A Textron Company

Repair & Service Manual

ELECTRIC POWERED UTILITY VEHICLE

625616

ISSUED JULY 2012

REVISED SEPTEMBER 2013

TABLE OF CONTENTS FOR SECTION 'A'

LIST OF ILLUSTRATIONS

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

NOTICES, CAUTIONS, WARNINGS AND DANGERS

Throughout this manual, the following **NOTICES, CAUTIONS**, **WARNINGS** and **DANGERS** are used. For the protection of all personnel and the vehicle, be aware of and observe the following:

NOTICE

A NOTICE indicates a condition that should be observed.

⚠ CAUTION

A CAUTION indicates a condition that may result in damage to the vehicle or surrounding facilities.

⚠ WARNING

A WARNING indicates a hazardous condition which could result in serious injury or death.

⚠ DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

IMPORTANT SAFETY WARNING

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

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

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

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

MODIFICATIONS TO VEHICLE

⚠ WARNING

To prevent personal injury or death to the operator or passenger(s), do not make changes to the weight distribution or the center of gravity which could make the vehicle unstable or prone to roll over.

Do not modify the vehicle in any manner that will change the weight distribution of the vehicle.

GENERAL MAINTENANCE

⚠ WARNING

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

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

When any maintenance procedure or inspection is performed, it is important that care be exercised to insure the safety of the technician/mechanic or bystanders and to prevent damage to the vehicle.

Always read and understand the **entire** relevant manual section (chapter) before attempting any inspection or service.

BEFORE SERVICING THE VEHICLE

Before attempting to inspect or service a vehicle, be sure to read and understand the following warnings:

⚠ WARNING

To prevent personal injury or death, observe the following:

Before working on vehicle, remove all jewelry (watches, rings, etc.).

