



AMERICAN CUSTOM GOLFCARS, INC.

2009

Neighborhood Electric Vehicle (NEV)

SERVICE MANUAL



California Roadster

Effective: July 1, 2009

FOREWORD

American Custom Golf Cars, Inc. vehicles are designed and built to provide maximum efficiency and performance; however, proper maintenance and repair are essential for achieving maximum service life and continued safe and reliable operation.

This manual provides detailed procedures for the maintenance and repair of those components that are common to **American Custom Golf Cars, Inc.** vehicles and should be used in conjunction with the appropriate maintenance and service supplement. The supplement will provide maintenance and repair procedures for those components specific to a particular type of vehicle.

This manual and the corresponding supplement should be thoroughly reviewed prior to servicing the vehicle. The procedures must be properly implemented, and the **DANGER, WARNING, and CAUTION** statements must be heeded.

This manual was written for the trained technician who already possesses knowledge and skills in electrical and mechanical repair. *If the technician does not have such knowledge and skills, attempted service or repairs to the vehicle may render it unsafe.* For this reason **American Custom Golf Cars, Inc.** advises that all repairs and/or service be performed by an authorized **American Custom Golf Cars, Inc.** distributor/dealer representative or by **American Custom Golf Cars, Inc.** factory-trained technician.

It is the policy of **American Custom Golf Cars, Inc.** to assist its distributors and dealers in continually updating their service knowledge and facilities so they can provide prompt and efficient service for vehicle owners.

Regional technical representatives, vehicle service seminars, periodic service bulletins, maintenance and service manuals, and other service publications also represent American Custom Golf Cars, Inc.'s continuing commitment to customer support.

This manual, used in conjunction with the appropriate maintenance and service supplement, covers all aspects of typical vehicle service. However, unique situations do sometimes arise when servicing a vehicle. If it appears that a service question is not answered in this manual or supplement, you may write to us at:

American Custom Golf Cars, Inc.
15740 El Prado Rd.
Chino, CA 91710

Attention: Technical Support.

Or call: 909-597-2885 and ask for a technician.

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SECTION 1 – SAFETY

To ensure the safety of those servicing American Custom Golf Cars, Inc. vehicles, and to protect the vehicles from possible damage resulting from improper service or maintenance, the procedures in this manual must be followed. It is important to note that throughout this manual there are statements labeled **DANGER, WARNING, or CAUTION**. These special statements relate to specific safety issues, and must be read, understood, and heeded before proceeding with procedures. There are statements labeled **NOTE**, which provide other essential service or maintenance information.

DANGER!

– indicates an immediate hazard that will result from severe personal injury or death.

WARNING!

– indicates an immediate hazard that could result in severe personal injury or death.

CAUTION!

– indicates hazards or unsafe practices that could result in product or property damage or minor personal injury.

Note:

Notes are for your information and to make procedures more easily understood.

GENERAL WARNING

The following safety procedures must be followed whenever the vehicle is being operated, repaired, or serviced. Service technicians should become familiar with these general statements, which can be found throughout this manual. Also, other specific warnings appear throughout this manual and on the vehicle.

DANGER!

Battery – Explosive gases! Do not smoke. Keep sparks and flames away from the vehicle and service area. Ventilate when charging or using in an enclosed space. Wear a full face shield and rubber gloves when working on or near batteries.

Battery – Poison! Contains acid! Causes severe burns. Avoid contact with skin, eyes, or clothing. Antidotes:

- **External: Flush with water. Call a physician immediately.**
- **Internal: Drink large quantities of milk or water. Follow with milk of magnesia or vegetable oil. Call a physician immediately.**
- **Eyes: Flush with water for 15 minutes. Call a physician immediately.**

WARNING!

Only trained technicians should repair or service the vehicle. Anyone doing even simple repairs or service should have knowledge and experience in electrical and mechanical repair.

Follow the procedures exactly as stated in this manual, and heed all DANGER, WARNING, and CAUTION statements in this manual as well as those affixed to the vehicle.

Improper use of the vehicle or failure to properly maintain it could result in decreased vehicle performance or severe personal injury.

Any modification or change to the vehicle that affects the stability or handling of the vehicle or increases maximum vehicle speed beyond factory specifications, could result in severe personal injury or death.

Check the vehicle owner's manual for proper location of all vehicle warning decals and make sure they are in place and are easy to read.

Wear safety glasses or approved eye protection when servicing the vehicle. Wear a full face shield and rubber gloves when working on or near batteries.

Do not wear loose clothing or jewelry such as rings, watches, chains, etc. when servicing vehicle.

Moving parts! Do not attempt to service the vehicle while it is running.

Hot! Do not attempt to service hot motor, resistors, engine, or exhaust system. Failure to heed this warning could result in severe burns.

Use insulated tools when working near batteries or electrical connections. Use extreme caution to avoid shorting of components or wiring.

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands of proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not

performing a test or service procedure that requires movement of the wheels, lock the brakes.

Turn the key switch OFF and remove key, place Forward/Reverse handle or switch in the NEUTRAL position, and chock the wheels prior to servicing the vehicles.

To avoid unintentionally starting the vehicle, disconnect the batteries as shown (Figure 1-1)

After disconnecting the batteries, wait 90 seconds for the controller capacitors to discharge.

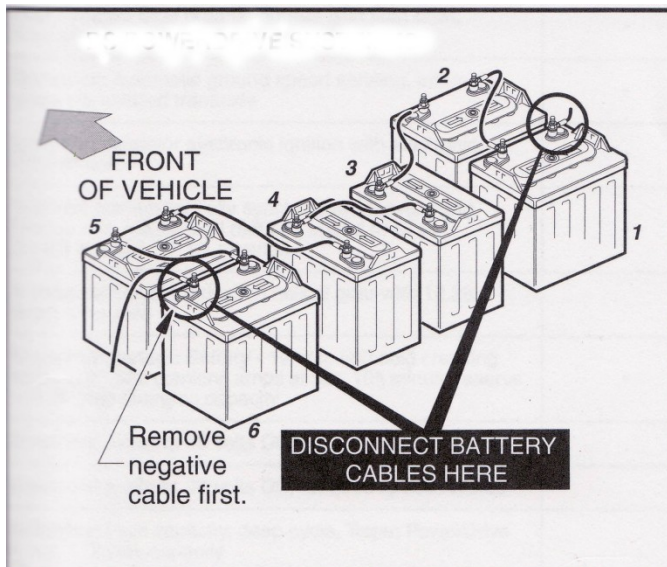


Figure 1-1

SECTION 2 – VEHICLE SPECIFICATIONS

Overall Length	123 inches
Overall Width	51 inches
Height to top of windshield	45 inches
Weight (no batteries)	738 lb.
Weight (curb, with batteries)	1262 lb.
Weight (GVWR)	2000 lb.
Front Wheels	13" x 7"
Rear Wheels	14" x 7"
Front Tire Size	P165 70/R13
Rear Tire Size	P185 60/R14
Front Brakes	Hydraulic disk
Rear Brakes	7" Mechanical Drum Type
Drive Motor	Direct Drive, 48 Volts DC, Series Wound, 11 hp
Transaxle	Double Reduction, high speed gears
Electrical System	48 Volts DC
Batteries	Six @ 8V each in series = 48V DC
Speed Controller	Wolf Performance 500 amp, Continuous Reduced Speed Reverse
Steering	Self-adjusting Rack and Pinion
Chassis	Aluminum I-beam
Body	One-piece fiberglass composite
Interior Material	Marine-type vinyl
Carpet	Marine-type synthetic
Forward Speed	21-25 mph
Braking Distance (@ 12 mph)	9 ft.
Standard Seating Capacity	2

SECTION 3 – GENERAL INFORMATION

Throughout this section, important features unique to each model are highlighted. We urge the owner/operator to read and understand this section, and to pay special attention to the features specific to the vehicle(s).

Refer to the owner's manual provided with the vehicle for information on the following topics:

- Controls and indicators
- Driving instructions
- Towing
- Transporting on a trailer
- Subsequent owner registration
- Warranties

SERIAL NUMBER IDENTIFICATION

The serial number of each American Custom Golf Cars, Inc. vehicle is printed on a decal mounted in two places: in the passenger side glove box and under the hood near the pop-up hood latch.

Note:

Always have the vehicle identification number at hand when ordering parts or making inquiries.

SAFETY COMMITTEE

If the vehicle (golf cart or NEV) is to be rented or is part of a fleet, we strongly recommend that a safety committee be appointed. One of the main concerns of this committee should be the safe operation of the vehicles.

This should include at a minimum:

- Where the vehicles should be driven.
- Ensuring that proper warnings of driving hazards are displayed and visible. See below for list of signs available from American Custom Golf Cars, Inc. Service Parts Department.
- Who should and who should not drive vehicles.
- Instructing first time drivers.
- Maintain vehicles in a safe driving condition.
- How various rules are to be enforced.

STORAGE

Read **DANGER** and **WARNING** in **SECTION 1 – SAFETY**.

WARNING!

- Turn the key switch **OFF**, remove the key, and leave the **Forward/Reverse** handle in the **NEUTRAL** position during storage. This is to prevent unintentionally starting the vehicle or a fire hazard.
- Do not attempt to charge frozen batteries or batteries with bulged cases. Discard the battery. Frozen batteries can explode!

CAUTION!

- Batteries in low state of charge will freeze at low temperatures.
- When washing the vehicle, do not direct water stream at the **Forward/Reverse** switch or other electrical components.

PREPARING THE VEHICLE FOR EXTENDED STORAGE

1. Fully charge batteries. See Section 13 – Batteries, in the appropriate Maintenance and Service Supplement.
2. Batteries should be clean and free of corrosion. Wash tops and terminals of batteries with a solution of baking soda and water (1 cup (237 mL) baking soda per 1 gallon (3.8 L) of water). Rinse solution off batteries. Do not allow this solution to enter the batteries. Be sure terminals are tight. Let the terminals dry and then coat them with Battery Terminal Protector Spray.
3. Store the vehicle in a cool place. This will minimize battery self-discharge.
4. Adjust tires to recommended tire pressure.
5. Lubricate front suspension and do all other semiannual periodic lubrication. See Periodic Lubrication Schedule, Section 10 – Periodic Maintenance, in the appropriate Maintenance and Service Supplement.
6. Thoroughly clean front body, rear body, seat, battery compartment, and underside of vehicle.
7. Do engage the park brake. Chock the wheels to prevent the vehicle from rolling.
8. Keep batteries fully charged during storage.

RETURNING THE STORED ELECTRIC VEHICLE TO SERVICE

1. If necessary, connect batteries
2. Fully charge batteries.
3. Adjust tire to recommended pressure.
4. Perform the Pre-Operation and Daily Safety Checklist in Section 10 – Periodic Maintenance, in the appropriate maintenance and service supplement.

SECTION 4 – BODY AND TRIM

WARNING!

Only trained technicians should repair or service the vehicle. Anyone doing even simple repairs or service should have knowledge and experience in electrical and mechanical repair.

Following the procedures exactly as stated in this manual and heed all DANGER, WARNING, and CAUTION statements in this manual, as well as those affixed to the vehicle.

Wear safety glasses or approved eye protection when servicing the vehicle. Wear a full face shield and rubber gloves when working on or near batteries.

Do not wear loose clothing or jewelry such as rings, watches, chains, etc. when servicing vehicle.

Moving parts! Do not attempt to service vehicle while it is running.

Hot! Do not attempt to service hot motor, resistors, engine, or exhaust system. Failure to heed this warning could result in severe burns.

Use insulated tools when working near batteries or electrical connections. Use extreme caution to avoid shorting of components or wiring.

Turn key switch OFF and remove key, place Forward/Reverse handle or switch in the NEUTRAL position, and chock the wheels prior to servicing the vehicle.

To avoid unintentionally starting the vehicle, disconnect the batteries as shown (Figure 1-1)

After disconnecting the batteries, discharge the controller capacitors as follows:

- Turn the key switch to ON and place the Forward/Reverse handle in the REVERSE position.
- Slowly depress the accelerator pedal and keep depressed until the reverse warning buzzer can no longer be heard. When the buzzer stops sounding, the controller capacitors are discharged.

CAUTION!

Do not use detergents or cleaning solvents that contain ammonia, aromatic solvents, or alkali materials on body panels or seats.

Do not allow battery acid to drip on body panels. Battery acid will cause permanent damage. Wash spilled battery acid from body panels immediately.

CLEANING THE VEHICLE

Read **DANGER** and **WARNING** in **SECTION 1 – SAFETY**.

American Custom Golf Cars, Inc. vehicles are equipped with composite front and rear bodies. Use only commercially available automotive cleaners with a soft cloth for normal cleaning. A garden hose at normal residential water pressure is adequate.

American Custom Golf Cars, Inc. does not recommend any type of pressure washing or steam cleaning. Such a process (especially if the vehicle has a composite rear body that is removed) will expose electrical components to moisture. Moisture entering electrical components can result in water damage and subsequent component failure.

Use non-abrasive wax products. Battery acid, fertilizers, tars, asphalt, creosote, paint, or chewing gum should be removed immediately to prevent possible stains.

Note:

Dispose of waste water properly.

SEAT

To preserve seat appearance, clean regularly with mild soap or detergent applied with a sponge or soft cloth. Use a soft bristle brush to clean areas that are especially soiled. Use the following guidelines:

Light Soiling: A solution of 10% liquid dish soap and warm water applied with a soft, damp cloth is recommended. A soft bristle brush may be used if necessary. Wipe off any residue with a water dampened cloth.

Difficult Stains Dampen a soft, white cloth with a solution of 10% household bleach (sodium hypochlorite) and 90% water. Rub gently to remove stain, and then rinse with water dampened cloth to remove bleach concentration.

More Difficult Stains: Perform previous procedure using full-strength bleach, or allow bleach to puddle on affected area for approximately 30 minutes. Rinse with a water dampened cloth to remove any remaining bleach concentration.

CAUTION!

To prevent damage to the vehicle when removing difficult stains or heavy soiling, remove the seat bottom from the vehicle first.

FRONT AND REAR BODY REPAIR

CAUTION!

Holding the heat gun too close to the body could melt the body or damage the finish.

SMALL SCRATCHES THAT CANNOT BE BUFFED OUT

1. Thoroughly clean the affected area with alcohol and then dry thoroughly.
2. Using 240 grit or finer paper to remove gloss from the surface. Sand as little body surface as possible beyond scratch.

SECTION 5

ACCELERATOR AND BRAKE PEDAL GROUP

WARNING!

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Wear safety glasses or approved eye protection when servicing the vehicle. Wear a full face shield and rubber gloves when working on or near batteries.

Do not wear loose clothing or jewelry such as rings, watches, chains, etc. when servicing vehicle.

Moving parts! Do not attempt to service the vehicle while it is running.

Hot! Do not attempt to service hot motor, resistors, engine, or exhaust system. Failure to heed this warning could result in severe burns.

Use insulated tools when working near batteries or electrical connections. Use extreme caution to avoid shorting of components or wiring.

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands of proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not performing a test or service procedure that requires movement of the wheels, lock the brakes.

Turn the key switch OFF and remove key, place Forward/Reverse handle or switch in the NEUTRAL position, and chock the wheels prior to servicing the vehicles.

To avoid unintentionally starting the vehicle, disconnect the batteries as shown (Figure 1-1)

After disconnecting the batteries, discharge the controller capacitors as follows:

-Turn the key switch to ON and place the Forward/Reverse handle in the REVERSE position.

-Slowly depress the accelerator pedal and keep depressed until the reverse warning buzzer can no longer be heard. When the buzzer stops sounding, the controller capacitors are discharged.

GENERAL INFORMATION

To properly service and adjust the pedal group, the accelerator type must be identified before the work begins. All **American Custom Golf Cars, Inc.** vehicles use a 2-wire or 3-wire potentiometer. Service and adjustment procedures differ significantly, so it is important to make sure that the correct procedure is used.

