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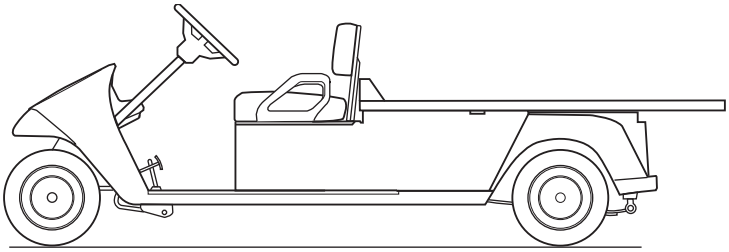
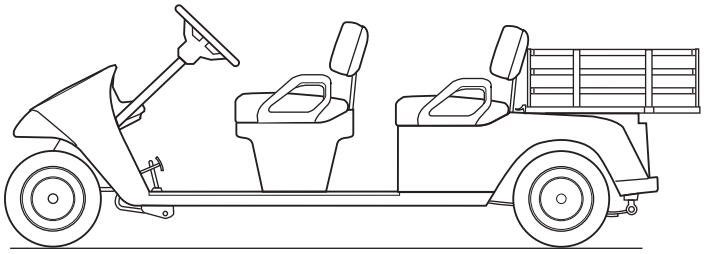
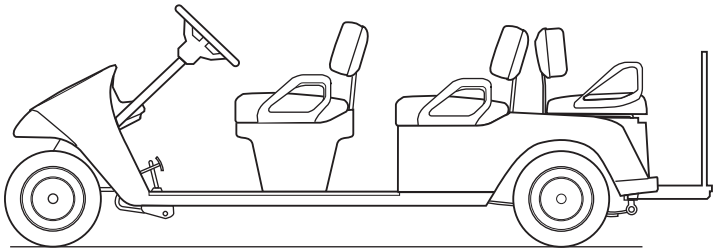
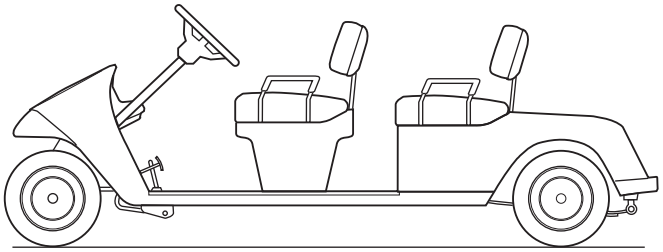
TECHNICIAN'S REPAIR AND SERVICE MANUAL









ELECTRIC POWERED PERSONNEL CARRIERS AND GOLF CAR

ISSUED SEPTEMBER 2004 REVISED NOVEMBER 2010

Rubber parts should be cleaned with non-abrasive household cleaner.

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

Corrosive materials used as fertilizers or for dust control can collect on the underbody of the vehicle. These materials will accelerate corrosion of underbody parts. It is recommended that the underbody be flushed occasionally with plain water. Thoroughly clean any areas where mud or other debris can collect. Sediment packed in closed areas should be loosened to ease its removal, taking care not to chip or otherwise damage paint.

VEHICLE CARE PRODUCTS

To help maintain the vehicle, there are several products available through local Distributors, authorized Branches, or the Service Parts Department.

- Touch-up paint specially formulated to match vehicle colors for use on TPE (plastic) bodies (P/N 28140-G** and 28432-G**).
- Multi-purpose Battery Protectant formulated to form a long-term, flexible, non-tacky, dry coating that will not crack, peel or flake over a wide temperature range (P/N 75500-G01).
- White Lithium Grease designed to provide lubrication protection in areas where staining or discoloring is a problem, or in areas of extreme temperature ranges (P/N 75502-G01).
- Penetrant/Lubricant, a 4-in-1 product that penetrates the most stubborn of frozen parts, lubricates leaving a light lubricating film, prevents corrosion by adhering to wet or dry surfaces and displaces moisture, sealing against future moisture return (P/N 75503-G01).
- Multi-purpose Cleaner and Degreaser that contains natural, environmentally safe solvents (P/N 75504-G01).
- Multi-purpose Hand Cleaner is an industrial strength cleaner containing no harsh solvents, yet gently lifts grease off hands. May be used with or without water (P/N 75505-G01).
- Battery Cleaner that promotes easy, non-violent neutralization of battery acids and battery acid crystals. The resulting sodium salts are water soluble and easily washed away (P/N 75506-G01).
- Battery Maintenance Kit for complete battery cleaning and watering, with battery maintenance instructions (P/N 25587-G01).
- Biodegradable Cleaner that cleans the toughest dirt and heavy soils by breaking down grease to be easily wiped or rinsed away (P/N 75507-G01).
- Multi-purpose Value Pack sampler package including 4 ounce (118 ml) aerosol cans of Battery Protector, Penetrant/Lubricant, White Lithium Grease, and Carburetor and Choke Cleaner (P/N 75508-G01).
- Plexus plastic cleaner and polish removes minor scratches from windshield (P/N 28433-G**).

TOP AND WINDSHIELD

⚠ WARNING ⚠ ***The top does not provide protection from roll over or falling objects.***

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

The top and windshield are designed for weather protection only.

Clean with lots of water and a clean cloth. Minor scratches may be removed using a commercial plastic polish or Plexus plastic cleaner available from Service Parts Department.

