

CUSHMAN[®]

A Textron Company

OWNER'S MANUAL and SERVICE GUIDE



TITAN

600737

ISSUED JULY 2006 REVISED APRIL 2009

SAFETY

For any questions on material contained in this manual, contact an authorized representative for clarification.

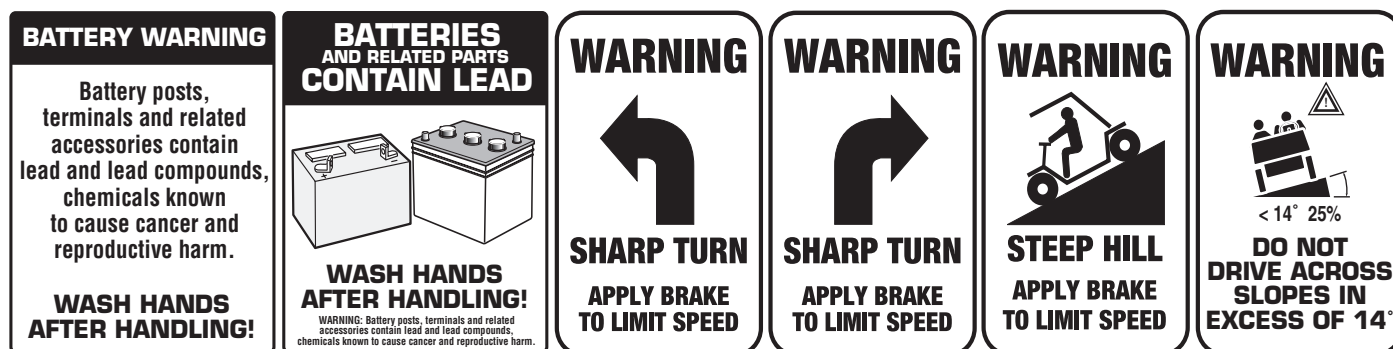
Read and understand all labels located on the vehicle. Always replace any damaged or missing labels.

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 GENERAL SPECIFICATIONS. Limit speed by applying the service brake.

Catastrophic damage to the drivetrain 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.

For towing/transporting vehicle, refer to "TRANSPORTING VEHICLE".

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 sold.

NOTES, CAUTIONS AND WARNINGS

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

NOTE

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.

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

Engine exhaust from this product contains chemicals known, in certain quantities, to cause cancer, birth defects, or other reproductive harm.

NOTE

The exhaust emissions of this vehicles' engine complies with regulations set forth by the Environmental Protection Agency (EPA) of the United States of America (USA) at time of manufacture. Significant fines could result from modifications or tampering with the engine, fuel, ignition or air intake systems.



WARNING

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

NOTE

This spark ignition system meets all requirements of the Canadian Interference-Causing

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

OWNER'S MANUAL AND SERVICE GUIDE

ELECTRIC UTILITY VEHICLES

TITAN 36V

TITAN 48V

TITAN PERSONNEL CARRIER 36V

TITAN PERSONNEL CARRIER 48V

STARTING MODEL YEAR 2005

E-Z-GO Division of TEXTRON Inc. 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.

E-Z-GO Division of TEXTRON Inc. 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.

TO CONTACT US

NORTH AMERICA:

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

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

INTERNATIONAL:

PHONE: 001-706-798-4311, FAX: 001-706-771-4609

E-Z-GO DIVISION OF TEXTRON INC., 1451 MARVIN GRIFFIN ROAD, AUGUSTA, GEORGIA USA 30906-3852

GENERAL INFORMATION

This vehicle has been designed and manufactured in the United States of America (USA) as a 'World Vehicle'. The Standards and Specifications listed in the following text originate in the USA unless otherwise indicated.

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

Overfilling battery may void the warranty.

Tampering with or adjusting the governor to permit vehicle to operate at above factory specifications will void the vehicle warranty.

When servicing engines, all adjustments and replacement components must be per original vehicle specifications in order to maintain the United States of America Federal and State emission certification applicable at the time of manufacture.

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. The battery charger and the controller are both sources of electrical drain. Disconnect the battery charger from the vehicle receptacle.

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

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SAFETY INFORMATION

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 E-Z-GO-manufactured vehicle to permit the vehicle to operate at or in excess of 20mph. When an E-Z-GO-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.

E-Z-GO will NOT approve Distributor, Dealer or customer modifications converting E-Z-GO products into LSV's.

The Company, in addition, recommends that all E-Z-GO 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 E-Z-GO, I am directing that E-Z-GO 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.

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The manufacturer 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.

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

These vehicles are designed and manufactured for off-road use. They do not conform to Federal Motor Vehicle Safety Standards and are not equipped for operation on public streets. Some communities may permit these vehicles to be operated on their streets on a limited basis and in accordance with local ordinances.

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.

Vehicles that are capable of higher speeds must limit their speed to no more than the speed of other vehicles when used in a golf course environment. Additionally, speed should be further moderated by the environmental conditions, terrain and common sense.

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.

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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 higher).

SAFETY INFORMATION

Notes:

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ANSI/ITSDF B56.8 - 2005

The following text is provided as recommended by part II of ANSI/ITSDF B56.8 - 2005. The manufacturer strongly endorses the contents of this specification.

6 GENERAL SAFETY PRACTICES

6.1 Introduction

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

6.1.2 Premise review — The user shall periodically review their premises, and as conditions warrant, identify areas where carriers should not be operated and to identify possible hazards such as the following examples:

- a) Steep Grade — In areas where steep grades exist, carrier operation should be restricted to the designated vehicle's pathways where possible, and shall be identified with a suitable warning giving the following information: "Warning, steep grade."
- b) Wet Areas — Wet areas could cause a carrier to lose traction and could affect steering, stability and braking.
- c) Sharp Turns, Blind Spots, Bridge Approaches — Sharp turns, blind spots, bridge approaches, and other potentially hazardous areas shall be identified with a suitable warning to the operator of the nature of the hazard and stating the proper precautions to be taken to avoid the hazard.
- d) Loose Terrain — Loose terrain could cause a carrier to lose traction and could affect steering, stability, and braking.

6.2 Operation

Experience has shown that carriers, which comply with the provisions, stated in paragraph 9.3.9 are 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 judgment 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.

6.3 Nameplates, Markings, Capacity, and Modifications

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

6.3.2 Except as provided in 6.3.4, no modifications or alterations to a carrier, which may affect the capacity, stability, or safe operation of the carrier, shall be made without the prior written approval of the original carrier manufacturer or a successor thereof. When the carrier manufacturer or its successor approves a modification or alteration, appropriate changes shall be made to capacity plates, decals, tags, and operation and maintenance manuals

6.3.3 As required under paragraphs 6.3.1 or 6.3.2, the manufacturer shall be contacted to secure new nameplates, warnings, or instructions, which shall then be affixed in their proper place on the carrier.

6.3.4 In the event that the carrier manufacturer is no longer in business and there is no successor in interest to the business, the user may arrange for a modification or alteration to a carrier, provided however, the controlling party shall:

SAFETY INFORMATION

- (1) Arrange for the modification or alteration to be designed, tested, and implemented by an engineer(s) expert in carrier(s) and their safety;
- (2) Maintain a permanent record of the design, test(s), and implementation of the modification or alteration;
- (3) Make appropriate changes to the capacity plate(s), decals, tags, and operation and maintenance manuals;
- (4) Affix a permanent and readily visible label on the carrier stating the manner in which the carrier has been modified or altered together with the date of the modification or alteration, and the name of the organization that accomplished the tasks.

6.4 Fuel Handling and Storage

6.4.1 The user shall supervise the storage and handling of liquid fuels (when used) to be certain that it is in accordance with ANSI/NFPA 505 and ANSI/NFPA 30 or as required by local ordinance.

6.4.2 Storage and handling of liquefied petroleum gas fuels shall be in accordance with ANSI/NFPA 505 and ANSI/NFPA 58 or as required by local ordinance. 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.

6.4.3 Prevent fire and explosion caused by static electric discharge. Use only non-metal, portable fuel containers approved by the Underwriter's Laboratory (U.L.) or the American Society for Testing & Materials (ASTM). If using a funnel, make sure it is plastic and has no screen or filter.

Static electric discharge can ignite gasoline vapors in an ungrounded fuel container. Remove the fuel container from the bed of a carrier or the trunk of a car and place on the ground away from the carrier before filling. Keep nozzle in contact with container opening while filling. When practical, remove equipment from trailers or truck beds and refuel them on the ground. If this is not possible, use a portable, plastic fuel container to refuel equipment on a truck bed or trailer.

6.5 Changing and Charging Storage Batteries for Electric Personnel and Burden Carriers

6.5.1 The user shall require battery changing and charging facilities and procedures to be in accordance with ANSI/NFPA 505 or as required by local ordinance.

6.5.2 The user shall periodically inspect facilities and review procedures to be certain that ANSI/NFPA 505 or as required by local ordinance, are strictly complied with, and shall familiarize carrier operators with it.

6.5.3 Maintenance and storage areas for carriers shall be properly ventilated to avoid fire hazards in accordance with applicable fire codes and ordinances.

Ventilation for internal combustion engine powered carriers shall be provided to remove flammable vapors (gases), fumes and other flammable materials. Consult applicable fire codes for specific levels of ventilation.

Ventilation for electric powered carriers shall be provided to remove the accumulation of flammable hydrogen gas emitted during the battery charging process. The amount of hydrogen gas emitted depends upon a number of factors such as the condition of the batteries, the output rate of the battery charger and the amount of time the batteries are on charge. Because of the highly volatile nature of hydrogen gas and its propensity to accumulate in pockets, a minimum number of air changes per hour is required during charging.

Consult applicable fire and safety codes for the specific ventilation levels required as well as the use of explosion proof electrical apparatus. SAE J1718 can be followed to check for hydrogen gas levels.

6.6 Hazardous Locations

6.6.1 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.

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

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6.7 Lighting for Operating Area

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.

6.8 Control of Noxious Gases and Fumes

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 may be accomplished by ventilation maintenance of emission control equipment recommended or provided by the manufacturer of the equipment.

6.9 Warning Device(s)

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

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

6.10 Safety Interlocks

The user shall make periodic inspections of the carrier to be certain that the safety interlock system, if so equipped, is operating properly.

7 OPERATING SAFETY RULES AND PRACTICES

7.1 Personnel and Burden Carrier Operator Qualifications

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 7, all other applicable parts of this Standard and the operators' manual.

7.2 Personnel and Burden Carrier Operators' Training

7.2.1 The user shall conduct an operators' training program.

7.2.2 Successful completion of the operators' training program by the operator shall be required 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.

7.2.3 The user shall include as a minimum in the operators' training program the following.

- a) Instructional material provided by the manufacturer including the operators' manual;
- b) Emphasis on safety of passengers, material loads, carrier operator, and other person(s);
- 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 of the environment which could affect carrier operation;
- e) Operator competency evaluations.

7.3 Personnel and Burden Carrier Operator Responsibility

7.3.1 General Operator Responsibility

SAFETY INFORMATION

7.3.1.1 Read and follow operators' manual

7.3.1.2 Do not operate carrier under the influence of drugs and alcohol.

7.3.1.3 Safeguard the pedestrians at all times. Do not drive carrier in a manner that would endanger other persons.

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

7.3.1.5 When a carrier is to be left unattended, stop the 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. Additionally, for the electric carriers, the forward and reverse directional controls, should be neutralized if a means is provided. Block the wheels if the carrier is on an incline.

7.3.1.6 A carrier is considered unattended when the operator is 7.6m (25 ft.) 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 7.6m (25 ft.) of the carrier still in his view, he still must have controls neutralized, and the parking brake(s) set to prevent movement.

7.3.1.7 Maintain a safe distance from potential hazards, such as edges of ramps and platforms.

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

7.3.1.9 Report all accidents to the user.

7.3.1.10 Do not add to, or modify, the carrier.

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

7.3.1.12 Only operate carrier while within operator's station.

7.3.2 Traveling

7.3.2.1 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.

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

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

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

7.3.2.5 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.

7.3.2.6 Ascend or descend grades slowly.

7.3.2.7 Avoid turning, if possible, and use caution on grades, ramps, or inclines, normally travel straight up and down.

7.3.2.8 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.

7.3.2.9 Make starts, stops, turns, or direction reversals in a smooth manner so as not to shift the load, endanger passengers, or lose control of the carrier.

7.3.2.10 Do not operate carrier in a dangerous manner.

7.3.2.11 Slow down when approaching, or on, wet or slippery surfaces.

7.3.2.12 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.

7.3.2.13 Avoid running over loose objects, potholes, and bumps.

7.3.2.14 Reduce carrier speed to negotiate turns.

7.3.2.15 Avoid any action verbal or physical by an operator or passenger, which could cause the operator to be distracted.

7.3.3 Loading

7.3.3.1 Refer to operators' manual for loading instruction.

SAFETY INFORMATION

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

7.3.3.3 Handle only loads within the capacity of each cargo area of the carrier as specified by the manufacturer.

7.3.3.4 Avoid material loads exceeding the physical dimensions of the carrier or as specified by the carrier manufacturer.

7.3.4 Operator Care of Personnel and Burden Carriers

7.3.4.1 Read and follow operators' manual.

7.3.4.2 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, safety interlocks, 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 user and the carrier shall not be operated until it has been restored to safe operating condition.

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

7.3.4.4 Do not make repairs or adjustments unless specifically trained and authorized to do so.

7.3.4.5 Before refueling, the engine shall be stopped and allowed to cool. The operator and passengers shall leave the carrier before refueling.

7.3.4.6 Spillage of hazardous materials shall be contained immediately and addressed via appropriate hazardous materials regulations.

7.3.4.7 Do not operate a carrier with a leak in the fuel system or battery(s). Battery(s) shall be charged and serviced per manufacturer's instructions.

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

8 MAINTENANCE PRACTICES

8.1 Introduction

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

8.2 Maintenance Procedures

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

- a) A scheduled preventive maintenance, lubrication, and inspection system shall be followed.
- b) Only trained 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) Chock wheels and support carrier, before working underneath it.
- e) Before disconnecting any part of the engine fuel system, be sure the shutoff valve, if so equipped, is closed and follow carrier manufacturer's recommended practice.
- f) Operation to check performance of the carrier shall be conducted in an authorized area where suitable conditions exist, free of vehicular and pedestrian traffic.
- g) Before returning carrier to service, follow the manufacturer's instructions and recommended procedure.
- h) 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.
- i) Properly ventilate the work area in accordance with applicable regulations or local ordinance.
- j) Handle fuel cylinders with care. Physical damage, such as dents, scrapes, or gouges, may dangerously weaken the tank and make it unsafe for use.

SAFETY INFORMATION

- k) Brakes, steering mechanisms, speed and directional control mechanisms, warning devices, lights, governors, guards, and safety devices shall be inspected regularly and maintained in accordance with manufacturer's recommendations.
- l) 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.
- m) Fuel systems shall be checked for leaks and condition of parts. If a leak is found, action shall be taken to prevent the use to the carrier until the cause of the leak has been repaired.
- n) The carrier manufacturer's capacity, operation, and maintenance instruction plated, tags, or decals shall be maintained in legible condition.
- o) Batteries, motors, speed and directional controllers, limit switches, protective devices, electrical conductors/insulators, and connections shall be inspected and maintained per carrier manufacturer's recommendation.
- p) Carriers shall be kept in a clean condition to minimize hazards and facilitate detection of components needing service.
- q) Modifications and additions which affect capacity and safe carrier operation shall not be performed 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 safety labels are changed accordingly.
- r) 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.
- s) Disconnect batteries, negative connection(s) first. When reconnecting, connect positive connection first.
- t) Hydraulic systems, if so equipped, shall be checked for leaks, for condition of parts. Keep body and hands away from pin-holes or nozzles that eject fluids under high pressure. Use paper or cardboard, not hands, to check for leaks.

