Club Car

1995-1996 **MAINTENANCE** SERVICE

DS GOLF CARS
GASOLINE/ELECTRIC

MANUAL NUMBER 101905101 EDITION CODE 1196H0799C

FOREWORD

Club Car golf cars are designed and built to provide maximum efficiency and performance. However, proper maintenance and repair is essential for achieving maximum service life and continued safe and reliable operation of the vehicle. This Maintenance and Service Manual will provide the mechanic with proper detailed procedures for the maintenance and repair of the Club Car DS Golf Car, including periodic maintenance, troubleshooting, disassembly, repair, and reassembly of all vehicle components. This manual should be thoroughly studied prior to servicing the vehicle. The procedures provided must be properly implemented, and the NOTE, CAUTION, WARNING, and DANGER statements must be heeded.

This manual was written for the vehicle mechanic who already posseses basic knowledge and skills in electrical and mechanical repair. If the mechanic does not have such basic knowledge and skills, attempted service or repairs to the vehicle may render it unsafe. For this reason, we advise that all repairs and/or service be performed by an authorized Club Car distributor's/dealer's representative or by a Club Car factory trained mechanic.

It is the policy of Club Car, Incorporated to assist its distributors and dealers in continually updating their service knowledge and facilities so that they can provide prompt and efficient service for the vehicle owner. Regional technical representatives, golf car service seminars, periodic service bulletins, this manual, and other service publications also represent Club Car's continuing commitment to customer support.

This service manual covers all aspects of DS Golf Car service. However, unique situations do sometimes arise when servicing a golf car. If it appears that a service question is not answered in this manual, you may write to us or contact a Club Car technical service representative by phone at (706) 863-3000, ext. 3580.

NOTE

- THIS MANUAL REPRESENTS THE MOST CURRENT INFORMATION AT TIME OF PUBLICATION. CLUB CAR, INC. IS CONTINUALLY WORKING TO FURTHER IMPROVE OUR VEHICLES AND OTHER PRODUCTS. THESE IMPROVEMENTS MAY AFFECT SERVICING PROCEDURES. ANY MODIFICATION AND/OR SIGNIFICANT CHANGE IN SPECIFICATIONS OR PROCEDURES WILL BE FORWARDED TO ALL CLUB CAR DISTRIBUTORS AND DEALERS AND WILL, WHEN APPLICABLE, APPEAR IN FUTURE EDITIONS OF THIS MANUAL.
- DAMAGE TO A VEHICLE OR COMPONENT THEREOF NOT RESULTING FROM A DEFECT OR WHICH OCCURS DUE TO UNREASONABLE OR UNINTENDED USE, OVERLOADING, ABUSE, OR NEGLECT (INCLUDING FAILURE TO PROVIDE REASONABLE OR NECESSARY MAINTE-NANCE AS INSTRUCTED IN THE VEHICLE OWNER'S MANUAL), ACCIDENT OR ALTERATION, INCLUDING INCREASING VEHICLE SPEED BEYOND FACTORY SPECIFICATIONS OR MODIFI-CATIONS WHICH AFFECT THE STABILITY OF THE VEHICLE OR THE OPERATION THEREOF, WILL VOID THE WARRANTY.
- CLUB CAR, INC. RESERVES THE RIGHT TO CHANGE SPECIFICATIONS AND DESIGNS AT ANY TIME WITHOUT NOTICE AND WITHOUT INCURRING ANY OBLIGATION OR LIABILITY WHATSOEVER.
- THERE ARE NO WARRANTIES EXPRESSED OR IMPLIED IN THIS MANUAL. SEE THE LIMITED WARRANTY FOUND IN THE VEHICLE OWNER'S MANUAL OR WRITE TO CLUB CAR, INC.

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WARNING

- READ SECTION 1 SAFETY BEFORE ATTEMPTING ANY SERVICE ON THIS VEHICLE.
- BEFORE SERVICING VEHICLE, READ COMPLETE SECTION(S) AND ANY REFERENCED INFORMATION RELEVANT TO SERVICE OR REPAIR TO BE PERFORMED.

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SECTION 1 - SAFETY

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

A DANGER

• A DANGER INDICATES AN IMMEDIATE HAZARD WHICH WILL RESULT IN SEVERE PER-SONAL INJURY OR DEATH.

A WARNING

• A WARNING INDICATES AN IMMEDIATE HAZARD WHICH COULD RESULT IN SEVERE PERSONAL INJURY.

A CAUTION

• A CAUTION INDICATES HAZARDS OR UNSAFE PRACTICES WHICH COULD RESULT IN MINOR PERSONAL INJURY, OR DAMAGE TO THE VEHICLE OR OTHER PROPERTY.

NOTE

• A NOTE PROVIDES KEY INFORMATION TO MAKE PROCEDURES MORE EASILY UNDERSTOOD OR IMPLEMENTED.

