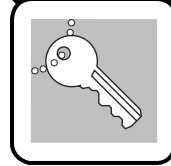
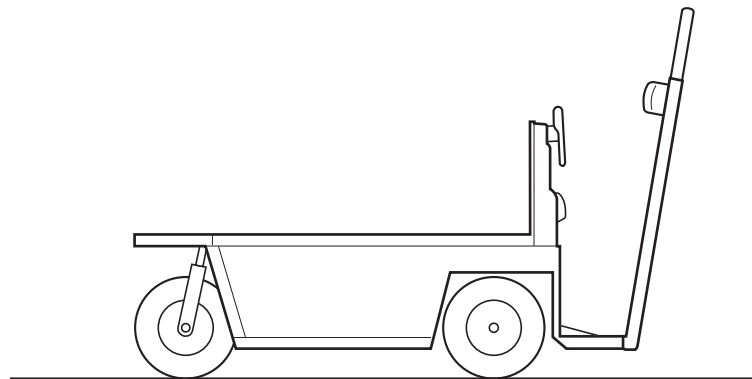


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**CUSHMAN**<sup>®</sup>  
A Textron Company



# OWNER'S MANUAL AND SERVICE GUIDE



**ELECTRIC POWERED THREE WHEEL  
SERVICE VEHICLE**

ISSUED JULY 2009

# SAFETY

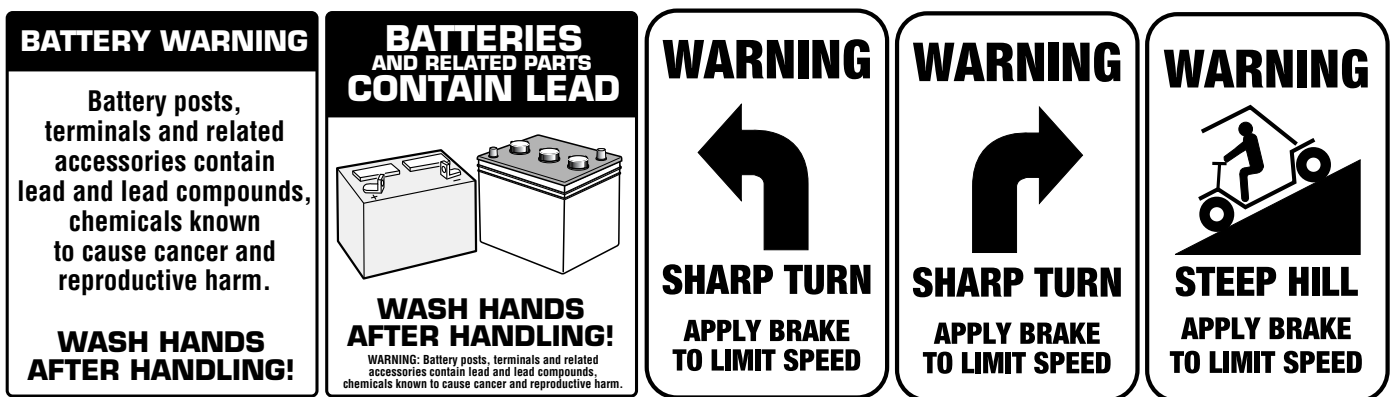
Read and understand all labels located on the vehicle. For any questions on any of the information, contact a representative for clarification.

Always replace any damaged or missing labels.

On steep hills it is possible for vehicles to coast at greater than normal speeds encountered on a flat surface. To prevent loss of vehicle control and possible serious injury, speeds should be limited to no more than the maximum speed on level ground. (See vehicle specification.) Limit speed by applying the service brake.

Catastrophic damage to the drive train components due to excessive speed may result from driving the vehicle above specified speed. Damage caused by excessive speed may cause a loss of vehicle control, is costly, is considered abuse and will not be covered under warranty.

If the vehicle is to be used in a commercial environment, signs similar to the ones illustrated should be used to warn of situations that could result in an unsafe condition.



Be sure that this manual remains as part of the permanent service record should the vehicle be resold.

## NOTES, CAUTIONS AND WARNINGS

Throughout this guide **NOTE**, **CAUTION** and **WARNING** will be used.

### NOTICE

A **NOTE** indicates a condition that should be observed.



### CAUTION

A **CAUTION** indicates a condition that may result in damage to the vehicle.



### WARNING

A **WARNING** indicates a hazardous condition that could result in severe injury or death.

Please observe these **NOTES**, **CAUTIONS** and **WARNINGS**; be aware that servicing a vehicle requires mechanical skill and a regard for conditions that could be hazardous. Improper service or repair may damage the vehicle or render it unsafe.



### WARNING

**Battery posts, terminals and related accessories contain lead and lead compounds. Wash hands after handling.**

(NOTES, CAUTIONS AND WARNINGS CONTINUED ON INSIDE OF BACK COVER)

# **OWNER'S MANUAL AND SERVICE GUIDE**

## **ELECTRIC POWERED THREE WHEEL SERVICE VEHICLE**

### **VEHICLES**

**CUSHMAN INDUSTRIAL 640  
CUSHMAN STOCK CHASER**

### **Starting Model Year 2009**

The CUSHMAN Division of Textron Inc. reserves the right to incorporate engineering and design changes to products in this Manual, without obligation to include these changes on units leased/sold previously.

The information contained in this Manual may be revised periodically by the CUSHMAN Division, and therefore is subject to change without notice.

The CUSHMAN Division **DISCLAIMS LIABILITY FOR ERRORS IN THIS MANUAL**, and the CUSHMAN Division **SPECIFICALLY DISCLAIMS LIABILITY FOR INCIDENTAL AND CONSEQUENTIAL DAMAGES** resulting from the use of the information and materials in this Manual.

#### **TO CONTACT US**

##### **NORTH AMERICA:**

**TECHNICAL ASSISTANCE & WARRANTY PHONE: 1-800-774-3946, FAX: 1-800-448-8124**

**SERVICE PARTS PHONE: 1-888-GET-CUSHMAN (1-888-438-3946), FAX: 1-800-752-6175**

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**PHONE: 010-1-706-798-4311, FAX: 010-1-706-771-4609**

**TEXTRON GOLF, TURF & SPECIALTY PRODUCTS**

**1451 MARVIN GRIFFIN ROAD, AUGUSTA, GEORGIA USA 30906-3852**

## NOTES

To obtain a copy of the limited warranty applicable to the vehicle, call or write a local Distributor, an authorized Branch or the Warranty Department with vehicle serial number and manufacturer code.

The use of non Original Equipment Manufacturer (OEM) parts may void the warranty.

Overfilling of batteries may void the warranty.

### 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 -75° F (-60° C).

For winter storage, the batteries must be clean, fully charged and disconnected from any source of electrical drain, such as the battery charger. Disconnect the battery charger cable from the vehicle batteries when not charging.

As with all electric vehicles, the batteries must be checked and recharged as required or at a minimum of 30 day intervals.

Refer to the 'Prolonged Storage' section within the BATTERIES AND CHARGING section of this manual.

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# SAFETY INFORMATION

*Read all of manual to become familiar with this vehicle. Pay particular attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.*

This manual has been designed to assist the owner-operator in maintaining the vehicle in accordance with procedures developed by the manufacturer. Adherence to these procedures and troubleshooting tips will ensure the best possible service from the product. To reduce the chance of personal injury and/or property damage, the following instructions must be carefully observed:



## CAUTION

Certain replacement parts can be used independently and/or in combination with other accessories to modify an CUSHMAN-manufactured vehicle to permit the vehicle to operate at or in excess of 20mph. When an CUSHMAN-manufactured vehicle is modified in any way by the Distributor, Dealer or customer to operate at or in excess of 20mph, UNDER FEDERAL LAW the modified product will be a Low Speed Vehicle (LSV) subject to the strictures and requirements of Federal Motor Vehicle Safety Standard 571.500. In these instances, pursuant to Federal law the Distributor or Dealer MUST equip the product with headlights, rear lights, turn signals, seat belts, top, horn and all other modifications for LSV's mandated in FMVSS 571.500, and affix a Vehicle Identification Number to the product in accordance with the requirements of FMVSS 571.565. Pursuant to FMVSS 571.500, and in accordance with the State laws applicable in the places of sale and use of the product, the Distributor, Dealer or customer modifying the vehicle also will be the Final Vehicle Manufacturer for the LSV, and required to title or register the vehicle as mandated by State law.

CUSHMAN will NOT approve Distributor, Dealer or customer modifications converting CUSHMAN products into LSV's.

The Company, in addition, recommends that all CUSHMAN products sold as personal transportation vehicles BE OPERATED ONLY BY PERSONS WITH VALID DRIVERS LICENSES, AND IN ACCORDANCE WITH APPLICABLE STATE REQUIREMENTS. This restriction is important to the SAFE USE AND OPERATION of the product. On behalf of CUSHMAN, I am directing that CUSHMAN Branch personnel, Distributors and Dealers advise all customers to adhere to this SAFETY RESTRICTION, in connection with the use of all products, new and used, the Distributor or Dealer has reason to believe may be operated in personal transportation applications.

Information on FMVSS 571.500 can be obtained at Title 49 of the Code of Federal Regulations, section 571.500, or through the Internet at the website for the U.S. Department of Transportation - at Dockets and Regulation, then to Title 49 of the Code of Federal Regulations (Transportation).

## GENERAL

Many vehicles are used for a variety of tasks beyond the original 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 the owner-operator read this entire manual paying particular attention to the CAUTIONS and WARNINGS contained therein. It is further recommended that employees and other operators be encouraged to do the same.

If you have any questions, contact your closest representative or write to the address on the back cover of this publication, Attention: Product Service Department.

TEXTRON Golf, Turf & Specialty Products reserves the right to make design changes without obligation to make these changes on units previously sold and the information contained in this manual is subject to change without notice.

TEXTRON Golf, Turf & Specialty Products is not liable for errors in this manual or for incidental or consequential damages that result from the use of the material in this manual.

# SAFETY INFORMATION

*Read all of manual to become familiar with this vehicle. Pay particular attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.*

This vehicle conforms to the current applicable standard for safety and performance requirements.

These vehicles do not conform to Federal Motor Vehicle Safety Standards and are not equipped for operation on public streets.

With electric 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.**

Refer to GENERAL SPECIFICATIONS for vehicle seating capacity.

**Never modify the 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 any other alteration which would adversely affect the safety of the vehicle.

## GENERAL OPERATION

Always use the vehicle in a responsible manner and maintain the vehicle in safe operating condition.

Always read and observe all warnings and operation instruction labels affixed to the vehicle.

Always follow all safety rules established in the area where the vehicle is being operated.

Always reduce speed to compensate for poor terrain or conditions.

Always apply service brake to control speed on steep grades.

Always maintain adequate distance between vehicles.

Always reduce speed in wet areas.

Always use extreme caution when approaching sharp or blind turns.

Always use extreme caution when driving over loose terrain.

Always use extreme caution in areas where pedestrians are present.

## MAINTENANCE

Always maintain your vehicle in accordance with the manufacturer's periodic service schedule.

Always ensure that mechanics performing repairs are trained and qualified to do so.

Always follow the manufacturer's directions if you do any maintenance on your vehicle. Be sure to disable the vehicle before performing any maintenance. Disabling includes removing the key from the key switch and removal of a battery wire.

Always insulate any tools used within the battery area in order to prevent sparks or battery explosion caused by shorting the battery terminals or associated wiring. Remove the batteries or cover exposed terminals with an insulating material.

# SAFETY INFORMATION

*Read all of manual to become familiar with this vehicle. Pay particular attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.*

Always check the polarity of each battery terminal and be sure to rewire the batteries correctly.

Always use specified replacement parts. Never use replacement parts of lesser quality.

Always use recommended tools.

Always determine that tools and procedures not specifically recommended by the manufacturer will not compromise the safety of personnel nor jeopardize the safe operation of the vehicle.

Always support the vehicle using wheel chocks and safety stands. Never get under a vehicle that is supported by a jack. Lift the vehicle in accordance with the manufacturer's instructions.

Never attempt to maintain a vehicle in an area where exposed flame is present or persons are smoking.

Always be aware that a vehicle that is not performing as designed is a potential hazard and must not be operated.

The manufacturer cannot anticipate all situations, therefore people attempting to maintain or repair the vehicle must have the skill and experience to recognize and protect themselves from potential situations that could result in severe personal injury or death and damage to the vehicle. Use extreme caution and, if unsure as to the potential for injury, refer the repair or maintenance to a qualified mechanic.

Always test drive the vehicle after any repairs or maintenance. All tests must be conducted in a safe area that is free of both vehicular and pedestrian traffic.

Always replace damaged or missing warning, caution or information labels.

Always keep complete records of the maintenance history of the vehicle.

## VENTILATION

Hydrogen gas is generated in the charging cycle of batteries and is explosive in concentrations as low as 4%. Because hydrogen gas is lighter than air, it will collect in the ceiling of buildings necessitating proper ventilation. Five air exchanges per hour is considered the minimum requirement.

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

Always use a dedicated circuit for each battery charger. Do not permit other appliances to be plugged into the receptacle when the charger is in operation.

Chargers must be installed and operated in accordance with charger manufacturers recommendations or applicable electrical code (whichever is more restrictive).



