Warequip SOLUTIONS
Manual Handling and Material Handling Solutions

Owners Guide

EMC Electric Vehicles






Contents

Service & Maintenance

Safety Procedures

The following list of safety procedures are to be used as a guide only and in no way supersede any specific instructions provided by the manufacturer.

Always:

- Maintain the vehicle in accordance with the manufacturer's periodic service schedule.
- Ensure repairs are only performed by persons trained and qualified to do so.
- Check the polarity of each battery terminal and ensure the batteries are re-wired correctly.
- Only use genuine replacement parts.
- Only use recommended tools. This includes insulated tools when working in or around batteries.
- Support the vehicle using wheel chocks and jack stands. Never get under a vehicle that is supported by a jack. Lift the vehicle in accordance with the manufacturer's instructions.
- Maintain the vehicle in an area away from exposed flame or persons who are smoking.
- Be aware that any vehicle that is not performing as designed is a potential hazard and must not be operated.
- Test drive the vehicle after any maintenance or repairs. All tests must be conducted by a qualified, trained and authorised person in a safe area that is free of both vehicular and pedestrian traffic.
- All maintenance and repairs must be performed by qualified persons with the skills and experience to recognize potential hazards and/or danger and protect themselves from situations that could result in damage to the vehicle or severe personal injury or death. Always use extreme caution.
- Follow manufacturer's instructions to immobilise the vehicle before commencing any maintenance.
- Block chassis before working underneath the golf vehicle.
- Avoid fire hazards and have fire protection available.
- Before performing any maintenance always disable the electrical system in accordance with the manufacturer's instructions. Disabling includes removing the key from the switch and disconnecting a battery wire.
- Brakes, steering mechanisms, warning devices, governors and all other safety devices should be inspected and maintained to a safe operating condition and should never be modified.
- All maintenance should be recorded in a log book in date order. The name of the person performing the maintenance and the maintenance performed should also be recorded.
- The maintenance manager should periodically inspect the maintenance log to ensure accuracy of entries.
- All name plates, warning and instructions supplied by the manufacturer should be maintained in a legible condition.
- The controlling party should not perform any modification or change to the vehicle without the manufacturer's prior written authorisation
- Where authorised modifications have been made, the controlling party shall ensure that capacity, operation, warning and maintenance instruction plates, tags or decals are affixed and/or changed accordingly.

Ventilation

Hydrogen gas is generated in the charging cycle of batteries and can be explosive in concentrations as low as 4%.

Ventilation is essential during the charging process because of the flammable hydrogen gas which is emitted. The amount of hydrogen gas emitted depends on a number of factors such as:

- The condition of the batteries,
- The output rate of the charger,
- The amount of time the batteries are required to be on charge.

Hydrogen emissions are generally considered to be within the area of 10 to 20 cubic litres per vehicle charge. Because of the highly volatile nature of hydrogen gas and its tendency to rise and accumulate in pockets in the ceiling, a minimum of 5 air changes per hour is required.
The controlling party should consult applicable fire and safety codes for the specific ventilation levels required as well as the use of explosion proof electrical apparatus.

Never charge a vehicle in an area that is subject to spark or flame. Pay particular attention to natural gas or propane water heaters and furnaces.

Always use a dedicated circuit for each individual battery charger.

Chargers must be operated in accordance with manufacturer's recommendations or applicable electrical code (whichever is higher).

Maintenance and storage areas should be properly ventilated in accordance with applicable fire codes and ordinances to avoid fire hazards.

Preventative Maintenance

It is recommended that a scheduled inspection and maintenance program be established for each vehicle. Such a program is a valuable tool to ensure the safe vehicle operation of the vehicle, thereby assisting in the prevention of accidents.

Parts and Materials

Only genuine EMC replacement parts and materials should be used.

Operator Qualifications

Only persons who possess a valid driver's license should be authorized to operate the vehicle.

Lifting the vehicle

Floor Jack Qty: 1

Jack Stands Qty:4

Chocks Qty:4

Some servicing operations may require the front wheels, the rear wheels or the entire vehicle be raised.

WARNING!

To reduce the possibility of severe injury or death from a vehicle falling from a jack:

- Be sure the vehicle is on a firm and level surface.
- Never get under a vehicle while it is supported by a jack
- Use jack stands and test the stability of the vehicle on the stands
- Always place chocks in front and behind the wheels not being raised
- Use extreme caution during the lifting process as the vehicle will be extremely unstable
- To raise the entire vehicle:
  - Install chocks in front and behind each wheel
  - Centre the jacks under the rear frame cross member
  - Raise the vehicle enough to place a jack stand under the outer ends of the rear axle
  - Lower the jack and test the stability of the vehicle on the two jack stands

Personnel

WARNING!

Only authorized and qualified persons should undertake service/maintenance.

To reduce the risk of injury:

- Do not attempt any type of maintenance or repair before reading and understanding all information, cautions and warnings in this material.
- Use eye protection when working on the vehicle. Use extra caution when working around batteries or using solvents or compressed air.
- To reduce the possibility of an electrical arc (can result in battery explosion), disconnect all electrical loads from the battery before removing the battery cables.
- Wrap wrenches with vinyl tape to reduce the possibility of a dropped wrench 'shorting out' a battery, which could result in an explosion.
- Remove, ground and disconnect battery wires at the negative terminal before servicing to reduce the possibility of accidental starting.
- Electrolyte spills should be neutralised by flushing the area with a solution of 2 teaspoons (10ml) sodium bicarbonate (baking soda) dissolved in 1 litre of water.
- Extreme caution must be used when using aerosol containers of battery terminal protectant. Insulate the metal container to reduce the possibility of any contact with the batter terminals which could result in an explosion.
- It is in the best interest of the vehicle owner and service technician to carefully follow the procedures recommended in this material. Preventative maintenance applied at regular intervals is the best guarantee for keeping the vehicle both dependable and economical.
- Only qualified, trained and authorised personnel should be permitted to inspect, adjust and maintain EMC Vehicles.

Vehicle cleaning

WARNING!

