150 X 210 X 10.8 (H) mm

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CD60/70/80/90S-9

Operation & Maintenance Manual

XSB2511E01NA

XSB2511E01NA
4. 2022

Operation & Maintenance Manual

CD60S-9, CD70S-9, CD80S-9, CD90S-9

FDB20, FDB21, FDB22, FDB23
DM03P De-tire/ DM03V Stage V

Forklifts

CROWN

Operation & Maintenance Manual

Forklifts

CD60S-9, CD70S-9, CD80S-9, CD90S-9

FDB20, FDB21, FDB22, FDB23
DM03P De-tire/ DM03V Stage V

2204

⚠ WARNING

A MOVING VEHICLE CAN BE DANGEROUS

You or others around you can be seriously injured or even killed if you are not careful or don't know how to use this truck correctly.

Do not operate this truck unless you are trained and authorised.

Read and obey all warnings and instructions in this Manual* and on the truck.

Make sure the truck is in good working order.

Head, arms, hands or legs outside the operator area can be pinned or crushed when ever the truck is moving. Stay within the operator area and stop completely before getting off.

A dockboard can move or drop while you are on it. Or you could drive off a dock. Falls from docks or dockboards can cause serious injury or even death. Make sure you are safe.

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Foreword

Literature Information

This manual should be stored in the operator's compartment in the literature holder or seat back literature storage area.

This manual contains safety, operation, transportation, lubrication and maintenance information.

Some photographs or illustrations in this publication show details or attachments that can be different from your lift truck. Guards and covers might have been removed for illustrative purposes.

Continuing improvement and advancement of product design might have caused changes to your lift truck which are not included in this publication. Read, study and keep this manual with the lift truck.

Whenever a question arises regarding your lift truck, or this publication, please consult your CROWN branch for the latest available information.

Safety

The Safety Section lists basic safety precautions. In addition, this section identifies the text and locations of warning signs and labels used on the lift truck. Read and understand the basic precautions listed in the Safety Section before operating or performing lubrication, maintenance and repair on this lift truck.

Operator Restraint System (If Equipped)

This manual contains safety, operation and maintenance information for the CROWN operator restraint system. Read, study and keep it handy.

⚠ WARNING

Your CROWN truck comes equipped with an operator restraint system. Should it become necessary to replace the seat for any reason, it should only be replaced with another CROWN operator restraint system.

Photographs or illustrations guide the operator through correct procedures of checking, operation and maintenance of the CROWN operator restraint system.

SAFE and EFFICIENT OPERATION of a lift truck depends to a great extent on the skill and alertness on the part of the operator. To develop this skill the operator should read and understand the Safe Driving Practices contained in this manual.

Forklift trucks seldom tip over, but in the rare event they do, the operator may be pinned to the ground by the lift truck or the overhead guard. This could result in serious injury or death.

Operator training and safety awareness is an effective way to prevent accidents, but accidents can still happen. The CROWN operator restraint system can minimise injuries. The CROWN operator restraint system keeps the operator substantially within the confines of the operator's compartment and the overhead guard.

This manual contains information necessary for Safe Operation. Before operating a lift truck, make sure that the necessary instructions are available and understood.

Operation

The Operation Section is a reference for the new operator and a refresher for the experienced one.

This section includes a discussion of gauges, switches, lift truck controls, attachment controls, transportation and towing information.

Photographs and illustrations guide the operator through correct procedures of checking, starting, operating and stopping the lift truck.

Operating techniques outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the lift truck and its capabilities.

Maintenance

The Maintenance Section is a guide to equipment care. The illustrated, step-by-step instructions are grouped by servicing intervals. Items without specific intervals are listed under "When Required" topics. Items in the "Maintenance Intervals" chart are referenced to detailed instructions that follow.

Maintenance Intervals

Use the service hour meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc.) can be used instead of service hour meter intervals if they provide more convenient servicing schedules and approximate the indicated service hour meter reading. Recommended service should always be performed at the interval that occurs first.

Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the "Maintenance Intervals" chart might be necessary.

Perform service on items at multiples of the original requirement. For example, at "Every 500 Service Hours or 3 Months", also service those items listed under "Every 250 Service Hours or Monthly" and "Every 10 Service Hours or Daily".

Environment Management

Note that the Crown internal combustion engine lift trucks are manufactured under ISO 14001 system which is harmonized with ISO 9001.

Periodic ENVIRONMENTAL AUDITS & ENVIRONMENTAL PERFORMANCE EVALUATIONS have been made by internal and external inspection entities.

LIFECYCLE ANALYSIS has also been made throughout the total product life. ENVIRONMENT MANAGEMENT SYSTEM includes DESIGN FOR ENVIRONMENT from the initial stage of the design.

ENVIRONMENT MANAGEMENT SYSTEM considers environmental laws & regulations, reduction or elimination of resource consumption as well as environmental emission or pollution from industrial activities, energy saving, environment friendly product design(lower noise, vibration, emission, smoke, heavy metal free, ozone depleting substance free, etc.), recycling, material cost reduction, and even environmentally oriented education for the employee.

Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards, and use common sense. Persons must also have the necessary training, skills and tools before attempting to perform these functions.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance, and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or other persons.

The hazards are identified by the "Safety Alert Symbol" and followed by a "Signal Word" such as "WARNING" as shown below.

⚠ WARNING

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning, explaining the hazard, can be either written or pictorially presented.

Operations that may cause product damage are identified by NOTICE labels on the product and in this publication.

CROWN cannot anticipate every possible circumstance that might involve a potential hazard, and common sense is always required. The warnings in this publication and on the product are therefore not all inclusive. Before any tool, procedure, work method or operating technique not specifically recommended by CROWN is used, you must be sure that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance or repair procedures you choose.

The information, specifications, and illustration in this publication are on the basis of information available at the time it was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service given to the product. Obtain the complete and most current information before starting any job. CROWN branches have the most current information available.

Safety

The safety rules and regulations in this section are representative of some, but not all rules and regulations that apply to lift trucks. Rules and regulations are paraphrased without representation that they have been reproduced verbatim.

Please refer to 29 CFR 1910.178 in the Code of Federal Regulations, the National Fire Protection Association No. 505 (NFPA), American National Standards Institute/Industrial Truck Standards Development Foundation, ANSI/ITSDF B56.1 Safety Standard for Low lift and High Lift Trucks, UL 558 Fire Safety Standard for Internal Combustion Engine-Powered Industrial Trucks and subsequent revisions for a complete list of rules and regulations as to the safe operation of powered industrial lift trucks. Since regulations vary from country to country outside of U.S.A., operate this lift truck in accordance with local regulations.

CROWN lift trucks are manufactured in accordance with the National Fire Protection Association (NFPA) No. 505 and the American National Standards Institute, Inc. / Industrial Truck Standards Development Foundation (ANSI/ITSDF) B56.1, Safety Standard for Low and High Lift Trucks and, for European models, according to the regulations and standards laid down in EU Machinery Directive 2006/42/EC and EMC directive 2014/30/EU.

The most effective method of reducing the risk of serious injury or death to you or others is for you to know how to properly operate this lift truck, to be alert and to avoid actions or conditions that could cause accidents.

Do not operate a lift truck if it is in need of maintenance, repair or appears to be unsafe in any way. Report all unsafe conditions immediately to your supervisor, then contact your authorised lift truck branch. Do not attempt any adjustments or repairs unless trained and authorised to do so.

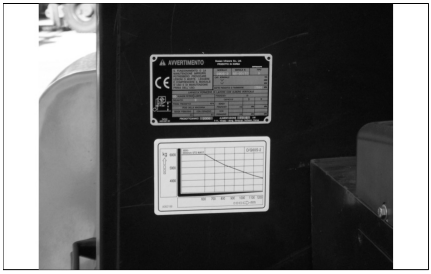
Warning Signs and Labels

There are several specific safety signs on your lift truck. Their exact location and description of the hazard are reviewed in this section. Please take the time to familiarise yourself with these safety signs.

Make sure that you can read all warning and instruction labels. Clean or replace these labels if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc.

You must replace a label if it is damaged, missing or cannot be read. If a label is on a part that is replaced, make sure a new label is installed on the replaced part. See your branch for new labels.

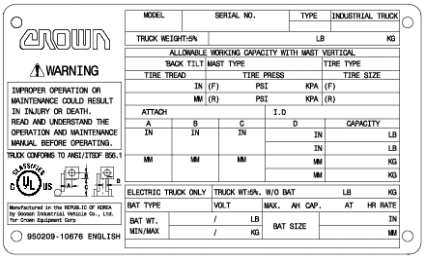
Training Required To Operate or Service Warning



Located on the around left side of seat support.

⚠ WARNING

Improper operation or maintenance could result in injury or death. Do not operate or work on the lift truck unless you are properly trained. Read and understand the Operation and Maintenance Manual. Additional manuals are available from CROWN Lift Truck branches.



This label also provides allowable lift truck capacity information.

General Warnings to Operator

Located on the around left side of seat support.

⚠ WARNING

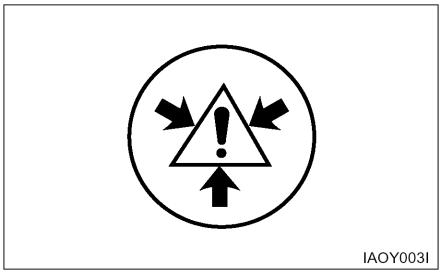
Only trained and authorised personnel may operate this machine. For safe operation, read and follow the operation and maintenance Manual furnished with this lift truck and observe the following warnings:

1. Before starting machine. Check all controls and warning devices for proper operation.
2. Refer to machine identification plate for allowable machine capacity. Do not overload. Operate machines equipped with attachments as partially loaded machines when not handling a load.
3. Put directional control or shift lever in neutral before "ON-OFF" switch is turned on.
4. Start, turn and brake smoothly. Slow down for turns, slippery or uneven surfaces. Extremely poor surfaces should be repaired. Avoid running over loose objects or holes in the roadway surfaces. Use extreme caution when turning on inclines.
5. Travel with load as low as possible and tilted back. If load interferes with visibility, travel with load trailing.
6. On grade operations travel with load up grade.
7. Watch out for pedestrians and obstructions. Check overhead clearances.
8. Do not permit riders on forks or machine at any time.
9. Do not allow anyone to stand or pass under the elevated portion of any machine.
10. Be sure operating surface can safely support machine.
11. Operate machine and attachments only from operator's position.
12. Do not handle unstable or loosely stacked loads.
13. Use minimum tilt when picking up or depositing a load.
14. Use extreme care when handling long, high or wide loads to ensure stability and durability of the truck.
15. Forks should be completely under load and spread apart as far as load permits.
16. Machine should be equipped with overhead guard or equivalent protection. Where load requires it, use load backrest extension. Use extreme caution if operating without these devices.
17. Parking-Lower lifting mechanism to floor. Put directional control or shift lever in neutral. Set parking/secondary brake. Turn "ON - OFF" switch off. Chock wheels if machine is on incline. Disconnect battery when storing electric machines.
18. Observe safety rules when handling fuel for engine powered machine and when changing batteries for electric machines.
19. Avoid overuse of the inching pedal as this may cause the automatic transmission oil to overheat or the clutch to slip. Do not use as a footrest or for long periods of time.
20. If user operates continuously pushing work or both brake pedal and accelerator pedal were depressed at the same time, it may cause the automatic transmission oil to overheat or the clutch to slip.

Pressure Warning

⚠ WARNING

Contents under pressure may be hot. Allow to cool before opening.



Located on the radiator top tank by the radiator cap

Hand Placement Warning

⚠ WARNING

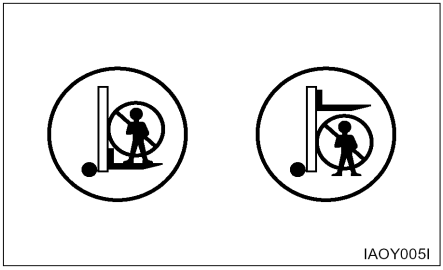
No hands. Do not place hands in this area. Do not touch, lean on, or reach through the mast or permit others to do so.

Located on the mast

No Standing On Forks Warning, No Standing Under Forks Warning

⚠ WARNING

Do not stand or ride on the forks. Do not stand or ride on a load or pallet on the forks. Do not stand or walk under the forks.

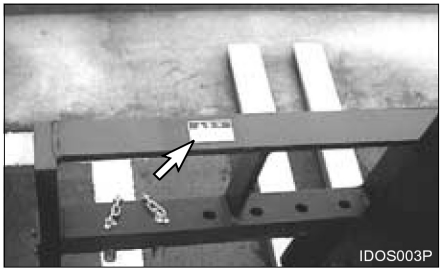


Located on the lift cylinder

Load Backrest Must Be In Place Warning

⚠ WARNING

Operation without this device in place may be hazardous.



Located on the load backrest

Overhead Guard Must Be In Place Warning

⚠ WARNING

Operation without this device in place may be hazardous. This guard conforms to A.N.S.I.B56.1 and F.E.M. Section IV. This design has been tested with an impact of appropriate value.

Located on the Overhead Guard

No Riders Warning

⚠ WARNING

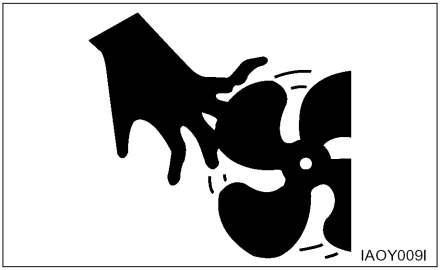
To avoid personal injury, allow no riders. A lift truck is designed for only one operator and no riders.

Located beside the operator's station

Moving Fan Warning

⚠ WARNING

To avoid personal injury, stay clear of moving fan.



Located inside the engine compartment cover

Tool Warning

⚠ WARNING

1. Do not use the tools provided by CROWN for other vehicles than CROWN's.

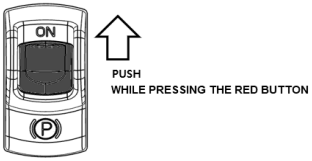
2. Check the tools for integrity before use. Do not use a defective tool.

Safety label on the tool box

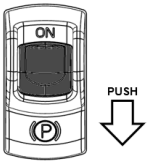
Parking Brake

Electronic Parking Brake

Push the front side on the switch while pressing the red button on the switch to engage the parking brake.



Push the rear side on the switch to release the parking brake.



Applying the parking brake puts the transmission in NEUTRAL. The parking brake must be applied when leaving the lift truck and when starting the engine. If the operator leaves the seat without applying the parking brake, an audible alarm will sound.

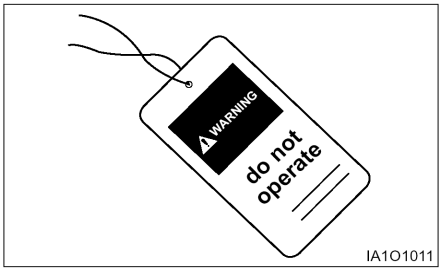
⚠ WARNING

When leaving machine apply parking brake! Parking brake is not automatically applied. Alarm will sound if parking brake is not applied.

⚠ WARNING

Correct adjustment is necessary to provide adequate braking. See the MAINTENANCE section for adjustment procedures. The lift truck may creep at engine idle and can cause damage, injury or death. Always apply the parking brake when leaving the lift truck. The parking brake is NOT automatically applied.

General Hazard Information



Attach a "Do Not Operate" or similar warning tag to start switch or controls before servicing or repairing the lift truck.

Do not start or service the lift truck when a "DO NOT OPERATE" or similar warning tag is attached to the start switch or controls.

Wear a hard hat, protective glasses and other protective equipment as required by job conditions.

Know the width of your attachments so proper clearance can be maintained when operating near fences, boundary obstacles, etc.

Do not wear loose clothing or jewelry that can catch on controls or other parts of the lift truck.

Keep the lift truck, especially the deck and steps, free of foreign material such as debris, oil tools and other items which are not part of the lift truck.

Secure all loose items such as lunch boxes, tools and other items which are not part of the lift truck.

Know the appropriate work-site hand signals and who gives them. Accept signals from one person only.

Always use the overhead guard. The overhead guard is intended to protect the lift truck operator from overhead obstructions and from falling objects.

A truck that is used for handing small objects or uneven loads must be fitted with a load backrest.

If the lift truck must be operated without the overhead guard in place due to low overhead clearance, use extreme care. Make sure there is no possibility of falling objects from any adjacent storage or work area. Make sure the load is stable and fully supported by the carriage and the load backrest extension (if equipped).

Do not raise loads any higher than necessary and never raise a load higher than 1830 mm (72 in) with the overhead guard removed.

Always use load backrest extension when the carriage or attachment does not fully support the load. The load backrest extension is intended to prevent the load or any part of the load from falling backwards into the operator's station.

When operating the lift truck, do not depend only on flashing lights or back-up alarms (if equipped) to warn pedestrians.

Always be aware of pedestrians and do not proceed until the pedestrians are aware of your presence and intended actions and have moved clear of the lift truck and/or load.

Do not drive lift truck up to anyone standing in front of an object.

Obey all traffic rules and warning signs.

Keep hands, feet and head inside the operator station. Do not hold onto the overhead guard while operating the lift truck. Do not climb on any part of the mast or overhead guard or permit others to do so.

Do not allow unauthorised personnel to ride on the forks or any other part of the lift truck, at any time.

When working in a building or dock, observe floor load limits and overhead clearances.

NOTICE

Inhaling Freon gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting Freon can cause bodily harm or death. Do not smoke when servicing air conditioners or wherever Freon gas may be present.

LPG Truck contains 0.6kg of HFC-134a, of which the CO2 equivalent value is 0.858 tons.

Diesel Truck contains 0.7kg of HFC-134a, of which the CO2 equivalent value is 1.001 tons.

The GWP of HFC-134a is 1,430.

This is only for the trucks with air-conditioner option. The above capacity information written on the film is attached to the truck.

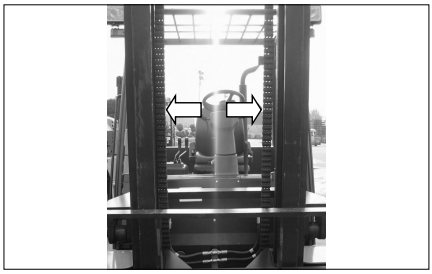
Never put maintenance fluids into glass containers.

Use all cleaning solutions with care.

Do not use steam, solvent, or high pressure to clean electrical components.

Report all needed repairs.

When you handle DEF/ad-Blue, wear protective equipment and observe Precautions for Handling.



Inspect the part of the chain that is normally operated over the crosshead roller. When the chain bends over the roller, the movements of the parts against each other causes wear.

Inspect to be sure that chain link pins do not extend outside of the bore hole.

If any single link pin is extended beyond its connecting corresponding link, it should be suspected of being broken inside of its bore hole.

Inspect the chain anchor and the anchor links for wear.

Do not change any factory set adjustment values (including engine rpm setting) unless you have both authorization and training. Especially Safety equipment and switches may not be removed or adjusted incorrectly. Repairs, adjustments and maintenances that are not correct can make a dangerous operating condition.

In order to protect the lift truck's electronic systems (ECU, TCU, etc.) during an electrical work on the vehicle for the purposes below, you should completely remove the ignition key and connectors (or plugs) from the electronic systems: ECU, TCU, and OSS.

Failure to follow the above warnings when performing electrical work, welding, or running an insulation test on the vehicle may cause serious damage to its electronic system due to an external abnormal current, electrical shock, etc.

For any checkup, repair, adjustments, maintenance and all other work concerning your forklift truck, please contact your CROWN branch. We would like to draw your attention to the fact that any secondary damages due to improper handling, insufficient maintenance, wrong repairs or the use of other than original CROWN spare parts waive any liability by CROWN.

Operation Information

Mounting and Dismounting

Mount and dismount the lift truck carefully.

Clean your shoes and wipe your hands before mounting.

Face the lift truck when mounting and dismounting.

Use both hands face the lift truck when mounting and dismounting.

Use the handgrips for mounting and dismounting.

Do not try to climb on or off the lift truck when carrying tools or supplies.

Do not use any controls as handholds when entering or leaving the operator's station.

Never get on or off a moving lift truck. Never jump off the lift truck.

Keep hands and steering wheel free of slippery material.

Before Starting the Lift Truck

Perform a walk-around inspection daily and at the start of each shift. Refer to the topic "Walk-around Inspection" in "Every 10 Service Hours or Daily" section of this manual.

Adjust the seat so that full brake pedal travel can be obtained with the operator's back against the seatback.

Make sure the lift truck is equipped with a lighting system as required by conditions.

Make sure all hydraulic controls are in the HOLD position.

Make sure the direction control lever is in the NEUTRAL position.

Make sure the parking brake is engaged.

Make sure no one is standing and/or working on, underneath or close to the lift truck before operating the lift truck.

Operate the lift truck and controls only from the operator's station.

Make sure the lift truck horn, lights, backup alarm (if equipped) and all other devices are working properly.

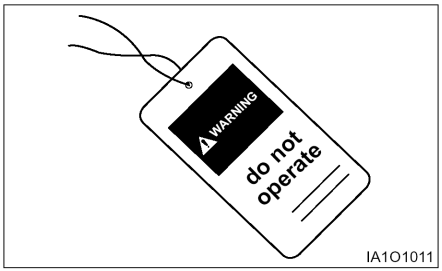
Check for proper operation of mast and attachments. Pay particular attention to unusual noises or erratic movement which might indicate a problem.

Make sure service and parking brakes, steering, and directional controls are operational.

Make sure all personnel are clear of lift truck and travel path.

Refer to the topic "Lift Truck Operation" in the "Operation Section" of this manual for specific starting instructions.

Starting the Lift Truck



Do not start the engine or move any of the controls if there is a "DO NOT OPERATE" or similar warning tag attached to the start switch or controls.

Before Operating the Lift Truck

Test brakes, steering controls, horn and other devices for proper operation. Report any faulty performance. Do not operate lift truck until repaired.

Learn how your lift truck operates. Know its safety devices. Know how the attachments work. Before moving the lift truck, look around. Start, turn and brake smoothly.

An operator must constantly observe his lift truck for proper operation.

Operating the Lift Truck

Always keep the lift truck under control.

Obey all traffic rules and warning signs.

Never leave the lift truck with the engine operating, or with the parking brake disengaged.

Operate the engine only in a well ventilated area.

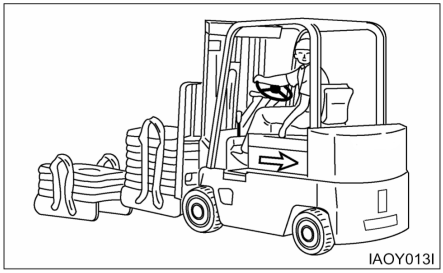
Lower the mast, with or without load, before turning or traveling. Tip over could result. Watch out for overhead obstructions.

Always observe floor load limits and overhead clearance.

Start, turn, and brake smoothly. Slow down for turns, grades, slippery or uneven surfaces.

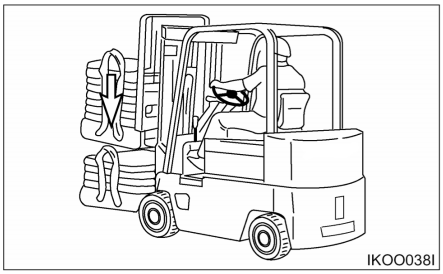
Watch the road carefully for any obstacle when driving the truck. Do not go fast over bumps, pot holes or other rough grounds, otherwise the engine might go OFF by a severe impact.

In case of engine going OFF, press the brake pedal at one time as hard as possible in order to stop the truck. Pressing the brake pedal several times has a risk that the brake would not work.



Use special care when operating on grades. Do not angle across or turn on grades. Do not use a lift truck on slippery grades. Travel with forks downgrade when unloaded. Travel with load upgrade.

Do not overload, or handle offset, unstable, or loosely stacked loads. Refer to load capacity plate on the lift truck. Use extreme caution when handling suspended, long, high or wide load.



Tilt an elevated load forward only when directly over unloading area and with load as low as possible.

Do not stunt ride or indulge in horseplay.

Always look and keep a clear view of the path of travel.

Travel in reverse if load or attachment obstructs visibility. Use extreme caution if visibility is obstructed.

Stay in designated travel path, clear of dock edges, ditches, and other drop-offs and surfaces which cannot safely support the lift truck.

Slow down and use extra care through doorways, intersections and other location where visibility is reduced.

Slow down for cross aisles, turns, ramps, dips, uneven or slippery surfaces and in congested areas and avoid pedestrians, other vehicles, obstruction, pot holes and other hazards or objects in the path of travel.

Always use overhead guards except where operation conditions do not permit. Do not operate lift truck in high stacking areas without overhead guards.

When stacking, watch for falling objects. Use load backrest extension and overhead guard.

Refer to the topic "Operation Techniques" in the

"Operation Section" of this manual.

Loading or Unloading Trucks/Trailers

Do not operate lift trucks on trucks or trailers which are not designed or intended for that purpose. Be certain truck or trailer brakes are applied and wheel chocks in place (or be certain unit is locked to the loading dock) before entering onto trucks or trailers.

If trailer is not coupled to tractor, make sure the trailer landing gear is properly secured in place. On some trailers, extra supports may be needed to prevent upending or corner dipping.

Be certain dock plates are in good condition and properly placed and secured. Do not exceed the rated capacity of dock boards or bridge plates.

Lift Truck Parking

When leaving the operator station, park the lift truck in authorised areas only. Do not block traffic.

Park the lift truck level, with the forks lowered and the mast tilted forward until the fork tips touch the floor.

Move the direction control lever to NEUTRAL.

Engage the parking brake.

Turn the key switch off and remove the key.

Turn the disconnect switch to OFF (if equipped).

Do operate the disconnecting switch after 30 seconds from start key-off.

Otherwise Engine Control Unit (ECU) can be damaged.

Block the drive wheels when parking on an incline.

Maintenance Information

Perform all maintenance, unless otherwise specified, as follows:

Park the lift truck in authorised areas only.

Park the lift truck level, with the forks lowered and the mast tilted forward until the fork tips touch the floor.

Place the transmission controls in neutral.

Engage the parking brake.

Stop the engine.

Remove the start switch key and turn the disconnect switch OFF (if equipped).

Block the drive wheels when parking on an incline.

Pressure Air

Pressure air can cause personal injury. When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Fluid Penetration

Always use a board or cardboard when checking for a leak. Escaping fluid under pressure, even a pinhole size leak, can penetrate body tissue, causing serious injury, and possible death. If fluid is injected into your skin, it must be treated by a doctor familiar with this type of injury immediately.

Crushing or Cutting Prevention

Support equipment and attachments properly when working beneath them. Do not depend on hydraulic cylinders to hold it up. Any attachment can fall if a control is moved, or if a hydraulic line breaks.

Never attempt adjustments while the lift truck is moving or the engine is running unless otherwise specified.

Where there are attachment linkages, the clearance in the linkage area will increase or decrease with movement of the attachment.

Stay clear of all rotating and moving parts.

Keep objects away from moving fan blades. They will throw or cut any object or tool that falls or is pushed into them.

Do not use a kinked or frayed wire rope cable. Wear gloves when handling the wire rope cable.

Retainer pins, when struck with force, can fly out and injure nearby persons. Make sure the area is clear of people when driving retainer pins.

Wear protective glasses when striking a retainer pin to avoid injury to your eyes.

Chips or other debris can fly off objects when struck.

Make sure no one can be injured by flying debris before striking any object.

Falling Objects Protective Structure (FOPS)

This is an attached guard located above the operator's compartment and secured to the lift truck.

To avoid possible weakening of the Falling Objects Protective Structure (FOPS), consult a CROWN branch before altering, by adding weight to, welding on, or cutting or drilling holes into the structure.

The overhead guard is not intended to protect against every possible impact. The overhead guard may not protect against some objects penetrating into the operator's station from the sides or ends of the lift truck.

The lift truck is equipped with an overhead guard and FOPS as standard. If there is a possibility of overhead objects falling through the guard, the guard must be equipped with smaller holes or a Plexiglas cover.

Any altering done that is not specifically authorised by CROWN invalidates CROWN's FOPS certification. The protection offered by this FOPS will be impaired if it has been subjected to structural damage. Structural damage can be caused by an overturn accident, by falling objects, etc.

Do not mount any item such as fire extinguishers, first aid kits and lights by welding brackets to or drilling holes in any FOPS structure. See your CROWN branch for mounting guidelines.

Burn Prevention

Coolant

At operating temperature, the engine coolant is hot and under pressure. The radiator and all lines to heaters or the engine contain hot water or steam.

Any contact can cause severe burns.

Steam can cause personal injury.

Check the coolant level only after engine has been stopped and the filter cap is cool enough to remove with your bare hand.

Remove the cooling system filter cap slowly to relieve pressure.

Cooling system additive contains alkali that can cause personal injury. Avoid contact with the skin and eyes and do not drink.

Allow cooling system components to cool before draining.

Oils

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

At operation temperature, the hydraulic tank is hot and can be under pressure.

Remove the hydraulic tank filter cap only after the engine has been stopped and the filter cap is cool enough to remove with your bare hand.

Remove the hydraulic tank filter cap slowly to relieve pressure.

Relieve all pressure in air, oil fuel or cooling systems before any lines, fittings or related items are disconnected or removed.

Batteries

Batteries give off flammable fumes which can explode.

Do not smoke when observing the battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear protective glasses when working with batteries.

Fire or Explosion Prevention

All fuels, most lubricants and some coolant mixtures are flammable.

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Do not smoke while refueling or in a refueling area.

Do not smoke in areas where batteries are charged, or where flammable materials are stored.

Batteries in series can be located in separate compartments. When using jumper cables always connect positive(+) cable to positive(+) terminal of battery connected to starter solenoid and negative(-) cable from external source to starter negative(-) terminal.

(If not equipped with starter negative (-) terminal, connect to engine block.)

See the Operation Section of this manual for specific starting instructions.

Clean and tighten all electrical connections. Check daily for loose or frayed electrical wires. Have all loose or frayed electrical wires tightened, repaired or replaced before operating the lift truck.

Keep all fuels and lubricants stored in properly marked containers and away from all unauthorised persons.

Store all oily rags or other flammable material in a protective container, in a safe place.

Do not weld or flame cut on pipes or tubes that contain flammable fluids. Clean them thoroughly with nonflammable solvent before welding or flame cutting on them.

Remove all flammable materials such as fuel, oil and other debris before they accumulate on the lift truck.

Do not expose the lift truck to flames, burning brush, etc., if at all possible.

Shields, which protect hot exhaust components from oil or fuel spray in the event of a line, tube or seal failure, must be installed correctly.

Do not operate in areas where explosive gases exist or are suspected.

Fire Extinguisher

Have a fire extinguisher-type BC and 1.5KG minimum capacity-on rear overhead guard leg with latch and know how to use it. Inspect and have it serviced as recommended on its instruction plate.

LPG

LPG is poisonous and flammable.

Breathing LPG vapors or repeated contact of LPG with skin can cause personal injury.

Use LPG only in well-ventilated areas.

Do not smoke while changing LPG cylinders.

Use LPG with care to avoid fires.

Do not store replacement LPG cylinders in living areas or in the operator's compartment.

Do not store LPG cylinders in direct sunlight or at temperatures above 39°C (102°F).

Discard cylinders in a safe place. Do not puncture or burn cylinders.

Keep LPG cylinders out of the reach of unauthorised personnel.

Lines, Tubes and Hoses

Do not bend or strike high pressure lines. Do not install bent or damaged lines, tubes or hoses.

Repair any loose or damaged fuel and oil lines, tubes and hoses. Leaks can cause fires. Contact your CROWN branch for repair or replacement.

Check lines, tubes and hoses carefully. Do not use your bare hand to check for leaks. Use a board or cardboard to check for leaks. See Fluid Penetration in the Safety Section for more details. Tighten all connections to the recommended torque. Replace if any of the following conditions are found.

End fittings damaged or leaking.

Outer covering chafed or cut and wire reinforcing exposed.

Outer covering ballooning locally.

Evidence of kinking or crushing of the flexible part of hose.

Armoring embedded in the outer cover.

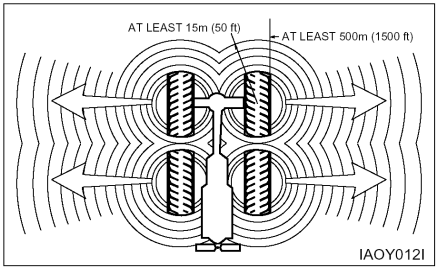
End fittings displaced.

Make sure that all clamps, guards and heat shields are installed correctly to prevent vibration, rubbing against other parts, and excessive heat during operation.

Tyre Information

Explosions of air-inflated tyres have resulted from heat-induced gas combustion inside the tyres. The heat, generated by welding or heating rim components, external fire, or excessive use of brakes can cause gaseous combustion.

A tyre explosion is much more violent than a blowout. The explosion can propel the tyre, rim and axle components as far as 500 m (1500 ft) or more from the lift truck. Both the force of the explosion and the flying debris can cause personal injury or death, and property damage.



Do not approach a warm tyre closer than the outside of the area represented by the shaded area in the above drawing.

Dry nitrogen (N2) gas is recommended for inflation of tyres. If the tyres were originally inflated with air, nitrogen is still preferred for adjusting the pressure. Nitrogen mixes properly with air.

Nitrogen inflated tyres reduce the potential of a tyre explosion, because nitrogen does not support combustion. Also, nitrogen helps prevent oxidation and the resulting deterioration of rubber and corrosion of rim components.

Proper nitrogen inflation equipment and training in its use are necessary to avoid over inflation. A tyre blowout or rim failure can result from improper or misused equipment.

Stand behind the tread and use a self-attaching chuck when inflation a tyre.

Servicing, changing tyres and rims can be dangerous and should be done only by trained personnel using proper tools and procedures. If correct procedures are not followed while servicing tyres and rims, the assemblies could burst with explosive force and cause serious personal injury or death. Follow carefully the specific information provided by your tyre or rim servicing personnel or branch.

CROWN forklift is equipped with wheels from different manufacturers.

Please re-use the original parts of the existing wheel, if there is no deformation of the wheel after checked. Mixing up new and old parts may cause incomplete assembly that might lead to unexpected dismantlement of parts and accident.

Operator Restraint System

Warning Signs and Labels

Your CROWN lift truck has the following tip over warning decals.

Make sure that you can read all safety signs. Clean or replace these if you cannot read the words or see the pictures. When cleaning the labels use a cloth, water and soap. Do not use solvent, gasoline, etc. You must replace a label if it is damaged, missing or cannot be read. If a label is on a part that is replaced, make sure a new label is installed on the replaced part. See you CROWN Lift Truck branch for new labels.

The most effective method of preventing serious injury or death to yourself or others is to familiarise yourself with the proper operation of the lift truck, to be alert, and to avoid actions or conditions which can result in an accident.

⚠ WARNING

Tip over can occur if the truck is improperly operated. In the event of tip over, injury or death could result.

"Survive in tipover" decal

IB9O0002

"Survive in tipover" decal

IB9O0003

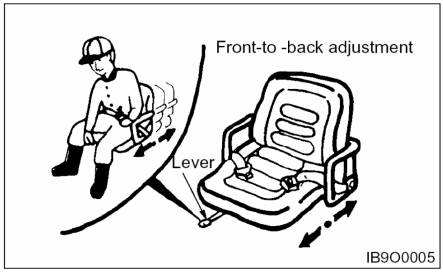
"Fasten seat belt" decal

"Survive in tipover" decal

IB9O0004

The "Survive in tip over" warning is located on the overhead guard. It shows the proper use of the operator restraint system.

Seat Adjustment



IB9O0005

Move the lever, slide the seat to the desired position, and release the lever.

Adjust the seat before operating the lift truck. After adjusting, set the seat to make sure it is properly locked. Do not adjust the seat while the truck is in motion.

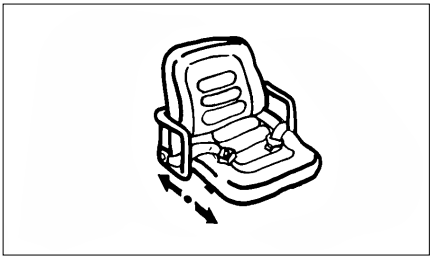
⚠ WARNING

Do not place your hand or fingers under the seat. Injury may occur as the seat moves up and down.

If Optional Suspension Seat Equipped

Forward and Backward Adjustment

The seat can be adjusted by pushing the lever on the right side of seat.



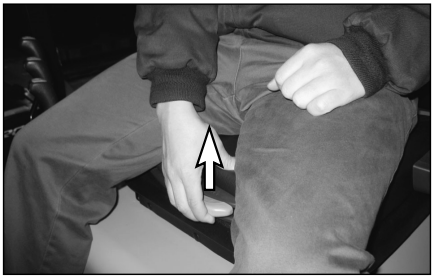
Adjust the seat before operating the lift truck. After adjusting, set the seat to make sure it is properly locked. DO NOT adjust the seat while the truck is in motion.

Weight adjustment

Pull the weight adjustment lever upwards and move right or left side.
Adjust to driver's weight in 7 steps (50 ~ 110 kg)

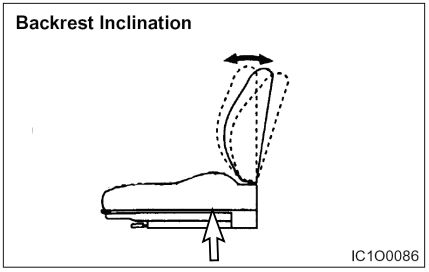
NOTICE

Do not place your hand or fingers under the seat. Injury may occur as the seat moves up and down.



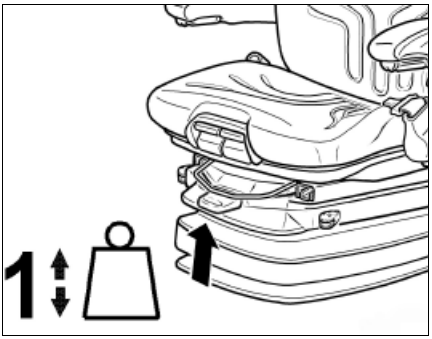
Backrest Inclination

The backrest angle can be adjusted by using the lever on the left side of seat.



If Optional Air Suspension Seat Equipped

Seat functions and operation



Weight adjustment

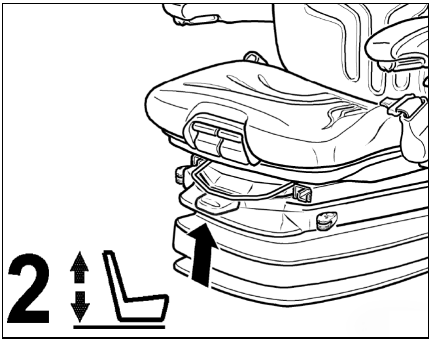
The seat should be adjusted for the driver's weight by briefly pulling the actuator lever of the automatic weight and height adjuster (arrow) with the vehicle at a standstill and the driver sitting on the seat.

The driver must sit absolutely still during adjustment.

⚠ WARNING

Before adjusting the weight, adjust shock absorbers to the position "soft".

To prevent damage to the health, the setting for the driver's weight must be checked and adjusted as necessary before the vehicle is driven.



Height adjustment

The seat height can be set pneumatically and is continuously adjustable.

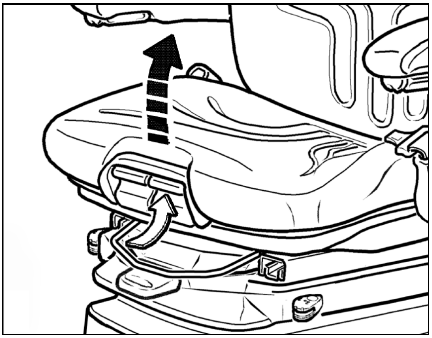
The seat height can be altered by pulling or pressing the actuator lever fully out or in (arrow).

If the adjustment reaches the top or bottom endstop, the height is adjusted automatically in order to guarantee a minimum spring travel.

⚠ WARNING

Before adjusting the height, adjust shock absorbers to the position "soft".

In order to avoid damage, do not operate compressor for more than 1 minute.

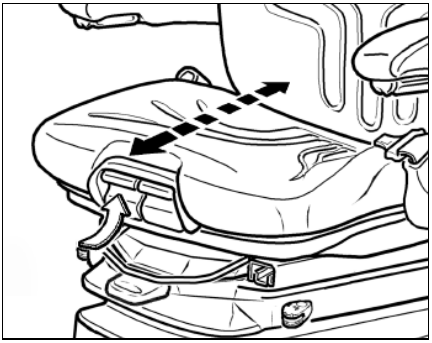


Seat pan angle adjustment

The angle of the seat pan can be individually

adjusted.

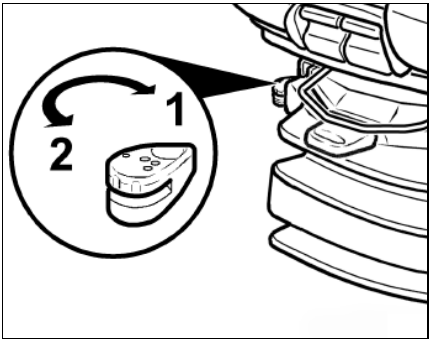
To adjust the angle of the seat pan, lift the L/H handle (see arrow). By exerting pressure on or off the seat pan it can be moved to the desired angle position.



Seat depth adjustment

The depth of the seat pan can be individually adjusted.

To adjust the depth of the seat cushion, lift the R/H handle (see arrow). By moving the seat cushion backwards or forwards the desired seating position can be reached.



Absorber

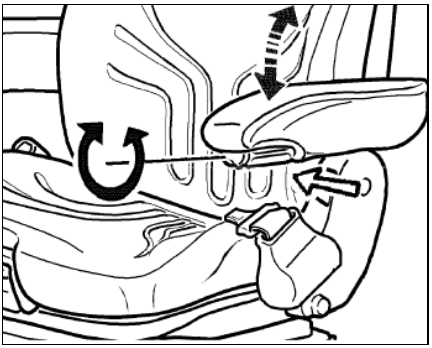
The absorber setting of the seat can be varied to suit the on and off-road driving conditions.

The cushioning effect can be individually adjusted for this purpose.

Turn the lever to the desired position and release.

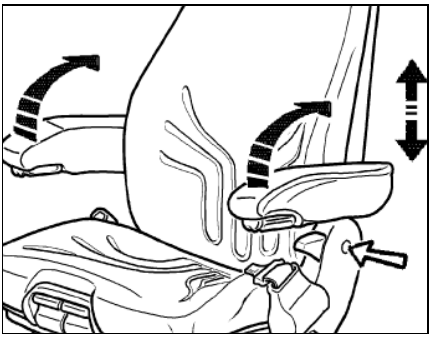
1 soft

2 hard



Armrest adjustment

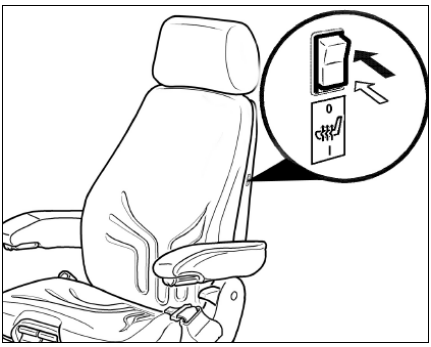
The inclination of the armrests can be modified by turning the adjustment knob (arrow).



Armrests

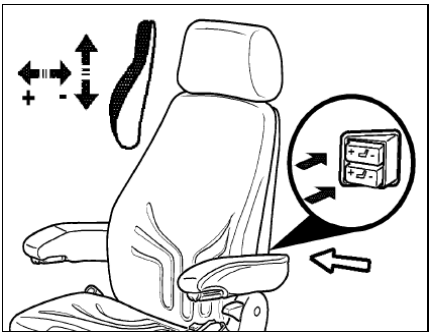
The armrests can be folded up if required and the height individually adjusted.

To adjust the armrests for height, separate the round cap (see arrow) from the cover,loosen the hexagon nut (size 13mm), adjust the armrest to the desired position and tighten the nut again. Press the previously separated cap cover back onto the nut.



Seat heater

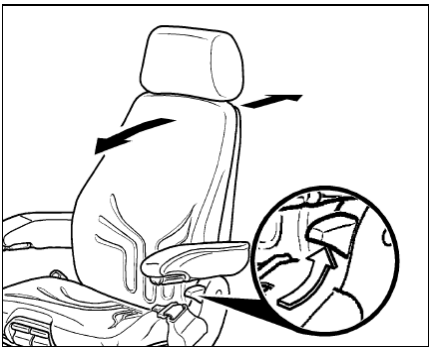
The seat heater is turned on by pressing the switch.



Lumbar support

The curve of the backrest cushion can be Individually adjusted by pressing the upper and lower switches.

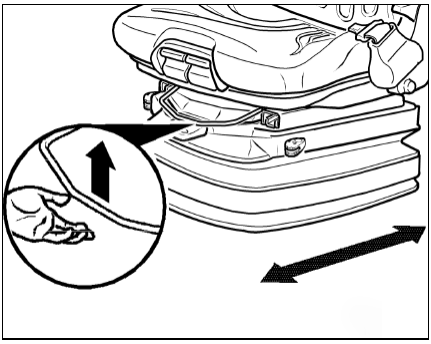
This increases both the seating comfort and the performance of the driver.



Backrest adjustment

The backrest is adjusted using the locking lever (arrow).

The locking lever must latch into the desired position. It should not be possible to move the backrest into another position when it is locked.



Fore/aft adjustment

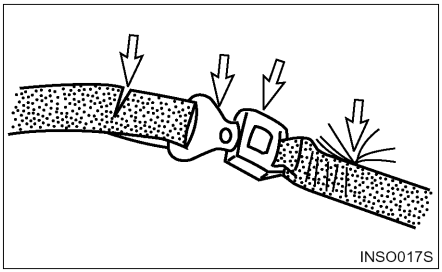
The fore/aft adjustment is released by lifting the locking lever.

The locking lever must latch into the desired position. It should not be possible to move the driver seat into another position when it is locked.

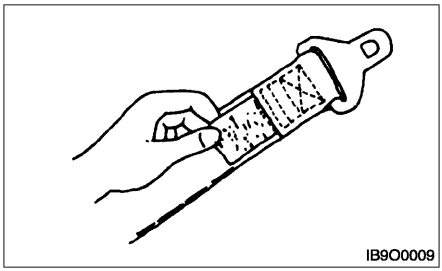
Seat Belt

The Operator Restraint System, Prevents the operator from the operator's compartment in the event of forward or side tip over. The system is designed to keep the operator on the seat and in the operator's compartment in the event of tip over.

Inspection



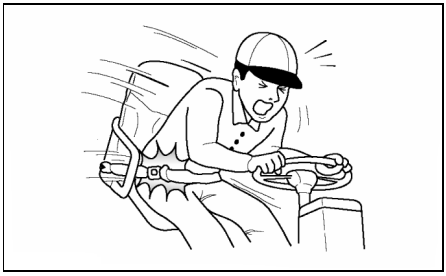
1. If the seat belt is torn, if pulling motion is interrupted during extension of the belt, or if the belt cannot be inserted into the buckle properly, replace the seat belt assembly.



2. Belt Maintenance – Every 500 service hours. Check that the belt fastening works properly and that winding device is free from run lock when jerked. Check that the belt is suitably fastened to the seat. Check that the seat is correctly secured to the hood and the chassis. On visual inspection, fastenings must be intact, otherwise, contact the safety manager.

⚠ WARNING

Your CROWN truck comes equipped with a CROWN operator restraint system. Should it become necessary to replace the seat for any reason, it should only be replaced with another CROWN operator restraint system.



3. In the event of tip over, the seat and restraint system should be inspected for damage and replaced, if necessary.

NOTE: Operator restraints shall be examined at the regular truck service intervals. It is recommended that they be replaced if any of the following conditions are found:

Cut or frayed strap

Worn or damaged hardware including anchor points

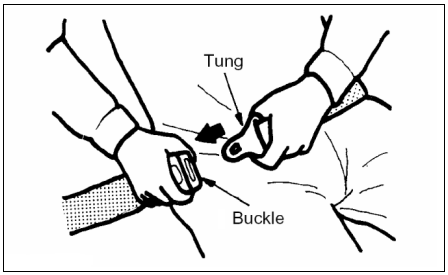
Buckle or retractor malfunction

Loosen stitching

⚠ WARNING

The seat belt may cause the operator to bend at the waist. If you are pregnant or have suffered from some abdominal disease, consult a doctor before you use the seat belt.

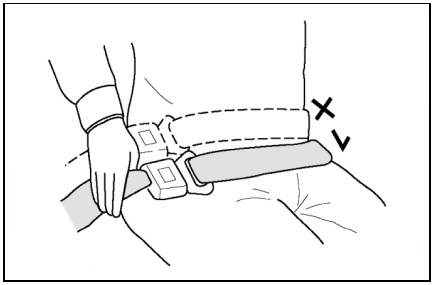
Fasten the Seat Belt



1. Grip the plate (connector) of the belt and pull the belt from the retractor. Then insert the plate into the slot of the buckle until a snap is heard. Pull on the belt to confirm it is latched.
2. Make sure the belt is not twisted.

⚠ WARNING

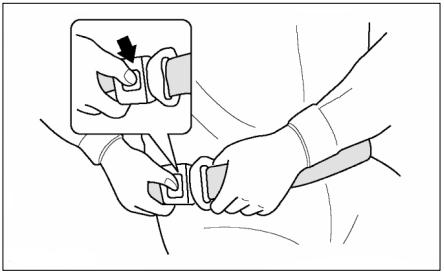
If you fasten the belt across your abdomen, the belt may injure your abdomen in an accident.



3. Be sure to fasten the belt across your hips, not across your abdomen.

NOTE: The belt is designed to automatically adjust to your size and movement. A quick pull on the belt will confirm that the automatic adjuster will hold the belt position in the event of an accident.

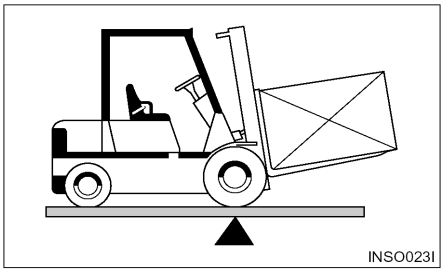
Release the Seat Belt



Push the button of the buckle to release the belt. The belt will automatically retract when released. Hold the plate of the belt and allow the belt to slowly retract.

Avoiding Lift Truck Tip over

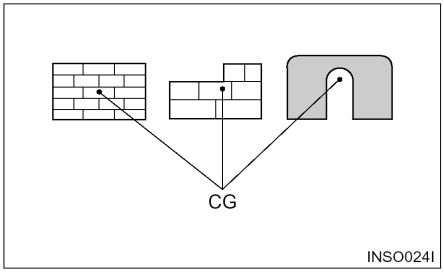
Lift Truck Stability



Counterbalanced lift truck design is based on the balance of two weights on opposite sides of a fulcrum (the front axle). The load on the forks must be balanced by the weight of the lift truck.

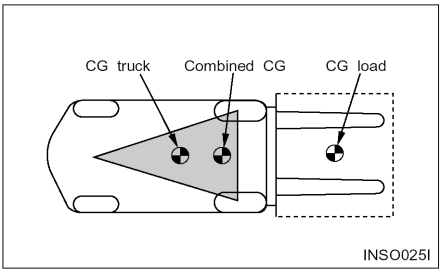
The location of the centre of gravity of both the truck and the load is also a factor. This basic principle is used for picking up a load. The ability of the lift truck to handle a load is discussed in terms of centre of gravity and both forward and sideways stability.

Centre of Gravity (CG)



The point within an object, at which the whole weight of the object may be regarded as being concentrated, is called the centre of gravity or CG. If the object is uniform, its geometric centre will coincide with its CG. If it is not uniform, the CG could be at a point outside of the object. When the lift truck picks up a load, the truck and load have a new combined CG.

Stability and Centre of Gravity



The stability of the lift truck is determined by the location of its CG; or, if the truck is loaded, the combined CG of the truck and load. The lift truck has moving parts and, therefore, has a CG that moves. The CG moves forward or backward as the mast is tilted forward or backward. The CG moves up or down as the mast moves up or down. The CG and, therefore, the stability of the loaded lift truck, are affected by a number of factors such as:

the size, weight, shape and position of the load

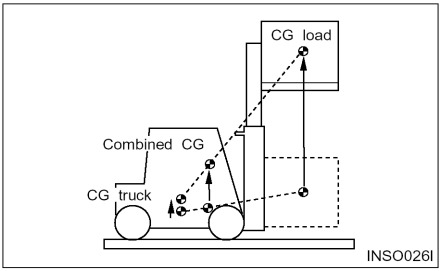
the height to which the load is lifted

the amount of forward or backward tilt

tyre pressure

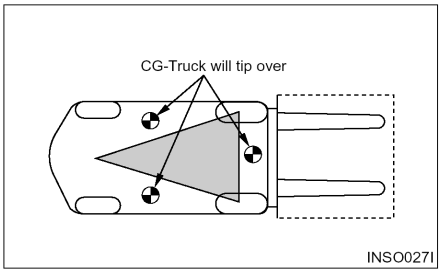
dynamic forces created when the lift truck is accelerated, braked or turned

condition and grade of surfaces on which the lift truck is operated



These same factors are also important for unloaded lift trucks. They tip over sideways easier than a loaded lift truck carrying its load in the lowered position.

Lift Truck Stability Base

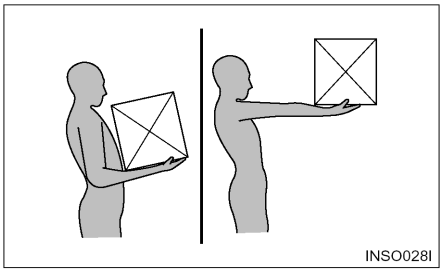


For the lift truck to be stable (not tip over forward or to the side), the CG must stay within the area of the lift truck stability base – a triangular area between the front wheels and the pivot of the steer wheels. If the CG moves forward of the front axle, the lift truck will tip forward. If the CG moves outside of the line on either side of the stability base, the lift truck will tip to the side.

⚠ WARNING

Dynamic forces (braking, acceleration, turning) also affect stability and can produce tip over even when the CG is within the stability triangle.

Capacity Load (Weight and Load Centre)



The capacity load of the lift truck is shown on the capacity/nameplate riveted to the truck. It is determined by the weight and load centre. The load centre is determined by the location of the CG of the load.

The load centre shown on the nameplate is the horizontal distance from the front face of the forks, or the load face of an attachment, to the CG of the load. The location of the CG in the vertical direction is the same as the horizontal dimension.

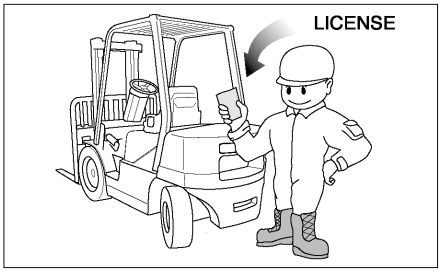
Remember that, unless otherwise indicated, the capacity load shown on the nameplate is for a standard lift truck with standard backrest, forks and mast, and having no special-purpose attachment. In addition, the capacity load assumes that the load centre is no further from the top of the forks than it is from the face of the backrest. If these conditions do not exist, the operator may have to reduce the safe operating load because the truck stability may be reduced. The lift truck should not be operated if its capacity/nameplate does not indicate capacity load.

NOTE: If the load is not uniform, the heaviest portion should be placed closer to the backrest and centred on the forks.

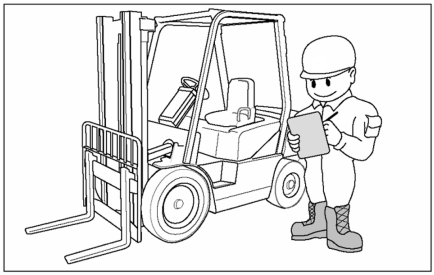
NOTICE

1. Capacity/Nameplates originally attached to forklifts sold by CROWN shall not be removed, altered or replaced without CROWN's approval.
2. CROWN assumes no responsibility for lift trucks placed in service without a valid CROWN Nameplate.
3. If necessary to change your specification, contact your CROWN lift truck branch.

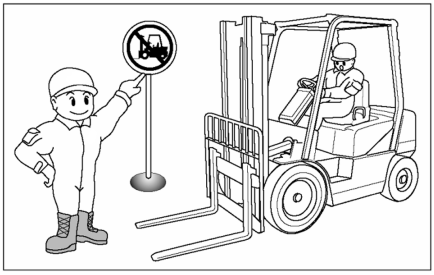
Safety Rules



Only properly trained and authorised personnel should operate forklift trucks. Wear a hard hat and safety shoes when operating a lift truck. Do not wear loose clothing.



Inspect and check the condition of your forklift truck using the operator's check list before starting work. Immediately report to your supervisor any obvious defects or required repairs.

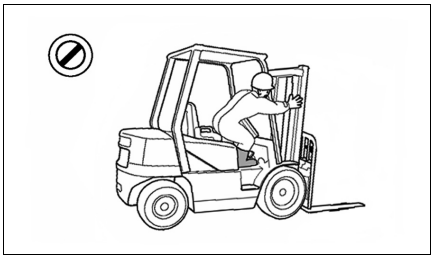


Do not operate your truck in unauthorised areas.

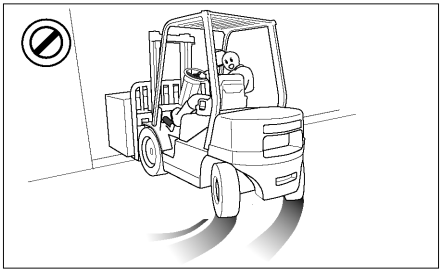
Know your forklift truck and think safety.

Do not compromise safety.

Follow all safety rules and read all warning signs.

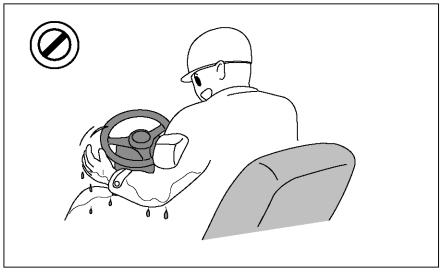


Do not operate a lift truck unless you are in the operator's seat. Keep hands and feet inside the operator's compartment. Do not put any part of the body outside of the operator's compartment. Never put any part of body into the mast structure or between the mast and the truck

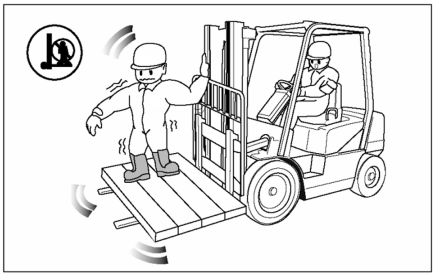


Do not start, stop, turn or change direction suddenly or at high speed. Sudden movement can cause the lift truck to tip over. Slow the speed of your truck and use the horn near corners, exits, entrances, and near people.

In case of a truck with the steering knob, do not operate the steering knob suddenly, to prevent accident caused by quick turning.

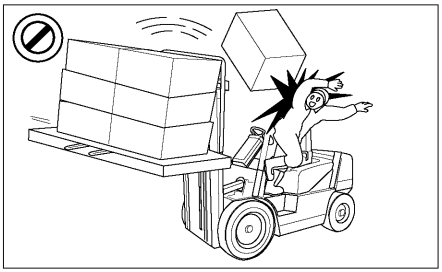


Never operate a lift truck with wet hands or shoes. Never hold any controls with grease on your hands. Your hands or feet will slide off of the controls and cause an accident.

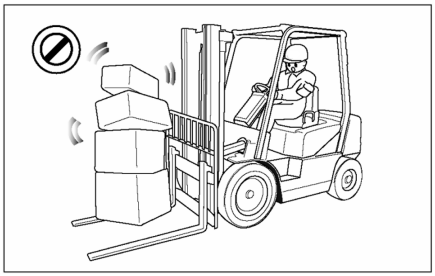


Do not raise anyone on the forks of your lift truck.

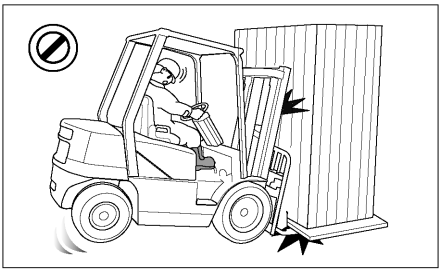
Do not let other people ride on the truck. Lift trucks are designed to carry loads, not people.



Do not operate your truck without the load backrest extension and overhead guard. Keep the load against the backrest with the mast tilted backward.

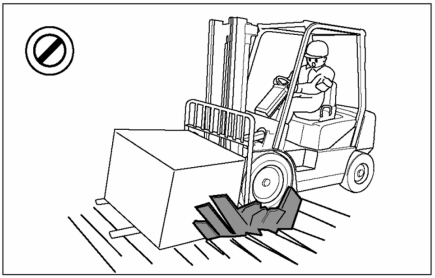


Do not lift or move loads that are not safe. Do not pick up an off centre load. Such a load increases the possibility of a tip over to the side. Make sure loads are correctly stacked and positioned across both forks. Always use the proper size pallet. Position the forks as wide as possible under the load. Position loads evenly on the forks for proper balance. Do not lift a load with one fork.



