH_FOR

REAR WINDOW WASHER
KET
MG610043

CAV	WIRE	COL	CSA
1	99Y	B	0.85
2	99Y	B	0.85

SIDE WINDOW WASHER (R)
KET
MG610043

CAV	WIRE	COL	CSA
1	52B	R	0.85
2	99W	B	0.85

SIDE WINDOW WASHER (F)
KET
MG610043

CAV	WIRE	COL	CSA
1	52A	R	0.85
2	99V	B	0.85

FRONT WINDOW WASHER
KET
MG610043

CAV	WIRE	COL	CSA
1	50B	BR	0.85
2	99X	B	0.85

LH
RR
RF
FRONT

DUST INDICATOR
TYCO AMP
282189-1

CAV	WIRE	COL	CSA
1	99AL	B	0.5
2	V177A	BW	0.5

INLET AIR TEMP SENSOR
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	E178A	Br	0.75
2	E187A	BrW	0.75

IMU SENSOR JOINT HARNESS 1
DEUTSCH
DT04-4P-E004

CAV	WIRE	COL	CSA
1	F103B	OrR	0.5
2	99AG	B	0.5
3	C31F	Br	0.5
4	C32F	Y	0.5

OPT

IMU SENSOR JOINT HARNESS 2
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	F102C	OrR	0.5
2	99AV	B	0.5

OPT

IMU SENSOR CAN 3 RESISTOR
AMP
174352-2
RESISTOR:300645-00246
CILP:368121-1

CAV	WIRE	COL	CSA
1	C31G	Br	0.5
2	C32G	Y	0.5

DIODE 4
AMP
174352-2
DIODE:2548-1027

CAV	WIRE	COL	CSA
1	99AF	B	0.5
2	V259B	YW	0.5

REVERSE FAN
DELPHI PACKARD
12015792

CAV	WIRE	COL	CSA
1	V259C	YW	0.5
2	99AE	B	0.5

REVERSE

P/V COOLING FAN
DELPHI PACKARD
12010973

CAV	WIRE	COL	CSA
1	V232A	G	0.5
2	V236D	GB	0.5

COOL

HYDRAULIC TEMP SENSOR
TYCO AMP
368412-1

CAV	WIRE	COL	CSA
1	V144C	LB	0.85
2	V153A	GW	0.85

ENGINE HARNESS 7
DEUTSCH
DT06-12SA

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	E101Q	Or	0.85	7	E116A	Br	0.75
2	99BL	B	0.5	8	E147A	W	0.75
3	C12D	YB	0.5	9	E150A	B	0.75
4	C11G	Y	0.5	10	E129A	L	0.75
5	E142A	R	0.75	11	E133A	B	0.75
6	E115A	B	0.75	12	-	-	-

SP_C11S3
SP_C12S3
BLUNT_C13G

DOZING MODULE
TYCO AMP
1-936059-1

CAV	WIRE	COL	CSA
1	E234A	Lg	0.75
2	E271A	G	0.75

CAC FAN
YAZAKI
7283-8497-90

CAV	WIRE	COL	CSA
1	16A	WL	5
2	99BJ	B	5
3	V111A	RY	0.5
4	V249C	RW	0.5

FUEL HEATER 1
DELPHI PACKARD
15300027

CAV	WIRE	COL	CSA
1	99E	B	3
2	F201A	RL	3

FUEL(LH)

WIF SENSOR
DEUTSCH
DT06-3S-P012

CAV	WIRE	COL	CSA
1	F103E	OrR	0.5
2	V154A	Br	0.5
3	V122A	BY	0.5

FUEL HEATER 2
DELPHI PACKARD
15300027

CAV	WIRE	COL	CSA
1	99F	B	3
2	F202A	R	3

FUEL(RH)

E-FEED PUMP
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	E175C	WR	0.5
2	99AM	B	0.5

E-FEED

HORN 2
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	403E	RW	0.85
2	99AP	B	0.85

HORN 2

HORN 1
DEUTSCH
DT06-2S-P012

CAV	WIRE	COL	CSA
1	403D	RW	0.85
2	99AN	B	0.85

HORN 1

FUEL FILTER TEMP SENSOR
TYCO AMP
936248-2

CAV	WIRE	COL	CSA
1	E138A	Gr	0.75
2	E132A	BR	0.75

ECU 1
BOSCH
1 928 405 452
COVER : 1 928 405 458
HOLDING PLATE : 1 928 405 453

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	E101A	Gr	1.25	29	E129A	L	0.75	58	-	-	-
2	999Q	B	1.25	30	C11H	Y	0.5	65	-	-	-
3	E101B	Or	1.25	31	C12H	YB	0.5	72	12A	Gr	0.75
4	999R	B	1.25	32	E132A	BR	0.75	74	E174A	BrW	0.75
5	E101C	Or	1.25	33	E133A	B	0.75	75	E175A	WR	0.75
6	999S	B	1.25	39	E139A	Br	0.75	76	E176A	Br	0.75
8	-	-	-	42	E142A	R	0.75	80	C42A	YL	0.5
10	E110A	BY	0.5	45	-	-	-	81	C41A	Br	0.5
11	E111A	BL	0.5	47	E147A	W	0.75	84	E184A	RG	0.75
15	E115A	B	0.75	50	E150A	B	0.75	87	E187A	BrW	0.75
16	E116A	Br	0.75	51	E151A	BrW	0.75	88	E188A	LY	0.5
18	E118A	BrY	0.5	53	-	-	-	89	E189A	LW	0.75
21	E121A	P	0.75	54	-	-	-	90	-	-	-
28	E128A	Or	0.75	55	11A	GrB	0.75				

ENGINE HARNESS 6
DEUTSCH
DT04-12PB

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	-	-	-	7	E203B	BG	0.85
2	E271A	G	0.75	8	-	-	-
3	E294A	Lg	0.75	9	-	-	-
4	E291A	BrB	0.75	10	-	-	-
5	E292A	BrR	0.75	11	-	-	-
6	E255A	BW	0.75	12	-	-	-

ENG 6

ENGINE HARNESS 5
DEUTSCH
DT04-12PA

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	E269A	BW	0.5	7	-	-	-
2	E258C	LR	0.75	8	-	-	-
3	E277C	LY	0.75	9	E205A	LG	0.75
4	E280C	LW	0.75	10	E215A	G	0.75
5	E280C	L	0.75	11	E254A	GL	0.75
6	-	-	-	12	E253A	GB	0.75

ENG 5

ENGINE HARNESS 4
KET
MG610513-4

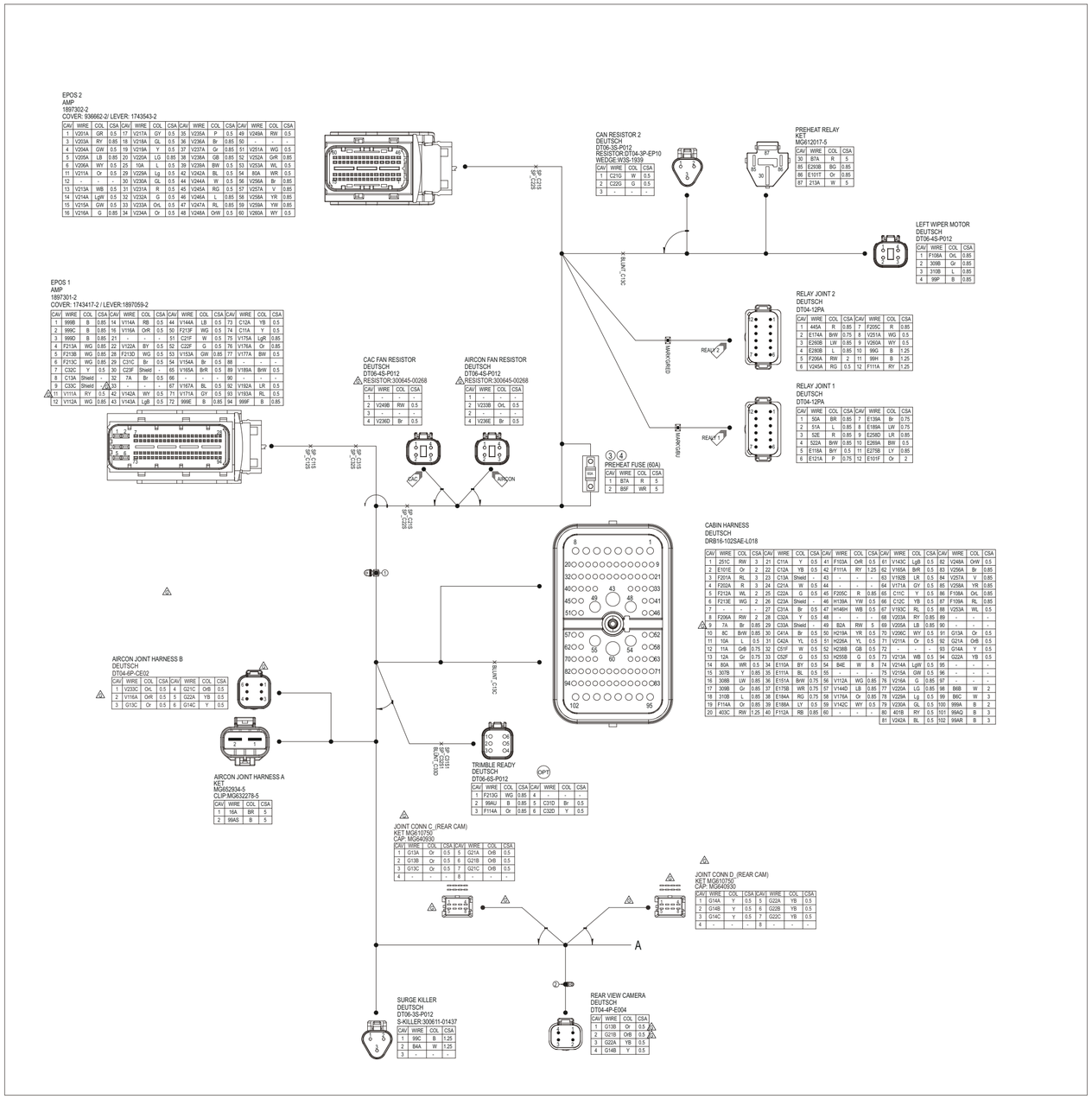
CAV	WIRE	COL	CSA
1	-	-	-
2	251A	RW	2
3	V206B	WY	0.5
4	251B	RW	2
5	V193B	RL	0.5
6	-	-	-

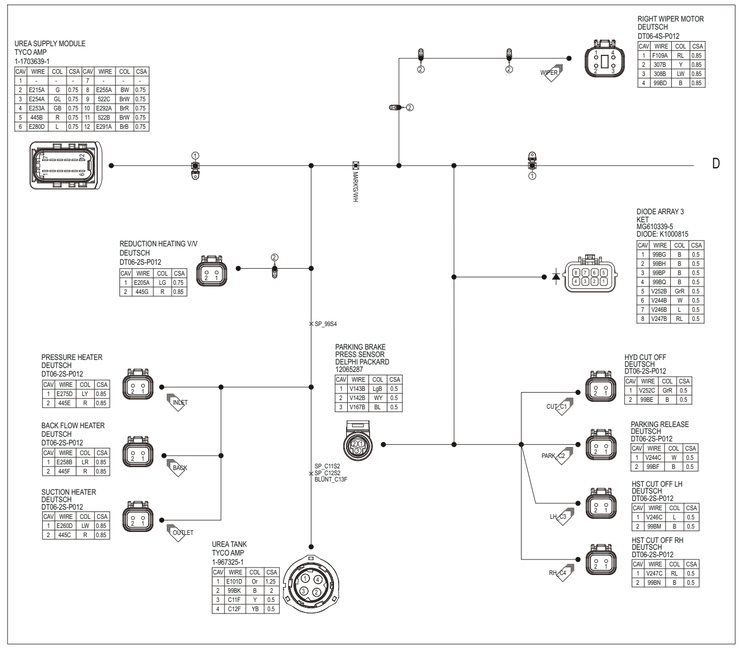
ENGINE HARNESS 3
KET
MG613801-5

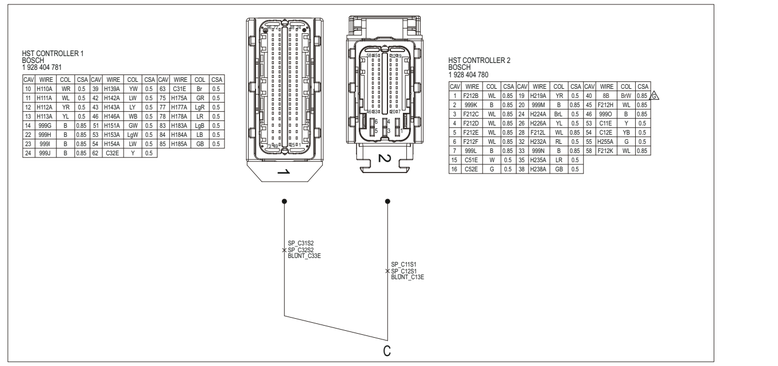
CAV	WIRE	COL	CSA
1	213A	W	5

NO.	CHANGE NO	DESCRIPTION
X09	C111340	Pilot Change

DS2300571







X17	C111340	Pilot Change
NO.	CHANGE NO	DESCRIPTION

DS2300572

Main Wire Harness (3/4)

WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
7A		AEXF	0.5	Br	EPOS 1	32		SP_7S	X	
7C		AEXF	0.85	Br	CABIN HARNESS	9		SP_7S	X	
7E		AEXF	0.85	Br	HST CONTROLLERS 2	40		SP_7S	X	
8C		AEXF	0.85	BrW	BATTERY HARNESS 1	1		CABIN HARNESS	10	
10A		AEXF	0.5	L	EPOS 2	25		CABIN HARNESS	11	
11A		AESSXF	0.75	GrB	ECU 1	55		CABIN HARNESS	12	
12A		AESSXF	0.75	Gr	ECU 1	72		CABIN HARNESS	13	
14A		AEXF	5	WL	MEGA FUSE 3	1		CAC FAN	1	
16A		AEXF	5	BR	MEGA FUSE 4	1		AIRCON JOINT HARNESS A	1	
50A		AEXF	0.85	BR	RELAY JOINT 1	1		SP_50S	X	
50B		AEXF	0.85	BR	FRONT WINDOW WASHER	1		SP_50S	X	
50C		AEXF	0.85	BR	DIODE ARRAY 1	7		SP_50S	X	
51A		AEXF	0.85	L	RELAY JOINT 1	2		SP_51S	X	
51B		AEXF	0.85	L	REAR WINDOW WASHER	1		SP_51S	X	
51C		AEXF	0.85	L	DIODE ARRAY 1	8		SP_51S	X	
52A		AEXF	0.85	R	SIDE WINDOW WASHER (F)	1		SP_52S	X	
52B		AEXF	0.85	R	SIDE WINDOW WASHER (R)	1		SP_52S	X	
52C		AEXF	0.85	R	DIODE ARRAY 1	5		SP_52S	X	
52D		AEXF	0.85	R	DIODE ARRAY 1	6		SP_52S	X	
52E		AEXF	0.85	R	RELAY JOINT 1	3		SP_52S	X	
80A		AEXF	0.5	WR	EPOS 2	54		CABIN HARNESS	14	
150A		AEXF	1.25	L	CABIN TILT MOTOR	2		BATTERY HARNESS 1	2	
210A		AEXF	1.25	RL	CABIN TILT MOTOR	1		BATTERY HARNESS 1	3	
213A		AEXF	5	W	ENGINE HARNESS 3	1		PREHEAT RELAY	87	
220A		AEXF	0.85	LgW	FUEL TEMP SENSOR	4		FUEL FULL LED LAMP	1	
251A		AEXF	2	RW	ENGINE HARNESS 4	2		SP_251S	X	
251B		AEXF	2	RW	ENGINE HARNESS 4	4		SP_251S	X	
251C		AEXF	3	RW	CABIN HARNESS	1		SP_251S	X	
307B		AEXF	0.85	Y	RIGHT WIPER MOTOR	2		CABIN HARNESS	15	
308B		AEXF	0.85	LW	RIGHT WIPER MOTOR	3		CABIN HARNESS	16	
309B		AEXF	0.85	Gr	LEFT WIPER MOTOR	2		CABIN HARNESS	17	
310B		AEXF	0.85	L	LEFT WIPER MOTOR	3		CABIN HARNESS	18	
400A		AEXF	1.25	R	CABIN TILT FUSE	2		BATTERY HARNESS 1	4	
401B		AEXF	0.5	RY	CABIN HARNESS	80		SP_401S	X	
401C		AEXF	0.5	RY	BACK BUZZER	1		SP_401S	X	
401D		AEXF	0.5	RY	DIODE 1	2		SP_401S	X	
403C		AEXF	1.25	RW	CABIN HARNESS	20		SP_403S	X	
403D		AEXF	0.85	RW	HORN 1	1		SP_403S	X	
403E		AEXF	0.85	RW	HORN 2	1		SP_403S	X	
410A		AEXF	5	R	EQUALIZER	2		EQUALIZER FUSE	1	
445A		AEXF	0.85	R	RELAY JOINT 2	1		SP_445S	X	
445B		AESSXF	0.75	R	UREA SUPPLY MODULE	5		SP_445S	X	
445C		AEXF	0.85	R	SUCTION HEATER	2		SP_445S	X	
445E		AEXF	0.85	R	PRESSURE HEATER	2		SP_445S	X	
445F		AEXF	0.85	R	BACK FLOW HEATER	2		SP_445S	X	
445G		AEXF	0.85	R	REDUCTION HEATING V/V	2		SP_445S	X	
522A		AEXF	0.85	BrW	RELAY JOINT 1	4		SP_522S	X	
522B		AESSXF	0.75	BrW	UREA SUPPLY MODULE	11		SP_522S	X	
522C		AESSXF	0.75	BrW	UREA SUPPLY MODULE	9		SP_522S	X	
B1A		AEXF	5	R	BATTERY HARNESS 2	1		SP_B1S	X	
B1B		AEXF	5	R	BATTERY HARNESS 2	2		SP_B1S	X	
B1C		AEXF	5	R	MEGA FUSE 3	2		SP_B1S1	X	
B1D		AEXF	5	R	MEGA FUSE 4	2		SP_B1S1	X	
B1E		AEXF	5	R	MEGA FUSE 1	2		SP_B1S1	X	
B1ZA		AEXF	5	R	SP_B1S	X		SP_B1S1	X	
B2A		AEXF	5	RW	CABIN HARNESS	49		SP_B2S	X	
B2F		AEXF	1.25	RW	CABIN TILT FUSE	1		SP_B2S	X	
B2H		AEXF	5	RW	MEGA FUSE 1	1		SP_B2S	X	
B4A		AEXF	1.25	W	SURGE KILLER	2		SP_B4S1	X	
B4B		AEXF	5	W	EQUALIZER FUSE	2		SP_B4S	X	
B4C		AEXF	5	W	BATTERY HARNESS 2	3		SP_B4S1	X	
B4D		AEXF	5	W	BATTERY HARNESS 3	1		SP_B4S1	X	
B4E		AEXF	8	W	CABIN HARNESS	54		SP_B4S	X	
B4ZA		AEXF	5	W	SP_B4S	X		SP_B4S1	X	
B5A		AEXF	8	WR	MEGA FUSE 2	2		SP_B5S	X	
B5B		AEXF	5	WR	PREHEAT RELAY	30		SP_B5S1	X	
B5E		AEXF	5	WR	PREHEAT FUSE (80A)	1		SP_B5S1	X	
B5F		AEXF	5	WR	PREHEAT FUSE (80A)	2		SP_B5S1	X	
B5G		AEXF	5	WR	BATTERY HARNESS 3	2		SP_B5S	X	
B5H		AEXF	5	WR	BATTERY HARNESS 3	3		SP_B5S	X	
B5ZA		AEXF	5	WR	SP_B5S	X		SP_B5S1	X	
B6A		AEXF	8	W	MEGA FUSE 2	1		SP_B6S	X	
B6B		AEXF	2	W	CABIN HARNESS	98		SP_B6S	X	
B6C		AEXF	3	W	CABIN HARNESS	99		SP_B6S	X	
B6D		AEXF	5	W	EQUALIZER	3		SP_B6S	X	
C11A		AEXF	0.5	Y	CABIN HARNESS	21	SH_01	SP_C11S	X	
C11B		AEXF	0.5	Y	EPOS 1	74	SH_02	SP_C11S	X	
C11C		AEXF	0.5	Y	CABIN HARNESS	65	SH_03	SP_C11S1	X	
C11E		AEXF	0.5	Y	HST CONTROLLERS 2	53	SH_04	SP_C11S1	X	
C11F		AEXF	0.5	Y	UREA TANK	3	SH_05	SP_C11S2	X	
C11G		AEXF	0.5	Y	ENGINE HARNESS 7	4	SH_06	SP_C11S3	X	
C11H		AEXF	0.5	Y	ECU 1	30	SH_07	SP_C11S3	X	
C11ZA		AEXF	0.5	Y	SP_C11S	X		SP_C11S1	X	
C11ZB		AEXF	0.5	Y	SP_C11S1	X		SP_C11S2	X	
C11ZC		AEXF	0.5	Y	SP_C11S2	X		SP_C11S3	X	
C12A		AEXF	0.5	YB	CABIN HARNESS	22	SH_01	SP_C12S	X	
C12B		AEXF	0.5	YB	EPOS 1	73	SH_02	SP_C12S	X	
C12C		AEXF	0.5	YB	CABIN HARNESS	66	SH_03	SP_C12S1	X	
C12E		AEXF	0.5	YB	HST CONTROLLERS 2	54	SH_04	SP_C12S1	X	
C12F		AEXF	0.5	YB	UREA TANK	4	SH_05	SP_C12S2	X	
C12G		AEXF	0.5	YB	ENGINE HARNESS 7	3	SH_06	SP_C12S3	X	
C12H		AEXF	0.5	YB	ECU 1	31	SH_07	SP_C12S3	X	
C12ZA		AEXF	0.5	YB	SP_C12S	X		SP_C12S1	X	
C12ZB		AEXF	0.5	YB	SP_C12S1	X		SP_C12S2	X	
C12ZC		AEXF	0.5	YB	SP_C12S2	X		SP_C12S3	X	
C13A		AEXF	-	Shield	CABIN HARNESS	23	SH_01	SP_C13S	X	
C13B		AEXF	-	Shield	EPOS 1	8	SH_02	SP_C13S	X	
C13C		AEXF	-	Shield	BLUNT_C13C	X		SP_C13S	X	
C13E		AEXF	-	Shield	BLUNT_C13E	X		SP_C13S	X	
C13F		AEXF	-	Shield	BLUNT_C13F	X		SP_C13S	X	

WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
C13G		AEXF	-	Shield	BLUNT_C13G	X		SP_C13S	X	
C13H		AEXF	-	Shield	BLUNT_C13H	X		SP_C13S	X	
C21A		AEXF	0.5	W	CABIN HARNESS	24	SH_08	SP_C21S	X	
C21F		AEXF	0.5	W	EPOS 1	51	SH_09	SP_C21S	X	
C21G		AEXF	0.5	W	CAN RESISTOR 2	1	SH_10	SP_C21S	X	
C22A		AEXF	0.5	G	CABIN HARNESS	25	SH_08	SP_C22S	X	
C22F		AEXF	0.5	G	EPOS 1	52	SH_09	SP_C22S	X	
C22G		AEXF	0.5	G	CAN RESISTOR 2	2	SH_10	SP_C22S	X	
C23A		AEXF	-	Shield	CABIN HARNESS	26	SH_08	SP_C23S	X	
C23F		AEXF	-	Shield	EPOS 1	30	SH_09	SP_C23S	X	
C23G		AEXF	-	Shield	BLUNT_C23G	X	SH_10	SP_C23S	X	
C31A		AEXF	0.5	Br	CABIN HARNESS	27	SH_11	SP_C31S	X	
C31C		AEXF	0.5	Br	EPOS 1	29	SH_12	SP_C31S	X	
C31D		AEXF	0.5	Br	TRIMBLE READY	5	SH_13	SP_C31S1	X	
C31E		AEXF	0.5	Br	HST CONTROLLERS 1	63	SH_14	SP_C31S2	X	
C31F		AEXF	0.5	Br	IMU SENSOR JOINT HARNESS 1	3	SH_15	SP_C31S3	X	
C31G		AEXF	0.5	Br	IMU SENSOR CAN 3 RESISTOR	1	SH_19	SP_C31S3	X	
C31ZA		AEXF	0.5	Br	SP_C31S	X		SP_C31S1	X	
C31ZB		AEXF	0.5	Br	SP_C31S1	X		SP_C31S2	X	
C31ZC		AEXF	0.5	Br	SP_C31S2	X		SP_C31S3	X	
C32A		AEXF	0.5	Y	CABIN HARNESS	28	SH_11	SP_C32S	X	
C32C		AEXF	0.5	Y	EPOS 1	7	SH_12	SP_C32S	X	
C32D		AEXF	0.5	Y	TRIMBLE READY	6	SH_13	SP_C32S1	X	
C32E		AEXF	0.5	Y	HST CONTROLLERS 1	62	SH_14	SP_C32S2	X	
C32F		AEXF	0.5	Y	IMU SENSOR JOINT HARNESS 1	4	SH_15	SP_C32S3	X	
C32G		AEXF	0.5	Y	IMU SENSOR CAN 3 RESISTOR	2	SH_19	SP_C32S3	X	
C32ZA		AEXF	0.5	Y	SP_C32S	X		SP_C32S1	X	
C32ZB		AEXF	0.5	Y	SP_C32S1	X		SP_C32S2	X	
C32ZC		AEXF	0.5	Y	SP_C32S2	X		SP_C32S3	X	
C33A		AEXF	-	Shield	CABIN HARNESS	29	SH_11	SP_C33S	X	
C33C		AEXF	-	Shield	EPOS 1	9	SH_12	SP_C33S	X	
C33D		AEXF	-	Shield	BLUNT_C33D	X	SH_13	SP_C33S	X	
C33E		AEXF	-	Shield	BLUNT_C33E	X	SH_14	SP_C33S	X	
C33F		AEXF	-	Shield	BLUNT_C33F	X	SH_15	SP_C33S	X	
C33G		AEXF	-	Shield	BLUNT_C33G	X	SH_19	SP_C33S	X	
C41A		AEXF	0.5	Br	ECU 1	81	SH_16	CABIN HARNESS	30	
C42A		AEXF	0.5	YL	ECU 1	80	SH_16	CABIN HARNESS	31	
C51E		AEXF	0.5	W	HST CONTROLLERS 2	15	SH_17	SP_C51S	X	
C51F		AEXF	0.5	W	CABIN HARNESS	32	SH_21	SP_C51S	X	
C51G		AEXF	0.5	W	CAN RESISTOR 5	1	SH_22	SP_C51S	X	
C52E		AEXF	0.5	G	HST CONTROLLERS 2	16	SH_17	SP_C52S	X	
C52F		AEXF	0.5	G	CABIN HARNESS	33	SH_21	SP_C52S	X	
C52G		AEXF	0.5	G	CAN RESISTOR 5	2	SH_22	SP_C52S	X	
E101A		AEXF	1.25	Or	ECU 1	1		SP_E101S	X	
E101B		AEXF	1.25	Or	ECU 1	3		SP_E101S	X	
E101C		AEXF	1.25	Or	ECU 1	5		SP_E101S	X	
E101D		AEXF	1.25	Or	UREA TANK	1		SP_E101S	X	
E101E		AEXF	2	Or	CABIN HARNESS	2		SP_E101S1	X	
E101F		AEXF	2	Or	RELAY JOINT 1	12		SP_E101S1	X	
E101G		AEXF	1.25	Or	BATTERY HARNESS 1	5		SP_E101S1	X	
E101Q		AEXF	0.85	Or	ENGINE HARNESS 7	1		SP_E101S	X	
E101T		AEXF	0.85	Or	PREHEAT RELAY	86		SP_E101S	X	
E101ZA		AEXF	2	Or	SP_E101S	X		SP_E101S1	X	
E110A		AEXF	0.5	BY	ECU 1	10		CABIN HARNESS	34	
E111A		AEXF	0.5	BL	ECU 1	11		CABIN HARNESS	35	
E115A		AESSXF	0.75	B	ECU 1	15		ENGINE HARNESS 7	6	
E116A		AESSXF	0.75	Br	ECU 1	16		ENGINE HARNESS 7	7	
E118A		AEXF	0.5	BrY	ECU 1	18		RELAY JOINT 1	5	
E121A		AESSXF	0.75	P	ECU 1	21		RELAY JOINT 1	6	
E128A		AESSXF	0.75	Or	ECU 1	28		FUEL FILTER TEMP SENSOR	1	
E129A		AESSXF	0.75	L	ECU 1	29		ENGINE HARNESS 7	10	
E132A		AESSXF	0.75	BR	ECU 1	32		FUEL FILTER TEMP SENSOR	2	
E133A		AESSXF	0.75	B	ECU 1	33		ENGINE HARNESS 7	11	
E139A		AESSXF	0.75	Br	ECU 1	39		RELAY JOINT 1	7	
E142A		AESSXF	0.75	R	ECU 1	42		ENGINE HARNESS 7	5	
E147A		AESSXF	0.75	W	ECU 1	47		ENGINE HARNESS 7	8	
E150A		AESSXF	0.75	B	ECU 1	50		ENGINE HARNESS 7	9	
E151A		AESSXF	0.75	BrW	ECU 1	51		CABIN HARNESS	36	
E174A		AESSXF	0.75	BrW	ECU 1	74		RELAY JOINT 2	2	
E175A		AESSXF	0.75	WR	ECU 1	75		SP_E175S	X	
E175B		AESSXF	0.75	WR	CABIN HARNESS	37		SP_E175S	X	
E175C		AEXF	0.5	WR	E-FEED PUMP	1		SP_E175S	X	
E176A		AESSXF	0.75	Br	ECU 1	76		INLET AIR TEMP SENSOR	1	
E184A		AESSXF	0.75	RG	ECU 1	84		CABIN HARNESS	38	
E187A		AESSXF	0.75	BrW	ECU 1	87		INLET AIR TEMP SENSOR	2	
E188A		AEXF	0.5	LY	ECU 1	88		CABIN HARNESS	39	
E189A		AESSXF	0.75	LW	ECU 1	89		RELAY JOINT 1	8	
E205A		AESSXF	0.75	LG	ENGINE HARNESS 5	9		REDUCTION HEATING V/V	1	
E215A		AESSXF	0.75	G	ENGINE HARNESS 5	10		UREA SUPPLY MODULE	2	
E253A		AESSXF	0.75	GB	ENGINE HARNESS 5	12		UREA SUPPLY MODULE	4	
E254A		AESSXF	0.75	GL	ENGINE HARNESS 5	11		UREA SUPPLY MODULE	3	
E255A		AESSXF	0.75	BW	ENGINE HARNESS 6	6		UREA SUPPLY MODULE	8	
E258B		AEXF	0.85	LR	BACK FLOW HEATER	1		SP_E258S	X	
E258C		AESSXF	0.75	LR	ENGINE HARNESS 5	2		SP_E258S	X	
E258D		AEXF	0.85	LR	RELAY JOINT 1	9		SP_E258S	X	
E260B		AEXF	0.85	LW	RELAY JOINT 2	3		SP_E260S	X	
E260C		AESSXF	0.75	LW	ENGINE HARNESS 5	4		SP_E260S	X	
E260D		AEXF	0.85	LW	SUCTION HEATER	1		SP_E260S	X	
E269A		AEXF	0.5	BW	ENGINE HARNESS 5	1		RELAY JOINT 1	10	
E271A		AESSXF	0.75	G	ENGINE HARNESS 6	2		DOZING MODUE	2	
E275B		AEXF	0.85	LY	RELAY JOINT 1	11		SP_E275S	X	
E275C		AESSXF	0.75	LY	ENGINE HARNESS 5	3		SP_E275S	X	
E275D		AEXF	0.85	LY	PRESSURE HEATER	1		SP_E275S	X	
E280B		AEXF	0.85	L	RELAY JOINT 2	4		SP_E280S	X	
E280C		AESSXF	0.75	L	ENGINE HARNESS 5	5		SP_E280S	X	
E280D		AESSXF	0.75	L	UREA SUPPLY MODULE	6		SP_E280S	X	
E291A		AESSXF	0.75	BrB	ENGINE HARNESS 6	4		UREA SUPPLY MODULE	12	
E292A		AESSXF	0.75	BrR	ENGINE HARNESS 6	5		UREA SUPPLY MODULE	10	
E293B		AEXF	0.85	BG	ENGINE HARNESS 6	7		PREHEAT RELAY	85	
E294A		AESSXF	0.75	Lg	ENGINE HARNESS 6	3		DOZING MODUE	1	
F103A		AEXF	0.5	OrR	CABIN HARNESS	41		SP_F103S	X	
F103B		AEXF	0.5	OrR	IMU SENSOR JOINT HARNESS 1	1		SP_F103S	X	
F103C		AEXF	0.5	OrR	IMU SENSOR JOINT HARNESS 2	1		SP_F103S	X	
F103E		AEXF	0.5	OrR	WIF SENSOR	1		SP_F103S	X	
F108A		AEXF	0.85	OrL	CABIN HARNESS	86		LEFT WIPER MOTOR	1	
F109A		AEXF	0.85	RL	CABIN HARNESS	87		RIGHT WIPER MOTOR	1	

WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
F111A		AEXF	1.25	RY	CABIN HARNESS	42		RELAY JOINT 2	12	
F112A		AEXF	0.85	RB	FUEL TEMP SENSOR	3		CABIN HARNESS	40	
F114A		AEXF	0.85	Or	CABIN HARNESS	19		TRIMBLE READY	3	
F201A		AEXF	3	RL	FUEL HEATER 1	2		CABIN HARNESS	3	
F202A		AEXF	3	R	FUEL HEATER 2	2		CABIN HARNESS	4	
F205C		AEXF	0.85	R	RELAY JOINT 2	7		CABIN HARNESS	45	
F206A		AEXF	2	RW	RELAY JOINT 2	5		CABIN HARNESS	8	
F212A		AEXF	2	WL	CABIN HARNESS	5		SP_F212S	X	
F212B		AEXF	0.85	WL	HST CONTROLLERS 2	1		SP_F212S	X	
F212C		AEXF	0.85	WL	HST CONTROLLERS 2	3		SP_F212S	X	
F212D		AEXF	0.85	WL	HST CONTROLLERS 2	4		SP_F212S	X	
F212E		AEXF	0.85	WL	HST CONTROLLERS 2	5		SP_F212S	X	
F212F		AEXF	0.85	WL	HST CONTROLLERS 2	6		SP_F212S	X	
F212H		AEXF	0.85	WL	HST CONTROLLERS 2	45		SP_F212S	X	
F212K		AEXF	0.85	WL	HST CONTROLLERS 2	58		SP_F212S	X	
F212L		AEXF	0.85	WL	HST CONTROLLERS 2	28		SP_F212S	X	
F213A		AEXF	0.85	WG	EPOS 1	4		SP_F213S	X	
F213B		AEXF	0.85	WG	EPOS 1	5		SP_F213S	X	
F213C		AEXF	0.85	WG	EPOS 1	6		SP_F213S	X	
F213D		AEXF	0.5	WG	EPOS 1	28		SP_F213S	X	
F213E		AEXF	2	WG	CABIN HARNESS	6		SP_F213S	X	
F213F		AEXF	0.5	WG	EPOS 1	50		SP_F213S	X	
F213G		AEXF	0.85	WG	TRIMBLE READY	1		SP_F213S	X	
G13A		AEXF	0.5	Or	CABIN HARNESS	91	TW_12	REAR VIEW CAMERA	1	
G14A		AEXF	0.5	Y	CABIN HARNESS	93	SH_18	REAR VIEW CAMERA	4	
G21A		AEXF	0.5	OrB	CABIN HARNESS	92	TW_12	REAR VIEW CAMERA	2	
G22A		AEXF	0.5	YB	CABIN HARNESS	94	SH_18	REAR VIEW CAMERA	3	
H110A		AEXF	0.5	WR	HST CONTROLLERS 1	10		RH MOTOR SPEED SENSOR	3	
H111A		AEXF	0.5	WL	HST CONTROLLERS 1	11		RH MOTOR SPEED SENSOR	4	
H112A		AEXF	0.5	YR	HST CONTROLLERS 1	12		LH MOTOR SPEED SENSOR	3	
H113A		AEXF	0.5	YL	HST CONTROLLERS 1	13		LH MOTOR SPEED SENSOR	4	
H139A		AEXF	0.5	YW	HST CONTROLLERS 1	39		CABIN HARNESS	46	
H142A		AEXF	0.5	LW	HST CONTROLLERS 1	42		RH TRAVEL FORWARD SENSOR	2	
H143A		AEXF	0.5	LY	HST CONTROLLERS 1	43		LH TRAVEL REVERSE SENSOR	2	
H146A		AEXF	0.5	WB	HST CONTROLLERS 1	46		SP_H146S	X	
H146B		AEXF	0.5	WB	LH MOTOR SPEED SENSOR	2		SP_H146S	X	
H146C		AEXF	0.5	WB	RH MOTOR SPEED SENSOR	2		SP_H146S	X	
H146D		AEXF	0.5	WB	RH TRAVEL FORWARD SENSOR	3		SP_H146S	X	
H146E		AEXF	0.5	WB	RH TRAVEL REVERSE SENSOR	3		SP_H146S	X	
H146F		AEXF	0.5	WB	LH TRAVEL FORWARD SENSOR	3		SP_H146S	X	
H146G		AEXF	0.5	WB	LH TRAVEL REVERSE SENSOR	3		SP_H146S	X	
H146H		AEXF	0.5	WB	CABIN HARNESS	47		SP_H146S	X	
H151A		AEXF	0.5	GW	HST CONTROLLERS 1	51		SP_H151S	X	
H151B		AEXF	0.5	GW	LH TRAVEL MOTOR P/V	1	TW_01	SP_H151S	X	
H153A		AEXF	0.5	LgW	HST CONTROLLERS 1	53		SP_H153S	X	
H153B		AEXF	0.5	LgW	LH PUMP FORWARD P/V	1	TW_02	SP_H153S	X	
H154A		AEXF	0.5	LW	HST CONTROLLERS 1	54		SP_H154S	X	
H154B		AEXF	0.5	LW	RH PUMP FORWARD P/V	1	TW_03	SP_H154S	X	
H175A		AEXF	0.5	GR	HST CONTROLLERS 1	75		SP_H175S	X	
H175B		AEXF	0.5	GR	RH TRAVEL MOTOR P/V	1	TW_04	SP_H175S	X	
H177A		AEXF	0.5	LgR	HST CONTROLLERS 1	77		SP_H177S	X	
H177B		AEXF	0.5	LgR	LH PUMP REVERSE P/V	1	TW_05	SP_H177S	X	
H178A		AEXF	0.5	LR	HST CONTROLLERS 1	78		SP_H178S	X	
H178B		AEXF	0.5	LR	RH PUMP REVERSE P/V	1	TW_06	SP_H178S	X	
H183A		AEXF	0.5	LgB	HST CONTROLLERS 1	83		SP_H183S	X	
H183B		AEXF	0.5	LgB	LH PUMP FORWARD P/V	2	TW_02	SP_H183S	X	
H183C		AEXF	0.5	LgB	LH PUMP REVERSE P/V	2	TW_05	SP_H183S	X	
H184A		AEXF	0.5	LB	HST CONTROLLERS 1	84		SP_H184S	X	
H184B		AEXF	0.5	LB	RH PUMP FORWARD P/V	2	TW_03	SP_H184S	X	
H184C		AEXF	0.5	LB	RH PUMP REVERSE P/V	2	TW_06	SP_H184S	X	
H185A		AEXF	0.5	GB	HST CONTROLLERS 1	85		SP_H185S	X	
H185B		AEXF	0.5	GB	LH TRAVEL MOTOR P/V	2	TW_01	SP_H185S	X	
H185C		AEXF	0.5	GB	RH TRAVEL MOTOR P/V	2	TW_04	SP_H185S	X	
H219A		AEXF	0.5	YR	HST CONTROLLERS 2	19		CABIN HARNESS	50	
H224A		AEXF	0.5	BrL	HST CONTROLLERS 2	24		LH TRAVEL FORWARD SENSOR	2	
H226A		AEXF	0.5	YL	HST CONTROLLERS 2	26		CABIN HARNESS	51	
H232A		AEXF	0.5	RL	HST CONTROLLERS 2	32		SP_H232S	X	
H232B		AEXF	0.5	RL	LH MOTOR SPEED SENSOR	1		SP_H232S	X	
H232C		AEXF	0.5	RL	RH MOTOR SPEED SENSOR	1		SP_H232S	X	
H235A		AEXF	0.5	LR	HST CONTROLLERS 2	35		RH TRAVEL REVERSE SENSOR	2	
H238A		AEXF	0.5	GB	HST CONTROLLERS 2	38	TW_07	SP_H238S	X	
H238B		AEXF	0.5	GB	CABIN HARNESS	52		SP_H238S	X	
H255A		AEXF	0.5	G	HST CONTROLLERS 2	55	TW_07	SP_H255S	X	
H255B		AEXF	0.5	G	CABIN HARNESS	53		SP_H255S	X	
H255C		AEXF	0.85	G	RH TRAVEL FORWARD SENSOR	1		SP_H255S	X	
H255D		AEXF	0.85	G	RH TRAVEL REVERSE SENSOR	1		SP_H255S	X	
H255E		AEXF	0.85	G	LH TRAVEL FORWARD SENSOR	1		SP_H255S	X	
H255F		AEXF	0.85	G	LH TRAVEL REVERSE SENSOR	1		SP_H255S	X	
V112A		AEXF	0.85	WG	EPOS 1	12		CABIN HARNESS	56	
V114A		AEXF	0.5	RB	EPOS 1	14		RETURN FILTER SWITCH	1	
V116A		AEXF	0.5	OrY	EPOS 1	16		AIRCON JOINT HARNESS B	2	
V122A		AEXF	0.5	BY	EPOS 1	22	TW_08	WIF SENSOR	3	
V133A		AEXF	0.5	RY	EPOS 1	33		CAC FAN	3	
V142A		AEXF	0.5	WY	EPOS 1	42		SP_V142S	X	
V142B		AEXF	0.5	WY	PARKING BRAKE PRESSURE SENSOR	2		SP_V142S	X	
V142C		AEXF	0.5	WY	CABIN HARNESS	59		SP_V142S	X	
V142D		AEXF	0.5	WY	LS PRESSURE SENSOR	1		SP_V142S	X	
V143A		AEXF	0.5	LgB	EPOS 1	43		SP_V143S	X	
V143B		AEXF	0.5	LgB	PARKING BRAKE PRESSURE SENSOR	1	TW_09	SP_V143S	X	
V143C		AEXF	0.5	LgB	CABIN HARNESS	61	TW_11	SP_V143S	X	
V143D		AEXF	0.5	LgB	LS PRESSURE SENSOR	3	TW_10	SP_V143S	X	
V144A		AEXF	0.5	LB	EPOS 1	44		SP_V144S	X	
V144B		AEXF	0.85	LB	FUEL TEMP SENSOR	2		SP_V144S	X	
V144C		AEXF	0.85	LB	HYDRAULIC TEMP SENSOR	1		SP_V144S	X	
V144D		AEXF	0.85	LB	CABIN HARNESS	57		SP_V144S	X	
V153A		AEXF	0.85	GW	EPOS 1	53		HYDRAULIC TEMP SENSOR	2	
V154A		AEXF	0.5	Br	EPOS 1	54	TW_08	WIF SENSOR	2	
V165A		AEXF	0.5	BrR	EPOS 1	65		CABIN HARNESS	62	
V167A		AEXF	0.5	BL	EPOS 1	67		SP_V167S	X	
V167B		AEXF	0.5	BL	PARKING BRAKE PRESSURE SENSOR	3	TW_09	SP_V167S	X	
V171A		AEXF	0.5	GY	EPOS 1	71		CABIN HARNESS	64	
V175A		AEXF	0.85	LgR	EPOS 1	75		FUEL TEMP SENSOR	1	
V176A		AEXF	0.85	Or	EPOS 1	76		CABIN HARNESS	58	
V177A		AEXF	0.5	BW	EPOS 1	77		DUST INDICATOR	2	
V189A		AEXF	0.5	BrW	EPOS 1	89		SP_V189S	X	
V189B		AEXF	0.5	BrW	LS PRESSURE SENSOR	2	TW_10	SP_V189S	X	
V192A		AEXF	0.5	LR	EPOS 1	92		SP_V192S	X	
V192B		AEXF	0.5	LR	CABIN HARNESS	63	TW_11	SP_V192S	X	

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Main Wire Harness (4/4)

WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
V193A		AEXF	0.5	RL	EPOS 1	93		SP_V193S	X	
V193B		AEXF	0.5	RL	ENGINE HARNESS 4	5		SP_V193S	X	
V193C		AEXF	0.5	RL	CABIN HARNESS	67		SP_V193S	X	
V201A		AEXF	0.5	GR	EPOS 2	1		P/V BLADE TILT RIGHT	1	
V203A		AEXF	0.85	RY	EPOS 2	3		CABIN HARNESS	68	
V204A		AEXF	0.5	GW	EPOS 2	4		P/V BLADE TILT LEFT	1	
V205A		AEXF	0.85	LB	EPOS 2	5		CABIN HARNESS	69	
V206A		AEXF	0.5	WY	EPOS 2	6		SP_V206S	X	
V206B		AEXF	0.5	WY	ENGINE HARNESS 4	3		SP_V206S	X	
V206C		AEXF	0.5	WY	CABIN HARNESS	70		SP_V206S	X	
V211A		AEXF	0.5	Or	EPOS 2	11		CABIN HARNESS	71	
V213A		AEXF	0.5	WB	EPOS 2	13		CABIN HARNESS	73	
V214A		AEXF	0.5	LgW	EPOS 2	14		CABIN HARNESS	74	
V215A		AEXF	0.5	GW	EPOS 2	15		CABIN HARNESS	75	
V216A		AEXF	0.85	G	EPOS 2	16		CABIN HARNESS	76	
V217A		AEXF	0.5	GY	EPOS 2	17		P/V BLADE RAISE	1	
V218A		AEXF	0.5	GL	EPOS 2	18		P/V BLADE DOWN	1	
V219A		AEXF	0.5	Y	EPOS 2	19		P/V BLADE ANGLE RIGHT	1	
V220A		AEXF	0.85	LG	EPOS 2	20		CABIN HARNESS	77	
V229A		AEXF	0.5	Lg	EPOS 2	29		CABIN HARNESS	78	
V230A		AEXF	0.5	GL	EPOS 2	30		CABIN HARNESS	79	
V231A		AEXF	0.5	R	EPOS 2	31		P/V BLADE ANGLE LEFT	1	
V232A		AEXF	0.5	G	EPOS 2	32		P/V COOLING FAN	1	
V233A		AEXF	0.5	OrL	EPOS 2	33		SP_V233S	X	
V233B		AEXF	0.5	OrL	AIRCON FAN RESISTOR	2		SP_V233S	X	
V233C		AEXF	0.5	OrL	AIRCON JOINT HARNESS B	1		SP_V233S	X	
V234A		AEXF	0.5	Or	EPOS 2	34		P/V RIPPER UP	1	
V235A		AEXF	0.5	P	EPOS 2	35		P/V RIPPER DOWN	1	
V236A		AEXF	0.85	Br	EPOS 2	36		SP_V236S	X	
V236B		AEXF	0.5	Br	P/V BLADE DOWN	2		SP_V236S	X	
V236C		AEXF	0.5	Br	P/V BLADE RAISE	2		SP_V236S	X	
V236D		AEXF	0.5	Br	CAC FAN RESISTOR	4		SP_V236S	X	
V236E		AEXF	0.5	Br	AIRCON FAN RESISTOR	4		SP_V236S	X	
V237A		AEXF	0.85	Gr	EPOS 2	37		SP_V237S	X	
V237B		AEXF	0.5	Gr	P/V BLADE ANGLE LEFT	2		SP_V237S	X	
V237C		AEXF	0.5	Gr	P/V BLADE ANGLE RIGHT	2		SP_V237S	X	
V238A		AEXF	0.85	GB	EPOS 2	38		SP_V238S	X	
V238B		AEXF	0.5	GB	P/V BLADE TILT RIGHT	2		SP_V238S	X	
V238C		AEXF	0.5	GB	P/V BLADE TILT LEFT	2		SP_V238S	X	
V238D		AEXF	0.5	GB	P/V COOLING FAN	2		SP_V238S	X	
V239A		AEXF	0.5	BW	EPOS 2	39		SP_V239S	X	
V239B		AEXF	0.5	BW	P/V RIPPER DOWN	2		SP_V239S	X	
V239C		AEXF	0.5	BW	P/V RIPPER UP	2		SP_V239S	X	
V242A		AEXF	0.5	BL	EPOS 2	42		CABIN HARNESS	81	
V244A		AEXF	0.5	W	EPOS 2	44		SP_V244S	X	
V244B		AEXF	0.5	W	DIODE ARRAY 3	6		SP_V244S	X	
V244C		AEXF	0.5	W	PARKING RELEASE	1		SP_V244S	X	
V245A		AEXF	0.5	RG	EPOS 2	45		RELAY JOINT 2	6	
V246A		AEXF	0.85	L	EPOS 2	46		SP_V246S	X	
V246B		AEXF	0.5	L	DIODE ARRAY 3	7		SP_V246S	X	
V246C		AEXF	0.5	L	HST CUT OFF LH	1		SP_V246S	X	
V247A		AEXF	0.85	RL	EPOS 2	47		SP_V247S	X	
V247B		AEXF	0.5	RL	DIODE ARRAY 3	8		SP_V247S	X	
V247C		AEXF	0.5	RL	HST CUT OFF RH	1		SP_V247S	X	
V248A		AEXF	0.5	OrW	EPOS 2	48		CABIN HARNESS	82	
V249A		AEXF	0.5	RW	EPOS 2	49		SP_V249S	X	
V249B		AEXF	0.5	RW	CAC FAN RESISTOR	2		SP_V249S	X	
V249C		AEXF	0.5	RW	CAC FAN	4		SP_V249S	X	
V251A		AEXF	0.5	WG	EPOS 2	51		RELAY JOINT 2	8	
V252A		AEXF	0.85	GR	EPOS 2	52		SP_V252S	X	
V252B		AEXF	0.5	GR	DIODE ARRAY 3	5		SP_V252S	X	
V252C		AEXF	0.5	GR	HYD CUT OFF	1		SP_V252S	X	
V253A		AEXF	0.5	WL	EPOS 2	53		CABIN HARNESS	88	
V256A		AEXF	0.85	Br	EPOS 2	56		CABIN HARNESS	83	
V257A		AEXF	0.85	V	EPOS 2	57		CABIN HARNESS	84	
V258A		AEXF	0.85	YR	EPOS 2	58		CABIN HARNESS	85	
V259A		AEXF	0.85	YW	EPOS 2	59		SP_V259S	X	
V259B		AEXF	0.5	YW	DIODE 4	2		SP_V259S	X	
V259C		AEXF	0.5	YW	REVERSE FAN	1		SP_V259S	X	
V260A		AEXF	0.5	WY	EPOS 2	60		RELAY JOINT 2	9	

WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
99A		AEXF	8	B	FRAME EARTH 1	1		SP_99S	X	
99B		AEXF	5	B	EQUALIZER	1		SP_99S1	X	
99C		AEXF	1.25	B	SURGE KILLER	1		SP_99S1	X	
99D		AEXF	5	B	SP_99S1	X		SP_99S	X	
99E		AEXF	3	B	FUEL HEATER 1	1		SP_99S	X	
99F		AEXF	3	B	FUEL HEATER 2	1		SP_99S	X	
99G		AEXF	1.25	B	RELAY JOINT 2	10		SP_99S1	X	
99H		AEXF	1.25	B	RELAY JOINT 2	11		SP_99S1	X	
99P		AEXF	0.85	B	LEFT WIPER MOTOR	4		SP_99S3	X	
99Q		AEXF	0.5	B	BACK BUZZER	2		SP_99S3	X	
99R		AEXF	0.5	B	DIODE	1		SP_99S3	X	
99V		AEXF	0.85	B	SIDE WINDOW WASHER (F)	2		SP_99S5	X	
99W		AEXF	0.85	B	SIDE WINDOW WASHER (R)	2		SP_99S5	X	
99X		AEXF	0.85	B	FRONT WINDOW WASHER	2		SP_99S5	X	
99Y		AEXF	0.85	B	REAR WINDOW WASHER	2		SP_99S6	X	
99Z		AEXF	2	B	BATTERY HARNESS 1	6		SP_99S6	X	
99AA		AEXF	0.85	B	DIODE ARRAY 1	1		SP_99S5	X	
99AB		AEXF	0.85	B	DIODE ARRAY 1	2		SP_99S5	X	
99AC		AEXF	0.85	B	DIODE ARRAY 1	3		SP_99S5	X	
99AD		AEXF	0.85	B	DIODE ARRAY 1	4		SP_99S6	X	
99AE		AEXF	0.5	B	REVERSE FAN	2		SP_99S7	X	
99AF		AEXF	0.5	B	DIODE 4	1		SP_99S7	X	
99AG		AEXF	0.5	B	IMU SENSOR JOINT HARNESS 1	2		SP_99S7	X	
99AL		AEXF	0.5	B	DUST INDICATOR	1		SP_99SB	X	
99AM		AEXF	0.5	B	E-FEED PUMP	2		SP_99SB	X	
99AN		AEXF	0.85	B	HORN 1	2		SP_99SB	X	
99AP		AEXF	0.85	B	HORN 2	2		SP_99SB	X	
99AV		AEXF	0.5	B	IMU SENSOR JOINT HARNESS 2	2		SP_99SB	X	
99AQ		AEXF	3	B	CABIN HARNESS	101		SP_99SE	X	
99AR		AEXF	3	B	CABIN HARNESS	102		SP_99SE	X	
99AS		AEXF	5	B	AIRCON JOINT HARNESS A	2		SP_99SE	X	
99AU		AEXF	0.85	B	TRIMBLE READY	2		SP_99SE	X	
99AT		AEXF	5	B	SP_99SC	X		SP_99SE	X	
99BA		AEXF	5	B	FRAME EARTH 2	1		SP_99SC	X	
99BC		AEXF	0.5	B	RETURN FILTER SWITCH	2		SP_99SC	X	
99BJ		AEXF	5	B	CAC FAN	2		SP_99SD	X	
99BL		AEXF	0.5	B	ENGINE HARNESS 7	2		SP_99SD	X	
99BE		AEXF	0.5	B	HYD CUT OFF	2		SP_99SE	X	
99BF		AEXF	0.5	B	PARKING RELEASE	2		SP_99SE	X	
99BG		AEXF	0.5	B	DIODE ARRAY 3	1		SP_99SE	X	
99BH		AEXF	0.5	B	DIODE ARRAY 3	2		SP_99SE	X	
99BK		AEXF	2	B	UREA TANK	2		SP_99SE	X	
99BD		AEXF	0.85	B	RIGHT WIPER MOTOR	4		SP_99SF	X	
99BM		AEXF	0.5	B	HST CUT OFF LH	2		SP_99SF	X	
99BN		AEXF	0.5	B	HST CUT OFF RH	2		SP_99SF	X	
99BP		AEXF	0.5	B	DIODE ARRAY 3	3		SP_99SF	X	
99BQ		AEXF	0.5	B	DIODE ARRAY 3	4		SP_99SF	X	
99BR		AEXF	0.85	B	FUEL FULL LED LAMP	2		SP_99SF	X	
99ZL		AEXF	5	B	SP_99SC	X		SP_99SD	X	
99ZM		AEXF	3	B	SP_99SC	X		SP_99SE	X	
99ZN		AEXF	3	B	SP_99SC	X		SP_99SF	X	
999A		AEXF	2	B	CABIN HARNESS	100		SP_999S2	X	
999B		AEXF	0.85	B	EPOS 1	1		SP_999S1	X	
999C		AEXF	0.85	B	EPOS 1	2		SP_999S1	X	
999D		AEXF	0.85	B	EPOS 1	3		SP_999S1	X	
999E		AEXF	0.85	B	EPOS 1	72		SP_999S2	X	
999F		AEXF	0.85	B	EPOS 1	94		SP_999S2	X	
999G		AEXF	0.85	B	HST CONTROLLERS 1	14		SP_999S3	X	
999H		AEXF	0.85	B	HST CONTROLLERS 1	22		SP_999S3	X	
999I		AEXF	0.85	B	HST CONTROLLERS 1	23		SP_999S3	X	
999J		AEXF	0.85	B	HST CONTROLLERS 1	24		SP_999S3	X	
999K		AEXF	0.85	B	HST CONTROLLERS 2	2		SP_999S3	X	
999L		AEXF	0.85	B	HST CONTROLLERS 2	7		SP_999S3	X	
999M		AEXF	0.85	B	HST CONTROLLERS 2	20		SP_999S3	X	
999N		AEXF	0.85	B	HST CONTROLLERS 2	33		SP_999S3	X	
999O		AEXF	0.85	B	HST CONTROLLERS 2	46		SP_999S3	X	
999P		AEXF	5	B	FRAME EARTH 3	1		SP_999S	X	
999Q		AESSXF	1.25	B	ECU 1	2		SP_999S	X	
999R		AESSXF	1.25	B	ECU 1	4		SP_999S	X	
999S		AESSXF	1.25	B	ECU 1	6		SP_999S	X	

WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
992A		AEXF	2	B	JOINT CONNECTOR A	1		SP_99S	X	
992B		AEXF	2	B	JOINT CONNECTOR A	8		SP_99S	X	
992D		AEXF	1.25	B	JOINT CONNECTOR A	3		SP_99S3	X	
992F		AEXF	2	B	JOINT CONNECTOR A	5		SP_99S5	X	
992G		AEXF	1.25	B	JOINT CONNECTOR A	6		SP_99S6	X	
992H		AEXF	1.25	B	JOINT CONNECTOR A	7		SP_99S7	X	
992K		AEXF	1.25	B	JOINT CONNECTOR A	10		SP_99SB	X	

WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
999ZA		AEXF	2	B	JOINT CONNECTOR B	1		SP_999S	X	
999ZB		AEXF	2	B	JOINT CONNECTOR B	4		SP_999S	X	
999ZC		AEXF	2	B	JOINT CONNECTOR B	2		SP_999S1	X	
999ZD		AEXF	2	B	JOINT CONNECTOR B	3		SP_999S2	X	
999ZE		AEXF	2	B	JOINT CONNECTOR B	5		SP_999S3	X	

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Main Harness(3/4)

WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
7A	AEXF	0.85	Br	EPOS 1	32	CABIN HARNESS	9
8A	AEXF	0.85	BrW	BATTERY HARNESS 1	1	SP_8S	X
8B	AEXF	0.85	BrW	HST CONTROLLERS 2	40	SP_8S	X
8C	AEXF	0.85	BrW	CABIN HARNESS	10	SP_8S	X
10A	AEXF	0.5	L	EPOS 2	25	CABIN HARNESS	11
11A	AESSXF	0.75	GrB	ECU 1	55	CABIN HARNESS	12
12A	AESSXF	0.75	Gr	ECU 1	72	CABIN HARNESS	13
14A	AEXF	5	WL	MEGA FUSE 4	1	CAC FAN	1
16A	AEXF	5	BR	MEGA FUSE 3	1	AIRCON JOINT HARNESS A	1
50A	AEXF	0.85	BR	RELAY JOINT 1	1	SP_50S	X
50B	AEXF	0.85	BR	FRONT WINDOW WASHER	1	SP_50S	X
50C	AEXF	0.85	BR	DIODE ARRAY 1	7	SP_50S	X
51A	AEXF	0.85	L	RELAY JOINT 1	2	SP_51S	X
51B	AEXF	0.85	L	REAR WINDOW WASHER	1	SP_51S	X
51C	AEXF	0.85	L	DIODE ARRAY 1	8	SP_51S	X
52A	AEXF	0.85	R	SIDE WINDOW WASHER (F)	1	SP_52S	X
52B	AEXF	0.85	R	SIDE WINDOW WASHER (R)	1	SP_52S	X
52C	AEXF	0.85	R	DIODE ARRAY 1	5	SP_52S	X
52D	AEXF	0.85	R	DIODE ARRAY 1	6	SP_52S	X
52E	AEXF	0.85	R	RELAY JOINT 1	3	SP_52S	X
80A	AEXF	0.5	WR	EPOS 2	54	CABIN HARNESS	14
150A	AEXF	1.25	L	CABIN TILT MOTOR	2	BATTERY HARNESS 1	2
210A	AEXF	1.25	RL	CABIN TILT MOTOR	1	BATTERY HARNESS 1	3
213A	AEXF	5	W	ENGINE HARNESS 3	1	PREHEAT RELAY	87
220A	AEXF	0.85	LgW	FUEL TEMP SENSOR	4	FUEL FULL LED LAMP	1
251A	AEXF	2	RW	ENGINE HARNESS 4	2	SP_251S	X
251B	AEXF	2	RW	ENGINE HARNESS 4	4	SP_251S	X
251C	AEXF	3	RW	CABIN HARNESS	1	SP_251S	X
307B	AEXF	0.85	Y	RIGHT WIPER MOTOR	2	CABIN HARNESS	15
308B	AEXF	0.85	LW	RIGHT WIPER MOTOR	3	CABIN HARNESS	16
309B	AEXF	0.85	Gr	LEFT WIPER MOTOR	2	CABIN HARNESS	17
310B	AEXF	0.85	L	LEFT WIPER MOTOR	3	CABIN HARNESS	18
400A	AEXF	1.25	R	CABIN TILT FUSE	2	BATTERY HARNESS 1	4
401B	AEXF	0.5	RY	CABIN HARNESS	80	SP_401S	X
401C	AEXF	0.5	RY	BACK BUZZER	1	SP_401S	X
401D	AEXF	0.5	RY	DIODE 1	2	SP_401S	X
403C	AEXF	1.25	RW	CABIN HARNESS	20	SP_403S	X
403D	AEXF	0.85	RW	HORN 1	1	SP_403S	X
403E	AEXF	0.85	RW	HORN 2	1	SP_403S	X
410A	AEXF	5	R	EQUALIZER	2	EQUALIZER FUSE	1
445A	AEXF	0.85	R	RELAY JOINT 2	1	SP_445S	X
445B	AESSXF	0.75	R	UREA SUPPLY MODULE	5	SP_445S	X
445C	AEXF	0.85	R	SUCTION HEATER	2	SP_445S	X
445E	AEXF	0.85	R	PRESSURE HEATER	2	SP_445S	X
445F	AEXF	0.85	R	BACK FLOW HEATER	2	SP_445S	X
445G	AEXF	0.85	R	REDUCTION HEATING V/V	2	SP_445S	X
522A	AEXF	0.85	BrW	RELAY JOINT 1	4	SP_522S	X
522B	AESSXF	0.75	BrW	UREA SUPPLY MODULE	11	SP_522S	X
522C	AESSXF	0.75	BrW	UREA SUPPLY MODULE	9	SP_522S	X
B1A	AEXF	5	R	BATTERY HARNESS 2	1	SP_B1S	X
B1B	AEXF	5	R	BATTERY HARNESS 2	2	SP_B1S	X
B1C	AEXF	5	R	MEGA FUSE 4	2	SP_B1S1	X
B1D	AEXF	5	R	MEGA FUSE 3	2	SP_B1S1	X
B1E	AEXF	5	R	MEGA FUSE 1	2	SP_B1S1	X
B1ZA	AEXF	5	R	SP_B1S	X	SP_B1S1	X
B2A	AEXF	5	RW	CABIN HARNESS	49	SP_B2S	X
B2F	AEXF	1.25	RW	CABIN TILT FUSE	1	SP_B2S	X
B2H	AEXF	5	RW	MEGA FUSE 1	1	SP_B2S	X
B4A	AEXF	1.25	W	SURGE KILLER	2	SP_B4S1	X
B4B	AEXF	5	W	EQUALIZER FUSE	2	SP_B4S	X
B4C	AEXF	5	W	BATTERY HARNESS 2	3	SP_B4S1	X
B4D	AEXF	5	W	BATTERY HARNESS 3	1	SP_B4S1	X
B4E	AEXF	8	W	CABIN HARNESS	54	SP_B4S	X
B4ZA	AEXF	5	W	SP_B4S	X	SP_B4S1	X
B5A	AEXF	8	WR	MEGA FUSE 2	2	SP_B5S1	X
B5F	AEXF	5	WR	PREHEAT FUSE (80A)	2	SP_B5S1	X
B5G	AEXF	5	WR	BATTERY HARNESS 3	2	SP_B5S	X
B5H	AEXF	5	WR	BATTERY HARNESS 3	3	SP_B5S	X
B5ZA	AEXF	5	WR	SP_B5S	X	SP_B5S1	X
B6A	AEXF	8	W	MEGA FUSE 2	1	SP_B6S	X
B6B	AEXF	2	W	CABIN HARNESS	98	SP_B6S	X
B6C	AEXF	3	W	CABIN HARNESS	99	SP_B6S	X
B6D	AEXF	5	W	EQUALIZER	3	SP_B6S	X
B7A	AEXF	5	R	PREHEAT RELAY	30	PREHEAT FUSE (80A)	1
C11A	AEXF	0.5	Y	CABIN HARNESS	21	EPOS 1	74
C11C	AEXF	0.5	Y	CABIN HARNESS	65	SP_C11S1	X
C11E	AEXF	0.5	Y	HST CONTROLLERS 2	53	SP_C11S1	X
C11F	AEXF	0.5	Y	UREA TANK	3	SP_C11S2	X
C11G	AEXF	0.5	Y	ENGINE HARNESS 7	4	SP_C11S3	X
C11H	AEXF	0.5	Y	ECU 1	30	SP_C11S3	X
C11ZB	AEXF	0.5	Y	SP_C11S1	X	SP_C11S2	X
C11ZC	AEXF	0.5	Y	SP_C11S2	X	SP_C11S3	X
C12A	AEXF	0.5	YB	CABIN HARNESS	22	EPOS 1	73
C12C	AEXF	0.5	YB	CABIN HARNESS	66	SP_C12S1	X
C12E	AEXF	0.5	YB	HST CONTROLLERS 2	54	SP_C12S1	X
C12F	AEXF	0.5	YB	UREA TANK	4	SP_C12S2	X
C12G	AEXF	0.5	YB	ENGINE HARNESS 7	3	SP_C12S3	X
C12H	AEXF	0.5	YB	ECU 1	31	SP_C12S3	X
C12ZB	AEXF	0.5	YB	SP_C12S1	X	SP_C12S2	X
C12ZC	AEXF	0.5	YB	SP_C12S2	X	SP_C12S3	X
C13A	AEXF	-	Shield	CABIN HARNESS	23	EPOS 1	8
C13C	AEXF	-	Shield	BLUNT_C13C	X	SP_C13S	X
C13E	AEXF	-	Shield	BLUNT_C13E	X	SP_C13S	X
C13F	AEXF	-	Shield	BLUNT_C13F	X	SP_C13S	X
C13G	AEXF	-	Shield	BLUNT_C13G	X	SP_C13S	X
C13H	AEXF	-	Shield	BLUNT_C13H	X	SP_C13S	X

WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
C21A	AEXF	0.5	W	CABIN HARNESS	24	SP_C21S	X
C21F	AEXF	0.5	W	EPOS 1	51	SP_C21S	X
C21G	AEXF	0.5	W	CAN RESISTOR 2	1	SP_C21S	X
C22A	AEXF	0.5	G	CABIN HARNESS	25	SP_C22S	X
C22F	AEXF	0.5	G	EPOS 1	52	SP_C22S	X
C22G	AEXF	0.5	G	CAN RESISTOR 2	2	SP_C22S	X
C23A	AEXF	-	Shield	CABIN HARNESS	26	SP_C23S	X
C23F	AEXF	-	Shield	EPOS 1	30	SP_C23S	X
C23G	AEXF	-	Shield	BLUNT_C23G	X	SP_C23S	X
C31A	AEXF	0.5	Br	CABIN HARNESS	27	SP_C31S	X
C31C	AEXF	0.5	Br	EPOS 1	29	SP_C31S	X
C31D	AEXF	0.5	Br	TRIMBLE READY	5	SP_C31S1	X
C31E	AEXF	0.5	Br	HST CONTROLLERS 1	63	SP_C31S2	X
C31F	AEXF	0.5	Br	IMU SENSOR JOINT HARNESS 1	3	SP_C31S3	X
C31G	AEXF	0.5	Br	IMU SENSOR CAN 3 RESISTOR	1	SP_C31S3	X
C31ZA	AEXF	0.5	Br	SP_C31S	X	SP_C31S1	X
C31ZB	AEXF	0.5	Br	SP_C31S1	X	SP_C31S2	X
C31ZC	AEXF	0.5	Br	SP_C31S2	X	SP_C31S3	X
C32A	AEXF	0.5	Y	CABIN HARNESS	28	SP_C32S	X
C32C	AEXF	0.5	Y	EPOS 1	7	SP_C32S	X
C32D	AEXF	0.5	Y	TRIMBLE READY	6	SP_C32S1	X
C32E	AEXF	0.5	Y	HST CONTROLLERS 1	62	SP_C32S2	X
C32F	AEXF	0.5	Y	IMU SENSOR JOINT HARNESS 1	4	SP_C32S3	X
C32G	AEXF	0.5	Y	IMU SENSOR CAN 3 RESISTOR	2	SP_C32S3	X
C32ZA	AEXF	0.5	Y	SP_C32S	X	SP_C32S1	X
C32ZB	AEXF	0.5	Y	SP_C32S1	X	SP_C32S2	X
C32ZC	AEXF	0.5	Y	SP_C32S2	X	SP_C32S3	X
C33A	AEXF	-	Shield	CABIN HARNESS	29	SP_C33S	X
C33C	AEXF	-	Shield	EPOS 1	9	SP_C33S	X
C33D	AEXF	-	Shield	BLUNT_C33D	X	SP_C33S	X
C33E	AEXF	-	Shield	BLUNT_C33E	X	SP_C33S	X
C33F	AEXF	-	Shield	BLUNT_C33F	X	SP_C33S	X
C33G	AEXF	-	Shield	BLUNT_C33G	X	SP_C33S	X
C41A	AEXF	0.5	Br	ECU 1	81	CABIN HARNESS	30
C42A	AEXF	0.5	YL	ECU 1	80	CABIN HARNESS	31
C51E	AEXF	0.5	W	HST CONTROLLERS 2	15	SP_C51S	X
C51F	AEXF	0.5	W	CABIN HARNESS	32	SP_C51S	X
C51G	AEXF	0.5	W	CAN RESISTOR 5	1	SP_C51S	X
C52E	AEXF	0.5	G	HST CONTROLLERS 2	16	SP_C52S	X
C52F	AEXF	0.5	G	CABIN HARNESS	33	SP_C52S	X
C52G	AEXF	0.5	G	CAN RESISTOR 5	2	SP_C52S	X
E101A	AEXF	1.25	Or	ECU 1	1	SP_E101S	X
E101B	AEXF	1.25	Or	ECU 1	3	SP_E101S	X
E101C	AEXF	1.25	Or	ECU 1	5	SP_E101S	X
E101D	AEXF	1.25	Or	UREA TANK	1	SP_E101S	X
E101E	AEXF	2	Or	CABIN HARNESS	2	SP_E101S1	X
E101F	AEXF	2	Or	RELAY JOINT 1	12	SP_E101S1	X
E101G	AEXF	0.5	Or	BATTERY HARNESS 1	5	SP_E101S1	X
E101Q	AEXF	0.85	Or	ENGINE HARNESS 7	1	SP_E101S	X
E101T	AEXF	0.85	Or	PREHEAT RELAY	86	SP_E101S	X
E101ZA	AEXF	2	Or	SP_E101S	X	SP_E101S1	X
E110A	AEXF	0.5	BY	ECU 1	10	CABIN HARNESS	34
E111A	AEXF	0.5	BL	ECU 1	11	CABIN HARNESS	35
E115A	AESSXF	0.75	B	ECU 1	15	ENGINE HARNESS 7	6
E116A	AESSXF	0.75	Br	ECU 1	16	ENGINE HARNESS 7	7
E118A	AEXF	0.5	BrY	ECU 1	18	RELAY JOINT 1	5
E121A	AESSXF	0.75	P	ECU 1	21	RELAY JOINT 1	6
E128A	AESSXF	0.75	Or	ECU 1	28	FUEL FILTER TEMP SENSOR	1
E129A	AESSXF	0.75	L	ECU 1	29	ENGINE HARNESS 7	10
E132A	AESSXF	0.75	BR	ECU 1	32	FUEL FILTER TEMP SENSOR	2
E133A	AESSXF	0.75	B	ECU 1	33	ENGINE HARNESS 7	11
E139A	AESSXF	0.75	Br	ECU 1	39	RELAY JOINT 1	7
E142A	AESSXF	0.75	R	ECU 1	42	ENGINE HARNESS 7	5
E147A	AESSXF	0.75	W	ECU 1	47	ENGINE HARNESS 7	8
E150A	AESSXF	0.75	B	ECU 1	50	ENGINE HARNESS 7	9
E151A	AESSXF	0.75	BrW	ECU 1	51	CABIN HARNESS	36
E174A	AESSXF	0.75	BrW	ECU 1	74	RELAY JOINT 2	2
E175A	AESSXF	0.75	WR	ECU 1	75	SP_E175S	X
E175B	AESSXF	0.75	WR	CABIN HARNESS	37	SP_E175S	X
E175C	AEXF	0.5	WR	E-FEED PUMP	1	SP_E175S	X
E176A	AESSXF	0.75	Br	ECU 1	76	INLET AIR TEMP SENSOR	1
E184A	AESSXF	0.75	RG	ECU 1	84	CABIN HARNESS	38
E187A	AESSXF	0.75	BrW	ECU 1	87	INLET AIR TEMP SENSOR	2
E188A	AEXF	0.5	LY	ECU 1	88	CABIN HARNESS	39
E189A	AESSXF	0.75	LW	ECU 1	89	RELAY JOINT 1	8
E205A	AESSXF	0.75	LG	ENGINE HARNESS 5	9	REDUCTION HEATING V/V	1
E215A	AESSXF	0.75	G	ENGINE HARNESS 5	10	UREA SUPPLY MODULE	2
E253A	AESSXF	0.75	GB	ENGINE HARNESS 5	12	UREA SUPPLY MODULE	4
E254A	AESSXF	0.75	GL	ENGINE HARNESS 5	11	UREA SUPPLY MODULE	3
E255A	AESSXF	0.75	BW	ENGINE HARNESS 6	6	UREA SUPPLY MODULE	8
E258B	AEXF	0.85	LR	BACK FLOW HEATER	1	SP_E258S	X
E258C	AESSXF	0.75	LR	ENGINE HARNESS 5	2	SP_E258S	X
E259D	AEXF	0.85	LR	RELAY JOINT 1	9	SP_E258S	X
E260B	AEXF	0.85	LW	RELAY JOINT 2	3	SP_E260S	X
E260C	AESSXF	0.75	LW	ENGINE HARNESS 5	4	SP_E260S	X
E260D	AEXF	0.85	LW	SUCTION HEATER	1	SP_E260S	X
E269A	AEXF	0.5	BW	ENGINE HARNESS 5	1	RELAY JOINT 1	10
E271A	AESSXF	0.75	G	ENGINE HARNESS 6	2	DOZING MODUE	2
E275B	AEXF	0.85	LY	RELAY JOINT 1	11	SP_E275S	X
E275C	AESSXF	0.75	LY	ENGINE HARNESS 5	3	SP_E275S	X
E275D	AEXF	0.85	LY	PRESSURE HEATER	1	SP_E275S	X
E280B	AEXF	0.85	L	RELAY JOINT 2	4	SP_E280S	X
E280C	AESSXF	0.75	L	ENGINE HARNESS 5	5	SP_E280S	X
E280D	AESSXF	0.75	L	UREA SUPPLY MODULE	6	SP_E280S	X
E291A	AESSXF	0.75	BrB	ENGINE HARNESS 6	4	UREA SUPPLY MODULE	12
E292A	AESSXF	0.75	BrR	ENGINE HARNESS 6	5	UREA SUPPLY MODULE	10
E293B	AEXF	0.85	BG	ENGINE HARNESS 6	7	PREHEAT RELAY	85
E294A	AESSXF	0.75	Lg	ENGINE HARNESS 6	3	DOZING MODUE	1
F103A	AEXF	0.5	OrR	CABIN HARNESS	41	SP_F103S	X
F103B	AEXF	0.5	OrR	IMU SENSOR JOINT HARNESS 1	1	SP_F103S	X
F103C	AEXF	0.5	OrR	IMU SENSOR JOINT HARNESS 2	1	SP_F103S	X
F103E	AEXF	0.5	OrR	WIF SENSOR	1	SP_F103S	X
F108A	AEXF	0.85	OrL	CABIN HARNESS	86	LEFT WIPER MOTOR	1
F109A	AEXF	0.85	RL	CABIN HARNESS	87	RIGHT WIPER MOTOR	1
F111A	AEXF	1.25	RY	CABIN HARNESS	42	RELAY JOINT 2	12
F112A	AEXF	0.85	RB	FUEL TEMP SENSOR	3	CABIN HARNESS	40
F114A	AEXF	0.85	Or	CABIN HARNESS	19	TRIMBLE READY	3

WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
F201A	AEXF	3	RL	FUEL HEATER 1	2	CABIN HARNESS	3
F202A	AEXF	3	R	FUEL HEATER 2	2	CABIN HARNESS	4
F205C	AEXF	0.85	R	RELAY JOINT 2	7	CABIN HARNESS	45
F206A	AEXF	2	RW	RELAY JOINT 2	5	CABIN HARNESS	8
F212A	AEXF	2	WL	CABIN HARNESS	5	SP_F212S	X
F212B	AEXF	0.85	WL	HST CONTROLLERS 2	1	SP_F212S	X
F212C	AEXF	0.85	WL	HST CONTROLLERS 2	3	SP_F212S	X
F212D	AEXF	0.85	WL	HST CONTROLLERS 2	4	SP_F212S	X
F212E	AEXF	0.85	WL	HST CONTROLLERS 2	5	SP_F212S	X
F212F	AEXF	0.85	WL	HST CONTROLLERS 2	6	SP_F212S	X
F212H	AEXF	0.85	WL	HST CONTROLLERS 2	45	SP_F212S	X
F212K	AEXF	0.85	WL	HST CONTROLLERS 2	58	SP_F212S	X
F212L	AEXF	0.85	WL	HST CONTROLLERS 2	28	SP_F212S	X
F213A	AEXF	0.85	WG	EPOS 1	4	SP_F213S	X
F213B	AEXF	0.85	WG	EPOS 1	5	SP_F213S	X
F213C	AEXF	0.85	WG	EPOS 1	6	SP_F213S	X
F213D	AEXF	0.5	WG	EPOS 1	28	SP_F213S	X
F213E	AEXF	2	WG	CABIN HARNESS	6	SP_F213S	X
F213F	AEXF	0.5	WG	EPOS 1	50	SP_F213S	X
F213Q	AEXF	0.85	WG	TRIMBLE READY	1	SP_F213S	X
G13A	AEXF	0.5	Or	CABIN HARNESS	91	JOINT CONN C_(REAR CAM)	1
G13B	AEXF	0.5	Or	REAR VIEW CAMERA	1	JOINT CONN C_(REAR CAM)	2
G13C	AEXF	0.5	Or	AIRCON JOINT HARNESS B	3	JOINT CONN C_(REAR CAM)	3
G21A	AEXF	0.5	OrB	CABIN HARNESS	92	JOINT CONN C_(REAR CAM)	5
G21B	AEXF	0.5	OrB	REAR VIEW CAMERA	2	JOINT CONN C_(REAR CAM)	6
G21C	AEXF	0.5	OrB	AIRCON JOINT HARNESS B	4	JOINT CONN C_(REAR CAM)	7
G14A	AEXF	0.5	Y	CABIN HARNESS	93	JOINT CONN D_(REAR CAM)	1
G14B	AEXF	0.5	Y	REAR VIEW CAMERA	4	JOINT CONN D_(REAR CAM)	2
G14C	AEXF	0.5	Y	AIRCON JOINT HARNESS B	6	JOINT CONN D_(REAR CAM)	3
G22A	AEXF	0.5	YB	CABIN HARNESS	94	JOINT CONN D_(REAR CAM)	5
G22B	AEXF	0.5	YB	REAR VIEW CAMERA	3	JOINT CONN D_(REAR CAM)	6
G22C	AEXF	0.5	YB	AIRCON JOINT HARNESS B	5	JOINT CONN D_(REAR CAM)	7
H110A	AEXF	0.5	WR	HST CONTROLLERS 1	10	RH MOTOR JOINT HARNESS	3
H111A	AEXF	0.5	WL	HST CONTROLLERS 1	11	RH MOTOR JOINT HARNESS	4
H112A	AEXF	0.5	YR	HST CONTROLLERS 1	12	LH MOTOR JOINT HARNESS	3
H113A	AEXF	0.5	YL	HST CONTROLLERS 1	13	LH MOTOR JOINT HARNESS	4
H139A	AEXF	0.5	YW	HST CONTROLLERS 1	39	CABIN HARNESS	46
H142A	AEXF	0.5	LW	HST CONTROLLERS 1	42	RH TRAVEL FORWARD SENSOR	2
H143A	AEXF	0.5	LY	HST CONTROLLERS 1	43	LH TRAVEL REVERSE SENSOR	2
H146A	AEXF	0.5	WB	HST CONTROLLERS 1	46	SP_H146S	X
H146B	AEXF	0.5	WB	LH MOTOR JOINT HARNESS	2	SP_H146S	X
H146C	AEXF	0.5	WB	RH MOTOR JOINT HARNESS	2	SP_H146S	X
H146D	AEXF	0.5	WB	RH TRAVEL FORWARD SENSOR	3	SP_H146S	X
H146E	AEXF	0.5	WB	RH TRAVEL REVERSE SENSOR	3	SP_H146S	X
H146F	AEXF	0.5	WB	LH TRAVEL FORWARD SENSOR	3	SP_H146S	X
H146G	AEXF	0.5	WB	LH TRAVEL REVERSE SENSOR	3	SP_H146S	X
H146H	AEXF	0.5	WB	CABIN HARNESS	47	SP_H146S	X
H151A	AEXF	0.5	GW	HST CONTROLLERS 1	51	SP_H151S	X
H151B	AEXF	0.5	GW	LH MOTOR JOINT HARNESS	5	SP_H151S	X
H153A	AEXF	0.5	LgW	HST CONTROLLERS 1	53	SP_H153S	X
H153B	AEXF	0.5	LgW	LH PUMP FORWARD P/V	1	SP_H153S	X
H154A	AEXF	0.5	LW	HST CONTROLLERS 1	54	SP_H154S	X
H154B	AEXF	0.5	LW	RH PUMP FORWARD P/V	1	SP_H154S	X
H175A	AEXF	0.5	GR	HST CONTROLLERS 1	75	SP_H175S	X
H175B	AEXF	0.5	GR	RH MOTOR JOINT HARNESS	5	SP_H175S	X
H177A	AEXF	0.5	LgR	HST CONTROLLERS 1	77	SP_H177S	X
H177B	AEXF	0.5	LgR	LH PUMP REVERSE P/V	1	SP_H177S	X
H178A	AEXF	0.5	LR	HST CONTROLLERS 1	78	SP_H178S	X
H178B	AEXF	0.5	LR	RH PUMP REVERSE P/V	1	SP_H178S	X
H183A	AEXF	0.5	LgB	HST CONTROLLERS 1	83	SP_H183S	X
H183B	AEXF	0.5	LgB	LH PUMP FORWARD P/V	2	SP_H183S	X
H183C	AEXF	0.5	LgB	LH PUMP REVERSE P/V	2	SP_H183S	X
H184A	AEXF	0.5	LB	HST CONTROLLERS 1	84	SP_H184S	X
H184B	AEXF	0.5	LB	RH PUMP FORWARD P/V	2	SP_H184S	X
H184C	AEXF	0.5	LB	RH PUMP REVERSE P/V	2	SP_H184S	X
H185A	AEXF	0.5	GB	HST CONTROLLERS 1	85	SP_H185S	X
H185B	AEXF	0.5	GB	LH MOTOR JOINT HARNESS	6	SP_H185S	X
H185C	AEXF	0.5	GB	RH MOTOR JOINT HARNESS	6	SP_H185S	X
H219A	AEXF	0.5	YR	HST CONTROLLERS 2	19	CABIN HARNESS	50
H224A	AEXF	0.5	BrL	HST CONTROLLERS 2	24	LH TRAVEL FORWARD SENSOR	2
H226A	AEXF	0.5	YL	HST CONTROLLERS 2	26	CABIN HARNESS	51
H232A	AEXF	0.5	RL	HST CONTROLLERS 2	32	SP_H232S	X
H232B	AEXF	0.5	RL	LH MOTOR JOINT HARNESS	1	SP_H232S	X
H232C	AEXF	0.5	RL	RH MOTOR JOINT HARNESS	1	SP_H232S	X
H235A	AEXF	0.5	LR	HST CONTROLLERS 2	35	RH TRAVEL REVERSE SENSOR	2
H238A	AEXF	0.5	GB	HST CONTROLLERS 2	38	SP_H238S	X
H238B	AEXF	0.5	GB	CABIN HARNESS	52	SP_H238S	X
H255A	AEXF	0.5	G	HST CONTROLLERS 2	55	SP_H255S	X
H255B	AEXF	0.5	G	CABIN HARNESS	53	SP_H255S	X
H255C	AEXF	0.85	G	RH TRAVEL FORWARD SENSOR	1	SP_H255S	X
H255D	AEXF	0.85	G	RH TRAVEL REVERSE SENSOR	1	SP_H255S	X
H255E	AEXF	0.85	G	LH TRAVEL FORWARD SENSOR	1	SP_H255S	X
H255F	AEXF	0.85	G	LH TRAVEL REVERSE SENSOR	1	SP_H255S	X
V111A	AEXF	0.5	RY	EPOS 1	11	CAC FAN	3
V112A	AEXF	0.85	WG	EPOS 1	12	CABIN HARNESS	56
V114A	AEXF	0.5	RB	EPOS 1	14	RETURN FILTER SWITCH	1
V116A	AEXF	0.5	OrR	EPOS 1	16	AIRCON JOINT HARNESS B	2
V122A	AEXF	0.5	BY	EPOS 1	22	WIF SENSOR	3
V142A	AEXF	0.5	WY	EPOS 1	42	SP_V142S	X
V142B	AEXF	0.5	WY	PARKING BRAKE PRESSURE SENSOR	2	SP_V142S	X
V142C	AEXF	0.5	WY	CABIN HARNESS	59	SP_V142S	X
V142D	AEXF	0.5	WY	LS PRESSURE SENSOR	1	SP_V142S	X
V143A	AEXF	0.5	LgB	EPOS 1	43	SP_V143S	X
V143B	AEXF	0.5	LgB	PARKING BRAKE PRESSURE SENSOR	1	SP_V143S	X
V143C	AEXF	0.5	LgB	CABIN HARNESS	61	SP_V143S	X
V143D	AEXF	0.5	LgB	LS PRESSURE SENSOR	3	SP_V143S	X
V144A	AEXF	0.5	LB	EPOS 1	44	SP_V144S	X
V144B	AEXF	0.85	LB	FUEL TEMP SENSOR	2	SP_V144S	X
V144C	AEXF	0.85	LB	HYDRAULIC TEMP SENSOR	1	SP_V144S	X
V144D	AEXF	0.85	LB	CABIN HARNESS	57	SP_V144S	X
V153A	AEXF	0.85	GW	EPOS 1	53	HYDRAULIC TEMP SENSOR	2
V154A	AEXF	0.5	Br	EPOS 1	54	WIF SENSOR	2
V165A	AEXF	0.5	BrR	EPOS 1	65	CABIN HARNESS	62
V167A	AEXF	0.5	BL	EPOS 1	67	SP_V167S	X
V167B	AEXF	0.5	BL	PARKING BRAKE PRESSURE SENSOR	3	SP_V167S	X
V171A	AEXF	0.5	GY	EPOS 1	71	CABIN HARNESS	64
V175A	AEXF	0.85	LgR	EPOS 1	75	FUEL TEMP SENSOR	1
V176A	AEXF	0.85	Or	EPOS 1	76	CABIN HARNESS	58
V177A	AEXF	0.5	BW	EPOS 1	77	DUST INDICATOR	2
V189A	AEXF	0.5	BrW	EPOS 1	89	SP_V189S	X
V189B	AEXF	0.5	BrW	LS PRESSURE SENSOR	2	SP_V189S	X

NO.	CHANGE NO	DESCRIPTION
X22	C111340	Plot Change

DS2300573

Main Harness(4/4)

WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
V192A	AEXF	0.5	LR	EPOS 1	92	SP_V192S	X
V192B	AEXF	0.5	LR	CABIN HARNESS	63	SP_V192S	X
V193A	AEXF	0.5	RL	EPOS 1	93	SP_V193S	X
V193B	AEXF	0.5	RL	ENGINE HARNESS 4	5	SP_V193S	X
V193C	AEXF	0.5	RL	CABIN HARNESS	67	SP_V193S	X
V201A	AEXF	0.5	GR	EPOS 2	1		1
V203A	AEXF	0.85	RY	EPOS 2	3	CABIN HARNESS	68
V204A	AEXF	0.5	GW	EPOS 2	4	P/V BLADE TILT LEFT	1
V205A	AEXF	0.85	LB	EPOS 2	5	P/V BLADE TILT RIGHT	69
V206A	AEXF	0.5	WY	EPOS 2	6	SP_V206S	X
V206B	AEXF	0.5	WY	ENGINE HARNESS 4	3	SP_V206S	X
V206C	AEXF	0.5	WY	CABIN HARNESS	70	SP_V206S	X
V211A	AEXF	0.5	Or	EPOS 2	11	CABIN HARNESS	71
V213A	AEXF	0.5	WB	EPOS 2	13	CABIN HARNESS	73
V214A	AEXF	0.5	LgW	EPOS 2	14	CABIN HARNESS	74
V215A	AEXF	0.5	GW	EPOS 2	15	CABIN HARNESS	75
V216A	AEXF	0.85	G	EPOS 2	16	CABIN HARNESS	76
V217A	AEXF	0.5	GY	EPOS 2	17	P/V BLADE RAISE	1
V218A	AEXF	0.5	GL	EPOS 2	18	P/V BLADE DOWN	1
V219A	AEXF	0.5	Y	EPOS 2	19	P/V BLADE ANGLE RIGHT	1
V220A	AEXF	0.85	LG	EPOS 2	20	CABIN HARNESS	77
V229A	AEXF	0.5	Lg	EPOS 2	29	CABIN HARNESS	78
V230A	AEXF	0.5	GL	EPOS 2	30	CABIN HARNESS	79
V231A	AEXF	0.5	R	EPOS 2	31	P/V BLADE ANGLE LEFT	1
V232A	AEXF	0.5	G	EPOS 2	32	P/V COOLING FAN	1
V233A	AEXF	0.5	OrL	EPOS 2	33	SP_V233S	X
V233B	AEXF	0.5	OrL	AIRCON FAN RESISTOR	2	SP_V233S	X
V233C	AEXF	0.5	OrL	AIRCON JOINT HARNESS B	1	SP_V233S	X
V234A	AEXF	0.5	Or	EPOS 2	34	P/V RIPPER UP	1
V235A	AEXF	0.5	P	EPOS 2	35	P/V RIPPER DOWN	1
V236A	AEXF	0.85	Br	EPOS 2	36	SP_V236S	X
V236B	AEXF	0.5	Br	P/V BLADE DOWN	2	SP_V236S	X
V236C	AEXF	0.5	Br	P/V BLADE RAISE	2	SP_V236S	X
V236D	AEXF	0.5	Br	CAC FAN RESISTOR	4	SP_V236S	X
V236E	AEXF	0.5	Br	AIRCON FAN RESISTOR	4	SP_V236S	X
V237A	AEXF	0.85	Gr	EPOS 2	37	SP_V237S	X
V237B	AEXF	0.5	Gr	P/V BLADE ANGLE LEFT	2	SP_V237S	X
V237C	AEXF	0.5	Gr	P/V BLADE ANGLE RIGHT	2	SP_V237S	X
V238A	AEXF	0.85	GB	EPOS 2	38	SP_V238S	X
V238B	AEXF	0.5	GB	P/V BLADE TILT RIGHT	2	SP_V238S	X
V238C	AEXF	0.5	GB	P/V BLADE TILT LEFT	2	SP_V238S	X
V238D	AEXF	0.5	GB	P/V COOLING FAN	2	SP_V238S	X
V239A	AEXF	0.5	BW	EPOS 2	39	SP_V239S	X
V239B	AEXF	0.5	BW	P/V RIPPER DOWN	2	SP_V239S	X
V239C	AEXF	0.5	BW	P/V RIPPER UP	2	SP_V239S	X
V242A	AEXF	0.5	BL	EPOS 2	42	CABIN HARNESS	81
V244A	AEXF	0.5	W	EPOS 2	44	SP_V244S	X
V244B	AEXF	0.5	W	DIODE ARRAY 3	6	SP_V244S	X
V244C	AEXF	0.5	W	PARKING RELEASE	1	SP_V244S	X
V245A	AEXF	0.5	RG	EPOS 2	45	RELAY JOINT 2	6
V246A	AEXF	0.85	L	EPOS 2	46	SP_V246S	X
V246B	AEXF	0.5	L	DIODE ARRAY 3	7	SP_V246S	X
V246C	AEXF	0.5	L	HST CUT OFF LH	1	SP_V246S	X
V247A	AEXF	0.85	RL	EPOS 2	47	SP_V247S	X
V247B	AEXF	0.5	RL	DIODE ARRAY 3	8	SP_V247S	X
V247C	AEXF	0.5	RL	HST CUT OFF RH	1	SP_V247S	X
V248A	AEXF	0.5	OrW	EPOS 2	48	CABIN HARNESS	82
V249A	AEXF	0.5	RW	EPOS 2	49	SP_V249S	X
V249B	AEXF	0.5	RW	CAC FAN RESISTOR	2	SP_V249S	X
V249C	AEXF	0.5	RW	CAC FAN	4	SP_V249S	X
V251A	AEXF	0.5	WG	EPOS 2	51	RELAY JOINT 2	8
V252A	AEXF	0.85	GrR	EPOS 2	52	SP_V252S	X
V252B	AEXF	0.5	GrR	DIODE ARRAY 3	5	SP_V252S	X
V252C	AEXF	0.5	GrR	HYD CUT OFF	1	SP_V252S	X
V253A	AEXF	0.5	WL	EPOS 2	53	CABIN HARNESS	88
V256A	AEXF	0.85	Br	EPOS 2	56	CABIN HARNESS	83
V257A	AEXF	0.85	V	EPOS 2	57	CABIN HARNESS	84
V258A	AEXF	0.85	YR	EPOS 2	58	CABIN HARNESS	85
V259A	AEXF	0.85	YW	EPOS 2	59	SP_V259S	X
V259B	AEXF	0.5	YW	DIODE 4	2	SP_V259S	X
V259C	AEXF	0.5	YW	REVERSE FAN	1	SP_V259S	X
V260A	AEXF	0.5	WY	EPOS 2	60	RELAY JOINT 2	9

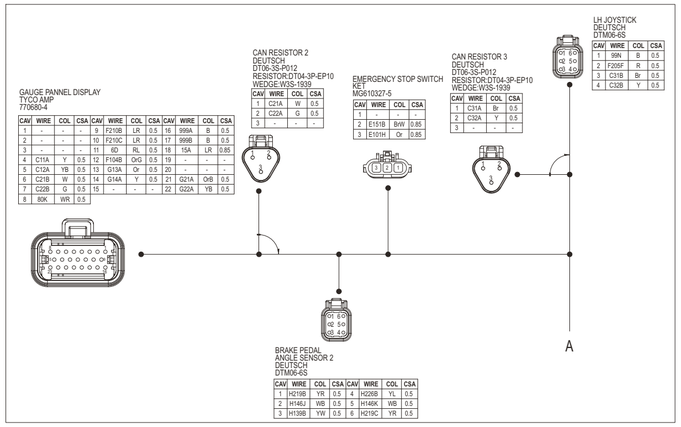
WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
99A	AEXF	8	B	FRAME EARTH 1	1	SP_99S	X
99B	AEXF	5	B	EQUALIZER	1	SP_99S1	X
99C	AEXF	1.25	B	SURGE KILLER	1	SP_99S1	X
99D	AEXF	5	B	SP_99S1	X	SP_99S	X
99E	AEXF	3	B	FUEL HEATER 1	1	SP_99S	X
99F	AEXF	3	B	FUEL HEATER 2	1	SP_99S	X
99G	AEXF	1.25	B	RELAY JOINT 2	10	SP_99S1	X
99H	AEXF	1.25	B	RELAY JOINT 2	11	SP_99S1	X
99P	AEXF	0.85	B	LEFT WIPER MOTOR	4	SP_99S3	X
99Q	AEXF	0.5	B	BACK BUZZER	2	SP_99S3	X
99R	AEXF	0.5	B	DIODE	1	SP_99S3	X
99V	AEXF	0.85	B	SIDE WINDOW WASHER (F)	2	SP_99S5	X
99W	AEXF	0.85	B	SIDE WINDOW WASHER (R)	2	SP_99S5	X
99X	AEXF	0.85	B	FRONT WINDOW WASHER	2	SP_99S5	X
99Y	AEXF	0.85	B	REAR WINDOW WASHER	2	SP_99S6	X
99Z	AEXF	2	B	BATTERY HARNESS 1	6	SP_99S6	X
99AA	AEXF	0.85	B	DIODE ARRAY 1	1	SP_99S5	X
99AB	AEXF	0.85	B	DIODE ARRAY 1	2	SP_99S5	X
99AC	AEXF	0.85	B	DIODE ARRAY 1	3	SP_99S5	X
99AD	AEXF	0.85	B	DIODE ARRAY 1	4	SP_99S6	X
99AE	AEXF	0.5	B	REVERSE FAN	2	SP_99S7	X
99AF	AEXF	0.5	B	DIODE 4	1	SP_99S7	X
99AG	AEXF	0.5	B	IMU SENSOR JOINT HARNESS 1	2	SP_99S7	X
99AL	AEXF	0.5	B	DUST INDICATOR	1	SP_99SB	X
99AM	AEXF	0.5	B	E-FEED PUMP	2	SP_99SB	X
99AN	AEXF	0.85	B	HORN 1	2	SP_99SB	X
99AP	AEXF	0.85	B	HORN 2	2	SP_99SB	X
99AV	AEXF	0.5	B	IMU SENSOR JOINT HARNESS 2	2	SP_99SB	X
99AQ	AEXF	3	B	CABIN HARNESS	101	SP_99SE	X
99AR	AEXF	3	B	CABIN HARNESS	102	SP_99SE	X
99AS	AEXF	5	B	AIRCON JOINT HARNESS A	2	SP_99SE	X
99AU	AEXF	0.85	B	TRIMBLE READY	2	SP_99SE	X
99AT	AEXF	5	B	SP_99SC	X	SP_99SE	X
99BA	AEXF	5	B	FRAME EARTH 2	1	SP_99SC	X
99BC	AEXF	0.5	B	RETURN FILTER SWITCH	2	SP_99SC	X
99BJ	AEXF	5	B	CAC FAN	2	SP_99SD	X
99BL	AEXF	0.5	B	ENGINE HARNESS 7	2	SP_99SD	X
99BE	AEXF	0.5	B	HYD CUT OFF	2	SP_99SE	X
99BF	AEXF	0.5	B	PARKING RELEASE	2	SP_99SE	X
99BG	AEXF	0.5	B	DIODE ARRAY 3	1	SP_99SE	X
99BH	AEXF	0.5	B	DIODE ARRAY 3	2	SP_99SE	X
99BK	AEXF	2	B	UREA TANK	2	SP_99SE	X
99BD	AEXF	0.85	B	RIGHT WIPER MOTOR	4	SP_99SF	X
99BM	AEXF	0.5	B	HST CUT OFF LH	2	SP_99SF	X
99BN	AEXF	0.5	B	HST CUT OFF RH	2	SP_99SF	X
99BP	AEXF	0.5	B	DIODE ARRAY 3	3	SP_99SF	X
99BQ	AEXF	0.5	B	DIODE ARRAY 3	4	SP_99SF	X
99BR	AEXF	0.85	B	FUEL FULL LED LAMP	2	SP_99SF	X
99ZL	AEXF	5	B	SP_99SC	X	SP_99SD	X
99ZM	AEXF	3	B	SP_99SC	X	SP_99SE	X
99ZN	AEXF	3	B	SP_99SC	X	SP_99SF	X
999A	AEXF	2	B	CABIN HARNESS	100	SP_999S2	X
999B	AEXF	0.85	B	EPOS 1	1	SP_999S1	X
999C	AEXF	0.85	B	EPOS 1	2	SP_999S1	X
999D	AEXF	0.85	B	EPOS 1	3	SP_999S1	X
999E	AEXF	0.85	B	EPOS 1	72	SP_999S2	X
999F	AEXF	0.85	B	EPOS 1	94	SP_999S2	X
999G	AEXF	0.85	B	HST CONTROLLERS 1	14	SP_999S3	X
999H	AEXF	0.85	B	HST CONTROLLERS 1	22	SP_999S3	X
999I	AEXF	0.85	B	HST CONTROLLERS 1	23	SP_999S3	X
999J	AEXF	0.85	B	HST CONTROLLERS 1	24	SP_999S3	X
999K	AEXF	0.85	B	HST CONTROLLERS 2	2	SP_999S3	X
999L	AEXF	0.85	B	HST CONTROLLERS 2	7	SP_999S3	X
999M	AEXF	0.85	B	HST CONTROLLERS 2	20	SP_999S3	X
999N	AEXF	0.85	B	HST CONTROLLERS 2	33	SP_999S3	X
999O	AEXF	0.85	B	HST CONTROLLERS 2	46	SP_999S3	X
999P	AEXF	5	B	FRAME EARTH 3	1	SP_999S	X
999Q	AESSXF	1.25	B	ECU 1	2	SP_999S	X
999R	AESSXF	1.25	B	ECU 1	4	SP_999S	X
999S	AESSXF	1.25	B	ECU 1	6	SP_999S	X

WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
99ZA	AEXF	2	B	JOINT CONNECTOR A	1	SP_99S	X
99ZB	AEXF	2	B	JOINT CONNECTOR A	8	SP_99S	X
99ZD	AEXF	1.25	B	JOINT CONNECTOR A	3	SP_99S3	X
99ZF	AEXF	2	B	JOINT CONNECTOR A	5	SP_99S5	X
99ZG	AEXF	1.25	B	JOINT CONNECTOR A	6	SP_99S6	X
99ZH	AEXF	1.25	B	JOINT CONNECTOR A	7	SP_99S7	X
99ZK	AEXF	1.25	B	JOINT CONNECTOR A	10	SP_99SB	X

WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
999ZA	AEXF	2	B	JOINT CONNECTOR B	1	SP_999S	X
999ZB	AEXF	2	B	JOINT CONNECTOR B	4	SP_999S	X
999ZC	AEXF	2	B	JOINT CONNECTOR B	2	SP_999S1	X
999ZD	AEXF	2	B	JOINT CONNECTOR B	3	SP_999S2	X
999ZE	AEXF	2	B	JOINT CONNECTOR B	5	SP_999S3	X

NO.	CHANGE NO	DESCRIPTION
00	C111340	Pilot Change

DS2300574



CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	-	-	-	9	F210B	LR	0.5	16	999A	B	0.5
2	-	-	-	10	F210C	LR	0.5	17	999B	B	0.5
3	-	-	-	11	6D	RL	0.5	18	15A	LR	0.85
4	C11A	Y	0.5	12	F104B	O/G	0.5	19	-	-	-
5	C12A	Y/B	0.5	13	G13A	Or	0.5	20	-	-	-
6	C21B	W	0.5	14	G14A	Y	0.5	21	G21A	O/B	0.5
7	C22B	G	0.5	15	-	-	-	22	G22A	Y/B	0.5
8	80K	W/R	0.5								

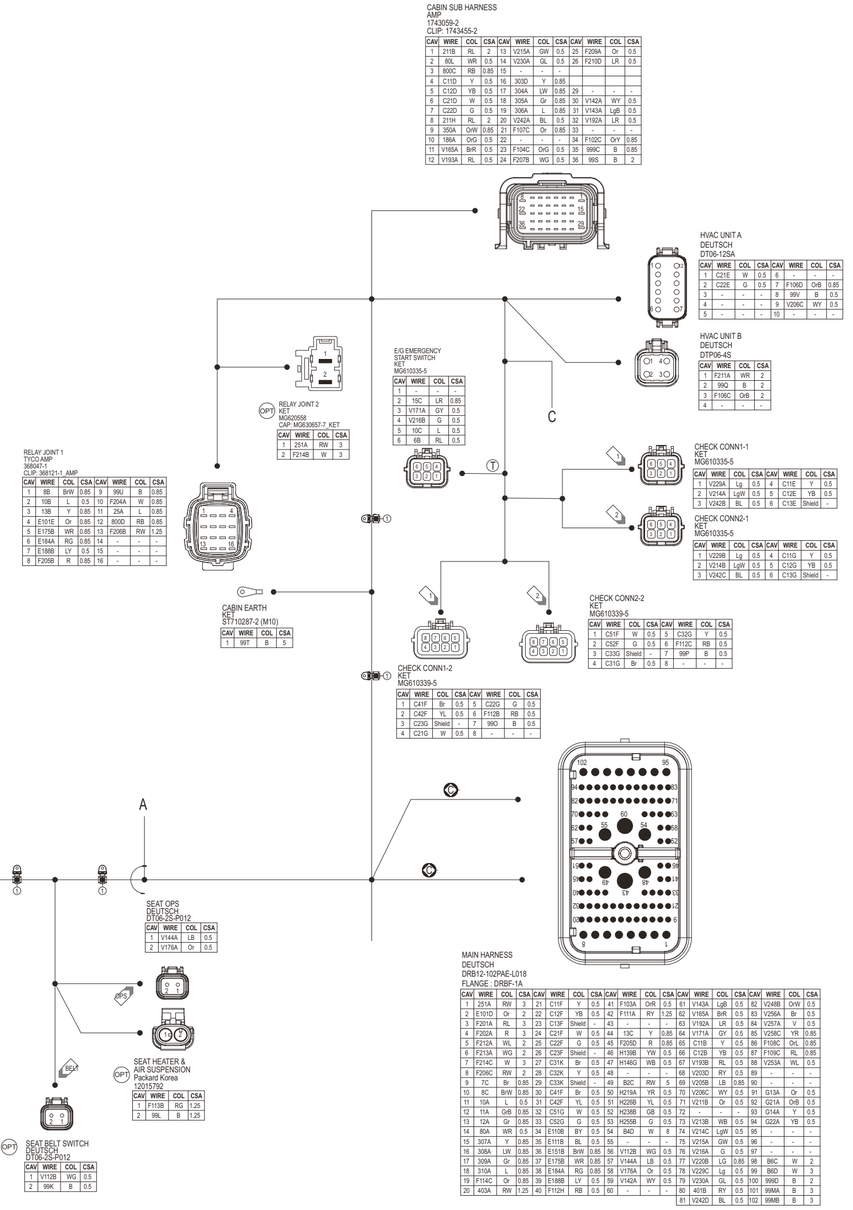
CAV	WIRE	COL	CSA
1	C27A	W	0.5
2	C22A	G	0.5
3	-	-	-

CAV	WIRE	COL	CSA
1	-	-	-
2	E151B	B/W	0.85
3	E101H	Or	0.85

CAV	WIRE	COL	CSA
1	C31A	Br	0.5
2	C32A	Y	0.5
3	-	-	-

CAV	WIRE	COL	CSA
1	99N	B	0.5
2	F205F	R	0.5
3	C31B	Br	0.5
4	C32B	Y	0.5

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	H219B	YR	0.5	4	H326B	YL	0.5
2	H146J	WB	0.5	5	H146K	WB	0.5
3	H139B	YW	0.5	6	H219C	YR	0.5



CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	21TB	RL	2	13	V215A	GW	0.5	25	F209A	Or	0.5
2	80L	WR	0.5	14	V230A	GL	0.5	26	F210D	LR	0.5
3	800C	RB	0.85	15	-	-	-				
4	C11D	Y	0.5	16	303D	Y	0.85				
5	C12D	Y/B	0.5	17	304A	LW	0.85	29	-	-	-
6	C21D	W	0.5	18	305A	Gr	0.85	30	V142A	WY	0.5
7	C22D	G	0.5	19	306A	L	0.85	31	V143A	Lg/B	0.5
8	21TH	RL	2	20	V242A	BL	0.5	32	V182A	LR	0.5
9	350A	O/W	0.85	21	F107C	Or	0.85	33	-	-	-
10	186A	O/G	0.5	22	-	-	-	34	F102C	O/Y	0.85
11	V185A	B/R	0.5	23	F104C	O/G	0.5	35	999C	B	0.85
12	V193A	RL	0.5	24	F207B	WG	0.5	36	99S	B	2

CAV	WIRE	COL	CSA
1	C21E	W	0.5
2	C22E	G	0.5
3	-	-	-
4	-	-	-
5	-	-	-

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
6	-	-	-	-	-	-	-
7	F106D	O/B	0.85	-	-	-	-
8	99V	B	0.5	-	-	-	-
9	V226C	W/Y	0.5	-	-	-	-
10	-	-	-	-	-	-	-

CAV	WIRE	COL	CSA
1	F211A	W/R	2
2	99Q	B	2
3	F106C	O/B	2
4	-	-	-

CAV	WIRE	COL	CSA
1	-	-	-
2	15C	LR	0.85
3	V171A	G/Y	0.5
4	V216B	G	0.5
5	10C	L	0.5
6	6B	R/L	0.5

CAV	WIRE	COL	CSA
1	251A	R/W	3
2	15C	LR	0.85
3	F106C	O/B	2

CAV	WIRE	COL	CSA
1	251A	R/W	3
2	15C	LR	0.85
3	V171A	G/Y	0.5
4	V216B	G	0.5
5	10C	L	0.5
6	6B	R/L	0.5

CAV	WIRE	COL	CSA
1	V229A	Lg	0.5
2	V214A	Lg/W	0.5
3	V242B	BL	0.5

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
4	C11E	Y	0.5				
5	C12E	Y/B	0.5	6	C13E	Shield	-

CAV	WIRE	COL	CSA
1	V229B	Lg	0.5
2	V214B	Lg/W	0.5
3	V242C	BL	0.5

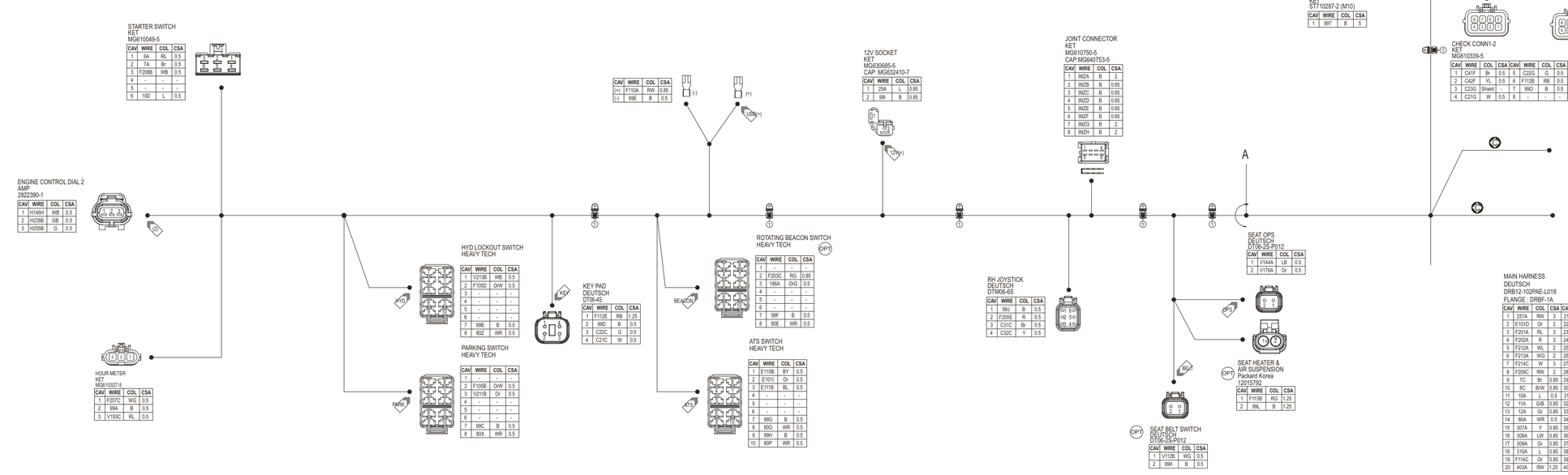
CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
4	C11G	Y	0.5				
5	C12G	Y/B	0.5	6	C13G	Shield	-

CAV	WIRE	COL	CSA
1	C31F	W	0.5
2	C32F	G	0.5
3	C33G	Shield	-
4	C31G	Br	0.5

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
5	C32G	Y	0.5				
6	F112C	R/B	0.5				
7	99P	B	0.5				
8	-	-	-				

CAV	WIRE	COL	CSA
1	C41F	Br	0.5
2	C42F	Y/L	0.5
3	C23G	Shield	-
4	C21G	W	0.5

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
5	C22G	G	0.5				
6	F112B	R/B	0.5				
7	99O	B	0.5				
8	-	-	-				



CAV	WIRE	COL	CSA
1	6A	R/L	0.5
2	7A	Br	0.5
3	F208B	W/B	0.5
4	-	-	-
5	-	-	-
6	10D	L	0.5

CAV	WIRE	COL	CSA
1	H146H	W/B	0.5
2	H238B	G/B	0.5
3	H255B	G	0.5

CAV	WIRE	COL	CSA
1	F207C	W/G	0.5
2	99A	B	0.5
3	V193C	R/L	0.5

CAV	WIRE	COL	CSA
1	V213B	W/B	0.5
2	F105O	O/W	0.5
3	-	-	-
4	-	-	-
5	-	-	-
6	-	-	-
7	99B	B	0.5
8	80Z	W/R	0.5

CAV	WIRE	COL	CSA
1	-	-	-
2	F105B	O/W	0.5
3	V211B	Or	0.5
4	-	-	-
5	-	-	-
6	-	-	-
7	99C	B	0.5
8	80A	W/R	0.5

CAV	WIRE	COL	CSA
(+)	F110A	R/W	0.85
(-)	99E	B	0.5

CAV	WIRE	COL	CSA
1	F112E	R/B	1.25
2	99D	B	0.5
3	C22C	G	0.5
4	C21C	W	0.5

CAV	WIRE	COL	CSA
1	-	-	-
2	F203C	R/G	0.85
3	186A	O/G	0.5
4	-	-	-
5	-	-	-
6	-	-	-
7	99F	B	0.5
8	80E	W/R	0.5

CAV	WIRE	COL	CSA
1	E110B	BY	0.5
2	E101I	Or	0.5
3	E111B	BL	0.5
4	-	-	-
5	-	-	-
6	-	-	-
7	99G	B	0.5
8	80O	W/R	0.5
9	99H	B	0.5
10	80P	W/R	0.5

