E-Z-GO TEXTRON

# X–440, X–444 ELECTRIC POWERED GOLF CAR

# OWNER'S OPERATION AND SERVICE MANUAL


MODEL YEARS 1988/1989 MANUAL NO. 24039–G1 ISSUED 4/01/88

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# ELECTRIC POWERED GOLF CAR X-440, X-444

**MODEL YEARS 1988/1989**

MANUAL NO. 24039-G1 ISSUED 4/01/88

E-Z-GO DIVISION OF TEXTRON, INC., P.O. BOX 388, AUGUSTA, GEORGIA 30913-2699

**TO OBTAIN A COPY OF THE LIMITED WARRANTY THAT IS APPLICABLE TO YOUR VEHICLE, CALL OR WRITE YOUR LOCAL DISTRIBUTOR, BRANCH, OR E-Z-GO WARRANTY DEPARTMENT.**

**NOTE**

**The use of NON E-Z-GO parts may void your warranty.**

# OPERATION AND SERVICE MANUAL

## SECTION TITLE: INTRODUCTION

This Operation and Service Manual has been designed to enable you to maintain the vehicle in accordance with procedures developed by E-Z-GO. Adherence to these procedures and trouble-shooting tips will ensure you of the best possible service from the product.

This manual is divided into individually numbered sections.

Please note that Sections I, O and Q are not used.

Certain illustrations and text may describe options or features that your vehicle is not equipped with; disregard these areas.

Throughout this manual you will find **NOTE, CAUTION,** and **WARNING** used. For the protection of all personnel and the vehicle, please observe the following:

**NOTE:** Indicates a condition that should be observed.

**CAUTION:** INDICATES A CONDITION THAT MAY RESULT IN DAMAGE TO VEHICLE.

**WARNING:** **INDICATES A CONDITION THAT MAY BE HAZARDOUS TO PERSONNEL AND MAY RESULT IN DAMAGE TO THE VEHICLE.**

To reduce the chance of personal injury and/or property damage, the following instructions must be carefully observed:

Proper service repair and maintenance are important to the safety of the service technician and the safe, reliable operation of all vehicles. If part replacement is necessary, the part must be replaced with the specified replacement part. Do not use a replacement part of lesser quality.

The procedures recommended and described in this manual are effective methods of performing service, repair, and maintenance. Some of these procedures require the use of tools specially designed for the purpose.

Accordingly, anyone who intends to use a replacement part, service procedure or tool, which is not recommended by the vehicle manufacturer, must first determine that neither his safety nor the safe operation of the vehicle will be jeopardized by the replacement part, service procedure or tool selected.

It is important to note that this manual contains various **NOTES, CAUTIONS,** and **WARNINGS** that must be carefully observed in order to reduce the risk of personal injury during service or repair, or the possibility that improper service or repair may damage the vehicle or render it unsafe.

**TO FACILITATE ORDERING PARTS, AN ILLUSTRATED PARTS BREAKDOWN CATALOGUE IS AVAILABLE FROM E-Z-GO SERVICE PARTS DEPARTMENT.**

# OPERATION AND SERVICE MANUAL

## SECTION TITLE: TABLE OF CONTENTS

# OPERATION AND SERVICE MANUAL

## SECTION TITLE: GENERAL

**A**

The model, serial, and manufacturing numbers are stamped on a plate on the right side of the dash housing of the E-Z-GO vehicle. (Fig. A-1).

Always provide these numbers to the dealer when ordering parts for the vehicle.

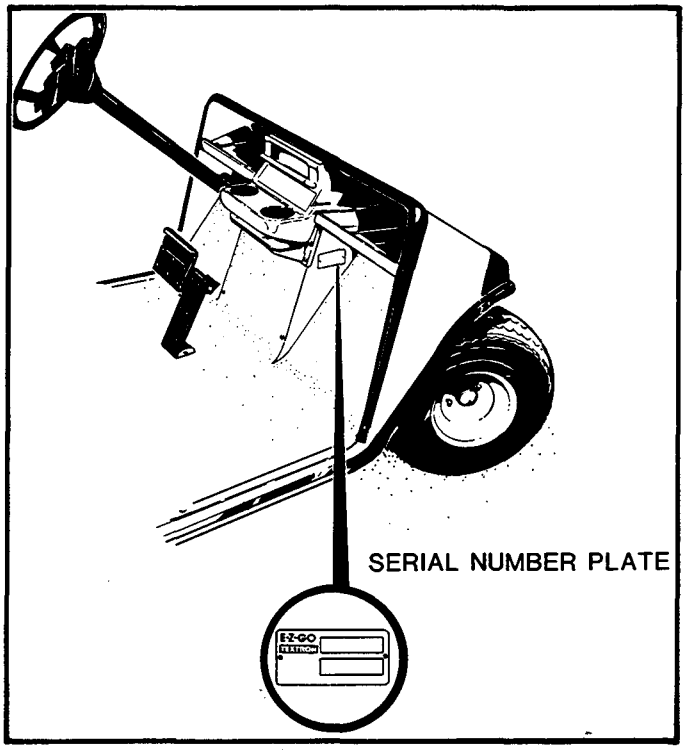



FIG. A-1 SERIAL NO. PLATE LOCATION

### CONTROLS

The controls of the new E-Z-GO vehicle consist of a Key Switch, Forward-Neutral-Reverse Lever, Accelerator Pedal and Combination Service Brake and Hill Brake Pedal.

### KEY SWITCH

Located on the seat support panel (Fig. A-2), this switch enables the basic electrical system of the vehicle to be turned off by turning the key to the "OFF" position.

For added security, when the vehicle is left unattended the key may be removed from the "OFF" position preventing inadvertent operation of the vehicle.

**NOTE:** If the vehicle is equipped with E-Z-GO installed custom accessories, some accessories remain operational with the ignition switch in the "OFF" position, e.g. radio, clock, cigarette lighter.

### FORWARD-NEUTRAL-REVERSE LEVER

Located on the seat support panel adjacent to the Key Switch (Fig. A-2), this lever permits the selection of either forward, neutral, or reverse.

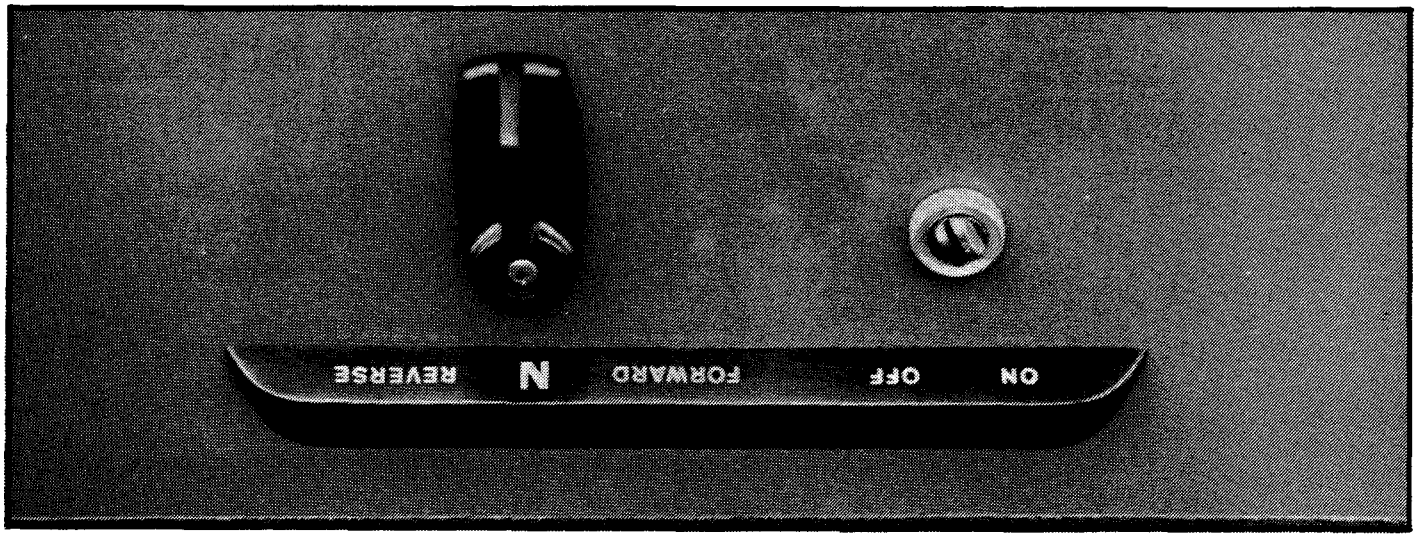



FIG. A-2 CONTROLS (PANEL MOUNTED)

**CAUTION:** TO AVOID COMPONENT DAMAGE, THE VEHICLE **MUST** BE BROUGHT TO A COMPLETE STOP BEFORE SHIFTING THE FORWARD-NEUTRAL-REVERSE LEVER.

## ACCELERATOR PEDAL

Depressing the accelerator (Fig. A-3) on an E-Z-GO vehicle will release the parking (hill) brake (if engaged). This is a feature to assure that the vehicle is not driven with the parking (hill) brake engaged.

Depressing the vehicle accelerator pedal starts the motor. Each time the pedal is released, the motor will stop.

## COMBINATION BRAKE AND HILL BRAKE PEDAL

The brake pedal (Fig. A-3) incorporates a parking (hill) brake feature. To engage, push down on the top section of the pedal until it locks in place. The parking (hill) brake will release when the brake pedal is depressed. Use the BOTTOM section of the brake pedal to operate the regular brake system. Depressing the bottom of the brake pedal is the preferred method of releasing the parking (hill) brake to assure the longest service life of brake components.

## BEFORE STARTING

Be sure you understand the vehicle, its equipment, and how to use it safely. Although E-Z-GO vehicles have been designed to provide you with a safe and reliable vehicle, maintaining its good performance depends to a large extent on the operator.

**CAUTION:** IMPROPER USE OR OPERATION OF THE VEHICLE OR THE LACK OF PROPER MAINTENANCE MAY RESULT IN DECREASED PERFORMANCE OR DAMAGE TO THE VEHICLE.

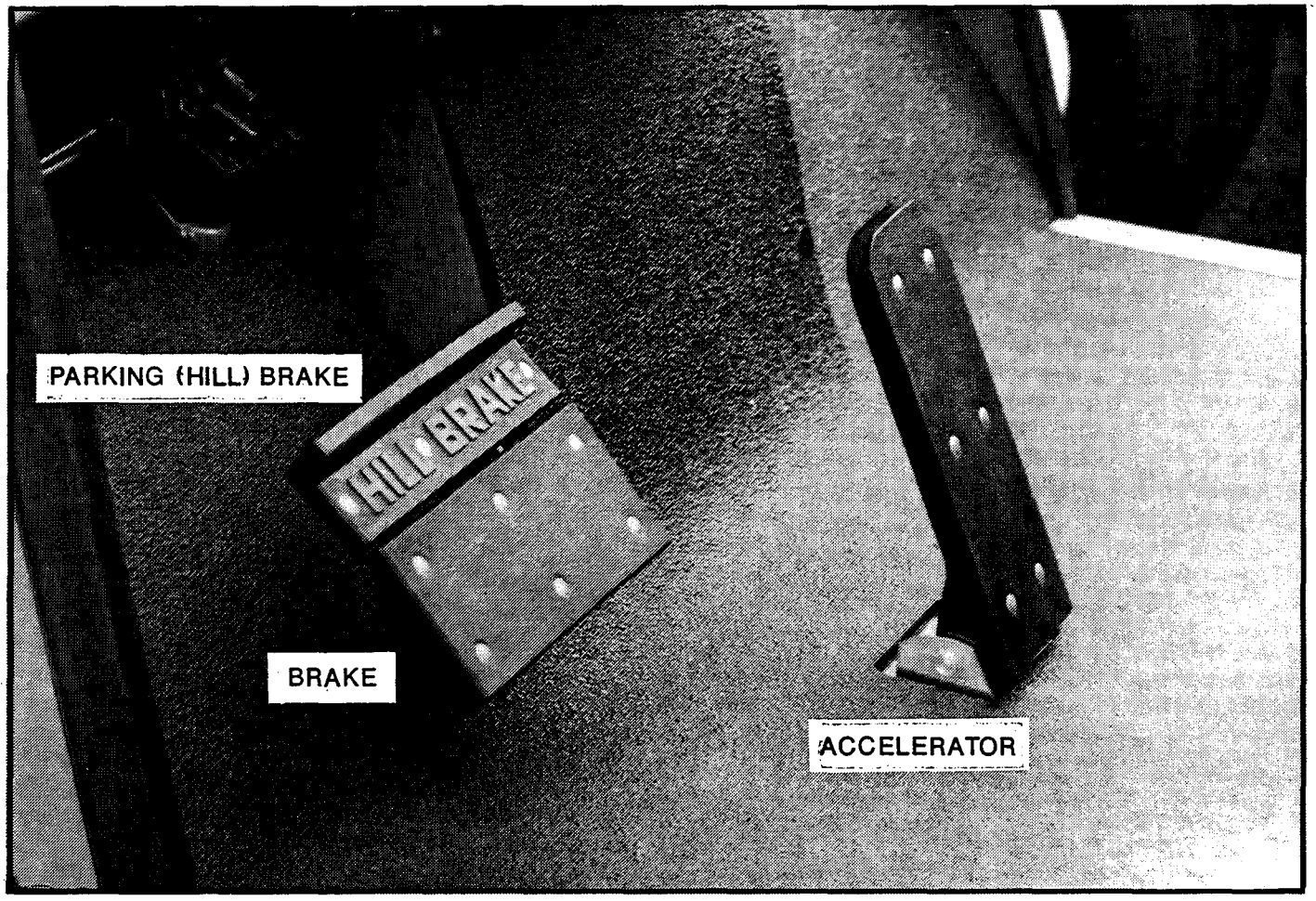



FIG. A-3 ACCELERATOR AND BRAKE CONTROLS

**CAUTION:** BEFORE INITIAL USE, REMOVE CLEAR PLASTIC SEAT COVERINGS.

BEFORE ENTERING VEHICLE

1. Check for correct tire inflation.
2. Inspect for fluid leaks.
3. Be certain that everything is properly stored and secured.

**NOTE:** Read and understand the following warnings before attempting to operate the vehicle.

**WARNING: WHEN THE VEHICLE IS TO BE LEFT UNATTENDED, TURN KEY TO "OFF" POSITION, REMOVE KEY AND ENGAGE HILL BRAKE.**

**WARNING: DRIVE THE VEHICLE ONLY AS FAST AS TERRAIN AND SAFETY CONSIDERATIONS ALLOW. CONSIDER THE TERRAIN AND EXISTING TRAFFIC CONDITIONS. ALSO CONSIDER THE ENVIRONMENTAL FACTORS WHICH AFFECT THE TERRAIN AND YOUR ABILITY TO HANDLE THE VEHICLE.**

**WARNING: AVOID DRIVING FAST DOWN-HILL. SUDDEN STOPS OR CHANGE OF DIRECTION MAY RESULT IN A LOSS OF CONTROL. USE BRAKE TO CONTROL SPEED WHEN TRAVELING DOWN AN INCLINE.**

**WARNING: USE EXTRA CARE AND REDUCED SPEED WHEN DRIVING ON POOR SURFACES, SUCH AS LOOSE DIRT, WET GRASS, GRAVEL, ETC.**

**WARNING: ALL TRAVEL SHOULD BE DIRECTLY UP OR DOWN HILLS.**

**WARNING: USE EXTRA CARE WHEN DRIVING THE VEHICLE ACROSS AN INCLINE.**

**WARNING: STAY IN DESIGNATED AREAS AND AVOID STEEP SLOPES. USE THE HILL BRAKE WHENEVER THE VEHICLE IS PARKED.**

**WARNING: KEEP FEET, LEGS, HANDS, AND ARMS INSIDE THE VEHICLE AT ALL TIMES.**

**WARNING: AVOID EXTREMELY ROUGH TERRAIN.**

**WARNING: CHECK THE AREA BEHIND THE VEHICLE BEFORE BACKING UP.**

**WARNING: MAKE SURE THAT FORWARD-NEUTRAL-REVERSE LEVER IS IN CORRECT POSITION BEFORE ATTEMPTING TO START VEHICLE.**

- **Always bring the vehicle to a complete stop before shifting the forward-neutral-reverse control.**

**WARNING: SLOW DOWN BEFORE AND DURING TURNS. ALL TURNS SHOULD BE EXECUTED AT REDUCED SPEED.**

**WARNING: STANDARD VEHICLE IS LIMITED TO 2 OCCUPANTS MAXIMUM PER SEAT.**

**WARNING: ALWAYS REMAIN SEATED AND HOLD ON WHILE VEHICLE IS IN MOTION.**

STARTING THE E-Z-GO ELECTRIC VEHICLE

To start the E-Z-GO electric vehicle; apply the parking (hill) brake; place the forward-neutral-reverse lever in neutral; place the key in the ignition switch and turn to the "ON" position; move forward-neutral-reverse lever to the direction desired; release parking (hill) brake by depressing the service brake pedal; depress the accelerator pedal to start the motor.

**NOTE:** When the lever is in the reverse position, a warning will sound. This is a device to indicate that the vehicle is ready to start and run in reverse.

When the accelerator pedal is released, the motor stops. To stop the vehicle more quickly, depress the **bottom of the brake pedal.**

When leaving the vehicle unattended, engage the hill brake by depressing the **TOP** of the brake pedal until it locks in place. To release the hill brake, depress the **BOTTOM** part of the brake pedal.

To change direction, bring the vehicle to a complete stop. Then shift the forward-neutral-reverse lever to the direction desired. Proceed by depressing the accelerator pedal.

**CAUTION:** TO AVOID COMPONENT DAMAGE, THE VEHICLE **MUST** BE BROUGHT TO A **COMPLETE** STOP BEFORE SHIFTING THE FORWARD-NEUTRAL-REVERSE LEVER.

## TOWING

**CAUTION:** ONLY ONE VEHICLE MAY BE TOWED AT A TIME. (Tow bars to fit both 3 and 4 wheel vehicles are available from the E-Z-GO Service Parts Department.)

**CAUTION:** MAXIMUM TOWING SPEED IS 12 M.P.H.

**CAUTION:** IT IS IN THE BEST INTEREST OF BOTH THE VEHICLE OWNER AND SERVICING DEALER TO CAREFULLY FOLLOW THE PROCEDURES RECOMMENDED IN THIS MANUAL. ADEQUATE PREVENTATIVE MAINTENANCE, APPLIED AT REGULAR INTERVALS, IS THE BEST GUARANTEE FOR KEEPING THE E-Z-GO ELECTRIC VEHICLE BOTH DEPENDABLE AND ECONOMICAL.

## SERVICING A NEW ELECTRIC VEHICLE

Before a new vehicle is put in operation, it is recommended that the owner make a check of the items shown in the INITIAL SERVICE CHART below.

Service operations are described in pertinent sections of the Service Manual. See Table of Contents for location.

**INITIAL SERVICE CHART**

| Item | Service Operation |
|---|---|
| Batteries | Check charge condition. |
| Seats | Remove protective plastic covering. |
| Brakes | Check operation and adjust if necessary. |
| Tires | Check pressure. |

## SEATS

### Preparation of Seats for Service

Remove protective plastic coverings from seats before placing vehicle in service. The function of the plastic coverings is to protect the seat bottoms and back rests during shipping. If the plastic covering is left on the seats and gets torn, dirt will get under the plastic covering and become ground into the cover material. Water getting under the plastic covering is trapped and eventually will damage the seat assembly.

## TIRES

Tire condition should be inspected on a daily basis. Recommended pressure for the standard tire is listed in the specifications Section 'S'. Inflation pressures should be checked on a weekly basis when the tires are cool.

Tire inflation should be governed by the condition of the terrain. For outdoor applications with major use on grassy areas, the following should be considered. On hard turf, it is desirable to have a slightly higher inflation pressure. On very soft turf, a lower pressure prevents tires from cutting into the turf. All tires should have the same pressure for optimum handling characteristics. Be careful not to overinflate. Due to the low volume of these small tires, overinflation can occur in a matter of seconds. Be sure to replace the valve dust cap after checking or inflating.

## PREVENTATIVE MAINTENANCE

E-Z-GO suggests that preventative maintenance be performed under the following headings: Daily, Weekly, and Semi-Annually.

## DAILY CHECK LIST

After the E-Z-GO vehicle has been put into service, it is recommended that the following items be checked daily by the personnel handling the vehicles, who can be an asset to a proper maintenance program if trained to look, listen, and feel for an unusual situation. This practice can be a great help in solving many maintenance problems in the minor stages while they can be corrected by simple adjustments.

A. Examine vehicle for damage or anything unusual to normal wear and tear.

- o Torn seats.
- o Damaged or missing equipment.
- o Cuts in tires.
- o Mechanical damage.
- o Be sure that the engaged hill brake will hold on a hill and that when disengaged, does not drag or prevent the vehicle from rolling freely.
- o Check the tires for wear and proper air pressure.
- o Assure that all switches are operating normally.
- o Make sure that service brakes operate properly.
- o Listen for any noise, such as rattles due to loose hardware; scraping sounds such as brakes dragging, etc.; unusual motor noises, and be sensitive to abnormal performance.

B. Clean vehicle.

- o Wipe seats.
- o Clean floormat.
- o Remove trash from dash tray.
- o Visually check the appearance of the vehicle for dents, scratches, loose equipment.
- o Wash accumulated dirt from motor compartment and underbody.

## SEMI-ANNUAL MAINTENANCE (100 HRS.)

- o Check the differential oil level.
- o Lubricate all moving linkages such as:

1. Accelerator rod ball joints.
2. Brake and accelerator linkage bushings.
3. Hill brake pivot pin.

**WARNING: DO NOT LUBRICATE THE HILL BRAKE LATCH ARM OR CATCH BRACKET NOR ANY CABLE CONTROLS.**

4. Steering gear and wheel bearings.

- o Wash batteries, when required, using baking soda and water to remove corrosion.

## PERIODIC CHECK LIST

The following inspections should be routinely done on the schedule indicated.

### STEERING

1. Gear Box - Assure that all mounting bolts are securely in place. Inspect for abnormal play in steering shaft and/or steering wheel.

   Time interval - once every 3 months (50 hours).

2. Tie rods and Pitman arms - Inspect for excessive play, bends or loose connections.

   Time interval - once every 3 months (50 hours).

3. Wheel alignment - Inspect toe-in, toe-out per specification. (See Alignment)

   Time interval - once every 6 months (100 hours) or more often if handling is unusual or tire wear is uneven.

4. King Pins - Check for excessive play.

   Time interval - every 6 months (100 hours).

### BRAKES

1. Brake Pedal - Check for smooth operation of pedal.

   Time interval - once every 3 months (50 hours).

2. Hill Brake - Check for proper engagement and release, wear or damage to latch arm or catch brackets. Check for abnormal brake travel that could hinder the proper operation of hill brakes. See Brake Section for brake adjustment and operation.

   Time interval - once every 3 months (50 hours) or as needed.

3. Brake Drum and Brake Shoes - Inspect for wear on brake shoes and brake drum.

   Inspect for scoring, scratches, or unusual sightings in shoes and drum (See Brake Section).

   Time interval - every 6 months (100 hours).

### FRONT SUSPENSION

1. Front Axle - 3 Wheel - Inspect for smooth operation.

   Time interval - 3 months (50 hours).

2. Front axle - 4 Wheel - Inspect for damage to the axle and for loose bolts at spring mounts.

   Time interval - 3 months (50 hours).

3. Shock Absorbers - Check for oil leakage or loose connections.

   Time interval - every 3 months (50 hours).

4. Front Springs

   Leaf Spring - Check for cracks or loose connections around the spring mounting bracket and attaching bolts.

   Coil Spring - Check for cracks in springs and around shock absorber. Check for loose connections around shock mounting bolts.

   Time interval - every 3 months (50 hours).

### REAR SUSPENSION AND AXLE

1. Rear Axle and Housings - Inspect for abnormal noise, loose connections at shocks, and oil leakage around the bottom cover plate. Inspect rear leaf springs for damage and loose hardware.

   Time interval - every 3 months (50 hours).

### WHEELS AND TIRES

1. Wheel - Inspect for proper tire pressure, abnormal wear, cracks or damage to tread area, tightness of lug nuts, dented or damaged wheel rims.

   Time interval - every 3 months (50 hours).

## ELECTRICAL SYSTEM

1. Batteries - Check for low electrolyte and corrosion build-up.

   Time interval - every week.

2. Wiring - Inspect all wiring for loose connections or cracked and/or worn insulation.

   Time interval - every month (20 hours).

3. Reverse Warning - Check for proper operation.

   Time interval - daily.

4. Forward-Neutral-Reverse Switch - Check for wear and lubricate.

   Time interval - semi-annually (100 hours).

5. Accelerator Switch - Check for wear and lubricate.

   Time interval - semi-annually (100 hours).

6. Motor Brushes - Check with gauge.

   Time interval - semi-annually (100 hours).

## MISCELLANEOUS

1. Inspect all lubrication areas around pedal shafts, chassis parts, etc.

   Time interval - every 3 months (50 hours).

2. Check for proper retention of all equipment.

   Time interval - daily.

## CARE AND CLEANING OF THE VEHICLE

It is very important that proper techniques and cleaning materials be used.

Ordinary cleaning of vinyl seats and plastic or rubber trim requires the use of a mild soap solution applied with a sponge or soft brush and the subsequent removal of the material with a damp cloth.

Removal of oil, tar, asphalt, shoe polish, and so forth will require the use of a commercially available vinyl/rubber cleaner.

The painted surfaces of the vehicle provide attractive appearance and durable protection. Frequent washing with lukewarm or cold water is the best method of preserving those painted surfaces.

Do not use hot water, strong soap, or harsh chemical detergents.

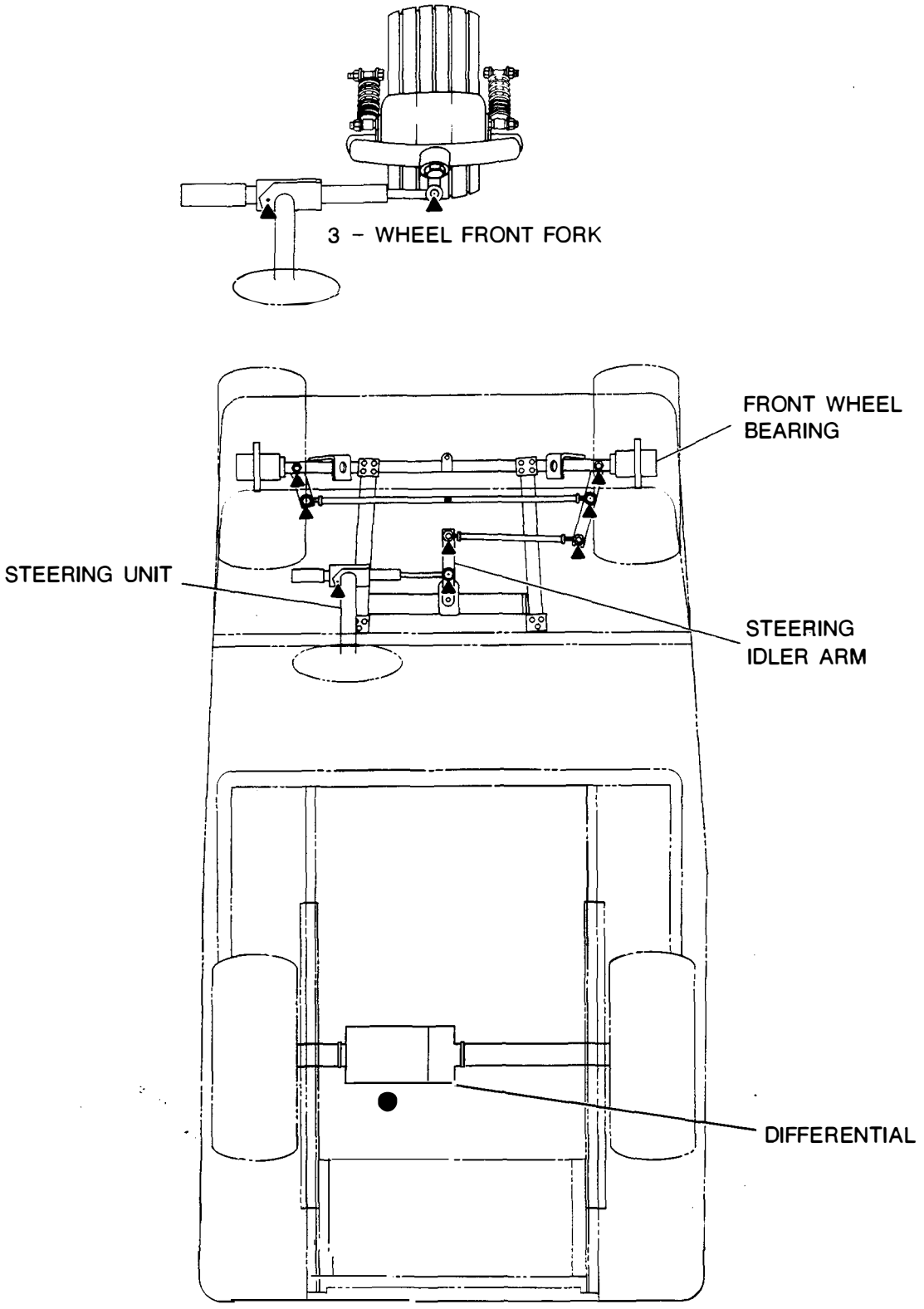
Occasional cleaning and polishing with appropriate materials will enhance the appearance and durability of the painted surfaces.

Corrosive materials used as fertilizers or for dust control can collect on the underbody of the vehicle. These materials will accelerate corrosion of underbody parts. It is recommended that the underbody be flushed occasionally with plain water. Thoroughly clean any areas where mud or other debris can collect. Sediment packed in closed areas should be loosened to expedite their removal.

## WINDSHIELD

Clean with lots of water and a clean cloth.

**CAUTION:** DO NOT USE ANY ABRASIVE OR VOLATILE SOLVENTS TO CLEAN PLASTIC PARTS.




▲ PRESSURE GUN GREASE FITTINGS LOCATIONS
● FILL/CHECK PLUGS

FIG. A-4 LUBRICATION CHART

# PERIODIC SERVICE SCHEDULE

| | DAILY | WEEKLY | QUARTERLY 50 HOURS | SEMI-AN. 100 HOURS | |
|---|---|---|---|---|---|
| **BATTERIES** | | | | | |
| A. CHANGE | • | | | | RECHARGE TO FULL CHARGE STATE AFTER EACH DAY'S USE |
| B. CHECK | | • | | | CHECK ELECTROLYTE LEVEL-CORRECT IF REQ'D |
| C. CLEAN & INSPECT | AS REQUIRED | | | | |
| **BRAKES** | CHECK AND ADJUST IF NECESSARY ON A DAILY BASIS | | | | |
| A. CHECK | • | | | | BEFORE CAR IS USED |
| B. ADJUSTMENT | AS REQUIRED | | | | |
| **TIRES** | EXAMINE DAILY FOR CUTS AND EXCESSIVE WEAR | | | | |
| A.CHECK | | • | | | CHECK PRESSURE |
| **CONTROL LINKAGES** | | | | | |
| A. CHECK | • | | | | CHECK FOR FREE & PROPER OPERATION |
| B. LUBRICATION | | | • | | LUBE BRUSHINGS WITH LIGHT OIL |
| **STEERING** | MAKE CERTAIN LOCKING DEVICES ARE TIGHT | | | | |
| A. CHECK | • | | | | USE CHEVRON MOLY-GREASE 2 |
| B. LUBRICATION | | | | • | |
| **WHEEL ALIGNMENT** | SEE SERVICE SECTION FOR ALIGNMENT PROCEDURE | | | | |
| A.CHECK | | | | • | |
| **RESISTOR ASSY.** | | | | | |
| A. COILS | | | • | | CHECK CONDITION |
| B. LEAD CONNECTIONS | | | • | | TIGHTEN AS REQUIRED |
| **ACCELERATOR SWITCH** | DO NOT OIL OR GREASE CONTACTS | | | | |
| A. CONTACTS | • | | | | CHECK CONDITION |
| B. LEAD CONNECTIONS | | | | • | TIGHTEN AS REQ'D. |
| C. LUBRICATION | | | | • | CHEVRON MOLY-GREASE 2 |
| **F-N-R SWITCH** | | | | | |
| A. CONTACTS | | | | • | USE PETROLEUM JELLY |
| B. LEAD CONNECTIONS | | | | • | TIGHTEN AS REQUIRED |
| C. LUBRICATION | | | | • | CHEVRON MOLY-GREASE 2 |
| **FRONT WHEEL BRGS.** | USE CHEVRON MOLY-GREASE 2 | | | | |
| A. ADJUST | | | | • | |
| B. REPACK | | | | • | |
| **DIFFERENTIAL** | USE SAE-30 WT OIL | | | | |
| A. CHECK LUBRICATION | | | | • | |
| **CHARGER & CHARGER RECEPTACLE** | CHECK & TIGHTEN WIRE CONNECTIONS AS REQUIRED. KEEP RECEPTACLES FREE OF DIRT & FOREIGN MATTER. | | | | |

**NOTE: INCLUDE ALL DAILY, WEEKLY, QUARTERLY, AND SEMI-ANNUALLY ITEMS IN THE ANNUAL SERVICE.**

FIG. A-5 PERIODIC SERVICE SCHEDULE

# OPERATION AND SERVICE MANUAL

## SECTION TITLE: SAFETY PROCEDURES

**B**

### GENERAL

When performing any inspection or maintenance work on the vehicle, always exercise care to prevent accidental personal injury to yourself or damage to the vehicle.

The following are general precautions which should be closely observed in carrying out any servicing operation.

- Set the hill parking brake.
- Do not work on the motor while connected to batteries.
- When working near batteries, remove any jewelry, such as rings, watch, etc.
- Never get under the car while it is supported by a jack. If it is necessary to work under the car, use safety stands.
- Keep smoking materials, flame or sparks away from the batteries.
- Never connect or disconnect either the batteries or any electrical component while the key is in the ignition switch.
- When connecting the battery cables, pay particular attention to their polarities. Never confuse the positive posts with the negative posts.

### BATTERY REMOVAL AND INSTALLATION

**Tools Required:**

- 7/16" Wrench (insulated) Quantity 1
- 1/2" Wrench (insulated) Quantity 1
- Battery Carrying Tool Quantity 1

**WARNING: USE INSULATED WRENCHES AND BE CAREFUL NOT TO ALLOW WRENCHES TO CONTACT METAL AREAS OF VEHICLE WHILE WORKING ON BATTERY TERMINALS. OBSERVE BATTERY POLARITY WHEN REINSTALLING CABLES.**

Using an insulated wrench, remove all wires from the vehicle batteries. Remove the two battery hold downs by removing the hardware and lifting the plastic retainers from the threaded hold down bolts.

Remove the batteries using a battery carrying tool.

**WARNING: BATTERIES ARE HEAVY AND CARE SHOULD BE TAKEN WHEN REMOVING THEM. BE CAREFUL TO LIFT BATTERIES WITHOUT TIPPING THEM, ELECTROLYTE MAY BE SPILLED WHICH COULD CAUSE BURNS OR DAMAGE TO VEHICLE AND CLOTHING. SHOULD ANY ELECTROLYTE BE SPILLED FLUSH THOROUGHLY WITH WATER.**

Care must be taken to observe the preceding warnings when reinstalling batteries.

WEAR EYE PROTECTION

USE CARE WHEN LIFTING BATTERIES

## IFTING THE 3 AND 4 WHEEL ELECTRIC OWERED VEHICLE (Fig. B-1)

**ools Required:**

| | |
|---|---|
| Hydraulic Trolley Jack | Quantity 1 |
| Jack Stands | Quantity 4 |
| Chocks or Wooden Blocks | Quantity 4 |

**VARNING: ALWAYS ENSURE THAT VEHICLE S ON FIRM AND LEVEL GROUND. NEVER VORK UNDER VEHICLE UNLESS THE VEHICLE IS SUPPORTED ON JACK STANDS. ALWAYS PLACE CHOCKS BOTH IN FRONT OF AND BEHIND WHEELS THAT WILL NOT BE RAISED.**

Place the jack under the frame at a point 4"-5" in front of the vertical seat panel. Raise the vehicle with the jack and place 1 jack stand under the most forward flat area of the frame. A second jack stand should be placed on the outboard end of the axle tube.

**CAUTION:** BE SURE THAT THE BRAKE CABLE AND HANGERS ARE NOT DAMAGED DURING THIS OPERATION.

**Slowly** lower the jack and move it to the opposite side of the vehicle and repeat the lifting procedure described above, placing the third and fourth jack stands with corresponding position to those placed on the opposite side.

**Slowly** lower the jack and check that the vehicle is **securely** supported by the four jack stands. Lower the vehicle using the reverse procedure.

## LIFTING PROCEDURE FOR FRONT OF 3 WHEEL VEHICLE (Fig. B-1)

**To lift the front of the vehicle:**

**Tools Required:**

| | |
|---|---|
| - Trolley Jack | Quantity 1 |
| - Jack Stands | Quantity 2 |
| - Chocks of Wood | Quantity 2 |

Place chocks in front of and behind the rear tires. Place a trolley jack on the left side of vehicle frame. Raise the vehicle, place a jack stand under the front of the frame. Lower the trolley jack. Repeat the procedure on the other side of the vehicle.

**WARNING: VEHICLE IS EXTREMELY UNSTABLE WHILE IN THE POSITION WITH ONE SIDE RAISED.**

## LIFTING PROCEDURE FOR REAR OF 3 WHEEL VEHICLE

**WARNING: E-Z-GO DOES NOT RECOMMEND OR ENDORSE ANY PROCEDURE THAT LIFTS THE REAR OF VEHICLE ALONE. USE PROCEDURE FOR LIFTING THE 3 WHEEL ELECTRIC POWERED VEHICLE.**

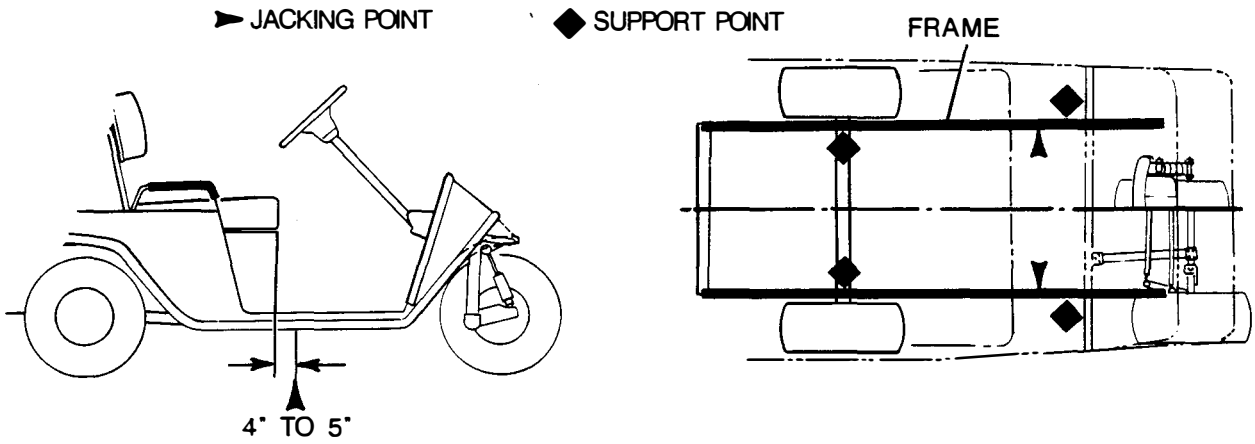



FIG. B-1 LIFTING AND JACKING POINTS

**Tools Required:**

- Lug Wrench Quantity 1
- Tire Tool Quantity 1
- Tire Brush Quantity 1
- Rubber Mallet Quantity 1

**Tire Repair**

The vehicle is fitted with low pressure tubeless tires mounted on one piece rims. Should a tire repair be necessary, proceed as follows: If tire is flat, remove wheel and inflate tire to approximately 20 psi. Immerse tire in water to locate air leak and mark the location.

**NOTE:** Small holes in casing can be plugged with a standard automotive tubeless tire repair kit, available at most automotive supply outlets.

To remove tire from rim deflate by removing valve core; separate both tire beads from rim and push bead from wide side into rim recess. Using tire tool, carefully remove the tire over the outside (valve stem side) of the wheel in the direction of the arrow shown.

**NOTE:** Care must be taken to prevent damage of tire bead. When bead is free of rim, insert tire tool under lower bead and pry tire off.

**Mounting Tire**

Clean both tire beads and wheel rim bead seats with a tire brush. This is important to prevent loss of air around rim. Install tire on rim (from valve stem side) using a rubber mallet and tire tool. Remove valve core and position bead against narrow flange side. Apply air pressure through stem while pressing around center of tread. Pressure will build up and snap beads into place. Remove pressure and install valve core. Inflate to recommended pressure (see Specifications Section 'S'). ADJUST to desired pressure.

**Wheel Installation**

Install wheel as shown by Fig. C-1.

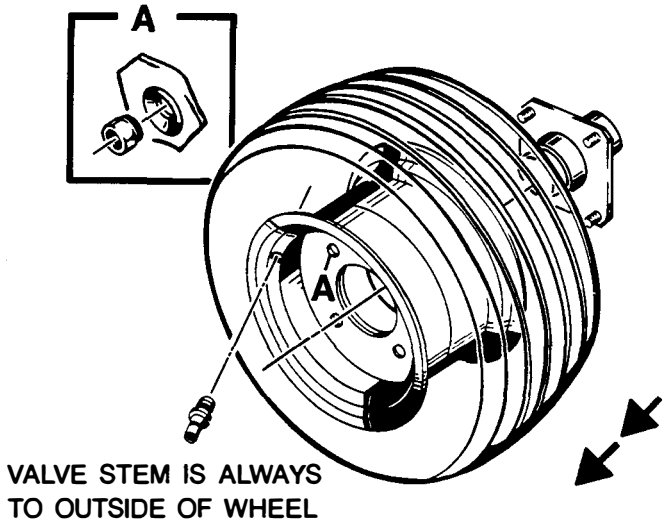



FIG. C-1 WHEELS AND TIRES

## GENERAL

The steering assembly is a rack and pinion type.

## STEERING ASSEMBLY REMOVAL (Fig. D-2)

**Tools Required:**

| | |
|---|---|
| - Phillips Screwdriver | Quantity 1 |
| - 15/16" Socket, 1/2" Drive | Quantity 1 |
| - Drive Ratchet, 1/2" | Quantity 1 |
| - Ball Peen Hammer, 2 lb. | Quantity 1 |
| - Torque Wrench, 1/2" drive | Quantity 1 |
| - Ball Joint Pulling Tool | Quantity 1 |
| - Pliers | Quantity 1 |
| - Mallet | Quantity 1 |

Turn the steering wheel full travel to the right to position rack end ball joint. (On four wheel vehicles it is necessary to remove the shield to provide access to the steering arm area.)

Remove cotter pin (1) from slotted nut (2) and back nut off until it protects ball joint stud threads. Using a ball joint pulling tool as a lever, apply pressure to ball joint and tap nut with a hammer to release ball stud. Remove nut and lift stud from arm. Remove 3 bolts (3) and lock washers (4) securing steering box to floorboard and lift assembly out of vehicle.

Reinstall in the reverse order of disassembly. Tighten ball joint stud slotted nut (2) to 40 ft. lbs. torque. Insert new cotter pin.

## DISASSEMBLY

**Steering Wheel Removal** (Fig. D-1)

Remove two screws (1) holding the scorecard assembly (2) located on the back of the steering wheel (3).

Loosen steering nut (4) two to three turns. Using a mallet placed against the steering nut, apply pressure upwards to steering wheel. Strike the mallet with a hammer which will cause the steering wheel to break loose from the steering shaft.

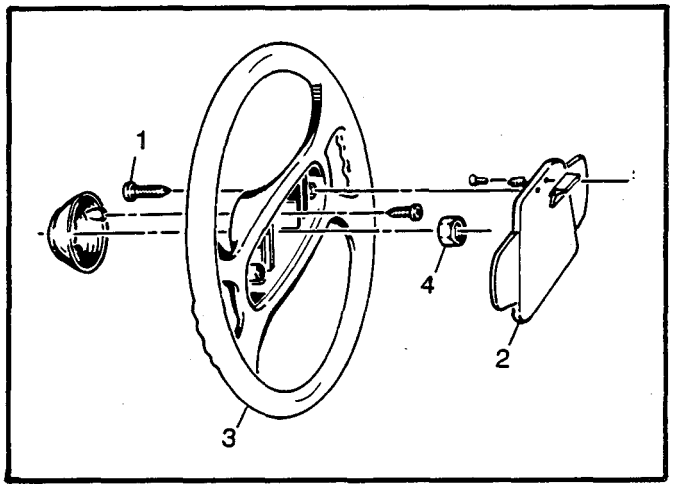



**FIG. D-1**
**STEERING WHEEL & SCORECARD HOLDER**

**CAUTION:** DO NOT STRIKE THE STEERING NUT OR THE END OF THE STEERING SHAFT DIRECTLY WITH A HAMMER.

Reinstall steering wheel as follows:

Slide steering wheel onto steering shaft splines. Apply steering nut and tighten to 10-15 ft. lbs. torque. Reinstall in the reverse order of disassembly.

**NOTE:** Reinstall steering wheel correctly relative to steering travel.

**CAUTION:** TIGHTEN SCORECARD ASSEMBLY SCREWS TO 6 IN. LBS. TORQUE MAXIMUM.

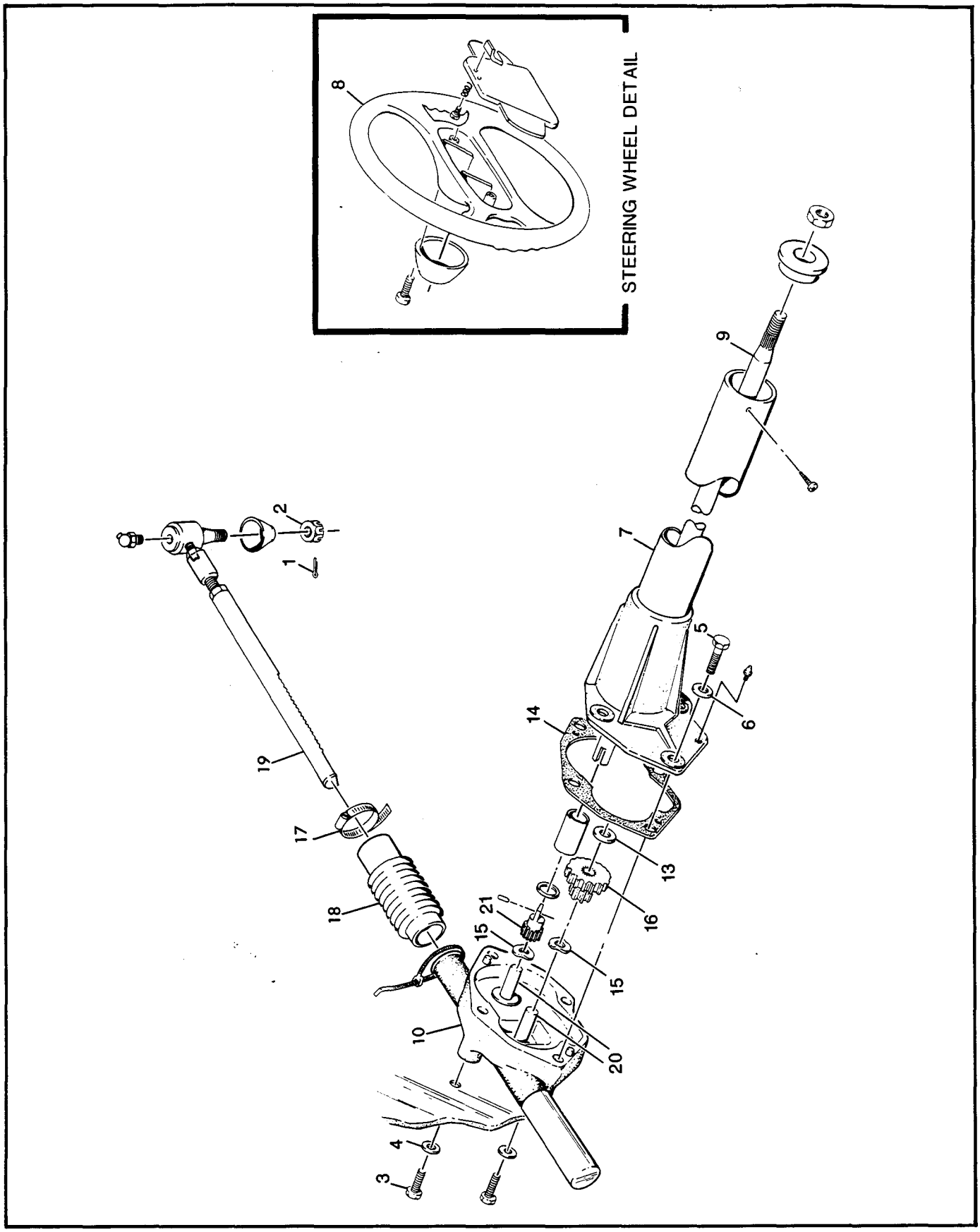



FIG. D-2 STEERING

**Steering Shaft Removal** (Fig. D-2)

Remove bolts (5) and lock washers (6) securing the column. Remove column (7) and gasket (14) and slide the shaft (9) out through flanged end of column.

**Gear and Rack Removal** (Fig. D-2)

Remove steering shaft (7) from gear box. When removing gears, make note of the position of the spring washers (15), one under the pinion (21) and one under the reduction gear (16). Be sure washers are properly positioned when reassembling gears.

The flat washer (13) is placed on top of the reduction gear (16).

Loosen clamp (17) securing the bellows (18). Slide rack and rod end assembly (19) out.

**NOTE:** If ball joint or tie rod end is worn or damaged, the rack and rod end assembly must be replaced as a complete unit. Clean all parts with solvent and check for wear. Replace worn or damaged parts with new parts. Repack gear box with a high quality gear grease. (The factory recommends Moly Grease 2.) Apply grease liberally to gear pins, rack and gears before reassembly.

**NOTE:** Pins (20) **must** be lubricated prior to reassembly.

Reassemble all parts in reverse order of disassembly. Be sure all bolts and nuts are tightened securely.

**Idler Arm - 4 Wheel Vehicles** (Fig. D-3)

If the idler arm assembly (1) is worn or has excessive play, the idler arm bushings (2) must be replaced.

**Idler Arm Removal** (Fig. D-3)

**Tools Required:**

| | |
|---|---|
| - Pliers | Quantity 1 |
| - Wrench 11/16" | Quantity 1 |
| - Socket 15/16" | Quantity 1 |
| - Torque wrench | Quantity 1 |

To remove the idler arm, disconnect the tie rod ball joint (3) at the bottom of the idler arm and the steering gear ball joint (4) at the top of the idler arm using the procedure outlined under "Steering Assembly Removal".

Lift front of vehicle per procedures in Section B and remove cotter pin (5). Using a pair of pliers or vice grips, rotate idler shaft (6) back and forth while pulling downwards until the idler arm shaft is removed. After removal of the idler arm shaft, the idler arm assembly may be removed.

Before reinstalling idler arm assembly, repack with a high quality gear grease. Reinstall in the reverse order of disassembly. Tighten ball joint nuts to 40 ft. lbs. torque and install new cotter pin.

**Tie Rod Inspection**

Lift front of vehicle per procedures in Section B and check for vertical movement of tie rod which would indicate a worn condition.

**King Pin Inspection**

Lift front of vehicle per procedures in Section B. Hold top and bottom of tire and use a rocking motion to check for king pin movement which would indicate a worn condition.

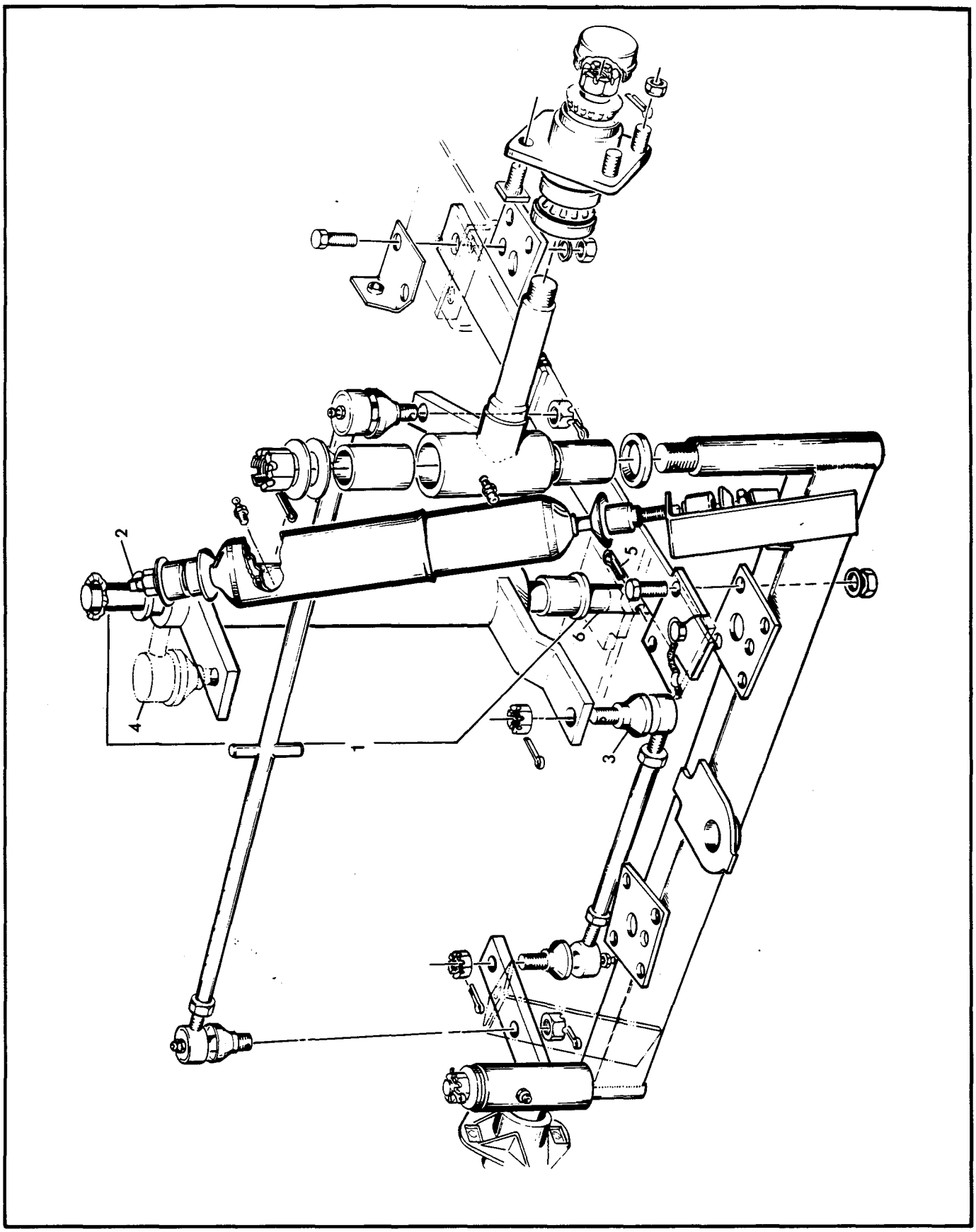



FIG. D-3 IDLER ARM REMOVAL

**FRONT (FOUR WHEEL VEHICLES)** (Fig. E-1)
**Tools Required:**

| | |
|---|---|
| - Pliers | Quantity 1 |
| - Pulling Tool | Quantity 1 |
| - Ball Pein Hammer | Quantity 1 |
| - Torque Wrench | Quantity 1 |
| - Box End Wrench 15/16" | Quantity 1 |
| - Socket 15/16" | Quantity 1 |

**FRONT SUSPENSION REMOVAL**

Removal of the front suspension assembly as a unit is not required for most repair work; however, if removal is required, proceed as follows: Lift front of vehicle (See procedures in Section B) and place on jack stands. Remove the front wheels. Remove the front bumper, if vehicle is so equipped, and remove the front shield.