BRAKE PEDAL AND PARK BRAKE

1. Disconnect batteries as instructed. See **WARNING** on page 14.
2. Place chocks under the front cross tube of the vehicle frame and lower the vehicle onto the jack stands. See following **WARNING**.

WARNING!

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454 kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands for proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not performing a test or service procedure that requires movement of the wheels, lock the brakes.

3. Remove the brake pedal assembly.
4. Disconnect the equalizer rod (13) from the pedal shaft by removing the bolt (14) and nut (15) (Figure 5-5).
5. Remove the nuts (5), flat washers (2), bolts (4) and mounting blocks (23). If the mounting blocks show signs of excessive wear or are damaged, they must be replaced with new ones before installing pedal assembly.
6. Remove the nut (12) and brake stop bumper (11).

BRAKE PEDAL INSTALLATION

1. From the top side of the floorboard, insert the brake pedal weldment assembly through the opening in the floor. Install the brake pedal stop bumper (11) on the weldment (Figure 5-5, page 5-5). Do not tighten the jam nut (12) at this time.
2. Attach the equalizer rod (13) to the brake pedal weldment assembly (6) as shown (Figure 5-5, page 5-5). Tighten the bolt (14) and nut (15) to 17 in-lb (1.9 Nm).
3. Position and attach brake pedal assembly and mounting blocks (23) and washers (2) to vehicle frame as shown. Tighten the bolts and nuts to 50 in-lb (5.7 Nm) (Figure 5-5, page 5-5).
4. Tighten the nut (2) on the equalizer rod (1) so that brake pedal free-play is $\frac{1}{4}$ inch to $\frac{1}{2}$ inch (6mm to 13mm) (Figure 5-4)

Note:

Brake pedal free-play is the distance the brake pedal can be depressed before the brake actuator arm moves.

5. Tighten the jam nut (3) while holding the adjustment nut (2) in the correct position (Figure 5-4).

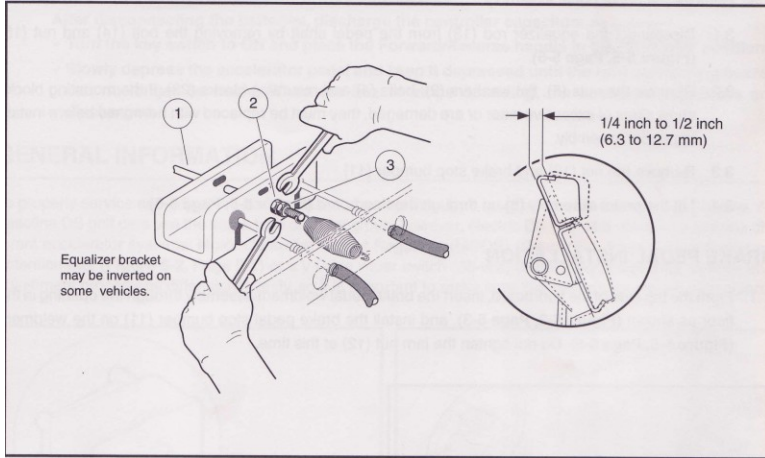


Figure 5-4

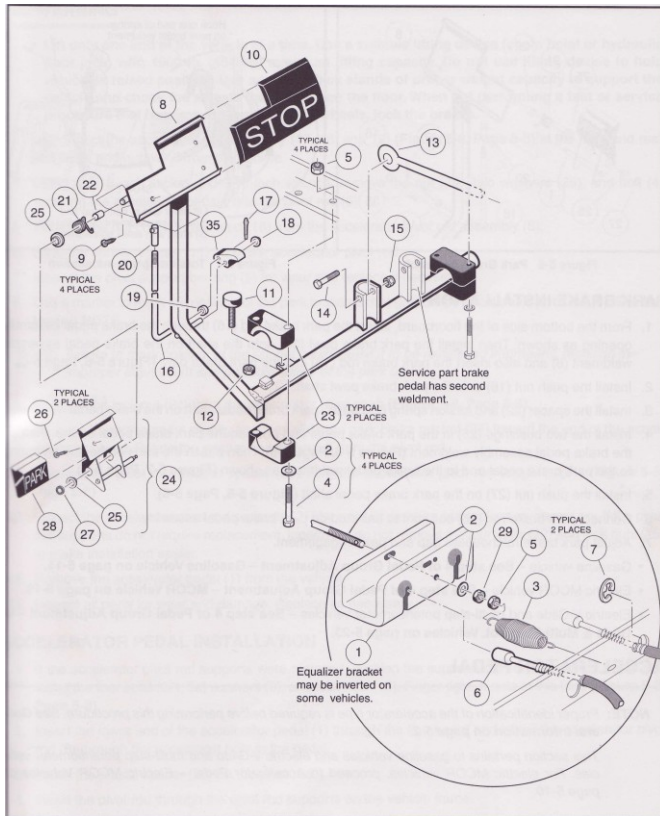


Figure 5-5

PARK BRAKE REMOVAL

1. Disconnect battery(ies) as instructed. See **WARNING** on page 14.
2. Place chocks under the rear wheels and lift the front end of the vehicle with a chain hoist or floor jack. Place Jack stands under the front cross tube of the vehicle frame and lower the vehicle onto the jack stands. See following **WARNING**.

WARNING!

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454 kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands for proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not performing a test or service procedure that requires movement of the wheels, lock the brakes.

3. Remove the park brake assembly.

3.1

To remove the park brake rod and pawl assembly (16-19 and 35), remove the push nut (18) and disconnect the ball joint sleeve (20) from the park brake pedal (24) (Figure 5-5). See following note.

Note: *New push nuts (18) and (27) must be used when reassembling the park brake*

3.2

To remove the park brake pedal (1), remove the push nut (27), disconnect the torsion spring (21) (Figure 5-6) and slide the pedal off of the shaft. See preceding note.

4. Inspect all parts for wear or damage and replace as necessary.

PARK BRAKE INSTALLATION

1. From the bottom side of the floorboard, insert the park brake rod (16) through the brake pedal assembly opening shown. Then install the park brake pawl (35) onto the shaft on the brake pedal assembly weldment (8) and also insert the park brake rod (16) into the park brake pawl (Figure 5-6).
2. Install the push nut (18) onto the park brake pawl shaft.
3. Install the spacer (22) and torsion spring (21) on the park brake pedal shaft on the brake pedal weldment.
4. Install the two bushings (25) in the park brake pedal and position the park brake pedal on the shaft on the brake pedal assembly weldment (Figure 5-6). Then attach the end of the torsion spring to the park brake pedal and to the brake pedal weldment as shown (Figure 5-7).
5. Install the push nut (27) on the park brake pedal shaft (Figure 5-6).
6. Connect park brake rod (16) ball joint to ball stud on park brake pedal assembly.
7. Adjust park brake ratchet/pawl gap and pawl engagement.

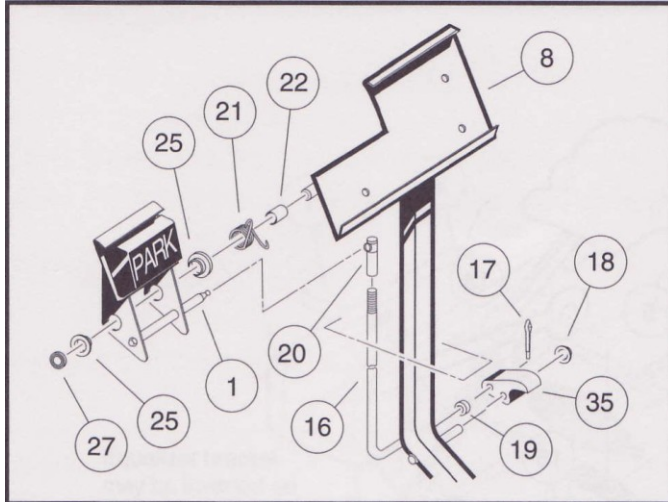


Figure 5-6

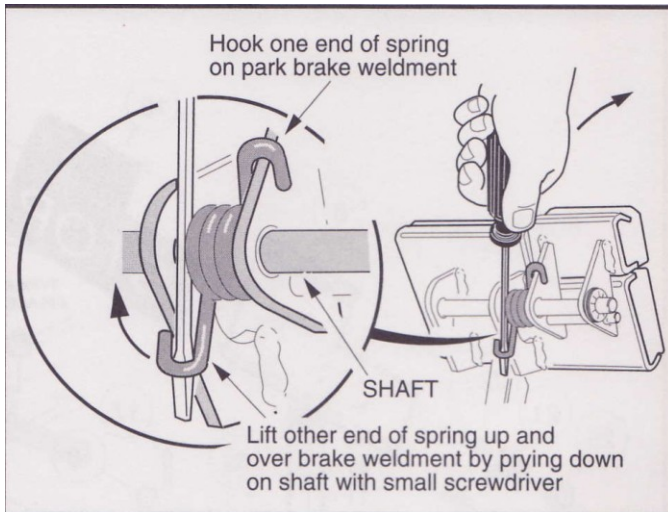


Figure 5-7

ACCELERATOR PEDAL REMOVAL

1. Disconnect batteries as instructed. See **WARNING** on page 14.
2. Place chocks under the rear wheels and lift the front end of the vehicle with a chain hoist or floor jack. Please jack stands under the front cross tube of the vehicle frame and lower the vehicle onto the jack stands. See following **WARNING**.

WARNING!

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454 kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands for proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not performing a test or service procedure that requires movement of the wheels, lock the brakes.

3. Disconnect the accelerator rod assembly (17, 18, and 19) (Figure 5-8) at the front and rear ball studs and remove it from the vehicle.
4. Using a 9/16-inch sock and 9/16-inch wrench, remove the nut (23), two washers (25), and bolt (4) securing the accelerator pedal (1) to the pivot rod (6).
5. Remove the nut (10) and ball stud (16) from the accelerator pivot rod assembly (6).
6. Slide the spring retainer (11) off of the accelerator pivot rod.
7. Inspect the pivot support bearing (9) for wear and replace if necessary.
8. Use a marker to mark the position of the park brake ratchet (24) on the accelerator pivot rod (6). See following Note.

Note:

Failure to mark position of the ratchet could cause it to be reinstalled improperly, resulting in improper adjustment and possible failure of the park brake.

9. Remove the lock nut (26) from the accelerator pivot shaft (Figure 5-8).
10. Depress the brake pedal slightly then slide the park brake ratchet (24) toward the end of the accelerator pivot rod. Rotate the ratchet and remove it from the pivot rod.
11. Remove the pivot rod (6) and spacer (20) from the accelerator pivot rod supports (21) (Figure 5-8).
12. Inspect the accelerator pivot rod supports (21) for wear or damage and replace as necessary. If the pivot rod supports do not require replacement, loosen but do not remove the four bolts (22) and lock nuts (15) to make installation easier.
13. Remove the accelerator pedal (1) from the vehicle.
14. Inspect all parts for wear and damage. Replace as necessary.

ACCELERATOR PEDAL INSTALLATION

1. If the accelerator pivot rod supports were replaced, position the supports (21) on the vehicle frame and install the four bolts (22), flat washers (8), and lock nuts (15). Finger tighten nuts at this time (Figure 5-8, page 5-8).
2. Insert the lower end of the accelerator pedal (1) through the floorboard and install the accelerator pivot rod (6) through the uppermost hole in the pedal.
3. Install the plastic spacer (20) on the pivot rod.
4. Insert the pivot rod through the pivot rod supports on the vehicle frame.
5. Tighten the four bolts (22) attaching the pivot rod supports to the frame to 75 in-lb (8.5 Nm).
6. Insert the bolt (4) through the lower hole in the pedal and through the pivot rod. Install the two washers (25), and nut (23) on the bolt. Finger tighten hardware at this time.
7. Install the ball stud (16) through the pivot rod. Install the spring retainer (11) onto the ball stud. Secure these parts with the nut (10) (Figure 5-8). Tighten the nut to 50 in-lb (5.5 Nm).
8. Depress the brake pedal slightly, and with the park brake ratchet oriented so that the tip of the ratchet is pointed toward the rear of vehicle, slide the ratchet onto the pivot rod (do not slide ratchet onto the pivot rod splines. Release the brake pedal and allow the ratchet until its tip is pointed downward. The ratchet should now rotate freely on the rod.
9. Rotate ratchet clockwise until it touches the park brake pawl, then slide the ratchet onto the splines of the pivot rod (it may be necessary to push the pivot rod toward the driver side of the vehicle to make the splines accessible). The ratchet may have to be rotated counterclockwise slightly to align the splines.
10. Move the pivot rod back toward the driver side of the vehicle and line up the scribed match marks on the pivot rod and ratchet. Rotate the pivot rod back and forth slightly to align the splines and slide the ratchet onto the splines.
11. Install nylon lock nut (26) on pivot rod and tighten the nut to 18 ft-lb (24.5 Nm) (Figure 5-8).
12. Install the accelerator rod assembly (17, 18, 19).
13. Adjust the accelerator pedal height.
14. Adjust the accelerator rod.

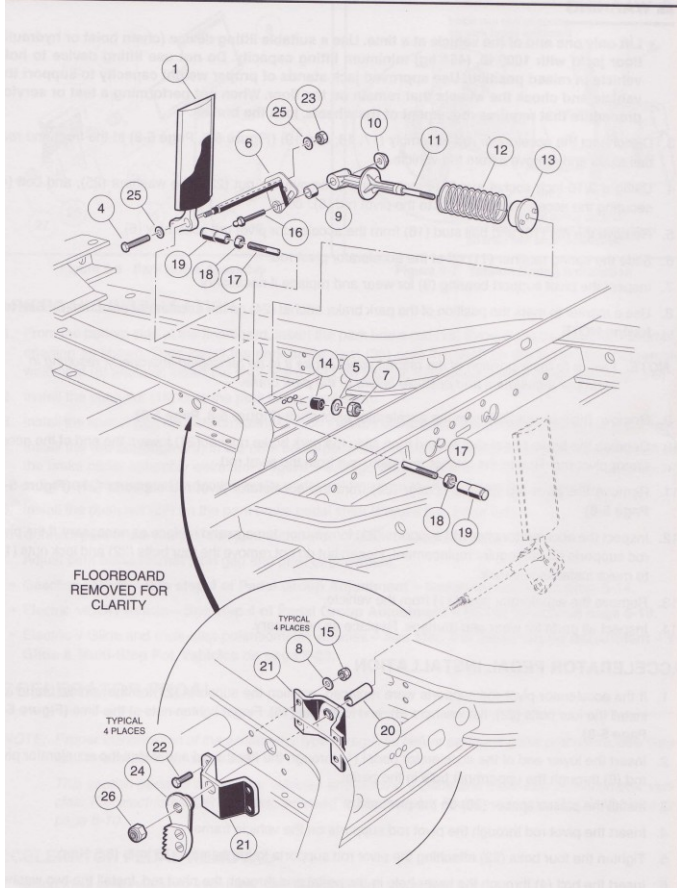


Figure 5-8

PEDAL GROUP ADJUSTMENT

1. Disconnect the batteries as instructed. See **WARNING** on page 14.
2. Adjust brake pedal height
3. Chock wheels and release park brake. Lift rear of vehicle and place jack stands under the axle tubes to support the vehicle.
4. To provide slack in the brake cables, loosen the equalizer retaining nuts (2 and 3) on the equalizer rods (1) (Figure 5-23).
5. Loosen the brake stop arm nut (31), and then relieve pedal pressure on the stop by pushing down slightly on the pedal. Next, adjust the brake stop bumper (22) up or down (Figure 5-24). Adjusting the bumper upward decreases distance between pedal and floorboard. Adjusting the bumper downward increases the distances between pedal and floorboard. Proper brake pedal height is 6 inches (15.2 cm) (Figure 5-25).
6. Tighten the jam nut (31) to 8 ft-lb (9.5 Nm) (Page 5-18).
7. Adjust brake pedal free play.