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

Thank you for purchasing this vehicle. Before driving the vehicle, we ask you to spend some time reading this Owner's Manual and Service Guide. This guide contains the information that will assist you in maintaining this highly reliable vehicle. Some illustrations may show items that are optional for your vehicle. This guide covers the operation of several vehicles; therefore, some pictorial views may not represent your vehicle. Physical differences in controls will be illustrated.

This vehicle has been designed and manufactured as a 'World Vehicle'. Some countries have individual requirements to comply with their specifications; therefore, some sections may not apply in your country.

Most of the service procedures in this guide can be accomplished using common automotive hand tools. Contact your service representative on servicing the vehicle in accordance with the Periodic Service Schedule.

Service Parts Manuals and Technician's Repair and Service Manuals are 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 date code.

BEFORE INITIAL USE

Read, understand and follow all of the safety labels affixed to the vehicle. Be sure you understand how to operate the vehicle, its equipment and how to use it safely. Maintaining good performance depends to a large extent on the operator.

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 water heaters and furnaces.

Before a new vehicle is put into operation, the items shown in the INITIAL SERVICE CHART must be performed (Ref Fig. 1 on page 1).

Vehicle batteries must be fully charged before initial use.

Check for correct tire inflation. See GENERAL SPECIFICATIONS.

Remove the protective clear plastic, that protect the seat bottom and back rest during shipping, before placing the vehicle in service.

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

Ref Isc 8

Fig. 1 Initial Service Chart

On-board Charger

The on-board charger is located under the cargo deck at the rear of the vehicle (Ref Fig. 2 on page 1). It is wired directly to the batteries, only requiring it be plugged into a dedicated 15 amp AC outlet to be operational.

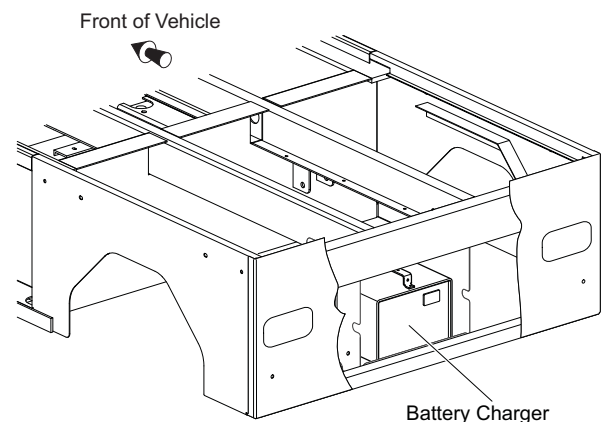


Fig. 2 On-board Charger

When charging cycle is complete, replace AC cord in area provided.

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

CONTROLS AND INDICATORS

Vehicle controls and indicators consist of:

- key/light switch (lights optional)
- direction selector
- state of charge meter
- hour meter
- accelerator pedal
- foot brake pedal
- Hand operated park brake
- Direction selector lever (36V models only)
- Direction selector switch (48V PDS models only)
- Run - tow/maintenance switch (48V PDS models only)
- Horn

Key/Light Switch

Located on the dash panel, this switch enables the basic electrical system of the vehicle to be turned on and off by turning the key. To prevent inadvertent operation of the vehicle when left unattended, the key should be turned to the 'OFF' position and removed (Ref Fig. 3 on page 2).

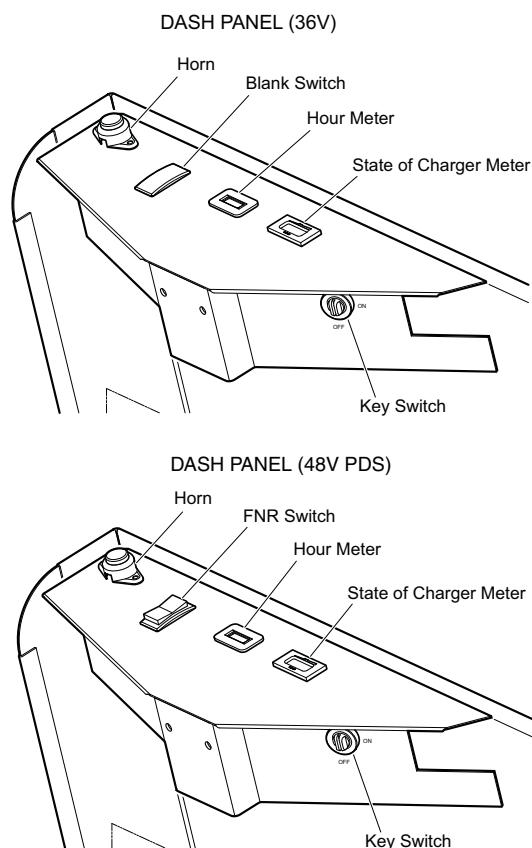


Fig. 3 Key/Light Switch, State of Charge Meter, Horn and Hour Meter

If the vehicle is equipped with lights, the key switch has a position to operate them, indicated by the light icon.

Direction Selector

WARNING

To prevent loss of control, do not move Precision Drive System (PDS) vehicle direction selector while the vehicle is in motion. Moving the selector will result in a sudden slowing of the vehicle and the beeping of a warning device.

CAUTION

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

On PDS models, if the direction selector is shifted before the vehicle comes to a complete stop, a warning beeper will activate.

Located on the dash panel or between seats, this lever or switch permits the selection of either 'F' (forward), 'R' (reverse) or neutral (the position between forward and reverse). Vehicle should be left in neutral when unattended (Ref Fig. 4 on page 2)

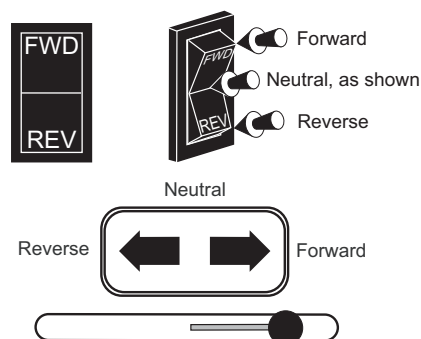


Fig. 4 Direction Selector Types

State Of Charge Meter

Located in the dash, the state of charge meter indicates the amount of usable power in the batteries (Ref Fig. 3 on page 2).

Hour Meter

Located in the dash, the hour meter indicates total hours of operation. (Ref Fig. 3 on page 2)

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

Accelerator Pedal

With the key switch 'ON', depressing the accelerator pedal starts the motor. When the pedal is released, the motor will stop (Ref Fig. 5 on page 3). To stop the vehicle more quickly, depress the foot brake.

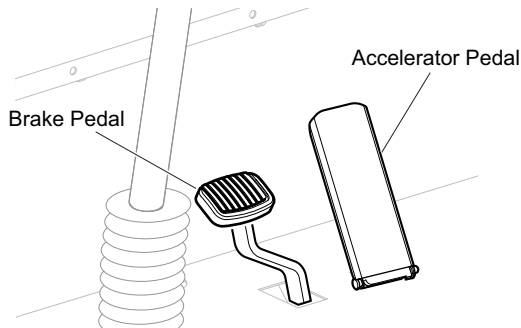


Fig. 5 Accelerator and Brake Controls

Brake Pedal

Depressing the foot operated brake pedal activates the brakes (Ref Fig. 5 on page 3).

Park Brake

The hand operated park brake is located between the front seats. The brake is engaged when the handle is raised and is disengaged when the handle is parallel to the panel. When leaving the vehicle unattended, engage the park brake by raising the handle until it is locked in place. To release the park brake, depress the release button in the end of the handle while slightly raising the handle, then lower the park brake handle.

Horn

The horn is operated by pushing the horn button located on the left side of the dash panel (Ref Fig. 3 on page 2)

Run - Tow/Maintenance Switch (48V PDS VEHICLES ONLY)

WARNING

To reduce the possibility of severe injury or death resulting from loss of vehicle control, consider the grade of the terrain the vehicle is on and set vehicle's park brake accordingly before switching the Run - Tow/Maintenance switch to the 'Tow/Maintenance' position. When in the 'Tow/Maintenance' position, the Anti-Roll Back and Walk-Away safety features of the

PDS system no longer function.

4 PASSENGER MODEL

The 4 passenger model features a fold down cargo bed which when raised converts to a second row seating for two additional passengers. Be sure to fasten the seat back restraining strap when lowering the seat.

NOTE

Remember to deduct the weight of the driver and all passengers from the overall vehicle weight capacity.

48V PDS VEHICLES



CAUTION

Before attempting to move vehicle, move the Run-Tow/Maintenance switch to the 'Tow/Maintenance' position. Failure to do so could damage the controller or motor.

Before disconnecting or connecting a battery, or any other wiring, move the Run-Tow/Maintenance switch to the 'Tow/Maintenance' position.

After connecting a battery, or any other wiring, wait a minimum of 30 seconds before moving the Run-Tow/Maintenance switch to the 'Run' position.

The 48V PDS vehicle is equipped with a two position switch located under the passenger cargo deck (Ref Fig. 6 on page 3).

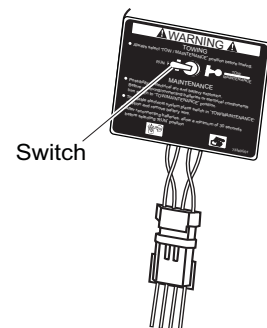


Fig. 6 Run-Tow/Maintenance Switch

With the switch in 'TOW/MAINTENANCE' position:

- the controller is deactivated
- the electronic braking system is deactivated which allows the vehicle to be moved or roll freely
- the warning beeper is deactivated

With the switch in 'RUN' position:

- the controller is activated

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

- the electronic braking system and warning beeper features are activated

NOTE

PDS vehicles operate only in the 'RUN' position.

The PDS is a low power consumption unit but, it will drain the vehicle batteries over a period of time. If the vehicle is to be stored for a prolonged period of time, the PDS should be disconnected from the batteries. (Refer to Prolonged Storage on page 23)

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 foot brake to control speed when traveling down an incline.

To prevent loss of control, do not move the direction selector of a PDS vehicle while the vehicle is in motion. Moving the selector will result in a sudden slowing of the vehicle and the beeping of a warning device.

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.



WARNING

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 seating capacity.

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).

Check the area behind the vehicle before operating in reverse.

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

Always remain seated and hold on while the vehicle is in motion. Keep feet, legs, hands and arms inside the vehicle at all times.

To prevent inadvertent movement when the vehicle is to be left unattended, engage the parking brake, move direction selector to neutral position, turn key to 'OFF' position and remove key.

Additional Warnings and Cautions (applicable to PDS vehicles)



WARNING

To prevent loss of control, do not move PDS vehicle direction selector while the vehicle is in motion. Moving the selector will result in a sudden slowing of the vehicle and the beeping of a warning device.

Permitting the vehicle to coast down an incline at speeds in excess of 2 mph (3 kph) with the accelerator pedal released after bringing the vehicle to a complete stop will cause an electronic braking force to be applied and a beeping from the warning device. Depressing the accelerator pedal will return control to the operator and deactivate the warning beeper.

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings



CAUTION

Before attempting to move vehicle, move the Run-Tow/Maintenance switch to the 'Tow/Maintenance' position. Failure to do so will damage the controller or motor.

Before disconnecting or connecting a battery, or any other wiring, move the Run-Tow/Maintenance switch to the 'Tow/Maintenance' position.

After connecting a battery, or any other wiring, wait a minimum of 30 seconds before moving the Run-Tow/Maintenance switch to the 'Run' position.

STARTING VEHICLE ON A HILL

PDS Vehicle (48V)

To start the PDS vehicle on a hill: With the left foot, apply the foot brake. Turn the key to the 'ON' position. Move the direction selector to the direction desired. **Fully release** the hand operated parking brake. With the right foot, depress the accelerator pedal to start the motor and release the foot brake as the vehicle starts to move.

NOTE

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 when the accelerator pedal is released. To stop the vehicle more quickly, depress the foot brake pedal.

36V Vehicle



CAUTION

Non PDS Vehicle (36V) 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.

When starting the electric vehicle on a hill, it is important to follow the procedure below to prevent excessive roll-back or permanent damage to the motor. Do not hold vehicle on hill by using accelerator and motor. Leaving motor in a stalled condition for more than 3 - 4 seconds will raise the commutator bars resulting in unacceptable noise and accelerated brush wear and cause permanent damage to motor.

To start the electric vehicle on a hill: Place left foot on the foot brake. Place the key in the key switch, and turn the

key to the 'ON' position. Move the direction selector to the direction desired. Place right foot on accelerator. **Fully release** park brake. Depress the accelerator pedal to start the motor and release the foot brake as the vehicle starts to move.

Anti-Stall Feature (48V PDS Vehicle)



WARNING

To prevent possible injury or vehicle damage, never walk or stand behind a vehicle stopped on a hill. Always maintain adequate clearance between cars in front and behind your vehicle.

PDS vehicles incorporate an anti-stall feature to protect the motor from damage. If the controller senses that the accelerator pedal is depressed (power applied to motor) and the motor is stalled long enough to cause motor damage, it will momentarily interrupt power to the motor. This brief interruption will permit the vehicle to roll backwards slightly before again stopping in the stalled condition. This process will repeat itself periodically until the vehicle is moved from the stalled condition.

If the brake is engaged while the accelerator is depressed, the controller will sense a stalled motor condition and remove power from the motor. When the brake pedal is released, the vehicle will roll backwards slightly before power is returned to the motor.

COASTING

Vehicle With PDS

The PDS controls the top speed of the vehicle while moving down hill. Therefore, overspeed coasting does not occur with PDS model vehicles. The PDS is not a substitute for the foot brake which should be used to control the speed of the vehicle.

NOTE

Some PDS models are equipped with a feature which slows the vehicle's speed when the accelerator pedal is released.

Vehicle Without PDS



WARNING

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

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

On steep hills, it is possible for non-PDS 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 accelerator and applying foot brake. 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.

Performance

NOTE

PDS vehicles operate only when the Run - Tow/Maintenance switch is in the 'RUN' position. (Refer to Run - Tow/Maintenance Switch (48V PDS VEHICLES ONLY) on page 3)

The options are defined as follows (Ref Fig. 7 on page 6)

Performance	Top Speed	Pedal-Up Speed Control
No Plugs	13.5 mph (22 kph)	Mild

Fig. 7 Performance Characteristics

The vehicle's top speed is sensed and regulated directly by the controller and the feature to slow the vehicle when the accelerator pedal is up is mild.

Speed Control

! WARNING

To prevent the possibility of loss of control that could cause severe injury or death, use foot brake to control speed. The PDS system is not a substitute for the foot brake.

PDS models are equipped with a motor control system.

Example: If all of the following events occur...

- the vehicle is being driven down a slope
- the vehicle attempts to exceed the specified top speed with the accelerator pedal depressed **or** released

the motor control system will limit the speed of the vehicle to the specified top speed (the warning beeper will **not** sound). When the system is activated by this sequence of events, the motor generates power which is returned to the batteries.

If the operator attempts to override the feature by moving the direction selector or key switch to another position, the warning beeper will sound and the vehicle will slow **rapidly** until it reaches the speed of approximately 2 mph (3 kph).

Pedal-Up Feature

The pedal-up feature slows the vehicle when the accelerator pedal is released while the vehicle is moving between 8 mph (13 kph) and the vehicle's top speed.

Example: If all of the following events occur...

- the vehicle is being driven down a slope
- the accelerator pedal is released for more than one second

the pedal-up feature will slow the vehicle (the warning beeper will **not** sound) until either the vehicle speed is reduced to 8 mph (13 kph), at which it freely coasts between 8 and 3 mph (5 kph), or the accelerator pedal is applied. When pedal-up feature is activated by this sequence of events, the motor generates power which is returned to the batteries.

Walk-Away Feature

Walk-Away limits vehicle movement without driver input, slowing the vehicle to 2 mph (3 kph) and sounding an audible alarm (reverse beeper).

