



**OWNER'S GUIDE**  
***AMBUSH iS***

**ISSUED JULY 2014**

**640691-G**

**REVISED JUNE 2016**

# WELCOME

Thank you for purchasing this vehicle. Before driving the vehicle, please take time to read and understand this entire Owner's Manual. This manual contains important safety information, as well as information that will assist in maintaining the vehicle for optimum performance.

This manual may cover the operation of several different models or show items that are optional; therefore, some illustrations/images may not be representative of all models.

Most service procedures can be accomplished using common tools. Perform service procedures at intervals shown in the Periodic Service Schedule located elsewhere in this manual.

Repair or replacement parts are available through your TEXTRON SPECIALIZED VEHICLES retailer.

**The following information is needed when contacting us concerning service or parts for your vehicle:**

**Vehicle Model:** \_\_\_\_\_

**VIN, PIN or Serial Number:** \_\_\_\_\_

**Manufacture Date Code:** \_\_\_\_\_

# OWNER'S MANUAL HYBRID VEHICLE

## 4 X 4 HYBRID UTILITY VEHICLE

## AMBUSH iS

## STARTING MODEL YEAR 2015

### **CALIFORNIA Proposition 65 Warning**

**WARNING:** Motor vehicles may contain fuels, oils and fluids, battery posts, terminals, and related accessories which contain lead, lead compounds and other chemicals identified by the State of California to potentially cause cancer, birth defects and other reproductive harm. These chemicals are found in vehicles, vehicle parts and accessories, both new and replacements. During maintenance, these vehicles generate used oil, waste fluids, grease, fumes and particulates, all identified by the State of California to potentially cause cancer, birth defects, and other reproductive harm.

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 specifications. Such modifications can cause serious personal injury or death. Textron Specialized Vehicles prohibits and disclaims responsibility for any such modifications or any other alteration which would adversely affect the safety of the vehicle.

TSV reserves the right to incorporate engineering and design changes to products in this manual, without obligation to include these changes on units sold previously.

The information contained in this manual may be revised periodically by TSV, and therefore is subject to change without notice.

TSV DISCLAIMS LIABILITY FOR ERRORS IN THIS MANUAL, and SPECIFICALLY DISCLAIMS LIABILITY FOR INCIDENTAL AND CONSEQUENTIAL DAMAGES resulting from the use of the information and materials in this manual.

These are the original instructions as defined by 2006/42/EC.

### **TO CONTACT US:**

Textron Specialized Vehicles, Inc.

1451 Marvin Griffin Road

Augusta, Georgia, USA 30906-3852

### **NORTH AMERICA:**

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

Service Parts PHONE: 1-888-438-3946, FAX: 1-800-752-6175

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

For parts and repair, contact local dealer. Dealers can be located at [www.BADBOYOFFROAD.com](http://www.BADBOYOFFROAD.com)

## FORWARD

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

**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.**

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

**Failure to properly maintain batteries may void the warranty. Refer to the battery manual for instructions on the proper maintenance and care of the batteries.**

### BATTERY PROLONGED STORAGE

**Batteries self-discharge over time. The rate of self-discharge varies depending on the ambient temperature, the age and condition of the batteries.**

**Fully charged batteries 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 may be left connected to the vehicle to maintain a full charge on the batteries, provided the charger is plugged into an active electrical source. If power to the electrical source is disconnected or interrupted, the battery charger will continue to check the charge on the battery pack. This will draw power from the battery pack and eventually drain the batteries if power is not restored in a timely manner.**

**The batteries must be checked and recharged as required or at a minimum of 30 day intervals.**

**Check and maintain the proper fluid level in all battery cells during the storage period. Proper fluid level is required for maximum battery performance.**

### BATTERY DISPOSAL

**Lead-acid batteries are recyclable. Return whole scrap batteries to distributor, manufacturer or lead smelter for recycling. For neutralized spills, place residue in acid-resistant containers with absorbent material, sand or earth and dispose of in accordance with local, state and federal regulations for acid and lead compounds. Contact local and/or state environmental officials regarding disposal information.**

### WARRANTY

**Separate inserts supplied in packaging with the vehicle provide information on Product Warranty and on Emissions Warranty. Failure to follow instructions for emission parts replacement may violate Federal Law (40 CFR part 1068.105 (b)) and be subject to fines and other penalties as described in the Clean Air Act.**

## SAFETY

|                             |   |
|-----------------------------|---|
| GENERAL .....               | 1 |
| GENERAL OPERATION .....     | 2 |
| MAINTENANCE .....           | 3 |
| LABELS AND PICTOGRAMS ..... | 4 |
| LABELS AND PICTOGRAMS ..... | 5 |

## GENERAL SPECIFICATIONS

## VEHICLE DIMENSIONS

## INTRODUCTION

|                           |    |
|---------------------------|----|
| FEATURES .....            | 11 |
| General Information ..... | 11 |

## OPERATING PROCEDURES

|                                                    |    |
|----------------------------------------------------|----|
| PIN AND SERIAL NUMBER LOCATION .....               | 15 |
| BEFORE INITIAL USE .....                           | 16 |
| PORTABLE CHARGER .....                             | 17 |
| Using the Charger .....                            | 18 |
| SEAT BELT OPERATION .....                          | 18 |
| OPERATING THE VEHICLE .....                        | 19 |
| COMMON SENSE OPERATION .....                       | 20 |
| ENVIRONMENTAL CONCERNS .....                       | 20 |
| STARTING AND DRIVING .....                         | 21 |
| Electric Powertrain .....                          | 21 |
| Gas Powertrain .....                               | 21 |
| Starting the Vehicle on a Hill .....               | 22 |
| RUN-IN .....                                       | 22 |
| STARTING THE VEHICLE WITH DISCHARGED BATTERY ..... | 23 |
| COASTING .....                                     | 23 |
| FUEL .....                                         | 24 |
| FUEL TANK .....                                    | 24 |
| Early Production Fuel Tank .....                   | 24 |
| Late Production Fuel Tank .....                    | 25 |
| BATTERY .....                                      | 25 |
| TOWING A TRAILER .....                             | 25 |
| TERRAIN .....                                      | 25 |

# TABLE OF CONTENTS

|                                                |    |
|------------------------------------------------|----|
| DIFFERENTIAL LOCK.....                         | 26 |
| DUMP BED .....                                 | 26 |
| REAR FACING SEAT / LOAD DECK .....             | 27 |
| WINCH OPERATION (IF EQUIPPED WITH WINCH) ..... | 27 |
| Winch Application .....                        | 27 |

## MAINTENANCE

|                                        |    |
|----------------------------------------|----|
| VEHICLE CLEANING AND CARE.....         | 31 |
| TRANSPORTING VEHICLE .....             | 31 |
| ROUTINE MAINTENANCE.....               | 32 |
| LIFTING THE VEHICLE.....               | 32 |
| LIGHT BULB REPLACEMENT .....           | 33 |
| Headlight Bulb Replacement .....       | 33 |
| Taillight Bulb Replacement .....       | 33 |
| WHEELS AND TIRES.....                  | 33 |
| Tire Repair .....                      | 33 |
| Wheel Installation .....               | 34 |
| Unidirectional Tires .....             | 34 |
| WHEEL ALIGNMENT .....                  | 34 |
| Wheel Alignment .....                  | 34 |
| BRAKES .....                           | 35 |
| Master Cylinder .....                  | 36 |
| Bleeding Brakes .....                  | 36 |
| Parking Brake Adjustment .....         | 37 |
| GAS POWERTRAIN .....                   | 37 |
| Engine .....                           | 37 |
| ELECTRIC POWERTRAIN.....               | 37 |
| System Test .....                      | 38 |
| AXLES .....                            | 38 |
| Front and Rear Axles .....             | 38 |
| Checking the Lubricant Level .....     | 38 |
| BATTERY CHARGING AND MAINTENANCE ..... | 39 |
| Battery Safety .....                   | 39 |
| Battery Disposal .....                 | 39 |
| Battery .....                          | 40 |
| Battery Maintenance .....              | 40 |

|                                            |    |
|--------------------------------------------|----|
| At Each Charging Cycle .....               | 40 |
| Monthly .....                              | 40 |
| Temperature Affects Battery Capacity ..... | 41 |
| Electrolyte Level and Water .....          | 41 |
| Cleaning Batteries .....                   | 43 |
| Battery Removal and Installation .....     | 43 |
| Storage .....                              | 45 |
| Battery Charging .....                     | 45 |
| BATTERY FAULT DIAGNOSIS .....              | 45 |
| HYDROMETER.....                            | 46 |
| Using A Hydrometer .....                   | 47 |
| PROLONGED STORAGE.....                     | 47 |
| Battery Set and Gas Starting Battery ..... | 47 |
| Gas Engine .....                           | 48 |
| HARDWARE .....                             | 48 |
| CAPACITIES AND REPLACEMENT PARTS .....     | 49 |
| PERIODIC SERVICE SCHEDULE                  |    |
| PERIODIC SERVICE SCHEDULE .....            | 51 |
| APPENDIX A                                 |    |
| SUBARU ENGINE OPERATORS MANUAL.....        | A  |

## Notes:

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## SAFETY

This manual has been designed to assist 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 or property damage, the following must be carefully observed:



### CAUTION

***Certain replacement parts can be used independently and/or in combination with other accessories to modify an TSV manufactured vehicle to permit the vehicle to operate at or in excess of 20 mph. When an TSV 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.***

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

The Company recommends that all TSV 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.

All customers should adhere to this SAFETY RESTRICTION, in connection with the use of all TSV 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 web site for the U.S. Department of Transportation - at Dockets and Regulation, then to Title 49 of the Code of Federal Regulations (Transportation).

## GENERAL

All vehicles can be 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 warning can replace 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. TSV strongly suggests that all users and maintenance personnel read this entire manual paying particular attention to the CAUTIONS, WARNINGS and DANGERS contained therein.

If you have any questions regarding this vehicle, contact your TEXTRON SPECIALIZED VEHICLES dealer or write to the address on the back cover of this publication, Attention: Customer Care Department.

TSV reserves the right to make design changes without obligation to make these changes on units previously sold. The information contained in this manual is subject to change without notice.

TSV IS NOT LIABLE FOR ERRORS IN THIS MANUAL. TSV IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES THAT RESULT FROM THE USE OF THE MATERIAL IN THIS MANUAL.

This vehicle conforms to the current applicable standard(s) 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 of the United States of America (USA) 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.

Refer to GENERAL SPECIFICATIONS for vehicle seating capacity.

With electric powered vehicles, be sure that all electrical accessories are grounded directly to a negative (-) battery post. **Never use the chassis or body as a ground connection EXCEPT** for grounding the gas engine starting battery.

Refer to GENERAL SPECIFICATIONS for vehicle seating capacity.

# SAFETY

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## WARNING

*Never modify the vehicle in any way that will alter the weight distribution of the vehicle, decrease its stability, or increase the speed or extend the stopping distance beyond the factory specification. Such modifications can result in serious personal injury or death.*

Never modify the vehicle in any way that will alter the weight distribution of the vehicle, decrease its stability, or increase the speed or extent the stopping distance beyond the factory specification. TSV prohibits and disclaims responsibility for all such modifications 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.

Operation of the vehicle is limited to persons above the height of 59 inches (150 cm).

## GENERAL OPERATION

Read 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, 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 affect the terrain and the ability to control the vehicle.*

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

*Use extra care and reduced speed when driving in poor conditions or on poor surfaces.*

*Stay in designated areas where provided and avoid steep slopes.*

*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 depressing the accelerator pedal.*

*Slow down before and during turns.*

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

*See GENERAL SPECIFICATIONS for vehicle load and seating capacity.*

## NOTICE

*Read the following text and warnings before attempting to service vehicle.*

In any product, components may eventually fail to perform properly as the result of normal use, age, wear, or abuse.

It is impossible to anticipate all possible component failures or the manner in which each component may fail.

A vehicle requiring repair is no longer functioning as designed and therefore could be potentially hazardous. Therefore, use extreme care when working on any vehicle. When diagnosing, removing, or replacing any components that are not

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

operating correctly, take time to consider the safety of yourself and others around you.

Some components are heavy, spring-loaded, highly corrosive, explosive, may produce high amperage, or reach high temperatures. Exposure to battery acid and hydrogen gas could result in serious bodily injury. Be careful to protect hands, face, feet, and body from injury.

Always use the appropriate tools listed in the tool list and wear approved safety equipment.

## **WARNING**

*Before working on the vehicle, remove all jewelry.*

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

*Use care not to touch hot objects.*

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

### **ALWAYS:**

- Use the vehicle in a responsible manner and maintain the vehicle in safe operating condition.
- Read and observe all warnings and operation instruction labels affixed to the vehicle.
- Follow all safety rules established in the area where the vehicle is being operated.
- Leave the vehicle and seek shelter when there is a risk of lightning.
- Reduce speed to compensate for poor terrain or conditions.
- Apply service brake to control speed on steep grades.
- Maintain adequate distance between vehicles.
- Reduce speed in wet areas.
- Reduce speed and use extreme caution when approaching sharp or blind turns.
- Reduce speed and use extreme caution when driving over loose terrain.
- Reduce speed and use extreme caution in areas where pedestrians are present.

## **MAINTENANCE**

### **ALWAYS:**

- Replace damaged or missing warning, caution or information labels.
- Maintain the vehicle in accordance with the manufacturer's periodic service schedule.
- Ensure that repairs are performed by trained and qualified personnel.
- Follow the manufacturer's maintenance procedures.
- Insulate any tools used within the battery area in order to prevent sparks or battery explosion.
- Use specified replacement parts, NEVER use replacement parts of lesser quality.
- Use recommended tools.
- 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.
- Support the vehicle using wheel chocks and jack stands. NEVER get under a vehicle that is supported by a jack. Lift the vehicle in accordance with the manufacturer's instructions.
- Maintain the vehicle in an area away from exposed flame or persons who are smoking.
- Be aware that a vehicle that is not performing as designed is a potential hazard and must not be operated.
- Test drive the vehicle after any repairs or maintenance in a safe area that is free of both vehicular and pedestrian traffic.
- Keep complete records of the maintenance history of the vehicle.

# SAFETY

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## LABELS AND PICTOGRAMS



Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## LABELS AND PICTOGRAMS



# SAFETY

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

**⚠ WARNING** Failure to follow these instructions could result in **DEATH** or **SERIOUS INJURY**

- ALWAYS remain PROPERLY SEATED with SEAT BELT FASTENED and HOLDING ON.
- ONLY 2 occupants on bench seat.
- Children may need assistance to remain PROPERLY SEATED with SEAT BELT FASTENED and HOLDING ON. NEVER leave children unattended.
- KEEP feet, legs, hands and arms inside the vehicle at all times.
- NEVER attempt to enter or exit a moving vehicle.
- AVOID standing in front of or behind vehicle.



628943



**⚠ WARNING** Failure to follow these instructions could result in **DEATH** or **SERIOUS INJURY**

- Maximum deck load is 250 lbs. (110 kg)
- The center of gravity of the load must not exceed 12 inches (30 cm) above the deck floor.
- The load must be as far forward as possible and secured.
- Top heavy loads may cause vehicle instability or tip over.
- Drive slowly straight up or down slopes and in turns.
- NEVER allow passengers to ride on load deck.



