

KION India

KION
GROUP

Safety, Operation & Preventive Maintenance Manual

Model – EVX 1500/2000, EVX 2500/3000 (MAX)



PART NO : MHOMEVXM001

VALID FOR TRUCK NO:

KION India Pvt. Ltd

<https://www.forkliftpdfmanuals.com/>

VOLTAS FORKLITS

USER INFORMATION

To verify this manual is correct for this truck compare the model with the nameplate on the truck .Refer to table of contents for nameplate location and information. If the model in this manual does not agree with the information on the nameplate contact your nearest KION Office.

SPECIAL NOTE

This operator manual contains complete and accurate information available at the time of publication for the components and systems listed .KION reserves the right to make changes to its product at any time and the possibility exists that latter changes are not covered in this operator manual, please you should contact local KION dealer office for additional information.

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 forklift truck. Guards and covers might have been removed for illustrative purposes. Continuing improvement and advancement of product design might have caused changes to your forklift truck which are not included in this publication. Read, study and keep this manual with the forklift truck.

Whenever a question arises regarding your lift truck, or this publication, please consult your VOLTAS forklift 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 forklift truck.

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, forklift truck controls, attachment controls, transportation and towing information.

Photographs and illustrations guide the operator through correct procedures of checking, starting, operating and stopping the forklift truck. Operating techniques outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the lift truck and its capabilities.

Maintenance

The Maintenance Section is a guide to equipment care. The illustrated, step - by - step instructions are grouped by servicing intervals. Items without specific intervals are listed under "When required" topics.

Items in the "Maintenance Intervals" chart are referenced to detailed instructions that follow.

Maintenance Intervals

Use the service hour meter to determine servicing intervals. Calendar intervals shown (daily, weekly, monthly, etc.) can be used instead of service hour meter intervals if they provide more convenient servicing schedules and approximate the indicated service hour meter reading.

Recommended service should always be performed at the interval that occurs first. Under extremely severe, dusty or wet operating conditions, more frequent lubrication than is specified in the "Maintenance Intervals" chart might be necessary.

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

EXPLANATION OF MODEL

E	V	X	30	HVT
Electric	Manufacturer	Type	Capacity	Mast
Fuel	:	E	Electric	
Manufacturer	:	V	Voltas	
Type	:	X	New Series	
Capacity	:	15	1500Kg At 500mm Load Center	
		20	2000Kg At 500mm Load Center	
		25	2500Kg At 500mm Load Center	
		30	3000Kg At 500mm Load Center	
Mast	:	HVM	High Visibility zero free lift Mast	
		HVD	Duplex Mast with free lift	
		HVT	Three stage mast with free lift	

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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. This person should also have the necessary training, skills and tools to perform these functions properly.

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.

VOLTAS cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by VOLTAS is used, you must satisfy yourself 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 is liable for change at any given time. These changes can affect the service given to the product. Obtain the complete and most current information before starting any job. KIPL dealers have the most current information available.

Warning Signs and Labels

There are several specific safety signs on your forklift 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. Don't use solvent, fuel, 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. Contact your dealer for new labels.



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 shift lever in neutral before "ON-OFF" switch is turned on.
- 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.
- Do not permit riders on forks or machine at any time.
- Do not allow anyone to stand or pass under the elevated portion of any machine.
- Be sure operating surface can safely support machine.
- Operate machine and attachments only from operator's position.
- Do not handle unstable or loosely stacked loads.
- Use minimum tilt when picking up or depositing a load.
- Use extreme care when handling long, high, or wide loads.
- Forks should be completely under load and spread apart as far as load permits.
- Machine should be equipped with overhead guard or equivalent protection. Where load requires it, use load backrest which is optional. Use extreme caution if operating without these devices.

- Parking to floor. Put shift lever in neutral. Set Parking brake. Turn "ON-OFF" switch off. Chock wheels if machine is on incline.
- Observe safety rules when handling fuel for engine powered machine.

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 handling 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).

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.

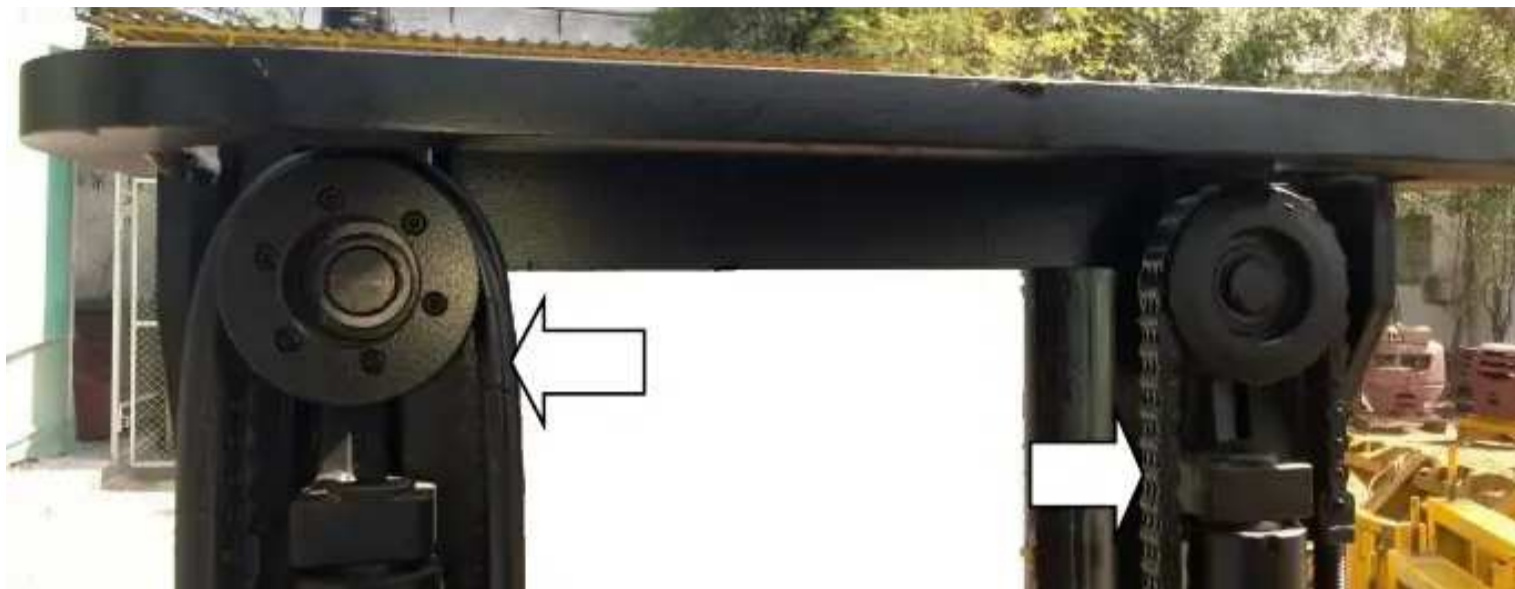
Inhaling Freon gas through a lit cigarette or other smoking method or inhaling fumes released from a flame contacting Freon can cause bodily harm or death. Do not smoke when servicing air conditioners or wherever Freon gas may be present.

Never put maintenance fluids into glass containers.

Use all cleaning solutions with care.

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

Report all needed repairs.



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.

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.
- Place the forward/reverse controls in neutral.
- Engage 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.

Fluid Penetration

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

Crushing or Cutting Prevention

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

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

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

Stay clear of all rotating and moving parts.

Keep objects away from moving fan blades of motor . 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.

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 fill cap only after the machine has been stopped and the fill cap is cool enough to remove with your bare hand.

Remove the hydraulic tank fill cap slowly to relieve pressure.

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

Batteries

Batteries give off flammable fumes which can explode.

Do not smoke when observing the battery electrolyte levels.

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

Always wear protective glasses when working with batteries.

Fire or Explosion Prevention

All fuels and most lubricants are flammable.

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

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 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 non-flammable solvent before welding or flame cutting on them.

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

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

Shields, which protect motor and control panel components from oil spray in the event of a line, tube or seal failure, must be installed correctly.

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

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 oil lines, tubes and hoses. Leaks can cause fires. Contact your VOLTAS 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.

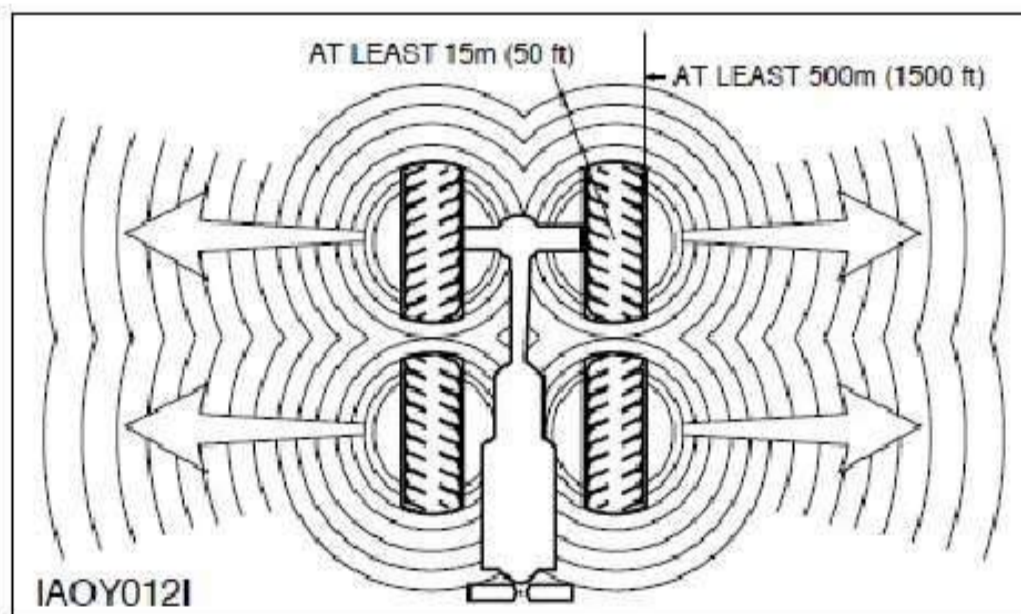
- End fittings damaged or leaking.
- Outer covering chafed or cut and wire reinforcing exposed.
- Outer covering ballooning locally.
- Evidence of kinking or crushing of the flexible part of hose.
- Armouring embedded in the outer cover.
- End fittings displaced.

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

Tyre Information

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

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



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

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

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

Proper nitrogen inflation equipment and training in its use are necessary to avoid over inflation. A tire blowout or rim failure can result from improper or misused equipment. Stand behind the tread and use a self-attaching chuck when inflating a tyre.

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

Mounting and Dismounting

Mount and dismount the lift truck carefully.

Clean your shoes and wipe your hands before mounting.

Face the lift truck when mounting and dismounting.

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

Use the handgrips for mounting and dismounting.

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

Never get on or off a moving lift truck.

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

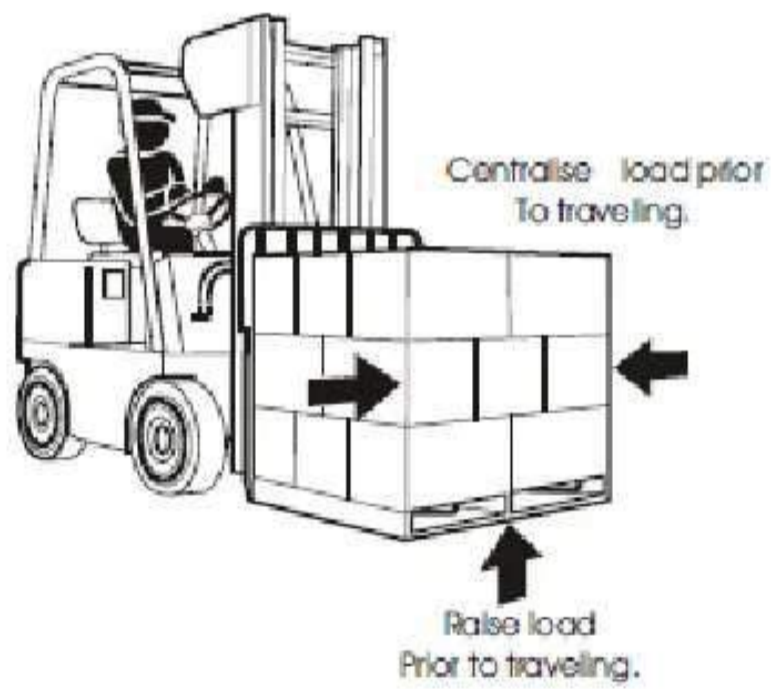
Never get on or off a moving lift truck. Never jump off the lift truck.

Keep hands and steering wheel free of slippery material.

Safety Rules



CAUTION: Do not
Put side loads on forks.



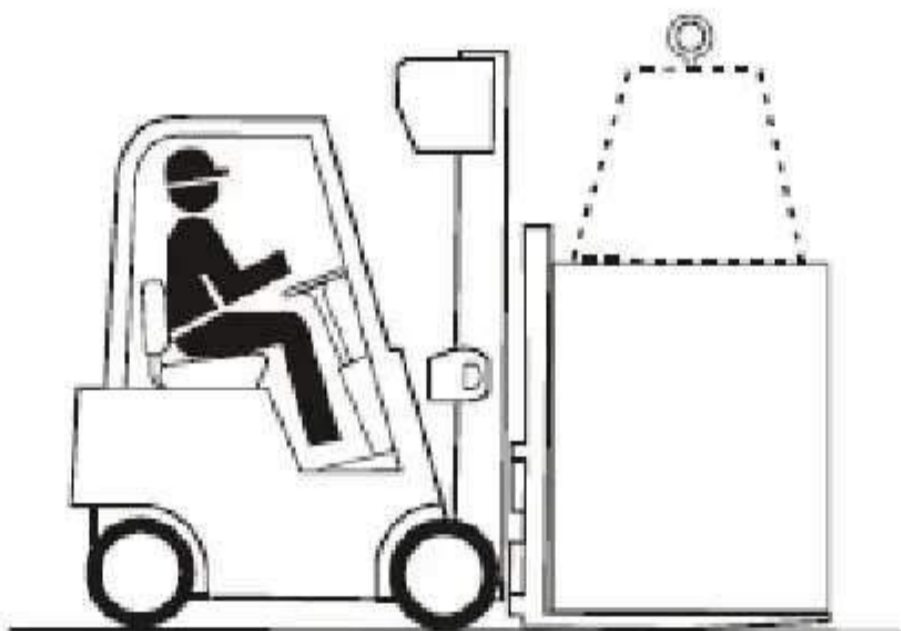
Centralise load prior
To traveling.