Example: If all of the following events occur...

- the vehicle has been stopped for more than 1.5 seconds
- the accelerator pedal has been released for more than one second
- the vehicle begins to roll above 2 mph (3 kph)

the walk-away feature will limit speed to approximately 2 mph (3 kph) and the warning beeper will sound. When the accelerator pedal is depressed, the walk-away feature and warning beeper will be overridden and normal vehicle operation resumes. Any unusual situation sensed by the PDS system will cause a similar response. The system functions in all key switch positions.

Anti-Roll Back Feature

Anti-Roll Back, like Walk-Away, limits backward motion of the vehicle down an incline to less than 2 mph (3 kph). See 'Walk-Away Feature' above.

Anti-Stall Feature

Anti-Stall protection prevents motor damage from stalling the vehicle against an object or on a hill.

Example: If all of the following events occur...

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

- a) the system senses that the accelerator pedal is depressed (power applied to motor)
- b) the motor is stalled long enough that any more time may cause motor damage

the PDS system will momentarily interrupt power to the motor. This brief interruption will permit the vehicle to roll backwards slightly before again stopping in the stalled condition. This process will repeat itself periodically until the vehicles is moved from the stalled condition.

Example: If all of the following events occur...

- a) the system senses that the accelerator pedal is depressed (power applied to motor)
- b) the brake is engaged so as to prevent vehicle motion

the PDS system will sense a stalled motor condition and remove power from the motor. When the brake pedal is released, the vehicle will roll backwards slightly before power is returned to the motor.

High Pedal Disable Feature

High pedal disable prevents undesired acceleration if the direction selector lever is changed, or the key is turned on while the accelerator is depressed.

Diagnostic Mode Feature

Diagnostic mode eases troubleshooting.

In the unlikely event of certain electrical system failures, the PDS controller will default to a mode that will permit the vehicle to operate, but at a very reduced speed.

This feature allows the vehicle to be driven back to its storage facility where the problem can be diagnosed.

The controller can be put in diagnostic mode by the technician and the controller will report the failure mode.

STARTING AND DRIVING

WARNING

To reduce the possibility of roll-back which could result in severe injury or vehicle damage, do not release the foot brake until motor has started.

All vehicles are equipped with an interlock system that disables the controller and prevents the vehicle from being operated while the charger is connected to an AC supply. Remove charger plug from the AC receptacle and properly store cable prior to moving vehicle.

To operate vehicle:

- Apply the foot brake, place the key in the key switch and turn it to the 'ON' position.
- Move the direction selector to the direction desired.
- Release the park brake.
- Slowly depress the accelerator pedal to start the motor. Release foot brake when motor starts.
- When the accelerator pedal is released, the motor stops. To stop the vehicle more quickly, depress the **foot brake pedal**.

NOTE

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

LABELS AND PICTOGRAMS

Vehicles may be labeled with pictograms as a method of conveying information or warnings. Appendix A illustrates and explains pictograms that may appear on the vehicle. Not all pictograms shown in Appendix A will be found on your vehicle.

TOWING A TRAILER

The vehicle may be equipped with a pintle hitch. The trailer and its load must not exceed 500 lbs (227 kg) and no more than 50 lbs (23 kg) tongue weight may be attached to the hitch. Remember that the overall capacity of the vehicle, operator, passenger, contents of loadbed and accessories must be reduced to compensate for the trailer and load.

The range of motion of the trailer is limited by the hitch. The trailer should not be used on rough trails or over objects such as logs, large rocks, holes, etc.

CAB AND WINDSHIELD

WARNING

The optional cab does not provide protection from roll over or falling objects.

The windshield does not provide protection from tree limbs or flying objects.

The cab and windshield provide protection from the elements This vehicle is not equipped with seat belts and the cab has not been designed to provide roll over pro-

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

tection. In addition, the cab does not protect against falling objects nor does the windshield protect against flying objects and tree limbs. Keep arms and legs inside of vehicle while it is moving.

VEHICLE CLEANING AND CARE

Vehicle Cleaning

WARNING

To reduce the possibility of severe injury or vehicle damage, read and understand all instructions supplied by manufacturer of pressure washer.

CAUTION

When pressure washing exterior of vehicle, do not use pressure in excess of 700 psi (4800kPa). To reduce the possibility of 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. Using excessive water pressure may cause severe injury to operator or bystander, damage to seals, plastics, seat material, body finish or electrical system. Do not use pressure in excess of 700 psi (4800 kPa) to wash exterior of vehicle.

Normal cleaning of vinyl seats 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 and mild detergent is required to preserve the painted surfaces.

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

Corrosive materials used as fertilizers or for dust control can collect on the underbody of the vehicle. These materials will cause corrosion of underbody parts unless 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

it's removal, taking care not to chip or otherwise damage paint.

REPAIR

Lifting the Vehicle

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

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

WARNING

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

Be sure the vehicle is on a firm and level surface.

Never get under a vehicle while it is supported by a jack.

Use jack stands and test the stability of the vehicle on the stands.

Always place chocks in front and behind the wheels not being raised.

Use extreme care since the vehicle is extremely unstable during the lifting process

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings



CAUTION

When lifting vehicle, position jacks and jack stands at the areas indicated only

To raise the entire vehicle, install chocks in front and behind each front wheel (Ref Fig. 8 on page 9). Center the jack under the rear frame crossmember. Raise the vehicle enough to place a jack stand under the outer ends of the rear frame crossmember.

Lower the jack and test the stability of the vehicle on the two jack stands.

Place the jack at the flat section of steering box skid plate. Raise the vehicle enough to place jack stands under the frame members as indicated.

Lower the jack and test the stability of the vehicle on all four jack stands.

If only the front or rear of the vehicle is to be raised, place the chocks in front and behind each wheel not being raised to stabilize the vehicle.

Lower the vehicle by reversing the lifting sequence.

WHEELS AND TIRES

Tire Repair

Tool List

Qty. Required

Lug wrench, 3/4"	1
Impact socket, 3/4", 1/2" drive.....	1
Impact wrench, 1/2" drive.....	1
Torque wrench, 1/2" drive	1



WARNING

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

To reduce the possibility of tire explosion, pressurize tire with small amount of air applied intermittently to seat beads. Due to the low volume of the small tires, overinflation can occur in seconds. Never exceed the tire manufacturer's recommendation when seating a bead. Protect face and eyes from escaping air when removing valve core.

To reduce the possibility of severe injury caused by a broken socket when removing wheels, use only sockets designed for impact wrench use.

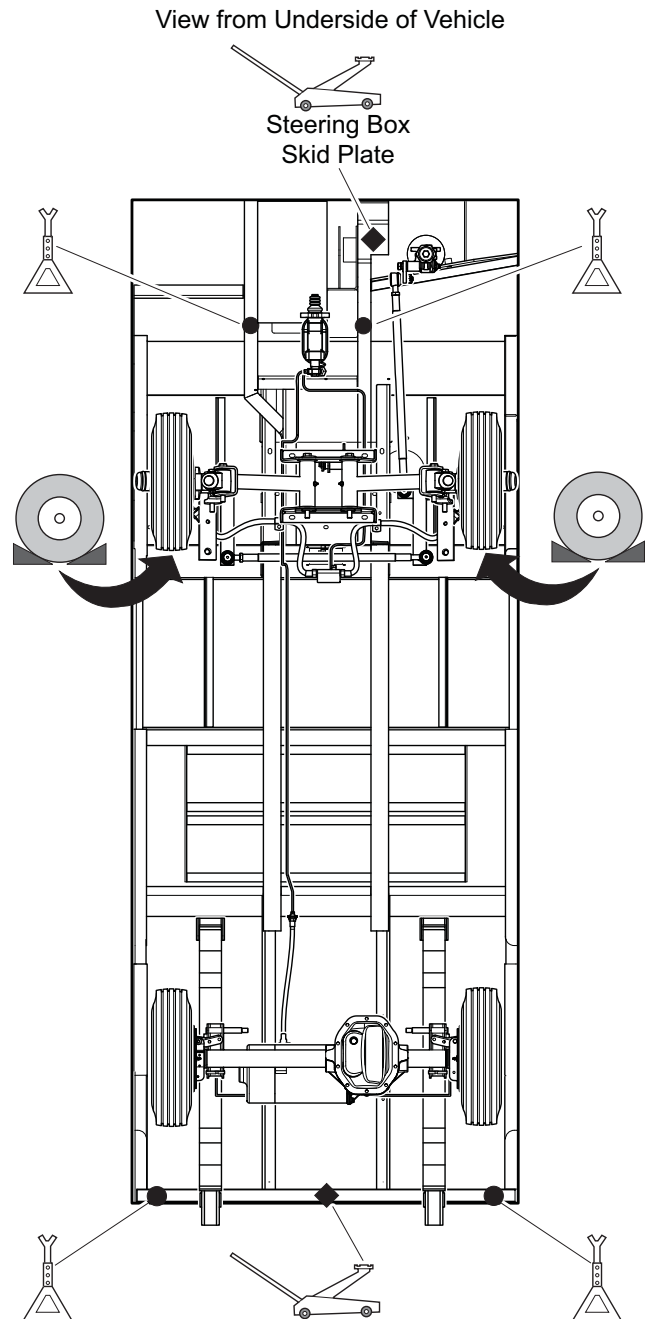


Fig. 8 Lifting the Vehicle

Use caution when inflating tires. Overinflation could cause the tire to separate from the wheel or cause the tire to explode, either of which could cause severe injury.

Use caution when inflating tires. Due to the low volume of the small tires, overinflation can occur in seconds. Over-

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

inflation could cause the tire to separate from the wheel or cause the tire to explode.

Tire inflation should be determined by the condition of the terrain. See GENERAL SPECIFICATIONS section for recommended tire inflation pressure. For outdoor applications with major use on grassy areas, the following should be considered. On hard turf, it is desirable to have a **slightly** higher inflation pressure. On very soft turf, a lower pressure reduces the possibility of tires cutting into the turf. For vehicles being used on paved or hard surfaces, tire inflation pressure should be in the higher allowable range, but under no condition should inflation pressure be higher than recommended on tire sidewall. **All four tires** should have the same pressure for optimum handling characteristics. Be sure to install the valve dust cap after checking or inflating.

The vehicle is fitted with low pressure tubeless tires mounted on one piece rims; therefore, the most cost effective way to repair a puncture in the tread is to use a commercial tire plug.

NOTE

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 wheel.

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 instructions.



WARNING

To reduce the possibility of severe injury, be sure mounting/demounting machine is anchored to floor. Wear OSHA approved safety equipment when mounting/demounting tires.

If the tire is to be removed or mounted, the tire changing machine manufacturer's recommendations must be followed in order to reduce possibility of severe injury.

Wheel Installation



CAUTION

To reduce the possibility of component damage, do not tighten lug nuts to more than 85 ft. lbs. (115 Nm) torque.

NOTE

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. 9 on page 10). Tighten lug nuts to 50 - 85 ft. lbs. (70 - 115 Nm) torque in 20 ft. lbs. (30 Nm) increments following the 'cross sequence' pattern.

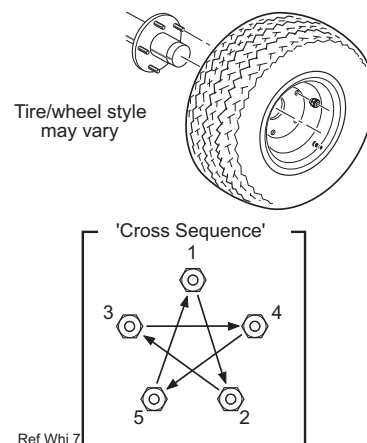


Fig. 9 Wheel Installation

LIGHT BULB REPLACEMENT

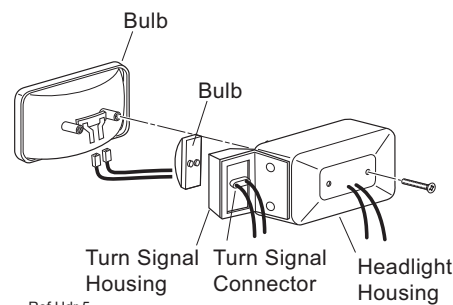


Fig. 10 Headlight, Turn Signal & Marker Light Bulb Replacement

For vehicles with headlights (Ref Fig. 10 on page 10), Remove the two screws on rear of the headlight. Remove screws, pull headlight out and disconnect wires. Connect wires to new headlight. Installation is the reverse of disassembly.

To replace the turn signal light bulb, remove connector from rear of bulb and lens. Unsnap bulb and lens from housing. Install new bulb and lens by snapping into housing. Install connector.

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

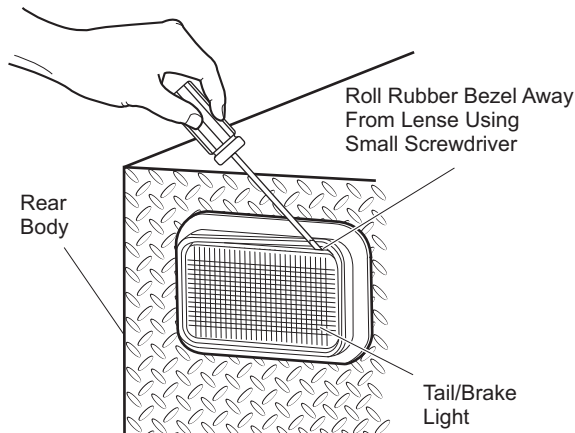


Fig. 11 Tail and Brake Light Bulb Replacement

To replace the tail and brake light bulb, insert a small screwdriver between the rubber bezel and the taillight lens. Roll the rubber bezel from around the edge of the lens and remove. Install replacement bulb and replace lens.

Headlight and taillight bulbs and fuses are available from a local Distributor, an authorized Branch or the Service Parts Department.

Fuse Replacement

To replace fuses, remove the load bed and remove the controller cover. Locate the fuse block in the electrical box adjacent to the controller. Pull out old fuse and replace with a new automotive type fuse.

TRANSPORTING VEHICLE

Towing

WARNING

This vehicle is not designed to be towed.

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

CAUTION

For non-PDS vehicles, place direction selector in neutral position prior to moving to prevent possible damage to electric motor.

For PDS vehicles, place Run-Tow/Maintenance switch in 'Tow/Maintenance' position prior to moving to prevent

damage to electric motor and controller.

PDS model vehicles are equipped with a 'Run-Tow/Maintenance' switch located below the rear of the load bed on the rear of the controller enclosure. The 'Tow/Maintenance' position allows the vehicle to roll freely without activating the warning beeper and eliminating potential damage to controller or motor (Ref Fig. 6 on page 3). Check to see that vehicles to be moved are switched to the 'Tow/Maintenance' position

WARNING

To prevent possible serious personal injury or death, never use ropes or chains to tow vehicle(s).

Hauling

WARNING

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

Secure the vehicle and contents.

Never ride on vehicle being transported.

If the vehicle is to be transported at highway speeds, the sun top (if equipped) must be removed. When transporting vehicle below highway speeds, check for tightness of hardware and cracks in sun top at mounting points. Always remove windshield when transporting. Always check that the vehicle and contents are adequately secured before transporting. The rated capacity of the trailer or truck must exceed the weight of the vehicle (see GENERAL SPECIFICATIONS for vehicle weight) and load plus 1000 lbs. (450 kg). Lock the park brake and secure the vehicle using ratchet tie downs.

SERVICE AND MAINTENANCE

WARNING

To reduce the possibility of severe injury or death from improper servicing techniques:

Do not attempt any type of servicing operation 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

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

running must be made with both drive wheels raised and vehicle properly supported on jack stands.

To reduce the possibility of motor damage, never operate vehicle at full throttle for more than 4 - 5 seconds while vehicle is in a 'no load' condition.