628942

# GENERAL SPECIFICATIONS

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## GENERAL SPECIFICATIONS



**BAD BOY**

OFF ROAD

**MODEL: TEXTRON SPECIALIZED VEHICLES - AMBUSH IS**

**TYPE: GAS / ELECTRIC PARALLEL DRIVE VEHICLE**

**MODEL YEAR: 2015**

**Part No.: 640373G01**



### PRODUCT SPECIFICATION

#### CONFIGURATION HIGHLIGHTS

|                          |                                                                                                         |                       |                                               |
|--------------------------|---------------------------------------------------------------------------------------------------------|-----------------------|-----------------------------------------------|
| <b>Engine:</b>           | Subaru EH72 Fuel Injection 28 hp (20.8 kW) Rated, 43.9 ci (720 cc)                                      |                       |                                               |
| • <b>Valve Train:</b>    | Overhead valve                                                                                          | • <b>Fuel System:</b> | Fuel injection with electromagnetic fuel pump |
| • <b>Lubrication:</b>    | Pressurized oil system, spin-on oil filter                                                              | • <b>Ignition:</b>    | Electronic spark/magneto                      |
| • <b>Balancer:</b>       | Internal counter rotating balance shaft                                                                 | • <b>Air Cleaner:</b> | Replaceable dry cartridge w/pre-filter        |
| <b>Electrical:</b>       | Starter/Generator, solid-state regulator, 12 Volt maintenance free battery (525 CCA, 60 minute reserve) |                       |                                               |
| <b>Drive Train Gas:</b>  | Automatic, continuously variable transmission (CVT). Manual locking differentials (front and rear)      |                       |                                               |
| <b>Drive Train Elec:</b> | 48V (6x8V) AC with speed sensor                                                                         |                       |                                               |
| <b>Brakes:</b>           | 4-wheel hydraulic disc brakes. Hand operated park brake (floor mounted).                                |                       |                                               |
| <b>Transaxle:</b>        | Differential with helical gears, ground speed governor, forward/reverse                                 |                       |                                               |
| <b>Seating:</b>          | Bench Seat                                                                                              |                       |                                               |
| <b>Cargo Bed:</b>        | Roto-molded cross-linked polyethylene. Lifts for access to powertrain.                                  |                       |                                               |

### PRODUCT OVERVIEW

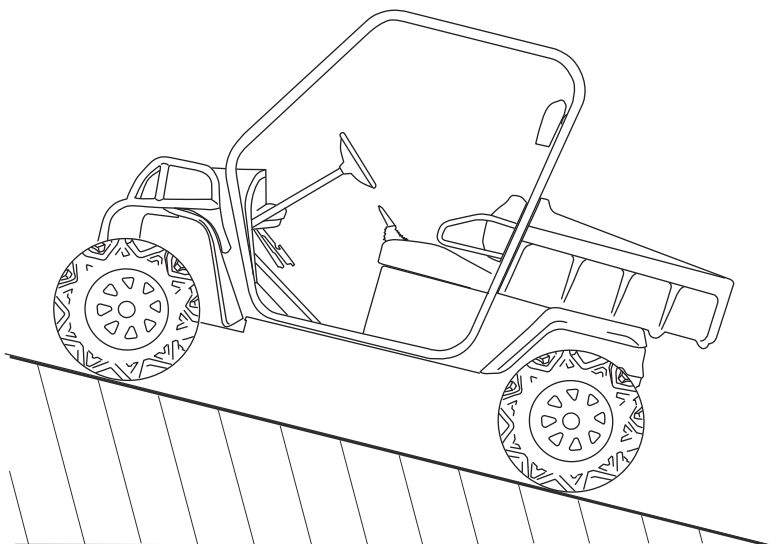
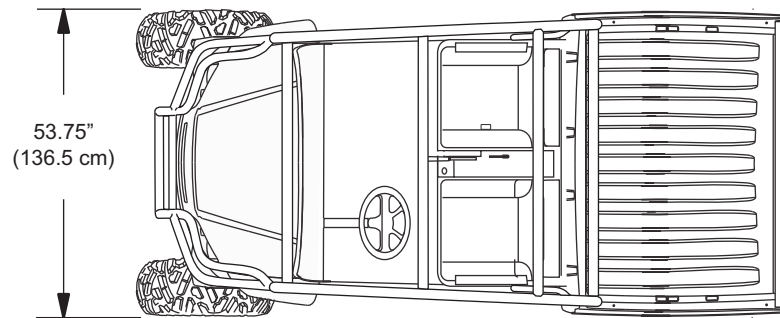
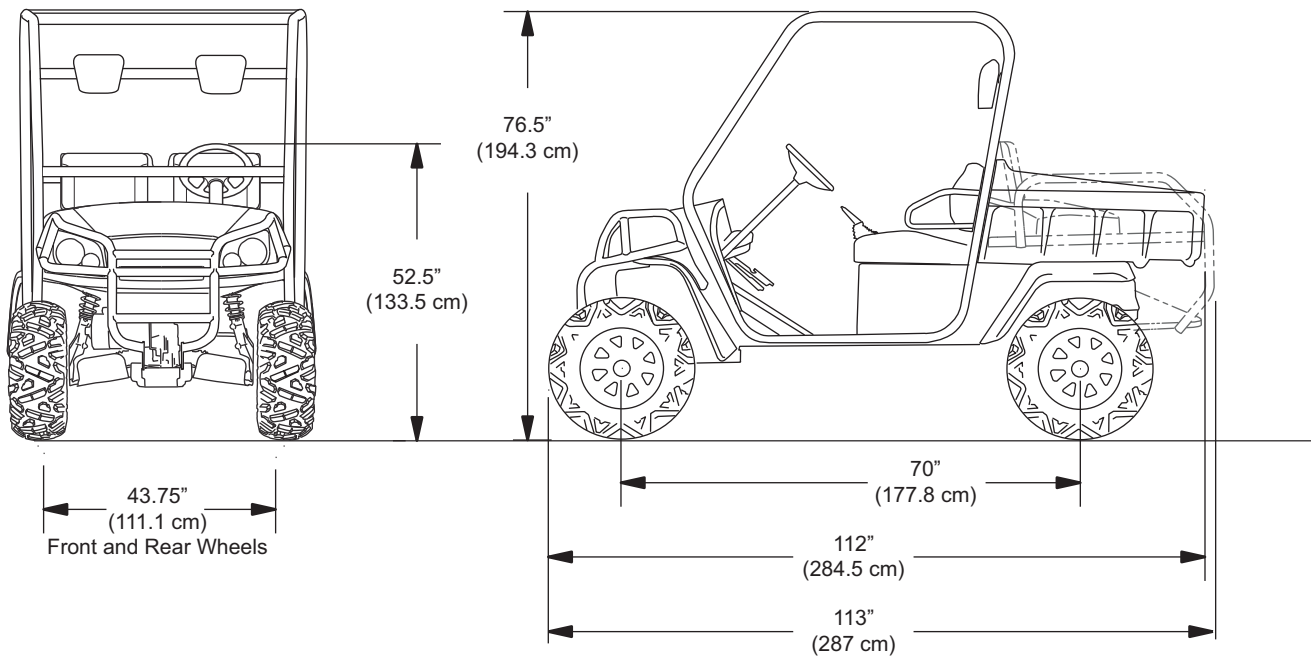
| Dimensions                   |                                                  | Vehicle Power Cont.      |                                               |
|------------------------------|--------------------------------------------------|--------------------------|-----------------------------------------------|
| Overall Length               | 115.5 in (293.4 cm)                              | Gear Selection           | Forward-Reverse                               |
| Overall Width                | 54.5 in (138.4 cm)                               | Front Axle Ratio         | 14.87:1                                       |
| Overall Height               | 51 in (130 cm) top of steering wheel             | Rear Axle Ratio          | 14.38:1 Fwd; 14.36 Rev                        |
|                              | 76 in (193 cm) from canopy                       | Performance              |                                               |
| Wheel Base                   | 81.5 in (207 cm)                                 | Seating Capacity         | 2 Persons                                     |
| Front Wheel Track            | 43.38 in (110 cm)                                | Curb Weight              | 1791 lb (812 kg)                              |
| Rear Wheel Track             | 44.38 in (113 cm)                                | Bed Load Capacity        | 500 lb (225 kg)                               |
| Gnd Clearance @ Differential | 7 in (17.8 cm) front skid plate                  | Vehicle load capacity    | 900 lb (408 kg)                               |
| Cargo Box Width (inside)     | 44.0 in (112 cm)                                 | Outside Clearance Circle | 33.2 ft (10.1 m)                              |
| Cargo Box Length (inside)    | 36.0 in (91 cm)                                  | Speed (Level Ground)     | 2WD Elec: 25 mph ± 1 mph (40.1 kph ± 1.6 kph) |
| Cargo Box Depth (inside)     | 10.5 in (27 cm)                                  |                          | 4WD : 25 mph ± 1 mph (40.1 kph ± 1.6 kph)     |
| Cargo Box Capacity           | 9.6 cu ft (0.27 m3)                              | Towing Capacity          | 1200 lb (544 kg)                              |
| Cargo Box Material           | Roto-molded polyethylene                         | Steering & Suspension    |                                               |
| Vehicle Power                |                                                  | Steering                 | Self-compensating rack and pinion             |
| Power Source                 | GAS: 4 cycle, 43.9 ci (720 cc)                   | Front Suspension         | Independent Mc Pherson Strut                  |
|                              | Elec: 48V AC Motor                               | Rear Suspension          | Independent Mc Pherson Strut                  |
| Valve Train                  | V Twin Cylinder OHV                              | Service Brake            | 4 wheel hydraulic disc brakes                 |
| Horsepower (kW)              | GAS 28 hp (20.8 kW) rated                        | Parking Brake            | Hand Operated                                 |
|                              | Elec 17.2 hp (12.8 kW) Peak                      | Front Tires              | Kenda 25x8-12 Uni-Directional                 |
| Electrical System            | Starter/Generator, solid-state regulator         | Rear Tires               | Kenda 25x11-12 Uni-Directional                |
| Battery (Qty, Type)          | One 12 Volt maintenance free for starter/gen     | Body & Chassis           |                                               |
|                              | 6x8 V for Elec Drive                             | Frame                    | Welded steel with DuraShield™ powder coat     |
| Key or Pedal Start           | Key Start                                        | Front Body & Finish      | Injection Molded TPO                          |
| Air Cleaner                  | Dry cartridge w/ pre-filter                      | Rear Body & Finish       | Steel. Base coat/clear coat                   |
| Lubrication                  | Pressurized oil system                           | Standard Color           | Matte Black                                   |
| Oil Filter                   | Spin-on oil filter                               |                          |                                               |
| Cooling System               | Air cooled                                       |                          |                                               |
| Fuel Capacity                | 5.3 gallon (20 L) tank                           |                          |                                               |
| Differential                 | Helical gears with manual front and rear lock-up |                          |                                               |

*Some items shown may be optional equipment*

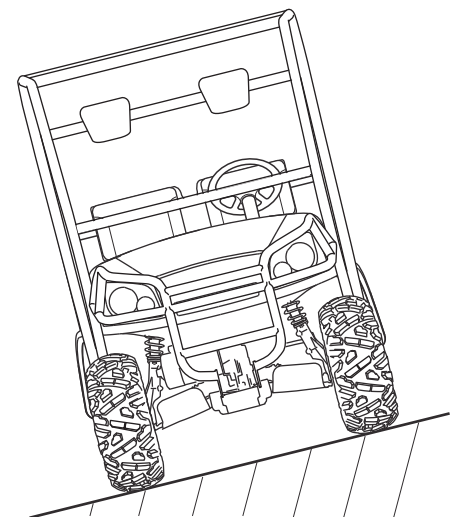
# GENERAL SPECIFICATIONS

Read all of **SAFETY** and this section before attempting any procedure. Pay particular attention to **Notices, Cautions, Warnings and Dangers.**

## VEHICLE DIMENSIONS



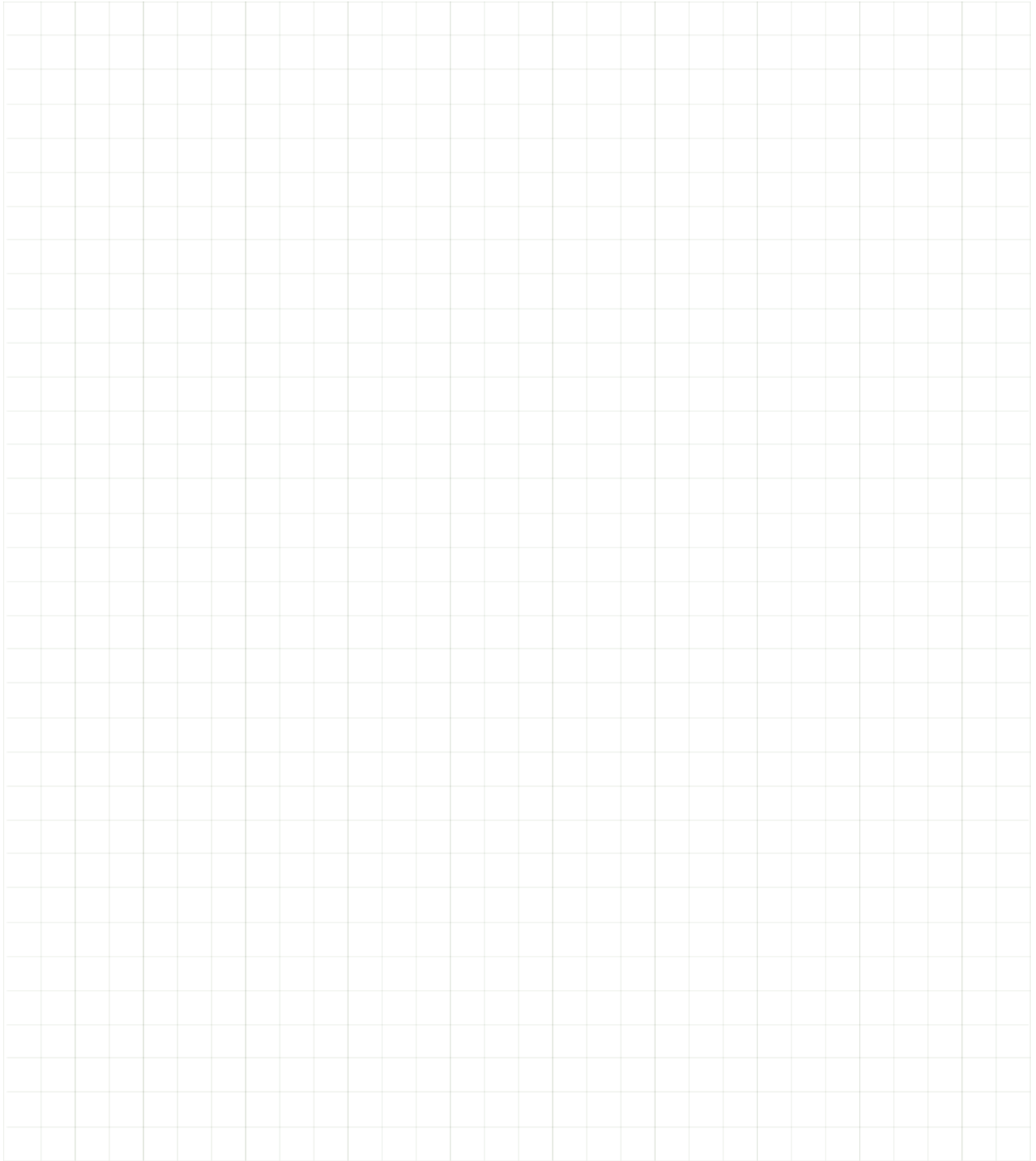
Maximum Recommended Ramp Grade  
25% or 14° Max.