Do not overload. Always handle loads within the rated capacity shown on the capacity plate.

Do not add extra counterweight to the truck. An overload can cause the truck to roll over and cause injury to personnel and damage to the lift truck.



Do not drive on soft ground.

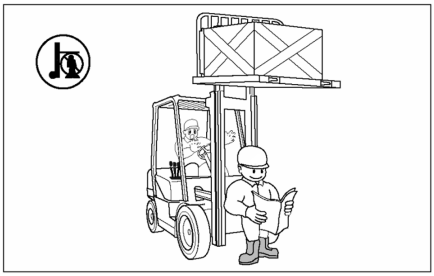
Observe all signs, especially those on maximum permitted floor loadings, elevator capacities and clearance heights.

Handle loads carefully and check them closely for stability and balance.

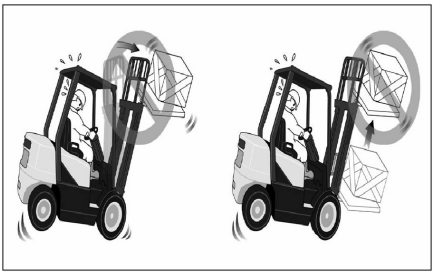
Do not drive on slippery surfaces.

Sand, gravel, ice or mud can cause a tip over.

If unavoidable, slow down.



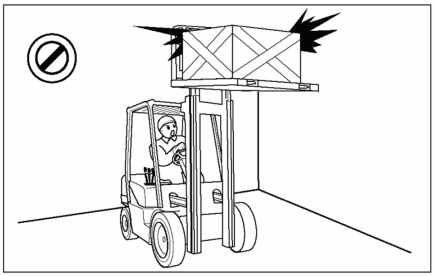
Do not permit anyone to stand or walk under the load or lifting mechanism. The load can fall and cause injury or death to anyone standing below.



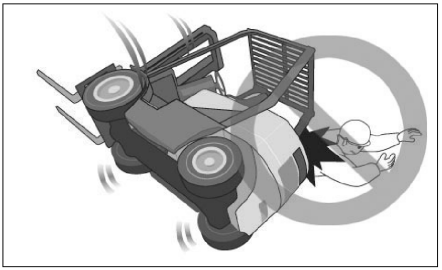
Do not elevate the load with the mast tilted forward.

Do not tilt the elevated loads forwards.

This will cause the lift truck to tip over forward.

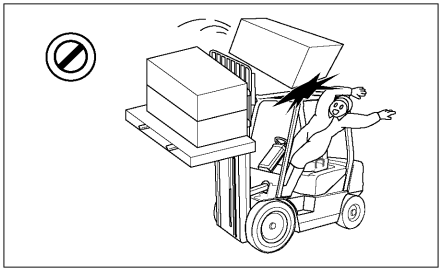


Look out for overhead obstructions when raising or stacking loads. Do not travel with a raised load. Do not travel with the mast raised. The lift truck can roll over and cause injury or death to you or other personnel.



Do not jump off if your truck starts to tip over.

Stay in your seat to survive.

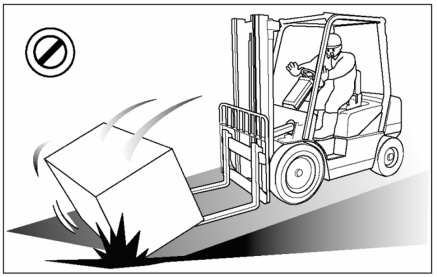


Do not move loose loads that are higher than the load backrest.

Be alert for falling loads when stacking.

Travel with the load tilted back and the forks as low as possible.

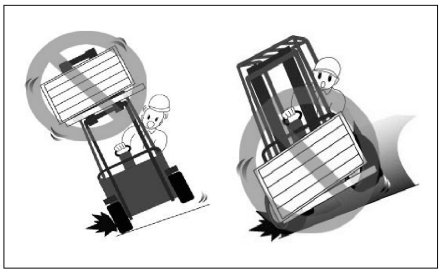
This will increase stability to the truck and load and permit better visibility for you.



Go up ramps in forward direction and down ramps in reverse direction when moving loads.

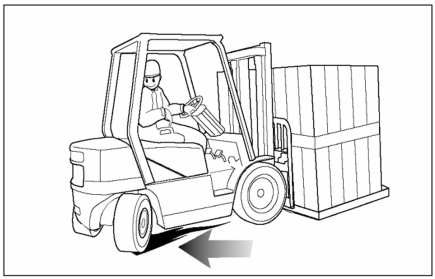
Never elevate a load with the forklift truck on an incline.

Go straight off and straight down. Use an assistant when going up or down a ramp with a bulky load.

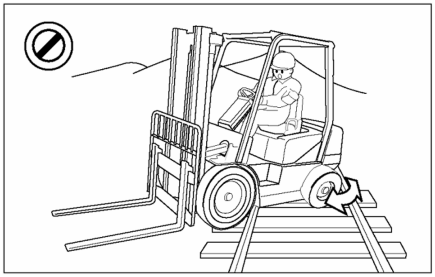


Do not stack or turn on ramps.

Do not attempt to pick-up or deposit a load unless the lift truck is level. Do not turn on or drive across an incline.

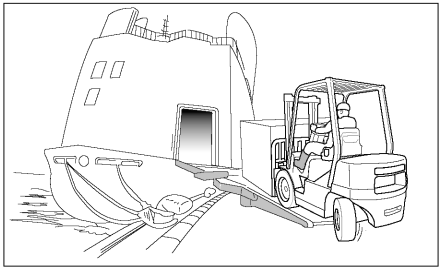


Do not drive in forward direction when loads restrict your visibility. Operate your lift truck in reverse to improve visibility except when moving up a ramp.



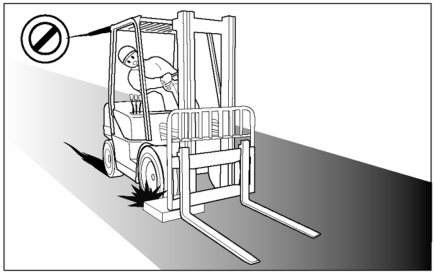
Do not go over rough terrain. If unavoidable, slow down.

Cross railroad tracks slowly and diagonally whenever possible. A railroad crossing can give a loaded forklift truck a real jolt. For smoother crossing, cross the railroad diagonally so one wheel crosses at a time.

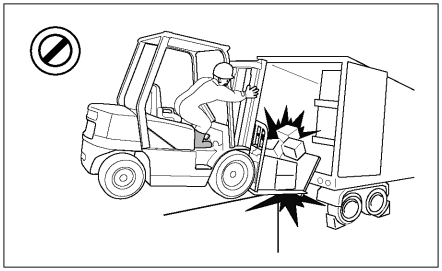


Be careful when operating a lift truck near the edge of a loading dock or ramp. Maintain a safe distance from the edge of docks, ramps and platforms. Always watch tail swing.

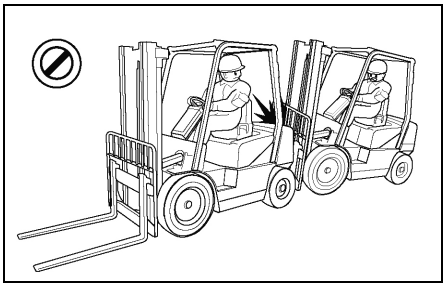
The truck can fall over the edge and cause injury or death.



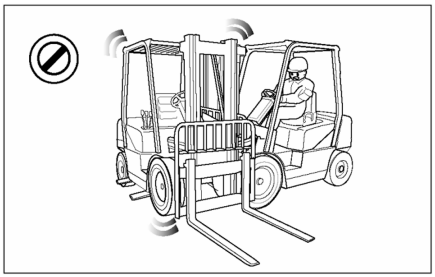
Avoid running over loose objects. Look in the direction of travel. Look out for other persons or obstructions in your path of travel. An operator must be in full control of his lift truck at all times.



Do not operate on bridge plates unless they can support the weight of the truck and load. Make sure that they are correctly positioned. Put blocks on the vehicle you enter to keep it from moving.



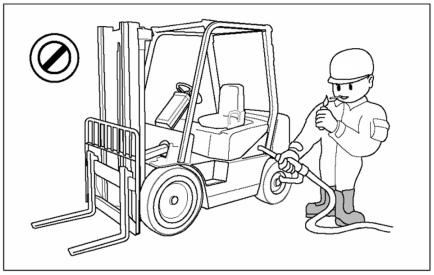
Do not operate your truck close to another truck. Always keep a safe distance from other trucks and make sure there is enough distance to stop safely. Never overtake other vehicles.



Do not use your lift truck to push or tow another truck.

Do not let another push or tow your truck.

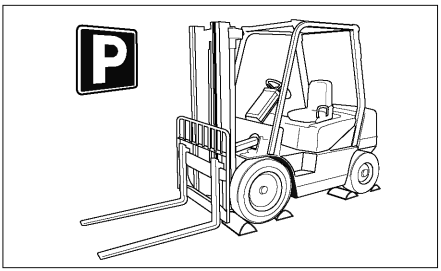
If a truck will not move, call a service technician.



Forklift trucks may only be refueled at specially reserved locations. Switch off the engine when refueling.

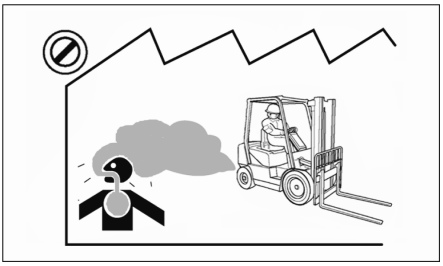
Smoking and handling of naked flames during refueling are strictly prohibited. This prohibition also applies during the changing of the LPG (liquefied propane gas) tank.

Mop up spilt fuel and do not forget to close the fuel tank before restarting the engine.

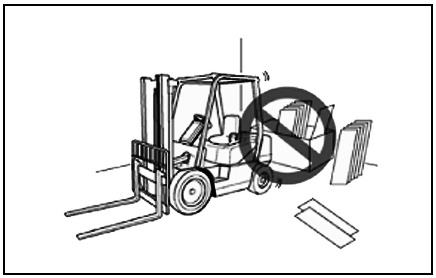


Park your lift truck in authorised areas only. Fully lower the forks to the floor, put direction lever in NEUTRAL position, engage the parking brake, and turn the key to the OFF position. Remove the key and put blocks behind the wheels to prevent the truck from rolling. Shut off your forklift truck when leaving it unattended.

Check the condition of your forklift truck after the day's work.

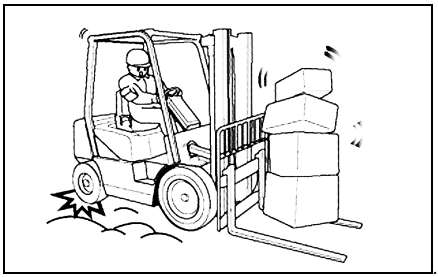


Exhaust from all internal combustion engines contains carbon monoxide, a colorless, odorless, tasteless, poisonous gas. Exposure to carbon monoxide can cause serious injury or health problems, including death, and avoid unnecessary idling of the engine. If nausea, dizziness or headaches are experienced stop the truck and seek fresh air.



Do not operate forklifts near flammable or combustible materials.

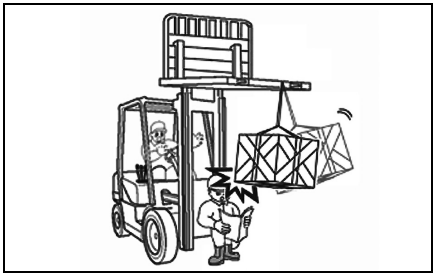
To avoid the discoloration, deformation or combustion of materials (such as lumber, veneer board, paper products and other similar items), always park at least 30 cm (12 inches) away from them.



Forklift trucks are not cars. They often have small tyres, no suspension, and are very heavy.

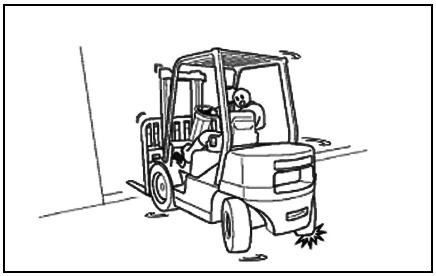
The forklift's centre of gravity will also change when carrying loads.

Avoid uneven bumps, pot holes and other hazards whenever possible.



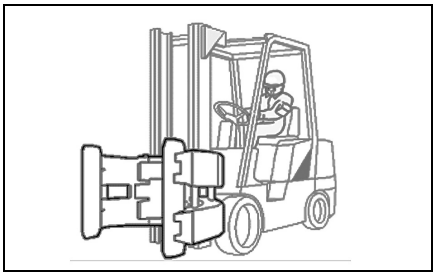
Carrying a load suspended on a chain or a cable may unbalance a truck.

Take extra care around pedestrians with a suspended load as it may sway or even strike them.



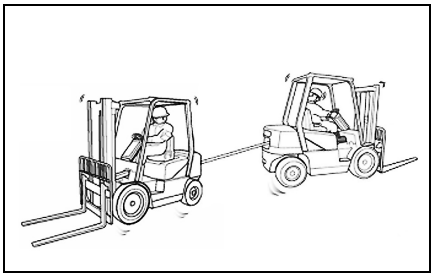
An unloaded forklift may be easier to tip over than a loaded truck.

When traveling without a load, the risk of lateral overturn is greater.



There are many special attachments available to replace the forks on a lift truck.

It is highly recommended that all receive safety education and special training for their operation.



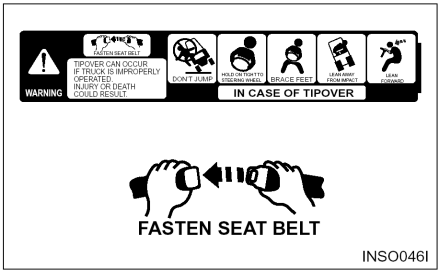
The counterweight draw bar should not be used for towing the forklift or for towing another forklift.

Towing is only advised in emergencies, by trained operators and at low speed, no faster than 2 km/h, to a convenient location for repair.

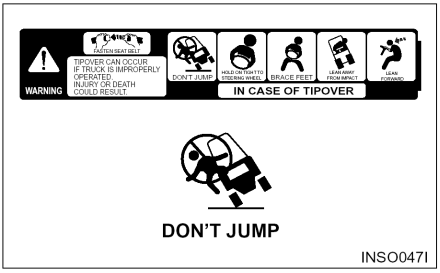
How to Survive in a Tip over (If Operator Restraint System Equipped)

⚠ WARNING

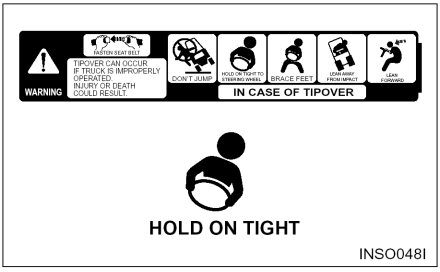
In the event of a tip over, the risk of serious injury or death will be reduced if the operator is using the operator restraint system and follows the instructions provided.



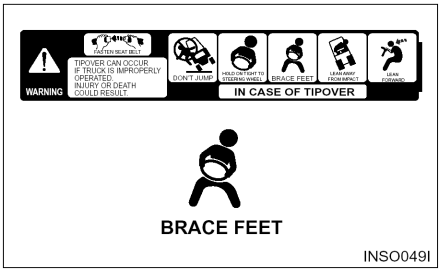
Always use operator restraint system.



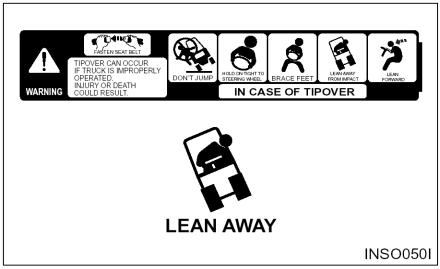
Don't jump.



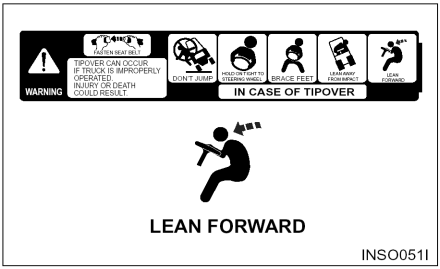
Hold on tight.



Brace your feet and keep them within the operator's compartment.



Lean away from the direction of fall.



Lean forward.

Declaration of Conformity

We,
Manufacturer
Doosan Industrial Vehicle Co., Ltd.
468, Injung-Ro, Dong-Gu, Incheon, Korea 22503

Authorised Representative and Compiler of Technical File According to 2006/42/EC and **Keeper** of Technical File According to 2000/14/EC

Doosan Industrial Vehicle Europe N.V., Mr. C.K.CHUNG
Europark Noord 36A, 9100 Sint-Niklaas, Belgium

herewith declare
that the following equipment conforms with the appropriate requirements of the Directives 2006/42/EC(Machinery Directive), Exhaust gas REGULATION (EU)2016/1628(Stage-V), 2000/14/EC as amended by 2005/88/EC(Noise Emission in the environment by equipment for use outdoors), and 2014/30/EU (EMC Directive) based on its design and type, as brought into circulation by us

Description of the equipment:

Type : Lift Truck, Combustion-engine driven, Counterbalanced

Function : Lifting and Moving materials

Family : CD60/70S-9(55.4 kW), CD60/70/80/90S-9(80.9 kW) series

Model / Commercial Name :

Serial Number :

Net installed power [kW] : 55.4/80.9 kW

Measured sound power level representative for this type : 99.6(55.4 kW)/103.1(80.9 kW) dB(A)

Guaranteed sound power level for this equipment : 100(55.4 kW) /104(80.9 kW) dB(A)

Conformity assessment procedure According to 2000/14/EC : **Annex V**

Applicable EC Directives	**: 2006/42/EC, 2014/30/EU, 2000/14/EC, (EU)2016/1628**
Applicable harmonized standard	**: EN 16307-1:2020, EN ISO 3691-1;2015+A1:2020**
	EN 1175:2020, EN 12895;2015+A1:2019
	EN 1175-2;1998+A1;2010, EN 1175-3;1998+A1;2010

Declaration of Conformity

We,
Manufacturer
Doosan Industrial Vehicle Co., Ltd.
468, Injung-Ro, Dong-Gu, Incheon, Korea 22503

Authorised Representative and Compiler of Technical File According to 2006/42/EC and **Keeper** of Technical File According to 2000/14/EC

Doosan Industrial Vehicle Europe N.V.,Mr. C.K.CHUNG
Europark Noord 36A, 9100 Sint-Niklaas, Belgium

herewith declare
that the following equipment conforms with the appropriate requirements of the Directives Supply of Machinery (Safety) Regulations 2008 (Machinery Directive), Exhaust gas REGULATION (EU)2016/1628(Stage-V), Noise Emission in the Environment by Equipment for use Outdoors Regulations 2001, and Electromagnetic Compatibility Regulations 2016 (EMC Directive) based on its design and type, as brought into circulation by us.

Description of the equipment:

Type : Lift Truck, Combustion-engine driven, Counterbalanced

Function : Lifting and Moving materials

Family : CD60/70S-9(55.4 Kw), CD80/90S-9(80.9 Kw) series

Model / Commercial Name :

Serial Number :

Net installed power [kW] : 55.4 / 80.9 kW

Measured sound power level representative for this type : 99.6(55.4* Kw), *103.1(80.9* Kw) *dB(A)

Guaranteed sound power level for this equipment : 100(55.4* Kw), *104(80.9* Kw) *dB(A)

Conformity assessment procedure According to 2000/14/EC : **Annex**

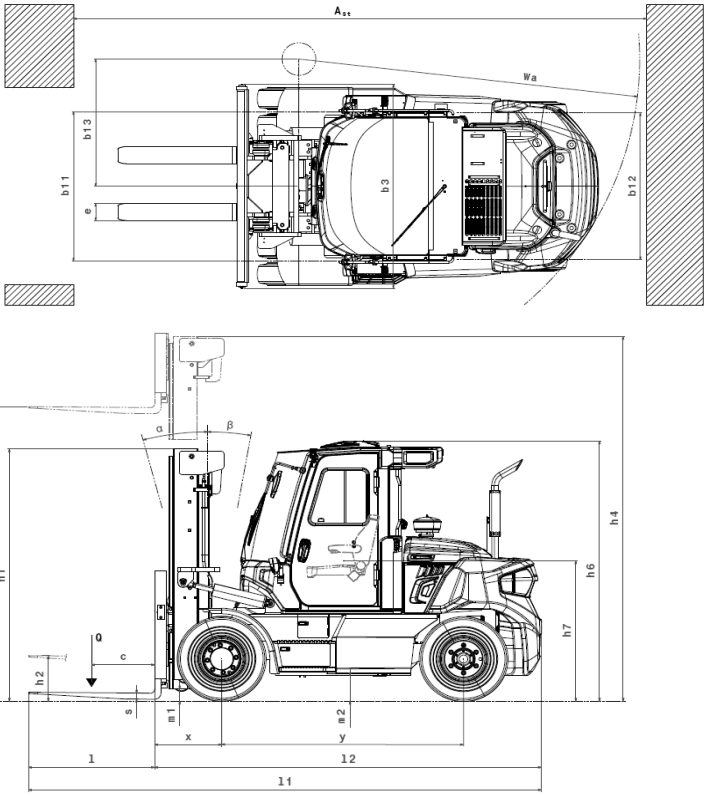
Applicable EC Directives : Supply of Machinery (Safety) Regulations 2008,
Electromagnetic Compatibility Regulations 2016
Noise Emission in the Environment by Equipment for use Outdoors Regulations 2001
Exhaust gas REGULATION (EU)2016/1628(Stage-V)

Applicable harmonized standard : BS EN 16307-1:2020, BS EN ISO 3691-1;2015+A1:2020
BS EN 1175:2020, BS EN 12895;2015+A1:2019
BS EN 1175-2;1998+A1;2010, BS EN 1175-3;1998+A1;2010

Specifications

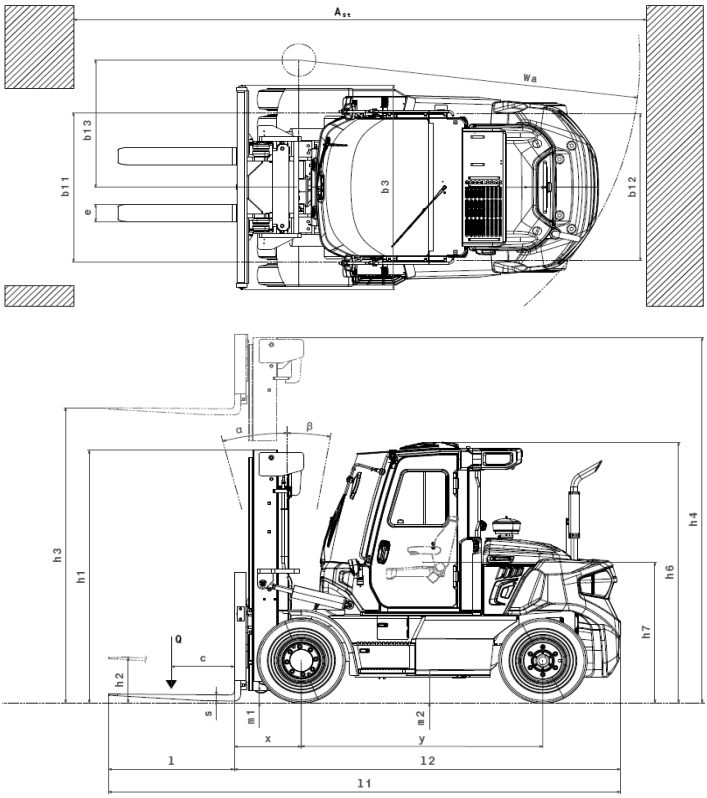
Characteristics	1.1	Manufacturer			**CROWN**	**CROWN**
	1.2	Model designation			CD60S-9 3 Speed (STAGE-V 55kW)	CD70S-9 3 Speed (STAGE-V 55kW)
	1.3	Drive: Diesel, Gasoline, LP			Diesel	Diesel
	1.4	Operator type: Hand, Pedestrian, Standing, Seated, Order-picker			Seated	Seated
	1.5	Load Capacity	Q	kg	6,000	7,000
	1.6	Load Centre	c	mm	600	600
	1.8	Load Distance: Centre of Driveaxle to fork	x	mm	632	632
	1.9	Wheelbase	y	mm	2,300	2,300
Weight	2.1	Service weight		kg	9,435	10,100
	2.2	Axle Loading, Laden Front/Rear		kg	13,530/1,970	14,955/2,210
	2.3	Axle Loading, Unladen Front/Rear		kg	4,285/5,150	4,175/5,925
Tyres	3.1	Tyres: pneumatic (P), superelastic (SE), cushion (C)			P	P
	3.2	Tyre size, Front			8.25x15-14PR	8.25x15-14PR
	3.3	Tyre size, Reat			8.25x15-14PR	8.25x15-14PR
	3.5	Wheels, number Front/Rear (x = driven wheels)			4/2	4/2
	3.6	Tread, Front	b_{11}	mm	1,584	1,584
	3.7	Tread, Rear	b_{12}	mm	1,550	1,550
Dimensions	4.1	Tilt of Mast/Fork carriage Forward/Backward	α/β	°	15/10	15/10
	4.2	Height, Mast lowered	h_1	mm	2,495	2,495
	4.3	Free Lift	h_2	mm	205	205
	4.4	Lift	h_3	mm	3,000	3,000
	4.5	Height, Mast Extended	h_4	mm	4,275	4,275
	4.7	Height of Overhead Guard(Cabin)	h_6	mm	2,468(2,535)	2,468(2,535)
	4.8	Height of Seat	h_7	mm	1,455	1,455
	4.19	Overall Length	l_1	mm	4,818	4,897
	4.20	Length to Forkface	l_2	mm	3,618	3,697
	4.21	Overall Width	b_1/b_2	mm	2,156	2,156
	4.22	Fork Dimensions	s/e/l	mm	60x180x1,200	60x180x1,200
	4.23	Fork carriage ISO 2328, class/type A,B			4/B	4/B
	4.24	Fork carriage width	b_3	mm	2,156	2,156
	4.31	Ground Clearance, laden, below mast	m_1	mm	196	196
	4.32	Ground Clearance, centre of wheelbase	m_2	mm	214	214
	4.34.1	Aisle withd for pallets 1,000 x 1,200 crossways	A_{st}	mm	5,252	5,293
	4.34.2	Aisle width for pallets 800 x 1,200 lengthways	A_{st}	mm	5,452	5,493
	4.35	Turning Radius	W_a	mm	3,380	3,430
	4.36	Internal Turning Radius	b_{13}	mm	1,344	1,344
Performance data	5.1	Travel Speed, Laden/Unladen		km/h	30.7/34.7	28.6/34.5
	5.2	Lift Speed, Laden/Unladen		m/s	0.47/0.53	0.41/0.47
	5.3	Lowering Speed, Laden/Unladen		m/s	0.5/0.45	0.5/0.45
	5.5	Drawbar pull, Laden/Unladen(@ 1.6km/h)		N	49,119	49,001
	5.6	Max. Drawbar pull, Laden/Unladen		N	65,756	65,933
	5.7	Gradeability, Laden/Unladen(@ 1.6km/h)		%	34.8/62	31/57
	5.8	Max. Gradeability, Laden/Unladen		%	49.0/95	43.0/85
	5.10	Service Brake			foot/hydraulic	foot/hydraulic

Characteristics	1.1	Manufacturer			**CROWN**	**CROWN**
	1.2	Model designation			CD60S-9 3 Speed (STAGE-V 55kW)	CD70S-9 3 Speed (STAGE-V 55kW)
Combustion Engine	7.1	Engine Manufacturer/type			DM03V	DM03V
	7.2	Engine power according to DIN ISO1585		kW	55	55
	7.3	Rated Speed		min^{-1}	2,300	2,300
	7.3.1	Torque at 1/min		N•m	400/1,300	400/1,300
	7.4	Number of Cylinders/Displacement		$-/cm^3$	4/3,409	4/3,409
	7.5	Fuel Consumption according to VDI Cycle		l/h or kg/h	5	5
	7.10	Battery Voltage/normal capacity		V/Ah	24/100	24/100
Addition Data	10.1	Operating pressure for attachments		bar	140	140
	10.2	Oil volume for attachments		l/min	135	135
	10.4	Fuel Tank Capacity		l	160	160
	10.7	Sound level at the driver's ear according to EN 12 053		dB(A)	73	73



Characteristics	1.1	**CROWN**	**CROWN**	**CROWN**	**CROWN**
	1.2	CD60S-9 3 Speed (STAGE-V 81kW)	CD70S-9 3 Speed (STAGE-V 81kW)	CD80S-9 3 Speed (STAGE-V 81kW)	CD90S-9 3 Speed (STAGE-V 81kW)
	1.3	Diesel	Diesel	Diesel	Diesel
	1.4	Seated	Seated	Seated	Seated
	1.5	6,000	7,000	8,000	9,000
	1.6	600	600	600	600
	1.8	632	632	725	725
	1.9	2,300	2,300	2,500	2,500
Weight	2.1	9,435	10,100	11,330	11,980
	2.2	13,530/1,970	14,955/2,210	17,165/2,230	18,625/2,420
	2.3	4,285/5,150	4,175/5,925	4,900/6,430	4,820/7,160
Tyres	3.1	P	P	P	P
	3.2	8.25x15-14PR	8.25x15-14PR	9.00x20-14PR	9.00x20-14PR
	3.3	8.25x15-14PR	8.25x15-14PR	9.00x20-14PR	9.00x20-14PR
	3.5	4/2	4/2	4/2	4/2
	3.6	1,584	1,584	1,668	1,668
	3.7	1,550	1,550	1,750	1,750
Dimensions	4.1	15/10	15/10	10/15	10/15
	4.2	2,495	2,495	2,835	2,835
	4.3	205	205	215	215
	4.4	3,000	3,000	3,100	3,100
	4.5	4,275	4,275	4,375	4,375
	4.7	2,468(2,535)	2,468(2,535)	2,673(2,771)	2,673(2,771)
	4.8	1,455	1,455	1,526	1,526
	4.19	4,818	4,897	5,214	5,240
	4.20	3,618	3,697	4,014	4,040
	4.21	2,156	2,156	2,230	2,230
	4.22	60x180x1,200	60x180x1,200	70x180x1,200	70x180x1,200
	4.23	4/B	4/B	5/B	5/B
	4.24	2,156	2,156	2,216	2,216
	4.31	196	196	283	283
	4.32	214	214	329	329
	4.34.1	5,252	5,293	5,575	5,685
	4.34.2	5,452	5,493	5,775	5,685
	4.35	3,380	3,430	3,650	3,680
	4.36	1,344	1,344	1,468	1,468
Performance data	5.1	30.8/34.3	30.2/34.2	30/35	30/35
	5.2	0.50/0.54	0.44/0.48	0.43/0.48	0.43/0.48
	5.3	0.5/0.45	0.5/0.45	0.5/0.45	0.5/0.45
	5.5	60,900	60,420	64,150	56,810
	5.6	77,750	77,260	72,180	71,870
	5.7	45/89	39/75	35/57	28/55
	5.8	61/100	52/100	40/78	37/75
	5.10	foot/hydraulic	foot/hydraulic	foot/hydraulic	foot/hydraulic
Combustion Engine	7.1	DM03VA	DM03VA	DM03VA	DM03VA
	7.2	81	81	81	81
	7.3	2,300	2,300	2,300	2,300
	7.3.1	460/1,400	460/1,400	460/1,400	460/1,400
	7.4	4/3,409	4/3,409	4/3,409	4/3,409

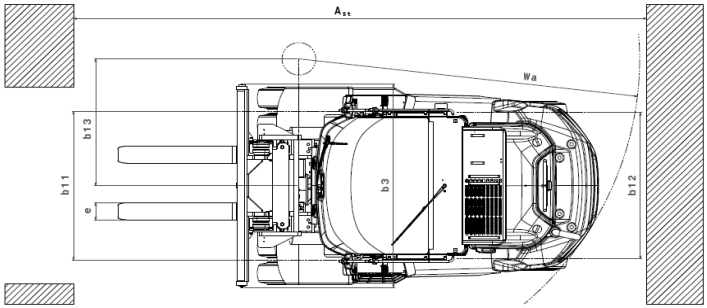
Characteristics	1.1	**CROWN**	**CROWN**	**CROWN**	**CROWN**
	1.2	CD60S-9 3 Speed (STAGE-V 81kW)	CD70S-9 3 Speed (STAGE-V 81kW)	CD80S-9 3 Speed (STAGE-V 81kW)	CD90S-9 3 Speed (STAGE-V 81kW)
	7.5	5	5	6.6	6.6
	7.10	24/100	24/100	24/100	24/100
Addition Data	10.1	140	140	140	140
	10.2	135	135	135	135
	10.4	160	160	255	255
	10.7	75	75	75	75

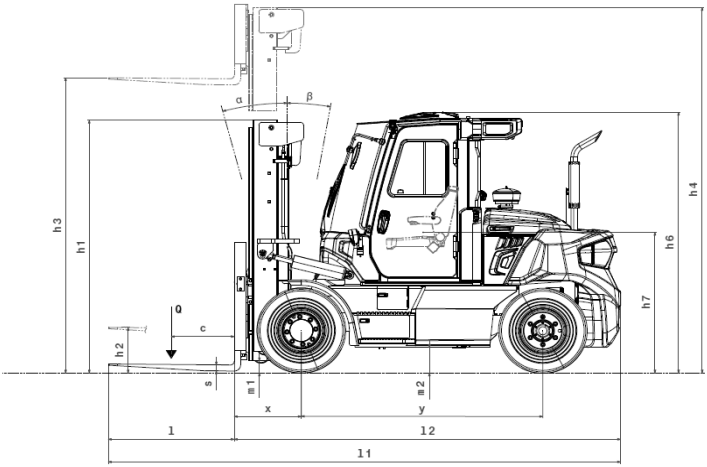


Specifications

Characteristics	1.1	Manufacturer			**CROWN**	**CROWN**
	1.2	Model designation			CD60S-9 3 Speed (TIER-IV 55kW)"	CD70S-9 3 Speed (TIER-IV 55kW)"
	1.3	Drive: Diesel, Gasoline, LP			Diesel	Diesel
	1.4	Operator type: Hand, Pedestrian, Standing, Seated, Order-picker			Seated	Seated
	1.5	Load Capacity	Q	lb (kg)	13,500(6,000)	15,500(7,000)
	1.6	Load Centre	c	in (mm)	23.6(600)	23.6(600)
	1.8	Load Distance: Centre of Driveaxle to fork	x	in (mm)	24.9(632)	24.9(632)
	1.9	Wheelbase	y	in (mm)	90.6(2,300)	90.6(2,300)
Weight	2.1	Service weight		lb (kg)	20,800.6(9,435)	22,266.7(10,100)
	2.2	Axle Loading, Laden Front/Rear		lb (kg)	29,828.5(13,530)/ 4,343.1(1,970)	32,970.1(14,955)/ 4,872.2(2,210)
	2.3	Axle Loading, Unladen Front/Rear		lb (kg)	9,446.8(4,285)/ 11,353.8(5,150)	9,204.3(4,175)/ 13,062.4(5,925)
Tyres	3.1	Tyres: pneumatic (P), superelastic (SE), cushion (C)			P	P
	3.2	Tyre size, Front			8.25x15-14PR	8.25x15-14PR
	3.3	Tyre size, Reat			8.25x15-14PR	8.25x15-14PR
	3.5	Wheels, number Front/Rear (x = driven wheels)			4/2	4/2
	3.6	Tread, Front	b_{11}	in (mm)	62.4(1,584)	62.4(1,584)
	3.7	Tread, Rear	b_{12}	in (mm)	61.0(1,550)	61.0(1,550)
Dimensions	4.1	Tilt of Mast/Fork carriage Forward/Backward	α/β	°	15/10	15/10
	4.2	Height, Mast lowered	h_1	in (mm)	98.2(2,495)	98.2(2,495)
	4.3	Free Lift	h_2	in (mm)	8.1(205)	8.1(205)
	4.4	Lift	h_3	in (mm)	118.1(3,000)	118.1(3,000)
	4.5	Height, Mast Extended	h_4	in (mm)	168.3(4,275)	168.3(4,275)
	4.7	Height of Overhead Guard (Cabin)	h_6	in (mm)	97.2(2,468)/ 99.8(2,535)	97.2(2,468)/ 99.8(2,535)
	4.8	Height of Seat	h_7	in (mm)	57.3(1,455)	57.3(1,455)
	4.19	Overall Length	l_1	in (mm)	189.7(4,818)	192.8(4,897)
	4.20	Length to Forkface	l_2	in (mm)	142.4(3,618)	145.6(3,697)
	4.21	Overall Width	b_1/b_2	in (mm)	84.9(2,156)	84.9(2,156)
	4.22	Fork Dimensions	s/e/l	in (mm)	2.4x7.1x47.2 (60x180x1,200)	2.4x7.1x47.2 (60x180x1,200)
	4.23	Fork carriage ISO 2328, class/type A,B			4/B	4/B
	4.24	Fork carriage width	b_3	in (mm)	84.9(2,156)	84.9(2,156)
	4.31	Ground Clearance, laden, below mast	m_1	in (mm)	7.7(196)	7.7(196)
	4.32	Ground Clearance, centre of wheelbase	m_2	in (mm)	8.4(214)	8.4(214)
	4.34.1	Aisle withd for pallets 1,000 x 1,200 crossways	A_{st}	in (mm)	206.8(5,252)	208.4(5,293)
	4.34.2	Aisle width for pallets 800 x 1,200 lengthways	A_{st}	in (mm)	214.6(5,452)	216.3(5,493)
	4.35	Turning Radius	W_a	in (mm)	133.1(3,380)	135.0(3,430)
	4.36	Internal Turning Radius	b_{13}	in (mm)	52.9(1,344)	52.9(1,344)
Performance data	5.1	Travel Speed, Laden/Unladen		mph (km/h)	19.1(30.7)/ 21.6(34.7)	17.8(28.6)/ 21.4(34.5)
	5.2	Lift Speed, Laden/Unladen		fpm (m/s)	92.5(0.47)/ 104.3(0.53)	80.7(0.41)/ 92.5(0.47)
	5.3	Lowering Speed, Laden/Unladen		fpm (m/s)	98.4(0.5)/88.6(0.45)	98.4(0.5)/88.6(0.45)
	5.5	Drawbar pull, Laden/Unladen (@ 1.6km/h)		lb(N)	11,042.4(49,119)	11,015.9(49,001)
	5.6	Max. Drawbar pull, Laden/Unladen		lb(N)	14,782.5(65,756)	14,822.3(65,933)

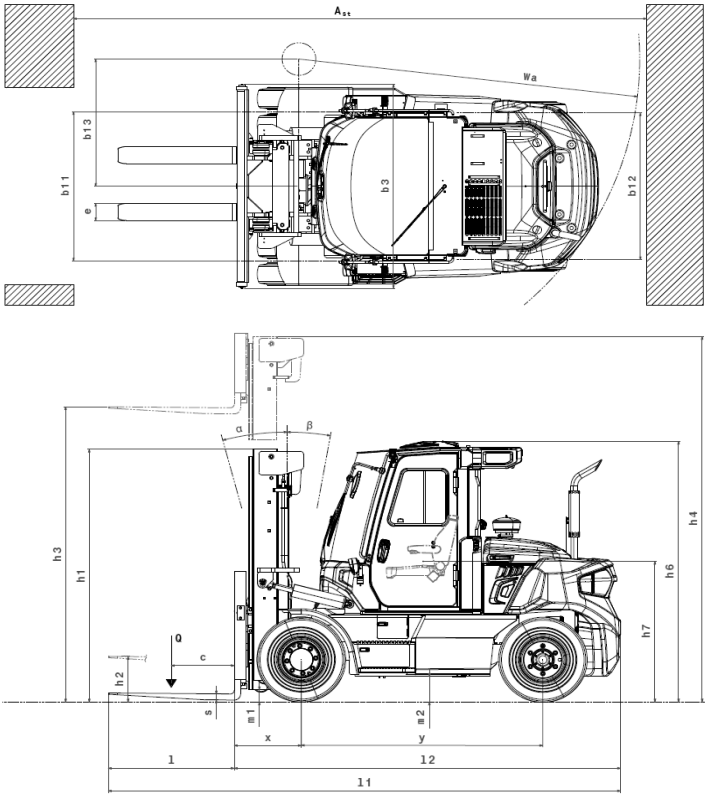
Charact eristics	1.1	Manufacturer			**CROWN**	**CROWN**
	1.2	Model designation			CD60S-9 3 Speed (TIER-IV 55kW)"	CD70S-9 3 Speed (TIER-IV 55kW)"
	5.7	Gradeability, Laden/Unladen (@ 1.6km/h)		%	34.8/62	31/57
	5.8	Max. Gradeability, Laden/Unladen		%	49/95	43/85
	5.10	Service Brake			foot/hydraulic	foot/hydraulic
Combustion Engine	7.1	Engine Manufacturer/type			DM03P	DM03P
	7.2	Engine power according to DIN ISO1585		hp(N)	74.3(55.4)	74.3(55.4)
	7.3	Rated Speed		min^{-1}	2,300	2,300
	7.3.1	Torque at 1/min		ft•lbs(N•m)	243.4 (330@ 900~1,400)	243.4 (330@ 900~1,400)
	7.4	Number of Cylinders/Displacement		-/cc(-/cm^3)	4/3,409	4/3,409
	7.5	Fuel Consumption according to VDI Cycle		gal/h or lb/h (l/h or kg/h)	1.32(5.0)	1.32(5.0)
	7.10	Battery Voltage/normal capacity		V/Ah	24/100	24/100
AdditOion Data	10.1	Operating pressure for attachments		Psi (bar)	2,030.5(140)	2,030.5(140)
	10.2	Oil volume for attachments		gpm (l/min)	35.7(135)	35.7(135)
	10.4	Fuel Tank Capacity		gal(l)	42.3(160)	42.3(160)
	10.7	Sound level at the driver's ear according to EN 12 053		dB(A)	73	73





Characteristics	1.1	**CROWN**	**CROWN**	**CROWN**	**CROWN**
	1.2	CD60S-9 3 Speed (TIER-IV 81kW)	CD70S-9 3 Speed (TIER-IV 81kW)	CD80S-9 3 Speed (TIER-IV 81kW)	CD90S-9 3 Speed (TIER-IV 81kW)
	1.3	Diesel	Diesel	Diesel	Diesel
	1.4	Seated	Seated	Seated	Seated
	1.5	13,500(6,000)	15,500(7,000)	17,500(8,000)	20,000(9,000)
	1.6	23.6(600)	23.6(600)	23.6(600)	23.6(600)
	1.8	24.9(632)	24.9(632)	28.5(725)	28.5(725)
	1.9	90.6(2,300)	90.6(2,300)	98.4(2,500)	98.4(2,500)
Weight	2.1	20800.6(9435)	22266.7(10100)	24978.4(11330)	26411.4(11980)
	2.2	29,828.5(13,530)/ 4,343.1(1,970)	32,970.1(14,955)/ 4,872.2(2,210)	37,842.4(17,165)/ 4,916.3(2,230)	41,061.1(18,625)/ 5,335.2(2,420)
	2.3	9,446.8(4,285)/ 11,353.8(5,150)	9,204.3(4,175)/ 13,062.4(5,925)	10,802.7(4,900)/ 14,175.7(6,430)	10,626.3(4,820)/ 15,785.1(7,160)
Tyres	3.1	P	P	P	P
	3.2	8.25x15-14PR	8.25x15-14PR	9.00x20-14PR	9.00x20-14PR
	3.3	8.25x15-14PR	8.25x15-14PR	9.00x20-14PR	9.00x20-14PR
	3.5	4/2	4/2	4/2	4/2
	3.6	62.4(1,584)	62.4(1,584)	65.7(1,668)	65.7(1,668)
	3.7	61.0(1,550)	61.0(1,550)	68.9(1,750)	68.9(1,750)
Dimensions	4.1	15/10	15/10	15/10	15/10
	4.2	98.2(2,495)	98.2(2,495)	111.6(2,835)	111.6(2,835)
	4.3	8.1(205)	8.1(205)	8.1(205)	8.1(205)
	4.4	118.1(3,000)	118.1(3,000)	122.1(3,100)	122.1(3,100)
	4.5	168.3(4,275)	168.3(4,275)	172.2(4,375)	172.2(4,375)
	4.7	97.2(2,468) /99.8(2,535)	97.2(2,468)/ 99.8(2,535)	105.2(2,673)/ 109.1(2,771)	105.2(2,673)/ 109.1(2,771)
	4.8	57.3(1,455)	57.3(1,455)	60.1(1,526)	60.1(1,526)
	4.19	189.7(4,818)	192.8(4,897)	205.3(5,214)	206.3(5,240)
	4.20	142.4(3,618)	145.6(3,697)	158.0(4,014)	159.1(4,040)
	4.21	84.9(2,156)	84.9(2,156)	87.8(2,230)	87.8(2,230)
	4.22	2.4x7.1x47.2 (60x180x1,200)	2.4x7.1x47.2 (60x180x1,200)	2.8x7.1x47.2 (70x180x1,200)	2.8x7.1x47.2 (70x180x1,200)
	4.23	4/B	4/B	5/B	5/B
	4.24	84.9(2,156)	84.9(2,156)	87.2(2,216)	87.2(2,216)
	4.31	7.7(196)	7.7(196)	11.1(283)	11.1(283)
	4.32	8.4(214)	8.4(214)	13.0(329)	13.0(329)
	4.34.1	206.8(5,252)	208.4(5,293)	219.5(5,575)	223.8(5,685)
	4.34.2	214.6(5,452)	208.4(5,493)	227.4(5,775)	231.7((5,885)
	4.35	133.1(3,380)	135.0(3,430)	143.7(3,650)	144.9(3,680)
	4.36	52.9(1,344)	52.9(1,344)	57.8(1,468)	57.8(1,468)
Performance data	5.1	19.1(30.8)/21.3(34.3)	18.8(30.2)/21.3(34.2)	18.6(30)/21.8(35)	18.6(30)/21.8(35)
	5.2	98.4(0.50)/106.3(0.54)	86.6(0.44)/94.5(0.48)	84.7(0.43)/94.5(0.48)	84.7(0.43)/94.5(0.48)
	5.3	98.4(0.5)/88.6(0.45)	98.4(0.5)/88.6(0.45)	98.4(0.5)/88.6(0.45)	98.4(0.5)/88.6(0.45)
	5.5	13,690.9(60,900)	13,583.0(60,420)	14,421.5(64,150)	12,771.4(56,810)
	5.6	17,478.9(77,750)	17,368.7(77,260)	16,226.7(72,180)	16,157.0(71,870)
	5.7	45/89	39/75	35/57	28/55
	5.8	61/100	52/100	40/78	37/75
	5.10	foot/hydraulic	foot/hydraulic	foot/hydraulic	foot/hydraulic
Combustion Engin	7.1	DM03PA	DM03PA	DM03PA	DM03PA
	7.2	108.5(80.9)	108.5(80.9)	108.5(80.9)	108.5(80.9)

Characteristics	1.1	**CROWN**	**CROWN**	**CROWN**	**CROWN**
	1.2	CD60S-9 3 Speed (TIER-IV 81kW)	CD70S-9 3 Speed (TIER-IV 81kW)	CD80S-9 3 Speed (TIER-IV 81kW)	CD90S-9 3 Speed (TIER-IV 81kW)
	7.3	2,300	2,300	2,300	2,300
	7.3.1	339.3(460 @ 1,400)	339.3(460 @ 1,400)	339.3(460 @ 1,400)	339.3(460 @ 1,400)
	7.4	4/3,409	4/3,409	4/3,409	4/3,409
	7.5	1.32(5.0)	1.32(5.0)	1.74(6)	1.74(6)
	7.10	24/100	24/100	24/100	24/100
Addition Data	10.1	2030.5(140)	2,030.5(140)	2,030.5(140)	2,030.5(140)
	10.2	35.7(135)	35.7(135)	35.7(135)	35.7(135)
	10.4	42.3(160)	42.3(160)	67.4(255)	67.4(255)
	10.7	75	75	75	75



Noise &Vibration

Noise

Model		Noise Level [Unit : dB(A)]	
		Sound Pressure Level at Operator's ear (Leq.)	Guaranteed Sound Power Level (LWA)
		prEN 12053	by new Directive 2000/14/EC
CD60S-9, CD70S-9 (55 kW)	OVHD	-	100
	With Cabin	73.3	100
CD60/70/80/90S-9 (81 kW)	OVHD	-	104
	With Cabin	75	104

* Test Model: CD70S-9 (55kW, Cabin)

* Test Model: CD90S-9 (81kW, Cabin)

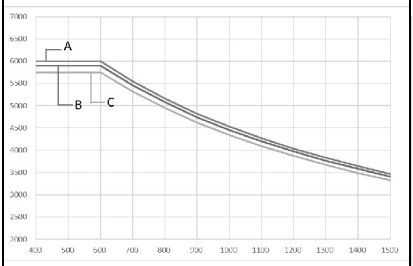
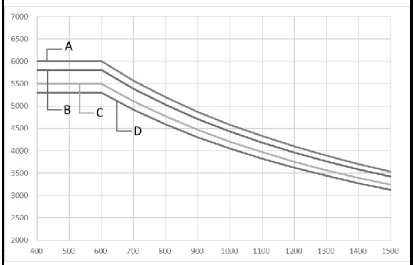
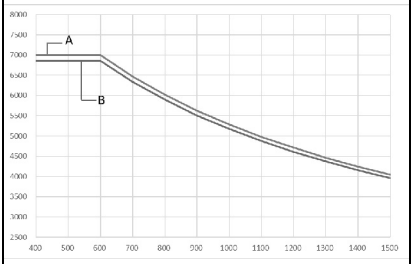
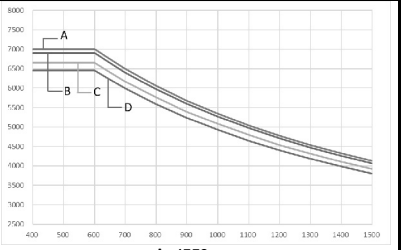
Vibration (weighted overall value)

Unit: m/sec^2

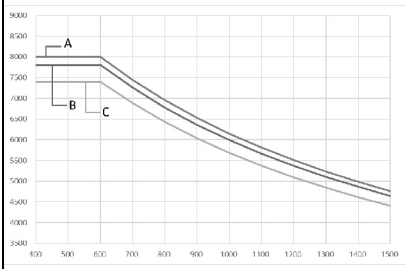
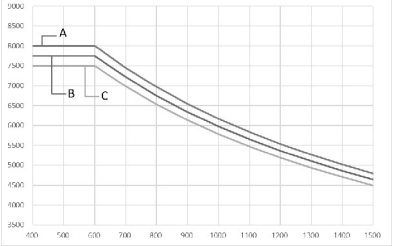
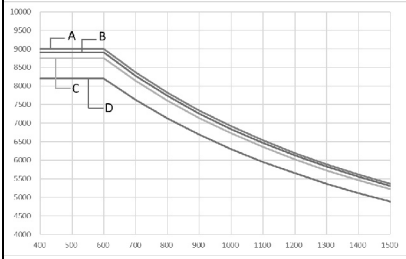
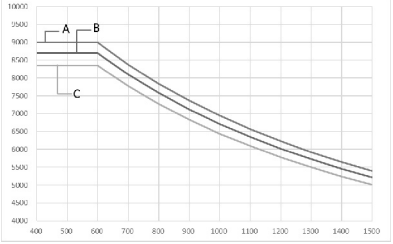
Model	Measuring Place		
	Seat	Steering Wheel	Floor Plate
CD60/70S-9 (55kW)	0.3	0.04	0.15
CD60/70/80/90S-9 (81kW)	0.3	0.07	0.08

* Test course: Concrete road

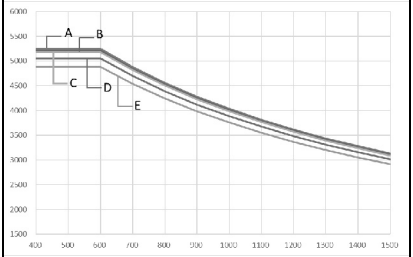
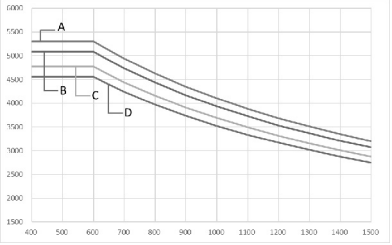
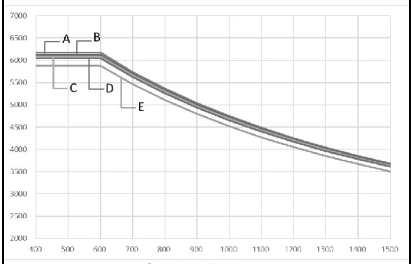
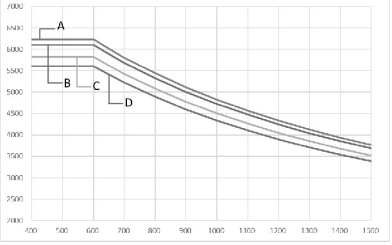
Capacity Chart - Without Side Shifter

MODEL	STD	FFT
CD60S-9	 A. 3000~5000mm B. 5500mm C. 6000mm	 A. 4550mm B. 5000mm C. 5600mm D. 6050mm
CD70S-9	 A. 3000~5000mm B. 5500mm C. 6000mm	 A. 4550mm B. 5000mm C. 5600mm D. 6050mm

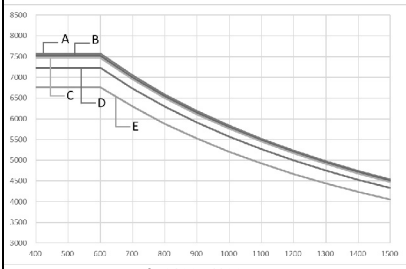
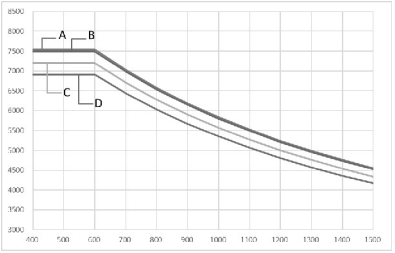
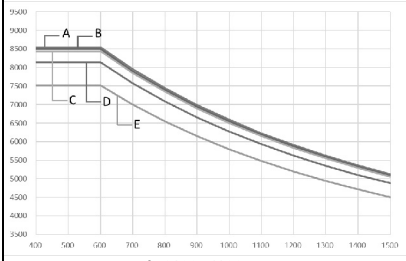
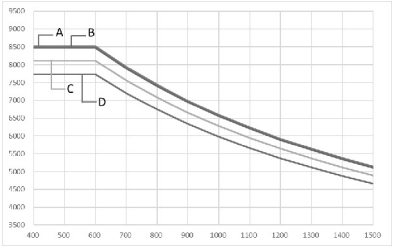
Capacity Chart - Without Side Shifter

MODEL	STD	FFT
CD80S-9	 A. 3100~5400mm B. 5600mm C. 6500mm	 A. 4350~4800mm B. 5400mm C. 5850mm
CD90S-9	 A. 3100~4600mm B. 5100mm C. 5600mm D. 6500mm	 A. 4350~4800mm B. 5400mm C. 5850mm

Capacity Chart - With Side Shifter

MODEL	STD	FFT
CD60S-9	 A. 3000~4000mm B. 4500mm C. 5000mm D. 5500mm E. 6000mm	 A. 4550mm B. 5000mm C. 5600mm D. 6050mm
CD70S-9	 A. 3000~4000mm B. 4500mm C. 5000mm D. 5500mm E. 6000mm	 A. 4550mm B. 5000mm C. 5600mm D. 6050mm

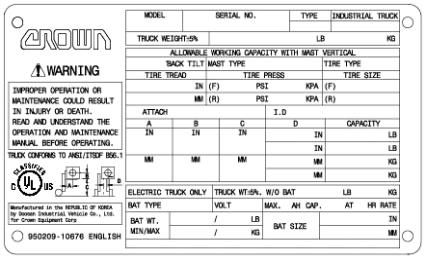
Capacity Chart - With Side Shifter

MODEL	STD	FFT
CD80S-9	 A. 3100~4100mm B. 4600mm C. 5100mm D. 5600mm E. 6500mm	 A. 4350mm B. 4800mm C. 5400mm D. 5850mm
CD90S-9	 A. 3100~4100mm B. 4600mm C. 5100mm D. 5600mm E. 6500mm	 A. 4350mm B. 4800mm C. 5400mm D. 5850mm

Serial Number

Serial Number Locations

For quick reference, record your lift truck's serial numbers in the spaces provided below the photographs.



Typical Example

Lift Truck Serial Number

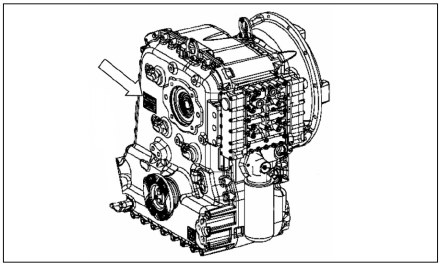
._____

Typical Example

Engine Serial Number

._____

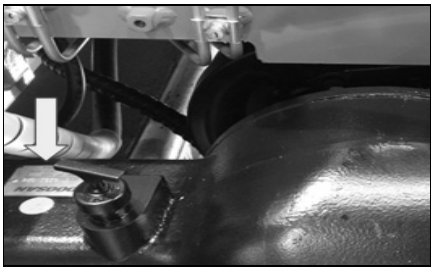
Diesel Engine(DM03)



CD60/70/80/90S-9

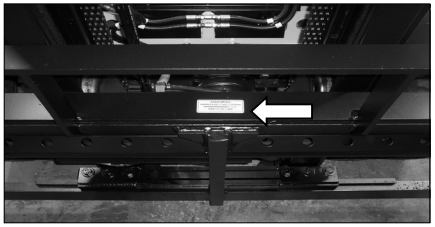
Transmission Serial Number

._____



Drive Axle Serial Number (OCDB type)

._____



Side shifter Serial Number (If equipped)

._____

Operator's Warning and Identification Plate

Familiarise yourself with the Operator's WARNING Plate and IDENTIFICATION, LIFT CAPACITY and ATTACHMENT PLATES. DO NOT exceed Capacity as equipped load ratings.

⚠ WARNING

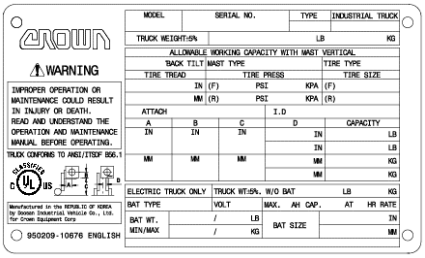
The load capacity of lift truck should never be exceeded. Overloading of the lift truck could be a hazard to the safety of others, material, or damage the truck.

Operator's Warning Plate

Typical Example

Located on the left side of operator's seat

Identification, Lift Capacity and Attachment Plate



Typical Example

Located on the right side of operator's seat

Lift Truck Capacity Rating

DO NOT exceed allowable lift truck working capacity load ratings.

The capacity of the lift truck is given by weight and distance to the load centre. For example: a capacity of 1200kg(2640 lb) at 600mm(24in) means that the lift truck can lift 1200kg(2640lb) if the load centre is 600 mm (24in) from both the vertical and horizontal faces of the forks.

Before attempting to lift any load, ensure that the weight and load centre combination is within the capacity of the lift truck as shown on the capacity rating plate. To determine the load centre, measure the distance from the face of the carriage to the gravitational centre of the load.

The rated capacity on the plate refers to the capacity of the lift truck as it left the factory. Subsequent changes of any form to the equipment or battery can alter the lift truck's rating.

The rated capacity of the lift truck applies to operating conditions where the lift truck is on level ground. The capacity of the lift truck is reduced on inclines.

Below are abbreviations that may appear on the Identification, Lift Capacity and Attachment Plate and their meanings.

Mast Abbreviations

STD - Standard Mast
(single inner member, low free lift)

FF - Full Free Lift Mast
(single inner member with high free lift duplex cylinder)

FFT - Triple Lift Mast (two inner members) with either low or full free lift characteristics.

QUAD Quadruple (Quad) Mast(with three inner members)

NOTE: When only a mast-type is listed on the identification plate, a standard carriage and forks are used.