Be sure that no loose clothing or hair can

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

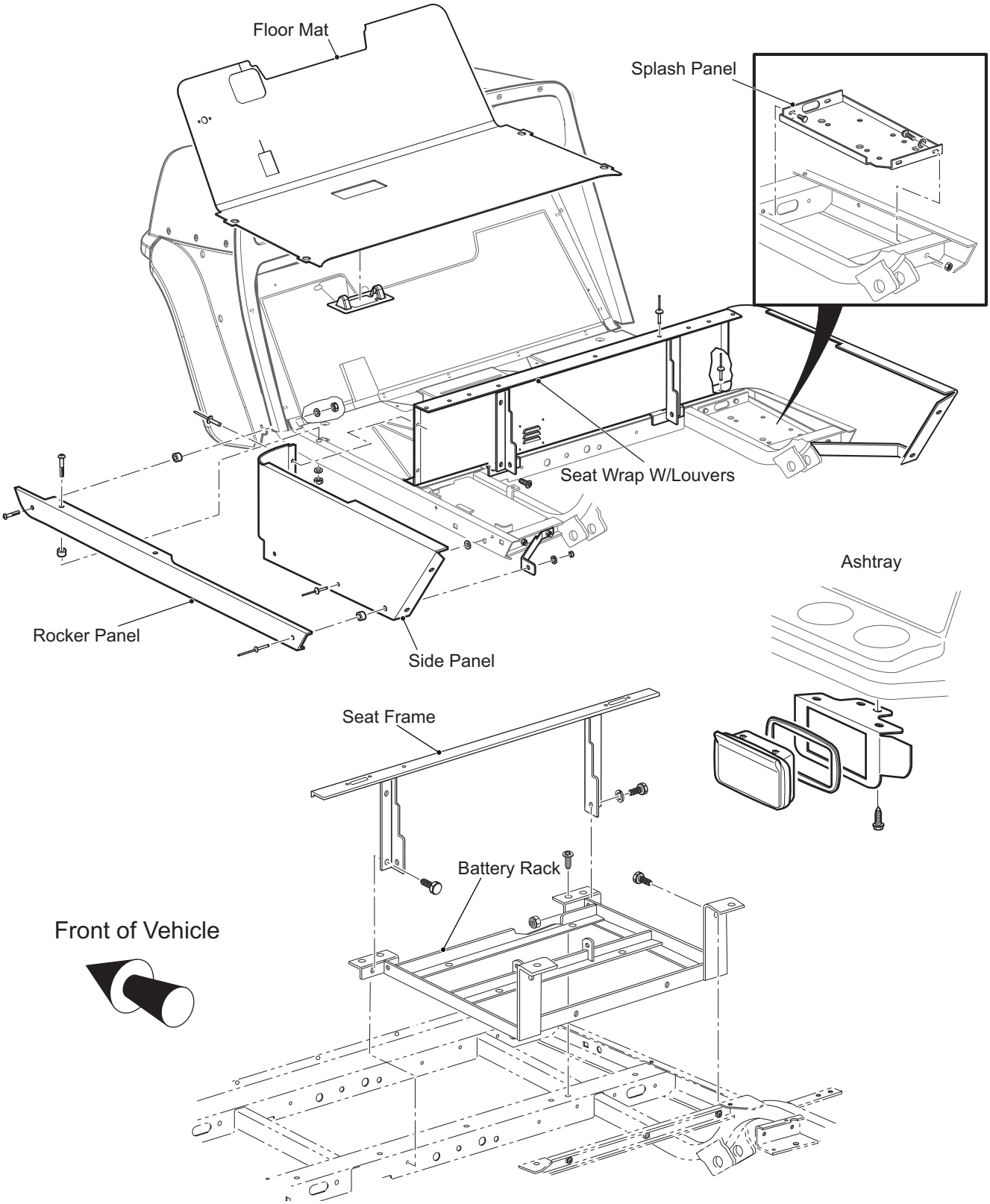

Fig. 3 Front Body Components (Continued)

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

NOTES:

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

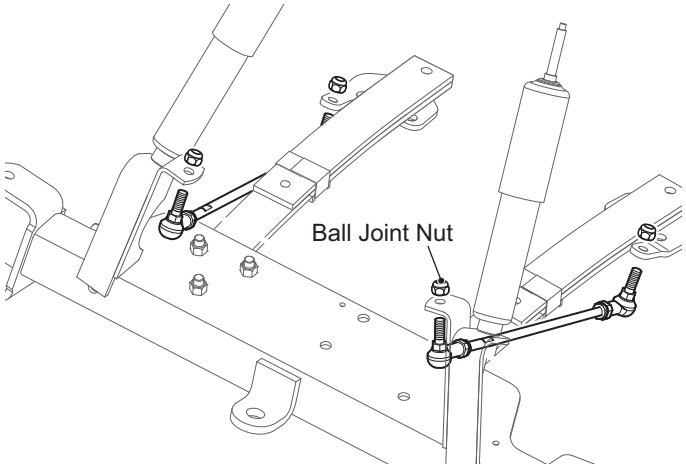

Fig. 7 Axle Linkage Rod Replacement

Front Spring Replacement

Tool List	Qty.
Jack Stands	4
Ratchet	1
Socket, 3/4"	1
Socket, 5/8"	1
Wrench, 5/8"	1
Torque Wrench ft. lbs.	1
Tape Measure	1

NOTICE

Failure of a single spring will result in overstressing the other spring; therefore, replace front springs as a set.

The following procedure will replace one spring at a time.

Loosen front wheels. Lift and support front of vehicle per SAFETY section. In addition, support front axle with jack stands. Remove front wheels.

To detach driver side spring:

Fully loosen the two rack and pinion unit lock nuts (15), one near the bellows and one on the rear side of the rack and pinion unit, until only one thread is engaged (Ref Fig. 6). Remove the lock nut (15) and washer (14) from the long bolt (20) and discard lock nut. The rack and pinion unit is now loose.

Remove the two 1 3/4" long bolts (18) and lock nuts (19) securing driver side spring to axle and discard lock nuts (19).

Hold nut (21) with wrench and loosen long bolt (20). Note location of washer (22) and thread long bolt out as far as possible to remove the washer, nut and spacer (23). Then pull long bolt and spring plate (24) from axle and spring. Retain above items (20 - 24) for assembly at their original locations.

Pull upper driver side of floor mat out of plastic trim retainer and away from floor. Locate and remove hardware (25 - 27) securing rear of spring (17) to vehicle frame and discard lock nuts (27).

⚠ CAUTION

To prevent stress and possible damage to the rack and pinion unit, the driver side spring must be mounted to the axle with the hardware (20 - 23) installed in its original location (Ref Fig. 6).

Driver side spring installation is the reverse order of disassembly making sure to install the long bolt (20), spring plate (24), spacer (23), nut (21) and washer (22) in their original locations. Use new lock nuts (15, 19, 27) to secure the rack and pinion unit (16), two short bolts (18) and rear bolts (25).

To detach passenger side spring:

Remove the hardware (18, 19, 24, 28) securing the front of the passenger side leaf spring (17) to the axle (3) and discard lock nuts (19) (Ref Fig. 6).

Pull upper passenger side of floor mat out of plastic trim retainer and away from floor. Locate and remove hardware (25 - 27) securing rear of spring (17) to vehicle frame and discard lock nuts (27).

Using new lock nuts (19, 27), install passenger side spring in the reverse order of disassembly.

NOTICE

After the springs are replaced, the axle will need to be aligned to the frame. Unless the axle has been replaced, wheel alignment will not be affected; however, it is always good practice to check wheel alignment any time the front-end components are replaced or adjusted.