Maximum Recommended Side Tilt  
25% or 14° Max.

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

## Notes:

A large grid of 20 columns and 30 rows, intended for taking notes. The grid is composed of light gray lines on a white background.

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

## Notes:

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## INTRODUCTION

### FEATURES

#### General Information

#### NOTICE

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

#### CAUTION

**ALL accessories that do NOT use the accessory wiring harness MUST be connected to draw from the entire 48 Volt battery pack. A DC to DC converter is required for accessories that require voltage other than 48 volts to operate properly.**

Accessories connected to this vehicle that do not use the accessory harness must be connected to the DC to DC converter.



#### 1. Key / Direction Selector Switch

Located on the dash to the right of the steering wheel, this four position switch allows the vehicles electrical system to be activated. It allows the operator to turn the electrical system off completely by moving the key to the OFF position; or select Reverse, Neutral, or Forward by rotating key to the right.

#### 2. Fuel Gauge with Low Oil Pressure Indicator

Located in the dash panel below the state of charge meter. The fuel gauge indicates the amount of gasoline in the fuel

# INTRODUCTION

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

tank, with 'F' indicating a full tank and 'E' indicating an empty fuel tank. The fuel gauge is equipped with a low oil pressure indicator. A low engine oil pressure condition is alerted with a yellow indicator light.

## 3. State of Charge Meter

The illuminated state of charge meter is located in the dash. It indicates the amount of usable power in the batteries, with 'F' indicating a full charge on the battery pack and 'E' indicating the batteries are low. The yellow light indicates the batteries must be charged immediately.

## 4. Light Switch

Located on the left side of dash, this ON/OFF switch controls the lights. In the ON position, the headlights, taillights and dash panel lights will illuminate.

## 5. Accessory Switch Location

Rectangular hole plugs may be removed to accommodate switches for accessory items.

## 6. Mode Switch

Located to the right of the key switch/direction selector, this switch permits the selection of either gas powered rear wheel drive, electric powered front wheel drive or four wheel drive utilizing both electric and gas powertrains at the same time.

## 7. Gas Engine Start Switch

Located on the dash panel to the right of the fuel gauge, this switch starts the gasoline engine when pressed with the key switch turned to ON.

## 8. Regen Mode Switch

Located on the dash panel to the right of the mode switch and the gas engine start switch. The operator can switch from high and low regen mode to suit terrain/range conditions.

## 9. 12 Volt Power Outlet

Located in the lower part of the dash above the cup holder, the 12 volt outlet supplies constant power for additional equipment equipped with a 12 volt plug.

## 10. Cupholder

A cupholder is provided for convenience of vehicle occupants.

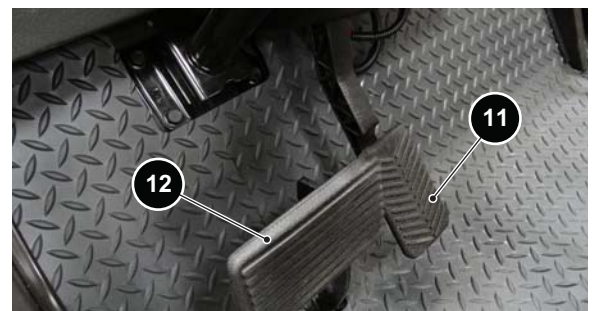
## 11. Accelerator Pedal

With the key switch set to 'R', 'ON' or 'F', pressing the accelerator pedal starts the electric motor, depending upon the position of the MODE switch.

## 12. Brake Pedal

The brake pedal is located on the floor to the left of the accelerator pedal. The brake pedal function is to slow or stop the moving vehicle.

This vehicle is equipped with four wheel hydraulic disc brakes.



*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

## 13. Park Brake

The hand operated park brake is located in the middle of the floor-board. The function of the park brake is to keep the vehicle from inadvertent movement when in a stationary position.

The brake is engaged when the handle is vertical and disengaged when the handle is almost parallel to the floor (as shown).

When leaving the vehicle unattended, engage the park brake by raising the handle until it locks in place. To release the park brake push the handle down towards the floor.



## 14. Differential Locks

Located in the seat wrap panel below the driver seat. The front and rear drive axles are equipped with manually operated locking differentials. With the lever(s) in the forward position the selected differential is locked and power is distributed to both of the axle drive wheels; with the lever(s) in the rear position the differential is unlocked and power will be transferred to the wheel that is losing traction, once the wheel regains traction the power will be transferred to both wheels.

## 15. Charger Receptacle

The polarized charger receptacle for the batteries is located on the panel below the driver seat. It is the receptacle for the charger cord when the batteries need to be charged.

Always check to be sure the receptacle is free from dirt and debris before connecting the charger cord.

## 16. Truck Bed Latch

A truck bed latch is located at the front of the manual lift truck bed. It is used to raise and lower the manual lift truck bed.

To release the latching mechanism, pull the handle upward then raise the front of the truck bed up.



## 17. Truck Bed

The truck bed provides space to transport cargo. A molded plastic bed is standard; some vehicles may be equipped with an optional aluminum bed.

## 18. Taillights

The taillights are located at the rear of the truck, below the truck bed.



# INTRODUCTION

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

## 19. Head Protection

Rubber pads provide head protection while driving over rough terrain. They are a standard safety feature on the vehicle and should not be altered or removed.

## 20. Side Nets

Side nets are a standard safety feature provided with the vehicle and must be properly secured before operating vehicle.



## 21. Rear Seat/Load Deck (if equipped)

The rear facing seat is designed for two occupants. The load deck is created by unfolding the rear facing seat.



*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

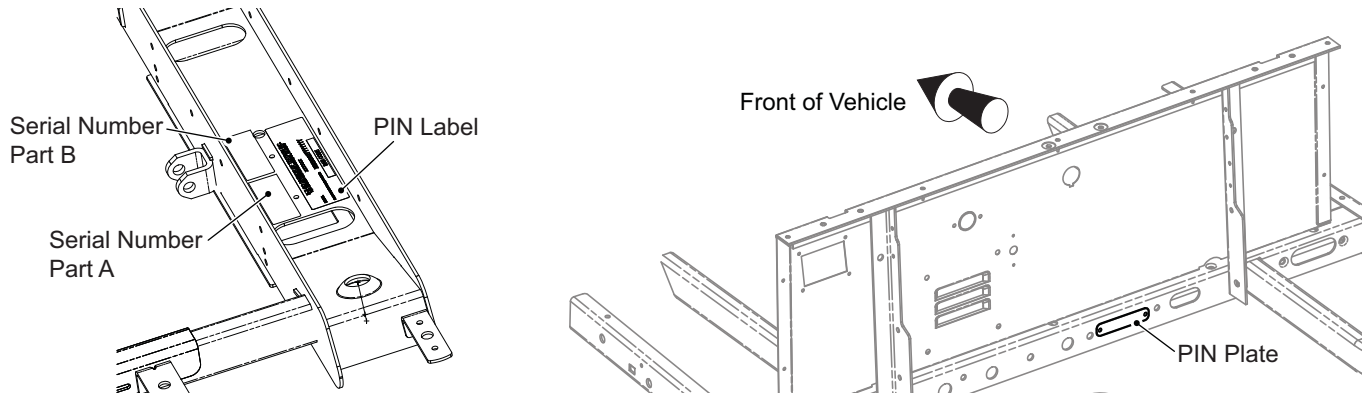
## OPERATING PROCEDURES

### PIN AND SERIAL NUMBER LOCATION

The PIN plate is riveted to the frame below the seat wrap panel.

Two serial number and manufacture date code plates are on the vehicle. One is located on the steering column, the other is located on the chassis under the cowl on the driver's side.

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



### **WARNING**

*Improper use of this vehicle could result in severe injury or death. The AMBUSH is a light duty utility vehicle, NOT an All Terrain Vehicle (ATV).*

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

*When driving vehicle, consider the terrain, traffic conditions and the environmental factors which affect 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 or gravel.*

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

*To prevent loss of control, do not move the vehicle direction selector while the vehicle is in motion. moving the direction selector will result in a sudden slowing of the vehicle.*

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

*Do not drive through water that is over 12 inches deep.*

*To prevent inadvertent movement when the vehicle is to be left unattended, engage the parking brake, turn key to OFF position and remove key.*

*Make sure the key switch/direction selector is set to the neutral position before attempting to start the vehicle.*

# OPERATING PROCEDURES

Read all of **SAFETY** and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

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

*Do not take vehicle out of gear while in motion (coast).*

*Check area behind vehicle before operating in reverse.*

*All occupants must be seated with seat belts fastened and front side nets latched. Keep entire body inside vehicle and hold on while vehicle is in motion.*

*This vehicle is not a toy and using it while engaging in horseplay is dangerous.*

## BEFORE INITIAL USE

### NOTICE

Record the four digit key number and store in a safe place. Individual keys can only be replaced if the key number is known. Without a key number the entire ignition switch will have to be replaced if keys are lost.

Make a note of the key number in the event that new keys must be ordered. The key number is stamped into the key and into the face of the ignition switch. Both numbers must match.

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

Before a new vehicle is put into operation, the items shown in the **INITIAL SERVICE CHART** must be performed.



Key Number



| INITIAL SERVICE CHART |                                                                                                                    |
|-----------------------|--------------------------------------------------------------------------------------------------------------------|
| Item                  | Service Operation                                                                                                  |
| Battery Charger       | Remove from vehicle and read operating instructions.                                                               |
| Batteries             | Charge battery for gas engine and battery set for electric motor.                                                  |
| Seats                 | Remove protective plastic covering.                                                                                |
| Brakes                | Check operation; adjust if necessary.                                                                              |
|                       | Check hydraulic fluid level; add if necessary.                                                                     |
| Tires                 | Check air pressure; adjust if necessary. See "WHEELS AND TIRES" on page 33 for tire pressure.                      |
| Fuel                  | Fill with correct fuel, regular unleaded, 10% or less Ethanol blend is permissible.                                |
| Engine                | Check oil level (Initial change after 20 hours).                                                                   |
| General Vehicle       | Check for oil or fuel leaks that could have developed during shipment.<br>Check for any loose or missing hardware. |

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

## 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.

## PORTABLE CHARGER

## WARNING

*Use charger ONLY on 72 volt battery systems. Other usage may cause personal injury and damage. Lead acid batteries may generate explosive hydrogen gas during normal operation. Keep sparks, flames, and smoking materials away from batteries. Provide adequate ventilation during charging. Never charge a frozen battery. Study all battery manufacturers' specific precautions such as recommended rates of charge and removing or not removing cell caps while charging.*

## DANGER

***Risk of electric shock. Connect charger power cord to an outlet that has been properly installed and grounded in accordance with all local codes and ordinances. A grounded outlet is required to reduce risk of electric shock – do not use ground adapters or modify plug. Do not touch uninsulated portion of output connector or uninsulated battery terminal.***

***Disconnect the DC supply before making or breaking the connections to the battery while charging. Do not open or disassemble charger. Do not operate charger if the AC supply cord is damaged or if the charger has received a sharp blow, been dropped, or otherwise damaged in any way – refer all repair work to qualified personnel. Not for use by children.***

The portable charger is shipped with the vehicle. Prior to vehicle or charger operation, the charger **must** be removed from the vehicle. **A dedicated circuit is required for the charger.** Refer to the charger manual for appropriate circuit protection. For optimum performance and shortest charge times, place the charger in an area with adequate ventilation and relatively free of dirt, mud, or dust. If the charger is operated in an outdoor location, rain and sun protection must be provided. The charger may get hot during operation and must be placed such that risk of contact by people is reduced.

# OPERATING PROCEDURES

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

## NOTICE

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

## WARNING

*To reduce the possibility of a physical hazard that could result in an electrical shock or electrocution, be sure that the charger plug is not damaged and is inserted into a grounded receptacle.*

*An ungrounded electrical device may become a physical hazard that could result in an electrical shock or electrocution.*

### Using the Charger

Before using, read the charger manufacturer's operation manual that is supplied with the charger.

## WARNING

*To prevent a physical hazard that could result in an electrical shock or electrocution, be sure that the charger plug is not damaged and is inserted into a grounded receptacle.*

*An ungrounded electrical device may become a physical hazard that could result in an electrical shock or electrocution.*

The charging (DC) cord is equipped with a polarized connector that fits into a matching receptacle on the vehicle. The receptacle is located in the seat panel below the seat on the driver's side of the vehicle.

### SEAT BELT OPERATION

## WARNING

*Seat belts must be worn by all occupants whenever vehicle is in motion.*

*Ensure seat belts are free from twists and latch securely.*

*Position shoulder belt across the top of the shoulder; do not place shoulder belt under the arm.*

*Keep belts snug and positioned low on hips. Loose fitting belts significantly reduce protection.*

*The vehicle is equipped with seat belts for the number of occupants it is designed to carry; do not exceed the recommended number of occupants for the vehicle.*

*Seat belts are designed for one occupant per belt. Do not attempt to secure more than one person in a seat belt.*

Seat belts must be worn at all times by all occupants when vehicle is in motion.



# OPERATING PROCEDURES

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

To keep seat belts in proper working condition, do the following:

- Inspect the seat belt webbing and hardware periodically. Check for cuts, frays or loose parts. Replace components if excessive wear or damage is noticed.
- Keep seat belts clean and dry. To clean, use mild soap and warm water. Do not use bleach, dye or abrasive cleaners as this will weaken the belt webbing material.
- Do not insert any foreign objects into the retractor mechanism.
- Periodically check for smooth operation and replace if the mechanism is not operating properly.

To properly secure the seat belts:

1. Pull the metal tab on the seat belt across the body toward the appropriate buckle located near the center of the seat.
2. Insert tab into buckle. (A click will be heard when the tab is securely latched).
3. Position the lap belt as low as possible on the hips, not at the waist.
- Adjust to ensure a snug fit by pulling the shoulder portion upward.

The retractor will lock the belt during sudden stops. It may also lock if occupant leans forward quickly. Slow, easy motions allow the belt to travel freely.

To release the safety belt, press the buckle release button and allow the belt to retract. If the belt does not retract, check for twisted straps.

## OPERATING THE VEHICLE



### CAUTION

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

Read the following warnings before attempting to operate the vehicle.