Note:

Brake pedal free play is the distance the brake pedal can be depressed before the brake actuator arm (at the brake cluster) moves.

8. Measuring perpendicular from the floorboard to the back of the brake pedal, depress the brake pedal and measure the distance that the pedal moves before all of the slack is taken out of the brake cables (Figure 5-25).
9. Tighten the nut (2) on the equalizer rod (1) so that the brake pedal free play is $\frac{1}{4}$ to $\frac{1}{2}$ inch (6.3 to 12.7mm) (Figure 5-26)
10. Tighten the jam nut while holding (3) while holding the adjustment nut (2) in the correct position (Figure 5-26).
11. Adjust park brake ratchet/pawl gap and pawl engagement.
12. Inspect the park brake pawl and ratchet for excessive wear, grooves, cracks or chips. If either the pawl or ratchet is damaged, both must be replaced.
13. Adjust retaining nut (7) on spring support rod until there is a .060 inch (1.5mm) gap between the pawl and the tips of the ratchet teeth. Use a feeler gauge to verify the gap. The gap should be consistent through the range of pawl movement. If the gap is not consistent, loosen the four bolts (6) securing the accelerator pivot rod supports and adjust the supports. If the gap becomes smaller as the park brake pedal is depressed, move the pivot rod supports slightly rearward until the gap is consistent. If the gap becomes larger as the park brake pedal is depressed, move the pivot rod supports slightly forward until gap is consistent.
14. With the park brake unlocked, measure and note the distance from the top of the accelerator pedal to the floorboard, and then lock the park brake.
15. With the park brake locked, make sure at least 75% of ratchet tooth length engages the pawl. Tooth engagement should be between the two lines marked on the pawl.
16. With park brake still locked, measure the distance from the top of accelerator pedal to floorboard. If the measurement has changed, ratchet tooth engagement is too deep and must be adjusted.
17. If ratchet/pawl engagement must be adjusted, disconnect the ball joint at the top of the brake rod and rotate the ball joint sleeve clockwise to increase engagement or counterclockwise to decrease engagement. Reconnect ball joint.
18. Check for proper brake operation prior to driving the vehicle.
19. Adjust accelerator pedal height.
20. Loosen the nut and bolt (Figure 5-31) securing the accelerator pedal to the pivot plate.
21. Clamp the accelerator pedal adjustment tool to the accelerator pedal, with the end marked *accelerator pedal height* closest to the floorboard (Figure 5-32). Depress the accelerator pedal until the end of the tool rests against the floorboard; pedal height should be 5-5/8 inches (14.3 cm). Use a rubber strap to hold pedal in position against the floorboard and then tighten nut to 26 ft-lb (35.3 Nm).
22. Adjust the brakes. See Brake Adjustment, Section 6.

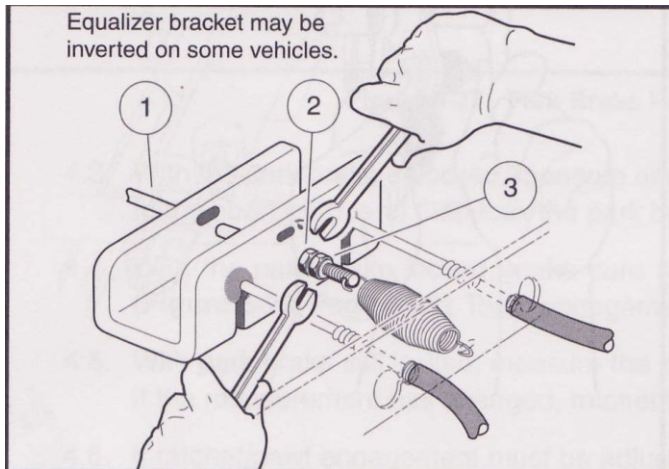


Figure 5-23

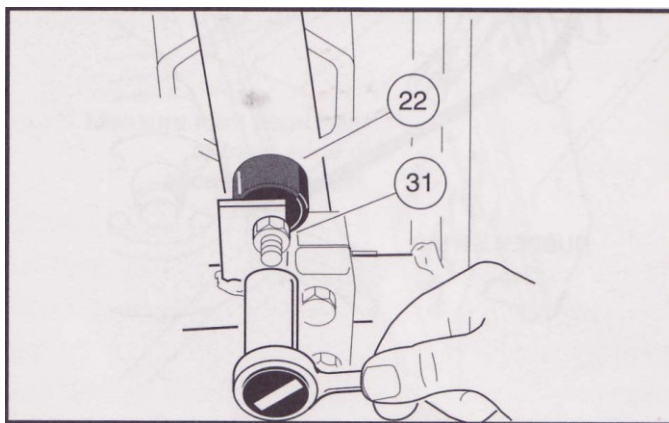


Figure 5.24

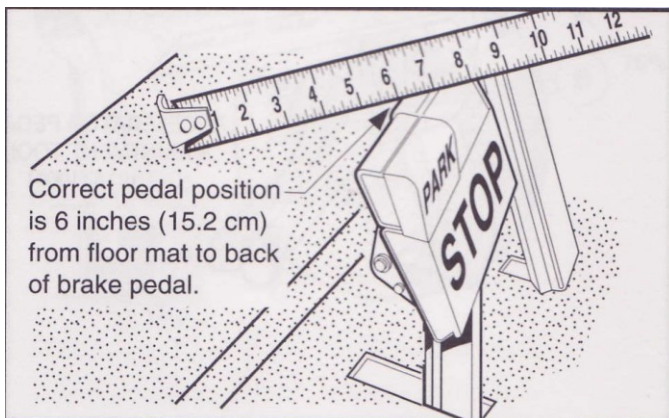


Figure 5-25

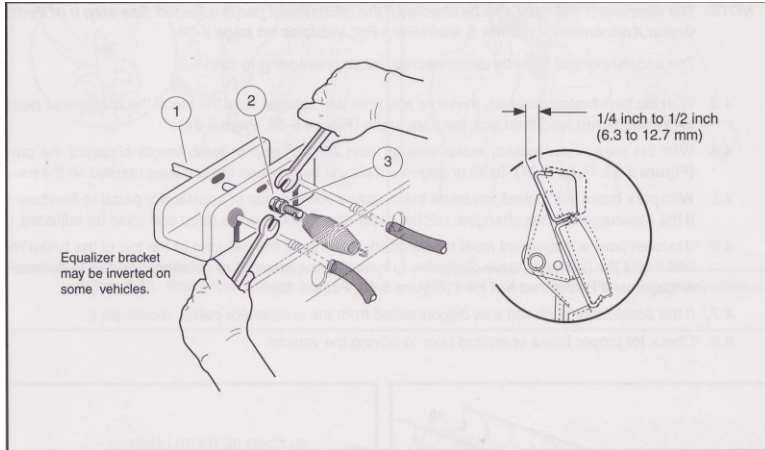


Figure 5-26

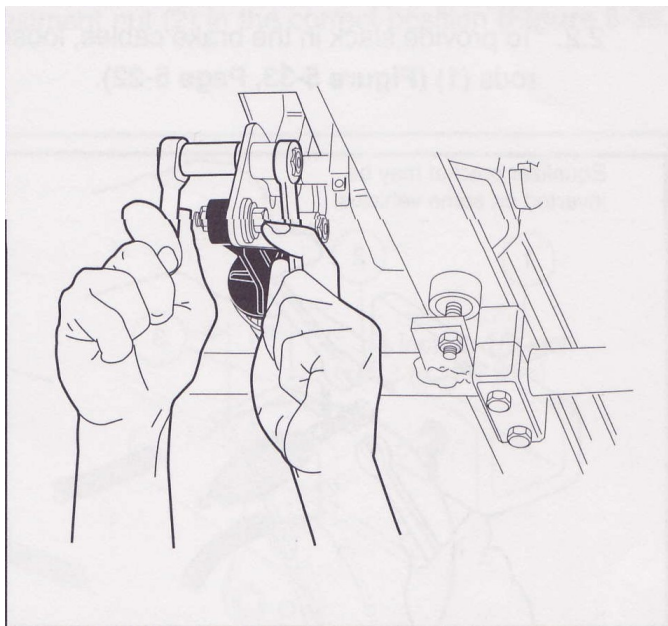


Figure 5-31

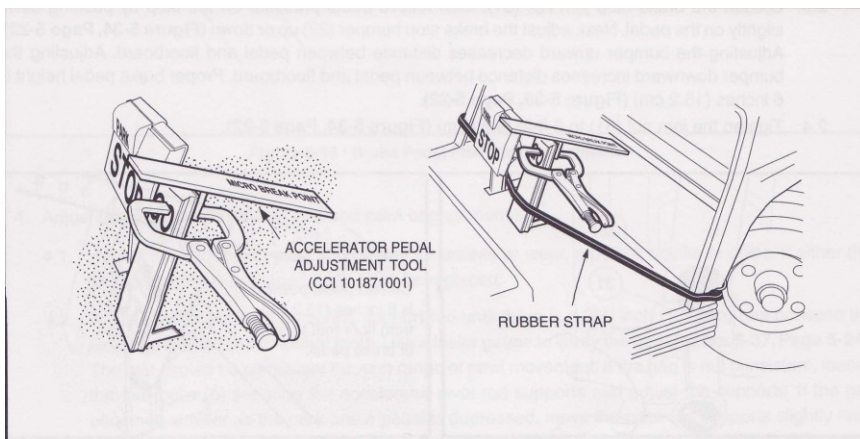


Figure 5-32

SECTION 6 – WHEEL BRAKE ASSEMBLIES

WARNING!

Only trained technicians should repair or service the vehicle. Anyone doing even simple repairs or service should have knowledge and experience in electrical and mechanical repair.

Follow the procedures exactly as stated in this manual, and heed all DANGER, WARNING, and CAUTION statements in this manual as well as those affixed to the vehicle.

Improper use of the vehicle or failure to properly maintain it could result in decreased vehicle performance or severe personal injury.

Any modification or change to the vehicle that affects the stability or handling of the vehicle or increases maximum vehicle speed beyond factory specifications, could result in severe personal injury or death.

Check the vehicle owner's manual for proper location of all vehicle warning decals and make sure they are in place and are easy to read.

Wear safety glasses or approved eye protection when servicing the vehicle. Wear a full face shield and rubber gloves when working on or near batteries.

Do not wear loose clothing or jewelry such as rings, watches, chains, etc. when servicing vehicle.

Moving parts! Do not attempt to service the vehicle while it is running.

Hot! Do not attempt to service hot motor, resistors, engine, or exhaust system. Failure to heed this warning could result in severe burns.

Use insulated tools when working near batteries or electrical connections. Use extreme caution to avoid shorting of components or wiring.

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands of proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not performing a test or service procedure that requires movement of the wheels, lock the brakes.

Turn the key switch OFF and remove key, place Forward/Reverse handle or switch in the NEUTRAL position, and chock the wheels prior to servicing the vehicles.

To avoid unintentionally starting the vehicle, disconnect the batteries as shown (Figure 1-1)

After disconnecting the batteries, discharge the controller capacitors as follows:

-Turn the key switch to ON and place the Forward/Reverse handle in the REVERSE position.

-Slowly depress the accelerator pedal and keep depressed until the reverse warning buzzer can no longer be heard. When the buzzer stops sounding, the controller capacitors are discharged.

GENERAL INFORMATION

American Custom Golf Cars, Inc. vehicles are equipped with self-adjusting, mechanically-expanding shoe drum brakes on each rear wheel. Components are shown in Figure 6-1.

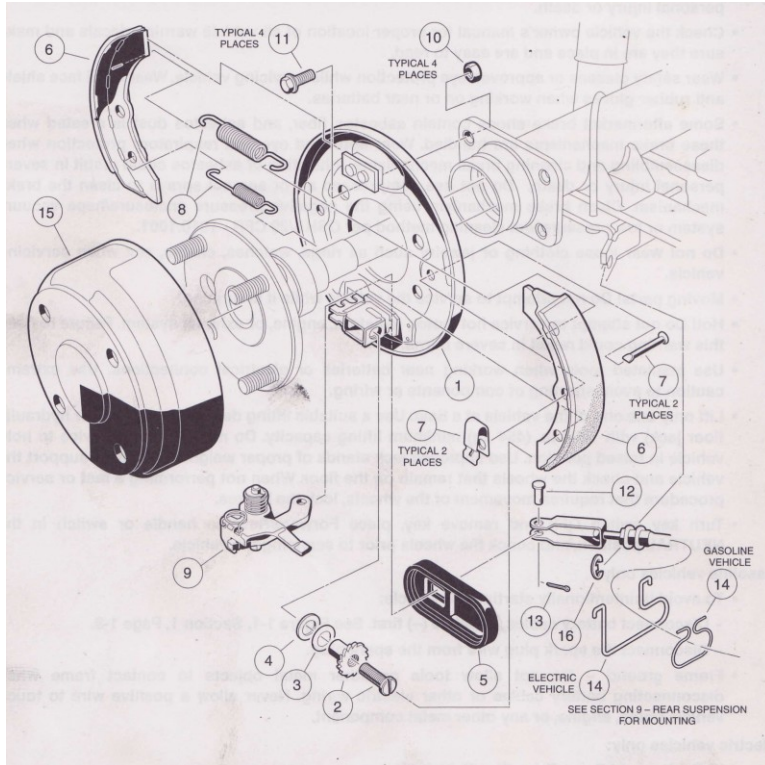


Figure 6-1

BRAKE SHOE REMOVAL

READ PREVIOUS WARNING!

1. Disconnect batteries as instructed. See previous WARNING!
2. Place chocks at the front wheels. Loosen, but do not remove lug nuts on rear wheels and lift the rear of the vehicle with a chain hoist or floor jack. Place jack stands under the axle tubes to support the vehicle.
Loosen the equalizer retaining nuts (2 and 3) on the equalizer rod (1) to loosen the brake cable (Figure 6-2).

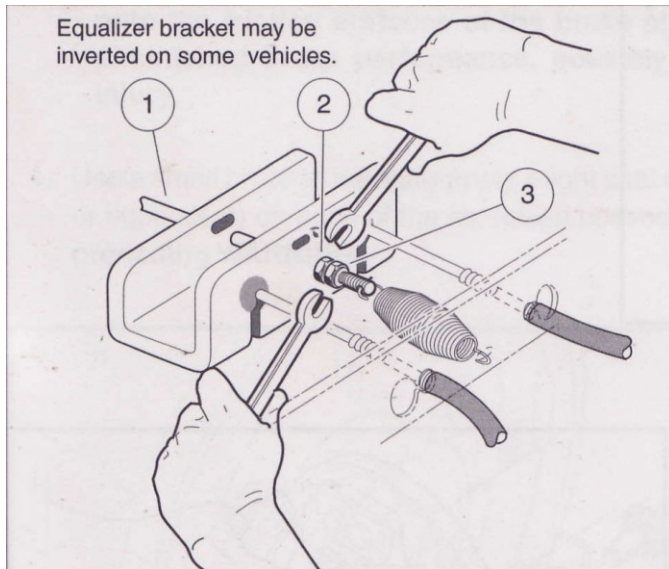


Figure 6-2

3. Remove the rear wheels and then the brake drums. If the brake drums were easily removed proceed to Step 6.

Note:

When servicing vehicles with severely worn brake shoes and when the drums cannot be removed by normal methods, proceed to Step 5 to minimize damage to the brake cluster and brake components.

4. Remove brake drums and badly worn brake shoes.
 - 5.1 On the back of each brake cluster assembly, locate the heads of two brake shoe retainer pins. It may be necessary to remove sealant material around the head of each pin.
 - 5.2 Insert a ½ inch x 5/8 inch cold chisel under the head of each pin and shear them off as illustrated (Figure 6-4). This will release the shoes from the backing plate, allowing them to pivot away from the inside of the brake drum, which should then allow the brake drum to be pulled free. After completing Step 6, skip step 7.