4.8 Control of Noxious Gases and Fumes

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

4.9 Warning Device(s)

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

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

5 OPERATING SAFETY RULES AND PRACTICES

5.1 Personnel and Burden Carrier Operator Qualifications

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

5.2 Personnel and Burden Carrier Operators' Training

5.2.1 The user shall conduct an operators' training program.

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

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

(a) instructional material provided by the manufacturer;

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

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

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

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

5.3 Personnel and Burden Carrier Operator Responsibility

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

5.4 General

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

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

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

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

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

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

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

Read all of Section B and this section before attempting any procedure. Pay particular attention to all Notes,

BODY

NOTE *In the following text, there are references to removing/installing bolts etc. Additional hardware (nuts, washers etc.) that are removed must always be installed in their original positions unless otherwise specified. Non-specified torques are as shown in the table in Section A.*

General

⚠ WARNING ⚠ ***To prevent possible injury or death from battery explosion.***

Batteries should always be removed before any servicing that will generate sparks.

It is important to use a sharp drill bit when removing the rivets on the side of the vehicle. Extreme care must be used when drilling out the rivets located in the front of the body and the bottom side of the body. Excessive pressure could result in the drill bit being forced through the body panel and penetrating a component. As extra protection, it is recommended that a protective piece of sheet metal be placed between the battery and the rivet. Use of a drill depth stop will provide additional protection.

In general, body component replacement can be accomplished with a minimum of specialized tools. Most body components are held in place with conventional removable hardware (nuts, bolts, washers and screws). Some components are mounted with 'pop' rivets which require that the rivet head be removed in order to push out the shank of the rivet. The rivet head is easily removed by drilling into the head with a **sharp** drill bit that is **slightly** larger than the shank of the rivet (Ref Fig. 1 on page C-1). Care must be exercised when drilling to prevent the drill from being forced through and damaging components where it could damage components located immediately behind the rivet. The best way to prevent this from occurring is to use a sharp drill bit that requires very little pressure to cut successfully and to place a piece of protective sheet metal between the surface being drilled and components directly behind it.

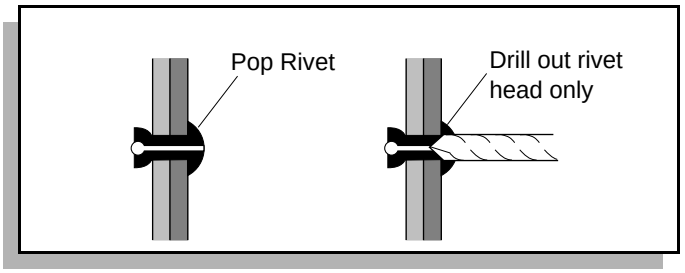


Fig. 1 Drill Out Metal Rivet

BODY COMPONENT REPLACEMENT

The body components can be replaced by removing the securing hardware, replacing the component and securing with hardware in the same orientation as removed. The illustrations on the following pages indicate the assembly methods for the various components.

Read all of Section B and this section before attempting any procedure. Pay particular attention to all Notes, Cautions and Warnings

Rocker Panel Removal

Tool List	Qty. Required
Phillips screwdriver bit, 3/8" drive	1
Phillips screwdriver	1
Wrench, 1/4"	1
Wrench, 7/16"	1

Remove the following hardware.

The rocker panel (item 1) is held in place with two horizontal screws, lock nuts and washers (items 2, 3 & 4). the front attachment uses a rocker panel to fender flair spacer (item 5) between the rocker panel and the side of the frame. The rear attachment uses a spacer (item 6) between the rocker panel and the side panel. Two additional truss head screws, spacers, washers and lock nuts (items 7, 8, 9 & 10), fasten the rocker panel to the floorboard and frame (Ref Fig. 9 on page C-11).

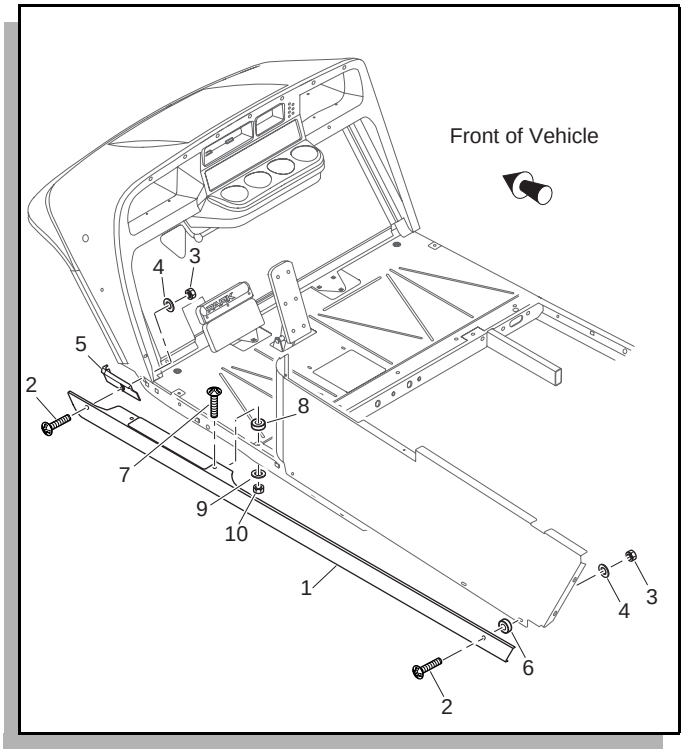


Fig. 9 Rocker Panel Removal

Reassembly is the reverse of disassembly. It is recommended that new lock nuts be used.