- If using a pressure washer, ensure all instructions supplied by the manufacturer are read and understood before operation to reduce the possibility of severe injury or damage to the vehicle.
  Caution: When pressure washing exterior of vehicle, do not use high pressure settings. To reduce the possibility of cosmetic damage, do not use any abrasive or reactive solvents when cleaning, particularly on any plastic parts.
- Ensure correct techniques and cleaning materials are used. Using excessive water pressure may cause severe injury to operator or bystander, damage to seals, plastics, seat material, body finish or electrical system.
- Clean windscreen with lots of water and a clean cloth. Minor scratches may be removed using a commercial plastic polish.
- To clean vinyl seats and plastic or rubber trim, apply a mild soap solution with a sponge or soft brush and wipe with a damp cloth.
- Removal of oil, tar, asphalt, shoe polish, etc. will require the use of a commercially available vinyl/rubber cleaner.
- The painted surfaces of the vehicle provide the vehicle with an attractive appearance and durable protection. Frequent washing with lukewarm or cold water and mild detergent is required to preserve the painted surfaces.
- Occasional cleaning and waxing of the vehicles painted surfaces with non-abrasive products designed for 'clearcoat' automotive finishes will enhance the appearance and durability.
- Some corrosive materials such as fertilisers can collect in the underbelly of the vehicle. These materials will cause corrosion of underbody parts unless flushed occasionally with water. Thoroughly clean any areas where mud or other debris can collect. Sediment packed in closed areas should be loosened to ease its removal, taking care not to chip or otherwise damage paint.

Wheel installation

Note: It is important to follow a 'cross sequence' pattern, when installing wheel nuts. This will ensure the even seating of the wheel against the hub.

- With the valve stem to the outside, mount the wheel onto the hub.
- Using your fingers, tighten the wheel nuts in increments following a 'cross sequence' pattern. Lightly tighten the top left wheel nut, then the bottom right wheel nut, top right wheel nut etc.
- Fully tighten the top left, followed by the bottom right, followed by the top right and finally the bottom left.

Tyre Inspection

The condition of each tyre should be inspected per the periodic Service Schedule. Inflation pressures should be checked when the tyres are cool. Be sure to install the valve dust cap after checking or inflating.

WARNING!

- Never exceed the inflation pressure specified on the tyre sidewall. Due to the low volume of the tyres, over inflation can occur in seconds. Over inflation can cause the tyre to separate from the wheel of even cause the tyre to explode. Always pressurise the tyre with small amounts of air at a time.
- Protect face and eyes from escaping air when removing valve core.
- To reduce the possibility of severe injury caused by a broken socket when removing wheels, use only sockets designed for such use.
- Tyre inflation should be determined by the condition of the terrain. For outdoor applications when the majority of use is on grassy areas, the following should be considered. On hard turf, a slightly higher inflation pressure is recommended. On very soft turf, a lower pressure should be used to reduce the possibility of tyres cutting into the turf.
- For vehicles being used on a paved or hard surface, tyre pressure should be kept at the higher allowable range, but under no condition should the inflation pressure be higher than the recommended pressure on tyre sidewall.
- All four tyres should have the same pressure for optimum handling characteristics. Ensure the valve dust cap is installed after checking and/or inflating.

  - The vehicle is fitted with low pressure tubeless tyres mounted on one piece rims. Therefore, the most cost effective way to repair a puncture in the tread is to use a commercial tyre plug.
  - *Note:* Tyre plug tools and plugs are available at most automotive parts outlets. The advantage of using one of these plugs is that it means the tyre doesn't need to be removed from the wheel.
  - If the tyre is flat, remove the wheel and inflate the tyre to the maximum recommended pressure. Immerse the tyre in water to locate the leak and mark with chalk. Insert tyre plug in accordance with manufacturer's instructions.

Brakes

WARNING!

- Always evaluate pedal travel before operating a vehicle to ensure braking function is present. This reduces the possibility of severe injury or death,
- All driving brake tests must be completed in a safe environment with a high regard for the safety of personnel. Please note that over time, a subtle loss of performance may take place. Therefore, it is important to establish the standard with a new vehicle.
- A periodic brake performance test should be performed regularly to evaluate the performance of the braking system. This test is useful as a method of identifying any subtle loss of performance over time.

Periodic Brake Test for Mechanical Brakes

The purpose of this test is to compare the braking performance of the subject vehicle to the braking performance of a new or vehicle or to an established safe and acceptable stopping distance.

Actual stopping distances will be influenced by weather conditions, terrain, road surface condition, actual vehicle weight (accessories installed) and the vehicles speed. No safe braking distance can be reliably specified.

The test is conducted by latching the parking brake to eliminate different pedal pressures and to include the effects of linkage miss-adjustment.

Establish the acceptable stopping distance by testing a new or 'known to be good' vehicle and recording the stopping location or stopping distance. For fleets of vehicles, several vehicles should be tested when new and the range of stopping locations or distances recorded.

Note: Over time, a subtle loss of performance may take place; therefore, it is important to establish the standard with a new vehicle.

How the test works:

- Drive the vehicle at maximum speed on a flat, dry, clean, paved surface.
- Quickly depress the brake pedal to latch the parking brake at the line or marker in the test area and remove foot from pedal. (Be sure to be seated securely and have a firm grip of the steering wheel.) The vehicle should stop aggressively. The wheel brakes may or may not lock
- Observe the vehicle stopping location or measure the vehicle stopping distance from the point at which the brakes were latched. The vehicle should stop within the 'normal' rage of stopping distances.
- If the vehicle stops more than 4ft. (1.2 m) beyond the acceptable stopping distance or pulls to one side, the vehicle has failed, and the test should be tested.
- If the vehicle fails the second test immediately take the vehicle out of service and contact your selling dealer at EMC. The rear axle is provided with a lubricant level check/fill plug located on the bottom of the differential. Unless leakage is evident, the lubricant only needs to be replaced after five years.

Service & Maintenance

WARNING!

