B25X-7 PLUS B30X-7 PLUS B35X-7 PLUS **DOOSAN**

SB2516E03

25/30/35X-7 PLUS

Operation & Maintenance Manual

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B25X-7 PLUS, B30X-7 PLUS, B35X-7 PLUS

FBA17,FBA19,FBA20

80 Volt

Doosan Industrial Vehicle Co., Ltd.

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Forklifts

Operation & Maintenance Manual

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FBA17,FBA19,FBA20 80 Volt

Translation of the original instruction

This document is the informational asset of Doosan Industrial Vehicle Co., Ltd. Thus, unauthorized access, revision, distribution and copying of this document are strictly prohibited.

WARNING

Do not start, operate or service this machine unless you have read and understood these instructions and received proper training.

Unsafe or improper use of the machine may cause serious injury or death.

Operators and maintenance personnel must read this manual and receive training before operating or maintaining the machine.

This manual should be kept with the machine for reference and periodically reviewed by the machine operator and by all personnel who will come into contact with it.

WARNING

This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm.

For more information go to www.P65Warnings.ca.gov.

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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 DOOSAN dealer 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 DOOSAN operator restraint system. Read, study and keep it handy.

WARNING

Your DOOSAN 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 DOOSAN operator restraint system.

Photographs or illustrations guide the operator through correct procedures of checking, operation and maintenance of the DOOSAN 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 tipover, 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 DOOSAN operator restraint system can minimize injuries. The DOOSAN 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 "First 50 - 100 Service Hours or a Week" and "Every 10 Service Hours or Daily".

Environment Management

Doosan Industrial Vehicle is ISO 14001 certified 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 through out 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 emplovee.

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.



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.

DOOSAN 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 DOOSAN 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. DOOSAN dealers 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 583 Fire Safety Standard for Electric-Battery-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.

DOOSAN 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 allert 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 authorized lift truck dealer. Do not attempt any adjustments or repairs unless trained and authorized 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 familiarize 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 dealer for new labels.

Training Required to Operate or Service Warning



Left of COWL viewed from the driver

▲ 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 DOOSAN Lift Truck dealers.

This label also provides allowable lift truck capacity information.

General Warnings to Operator

WARNING

Only trained and authorized 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:

- Before starting machine. Check all controls and warning devices for proper operation.
- 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.
- 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.
- Travel with load as low as possible and tilted back. If load interferes with visibility, travel with load trailing.
- On grade operations travel with load up grade.
- 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.
- 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.
- 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. Lower the lifting fork on the floor for parking the truck. Set the forward/reverse switch at neutral. Check that parking brake lamp is on, and turn the ignition switch to OFF position. Chock the wheels when parking the truck on a slope. Disconnect battery when parking an electric lift truck.
- 18. When charging the batteries of an electric forklift, observe safety instruction.
- 19. The emergency switch uses in emergency really. When you use often emergency switch by key switch, you can cause fatal mistake to your machine.
- 20. If user operates continuously pushing work or both brake pedal and accelerator pedal were depressed at the same time, main electric parts were able to damage.

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.

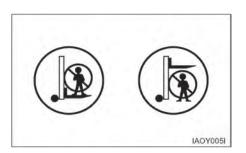


Located on the mast.

No Standing On Forks Warning, No Standing Under Forks Warning

M 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

M WARNING

Operation without this device in place may be hazardous.



Located on the load backrest.

Overhead Guard Must Be In Place Warning

M 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.



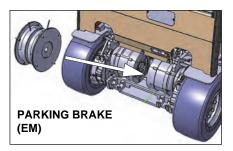
Located beside the operator's station.

Parking Brake Warning

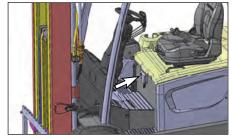
M WARNING

The parking brake is automatically engaged with a "clunk" after the vehicle stops. Do not exit the vehicle until it is engaged.

Braking with the emergency switch during driving may cause damage to the parking brake. Inspect the parking brake after an emergency stop, and replace it if needed.



Battery Restraint Warning



Located on front of battery cover.

WARNING

Before operating truck, ensure that hood is securely locked by hood latch, and turn stopper to locking position. Otherwise, a battery may come out of a truck in case of tipover. It could cause the risk of serious injury or death.

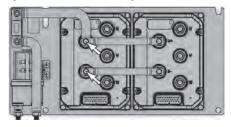


Battery Disconnect Before Servicing Warning

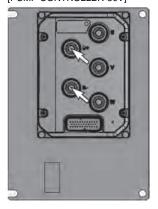
M WARNING

Disconnect battery from truck and also discharge high voltages from capacitor banks with a 150 ohm, 25 watt Resistor before attempting to service this truck.(B+, B-)

[DRIVE CONTROLLER-80V]



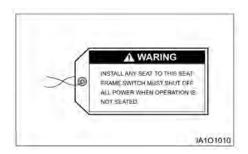
[PUMP CONTROLLER-80V]



Seat Switch Warning

M WARNING

Install any seat to this seat frame. Switch must shut off all power when operator is not seated.



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 alarm (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 unauthorized 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.

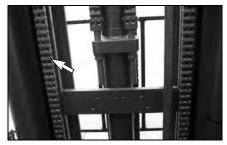
Inhaling Freon gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting Freon can cause bodily harm or death. Do not smoke when servicing air conditioners or wherever Freon gas may be present.

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.

Lift Chains



Inspect the part of the chain that is normally operated over the crosshead 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 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.

For any checkup, repair, adjustments, maintenance and all other work concerning your forklift truck, please contact your DOOSAN dealer.

Please be aware that Doosan assumes no responsibility for any secondary damages resulting from improper handling, insufficient maintenance or faulty repairs. Use of Doosan genuine parts is recommended when servicing parts.

Operation Information Mounting and Dismounting

Mount and dismount the lift truck carefully.

Clean your shoes and wipe your hands before mounting.

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 seat back.

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 directional control forward/reverse switch is in the NEUTRAL position.

Check the parking brake lamp to verify engagement of the parking brake.

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 turning the key switch on, 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.

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, 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 authorized 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 directional control forward/reverse switch to NEUTRAL.
- The parking brake is automatically engaged with a "clunk" after the vehicle stops.
- When the parking brake has been engaged, turn the key switch to OFF and pull it out.
- Turn the disconnect switch to OFF (if equipped).
- Block the drive wheels when parking on an incline.

Maintenance Information

Perform all maintenance unless otherwise specified as follows:

- Park the lift truck in authorized areas only.
- Park the lift truck level, with the forks lowered and the mast tilted forward until the fork tips touch the floor.
- Set the directional control forward/reverse switch to NEUTRAL position.
- Check the parking brake lamp to verify engagement of the parking brake.
- 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 unless otherwise instructed or 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 DOOSAN dealer 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 authorized by DOOSAN invalidates DOOSAN'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 DOOSAN dealer for mounting guidelines.

Burn Prevention

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

Only trained and designated personnel should inspect, recharge or exchange batteries.

Always wear protective glasses when working with batteries.

Service, exchange and handle batteries only in authorized areas when proper safety and ventilation facilities are provided.

Do not smoke, or expose battery to sparks or flame when checking, charging or servicing battery. Keep chains and metallic tools away from top of battery.

Batteries give off flammable fumes which can explode.

Highly explosive gases are especially hazardous toward the end of the charging period as the battery approaches a full charge condition.

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

Service batteries in accordance with battery manufacture instructions.

Refer to the topic "Batteries" in the "Maintenance Section" of this manual.

Fire or Explosion Prevention

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

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

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 unauthorized 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.

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.

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 DOOSAN dealer 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.

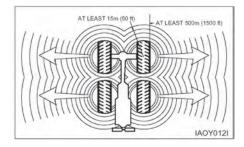
- End fittings damaged or leaking.
- Outer covering chafed or cut and wire reinforcing exposed.
- · Outer covering ballooning locally.
- Evidence of kinking or crushing of the flexible part of hose.
- · Armoring embedded in the outer cover.
- End fittings displaced.

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

Tire Information

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

A tire explosion is much more violent than a blowout. The explosion can propel the tire, 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 tire 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 tires. If the tires were originally inflated with air, nitrogen is still preferred for adjusting the pressure. Nitrogen mixes properly with air.

Nitrogen inflated tires reduce the potential of a tire 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 tire blowout or rim failure can result from improper or misused equipment.

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

Servicing, changing tires 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 tires and rims, the assemblies could burst with explosive force and cause serious personal injury or death. Follow carefully the specific information provided by your tire or rim servicing personnel or dealer.

DOOSAN 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 (If Equipped)

Warning Signs and Labels

Your DOOSAN lift truck has the following tipover 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 DOOSAN Lift Truck dealer for new labels.

The most effective method of preventing serious injury or death to yourself or others is to familiarize 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

Tipover can occur if the truck is improperly operated. In the event of tipover, injury or death could result.







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

Seat Adjustment

Forward and Backward Adjustment

Daewon Seat (Weight Input Adjustable)



Use the lever at the right-hand side to adjust the seat to the position you desire.

Make this seat adjustment before you drive the vehicle. After the adjustment, make sure the seat is fixed properly. Do not adjust the position of the seat while the vehicle is moving.

Grammer Seat (Weight Input Adjustable)



Use the lever at the left-hand side to adjust the seat to the position you desire.

Make this seat adjustment before you drive the vehicle. After the adjustment, make sure the seat is fixed properly. Do not adjust the position of the seat while the vehicle is moving.

WARNING

Do not put your hand or finger under the seat. The movement of the seat's suspension may cause injury.

Weight adjustment

Caution

Do not put your hand or finger under the seat. The up-and-down movement of the seat's suspension may cause injury.

Daewon Seat (Weight Input Adjustable)



Pulling the weight adjusting lever upward, move it right or left to adjust the weight input based on your weight (50–130 kg).

Grammer Seat (Weight Input Adjustable)



Pulling the weight adjusting lever forward by turning, move it up or down to adjust the weight input based on your weight (50–170 kg).

Backrest Inclination

Use the lever at the left-hand side to tilt the backrest backward or forward.

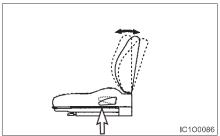
Daewon Seat (Weight Input Adjustable)



Grammer Seat (Weight Input Adjustable)



Lumbar Support Adjustment



Grammer Seat (Weight Input Adjustable)

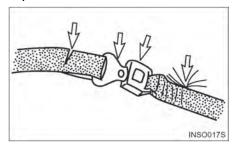


Turn the lumbar support adjusting lever to the right or left to tilt it backward or forward.

Seat Belt

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

Inspection



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



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

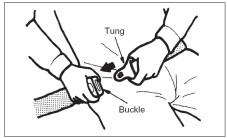
NOTE: Operator restraints shall be examined at the regular truck service intervals. It is recommended that they be replaced if any of the following conditions are found:

- · Cut or frayed strap
- Worn or damaged hardware including anchor points
- · Buckle or retractor malfunction
- Loose stitching

M 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



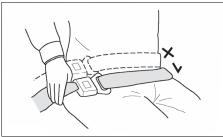
belt from the retractor. Then insert the plate into the slot of the buckle until a snap is heard. Pull on the belt to confirm it is latched.

2. Make sure the belt is not twisted.

MARNING

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

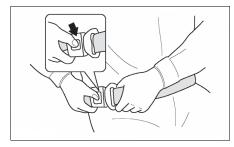




Be sure to fasten the belt across your hips, not across your abdomen.

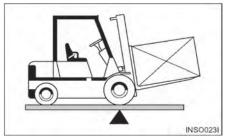
NOTE: The belt is designed to automatically adjust to your size and movement. A quick pull on the belt will confirm that the automatic adjuster will hold the belt position in the event of an accident.

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.

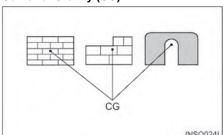
Avoiding Lift Truck Tipover Lift Truck Stability



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.

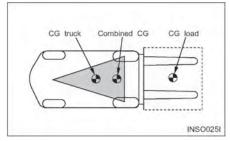
The location of the center of gravity of both the truck and the load is also a factor. This basic principle is used for picking up a load. The ability of the lift truck to handle a load is discussed in terms of center of gravity and both forward and sideways stability.

Center of Gravity (CG)



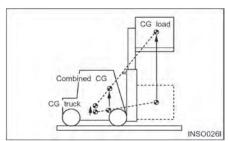
The point within an object, at which the whole weight of the object may be regarded as being concentrated, is called the center of gravity or CG. If the object is uniform, its geometric center will coincide with its CG. If it is not uniform, the CG could be at a point outside of the object. When the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

Stability and Center of Gravity



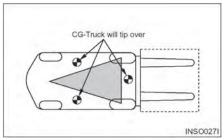
The stability of the lift truck is determined by the location of its CG; or, if the truck is loaded, the combined CG of the truck and load. The lift truck has moving parts and, therefore, has a CG that moves. The CG moves forward or backward as the mast is tilted forward or backward. The CG moves up 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
- tire 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

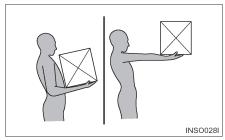


For the lift truck to be stable (not tip over forward or to the side), the CG must stay within the area of the lift truck stability base – a triangular area between the front wheels and the pivot of the steer wheels. If the CG moves forward of the front axle, the lift truck will tip forward. If the CG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

M WARNING

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

Capacity Load (Weight and Load Center)



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 center. The load center is determined by the location of the CG of the load.

The load center 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 center 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 centered on the forks.

NOTICE

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

Safety Rules



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



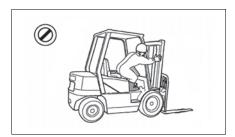
Inspect and check the condition of your forklift truck using the operator's check list before starting work. Immediately report to your supervisor any obvious defects or required repairs.



Do not operate your truck in unauthorized areas. Know your forklift truck and think safety.

Do not compromise safety.

Follow all safety rules and read all warning signs.

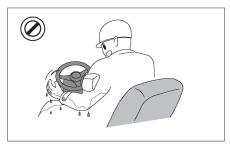


Do not operate a lift truck unless you are in the operator's seat. Keep hands and feet inside the operator's compartment. Do not put any part of the body outside of the operator's compartment. Never put any part of body into the mast structure or between the mast and the truck

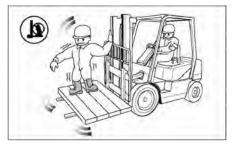


Do not start, stop, turn or change direction suddenly or at high speed. Sudden movement can cause the lift truck to tip over. Slow the speed of your truck and use the horn near corners, exits, entrances, and near people.

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 unless using an approved safety cage. 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 center load. Such a load increases the possibility of a tipover 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.

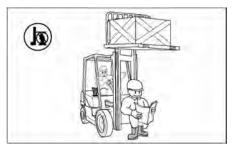
Handle loads carefully and check them closely for stability and balance.



Do not drive on slippery surfaces.

Sand, gravel, ice or mud can cause a tipover.

If unavoidable, slow down.



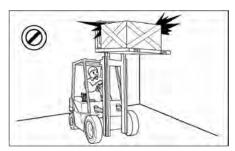
Do not permit anyone to stand or walk under the load or lifting mechanism. The load can fall and cause injury or death to anyone standing below.



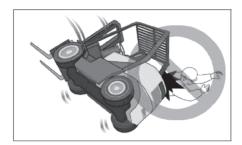
Do not elevate the load with the mast tilted forward.

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.

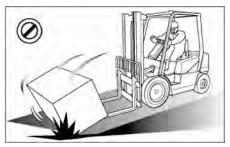


Do not move loose loads that are higher than the load backrest.

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.

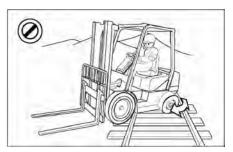
Never elevate a load with the forklift truck on an incline.

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 go over rough terrain. If unavoidable, slow down.

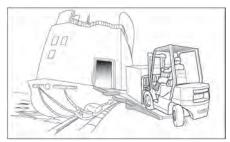
Cross railroad tracks slowly and diagonally whenever possible. A railroad crossing can give a loaded forklift truck a real jolt. For smoother crossing, cross the railroad diagonally so one wheel crosses at a time.



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 drive in forward direction when loads restrict your visibility. Operate your lift truck in reverse to improve visibility except when moving up a ramp.

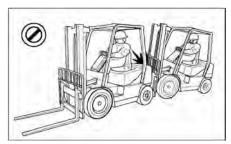


Be careful when operating a lift truck near the edge of a loading dock or ramp. Maintain a safe distance from the edge of docks, ramps and platforms. Always watch tail swing.

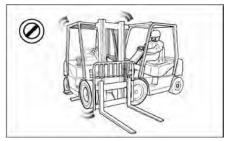
The truck can fall over the edge and cause injury or death.



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.



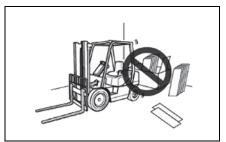
Do not use your lift truck to push or tow another truck.

Do not let another push or tow your truck.

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



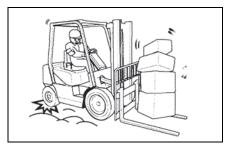
Park your lift truck in authorized areas only. Fully lower the forks to the floor, put direction lever in NEUTRAL position, engage the parking brake, and turn the key to the OFF position. Remove the key and put blocks behind the wheels to prevent the truck from rolling. Shut off your forklift truck when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



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

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 tires, no suspension, and are very heavy.

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

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



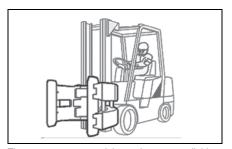
Carrying a load suspended on a chain or a cable may unbalance a truck.

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



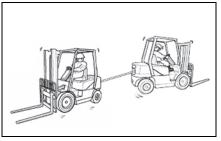
An unloaded forklift may be easier to tip over than a loaded truck.

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.

All carry safety implications and special training in their operation is highly recommended.