Service technicians should become familiar with the following general safety statements. These will be found frequently throughout this manual:

A DANGER

- GASOLINE FLAMMABLE! EXPLOSIVE! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY FROM THE VEHICLE SERVICE AREA.
- DO NOT OPERATE IN AN ENCLOSED AREA WITHOUT PROPER VENTILATION. ENGINE PRODUCES CARBON MONOXIDE, WHICH IS AN ODORLESS, DEADLY POISON.
- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VEN-TILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR FULL FACE SHIELD WHEN WORKING ON OR NEAR BATTERIES.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

General Safety Statements, Continued:

WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- IMPROPER USE OF THIS VEHICLE, OR FAILURE TO MAINTAIN IT PROPERLY, COULD RESULT IN DECREASED PERFORMANCE OR SEVERE PERSONAL INJURY.
- ANY MODIFICATION OR CHANGE TO THE VEHICLE WHICH AFFECTS THE STABILITY, OR INCREASES THE SPEED BEYOND FACTORY SPECIFICATIONS, COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.
- CHECK THE OWNER'S MANUAL FOR PROPER LOCATION OF ALL VEHICLE WARNING DECALS AND MAKE SURE THAT THEY ARE IN PLACE AND ARE EASILY READ.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSI-TION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT MOTOR, RESISTORS, ENGINE, OR EXHAUST SYSTEMS. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.

GASOLINE VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR 22-6, PAGE 22. THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${
 m ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

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SECTION 2 - VEHICLE SPECIFICATIONS

Club Car, Inc. reserves the right to change specifications and design of either gasoline or electric vehicles at any time without notice and without obligation to make these changes on units previously sold.

SPECIFICATIONS	DS GASOLINE	POWERDRIVE SYSTEM 48 ELECTRIC	POWERDRIVE PLUS ELECTRIC	DS 36 VOLT ELECTRIC
POWER SOURCE				
Engine: 4 cycle, OHV, 286 cc, 9.0 hp rated, single cylinder, air cooled, with pressure lubrication system.	•			
Drive Motor: Direct drive, 48 volts DC, series wound, 3.1 hp.		•		
Drive Motor: Direct drive, 48 volts DC, shunt wound, 3.2 hp.			•	
Drive Motor: Direct drive, 36 volts DC, series wound, 2.97 hp.				•
Fuel System: Side draft carburetor with float bowl, fixed jets, fuel filter, and impulse fuel pump.	•			
Governor: Automatic ground speed sensing, internally geared in the transmission.	•			
Ignition: Transistor electronic ignition with electronic RPM limiter.	•			
Transmission: Fully synchronized forward and reverse with neutral (97:1 forward, 1.03:1 reverse).	•			
Drive Unit: Double reduction helical gear with 12.28:1 direct drive axle.	•	•	•	•
Electrical System: 12 volt, 460 cold cranking amp battery and 35 amp charging capacity.	•			
Electrical System: 48 volts DC, reduced speed reverse.		•	•	
Electrical System: 36 volts DC, reduced speed reverse.				•
Batteries: High capacity, deep cycle, Trojan PowerDrive 8 volt, 117 min. capacity.		•	•	
Batteries: High capacity, deep cycle, Trojan 6 volt, 115 min. capacity.				•
Charger: Automatic, 17 amp PowerDrive; UL and CSA listed.		•	•	
Charger: Automatic, 21 amp Accu-Power; UL and CSA listed.				•
Torque Converter: Automatic, variable speed, dry type.	•			
STEERING/SUSPENSION/BRAKES				
Steering: Self-adjusting rack and pinion.	•	•	•	•
Suspension: Front and rear tapered mono-leaf springs with dual hydraulic shocks.	•	•	•	•
Brakes: Dual rear wheel self-adjusting brakes with cast iron drums and single brake pedal with automatic-release park brake.	•	•	•	•
BODY/CHASSIS				
Frame/Chassis: Twin I-Beam welded aluminum.	•	•	•	•
Front and Rear Body: Armorflex®	•	•	•	•
Body Finish: Protective coat over molded-in color.	•	•	•	•
Tires: 18.00 x 8.50 - 8.00 tubeless, 4 ply rated.	•	•	•	•
SEATING CAPACITY/FUEL CAPACITY				
Standard Seating Capacity: 2 persons	•	•	•	•
Fairway Villager Seating Capacity: 4 persons	•	•	N/A	N/A
Fuel Tank: 7 gallons (26.5 liters), unleaded gasoline only.	•			