# SAFETY INFORMATION

*Read all of manual to become familiar with this vehicle. Pay particular attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.*

## GENERAL

The following text is provided as recommended by part II of ASME/ANSI B56.8-1988. CUSHMAN strongly endorses the contents of this specification.

## PART II FOR THE USER

### 4 GENERAL SAFETY PRACTICES

#### 4.1 Introduction

**4.1.1** Like other machines, carriers can cause injury if improperly used or maintained. Part II contains broad safety practices applicable to carrier operations. Before operation, the user shall establish such additional specific safety practices as may reasonably be required for safe operation.

#### 4.2 Stability

**4.2.1** Experience has shown that this vehicle, which complies with this standard, is stable when properly operated and when operated in accordance with specific safety rules and practices established to meet actual operating terrain and conditions. However, improper operation, faulty maintenance, or poor housekeeping may contribute to a condition of instability and defeat the purpose of the standard. Some of the conditions which may affect stability are failure of the user to follow safety practices; also, ground and floor conditions, grade, speed, loading, the operation of the carrier with improper loads, battery weight, dynamic and static forces, and the judgement exercised by the carrier operator.

(a) The user shall train carrier operators to adhere strictly to the operating instructions stated in this Standard.

(b) The user shall survey specific operating conditions and environment, and establish and train carrier operators to comply with additional, specific safety practices.

#### 4.3 Nameplates, Markings, Capacity, and Modifications

**4.3.1** The user shall maintain in a legible condition all nameplates, warnings, and instructions which are supplied by the manufacturer.

**4.3.2** The user shall not perform any modification or addition which affects capacity or safe operation, or make any change not in accordance with the owner's

manual without the manufacturer's prior written authorization. Where authorized modifications have been made, the user shall ensure that capacity, operation, warning, and maintenance instruction plates, tags, or decals are changed accordingly.

**4.3.3** As required under paras. 4.3.1 or 4.3.2, the manufacturer shall be contacted to secure new nameplates, warnings, or instructions which shall then be affixed in their proper place on the carrier.

#### 4.4 Fuel Handling and Storage

**4.4.1** The user shall supervise the storage and handling of liquid fuels (when used) to be certain that it is in accordance with appropriate paragraphs of ANSI/NFPA 505 and ANSI/NFPA 30.

**4.4.2** Storage and handling of liquefied petroleum gas fuels shall be in accordance with appropriate paragraphs of ANSI/NFPA 505 and ANSI/NFPA 58. If such storage or handling is not in compliance with these standards, the user shall prevent the carrier from being used until such storage and handling is in compliance with these standards.

#### 4.5 Changing and Charging Storage Batteries for Electric Personnel and Burden Carriers

**4.5.1** The user shall require battery changing and charging facilities and procedures to be in accordance with appropriate paragraphs of ANSI/NFPA 505.

**4.5.2** The user shall periodically inspect facilities and review procedures to be certain that appropriate paragraphs of ANSI/NFPA 505, are strictly complied with, and shall familiarize carrier operators with it.

#### 4.6 Hazardous Locations

**4.6.1** The user shall determine the hazard classification of the particular atmosphere or location in which the carrier is to be used in accordance with ANSI/NFPA 505.

**4.6.2** The user shall permit in hazardous areas only those carriers approved and of the type required by ANSI/NFPA 505.

#### 4.7 Lighting for Operating Areas

**4.7.1** The user, in accordance with his responsibility to survey the environment and operating conditions, shall determine if the carrier requires lights and, if so, shall equip the carrier with appropriate lights in accordance with the manufacturer's recommendations.

# SAFETY INFORMATION

Read all of manual to become familiar with this vehicle. Pay particular attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.

## 4.8 Control of Noxious Gases and Fumes

**4.8.1** When equipment powered by internal combustion engines is used in enclosed areas, the atmosphere shall be maintained within limits specified in the American Conference of Governmental Industrial Hygienists publication, "Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment". This shall be accomplished by ventilation provided by the user, and/or the installation, use, and proper maintenance of emission control equipment recommended or provided by the manufacturer of the equipment.

## 4.9 Warning Device(s)

**4.9.1** The user shall make periodic inspections of the carrier to be certain that the sound-producing and/or visual device(s) are maintained in good operating condition.

**4.9.2** The user shall determine if operating conditions require the carrier to be equipped with additional sound-producing and/or visual devices and be responsible for providing and maintaining such devices, in accordance with the manufacturer's recommendations.

## 5 OPERATING SAFETY RULES AND PRACTICES

### 5.1 Personnel and Burden Carrier Operator Qualifications

**5.1.1** Only persons who are trained in the proper operation of the carrier shall be authorized to operate the carrier. Operators shall be qualified as to visual, auditory, physical, and mental ability to safely operate the equipment according to Section 5 and all other applicable parts of this Standard.

### 5.2 Personnel and Burden Carrier Operators' Training

**5.2.1** The user shall conduct an operators' training program.

**5.2.2** Successful completion of the operators' training program shall be required by the user before operation of the carrier. The program shall be presented in its entirety to all new operators and not condensed for those claiming previous experience.

**5.2.3** The user should include in the operators' training program the following:

- (a) instructional material provided by the manufac-

turer;

- (b) emphasis on safety of passengers, material loads, carrier operator, and other employees;

- (c) general safety rules contained within this Standard and the additional specific rules determined by the user in accordance with this Standard, and why they were formulated;

- (d) introduction of equipment, control locations and functions, and explanation of how they work when used properly and when used improperly, and surface conditions, grade, and other conditions of the environment in which the carrier is to be operated;

- (e) operational performance tests and evaluations during, and at completion of, the program.

### 5.3 Personnel and Burden Carrier Operator Responsibility

**5.3.1** Operators shall abide by the following safety rules and practices in paras. 5.4, 5.5, 5.6, and 5.7.

### 5.4 General

**5.4.1** Safeguard the pedestrians at all times. Do not drive carrier in a manner that would endanger anyone.

**5.4.2** Riding on the carrier by persons other than the operator is authorized only on personnel seat(s) provided by the manufacturer. All parts of the body shall remain within the plan view outline of the carrier.

**5.4.3** When a carrier is to be left unattended, stop carrier, apply the parking brake, stop the engine or turn off power, turn off the control or ignition circuit, and remove the key if provided. Block the wheels if machine is on an incline.

**5.4.4** A carrier is considered unattended when the operator is 25 ft. (7.6 m) or more from the carrier which remains in his view, or whenever the operator leaves the carrier and it is not within his view. When the operator is dismounted and within 25 ft. (7.6 m) of the carrier still in his view, he still must have controls neutralized, and the parking brake(s) set to prevent movement.

**5.4.5** Maintain a safe distance from the edge of ramps and platforms.

**5.4.6** Use only approved carriers in hazardous locations, as defined in the appropriate safety standards.

**5.4.7** Report all accidents involving personnel, building structures, and equipment.

**5.4.8** Operators shall not add to, or modify, the carrier.

# SAFETY INFORMATION

*Read all of manual to become familiar with this vehicle. Pay particular attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.*

**5.4.9** Carriers shall not be parked or left unattended such that they block or obstruct fire aisles, access to stairways, or fire equipment.

## 5.5 Traveling

**5.5.1** Observe all traffic regulations, including authorized speed limits. Under normal traffic conditions keep to the right. Maintain a safe distance, based on speed of travel, from a carrier or vehicle ahead; and keep the carrier under control at all times.

**5.5.2** Yield the right of way to pedestrians, ambulances, fire trucks, or other carriers or vehicles in emergency situations.

**5.5.3** Do not pass another carrier or vehicle traveling in the same direction at intersections, blind spots, or at other dangerous locations.

**5.5.4** Keep a clear view of the path of travel, observe other traffic and personnel, and maintain a safe clearance.

**5.5.5** Slow down or stop, as conditions dictate, and activate the sound-producing warning device at cross aisles and when visibility is obstructed at other locations.

**5.5.6** Ascend or descend grades slowly.

**5.5.7** Avoid turning, if possible, and use extreme caution on grades, ramps, or inclines; normally travel straight up and down.

**5.5.8** Under all travel conditions the carrier shall be operated at a speed that will permit it to be brought to a stop in a safe manner.

**5.5.9** Make starts, stops, turns, or direction reversals in a smooth manner so as not to shift the load, endanger passengers, or overturn the carrier.

**5.5.10** Do not indulge in dangerous activities, such as stunt driving or horseplay.

**5.5.11** Slow down when approaching, or on, wet or slippery surfaces.

**5.5.12** Do not drive carrier onto any elevator unless specifically authorized to do so. Approach elevators slowly, and then enter squarely after the elevator car is properly leveled. Once on the elevator, neutralize the controls, shut off power, and set parking brakes. It is advisable that all other personnel leave the elevator before a carrier is allowed to enter or exit.

**5.5.13** Avoid running over loose objects, potholes, and bumps.

**5.5.14** To negotiate turns, reduce speed to improve stability, then turn hand steering wheel or tiller in a

smooth, sweeping motion.

## 5.6 Loading

**5.6.1** Handle only stable and safely arranged loads. When handling off-center loads which cannot be centered, operate with extra caution.

**5.6.2** Handle only loads within the capacity of the carrier as specified on the nameplate.

**5.6.3** Handle loads exceeding the dimensions used to establish carrier capacity with extra caution. Stability and maneuverability may be adversely affected.

## 5.7 Operator Care of Personnel and Burden Carriers

**5.7.1** At the beginning of each shift during which the carrier will be used, the operator shall check the carrier condition and inspect the tires, warning devices, lights, battery(s), speed and directional controllers, brakes, and steering mechanism. If the carrier is found to be in need of repair, or in any way unsafe, the matter shall be reported immediately to the designated authority and the carrier shall not be operated until it has been restored to safe operating condition.

**5.7.2** If during operation the carrier becomes unsafe in any way, the matter shall be reported immediately to the designated authority, and the carrier shall not be operated until it has been restored to safe operating condition.

**5.7.3** Do not make repairs or adjustments unless specifically authorized to do so.

**5.7.4** The engine shall be stopped and the operator shall leave the carrier while refueling.

**5.7.5** Spillage of oil or fuel shall be carefully and completely absorbed or evaporated and fuel tank cap replaced before starting engine.

**5.7.6** Do not operate a carrier with a leak in the fuel system or battery(s).

**5.7.7** Do not use open flames for checking electrolyte level in storage battery(s) or liquid level in fuel tanks.

# 6 MAINTENANCE PRACTICES

## 6.1 Introduction

**6.1.1** Carriers may become hazardous if maintenance is neglected. Therefore, maintenance facilities, trained personnel, and procedures shall be provided. Such facilities may be on or off the premises.

# SAFETY INFORMATION

*Read all of manual to become familiar with this vehicle. Pay particular attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.*

## 6.2 Maintenance Procedures

**6.2.1** Maintenance and inspection of all carriers shall be performed in conformance with the manufacturer's recommendations and the following practices.

(a) A scheduled preventive maintenance, lubrication, and inspection system shall be followed.

(b) Only qualified and authorized personnel shall be permitted to maintain, repair, adjust, and inspect carriers.

(c) Before undertaking maintenance or repair, follow the manufacturer's recommendations for immobilizing the carrier.

(d) Block chassis before working underneath it.

(e) Before disconnecting any part of the engine fuel system of a gasoline or diesel powered carrier with gravity feed fuel systems, be sure shutoff valve is closed, and run engine until fuel system is depleted and engine stops running.

(f) Before disconnecting any part of the engine fuel system of LP gas powered carriers, close the LP gas cylinder valve and run the engine until fuel in the system is depleted and the engine stops running.

(g) Operation to check performance of the carrier shall be conducted in an authorized area where safe clearance exists.

(h) Before commencing operation of the carrier, follow the manufacturer's instructions and recommended procedures.

(i) Avoid fire hazards and have fire protection equipment present in the work area. Do not use an open flame to check level or leakage of fuel, battery electrolyte, or coolant. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.

(j) Properly ventilate the work area.

(k) Handle LP gas cylinders with care. Physical damage, such as dents, scrapes, or gouges, may dangerously weaken the tank and make it unsafe for use.

(l) Brakes, steering mechanisms, speed and directional control mechanisms, warning devices, lights, governors, guards, and safety devices shall be inspected regularly and maintained in a safe operating condition.

(m) Special carriers or devices designed and approved for hazardous area operation shall be inspected to ensure that maintenance preserves the original approved safe operating features.

(n) Fuel systems shall be checked for leaks and condition of parts. If a leak is found, action shall be taken to

prevent the use of the carrier until the leak has been eliminated.

(o) The carrier manufacturer's capacity, operation, and maintenance instruction plates, tags, or decals shall be maintained in legible condition.

(p) Batteries, motors, speed and directional controllers, limit switches, protective devices, electrical conductors, and connections shall be inspected and maintained in conformance with manufacturers recommended procedures.

(q) Carriers shall be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.

(r) Modifications and additions which affect capacity and safe machine operation shall not be performed by the customer or user without manufacturer's prior written authorization; where authorized modifications have been made, the user shall ensure that capacity, operation, warning, and maintenance instruction plates, tags, or decals are changed accordingly.

(s) Care shall be taken to ensure that all replacement parts are interchangeable with the original parts and of a quality at least equal to that provided in the original equipment.