When front springs are replaced, the front axle must be aligned to the frame. The distance from the center bolt at rear of left spring to the center bolt at front of right spring must be the same as the distance from the center bolt at rear of right spring to the center bolt at front of left spring (Ref Fig. 8). Tighten the spring hardware (21, 19, 27) first and rack and pinion unit hardware (15) next to 35 - 50 ft. lbs. (50 - 70 Nm) torque.

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

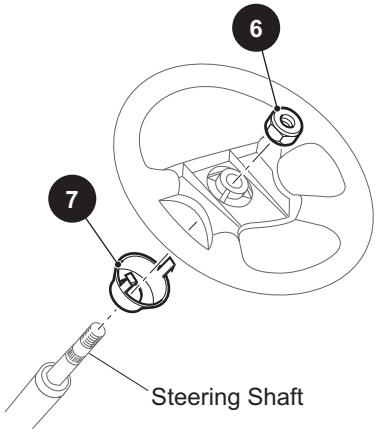

Fig. 23 Steering Wheel Replacement

⚠ CAUTION

Do not strike steering nut or end of steering shaft directly with ball peen hammer. Internal damage to rack and pinion unit can result.

When steering wheel is loosened, remove retaining nut and remove steering wheel.

Prior to replacement, assemble the replacement steering wheel by aligning the retaining tabs on the rear collar hub (7) with slots in back of steering wheel. Squeeze tabs to allow insertion of hub. **Do not force**. Squeeze hub on top and bottom to fully seat.

Replace steering wheel by first lightly coating the splines of the steering shaft with a commercially available anti-seize compound. With the vehicle wheels in the straight ahead position, align the steering wheel on the steering shaft and slide wheel on shaft. Tighten the steering wheel nut (6) to 15 - 20 ft. lbs. (20 - 27 Nm) torque.

Inspect the four retaining tabs on the steering wheel cover (5) for white stress lines (Ref Fig. 22). If stress lines are present, replace steering wheel cover. Install by carefully pressing, first the top two, then the bottom two retaining tabs into the matching slots in steering wheel.

Steering Shaft and Column Replacement

Tool List	**Qty.**
Ratchet	1
Socket, 3/4"	1
Socket, 13 mm	1
Ratchet	1
Socket, 9/16"	1
Snap RIng Pliers	1
Bearing Separator	1
Gear Puller	1
Arbor Press	1
Bearing Driver Set	1
Torque Wrench, ft. lbs.	1
Torque Wrench, in. lbs.	1
Wheel Bearing Grease	AR

To remove steering shaft (4) (Ref Fig. 24), remove the steering wheel. See “Steering Wheel Replacement” on page E - 16.

Loosen front wheels. Lift and support front of vehicle per SAFETY section and remove front wheels.

Remove the bolt (1) and washer (2) that secures the intermediate shaft (3) to the steering shaft (4).

Steering Shaft

Remove the four bolts (5) and washers (6) that secure the steering column (7) to the chassis and remove the column.

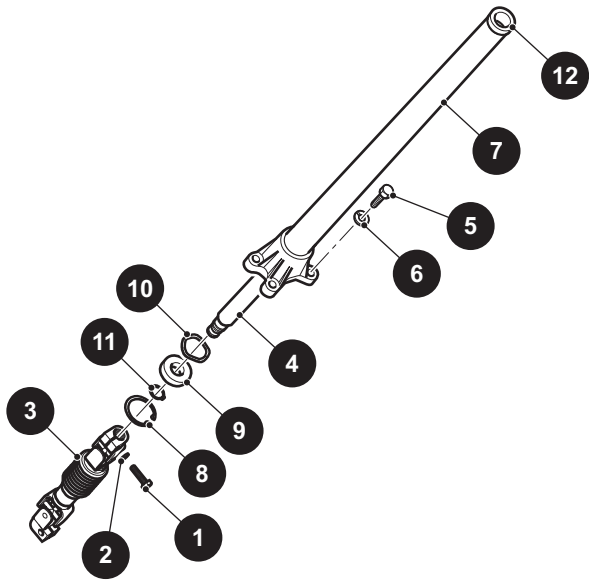

Fig. 24 Steering Shaft and Column

Remove large retaining ring (8) on bottom end of column and pull shaft and bearing (9) out as an assembly. Slide wave washer (10) out bottom end of steering column and keep for reuse.

Remove small retaining ring (11) and press bearing from steering shaft.

To assemble steering shaft, first press new bearing onto shaft until it stops against shoulder. Then, with small retaining ring oriented with arch up, slide ring onto shaft

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

⚠ CAUTION

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

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

Turn the key switch to 'OFF' and place the direction selector in neutral before disconnecting power by removing the BL- connection to the battery. **Always use insulated wrenches when working on batteries.** To check for continuity, set the DVOM to the KW setting and select 'Continuity'. The meter will give an audible signal when it detects continuity. If the meter does not have a continuity setting, set it to KW, the meter will indicate "0" when it detects continuity.