Attachment Abbreviations (includes Special Forks)

SC- Special Carriage-increased width, height or outreach

SSS - Shaft-type Side shift Carriage

HSS - Hook-type Side shift Carriage (ITA)

CW - Counterweight

SF - Special Forks

SWS - Swing Shift, Side shift

RAM - Ram or Boom

DBCBH - Double Cube Block Handler

HFP - Hydraulic Fork Positioner

CR - Crane Arm or Crane Boom

TH - Tyre Handler

CTH - Container Handler

LPP - Load Push-Pull Device

CC - Carton Clamp

RC - Roll Clamp

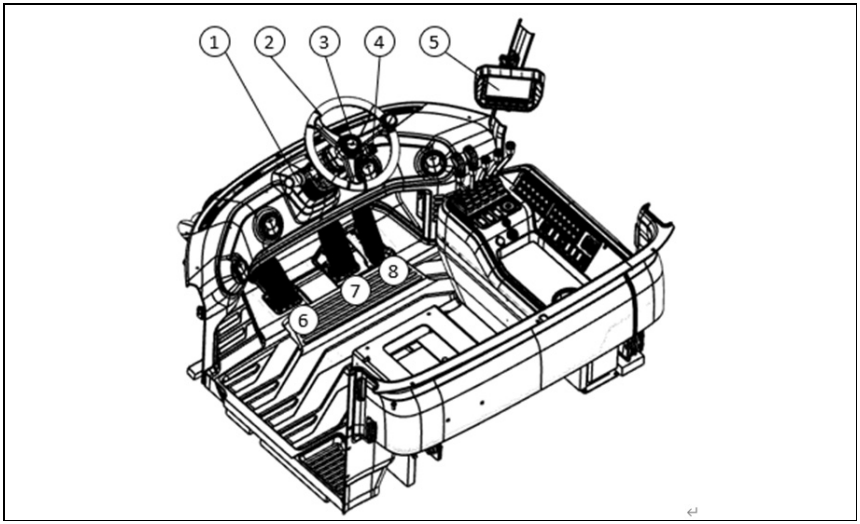
LS - Load Stabiliser

PWH - Pulp Wood Handler

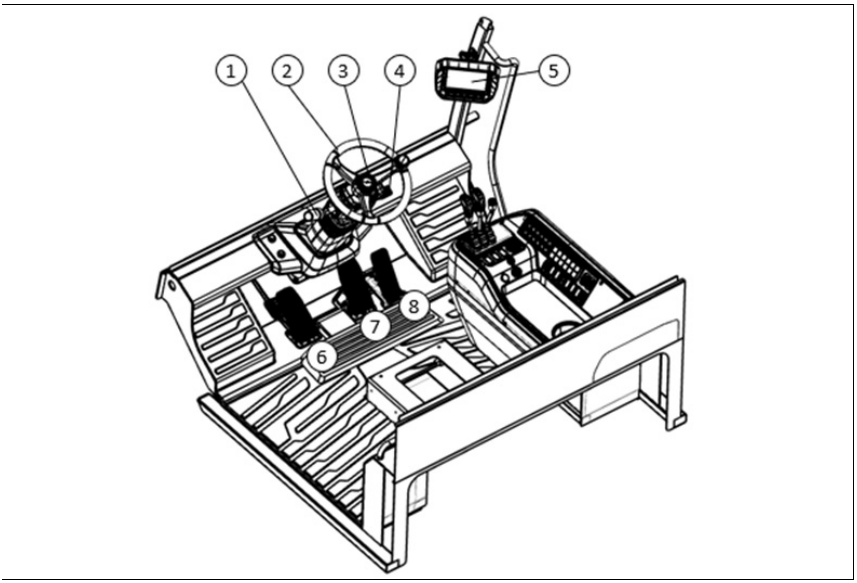
SS-ST - Side shift-Side Tilt Carriage

Operator’s Station and Monitoring Systems

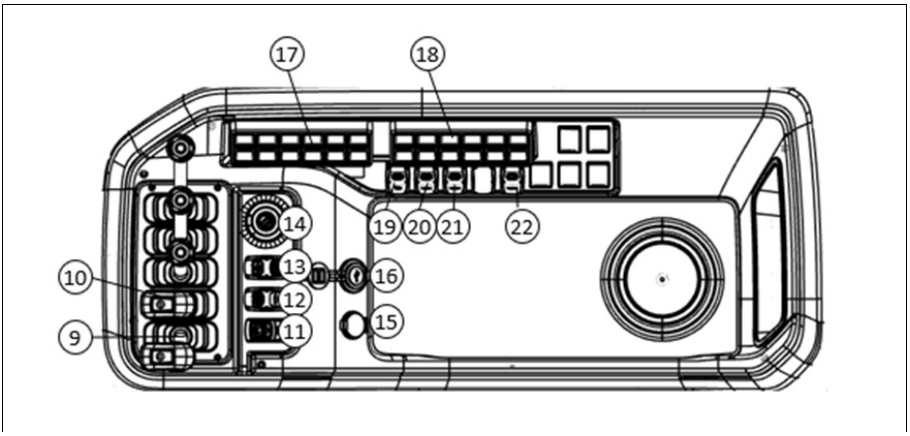
Cabin



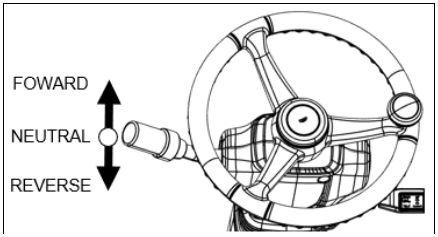
Overhead Guard



Console panel



1. Forward/Backward Control Lever



Typical Example

Forward – Reverse

F	Forward
N	Neutral
R	Reverse

Speed Select

1	1st
2	2nd
3	3rd (3 speed ONLY)

Rotating the direction control lever changes the speed of travel. With handle rotated counter clockwise (towards the operator), the lift truck is in FIRST speed.

Rotate the lever clockwise (away from the operator) for the SECOND and THIRD speeds.

Always brake to a full stop before reversing the direction of travel.

2. Steering Wheel

3. Horn Switch

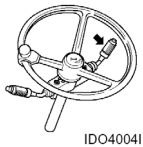
IDO4003I

To give alarm to fellow worker(s) around and in the path of your truck, press the rubber at the centre of the hand wheel.

⚠ WARNING

Don't run the truck while the alarm is sounding. It is dangerous to do so, since poor effect is expected. .

4. Turn Signal Lever (Optional)



IDO4004I

This is the lever to indicate the turning direction of the lift truck. As this lever is maneuvered, the signal lamp blinks.

5. Instrument Display

6. Inching Control Pedal

7. Service Foot Brake Pedal

8. Accelerator Pedal

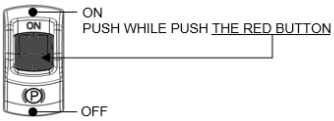
9. Lift Lever

10. Tilt Lever

11. Parking Switch

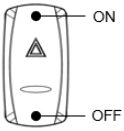
Parking brake on : Push switch “on” while pressing the red button

Parking brake off : Push switch “off”



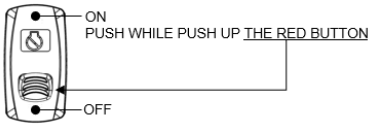
12. Hazard Lamp Switch (Optional)

Push switch “on” to active the hazard lamp. Hazard lamp put the same with turn signal lamp.

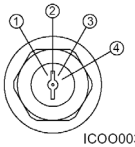


13. Emergency Engine Stop Switch (Optional)

Push switch “on” while push up the red button to turn off the engine. Must use when needed the emergency stop situation.



14. Engine Ignition Start Switch



ICOO003I

1) Key type

The key switch is a four position switch. Position (1) is ACCESSORY ON. Position (2) is OFF. Position (3) is ON or RUN and accessory ON. Position (4) is START, which engages the starter.

After the key has been turned to the START position, the key must be returned to the OFF position before it can be turned to the START position again.

2) Button type (Optional)

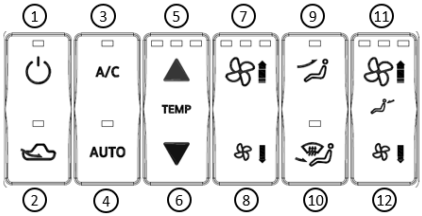
To start the truck, push the key button on the console at the right hand until the engine ignition completely.

To turn off the truck, re-push the key button.

15. Power Jack (12V)

16. USB (5V)

17. Aircon, Heater control pad (Optional)



① Aircon, Heater Power on/off

② External air intake on/off

③ Air conditioning on/off

④ Automatic temperature on/off

⑤ Temperature up

⑥ Temperature down

⑦ Front Fan up

⑧ Front Fan down

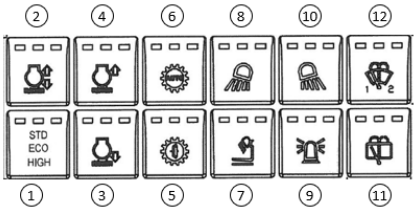
⑨ Upper air flow on/off

⑩ Lower air flow & Front windshield defroston/off

⑪ Rear Fan up

⑫ Rear Fan down

18. Vehicle control pad



① Engine Performance select

1 Lamp : STD

2 Lamp : ECO

3 Lamp : HIGH Performance

② Idle rpm select on/off

Lamp on : Idle 800 → 950rpm

Lamp off : Idle 950 → 800rpm

③ Idle rpm down

50rpm down by 1click, Min 900rpm limit

④ Idle rpm up

50rpm up by 1click, Max 1400rpm limit

⚠ WARNING

If you increase engine rpm with using this switch, truck creep speed will be faster than normal mode.

Before change direction lever, press brake pedal and release smoothly to prevent accident cause a sudden movement.

⑤ Inching pedal on/off

Lamp on : Normal inching operation is available using the inching pedal.
Lamp off : The inching pedal is not operable but braking with the inching pedal is available.

NOTE: When driving a middle or long distance without using the inching function, set this switch to "on" position to prevent the transmission clutch pedals from unnecessary wear or overheat..

⑥ Auto transmission select

1 Lamp : The speed will be controlled at the at the 1st, 2nd and 3rd gear ratio automatically, according to the load and engine speed.
2 Lamp : The speed will be controlled at the 2nd and 3rd gear ratio automatically, according to the load and engine speed.
3 Lamp : Travel mode is switched to “MANUAL” and allows operator to choose speeds manually.

⑦ Front working lamp on the mast on/off

⑧ Front working lamp on the operator cell on/off

⑨ Strobe on/off

⑩ Rear working lamp on/off

⑪ Top & Rear wiper control
Washer fluid jet : Press button by 0.5sec

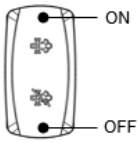
⑫ Front wiper control

1 Lamp : Basic speed

2 Lamp : Fast speed

Washer fluid jet : Press button by 0.5sec

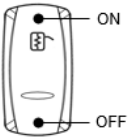
19. DPF / SCR (81Kw only) Cleaning Switch



Cleaning start : Push brake pedal and release accel pedal to fully stop the truck. And then push switch “on” by 3 sec

Cleaning stop : Push switch “off” or release brake pedal or press accel pedal

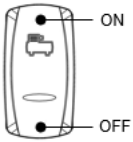
20. Rear mirror heating switch (Optional)



21. Seat heating switch (Optional)

22. Air gun switch (Optional)

To use the air gun, push switch “on” firstly to operate air compressor



Instrument Panel

Your lift truck may not have the same indicator or warning lights as shown in the illustrations.
Due to the various options available, typical instrument panels are shown.

However, the symbols on the indicators and lights on your panel identify what those particular items are.
Also, the symbol for each of the items is identified and an explanation of their function and location is described on the following pages.

1. Diesel Engine Water in Fuel Filter Indicator Light
2. Alternator Indicator Light
3. Diesel Engine Start Preheat Indicator Light
4. Fuel Level Gauge
5. Engine Coolant Temperature Gauge
6. Transmission Oil Temperature Gauge
7. Engine Malfunction Indicator Light (MIL)
8. Seat Belt Warning Light (If Equipment)
9. Service Hour Meter
10. Parking Indicator Light
11. Front Floodlights
12. Transmission Neutral Position Light
13. Mast Interlock
14. Directional Turning Indicator Light
15. Brake oil level
16. ECT Warning Lamp
17. Engine Oil Pressure Warning Lamp
18. Fuel Warning Lamp
19. Speedometer
20. Odometer
21. Engine rpm Gauge
22. Vehicle Mode
23. T/M Gear Inform
24. After Treatment Indicator (After Treatment Only)
25. Regen Gauge (After Treatment Only)
26. Clock
27. Weight Scale Indicator (OPT)
28. Speed Limit Indicator
29. Air Cleaner Indicator

1. Diesel Engine Water in Fuel Filter Indicator Light - Indicates when the engine is running, there is water in the fuel filter exceeds 100cc.

The light will come ON when the ignition switch is turned to the ON position. The light should go off after the engine is started. If the light turns on with the engine running, park the lift truck and stop the engine.

Drain some fuel (and any water) until clean fuel flows from the filter which approximately takes 5 to 6 seconds

2. Alternator Indicator Light - Indicates if the battery charging system is operational. The light will come on when the ignition switch is turned to the ON position.

The light should go off after the engine is started, indicating the alternator is producing sufficient voltage to charge the battery. If the light turns on with the engine running, check the alternator charging system for a malfunction.

3. Diesel Engine Start Preheat Indicator Light - The light will come ON when the key is turned to the ON position from the OFF position. This indicates that the glow plugs are preheating the pre-combustion chambers for easier starting.

The amount of time needed to preheat the pre-combustion chambers is approximately seven seconds, depending on the surrounding air temperature. When the light goes OFF the maximum pre-combustion chamber temperature has been reached and the key can be turned to the START position to start the engine.

4. Fuel Level Gauge - Shows current level of the fuel in the fuel tank. Replenish fuel when the Level Gauge indicates "E" during the forklift operation.

5.Engine Coolant Temperature Gauge - Indicates coolant temperature. Shows current temperature of the engine coolant. If the gauge pointer moves beyond the red band during the operation, the engine is overheated. Park the lift truck and stop the engine.

Check the cooling system for any defect. The pointer will be in the red band when the coolant temperature reaches approximately 110 °C on all engines.

6. Transmission Oil Temperature Gauge - Shows transmission oil temperature If the gauge pointer moves beyond the red band during operation, the engine is overheated. Park the lift truck and stop the engine.

Check the system for any defect. The pointer will be in the red band when the transmission oil temperature reaches approximately 125 °C.

7. Engine Malfunction Indicator Light (MIL) - Engine control system is equipped with built-in fault diagnostics. Detected system faults can be displayed by the Malfunction Indicator Lamp (MIL) as Diagnostic Fault Codes (DFC) or flash codes, and viewed in detail with the use of service tool software. When the ignition key is turned ON the MIL will perform a self-test, illuminate once and then go OFF. If a detected fault condition exists, the fault or faults will be stored in the memory of the engine control unit (ECM). Once a fault occurs the MIL will light up and remain ON. This signals the operator that a fault has been detected by the SCEM.

8. Seat Belt Warning Light (If Equipment) Indicates when the seat belt dose not fastened by operator.

The light will come on when the ignition switch is turned to the on position.

The light should go off after engine is started.

9. Service Hour Meter - Indicates the total number of hours the engine and the lift truck have operated. The hour meter will operate when the ignition switch is in the ON position, whether the engine is running or not. The hour meter is used to determine lubrication and maintenance intervals.

10. Parking Indicator Light - The light will come ON when the parking lever is applied.

11. Front Floodlights - Push down on the switch (14), to the first step, to turn the front floodlights on.

Front and Rear Floodlights – Push down on the switch (14), to the second step, to turn both the front and rear floodlights on. The floodlights are optional.

12. Transmission Neutral Position Light - Indicates the neutral position of transmission.

13. Mast Interlock – Alarm warning lights when operator leaves the seat without applying parking brake and then, operation of mast is automatically interrupted.

14. Directional Turning Indicator Light

15. Brake oil level – Brake oil level Lamp indicates when the brake oil level is low.

16. ECT Malfunction Warning Lamp (if installed) – electronic transmission control system has a built-in diagnosis system. If a failure occurs, the electronic transmission control system reports the operator of the failure code by the number of flashes with the malfunction warning lamp.

17. Engine Oil Pressure Warning Lamp – The warning lamp will light up if the engine oil is short or the pressure is low.

18. Fuel Warning Lamp – The warning lamp will light up to warn the operator to refuel.

19. Speedometer – Shows vehicle speed

ODO **20. Odometer** – Shows vehicle run time

21. Engine rpm gauge – Shows engine rpm speed

STANDARD **22. Vehicle mode** – Shows Vehicle mode (High, Standard, ECO)

2F **23. T/M Gear inform** – Shows T/M Gear state

24. After treatment indicator – Shows After treatment warning and inform.

When this waring lamp is on, refer to topic “operation section - after staring the engine - Electronic Controlled Diesel Engines.

1) SCR fault warning lamp: When the first lamp is on, check the SCR system.
2) SCR cleaning lamp: The SCR system shall be initialized on a regular basis to maintain the emission purification efficiency at an adequate level. This process is called SCR cleaning. When the second lamp is on, start the SCR cleaning process, during which the vehicle shall not be used. The lamp lights up with a message popping up 10 hours prior to the required timing of SCR cleaning. The cleaning process takes about 30 minutes, with this lamp flickering. Press the cleaning switch for about 3 seconds to start the cleaning process.
3) High-temperature exhaust lamp: During SCR cleaning the temperature of exhaust emissions exceeds 600°C. When this lamp light on, the operator shall warn other people around not to approach the vehicle or touch the exhaust system, particularly at the back of the vehicle. If there is any flammable substance such as gas or particles around the vehicle, move it to a safe place.
4) SCR cleaning inhibition lamp: One you press the inhibition switch, this lamp lights up and the SCR process is suspended. When in a place with flammable substances or dust, you shall press the inhibition switch to prevent any fire or explosion that can be caused by high temperature emissions.

25. Regen gauge – Shows DPF Soot or DeSox Level

12:34 **26. Clock – Shows Time**

27. Weight scale indicator (Optional) – Shows weight and over weight warning

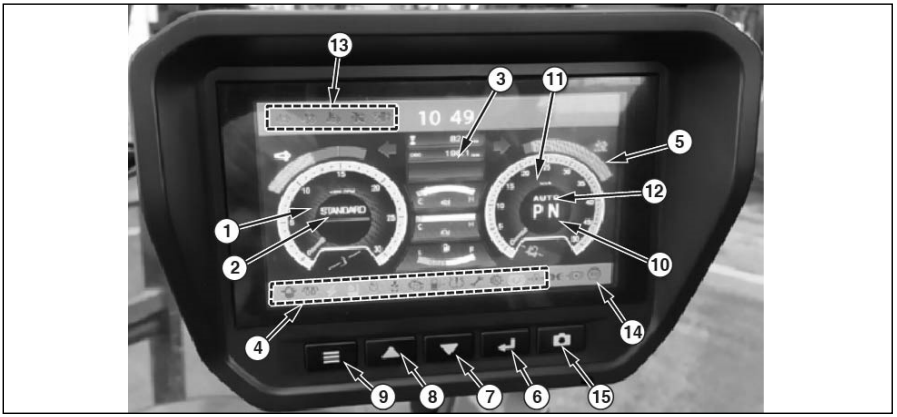
28. Speed limit indicator – Shows limit speed

29. Air cleaner indicator – If it on, need to change the air filter

High-temperature Exhaust Lamp

During SCR cleaning, the temperature of the exhaust emissions exceeds 600 °C. When this lamp lights up, the operator should warn other people around not to approach the vehicle or touch the exhaust system, particularly at the back of the vehicle. If there is any flammable substance, such as gas or particles, near the vehicle, move it to a safe place.

SCR Display (Diesel 81kW Only)



1. Tachometer (RPM GAUGE)

- Display engine RPM with 1/1000 unit.

2. MULTI TORQUE MODE for engine

- Display mode of multi torque, for setting mode, refer page 72.
- "S" means "standard mode" with registered in specification sheet. "E" means "economic mode" and this mode shall restrict max rpm 2320 and derate max torque and power. "D" means "driving mode" and this mode shall restrict max rpm 2520 and derate max torque and power. Refer to service manual for the derated max torque level and power of "E" and "D" mode.

3. ODOMETER

- Accumulated total mileage.

4. WARNING LAMP

- Warning Lamp for Transmission and engine etc.

5. DEF/Ad-Blue LEVEL GUAGE

- Display DEF/Ad-Blue Level, residual quantity of DEF/Ad-Blue in DEF/Ad-Blue Tank (DEF /Ad-Blue: Fluid for SCR System)

6. ENTER (SELECT)

- Key for operating LCD Display.

7. DOWN (RIGHT)

- Key for operating LCD Display.

8. UP (LEFT)

- Key for operating LCD Display.

9. MODE (BACK)

- Key for operating LCD Display by pressing button.

10. DIRECTION (T/M STATUS)

- Display Status for direction. "N" or "F" or "R"

11. SPEEDOMETER

- Display the current vehicle speed.

12. GEAR DISPLAY (AUTO / MANUAL)

- The gear range indicator bars will indicate which gear is selected by displaying the corresponding number of bars. The forward and reverse indicator bars will be "OFF" when the transmission is in "MANUAL MODE". When transmission is in "AUTOMATIC MODE", all the gear range indicator bars and both travel direction indicators will be "ON".

13. DEF/Ad-Blue Level Indicator

- Indicator lamps for DEF/Ad-Blue Level

a. For USA

· Over 25%: Green ON

· 10~25%: Yellow ON

· 5~10%: Red Blink (Slow Blink)

· Below 2.5%: Red Blink (Fast Blink)

b. For Europe

· Over 10%: Green ON

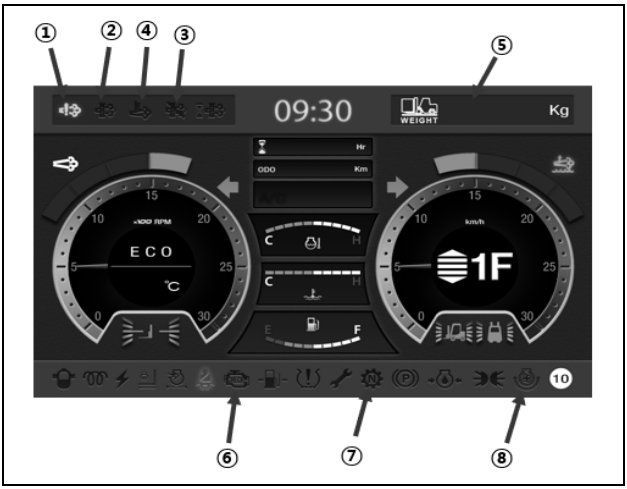
· 5~10%: Yellow ON

· Below 5%: Red Blink

14. Speed limit Symbol

- If speed limit option selected, the symbol is on

15. Rear Camera



1. DEF/Ad-Blue FAULT WARNING
- If the lamp is turned on, after-treatment system should be checked.
- Refer page. 85 (Section “Detecting control failure)

2. SCR Cleaning-DeSOx Request / On
- In order that the SCR system may maintain its exhaust cleaning efficiency at a proper level, it should be periodically initialized - “SCR cleaning.”
  Once the indicator lamp lights up, you should conduct the SCR cleaning process. During this process you can't use the vehicle.
- Pop-up window and the lamp will be turned on 10 hours before if “Service SCR Cleaning-DeSOx” needed.
- “Service SCR Cleaning-DeSOx” will take about 30 minutes; the lamp will blink during the process.
- Press the “SCR Cleaning-DeSOx” switch continuously for 3 sec, SCR cleaning will be started. For detailed instructions refer to p.72.

3. SCR Cleaning-DeSOx Inhibition
- When the symbol is turned on and “Active SCR Cleaning-DeSOx” is inhibited by pressing the inhibition switch. In places where there is a risk of fire or explosion, to prevent fire or explosion caused by flammable substances or particles inhibition switch should be used.

4. High Exhaust System Temperature (HEST)
- While SCR Cleaning-DeSOx for after-treatment, the temperature of exhaust gas will increase over 600℃. If this lamp on, operator should warn passengers around the truck not to approach or touch exhaust system especially rear side. And if the place of your truck has flammable material (Gas, Particle etc.) please replace truck to other safety zone.

5. Weight Scale Mode
- Press “MODE” once, Display will change to weight scale mode, for detailed instructions, refer to page 61.

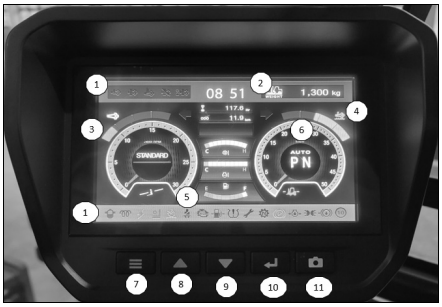
6. Engine Check Lamp (RED)
- Malfunction or necessary for diagnostic of engine, this lamp will light on.
- To check error, press “MODE” 3 seconds, display will converse to main menu then you can use check function. For detailed instructions refer to p.85.

7. Transmission Check Lamp (RED)
- Malfunction or necessary for diagnostic of transmission, this lamp will light on.
- To check error, press “MODE” 3 seconds, display will converse to main menu then you can use check function. For detailed instructions refer to p.69.

8. Fan Reverse (For D100 Model)

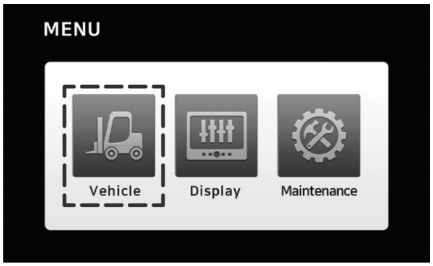
Display Cluster

Display

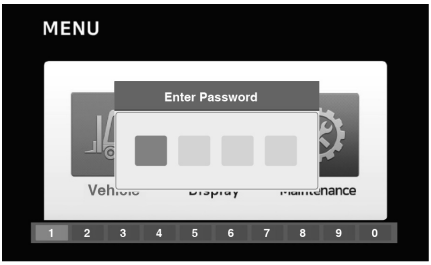


1) SCR device warning display information.
2) Weight information on the weight scale (Option).
3) SCR cleaning warning display and guideline.
4) Urea residual quantity warning display and guideline.
5) Engine check warning lamp.
6) Speed limit setting speed
(the lamp comes ON when it is set up).
7) Menu button.
8) UP button.
9) Down button.
10) Enter button.
11) Rear view camera operation button (manual).

Menu

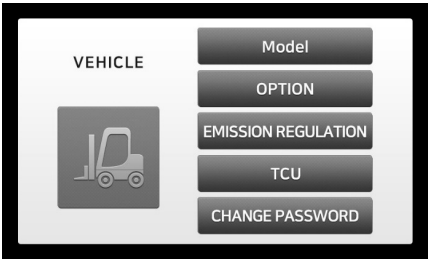


Menu - Vehicle



The password needs to be entered.
The initial password is 1111.

Menu - Vehicle - Model



Consists of the CROWN model and the Crown model. Upon selecting either model, the corresponding brand logo will be displayed at the time of initial starting.

Menu - Vehicle - Option

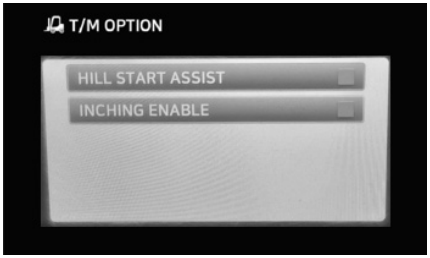
Menu - Vehicle - Option - Multi Torque

ECO: Fuel economy operation mode.

STANDARD: Ordinary operation mode.

HIGH: Heavy duty operation mode.

Menu - Vehicle - Option - T/M Option

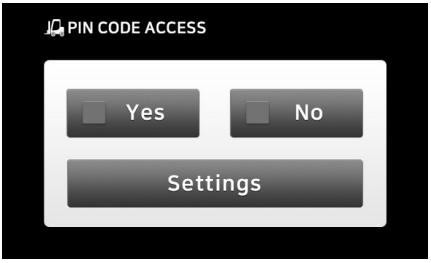


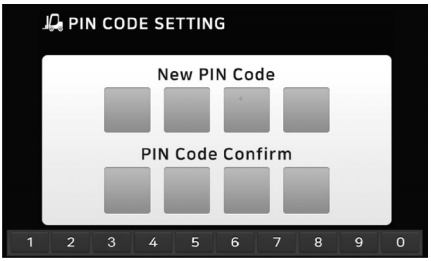
The electronic transmission option can be selected.

HILL START ASSIST: Prevents the slip of the uphill roda. This function is off after ten-seconds or push the accel pedal.

Inching enable: Inching pedal ON/OFF.

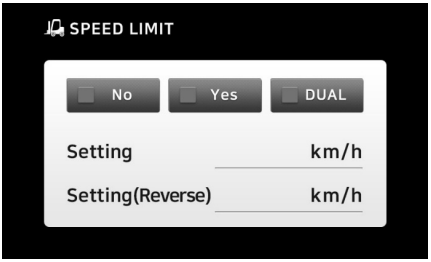
Menu - Vehicle - Option - Pin Code Access





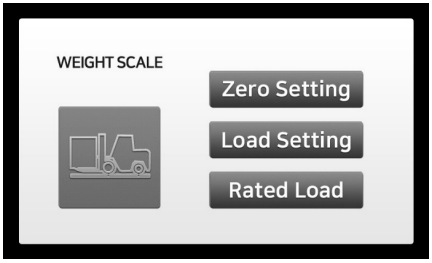
The anti-theft function allows vehicle start-up only after entering the password.

Menu - Vehicle - Option - Speed Limitation

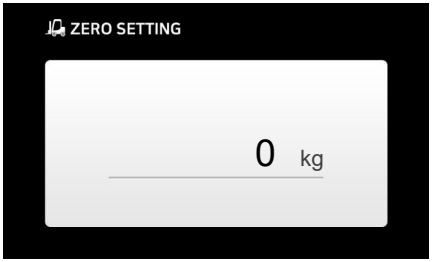


This function limits the maximum vehicle speed to the setting speed; and forward/backward speeds are identical in the case of regular setting, whereas forward/backward speeds differ in the case of dual setting.

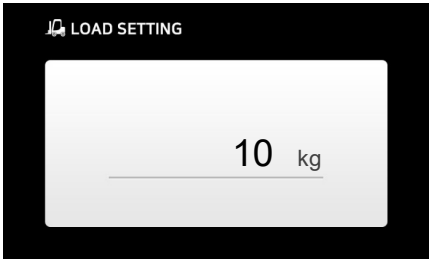
Menu - Vehicle - Option - Weight Scale



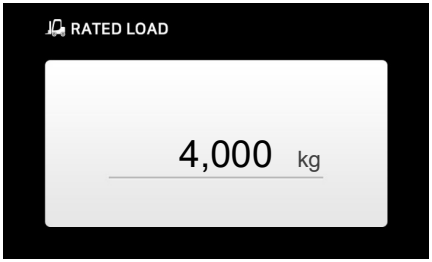
There are three sub-menus: (No load setting, load setting, rated load setting).



Zero setting under no-load condition.

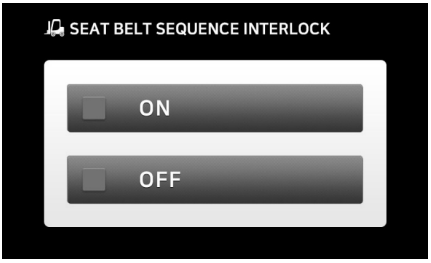


Enter the prepared load to set the corresponding load value.



Rated load setting for warning against overload.

Menu - Vehicle - Option - Seat Belt Interlock



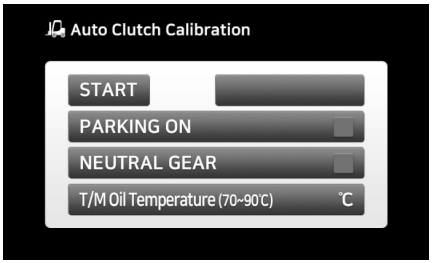
This safety function enables operation only when the seat is occupied and the safety belt is on.

Menu - Vehicle - Emission regulation

Tier-4, Stage-5 emission regulation setting.

Menu - Vehicle - TCU

Menu - Vehicle - TCU - Auto Clutch Calibration



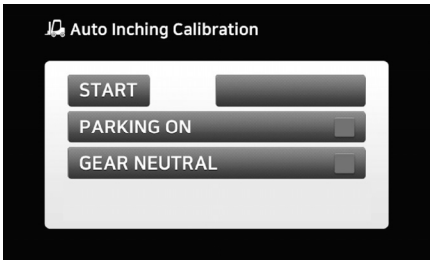
After any service below, should conduct the auto clutch calibration. See the topic, "Drive axle Oil, Transmission Oil, Oil Filter & Strainer - Clean, Change" in First 50-100 Service hours or a week.

the oil and filter - change

the transmission - change

the TCU - change

Menu - Vehicle - TCU - Auto Inching Calibration



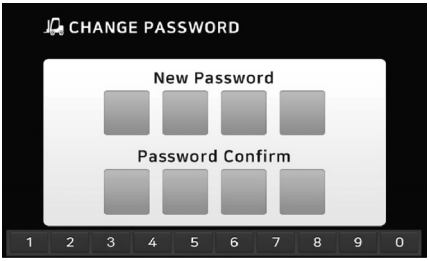
After any service below, should conduct the auto inching calibration. See the topic, "Drive axle Oil, Transmission Oil, Oil Filter & Strainer - Clean, Change" in First 50-100 Service hours or a week.

the inching pedal - adjust

the inching sensor - change

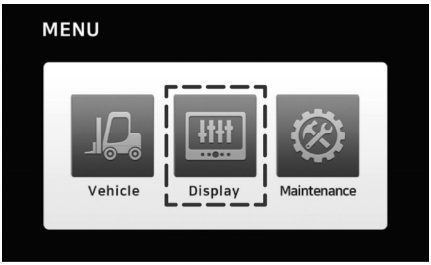
the TCU – change

Menu - Vehicle - Change Password

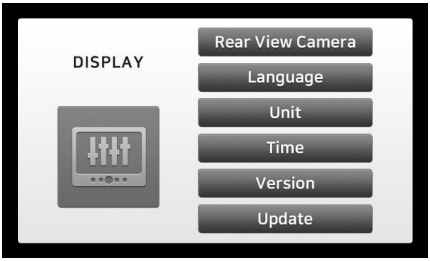


New password and setting by confirming

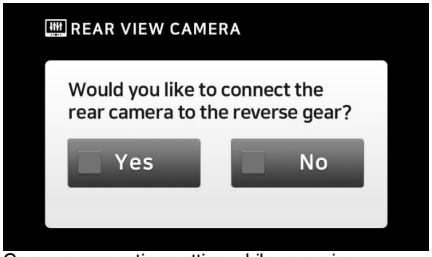
Menu



Menu - Display



Menu - Display - Rear View camera
(If the rear view camera is equipped)

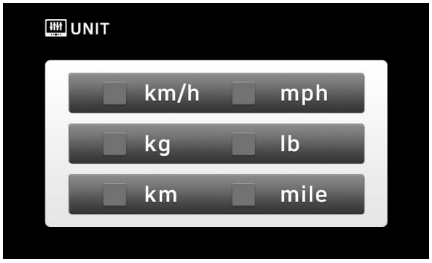


Camera connection setting while reversing

Menu - Display - Language

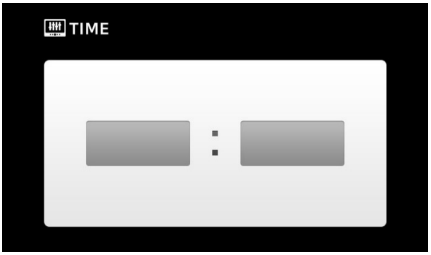
Setting for Korean, English, Chinese and Spanish

Menu - Display - Unit



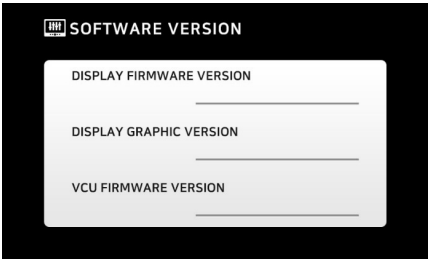
Setting for SI unit system and US unit system

Menu - Display - Time



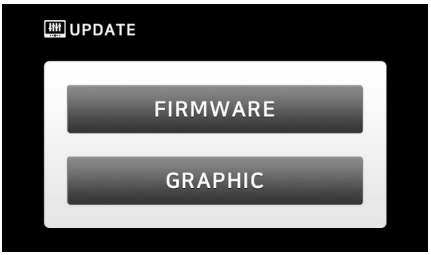
Current time setting

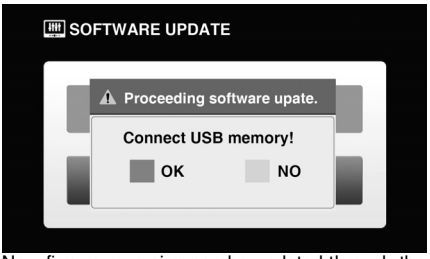
Menu - Display - Software Version



Instrument panel firmware, graphic version and VCU firmware version can be checked.

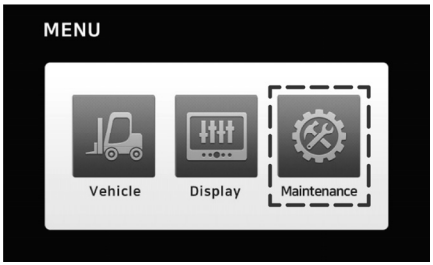
Menu - Display - Software Update



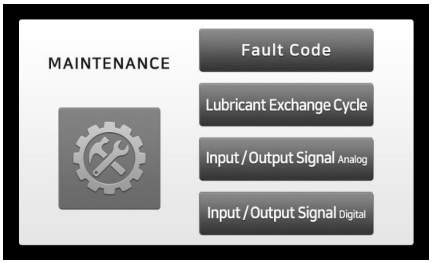


New firmware version can be updated through the USB memory.

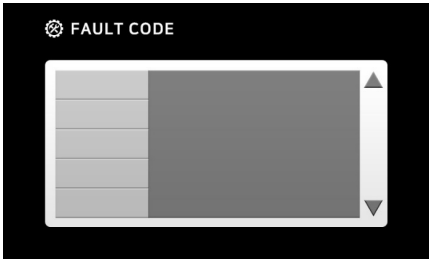
Menu



Menu - Maintenance

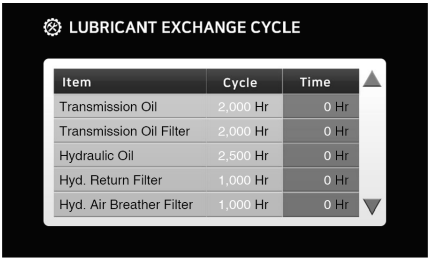


Menu - Maintenance - Fault Details



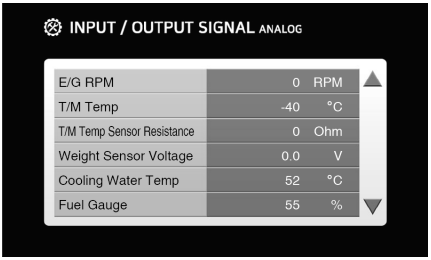
Details of faults that currently occur can be checked.

Menu - Maintenance - Consumable Item Management



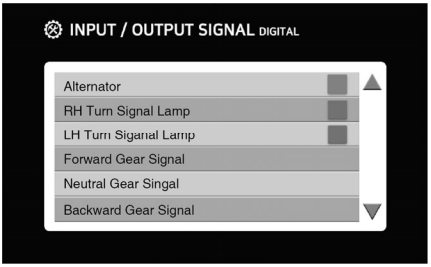
The replacement cycles and amount (in hours) of use of consumable items can be checked.

Menu - Maintenance - Input/Output Signal Analogue



The vehicle analogue signal can be checked

Menu - Maintenance - Input/Output Signal Digital



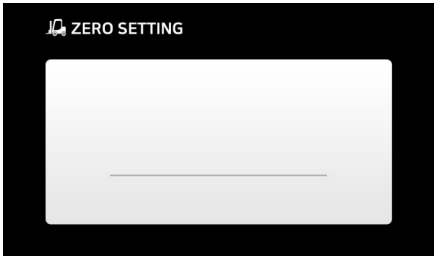
The vehicle digital signal can be checked (Alternator, RH turn signal lamp, LH turn signal lamp, forward gear signal, neutral gear signal, Backward gear signal)

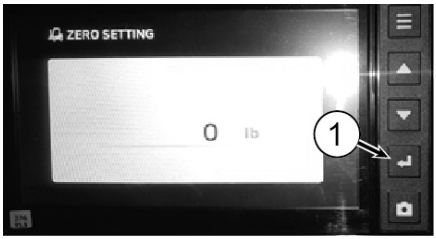
Weight Scale Mode (Optional - Hydraulic)

This option enables the operator to measure and limit the weight of the load using the LCD display. Use "WEIGHT SCALE" under the "VEHICLE" menu.

Zero Setting

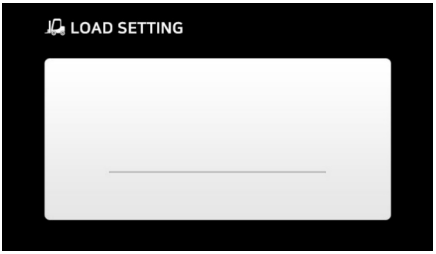
Raise the forks by 1 m as unloaded and press ENTER(1) to set the weight of the mast assembly to be zero.

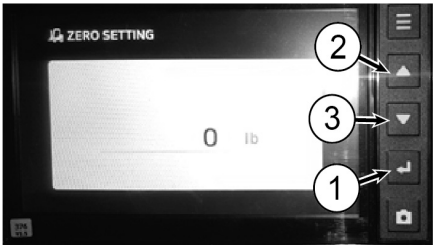




Load Setting

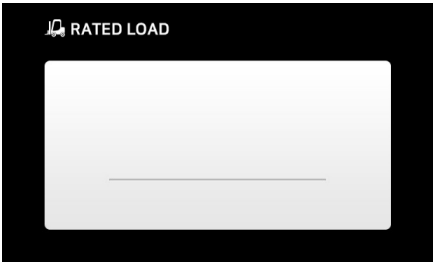
Prepare a reference load whose weight is accurately known and enter its weight into the display. Put the reference load on the forks and raise the forks. And then press ENTER(1) to complete the setting of a reference load value.
If the measured weight is different from the Load weight, press the button(2), (3) to change the weight.
Since the weights of any loads will be measured based on this reference load value, it must be accurately set.

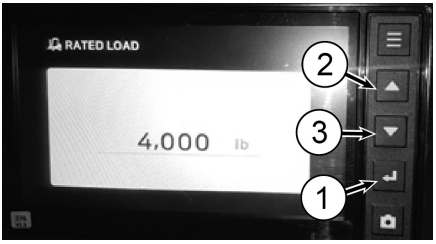




Rated Load Setting

Enter(1) the rated load capacity of the vehicle into the display and press ENTER(1) to complete the setting of the rated load value.
Press the button (2), (3) to set the rated capacity, then press Enter(1) to set it.
An overload warning will be given if any weight exceeding the rated load entered is measured.





Weight Scale Optional (Load Cell Type)

With this weight scale option, the operator can measure and limit the load's weight using a display panel. Using the key (ENTER), you can start settings.

1. Entering the Calibration Mode

To perform initial settings for the load cell, enter the calibration mode as follows:

(ENTER) Press this key when “ST.CAL” is displayed to start calibration mode.

(ENTER) Press this key once again.

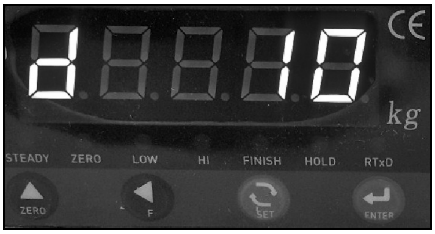
2. Specifying a Minimum Scale

You can select a minimum scale on which the load cell displays the weight from among 1 kg, 2 kg, 5 kg, 10 kg, 20 kg, and 50 kg (for example, 1235 kg is displayed with a 5 kg minimum scale and 1250 kg displayed with a 50 kg scale). The default value is "10 kg."

(F) Each time you press this key, the setting increases in the order of 01, 02, 05, 10, 20, and 50.

(ENTER) Press this key to save the minimum scale setting and proceed the subsequent step.

(SET) Press this key to move to the previous step.



3. Specifying a Maximum Measuring Scale

This step is to specify the rated capacity of the vehicle on which the load cell is installed.

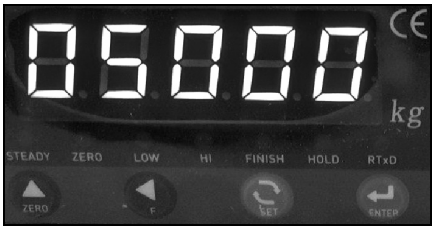
Since the device does not weigh a load heavier than the set capacity (determines to be overloaded**), it is recommended to set the capacity to be 5% higher than the actual value taking into consideration the safety factor**.

(ZERO) Each time you press this key, the number (0 to 9) at the cursor position increases by 1.

(F) Each time you press this key, the cursor is moved to the left by one point.

(ENTER) Press this key to save the set value and proceed the subsequent step.

(SET) Press this key to move to the previous step.



4. Inputting a Reference Load

This step is to input the weight of a reference load needed for weight setting.

If the weight of the reference load is 3,000 kg, input "3000" and proceed the next step (reference load lift).

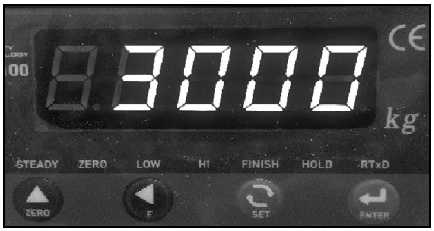
The initial setting value should be set to 50% to 60% of the rated capacity (for a 7 ton capacity model for example, use a 3.5 to 4 ton load).

(ZERO) Each time you press this key, the number (0 to 9) at the cursor position increases by 1.

(F) Each time you press this key, the cursor is moved to the left by one point.

(ENTER) Press this key to save the set value and proceed the subsequent step.

(SET) Press this key to move to the previous step.



NOTE: After the initial setting, if the load weight is measured with an error, you must adjust this value.

NOTE: Example: If you have inputted 3,000 kg but the actual load weighs 2,900 kg, adjust the reference load value to 2,900 kg; if the load weighs 3,100 kg, adjust the value to 3,100 kg.

5. Zero Adjustment

This step is to set the weight condition of the vehicle's unloaded front end to zero. Keeping the mast unloaded, raise it approx. 300 mm from the ground just vertically.

Press this key to save the set value and proceed the subsequent step.

Press this key to move to the previous step.

6. Reference Load Lift

Put a reference load that weighs as much as the set value on the attachment (e.g. forks).

You should align the centres of gravity of the attachment and of the reference load.

Raise the mast approx. 300 mm from the ground vertically.

Once the vehicle's vibration ends after lifting the load, press the Enter key.

Press this key.

7. Finishing Calibration

Once you have done all the steps above, a certain figure appears along with a blinking message "C._End" on the display for a while, and then the weight scale mode resumes."

Initial settings for the load cell has been finished.

Use this device after fully lowering the load for the indicator to display 0 kg.

Audio System (Radio/USB Player/Bluetooth)

Precaution

Safety information

⚠ WARNING

To reduce the risk of fire or electric shock, do n ot expose this product to rain or moisture.

To reduce the risk of fire or electric shock and a nnoying interference, use only the included com ponents.

Handling precautions for safety

Do not operate any function that takes your attention away from safely driving your vehicle.
Any function that requires your prolonged attention should only be performed after coming to a complete stop. Always stop the vehicle in a safe location before performing these functions. Failure to do so may result in an accident.

Keep the volume at a level where you can still hear outside noises while driving.
Excessive volume levels that obscure sounds such as emergency vehicle sirens or road warning signals (train crossings, etc.) can be dangerous and may result in an accident. Listening at loud volume levels in a car may also cause hearing damage.

Minimise display viewing while driving.
Viewing the display may distract the driver from looking ahead of the vehicle and cause an accident.

Do not disassemble or alter.
Doing so may result in an accident, fire or electric shock.

Do not block vents or radiator panels.
Doing so may cause heat to build up inside and may result in fire.

When driving
Keep the volume level low enough to be aware of road and traffic conditions.

When washing your car
Do not expose the product, including the speakers and USB device, to water or excessive moisture. This could cause electrical short, fire, or other damage.

When parked
Parking in direct sunlight can produce very high temperatures inside your car. Give the interior a chance to cool down before switching the unit on.

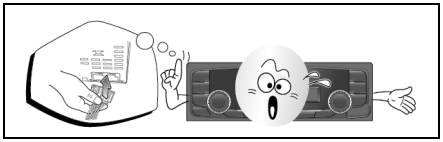
Use the proper power supply
This product is designed to operate with a DC 14.4 V or 28.8 V, negative-ground battery system.

Use authorised service centres
This product is made of precision parts. Do not attempt to disassemble or adjust any parts. Please refer to the Service Centre list included with this product for service assistance.

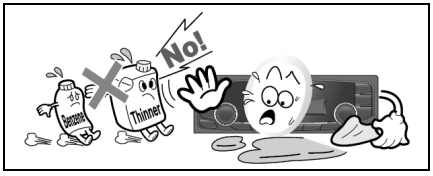
For installation
This product should be installed in a horizontal position with the front end up at a convenient angle, but not more than 30°.

NOTE: The preset memory is cleared to return to the original factory setting when the power connector or battery is disconnected.

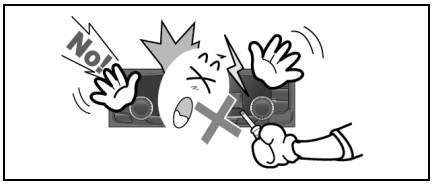
- This unit is designed for DC 14.4 V or 28.8 V negative- ground vehicles only. Do not use a non-standard power supply.



- Do not use gasoline, thinner, benzene, organic solvent, etc., to clean the unit.

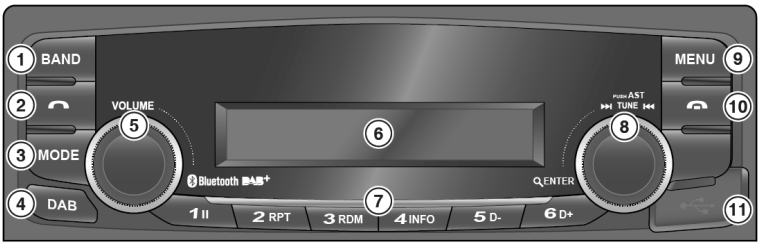


- Do not forcibly press function buttons. By pressing lightly, damage can be avoided.



Location of controls

Front view



1. **BAND** button: selects AM/FM Radio mode.

2. **(Call)** button: accept incoming a call or enter the call log mode, switch between hands-free and private call modes (press); make a call a recently connected number (press and hold).

3. **MODE** button: selects USB, Bluetooth audio or AUX play mode (press)

4. **DAB** button (option for DAB service region only): enters DAB mode (press).

5. **POWER** button with VOLUME dial: turns power on, mute function on/off or selects a menu item (press); turns power off and shows clock (press and hold); control the volume level or menu items.

6. Display window for Play/Reception/Menu state and information.

7. **PRESET** [1 II] - [6 D+] buttons

   - Radio/DAB: Recall each stored station(press); store each station (press and hold)
   - USB: Changes playback mode (press 1II, 2 RPT or 3 RDM buttons); shows available information about the current track (press 4 INFO button); move to folder down/up (press 5 D-/6 D+ buttons).
   - Bluetooth audio: pause/resume playback (press 1II); shows information of the connected Bluetooth device (press 4 INFO button).

8. **ENTER/AST** button with I◄◄TUNE►►I dial.

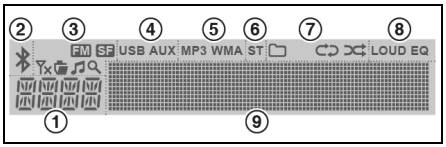
   - Radio/DAB: plays radio frequencies with superior reception for 5 seconds each (press); saves frequencies with superior reception to Preset buttons (press and hold); selects reception frequency manually (rotate).
   - USB/Bluetooth audio: scans beginning parts (approx. 10 seconds) of tracks (press); moves to the previous/next track (rotate); rewind or fast-forward the track (rotate and hold).

9. **MENU** button: enters Menu setting mode or returns to the previous menu (press).

10. **(End)** button: reject incoming a call or ends a call (press).

11. **USB** port with cover for plugging the USB device.

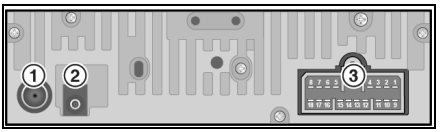
Display window



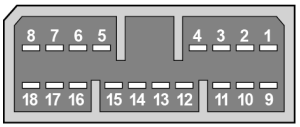
1. **Function** display area for showing the function mode.
2. **(Bluetooth)** indicator for the Bluetooth connection.
3. **DAB mode** indicator for the DAB function mode.
   - FM : FM Linking
   - SF : Service Follow is activated
   - : Digital signals are not received
   - : Ensemble name display
   - : Service name display
   - : Search mode
4. **USB/AUX** indicators for the USB or External device connection.
5. **MP3/WMA** indicators for USB's Audio Stream detections.
6. **ST (Stereo)** indicators for FM stereo reception.
7. **Playback mode** indicators for USB playback mode.
   - Folder mode
   - **INT** Intro playback
   - Repeat playback
   - Random playback
8. **LOUD/EQ** indicators for sound effect.
   - **LOUD**: Loudness mode
   - **EQ**: EQ mod

9 Multi-function display area for showing the play, reception or menu information.

Rear view/Connectors



1. **Antenna** jack: To plug the FM antenna cable.
2. **DAB Antenna** jack: To plug the DAB antenna cable.
3. **I/O** connector: To plug the I/O cable.



1. Backup B (+)
2. Ground
3. AUX L-CH (option)
4. AUX R-CH (option)
5. AUX Det (option)
6. AUX GND (option)
7. CAN Signal (+)
8. CAN Signal (-)
9. ACC B (+)
10. Illumination (+)
11. External Microphone (+)
12. External Microphone (-)
13. N.C
14. External Microphone Ground
15. Rear Right Channel Speaker (+)
16. Rear Right Channel Speaker (-)
17. Rear Left Channel Speaker (+)
18. Front Left Channel Speaker (-)

Getting started

Turning the unit on/off

1. Turn your car's ignition key to ACC or IGN (ON) position.

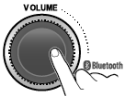
2. Press the **POWER** button to turn the power on.
   - If the source is ready, playback also starts.
   - **To turn on the power directly**
     By connecting an USB into the USB port or pressing the BAND, MODE (while the USB is connected), you can also turn on the power and the unit then plays.

3. When power is on, press and hold the POWER button to turn power off.

Adjusting volume directly

1. Turn the **VOLUME** dial to control volume.
   - Available volume range: 00 (mute) ~ 41.

Muting the sound quickly



1. Press the MUTE button to turn mute on. "MUTE" will flash on the display and mute the sound.

   Press the MUTE button again or turn VOLUME dial to restore sound.

Setting the sound

1. Press MENU button to enter the Settings menu mode.
   - After entering MENU mode, press MENU button to return to the previous item.

2. Turn **VOLUME** dial to select the "**SOUND**" or "**EQUALIZER**" as below, then press this dial; **SOUND** ↔ **EQUALIZER** ↔ BLUETOOTH ↔ DAB ↔ SYSTEM ↔ PREVIOUS.
   - **SOUND**: sets the sound mode
   - **EQUALIZER**: selects the equalizer style.

3. Turn **VOLUME** dial to select the desired Sound setting mode, then press this dial.
   - **BASS**: sets the bass sound level. (-5 ~ +5)
   - **MIDDLE**: sets the middle sound level. (-5 ~ +5)
   - **TREBLE**: sets the treble sound level. (-5 ~ +5)

- **BALANCE**: sets the sound balance between the right and left speakers. (LEFT 15 ~ RIGHT 15)
- **EQUALIZER**: selects the one of the 7 EQ styles (EQ OFF, POP, ROCK, COUNTRY, VOICE, JAZZ, CLASSIC).
- **PREVIOUS:** Return to previous menu screen..

4. Turn VOLUME dial to adjust the value of the level, balance or style, then press this dial.

Setting the Bluetooth mode

1. During the Settings menu mode, turn VOLUME dial to select the "BLUETOOTH" as below, then press this dial;
SOUND ↔ EQUALIZER ↔ BLUETOOTH ↔ DAB ↔ SYSTEM ↔ PREVIOUS.

- **Bluetooth:** sets the Bluetooth features

2. Turn VOLUME dial to select the desired Bluetooth setting mode, then press this dial.

- **PAIR**: register a Bluetooth device
- **SELECT**: selects/connects a device from registered Bluetooth devices
- **DELETE**: removes a device from registered Bluetooth device.
- **MIC VOL**: adjusts the Bluetooth microphone volume.
- **H/F VOL**: adjusts the Bluetooth hands-free volume.
- **Phone Book**: activates/deactivates the phone book download feature from connected device
- **BT INFO**: shows the Bluetooth information of this system
- **PREVIOUS**: returns to previous menu screen.

3. To change the connected Bluetooth device, turn the VOLUME dial to select the "SELECT", then press this dial.

Turn the VOLUME dial to select the desired device list, then press this dial.

To delete the Bluetooth device, turn the VOLUME dial to select the **"**DELETE**"**, then press this dial.

Turn the VOLUME dial to select the desired device list, then press this dial.

- When the connected device is deleted, Bluetooth stops working. If you select another device in "SELECT" mode or turn the vehicle off and on, it will try to connect with the next priority Bluetooth device.

To adjust the Bluetooth microphone initial volume, turn the VOLUME dial to select the "MIC VOL", then press this dial.

Turn the VOLUME dial to set desired Bluetooth microphone initial volume level, then press this dial.

- The default setting is 3, the volume range is 1 ~ 5.

To adjust the Bluetooth hands-free initial volume, turn the VOLUME dial to select the "H/F VOL", then press this dial.

Turn the VOLUME dial to set desired Bluetooth hands-free initial volume level, then press this dial.

- The default setting is 20, the volume range is 6 ~ 32.

To download the Phone book, turn the VOLUME dial to select the "Phone Book", then press this dial.

Turn the VOLUME dial to select the "ENABLE", then press this dial.

- The phone book can download up to 1,000 phone numbers and 5 phone numbers per person.

Setting the DAB feature

1. During the Settings menu mode, turn the VOLUME dial to select the "DAB" as below, then press this dial;
   SOUND ↔ EQUALIZER ↔ BLUETOOTH ↔ DAB ↔SYSTEM ↔ PREVIOUS

   - **DAB**: sets the DAB features

2. Turn the VOLUME dial to select the "Service follow" or "Short label" as below, then press this dial;
   Service follow ↔ Short label ↔ PREVIOUS

   - **Service follow**: if the DAB service also provides FM, to switch to FM when the DAB signal is weak.
   - **Short label**: display the short name of the service or ensemble.
   - **PREVIOUS**: Return to previous menu screen.

3. Turn VOLUME dial to select On or Off, then press this dial.

Setting the system functions

1. During the Settings menu mode, turn the VOLUME dial to select the "SYSTEM" as below, then press this dial;
   SOUND ↔ EQUALIZER ↔ BLUETOOTH ↔ DAB ↔ SYSTEM ↔ PREVIOUS

   - **SYSTEM**: sets the system features

2. Turn the VOLUME dial to select the "BT ON/OFF", "SCROLL" or "LOUDNESS" or "BEEP" then press this dial;
   BT ON/OFF ↔ AREA ↔ SCROLL ↔ LOUDNESS ↔ BEEP ↔ SOFTWARE ↔ PREVIOUS

   - **BT** (Bluetooth) **ON/OFF**: activate (On) or deactivate (Off) the Bluetooth function.
   - **SCROLL** (Scroll): activate (On) or deactivate (Off) the text scroll feature for LCS display screen.
   - **LOUD** (Loudness): activate (On) or deactivate (Off) the loudness feature.
   - **BEEP** (Beep): activate (On) or deactivate (Off) the beep sound feature.

3. Turn VOLUME dial to select ON or OFF, then press this dial.

Setting the region

1. During the System settings mode, turn the VOLUME dial to select the "AREA" as below, then press this dial;
   BT ON/OFF ↔ AREA ↔ SCROLL ↔ LOUDNESS ↔ BEEP ↔ SOFTWARE ↔ PREVIOUS

   • **AREA**: sets the region for radio or DAB

2. Turn the **VOLUME** dial to select the desired area as below, then press this dial.

   • **EUROPE**
   FM: 87.5 ~ 108.0 MHz (50 kHz step)
   AM: 522 ~ 1,629 kHz (9 kHz step) DAB: BAND III

   • **ASIA**
   FM: 87.5 ~ 108.0 MHz (100 kHz step)
   AM: 531 ~ 1,602 kHz (9 kHz step)

   • **EUROPE**
   FM: 87.5 ~ 108.0 MHz (50 kHz step)
   AM: 522 ~ 1,629 kHz (9 kHz step) DAB: BAND III

   • **NORTH AMERICA (option)**
   FM: 87.7 ~ 107.9 MHz (200 kHz step)
   AM: 530 ~ 1,710 kHz (10 kHz step)

   • **SOUTH AMERICA (option)**
   FM: 87.5 ~ 108.0 MHz (100 kHz step)
   AM: 530 ~ 1,710 kHz (10 kHz step)

   • If the region setting is not selected correctly to your country or region, the radio reception can not be received. Retry the setting the region of radio reception correctly.