Wear eye protection when working on vehicle. Use extra care when working around batteries, using solvents or compressed air.

To reduce the possibility of causing an electrical arc, which could result in a battery explosion, turn off all electrical loads from the battery before removing battery wires.



Wrap wrenches with vinyl tape to reduce the possibility of a dropped wrench 'shorting out' a battery, which could result in an explosion.

The electrolyte in a 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.

Any electrolyte spills should be neutralized with a solution of 2 teaspoons (10 ml) sodium bicarbonate (baking soda) dissolved in 1 quart (1 liters) of water and flushed with water.

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

It is in the best interest of both vehicle owner and service technician, to carefully follow the procedures recommended in this manual. Preventative maintenance, applied at recommended intervals, is the best guarantee for keeping the vehicle both dependable and economical.



CAUTION

Before any electrical service is performed on PDS model vehicles, the 'Run-Tow/Maintenance' switch must be placed in the 'Tow/Maintenance' position.

If a power wire (battery, motor or controller) is discon-

nected for any reason on the PDS model vehicle, the 'Run-Tow/Maintenance' switch must be left in the 'Tow/Maintenance' position for at least 30 seconds after the circuit is restored.

This vehicle will give years of satisfactory service, providing it receives regular maintenance. Refer to the Periodic Service Schedule for appropriate service intervals (Ref. Fig. 16 on page 16). Refer to Lubrication Points Illustration for appropriate lubrication locations (Ref. on page 16).



CAUTION

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

To access powertrain for routine maintenance, lift or remove load bed. For major repair, refer to appropriate Technician's Repair and Service Manual.

Some service procedures may require the vehicle to be lifted. Refer to LIFTING THE VEHICLE for proper lifting procedure and safety information.

Serial and Manufacturing Number Label Locations

Supplemental Information Label Location

The Supplemental Information Label is located on the inside of the cowl (driver side)

Serial and Manufacturing No. Label Location

The serial and manufacturing number label is located on the inside of the cowl (driver side)

Serial and Manufacturing No. (Stamped) - For EE vehicle only

The serial number and manufacturing number are stamped on the frame below the load bed.

Serial No. Sticker Location

The serial number is located on the steering column.

Design changes take place on an ongoing basis. In order to obtain correct components for the vehicle, the manu-

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

factory date code, serial number and vehicle model must be provided when ordering parts.

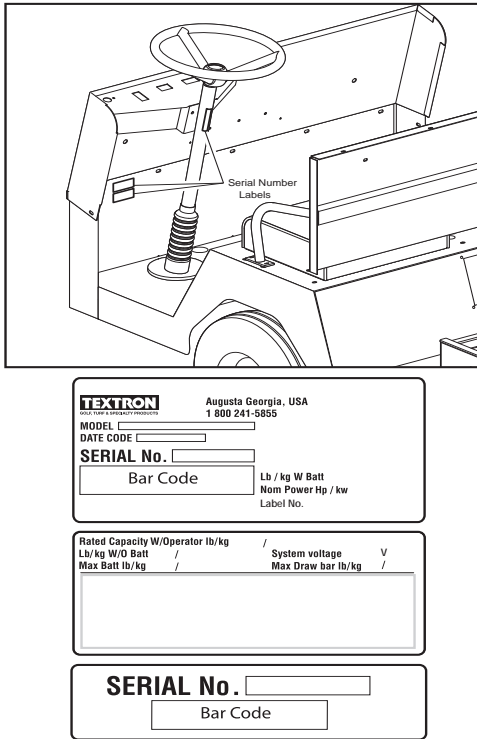


Fig. 12 Serial Number Plate & Location

Tire Inspection

Tire condition should be inspected per the Periodic Service Schedule (Ref. Fig. 16 on page 16). Inflation pressures should be checked when the tires are cool. Be sure to install the valve dust cap after checking or inflating.

Brakes

WARNING

To reduce the possibility of severe injury or death, always evaluate pedal travel before operating a vehicle to verify some braking function is present.

All driving brake tests must be done in a safe location with regard for the safety of all personnel.

Periodic Brake Test for Hydraulic Brakes

Depress the brake pedal. The pedal should have some free travel and then become hard. A brake pedal that has no free travel, excessive free travel or a spongy feel indi-

cates that a brake inspection is required. A brake pedal that falls after it is applied indicates a leak in the master or wheel cylinders.

It is important to periodically check and maintain proper brake fluid levels in the brake master cylinder. The fill cap for the cylinder is located under the front floorboard and is accessible by removing the cover panel. When checking the fluid, wipe off any dirt from the fill cap before removing it to reduce the possibility of contamination. Fluid level should be maintained at 1/8" (3 mm) below the top of the housing. If fluid must be added, inspect system for fluid leaks

PDS System Test

At monthly intervals, test the PDS system by allowing the vehicle to roll down an incline with the accelerator pedal released. Braking force should be felt at approximately 2 mph (3 kph) indicating that the PDS system is functioning. If vehicle speed continues to rise, apply the foot brake and have vehicle inspected by a trained mechanic

Capacities and Replacement Parts

Rear Axle Oil	40 oz (1.2 liters) / SAE 30
Fuse	15 amp (P/N 35212-G01)
Headlight Bulb	#894 (P/N 74004-G01)
Marker Bulb	#912 (P/N 74005-G01)
Turn Signal Bulb	#921 (P/N 74006-G01)
Tail Light Bulb	#1157 (P/N 21759-G1)

Ref Cap 2

Fig. 13 Capacities and Replacement Parts

Rear Axle

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

Clean the area around the check/fill plug and remove plug. The correct lubricant level is just below the bottom of the threaded hole. If lubricant is low, add lubricant as required. Add lubricant slowly until lubricant starts to seep from the hole. Install the check/fill plug. In the event that the lubricant is to be replaced, vehicle must be elevated and the oil pan removed or the oil siphoned through the check/fill hole (Ref Fig. 14 on page 14)

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

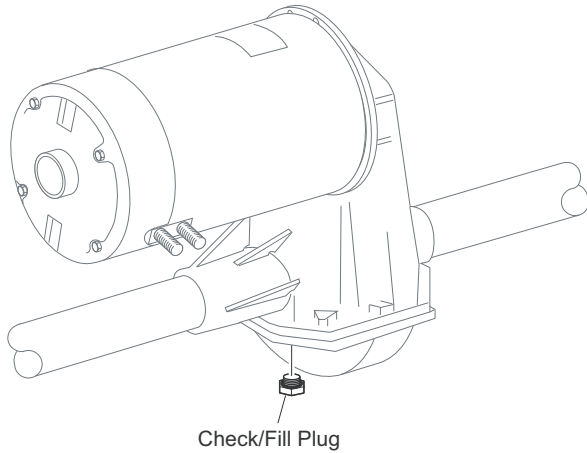


Fig. 14 Add, Check and Drain Axle Lubricant

Lubrication

CAUTION

Do not use more than three (3) pumps of grease in any grease fitting at any one time. Excess grease may cause grease seals to fail or grease migration into areas that could damage components.

Putting more than three pumps of grease in a grease fitting could damage grease seals and cause premature bearing failure (Ref Fig. 15 on page 14)

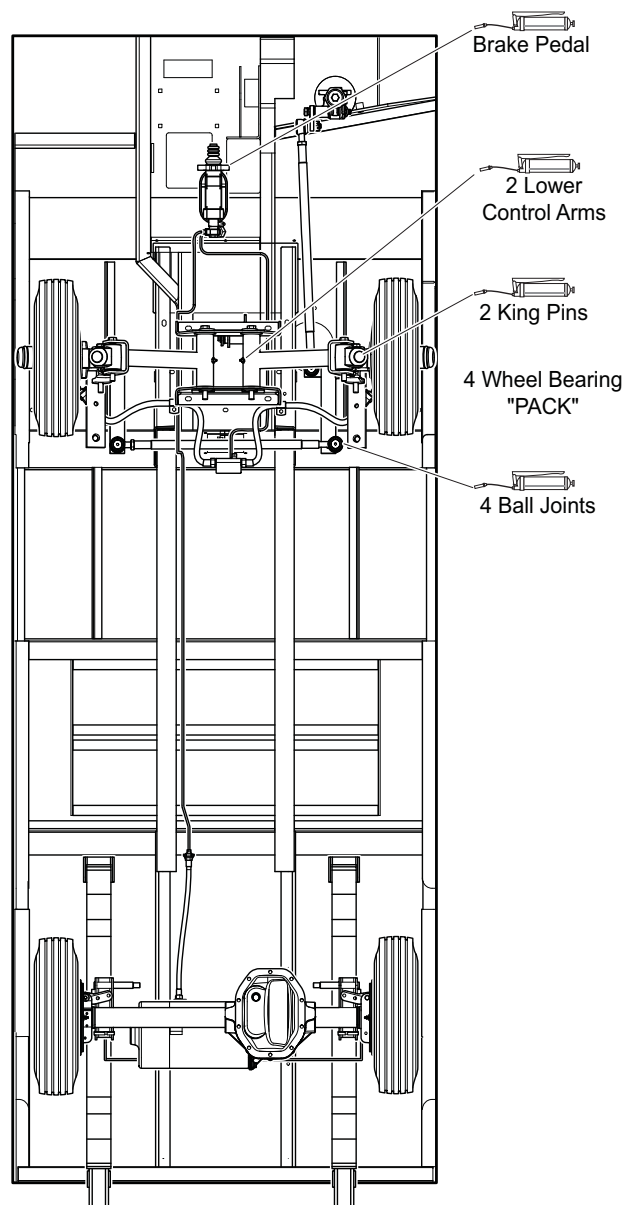


Fig. 15 Lubrication Points

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

Hardware

Periodically, the vehicle should be inspected for loose fasteners. Fasteners should be tightened in accordance with the Torque Specifications table (Ref Fig. 17 on page 17).

Use care when tightening fasteners and refer to the Technician's Repair and Service Manual for specific torque values.

Generally, three grades of hardware are used in the vehicle. Grade 5 hardware can be identified by the three marks on the hexagonal head and grade 8 hardware is identified by 6 marks on the head. Unmarked hardware is Grade 2 (Ref Fig. 17 on page 17)

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

PERIODIC SERVICE SCHEDULE

✓ Check ♦ Clean, Adjust, etc. ▲ Replace To perform service that is listed in this schedule but not described in this manual, contact a local Service Representative or see the Repair and Service Manual for this vehicle. NOTE: Some maintenance items must be serviced more frequently on vehicles used under severe driving conditions	
BEFORE USE:	
✓ Check foot brake general operation ✓ Check park brake function ✓ Check warning device function in reverse ✓ Check tire condition ✓ Check overall vehicle condition ♦ Recharge batteries to full state of charge after each day's use ✓ Inspect charger AC plug and cord for damage. Be sure ground pin is in place	
TIRES	
	✓ Examine for cuts, excessive wear and pressure (See GENERAL SPECIFICATIONS)
WHEELS	✓ Check for bent rims, missing or loose lug nuts
BATTERIES	
	♦ Clean batteries & terminals. See BATTERY CLEANING.
	✓ Check charge condition and all connections
WIRING	✓ Check all wiring for loose connections and broken/missing insulation
ACCELERATOR	✓ Check for smooth movement
foot brake (HYDRAULIC BRAKES)	✓ Conduct brake performance test
PARK BRAKE	✓ Check brake performance and adjust if required
DIRECTION SELECTOR (36V models)	✓ Check attachment, tighten if required
STEERING ASSEMBLY	✓ Check for abnormal play, tightness of all hardware
TIE ROD/LINKAGES	✓ Check for excessive play, bent components or loose connections
PDS SYSTEM	✓ Check for PDS Controller braking force (see PDS MODEL VEHICLES in text) proper operation of system
REAR AXLE	✓ Check for leakage, add SAE 30 oil as required
FRONT AXLE	
	✓ Check for damage to axle and loose or missing hardware
FRONT SHOCK ABSORBERS	✓ Check for oil leakage and loose fasteners
FRONT SPRINGS	✓ Check for loose hardware, cracks at attachments
FRONT WHEEL ALIGNMENT	✓ Check for unusual tire wear, align if required







Fig. 16 Periodic Service Schedule

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

PARK BRAKE	<ul style="list-style-type: none"> ✓ Check for smooth operation of lever ✓ Check for damage to ratchet, ✓ Check that park brake holds vehicle at 6th click ◆ Lubricate as required, use light oil. DO NOT LUBRICATE CABLES OR BRAKE LATCH
REAR SHOCK ABSORBERS	✓ Check for oil leakage, loose mounting hardware
HARDWARE AND FASTENERS	<ul style="list-style-type: none"> ✓ Check for loose or missing hardware and components ◆ Tighten or replace missing hardware
DIRECTION SELECTOR	✓ Check for wear and smooth movement (lubricate shaft with light oil if required)
KING PINS	✓ Check for excessive play and tightness of retaining nuts
STEERING ASSEMBLY	✓ Check bellows and pinion seal for damage or grease leakage
GREASE FITTINGS	◆ Lubricate, use wheel bearing grease
REAR AXLE	✓ Check for unusual noise and loose or missing mounting hardware
FRONT WHEEL BEARINGS	✓ Check and adjust as required, see Technician's Repair and Service Manual
REAR AXLE	✓ Check lubricant, add lubricant (SAE 30 oil) as required
foot brakeS	<ul style="list-style-type: none"> ◆ Clean and adjust, see Technician's Repair and Service Manual ✓ Check brake shoe linings, see Technician's Repair and Service Manual ✓ Check brake fluid

Fig. 16 Periodic Service Schedule

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)
Grade 8 	6 (8)	18 (24)	35 (47)	55 (75)	80 (108)	110 (149)	170 (230)	280 (380)	460 (624)	680 (922)
BOLT SIZE	M4	M5	M6	M8	M10	M12	M14			
Class 5.8 (Grade 2) 	1 (2)	2 (3)	4 (6)	10 (14)	20 (27)	35 (47)	55 (76.4)			
Class 8.8 (Grade 5) 	2 (3)	4 (6)	7 (10)	18 (24)	35 (47)	61 (83)	97 (131)			
Class 10.9 (Grade 8) 	3 (4)	6 (8)	10 (14)	25 (34)	49 (66)	86 (117)	136 (184)			

Ref Tsp 1

Fig. 17 .Torque Specifications and Bolt Grades

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

BATTERIES AND CHARGING

Safety

NOTE

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

! WARNING

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

Hydrogen gas is 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. Do not 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 damage to the vehicle and storage facility.

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.



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.

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.

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

Swing Out Battery Tray

Bumper should be always in contact with battery door when closed (Ref Fig. 18 on page 19).

Adjust rubber bumper as needed to remove slack between the latch and latch lock.

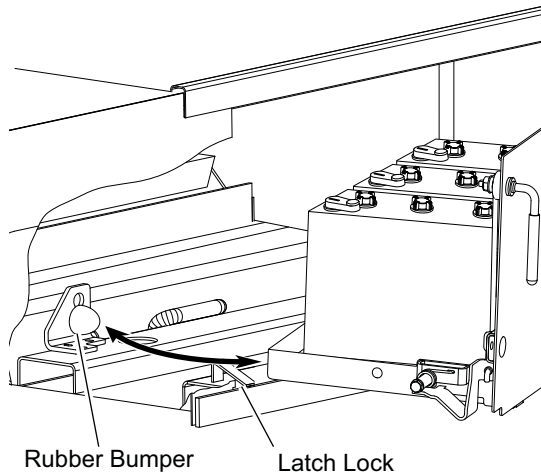


Fig. 18 Swing Out Battery Tray

Battery Maintenance

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

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 the AC plug of the battery charger for damage.

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. 19 on page 19).