Raise load
Prior to traveling.

Limit side shift operation
with raised load.



Limit truck movement
with raised load.



Load weight must not exceed combined truck / attachment capacity (see truck nameplate)

Total fork capacity (LH + RH forks) must be greater than load weight.



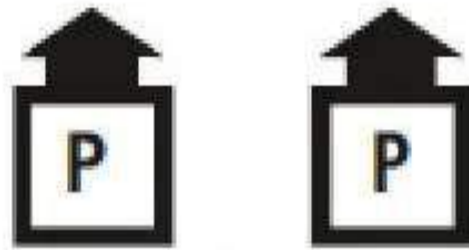
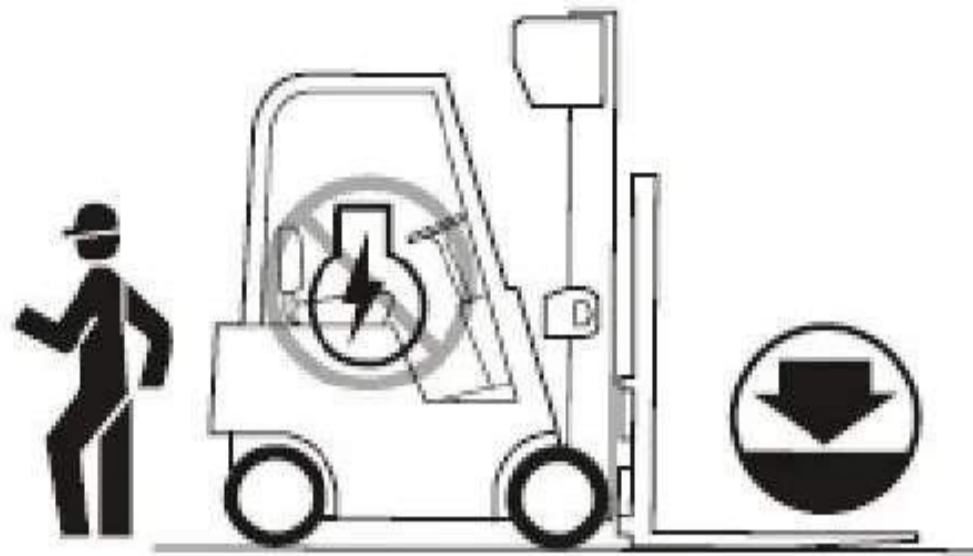
No Riders



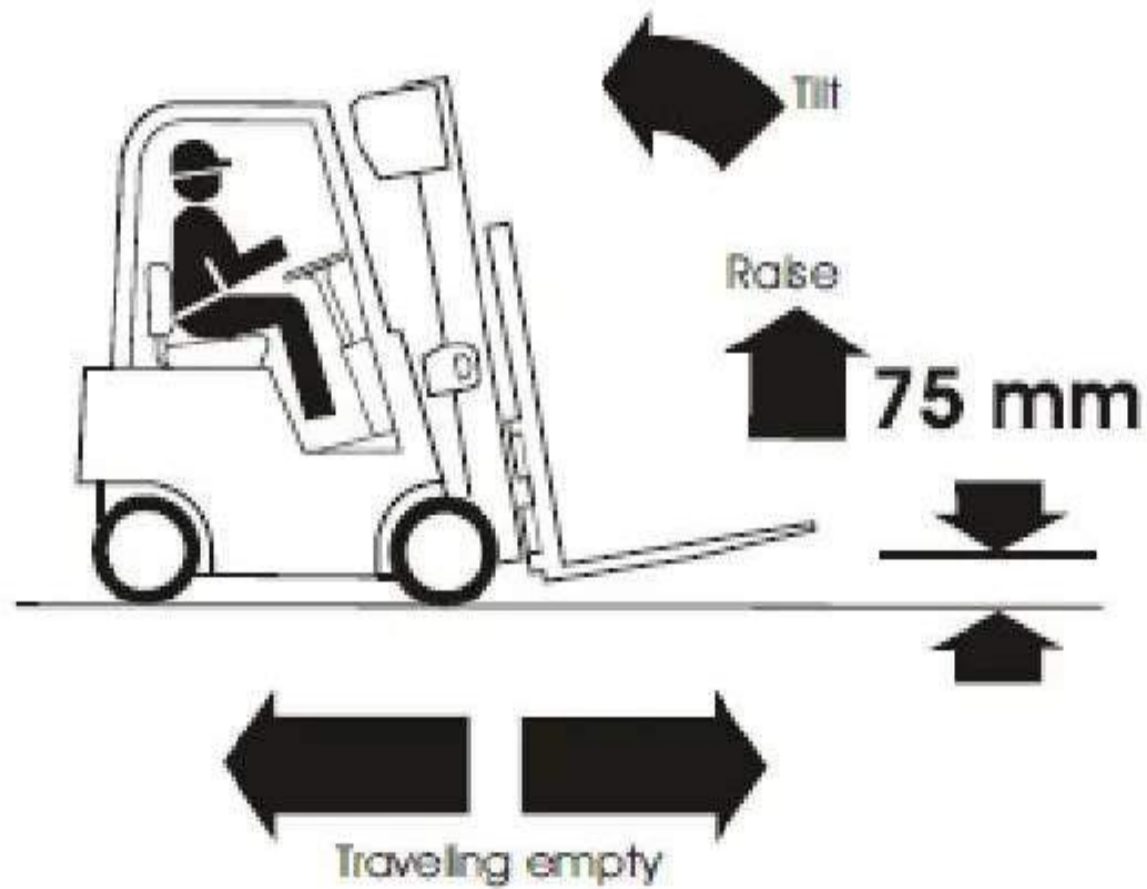
No reach through mast.



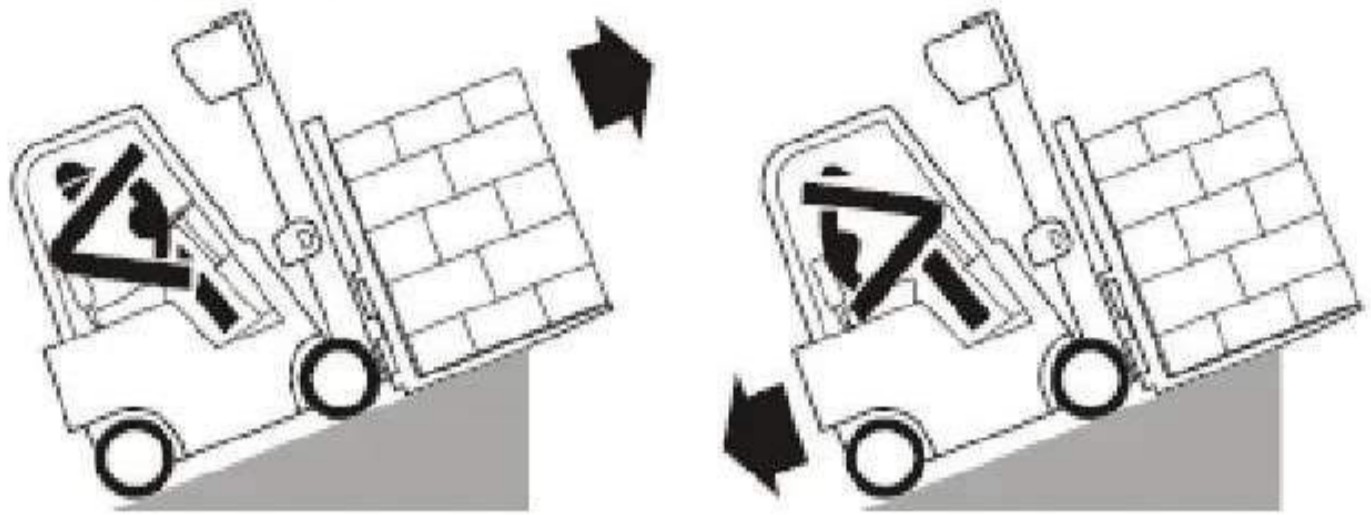
No under load.



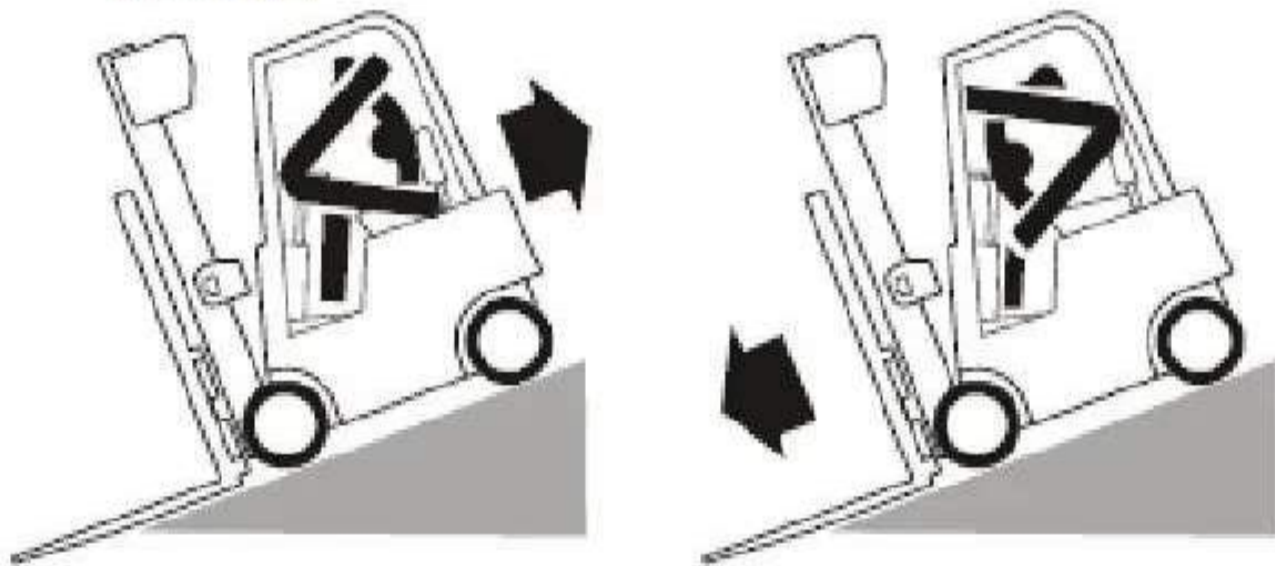
Prime mover off, park, lower load.



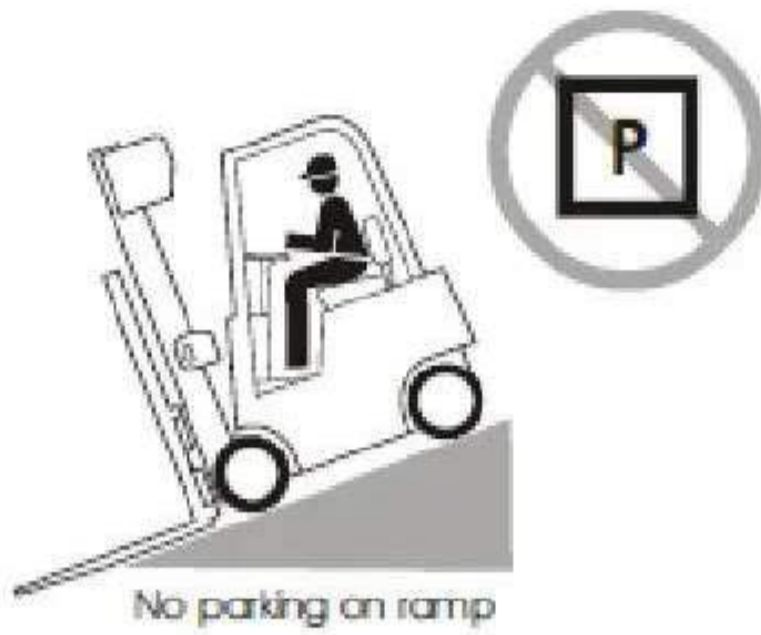
With load



No load



ON RAMPS



Operation and maintenance

Preparing to Switch on the machine

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 direction control lever is in the NEUTRAL position.

Make sure the parking brake is engaged.

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

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

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

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

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

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

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

Preparing to Operate the Lift Truck

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

Learn how your lift truck operates. Know its safety devices. Know how the attachments work.

Before moving the lift truck, look around. Start, turn and brake smoothly.

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

Operating the Lift truck

Always keep the lift truck under control.

Obey all traffic rules and warning signs.

Never leave the lift truck with the key switch on, or with the parking brake disengaged.

Lower 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 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 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 locations where visibility is reduced.

Slow down for and avoid pedestrians, other vehicles, obstructions, 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 "Operating 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

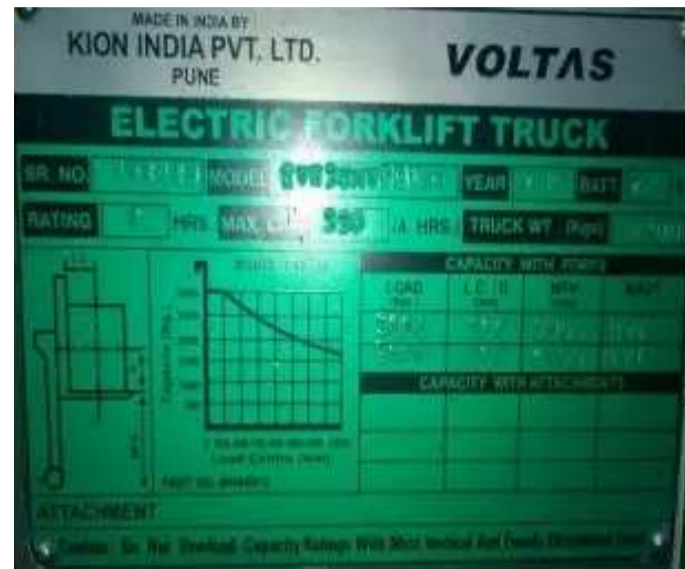
When leaving the operator station, park the lift truck in authorized areas only. Do not block traffic.