Testing a Switch for Continuity

Place one probe on one contact of the switch, place the second probe on the second terminal of the switch (Ref Fig. 5).

Actuating a normally open (NO) switch will cause the DVOM to show "0" or give an audible indication when the switch is operated. A normally closed (NC) switch will cause the meter to show "0" or give an audible indication when the probes are attached without activating switch. The audible indicator will stop and the meter display will indicate a value greater than "0" when the switch is activated.

The change in display or audible indicator demonstrates that the switch is functioning.

Testing a Solenoid for Continuity

Place one probe on one of the large terminals and the other probe on the second large terminal (Ref Fig. 6). If the meter shows "0" or gives an audible indication, the solenoid terminals are "welded" closed and **the solenoid must be replaced.**

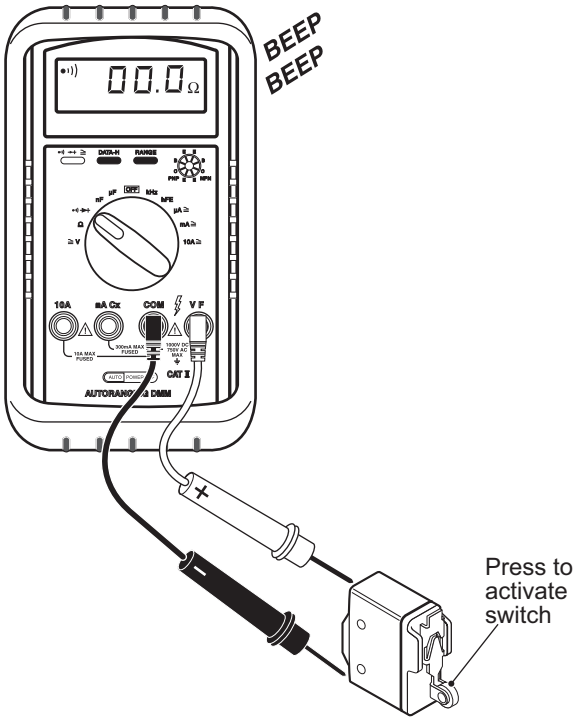

Fig. 5 Continuity Check of Switch

If the continuity test indicates that contacts are not "welded" and the wiring to the solenoid coil is good, the coil has failed and **the solenoid must be replaced.**

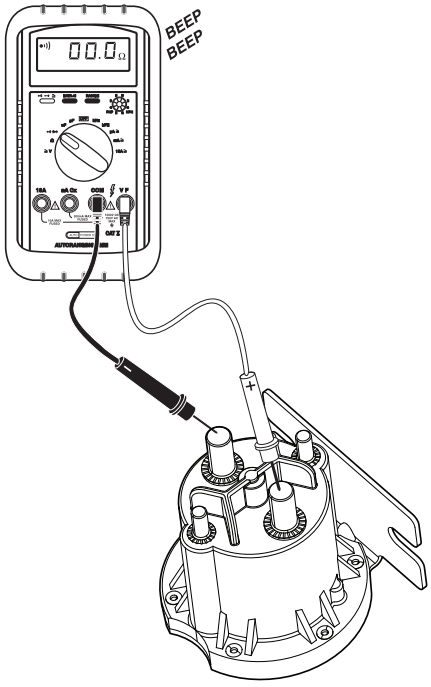

Fig. 6 Continuity Check of Solenoid

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

NOTES:

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LIST OF ILLUSTRATIONS

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LIST OF ILLUSTRATIONS

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

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. 3 on Page K-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.

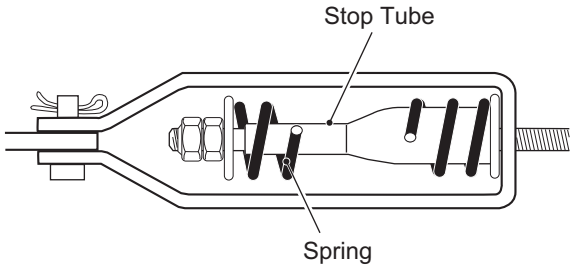


Fig. 3 Compensator Assembly

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.

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

7. Check the condition and operation of the moving anchor assembly (Ref. Fig. 22 on Page K-16).
   Operate the brake lever to check for free motion. The adjuster assembly and brake lever should move smoothly from front to back on the backing plate. If the moving anchor assembly is damaged or binds 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. 14 on Page K-12). 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 springs must be inserted with the light spring at the bottom. The long hook is installed down through the rear brake shoe. The heavier top spring is installed with the spring hooks facing up. The heavy top spring is installed with both spring hooks installed down through the brake shoes (Ref. Fig. 17 on Page K-13). Repeat procedure at the opposite wheel brake.

11. 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 K-14. This includes all linkage and wheel brake components.