Only qualified persons should undertake service. To reduce the possibility of severe injury or death from improper servicing techniques:

- Do not attempt any type of servicing operations before reading and understanding all notes, cautions and warnings in this material.
- To reduce the possibility of motor damage, never operate vehicle at full throttle for more than 4-5 seconds while vehicle is in a 'no load' condition.
- Wear eye protection when working on the vehicle. Use extra caution when working around batteries, or using solvents or compressed air.
- To reduce the possibility of causing an electrical arc, which could result in a battery explosion, turn off all electrical loads from the battery before removing battery wires.
- Wrap wrenches with vinyl tape to reduce the possibility of a dropped wrench 'shorting out' a battery, which could result in an explosion.
- Reduce the possibility of accidental starting by removing and grounding wires and disconnecting battery at negative terminal before servicing.
- Electrolyte spills should be neutralised with a solution of 2 teaspoons (10ml) sodium bicarbonate (baking soda) dissolved in 1 litre of water and flushed with water.
- Aerosol containers of battery terminal protectant must be used with extreme caution. Insulate metal container to reduce the possibility of contacting battery terminals which could result in an explosion.
- It is in the best interest of the vehicle owner and service technician to carefully follow the procedures recommended in this material. Preventative maintenance, applied at regular intervals, is the best guarantee for keeping the vehicle both dependable and economical.

Lubrication

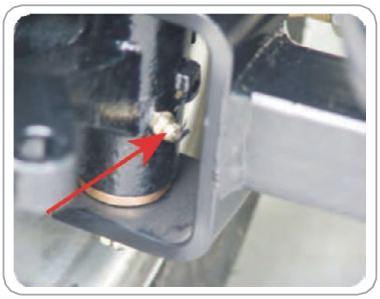
Caution: Do not use more than three pumps of grease fitting at any one time. Excess grease may cause grease seals to fail or grease migration into areas that could damage components.

Putting more than three pumps of grease in grease fitting could damage grease seals and cause premature bearing failure.

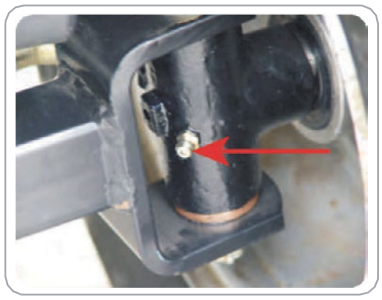
Checking the Lubricant Level

- Clean the area around the check/fill plug and remove plug. The correct lubricant level is just below the bottom of the threaded hole.
- If lubricant is low, add lubricant as required. Add lubricant slowly until lubricant starts to seep from hole.
- Install the check/fill plug. In the event that the lubricant is to be replaced, the vehicle must be elevated and the oil pan removed or the oil siphoned through the check/fill hole.

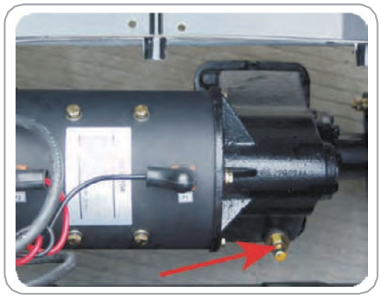
Below is a diagram to help you identify which points to lubricate:



Spindle (Passenger Side)



Spindle (Driver Side)



Rear End

Middle Shaft

Grease point for steering rack

Light bulb replacement

Caution: To reduce the possibility of premature bulb failure, do not touch new bulbs with bare fingers. Use clean, dry tissue or paper towel to handle glass portion of the bulb.

For vehicles equipped with head light/s locate bulb socket on backside of light bar and turn bulb socket a quarter turn counter clockwise to unlock and pull out bulb. Insert new bulb and rotate socket a quarter turn clockwise to secure.

To replace the tail and brake light bulb, remove hardware securing lens and remove lens. Install replacement bulb as per above.

Serial plate number location

The serial number and manufacture date code are located on a plate on the passenger side of the dash housing or for 4 and 6 seat models on the rear of the front seat.

Design changes take place on an ongoing basis. In order to obtain correct components for the vehicle, the manufacturer date code, serial number and vehicle model must be provided when ordering service parts.

Caution: To prolong vehicle life, some maintenance items must be serviced more frequently on vehicles used under severe driving conditions such as extreme temperatures, extreme debris/dust conditions, frequent use with a maximum load.

Periodic service schedule

DAILY/BEFORE USE:

- Check service brake
- Check park brake function, lock, hold and general operation
- Check hand brake function (if fitted)
- Check warning device function in reverse
- Check TYRE condition
- Check overall vehicle condition
- Recharge batteries to full state of charge after each days use
- Inspect charger connector and receptacle at each charge

WEEKLY

- TYRES – examine for cuts, excessive wear and pressure.
- Wheels – Check for bent rims, missing or loose wheel nuts.

MONTHLY – 20 HOURS

- Batteries – clean batteries and terminals, check condition, all connections.
- Wiring – check all wiring for loose connections and broken/missing insulation
- Charger/Receptacle – Clean connections, keep receptacles free of dirt and foreign matter
- Accelerator – check for smooth movement
- Service Brake – conduct brake performance test
- Park Brake – check brake performance and adjust if required
- Steering assembly – check for abnormal play, tightness of all hardware
- Tie Rod/linkages – check for excessive play, bent components or loose connections
- Rear Axle – check for leakage, add oil as required.

QUARTERLY – 50 HOURS

- Front Axle – Check for damage to axle and loose or missing hardware
- Front Shock Absorbers – Check for oil leakage and loose fastness
- Front Springs – Check for loose hardware, cracks at attachments
- Front Wheel Alignment – Check for unusual TYRE wear, align if required
- Park Brake – Check for bent/binding linkage rod, check for damage or wear to latch arm or catch bracket, lubricate as required, use light oil, DO NOT LUBRICATE CABLES OR BRAKE LATCH. Check and adjust foot brake lock if required.
- Rear Shock Absorbers – Check for oil leakage, loose mounting hardware
- Hardware and Fasteners – Check for loose or missing hardware and components, tighten or replace missing Hardware.

SEMI-ANNUAL – 125 HOURS

- King Pins – check for excessive play and tightness of retaining nuts
- Steering Assembly – check bellows and pinion seal for damage or grease leakage
- Rack End Ball Point – Lubricate, use wheel bearing grease
- Rear Axle – Check for unusual noise and loose or missing mounting hardware

ANNUAL – 200-300 HOURS

- Front Wheel Bearings – Check and adjust as required
- Rear Axle – Check lubricant, add lubricant as required
- Service Brakes – Clean and adjust, check brake shoe linings

Operation

Operator safety rules and practices

Caution: Improper use of the vehicle or the lack of proper maintenance may result in damage or decreased performance. Read and understand the following warnings before attempting to operate the vehicle.