- Park the lift truck level, with the forks lowered and the mast tilted forward until the fork tips touch the floor.
- Move the direction control lever to NEUTRAL.
- Engage the parking brake.
- Turn the key switch off and remove the key.
- Turn the disconnect switch to OFF if equipped.
- Block the drive wheels when parking on an incline.



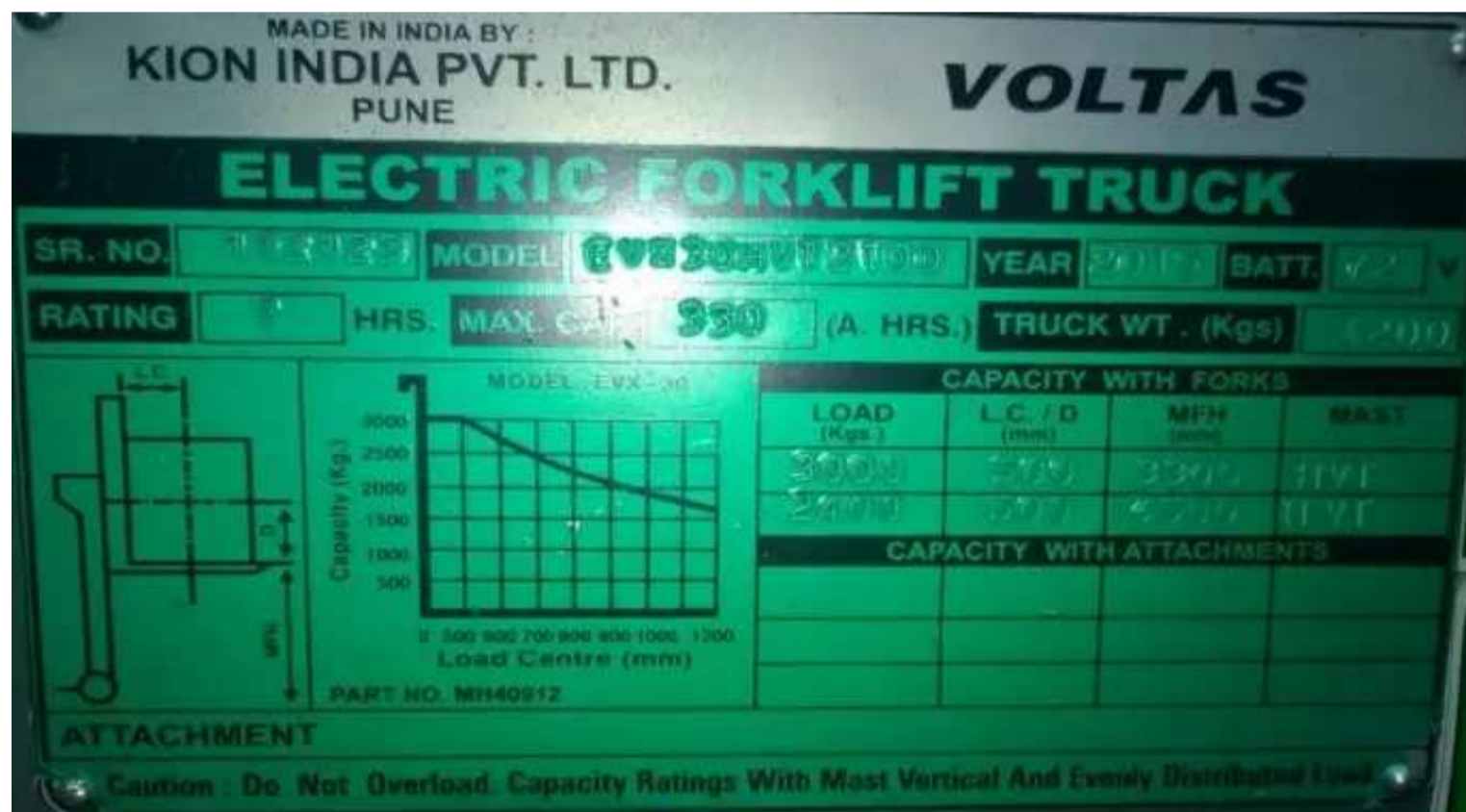
Serial Number Locations

Serial number is on the plate fitted on the front cowl of the lift truck.



Identification, Lift Capacity and Attachment Plate

Lift capacity & attachment is on the plate fitted on the front cowl of the lift truck.



Mast Abbreviations

HVM: - High Visibility Mast

HVT: - High Visibility Triplex Mast

HVD: - High Visibility Duplex Mast

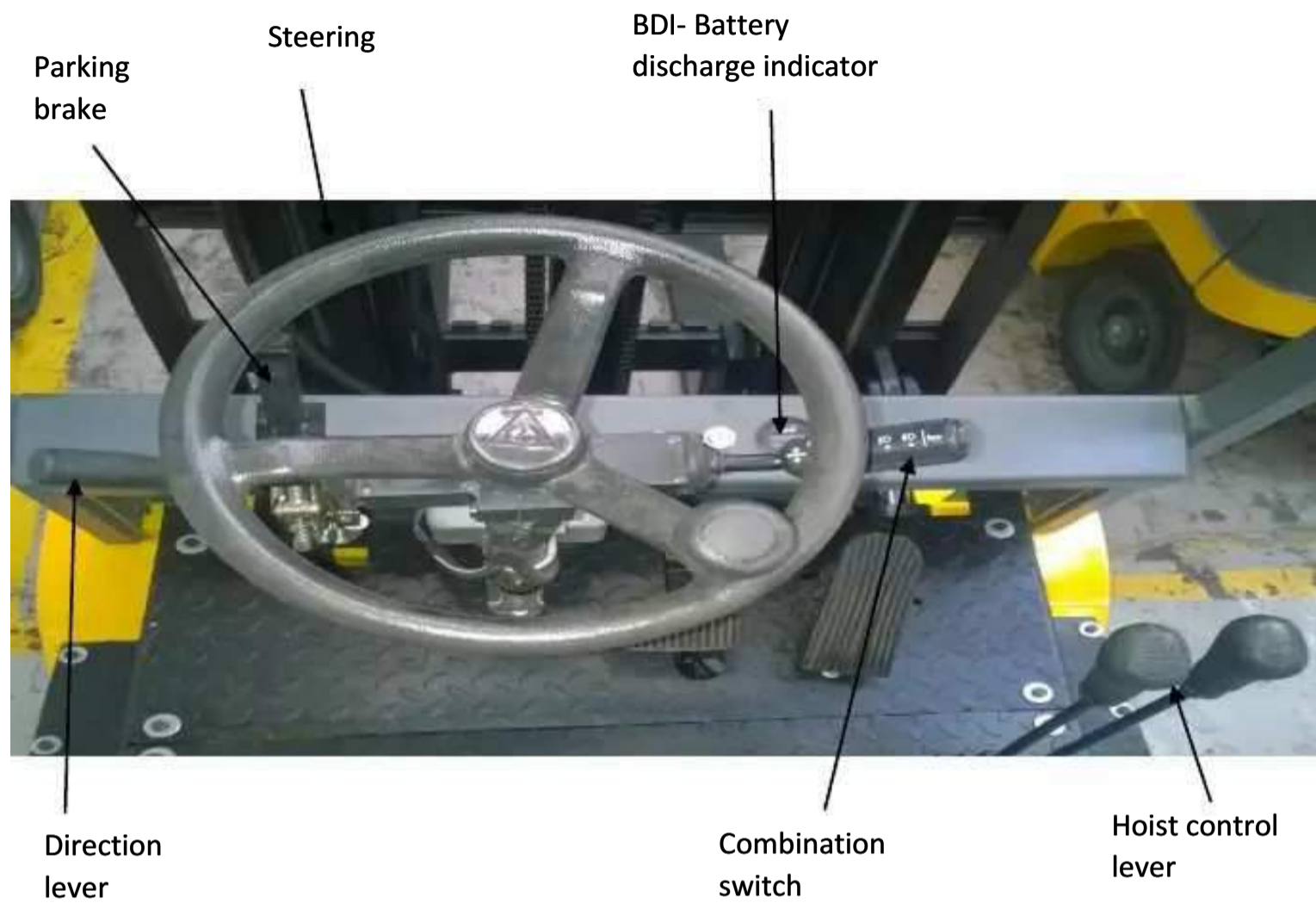
Operator's Station and Monitoring Systems



Battery Compartment



Controls

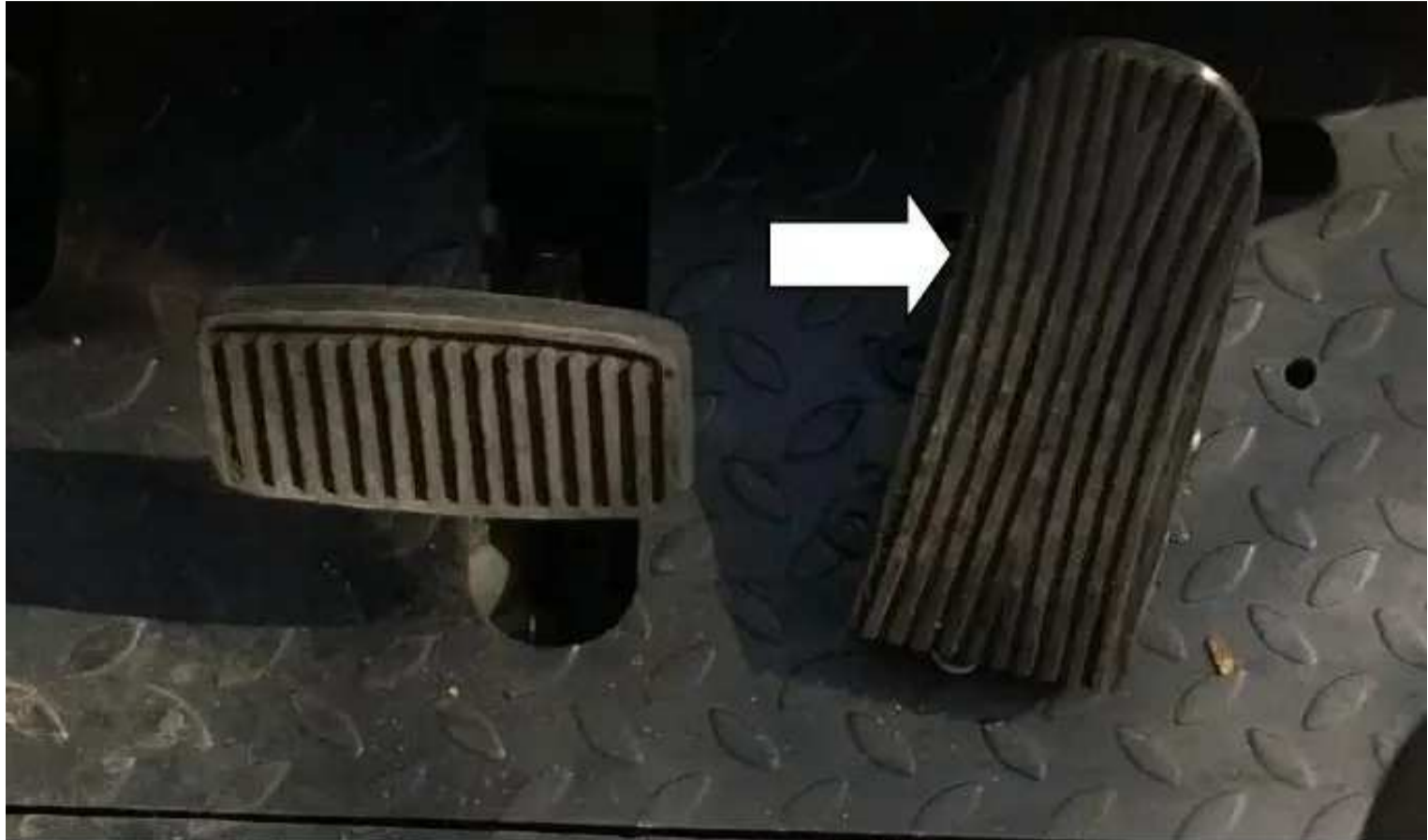


Brake Pedal



Push DOWN on the brake pedal to slow or stop the lift truck
RELEASE the brake pedal to allow the lift truck to move

Accelerator Pedal



Push **DOWN** on the pedal to increase motor rpm (speed).
RELEASE the pedal to decrease motor rpm (speed).

Parking Brake Lever



Pull the lever **BACK** to engage the parking brake.
Push the lever **FORWARD** to release the parking brake.