   • The region setting is required only for the first time.

   • The DAB broadcasting is only supported Europe region.

Checking/updating the system

1. During the System settings mode, turn the VOLUME dial to select the "SOFTWARE" as below, then press this dial;
   BT ON/OFF ↔ AREA ↔ SCROLL ↔ LOUDNESS ↔ BEEP ↔ SOFTWARE ↔ PREVIOUS

   • **SOFTWARE**: check/update the system software.

2. **To update the system software,** turn the VOLUME dial to select the "UPDATE", then press this dial.

To update the system software, turn the **VOLUME** dial to select the "UPDATE", then press this dial.
Download the latest system software to a USB device for update to this unit, then open the cover and plug the USB device to the USB port.

CAUTION

• Perform update with the start switch “ON” when the battery is sufficiently charged by driving the vehicle. When the battery is discharged while updating, the system may get damaged with the update stopped

Radio

Tuning in a radio station

1. Press the BAND button repeatedly to enter the radio band in order of FM1, FM2, FMA, AM1, AM2 or AMA.
   - You can select the FM1, FM2, FMA or AM1, AM2, radio band.
   - While the Auto Store stations are stored, you can select the AMA or FMA band by additional.
   - The previously chosen broadcasting station will be received.

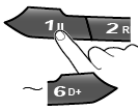
2. Turn the ▶▶I TUNE I◀◀ dial to select the station.
   - **Briefly turn this dial**, plays previous/next frequency.
   - **Turn and hold this dial**, automatically search for station with superior reception.
   - **Press this dial,** starting from the current station, stations with superior reception are scanned for 5 seconds and the previous station is restored.
     During the seeking or scanning, if press or turn the dial left/right again, the selected station will begin playing.
   - During the FM reception, the Stereo [ST] indicator is on.

Saving radio stations manually

You can save up to 6 preset channels each for FM1, FM2, AM1 and AM2 band.

If change the stations while driving, use preset button to prevent accidents

1. Press the BAND button repeatedly to select the band.

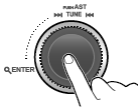


2. After selecting the frequency, press and hold the PRESET [1II] ~ [6 D+] button.
   - The frequency is saved to the selected preset button.
   - A total of 24 frequencies with 6 preset frequencies each for FM1/FM2/AM1/AM2 modes can be saved

Saving radio stations automatically

You can save up to 6 preset channels automatically each for FMA and AMA band.

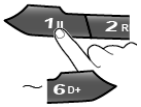
1. Press the BAND button repeatedly to select the band.
   - The previously chosen broadcasting station will be received.



2. Press and hold the AST button to automatically save receivable frequencies to Preset button.
   - Up to 6 stations can be stored in each of the FMA and AMA band.

Listening to a preset station

1. Press the BAND button repeatedly to select the band.
   - You can select the FM1, FM2, FMA or AM1, AM2, AMA radio band.
   - While the Auto Store stations are stored, you can select the AMA or FMA band by additional.
   - The previously chosen broadcasting station will be received.



2. Press the PRESET [1II] ~ [6 D+] button.
   - From the 6 presets, select the frequency you want to listen to.

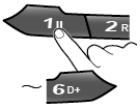
DAB (option for DAB service region)

Listening to a DAB station

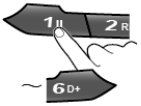
1. Press the DAB button to enter the DAB mode.
   - Received with the service name of the previously selected DAB broadcast displayed.

2. Press the DAB button to switch display information between the Service name and the Ensemble name.

3. Turn the ▶▶I TUNE I◀◀ dial to select the DAB station.
   Briefly turn this dial, plays previous/next DAB Service station.
   Turn and hold this dial, automatically search for DAB Ensemble station with superior reception..
   - During the searching, if press or turn the this dial again, the selected station will begin playing.



4. To store the DAB service or ensemble station to Preset buttons, press and hold the PRESET [1II]. ~ [6 D+] button.
   - During the searching, if press or turn the this dial again, the selected station will begin playing.

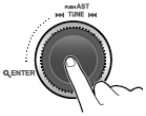


5. To listen to Preset station, press PRESET [1II] ~ [**6** D+] button.

- From the 6 presets, select the DAB station you want to listen to.

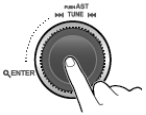
Changing the DAB service

1. Press the ENTER button to show the DAB service list.



2. To change the DAB service, turn the ▶▶I TUNEI◀◀ dial to select the desired Service name, then press this dial.

Seeking the full Ensemble stations

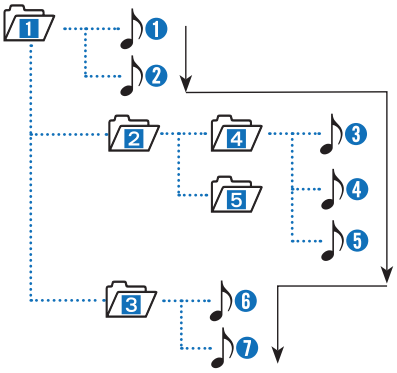


1. Press and hold the ENTER or DAB button to automatically seek for the available Ensemble. Automatically searches for all available ensemble, then receives the first service.

USB player

Handling precautions for USB device

- When using the external USB device, make sure to keep the device disconnected and connect only some time after turning on the vehicle ignition. The USB device may be damaged if the USB device already connected when the ignition is turned on. (USB device is not an electronic automotive component).
- Some USB devices may not operate properly because of compatibility issues. Check that the external device is supported by the device before starting use.
- The device will only recognize USB devices formatted in FAT 16/32. When formatting the external USB device, the device may not properly recognize a Byte/Sector selection other than 512 Bytes or 2,048 Bytes.
- Avoid the contact of bodily parts and foreign substances with the USB connector.
- Repeatedly connecting/disconnecting the USB in a short period of time may cause damage to the device.
- When disconnecting the USB, an abnormal sound may occur occasionally.
- Abruptly disconnecting the external USB device while the USB is operating may cause the device to be damaged or function abnormally. Make sure to disconnect the USB device only after the audio power is turned off or when the audio is operating in a different mode.
- The amount of time required to recognize the external USB device may differ depending on the type, size, or file formats stored on the USB. Such differences in the required time are not indications of malfunction. Please wait the period of time required to recognize the device.
- The device supports only USB devices used to play music files.
- This unit can recognize maximum 9,999 files and 256 folders into the USB device.
- Do not use the USB I/F to charge batteries or USB accessories which generate heat. Such acts may lead to deteriorated performance or damage to the device.
- The device may not recognize the USB device if separately purchased USB hubs and extension cables are being used.
- In the case of high capacity USB devices, there are instances where the logical drives are partitioned for user convenience. In this case, it will only be possible to play the USB music in the top level drive.
  When using partitioned drives, save the songs you wish to play on the device only in the top-level logical drive. In addition, certain USB devices are configured with a separate drive used to install application programs and it may not be possible to play songs from such drives for the reasons as described above.
- The device may not support normal operation when using formats such as HDD Type, CF, or SD Memory.
- The device will not support files locked by DRM (Digital Rights Management).
- Folder selection order/File playback order;



About MP3/WMA

- This unit can play MP3 (WMA) files with .mp3, .wma (lower case letters) or .MP3 and .WMA (capital letters) file name extensions.
- This unit can display ID3 Tag (Version 1.0, 1.1, 2.2, 2.3 or 2.4) information for MP3 files, such as the album name and the artist.
- This unit can display English or Korean characters.
- This unit can playback MP3/WMA files meeting the conditions below;

- Bit rate: 8 kbps ~ 320 kbps / VBR for MP3
- Sampling frequency

  48 kHz, 44.1 kHz, 32 kHz (for MPEG-1 Layer 2/3)

  24 kHz, 22.05 kHz, 16 kHz(for MPEG-2 Layer 2/3)

  12 kHz, 11.025 kHz, 8 kHz(for MPEG-2.5 Layer 3)
- MP3 (WMA) discs made in ISO-9660 level 1/2, Romeo, Joliet or Windows long file name system.

- The file/folder names that can be used per disc storage type are as follows, including the four-digit file name extensions (.mp3).

- ISO 9660 Level 1: Maximum of 12 characters
- ISO 9660 Level 2: Maximum of 31 characters
- Romeo: Maximum of 128 characters (1 byte)
- Joliet: Maximum of 64 characters (1 byte)
- Windows long file name: Maximum of 28 characters (1 byte)

- This unit can recognize maximum 9,999 files and 256 folders into the USB device.
- This unit can playback files recorded in VBR (variable bit rate). Files recorded in VBR have a discrepancy in elapsed time display, and do not show the actual elapsed time. After performing the search function, this difference becomes noticeable.

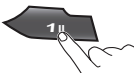
Playing a USB device

1. Open the cover, plug the USB device to the USB port.

- Once a USB is connected, USB will automatically start playing from the first file within the USB.
- If a previously played USB is reconnected, then the file after the most recently played file is played.
- If a different USB is connected or the file information within the USB was changed, then the USB will start playing from the first song within the USB.

2. When an USB device to be played is already connected, press the **MODE** button to play USB device.

- The previously selected file is played.



3. While playing, press the [1 II] button to pause the file.

- Press the button again to play the current file.

Changing the song information

1. Press the [4 INFO] button repeatedly to display information about the file being played.

- The information displayed includes the file name, playing time, ID3 Tag or folder name information saved with the song.
- If there is no information on the playing file, the unit will display "**NO INFO**", and then file name.

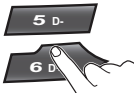
Controlling the playback

1. While playing, turn the ▶▶I TRACK I◀◀ dial left/right to moves to the previous or next track.

- Clockwise: move to the next file
  Counter-clockwise: move to the previous file
- You can skip files within the same folder.

2. While the ▶▶I TRACK I◀◀ dial is being turned and held, the file will rewind or fast forward at high speed. Once released, the file will begin playing at normal speed.

- **Clockwise**: fast forward
- **Counter-clockwise**: fast rewind
- The search function works but search speed is not constant.
- While fast forwarding or rewinding, you can only hear intermittent sounds.



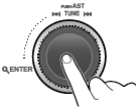
3. Press the [5 D-] or [6 D+] button to moves to the previous or next folder.

- **[5 D-]**: move to previous folder

  [6 D+]: move to next folder
- While folder moving, he folder name will be displayed briefly.

4. While playing, press the [1 II] button to pause the track.

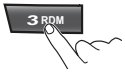
- Press the button again to play the current track.



5. To find the song you want to play directly, press the 🔍(Search) button.
Turn the ▶▶I TRACK I◀◀ dial to select the desired file name, then press this dial.

Change the playback mode

1. Press the [2 RPT] button to select the Repeat playback mode
   - : The current file plays repeatedly.
   - , : The current folder plays repeatedly.
   - Off: Cancels repeat playback.



2. Press the [3 RDM] button to select the Random playback mode.
   - , : All files of current folder play in random order.
   - : All files of USB device play in random order.
   - Off: Cancels random playback.

Bluetooth

About Bluetooth wireless technology

- Bluetooth® Wireless Technology refers to a short-distance wireless networking technology which uses a 2.45GHz frequency to connect various devices within a certain distance.
- The Bluetooth function can be used only if a Bluetooth device has been connected. Pairing and connection of Bluetooth devices, refer to "Pairing/Connecting Your Bluetooth device.".
- When your Bluetooth device is connected, "ᛒ" is displayed on the display. If "ᛒ" does not appear, because it does not have the Bluetooth connection status before using the connection.
- To be able to set up a Bluetooth pairing and connection to this unit, the Bluetooth function of your Bluetooth device must be activated. (Bluetooth function setting method may vary depending on the device. For further information, please consult the user guide of the Bluetooth device.)
- If the Bluetooth device is to be connected together with another Bluetooth device (MP3 player, mobile phone, digital camera, etc. via USB port), this unit may not operate properly.
- Some features may not be supported by some Bluetooth devices specification.
- Bluetooth functions can be operated to some unstable depending on the communication status.
- The hands-free call volume and quality may differ depending on the device.
- While driving, please refrain from Bluetooth-related menu operation for safety reasons.
- Up to 5 devices can be paired to this unit. Only one paired device can be connected to this unit at a time.
- The Bluetooth device is connected, you can not register other devices.
- Only supports Bluetooth hands-free and Bluetooth audio related functions.
- When the connection is terminated abnormally due to being out of range or device failures, the connection is automatically restored as soon as the device returns to the connection range or normal state. (Communication device powered off or out of range, Bluetooth communication error, etc.)
- If you do not want automatic connection with your Bluetooth devices, turn the Bluetooth function off on the Bluetooth device.

About Bluetooth music mode

- Bluetooth Audio mode can be used only if a Bluetooth Audio device has been connected.
- If the Bluetooth device is disconnected while Bluetooth music is active, then the music will also stop.
- During the track up/down from the Bluetooth music playback status, some device can be output pop noise and sound broken
- During a phone call from the Bluetooth music playback status, some phone can be output mixed with the phone sound.
- End the phone call and returning to a Bluetooth music mode, some mobile phones may not be played automatically.
- Bluetooth hands-free and Bluetooth music functions can not be used simultaneously. (While the Bluetooth music playback, if you enter the phone features, Bluetooth music playback will end).

Pairing/Connecting your device

- Firstly, set up the Bluetooth device to be connected from the Bluetooth settings menu to enable other devices to search for the Bluetooth device.

1. Press MENU button to enter the Menu settings mode.

2. Turn VOLUME dial to select the "BLUETOOTH" as below, then press this dial;
SOUND ↔ EQUALIZER ↔ BLUETOOTH ↔ DAB ↔ SYSTEM ↔ PREVIOUS

- BLUETOOTH: Bluetooth setting mode

3. Turn the VOLUME dial to select the "PAIR", then press this dial.
When you first register, appear the "BT Pairing" on the display window, then search the Bluetooth devices for connection

- If a Bluetooth device is not connected, press and hold the (Call) button to enter the pairing mode directly.

4. Search and select device “CROWN” in your Bluetooth device, then confirm

- The Bluetooth registration standby proceeds for 1 minute. If the registration is failed during 1minute, restart over from the beginning.
After a while, the Bluetooth device is automatically registered.
When pairing is successful, the "Connected" and "Device name" will be displayed 3 seconds.

- When your Bluetooth device is connected, "" appear on the display. If the Bluetooth device is disconnected, "" disappear.

5. Repeat items 1~ 4 to register to add another Bluetooth device.

- Up to 5 devices can be paired to this unit.

- The last device connected to this unit is set to automatically connect to the highest priority.

Playing the Bluetooth music

To play Bluetooth music

- This function only operates with Bluetooth devices that support A2DP (Advanced Audio Distribution Profile) version 1.2 or above.

- Should be set to Stereo Headset in Bluetooth device type menu of your device.

1. Press the MODE button repeatedly to select the BT Audio mode. Appears "BT" on display window and start playback.

- If a Bluetooth device is not connected, you can not select.

- If music is not yet playing from your mobile device after switching to Bluetooth Music (streaming audio) mode or after pressing Play on the mobile device itself, try to start music playback by pressing the Play button again.

- The output music playback from Bluetooth devices with this unit.

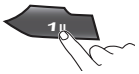
- There will be music playback automatically play upon entering since once played, it stops automatically when you exit from the music.

- You can also phone or Bluetooth device other than the home screen mode, Bluetooth music play mode when entering and exiting, the device does not play automatically.

Controlling the playback

1. While playing, turn the ▶▶I TRACK I◀◀ dial to moves to the previous or next track.

• Clockwise: move to the next file
Counter-clockwise: move to beginning of the current file or previous file.



2. While playing, press the [1 II] button to pause the track with "PAUSE" indicator.

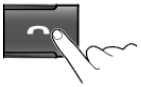
• Press this button again to play the current track.

3. Press the [4 INFO] button to check the information of current connected device.

• About the music files are not displayed.

• During Bluetooth music playback, do not operate the music changes too quickly. Allow enough time for the machine-to-machine communication.

Answering a call



When a call comes in, the audio source is muted, and display the call information with ring tone.

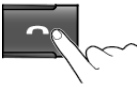
If the phonebook is not downloaded, incoming phone numbers are displayed without caller information.

1. To answer a call, press the (Call) button or to reject a call press the (End)button.

• When a call comes in, the audio source is muted.

• When a call is ended, this unit returns to the previous state media playback.

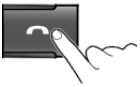
Making a call by recently



1. **To call the recently connected number,** press the (**Call**) button to display recent call number.

• The recent calls list is displayed.
Turn the VOLUME dial to select a recent call number, then press this dial to make a call

• The recent calls list displays up to 10.

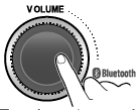


2. **To call the last connected number directly,** press and hold the (**Call**) button.

During a call…

1. To adjust the a call volume, turn the VOLUME dial.

• The call volume works with Bluetooth devices, and operates separately from the volume of this unit.

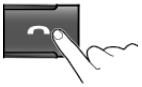


2. To deactivate the microphone, press the and hold MUTE button.

• To reactivate the microphone, press MUTE button.

3. To switch from hands-free mode to the phone handset mode, press the Call) button. To returns the phone conversation to hands- free mode, press the (Call) button..

4. **Call waiting feature**
When a new call comes in during a call, "Call in" and the incoming call information are displayed alternately.



To wait for the first call and connect the second call, press and hold the (Call) button.

To end the first call and connect the second call, press the (End) button.

To keep the first call and decline the second, press and hold the (End) button.

5. To end a call, press the (End)button.

• End a call, then return to the playing state.

Troubleshooting

Common

Symbol	Possible causes	Possible remedies
Sound is not generated.	MUTE is set to ON.	Set MUTE to OFF. (refer to 6 page)
Noise	There is an electromagnetic-wave generator near the unit or its electrical lines.	Keep an electromagnetic-wave generator s away from the unit and the wiring of the unit. In case the noise cannot be eliminated due to the wiring harness of the car, consult your branch.
No sound from speaker(s)	Balance setting is not appropriate.	Readjust balance. (refer to 6 page)

Radio/DAB (option)

Symbol	Possible causes	Possible remedies
A radio broadcast cannot be received.	The region of radio reception is not selected correctly.	Retry the setting the region of radio reception correctly. (Refer to page 9)
Seeking takes too long.	The auto antenna (aerial) will not go up.	Check the connection of the power antenna (aerial) control lead.
Poor reception or noise	Out of receiving area.	The strength of radio waves may vary depending on the location, and reception may worsen due to burial. If the reception is poor, reselect a good station with the auto tuning function or the search function.
Preset stations cannot be stored	Auto seeking may take some time.	Change to auto seeking, and proceedwith seeking again.

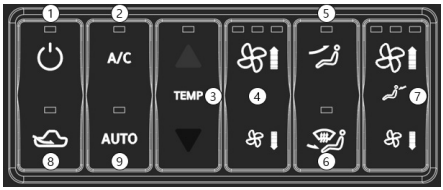
USB

Symbol	Possible causes	Possible remedies
The USB does not work.	USB memory is damaged.	Please use after formatting the USB into FAT 16/32 format.
	USB memory has been contaminated.	Remove any foreign substances on the contact surface of the USB memory and USB port.
	A separately purchased USB HUB is being used.	Directly connect the USB memory with the USB port.
	A USB extension cable is being used.	Directly connect the USB memory with the USB port.
	A USB which is not a Metal Cover Type USB Memory is being used.	Use a standard USB Memory.
	A HDD type, CF, SD Memory is being used.	Use a standard USB Memory.
	There are no music files which can be played.	Only MP3, WMA file formats are supported. Please use only the supported music file formats.

Bluetooth

Symbol	Possible causes	Possible remedies
Bluetooth function does not work.	Device registration / connection failed.	Check the [ᛒ] is turned on in the function display. If the [ᛒ] indicator is not lit, connect a Bluetooth device by referring to **"Pairing/Connecting your device**".
No audio detected on Bluetooth device.	Registration mode not executed.	Press the **MENU** button and select "**BLUETOOTH**" > "**PAIR**" to enter Pairing Mode.

Air Conditioner & Heater (Optional)



⚠ WARNING

At the activation of the A/C button, engine low idle speed is increased to engine rpm and the truck may speed up. Apply foot brake to stop or control the traveling speed.

1. Air conditioner & Heater on/off switch

2. Air conditioner & Heater on/off switch.

3. Temperature high/low button.

4. Fan up/down button.

5. Blower mode setting button. Front operation only.

6. Defrost button (Removing the window fogging up)

7. Wind volume control button for the rear air conditioner fan. (3-Stage)

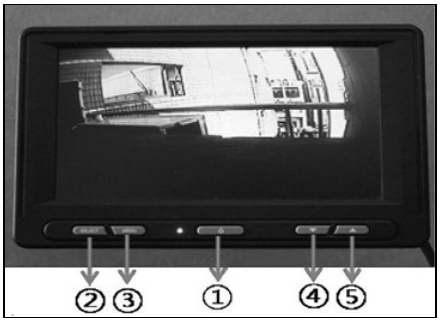
8. Inside air mode/outside air mode switch button.

9. Automatic mode button.

This button is intended for controlling air-conditioner/heater automatically according to the setting temperature.
Rear fan will not work while the heater is running.

Front View Camera (optional)

a. Front display (basic operation menu)



1. 'POWER' button

- Turns power on and off

2. 'SELECT' button

- Switches camera and AV input image

3. 'MENU' button

- Press shortly to adjust image

- Press 3 seconds to enter set up menu

4. '▲' button

- Increases speaker volume

5. '▼' button

- Reduces speaker volume

b. Operating Method

▶ Color tone control

1. Press MENU button for 0.5~1 second.

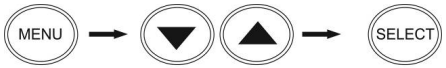
2. Select brightness, value of color, color tone and color depth using SELECT button.

3. Adjust each title using UP and DOWN buttons.

▪ The basic level is set up at 25.

▶ **Main MANU (SETUP MENU) setting method**

- Call SETUP MENU window by pressing MENU button for 2 seconds.
- OSD menu disappears if no entry for 5 seconds.



1. NORMAL / MIRROR

- This function turns the camera image right ↔ left.

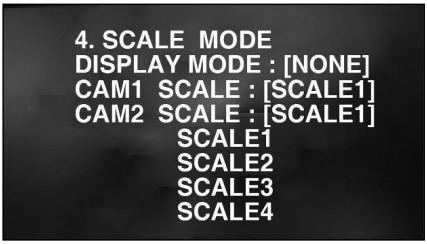
2. TRIGGER DELAY

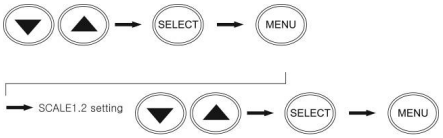
- When 2 trigger signals are active, each trigger source can be selected.
- When trigger signal is activated, the selected image appears in the screen.
- Each trigger signal can be set up with 0~20 seconds of delay.

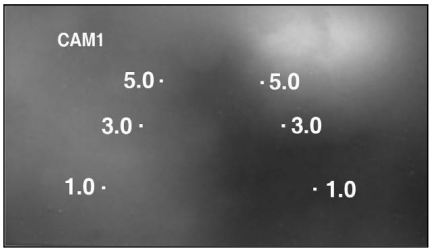
3. CAMERA NAME

- Name of each camera can be registered and displayed in the screen OSD.

4. SCALE MODE

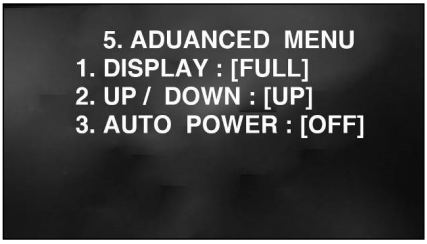






- To show distance together with the camera image on the monitor, this function controls figures and dots of a certain size.
- Other scale modes of CAM1~CAM2 can be set up, which can be turned ON/OFF in DISPLAY MODEP.
- SCALE1 and SCALE2 are indicated with adjustable figures.
- When trigger signal is activated, the scale OSD set up in the screen appears.
  - This is simply an electrical expression of the distance from the truck.

5. ADVANCED MENU



- DISPLAY
  - FULL: images are displayed in a 16:9 ratio.
  - NORMAL: images are displayed in a 4:3 ratio.

- UP/DOWN
  - Turns images upside down.

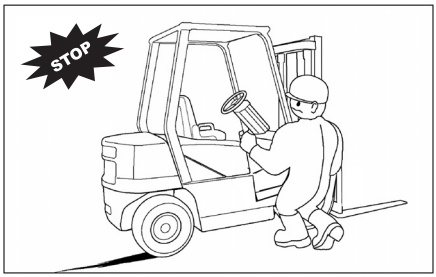
- AUTO POWER
  - If AUTO POWER is set to ON, the monitor turns 'AUTO ON' when the vehicle power is turned on.
  - If AUTO POWER is set to OFF, the monitor is not turned on automatically when the vehicle power is turned on.

6. AUTO SCAN

6. AUTO SCAN
AUTO SCAN : [OFF;ON]
SCAN CAM1 : [1SEC TO 20SEC]
SCAN CAM2 : [1SEC TO 20SEC]

- If AUTO SCAN is set to ON, images are displayed in the sequence of CAM1→CAM2.
- The duration of an image display can be set to 0~20 seconds. '0' setting eliminates the image.
- Press the SELECT button to stop repeating images, and press it again to see the images repeatedly.

Seat Switch System



The lift truck is equipped with a SEAT SWITCH SYSTEM. In normal operation if the direction lever is placed in either forward or reverse, the lift truck will move at a speed proportional to the accelerator pedal's position. If the operator leavers the seat without setting the parking brake, within three seconds after leaving the seat, the SEAT SWITCH SYSTEM will automatically disengage the transmission. The directional lever, however, will remain in that forward or reverse location although internally the transmission will have shifted into neutral.

Before exiting the lift truck, the parking brake should always be applied.

⚠ WARNING

WHEN LEAVING MACHINE APPLY PARKING BRAKE!

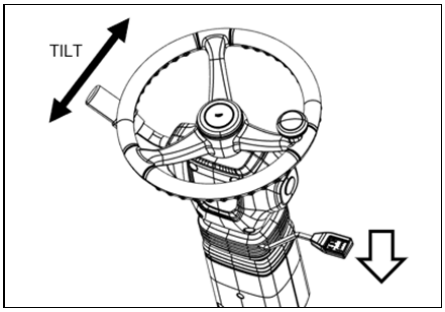
PARKING BRAKE IS NOT AUTOMATICALLY APPLIED.

NOTE: Some trucks may be equipped (ask your branch if this applies to your truck) with an alarm that will sound if the parking brake is not applied when leaving the machine.

NOTICE

1. **Prior to operating the lift truck, be sure to understand and check the SEAT SWITCH SYSTEM.**
2. **While in normal operation and on level ground, select a direction with the directional lever and with the park brake released. You will note that the truck will move slowly in the selected direction. If you lift your hips off of the seat, within three seconds, the SEAT SWITCH SYSTEM will disengage the transmission allowing the truck to coast but not automatically stop.**
3. **To restore the lift truck to normal operation, while sitting in the operator's seat depress the brake pedal to hold the lift truck, return the directional lever to the neutral position, and then reselect a direction of travel (either forward or reverse). The transmission will then re-engage.**
4. **If seat or seat switch replacement becomes necessary, be sure to use genuine CROWN Industrial Vehicle lift truck parts. Lift trucks should never be operated without an operational SEAT SWITCH SYSTEM.**

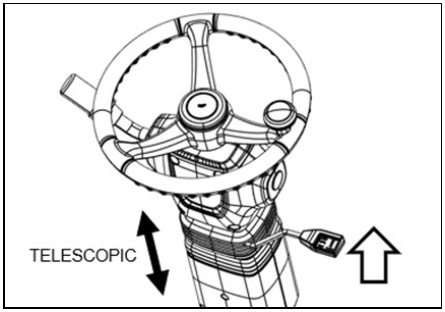
Steering Wheel Column Tilt Angle Adjustment



Typical Example

The steering wheel column tilt angle is adjustable within 40 degrees to fit for the operator position. The steering column is unlocked by push down the lever on the right side of column and locked by release.

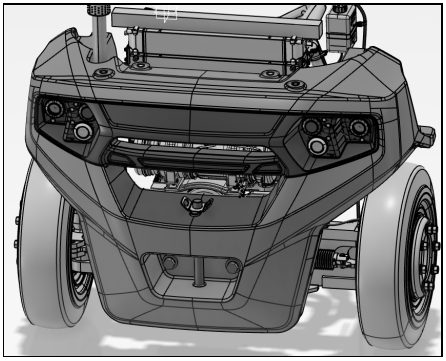
Steering Wheel Column Telescopic Adjustment



Typical Example

The steering wheel column height is adjustable within 85mm to fit for the operator position. The steering column is unlocked by pull up the lever on the right side of column and locked by release.

Tow Eye



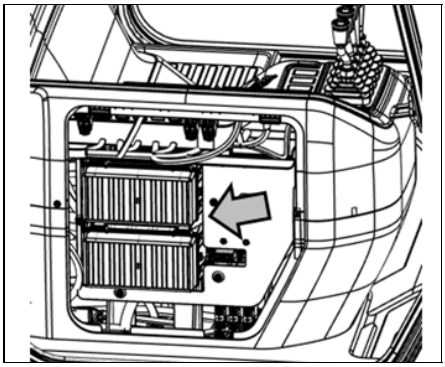
Typical Example

It is for emergency use in towing a disabled vehicle or being towed by another truck when your truck is disabled. Use wire rope strong enough according to the weight and size of the vehicle to be towed.

Electrical Disconnect Switch (If Equipped)

1. ON - Connects the battery for electrical power to all electrical circuits.
2. OFF - Disconnects the battery from all electrical circuit.

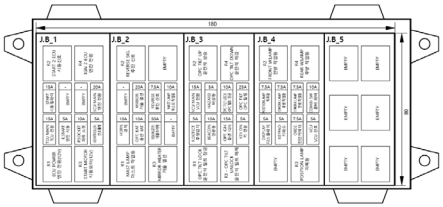
Fuse Box



Typical Example

Fuse Locations

1. CD60/70/80/90S-9 (3 SPEED)



Fuses protect the electrical system from damage caused by overloaded circuits. Change a fuse if the element separates. If the element of a new fuse separates, have the circuit checked and repaired.

J.B_1

No.	Description	Rated Capacity
1	START RELAY	15A
2	ECU MAIN	20A
3	TCU MAIN	15A
4	ESTART	5A
5	PSOCKET	10A
6	CONTROLLER	5A

J.B_2

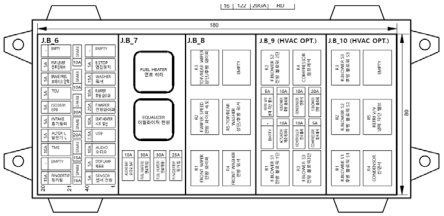
No.	Description	Rated Capacity
1	MIRROR	20A
2	REVERSE	7.5A
3	MAST LAMP	10A
4	HORN	10A
5	OPT BAT	10A
6	EQUALIZER	30A

J.B_3

No.	Description	Rated Capacity
1	VCU MAIN	15A
2	HARZARD	5A
3	OPC TILT LOCK	10A
4	OPC TILT	25A
5	R.DETECT	5A
6	BEACON	10A
7	OPT.IGN	15A
8	KEY ON	5A

J.B_4

No.	Description	Rated Capacity
1	POSITION LAMP	7.5A
2	R.WORK LAMP	7.5A
3	F.WORK LAMP	7.5A
4	COMBI SW	10A
5	DISPLAY	5A
6	KEYPAD	5A
7	OBD2	7.5A
8	VCU	5A



J.B_6

No.	Description	Rated Capacity
1	FNR LEVER	5A
2	BRAKE PRES	5A
3	TCU	5A
4	ISO3691	5A
5	INTAKE	5A
6	ALTER L	5A
7	TMS	10A
8	FINGERTIP	15A
9	E.STOP	5A
10	WASHER	15A
11	R.WIPER	10A
12	F.WIPER	20A
13	SEAT HEATER	10A
14	USB	7.5A
15	AUDIO	10A
16	STOP LAMP	5A
17	SENSOR	5A

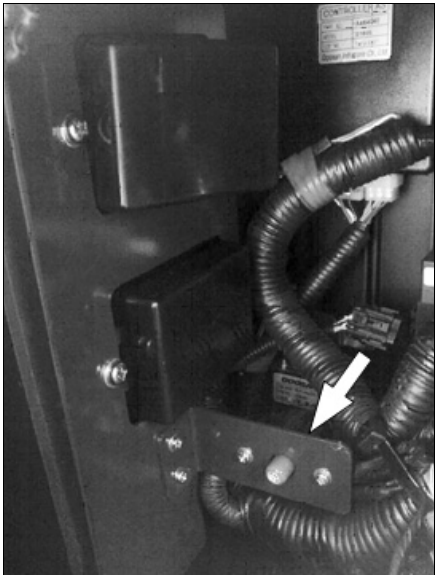
J.B_7

No.	Description	Rated Capacity
1	AUDIO BAT	10A
2	FUEL HEATER2	30A
3	FUEL HEATER1	30A
4	FINGERTIP	25A

J.B_9 (HVAC OPT)

No.	Description	Rated Capacity
1	REFRI V/V	5A
2	R.BLOWER	10ª
3	CONDENSOR	10A
4	F.BLOWER	20A
5	ACTUATOR	10A
6	CONTROLLER	10A
7	COMPRESSOR	5A

Circuit Breaker



Typical Example Diesel Engine Truck

Circuit Breaker protects the main electrical circuit. It is located under the fuse box.

To reset the circuit breaker, push the button in. If the button comes back out, have the electrical circuits checked.

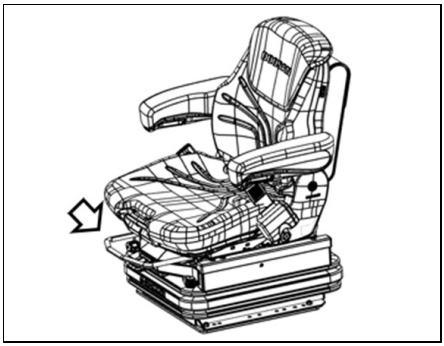
Seat

Seat Adjustment

NOTE: Seat arrangements may vary. Basic operation will be similar.

Seat adjustment should be checked at the beginning of each shift and when operators change.

Lock the seat into position before operating, to prevent an unexpected seat change.



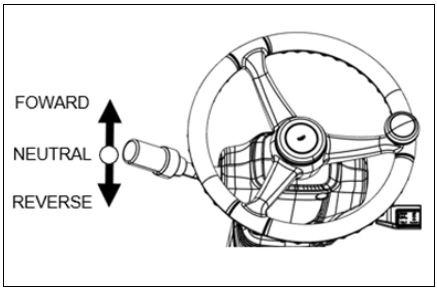
Typical Example

Adjust seat to allow full brake pedal travel with operator's back against seat back.

NOTE: The seat can only be correctly adjusted with the operator fully seated.

Lift Truck Controls

Direction Control Lever



Typical Example

Forward – Reverse

F	Forward
N	Neutral
R	Reverse

Speed Select

1	1st
2	2nd
3	3rd (3 speed ONLY)

Rotating the direction control lever changes the speed of travel. With handle rotated counter clockwise (towards the operator), the lift truck is in FIRST speed.

Rotate the lever clockwise (away from the operator) for the SECOND and THIRD speeds.

Always brake to a full stop before reversing the direction of travel.

Do not fail to place the forward-reverse lever in the neutral position before starting the engine.

Neutral Lever Lock (3 Speed Only)

A transmission neutral lever lock is in base of the direction control lever. This neutral lever lock prevents the direction control lever from being moved out of "NEUTRL".

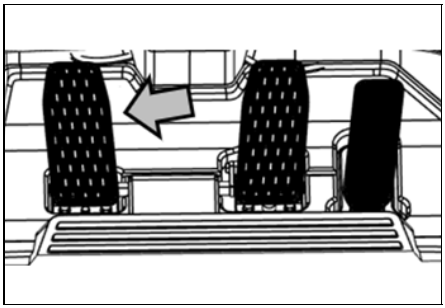
N "NEUTRAL LOCK" position. Prevents the direction control lever to be moved out of "NEUTRAL".

D "DRIVE" position. Allows the direction control lever to be moved from "NEUTRAL" to "FORWARD and REVERSE".

⚠ WARNING

"LOCK" the direction control lever. Whenever machine is parked, "LOCK" the direction control lever in "NEUTRAL" to prevent accidental machine movement.

Transmission Inching Control Pedal



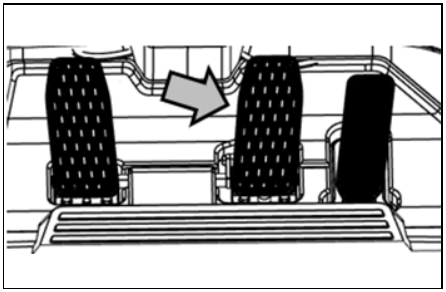
Typical Example

Inching Control Pedal - Pushing down on the inching pedal, modulates the hydraulic pressure to the clutch packs, permitting disc slippage.

Further pushing on the pedal completely relieves clutch pack pressure and applies the service brakes to stop and hold the lift truck.

NOTE: The purpose of the inching control pedal is to provide precise inching control at slow travel speed, with high engine rpm. This is used for fast hydraulic lift during load approach, pickup or positioning.

Service Foot Brake Pedal

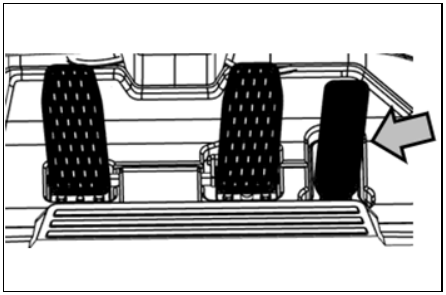


Typical Example

Push DOWN on the brake pedal to slow or stop the lift truck.

RELEASE the brake pedal to allow the lift truck to move.

Accelerator Pedal



Typical Example

Push DOWN on the pedal to increase engine rpm (speed).

RELEASE the pedal to decrease engine rpm (speed).

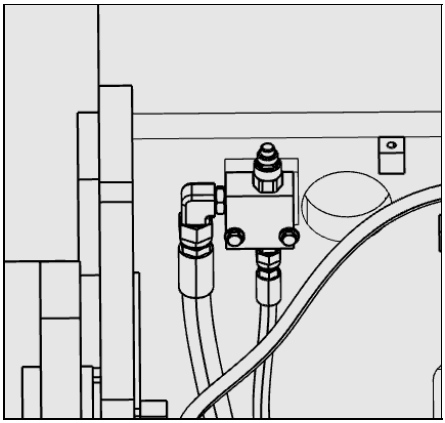
Emergency Lowering Device

⚠ WARNING

If the carriage fails to descend when the lift lever is pushed forward, it can be lowers using the emergency lowering valve in the control box. Do not stay beneath or near the carriage when using the emergency lowering valve, otherwise, you may get severely injured.

Observe the following procedure when using the emergency lowering valve.

1. Stop the engine and open the door of the control box on the right side of the operator.
2. Turn the nut and adjusting screw of the emergency lowering valve by 2 turns counterclockwise. The carriage will descend slowly.
3. When the carriage is on the ground, tighten the adjusting screw and nut to prevent further settlement by the valve.
4. Close the control box door.



Parking Brake Control

NOTICE

Do not engage the parking brake while the lift truck is moving unless an emergency exists. The use of the parking brake as a service foot brake in regular operation will cause severe damage to the parking brake system.

Electronic Parking Brake

How to Operate

How to Release the Parking Brake

1. Sit on the operator's seat and check that the lever is in neutral.
2. With the brake pedal pressed, start the ignition.
3. Check that the instrument panel's parking brake lamp is on.
4. Press the parking brake switch, which is located on the right side of the seat. Then, check that the parking brake lamp turns off and the buzzer sounds three times.
5. Put the direction control lever in forward or reverse.
6. Release the brake pedal and operate the vehicle.

⚠ WARNING

After pressing the parking brake switch, hold down the brake pedal to keep the vehicle stationary until the buzzer sounds three times.

The buzzer sound indicates a complete release of the parking brake.

Releasing the brake pedal before the buzzer sounds may cause a move of the vehicle or damage on the parking brake components.

NOTICE

When the ignition is off, the parking brake always stays engaged and you cannot release it even using the parking brake switch.

If the vehicle needs to be towed with the ignition off, the parking brake has to be released.

For how to tow the vehicle, refer to the Operation Section.

How to Engage the Parking Brake

1. Hold down the brake pedal to keep the vehicle stationary.
2. Put the direction control lever in neutral.
3. Press the parking brake switch, which is located on the right side of the seat.
4. Once it is checked that the parking brake lamp turns on and the buzzer sounds three times, release the brake pedal.

⚠ WARNING

Never engage the parking brake while the vehicle is driving, except for when emergency braking is necessary.

The engagement of the parking brake during the driving of the vehicle causes a sudden stop, which can lead to a tipover of the vehicle or a fall of the load. In addition, this may bring about mechanical damage on the parking brake and a consequent loss of its braking force. These troubles will eventually result in damage on the vehicle or load and personal injuries.

Be sure to engage the parking brake only when the vehicle is stationary.

Safety Function

Once the operator leaves the seat for three seconds with the parking brake released, the parking brake gets engaged by itself to keep the vehicle from moving.

At the same time, the transmission automatically shifts into neutral. The parking brake warning buzzer then sounds for 10 minutes. You can turn it off by pushing the parking brake switch.

To release the parking brake while the warning is sounding, sit on the seat and perform the following steps:

Procedure

1. Press the brake pedal.
2. Put the direction control lever in neutral.
3. Engage the parking brake and then release it again.
4. The release of the parking brake is indicated by the three times sounding of the buzzer.

⚠ WARNING

If the seat switch is short-circuited, the parking brake's safety function will not work.

⚠ WARNING

Make sure to check that the parking brake is normally engaged before getting out of the vehicle.

Emergency Braking Function

In an emergency where the vehicle should be stopped, push the parking brake switch for emergency braking.

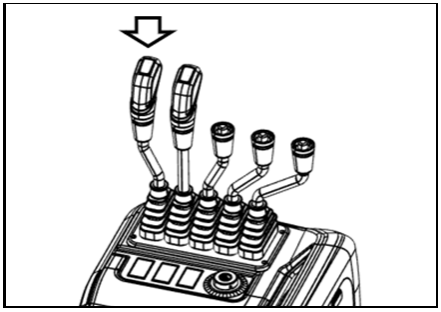
⚠ WARNING

After an emergency stop, inspect for any damage on the parking brake and, if necessary, adjust or repair the parking brake components.

The use of the parking brake for emergency braking can cause an abnormal wear of the frictional part or damage on other components. This problems can lead to a poor braking force vulnerable to safety accidents.

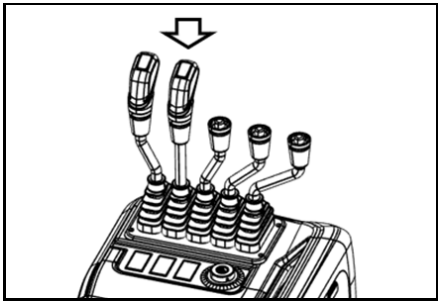
For how to inspect and adjust the parking brake, refer to the Maintenance Section.

Lift Control



The forks can be raised or lowered by pulling backwards or pushing forwards on this lever. The lift speed is controlled by tilt angle of the lever and accelerator pedal effort. The lowering speed can be controlled by tilt angle of the lever. The engine speed or accelerator pedal has nothing to do with the lowering speed of the forks.

Tilt Control



The mast can be tilted by operation of this tilt lever. Pulling on this lever backwards will tilt the mast backwards, and pushing it forwards will tilt the mast forwards. The tilt speed can be controlled by tilt angle of the lever and accelerator pedal effort.

Fuel Replenishment

Diesel Engine

⚠ WARNING

Explosive fumes may be present during refueling.

Do not smoke in refueling areas. Lift truck should be refueled only at designated safe locations. Safe outdoor locations are preferable to those indoors.

Stop the engine and get off the lift truck during refueling.

NOTICE

Do not allow the lift truck to become low on fuel or completely run out of fuel. Sediment or other impurities in the fuel tank could be drawn into the fuel system. This could result in difficult starting or damage to components.

Fill the fuel tank at the end of each day of operation to drive out moisture laden air and to prevent condensation. In the cold weather, the moisture condensation can cause rust in the fuel system and hard starting due to its freezing. Do not fill the tank to the top. Fuel expands when it gets warm and may overflow.

Typical Example

1. Park the lift truck only at a designated safe location. Place the transmission in Neutral. Lower the forks on the ground. Apply the parking brake. Stop the engine.

Typical Example

2. Remove the filler cap.
3. Fill the fuel tank slowly. Refer to the section on 'Refill Volume." Close the filler cap. If spillage occurs, wipe off excess fuel and absorb any excess fuel with absorbent material.

NOTE: Remove the drain plug under the fuel tank to drain the water and sediment in the tank, occasionally, or as necessary. In addition, drain water and sediment from the main fuel storage tank weekly and before the tank is refilled. This will help prevent water or sediment being pumped from the storage tank into the lift truck fuel tank.

DEF/Ad-Blue Replenishment (81kW Diesel Engine Only)

NOTICE

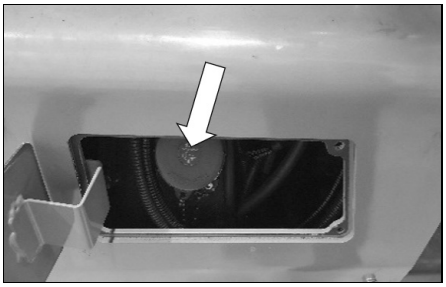
Do not allow the lift truck to become low on DEF(Ad-Blue) or completely run out of /DEF (Ad-Blue). Sediment or other impurities in the DEF(Ad-Blue) Tank could be drawn into the after treatment. This could result in damage to components.

Do not fill the DEF(Ad-Blue) tank to the top. DEF(Ad-Blue) Tank could be damaged because of volume expansion during DEF(Ad-blue) freezing in cold condition.

Typical Example

1. Park the lift truck only at a designated safe location. Place the transmission in Neutral. Lower the forks on the ground. Apply the parking brake. Stop the engine.

2. Using the start key, open the DEF/Ad-Blue tank door beside the frame. Open the blue DEF/Ad-Blue tank filler cap.



Typical Example

3. Fill the DEF/Ad-Blue tank slowly until “F” level on urea level gauge. If you fill over “F” level, there will be DEF/Ad-Blue backflow line plausibility error at DETECTIONMODE(P1893) during urea defrosting. Refer to the section on ‘Fuel and DEF/Ad-Blue Refill Volume.”

4. After the refill, close the DEF/Ad-Blue tank cap firmly. Remove spilt DEF/Ad-Blue, if any, with an adsorbent.

⚠ CAUTION

LOW DEF/Ad-Blue LEVEL WILL DISTURB AFTER TREATMENT FOR EPA TIER-Ⅳ (EURO STAGE V) EXHAUST GAS EMISSION, AND CAN BE CAUSE OF SERIOUS DAMAGE TO ENGINE AND SYSTEM.

OVERCHARGED DEF/Ad-Blue LEVEL (OVER “F” LEVEL ON UREA LEVEL GAUGE) WILL DISTURB UREA DEFROSTING BECAUSE OF DEF/Ab-Blue BACKFLOW LINE PLAUSIBLITY ERROR AT DETECTIONMODE(P1893). BELOW ERRORS ARE RELATED ONES AND NOT BE GUARANTEED. SO PLEASE DO NOT FILL DEF/Ad-Blue OVER “F” LEVEL ON UREA LEVEL GAUGE.

<FAULT LIST – UREA DEFROSTING>

1. DFC_SCRMonPresRdcErr : P1459
2. DFC_SCRMonAftRunUndrPErr : P1460
3. DFC_SCRMonPBldUpErrAsym : P1457

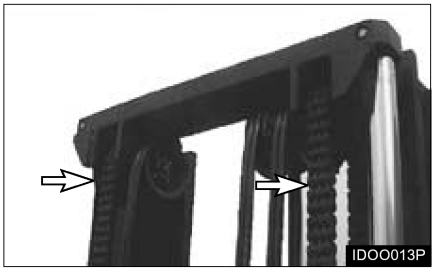
Before Starting the Engine

Walk-Around Inspection

Make a thorough walk-around inspection before mounting the lift truck or starting the engine. Look for such items as loose bolts, debris buildup, oil or coolant leaks. Check condition of tyres, mast, carriage, forks or attachments. Have repairs made as needed and all debris removed.

Typical Example

1. Inspect the operator's compartment for loose items and cleanliness.
2. Inspect the instrument panel for broken or damaged indicator lights or gauges.
3. Test the horn and other safety devices for proper operation.

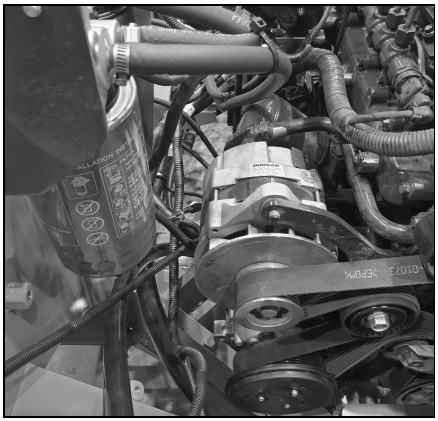


Typical Example

4. Inspect the mast and lift chains for wear, broken links, pins and loose rollers.
5. Inspect the carriage, forks or attachments for wear, damage and loose or missing bolts.
6. Inspect the tyres and wheels for cuts, gouges, foreign objects, inflation pressure and loose or missing bolts.
7. Inspect the overhead guard and cabin for damage and loose or missing mounting bolts.
8. Inspect the hydraulic system for leaks, worn hoses or damaged lines.
9. Look for transmission and drive axle leaks on the lift truck and on the ground.
10. Inspect the common parts and drive axle, mast etc. for damaged, loosen or missing mounting bolts.
11. Inspect the engine compartment for oil, coolant and fuel leaks.

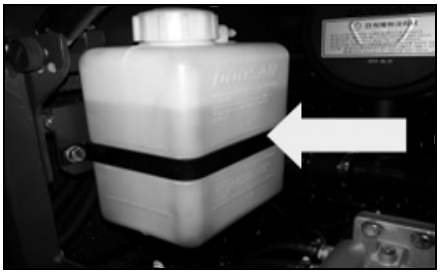
Typical Example Diesel Engine (G2 DM03)

Typical Example Diesel Engine



Typical Example

12. Measure the engine crankcase oil level with the dip stick. Maintain the oil level between the MAX. and MIN., (or FULL and ADD) notches on the dip stick.



Typical Example Coolant Water Reservoir Tank

13. Observe the engine coolant level in the coolant recovery bottle. With the engine cold, maintain the level to the COLD mark. If the recovery bottle is empty, also fill the radiator at the top tank.

Typical Example

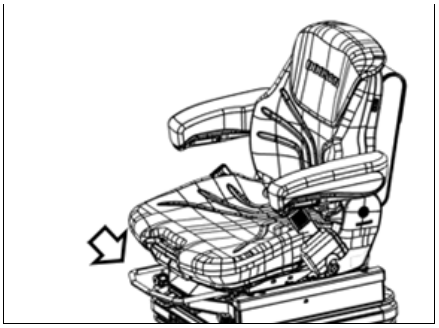
14. Observe the fuel level gauge after starting the truck. Add fuel if necessary

⚠ WARNING

Personal injury may occur from accidents caused by improper seat adjustment.

Always adjust the operator's seat before starting the lift truck engine.

Seat adjustment must be done at the beginning of each shift and when operators change.



Typical Example

15. To position the seat, PUSH the lever away from the seat track and move the seat forward or backward to a comfortable position.

16. Inspect seat belt for wear and correct operation.

Starting the Engine

Prestart Conditions

NOTE: The engine will not start unless the transmission directional control lever is in the NEUTRAL position.

Electronic Parking Brake

Typical Example

1. Engage the parking brake, if not already engaged.
2. Place the transmission directional control lever in NEUTRAL position.

NOTICE

When you restart the engine after turning off it, wait 4 to 5 seconds and restart it to protect the starter.

Diesel Engine

Starting Diesel Engine at cold

1. Turn the ignition key to the ON position. The start preheat light will come ON. The preheat light will stay ON maximum 20 seconds, depending on the ambient air temperature.

NOTICE

Do not crank more than **10** seconds continuously.

If engine coolant is cold, engine low idle speed could be higher than normal condition. (Electronic Engine)

2. After the preheat light goes OFF, turn the ignition key to the START position.
3. Release the ignition key after engine starting and check the engine condition.
4. If the engine stalls or does not start, turn the ignition key to the OFF position, then repeat steps 1 thru 3.

Starting Diesel Engine at Warm (Mechanical engine)

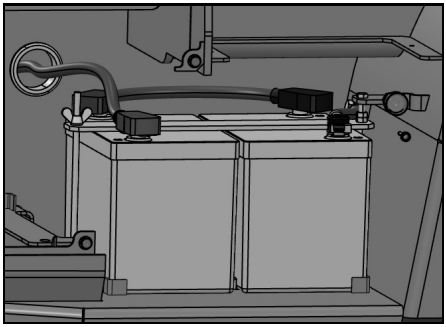
1. Turn the ignition key to the ON position and then to START position, without waiting for the preheat light to go OFF. At the same time fully depress the accelerator.
2. Release the ignition key when the engine starts and release the accelerator pedal to a low idle position.
3. Release the ignition key after engine starting and check the engine conditions.

Starting From a 12/24 Volt External Source

⚠ WARNING

Sparks occurring near the battery could cause vapors to explode.

Always connect the external power source ground cable to a point away from and below the battery, and well clear of fuel system components.



Typical Example Diesel Engine Truck

NOTICE

Do not reverse battery cables. It can cause damage to the alternator.

Always connect the external power source cables in parallel with the lift truck battery cables:

POSITIVE(+) to POSITIVE(+) and NEGATIVE(-) to NEGATIVE(-).

Attach ground cable last, remove first.

All lift trucks equipped with CROWN built internal combustion engines are NEGATIVE(-) ground.

Starting with Jumper Cables

⚠ WARNING

Batteries give off flammable fumes that can explode.

Prevent sparks near the batteries. They could cause vapors to explode. Do not allow jump cable ends to contact each other or the lift truck. Do not smoke when checking battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear eye protection when starting a lift truck with jump cables.

Improper jump procedures can cause an explosion resulting in personal injury.

Always connect battery positive (+) to battery positive (+) and battery negative (-) to be battery negative (-).

Jump only with a battery source and with the same voltage as the stalled lift truck.

Turn off all lights and accessories on the stalled lift truck. Otherwise, they will operate when the jump source is connected.

NOTICE

When starting from another machine, make sure the machines Do not touch. This could prevent damage to engine bearings and electrical circuits.

Turn on (close) the disconnect switch prior to the boost connection to prevent damage to electrical components on the stalled machine.

Severely discharged maintenance free batteries might not fully recharge by the alternator alone after jump starting.

The batteries must be charged to the proper voltage by the battery charger.

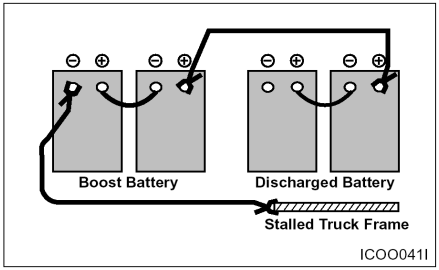
Many batteries thought to be unusable, are still rechargeable.

This machine has a 24 volt starting system. Use only equal voltage for jump starting. Use of a welder or higher voltage equipment will damage the electrical system.

Use of Jumper Cables

When auxiliary start receptacles are not available, use the following procedure.

1. Make initial determination as to failure of lift truck to crank. Procedure applies even if lift truck does not have diagnostic connector.
2. Place the directional control in NEUTRAL on the stalled lift truck. Engage the parking/secondary brake. Lower all attachments to the ground. Move all controls to HOLD (CENTRE).
3. On stalled lift truck, turn the start switch to OFF. Turn off all accessories.
4. On stalled lift truck, turn on (close) the disconnect switch (if equipped).
5. Move boost start lift truck near enough to stalled lift truck for cables to reach, but DO NOT ALLOW LIFT TRUCKS TO TOUCH.
6. Stop the engine on the boost lift truck. Or, if using an auxiliary power source, turn off the charging system.
7. Make sure battery caps are all in place and tight on both lift trucks.



Typical Example of 24 Voltage

8. Connect positive (+) jumper cable (red) to positive (+) cable terminal of discharged battery, or battery set on the stalled lift truck. Do not allow positive cable clamps to touch any metal other than battery terminals.
9. Connect the other end of this positive jumper cable (red) to positive (+) terminal of boost battery. Use procedure of Step 8 to determine correct terminal.
10. Connect one end of the negative (-) jumper cable to the other terminal (negative) of the boost battery.
11. Make final connection of negative (-) cable to the stalled truck frame (not battery negative post) away from battery, fuel or hydraulic lines, or moving parts.
12. Start the engine on the boost lift truck, or energize the charging system on the auxiliary power source.
13. Wait a minimum of two minutes for the batteries in the stalled lift truck to partially charge.
14. Attempt to start the stalled engine. Refer to section on 'Engine Starting'.
15. Immediately after starting the stalled engine, disconnect the jumper cables in reverse order.
16. Conclude failure analysis on starting/charging system of the stalled lift truck as required with the engine running and charging system in operation.

After Starting the Engine

Observe all indicator lights and gauges frequently during operation, to make sure all systems are working properly.

⚠ WARNING

If any light comes on, have corrections made before operating truck.

Typical Example

1. Alternator indicator light will be OUT in normal operation. If the light comes ON with the engine running, the alternator is not charging.

Typical Example

2. Observe fuel gauge and service hour meter frequently to assure they are operating properly.

3. Observe the brake air pressure gauge and indicator light frequently (if equipped) while engine is running. Air pressure indicator must be in the green range. If light comes on, it indicates loss of air pressure.

NOTE: Do not idle engines for prolonged periods of time. These engines can be started easily, even when hot.

NOTE: At an oil temperature in the shifting circuit lower than -12°C, the transmission must be warmed-up for some minutes. This must be carried out in Neutral with an increased engine speed (about 1500 rpm). Until this oil temperature is reached, the Electronics remains in Neutral, and the symbol of the cold start phase will be indicated on the Transmission Display.

4. The engine oil pressure indicator light (1), will not come ON with the engine running, unless there is low or no oil pressure. Stop the engine immediately, if the light comes ON.

The engine MIL (Malfunction indicator Light) will not come ON with engine running, unless the fault or faults are stored in the memory of the engine control module (ECM). Stop the engine and check the electric engine control system if the light comes ON.

If MIL does not disappear, please contact service centre.

(1) Engine oil pressure indicator light

(2) Engine malfunction indicator light

Diesel Engine

Engine and After-treatment System

Introduction

The DM03 engine which is a high-power engine in compliance with the EPA/CARB TIER-4 (EURO STAGE Ⅴ) Engine Emissions Standard is provided with various systems. The DM03 engine is equipped with a turbo charger intercooler system that compresses and cools air and feeds it to the intake manifold. Here, MAF sensor and temperature/pressure sensors detect the air condition and transmit the data to the ECU which controls fuel injection rate according to the engine load, speed and air quantity. Fuel is supplied to a high pressure pump through a fuel filter. The fuel compressed in the high pressure pump is transferred to common rail and injected by injectors in the order in which the fluids are controlled. Surplus fuel after injection returns to the fuel tank via a return hose.

The DOC (Diesel Oxidation Catalyst) uses a chemical process to reduce hydrocarbons(HC) and carbon monoxide(CO). SCR (Selective Catalytic Reduction) as after-treatment is the process by which the oxides of nitrogen (NOx) contained in diesel exhaust are reduced to nitrogen (N2) and water (H2O). For SCR process, DEF (Diesel Exhaust Fluid or Ad-Blue) is required. DPF (Diesel Particulate Filter) as after-treatment is the process by which the oxides of nitrogen (NOx) contained in diesel exhaust are reduced to nitrogen (N2) and water (H2O).

The figure below shows the positions of the electronic control system and sensors.

NOTICE

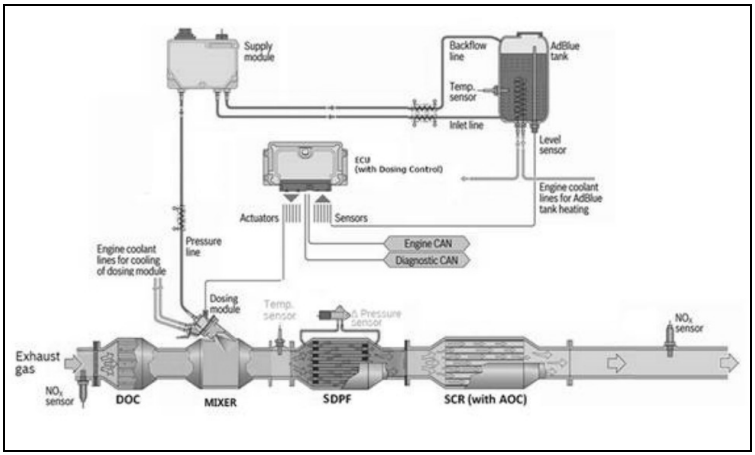
It is normal to hear a slight knocking or pinging sound from the engine during operation. This is the ECU regulating the amount of fuel necessary for fuel injection to meet emission standards.