WARNING!

To reduce the possibility of severe injury or death resulting from loss of vehicle control, the following warnings must be observed.

- When the vehicle is to be left unattended, engage the park brake (and hand brake when fitted) and remove the key. Never park or leave the vehicle unattended on a hill or incline. Always park on level ground.
- Depressing accelerator pedal will release foot operated park brake and may cause inadvertent vehicle movement. Always park on a level surface.
- Drive vehicle only as fast as terrain and safety considerations allow. Consider the terrain and traffic conditions and avoid extremely rough terrain. Consider environmental factors and the ability to control the vehicle and stay in designated areas.
- Use extra caution and reduced speed when driving on poor surfaces, such as loose dirt, wet grass, gravel or when driving the vehicle across an incline.
- All travel should be directly up or down hills. Maintain a safe speed when driving downhill. Use service brake to control speed when travelling down an incline. A sudden stop or change of direction may result in loss of control. Never drive vehicle up, down or across an incline that exceeds 14 degrees (25% grade).
- Slow down before and during turns. All turns should be executed at reduced speed.
- To prevent loss of control, do not move the direction selector switch while the vehicle is in motion. Moving the selector will result in a sudden slowing and severe damage to the vehicle. Always bring vehicle to a complete stop before shifting the direction selector.
- Make sure that the direction selector is in correct position before attempting to start the vehicle.
- Do not take vehicle out of 'gear' while in motion (coast).
- Keep feet, legs, hands and arms inside vehicle at all times. All occupants must be seated while the vehicle is in motion.
- Check area behind the vehicle before operating in reverse.
- Never carry more people than the allocated seats.

Operaton and Service Information

Before driving the vehicle, we ask you to spend some time reading this material. This guide contains information that will assist you in maintaining this highly reliable vehicle. Some references may apply to items that are optional or not available for your vehicle. This guide covers the operation of several models, therefore, some information may not apply to or may not represent your vehicle. Physical differences in controls may apply.

Most of the service procedures in this guide can be accomplished using common automotive hand tools. Contact your service representative at EMC to service the vehicle in accordance with the periodic Service Schedule.

BEFORE INITIAL USE

Read this material completely and be sure you understand how to operate the vehicle, its equipment and how to use it safely. Maintaining good performance depends to a large extent on the operator.

Controls and indicators

Vehicle controls and indicators consist of:

- Dash mounted “Power On” Key / lights, accessories switch (optional, some models do not have lights or accessories). *LSV key/ignition in column
- Dash mounted direction selector switch Forward - Neutral - Reverse (Note: Neutral is the centre position)
- Steering Column mounted turn signal selector. (optional) (May incorporate horn on some models)
- State of change meter. (Sometimes referred to as battery status gauge)
- Accelerator pedal
- Combination service and park brake pedal
- Manual Hand brake. (Optional, some models do not have manual hand brake)
- Steering column mounted Light switch. (some models do not have lights)
- Floor mounted horn button. (Some models horn is operated by pulling back on turn signal selector)
- Run and Tow Switch **note:* When vehicle is broken down/not moving: just flick the switch for moving and tow

Key/accessories switch

Located on the dash panel, this switch enables the basic electrical system of the vehicle to be turned on and off by turning the key.

To prevent inadvertent operation of the vehicle when left unattended, the key should be turned to the ‘OFF’ position and removed.

If the vehicle is equipped with lights, the key switch has a second “On” position to allow lights and accessories to be powered.

Note: If the vehicle is equipped with factory installed custom accessories, some accessories require the key to be switched to the second “on” position for the accessories to operate.

Direction Selector

WARNING!

To prevent loss of control and or damage to the vehicle do not move the direction switch while the vehicle is in Motion. Moving the selector can result in sudden slowing of the vehicle and severe damage to the electronics.

Caution: To reduce the possibility of component damage, the vehicle must be completely stopped before moving the direction selector.

Located on the dash panel, this switch permits the selection of either ‘F’ (forward), ‘R’ (reverse) or neutral (the position between forward and reverse)

NOTE: The vehicle will not operate when switched to neutral position.

State of charge meter

Located on the dash, the state of change meter indicates the amount of useable power in the batteries.

NOTE:

The state of charge meter does not necessarily display the remaining range or distance the vehicle will travel before a recharge is required. For example, if the batteries are discharged by approximately 50%. Depending on battery condition and other factors the time required to fully recharge the batteries may be 8 hours but if the batteries are only charged for 2 hours the state of charge meter may well indicate fully charged batteries. In this case when the vehicle is operated the battery meter will drop very quickly to indicate the lower state of charge. The state of charge meter should be considered a guide only, and not relied upon as a remaining range or “distance to empty” indicator.
The state of charge meter also operates as a fault identification display. When the onboard computer (The Curtis Controller) detects a fault a fault code will be displayed on the battery state of charge meter. The fault code may be a series of off/on or alternating blinking lights. If a fault code is displayed, for example the top and the bottom light bar blink on 3 times then pause and then 3 times then pause. Call your selling dealer or service agent.

Accelerator pedal

WARNING!

Unintentional movement of the accelerator pedal will release the park brake and may cause the vehicle to move which could result in severe injury or death.

- With the key switch in the 'ON' position, depressing the accelerator pedal starts the motor and if the direction switch is set to either forward or reverse the vehicle will move in that direction.
- When the pedal is released, the motor will stop. Depress the service brake to stop the vehicle.
- If the key switch is 'ON' and park brake is set, depressing the accelerator inadvertently will release the park brake and will cause the vehicle to move which could cause severe injury or death.,
- Depressing the accelerator pedal will release the park brake if it is engaged. This is a feature to assure the vehicle is not driven with the park brake engaged.

Note: If the vehicle is fitted with a manual hand brake this brake will remain engaged even when the accelerator pedal is depressed. Driving or attempting to drive the vehicle while the hand brake is on will cause serious damage to the vehicle. *Always* release the hand brake before driving.