Remove the tie rod assembly (7) from the idler arm assembly (1) as follows: Remove the cotter pin (8) from the slotted nut (9) and back off until it protects the ball joint threads. Using a pulling tool lever, apply pressure to the rod end ball joint and tap the nut with a hammer to loosen the ball stud. Remove the nut and lift the stud from the idler arm.

Remove the nut (10), washers (11), and bushings (12) from the top of the shock absorber (13). Collapse the shock absorbers. Remove the bolts (14), lock washer (15), and nut (16) and remove the front suspension assembly from the vehicle.

Replace all broken or worn parts and reinstall in reverse order of disassembly. Tighten slotted nut on the rod end at idler arm to 40 ft. lbs. torque. Install a new cotter pin.

**SPINDLE REPAIR** (Fig. E-1)
**Tools Required:**

| | |
|---|---|
| - Pliers | Quantity 1 |
| - Box End Wrench 15/16" | Quantity 1 |
| - Sizing Reamer .875" dia. | Quantity 1 |
| - Torque Wrench | Quantity 1 |
| - Socket 15/16" | Quantity 1 |

To replace the spindles (17) and (18), king pin bushings (19), or seal (20), proceed as follows:

Remove the wheel and hub (refer to Bearing Service Procedures). Disconnect the ball joint (21 or 22) from the steering arm (refer to Front Suspension Removal). Remove the cotter pin (23) and nut (24). Lift the spindle off of the king pin, taking care to note the position of the thrust washers (25 and 26) at top. Clean the spindle with a solvent and inspect for damage or worn bushings or seals. If bushings are worn larger than .880 inch, press out and replace with new bushings. Press bushings in until flush.

**NOTE:** Bushing I.D. will close slightly when pressed into the housing. If a ream operation is required, use a .875 inch sizing reamer.

Reinstall in the reverse order of disassembly. Tighten the ball joint nut at the steering arm to 40 ft. lbs. torque and install a new cotter pin.

**MAINTENANCE ON FRONT WHEEL BEARINGS**
**4 WHEEL (FIG. E-2)**
**3 WHEEL (FIG. E-4)**

When maintenance is performed on either set of these bearings, they must be repacked with grease to assure proper lubrication during operation. Pack bearings as follows. Use a grease packing device or use the following manual procedure (See Periodic Service Schedule for grease specification):

Place a dab of grease in the palm of the hand. Using the other hand, take the bearing and dip the bearing into the grease pushing grease up between the rollers of the bearing. This must be done around the complete bearing. Reinstall bearings.

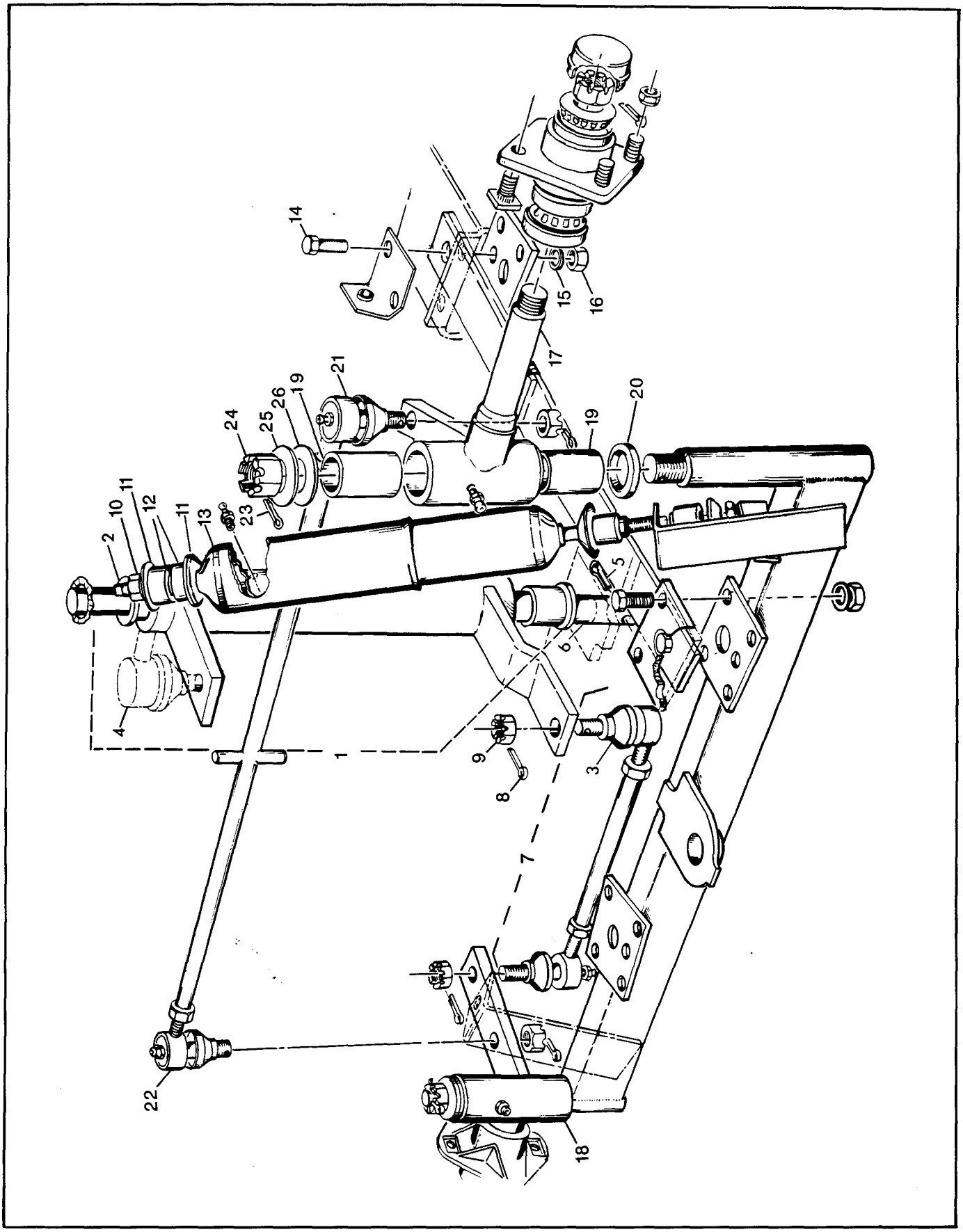



FIG. E-1 4 WHEEL FRONT SUSPENSION

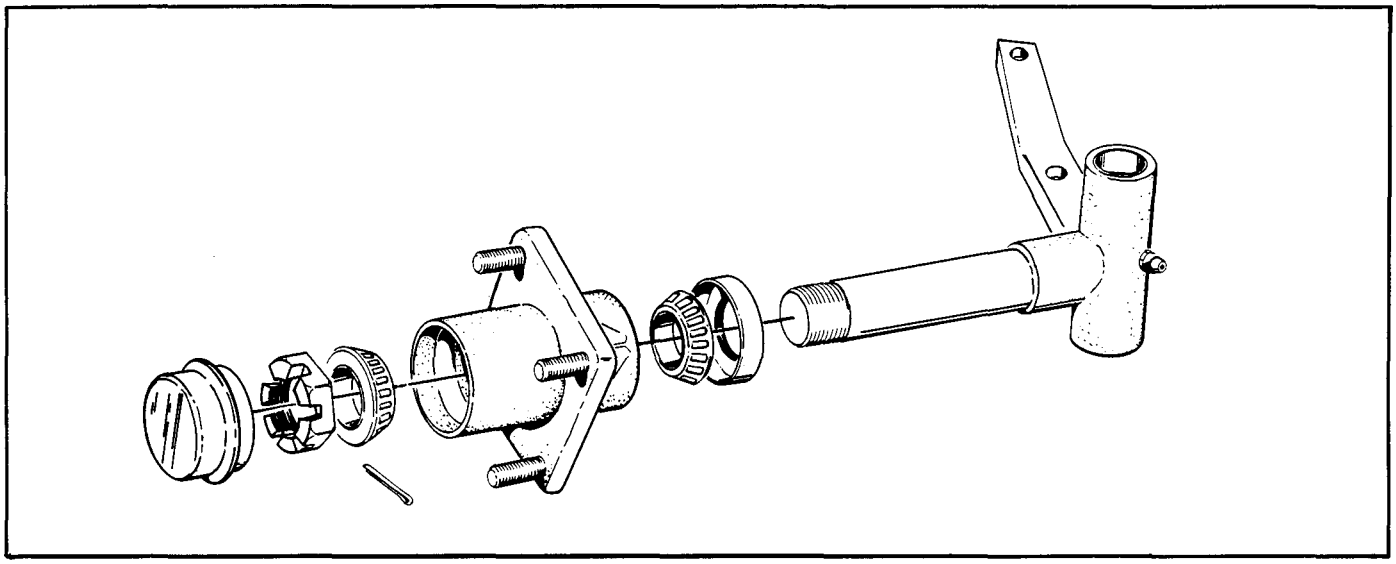


FIG. E-2 FRONT SPINDLE

**FORK REMOVAL AND BEARING SERVICE** (Fig. E-3)

**Tools Required:**

| | |
|---|---|
| - Jack Stands | Quantity 2 |
| - 11/16" Open End Wrench | Quantity 1 |
| - Pliers | Quantity 1 |
| - 2" Socket or Open End Wrench | Quantity 1 |
| - Hammer, Ball Pein, 2 lb. | Quantity 1 |
| - Axle or Bearing Grease | AR |
| - Puller, Slide Hammer | Quantity 1 |
| - Punch, Long Tapered | Quantity 1 |
| - Brass Bar | Quantity 1 |
| - Torque Wrench, 1/2" Drive | Quantity 1 |

Lift the front of the vehicle (See procedures in Section B) and place on jack stands, disconnect the steering rack and ball joints, remove the cowl center support and remove the console assembly if equipped (See Console Removal Section). Remove the dash tray liner or dash mat (1) by pushing out the plastic fasteners (2) from the underside of the dash tray. Remove the stem nut (3) and washer (4) from the fork stem (5).

**CAUTION:** WHILE REMOVING NUT, SUPPORT FORK SO THAT IT WILL NOT DROP OUT AND DAMAGE FORK STEM AND/OR BEARINGS.

The lower bearing (6) will remain on the fork stem. To remove this bearing, tap lightly on the bottom surface to separate the bearing from the stem. Slide the bearing off the stem. With the fork removed from the vehicle, inspect the bearings and grease seals for damage. If the seal is damaged, the bearing and seal assembly must be replaced.

Clean the bearings with solvent and dry thoroughly. Inspect for damage or wear. Replace with new parts, if necessary. Repack the bearings with grease (see Packing Procedure), making sure rollers are completely covered with grease and making sure that there is grease between the rollers and races (See Maintenance on Front Wheel Bearings).

Inspect the outer races (7) and the stem housing for pitting or other damage. If it is necessary to remove and replace the race, proceed as follows: The lower race can be removed using a slide hammer puller.

To remove the top race, use a long tapered punch. Insert the punch through the bottom end of the housing and against the lower edge of the race, strike the punch with a hammer while alternately changing punch position around the edge of the race. Install a new race by tapping **lightly** with a brass bar and hammer. Reinstall the fork and bearings in the reverse order of disassembly.

Tighten the fork stem nut until the fork is snug in the frame, then back off 1/4 turn. Reinstall the dash liner. Reinstall the cowl support and the console.

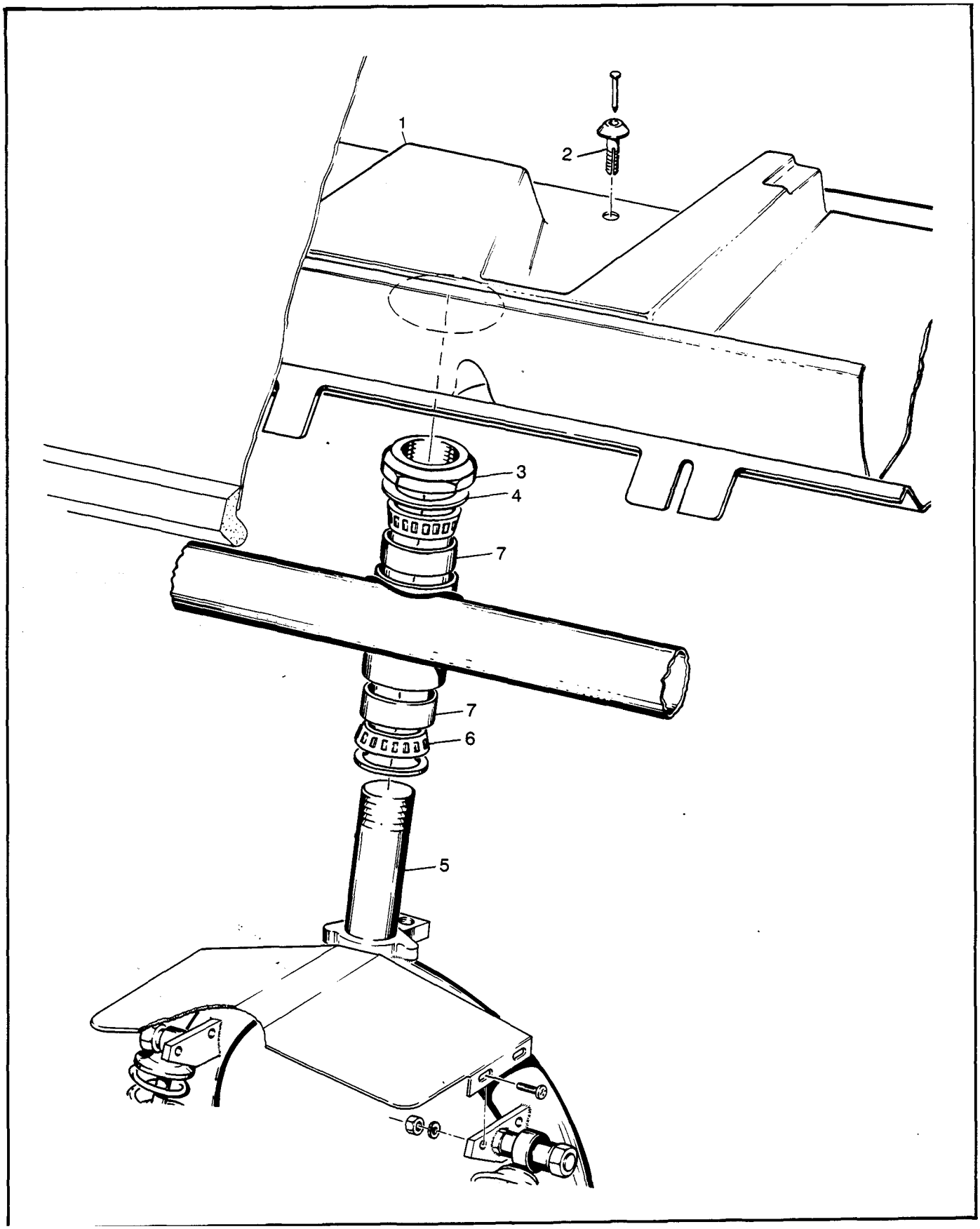



FIG. E-3 FRONT FORK REMOVAL

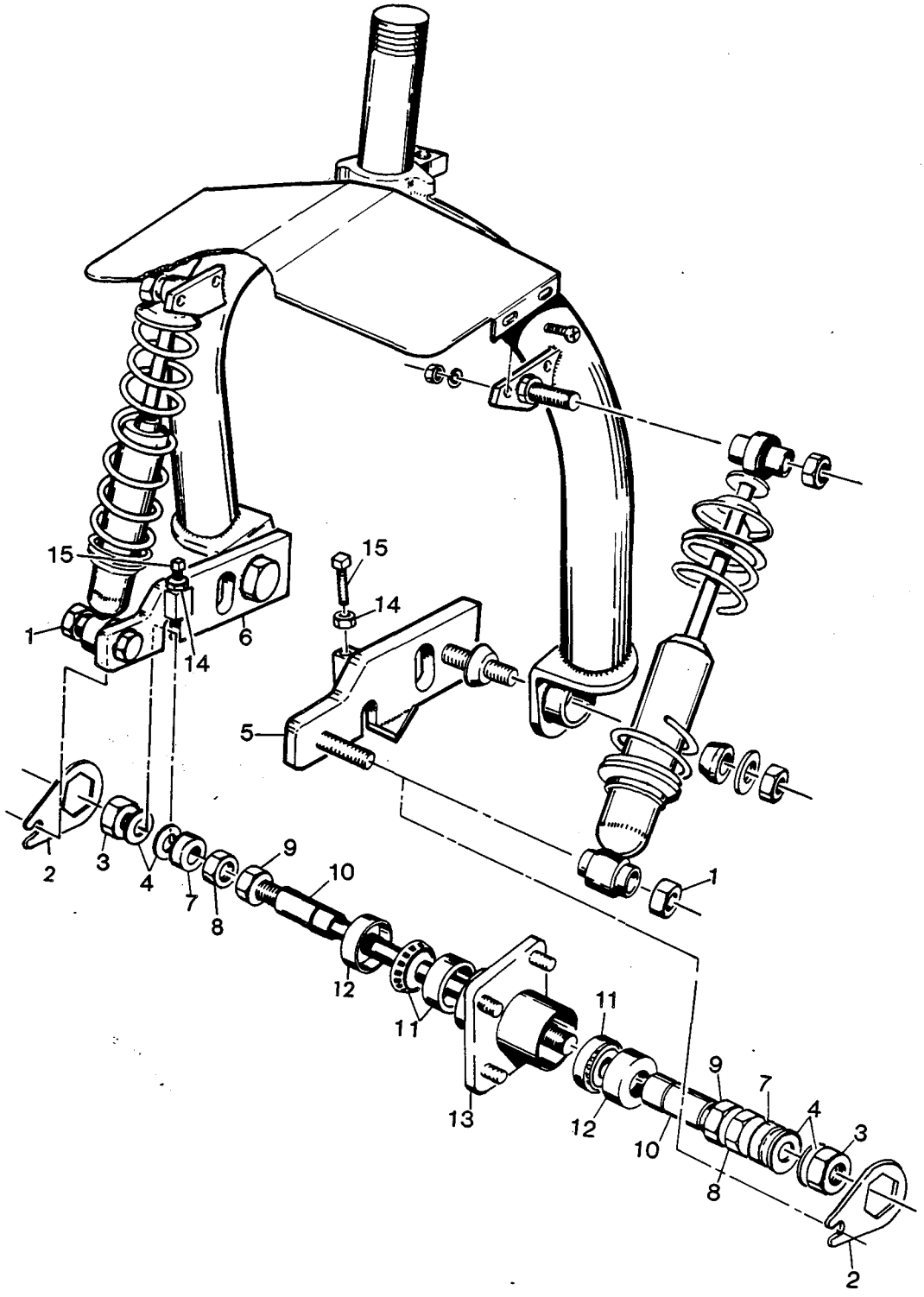



FIG. E-4 FRONT FORK ASSEMBLY

## REMOVAL OF AXLE AND HUB ASSEMBLY
(Fig. E-4)

**Tools Required:**

| | |
|---|---|
| - 11/16" Open End Wrench | Quantity 1 |
| - 1 1/8" Open End Wrench | Quantity 2 |
| - Punch Long Tapered | Quantity 1 |
| - Hammer, Ball Pein | Quantity 1 |
| - 3/4" Socket, 1/2" Drive | Quantity 1 |
| - Torque Wrench, 1/2" Drive | Quantity 1 |

Loosen the shock absorber nut (1) 4 to 5 turns. Slide the retainer, axle nut (2) away from the axle nuts on both sides of the fork.

Loosen the axle nut (3) to permit the flat washer (4) to clear the axle bracket assembly and to permit the axle and hub assembly to drop out of the axle brackets (5 and 6). After the axle and hub assemblies have been removed, slide the ring adjuster (7) off the end of the axle shaft. Loosen the jam nut (8) and unscrew both outside and inside (9) jam nuts from the axle shaft **(one end only).** After removing the jam nuts from axle shaft, slide the spacers (10) and hub assembly from the end of the axle shaft.

To remove the bearings (11) and grease seals (12) from the hub assembly (13), insert a punch on the opposite side of the bearing to be removed, position it on the bearing cone, tap lightly around the bearing to push bearing and grease seal out of the hub. Clean the bearings with a solvent and dry thoroughly, and check for wear around the rollers and in the races. Clean the hub assembly with solvent and dry thoroughly and check the outer races in the hub assembly for damage or wear. Reinstall in the reverse order of disassembly.

**CAUTION:** BE SURE THAT THE SEAL RETAINING SURFACE OF THE HUB IS CLEAN AND FREE OF GREASE.

**NOTE:** When installing grease seals into hubs, insert the grease seals, flange side inward (Fig. E-5), tap lightly and evenly around the seal until the seal is flush with the outer side of the hub assembly. Lubricate seal surface. The hub assembly may be reassembled to the axle assembly using the reverse procedure. When reinstalling the jam nut (9) on the axle shaft, position the inside jam nut against the spacer, tighten the nut until the hub becomes difficult to turn on the axle shaft, back off the jam nut until the hub turns freely. While holding the inner jam nut, tighten the outside jam nut to 70-90 ft. lbs. torque. Reinstall the tire and rim assembly on hub and tighten the lug nuts to 50-60 ft. lb. torque and install axle in fork assembly with reverse procedure. Tighten outside lock nuts to 90-110 ft. lbs. torque.

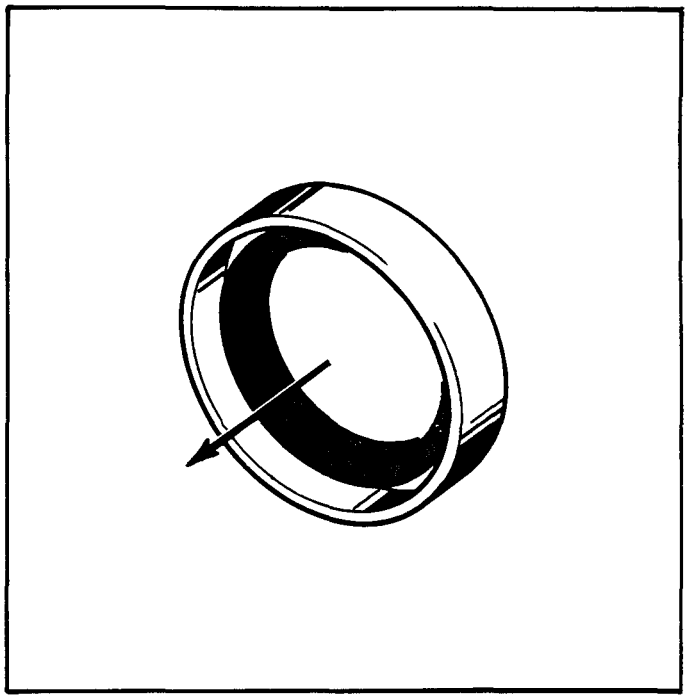


FIG. E-5 INSTALLING GREASE SEAL

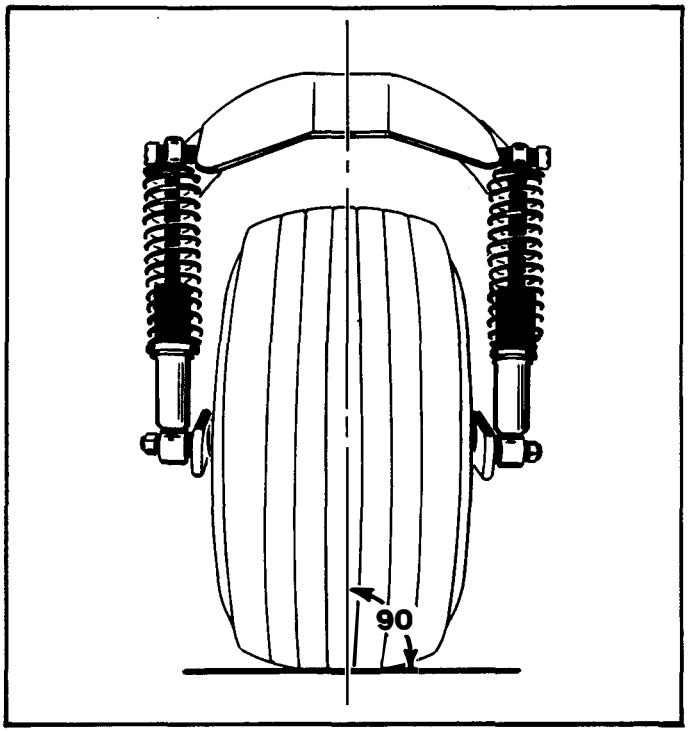



FIG. E-6 VERTICAL ALIGNMENT

## FRONT WHEEL ALIGNMENT

**Tools Required:**

- 11/16" Open End Wrench — Quantity 1
- 6" Adjustable Wrench — Quantity 1
- Square — Quantity 1

### THREE WHEEL VEHICLE (Fig. E-6)

Should the steering tend to pull to one side, align the wheel as follows: Position the vehicle on a flat level surface and set the wheel in a straight position. Loosen the nut (3) at both ends of the axle (refer to Fig. E-4).

Using a square, check the vertical alignment of the wheel/tire. Remove the axle nut retainers (2) from the outside axle nut. Loosen the jam nuts on the axle set screws (15). Adjust the set screws to position the wheel/tire vertically (90°) to the floor. Retighten the jam nuts. Reinstall the axle nut retainers (2) and tighten nuts to 90-110 ft. lbs. torque

**WARNING: WHEN ADJUSTING THE FORK, ENSURE THAT A MINIMUM OF ONE FULL AXLE DIAMETER REMAINS IN THE FORK ARM SLOT.**

### Four Wheel Vehicle (Fig. E-7)

To check the front end alignment, lift the front of the vehicle (see procedures in Section B) and rotate each front tire and scribe or chalk a line around the circumference of each tire at approximately the center of the tire. Toe-in dimensions shall be as follows: (Fig. E-7) Toe-in front dimension is to be 1/4" ± 1/16" smaller than rear dimension, when measured at points $X_1$ to $X_1$ and $X_2$ to $X_2$. If toe-in is not within the above range, an adjustment should be made as follows: Loosen the nuts or clamps "B" on the tie rod "C" and rotate tie rod tube as required until the toe-in dimensions are within the acceptable range.

**NOTE:** After an acceptable range has been achieved, rotate the tie rod tube as required to locate tow pin "D" in a vertical position. Tighten nuts or clamp bolts "B" securely.

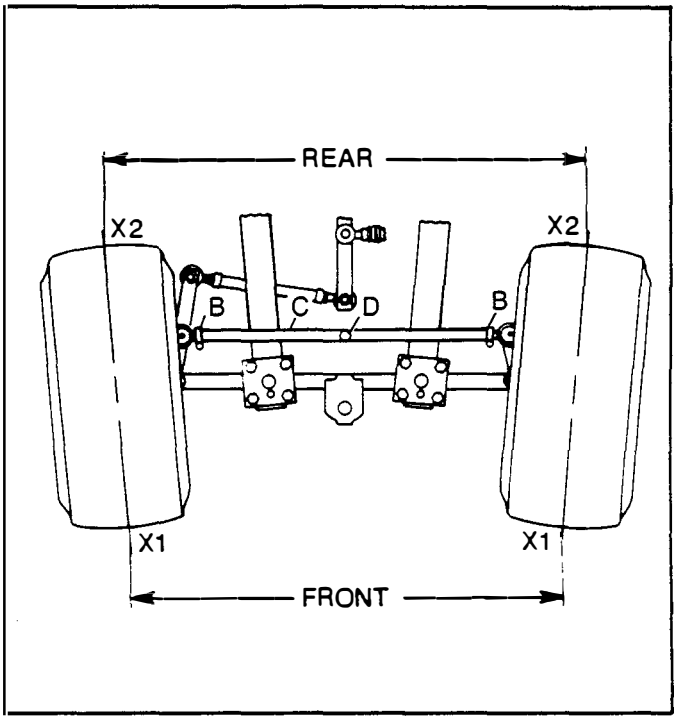



**FIG. E-7 4 WHEEL FRONT END ALIGNMENT**

### FRONT WHEEL BEARINGS (Four Wheel Vehicles) (Fig. E-8)

**Tools Required:**

- 1 1/2" Box Wrench — Quantity 1
- Jack — Quantity 1
- Jack Stand — Quantity 4
- Needle Nose Pliers — Quantity 1
- Channel Lock Pliers — Quantity 1
- Punch — Quantity 1
- Hammer — Quantity 1
- 3/4" Socket, 1/2" Drive — Quantity 1
- 6" Extension, 1/2" Drive — Quantity 1
- 1/2" Drive Ratchet — Quantity 1

Lift the front of vehicle (See procedures in Section B) so that wheels are off the floor and install jack stands. Remove the wheel lug nuts and remove the wheels. Remove the dust cap (1), remove the cotter pin (2), remove the slotted nut (3), pull the hub (4) and the outer bearing (5) off spindle (6). To remove the inside bearing and seal, insert a punch from the outside and lightly tap around the bearing cone (7). Clean the bearings, hub, seal and dust cap with a solvent and dry thoroughly. Inspect for wear or damage.

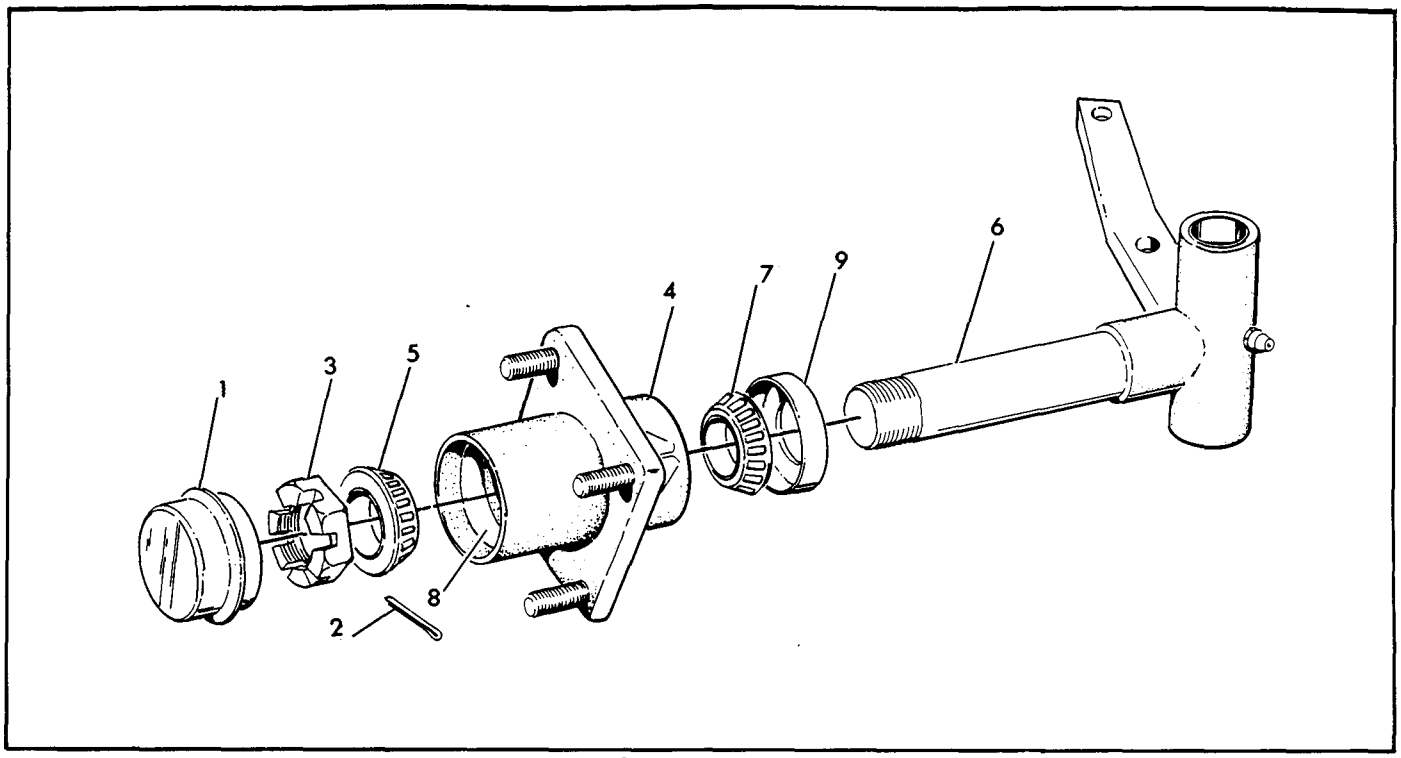



FIG. E-8 FRONT SPINDLE

Worn or damaged parts should be replaced. If the bearing cups (8) are worn or damaged, use a punch to remove and press in new cups. Repack the bearings with wheel bearing grease, making sure that grease is forced down between the rollers and race. (See Maintenance on Front Wheel Bearings 3 and 4 Wheel.)

**CAUTION:** BE SURE THAT THE SEAL RETAINING SURFACE OF THE HUB IS CLEAN AND FREE OF GREASE.

Install seal. Lubricate seal. Reassemble using the reverse order of disassembly.

**REAR SUSPENSION (3 AND 4 WHEEL VEHICLES)** (Fig. E-9)

**REMOVAL OF REAR SHOCK ABSORBERS** (Fig. E-9)

**Tools Required:**

| | |
|---|---|
| - 9/16" Box Wrench | Quantity 1 |
| - 15/16" Box Wrench | Quantity 2 |
| - 3/4" Socket, 1/2" Drive | Quantity 1 |
| - 6" Extension, 1/2" Drive | Quantity 1 |
| - 1/2" Drive Ratchet | Quantity 1 |
| - Torque Wrench | Quantity 1 |
| - Trolley Jack | Quantity 1 |

Loosen both rear wheel and tire assemblies by loosening the lug nuts but do not remove. Raise the vehicle (see procedures in Section B). Remove the rear wheel and tire assemblies. Use a 9/16" box end wrench on the nut (1) at the top of the shock absorber (2). Rotate the top part of the shock absorber counter clockwise. Lower the body of the shock absorber and retain all hardware. Use a 15/16" box wrench to remove the bottom hardware. Remove the shock absorber. Reassemble using the reverse order of disassembly.

**REMOVAL OF REAR LEAF SPRINGS** (Fig. E-9)

**Tools Required:**

| | |
|---|---|
| - Trolley Jack | Quantity 1 |
| - Torque Wrench | Quantity 1 |
| - 9/16" Box End Wrench | Quantity 1 |
| - 9/16" Deep Socket, 1/2" Drive | Quantity 1 |
| - 1/2" Drive Ratchet | Quantity 1 |
| - 3/4" Socket, 1/2" Drive | Quantity 1 |
| - 6" Extension, 1/2" Drive | Quantity 1 |
| - Needle Nose Pliers | Quantity 1 |
| - Screwdriver, Standard | Quantity 1 |
| - 1/2" Wrench | Quantity 1 |

**READ REMOVING REAR AXLE ASSEMBLY FROM VEHICLE (SECTION M1) BEFORE PROCEEDING.**

Remove batteries (See Safety Procedures in Section B). Remove the top end of the shock absorber using previous procedures. Place a trolley jack underneath the differential housing and remove the wiring from the motor (See Electric Motor Section). Using needle nose pliers, remove the cotter pin and retaining ring from the brake assembly. Remove the pin from the brake lever. Remove the cable from the shackle. With the jack elevating the rear end, remove the 4 'U' bolts (3) from the rear end. Lower the rear end slowly. Remove the rear end from underneath the vehicle. Remove the lower nut and bolt assembly (4) from the front of the spring. Remove the nuts and hardware (5) from the shackle (6) and remove the spring (7) from the vehicle.

Install using the reverse order of disassembly. Tighten all 'U' bolt hardware to 30-35 ft. lbs. torque. Tighten all hardware until the bushings are compressed to the diameter of the retaining washers.

**REMOVAL OF STABILIZER BAR (3 WHEEL VEHICLES ONLY)** (Fig. E-9)

Use the previous procedure for removing the rear springs. Remove 'U' bolt and nut assembly from each side of the vehicle above motor.

Remove the stabilizer bar complete with the spring retainer bracket assembly. Install using the reverse order of assembly and tighten stabilizer bar 'U' bolt hardware to 18-25 ft. lbs. torque.

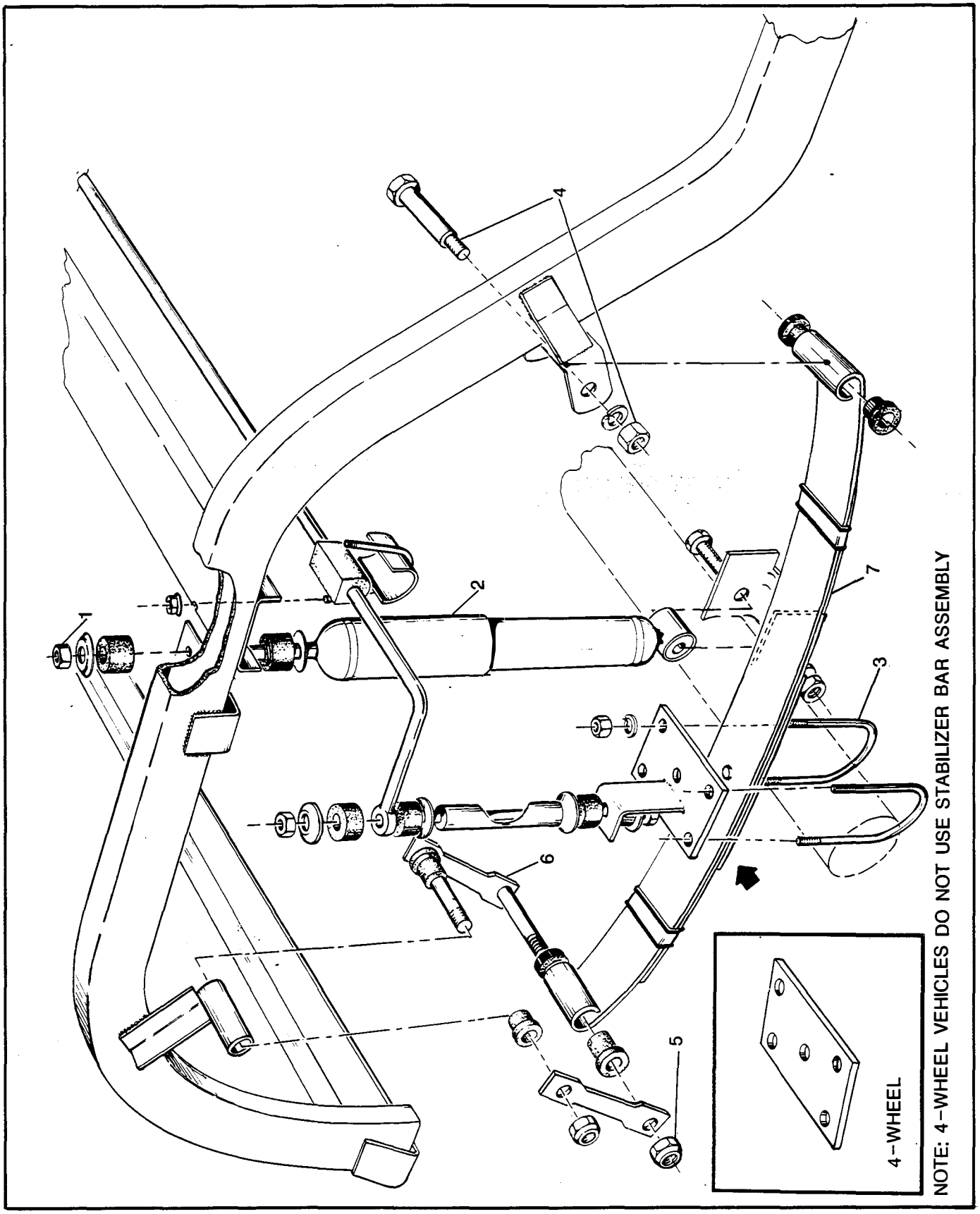



FIG. E-9 REAR SUSPENSION

**ACCELERATOR ADJUSTMENT** (Fig. F-1 and F-2)

**Tools Required:**

- Pliers, Needle Nose — Quantity 1
- 1/2" Open End Wrench — Quantity 1

**WARNING: DISCONNECT BATTERIES BEFORE ATTEMPTING THIS ADJUSTMENT. A COMPONENT FAILURE OR INADVERTANTLY LEAVING THE KEY IN THE "ON" POSITION COULD RESULT IN THE VEHICLE ACCELERATING OUT OF CONTROL.**

To determine the need for an accelerator adjustment, observe the accelerator switch assembly (1) with the accelerator pedal (2) in the **fully released** position. The spring loaded brush should be located on the bottom contact stud **only** and with the contact arm (4) resting against the stop (5).

Observe the accelerator switch assembly (1) with the accelerator pedal (2) in the **fully depressed** position. The spring loaded brush (12) should be located in **full** contact with the top contact stud (6) **only.**

The accelerator requires adjustment if either of the above conditions are **not** met.

Raise the front of the vehicle (see procedures in Section B) to provide access to the underside of the accelerator linkage.

Loosen the jam nut (7) at the adjustable yoke (8). Remove the cotter pin (9) and slide the hill brake kick off rod (10) out of the adjustable yoke (8) being careful to note the position of the two flat washers (11). Inspect all parts for abnormal wear and replace if required. Separate the accelerator rod assembly (13) from the accelerator pedal and rotate the adjustable yoke (8) clockwise to shorten, or counterclockwise to lengthen the accelerator rod assembly.

The correct adjustment of the accelerator rod assembly is achieved when the above criteria are met.

Reassemble using the reverse procedure and use a new cotter pin (9) to secure the assembly. Recheck the adjustments and, with the accelerator in the **fully raised** position, bend the stop leg (17) to provide 1/32" clearance with the accelerator pedal.

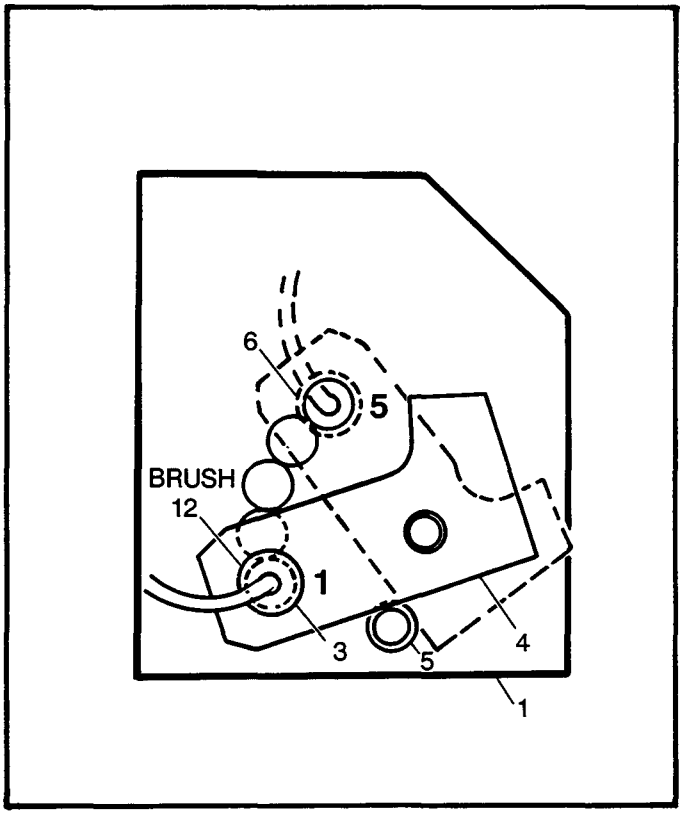



**FIG. F-1 ACCELERATOR SWITCH ADJUSTMENT**

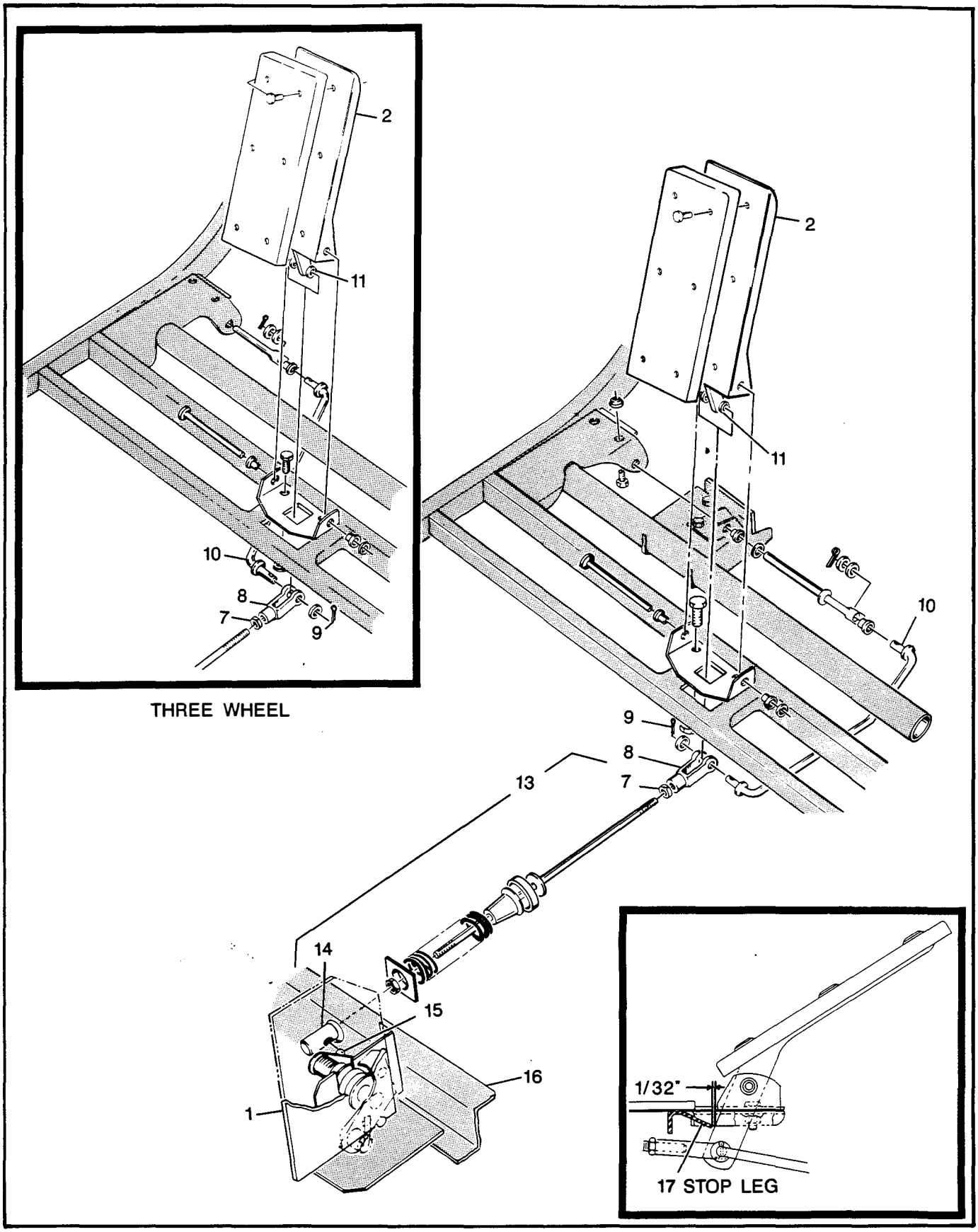



FIG. F-2 ACCELERATOR LINKAGE REMOVAL

**ACCELERATOR LINKAGE REMOVAL** (Fig. F-2)

**Tools Required:**

- 1/2" Open End Wrench Quantity 1
- 1 1/8" Open End Wrench Quantity 1
- Long Screwdriver or Alignment Punch Quantity 1
- Hammer Quantity 1

Remove the adjustable yoke (8) from the accelerator pedal (2) (see Accelerator Pedal Adjustment Procedure). At the accelerator switch assembly (1): Slide the barrel of the ball joint socket (14) forward and push the accelerator rod assembly (13) away from the pivot arm assembly (15). Pull the complete accelerator rod assembly through the cross-member (16) and out of the vehicle.

**NOTE:** If vehicle has been driven under adverse conditions, some difficulty may be encountered when attempting to slide the barrel of the ball joint socket (14). If such difficulty is encountered, tap the barrel using either a straight blade screwdriver or an alignment punch and a hammer.

**CAUTION:** TAP LIGHTLY TO PREVENT DAMAGE TO THE ACCELERATOR SWITCH ASSEMBLY.

**ACCELERATOR PEDAL REMOVAL** (Fig. F-3)

**Tools Required:**

- 7/16" Box End Wrench Quantity 1
- Needle Nose Pliers Quantity 1
- 1/2" Open End Wrench Quantity 1

Remove the adjustable yoke from the accelerator pedal (see Accelerator Pedal Adjustment Procedure). Remove the two screws (1) and the two lock nuts (2) that secure the accelerator pedal assembly (3) to the floor of the vehicle (4). Lift the accelerator pedal assembly from the vehicle. Should the pivot bearings (5) need to be replaced, they may be removed by removing the pivot pin (6). A new push nut (7) will be required for reassembly.

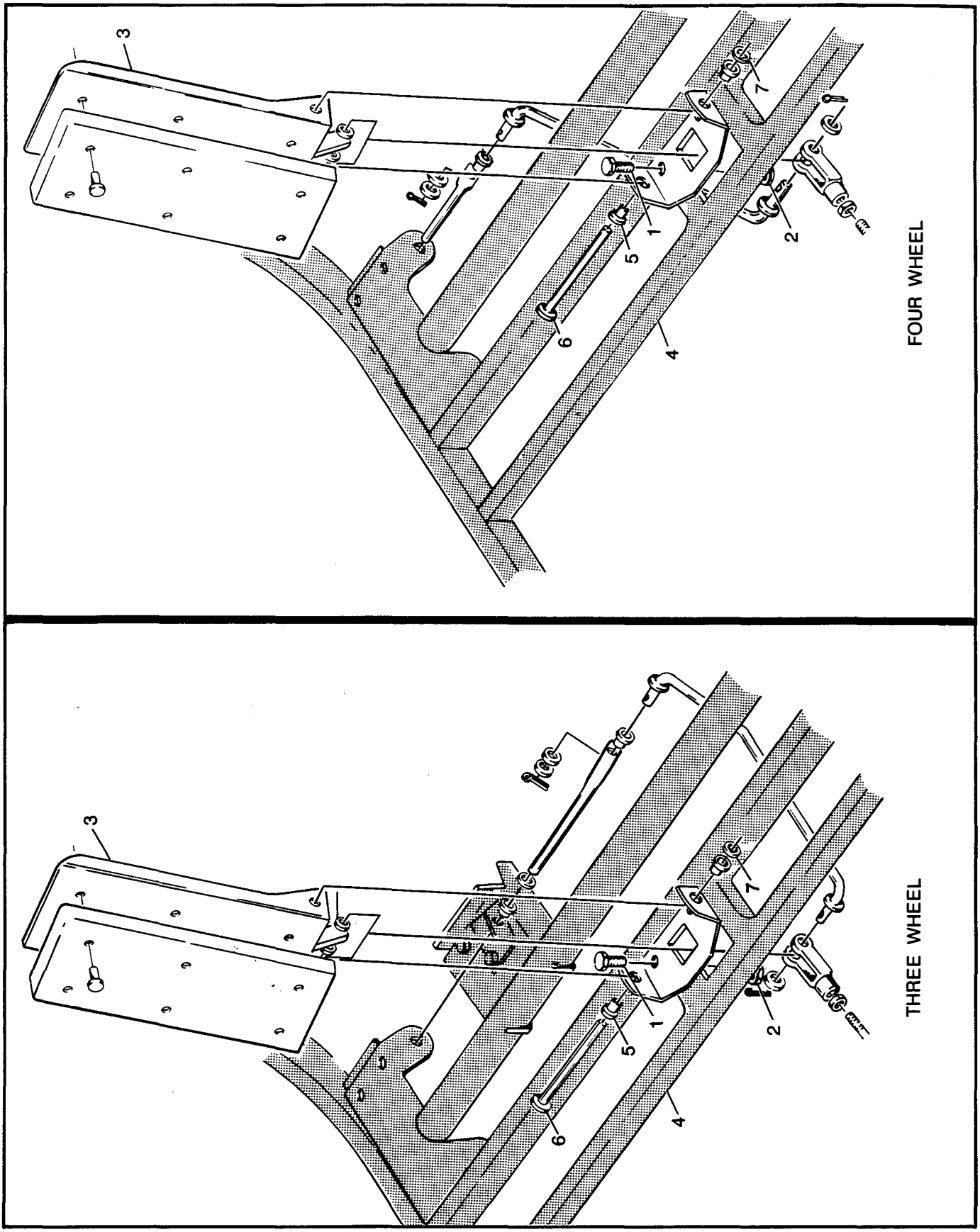



FIG. F-3 ACCELERATOR PEDAL REMOVAL

### HOW THE BRAKE WORKS

The brake assembly is a servo action brake.

The brake assembly is a self-adjusting unit and should not require any adjustment; however, periodic adjustment to the actuating linkage may be required to compensate for component wear or as a result of a component replacement.

Depressing the brake pedal causes the brake cable to pull the brake actuating lever forward which in turn pushes the rear brake shoe against the brake drum. Continued movement of the brake actuating lever causes the lever slide mechanism to move which pushes the front shoe against the drum. As the shoes contact the drum "servo action" takes place. If the vehicle is moving forward the rear brake shoe moves upwards applying pressure against the upper rear portion of the brake drum. The front shoe moves downwards applying pressure against the lower front portion of the brake drum.

The action reverses when the brakes are applied with the vehicle operating in reverse.

The resulting brake shoe wear is shown (Fig. G-1) in quadrants A, B, C and D with quadrant 'A' showing the most wear, 'B' will show the second most wear. Quandrants B and D will always be to the rear of the vehicle.

Brake shoes must be replaced when the lining thickness (measured at the point of greatest wear) reaches .040 thick.