Rear Fender Removal

Tool List	Qty. Required
Ratchet, 3/8" drive	1
Socket, 7/16", 3/8 drive	1
Lug wrench	1
Wrench, 7/16"	1
3/8" drill	1
3/16" drill bit	1
Rivet gun	1
Small pry bar	1
Phillips screwdriver	1
Pliers	1
Floor jack, 1 1/2 ton	1
Jack stands	2
Wheel chocks	4

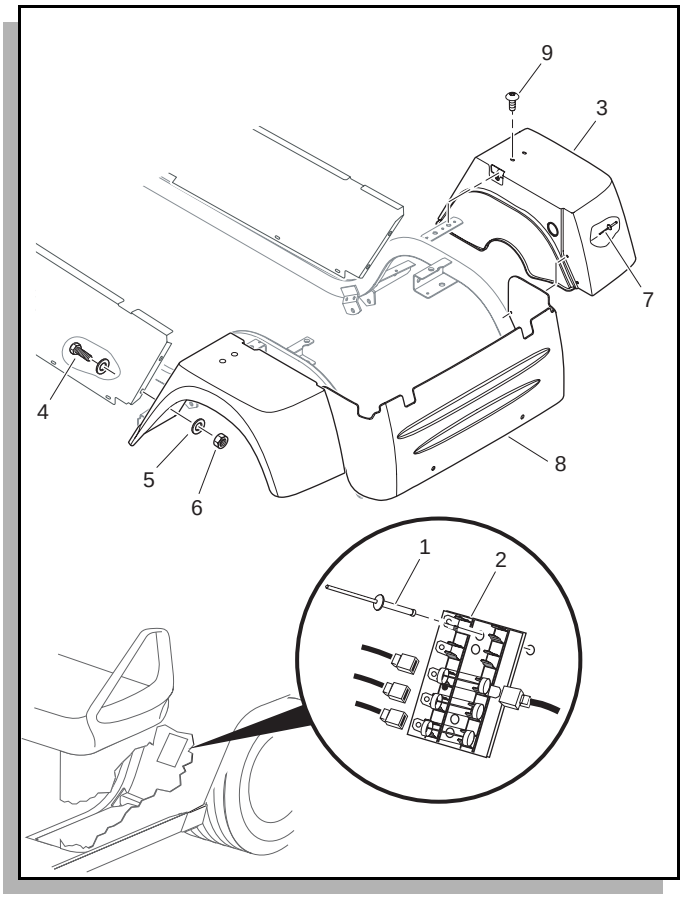


Fig. 10 Rear Fender Removal

FRONT SUSPENSION AND STEERING

E

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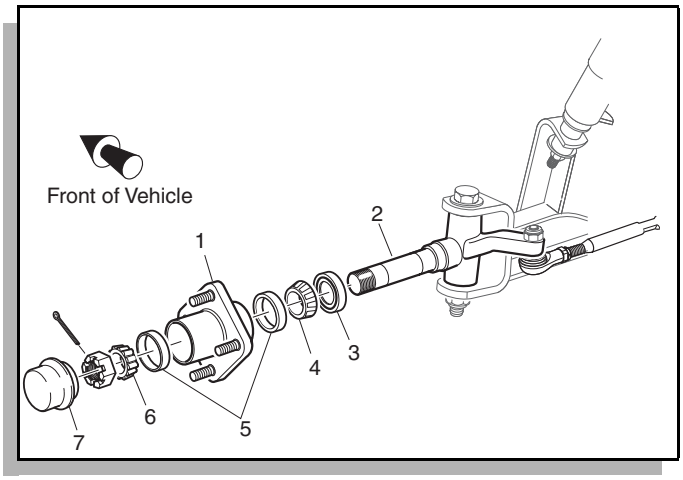

Fig. 11 Wheel Bearing Replacement

To install race (5), make sure bore of hub (1) is clean and place new race over bore of hub. Evenly tap with hammer and bearing driver to drive race fully in bore. Repeat on other side of hub.

Clean spindle (2) and pack new bearings with grease. See ‘Wheel Bearing Packing’ on page E-2.

Install inner wheel bearing (4) and new grease seal in hub and mount hub to spindle. See ‘Hub Replacement’ on page E-7.Adjust bearing. See ‘Wheel Bearing Adjustment’ on page E-3.

Replace the dust cap (7).

Lower vehicle per SAFETY section and tighten front wheel(s) per WHEELS AND TIRES section.