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 Tipover (If Operator Restraint System Equipped)

WARNING

In the event of a tipover, 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

Authorized Representative and Compiler of Technical File According to 2006/42/EC

Doosan Industrial Vehicle Europe N.V. Mr. Chankyo 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), 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, Battery Powered Driven, Counterbalanced

Function : Lifting and Moving materials

Family : B25/30/35X-7 PLUS Series (with 80 Voltage)

Model Name : B35X-7 PLUS

Applicable EC Directives : 2006/42/EC, 2014/30/EU

Applicable harmonized standard : EN 16307-1:2020, EN ISO 3691-1;2015/A1:2020

EN 1175:2020, EN 12895;2015+A1:2019

INT-NIKLAAS, BELGIUM, January 4, 2023

Place and date of the declaration Signature (for the Authorized Representative)

Signatory's name : **C. K. Chung**Signatory's title : Vice president
Doosan Industrial Vehicle Europe N.V.

C. K. Chung

Declaration of Conformity

We.

Manufacturer

Doosan Industrial Vehicle Co., Ltd. 468, Injung-ro, Dong-gu, Incheon, Korea 22503

<u>Authorized Representative and Compiler of Technical File According to Supply of Machinery</u> (Safety) Regulations 2008

Doosan Industrial Vehicle UK Ltd. Mr. Chankyo Chung

12 Kilvey Road, Brackmills Industrial Estate, Northampton, NN4 7BQ, UK

herewith declare

that the following equipment conforms with the appropriate requirements of the Directives Supply of Machinery (Safety) Regulations 2008 (Machinery Directive), 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, Battery Powered Driven, Counterbalanced

Function : Lifting and Moving materials

Family : B25 /30/ 35X-7 Plus Series (with 80 Voltage)

Model / Commercial Name : B35X-7 Plus

Applicable Directives : Supply of Machinery (Safety) Regulations 2008,

Electromagnetic Compatibility Regulations 2016

Applicable harmonized standard: BS EN 16307-1:2020, BS EN 12895:2015+A1:2019

BS EN 1175-1;1998+A1;2010, BS EN ISO 3691-1:2015+A1:2020

C. K. Chung

Northampton, NN4 7BQ, UK, January 4, 2023

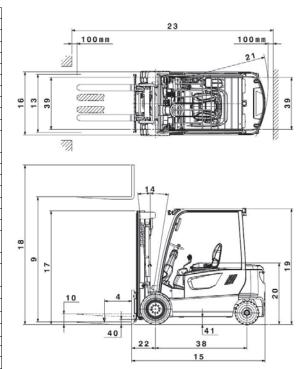
Place and date of the declaration Signature (for the Authorized Representative)

Signatory's name : **C. K. Chung**Signatory's title : Vice president
Doosan Industrial Vehicle UK Ltd.

Specifications

•	1	Manufacturer					DOOSAN
CHARACTERISTICS	2	Model					B25X-7 PLUS
ST	3	Load Capacity	at rated load ce	ontor		kg	2.500
Ē.	4	Load center	at lateu load ce	sinei		mm	500
Ë	5	Power type				111111	Electric
₹	6	Operator type					Driver Seated
₹	7	Tire Type	P · Pneumatic	F · Solid Soft C · I	Cushion		P, E
ᇴ	8	Wheels (x=Driven)	P : Pneumatic, E : Solid Soft, C : Cushion Number of front / rear				x 2 / 2
	9	Max.Fork Height	with STD 2-stage mast			mm	3,230
	10	Free Lift	with STD 2-stage mast			mm	147
	12	Fork carriage	ISO Class				CLASS II
	12	1 ork carriage	ISO Class			40 x 100 x 1,050	
	13	Fork		Thickness x Width x Length		mm mm	272 x 1,035
	14	Tilt of Mast	Fork Spacing (Min. x Max.)			deg	6/9
m	15	Till Of Mast	Forward / Backward				2,329
ž	16			race		mm mm	1,245
DIMENSIONS	17		Mast Lowered Height			mm	2,160
Ē	18	Overall Dimensions	Mast Extended			mm	3,990
≧	19			rd Height(Cabin)		mm	2,185(2,236)
	20		Seat Height	ra rioigin(oabiii)		mm	1,070
		Outer Turning Radius	Courringin			mm	1,950
	21	Inner Turning Radius				mm	348
	22	Load Moment Center	Contar of drive	axle to fork face		mm	448
		"Right Angle Stacking Aisle Width	Center of drive	Pallet 1000 x 12	00 crosswavs	mm	3,620
	23	(With Pallets & Clearance)"		Pallet 800 x 12		mm	3,799
111	24	(That I dilete a cicarance)	Travel			km/h	16 / 18
5				-	Loaded / Unloaded		
₹	25	Speed	Lifting	Loaded / Unloaded		mm/s	480 / 600
8	26		Lowering	Lowering Loaded / Unloaded		mm/s	490 / 460
PERFORMANCE	28	Max. Drawbar pull	Loaded at 1.6km/h		kg	1,768 / 1,675	
Н	30	Max. Gradeability	Loaded at 1.6km/h		%	25 / 38	
노	32	Total weight	with min. weigh	with min. weight of battery		kg	4,623
EIGHT	33	Autotopid	Loaded , Front / Rear		kg	6,275 / 848	
¥	34	Axle Load	Unloaded, Fro	nt / Rear		kg	2,284 / 2,339
	35		Number of Wheels (Front / Rear)			2/2	
	36	Tires		Front			23 x 10 - 12
	37		Size	Rear			18 x 7 - 8
	38	Wheel Base	Distance	redi		mm	1,589
CHASSIS	- 50	Whice Base	Front		mm	998	
Ą	39	Tread Width			mm	998	
끙			Rear	T	at lawart		
•	40	Ground clearance	Loaded	at lowest		mm	130
	41		at center of wheel base		mm	140	
	42	Brakes		Service			Electric
	43		Parking	Parking			Auto-Electric
		45 Battery	Туре			DIN 43536 A	
	45 B		Voltage	Voltage		V	80
			"Capacity		Normal	AH	500
_			(5 Hours Rating)"		Max.	AH	620
POWER TRAIN			Min. Weight	Min. Weight		kg	1,560
		Battery compartment	At Chassis sizes (W x L x H)		mm	1,040 x 720 x 765	
	47		Drive motor rating at S2 60 minute			kW	10.0 x 2
	48	Electric Motors	Lifting motor rating at S3 15%		kW	21	
	54	Control Type	Drive and Hydraulic			Туре	MOSFET Inverter
	55	Drive Axle	Brake Type			Туре	-
	- 55		System			kpa	193
	57	Relief Pressure	Attachment			kpa	155
			Attachment		кра	199	

DOOSAN	DOOSAN	1	
B30X-7 PLUS	B35X-7 PLUS	2	
3,000	3,500	3	
500	500	4	
Electric	Electric	5	
Driver Seated	Driver Seated	6	
P, E	P, E	7	
x 2 / 2	x 2 / 2	8	
3,230	3,000	9	
152	152	10	
CLASSIII	CLASSIII	12	
45 x 125 x 1,050	45 x 125 x 1,050	13	
286 x 1,044	286 x 1,044		
6/9	6/9	14	
2,480	2,564	15	
1,245	1,245	16	
2,160	2,160	17	
3,990	3,760	18	
2,210(2,261)	2,210(2,261)	19	
1,070	1,070	20	
2,095	2,155	21	
340	340		
454	454	22	
3,772	3,832	23	
3,950	4,010		
16 / 18	16 / 18	24	
420 / 600	380 / 600	25	
490 / 460	500 / 460	26	
1,768 / 1,675	1,768 / 1,675	28	
22 / 34	20 / 31	30	
5,068	5,486	32	
7,197 / 870	7,940 / 1,046	33	
2,547 / 2,521	2,532 / 2,954	34	
2/2	2/2	35	
23 x 10 - 12	23 x 10 - 12	36	
18 x 7 - 8	18 x 7 - 8	37	
1,734	1,750	38	
998	998	39	
998	998		
130	130	40	
140	140	41	
Electric	Electric	42	
Auto-Electric	Auto-Electric	43	
DIN 43536 A	DIN 43536 A		
80	80		
600	600	45	
775	775		
1,870	1,870		
1,040 x 865 x 765	1,040 x 865 x 765		
10.0 x 2	10.0 x 2	47	
21	21	48	
MOSFET Inverter	MOSFET Inverter	54	
-	-	55	
207			
155 155			



Noise and Vibration

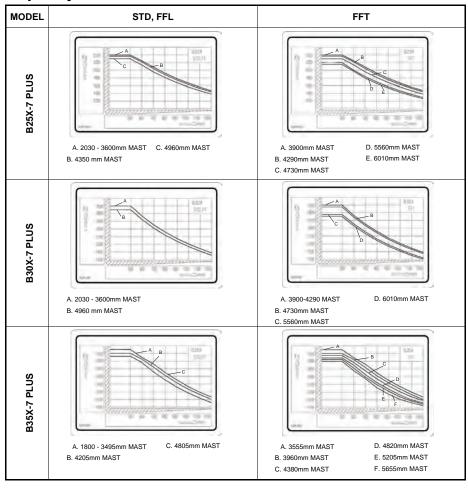
Noise at operator ear (measured by PREN 12053)

unit:dB(A)

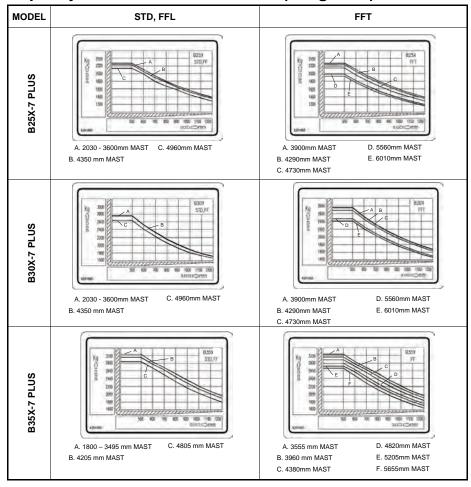
	Noise Level [Unit : dB(A)]	
Model	Sound Pressure Level	at Operator's Ear (Leq.)
	EN 12053	
B25X-7 PLUS	W/O Oakin	Wish Calain
B30X-7 PLUS	W/O Cabin 68	With Cabin 72
B35X-7 PLUS		_

^{*}Test Model : B35X-7 PLUS

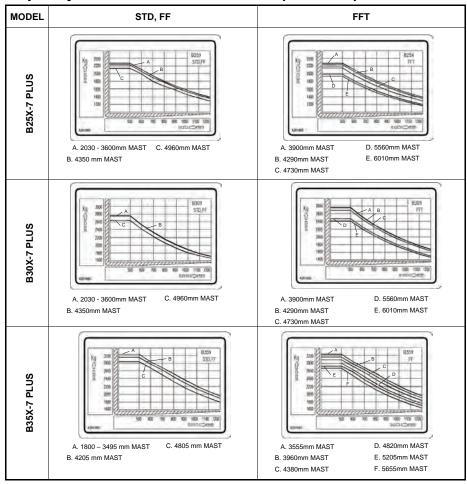
Capacity Chart



Capacity Chart - With Side Shifter (Integrated)



Capacity Chart - With Side Shifter (Hook on)



Serial Number

Serial Numbers Locations

For quick reference, record the serial numbers in the space provide below the illustration photographs.



Lift Truck Serial Number

Operator's Warning and Identification Plate

Familiarize yourself with the information on the Identification, Lift Capacity and Attachment Plates. Do not exceed allowable lift truck working capacity load ratings.

Operator's Warning Plate



Located on the right side of the operator's seat on the battery cover.

Identification, Lift Capacity and Attachment Plate



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 center. For example: a capacity of 1200kg(2540 lb) at 600mm(24in) means that the lift truck can lift 1200kg(2640lb) if the load center 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 center combination is within the capacity of the lift truck as shown on the capacity rating plate. To determine the load center measure the distance from the face of the carriage to the gravitational center 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

The identification plate indicates the type of mast installed on the lift truck when it left the factory. The type of mast is indicated by an abbreviation.

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

FF - Full Free Mast (single inner member, high free lift with primary cylinder).

 FFT - Triple Lift Mast (two inner members, high free lift with primary cylinder).

 QUAD - Quadruple(Quad) Mast(three inner members, high free lift with primary cylinder).

 SPEC - Special Mast, such as non-telescopic or double mast, not within the other classifications.

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 Sideshift Carriage.

HSS - Hook-type Sideshift Carriage(ITA).

ISS - Integral type Sideshift Carriage.

ISFP - Integral Shifting type Fork Positioner.

CW - Special Counterweight.

SF - Special Forks.

Numbers following this abbreviation indicate number and/or length of forks.

SS - SWS-Sideshift-Swing Shift.

RAM - Ram or Boom

ROTC - Rotating Carriage.

DBCBH - Double Cube Block Handler

HFP - Hydraulic Fork Positioner, Non Sideshift.

CR - Crane Arm or Crane Boom.

TH - Tire Handler.

CTH - Container Top Handler.

CSH - Container Side Handler

LP - Load Push Device, Non Sideshift.

LPP - Load Push-Pull Device, Non Sideshift.

 General Clamp (other than Bale, Carton or Roll).

OI IXOII)

BC - Bale Clamp.

CC - Carton Clamp.

RC - Roll Clamp.

LS - Load Stabilizer.

LH - Log Handler.

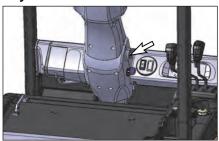
PWH - Pulp Wood Handler.

SS-ST - Sideshift-Side Tilt Carriage.

Operator's Station and Monitoring Systems

Read and understand the "Safety", "Operation" and "Maintenance" sections before operating the lift truck.

Key Switch



The key switch is located on the right side of the steering column.



OFF - Turn the key switch to OFF (1) to disconnect the electrical circuits.



ON - Turn the key switch the ON (2) to connect the electrical circuits. If the key switch is left in the ON position when the

operator leaves the lift truck, the LCD display will show a flashing "EE".

The power steering pump motor is activated when the key switch is turned to ON and the seat switch is closed.

NOTE: If the directional control forward/reverse switch is mounted on the left side of the lift lever, and when no operation lever is operated for about 6 seconds, power supply to the power steering pump motor will be cut-off. Then, if any one of the operation levers is operated, the power steering pump motor will restart.

Seat Switch



the seat switch is located under the operator's seat.



OPEN - When the operator's seat is in the up position the electrical circuits are disconnected.



CLOSE - When the operator's seat is in the down position(operator seated) the electrical circuits are connected.

The power steering pump motor is activated when the key switch is turned to ON and the seat switch is closed.

Seat Belt Switch



The seat belt switch is located next to the operator's seat.



OPEN - If the operator does not wear the seat belt, the electric circuit will cut off.

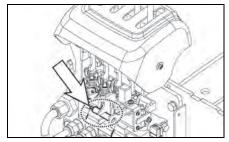


CLOSE – When the operator wears the seat belt, the electric circuit is connected.

When the key switch is turned ON and turned to the CLOSE position, and the seat belt switch is turned to the CLOSE position, the power steering pump motor can be operated.

NOTE: If the operator wears and fastens the seat belt before sitting on the seat, it is recognized as a sequence error, the "E8" error is displayed on the display and the buzzer is activated. In order for the forklift to be in normal waiting state, the seat belt must be released and then put on again.

Lift Neutral Sensor



The lift neutral sensor is located in the main control valve at the bottom of the operating lever.

If the lift lever is not neutral when the forklift is started or the operator returns to the forklift, the lift neutral sensor detects and FL error is displayed.

The lift neutral sensor and detection unit must be adjusted so that they do not overlap and are not sensed in neutral

Monitoring Systems Indicator



Located on the middle of the console cover panel.

The symbols shown on the instrument panel identify different features of the lift truck. The symbol for each feature is identified and an explanation of the function and location is described on the following page.

Display Segments

The display gives the following information about the operating state of the system:



Lift truck speed (expressed in kmh or (dam



Warning symbol indicating that the parking brake is being applied.



Safety contact open, indicated both by EE blinking message visualized in timemeter area and by relative symbol

With any directional switch active and safety contact still open, lift truck can't be moved, even after seat switch is closed: in such a case, after safety contact is closed, the symbol disappears.

EE code disappears only after active directional switch is turned off.

IRREAL Time gauge or odometer



Indicates steering angle



Maintenance notice: Notifies maintenance schedule set time is



Turtle mode (Low speed operation mode)



Economic. Standard High Operation mode



Speedometer having graduations from 0 (low) to 9 (high) segments.



Battery voltage level gauge having 9 segments.

Table 1 shows the relationship between the battery charging progress and the No. of blocks. Both 36V/48V systems have the same relationship. Warning code EL indicates that the batteries are fully discharged.

LED Indicator

When switched, 4 LEDs appear in the left side of the COMPACT display to provide following information:



Warning message; red LED



Lamp message; green LED



Active indicator lamp; green LED (option)



Seat belt warning (option); red LED on for 10 s

NOTE: The warning information

LEDs indicate following

- Normal operation: LED turns on for a moment at system switch on or off.
- Communication to control board is lost: LED turns on after 3 s from the lost of communication to the control board.
- Board microprocessor failure: warning LED turns

Relation between battery charge level and number of visualized bars

Battery charge level	BDI Percent [%]
9	75%<
8	74% ~ 67%
7	66% ~ 59%
6	58% ~ 52%
5	51% ~ 45%
4	44% ~ 38%
3	37% ~ 32%
2	31% ~ 26%
1	25% ~ 20%
EL	> 20%

[Table 1. Relation between battery charge level and No. of indicator blocks]

The display shows system operating condition with the abbreviations. See Table 4.