Combination brake and park brake pedal

The brake pedal incorporates a park brake feature. To engage the park brake, push down on the upper section of the pedal until it locks in place. The park brake will release when the accelerator pedal is depressed.

*Pullup handbrake fitted on some models.

Horn

The horn is operated by pushing the horn button located on the floor to the left of the brake pedal or pulling back on the turn signal blinker stalk. (Depending on model) (Horn not fitted to all models)

Sun top canopy and windshield

WARNING!

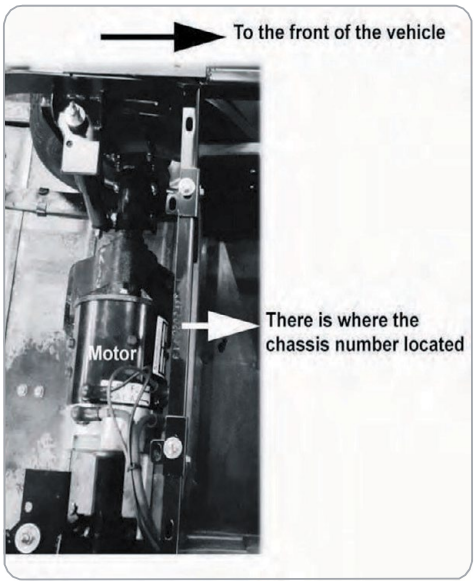
- The sun top canopy (if fitted) does not provide protection from roll over or falling objects.
- The windshield does not provide protection from tree limbs or flying objects.
- The sun top canopy and windshield provide some protection from the elements; however, they will not keep the operator and passenger dry in a downpour. The sun top does not provide protection from falling objects nor does the windshield protect against flying objects and tree limbs. Keep arms and legs inside of vehicle while it is moving.
- Check for correct TYRE inflation. See GENERAL SPECIFICATION (pg. 20)
- Determine and record braking distance required to stop vehicle for future brake performance tests.

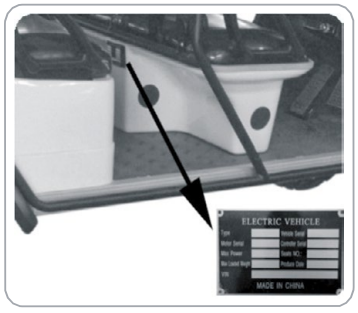
Safety Information

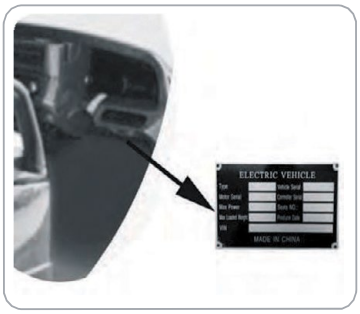
To reduce the chance of personal injury or property damage, the following must be fully observed:

General

- Many vehicles are used for a variety of tasks beyond the intended use of the vehicle; therefore, it is impossible to anticipate and warn against every possible combination of circumstances that may occur. No warnings can take the place of good common sense and prudent driving practices.
- Good common sense and prudent driving practices do more to prevent accidents and injury than all of the warnings and instructions combined. The manufacturer strongly suggests that all users and maintenance personnel read this entire material paying particular attention to the cautions and warnings contained therein.
- If you have any questions regarding this vehicle, contact your selling dealer at EMC. Contact details are on the front of this Owner's Guide.
- EMC reserves the right to make design changes without obligation to make these changes on units previously sold and the information contained in this material is subject to change without notice.
- EMC is not liable for errors in this material or for incidental or consequential damages that result from the use of the material.
- These vehicles are designed and manufactured for off-road use. They do not conform to Australian Motor Vehicle Safety Standards and are not equipped for operation on public streets. Some States and Territories may permit these vehicles to be operated on their streets on a limited basis and in accordance with local laws, rules and regulations.
- With electrically powered vehicles, be sure that all electrical accessories are grounded directly to the battery (-) post. Never use the chassis or body as a ground connection.
- Never modify vehicle in any way that will alter the weight distribution of the vehicle, decrease its stability or increase the speed beyond the factory specification. Such modifications can cause serious personal injury or death.
- Modifications that increase the speed and/or weight of the vehicle will extend the stopping distance and may reduce the stability of the vehicle. Do not make any such modifications or changes. The manufacturer prohibits and disclaims responsibility for any such modifications or other alteration, which would adversely affect the safety of the vehicle.
- Vehicles that are capable of higher speeds must limit their speed to no more than the speed of other vehicles when used in the same environment. Additionally, speed should be further moderated by the environmental conditions, terrain and common sense.
- *Note*: The location of the Chassis number of the vehicle







Batteries

Battery Safety

WARNING!

To prevent battery explosion that could result in severe personal injury or death, keep all smoking materials, open flame or sparks away from the batteries.

- Hydrogen gas is generated as a natural part of the lead acid battery charging process. A 4% concentration of hydrogen gas is explosive and could cause severe injury or death. Charging must take place in an area that is adequately ventilated (minimum of 5 air exchanges per hour).
- To reduce the chance of battery explosion that could result in severe injury or death, never smoke around or charge batteries in an area that has an open flame or electrical equipment that could cause and electrical arc.
- Vehicle batteries must be fully charged before initial use.
- Be sure that the key switch is off and all electrical accessories are turned off before starting work on the vehicle.
- Never disconnect a circuit under load at a battery terminal.
- Batteries are heavy. Use proper lifting techniques when moving them. Always lift the battery with a commercially available battery lifting device. Use caution not to tip batteries when removing or installing them; spilled electrolyte can cause burns and damage.
- The electrolyte in a storage battery is an acid solution which can cause severe burns to the skin and eyes. Treat all electrolyte spills to the body and eyes with extended flushing with clear water. Contact a physician immediately.
- Always wear a safety shield or approved safety goggles when adding water or charging batteries.
- Any electrolyte spills should be neutralised with a solution of ¼ cup (160ml) sodium bicarbonate (baking soda) dissolved in 6litres of water and flushed with water.
- Overfilling batteries may result in electrolyte being expelled from the battery during the charge cycle. Expelled electrolyte may cause damage to the vehicle and storage facility.
- Aerosol containers of battery terminal protectant must be used with extreme caution. Insulate metal container to prevent can from conducting battery terminals which could result in an explosion.
- Wrap wrenches with vinyl tape to prevent the possibility of a dropped wrench from shorting out a battery, which could result in an explosion and severe personal injury or death.
- Use protection when working on the vehicle. Use extra caution when working around batteries or using solvents or compressed air. Use eye protection, hand protection, foot protection, body protection or any other safety equipment based on the maintenance being carried out on the vehicle.