ELECTRONIC SPEED CONTROL

F

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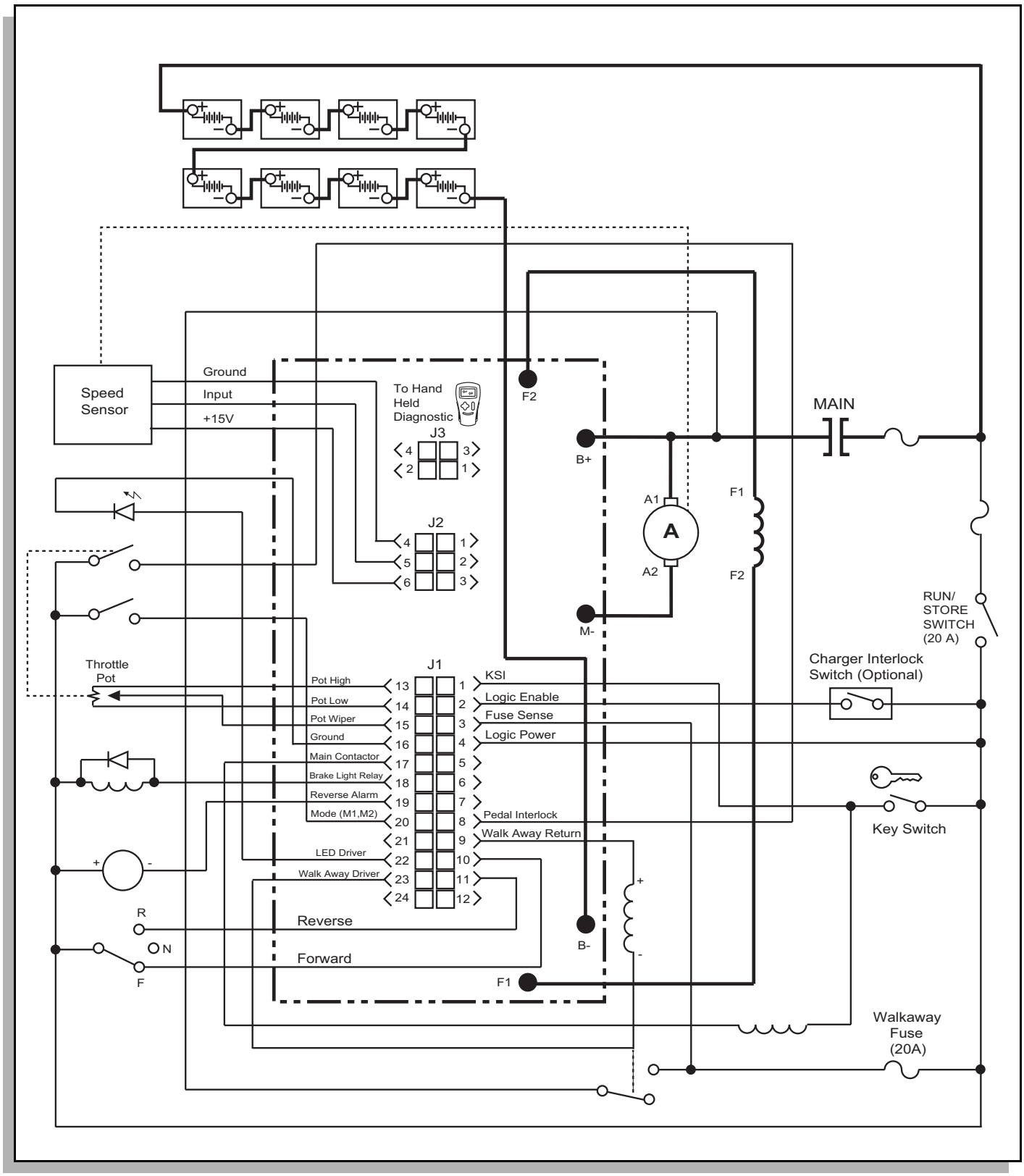

Fig. 10 48 Volt Wiring Diagram

BRAKES - FRONT DISC

G

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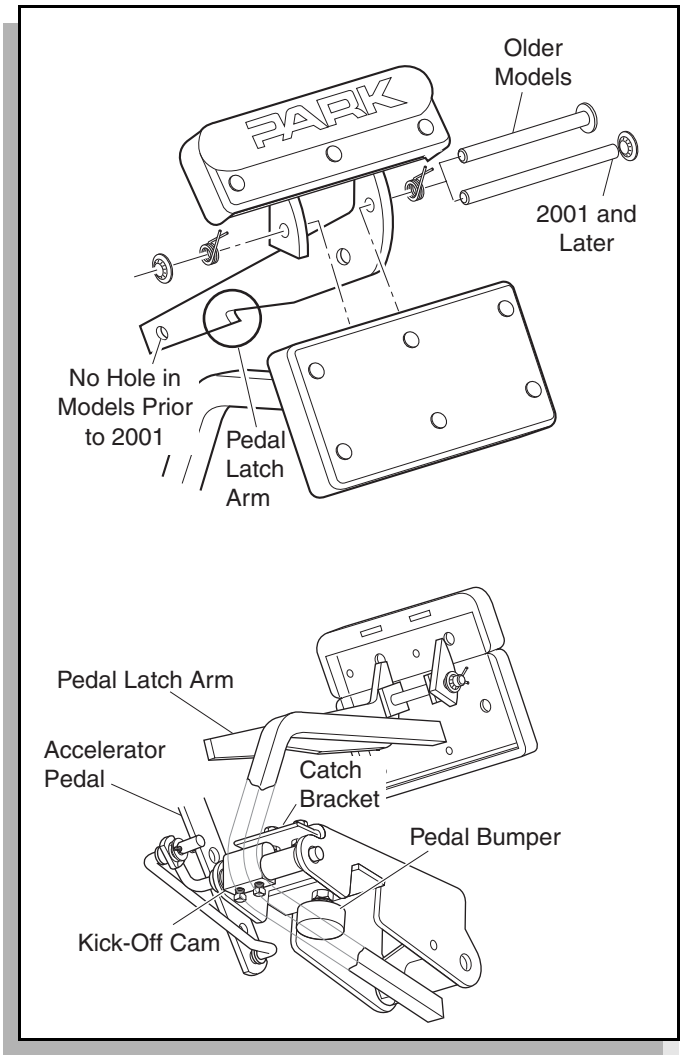

Fig. 3 Parking Brake and Kick-Off Mechanism

bracket. The service brake pedal is held in the applied (down) position by the catch bracket. The latch arm is held in position by the tension in the brake linkage. The Parking Brake can be released by two methods:

1. Depressing the service brake, which permits the spring loaded Parking Brake pedal to return to its original position, disengaging the latch arm from the catch bracket. This is the preferred method which minimizes wear on components.