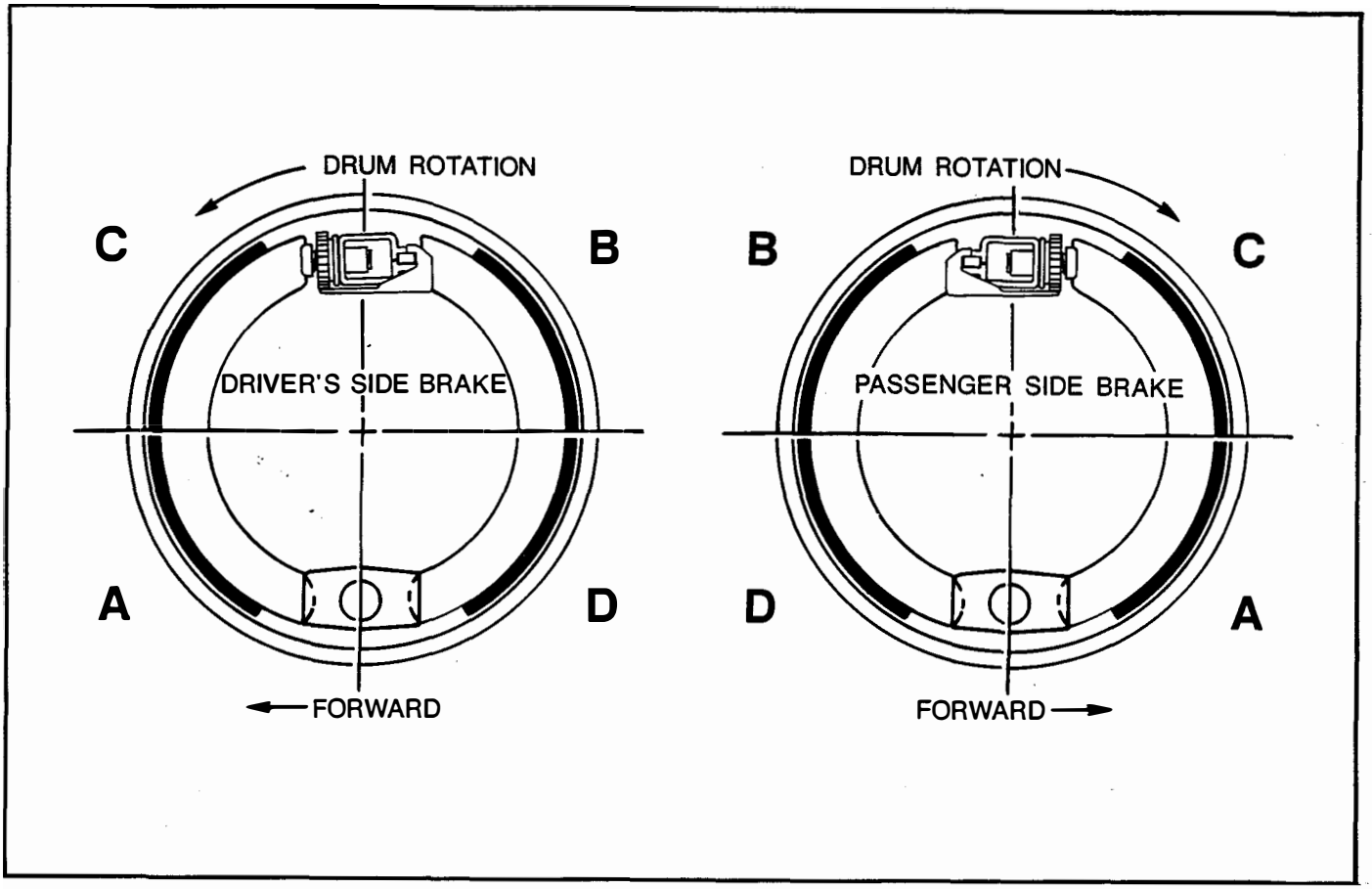



FIG. G-1 BRAKE WEAR

An overall view of the brake system is shown in Fig. G-2.

**HOW THE ADJUSTER WORKS** (Fig. G-3)

The brake has an automatic adjuster mechanism that compensates for lining wear.

The brake adjuster is activated by movement of the lever attached to the brake cable. Movement of this lever activates the adjuster lever (1) which rotates the 'star' wheel (2). The star wheel's rotation pushes the adjuster screw (3) outwards which in turn moves the brake shoes outward. With the brake correctly adjusted, the adjuster lever does not have enough movement to rotate the star wheel since lever movement is limited to approximately 1/8". The 1/8" of movement limits the adjuster lever's motion to the flat of the tooth that it is sitting on.

As the brake shoe wears, the lever's motion increases which causes the adjuster lever to engage the next tooth of the star wheel. The wheel is then rotated which expands the brake shoes.

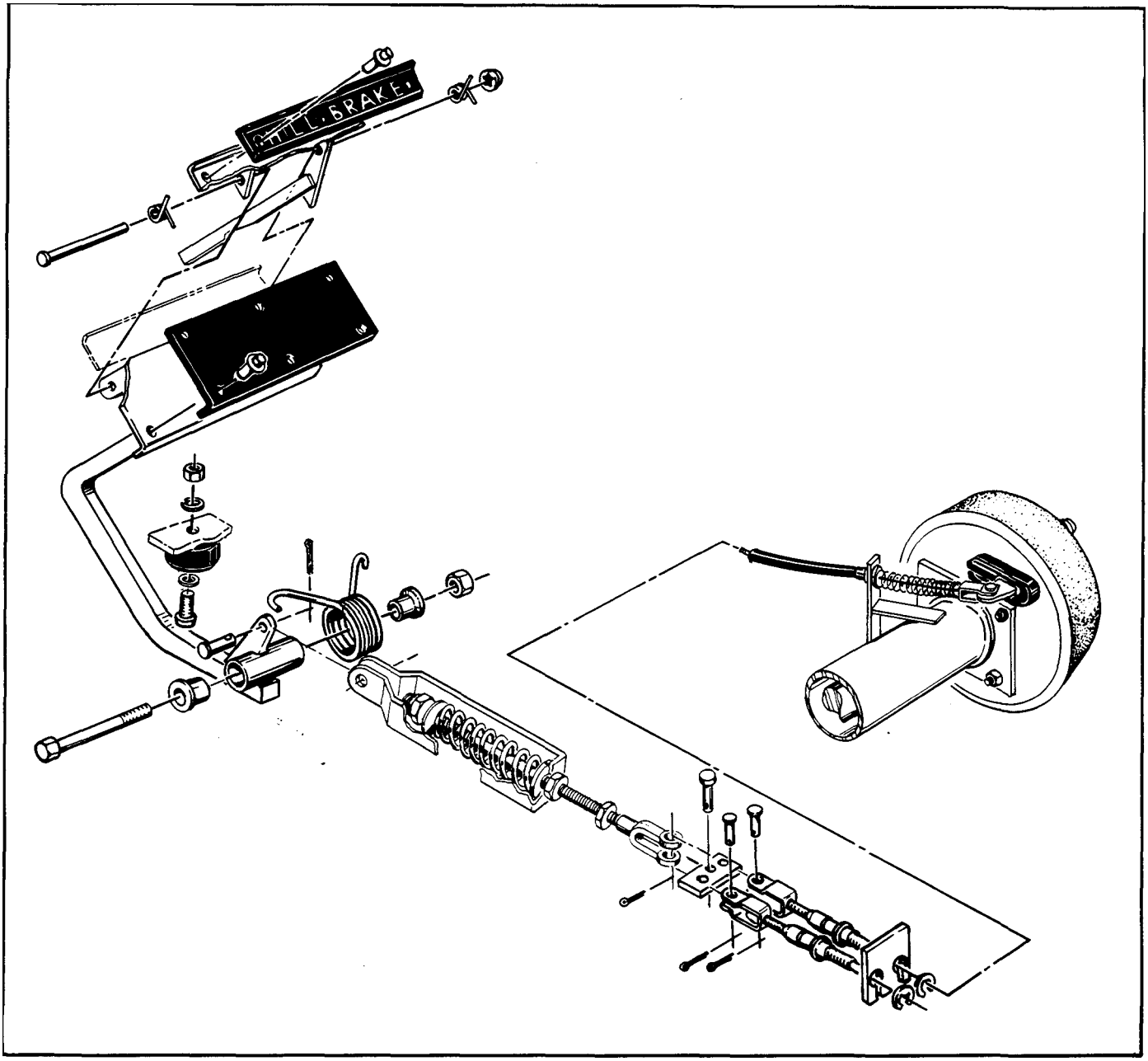
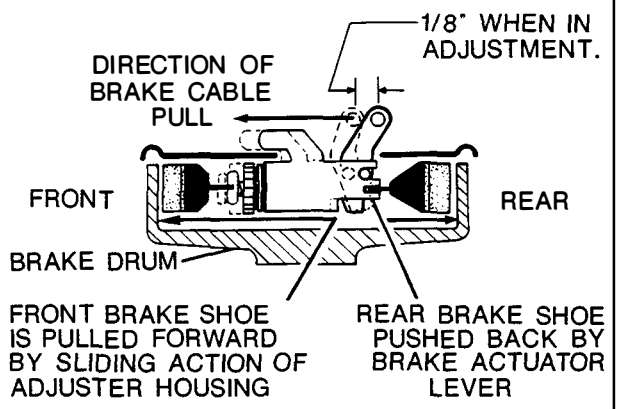
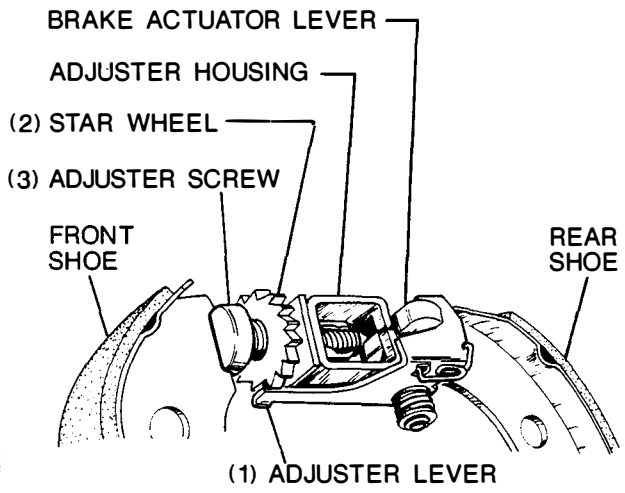



FIG. G-2 BRAKE LINKAGE

ILLUSTRATIONS SHOW DRIVER'S SIDE BRAKE ONLY. PASSENGER SIDE IS MIRROR IMAGE.




NOTE: TEETH ARE NUMBERED IN ILLUSTRATION TO CLARIFY THEIR POSITIONS.

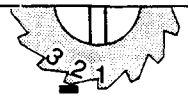
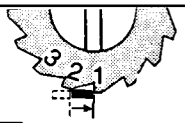
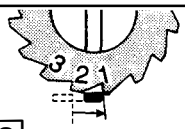
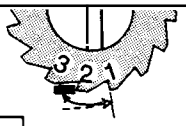
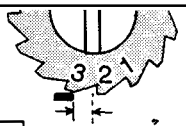
| | | |
|---|---|---|
| THE DISTANCE OF THE ADJUSTER LEVER TRAVEL IS REGULATED BY THE AMOUNT OF BRAKE SHOE WEAR.(A) |  A | POSITION OF ADJUSTER LEVER WITH BRAKES DISENGAGED. |
| WHEN BRAKE SHOE WEAR IS MINIMAL, THE DISTANCE OF ADJUSTER LEVER TRAVEL IS TOO SHORT TO FULLY RE-ADJUST BRAKES.(B) |  B | POSITION OF ADJUSTER LEVER WITH MINIMUM SHOE WEAR AND BRAKES ENGAGED. |
| AS SHOE WEAR INCREASES, ADJUSTER LEVER TRAVEL INCREASES, THUS TURNING THE STAR WHEEL.(C) |  C | POSITION OF ADJUSTER LEVER WITH BRAKES ENGAGED AND SHOES WORN TO POINT OF NEEDING SELF-ADJUSTMENT. |
| WHEN BRAKE SHOES HAVE WORN SUFFICIENTLY TO REQUIRE RE-ADJUSTMENT, THE ADJUSTER LEVER ADVANCES AND RATCHETS TO THE NEXT TOOTH WHEN BRAKES ARE RELEASED.(D) |  D | POSITION OF ADJUSTER LEVER WITH BRAKES DISENGAGED AND READY TO RESET ADJUSTER SCREW. |
| WHEN BRAKE IS NEXT ENGAGED, THE ADJUSTER LEVER WILL ROTATE THE STAR WHEEL FAR ENOUGH TO EXTEND THE ADJUSTER SCREW, THUS RE-SETTING THE PROPER SHOE/DRUM CLEARANCE.(E) |  E | POSITION OF ADJUSTER LEVER WITH BRAKES ENGAGED DURING RE-ADJUSTMENT OF SCREW. |
| WHEN THE SHOE/DRUM CLEARANCE IS RESET, LESS EFFORT IS REQUIRED TO ENGAGE THE BRAKES, THUS THE ADJUSTER LEVER TRAVEL IS ONCE AGAIN REDUCED.(F,A) |  F | POSITION OF ADJUSTER LEVER WITH BRAKES DISENGAGED AND RE-ADJUSTMENT COMPLETED. NOTE NEW POSITIONS OF TEETH. |

FIG. G-3 HOW THE BRAKE ADJUSTER WORKS

**DISASSEMBLY OF BRAKE PEDAL** (See Fig. G-4)

**Tools Required:**

- Straight Blade Screwdriver . . Quantity 1
- Pliers . . . . . Quantity 1
- Ball Pein Hammer . . . . . Quantity 1

To repair or replace damaged or worn brake pedal parts, disassemble as follows:

Unhook the pedal return spring (1). (Insert a thin blade screwdriver between the small hook end and the pedal bracket, move spring back and away from the bracket.)

Remove the lock nut (2) from the pivot bolt (3) and remove the bolt. Remove the spring, disconnect the cable clevis (4) and lift the pedal out through the floorboard.

To remove the hill brake pedal, note the position of the two springs (5). Remove the "push on" retainer nut (6) (new nut required for reassembly), and remove the hinge pin (7). Reassemble in the reverse order of disassembly.

**REMOVAL OF HILL BRAKE RELEASE LINKAGE** (See Fig. G-5)

**Tools Required:**

- Pliers . . . . . Quantity 1
- Hydraulic Trolley Jack . . . . Quantity 1
- Jack Stands . . . . . Quantity 1
- 8 mm Open End Wrench . . Quantity 1

To remove the hill brake release linkage, raise the front of vehicle (See procedure in Section B) to allow access to underside.

To remove the linkage rod (1), remove the cotter pin (2) and washers (3) and (12) from lever arm (4).

Loosen the two setscrews (5) in cam (6), and slide the pivot arm shaft (4) out of the pivot bracket (8). The cam and nylon spacer will come out when the pivot arm shaft is removed.

If the spacers (9) or bearings (10 and 11) are worn, replace them with new spacers or bearings.

Reassemble by reverse procedure.

**NOTE:** It may be necessary to remove the indentures on the shaft (4) caused by the set-screws (5).

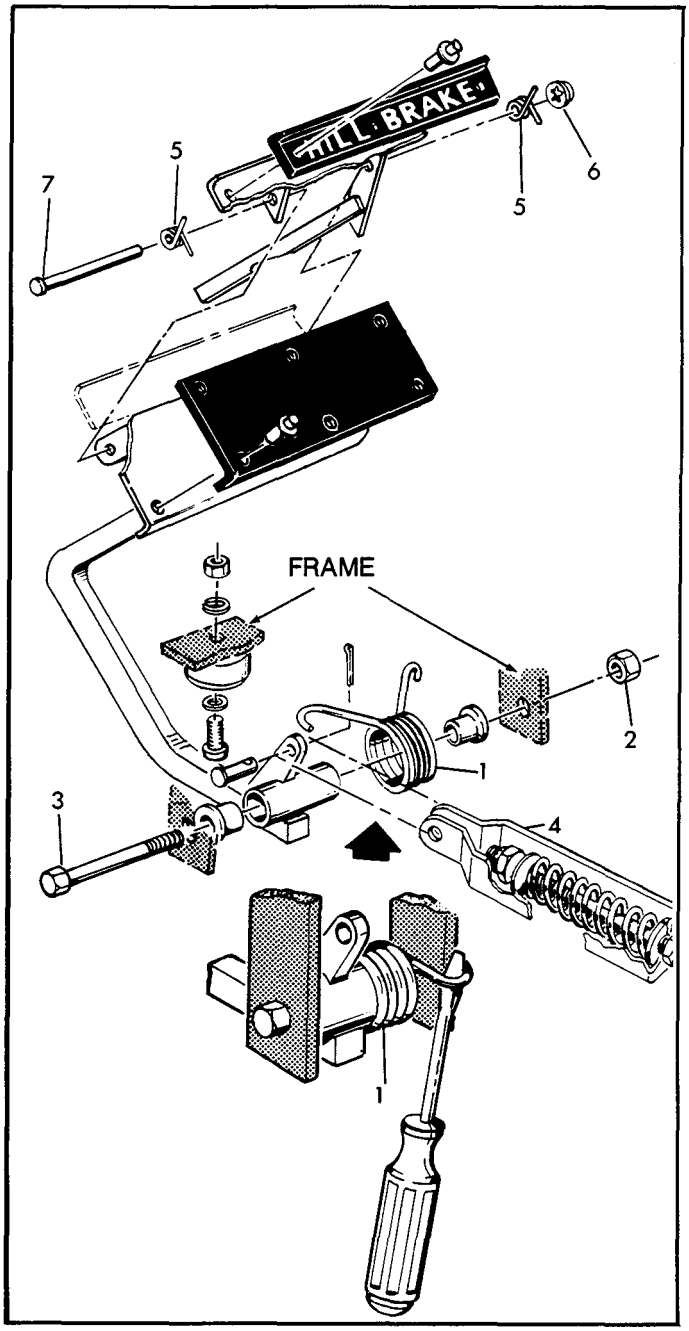



**FIG. G-4 BRAKE PEDAL SPRING REMOVAL**

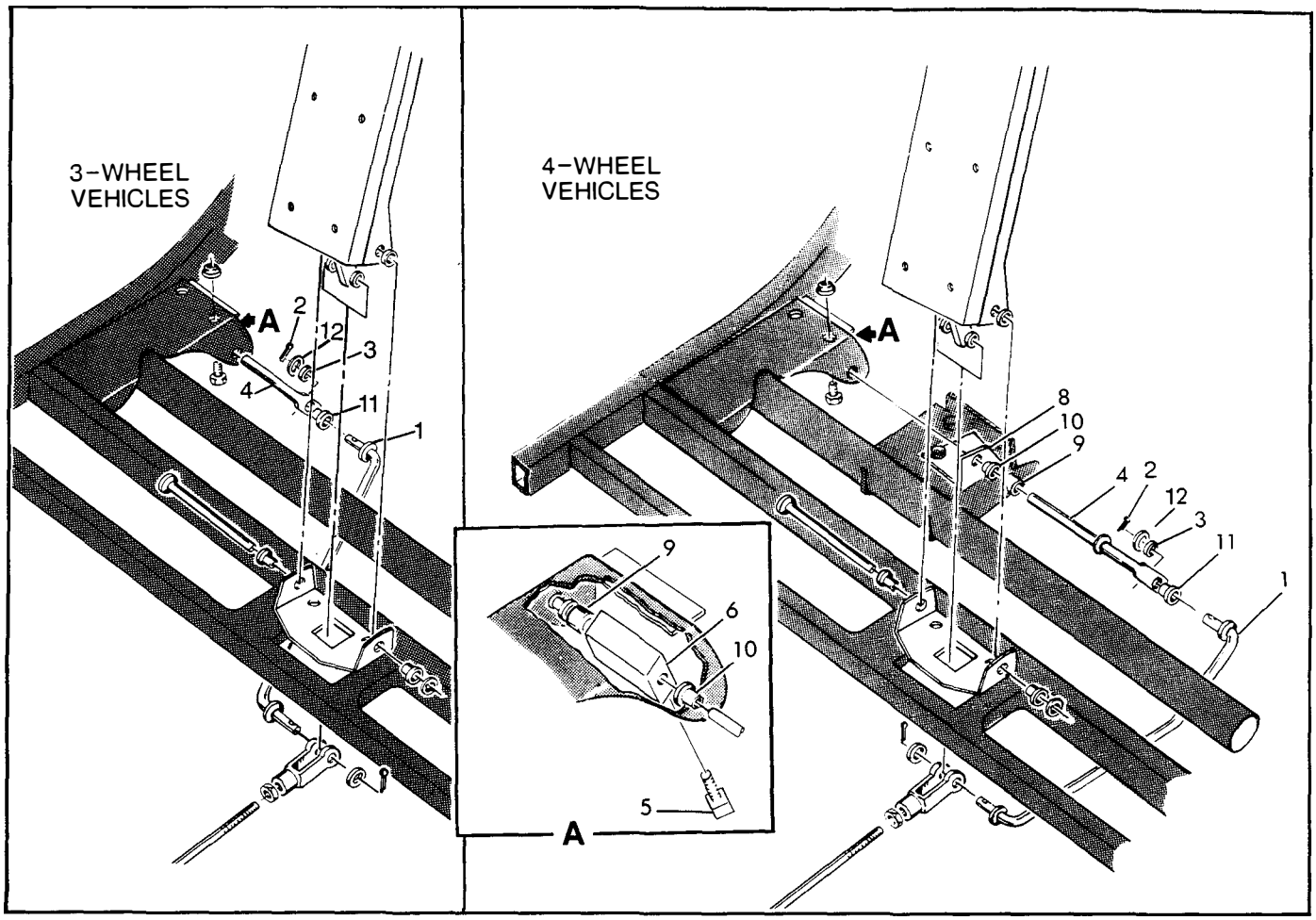



FIG. G-5 BRAKE "KICK OFF" LINKAGE

**BRAKE DRUM, SHOE AND BRAKE ASSEMBLY REMOVAL** (Fig. G-6 and G-7)

**Tools Required:**

- Hydraulic Trolley Jack. . . . . Quantity 1
- Plastic Tipped Hammer . . . Quantity 1
- Jack Stands . . . . . Quantity 4
- Flat Blade Screwdriver . . . Quantity 2
- 1/2" Socket . . . . . Quantity 1
- 1/2" Drive Ratchet . . . . . Quantity 1
- 1 1/6" Socket . . . . . Quantity 1
- Torque Wrench . . . . . Quantity 1
- Pliers . . . . . Quantity 2
- 1/2" Wrench . . . . . Quantity 1

**DRUM REMOVAL**

Loosen lug nuts on rear wheels 1/8 to 1/4 turn. Raise the vehicle (see procedure in Section B). Remove the rear wheel(s).
Remove the cotter pin (5) and clevis pin (6) from the brake lever. Remove the cotter pin (8) from the axle nut (9) and remove the nut and washer (10). **TAP** the brake drum (11) with a plastic faced hammer to remove the drum. If the drum does not come off, it will be necessary to loosen the brake adjuster mechanism.

Rotate the brake drum until one of the holes is located over the star wheel position. (11 o'clock for driver's side, 1 o'clock for passenger side).

The hole is aligned with the brake adjuster mechanism when in this position. Insert a flat blade screwdriver between the adjuster lever and the adjuster screw housing. Insert a second flat blade screwdriver and push on the bottom portion of the 'star' wheel which will loosen the adjuster screw and retract the shoes to permit the drum to be removed.

Using a pair of pliers, compress the brake shoe retainer (1) at the open end of the spring.

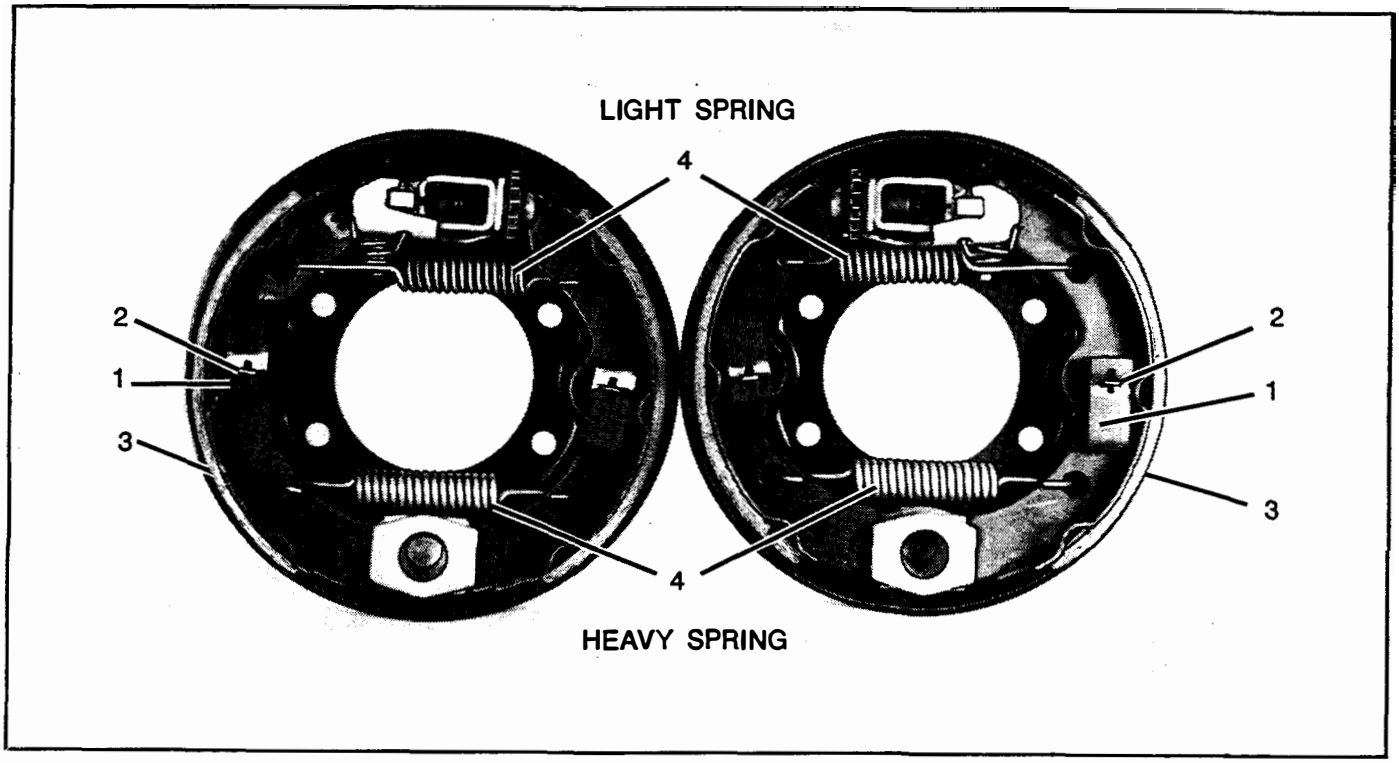



FIG. G-6 WHEEL BRAKES DRIVER'S AND PASSENGER SIDE

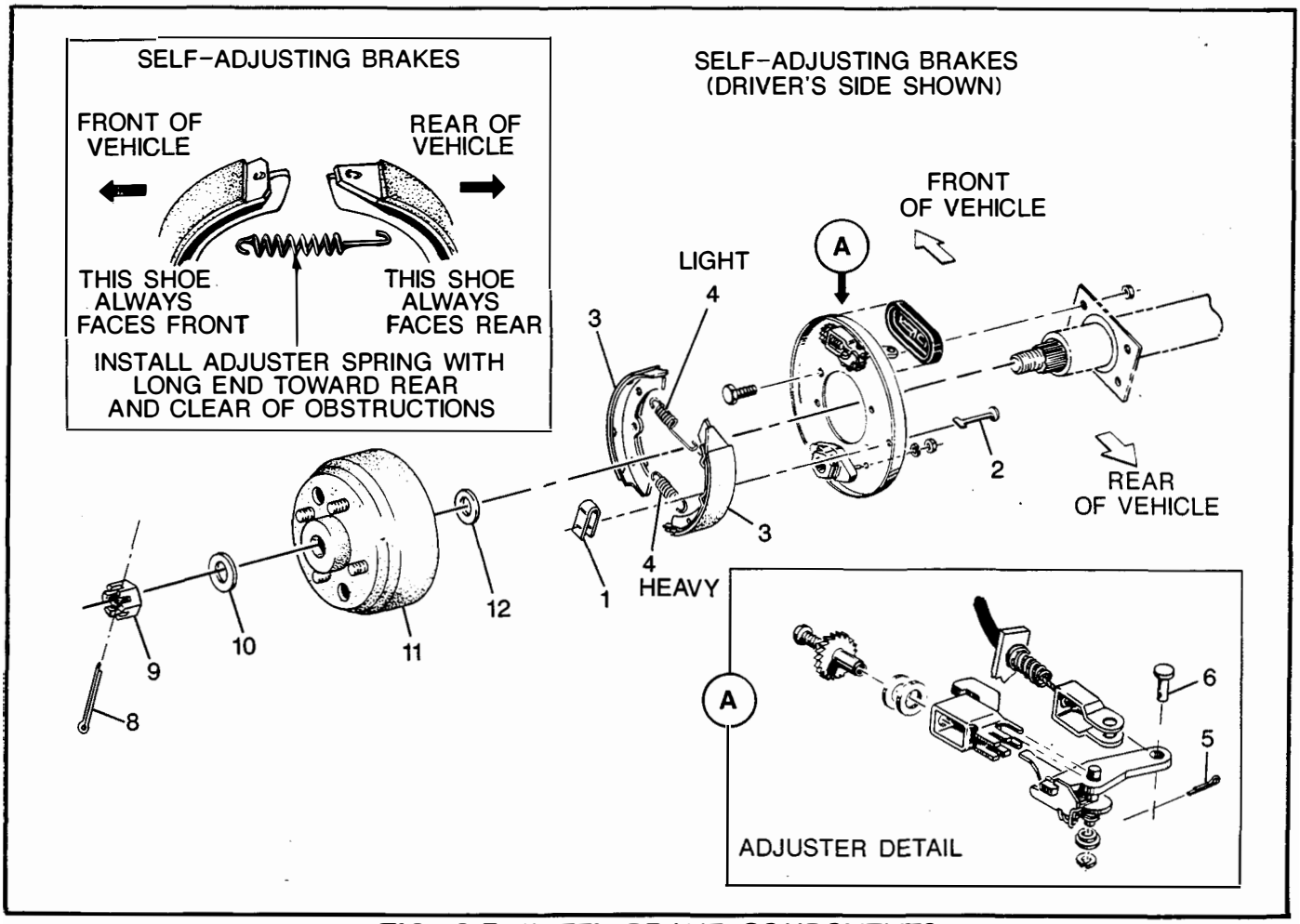



FIG. G-7 WHEEL BRAKE COMPONENTS

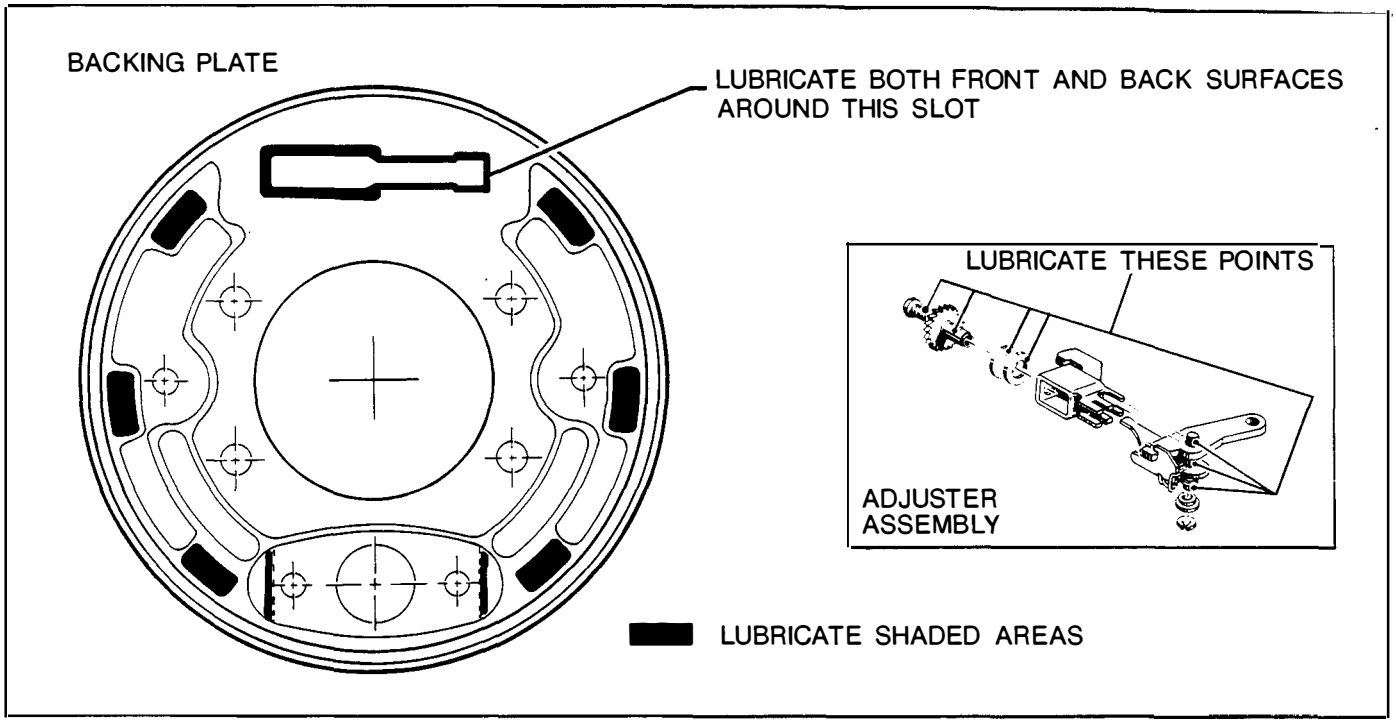



**FIG. G-8 BRAKE LUBRICATION AREAS**

While holding the tension pin (2) with a second set of pliers turn the retainer spring 1/4 turn to align the slot in the spring retainer with the flats in the tension pin. Remove the brake shoe retainer springs.

Grasp the brake shoes (3) in the center and tilt them outwards and away from the back mounting plate. This will release the tension in the brake springs (4). Remove the brake springs and remove the brake shoes.

Check for free lateral (front to back) movement of the adjusting mechanism and for free movement of the 'star' wheel. Remove the boot on the brake lever. Clean any accumulated brake dust from the backing plate and adjuster mechanism using a brush or air hose.

**WARNING: WEAR PROTECTIVE GOGGLES AND MASK WHEN CLEANING BRAKE COMPONENTS. LUBRICATE AREAS INDICATED WITH WHITE LITHIUM GREASE. (FIG. G-8)**

If the brake is being removed for an axle bearing and seal replacement the four bolts and nuts securing the brake assembly to the rear axle must be removed. When reinstalling the brake mounting bolts tighten to 23-35 ft. lbs. torque.

**REPLACING BRAKE SHOES** (Figs. G-6 and G-7)

Inspect brake shoes. If a brake shoe has less than .040 lining material thickness **AT ANY POINT** on the shoe then the shoe set must be replaced.

**NOTE:** That the metal portion of the brake shoes differs between front and rear shoes. The identical ends of the shoes fit against the fixed anchor at the bottom of the brake. The shoe with the straight end engages in the slot in the adjusting screw, while the triangular ended shoe engages in the rear of the adjusting mechanism.

The springs must be inserted with the light spring at the top. The long hook is installed down through the rear brake shoe. The heavier bottom spring is installed with the spring hooks facing up.

Install the brake shoes using the reverse order of disassembly and secure with the spring retainer and springs.

Clean the axle shaft to remove grease, dirt and all foreign matter. Apply a small amount of lubricant (Neverseize) to the spline.

Insert a straight blade screwdriver between the adjusting lever and the adjusting mechanism. Rotate the star wheel counter clockwise until the shoes have retracted sufficiently to permit the brake drum to be installed. Install washer (12), brake drum (11), washer (10), and tighten the axle nut to 70 ft. lbs. torque minimum.

If the slot in the axle nut and the hole in the axle are not in alignment, continue to tighten the axle nut until the alignment is achieved.

**NOTE:** Minimum torque is 70 ft. lbs. Torque readings of up to 140 ft. lbs. are satisfactory.

Install new cotter pin (8).

Move the brake lever forward and release fully, repeat until the travel of the lever is approximately 1/8". Install brake cables using clevis pin (6) and a new cotter pin (5).

**COMPENSATING BRAKE LINKAGE ADJUSTMENT** (Fig. G-9)

**Tools Required:**

- Ratchet, 1/2" Drive . . . . . Quantity 1
- Extension, 1/2" Drive . . . . Quantity 1
- 3/4" Socket, 1/2" Drive . . . Quantity 1
- 1/2" Wrench . . . . . Quantity 1
- Pliers . . . . . Quantity 1
- Hammer, Ball Pein . . . . . Quantity 1

Raise the Vehicle (See Procedure in Section B)

1. Check the position of the equalizer (1) with hill brake **ENGAGED** (Detail 'A')
   a. If dimension exceeds 1/8" proceed to Step 2.
   b. If dimension is within specification proceed to Step 7.

2. Remove compensating linkage (2) from equalizer (1) by removing cotter pin (3) P/N 13087-G3 and clevis pin (4) P/N 13686-G3.

3. Remove the wheel and tire corresponding to the position of the equalizer (Detail 'A').

**ADJUSTMENT OF THE WHEEL BRAKE**

4. With the wheel removed the brake lever is accessible. Push the brake lever forward and release (Detail 'B') - repeat as needed until the lever travel is approximately 1/8".

   **NOTE:** A hammer handle works as well as a tool to push the lever.

5. Reinstall wheel.

6. Reconnect compensating linkage (2).

   **NOTE:** Always use a new cotter pin (3).

**ADJUSTING COMPENSATING SPRING**

7. With the hill brake **DISENGAGED** check that the compensating spring length is between 3 7/8" and 3 15/16" (Detail C). If adjustment is required it is made at the nut (6) located in front of the spring (7) (Detail 'C').

**ADJUSTING FREE PEDAL TRAVEL**

8. Measure the free pedal play to determine if it is between 1" - 1 1/2". If an adjustment is required; release the jam nut (8) from the yoke (9) and adjust at the threaded rod welded nut (10) (Detail 'D').

   **NOTE:** If the nut (6) in front of spring (7) does **NOT** rotate with the threaded rod, a second 1/2" wrench will be required. Turn both wrenches simultaneously.

   **SERVICE TIP** - Installing a 5/16-24 jam nut against the nut (6) and locking it in place will eliminate nut movement on the threaded rod and eliminate the need for a second wrench.

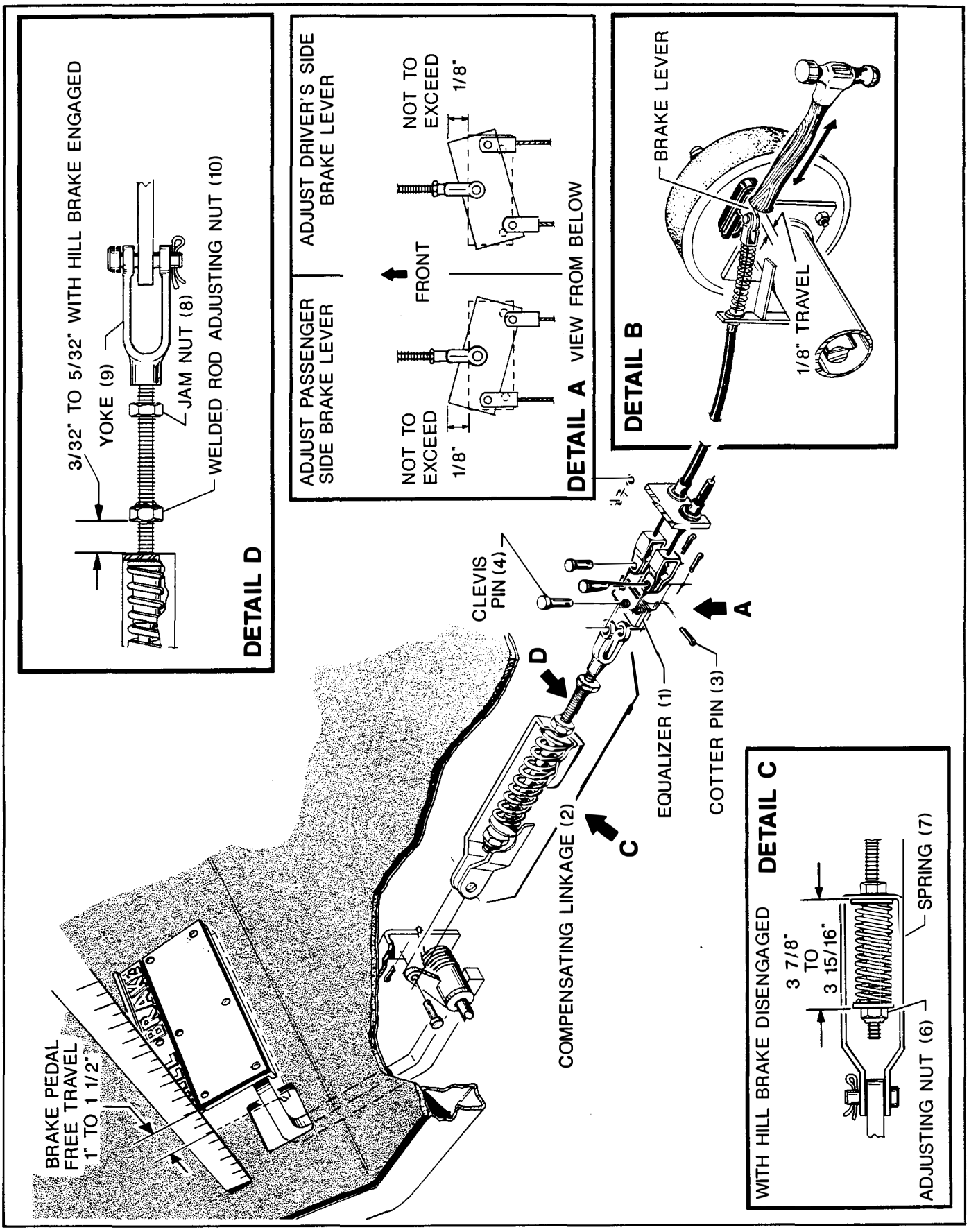



FIG. G-9 BRAKE LINKAGE ADJUSTMENTS

## ADJUSTING THE WHEEL BRAKE AND SEATING BRAKE COMPONENTS

9. Engage the hill brake and then **RELEASE.** Repeat twenty (20) times.

   **NOTE:** Be sure to allow the pedal to return fully after each cycle.

10. **ENGAGE** the hill brake and check for a gap of between 3/32"-5/32" (Detail 'D'). If an adjustment is required, the adjustment is made at the welded rod adjusting nut (10).

    **NOTE:** Be sure that the adjusting nut (6) rotates with the threaded rod. (See Service Tip)

## FINAL CHECK

11. Remeasure the free travel (1"-1 1/2") - if an adjustment is required, the adjustment is made at the welded rod adjusting nut (10) but the gap dimension specified in Detail "D" must be maintained.

12. Tighten jam nut (8).

13. Lower vehicle.

14. Test drive and return to service.

## HILL BRAKE ADJUSTMENT (Fig. G-10)

The hill brake engagement and holding force should be properly adjusted if the brakes have been adjusted per the "recommended brake adjusting procedure."

## HILL BRAKE FUNCTION

1. To check for proper hill brake function, lift the rear of the vehicle (see procedures in Section B) so that both rear tires are clear of the ground and there are no objects near the tires.

2. Remove the seat, place the forward-neutral-reverse switch in the "forward" position, turn the ignition switch to the "on" position, and fully engage the hill brake.

**WARNING: TO TEST FOR THE AUDIBLE "CLICK" OF THE MICRO SWITCH, THE VEHICLE FORWARD-NEUTRAL-REVERSE SWITCH MUST BE IN THE NEUTRAL POSITION OR HAVE THE REAR WHEELS RAISED TO PREVENT THE POSSIBILITY OF INJURY IF VEHICLE IS ACTIVATED.**

3. Slowly depress the accelerator pedal until the "click" of the accelerator switch is detected (the limit switch on the accelerator switch assembly activates the solenoid). If the solenoid is activated (clicked) **AFTER** the hill brake is released, the hill brake is functioning properly.

4. If the accelerator switch solenoid is activated prior to complete hill brake disengagement, the cause may be one or a combination of the following:

   a. An improperly adjusted hill brake kick-off cam.

   b. The catch bracket and/or latch arm is worn or damaged.

5. To check the above items (a,b), lower the rear wheels to the ground. Lift the front of the vehicle (see procedures in Section B). If the vehicle has four wheels, remove the left front wheel (driver's side) for better access to the hill brake kick-off mechanism, and proceed as follows:

   a. Inspect the catch bracket (1) and latch arm (2) for any damage or wear.

   b. If the hill brake latch arm needs replacing, see section on "Disassembly of Brake Pedal".

   c. If the catch bracket needs replacing, proceed as follows:

      1. Be sure that the hill brake has been released.
      2. Roll the floormat back from the brake area to provide access to the 1/4" catch bracket mounting nuts (5).

3. Using a 7/16" wrench, remove the 1/4" x 3/4" long bolts (3), lock washers (4), and the nuts (5) which retain the catch bracket (1) to the brake bracket.
4. Remove the catch bracket and install a new catch bracket in the reverse order of disassembly.

d. Check the cam (6) for proper adjustment. When the latch arm is engaging the catch bracket, there must **NOT** be any gap between the top of the cam and the latch arm (see Fig. G-10).

e. If the cam requires adjustment, proceed as follows:

1. Engage the hill brake.
2. Loosen the two cam setscrews (7).
3. Rotate the pivot arm assembly (1, Fig. G-11) upward (clockwise when viewed from the driver's side of the vehicle) to remove the free play in the linkage.
4. Rotate the cam counterclockwise so that the top of the cam is contacting the latch arm.
5. While holding the cam and the pivot arm assembly in proper position, tighten the cam setscrews.

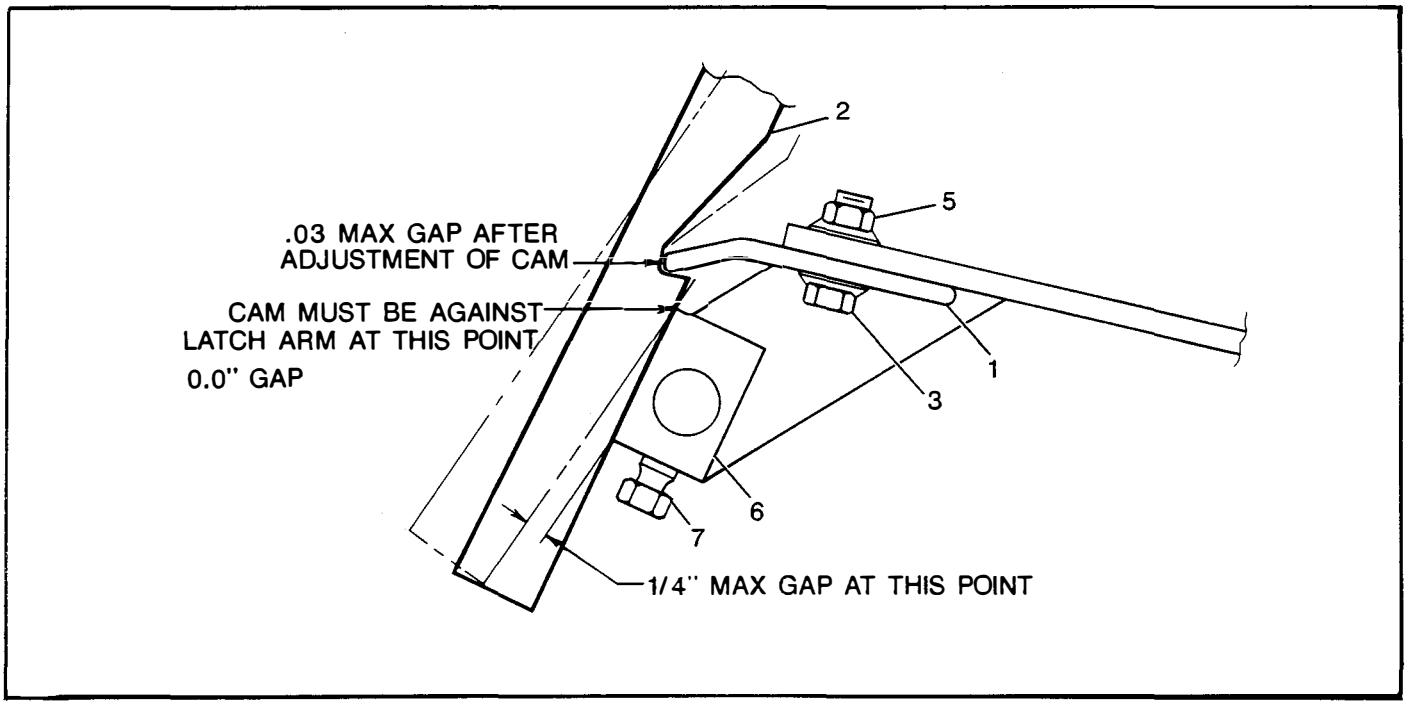



FIG. G-10 CATCH BRACKET ADJUSTMENT

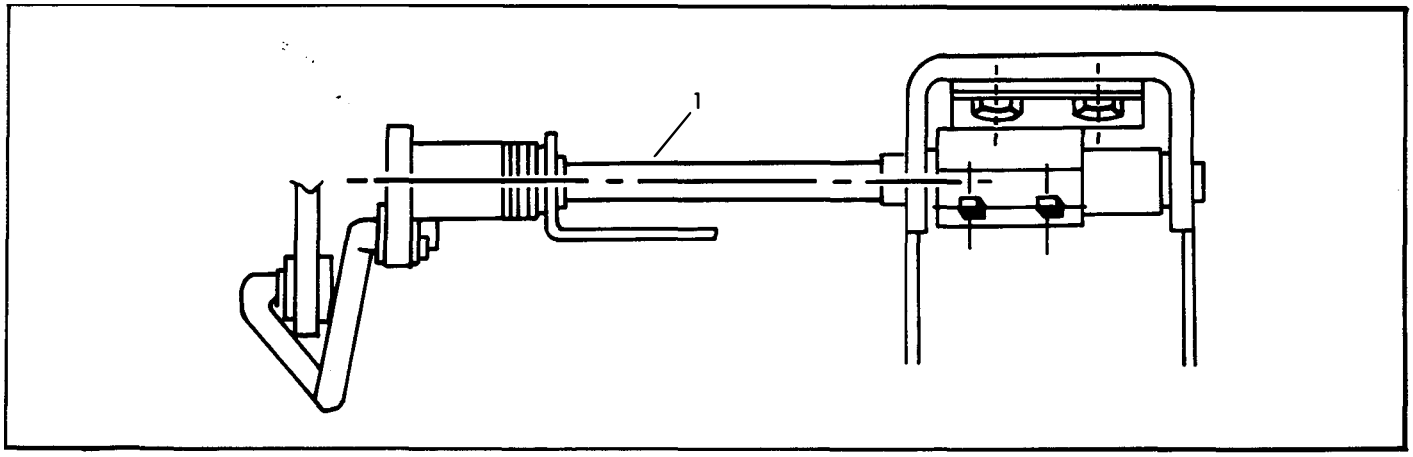



FIG. G-11 PIVOT ARM ASSEMBLY

## GENERAL

Electric vehicle batteries require careful maintenance to maximize their useful service life.

**WARNING: THE ELECTROLYTE IN A STORAGE BATTERY IS A DILUTE ACID WHICH CAN CAUSE SEVERE BURNS. ALWAYS WEAR SAFETY GOGGLES WHEN ADDING WATER, CHARGING BATTERIES, OR CLEANING BATTERIES. TREAT ALL ELECTROLYTE SPILLS BY EXTENDED FLUSHING WITH CLEAR WATER.**

**WARNING: HYDROGEN GAS IS FORMED WHEN CHARGING BATTERIES. DO NOT CHARGE BATTERIES WITHOUT ADEQUATE VENTILATION. DO NOT SMOKE IN AN AREA BEING USED FOR CHARGING BATTERIES. CONCENTRATIONS OF 4% HYDROGEN GAS OR MORE IS EXPLOSIVE.**

## PREVENTATIVE MAINTENANCE

- Check the electrolyte level at **least** once a week.
- Inspect all wiring for breaks or deterioration of the insulation.
- Before charging batteries, inspect all terminations for frayed conductors and loose or damaged connectors.
- Before charging batteries, inspect all terminations to assure that they are both clean (corrosion free) and securely fastened to battery posts.
- When adding water, do not overfill (Fig. H-1). Overfilling will cause a loss of acid from the electrolyte. Use distilled water when adding water to batteries. E-Z-GO strongly recommends that other water sources **not** be used since impurities can reduce the useful life of the batteries. If it is suspected that a suitable water source other than distilled be available, a water analysis and a consultation with your local representative will indicate if the water is detrimental to battery operation. You may also consult your local telephone company to determine if they use the local water. (The telephone company is a major user of battery powered systems.

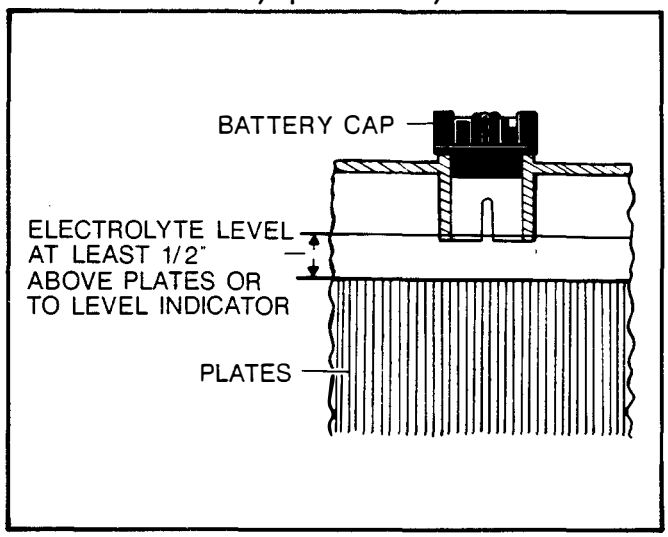



**FIG. H-1 BATTERY ELECTROLYTE LEVEL**

- Batteries should be recharged after each day's use. Charge batteries between rounds if possible.

  **CAUTION:** DO NOT SEND A VEHICLE OUT UNLESS IT'S BATTERIES ARE IN A GOOD STATE OF CHARGE. DISCHARGING A BATTERY COMPLETELY BEFORE RECHARGING (DEEP CYCLING) IS DETRIMENTAL TO BATTERY LIFE.

- Keep batteries clean. Wash batteries with a stiff bristle brush using water and bicarbonate of soda. Rinse with water after cleaning.

  **WARNING: WEAR GLOVES AND EYE PROTECTION WHEN WORKING WITH BATTERIES. ACID IN THE ELECTROLYTE CAN CAUSE BURNS TO THE EYES, SKIN AND CLOTHING.**

- Batteries should be checked frequently to be sure that they are in a good state of charge. Full charge for a new battery should yield a hydrometer reading of 1.280 specific gravity while an older battery may give a reading of 1.250 specfic gravity and still be fully charged.

- In the "off season", the batteries should be **fully charged** and stored in an unheated covered area. Check the batteries during the "off season" at thirty day intervals and recharge if a hydrometer shows a reading of less than 1.220 specific gravity.

- Before returning batteries to service, perform all of the preceding preventative maintenance.

- To prevent unnecessary drag on the vehicle which will result in poor performance and a higher amperage draw, inspect for improperly adjusted wheel bearings, dragging brakes, and underinflated tires.

## BATTERY INSTALLATION

**WARNING: BEFORE PROCEEDING, REMOVE ALL JEWELRY, RINGS, WATCHES, ETC., AND WRAP ALL WRENCHES IN VINYL INSULATING TAPE (FIG. H-2) TO ELIMINATE THE POSSIBILITY OF A SHORT CIRCUIT SHOULD THE OPPOSING TERMINALS BE "SHORTED OUT" OR CONTACTED TO THE FRAME. A SHORT CIRCUIT COULD RESULT IN AN EXPLOSION AND SEVERE PERSONAL INJURY.**

**WARNING: BE SURE THAT THE FORWARD-NEUTRAL-REVERSE SWITCH IS IN THE NEUTRAL POSITION AND THE KEY SWITCH IS IN THE "OFF" POSITION.**

See Safety Procedures in Section B. Carefully note the manner in which the old set of batteries were installed. Pay particular attention to the polarity of the wiring (Fig. H-3).

Remove the wiring from each battery using an **INSULATED WRENCH** (Fig H-2) and remove the two battery hold downs. Remove the batteries using a battery removal tool.

**WARNING: BATTERIES ARE HEAVY AND CARE SHOULD BE TAKEN WHEN REMOVING THEM. BE CAREFUL TO LIFT BATTERIES WITHOUT TIPPING THEM, ELECTROLYTE MAY BE SPILLED WHICH COULD CAUSE BURNS OR DAMAGE TO VEHICLE AND CLOTHING. SHOULD ANY ELECTROLYTE BE SPILLED, FLUSH THOROUGHLY WITH WATER.**

Inspect the battery racks for corrosion and clean if required using a putty knife and a wire brush. Remove **all** corrosion before priming and painting with a corrosion resistant paint.