# ELECTRIC THREE WHEEL SERVICE VEHICLE

*Read all of manual to become familiar with this vehicle. Pay attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.*

Thank you for this purchase. The vehicle is equipped with an electronic speed control unit that is the most advanced in the industry. Before driving the vehicle, we ask you to spend some time reading this Owner's Manual and Service Guide. This guide contains information that will assist you in maintaining your highly reliable vehicle. Some illustrations may show items that are optional for your vehicle.

Most of the service procedures in this guide can be accomplished by an individual using common automotive hand tools. Refer to an authorized service representative for information on servicing the vehicle in accordance with the Periodic Service Schedule.

To facilitate maintenance, a Service Parts Manual and a Technician's Repair and Service Manual is available from a local Distributor, an authorized Branch or the Service Parts Department. When ordering parts or requesting information for your vehicle, provide vehicle model, serial number and manufacture code.

## BEFORE INITIAL USE

Read, understand and follow safety label on the instrument panel. The vehicle has been designed to operate in a warehouse or factory environment with semi-smooth floors, road and ramps.

Be sure you understand the vehicle, its equipment and how to use it safely. Although the vehicle has been designed to provide safe and reliable operation, maintaining good performance depends to a large extent on the operator.

Vehicle batteries must be fully charged before initial use.

### **WARNING**

**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 open flame or electrical equipment that could cause an electrical arc.**

Hydrogen gas is generated in the charging cycle of batteries and is explosive in concentrations as low as 4%. Because hydrogen gas is lighter than air, it will collect in the ceiling of buildings necessitating proper ventilation. Five air exchanges per hour is considered the minimum requirement.

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

Before a new vehicle is put into operation, it is recommended that the items listed in the INITIAL SERVICE CHART be performed (Ref Fig. 1).

ITEM	SERVICE OPERATION
Batteries	Charge batteries
Backrest	Remove protective plastic covering
Brakes	Check operation and adjust if necessary
Tires	Check air pressure (see SPECIFICATIONS)

**Fig. 1 Initial Service Chart**

## On Board Charger

The on board charger is wired directly to the batteries, only requiring it be plugged into a dedicated 15 amp AC outlet to be operational. When charge cycle is complete, replace cord in appropriate area under instrument panel.

## Portable Charger Installation (if equipped)

### **WARNING**

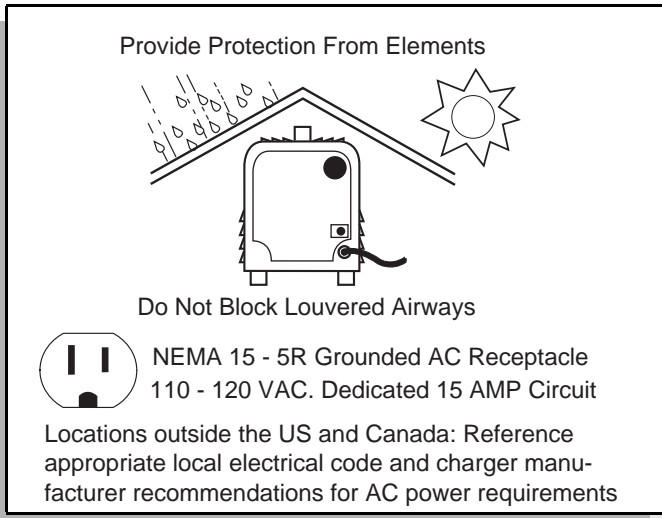
**To prevent overheating that may cause serious damage to the charger and create the potential for fire, do not block or obstruct the airways. Portable chargers must be mounted on a platform above the ground or in such a manner as to permit the maximum air flow underneath and around the charger.**

Portable chargers are shipped with the vehicle. 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. If the charger is operated in an outdoor location, rain and sun protection must be provided (Ref Fig. 2).

A dedicated circuit is required for the charger. Refer to label on side of charger for appropriate circuit protection.

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**Fig. 2 Charger Installation**

The charger may remain plugged in to the AC outlet. To charge the vehicle, refer to the instruction labels on the charger. Insert the DC plug completely into the vehicle receptacle. The receptacle is located on the side of the instrument panel to the left of the steering wheel (Ref Fig. 5). After inserting the polarized DC plug, wait a few seconds and observe ammeter on charger to make sure it moves indicating that charger is charging.

The charger will automatically start a few seconds after plug insertion. The charger will automatically stop when batteries are fully charged and the DC plug can be removed to permit use of the vehicle.

## NOTICE

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 a grounded receptacle.**

**The power (AC) cord is equipped with a grounded plug, do not attempt to pull out,**

**cut or bend the ground post.**

To disconnect charger before the charging cycle is completed, disconnect the AC cord from the AC outlet first and then disconnect the DC cord from the vehicle.

The charging (DC) cord is equipped with a polarized connector which fits into a matching receptacle on the vehicle.

The power (AC) cord is equipped with a ground plug, do not attempt to pull out, cut or bend the ground plug.

## NOTICE

If vehicle is to be charged with a non Original Equipment Manufacturer (OEM) charger, refer to the instructions supplied with the charger.

## Lift Out Battery Trays (if equipped)

The vehicle may be equipped with lift out battery trays. Lift out battery trays permit the vehicle to operate on one set of batteries while another set is charging.

## WARNING

**Before separating the battery connector, always turn off any electrical accessories or options. Breaking a live circuit will result in an electrical arc that could cause a battery explosion.**

**Be sure that any hoist used to remove batteries has a working rating that exceeds the weight of the batteries and battery tray. The hoist must be capable of lifting the battery tray without allowing the batteries to tip.**

**To eliminate the possibility of battery explosion, batteries must be covered to prevent the possibility of shorting live battery terminals which could result in an explosion.**

**Battery posts, terminals and related accessories contain lead and lead compounds. Wash hands after handling.**

Turn the key and any accessories to the "OFF" position in order to remove any electrical load from the batteries. To gain access to the battery trays, the cargo deck must be removed. The vehicle has a total of four batteries separated into a left and right side tray containing two batteries each. Unplug the two large battery wire connectors from the receptacles mounted on the vehicle frame.

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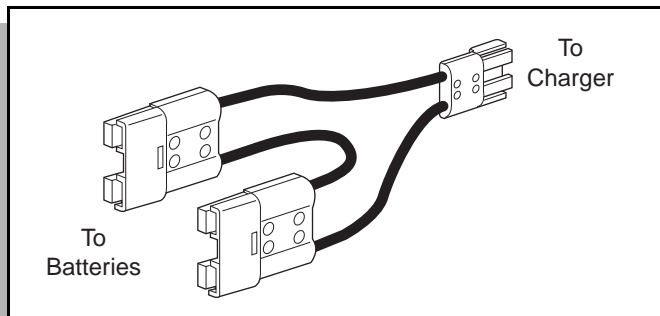
Use a hoist with a minimum working rating of 150 lbs. (70 kg). The hoist must be fitted with insulated lifting hook and chain or cable to prevent any possibility of shorting exposed battery terminals or connections. As an added precaution, cover the batteries to further prevent the possibility of shorting battery terminals or connections. Each tray has a lift point to attach the hoist to. Lift out only one tray at a time and lower to floor.

## NOTICE

*The left side of the cargo deck frame is notched to allow the left side battery tray to clear the steering linkage.*

Install the trays of charged batteries, plug in the large battery wire connectors and replace the cargo deck.

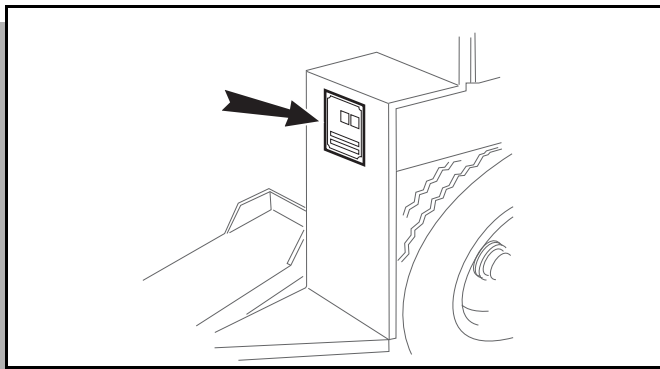
Connect the charger distribution harness to the discharged battery set and then plug the portable charger into the small connector of the charger distribution harness (Ref Fig. 3).



**Fig. 3 Charger Distribution Harness**

## SERIAL PLATE LOCATION

The plate with the serial and manufacturing numbers are located as shown (Ref Fig. 4).



**Fig. 4 Serial Plate Location**

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

## CONTROLS AND METERS

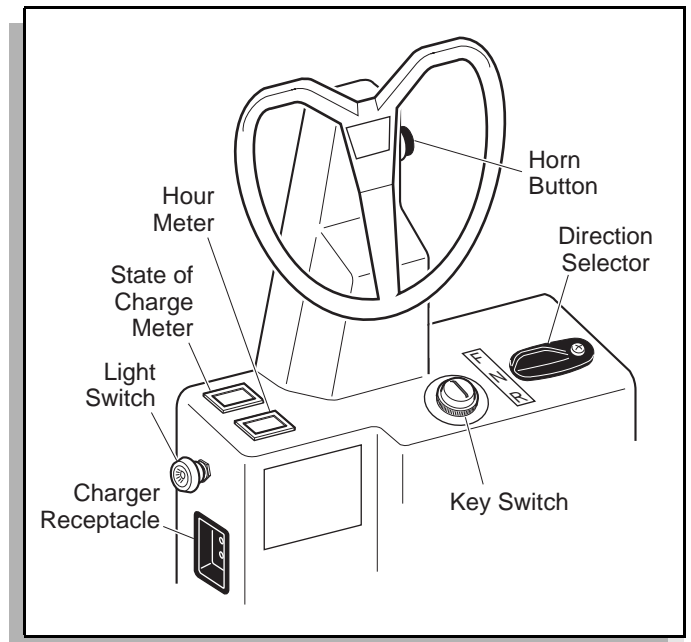
The controls and meters on the vehicle consist of:

- key switch
- direction selector lever
- state of charge meter
- hour meter
- horn
- combination accelerator and brake pedal
- headlights and taillight

### Key Switch

Located on the instrument panel, the key switch enables the basic electrical system of the vehicle to be turned on and off by turning the key (Ref Fig. 5).

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



**Fig. 5 Controls and Meters**

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## NOTICE

If the vehicle is equipped with manufacturer installed custom accessories, some accessories remain operational with the key switch in the 'OFF' position.

### Direction Selector

The direction selector is located on the instrument panel (Ref Fig. 5). This lever permits the selection of forward (F), neutral (N) or reverse (R). It should be left in (N) when the vehicle is unattended.

## CAUTION

To prevent component damage, the vehicle must be completely stopped before moving the direction selector.

### State of Charge Meter

Located on the instrument panel, the state of charge meter indicates the amount of usable power in the batteries (Ref Fig. 5).

### Hour Meter

Located on the instrument panel, the hour meter indicates total hours of operation (Ref Fig. 5).

### Horn

The horn button is located behind the steering wheel on the right side of the instrument panel (Ref Fig. 5). Activate horn by pressing the button.

### Accelerator and Brake Combination

## CAUTION

If unfamiliar with this type of operation, it is recommended that the vehicle be operated in a non-congested area at low speed until the operator becomes more familiar with the vehicles characteristics.

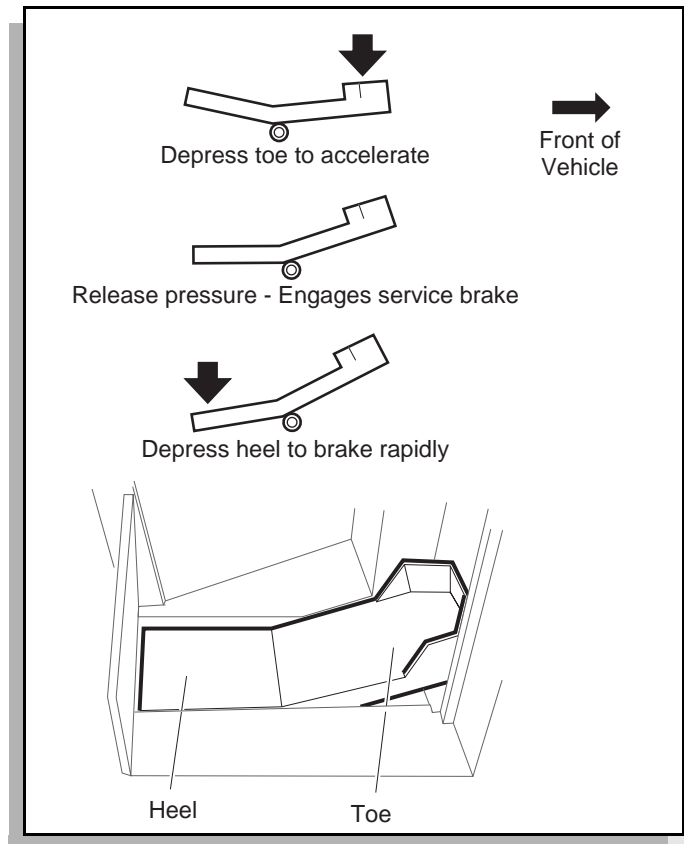
## WARNING

**Removing partial pressure from the foot pedal reduces the speed but does not engage the service brake system. The service brake is activated only when foot pres-**

**sure is COMPLETELY removed. Depressing the rear (heel) portion of the pedal further activates the service brake.**

**Removing foot pressure from the pedal while traveling at high speed will engage the service brake and result in sudden deceleration as the brake engages. Always hold on during vehicle operation.**

**To prevent inadvertent movement when the vehicle is to be left unattended, release pedal completely, move direction selector to neutral position, turn key to 'OFF' position and remove key.**



**Fig. 6 Combination Accelerator and Brake Pedal**

The vehicle is equipped with a combination accelerator and service brake incorporated into one pedal (Ref Fig. 6). When at rest, the pedal keeps the brakes applied to prevent the vehicle from moving when parked. Applying pressure to the toe of the pedal releases the brakes and causes the vehicle to accelerate. Decreasing pressure on the toe of the pedal reduces speed but does not apply the brakes. Completely releasing the pedal activates the

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brakes. Apply pressure to the heel of the pedal to stop more quickly.