### WARNING

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

*When driving vehicle, 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.*

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

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

*Never drive vehicle up, down, or across an incline that exceeds 14° (25% grade).*

*Refer to GENERAL SPECIFICATIONS for seating capacity.*

***To reduce the possibility of severe injury or death resulting from improper vehicle operation, the following warnings must be observed:***

# OPERATING PROCEDURES

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

*Pressing accelerator pedal may cause inadvertent vehicle movement. Turn the key to the 'OFF' position whenever the vehicle is parked.*

*To prevent inadvertent movement when the vehicle is to be left unattended, engage the park brake, turn key to 'OFF' position and remove key.*

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

*Do not take vehicle out of 'gear' while in motion (coast).*

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

*All occupants must be seated and wearing their seat belts, front side nets must be latched. Keep entire body inside vehicle and hold on while vehicle is in motion.*

## COMMON SENSE OPERATION

### WARNING

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

*Never transport loaded firearms on or in vehicle.*

*Check that firearms are unloaded with the safety engaged and are properly secured with muzzle pointing in a safe direction before operating vehicle. Be aware of other firearms in proximity to operator and passengers.*

**This vehicle is not a toy.** If not operated properly and responsibly, it can cause severe injury or death to the operator, passengers or bystanders. All operators should possess a valid driver's license. Children should not be permitted to operate the vehicle. Children may not have the skill, judgement or strength to operate this or similar vehicles.

Alcohol, drugs and many over the counter medications reduce the ability of the driver to operate the vehicle safely. Always review side effects of any medication with a doctor or pharmacist before operating vehicle.

Protective clothing and an approved motorcycle helmet are recommended for operator and passengers when operating vehicle in rough or densely wooded terrain.

When driving at full speed on a dirt road, loose surfaces or wet grass, vehicle stopping distance will increase. If the vehicle is fully loaded, it will take longer to stop than with no load. When operating vehicle in wet weather conditions, remember that the brakes may need to be **lightly** applied in order to provide enough friction to dry the brake unit. If wet, the brakes will lose much of their effect.

Slow down when in unfamiliar terrain. Slow down when cresting a hill in an area that you are unfamiliar with.

Some hills are too steep to climb. If you attempt to climb a hill that is too steep or if you are unable to achieve adequate traction, **do not attempt to turn around on the hill. Slowly back straight down the hill using the service brake to control speed.**

## ENVIRONMENTAL CONCERNS

### WARNING

*As a responsible user, practice respect for all wildlife and their habitat. Respect private property and comply with all local laws and regulations governing the use of light duty utility vehicles. To prevent severe injury or death while driving, be aware of the following:*

*Environmental hazards such as steep slopes, overhanging limbs, etc.*

*Danger of fire when vehicle is operated over dry combustible organic material.*

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

When driving, be aware of environmental hazards such as steep slopes, overhanging limbs, etc. Be aware of the danger of fire when the gasoline powered vehicle is operated over dry combustible organic material.

## STARTING AND DRIVING

Operation of this vehicle is limited to persons who are licensed drivers.

This vehicle is to be operated by licensed drivers only. Do not attempt to operate the buggy under the influence of drugs or alcohol. Never turn the key switch to OFF while the buggy is in motion, this can cause loss of control and lead to serious injury or death.

Use caution when traveling uphill or downhill; on a downhill slope it is possible for the buggy to achieve speeds greater than if it were operating on flat terrain. Speed on an uphill slope should be limited to not more than 5 mph and in a downhill situation must be limited to 5 mph by using the service brake to slow the vehicle. If allowed to travel too fast on a downhill slope loss of control may occur, this can cause serious injury or death.

Use caution when traveling through water and never operate vehicle in water over 12 inches deep.

This vehicle has two separate powertrains that may be operated individually to provide two wheel drive or at the same time to provide four wheel drive. When the MODE switch is set to ELEC (top of switch pressed) only the front drive axle is engaged, drawing power from the battery set. With the MODE switch set to GAS (bottom of switch pressed) only the rear axle is engaged powered by the gas engine. With the MODE switch set to 4WD (switch in neutral position) both the electric and gas powertrains are engaged for four wheel drive.

While operating in GAS mode (rear wheel drive) the vehicle can be changed on the fly from 2 wheel rear drive to full time 4 wheel drive by setting the Mode Switch on the instrument panel to the 4WD (middle) position.

## WARNING

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



### Electric Powertrain

To operate the vehicle in electric only mode:

- Set the Mode Switch to ELEC.
- Place the key in the key switch and turn it to the ON/N position.
- Turn the key to the desired direction; F for forward or R for reverse.
- Press the brake pedal and hold it down.
- Release the parking brake.
- Slowly press the accelerator pedal to start the electric motor while releasing pressure on the brake pedal.
- When the accelerator pedal is released the motor will stop and the vehicle will slow down and eventually stop. To stop the vehicle more quickly, press the brake pedal.



### Gas Powertrain

To operate the vehicle in gas engine only mode:

- Set the Mode Switch to GAS.
- Place the key in the key switch and turn it to the ON/N position.
- Press the brake pedal and hold it down.
- Press and hold the start engine switch until the engine starts.

# OPERATING PROCEDURES

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

- Release the parking brake.
- Turn the key to the desired direction; F for forward or R for reverse.
- Release the parking brake.
- Slowly press the accelerator pedal while releasing the pressure on the brake pedal.
- When the accelerator pedal is released the vehicle will slow down and the engine will idle. To stop the vehicle more quickly, press the brake pedal.

## CAUTION

***Do not allow the starter to operate continuously for more than 10 seconds. Allow 30 seconds between starting attempts. If the vehicle does not start on the third attempt, turn the key switch off and determine the cause of the problem.***

If the vehicle had been running and the engine does not start within 10 seconds, use the choke.

### Starting the Vehicle on a Hill

## WARNING

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

## CAUTION

***Do not hold vehicle on hill by using accelerator and motor. This will cause premature and excessive wear to drive train components.***

To reduce the possibility of permanent damage to the drive system, it is important to prevent excessive roll-back when starting the vehicle on a hill.

Place left foot on service brake and release the park brake. Depress accelerator with right foot and release the service brake by lifting left foot.

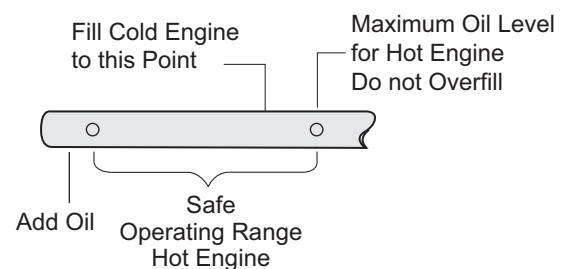


### RUN-IN

Check for oil or fuel leaks that could have developed in shipment from the factory. Avoid full throttle starts and rapid acceleration until the engine has achieved operating temperature.

All engines consume more oil than normal during the first hours of operation. As internal moving parts are run-in, oil consumption should gradually decrease until the rate of consumption stabilizes.

Check the oil level per the Periodic Service Schedule. Add oil if the level on the dipstick indicates that oil is in the add oil range.



Check Oil Level on Dipstick

## CAUTION

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

**Do not overfill engine. Too much oil may cause smoking or allow oil to enter the air filter enclosure.**

## NOTICE

*The oil dipstick/fill cap must be in place before operating the engine. Failure to install the dipstick/fill cap will result in oil becoming contaminated and/or being discharged into the engine compartment.*



## STARTING THE VEHICLE WITH DISCHARGED BATTERY

### ! WARNING

*Do not attempt to 'jump start' a vehicle using another vehicle.*

The vehicle is equipped with a starter/generator. When starting the engine, the starter/generator functions as a starter and with the engine running, it functions as a generator. Since the engine stops when the accelerator is released, **do not attempt jump starting.**

With the running times associated with this kind of vehicle, the generator is more than adequate to maintain the battery charge level. The generator is not designed to charge a discharged battery.

If the vehicle is equipped with additional lights and/or a strobe light that is used when the vehicle is not in motion, the starter/generator may not be adequate to maintain battery charge. If the vehicle battery has become discharged, it must be charged using a 12V charger that is rated at 10 amps or less. Observe all instructions provided by the manufacturer of the charger.

## COASTING

### ! WARNING

*To reduce the possibility of severe injury or death from coasting at above recommended speeds, limit speed with service brake.*

On steep hills, it is possible for the vehicle to coast at greater than normal speeds encountered on a flat surface. To reduce the possible loss of vehicle control and severe drivetrain damage, speeds should be limited to no more than the maximum governed speed on level ground (see GENERAL SPECIFICATIONS). Limit speed by applying pressure to the brake pedal.

# OPERATING PROCEDURES

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.



## FUEL

### WARNING

*To decrease the risk of severe injury or death from improper fuel handling:*

*Do not smoke near the fuel tank.*

*Do not add fuel near open flame or electrical items that can cause a spark.*

*Always handle gasoline in a well ventilated area.*

*Always wear eye protection to protect against splashed fuel and fuel vapors.*

*Inspect the fuel cap, tank and other components for leaks or damage that can cause a hazardous condition.*

### CAUTION

***Oxygenated or reformulated gasoline, is mixed with alcohols or ethers. Excessive amounts of these blends can damage the fuel system or cause performance problems. If any operating problems occur, use gasoline with a lower percentage of alcohol or ether.***

***Use clean regular grade unleaded fuel. The Ethanol blend fuel up to 10% is permitted.***

**Do not** use gasoline that contains methanol.

High altitude or heavy use/load applications can benefit from higher octane gasoline.

## FUEL TANK

The fuel tank is found below the seat on the passenger side of the vehicle. Fill the tank with clean, automotive grade gasoline.

### Early Production Fuel Tank

### WARNING

***Always allow enough space for the expansion of gasoline. Leave at least 1-inch (2.5 cm) of space below bottom of filler neck.***

Early production fuel tanks can be identified by the location of the fuel cap which is located in the middle of the top of the tank as shown.

Early production fuel tanks require enough space for the expansion of the gasoline. Leave at least 1-inch (2.5 cm) of space below the bottom of the filler neck.



Early Production Fuel Tank

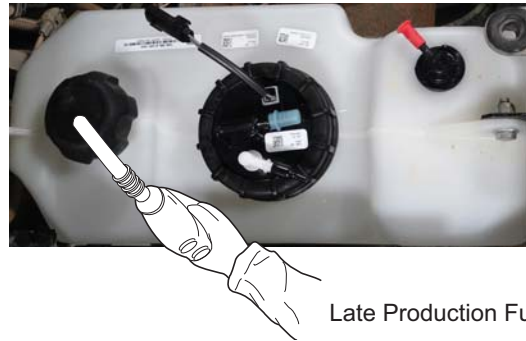
# OPERATING PROCEDURES

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

## Late Production Fuel Tank

Late production fuel tanks can be identified by the location of the fuel cap which is located in the rear of the top of the tank as shown.

Late production fuel tanks are designed to allow for fuel expansion and do NOT require space below bottom of filler neck.



Late Production Fuel Tank



## BATTERY

If the gas engine starting battery has become discharged, it must be charged using a 12 volt charger that is rated at 10 amps or less and in accordance with all instructions provided by the manufacturer of the charger.

## TOWING A TRAILER

The vehicle is equipped with a 2-inch receiver. The trailer and its load must not exceed 1200 lbs (544kg) and no more than 100 lbs (45 kg) tongue weight may be attached to the hitch. Remember that the overall capacity of the vehicle, operator, passenger, contents of load bed and accessories must be reduced to compensate for the trailer and load.

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

Never install baskets or extensions using the hitch receivers. Such items will change the performance characteristics of vehicle and result in unsafe handling, possible roll over or vehicle damage.

## TERRAIN

The vehicle is NOT designed for use on public roads. The vehicle may be used on established trails or open terrain that is free from stumps, large rocks or holes. The vehicle should not be used to cross water that is more than 12 inches (30 cm) deep or fast moving water.

Be aware of steep slopes, overhanging limbs or danger of fire when the gas engine is operated over dry combustible material. Consult dealer for an available spark arrestor for this vehicle.

When traveling up or down steep slopes do not attempt to turn the vehicle around on the slope. Vehicle stopping distance increases when driving on wet gras, dirt roads or loose surfaces.

# OPERATING PROCEDURES

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## DIFFERENTIAL LOCK

### WARNING

*To reduce the possibility of severe injury or death from loss of control while vehicle is in motion, do not engage front differential lock while turning steering wheel. Lock engagement may force steering wheel to center abruptly, causing loss of grip on wheel and control of vehicle.*

### CAUTION

***Do not drive vehicle on pavement or other hard surfaces with differentials in the locked position. Sharp maneuvers and turns can cause premature wear and damage to the CV shafts and tires.***

***Differential locks should only be used when additional traction is required. Continued use of rear differential lock may cause excessive wear to tires. Continued use of front differential lock may increase steering effort.***

***Vehicle must be completely stopped before engaging or disengaging differential lock. Failure to stop may damage differential.***

Front and rear differentials are equipped with manually actuated locks. A **locked** differential distributes power to both tires on the axle at all times, which greatly increases traction. Locks are not intended to be engaged at all times. Their purpose is to free, or prevent vehicle from being stuck as terrain demands, ideally for short runs at slow speeds. Always disengage differential locks as terrain and conditions allow.

Push lever(s) to the forward position to engage the differential lock(s). Pull the levers into the rear position to disengage the lock(s).



## DUMP BED

### WARNING

***Passengers should never be allowed to ride in the dump bed. Severe injury or death could result if they should fall out or the vehicle is involved in an accident or sudden maneuver.***

Be careful when loading the vehicle. Secure loads to prevent shifting. Do not overload vehicle. A dump bed warning label is affixed to the inside of the bed on the front panel.

This label must be understood and observed at all times for safe operation of the vehicle. The dump bed is limited to a maximum load of 500 lbs. The load must be positioned in the bed as far forward as possible, its center of gravity must not be higher than 12" above the bed floor, and securely fastened down. Failure to follow these instructions could cause personal injury, damage to the vehicle and/or cause the vehicle to tip over. Operate the vehicle with awareness of the load.

Do not drive the vehicle with the dump bed raised or with the tailgate unsupported.

When using the optional electric dump, be sure to avoid backing up to the edge of a drop off, such as a loading dock or ravine. A misjudgment of distance or an unstable surface could result in the vehicle falling backwards.

Always insure that no one is behind or close to the dump bed while the electric dump mechanism is being operated.

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## REAR FACING SEAT / LOAD DECK

### **WARNING**

*Passengers should never be allowed to ride on the load deck. Severe injury or death could result if they should fall out or the vehicle is involved in an accident or sudden maneuver.*

The rear facing seat will accommodate two passengers with a combined weight of less than 400 pounds or, the seat bottom may be folded out to form a load deck. When using the load deck, position the load as far forward as possible and securely fastened down. The maximum load is 250 lbs and the center of gravity must not be higher than 12" above the load deck.

## WINCH OPERATION (IF EQUIPPED WITH WINCH)

This vehicle may be equipped with an optional winch. Read, understand and follow all of the information supplied with the winch on the operation and use of the winch before attempting to operate it.

### Winch Application

A winch may be used for a number of purposes, including pulling the vehicle if it loses traction on unsuitable terrain.

### **WARNING**

*Improper use of the winch could result in a number of conditions that could cause severe injury or death to operator, occupants of vehicle or bystander.*

It is impossible to predict all conditions that the winch could be used, therefore the following warnings should not be considered as complete. Before operating the winch, consider the possible dangers and take precautions to protect yourself, your passenger and any bystanders.