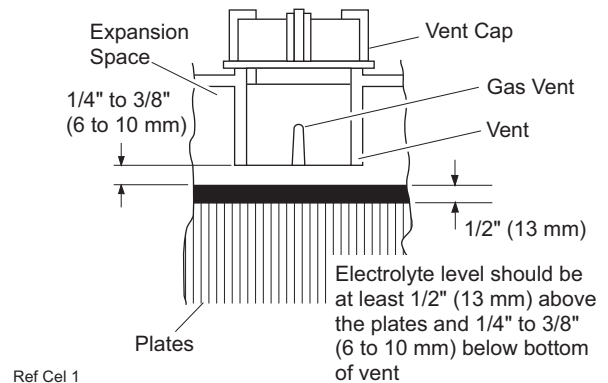


Fig. 19 Correct Electrolyte Level

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

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

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. 20 on page 20).

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

Wpt 1S

Fig. 20 Water Purity Table

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 (P/N 25587-G01) can be used with an approved water source (Ref Fig. 21 on page 20). These watering devices are **fast and accurate** to use and maintain the correct electrolyte level within the battery cells.

Watering gun similar to the type included in the Battery Maintenance Kit

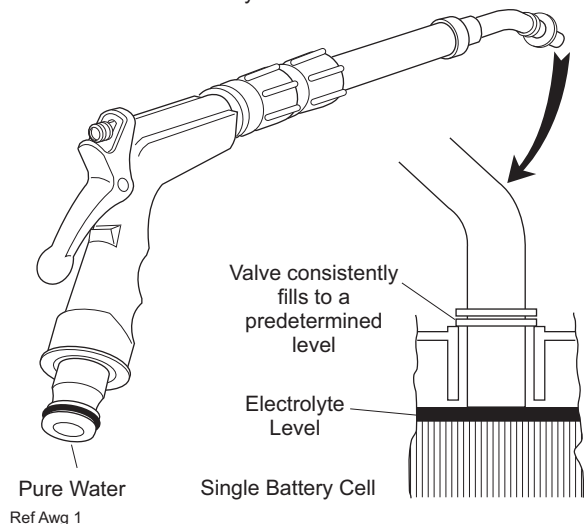


Fig. 21 Automatic Watering Gun

NOTE

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

Battery Cleaning

CAUTION

To prevent battery damage, be sure that all battery caps (if equipped) are tightly installed.

To reduce the possibility of damage to vehicle or floor, neutralize acid before rinsing battery.

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

Cleaning should take place per the Periodic Service Schedule (Ref. Fig. 16 on page 16).

When cleaning the outside of batteries and terminals, first spray with a solution of sodium bicarbonate (baking soda) and water to neutralize any acid deposits before rinsing with clear water.

Use of a water hose without first neutralizing any acid will move acid from the top of batteries to another area of the vehicle or storage facility where it will attack the metal structure or the concrete/asphalt floor. Additionally, conductive residue will remain on the batteries and contribute to their self discharge.

WARNING

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

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 or plastic spray bottle**. The solution should consist of the ingredients shown in the illustration (Ref Fig. 22 on page 21). In addition, special attention should be paid to metal components adjacent to the batteries which should also be sprayed with the solution.

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

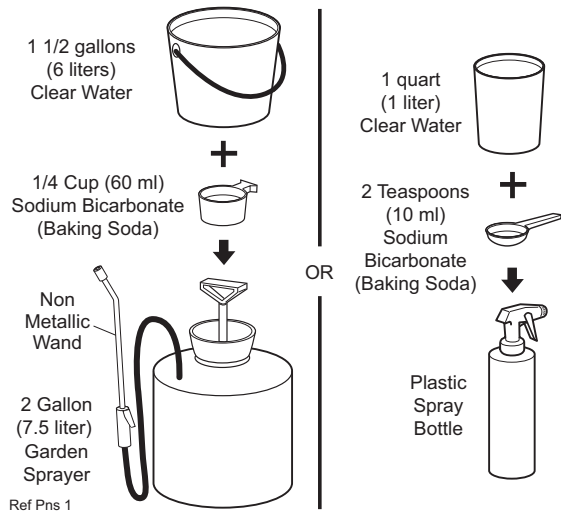


Fig. 22 Preparing Acid Neutralizing Solution

Allow the solution to sit for at least three minutes. Use a soft bristle brush or cloth to wipe the tops of the batteries to remove any conductive residue. Rinse the entire area with low pressure clear water. Do not use a pressure washer. All of the items required for complete battery cleaning and watering (electric vehicles only) are contained in the Battery Maintenance Kit (P/N 25587-G01).

Battery Watering, Cleaning & Replacement

The 48V 2 passenger model is equipped with swing out battery racks to make the batteries accessible for watering, cleaning and removal.

Starting with model year 2007 the 2 passenger model of the 36V vehicle is equipped with swing out battery racks. 2005 & 2006 models require that the load bed be removed to access the battery set.

The 4 passenger 36V and 48V models require the load bed to be removed to access the battery set.



CAUTION

Before any electrical service is performed on 48 V (PDS) model vehicles, the Run-Tow/Maintenance switch must be placed in the 'Tow/Maintenance' position.

If a power wire (battery, motor or controller) is disconnected for any reason on the PDS model vehicle, the Run-Tow/Maintenance switch must be left in the 'Tow/Maintenance' position for at least 30 seconds after the circuit is restored.

Remove battery hold downs and cables. Lift out batteries with a commercially available lifting device.

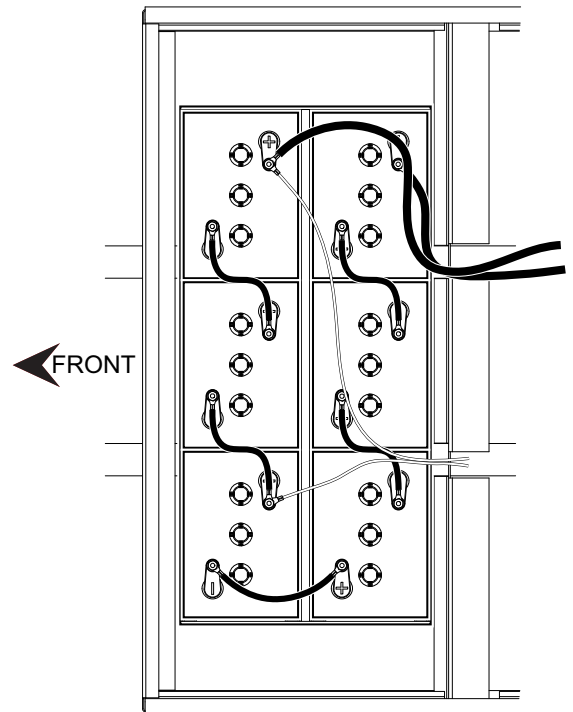


Fig. 23 36V (4 Passenger) Battery Connections

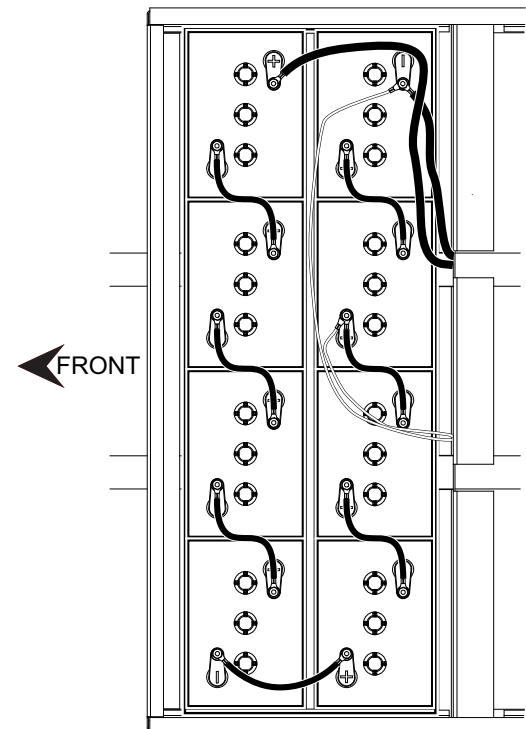


Fig. 24 48V (4 Passenger) Battery Connections

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

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 depending on vehicle model (Ref Fig. 23 36V (4 Passenger) Battery Connections on page 21), (Ref Fig. 24 48V (4 Passenger) Battery Connections on page 21), (Ref Fig. 25 36V (2 Passenger) Battery Connections on page 22), (Ref Fig. 26 36V (2 Passenger) Battery Connections beginning mid-model Year 2007 on page 22), (Ref Fig. 27 48V (2 Passenger) Battery Connections on page 23). 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.

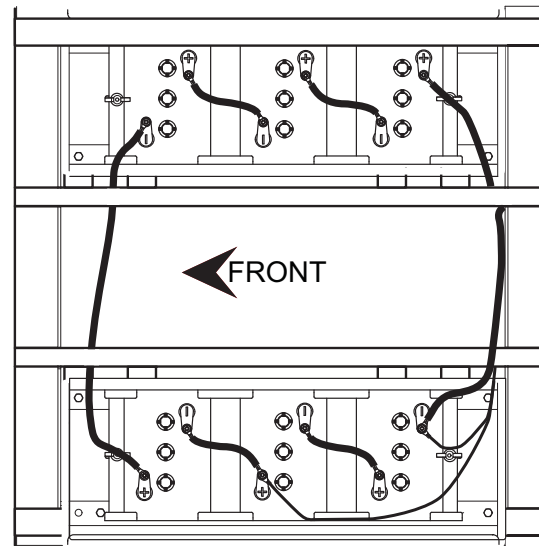


Fig. 25 36V (2 Passenger) Battery Connections

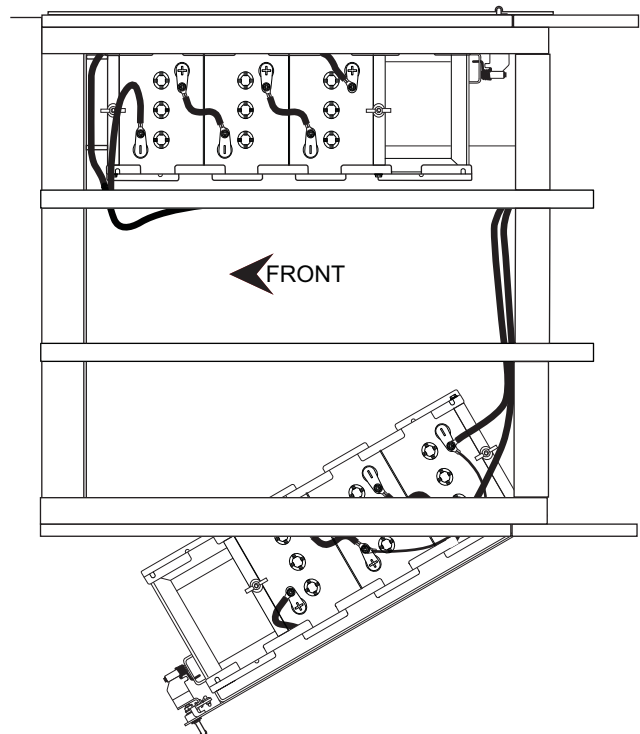


Fig. 26 36V (2 Passenger) Battery Connections beginning mid-model Year 2007

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

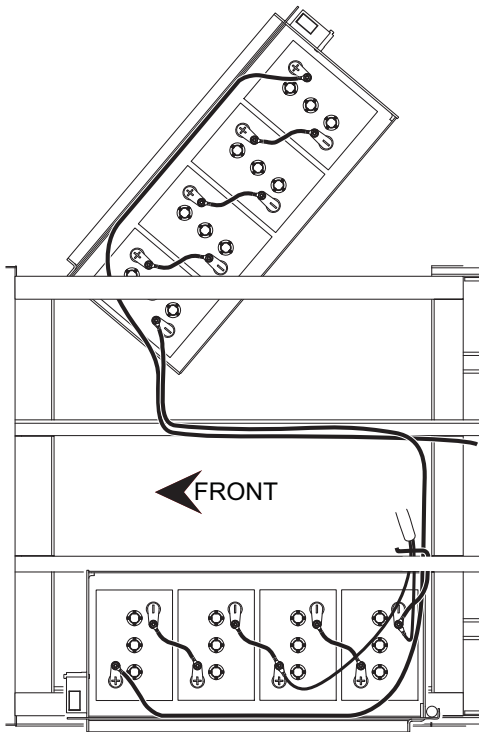


Fig. 27 48V (2 Passenger) Battery Connections

Prolonged Storage

CAUTION

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

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

In high temperatures the chemical reaction is faster, while low temperatures cause the chemical reaction to slow down. A vehicle that is stored at 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.

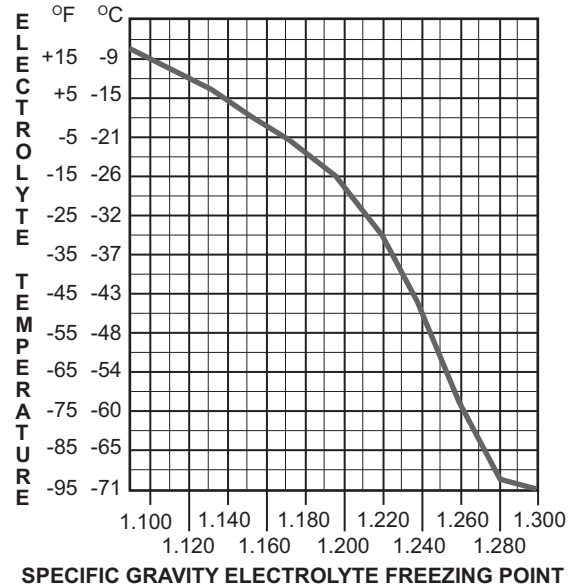


Fig. 28 Freezing Point of Electrolyte

In winter conditions, the battery must be fully charged to prevent the possibility of freezing (Ref Fig. 28 on page 23). 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 PDS vehicles, the controller should be disconnected from the batteries by setting the Run-Tow/Maintenance switch, located below the rear of the load bed on the rear of the controller enclosure, to the 'TOW/MAINTENANCE' position. Disconnect the charging harness from the batteries. The batteries must be cleaned and all deposits neutralized and removed from the battery case 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:

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings



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 plug and cord are in good condition and the ground pin is in place.

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.

Troubleshooting

In general, troubleshooting will be done for two distinct reasons. First, a battery that performs poorly and is outside of the manufacturers 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 manufacturer representative for specific requirements.

cle 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.

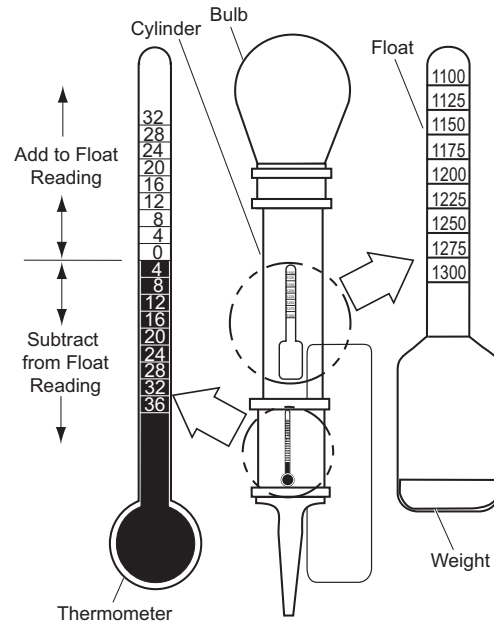


Fig. 29 Hydrometer

Hydrometer

A hydrometer (P/N 50900-G1) is used to test the state of charge of a battery cell (Ref Fig. 29 on page 24). 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.

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

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 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.

NOTE

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.