Note:

Although Step 6 – Removing the Axle allows easier access to the brake shoes, it is not imperative to do so in order to remove the brake shoes.

5. Remove the axle.
 - 6.1 Using 90° snap ring pliers, remove the axle retaining ring (1) (Figure 6-3)
 - 6.2 Pull the axle shaft (2) from the axle tube (Figure 6-3).

- Using needle nose pliers, turn the clip retainer (1) 90° to remove the shoe retainer clip (2) (Figure 6-5).

CAUTION!

The brake shoes are under and can release suddenly when brake shoe retainers are removed.

- Grasp both brake shoes and pull them, together with the springs, out of the brake assembly (Figure 6-6).
- Remove adjuster wheel (1) with two washers (2 and 3) from the backing plate (Figure 6-7).

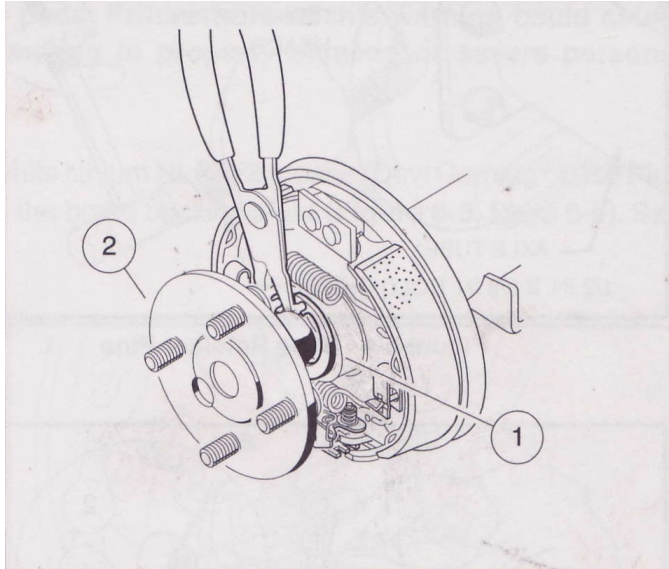


Figure 6-3

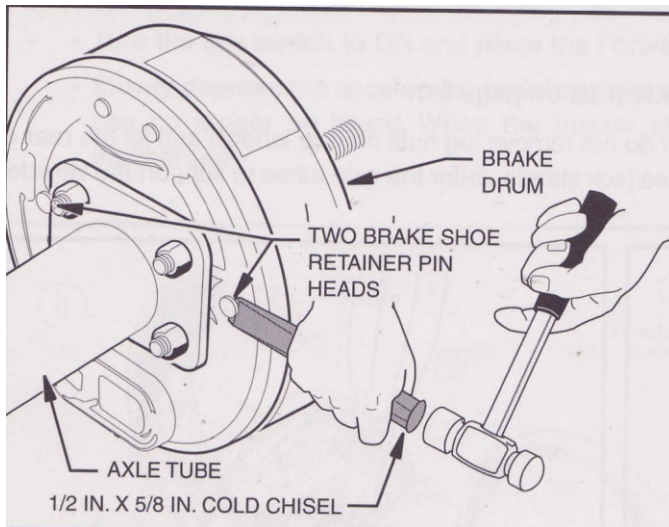


Figure 6-4

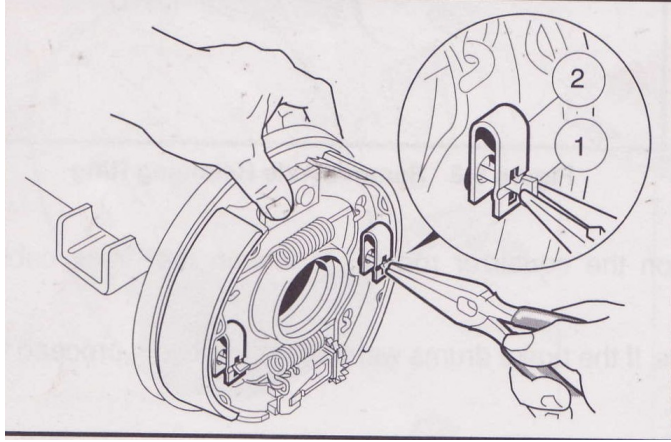


Figure 6-5

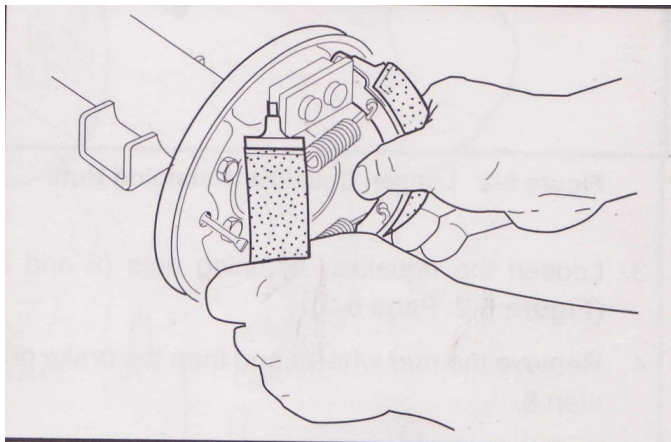


Figure 6-6

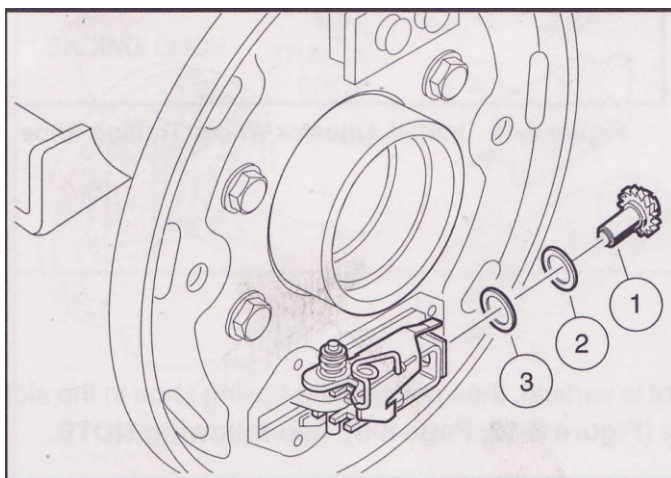


Figure 6-7

BRAKE ASSEMBLY CLEANING

Read **WARNING!**

1. Carefully clean the brake backing plate and ball of its mechanical components.
2. Remove the rubber boot from backing plate and wipe with a clean damp cloth.
3. Lubricate the slide (1) and slide plate (2) with dry moly lubricant on both sides of the backing plate (Figure 6-8). After lubricating, work the slide back and forth to ensure that it slides smoothly and easily. Reinstall rubber boot onto backing plate.

WARNING!

Apply grease carefully when performing the following steps. Do not allow any grease to get onto the friction surfaces of the brake shoe pads. Failure to heed this warning could cause diminished brake performance, possibly resulting in property damage or severe personal injury.

4. Use a small brush to carefully apply a light coat of white lithium grease (Dow Corning BR2-Plus or equivalent) on each of the six raised bosses on the brake backing plate (Figure 6-9).
5. Use a small brush to carefully apply a light coat of white lithium grease (Dow Corning BR2-Plus or equivalent) on each end of both brake shoes and into the slots in the brake shoe mounting block as show (Figure 6-11). See preceding WARNING.
6. Use a small brush to carefully apply a light coat of white lithium grease (Dow Corning BR2-Plus or equivalent) to the brake adjuster assembly, adjust wheel shoe slots, and the shaft of the adjuster wheel as shown (Figure 6-11). See preceding WARNING.
7. Install the adjust wheel (1) and two washers (2 and 3) into the adjuster assembly (Figure 6-7).

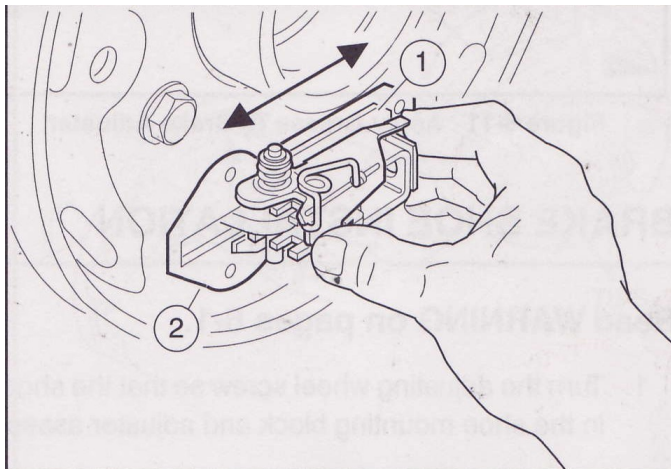


Figure 6-8

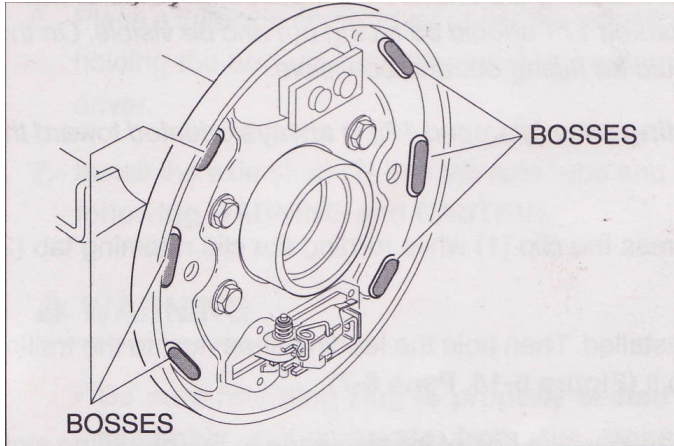


Figure 6-9

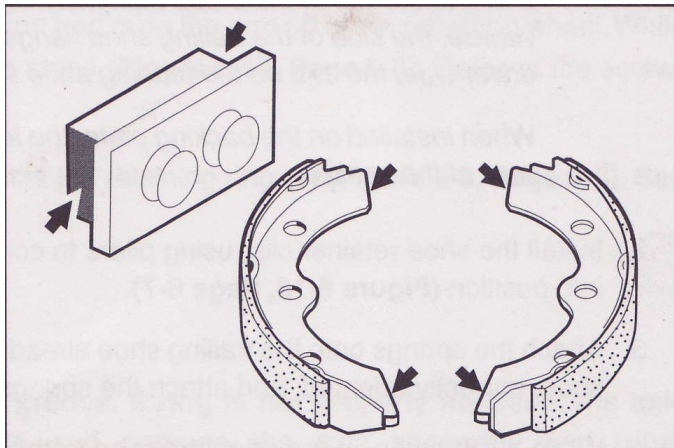


Figure 6-10

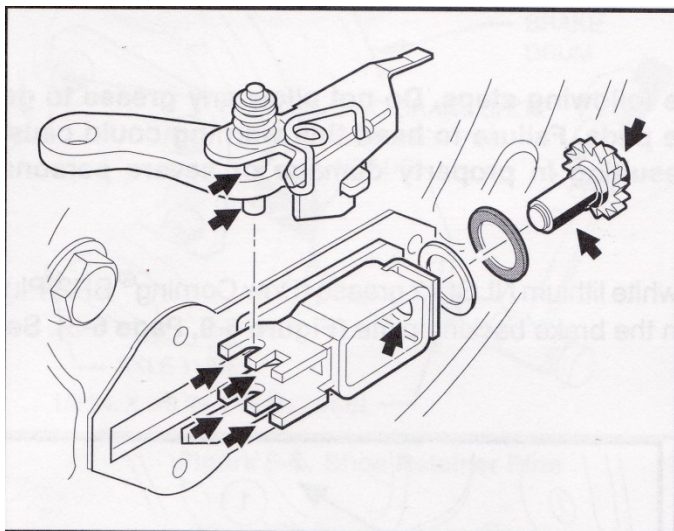


Figure 6-11

BRAKE SHOE INSTALLATION

Read Warning in previous section.

1. Turn the adjusting wheel screw so that the shoe slot is vertical, then position the trailing shoe in the slots in the shoe mounting block and adjuster assembly (Figure 6-12). See following NOTE.

Note:

The trailing shoe has 17T stamped into the tip of the shoe flange (Figure 6-12). The leading shoe is stamped 17L. When installing the shoes, the stamping on both sides should be oriented to the top of the brake assembly. When installing the shoes on the passenger side of the vehicle, the side of the trailing shoe flange marked 17T should be facing out and be visible. On the driver side, the 17L on the leading shoe should be facing out and be visible.

2. Install the shoe retainer clip, using pliers to compress the clip (1) while turning the clip retaining tab (2) into position (Figure 6-13).
3. Attach the springs onto the trailing shoe already installed. Then hold the leading shoe next to the trailing shoe, correctly oriented, and attach the spring to it (Figure 6-14)
4. While maintaining spring attachment on both shoes, position tips of leading shoe in the mounting slots and then push shoe into place. Hold shoe in position and install retaining clip (Figure 6-15).
5. After the shoes are installed, move them together up and down and side to side to make sure that they will easily slide approximately $\frac{1}{4}$ to $\frac{3}{8}$ inch (6.3 to 9.5mm) without binding (Figure 6-16).
6. Place a flat blade screwdriver under the adjusting arm and raise the arm off of the adjusting wheel. While holding the arm up, turn the wheel upward until it stops (Figure 6-17). Remove the screwdriver.
7. Install the axle shaft (2) into the axle tube and install the retaining ring (1) (Figure 6-3). See following WARNING and CAUTION.

WARNING!

Be sure retaining ring is properly seated in groove. If ring is not properly installed, the axle assembly will separate from the transaxle and damage the axle assembly and other components. Loss of control of the vehicle could result in severe personal injury or death.

CAUTION!

Before installing axle shaft, clean any residual oil from the exposed end of the axle tube and from the oil seal area.

8. Install the brake drum, and make sure that it is properly seated. See following NOTE.

Note:

If drum installation is difficult, the brake shoes may need to be adjusted vertically in the mounting slots.

9. After the drum is installed, make sure the axle and drum turn freely and then install the wheel. See Wheel Installation, Section 8.