### **WARNING**

*To prevent severe injury or death to operator, occupants or bystanders, consider the following when selecting an object to attach the cable to:*

*Make sure the object cannot be pulled over or otherwise damaged.*

*The object the winch cable is attached to could fall on the vehicle and it's occupants.*

*If attaching the winch to a dead tree, a section could fall.*

*When pulling vehicle with winch, pull straight only. Do not permit the cable to contact the side of the drum.*

*Do not pull vehicle at an angle. If the vehicle is pulled at an angle, it could turn over causing severe injury or death to anyone in the area. The winch cable could also become overstressed and break causing severe injury or death to anyone struck by the cable.*

The rear drive axle is equipped with a manually operated locking differential. With the differential unlocked, if one drive wheel loses traction, all available power is transferred to that wheel until it regains traction. In normal driving this is not a problem. However, if the vehicle becomes 'hung up' on an object, the vehicle will stop. With the differential locked, power is distributed to both drive wheels at all times. If both drive wheels lose traction as a result of the vehicle becoming 'hung

# OPERATING PROCEDURES

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

up' on an object, the vehicle will stop. If the vehicle cannot be pushed off the obstruction, it will have to be pulled off using the winch.

## WARNING

*To prevent severe injury or death, read and understand the following warnings before attempting to use the winch:*

*The winch is not intended to be used in any hoisting operation.*

*The rolling load capacity of the winch decreases with the steepness of the slope.*

*The winch is designed for intermittent duty only.*

*The electric motor should not be allowed to become excessively hot. If the motor becomes uncomfortably hot to the touch, stop winching and allow the motor to cool.*

*Always wear thick leather gloves when handling the wire cable.*

*Replace frayed wire cable with a direct factory replacement only.*

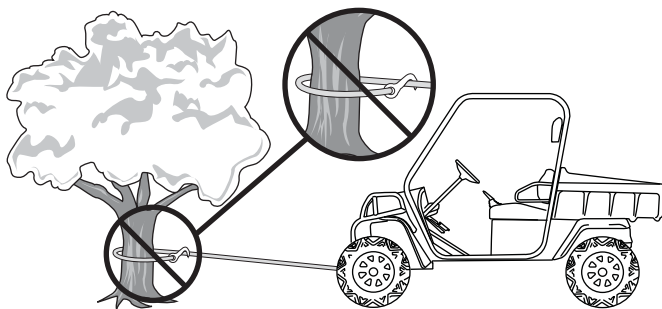
*Never operate the winch with less than five (5) full turns of cable around the drum.*

If the winch motor stalls from overloading, do not continue to activate the winch remote control. The wire cable may become overstressed.

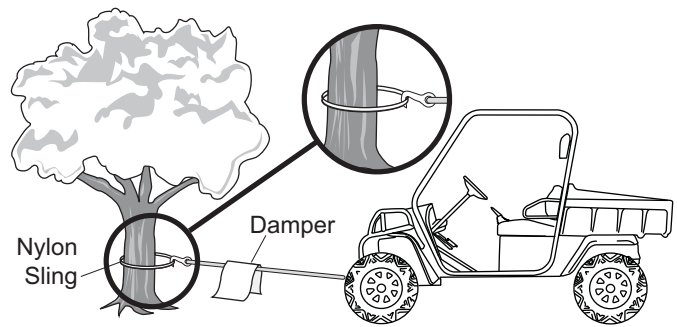
Do not attempt to pull loads exceeding the manufacturers maximum load rating.

Have all persons and pets leave the area while operating winch. Never allow anyone to remain in the vehicle.

To prevent damage to the wire cable, never hook the cable to itself. Always use a nylon sling.



Do Not Hook Cable to Itself



Use a Nylon Sling and Install a Damper when Winching

Stay clear of the winch, the cable and the cable hook. Place a heavy cloth, jacket or blanket over the cable to act as a damper should the cable break when operating the winch.

When operating the winch, keep the entire area in view.

Never release the free spool clutch while the cable is under load.

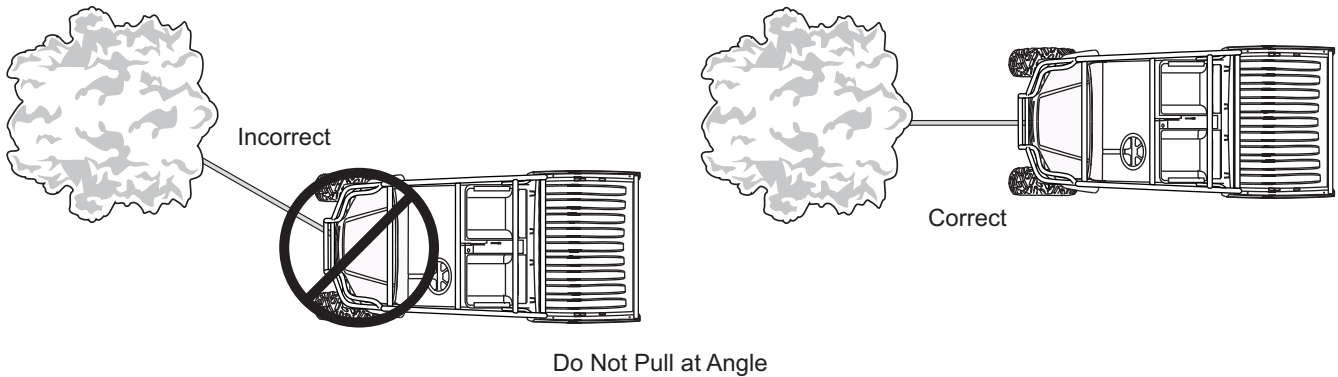
Never work around the winch drum or the winch cable while it is under tension.

Unplug the winch switch before working on the winch drum in order to prevent inadvertent operation.

When operating winch, take up slack slowly. Stop winch before cable becomes tight and inspect all winching connections. Check winch attachment, hook attachment, nylon sling (if required) and load attachment.

# OPERATING PROCEDURES

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*



Do not pull at an angle. This will cause the wire cable to pile up on one end of the winch. This may jam the winch causing damage to the cable and/or the winch. Pulling the vehicle at an angle can cause damage to the front suspension and may cause the vehicle to overturn. When pulling vehicle, pull straight only.

If the vehicle is being used as an anchor to winch a load, it should have the parking brake applied and chocks installed on all wheels.

Never use the winch to lift people or other overhead loads.

Do not use the winch to secure loads. Use a tie down designed for the job.

Do not apply shock loads to the winch.

Do not attempt to modify or weld the winch.

# OPERATING PROCEDURES

**Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.**

## Notes:

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

## MAINTENANCE

### VEHICLE CLEANING AND CARE

#### **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 and maintain a 12" minimum distance from spray nozzle to painted surface. 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 to wash exterior of vehicle.

Clean windshield with lots of water and a clean cloth. Minor scratches may be removed using a commercial plastic polish or Plexus® plastic cleaner available from the service parts department.

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 under-body of the vehicle. These materials will cause corrosion of under-body 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 its removal, taking care not to chip or otherwise damage paint.

### TRANSPORTING VEHICLE

#### **WARNING**

*Be sure vehicle and all contents are secure before transporting a vehicle.*

*Never ride on the vehicle being transported.*

*Always remove windshield (if equipped) before transporting.*

*Maximum speed with sun top installed is 70mph (112 kph).*

If the vehicle is to be transported at highway speeds, the windshield must be removed and the seat bottom secured. When transporting vehicle below highway speeds, check for tightness of hardware and cracks in sun top at mounting points.

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. (454 kg).

Secure the vehicle using ratchet tie downs.

# MAINTENANCE

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## ROUTINE MAINTENANCE

Preventive maintenance, applied at recommended intervals, is the best guarantee for keeping the vehicle dependable.

This vehicle will give years of satisfactory service, providing it receives regular maintenance. Refer to the PERIODIC SERVICE SCHEDULE for appropriate service intervals.

## LIFTING THE VEHICLE

| Tool List         | Qty |
|-------------------|-----|
| Floor Jack.....   | 1   |
| Jack Stands.....  | 4   |
| Wheel Chocks..... | 4   |

### WARNING

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

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

*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.*

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

### CAUTION

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

Remove payload from vehicle before lifting. No person(s) should be in or on the vehicle while lifting.

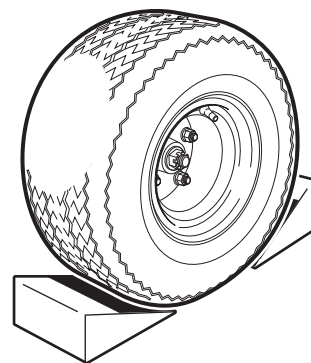
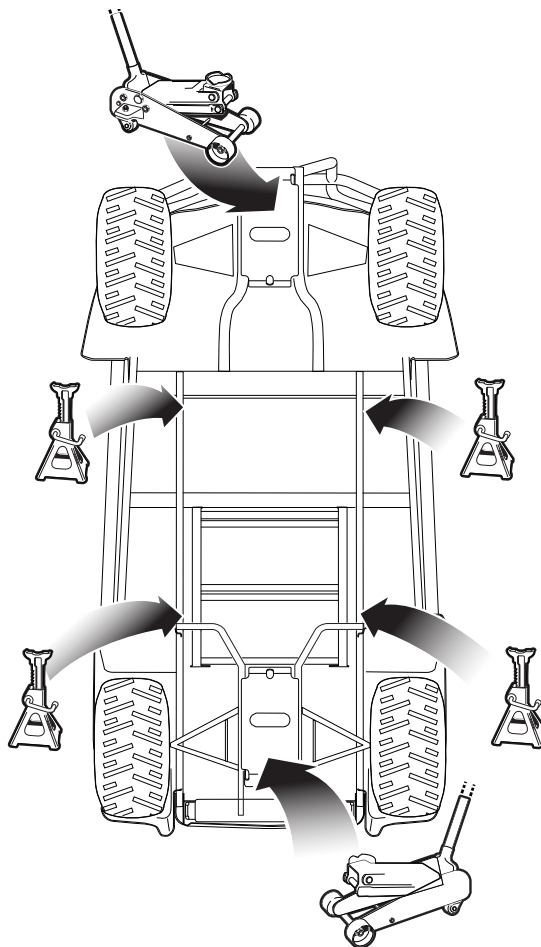
To raise the entire vehicle, install the wheel chocks in front and behind each front wheel. Center the jack under the rear axle tube next to differential housing or under the skid plate. Raise the vehicle and position the jack stands under the frame where the leaf spring mounting bracket is welded to the frame.

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

Place the jack under the center front of the car just behind the bumper. Raise the vehicle and position the jack stands under the frame where the instrument panel support is attached to the frame.

Lower the jack and test the stability of the vehicle on all four jack stands. To raise only the front or rear of the vehicle, place the wheel chocks in front and behind the wheels that are not to be raised. The jack may be left under the center front of the frame while the front end of the vehicle is on the jack stands.

Lower the vehicle by reversing the lifting sequence.



Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## LIGHT BULB REPLACEMENT



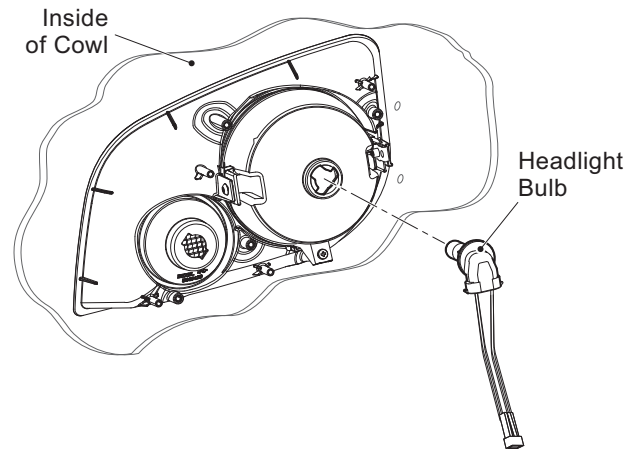
### CAUTION

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

#### Headlight Bulb Replacement

Make sure that the vehicle key switch is in the OFF position and the key has been removed.

Locate the headlight bulb socket on the backside of the light assembly. Turn bulb socket a quarter turn counterclockwise to unlock. Pull out bulb and socket, remove old bulb from the socket. Insert new bulb in socket and position bulb socket into headlight housing and rotate socket a quarter turn clockwise to secure.



#### Taillight Bulb Replacement

Make sure that the vehicle key switch is in the OFF position and the key has been removed.

The taillight contains an LED light board rather than a light bulb, if the LEDs burn out the whole light will have to be replaced.

## WHEELS AND TIRES



### WARNING

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

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

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

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

#### Tire Repair

| Tool List                     | Qty. | Tool List                        | Qty. |
|-------------------------------|------|----------------------------------|------|
| Lug Wrench, 3/4" or 17mm..... | 1    | Impact Socket, 3/4" or 17mm..... | 1    |
| Impact Wrench .....           | 1    | Torque Wrench, ft. lbs. ....     | 1    |

Steel wheel rims will require the 3/4" lug wrench and aluminum wheel rims will require the 17mm lug wrench.

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

# MAINTENANCE

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

If the tire is flat, raise vehicle and remove wheel. Refer to 'Lifting the Vehicle' for proper lifting procedure and safety information. Inflate tire to the maximum recommended pressure, immerse tire in water to locate the leak and mark the leak with chalk. Insert tire plug in accordance with manufacturer's specifications.

Use caution when inflating tires. Due to the low volume of the small tires, over inflation can occur in seconds. Over inflation could cause the tire to separate from the wheel or cause the tire to explode.

See GENERAL SPECIFICATIONS section for recommended tire inflation pressure. 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 stem dust cap after checking or inflating. The vehicle is fitted with low volume tubeless tires mounted on one piece rims.

## Wheel Installation



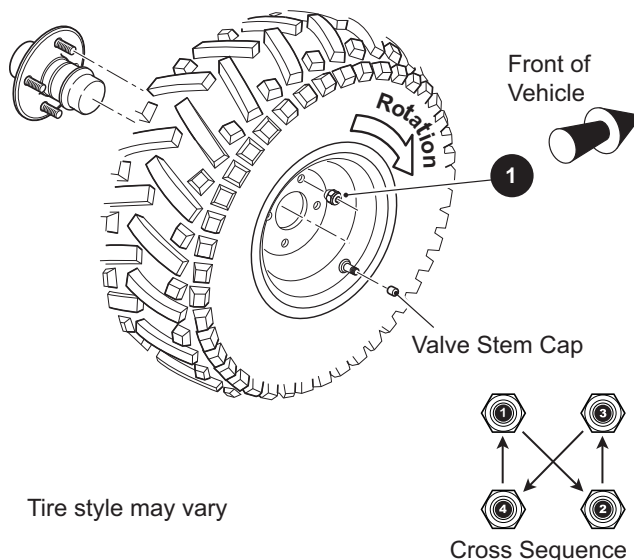
### CAUTION

To reduce the possibility of component damage, do not tighten lug nuts to more than 75 ft. lbs. (101 Nm) torque.