Table 4. Abbreviated code

Code	Description	Abbreviation
F	EEPROM failure	EEPROM FAULT
17	Main circuit breaker fault	CONTACTOR FAULT
60	Battery/inverter mismatch	BATT MISMATCH
66	Drive right-side module overheated (95°C)	D-INV SHUTDOWN
67	Drive left-side module overheated (95°C)	L-INV SHUTDOWN
68	Pump module overheated (95°C)	P-INV SHUTDOWN
76	Pump motor encoder	P-MOTOR ENCODER
77	Right traction motor temperature sensor failure	D-M TEMP SENSOR
78	Left traction motor temperature sensor failure	L-M TEMP SENSOR
79	Pump motor temperature probe failure	P-M TEMP SENSOR
80	Left EM brake shorted	L-EM BRAKE

Code	Description	Abbreviation
81	Right EM brake shorted	R-EM BRAKE
82	EM brake mechanical warning	EM brake WARN
83	Controller parameter change fault	PAR CHANGE FAULT
84	Software mismatch (between TM, TS, PU)	Software mismatch
88	EM Brake locked automatically	EM BRAKE LOCKED
H1	Drive right-side module low temperature (-40°C)	D-INV UNDERTEMP
H2	Drive left-side module low temperature (-40°C)	L-INV UNDERTEMP
НЗ	Pump low temperature (-40°C)	P-INV UNDERTEMP
H4	Right traction motor open	D-MOTOR OPEN
H5	Left traction motor open	L-MOTOR OPEN
H6	Pump motor open	P-MOTOR OPEN
H7	CAN communication fault	CAN COMM FAULT
Н8	Expansion parameter error	EXM PAR FAULT
НН	Software fault	SOFTWARE FAULT
А	Capacitor not charged	CAP NOT CHARGED
E1	Drive right-side module overheated (85°C)	D-INV OVERTEMP
E2	Drive left-side module overheated (85°C)	L-INV OVERTEMP
E3	Pump module overheated (85°C)	P-INV OVERTEMP
E4	Drive right-side module overheated (145°C)	D-MOTOR OVERTEMP

Code	Description	Abbreviation
	Drive left-side	
_	module	L-MOTOR
E5	overheated	OVERTEMP
	(145°C)	OVERVIENII
	Pump module	
E6	overheated	P-MOTOR
	(145°C)	OVERTEMP
	Sitting sequence	
	error	SEAT SQN
E8	(Engine	FAULT
		FAULI
E8	start>sitting>belt)	
	0-4-4-1-14	SEAT BELT
(FLAS	Safety belt switch	SW OPEN
HING)		
EE	Start failure	WRONG
	Otal Claim	START
EE		SEAT SW
(FLASI	Seat switch	OPEN
NG)		_
EL	Low battery	LOW BATT
LL	voltage	VOLT
F0	Max. battery	MAX BATT
FU	voltage	VOLT
F1	Min. battery	MIN BATT
FI	voltage	VOLT
-	Pedal trimmer	400EL EALLE
F2	failure	ACCEL FAULT
	Drive right-side	
	module non-	D-INVERTER
F3	saturated /	FAULT
	overcurrent	
	Drive left-side	
	module non-	L-INVERTER
F4	saturated /	FAULT
	overcurrent	
	Pump module	
F5	non-saturated /	P-INVERTER
	overcurrent	FAULT
	Drive right-side	
F6	motor current off-	D-MOTOR I
10	set	OFFSET
	Drive left-side	
F7	motor current off-	L-MOTOR I
''	set	OFFSET
	Pump motor	P-MOTOR I
F8	current off-set	OFFSET
<u> </u>	Steering sensor	STEER
F9	failure	SENSOR OUT
	12V encoder	
FA	failure	12V NOT OK
	Drive right-side	D-MOTOR
FC		ENCODER
-	motor encoder Drive left-side	L-MOTOR
Fd		
FH	motor encoder	ENCODER
гН	5V output failure	5V NOT OK

Code	Description	Abbreviation
FL	Pump input at	PUMP SIGN
1 -	start up	ON
	Lift neutral sensor	LIFT
FU	and lift lever	UNMATCH
	mismatch	
EF	Fingertip controller	EXTENSION
	failure	FAULT
L1	Lift coil open /	LIFT SOL
L1	short	FAULT
L2	Low coil open /	LOW SOL
LZ	short	FAULT
L3	Tilt forward coil	TILT FWD
LJ	open / short	SOLFAU
L4	Tilt reverse coil	TILT BACK
L4	open / short	SOLFAU
L5	AUX1 left coil	AUX1 L-
LO	open / short	SOLFAU
L6	AUX1 right coil	AUX1 R-
LO	open / short	SOLFAU
L7	AUX2 left coil	AUX2 L-
L/	open / short	SOLFAU
L8	AUX2 right coil	AUX2 R-
L8	open / short	SOLFAU
	ISO/UNLOAD coil	ISO/UNLOAD
L9	open / short	SOL
	Height sensor	
UH	mismatch/separat	HEIGHT
	ed .	UNMATCH
04	Fingertip controller	EXT VOLT
21	over / low voltage	FAULT
-4	Fingertip controller	EXT TIME
51	CAN error	FAULT
	Fingertip controller	EXT CUR
C1	current over 18A	FAULT
	Fingertip controller	
C2	12V/5V voltage	EXT POWER
-	error	FAULT
	Fingertip knob	FINGERTIP
FF	output error	FAULT
	Drive right side	DSUPERVISIO
b1	controller error	N FLT
	Drive left side	LSUPERVISIO
b2	controller error	N FLT
	Pump controller	PSUPERVISIO
b3	error	N FLT
	Unintended	
b4	movement of right	DUNINTEND
ν τ	side motor	MOVING
	Unintended	
b5	movement of left	LUNINTEND
55	side motor	MOVING
	Unintended	
b6	movement of	PUNINTEND
סט	pump motor	MOVING
	ματην ποιοι	

Code	Description	Abbreviation
AF	Forward/reverse lever connection open	FR UNIT OPEN
A7	Display CAN Communication error	DISPLAY CAN FAU
C7	Right side controller CAN communication error	R-CONT CAN FAU
P7	Pump CAN Communication error	P-CONT CAN FAU
LL	Fingertip CAN module communication error	F-KNOB CAN FAU
EP	Temperature difference between right side and left side motors	MOTOR TEMP FAU

Lift truck Operation Mode



Press E-S-H button to enter Economic, Standard, or High mode.

Availability of this function can be verified in the EASYVIEW menu.

- Pressing the E-S-H button enables switching to the respective mode and can edit the parameter related to a value which the driver cannot change and suitable for the selected mode.
- E-S-H unavailable: the symbol does not appear.
- E-S-H available: the symbol shows active mode

NOTE: While the forklift is in normal operation, the symbol indicates truck speed.

Alarm message displayed in the speedometer column in alphanumerical code.

Refer to Table 6 for the meaning of the alarm codes.

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Motor and controller overheat alarm.

Front and Rear Floodlights Switch



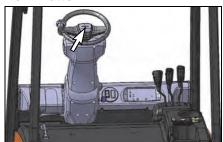
Located on the right side of the instrument panel.

OFF – Push the switch down to turn off the headlamp and rear lamp /rear.

Headlamp – When the switch is pushed upwards, the headlamp turns on at the first position.

Headlamp/Rear lamp – When the switch is pushed upwards, the headlamp and rear lamp turn on at the second position The rear lamp is an option.

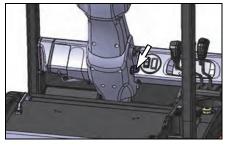
Horn Button





Located in the center of the steering wheel. Push in on the horn button to sound the horn.

Tilt Steering Column



Located on the lower front of the steering column.

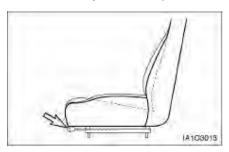
To adjust the steering column, raise the handle(1) and move the steering column to the desired position. Release the handle and the steering column will remain in the desired position.

Seat Adjustment

Adjust the seat at the beginning of each shift or when changing operators.

Adjust the seat to allow full travel of all pedals with the operator seated against the seat back.

The seat must be adjusted with the operator seated.



Move the lever to adjust the seat forward or backward. Release the lever. Move the seat slightly to lock it.

Sitting sequence

In order to use the forklift, sitting and putting on the seat belt must proceed in the correct sequence. The operator must first sit on the seat and then fasten the seat belt. If this sequence is not performed correctly, the operation of the vehicle may be restricted and an alarm will be activated. The correct sitting sequence is; sit on the seat -> put on the safety belt.

[EE blinking warning]



If the operator is not seated on the seat, "EE" will blink and the vehicle will not operate.

[E8 blinking warning]



If the operator has not put on the seat belt but remains seated, "E8" will blink and the vehicle will not operate.

[E8 error]



If the seat belt is fastened with the operator not seated on the seat, "E8" will be displayed, a warning sound will be activated, and the vehicle will not operate.

In order to clear the alarm, use the correct sitting sequence.

Emergency Switch (If Equipped)





OFF - Push the emergency switch button to disconnect the electrical circuits. (It must be done after the key switch is turned off)



ON - Pull the emergency switch button to connect the electrical circuit.

NOTE: Use the emergency switch in an emergency only. Frequent use of the switch may cause serious damage to the parking brake.

Audio System (Radio/USB Player/Bluetooth)

Precaution

Safety information

▲ WARNING

To reduce the risk of fire or electric shock, do not expose this product to rain or moisture.

To reduce the risk of fire or electric shock and annoying interference, use only the included components.

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.

Minimize 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 authorized service centers

This product is made of precision parts. Do not attempt to disassemble or adjust any parts. Please refer to the Service Center 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 nonstandard 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

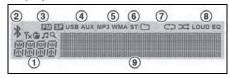
Front view



- 1. BAND button: selects AM/FM Radio mode.
- (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).
- MODE button: selects USB, Bluetooth audio or AUX play mode (press)
- DAB button (option for DAB service region only): enters DAB mode (press).
- 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.
- Display window for Play/Reception/Menu state and information.
- 7. PRESET [1 ||] [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. QENTER/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 fastforward the track (rotate and hold).
- 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



- 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

Tx : Digital signals are not received

Ensemble name display

• J : Service name display

Search mode

- USB/AUX indicators for the USB or External device connection.
- MP3/WMA indicators for USB's Audio Stream detections.
- 6. ST (Stereo) indicators for FM stereo reception.
- 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.
- DAB Antenna jack: To plug the DAB antenna cable.
- 3. I/O connector: To plug the I/O cable.



- 1. Backup B (+)
- 2. Ground
- AUX L-CH (option)
- 4. AUX R-CH (option)
- 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



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.



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



- 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



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



- 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



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

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



During the Settings menu mode, turn the VOLUME dial to select the "DAB" as below, then press this dial;
 SOUND AS FOUNTIES AS BUILTOOTH AS

SOUND \leftrightarrow EQUALIZER \leftrightarrow BLUETOOTH \leftrightarrow DAB \leftrightarrow SYSTEM \leftrightarrow PREVIOUS

. DAB: sets the DAB features



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



- During the Settings menu mode, turn the VOLUME dial to select the "SYSTEM" as below, then press this dial;
 - SOUND \leftrightarrow EQUALIZER \leftrightarrow BLUETOOTH \leftrightarrow DAB \leftrightarrow SYSTEM \leftrightarrow PREVIOUS
- SYSTEM: sets the system features



- Turn the VOLUME dial to select the "BT ON/OFF", "SCROLL" or "LOUDNESS" or "BEEP" then press this dial;
 - BT ON/OFF \leftrightarrow AREA \leftrightarrow SCROLL \leftrightarrow LOUDNESS \leftrightarrow BEEP \leftrightarrow SOFTWARE \leftrightarrow 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



 During the System settings mode, turn the VOLUME dial to select the "AREA" as below, then press this dial;

BT ON/OFF \leftrightarrow AREA \leftrightarrow SCROLL \leftrightarrow LOUDNESS \leftrightarrow BEEP \leftrightarrow SOFTWARE \leftrightarrow 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



 During the System settings mode, turn the VOLUME dial to select the "SOFTWARE" as below, then press this dial;

BT ON/OFF \leftrightarrow AREA \leftrightarrow SCROLL \leftrightarrow LOUDNESS \leftrightarrow BEEP \leftrightarrow SOFTWARE \leftrightarrow PREVIOUS

SOFTWARE: check/update the system software.



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



- 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.



- 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



 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.



- 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



- 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.



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



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.



- 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.



- 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



 Press the SENTER button to show the DAB service list.



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



 Press and hold the SENTER 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.

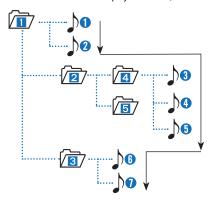
In the case of high capacity USB devices, there are instances where the logical drives are partitioned for user convenience. In this case, it will only be possible to play the USB music in the top level drive.

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

 $48\ \text{kHz},\,44.1\ \text{kHz},\,32\ \text{kHz}$ (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



- 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.



- 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 ||] 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



- While playing, turn the ►►I TRACK I d 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.



- While playing, press the [1 II] button to pause the track.
 - Press the button again to play the current track.





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



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



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

Bluetooth

About Bluetooth wireless technology

Bluetooth® Wireless Technology refers to a shortdistance 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, "*" is displayed on the display. If "*" 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.



 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 ↔

• BLUETOOTH: Bluetooth setting mode

DAB ↔ SYSTEM ↔ PREVIOUS



 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.
- Search and select device "Doosan" in your Bluetooth device, then confirm
 - The Bluetooth registration standby proceeds for 1 minute. If the registration is failed during 1 minute, 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.
- 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.



- 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



- 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 recentry



 To call the recentry 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.



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

During a call...



- 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.



- To deactivate the microphone, press the and hold MUTE button.
 - To reactivate the microphone, press MUTE button.



 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 <a> (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 dealer.
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 [*] is turned on in the function display. If the [*] 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.

Functional safety System

M WARNING

These are the functions added for functional safety.

When using these functions, the vehicle is switched to neutral for safety purposes.

Therefore, attention is required when using

Therefore, attention is required when using them.

1. Seat & Seat belt interlock

-. With this safety function, sitting is recognized only when the seat belt is put on after the operator has sat in the operator seat. However, if the seat and the belt are engaged together at the time of initial starting, sitting is recognized. If the seat belt is released while the vehicle is being operated, the operator is recognized as away from his seat, and the vehicle is switched to neutral. In seat sw off and seat belt sw off condition, EE flashing fault is triggered. In seat sw on and seat belt sw off condition, E8 flashing fault is triggered. In seat sw off and seat belt sw on condition, EE flashing fault is triggered. To clear the alarm, use the correct sitting sequence. The correct sitting sequence is; sit on the seat -> put on the seat belt. See 'Sitting sequence' for detailed information.

2. Seat belt switch

-. The seat belt switch is located next to the operator's seat. If the operator does not wear the seat belt, the electric circuit will cut off. When the operator wears the seat belt, the electric circuit will be connected. If the operator wears and fastens the seat belt before sitting on the seat, it is recognized as a sequence error, the "E8" error is displayed on the display and the buzzer is activated. To return the truck to normal state, the seat belt must be released and then put on again. See 'Seat Belt Switch' for detailed information.

3. FR control

-. EE Fault is triggered if FR control is not in neutral position when the vehicle starts. To clear the alarm, operator must turn the switch to neutral and restart the vehicle. When FNR knob gets disconnected or in abnormal state, AF Fault is triggered. In this case, the operator should check the FNR knob for repair. In seat switch off condition during FR control engaged, EE Fault is triggered. To clear the alarm, the operator should sit on the seat to turn the seat switch on. See P.77 for detailed information.

4. Lever neutral detection

-. If the forklift is started or the operator returns to

the forklift, Lift function is only available when lever is at the neutral position. The truck uses proximity sensor to detect whether the lever is neutral. The lift neutral sensor is located in the main control valve at the bottom of the operating lever. If the lift lever is not neutral when the forklift is started or the operator returns to the forklift, the lift neutral sensor gets detected and FL error is displayed. To clear the alarm, the operator must turn the lever to neutral position and restart the vehicle. The lift neutral sensor and detection unit must be adjusted so that they do not overlap and are not sensed in neutral See 'Lift Neutral Sensor' for detailed information.

5. Parking brake

 The parking brake is automatically engaged after the vehicle stops. press the accelerator pedal lightly to release the parking brake. See 'Parking Brake' for detailed information

Performance Level

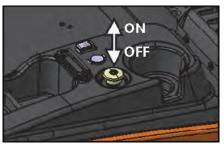
The table below shows the Performance Level based on ISO 13849-1/2:2015 regarding the PLr(Required Performance Level) of EN 1175:2020. The SRP/CS (Safety-related parts of control systems) consists of the parts in Category B. 1, 2, 3, and 4, while the control action to achieve a safe state under Clause 4.5 of EN 1175:2020 belongs to the control systems of Category 2. However, there may be Clauses that are irrelevant to the composition of this vehicle because the composition of the SRP/CS shown in the table below differs for each vehicle/model.

01	PLr for Counterbalance	PL calculation	PLr for	PL calculation
Clause	truck	results	Reach truck	results
4.3.7	b	b	b	b
4.4.2.1	b	b	b	b
4.4.2.2	b	b	b	b
4.5.2	С	С	С	С
4.5.3	b	b	b	b
4.5.5	а	а	а	а
4.5.6.2	С	С	С	С
4.5.6.3	b	b	b	b
4.5.7	С	С	С	С
4.5.8	С	С	С	С
4.5.9.1a	С	С	С	С
4.5.9.1b	b	b	b	b
4.5.9.1c	b	b	b	b
4.5.9.1d	а	а	а	а
4.5.9.2	а	а	а	а
4.5.9.3	а	а	а	а
4.5.10a	С	С	С	С
4.5.10b	С	С		
4.5.10c			С	С
4.5.10d	С	С		
4.5.10g	С	С	С	С
4.5.10h	С	С		
4.5.10i	С	С		
4.6.2	С	С	С	С
4.6.3	b	b	b	b
4.6.4a	С	С	С	С
4.6.4b	а	а	а	а
4.6.5	С	С	С	С
4.6.6	С	С	С	С
4.7.2.2a	d	d	d	d
4.7.2.2b	С	С	С	С
4.7.2.3	С	С	С	С
4.7.2.4	а	а	а	а
4.7.2.5	С	С	С	С
4.7.3	а	а	а	а
4.9.1.2.1	С	С	С	С
4.9.1.2.2	b	b	b	b
4.9.2.3a	С	С		
4.9.2.3b	b	b		
4.9.2.5	b	b	b	b
4.9.2.6	a	а	а	а
5.3.4	b	b	b	b

Lift Truck Controls Parking Brake

NOTICE

Do not operate the emergency switch while the forklift is in motion, unless in an emergency case. Using the parking brake in place of the service brake damages the parking brake severely.