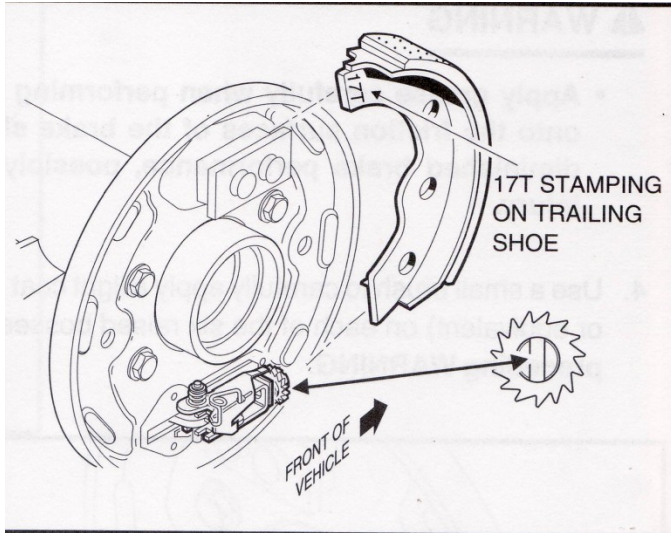


Figure 6-12

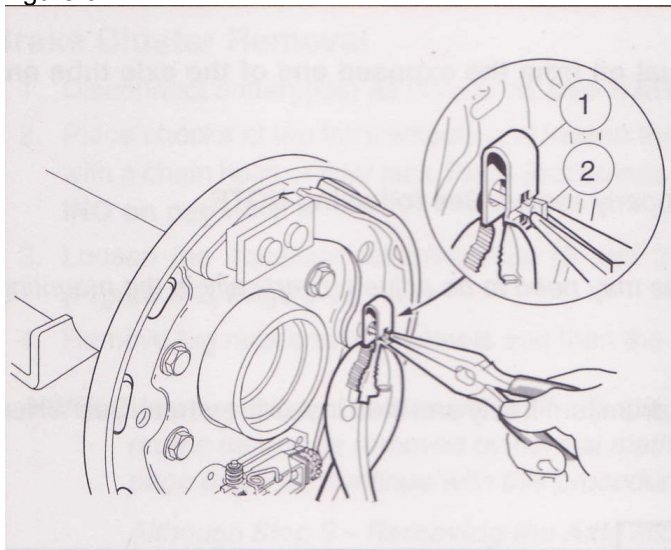


Figure 6-13

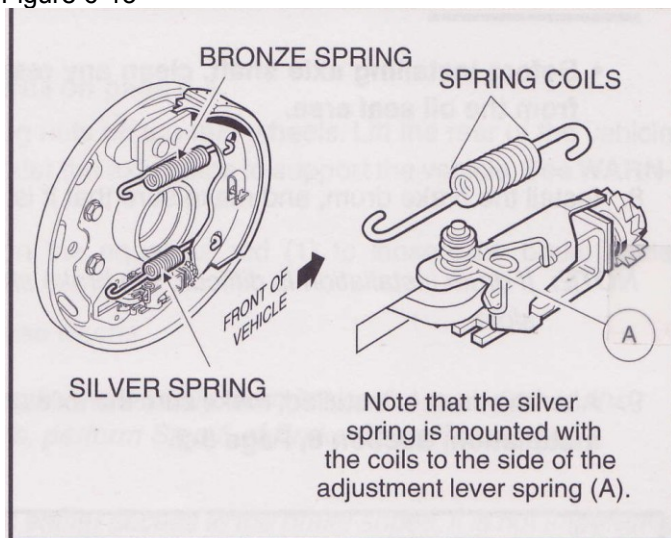


Figure 6-14

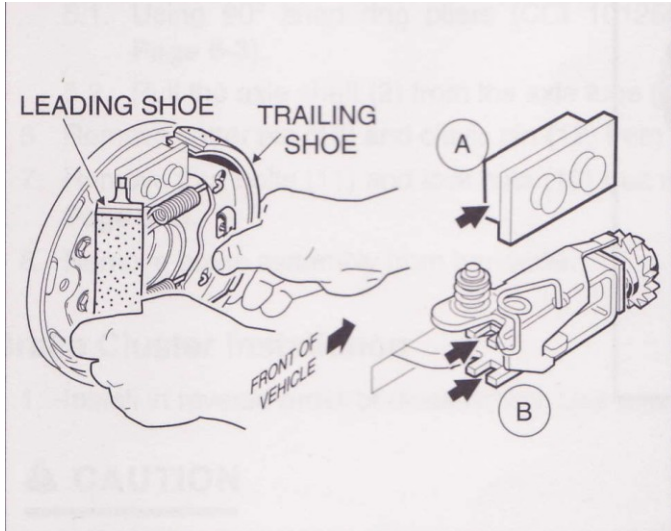


Figure 6-15

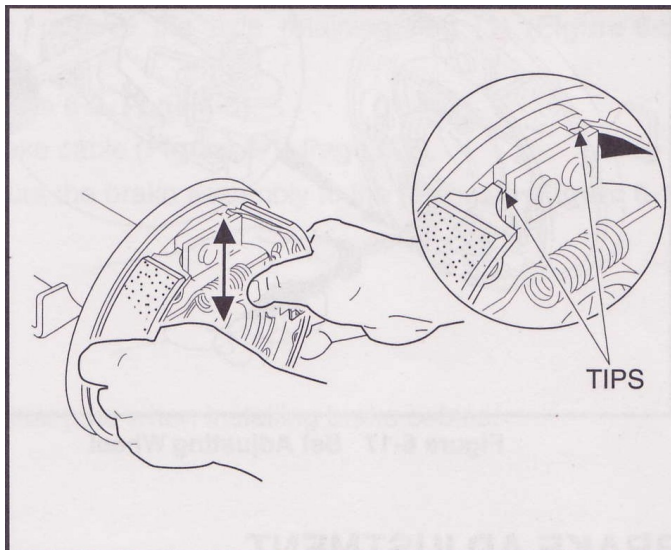


Figure 6-16

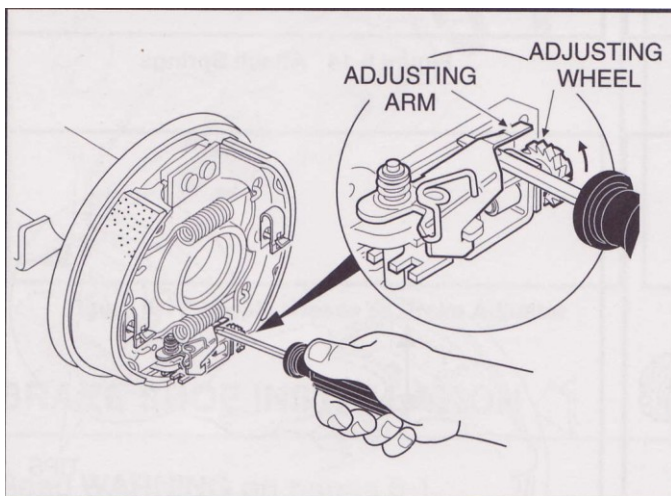


Figure 6-17

BRAKE ADJUSTMENT

Read **WARNING** at beginning of section.

1. When cleaning or repair on both wheels is complete, and with the brake cable still loose lower the vehicle to the floor.
2. Depress and release the brake pedal repeatedly until an audible clicking can no longer be heard.
3. Adjust brake pedal free play.

BRAKE CLUSTER REMOVAL AND INSTALLATION

Read **WARNING** at beginning of this section.

Brake Cluster Removal

1. Disconnect batteries as instructed. See **WARNING** at beginning of section.
2. Place chocks at the front wheels and loosen the lug nuts on the rear wheels. Lift the rear of the vehicle with a chain hoist or floor jack. Place jack stands under the axle tubes to support the vehicle.
3. Loosen the equalizer retaining nuts (2 and 3) on the equalizer rod (1) to loosen the brake cable (Figure 6-2).
4. Remove lug nuts and rear wheels and then the brake drums.

Note:

When servicing vehicles with self-adjusting brakes with badly worn brake shoes and when the drums cannot be removed by normal methods, perform Step 5 of Brake Shoe Removal, then continue this procedure.

5. Remove the axle.
 - 5.1 Using 90° snap ring pliers, remove the axle retaining ring (1) (Figure 6-3).
 - 5.2 Pull the axle shaft (2) from the axle tube (Figure 6-3).
6. Remove cotter pin (13) and clevis pin (12) from brake cable (Figure 6-1).
7. Remove four bolts (11) and lock nuts (10) that mount the brake assembly to the transaxle (Figure 6-1)
8. Remove brake assembly from transaxle.

Brake Cluster Installation

1. Install in reverse order of disassembly. Use new cotter pins when installing brake cables.

CAUTION!

Before installing axle shaft, clean any residual oil from the exposed end of the axle tube and from the oil seal area.

2. Be sure bolt (11) and new lock nuts (10) are used to mount the brake assembly (Figure 6-1).
3. Torque bolts to 30 ft-lb (40.6 Nm)

WARNING!

Be sure retaining ring is properly seated in groove. If ring is not properly installed, the axle assembly will separate from the transaxle and damage the axle assembly and other components. Loss of control of the vehicle could result in severe personal injury or death.

4. Tighten lug nuts on rear wheels, using crisscross pattern, to 55 ft-lb (74.6 Nm). See Wheel Installation, Section 8.
5. Adjust the brakes. See Brake Adjustment.

BRAKE CABLE REMOVAL AND INSTALLATION

Read **WARNING** at beginning of this section.

Brake Cable Removal

1. Disconnect batteries as instructed. See Warning at beginning of section.
2. Place chocks at the front wheels.
3. Release the park brake if latched and loosen equalizer retaining nuts (1) on equalizer rod (2) to loosen the brake cables (3) (Figure 6-18).
4. Rotate the brake cable upward and pull cable end through the hole in top of equalizer (4).
5. Remove E-clip from cable at vehicle frame (5) (Figure 6-18). Remove cable from frame.
6. Remove cotter pin (1) and the clevis pin (2) from the brake lever on each wheel and pull the clevis (3) away from the lever (Figure 6-19).
7. Remove E-clip (4) from cable at the cable support bracket (5). Remove cable from bracket.
8. Note routing of cable through hanger for installation of new cable. Pull cable from vehicle.

Brake Cable Installation

1. Place end of the new cable into the equalizer (4) (Figure 6-18). Secure the cable to the vehicle frame with new E-clip. Route cable through hanger in the same manner as before.
2. At the rear wheel brake, connect the cable to the brake actuator arm using new clevis pin (2) and new cotter pin (1) (Figure 6-19).
3. Place the cable in the cable support bracket (5) and secure with new E-clip (3).
4. Adjust the brakes. See Brake Adjustment.

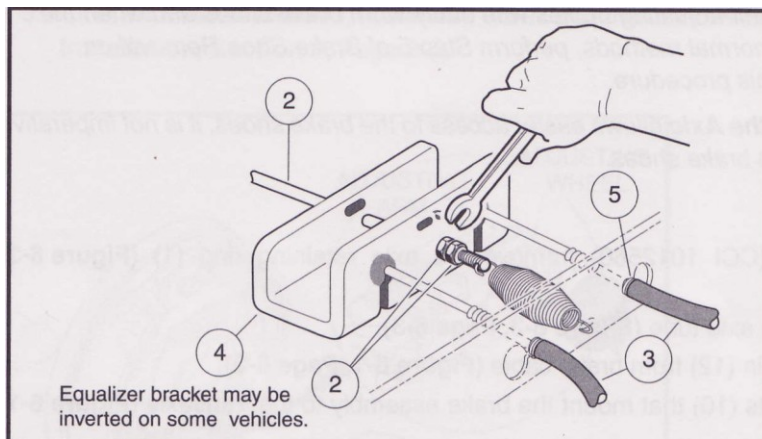


Figure 6-18

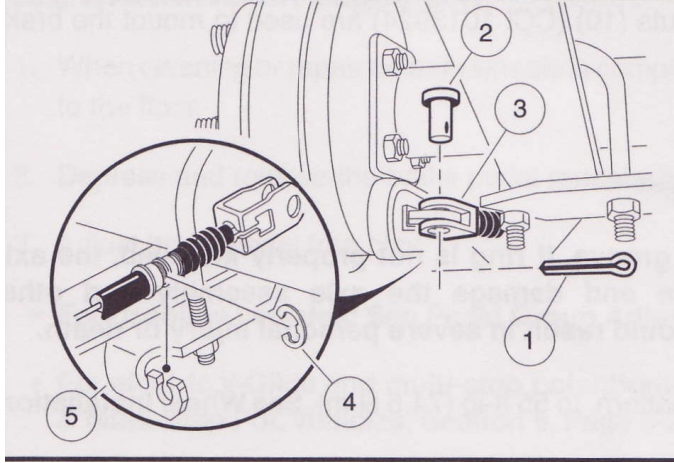


Figure 6-19

SECTION 7

STEERING AND FRONT SUSPENSION

WARNING!

Only trained technicians should repair or service the vehicle. Anyone doing even simple repairs or service should have knowledge and experience in electrical and mechanical repair.

Follow the procedures exactly as stated in this manual, and heed all **DANGER**, **WARNING**, and **CAUTION** statements in this manual as well as those affixed to the vehicle.

Improper use of the vehicle or failure to properly maintain it could result in decreased vehicle performance or severe personal injury.

Any modification or change to the vehicle that affects the stability or handling of the vehicle or increases maximum vehicle speed beyond factory specifications, could result in severe personal injury or death.

Check the vehicle owner's manual for proper location of all vehicle warning decals and make sure they are in place and are easy to read.

Wear safety glasses or approved eye protection when servicing the vehicle. Wear a full face shield and rubber gloves when working on or near batteries.

Do not wear loose clothing or jewelry such as rings, watches, chains, etc. when servicing vehicle.

Moving parts! Do not attempt to service the vehicle while it is running.

Hot! Do not attempt to service hot motor, resistors, engine, or exhaust system. Failure to heed this warning could result in severe burns.

Use insulated tools when working near batteries or electrical connections. Use extreme caution to avoid shorting of components or wiring.

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands of proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not performing a test or service procedure that requires movement of the wheels, lock the brakes.

Turn the key switch **OFF** and remove key, place Forward/Reverse handle or switch in the **NEUTRAL** position, and chock the wheels prior to servicing the vehicles.

To avoid unintentionally starting the vehicle, disconnect the batteries as shown (Figure 1-2, 1-3, or 1-4)

After disconnecting the batteries, discharge the controller capacitors as follows:

- Turn the key switch to **ON** and place the Forward/Reverse handle in the **REVERSE** position.
- Slowly depress the accelerator pedal and keep depressed until the reverse warning buzzer can no longer be heard. When the buzzer stops sounding, the controller capacitors are discharged.

GENERAL INFORMATION

Steering is controlled through a rack and pinion steering assembly that is connected by a steering column to a steering wheel. No manual adjustment to the rack and pinion gear assembly is required. A spring loaded self-adjusting mechanism is incorporated into the assembly.

STEERING WHEEL

Read WARNING at beginning of this section.

STEERING WHEEL REMOVAL

1. Disconnect batteries as instructed. See WARNING at beginning of section.
2. Remove the two mounting screws and plate.
3. Match mark the steering wheel and steering shaft so when the steering wheel is removed it can be place back in exactly the same position on steering column shaft.
4. Loosen the steering wheel nut and back it off approximately $\frac{1}{4}$ inch (6mm). Do not remove the nut.
5. Use the steering wheel puller to remove the steering wheel.
6. Place the puller anvil through the top opening of the steering wheel.
7. Insert the anvil feet through the two slots in the base plate (marked "B").
8. Rotate the anvil screw clockwise until the base plate contacts the bottom of the steering wheel where it attaches to the steering column.
9. Using $\frac{1}{2}$ inch drive air impact wrench, tighten the anvil screw until the steering wheel breaks free from the steering shaft.
10. Remove the steering wheel puller.
11. Remove the steering wheel nut and the steering wheel from the steering column.

STEERING WHEEL INSTALLATION

Note:

To minimize corrosion and to make future removal of the steering wheel easier, apply a small amount of oil or anti-seize compound to steering shaft splines and taper before installing the steering wheel.

1. Install the steering wheel on the splines of the steering shaft. Be sure to align the match marks placed on the wheel and steering column in step 3 above.
2. Install the steering wheel nut and tighten to 13 ft-lb (17.6 Nm).
3. Install the scorecard plate and plate mounting screws. Tighten screws to 16 in-lb (1.8 Nm).

STEERING COLUMN

Read **WARNING** at beginning of this section.

STEERING COLUMN REMOVAL

1. Disconnect batteries as instructed.
2. Remove the steering wheel as previously instructed.
3. Remove the front body as instructed in Section 4 – Body and Trim.
4. Remove the center dash panel.
5. Remove the plastic cap covering the mounting screw on each side of the center dash panel.
6. Loosen (but do not remove) the screw on each side of the center dash panel.
7. Insert screwdriver at the top center of the dash between dash and cowl brace. Gently pry center dash out slightly from under edge of cowl brace.
8. Pull center dash out approximately 1 inch (2.5cm) from the frame and then bend the top right corner of the center dash inward while pulling the top of the panel out and down.

Note:

Bending the top right corner of the center dash inward during removal will prevent the contacts on the back of the key switch from touching the metal frame around the dash.