When the engine is regularly turned off using the ignition key after operation, the supply module starts up (after-run) in order to remove the DEF/Ad-Blue remaining in the after-treatment system by returning it into the DEF tank. This is to prevent the hose from bursting due to a freeze-up or any other kind of obstruction. A sound is produced during the after-run.

Do not cut off the battery's main supply during the after-run.

If the after-run does not begin after the engine is turned off, inspect the system.

White Smoke can be emitted during DPF Regeration / SCR Cleaning.



Detecting Control Failure

As shown in the table below, the ECU / DCU performs self diagnosis. If a fault/failure is detected, engine check lamp lights up and failure code (DTC) is indicated by the number of flashes of the engine check lamp.

To check failure code(DTC) refer page.48 #6 Engine Check Lamp(RED) section.

ECU Fault List

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
1	U0607	0	19	Timeout Error of CAN-Receive-Frame TSC1VE (Engine speed & Torque demand)	ON	Level1 (Mild)			
2	P042E	27	0	EGR Position Open jammed fault	Blink	Level2 (severe)			EGR Block (EGR only)
3	P042F	27	1	EGR Position Closed jammed fault	ON	Level1 (Mild)			EGR Block (EGR only)
4	P0406	27	3	EGR Position Sensor High Fault	ON	Level1 (Mild)			EGR Block (EGR only)
5	P0407	27	4	EGR Position Sensor Low Fault	ON	No			EGR Block (EGR only)
6	P0C17	27	20	EGR Close Position Learning Range Over Fault	ON	No			EGR Block (EGR only)
7	P0C18	27	22	EGR Close Position Learning Drift Fault for long time	ON	No			EGR Block (EGR only)
8	P0C19	27	23	EGR Close Position Learning Drift Fault for short time	ON	No			EGR Block (EGR only)
9	P0223	29	3	Accel pedal position track2 sensor High fault	ON	Level1 (Mild)			
10	P0222	29	4	Accel pedal position track2 sensor Low fault	ON	Level1 (Mild)			
11	P0221	29	15	Hand pedal position track2 sensor High fault	ON	Level1 (Mild)			
12	P0224	29	17	Hand pedal position track2 sensor Low fault	ON	Level1 (Mild)			
13	P02E4	51	0	Throttle valve Position Open jammed fault	ON	No			
14	P02E5	51	1	Throttle valve Position Closed jammed fault	ON	No			
15	P02E9	51	3	Throttle valve Position Sensor High Fault	ON	No			
16	P02E8	51	4	Throttle valve Position Sensor Low Fault	ON	No			
17	P02EA	51	22	Throttle valve Close Position Learning Drift Fault for long time	ON	No			
18	P02EB	51	23	Throttle valve Close Position Learning Drift Fault for short time	ON	No			
19	P02E7	51	30	Throttle valve Close Position Learning Drift Fault	ON	No			
20	P0123	91	3	Accel pedal position track1 sensor High fault	ON	Level1 (Mild)			
21	P0122	91	4	Accel pedal position track1 sensor Low fault	ON	Level1 (Mild)			
22	P2135	91	11	Accel pedal position sensor plausibility fault (Not synchronism between track1 and track2)	ON	Level1 (Mild)			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
23	P2136	91	12	Hand pedal position sensor plausibility fault (Not synchronism between track1 and track2)	ON	Level1 (Mild)			
24	P0121	91	15	Hand pedal position track1 sensor High fault	ON	Level1 (Mild)			
25	P0124	91	17	Hand pedal position track1 sensor Low fault	ON	Level1 (Mild)			
26	U0606	91	19	Timeout Error of CAN-Receive-Frame EEC2 (Pedal)	ON	Level1 (Mild)			
27	P2267	97	3	Water In Fuel Sensor signal range high fault	Blink	Level2 (severe)			
28	P2266	97	4	Water In Fuel Sensor signal range low fault	Blink	Level2 (severe)			
29	P2269	97	14	Water in fuel detected – Warning step	ON	No			
30	P2265	97	23	Water in fuel detected – Torque de-rate step (After 20min)	Blink	Level2 (severe)			
31	P250D	98	3	Oil combination (Level and temperature) signal short circuit to battery error	ON	No			
32	P250C	98	4	Oil combination (Level and temperature) signal short circuit to ground error	ON	No			
33	P250A	98	5	Oil combination (Level and temperature) sensor itself open or short circuit error	ON	No			
34	P250F	98	18	Engine oil level is too low (Low step3)	ON	No			
35	P350D	98	22	Oil combination (Level and temperature) sensor timeout fault	ON	No			
36	P0196	175	11	Oil combination (Level and temperature) sensor itself Oil temperature out of range error	ON	No			
37	P350E	98	23	Oil combination (Level and temperature) sensor itself Voltage out of range error	ON	No			
38	P350F	98	24	Engine oil level is low (Low step2)	ON	No			
39	P1522	100	1	Engine Oil Pressure Too Low Fault	Blink	Level2 (severe)	Used		
40	P0523	100	3	Engine Oil Pressure Sensor High Fault	Blink	Level2 (severe)	Used		
41	P0522	100	4	Engine Oil Pressure Sensor Low Fault	Blink	Level2 (severe)	Used		
42	P0108	102	3	Intake Manifold Pressure Sensor High Fault	ON	Level1 (Mild)			EGR Block (EGR only)
43	P0107	102	4	Intake Manifold Pressure Sensor Low Fault	ON	Level1 (Mild)			EGR Block (EGR only)
44	P00AD	105	3	Intake manifold temperature sensor High fault	ON	No			EGR Block (EGR only)
45	P00AC	105	4	Intake manifold temperature sensor Low fault	ON	No			EGR Block (EGR only)
46	P10AD	105	16	Intake manifold temperature High fault	ON	No			
47	P2229	108	3	Atmospheric Pressure Sensor High Fault	ON	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
48	P2228	108	4	Atmospheric Pressure Sensor Low Fault	ON	No			
49	P1118	110	0	Coolant high temperature Fault	ON	No			
50	P0118	110	3	Coolant Temperature Sensor High Fault	ON	Level1 (Mild)			EGR Block (EGR only)
51	P0117	110	4	Coolant Temperature Sensor Low Fault	ON	Level1 (Mild)			EGR Block (EGR only)
52	P011E	110	10	Coolant Temperature Plausibility Fault	ON	Level1 (Mild)			
53	P00BC	132	1	Intake manifold pressure low plausibility fault (Compressor out pressure too low)	Blink	Level2 (severe)			
54	P0103	132	3	Signal range check high error for Air mass flow sensor	ON	Level1 (Mild)			EGR Block (EGR only)
55	P0102	132	4	Signal range check low error for Air mass flow sensor	ON	Level1 (Mild)			EGR Block (EGR only)
56	P0101	132	5	Battery voltage error of Air mass flow sensor	ON	No			
57	P0100	132	19	Signal error of Air mass flow sensor	ON	Level1 (Mild)			EGR Block (EGR only)
58	P00BE	132	21	Sensitivity drift error low for Air mass flow sensor	Blink	Level2 (severe)			EGR Block (EGR only)
59	P0087	157	10	Fuel Leakage is detected based on fuel quantity balance	ON	Level1 (Mild)	Used		
60	P0002	157	11	Maximum positive deviation of rail pressure exceeded	ON	Level1 (Mild)	Used		
61	P190C	157	26	Rail pressure too low fault	ON	Level1 (Mild)	Used		
62	P190B	157	27	Maximum rail pressure exceeded	ON	Level1 (Mild)			
63	P1934	157	28	Pressure relief valve(PRV) failure	Blink	Level2 (severe)	Used	Used	
64	P1073	171	0	Environment Temperature Too High	ON	No			
65	P0073	171	3	Environment Temperature Sensor Signal High	ON	No			
66	P0072	171	4	Environment Temperature Sensor Signal Low	ON	No			
67	P107D	172	0	Inlet air temperature High fault	ON	No			
68	P007D	172	3	Inlet air temperature sensor High fault	ON	No			
69	P007C	172	4	Inlet air temperature sensor Low fault	ON	No			
70	P0421	173	1	DOC Exothermal Efficiency Fault	ON	No			
71	P1183	174	0	Fuel temperature high fault	ON	No			
72	P0183	174	3	Fuel Temperature Sensor High Fault	ON	No			
73	P0182	174	4	Fuel Temperature Sensor Low Fault	ON	No			
74	P273F	177	15	Transmission oil temperature high fault (CAN)	ON	Level1 (Mild)			
75	P274F	177	16	Transmission oil temperature high fault (H/W Switch)	ON	Level1 (Mild)			
76	P0219	190	0	Engine over speed detection fault	ON	No			
77	P1563	444	0	Battery Voltage High fault (Warning)	ON	No			
78	P1562	444	1	Battery Voltage Low fault (Warning)	ON	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
79	P1565	444	2	Powerstage diagnosis could be disabled due to low Battery voltage	ON	No			
80	P0563	444	3	Battery Voltage Signal Range Max fault	ON	Level1 (Mild)			
81	P0562	444	4	Battery Voltage Signal Range Min fault	ON	Level1 (Mild)			
82	P1564	444	12	Powerstage diagnosis disabled due to high Battery voltage	ON	No			
83	P0512	626	12	Starter switch stuck fault (Cranking request is too long.)	ON	No			
84	P0372	636	2	Crank Signal disturbed fault	Blink	Level2 (severe)	Used		
85	P0374	636	8	Cranks No signal error	Blink	Level2 (severe)	Used		
86	P0344	637	2	Cam Signal disturbed fault	ON	No			
87	P0342	637	8	Cam Signal Lost fault	ON	No			
88	P0340	637	30	Cam Signal Drift Fault	ON	No			
89	U0029	639	2	CAN communication error	ON	Level1 (Mild)			
90	U0028	639	19	CAN bus off error	ON	Level1 (Mild)			
91	P268C	651	2	Injector Code(IQA) Program Missing Fault (Cylinder#1)	ON	No			
92	P02EE	651	4	Injector Short circuit Fault (Cylinder #1)	ON	No			
93	P0201	651	5	Injector Open circuit Fault (Cylinder #1)	ON	No			
94	P32EE	651	22	Injector High Low side Short circuit Fault (Cylinder #1)	ON	No			
95	P268D	652	2	Injector Code(IQA) Program Missing Fault (Cylinder#2)	ON	No			
96	P02EF	652	4	Injector Short circuit Fault (Cylinder #2)	ON	No			
97	P0202	652	5	Open load on the power stage for cylinder #2	ON	No			
98	P32EF	652	22	Injector High Low side Short circuit Fault (Cylinder #2)	ON	No			
99	P268E	653	2	Injector Code(IQA) Program Missing Fault (Cylinder#3)	ON	No			
100	P02F0	653	4	Injector Short circuit Fault (Cylinder #3)	ON	No			
101	P0203	653	5	Injector Open circuit Fault (Cylinder #3)	ON	No			
102	P32F0	653	22	Injector High Low side Short circuit Fault (Cylinder #3)	ON	No			
103	P268F	654	2	Injector Code(IQA) Program Missing Fault (Cylinder#4)	ON	No			
104	P02F1	654	4	Injector Short circuit Fault (Cylinder #4)	ON	No			
105	P0204	654	5	Injector Open circuit Fault (Cylinder #4)	ON	No			
106	P32F1	654	22	Injector High Low side Short circuit Fault (Cylinder #4)	ON	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
107	P0384	676	3	Glow plug Relay driver Short circuit to Battery Fault	ON	No			
108	P0383	676	4	Glow plug Relay driver Short circuit to Ground Fault	ON	No			
109	P0380	676	5	Glow plug Relay driver Open circuit Fault	ON	No			
110	U1003	970	12	Engine shut off request through CAN (EBC1)	OFF	No		Used	
111	P0215	970	22	Engine shut off request through hardwire	OFF	No		Used	
112	P028E	975	3	PWM FAN Output short to battery circuit fault	ON	No			
113	P028D	975	4	PWM FAN Output short to ground circuit fault	ON	No			
114	P028A	975	5	PWM FAN Output open circuit fault	ON	No			
115	P1931	987	3	CE(Check engine) Lamp Short to Battery	ON	No			
116	P192F	987	4	CE(Check engine) Lamp Short to Ground	ON	No			
117	P192E	987	5	CE(Check engine) Lamp Open circuit	ON	No			
118	P0004	1076	3	Fuel Metering unit plausibility error in overrun mode	ON	Level1 (Mild)	Used		
119	P0003	1076	4	Fuel Metering unit plausibility error in idle mode	ON	Level1 (Mild)	Used		
120	P0254	1076	16	Maximum negative rail pressure deviation with metering unit on lower limit is exceeded	ON	Level1 (Mild)	Used		
121	P0252	1076	20	Rail pressure too low for injection	ON	No			
122	P2381	1081	3	Glow plug Lamp Short to Battery	ON	No			
123	P1904	1081	4	Glow plug Lamp Short to Ground	ON	No			
124	P0381	1081	5	Glow plug Lamp Open circuit	ON	No			
125	P0669	1207	0	ECU temperature High fault	ON	No			
126	P06AE	1207	3	ECU temperature sensor High fault (Short circuit to battery)	ON	No			
127	P06AD	1207	4	ECU temperature sensor Low fault (Short circuit to ground)	ON	No			
128	P018D	1382	0	Fuel filter pressure high fault	ON	Level1 (Mild)			
129	P018C	1382	1	Fuel filter pressure low fault	Blink	Level2 (Severe)			
130	P01C6	1382	3	Fuel filter pressure sensor signal high fault	ON	No			
131	P01C2	1382	4	Fuel filter pressure sensor signal low fault	ON	No			
132	P01C4	1382	7	Fuel Filter Pressure low detection 1 - Warning	ON	No			
133	P01C5	1382	13	Fuel Filter Pressure low detection 2 - Torque reduction	ON	Level1 (Mild)			
134	P0685	1485	7	ECU Main relay Stuck fault	ON	No			
135	P068A	1485	11	ECU Main relay Early opening fault	ON	No			
136	P2547	1568	3	Multi-torque switch signal too high	ON	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
				fault					
137	P2546	1568	4	Multi-torque switch signal too low fault	ON	No			
138	P062D	1612	3	Injector bank 1st Short circuit fault	ON	No			
139	P062E	1612	12	Injector bank 2nd Short circuit fault	ON	No			
140	P0528	1639	3	Fan speed too high fault	ON	No			
141	P0529	1639	4	Fan speed too low fault	ON	No			
142	P0527	1639	11	Fan speed signal long period fault path	ON	No			
143	P1230	1761	19	DEF Tank Level Signal error	ON	SCR induce			Tampering
144	P2505	1867	1	ECU over temperature for SCR Monitoring	ON	No			
145	P2508	1867	3	"ABE active" report due to overvoltage detection	ON	No			
146	P2507	1867	4	"ABE active" report due to undervoltage detection	ON	No			
147	P2511	1867	11	"WDA/ABE active" report due to unknown reason	ON	No			
148	P2509	1867	19	"WDA active" report due to errors in query- response communication	ON	No			
149	P2506	1867	22	ECU Software Reset 0 fault	ON	No			
150	P1546	2789	0	Turbine inlet temperature High fault	ON	Level1 (Mild)			
151	P0546	2789	3	Turbine inlet temperature sensor High fault	ON	No			EGR Block (EGR only)
152	P0545	2789	4	Turbine inlet temperature sensor Low fault	ON	No			EGR Block (EGR only)
153	P0544	2789	11	Turbine inlet temperature Plausibility Fault	ON	No			
154	P2145	2791	3	EGR H-Bridge Driver Short circuit to battery	ON	No			EGR Block (EGR only)
155	P2144	2791	4	EGR H-Bridge Driver Short circuit to ground	ON	No			EGR Block (EGR only)
156	P2143	2791	5	EGR H-Bridge Driver Open Circuit Fault	ON	No			EGR Block (EGR only)
157	P205E	3031	14	DEF Tank temperature overheated	ON	No			
158	P1045	3031	16	DEF Tank Temperature sensor High plausibility fault	ON	No			
159	P1044	3031	18	DEF Tank Temperature sensor Low plausibility fault	ON	No			
160	P2397	3216	4	NOx sensor signal low fault (Upstream NOx sensor)	ON	SCR induce			Dosing interrupt
161	P225D	3216	18	NOx sensor 1 (Upstream) concentration Low plausibility fault	ON	SCR induce			Tampering
162	U030D	3219	7	NOx sensor heating error (Upstream NOx sensor)	ON	SCR induce			Tampering
163	P2203	3224	5	NOx sensor Open circuit fault (Upstream NOx sensor)	ON	SCR induce			Tampering
164	P2202	3224	6	NOx sensor Short circuit fault (Upstream NOx sensor)	ON	SCR induce			Tampering

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
165	P2398	3226	4	NOx sensor signal low fault (Downstream NOx sensor)	ON	SCR induce			Dosing interrupt
166	U030E	3229	7	NOx sensor heating error (Downstream NOx sensor)	ON	SCR induce			Tampering
167	P2216	3234	5	NOx sensor Open circuit fault (Downstream NOx sensor)	ON	SCR induce			Tampering
168	P2215	3234	6	NOx sensor Short circuit fault (Downstream NOx sensor)	ON	SCR induce			Tampering
169	P0408	3236	16	Maximum EGR rate governor deviation	ON	Level1 (Mild)			EGR Block (EGR only)
170	P049B	3236	0	EGR rate slow response positive error	ON	Level1 (Mild)			EGR Block (EGR only)
171	P1033	3242	0	DPF(SDPF) inlet temperature High fault	ON	No			
172	P2033	3242	3	DPF(SDPF) inlet temperature sensor High fault	ON	SCR induce			Tampering
173	P2032	3242	4	DPF(SDPF) inlet temperature sensor Low fault	ON	SCR induce			Tampering
174	P2034	3242	11	DPF(SDPF) inlet temperature Plausibility Fault	ON	SCR induce			Tampering
175	P2035	3242	20	DPF(SDPF) inlet temperature Drift fault	ON	Level1 (Mild)			
176	P2455	3251	3	DPF differential pressure sensor High fault	ON	Level1 (Mild)			Tampering
177	P2454	3251	4	DPF differential pressure sensor Low fault	ON	Level1 (Mild)			Tampering
178	P3052	3251	13	DPF differential pressure drift fault	ON	No			
179	P1454	3251	18	DPF differential pressure too low fault	ON	Level1 (Mild)			Tampering
180	P263D	3360	14	DEF pressure line heater error (Perform afterrun)	ON	SCR induce			Dosing interrupt
181	P2047	3361	3	DEF dosing valve actuator Short circuit to battery Fault	ON	SCR induce			Dosing interrupt
182	P2048	3361	4	DEF dosing valve actuator Short circuit to ground Fault	ON	SCR induce			Dosing interrupt
183	P2049	3361	5	DEF dosing valve actuator Open Circuit Fault	ON	SCR induce			Tampering
184	P202E	3361	13	DEF dosing valve actuator Over temperature Fault	ON	SCR induce			Dosing interrupt
185	P2C11	3361	14	DEF dosing valve plausibility fault	ON	SCR induce			Tampering
186	P2050	3361	22	DEF dosing valve actuator HS(High side) Short circuit to battery Fault	ON	SCR induce			Dosing interrupt
187	P2051	3361	23	DEF dosing valve actuator HS(High side) Short circuit to ground Fault	ON	SCR induce			Dosing interrupt
188	P208E	3361	27	DEF Dosing valve is blocked	ON	SCR induce			Tampering
189	P20B4	3363	3	DEF Tank heating coolant valve output Short circuit to battery Fault	ON	SCR induce			Dosing interrupt
190	P20B3	3363	4	DEF Tank heating coolant valve output Short circuit to ground Fault	ON	SCR induce			Dosing interrupt

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
191	P20B1	3363	5	DEF Tank heating coolant valve output Open circuit Fault	ON	SCR induce			Tampering
192	P30B1	3363	7	DEF Tank heating coolant valve output Over temperature Fault	ON	SCR induce			Dosing interrupt
193	P0659	3509	3	ECU Sensor Supply (5V)1 Over voltage fault	ON	Level1 (Mild)			
194	P0658	3509	4	ECU Sensor Supply (5V)1 Under voltage fault	ON	Level1 (Mild)			
195	P1657	3509	5	ECU Sensor Supply (5V)1 voltage fault	ON	Level1 (Mild)			
196	P0657	3509	6	ECU Sensor Supply (5V)1 Short circuit to ground	ON	Level1 (Mild)			
197	P0641	3509	11	ECU Sensor Supply (5V) Overvoltage monitoring error	ON	No			
198	P2671	3510	3	ECU Sensor Supply (5V)2 Over voltage fault	ON	Level1 (Mild)			
199	P2670	3510	4	ECU Sensor Supply (5V)2 Under voltage fault	ON	Level1 (Mild)			
200	P1669	3510	5	ECU Sensor Supply (5V)2 voltage fault	ON	Level1 (Mild)			
201	P2669	3510	6	ECU Sensor Supply (5V)2 Short circuit to ground	ON	Level1 (Mild)			
202	P0642	3510	11	ECU Sensor Supply (5V) Undervoltage monitoring error	ON	No			
203	P2686	3511	3	ECU Sensor Supply (5V)3 Over voltage fault	ON	Level1 (Mild)			
204	P2685	3511	4	ECU Sensor Supply (5V)3 Under voltage fault	ON	Level1 (Mild)			
205	P1684	3511	5	ECU Sensor Supply (5V)3 voltage fault	ON	Level1 (Mild)			
206	P2684	3511	6	ECU Sensor Supply (5V)3 Short circuit to ground	ON	Level1 (Mild)			
207	P106D	3516	0	DEF Quality Too High fault	ON	SCR induce			DEF Quality
208	P106C	3516	1	DEF Quality Too Low fault	ON	SCR induce			DEF Quality
209	P203F	3517	18	DEF Tank level is empty	ON	SCR induce			DEF level
210	U1028	3520	3	DEF Quality Sensor Open circuit	ON	SCR induce			Tampering
211	U1030	3520	4	DEF Quality Sensor Short circuit	ON	SCR induce			Tampering
212	P203A	3532	3	DEF Level Sensor Open circuit	ON	SCR induce			Tampering
213	P2041	3532	4	DEF Level Sensor Short circuit	ON	SCR induce			Tampering
214	P25BC	3695	3	DPF regeneration inhibit switch Short to Battery fault (Hardwire)	ON	No			
215	P25BB	3696	3	DPF regeneration enable switch Short to Battery fault (Hardwire)	ON	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
216	P25BA	3696	11	DPF regeneration inhibit & enable switch plausibility fault (Hardwire)	ON	No			
217	P2611	3697	3	DPF lamp 1 (DPF regeneration switch enable lamp) Short to Battery	ON	No			
218	P260F	3697	4	DPF lamp 1 (DPF regeneration switch enable lamp) Short to Ground	ON	No			
219	P260E	3697	5	DPF lamp 1 (DPF regeneration switch enable lamp) Open circuit	ON	No			
220	P246B	3715	14	DPF regeneration failure (DPF regeneration is not performed well during machine operation mode)	OFF	No			
221	P242F	3720	16	DPF Ash loading High fault (Ash cleaning is needed)	ON	No			
222	P025D	4082	3	Fuel metering unit Short circuit to Battery fault	ON	Level1 (Mild)			
223	P025C	4082	4	Fuel metering unit Short circuit to Ground fault	ON	Level1 (Mild)			
224	P025A	4082	5	Fuel metering unit Open circuit fault	ON	Level1 (Mild)			
225	P025B	4082	7	Fuel metering unit Over temperature fault	ON	Level1 (Mild)			
226	P1450	4335	0	DEF Overpressure error at METERINGCONTROL (DEF pump pressure is too high)	ON	SCR induce			Tampering
227	P1451	4335	1	DEF Underpressure error at METERINGCONTROL (DEF pump pressure is too low)	ON	SCR induce			Tampering
228	P1457	4335	2	DEF pressure build up error at PRESSUREBUILDUP (DEF pump pressure is too low)	ON	SCR induce			Tampering
229	P202D	4335	7	DEF Leakage detection at METERINGCONTROL	ON	No			
230	P1452	4335	12	DEF Overpressure error regardless of the state (DEF pump pressure is too high)	ON	SCR induce			Tampering
231	P1459	4335	15	DEF Pressure reduction error at PRESSUREREDUCTION (Detected an insufficient pressure drop)	ON	SCR induce			Tampering
232	P1460	4335	16	DEF underpressure error at AFTERRUN_PRESSURECOMPENSATION	ON	No			
233	P1893	4344	2	DEF backflow Line plausibility error at DETECTIONMODE (Does not detect a pressure drop)	ON	SCR induce			Tampering
234	P221D	4354	5	DEF Pressure line heater circuit Open circuit Fault	ON	No			
235	P221C	4354	6	DEF Pressure line heater circuit Open circuit or Short circuit to ground Fault	ON	No			
236	P221F	4355	5	DEF Backflow line heater circuit Open circuit Fault	ON	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
237	P221E	4355	6	DEF Backflow line heater circuit Open circuit or Short circuit to ground Fault	ON	No			
238	P215F	4356	5	DEF Suction line heater circuit Open circuit Fault	ON	No			
239	P215E	4356	6	DEF Suction line heater circuit Open circuit or Short circuit to ground Fault	ON	No			
240	P20EE	4364	14	SCR Efficiency Too low fault	ON	Level1 (Mild)			
241	P2043	4365	3	DEF Temperature Sensor Open circuit	ON	SCR induce			Tampering
242	P2046	4365	4	DEF Temperature Sensor Short circuit	ON	SCR induce			Tampering
243	P1227	4365	14	DEF Tank temperature plausibility fault (Insufficient temperature increment)	ON	SCR induce			Tampering
244	P208D	4374	3	DEF Supply Pump Motor Signal Short circuit to battery Fault	ON	SCR induce			Dosing interrupt
245	P208C	4374	4	DEF Supply Pump Motor Signal Short circuit to ground Fault	ON	SCR induce			Dosing interrupt
246	P208A	4374	5	DEF Supply Pump Motor Signal Open circuit Fault	ON	SCR induce			Tampering
247	P208B	4374	7	DEF Supply Pump Motor Signal Over temperature Fault	ON	SCR induce			Dosing interrupt
248	P108A	4374	8	DEF Supply Pump Motor Speed Deviation Fault	ON	SCR induce			Dosing interrupt
249	P108B	4374	9	DEF Supply Pump Motor Speed Deviation Permanent Fault	ON	SCR induce			Dosing interrupt
250	P108C	4374	12	DEF Supply Pump Motor No activation Fault	ON	SCR induce			Dosing interrupt
251	P24A3	4781	15	DPF Soot mass too high status (> 120%)	Blink	Level2 (severe)			
252	P2463	4781	16	DPF Soot mass high status (> 110%)	ON	Level1 (Mild)			
253	P0593	5067	3	PTO (Idle up) Lamp Short to Battery	ON	No			
254	P0592	5067	4	PTO (Idle up) Lamp Short to Ground	ON	No			
255	P0591	5067	5	PTO (Idle up) Lamp Open circuit	ON	No			
256	P055D	5099	3	Oil Pressure Warning Lamp Short to Battery	ON	No			
257	P055C	5099	4	Short circuit to ground error of oil pressure lamp	ON	No			
258	P055B	5099	5	Oil Pressure Warning Lamp Open circuit	ON	No			
259	P0193	5313	3	Rail pressure sensor High fault	ON	Level1 (Mild)			
260	P0192	5313	4	Rail pressure sensor Low fault	ON	Level1 (Mild)			
261	P02E3	5419	3	Throttle valve H-Bridge Driver Short circuit to battery	ON	No			
262	P02E2	5419	4	Throttle valve H-Bridge Driver Short circuit to ground	ON	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
263	P02E0	5419	5	Throttle valve H-Bridge Driver Open Circuit Fault	ON	No			
264	P1453	5435	10	DEF pressure stabilization error at DETECTIONMODE (DEF pump pressure is not stable)	ON	SCR induce			Tampering
265	P204A	5435	12	DEF pressure check error at DETECTIONMODE (Detected an insufficient pressure drop)	ON	SCR induce			Tampering
266	P20A3	5436	3	DEF Reverting valve output Short circuit to battery Fault	ON	SCR induce			Tampering
267	P20A2	5436	4	DEF Reverting valve output Short circuit to ground Fault	ON	SCR induce			Tampering
268	P20A0	5436	5	DEF Reverting valve output Open circuit Fault	ON	SCR induce			Tampering
269	P20A1	5436	7	DEF Reverting valve output Over temperature Fault	ON	SCR induce			Tampering
270	P20A5	5436	11	DEF Reverting valve Pressure drop plausibility fault	ON	SCR induce			Tampering
271	P1461	5436	14	DEF Reverting valve is blocked (Detected an insufficient pressure drop)	ON	SCR induce			Tampering
272	P20C0	5491	3	DEF Pressure line heater relay output Short circuit to battery Fault	ON	SCR induce			Dosing interrupt
273	P20BF	5491	4	DEF Pressure line heater relay output Short circuit to ground Fault	ON	SCR induce			Dosing interrupt
274	P20BD	5491	5	DEF Pressure line heater relay output Open circuit Fault	ON	SCR induce			Tampering
275	P30BD	5491	7	DEF Pressure line heater relay output Over temperature Fault	ON	SCR induce			Dosing interrupt
276	P20BE	5491	12	DEF Pressure line heater feedback plausibility Fault	ON	SCR induce			Dosing interrupt
277	P009B	5571	22	Common rail pressure relief valve reached maximum allowed opening count	ON	No			
278	P009C	5571	23	Common rail pressure relief valve Forced to open status (Pressure increase)	ON	Level1 (Mild)	Used		
279	P009D	5571	24	Common rail pressure relief valve Forced to open status (Pressure shock)	ON	Level1 (Mild)	Used		
280	P000F	5571	25	Common rail pressure relief valve is open	ON	Level1 (Mild)	Used		
281	P009F	5571	27	Averaged rail pressure is outside the expected tolerance range	ON	No			
282	P018F	5571	28	Common rail pressure relief valve reached maximum allowed open time	ON	No			
283	P246C	5629	14	DPF differential pressure too high fault	ON	Level1 (Mild)			
284	P214F	5706	5	DEF Supply module heater circuit Open circuit Fault	ON	No			
285	P21DD	5706	6	DEF Supply module heater circuit Open circuit or Short circuit to ground Fault	ON	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
286	P23B3	5706	12	DEF Supply module heater temperature plausibility fault (Insufficient temperature increment)	ON	SCR induce			Tampering
287	P23B4	5706	14	DEF Supply module heater temperature plausibility fault at cold start (Insufficient temperature increment)	ON	SCR induce			Tampering
288	P23B2	5706	22	DEF Supply module heater plausibility fault (Insufficient temperature increment)	ON	SCR induce			Tampering
289	P21C4	5746	3	DEF Main heater relay output Short circuit to battery Fault	ON	SCR induce			Dosing interrupt
290	P21C3	5746	4	DEF Main heater relay output Short circuit to ground Fault	ON	SCR induce			Dosing interrupt
291	P21C2	5746	5	DEF Main heater relay output Open circuit Fault	ON	SCR induce			Tampering
292	P05ED	5746	6	DEF heater line circuit Short circuit to battery Fault	ON	No			
293	P31C5	5746	7	DEF Main heater relay output Over temperature Fault	ON	SCR induce			Dosing interrupt
294	P21C9	5965	3	SCR system Main relay short circuit to battery	ON	SCR induce			Tampering
295	P21C8	5965	4	SCR system Main relay short circuit to ground	ON	SCR induce			Tampering
296	P21C7	5965	5	SCR system Main relay open circuit	ON	SCR induce			Tampering
297	P2634	6323	3	Electric fuel feed pump Output short to battery circuit fault	ON	No			
298	P2633	6323	4	Electric fuel feed pump Output short to ground circuit fault	ON	No			
299	P2632	6323	5	Electric fuel feed pump Output open circuit fault	ON	No			
300	P2635	6323	13	Electric fuel feed pump performance fault	ON	No			
301	U1033	6385	19	Timeout Error of CAN-Receive-Frame EOI (Engine Starter Motor Relay Control)	ON	No			
302	P204D	6875	3	DEF Supply Pump pressure sensor High fault	ON	SCR induce			Dosing interrupt
303	P204C	6875	4	DEF Supply Pump pressure sensor Low fault	ON	SCR induce			Dosing interrupt
304	P304D	6875	16	DEF Supply Pump pressure sensor High plausibility fault	ON	SCR induce			Dosing interrupt
305	P304C	6875	18	DEF Supply Pump pressure sensor Low plausibility fault	ON	SCR induce			Dosing interrupt
306	P3611	6915	3	DPF lamp 2 (DPF Regeneration Active Lamp) Short to Battery	ON	No			
307	P360F	6915	4	DPF lamp 2 (DPF Regeneration Active Lamp) Short to Ground	ON	No			
308	P360E	6915	5	DPF lamp 2 (DPF Regeneration Active Lamp) Open circuit	ON	No			
309	P1908	6916	3	DPF lamp 3 (DPF regeneration switch inhibit lamp) Short to Battery	ON	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
310	P1907	6916	4	DPF lamp 3 (DPF regeneration switch inhibit lamp) Short to Ground	ON	No			
311	P1906	6916	5	DPF lamp 3 (DPF regeneration switch inhibit lamp) Open circuit	ON	No			
312	P20C4	7069	3	DEF Backflow line heater relay output Short circuit to battery Fault	ON	SCR induce			Dosing interrupt
313	P20C3	7069	4	DEF Backflow line heater relay output Short circuit to ground Fault	ON	SCR induce			Dosing interrupt
314	P20C1	7069	5	DEF Backflow line heater relay output Open circuit Fault	ON	SCR induce			Tampering
315	P30C1	7069	7	DEF Backflow line heater relay output Over temperature Fault	ON	SCR induce			Dosing interrupt
316	P20C2	7069	12	DEF Backflow line heater feedback plausibility Fault	ON	SCR induce			Dosing interrupt
317	P23B5	7107	12	DEF Supply module temperature plausibility fault (Insufficient temperature increment)	ON	SCR induce			Tampering
318	P23B6	7107	14	DEF Supply module temperature plausibility fault at cold start (Insufficient temperature increment)	ON	SCR induce			Tampering
319	P20BC	7416	3	DEF Supply module heater relay output Short circuit to battery Fault	ON	SCR induce			Dosing interrupt
320	P20BB	7416	4	DEF Supply module heater relay output Short circuit to ground Fault	ON	SCR induce			Dosing interrupt
321	P20B9	7416	5	DEF Supply module heater relay output Open circuit Fault	ON	SCR induce			Tampering
322	P30B9	7416	7	DEF Supply module heater relay output Over temperature Fault	ON	SCR induce			Dosing interrupt
323	P20BA	7416	12	DEF Supply module heater feedback plausibility Fault	ON	SCR induce			Dosing interrupt
324	P06F0	7538	12	DEF Supply module temperature duty cycle in failure range	ON	SCR induce			Dosing interrupt
325	P06F1	7538	13	Diagnostic Fault Check for DEF supply module duty cycle in the invalid range	ON	SCR induce			Dosing interrupt
326	P20AC	7538	22	DEF Supply module heater temperature duty cycle in failure range	ON	SCR induce			Dosing interrupt
327	P20AD	7538	23	DEF Supply module heater temperature duty cycle in invalid range	ON	SCR induce			Dosing interrupt
328	P20B0	7538	24	DEF Supply module temperature measurement non-availability fault	ON	SCR induce			Dosing interrupt
329	P20FF	7538	25	DEF Supply module time period outside specified range	ON	SCR induce			Dosing interrupt
330	P056D	7538	26	DEF Supply module PWM signal fault	ON	SCR induce			Dosing interrupt
331	P20C8	7540	3	DEF Suction line heater relay output Short circuit to battery Fault	ON	SCR induce			Dosing interrupt
332	P20C7	7540	4	DEF Suction line heater relay output Short circuit to ground Fault	ON	SCR induce			Dosing interrupt
333	P20C5	7540	5	DEF Suction line heater relay output Open circuit Fault	ON	SCR induce			Tampering

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
334	P30C5	7540	7	DEF Suction line heater relay output Over temperature Fault	ON	SCR induce			Dosing interrupt
335	P20C6	7540	12	DEF Suction line heater feedback plausibility Fault	ON	SCR induce			Dosing interrupt
336	P0617	7748	3	Starter relay power stage output short circuit to battery	ON	No			
337	P0616	7748	4	Starter relay power stage output short circuit to ground	ON	No			
338	P0615	7748	5	Starter relay power stage output open circuit	ON	No			
339	P213E	8614	12	Injection cut off demand (ICO) for shut off coordinator	Blink	Level2 (severe)		Used	
340	P062F	55296	12	ECU EEPROM Read Error	ON	No			
341	P0630	55552	12	ECU EEPROM Write Error	ON	No			
342	U01B7	57344	19	Timeout Error of CAN-Receive-Frame CM1 (Status of regeneration initiate and inhibit switches)	ON	No			
343	U01B9	61441	19	Timeout Error of CAN-Receive-Frame EBC1 (Engine shut off request)	ON	No			
344	U029D	61454	19	Timeout Error of CAN-Receive-Frame AT1IG1 (NOx Upstream Concentration)	ON	SCR induce			Tampering
345	U029E	61455	19	Timeout Error of CAN-Receive-Frame AT1O1 (NOx Downstream Concentration)	ON	SCR induce			Tampering
346	U02A2	64923	19	Timeout Error of CAN-Receive-Frame A1DEFI (DEF Tank)	ON	SCR induce			Tampering
347	U0619	65110	19	Timeout Error of CAN-Receive-Frame AT1T1I (DEF Level, Temperature over CAN)	ON	SCR induce			Tampering
348	U1001	65164	19	Timeout Error of CAN-Receive-Frame AAI (Hydraulic Oil Temperature)	ON	No			
349	U1031	65241	19	Timeout Error of CAN-Receive-Frame AUXIO1 (status of vehicle cut off [Safety bar])	ON	No			
350	U1032	65265	19	Timeout Error of CAN-Receive-Frame RxCCVS (PTO / Idle up)	ON	No			
351	P0218	65272	19	Timeout Error of CAN-Receive-Frame TRF1 (Transmission oil temperature)	ON	No			
352	U0632	65320	19	Timeout Error of CAN-Receive-Frame FanCtl (FAN Control)	ON	No			
353	U0608	65400	19	Timeout Error of CAN-Receive-Frame RxSMVCU (Pedal & Engine speed demand from VCU)	ON	Level1 (Mild)			
354	U013C	65400	22	Message Check Sum Error of CAN Receive Frame SMVCU (Pedal & Engine speed demand from VCU)	ON	Level1 (Mild)			
355	U043D	65400	23	Message Counter Error of CAN Receive Frame SMVCU (Pedal & Engine speed demand from VCU)	ON	Level1 (Mild)			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
356	U010F	65401	19	Timeout Error of CAN-Receive-Frame DPM1 (Air Conditioning Switch Status / Oil life reset)	ON	No			
357	U01B8	65402	19	Timeout Error of CAN-Receive-Frame DPM9 (Multiple torque Map select switch)	ON	No			
358	P2383	104332	9	NOx sensor Mounting Error (Upstream NOx sensor)	ON	SCR induce			Tampering
359	P2384	104385	9	NOx sensor Mounting Error (Downstream NOx sensor)	ON	SCR induce			Tampering
360	P160B	520601	12	CY327(Power control chipset) SPI (Serial Peripheral Interface Bus) Communication Error	ON	No			
361	P060B	520618	12	ECU ADC(Analog to Digital Convertor) NTP(Null Load Test Pulse) Monitoring fault	ON	No			
362	P160F	520641	12	ECU ROM Memory multiple error	ON	No			
363	P1610	520642	12	ECU MM(Monitoring Module) Synchronization Loss fault during Shut-off path test	ON	No			
364	P101A	520643	12	MoF(Monitoring of Function) Over Run error	ON	No			
365	P160C	520696	12	ECU ADC(Analog to Digital Convertor) Test error	ON	No			
366	P160D	520697	12	ECU ADC(Analog to Digital Convertor) Voltage ratio error	ON	No			
367	P060C	520698	12	ECU query response-communication error	Blink	Level2 (severe)		Used	
368	P160E	520699	12	ECU SPI (Serial Peripheral Interface Bus) communication error	ON	No			
369	P1611	520700	12	ECU Shut−off path test error	Blink	Level2 (severe)			
370	P1612	520701	12	ECU Wrong set response time error during shut off path test	ON	No			
371	P1613	520702	12	ECU Too many SPI (Serial Peripheral Interface Bus) errors during shut off path test	ON	No			
372	P1615	520703	12	ECU WDA working error during Shut-off path test	ON	No			
373	P1616	520704	12	ECU OS Timeout error during Shut-off path test	ON	No			
374	P1617	520705	12	ECU Positive test failure error during Shut- off path test	ON	No			
375	P1618	520706	12	ECU Shut-off path test timeout fault	ON	No			
376	P1619	520707	3	ECU Overvoltage error during Shut-off path test	ON	No			
377	P1614	520707	4	ECU Undervoltage error during Shut-off path test	ON	No			
378	P12E5	520723	12	NCD inducement Fault Level1 (Group1 - EGR Block)	OFF	No			

No.	Code	SPN	FMI	Description	CE lamp	Torque de-rate	Speed limit	Eng. stop	NCD induce
379	P12E6	520724	12	NCD inducement Fault Level2 (Group1 - EGR Block)	OFF	No			
380	P12E7	520725	12	NCD inducement Fault Level3 Final inducement (Group1 - EGR Block)	OFF	No			
381	P12E8	520726	12	NCD inducement Fault Warning (Group1 - EGR Block)	OFF	No			
382	P12E9	520727	12	NCD inducement Fault Level1 (Group2 – Dosing Interrupt)	OFF	No			
383	P12EA	520728	12	NCD inducement Fault Level2 (Group2 – Dosing Interrupt)	OFF	No			
384	P12EB	520729	12	NCD inducement Fault Level3 Final inducement (Group2 – Dosing Interrupt)	OFF	No			
385	P12EC	520730	12	NCD inducement Fault Warning (Group2 – Dosing Interrupt)	OFF	No			
386	P12F2	520736	12	NCD inducement Fault Level1 (Group4 – DEF Quality)	OFF	No			
387	P12F3	520737	12	NCD inducement Fault Level2 (Group4 – DEF Quality)	OFF	No			
388	P12F4	520738	12	NCD inducement Fault Level3 Final inducement (Group4 – DEF Quality)	OFF	No			
389	P12F5	520739	12	NCD inducement Fault Warning (Group4 – DEF Quality)	OFF	No			
390	P12F6	520740	12	NCD inducement Fault Level1 (Group5 – Tampering)	OFF	No			
391	P12F7	520741	12	NCD inducement Fault Level2 (Group5 – Tampering)	OFF	No			
392	P12F8	520742	12	NCD inducement Fault Level3 Final inducement (Group5 – Tampering)	OFF	No			
393	P12F9	520743	12	NCD inducement Fault Warning (Group5 – Tampering)	OFF	No			
394	P1303	520790	12	NCD inducement Repeat offense Level1	OFF	No			
395	P1304	520791	12	NCD inducement Repeat offense Level2	OFF	No			
396	P1305	520792	12	NCD inducement Repeat offense Level3 Final inducement	OFF	No			
397	P1013	520797	12	MoF(Monitoring of Function) Engine speed error	ON	No			

DCU Fault List

An inducement is set to limit engine power and speed when the SCR system fails to regularly reduce nitrogen oxides. This is for the operator to stop work and take a measure.

DTC	Description	Inducement
P2530	Key Position Error	-
P0071	Environment Temperature Too High	Interruption of Dosing
P0071	Environment Temperature Too Low	Interruption of Dosing
P0073	Environment Temperature Sensor High	-
P0072	Environment Temperature Sensor Low	-
P1563	Battery Voltage High	-
P1562	Battery Voltage Low	-
P1561	DEF tank: poor DEF quality	When DEF quality is poor
P1566	Battery voltage abnormal	
U1544	SAE J1939 Error (Reference Torque, ECU)	-
U1401	UDS CAN ID Error	-
U110E	CAN A Bus-off	-
P203B	DEF Level Too High	-
P203B	DEF Level Too Low	-
P203F	DEF Level is Warning	DEF
P203F	DEF Level is Empty	DEF
P203A	DEF Level Signal Error	-
P203E	DEF Fill Level High	-
P203E	DEF Fill Level Low	-
P205B	DEF Temperature Too High	-
P205B	DEF Temperature Too Low	-
P205B	DEF Temperature Plausibility High	-
P205B	DEF Temperature Plausibility Low	-
P205E	DEF Overheating	-
P205A	DEF Temperature Sensor Error	-
P205A	DEF Temperature Signal Error	-
P2202	Inlet Nox Sensor Short Circuit	Tampering
P2203	Inlet Nox Sensor Open	Tampering
U1216	Inlet NOx Sensor SAE J1939 Error (Concentration)	-
P23C1	Inlet Nox O2 Plausibility (Full-Load)	-
P23A3	Inlet NOx Sensor SAE J1939 Error (Binary Lambda Max)	-
P23A5	Inlet NOx Sensor SAE J1939 Error (Binary Lambda Min)	-
U1217	SAE J1939 Error (inlet Nox Sensor)	-
P23C3	O2 Plausibility in overrun (Sensor 1)	-
P23C5	O2 Plausibility in part load (Sensor 1)	-
P23F0	Inlet Nox Delay (O2 Signal High)	-
U1223	Inlet NOx Sensor SAE J1939 Error (Power Signal)	-

DTC	Description	Inducement
P23E1	Inlet Nox Delay (O2 Signal Low)	-
U1219	Inlet NOx Sensor SAE J1939 Error (Temperature)	-
P23EE	Inlet NOx sensor Wire monitoring	-
P23EF	Outlet NOx sensor Wire monitoring	-
P23D1	Inlet Nox Dynamic Error (O2 Signal High)	-
P23D2	Outlet Nox Dynamic Error (O2 Signal High)	-
P23D3	Inlet Nox Dynamic Error (O2 Signal Low)	-
P23D4	Outlet Nox Dynamic Error (O2 Signal Low)	-
P23A7	Inlet NOx sensor SAE J1939 Error (Linear lambda Max)	-
P23A9	Inlet NOx sensor SAE J1939 Error (Linear lambda Min)	-
P23A1	Inlet NOx sensor signal readiness Error	Tampering
P2391	Inlet NOx Sensor offset max error	-
P2393	Inlet NOx Sensor offset min error	-
P2395	Inlet NOx Sensor SRC Max	-
P2397	Inlet NOx Sensor SRC Min	-
U1224	Inlet NOx Sensor SAE J1939 Error (Nox Signal)	-
P239E	Nox Undershoot Error (Sensor 1)	-
U1234	SAE J1939 Error (inlet Nox Sensor Signal)	-
P2215	Outlet Nox Sensor Short Circuit	Tampering
P2216	Outlet Nox Sensor Open	Tampering
U1226	Outlet NOx Sensor SAE J1939 Error (Concentration)	-
P23C2	Outlet Nox O2 Plausibility (Full-Load)	-
P23A4	Outlet NOx Sensor SAE J1939 Error (Binary Lambda Max)	-
P23A6	Outlet NOx Sensor SAE J1939 Error (Binary Lambda Min)	-
U1227	Outlet NOx Sensor SAE J1939 Error (Oxidation Factor)	-
P23C4	O2 Plausibility in overrun (Sensor 2)	-
P23C6	O2 Plausibility in part load (Sensor 2)	-
P23F1	Outlet Nox Delay (O2 Signal High)	-
U1233	Outlet NOx Sensor SAE J1939 Error (Power Signal)	-
P23E2	Outlet Nox Delay (O2 Signal Low)	-
U1229	Outlet NOx Sensor SAE J1939 Error (Temperature)	-
P23A8	Outlet NOx sensor SAE J1939 Error (Linear lambda Max)	-
P23AA	Outlet NOx sensor SAE J1939 Error (Linear lambda Min)	-
P23A2	Outlet NOx sensor signal readiness Error	Tampering
P2392	Outlet NOx Sensor offset max error	-
P2394	Outlet NOx Sensor offset min error	-
P2396	Outlet NOx Sensor SRC Max	-
P2398	Outlet NOx Sensor SRC Min	-
U1225	Outlet NOx Sensor SAE J1939 Error (Nox Signal)	-
P239F	Nox Undershoot Error (Sensor 2)	-

DTC	Description	Inducement
U1235	Outlet NOx Sensor SAE J1939 Error (O2 Signal)	-
P2047	Dosing Valve Short Circuit to Battery	Tampering
P2048	Dosing Valve Short Circuit to Ground	Tampering
P2049	Dosing Valve Short Circuit to Battery	Tampering
P202E	Dosing Valve Over Temperature	Tampering
P2064	Dosing Valve Short Circuit to Ground	-
P208E	Dosing Valve is blocked	-
P202C	DEF Tank Heater SCB	Interruption of Dosing
P202B	DEF Tank Heater SCG	Interruption of Dosing
P202A	DEF Tank Heater Open	Interruption of Dosing
P209F	DEF Tank Heater Over-temperature	Interruption of Dosing
P068A	DCU Main Relay (Early opening)	-
P2510	DCU Main Relay (Stuck)	-
P0659	DCU Actuator Relay 0 SCB	-
P0658	DCU Actuator Relay 0 SCG	-
P2671	DCU Actuator Relay 1 SCB	-
P2670	DCU Actuator Relay 1 SCG	-
P2686	DCU Actuator Relay 2 SCB	-
P2685	DCU Actuator Relay 2 SCG	-
P26E9	DCU Actuator Relay 3 SCB	-
P26E8	DCU Actuator Relay 3 SCG	-
P206B	DEF Quality Error	DEF Quality
P206B	DEF Quality Error	DEF Quality
P206D	DEF Quality Sensor Open	Tampering
P206C	DEF Quality Sensor SCG	Tampering
P206A	DEF Quality Sensor Fail	Tampering
P206A	DEF Quality Sensor Fail	Tampering
P203D	DEF Level Sensor Open	Tampering
P203C	DEF Level Sensor SCG	Tampering
P203A	DEF Level Signal Error	-
P27B3	Outlet NOx Peak Plausibility Error	-
P27B4	Outlet NOx Stuck Error	-
P20E8	DEF Pump Pressure Too Low	-
P204D	DEF Pump Pressure Max	Tampering
P204C	DEF Pump Pressure Min	Tampering
P204F	DEF Pump Pressure Signal Error	-
P23BB	DEF Pump Pressure Too High	-
P23BA	DEF Pump Pressure Too Low	-
P204E	Defective Pressure Reduction	-
P204D	DEF Pump Pressure Max	Tampering

DTC	Description	Inducement
P204C	DEF Pump Pressure Min	Tampering
P204B	Monitoring of Pressure Build-up	Tampering
P204D	DEF Pump Pressure Max	Tampering
P27F0	Nox Controller Reset Error	-
P20C8	DEF Line Heater SCB	Interruption of Dosing
P20BD	DEF Line Heater 3 SCG or Open	Interruption of Dosing
P20C2	General Backflow Line Plausibility Error	Interruption of Dosing
P20C1	DEF Line Heater 4 SCG or Open	Interruption of Dosing
P20C5	DEF Line Heater 5 SCG or Open	Interruption of Dosing
P21C4	DEF Heater Relay SCB	Interruption of Dosing
P21C3	DEF Heater Relay SCG	Interruption of Dosing
P21C2	DEF Heater Relay Open	Interruption of Dosing
P21C2	DEF Heater Relay Open	Interruption of Dosing
P20BE	Pressure Line Heater Plausibility Error	Interruption of Dosing
P20C0	Pressure Line Heater SCB	Interruption of Dosing
P20BF	Pressure Line Heater SCG	Interruption of Dosing
P20BD	DEF Line Heater 3 SCG or Open	Interruption of Dosing
P20BE	Pressure Line Heater Plausibility Error	Interruption of Dosing
P20BE	Pressure Line Heater Plausibility Error	Interruption of Dosing
P20C2	General Backflow Line Plausibility Error	Tampering
P20C4	Backflow Line Heater SCB	Interruption of Dosing
P20C3	Backflow Line Heater SCG	Interruption of Dosing
P20C1	DEF Line Heater 4 SCG or Open	Interruption of Dosing
P20C2	General Backflow Line Plausibility Error	Interruption of Dosing
P20C6	Suction Line Heater Plausibility Error	Interruption of Dosing
P20C8	DEF Line Heater SCB	Interruption of Dosing
P20C7	Suction Line Heater SCG	Interruption of Dosing
P20C5	DEF Line Heater 5 SCG or Open	Interruption of Dosing
P20C6	Suction Line Heater Plausibility Error	Interruption of Dosing
P0426	SCR Inlet Temperature Error	Interruption of Dosing
P0426	SCR Inlet Temperature Error	Interruption of Dosing
P0428	SCR Inlet Temperature Sensor Signal High	Tampering
P0427	SCR Inlet Temperature Sensor Signal Low	Tampering
P24F6	SCR Inlet Temperature Plausibility Max	-
P24F5	SCR Inlet Temperature Plausibility Min	-
P24F4	SCR Inlet Temperature Static Plausibility	-
P0426	SCR Inlet Temperature Error	Interruption of Dosing
P042B	SCR Outlet Temperature Error	Interruption of Dosing
P042B	SCR Outlet Temperature Error	Interruption of Dosing
P042D	SCR Outlet Temperature Sensor Signal High	-

DTC	Description	Inducement
P042C	SCR Outlet Temperature Sensor Signal Low	-
P24FA	SCR outlet Temperature Static Plausibility	-
P042B	SCR Outlet Temperature Error	Interruption of Dosing
P27B6	Inlet Nox Plausibility Max	-
P27B5	Inlet Nox Plausibility Min	-
P27B1	Long-term Adaption Factor Max	-
P27B0	Long-term Adaption Factor Min	-
P27C0	Average Efficiency Error (SCR System)	-
P27C1	Average Efficiency Error (SCR System)	-
P27C2	Average Efficiency Error (SCR System)	-
P27C3	Average Efficiency Error (SCR System)	-
P115D	DEF Temperature Sensor Open	Tampering
P115C	DEF Temperature Sensor SCG	Tampering
P115A	DEF Temperature Sensor Fail	Tampering
P2A8D	DEF Pump Motor Speed Duty High	Tampering
P2A8C	DEF Pump Motor Speed Duty Low	Tampering
P208B	DEF Pump Motor Over temperature	-
P201F	DEF Pump Motor Speed Deviation Error (permanent)	Tampering
P208D	DEF Pump Motor SCB	Tampering
P208C	DEF Pump Motor SCG	Tampering
P208A	DEF Pump Motor Open	Tampering
P208B	DEF Pump Motor Over temperature	-
P2B8D	DEF Pump Motor Internal Duty High	Tampering
P2B8C	DEF Pump Motor Internal Duty Low	Tampering
P20FD	DEF Backflow Pump SCB	Tampering
P20FC	DEF Backflow Pump SCG	Tampering
P20FA	DEF Backflow Pump Open	Tampering
P20FB	DEF Backflow Pump Over temperature	Tampering
P2081	DOC Inlet Temperature Error	-
P2081	DOC Inlet Temperature Error	-
P2080	DOC Inlet Temperature Sensor Signal Error	-
P2080	DOC Inlet Temperature Sensor Signal Error	-
U1024	CAN communications faulty: DOC Inlet NOx sensor	-
U1025	CAN communications faulty: DOC Inlet NOx sensor	-
U1026	CAN communications faulty: DOC Inlet NOx sensor	-
U1027	CAN communications faulty: DOC Inlet NOx sensor	-
U1028	CAN communications faulty: DOC Inlet NOx sensor	-
U1029	CAN communications faulty: DOC Inlet NOx sensor	-
U102A	CAN communications faulty: DOC Inlet NOx sensor	-
U102B	CAN communications faulty: DOC Outlet NOx sensor	-

DTC	Description	Inducement
U102C	CAN communications faulty: DOC Outlet NOx sensor	-
U102D	CAN communications faulty: DOC Outlet NOx sensor	-
U102E	CAN communications faulty: DOC Outlet NOx sensor	-
U102F	CAN communications faulty: DOC Outlet NOx sensor	-
U1030	CAN communications faulty: DOC Outlet NOx sensor	-
U1031	CAN communications faulty: DOC Outlet NOx sensor	-
P204B	Monitoring of Pressure Build-up	Tampering
P204A	General Pressure Check Error	Tampering
U140F	DEF Pump Motor Communication Fail (Supply Module)	Tampering
P23B2	Supply Module Heater Plausibility Error	-
P25E1	Supply Module Heater Duty High	Tampering
P25E0	Supply Module Heater Duty Low	Tampering
P23B3	Supply Module Heater Temperature Plausibility Error	-
P23B4	Supply Module Heater Temperature cold start Plausibility Error	-
P20BC	Supply Module Heater SCB	Interruption of Dosing
P20BB	Supply Module Heater SCG	-
P20B9	Supply Module Heater Open	Interruption of Dosing
P20BA	Supply Module Heater Over temperature	Interruption of Dosing
P25E3	Supply Module Temperature Duty High	Tampering
P25E2	Supply Module Temperature Duty Low	Tampering
P23B5	Supply Module Temperature Plausibility Error	-
P23B6	Supply Module Temperature cold start Plausibility Error	-
P06EB	Outlet NOx Sensor Self-Diagnosis	-
P06EB	Outlet NOx Sensor Self-Diagnosis	-
P06EB	Outlet NOx Sensor Self-Diagnosis	-
P06EA	Inlet NOx Sensor Self-Diagnosis	-
P06EA	Inlet NOx Sensor Self-Diagnosis	-
P06EA	Inlet NOx Sensor Self-Diagnosis	-
U1904	Timeout of NOxSensGlbReqTx (NOX sensor)	-
U1646	Timeout of DM1ECU BAM (ECU)	-
U1660	Timeout of DM1ECU Packet (ECU)	-
U1444	Timeout of EEC1 (ECU)	-
U111A	Timeout of AT1I1 (Inlet Nox sensor)	-
U116D	Timeout of AT1O1 (Outlet Nox sensor)	-
U1300	Variant Dataset Error	-
P062F	EEPROM Code Word Error	-
U116F	Timeout of AT1OGC2 (Outlet Nox sensor)	-
U116E	Timeout of AT1OGC1 (Outlet Nox sensor)	-
U111C	Timeout of AT1IGC2 (Inlet Nox sensor)	-
U111B	Timeout of AT1IGC1 (Inlet Nox sensor)	-

DTC	Description	Inducement
U1800	Timeout of A1DOC (DOC Inlet Temperature Sensor)	-
U121A	Timeout AT1T1I (DEF Tank)	-
U1916	Timeout of EEC7 (ECU)	-
U1923	Timeout of A1DEFI (DEF Tank)	-
U1126	Timeout of DM1ECU (ECU)	-
U1661	Timeout of DM1ECUSPN1 (ECU)	-
U1147	Timeout of EEC3 (ECU)	-
U1162	Timeout of ET1	-
U1169	Timeout of AMB	-
U1170	Timeout of IC1	-
U1196	Timeout of PROSCR1 (ECU)	-
U1200	Timeout of PROSCR3 (ECU)	-
P23B0	Leakage Detection	-
P23B1	Evaluate Filter Clog	-
P2381	Inlet NOx Sensor Heater Readiness Error	-
P2383	Inlet NOx Sensor Mounting Error	-
P2385	Inlet NOx Sensor Signal Validity Error	-
P237E	Heater No Availability (Sensor 1)	-
P2387	Inlet NOx Sensor Dynamic High Error	-
P2388	Inlet NOx Sensor Dynamic Low Error	-
P2382	Outlet NOx Sensor Heater Readiness Error	-
P2384	Outlet NOx Sensor Mounting Error	-
P2386	Outlet NOx Sensor Signal Validity Error	-
P237F	Heater No Availability (Sensor 2)	-
P160C	DCU Reset 0	-
P160D	DCU Reset 1	-
P160E	DCU Reset 2	-
P160C	DCU Reset 0	-
P160D	DCU Reset 1	-
P160E	DCU Reset 2	-
P160F	Peripheral Monitoring Error	-
P1602	Sensor Supply Error	-
P1220	DEF Temperature Plausibility High	
P1221	DEF Temperature Plausibility Low	
P1223	DEF Temperature Too High	
P1224	DEF Temperature Too Low	
P1227	DEF Temperature Sensor Error	
P1229	DEF Temperature Signal Error	
P1230	DEF Level Signal Error	
P1231	DEF Level Sensor Fail	

DTC	Description	Inducement
P123A	DEF Fill Level High	
P123B	DEF Fill Level Low	
P123C	DEF Level is Warning	
P123D	DEF Level is Empty	
P1332	Dosing Valve Tip Temperature Error at Cold condition	
P1337	Dosing Valve Tip Temperature Error	
P1343	Dosing Valve Short Circuit to Battery	
P1344	Dosing Valve Short Circuit Error	
P1350	DOC Inlet Temperature Too High	
P1351	DOC Inlet Temperature Too Low	
P1353	DOC Inlet Temperature Sensor Signal High	
P1354	DOC Inlet Temperature Sensor Signal Low	
P1360	SCR Inlet Temperature Too High	
P1361	SCR Inlet Temperature Too Low	
P1370	SCR Outlet Temperature Too High	
P1371	SCR Outlet Temperature Too Low	
P1443	DEF Pump Pressure Max	
P1444	DEF Pump Pressure Min	
P1450	Overpressure in Metering Control	
P1451	Underpressure in Metering Control	
P1452	Monitoring of Over Pressure	
P1453	Pressure Stabilization Error	
P1455	Monitoring of Pressure Build-up	
P1511	DEF Quality Sensor Fail	
P1531	DEF Quality Signal Error	
P1560	DEF Quality Too High	
P1630	DCU EEP Read Error	
P1631	DCU EEP Write Error	
P16C0	DCU Reset 0	
P16C1	DCU Monitoring Error (query-/response-communication)	
P16C2	DCU Reset 1	
P16C3	DCU Monitoring Error (SPI communication)	
P16C4	DCU Reset 2	
P16C5	DCU Monitoring Error (ROM-test)	
P1710	Environment Temperature Too High	
P1711	Environment Temperature Too Low	
P1880	DEF Line failure	
P1882	Pressure Line Heater Plausibility Error	
P1884	Pressure Line Heater Over-temperature	
P1885	Pressure Line Heater Open Load	

DTC	Description	Inducement
P1892	Backflow Line Heater SCB	
P1893	General Backflow Line Plausibility Error	
P1894	Backflow Line Heater Over-temperature	
P1895	Backflow Line Heater Open Load	
P18A2	Suction Line Heater Plausibility Error	
P18A3	Suction Line Heater SCB	
P18A4	Suction Line Heater Over-temperature	
P18A5	Suction Line Heater Open Load	
P18B0	DEF Line Heater SCB	
P18B2	DEF Heater Relay Over-temperature	
P18B5	DEF Heater Relay Open Load	
P1A32	Self-Diagnosis in Nox Sensor 2 (Outlet Nox sensor)	
P1A37	Self-Diagnosis abort in Nox Sensor 2 (Outlet Nox sensor)	
P1A39	Nox Sensor 2 timeout to self-Diagnosis ((Outlet Nox sensor)	
P1A42	Self-Diagnosis in Nox Sensor 1 (Inlet Nox Sensor)	
P1A47	Self-Diagnosis abort in Nox Sensor 1 (Inlet Nox Sensor)	
P1A49	Nox Sensor 1 timeout to self-Diagnosis (Inlet Nox Sensor)	
P20EE	SCR Efficiency Monitoring (Nox Sensor)	
P20FF	Dosing Valve Tip Temperature Error	*TRQ3
U0024	SAE J1939 Error (Inlet Nox sensor)	
U0025	SAE J1939 Error (Inlet Nox sensor)	
U0026	SAE J1939 Error (Inlet Nox sensor)	
U0027	SAE J1939 Error (Inlet Nox sensor)	
U0028	SAE J1939 Error (Inlet Nox sensor)	
U0029	SAE J1939 Error (Inlet Nox sensor)	
U002A	SAE J1939 Error (Inlet Nox sensor)	
U002B	SAE J1939 Error (outlet Nox sensor)	
U002C	SAE J1939 Error (outlet Nox sensor)	
U002D	SAE J1939 Error (outlet Nox sensor)	
U002E	SAE J1939 Error (outlet Nox sensor)	
U002F	SAE J1939 Error (outlet Nox sensor)	
U0030	SAE J1939 Error (outlet Nox sensor)	
U0031	SAE J1939 Error (outlet Nox sensor)	
U010E	CAN A Bus-off	
U011A	Timeout of AT1I1 (Inlet Nox sensor)	
U011B	Timeout of AT1IGC1 (Inlet Nox sensor)	
U011C	Timeout of AT1IGC2 (Inlet Nox sensor)	
U0147	Timeout of EEC3 (ECU)	
U0162	Timeout of ET1	
U0169	Timeout of AMB	

DTC	Description	Inducement
U016D	Timeout of AT1O1 (Outlet Nox sensor)	
U016E	Timeout of AT1OGC1 (Outlet Nox sensor)	
U016F	Timeout of AT1OGC2 (Outlet Nox sensor)	
U0170	Timeout of IC1	
U0196	Timeout of PROSCR1 (ECU)	
U0200	Timeout of PROSCR3 (ECU)	
U0216	SAE J1939 Error (inlet Nox sensor)	
U0219	SAE J1939 Error (inlet Nox sensor)	
U021A	Timeout AT1T1I (DEF Tank)	
U0223	SAE J1939 Error (inlet Nox sensor)	
U0224	SAE J1939 Error (inlet Nox sensor)	
U0225	SAE J1939 Error (outlet Nox sensor)	
U0226	SAE J1939 Error (outlet Nox sensor)	
U0227	SAE J1939 Error (outlet Nox sensor)	
U0229	SAE J1939 Error (outlet Nox sensor)	
U0233	SAE J1939 Error (outlet Nox sensor)	
U0235	SAE J1939 Error (outlet Nox sensor)	
U0300	Variant Dataset Error	
U0401	UDS CAN ID Error	
U040F	DEF Pump Motor Communication Fail (Supply Module)	Tampering
U0444	Timeout of EEC1 (ECU)	
U0646	Timeout of DM1ECU BAM (ECU)	
U0660	Timeout of DM1ECU Packet (ECU)	
U0661	Timeout of DM1ECUSPN1 (ECU)	
U0800	Timeout of A1DOC (DOC Inlet Temperature Sensor)	
U0904	Timeout of NOxSensGlbReqTx (NOX sensor)	
U0916	Timeout of EEC7 (ECU)	
U0923	Timeout of A1DEFI (DEF Tank)	

Information - correlation between Symbol and message (Display)

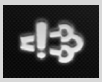
As shown in the table below, for your information, we provide correlation between Engine fault warning strategy and LCD display.