2. Pressing the accelerator pedal rotates the kick-off cam which forces the pedal latch arm to move away from the catch bracket. The spring loaded Parking Brake pedal returns to its original position, releasing the brake.

Compensator Assembly

The compensator assembly contains a spring, which is compressed until the stop tube within the spring is engaged and the linkage becomes solid (Ref Fig. 4 on page H-3). The brake compensator assembly applies a spring load to the parking brake system and insures that the parking brake remains under tension whenever it is engaged.

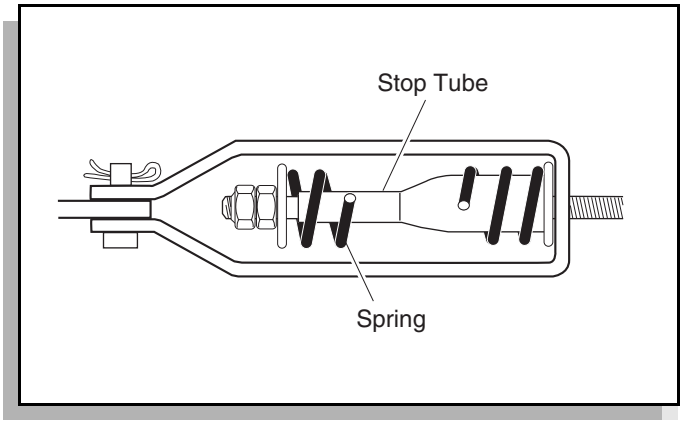

Fig. 4 Compensator Assembly

Kick-Off Actuating Linkage

The kick-off actuating linkage may require periodic adjustment to compensate for the normal wear. Replacement of any linkage components will also require an adjustment.

against the backing plate, replace both of the wheel brake assemblies.

⚠ WARNING ⚠ ***A backing plate assembly that shows any indication of galling or gouging is not repairable and must be replaced with a new wheel brake assembly. Always replace wheel brake assemblies in pairs.***

8. Inspect the backing plate.
   Inspect for gouges, galling or other damage, particularly where the backing plate is contacted by the brake shoes and by the moving anchor assembly. Replace both backing plates if any gouges or galling is found.
9. Measure the brake shoe thickness.
   Measure at the most worn area. Brake shoe thickness must never be less than .06" (1.5 mm) at any point on the shoe. It is normal for the shoes to show more wear at the leading and trailing edges (Ref Fig. 16 on page H-13). If the brake shoe thickness is approaching .06" (1.5 mm), it is recommended that the shoes be replaced. It is recommended that the brake shoe springs and brake adjusters be replaced when installing new brake shoes.
10. Inspect the brake shoe springs.
    Be sure that they are not broken or damaged and are correctly installed. The hooked end of the adjuster spring is inserted through the front of the front shoe and the opposite end hooked to the adjuster with the hook end facing out. The brake shoe springs must be installed with the light spring closest to the adjuster mechanism with the hook installed down through the rear brake shoe and up through the front brake shoe. The heavy top spring is installed with both spring hooks installed down through the brake shoes (Ref Fig. 17 on page H-14).
11. Repeat procedure at the opposite wheel brake.
12. Check/adjust brake pedal free travel.
    Whenever the brake system is serviced or requires a parts replacement, the brake pedal free travel must be checked and adjusted. See 'Adjusting Brake Pedal Free Travel' on page H-15. This includes all linkage and wheel brake components.