Inspect all batteries visually for damaged containers, covers or terminals that may have been damaged or broken during transit. Inspect each cell (a dry cell could indicate a possible crack in the battery case).

Inspect all cables and terminations for any defects and replace as required. If they are to be reused, clean in a solution of water and bicarbonate of soda (1 bucket water to 1 cup of bicarbonate of soda). Rinse thoroughly and clean and dry. Remove any remaining corrosion from the wire terminations using a wire brush. Clean the battery terminals with a wire brush until all corrosion is removed.

Install the batteries and the battery hold downs. Tighten the hold down hardware snugly (25-30 in. lbs.) to prevent battery bounce but do not overtighten since the battery case could be distorted.

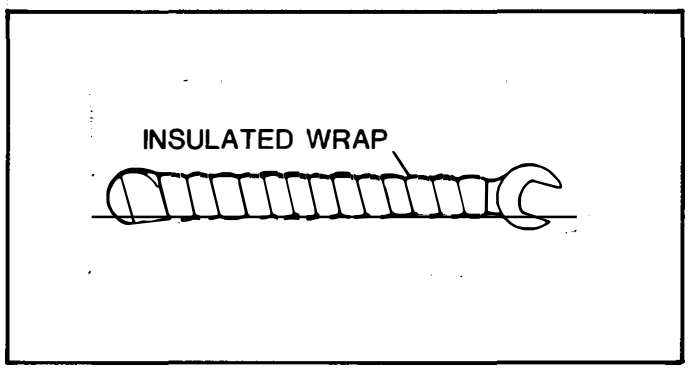



**FIG. H-2 INSULATED WRENCH**

Use an insulated wrench to install the battery wiring and tighten nuts to provide a tight connection between the wire terminations and the battery posts.

Apply a coat of petroleum jelly to the outside of the connection to retard corrosion of the joint.

Before the vehicle is put into service for the first time with new batteries, a 12 hour charge is required to charge all batteries to a common level of charge.

When electric golf cars are used for 36 holes or more, the batteries become deeply discharged, which is reflected in a low specific gravity reading. Batteries in this state of discharge require longer charge cycles to restore their full capacity.

If this lengthy charge time is prematurely terminated because the car is returned to service, the balance of the charge should be made up. This make up or catch up charge should be accomplished at the earliest possible time.

If the recharge is not made up, the batteries become more and more discharged as they are used. When batteries are allowed to remain deeply discharged, their life is shortened.

## CHARGING (Fig. H-4)

It is most important to follow the following steps when charging batteries.

- Check that electrolyte covers the plates in **all** cells.
- Charging must be performed in a well ventilated area.
- Inspect the charger D. C. plug for loose, bent, arced or dirty contacts.
- Inspect the vehicle receptacle for loose wires or damage.
- Insert plug fully into receptacle and check that the connection is tight.
- Be careful not to pull on the D. C. cord or place it in a position where it can be driven over or present a hazard to personnel working in the area.

**WARNING: WHEN CONNECTING OR DISCONNECTING THE CHARGER TO A VEHICLE, ALWAYS MAKE SURE THAT THE TIMER, ELAPSED TIME INDICATOR, OR POWER SWITCH IS SET IN THE OFF POSITION. IF IT IS NOT, AN ELECTRICAL ARC WILL OCCUR AND MAY CAUSE AN EXPLOSION OR FIRE.**

Observe the ambient temperature in the charging area. A battery requires a longer charge time than normal when the ambient temperature falls below $60^{\circ}$ F. The time required increases as the ambient temperature decreases.

## A. C. LINE VOLTAGE

The E-Z-GO battery charger's initial output is directly proportional to the input voltage. If a problem is encountered with several vehicles that indicates an insufficient initial (start) charge, it is suggested that the batteries be tested, and if found satisfactory, then the input A. C. voltage should be checked by the power company and their recommendations be followed. For additional information pertaining to the battery charger, see the BATTERY CHARGER SECTION in this manual.

## ROTATING CARS

It is important to charge each car fully after each day of play. With this in mind, the fleet should be "rotated" such that the first car on charge should be the first car to be used the following day. In this way, batteries will receive the maximum charge available and the wear on the vehicles will be evenly distributed.

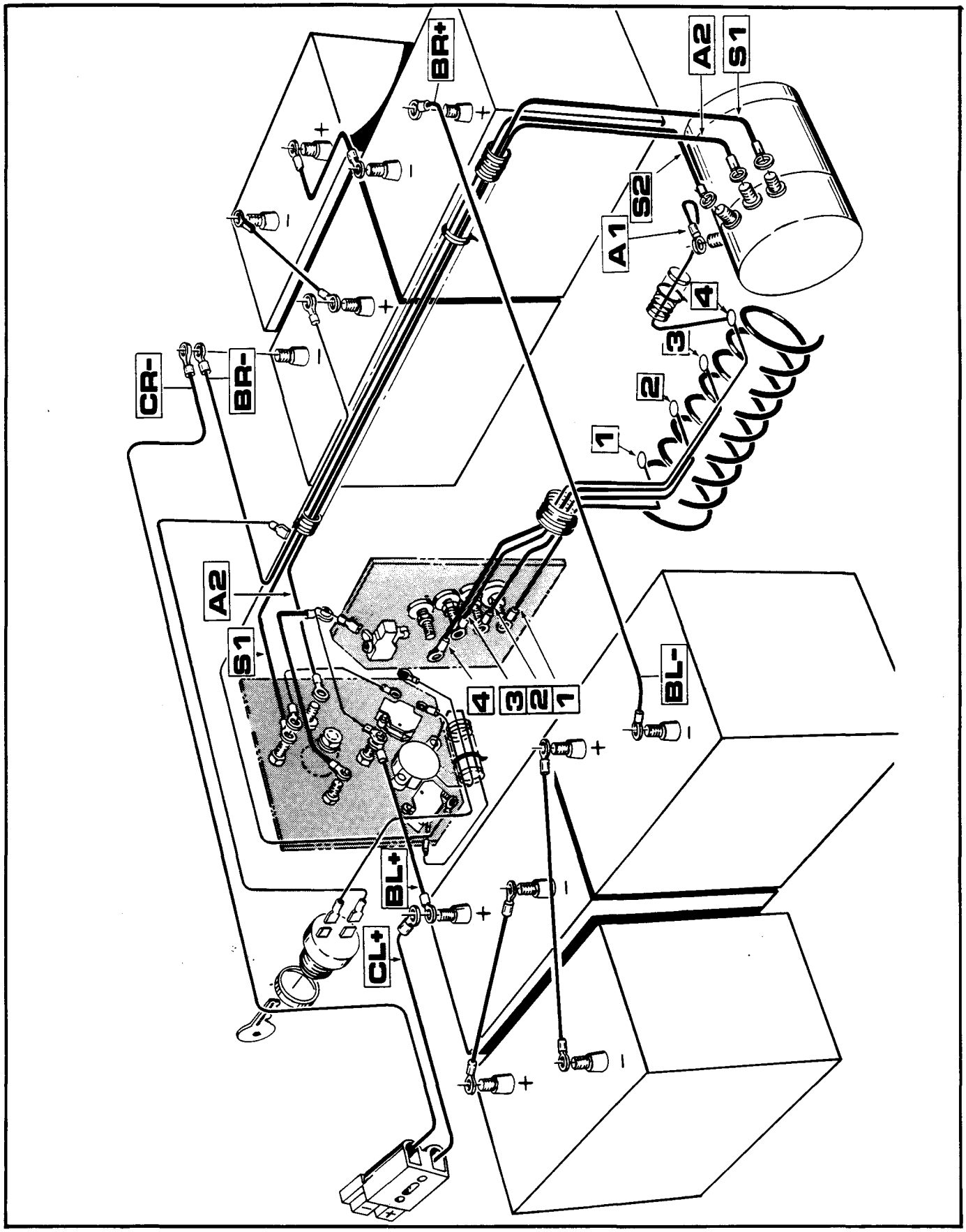
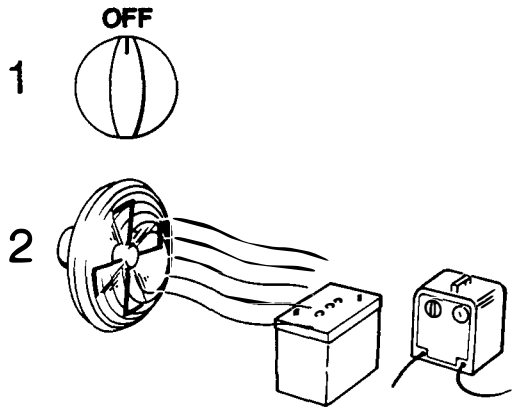



FIG. H-3 POWER WIRING DIAGRAM

DO!




DON'T!

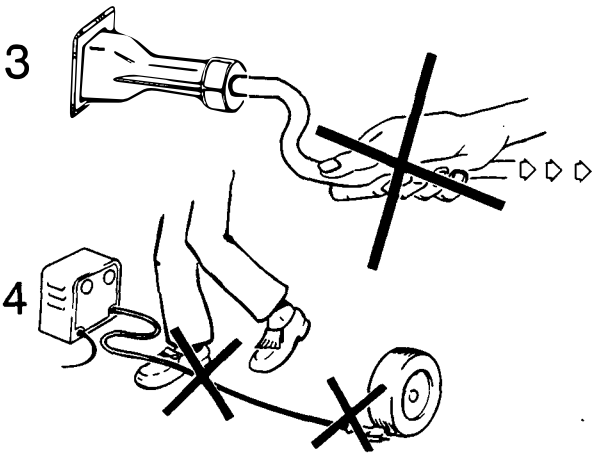



FIG. H-4 CHARGING BATTERIES

## ADDING WATER

The electrolyte in the vehicle's batteries is a solution of sulfuric acid and water. Some of the water portion of this solution evaporates or is lost in the charging cycle but the acid is retained. In the life of a battery, it is only necessary to replenish water and not the acid.

**WARNING: IF A CONSIDERABLE AMOUNT OF BATTERY ELECTROLYTE IS SPILLED, IT MAY BE REPLACED. BE SURE TO OBSERVE ALL PROCEDURES, CAUTIONS, AND WARNINGS PROVIDED BY THE ELECTROLYTE MANUFACTURER.**

When replenishing water, use only distilled water.

In the life of an average battery, the water usage will be approximately 2 1/2 times the original electrolyte quantity, or approximately 16 quarts.

**CAUTION:** USE OF **NON** DISTILLED WATER CONTAINING VARIOUS MINERALS BECOMES SIGNIFICANT IN THIS QUANTITY AND WILL HAVE A DETRIMENTAL EFFECT ON THE LIFE OF THE BATTERY.

**WATER LEVEL** (Fig. H-5)

Add water to the indicator ring if equipped or to 1/2" above the top of the separators. Filling above this level will cause the loss of electrolyte during the charging cycle. The charging cycle causes bubbles to occur which will cause the electrolyte to fill the cavity above the plates. If the electrolyte is overfilled the gassing will force a portion of the electrolyte out through the vent holes in the vent caps. The result of this electrolyte loss will additionally result in corrosion of the wire and connections and the corrosion of the battery support members.

**CAUTION:** BEFORE CHARGING, BE SURE THAT ELECTROLYTE IS ABOVE THE SEPARATORS. NEVER ALLOW THE ELECTROLYTE TO FALL BELOW THE TOP OF THE PLATES SINCE PERMANENT DAMAGE CAN RESULT TO THE UNCOVERED PORTION OF THE PLATES.

**NOTE:** It is recommended that any additional water required be added at the end of the charging cycle.

E-Z-GO recommends that all vent caps be removed and immersed in a clean container of water while watering the batteries. This will prevent loss of the caps and dilute any acid residue that could result in burned fingers. After replacing vent caps, rinse off batteries with a hose to eliminate any spilled electrolyte that may have been splashed during the watering operation.

## CLEANING

A coating of acid impregnated dirt on the top surface of a battery will create an electrical path between the terminals of the battery. This electrical path will cause a "current leakage" which will both reduce the operating efficiency of the battery and reduce its useful life.

**CAUTION:** BE SURE ALL VENT CAPS ARE SECURELY IN PLACE BEFORE CLEANING BATTERIES. THIS WILL PREVENT CONTAMINANTS FROM ENTERING BATTERIES.

**WARNING: USE EYE PROTECTION AND GLOVES DURING THE FOLLOWING CLEANING OPERATION.**

Wash with a hose and remove any remaining foreign matter using a stiff bristle brush and a solution of water and bicarbonate of soda (1 cup of bicarbonate of soda to 1 bucket, approximately 8 quarts, of water). Hose off batteries after cleaning.

## TESTING BATTERIES

**What To Check:** If a vehicle fails to perform satisfactorily and it is suspected there is a battery failure, each battery should first be checked individually and then all batteries in the vehicle should be checked as a set.

**Test With Hydrometer:** Using a battery hydrometer, test each battery individually, comparing the three cell readings of each battery. If the variation between the highest and lowest cell readings in any one battery is .050 (50 gravity points) or more, there is reason to suspect a weak or failing cell. This test is best accomplished with the batteries in a **partially** discharged state; after the car has been used for at least 9 holes of golf.

**Instructions For Using Hydrometer:** (Fig. H-6)

1. Draw the minimum of electrolyte into the test tube to permit the float to float freely without contacting the top or bottom of the test tube.

2. Hold hydrometer in a vertical position and take a reading at your eye level.

3. Always correct hydrometer Specific Gravity reading to 80° F. For each ten degrees temperature above 80° F, add 4 points to reading. Example: 90° F 1.250 Sp. Gr. = 1.254. For each ten degrees below 80° F, subtract 4 points from reading. Example: 70° F 1.250 Sp. Gr. = 1.246.

4. Test each cell, record readings (corrected to 80° F). A variation of 50 points between any two cell readings (example 1.250 = 1.200) indicates a defect in the low reading cells.

## VOLTMETER CHECK

If the voltage of **each** cell cannot be measured, test the terminal voltage of each battery (if a set of batteries is being checked). Compare the voltage of the batteries against one another. If the battery voltage readings vary by 0.5 volts or more, there is probably a weak or failing battery. As stated under "Hydrometer Check", the Voltmeter check is more effective if the batteries are partially charged.

If the batteries in the vehicle have been on charge and are to be tested with a voltmeter, drive the vehicle around for approximately 30 seconds, then let it stand idle for three or more minutes before testing. This stabilizes the voltage. In this instance, it removes a "surface charge" from the plates which would give a false high voltage reading.

## LOAD TEST

This test is designed to simulate the demands imposed on batteries supplying power to electric vehicles.

Batteries fully charged and with the electrolyte temperature @ 80°F ± 5°F (26.7°C ± 3°C) are discharged at the constant rate specified for the type battery being tested to a terminal voltage equivalent of 1.75 volts per cell. The discharge time in minutes is the battery capacity. The full charge electrolyte specific gravity is to be the same as specified by the battery manufacturer.

Golf car batteries shall be tested as indicated above at a rate of 75± 1 ampere. There are load testers on the market that are capable of testing batteries in the vehicle.

If the Hydrometer or Voltmeter check indicates a battery, or one battery in a set of batteries is failing, fully charge it and conduct the above Load Test. Record the discharge time in minutes for the battery voltage to reach 5.25 volts. A battery which delivers 50% or less of its rated capacity in minutes should be replaced.

## BATTERY LIFE

The life of an electric vehicle battery is determined not only by the number of cycles (a discharge and a recharge) it receives but also by the 'depth' of each cycle. Suppose batteries are used to operate a golf car for 18 holes per day. Let us call that one life cycle. If they are used for 36 holes, this is a much deeper discharge and would be equivalent to approximately three life cycles. A battery used 36 holes per day will have a life span approximately one-third that of one used 18 holes per day.

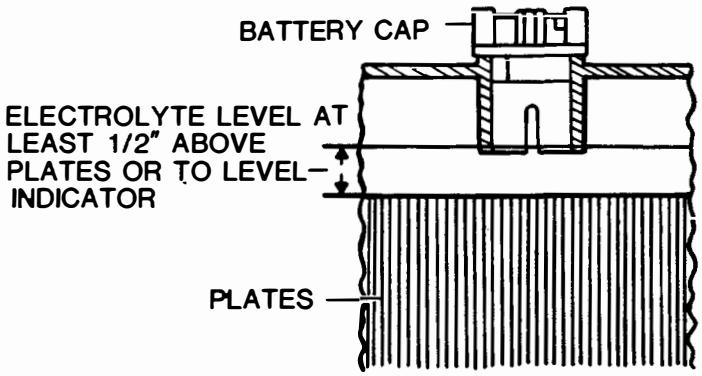



FIG. H-5 BATTERY ELECTROLYTE LEVEL

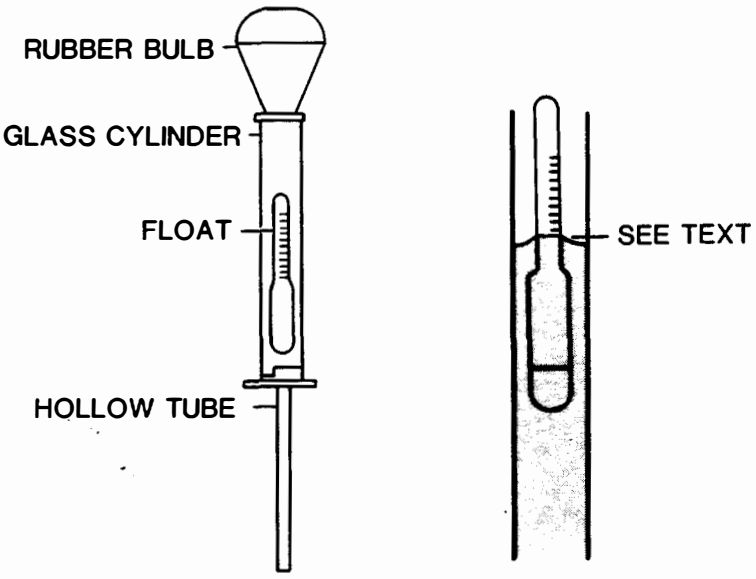



FIG. H-6 USING HYDROMETER

# OPERATION AND SERVICE MANUAL

## SECTION TITLE: BATTERY CHARGER

**J**

### GENERAL

The E-Z-GO battery charger is semi-automatic and is designed specifically for charging electric vehicle batteries.

The charger type is known as a ferro-resonant. The term ferro-resonant is applied to a charger that starts the charge at a relatively high rate of charge and continuously reduces the rate as the battery or batteries become nearer the full charge condition.

### CHARGER INSTALLATION (Fig. J-1)

Each charger requires an input of a dedicated 110-120 Volt A.C. 60 cycle 15 Amp circuit with a standard three prong, NEMA 15-5R receptacle.

**WARNING: CHARGERS SHOULD BE MOUNTED ON A PLATFORM ABOVE THE GROUND, OR IN SUCH A MANNER AS TO PERMIT THE MAXIMUM AIR FLOW UNDERNEATH AND AROUND THE CHARGER. IF THE CHARGER IS MOUNTED SUCH THAT INSUFFICIENT AIR FLOW IS PREVENTED FROM ENTERING THE LOUVERS, OVERHEATING MAY RESULT WHICH COULD CAUSE SERIOUS DAMAGE TO THE CHARGER AND THE POTENTIAL FOR FIRE.**

If the charger is operated in an outdoor location, rain and sun protection must be provided.

See paragraph in BATTERIES SECTION of this manual for symptoms that may indicate a low input voltage (A.C.) condition.

The charging (D.C.) cord is equipped with a polarized connector which fits into a matching receptacle on the vehicle.

The power (A.C.) cord is equipped with a standard three prong U. L. listed grounded type plug. Electrical outlet receptacles installed for use at the battery charging locations must be of the three prong grounded type (NEMA 15-5R), which will ground the charger to eliminate any electrical hazard.

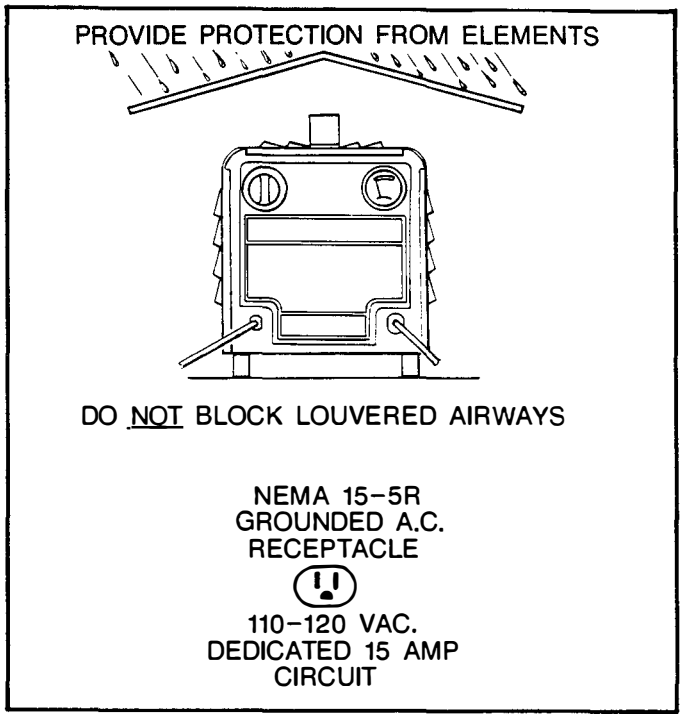



FIG. J-1 CHARGER INSTALLATION

**WARNING: AN UNGROUNDED ELECTRICAL DEVICE MAY BECOME A PHYSICAL HAZARD THAT COULD RESULT IN AN ELECTRICAL SHOCK OR ELECTROCUTION.**

**WARNING: WHEN CONNECTING OR DISCONNECTING THE CHARGER TO A VEHICLE, ALWAYS MAKE SURE THAT THE TIMER, ELAPSED TIME INDICATOR, OR POWER SWITCH IS SET IN THE OFF POSITION. IF IT IS NOT, AN ELECTRICAL ARC WILL OCCUR AND MAY CAUSE AN EXPLOSION OR FIRE.**

## TROUBLE-SHOOTING STANDARD BATTERY CHARGER

### GENERAL

The charger can be connected to a vehicle that has been driven any number of hours and set to the START position without undercharging the batteries. If the charger is connected to a vehicle that has been operated for 36 holes (70-80 minutes) and the timer is set to the START position, the charger will operate at a "charge rate" as long as the battery voltage indicates that the battery requires charging.

When the battery voltage indicates a fully charged condition, the charger automatically reduces the rate of charge and continues to operate at a "trickle rate" until the 12 Hour time setting has expired and shuts the charger off. If the vehicle has been operated for 9 holes (15-20 minutes) and the charger is set for 12 Hours, the charger will respond in the same way.

Under certain conditions, it may be better to reduce the charge time rather than let the charger operate for a 12 hour period. If prolonged daily usage of a vehicle is for only 9 holes (15-20 minutes) and the batteries are near the end of their useful life, it is recommended that they be charged for a shorter period of time. Consult your E-Z-GO's representative's service manager for proper procedures when these conditions exist.

### TROUBLE-SHOOTING

**CHARGER TROUBLE-SHOOTING** (Fig. J-2, J-3)

A simple but effective method of trouble-shooting a battery charger that does not operate is as follows. Use Fig. J-1 & J-2 for reference. Follow the sequenced procedures.

**WARNING: DISCONNECT THE BATTERY CHARGER FROM BOTH THE A.C. POWER AND THE BATTERIES BEFORE PROCEEDING.**

**CHECK FOR A.C. POWER.**

1. Remove the top cover (1) by removing the Phillips head screws (2) from the flanges. Set VOM meter to the X1 ohms scale. Examine the D.C. plug (3) that connects to the vehicle carefully for loose terminals or broken wires. If everything is in good condition, use the Ohm Meter. Touch the red probe to the tip in the D.C. plug on the positive side (4) , touch the black probe to the heat sink (5). The ohm meter's needle should deflect. If the needle does not move there is an open circuit between the D.C. plug and the heat sink which indicates a break in the white wire or a bad circuit breaker.

2. To test the circuit breaker (6), place a probe on one side of the circuit breaker and the other probe on the other side of the circuit breaker, the needle should deflect on the ohm meter. If it does not move, a bad circuit breaker is indicated.

3. Touch the red (+) probe to the heat sink (5) and the black (-) probe to the joint of the wire and silicon diode (7). If the needle moves, it indicates a bad diode. If the needle does not move, reverse the leads, touch the black (-) probe on the heat sink and the red (+) probe on the joint, the needle of the ohm meter should deflect. If it does not move, a bad diode is indicated (7). Conformance to this procedure indicates that all circuitry between the tip of the positive wire at the D.C. plug to the joint at the wires coming from the diodes is functioning correctly.

4. To test the negative side of the D. C. cord, touch either probe to the tip of the negative wire (8) at the D.C. plug and the other to the terminal on the ammeter (9) which has 2 wires that connect to the transformer (10). If a full needle deflection does **not** take place, an open circuit somewhere in the negative or black wire is indicated. This may be a broken

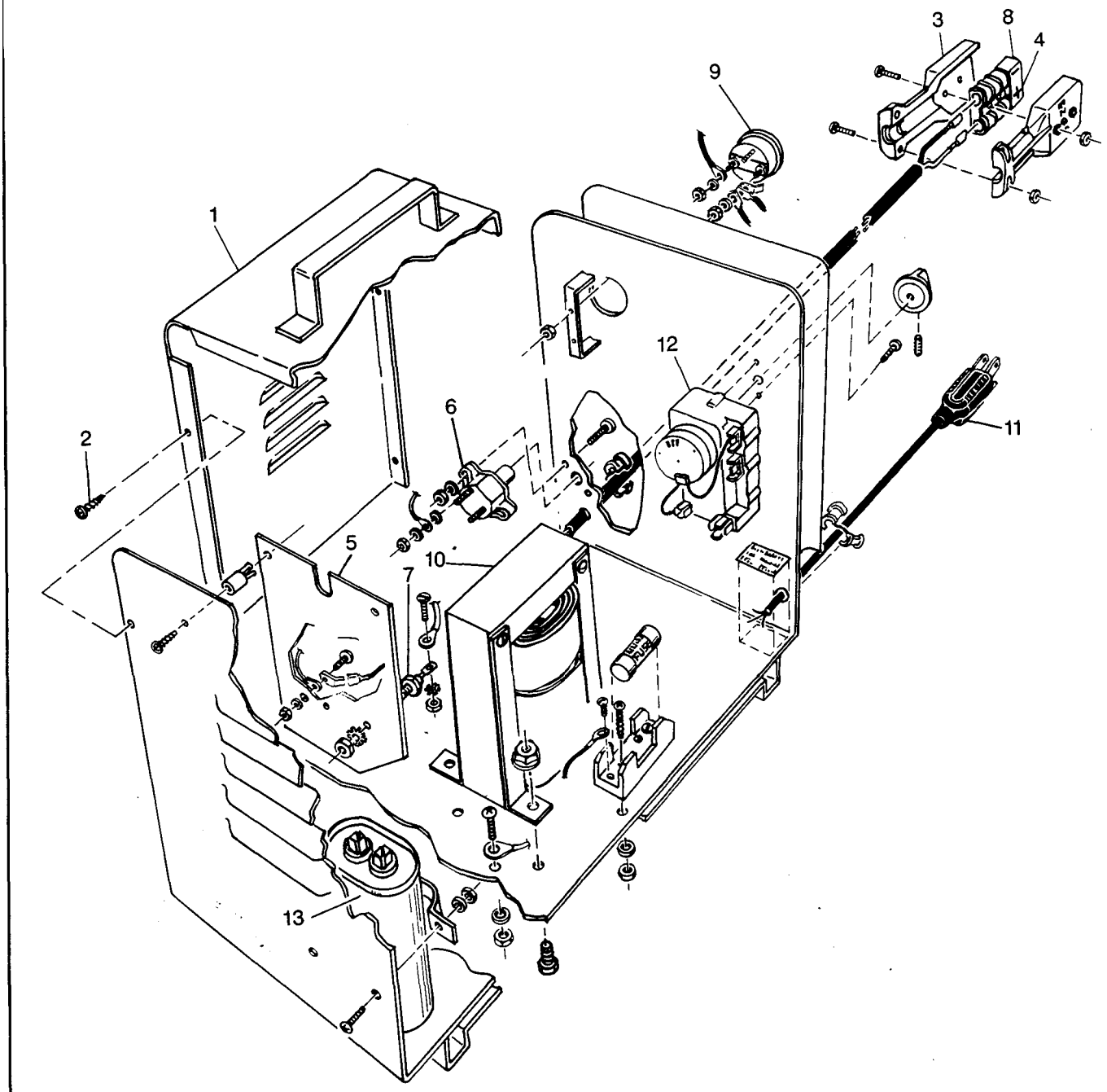



FIG. J-2 BATTERY CHARGER (STANDARD)

wire, a loose terminal, or a defective ammeter. If the needle does not deflect, probe each component in the circuit until the open circuit is found. When the probe crosses the "open", it will deflect full scale.

5. Touch the red (+) probe to one blade of the A.C. plug (11) (not the ground pin) and the black (-) probe to the black wire from the A.C. cord to the timer (12). If the needle of the Ohm Meter does not deflect, switch the red (+) probe to the other blade of the A.C. plug. It should deflect to indicate a complete circuit. If the needle does not deflect, it indicates a broken A.C. input wire. If the black wire is sound, repeat the same test to the white wire and the other blade of the A.C. plug.

6. Locate the wires at the top contact that join the timer motor and the transformer (terminal C). Touch the red (+) probe to terminal C and touch the black (-) probe to terminal B. Turn the timer on. The Ohm meter needle should deflect indicating a good timer. All circuitry from the A. C. plug to the primary winding of the transformer is functioning. The ohm meter will check the transformer correctly only for an open circuit or shorted winding to ground. Disconnect the primary winding transformer lead from terminal C on the timer. Touch one probe to the transformer lead and touch the other probe to the terminal D on the timer. The meter will deflect if the primary winding is complete. Touch one probe to the + terminal on the ammeter and touch the other probe to each wire at the diodes.

   The meter will deflect each time if the secondary winding is complete. Touch one probe to the transformer laminations and touch the other probe to one primary transformer lead wire. If the meter deflects, the primary winding is shorted to ground. Remove the probe from the primary transformer lead wire and touch it to each diode wire. If the meter deflects either time, the secondary winding is shorted to ground.

**WARNING: BE SURE TO DISCHARGE THE CAPACITOR (13) BEFORE TOUCHING EITHER WIRE OR TERMINAL. THIS IS DONE BY SHORTING OR TOUCHING BOTH CAPACITOR WIRES OR TERMINALS WITH AN INSULATED SCREWDRIVER WHILE HOLDING THE INSULATED HANDLE.**

Remove the probe from the diode lead wire and touch it to one disconnected capacitor lead wire. If the meter deflects, the ferroresonant winding is shorted to ground.

7. Set the Ohm Meter to 1K ohms. Touch one probe to each terminal of the capacitor, reverse the probes. The needles should deflect and then return to neutral. Repeat this procedure; as the capacitor charges and discharges, the needle will deflect and return each time the probes are reversed. If the needle does not deflect at all, it indicates an open circuit. If the needle deflects full scale and remains at full scale with the probes in either position, the capacitor is shorted.

With one wire removed from the capacitor, touch one probe to the wire connected to the capacitor and touch the other probe to the wire removed. The meter will deflect if the ferroresonant winding is complete.

An Ohm Meter is unable to test for a transformer with a short circuit. Should the charger fail to work after the above tests have been completed, the transformer should be exchanged for one that is known to be good.

## COMPONENT REPLACEMENT

In general, component replacement within the battery charger requires no explanation; however, diode replacement must be done with extreme care.

**CAUTION:** TO PREVENT DAMAGE AND PREMATURE FAILURE OF DIODES, THE FOLLOWING PROCEDURES MUST BE FOLLOWED.

Before installing the diode to the heat sink, clean the heat sink and apply a thin layer of heat sink compound (available at any electronics supply house) between the body of the diode and the heat sink. Tighten the diode hardware to 15-20 in. lbs. torque. Remove any excess heat sink compound.

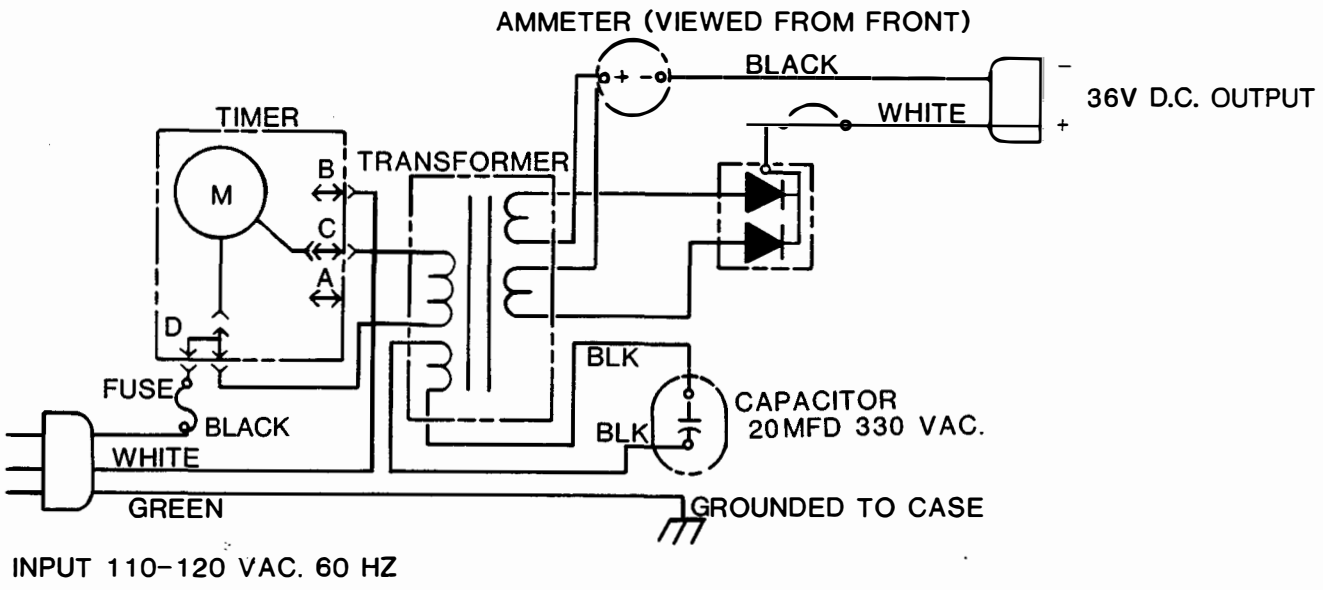



FIG. J-3 WIRING DIAGRAM (STANDARD)

## GENERAL (Fig. K-1)

There are two distinct circuits used in the operation of an electric vehicle. These circuits are the **control** and the **power** circuits.

The control circuits may be identified by the light gauge wire used. The control circuit components consist of the key switch, the solenoid, a reverse warning device and two micro switches. Micro switch MS-2 is actuated by the forward-neutral-reverse switch, and micro switch MS-3 is actuated by the accelerator switch.

## CONTROL CIRCUIT (Fig. K-1)

### Forward Operation

With the key switch in the "ON" position and the forward-neutral-reverse switch in the "FORWARD" (F) position, micro switch MS-2 is closed which provides an electrical path to the solenoid. Depressing the accelerator pedal moves the "wiper" side of the accelerator switch from the "OFF" position (0) to the (1) position, and also activates micro switch MS-3. The closure of MS-3 completes the control circuit and activates the coil of the solenoid which causes the solenoid contacts to close which in turn activates the power circuit.

### Reverse Operation

The reverse operation is identical to forward operation except that a reverse warning device is activated by the forward-neutral-reverse switch that is placed in the "REVERSE" (R) position. This warning device is in continuous operation while the forward-neutral-reverse switch is in the "REVERSE" (R) position.

## POWER CIRCUIT

With the control circuit activated, the solenoid contacts are closed. Power is applied to the power circuit. Depressing the accelerator pedal moves the "wiper" side of the accelerator switch from the "OFF" position (0) to the (1) position. Power now flows through the resistor R1, R2, and R3, through the forward-neutral-reverse switch which directs power in the correct orientation through the armature and field windings of the motor.

As the accelerator pedal is depressed further, the wiper advances to position (2) which bypasses resistor R1. Position (3) bypasses resistors R1 and R2. The final position (4) bypasses all resistors and unrestricted battery power is transmitted to the motor which yields the maximum speed and power.

## CIRCUIT TESTING (Fig. K-2, K-3, K-4)

**Tools Required:**

- V.O.M. Quantity 1

If the car fails to operate or operates poorly, the following test sequence should be followed.

**WARNING: TO PREVENT THE VEHICLE FROM INADVERTENTLY ACCELERATING, WHICH COULD CAUSE BODILY INJURY, THE VEHICLE MUST BE LIFTED TO RAISE BOTH DRIVE WHEELS ABOVE THE GROUND.**

Raise the vehicle (see procedures in Section B) before proceeding.

To test the control circuit, turn the key switch (1) to the "ON" position. Set the volt meter to the 50 VDC range. Touch the black probe to the negative (-) contact of the vehicle D.C. receptacle and the red (+) probe to the positive (+) contact of the vehicle D.C. receptacle. (Fig. K-3)

A meter reading of 36 VDC $\pm$ 5V indicates that batteries are satisfactory. A reading of below 36 VDC $\pm$ 5V indicates that one or all batteries are defective or are in need of charging (See Batteries Section for testing procedures). No reading indicates an "open" condition and the power transmission circuit should be inspected for a broken or disconnected conductor.

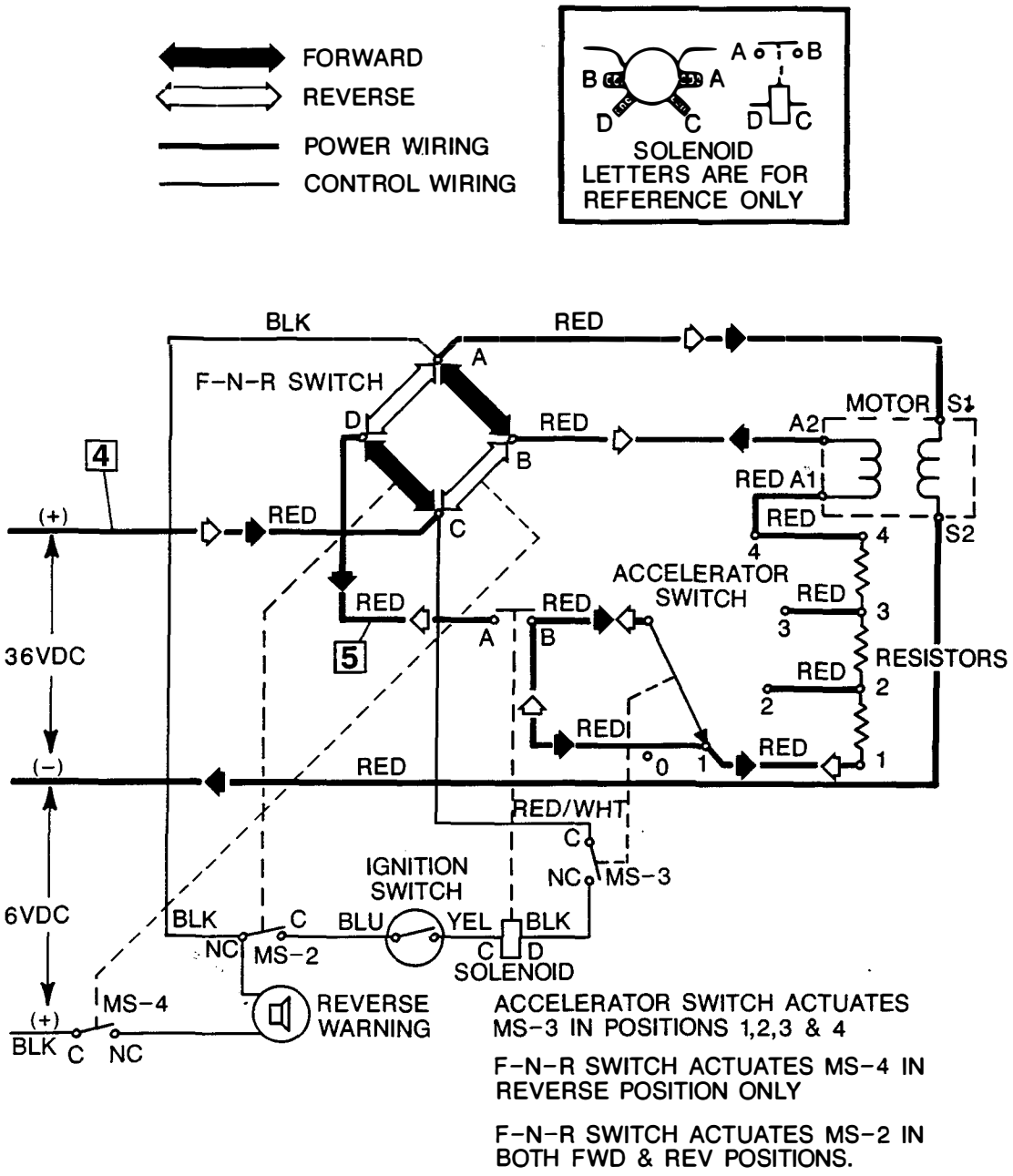



FIG. K-1 ELECTRIC CAR WIRING DIAGRAM

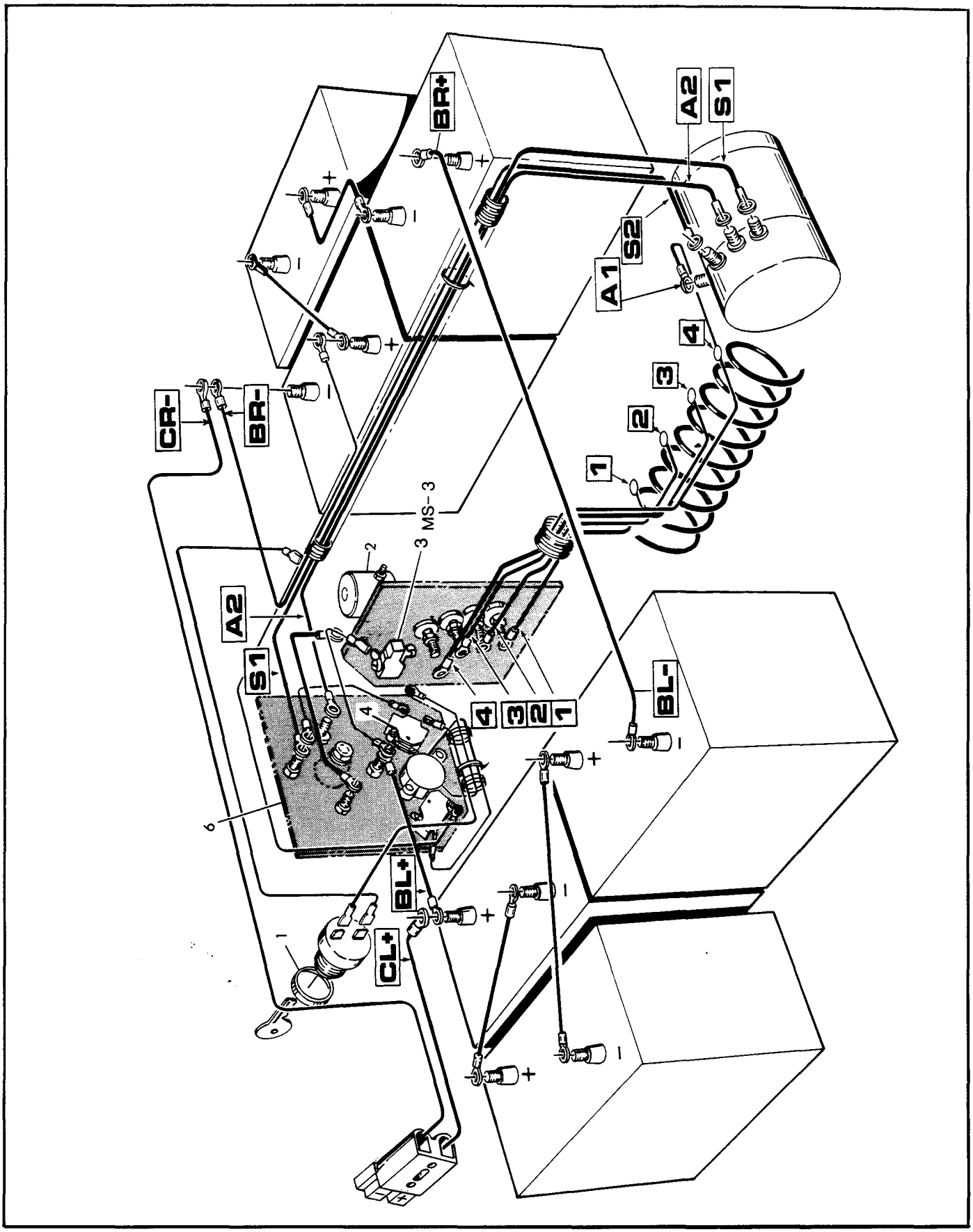



FIG. K-2 POWER WIRING DIAGRAM

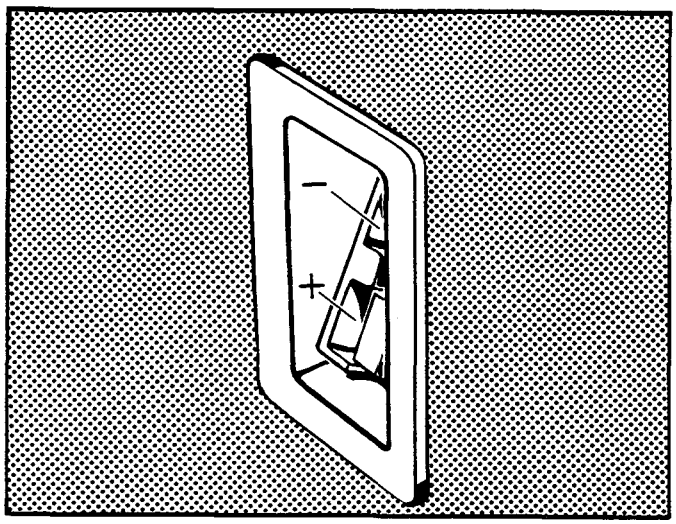



FIG. K-3 VEHICLE RECEPTACLE (VIEWED FROM FRONT)

With the forward-neutral-reverse switch in the forward position, remove the red (+) probe from the positive contact of the receptacle and relocate it to the positive (+) terminal of the solenoid (2). The positive terminal may be identified by the heavy gauge wire that is attached to the F-N-R Switch. A meter reading of 36 VDC ± 5V will indicate that the heavy gauge wire (BR+) and terminations between the battery and solenoid positive (+) terminal are in good condition.

With the forward-neutral-reverse switch in the neutral position, locate the red (+) probe on the common terminal (3) of MS-3 (located on the accelerator switch). The common terminal may be identified by the RED/WHITE wire attached to it. A meter reading of 36 VDC ± 5V indicates that the RED/WHITE wire and termination between the micro switch MS-3 and the forward-neutral-reverse switch are in good condition.

**Depress** the accelerator pedal. Locate the red (+) probe on the normally closed (NC) terminal of micro switch MS-3. This terminal may be identified by the black wire attached between it and the solenoid. A meter reading of 36 VDC ± 5V indicates that the micro switch is functioning. If the meter fails to move from the "O" position, check that the accelerator pedal is depressed, if it is and there is no reading, the micro switch MS-3 must be replaced.

**Depress** the accelerator pedal. Locate the red (+) probe on the small terminal of the solenoid (2) with the black wire attached. A meter reading of 36 VDC ± 5V indicates that the black wire from the solenoid to MS-3 is in good condition. Move the red (+) probe to the other small terminal located on the solenoid. If the meter needle deflects, the solenoid coil is working. A meter reading of "O" indicates that the solenoid should be replaced.
Locate the red (+) probe to the key switch (1), terminal 4. A meter reading of 36 VDC ± 5V indicates that the yellow wire from the solenoid to the key switch is in good condition. Locate the red (+) probe to the key switch, terminal 3. **Turn key on.** A meter reading of 36 VDC ± 3V indicates that the key switch is in satisfactory condition. No reading indicates that the key switch should be replaced.

Locate the red (+) probe on the common (c) terminal of micro switch (4) MS-2 situated on the forward-neutral-reverse switch assembly (6). The terminal may be identified by the blue wire attached to it. A meter reading of 36 VDC ± 5V will indicate that the wire from the key switch to micro switch MS-2 is in good condition.

Place the red (+) probe to the positive (+) contact of the vehicle receptacle. Locate the black (-) probe to the normally closed (NC) position of micro switch MS-2. This terminal may be identified by the black wire attached to it. A meter reading of 36 VDC ± 5V will indicate that the micro switch (4) is in good condition.

The completion of this test procedure will have checked all wiring and components in the control circuit.

The reverse warning device does not affect the operation of the vehicle, however, E-Z-GO strongly recommends that it's operation be checked and maintained since the correct functioning of this safety device may prevent an accident.

The warning device (1) (Fig. K-4) should sound whenever the forward-neutral-reverse switch is in the "REVERSE" (R) position. Should the warning device fail to sound, the following procedure should be used to trouble-shoot the circuit.

Set the volt meter to the 50 VDC range, check that the key switch in "ON" and the forward-neutral-reverse switch is in the "REVERSE" (R) position. Locate the black probe (-) in the negative side of the vehicle receptacle (Fig. K-3) and place the red (+) probe to the terminal on MS-4 with the black wire. A meter reading of 36 VDC ± 5V indicates that the black wire between the positive (+) terminal of the front right battery and the micro switch MS-4 is in good condition.

Locate the red (+) probe on the other terminal of micro switch MS-4. A meter reading of 36 VDC ± 5V will indicate that the micro switch MS-4 is in good condition and that the warning device must be replaced.

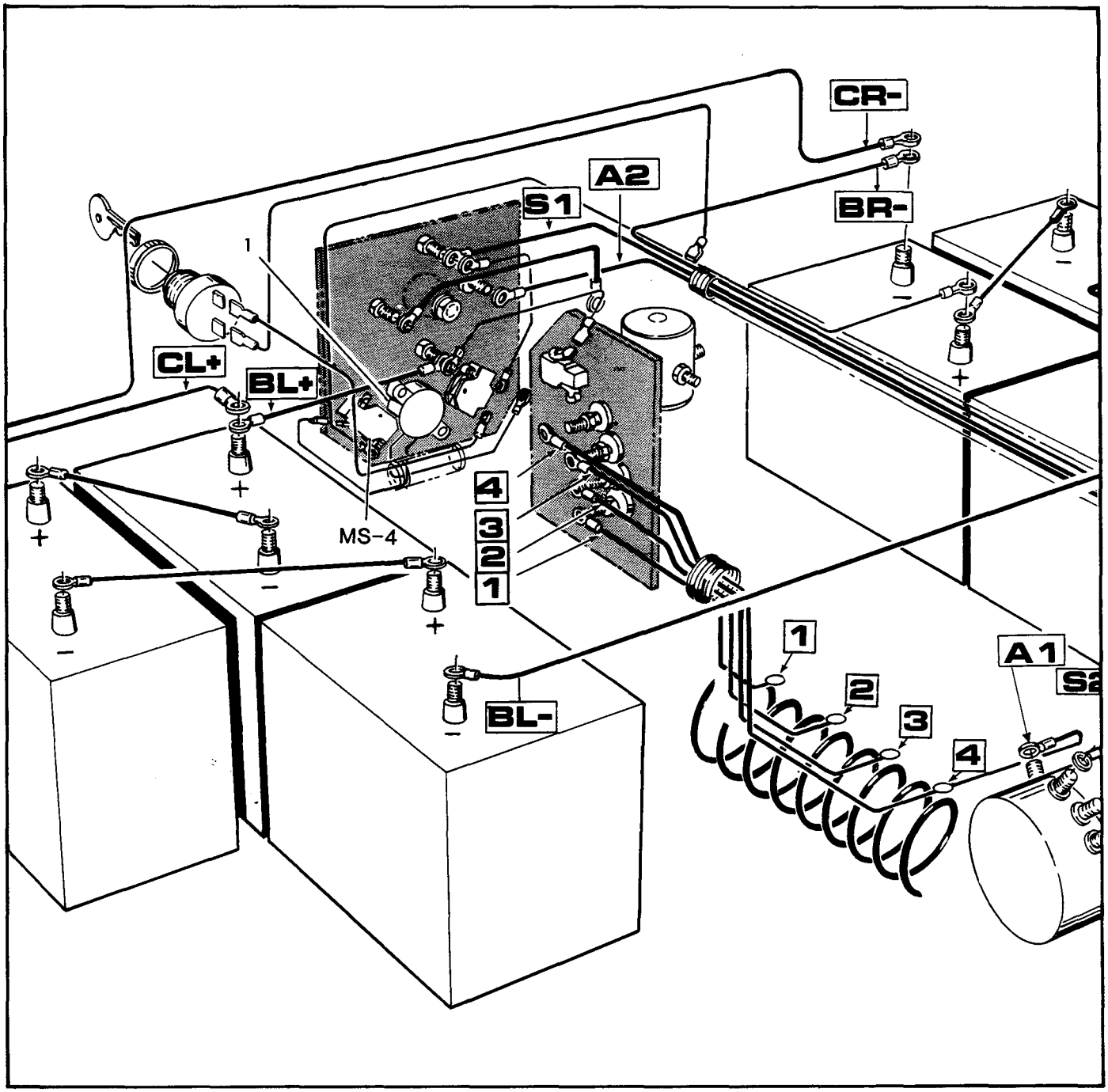



FIG. K-4 WARNING DEVICE

**POWER CIRCUIT** (Fig. K-5)

**Tools Required:**

- V. O. M. Quantity 1

**If The Vehicle Does Not Run:**

**WARNING: TO PREVENT THE VEHICLE FROM INADVERTENTLY ACCELERATING, WHICH COULD CAUSE BODILY INJURY, THE VEHICLE MUST BE LIFTED TO RAISE BOTH DRIVE WHEELS ABOVE THE GROUND.**

Raise the vehicle (see procedures in Section B) before proceeding.

Place key switch (1) in the 'ON' position and the forward-neutral-reverse switch (6) to the forward 'F' position.

Set the volt meter to the 50 VDC range. Touch the black (-) probe to the negative (-) contact of the vehicle D.C. receptacle and the red (+) probe to the positive (+) contact of the vehicle D.C. receptacle (Fig. K-3, K-5).

A meter reading of 36 VDC $\pm$ 5 VDC indicates that the batteries are satisfactory. A reading below 36 VDC $\pm$ 5V indicates that one or all batteries are defective or are in need of charging. (See Batteries Section for testing procedures.) No reading indicates an "open" condition and the following procedure should be followed.

Locate the red (+) probe on the positive (+) post of the battery (7) that has two heavy gauge wires attached to it. Locate the black (-) probe on motor (8) terminal S2. A meter reading of 36 VDC $\pm$ 5 VDC indicates that the wire joining the motor (S2) and the battery (BR-) is satisfactory.

A reading of less than 36 VDC $\pm$ 5V indicates a broken wire, a poor connection, or corrosion at either the battery or motor termination.

Locate the black (-) probe to the motor (8) terminal S1. A reading of 36 VDC $\pm$ 5 VDC indicates that the field coils are satisfactory. A meter reading of 0 VDC indicates that the field coil is "open", which will require the repair or replacement of the motor. Locate the black (-) probe to the motor (8) terminal A1. A meter reading of 36 VDC $\pm$ 5 VDC indicates that the armature is satisfactory. Locate the black (-) probe on each of the four motor (8) terminals and the number 1 contact of the accelerator switch (5). A reading of 36 VDC $\pm$ 5 VDC at each terminal will indicate that the wiring and resistors are good. A reading of 0 VDC indicates an "open" condition that may be located by visual inspection, or using an ohm meter, perform a "continuity" test between the terminals of each wire.