Warning Stage	Warning Strategy				LCD Display	
	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit	Method	Message on the Display
						
Normal	Off	Off	0%	NA	NA	NA
Level1	On	On	Reduced	Reduced	Continuous	**ENGINE MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power Reduced!
Level2	Blinking	On	Limp home	Limp home	Continuous	**ENGINE MALFUNCTION CALL CROWN SERVICE AGENT** Engine is in Limp home Mode
Level3	Blinking	On	Engine Stop	Engine Stop	Continuous	**FATAL ENGINE ERROR CALL CROWN SERVICE AGENT** Engine Stop after 5min

DEF/Ad-Blue Level inducement for USA / Europe

There are several DEF/Ad-Blue level points at which the DEF level indicator lamp changes and the display shows a message to warn the shortage of DEF/Ad-Blue. The lower the point, the more the system limits the engine power and speed in order to prevent nitrogen oxide emissions from exceeding the acceptable level due to a lack of DEF/Ad-Blue. As shown in the table below, for your information, we provide correlation of DEF/Ad-Blue level inducement strategy and LCD display.

DEF/Ad-Blue Level Inducement for USA

Inducement Stage	Condition DEF volume [%]	Repeat Offence (within 40hrs)	Inducement Strategy					
			DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
								
Normal	25 ~ 100	NA	Green ON	Off	Off	Off	0%	NA
Warning	10 ~ 25	NA	Yellow ON	On	Off	Off	0%	NA
Level1	2.5~10	NA	Red Blink	Slow Blink	Off	Off	25%	NA
Level2	0~2.5	NA	Red Blink	Fast Blink	Off	On	0%	Low idle only

Inducement Stage	Condition DEF volume [%]	Repeat Offence (within 40hrs)	LCD Display	
			Method	Message on the Display
				
Normal	25 ~ 100	NA	NA	NA
Warning	10 ~ 25	NA	At starting & Every 20min	**DEF LOW - REFILL** Engine Power Will Be Reduced
Level1	2.5~10	NA	At starting & Every 20min	**DEF VERY LOW - REFILL NOW** Engine Power Reduced By 25%
Level2	0~2.5	NA	Continuous	**DEF EMPTY** Engine can run LOW IDLE ONLY

DEF/Ad-Blue Level Inducement for Europe

Inducement Stage	Condition DEF volume [%]	Repeat Offence (within 40hrs)	Inducement Strategy					
			DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
								
Normal	25 ~ 100	NA	Green ON	Off	Off	Off	0%	NA
Warning	10 ~ 25	NA	Green ON	Off	Off	Off	0%	NA
Level1	2.5~10	NA	Yellow ON	Slow Blink	Off	Off	25%	NA
Level2	0~2.5	NA	Red Blink	Fast Blink	On	Off	50%	Low idle only

Inducement Stage	Condition DEF volume [%]	Repeat Offence (within 40hrs)	LCD Display	
			Method	Message on the Display
				
Normal	25 ~ 100	NA	NA	NA
Warning	10 ~ 25	NA	At starting & Every 20min	**DEF LOW - REFILL** Engine Power Will Be Reduced
Level1	2.5~10	NA	Every 10min	**DEF VERY LOW - REFILL NOW** Engine Power Reduced By 25%
Level2	0~2.5	NA	Continuous	**DEF EMPTY** Engine can run LOW IDLE ONLY

DEF/Ad-Blue Quality Failure for USA / Europe

If you use a poor quality DEF/Ad-Blue type, engine power will decrease in order to prevent the SCR system from functional degradation and damage. Continued use of poor quality DEF/Ad-Blue may result in high replacement cost due to damage caused to the SCR system. As shown in the table below, for your information, we provide correlation of DEF/Ad-Blue quality inducement strategy and LCD display.

DEF/Ad-Blue Quality Failure for USA

Inducement Stage	Condition	Repeat Offence (within 40hrs)	Inducement Strategy					
			DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
								
Normal	NA	NA	Green ON	Off	Off	Off	0%	NA
Warning	Tampering was detected	NA	Green ON	On	Off	Off	0%	NA
Level1	~0.5hrs	NA	Green ON	Slow Blink	On	Off	25%	NA
Level2	0.5~2.5hrs	Immediately	Green ON	Fast Blink	On	Off	50%	60% (about 1500rpm)
Level3	2.5~3.5hrs	~25min	Green ON	Fast Blink	Blinking	On	0%	Low idle only

Inducement Stage	Condition	Repeat Offence (within 40hrs)	LCD Display	
			Method	Message on the Display
				
Normal	NA	NA	NA	NA
Warning	Tampering was detected	NA	At starting & Every 20min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power Reduced in 30min
Level1	~0.5hrs	NA	At starting & Every 20min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power is Reduced By 25%
Level2	0.5~2.5hrs	Immediately	Every 10min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power is Reduced By 50%
Level3	2.5~3.5hrs	~25min	Continuous	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine can run LOW IDLE ONLY

DEF/Ad-Blue Quality Failure for Europe

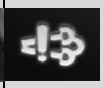
Inducement Stage	Condition	Repeat Offence (within 40hrs)	Inducement Strategy					
			DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
								
Normal	NA	≥ 90% of counter value for severe induce ment (18hrs)	Green ON	Off	Off	Off	0%	NA
Warning	Poor DEF quality was detected		Green ON	On	Off	Off	0%	NA
Level1	10~20hrs		Green ON	Slow Blink	On	Off	25%	NA
Level2	over 20hrs		Green ON	Fast Blink	Blinking	Off	50%	60% (about 1500rpm)

Inducement Stage	Condition	Repeat Offence (within 40hrs)	LCD Display	
			Method	Message on the Display
				
Normal	NA	≥ 90% of counter value for severe inducement (20hr)	NA	NA
Warning	Poor DEF quality was detected		At starting & Every 20min	**DEF QUALITY POOR - CHANGE NOW** Engine Power will be Reduced
Level1	10~20hrs		At starting & Every 20min	**DEF QUALITY POOR - CHANGE NOW** Engine Power Reduced By 25%
Level2	over 20hrs		Continuous	**DEF QUALITY POOR - CHANGE NOW** Engine Power Reduced By 50%

SCR system tampering for USA / Europe

There are several tampering level points at which the DEF indicator lamp lights up or blinks and the display shows a message to warn that the DEF/Ad-Blue is not being consumed due to the malfunctioning of the SCR system, the installation of another device to the system, or the handling of related parts. The lower the point, the more the system limits the engine power and speed. As shown in the table below, for your information, we provide correlation of SCR tampering inducement strategy and LCD display.

SCR system Tampering for USA

Inducement Stage	Condition	Repeat Offence (within 40hrs)	Inducement Strategy					
			DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
								
Normal	NA	NA	Green ON	Off	Off	Off	0%	NA
Warning	Tampering was detected	NA	Green ON	On	Off	Off	0%	NA
Level1	~0.5hrs	NA	Green ON	Slow Blink	On	Off	25%	NA
Level2	0.5~2.5hrs	Immediately	Green ON	Fast Blink	On	Off	50%	60% (about 1500rpm)
Level3	2.5~3.5hrs	~25min	Green ON	Fast Blink	Blinking	On	0%	Low idle only

Inducement Stage	Condition	Repeat Offence (within 40hrs)	LCD Display	
			Method	Message on the Display
				
Normal	NA	NA	NA	NA
Warning	Tampering was detected	NA	At starting & Every 20min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power Reduced in 30min
Level1	~0.5hrs	NA	At starting & Every 20min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power is Reduced By 25%
Level2	0.5~2.5hrs	Immediately	Every 10min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power is Reduced By 50%
Level3	2.5~3.5hrs	~25min	Continuous	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine can run LOW IDLE ONLY

SCR system Tampering for Europe

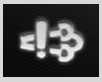
Inducement Stage	Condition	Repeat Offence (within 40hrs)	Inducement Strategy					
			DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
								
Normal	NA	≥ 95% of counter value for severe induce ment (95hrs)	Green ON	Off	Off	Off	0%	NA
Warning	Tamperin g was detected		Green ON	On	Off	Off	0%	NA
Level1	36~100 hrs		Green ON	Slow Blink	On	Off	25%	NA
Level2	Over 100hrs		Green ON	Fast Blink	Blinking	Off	50%	60% (about 1500rpm)

Inducement Stage	Condition	Repeat Offence (within 40hrs)	LCD Display	
			Method	Message on the Display
				
Normal	NA	≥ 95% of counter value for severe inducement (95hrs)	NA	NA
Warning	Tampering was detected		At starting & Every 20min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power will be Reduced
Level1	36~100 hrs		At starting & Every 20min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power is Reduced By 25%
Level2	Over 100hrs		Continuous	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power is Reduced By 50%

Impeded EGR / Interruption of Dosing for Europe only

There are several interruption level points at which the DEF indicator and engine check lamps light up or blink and the display shows a message to warn that the DEF/Ad-Blue is not being consumed due to a fault on the engine EGR valve and SCR system. The lower the point, the more the system limits the engine power and speed. As shown in the table below, for your information, we provide correlation of Impeded EGR / Interruption of Dosing inducement strategy and LCD display.

Interruption of Dosing for Europe

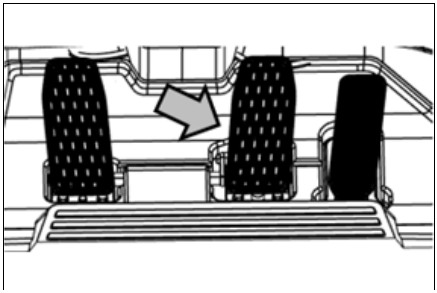
Inducement Stage	Condition	Repeat Offence (within 40hrs)	Inducement Strategy					
			DEF Level Indicator	DEF Indicator	Engine Check Lamp	Buzzer	Torque Reduction	RPM Limit
								
Normal	NA	≥ 90% of counter value for severe induce ment (18hrs)	Green ON	Off	Off	Off	0%	NA
Warning	Impeded Dosing detected		Green ON	On	Off	Off	0%	NA
Level1	10~20hrs		Green ON	Slow Blink	On	Off	25%	NA
Level2	Over 20hrs		Green ON	Fast Blink	Blinking	Off	50%	60% (about 1500rpm)

Inducement Stage	Condition	Repeat Offence (within 40hrs)	LCD Display	
			Method	Message on the Display
				
Normal	NA	≥ 90% of counter value for severe inducement (18hrs)	NA	NA
Warning	Impeded Dosing detected		At starting & Every 20min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power will be Reduced
Level1	10~20hrs		At starting & Every 20min	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power is Reduced By 25%
Level2	Over 20hrs		Continuous	**SCR SYSTEM MALFUNCTION CALL CROWN SERVICE AGENT** Engine Power is Reduced By 50%

Lift Truck Operation

Power Shift Transmission / Drive Axle

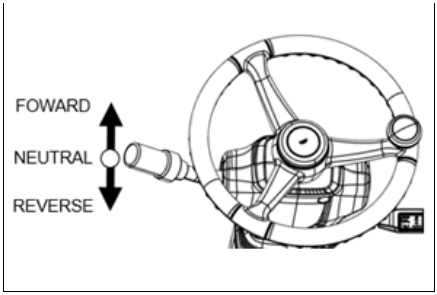
1. Start the engine. See item "Starting the Engine"



Typical Example

2. PUSH DOWN on the service foot brake pedal to hold the lift truck until ready to move it.

3. RELEASE the parking brake.



Typical Example

4. Select the direction of travel by PUSHING the directional lever FORWARD for forward direction or PULLING the lever BACK for reverse direction.

5. Rotate the speed range control to first (low) speed range.

NOTE: From a stopped position, move the lift truck in first (low) range ONLY.

⚠ WARNING

A lift truck with the engine running but without an operator can move slowly (creep) if the transmission is left engaged.

This could result in personal injury.

Always place the transmission control levers in the NEUTRAL (centre) position and apply the parking brake before dismounting from the lift truck.

6. RELEASE the service foot brake.

7. PUSH DOWN on the accelerator pedal to obtain the desired travel speed. RELEASE the pedal to decrease travel speed.

8. Transmission speed changes to second and third speed range can be made on the go, without deceleration or braking. When faster travel speed is needed.

NOTICE

Come to a complete stop before changing direction of travel.

⚠ WARNING

Sudden reversal of a loaded lift truck traveling forward can cause the load to fail or the lift truck to tip over.

Stop the loaded lift truck completely, before shifting to reverse.

Failure to comply could result in personal injury.

9. To change the lift truck direction of travel, RELEASE the accelerator pedal.

10. PUSH DOWN on the service foot brake pedal to bring the lift truck to a complete stop.

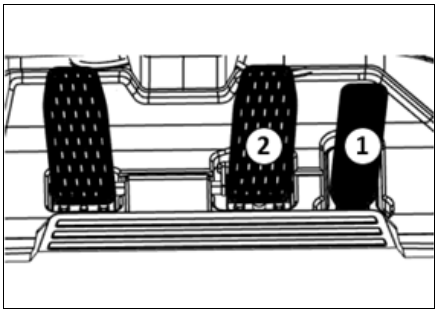
11. SHIFT the directional lever to the desired direction of travel. Rotate the speed selector lever to first (low) speed range, if it is not already in this position.

12. RELEASE the service foot brake. PUSH DOWN on the accelerator pedal to obtain the desired travel speed.

⚠ WARNING

Watch the road carefully for any obstacle when driving the truck. Do not go fast over bumps, pot holes or other rough grounds, otherwise the engine might go OFF by a severe impact.

In case of engine going OFF, press the brake pedal at one time as hard as possible in order to stop the truck. Pressing the brake pedal several times has a risk that the brake would not work.



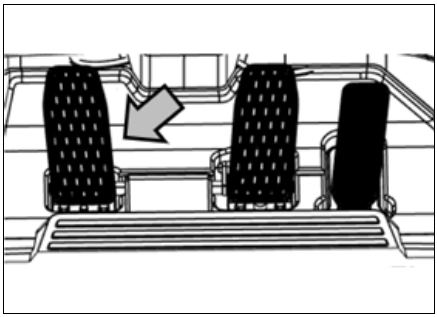
Typical Example

13. To stop the lift truck when travelling in either direction, RELEASE accelerator pedal (1).

14. PUSH DOWN on service foot brake pedal (2) and bring the lift truck to a smooth stop.

Inching

NOTE: The purpose of the inching pedal is to provide precise lift truck inching control at very slow travel speed and high engine rpm. This is used for fast hydraulic lift during load approach, pick up or load positioning.



Typical Example

1. To inch (creep) in either direction, slowly push down on the inching pedal. This will start to apply the service foot brakes and allow the transmission clutch discs to slip.

2. Vary the position of inching pedal and the accelerator pedal to control the inching speed and distance.

3. Pushing down further on the inching pedal will disengage the transmission completely and apply the service brakes fully to stop and hold the lift truck. This will provide full engine power for fast hydraulic lift.

4. Avoid overuse of the inching pedal as this may cause the automatic transmission oil to overheat or the clutch to slip. Do not use as a footrest or for long periods of time.

5. If user operates continuously pushing work or both brake pedal and accelerator pedal were depressed at the same time, it may cause the automatic transmission oil to overheat or the clutch to slip.

TMS(Lin-Q) (Option)

Safety Precautions

This information is intended to protect the safety and property of the user.

Before using the TMS (LIN-Q) terminal, make sure to read the user manual carefully and familiarise yourself with the contents.

Operating Environment

- The TMS (LIN-Q) terminal has an operating voltage of DC 9 V – 34 V.
- Make sure to use it within the specified temperature range.

Installation and Wiring

- The installation and wiring procedures require professional expertise. Consult a professional technician for assistance with installing the product. Improper installation or wiring may cause a fire and/or malfunction.
- Perform the installation and wiring in a place free of moisture. Installing the product in a place with the risk of water or rain splashing on it or with significant amounts of dust or dirt may cause malfunctions and accidents.
- Use the specified cables and parts.
- When installing the product on the ceiling of the machine or in places with severe vibrations, take care to ensure that it does not fall and make sure that it is secured properly.
- Do not block any vents or heat sinks. Doing so may cause a fire.

Precautions for Using the Product

- Avoid operating the terminal while the vehicle is running; otherwise, an accident may occur. Stop the machine in a safe place before operating the terminal.
- Do not disassemble or modify the terminal without permission. Unauthorised disassembly and modification may cause a malfunction and void the warranty for after-sales service.

Basic TMS

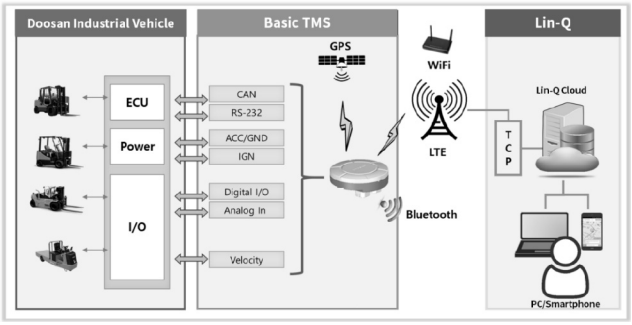
Lift Control knob

The TMS (LIN-Q) terminal is mounted on the forklift to monitor the driving and operating state of the vehicle.

To register and use the product, visit the Lin-Q website or contact an administrator.

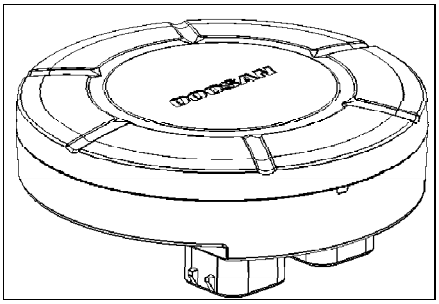
System Schematic Drawing

The terminal uses LTE, Wi-Fi communications (providing each terminal) and is an IoT terminal which can be used anywhere in the world.



Product Configuration and Functions

The TMS (LIN-Q) terminal is configured and connected as shown in the figure below. A separate harness cable assembly is required to connect it to the vehicle.



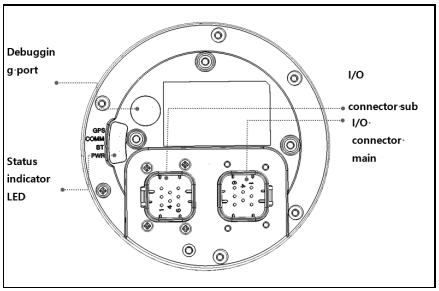
- LTE communications (Cat 4, 150M DL/ 50M UL), globally supported modem
- CAN data (J1939) collection
- Data collection from various vehicle sensors
- Periodic transmission of collected data
- Transmission of irregular event data
- Operating restriction by syncing with NFC
- Impact detection
- Remote update function
- Various I/O ports
  - 2 digital inputs
  - 3 digital in/outputs
  - 1 analog input
  - CAN
  - UART 2 ports

Product Specifications

Item	DTM-02L	
Size	ø117.7 (D) x 31 (H) [mm] [Unit: mm]	
Weight	204 grams	
Operating temp.	-30°C to +70°C (-22°F to +158°F)	
Storage temp.	-40°C to +85°C (-40°F to +185°F)	
Vibrations	Random 5 – 20 Hz 0.05 g2/Hz, 20 – 150 Hz: -3 dB/oct. (1.7g rms), 3-axis, 30 minutes for each axis.	
Thermal shock	-40°C (1H)/+85°C (1H), 1 cycle - total 24 cycles, 48H, non-operating	
Humidity	+70°C /95%/48 hours, operating	
Communication	LTE	LTE data modem (LTE Cat4, worldwide)
	BT	nRF52810, Bluetooth 5.0
GPS	Chipset	Gen8C-Lite
	TTFF	Cold start: 35 sec./Hot start: 2.5 sec.
IP class	IP66	
Operating voltage	+9 V DC to +34 V DC	
Current consumption	Sleep mode: 20 uAh or less (IGN OFF) /Standby mode: 100 mAh or less	
I/O ports	2 X 8 pin waterproof connectors	
Antenna	LTE	Internal
	BT	Internal
	GPS	Internal
SIM	ESIM	
LED	4 LEDs (POWER, BT, COMM, GPS)	

Names and Functions of Parts

Terminal Body



Name	Feature	Remarks
I/O connector main	A connector for connecting to the vehicle	8 pins, black
I/O connector sub	A connector for connecting to the vehicle	8 pins, natural
Status indicator LED	Four LEDs indicating the current status of the terminal	
Debuggin g port	Debugging port for developers	

There are two types of connectors: A (black) and B (natural). The pin map is shown in the table below.

CONNECTOR Main (776276-1, Black)

No.	Name	Type	Description
1	FUEL_ ADC	Input	Signal Input Analog (with ADC)
2	CAN Low	Input/ Outpu t	CAN Low Signal
3	IGN+	Input	IGN+ Signal Input (Logic)
4	BRK	Input	Brake Signal Input (Logic)
5	GND1	Powe r	Digital Ground
6	SPD	Input	Speed Signal Input (Logic)
7	CAN High	Input/ Outpu t	CAN High Signal
8	BAT+	Powe r	Car Battery +

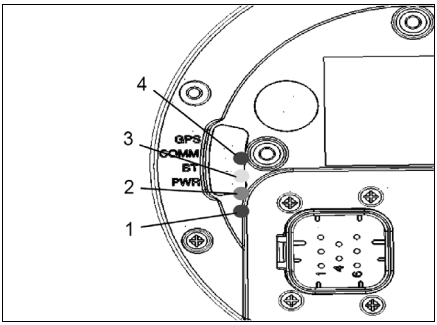
CONNECTOR Sub (776276-2, Natural)

No.	Name	Type	Description
1	ACC_T XD	Outp ut	RS232C Level TXD Signal (Acc_Sensor)
2	GPI01	Input/ Outpu t	Digital Signal Input1/Output1 (Logic)
3	NFC_T XD	Outp ut	RS232C Level TXD Signal (NFC Reader)
4	GPI02	Input/ Outpu t	Digital Signal Input2/Output2 (Logic)
5	GND2	Powe r	Digital Ground
6	ACC_ RXD	Input	RS232C Level RXD Signal (Acc_Sensor)
7	GPI03	Input/ Outpu t	Digital Signal Input3/Output3 (Logic)
8	NFC_R XD	Input	RS232C Level RXD Signal (NFC Reader)

Status Indicator LED

DTM-02L indicates the status of the terminal with LEDs.

There are four LEDs which indicate the status of the terminal with colors as shown in the table below.



No.	Display Info	Color	Status	Detailed Status	Description
1	POWER	Red	Power status	Off	Power off
				On	Power on
2	BT	Green	BT communication status	Off	BT disconnected
				On	BT connected
				Blinking	BT data transmission in progress
3	COMM	Yellow	Communication status	Off	LTE disconnected
				On	LTE connected
				Blinking	LTE data transmission
4	GPS	Red	GPS connection status	Off	GPS disconnected
				On	GPS connected

Using the Product

A. User Registration

You must perform user registration in order to use the product.

To register a user, visit the branch from which the product was purchased or go to https://lin-q.doosan-iv.com.

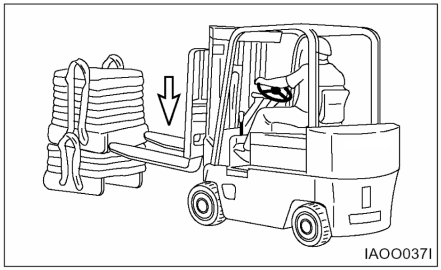
For more details, refer to the Lin-Q user manual.

B. Activating LTE Mode

The product comes with an ESIM (chip setting SIM card) installed and activated.

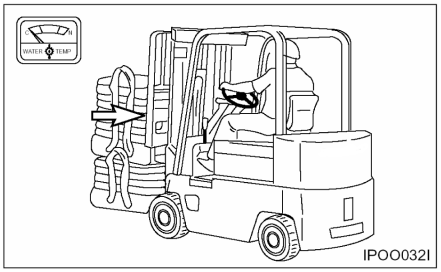
Operating Techniques

Inching into Loads



Typical Example

1. Move the lift truck slowly FORWARD into position and engage the load. The truck should be square with load, forks spaced evenly between pallet stringers and as far apart as load permits.

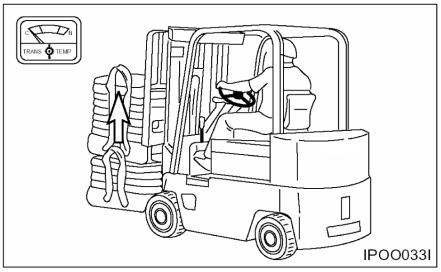


Typical Example

2. Move the lift truck FORWARD until the load touches the carriage.

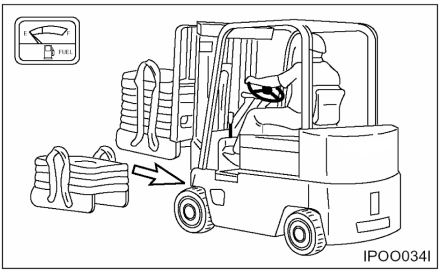
Lifting the Load

1. Lift the load carefully and tilt the mast back a short distance.



Typical Example

2. Tilt the mast further back to cradle the load



Typical Example

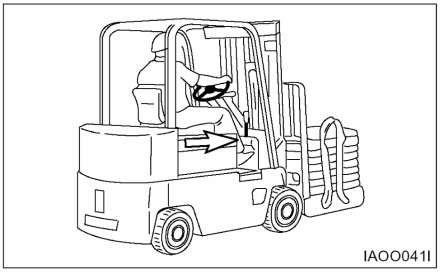
3. Operate the lift truck in reverse until the load is clear of the other material.
4. Lower the cradled load to the travel position.

NOTE: Lift and tilt speeds are controlled by engine rpm.

Traveling with the Load

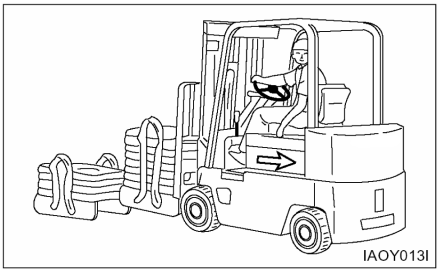
NOTICE

Travel with the load as low as possible, while still maintaining ground clearance.



Typical Example

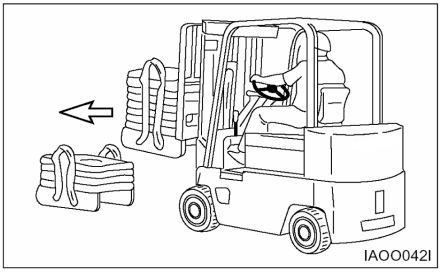
1. Carry the load as low as possible but maintain clearance.
2. On grades, always travel with the load on the UPHILL side, as shown above.



Typical Example

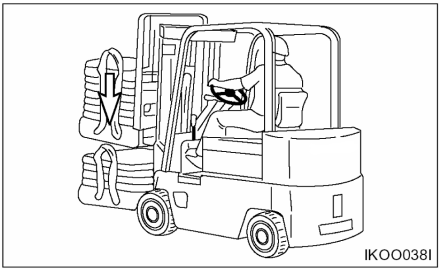
3. For better vision, travel in reverse with bulky loads.

Unloading



Typical Example

1. Move the lift truck into the unloading position.

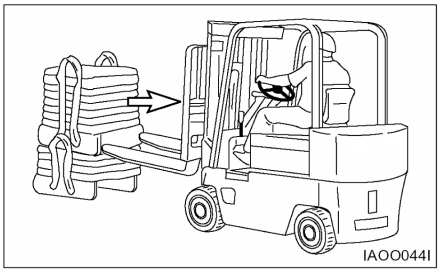


Typical Example

2. Tilt the mast FORWARD only when directly over the unloading area.

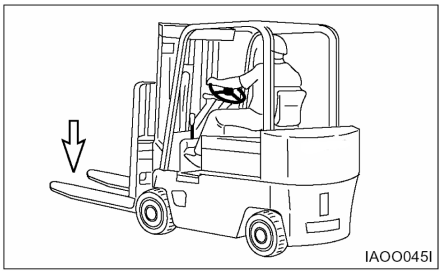
⚠ WARNING

Do not tilt the mast forward with the load unless directly over the unloading area, even if the power is off.



Typical Example

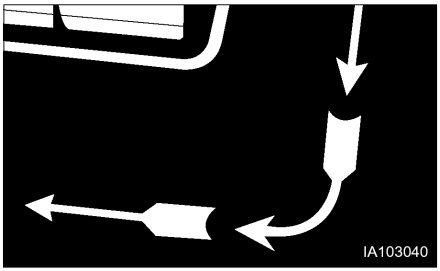
3. Deposit the load and BACK away carefully to disengage the forks.



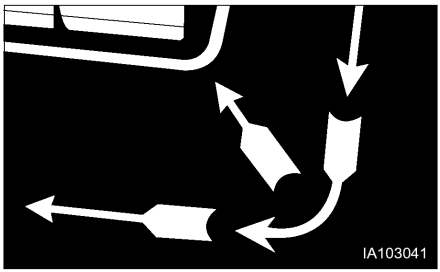
Typical Example

4. Lower the carriage and forks to the travel position or to the park position.

Turning

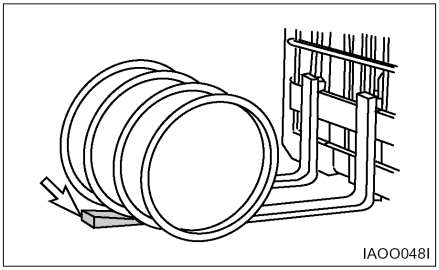


1. When turning sharp corners, keep close to the inside corner. Begin the turn when the inside drive wheel meets the corner.

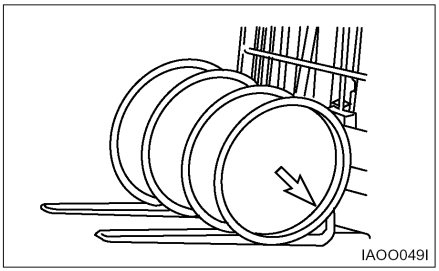


2. In narrow aisles, keep away from the stockpile when turning into the aisle. Allow for counterweight swing.

Lifting Drums or Round Objects



1. Block drums or round objects. Tilt the mast FORWARD and side the fork tips along the floor to get under the load.



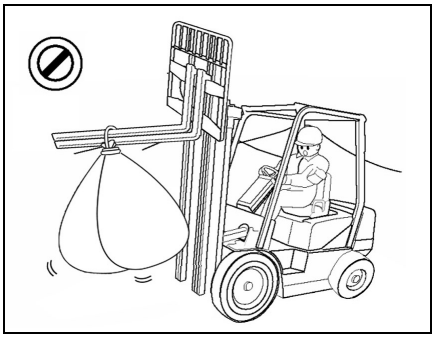
2. Before lifting, tilt the mast BACK slightly until the load is cradled on the forks.

Operating in Hot Weather

Keep the following points in mind when you operate the lift truck in hot weather.

1. Check the radiator. Clogging can cause the overheating. Clean them out regularly with a blast of compressed air. Also, check the leakage of water.
2. Check the fan belt tension and adjust to proper tension
3. Even if the engine overheats and the coolant boils over, let the engine idle for a while with opening engine hood until temperature falls before shut off the engine.

Safety instructions for attachments when transporting suspended load



⚠ WARNING

Swinging/wide loads and a reduced residual capacity can result in accidents.

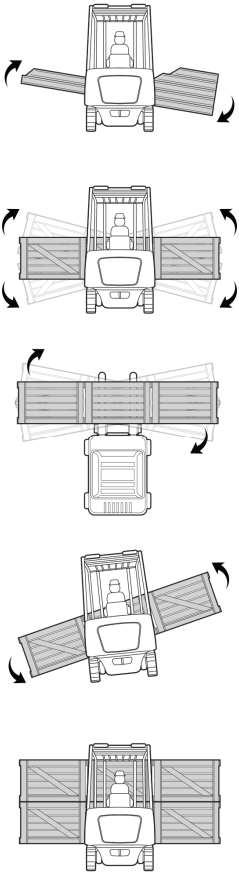
Adapt the travel speed to the load, less than walking pace.

Secure swinging loads for example with lifting slings.

Reduce the residual capacity and have it certified by an expert.

Failure to follow the operation precautions may cause early damage to parts.

Safety instructions for attachments when transporting wide loads



Load lateral centre of gravity
Where it is necessary to lift a wide load where the lateral load centre of gravity is unknown.
Do a test lift first to determine lateral centre of gravity and potential movement with the load during transport. Exercise extra caution when handling offcentre loads that cannot be centred.

Load Stability
Be careful when stopping or changing direction suddenly, lifting or lowering suddenly as wide loads could become unstable.

Load Swing
Be careful whilst travelling or turning, the load ends will swing wide. Make sure you have adequate clearance, and watch out for people in the area.

Load Shift
Be careful when turning, turn slowly to prevent load from shifting.

Visibility
When carrying a bulky load which blocks or restricts forward visibility the truck shall be driven with the load trailing and if necessary under the direction of a person who has visibility in the direction of travel, unless safe work practices allow otherwise

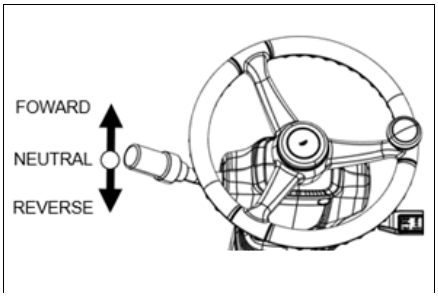
Parking the Lift Truck

Typical Example

Park the lift truck level, with the forks lowered and the mast tilted forward until the fork tips touch the floor.

Block the drive wheels when parking on an incline.

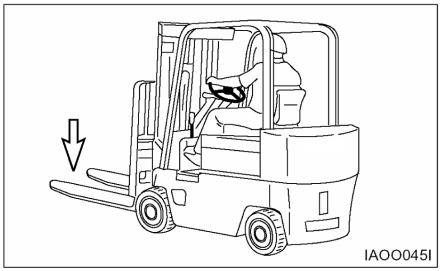
1. Park in authorised area only. Do not block traffic.



Typical Example

2. Place the transmission controls in NEUTRAL.

3. Engage the parking brake.



Typical Example

4. Lower the forks to the ground.

⚠ WARNING

Blocking the wheels will prevent unexpected lift truck movement, which could cause personal injury.

5. Turn the ignition key switch to the OFF position and remove the key.

6. Turn the disconnect switch to OFF (if equipped).

7. Do operate the disconnecting switch after 30 seconds from start key-off.

8. Otherwise Engine Control Unit (ECU) can be damaged.

9. Actuate each loading lever several times to remove the residual pressure in the respective cylinders and hoses.

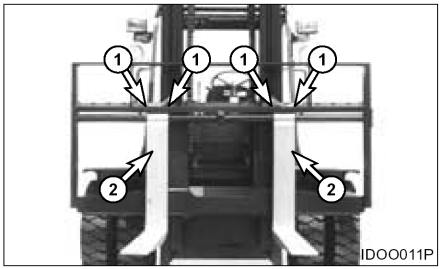
10. Block the drive wheels if parking on an incline.

Lift Fork Adjustment

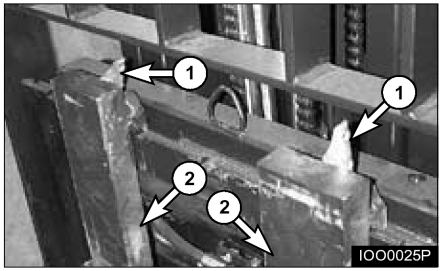
⚠ WARNING

When adjusting the fork spread, be careful not to pinch your hand between forks and the carriage slot.

For load stability, always adjust the forks as wide as possible. Position the load evenly on both forks.



Typical Example of Shaft type Fork



Typical Example of Hook-on type Fork

1. Move up the hook pin(1) in each fork to slide the fork(2) on the carriage bar.
2. Adjust the forks in the position most appropriate for the load and as wide as possible for load stability.
3. When adjusting the forks, make sure that the weight of the load is centred on the truck.
4. After adjustment, set the hook pins to keep the forks in place.

⚠ WARNING

Make sure the forks are locked before carrying a load.

If the fork/locking pin is not fully engaged, the fork could become unintentionally disengaged.

Storage Information

Before Storage

Before storing your lift truck, clean and inspect as per the following procedures.

1. Wipe away grease, oil, etc. adhering to the body of the truck with waste cloth, and use water, if needed.
2. While cleaning the truck, check general condition of the truck. Especially check the truck body for dents or damage and tyres for wear or nails or stones in the tread.
3. Fill the fuel tank with fuel specified.
4. Check for leakage of hydraulic oil, engine oil, fuel, or coolant, etc.
5. Apply grease, where needed.
6. Check for looseness of nuts and bolts, especially hub nuts.
7. Check mast rollers to see that they rotate smoothly.
8. Prime the oil into the lift cylinders by actuating the lift lever all the way several times.
9. Drain off coolant completely in cold weather, if antifreeze is not used.
10. Drain off DEF/Ad-Blue completely for long term storage. (If not the purity of DEF/Ad-Blue would be changed to lower quality.)

Long Time Storage

Perform the following service and checks in addition to the "Parking the lift truck" services.

1. Taking the rainy season into consideration, park the machine on higher and hard ground.
2. Avoid parking on soft grounds such as an asphalt ground in summer.
3. Dismount the battery from the machine. Even though the machine is parked indoors, if the place is hot or humid, the battery should be kept in a dry, cool place. Charge the battery once a month.
4. Apply antirust to the exposed parts which tend to rust.
5. Cover components such as the breather and air cleaner which may be caught with humidity.
6. The machine should be operated at least once a week. Fill the cooling system, if cooling water is discharged, and mount the battery. Start the engine and warm up thoroughly. Move the machine a little forwards and backwards. Operate the hydraulic controls several times.

To Operate the Lift Truck After a Long Time Storage

1. Remove covers and antirust from each of the components and exposed parts.
2. Drain the engine crankcase, transmission (clutch type machine), differential and final reduction gear, clean the inside of them and add new oil.
3. Drain off foreign matter and water from the hydraulic oil tank and fuel tank.
4. Remove the head cover from the engine cylinder. Oil valves and rocker shaft and check each valve for proper operation.
5. Add cooling water to the specified level.
6. Charge the battery and mount it on the machine. Connect the cables.
7. Perform pre - operational checks carefully. (Refer to "Before Starting the Engine")
8. Warm up the machine.
9. If deteriorated DEF/Ad-Blue warning lamp turns on and message appears, drain the fluid in the DEF/Ad-Blue tank thoroughly and refill with new DEF/Ad-Blue.
10. Check level of DEF/Ad-Blue and if necessary refill DEF/Ad-Blue (refer page.77)

Method and Caution for Cabin Tilting (Optional)

Cabin Tilting

Cabin Tilting Lock (Driver absence)

Cabin tilting is locked when the seat detects the driver's presence. It is possible to tilt the cabin if driver absence is detected.

Mast angle sensor

The mast angle sensor measures the slope of the mast. It is possible to tilt the cabin if the mast is slanted forward or 90 degree.

⚠ WARNING

If the mast angle sensor is not active, the cabin will be tilted when the mast is inclined backwards. This may damage cabin chassis or cabin front glazing.

Cabin Door

Check that the cabin door is closed before tilting the cabin.

⚠ WARNING

If the cabin door is open when tilting, the cabin door may touch the frame and damaged.

Cabin Tilting (power type)

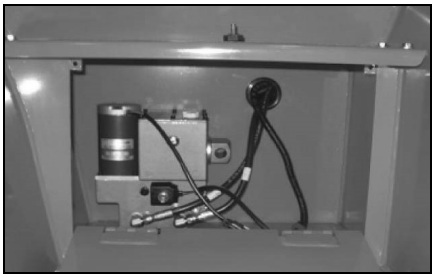
⚠ WARNING

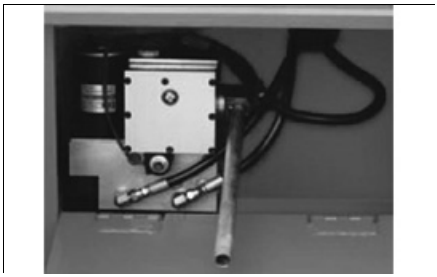
Make sure that there is sufficient space before tilting the cabin.

Press the tilting switch on top of the left hood to tilt the cabin. Press the upper or lower arrow switches to open or close the cabin, respectively.

Cabin Tilting (manual)

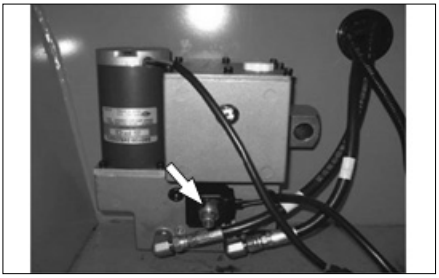
1. For manual cabin tilting, open the cover under the left step equipped with power-pack. Support the power-pack with a lever and move the lever up and down.





2. To adjust cabin tilting position in manual tilting operation, change the direction with the Manual Override Position shown below.

- NORMAL POSITION: keep pressing the button, rotate the button counterclockwise by 180 degrees and release the button.
- SHIFTED POSITION: keep pressing the button, rotate the button clockwise by 180 degrees and release the button.



Transportation Hints

Lift Truck Shipping

Check travel route for overpass clearances. Make sure there is adequate clearance if the lift truck being transported is equipped with a high mast, overhead guard or cab.

To prevent the lift truck from slipping while loading, or shifting in transit, remove ice, snow or other slippery material from the loading dock and the truck bed before loading.

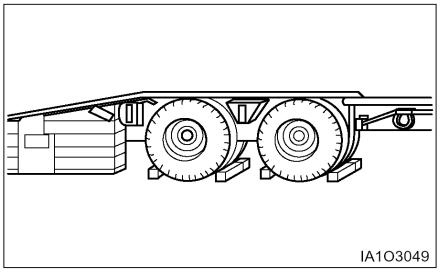
NOTICE

Obey all state and local laws governing the height, weight, width and length of a load.

Observe all regulations governing wide loads.

NOTICE

Remove ice, snow or other slippery material from the shipping vehicle and the loading dock.



Typical Example

Always block the trailer or the rail car wheels before loading the lift truck.

Position the lift truck on the truck bed or the rail car. Apply the parking brake and place the transmission control in NEUTRAL.

Turn ignition switch to the OFF position and remove the key.

If LP equipped, remove the LP fuel tank.

Block the wheels and secure lift truck with tie downs.

Machine Lifting and Tie down Information

NOTICE

Improper lifting or tie downs can allow load to shift and cause injury and/or damage.

1. Weight is given on the serial plate.
2. Use proper rated cables and slings for lifting. Position the crane for level lift truck lift.
3. Spreader bar widths should be sufficient to prevent contact with the lift truck
4. Use the tie down locations provided for lift truck tie down.

Check the state and local laws governing weight, width, and length of a load.

Contact your CROWN Lift Truck branch for shipping instructions for your lift truck.

Lifting a Forklift Using a Crane

⚠ WARNING

1. If lifting rope/cable breaks, serious injury/damage would occur.

2. The lifting wire rope and stay must be long enough to avoid contact with the forklift. Short rope/stay can damage the vehicle. If it's too long, it may cause interference.

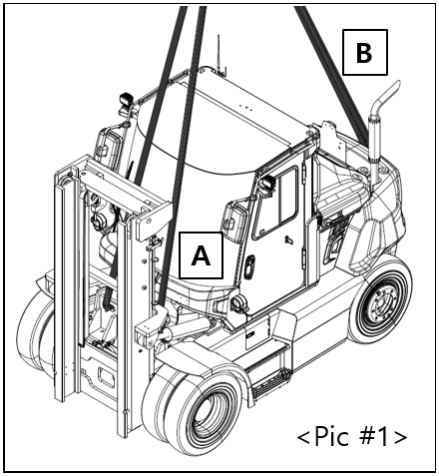
Cover the rope/chain with rubber sheet or cloth to prevent damage to the vehicle, as necessary.

3. Rope/chain and other lifting tools must have sufficient strength, and free of any defect or wear.

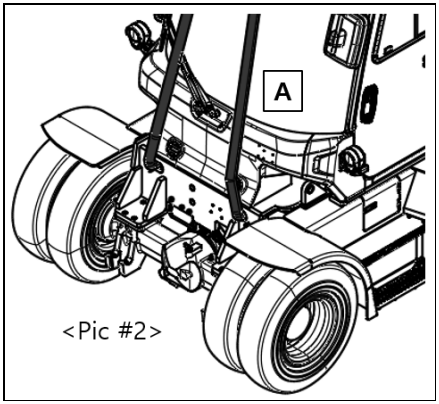
4. Avoid impact load to the lifting devices/tools.

5. Apply only for OVHG Type truck. Not for Cabin type truck.

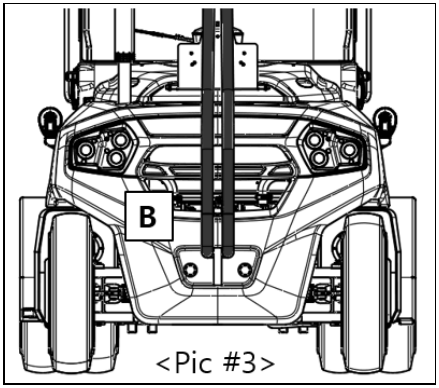
1. Check the weight, length, width and height of the vehicle before lifting.
2. Park the crane at an appropriate position.
3. Connect the rope/chain to the points A and B of the figure below (Pic#1, 2, 3). Front 2 rope/chains should be tied through middle stay of the mast (refer Pic#4).
4. If the wire rope/chain contacts the vehicle, insert a rubber plate between the rope/chain and the vehicle to protect the vehicle.
5. Lift up the vehicle extremely slowly
6. Strongly recommend to use moving basement or stay to move equipment at safety status, or use temporary bridge. (refer Pic#5, 6)
7. While transport, assign supervisor and warn people around enough.
8. Assist rope/cable can be helpful to move safety and stably.



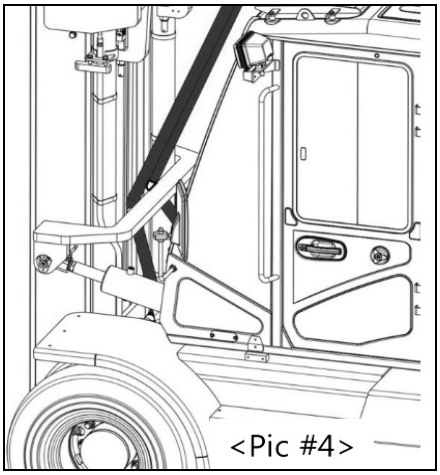
<Pic #1>

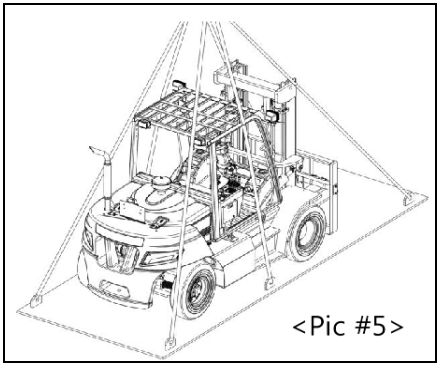


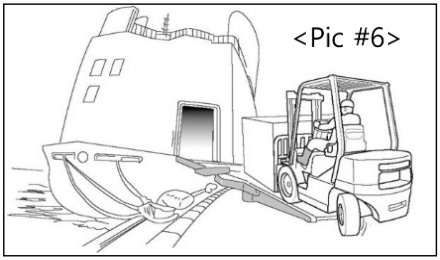
<Pic #2>



<Pic #3>

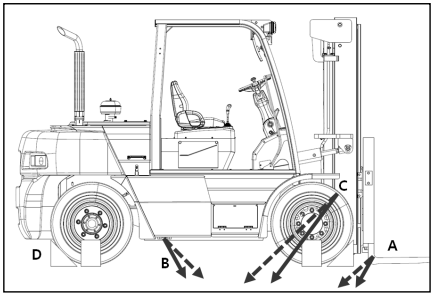






How to Fix Forklift to a Carrier

1. The rope/chain must have sufficient length for fixing.
2. Park the vehicle on a level ground.
3. Set the mast vertically. Lower the fork or attachment to the lowest position.
4. Set all the operating devices to Neutral Position. Turn OFF the start switch.
5. Apply the parking brake. Stop the tyres with blocks (D).
6. If the vehicle has a mast, connect fixing rope/chain to the fork (A) and fix the vehicle using the reinforcing bar (B) of the lower frame. If without mast, fix with the drive axle wheel (C).



Towing Information

⚠ WARNING

Personal injury or death could result when towing a disabled lift truck incorrectly.

Block the lift truck wheels to prevent movement before releasing the brakes. The lift truck can roll free if it is not blocked.

Follow the recommendations below, to properly perform the towing procedure.

These towing instructions are for moving a disabled lift truck a short distance, at low speed, no faster than 2 km/h (1.2 mph), to a convenient location for repair. These instructions are for emergencies only. Always transport the lift truck if long distance moving is required.

Shield must be provided on the towing lift truck to protect the operator if the tow line or bar should break.

Do not allow riders on the lift truck being towed unless the operator can control the steering and/or braking.

Before towing, make sure the tow line or bar is in good condition and has enough strength for the towing situation involved. Use a towing line or bar with a strength of at least 1.5 times the gross weight of the towing lift truck for a disabled lift truck stuck in the mud or when towing on a grade.

Keep the tow line angle to a minimum. Do not exceed a 30° angle from the straight ahead position. Connect the tow line as low as possible on the lift truck that is being towed.

Quick lift truck movement could overload the tow line or bar and cause it to break. Gradual and smooth lift truck movement will work better.

Normally, the towing lift truck should be as large as the disabled lift truck. Satisfy yourself that the towing lift truck has enough brake capacity, weight and power, to control both lift trucks for the grade and the distance involved.

To provide sufficient control and braking when moving a disabled lift truck downhill, a larger towing lift truck or additional lift trucks connected to the rear could be required. This will prevent uncontrolled rolling. The different situation requirements cannot be given, as minimal towing lift truck capacity is required on smooth level surfaces to maximum on inclines or poor surface conditions.

Consult your CROWN Lift Truck branch for towing a disabled lift truck.

Electronic Parking Brake

NOTICE

In the case of the electronic parking brake, it always stays engaged when the ignition is off, regardless of where the parking switch is positioned.

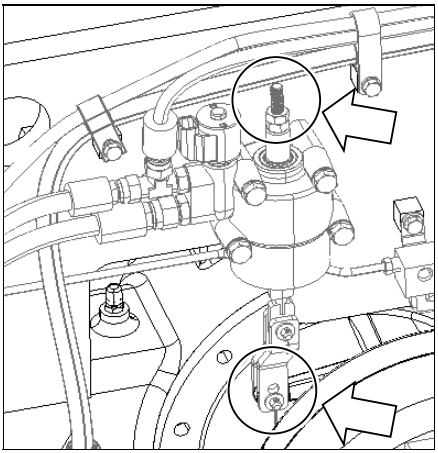
Before towing the vehicle, therefore, you should release the parking brake by force to prevent excessive wear and damage on the park brake system.

1. Secure the wheels with blocks.
2. Direction control lever is in neutral.
3. Release the service brake pedal.
4. Turn the key switch off.
5. Direction control lever is in neutral.
6. Release the parking brake by force.

Step 1. Tilt the cabin open.

Step 2. Completely loosen two nuts (1) of the hydraulic actuator located at the fore part of the vehicle.

Step 3. Check that the parking brake lever is completely put down to the horizontal position.



⚠ WARNING

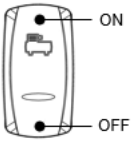
Be sure all necessary repairs and adjustments have been made before a lift truck that has been towed to a service area is put back into operation.

After a repair of a vehicle equipped with an electronic parking brake, make sure to readjust the parking brake before you operate the vehicle. For how to make adjustment, refer to the Maintenance Section.

Air blower gun (Option)

Precautions during using the air gun

1. To use the air gun, push switch “on” firstly to operate air compressor

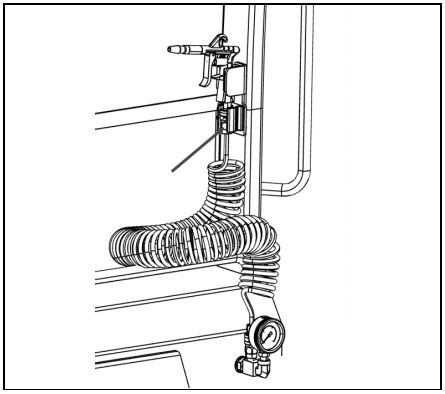


2. If lubricated, air should be discharged two or three times when using it for the first ime.
3. If not used for a long time, moisture might have existed on the hose connected to the air-conditioner due to condensation when used for the first time. For this reason, air should be discharged 1 or 2 times when using it for the first time.

Adding oil to the air gun

CAUTION! Add oil to the air-conditioner regularly.

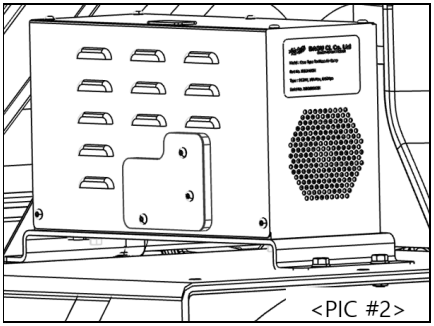
- Air filling location : Air inlet on the bottom of the air gun



- Oil type: Silicone or spindle oil (nonvolatile regular lubricant) -> Using the excavator hydraulic oll will also do good.
- Oil filling interval: 15 days
- Amount to be filled: More than 5m

Replacing the air compressor relay

If the phenomenon described below occurs, open the inspection hole to replace the relay.



1. If the air compressor continues to operate even when switched off;
2. If the air compressor fails to operate continuously even when switched on;

Jacking Information

⚠ WARNING

Jacking up Truck can be dangerous and should be done only by trained personnel using proper tools and procedures.

Block the lift truck wheels to prevent movement while lifting the wheels. The lift truck can roll free if it is not blocked.

Follow the recommendations below, to properly perform the jacking procedure.

NOTICE

Move Trucks to a Secure Non Traffic Maintenance Area with a Level Floor. No Load on Forks.
Remove key from ignition switch.

Hydraulic Jack & Jack Stand Capacity

Hydraulic Jack Capacity

	Model	Height Minimum*	Minimum Requirement	
1 ton class	CGC15/18S-5, CGC15/18S-5, CGC20SC-5	100mm	2000Kg	4400lbs
	CD15/18S-5, CD20SC-5, CG15/18S-5, CG20SC-5	150mm		
2 ton class	CD20/25/ 30/33S-5/7, CD35C-5/7, CG20/25/30E-5, CG20/25 /30/33P-5/7, CG35C-5/7	150mm	3000Kg	6600lbs
	CGC20/25/30/ 33E-5, CGC20/25/30/ 33P-5	120mm		
4 ton class	CD35/40/45S-5/7/9, CD50/55C-5/7/9, CD40/45/50/ 55SC-5/7/9, CG35/40/45S-5/7, CG50/55C-5/7, CG40/45/50/ 55SC-5/7 CGC35/45S-9(BCS) CGC55C-9 (BCS)	180mm	3900Kg	8600lbs
6 ton class	CD50/60/70S-5/7/9, CG50/60/70S-5/7/9	250mm	5800Kg	12800lbs
8 ton class	CD80/90S-5/7/9	250mm	7500Kg	16500lbs
11 ton class	CD110/130 /160S-5	300mm	10000 Kg	22050lbs
18/20 ton class	CDV180/200S-7	350 mm	14000 Kg	30900lbs
25 ton class	CDV250S-7	400 mm	19000 Kg	42000lbs

• The height of lift truck with a flat tyre is lower than with an inflated tyre. So Height Minimum of Jack must be less than the value of the above chart.