Charger Installation (Not applicable for optional onboard charger)

WARNING!

To prevent overheating that may cause serious damage to the charger and create the potential for fire, do not block or obstruct the airways. Chargers must be mounted on a platform above the ground or in such a manner as to permit the maximum air flow underneath and around the charger.

Prior to vehicle or charger operation, chargers must be removed and mounted on a platform or wall above the ground to permit maximum air flow around and underneath the charger. The charger must not be operated in an outdoor location, water and sun protection must be provided. The charger must never come into contact with water. A dedicated circuit is required for the charger. Refer to the charger manual for appropriate circuit protection. Make sure the AC power outlet is turned off when you insert the polarised DC plug completely into the vehicle receptacle.

Then turn the charger on by switching the AC wall switch to"ON". The charger will automatically start a few seconds after you switch it on. The charger will automatically stop when batteries are fully charged. Switch the AC power off at the wall outlet and the DC plug can be removed to permit use of the vehicle. Some chargers require that you push the "STOP" button before removing the plug from the vehicle even when the AC power is turned off at the wall outlet.

Note: Looping the DC cord through the steering wheel when charging serves as a good reminder to store the cord out of the way when finished with charging. The DC plug can be damaged by driving over or catching the cord on the vehicle when driving away.

WARNING!

To prevent a physical hazard that could result in an electrical shock or electrocution, be sure that the charger plug is not damaged and is inserted into the grounded receptacle. The power (AC) cord is equipped with a grounded plug, do not attempt to pull out, cut or bend the ground post.

The charging (DC) cord is equipped with a polarised connector which fits into a matching receptacle on the vehicle. The power (AC) cord is equipped with a grounded plug. Do not attempt to remove, cut or bend the ground post.

STORAGE/BATTERY CHARGING
The controlling party shall require battery changing and charging facilities and procedures are in accordance with all applicable regulations.

Battery General

A battery is defined as two dissimilar metals immersed in an acid. If the acid is absent or if the metals aren't dissimilar, a battery has not been created. The batteries most commonly used in these vehicles are lead acid.

A battery does not store electricity, but it is able to produce electricity as the result of a chemical reaction which releases stored chemical energy in the form of electrical energy. The chemical reaction takes place faster in warm conditions and slower in cold conditions. Temperature is important when conducting tests on a battery and test results must be corrected to compensate for temperature differences.

As a battery ages, it still performs adequately except that its capacity is diminished. Capacity describes the time that a battery can continue to provide its design amperes from a full charge.

A battery has a maximum life, therefore good maintenance is designed to maximise the available life and reduce the factors that can reduce the life of the battery.

Battery prolonged storage

All Batteries will self discharge over time. The rate of self discharge varies depending on the ambient temperature and the age and condition of the batteries. A fully charged battery will not freeze in winter temperatures unless the temperature falls below -60c.

For winter storage, the batteries must be clean, fully charged and disconnected from any source of electrical drain. Unplug the battery charger DC from the vehicle receptacle. As with all electric vehicles, the batteries must be checked and recharged as required or at a minimum of 30 day intervals.

Caution: Battery charger and other electronic devices need to be disconnected since they will contribute to the premature discharge of batteries.

During periods of storage, the batteries will need attention to keep them maintained and prevent discharge. In high temperatures the chemical reaction is faster, while low temperatures cause the chemical reaction to slow down. A vehicle that is stored at 32 C will loose .002 of specific gravity of 1.275, and the battery is allowed to sit unused, it will become partially discharged. When it reaches 1.240, which it will do in less than twenty days, it should be recharged. If a battery is left in a discharged state, sulphating takes place on and within the plates. This condition is not reversible and will cause permanent damage to the battery. In order to prevent damage, the battery should be recharged. A hydrometer can be used to determine the specific gravity and therefore the stateof change of a battery.

In winter conditions, the battery must be fully charged to prevent the possibility of freezing. A fully charged battery will not freeze in temperature's above -60 C. Although the chemical reaction is slowed in cold temperatures, the battery must be stored fully charged and disconnected from any circuit that could discharge the battery.

Chargers: disconnect the charging plug from the vehicle receptacle. The batteries must be cleaned and all deposits neutralised and removed from the battery case to prevent self discharge. The batteries should be tested or recharged at thirty day minimum intervals.

Batteries & charging

The battery charger is designed to fully charge the battery set. If the batteries are severely deep cycled, some automatic battery changers contain an electronic module that may not activate and the battery charger will not function. Automatic chargers will determine the correct duration of charge to the battery set and will shut off when the battery set is fully charged. Always refer to the instructions of the specific charger used.

Before charging, the following should be observed:

Caution: Do not overfill batteries. The charging cycle will expel electrolyte and result in component damage.

- The electrolyte level in all cells must be at the recommended level and cover the plates.
- The charging must take place in an area that is well ventilated and capable of removing the hydrogen gas that is generated by the charging process. A minimum of five air exchanges per out is recommended. The charging connector components are in good condition and free from dirt or debris.
- The charger connector is fully inserted into the vehicle receptacle.
- The charger connector/cord set is protected from damage and is located in an area to prevent injury that may result from personnel running over or tripping over the cord set.
- The charger must be turned off during the connect/disconnect cycle and therefore no electrical arc is generated at the DC plug/receptacle contacts. (Some chargers require the “STOP” button to be pushed before the charger is unplugged from the vehicle)

Battery Maintenance

Tool List Qty. Required Insulated Wrench 9/16” 1

Battery carrier 1

Hydrometer 1

Battery maintenance 1

At Each Charging Cycle

WARNING!

To reduce the possibility of fire, never attach a battery charger to a vehicle that is unattended beyond the normal charging cycle. Overcharging could cause damage to the vehicle batteries and result in extreme overheating. The charger should be checked after 24 hours and unplugged after the charge cycle is complete.