Lift & Tilt Control

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

Lift Control

1. Lower Position - Push the lever FORWARD smoothly to lower the load.

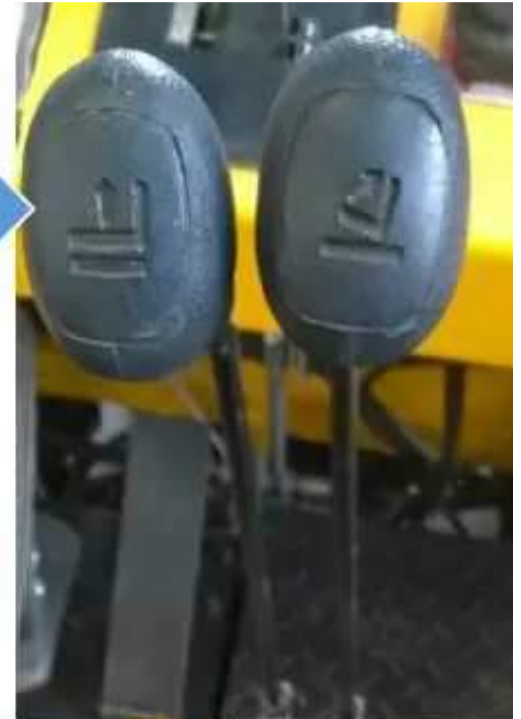


Lift Lever

2. Hold Position - When the lever is released it will return to the HOLD or center position. Lifting or lowering action will stop



3. Lift Position - Pull the lever BACK smoothly to lift the load.



Tilt Control

1. Mast Tilt Forward - Push the lever FORWARD smoothly to tilt the mast forward.



2. Mast Hold - When the lever is released it will return to the HOLD or center position. Tilting action will stop



3. Mast Tilt Back - Pull the lever BACK smoothly to tilt the mast backward.



Tilt Lever

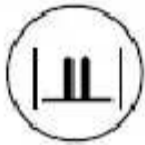


Sideshift Attachment (If Equipped)

1. Side shift Left - Push the lever FORWARD to shift the carriage to the left.



2. Side shift Hold - When the lever is released it will return to the HOLD or centre position. Side shifting action will stop.



3. Side shift Right - Pull the lever BACK to shift the carriage to the right.



Seat

Seat Adjustment

NOTE: Seat arrangements may vary from model to model .However, the basic operation will be similar.

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

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



Adjust seat to allow full brake pedal travel with operator's back against seat back.
NOTE: The seat can only be correctly adjusted with the operator fully seated.

Battery Maintenance and Charging



Explosive fumes may be present during charging.

Do not smoke in charging areas.

Lift truck battery should be charged only at designated safe locations. Safe indoor locations with proper ventilation are preferable.

Stop the key switch and get off the lift truck during charging.

NOTICE

Do not allow the lift truck to become low battery charge, should not discharge batteries more than 80 %. This could result in damage to electrical/electronic components.

Charge the battery at the end of each day/shift of operation if the battery charge is near 20%.

Battery Safety

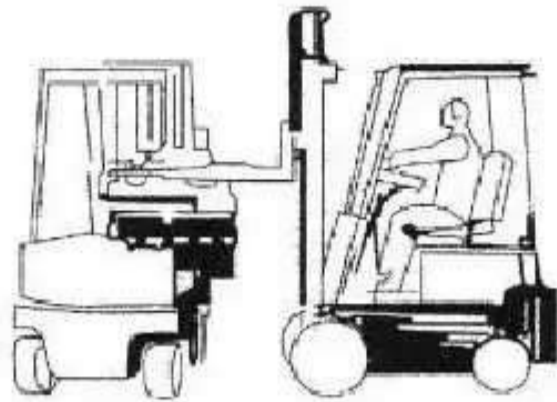
1. Before embarking on any kind of battery maintenance ALWAYS wear the appropriate Personal Protective Equipment when working on batteries, including.
2. Apron.
3. Goggles.
4. Gloves.
5. NEVER smoke or allow any sources of ignition near a battery.
6. NEVER place metallic objects on top of a battery.
7. Always remember that batteries are a source of stored energy even when they are fully discharged.

General Battery Maintenance

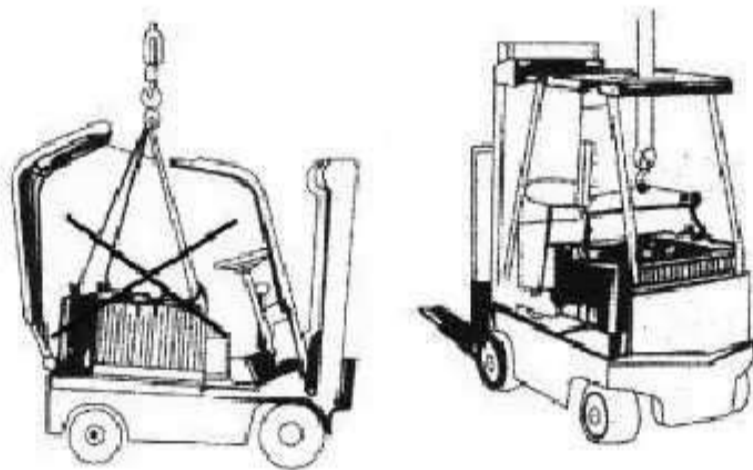
1. Make sure the battery is charged as soon as possible after it has been discharged.
2. Never allow the charge cycle to be interrupted.
3. Make sure the battery is fully charged before you take it off the charger.
4. Always press the stop button on the charger before disconnection.
5. Prevent short circuits by making sure the battery top is clean, dry and not corroded.
6. Check that the battery cables and plug are in good condition.
7. Make sure that electrolyte levels are correct when the battery is fully charged.
8. Only top up using the correct equipment.
9. Never top up with tap water – only use distilled or deionised water.
10. Never top up a battery before it is charged.
11. Never overfill a battery.
12. Never top up a battery with acid.
13. Make sure any spillage caused by topping is cleaned up immediately.

Battery Handling

1. Batteries are heavy and should not be lifted manually – only the correct load tested and certified lifting equipment should be used, always check if you are not sure.
2. When using lifting equipment fitted with chains make sure they do not come into contact with the battery surface, they could cause a short circuit.
3. Take care when changing batteries, most damage is caused at this stage.



THE BATTERY MAY BE FITTED USING SECOND TRUCK



USE APPROVED LIFTING DEVICE FOR BATTERY CHANGING

Battery Charging

1. Make sure the truck is not running and the battery plug has been disconnected.
2. Make sure you fully understand how to use the charger.
3. Always switch the charger off before disconnecting the battery.

Battery Topping

The largest cause of early failure of lead acid batteries – and therefore loss of warranty on them – is overtopping or undertopping them.

Undertopping - increases the acid strength within a battery which increases the corrosion rates on the plates. Low water levels create sulphation at the top of the plates which can then harden and reduce the capacity of the cells.

Overtopping - conversely, overtopping can reduce the strength of the acid, therefore diminishing the performance of the battery.

Five Step Guide

1. Make sure the battery is fully charged.
2. Only top up using deionised or demineralised water, never tap water.
3. Never top up more than 5mm above the separators.
4. Ensure correct personal protective equipment and eye protection is used. Rubber gloves, apron and either a face guard or goggles.
5. Overspills can be hazardous – make sure they are cleaned up.



Before switch on the Machine

Walk - Around Inspection

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

1. Inspect the operator's compartment for loose items and cleanliness.
2. Inspect the instrument panel for broken or damaged indicator lights or BDI.
3. Test the horn and other safety 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 tyres and wheels for cuts, gouges, foreign objects, inflation pressure and loose or missing bolts.
7. Inspect the overhead guard for damage and loose or missing mounting bolts.
8. Inspect the hydraulic system for leaks, worn hoses or damaged lines.
9. Look for transmission and drive axle leaks on the lift truck and on the ground.
10. Inspect the battery compartment for electrolyte leaks.
11. Observe the fuel level gauge after starting the truck. Add fuel if necessary.
12. To position the seat, PUSH the lever away from the seat track and move the seat forward or backward to a comfortable position.



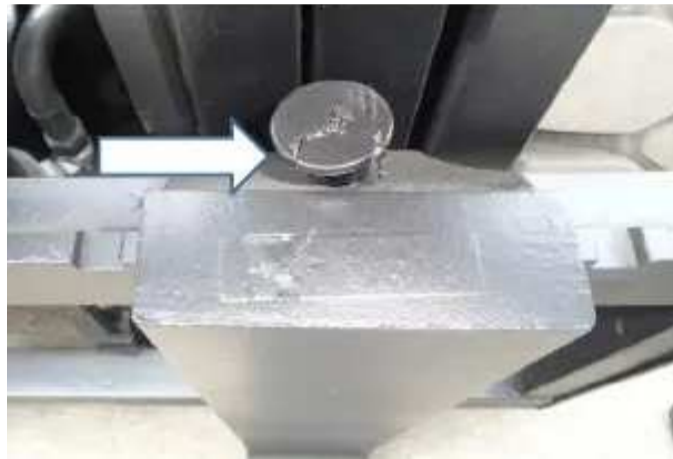
Personal injury may occur from accidents caused by improper seat adjustment. Always adjust the operator's seat before switching on the lift truck.

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

Lift Fork Adjustment

Hook - type Fork

For load stability, always adjust the forks as wide as possible. Position the load evenly on both forks.



1. Lift hook pin and slide the fork to the new position.
2. Secure the hook pin in the carriage slot. Follow the same procedure for the other fork.

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 improper repair or modification. They can also be damaged by the cumulative effects of age, abrasion, corrosion, overloading and misuse.

A fork failure during use can cause damage to the equipment and the load. A fork failure can also cause serious injury.

A good fork inspection and maintenance program along with the proper application can be very effective in preventing sudden 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.

Causes of Fork Failure

1. Improper Modification or Repair. Fork failure can occur as a result of a field modification involving welding, flame cutting or other similar process, 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.

2. 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.

3. 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 from 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 fork tips as pry bars. Also, by handling loads in a manner which cause 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.

4. 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 which the forks are used, the fork manufacturer, type, original section size, original length and capacity. Also list any special characteristics specified in the fork design.

Record the date and results of each inspection, making sure the following information is included:

- Actual wear conditions, such as percent of original blade thickness remaining.
- Any damage, failure or deformation which might impair the use of the truck.
- Note any repairs or maintenance.

An ongoing record of this information will help in identifying proper inspection intervals for each operation, in identifying and solving problem areas and in anticipating time for replacement of the forks.

First Installation

1. Inspect forks to ensure they are the correct size for the truck on which they will be used. Make sure they are the correct length and type for the loads to be handled.
2. Make sure fork blades are level to each other within acceptable tolerances.
3. Make sure positioning lock is in place and working.

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

1. Visually inspect forks for cracks, especially in the heel section, around the mounting brackets, and all weld areas. Inspect for broken or jagged fork tips, bent or twisted blades and shanks.

2. Make sure positioning lock is in place and working. Lock the forks in position before using the truck.

3. Remove all defective forks from service.

12 Month 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.

Maintenance and Repair

1. Repair forks only in accordance with the manufacturers 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.

2. The following repairs or modifications SHOULD NOT be attempted.

- Flame cutting holes or cut-outs 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.

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.

Switch on the Machine

Prestart Conditions

Engage the parking brake, if not already engaged. Place the direction change lever in the NEUTRAL position.

NOTICE

Do not leave the key in ON position when machine is NOT operating.

After switch on the Machine

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



1. Battery charging status, HMR and fault codes will displayed in the screen.
2. Red to green LED's will show the battery charge status.
3. Two type Hour meter readings are normally displayed, total operation hours and traction hours.
4. Fault code may displayed during any malfunction or failure of components, example fault code 47 is sequential error due to switch on the machine with direction change lever not in neutral and fault code 73 is motor speed sensing failure.
5. Should not discharge batteries more than 80 %.Machine hoist operation will be stopped at 80% battery discharge.

Lift Truck Operation

1. Switch on the machine. See topic "Switch on the Machine".
2. Push down on the service brake pedal to hold the lift truck until ready to move it.



3. Release the parking brake.

NOTE: The parking brake must be released before the directional control can be used.



4. Select the direction of travel by pushing the directional lever FORWARD for forward direction or by pulling the lever BACK for reverse direction.

⚠ WARNING

A lift truck with the motor running but without an operator can move slowly (creep) if the direction switch is engaged.

This could result in personal injury.

Always place the direction shift lever in the NEUTRAL (centre) position and apply the parking brake before dismounting the lift truck.

5. Release the service brake.

6. Push down on the accelerator pedal to obtain the desired travel speed. Release the pedal to decrease travel speed.

⚠ WARNING

Sudden reversal of a loaded lift truck travelling forward can cause the load to fall or the lift truck to tip.

Failure to comply could result in personal injury.

Stop the loaded lift truck completely, before shifting to reverse.

7. To change the lift truck direction of travel, release the accelerator pedal.

8. Push down on the service brake pedal to reduce the lift truck speed as necessary.

9. Change the direction, slowly push down on the accelerator pedal as the lift truck changes direction.

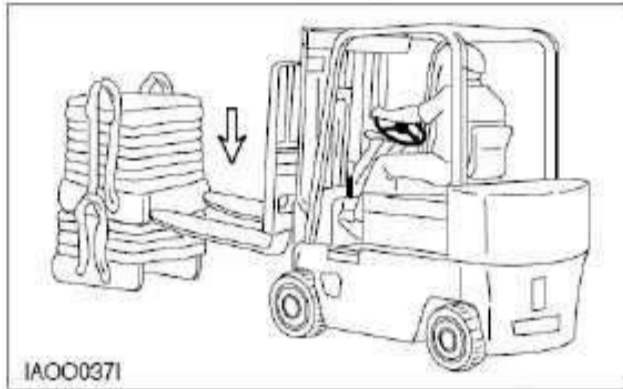
10. Continue to push down on the accelerator pedal to obtain the desired travel speed.

11. To stop the lift truck when travelling in either direction, release the accelerator pedal.

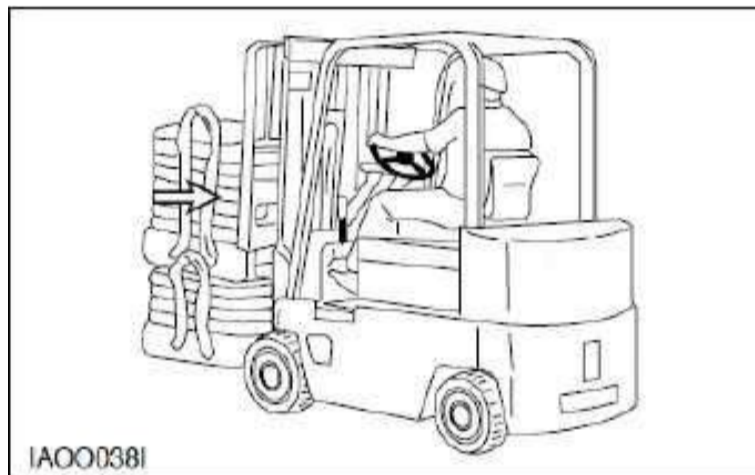
12. Push down on the service brake pedal and bring the lift truck to a smooth stop.