**CAUTION:** REMOVE BATTERY (+) CONNECTIONS BEFORE USING OHM METER. (SEE SAFETY PROCEDURES IN SECTION B.)

No reading indicates a broken wire, a poor connection, or corrosion at either of the wire terminations.

**If The Vehicle Runs But Performs Erratically:**

**WARNING: TO PREVENT THE VEHICLE FROM INADVERTENTLY ACCELERATING, WHICH COULD CAUSE BODILY INJURY, THE VEHICLE MUST BE LIFTED TO RAISE BOTH DRIVE WHEELS ABOVE THE GROUND.**

Raise the vehicle (see procedures in Section B) before proceeding.

Place key switch (1) in the 'ON' position and the forward-neutral-reverse switch (6) to the forward 'F' position.

Visually inspect all components for burned or broken wires, loose connections at each of the accelerator switch (5) contacts, resistor coils (9) and the forward-neutral-reverse switch. Inspect all terminals for corrosion and clean if required. If a visual inspection fails to yield the cause of the problem, an ohm meter may be used to perform a "continuity" test at each component.

**CAUTION:** REMOVE BATTERY (+) CONNECTIONS BEFORE USING AN OHM METER. (SEE SAFETY PROCEDURES IN SECTION B.)

**NOTE:** A test light may be substituted for an ohm meter.

If the vehicle continues to run with the accelerator switch (5) in the released position, either the accelerator linkage is out of adjustment (See Accelerator Adjustment in Section F) or the solenoid (2) contacts are stuck

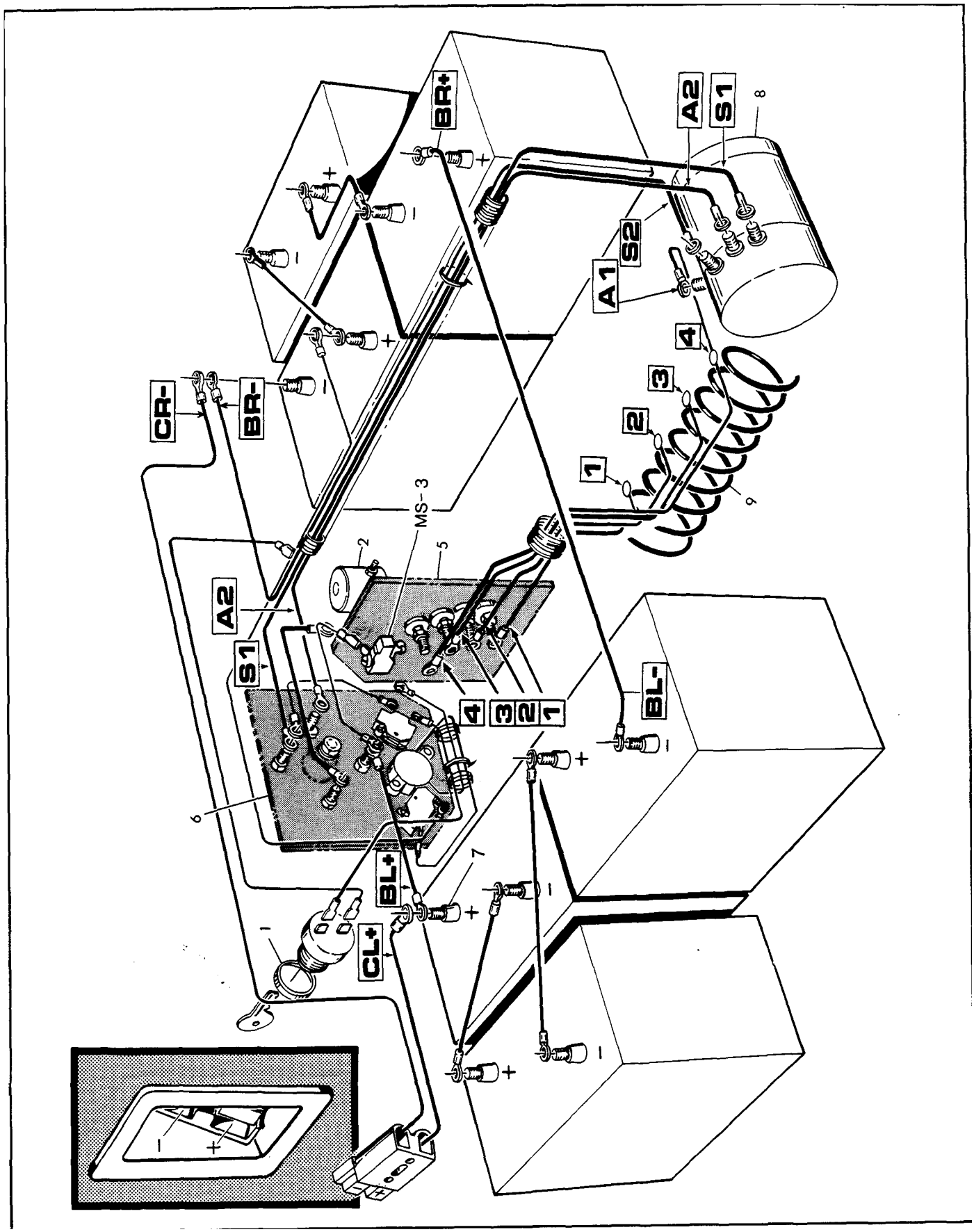



FIG. K-5 POWER WIRING DIAGRAM

in the 'ON' position. If the vehicle continues to operate after determining that the accelerator linkage is in correct adjustment, the solenoid (2) must be replaced.

**TESTING THE MOTOR** (Fig. K-5)

**NOTE:** This test if valid only after the control and power wiring has been inspected as detailed in the preceding procedures.

**Tools Required:**

- V.O.M. Quantity 1

**WARNING: TO PREVENT THE VEHICLE FROM INADVERTENTLY ACCELERATING, WHICH COULD CAUSE BODILY INJURY, THE VEHICLE MUST BE LIFTED TO RAISE BOTH DRIVE WHEELS ABOVE THE GROUND.**

Raise the vehicle (see procedures in Section B) before proceeding.

Place key switch (1) in the 'ON' position and the forward-neutral-reverse switch (6) to the forward 'F' position.

**NOTE:** Use the following test ONLY IF THE MOTOR WILL **NOT** RUN.

This check is for **open** circuits in field coils, brushes, or brush rigging. To check for a short circuit, refer to the Motor Section.

Set the volt meter to the 50 VDC range.

Locate the black (-) probe to the negative (-) contact of the vehicle D.C. receptacle and the red (+) probe to the motor terminal S2. A meter reading of 0 VDC indicates a good condition. Locate the red (+) probe on the motor (8) terminal S1. A meter reading of 0 VDC indicates that the field coils are satisfactory. A meter reading of 36 VDC ± 5 VDC indicates that the field coils are open and the motor must be repaired or replaced.

Locate the red (+) probe on the motor terminal A2. A reading other than 0 VDC indicates that the power wiring should be rechecked. Locate the red (+) probe to the motor terminal A1. A meter reading of 0 VDC indicates that the brushes, brush holder, and all connections are satisfactory. A meter reading of 36 VDC ± 5 VDC indicates a problem with the brushes, brush holder, or connections.

The following tests may be performed with an ohm meter or test light.

**WARNING: REMOVE BATTERY (+) CONNECTIONS BEFORE CONTINUING WITH THIS TEST. SHORTING OF MOTOR WIRES COULD RESULT IN AN EXPLOSION.**

Remove wires from motor terminals A1 and S2. Set the ohm meter to the RX1 scale. Using the ohm meter, place probes on motor terminals S1 and S2. A meter reading of "0" indicates a satisfactory condition at the field coils. No needle deflection indicates an "open" condition that will require the motor to be repaired or replaced.

Place the probes on motor terminals A1 and A2. A meter reading of "0" indicates a satisfactory condition at the brushes and rigging. No needle deflection indicates a condition that will require the motor to be repaired or replaced.

Check for continuity between each of the motor terminals and the motor shell. Continuity between terminals S1 and S2 to the motor shell indicates a short circuit between the field coils and the case. Continuity between terminals A1 or A2 to the motor shell indicates a short circuit in the armature. Both of the preceding conditions will require the motor to be repaired or replaced.

Retighten all motor terminal connections to 35-40 in. lbs. torque.

**FORWARD-NEUTRAL-REVERSE SWITCH** (Fig. K-6)

The Forward-Neutral-Reverse switch operation is described in Power Circuit at the beginning of this section.

**Switch Lubrication**

During the servicing of the vehicle, the forward-neutral-reverse switch shaft should be removed, cleaned, and lubricated with bearing grease. The contact surfaces may also be lubricated with a thin coat of petroleum jelly to permit smooth operation of the switch.

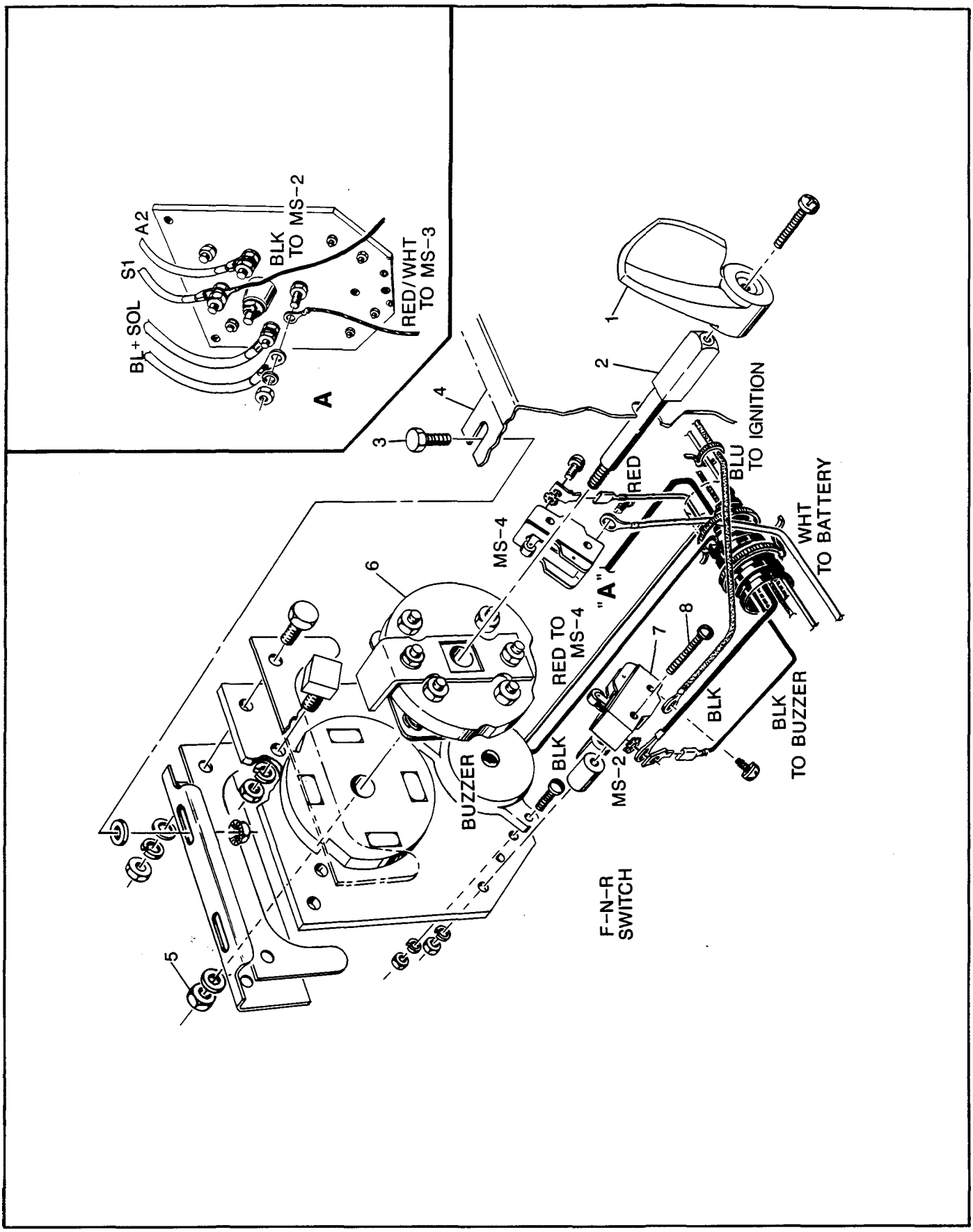



FIG. K-6 FORWARD-NEUTRAL-REVERSE SWITCH ASSEMBLY

**Forward-Neutral-Reverse Switch Inspection and Repair:**

**WARNING: DISCONNECT THE BATTERY LEAD (#4) (FIG. K-1) FROM THE BATTERY BEFORE ATTEMPTING SERVICE OF THE FORWARD-NEUTRAL-REVERSE SWITCH.**

Periodic inspection of the switch should include the following:

1. Check that all wire connections are tight and free of corrosion.

2. Check the contacts for abnormal wear. The contacts in the movable cam portion of the switch are spring loaded and the cam assembly must be replaced when worn sufficiently to cause a loss of spring pressure.

3. Rotate the switch lever from "stop to stop" to check for smooth operation. If the switch is excessively hard to operate, inspect for rough contact surfaces and replace if required. If the contact surfaces are good, the stationary contact surfaces may be lubricated, if required, with a very thin coat of petroleum jelly.

If the switch is abnormally loose, check the shaft nut and tighten if required. Inspect for abnormally worn spring loaded contacts.

Inspect the micro switch for adjustment and dirt that might inhibit its operation.

Reassemble in the reverse order of disassembly.

**FORWARD-NEUTRAL-REVERSE SWITCH REMOVAL AND DISASSEMBLY** (Fig. K-6)

**Tools Required:**

- 7/16"-1/2" Box Combination Wrench — Quantity 1
- 9/16" Box Wrench — Quantity 1

Remove lever (1) from shaft (2).

Disconnect the wiring connections on the rear of the switch, disconnect one push-on connection from the solenoid and one from the warning device. Disconnect the wire from the micro switch to the key switch at the key switch.

Loosen the two screws (3) which secure the switch bracket to the seat support frame (4) and slide the switch assembly from the slotted bracket.

Remove the nut (5) from the switch shaft (2), remove the cam (6) complete with the shaft (2) from the bushing, and remove the shaft (2) from the cam assembly (6).

Reassemble the switch in the reverse order of disassembly. Rotate the cam from stop to stop and check the operation of the micro switch (7) roller. The switch roller must be positioned as shown in Figure K-6, when the cam is located in the reverse stop position. Loosen the mounting screws (8) and adjust the position of the micro switch to achieve the position shown.

Reinstall the forward-neutral-reverse switch in the vehicle and adjust the switch to align with the hole in the vertical support panel. Tighten the hardware that secures the forward-neutral-reverse switch to the vehicle to 10-12 ft. lbs. torque.

**ACCELERATOR SWITCH** (Fig. K-7)

The accelerator switch is a rheostat type, mechanically controlled by a push-rod linkage connected to the accelerator foot pedal. Switch operation is described in the Power Circuit, Forward Operation, at the beginning of this section.

**Switch Lubrication**

**DO NOT** lubricate the five copper contact studs or the spring loaded brush contact.

The contact arm shaft (2) is the only part on the switch assembly (1) requiring lubrication. This part should be removed (semi-annually), cleaned and lubricated with wheel bearing grease.

**Switch Inspection and Repair** (Fig. K-7)

**WARNING; DISCONNECT THE BATTERY LEAD (#4) (FIG. K-1) FROM THE BATTERY BEFORE PROCEEDING WITH INSPECTION.**

**NOTE:** To assure efficient operation, the accelerator switch must be kept in good repair. Periodic inspection of wiring harness connections, board mounted contact studs, and the spring loaded sliding brush contact should be made as follows:

1. Inspect and tighten (if required) the nuts (3), lock washers (4), securing contact studs (5) to 30-35 in. lbs. torque.

2. Inspect and tighten (if required) all wire connections to 30-35 in. lbs. torque.

3. Observe badly pitted or worn contact studs (5). If a contact is burned or melted (resulting from a stuck or misadjusted accelerator linkage), the contact board assembly (6) (includes contacts and hardware) must be replaced.

4. Inspect the spring loaded brush contact (7) for firm spring pressure and a free action in the bushing.

5. Inspect the brush (7) for a burned tip and abnormal wear. When the brush is worn to approximately 1/2" in length, the brush must be replaced. To check the length, remove the brush by removing the shaft and arm assembly (2) and sliding the brush from it's carrier.

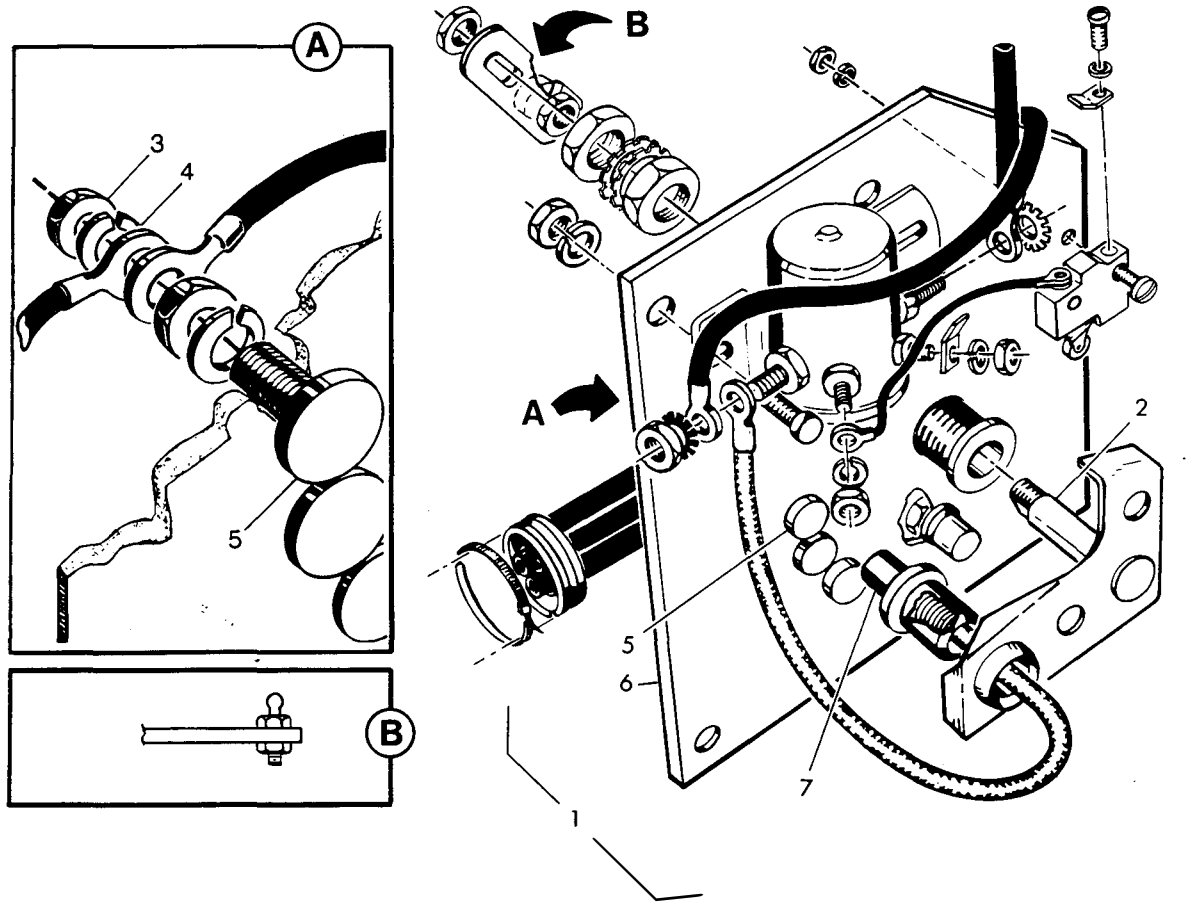



FIG. K-7 ACCELERATOR SWITCH ASSEMBLY

**ACCELERATOR SWITCH REMOVAL** (Fig. K-8)

**Tools Required:**

- 1 1/8" Open End Wrench Quantity 1
- Long Standard Screwdriver Quantity 1
- Small Hammer Quantity 1
- 1/2" Box End Wrench Quantity 1

To remove the accelerator switch assembly (1) from the vehicle, disconnect the wire #4 (Fig. K-1) at the batteries. (See Safety Procedures in Section B.)

Disconnect the wire #5 (Fig. K-9) at the forward-neutral-reverse switch.

Disconnect the red/white wire at the micro switch, the yellow wire at the solenoid and the wire from motor terminal A1 (Fig. K-9). Disconnect the accelerator linkage (2) from the accelerator switch arm (3) (See Section F). Loosen nut (4) and lift assembly (1) to gain access to hardware (5 and 6) securing power wiring to the switch. Remove wiring.

**RESISTOR REPLACEMENT** (Fig. K-11)

**Tools Required:**

- 1/2" Box Wrench Quantity 1
- 7/16" Box Wrench Quantity 1

**WARNING: TO PREVENT THE VEHICLE FROM INADVERTENTLY ACCELERATING, WHICH COULD CAUSE BODILY INJURY, THE VEHICLE MUST BE LIFTED TO RAISE BOTH DRIVE WHEELS ABOVE THE GROUND.**

**WARNING: REMOVE BATTERY (+) CONNECTIONS BEFORE PROCEEDING.**

Raise the vehicle (See procedures in Section B).

Remove the four nuts (1) that secure the wiring to the four bolts (2) located in the center of the resistor assembly (3). Remove the hardware securing the resistor assembly to the battery racks and lift the entire unit from the vehicle.

Visually inspect the resistor coils for breaks or burns.

If it is determined that a defective resistor coil exists the inner heat shield (4) must be removed by removing the four nuts (5) and lock washers (6) that secure the inner heat shield to the outer shield (7). The resistor board (8) may then be separated from the inner heat shield by removing the remaining nuts (9) and lock washers (10), and metal strips (15).

Remove the lock washer (11), flat washer (12) and the nut (13) from either end of the defective resistor. Replace the defective resistor and reinstall placing the flat washer (14) between it and the resistor board (8).

Tighten hardware attaching resistor and wiring to 15-20 ft. lbs. torque.

Reinstall resistor board assembly to heat shield and tighten hardware to 40-50 ft. lbs. torque.

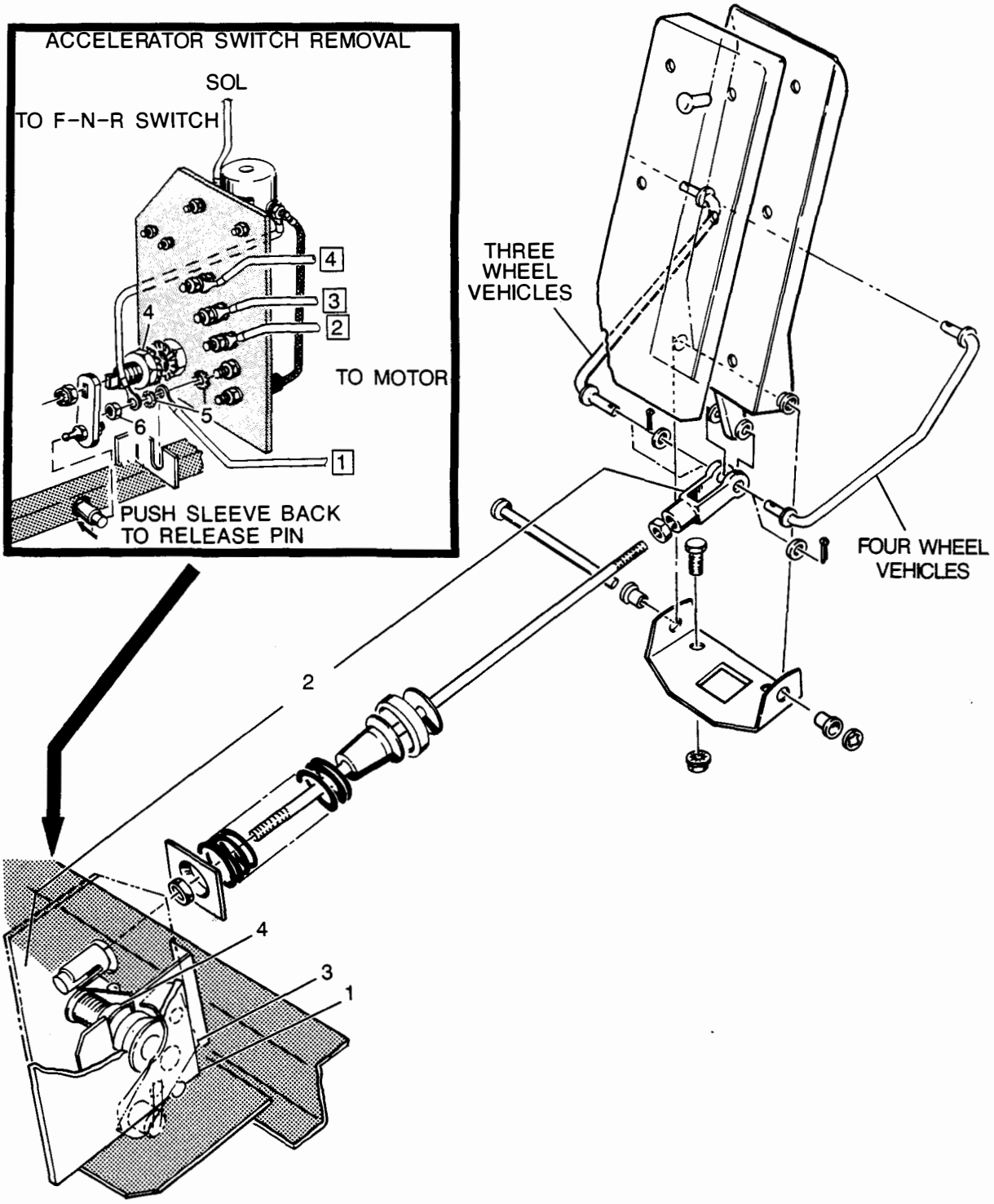



FIG. K-8 ACCELERATOR AND HILL BRAKE LINKAGE

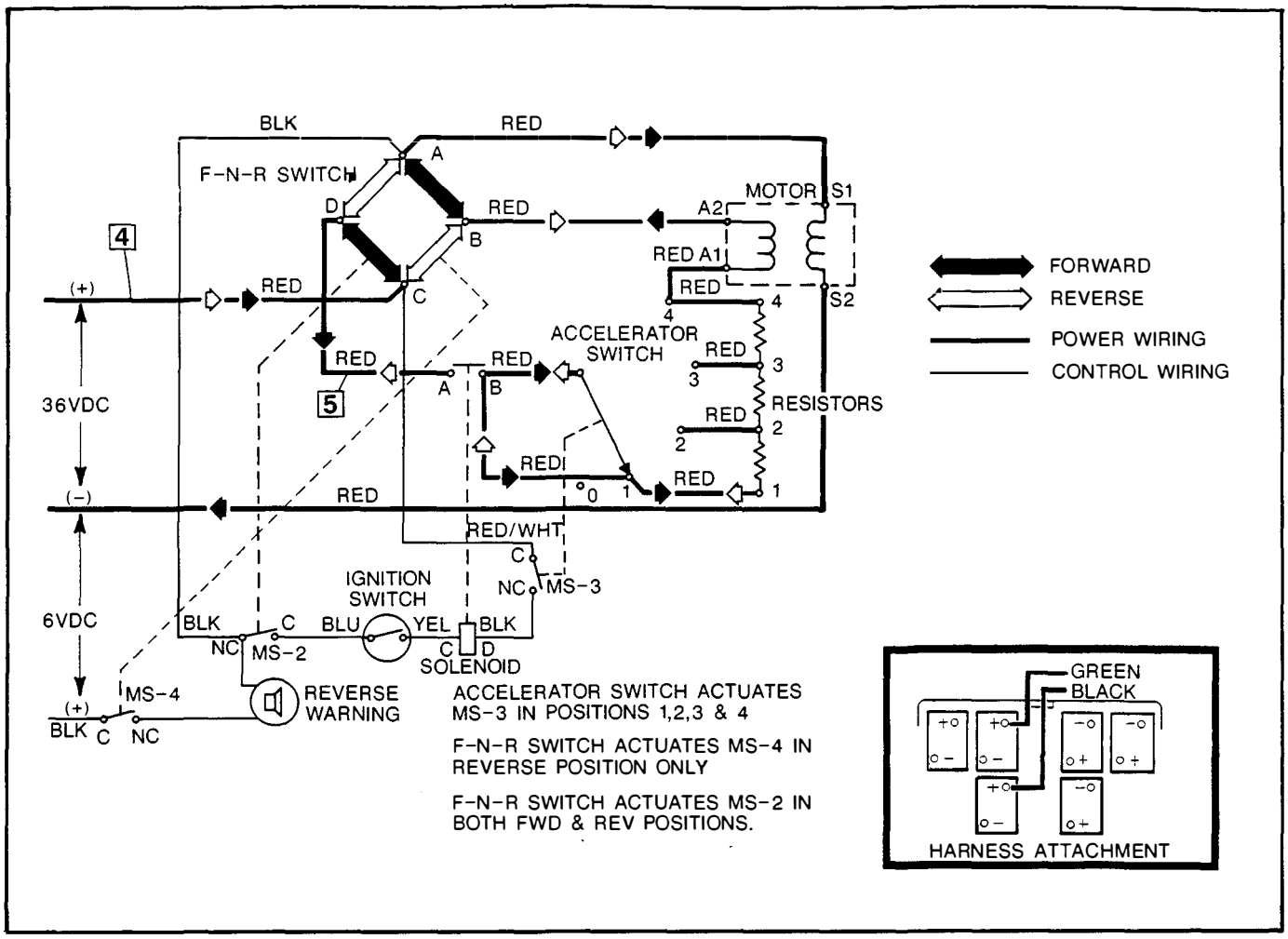



FIG. K-9 ELECTRIC VEHICLE WIRING DIAGRAM

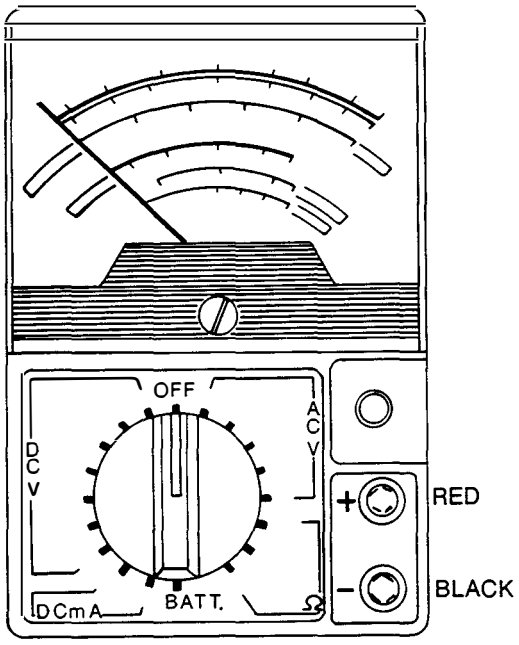



FIG. K-10 VOM SET UP

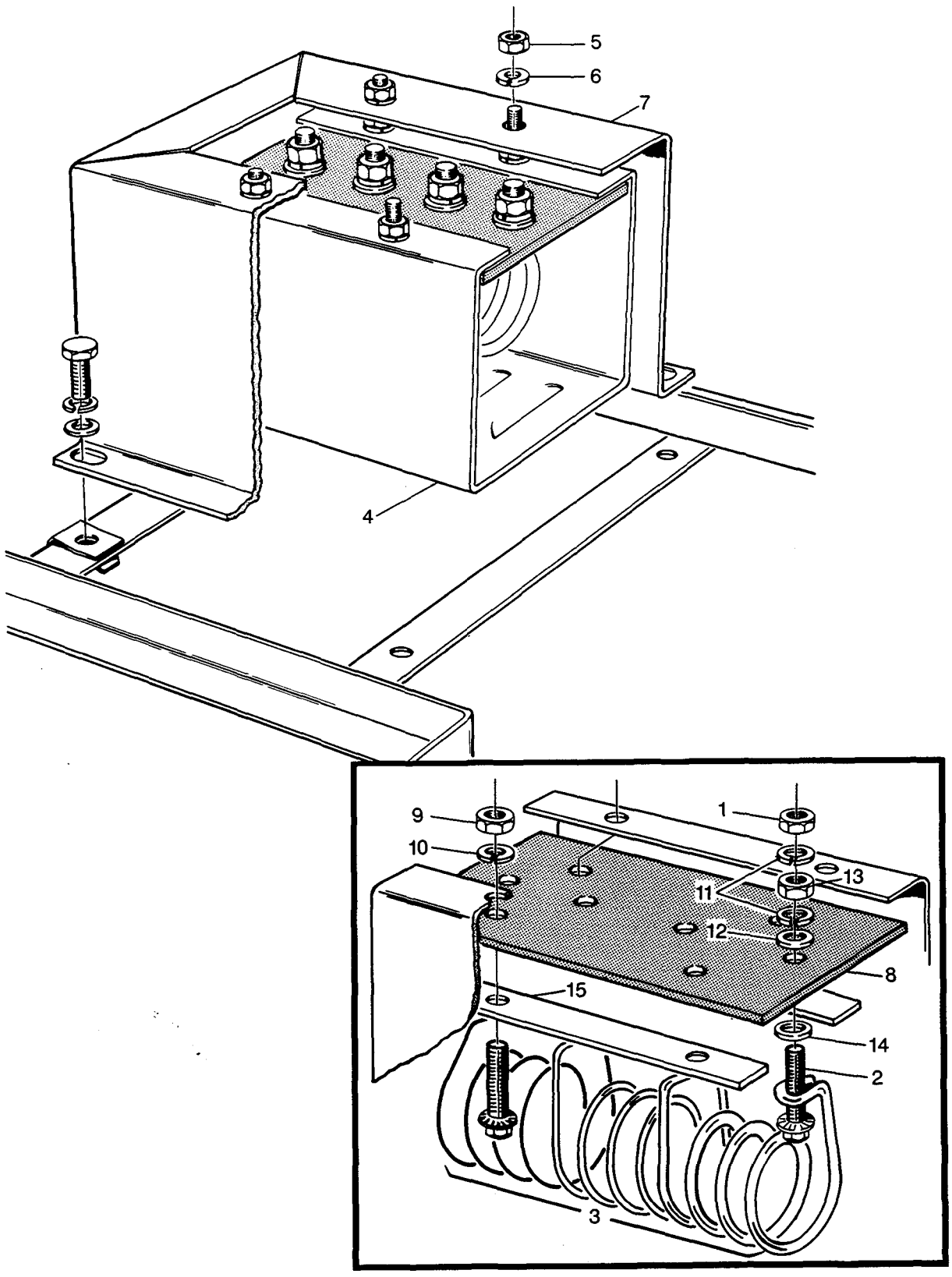



FIG. K-11 RESISTOR ASSEMBLY

## HORN CIRCUIT (IF EQUIPPED)

The horn circuit is a 12 volt system and consists of a horn switch, fuse block, fuse, horn, and central wiring harness.

### HORN

When the horn switch is depressed, the horn circuit is completed permitting current to flow from the battery to the fuse and through the horn causing it to sound. The horn will operate if the vehicle is in either the ON or OFF position.

**TESTING THE HORN CIRCUIT** (Fig. K-10, K-12)

**Tools Required:**

- V.O.M. Quantity 1

If the vehicle runs but the horn is inoperative:

1. Check for loose wires at the terminals-connections and for worn insulation or bare wires touching the frame. **Bare wires may cause a short circuit.** Refer to Fig. K-10 for meter set-up.

2. Check for adequate battery volts (Nominal 12 VDC) by setting VOM to 12 VDC range and place the red probe (+) on the battery post with the green wire attached. Place the black probe (-) on the battery post with the black wire attached. A reading of 11 VDC or better indicates adequate battery condition. No reading indicates (a) a poor connection between the probes and the battery terminals; (b) a defective VOM. A voltage reading below 11 volts indicates poor battery condition and the vehicle should be recharged before proceeding with the test.

**NOTE:** Due to the resistance of the wires involved within the harness, voltage readings may be somewhat lower than battery voltage. A reading of 1 volt below battery voltage is acceptable.

3. Firmly attach the black probe (-) to the battery post with the black wire attached and the red probe (+) to the green terminal at the fuse block. A reading of battery voltage indicates that the green wire is in good condition.

**NOTE:** Green wire supplies power to the entire fuse block.

4. Place the red probe (+) to the orange/white wire terminal on the fuse block. A reading of battery voltage indicates that the fuse is in good condition. No reading indicates a defective fuse, replace with a good 15 amp fuse.

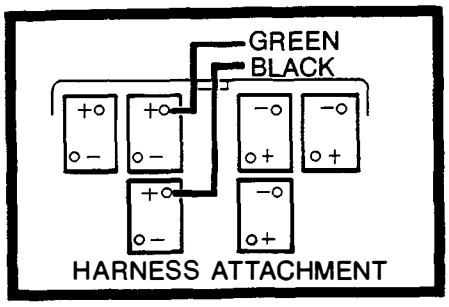
5. Place the red probe (+) to the yellow connection at the horn switch. A reading of battery voltage indicates that the yellow wire supplying power to the switch is in good condition. If no reading is indicated, move the probe to the other yellow wire terminal at the horn switch and repeat test.

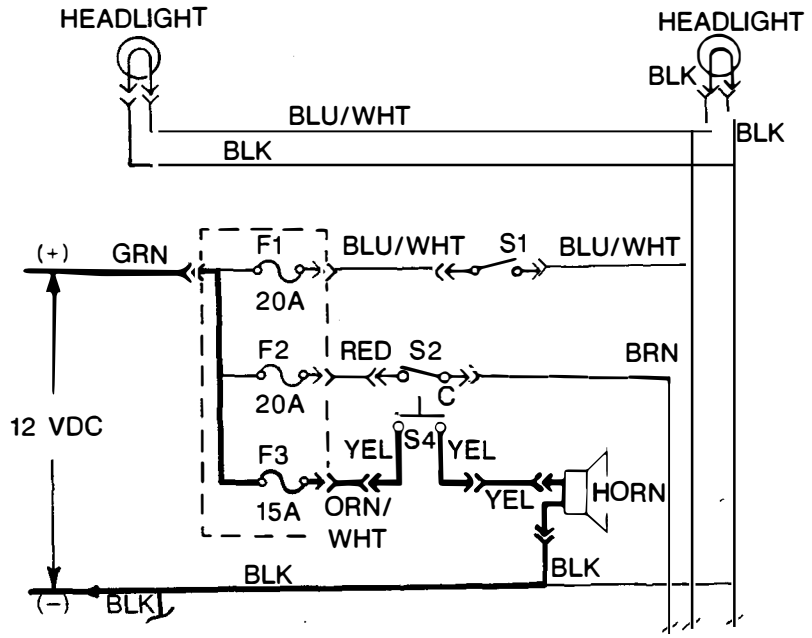
6. Place the red probe (+) to the other horn switch terminal (yellow wire) and depress horn switch button. A reading of battery voltage indicates a good horn switch. No reading indicates a defective switch, replace it with a good horn switch.

7. Place the red probe (+) to the horn terminal with the yellow wire. Depress horn button. A reading of battery voltage indicates a good yellow wire.

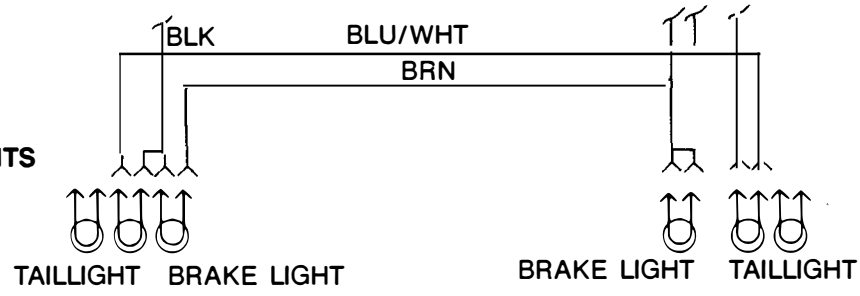
8. Remove the black wire from the horn. Select ohms x 1 (continuity) position on the VOM. Place the red probe (+) to the terminal of the black wire. A reading of .00 on a digital VOM or less than 5 ohms on a needle type meter indicates that the black wire is in good condition. All wiring has now been checked; therefore, the horn is defective. Replace with a good horn.

**NOTE:** If any VOM readings indicate a defective wire, it is recommended that the condition of the terminals and wire junction be examined. A defective wire should be replaced with one of the same gauge and color and wired between the correct components and wire tied to the harness bundle. The defective wire should be cut back close to the harness and the ends protected with vinyl electrical tape.




**VEHICLES WITH MULTIPLE TAILLIGHTS**




**VEHICLES WITH SINGLE TAILLIGHT**

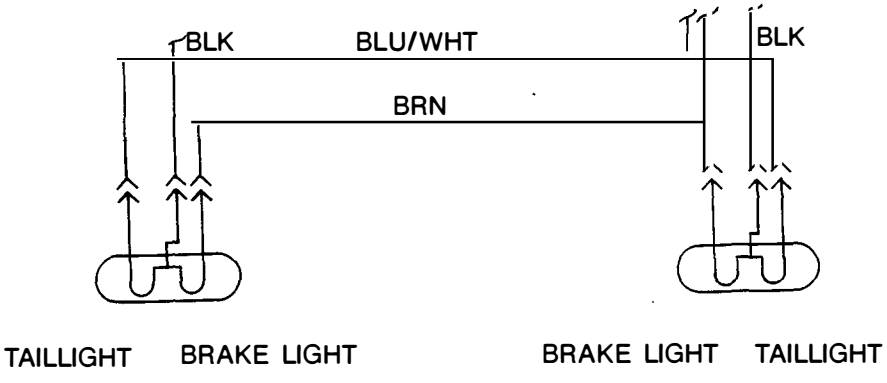



FIG. K-12 HORN CIRCUIT

## HEADLIGHT AND TAILLIGHT CIRCUIT (IF EQUIPPED)

The headlight and taillight circuit is a 12 volt system and consists of a light switch, fuse block, fuse, headlights, taillights, and central wiring harness.

## HEADLIGHTS AND TAILLIGHTS

When the headlight/taillight switch is pulled, the circuit is completed permitting current to flow from the battery to the fuse and through the lights causing them to illuminate. The headlights/taillights will operate if the vehicle is in either the ON or OFF position.

## TESTING THE HEADLIGHTS AND TAILLIGHTS CIRCUIT (Fig. K-10, K-13, K-14, K-15)

**Tools Required:**

- V.O.M. Quantity 1

If the vehicle runs but the headlights and taillights are inoperative: Proceed to Step 1. If any lights are functional proceed to Step 7.

1. Check for loose wires at the terminals-connections and for worn insulation or bare wires touching the frame. **Bare wires may cause a short circuit.** Refer to Fig. K-9 for meter set-up.

2. Check for adequate battery volts (Nominal 12 VDC) by setting VOM to the 12 VDC range and place the red probe (+) on the battery post with the green wire attached. Place the black probe (-) on the battery post with the black wire attached. A reading of 11 VDC or better indicates adequate battery condition. No reading indicates (a) a poor connection between the probes and the battery terminals; (b) a defective VOM. A voltage reading below 11 volts indicates poor battery condition and the vehicle should be recharged before proceeding with the test.

**NOTE:** Due to the resistance of the wires involved within the harness, voltage readings may be somewhat lower than battery voltage. A reading of 1 volt below battery voltage is acceptable.

3. Firmly attach the black probe (-) to the battery post with the black wire attached to perform Steps 3 through 4 and the red probe (+) to the green terminal at the fuse block. A reading of battery voltage indicates that the green wire is in good condition.

**NOTE:** This wire supplies power to the entire fuse block.

4. Place the red probe (+) to the blue/white wire terminal on the fuse block. A reading of battery voltage indicates that the fuse is in good condition. No reading indicates a defective fuse, replace with a good 15 amp fuse.

5. Place the red probe (+) to the blue/white connection at the horn switch. A reading of battery voltage indicates that the orange/white wire is in good condition.

Disconnect both wires from the light switch. Select ohms x 1 (continuity) position on the VOM. Place the red probe (+) to one terminal and the black probe (-) to the other. Pull out switch button. A reading of .00 on a digital VOM or less than 5 ohms on an ananeedle type meter indicates that the switch is in good condition. A reading of infinity indicates a defective switch. Replace with a good switch and reconnect the wiring.

**If one or more lights are operational,** check for defective wiring or a defective bulb or module (rear light). Check for voltage to headlights. Pull out light switch and disconnect blue/white wire at the defective headlight. Set the VOM to 12 VDC range, place the red probe (+) to the blue/white wire terminal and the black probe (-) to the ring terminal with the black wire that is attached to the headlight mounting bolt. A reading of battery voltage indicates that either the socket is corroded or defective, or that the bulb is defective. Replace the bulb after inspecting the socket and reconnect the wiring.

At taillights, repeat the process except that the black harness wire should be disconnected from the black light module wire and the black probe (-) should be placed on the black wire terminal.

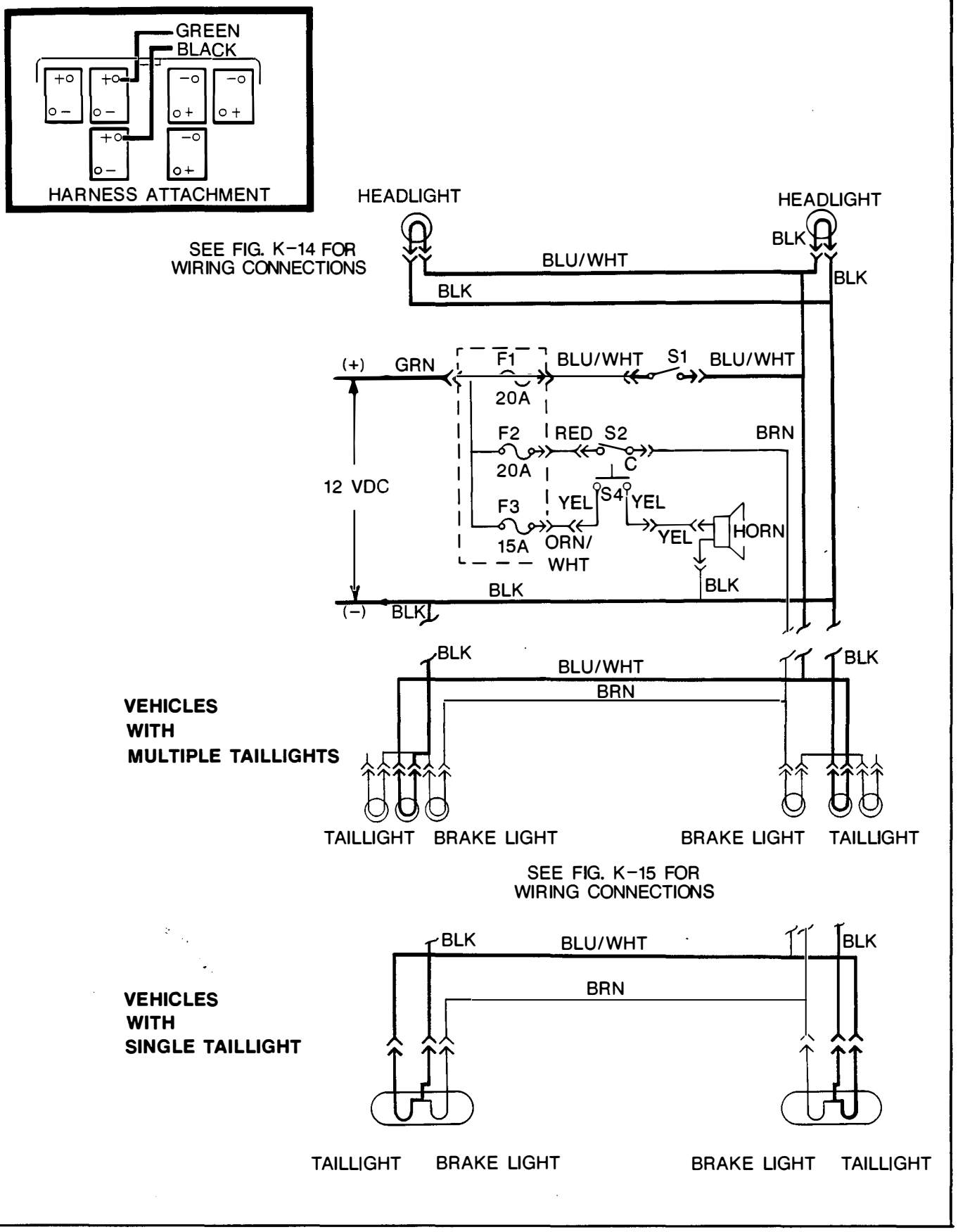



FIG. K-13 HEADLIGHT AND TAILLIGHT CIRCUIT

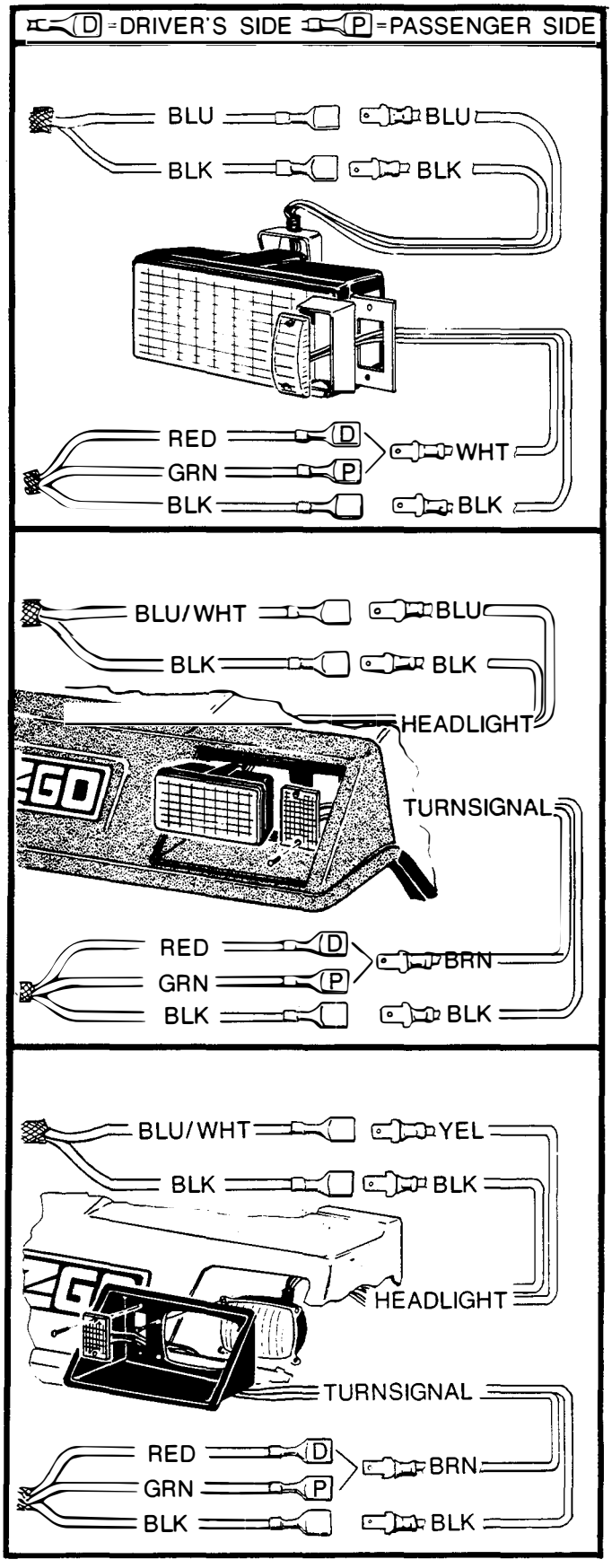



FIG. K-14 HEADLIGHT INSTALLATION WITHOUT TURNSIGNAL SWITCH

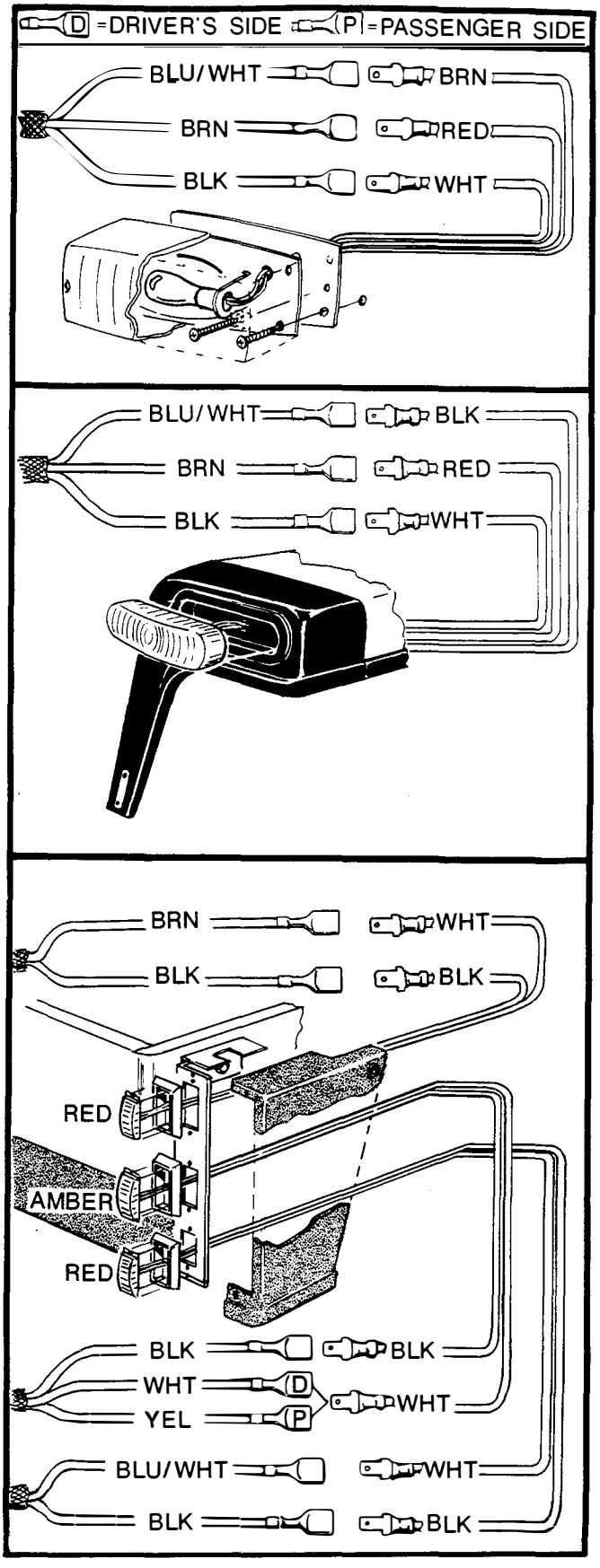



FIG. K-15 TAILLIIGHT INSTALLATION WITHOUT TURNSIGNAL SWITCH

**TWO TAILLIGHT SYSTEMS ARE IN USE**

a) Multiple taillights are made up of individual lamp modules. To replace a rear lamp module, gently pry the lamp module from its retaining bezel using a straight blade screwdriver. (Use caution to prevent breakage) Unplug the lamp module from the plug and replace by snapping into the bezel. Replace all wires disconnected in the test.

b) The single taillight is a conventional single bulb, two filament type that may be accessed by removing the two screws in the lense.

**NOTE:** If any VOM readings indicate a defective wire, it is recommended that the condition of the terminals and wire junction be examined. A defective wire should be replaced with one of the same gauge and color and wired between the correct components and wire tied to the harness bundle. The defective wire should be cut back close to the harness and the ends protected with vinyl electrical tape.

**BRAKE LIGHT CIRCUIT (IF EQUIPPED)** (Fig. K-10, K-16, K-17)

The brake circuit is a 12 volt system and consists of a brake pedal operated micro switch, a fuse block, fuse, brake lights, and a central wiring harness.