### NOTICE

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

With the valve stem to the outside, mount the wheel onto the hub with lug nuts. Finger tighten the lug nuts (1) in a 'cross sequence' pattern. Tighten the lug nuts to 65 to 75 ft. lbs. (88 to 101 Nm) torque in 20 ft. lbs. (27 Nm) increments following the 'cross sequence' pattern.



## Unidirectional Tires

Unidirectional tires may be identified by a directional arrow on the sidewall. Be sure to position the wheel on the hub correctly with the arrow indicating the direction of rotation when moving forward.

## WHEEL ALIGNMENT

Driving over rough terrain may cause mis-alignment of the wheels. With four wheel independent suspension both front and rear wheels may need to be aligned.

### Wheel Alignment

| Tool List                   | Qty. | Tool List                   | Qty. |
|-----------------------------|------|-----------------------------|------|
| Tape Measure.....           | 1    | Open End Wrench, 12 mm..... | 1    |
| Open End Wrench, 17 mm..... | 1    | Open End Wrench, 19 mm..... | 1    |

Park the buggy on a level surface, set the front wheels straight ahead. Turn the key switch to OFF, remove the key and set the parking brake.

With the buggy empty (no passengers or payload) measure the distance between the center of both the front and the rear sets of tires. Measure both in front and behind each tire set, keeping the tape measure parallel to the ground. The measurement behind the front tires should be 1/8" to 1/4" greater than the measurement taken at the front of the tires to produce a toe-in condition. The measurement behind the rear tires should be 0" to 1/8" greater than the measurement taken at the front of the tires to produce a toe-in condition.

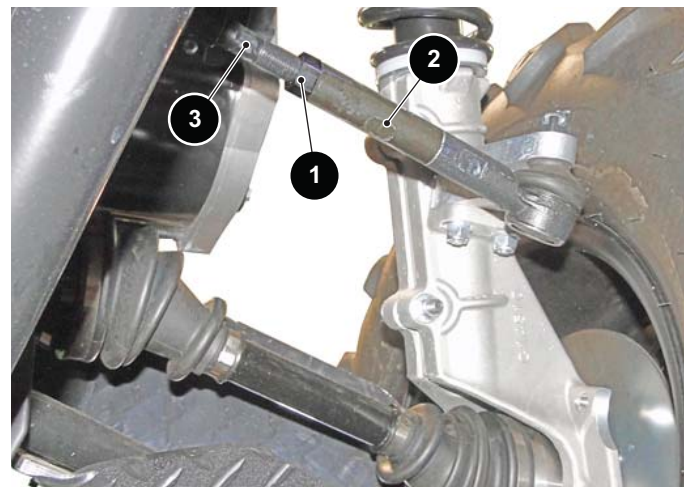
Read all of **SAFETY** and this section before attempting any procedure. Pay particular attention to **Notices, Cautions, Warnings and Dangers.**



## Front

Adjust both tie rods equally to obtain the correct toe-in. Hold tie rod (2) with an open end wrench, loosen the jam nut (1) and turn the adjustment shaft (3) to move the wheel in the desired direction..

Recheck the measurement at the front and at the rear of the front tires, if the 1/8" to 1/4" toe-in has been achieved tighten the lock nut (1) on each tie rod.

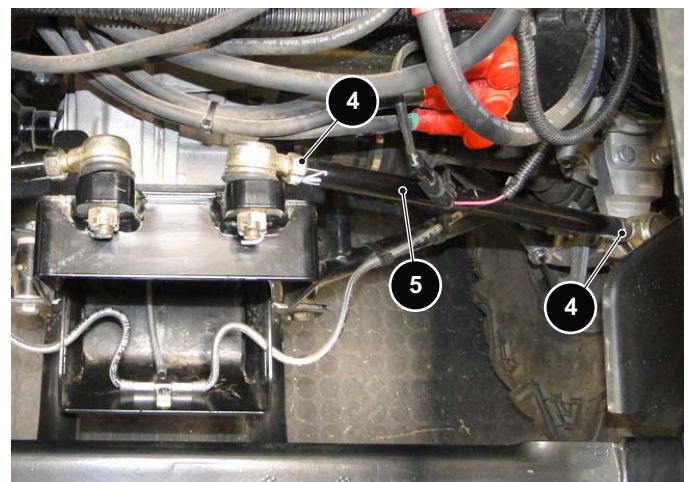


## Rear

The rear tie rods have jam nuts (4) at each end, one end has the standard right hand threads and the other end has left hand threads.

Loosen the jam nuts (4) on both tie rods, turn the center tube (5) with an open end wrench to adjust the length of each tie rod equally.

Recheck the measurement at the front and at the rear of the rear tires, if the 0 to 1/8" toe-in has been achieved tighten the lock nuts (4) on each tie rod.



## BRAKES

This vehicle is equipped with four wheel hydraulic disc brakes. The parking brake is hand operated. Check the fluid level at intervals specified in the **PERIODIC SERVICE SCHEDULE**; if fluid leaks are noticed or the brake pedal seems soft check the fluid level immediately. If the brake pedal is soft, the brake system should be bled to remove air from the brake lines. Instructions for bleeding the brake system are included in the vehicle repair manual.

# MAINTENANCE

Read all of **SAFETY** and this section before attempting any procedure. Pay particular attention to **Notices, Cautions, Warnings and Dangers.**

## Master Cylinder

The master cylinder is located under the front of the vehicle near the driver side front wheel well. Before removing the reservoir cap, clean any dirt or debris from around the reservoir and cap.

Check fluid level in the reservoir. The fluid level should be between the MAX and MIN lines. Use fresh DOT 3 brake fluid only.

To fill the reservoir, remove the cap to expose the rubber diaphragm, remove the diaphragm, making sure to keep it clean. Add enough brake fluid to bring the level up to the MAX line. Collapse and replace the diaphragm and install the reservoir cap. Clean any spilled brake fluid from the area.



## Bleeding Brakes

| Tool List               | Qty. | Tool List                 | Qty. |
|-------------------------|------|---------------------------|------|
| Hose .....              | A/R  | Clean Container .....     | 1    |
| Brake Fluid, DOT 3..... | A/R  | Wrench, 1/4" box end..... | 1    |

The hydraulic brake system must be free of air to operate properly. Air can enter the system when hydraulic parts are disconnected for servicing or replacement, or when the fluid level in the master cylinder reservoir is very low. Air in the system will give the brake pedal a spongy feeling upon application.

### NOTICE

*An assistant will be necessary to perform this procedure.*

1. Use a clean cloth to wipe off the master cylinder reservoir and wheel cylinder bleeder valves. Clean each fitting before opening to prevent contaminating the system.
2. Open the master cylinder reservoir and top off with standard automotive DOT 3 brake fluid.

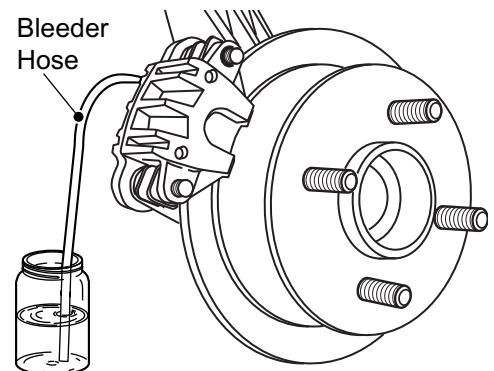
### WARNING

*Never return brake fluid to the original container or reuse brake fluid due to the possibility of contamination by dirt, grease, moisture. Contaminated brake fluid could cause failure of the braking system. Dispose of brake fluid in accordance with Federal, state and local codes.*

3. Attach a short length of clear hose to the caliper bleed valve and insert the other end into a suitable clean container containing fresh, clean brake fluid.

**Check the fluid level in the master cylinder frequently during this operation to prevent air from entering the lines.**

4. Starting with the passenger side rear brake, then driver side rear brake, passenger side front brake and driver side front brake last. Bleeding the brakes requires an assistant to pump the brake pedal and keep pressure on the pedal. Bleed the brakes using the following procedure:



*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

- Build pressure in the brake system, if possible, by slowly pumping the brake pedal.
- Open the bleeder valve while an assistant holds pressure on the brake pedal as the pedal slowly goes through the full stroke.
- Close the bleeder valve and have the assistant slowly release the brake pedal.
- Repeat the process until no bubbles can be seen leaving the bleeder valve.
- Close the valve and move to the next brake.

## Parking Brake Adjustment

The floor mounted parking brake has an adjustment knob on the end of the handle. If the vehicle starts to roll when the parking brake is engaged on a hill, place one foot on the service brake pedal, turn the adjustment knob clockwise to increase tension on the brake, release the service brake and check to see if the parking brake is holding, repeat the process if necessary.



## GAS POWERTRAIN

### Engine

This vehicle is powered by a 28hp Subaru V-Twin Cylinder OHV engine. For all maintenance procedures for the gas engine refer to the Subaru Manual located in Appendix A of this owner's guide.

The 12 volt engine starter battery is located under the front of the vehicle. It is charged by the generator as the engine runs. See BATTERY MAINTENANCE on page 34.



## ELECTRIC POWERTRAIN

### ⚠ WARNING

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

**DO NOT** attempt any type of servicing operations before reading all notes, cautions and warnings in this manual.

*Never press the accelerator pedal with drive wheels off the ground.*

*Any servicing requiring adjustments to be made to the powertrain while the motor is running must be made with all four 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.*

*Reduce the possibility of accidental starting by disconnecting battery at negative terminal before servicing.*



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

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

# MAINTENANCE

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.



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 electro-

lyte 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.

## System Test

At monthly intervals, test the controller by setting the MODE switch to ELEC and 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 system is functioning. If vehicle speed continues to rise, press on the brake pedal to stop the vehicle and have the vehicle inspected by a trained mechanic.

## 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, or frequent use with maximum load.**

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.

This vehicle will give years of satisfactory service, providing it receives regular maintenance. Refer to the PERIODIC SERVICE SCHEDULE for appropriate service intervals.

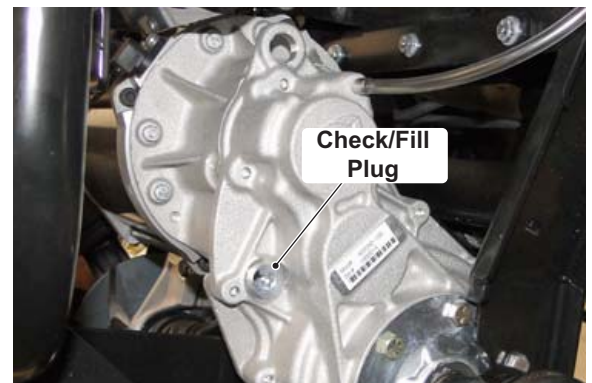
## AXLES

### Front and Rear Axles

The only maintenance required for the first five years is the periodic inspection of the rear axle for lubricant leakage. Unless leakage is evident, the lubricant need only be replaced after five years. Refer to the Service and Repair Manual for the fluid replacement procedure.

## CAUTION

*The front and rear axle do NOT use the same lubricant. Extreme care should be used when topping off or refilling the axles.*



The axles use different lubricants. Do NOT mix oils in an axle. The front axle contains 14 ounces of 90 weight gear oil, the rear axle contains 22 ounces of SAE 80 weight gear oil.

### Checking the Lubricant Level

Clean the area around the check/fill plug and remove the 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 it starts to seep from the hole. Install

*Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.*

the check/fill plug.

## BATTERY CHARGING AND MAINTENANCE

### Battery Safety

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 flames 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 the vehicle.*

*Never disconnect a circuit under load at a battery terminal.*



*Batteries are heavy. Use proper lifting techniques when moving them. Always lift the battery with a commercially available battery lifting device. Use care not to tip batteries when removing or installing them; spilled electrolyte can cause burns and damage.*

*The electrolyte in a storage battery is an acid solution which can cause severe burns to the skin and eyes. Treat all electrolyte spills to the body and eyes with extended flushing with clear water. Contact a physician immediately.*



*Always wear a safety shield or approved safety goggles when adding water or charging batteries.*

*Any electrolyte spills should be neutralized with a solution of 1/4 cup (60 ml) sodium bicarbonate (baking soda) dissolved in 1 1/2 gallons (6 liters) of water and flushed with water.*

*Overfilling batteries may result in electrolyte being spilled 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 Disposal

Lead-acid batteries are recyclable. Return whole scrap batteries to distributor, manufacturer or lead smelter for recycling. For neutralized spills, place residue in acid-resistant containers with absorbent material, sand or earth and dispose of in accordance with local, state and federal regulations for acid and lead compounds. Contact local and/or state environmental officials regarding disposal information.

# MAINTENANCE

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## Battery

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

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

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

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

## Battery Maintenance

| Tool List                                   | Qty. | Tool List                      | Qty. |
|---------------------------------------------|------|--------------------------------|------|
| Insulated Wrench, 9/16" .....               | 1    | Battery Carrier .....          | 1    |
| Insulated Wrench, 1/2" .....                | 1    | Hydrometer .....               | 1    |
| Battery Maintenance Kit P/N 25587-G01 ..... | 1    | Battery Protective Spray ..... | 1    |
| Socket, 9/16" .....                         | 1    | Torque Wrench, in. lbs. ....   | 1    |
| Socket, 1/2" .....                          | 1    |                                |      |

Most of the battery set for the electric motor is located under the seat, two batteries are located under the cowl. The tow batteries located under the cowl are supplied with a battery fill system tube that is located in the passenger side glove box, the remaining batteries for the electric motor are accessed by raising and removing the seat bottom and the battery compartment cover. The single battery for starting the gas engine is located under the front of the vehicle between the front frame members.

## At Each Charging Cycle



*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 battery pack, inspect the plug of the battery charger and vehicle receptacle housing for dirt or debris. Charge the batteries after each day's 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.
- Torque battery terminal nuts to 95 - 105 in. lbs. (11 - 12 Nm).
- Coat battery terminals with commercially available protectant.
- Replace all terminal covers.
- Replace battery compartment covers.

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## Temperature Affects Battery Capacity

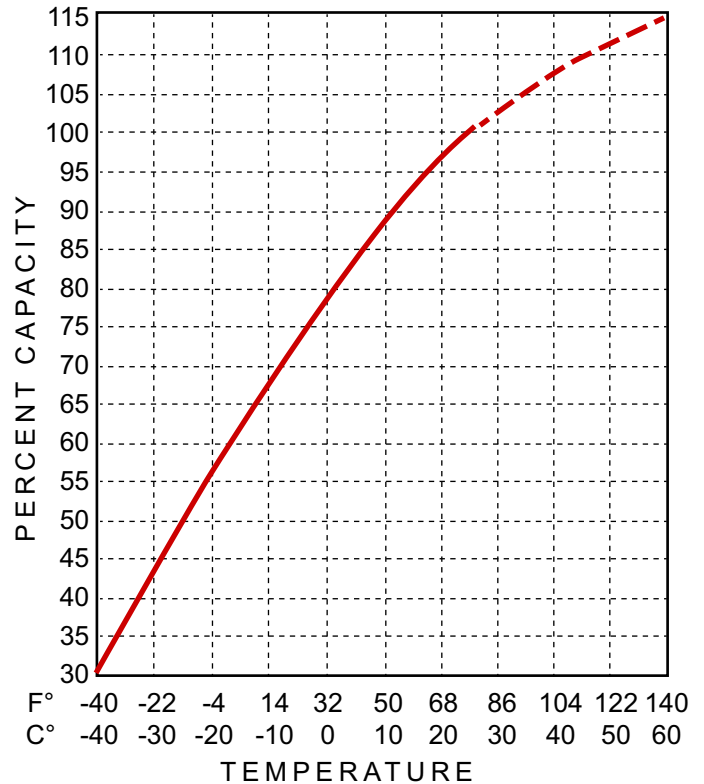
Battery storage capacity is affected by the temperature; the colder it is, the less energy it is able to store; as temperature increases so does the storage capacity of the battery.