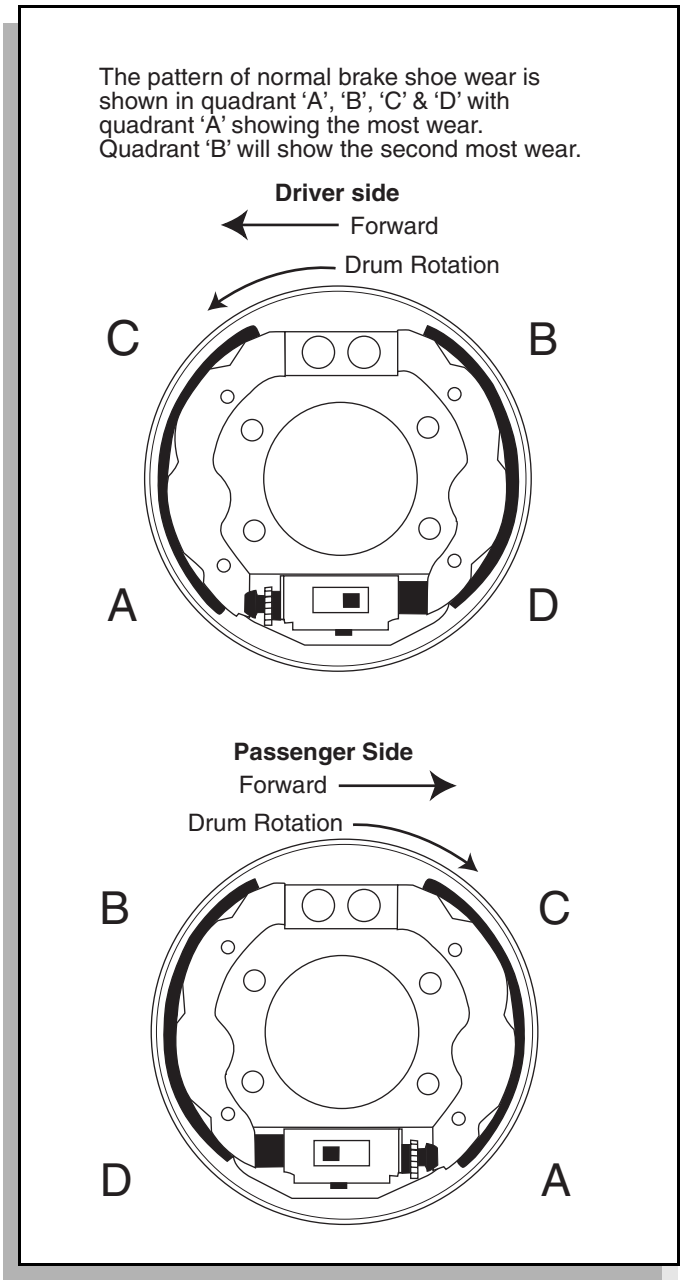

Fig. 16 Brake Shoe Wear

ELECTRICAL SYSTEM

J

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MOTOR

K

Read all of Section B and this section before attempting any procedure. Pay particular attention to all Notes,

GENERAL

CAUTION **Do not hold vehicle on hill by using accelerator and motor. Leaving the motor in a stalled condition for more than 3-4 seconds will raise the commutator bars resulting in unacceptable noise and accelerated brush wear and cause permanent damage to motor.**

Disassembly of the motor is not recommended except to replace a worn or noisy bearing. If the motor is disassembled, it should be cleaned of any dirt buildup and the brush length checked. Replace brushes if required.

The motor housing is not available as a service item, therefore in the unlikely event of a failure in this component, the entire motor must be replaced.

Motor Removal

⚠ WARNING ⚠ Disconnect the negative (BL-) battery cable with an insulated wrench before attempting to remove wires from the motor (see safety procedures in SAFETY section of this manual). The shorting of motor wires could cause an explosion.

Tool List	Qty. Required
Insulated wrench, 9/16"	1
Chalk or paint pen	1
Socket, 7/16", 3/8" drive	1
Ratchet, 3/8" drive	1
Internal snap ring pliers	1

Using an insulated wrench, disconnect the negative (-) battery cable from the battery (Ref Fig. 1 on page K-1). Remove all wires from motor.

Mark both the axle and motor housings to permit realignment during reassembly of motor to rear axle (Ref Fig. 2 on page K-1).

CAUTION **Take care not to damage the splines when removing and reassembling the motor to the rear axle housing.**

Remove the three bolts that secure the motor to the axle housing and carefully slide the motor straight out from the axle splines.

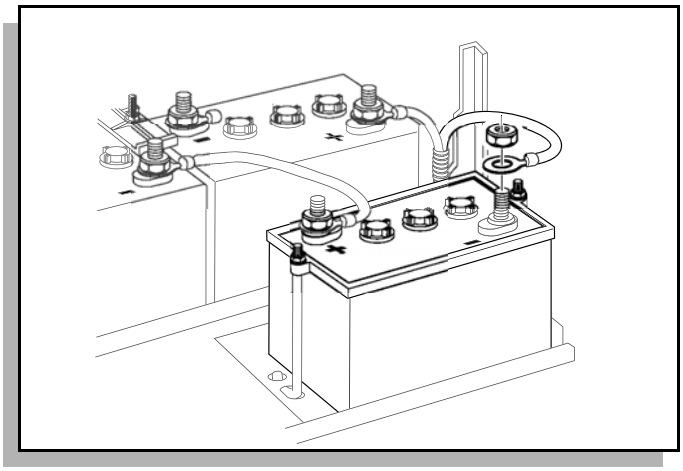

Fig. 1 Disconnect Battery Cable

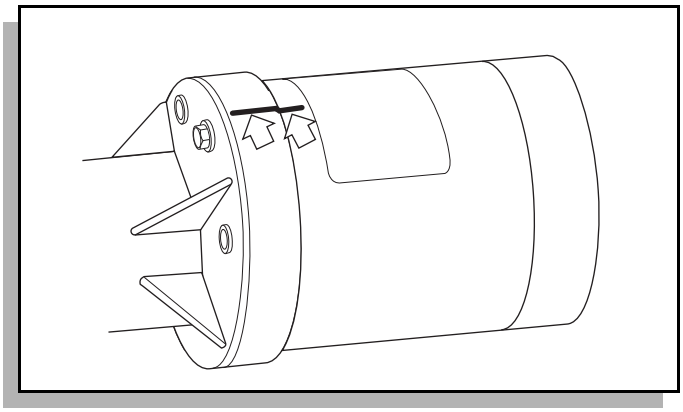

Fig. 2 Mark Axle and Motor

Motor Disassembly

Tool List	Qty. Required
Straight blade screwdriver	1
Ratchet, 3/8" drive	1
Socket, 3/8", 3/8" drive	1
Plastic faced hammer	1

Remove bearing cap (1) (Ref Fig. 3 on page K-2). Remove the magnet on the end of the armature by carefully removing the attaching screw.