When the service brake pedal is depressed, a micro switch is closed which completes the brake light circuit which permits current to flow to the brake lights. The brake lights will operate if the vehicle is in either the ON or OFF position.

**TESTING THE BRAKE LIGHT CIRCUIT**
**Tools Required:**

- V.O.M. Quantity 1

1. **BRAKE LIGHTS** (Fig. K-10, K-16, K-17)

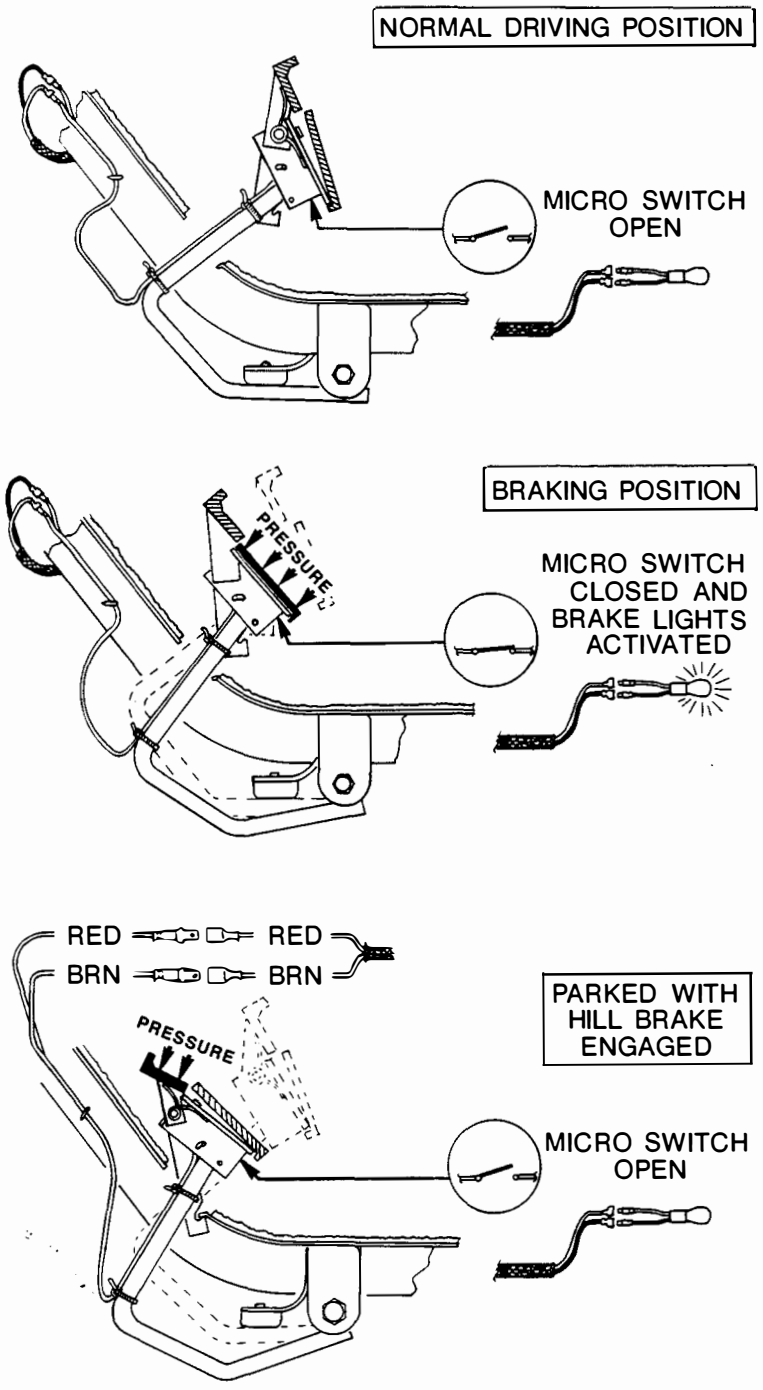
   a. **If only one brake light is inoperative,** the overall system is functional; therefore the following steps should be followed: If no brake lights are functional proceed to Step 1b.

   Assure that the brown wire from the harness is attached to the white wire from the inoperative lamp module plug. If the lamp still fails to light when the brake pedal is depressed, proceed as follows.
   Separate the brown harness wire from the white lamp module wire. Select the 12 VDC range of the VOM. Place the red probe (+) to the brown wire and the black probe (-) to the black wire connection at the battery. Depress the brake pedal. A reading of 12 VDC volt indicates that the brown wire is in good condition and that the lamp module is defective. The taillights are made up of individual lamp modules. To replace a rear lamp module, gently pry the lamp module from its retaining bezel using a straight blade screwdriver. (Use caution to prevent breakage) Unplug the lamp module from the plug and replace by snapping into the bezel. Replace all wires disconnected in the test.

   b. **If both brake lights are inoperative and the vehicle runs.** Visually check for disconnected wires under the floorboard, at the micro switch and at the rear lights.

1. Check for loose wires at the terminal-connections and for worn insulation or bare wires touching the frame. **Bare wires may cause a short circuit.**

2. Check for adequate battery volts (Nominal 12 VDC) by setting VOM to 12 VDC range and place the red probe (+) on the battery post with the green wire attached. Place the black probe (-) on the battery post with the black wire attached. A reading




NOTE: AUDIBLE CLICK WHILE APPLYING AND RELEASING BRAKES INDICATES PROPER SWITCH ADJUSTMENT.

FIG. K-16 BRAKE SYSTEM MICRO SWITCH

of 11 VDC or better indicates adequate battery condition. No reading indicates (a) a poor connection between the probes and the battery terminals; (b) a defective VOM. A voltage reading below 11 volts indicates poor battery condition and the vehicle should be recharged before proceeding with the test.

**NOTE:** Due to the resistance of the wires involved within the harness, voltage readings may be somewhat lower than battery voltage. A reading of 1 volt below battery voltage is acceptable.

3. Firmly attach the black probe (-) to the battery post with the black wire attached and the red probe (+) to the green wire terminal at the fuse block. A reading of battery voltage indicates that the green wire is in good condition.

**NOTE:** This wire supplies power to the entire fuse block.

4. Place the red probe (+) to the red wire terminal on the fuse block. A reading of battery voltage indicates that the fuse is in good condition. No reading indicates a defective fuse, replace with a good 20 amp fuse.

Check for correct operation and function of brake pedal actuated micro switche.

1. Raise the front of vehicle (see Safety Procedures in Section B).

2. Depress service brake pedal and listen for audible click from micro switch. Release pedal and listen for an audible click.

An audible click in both the up and down pedal positions indicates a correct micro switch adjustment.

If the switch is not activated and released correctly, it may be adjusted by loosening the two bolts that secure the micro switch and moving the switch until the appropriate adjustment is achieved. If the switch is in correct adjustment and the brake lights are not activated, it is necessary to check for defective wiring or components.

Set the VOM to the 12 VDC range and attach the black probe (-) to the negative battery post with the black wire attached. Place the red probe (+) to the micro switch terminal with the brown wire attached. Depress the brake pedal. A reading of battery voltage indicates that the service brake micro switch is operating correctly. If no voltage is indicated, the micro switch must be tested.

1. Move the red probe (+) to the service brake micro switch terminal with the red wire attached. A reading of battery voltage indicates that the red wire is in good condition. Move the red probe (+) to the other terminal of the service brake micro switch and manually activate the switch by pressing the roller of the actuating arm toward the switch until an audible click is heard. A reading of battery voltage indicates that the switch is in good condition. No reading indicates that the micro switch needs replacement.

2. Move to the rear of the vehicle, and access the lights. Move the red probe (+) to the brake light at the brown wire. Depress the service brake. A reading of battery voltage indicates that the brown wire is in good condition.

3. Disconnect the connector from the light module and move the red probe (+) to the white terminal. Depress the service brake. A reading of battery voltage indicates that the connector wiring is in good condition.

**NOTE:** If any VOM readings indicate a defective wire, it is recommended that the condition of the terminals and wire junction be examined. A defective wire should be replaced with one of the same gauge and color and wired between the correct components and wire tied to the harness bundle. The defective wire should be cut back close to the harness and the ends protected with vinyl electrical tape.

**NOTE:** When replacing micro switches, be sure to check the switch adjustment.

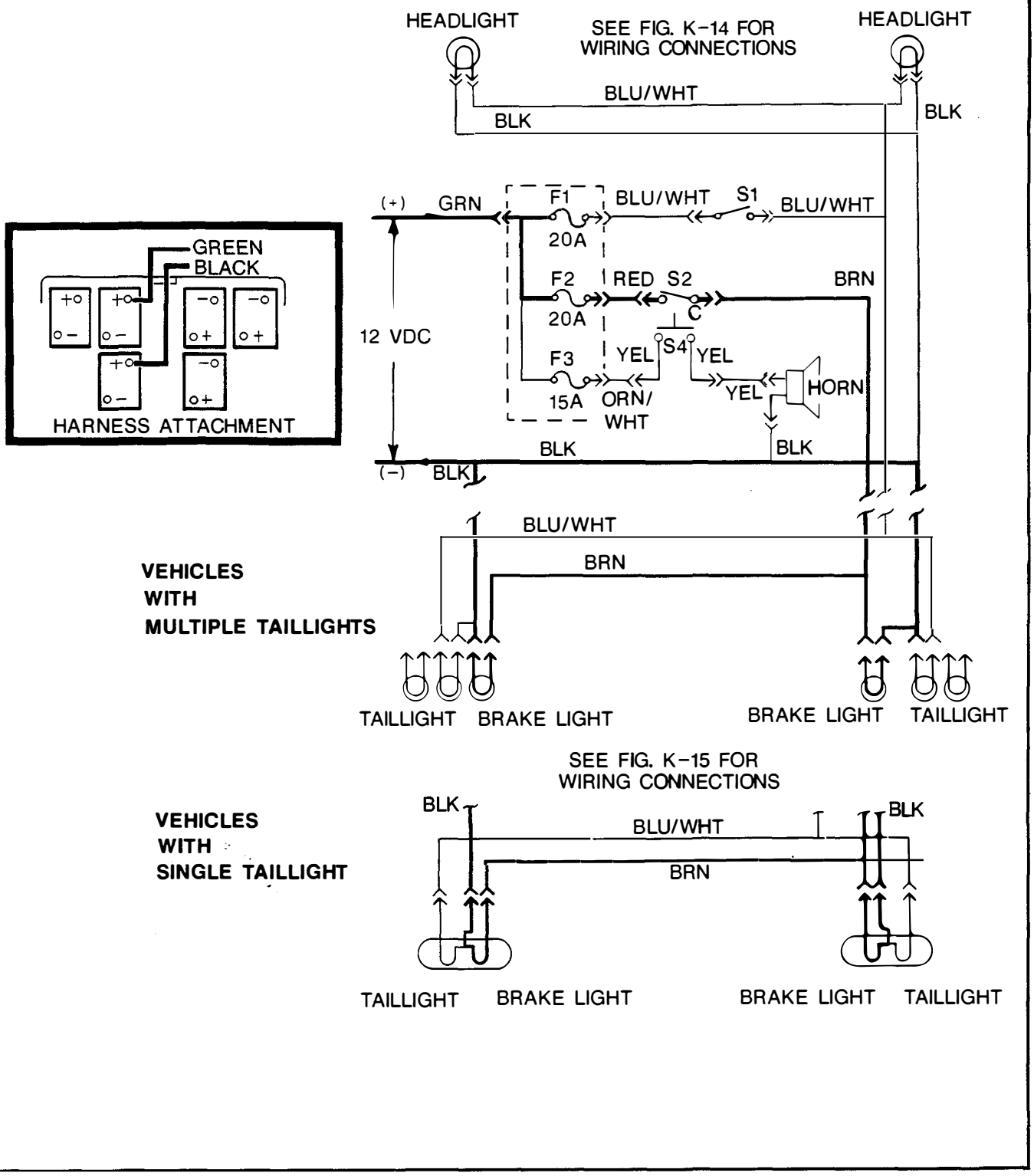



FIG. K-17 BRAKE LIGHT CIRCUIT

**NOTE:** Due to the resistance of the wires involved within the harness, voltage readings may be somewhat lower than battery voltage. A reading of 1 volt below battery voltage is acceptable.

## TURN SIGNALS AND FLASHER CIRCUIT (IF EQUPPED)

The turn signal and flasher is a 12 volt system and consists of a turn signal/flasher switch, fuse block, fuse, front and rear lamps, and central wiring harness.

## TURN SIGNALS AND FLASHER

When the turn signal/flasher switch is activated, the circuit is completed permitting current to flow from the battery to the fuse and through the flasher causing the appropriate lights to flash. The turn signal/flasher will operate if the vehicle is in either the ON or OFF position.

## TESTING THE TURN SIGNAL/FLASHER CIRCUIT (Fig. K-10, K-18, K-19)

The test procedure for this test is the same for both the single and multiple unit taillight vehicles A difference **does** exist in the turn signal switch wiring (brown wire). **BOTH CIRCUIT DIAGRAMS ARE PROVIDED FOR REFERENCE.**

**Tools Required:**

- V.O.M. Quantity 1

**If the vehicle runs but all turn signals and flasher are inoperative:**

1. Check for loose wires at the terminals-connections and for worn insulation or bare wires touching the frame. **Bare wires may cause a short circuit.**

2. Check for adequate battery volts (Nominal 12 VDC) by setting VOM to 12 VDC range and place the red probe (+) on the battery post with the green wire attached. Place the black probe (-) on the battery post with the black wire attached. A reading of 11 VDC or better indicates adequate battery condition. No reading indicates (a) a poor connection between the probes and the battery terminals; (b) a defective VOM. A voltage reading below 11 volts indicates poor battery condition and the vehicle should be recharged before proceeding with the test.

**NOTE:** Due to the resistance of the wires involved within the harness, voltage readings may be somewhat lower than battery voltage. A reading of 1 volt below battery voltage is acceptable.

3. Firmly attach the black probe (-) to the battery post with the black wire attached and the red probe (+) to the green terminal of the fuse block. A reading of battery voltage indicates that the green wire is in good condition.

**NOTE:** This green wire supplies power to the entire fuse block.

4. Place the red probe (+) to the red wire terminal on the fuse block. A reading of battery voltage indicates that the fuse is in good condition. No reading indicates a defective fuse, replace with a good 20 amp fuse.

5. Remove the flasher from its socket. Select ohms x 1 (continuity) position on the VOM. Place the red probe (+) on one of the flasher terminals and the black probe (-) on the other flasher terminal. A reading of .00 on a digital VOM or less than 5 ohms on a needle type meter indicates that the flasher is in good condition.

6. Inspect the flasher socket for corrosion before replacing the flasher.

7. Separate the harness to turn signal connector and inspect for corrosion and correct placement of pins and sockets in the connector housings.

8. Check that the black wire from the flasher socket is attached to the red wire from the harness and that the black wire from the turn signal is attached to the black wire from the harness, and the black wire from the flasher is firmly attached to the orange wire from the turn signal.

9. If the system does not function after the above check, the turn signal switch and harness assembly must be replaced.

If the left, right, or emergency flasher works, the flasher unit is satisfactory and a defective bulb or wiring should be suspected.

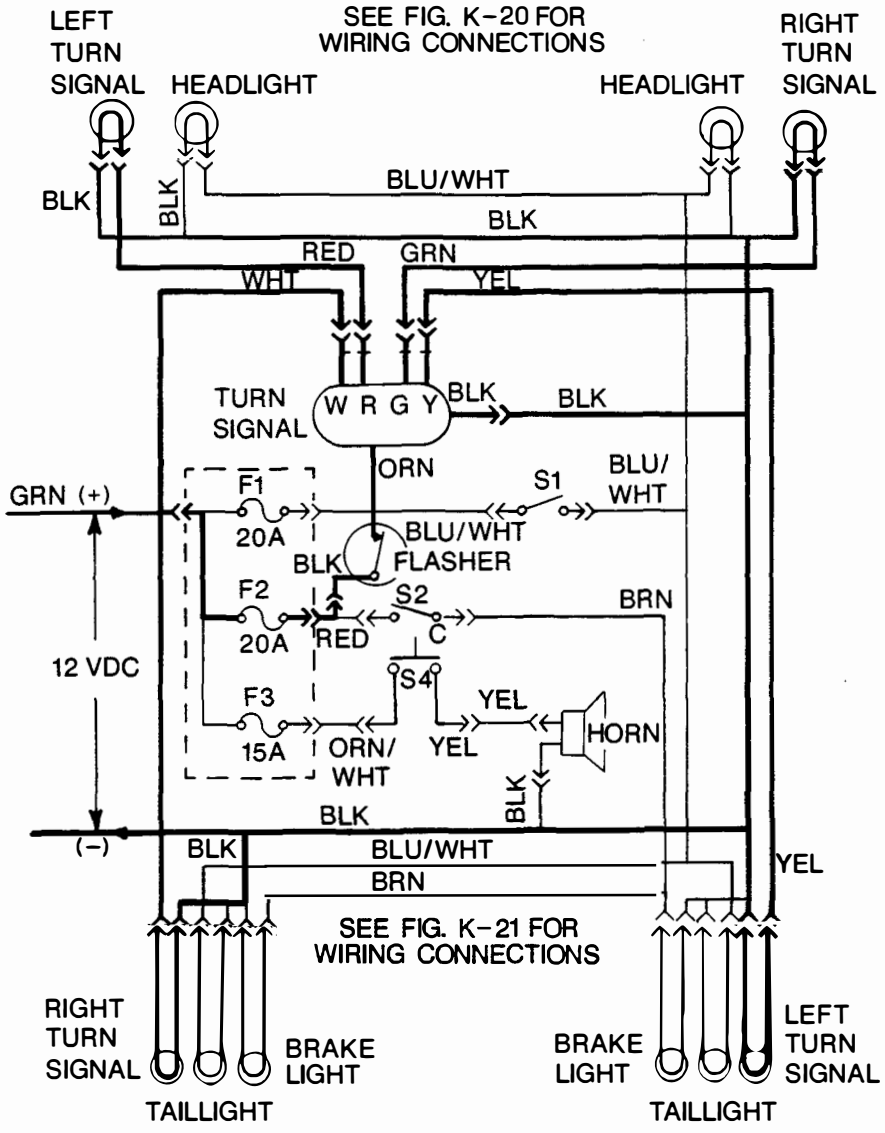
1. Select the 12 VDC range of the VOM. Place the red probe (+) to:

   Left Front. . . . . Red Wire
   Left Rear. . . . . White Wire
   Right Front. . . . . Green Wire
   Right Rear. . . . . Yellow Wire

   and the black probe (-) to the black wire connection at the negative post of the battery. Turn on the appropriate turn signal. A pulsating reading of 12 VDC indicates that power is available to the light, therefore the light module is defective. If no voltage is present a defective wire is indicated.

To replace a front lamp module, gently pry lamp module from its retaining bezel using a straight blade screwdriver. (Use caution to prevent breakage.) Unplug the lamp module from the plug and replace by snapping into the bezel. Replace all wires disconnected in test.

**NOTE:** If any VOM readings indicate a defective wire, it is recommended that the condition of the terminals and wire junction be examined. A defective wire should be replaced with one of the same gauge and color and wired between the correct components and wire tied to the harness bundle. The defective wire should be cut back close to the harness and the ends protected with vinyl electrical tape.



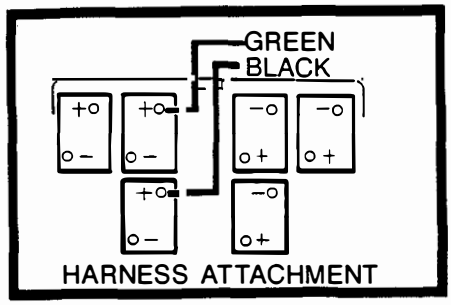
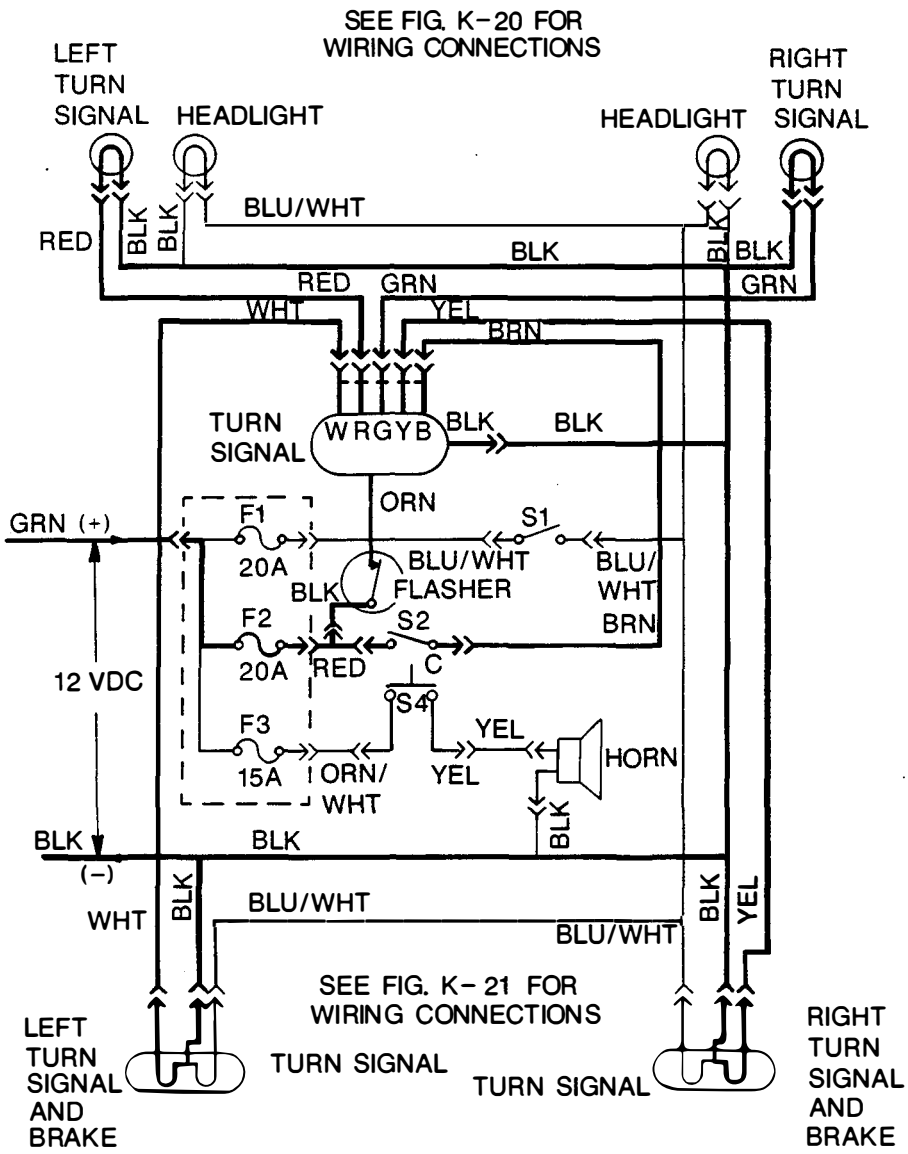




FIG. K-18 TURN SIGNAL AND FLASHER CIRCUIT (MULTIPLE UNIT TAILLIGHT VEHICLES)



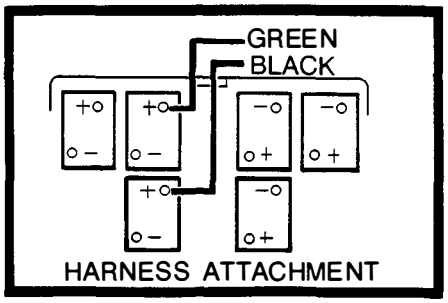




FIG. K-19 TURN SIGNAL AND FLASHER CIRCUIT (SINGLE UNIT TAILLIGHT VEHICLES)

## HOUR METER CIRCUIT (IF EQUIPPED)

The hour meter circuit is a 36 volt system and consists of an hour meter and central wiring harness.

### HOUR METER

The hour meter is wired to the 36 volt battery set of the vehicle and indicates the number of hours that the vehicle has operated. The hour meter will operate only when the vehicle is running.

### TESTING HOUR METER CIRCUIT (Fig. K-10, K-22)

**Tools Required:**

- V.O.M. Quantity 1

If the vehicle runs but the hour meter is inoperative:

1. Check for loose wires at the terminals-connections and for worn insulation or bare wires touching the frame. Bare wires may cause a short circuit.

2. Raise vehicle (see procedures in Section B).

   **WARNING: THIS TEST WILL CAUSE VEHICLE WHEELS TO TURN. BE SURE THAT VEHICLE IS ADEQUATELY SUPPORTED WITH BOTH REAR WHEELS CLEAR OF FLOOR. KEEP CLEAR OF ROTATING WHEELS. CLOTHING BECOMING TRAPPED BY WHEEL COULD CAUSE SERIOUS PERSONAL INJURY.**

3. Check for adequate battery volts (Nominal 36 VDC) by setting VOM to 36 VDC range, unplug the yellow and gray wires from the rear of the hour meter. Place the black probe (-) on the gray wire terminal. Place the red probe (+) on the yellow wire terminal. Turn key switch to ON and depress accelerator pedal. A reading of 36 VDC $\pm$ 5V or better indicates adequate battery condition. No reading indicates (a) a poor connection between the probes and the terminals; (b) a defective VOM. A voltage reading below 32 volts indicates poor battery charge and the vehicle should be recharged before proceeding with the test.

4. If battery voltage meets the criteria specified and the hour meter does not function, the hour meter should be replaced being careful to rewire with gray to the negative (-) terminal and yellow to the positive (+) terminal.

## STATE OF CHARGE METER CIRCUIT (IF EQUIPPED)

The state of charge circuit is a 36 volt system and consists of a state of charge meter and central wiring harness.

### STATE OF CHARGE METER

The state of charge meter is wired to the 36 volt battery set of the vehicle and indicates the charge condition of the battery set. The state of charge meter will operate if the vehicle is in either the ON or OFF position.

### TESTING STATE OF CHARGE METER CIRCUIT (Fig. K-9, K-23)

**Tools Required:**

- V.O.M. Quantity 1

If the vehicle runs but the state of charge meter is inoperative:

1. Check for loose wires at the terminals-connections and for worn insulation or bare wires touching the frame. **Bare wires may cause a short circuit.**

2. Check for adequate battery volts (Nominal 36 VDC) by setting VOM to 36 VDC range, unplug the green and gray wires from the rear of the state of charge meter. Place the red probe (+) on the green wire terminal. Place the black probe (-) on the gray wire terminal. A reading of 36 VDC $\pm$ 5V or better indicates adequate battery condition. No reading indicates (a) a poor connection between the probes and the battery terminals; (b) a defective VOM. A voltage reading below 32 volts indicates poor battery charge and the vehicle should be recharged before proceeding with the test.

3. If battery voltage meets the criteria specified and the state of charge meter does not function, the state of charge meter should be replaced being careful to rewire with gray to the negative (-) terminal and green to the positive (+) terminal.

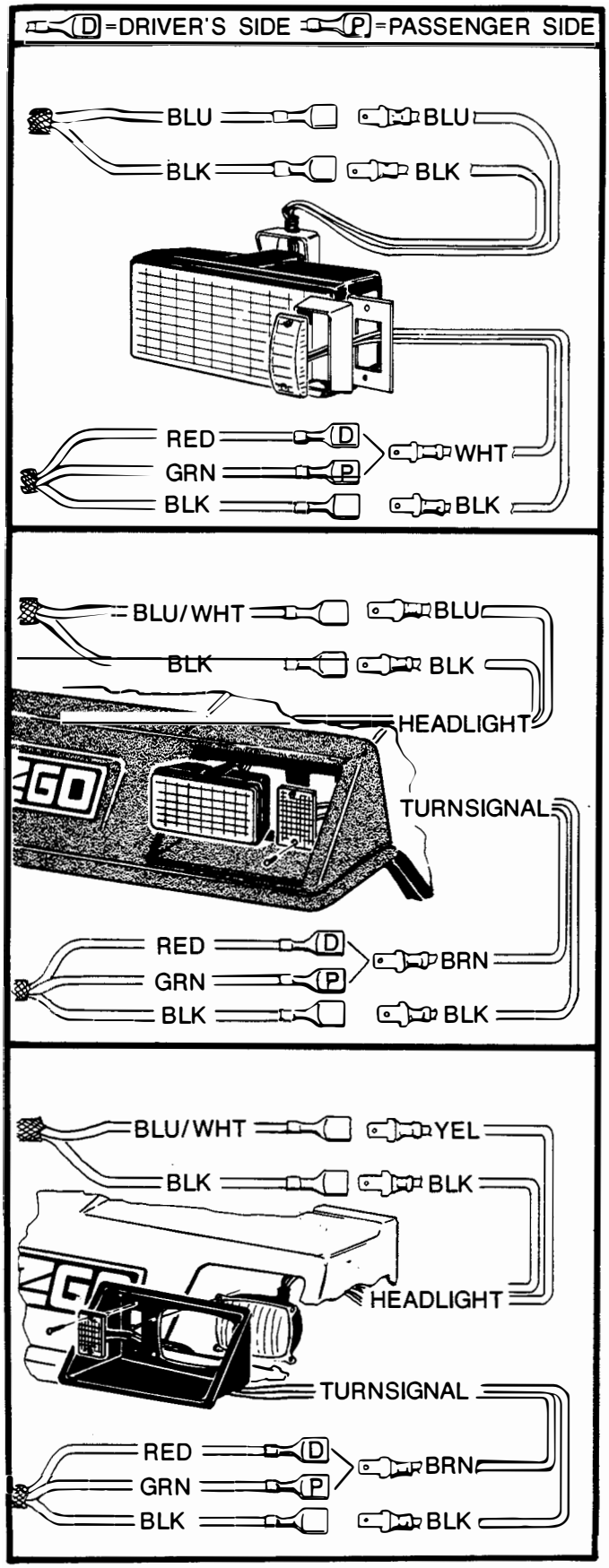
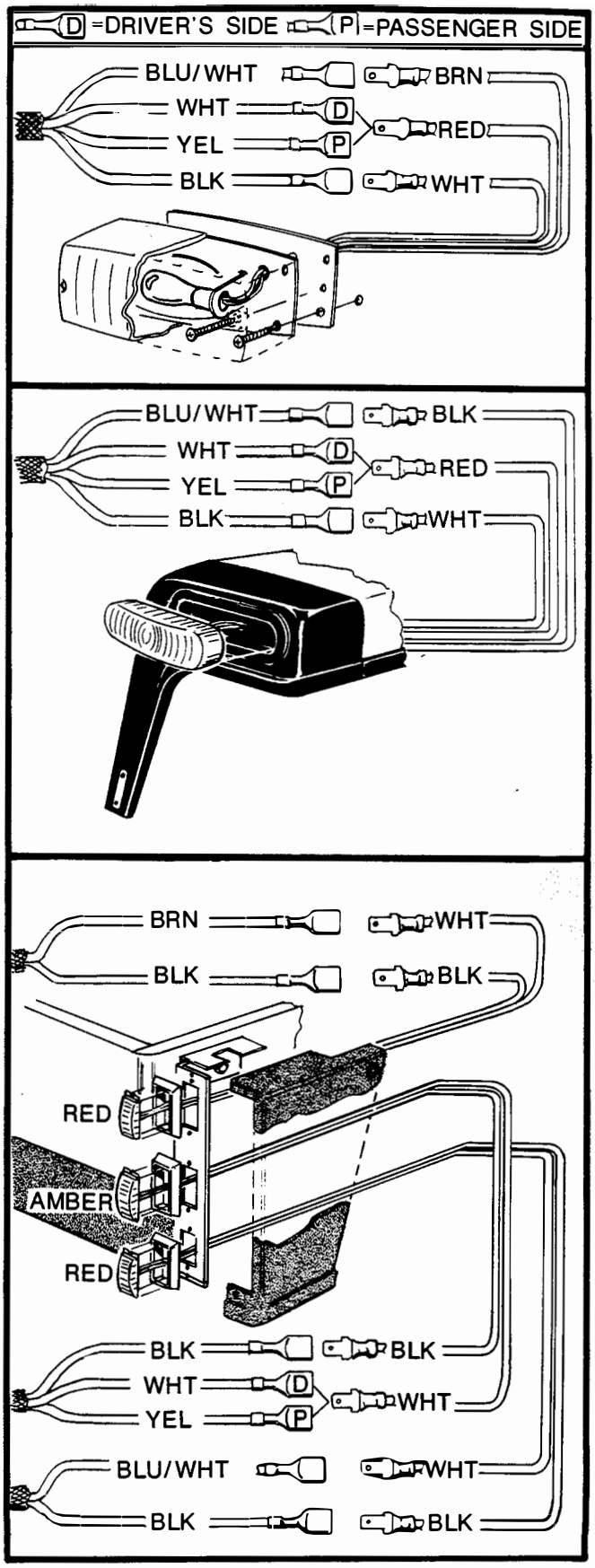



FIG. K-20 HEADLIGHT INSTALLATION WITH TURNSIGNAL SWITCH




K-21 TAILLIGHT INSTALLATION WITH TURNSIGNAL SWITCH

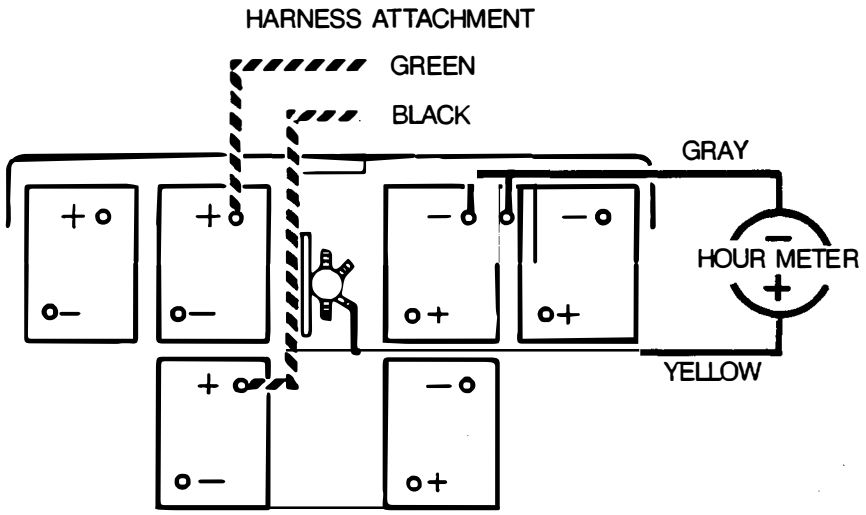



FIG. K-22 HOUR METER CIRCUIT

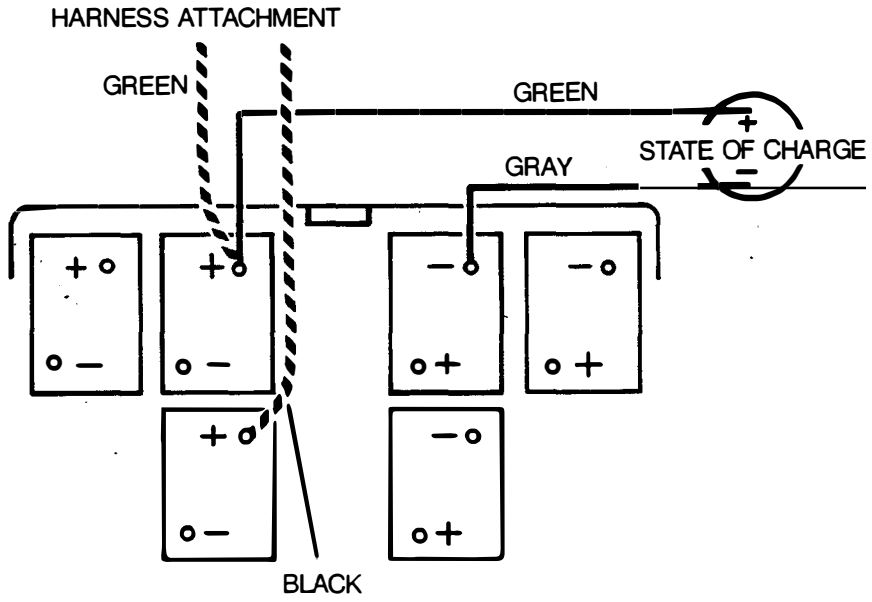



FIG. K-23 STATE OF CHARGE METER CIRCUIT

## MOTOR REMOVAL AND DISSASSEMBLY (FIG. L-1 AND L-2)

**Tools Required:**

- 1/2" Box Wrench Quantity 1

**WARNING: REMOVE BATTERY (+) CONNECTION BEFORE PROCEEDING (SEE SAFETY PROCEDURES IN SECTION B). SHORTING OF MOTOR WIRES COULD RESULT IN AN EXPLOSION.**

Remove all wires from motor (Fig. L-1). Mark the motor/axle housing at one of the bolts to ensure correct alignment when re-installing the motor (Fig. L-1). Remove the 3 bolts and washers that secure the motor to the axle housing (Fig. L-1). Slide the motor out from the axle housing (Fig. L-1).

**CAUTION:** CARE MUST BE TAKEN IN HANDLING MOTOR TO PREVENT DAMAGE TO AXLE AND MOTOR SPLINES.

Loosen the nuts (1) that attach the terminals S1 and S2. Remove the two clamp bolts (2) that secure the commutator end shield (3) to the motor frame (4).
Slide the commutator end shield (3) and the armature (5) out of the motor frame. Remove the brushes (6) (See Brush Spring Measurement). Reassemble in reverse order of disassembly and tighten end shield hardware to 100-120 in. lb. torque.

## ELECTRIC MOTOR REPAIR (FIG. L-2)

**Tools Required:**

- Gauge assembly Quantity 1
  E-Z-GO P/N A-172190G1
- Ohm meter Quantity 1

**Major** motor repair should **not** be attempted by nonspecialized staff. There are some maintenance and repair procedures that do not require specialized tools or knowledge that may be attempted. Replacement of brushes and field coils may be attempted; however, major repairs, such as armature turning or bearing replacement, should only be attempted by a qualified motor technician.

## VOLTAGE AND RESISTANCE MEASUREMENT

The following tests may be performed with an ohm meter or test light.

**WARNING: REMOVE BATTERY (+) CONNECTIONS BEFORE CONTINUING WITH THIS TEST. SHORTING OF MOTOR WIRES COULD RESULT IN AN EXPLOSION.**

Remove wires from motor terminals A1 and S2. Set the ohm meter to the RX1 scale. Using the ohm meter, place probes on motor terminals S1 and S2. A meter reading of "0" indicates a satisfactory condition at the field coils. No needle deflection indicates an "open" condition that will require the motor to be repaired or replaced.

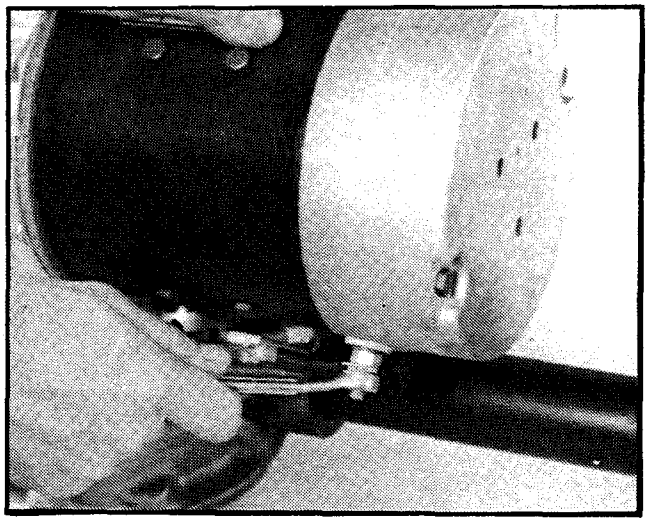
Place the probes on motor terminals A1 and A2. A meter reading of "0" indicates a satisfactory condition at the brushes and rigging. No needle deflection indicates a condition that will require the motor to be repaired or replaced.,

Check for continuity between each of the motor terminals and the motor shell. Continuity between terminals S1 and S2 to the motor shell indicates a short circuit between the field coils and the case. Continuity between terminals A1 or A2 to the motor shell indicates a short circuit in the armature. Both of the preceding conditions will require the motor to be repaired and replaced.

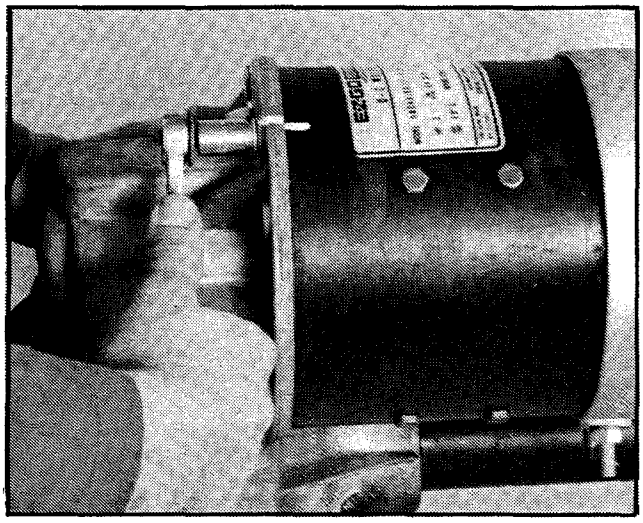
Retighten all motor terminal connections to 35-40 in. lbs. torque.

1. A. Routine Examination and Brush Replacement (Fig. L-3).

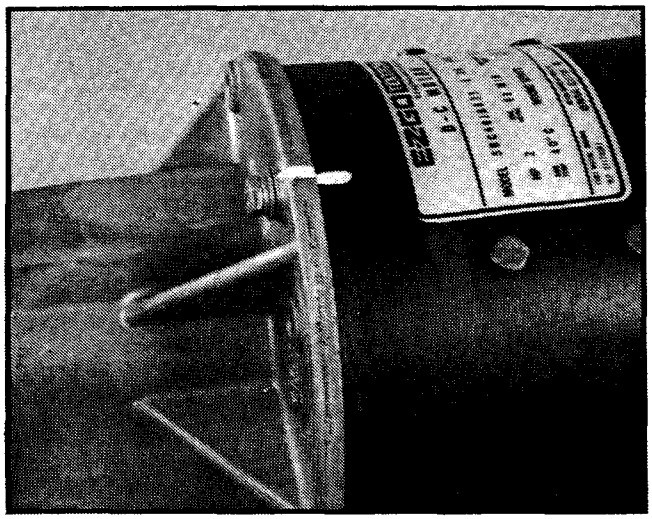
   1. The motor is totally enclosed and brush wear is determined by use of an E-Z-GO gauge inserted in a hole in the endshield as shown.



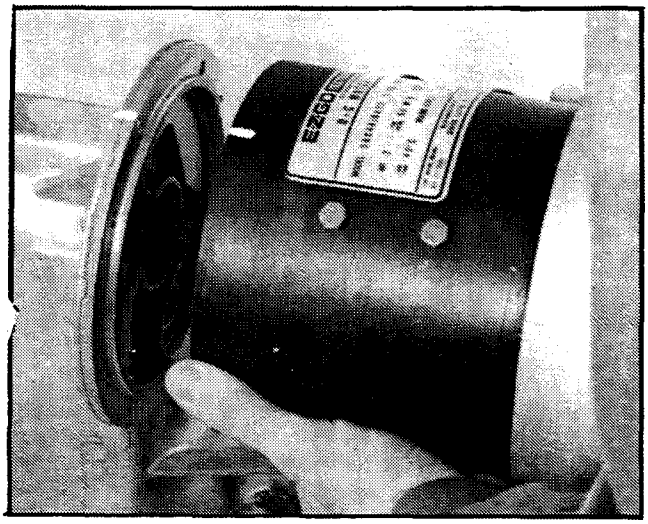
REMOVE ALL WIRES



REMOVE BOLTS/WASHERS



MARK MOTOR/AXLE HOUSING



SLIDE MOTOR OUT

FIG. L-1 MOTOR REMOVAL

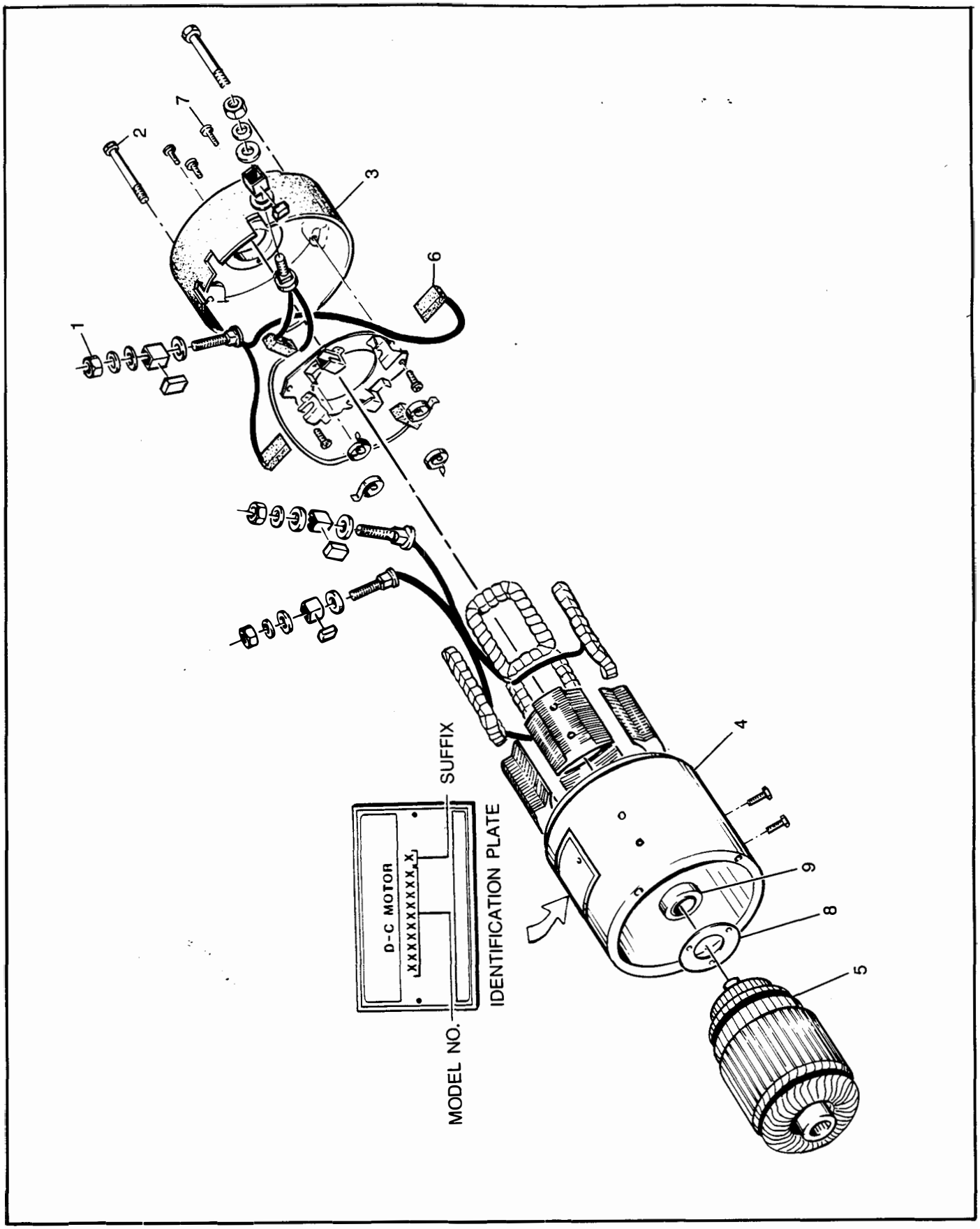
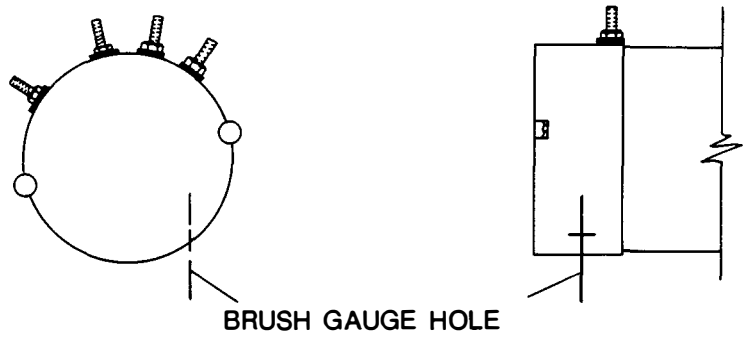



FIG L-2 ELECTRIC MOTOR



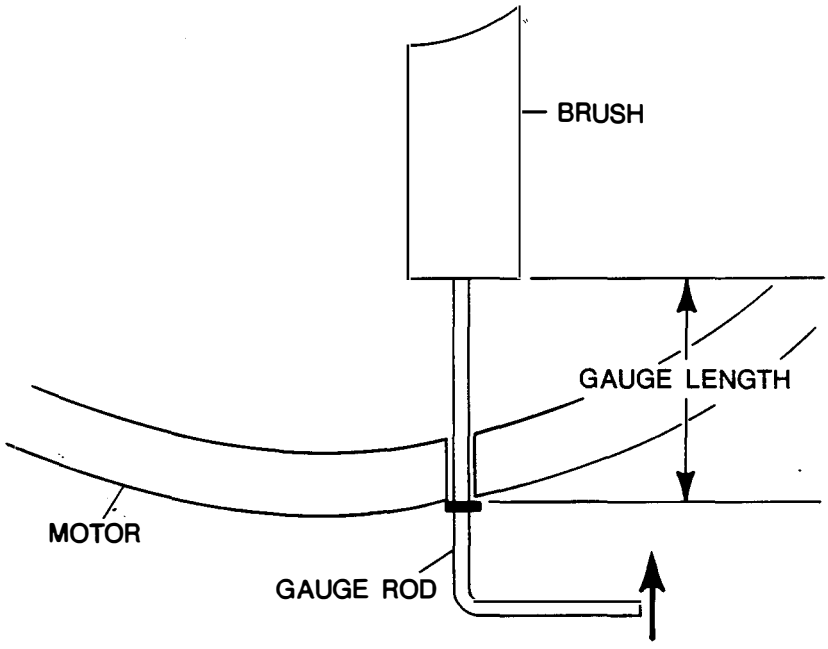




FIG. L-3 BRUSH WEAR MEASUREMENT

**NOTE:** With new brushes, the gauge rod can be inserted approximately .78" into brush measurement holes. Brushes should be replaced when rod can be inserted 1.56" into hole. This leaves approximately 1/8" allowable wear remaining.

a. If brush is worn to a condition requiring replacement, the motor must be disassembled. See Disassembly Par. II.

b. Check each brush for free movement in its holder and examine it for wear and general condition. If brush is broken, cracked, severely chipped, or worn to a length of less than 5/8 inch measured on the short side of the brush, replace it (Fig. L-4). Whenever any brushes are replaced, it is good practice to replace all of them. Keep extra brushes on hand.

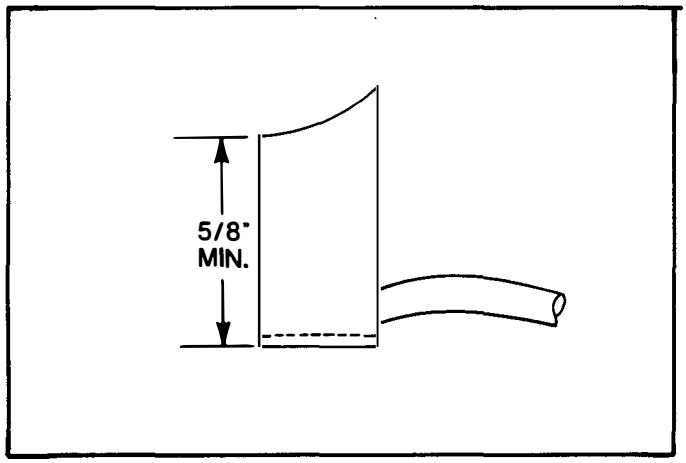



**FIG. L-4 MINIMUM BRUSH LENGTH**

c. Examine the condition of the brush springs. Make sure the spring coils are uniform and the springs do not appear discolored which could indicate heating that has caused loss of spring quality. If these or other signs of spring damage are evident, replace the spring or use a small spring scale to see if the spring requires one pound or more force to lift it at the point of contact with the worn brush.

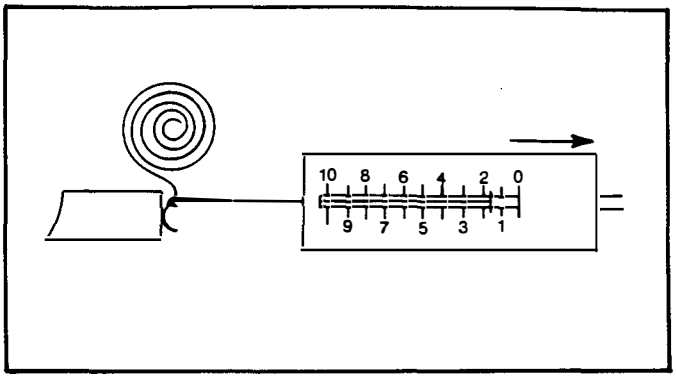



**FIG. L-5 BRUSH SPRING TENSION**

d. Observe the condition of the commutator and the armature coils which may be visible. Refer to Section III for details to look for during this inspection.

II. Disassembly (after removal from rear axle assembly).

A. Smooth away any signs of roughness or burrs from the shaft.

B. Mark the exact relationship between the motor housing and endshield by marking with a chisel or marker (Fig. L-1.

C. Remove the clamp screws at the commutator end of the motor which hold the close fit rabbeted endshield to the motor housing.

D. If upon inspection, the armature or field coils appear oily, a faulty oil seal or 'O' ring in the rear axle is suspect, allowing the rear axle lubricant to pass into the motor. Oil on a commutator will cause sparking, resulting in both rapid commutator and brush wear.

To replace seals (Fig. L-2).

Dissassemble the motor (See Motor Removal and Dissassembly). Clean armature and/or field coils by wiping with a clean cloth and contact cleaner or alcohol.

Remove the three screws (7) that retain the bearing retainer (8). Remove the bearing retainer and inspect the bearing (9) for wear or damage.

Lightly lubricate the bearing with motor oil and press into place. Reinstall bearing retainer. Reinstall retaining screws and "snug" into place.

E. Remove the motor housing assembly. When necessary, the field coils can be removed by removing the terminal screws, nuts, and the pole piece screws from the motor housing.

F. Remove the armature.

G. When necessary, the commutator endshield may be further disassembled to change brushes, brush rigging, and crossover leads by removing the appropriate and obvious screws. This should be done if the brush holders or insulation plate appear burned, warped or have loosened rivets.

III. Inspection of Armature

**NOTE:** Replacement is suggested as the best means for maintaining the integrity of these heavy duty motors.

A. If deep burned sections are evident on the commutator bars, this is a symptom of an open circuit in the armature winding. If such evidence is noted, measure the armature resistance by selecting at random any two bars of the commutator with a bar span given in the Motor Reference Data. If this measurement does not meet the value given, the armature should not be used.

**NOTE:** This condition could be caused by an undetected fault of manufacture appearing early in normal field service conditions, or it could be caused by overloading of the motor causing high temperature failure of connections. The resulting high resistance in a joint could cause this symptom appearance. Evidence of general overheating accompanying flat spots would tend to indicate overworking of the motor.

B. If one or more armature conductors are abnormally black or appear burned compared with the other armature conductors, this is an indication of shorted armature winding. If such evidence is detected, a dirty armature should first be blown off to clean it and then checked with a growler. If the short circuit is not confirmed by this indication, check resistances and apply a high potential test not exceeding 600 volts AC for 1 minute. If the armature does not pass these tests, it should not be used.

HIGH POTENTIAL LAMP TEST armature and field. Construct a test fixture as per figure (Fig. L-6).