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SPECIFICATIONS	DS GASOLINE	POWERDRIVE SYSTEM 48 ELECTRIC	POWERDRIVE PLUS ELECTRIC	DS 36 VOLT ELECTRIC
DIMENSIONS/WEIGHT				
Overall Length	91-1/2"	91-1/2"	91-1/2"	91-1/2"
	(232 cm)	(232 cm)	(232 cm)	(232 cm)
Overall Width	47-1/4"	47-1/4"	47-1/4"	47-1/4"
	(120 cm)	(120 cm)	(120 cm)	(120 cm)
Overall Height: At Steering Wheel.	48"	48"	48"	48"
	(122 cm)	(122 cm)	(122 cm)	(122 cm)
Wheelbase	65-1/2"	65-1/2"	65-1/2"	65-1/2"
	(166 cm)	(166 cm)	(166 cm)	(166 cm)
Ground Clearance	4-1/2"	4-1/2"	4-1/2"	4-1/2"
	(11 cm)	(11 cm)	(11 cm)	(11 cm)
Front Wheel Tread	34-1/2"	34-1/2"	34-1/2"	34-1/2"
	(88 cm)	(88 cm)	(88 cm)	(88 cm)
Rear Wheel Tread	38-1/2"	38-1/2"	38-1/2"	38-1/2"
	(98 cm)	(98 cm)	(98 cm)	(98 cm)
Weight: Standard electric vehicle (without batteries)		455 lbs. (206 kg)	455 lbs. (206 kg)	448 lbs. (203 kg)
Weight: Fairway Villager electric vehicle (without batteries)		495 lbs. (225 kg)	N/A	N/A
Weight: Standard gasoline powered vehicle (dry)	593 lbs. (269 kg.)			
Weight: Fairway Villager gasoline powered vehicle (dry)	633 lbs. (287 kg.)			
Forward Speed	12 - 15 mph	12 - 15 mph	12 - 15 mph	12 - 15 mph
	(19 - 24 kph)	(19 - 24 kph)	(19 - 24 kph)	(19 - 24 kph)
Clearance Circle (diameter)	17'-6"	17'-6"	17'-6"	17'-6"
	(533 cm)	(533 cm)	(533 cm)	(533 cm)
Braking Distance: At 12 mph (19 kph).	14'	14'	14'	14'
	(427 cm)	(427 cm)	(427 cm)	(427 cm)

SECTION 3 - GENERAL INFORMATION

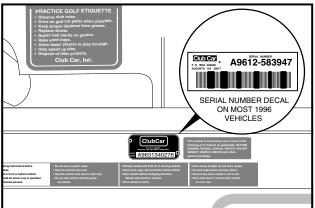
There are four DS Golf Car models: the DS gasoline powered vehicle, the DS V-Glide 36 volt electric vehicle, the DS PowerDrive System 48 (48 volt) electric vehicle, and the DS PowerDrive Plus (48 volt) electric vehicle with regenerative braking. Throughout this manual, important features unique to each model are highlighted. We urge the owner/operator to read and understand this manual, and to pay special attention to the features specific to his/her vehicle.

MODEL IDENTIFICATION

The serial number of your CLUB CAR is on a stamped data plate (1995 and early 1996) or bar coded decal (most of 1996) mounted on the frame directly above the accelerator pedal (Example: A9601-123456 for Electric or AG9601-123456 for Gasoline) (See Figure 3-1). Vehicles with bar code decals have a second serial number decal located on the vehicle frame behind the center dash (Figure 3-2).

NOTE

• ALWAYS MENTION THIS NUMBER WHEN ORDERING PARTS OR MAKING INQUIRIES. IF THIS VEHICLE IS EQUIPPED AS A FAIRWAY VILLAGER FOUR PASSENGER VEHICLE, READ THE SPECIAL INSTRUCTIONS IN THE DS OWNER'S MANUAL.



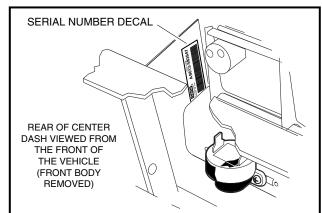


FIGURE 3-1

FIGURE 3-2

SAFETY COMMITTEE

If the golf car is to be rented or is part of a fleet, we strongly recommend that a safety committee be appointed. One of the main concerns of this committee should be the safe operation of the golf cars.

This should include at a minimum:

- · Where golf cars should be driven.
- Ensuring that proper warnings of driving hazards are displayed and visible.

NOTE

- SIGNS SUCH AS STEEP HILL AND SHARP TURN ARE AVAILABLE FROM THE GOLF CAR MAN-UFACTURERS ASSOCIATION MEMBERS.
- Who should and who should not drive golf cars.
- · Instructing first time drivers.

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Safety Committee, Continued:

- Maintaining golf cars in a safe driving condition.
- · How various rules are to be enforced.

The safety committee should include all these items and such others as the committee feels necessary or appropriate.

PRE-OPERATION CHECKLIST

Your CLUB CAR has been thoroughly inspected and adjusted at the factory, and also by your CLUB CAR distributor/dealer. However, upon arrival of your new CLUB CAR(s), you should become familiar with its controls and operation, and carefully inspect each vehicle to be satisfied that it is in proper working condition before accepting delivery.

Use the following checklist as a guide to inspect your new vehicle. Any problems should be corrected only by your CLUB CAR distributor/dealer or a trained technician.

- **General:** All the parts should be in place and properly installed. Be sure that all nuts, bolts, and screws are tight. On the DS Gasoline vehicle, check all hose clamps for tight fit as well as the starter belt for tightness.
- Warning Labels: Check to ensure that all warning and operation labels are in place (See the Vehicle Identification pages at the beginning of the vehicle Owner's Manual).
- Tires: Check for proper tire pressure (See Capacities, Section 4, Page 4-4).
- DS Electric Batteries (all models): Check electrolyte to ensure that it is at its proper level (See Figure 22-7, Section 22, Page 6). Check battery posts. Wires should be tight and free of corrosion. Charge batteries fully before first use of vehicle.
- DS V-Glide Speed Switch: Be sure speed switch cover is properly secured prior to operating the vehicle.
- DS Gasoline Engine: Check for proper engine oil level (See Section 13, Page 47).
- DS Gasoline Fuel: Check fuel level.