When vehicle is to be left unattended, release pedal completely, move direction selector to neutral position, turn key to 'OFF' position and remove key.

## Headlights and Taillight

The light switch is located on the left side of the instrument panel and operates independent of the key switch (Ref Fig. 5). Pull the switch out to turn the lights on.

## BEFORE ENTERING VEHICLE

1. Check for correct tire inflation.
2. Inspect for fluid leaks.
3. Be sure everything is properly stored and secured.

If vehicle has on board charger, unplug power cord from electrical outlet and properly store cord under instrument panel prior to moving vehicle. If vehicle has a portable charger, remove charger plug from vehicle receptacle and properly store cable prior to moving vehicle.

## OPERATING THE VEHICLE



### CAUTION

Improper use of the vehicle or the lack of proper maintenance may result in decreased performance or damage to the vehicle.

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:**

**Drive the vehicle only as fast as terrain and safety considerations allow. Consider the terrain, traffic conditions and the environmental factors which effect the terrain and the ability to control the vehicle.**

**Use extra care and reduced speed when driving on poor surfaces, such as loose dirt, wet grass, gravel, etc.**

**Avoid extremely rough terrain.**

**Avoid driving fast down hill. A sudden stop or change of direction may result in loss of control. Use service brake to control speed when traveling down an incline.**

**Slow down before and during turns. All turns should be executed at reduced speed.**

**All travel should be directly up or down hills.**

**Use extra care when driving the vehicle across any incline.**

**Do not permit anyone to ride on cargo deck.**

**Stay in designated areas and avoid steep slopes. To reduce the possibility of severe injury or death resulting from improper vehicle operation, the following warnings must be observed:**

**Refer to GENERAL SPECIFICATIONS for capacity.**

**Depressing accelerator pedal will release brakes and may cause inadvertent vehicle movement. Turn the key to the 'OFF' position whenever the vehicle is parked.**

**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).**

**Always bring the vehicle to a complete stop before shifting the direction selector.**

**Check the area behind the vehicle before operating in reverse.**

**Always remain standing with back against backrest and hold on while the vehicle is in motion. Keep feet, legs, hands and arms inside the vehicle at all times.**

**Check stability of vehicle when using optional ladder for reaching or placing cargo on shelves. Do not overextend**

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**reach.**

**To prevent inadvertent movement when the vehicle is to be left unattended, release pedal completely, move direction selector to neutral position, turn key to 'OFF' position and remove key.**

## STARTING THE VEHICLE

To start the vehicle: Place the key in the key switch and turn to the 'ON' position. Move the direction selector to the direction desired and press the toe of the pedal to start the motor.

### NOTICE

When the direction selector is in the reverse position, a warning signal will sound. This is a device to indicate the vehicle is ready to run in reverse.

The motor stops and the brake is applied when the toe of the pedal is completely released. To stop the vehicle more quickly, press the heel of the pedal.

### CAUTION

To avoid component damage, the vehicle must be brought to a complete stop before shifting the direction selector.

Do not hold vehicle on hill by using accelerator and motor. Leaving motor in a stalled condition for more than 3-4 seconds will cause permanent damage to motor.

## COASTING

### WARNING

**To prevent injury or death resulting from coasting at above recommended speeds, limit speed with service brake.**

On steep hills, it is possible for vehicles to coast at faster than normal speeds that may be encountered on a flat surface. To prevent loss of vehicle control, speeds should be limited to no more than the maximum speed on level ground (see GENERAL SPECIFICATIONS). Limit speed by releasing the toe of the pedal and applying pressure to the heel of the pedal. Severe damage to the drive train components due to excessive speed may result from

driving the vehicle above specified speed. Damage caused by excessive speed may cause a loss of control, is costly, is considered abuse and will not be covered under warranty.

## SERVICING THE ELECTRIC VEHICLE

### WARNING

**To prevent severe injury or death, resulting from improper servicing techniques, observe the following Warnings:**

**Do not attempt any type of servicing operations before reading and understanding all notes, cautions and warnings in this manual.**

**Any servicing requiring adjustments to be made to the powertrain while the motor is running must be made with the entire vehicle raised.**



**Wear eye protection when working on the vehicle. In particular, use care 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 batteries before removing any heavy gauge battery wires.**

**To prevent the possibility of motor disintegration, never operate vehicle at full throttle for more than 4 - 5 seconds while vehicle is in a "no load" condition.**

**Battery posts, terminals and related accessories contain lead and lead compounds. Wash hands after handling.**

It is in the best interest of both vehicle owner and servicing dealer to carefully follow the procedures recommended in this manual. Adequate preventative maintenance, applied at regular intervals, is the best guarantee for keeping the vehicle both dependable and economical.

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## TOWING

### WARNING

***This vehicle is not designed to be towed.***

It is recommended that this vehicle be moved by placing the entire vehicle on a trailer, flatbed truck or other suitable transport.

## LIFTING THE VEHICLE

Tool List	Qty. Required
Floor jack .....	1
Jack stands .....	2
Chocks .....	4
Chain hoist .....	1

Some servicing operations may require the vehicle be raised.

### WARNING

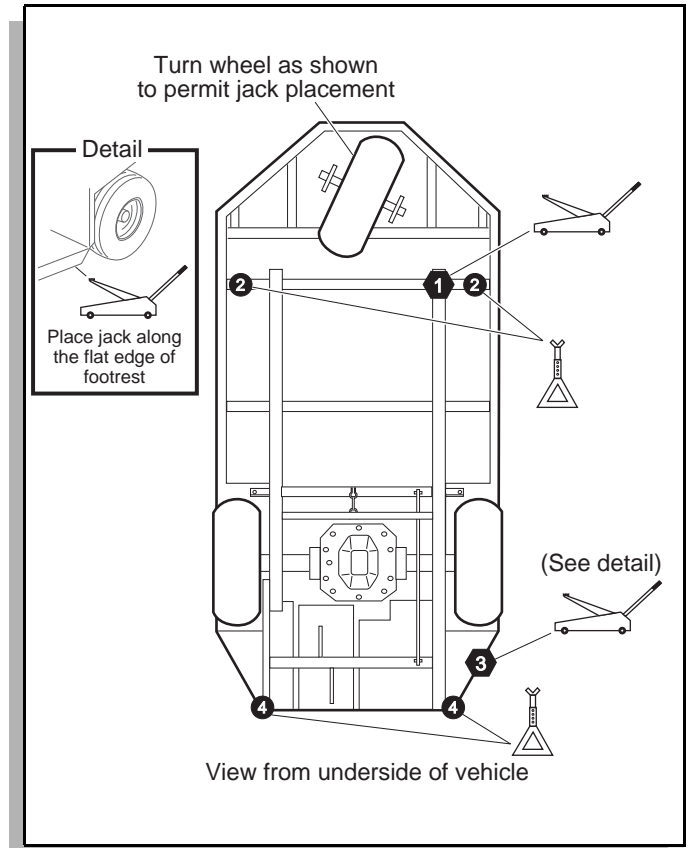
***To prevent possible injury or death resulting from a vehicle falling from a jack, be sure the vehicle is on a firm and level surface. Never get under a vehicle while it is supported by a jack. Use jack stands and test the stability of the vehicle on the stands. Always place chocks in front and behind the wheels not being raised. Use extreme care since the vehicle is extremely unstable during the lifting process.***

***Never attempt to raise the rear wheels of a three wheel vehicle without first raising the front of the vehicle and supporting on jack stands.***

### CAUTION

**When lifting vehicle, position jacks and jack stands only on the areas indicated.**

Due to the low ground clearance and short wheel base, the vehicle should only be raised enough to remove the front axle or the rear wheels. Servicing that requires access to the underside of the vehicle should be accomplished by raising the front of the vehicle with a chain hoist attached to the front frame members. Always use an additional safety chain to prevent injury should the



**Fig. 7 Lifting the Vehicle**

To remove a wheel or the front axle, loosen the hardware and turn the front wheel to the position indicated (Ref Fig. 7). Position a jack in the location indicated and carefully raise the front of the vehicle. Position the jack stands as shown. Use care not to place the jack or stands where they could interfere with wiring or linkages. Slowly lower the jack and test the stability of the vehicle.

To raise the rear of the vehicle, first raise the front of the vehicle as previously described and support on jack stands. Then position the jack in the position shown at the rear of the vehicle. Carefully raise the rear of the vehicle with the jack and place two jack stands in the position shown. Slowly lower the jack and check that the vehicle is securely supported by the jack stands before proceeding.

Lower the vehicle by reversing the lifting sequence.

## ROUTINE MAINTENANCE

This vehicle will give years of satisfactory service, providing it receives regular maintenance. Refer to the Periodic Service Schedule for appropriate service intervals (Ref

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Fig. 14). Refer to Lubrication Points for appropriate lubrication locations (Ref Fig. 8).

## NOTICE

Some maintenance items must be serviced more frequently on vehicles used under severe driving conditions.



## CAUTION

Use maximum of three pumps of grease for each grease fitting - Overgreasing may damage grease seals.

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

## REAR AXLE

The only maintenance required for the first five years is the periodic inspection of the lubricant level. 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 need only be replaced after five years.

## Checking the Lubricant Level

With the vehicle on level ground, clean the area around the check/fill plug and remove plug (Ref Fig. 9). The correct lubricant level is just below the bottom of the threaded hole. If lubricant is low, add as required. Add lubricant slowly until lubricant starts to seep from the 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 out through the check/fill hole.

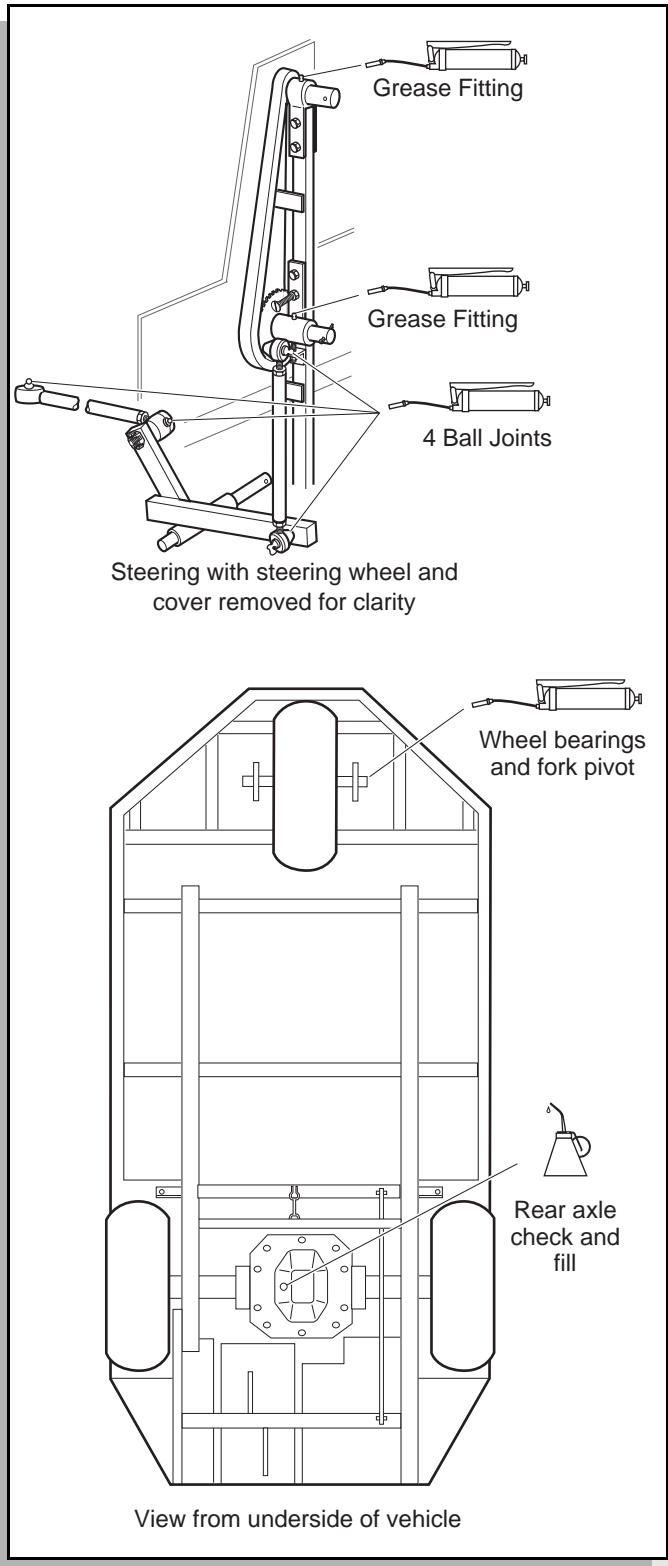


Fig. 8 Lubrication Points

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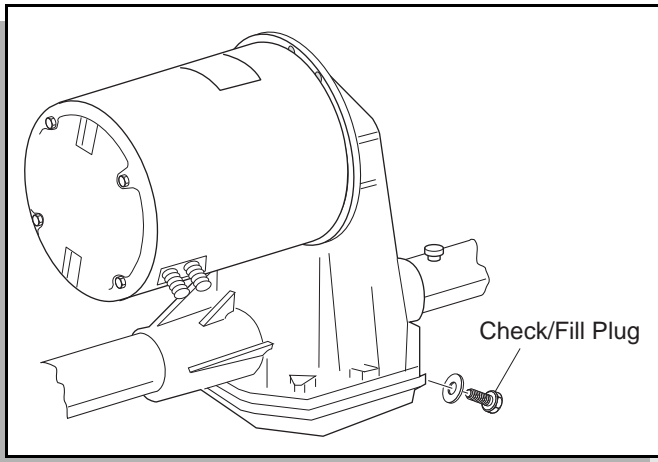