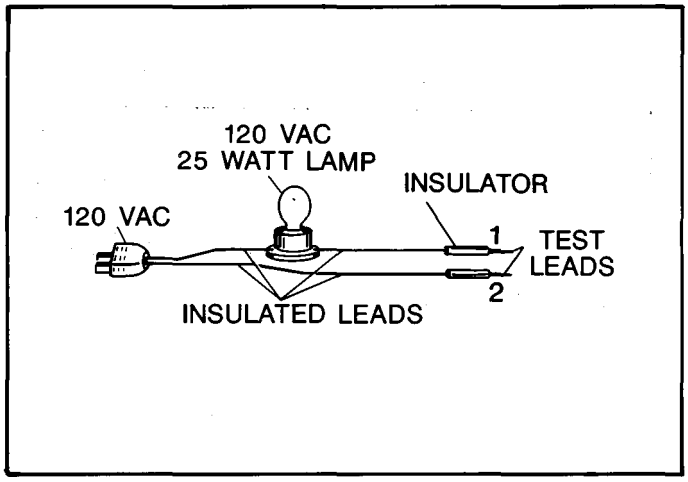



**FIG. L-6 HIGH POTENTIAL LAMP TEST FIXTURE**

**WARNING: TEST FIXTURE TO BE CONSTRUCTED AND OPERATED BY QUALIFIED ELECTRICAL SERVICE PERSONNEL. SEVERE ELECTRICAL SHOCK OR ELECTROCUTION MAY RESULT.**

## I. ARMATURE/COMMUTATOR

### A. Grounded Commutator Segment to Armature Test.

1. Attach test lamp lead #1 to armature shaft.
2. Touch test lamp lead #2 to each segment of the commutator.
3. If test lamp illuminates, a short is present between armature shaft and the commutator segment.
4. If test lamp does not illuminate, the test is satisfactory.

### B. Open Commutator Segments

1. Touch test lamp leads 1 and 2 between opposite segments of the commutator.
2. If test lamp illuminates, the segment is satisfactory.
3. If test lamp does not illuminate, the segment is open.

### C. Shorted Commutator Segments

1. Touch test lamp lead #1 to A segment.
2. Touch test lamp lead #2 to each segment in turn.
3. If test lamp lights at other than the opposite segment of commutator, the commutator winding is shorted.

## II. FIELD COILS

### A. Grounded Field Coils Test

1. Attach test lamp lead #1 to motor housing.
2. Touch test lamp lead #2 to Terminals S1 and S2 on housing.
3. Test lamp should not illuminate. If test lamp illuminates, the field coils are shorted to motor housing.

### B. Open Field Coil Test

1. Attach test lamp lead #1 to Terminal
2. Attach test lamp lead #2 to Terminal
3. Test lamp should illuminate. If test lamp does not illuminate the field coils are open.

## III. TESTS TO BE COMPLETED AFTER MOTOR REPAIR AND BEFORE INSTALLATION IN VEHICLE. (MOTOR REASSEMBLED)

### A. Armature To Field Coil Short

1. Attach test lead #1 to Terminal A1.
2. Attach test lead #2 to Terminal F1.
3. Test lamp should not illuminate. If test lamp illuminates, motor should be disassembled to locate source of problem.

### B. Armature To Motor Case Short

1. Attach test lamp #1 to motor case.
2. Attach test lamp #2 to Terminal A1, then A2.
3. Test lamp should not illuminate. If test lamp illuminates the motor should be disassembled to locate source of problem.

### C. Field Coil To Case Test

1. Follow instructions as in II Field Coils.
   a. Grounded field coil test, Sections 1, 2 and 3.

**NOTE:** Short circuited coils can be caused by several things, as well as an undetected manufacturing fault which most likely would show up early in normal service.

A. If a generally heat discolored appearance uniformly over the commutator or windings is observed, it is usually a sign of overloading of the vehicle or motor. This should be corrected or the symptoms will be repetitive and motors will be burned out frequently.

B. Bubbled insulation and individual brush burn marks on the commutator is a typical example of a motor armature which has been loaded to stall with power applied. It overheated and its elements boiled to failure.

C. Commutator Inspection and Care

**NOTE:** The following operations should only be performed by an experienced and competent electric motor shop.

1. Inspect the commutator during each brush inspection.

2. Commutator bars should not be pitted, burned or grooved in the brush track. If found in this condition, the surface should be refinished in a lathe, limiting the depth of cut to .005 inch or less on a side and repeat until smooth.

   Before a final cut, the mica insulation between commutator bars should be undercut, .032 inch and no mica slivers should be left along the side of the bars above the undercut.

   Next, dynamic balance the armature to within .0015 inch amplitude at 3000 RPM. After this, the final finish cut should be made with a diamond tool to obtain a surface finish of 8 to 16 micro inch. The armature should not be put back in service with a diameter of less than 2.625 inches.

3. After refinishing a commutator, check it for eccentricity. It should not exceed .001 inch total indicator reading for the entire diameter and with a .0002 inch maximum bar-to-bar difference.

## IV. INSPECTION OF FIELD WINDINGS

If, upon inspection, the insulation on the field coils appears blackened or charred, the serviceability of the coils is questionable. Burned or scorched coil insulation is a symptom of coil overheating due to overloads, grounded, or short circuited winding.

To check the windings electrically for grounds or open circuits, a continuity tester, ground tester, and ohm meter are required.

To check for a grounded field connect the tester between terminal studs S1 to ground and S2 to ground.

To check for an open or shorted winding: Connect the ohm meter between S2 and S1. The resistance should conform to the value in the Motor Reference Data.

## V. BEARING INSPECTION AND CARE

A. The bearing is prelubricated with Chevron SRI-2 high temperature grease or equivalent, sufficient for the life of the bearing.

**NOTE:** Do not use silicone grease in a DC motor.

B. Check the bearing by turning it with your fingers. Feel for bindings or gritty effects and for excessive looseness or wobble. If any defect is apparent or if there is any doubt at all as to serviceability of the bearing, replace it with a new one.

C. Remove the old bearing by using a suitable bearing puller. Press new bearing into place by means of an arbor press that exerts pressure on the inner ring.

**CAUTION:** DO NOT USE A HAMMER FOR BEARING REPLACEMENT. IT WILL DAMAGE THE BEARING.

## VI. REASSEMBLY

A. Install the bearing and retainer in the endshield.

B. Set commutator endshield in place on bench with the brush rigging facing upward. Push each brush back up into brush holder until its end would permit commutator to pass under without hitting. Adjust end of spring so that it is against side of brush and holds brush in "cocked" position.

C. Set armature into place in the endshield.

D. Push on end of each brush to release onto the commutator. Observe that all brushes seat on commutator properly and that end of springs ride on brush tops in line with brush holder grooves. Make sure that the brush spring will travel down the holder slot as the brush wears.

E. Position the motor housing over the armature and position it exactly with mark on endshield. Gently seat on rabbet.

F. Gently fit the motor over the rear axle input spline. Line up marks and secure the motor to the rear axle with existing hardware.

G. Be sure the endshield is a snug fit in the stator rabbet, then replace the clamp screws. Check to determine that armature is free to turn. If it will not turn, check the assembly.

H. Make a high potential test (up to a maximum of 600 volts AC for 1 minute) to assure motor has been properly reassembled.

## VII. PARTS IDENTIFICATION

A. The motor model number identifies completely every part of the motor.

B. Always describe the particular part and reference the motor model number.

| MOTOR REFERENCE DATA | |
|---|---|
| Horsepower - 60 min. | 2 |
| Speed in RPM (nominal) | 2800 |
| Volts DC | 36 |
| Amperes at Full Load (Nominal) | 55 |
| Winding | Series |
| Enclosure | Totally Enclosed |

**FIG. L-8 MOTOR REFERENCE DATA**

## GENERAL

The vehicle's rear axle is a high efficiency unit featuring low friction helical cut gears. The vehicle is equipped with expanding shoe drum brakes on the rear wheels. Brake service instructions are covered in the Brake Section of this manual.

### Differential Lubrication

The lubricant level should be checked at intervals specified in the Periodic Service Schedule. With the vehicle on a level surface, the minimum lubricant level should be checked using the dip stick provided. If the lubricant is low, make reference to the periodic service schedule and specifications for recommended lubricant.

**NOTE:** 8-10 oz. lubricant present in axle when lubricant is in the satisfactory range.

The axle shaft wheel bearings are factory lubricated and sealed and do NOT receive any lubrication from the rear axle.

### Axle Adjustments

The helical axle has no adjustments or shims; therefore, no dissassembly is required except to replace worn or defective components caused by conditions beyond normal control.

## REMOVING REAR AXLE ASSEMBLY FROM VEHICLE (Fig. M-1)

**Tools Required:**

| | |
|---|---|
| - Pliers, Needle Nose | Quantity 1 |
| - 1/2" Open End Wrench | Quantity 1 |
| - 9/16" Open End Wrench | Quantity 1 |
| - Jack Stands | Quantity 2 |
| - Trolley Jack | Quantity 1 |

Disconnect the batteries (see procedures in Section B). Remove the wiring from the motor (See Motor Removal and Disassembly).

Loosen both rear wheel and tire assemblies by loosening the lug nuts approximately one turn. Raise the vehicle (see procedure in Section B). Remove the rear wheel and tire assemblies. Place the jack under the center of the rear bumper and elevate until the rear axle is clear of the jack stands. Remove the jack stands and relocate them under the outboard ends of the rear bumper. Lower the vehicle onto the jack stands that are adjusted such that the rear axle assembly is as low as possible but still remains clear of the shop floor.

**WARNING: BEFORE PROCEEDING, BE SURE THAT THE VEHICLE IS SECURELY SUPPORTED ON THE JACK STANDS.**

Remove the trunk lid (see Body and Trim Section) to gain access to the upper mounting hardware of the rear shock absorbers. (1) (2) (3) Remove the upper mounting hardware of the rear shock absorbers.

Disconnect the brake cables from their actuating levers.

**NOTE:** It is suggested that an additional person support the motor during the following procedure.

Use the jack to support the motor and axle assembly before removing the nuts (4) and washers (5) from the four "U" bolts (6).

**WARNING: DUE TO THE WEIGHT AND LOCATION OF THE MOTOR, CARE MUST BE TAKEN NOT TO ALLOW THE AXLE ASSEMBLY TO ROTATE OR FALL DURING THE FOLLOWING OPERATION.**

Slowly lower the jack and pull the complete motor and axle assembly through the vehicle's wheel well.

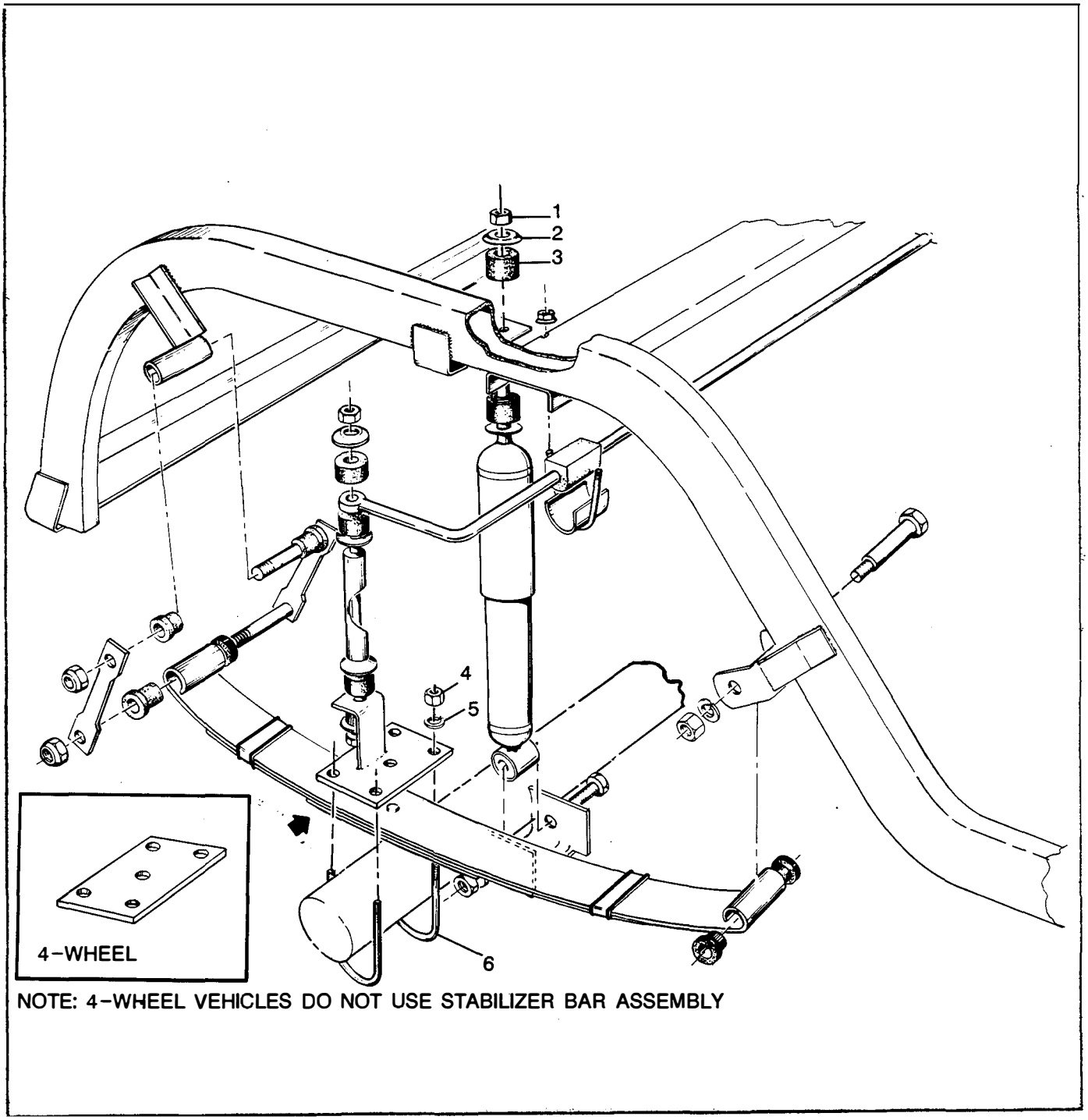
**WARNING: CARE MUST BE TAKEN TO PREVENT THE MOTOR AND AXLE ASSEMBLY FROM STRIKING THE VEHICLE OR THE JACK STANDS WHILE REMOVING IT FROM THE VEHICLE.**

Reassemble the motor and axle assembly using the reverse order of disassembly.

Tighten the nuts (4) fastening the "U" bolts (6) to 30-35 ft. lbs. torque. Tighten the nuts (1) retaining the shock absorber until the top rubber bushing (3) is compressed to the same diameter as the washer (2).

Tighten the nuts fastening the motor wire terminals to 35-40 in. lbs. torque.

**NOTE:** For motor removal, see Section L.




NOTE: 4-WHEEL VEHICLES DO NOT USE STABILIZER BAR ASSEMBLY

FIG. M-1 REAR SUSPENSION

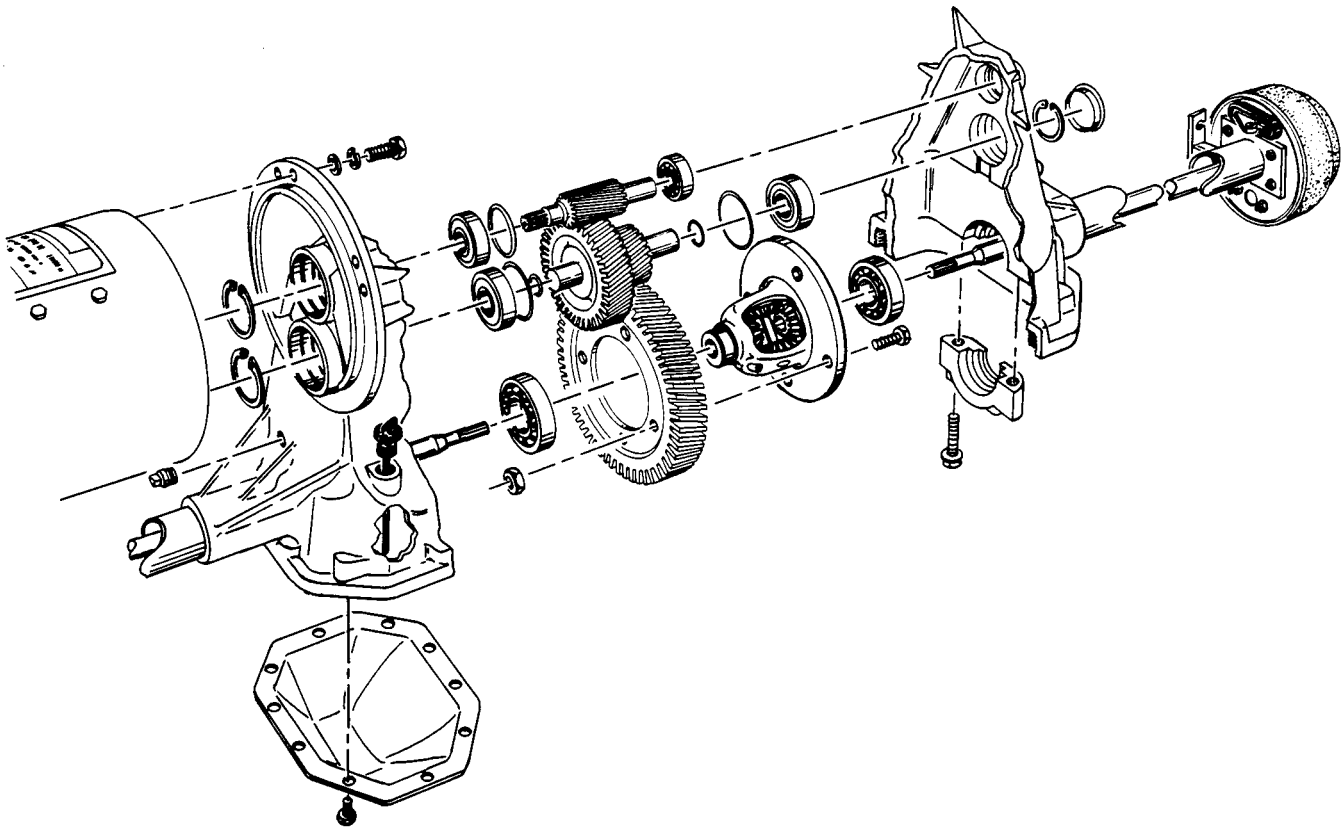


FIG. M-2 REAR AXLE

**Torque Requirements for Rear Axle Assembly**

| | |
|---|---|
| Cover Plate Screws | 18-23 Ft. Lbs. |
| Bearing Cap Screws | 35-45 Ft. Lbs. |
| Axle Nut | 70 Ft. Lbs. Min. |

**NOTE:** Removal of brake assemblies are not necessary for rear axle assembly repair.

**CAUTION:** HANDLE ALL GEARS WITH CARE TO PREVENT DAMAGE TO THE GEAR TEETH.

**Bearings**

**NOTE:** It is recommended that whenever bearings are removed, they (regardless of mileage) be replaced with new ones.

**Oil Seals, 'O'Rings**

Inspect for any signs of oil leakage past seals.

**NOTE:** It is recommended that when seals or 'O'rings are removed that they be replaced with new ones. Wipe seals and 'O'rings with motor oil before installation.

**Seal Surfaces**

Inspect the sealing surface for nicks or grooves. Replace damaged parts.

**Snap Rings**

**CAUTION:** WHEN INSTALLING AND REMOVING SNAP RINGS USE CARE NOT TO DAMAGE BEARING SEALS.

**BRAKE DRUM AND HUB DISASSEMBLY/ ASSEMBLY**

Loosen both rear wheel and tire assemblies by loosening the lug nuts approximately one turn. Raise the vehicle (see procedure in Section B). Remove the rear wheel and tire assemblies.

**NOTE:** The following procedures do not require disassembly or removal of the motor or rear axle assembly from the vehicle.

**Tools Required:**

- Needle Nose Pliers . . . . . Quantity 1
- 1 1/16" Hex Socket - 1/2" Drive . . . . . Quantity 1
- 1/2" Drive Pull Handle or Ratchet . . . . . Quantity 1

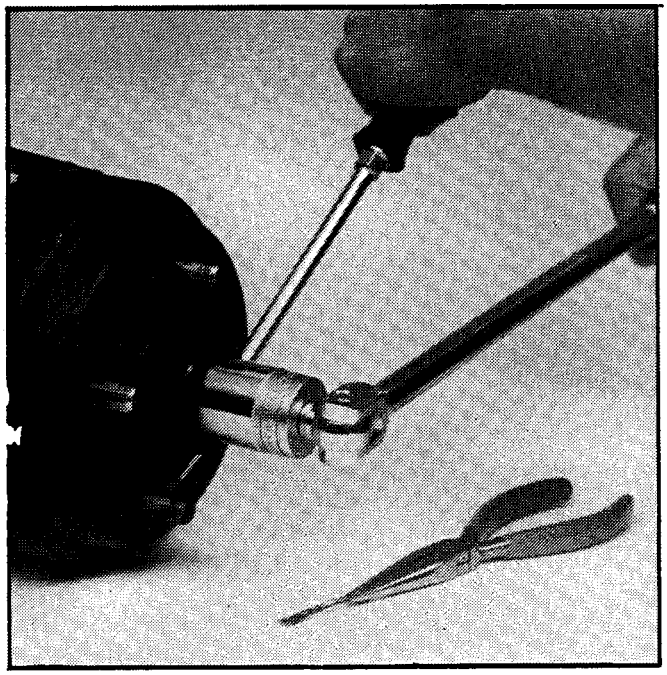


**FIG. M-3**

After removing wheel, remove cotter pin, axle nut and washer. Fig. M-3 and M-8.

Remove the brake drum hub and washer (1).

**AXLE SHAFT REMOVAL AND DISASSEMBLY**

- Arbor Press . . . . . Quantity 1
- Needle Nose Pliers . . . . Quantity 1
- Snap Ring Pliers (Internal). . Quantity 1
- Slide Hammer . . . . . Quantity 1

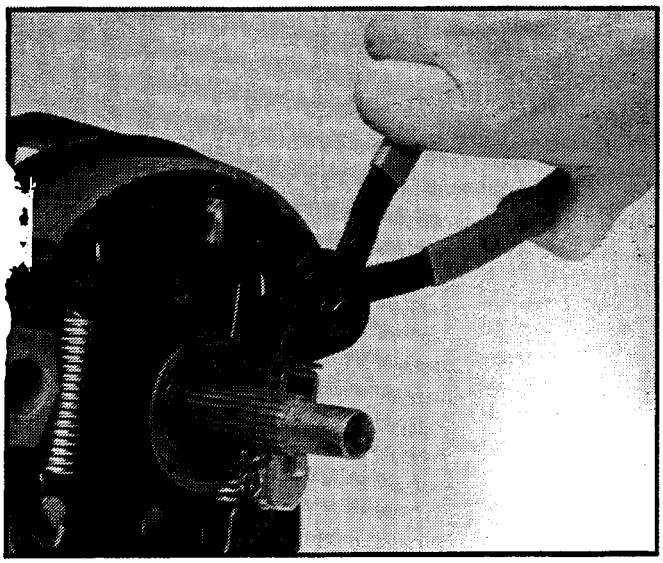


**Fig. M-4**

Remove the outer snap ring (2). Fig. M-4 and M-8.

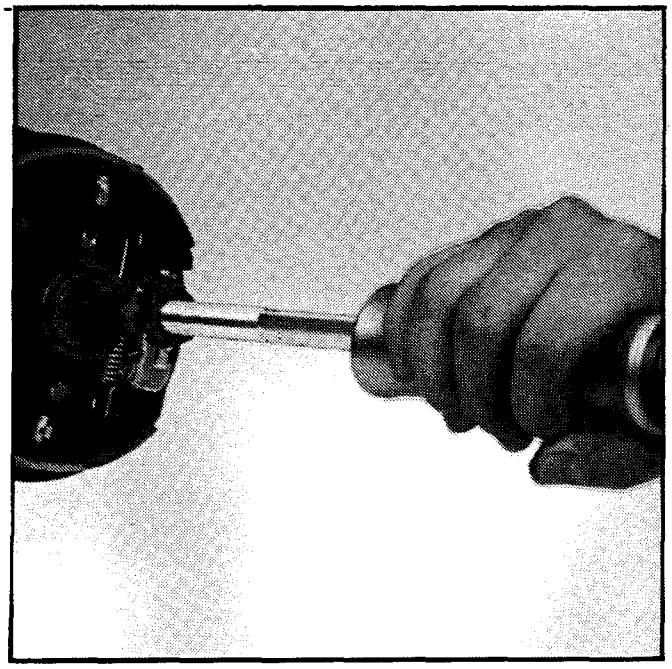


FIG. M-5

Attach slide hammer to the axle shaft thread and remove axle and bearing assembly. Fig. M-5.

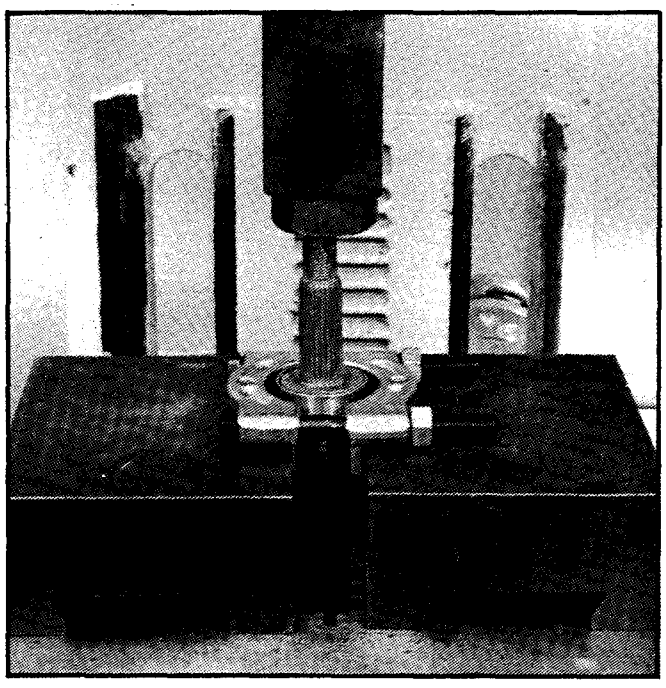


FIG. M-6

Bearing removal is accomplished by supporting bearing inner race on arbor press bed and applying pressure to threaded end of axle shaft. Fig. M-6.

## SHAFT SEAL REMOVAL AND REPLACEMENT

- Snap Ring Pliers (Internal). . Quantity 1
- Seal Puller . . . . . Quantity 1
- Seal Installation Tool . . . . Quantity 1 (E-Z-GO P/N 18739-G1)
- Ball Pein Hammer . . . . . Quantity 1

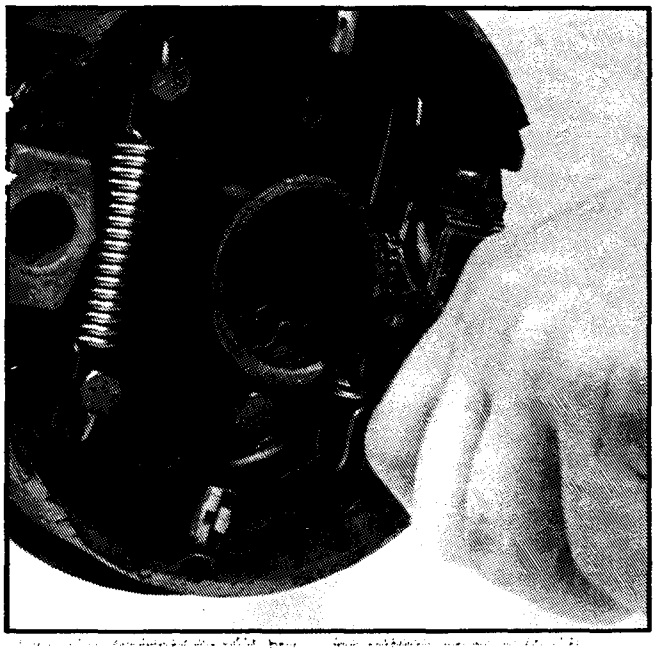


FIG. M-7

Remove the inner snap ring (3). Fig. M-7 and M-8.

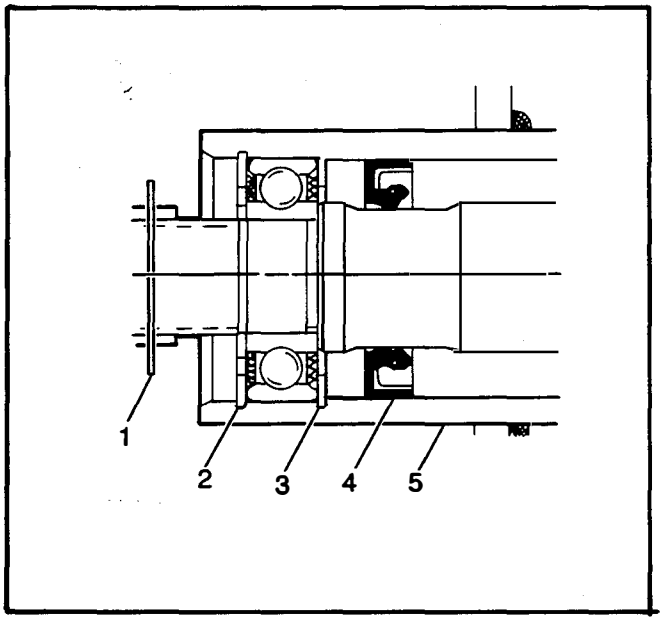



FIG. M-8

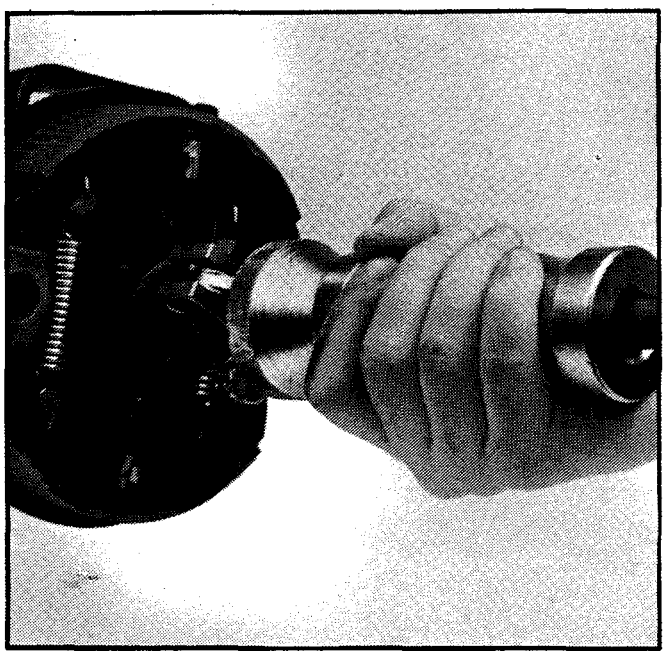


FIG. M-9

Use a puller to remove the seal (4). Fig. M-8 and M-9.

**CAUTION:** USE CARE TO PREVENT DAMAGE TO INNER SURFACE OF AXLE TUBE AT SEALING AREA. FIG. M-8.

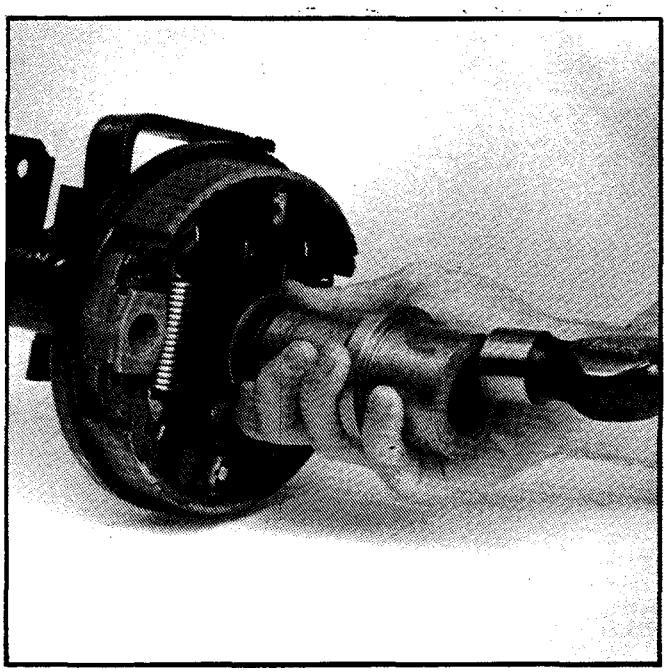


FIG. M-10

To install the seal a special tool (P/N 18739-G1) is used to drive the seal into its proper position. Fig. M-8, Fig. M-10.

Install the inner snap ring. Fig. M-7.

## AXLE SHAFT REPLACEMENT

Carefully insert axle shaft and bearing assembly through oil seal. Rotate shaft until spline engages with differential side gear. Install outer snap ring (2). Fig. M-7.

Coat spline of axle shaft with anti-seize compound. Install brake hub and drum, thrust washer, nut, and a new cotter pin.

**NOTE:** Tighten axle nut to 70 ft. lbs. torque minimum. Increase torque as required to align slot in nut with cotter pin hole.

## DIFFERENTIAL REMOVAL

**Tools Required:**

- 1/2" Drive Ratchet . . . . . Quantity 1
- Putty Knife . . . . . Quantity 1
- 1/2" Hex Socket . . . . . Quantity
- Permatex Sealent . . . . . Quantity 1
- Drain Pan . . . . . Quantity 1

**CAUTION:** CARE MUST BE TAKEN IN HANDLING GEARS TO PREVENT DAMAGE TO GEAR TEETH.

**CAUTION:** TO PREVENT CONTAMINATION THE FOLLOWING OPERATIONS SHOULD BE PERFORMED IN A CLEAN ENVIRONMENT.

Remove the left and right axle assemblies. (See relevent instructions located elsewhere in this section).

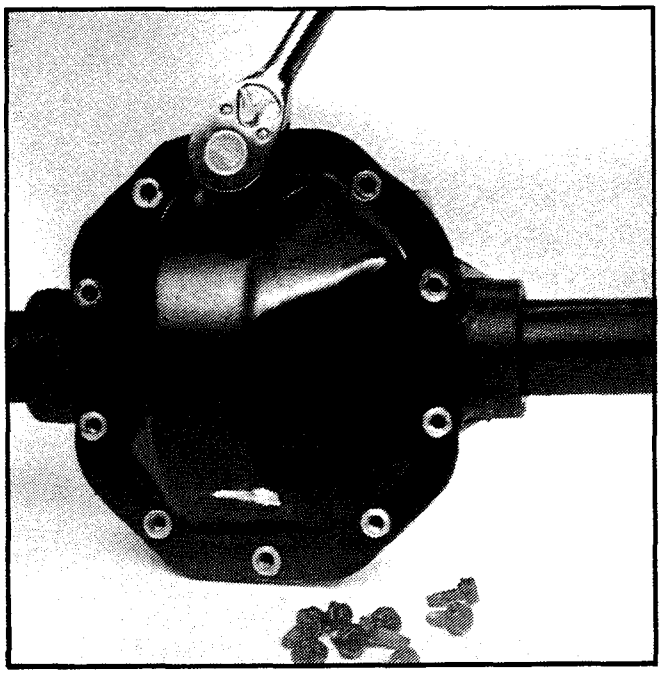


FIG. M-11

Remove the ten cover plate bolts and remove the cover plate. Fig. M-11.

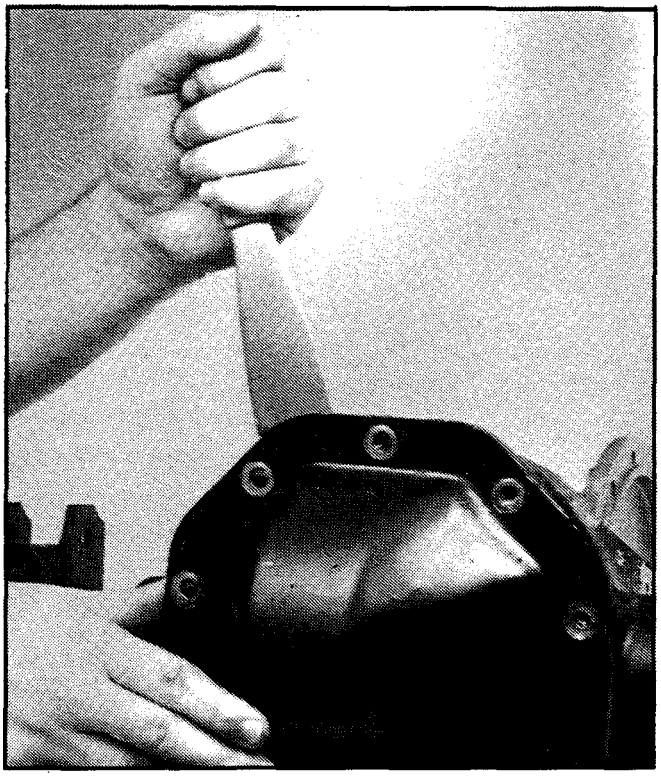


FIG. M-12

A putty knife may be required to separate the cover plate from the housing. Fig. M-12. Sealent should be removed from the cover plate and the housing sealing surfaces.

**CAUTION:** USE CARE TO PREVENT DAMAGE TO THE SEALING SURFACES.

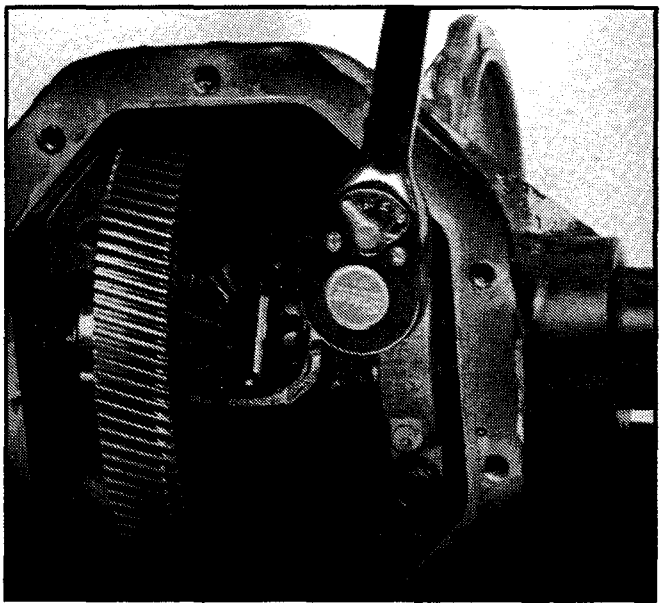


FIG. M-13

Bearing caps are marked for identification. When reassembling, they must be installed in their original position. Remove the four bearing cap screws and remove the caps. Fig. M-13.

**CAUTION:** AVOID DAMAGING THE MACHINED SURFACES OF THE CAPS.

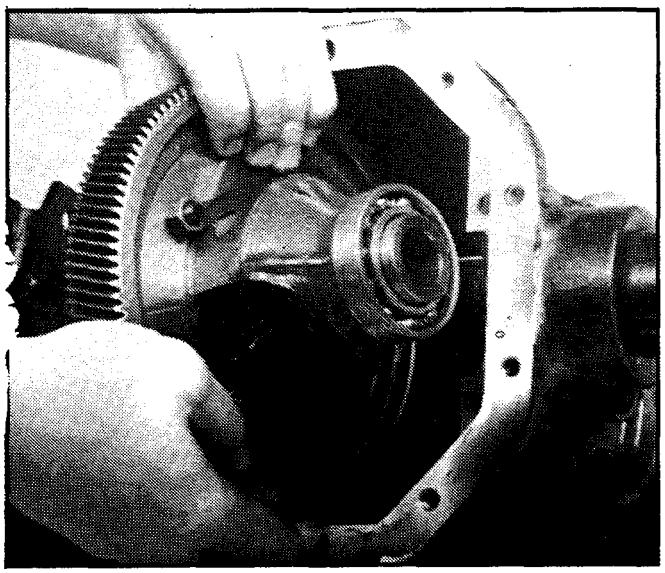


FIG. M-14

Lift the differential case from the housing. Fig. M-14.

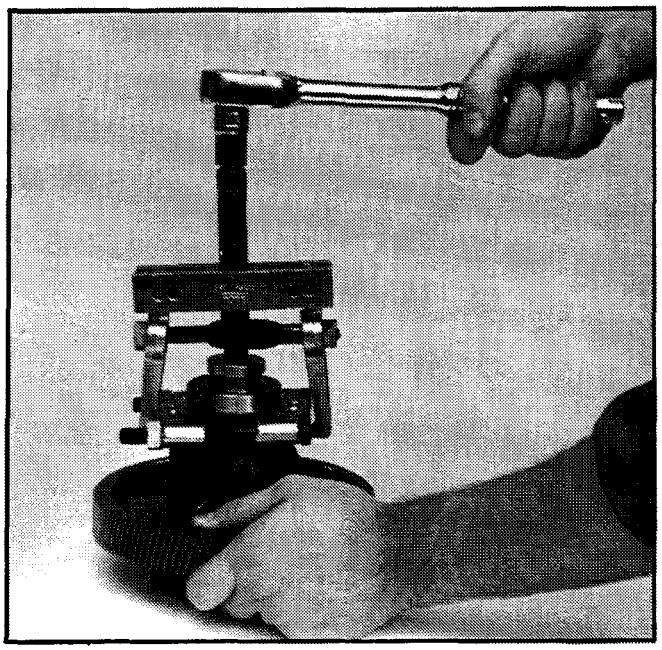


FIG. M-15

Do not remove the bearing from the differential case unless a bearing failure is evident. If bearings are damaged, remove them with a bearing puller and replace with new bearings. Fig. M-15.

Installation is in reverse order of removal. Permatex is required as a sealent between the cover plate and housing.

## INTERMEDIATE GEAR REMOVAL

**Tools Required:**

- Snap Ring Pliers (Internal) . . Quantity 1
- Brass Drift . . . . . Quantity 1
- Bearing Puller . . . . . Quantity 1 (Innner Diameter)
- Bearing Puller (Jaw Type) . . Quantity 1

**CAUTION:** CARE MUST BE TAKEN IN HANDLING GEARS TO PREVENT DAMAGE TO GEAR TEETH.

FIG. M-16

Remove the plastic dust cover. Fig. M-16.

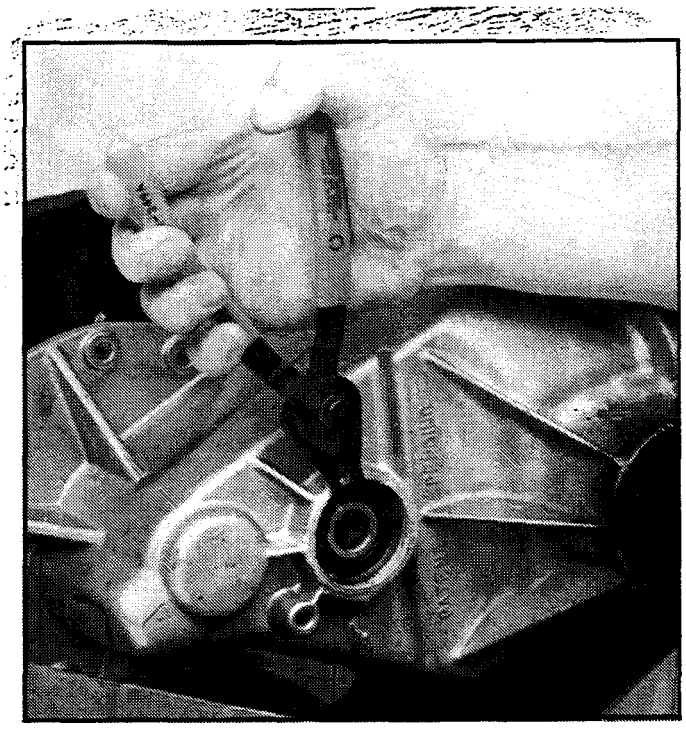


FIG. M-17

Remove the snap ring from each side of the housing. Fig. M-17.

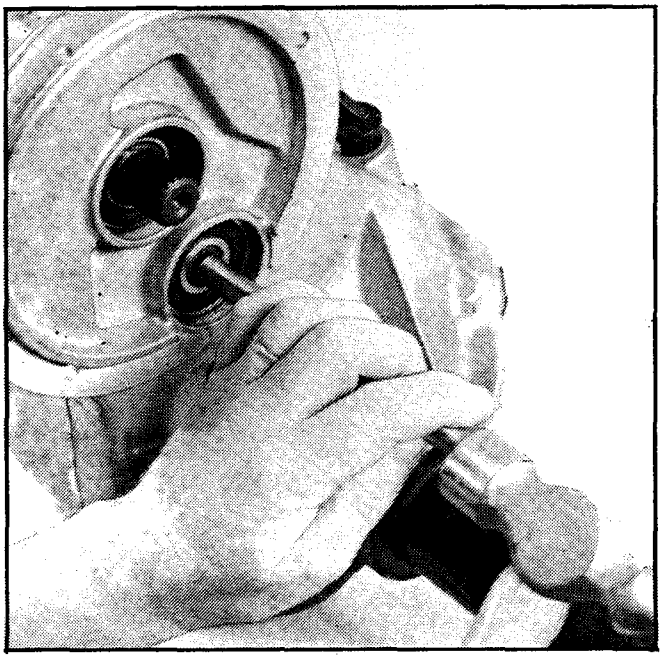


FIG. M-18

Use a brass drift to drive the intermediate gear away from the flanged side of the axle housing. Fig. M-18.

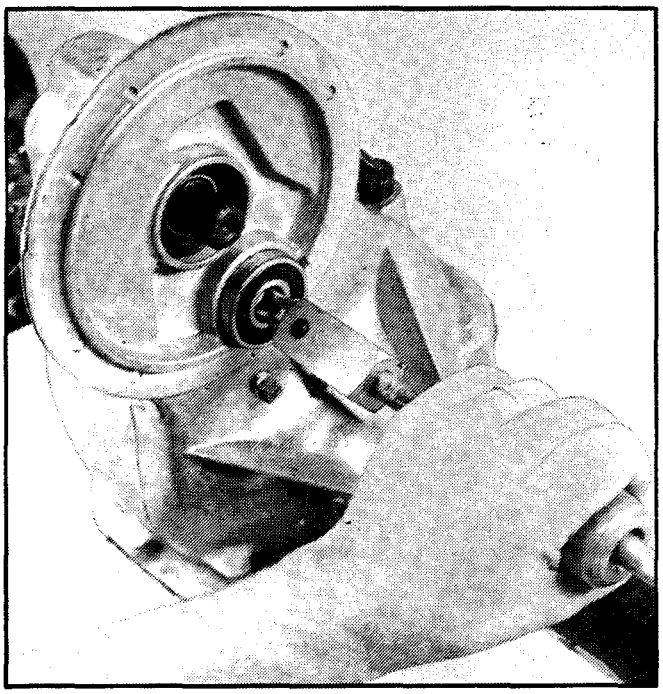


FIG. M-19

Use an inner diameter bearing puller attached to a slide hammer to remove the bearing from the flanged side of the housing. Fig. M-19.

**NOTE:** If the bearing does not remain in the housing bore, it may be separated from the gear using two wooden wedges . Fig. M-20.

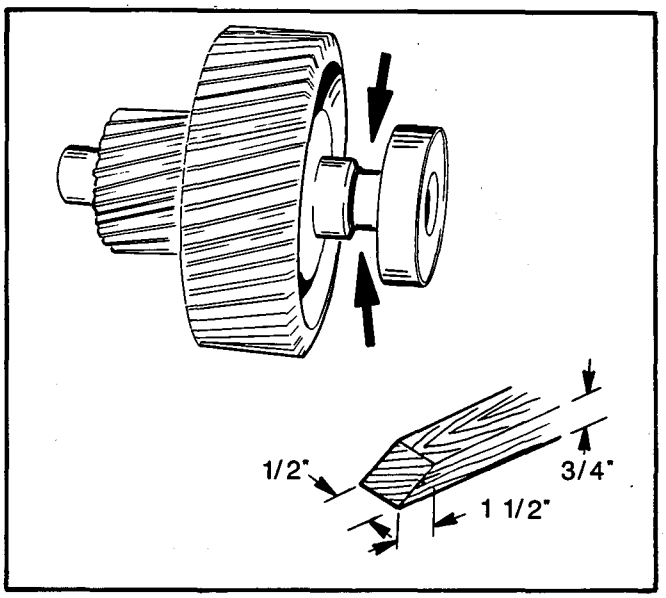



FIG. M-20

Remove the bearing opposite the flanged side of the housing by driving the intermediate gear and bearing towards the non-flanged side of the housing until the bearing is fully exposed.

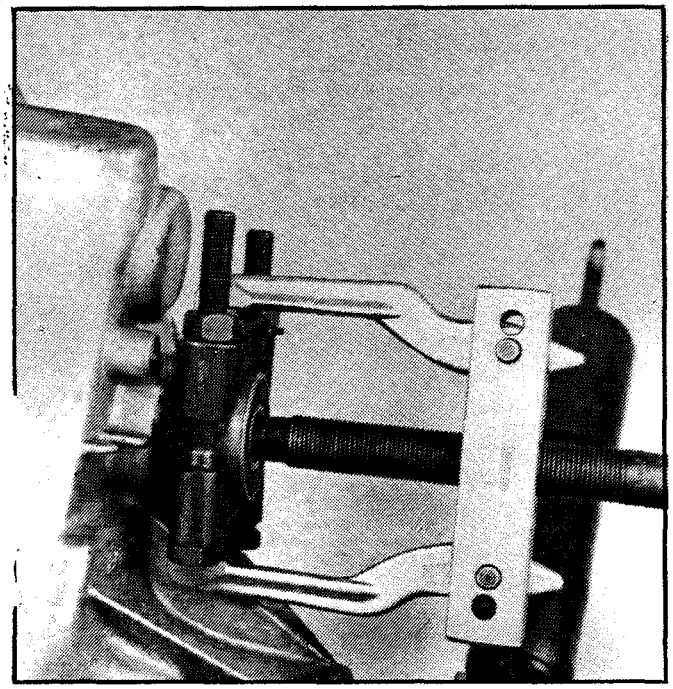


FIG. M-21

Use a bearing puller to remove the bearing from the intermediate gear. Fig. M-21

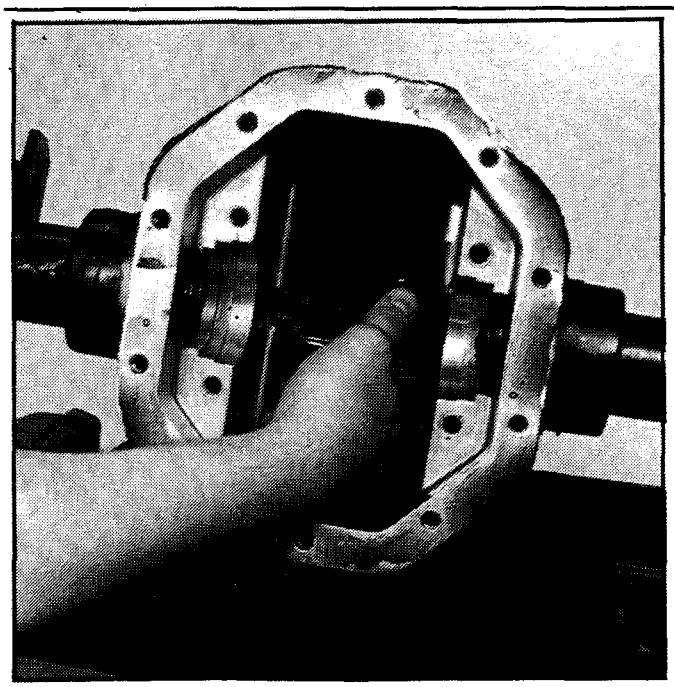


FIG. M-22

Tilt the small diameter end of the intermediate gear towards the opening in the bottom of the housing and remove. Fig. M-22.

Remove old 'O'rings and replace with new ones.

## INTERMEDIATE GEAR INSTALLATION

Install new 'O'rings on each end of the intermediate gear shaft. Place the intermediate gear into position within the housing. Push the bearings onto the intermediate gear shaft ends. Press the bearings fully onto the shoulders of the shaft to assure a correct fit. Install the outer snap rings and install the plastic dust cover.

## INPUT GEAR REMOVAL

- Snap Ring Pliers (Internal) . . Quantity 1
- Slide Hammer . . . . . Quantity 1
- Arbor Press . . . . . Quantity 1

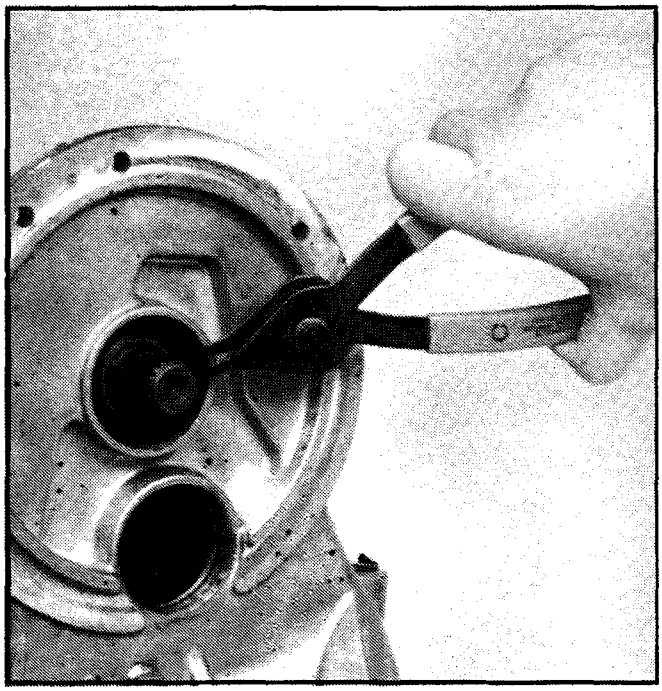


FIG. M-23

Remove the snap ring. Fig. M-23.

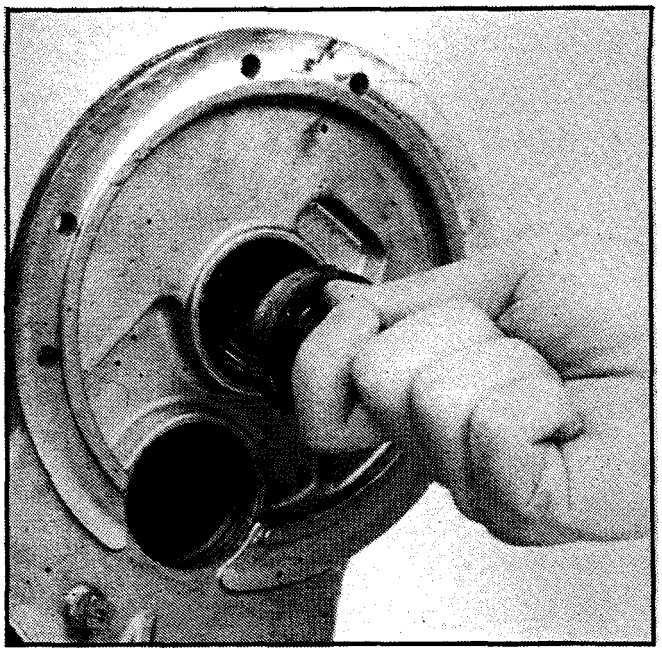


FIG. M-24

Pull the input gear from the axle housing.

**NOTE:** The gear and bearings should slide out of the housing easily. If undue resistance is encountered, a slide hammer may be required to remove the assembly.