Operating Techniques

Inching into Loads



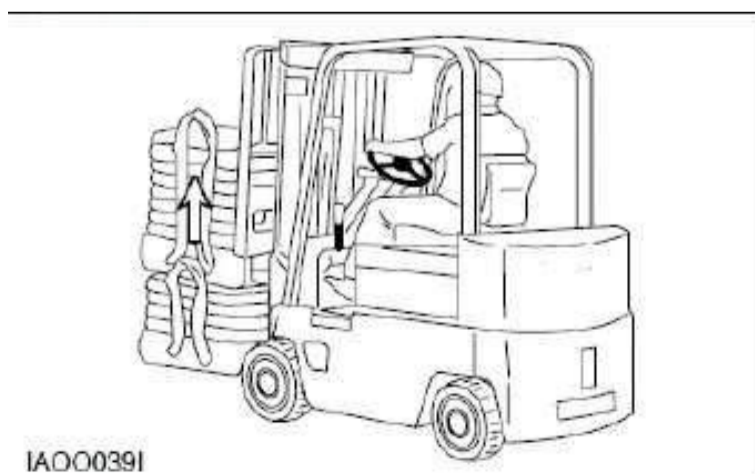
1. Move the lift truck slowly FORWARD into position and engage the load. The lift truck should be square with load, forks spaced evenly between pallet stringers and as far apart as load permits.



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

Lifting the Load

1. Lift the load carefully and tilt the mast back a short distance.



2. Tilt the mast further back to cradle the load.



3. Operate the lift truck in reverse until the load is clear of the other material.

4. Lower the cradled load to the travel position.

NOTE: Lift and tilt speeds are controlled by motor rpm.

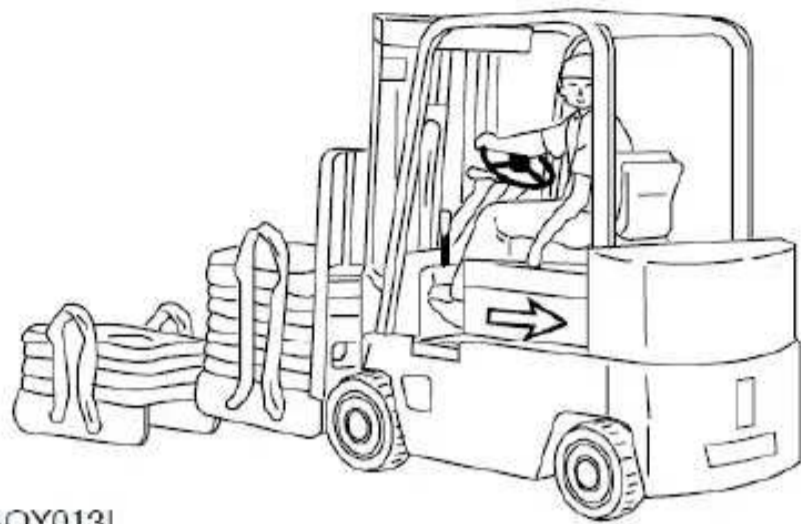
Travelling With the Load

NOTICE

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



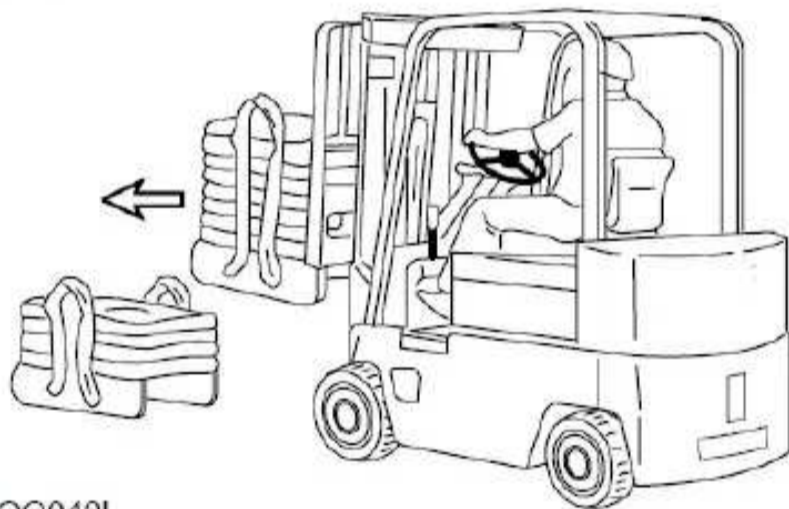
1. Travel with the load uphill on upgrades and downgrades.



IAOY013I

2. for better vision, travel in reverse with bulky loads.

Unloading



IAOO042I

1. Move the lift truck into the unloading position.

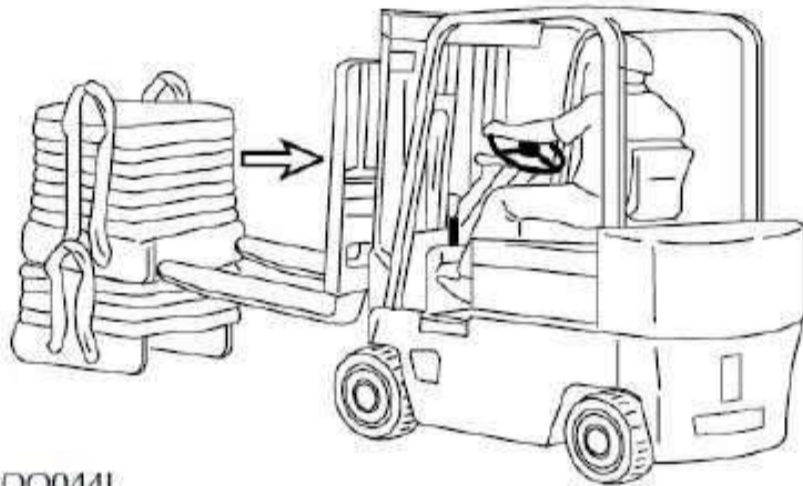


ILOO030P

2. Tilt the mast FORWARD only when directly over the unloading area.

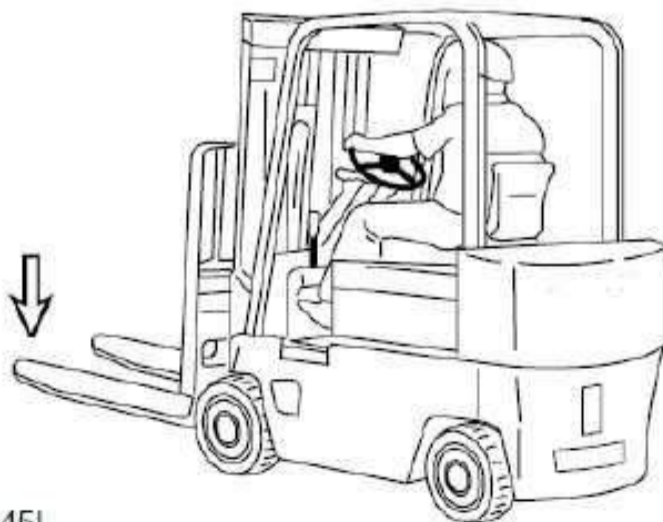
⚠ WARNING

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



IAOO044I

1. Deposit the load & back carefully to disengage the forks



IAOO045I

4. Lower carriage & fork to the travel position or to the park position.

Turning

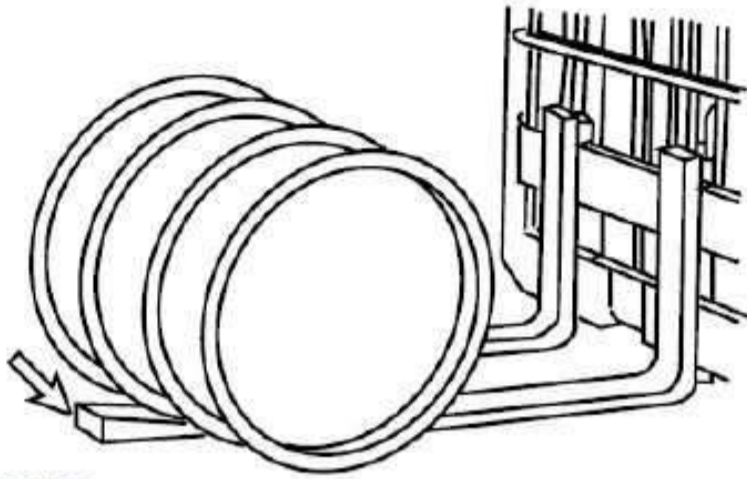


1. When turning sharp corners, keep close to the inside corner. Begin the turn when the inside drive wheel meets the corner.



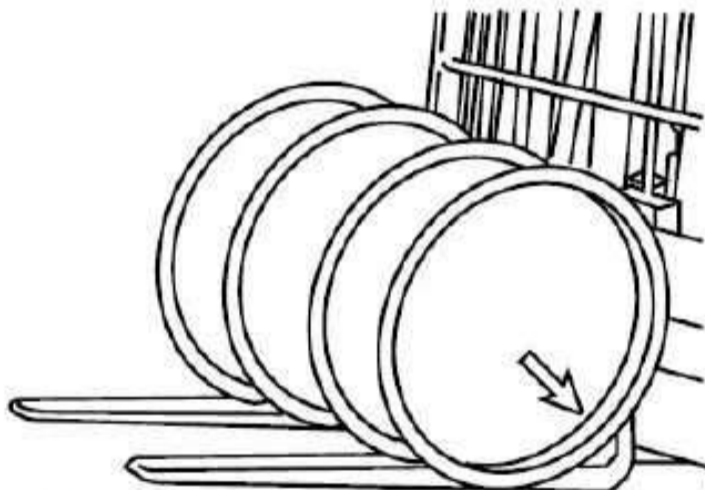
2. In narrow aisles, keep away from the stockpile when turning into the aisle. Allow for counterweight swing.

Lifting Drums or Round Objects



IA00048

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



IA00049

2. Before lifting, tilt the mast BACK slightly until the load is cradled on the forks.

Operating in open area

Keep the following points in mind when you operate the lift truck in open area.

1. Floor surface should be plane and without any water clogging.
2. Should not operate the machine in wet floor or exposed to rain water.

Parking the Lift Truck



1. Park in an authorized area only. Do not block traffic.
2. Place the direction shift in NEUTRAL.
3. Engage the parking brake.
4. Lower the forks to the ground.
5. Turn the key switch to the OFF position and remove the key.

Towing Information

WARNING

Personal injury or death could result when towing a disabled lift truck incorrectly.

Block the lift truck wheels to prevent movement before releasing the brakes. The lift truck can roll free if it is not blocked.

Follow the recommendations below, to properly perform the towing procedure.

These towing instructions are for moving a disabled lift truck a short distance, at low speed, no faster than 2 km/h (1.2 mph), to a convenient location for repair. These instructions are for emergencies only. Always 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 degree 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 VOLTAS Lift Truck dealer for towing a disabled lift truck.



1. Release the parking brake.

NOTICE

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

2. Check that the service brake pedal is released.
3. Key switch is in the OFF position.
4. Direction control lever is in neutral.
5. Fasten the tow bar to the lift truck.
6. Remove the wheel blocks. Tow the lift truck slowly.

Do not tow anything faster than 2 km/h (1.2 mph).

 **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.

LUBICATION CHART

Recommended Lubricants						
Models:- EVX 20-30 Max						
System	Specs	Viscosity	Indian Corp	Oil	Bharat Petroleum	Castrol
Hydraulic Oil	SAE 68	ISO 68 VG	Servo Premium CF4	15W 40	Bharat Ultra Supreme 68	Castrol 68
Grease	EPL 2		S.Gem EP 2		LANTHAX EP 2	Castrol Ball Bearing EPL 2 Grease
Brake {Master Cyl. Opr Only}	DOT3 / DOT4	J 1703	Servo Brake fluid		Mak Brake fluid	Castrol Brake fluid Dot 3
Drive Housing axle	API - GL 5	85W 140	S.GEAR HP 85 W 140		SPIROL EP 85 W 140	Diff oil Lsx 85 W 140

MAINTENANCE SCHEDULE

Schedule Changes along with the specified filters		
System	Schedule change	Quantity
Hydraulic Oil	Every 2000 Hrs	30 Ltr
Grease	Lubricate every 250 Hrs	300 Gms
Drive axle Housing oil	Every 1000 Hrs	6 Ltr

When Required

You must read and understand the warnings and instructions before performing any operation or maintenance procedures.

Operator's Seat, Hood Latch & Support Cylinder



Check/Lubricate

1. Check the operation of the seat adjuster rod. Make sure that the seat slides freely on its track. Lightly oil the seat slider tracks if necessary.
2. Pull the hood to raise the hood and seat assembly. Push the hood support cylinder to close hood and seat assembly. Make certain the support cylinder will hold the hood open.



3. Lightly oil the hood hinge mechanism.

Fuses, Bulbs and Circuit Breaker

Replace/Reset

Fuses

NOTE: If a fuse filament separates, use only the same type and size fuses for replacement. If the filament in a new fuse separates, have the circuits and instruments checked.