Fig. 9 Rear Axle Lubricant Check and Fill

## BRAKES

Service brakes in accordance with the Periodic Service Schedule (Ref Fig. 14). After the vehicle has been put into service, it is recommended that the brakes be checked by performing the following test:

### Test Method

## ⚠ WARNING

**To prevent severe injury or death resulting from operating a vehicle with improperly operating brake system, the braking system must be properly maintained. All driving brake tests must be done in a safe location with regard for the safety of all personnel.**

## NOTICE

Over time, a subtle loss of performance may take place. Therefore, it is important to establish the normal braking distance with a new vehicle.

Determine the braking performance of the vehicle by engaging the service brake (release accelerator pedal only) at a **common point** on a flat, dry, clean paved surface while traveling at maximum speed (Ref Fig. 10). Observe the vehicle stopping location. If the vehicle stops in a significantly greater distance than normal or pulls to one side, it should be tested again.

If the vehicle fails the second test, it should **immediately** be removed from service. The vehicle needs to be inspected by a qualified mechanic.

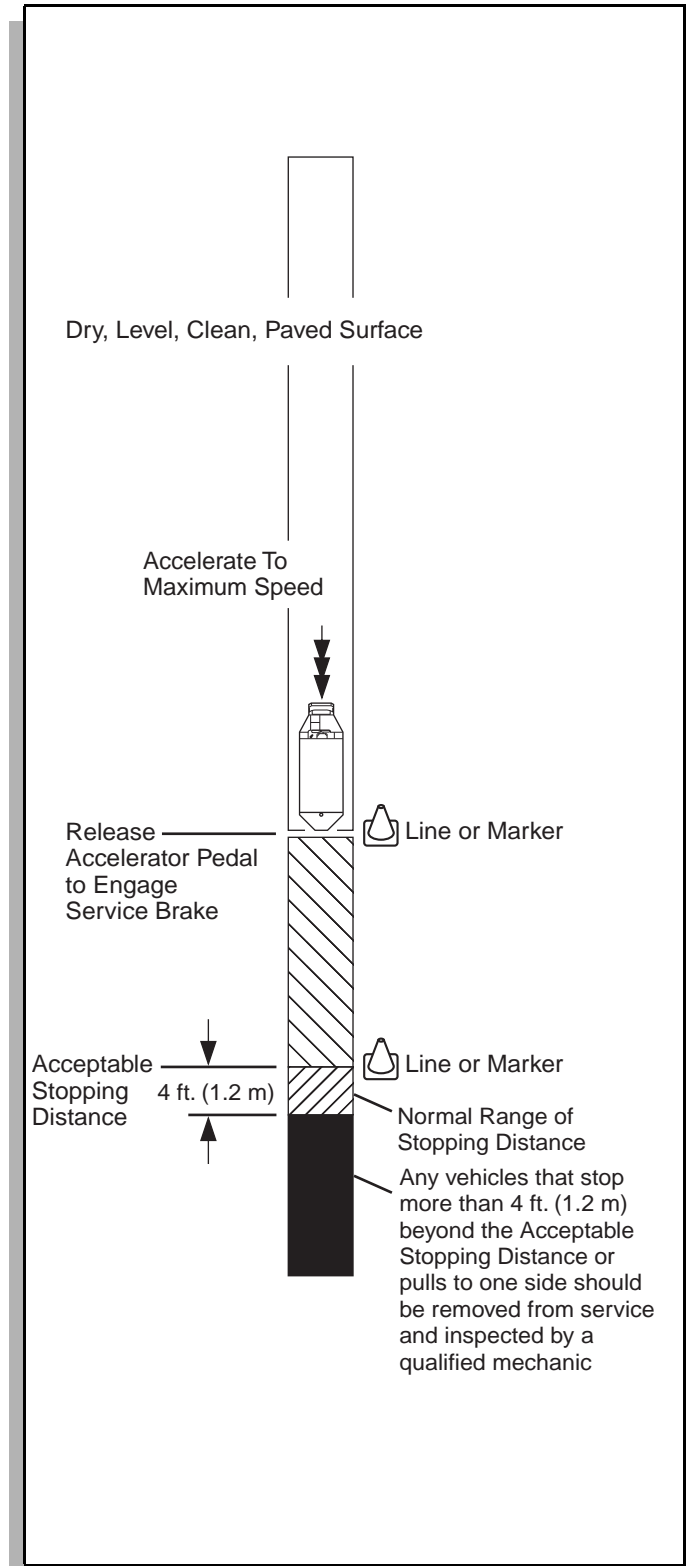


Fig. 10 Periodic Brake Performance Test

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## TIRES

Tools List	Qty. Required
Impact wrench, 1/2" drive .....	1
Impact socket, 3/4", 1/2" drive .....	1
Torque wrench, 1/2" drive, ft. lbs. ....	1
Wrench, 1 1/8" .....	2

### **WARNING**

**To prevent injury caused by a broken socket, use only sockets designed for impact wrench use. Never use a conventional socket.**

Tire condition should be inspected per the Periodic Service Schedule (Ref. Fig. 14 on page 13). Inflation pressures should be checked when the tires are cool. When removing wheels with an impact wrench, use only impact sockets. Regular sockets are not designed for impact pressures exerted by power tools.

### **WARNING**

**A tire explosion can cause severe injury or death. Never exceed inflation pressure rating on tire sidewall.**

**To prevent tire explosion, pressurize tire with small amount of air applied intermittently to seat beads. Never exceed the tire manufacturer's recommendation when seating a bead. Protect face and eyes from escaping air when removing valve core.**

**Use caution when inflating tires. Due to the low volume of these small tires, overinflation can occur in a matter of seconds. Overinflation could cause the tire to separate from the wheel or cause the tire to explode, either of which could cause personal injury.**

Use caution when inflating tires. Due to the low volume of these small tires, overinflation can occur in a matter of seconds. Overinflation could cause the tire to separate from the rim or cause the tire to explode, either of which could cause personal injury.

See GENERAL SPECIFICATIONS section for recommended tire inflation pressure. Under no condition

should inflation pressure be higher than recommended on tire sidewall. **All three tires** should have the same pressure for optimum handling characteristics. Be careful not to overinflate. Due to the low volume of these small tires, overinflation can occur in a matter of seconds. Be sure to install the valve dust cap after checking or inflating.

## Tire Repair

The vehicle is fitted with tubeless tires mounted on one piece rims.

Generally, the most cost effective way to repair a flat tire resulting from a puncture in the tread portion of the tire is to use a commercial tire plug.

### **NOTICE**

*Tire plug tools and plugs are available at most automotive parts outlets and have the advantage of not requiring the tire be removed from the rim.*

If the tire is flat, remove the wheel and inflate the tire to the maximum recommended pressure for the tire. Immerse the tire in water to locate the leak and mark with chalk. Insert tire plug in accordance with manufacturer's specifications.

If tire is to be removed from or mounted on rim, the tire changing machine manufacturer's recommendations must be followed to reduce possibility of personal injury.

### **WARNING**

**To prevent injury, be sure mounting/demounting machine is anchored to floor. Wear OSHA approved safety equipment when mounting/demounting tires.**

Follow all instructions and safety warnings provided by the mounting/demounting machine manufacturer.

## Wheel Installation

### **CAUTION**

**Do not tighten lug nuts to more than 85 ft. lbs. (115 Nm) torque.**

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## NOTICE

It is important to follow the 'cross sequence' pattern when installing lug nuts. This will assure even seating of the wheel against the hub.

With the valve stem to the outside, mount the wheel onto the hub with lug nuts. Finger tighten lug nuts in a 'cross sequence' pattern (Ref Fig. 11). Then, tighten lug nuts to 50 - 85 ft. lbs. (70 - 115 Nm) torque in 20 ft. lbs. (30 Nm) increments following the same 'cross sequence' pattern.

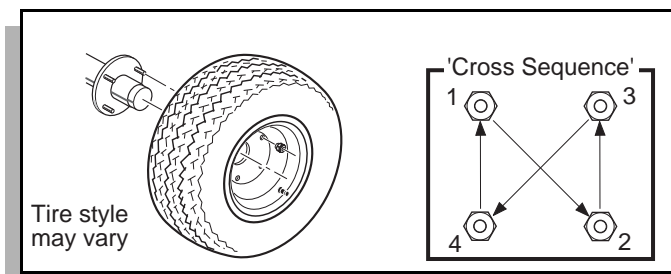


Fig. 11 Wheel Installation

## LIGHT BULB REPLACEMENT

To replace the headlight bulb, pivot the headlight forward and remove the two Phillips head screws from back side and separate light assembly. Place new light bulb in place and secure with screws previously removed.

To replace the taillight bulb, remove hardware securing lens and remove lens. Install replacement bulb.

## CARE AND CLEANING OF THE VEHICLE

### CAUTION

To prevent cosmetic damage, do not use any abrasive or reactive solvents to clean plastic parts.

It is important that proper techniques and cleaning materials be used.

Normal cleaning of the vinyl backrest and plastic or rubber trim requires the use of a mild soap solution applied 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 attractive appearance and durable protection. Frequent washing

with lukewarm or cold water is the best method of preserving the painted surfaces.

Do not use hot water, strong soap or harsh chemical detergents.

Rubber parts should be cleaned with nonabrasive household cleaner.

Occasional cleaning and waxing with nonabrasive products designed for 'clear coat' automotive finishes will enhance the appearance and durability of the painted surfaces.

Corrosive materials used for dust control can collect on the underbody of the vehicle. These materials will accelerate corrosion of underbody parts. It is recommended that the underbody be flushed occasionally with plain 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.

## TRAILERING

### WARNING

To prevent personal injury to occupants of other highway vehicles, be sure that the vehicle and contents are adequately secured to trailer.

Do not ride on vehicle being trailered.

Always check that the vehicle and contents are adequately secured before trailering the vehicle. The rated capacity of the trailer must exceed the weight of the vehicle and load plus 400 pounds (see GENERAL SPECIFICATIONS section for vehicle weight). Secure the vehicle to the trailer using ratchet tie downs.

## HARDWARE

Periodically, the vehicle should be inspected for loose fasteners. Fasteners should be tightened in accordance with the Torque Specifications table (Ref Fig. 13). Use care when tightening fasteners and refer to the Technician's Repair and Service Manual for specific torque values.

Generally, two grades of hardware are used in the vehicle. Grade 5 hardware can be identified by the three marks on the hexagonal head. Unmarked hardware is Grade 2 (Ref Fig. 12).

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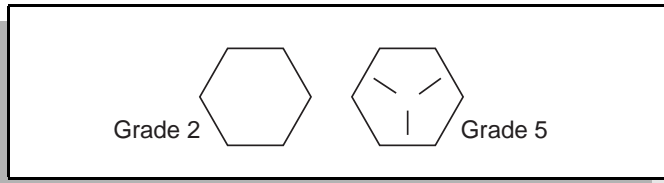


Fig. 12 Bolt Grades

## TORQUE SPECIFICATIONS

### ALL TORQUE FIGURES ARE IN FT. LBS. (Nm)

Unless otherwise noted in text, tighten all hardware in accordance with this chart.

This chart specifies 'lubricated' torque figures. Fasteners that are plated or lubricated when installed are considered 'wet' and require approximately 80% of the torque required for 'dry' fasteners.

BOLT SIZE	1/4"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"
Grade 2	4 (5)	8 (11)	15 (20)	24 (33)	35 (47)	55 (75)	75 (102)	130 (176)	125 (169)	190 (258)
Grade 5	6 (8)	13 (18)	23 (31)	35 (47)	55 (75)	80 (108)	110 (149)	200 (271)	320 (434)	480 (651)

Fig. 13 Torque Specifications

# ELECTRIC THREE WHEEL SERVICE VEHICLE

Read all of manual to become familiar with this vehicle. Pay attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.