A WARNING

• BE SURE THE PLASTIC HAS BEEN REMOVED FROM THE SEAT BOTTOM BEFORE OPERATING THE VEHICLE. FAILURE TO DO SO COULD RESULT IN A FIRE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

PERFORMANCE INSPECTION:

After you have familiarized yourself with the vehicle's controls and have read and understood the driving instructions, take the vehicle for a test drive. Check the following:

All Vehicles:

- **Brakes:** Be sure that the brakes function properly. Both rear wheels should brake simultaneously. The pedal should not go more than halfway to the floor. If it does, have the brake system checked.
- Park Brake: The park brake should lock the wheels when latched, and should release when either the accelerator or brake pedal is depressed.
- Steering: The vehicle should be easy to steer and should not have any play in the steering wheel.
- Accelerator: As the accelerator pedal is depressed, the engine or motor should start and the vehicle should come up smoothly to full speed. When the pedal is released it should return to the original position and the engine or motor should stop. The DS Electric vehicle runs at reduced speed in reverse.

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DS PowerDrive Plus Vehicles with Regenerative Braking:

- **Zero Speed Detect:** With the vehicle parked on level ground and the park brake disengaged, turn the ignition key to the **ON** position and attempt to push the vehicle. It should resist rolling with the forward and reverse switch in any position.
- "Pedal Up" Motor Braking: Accelerate the vehicle to full speed and then release the accelerator pedal. The vehicle should quickly and smoothly slow to approximately 9 mph using motor braking.
- "Pedal Down" Motor Braking: Accelerate down an incline with the accelerator pedal depressed. When the vehicle reaches approximately 15 mph, the regenerative braking should engage and moderate vehicle speed between 15 and 16 mph, depending upon the grade of the hill.

CONTROLS

A DANGER

 DO NOT OPERATE THE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTILATION. GASOLINE ENGINES PRODUCE CARBON MONOXIDE GAS, WHICH IS AN ODORLESS, DEADLY POISON.

WARNING

- IF RENTING OR LOANING THE VEHICLE, MAKE SURE THE DRIVER IS FAMILIAR WITH ALL CONTROLS AND OPERATING PROCEDURES BEFORE ALLOWING THE VEHICLE TO BE DRIVEN.
- DO NOT TAMPER WITH THE GASOLINE VEHICLE GOVERNOR. DOING SO WILL VOID THE WARRANTY, AS WELL AS DAMAGE THE ENGINE AND OTHER COMPONENTS, AND COULD RESULT IN PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH DUE TO UNSAFE SPEEDS.
- DO NOT MODIFY OR CHANGE THE VEHICLE IN ANY WAY THAT MAY AFFECT VEHICLE STA-BILITY OR INCREASE SPEED BEYOND FACTORY SPECIFICATIONS. PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH COULD RESULT.
- DO NOT SHIFT THE FORWARD/REVERSE LEVER WHILE THE VEHICLE IS IN MOTION. TO AVOID INJURY TO AN UNSUSPECTING PASSENGER OR DAMAGE TO THE VEHICLE, ALWAYS BRING THE VEHICLE TO A FULL STOP BEFORE SHIFTING THE LEVER. A BUZZER WILL SOUND AS A WARNING WHEN THE VEHICLE IS IN REVERSE.
- DEPRESS THE BRAKE PEDAL FIRMLY UNTIL THE VEHICLE IS STOPPED. SET THE PARK BRAKE, AND TURN THE KEY SWITCH TO OFF. TO AVOID UNINTENTIONAL STARTING OR ROLLING OF THE VEHICLE, REMOVE THE KEY WHEN LEAVING.

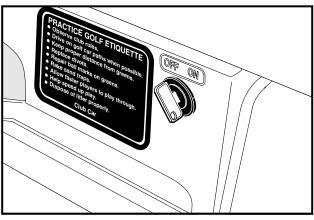
KEY SWITCH -

The key switch is mounted on the dash to the right of the steering column (See Figure 3-3, Page 3-4). It has two positions, OFF and ON, which are clearly labeled.

NOTE

• THE KEY CAN BE REMOVED ONLY WHEN THE KEY SWITCH IS IN THE OFF POSITION.