CAV	WIRE	COL	CSA
1	8A	B/W	0.85
2	10B	L	0.5
3	10B	Y	0.85
4	E101E	Or	0.85
5	E175B	W/R	0.85
6	E184A	R/G	0.85
7	E188B	L/Y	0.5
8	F205B	R	0.85

CAV	WIRE	COL	CSA
9	99U	B	0.85
10	E111B	BL	0.5
11	25A	L	0.85
12	800D	R/B	0.85
13	F206B	R/W	1.25
14	-	-	-
15	-	-	-
16	-	-	-

CAV	WIRE	COL	CSA
1	99A	B	0.5
2	99K	B	0.5

CAV	WIRE	COL	CSA
1	25A	L	0.85
2	99I	B	0.85

CAV	WIRE	COL	CSA
1	99ZA	B	2
2	99ZB	B	0.85
3	99ZC	B	0.85
4	99ZD	B	0.85
5	99ZE	B	0.85
6	99ZF	B	0.85
7	99ZG	B	2
8	99ZH	B	2

CAV	WIRE	COL	CSA
1	99J	B	0.5
2	F205E	R	0.5
3	C31C	Br	0.5
4	C32C	Y	0.5

CAV	WIRE	COL	CSA
1	V144A	LR	0.5
2	V176A	Or	0.5

CAV	WIRE	COL	CSA
1	F113B	R/G	1.25
2	99L	B	1.25

CAV	WIRE	COL	CSA
1	V112B	W/G	0.5
2	99K	B	0.5

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
1	251A	R/W	3	21	C11F	Y	0.5	41	F103A	O/R	0.5
2	E101D	Or	2	22	C12F	Y/B	0.5	42	F111A	R/Y	1.25
3	F201A	R/L	3	23	C13F	Shield	-	43	-	-	-
4	F202A	R	3	24	C21F	W	0.5	44	13C	Y	0.85
5	F212A	W/L	2	25	C22F	G	0.5	45	F205D	R	0.85
6	F213A	W/G	2	26	C23F	Shield	-	46	H139B	Y/W	0.5
7	F214C	W	3	27	C31K	Br	0.5	47	H146G	W/B	0.5
8	F206C	R/W	2	28	C32K	Y	0.5	48	-	-	-
9	7C	Br	0.85	29	C33K	Shield	-	49	B2C	R/W	5
10	8C	B/W	0.85	30	C41F	Br	0.5	50	H219A	Y/R	0.5
11	10A	L	0.5	31	C42F	Y/L	0.5	51	H226B	Y/L	0.5
12	11A	G/B	0.85	32	C51G	W	0.5	52	H238B	G/B	0.5
13	12A	Gr	0.85	33	C52G	G	0.5	53	H255B	G	0.5
14	80A	W/R	0.5	34	E101B	B/Y	0.5	54	84D	W	8
15	307A	Y	0.85	35	E111B	BL	0.5	55	-	-	-
16	308A	LW	0.85	36	E151B	B/W	0.85	56	V112B	W/G	0.5
17	309A	Gr	0.85	37	E175B	W/R	0.85	57	V144A	LB	0.5
18	310A	L	0.85	38	E184A	R/G	0.85	58	V176A	Or	0.5
19	F114C	Or	0.85	39	E188B	L/Y	0.5	59	V142A	WY	0.5
20	403A	R/W	1.25	40	F112H	R/B	0.5	60	-	-	-

CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA	CAV	WIRE	COL	CSA
61	V143A	Lg/B	0.5	82	V248B	O/W	0.5				
62	V165A	B/R	0.5	83	V256A	Br	0.5				
63	V192A	LR	0.5	84	V257A	V	0.5				
64	V171A	G/Y	0.5	85	V258C	Y/B	0.85				
65	C11B	Y	0.5	86	F108C	O/L	0.85				
66	C12B	Y/B	0.5	87	F109C	R/L	0.85				
67	V193B	R/L	0.5	88	V253A	W/L	0.5				
68	V203D	R/Y	0.5	89	-	-	-				
69	V205B	LB	0.85	90	-	-	-				
70	V206C	W/Y	0.5	91	G13A	Or	0.5				
71	V211B	Or	0.5	92	G21A	O/B	0.5				
72	-	-	-	93	G14A	Y	0.5				
73	V213B	W/B	0.5	94	G22A	Y/B	0.5				
74	V214C	Lg/W	0.5	95	-	-	-				
75	V215A	G/W	0.5	96	-	-	-				
76	V216A	G	0.5	97	-	-	-				
77	V220B	LG	0.85	98	B6C	W	2				
78	V229C	Lg	0.5	99	B6D	W	3				
79	V230A	GL	0.5	100	999D	B	2				
80	401B	R/Y	0.5	101	999AA	B	3				
81	V242D	BL	0.5	102	999AB	B	3				

DS2201509

Cabin Wire Harness (2/2)

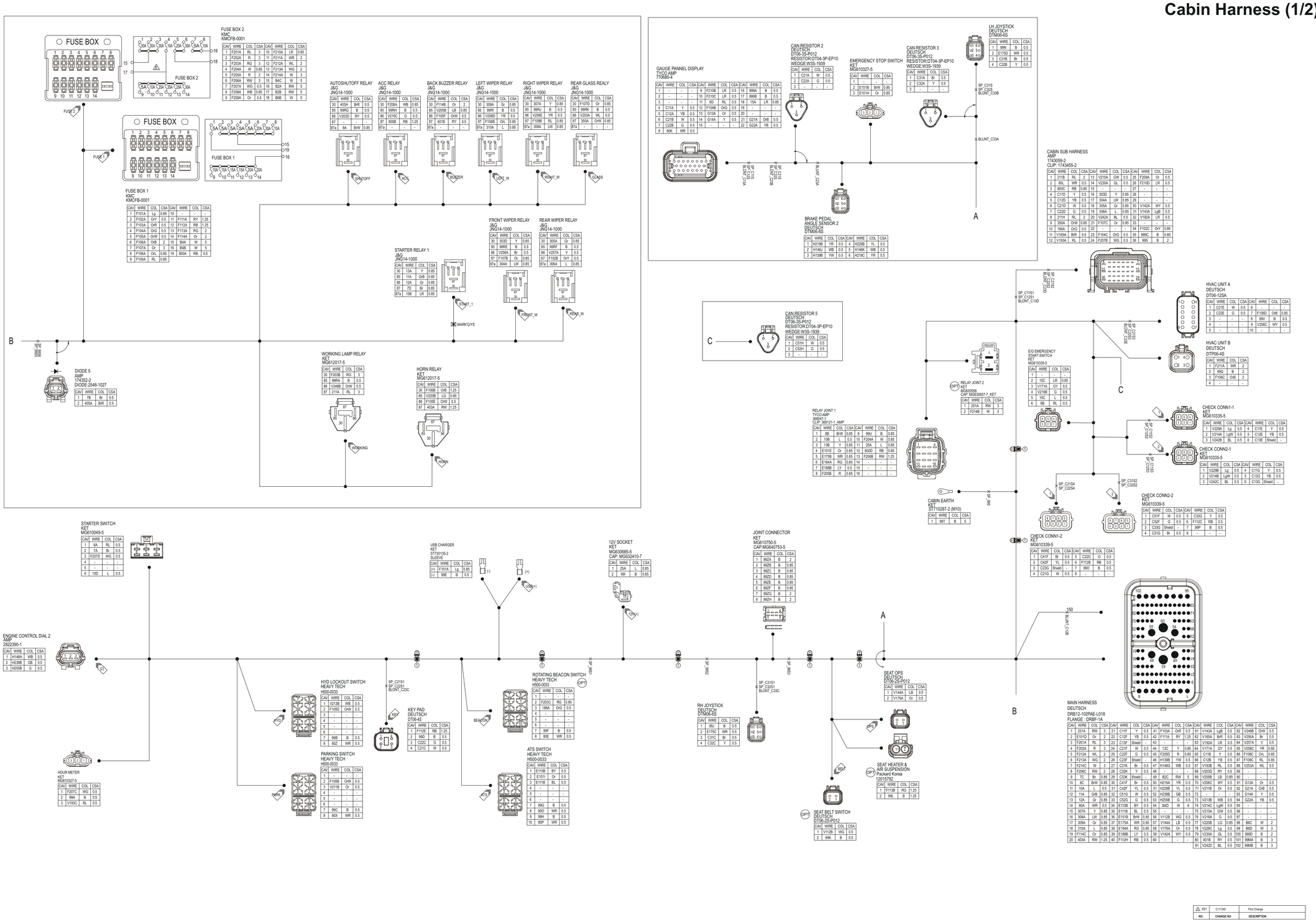
WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
6A		AVSS	0.5	RL	STARTER SWITCH	1		SP_6S	X	
6B		AVSS	0.5	RL	EMERGENCY STARTING SWITCH	6		SP_6S	X	
6D		AVSS	0.5	RL	GP DISPLAY	11		SP_6S	X	
7A		AVSS	0.5	Br	STARTER SWITCH	2		SP_7S	X	
7B		AVSS	0.5	Br	DIODE 5	1		SP_7S	X	
7C		AVSS	0.85	Br	MAIN HARNESS	9		SP_7S	X	
7D		AVSS	0.85	Br	STARTER RELAY 1	87		SP_7S	X	
8A		AVSS	0.85	BrW	AUTOSHUTOFF RELAY	87a		SP_8S	X	
8B		AVSS	0.85	BrW	RELAY JOINT 1	1		SP_8S	X	
8C		AVSS	0.85	BrW	MAIN HARNESS	10		SP_8S	X	
10A		AVSS	0.5	L	MAIN HARNESS	11		SP_10S	X	
10B		AVSS	0.5	L	RELAY JOINT 1	2		SP_10S	X	
10C		AVSS	0.5	L	EMERGENCY STARTING SWITCH	5		SP_10S	X	
10D		AVSS	0.5	L	STARTER SWITCH	6		SP_10S	X	
11A		AVSS	0.85	GrB	STARTER RELAY 1	85		MAIN HARNESS	12	
12A		AVSS	0.85	Gr	STARTER RELAY 1	86		MAIN HARNESS	13	
13A		AVSS	0.85	Y	STARTER RELAY 1	30		SP_13S	X	
13B		AVSS	0.85	Y	RELAY JOINT 1	3		SP_13S	X	
13C		AVSS	0.85	Y	MAIN HARNESS	44		SP_13S	X	
15A		AVSS	0.85	LR	GP DISPLAY	18		SP_15S	X	
15B		AVSS	0.85	LR	STARTER RELAY 1	87a		SP_15S	X	
15C		AVSS	0.85	LR	EMERGENCY STARTING SWITCH	2		SP_15S	X	
25A		AVSS	0.85	L	12V SOCKET	1		RELAY JOINT 1	11	
80A		AVSS	0.5	WR	MAIN HARNESS	14		SP_80S	X	
80E		AVSS	0.5	WR	ROTATING BEACON SWITCH	8		SP_80S	X	
80K		AVSS	0.5	WR	GP DISPLAY	8		SP_80S	X	
80L		AVSS	0.5	WR	CABIN SUB HARNESS	2		SP_80S	X	
80O		AVSS	0.5	WR	ATS SWITCH	8		SP_80S	X	
80P		AVSS	0.5	WR	ATS SWITCH	10		SP_80S	X	
80X		AVSS	0.5	WR	PARKING SWITCH	8		SP_80S	X	
80Z		AVSS	0.5	WR	HYD LOCKOUT SWITCH	8		SP_80S	X	
186A		AVSS	0.5	OrG	ROTATING BEACON SWITCH	3		CABIN SUB HARNESS	10	
211A		AVS	3	RL	WORKING LAMP RELAY	87		SP_211S	X	
211B		AVSS	2	RL	CABIN SUB HARNESS	1		SP_211S	X	
211H		AVSS	2	RL	CABIN SUB HARNESS	8		SP_211S	X	
251A		AVS	3	RW	RELAY JOINT 2	1		MAIN HARNESS	1	
303D		AVSS	0.85	Y	FRONT WIPER RELAY	30		CABIN SUB HARNESS	16	
304A		AVSS	0.85	LW	FRONT WIPER RELAY	87a		CABIN SUB HARNESS	17	
305A		AVSS	0.85	Gr	REAR WIPER RELAY	30		CABIN SUB HARNESS	18	
306A		AVSS	0.85	L	REAR WIPER RELAY	87a		CABIN SUB HARNESS	19	
307A		AVSS	0.85	Y	RIGHT WIPER RELAY	30		MAIN HARNESS	15	
308A		AVSS	0.85	LW	RIGHT WIPER RELAY	87a		MAIN HARNESS	16	
309A		AVSS	0.85	Gr	LEFT WIPER RELAY	30		MAIN HARNESS	17	
310A		AVSS	0.85	L	LEFT WIPER RELAY	87a		MAIN HARNESS	18	
350A		AVSS	0.85	OrW	REAR GLASS REALY	87		CABIN SUB HARNESS	9	
401B		AVSS	0.5	RY	BACK BUZZER RELAY	87		MAIN HARNESS	80	
403A		AVSS	1.25	RW	MAIN HARNESS	20		HORN RELAY	87	
405A		AVSS	0.5	BrR	AUTOSHUTOFF RELAY	30		DIODE 5	2	
800A		AVSS	0.5	RB	FUSE BOX1	19		SP_800S	X	
800B		AVSS	1.25	RB	ACC RELAY	87		SP_800S	X	
800C		AVSS	0.85	RB	CABIN SUB HARNESS	3		SP_800S	X	
800D		AVSS	0.85	RB	RELAY JOINT 1	12		SP_800S	X	
B2A		AVS	5	RW	FUSE BOX2	16		SP_B2S	X	
B2B		AVS	5	RW	FUSE BOX2	17		SP_B2S	X	
B2C		AVS	5	RW	MAIN HARNESS	49		SP_B2S	X	
B4A		AVS	5	W	FUSE BOX1	15		SP_B4S	X	
B4B		AVS	5	W	FUSE BOX1	16		SP_B4S	X	
B4C		AVS	5	W	FUSE BOX2	15		SP_B4S	X	
B4D		AVS	8	W	MAIN HARNESS	54		SP_B4S	X	
B6B		AVS	5	W	FUSE BOX2	18		SP_B6S	X	
B6C		AVSS	2	W	MAIN HARNESS	98		SP_B6S	X	
B6D		AVS	3	W	MAIN HARNESS	99		SP_B6S	X	
C11A		AVSS	0.5	Y	GP DISPLAY	4	SH_01	SP_C11S	X	
C11B		AVSS	0.5	Y	MAIN HARNESS	65	SH_02	SP_C11S	X	
C11D		AVSS	0.5	Y	CABIN SUB HARNESS	4	SH_03	SP_C11S1	X	
C11E		AVSS	0.5	Y	CHECK CONN1-1	4	SH_04	SP_C11S2	X	
C11F		AVSS	0.5	Y	MAIN HARNESS	21	SH_05	SP_C11S3	X	
C11G		AVSS	0.5	Y	CHECK CONN2-1	4	SH_06	SP_C11S3	X	
C11ZA		AVSS	0.5	Y	SP_C11S	X		SP_C11S1	X	
C11ZB		AVSS	0.5	Y	SP_C11S1	X		SP_C11S2	X	
C11ZC		AVSS	0.5	Y	SP_C11S2	X		SP_C11S3	X	
C12A		AVSS	0.5	YB	GP DISPLAY	5	SH_01	SP_C12S	X	
C12B		AVSS	0.5	YB	MAIN HARNESS	66	SH_02	SP_C12S	X	
C12D		AVSS	0.5	YB	CABIN SUB HARNESS	5	SH_03	SP_C12S1	X	
C12E		AVSS	0.5	YB	CHECK CONN1-1	5	SH_04	SP_C12S2	X	
C12F		AVSS	0.5	YB	MAIN HARNESS	22	SH_05	SP_C12S3	X	
C12G		AVSS	0.5	YB	CHECK CONN2-1	5	SH_06	SP_C12S3	X	
C12ZA		AVSS	0.5	YB	SP_C12S	X		SP_C12S1	X	
C12ZB		AVSS	0.5	YB	SP_C12S1	X		SP_C12S2	X	
C12ZC		AVSS	0.5	YB	SP_C12S2	X		SP_C12S3	X	
C13A		AVSS	-	Shield	BLUNT_C13A	X	SH_01	SP_C13S	X	
C13B		AVSS	-	Shield	BLUNT_C13B	X	SH_02	SP_C13S	X	
C13D		AVSS	-	Shield	BLUNT_C13D	X	SH_03	SP_C13S	X	
C13E		AVSS	-	Shield	CHECK CONN1-1	6	SH_04	SP_C13S	X	
C13F		AVSS	-	Shield	MAIN HARNESS	23	SH_05	SP_C13S	X	
C13G		AVSS	-	Shield	CHECK CONN2-1	6	SH_06	SP_C13S	X	
C21A		AVSS	0.5	W	CAN RESISTOR 2	1	SH_07	SP_C21S	X	
C21B		AVSS	0.5	W	GP DISPLAY	6	SH_08	SP_C21S	X	
C21C		AVSS	0.5	W	KEY PAD	4	SH_09	SP_C21S1	X	
C21D		AVSS	0.5	W	CABIN SUB HARNESS	6	SH_10	SP_C21S2	X	
C21E		AVSS	0.5	W	HVAC UNIT A	1	SH_11	SP_C21S3	X	
C21F		AVSS	0.5	W	MAIN HARNESS	24	SH_12	SP_C21S4	X	
C21G		AVSS	0.5	W	CHECK CONN1-2	4	SH_13	SP_C21S4	X	
C21ZA		AVSS	0.5	W	SP_C21S	X		SP_C21S1	X	
C21ZB		AVSS	0.5	W	SP_C21S1	X		SP_C21S2	X	
C21ZC		AVSS	0.5	W	SP_C21S2	X		SP_C21S3	X	
C21ZD		AVSS	0.5	W	SP_C21S3	X		SP_C21S4	X	
C22A		AVSS	0.5	G	CAN RESISTOR 2	2	SH_07	SP_C22S	X	
C22B		AVSS	0.5	G	GP DISPLAY	7	SH_08	SP_C22S	X	
C22C		AVSS	0.5	G	KEY PAD	3	SH_09	SP_C22S1	X	
C22D		AVSS	0.5	G	CABIN SUB HARNESS	7	SH_10	SP_C22S2	X	
C22E		AVSS	0.5	G	HVAC UNIT A	2	SH_11	SP_C22S3	X	
C22F		AVSS	0.5	G	MAIN HARNESS	25	SH_12	SP_C22S4	X	
C22G		AVSS	0.5	G	CHECK CONN1-2	5	SH_13	SP_C22S4	X	
C22ZA		AVSS	0.5	G	SP_C22S	X		SP_C22S1	X	
C22ZB		AVSS	0.5	G	SP_C22S1	X		SP_C22S2	X	
C22ZC		AVSS	0.5	G	SP_C22S2	X		SP_C22S3	X	
C22ZD		AVSS	0.5	G	SP_C22S3	X		SP_C22S4	X	

WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
C23A		AVSS	-	Shield	BLUNT_C23A	X	SH_07	SP_C23S	X	
C23B		AVSS	-	Shield	BLUNT_C23B	X	SH_08	SP_C23S	X	
C23C		AVSS	-	Shield	BLUNT_C23C	X	SH_09	SP_C23S	X	
C23D		AVSS	-	Shield	BLUNT_C23D	X	SH_10	SP_C23S	X	
C23E		AVSS	-	Shield	BLUNT_C23E	X	SH_11	SP_C23S	X	
C23F		AVSS		Shield	MAIN HARNESS	26	SH_12	SP_C23S	X	
C23G		AVSS	-	Shield	CHECK CONN1-2	3	SH_13	SP_C23S	X	
C31A		AVSS	0.5	Br	CAN RESISTOR 3	1	SH_14	SP_C31S	X	
C31B		AVSS	0.5	Br	LH JOYSTICK	3	SH_15	SP_C31S	X	
C31C		AVSS	0.5	Br	RH JOYSTICK	3	SH_16	SP_C31S1	X	
C31G		AVSS	0.5	Br	CHECK CONN2-2	4	SH_17	SP_C31S2	X	
C31K		AVSS	0.5	Br	MAIN HARNESS	27	SH_23	SP_C31S2	X	
C31ZA		AVSS	0.5	Br	SP_C31S	X		SP_C31S1	X	
C31ZB		AVSS	0.5	Br	SP_C31S1	X		SP_C31S2	X	
C32A		AVSS	0.5	Y	CAN RESISTOR 3	2	SH_14	SP_C32S	X	
C32B		AVSS	0.5	Y	LH JOYSTICK	4	SH_15	SP_C32S	X	
C32C		AVSS	0.5	Y	RH JOYSTICK	4	SH_16	SP_C32S1	X	
C32G		AVSS	0.5	Y	CHECK CONN2-2	5	SH_17	SP_C32S2	X	
C32K		AVSS	0.5	Y	MAIN HARNESS	28	SH_23	SP_C32S2	X	
C32ZA		AVSS	0.5	Y	SP_C32S	X		SP_C32S1	X	
C32ZB		AVSS	0.5	Y	SP_C32S1	X		SP_C32S2	X	
C33A		AVSS	-	Shield	BLUNT_C33A	X	SH_14	SP_C33S	X	
C33B		AVSS	-	Shield	BLUNT_C33B	X	SH_15	SP_C33S	X	
C33C		AVSS	-	Shield	BLUNT_C33C	X	SH_16	SP_C33S	X	
C33G		AVSS	-	Shield	CHECK CONN2-2	3	SH_17	SP_C33S	X	
C33K		AVSS	-	Shield	MAIN HARNESS	29	SH_23	SP_C33S	X	
C41F		AVSS	0.5	Br	CHECK CONN1-2	1	SH_18	MAIN HARNESS	30	
C42F		AVSS	0.5	YL	CHECK CONN1-2	2	SH_18	MAIN HARNESS	31	
C51F		AVSS	0.5	W	CHECK CONN2-2	1	SH_19	SP_C51S	X	
C51G		AVSS	0.5	W	MAIN HARNESS	32	SH_21	SP_C51S	X	
C51H		AVSS	0.5	W	CAN RESISTOR 5	1	SH_22	SP_C51S	X	
C52F		AVSS	0.5	G	CHECK CONN2-2	2	SH_19	SP_C52S	X	
C52G		AVSS	0.5	G	MAIN HARNESS	33	SH_21	SP_C52S	X	
C52H		AVSS	0.5	G	CAN RESISTOR 5	2	SH_22	SP_C52S	X	
E101D		AVSS	2	Or	MAIN HARNESS	2		SP_E101S	X	
E101E		AVSS	0.85	Or	RELAY JOINT 1	4		SP_E101S	X	
E101H		AVSS	0.85	Or	EMERGENCY STOP SWITCH	3		SP_E101S	X	
E101I		AVSS	0.5	Or	ATS SWITCH	2		SP_E101S	X	
E110B		AVSS	0.5	BY	ATS SWITCH	1		MAIN HARNESS	34	
E111B		AVSS	0.5	BL	ATS SWITCH	3		MAIN HARNESS	35	
E151B		AVSS	0.85	BrW	EMERGENCY STOP SWITCH	2		MAIN HARNESS	36	
E175B		AVSS	0.85	WR	RELAY JOINT 1	5		MAIN HARNESS	37	
E184A		AVSS	0.85	RG	RELAY JOINT 1	6		MAIN HARNESS	38	
E188B		AVSS	0.5	LY	RELAY JOINT 1	7		MAIN HARNESS	39	
F102A		AVSS	0.5	OrY	FUSE BOX1	2		SP_F102S	X	
F102B		AVSS	0.5	OrY	REAR WIPER RELAY	87		SP_F102S	X	
F102C		AVSS	0.85	OrY	CABIN SUB HARNESS	34		SP_F102S	X	
F103A		AVSS	0.5	OrR	FUSE BOX1	3		MAIN HARNESS	41	
F104A		AVSS	0.5	OrG	FUSE BOX1	4		SP_F104S	X	
F104B		AVSS	0.5	OrG	GP DISPLAY	12		SP_F104S	X	
F104C		AVSS	0.5	OrG	CABIN SUB HARNESS	23		SP_F104S	X	
F105A		AVSS	0.5	OrW	FUSE BOX1	5		SP_F105S	X	
F105B		AVSS	0.5	OrW	PARKING SWITCH	2		SP_F105S	X	
F105D		AVSS	0.5	OrW	HYD LOCKOUT SWITCH	2		SP_F105S	X	
F105E		AVSS	0.5	OrW	HORN RELAY	86		SP_F105S	X	
F105F		AVSS	0.5	OrW	BACK BUZZER RELAY	86		SP_F105S	X	
F106A		AVSS	2	OrB	FUSE BOX1	6		SP_F106S	X	
F106B		AVSS	1.25	OrB	HORN RELAY	30		SP_F106S	X	
F106C		AVSS	2	OrB	HVAC UNIT B	3		SP_F106S	X	
F106D		AVSS	0.85	OrB	HVAC UNIT A	7		SP_F106S	X	
F107A		AVS	3	Or	FUSE BOX1	7		SP_F107S	X	
F107B		AVSS	0.85	Or	FRONT WIPER RELAY	87		SP_F107S	X	
F107C		AVSS	0.85	Or	CABIN SUB HARNESS	21		SP_F107S	X	
F107D		AVSS	0.85	Or	REAR GLASS RELAY	30		SP_F107S	X	
F108A		AVSS	0.85	OrL	FUSE BOX1	8		SP_F108S	X	
F108B		AVSS	0.85	OrL	LEFT WIPER RELAY	87		SP_F108S	X	
F108C		AVSS	0.85	OrL	MAIN HARNESS	86		SP_F108S	X	
F109A		AVSS	0.85	RL	FUSE BOX1	9		SP_F109S	X	
F109B		AVSS	0.85	RL	RIGHT WIPER RELAY	87		SP_F109S	X	
F109C		AVSS	0.85	RL	MAIN HARNESS	87		SP_F109S	X	
F110A		AVSS	0.85	RW	FUSE BOX1	10		USB CHAGER	(+)	
F111A		AVSS	1.25	RY	FUSE BOX1	11		MAIN HARNESS	42	
F112A		AVSS	1.25	RB	FUSE BOX1	12		SP_F112S	X	
F112B		AVSS	0.5	RB	CHECK CONN1-2	6		SP_F112S	X	
F112C		AVSS	0.5	RB	CHECK CONN2-2	6		SP_F112S	X	
F112E		AVSS	1.25	RB	KEY PAD	1		SP_F112S	X	
F112H		AVSS	0.5	RB	MAIN HARNESS	40		SP_F112S	X	
F113A		AVSS	2	RG	FUSE BOX1	13		SP_F113S	X	
F113B		AVSS	1.25	RG	SEAT HEATER & AIR SUSPENSION	1		SP_F113S	X	
F114A		AVSS	2	Or	FUSE BOX1	14		SP_F114S	X	
F114B		AVSS	2	Or	BACK BUZZER RELAY	30		SP_F114S	X	
F114C		AVSS	0.85	Or	MAIN HARNESS	19		SP_F114S	X	
F201A		AVS	3	RL	FUSE BOX2	1		MAIN HARNESS	3	
F202A		AVS	3	R	FUSE BOX2	2		MAIN HARNESS	4	
F203A		AVS	3	RG	FUSE BOX2	3		SP_F203S	X	
F203B		AVS	3	RG	WORKING LAMP RELAY	30		SP_F203S	X	
F203C		AVSS	0.85	RG	ROTATING BEACON SWITCH	2		SP_F203S	X	
F204A		AVSS	0.85	W	FUSE BOX2	4		RELAY JOINT 1	10	
F205A		AVSS	2	R	FUSE BOX2	5		SP_F205S	X	
F205B		AVSS	0.85	R	RELAY JOINT 1	8		SP_F205S	X	
F205D		AVSS	0.85	R	MAIN HARNESS	45		SP_F205S	X	
F205E		AVSS	0.5	R	RH JOYSTICK	2		SP_F205S	X	
F205F		AVSS	0.5	R	LH JOYSTICK	2		SP_F205S	X	
F206A		AVS	3	RW	FUSE BOX2	6		SP_F206S	X	
F206B		AVSS	1.25	RW	RELAY JOINT 1	13		SP_F206S	X	
F206C		AVSS	2	RW	MAIN HARNESS	8		SP_F206S	X	
F207A		AVSS	0.5	WG	FUSE BOX2	7		SP_F207S	X	
F207B		AVSS	0.5	WG	CABIN SUB HARNESS	24		SP_F207S	X	
F207C		AVSS	0.5	WG	HOUR METER	1		SP_F207S	X	
F208A		AVSS	0.5	WB	FUSE BOX2	8		SP_F208S	X	
F208B		AVSS	0.5	WB	STARTER SWITCH	3		SP_F208S	X	
F208C		AVSS	0.85	WB	ACC RELAY	30		SP_F208S	X	
F209A		AVSS	0.5	Or	FUSE BOX2	9		CABIN SUB HARNESS	25	
F210A		AVSS	0.85	LR	FUSE BOX2	10		SP_F210S	X	
F210B		AVSS	0.5	LR	GP DISPLAY	9		SP_F210S	X	
F210C		AVSS	0.5	LR	GP DISPLAY	10		SP_F210S	X	
F210D		AVSS	0.5	LR	CABIN SUB HARNESS	26		SP_F210S	X	
F211A		AVSS	2	WR	FUSE BOX2	11		HVAC UNIT B	1	
F212A		AVSS	2	WL	FUSE BOX2	12		MAIN HARNESS	5	
F213A		AVSS	2	WG	FUSE BOX2	13		MAIN HARNESS	6	

WIRE	MC	MATERIAL	CSA	COL	FROM	CAV1	PLATING	TO	CAV2	PLATING
F214A		AVS	3	W	FUSE BOX2	14		SP_F214S	X	
F214B		AVS	3	W	RELAY JOINT 2	2		SP_F214S	X	
F214C		AVS	3	W	MAIN HARNESS	7		SP_F214S	X	
G13A		AVSS	0.5	Or	GP DISPLAY	13	TW_01	MAIN HARNESS	91	
G14A		AVSS	0.5	Y	GP DISPLAY	14	SH_20	MAIN HARNESS	93	
G21A		AVSS	0.5	OrB	GP DISPLAY	21	TW_01	MAIN HARNESS	92	
G22A		AVSS	0.5	YB	GP DISPLAY	22	SH_20	MAIN HARNESS	94	
H139B		AVSS	0.5	YW	BREAK PEDAL ANGLE SENSOR 2	3		MAIN HARNESS	46	
H146G		AVSS	0.5	WB	MAIN HARNESS	47		SP_H146S	X	
H146H		AVSS	0.5	WB	ENGINE CONTROL DIAL 2	1		SP_H146S	X	
H146J		AVSS	0.5	WB	BREAK PEDAL ANGLE SENSOR 2	2		SP_H146S	X	
H146K		AVSS	0.5	WB	BREAK PEDAL ANGLE SENSOR 2	5		SP_H146S	X	
H219A		AVSS	0.5	YR	MAIN HARNESS	50		SP_H219S	X	
H219B		AVSS	0.5	YR	BREAK PEDAL ANGLE SENSOR 2	1		SP_H219S	X	
H219C		AVSS	0.5	YR	BREAK PEDAL ANGLE SENSOR 2	6		SP_H219S	X	
H226B		AVSS	0.5	YL	BREAK PEDAL ANGLE SENSOR 2	4		MAIN HARNESS	51	
H238B		AVSS	0.5	GB	ENGINE CONTROL DIAL 2	2	TW_02	MAIN HARNESS	52	
H255B		AVSS	0.5	G	ENGINE CONTROL DIAL 2	3	TW_02	MAIN HARNESS	53	
V112B		AVSS	0.5	WG	SEAT BELT SWITCH (OPT)	1		MAIN HARNESS	56	
V142A		AVSS	0.5	WY	MAIN HARNESS	59		CABIN SUB HARNESS	30	
V143A		AVSS	0.5	LgB	MAIN HARNESS	61	TW_03	CABIN SUB HARNESS	31	
V144A		AVSS	0.5	LB	MAIN HARNESS	57		SEAT OPS	1	
V165A		AVSS	0.5	BrR	CABIN SUB HARNESS	11		MAIN HARNESS	62	
V171A		AVSS	0.5	GY	EMERGENCY STARTING SWITCH	3		MAIN HARNESS	64	
V176A		AVSS	0.5	Or	MAIN HARNESS	58		SEAT OPS	2	
V192A		AVSS	0.5	LR	MAIN HARNESS	63	TW_03	CABIN SUB HARNESS	32	
V193A		AVSS	0.5	RL	CABIN SUB HARNESS	12		SP_V193S	X	
V193B		AVSS	0.5	RL	MAIN HARNESS	67		SP_V193S	X	
V193C		AVSS	0.5	RL	HOUR METER	3		SP_V193S	X	
V203D		AVSS	0.5	RY	AUTOSHUTOFF RELAY	86		MAIN HARNESS	68	
V205B		AVSS	0.85	LB	BACK BUZZER RELAY	85		MAIN HARNESS	69	
V206C		AVSS	0.5	WY	HVAC UNIT A	9		MAIN HARNESS	70	
V211B		AVSS	0.5	Or	PARKING SWITCH	3		MAIN HARNESS	71	
V213B		AVSS	0.5	WB	HYD LOCKOUT SWITCH	1		MAIN HARNESS	73	
V214A		AVSS	0.5	LgW	CHECK CONN1-1	2		SP_V214S	X	
V214B		AVSS	0.5	LgW	CHECK CONN2-1	2		SP_V214S	X	
V214C		AVSS	0.5	LgW	MAIN HARNESS	74		SP_V214S	X	
V215A		AVSS	0.5	GW	CABIN SUB HARNESS	13		MAIN HARNESS	75	
V216A		AVSS	0.5	G	MAIN HARNESS	76		SP_V216S	X	
V216B		AVSS	0.5	G	EMERGENCY STARTING SWITCH	4		SP_V216S	X	
V216C		AVSS	0.5	G	ACC RELAY	86		SP_V216S	X	
V220B		AVSS	0.85	LG	HORN RELAY	85		MAIN HARNESS	77	
V229A		AVSS	0.5	Lg	CHECK CONN1-1	1		SP_V229S	X	
V229B		AVSS	0.5	Lg	CHECK CONN2-1	1		SP_V229S	X	
V229C		AVSS	0.5	Lg	MAIN HARNESS	78		SP_V229S	X	
V230A		AVSS	0.5	GL	CABIN SUB HARNESS	14		MAIN HARNESS	79	
V242A		AVSS	0.5	BL	CABIN SUB HARNESS	20		SP_V242S	X	
V242B		AVSS	0.5	BL	CHECK CONN1-1	3		SP_V242S	X	
V242C		AVSS	0.5	BL	CHECK CONN2-1	3		SP_V242S	X	
V242D		AVSS	0.5	BL	MAIN HARNESS	81		SP_V242S	X	
V248B		AVSS	0.5	OrW	WORKING LAMP RELAY	86		MAIN HARNESS	82	
V253A		AVSS	0.5	WL	MAIN HARNESS	88		REAR GLASS REALY	86	
V256A		AVSS	0.5	Br	MAIN HARNESS	83		FRONT WIPER RELAY	86	
V257A		AVSS	0.5	V	MAIN HARNESS	84		REAR WIPER RELAY	86	
V258C		AVSS	0.85	YR	MAIN HARNESS	85		SP_V258S	X	
V258D		AVSS	0.5	YR	LEFT WIPER RELAY	86		SP_V258S	X	
V258E		AVSS	0.5	YR	RIGHT WIPER RELAY	86		SP_V258S	X	
99A		AVSS	0.5	B	HOUR METER	2		SP_99S1	X	
99B		AVSS	0.5	B	HYD LOCKOUT SWITCH	7		SP_99S1	X	
99C		AVSS	0.5	B	PARKING SWITCH	7		SP_99S1	X	
99D		AVSS	0.5	B	KEY PAD	2		SP_99S1	X	
99E		AVSS	0.5	B	USB CHAGER	(-)		SP_99S1	X	
99F		AVSS	0.5	B	ROTATING BEACON SWITCH	7		SP_99S1	X	
99G		AVSS	0.5	B	ATS SWITCH	7		SP_99S2	X	
99H		AVSS	0.5	B	ATS SWITCH	9		SP_99S2	X	
99I		AVSS	0.85	B	12V SOCKET	2		SP_99S2	X	
99J		AVSS	0.5	B	RH JOYSTICK	1		SP_99S2	X	
99K		AVSS	0.5	B	SEAT BELT SWITCH	2		SP_99S3	X	
99L		AVSS	1.25	B	SEAT HEATER & AIR SUSPENSION	2		SP_99S3	X	
99N		AVSS	0.5	B	LH JOYSTICK	1		SP_99S3	X	
99O		AVSS	0.5	B	CHECK CONN1-2	7		SP_99S4	X	
99P		AVSS	0.5	B	CHECK CONN2-2	7		SP_99S4	X	
99Q		AVSS	2	B	HVAC UNIT B	2		SP_99S4	X	
99S		AVSS	2	B	CABIN SUB HARNESS	36		SP_99S4	X	
99T		AVS	5	B	CABIN EARTH	1		SP_99S	X	
99U		AVSS	0.85	B	RELAY JOINT 1	9		SP_99S5	X	
99V		AVSS	0.5	B	HVAC UNIT A	8		SP_99S4	X	
99RA		AVSS	0.5	B	WORKING LAMP RELAY	85		SP_99S	X	
99RE		AVSS	0.5	B	FRONT WIPER RELAY	85		SP_99S5	X	
99RF		AVSS	0.5	B	REAR WIPER RELAY	85		SP_99S5	X	
99RI		AVSS	0.5	B	LEFT WIPER RELAY	85		SP_99S5	X	
99RJ		AVSS	0.5	B	RIGHT WIPER RELAY	85		SP_99S5	X	
99RH		AVSS	0.5	B	ACC RELAY	85		SP_99S6	X	
99RG		AVSS	0.5	B	AUTOSHUTOFF RELAY	85		SP_99S6	X	
99RK		AVSS	0.5	B	REAR GLASS REALY	85		SP_99S6	X	
99MA		AVS	3	B	MAIN HARNESS	101		SP_99S6	X	
99MB		AVS	3	B	MAIN HARNESS	102		SP_99S6	X	
99ZA		AVSS	2	B	JOINT CONNECTOR	1		SP_99S	X	
99ZB		AVSS	0.85	B	JOINT CONNECTOR	2		SP_99S1	X	
99ZC		AVSS	0.85	B	JOINT CONNECTOR	3		SP_99S2	X	
99ZD		AVSS	0.85	B	JOINT CONNECTOR	4		SP_99S3	X	
99ZE		AVSS	0.85	B	JOINT CONNECTOR	5		SP_99S4	X	
99ZF		AVSS	0.85	B	JOINT CONNECTOR	6		SP_99S5	X	
99ZG		AVSS	2	B	JOINT CONNECTOR	7		SP_99S6	X	
99ZH		AVSS	2	B	JOINT CONNECTOR	8		SP_99S	X	
999A		AVSS	0.5	B	GP DISPLAY	16		SP_999S	X	
999B		AVSS	0.5	B	GP DISPLAY	17		SP_999S	X	
999C		AVSS	0.85	B	CABIN SUB HARNESS	35		SP_999S	X	
999D		AVSS	2	B	MAIN HARNESS	100		SP_999S	X	

DS2201510

Cabin Harness (1/2)



⚠ X01	C111340	Pilot Change
NO.	CHANGE NO.	DESCRIPTION

DS2300569

Cabin Harness (2/2)

WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
6A	AVSS	0.5	RL	STARTER SWITCH	1	SP_6S	X
6B	AVSS	0.5	RL	EMERGENCY STARTING SWITCH	6	SP_6S	X
6D	AVSS	0.5	RL	GP DISPLAY	11	SP_6S	X
7A	AVSS	0.5	Br	STARTER SWITCH	2	SP_7S	X
7B	AVSS	0.5	Br	DIODE 5	1	SP_7S	X
7C	AVSS	0.85	Br	MAIN HARNESS	9	SP_7S	X
7D	AVSS	0.85	Br	STARTER RELAY 1	87	SP_7S	X
8A	AVSS	0.85	BrW	AUTOSHUTOFF RELAY	87a	SP_8S	X
8B	AVSS	0.85	BrW	RELAY JOINT 1	1	SP_8S	X
8C	AVSS	0.85	BrW	MAIN HARNESS	10	SP_8S	X
10A	AVSS	0.5	L	MAIN HARNESS	11	SP_10S	X
10B	AVSS	0.5	L	RELAY JOINT 1	2	SP_10S	X
10C	AVSS	0.5	L	EMERGENCY STARTING SWITCH	5	SP_10S	X
10D	AVSS	0.5	L	STARTER SWITCH	6	SP_10S	X
11A	AVSS	0.85	GrB	STARTER RELAY 1	85	MAIN HARNESS	12
12A	AVSS	0.85	Gr	STARTER RELAY 1	86	MAIN HARNESS	13
13A	AVSS	0.85	Y	STARTER RELAY 1	30	SP_13S	X
13B	AVSS	0.85	Y	RELAY JOINT 1	3	SP_13S	X
13C	AVSS	0.85	Y	MAIN HARNESS	44	SP_13S	X
15A	AVSS	0.85	LR	GP DISPLAY	18	SP_15S	X
15B	AVSS	0.85	LR	STARTER RELAY 1	87a	SP_15S	X
15C	AVSS	0.85	LR	EMERGENCY STARTING SWITCH	2	SP_15S	X
25A	AVSS	0.85	L	12V SOCKET	1	RELAY JOINT 1	11
80A	AVSS	0.5	WR	MAIN HARNESS	14	SP_80S	X
80E	AVSS	0.5	WR	ROTATING BEACON SWITCH	8	SP_80S	X
80K	AVSS	0.5	WR	GP DISPLAY	8	SP_80S	X
80L	AVSS	0.5	WR	CABIN SUB HARNESS	2	SP_80S	X
80O	AVSS	0.5	WR	ATS SWITCH	8	SP_80S	X
80P	AVSS	0.5	WR	ATS SWITCH	10	SP_80S	X
80X	AVSS	0.5	WR	PARKING SWITCH	8	SP_80S	X
80Z	AVSS	0.5	WR	HYD LOCKOUT SWITCH	8	SP_80S	X
186A	AVSS	0.5	OrG	ROTATING BEACON SWITCH	3	CABIN SUB HARNESS	10
211A	AVS	3	RL	WORKING LAMP RELAY	87	SP_211S	X
211B	AVSS	2	RL	CABIN SUB HARNESS	1	SP_211S	X
211H	AVSS	2	RL	CABIN SUB HARNESS	8	SP_211S	X
251A	AVS	3	RW	RELAY JOINT 2	1	MAIN HARNESS	1
303D	AVSS	0.85	Y	FRONT WIPER RELAY	30	CABIN SUB HARNESS	16
304A	AVSS	0.85	LW	FRONT WIPER RELAY	87a	CABIN SUB HARNESS	17
305A	AVSS	0.85	Gr	REAR WIPER RELAY	30	CABIN SUB HARNESS	18
306A	AVSS	0.85	L	REAR WIPER RELAY	87a	CABIN SUB HARNESS	19
307A	AVSS	0.85	Y	RIGHT WIPER RELAY	30	MAIN HARNESS	15
308A	AVSS	0.85	LW	RIGHT WIPER RELAY	87a	MAIN HARNESS	16
309A	AVSS	0.85	Gr	LEFT WIPER RELAY	30	MAIN HARNESS	17
310A	AVSS	0.85	L	LEFT WIPER RELAY	87a	MAIN HARNESS	18
350A	AVSS	0.85	OrW	REAR GLASS REALY	87	CABIN SUB HARNESS	9
401B	AVSS	0.5	RY	BACK BUZZER RELAY	87	MAIN HARNESS	80
403A	AVSS	1.25	RW	MAIN HARNESS	20	HORN RELAY	87
405A	AVSS	0.5	BrR	AUTOSHUTOFF RELAY	30	DIODE 5	2
800A	AVSS	0.5	RB	FUSE BOX1	19	SP_800S	X
800B	AVSS	1.25	RB	ACC RELAY	87	SP_800S	X
800C	AVSS	0.85	RB	CABIN SUB HARNESS	3	SP_800S	X
800D	AVSS	0.85	RB	RELAY JOINT 1	12	SP_800S	X
B2A	AVS	5	RW	FUSE BOX2	16	SP_B2S	X
B2B	AVS	5	RW	FUSE BOX2	17	SP_B2S	X
B2C	AVS	5	RW	MAIN HARNESS	49	SP_B2S	X
B4A	AVS	5	W	FUSE BOX1	15	SP_B4S	X
B4B	AVS	5	W	FUSE BOX1	16	SP_B4S	X
B4C	AVS	5	W	FUSE BOX2	15	SP_B4S	X
B4D	AVS	8	W	MAIN HARNESS	54	SP_B4S	X
B6B	AVS	5	W	FUSE BOX2	18	SP_B6S	X
B6C	AVSS	2	W	MAIN HARNESS	98	SP_B6S	X
B6D	AVS	3	W	MAIN HARNESS	99	SP_B6S	X
C11A	AVSS	0.5	Y	GP DISPLAY	4	SP_C11S	X
C11B	AVSS	0.5	Y	MAIN HARNESS	65	SP_C11S	X
C11D	AVSS	0.5	Y	CABIN SUB HARNESS	4	SP_C11S1	X
C11E	AVSS	0.5	Y	CHECK CONN1-1	4	SP_C11S2	X
C11F	AVSS	0.5	Y	MAIN HARNESS	21	SP_C11S3	X
C11G	AVSS	0.5	Y	CHECK CONN2-1	4	SP_C11S3	X
C11ZA	AVSS	0.5	Y	SP_C11S	X	SP_C11S1	X
C11ZB	AVSS	0.5	Y	SP_C11S1	X	SP_C11S2	X
C11ZC	AVSS	0.5	Y	SP_C11S2	X	SP_C11S3	X
C12A	AVSS	0.5	YB	GP DISPLAY	5	SP_C12S	X
C12B	AVSS	0.5	YB	MAIN HARNESS	66	SP_C12S	X
C12D	AVSS	0.5	YB	CABIN SUB HARNESS	5	SP_C12S1	X
C12E	AVSS	0.5	YB	CHECK CONN1-1	5	SP_C12S2	X
C12F	AVSS	0.5	YB	MAIN HARNESS	22	SP_C12S3	X
C12G	AVSS	0.5	YB	CHECK CONN2-1	5	SP_C12S3	X
C12ZA	AVSS	0.5	YB	SP_C12S	X	SP_C12S1	X
C12ZB	AVSS	0.5	YB	SP_C12S1	X	SP_C12S2	X
C12ZC	AVSS	0.5	YB	SP_C12S2	X	SP_C12S3	X
C13A	AVSS	-	Shield	BLUNT_C13A	X	SP_C13S	X
C13B	AVSS	-	Shield	BLUNT_C13B	X	SP_C13S	X
C13D	AVSS	-	Shield	BLUNT_C13D	X	SP_C13S	X
C13E	AVSS	-	Shield	CHECK CONN1-1	6	SP_C13S	X
C13F	AVSS	-	Shield	MAIN HARNESS	23	SP_C13S	X
C13G	AVSS	-	Shield	CHECK CONN2-1	6	SP_C13S	X
C21A	AVSS	0.5	W	CAN RESISTOR 2	1	SP_C21S	X
C21B	AVSS	0.5	W	GP DISPLAY	6	SP_C21S	X
C21C	AVSS	0.5	W	KEY PAD	4	SP_C21S1	X
C21D	AVSS	0.5	W	CABIN SUB HARNESS	6	SP_C21S2	X
C21E	AVSS	0.5	W	HVAC UNIT A	1	SP_C21S3	X
C21F	AVSS	0.5	W	MAIN HARNESS	24	SP_C21S4	X
C21G	AVSS	0.5	W	CHECK CONN1-2	4	SP_C21S4	X
C21ZA	AVSS	0.5	W	SP_C21S	X	SP_C21S1	X
C21ZB	AVSS	0.5	W	SP_C21S1	X	SP_C21S2	X
C21ZC	AVSS	0.5	W	SP_C21S2	X	SP_C21S3	X
C21ZD	AVSS	0.5	W	SP_C21S3	X	SP_C21S4	X
C22A	AVSS	0.5	G	CAN RESISTOR 2	2	SP_C22S	X
C22B	AVSS	0.5	G	GP DISPLAY	7	SP_C22S	X
C22C	AVSS	0.5	G	KEY PAD	3	SP_C22S1	X
C22D	AVSS	0.5	G	CABIN SUB HARNESS	7	SP_C22S2	X
C22E	AVSS	0.5	G	HVAC UNIT A	2	SP_C22S3	X
C22F	AVSS	0.5	G	MAIN HARNESS	25	SP_C22S4	X
C22G	AVSS	0.5	G	CHECK CONN1-2	5	SP_C22S4	X
C22ZA	AVSS	0.5	G	SP_C22S	X	SP_C22S1	X
C22ZB	AVSS	0.5	G	SP_C22S1	X	SP_C22S2	X
C22ZC	AVSS	0.5	G	SP_C22S2	X	SP_C22S3	X
C22ZD	AVSS	0.5	G	SP_C22S3	X	SP_C22S4	X

WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
C23A	AVSS	-	Shield	BLUNT_C23A	X	SP_C23S	X
C23B	AVSS	-	Shield	BLUNT_C23B	X	SP_C23S	X
C23C	AVSS	-	Shield	BLUNT_C23C	X	SP_C23S	X
C23D	AVSS	-	Shield	BLUNT_C23D	X	SP_C23S	X
C23E	AVSS	-	Shield	BLUNT_C23E	X	SP_C23S	X
C23F	AVSS	-	Shield	MAIN HARNESS	26	SP_C23S	X
C23G	AVSS	-	Shield	CHECK CONN1-2	3	SP_C23S	X
C31A	AVSS	0.5	Br	CAN RESISTOR 3	1	SP_C31S	X
C31B	AVSS	0.5	Br	LH JOYSTICK	3	SP_C31S	X
C31C	AVSS	0.5	Br	RH JOYSTICK	3	SP_C31S1	X
C31G	AVSS	0.5	Br	CHECK CONN2-2	4	SP_C31S2	X
C31K	AVSS	0.5	Br	MAIN HARNESS	27	SP_C31S2	X
C31ZA	AVSS	0.5	Br	SP_C31S	X	SP_C31S1	X
C31ZB	AVSS	0.5	Br	SP_C31S1	X	SP_C31S2	X
C32A	AVSS	0.5	Y	CAN RESISTOR 3	2	SP_C32S	X
C32B	AVSS	0.5	Y	LH JOYSTICK	4	SP_C32S	X
C32C	AVSS	0.5	Y	RH JOYSTICK	4	SP_C32S1	X
C32G	AVSS	0.5	Y	CHECK CONN2-2	5	SP_C32S2	X
C32K	AVSS	0.5	Y	MAIN HARNESS	28	SP_C32S2	X
C32ZA	AVSS	0.5	Y	SP_C32S	X	SP_C32S1	X
C32ZB	AVSS	0.5	Y	SP_C32S1	X	SP_C32S2	X
C33A	AVSS	-	Shield	BLUNT_C33A	X	SP_C33S	X
C33B	AVSS	-	Shield	BLUNT_C33B	X	SP_C33S	X
C33C	AVSS	-	Shield	BLUNT_C33C	X	SP_C33S	X
C33G	AVSS	-	Shield	CHECK CONN2-2	3	SP_C33S	X
C33K	AVSS	-	Shield	MAIN HARNESS	29	SP_C33S	X
C41F	AVSS	0.5	Br	CHECK CONN1-2	1	MAIN HARNESS	30
C42F	AVSS	0.5	YL	CHECK CONN1-2	2	MAIN HARNESS	31
C51F	AVSS	0.5	W	CHECK CONN2-2	1	SP_C51S	X
C51G	AVSS	0.5	W	MAIN HARNESS	32	SP_C51S	X
C51H	AVSS	0.5	W	CAN RESISTOR 5	1	SP_C51S	X
C52F	AVSS	0.5	G	CHECK CONN2-2	2	SP_C52S	X
C52G	AVSS	0.5	G	MAIN HARNESS	33	SP_C52S	X
C52H	AVSS	0.5	G	CAN RESISTOR 5	2	SP_C52S	X
E101D	AVSS	2	Or	MAIN HARNESS	2	SP_E101S	X
E101E	AVSS	0.85	Or	RELAY JOINT 1	4	SP_E101S	X
E101H	AVSS	0.85	Or	EMERGENCY STOP SWITCH	3	SP_E101S	X
E101I	AVSS	0.5	Or	ATS SWITCH	2	SP_E101S	X
E110B	AVSS	0.5	BY	ATS SWITCH	1	MAIN HARNESS	34
E111B	AVSS	0.5	BL	ATS SWITCH	3	MAIN HARNESS	35
E151B	AVSS	0.85	BrW	EMERGENCY STOP SWITCH	2	MAIN HARNESS	36
E175A	AVSS	0.85	WR	MAIN HARNESS	37	SP_E175S	X
E175B	AVSS	0.85	WR	RELAY JOINT 1	5	SP_E175S	X
E175C	AVSS	0.5	WR	RH JOYSTICK	2	SP_E175S	X
E175D	AVSS	0.5	WR	LH JOYSTICK	2	SP_E175S	X
E184A	AVSS	0.85	RG	RELAY JOINT 1	6	MAIN HARNESS	38
E188B	AVSS	0.5	LY	RELAY JOINT 1	7	MAIN HARNESS	39
F101A	AVSS	0.85	Lg	FUSE BOX1	1	USB CHAGER	(+)
F102A	AVSS	0.5	OrY	FUSE BOX1	2	SP_F102S	X
F102B	AVSS	0.5	OrY	REAR WIPER RELAY	87	SP_F102S	X
F102C	AVSS	0.85	OrY	CABIN SUB HARNESS	34	SP_F102S	X
F103A	AVSS	0.5	OrR	FUSE BOX1	3	MAIN HARNESS	41
F104A	AVSS	0.5	OrG	FUSE BOX1	4	SP_F104S	X
F104B	AVSS	0.5	OrG	GP DISPLAY	12	SP_F104S	X
F104C	AVSS	0.5	OrG	CABIN SUB HARNESS	23	SP_F104S	X
F105A	AVSS	0.5	OrW	FUSE BOX1	5	SP_F105S	X
F105B	AVSS	0.5	OrW	PARKING SWITCH	2	SP_F105S	X
F105D	AVSS	0.5	OrW	HYD LOCKOUT SWITCH	2	SP_F105S	X
F105E	AVSS	0.5	OrW	HORN RELAY	86	SP_F105S	X
F105F	AVSS	0.5	OrW	BACK BUZZER RELAY	86	SP_F105S	X
F106A	AVSS	2	OrB	FUSE BOX1	6	SP_F106S	X
F106B	AVSS	1.25	OrB	HORN RELAY	30	SP_F106S	X
F106C	AVSS	2	OrB	HVAC UNIT B	3	SP_F106S	X
F106D	AVSS	0.85	OrB	HVAC UNIT A	7	SP_F106S	X
F107A	AVS	3	Or	FUSE BOX1	7	SP_F107S	X
F107B	AVSS	0.85	Or	FRONT WIPER RELAY	87	SP_F107S	X
F107C	AVSS	0.85	Or	CABIN SUB HARNESS	21	SP_F107S	X
F107D	AVSS	0.85	Or	REAR GLASS RELAY	30	SP_F107S	X
F108A	AVSS	0.85	OrL	FUSE BOX1	8	SP_F108S	X
F108B	AVSS	0.85	OrL	LEFT WIPER RELAY	87	SP_F108S	X
F108C	AVSS	0.85	OrL	MAIN HARNESS	86	SP_F108S	X
F109A	AVSS	0.85	RL	FUSE BOX1	9	SP_F109S	X
F109B	AVSS	0.85	RL	RIGHT WIPER RELAY	87	SP_F109S	X
F109C	AVSS	0.85	RL	MAIN HARNESS	87	SP_F109S	X
F111A	AVSS	1.25	RY	FUSE BOX1	11	MAIN HARNESS	42
F112A	AVSS	1.25	RB	FUSE BOX1	12	SP_F112S	X
F112B	AVSS	0.5	RB	CHECK CONN1-2	6	SP_F112S	X
F112C	AVSS	0.5	RB	CHECK CONN2-2	6	SP_F112S	X
F112E	AVSS	1.25	RB	KEY PAD	1	SP_F112S	X
F112H	AVSS	0.5	RB	MAIN HARNESS	40	SP_F112S	X
F113A	AVSS	2	RG	FUSE BOX1	13	SP_F113S	X
F113B	AVSS	1.25	RG	SEAT HEATER & AIR SUSPENSION	1	SP_F113S	X
F114A	AVSS	2	Or	FUSE BOX1	14	SP_F114S	X
F114B	AVSS	2	Or	BACK BUZZER RELAY	30	SP_F114S	X
F114C	AVSS	0.85	Or	MAIN HARNESS	19	SP_F114S	X
F201A	AVS	3	RL	FUSE BOX2	1	MAIN HARNESS	3
F202A	AVS	3	R	FUSE BOX2	2	MAIN HARNESS	4
F203A	AVS	3	RG	FUSE BOX2	3	SP_F203S	X
F203B	AVS	3	RG	WORKING LAMP RELAY	30	SP_F203S	X
F203C	AVSS	0.85	RG	ROTATING BEACON SWITCH	2	SP_F203S	X
F204A	AVSS	0.85	W	FUSE BOX2	4	RELAY JOINT 1	10
F205A	AVSS	2	R	FUSE BOX2	5	SP_F205S	X
F205B	AVSS	0.85	R	RELAY JOINT 1	8	SP_F205S	X
F205D	AVSS	0.85	R	MAIN HARNESS	45	SP_F205S	X
F206A	AVS	3	RW	FUSE BOX2	6	SP_F206S	X
F206B	AVSS	1.25	RW	RELAY JOINT 1	13	SP_F206S	X
F206C	AVSS	2	RW	MAIN HARNESS	8	SP_F206S	X
F207A	AVSS	0.5	WG	FUSE BOX2	7	SP_F207S	X
F207B	AVSS	0.5	WG	CABIN SUB HARNESS	24	SP_F207S	X
F207C	AVSS	0.5	WG	HOUR METER	1	SP_F207S	X
F207D	AVSS	0.5	WG	STARTER SWITCH	3	SP_F207S	X
F208A	AVSS	0.85	WB	FUSE BOX2	8	ACC RELAY	30
F209A	AVSS	0.5	Or	FUSE BOX2	9	CABIN SUB HARNESS	25
F210A	AVSS	0.85	LR	FUSE BOX2	10	SP_F210S	X
F210B	AVSS	0.5	LR	GP DISPLAY	9	SP_F210S	X
F210C	AVSS	0.5	LR	GP DISPLAY	10	SP_F210S	X
F210D	AVSS	0.5	LR	CABIN SUB HARNESS	26	SP_F210S	X
F211A	AVSS	2	WR	FUSE BOX2	11	HVAC UNIT B	1
F212A	AVSS	2	WL	FUSE BOX2	12	MAIN HARNESS	5

WIRE	MATERIAL	CSA	COL	FROM	CAV1	TO	CAV2
F213A	AVSS	2	WG	FUSE BOX2	13	MAIN HARNESS	6
F214A	AVS	3	W	FUSE BOX2	14	SP_F214S	X
F214B	AVS	3	W	RELAY JOINT 2	2	SP_F214S	X
F214C	AVS	3	W	MAIN HARNESS	7	SP_F214S	X
G13A	AVSS	0.5	Or	GP DISPLAY	13	MAIN HARNESS	91
G14A	AVSS	0.5	Y	GP DISPLAY	14	MAIN HARNESS	93
G21A	AVSS	0.5	OrB	GP DISPLAY	21	MAIN HARNESS	92
G22A	AVSS	0.5	YB	GP DISPLAY	22	MAIN HARNESS	94
H139B	AVSS	0.5	YW	BREAK PEDAL ANGLE SENSOR 2	3	MAIN HARNESS	46
H146G	AVSS	0.5	WB	MAIN HARNESS	47	SP_H146S	X
H146H	AVSS	0.5	WB	ENGINE CONTROL DIAL 2	1	SP_H146S	X
H146J	AVSS	0.5	WB	BREAK PEDAL ANGLE SENSOR 2	2	SP_H146S	X
H146K	AVSS	0.5	WB	BREAK PEDAL ANGLE SENSOR 2	5	SP_H146S	X
H219A	AVSS	0.5	YR	MAIN HARNESS	50	SP_H219S	X
H219B	AVSS	0.5	YR	BREAK PEDAL ANGLE SENSOR 2	1	SP_H219S	X
H219C	AVSS	0.5	YR	BREAK PEDAL ANGLE SENSOR 2	6	SP_H219S	X
H226B	AVSS	0.5	YL	BREAK PEDAL ANGLE SENSOR 2	4	MAIN HARNESS	51
H238B	AVSS	0.5	GB	ENGINE CONTROL DIAL 2	2	MAIN HARNESS	52
H255B	AVSS	0.5	G	ENGINE CONTROL DIAL 2	3	MAIN HARNESS	53
V112B	AVSS	0.5	WG	SEAT BELT SWITCH (OPT)	1	MAIN HARNESS	56
V142A	AVSS	0.5	WY	MAIN HARNESS	59	CABIN SUB HARNESS	30
V143A	AVSS	0.5	LgB	MAIN HARNESS	61	CABIN SUB HARNESS	31
V144A	AVSS	0.5	LB	MAIN HARNESS	57	SEAT OPS	1
V165A	AVSS	0.5	BrR	CABIN SUB HARNESS	11	MAIN HARNESS	62
V171A	AVSS	0.5	GY	EMERGENCY STARTING SWITCH	3	MAIN HARNESS	64
V176A	AVSS	0.5	Or	MAIN HARNESS	58	SEAT OPS	2
V192A	AVSS	0.5	LR	MAIN HARNESS	63	CABIN SUB HARNESS	32
V193A	AVSS	0.5	RL	CABIN SUB HARNESS	12	SP_V193S	X
V193B	AVSS	0.5	RL	MAIN HARNESS	67	SP_V193S	X
V193C	AVSS	0.5	RL	HOUR METER	3	SP_V193S	X
V203D	AVSS	0.5	RY	AUTOSHUTOFF RELAY	86	MAIN HARNESS	68
V205B	AVSS	0.85	LB	BACK BUZZER RELAY	85	MAIN HARNESS	69
V206C	AVSS	0.5	WY	HVAC UNIT A	9	MAIN HARNESS	70
V211B	AVSS	0.5	Or	PARKING SWITCH	3	MAIN HARNESS	71
V213B	AVSS	0.5	WB	HYD LOCKOUT SWITCH	1	MAIN HARNESS	73
V214A	AVSS	0.5	LgW	CHECK CONN1-1	2	SP_V214S	X
V214B	AVSS	0.5	LgW	CHECK CONN2-1	2	SP_V214S	X
V214C	AVSS	0.5	LgW	MAIN HARNESS	74	SP_V214S	X
V215A	AVSS	0.5	GW	CABIN SUB HARNESS	13	MAIN HARNESS	75
V216A	AVSS	0.5	G	MAIN HARNESS	76	SP_V216S	X
V216B	AVSS	0.5	G	EMERGENCY STARTING SWITCH	4	SP_V216S	X
V216C	AVSS	0.5	G	ACC RELAY	86	SP_V216S	X
V220B	AVSS	0.85	LG	HORN RELAY	85	MAIN HARNESS	77
V229A	AVSS	0.5	Lg	CHECK CONN1-1	1	SP_V229S	X
V229B	AVSS	0.5	Lg	CHECK CONN2-1	1	SP_V229S	X
V229C	AVSS	0.5	Lg	MAIN HARNESS	78	SP_V229S	X
V230A	AVSS	0.5	GL	CABIN SUB HARNESS	14	MAIN HARNESS	79
V242A	AVSS	0.5	BL	CABIN SUB HARNESS	20	SP_V242S	X
V242B	AVSS	0.5	BL	CHECK CONN1-1	3	SP_V242S	X
V242C	AVSS	0.5	BL	CHECK CONN2-1	3	SP_V242S	X
V242D	AVSS	0.5	BL	MAIN HARNESS	81	SP_V242S	X
V248B	AVSS	0.5	OrW	WORKING LAMP RELAY	86	MAIN HARNESS	82
V253A	AVSS	0.5	WL	MAIN HARNESS	88	REAR GLASS REALY	86
V256A	AVSS	0.5	Br	MAIN HARNESS	83	FRONT WIPER RELAY	88
V257A	AVSS	0.5	V	MAIN HARNESS	84	REAR WIPER RELAY	86
V258C	AVSS	0.85	YR	MAIN HARNESS	85	SP_V258S	X
V258D	AVSS	0.5	YR	LEFT WIPER RELAY	86	SP_V258S	X
V258E	AVSS	0.5	YR	RIGHT WIPER RELAY	86	SP_V258S	X
99A	AVSS	0.5	B	HOUR METER	2	SP_99S1	X
99B	AVSS	0.5	B	HYD LOCKOUT SWITCH	7	SP_99S1	X
99C	AVSS	0.5	B	PARKING SWITCH	7	SP_99S1	X
99D	AVSS	0.5	B	KEY PAD	2	SP_99S1	X
99E	AVSS	0.5	B	USB CHAGER	(-)	SP_99S1	X
99F	AVSS	0.5	B	ROTATING BEACON SWITCH	7	SP_99S1	X
99G	AVSS	0.5	B	ATS SWITCH	7	SP_99S2	X
99H	AVSS	0.5	B	ATS SWITCH	9	SP_99S2	X
99I	AVSS	0.85	B	12V SOCKET	2	SP_99S2	X
99J	AVSS	0.5	B	RH JOYSTICK	1	SP_99S2	X
99K	AVSS	0.5	B	SEAT BELT SWITCH	2	SP_99S3	X
99L	AVSS	1.25	B	SEAT HEATER & AIR SUSPENSION	2	SP_99S3	X
99N	AVSS	0.5	B	LH JOYSTICK	1	SP_99S3	X
99O	AVSS	0.5	B	CHECK CONN1-2	7	SP_99S4	X
99P	AVSS	0.5	B	CHECK CONN2-2	7	SP_99S4	X
99Q	AVSS	2	B	HVAC UNIT B	2	SP_99S4	X
99S	AVSS	2	B	CABIN SUB HARNESS	36	SP_99S4	X
99T	AVS	5	B	CABIN EARTH	1	SP_99S	X
99U	AVSS	0.85	B	RELAY JOINT 1	9	SP_99S5	X
99V	AVSS	0.5	B	HVAC UNIT A	8	SP_99S4	X
99RA	AVSS	0.5	B	WORKING LAMP RELAY	85	SP_99S	X
99RE	AVSS	0.5	B	FRONT WIPER RELAY	85	SP_99S5	X
99RF	AVSS	0.5	B	REAR WIPER RELAY	85	SP_99S5	X
99RI	AVSS	0.5	B	LEFT WIPER RELAY	85	SP_99S5	X
99RJ	AVSS	0.5	B	RIGHT WIPER RELAY	85	SP_99S5	X
99RH	AVSS	0.5	B	ACC RELAY	85	SP_99S6	X
99RG	AVSS	0.5	B	AUTOSHUTOFF RELAY	85	SP_99S6	X
99RK	AVSS	0.5	B	REAR GLASS REALY	85	SP_99S6	X
99MA	AVS	3	B	MAIN HARNESS	101	SP_99S6	X
99MB	AVS	3	B	MAIN HARNESS	102	SP_99S6	X
99ZA	AVSS	2	B	JOINT CONNECTOR	1	SP_99S	X
99ZB	AVSS	0.85	B	JOINT CONNECTOR	2	SP_99S1	X
99ZC	AVSS	0.85	B	JOINT CONNECTOR	3	SP_99S2	X
99ZD	AVSS	0.85	B	JOINT CONNECTOR	4	SP_99S3	X
99ZE	AVSS	0.85	B	JOINT CONNECTOR	5	SP_99S4	X
99ZF	AVSS	0.85	B	JOINT CONNECTOR	6	SP_99S5	X
99ZG	AVSS	2	B	JOINT CONNECTOR	7	SP_99S6	X
99ZH	AVSS	2	B	JOINT CONNECTOR	8	SP_99S	X
999A	AVSS	0.5	B	GP DISPLAY	16	SP_999S	X
999B	AVSS	0.5	B	GP DISPLAY	17	SP_999S	X
999C	AVSS	0.85	B	CABIN SUB HARNESS	35	SP_999S	X
999D	AVSS	2	B	MAIN HARNESS	100	SP_999S	X

NO.	CHANGE NO	DESCRIPTION
A00	C111340	Plot Change

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