Remove bolts (2) that hold the commutator end cover (3) to the motor housing (4).

Pull on commutator end cover to remove armature (5) and cover (as an assembly) from the housing. A light tap on the end cover may be necessary to loosen.

Read all of Section B and this section before attempting any procedure. Pay particular attention to all Notes, Cautions and Warnings

Battery Charging

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

Before charging, the following should be observed:

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

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

NOTE *In some portable chargers, there will be a rattle present in the body of the charger DC plug. This rattle is caused by an internal magnet contained within the charger plug. The magnet is part of the interlock system that prevents the vehicle from being driven when the charger plug is inserted in the vehicle charging receptacle.*

AC Voltage

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

TROUBLESHOOTING

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

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

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

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

Hydrometer

A hydrometer (P/N 50900-G1) is used to test the state of charge of a battery cell (Ref Fig. 7 on page L-6). 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 a 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

REAR AXLE

N

Read all of Section B and this section before attempting any procedure. Pay particular attention to all Notes,

For further axle information, see Electric Rear Axle Manual P/N 28148-G01.

REAR AXLE REMOVAL

Tool List	Qty. Required
Wrench, 1/2" insulated	1
Lug wrench, 3/4"	1
Wheel chocks	4
Jack stands	6
Floor jack	1
Needle nose pliers	1
Flare nut wrench, 3/8"	1
Wrench, 3/4"	1
Socket, 9/16", deepwell, 1/2" drive	1
Ratchet, 1/2" drive	1

Remove rear facing rear seat, rear access panel or cargo deck or raise rear of vehicle to gain access to the motor and axle.

⚠ WARNING ⚠ ***To reduce the possibility of personal injury, follow the lifting procedure in the SAFETY section of this manual. Place wheel chocks in front and behind each wheel not being raised and check the stability of the vehicle on the jack stands before starting any repair procedure. Never work on a vehicle that is supported by a jack alone.***

The rear axle assembly is top heavy. To reduce the possibility of personal injury while removing the rear axle, be sure to support the motor with an overhead hoist when separating axle from springs.

If no hoist is available, a second person should hold the motor and axle in position while the springs are removed. Both persons should lift the axle from jack stands and remove assembly from under vehicle.

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.

Using an insulated wrench remove the B+ wire from the battery to disconnect power supply.

Loosen both rear wheels by loosening each lug nut approximately one half turn.

Lift the entire vehicle according to lifting procedure in the SAFETY section. Place two additional jacks under the rear axle to support the axle when hardware is removed.

Disable the electrical system to the motor by turning the key switch to the 'OFF' position and remove battery wire (B-).

Disconnect the parking brake cables from their actuating levers and axle brackets (Ref Fig. 1 on page N-1).

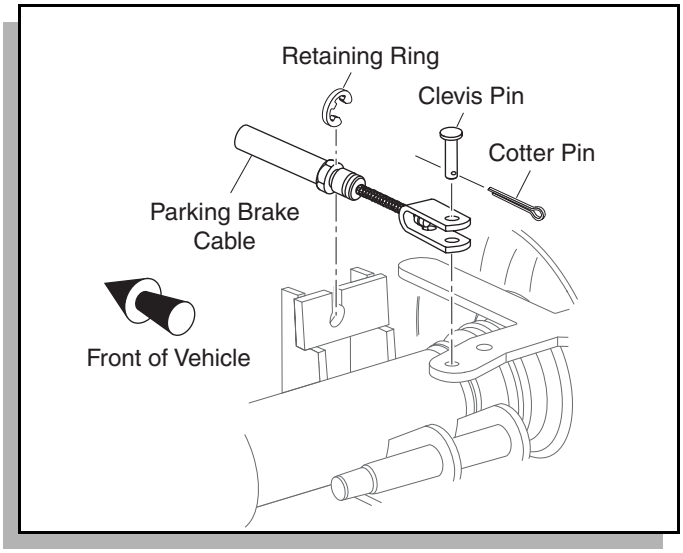

Fig. 1 Disconnecting Parking Brake Cables

Disconnect the hydraulic brake line at the "T" connection on the axle housing (Ref Fig. 2 on page N-2). Remove nut securing "T" to axle. Drain fluid and discard. Bleeding the hydraulic brakes is mandatory after reassembly.

Remove the four wires connected to the motor. Remove the hardware (1) securing the bottom of the shock absorber (2) to the axle and compress the shock absorber (Ref Fig. 3 on page N-2). Being careful to prevent the axle assembly (3) from rotating, remove the 'U' bolt hardware (4) and spring plate (5). Remove hardware (6) securing the springs (7) to the shackles at the rear of the vehicle. Allow rear of springs to rest on floor.

The rear axle and motor assembly can now be lifted off the jack stands and lowered to rest the tires on the floor. Roll the axle and motor assembly out from under vehicle.