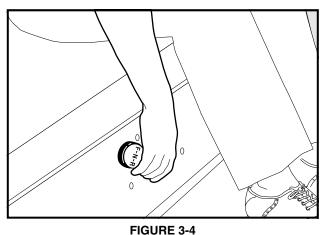


FIGURE 3-3

FORWARD AND REVERSE CONTROL -

DS Gasoline, DS V-Glide Electric, and DS PowerDrive System 48:

The Forward and Reverse Shift Lever is located on the seat support panel, below and to the right of the driver's right knee (See Figure 3-4). The lever has three distinct positions: F (forward), N (neutral), and R (reverse). Rotate the lever towards the driver, F (forward), to run the vehicle in the forward direction, or towards the passenger, R (reverse), to run the vehicle in reverse. When the lever is in the straight up, or N (neutral) position, the vehicle will not run. The engine on the DS Gasoline will stop if it is shifted to neutral while it is running. The DS Electric vehicle operates at reduced speed in reverse.

DS PowerDrive Plus With Regenerative Braking:

The Forward and Reverse Shift Switch is located in the same place on the PowerDrive Plus as the Forward and Reverse Shift Lever is on all other DS models; on the seat support panel below and to the right of the driver's right knee. The Forward (**F**) and Reverse (**R**) positions are clearly marked on the switch. Push down the **F** (forward) side of the switch to run the vehicle in the forward direction, or push down the **R** (reverse) side of the switch to run the vehicle in reverse. When the switch is positioned with neither side down, the vehicle is in the NEUTRAL position and the vehicle will not run if the accelerator is depressed (**See Figure 3-5**).

NOTE

• THE REVERSE BUZZER WILL SOUND AS A WARNING WHEN THE VEHICLE IS IN REVERSE.

ACCELERATOR PEDAL -

The accelerator pedal is the pedal on the right, with the word GO molded into it (See Figure 3-6).

NOTE

- OPERATION OF THE ACCELERATOR PEDAL DIFFERS FROM THAT OF AN AUTOMOBILE. WHEN THE KEY SWITCH IS ON, AND THE SHIFT LEVER IS IN EITHER FORWARD OR REVERSE, DEPRESSING THE ACCELERATOR PEDAL WILL AUTOMATICALLY RELEASE THE PARK BRAKE AND START THE VEHICLE MOVING IN THE DIRECTION SELECTED (FORWARD OR REVERSE). AS THE ACCELERATOR PEDAL IS DEPRESSED, SPEED WILL INCREASE UNTIL FULL SPEED IS REACHED. WHEN THE ACCELERATOR IS RELEASED, POWER WILL BE CUT OFF AND THE ENGINE OR MOTOR WILL STOP RUNNING
- POWERDRIVE PLUS VEHICLES WITH REGENERATIVE BRAKING ONLY: SEE "PEDAL UP" AND "PEDAL DOWN" MOTOR BRAKING ON PAGE 3-3.

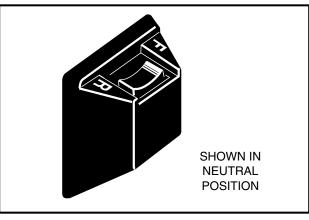




FIGURE 3-5 FIGURE 3-6

BRAKE PEDAL -

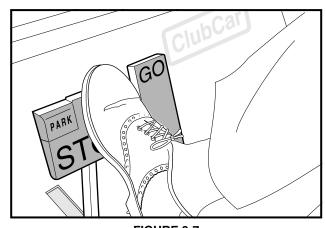
The brake pedal is the large pedal on the left with the word *STOP* molded into it (See Figure 3-6). To slow or stop the vehicle, depress the brake pedal with your right foot (See Figure 3-7).

A WARNING

 THE PARK BRAKE WILL RELEASE AUTOMATICALLY WHEN EITHER THE ACCELERATOR OR BRAKE PEDAL IS DEPRESSED. THE PARK BRAKE HAS MULTIPLE LOCKING POSITIONS AND SHOULD BE FIRMLY PRESSED TO PREVENT THE VEHICLE FROM ROLLING.

PARK BRAKE PEDAL -

The park brake pedal is the small raised portion in the upper left corner of the brake pedal. It has the word PARK molded into it and the words PARK BRAKE marked on top of it (See Figure 3-7). To set the park brake, depress the brake pedal firmly and tilt the park brake portion of the pedal forward with your foot (See Figure 3-8).



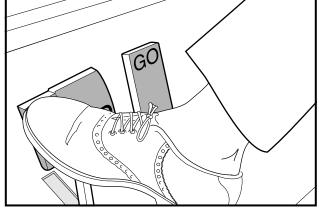


FIGURE 3-7

FIGURE 3-8

GASOLINE VEHICLES ONLY:

NEUTRAL LOCK-OUT -

The vehicle has a neutral lock-out circuit that prevents the driver from starting the vehicle in NEUTRAL. If the vehicle is started in forward or reverse and then shifted to neutral, the engine will stop running. However, for the convenience of the trained mechanic, there is a neutral lock-out cam located on the back of the forward and reverse lever.

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Neutral Lock-out Continued:

If the neutral lock-out cam is pulled out approximately 3/8 inch (10 millimeters) and then rotated one-half turn until it snaps into place, the vehicle will be in the SERVICE position (See Figure 3-9). This will allow the mechanic to run the engine in NEUTRAL for certain maintenance procedures. With the cam in this position, the vehicle will not operate if the forward/reverse lever is placed in either the forward or reverse position. To put the vehicle back into the OPERATE position, pull the cam out approximately 3/8 inch (10 millimeters) and rotate it one-half turn until it snaps into place (See Figure 3-10).