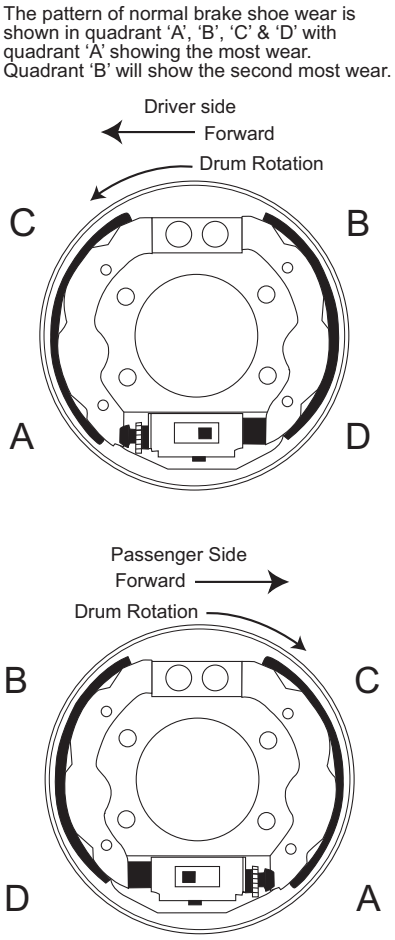


Fig. 16 Brake Shoe Wear

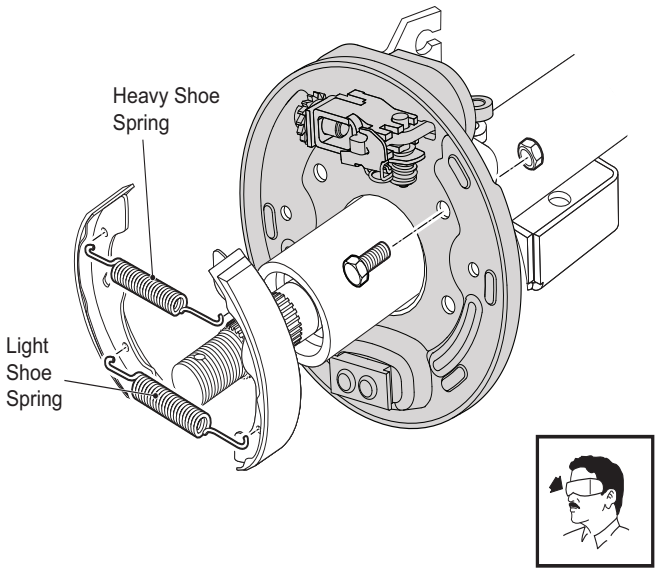
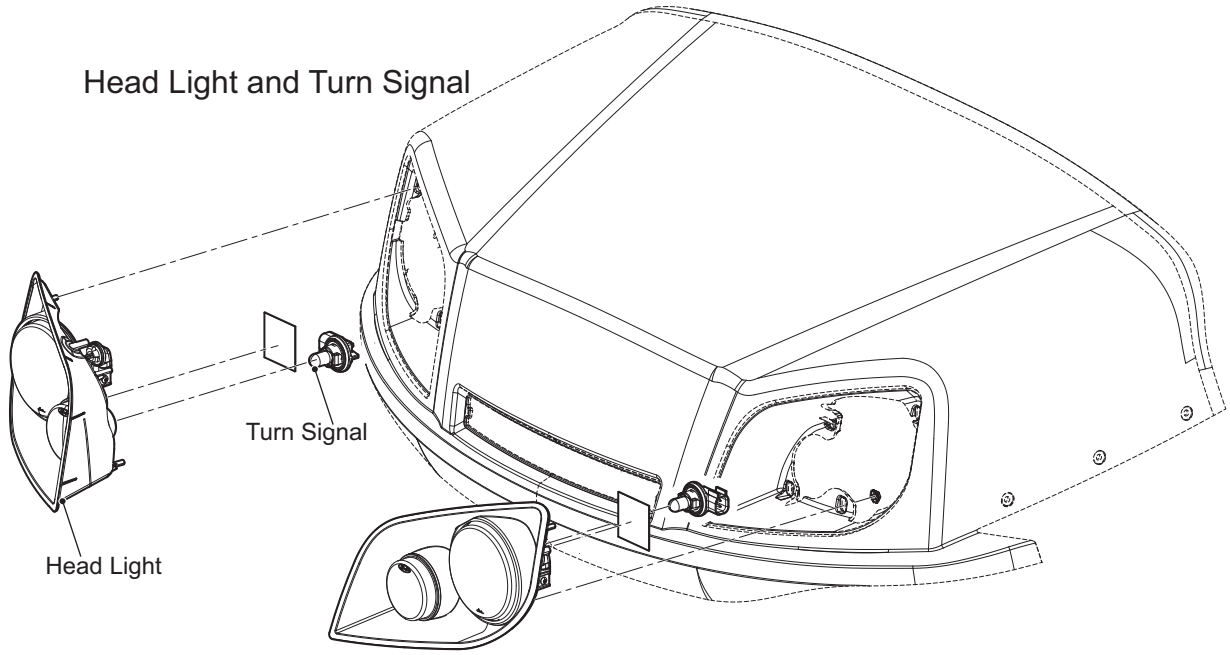