9. Disconnect the wires from the electrical components mounted on the dash panel. Do not allow wires to touch.
10. Slide center dash panel up the steering column
11. Remove the driver side dash pocket.
12. Remove cup holder hardware and cup holder.
13. Remove the flange lock screw from the top of the dash pocket.
14. Drill out the two pop rivets holding the dash pocket in place.
15. Slide dash pocket out of vehicle.
16. Remove the upper bolt and lock washer from the universal joint.
17. Remove the nuts, bolts, and washers from the steering column mount.
18. Remove the steering column from the vehicle.

STEERING COLUMN DISASSEMBLY

1. Remove screws and mount from steering column. Remove boot.
2. While supporting steering column on a workbench, remove snap ring from shaft.

Note:

Do not allow the steering shaft to slide out of the steering tube when removing the snap ring.

3. Remove the washer, spring, and wedge.

Note:

Use a new seal, retaining rings and new bearings for reassembly.

4. Slide the shaft out of the tube to expose the retaining ring. Use pliers to twist the retaining ring until it breaks off, then remove the wedge
5. Remove the shaft from the bottom of the tube.
6. Use steering shaft to push bearing seat out from the opposite end of the steering tube.
7. Insert a flat blade screwdriver between the bottom of the outer race of the bearing and the bottom lip of the bearing seat and remove the bearing.

STEERING COLUMN ASSEMBLY

1. Insert bearing seat into both ends of steering tube. Place a block of wood on bearing seat and tap lightly on block until bearing seat is fully seated in steering tube.
2. Press the bearing all the way into the bearing seat using a steering column bearing press tool or a metal tube approximately six inches (15.2 cm) long with a maximum outer diameter of 1-3/16 inches (3.3 cm) and a minimum inside diameter of 7/8 in (2.2 cm). Be sure the bearing is installed in the bearing seat as shown (Figure 7-5) so the wedge (16) will ride against the inner race of the bearing.
3. Install the wedge (16), spring (15), washer (14), and snap ring (13) onto the bottom end of the steering shaft (19) (Figure 7-5).
4. Insert the shaft from the bottom of the steering tube.
5. Turn the assembly over and place the shaft (19) on a bench. Install the wedge (16) and retaining ring (22) onto the top of the shaft. Be sure the prongs on the retaining ring face up and away from the wedge. Use a steering column retaining ring tool to seat the remaining ring to the proper depth. Support end of tube while pressing. If you do not have the recommended tool, use the same tube as was used in step 2 to press the retaining ring onto the top of the shaft. The retaining ring should be pressed on the shaft until 2 to 2-1/8 inches (5.1-5.4 cm) of the shaft extends from the top of the bearing seat in the steering tube (Figure 7-5).

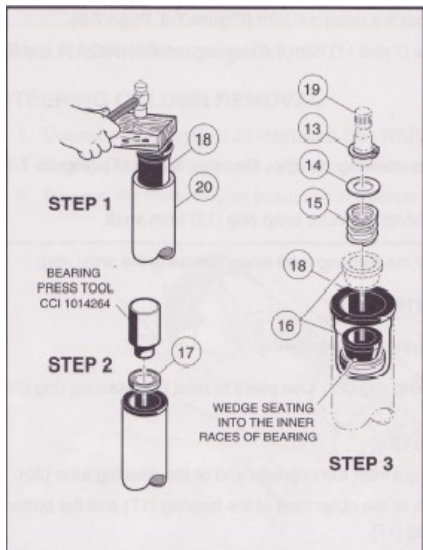


Figure 7-5 Steering Shaft Bottom End

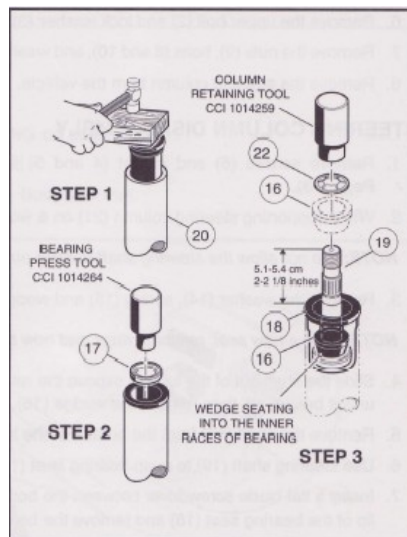


Figure 7-6 Steering Shaft Top End

STEERING COLUMN INSTALLATION

1. Install boot. Reinstall mount onto the end of the steering column. Tighten bolts to 20 ft-lb (27 Nm).
2. For ease of assembly and to prevent corrosion, apply a light coat of anti-seize or lubricating compound to both splined ends of the steering shaft.
3. Position the steering column assembly in the vehicle while inserting the steering column shaft into the upper universal joint. The flat portion of the steering shaft spline must be aligned with the bolt hole in the universal joint before sliding the spline into the universal joint. While holding the steering column in place, attach it to the frame using bolts, washers, and nuts. Thread the nuts onto the bolts but do not tighten them.
4. Reinstall washer and screw. Tighten to 20 ft-lb (27 Nm).
5. Install the bolt and lock washer on the upper universal joint and finger tighten.
6. Tighten the two nuts and bolts to 17 ft-lb (23 Nm)
7. Tighten the bolt on the upper universal joint to 15 ft-lb (20 Nm)
8. Check the other two bolts on the universal joint to ensure that they are properly tightened to 15 ft-lb (20 Nm).
9. Reinstall dash pocket and related hardware.
10. Reinstall center dash panel in reverse order of disassembly. Make sure the key switch terminals do not touch the frame and the center dash panel is properly seated and snapped into place.
11. Install front body and bumper. See Section 4 – Body and Trim.

STEERING ADJUSTMENT

Read **WARNING** at beginning of this section.

1. Turn the steering wheel all the way to the right. Note the distance between the passenger side spindle stop (2) and passenger side A-plate (3) (Figure 7-7). The internal stop on the rack must reach its limit of travel against rack and pinion housing at exactly the same time the spindle stops against the passenger side A-plate (with vehicle wheels turned to the right). If simultaneous contact occurs, steering is in correct adjustment; Proceed to Step 4. If simultaneous contact does not occur, proceed to Step 2.
2. Loosen the nuts (27 and 29) and turn the drag link (28) (Figure 7-12) to adjust the drag link rod. Adjust the link rod with the steering wheel turned all the way to the right, so the passenger side spindle stop lightly touches the passenger side A-plate. The internal stop on the rack must reach its limit of travel at the same time the spindle stops against the passenger side A-plate (with vehicle wheels turned to the right). See following CAUTION.

CAUTION!

The drag link has both left and right-hand threads. The end of the drag link toward the spindle has left-hand threads, and the end toward the rack has right-hand threads. To prevent damage to threaded parts, care should be taken when servicing the drag link.

3. When all adjustments have been completed, tighten the nuts (27 and 29) on the drag link assembly with an open end wrench. Tighten nuts to 21 ft-lb (28.4 Nm) (Figure 7-12).

CAUTION!

When tightening the nuts (27 and 29), make sure the drag link (28) does not turn (Figure 7-12).

4. Straighten wheels and then turn steering wheel from lock to lock. Wheels should turn smoothly and easily. If steering wheel does not turn smoothly and easily, inspect steering assemblies; e.g. ball joints (23) (Figure 7-12) and (6 and 13) (Figure 7-20), spindle bushings (3 and 4) (Figure 7-21), wave washers (20) (Figure 7-21), and rack assembly (17) (Figure 7-12). Also inspect front suspension assemblies; e.g., A-plates (1) (Figure 7-20) urethane bushings (2) (Figure 7-20) and leaf springs (6) (Figure 7-21). Replace components as necessary.

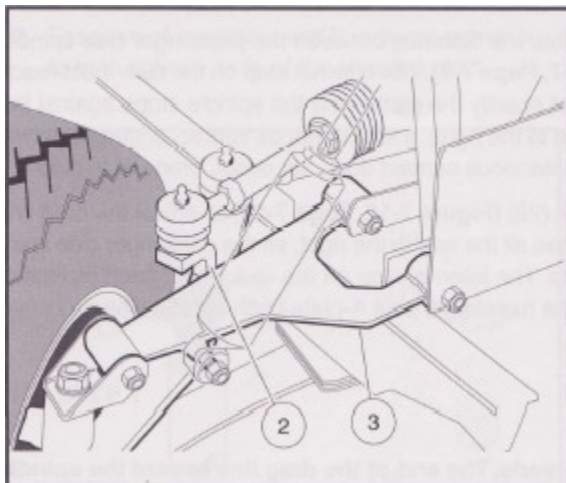


Figure 7-7 Adjusting Steering Alignment

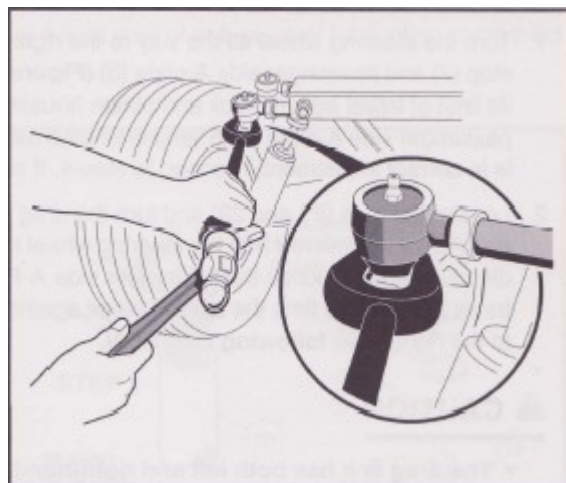


Figure 7-8 Ball Joint Tool

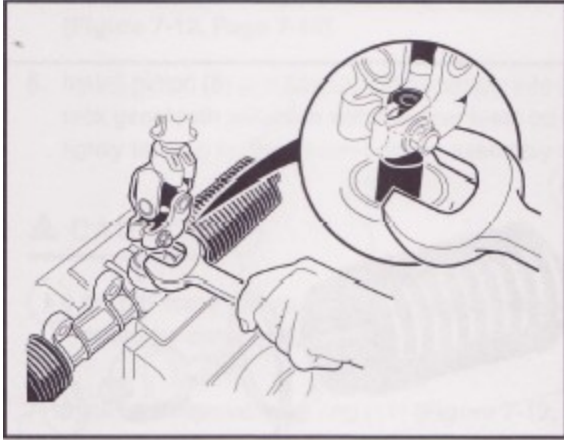


Figure 7-9 Remove Pinion from Housing

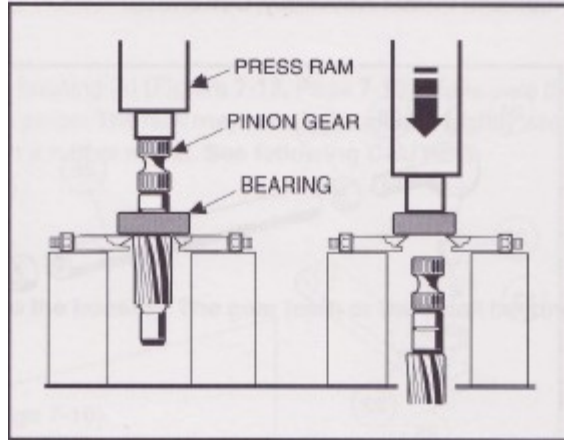


Figure 7-10 Remove Bearing from Pinion

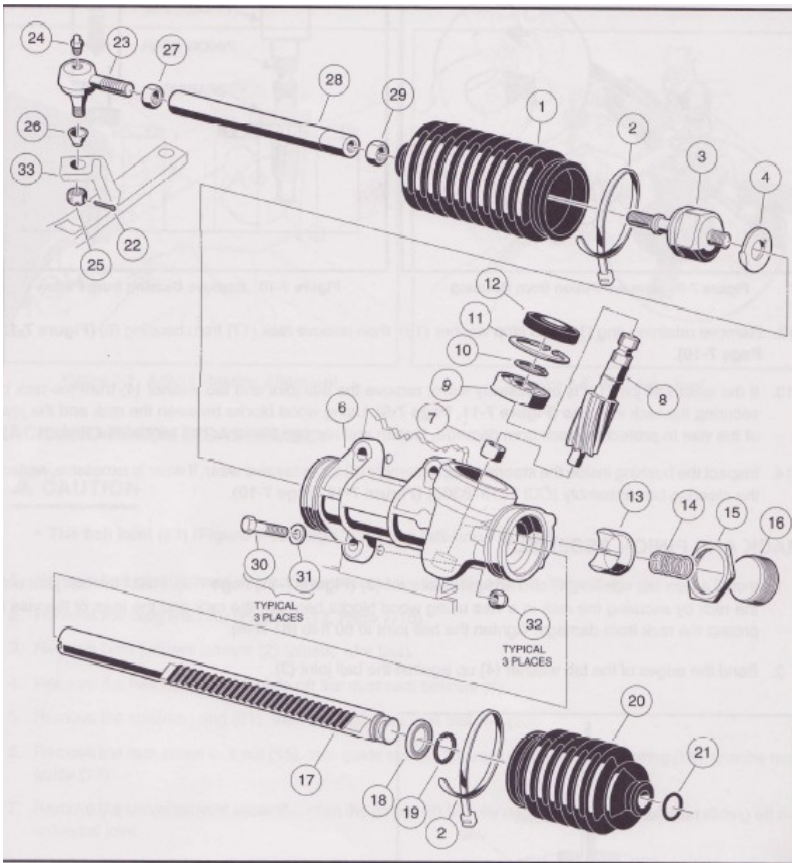


Figure 7-12 Steering Gear

RACK AND PINION

Read **WARNING** at beginning of this section.

RACK AND PINION REMOVAL

1. Remove the front body as instructed in Section 4.
2. Remove the cotter pin (22) and ball joint retaining nut (25) (Figure 7-12).
3. Using a ball joint removal tool, remove the ball joint (23) (Figure 7-12) from the spindle assembly. See Figure 7-8.
4. Remove the bolts (30), washers (31), and lock nuts (32) from the steering rack assembly mounting bracket (Figure 7-12).
5. Remove the bolt and washer on the upper universal joint, and then remove the rack assembly and universal joint from the vehicle.

RACK AND PINION DISASSEMBLY

CAUTION!

The ball joint (23) (Figure 7-12) has left-hand threads).

1. Remove ball joint (23) and inspect it for excessive wear (Figure 7-8).
2. Remove the drag link (28) (Figure 7-12).
3. Remove both bellows clamps (2) (plastic wire ties).
4. Remove the hex nut (29) and slide off the dust seal bellows (20).
5. Remove the retaining ring (21), and then slide off dust seal bellows (20).
6. Remove the rack screw lock nut (15), rack guide screw (16), rack guide pressure spring (14), and the rack universal joint.
7. Remove the universal joint assembly from the pinion (8) by fully removing the bolt and then sliding off the universal joint.
8. If necessary, remove the dust seal (12). See following Note.

Note:

If the dust seal (12) is removed, replace with a new one (Figure 7-12).

9. Using snap ring pliers remove the internal snap ring (11) (Figure 7-12).
10. Install the universal joint to the pinion and place a large open end wrench under the universal joint (Figure 7-9). Use the wrench as a lever to pull the pinion from the housing.
11. If the ball bearing (9) has been damaged, remove the external snap ring (10) (Figure 7-12) and press the bearing off (Figure 7-10).
12. Remove the retaining ring (19) and stop washer (18), then remove rack (17) from housing (6) (Figure 7-12).
13. If the inner ball joint (3) is excessively worn, remove the ball joint and tab washer (4) from the rack by securing the rack in a vise (Figure 7-11). Using wood blocks between the rack and the jaws of the vise to protect the rack from damage loosen and remove the inner ball joint with a wrench.
14. Inspect the bushing inside the steering box assembly (6) for excessive wear. If wear is excessive, replace the steering assembly (Figure 7-12).