WARNING

WITH THE CAM IN THE SERVICE POSITION AND THE ENGINE RUNNING, THE VEHICLE MAY
MOVE SUDDENLY IF THE FORWARD AND REVERSE LEVER IS SHIFTED OR ACCIDENTALLY
BUMPED. TO PREVENT THIS, BLOCK THE FRONT AND REAR WHEELS AND ALWAYS FIRMLY
SET THE PARK BRAKE BEFORE SERVICING OR LEAVING THE VEHICLE.

NOTE

• BE SURE TO RETURN THE CAM TO THE OPERATE POSITION AFTER SERVICING THE VEHI-CLE. OTHERWISE, THE VEHICLE WILL NOT RUN WITH THE FORWARD AND REVERSE LEVER IN EITHER THE FORWARD OR REVERSE POSITION.

CHOKE-

The choke is located on the seat support panel below and to the left of the driver's left knee (See Figure 3-11). If the vehicle is hard to start in cool or cold temperatures, simply push in the choke cover with your left hand to activate it. Hold it in during start up and release it after the engine starts and runs smoothly.

OIL LIGHT-

The DS Gasoline golf car is equipped with a low oil warning light, located on the dash panel just above the steering column (See Figure 3-12). If the oil warning light comes on, oil should be checked and added to the engine as necessary before continuing to use the vehicle. The vehicle should never be driven with the oil warning light remaining on. If the oil warning light goes on and off, you may proceed, but oil should be added at the first opportunity. If the oil level is correct and the light stays on, have a trained mechanic check the vehicle.

A WARNING

• FAILURE TO ADD OIL IMMEDIATELY WHEN THE OIL LIGHT STAYS ON MAY RESULT IN PER-MANENT ENGINE DAMAGE.

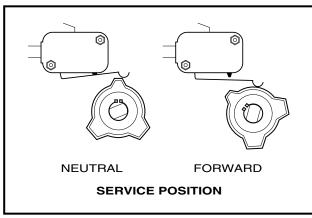
POWERDRIVE SYSTEM 48 AND POWERDRIVE PLUS VEHICLES:

BATTERY WARNING LIGHT -

The PowerDrive System 48 vehicle features a dash mounted warning light (in the same location as the oil warning light on the gasoline vehicle) (See Figure 3-12) that, when the vehicle is in operation, indicates low battery voltage, or, when the vehicle is being charged, indicates a charging problem. The battery warning light is controlled by the PowerDrive System 48 on-board computer.

When the vehicle is in operation, the warning light will come on and remain illuminated if:

- Batteries voltage drops below 48 when there is no load on the batteries (the vehicle is stopped and there are no accessories on).
- Batteries have discharged to less than 25% of rated capacity.



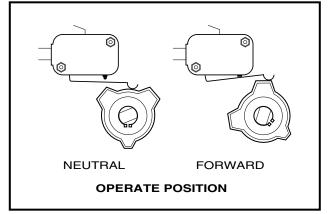
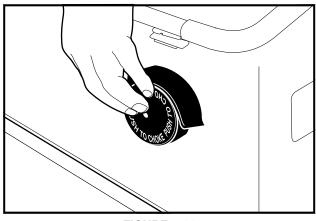


FIGURE 3-9 FIGURE 3-10



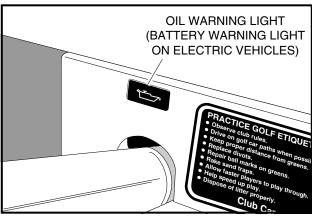


FIGURE 3-11 FIGURE 3-12

If the warning light comes on during a round of golf, there is enough power remaining to finish the round, but the car should be charged before being used again. If the warning light comes on and the vehicle is unable to finish the round, have your Club Car distributor/dealer check the vehicle for a possible battery or electrical system problem.

When the batteries receive an incomplete charge because 1) the DC power cord is disconnected, 2) AC power to the charger is interrupted, 3) automatic charger shut-off occurs after 16 hours of operation, or 4) the charger malfunctions, the warning light will indicate as follows:

- The warning light will not come on if the charge is 90% or more complete. The on-board computer will retain in memory the amount of charge needed to fully replenish the batteries and will complete the charge during the next charge cycle.
- When the charger is unplugged, the warning light will come on and remain illuminated for 10 seconds if
 the charge is less than 90% complete but the car has enough power to complete 36 holes of golf. This
 will alert the fleet operator that the car may be used, but that it must be charged to completion as soon
 as possible.
- The warning light will come on and remain illuminated if the charger times out at 16 hours (see charger manual) and the batteries are not sufficiently charged. This indicates an abnormal charge cycle. The charger and batteries should be checked by your Club Car distributor/dealer.
- The warning light will come on during a charge cycle (DC plug is still connected) if AC power to the charger is interrupted. The light will go out when AC power is restored.