The ideal battery temperature for deep cycle batteries that are available today is 77°F (25°C). At 32°F (0°C) the storage capacity of the battery will be reduced by 20%, this means in cold weather the vehicle will not travel as far as it would in warm weather.

## Electrolyte Level and Water

The correct level of the electrolyte is 1/2" (13 mm) above the plates in each cell.

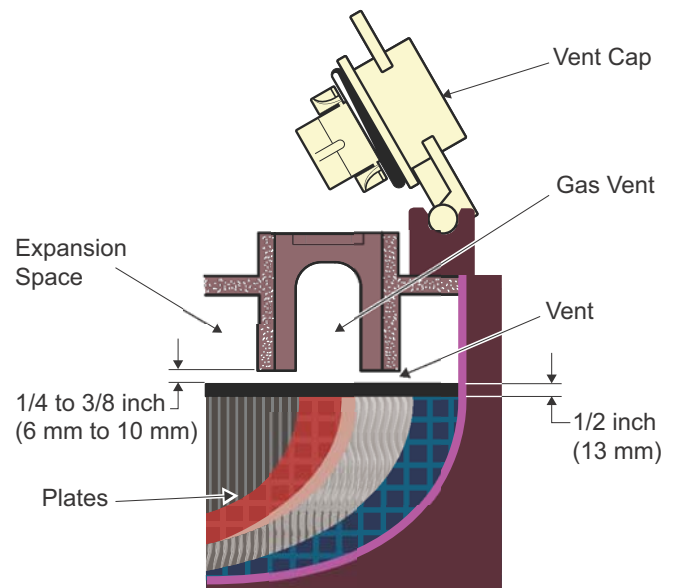
This level will leave approximately 1/4" - 3/8" (6 - 10 mm) of space between the electrolyte and the vent tube. The electrolyte level is important since any portion of the plates exposed to air will be ruined beyond repair. Also avoid filling with too much water, which will result in electrolyte being forced out of the battery due to gassing and a decrease 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.**

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.



Electrolyte level should be at least 1/2" (13 mm) above the plates and 1/4" to 3/8" (6 to 10 mm) below vent.

# MAINTENANCE

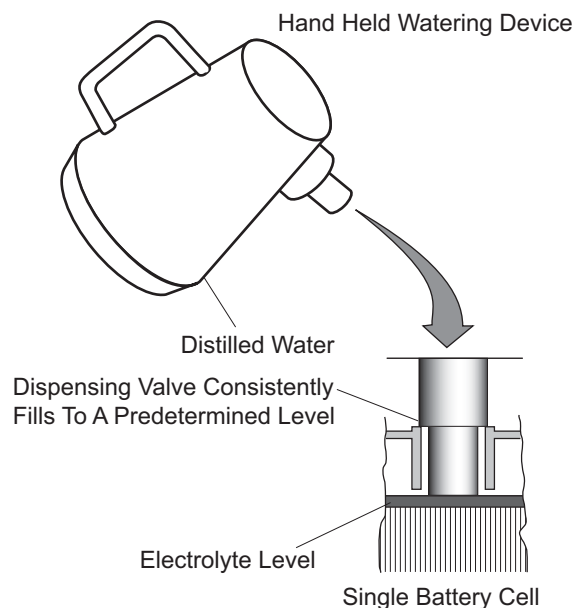
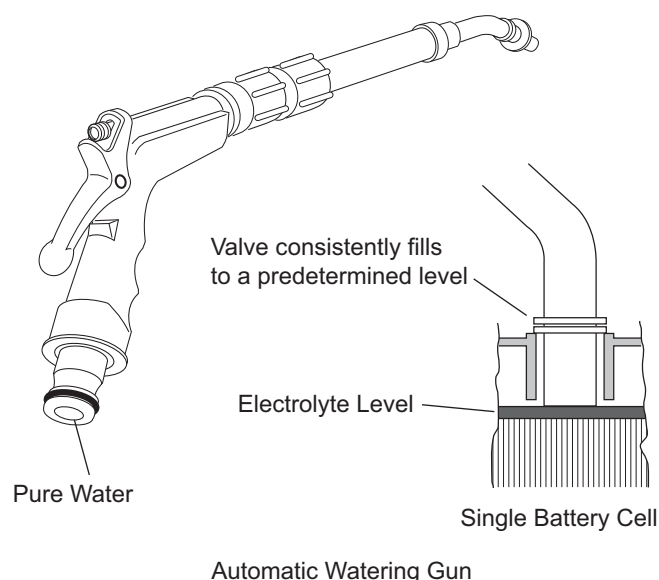
Read all of **SAFETY** and this section before attempting any procedure. Pay particular attention to **Notices, Cautions, Warnings and Dangers.**

Over the life of the battery, a considerable amount of water is consumed. It is important that the water used be pure and free of contaminants that could reduce the life of the battery by reducing the chemical reaction. The water must be distilled or purified by an efficient filtration system. 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.

An Automatic Watering Gun or a Battery Watering Jug; available from many auto parts stores; may be used to fill the batteries, these watering devices are accurate, easy to use and allow for rapid filling. They also maintain the correct electrolyte level within the battery cells.

| 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                 |

Water Purity Table



## NOTICE

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

## WARNING

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.



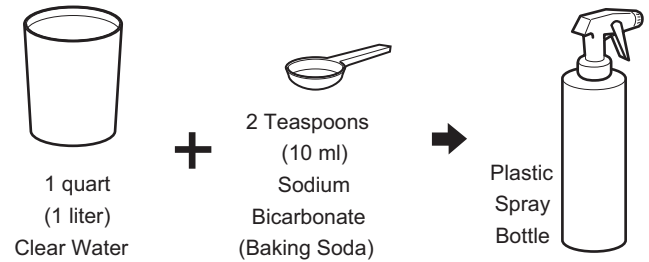
Any electrolyte spills should be neutralized with a solution of 2 teaspoons (10 ml) sodium bicarbonate (baking soda) dissolved in 1 quart (1 liter) of water and flushed with water.

Always wear a safety shield or approved safety goggles when adding water or charging batteries.

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## Cleaning Batteries

When cleaning the outside of the batteries and terminals, do not use a water hose without first spraying the batteries with a solution of baking soda (sodium bicarbonate) and water to neutralize any acid deposits. Use of a water hose without first neutralizing the acid will move the acid from the top of the batteries to another area of the vehicle or storage facility, where it will attack the metal structure or the concrete/asphalt floor. After hosing down the batteries, a residue will be left on the batteries, which is conductive and will contribute to the discharge of the batteries.



## CAUTION

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

**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.**

The correct cleaning technique is to spray the top and sides of the batteries with a solution of baking soda and water. This solution is best applied with a plastic spray bottle. The solution should consist of 2 teaspoons (10 ml) sodium bicarbonate (baking soda) dissolved in 1 quart (1 liter) of water. In addition to the batteries, special attention should be paid to metallic components adjacent to the batteries, these should also be sprayed with the baking soda solution.

Most of the battery set for the electric motor is located under the seat, two batteries are located under the cowl. The tow batteries located under the cowl are supplied with a battery fill system tube that is located in the passenger side glove box, the remaining batteries for the electric motor are accessed by raising and removing the seat bottom and the battery compartment cover. The single battery for starting the gas engine is located under the front of the vehicle between the front frame members.

Allow the solution to set for at least three minutes; use a soft bristle brush or cloth to wipe the tops of the batteries in order to remove any residue that could cause the self-discharge of the battery. Rinse the entire area with low pressure clear water.

Cleaning should take place once a month or more often under extreme conditions. After batteries are clean and dry, the terminals should be coated with a commercially available protectant. Aerosol containers of battery terminal protectant must be used with extreme care. Insulate the metal container to prevent the can from contacting the battery terminals.

## Battery Removal and Installation



## WARNING

**Improper handling of high voltage wiring, batteries, or control systems could result in serious or fatal injury by electric shock. Only qualified technicians should repair or access high voltage wiring, battery packs, and associated systems.**

**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.**

# MAINTENANCE

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.



## CAUTION

**If the batteries are replaced, make sure they are the exact type and model originally supplied with the vehicle. Failure to follow this caution can result in damage to the vehicle's electrical system.**

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

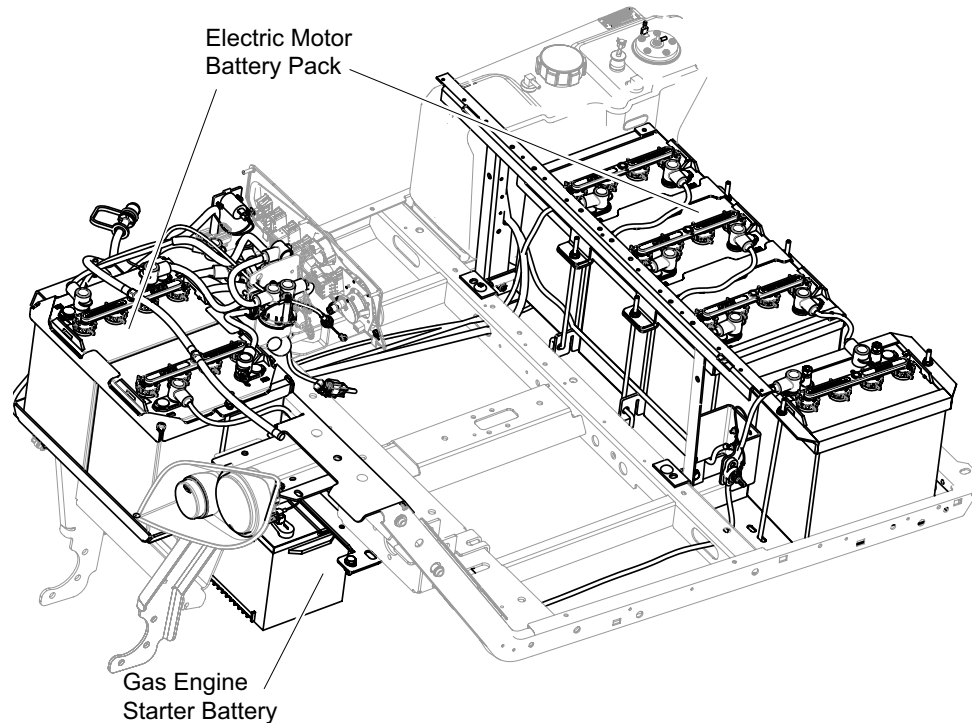
If the batteries have been cleaned and any acid in the battery rack areas neutralized as recommended, no corrosion to the battery racks or surrounding area should be present. Any corrosion found should be immediately removed with a putty knife and a wire brush. The area should be washed with a solution 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.

Use care to connect the battery wires as shown.

Tighten the battery post hardware to 90 - 100 in. lbs. (6 - 8 Nm) torque. Do not over-torque the terminal stud nut, this will cause a "mushroom" effect on the battery post which will prevent the terminal nut from being properly tightened. Protect the battery terminals and battery wire terminals with a commercially available coating.



BATTERY CONFIGURATION

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## Storage

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

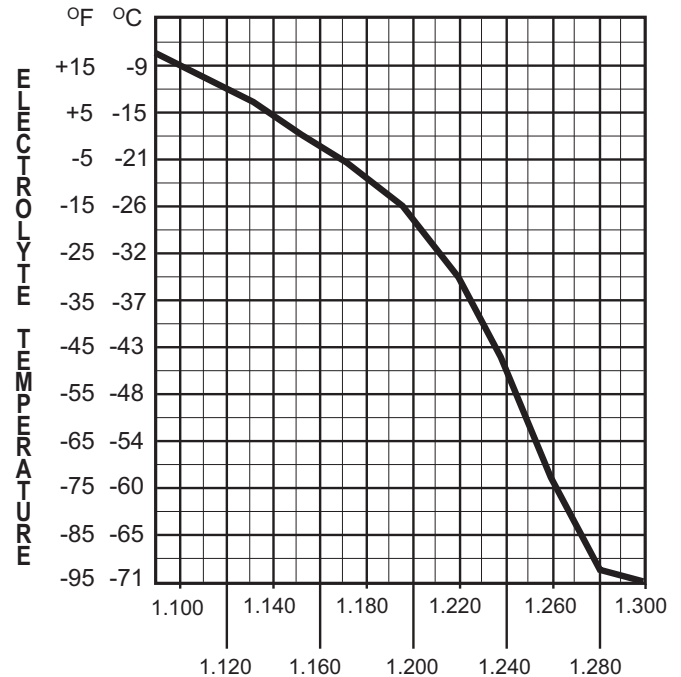
In winter conditions, the battery must be fully charged to prevent the possibility of freezing. A fully charged battery will not freeze in temperatures above -75° F (-60° C). Although the chemical reaction is slowed in cold temperatures, the battery must be stored fully charged, and disconnected from any circuit that could discharge the battery. The batteries must be cleaned and all deposits neutralized and removed from the battery case to prevent self discharge.

The battery charger may be left connected to the vehicle to maintain a full charge on the batteries, provided the charger is plugged into an active electrical source. If power to the electrical source is disconnected or interrupted the battery charger will continue to check the charge on the battery pack, this will draw power from the battery pack and eventually drain the batteries if power is not restored in a timely manner.

## 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:



SPECIFIC GRAVITY ELECTROLYTE FREEZING POINT



## CAUTION

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

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

## BATTERY FAULT DIAGNOSIS

In general, fault diagnosis 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 the manufacturer's representative for specific requirements.

The second reason is to determine why a particular vehicle does not perform adequately. Performance problems may

# MAINTENANCE

Read all of **SAFETY** and this section before attempting any procedure. Pay particular attention to **Notices, Cautions, Warnings and Dangers.**

result in a vehicle that runs slowly or in a vehicle that is unable to operate for the time required.

A new battery must **mature** before it will develop its maximum capacity. Maturing may take up to 100 charge/discharge cycles. After the maturing phase, the older a battery gets, the lower the capacity. The only way to determine the capacity of a battery is to perform a load test using a discharge machine following manufacturer's recommendations.