Before changing the batteries, inspect the plug of the battery charger and vehicle receptacle housing for dirt or debris. Charge the batteries after each days use.

Monthly

- Inspect all wiring for fraying, loose, terminations, corrosion or deterioration of insulation.
- Check that the electrolyte level is correct and add suitable water as required.
- Clean the batteries and wire terminations.

Electrolyte level and water

The correct level of the electrolyte is 13mm above the plates in each cell.

This level will leave approximately 6-10mm of space between the electrolyte and the vent tube. The electrolyte level is important since any portion of the plates exposed to air will be ruined beyond repair. Of equal importance is too much water which will result in electrolyte being forced out of the battery due to gassing and the increase in volume of the electrolyte that results from the charging cycle.

Caution: Do not overfill batteries. The charging cycle will expel electrolyte and result in component damage.

A battery being charged will 'gas' with the majority of the gassing taking place at the end of the charging cycle. This gas is hydrogen which is lighter than air. Water and sulphuric acid droplets will be carried out of the battery vents by the hydrogen gas; however, this loss is minimal. If the battery electrolyte level is too high, the electrolyte will block the vent tube and the gas will force it out of the vent tube and battery cap. The water will evaporate but the sulphuric acid will remain where it can damage vehicle components and the storage facility. Sulphuric acid loss will weaken the concentration of acid within the electrolyte and reduce the life of the battery.

Over the life of the battery, a considerable amount of water is consumed. It is important that the water used be pure and free of contaminants that could reduce the life of the battery by reducing the chemical reaction. The water must be distilled or purified by an efficient filtration system. Water that is not distilled should be analysed and if required, filtration installed to permit the water to meet the requirements of the water purity table.

Even if the water is colourless, odourless, tasteless and fit for drinking, the water should be analysed to see that it does not exceed the impurity levels specified in the table. Automatic watering devices can be used with an approved water source. These watering devices are fast and accurate to use and maintain the correct electrolyte level within the battery cells.

Battery Cleaning

Caution: To prevent battery damage, be sure that all battery caps (if equipped) are tightly installed. To reduce the possibility of damage to vehicle or floor, neutralise acid before wiping battery.

To reduce the possibility of damage to electrical components while cleaning, do not use a pressure washer/hose/bucket.

Cleaning should take place on a regular basis. When cleaning the outside of batteries and terminals, first spray with a solution of sodium bicarbonate (baking soda) and water to neutralise any acid deposits before wiping with clear water. Use of a wiping without first neutralising any acid will move acid from the top of batteries to another area of the vehicle or storage facility where it will attack the metal structure or the concrete/asphalt floor. Additionally, conductive residue will remain on the batteries and contribute to their self discharge.

WARNING!

To reduce the possibility of battery explosion that could result in severe injury or death, do not use metallic spray wand to clean battery and keep smoking materials, open flame or sparks away from the battery.

The correct cleaning technique is to spray the top and sides with a solution of sodium bicarbonate (baking soda) and water. This solution is best applied with a garden type sprayer equipped with a non metallic spray wand or plastic spray bottle. In addition, special attention should be paid to metal components adjacent to the batteries which should also be sprayed with the solution.

Allow the solution to sit for at least three minutes. Use a soft bristle brush or cloth to wipe the tops of the batteries to remove any conductive residue. Rinse the entire area with a handheld spray bottle clear water. Do not use a pressure washer, bucket or hose.

Battery replacement

Disconnect batteries and be aware of the correct arrangement for reconnection.

Remove battery hold downs and cables. Lift out batteries with a commercially available lifting device. If the batteries have been cleaned and any acid in the battery rack area neutralised as recommended, no corrosion to the battery racks or surrounding area should be present. Any corrosion found should be immediately removed. The area should be washed with a solution of sodium bicarbonate (baking soda) and water and thoroughly dried before priming and painting with a corrosion resistant paint.

The batteries should be placed into the battery racks and the battery hold downs tightened to 5-6 Nm torque, to prevent movement but not tight enough to cause distortion of the battery cases.

Inspect all wires and terminals. Clean any corrosion from the battery terminals or the wire terminals with a solution of sodium bicarbonate (baking soda) and brush clean if required.

WARNING!

To prevent battery explosion that could result in severe personal injury or death, extreme caution must be used with aerosol containers of battery terminal protectant. Insulate the metal container to prevent the metal can from contacting battery terminals which could result in an explosion.

Use caution to connect the battery wires correctly. Tighten the battery post hardware. Protect the battery terminals and battery wire terminals with a commercially available protective coating.

Troubleshooting

In general, troubleshooting will be done for two distinct reasons. First, a battery that performs poorly and is outside of the manufacturer's specifications should be identified in order to replace it under the terms of the manufacturer representative for specific requirements.

The second reason is to determine why a particular vehicle does not perform adequately. Performance problems may result in a vehicle that runs slowly or in a vehicle that is unable to operate for the time required.

A new battery must mature before it will develop its maximum capacity. Maturing may take up to 100 charge/discharge cycles.

After the maturing phase, the older a battery gets, the lower the capacity. The only way to determine the capacity of a battery is to perform a load test using a discharge machine following manufacturer's recommendations.

A cost effective way to identify a poorly performing battery is to use a hydrometer to identify a battery in a set with a lower than normal specific gravity. Once the particular cell or cells that are the problem are identified, the suspect battery can be removed and replaced. At this point there is nothing that can be done to salvage the battery; however, the individual battery should be replaced with a good battery of the same brand, type and approximate age.

Hydrometer

A hydrometer is used to test the state of charge of a battery cell. This is performed by measuring the density of the electrolyte, which is accomplished by measuring the specific gravity of the electrolyte. The greater the concentration of sulphuric acid, the more dense the electrolyte becomes. The higher the density, the higher the state of change.

WARNING!

To prevent battery explosion that could result in severe personal injury or death, never insert a metal thermometer into a battery. Use a hydrometer with a built in thermometer that is designed for testing batteries.

Battery Filling Systems

- **Batteries should only be filled after charging**
- **Personal protective equipment should be worn during installation and watering**
- **Do not store hand pump in battery compartment**

STEP 1: FULLY CHARGE THE BATTERIES
This must be done before water is added to the batteries to avoid electrolyte loss.