DRIVING INSTRUCTIONS

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A WARNING

- IF RENTING OR LOANING THE VEHICLE, MAKE SURE THE DRIVER IS FAMILIAR WITH ALL CONTROLS AND OPERATING PROCEDURES BEFORE ALLOWING THE VEHICLE TO BE DRIVEN.
- NO MORE THAN TWO PEOPLE SHOULD BE ON THE VEHICLE AT ONE TIME.
- THE VEHICLE IS NOT SPECIALLY EQUIPPED FOR HANDICAPPED PERSONS. BE SURE ALL PERSONS CAN PROPERLY OPERATE THE VEHICLE BEFORE ALLOWING THEM TO DRIVE THE VEHICLE.
- FOR NIGHT USE, THE VEHICLE MUST BE EQUIPPED WITH HEADLIGHTS, TAILLIGHTS, AND REFLECTORS.
- STOP THE VEHICLE BEFORE SHIFTING THE FORWARD/REVERSE LEVER. FAILURE TO DO SO MAY RESULT IN INJURY TO AN UNSUSPECTING PASSENGER AND (OR) DAMAGE TO THE VEHICLE. A BUZZER WILL SOUND AS A WARNING WHEN THE VEHICLE IS IN REVERSE.

WHEN DRIVING THE VEHICLE:

- OPERATE THE VEHICLE FROM THE DRIVER'S SEAT ONLY.
- TO PREVENT FALLS, REMAIN SEATED IN A MOVING VEHICLE AND HOLD ON TO SEAT HANDLES OR HANDRAILS AT ALL TIMES. THE DRIVER SHOULD KEEP BOTH HANDS ON THE STEERING WHEEL AT ALL TIMES.
- KEEP ALL BODY PARTS INSIDE THE VEHICLE TO PREVENT THEM FROM GETTING CAUGHT BETWEEN THE VEHICLE AND THE GROUND OR OTHER OBJECTS.
- DRIVE SLOWLY IN TURNS AND DRIVE SLOWLY STRAIGHT UP AND DOWN SLOPES. DO NOT DRIVE THE VEHICLE ON SLOPES GREATER THAN 20%. FAILURE TO HEED THIS WARNING COULD RESULT IN OVERTURNING OF THE VEHICLE.
- TO AVOID INJURY TO AN UNSUSPECTING PASSENGER AND (OR) DAMAGE TO THE VEHICLE, AVOID SUDDEN STARTS, SUDDEN STOPS, AND ABRUPT TURNS.
- TO AVOID THE POSSIBILITY OF LOSING CONTROL OF, OR OF OVERTURNING THE VEHICLE, REDUCE SPEED FOR ADVERSE DRIVING CONDITIONS SUCH AS WET GRASS OR ROUGH TERRAIN.
- DO NOT USE THIS VEHICLE ON PUBLIC ROADS. IT IS NOT DESIGNED OR INTENDED FOR STREET USE AND SHOULD NOT BE LICENSED FOR USE ON PUBLIC ROADS.
- OBEY ALL LOCAL RULES CONCERNING GOLF CARS.
- THE VEHICLE SHOULD BE DRIVEN IN SPECIFIED AREAS ONLY BY TRAINED DRIVERS.
- TO AVOID BEING STRUCK, DO NOT STAND IN FRONT OF OR BEHIND THE VEHICLE.
- DO NOT DRIVE WHILE UNDER THE INFLUENCE OF ALCOHOL, DRUGS, OR MEDICATIONS.

No one should drive the vehicle without first being instructed in the proper operation and use of the vehicle's controls. An experienced operator should accompany each first-time driver on a test drive before allowing him(her) to operate the vehicle alone. Only licensed drivers should be allowed to drive this vehicle.

To ensure safe operation of the vehicle, follow exactly and in order, all of the procedures listed below. Read and understand all instructions prior to driving the vehicle.

STARTING THE VEHICLE

- 1. Enter the vehicle.
- 2. Study and understand vehicle controls.

- 4. Read safety warnings located above pedals.
- 5. Make sure wheels are turned in desired direction.
- 6. Turn key to **ON** position and be sure nothing is in your path.
- 7. Select direction by placing shift lever in desired position (F = forward or R = reverse).
- 8. Slowly depress accelerator pedal. The park brake will release automatically and the vehicle will start to move. As the accelerator pedal is depressed, speed will increase until full speed is reached.

NOTE

- THE VEHICLE OPERATOR MUST CONTROL SPEED WHEN GOING DOWNHILL.
- GASOLINE VEHICLE ONLY: DEPRESS THE BRAKE PEDAL AS NECESSARY AND PARTIALLY DEPRESS THE ACCELERATOR WHEN DESCENDING A HILL. WITH THE ACCELERATOR PEDAL PARTIALLY DEPRESSED, THE ENGINE GOVERNOR WILL CAUSE THE ENGINE TO CONTROL DOWNHILL SPEED.
- POWERDRIVE PLUS VEHICLE WITH REGENERATIVE BRAKING: "PEDAL DOWN" OR "PEDAL UP" MOTOR BRAKING MAY BE USED TO CONTROL SPEED WHEN GOING DOWNHILL. SEE DS POWERDRIVE PLUS VEHICLES ON PAGE 3-3.