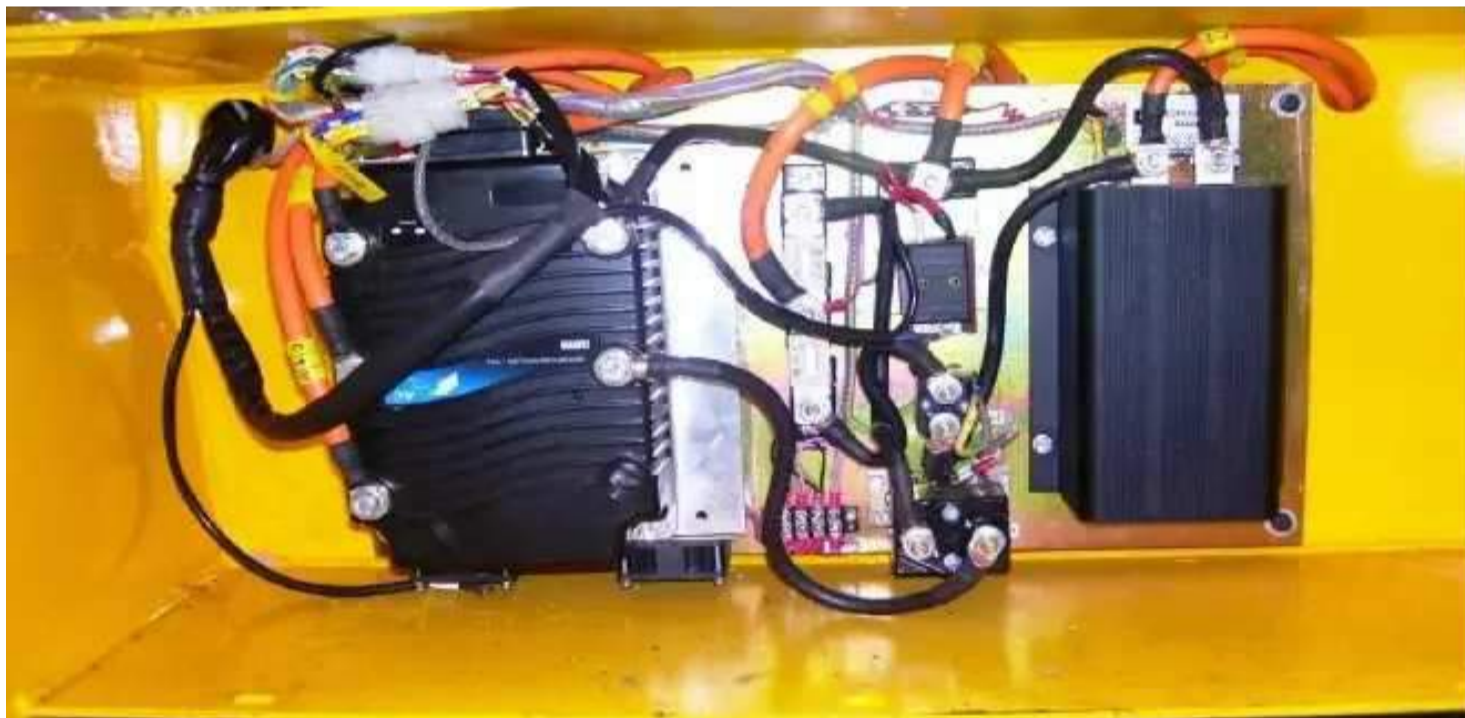
NOTICE

Always replace fuses with ones of the correct ampere rating.

Remove the front cover from the fuse box located in control panel.



Fuse –Protects an electrical circuit from an overload .Opens (filament separates) if an overload occurs .



Check the fuses. Use a flashlight, if necessary.

Fuses are identified as follows:

10A glass fuse is for lights.

250A fuse is for traction

355A fuse is for hoist/steering.

Bulbs

Bulbs are identified as follows:

Voltage and wattage is important to identify suitable bulbs.

DIAGNOSTICS AND TROUBLESHOOTING

The 1236/38 controller detects a wide variety of faults or error conditions. Faults can be detected by the operating system or by the VCL code. This section describes the faults detected by the operating system. Faults detected by VCL code (faults 51–67 in Table 5) cannot be defined here as they will vary from application to application. Refer to the appropriate OEM documentation for information on these faults.

Diagnostics

Diagnostics information can be obtained in either of two ways: (1) by reading the display on a 1311 programmer or (2) by observing the fault codes issued by the Status LEDs. See Table 4 for a summary of LED display formats. The 1311 programmer will display all faults that are currently set as well as a history of the faults that have been set since the history log was last cleared. The 1311 displays the faults by name. The pair of LEDs built into the controller (one red, one yellow) produce flash codes displaying all the currently set faults in a repeating cycle. Each code consists of two digits. The red LED flashes once to indicate that the first digit of the code will follow; the yellow LED then flashes the appropriate number of times for the first digit. The red LED flashes twice to indicate that the second digit of the code will follow; the yellow LED flashes the appropriate number of times for the second digit.

Example: Battery Under voltage (code 23).

In the Fault menu of the 1311 programmer, the words

Example: Battery Undervoltage (code 23).

In the Fault menu of the 1311 programmer, the words **Undervoltage Cutback** will be displayed; the real-time battery voltage is displayed in the Monitor menu (“Keyswitch Voltage”).

The controller’s two LEDs will display this repeating pattern:

RED	YELLOW	RED	YELLOW
*	* *	* *	* * *
(first digit)	(2)	(second digit)	(3)

The numerical codes used by the yellow LED are listed in the troubleshooting chart (Table 5), which also lists possible fault causes and describes the conditions that set and clear each fault.

Summary of LED display formats

The two LEDs have four different display modes, indicating the type of information they are providing.

DISPLAY	STATUS
Neither LED illuminated	Controller is not powered on, has a dead battery, or is severely damaged.
Yellow LED flashing	Controller is operating normally.
Yellow and red LEDs both on solid	Controller is in Flash program mode.
Red LED on solid	Watchdog failure. Cycle KSI to restart.
Red LED and yellow LED flashing alternately	Controller has detected a fault. 2-digit code flashed by yellow LED identifies the specific fault; one or two flashes by red LED indicate whether first or second code digit will follow.

TROUBLESHOOTING – 1236

The troubleshooting chart, Table 5, provides the following information on all the controller faults:

- fault code
- fault name as displayed on the programmer's LCD
- the effect of the fault
- possible causes of the fault
- fault set conditions
- fault clear conditions.

Whenever a fault is encountered and no wiring or vehicle fault can be found, shut off KSI and turn it back on to see if the fault clears. If not, shut off KSI and remove the 35-pin connector. Check the connector for corrosion or damage, clean it if necessary, and re-insert it.

Table 5 TROUBLESHOOTING CHART

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
12	Controller Overcurrent <i>Shutdown Main Contactor;</i> <i>Shutdown Motor;</i> <i>Shutdown EM Brake.</i>	<ol style="list-style-type: none"> 1. External short of phase U, V, or W motor connections. 2. Motor parameters are mis-tuned. 3. Controller defective. 	<p><i>Set:</i> Phase current exceeded the current measurement limit.</p> <p><i>Clear:</i> Cycle KSI.</p>
13	Current Sensor Fault <i>Shutdown Main Contactor;</i> <i>Shutdown Motor;</i> <i>Shutdown EM Brake.</i>	<ol style="list-style-type: none"> 1. Leakage to vehicle frame from phase U, V, or W (short in motor stator). 2. Controller defective. 	<p><i>Set:</i> Controller current sensors have invalid offset reading.</p> <p><i>Clear:</i> Cycle KSI.</p>
14	Precharge Failed <i>Shutdown Main Contactor;</i> <i>Shutdown Motor;</i> <i>Shutdown EM Brake.</i>	<ol style="list-style-type: none"> 1. External load on capacitor bank (B+ connection stud) that prevents the capacitor bank from charging. 2. See 1311 menu Monitor » Battery: Capacitor Voltage. 	<p><i>Set:</i> Precharge failed to charge the capacitor bank to the KSI voltage.</p> <p><i>Clear:</i> Cycle Interlock input or use VCL function <i>Precharge()</i>.</p>
15	Controller Severe Undertemp <i>Shutdown Main Contactor;</i> <i>Shutdown Motor;</i> <i>Shutdown EM Brake;</i> <i>Shutdown Throttle;</i> <i>Full Brake.</i>	<ol style="list-style-type: none"> 1. Controller is operating in an extreme environment. 2. See 1311 menu Monitor » Controller: Temperature. 	<p><i>Set:</i> Heatsink temperature below -40°C.</p> <p><i>Clear:</i> Bring heatsink temperature above -40°C, and cycle interlock or KSI.</p>
16	Controller Severe Overtemp <i>Shutdown Main Contactor;</i> <i>Shutdown Motor;</i> <i>Shutdown EM Brake;</i> <i>Shutdown Throttle;</i> <i>Full Brake.</i>	<ol style="list-style-type: none"> 1. Controller is operating in an extreme environment. 2. Excessive load on vehicle. 3. Improper mounting of controller. 4. See 1311 menu Monitor » Controller: Temperature. 	<p><i>Set:</i> Heatsink temperature above +95°C.</p> <p><i>Clear:</i> Bring heatsink temperature below +95°C, and cycle interlock or KSI.</p>
17	Severe Undervoltage <i>Reduced Drive torque.</i>	<ol style="list-style-type: none"> 1. Battery Menu parameters are misadjusted. 2. Non-controller system drain on battery. 3. Battery resistance too high. 4. Battery disconnected while driving. 5. See 1311 menu Monitor » Battery: Capacitor Voltage. 6. Blown B+ fuse or main contactor did not close. 	<p><i>Set:</i> Capacitor bank voltage dropped below the Severe Battery Undervoltage limit (see page 49) with FET bridge enabled.</p> <p><i>Clear:</i> Bring capacitor voltage above Severe Battery Undervoltage limit.</p>
18	Severe Overvoltage <i>Shutdown Main Contactor;</i> <i>Shutdown Motor;</i> <i>Shutdown EM Brake;</i> <i>Shutdown Throttle;</i> <i>Full Brake.</i>	<ol style="list-style-type: none"> 1. Battery Menu parameters are misadjusted. 2. Battery resistance too high for given regen current. 3. Battery disconnected while regen braking. 4. See 1311 menu Monitor » Battery: Capacitor Voltage. 	<p><i>Set:</i> Capacitor bank voltage exceeded the Severe Battery Overvoltage limit (see page 49) with FET bridge enabled.</p> <p><i>Clear:</i> Bring capacitor voltage below Severe Battery Overvoltage limit, and then cycle KSI.</p>
21	Controller Undertemp Cutback <i>None, unless a fault action is programmed in VCL.</i>	<ol style="list-style-type: none"> 1. Controller is performance-limited at this temperature. 2. Controller is operating in an extreme environment. 3. See 1311 menu Monitor » Controller: Temperature. 	<p><i>Set:</i> Heatsink temperature dropped below -25°C.</p> <p><i>Clear:</i> Bring heatsink temperature above -25°C.</p>

Table 5 TROUBLESHOOTING CHART, continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
22	Controller Overtemp Cutback <i>Reduced drive and brake torque.</i>	<ol style="list-style-type: none"> 1. Controller is performance-limited at this temperature. 2. Controller is operating in an extreme environment. 3. Excessive load on vehicle. 4. Improper mounting of controller. 5. See 1311 menu Monitor » Controller: Temperature. 	<p><i>Set:</i> Heatsink temperature exceeded 85°C. <i>Clear:</i> Bring heatsink temperature below 85°C.</p>
23	Undervoltage Cutback <i>Reduced drive torque.</i>	<ol style="list-style-type: none"> 1. Normal operation. Fault shows that the batteries need recharging. Controller is performance limited at this voltage. 2. Battery parameters are misadjusted. 3. Non-controller system drain on battery. 4. Battery resistance too high. 5. Battery disconnected while driving. 6. See 1311 menu Monitor » Battery: Capacitor Voltage. 7. Blown B+ fuse or main contactor did not close. 	<p><i>Set:</i> Capacitor bank voltage dropped below the Battery Undervoltage limit (see p. 49) with the FET bridge enabled. <i>Clear:</i> Bring capacitor voltage above the Undervoltage limit.</p>
24	Overvoltage Cutback <i>Reduced brake torque.</i>	<ol style="list-style-type: none"> 1. Normal operation. Fault shows that regen braking currents elevated the battery voltage during regen braking. Controller is performance limited at this voltage. 2. Battery parameters are misadjusted. 3. Battery resistance too high for given regen current. 4. Battery disconnected while regen braking. 5. See 1311 menu Monitor » Battery: Capacitor Voltage. 	<p><i>Set:</i> Capacitor bank voltage exceeded the Battery Overvoltage limit (see page 49) with the FET bridge enabled. <i>Clear:</i> Bring capacitor voltage below the Overvoltage limit.</p>
25	+5V Supply Failure <i>None, unless a fault action is programmed in VCL.</i>	<ol style="list-style-type: none"> 1. External load impedance on the +5V supply (pin 26) is too low. 2. See 1311 menu Monitor » outputs: 5 Volts and Ext Supply Current. 	<p><i>Set:</i> +5V supply (pin 26) outside the +5V±10% range. <i>Clear:</i> Bring voltage within range.</p>
26	Digital Out 6 Overcurrent <i>Digital Output 6 driver will not turn on.</i>	<ol style="list-style-type: none"> 1. External load impedance on Digital Output 6 driver (pin 19) is too low. 	<p><i>Set:</i> Digital Output 6 (pin 19) current exceeded 15 mA. <i>Clear:</i> Remedy the overcurrent cause and use the VCL function <i>Set_DigOut()</i> to turn the driver on again.</p>
27	Digital Out 7 Overcurrent <i>Digital Output 7 driver will not turn on.</i>	<ol style="list-style-type: none"> 1. External load impedance on Digital Output 7 driver (pin 20) is too low. 	<p><i>Set:</i> Digital Output 7 (pin 20) current exceeded 15 mA. <i>Clear:</i> Remedy the overcurrent cause and use the VCL function <i>Set_DigOut()</i> to turn the driver on again.</p>