Stand Capacity should be more than the minimum requirement of Hydraulic Jack Capacity.
Hydraulic Jack & Jack Stand are commercially available and should be especially designed for forklift trucks.

Jacking Procedure

Steering Wheel

1. Raise Forks 3 to 6 in (76 to 152 mm) from Floor.
2. Place Wheel Chocks under Both Drive Wheels.
3. Locate Hydraulic Jack under Steering Axle as Shown in Figure A.
4. Jack Up Truck with Hydraulic Jack.
5. Set Jack Stand Height as Required Not to Exceed 16 in (405mm).

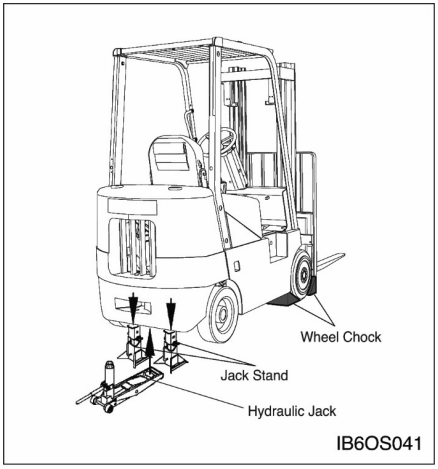


Figure A

Side

1. Lower Forks Completely.
2. Locate Hydraulic Jack under Frame as Shown in Figure B.
3. Jack Up One Side of Truck.
4. Place Hard Wood Block directly under First Stage Mast.
   - 1ton/2ton class - Use 6X6 in (150X150mm) Block
   - 3ton/5ton class - Use 8X8 in (200X200mm) Block
   - 11ton class - Use 12X12 in (300X300mm) Block
5. Jack Up Opposite Side of Truck.
6. Place Second Hard Wood Block under Other Side of First Stage Mast.
7. Do Not Tilt Mast after Blocked.

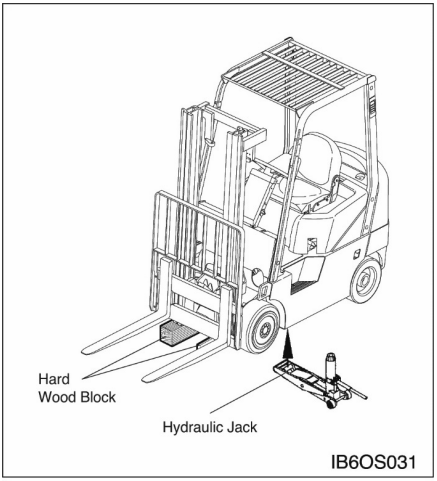


Figure B

⚠ WARNING

Locate Hydraulic Jack under Frame. Do NOT locate on side panel. Do NOT raise side of truck any more than required to insert hard wood block.

⚠ WARNING

Locate Hydraulic Jack and Jack Stands under steer axle. Do NOT locate Hydraulic Jack or Jack Stands on Counter Weight.

Inspection, Maintenance and Repair of Lift Truck Forks

The following section gives practical guidelines for inspection, maintenance and repair of lift truck forks. It also provides general information on the design and application of forks and the common cause of fork failures.

Lift truck forks can be dangerously weakened by improper repair or modification. They can also be damaged by the cumulative effects of age, abrasion, corrosion, overloading and misuse.

A fork failure during use can cause damage to the equipment and the load. A fork failure can also cause serious injury.

A good fork inspection and maintenance program along with the proper application can be very effective in preventing sudden failures on the job.

Repairs and modifications should be done only by the fork manufacturer or a qualified technician who knows the material used and the required welding and heat treatment process.

Users should evaluate the economics of returning the forks to the manufacturer for repairs or purchasing new forks. This will vary depending on many factors including the size and type of fork.

Forks should be properly sized to the weight and length of the loads, and to the size of the machine on which they are used. The general practice is to use a fork size such that the combined rated capacity of the number of forks used is equal to or greater than the "Standard (or rated) Capacity" of the lift truck.

The individual load rating, in most cases, will be stamped on the fork in a readily visible area. This is generally on the top or side of the fork shank.

- A fork rated at 1500 pounds at 24 inch load centre will be stamped 1500X24.
- A fork rated at 2000 kg at 600 mm load centre will be stamped 2000X600.

The manufacturer identification and year and date of manufacture is also usually shown.

Some countries have standards or regulations which apply specifically to the inspection and repair of forks.

Users may also refer to the International Organization For Standardization-ISO Technical Report 5057-Inspection and Repair of Fork Arms and ISO Standard 2330-Fork Arms-Technical Characteristics and Testing.

While there are no specific standards or regulations in the United States, users should be familiar with the requirements for inspection and maintenance of lift trucks as provided by the 29 Code Federal Register 1910.178 Powered Industrial Truck, and ANSI/ASME Safety Standard(s) B56.1–as applicable to the type of machine(s) in use.

Environment Protection

When servicing this lift truck, use an authorised servicing area and an approved container to collect coolant, oil, fuel, grease, electrolyte and any other potential environmental pollutant before any lines, fittings or related items are disconnected or removed. After servicing, dispose of those materials in an authorised place and container. When cleaning the lift truck, be sure to use an authorised area.

Causes of Fork Failure

Improper Modification or Repair

Fork failure can occur as a result of a field modification involving welding, flame cutting or other similar processes which affect the heat treatment and reduces the strength of the fork.

In most cases, specific processes and techniques are also required to achieve proper welding of the particular alloy steels involved. Critical areas most likely to be affected by improper processing are the heel section, the mounting components and the fork tip.

Bent or Twisted Forks

Forks can be bent out of shape by extreme overloading, glancing blows against walls or other solid objects or using the fork tip as a pry bar.

Bent or twisted forks are much more likely to break and cause damage or injury. They should be removed from service immediately.

Fatigue

Parts which are subjected to repeated or fluctuating loads can fail after a large number of loading cycles even though the maximum stress was below the static strength of the part.

The first sign of a fatigue failure is usually a crack which starts in an area of high stress concentration. This is usually in the heel section or on the fork mounting.

As the crack progresses under repetitive load cycling, the load bearing cross section of the remaining metal is decreased in size until it becomes insufficient to support the load and complete failure occurs.

Fatigue failure is the most common mode of fork failure. It is also one which can be anticipated and prevented by recognizing the conditions which lead up to the failure and by removing the fork service prior to failing.

- Repetitive Overloading

Repetitive cycling of loads which exceeds the fatigue strength of the material can lead to fatigue failure. The overload could be caused by loads in excess of the rated fork capacity and by use of the forks tips as pry bars. Also, by handling loads in a manner which causes the fork tips to spread and the forks to twist laterally about their mountings.

- Wear

  Forks are constantly subjected to abrasion as they slide on floors and loads. The thickness of the fork blade is gradually reduced to the point where it may not be capable of handling the load for which it was designed.

- Stress Risers

  Scratches, nicks and corrosion are points of high stress concentration where cracks can develop. These cracks can progress under repetitive loading in a typical mode of fatigue failure.

Overloading

Extreme overloading can cause permanent bending or immediate failure of the forks. Using forks of less capacity than the load or lift truck when lifting loads and using forks in a manner for which they were not designed are some common causes of overloading.

Fork Inspection

Establish a daily and 12 month inspection routine by keeping a record for the forks on each lift truck.

Initial information should include the machine serial number on each the forks are used, the fork manufacturer, type, original section size, original length and capacity. Also list any special characteristics specified in the fork design.

Record the date and results of each inspection, making sure the following information is included.

Actual wear conditions, such as percent of original blade thickness remaining.

Any damage, failure or deformation which might impair the use of the truck.

Note any repairs or maintenance.

An ongoing record of this information will help in identifying proper inspection intervals for each operation, in identifying and solving problem areas and in anticipating time for replacement of the forks.

First Installation

1. Inspect forks to ensure they are the correct size for the truck on which they will be used. Make sure they are the correct length and type for the loads to be handled.
2. If the forks have been previously used, perform the "12 Month Inspection".
3. If the forks are rusted, see "Maintenance and Repair".
4. Make sure fork blades are level to each other within acceptable tolerances. See "Forks, Step 4," in the "2000 Service Hours or Yearly" in "Maintenance Intervals"
5. Make sure positioning lock is in place and working Lock forks in position before using truck. See "Forks, Step 7", in the "2000 Service Hours or Yearly" in "Maintenance Intervals".

Daily Inspection

1. Visually inspect forks for cracks, especially in the heel section, around the mounting brackets, and all weld areas. Inspect for broken or jagged fork tips, bent or twisted blades and shanks.
2. Make sure positioning lock is in place and working. Lock the forks in position before using the truck. See "2000 Service Hours or Yearly" in "Maintenance Intervals".
3. Remove all defective forks from service.

12 Months Inspection

Forks should be inspected, at a minimum, every 12 months. If the truck is being used in a multi-shift or heavy duty operation, they should be checked every six months. See "Forks" in the "2000 Service Hours or Yearly" in "Maintenance Intervals."

Maintenance and Repair

1. Repair forks only in accordance with the manufacturer's recommendations.
2. Most repairs or modifications should be done only by the original manufacturer of the forks or an expert knowledgeable of the materials, design, welding and heat treatment process.
3. The following repairs or modifications SHOULD NOT be attempted.

Flame cutting holes or cutouts in fork blades.

Welding on brackets or new mounting hangers.

Repairing cracks or other damage by welding.

Bending or resetting.

4. The following repairs MAY be performed.

Forks may be sanded or lightly ground, to remove rust, corrosion or minor defects from the surfaces.

Heel sections may be ground with a carbon stone to remove minor surface cracks or defects. Polish the inside radius of the heel section to increase the fatigue life of the fork. Always grind or polish in the direction of the blade and shank length.

Repair or replace the positioning locks on hook type forks.

Repair or replace most fork retention devices used with other fork types.

5. A fork should be load tested before being returned to service on completion of repairs authorised and done in accordance with the manufacturer's recommendations.
6. Most manufacturers and standards require the repaired fork to be tested with a load 2.5 times the specified capacity and at the load centre marked on the fork arm.
7. With the fork restrained in the same manner as its mounting on the lift truck, apply the test load twice, gradually and without shock. Maintain the test for 30 seconds each time.
8. Check the fork arm before and after the second application of the test load. It shall not show any permanent deformation.
9. Consult the fork manufacturer for further information as may be applicable to the specific fork involved.
10. Testing is not required for repairs to the positioning lock or the markings.

Tyre Inflation Information

Tyres Inflation

⚠ WARNING

Personal injury or death could result when tyres are inflated incorrectly.

Use a self-attaching inflation chuck and stand behind the tread when inflating a tyre.

Proper inflation equipment, and training in using the equipment, are necessary to avoid over inflation. A tyre blowout or rim failure can result from improper or misused equipment.

Always remove (deflate) all air from a single tyre and from both tyres on a dual assembly before changing them.

NOTICE

When changing tyres, change them in sets, even if only one of the tyres is damaged. If new and used tyres are used on the same axle, tilting of the mast and rapid tyre wear will result.

The mounting faces of the hub, wheel nuts and wheels must be free of any foreign material and lubricants of any kind. Tighten wheel nuts again after 24 hours of operation.

Do not re-inflate a tyre that has been driven on while flat or underinflated, without first checking to be sure the locking ring on the wheel is not damaged and in position.

Always deflate tyres before changing them.

Tyre Shipping Pressure

The tyre inflation pressures shown in the following chart are cold inflation shipping pressures.

Size	Ply Rating Or Strength Index	Shipping Pressure	
		kPa	psi
8.25 x 15	14PR	790	115
8.25 x 15	16PR	880	128
8.25R15	-	1000	145
9.00 x 20	14PR	790	115

Standard tyre, ply rating and inflation pressures.

The operating inflation pressure is based on the weight of a ready-to-work machine without attachments, at rated payload, and in average operating conditions. Pressures for each application may vary and should always be obtained from your tyre supplier.

NOTE: Fill tyres to the recommended pressures listed ± 35 kPa (5 psi). Tyres can be filled with nitrogen.

Tyre Inflation Pressures Adjustment

A tyre inflation in a warm shop area, 18° to 21°C (65° to 70°F), will be underinflated if the machine works in freezing temperatures. Low pressure shortens the life of a tyre.

Torque Specifications

Metric Hardware - This lift truck is almost totally metric design. Specifications are given in metric and U.S. Customary measurement.

Metric hardware must be replaced with metric hardware. Check parts books for proper replacement.

NOTE: Use only metric tools on most hardware for proper fit. Other tools could slip and possibly cause injury.

Torques for Standard Hose Clamps - Worm Drive Band Type

NOTICE

The following chart gives the torques for initial installation of hose clamps on new hose and for reassembly or retightening of hose clamps on existing hose.

Clamp Width	Initial Installation Torque On New Hose	
	N·m[1]	lb·in
16 mm (.625 in)	7.5 ± 0.5	65 ± 5
13.5 mm (.531 in)	4.5 ± 0.5	40 ± 5
8 mm (.312 in)	0.9 ± 0.2	8 ± 2
Clamp Width	**Reassembly or Retightening Torque On Existing Hose**	
	N•m[1]	lb•in
16 mm (.625 in)	4.5 ± 0.5	40 ± 5
13.5 mm (.531 in)	3.0 ± 0.5	25 ± 5
8 mm (.312 in)	0.7 ± 0.2	6 ± 2

[1]1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

Torques for Standard Bolts, Nuts and Taper lock Studs

NOTICE

The following charts give general torques for bolts, nuts and taper lock studs or SAE Grade 5 or better quality.

Torques for Bolts and Nuts With Standard Threads

Thread Size Inch	Standard Nut and Bolt Torque	
	N·m	lb·ft
1/4	12 ± 4	9 ± 3
5/16	25 ± 7	18 ± 5
3/8	45 ± 7	33 ± 5
7/16	70 ± 15	50 ± 11
1/2	100 ± 15	75 ± 11
9/16	150 ± 20	110 ± 15
5/8	200 ± 25	150 ± 18
3/4	360 ± 50	270 ± 37
7/8	570 ± 80	420 ± 60
1	875 ± 100	640 ± 75
1 1/8	1100 ± 150	820 ± 110
1 1/4	1350 ± 175	1000 ± 130
1 3/8	1600 ± 200	1180 ± 150
1 1/2	2000 ± 275	1480 ± 200

[1]1 Newton meter (N·m) is approximately the same as 0.1 kg ·m.

Torques for Taper lock Studs

Thread Size Inch	Standard Taper lock Stud Torque	
	N·m[1]	lb·ft
1/4	8 ± 3	6 ± 2
5/16	17 ± 5	13 ± 4
3/8	35 ± 5	26 ± 4
7/16	45 ± 10	33 ± 7
1/2	65 ± 10	48 ± 7
5/8	110 ± 20	80 ± 15
3/4	170 ± 30	125 ± 22
7/8	260 ± 40	190 ± 30
1	400 ± 60	300 ± 45
1/8	500 ± 700	370 ± 50
1/4	650 ± 80	480 ± 60
3/8	750 ± 90	550 ± 65
1/2	870 ± 100	640 ± 75

[1]1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

Torques for Metric Fasteners

NOTICE

Be very careful never to mix metric with U.S. customary (standard) fasteners. Mismatched or incorrect fasteners will cause lift truck damage or malfunction and may even result in personal injury.

Original fasteners removed from the lift truck should checked for any damages and kept for reassembly whenever possible. If new fasteners are needed, they must be of the same size and grade as the ones that are being replaced.

The material strength identification is usually shown on the bolt head by numbers (8.8, 10.9, etc.). The following chart gives standard torques for bolts and nuts with Grade 8.8.

For mounting torques of main parts, Please refer to Service manual for detail.

NOTE: Metric hardware must be replaced with metric hardware. Check parts book for proper replacement.

Thread Size Metric	Standard Torque	
	N·m[1]	lb·ft
M6	12 ± 4	9 ± 3
M8	25 ± 7	18 ± 5
M10	55 ± 10	41 ± 7
M12	95 ± 15	70 ± 11
M14	150 ± 20	110 ± 15
M16	220 ± 30	160 ± 22
M20	450 ± 70	330 ± 50
M24	775 ± 100	570 ± 75
M30	1600 ± 200	1180 ± 150
M36	2700 ± 400	2000 ± 300

[1]1 Newton meter (1 N·m) is approximately the same as 0.1 kg·m.

[2]ISO - International Standards organization.

Cooling System Specifications

Coolant Information

NOTE: The following information is generic and valid for lift trucks.

Engine operating temperatures have increased to improve engine efficiency. This means proper cooling system maintenance is especially important. Overheating, overcooling, pitting, cavitation erosion, cracked heads, piston seizures, and plugged radiators are classic cooling system failures. In fact, coolant is as important as the quality of fuel and lubricating oil.

NOTICE

CROWN recommends that the coolant mixture contain a minimum of 30% antifreeze or equivalent.

Never add coolant to an overheated engine, engine damage can result. Allow the engine to cool first.

All water is corrosive at engine operating temperature. The cooling system should be protected with a 3 to 6% concentration of liquid supplemental coolant additive at all times, regardless of the concentration of antifreeze.

Excessive supplemental coolant additive greater than the recommended 6%, together with concentrations of antifreeze greater than 65% can cause deposits to form and can result in radiator tube blockage, overheating, and/or water pump seal damage.

If the machine is to be stored in, or shipped to, an area with freezing temperatures, the cooling system must be protected to the lowest expected outside (ambient) temperature.

The engine cooling system is normally protected to -28°C(-20°F) with antifreeze, when shipped from the factory unless special requirements are defined.

Check the specific gravity of the coolant solution frequently in cold weather to ensure adequate protection.

Clean the cooling system if it is contaminated, the engine overheats or foaming is observed in the radiator.

Old coolant should be drained, the system cleaned and new coolant added every 2000 service hours or yearly.

Refer to topic, "Cooling System - Clean, Change" in Every 2000 Service Hours or Yearly section.

Filling at over 20 liters (5 U.S. gallons) per minute can cause air pockets in the cooling system.

After draining and refilling the cooling system, operate the engine with the radiator cap removed until the coolant reaches normal operating temperature and the coolant level stabilises. Add coolant as necessary to fill the system to the proper level.

Never operate without a thermostat in the cooling system. Cooling system problems can arise without a thermostat.

Coolant Water

Hard water, or water with high levels of calcium and magnesium ions, encourages the formation of insoluble chemical compounds by combining with cooling system additives such as silicates and phosphates.

The tendency of silicates and phosphates to precipitate out-of-solution increases with increasing water hardness. Hard water, or water with high levels of calcium and magnesium ions encourages the formation of insoluble chemicals, especially after a number of heating and cooling cycles.

CROWN prefers the use of distilled water or de-ionized water to reduce the potential and severity of chemical insolubility.

Acceptable Water	
Water Content	**Limits (PPM)**
Chlorides (Cl)	50 maximum
Sulfates (SO_4)	50 maximum
Total hardness	80 mg/l
Total solids	250 maximum
PH	6.0 to 8.0

ppm = parts per million

Using water that meets the minimum acceptable water requirement may not prevent drop-out of these chemical compounds totally, but should minimise the rate to acceptable levels.

Antifreeze

NOTICE

CROWN recommends using automotive antifreeze suitable for gasoline engines having aluminum alloy parts. Antifreeze of poor quality will cause corrosion of the cooling system, and thus always use automotive antifreeze prepared by a reliable maker, and never use it mixed with antifreeze of different brand.

CROWN recommends that the coolant mix contain 50% commercially available automotive antifreeze, or equivalent and acceptable water to maintain an adequate water pump cavitation temperature for efficient water pump performance.

Premix coolant solution to provide protection to the lowest expected outside (ambient) temperature. Pure undiluted antifreeze will freeze at –23°C (- 10°F).

Use a greater concentration (above 50%) of commercially available automotive antifreeze only as needed for anticipated outside (ambient) temperatures. Do not exceed the recommendations, provided with the commercially available automotive antifreezes, regarding the coolant mixture of antifreeze to water.

Make proper antifreeze additions.

Adding pure antifreeze as a makeup solution for cooling system top-up is an unacceptable practice. It increases the concentration of antifreeze in the cooling system which increases the concentration of dissolved solids and undisclosed chemical inhibitors in the cooling system. Add antifreeze mixed with water to the same freeze protection as your cooling system.

Use the chart below to assist in determining the concentration of antifreeze to use.

Antifreeze Concentrations	
Protection Temperature	**Concentrations**
Protection to -15 °C (5 °F)	30% antifreeze and 70% water
Protection to -23 °C (-10 °F)	40% antifreeze and 60% water
Protection to -37 °C (-34 °F)	50% antifreeze and 50% water
Protection to -51 °C (-60 °F)	60% antifreeze and 40% water

Specifications of Fuel and DEF/Ad-Blue

General Fuel Information

Use only fuel as recommended in this section.

NOTICE

Fill the fuel tank at the end of each day of operation to drive out moisture laden air and to prevent condensation. Maintain a constant level near the top of the day tank to avoid drawing moisture into the tank as the level decreases.

Do not fill the tank to the top. Fuel expands as it gets warm and can overflow.

Do not fill the fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to the fuel system parts.

Drain the water and sediment from main fuel storage tank before it is refilled. This will help prevent water and/or sediment from being pumped from the fuel storage tank into the engine fuel tank.

Diesel Specifications

These engines utilize Tier 4 standards, the use of Ultra Low Sulfer Diesel (ULSD) is mandatory for these engines.

Diesel Fuel Specification	Location
ASTM D975 No.1D/2D S15	USA
EN590:96	EU
IS0 8217 DMX	International
BS 2869-A1 or A2	United Kingdom
JIS K2204 Grade No. 2	Japan
KSM-2610	Korea
GB252	China

Additional Technical Fuel Requirements

Cetane Rating: The minimum recommended Fuel Cetane Rating is 45. A cetane rating greater than 50 is preferred, especially for ambient temperatures below 20 °C (4 °F) or elevations above 1500m.

Diesel Fuel Specification Type and Sulfer Content % (ppm) used, must be compliant with all applicable emission regulations for the area in which the engine is operated.

DO NOT USE Fuels that have sulfer content greater than 0.0015 % (15 ppm).

Diesel fuels specified to EN 590 or ASTM D975 are recommended.

No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)

These engines utilize Tier 4 standards, the use of Ultra Low Sulfer Diesel is mandatory for these engines, when operated in US EPA regulated areas. Therefore, please use No.2-D S15 diesel fuel as an alternative to

No.2-D, and use No.1-D S15 diesel fuel as an alternative to No.1-D for ambient temperature below 10 °C (14 °F).

a) No.1-D or No.2-D, S15: Ultra Low Sulfer Diesel (ULSD) 15 ppm or 0.0015 wt.%

Bio-Diesel Fuels

In Europe and in the United States, as well as some other countries, non-mineral oil based fuel resources such as RME (Rapeseed Methyl Ester) and SOME (Soybean Methyl Ester), collectively known as FAME (Fatty Acid Methyl Esters), are being used as extenders for mineral oil derived diesel fuels.

CROWN approves the use of bio-diesel fuels that do not exceed a blend of 7% (by volume) of FAME with 93% (by volume) of approved mineral oil derived diesel fuel. Such bio-diesel fuels are known in the marketplace as B7 diesel fuels.

These B7 diesel fuels must meet certain requirements.

1. The bio-fuels must meet the minimum specifications for the country in which they are used.

In Europe, bio-diesel fuels must comply with the European Standard EN14214.

In the United States, bio-diesel fuels must comply with the American Standard ASTM D-6751.

2. Bio-fuels should be purchased only from recognized and authorised diesel fuel suppliers.

Precautions and concerns regarding the use of bio-fuels:

1. Free methanol in FAME may result in corrosion of aluminum and zinc FIE components.
2. Free water in FAME may result in plugging of fuel filters and increased bacterial growth.
3. High viscosity at low temperatures may result in fuel delivery problems, injection pump seizures, and poor injection nozzle spray atomization.
4. FAME may have adverse effects on some elastomers (seal materials) and may result in fuel leakage and dilution of the engine lubricating oil.
5. Even bio-diesel fuels that comply with a suitable standard as delivered, will require additional care and attention to maintain the quality of the fuel in the equipment or other fuel tanks. It is important to maintain a supply of clean, fresh fuel. Regular flushing of the fuel system, and / or fuel storage containers, may be necessary.
6. With the standards as agreed to by the diesel engine manufacturers and the diesel fuel injection equipment manufacturers, or biodiesel fuels that have degraded as per the precautions and concerns above, may affect the warranty coverage of your engine.

General DEF/Ad-Blue Information

DEF/Ad-Blue Information

Diesel Exhaust Fluid (DEF), commonly referred to as AdBlue in Europe, is an emissions control liquid required by modern diesel engines. It is injected into the exhaust stream. DEF/Ad-Blue is never added to diesel fuel. It is a non-hazardous solution of 32.5% urea in 67.5% de-ionized water. DEF/Ad-Blue is clear and colorless, and looks exactly like water. It has a slight smell of ammonia, similar to some home cleaning agents. DEF/Ad-Blue is used in by Selective Catalytic Reduction (SCR) technology to remove harmful NOx emissions from diesel engines.

The 32.5% urea concentration is the ideal solution as it provides the lowest freeze point. Also, SCR systems will be calibrated to the 32.5%, so that optimum NOx will be reduced during operation.
DEF/Ad-Blue should comply with the following specifications. The table lists several worldwide specifications for diesel fuels.

DEF/Ad-Blue Specification	Region
IS0 22241-1	International
DIN 70700	Germany
KS R ISI 22241-1	South Korea
Certification of API	USA

A 32.5% solution of DEF/Ad-Blue will begin to crystallize and freeze at 12 deg F (-11 deg C). At 32.5%, both the urea and water will freeze at the same rate, ensuring that as it thaws, the fluid does not become diluted, or over concentrated. The freezing and unthawing of DEF/Ad-Blue will not cause degradation of the product.

CAUTION

- Make sure to wear personal protective equipment and observe precautions when handling DEF/Ad-Blue.
- Lack of DEF/Ad-Blue will reduce engine power. Check the DEF/Ad-Blue level frequently.
- Use genuine DEF/Ad-Blue that meets quality standards.
- Take care not to refill diesel fuel when replacing the DEF/Ad-Blue.
- Do not add any additives, antifreeze in particular, to prevent the DEF/Ad-Blue from freezing.
- Before operating a vehicle which has been stored for a six month period or longer, replace the DEF/Ad-Blue.
- Do not fill over “F” level on urea level gauge because of DEF/Ad-Blue backflow line plausibility error at DETECTIONMODE(P1893). Not be guaranteed

Specification

ISO 22241-1/DIN20200

	Min	Max	
Urea Content	31.8	33.2	% by weight
Density at 20°C	1.087	1.093	g/cm³
Refracting Index at 20°C	1.3814	1.3843	
Alkalinity as NH3		0.2	%
Biuret		0.3	%
Aldehyde		5	mg/kg
Insolubles		20	mg/kg
Phosphate (PO4)		0.5	mg/kg
Calcium		0.5	mg/kg
Iron		0.5	mg/kg
Copper		0.2	mg/kg
Zinc		0.2	mg/kg
Chromium		0.2	mg/kg
Nickel		0.2	mg/kg
Aluminum		0.5	mg/kg
Magnesium		0.5	mg/kg
Sodium		0.5	mg/kg
Potassium		0.5	mg/kg

Storage

Between 4°C/40°F and 26°C/80°F is recommended to maintain shelf life.

Above -10°C/12° F is recommended to avoid freezing, which starts at -11°C/11° F.

Below 30°C/86° F is recommended, which cause hydrolysis to occur, with the consequent formation of ammonia and pressure rise, and will reduce shelf life.

Storage Temperature		Shelf life at constant Temperature
°C	°F	Months
16	60	36
27	80	12
38	100	3
49	120	1.5

Precautions for Handling

1. Read manufacturer's user manual and/or precautions carefully before using DEF/Ad-Blue.
2. Wash hands thoroughly after handling DEF/Ad-Blue.
3. Wear appropriate personal protective equipment, including safety gloves, appropriate clothes, goggles, and face shield.
4. Wash skin with plenty of water if exposed.
5. Take medical treatment if a large volume is swallowed.
6. Consult a doctor for any skin irritation.
7. Wash contaminated clothes before reusing.

   If the eyes are exposed, carefully wash with flowing water for several minutes.
8. Remove contact lenses if possible.
9. Seek medical advice if eye irritation continues.
10. Seek medical advice for any risk of exposure or contact.
11. The product and the container must be disposed of according to a safe procedure provided by the manufacturer.

Lubricant Specifications

Lubricant Information

Some classifications and abbreviations we use in this section follow S.A.E. (Society of Automotive Engineers) J754 nomenclature and others follow S.A.E. J183.

All MIL specifications are U.S.A. Military.

Recommended oil viscosities are given in the "Lubricant Viscosities" chart later in this section of the manual.

Greases are classified according to the National Lubricating Grease Institute (NLGI) based on ASTM D217-68 worked Penetration characteristics which give a defined consistency number.

Engine Oil (DEO and EO)

The following oil specifications provide guidelines for the selection of commercial products:

• DM03 Tier4 Final Engine

: API CJ4 & CK4, ACEA E9 or higher

NOTICE

Failure to follow the oil recommendations can cause shortened engine life due to carbon deposits or excessive wear. Especially for DM03 Tier4 Final engine, API CJ4 & CK4 (ACEA E9) engine oil should be used, because of EGR & SCR performance.

Consult the EMA Lubricating Oils Data Book for a listing of oil brands.

NOTE: The percentage of sulphur in the fuel will affect the engine oil recommendations. For fuel sulphur effects, the Infrared Analysis or the ASTM D2896 procedure can be used to evaluate the residual neutralization properties of engine oil. The sulphur products formation depends on the fuel sulphur content, oil formulation, crankcase blowby, engine operating conditions and ambient temperature.

Hydraulic Oil (HYDO)

The following commercial classifications can be used in the hydraulic system.

- ISO 6743/4 HM
- AFNOR NFE 48-603 HM
- DIN 51524 TEIL 2 H-LP
- HAGGLUNDS DENISON HFO-HF2
- CINCINNATI P68, 69, 70
- Viscosity: ISO VG32

Industrial premium hydraulic oils that have passed the Vickers vane pump test (35VQ25).

These oils should have anti-wear, antifoam, antirust and antioxidation additives for heavy duty use as stated by the oil supplier. ISO viscosity grade of 32 would normally be selected.

Transmission Oil (TDTO)

NOTICE

These oils are formulated for transmissions and drive trains only, and should not be used in engines. Shortened engine life will result.

NOTE: Multi-grade oils are not blended by CROWN for use in transmissions. Multi-grade oils which use high molecular weight polymers as viscosity index improvers lose their viscosity effectiveness by permanent and temporary shear of the viscosity index improver and therefore, are not recommended for transmission and drive train compartments.

NOTE: Failure to follow this recommendation can cause shortened transmission life due to material incompatibility, inadequate frictional requirements for disk materials and/or excessive gear wear.

Select Oil that meets below specifications.

ZF 3WG94

CD60/70/80/90S-9(3 Speed)

ZF TE-ML03

Drive Axle Oil

NOTE: Failure to follow the recommendation will cause shortened life due to excessive gear wear.

• Oil Cooled Disc Brake (OCDB)

Select oil that meets below specifications.

: Universal Transmission Tractor Oil (UTTO)

The following UTTO products of API GL4 class are authorised for use

Supplier	Product Name
MOBIL	MOBIL FLUID 424
GS Caltex	Textran TDH Premium

Lubricating Grease

NOTICE

Use MPGM for heavily loaded bearings and joints where an extreme pressure grease will maximize the life of CROWN equipment. This NLGI No. 2 grade is suitable for most temperatures.

If MPGM is not available, use a type of multipurpose grease which contains 3 to 5% molybdenum.

This NLGI no. 2 grade is recommended for light duty automotive type applications where a high temperature [up to 175°C (350°F)] is required.

This grease offers excellent mechanical stability, high resistance to oxidation, good rust protection and excellent breakaway torque.

If this grease is not available, use a similar type of multipurpose grease.

Lubricant Viscosities and Refill Capacities

Lubricant Viscosities

LUBRICANT VISCOSITIES FOR AMBIENT (OUTSIDE) TEMPERATURES					
Compartment or System	**Oil Viscosities**	**°C**		**°F**	
		Min	Max	Min	Max
Engine Crankcase (Diesel) **API CJ4 & CK4, ACEA E9**	SAE 5W30	-30	+30	-22	86
	SAE10W30	-20	+30	-4	86
	SAE5W40	-30	+40	-22	104
	SAE10W40	-20	+40	-4	104
	SAE15W40	-15	+40	5	104
	SAE15W50	-15	+50	5	122
	SAE20W50	-10	+50	14	122
Engine Crankcase (LP) and Lift Chains **API SJ**	SAE 5W30	-30	+30	-22	+86
Auto Shift Transmission **API GL4**	UTTO (API GL4)	-20	+50	-4	+122
Hydraulic and Power Steering System **ISO 6743/4 HM**	ISO VG32	-20	+30	-4	+86
	ISO VG46	-10	+40	+14	+104
	ISO VG68	0	+50	+32	+122
Drive Axle Housing Disc Brake (OCDB) API GL4	UTTO (API GL4)	-20	+50	-4	+122

The SAE grade number indicates the viscosity of oil. A proper SAE grade number should be selected according to ambient temperature.

Refill Capacities

Refill Capacities (Approximate)		**55kW**	**81kW**	
		5/6/7 TON	**5/6/7 TON**	**8/9 TON**
Compartment or System		**Liters**		
Engine Crankcase w/Filter	DM03	12.6		
Cooling System w/Coolant Reservoir tank		12.7		
Fuel Tank Diesel		160		255
DEF / Ad-Blue Tank		-	15	30
Auto Shift Transmission	ZF 3WG94	21		
Hydraulic Tank		117	93	137
		Proper quantity		
Drive Axle	Disc Brake	14		

NOTE: The refill volume varies by the residual oil volume. Check the level gauge and refer to the related instruction on the oil replacement.

NOTE: Dieseling may occur, causing damage to the engine if oil is refilled excessively. Refill the oil half way between MIN and MAX using the dipstick.

Maintenance Intervals

NOTICE

Never exceed the Maintenance Intervals specified in the manual. Defects and/or damage to the important functional components may be resulted in.

NOTICE

All maintenance and repair, except every 10 service hours or daily, on the lift truck must be performed by qualified and authorised personnel only.

NOTICE

Careless disposal of waste oil can harm the environment and can be dangerous to persons. Make sure to have only authorised personnel dispose waste oil

When Required

Air Intake System - Check, Clean..... 192
Engine Valve Lash (Diesel E/G Only) - Check, Adjust 194
Inspecting Engine Fuel Supply System 195
Separating Water from Fuel 195
Priming the Fuel System (Diesel Engine Only) ... 196
Fuel Tank Filter Cap & Screen - Clean 197
Seat - Check, Lubricate..... 197
Battery Terminal - Clean, Inspect 197
DPF Regeneration / SCR Cleaning 198
Automatic SCR Cleaning 199
Fuses, Bulbs & Circuit Breaker - Change, Reset 202
Tyres and Wheels - Inspect, Check..... 205
Radiator Cap - Clean, Change 206
Carriage Roller Extrusion - Adjust 206
Mast, Carriage, Lift Chains & Attachments - Inspect, Lubricate..... 207
Steering Mechanism (Link Bearing) - Check, Lubricate..... 208

Every 10 Service Hours or Daily

Inspection Engine for Fluid Leaks 209
Engine Oil Level - Check..... 209
Coolant Level - Check..... 209
Air Cleaner Indicator - Check 210
Inspect Engine for Exhaust Leaks 211
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Mast Channels - Lubricate.....212
DEF/Ad-Blue Fluid Level - Check.....212
Hydraulic Oil Level - Check.....212
Transmission Oil Level - Check 213
Drive Axle Oil Level – Check 213

First 50-100 Service Hours or a Week

Engine Oil & Oil Filter - Change 214
Transmission Oil & Oil Filter - Change 215
Drive Axle Oil - Change 216
Parking Brake - Test, Adjust 217

Every 500 Service Hours or 3 Months

Air Intake System – Change 219
Belts (Diesel E/G Only) - Check, Adjust 219
Mast Hinge Pins - Lubricate.....220
Tilt Cylinders - Check, Adjust, Lubricate.....220
Crosshead Rollers - Inspect.....221
Parking Brake - Test, Adjust 221
Horn and Lights(If Equipped) - Check 221
Overhead Guard (If Equipped) - Inspect 221
Steer Suspension - Inspect.....222
Universal Joint - Inspect, Lubricate 222
Engine Oil & Filter (Diesel Engine Only) - Change 222
Fuel Filter - Check, Clean, Change 222
Wheel Bolts & Nuts - Inspect 223
Steering Mechanism - Check, Lubricate.....224
Steering Axle Support - Check, Oiling.....224

Every 1000 Service Hours or 6 Months

Drive Axle Oil (OCDB) - Change.....225
Hydraulic Return Filter & Breather - Check, Clean, Change 225
Fuel Filter - Check, Clean, Change 226
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Every 2000 Service Hours or Yearly

Transmission Oil & Oil Filter – Change (3 Speed, ZF 3WG94).....229
Steer Wheel Bearings - Reassemble 229
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Every 2500 Service Hours or 15 Months

Hydraulic Oil, Strainer - Check, Clean, Change .. 233
Inspect Battery System 233

Every 3000 Service Hours or 36 Months

DEF/Ad-Blue Supply module filter replacement (7Ton DM03 Engine Only) 234
DEF/Ad-Blue Supply module filter replacement (8/9 Ton DM03 81kW Engine Only)..... 234

Environment Protection

Environment Protection..... 236

Quick Reference to Maintenance Schedule				FIRST	EVERY					
ITEMS	SERVICES	PAGE	When Required	First 50-100 Service Hours or a Week	Every 10 Service Hours or Daily	Every 500 Service Hours or 3 Months	Every 1000 Service Hours or 6 Months	Every 2000 Service Hours or Yearly	Every 2500 Service Hours or 15 Months	Every 3000 Service Hours or 36 Months
Air Cleaner Indicator	Check	210		O						
Air Intake System	Check, Clean	192	O							
Air Intake System	Change	219				O				
Automatic SCR Cleaning		199	O							
Battery Terminal	Clean, Inspect	197	O							
Belts (Diesel E/G Only)	Check, Adjust	219				O				
Carriage Roller Extrusion	Adjust	206	O							
Coolant Level	Check	209		O						
Cooling System	Clean, Change	230						O		
Crosshead Rollers	Inspect	221				O				
DEF/Ad-Blue Fluid Level	Check	212		O						
DEF/Ad-Blue Supply module filter replacement (7Ton DM03 Engine Only)		234								O
DEF/Ad-Blue Supply module filter replacement (8/9 Ton DM03 81kW Engine Only)		234								O
DPF Regeneration / SCR Cleaning		198	O							
Drive Axle Oil	Change	216			O					
Drive Axle Oil (OCDB)	Change	225					O			
Drive Axle Oil Level	Check	213		O						
Engine Oil & Filter (Diesel Engine Only)	Change	222				O				
Engine Oil & Oil Filter	Change	214			O					
Engine Oil Level	Check	209		O						
Engine Valve Lash (Diesel E/G Only)	Check, Adjust	194	O							
Fork	Inspect	231						O		
Fuel Filter	Check, Clean, Change	222,226				O	O			
Fuel Tank Filter Cap & Screen	Clean	197	O							
Fuses, Bulbs & Circuit Breaker	Change, Reset	202	O							
Horn and Lights(If Equipped)	Check	221				O				
Hydraulic Oil Level	Check	212		O						
Hydraulic Oil, Strainer	Check, Clean, Change	233							O	
Hydraulic Return Filter & Breather	Check, Clean, Change	225					O			
Inspect Battery System		233							O	
Inspect Engine for Exhaust Leaks		211		O						
Inspecting Engine Fuel Supply System		195	O							
Inspection Engine for Fluid Leaks		209		O						
Lift Chains	Test, Check, Adjust	226					O			
Mast Channels	Lubricate	212		O						
Mast Hinge Pins	Lubricate	220				O				
Mast, Carriage, Lift Chains & Attachments	Inspect, Lubricate	207	O							
Overhead Guard (If Equipped)	Inspect	221				O				
Parking Brake	Test, Adjust	217,221			O	O				

Quick Reference to Maintenance Schedule				FIRST	EVERY					
ITEMS	SERVICES	PAGE	When Required	First 50-100 Service Hours or a Week	Every 10 Service Hours or Daily	Every 500 Service Hours or 3 Months	Every 1000 Service Hours or 6 Months	Every 2000 Service Hours or Yearly	Every 2500 Service Hours or 15 Months	Every 3000 Service Hours or 36 Months
Priming the Fuel System (Diesel Engine Only)		196	O							
Radiator Cap	Clean, Change	206	O							
Seat	Check, Lubricate	197	O							
Separating Water from Fuel		195	O							
Steer Suspension	Inspect	222				O				
Steer Wheel Bearings	Reassemble	229						O		
Steering Axle Support	Check, Oiling	224				O				
Steering Mechanism	Check, Lubricate	224				O				
Steering Mechanism (Link Bearing)	Check, Lubricate	208	O							
Tilt Cylinders	Check, Adjust, Lubricate	220				O				
Transmission Oil & Oil Filter	Change	215			O					
Transmission Oil & Oil Filter	Change (3 Speed, ZF 3WG94)	229						O		
Transmission Oil Level	Check	213		O						
Tyres and Wheels	Inspect, Check	205	O							
Universal Joint	Inspect, Lubricate	222				O				

When Required

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

When required indicates no set schedule for review or replacement. This should be done based on operational conditions and operational environment. The Air filtration system should be kept as clean as possible and checked as often as the operational conditions demand. The harsher the application the more frequently the air filter should be checked. In some applications daily inspection may be required.

Air Intake System - Check, Clean

Precleaner or rain cap (when Equipped)

NOTICE

Never service pre-cleaner with the engine running.

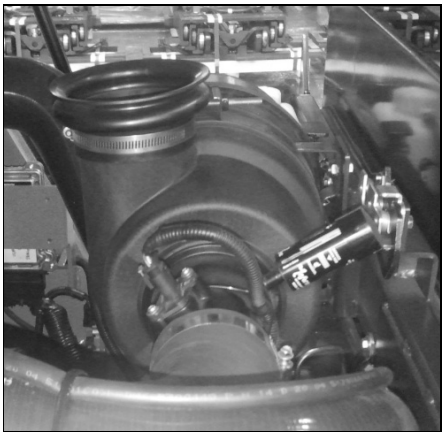
Typical Example

1. Check the pre-cleaner bowl for dirt build-up. If the dirt is up to the line, remove the pre-cleaner bowl and empty it. Periodically wash the cover and bowl in water.

Servicing Filter Element

NOTICE

Never service filter with the engine running.

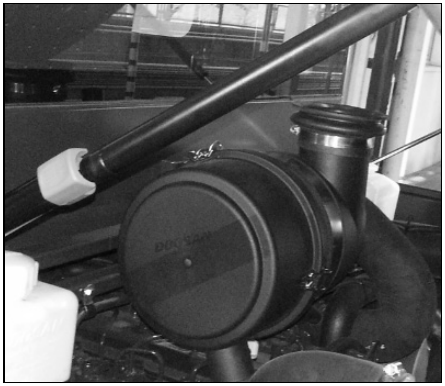


Typical Example Diesel Engine Truck

Service the air cleaner when the red target in the service indicator stays locked in the visible position with the engine stopped.

1. To service the air cleaner, raise the side cover. Loosen the cover latches and remove the cover.

Diesel Engine Truck (Dual Element)



Typical Example

1. Replace the nut and clamp.
2. Remove the element to separate it from its base and remove it from the air cleaner housing.
3. Clean and inspect the element.
4. Clean the inside of air cleaner housing and the cover. Inspect all connections between the air cleaner and carburetor. Check intake hose for cracks, damage and loose clamps. Tighten or replace parts as necessary to prevent leakage.

NOTICE

Do not allow dirty air to enter the intake hose when cleaning the inside of the cleaner housing.

5. Check the air cleaner housing for loose latches.
6. Reset the air cleaner service indicator.
7. Install the air filter element.
8. Install the cover and tighten the cover latches.
9. Start the engine and observe the position of the indicator. If the indicator shows RED after the installation of the primary element, install another clean or a new element or, replace the secondary element. See topic, "Air Intake System - Change" in Every 500 Service Hours or 3 months section.
10. Stop the engine and close the right side cover.

Cleaning Primary Filter Elements

⚠ WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

NOTICE

Do not clean the elements by bumping or tapping them.

Inspect filter elements after cleaning. Do not use a filter with damaged pleats, gaskets or seals.

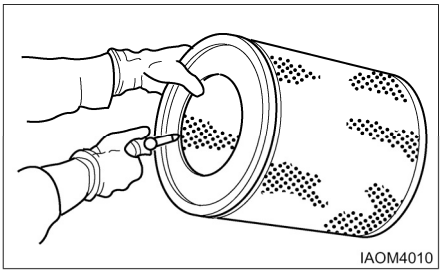
When cleaning with pressure air, use 205 kPa (30 psi) maximum pressure to prevent filter element damage.

When cleaning with pressure water, use 280 kPa (40 psi) maximum pressure to prevent filter element damage.

Have spare elements on hand to use while cleaning used elements.

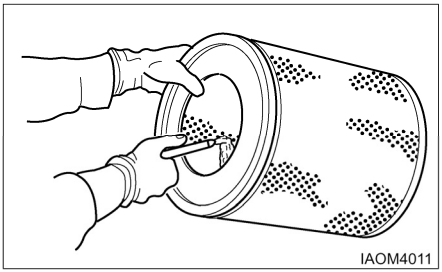
The primary element should be replaced after 3 months service. In case of harsh application having lots of dirt, please clean and replace the primary element more often.

Air-205 kPa (30 psi) Maximum Pressure



Direct air on the inside and outside of the element along the length of the pleats. Check the element for any tears, rips or damage.

Water-280 kPa (40 psi) Maximum Pressure

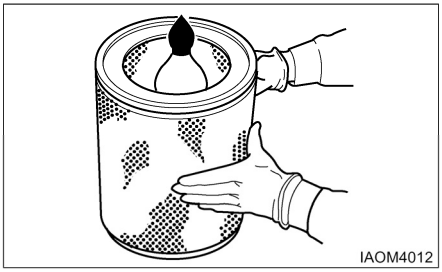


Direct water on the inside and outside of the element along the length of the pleats. Air-dry it thoroughly and then examine it.

Detergent

1. Wash the element in warm water and mild household detergent.
2. Rinse the element with clean water. See instructions in preceding topic for cleaning with water.
3. Air dry it thoroughly, and then examine it.

Checking Element



1. Insert a light inside the clean dry element and examine it. Discard the element if tears, rips or damage are found.
2. Wrap and store good elements in a clean, dry place.

Engine Valve Lash (Diesel E/G Only) - Check, Adjust

NOTICE

The valve clearances are to be adjusted at the times of the following situations.

When the engine is overhauled and the cylinder heads are disassembled.

When severe noise comes from valve train.

When the engine is not normally operated even though there is no trouble in the fuel system.

⚠ WARNING

To prevent possible injury when adjusting diesel engines, do not use the starter motor to turn the flywheel.

Hot engine components can cause burns. Allow additional time for the engine to cool before measuring valve clearance.

NOTICE

Measure the valve lash with the engine stopped. To obtain an accurate measurement, allow at least 20 minutes for the engine cylinder head and block to cool.

Set the clearance to the nominal appropriate clearance given in the "Valve Clearance Setting" chart shown below.

Valve Clearances		
Engine	**Valve**	**Clearance**
D34P D34NAP	Exhaust Valves	.45 mm (.18 in)
	Intake Valves	.40 mm (.16 in)

Refer to the "Service Manual" for the complete valve adjustment procedure.

NOTE: In case of Diesel Engine (only DM03), no valve adjustment is necessary.

Inspecting Engine Fuel Supply System

⚠ WARNING

Once a lot of foreign substances or water are detected in the fuel supply line, the warning function is activated. Failure to check the fuel supply line in response to the warning may cause a serious fault or damage in the engine.

Separating Water from Fuel

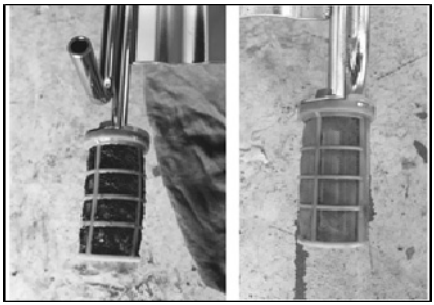
Once water is detected in the fuel, the water-in-fuel warning function is triggered to set off the warning buzzer, light up the warning lamp, and derate the engine. If a water-in-fuel warning occurs, check the fuel supply line as follows:

1. Turn off the engine and put a drip pan on the floor to catch drained fuel.
2. Remove the plug at the bottom of the fuel filter and wait until all fuel and water drain out of the filter.
3. Once they drain out, mount the plug and remove air according to the fuel system priming procedure.
4. Start up the engine and check if the warning has been cleared and the vehicle operates normally.

Getting Rid of Foreign Substances from Fuel Supply System

Once foreign substances are detected in the fuel, the pressure sensor warning function is activated. With this warning triggered, all or either of the following measures are taken depending on the vehicle settings: setting off the warning buzzer, lighting up the warning lamp, and derating the engine. If a pressure sensor warning occurs, check the system as follows:

1. Take out the fuel tank cover and remove the fuel tank filter.
2. Wipe foreign substances off the filter with a clean cloth or blowing them off using an air compressor.



3. Reinstall the filter and cover on the fuel tank.
4. Start the ignition and check if the warning has been cleared and the vehicle operates normally.
5. If the pressure sensor warning persists, replace the fuel filter cartridge. This replacement is one of the items described in the subsection of “Every 500 Service Hours or 3 Months.

NOTICE

Be careful not to damage the fuel tank filter when cleaning it. A damaged fuel tank filter may cause the contamination of the fuel filter with foreign substances and consequently a serious trouble in the engine.

⚠ WARNING

Before you perform service or maintenance, test the fuel system for leaks.

Priming the Fuel System (Diesel Engine Only)

Bleeding the Fuel System

After changing the fuel filter, or after having serviced any part of the fuel system, make sure that the air is bled from the system.

DM03

1. Operate priming pump for five minutes.
2. Make sure to check leakage of injection pump and filter after operating feed pump many times.

Draining Water from Fuel Filter

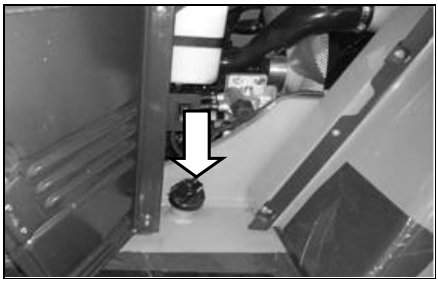
Applicable to diesel engines only

1. Turn the wing nut counterclockwise on the fuel filter's lower part to open the drain valve on the bottom of the filter.

Drain the fuel (including water) from the filter until clean fuel appears.

Fuel Tank Filter Cap & Screen - Clean

Park the lift truck with the forks lowered, parking brake applied, transmission in neutral and the engine stopped.



Typical Example

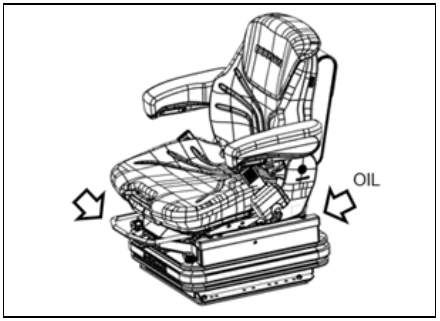
1. Raise the left side cover.
2. Remove the filter cap assembly. Separate the cap from the screen. Clean both in clean, nonflammable solvent.
3. Dry and assemble cap and screen.
4. Install cap assembly.

⚠ WARNING

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

5. Drain moisture and sediment from fuel tank as required by prevailing conditions.

Seat - Check, Lubricate



Typical Example

Check the operation of the seat adjuster rod. Make sure that the seat slides freely on its track. Lightly oil the seat slider tracks if necessary.

Battery Terminal - Clean, Inspect

⚠ WARNING

Batteries give off flammable fumes that can explode.

Do not smoke when observing the battery electrolyte levels.

Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Always wear protective glasses when working with batteries.

Typical Example Diesel Engine Truck

1. Clean the top of the battery and terminals.
2. Check terminals for corrosion. Coat terminals with heavy grease.

DPF Regeneration / SCR Cleaning

DPF Regeneration / SCR Cleaning - Display Pop-up

In order that the DPF/SCR system may maintain its exhaust cleaning efficiency at a proper level, it should be periodically initialized - “DPF Regeneration / SCR cleaning.”

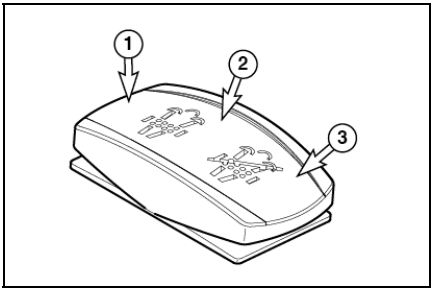
NOTICE

Keep monitoring the vehicle condition via the SCREEN display.

- At a workplace which is near inflammables or, heavily populated, or an indoor space, disable the DPF regeneration / SCR cleaning function.
- Be careful of the high temperature of the exhaust tube or other parts during DPF regeneration / SCR cleaning.
- Do not operate the vehicle (e.g. pushing the accelerator pedal) during DPF Regeneration / SCR cleaning.
- Do not switch off the ignition during DPF Regeneration / SCR cleaning. The DPF/SCR system might be damaged.

DOC & DPF/SCR Position

DPF/SCR Cleaning switch



Cleaning start : Push brake pedal and release accel pedal to fully stop the truck. And then push switch “on” by 3 sec

Cleaning stop : Push switch “off” or release brake pedal or press accel pedal

Automatic SCR Cleaning

Automatic DPF Regeneration / SCR Cleaning

The ECU attempts to start DPF regeneration / SCR cleaning during working—"automatic DPF regeneration / SCR cleaning"—at a proper moment after determining the moment. Once automatic DPF regeneration / SCR cleaning starts, the high temperature indicator lamp lights up with a popup appearing for the operator to notice it.

Display that notifies the operator of automatic DPF regeneration / SCR cleaning

If automatic DPF regeneration / SCR cleaning is failed due to a low exhaust temperature, you should perform it after the vehicle stops. Therefore, it is recommended to keep the vehicle working as far as possible in order to ensure automatic DPF regeneration / SCR cleaning is fully completed. While automatic DPF regeneration / SCR cleaning is being carried out, exhaust emissions above 500 ℃ may cause fires or burns.Setting this switch to position "3" prohibits automatic DPF regeneration / SCR Cleaning in an environment subject to dust, explosion or regulated noise level. At position "3", a pop-up appears as shown below:

The switch returns to the normal position of "2" after pressed by the operator to position "1". However, it does not return when pressed to position "3" and the operator shall return the switch from position "3".

DPF regeneration

SCR Cleaning inhibited

If automatic DPF regeneration / SCR cleaning is failed, you should carry it out a while after the vehicle starts working.

1) A pop-up on the DPF/SCR Display warns the operator to perform DPF regeneration / SCR Cleaning. (3 warnings: at 10 hrs remaining, 5 hrs remaining, Immediate)

Exemplary warning – 10 hrs remaining

Limit the engine power and stop the current work when DPF regeneration / SCR cleaning is not used; you will be violating the exhaust regulations if you do not.

To carry out DPF regeneration / SCR cleaning safely, observe the following steps:

1. Park the vehicle at a safe place. White smoke can be emitted during DPF regeneration / SCR Cleaning.
2. Remove the flammable material or stained oil from exhaust system. High temperature of exhaust system and gas can cause fire.
3. Engage the parking brake, and make sure the gear is in neutral.
4. Allow engine to warm up sufficiently; the DPF regeneration / SCR cleaning is not possible in cold condition.
5. After holding down the switch at the “3” position for three seconds, check that DPF regeneration / SCR cleaning has started.
6. Once DPF regeneration / SCR cleaning finishes, the LCD display will show a notification.
7. Press this switch and release it after 3 sec, DPF regeneration / SCR Cleaning will be started and the engine speed will be increased. Screen pop-up provides information on the warning up and cleaning process.

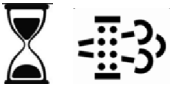
Warming up process

Proceeding

Completed

Information - correlation between Symbol and message (Display)

As shown in the table below, for your information, we provide Information about correlation between Symbol and message (Display)

No	State	SYMBOL	Lamp	Message on the Display
1	Request Service DPF regeneration / SCR Cleaning		-	Recommend DPF regeneration / SCR Cleaning in 10hr Need Engine Warm up
2			ON	Should Do DPF regeneration / SCR Cleaning in 5hr Need Engine Warm up
3			Blink	Must Do DPF regeneration / SCR Cleaning Immediately Need Engine Warm up
4	Progressing Passive DPF regeneration / SCR Cleaning Progressing Service DPF regeneration / SCR Cleaning		ON	Hot Exhaust Gas
5	Service DPF regeneration / SCR Cleaning Preparation Lamp		ON	Warming up for DPF regeneration / SCR Cleaning
6	Under DPF Regeneration / SCR Cleaning		ON	DPF regeneration / Cleaning SCR DO NOT STOP ENGINE
7	DPF regeneration / SCR Cleaning Finish		-	DPF regeneration / SCR Cleaning completed
8	DPF regeneration / SCR Cleaning inhibit switch ON		ON	DPF regeneration / SCR Cleaning is inhibited

Fuses, Bulbs & Circuit Breaker - Change, Reset

Fuses

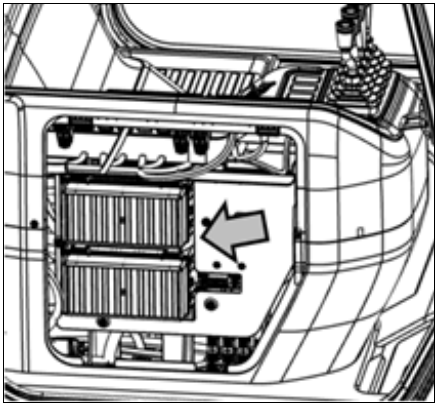
NOTE: If a fuse filament separates, use only the same type and size fuses for replacement. If the filament in a new fuse separates. Have the circuits and instruments checked.

NOTICE

Always replace fuses with ones of the correct ampere rating.

Remove the front cover of fuse box. The fuses are located under the cover.

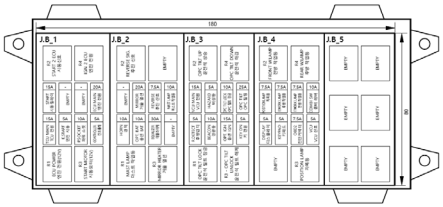
Fuse - Protects an electrical circuit from an overload. Opens (filament separates) if an overload occurs.



Typical Example

Check the fuses. Use a flashlight, if necessary.

Fuses are identified as follows:



Fuses protect the electrical system from damage caused by overloaded circuits. Change a fuse if the element separates. If the element of a new fuse separates, have the circuit checked and repaired.

J.B_1

No.	Description	Rated Capacity
1	START RELAY	15A
2	ECU MAIN	20A
3	TCU MAIN	15A
4	ESTART	5A
5	PSOCKET	10A
6	CONTROLLER	5A

J.B_2

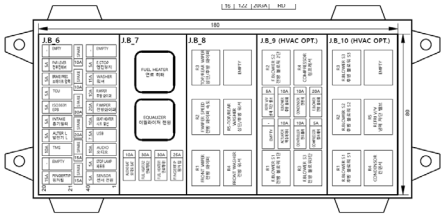
No.	Description	Rated Capacity
1	MIRROR	20A
2	REVERSE	7.5A
3	MAST LAMP	10A
4	HORN	10A
5	OPT BAT	10A
6	EQUALIZER	30A

J.B_3

No.	Description	Rated Capacity
1	VCU MAIN	15A
2	HARZARD	5A
3	OPC TILT LOCK	10A
4	OPC TILT	25A
5	R.DETECT	5A
6	BEACON	10A
7	OPT.IGN	15A
8	KEY ON	5A

J.B_4

No.	Description	Rated Capacity
1	POSITION LAMP	7.5A
2	R.WORK LAMP	7.5A
3	F.WORK LAMP	7.5A
4	COMBI SW	10A
5	DISPLAY	5A
6	KEYPAD	5A
7	OBD2	7.5A
8	VCU	5A



J.B_6

No.	Description	Rated Capacity
1	FNR LEVER	5A
2	BRAKE PRES	5A
3	TCU	5A
4	ISO3691	5A
5	INTAKE	5A
6	ALTER L	5A
7	TMS	10A
8	FINGERTIP	15A
9	E.STOP	5A
10	WASHER	15A
11	R.WIPER	10A
12	F.WIPER	20A
13	SEAT HEATER	10A
14	USB	7.5A
15	AUDIO	10A
16	STOP LAMP	5A
17	SENSOR	5A

J.B_7

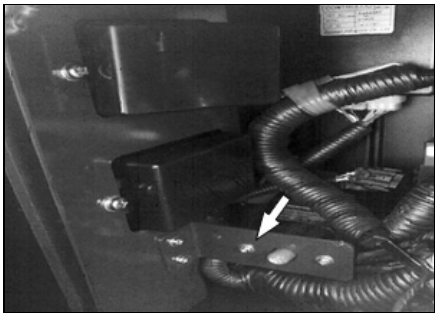
No.	Description	Rated Capacity
1	AUDIO BAT	10A
2	FUEL HEATER2	30A
3	FUEL HEATER1	30A
4	FINGERTIP	25A

J.B_9 (HVAC OPT)

No.	Description	Rated Capacity
1	REFRI V/V	5A
2	R.BLOWER	10ª
3	CONDENSOR	10A
4	F.BLOWER	20A
5	ACTUATOR	10A
6	CONTROLLER	10A
7	COMPRESSOR	5A

Circuit Breaker

1. Operation the pilot box.



Typical Example Diesel Engine Truck

2. The main circuit breaker is located on the rear of the support for the controls.

NOTE: To reset circuit breakers push on the button. The button should stay in if the breaker is reset. If the button will not stay in, or comes out shortly after reset, have the circuits checked?