Using A Hydrometer

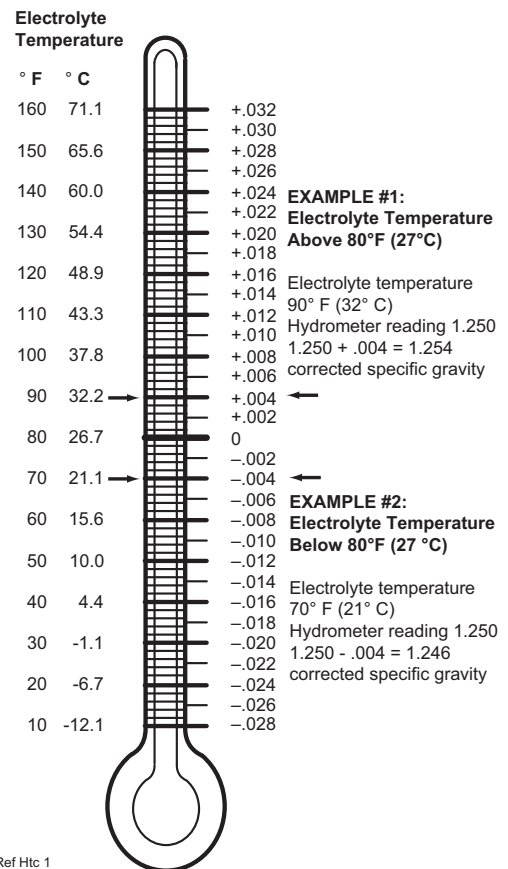
1. Draw electrolyte into the hydrometer several times to permit the thermometer to adjust to the electrolyte temperature and note the reading. Examine the color of the electrolyte. A brown or gray coloration indicates a problem with the battery and is a sign that the battery is nearing the end of its 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. 30 on page 25).

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.



Ref Htc 1
Fig. 30 Hydrometer Temperature Correction

OPERATION AND SERVICE INFORMATION

Read all of Manual to become thoroughly familiar with this vehicle. Pay particular attention to all Notes, Cautions and Warnings

Notes: _____

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GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

TITAN 36V - 2 Passenger

(Model Year 2005 - Mid 2007)

WEIGHT (without batteries)	1410 lbs. (640 kg)
GROUND CLEARANCE (at differential)	5 in (12.7 cm)
TIRES	Sure Trail Industrial, 5.70 x 8 LRC
TIRE PRESSURE	70 psi (483 kPa)
LOAD CAPACITY (including operator, passenger, cargo and accessories)	3,000 lbs (1360 kg)
CHASSIS, BODY & FINISH	1 piece body with welded high yield strength tubular steel with powder coat paint Heavy duty four way diamond pattern body. Safety yellow modified acrylic topcoat over polyester primer
SAFETY	Removable dash mounted key switch, reverse warning indicator, 'deadman' accelerator control, operator presence seat switch, integral handgrip on hip restraints, forward/reverse selector with 'neutral' and electric horn
LIGHTING PACKAGE	Dual taillights, brake lights (optional headlights)
STEERING	Automotive, with steering wheel
BRAKES	Dual rear wheel, hydraulic drum brakes. Hand operated parking brake with manual adjustment. Front hydraulic brakes (optional)
FRONT SUSPENSION	Independent, leaf spring with hydraulic shock absorbers
REAR SUSPENSION	Leaf springs with hydraulic shock absorbers
SEATING	Formed fabric backed vinyl covers over cushion foam. Seating for operator and one passenger
SPEED	Up to 13.5 mph (21.7 km/h)
TRANSAXLE	Direct drive, 14.76:1 ratio
CLASSIFICATION	UL (Underwriters Laboratory) Approved type "E" classification
ELECTRICAL SYSTEM	36 volt DC, six 6 volt heavy duty, deep cycle storage batteries (115 minute, 225 amp hour @ 20 hour discharge rate)
SPEED CONTROL	Solid state controller, 400 amp rated
MOTOR	36 volt DC, high efficiency series wound, brazed armature, solid copper windings, vented, 8 hp (6kw) at 1600 rpm
CHARGER	PowerWise™ on board, 21 amp DC output at 36 volts; input 110 - 120 volts, 9.5 amps, 60 cycle AC, Underwriters Laboratory (UL) Listed, CSA Certified, anti-drive away charger/vehicle interlock

GENERAL SPECIFICATIONS

TITAN 36V - 2 Passenger

(From Mid 2007)

WEIGHT (without batteries)	1148 lbs. (521 kg)
GROUND CLEARANCE (at differential)	5 in (12.7 cm)
TIRES	Sure Trail Industrial, 5.70 x 8 LRC
TIRE PRESSURE	70 psi (483 kPa)
LOAD CAPACITY (including operator, passenger, cargo and accessories)	3,000 lbs (1360 kg)
CHASSIS, BODY & FINISH.....	1 piece body with welded high yield strength tubular steel with powder coat paint Heavy duty four way diamond pattern body. Safety yellow modified acrylic topcoat over polyester primer
SAFETY	Removable dash mounted key switch, reverse warning indicator, 'deadman' accelerator control, operator presence seat switch, integral handgrip on hip restraints, forward/reverse selector with 'neutral' and electric horn
LIGHTING PACKAGE	Dual taillights, brake lights (optional headlights)
STEERING	Automotive, with steering wheel
BRAKES	Dual rear wheel, hydraulic drum brakes. Hand operated parking brake with manual adjustment. Front hydraulic brakes (optional)
FRONT SUSPENSION.....	Independent, leaf spring with hydraulic shock absorbers
REAR SUSPENSION	Leaf springs with hydraulic shock absorbers
SEATING	Formed fabric backed vinyl covers over cushion foam. Seating for operator and one passenger
SPEED.....	Up to 13.5 mph (21.7 km/h)
TRANSAXLE	Direct drive, 14.76:1 ratio
CLASSIFICATION.....	UL (Underwriters Laboratory) Approved type "E" classification
ELECTRICAL SYSTEM.....	36 volt DC, six 6 volt heavy duty, deep cycle storage batteries (115 minute, 225 amp hour @ 20 hour discharge rate)
SPEED CONTROL	Solid state controller, 400 amp rated
MOTOR.....	36 volt DC, high efficiency series wound, brazed armature, solid copper windings, vented, 8 hp (6kw) at 1600 rpm
CHARGER.....	PowerWise™ on board, 21 amp DC output at 36 volts; input 110 - 120 volts, 9.5 amps, 60 cycle AC, Underwriters Laboratory (UL) Listed, CSA Certified, anti-drive away charger/vehicle interlock
NOISE.....	Sound pressure, continuous A-weighted < 70 dB (A)
VIBRATION, WBV.....	The weighted RMS acceleration is 0.7 m/s ²
VIBRATION, HAV.....	The weighted RMS acceleration is less than 2.5 m/s ² .

GENERAL SPECIFICATIONS

TITAN 48V - 2 Passenger

(Model Year 2005 - Mid 2007)

WEIGHT (without batteries)	1740 lbs. (790 kg)
GROUND CLEARANCE (at differential)	5 in (12.7 cm)
TIRES	Sure Trail Industrial, 5.70 x 8 LRC
TIRE PRESSURE	70 psi (483 kPa)
LOAD CAPACITY (including operator, passenger, cargo and accessories)	3,000 lbs (1360 kg)
CHASSIS, BODY & FINISH	1 piece body with welded high yield strength tubular steel with powder coat paint Heavy duty four way diamond pattern body. Safety yellow modified acrylic topcoat over polyester primer
SAFETY	Removable dash mounted key switch, reverse warning indicator, 'deadman' accelerator control, operator presence seat switch, integral handgrip on hip restraints, forward/reverse selector with 'neutral' and electric horn
LIGHTING PACKAGE	Dual taillights, brake lights (optional headlights)
STEERING	Automotive, with steering wheel
BRAKES	Dual rear wheel, hydraulic drum brakes. Hand operated parking brake with manual adjustment. Front hydraulic brakes (optional)
FRONT SUSPENSION	Independent, leaf spring with hydraulic shock absorbers
REAR SUSPENSION	Leaf springs with hydraulic shock absorbers
SEATING	Formed fabric backed vinyl covers over cushion foam. Seating for operator and one passenger
TRANSAXLE	Direct drive, 14.76:1 ratio
CLASSIFICATION	UL (Underwriters Laboratory) Approved type "E" classification
ELECTRICAL SYSTEM	48 volt DC, eight 6-volt 225 amp hr batteries. Precision Drive System (PDS) electronic speed controller. Regenerative braking Batteries contained in swing out battery trays (1 per side)
DIRECTION SELECTOR	Electronic Three position switch
SPEED CONTROL	Solid State continuously variable speed controller
CHARGER	Lestronic, fully automatic, 48 volt output 25 amp On-board
MOTOR	High efficiency DC shunt wound, brazed armature, solid copper windings.
SPEED	Up to 13.5 mph (22 kph)

GENERAL SPECIFICATIONS

TITAN 48V - 2 Passenger

(From Mid 2007)

WEIGHT (without batteries)	1164 lbs. (528 kg)
GROUND CLEARANCE (at differential)	5 in (12.7 cm)
TIRES	Sure Trail Industrial, 5.70 x 8 LRC
TIRE PRESSURE	70 psi (483 kPa)
LOAD CAPACITY (including operator, passenger, cargo and accessories)	3,000 lbs (1360 kg)
CHASSIS, BODY & FINISH.....	1 piece body with welded high yield strength tubular steel with powder coat paint Heavy duty four way diamond pattern body. Safety yellow modified acrylic topcoat over polyester primer
SAFETY	Removable dash mounted key switch, reverse warning indicator, 'deadman' accelerator control, operator presence seat switch, integral handgrip on hip restraints, forward/reverse selector with 'neutral' and electric horn
LIGHTING PACKAGE	Dual taillights, brake lights (optional headlights)
STEERING	Automotive, with steering wheel
BRAKES	Dual rear wheel, hydraulic drum brakes. Hand operated parking brake with manual adjustment. Front hydraulic brakes (optional)
FRONT SUSPENSION.....	Independent, leaf spring with hydraulic shock absorbers
REAR SUSPENSION	Leaf springs with hydraulic shock absorbers
SEATING	Formed fabric backed vinyl covers over cushion foam. Seating for operator and one passenger
TRANSAXLE	Direct drive, 14.76:1 ratio
CLASSIFICATION.....	UL (Underwriters Laboratory) Approved type "E" classification
ELECTRICAL SYSTEM.....	48 volt DC, eight 6-volt 225 amp hr batteries. Precision Drive System (PDS) electronic speed controller. Regenerative braking Batteries contained in swing out battery trays (1 per side)
DIRECTION SELECTOR.....	Electronic Three position switch
SPEED CONTROL	Solid State continuously variable speed controller
CHARGER.....	Lestronic, fully automatic, 48 volt output 25 amp On-board
MOTOR.....	High efficiency DC shunt wound, brazed armature, solid copper windings.
SPEED.....	Up to 13.5 mph (22 kph)
NOISE.....	Sound pressure, continuous A-weighted < 70 dB (A)
VIBRATION, WBV.....	The weighted RMS acceleration is 0.7 m/s ²
VIBRATION, HAV.....	The weighted RMS acceleration is less than 2.5 m/s ² .

GENERAL SPECIFICATIONS

TITAN 36V 4 Passenger

(Model Year 2005 - Mid 2007)

WEIGHT (without batteries)	1475 lbs. (640 kg))
GROUND CLEARANCE (at differential)	5 in (12.7 cm)
TIRES	Sure Trail Industrial, 5.70 x 8 LRC
TIRE PRESSURE	70 psi (483 kPa)
LOAD CAPACITY (including operator, passenger, cargo and accessories)	3,000 lbs (1360 kg)
CHASSIS, BODY & FINISH	1 piece body with welded high yield strength tubular steel with powder coat paint Heavy duty four way diamond pattern body. Safety yellow modified acrylic topcoat over polyester primer
SAFETY	Removable dash mounted key switch, reverse warning indicator, 'deadman' accelerator control, operator presence seat switch, integral handgrip on hip restraints, forward/reverse selector with 'neutral' and electric horn
LIGHTING PACKAGE	Dual taillights, brake lights (optional headlights)
STEERING	Automotive, wheel type
BRAKES	Dual rear wheel, hydraulic drum brakes. Hand operated parking brake with manual adjustment. Front hydraulic brakes (optional)
FRONT SUSPENSION	Independent, leaf spring with hydraulic shock absorbers
REAR SUSPENSION	Leaf springs with hydraulic shock absorbers
SEATING	Formed fabric backed vinyl covers over cushion foam. Seating for operator and three passengers
SPEED	Up to 13.5 mph (21.7 km/h)
TRANSAXLE	Direct drive, 14.76:1 ratio
CLASSIFICATION	UL (Underwriters Laboratory) Approved type "E" classification
ELECTRICAL SYSTEM	36 volt DC, six 6 volt heavy duty, deep cycle storage batteries (115 minute, 225 amp hour @ 20 hour discharge rate)
SPEED CONTROL	Solid state controller, 400 amp rated
MOTOR	36 volt DC, high efficiency series wound, brazed armature, solid copper windings, vented, 8 hp (6kw) at 1600 rpm
CHARGER	PowerWise™ on board, 21 amp DC output at 36 volts; input 110 - 120 volts, 9.5 amps, 60 cycle AC, Underwriters Laboratory (UL) Listed, CSA Certified, anti-drive away charger/vehicle interlock

GENERAL SPECIFICATIONS

TITAN 36V 4 Passenger

(From Mid 2007)

WEIGHT (without batteries)	1124 lbs. (510 kg)
GROUND CLEARANCE (at differential)	5 in (12.7 cm)
TIRES	Sure Trail Industrial, 5.70 x 8 LRC
TIRE PRESSURE	70 psi (483 kPa)
LOAD CAPACITY (including operator, passenger, cargo and accessories)	3,000 lbs (1360 kg)
CHASSIS, BODY & FINISH.....	1 piece body with welded high yield strength tubular steel with powder coat paint Heavy duty four way diamond pattern body. Safety yellow modified acrylic topcoat over polyester primer
SAFETY	Removable dash mounted key switch, reverse warning indicator, 'deadman' accelerator control, operator presence seat switch, integral handgrip on hip restraints, forward/reverse selector with 'neutral' and electric horn
LIGHTING PACKAGE	Dual taillights, brake lights (optional headlights)
STEERING	Automotive, wheel type
BRAKES	Dual rear wheel, hydraulic drum brakes. Hand operated parking brake with manual adjustment. Front hydraulic brakes (optional)
FRONT SUSPENSION.....	Independent, leaf spring with hydraulic shock absorbers
REAR SUSPENSION	Leaf springs with hydraulic shock absorbers
SEATING	Formed fabric backed vinyl covers over cushion foam. Seating for operator and three passengers
SPEED.....	Up to 13.5 mph (21.7 km/h)
TRANSAXLE	Direct drive, 14.76:1 ratio
CLASSIFICATION.....	UL (Underwriters Laboratory) Approved type "E" classification
ELECTRICAL SYSTEM.....	36 volt DC, six 6 volt heavy duty, deep cycle storage batteries (115 minute, 225 amp hour @ 20 hour discharge rate)
SPEED CONTROL	Solid state controller, 400 amp rated
MOTOR.....	36 volt DC, high efficiency series wound, brazed armature, solid copper windings, vented, 8 hp (6kw) at 1600 rpm
CHARGER.....	PowerWise™ on board, 21 amp DC output at 36 volts; input 110 - 120 volts, 9.5 amps, 60 cycle AC, Underwriters Laboratory (UL) Listed, CSA Certified, anti-drive away charger/vehicle interlock
NOISE.....	Sound pressure, continuous A-weighted < 70 dB (A)
VIBRATION, WBV.....	The weighted RMS acceleration is 0.7 m/s ²
VIBRATION, HAV.....	The weighted RMS acceleration is less than 2.5 m/s ² .

Specifications subject to change without notice.