RACK AND PINION ASSEMBLY

1. Install a new tab washer (4) and an inner ball joint (3) (Figure 7-11). Install the ball joint onto the rack by securing the rack in a vise using wood blocks between the rack and the jaws of the vise to protect the rack from damage. Tighten the ball joint to 60 ft-lb (81 Nm).

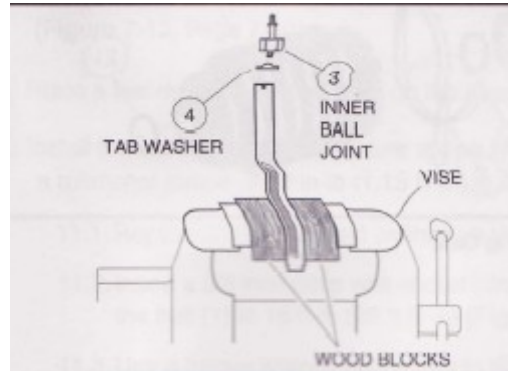


Figure 7-11 Secure Rack in Vise

2. Bend the edges of the tab washer (4) up against the ball joint (3).
3. Apply a liberal amount of EP grease to the teeth of the rack (17), then slide the rack through the housing (6). Install the stop washer (18) and retaining ring (19) to the end of the rack (Figure 7-12).

CAUTION!

In Step 4, do not pass against the outer race of the bearing.

4. If the bearing (9) was removed, press on a new bearing, exerting all pressure on the inner race (grease the bearing before installing it). Then install the external snap ring (10) (Figure 7-12).
5. If the needle bearing (7) is damaged, the steering box assembly must be replaced (Figure 7-12).
6. Install pinion (8) and bearing (9) assembly into the housing (6) (Figure 7-12). Make sure the rack gear teeth will mesh with the gear teeth on the pinion. The rack may need to be rotated slightly while lightly tapping on the pinion-bearing assembly with a rubber mallet. See following CAUTION.

CAUTION!

Do not force the pinion-bearing assembly into the housing. The gear teeth or the small bearing could be damaged.

7. Install the internal snap ring (11) (Figure 7-12).
8. Using a socket to apply pressure evenly, press in a new dust seal (Figure 7-13).

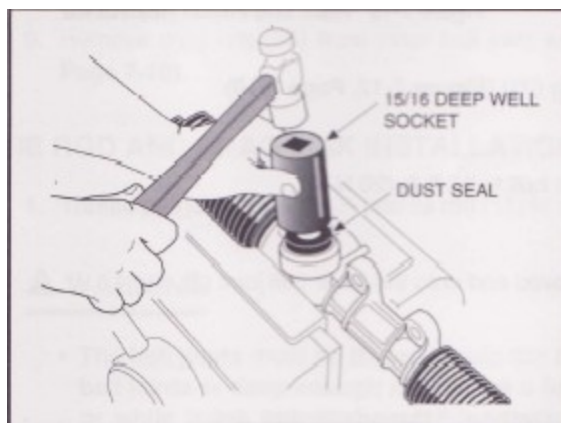


Figure 7-13 Press in Dust Seal

9. Apply a small amount of grease to the rack guide (13) where it comes into contact with the rack (17) (Figure 7-12).
10. Place a few drops of Loctite® 222 on the threads of the screw (16) (Figure 7-12).
11. Install the rack guide (13), pressure spring (14), and screw (16). The screw should be threaded in until a rotational torque of 10 in-lb (1.13 Nm) is achieved (Figure 7-12).
 Reposition the rack and pinion in a vise.
 Insert a 3/8 inch deep well socket into the steering column end of the universal joint (2) and tighten the bolt (1) to 15 ft-lb (20.3 Nm) (Figure 7-15).
 Use a torque wrench connected to the 3/8 inch deep well socket to measure the resistance of the rack and pinion. Rotational resistance should measure 7 to 15 in-lb (.8 to 1.7 Nm).
 If measured resistance does not equal 7 to 15 in-lb, loosen the lock nut (15) and tighten the screw (16) until it bottoms out, then back the screw off one quarter turn.
 Tighten the lock nut to 28 ft-lb (38 Nm) (Figure 7-14).

Note:

When tightening the lock nut (15), make sure the screw (16) does not change adjustment (Figure 7-14).

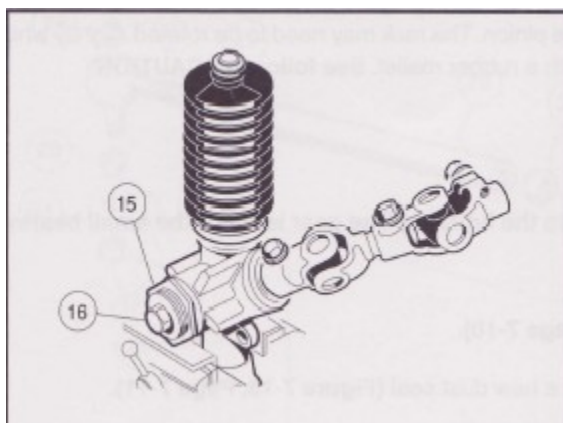


Figure 7-14 Rack and Pinion Adjustment

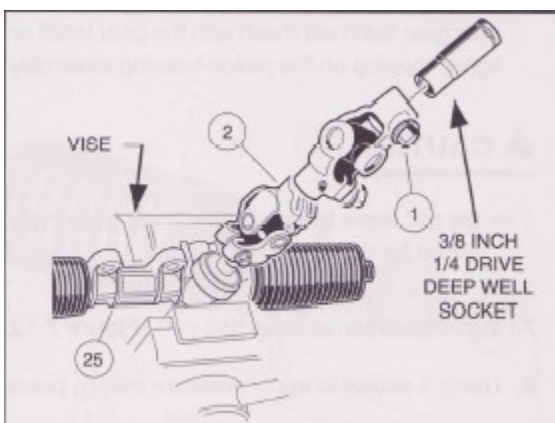


Figure 7-15 Rack and Pinion Resistance

12. Install the dust seal bellows (20) and retaining ring (21) (Figure 7-12).
13. Install the dust seal bellows (1) and hex nut (29).

14. Install the universal joint on the pinion. Tighten the bolt to 15 ft-lb (20 Nm).
15. Install new bellows clamps (wire ties) (2).
16. Install the drag link (28) by fully threading the grooved end onto the inner ball joint (3).

CAUTION!

The ball joint (23) (Figure 7-12) has left hand threads. The tie rod and drag link have right-hand threads on one end and left-hand threads on the other end. Right-hand threads are identified by a groove in the tie rod or drag link.

17. Install the ball joint (23). See preceding CAUTION.
18. Adjust the steering. See Steering Adjustment.

RACK AND PINION INSTALLATION

1. Position the steering gear box assembly on the shock and gear support and install the bolts (30), washers (31), and nuts (32). Do not tighten the mounting bolts (Figure 7-12).
2. For ease of assembly and to prevent corrosion, apply a light coat of anti-seize and lubricating compound to the splined end of the steering column shaft.
3. Align the flat portion of the steering shaft spline with the bolt hole in the universal joint and then slide the shaft into the upper universal joint. Install the bolt and lock washer on the upper universal joint and tighten to 15 ft-lb (20 Nm).
4. Tighten the steering rack mounting bolts (30) to 22 ft-lb (29.8 Nm) (Figure 7-12).
5. Adjust the steering. See Steering Adjustment.

TIE ROD AND DRAG LINK

Read **WARNING** at beginning of section.

TIE ROD AND DRAG LINK REMOVAL

1. Using locking pliers to hold tie rod and drag link, loosen jam nuts (7 and 12) on the tie rod ball joints (Figure 7-20), and loosen jam nuts (27 and 29) on the drag link (Figure 7-12).
2. Remove the cotter pin (22) and ball joint retaining nut (25) (Figure 7-12).
3. Remove the cotter pins (21) and ball joint retaining nuts (20) (Figure 7-21).
4. Use a ball joint removal tool to remove ball joints (13 and 6) (Figure 7-20) and (23) (Figure 7-12) from the spindles.
5. Remove the ball joints from the tie rod (11) (Figure 7-20).
6. Remove the drag link (28) from the inner ball joint assembly (3) and drag link ball joint (23) (Figure 7-12).

TIE ROD AND DRAG LINK INSTALLATION

1. Thread ball joints (6 and 13) into tie rod (11) to a depth of $\frac{1}{2}$ inch (12.5 mm) (Figure 7-20)

WARNING!

The ball joints must be threaded into the rod at least $\frac{5}{16}$ of an inch (8 mm). Failure to thread ball joints in deep enough may cause a ball joint to separate from the rod during adjustment or while being operated, possibly resulting in loss of vehicle control and severe personal injury.

CAUTION!

The tie rod and drag link have right-hand threads on one end and left-hand threads on the other end. Right-hand threads are identified by a groove in the tie rod or drag link.

2. Install ball joint ends (6 and 13) into the left and right-hand spindle arms (23), then install the retaining nuts (20) and cotter pins (22) (Figure 7-20).
3. Thread the drag link rod (28) all the way onto the threaded stud of the inner ball joint assembly (3) (right-hand threads) (Figure 7-12).
4. Thread the ball joint (23) into the drag link rod (28) (left-hand threads) to full thread depth (Figure 7-12).
5. Install the ball joint (23) on the spindle arm riser (33), then install the retaining nut (25) and a new cotter pin (22) (Figure 7-12). Tighten nut to 18 ft-lb (24.4 Nm), then install cotter pin.
6. Adjust wheel toe-in and steering.

FRONT SUSPENSION

Read **WARNING** at beginning of this section.

LUBRICATION

Five grease fittings are provided (one in each spindle housing, one in the ball joint on each end of the tie rod, and one in the ball joint of the steering drag link). Lubricate these fittings at the recommended interval with the proper lubricant.

CAUTION!

To ensure proper lubrication of the front suspension and steering linkages, raise front of vehicle to lubricate.

WHEEL ALIGNMENT

Wheel alignment is limited to equalizing the camber angle of each front wheel and adjusting toe-in of the front wheels. There is also a drag link adjustment to equalize the turning radius in both directions. See Steering Adjustment.

Note:

Prior to making any front suspension adjustments, inspect components for wear or damage and repair or replace as necessary.

Camber Adjustment

1. Check each front wheel with a framing square. At the floor (or ground), there should be an equal amount of space between each tire and the framing square (Figure 7-16).
2. Loosen (do not remove) the four bolts (30) that secure the leaf spring (6) to the bottom spring plate (29) (Figure 7-21).
3. Loosen (do not remove) the hex nut (8) on the adjustment eccentric adjuster (7) (Figure 7-17) in the center of the spring.
4. Use a 7mm deep well socket to rotate the eccentric (Figure 7-17).
5. After adjusting camber, tighten the four spring retaining bolts (30) (Figure 7-21) to 23 ft-lb (31 Nm). Then roll the vehicle forward one full tire revolution and recheck the camber.
6. Tighten the hex nut (8) on the adjustment eccentric (7) to 10 ft-lb (13.5 Nm) (Figure 7-21).

Toe-in Adjustment

1. On a level surface, roll the vehicle forward, and then stop. Make sure the front wheels are pointed straight ahead. Do not turn the steering wheel again during this procedure.
2. On each front tire, mark (as closely as possible) the center of the tread face that is oriented toward the rear of the vehicle. The marks should be even with the bottom surfaces of the vehicle frame I-beams.
3. Measure the distance between the marks on the rear-facing surfaces of the tires, and then roll the vehicle forward one and one-half wheel revolutions until the marks appear on the forward facing surfaces of the tires at about the same height from the floor (Figure 7-18).
4. Measure the distance between the marks on the forward-facing surfaces of the tires (Figure 7-18).

Note:

The front measurement must be less than the rear measurement.

5. Subtract the measurement on the front of the tires from the measurement on the rear of the tires. The difference is the toe-in. Proper toe-in is 1/8 to 3/8 of an inch (3.2 to 9.5 mm).
6. If adjustment is necessary, loosen the jam nut on each tie rod ball joint and rotate the tie rod to increase or decrease toe-in (Figure 7-19).

CAUTION!

The tie rod has right-hand threads on one end and left-hand threads on the other end. Right-hand threads are identified by a groove in the tie rod.

7. Tighten nuts (loosened in Step 6) to 21 ft-lb (28 Nm) and recheck toe-in.
8. After toe-in adjustment is made and with wheels in the straight ahead position, the steering wheel should be at the center of its travel. There should be equal travel to the left and right.

Note:

If the minimum turning radius is not the same for both left and right turns, adjust the steering. See Steering Adjustment.

FRONT SUSPENSION COMPONENTS

Read **WARNING** at beginning of this section.

TAPERED LEAF SPRING REMOVAL

1. Loosen lug nuts on both front wheels and raise front of vehicle with a chain hoist or floor jack. Place jack stands under the front cross tube of the vehicle frame and lower the vehicle onto the jack stands.
2. Remove both front wheels.
3. Remove the nuts (14) and bolts (25) from the bottom of each king pin (26) (Figure 7-21).
4. Remove the four bolts (30), four nuts (32), four lock washers (31), and bottom spring plate (29).
5. Remove tapered leaf spring (6).
6. Check the condition of the urethane bushings (27) and steel sleeves (28). Replace any that are worn or damaged.

KINGPIN AND STEERING SPINDLE REMOVAL

1. Remove the front hub. See Front Wheel Bearings and Hubs.
2. Remove cotter pins (22) and nuts (20), and then remove ball joints from the spindles (Figure 7-20). Remove drag link ball joint. See also Tie Rod and Drag Link Removal.
3. Remove the nut (17) and lock washer (if present) from the top of the king pin (26) (Figure 7-21).
4. Raise the upper clevis (16) from the kingpin (Figure 7-21).
5. Remove the thrust washer (19).
6. Slide the spindle off the king pin (26).
7. Remove the wave washer (20) and inspect it. If the washer is broken or has a wave bottom to wave crest height dimension of less than .040 inch (.10 cm), it must be replaced.
8. Remove bolt (25) and nut (14) from bottom of king pin (26) and remove kingpin.
9. Inspect the kingpin and spindle. If either is worn or damaged, it must be replaced.
10. Inspect the bushings (3 and 4). If the bushings are worn or damaged, remove them and press in new ones. See following Note.

Note:

If the bushings are replaced, ream new bushings to .750-.752 (3/4 inch) (19.05-19.10 mm) in diameter. The reamer should be long enough to ream both bushings from one direction.

KINGPIN AND STEERING SPINDLE INSTALLATION

1. Inspect all parts and replace them as necessary.
2. Install the king pin (26) over the leaf spring eye. Insert the bolt (25) and install the nut (14) (Figure 7-21). Tighten the bolt to 17 ft-lb (23 Nm).
3. Install the wave washer (20) on the king pin.
4. Install the steering spindle on the king pin. Then install the thrust washer (19), upper plate clevis (16), and nut (17). If lock washer was present, do not reinstall. Tighten the nut to 40 ft-lb (54.2 Nm) (Figure 7-21).
5. Attach the ball joints (6 and 13) to the spindle arm (23), install and tighten the nut (20), and install the cotter pin (22) (Figure 7-20).
6. Install the drag link ball joint. See Tie Rod and Drag Link Installation.
7. Install front hub and wheel. See Front Wheel Bearings and Hub Installation.

DELTA A-PLATE REMOVAL

1. Loosen lug nuts on both front wheels and raise front of the vehicle with a chain hoist or floor jack. Place jack stands under the front cross tube of the vehicle frame and lower the vehicle onto the jack stands.
2. Remove wheel.
3. Remove bolts (10 and 24), A-plate straps (14), and nuts (5) (Figure 7-20).
4. Remove the lower shock absorber mounting nut (9), then slide the shock absorber free of the Delta A-Plate.
5. Remove the Delta A-Plate (1).
6. Inspect the bushings (2) and sleeves (3 and 4) in the Delta A-Plate and replace them if necessary.