Fig. 17 Orientation of Brake Shoe Springs

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

NOTES:

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



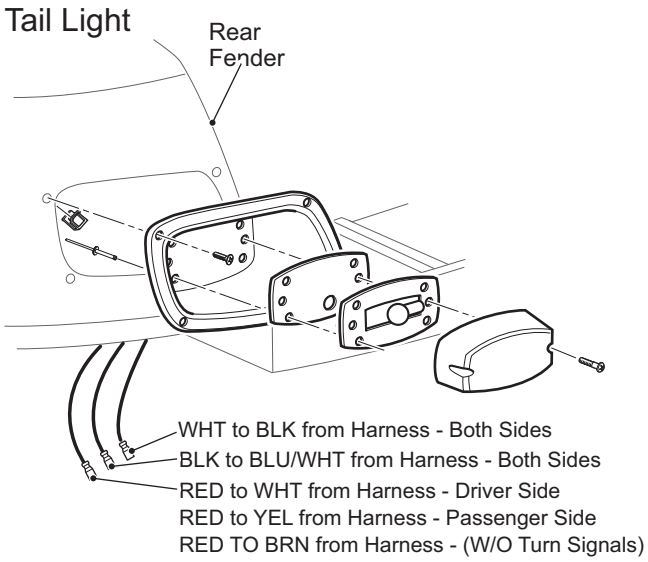


Fig. 5 Electrical Accessories (Continued)

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

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

Refer to REAR SUSPENSION section for axle removal.

REAR AXLE MAINTENANCE

The only maintenance required for the first five years is the periodic inspection of the lubricant level. The rear axle is provided with a lubricant level check/fill plug located on the bottom of the differential. Unless leakage is evident, the lubricant need only be replaced after five years.

Checking the Lubricant Level

Clean the area around the check/fill plug and remove plug. The correct lubricant level is just below the bottom of the threaded hole. If lubricant is low, add lubricant as required. Add lubricant slowly until lubricant starts to seep from the hole. Install the check/fill plug. In the event that the lubricant is to be replaced, the vehicle must be elevated and the oil pan removed or the oil siphoned out through the check/fill hole
(Ref. Fig. 1 on Page N-1).

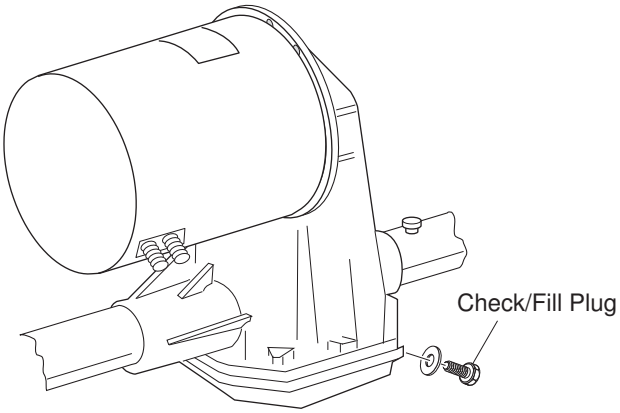


Fig. 1 Add, Check and Drain Rear Axle Lubricant

REAR AXLE DISASSEMBLY

⚠ CAUTION

The rear axle is a precision assembly, and therefore any repair or replacement of parts must be done with extreme care in a clean environment. Before attempting to perform any service on the axle, read and understand all of the following text and illustrations before disassembling the unit.

Handle all splines with extreme care.

Snap rings must be removed/installed with care to prevent damage of bearings, seals and bearing bores.

NOTICE

It is recommended that whenever a bearing, seal or 'O' ring is removed, it be replaced with a new one regardless of mileage. Always wipe the seals and 'O' rings with a light oil before installing.

⚠ WARNING

To reduce the possibility of personal injury, follow the lifting procedure in SAFETY section of this manual. Place wheel chocks in front and behind the front wheels 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.

Axle Shaft Removal and Disassembly

Tool List	Qty.
Arbor press	1
Bearing separator	1
Needle nose pliers	1
Internal snap ring pliers	1
Slide hammer, P/N 18753G1	1

For brake drum removal, see BRAKES section.

Remove the outer snap ring from the axle tube
(Ref. Fig. 2 on Page N-1).