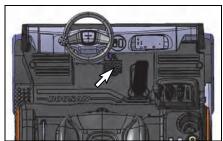


Parking brake activation - The parking brake is automatically engaged with a "clunk" after the vehicle stops.



Release of parking brake - press the accelerator pedal lightly to release the parking brake.

Service Brake Pedal



Service Brake - The service brake pedal is located on the floor of the operator's compartment.



Depress the service brake pedal to slow or stop the lift truck. Drive circuit will be interrupted while the pedal is depressed.

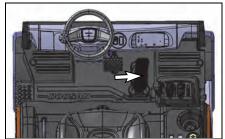


Release the service brake pedal to allow the lift truck to move.

Accelerator Pedal

NOTICE

The service brake and accelerator pedals should not be used at the same time, except for emergency situations. Use of both the brake and accelerator pedals at the same time may cause the drive motor to overheat.



Accelerator Pedal - The accelerator pedal is located on the floor of the operator's compartment.

Push down the pedal to increase travel speed.

If the accelerator pedal is pressed before turning the key switch to ON, "EE" error will be displayed and the alarm buzzer will sound. Release the foot and step on the pedal again to move the lift truck.

Release the pedal to decrease travel speed.

Directional control forward/reverse switch





Forward (1) – Push the forward/reverse switch forward to drive the truck forward.



Neutral (2) – If the forward/reverse switch is at the neutral position, the truck does not travel.

The forward/reverse switch must be at the neutral position when the driver is off from the driver's seat or the key switch is OFF. The lift truck does not move until the accelerator pedal is released and the directional control forward/reverse switch is returned to neutral position. Forward/reverse switch for direction change.

NOTE: Wait Mode of Operation - This condition will go into effect when the following occurs. The seat switch is closed, key switch is on and the directional control forward/reverse switch is left in NEUTRAL for more than five seconds, with no operator input to any control.

The line contactor will open and the power steering motor will turn off to conserve energy. The lift truck will remain in this mode until the operator moves the directional control forward/reverse switch, pushes on the accelerator pedal and/or moves any control valve lever.



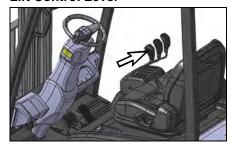
Reverse (3) – Pull the forward/reverse switch to drive the truck reverse.

NOTE: The directional control forward/reverse switch can be used for electrical braking (plugging). To slow or stop the lift truck when traveling in either direction, move the directional control forward/reverse switch to the opposite direction of travel while keeping the accelerator depressed. The lift truck will slow to a complete stop and then accelerate in the opposite direction.

If the driver stands up from the driver's seat while the lift truck is in operation, the seat switch will be activated and the drive motor will be turned off after 3 s. In this case, release the accelerator pedal and close the seat switch, return the forward/reverse switch to neutral and then shift it to desired position.

Push down on the accelerator.

Lift Control Lever



The forks' lift control is located at the operator's right side front. The lift control lever is the lever at the left.



Lower(1) - Push the lever forward smoothly to lower the lift forks.



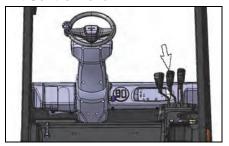
Hold(2) - Release the lift lever. The lever will return to the center(hold) position and the forks will remain in the position they are in.



Raise(3) - Pull the lever back smoothly to raise the lift forks.

NOTE: To prevent a sudden change of position of the load, operate all lift, tilt and attachment controls smoothly.

Tilt Control Lever



The forks' tilt control is located at the operator's right side front. The tilt control lever is the lever at the center.



Tilt Forward(1) - Push the lever forward smoothly to tilt the forks forward.



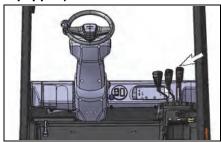
Hold(2) - Release the tilt lever. The lever will return to the center(hold) position and the forks will remain in the position they are in



Tilt Back(3) - Pull the lever back smoothly to tilt the forks back.

NOTE: To prevent a sudden change of position of the load, operate all lift, tilt and attachment controls smoothly. Never tilt an elevated load forward past vertical.

Sideshift Attachment Control (If Equipped)



The sideshift attachment control is located at the operator's right side front. The sideshift attachment control lever is the lever at the right.



Sideshift Left(1) - Push the lever forward smoothly to shift the carriage to the left.



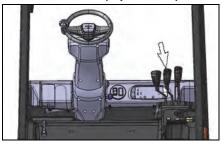
Sideshift Hold(2) - Release the sideshift attachment lever. The lever will return to the center(hold) position and sideshifting action will stop.



Sideshift Right(3) - Pull the lever back smoothly to shift the carriage to the right.

NOTE: To prevent a sudden change of position of the load, operate all lift, tilt and attachment controls smoothly.

Auto tilt control (If provided)



The auto tilt controller is on the left side of the tilt knob. Press the auto tilt switch to turn on the switch lamp and push the tile knob forward. The mast will stop at 90 degrees angle.

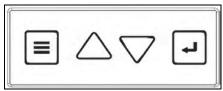
NOTE: To prevent sudden position shift of the load, operate the lift, tilting and side shift controller smoothly.

Speed limit (If provided)

This option is a function to limit the maximum speed of the vehicle when it is inside by detecting the outside or inside when the vehicle is moving from outside to inside or from inside to outside.

One of three speed modes can be selected.

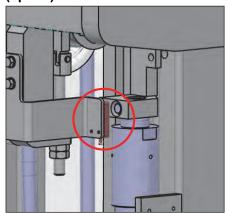
Model	Mode	Description	
	Mode 1	1500 rpm	
Electric	Mode 2	2000 rpm	
	Mode 3	2500 rpm	



The speed limit mode selection proceeds in the following order.

- 1. Press the Mode button.
- 2. "8" is blinked in 7 Seament.
- 3. Use the Up/Down buttons to select a mode.
- 4. If you press the Enter button, after outputting "0", ress the Enter button or "0" disappears from the 7 Segment after a certain period of time.
- 5. Setup is complete.

GSS – Guardian Stability System (option)



This option is applicable to FFL (Full Free Lift) and FFT (Full Free Triple) Mast vehicles. The GSS function consists of a basic function and several sub-options that can be added separately.

Basic option - When the mast is switched from the primary section to the secondary section, the height sensor detects this and the function is executed. The GSS function limits the vehicle's speed to 50% and secures stability when a cargo is raised high.

Additional option 1 (Forward tilt angle limit) - The forward tilt angle of the mast is limited to 2 degrees in the secondary section.

Additional option 2 (Forward tilt angle excess alarm) – A warning sound is activated when the tilt forward angle exceeds 2 degrees in the secondary section.

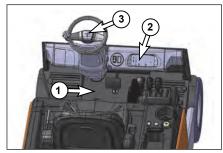
Additional option 3 (additional forward tilt function) – If forward tilt is executed with the GSS function executed and the Auto tilt button pressed, forward tilt exceeding 2 degrees is also possible.

Before Operating the Lift Truck

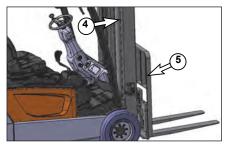
Walk-Around Inspection

For your own safety and maximum service life of the lift truck, make a thorough walk-around inspection before mounting the lift truck or starting to move it.

Look for such items as loose bolts, trash build-up, oil leaks, condition of tires, mast, carriage, forks or attachments.



- Inspect the operator's compartment for loose items and clean any mud or debris from the floor plates for safe footing.
- Inspect the instrument panel for damage to the indicator display.
- Test the horn and other safety devices for proper operation.

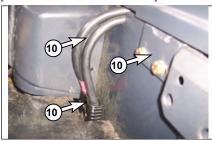


- Inspect the mast and lift chains for wear, broken links, pins and loose rollers.
- Inspect the carriage, forks or attachments for wear, damage and loose or missing bolts.

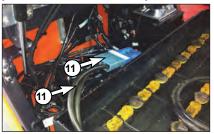


- Inspect the tires and wheels for proper inflation, cuts, gouges, foreign objects and loose or missing nuts.
- Inspect the overhead guard for damage, loose or missing mounting bolts.
- **8.** Inspect the hydraulic system for leaks, worn hoses or damaged lines.
- Inspect the drive axle housing and the ground for oil leaks.
- 10. Inspect common parts and drive axle, mast etc. for grounded, loosen or missing mounting bolts.

[OUTSIDE BATTERY CONNECTOR]



[INSIDE BATTERY CONNECTOR]



Inspect the battery compartment for loose connections, frayed cables and properly secured battery restraint.

M 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.

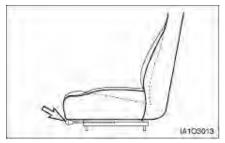


- **11.** Tilt the steering column to the full upright position and move the seat fully rearward.
- **12.** Raise the seat and cover assembly. Disconnect the battery.
- 13. Observe the battery electrolyte level for proper level. Connect the battery to the lift truck and lower the seat and cover assembly.

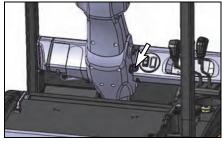
WARNING

Personal injury may occur from accidents caused by improper seat adjustment. Always adjust the operator's seat before operating the lift truck.

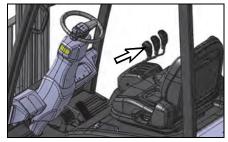
Seat adjustment must be done at the beginning of each shift and when operators change.



14. Position the seat by operating the lever and moving the seat forward or backward to a comfortable position.



15. Adjust the steering wheel to comfortable position. Grasp the steering wheel and raise the handle to release the steering column. PULL the steering column BACK or PUSH FORWARD to obtain the most comfortable position. RELEASE the knob and make sure the steering column is locked in this position.



16. With the seat switch closed and the directional control forward/reverse switch in NEUTRAL, turn the key switch ON. Observe the battery discharge indicator.



17. Make sure the battery is charged before operating the lift truck. A fully charged battery will cause "9 Segments" to be displayed on the BDI display.

Better Battery Performance

NOTICE

The lift truck operator must not start a shift with a battery that has been taken off a charger too soon.

A battery should never be disconnected from a charge until the charge cycle has been completed.

The batteries that have been fully charged should have a tag attached for identification.

In Operation, a battery should be discharged then recharged in 8 to 12 hours, depending on the charger type. Then, they should be allowed to cool and stabilize 4 to 8 hours. Repeated undercharging must be prevented. It can damage the battery.

If there is an indication of low battery operation, the lift truck operator should return the lift truck to the battery charging area.

NOTE: Refer to the Maintenance Section of this guide for additional battery exchanging and charging information.

Lift Truck Operation

Be sure no one is working on or near the lift truck.

Keep the lift truck under control at all times.

Reduce speed when maneuvering in tight quarters or when braking over a rise.

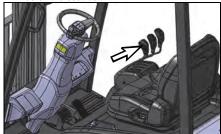
Do not allow the lift truck to overspeed downhill. Use the service brake pedal to reduce speed when traveling down hill.

NOTICE

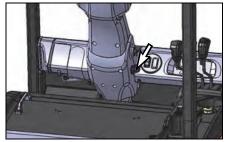
Do not move the directional control forward/reverse switch from one direction to the other(plug) when the drive wheels are off the ground and rotating at full speed.

Damage can occur to the control panel.

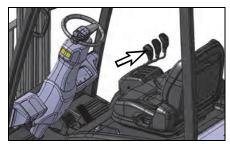
- 1. Adjust the operator's seat.
- 2. Fasten the seat belt.



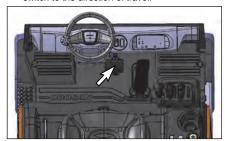
Move the directional control forward/reverse switch into the NEUTRAL position, if it is not already in this position.



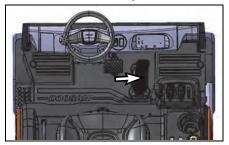
Turn the key switch to the ON position. Raise the attachments.



Move the directional control forward/reverse switch to the direction of travel.

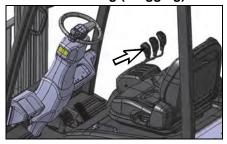


6. Release the service brake pedal.



- 7. Step on the acceleration pedal lightly and release it to release the parking brake.
- Push down on the accelerator pedal to obtain the desired travel speed. Release the pedal to decrease travel speed.
- To change the lift truck direction of travel, electrical braking(plugging) can be used to slow or stop the lift truck.

Electrical Braking (Plugging)

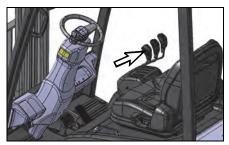


To slow, stop or change direction when traveling in either direction, move the directional control lever (1) to the opposite direction while keeping the accelerator pedal (2) depressed.

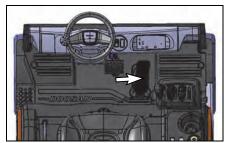
The Micro-controller senses that the motors are turning opposite to the lift truck and immediately goes into the plugging mode.

Rotation of the motors is retarded at a predetermined rate by electrical braking (plugging).

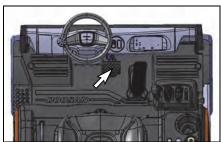
If the accelerator pedal is kept depressed, the Microcontroller will slow the lift truck to a complete stop and then accelerate in the opposite direction.



 Move the directional control lever to the opposite direction of lift truck travel.



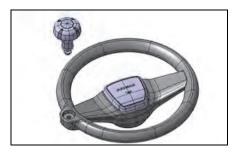
- Hold the accelerator pedal down until the lift truck nearly comes to a complete stop. Release the accelerator pedal.
- 3. Push down on the service brake pedal to bring the lift truck to a complete stop and hold it.
- If a change of direction is desired, continue to push down on the accelerator pedal until the desired travel speed in the opposite direction is obtained.



5. To stop the lift truck where conditions do not permit electrical braking(plugging). Release the accelerator pedal (1). Push down on the service brake pedal (2) and bring the lift truck to a smooth stop.

Steering Knob (If Equipped)

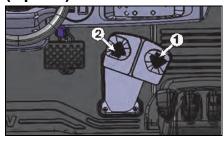
There is a steering knob available for inclusion with new truck deliveries. This option is solely intended for slow travel situations when two handed steering is not possible due to hydraulic operations.



M WARNING

Loss of stability can occur when a lift truck steering wheel is rotated quickly while the truck is in motion. A steering knob will assist with easy rotation of the steering wheel, but if a steering knob is improperly used (e.g., rotating the steering wheel quickly while the truck is in motion), this can contribute to truck instability and a tip over. A steering knob is intended for slow travel maneuverability ONLY.

Mono-Ped Control System (Option)





Forward-Push the left side (2) of the pedal for FORWARD direction travel.



Neutral-The lift truck should not move when the Mono-Ped pedal is released.



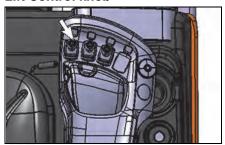
Reverse-Push the right side (1) of the pedal for REVERSE direction travel.

The MONO-PED pedal controls the speed and direction of the lift truck. Pushing on the right side of the pedal (1) causes the lift truck to move in REVERSE. The optional reverse lights and optional back-up alarm will be ON in the REVERSE position. Pushing on the left side of the pedal (2) causes the lift truck to move in FORWARD.

The speed of the truck increases as the pedal is depressed

Finger Tip

Lift Control knob





Lower - Push the knob forward smoothly to lower the lift forks.



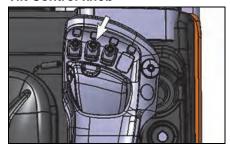
Hold - Release the lift knob. The knob will return to the center(hold) position and the forks will remain in the position they are in.



Raise - Pull the knob back smoothly to raise the lift forks.

NOTE: To prevent a sudden change of position of the load, operate all lift, tilt and attachment knobs smoothly.

Tilt Control knob





Tilt Forward - Push the knob forward smoothly to tilt the lift forks forward.



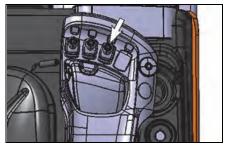
Hold - Release the tilt knob. The knob will return to the center(hold) position and the forks will remain in the position they are in.



Tilt Back - Pull the knob back smoothly to tilt the lift forks back.

NOTE: To prevent a sudden change of position of the load, operate all lift, tilt and attachment knobs smoothly.

Sideshift Attachment Control



The side shift attachment controller is at the frontright side of the driver, and the side shift control lever is at the right as shown in the figure.



Side shift Left (1) – open the knob softly forward to move the carriage to the left.



Side shift Stop (2) - release the side shift knob. The knob will return to the HOLD position and side shifting operation will stop.



Side shift Right (3) - pull the knob softly forward reverse to move the carriage to the right.

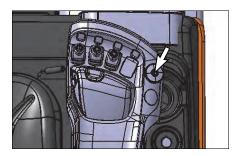
NOTE: To prevent a sudden change of position of the load, operate all lift, tilt and attachment knobs smoothly.

Emergency Switch

WARNING

In an emergency situation, must press the emergency switch to stop the forklift.

If there is no emergency switch, turn off the key switch to cut off the battery power.