Read all of Section B and this section before attempting any procedure. Pay particular attention to all Notes, Cautions and Warnings

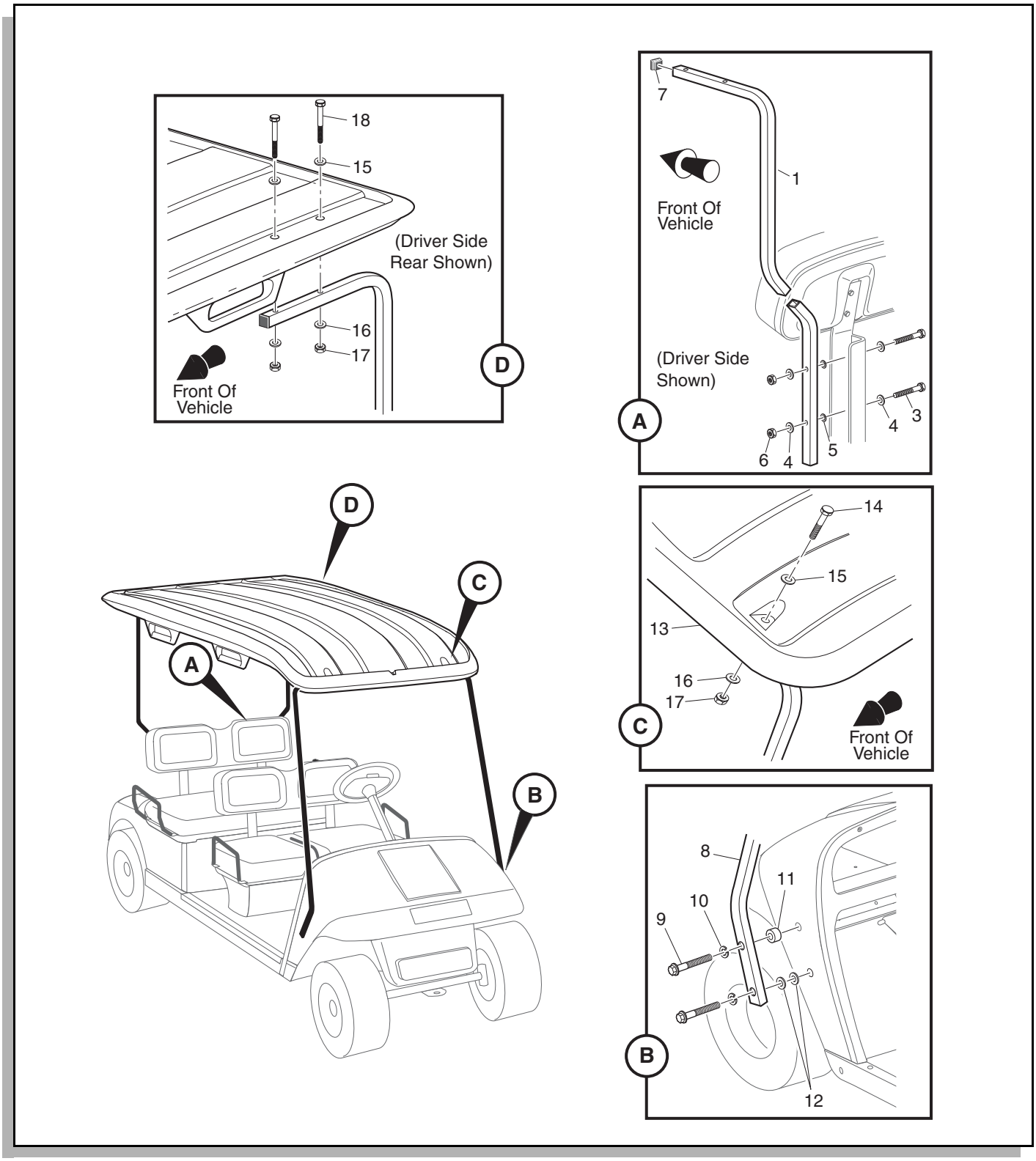

Fig. 2 TXT 5E Sun Top

TROUBLESHOOTING

R

Read all of Section B and this section before attempting any procedure. Pay particular attention to all Notes,

ELECTRICAL SYSTEM

For non-PDS vehicles, see Electronic Speed Control Section.

For PDS vehicles, see Electronic Speed Control (PDS) Section.

For PDS vehicles, also use Diagnostic Mode, PDS Fault Codes and Troubleshooting Diagrams.

Condition	Possible Cause	Correction
VEHICLE WILL NOT MOVE	Key 'OFF' or no direction selected	Turn key 'ON' and select direction
	Batteries discharged	Charge batteries
	Batteries unable to be charged	Load test and replace batteries that cannot be charged
	Corroded or loose battery connections	Clean and tighten battery connections Apply a coat of commercial terminal protectant to all terminals
	Corroded or loose battery connections to ESC controller, direction switch or motor	Clean, tighten or replace faulty wiring
	Solenoid has failed	Replace solenoid
	Key switch has failed	Replace key switch
	Micro switch at direction selector switch has failed	Replace micro switch
	Connector(s) loose or separated	Install connector(s) correctly
	Faulty motor	Repair or replace motor Test by checking continuity of field coils (S1 - S2) and armature (A1 - A2) Check for continuity of armature to ground and field coils to ground which indicates a shorted condition
	Faulty ESC system	Test and replace components as indicated by test procedure
	Ignition interlock switch has failed	Replace reed switch
VEHICLE SPEED ERRATIC	Faulty ESC system	Test and replace components as indicated by test procedure
NO REDUCED SPEED IN REVERSE	Faulty ESC system	Test and replace components as indicated by test procedure
MOTOR NOISY	Damaged bearing	Replace bearing
	Raised commutator bar(s)	Replace motor
	Loose motor mounting hardware	Tighten

GENERAL SPECIFICATIONS

T

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LIST OF ILLUSTRATIONS