## PERIODIC SERVICE SCHEDULE

✓ Check	◆ Clean, Adjust, etc.	▲ Replace
<b>NOTE: Some maintenance items must be serviced more frequently on vehicles used under severe driving conditions</b>		
<b>DAILY</b>		
BODY	◆ Clean body components as required	
REVERSE WARNING DEVICE	✓ Check operation when direction selector is in reverse	
TIRES	✓ Examine for cuts, excessive wear and pressure (See GENERAL SPECIFICATIONS)	
WHEELS	✓ Check for bent rims, missing or loose lug nuts	
BATTERIES	◆ Recharge to full state of charge after each day's use	
CHARGER / RECEPTACLE	✓ Inspect connector system at each charge	
<b>MONTHLY - 20 HOURS (includes items listed in previous table &amp; the following)</b>		
BATTERIES	◆ Clean batteries & terminals with 1/4 cup (60 ml) baking soda to 1 1/2 gallons (6 liters) water solution, rinse with clear water ✓ Check charge condition and all connections	
SERVICE BRAKE	✓ Check brake performance, smooth operation ◆ Adjust if required	
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	
DIRECTION SELECTOR	✓ Check attachment, tighten if required	
STEERING AND LINKAGES	✓ Check for excessive play, tightness of all hardware and bent or loose components	
REAR AXLE	✓ Check for oil leakage, add lubricant (SAE 30 oil) as required	
<b>QUARTERLY - 50 HOURS (includes items listed in previous tables &amp; the following)</b>		
FRONT FORK	✓ Check for damage to axle and loose or missing hardware	
CHARGER / RECEPTACLE	◆ Spray with P/N 27934-G02	
FRONT WHEEL ALIGNMENT	✓ Check for unusual tire wear, align if required	
SERVICE BRAKE	✓ Check for bent/binding linkage rods ✓ Check for damage or wear	
<b>SEMI-ANNUAL - 125 HOURS (includes items listed in previous tables &amp; the following)</b>		
DIRECTION SELECTOR	✓ Check for wear and smooth movement (lubricate shaft with light oil if required)	
SERVICE BRAKES	◆ Clean and adjust, see Technician's Repair and Service Manual ✓ Check brake shoe linings, see Technician's Repair and Service Manual	
BODY	◆ Clean body components and wax all painted surfaces	
STEERING AND LINKAGES	◆ Lubricate, use wheel bearing grease	
<b>ANNUAL - 250-300 HOURS (includes items listed in previous tables &amp; the following)</b>		
FRONT WHEEL BEARINGS	◆ Adjust, see Technician's Repair and Service Manual ◆ Pack, use wheel bearing grease	
REAR AXLE	✓ Check lubricant, add lubricant (SAE 30 oil) as required ▲ Replace lubricant after 5 years	

Fig. 14 Periodic Service Schedule

# ELECTRIC THREE WHEEL SERVICE VEHICLE

Read all of manual to become familiar with this vehicle. Pay attention to all **NOTICES, CAUTIONS, WARNINGS and DANGERS.**

## BATTERIES AND CHARGING

### Safety

#### NOTICE

Always observe the following warnings when working on or near batteries:

#### **WARNING**

To prevent burns or 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 formed when charging batteries. Do not charge batteries without adequate ventilation. A 4% concentration of hydrogen gas is explosive.

Be sure that the key switch is off and all electrical accessories are turned off before starting work on 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 care 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 neutralized with a solution of 1/4 cup (60 ml) sodium bicarbonate (baking soda) dissolved in 1 1/2 gallons (6 liters) 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 personal injury and damage to the vehicle and storage facility.



**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.**

**Aerosol containers of battery terminal protectant must be used with extreme care. Insulate metal container to prevent can from contacting battery terminals which could result in an explosion.**

## BATTERY

A battery is defined as two dissimilar metals immersed in an acid. If the acid is absent or if the metals are not 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 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 maximize the **available** life and reduce the factors that can reduce the life of the battery.

## BATTERY MAINTENANCE

Tool List	Qty. Required
Insulated wrench, 9/16" .....	1
Battery carrier .....	1
Hydrometer .....	1
Battery maintenance kit P/N 25587-G01 .....	1

# ELECTRIC THREE WHEEL SERVICE VEHICLE

Read all of manual to become familiar with this vehicle. Pay attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.

## At Each Charging Cycle

### WARNING

**To reduce the possibility of fire, never attach a battery charger to a vehicle that is to be 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 charging the batteries, inspect all plugs/receptacles of the battery charging system for dirt or debris.

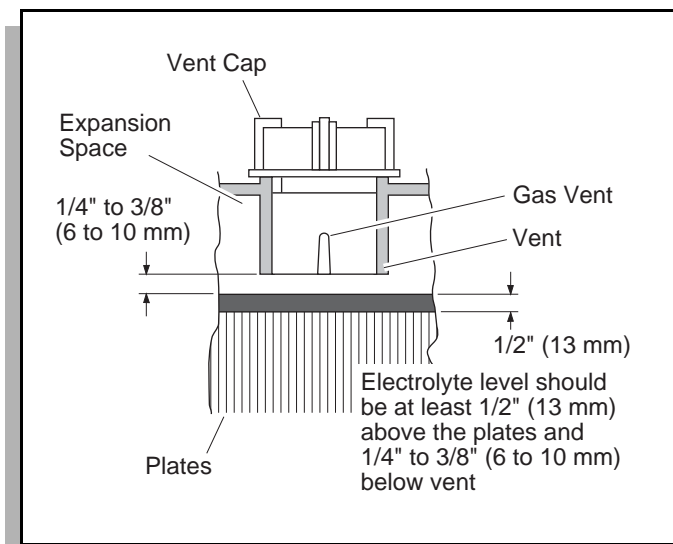
Charge the batteries after each days use.

### 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 1/2" (13 mm) above the plates in each cell (Ref Fig. 15).



**Fig. 15 Correct Electrolyte Level**

This level will leave approximately 1/4" - 3/8" (6 - 10 mm) 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 sulfuric 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 sulfuric acid will remain where it can damage vehicle components and the storage facility floor. Sulfuric 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 analyzed and if required, filtration installed to permit the water to meet the requirements of the water purity table (Ref Fig. 16).

Impurity	Parts Per Million
Color .....	Clear
Suspended.....	Trace
Total Solids .....	100
Calcium & Magnesium Oxides.....	40
Iron.....	5
Ammonia.....	8
Organic & Volatile Matter .....	50
Nitrites.....	5
Nitrates .....	10
Chloride .....	5

**Fig. 16 Water Purity Table**

# ELECTRIC THREE WHEEL SERVICE VEHICLE

Read all of manual to become familiar with this vehicle. Pay attention to all **NOTICES**, **CAUTIONS**, **WARNINGS** and **DANGERS**.

Even if the water is colorless, odorless, tasteless and fit for drinking, the water should be analyzed to see that it does not exceed the impurity levels specified in the table.

Automatic watering devices such as the one included in the Battery Maintenance Kit can be used with an approved water source (Ref Fig. 17). These watering devices are **fast and accurate** to use and maintain the correct electrolyte level within the battery cells.

## NOTICE

The watering device should only be used if the electrolyte level is less than 1/2" (13 mm) above top of plates.

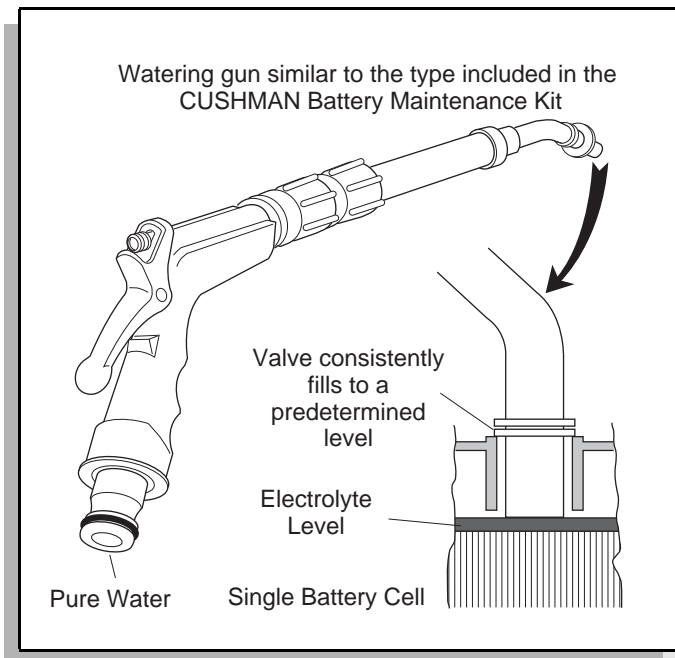


Fig. 17 Automatic Watering Gun

## Cleaning Batteries

When cleaning the outside of the batteries and terminals, do not use a water hose without first spraying with a solution of sodium bicarbonate (baking soda) and water to neutralize any acid deposits.

Use of a water hose without first neutralizing any acid, will move acid from the top of the batteries to another area of the vehicle or storage facility where it will attack the metal structure or the concrete/asphalt floor. After hosing down the batteries, a residue will be left on the

batteries which is conductive and will contribute to the discharge of the batteries.

## CAUTION

To prevent battery damage, be sure that all battery caps are tightly installed.

The correct cleaning technique is to spray the top and sides of the batteries 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**. The solution should consist of 1/4 cup (60 ml) of sodium bicarbonate (baking soda) mixed with 1 1/2 gallons (6 liters) of clear water (Ref Fig. 18). In addition to the batteries, special attention should be paid to metallic components adjacent to the batteries which should also be sprayed with the sodium bicarbonate (baking soda) solution.

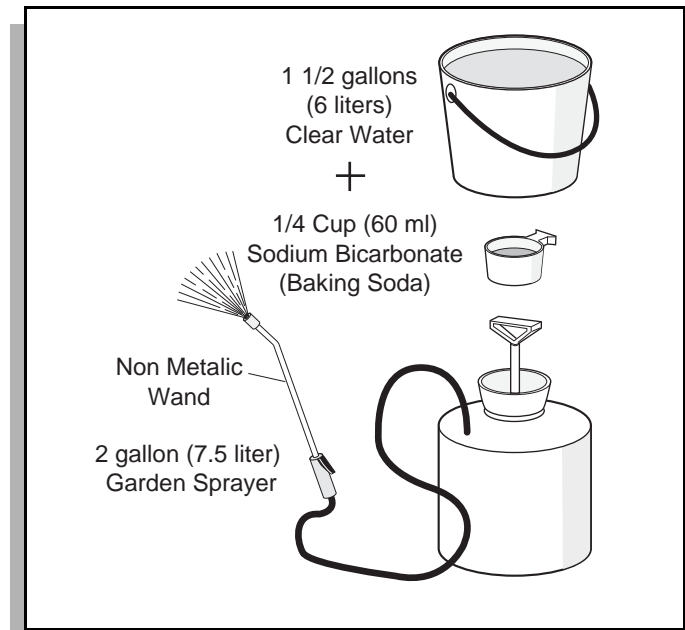


Fig. 18 Preparing Acid Neutralizing Solution

Allow the solution to sit for at least three minutes; use a soft bristle brush or cloth to wipe the tops of the batteries in order to remove any residue that could cause the self discharge of the battery. Rinse the entire area with low pressure clear water. All of the items required for complete battery cleaning and watering are contained in the Battery Maintenance Kit.

Cleaning should take place once a month or more often under extreme conditions.

# ELECTRIC THREE WHEEL SERVICE VEHICLE

Read all of manual to become familiar with this vehicle. Pay attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.

## Battery Replacement

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 neutralized as recommended, no corrosion to the battery racks or surrounding area should be present. Any corrosion found should be immediately removed with a putty knife and a wire brush. 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 45 - 55 in. lbs. (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 care 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 care to connect the battery wires as shown (Ref Fig. 19). Tighten the battery post hardware to 50 - 70 in. lbs. (6 - 8 Nm) torque. Protect the battery terminals and battery wire terminals with a commercially available protective coating.