DELTA A-PLATE INSTALLATION

1. Install the A-Plate in reverse order of removal. Tighten the A-plate suspension bolts (10 and 24) to 20 ft-lb (27 Nm) (Figure 7-20).
2. Tighten shock absorber mounting nut (9) to 20 ft-lb (27.1 Nm).
3. Install the wheels and adjust the wheel alignment as instructed.

SHOCK ABSORBER REMOVAL

1. Inspect the shock absorbers for fluid leakage at the point where the shaft enters the shock absorber body. Leaking shock absorbers should be replaced.
2. Remove the nut (9) attaching the shock absorber to the A-Plate (Figure 7-20).
3. Remove the nut (9) and bolt (8) attaching the shock absorber to the shock and gear support.
4. Remove the shock absorber.

SHOCK ABSORBER INSTALLATION

Note:

When installing shock absorbers make sure front shocks have identical part numbers and rear shocks have identical part numbers.

1. Install the shock absorber by reversing the removal procedure.
2. Tighten the nuts to 20 ft-lb (27 Nm).

SECTION 8 – WHEELS AND TIRES

WARNING!

Only trained technicians should repair or service the vehicle. Anyone doing even simple repairs or service should have knowledge and experience in electrical and mechanical repair.

Follow the procedures exactly as stated in this manual, and heed all DANGER, WARNING, and CAUTION statements in this manual as well as those affixed to the vehicle.

Improper use of the vehicle or failure to properly maintain it could result in decreased vehicle performance or severe personal injury.

Any modification or change to the vehicle that affects the stability or handling of the vehicle or increases maximum vehicle speed beyond factory specifications, could result in severe personal injury or death.

Check the vehicle owner's manual for proper location of all vehicle warning decals and make sure they are in place and are easy to read.

Wear safety glasses or approved eye protection when servicing the vehicle. Wear a full face shield and rubber gloves when working on or near batteries.

Do not wear loose clothing or jewelry such as rings, watches, chains, etc. when servicing vehicle.

Moving parts! Do not attempt to service the vehicle while it is running.

Hot! Do not attempt to service hot motor, resistors, engine, or exhaust system. Failure to heed this warning could result in severe burns.

Use insulated tools when working near batteries or electrical connections. Use extreme caution to avoid shorting of components or wiring.

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands of proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not performing a test or service procedure that requires movement of the wheels, lock the brakes.

Turn the key switch OFF and remove key, place Forward/Reverse handle or switch in the NEUTRAL position, and chock the wheels prior to servicing the vehicles.

To avoid unintentionally starting the vehicle, disconnect the batteries as shown (Figure 1-1)

After disconnecting the batteries, discharge the controller capacitors as follows:
-Turn the key switch to ON and place the Forward/Reverse handle in the REVERSE position.
-Slowly depress the accelerator pedal and keep depressed until the reverse warning buzzer can no longer be heard. When the buzzer stops sounding, the controller capacitors are discharged.

GENERAL INFORMATION

Maximum tire life and good vehicle handling qualities are directly related to proper wheel and tire care.

- Keep tires properly inflated.
- Keep lug nuts properly torqued
- Keep the front end aligned and adjusted.

WHEELS

Read WARNING at beginning of section.

WHEEL REMOVAL

1. Slightly loosen the lug nuts on the wheel to be removed.
2. Raise the end of the vehicle from which the wheel is to be removed. Make sure that the wheels are off the ground.
3. Remove the lug nuts and remove the wheel.

WHEEL INSTALLATION

1. Install wheel(s), and tighten the lug nuts (using a crisscross pattern) until they are snug.
2. Lower the vehicle and finish tightening lug nuts (using a crisscross pattern) to 55 ft-lb (74.6 Nm).

TIRES

Read WARNING at beginning of section.

TIRE REMOVAL

Note:

Tire must be removed or installed from the valve stem side of the rim.

1. Remove the tire and wheel assembly from the vehicle as instructed above.
2. Remove the valve cap and valve core and allow air to escape from the tire.
3. If possible, use a tire machine to remove the tire from the rim.
 - a. If a tire machine is not available, loosen both tire beads by applying pressure to the tire side walls and pushing the tire bead away from the rim flange and into the rim well (Figure 8-1, Detail A).
 - b. With the valve stem side of the wheel up, use a tire tool to carefully start the upper bead over the edge of the wheel rim (Figure 8-1, Detail B).

CAUTION!

To avoid damage to the tire, do not use excessive force when starting the bead over the edge of the rim.

4. When top bead is free of the rim, pull the bead from the bottom side of the rim up into the upper part of the rim well. Insert the tire tool under the lower bead as shown (Figure 8-1, Detail C) and carefully pry the lower bead over the rim flange.
5. Once the lower bead is started over the rim, the tire can be removed from the rim by hand.

TIRE REPAIR

1. Determine the location and cause of the air leak.
 - 1.1 Remove the wheel. See Wheel Removal. Inflate the tire to no more than 20 psi (1.38 Bars).
 - 1.2 Immerse the tire in water and then mark the point where bubbles are formed by escaping air.
 - 1.3 Determine the cause of the air leak. See following Note:

Note:

An air leak could be due to a punctured casing, faulty valve core, improperly seated valve stem, or improperly seated tire bead.

Small holes in the casing can be plugged using a standard automotive tubeless tire repair kit available at auto supply stores.

2. When the cause of the air leak has been determined, remove tire from the rim and repair as required. See Tire Removal.

TIRE INSTALLATION

WARNING!

While mounting or inflating tire, keep hands, fingers, etc. from exposed areas between the tire bead and rim.

1. Clean both tire beads to remove dirt or other foreign matter.
2. Where the tire beads seat, clean the wheel rim with a wire brush. Wipe away any debris with a clean cloth.

Note:

Because tubeless tires require a perfect seal in order to seat, keeping the tire and rim clean is very important.

3. Apply a liberal amount of tire-mounting lubricant (soap and water solution) to both tire beads and rim flanges.
4. Install the tire on the rim from the valve stem side. If there is no tire machine available, use a rubber mallet and tire iron.
5. Remove the valve core, and position tire so that both beads are on the rim flange narrow bead seats.
6. Place tire and wheel assembly against wall in upright position and push it against wall while inflating tire to 30-35 psi (2.07-2.42 Bars). The three-point contact (wall, floor, and hand) will help ensure that beads snap into place and form a proper seal as tire is inflated (Figure 8-2). See following.
7. Quickly remove the air nozzle and install the valve core.
8. Adjust air pressure in tire to recommended pressure.
9. Immerse the wheel and tire assembly in water to make sure there no leaks.

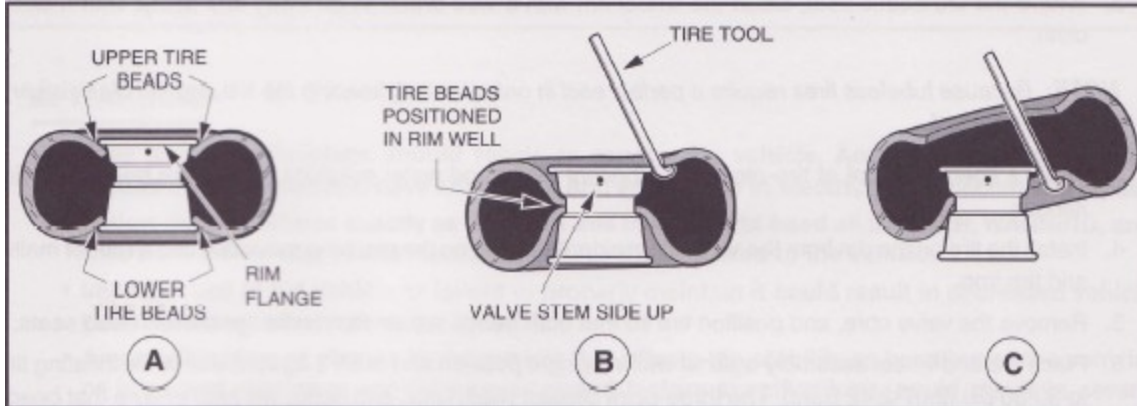


Figure 8-1

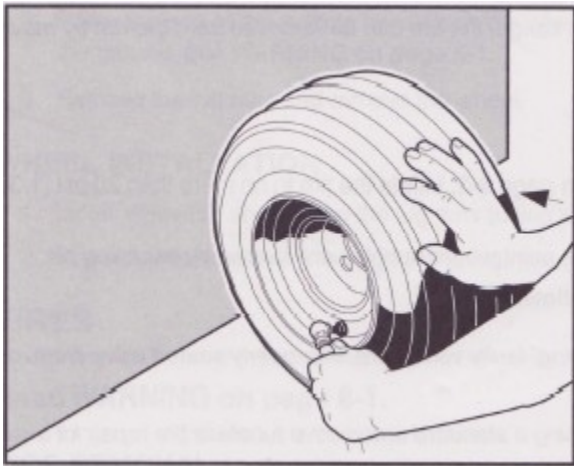


Figure 8-2

SECTION 9 – REAR SUSPENSION

WARNING!

Only trained technicians should repair or service the vehicle. Anyone doing even simple repairs or service should have knowledge and experience in electrical and mechanical repair.

Follow the procedures exactly as stated in this manual, and heed all DANGER, WARNING, and CAUTION statements in this manual as well as those affixed to the vehicle.

Improper use of the vehicle or failure to properly maintain it could result in decreased vehicle performance or severe personal injury.

Any modification or change to the vehicle that affects the stability or handling of the vehicle or increases maximum vehicle speed beyond factory specifications, could result in severe personal injury or death.

Check the vehicle owner's manual for proper location of all vehicle warning decals and make sure they are in place and are easy to read.

Wear safety glasses or approved eye protection when servicing the vehicle. Wear a full face shield and rubber gloves when working on or near batteries.

Do not wear loose clothing or jewelry such as rings, watches, chains, etc. when servicing vehicle.

Moving parts! Do not attempt to service the vehicle while it is running.

Hot! Do not attempt to service hot motor, resistors, engine, or exhaust system. Failure to heed this warning could result in severe burns.

Use insulated tools when working near batteries or electrical connections. Use extreme caution to avoid shorting of components or wiring.

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands of proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not performing a test or service procedure that requires movement of the wheels, lock the brakes.

Turn the key switch OFF and remove key, place Forward/Reverse handle or switch in the NEUTRAL position, and chock the wheels prior to servicing the vehicles.

To avoid unintentionally starting the vehicle, disconnect the batteries as shown (Figure 1-1)

After disconnecting the batteries, discharge the controller capacitors as follows:

- Turn the key switch to ON and place the Forward/Reverse handle in the REVERSE position.
- Slowly depress the accelerator pedal and keep depressed until the reverse warning buzzer can no longer be heard. When the buzzer stops sounding, the controller capacitors are discharged.

GENERAL INFORMATION

The rear suspension of the DS vehicle is completely independent. It consists of two leaf springs controlled by two shock absorbers mounted between the springs and the vehicle frame.

SHOCK ABSORBERS

Read WARNING at beginning of this section

SHOCK ABSORBERS REMOVAL AND INSPECTION

1. Check shock absorbers (7) for damage or fluid leakage the point where the shaft enters the shock absorber body. Replace damaged or leaking shock absorbers (Figure 9-1).
2. To remove a shock absorber, remove the nut (5), cup washer (9) and rubber bushing (10) from the stem at the top of the shock absorber.
3. Remove the nut (5), cup washer (9), and rubber bushing (10) from lower mounting stem.
4. Compress the shock absorber to remove it.

SHOCK ABSORBER INSTALLATION

1. To install, reverse the removal procedure.
2. On the upper and lower shock absorber mounting stems, tighten the nuts until the rubber bushing expands to the size of the cup washer.

LEAF SPRINGS

Read **WARNING** at beginning of this section.

LEAF SPRING REMOVAL

1. Loosen, but do not remove lug nuts on tire and wheel assembly on the side from which the spring is to be removed. Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or floor jack. Position jack stands under the frame cross member between the spring mount and the side stringer, just forward of each rear wheel. Lower the vehicle to let the jack stands support the vehicle (Figure 9-2). See following **WARNING**.

WARNING!

Lift only one end of the vehicle at a time. Use a suitable lifting device (chain hoist or hydraulic floor jack) with 1000 lb. (454kg) minimum lifting capacity. Do not use lifting device to hold vehicle in raised position. Use approved jack stands of proper weight capacity to support the vehicle and chock the wheels that remain on the floor. When not performing a test or service procedure that requires movement of the wheels, lock the brakes.

2. Place a floor jack under the transaxle differential casing to support (but not lift) the drivetrain. Raise it just enough to relieve tension on the shock absorbers without compressing them.
3. Remove the tire and wheel assembly on the side from which the spring is to be removed.
4. Remove the cotter pin (1) and the clevis pin (2) at the brake lever and brake cable connection and pull the clevis (3) away from the lever (Figure 9-3). Detach the brake cable from the shock mount bracket.
5. Remove the nut (5), cup washer (9), and rubber bushing (10) from the lower mounting stem of the shock absorber.
6. Remove the nuts (14) and the U-bolt (11) securing the spring to the transaxle. Remove the shock mount bracket (16) and the U-bolt.
7. Remove the bolt (15) and nut (2) attaching the rear spring to the shackle (1).
8. Remove the nut (2) and bolt (15) attaching the front of the spring to the vehicle frame and remove the spring.
9. Inspect the bushings (4) and spacers (3) in the spring eyes and replace them if they are worn or damaged.

LEAF SPRING INSTALLATION

1. To install the springs, reverse the removal procedure. See the following **CAUTION**.

CAUTION!

When positioning the spring on the transaxle, be sure to insert the locating bolt on the spring in the locating hole in the transaxle saddle.

2. Tighten the nuts on the U-bolts to 35 ft-lb (46.5 Nm).
3. Tighten nylon lock nuts on spring mounting bolts (15) to 27 ft-lb (36.6 Nm)

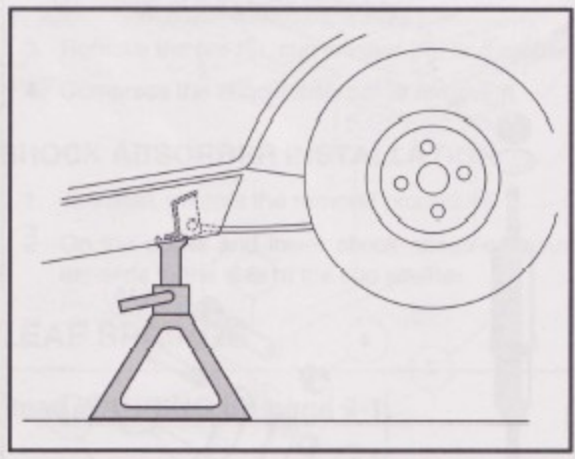


Figure 9-2

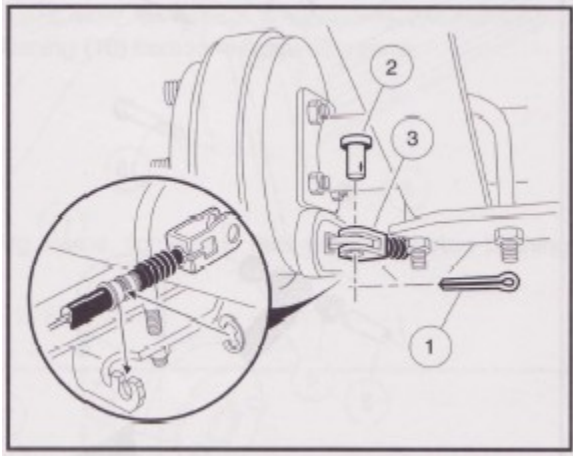


Figure 9-3



2009 ACG California Roadster NEV

Manufactured by:

American Custom Golf Cars, Inc. (ACG)

**15740 El Prado Rd.
Chino, CA 91710 USA
(909) 597-2885
(909) 597-7183 fax**

www.californiaroadster.com

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