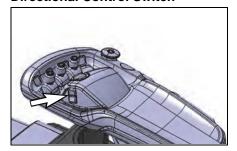


OFF - Push the emergency switch button to disconnect the electrical circuits. (It must be done after the key switch is turned off)



ON - Pull the emergency switch button to connect the electrical circuit.

Directional Control Switch





Forward - push the forward/reverse switch forward to drive the truck forward.



Neutral - if the forward/reverse switch is at the neutral position, the truck does not travel.

The forward/reverse switch must be at the neutral position when the driver is off from the driver's seat or the key switch is OFF. The forklift truck does not move until the accelerator pedal is released and the directional control forward/reverse switch is returned to neutral position.

NOTE: operation wait mode: - this mode is effective in the following condition While the driver is not driving, the seat switch is closed and the key switch is ON, and the directional control forward/reverse switch is at neutral for 5 s or longer

The circuit breaker opens and the power steering motor is shut down to save energy. The lift truck maintains the mode until the driver operates the directional control switch and step on the acceleration pedal or operated the control valve lever.



Reverse - pull the forward/reverse switch towards the driver to drive the lift truck reverse.

NOTE: The directional control forward/reverse switch may be used for electrical braking (plugging). To stop or low down the lift truck during travel, operate the directional control switch to the opposite direction of the travel. When the lift truck has slowed down sufficiently or stopped, accelerate the lift truck in the opposite direction.

If the driver stands up from the driver's seat while the forklift truck is in operation, the seat switch will be activated and the drive motor will turned off after 3 s. In this case, release the accelerator pedal and close the seat switch, return the forward/reverse switch to neutral and then shift it to desired position in the respective direction. Then, step on the acceleration pedal.

Horn Button

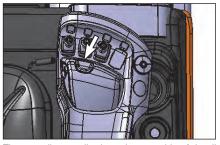




Located in the right side of the directional control switch.

Push in on the horn button to sound the horn.

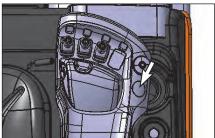
Auto Tilt Control (If provided)



The auto tilt controller is at the rear side of the tilt knob. Press the auto tilt switch to turn on the switch lamp and push the tile knob forward. The mast will stop at 90 degrees angle.

NOTE: To prevent sudden position shift of the load, operate the lift, tilting and side shift controller smoothly.

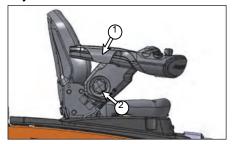
Auto Clamp Control (If provided)



The auto clamp controller is at the rear side of the emergency switch. Pressing the auto clamp switch enables operation of the AUX2 knob. If not AUX2 operation signal is provided for 10 s after the trigger, the AUX2 will be locked. To reset the AUX2, press the auto clamp switch again. In addition, if no AUX2 operation signal is provided after key switch ON, the AUX2 will be locked up.

NOTE: To prevent sudden position shift of the load, operate the lift, tilting and side shift controller smoothly.

Adjustment of Armrest

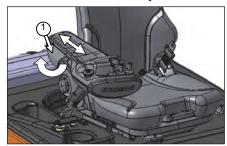


Using the two adjustment device, adjust the positions of the arm rests to a comfortable positions.

knob #1 - forward, backward adjustment

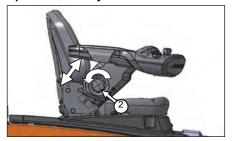
knob #2 - upward, downward adjustment

Forward and Backward Adjustment



- 1. Turn No. 1 lever upwards.
- 2. Adjust the position of the arm rest.
- 3. Release the No. 1 lever to fix the arm rest.

Up and Down Adjustment



Turn No. 2 knob leftwards (CCW) to adjust the arm rest position up/down.



Turn No. 2 knob to the right (CW) to fix the arm rest.

Hood Opening



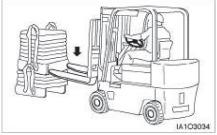
- 1. Slide the seat to the backward-most position.
- 2. Slide the armrest to the backward-most position.
- 3. Slide the armrest to the downward-most position.
- 4. Open the hood.

Operating Techniques

NOTE: The photographs and line art used in the following Operating Techniques, are typical examples and may not apply to your particular lift truck.

Inching into Loads

 Move the lift truck slowly forward into position and engage the load. Lift truck should be square with load. The forks should be spaced evenly between pallet stringers and as far apart as the load will permit.



2. Move the lift truck forward until the load touches the carriage



A WARNING

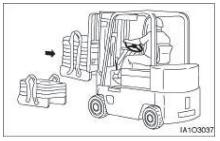
The forklift truck must not be used to push loads or other vehicles.

Only the moving equipment supplied or the rear hook for towing must be used.

Lifting the Load



- Lift the load carefully and tilt the mast back a short distance.
- 2. Tilt the mast further back to cradle the load.



- Operate the lift truck in reverse until the load is clear of the other loads.
- Lower the load to the travel position before turning or traveling.

Traveling With or Without a load

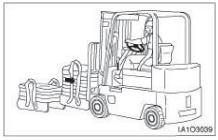
When traveling with and without a load, travel with the fork as low as possible, while still maintaining good floor clearance height.



 Carry the load as low as possible, while still maintaining ground clearance.



Travel with the load uphill on upgrades and downgrades.



For better vision, travel in reverse with bulky loads.

Lift Truck Turning



 When turning sharp corners, keep close to the inside corner. Begin the turn when the inside drive wheel meets the corner.

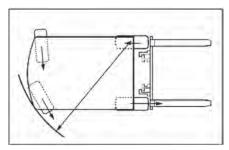


When turning in narrow aisles, keep as far from the stockpile as possible when making a turn into the aisle. Allow for counterweight swing.

NOTE: The MicroCommand control uses the steer wheel angle signals to adjust drive motor speeds to match the steering cramp angle.

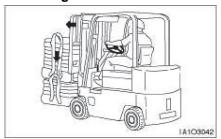
With steer wheel cramp angles of 20° or more, the MicroCommand control limits drive motor speed to both drive motors.

Limiting motor speed when turning reduces lift truck rotational speed while maintaining traction and power to both drive wheels.



3. As the steer wheel angle increases, the inside drive motor speed is progressively slowed down with respect to the outside drive motor speed.

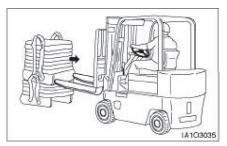
Unloading Lift Truck



- 1. Move the lift truck into the unloading position.
- Tilt the mast forward only when directly over the unloading area.

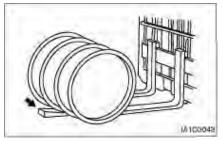
M WARNING

Do not tilt the mast forward with the load unless directly over the unloading area, even if the power is off.

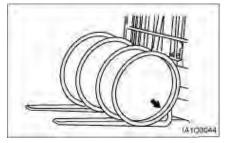


- 3. Deposit the load and back away carefully to disengage the forks.
- **4.** Lower the carriage and forks to either travel position or park position.

Lifting Drums or Round Objects

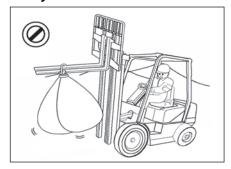


 Block drums or round objects. Tilt mast forward and slide fork tips along the floor to get under the load.



- 2. Tilt the mast back slightly until the load is cradled on the forks before lifting.
- 3. Lift the load to the travel position.

Safety instructions for attachments when transporting suspended loads



M WARNING

Swinging/Wide loads and a reduced residual capacity can result in accidents

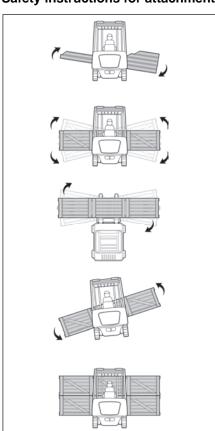
Adapt the travel speed to the load, less than walking pace.

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 center of gravity

Where it is necessary to lift a wide load where the lateral load center of gravity is unknown.

Do a test lift first to determine lateral center of gravity and potential movement with the load during transport. Exercise extra caution when handling offcenter loads that cannot be centered.

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 practises allow otherwise.

Parking the Lift Truck

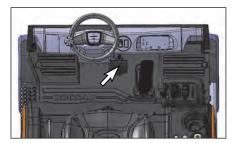
NOTICE

Parking or storage of electric lift trucks outdoor can cause lift truck system damage or failure.

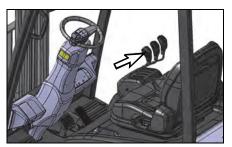
Park or store all electric lift trucks inside a building to protect electrical system from moisture damage.

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

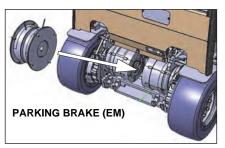
Park the lift truck level, with the forks lowered and the mast tilted forward until the fork tips touch the floor. Block the drive wheels when parking on an incline.



1. Apply the service brake to stop the lift truck.



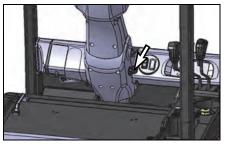
Move the directional control forward/reverse switch into NEUTRAL.



3. The parking brake is automatically engaged with a "clunk" after the vehicle stops.



4. Tilt the mast forward and lower forks to the floor.



5. Turn key switch to OFF and remove the key.

[OUTSIDE BATTERY CONNECTOR]



[INSIDE BATTERY CONNECTOR]



6. Disconnect the battery.



7. Block the 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.

Hook-on type Fork



- Move up the hook pin to the free position in each fork to side the fork on the carriage bar.
- 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 centered on the truck.
- After adjustment, set the fork locks 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

To place the machine in storage for an extended period of time, the following measures must be taken to ensure that it can be returned to operation with minimal service.

- After every part is washed and dried, the machine should be housed in a dry building. Never leave it outdoors. In case it has to be left outdoors, lay wooden boards on the ground, park the machine on the boards and cover it with canvas, etc.
- 2. Lubricate, grease and replace oil before storage.
- Apply a thin coat of grease to exposed hydraulic cylinder piston rods.
- Cover batteries after removing terminals, or remove them from the machine and store separately.

During Storage

Drive the truck for a short period at least once a month. This coats moving part surfaces with a new film of oil. Charge the battery at this same time.

After Storage

After storage (when it is kept without cover or rust preventive and once is month operation has not been made), you should apply the following treatment before operation.

- Remove the drain plug on hydraulic tank and drain mixed water.
- Wipe off grease from hydraulic cylinder piston rod.
- Measure specific gravity and check that battery is charged.
- Drive at low speed to make sure inside of transfer is well oiled.

Transportation Hints 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.

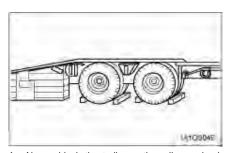
NOTICE

Obey all state and local laws governing the 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.



- Always block the trailer or the rail car wheels before loading the lift truck.
- 2. Position the lift truck on the trailer or the rail car.
- 3. Check that the parking brake lamp is on, set the directional control forward/reverse switch.
- 4. Tilt the mast forward and lower forks to the floor.
- 5. Turn key switch OFF and remove the key.
- 6. Disconnect the battery.
- Block the tires and secure the lift truck with tiedowns.

Machine Lifting and Tiedown Information

NOTICE

Improper lifting or tiedowns can allow load to shift and cause injury and/or damage.

- Weight and instructions given herein apply to lift trucks as manufactured by DOOSAN.
- Use properly 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.
- Use the tiedown locations provided for lift truck tiedown.

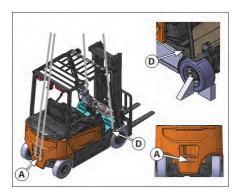
Check the state and local laws governing weight, width and length of a load.

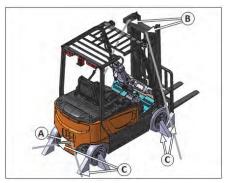
Contact your DOOSAN Lift Truck dealer for shipping instructions for your lift truck.

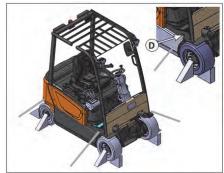
Lifting a Forklift using a Crane

A WARNING

- Batteries of an electric forklift must be removed before lifting. Lifting an electric forklift without removing the batteries can lead to serious injury to the workers or damage to the equipment by electric shock or leakage of electrolyte.
- 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 with rubber or cloth to prevent damage to the vehicle, as necessary.
- Wire rope and other lifting tools must have sufficient strength, and free of any defect or wear.
- 4. Avoid impact load to the lifting devices/tools.
- 1. Check the weight, length, width and height of the vehicle before lifting.
- 2. Park the crane at an appropriate position.
- Connect the slings to the points A and D of the figure below.
- **4.** If the sling contacts the vehicle, insert a rubber plate between the sling and the vehicle.
- 5. Lift up the vehicle slowly.







How to Fix Forklift to a Carrier

- The rope/chain must have sufficient length for fixing.
- 2. Park the vehicle on a level ground.
- Set the mast vertically. Lower the fork or attachment to the lowest position.
- Set all the operating devices to Neutral Position. Turn OFF the start switch.
- 5. Check that the parking brake lamp is on, chock the wheels with blocks (C).
- **6.** Fix the mast top B and rear tow pin A with towing hooks, as shown in the figure below.
- If the forklift is without mast, fix the rear tow pin A and front cowl D with towing hooks, as shown in the figure below.

Towing Information

MARNING

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 haul 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 $30^{\circ}\Delta$ angle from the straight ahead position.

Connect the tow line as low as possible on the lift truck that is being towed.

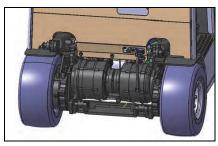
Quick lift truck movement could overload the tow line or bar and cause it to break. Gradual and smooth lift truck movement will work better.

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 DOOSAN Lift Truck dealer for towing a disabled lift truck.



1. Turn the key switch to OFF.

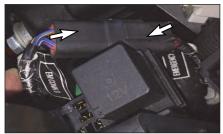


- 2. Release the service brake pedal.
- Remove the top cover of the counter-weight.
- There are EM CONN A, EM CONN B, EMERGENCY C Connector beside of Hyd. Tank.



5. Removed EM CONN A and EM CONN B.

Operation Section



- Connect EM CONN B and EMERGENCY C.
- Tighten the traction bar connected to the lift truck.
- Remove the wheel chocks. Tow the lift truck carefully. Do not tow the lift truck faster than 2km/h (1.2 mph).

NOTICE

Release the parking brake to prevent excessive wear and damage to the parking brake system.

A 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. Personal injury or death could result.

If the EM Brake is released from the ramp to move the lift truck, so please work on the plains.

Please chock the wheels with blocks when working in flats.

Inspection, Maintenance and Repair of Lift Truck Forks

The following provides 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 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 on the job failures.

Repairs and modifications should be done only by the fork manufacturer or a qualified technician knowledgeable of 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. Generally on the top or side of the fork shank.

- A fork rated at 1500 pounds at 24 inch load center will be stamped 1500B24.
- A fork rated at 2000 kg at 600 mm load center will be stamped 2000B600.

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.

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

 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.

If the forks have been previously used, perform the "12 Month Inspection".

If the forks are rusted, see "Maintenance and Repair".

- Make sure fork blades are level to each other within acceptable tolerances. See "Forks, Step 4," in the "2000 Service Hours or 1 Year" in "Maintenance Intervals"
- 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 1 Year" in "Maintenance Intervals".

Daily Inspection-Before First Use and at Each Preventive Maintenance Inspection

- 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 "2000 Service Hours or 1 Year" 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 Maintenance Section of this manual.

Maintenance and Repair

Repair forks only in accordance with the manufacturer's recommendations.

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.

- 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.
- 3. 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.

4. A fork should be load tested before being returned to service on completion of repairs authorized and done in accordance with the manufacturer's recommendations.

Most manufacturers and standards require the repaired fork to be tested with a load 2.5 times the specified capacity and at the load center marked on the fork arm.

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.

Check the fork arm before and after the second application of the test load. It shall not show any permanent deformation.

Consult the fork manufacturer for further information as may be applicable to the specific fork involved.

Testing is not required for repairs to the positioning lock or the markings.

Insulation resistance inspection

Insulation resistance should be conducted accordance with following standard at least once a year to ensure operator's safety.

- DIN EN 1175, DIN 43539
- VDE 0117, VDE 0510
- DZ.U. 2003 NR 193 POZ. 1890 art 12

Test values for the battery

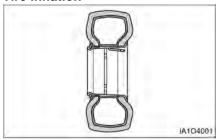
root valuos for the battery					
Component	Recommended Test Voltage	Measurements		Nominal voltage	Test values
Battery	50VDC	Batt +	Battery	24V	>1200Ω
	100VDC	Batt -	Case	48V	>2400Ω
	100VDC			80V	>4000Ω

Test values for the entire truck

Nominal voltage	Recommended Test voltage	Test values
24V	50VDC	>24KΩ
48V	100VDC	>48KΩ
80V	100VDC	> 80K Ω

Tire Inflation Information

Tire Inflation



WARNING

Personal injury or death could result when tires are inflated incorrectly.

Use a self-attaching inflation chuck and stand behind the tread when inflating a tire.

Proper inflation equipment, and training in using the equipment, are necessary to avoid overinflation. A tire blowout or rim failure can result from improper or misused equipment.

NOTICE

Set the tire inflation equipment regulator at no more than 140 kPa(20 psi) over the recommended tire pressure.

Tire Shipping Pressure

The inflation pressures shown in the following chart are cold inflation shipping pressures for tires on DOOSAN lift trucks.

Size	Ply Rating or Strength Index	Shipping pressure	
	Strength maex	kPa	psi
B25/30/35X-7 PLUS			
18X7-8 Steer	16	1000	145
23X10-12Drive	16	809	117

The operating inflation pressure is based on the weight of a ready-to-work lift truck without attachments, at rated payload, and in average operating conditions. Pressures for each application may vary and should always be obtained you're your tire supplier.