GENERAL SPECIFICATIONS

TITAN 48V 4 Passenger

(From Mid 2009)

WEIGHT (without batteries)	1124 lbs. (510 kg)
GROUND CLEARANCE (at differential)	5 in (12.7 cm)
TIRES	Sure Trail Industrial, 5.70 x 8 LRC
TIRE PRESSURE	70 psi (483 kPa)
LOAD CAPACITY (including operator, passenger, cargo and accessories)	3,000 lbs (1360 kg)
CHASSIS, BODY & FINISH	1 piece body with welded high yield strength tubular steel with powder coat paint Heavy duty four way diamond pattern body. Safety yellow modified acrylic topcoat over polyester primer
SAFETY	Removable dash mounted key switch, reverse warning indicator, 'deadman' accelerator control, operator presence seat switch, integral handgrip on hip restraints, forward/reverse selector with 'neutral' and electric horn
LIGHTING PACKAGE	Dual taillights, brake lights (optional headlights)
STEERING	Automotive, wheel type
BRAKES	Dual rear wheel, hydraulic drum brakes. Hand operated parking brake with manual adjustment. Front hydraulic brakes (optional)
FRONT SUSPENSION	Independent, leaf spring with hydraulic shock absorbers
REAR SUSPENSION	Leaf springs with hydraulic shock absorbers
SEATING	Formed fabric backed vinyl covers over cushion foam. Seating for operator and three passengers
SPEED	Up to 13.5 mph (21.7 km/h)
TRANSAXLE	Direct drive, 14.76:1 ratio
CLASSIFICATION	UL (Underwriters Laboratory) Approved type "E" classification
ELECTRICAL SYSTEM	48 volt DC, eight 6-volt 225 amp hr batteries. Precision Drive System (PDS) electronic speed controller. Regenerative braking Batteries contained in swing out battery trays (1 per side)
DIRECTION SELECTOR	Electronic Three position switch
SPEED CONTROL	Solid State continuously variable speed controller
CHARGER	Lestronic, fully automatic, 48 volt output 25 amp On-board
MOTOR	High efficiency DC shunt wound, brazed armature, solid copper windings.
SPEED	Up to 13.5 mph (22 kph)
NOISE	Sound pressure, continuous A-weighted < 70 dB (A)
VIBRATION, WBV	The weighted RMS acceleration is 0.7 m/s ²
VIBRATION, HAV	The weighted RMS acceleration is less than 2.5 m/s ² .

Specifications subject to change without notice.

GENERAL SPECIFICATIONS

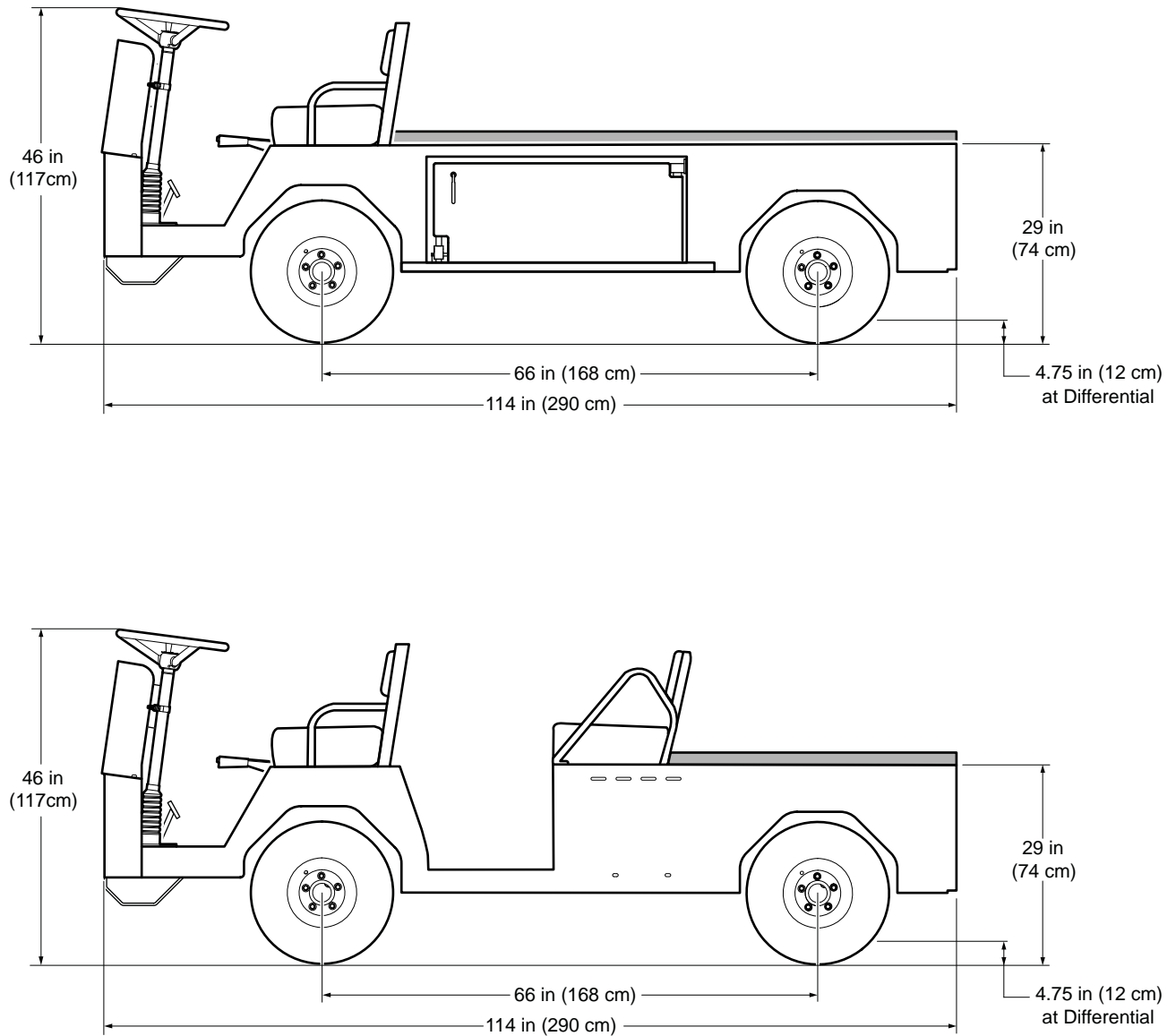


Fig. 30 Vehicle Dimensions

GENERAL SPECIFICATIONS

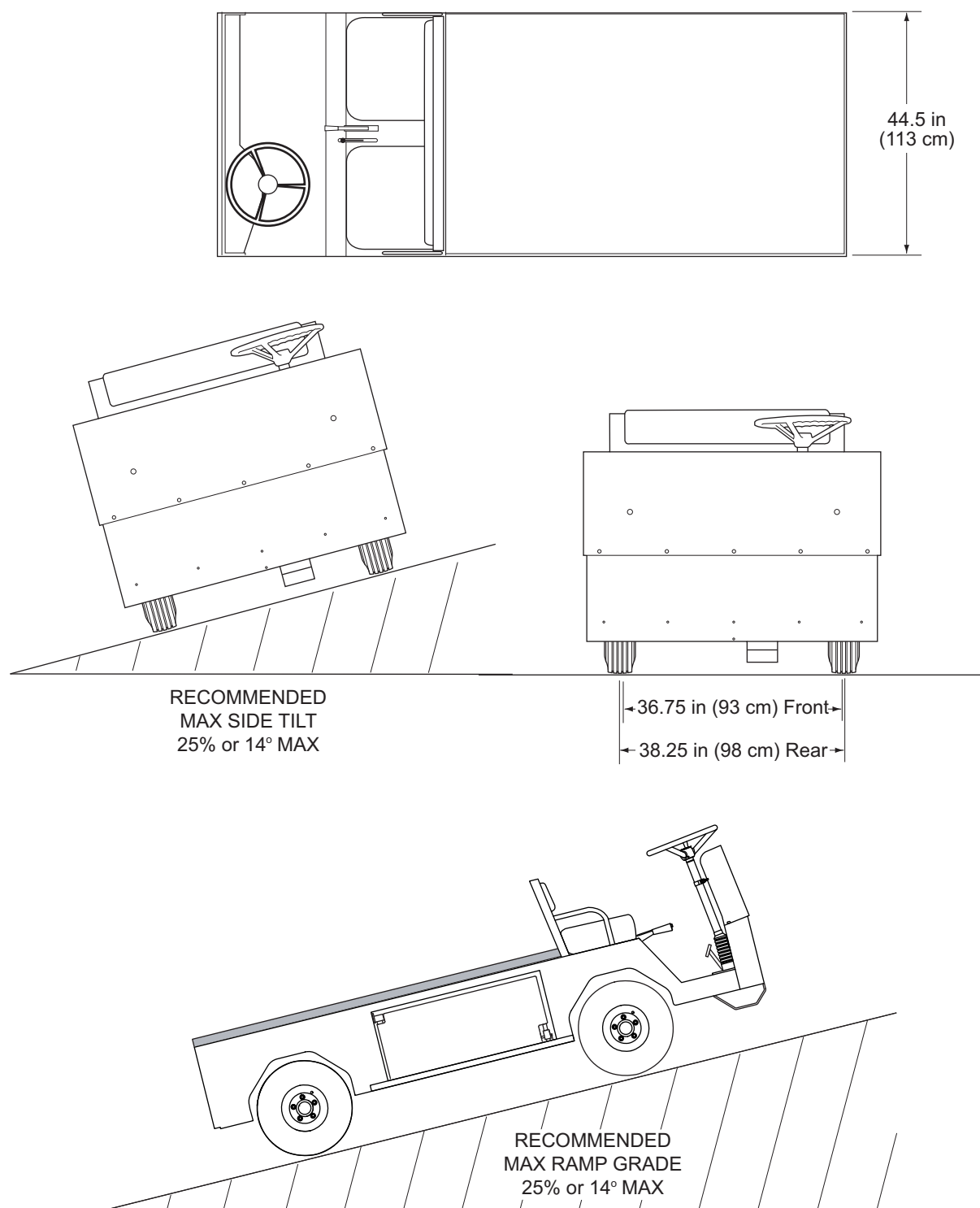


Fig. 31 Vehicle Dimensions and Incline Specifications

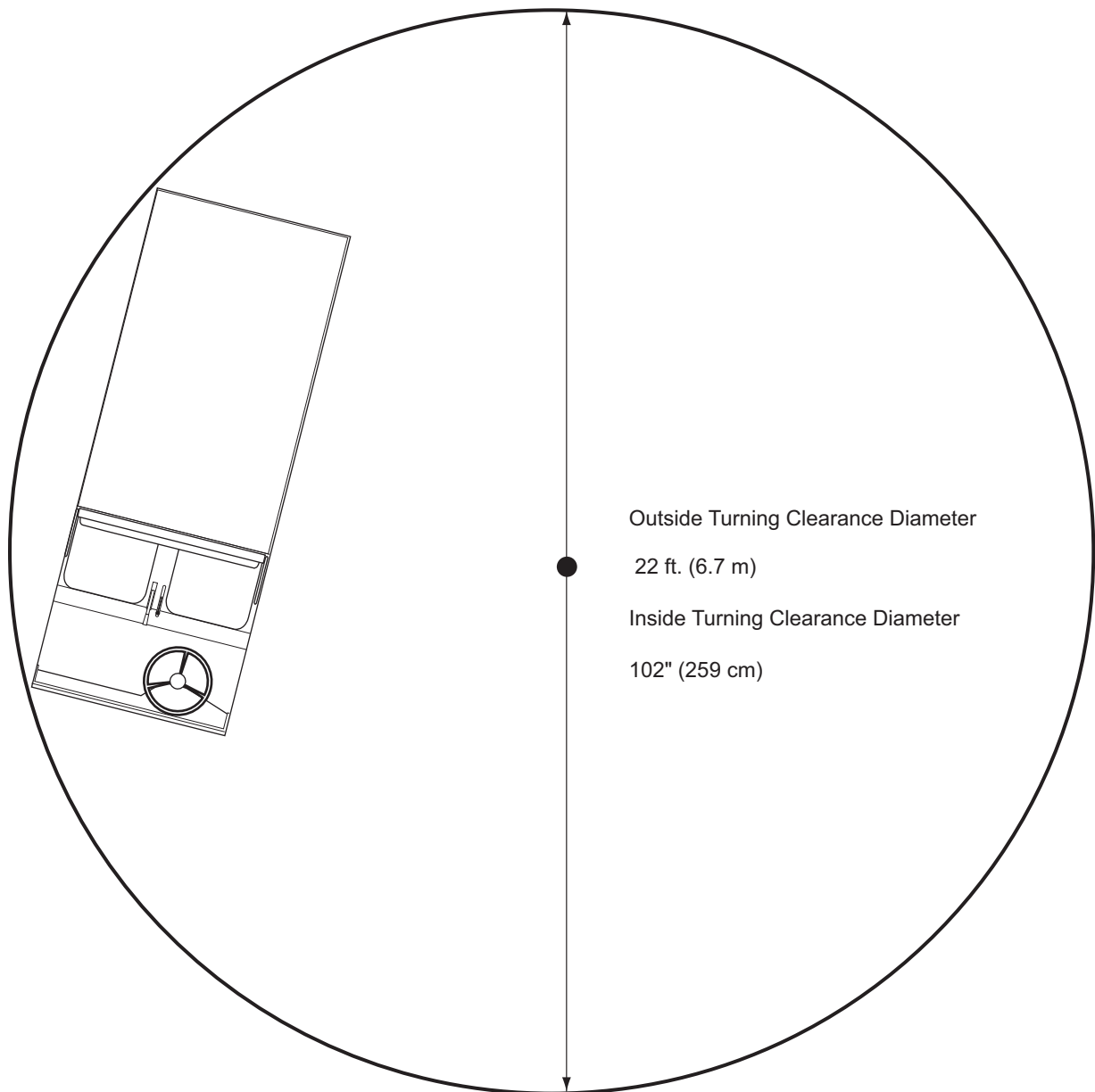


Fig. 32 Vehicle Turning Clearance Diameter

GENERAL SPECIFICATIONS

LIMITED WARRANTIES

VEHICLE WARRANTIES

DOMESTIC WARRANTY (U.S. AND CANADA)