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

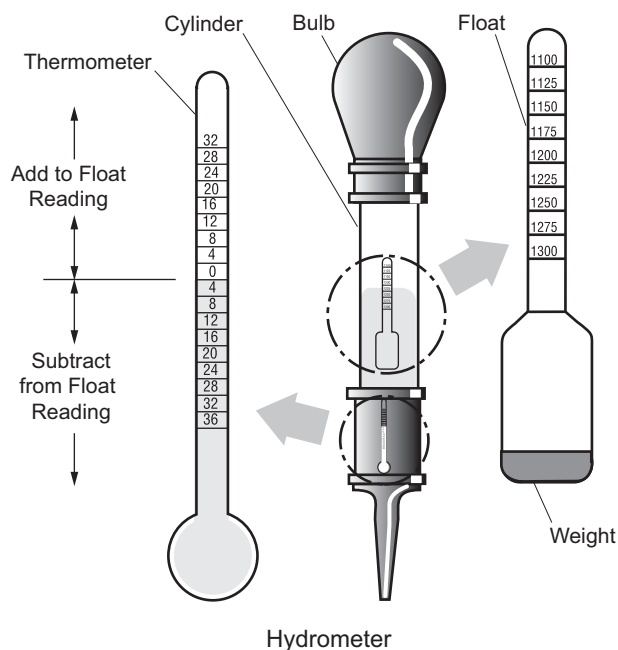
## HYDROMETER

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

### **WARNING**

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

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



### **NOTICE**

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

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

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

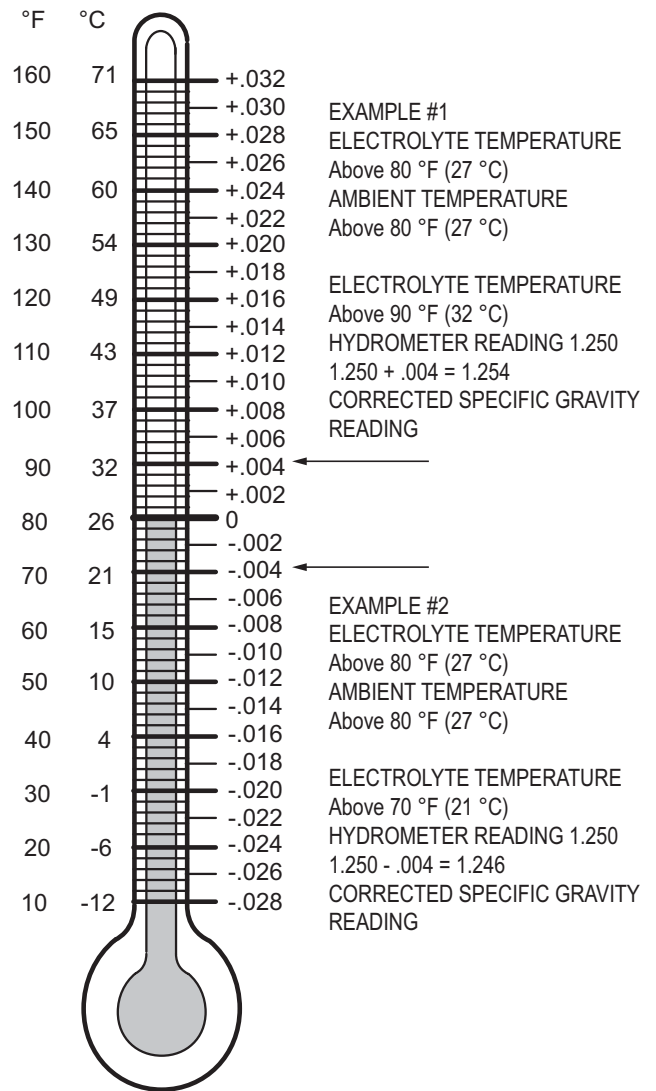
## Using A Hydrometer

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

### ELECTROLYTE TEMPERATURE



Hydrometer Temperature Correction

## PROLONGED STORAGE



### Battery Set and Gas Starting Battery

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.

# MAINTENANCE

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.



## Gas Engine

### WARNING

*To reduce the possibility of severe injury or death resulting from a possible explosion:*

*Do not handle fuel in an area that is not adequately ventilated. Do not smoke near the fuel tank or refuel near open flame or electrical items which could produce a spark.*

*Store vehicle in a clean, dry area. Do not store in same area as a stove, furnace, water heater, or other appliance that uses a pilot light or has a device that can create a spark.*

*When refueling, inspect the fuel cap for leaks or breaks that could result in fuel spillage.*

*Always wear safety glasses while refueling to prevent possible eye injury from gasoline or gasoline vapor.*

*Keep hands, clothing and jewelry away from moving parts. Use care not to contact hot objects.*

*Raise the rear of the vehicle and support on jack stands before attempting to run the engine.*

Preparing the engine for a prolonged storage period (30 days or more) calls for a few simple steps to prevent a build up of varnish and gum in the throttle body and corrosion in the engine.

- Perform all routine maintenance per the Periodic Service Schedule.
- Add commercially available fuel stabilizer to the fuel tank. Follow the manufacturer's instructions.
- Start the engine and allow to run for several minutes in a well ventilated area to allow the fuel stabilizer to be mixed through the fuel system.
- Turn the fuel shut-off valve to the closed (OFF) position at the fuel tank
- With proper ventilation, run the engine until the remaining fuel in the system is depleted and the engine stalls.
- Remove both spark plug wire boots from the spark plugs.
- Remove both spark plugs.
- Use a conventional cylinder fogging oil or add one ounce of 30 weight oil to each spark plug hole.
- Inspect the spark plugs prior to installation. Replace if needed.
- Rotate the engine several times with the starter prior to reinstalling the spark plug wire boots onto the spark plugs. This will allow the fogging oil to coat the cylinders.
- Reinstall the spark plug wire boots onto the spark plugs.
- Turn the Key Switch to OFF position, and remove the key.
- Secure the vehicle to prevent rolling while in storage.



Fuel Shut-off Valve  
Turn to "OFF" Position

## HARDWARE

Periodically, the vehicle should be inspected for loose fasteners. Use care when tightening fasteners, refer to the Technician's Repair and Service Manual for specific torque values.

Generally, three classes of standard hardware and two classes of metric hardware are used in the vehicle. Grade 5 hardware can be identified by the three marks on the hex head and grade 8 hardware is identified by six marks on the head. metric hardware is marked on the head with 8.8 or 10.9. Unmarked hardware is Grade 2.

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

| 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<br>(5) | 8<br>(11)  | 15<br>(20) | 24<br>(33) | 35<br>(47)  | 55<br>(75)   | 75<br>(102)  | 130<br>(176) | 125<br>(169) | 190<br>(258) |
| Grade 5                                                                                                                | 6<br>(8) | 13<br>(18) | 23<br>(31) | 35<br>(47) | 55<br>(75)  | 80<br>(108)  | 110<br>(149) | 200<br>(271) | 320<br>(434) | 480<br>(651) |
| Grade 8                                                                                                                | 6<br>(8) | 18<br>(24) | 35<br>(47) | 55<br>(75) | 80<br>(108) | 110<br>(149) | 170<br>(230) | 280<br>(380) | 460<br>(624) | 680<br>(922) |
| BOLT SIZE                                                                                                                                                                                               | M4       | M5         | M6         | M8         | M10         | M12          | M14          |              |              |              |
| Class 5.8 <br>(Grade 2)                                                                                                | 1<br>(2) | 2<br>(3)   | 4<br>(6)   | 10<br>(14) | 20<br>(27)  | 35<br>(47)   | 55<br>(76.4) |              |              |              |
| Class 8.8 <br>(Grade 5)                                                                                                | 2<br>(3) | 4<br>(6)   | 7<br>(10)  | 18<br>(24) | 35<br>(47)  | 61<br>(83)   | 97<br>(131)  |              |              |              |
| Class 10.9 <br>(Grade 8)                                                                                               | 3<br>(4) | 6<br>(8)   | 10<br>(14) | 25<br>(34) | 49<br>(66)  | 86<br>(117)  | 136<br>(184) |              |              |              |

Torque Specifications and Bolt Grades

## CAPACITIES AND REPLACEMENT PARTS

| CAPACITIES                   |                           |
|------------------------------|---------------------------|
| Front Axle Oil               | 13.8 oz. 90 wt. Gear Oil  |
| Rear Axle Oil                | 13.8 oz. 90 wt. Gear Oil  |
| Brake Fluid                  | DOT 3                     |
| Fuel Tank (Early Production) | 5.3 Gallons (20 Liters)   |
| Fuel Tank (Late Production)  | 5.6 Gallons (21.3 Liters) |

| REPLACEMENT PARTS    |              |
|----------------------|--------------|
| LED Headlight Bulb   | P/N 619101   |
| Headlight Bulb       | P/N 619100   |
| ATC Type Fuse 10 Amp | P/N 35212G07 |
| ATC Type Fuse 15 Amp | P/N 35212G01 |
| ATC Type Fuse 20 Amp | P/N 35212G02 |

**Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.**

## Notes:

# PERIODIC SERVICE SCHEDULE

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

## PERIODIC SERVICE SCHEDULE

### PERIODIC SERVICE SCHEDULE

CH - CHECK

C&A - CHECK & ADJUST

CL - CLEAN

R - REPLACE

| REMARKS                                                                                                                                                                                  | Before each use<br>DAILY | 250 miles/415 kms<br>MONTHLY | 750 miles/1250 kms<br>QUARTERLY | 1500 miles/2500 kms<br>SEMI-ANNUAL | 3000 miles/5000 kms<br>ANNUAL | REPLACE AFTER           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------|---------------------------------|------------------------------------|-------------------------------|-------------------------|
| Tires - pressure, condition of tires & rims                                                                                                                                              | CH                       | CH                           | CH                              | CH                                 | CH                            |                         |
| Hardware - loose or missing                                                                                                                                                              | CH                       | CH                           | CH                              | CH                                 | CH                            |                         |
| Overall Vehicle Condition                                                                                                                                                                | CH                       | CH                           | CH                              | CH                                 | CH                            |                         |
|                                                                                                                                                                                          |                          |                              |                                 |                                    |                               |                         |
| Batteries - state of charge, condition, loose terminals, corrosion, hold downs & hardware                                                                                                |                          | CH                           | CL                              | CL                                 | CL                            |                         |
| Batteries* - check electrolyte level, fill after charging if required (if plates are exposed before charging, add only enough water to cover any exposed plates and fill after charging) |                          | C&A                          | C&A                             | C&A                                | C&A                           |                         |
| Brakes - Check fluid level in master cylinder                                                                                                                                            |                          | CH                           | CH                              | CH                                 | CH                            | 3000 miles/<br>5000 kms |
| Brakes - smooth operation of pedal, stopping distance                                                                                                                                    | CH                       | CH                           | CH                              | CH                                 | CH                            |                         |
|                                                                                                                                                                                          |                          |                              |                                 |                                    |                               |                         |
| Park Brake - ability to hold on a hill                                                                                                                                                   |                          | C&A                          | C&A                             | C&A                                | C&A                           |                         |
| Accelerator - smooth operation                                                                                                                                                           | CH                       | CH                           | CH                              | CH                                 | CH                            |                         |
| Wiring - loose connections, broken or missing insulation                                                                                                                                 |                          | CH                           | CH                              | CH                                 | CH                            |                         |
| Charger Receptacle - inspect and clean receptacle at each charge                                                                                                                         |                          | CL                           | CL                              | CL                                 | CL                            |                         |
| Direction Selector - attachment and mechanism                                                                                                                                            |                          | C&A                          | C&A                             | C&A                                | C&A                           |                         |
| Steering Assembly - excessive play, loose or missing hardware                                                                                                                            |                          | CH                           | CH                              | CH                                 | CH                            |                         |
| Tie Rods - excessive play, bent rods, loose or missing hardware                                                                                                                          |                          | CH                           | CH                              | CH                                 | CH                            |                         |
| Front and Rear Axle - oil leakage, noise, loose or missing hardware                                                                                                                      |                          | CH                           | CH                              | CH                                 | CH                            |                         |
| Front and Rear Axle - drain and replace fluid                                                                                                                                            |                          |                              |                                 |                                    |                               | 5000 miles/<br>8000 kms |
| Front Suspension - strut oil leakage, excessive play in hubs or kingpins, worn bushings, loose or missing hardware                                                                       |                          | CH                           | CH                              | CH                                 | CH                            |                         |
| Rear Suspension - strut oil leakage, worn bushings, loose or missing hardware                                                                                                            |                          |                              | CH                              | CH                                 | CH                            |                         |
| Front Wheel Alignment - unusual tire wear                                                                                                                                                |                          |                              | C&A                             | C&A                                | C&A                           |                         |

\* Use only distilled or purified water that is free from contaminants to fill batteries.

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

## PERIODIC SERVICE SCHEDULE

**Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.**

## Notes:

Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.

# APPENDIX A

## SUBARU ENGINE OPERATORS MANUAL

Safety Precautions .....1

Components .....4

Pre-operation Checks.....5

Battery Installation.....7

Operating Your Engine .....9

Easy Troubleshooting.....11

Spark Arrestor (Optional) .....13

Maintenance Schedule .....14

“How-To” Maintenance .....16

Preparations for Storage .....20

Specifications .....21

*The Subaru Owner’s Manual (2ZZ9990168 issue EMD-EU6943) is included in this manual (without changes or editing) with the permission of Subaru Industrial Power Products. Copying or reprinting of this manual is prohibited.*

**Read all of SAFETY and this section before attempting any procedure. Pay particular attention to Notices, Cautions, Warnings and Dangers.**

## Notes:

## NOTICE

*Read the following warnings before operating vehicle:*

### **WARNING**

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

*When vehicle is to be left unattended, engage park brake, move direction selector to neutral, turn key to OFF position and remove from key switch.*

*Drive vehicle only as fast as terrain and safety considerations allow. 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 loss of control. Use service brake to control speed when traveling down an incline.*

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

*All travel should be directly up or down hills; use extra care if ever forced to drive across an incline.*

*Stay in designated areas and avoid steep slopes. Activate the park brake when 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 direction selector is in desired position before starting 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 direction selector.*

*See GENERAL SPECIFICATIONS for vehicle load and seating capacity.*

## NOTICE

*Read the following information and warnings before operating 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 they may fail.

A vehicle requiring repair indicates that it is no longer functioning as designed and therefore should be considered potentially hazardous.

Use extreme care when working on vehicle. When diagnosing, removing or replacing any components that are not operating properly, 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, 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 utmost caution. Be careful not to place hands, face, feet or body in a location that could expose them to injury should an unexpected situation occur.

Always use the appropriate tools listed in the tool list and wear approved safety equipment.

### **WARNING**

*Before working on vehicle, remove all jewelry (rings, watches, 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 running or adjusting 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 forms when charging batteries. Do not charge batteries without adequate ventilation.*

*Do no permit open flame or smokers in an area being used for charging batteries. A concentration of 4% hydrogen gas or more is explosive.*



**Textron Specialized Vehicles, Inc.**  
1451 Marvin Griffin Road  
Augusta, Georgia 30906-3852 USA

**CONTACT US:**

North America:

**Technical Assistance & Warranty  
Service Parts**

Phone: 1-800-774-3946, FAX: 1-800-448-8124

Phone: 1-888-438-3946, FAX: 1-800-752-6175

International:

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

Service Parts Manuals, as well as Repair and Service Manuals  
are available from a local Distributor, an authorized Branch,  
Parts & Accessories Department or at [www.badboyoffroad.com](http://www.badboyoffroad.com).

Copyrighted Material

This manual may not be reproduced in whole  
or in part without the express permission of  
TSV Technical Communications Department