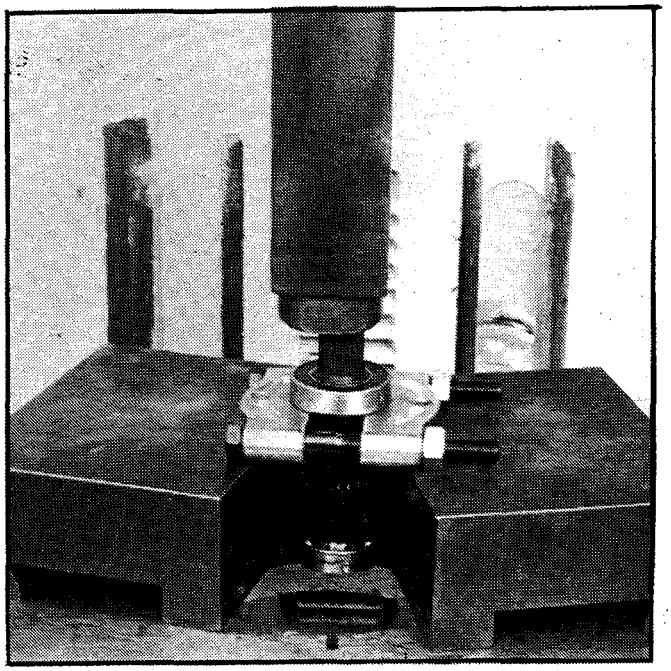


FIG. M-25

To remove the bearings from the input gear shaft, support the bearing outer face on an arbor press and apply pressure to end of the gear shaft. Fig. M-25.

## DIFFERENTIAL DISASSEMBLY

**Tools Required:**

- 9/16" Closed End Wrench . . . Quantity 1
- 9/16 Hex Socket 1/2" Drive Quantity 1
- 1/2" Drive Pull Handle . . . Quantity 1
  Ratchet
- Plastic Tipped Hammer . . . Quantity 1
- Ball Pein Hammer . . . . . Quantity 1
- Punch . . . . . Quantity 1

**CAUTION:** CARE MUST BE TAKEN IN HANDLING GEARS TO PREVENT DAMAGE TO GEAR TEETH.

Remove the differential from its housing. (See differential removal section)

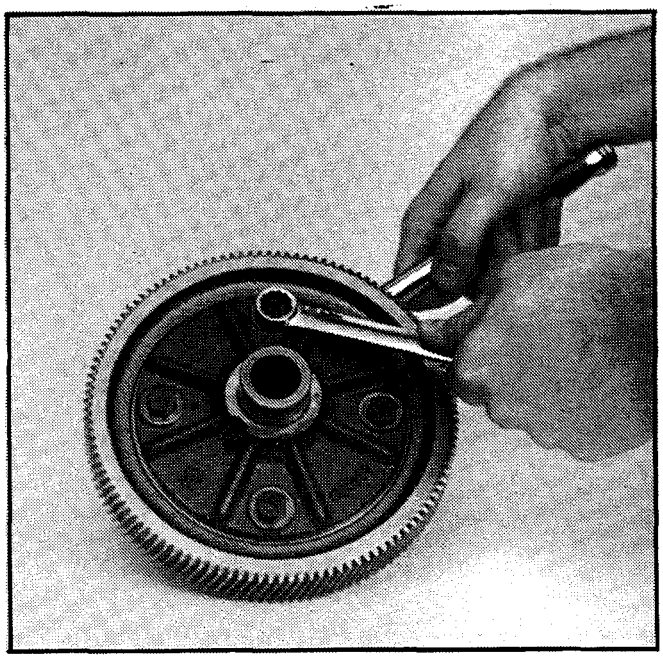


FIG. M-26

Remove the four bolts and nuts that secure the large gear to the differential case. Fig. M-26.

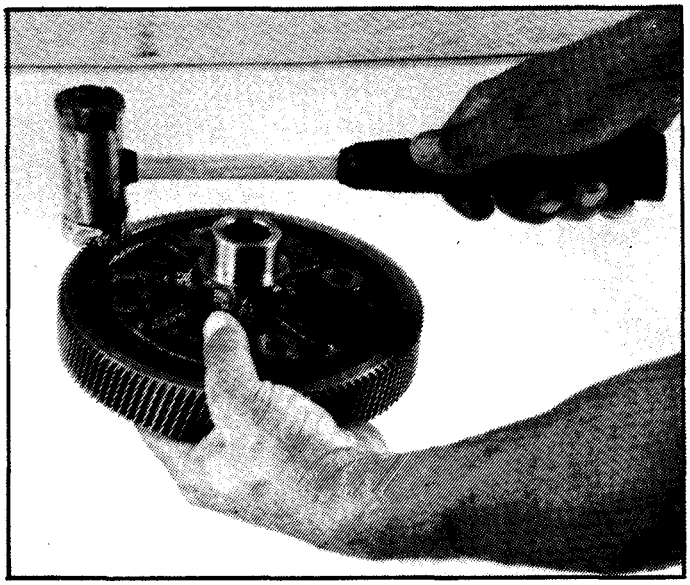


FIG. M-27

If the ring gear does not separate easily from the differential case, it may require the use of a plastic tipped hammer to remove it.

**CAUTION:** BE CAREFUL NOT TO DAMAGE GEAR TEETH.

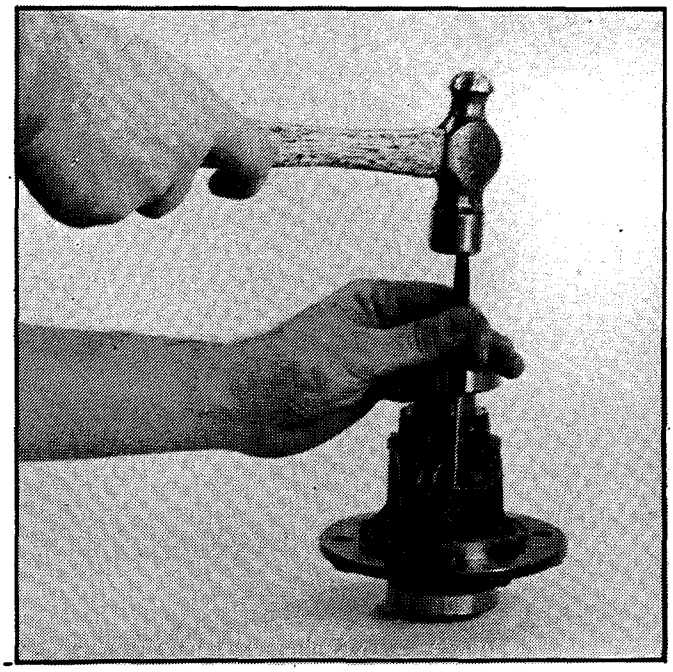


FIG. M-28

Drive the lock pin out of the pinion shaft. Fig. M-28.

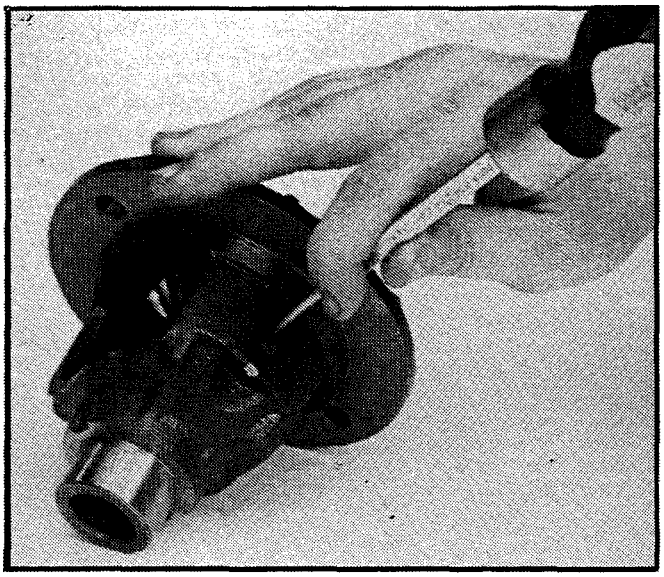


FIG. M-29

Supporting the differential case, drive the pinion shaft from the pinion mate gears. Fig. M-29.

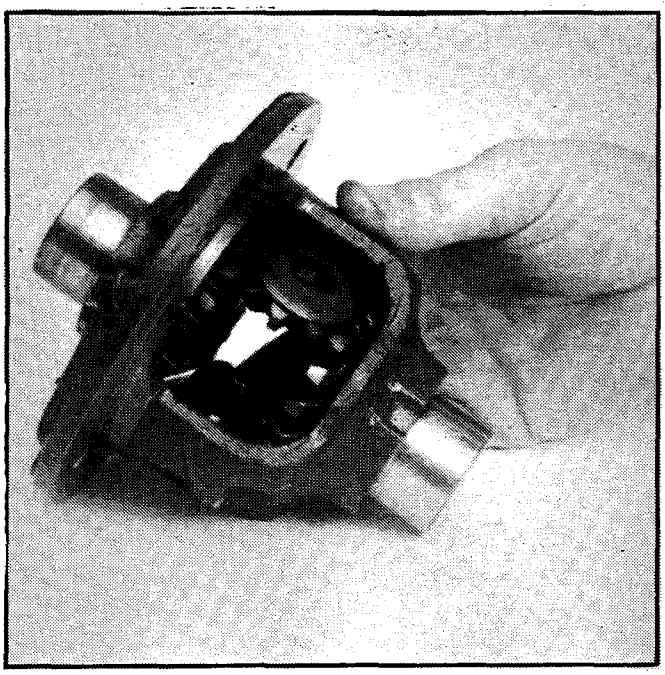


FIG. M-30

Remove the pinion mate gears and the thrust washers by rotating both gears 90° to the opening in the differential case. Fig. M-30, M-31.

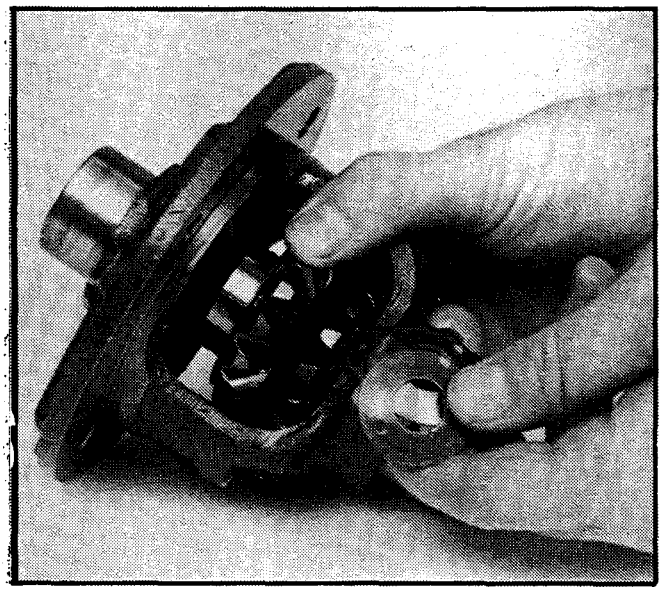


FIG. M-31

Reassemble in reverse order of disassembly.

**CAUTION:** THE HEAD OF THE BOLT MUST BE AGAINST THE DIFFERENTIAL CASE AND THE NUT AGAINST THE RING GEAR. FAILURE TO FOLLOW THIS CAUTION WILL RESULT IN SERIOUS DAMAGE TO THE OTHER COMPONENTS.

## RETOPCOAT INSTRUCTIONS - E-Z-GO VEHICLES

Step 1 - Lightly sand with water using #320 paper until all gloss is removed and the desired finish obtained. Do not remove the galvanneal surface from the metal. Silver chips in sanding dust will indicate galvanneal removal.

Step 2 - Clean surface with solvent - mineral spirits or naptha.

Step 3 - Mix Polane catalyst #V66-V29 at a ratio of 1 to 8 (16 oz. per gallon of paint). Reduce with thinner #R7K212 to a viscosity of 24-26 Saybolt Universal Seconds. Add retarder R7K6251 as necessary to slow drying time.

**NOTE:** Viscosity should be measured by standard cup such as a Zahn or Ford. The cup can be purchased at most paint supply outlets. A cup filled with paint mixture should flow through the bottom orifice at the above time frame.

Step 4 - Apply paint spray in a light tack coat followed by the heavier coat until a thickness of (1) mil is obtained.

**NOTE:** A (1) mil thickness is the normal coverage required to hide primer or bare metal.

Step 5 - Allow 4-6 hours drying time for finished coat. Most Polane topcoats have small transparent bubbles at initial application. Most will disappear after a cure of 2-3 days.

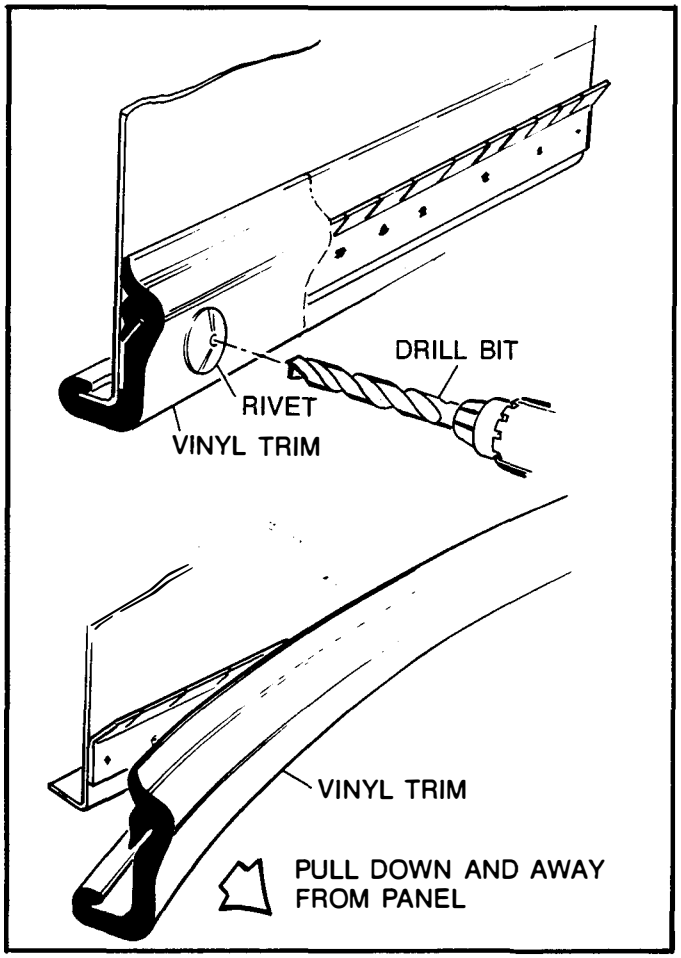
## GENERAL

### Trim

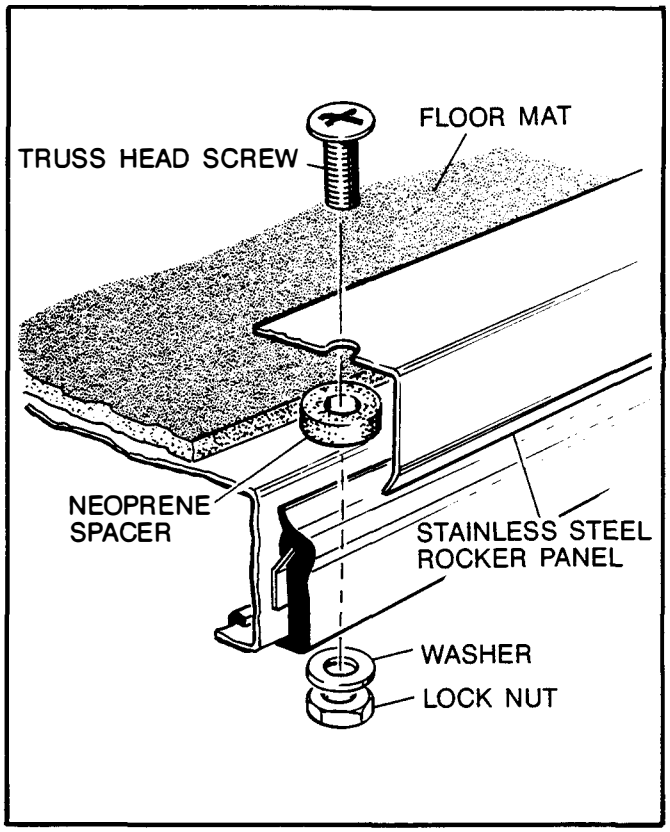
Trim consists of a vinyl extrusion that is installed around the outside edges of the body panels and the rear of the dash tray. The ends of the trim (except the dash tray edge) are secured to the body panels with a rivet.

### Trim Removal

Use an electric or air drill and a 1/4" drill bit to drill out the rivet head. Push the rivet through the panel using an awl or suitable punch. Grasp the loose end of the vinyl trim and pull out and down from the body panel.



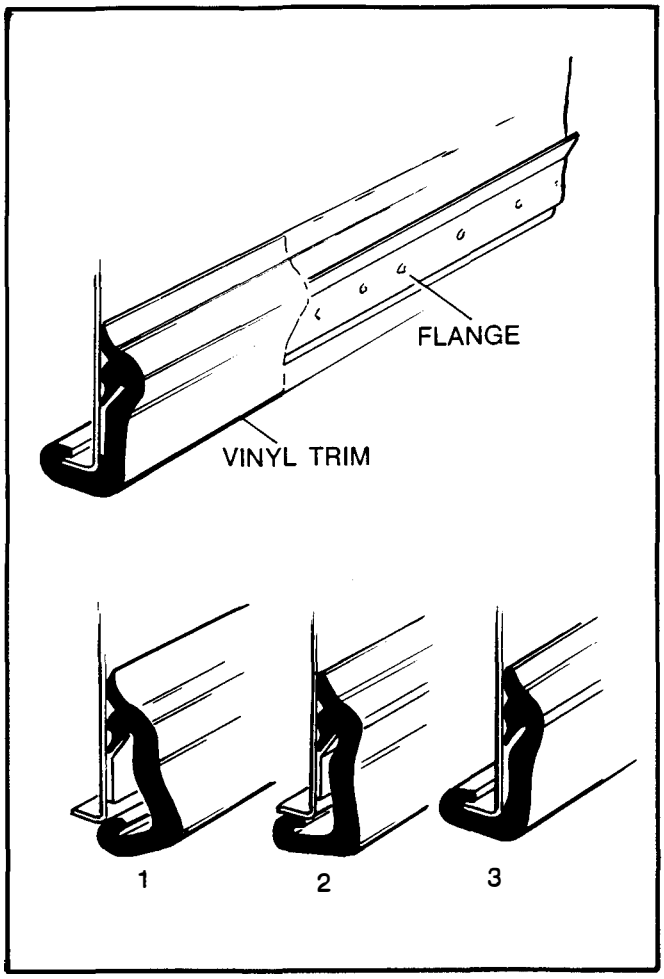

The removal of the trim running along the floorboard will require that the rocker panel trim be removed. The stainless steel rocker panel trim is retained by two stainless steel truss head screws, neoprene spacers, washers and lock nuts.




### Trim Installation

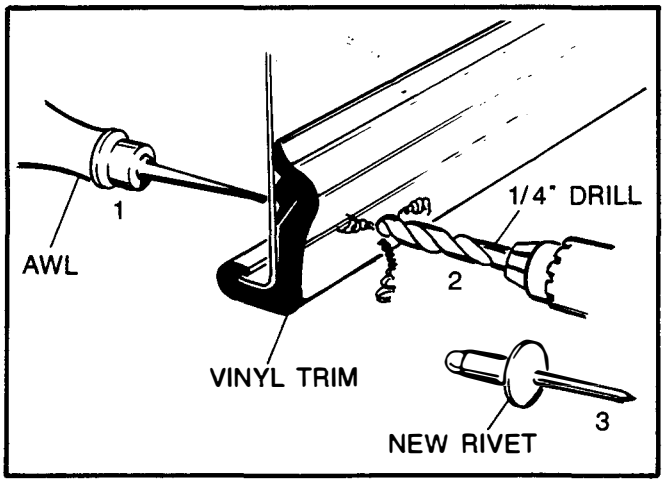
When installing the vinyl trim, it is best to heat the material to a working flexibility. This can be done under field conditions by immersing the trim in a container of hot water (110° - 120°) for approximately ten minutes. Hook the trim over the flange on the outside of the panel, press down and push the lower edge of the trim over the flange at the edge of the panel.

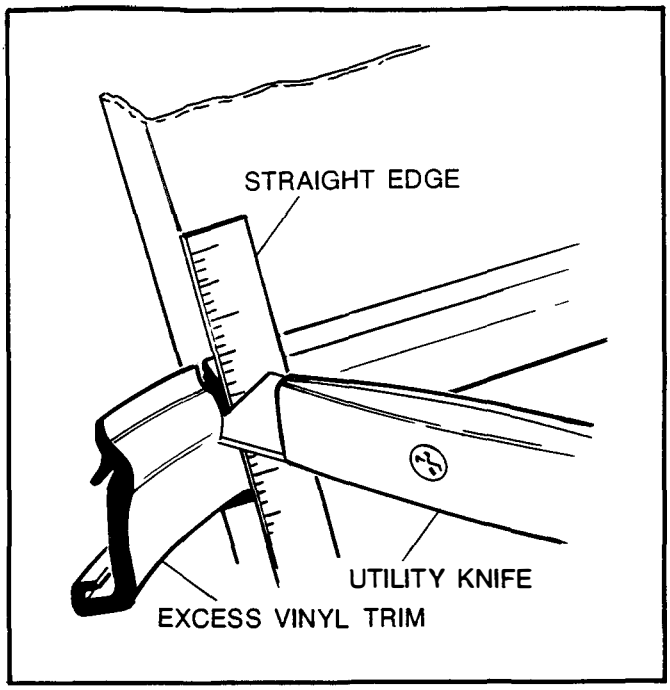
**NOTE:** Short sections of trim that have been pulled from body panels should be heated with a hair dryer to improve the trim flexibility, before being pressed into place.




Use an awl to locate the rivet hole and force through the trim. Drill through the vinyl trim and install the rivet. Use a sharp utility knife to cut the exess trim to contour.

**NOTE:** Use of a straight edge and extreme care to prevent cutting into the paint finish will provide a professionally finished appearance.



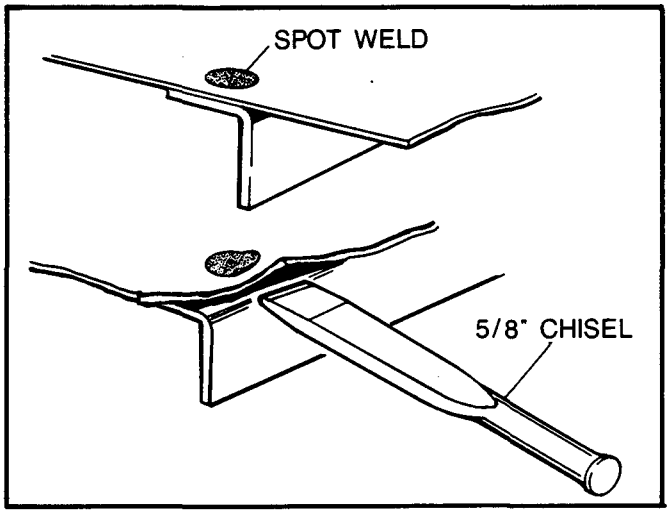

## BODY

**WARNING: DISCONNECT BATTERY OR BATTERIES BEFORE PROCEEDING. SEE PROCEDURES IN SECTION B.**

A variety of methods are used to fasten components and each has a recommended method of removal and installation.

### Spot Welds

Some sheet metal components are secured to the vehicle framework with spot welds. The components may be removed by breaking each spot weld; this may be accomplished by forcing through each weld with a 5/8" chisel.



**NOTE:** Although this task may be accomplished with a hammer and chisel, a pneumatic air chisel is recommended.

**WARNING: USE EYE AND EAR PROTECTION WHEN USING EITHER HAMMER OR AIR CHISEL.**

Service replacement parts do not require spot welding and are retained by self drilling and tapping screws or weld studs and lock nuts.

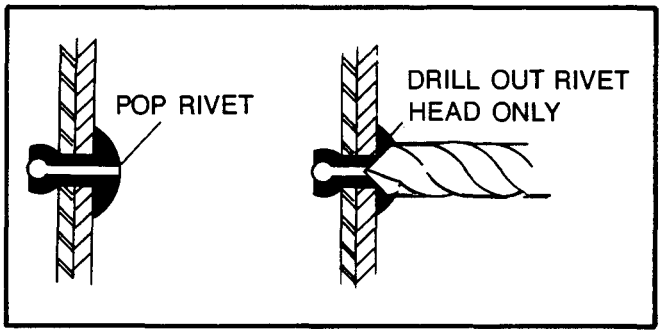
### Metal Rivets

Metal rivets may be removed by drilling through the head of the rivet and driving the remains of the rivet shank from the panel.

**CAUTION:** DRILL OUT RIVET HEAD ONLY, DO NOT DRILL INTO BODY PANELS.

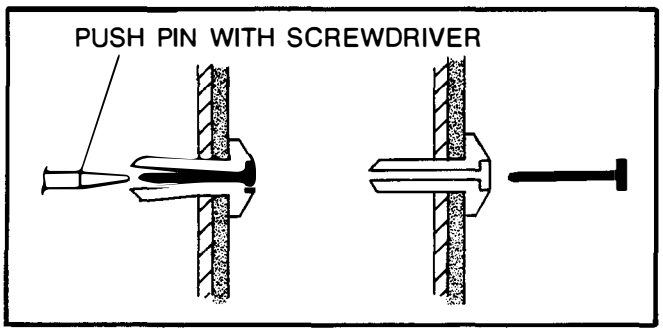
Replace rivet using a new rivet.

**WARNING: USE EYE PROTECTION WHEN USING DRILL.**




### Plastic Rivets

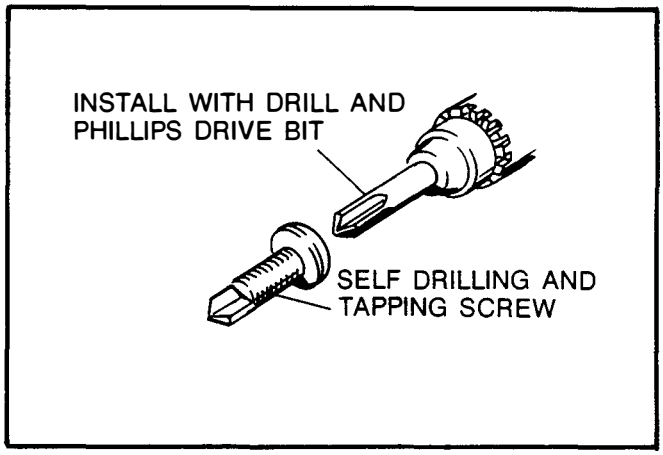
Plastic rivets may be removed by pushing the pin from the rear of the rivet using a screwdriver. With the pin removed the rivet may be pushed out of the panels. The rivet may be reused by pushing firmly in place and installing the pin by pressing the pin head with the flat portion of the screwdriver.




### Self Drilling and Tapping Screws

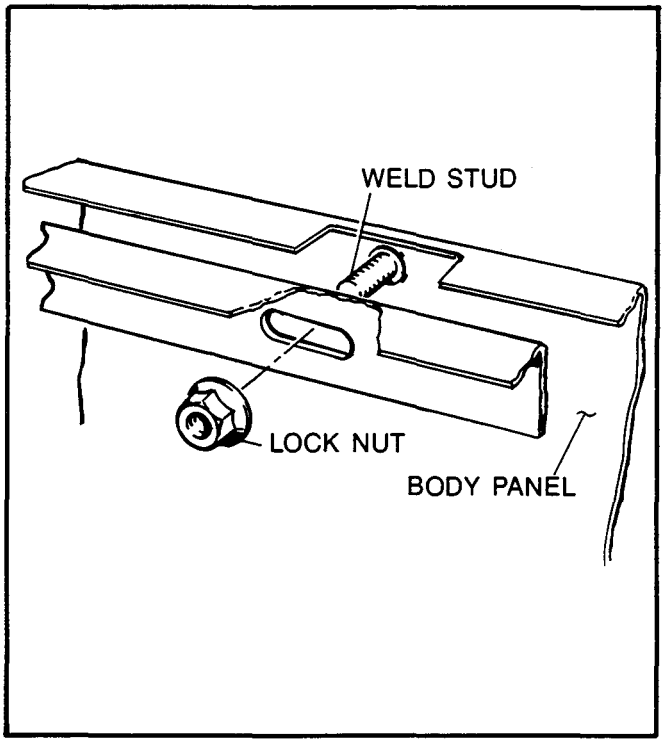
These screws may be removed with an appropriately sized Phillips screwdriver.

**NOTE:** Some screws may require the use of an appropriately sized Phillips head bit and an impact driver. They are installed using a drill equipped with a suitably sized Phillips head bit, and drill their own pilot hole and thread.



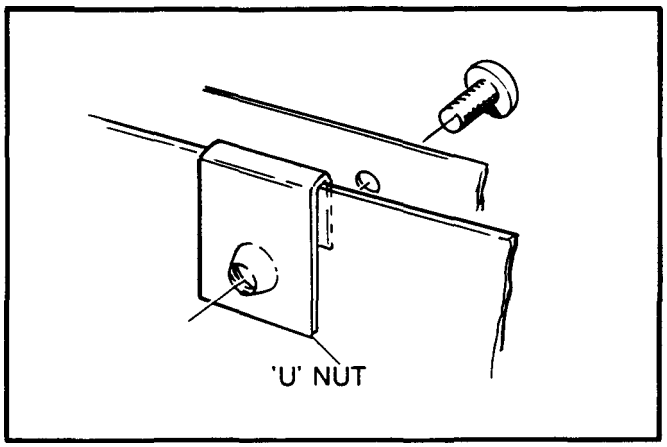

### Weld Studs

Weld studs are attached to body panels and retained by lock nuts. New panels are supplied with studs attached and may be installed with suitably sized lock nuts.



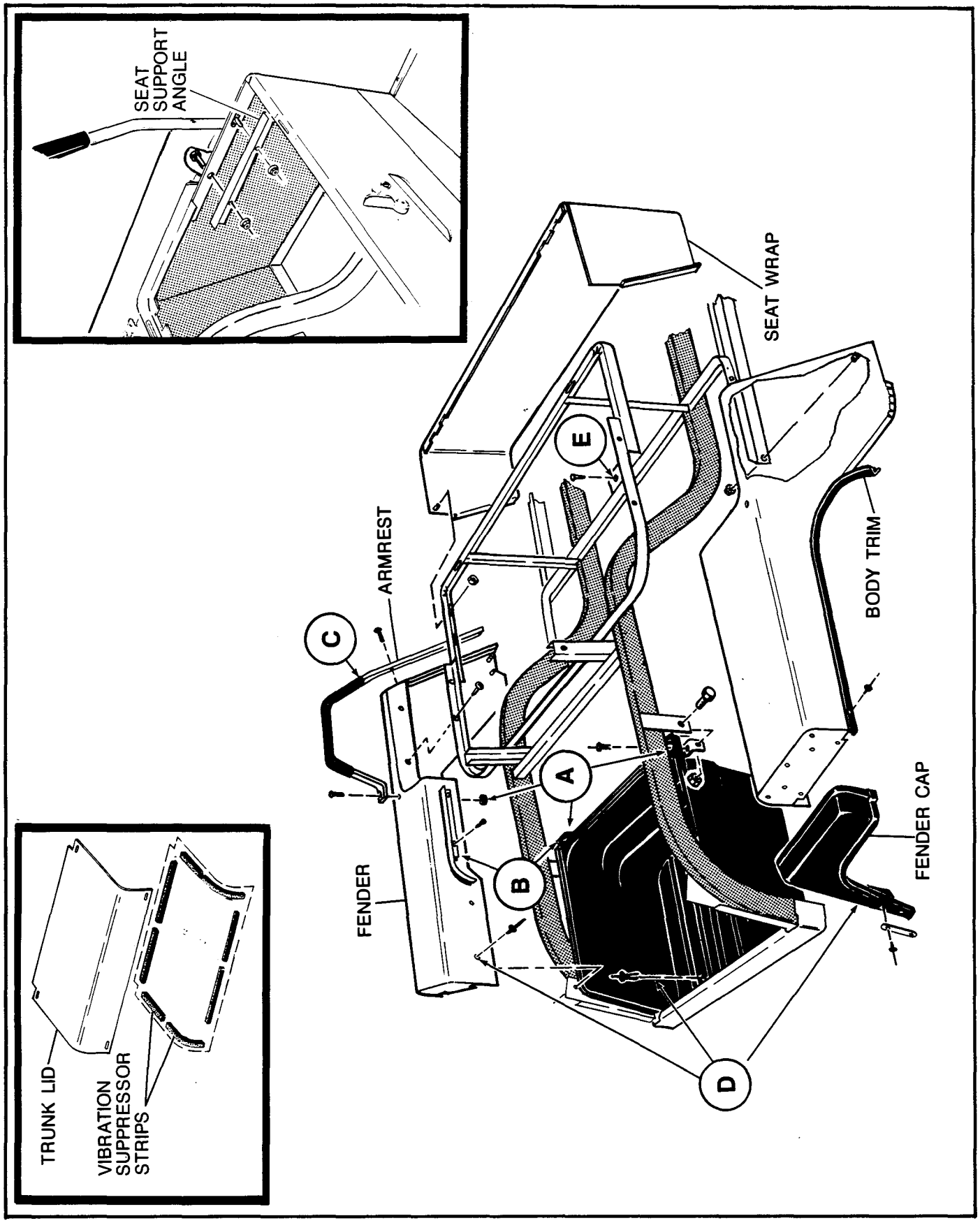
## U Nuts

Several types of 'U' nuts are in use and may generally be removed by sliding them from the old panel after spreading slightly with a straight blade screwdriver. These 'U' nuts may be reused on new panels.

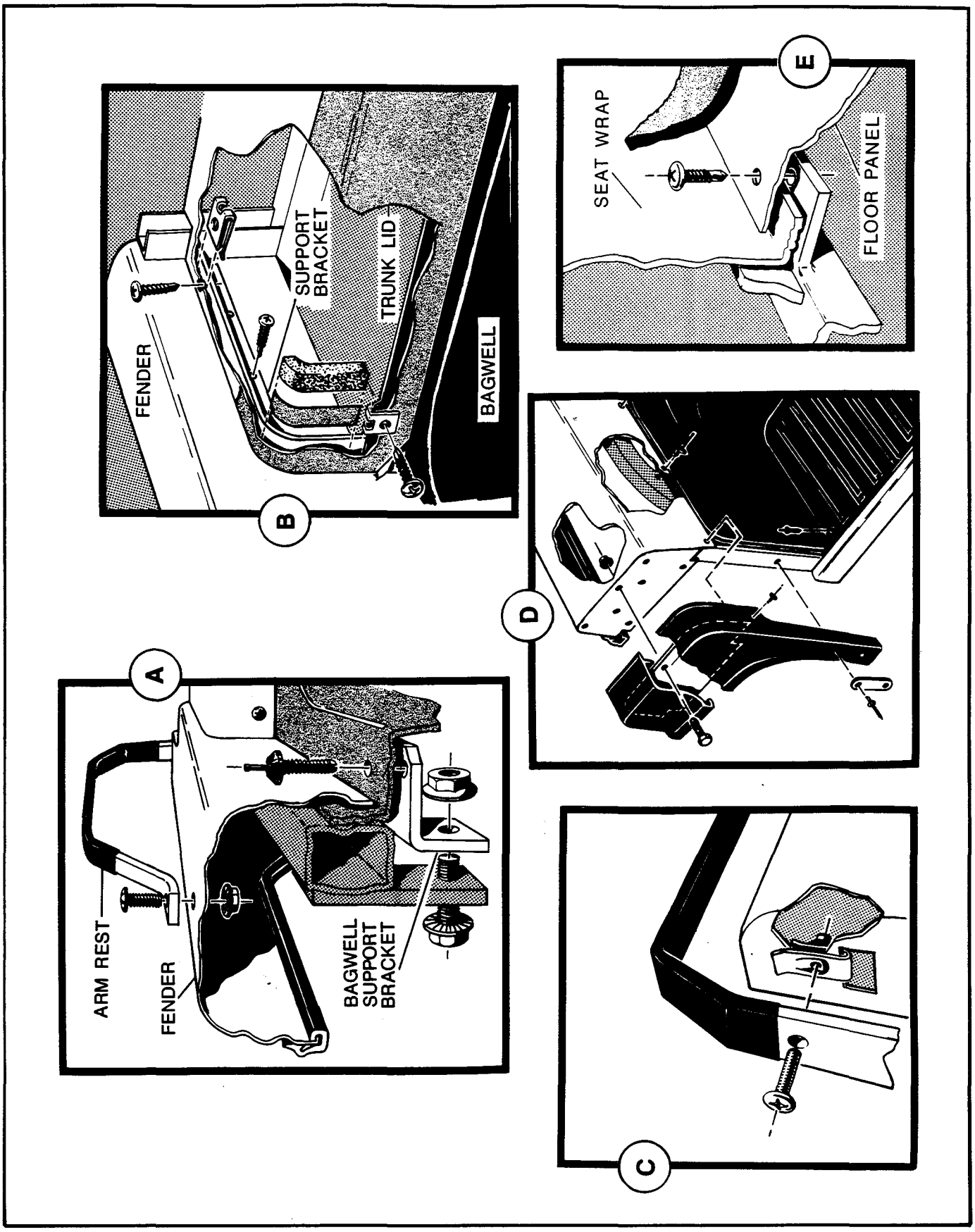



Refer to the following exploded views for pictorial representation of component attachment. Removal of non body and trim components is detailed elsewhere in this manual.

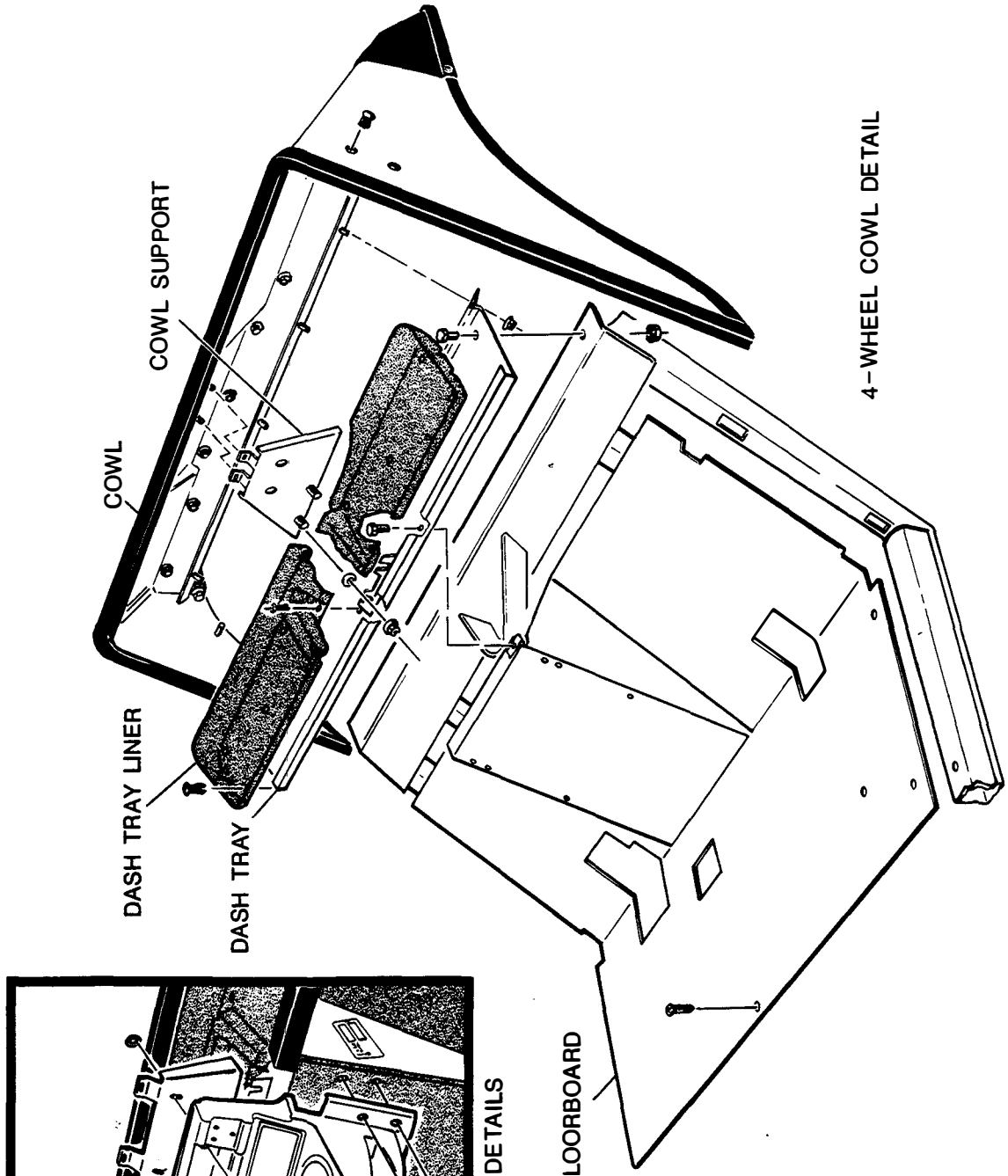
**NOTE:** Specific components and hardware may be identified by reviewing the Service Parts catalogue available from the E-Z-GO Service Parts Department.

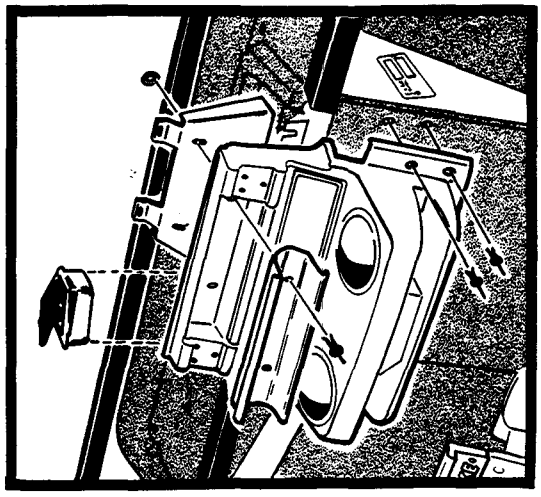

SEAT SUPPORT ANGLE
SEAT WRAP
ARMREST
BODY TRIM
FENDER
FENDER CAP
A
B
C
D
E
TRUNK LID
VIBRATION SUPPRESSOR STRIPS

REAR BODY

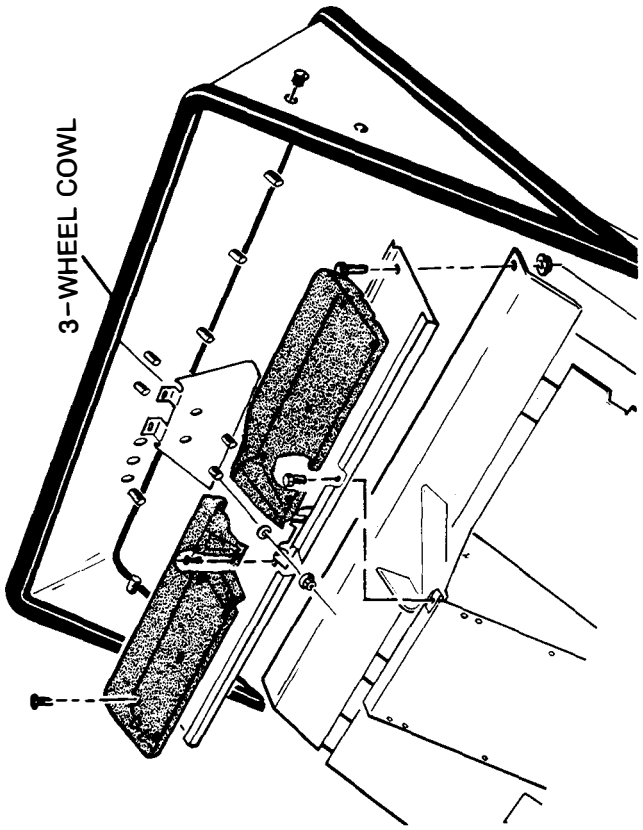


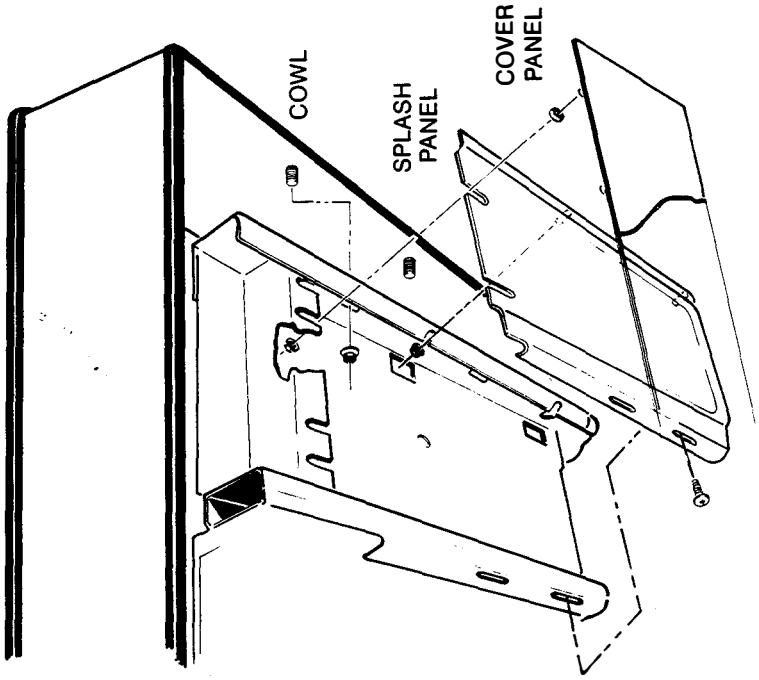

BODY DETAILS




FRONT BODY AND CONSOLE




3-WHEEL COWL DETAILS

3-WHEEL COWL AND SPLASH PANEL

## SUSPENSION AND STEERING

| CONDITION | POSSIBLE CAUSE | CORRECTION |
|---|---|---|
| Hard Or Erratic Steering | 1. Incorrect tire pressure. | 1. Inflate tires to recommended pressure. |
| | 2. Insufficient or incorrect lubrication. | 2. Lubricate as required. |
| | 3. Suspension, steering or linkage parts damaged. | 3. Repair or replace parts as required. |
| | 4. Improper front wheel alignment. | 4. Adjust wheel alignment. |
| | 5. Deformed springs. | 5. Replace springs. |
| Abnormal Play Or Looseness In Steering | 1. Steering wheel loose. | 1. Inspect splines. Remove scorecard holder and tighten steering wheel nut. |
| | 2. Steering linkage or attaching parts loose or worn. | 2. Tighten, adjust, or replace worn parts. |
| | 3. Steering box attaching hardware loose. | 3. Tighten hardware. |
| | 4. Loose or worn wheel bearings. | 4. Adjust or replace bearings. |
| | 5. Steering gear parts badly worn. | 5. Replace worn parts. |
| Wheel Vibration | 1. Improper tire pressure. | 1. Inflate tires to recommended pressures. |
| | 2. Wheels, tires, or brake drums out-of-round. | 2. Inspect parts and replace out of specification parts. |
| | 3. Defective, worn, or loose shock absorbers or mounting parts. | 3. Replace shock absorbers or mounting hardware. |
| | 4. Loose or worn steering or suspension parts. | 4. Tighten or replace as required. |
| | 5. Loose or worn wheel bearings. | 5. Adjust or replace bearings. |
| | 6. Incorrect front wheel alignment. | 6. Adjust front wheel alignment. |
| Tire Wear | 1. Improper tire pressure. | 1. Inflate tires to recommended pressure. |
| | 2. Brakes grabbing. | 2. Adjust or repair brakes. |
| | 3. Incorrect front wheel alignment. | 3. Align front wheels. |
| | 4. Broken or damaged steering and suspension parts. | 4. Repair or replace defective parts. |
| | 5. Wheel runout. | 5. Replace faulty wheel. |

| CONDITION | POSSIBLE CAUSE | CORRECTION |
|---|---|---|
| Car Pulls To One Side | 1. Improper tire pressure. | 1. Inflate tires to recommended pressures. |
| | 2. Front tires with uneven tread depth, wear pattern, or different tread design. | 2. Install tires of same construction and tread depth and design. |
| | 3. Incorrect front wheel alignment. | 3. Align front wheels. |
| | 4. Brakes dragging. | 4. Adjust or repair brakes. |
| | 5. Defective tire. | 5. Replace defective tire. |

## CHECK ITEMS

1. Batteries discharge much faster than normal after a correct charge.

A. Batteries, charger and charging circuit.

- o Inspect battery terminals for tightness or corrosion.
- o Inspect the battery electrolyte level.
- o Check the specific gravity of battery electrolyte.
- o Inspect battery cases for damage.
- o Inspect the charging circuit for loose connections, broken wires, or connections.
- o Check the A.C. voltage (115 Volts, 15 Amps) at the battery charger A.C. connection.
- o Check that the charging plug is firmly connected to the charger receptacle.
- o Inspect the D.C. cord and plug for damage.

B. Traction motor and power transmission circuit.

- o Inspect the power transmission circuit and motor circuit for loose connections. (Check for loose connectors at the accelerator switch, solenoid, and motor.)
- o Inspect the accelerator switch for dirty, burned or worn contacts, and for full arm travel.
- o Inspect the motor for worn or damaged brushes, or dirty commutator.

C. Mechanical

- o Inspect the brakes.
- o Inspect the accelerator switch and linkage for adjustment.
- o Check the tire pressures.
- o Check for excessive wheel bearing drag.
- o Inspect the rear axle for oil leakage or defective action.
- o Check the operation of all controls. The vehicle should be run with the accelerator pedal fully depressed unless safety conditions require reduced speed. This will minimize power consumption.

2. If the vehicle does not move in either direction.

   - o Check if the batteries are discharged.
   - o Check the battery posts and terminals for corroded, loose, or broken connections.
   - o Hold down brake pedal and be sure the area is clear. Place the forward-neutral-reverse switch in the forward position and depress the accelerator pedal and listen for a click. If no click is produced, check operation and connections of the solenoids, the key switch, accelerator switch, and micro switches.
   - o Inspect the motor, accelerator switch, and resistors for loose or broken connections.
   - o Inspect the accelerator switch for worn contact points and correct operation.
   - o Inspect the motor for worn or defective brushes, or dirty commutator. Also check the armature for broken wires or a short circuit.

3. If the acceleration becomes rough and uneven.

   - o Inspect for loose or broken connections between the accelerator switch and resistor.
   - o Inspect the accelerator switch for dirty, burned, corroded, shorted, or worn contact points.
   - o Inspect the resistors for damage.
   - o Inspect for loose terminals.

4. If car starts immediately when the forward-neutral-reverse switch is set in the forward or reverse position.

   - o Check the accelerator linkage adjustment.
   - o Inspect the accelerator switch for jammed contact points.
   - o Inspect for stuck accelerator pedal.
   - o Inspect for stuck solenoid contacts.

5. The vehicle stops suddenly - refer to procedures 2 and 3.

6. The vehicle speed slows.

   - o Check the battery electrolyte level and charged condition.
   - o Check the batteries, accelerator switch, resistors, and motor for loose connections.
   - o Inspect the accelerator switch for dirty or worn contact points, particularly the upper contacts. Also check for wires shorted or broken at connections and for full arm movement.
   - o Inspect the motor for worn or damaged brushes or dirty commutator.

7. If the accelerator switch contacts are burned abnormally.

   - o Check that the wiper contact is in contact with the fixed contacts.

8. If the motor does not stop even when the accelerator pedal is released.

   If the motor stops when the forward-neutral-reverse switch is placed in the "N" position:
   - o Check the accelerator switch micro switch.
   - o Check the solenoid for stuck contacts.
   - o Check accelerator linkage.

## MOTOR

| CONDITION | POSSIBLE CAUSE | CORRECTION |
|---|---|---|
| Motor Does Not Turn | 1. Brushes are not contacting commutator. | 1. Adjust properly. |
| | 2. Motor terminals are loose or corroded. | 2. Tighten or clean. |
| | 3. Power transmission wires are broken. | 3. Check for breaks at joints. Replace leads. |
| | 4. Field coil is "open". | 4. Repair or replace. |
| | 5. Armature is broken. | 5. Repair or replace. |
| Motor Turns Slowly | 1. Terminals are loose or corroded. | 1. Tighten or clean. |
| | 2. Wires are defective or connections are faulty. | 2. Check for any defect of leads, particularly at joints. Replace wires. |
| | 3. Accelerator wiper movement is incomplete. | 3. Adjust. |
| | 4. Batteries may need charging. | |
| Noisy Motor | 1. Bolts are loose. | 1. Retighten. |
| | 2. Motor has foreign matter inside. | 2. Clean interior of motor. |
| | 3. Bearings are defective. | 3. Replace. |
| | 4. Bearings are dirty. | 4. Replace. |
| Bearing Heat Excessive | 1. Bearings are defective. | 1. Replace. |
| | 2. Improperly installed. | 2. Adjust. |
| Erratic Operation | 1. Load exceeds specification. | 1. Reduce load. |
| | 2. Commutator is out of round. | 2. Repair or replace at service shop. |
| | 3. Brushes are worn beyond spec. | 3. Replace. |
| | 4. Commutator is excessively rough. | 4. Smooth with sandpaper (#500-600). |
| | 5. High mica at commutator. | 5. Recondition. |
| | 6. Commutator is dirty. | 6. Clean with a cleaner, dry thoroughly. |
| | 7. Armature coil is shorted or broken. | 7. Replace. |
| Vibration | 1. Motor loose. | 1. Tighten. |
| | 2. Motor turns erratically. | 2. Repair or replace. |
| Motor Operates at Excessive Speed | 1. Field coil winding is shorted in motor. | 1. Repair or replace field coils. |

## SPECIFICATIONS

| | | |
|---|---|---|
| Weight (Without Batteries) | 562 Lbs. (4 Wheel) | 521 Lbs. (3 Wheel) |
| Length | 93 Inches (4 Wheel) | 88 1/2 Inches (3 Wheel) |
| Width | 48 Inches | |
| Tread (Rear Wheels) | 39 Inches | |
| Wheel Base | 66 Inches (4 Wheel) | 60 Inches (3 Wheel) |
| Height of Steering Wheel | 48 5/8 Inches | |
| Height at Floor | 11 Inches | |
| Ground Clearance (At Differential) | 5 Inches | |
| Seat Height | 29 Inches | |
| Clearance Circle | 19'-6" (4 Wheel) | 17'-6" (3 Wheel) |
| Load Capacity (Including Operator, Passenger(s) and Accessories) | 800 lbs. | |
| Brakes | Drum, Mechanical, Auto Adjusting (Rear Wheels) | |
| Hill Brake | Mechanical, Automatic Release, Self-Compensating | |
| Tires | 18 x 8.50 x 8 | |
| Tire Pressure | 18 - 22 psi. | |
| Electrical System | 36 Volt D.C., 6 Volt Deep Cycle Lead Acid Batteries | |
| Accelerator Switch | Four Speed, Single Solenoid, Self-Adjusting Wiper Arm Contact | |
| Drive Train | Direct, Motor Shaft Connected to Axle Input Pinion | |
| Differential | Helical Drive 12.55:1 | |
| Differential Lubrication | RPM Delo Multi-Service SAE-30, 8-10 oz. | |
| Speed | 12 M.P.H. | |
| Front Suspension (3 Wheel) | Coil Springs and Shock Absorbers | |
| Front Suspension (4 Wheel) | Leaf Springs and Shock Absorbers | |

| | |
|---|---|
| Rear Suspension | Leaf Springs and Shock Absorbers |
| Hill Climbing | 40% |
| Steering | Rack and Pinon |
| Body | All Replaceable Steel Panels |
| Chassis | Rectangular Steel Tubing |
| Charger | 110-120 Volt 60 Cycle A. C. Input, 21 Amp, 36 Volt D.C. Output, U.L. Listed |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