Adjusted Inflation Pressures

A tire inflation in a warm shop area, 18°C to 21°C (65°F to 70°F), will be underinflated if the lift truck works in freezing temperatures. Low pressure shortens the life of a tire.

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.

Use only metric tools on most hardware for proper fit. Other tools could slip and possibly cause injury.

Torque for Standard Hose Clamps-Worm Drive Band Type

NOTICE

The following chart gives the torques for initial installation of hose clamps on new hoses 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 inch)	7.5±0.5	65±5	
13.5 mm (.531 inch)	4.5±0.5	40±5	
8 mm (.312 inch)	0.9±0.2	8±2	
	Reassembly or		
Clamp Width	Retightening Torque		
	N·m¹	lb-in	
16 mm (.625 inch)	4.5±0.5	40±5	
13.5 mm (.531 inch)	3.0±0.5	25±5	
8 mm (.312 inch)	0.7±0.2 6±2		

¹1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

Torque for Standard Bolts, Nuts and Taperlock Studs

NOTICE

The following charts give general torques for bolts, nuts and taperlock studs of SAE Grade 5 or better quality.

Torques for Bolts and Nuts With Standard Threads

Thread Size	Standard Bolt & Nut Torque			
Inch	N·m¹	lb-in		
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		

¹1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

Torques for Taperlock studs

Thread Size	Standard Taperlock Stud Torque		
inch	N·m¹	lb-in	
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 1/8	500±70	370±50	
1 1/4	650±80	480±60	
1 3/8	750±90	550±65	
1 1/2	870±100	640±75	

¹¹ Newton meter (N·m) is approximately the same as0.1 kg·m.

Torque 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 be 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.

METRIC ISO2 THREAD				
Thread Size	Standard Torque			
Metric	N·m¹ lb·in			
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		

¹1 Newton meter (N·m) is approximately the same as 0.1 kg·m.

²ISO-International Standard Organization.

Lubricant Specifications

Lubricant Information

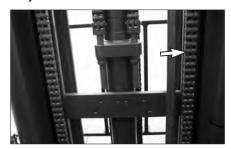
Some classifications and abbreviations we use in this section follow S.A.E. (Society of automotive Engineers) J754 nomenclature and others follow S.A.E. J183.

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.

Chain and Linkage Oils (DEO or EO)



Use following engine oils are recommended for use on chains and linkages.

- European oil specification CCMC D3.
- API Specification CD, CD/SF, CE
- Military specifications MIL-L-2104D or E

Hydraulic Oils (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 VG 32

These oils should have antiwear, antifoam, antirust and antioxidation additives for heavy duty use as stated by the oil supplier. ISO viscosity grade of 32 would normally be selected.

NOTICE

Correct Hydraulic Oil should be used to achieve maximum life and performance from hydraulic system components. The following hydraulic Oil is recommended in most hydraulic and hydrostatic systems.

Make-up oil added to the hydraulic tanks must mix with the oil already in the systems. Use only petroleum products unless the systems are equipped for use with special products.

If the hydraulic oil becomes cloudy, water or air is entering the system. Water or air in the system will cause pump failure. Drain the fluid, retighten all hydraulic suction line clamps, purge and refill the system. Consult your DOOSAN Lift Truck dealer for purging instructions.

Drive Axle Oil

Do not use Gear Oil in the final drives or differentials. Gear Oil can cause seal material to fail and possibly leak oil.

NOTE: Failure to follow the recommendation will cause shortened life due to excessive gear wear.

The API GL-4 specification or MIL-L-2105A oils could be used.

Multi-grade oils are not blended by DOOSAN 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.

Lubricating Grease(MPGA)

Use Multipurpose Molybdenum Grease (MPGM) for all lubrication points. If MPGM grease can not be used, a multipurpose type grease which contains 3% to 5% molybdenum disulfide can be used.

NLGI NO.2 grade is suitable for most temperatures. Use NLGI No.1 or No.0 grade for extremely low temperature.

Battery Discharge Indicator

The battery discharge indicator should be observed frequently before and during operation.



A fully charged battery will cause a "9 segments" to be displayed on the LCD display. As the battery is discharged, the LCD display will count down, 9, 8, 7, and etc., until "EL" is displayed. When the battery reaches 80% discharge level, the Micro-Controller will cause the LCD display to continuously index through the entire range (1 through 9 segments) to signal that the battery is discharged and lift interrupt is imminent.



If the warning is ignored, lift interrupt will prevent the hydraulic pump motor from operating and an "EL" will be displayed on the LCD display.

To prevent over-discharge, the lift interrupt should not be reset by disconnecting and reconnecting the battery.

If the batteries are weak, have them charged or replaced.

The batteries should not be discharged below 80% of the full charge as indicated by their specific gravity. This specification varies with different battery manufacturers. See the manufacturer's specifications for specific gravity at 80% discharge. If information is not available from the battery supplier, use 1.140 specific gravity level.

Battery

WARNING

When using pressure air for cleaning purposes, wear a protective face shield and protective clothing. Maximum air pressure must be below 207 kPa (30 psi).

Do not smoke near batteries that are being stored or when checking the electrolyte level.

Electrolyte is an acid solution and can cause personal injury. Avoid contact with skin and eyes.

Maximum life and performance of lift truck batteries is dependent on the operator, battery charging, maintenance and service.

Most dirt and dust picked up by the battery can usually be blown off with low pressure compressed air.

However, if cells are overfilled and electrolyte collects on the covers, the top of the battery will stay wet.

If necessary, clean the top of the battery with a solution of baking soda and hot water.

NOTICE

Vent caps must be tight to prevent soda solution from entering battery cells.

To make the solution, add 0.5 kg (1 lb) of baking soda to 4 liters (1 gallon) of water. Use a brush having flexible bristles. Apply the soda solution to the top of the battery until the cleaning action of the soda stops.

After cleaning action has stopped, rinse batteries thoroughly with water. Dry the batteries with low air pressure.

The lift truck operator must not start his shift with a battery that has been taken off a charger too soon. Batteries are designed to be charged and allowed to cool and stabilize. A battery should never be disconnected from a charger until the charge cycle has been completed.

Low battery operation must be prevented. Operation with a low battery may cause damage to

the battery.

Low battery operation will cause higher than normal current in the electrical system. This can damage contactor tips or shorten motor brush life.

Batteries that have been fully charged should have a tag attached for identification.

A battery should be recharged in 8 to 12 hours after being discharged, depending on the charger type, then allowed to cool and stabilize 4 to 8 hours. Repeated undercharging must be prevented because it can damage the battery.

A battery requires an equalizing charge at least once every 20 normal charge/discharge cycles. This helps correct and prevent unequal cell specific gravity (SG) readings. An "equalizing charge" is a cycle charge with modification, given usually at an interval to bring all cells up to a state of equal charge. An equalizing charge usually adds three to four more hours to the cycle charge, at a low finish rate. It is usually given when the specific gravity (SG) of electrolyte has a variation of more than 20 points (.020) from cell to cell, after a regular cycle charge.

A "cycle charge" will completely recharge the battery. The typical cycle charge for a fully discharged battery usually is an eight-hour charge. The battery must be recharged before it has been discharged over 80% of the rated capacity of the battery. The work shift of the lift truck can be planned so the battery will not be discharged more than 80%.

A battery should never be left in a discharged state because of sulfate formation. This reduces battery life drastically. To extend life always recharge the battery without delay after it has been discharged.

Repeated over discharging of the battery will damage the cells, which will shorten battery life and increase operating cost. Battery life(number of cycles) decreases as the depth of discharge increases. The estimated life of the battery discharged to 80% will be approximately twice as long as if it were discharged 100%.

The battery's maximum temperature is critical. The electrolyte temperature should never exceed 43°C (110°F) either while operating or charging. If higher temperatures are maintained through use or abuse, reduced battery service life can be expected.

Battery condition is important for a long life. The electrolyte level should be maintained at the recommended levels and the battery should be kept clean and dry. "Washing down" batteries at different time periods will reduce the chance of "grounds" caused by electrolyte spills and corrosion. If done often enough, just washing with water alone will eliminate the need for using baking soda. If not, a solution of baking soda and water must be used to wash battery at different time periods.

Add water at regular intervals. Enough water should be added to bring the electrolyte approximately 13.0 mm (.50 inch) above the plates. This is a simple matter with the use of an automatic cell filler, which shows a light when the correct level has been reached. Water should always be added before charging to be sure thorough mixing with acid when gassing occurs near the end of charging period. Use distilled water or have the water supply analyzed.

Charge batteries correctly. It is important that all batteries should be charged according to the manufacturer's instructions. Most of the charging equipment is fully automatic and should be checked periodically. Never operate the lift truck with a fully discharged battery because this will damage the battery.

When a battery charger operates correctly and brings a good battery up to full charge, the current readings will level to the "finish rate." The charging voltage will stabilize, the specific gravity will stop rising and normal gassing can be seen.

NOTICE

· DISPOSAL OF OLD BATTERY

Careless disposal of a battery can harm the environment and can be dangerous to persons. Always dispose of a battery to an authorized personnel only.

Do not attempt to open or dismantle a battery or a cell.

Cold Storage Applications

When an electric lift truck is operated in cold storage applications, at temperatures as low as -20°C (-4°F), the battery capacity is decreased. Operation at cold temperatures can also cause mechanical failures, short circuits and too much wear due to the formation of ice crystals.

The direct cause of these problems is the extreme changes in temperature in combination with humidity in the air which can result in condensation.

To protect the electric lift truck's components and decrease the effects of the cold temperature, perform the following items before you put the lift truck to work in cold storage applications.

Warm-up over 10 minutes before operation / Operation within 1 hour (30 minutes at best, if possible) / Storage outside of cold workplace.

- Warm-up the vehicle over 10 minutes before operation before operation in cold workplace.
 - For smooth operation through warm-up of powertrain and hydraulic product & oil
 - Operate powertrain and hydraulic parts before working in cold workplace
 - Warm-up for 15 min. in normal place / Operate the actuating devices more than 3 times
- 2. Do not work more than 1 hour in the cold storage plant
 - Every 30 min. of interval, go in and out of cold workplace: similar rule for cold storage warehouse
 - Stay for 30 min. outside cold workplace or, warm-up more than 20 min. before operation
- 3. Store the vehicle outside cold workplace
 - Do not park or stop in cold workplace (Do not leave the vehicle with the power off)
 - Lifetime of electric components and battery may be seriously shortened while freezing and melting, if the vehicle is parked inside cold workplace with power off.

Battery

There is a reduction in battery capacity in cold storage applications. For this reason, it is important to:

- Be sure the battery is completely charged at the start of each work cycle.
- b. If possible, keep the lift truck in a warm storage area when it is not in use.
- c. Do not store a discharged battery at below freezing temperature.



Observe the battery discharge indicator frequently

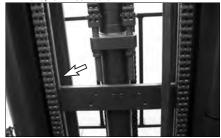
Hydraulic System



Drain the hydraulic system and fill it with SAE 5 or ISO VG 15, MIL-H-5606A hydraulic oil

Lift Chains

- Remove the chains Clean them in a nonflammable cleaning solvent.
- Put the chains in molybdenum disulfide (MPGM) grease for one hour. Then, before installation, hang the chains, where they will not move, for three hours.



- 3. Put MPGM grease on the chains at one-week intervals.
- 4. Check chains very carefully for wear on the link plate edges, caused when they run over the sheaves. Check the chains regularly for cracked links, loss of shape in the holes, and corrosion.

Lubricant Viscosities and Refill Capacities

Lubricant Viscosities

LUBRICANT VISCOSITIES FOR AMBIENT (OUTSIDE) TEMPERATURES						
Compartment	0	il	۰	С	۰	F
or System	Visco	sities	Min	Max	Min	Max
	ISO V	/G 15	-40	+10	-40	+50
Hydraulic	ISO V	G22	-30	+20	-22	+68
and Power Steering	ISO V	/G 32	-20	+30	-4	+86
System	ISOV	/G 46	-10	+40	+14	+104
•	ISO VG 68		0	+50	+32	+122
*Drive Axle Housing	API GL-4	SAE 80W	-20	+40	-4	+104

^{*} For the detailed information about the lubricant specifications, see "Lubricant Specifications" section.

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)			
Compartment or System	Liters	U.S. Gal	Imperial Gal
Hydraulic & Power Steering System	32	8.3	7.0
Drive Axle Housing	1.2 x 2	0.32 x 2	0.27 x 2

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 authorized personnel only.

NOTICE

Careless disposal of waste oil can harm the environment and can be dangerous to persons. Always dispose of waste oil to an authorized personnel only.

When Required

Self Diagnostics - Test	119
Compact Display Button	119
Run Time Diagnostic	120
Carriage Roller Extrusion – Adjust	123
Power Modules – Discharge	124
Fuses – Replace	125
Seat - Lubricate	125
Wheel Bolts - Check for Tightness	126
Drive Axle Gear Boxes	126
Greasing Point	127

Every 10 Service Hours or Daily

vvalk - Around Inspection - Inspect	128
Mast Channels - Lubricate	130
Battery - Check, Exchange, Change	130
Indicator - Check	132
Tires and Wheels - Inspect	133

First 150 Service Hours or 2 Weeks

Drive Axle Oil - Change	134

Every 500 Service Hours or 3 Months

Tilt Cylinders	135
Cylinder Rod Extension - Adjust	136
Crosshead Rollers - Check	136
Mast Hinge Pins - Lubricate	137
Steering Mechanism - Lubricate	137
Overhead Guard - Inspect	137
Control Panel - Clean, Inspect	138
Direction Control forward/reverse Switch- Check	<
	139
Parking Brake - Test	140
Hydraulic Oil Level - Check	140
Steer Angle Switches - Check, Clean	141
Mast Carriage, Chains and Attachments - Inspe	ct,
Adjust, Lubricate	141

Every 1000 Service Hours or 6 Months

Air Breather - Change	143
Drive & Pump Motor - Clean, Inspect	
Tires and Wheels - Inspect, Check	145
Lift Chains - Test, Check, Adjust	146
Hydraulic Return Filter - Change	148

Every 2000 Service Hours or Yearly

Hydraulic, Power Steering System	149
Steer Wheel Bearings - Reassemble	150
Fork - Inspect	152
Hydraulic Oil - Check, Change	155
Drive Axle Oil - Change	155

Environment Protection

Environment Protection	156

Quick Reference to Maintenance Schedule				FIRST	ST EVERY			
230K ROTOTOTO TO MAINTONATION CONTOURING								
ITEMS	SERVICES	PAGE	When Required	First 150 Service Hours or 2 Weeks	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
Air Breather	Change	143					0	
Battery	Check, Exchange, Change	130			0			
Carriage Roller Extrusion	Adjust	123	0					
Compact Display Button		119	0					
Control Panel	Clean, Inspect	138				0		
Crosshead Rollers	Check	136				0		
Cylinder Rod Extension	Adjust	136				0		
Direction Control forward/reverse Switch	Check	139				0		
Drive & Pump Motor	Clean, Inspect	143					0	
Drive Axle Gear Boxes		126	0					
Drive Axle Oil	Change	134,155		0				0
Fork	Inspect	152						0
Fuses	Replace	125	0					
Greasing Point		127	0					
Hydraulic Oil	Check, Change	155						0
Hydraulic Oil Level	Check	140				0		
Hydraulic Return Filter	Change	148					0	
Hydraulic, Power Steering System		149						0
Indicator	Check	132			0			
Lift Chains	Test, Check, Adjust	146					0	
Mast Carriage, Chains and Attachments	Inspect, Adjust, Lubricate	141				0		
Mast Channels	Lubricate	130			0			
Mast Hinge Pins	Lubricate	137				0		
Overhead Guard	Inspect	137				0		
Parking Brake	Test	140				0		
Power Modules	Discharge	124	0					
Run Time Diagnostic	j j	120	0					
Seat	Lubricate	125	0					
Self Diagnostics	Test	119	0					
Steer Angle Switches	Check, Clean	141				0		
Steer Wheel Bearings	Reassemble	150						0
Steering Mechanism	Lubricate	137				0		
Tilt Cylinders		135				0		
Tires and Wheels	Inspect	133			0			
Tires and Wheels	Inspect, Check	145					0	
Walk - Around Inspection	Inspect	128			0		É	
Wheel Bolts	Check for Tightness	126	0			1		

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.

Self Diagnostics - Test

Test Circuits and Components

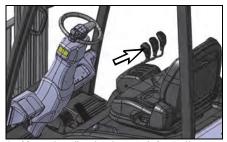
The Micro-Controller has a built-in diagnostic system to provide aid in rapid troubleshooting of lift truck problems.

NOTE: Make sure the battery is fully charged before any of the following tests are made.

After the self-diagnostics tests have been started, the procedure does not have to be completed. At any point the procedure can be interrupted, and the lift truck made ready for operation.

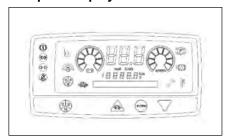


- Park the lift truck level, with the forks lowered and the mast tilted forward until the fork tips touch the floor.
- 2. Check the parking brake lamp.
- 3. Release the parking brake.



- Move the directional control forward/reverse switch to NEUTRAL.
- 5. Move the key switch to OFF.

Compact Display Button



As shown in the figure, there are 4 keys; E-S-H, UP (TURTLE), DOWN and ENTER are provided in the display

The function of each of them is described as follows:

ENTER Button

- When you switch your device on, this key, pressed for 3 consecutive seconds, allows entering both to parameter calibration and to diagnostic mode.
- During usual operations, this button, pressed for 3 consecutive s, allows you to access merely to diagnostic mode.

Remember that if the display is operating in diagnostic mode during typical operations, you can exit this procedure pressing once ENTER key.

Moreover, ENTER button is used to confirm the new value of the parameter in calibration procedure

UP Button

- Pressing of this button, in calibration and diagnostic mode, you increase the number of the parameter displayed.
- In calibration phase, you increase the numeric value of the parameter displayed.