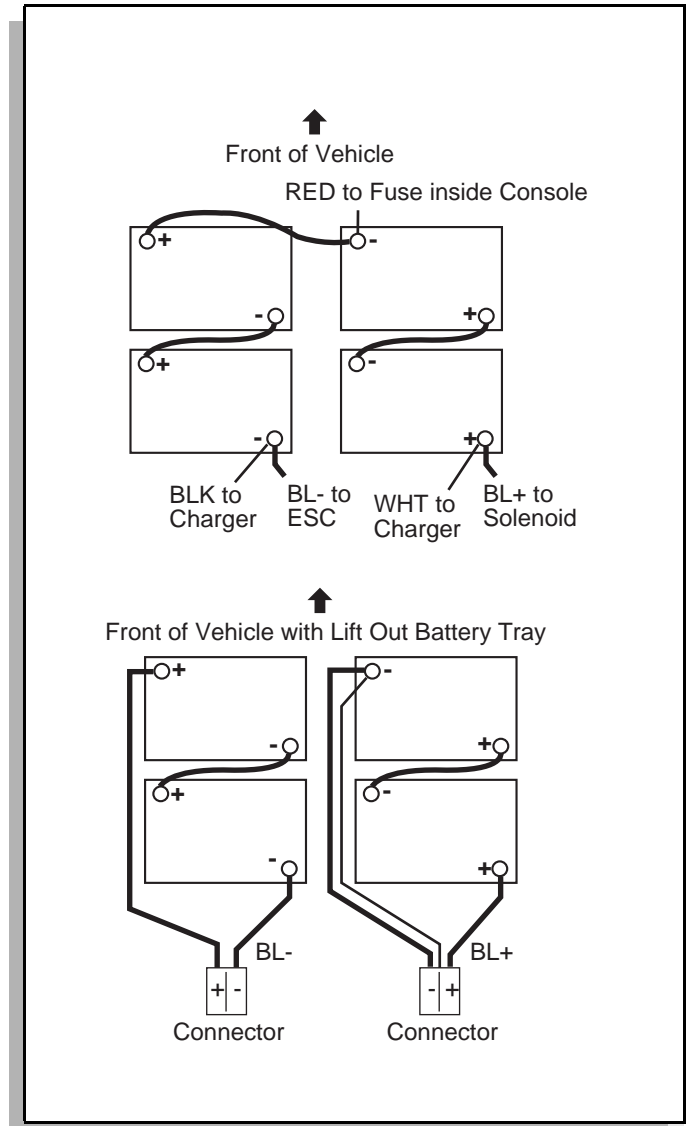


Fig. 19 Battery Connections

## Prolonged Storage

## ⚠ CAUTION

**Battery charger and controller must be disconnected since they will contribute to the premature discharge of batteries. Other electronic devices may need to be disconnected.**

During periods of storage, the batteries will need attention to keep them maintained and prevent discharge.

# ELECTRIC THREE WHEEL SERVICE VEHICLE

Read all of manual to become familiar with this vehicle. Pay attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.

In high temperatures the chemical reaction is faster, while low temperatures cause the chemical reaction to slow down. A vehicle that is stored at 90° F (32° C) will lose .002 of specific gravity each day. If a fully charged battery has a 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, sulfating 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 state of charge of a battery.

to prevent self discharge. The batteries should be tested or recharged at thirty day minimum intervals.

## Battery Charging

The battery charger is designed to fully charge the battery set. If the batteries are severely deep cycled, some automatic battery chargers 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 hour 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 is automatically turned off during the connect/disconnect cycle and therefore no electrical arc is generated at the DC plug/receptacle contacts.

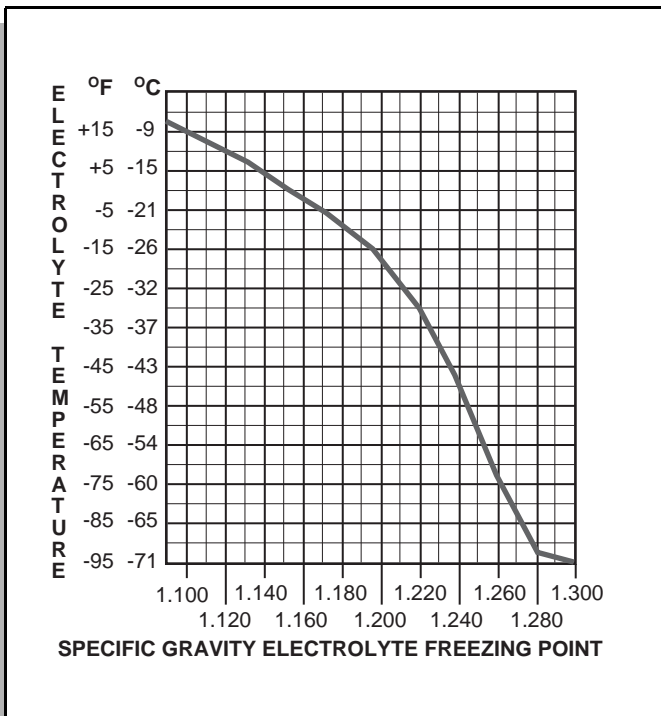


Fig. 20 Freezing Point of Electrolyte

In winter conditions, the battery must be fully charged to prevent the possibility of freezing (Ref Fig. 20). A fully charged battery will not freeze in temperatures above -75° F (-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. For portable chargers, disconnect the charging plug from the vehicle receptacle. For on-board chargers, disconnect the charging harness from the batteries. The batteries must be cleaned and all deposits neutralized and removed from the battery case

## AC Voltage

Battery charger output is directly related to the input voltage. If multiple vehicles are receiving an incomplete charge in a normally adequate time period, low AC voltage could be the cause and the power company should be consulted.

# ELECTRIC THREE WHEEL SERVICE VEHICLE

Read all of manual to become familiar with this vehicle. Pay attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.

## TROUBLESHOOTING

In general, troubleshooting will be done for two distinct reasons. First, a battery that performs poorly and is outside of the manufacturer's specification should be identified in order to replace it under the terms of the manufacturer's warranty. Different manufacturers have different requirements. Consult the battery manufacturer or a service 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 (P/N 50900-G1) is used to test the state of charge of a battery cell (Ref Fig. 21). 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 sulfuric acid, the more dense the electrolyte becomes. The higher the density, the higher the state of charge.

## ⚠ 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.**

Specific gravity is the measurement of a liquid that is compared to a baseline. The baseline is water which is

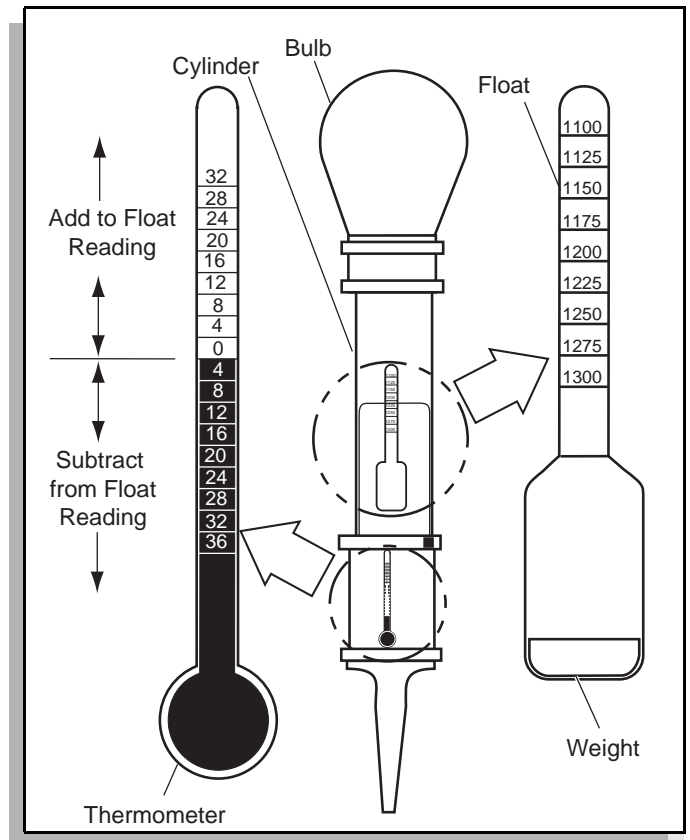


Fig. 21 Hydrometer

assigned a base number of 1.000. The concentration of sulfuric acid to water in a new golf car battery is 1.280 which means that the electrolyte weighs 1.280 times the weight of the same volume of water. A fully charged battery will test at 1.275 - 1.280 while a discharged battery will read in the 1.140 range.

## NOTICE

Do not perform a hydrometer test on a battery that has just been watered. The battery must go through at least one charge and discharge cycle in order to permit the water to adequately mix with the electrolyte.

The temperature of the **electrolyte** is important since the hydrometer reading must be corrected to 80° F (27° C). High quality hydrometers are equipped with an internal thermometer that will measure the temperature of the electrolyte and will include a conversion scale to correct the float reading. It is important to recognize that the electrolyte temperature is significantly different from the ambient temperature if the vehicle has been operated.

# ELECTRIC THREE WHEEL SERVICE VEHICLE

Read all of manual to become familiar with this vehicle. Pay attention to all NOTICES, CAUTIONS, WARNINGS and DANGERS.

## Using A Hydrometer

1. Draw electrolyte into the hydrometer several times to permit the thermometer to adjust to the electrolyte temperature and note the reading. Examine the color of the electrolyte. A brown or gray coloration indicates a problem with the battery and is a sign that the battery is nearing the end of its life.
2. Draw the minimum quantity of electrolyte into the hydrometer to permit the float to float freely without contacting the top or bottom of the cylinder.
3. Hold the hydrometer in a vertical position at eye level and note the reading where the electrolyte meets the scale on the float.
4. Add or subtract four points (.004) to the reading for every 10° F (6°C) the electrolyte temperature is above or below 80° F (27° C). Adjust the reading to conform with the electrolyte temperature, e.g., if the reading indicates a specific gravity of 1.250 and the electrolyte temperature is 90° F (32° C), **add** four points (.004) to the 1.250 which gives a corrected reading of 1.254. Similarly if the temperature was 70° F (21° C), **subtract** four points (.004) from the 1.250 to give a corrected reading of 1.246 (Ref Fig. 22).
5. Test each cell and note the readings (corrected to 80° F or 27° C). A variation of fifty points between any two cell readings (example 1.250 - 1.200) indicates a problem with the low reading cell(s).

As a battery ages the specific gravity of the electrolyte will decrease at full charge. This is not a reason to replace the battery, providing all cells are within fifty points of each other.

Since the hydrometer test is in response to a vehicle exhibiting a performance problem, the vehicle should be recharged and the test repeated. If the results indicate a weak cell, the battery or batteries should be removed and replaced with a good battery of the same brand, type and approximate age.