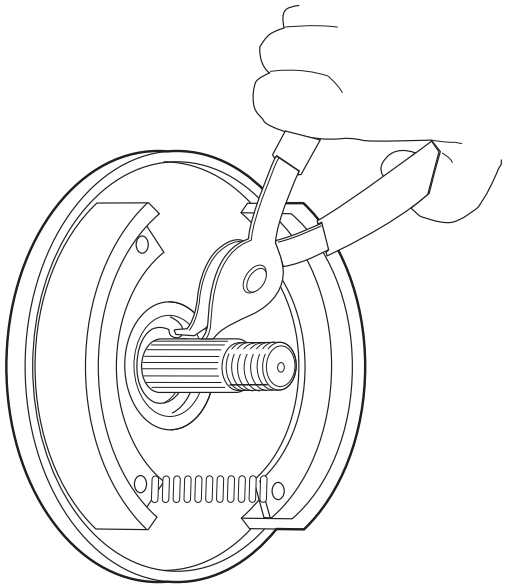


Fig. 2 Removing/Installing Outer Snap Ring

Attach a slide hammer to the axle shaft thread and remove the axle and bearing from the axle tube
(Ref. Fig. 3 on Page N-2).

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

Menu	Submenu 1	Submenu 2	Submenu 3	Data Range	Default Value	Units
Programmer Setup	Program	LCD Contrast		-150 - 150		
		Language		English	English	
		Set Security Code		Display security code creation		
	Faults	Fault History		Display fault history of the handheld		
		Clear Fault History		YES / NO		
	Information	OEM Info		Display OEM information		
		Reconfigured		Display reconfigure status		
		Model Number		Display handheld model number		
		Serial Number		Display handheld serial number		
		Manufacture Date		Display handheld manufacture number		
		Software Version		Display handheld software version		
		Hardware Version		Display handheld hardware version		
		MC - Protocol Ver		Display MC- Protocol version		
		ES - Protocol Ver		Display ES - Protocol version		
		S - Protocol Ver		Display S - Protocol version		
		Device Type		Display device type		

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

GS-726-006	REVISION: A	TITLE: General Specification: Lightning Protection and Grounding
EFFECTIVE: 10/19/92	SUPERCEDES: Rev -, ECN 027194	

1. Grounding Requirements

For the purpose of this specification, building ground systems should serve two primary functions: personal safety and equipment protection. In order to be effective, all elements and functions of building ground system must receive equal consideration in design and installation. Once installed, it is up to the owner to adequately maintain the system by implementing periodic inspections and ground tests in order to determine its effectiveness.

2. Ground Systems

All electronic equipment is inherently related to earth by capacitive coupling, accidental or incidental contact and intentional connection. The earth forms a natural readily available form of common potential reference for all electrical circuits. For maximum effectiveness, grounding must be looked at from a total system viewpoint, with various subsystems comprising the total facility ground system. The interconnection of the various sub-systems into a building ground system will provide a direct path, of known low impedance, between earth and the various electrical and other equipment. This effectively extends an approximation of ground reference throughout the building. The total building ground system is composed of an earth electrode system, a lightning protection system and an equipment fault protective system.

Resistance To Earth: The resistance to earth of the ground system should not exceed 10 ohms. Where the resistance of 10 ohms cannot be obtained due to high soil resistivity, rock formations or other abnormal conditions, alternate methods for reducing the resistance to earth must be considered.

Chemical Treatments: No salt, coke or other chemicals may be used to treat the soil in order to obtain the required ground resistance readings. Approved methods of enhancement are bentonite clay or the GEM product for ground enhancement as manufactured by Erico Products of Solon, Ohio.

Ground Tests: The resistance to earth of the ground system shall be measured by the “Fall of Potential Method”. Acceptable resistance meters/testers are those manufactured by Biddle or AEMC.

3. Lightning Protection Requirements

The external lightning protection system shall be designed and installed by a contractor who specializes in the lightning protection field. The contractor must be listed with Underwriters Laboratories Inc. and be in good standing. All work shall be under the direct supervision of a Certified Master Installer with current credentials from the Lightning Protection Institute.

The materials and design for the structure will comply with the most recent edition of the National Fire Protection Association Lightning Protection Code, NFPA 780 and the Materials Standard for Safety from Underwriters Laboratories UL96. Materials for this project may be those of Harger Lightning Protection, 1066 Campus Drive, Mundelein, Illinois (800-842-7437).

Upon completion of the project, the contractor will supply to the owner the Master Label issued by Underwriters Laboratories.

4. Equipment Fault and Personal Safety System

The standard method of providing an equipment fault protection ground network is to run a good ground conductor (green wire) through the conduit together with the AC distribution system. This method is required for all types of conduit, including metallic.

5. Ground Network Requirements

Install the conduit in accordance with local regulations or as prescribed by the National Electrical Code.

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

SPLIT WINDSHIELD (CLIP-ON TYPE)

Clip-on type windshield is used on vehicles with tubular struts. Windshield is secured to front strut with tube clamps, sleeves and grommets.