Table 5 TROUBLESHOOTING CHART, continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
28	Motor Temp Hot Cutback <i>Reduced drive torque.</i>	<ol style="list-style-type: none"> 1. Motor temperature is at or above the programmed Temperature Hot setting, and the requested current is being cut back. 2. Motor Temperature Control Menu parameters are mis-tuned. 3. See I311 menus Monitor » Motor: Temperature and Monitor » Inputs: Analog2. 4. If the application doesn't use a motor thermistor, Temp Compensation and Temp Cutback should be programmed Off. 	<p><i>Set:</i> Motor temperature is at or above the Temperature Hot parameter setting.</p> <p><i>Clear:</i> Bring the motor temperature within range.</p>
29	Motor Temp Sensor Fault <i>MaxSpeed reduced (LOS, Limited Operating Strategy) and motor temperature cutback is disabled.</i>	<ol style="list-style-type: none"> 1. Motor thermistor is not connected properly. 2. If the application doesn't use a motor thermistor, Temp Compensation and Temp Cutback should be programmed Off. 3. See I311 menus Monitor » Motor: Temperature and Monitor » Inputs: Analog2. 	<p><i>Set:</i> Motor thermistor input (pin 8) is at the voltage rail (0 or 10V).</p> <p><i>Clear:</i> Bring the motor thermistor input voltage within range.</p>
31	Coil1 Driver Open/Short <i>ShutdownDriver1.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Driver 1 (pin 6) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
31	Main Open/Short <i>ShutdownDriver1; ShutdownMotor; ShutdownEMBrake.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Main contactor driver (pin 6) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
32	Coil2 Driver Open/Short <i>ShutdownDriver2.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Driver 2 (pin 5) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
32	EM Brake Open/Short <i>ShutdownDriver2; ShutdownThrottle; FullBrake.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Electromagnetic brake driver (pin 5) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
33	Coil3 Driver Open/Short <i>ShutdownDriver3.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Driver 3 (pin 4) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
34	Coil4 Driver Open/Short <i>ShutdownDriver4.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Driver 4 (pin 3) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
35	PD Open/Short <i>ShutdownPD.</i>	<ol style="list-style-type: none"> 1. Open or short on driver load. 2. Dirty connector pins. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Proportional driver (pin 2) is either open or shorted.</p> <p><i>Clear:</i> Correct open or short, and cycle driver.</p>
36	Encoder Fault <i>Control Mode changed to LOS (Limited Operating Strategy).</i>	<ol style="list-style-type: none"> 1. Motor encoder failure. 2. Bad crimps or faulty wiring. 3. See I311 menu Monitor » Motor: Motor RPM. 	<p><i>Set:</i> Motor encoder phase failure detected.</p> <p><i>Clear:</i> Cycle KSL.</p>

Table 5 TROUBLESHOOTING CHART, continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
37	Motor Open <i>ShutdownMainContactor;</i> <i>ShutdownMotor;</i> <i>ShutdownEMBrake.</i>	<ol style="list-style-type: none"> 1. Motor phase is open. 2. Bad crimps or faulty wiring. 3. Bad crimps or faulty wiring. 	<p><i>Set:</i> Motor phase U, V, or W detected open.</p> <p><i>Clear:</i> Cycle KSI.</p>
38	Main Contactor Welded <i>ShutdownMainContactor;</i> <i>ShutdownMotor;</i> <i>ShutdownEMBrake.</i>	<ol style="list-style-type: none"> 1. Main contactor tips are welded closed. 2. Motor phase U is disconnected or open. 3. An alternate voltage path (such as an external precharge resistor) is providing a current to the capacitor bank (B+ connection stud). 	<p><i>Set:</i> Just prior to the main contactor closing, the capacitor bank voltage (B+ connection stud) was loaded for a short time and the voltage did not discharge.</p> <p><i>Clear:</i> Cycle KSI.</p>
39	Main Contactor Did Not Close <i>ShutdownMainContactor;</i> <i>ShutdownMotor;</i> <i>ShutdownEMBrake.</i>	<ol style="list-style-type: none"> 1. Main contactor did not close. 2. Main contactor tips are oxidized, burned, or not making good contact. 3. External load on capacitor bank (B+ connection stud) that prevents capacitor bank from charging. 4. Blown B+ fuse. 	<p><i>Set:</i> With the main contactor commanded closed, the capacitor bank voltage (B+ connection stud) did not charge to B+.</p> <p><i>Clear:</i> Cycle KSI.</p>
41	Throttle Wiper High <i>ShutdownThrottle.</i>	<ol style="list-style-type: none"> 1. Throttle pot wiper voltage too high. 2. See 1311 menu Monitor » Inputs: Throttle Pot. 	<p><i>Set:</i> Throttle pot wiper (pin 16) voltage is higher than the high fault threshold (can be changed with the VCL function <i>Setup_Pot_Faults()</i>).</p> <p><i>Clear:</i> Bring throttle pot wiper voltage below the fault threshold.</p>
42	Throttle Wiper Low <i>ShutdownThrottle.</i>	<ol style="list-style-type: none"> 1. Throttle pot wiper voltage too low. 2. See 1311 menu Monitor » Inputs: Throttle Pot. 	<p><i>Set:</i> Throttle pot wiper (pin 16) voltage is lower than the low fault threshold (can be changed with the VCL function <i>Setup_Pot_Faults()</i>).</p> <p><i>Clear:</i> Bring throttle pot wiper voltage above the fault threshold.</p>
43	Brake Wiper High <i>FullBrake.</i>	<ol style="list-style-type: none"> 1. Brake pot wiper voltage too high. 2. See 1311 menu Monitor » Inputs: Brake Pot. 	<p><i>Set:</i> Brake pot wiper (pin 17) voltage is higher than the high fault threshold (can be changed with the VCL function <i>Setup_Pot_Faults()</i>).</p> <p><i>Clear:</i> Bring brake pot wiper voltage below the fault threshold.</p>
44	Brake Wiper Low <i>FullBrake.</i>	<ol style="list-style-type: none"> 1. Brake pot wiper voltage too low. 2. See 1311 menu Monitor » Inputs: Brake Pot. 	<p><i>Set:</i> Brake pot wiper (pin 17) voltage is lower than the low fault threshold (can be changed with the VCL function <i>Setup_Pot_Faults()</i>).</p> <p><i>Clear:</i> Bring brake pot wiper voltage above the fault threshold.</p>
45	Pot Low Overcurrent <i>ShutdownThrottle;</i> <i>FullBrake.</i>	<ol style="list-style-type: none"> 1. Combined pot resistance connected to pot low is too low. 2. See 1311 menu Monitor » Outputs: Pot Low. 	<p><i>Set:</i> Pot low (pin 18) current exceeds 10mA.</p> <p><i>Clear:</i> Clear pot low overcurrent condition and cycle KSI.</p>

Table 5 TROUBLESHOOTING CHART, continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
46	EEPROM Failure <i>ShutdownMain Contactor;</i> <i>ShutdownMotor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	1. Failure to write to EEPROM memory. This can be caused by EEPROM memory writes initiated by VCL, by the CAN bus, by adjusting parameters with the 1311, or by loading new software into the controller.	<i>Set:</i> Controller operating system tried to write to EEPROM memory and failed. <i>Clear:</i> Download the correct software (OS) and matching parameter default settings into the controller and cycle KSI.
47	HPD/Sequencing Fault <i>ShutdownThrottle.</i>	1. KSI, interlock, direction, and throttle inputs applied in incorrect sequence. 2. Faulty wiring, crimps, or switches at KSI, interlock, direction, or throttle inputs. 3. See 1311 menu Monitor » Inputs.	<i>Set:</i> HPD (High Pedal Disable) or sequencing fault caused by incorrect sequence of KSI, interlock, direction, and throttle inputs. <i>Clear:</i> Reapply inputs in correct sequence.
49	Parameter Change Fault <i>ShutdownMain Contactor;</i> <i>ShutdownMotor;</i> <i>ShutdownEMBrake.</i>	1. This is a safety fault caused by a change in certain 1311 parameter settings so that the vehicle will not operate until KSI is cycled. For example, if a user changes the Throttle Type this fault will appear and require cycling KSI before the vehicle can operate.	<i>Set:</i> Adjustment of a parameter setting that requires cycling of KSI. <i>Clear:</i> Cycle KSI.
51-67	OEM Faults <i>(See OEM documentation.)</i>	1. These faults can be defined by the OEM and are implemented in the application-specific VCL code. See OEM documentation.	<i>Set:</i> See OEM documentation. <i>Clear:</i> See OEM documentation.
68	VCL Runtime Error <i>ShutdownMain Contactor;</i> <i>ShutdownMotor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	1. VCL code encountered a runtime VCL error. 2. See 1311 menu Monitor » Controller: VCL Error Module and VCL Error. This error can then be compared to the runtime VCL module ID and error code definitions found in the specific OS system information file.	<i>Set:</i> Runtime VCL code error condition. <i>Clear:</i> Edit VCL application software to fix this error condition; flash the new compiled software and matching parameter defaults; cycle KSI.
69	External Supply Out of Range <i>None, unless a fault action is programmed in VCL.</i>	1. External load on the 5V and 12V supplies draws either too much or too little current. 2. Fault Checking Menu parameters Ext Supply Max and Ext Supply Min are mis-tuned. 3. See 1311 menu Monitor » Outputs: Ext Supply Current.	<i>Set:</i> The external supply current (combined current used by the 5V supply [pin 26] and 12V supply [pin 25]) is either greater than the upper current threshold or lower than the lower current threshold. The two thresholds are defined by the Ext Supply Max and Ext Supply Min parameter settings (page 45). <i>Clear:</i> Bring the external supply current within range.

Table 5 TROUBLESHOOTING CHART, continued

CODE	PROGRAMMER LCD DISPLAY EFFECT OF FAULT	POSSIBLE CAUSE	SET/CLEAR CONDITIONS
71	OS General <i>ShutdownMainContactor;</i> <i>ShutdownMotor;</i> <i>ShutdownEMBrake;</i> <i>ShutdownThrottle;</i> <i>ShutdownInterlock;</i> <i>ShutdownDriver1;</i> <i>ShutdownDriver2;</i> <i>ShutdownDriver3;</i> <i>ShutdownDriver4;</i> <i>ShutdownPD;</i> <i>FullBrake.</i>	1. Internal controller fault.	<i>Set:</i> Internal controller fault detected. <i>Clear:</i> Cycle KSI.
72	PDO Timeout <i>ShutdownInterlock;</i> <i>CAN NMT State set to Pre-operational.</i>	1. Time between CAN PDO messages received exceeded the PDO Timeout Period.	<i>Set:</i> Time between CAN PDO messages received exceeded the PDO Timeout Period. <i>Clear:</i> Cycle KSI.
73	Stall Detect <i>Control Mode changed to LOS (Limited Operating Strategy).</i>	1. Stalled motor. 2. Motor encoder failure. 3. Bad crimps or faulty wiring. 4. Problems with power supply for the motor encoder. 5. See 1311 menu Monitor → Motor: Motor RPM.	<i>Set:</i> No motor encoder movement detected. <i>Clear:</i> Either cycle KSI, or detect valid motor encoder signals while operating in LOS mode and return Throttle Command = 0 and Motor RPM = 0.

MAINTENANCE

There are no user serviceable parts in the Curtis 1236/38 controller. No attempt

should be made to open, repair, or otherwise modify the controller. Doing so may damage the controller and will void the warranty. It is recommended that the controller and connections be kept clean and dry and that the controller's diagnostics history file be checked and cleared periodically.

CLEANING

Periodically cleaning the controller exterior will help protect it against corrosion and possible electrical control problems created by dirt, grime, and chemicals that are part of the operating environment and that normally exist in battery

powered systems.

When working around any battery powered system, proper safety precautions should be taken. These include, but are not limited to: proper training, wearing eye protection, and avoiding loose clothing and jewelry.

Use the following cleaning procedure for routine maintenance. Never use a high pressure washer to clean the controller.

1. Remove power by disconnecting the battery.
2. Discharge the capacitors in the controller by connecting a load (such as a contactor coil) across the controller's B+ and B- terminals.
3. Remove any dirt or corrosion from the power and signal connector areas. The controller should be wiped clean with a moist rag. Dry it before reconnecting the battery.
4. Make sure the connections are tight. Refer to Section 2, page 6, for maximum tightening torque specifications for the battery and motor connections.

DIAGNOSTIC HISTORY

The 1311 programmer can be used to access the controller's diagnostic history file. The programmer will read out all the faults the controller has experienced since the last time the diagnostic history file was cleared. Faults such as contactor faults may be the result of loose wires; contactor wiring should be carefully checked. Faults such as overtemperature may be caused by operator habits or by overloading.

After a problem has been diagnosed and corrected, it is a good idea to clear the diagnostic history file. This allows the controller to accumulate a new file of faults. By checking the new diagnostic history file at a later date, you can readily determine whether the problem was indeed fixed.

DIAGNOSTICS AND TROUBLESHOOTING – 1253 – pump controller

The 1253 controller provides diagnostics information to assist technicians in troubleshooting pump system problems. The diagnostics information can be obtained by observing the appropriate display on the handheld programmer or the fault codes

issued by the optional Status LED. Refer to the troubleshooting chart (Table 5) for suggestions covering a wide range of possible faults.

PROGRAMMER DIAGNOSTICS

The programmer presents complete diagnostic information in plain language. Faults are displayed in the Faults Menu (see column 2 in the troubleshooting chart), and the status of the controller inputs/outputs is displayed in the Monitor Menu.

Accessing the Fault History Menu provides a list of the faults that have occurred since the fault history file was last cleared. Checking (and clearing)

the fault history file is recommended each time the vehicle is brought in for maintenance.

The following 4-step process is recommended for diagnosing and troubleshooting an inoperative pump system: (1) visually inspect the vehicle for obvious problems; (2) diagnose the problem, using the programmer; (3) test the circuitry with the programmer; and (4) correct the problem. Repeat the last three steps as necessary until the pump system is operational.

Example: A vehicle that cannot perform the operation requested by Speed Select 2 is brought in for repair.

STEP 1: Examine the vehicle and its wiring for any obvious problems, such as broken wires or loose connections.