TURTLE Button

Remember that pressing this button you can toggle between slow running and normal working condition (if the lift truck is already in speed limitation mode).

DOWN Button

- Pressing of this button, in calibration and diagnostic mode, you decrease the number of the parameter displayed.
- 2. In calibration phase, you decrease the numeric value of the parameter displayed.
- "3 way of shifting from the visualization of "time meter" and "odometer": you can do it by pressing the "DOWN ARROW" button of Compact display for 1 second in succession during normal working of the display."

E-S-H Button

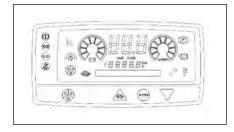
With this button, you can modify the device operating condition, in a circular sequence, as described in

Table 7:

CURRENT WORKING CONDITION	WORKING CONDITION AFTER THE KEY PRESSURE
Economic (E)	Standard (S)
Standard (S)	High (H)
High (H)	Economic (E)

NOTE: You can modify system operating modes only after enabling their management with EASYVIEW applicative software

Run Time Diagnostic



This operating mode enables you to test main analog and digital signals managed by your system.

Enter diagnostic mode if you are switching on your lift truck:

- Press ENTER key (for 3 consecutive s) until the symbol "0" lights up.
- Press DOWN key to enter diagnostic mode; the symbol "d" is visualized and it persists until the first parameter has been selected.

Enter diagnostic mode if you are working as usual with your lift truck:

 Press ENTER key (for 3 consecutive s) until symbol "d" appears; it will persist as long as the first parameter has been selected.

After diagnostic operation mode has been enabled, you can choose the parameter you want to analyse using UP and DOWN keys (parameter number increases using UP key and decreases with DOWN key)

Here, in Table 11, you have a list of the parameters you can analyze with their respective displaying order: DOWN key).

Parameter Number	Parameter Name	
1	Left traction motor speed [rpm]	
2	Left traction motor speed standard [rpm]	
3	Right traction motor speed [rpm]	
4	Right traction motor speed standard [rpm]	
5	Lift voltage [mV]	
6	Battery voltage [V-10]	
7	Left traction motor power supply module temperature [°C / °F]	
8	Pump motor power supply module temperature [°C / °F]	
9	Pump motor speed [rpm]	
10	Pump motor speed standard [rpm]	
11	Accelerator potentiometer voltage [mV]	
12	Accelerator 2 nd potentiometer voltage [mV]	
13	Steering sensor voltage [mV]	
14	Right traction motor power supply module temperature [°C / °F]	
15	Left traction motor phase current U [A rms]	
16	Left traction motor phase current V [A rms]	
17	Left traction motor phase current W [A rms]	
18	Left traction motor phase current U [A rms]	
19	Right traction motor phase current V [A rms]	
20	Right traction motor phase current W [A rms]	
21	Pump motor phase current U [A rms]	
22	Pump motor phase current V [A rms]	
23	Pump motor phase current W [A rms]	
24	Left traction motor temperature [°C / °F]	
25	Right traction motor temperature [°C / °F]	
26	Pump motor temperature [°C / °F]	
27	Seat switch hour counter [h]	
28	Drive motor hour counter [h]	
29	Pump motor hour counter [h]	
30	Seat switch [digit]	
31	Parking brake switch [digit]	
33	Reverse direction traction switch [digit]	
34	Normal direction traction switch [digit]	
35	Pedal brake switch [digit]	
38	AUX2 function switch [digit]	
40	High lift 1 switch [digit]	
41	Tilt switch [digit]	
42	Mast tilt switch [digit]	
43	Main breaker command [digit]	
44	5V output [digit]	
45	12V output [mV]	
46	Auto tilt switch 3 [digit]	
48	Fan command [digit]	

Table 11: List of accessible parameters in diagnostic mode (from 1th to 48th).

In diagnostic mode selected parameter is visualized as follows:

- In the area dedicated to speed and alarm signals, appears parameter number(flashing)
- Its actual value is displayed in the area reserved to the time meter.

In particular, if the selected parameter is:

Analogue input: COMPACT display shows the parameter value, expressed in the unit of Table 11

Digital input: if the command activated by the operator corresponds to the parameter selected, the value of the quantity is visualized.

Other way the symbol e (error) appears, except in following case:

Seat switch active, for any selected digital input.

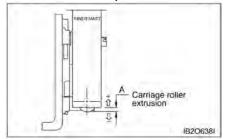
To exit diagnostic mode, type ENTER key again.

NOTE: If an alarm occurs when diagnostic mode is enabled, and the system is working as usual, display returns automatically to its typical visualization mode. However you can enter diagnostic mode again, pressing ENTER key (for 3 consecutives), until the last parameter displayed before exiting is visualized.

If the selected parameter is a temperature, also thermal alarm symbol **\mathbb{E}** is visualized.

Carriage Roller Extrusion - Adjust

- 1. Set the mast vertical.
- 2. Lower the carriage completely.
- 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.



- Measure the distance from the bottom of the inner upright to the bottom of carriage bearing.
- The measurement (A) must be as follows in Chart below.

B25X-7 PLUS

Height of carriage roller extrusion (A)			
STD mast FF mast		FFT mast	
-6	41	41	

B30X-7 PLUS, B35X-7 PLUS

Height of carriage roller extrusion (A)			
STD mast FF mast		FFT mast	
0	41	41	

Power Modules - Discharge

WARNING

Personal injury could result if power modules have not been discharged properly.

Battery voltage and high amperage are present.

The power modules must be discharged before any contact with the electrical control system is made.

Before touching any electrical components, remove rings, watches and other metallic objects from the hands and arms, then discharge the power modules.



The power modules is located in the control panel at the rear of the lift truck.

IOUTSIDE BATTERY CONNECTORI



[INSIDE BATTERY CONNECTOR]

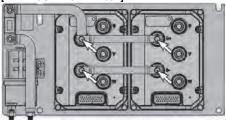


1. Disconnect the battery.



2. Open the hood.

[DRIVE CONTROLLER-80V]



[PUMP CONTROLLER-80V]



- 3. Before touching any electrical components, the power modules must be discharged. Put a 90 ohm, 30 watt resistor in position between the terminals of the power modules as shown. Hold the resistor in this position for approximately ten seconds. This will discharge the power modules.
- **4.** Perform any necessary maintenance and repair at this time.
- 5. Close the hood.
- 6. Connect the battery.

Fuses - Replace

The fuses are located in the control panel and fuse box at the rear of the lift truck.

They 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.

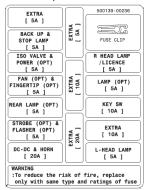
NOTICE

Replace fuses with the same type and size only. Otherwise, electrical damage can result.

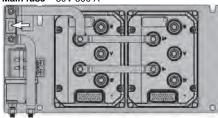
If it is necessary to replace fuses frequently, an electrical problem may exist. Contact your DOOSAN Lift Truck dealer.



Backup & Stop Lamp - 5 A ISO Relay & POWER - 5 A FAN & FINGERTIP - 5 A -5A Rear Lamp Strobe & Flasher - 5 A DC-DC & Horn - 20 A R Head Lamp - 5A - 5 A Lamp (OPT) Key Switch - 10 A L Head Lamp - 5A

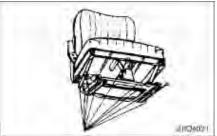


Main Fuse - 500 amps Main fuse - 80V 500 A



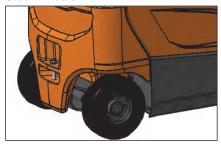
Seat - Lubricate





Check the operation of the seat adjusters. Make sure that the seat slides freely on its track. Lightly oil the seat slider tracks.

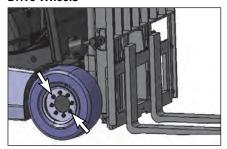
Wheel Bolts - Check for Tightness Steer Wheels



Typical example

 Inspect tightness of wheel nuts in a sequence opposite each other 140 N·m (105 lb·ft).

Drive Wheels



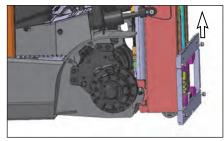
Typical example

 Inspect tightness of wheel nuts in a sequence opposite each other to 200±10 N·m (148 lb·ft).

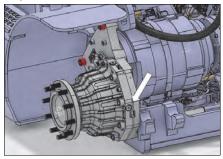
Drive Axle Gear Boxes

NOTE: If there is a leak from drive axle, the oil level should be measured as follows.

Measure Lubricant Level

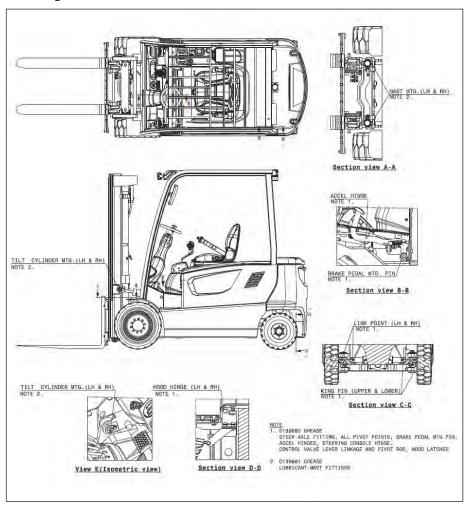


- Park the lift truck on a level surface. Raise the carriage high enough to gain access to the housing level/fill plugs.
- 2. Use blocking to secure the carriage in this position.



- Remove the housing level checking plugs. Maintain lubricant level to the bottom of the plug opening. Install the level checking plugs.
- 4. Remove blocking. Lower the carriage.

Greasing Point



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.

Walk - Around Inspection - Inspect



- Inspect the operator's compartment for loose items and clean any mud or debris from the floor plates.
- Inspect the instrument panel for damage to the display.
- Test the horn and other warning devices for proper operation.



- 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 tires, valve stems and wheels for cuts, gouges, foreign objects and loose or missing nuts. Refer to "Tires and Wheels" in "Every 10 Service Hours or Daily" section, if repairs or replacement is necessary.



Inspect the overhead guard for damage, loose or missing mounting bolts.



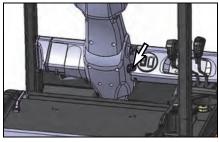
Inspect the hydraulic system for leaks, worn hoses or damaged lines.



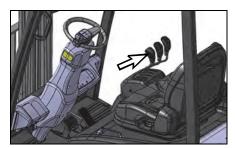
Inspect the drive axle housing and the ground for oil leaks. Refer to "Drive Axle" in "When Required" section, if an oil leak is found.



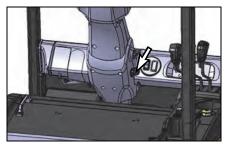
10. Adjust the operator's seat.



11. Adjust the steering wheel to a comfortable position.



12. Move the directional control forward/reverse switch to NEUTRAL.



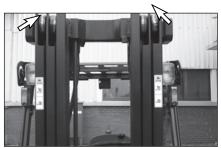
13. Turn the key switch to ON.



14. Check the LCD display for battery discharge status. A fully charged battery will be displayed on the LCD display.

15. Check the operation of parking brake, service brake, controls and other devices that may be equipped on your lift truck.

Mast Channels - Lubricate



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.

Battery - Check, Exchange, Change

Battery Access

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

- 1. Tilt the steering column to the full upright position and move the seat fully rearward.
- Release the hood latch lever which retain the seat and battery cover.
- 3. Turn the attachment operator lever cover.



4. Raise the seat and battery cover.





[INSIDE BATTERY CONNECTOR]



5. Disconnect the battery.

Check Electrolyte



- Inspect the battery compartment for loose connections, frayed cables and properly secured battery restraint.
- Clean the top of the battery. If necessary, clean the top of the battery with a solution of baking soda and hot water.

NOTICE

Vent caps must be tight to prevent soda solution from entering battery cells.

A clean battery top is essential to avoid conductive paths on higher voltage batteries.

To make the solution, add 0.5 kg (1 lb) of baking soda to 4 liters (1 gallon) of water. Use a brush having flexible bristles. Apply the soda solution to the top of the battery until the cleaning action of the soda stops.

After cleaning action has stopped, rinse batteries thoroughly with water. Dry the batteries with low air pressure.



Check the specific gravity of the battery. If the specific gravity reading is below 1.150, the battery must be charged.

NOTICE

The battery should not be used if a difference in specific gravity between two cells is greater than .020. If this condition exists, the battery should be put on an equalization charge. If this does not correct the condition, consult your battery supplier.

- 4. Check the electrolyte level of all cells. Maintain the electrolyte level about 13 mm (.50 inch) above the plates. Add water as needed. Use only distilled water. Water is always added after a battery is charged.
- Lower the seat and battery cover. To closed position and secure with the latch on the front of the cover.
- 6. Connect the battery.

Battery Exchanging

NOTE: Batteries should be changed, water added and charged only in areas where proper protective and ventilation facilities are provided.

- Refer to "Battery Access" topic for battery access.
- Cover the battery with hinged battery cover or with plywood.
- Install insulated battery tree and hoist, of sufficient capacity, to the battery.
- **4.** Remove the battery. Recharge the battery.
- 5. Install a fully charged battery.
- Remove the battery tree. Remove hinged battery cover or plywood from the top of the battery.
- 7. Connect the battery.
- Lower the seat and battery cover to closed position and secure with the latch on the front of the cover.
- 9. Adjust the seat position.

Battery Charging

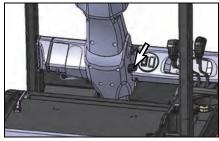
WARNING

When charging, proper provision must be made for venting of the charging gases. Battery container lids and the covers of battery compartments must be opened or removed. The vent plugs should stay on the cells and remain closed.

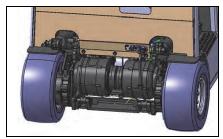
With Battery Installed in Lift Truck

- Refer to "Battery Access" topic for battery access.
- Connect the battery to the charger and charge the battery. Observe safety warnings for charging batteries.
- **3.** When the battery is fully charged, disconnect the battery from the battery charger.
- 4. Connect the battery to the lift truck.
- Lower the seat and battery cover to closed position and secure with the latch on the front of the cover.
- 6. Adjust the seat position.

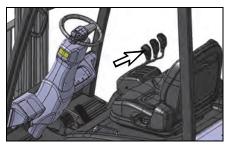
Indicator - Check



1. Turn the key switch to ON.



Check the parking brake lamp to verify engagement of the parking brake.

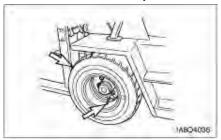


- Move the directional control forward/reverse switch to the NEUTRAL position.
- 4. Close the seat switch.

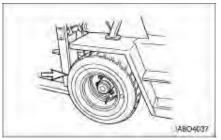


Check the indicator LCD display for the discharge state of the battery and the brake oil level

Tires and Wheels - Inspect

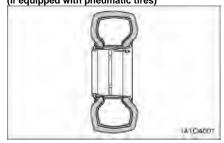


Inspect tires and valve stems for wear, cuts, gouges and foreign objects.



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.

Check Inflation Pressure (If equipped with pneumatic tires)



Measure the tire air pressure on each tire.



Inflate the tires, if necessary. See "Tire Inflation Information" section of this manual.

First 150 Service Hours or 2 Weeks

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

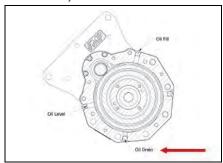
Drive Axle Oil - Change

After the first 150 hour of operation, subsequently after every 2000 hours or yearly.



Park the lift truck on a level ground. Check that the parking brake lamp is on, and shift the control lever to the neutral position.

- 1. Raise the mast and block in place.
- 2. Turn the key switch to OFF.



- 3. Remove oil: Remove the drain plug, in order to facilitate oil draining it is recommended to remove the oil level plug, allow all the oil to flow out to gearbox
- Refill oil: unscrew the fill plug and the level plug, check that the drain plugs are tightened, fill the gearbox with the following volumes of oil.

- Fill the drive axle housing with oil filling plug hole, the accurate amount of oil is defined by the opening of level checking plug.
- 6. Maintain the oil level.
- Plug: put the plugs with washers back in place, run the unit and after few minutes check the oil level, top off with oil if necessary, replace the plugs with washers.
- 8. Raise the mast and remove the blocking.

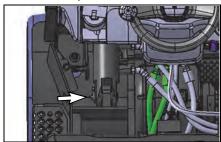
Every 500 Service Hours or 3 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

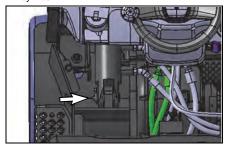
Tilt Cylinders Chassis Pivot Eyebolts - Lubricate



1. Remove floor plates.

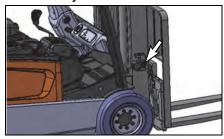


Lubricate pivot eyebolts, one fitting on each tilt cylinder.



Check the pivot eye pins for loose retainer bolts and wear.

Mast Pivot Eyes - Lubricate

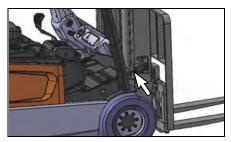


- Lubricate the mast pivot eyes, one fitting on each side of the mast.
- Check the mast pivot eye pins for loose retainer bolts and wear.

Cylinder Rod Extension - Adjust



1. Tilt the mast to the full forward position.



- Measure the extended length of the cylinder rods from the cylinder housing to the pivot eye. The cylinder rods must be within 3.18 mm (.125 inch) of each other.
- 3. To adjust the cylinder rod extension, loosen bolt.
- 4. Turn the cylinder rod in or out of pivot eye to obtain the proper adjustment. Turning the rod into pivot eye shortens the stroke. Turning the rod out of pivot eye lengthens the stroke.
- Tighten bolt to a torque of 95±15 N·m (70±10 lb·ft). Check the cylinder rods again for even travel.
- 6. With the mast at the tilt back position, install shims as required to permit no gap between pivot eye and spacer, so the mast does not twist at full tilt back position.