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

**DECLARATION OF CONFORMITY
(EUROPE ONLY)**

VEHICLE WARRANTIES

Notes: _____

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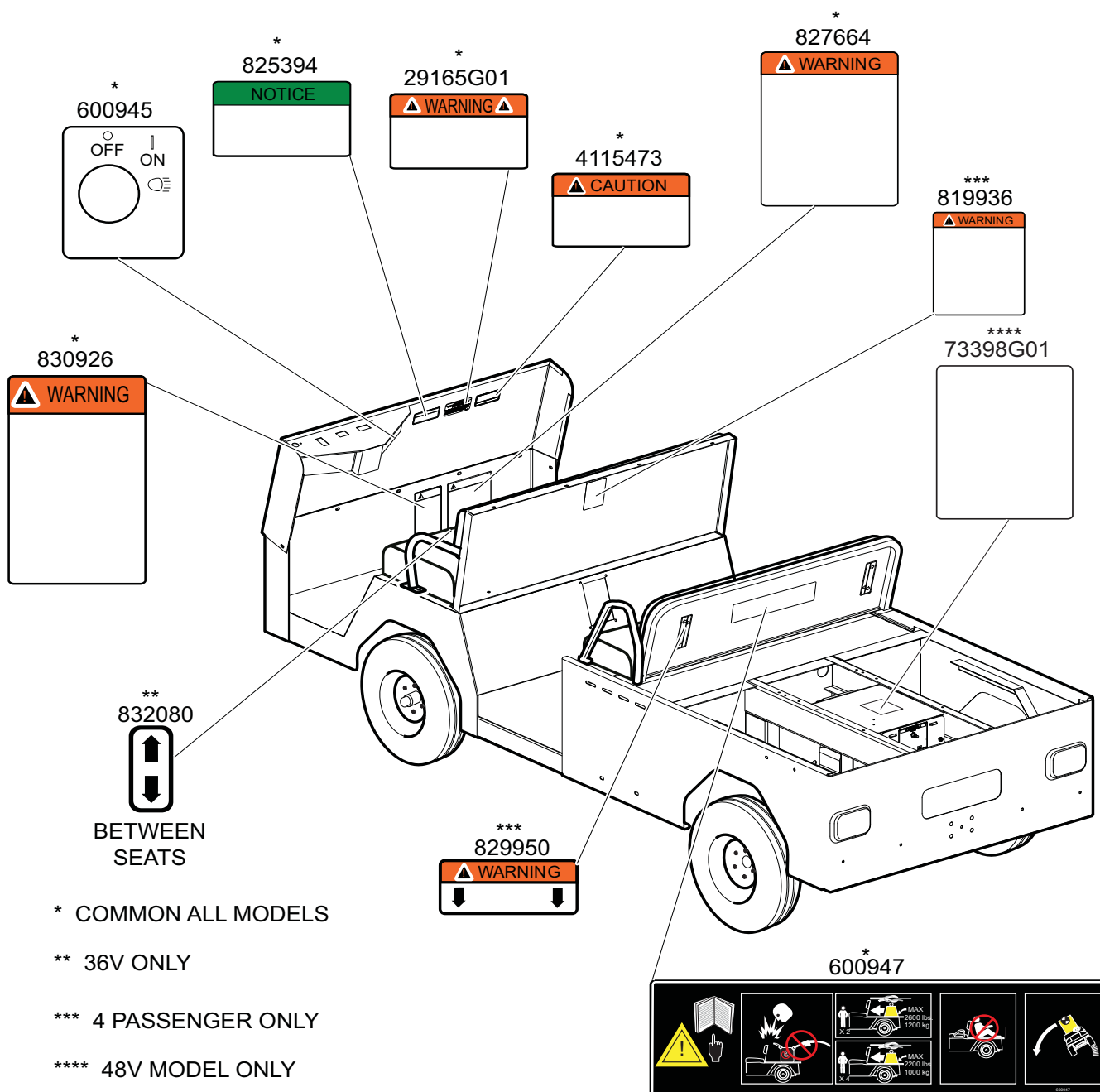
NOT AVAILABLE AT THE TIME OF PUBLICATION

VEHICLE WARRANTIES

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LABELS AND PICTOGRAMS

LABELS AND PICTOGRAMS



* COMMON ALL MODELS

** 36V ONLY

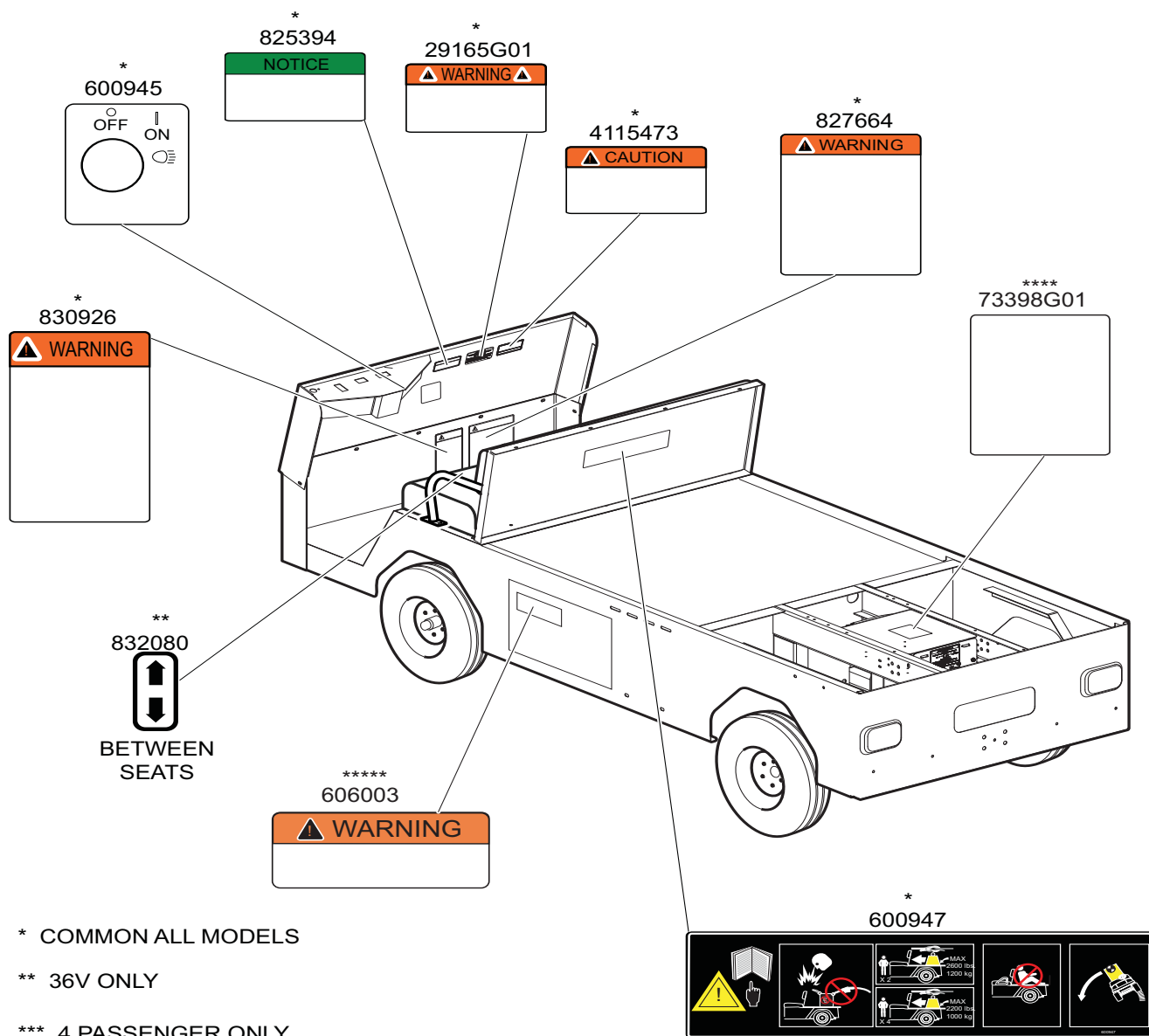
*** 4 PASSENGER ONLY

**** 48V MODEL ONLY

***** SWING OUT BATTERY TRAY MODELS

See Following Pages for Explanation of Pictograms (1, 2, 7, 8, 10, 11, 12)

LABELS AND PICTOGRAMS



* COMMON ALL MODELS

** 36V ONLY

*** 4 PASSENGER ONLY








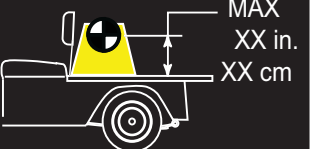
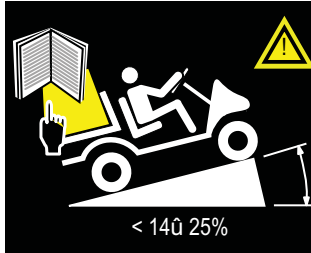
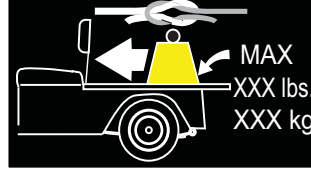


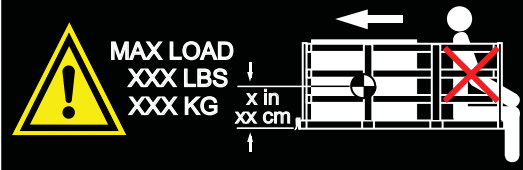
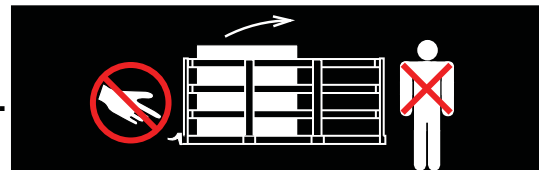
**** 48V MODEL ONLY

***** SWING OUT BATTERY TRAY MODELS

See Following Pages for Explanation of Pictograms (1, 2, 7, 8, 10, 11, 12)








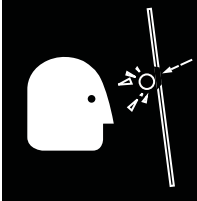


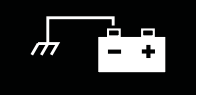






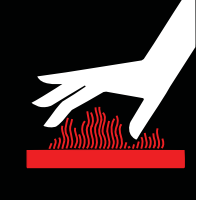



LABELS AND PICTOGRAMS

Generic Note: Not all labels & pictograms illustrated are pertinent to the vehicle. See A-2, A-3 for specific labels & pictograms

1.  WARNING
2.  READ MANUAL
3.  WARNING
USE CAUTION IN
INCLEMENT WEATHER
4.  WARNING
DO NOT OPERATE
UNDER THE INFLUENCE
OF DRUGS OR ALCOHOL
5.  MAX
14°/ 25%
MAXIMUM
CROSS HILL/RAMP
ANGLE AS SPECIFIED
6.  WARNING
MAXIMUM CROSS
HILL/RAMP ANGLE
AS SPECIFIED
< 14° 25%
7.  LOAD WITH
HIGH CENTER
OF GRAVITY
COULD RESULT
IN TIP OVER
8.  MAX
XX in.
XX cm
LOAD
CENTER
OF GRAVITY,
MAXIMUM
HEIGHT
9.  WARNING
READ MANUAL
FOR MAXIMUM
LOAD BED
CAPACITY.
MAXIMUM RAMP/HILL
< 14° 25%
10.  MAX
XXX lbs.
XXX kg
SECURE LOAD
AS FAR FORWARD
AS POSSIBLE.
MAXIMUM LOAD BED
CAPACITY
11.  DO NOT RIDE IN
LOAD BED
12.  DANGER OF EXPLOSION
DO NOT FILL GAS CAN
IN LOAD BED
13.  MAX LOAD
XXX LBS
XXX KG
x in
xx cm
WARNING
MAXIMUM LOAD
& CENTER OF
GRAVITY.
KEEP LOAD
AS FAR
FORWARD AS
POSSIBLE.
DO NOT RIDE
IN LOAD BED
14.  KEEP HANDS &
FINGERS AWAY
FROM DUMP BED.
DO NOT STAND
BEHIND DUMP
BED


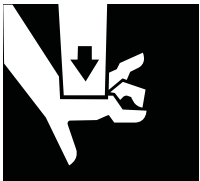


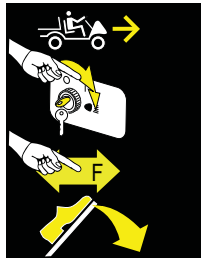

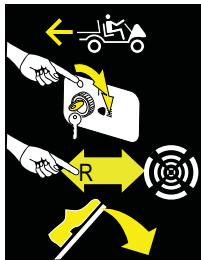

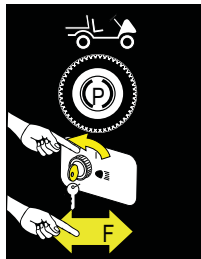

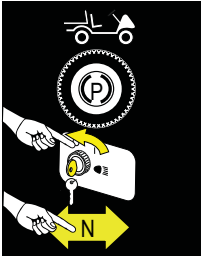

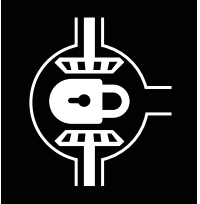

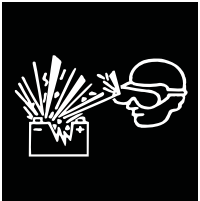
Ref Pic 1-1

LABELS AND PICTOGRAMS

- | | | | | | |
|-----|---|--|-----|---|---|
| 15. |  | CLEAN UP GASOLINE SPILLS WITH WATER BEFORE STARTING ENGINE | 27. |  | DO NOT EXPOSE TO FLAME |
| 16. |  | UNLEADED GASOLINE | 28. |  | DO NOT DISPOSE OF BATTERIES IN LANDFILL |
| 17. |  | DO NOT SPILL FUEL ON A HOT ENGINE | 29. |  | DO NOT DRIVE ON HIGHWAY |
| 18. |  | GROUND FUEL PUMP | 30. |  | WINDSHIELDS DO NOT PROVIDE PROTECTION FROM FLYING OBJECTS |
| 19. |  | LOW OIL PRESSURE | 31. |  | BATTERIES ARE HEAVY. USE CARE LIFTING |
| 20. |  | NEGATIVE GROUND BATTERY | 32. |  | USE INSULATED TOOLS |
| 21. |  | DO NOT CONNECT POSITIVE BATTERY TERMINAL TO GROUND | 33. |  | WEAR EYE PROTECTION |
| 22. |  | SHORTING BATTERY TERMINALS MAY CAUSE EXPLOSION | 34. |  | NO SMOKING |
| 23. |  | NO TAMPERING. KEEP HANDS OUT | 35. |  | HOT SURFACE |
| 24. |  | WARNING CORROSIVE | | | |
| 25. |  | WARNING EXPLOSIVE | | | |
| 26. |  | WARNING LETHAL VOLTAGE | | | |

Ref Pic 1-2

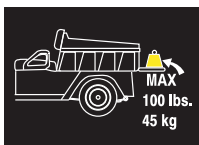
LABELS AND PICTOGRAMS

- | | | | | | |
|-----|---|---|-----|--|---|
| 36. |  | OPERATE FROM DRIVERS SIDE ONLY | 42. |  | KEEP CLEAR HAND OR FINGERS CAN BE TRAPPED |
| 37. |  | KEEP ARMS AND LEGS WITHIN VEHICLE | 43. |  | ON POSITION |
| 38. |  | TO OPERATE VEHICLE IN FORWARD:
? TURN KEY TO ON
? MOVE DIRECTION SELECTOR TO FORWARD
? DEPRESS ACCELERATOR PEDAL AND ACCELERATE SMOOTHLY | 44. |  | OFF POSITION |
| 39. |  | TO OPERATE VEHICLE IN REVERSE:
? TURN KEY TO ON
? MOVE DIRECTION SELECTOR TO REVERSE
? AN AUDIBLE DEVICE WILL SOUND
? DEPRESS ACCELERATOR PEDAL AND ACCELERATE SMOOTHLY | 45. |  | HEADLIGHTS |
| 40. |  | TO LEAVE A GASOLINE POWERED VEHICLE IN PARK:
? APPLY PARKING BRAKE
? TURN KEY TO OFF
? MOVE DIRECTION SELECTOR TO FORWARD | 46. |  | UNLOCKED |
| 41. |  | TO LEAVE AN ELECTRIC POWERED VEHICLE IN PARK:
? APPLY PARKING BRAKE
? TURN KEY TO OFF
? MOVE DIRECTION SELECTOR TO NEUTRAL | 47. |  | LOCKED |
| | | | 48. |  | DIFFERENTIAL LOCKED |
| | | | 49. |  | WARNING
KEEP ENTIRE BODY INSIDE CAR |
| | | | 50. |  | WARNING
POSSIBLE ELECTRIC ARC OR BATTERY EXPLOSION. WEAR EYE PROTECTION. |

Ref Pic 1-3

LABELS AND PICTOGRAMS

51.



MAXIMUM
TAILGATE
LOAD

52.



DEPRESS
PEDAL

53.



RELEASE &
DEPRESS
PEDAL
SIMULTANEOUSLY

Ref Pic 1-4

LABELS AND PICTOGRAMS

Notes:

NOTE

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, engage parking (PARK) brake, 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 pavement, 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 seating capacity.

NOTE

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

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 rear of 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.



A Textron Company

E-Z-GO Division Of Textron, Inc.,
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-EZGO (1-888-438-3946), FAX: 1-800-752-6175

International:

Phone: 001-706-798-4311, FAX: 001-706-771-4609

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