STEP 2: FILLING WITH A MANUAL PUMP
Insert the manual pump assembly end into a jug of distilled water.

STEP 3: ATTACH WATER SUPPLY LINE
Remove the dust cap from the watering system fill tube. Connect it to the manual pump connector by inserting it into the quick connect.

STEP 4: FILL BATTERY WITH WATER
Squeeze the bulb on the manual pump to begin filling the battery cells with water. When the bulb becomes hard, and the valve indicator eyes have risen, all of the cells are full.

STEP 5: DISCONNECT
Disconnect the manual pump connector from the watering system and replace the dust cap.

WARNING!

NEVER LEAVE WATERING SYSTEM CONNECTED TO MANUAL PUMP OR ANY OTHER FILLING DEVICE!

Transport

Towing

Make sure the vehicle is turned off and the key is removed from the switch before towing.

WARNING!

To reduce the possibility of severe injury or death resulting from loss of vehicle control, consider the grade of the terrain the vehicle is on.

WARNING!

Only qualified persons using approved towing equipment should attempt towing. It is NOT necessary to remove a battery lead before towing but towing distance should be limited and not more than 2 kilometres at very low speeds.

To reduce the possibility of severe injury or death:

- Use extra caution when towing vehicle
- Do not ride on vehicle being towed
- Do not tow vehicle on highways.
- Do not tow vehicle at speeds in excess of 10kph. (lower speed is preferable)
- Do not tow more than one vehicle at a time.

Trucking, transporting & hauling

WARNING!

To reduce the possibility of severe injury or death while transport vehicle:

- Secure the vehicle and contents
- Never ride on vehicle being transported
- Always remove windshield before transporting
- Maximum speed with sun top installed is 80kph

If the vehicle is to be transported at highway speeds the seat bottom/s must be secured. Utility vehicles may require battery maintenance hatch and or battery tray to be secured. When transporting vehicle check for tightness of hardware and cracks in sun top at mounting points. Always remove windshield when transporting. Always check that the vehicle and contents are adequately secured before transporting.

The rated capacity of the trailer or truck must exceed the weight of the vehicle and load plus 500kg). Lock the park brake (and hand brake if fitted) and secure the vehicle using ratchet tie downs.

Specifications

EXECUTIVE- standard equipment	
Batteries	Six 8 volt Deep Cycle (Trojan T875 or US8VGC)
Controller	Curtis Solid State, Non-Contact Inductive Throttle Sensor
Motor	48 V wound, Non Vented 3KW Brazed Armature and solid copper windings.
Transaxle	12.44:1 Helical Geared with Input Pinion Shaft Directly connected to motor shaft
Brakes	Dual rear wheel, self-adjusting mechanical drum brakes
Parking brake	Automatic parking brake release with self-compensating system
Front suspension	Leaf springs with hydraulic shock absorbers
Rear suspension	Leaf springs with hydraulic shock absorbers
Steering	Singe reduction rack and pinion
Steering wheel	Dual handgrips, pencil holder & scorecard holder
Seating	Cushion Foam/vinyl cover, hip restraint/hand hold
Seating capacity	2, 3, 4, Seat
Total load capacity	SWB: 320kg, LWB: 480kg, XLWB: 640kg
Speed	16 - 18 kph
Chassis	Welded Tubular steel
Body	Flexible, Impact Resistant Injection Moulded Plastic
Standard colours	White, Green and Yellow, Blue, Black, Champagne and Silver
Dash panel	Reinforced plastic with 4 Drink Holders, Tee & Ball Storage
Tyres	10 inch. 18 x 8.50 – 10 (4 ply rated) With Wheel Covers
Tyre pressure	18 – 22 psi
Weight	SWB: 480kg,
Operating controls and instrumentation	Standard black steering wheel, foot operated dual function service brake and parking brake. Removable Three position Key, Direction Selector, Audible Reverse Warning. Light switch, state of charge meter
Weather canopy	Glass fibre reinforced or moulded plastic
Windscreen	One piece fixed resin
Electrics package	Headlight, tail lights, turn signal indicator lights, horn.

Specifications

ELITE - standard equipment	
Batteries	Six 8 volt Deep Cycle (Trojan T875 or US8VGC)
Speed Controller	Curtis Solid State, with Non-Contact Inductive Throttle Sensor
Motor	48V wound, Non Vented 4kw Brazed Armature and solid copper windings
Transaxle	12.44:1 Helical Geared with Input Pinion Shaft directly connected to motor shaft
Brakes	Dual rear wheel, self adjusting mechanical drum brakes
Parking brake	Automatic parking brake release with self-compensating system
Front suspension	Leaf springs with hydraulic shock absorbers
Rear suspension	Leaf springs with hydraulic shock absorbers
Steering	Singe reduction rack and pinion
Steering wheel	Deluxe wood grain style with dual handgrips, pencil holder & scorecard holder
Seating	Cushion Foam/vinyl cover, hip restraint/hand hold
Seating capacity	2, 3, 4, 6, & 8 Seat
Total load capacity	SWB: 320kg, LWB: 480kg, XLWB: 640kg
Speed	21 – 26 kph *Limited to 20kph *subject to Conditional registration
Chassis	Welded Tubular steel
Body	Flexible, Impact Resistant Injection Moulded Plastic
Standard colours	Champagne, Sapphire Blue, Red, Black, White, Green, Yellow,
Dash panel	Wood grain style reinforced plastic with 4 drink holders, tee & ball storage
Tyres	10 inch. 18 x 8.50 – 10 (4 ply rated) with wheel covers
Tyre pressure	18 – 22 psi
Weight	SWB: 480kg, LWB: 580kg, XLWB: 670kg
Instrumentation	Steering wheel, foot operated brake and parking brake. Removable Key, Direction Selector, and Audible Reverse Warning. Light switch, state of charge meter
Weather canopy	Glass fiber reinforced or moulded plastic
Windscreen	Tinted split-fold

Note:

These are the standardised specifications that cover our vehicles at EMC. However, some specifications vary depending on your vehicle type due to circumstances such as modifications to your vehicle.