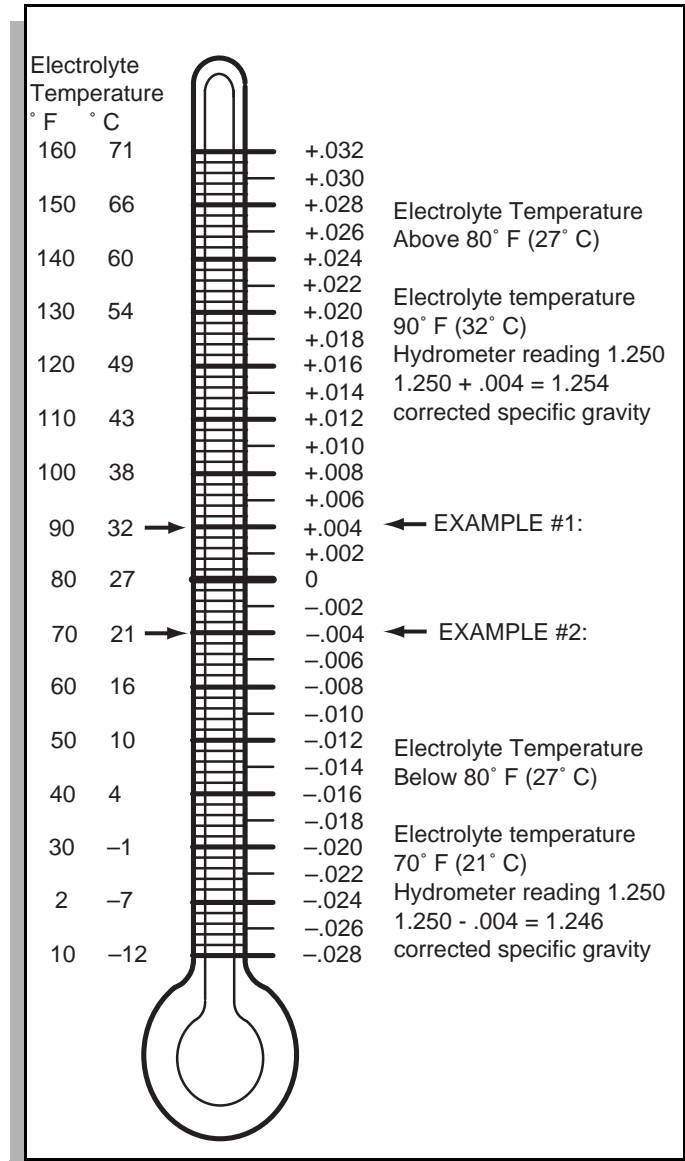


Fig. 22 Hydrometer Temperature Correction

# GENERAL SPECIFICATIONS

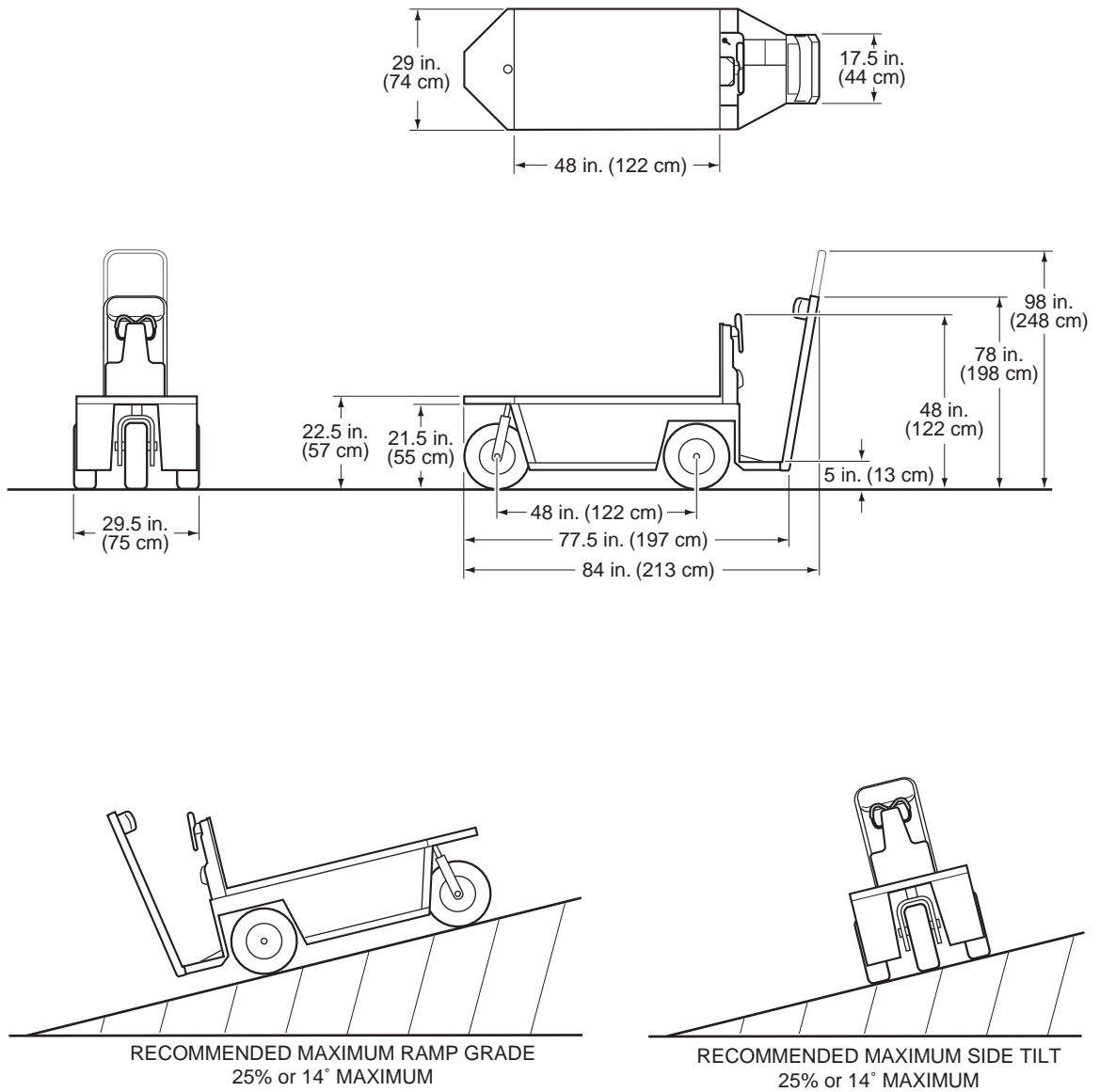
# GENERAL SPECIFICATIONS

## ELECTRIC POWERED THREE WHEEL SERVICE VEHICLE

BATTERIES.....	Four 6 volt deep cycle (105 minute minimum, 220 amp-hour @ 20 hour discharge rate)
SPEED CONTROLLER.....	Solid state, 275 amp capacity with potentiometer throttle sensor
MOTOR.....	24 VDC, series wound 1.5 hp (1.1 kW) @ 2800 rpm & 4.3 hp (3.2 kW) @ 1200 rpm, brazed armature and solid copper windings
TRANSAXLE.....	14.78:1 helical geared with input pinion shaft directly connected to motor shaft
BRAKES.....	Dual rear wheel, mechanical drum brakes
PARKING BRAKE.....	Automatic
FRONT SUSPENSION.....	One piece front axle
REAR SUSPENSION.....	Coil springs over hydraulic shock absorbers
STEERING.....	Chain & linkage
STEERING WHEEL.....	Dual handgrips
SEATING.....	None
CAPACITY.....	Operator
TOTAL LOAD CAPACITY.....	1000 lbs. (454 kg) including operator, accessories & cargo
SPEED.....	9 mph (15 kph)
CHASSIS.....	Welded tubular steel; powder coated (Durashield™)
VEHICLE PROTECTION.....	None
BODY.....	Bolt-on diamond pattern body panels with Durashield™ Industrial Yellow powder coat paint
STANDARD COLOR(S).....	Industrial Yellow
LOAD BED.....	29" (74 cm) W x 48" (122 cm) L
LOAD BED FEATURES.....	Removable for powertrain access
LIGHTING/HORN (Standard).....	Rear brake light, horn
TIRES (Standard).....	4.80 x 8 Industrial Load Range B
TIRE PRESSURE.....	60 psi (415 kPa)
WEIGHT (without batteries).....	490 lbs. (225 kg)
OPERATING CONTROLS & INSTRUMENTATION.....	Removable key, 'deadman' accelerator control, direction selector, audible reverse warning
BATTERY CHARGER.....	Total Charge® III on-board 24 V, 120 VAC, fully automatic, line compensating, 21 amp DC output at 24 volts, 6.5 amps input, 60 Hz, UL recognized, CSA certified
OPTIONS/ACCESSORIES.....	Audible forward motion indicator Batteries 145 minute 250 amp-hour @ 20 hour discharge rate Beacon light Bolt-on 4 step ladder Bolt-on 6 step ladder (includes counterweight) Differential scuff guard 'E' hitch Front counterweight Galvanized steel cargo deck Headlights and taillight Hour meter Lift out battery tray with batteries Lift out battery tray with batteries, 145 minute 250 amp-hour @ 20 hour discharge rate Lift out battery tray without batteries Paint color (custom) Pintle hitch Stainless steel cargo deck State of Charge meter (LED) Tires 4.80 x 8 (6 ply rated) Industrial Load Range B (Foam Filled) Total Charge® III portable 24 V, 120 VAC, fully automatic, line compensating, 21 amp DC output at 24 volts, 6.5 amps input, 60 Hz UL listed, CSA certified Tubular steel side rails UL approved 'EE' classification

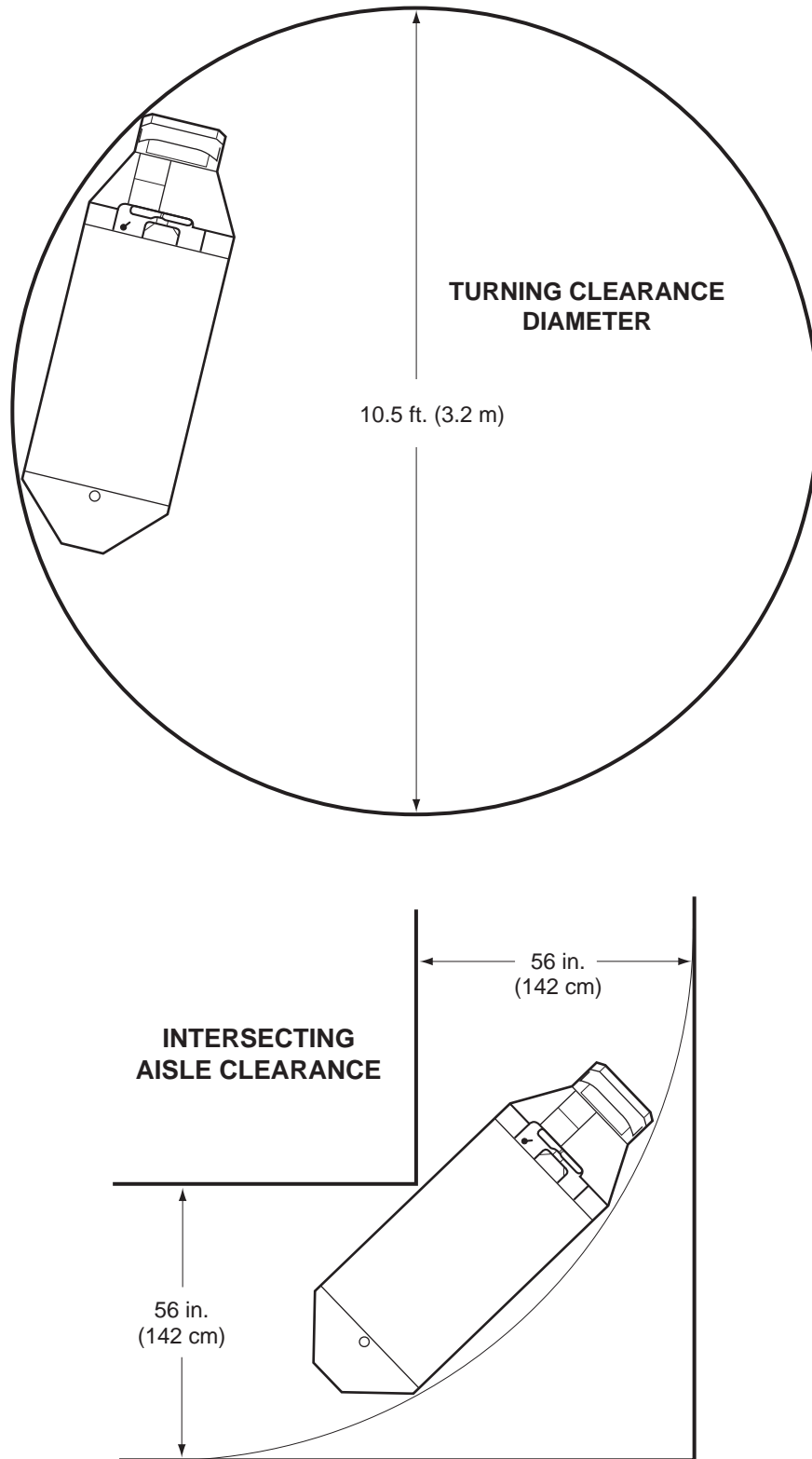
Specifications subject to change without notice

# GENERAL SPECIFICATIONS



**Fig. 23 Vehicle Dimensions and Incline Specifications**

# GENERAL SPECIFICATIONS



**Fig. 24 Vehicle Turning Clearance Diameter and Intersecting Aisle Clearance**

## NOTICE

Read and understand the following warnings before attempting to operate the vehicle:

### **WARNING**

**To prevent personal injury or death, observe the following:**

**When vehicle is to be left unattended, release pedal completely, move direction selector to neutral, turn key to 'OFF' position and remove key.**

**Drive vehicle only as fast as terrain and safety considerations allow. Consider the terrain and traffic conditions. Consider environmental factors which effect the terrain and the ability to control the vehicle.**

**Avoid driving fast down hill. Sudden stops or change of direction may result in a loss of control. Use service brake to control speed when traveling down an incline.**

**Use extra care and reduced speed when driving on poor surfaces, such as loose dirt, wet grass, gravel, etc.**

**All travel should be directly up or down hills.**

**Use extra care when driving the vehicle across an incline.**

**Stay in designated areas and avoid steep slopes. Use the parking brake whenever the vehicle is parked.**

**Keep feet, legs, hands and arms inside vehicle at all times.**

**Avoid extremely rough terrain.**

**Check area behind the vehicle before operating in reverse.**

**Make sure the direction selector is in correct position before attempting to start the vehicle.**

**Slow down before and during turns. All turns should be executed at reduced speed.**

**Always bring vehicle to a complete stop before shifting the direction selector.**

**See GENERAL SPECIFICATIONS for standard vehicle load and occupant capacity.**

## NOTICE

Read and understand the following text and warnings before attempting to service vehicle:

In any product, components will eventually fail to perform properly as the result of normal use, age, wear or abuse. It is virtually impossible to anticipate all possible component failures or the manner in which each component may fail.

Be aware that a vehicle requiring repair indicates that the vehicle is no longer functioning as designed and therefore should be considered potentially hazardous. Use extreme care when working on any vehicle. When diagnosing, removing or replacing any components that are not operating correctly, take time to consider the safety of yourself and others around you should the component move unexpectedly.

Some components are heavy, spring loaded, highly corrosive, explosive or may produce high amperage or reach high temperatures. Battery acid and hydrogen gas could result in serious bodily injury to the technician/mechanic and bystanders if not treated with the utmost caution. Be careful not to place hands, face, feet or body in a location that could expose them to injury should an unforeseen situation occur.

### **WARNING**

**To prevent personal injury or death, observe the following:**

**Before working on the vehicle, remove all jewelry (rings, watch, necklaces, etc.).**

**Be sure no loose clothing or hair can contact moving parts.**

**Use care not to touch hot objects.**

**Raise entire vehicle and support on jack stands before attempting to run or adjust powertrain.**

**Wear eye protection when working on or around the vehicle. In particular, use care when working around batteries, using solvents or compressed air.**

**Hydrogen gas is formed when charging batteries. Do not charge batteries without adequate ventilation.**

**Do not permit open flame or anyone to smoke in an area that is being used for charging batteries. A concentration of 4% hydrogen gas or more is explosive.**



1451 Marvin Griffin Road, Augusta, Georgia USA 30906-3852

**TO CONTACT US**

**North America:**

Technical Assistance & Warranty Phone: 1-800-774-3946, FAX: 1-800-448-8124

Service Parts Phone: 1-888-GET-CUSHMAN (1-888-438-3946), FAX: 1-800-752-6175

**International:**

Phone: 010-1-706-798-4311, FAX: 010-1-706-771-4609

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