Tool List **Qty.**

Plastic faced mallet 1
Wrench, 7/16"..... 1
Phillips screwdriver..... 1

Remove protective covering from the windshields (1, 2).

Fix the tube clamps (8) on the front strut, align the existing holes on lower windshield (1) with tube clamps (8) as shown. Insert isolator grommets (3) to small hole located at bottom of the upper windshield (2). Place grommets (13) at grooves located at bottom of the lower windshield (1). Insert pan head bolt (10) through washer (12), fastener grommet (9) and existing hole in the tube clamp (8) mounted on front strut. Secure with washer (12) and lock nut (11). Do not overtighten or squeeze the fastener grommet (9). Place grommet (13) at bottom of the windshield as shown and press the sleeve (14) starting at the grommet, onto the front strut so that it snaps into place.

Repeat for other side of windshield.

Swing the top section of windshield (2) up and secure by hooking the upper round latch (4) on each side of strut to the upper windshield (2). Using a plastic faced mallet, gently tap the latch (4) to ensure windshield seats properly. To secure windshield when lowered, press edge of windshield firmly into lower latches (5).

⚠ CAUTION

Take care not to warp windshield when raising and lowering the top section of windshield.

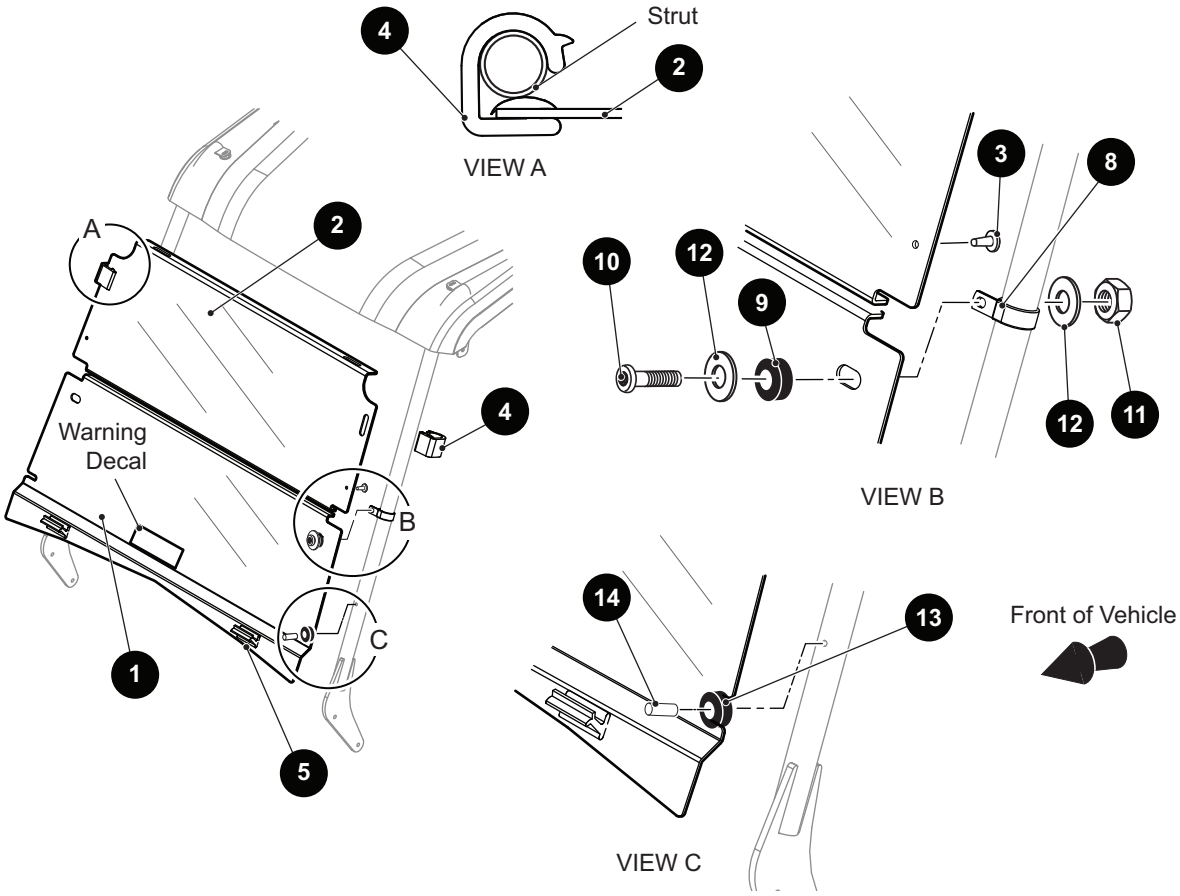


Fig. 4 Split Windshield (Clip-On Type)