Crosshead Rollers - Check Check Operation

 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.



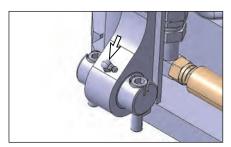
Typical example

Check for damaged crosshead rollers, guards and retainer rings.

Mast Hinge Pins - Lubricate Lubricate two fittings



1. Lower the forks and tilt the mast forward.



2. Lubricate the mast hinge pins. One fitting on each side of the mast. Total of two fittings.

Steering Mechanism - Lubricate Lubricate one fitting



Lubricate fitting on steer axle.

Overhead Guard - Inspect



Look for any loose or damaged bolts. Replace damaged bolts or missing bolts with original equipment part only. Retighten bolts to a torque of 90±10 N·m (67.5±10 lb·ft).

Check the overhead guard for bent or cracked sections. Repair if needed.

Control Panel - Clean, Inspect

Park the lift truck level, with the forks lowered, parking brake engaged, directional control lever in NEUTRAL, and the key switch to OFF.

1. Open the hood.

[OUTSIDE BATTERY CONNECTOR]



[INSIDE BATTERY CONNECTOR]



2. Disconnect the battery.

WARNING

Battery voltage and high amperage are present.

The power modules must be discharged before any contact with the control panel is made.

Personal injury could result if it has not been discharged properly.

Discharge the head capacitor. See "power modules" in "When Required" section of this manual.

M WARNING

Pressurized air can cause personal injury.

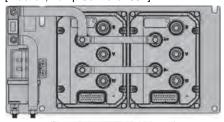
When using pressurized air for cleaning, wear a protective face shield, protective clothing and protective shoes.

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



 Clean the control panel with 205 kPa (30 psi) maximum air pressure, until dust is removed from the control panel.

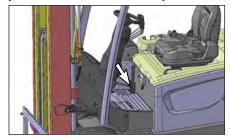
[Traction, Pump Controller-80V]





- 5. Inspect all wiring for loose connections, frayed cables and loose mounting bolts.
- Inspect the fuses for looseness, corrosion and broken connections.

[OUTSIDE BATTERY CONNECTOR]

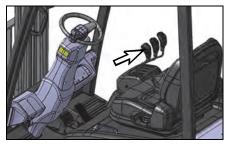


[INSIDE BATTERY CONNECTOR]



7. Close the hood cover and connect the battery.

Direction Control forward/reverse Switch- Check



Check the tightness of the directional forward/reverse switch mounting bracket. Adjust if needed.

Check for ease of movement of directional forward/reverse switch.

Adjust if needed.

Check for loose wiring. Secure wiring if needed.

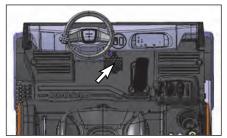
Parking Brake - Test

NOTE: Be sure area around the lift truck is clear of personnel and obstructions.

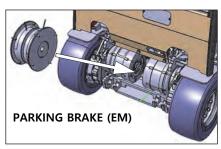
Drive the lift truck with a rated load up a 15% incline.

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.

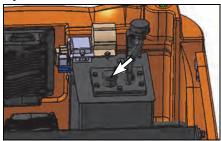


2. Halfway up the incline, stop the lift truck by applying the service brakes.



- Once the vehicle stops, the parking brake is automatically engaged with a "clunk", turning on its indicator lamp.
- **4.** If the parking brake is normal, the lift truck shall stand at the parked position.
- If the parking brake fails to keep the lift truck at the parked position, repair or replace the parking brake.

Hydraulic Oil Level - Check



- Operate the lift truck for a few minutes to warm the oil.
- Park the lift truck level, with the forks lowered, mast tilted back (all cylinders retracted), parking brake engaged, directional control lever in NEUTRAL, and the key switch to OFF.
- 3. Open the hood.
- 4. Remove the dipstick.
- Maintain the oil level to the full mark on the dipstick.
- 6. Install the dipstick.
- 7. Install the access cover.

Steer Angle Switches - Check, Clean



- Clean steer angle switches with 205 kpa (30 psi) maximum air pressure until dust is removed.
- Check the operation of steer angle switches and the tightness of bracket Adjustment if needed.

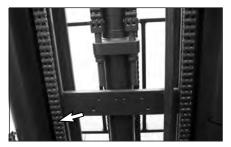
Mast Carriage, Chains and Attachments - Inspect, Adjust, Lubricate



 Operate the lift, tilt and attachment controls. Listen for unusual noises. These may indicate a need for repair.



- Inspect for loose bolts and nuts on the carriage and load backrest. Remove any debris from the carriage and mast.
- Inspect the forks and attachments for free operation and damage. Have repairs made if needed.



- 4. Brush in a film of oil on all links of the chain.
- 5. Raise and lower the carriage a few times to work lubricant into the chain links.

NOTICE

Lubricate chains more frequently than normal where the atmosphere can cause corrosion to components, or when lift truck must work in rapid lift cycles.



6. Inspect the chain anchors and individual links for wear, loose pins or cracked leaves.

NOTE: Have all repairs and adjustments made as required

.

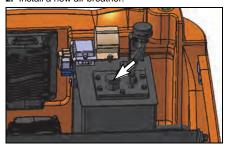
Every 1000 Service Hours or 6 Months

You must read and understand the warnings and instructions contained in the Safety section of this manual, before performing any operation or maintenance procedures.

Air Breather - Change

Park the lift truck level, with the forks lowered, parking brake engaged, directional control forward/reverse switch in NEUTRAL and the key switch to OFF.

- 1. Open the hood.
- 2. Install a new air breather.



3. Close the hood.

Drive & Pump Motor - Clean, Inspect

1. Open the hood.

[OUTSIDE BATTERY CONNECTOR]



[INSIDE BATTERY CONNECTOR]



- 2. Disconnect the battery.
- 3. Block the steer wheels.
- Remove the battery. See topic, "Battery" in "Every 10 Service Hours or Daily" section of this manual.



- 5. Fasten lift chains, of equal length, in lift openings in the front of the lift truck.
- Slowly lift the front of the lift truck, until the drive wheels are just off the ground.
- Put stands under the frame. Remove the tension on the lift chains.
- 8. Remove the battery.
- 9. Remove the floor plate.

NOTICE

Do not move directional lever from one direction to the other when the drive wheels are off the ground and rotating.

Damage can be caused to the control panel.

A WARNING

Battery voltage and high amperage are present.

The power modules must be discharged before any contact with the control panel is made.

Personal injury could result if it has not been discharged properly.

10. Blow off the drive motor end shield with 205 kPa (30 psi) maximum air pressure, until dust is removed from the motor.

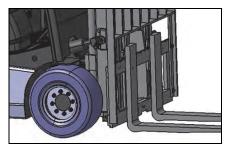


- 11. Install the floor plate.
- 12. Slowly lift the front of the lift truck and remove the stands. Lower the lift truck to the floor. Remove the chains.
- **13.** Install and connect the battery. Lower the battery cover and adjust the seat.

Tires and Wheels - Inspect, Check

WARNING

Servicing and changing tires 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 tires and rims, the assemblies could burst with explosive force and cause serious physical injury or death. Follow carefully the specific information provided by your tire serving man or dealer.



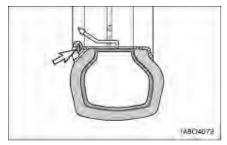
Inspect tires for wear, cuts, gouges and foreign objects. Look for bent rims and correct seating of locking ring.

If equipped with pneumatic tires, check tires for proper inflation. See topic, "Tire Inflation Pressure."

To inflate tires always use a clip-on chuck with minimum 60 cm (24 inches) length of hose to an inline valve and gauge.

Always stand behind the tread of the tire, NOT in front of the rim.

Lift truck capacity is dependent on tire type. Your lift truck dealer should be consulted for possible down ratings when pneumatic tires are used to replace solid (cushion) tires.

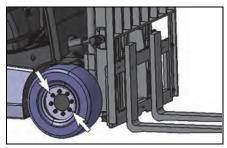


Do NOT inflate a tire that has been run while flat or underinflated, without first checking to make sure the locking ring on the wheel is not damaged and is in position.

When tires 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.



- Install drive wheel. Install two nuts opposite each other (180°).
- Install the remaining nuts. Tighten all nuts in a crisscross sequence opposite each other (180°) to 250 N·m (187 lb-ft).
- 3. Reverse the lifting procedure for the front of the lift truck and lower it to the ground.

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.

 Lift the mast and carriage enough for getting tension on lift chains.



Typical example

- 2. Measure precisely ten links of chain distance at the center of pins in millimeter.
- 3. Calculate chain wear rate*.
- If the chain wear rate is 2% or more, replace the lift chain.
- * Chain wear rate (%)

- FOR STD, FF, FFT MAST 19.05mm(0.75 in) for 2~3 ton truck (4000~6500\(\ext{tb} \)).
 - 25.4mm(1 in) for 3.3~Light 3.5 ton truck(7000\ellb)
- 2) FOR QUAD MAST (for 2.5 ton)
 - 19.05mm(0.75 in) for inner mast chain.
 - 25.4mm(1 in) for carriage and outer mast 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.

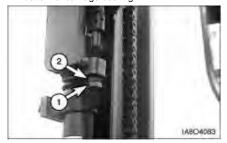
^{**}Chain Pitch = 15.88 mm(0.63 in)

Carriage Chain Adjustment

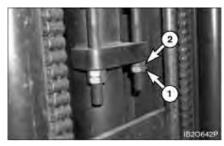
Make sure that carriage height is correct. If correct, adjust the chain for equal tension. If not, adjust the chain for correct carriage height by adjusting anchor nuts(1), (2).

NOTE: See the previous section, "Carriage Roller Extrusion" in "When Required". for proper height of carriage.

- 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.
- Loosen nut(1) and adjust nut(2) to get proper distance from bottom of inner upright to the bottom of carriage bearing.



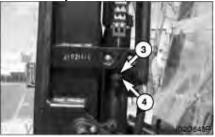
Typical example for carriage chain of STD mast



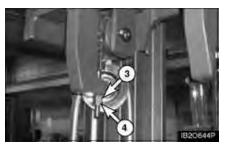
Typical example for carriage chain of FF, FFT, QUAD mast

- Make adjustment anchor nut(1), (2) for equal chain tension.
- 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.
- Put LOCTITE No. 242 Tread lock on the threads of the anchor nuts(1), (2) after the adjustment is completed.

Mast Chain Adjustment - FF, FFT Mast



Typical example for FF mast



Typical example for FFT mast, QUAD 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(3), (4).

NOTE: See the previous section, "Carriage Roller Extrusion" in "When Required". for proper inner mast height.

- Lift the inner mast and put blocks under the inner mast to release the tension from the lift chains.
- Loosen nut(3) and adjust nut(4) to make inner mast rail flush with outer mast rail bottom.
- 3. Make adjustment anchor nuts(3), (4) for equal chain tension.
- Raise the inner mast and check equal chain tension. If not equal, repeat the same procedure as step 1 through step 3.
- Put LOCTITE No. 242 tread lock on the threads of the anchor nuts(3), (4) after the adjustment is completed.

Hydraulic Return Filter - Change

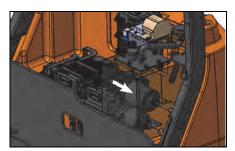
M WARNING

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, directional control forward/reverse switch in NEUTRAL and the key switch to OFF.



 Loosen the bolts of the hydraulic tank top plate assembly.



- 2. Remove the return filter by hand and discard it.
- 3. Install a new filter assembly.
- 4. Install the tank top plate assembly and fasten the bolts.

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.

Hydraulic, Power Steering System Change Oil and Filter Element



 Operate the lift truck a few minutes to warm the oil.

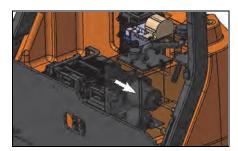
Park the lift truck level, with the forks lowered, parking brake engaged, directional control forward/reverse switch in NEUTRAL and the key switch to OFF.



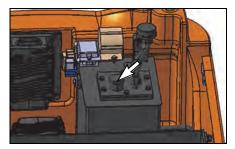
Remove the hydraulic tank drain plug. Allow the oil to drain. Clean and install the plug.



3. Remove an discard the hydraulic filter.



- Remove the breather / dipstick and the strainer. Wash them in clean, nonflammable solvent and dry them.
- Install the strainer. Fill the hydraulic tank. See "Refill Capacities." Install the dipstick.
- Turn the key switch to ON and close the seat switch. Operate the hydraulic controls and steering system through a few cycles, to fill the filter and lines.



- Check for oil leaks.
- 8. Retract all cylinders.
- 9. Turn the key switch to OFF.
- **10.** Maintain the oil level to the FULL mark on the breather / dipstick. Add oil if necessary.

Steer Wheel Bearings - Reassemble

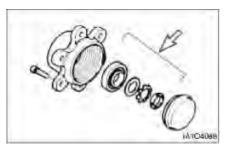
Park the lift truck level with the forks lowered, parking brake engaged, and directional control forward/reverse switch in NEUTRAL.



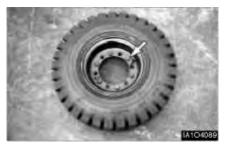
- Lift the steer wheels off the ground. Place stands or blocking under the frame and steer axle to support the lift truck.
- Remove the hub cap which is pressed into the wheel hub.



3. Straighten the lockwasher tangs.



4. Remove the locknut, lockwasher and flat washer. Remove the outer wheel bearing.



Remove the wheel assembly. Examine the wheel for damage and wear. Replace the wheel if necessary.

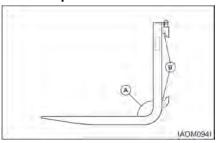


6. Install the steer wheel. Put two nuts opposite each other (180°). Tighten both. Install all remaining nuts. Tighten all nuts in a crisscross sequence opposite each other (180°) to a torque of 140 N·m (105 lb·ft).



- While rotating the wheel, tighten the locknut to 34 N-m (24 lb-ft). Loosen the nut completely. Tighten the nut again to a torque of 11±3 N-m (8±2 lb-ft) and lock within this range. Install the cover.
- Raise the lift truck and remove the blocking. Lower the lift truck to the floor.

Fork - Inspect



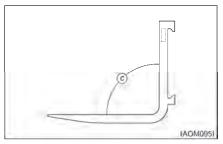
Forks should be inspected, at a minimum, every 12 months. If the truck is being used in a multi-shift or heavy duty operation, they should be checked every six months.

 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.

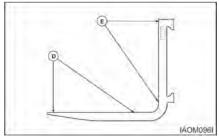
Forks with cracks should be removed from service

"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.

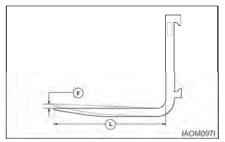


2. Check the angle between the upper face of the blade and the front face of the shank. The fork should be withdrawn from service if angle (C) exceeds 93 degrees or deviates by more than 3 degrees from an original angle other than 90 degrees, as may be found in some special application forks.



Check the straightness of the upper face of blade (D) and the front face of shank (E) with a straight edge.

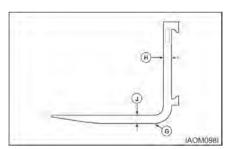
The fork should be withdrawn from service if the deviation from straightness exceeds 0.5 percent of the length of the blade and/or the height of the shank respectively 5 mm/1000 mm (0.18"/36").



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.

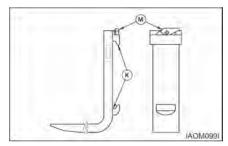
The maximum recommended difference in fork tip elevation (F) is 6.5 mm (0.25") for pallet forks and 3 mm (0.125") for fully tapered forks. The maximum allowable difference in fork tip elevation between the two or more forks is 3 percent of blade length (L).

Replace one or both forks when the difference in fork tip height exceeds the maximum allowable difference. Contact your local DOOSAN Lift Truck Dealer for further information.



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.



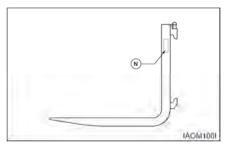
- 6. Check the fork mountings (K) for wear, crushing and other local deformation, which can cause excessive side to side wobble of the forks. Excessive clearance on hook type forks may allow them to fall from the carrier. Forks which show visible signs of such damage should be removed from service.
- 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.

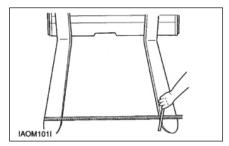
When adjusting the fork spacing, the forks are prevented from sliding off the end of the carriage by stop blocks. These stop blocks are at both ends of the carriage and in the path of the bottom fork hook. The load backrest extension may be used in place of the stop blocks in some cases.

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.

Maintenance Section



8. Check fork markings (N) for legibility. Renew markings as required to retain legibility.



- 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, accross 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 completer 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.

Hydraulic Oil - Check, Change



 Operate the lift truck a few minutes to warm the oil.

Park the lift truck level, with the forks lowered, parking brake engaged, directional control forward/reverse switch in NEUTRAL and the key switch to OFF.

- Remove the hydraulic tank drain plug. Allow the oil to drain. Clean and install the plug.
- 3. Open the hood.



- 4. Remove the dipstick/filler cap assembly.
- Fill the hydraulic tank. See topic, "Refill Capacities". Install the dipstick /filler cap assembly.
- Turn the key switch to ON and close the seat switch. Operate the hydraulic controls and steering system through a few cycles, to fill the filter and lines.
- 7. Check for oil leaks.
- 8. Retract all cylinders.
- 9. Turn the key switch to OFF.
- Maintain the oil level to the FULL mark on the dipstick. Add oil if necessary.

Drive Axle Oil - Change

See topic, "Drive Axle Oil - Change" in "First 150 Service Hours or 2 Weeks".

Environment Protection

Environment Protection

When servicing this lift truck, use an authorized 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 authorized place and container. When cleaning the lift truck, be sure to use an authorized area.

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