STEP 2: Connect the programmer, select the Faults Menu, and read the displayed fault information. In this example, the display shows "No Known Faults," indicating that the controller has not detected anything out of the norm.

STEP 3: Select the Monitor Menu, and observe the status of the SS2 input. In this example, the display shows that the switch does not close when SS2 is selected, which means the problem is either in the SS2 switch or the switch wiring.

STEP 4: Check or replace the SS2 switch and wiring and repeat the test. If the programmer shows the SS2 switch closing and the system now operates normally, the problem has been corrected.

Table 5 TROUBLESHOOTING CHART

LED CODE	PROGRAMMER LCD DISPLAY	EXPLANATION	POSSIBLE CAUSE
1,1	EEPROM FAULT	EEPROM fault. <i>Note: Usually can be cleared by modifying any parameter value in the Program Menu.</i>	1. EEPROM data lost or damaged. 2. EEPROM checksum error.
1,2	HW FAILSAFE	Self-test or watchdog fault.	1. MOSFET shorted. 2. Controller defective.
1,3	MOTOR SHORTED	Motor shorted.	1. Motor is shorted.
2,1	UNDERVOLTAGE CUTOFF	Undervoltage cutoff.	1. Battery voltage < LOVOLT CUTOFF setting.
2,2	LIFT LOCKOUT	Lift operation locked out due to undervoltage.	1. Controller received appropriate lift lockout signal. 2. Inappropriate lift lockout signal; SS LOCKOUT parameter not set correctly.
2,3	SEQUENCE ERROR	Startup lockout.	1. Improper sequence of throttle or SS and KSI or KSI plus interlock. 2. STARTUP LOCKOUT parameter not set correctly. 3. Misadjusted throttle.
2,4	THROTTLE FAULT	Wiper signal out of range (pot low fault).	1. Throttle input wire open or shorted. 2. Throttle defective. 3. THROTTLE TYPE parameter not set correctly.
3,1	CONT DRVR OC	Main contactor coil overcurrent.	1. Main contactor coil shorted. 2. Controller defective.
3,2	MAIN CONT WELDED	Main contactor welded.	1. Main contactor stuck closed. 2. CONT CNTRL parameter not set correctly. 3. Main contactor driver shorted.
3,3	PRECHARGE FAULT	Precharge fault.	1. Precharge circuit failure. 2. External short or leakage between B+ and B-.
3,4	MAIN CONT DNC	Main contactor did not close.	1. Main contactor coil connection loose. 2. Main contactor did not close. 3. CONT CNTRL parameter not set correctly.
4,1	LOW BATTERY VOLTAGE	Low battery voltage.	1. Battery voltage < undervoltage cutback threshold. 2. Corroded battery terminal. 3. Loose battery or controller terminal.
4,2	OVERVOLTAGE	Overvoltage.	1. Battery voltage > overvoltage shutdown threshold. 2. Vehicle operating with charger attached.
4,3	THERMAL CUTBACK	Over-/undertemperature cutback.	1. Temperature > 85°C or < -25°C. 2. Excessive load on pump motor. 3. Improper mounting of controller 4. Operation in extreme environment. 5. Thermistor failure.

Maintenance

There are no user serviceable parts in the Curtis 1253 controller. No attempt should be made to open, repair, or otherwise modify the controller. Doing so may damage the controller and will void the warranty. It is recommended that the controller be kept clean and dry that its fault history file be checked and cleared periodically.

CLEANING

Periodically cleaning the controller exterior will help protect it against corrosion and possible electrical control problems created by dirt, grime, and chemicals that are part of the operating environment and that normally exist in battery powered systems.

When working around any battery powered system, proper safety precautions should be taken. These include, but are not limited to: proper training, wearing eye protection, and avoiding loose clothing and jewelry. Use the following cleaning procedure for routine maintenance. Never use a high pressure washer to clean the controller.

1. Remove power by disconnecting the battery.
2. Discharge the capacitors in the controller by connecting a load (such as a contactor coil) across the controller's B+ and B- terminals.
3. Remove any dirt or corrosion from the power and signal connector areas. The controller should be wiped clean with a moist rag. Dry it before reconnecting the battery.
4. Make sure the connections are tight.

FAULT HISTORY

The programmer can be used to access the controller's fault history file. The programmer will read out all the faults that the controller has experienced since the last time the fault history file was cleared. The faults may be intermittent faults, faults caused by loose wires, or faults caused by operator errors. Faults such as contactor faults may be the result of loose wires; contactor wiring should be carefully checked. Faults such as start up lockout or over temperature may be caused by operator habits or by overloading. After a problem has been diagnosed and corrected, it is a good idea to clear the diagnostic history file. This allows the controller to accumulate a new file of faults. By checking the new fault history file at a later date, you can readily determine whether the problem was indeed fixed.

Electric Motor (DC) maintenance

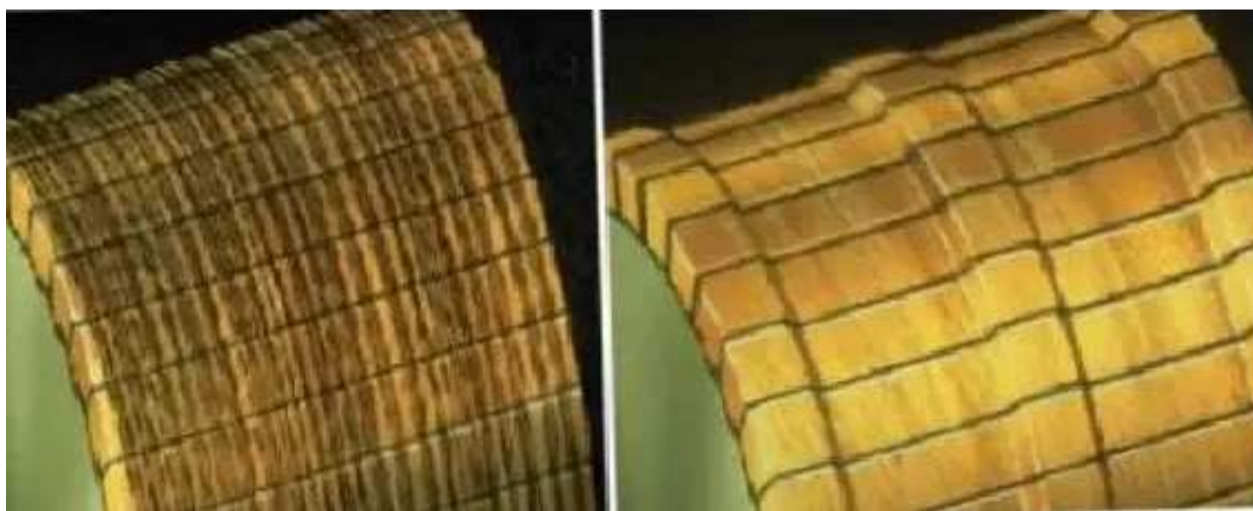


DC motors have characteristics which can cause serious or fatal injury unless they are selected, installed, maintained and operated by qualified personnel familiar with special requirements of DC machines.

To guard against personal injury or death, ensure that all power to the motor has been removed and the motor shaft is stationary. Brushes must not be touched or replaced while motor is energized or rotating.

Regular inspection at intervals dependent upon service conditions is the best insurance against costly maintenance and breakdown. Record inspection results and maintenance action required or performed.

1. Check the carbon brush wear limit and pattern.
2. Check commutator slot and clean when found clogged with dust, presence of dust will eventually favour more wear.



Damaged commutator

Good commutator

3. Carbon brush holder spring tension should be equal on all carbon brushes associated with that particular motor. The brush holders in all motors are often constant pressure design and do not require nor are capable of adjustment over the life of the brushes.
4. Ensure all motor connections are tight (internal/external).
5. Brushes and brush-holders should be clean so that the brushes are free to move in the holders.

6. Replace brushes with new brushes of the same grade before wear permits the rivet or tamped pigtail to score the commutator. It is best to change out complete set.
7. Fit the face of new brushes to the contour of the commutator with sandpaper only, no emery abrasive. Keep brush lead (pigtail) connections tight. Replacement brushes should have sleeved pigtails.
8. A commutator in good condition is clean and smooth with a medium polish and a light brown colour. Keep clean by occasionally wiping with a canvas pad. Use no lubricant or emery abrasive. If a commutator becomes rough, it needs to be resurfaced. Roughness can be easily detected with the machine running by resting a pencil-like rod of insulating material (dry wood) on one of the brushes. In mild cases, a commutator dressing stone can be used. Very rough or out of round commutators require turning in a lathe. In every case, maintain concentricity and remove the minimum material required for proper clean up.
9. Intermittent sparking due to overloads or slight visible sparking does not necessarily indicate poor commutation. Poor commutation exists when there is excessive sparking requiring abnormal maintenance. Every case of excessive sparking should be investigated to determine the cause and correct it.
10. For long life, keep windings clean and dry. Dirt or dust can be removed by wiping them with a clean cloth, by blowing with clean, dry, low pressure air or by vacuum cleaner. Oil or grease can be removed with a cloth moistened with mineral solvent. Be sure not to get any solvent on the commutator and observe all product warnings.

Tires and Wheels

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 servicing man or dealer.

Check Inflation and Damage

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

Check tires for proper inflation. See "Tyre Inflation Pressures"

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

Always stand behind the tread of the tyre. NOT in front of the rim.



Do NOT reflate a tyre that has been run while flat or underinflated, without first checking to make sure the locking ring on the rim is not damaged and is in the correct 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, and heat or braze any rim components.

Wheel Bolts

Check Tightness

Rear Steer Wheels



1. Inspect tightness of wheel bolts in a sequence opposite each other

Drive Wheels



2. Inspect tightness of wheel nuts in a sequence opposite each other

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

For maximum service life of the lift truck, make a thorough walk-around inspection. Look around and under the truck for such items as loose or missing bolts, debris or dirt build up, fuel, oil or coolant leaks and cut or gouged tires.

Have any repairs made and debris removed, as needed.

- 1.** Inspect the tyres and wheels for cuts, gouges, foreign objects, inflation pressure and loose or missing bolts.
- 2.** Inspect the mast and lift chains for wear, broken links, pins and loose rollers.
- 3.** Inspect the hydraulic system for leaks, worn hoses or damaged lines.
- 4.** Look for transmission and drive axle leaks on the lift truck and on the ground.
- 5.** Inspect the operator's compartment for loose items and cleanliness.
- 6.** Inspect the instrument panel for broken gauges and BDI.
- 7.** Test the horn and other safety devices for proper operation.
- 9.** Inspect Battery compartment for electrolyte leaks.
- 10.** Inspect the forks.
 - 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 "Forks" in "Every 2000 Service Hours or 1 Year".
 - Remove all defective forks from service.

Traction Battery

Measure electrolyte Level

1. Raise the hood and seat assembly.



Battery electrolyte and components can cause personal injury. Do not allow electrolyte and battery terminals to contact skin or metal tools.

Recommended level for top up is 5mm above separator ,Never top up more than 5mm above the separators

Weekly maintenance

Differential (Drive axle)

Measure Oil Level

Stop the machine and apply parking brake, lift up the fork to safe height and place safety support to mast.

Remove the level plug in the drive axle housing, maintain the oil level up to level plug bottom level.



Hydraulic Tank

Measure Oil Level

Keep the mast fully down allow the fork to rest on level ground and off the machine ,maintain the tank oil level up to the recommended level marking on the dipstick .



Traction Battery

Measure leakage voltage Level and wash the battery

1. Raise the hood and seat assembly.

⚠ WARNING

Battery electrolyte and components can cause personal injury, water coming from the battery after washing is hazardous, do the washing only in recommended place.

Allowable maximum leakage voltage on the battery compartment/machine frame is 10V ,battery washing to be done if it is above or equal to 10V.

Remove the battery from the machine ,refer "Battery handling" ,and carry out washing with normal tap water with caustic soda .

Battery should be placed on wooden/plastic pallet for washing ,should not be on metal surface .

The water flow should be continued till all the precipitate clears out of the battery compartment. This can be ensured with colourless water coming out the base of the battery compartment.

Before putting back the battery back on the forklift, ensure that the battery has been dried by blowing air.

Mast Channels

Lubricate



The channels on the roller-type mast require a breaking 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.

General Terms and conditions for Warranty

1. This equipment of KION India Pvt Ltd is covered, for warranty up to 1 year from the date of invoice or 2000 hrs of operations (whichever is earlier) against material defect or any issue with workmanship.
2. Warranty is not applicable to any wear and tear items like fuses, bulbs, rubber items, cosmetic parts and tyres etc.
3. Periodic maintenances and lubrication / filter changes as prescribed by manufacturer are to be done in time. Any deviation will result in denial of warranty. We also offer PMC (Preventive maintenance contract) during warranty period to address the total services of your machines.
4. Routine services like cleaning / replacement of filters, greasing, oil-changes as prescribed (apart from 50/100, 500, 1000 and 2000 hrs) etc to be done by customer with utmost care.
5. Customer to use only genuine parts of KION India Pvt Ltd and recommended lubricants.
6. Any part replaced in warranty will be covered for warranty, up to the end of equipment warranty only.
7. Customer needs to return the failed parts under warranty to dealer / KION India Pvt Ltd.
8. Customer to ensure that the equipment is used as per its rated capacity and technical specification provided.
9. All the safety aspects must be followed during the equipment operation.
10. Any problem observed, must be reported to KION India Pvt Ltd / dealer immediately and equipment must not be run unless the same is taken in writing from KION India Pvt Ltd / dealer.
11. No alterations to be done on the machine without the prior approval of KION India Pvt Ltd.
12. Warranty is not transferable. If the equipment is sold, the warranty stands nullified with immediate effect.
13. KION India Pvt Ltd is not responsible for any sort of consequential damages /claims / losses arising out of the equipment supplied.
14. Responsibility of KION India Pvt Ltd is to see that the machine is put on road by arranging the parts and service. The same will be chargeable if the failure is out warranty or not warrantable.
15. Operator must possess forklift driving license.

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