Lamps

Lamps are identified as follows

[Diesel Engine]

1. LED head lamp
2. LED tail light
3. LED turn signal light (front)
4. LED turn signal light (rear)
5. LED stoplight, tail light
6. LED backup lamp
7. Strobe light

Tyres and Wheels - Inspect, Check

⚠ WARNING

Servicing and changing tyres and rims can be dangerous and should be done only by trained personnel using proper tools and procedures. Deflate tyre before removing wheel nuts from the truck.

If correct procedures are not followed while servicing tyres and rims, the assemblies could burst with explosive force and cause serious physical injury or death.

Follow carefully the specific information provided by your tyre servicing man or branch.

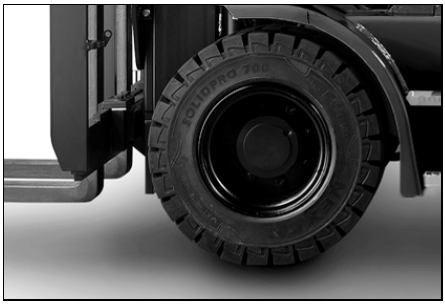
Check Inflation and Damage

Inspect tyres for wear, cuts, gouges and foreign objects. Look for bent rims and correct seating of locking ring.

Check tyres for proper inflation. See "Tyre Inflation Pressures".

To inflate tyres always use a clip-on chuck with a minimum 60 cm (24 inches) length of hose to an inline valve and gauge.

Always stand behind the tread of the tyre. NOT in front of the rim.



Typical Example

Do not re-inflate a tyre that has been run while flat or underinflated, without first checking to make sure the rim is not damaged and is in the correct position.

When tyres are changed, be sure to clean all rim parts and, if necessary, repaint to stop detrimental effects of corrosion. Sand blasting is recommended for removal of rust.

Check all components carefully and replace any cracked, badly worn, damaged and severely rusted or corroded parts with new parts of the same size and type. If there is any doubt, replace with new parts.

Do not, under any circumstances, attempt to rework, weld, heat or braze any rim components.

Radiator Cap - Clean, Change

Clean Pressure Cap

⚠ WARNING

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

1. Remove the radiator cap slowly to relieve pressure.
2. Inspect the cap for damage, deposits or foreign material. Clean the cap with a clean cloth or change the cap as necessary.
3. Install the cap.

Clean Outside of Radiator Core

⚠ WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

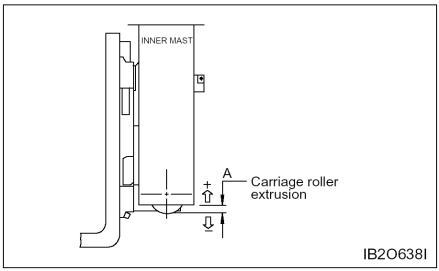
The maximum air pressure must be below 205 kPa (30 psi) for cleaning purposes.

Compressed air, high pressure water or steam can be used to remove dust, leaves and general debris from a radiator. Clean as required by condition of radiator.

The use of compressed air is preferred.

Carriage Roller Extrusion - Adjust

1. Set the mast vertical.
2. Lower the carriage completely.
3. On full free lift and full free triple lift models, the bottom of the inner mast must be flush with the bottom of the stationary mast.

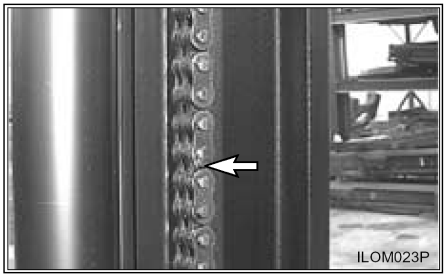


4. Measure the distance from the bottom of the inner upright to the bottom of carriage bearing.
5. The measurement (A) must be as follows in Chart below.

Height of carriage roller extrusion (A)		
STD mast	**FF mast**	**FFT mast**
CD60/70S-9 (3 Speed)		
23	-	26
CD80/90S-9 (3 Speed)		
42	-	42

Mast, Carriage, Lift Chains & Attachments - Inspect, Lubricate

1. Operate the lift, tilt and attachment controls. Listen for unusual noises. These may indicate a need for repair.
2. Check for loose bolts and nuts on the carriage.
3. Remove any debris from the carriage and mast.
4. Check the forks and attachments for free operation and damage. Have repairs made if necessary.



Typical Example

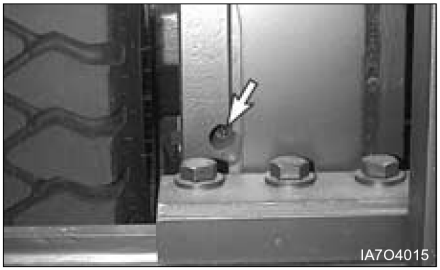
5. Brush a film of oil on all links of the chain.
6. Raise and lower the carriage a few times to allow lubricant to enter into the chain links.

NOTICE

Lubricate chains more frequently than normal in applications where the lift truck is operating in an atmosphere which could cause corrosion of components or when lift truck must work in rapid lift cycles.

7. Check the air cleaner housing for loose latches.

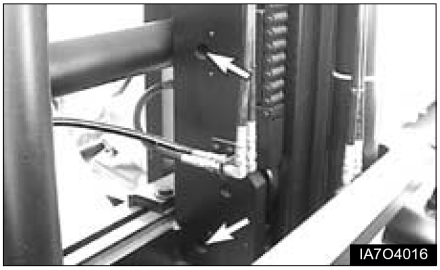
Lubricate Mast Side Rollers



Typical Example

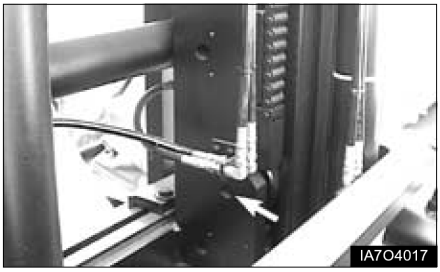
1. Lubricate the 2 fittings on the inner mast.

Lubricate Carriage Side Rollers



Typical Example

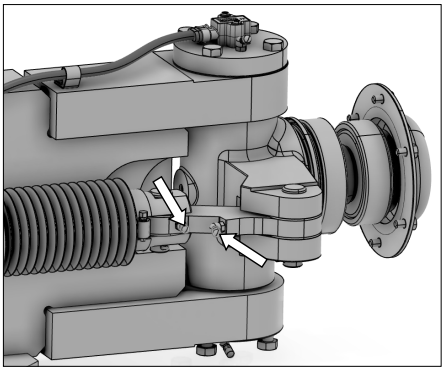
1. Lubricate the 4 fittings for the carriage side rollers, two on each side of the carriage side rollers.



Typical Example

2. Lubricate the 2 fittings for the carriage middle rollers, one on each side of the carriage middle rollers.

Steering Mechanism (Link Bearing) - Check, Lubricate



Typical Example

1. Lubricate the steering link bearings, total of four fittings. Two on the right side and two on the left side
2. Check for any worn or loose components of the steering mechanism. Remove any debris or trash as required.

Every 10 Service Hours or Daily

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Inspection Engine for Fluid Leaks

1. Start the engine and allow it to reach operating temperatures.
2. Turn the engine off.
3. Inspect the entire engine for oil and/or coolant leaks.
4. Repair as necessary before continuing.

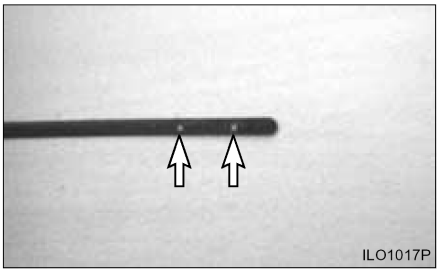
Engine Oil Level - Check

1. Raise the hood and seat assembly.

⚠ WARNING

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

Excessive refill volume of engine oil can cause dieseling phenomenon resulting in severe engine, damage. Keep appropriate engine oil level.



Typical Example

2. The oil level should be close as possible to upper point of the oil dip stick. Do not refill more than upper point.

Coolant Level - Check

⚠ WARNING

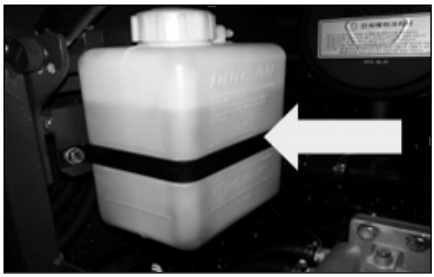
At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

Check the coolant level only after the engine has been stopped and the filter cap is cool enough to touch with your bare hand.

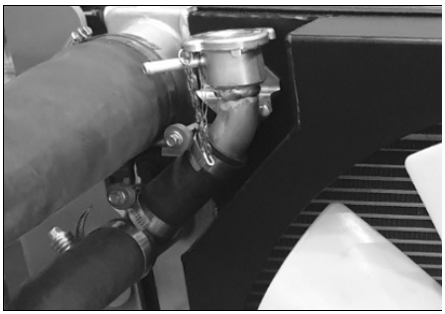
Remove the filter cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.



Typical Example

1. Observe the coolant level with engine cold. Maintain coolant level to the proper line on expansion bottle. If the expansion bottle has no coolant, it will be necessary to check coolant at the radiator filter neck.
2. Remove the radiator cap. Fill radiator to the top of the filter neck. Inspect radiator cap. Replace if damaged. Install the radiator cap.



Typical Example

3. Start and run the engine to stabilise the coolant level in the filter neck. If low, add coolant until it reaches the top of the filter neck. Install the radiator cap. Observe coolant level in the expansion bottle. If necessary, add coolant to bring the coolant to the appropriate line on the expansion bottle.
4. Stop the engine.
5. Inspect the cooling system for leaks, hose cracks or loose connections.

⚠ WARNING

Pressure air can cause personal injury.

When using pressure air for cleaning, wear a protective face shield, protective clothing and protective shoes.

Maximum air pressure must be less than 205 kPa (30 psi) for cleaning purposes.

6. Blow any dust and lint from the radiator fins.

Air Cleaner Indicator - Check

Service Indicator

Typical Example Diesel Engine Truck

1. Observe the air cleaner service indicator.
2. Service the air cleaner when the RED band in the service indicator, locks in the visible position. See topic, "Air Intake System - Check, Clean" in " When Required".

NOTE: Service the element more frequently, as required, in severe dust or lint conditions. Also, service it more frequently where the operator is required to wear a respirator.

3. Close hood and seat assembly.

Inspect Engine for Exhaust Leaks

1. Start the engine and allow it to reach operating temperatures.
2. Perform visual inspection of exhaust system. Repair any/all leaks found.

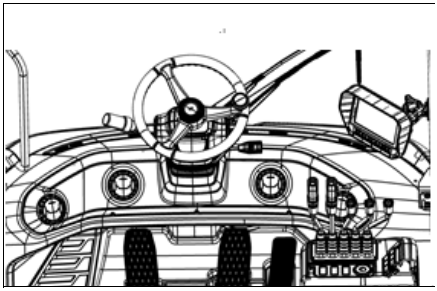
Walk-Around Inspection - Inspect

For maximum service life of the lift truck, make a thorough walk-around inspection. Look around and under the truck for such items as loose or missing bolts, debris or dirt buildup, fuel, oil or coolant leaks and cut or gouged tyres.

Have any repairs made and debris removed, as needed.

Typical Example

1. Inspect the tyres and wheels for cuts, gouges, foreign objects, inflation pressure and loose or missing bolts.
2. Inspect the mast and lift chains for wear, broken links, pins and loose rollers.
3. Inspect the hydraulic system for leaks, worn hoses or damaged lines.
4. Look for transmission and drive axle leaks on the lift truck and on the ground.



Typical Example

5. Inspect the operator's compartment for loose items and cleanliness.
6. Inspect the instrument panel for broken gauges and indicator lights.
7. Test the horn and other safety devices for proper operation.
8. Inspect engine compartment for oil, coolant and fuel leaks.
9. Inspect the cooling system for leaks, worn hoses and debris buildup.
10. Inspect the carriages, forks or attachments for wear, damage, and loose or missing bolts.

Visually inspect forks for cracks, especially in the heel section, around the mounting brackets, and all weld areas.

Inspect for broken or jagged fork tips, bent or twisted blades and shanks.

Make sure positioning lock is in place and working. Lock the forks in position before using the truck. See Step 7 of "Forks" in "Every 2000 Service Hours or Yearly".

Remove all defective forks from service.

Mast Channels - Lubricate

Typical Example

The channels on the roller-type mast require a break-in period. Apply a light film of lubricant on the channels where the rollers ride. This will prevent metal peel until the rollers set a pattern.

DEF/Ad-Blue Fluid Level - Check

1. Start the engine and check DEF/Ad-Blue level at the LCD.
2. DEF/Ad-Blue level is less than 20%, must refill DEF/ Ad-Blue in the DEF/ Ad-Blue tank.

Hydraulic Oil Level - Check

⚠ WARNING

At operating temperature, the hydraulic tank is hot and under pressure.

Hot oil can cause burns.

Remove the filter cap only when the engine is stopped, and the cap is cool enough to touch with your bare hand. Remove the filter cap slowly to relieve pressure.

1. Operate the lift truck for a few minutes to warm the oil. Park the lift truck on a level surface, with the forks lowered, mast tilted back, parking brake engaged, transmission in NEUTRAL and the engine stopped.
2. Raise the hood and seat assembly. Make sure the air lift cylinder securely holds the hood open.

Typical Example

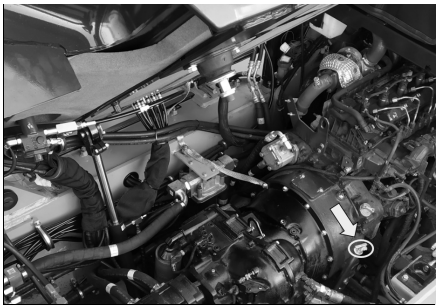
3. Check the oil level.
4. Maintain the oil level to the FULL mark on the dip stick/filter cap assembly.
5. Install the dip stick/filter cap assembly.

Transmission Oil Level - Check

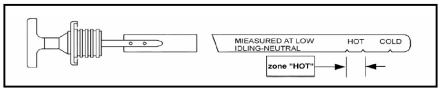
⚠ WARNING

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

1. Start and operate the lift truck until the transmission reaches normal operating temperature (about 80°C).
2. Park the lift truck level with the forks lowered, parking brake applied and the transmission controls in NEUTRAL.
3. With the service brake applied and the engine at low idle, shift the directional control lever to forward and then to reverse, to fill the clutches.
4. Shift the transmission into NEUTRAL. Engage the parking brake.



Typical Example CD60/70/80/90S-9 (3 Speed)



5. Loosen the oil dipstick counter-clockwise, remove and clear it. Insert the oil dipstick slowly into the oil level tube until contact is obtained, and pull the dipstick out again.
6. When the oil temperature is around 40°C, the marking on the oil dipstick must be lying above the cold start mark, "COLD". When the oil temperature is around 80°C, the oil level must be lying in the zone "HOT".
7. Install the oil dipstick again and tighten it clockwise.
8. Check for oil leaks at the filter and drain plug.
9. Stop the engine.

Drive Axle Oil Level – Check

⚠ WARNING

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

Oil Cooled Disc Brake (OCDB) Type

Park the lift truck on a level surface. Apply the parking brake. The engine is at the low idle. Place the directional control level in NEUTRAL.

1. Remove the dip stick/filter cap. Observe the oil level.
2. Maintain the oil level between lower mark and upper mark on the dip stick/filter cap.
3. Install the dip stick/filter cap.

First 50-100 Service Hours or a Week

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

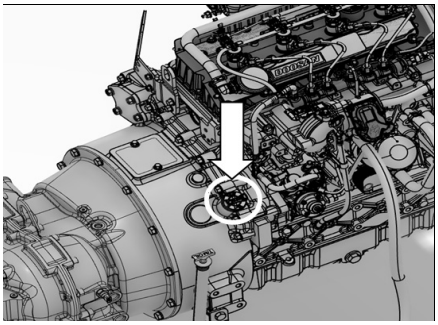
Engine Oil & Oil Filter - Change

The percentage of sulphur in the fuel will affect the engine oil recommendations. If the fuel has over 0.5% sulphur content, the engine oil must have a TBN of 20 times the percentage of fuel sulphur (TBN as measured by the ASTM D-2896 method). Your oil supplier should be able to furnish the correct oils.

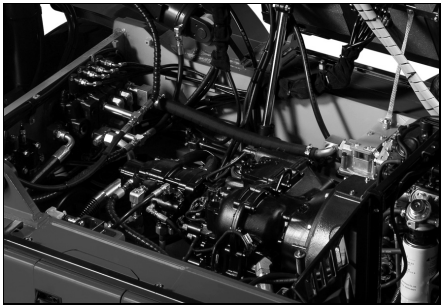
1. Operate lift truck a few minutes to warm oil. Park the lift truck with the forks lowered, parking brake applied, transmission in neutral and the engine stopped.
2. Raise rear of lift truck off the ground and block securely.

⚠ WARNING

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



Typical Example **Diesel Engine (DM03)**



Typical Example **Diesel Engine**

NOTICE

Careless disposal of waste oil can harm the environment and can be dangerous to persons. Make sure to have only authorised personnel dispose waste oil

3. Remove the crankcase drain plug and allow oil to drain. Clean and install drain plug.
4. Raise the left side cover.
5. Remove and discard oil filter element.
6. Wipe sealing surface of oil filter element mounting base. Make sure all of the old gasket is removed.
7. Before installing a new filter element, apply a small amount of clean engine oil to the filter element gasket.
8. Install the new filter element. When the gasket contacts the base, tighten it 3/4 of a turn more. Do not over tighten.
9. Raise the lift truck, remove the blocking and lower the lift truck.
10. Fill the crankcase. See "Refill Capacities".
11. Start the engine and allow the oil to fill the filter and passages.
12. Check for oil leaks.
13. Stop the engine and measure the oil level. The oil level should be close as possible to upper point of the oil dip stick.
14. Close side cover.

⚠ WARNING

Do not refill more than upper point.

NOTICE

Servicing of the engine oil and oil filter element will largely affect the engine performance as well as the engine life.

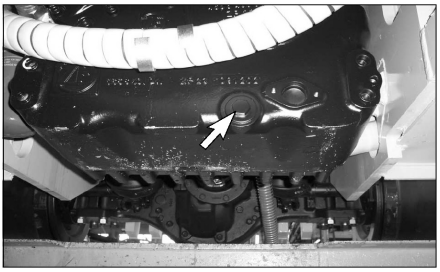
Engine oil and filter element must be changed after the first 50-100 Service hours or a week.

Transmission Oil & Oil Filter - Change

⚠ WARNING

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

Park the lift truck level, with the forks lowered, parking brake engaged, transmission in NEUTRAL and the engine stopped.



Typical Example CD60/70/80/90S-9 (3 Speed)

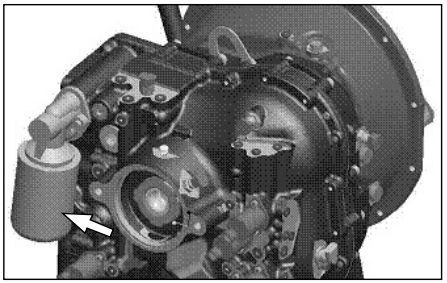
1. Remove drain plug. Allow the oil to drain.

NOTICE

Careless disposal of waste oil can harm the environment and can be dangerous to persons. Make sure to have only authorised personnel dispose waste oil.

2. Install the drain plug.

ZF 3WG94



Typical Example CD60/70/80/90S-9 (3 Speed)

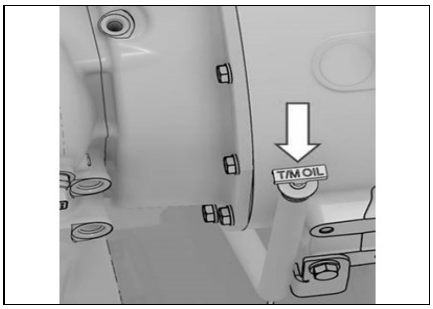
3. Rotate the oil filter counter clockwise to remove it.

- Replacement Interval of Transmission Oil Filter

  CD60/70/80/90S-9 (3 Speed)

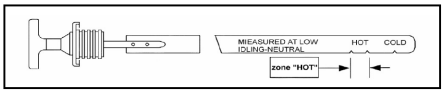
  : Every 2,000 Service Hours or 12 Months.

4. Put a small amount of clean oil on the seal gasket on the new filter. Install the filter by hand. When the filter contacts the base, tighten it an additional 3/4 turn.
5. Remove the dipstick and fill new transmission oil through the dipstick's filler pipe. See "Refill Capacities". Install the dipstick.



6. Close the cabin.
7. Start the engine.
8. With the service brake applied and engine at low idle, shift the transmission to forward and reverse to fill the clutches.
9. Shift the transmission into NEUTRAL. Engage the parking brake.

Loosen the oil dipstick counter-clockwise, remove and clear it. Insert the oil dipstick slowly into the oil level tube until contact is obtained, and pull the dipstick out again.



10. When the oil temperature is around 40°C, the marking on the oil dipstick must be lying above the cold start mark, "COLD". When the oil temperature is around 80°C, the oil level must be lying in the zone "HOT".
11. Install the oil dipstick again and tighten it clockwise.
12. Check for oil leaks at the filter and drain plug.
13. Stop the engine.

Drive Axle Oil - Change

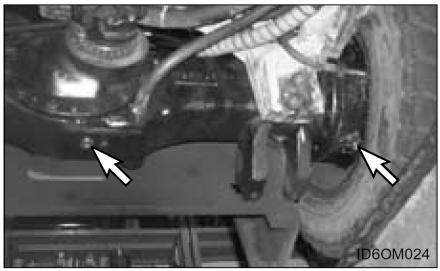
Park the lift truck on a level surface, parking brake applied, transmission in neutral.

⚠ WARNING

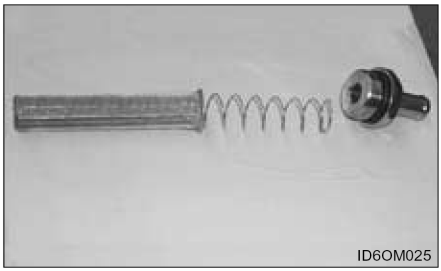
Hot oil and components can cause personal injury. Do not allow hot oil or components to contact skin.

Oil Cooled Disc Brake (OCDB) Type

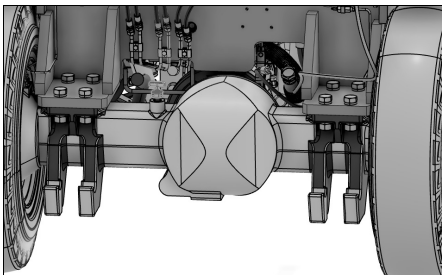
Park the lift truck on a level surface. Apply the parking brake. Place the directional control level in NEUTRAL and stop the engine.



1. Remove three drain plugs of the drive axle housing and both wheel ends. Allow the oil to drain into a suitable container. Clean the magnetic drain plugs. Check O-ring seal and replace if necessary.
2. Install the drain plug.
3. Remove strainer assembly.



4. Wash the strainer assembly in clean, nonflammable solvent and dry it.
5. Install the strainer assembly and reconnect the hose and harness.



6. Remove the dip stick/filter cap. Fill the drive axle housing with oil. See "Lubricant Specification - Drive Axle Oil" and "Refill Capacity".
7. Start the lift truck. With the engine at low idle, place the directional control lever to the NEUTRAL.
8. Maintain the oil level between lower mark and upper mark on the dip stick/filter cap.
9. Install the dip stick/filter cap.

Parking Brake - Test, Adjust

⚠ WARNING

To prevent personal injury, the operator must be ready to use the service brake if the parking brake is not adjusted correctly and the lift truck starts to move.

NOTE: Be sure area around the lift truck is clear of personnel and obstructions.

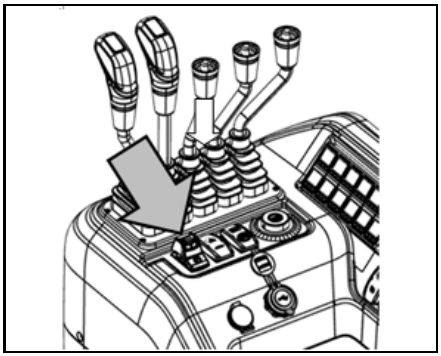
1. Drive the lift truck with a rated load up a 15% incline.
2. Halfway up the incline, stop the lift truck by applying the service brakes.
3. Engage the parking brake and slowly release the service brake.
4. If the parking brake has the correct adjustment the lift truck will be hold in place. If the parking brake does not hold, adjust the parking brake.

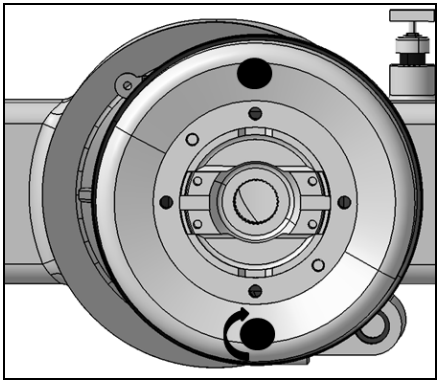
To Adjust

Park the lift truck level, with the forks lowered, transmission in NEUTRAL, the engine stopped and the wheels securely blocked.

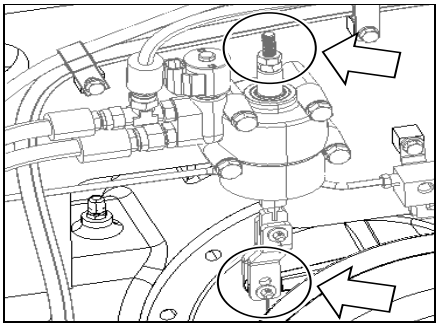
Electronic Parking Brake

1. Park the vehicle with the parking brake drum's rubber cap positioned at 6 o'clock and then turn off the ignition.

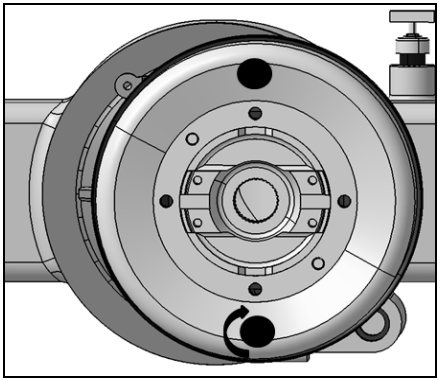




2. Secure the wheels firmly with blocks.
3. Tilt the cabin open.
4. Completely loosen two nuts (1) of the hydraulic actuator located at the fore part of the vehicle.
5. Check that the parking brake lever is completely put down to the horizontal position.



6. Remove the 6-o'clock-positioned rubber cap from the parking brake drum.
7. Screw up the adjuster as far as possible.
8. Screw down the adjuster exactly by two clicks.
9. Install the rubber cap on the parking brake drum.
10. Put a nut on the hydraulic actuator and tighten it up to a height of 23-25 mm.
11. Put the other nut and tighten it firmly.
12. Close down the cabin.
13. Turn on the ignition and press the parking brake switch to check if the parking brake works normally.
14. Test the parking brake.



Every 500 Service Hours or 3 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Air Intake System – Change

Changing Primary Element

See topic, “Air Intake System - Check, Clean” in “When Required”.

Changing Secondary Element

Replace the secondary element after the primary element has been cleaned three times or yearly.

1. Remove the primary air cleaner element. See topic “Servicing Filter Element”. Clean the inside of the air cleaner housing and cover.

2. Remove the secondary element. Inspect the gasket between the air cleaner housing and the engine inlet. Replace the gasket if it is damaged.

NOTICE

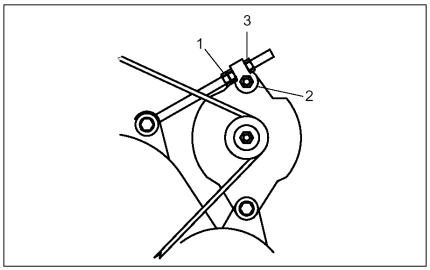
Always replace the secondary element. Do not attempt to reuse it by cleaning.

3. Install a new secondary element. Install a new or cleaned primary element. Install the cover. Tighten the latches.
4. Start the engine and observe the air cleaner service indicator. If the indicator shows RED after installing a new secondary element and a cleaned primary (outer) element, replace the cleaned primary filter with a new element.
5. Stop the engine. Close the hood and seat assembly.

Belts (Diesel E/G Only) - Check, Adjust

Typical Example Diesel (G2 DM03)

1. Check the condition and adjustment of the belt. Correct adjustment allows 10 mm (3/8 inch) deflection under 110 N (25 lb) of force.



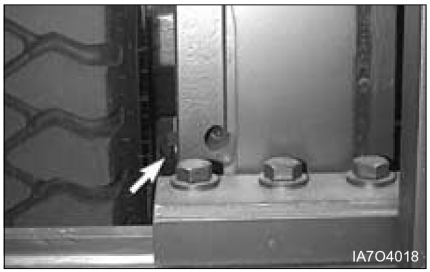
Typical Example

NOTICE

Failure to loosen the alternator mounting bolt (2) will cause excessive stress and break the alternator mounting ear.

2. To adjust the alternator drive belt, loosen adjusting bracket nut (1), mounting bolt and nut (2) and nut (3). Move the nut (1) in or out as required. Tighten the mounting bolt and nut (1, 2, 3).

Mast Hinge Pins - Lubricate

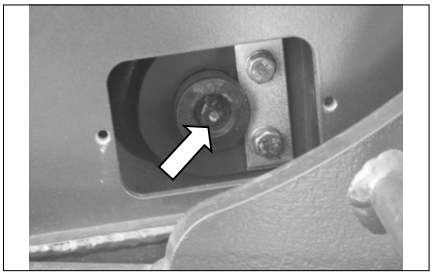


Typical Example

1. Lower the forks and tilt the mast forward.
2. Lubricate the two fittings for the mast hinge pins, one on each side of the mast.

Tilt Cylinders - Check, Adjust, Lubricate

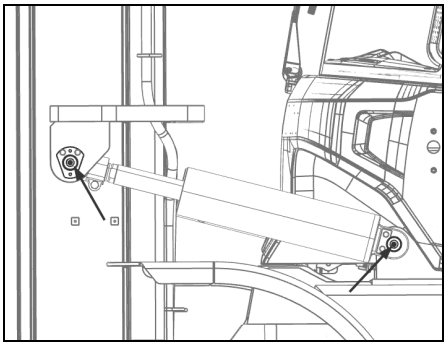
Chassis Pivot Eyebolts



Typical Example

1. Lubricate two fittings for the pivot eyebolts, one on each tilt cylinder.
2. Check the pivot eye pins for loose retainer bolts and wear.

Mast Pivot Eyes

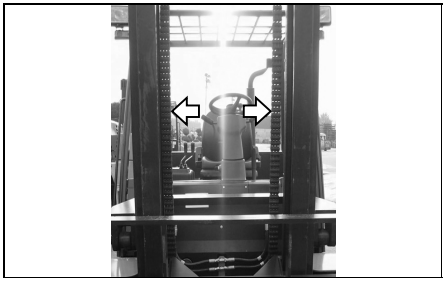


Typical Example

1. Lubricate two fittings for the mast pivot eyes, one on each side of the mast.
2. Check the pivot eye pins for loose retainer bolts and wear.

Crosshead Rollers - Inspect

1. Operate the mast through a lift cycle. Watch the chains move over the crosshead rollers. Make sure the chain is tracking over the rollers properly.



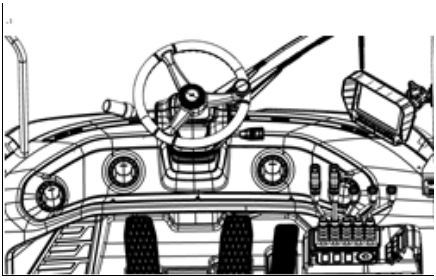
Typical Example

2. Check for damaged crosshead rollers, guards and retainer rings.

Parking Brake - Test, Adjust

See topic, "Parking Brake - Test, Adjust "in" First 50-100 Service Hours or a Week."

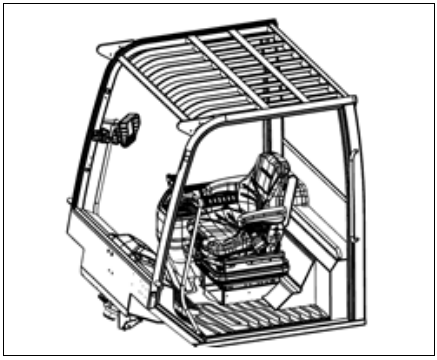
Horn and Lights(If Equipped) - Check



Typical Example

1. Press horn button, to determine if horn is operational.
2. Check all lights such as warning, directional, backup, driving and flood lights for correct operation. Replace all burned out bulbs. Have repairs made if needed.

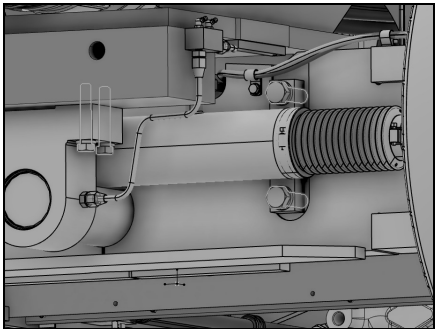
Overhead Guard (If Equipped) - Inspect



Typical Example

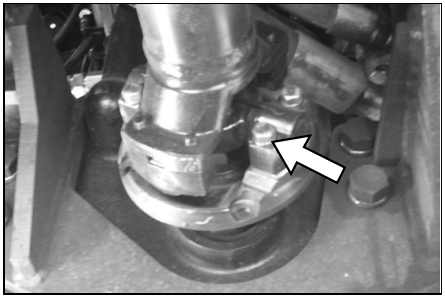
1. Check tightness of overhead guard mounting bolts at 240 N·m (175 lb·ft).
2. Check overhead guard for bent or cracked sections. Have repairs made if needed.

Steer Suspension - Inspect



1. Inspect the suspension mounting bolts. Tighten suspension each four mounting bolts (total eight bolts), if necessary, to 240±40N·m (177±29 lb·ft).
2. Look for leaks at the power steering hose and tube connections.
3. Remove any trash buildup on the suspension or steer axle.

Universal Joint - Inspect, Lubricate



Typical Example

Check for worn or damaged bearings. Check for loose retaining bolts and nuts. Tighten the bolts and nuts, if necessary. (55N·m, 41 lb·ft) Lubricate one fitting on the universal joint.

Engine Oil & Filter (Diesel Engine Only) - Change

Diesel Engine Crankcase

See topic, "Engine Oil & Filter (Diesel E/G Only) - Change" in "First 50-100 Service Hours or a Week".

*Engine Oil maintenance interval is 1000 hrs when using API CK 4.

Fuel Filter - Check, Clean, Change

Diesel Engine

Park lift truck with the forks lowered, parking brake applied, transmission in neutral, engine stopped and cool.

1. Open left door of hood.

⚠ WARNING

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.

Typical Example Diesel Engine Truck

2. Remove fuel filter cartridge assembly.
3. Before installing a new cartridge assembly, apply a small amount of clean fuel to the filter cartridge gasket.

NOTICE

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts.

4. Install the new fuel filter cartridge assembly.
5. Turn the new fuel filter cartridge assembly until the filter gasket is fitted against the sealing face.
6. Turn the fuel filter cartridge assembly an additional 2/3 of turn.

Wheel Bolts & Nuts - Inspect

Inspect Tightness

Steer Wheels

Typical Example

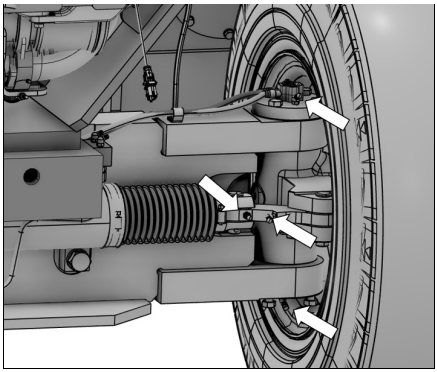
1. Install steer wheel. Put two nuts opposite each other (180°). Tighten bolt.
2. Inspect tightness of wheel nuts in a sequence opposite each other 620 ~ 680 N·m.

Drive Wheels

Typical Example

1. Install drive wheel. Put two nuts opposite each other (180°).
2. Inspect tightness of wheel nuts in a sequence opposite each other to 620 ~ 680 N·m

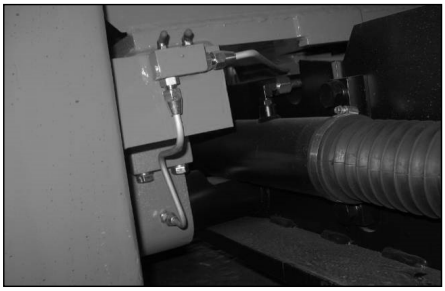
Steering Mechanism - Check, Lubricate



Typical Example

1. Lubricate the steer axle kingpins, total of four fittings. Two on the right side and two on the left side.
2. Lubricate the steering link bearings, total of four fittings. Two on the right side and two on the left side
3. Check for any worn or loose components of the steering mechanism. Remove any debris or trash as required.

Steering Axle Support - Check, Oiling



1. Apply lubricant to the fitting at the end of the tube connected to the steering axle support. Lubricate the point in the event of abnormal noise.

Every 1000 Service Hours or 6 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Drive Axle Oil (OCDB) - Change

See topic, "Drive Axle Oil - Change" in "First 50-100 Service Hours or a Week".

Hydraulic Return Filter & Breather - Check, Clean, Change

⚠ WARNING

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

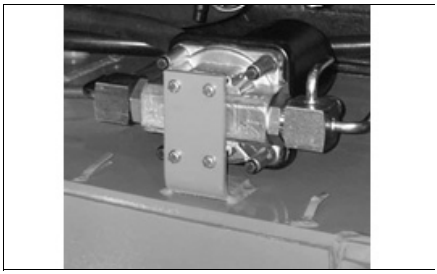
Park the lift truck level with the forks lowered, parking brake engaged, transmission in NEUTRAL and the engine stopped.

4.

5. Remove the breather.

6. Wash the breather in clean, nonflammable solvent and dry it.

7. Install the breather.



8. Remove bolts and return filter housing.

9. Remove and discard filter element from filter housing.

10. Clean the filter housing with a clean, nonflammable solvent.

11. Clean the housing base.

12. Insert a new filter element into the filter housing.

13. Inspect the filter housing seal. Replace if necessary.

14. Apply a small amount of clean oil to the filter element seal and housing seal.

15. Install the filter housing with filter to the housing base. Install bolts and tighten 20 to 30 N·m (15 to 20 lb·ft).

16. Start the engine and operate the hydraulic controls, and the steering system, through a few cycles to fill the lines. Look for oil leaks.

17. Stop the engine and check the oil level. With all cylinders retracted, maintain the oil level to the FULL mark on the dip stick/filter cap assembly.

Fuel Filter - Check, Clean, Change

Diesel Engine

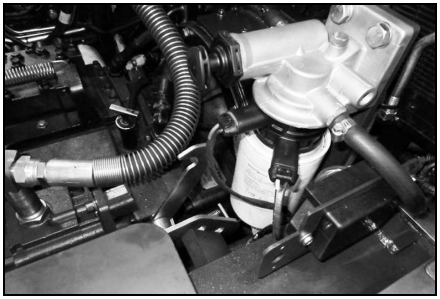
Park lift truck with the forks lowered, parking brake applied, transmission in neutral, engine stopped and cool.

1. Open left door of hood.

⚠ WARNING

Fuel leaked or spilled onto hot surfaces or electrical components can cause a fire.

Turn the disconnect switch OFF or disconnect the battery when changing fuel filters.



Typical Example Diesel Engine Truck

2. Remove fuel filter cartridge assembly.

3. Before installing a new cartridge assembly, apply a small amount of clean fuel to the filter cartridge gasket.

NOTICE

Do not fill fuel filters with fuel before installing them. Contaminated fuel will cause accelerated wear to fuel system parts.

4. Install the new fuel filter cartridge assembly.

5. Turn the new fuel filter cartridge assembly until the filter gasket is fitted against the sealing face.

6. Turn the fuel filter cartridge assembly an additional 2/3 of turn.

Lift Chains - Test, Check, Adjust

Lift Chain Wear Test

Inspect the part of the chain that is normally operated over the cross head roller. When the chain bends over the roller, the movement of the parts against each other causes wear.

Inspect to be sure that chain link pins. Do not extend outside of the link hole. If any single link pin is extended beyond its connecting corresponding link, it should be suspected of being broken inside of its link hole. Lift chains are required to check for wear about every 1,000 service hours or 6 months.

Chain wear test is a measurement of wear of the chain links and pins. Take the following steps to check chain wear.

1. Lift the mast and carriage enough for getting tension on lift chains.

Typical example

2. Measure precisely ten links of chain distance at the centre of pins in millimeter.

3. Calculate chain wear rate*.

4. If the chain wear rate is 2% or more, replace the lift chain.

Check for Equal Tension

Typical example

Lift the carriage and the mast high enough for getting tension on lift chains. Check the chains, and make sure the tension is the same. Lift chains are required to check for equal tension about every 1,000 service hours or 6 months.

⚠ WARNING

Personal injury can be caused by sudden movement of the mast and carriage.

Keep hands and feet clear of any parts that can move.

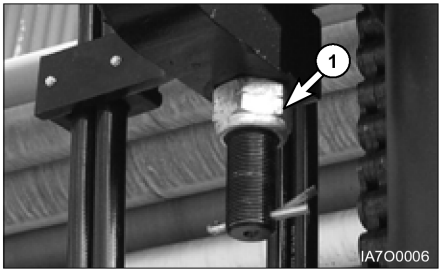
Lift Chain Adjustment

Typical example for carriage equal tension

If the tension is not the same on both chains, take the procedure as follows.

NOTE: If carriage height is not correct, make adjustments by following procedures.

Carriage Chain Adjustment - STD Mast



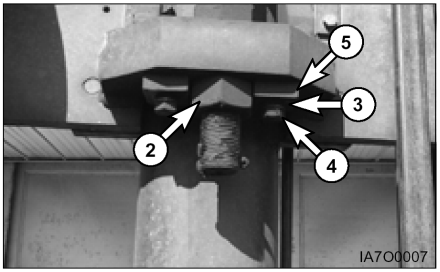
Typical example for carriage chain of STD mast

Make sure that carriage height is correct. If correct, adjust chain for equal tension. If not, adjust chain for correct carriage height by adjusting anchor nuts (1).

NOTE: See the previous section, "Carriage Roller Extrusion" in "When Required" for proper carriage height.

1. Fully lower the carriage and tilt mast forward or lift the carriage and put blocks under the carriage to release the tension from the lift chains.
2. Adjust nut (1) to get proper distance from the bottom of inner upright to the bottom of carriage bearing.
3. Make adjustment anchor nut (1) for equal chain tension.
4. Set the mast vertical and raise the carriage and check equal chain tension. If not equal, repeat the same procedure as step 1 through step 3.
5. Put LOCTITE No. 242 tread lock on the threads of the anchor nuts (1) after the adjustment is completed.

Carriage Chain Adjustment - FFT



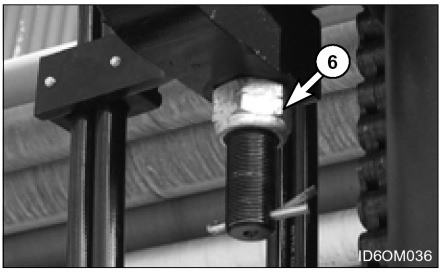
Typical example for carriage chain of FFT mast

Make sure that carriage height is correct. If correct, adjust chain for equal tension. If not, adjust chain for correct carriage height by adjusting anchor nuts (2).

NOTE: See the previous section, "Carriage Roller Extrusion" in "When Required" for proper carriage height.

1. Fully lower the carriage and tilt mast forward or lift the carriage and put blocks under the carriage to release the tension from the lift chains.
2. Remove bolt (3), washer (4) and stopper (5) and adjust nut (2) to get proper distance from bottom of inner upright to the bottom of carriage bearing.
3. Make adjustment anchor nut (2) for equal chain tension.
4. Set the mast vertical and raise the carriage and check equal chain tension. If not equal, repeat the same procedure as step 1 through step 3.
5. Put LOCTITE No. 242 tread lock on the threads of the anchor nuts (2) after the adjustment is completed.

Mast Chain Adjustment - FFT



Typical example for FFT mast

Make sure that mast height is correct. If correct, adjust chain for equal tension. If not, adjust mast chain for correct mast height by adjusting anchor nuts (6).

NOTE: See the previous section, "Carriage Roller Extrusion" in "When Required" for proper inner mast height.

1. Lift the inner mast and put blocks under the inner mast to release the tension from the lift chains.
2. Adjust nut (6) to make inner mast bottom flush with outer mast bottom.
3. Make adjustment anchor nut (6) for equal chain tension.
4. Raise the inner mast and check equal chain tension. If not equal, repeat the same procedure above step 1 through step 3.
5. Put LOCTITE No. 242 tread lock on the threads of the anchor nuts (6) after the adjustment is completed.

Every 2000 Service Hours or Yearly

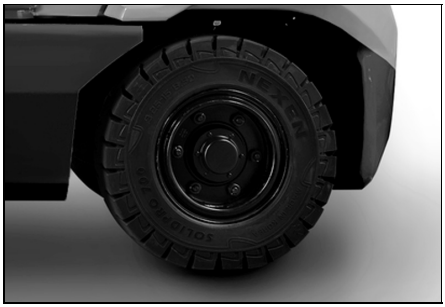
You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Transmission Oil & Oil Filter – Change (3 Speed, ZF 3WG94)

See topic, "Transmission Oil & Oil Filter – Change" in "First 50-100 Service Hours or a Week".

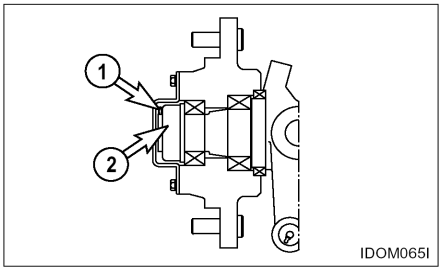
Steer Wheel Bearings - Reassemble

Park the lift truck level with the forks lowered, parking brake engaged, transmission in NEUTRAL and the engine stopped.



Typical Example

1. Lift the steer wheels off the ground. Place stands or blocking under the frame and steer axle to support the lift truck.
2. Remove the hub cap and gasket.



Typical Example

3. Remove the pin (1) and nut (2). Remove the outer wheel bearing.

Typical Example

4. Remove the wheel assembly. Examine the wheel for damage and wear. Replace the wheel if necessary.
5. Remove the inner bearing. Clean and lubricate the steering knuckle. Reassemble both the inner and outer bearing cones.
6. Install the inner bearing. Lubricate the seal and install the wheel assembly on the knuckle.
7. Install the outer wheel bearing and the outer nut.
8. Tighten the nut to 200 N·m (148 lb·ft), while turning wheel hub to seat the bearing.
9. Install the pin.
10. Install the hub cap.
11. Raise the lift truck and remove the blocking Lower the lift truck to the ground.

Cooling System - Clean, Change

⚠ WARNING

At operating temperature, the engine coolant is hot and under pressure.

Steam can cause personal injury.

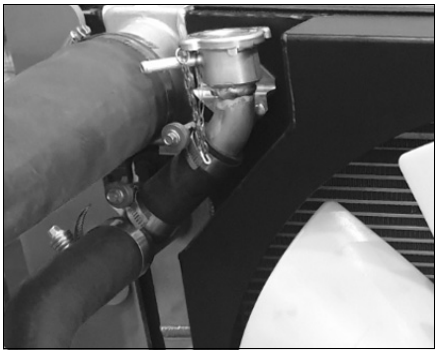
Check the coolant level only after the engine has been stopped and the filter cap is cool enough to touch with your bare hand.

Remove the filter cap slowly to relieve pressure.

Cooling system conditioner contains alkali. Avoid contact with the skin and eyes to prevent personal injury.

Use all cleaning solutions with care.

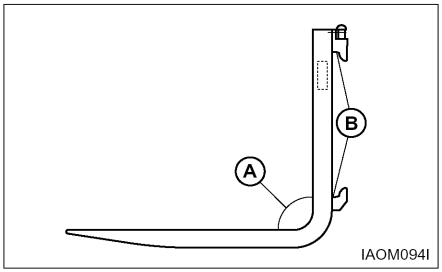
The lift truck must be level, the forks lowered, the parking brake engaged, the transmission in NEUTRAL and the engine stopped and cool.



Typical Example

1. Turn the radiator cap slowly to relieve the pressure, then remove the cap.
2. Remove the block drain plug.
3. Open radiator drain valve. Allow the coolant to drain. Drain the recovery bottle.
4. Close radiator drain valve and install block drain plug. Fill the cooling system with 1 kg (2 lb) sodium bisulphate per 40 liters (10 gallons) of water. Most commercial cooling system cleaners can be used.
5. Start and run the engine for 30 minutes.
6. Stop the engine and drain the cleaning solution.
7. Flush the system with clean water, until draining water is clear.
8. Close the drain valve and install the block drain plug. Fill the system with neutralizing solution, 250 g (1/2 lb) sodium carbonate per 40 liters (10 gallons) of water.
9. Start and run the engine for 10 minutes.
10. Stop the engine and drain the neutralizing solution.
11. Flush the system with clean water until draining water is clear.
12. Close the drain valve and install the block drain plug. Add coolant to the top of the filter neck.
13. Start and run the engine to stabilise the coolant level. See topic, "Coolant level - Check" in "Every 10 Service Hours or Daily".

Fork - Inspect



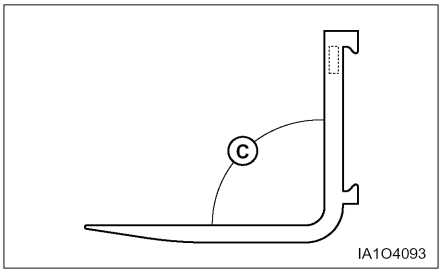
Forks should be inspected, at a minimum, every 12 months. If the truck is being used in a multi-shift or heavy duty operation, they should be checked every six months.

1. Inspect the forks carefully for cracks. Special attention should be given to the heel section (A), all weld areas and mounting brackets (B). Inspect the top and bottom hooks on forks used on hook type carriages and tubes on shaft mounted forks.

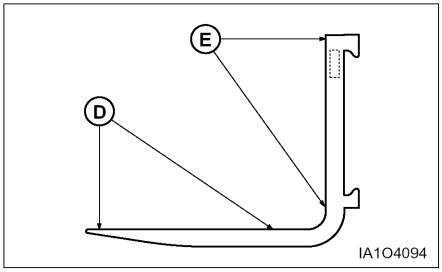
   Forks with cracks should be removed from service.

   "Wet Test" magnetic particle inspection is generally preferred due to its sensitivity and the ease of interpreting the results. Portable equipment is usually recommended so it can be moved to the lift truck.

   Inspectors should be trained and qualified in accordance with The American Society for Non Destructive Testing, Level II Qualifications.

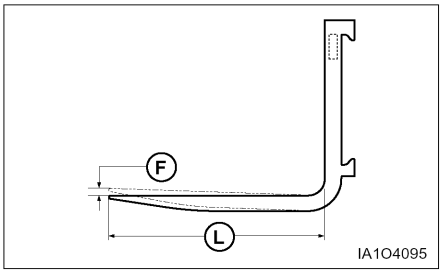


2. Check the angle between the upper face of the blade and the front face of the shank. The fork should be withdrawn from service if angle (C) exceeds 93 degrees or deviates by more than 3 degrees from an original angle other than 90 degrees, as may be found in some special application forks.



3. Check the straightness of the upper face of blade (D) and the front face of shank (E) with a straight edge.

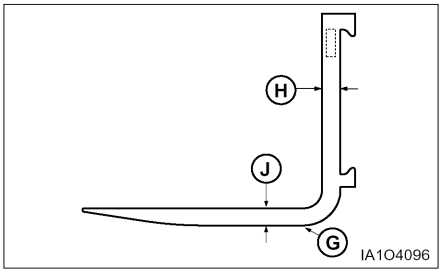
   The fork should be withdrawn from service if the deviation from straightness exceeds 0.5 percent of the length of the blade and/or the height of the shank respectively 5 mm/1000 mm (0.18"/36").



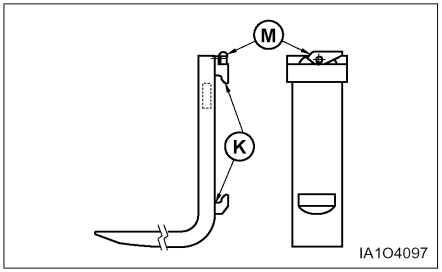
4. Check the difference in height of one fork tip to the other when mounted on the fork carrier. A difference in fork tip height can result in uneven support of the load and cause problems with entering loads.

   The maximum recommended difference in fork tip elevation (F) is 6.5 mm (0.25") for pallet forks and 3 mm (0.125") for fully tapered forks. The maximum allowable difference in fork tip elevation between the two or more forks is 3 percent of blade length (L).

   Replace one or both forks when the difference in fork tip height exceeds the maximum allowable difference. Contact your local CROWN Lift Truck Branch for further information.

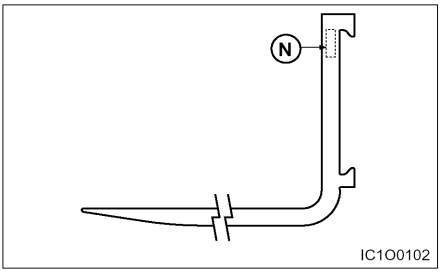


5. Check the fork blade (J) and shank (H) for wear with special attention to the heel (G). The fork should be withdrawn from service if the thickness is reduced to 90 percent or less of the original thickness.
Fork blade length may also be reduced by wear, especially on tapered forks and platens. Remove the forks from service when the blade length is no longer adequate for the intended loads.



6. Check the fork mountings (K) for wear, crushing and other local deformation, which can cause excessive side to side wobble of the forks.
Excessive clearance on hook type forks may allow them to fall from the carrier. Forks which show visible signs of such damage should be removed from service.

7. Check the positioning lock and other fork retention devices to make sure they are in place and working.
Hook type forks use a spring loaded pin (M), located in the top hook, to engage notches in the top carriage bar to hold the fork in place.
When adjusting the fork spacing, the forks are prevented from sliding off the end of the carriage by stop blocks. These stop blocks are at both ends of the carriage and in the path of the bottom fork hook. The load backrest extension may be used in place of the stop blocks in some cases.
Shaft mounted forks may use set collars or spacers on the shaft to either side of the fork.
They may also use U bolts, pins, or similar devices which engage the fork through the top structure of the carriage.



8. Check fork markings (N) for legibility. Renew markings as required to retain legibility.

9. **a.** Lift the mast and operate the tilt control lever, until the top surface of the forks is parallel with the floor. Place two straight bars that are the same width as the carriage, across the forks as shown.

b. Measure the distance from the bottom of each end of the two bars to the floor. The forks must be parallel within 3 mm (.12 in) for Full Tapered and Polished (FTP) forks, all other forks 6.4 mm (.25 in), for their complete length.

c. Put one fork, one third from the tip, under a fixture that will not move. Then operate the tilt control with caution until the rear of the truck lifts just off the floor. Follow the same procedure with the second fork. Repeat Step a.

Every 2500 Service Hours or 15 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

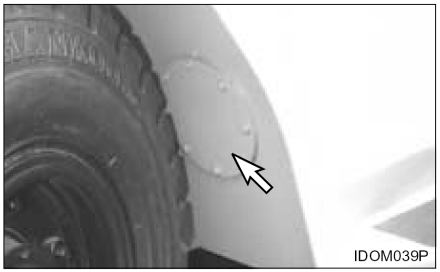
Hydraulic Oil, Strainer - Check, Clean, Change

⚠ WARNING

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

Park the lift truck level with the forks lowered, parking brake engaged, transmission in NEUTRAL and the engine stopped.

1. Remove the hydraulic tank drain plug located on the bottom of the frame. Allow the oil to drain in a suitable container. Clean and install the plug.



2. Loosen the bolts of the hydraulic tank cover.
3. Remove the strainer from the tank.
4. Install the new strainer by hand.
5. Install the hydraulic tank cover and fasten the bolts.

6. Remove dipstick/breather. Fill the hydraulic tank. See “Refill Capacities.” Install the breather/dipstick.
7. Start the engine and operate the hydraulic controls, and the steering system, through a few cycles to fill the lines. Look for oil leaks.
8. Stop the engine and check the oil level. With all cylinders retracted, maintain the oil level to the FULL mark on the dip stick/breather assembly.

Inspect Battery System

Clean battery outer surfaces with a mixture of baking soda and water.

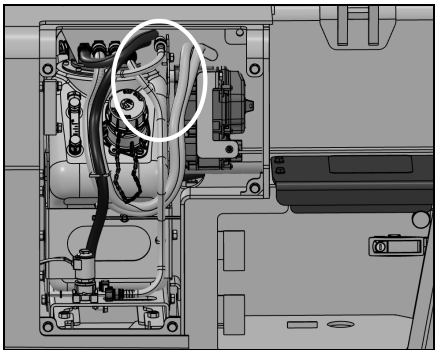
Inspect battery outer surfaces for damage and replace as necessary.

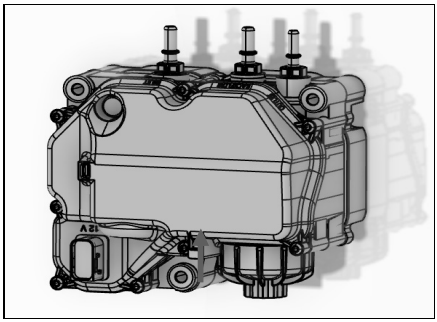
Remove battery cable and clean, repair and/or replace as necessary.

Every 3000 Service Hours or 36 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

DEF/Ad-Blue Supply module filter replacement (7Ton DM03 Engine Only)

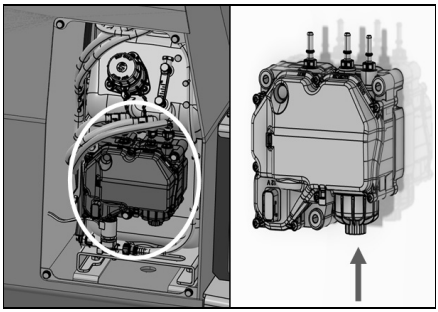




1. Loosen the supply module plug located on the inside of frame cover (RH).
2. Remove a battery under the supply module first.
3. Remove the filter element from the supply module.
4. Insert a new filter element and install the battery.
5. Fasten with the supply module plug.

For more details, refer to the “engine service manual”

DEF/Ad-Blue Supply module filter replacement (8/9 Ton DM03 81kW Engine Only)



1. Loosen the supply module plug located on the
2. inside of frame cover (RH).
3. Remove the filter element from the supply module.
4. Insert a new filter element.
5. Fasten with the supply module plug.

For more details, refer to the “engine service manual”

Every 5000 Service Hours or 30 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

DPF Maintenance (DM03V Stage 5 Engine Only) - Ash Cleaning

⚠ WARNING

Ash cleaning services is recommended by the designated repair shop, if not, it can lead to damage of the product and system.

Visit designated Repair & Inspection Shop for Ash Cleaning service every 5000 Hours or 30 Months. If not the efficiency of filtering and performance of back pressure would be reduced.

DPF

Use recommended engine oil to reduce the amount of generated ash (API CJ/CK-4 Grade).

Environment Protection

When servicing this lift truck, use an authorised servicing area and an approved container to collect coolant, oil, fuel, grease, electrolyte and any other potential environmental pollutant before any lines, fittings or related items are disconnected or removed. After servicing, dispose of those materials in an authorised place and container. When cleaning the lift truck, be sure to use an authorised area.

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