STOPPING THE VEHICLE

To stop the vehicle, release the accelerator pedal and depress the brake pedal with your right foot until the vehicle comes to a complete stop.

WARNING

 DRIVING THROUGH WATER MAY AFFECT THE BRAKES. CHECK THEIR EFFECTIVENESS BY DEPRESSING THE BRAKE PEDAL GENTLY. IF THE VEHICLE DOES NOT SLOW DOWN AT THE NORMAL RATE, CONTINUE TO DEPRESS THE BRAKES UNTIL THEY DRY OUT AND NORMAL PERFORMANCE RETURNS.

A CAUTION

• WHEN STOPPED ON A HILL, USE THE BRAKE PEDAL TO HOLD YOUR POSITION. DO NOT USE THE ACCELERATOR PEDAL.

PARKING AND LEAVING THE VEHICLE

- 1. After stopping the vehicle, firmly depress the park brake pedal until it locks. This will prevent the vehicle from rolling.
- 2. Turn the key switch to OFF and place the shift lever in the NEUTRAL position. Remove the key when the vehicle is not in use.
- Regenerative Braking Vehicles Only: When the vehicle is in use with the key switch ON, the "zero speed detect" function will resist vehicle rolling (See "Zero Speed Detect", Page 3-3).

TOWING

All vehicles are equipped with both front and rear tow bar attaching points. A light duty tow bar is available for break-down towing and single vehicle towing. A heavy duty tow bar and an on-board tow bar are available for multi-vehicle towing. When towing, observe all WARNINGS at top of Page 3-10.

Towing, Continued:

A WARNING

- NEVER TOW THE VEHICLE ON PUBLIC STREETS OR HIGHWAYS.
- USE ONLY APPROVED CLUB CAR TOW BARS.
- TURN THE KEY SWITCH TO OFF AND PLACE THE FORWARD/REVERSE SHIFT LEVER IN THE NEUTRAL POSITION BEFORE TOWING THE VEHICLE.
- EXTREME CAUTION SHOULD BE USED WHEN TOWING ANY VEHICLE.
- DO NOT EXCEED 5 MPH (8KPH) WHEN TOWING.
- DO NOT ALLOW PEOPLE IN THE VEHICLE(S) BEING TOWED.
- AVOID SUDDEN STARTS, SUDDEN STOPS, AND TIGHT TURNS WHEN TOWING.
- DO NOT TOW MORE THAN ONE (1) VEHICLE WITH ANOTHER CLUB CAR. IF MORE THAN ONE VEHICLE MUST BE TOWED, A PROPERLY FITTED VEHICLE WITH A TOW HITCH HEIGHT OF 11 INCHES (28 CM) SHOULD BE USED. ONLY HEAVY-DUTY TOW BARS SHOULD BE USED FOR MULTI-VEHICLE TOWING. NEVER TOW MORE THAN FIVE VEHICLES AT ONE TIME.
- POWERDRIVE PLUS VEHICLE WITH REGENERATIVE BRAKING ONLY: THE KEY SWITCH MUST BE OFF BEFORE THE VEHICLE CAN BE TOWED. THE VEHICLE WILL NOT ROLL OTH-ERWISE.

TRANSPORTING ON A TRAILER

If your vehicle must be transported over long distances or on public highways, it should be done on an approved trailer. **Observe all the following WARNINGS**:

WARNING

- FOR USE ON PUBLIC ROADS, THE TRAILER MUST MEET ALL FEDERAL, STATE, AND LOCAL REQUIREMENTS SUCH AS TAILLIGHTS, BRAKE LIGHTS, ETC.
- ALWAYS USE AN APPROVED TRAILER THAT HAS A LOAD RATING OF 1200 LBS. (544 KG.)
 PER VEHICLE (EXAMPLE: A TWO-CAR TRAILER SHOULD BE RATED AT 2 X 1200 = 2400 LBS.
 (2 X 544 = 1088 KG.).
- NEVER TOW A VEHICLE BEHIND A PASSENGER VEHICLE OR TRUCK UNLESS IT IS ON AN APPROVED TRAILER.
- THE VEHICLE SHOULD BE SECURELY TIED DOWN TO THE TRAILER, WITH THE FORWARD AND REVERSE SHIFT LEVER IN THE NEUTRAL POSITION, THE KEY SWITCH OFF, AND THE PARK BRAKE FIRMLY DEPRESSED AND LOCKED.
- WHEN TOWING A TRAILER, NORMAL SPEED SHOULD BE REDUCED AND CARE SHOULD BE USED WHEN TURNING A CORNER DUE TO THE ADDED LENGTH OF THE TRAILER.
- REMOVE THE VEHICLE WINDSHIELD BEFORE TRANSPORTING ON A TRAILER.

STORAGE - GASOLINE VEHICLE

To prepare your vehicle for extended off season storage:

1. Store the vehicle in a cool place. This will prevent self-discharge of the battery. If the battery appears to be weak, have it charged using an automotive type 12 volt battery charger rated 10 amps or less.

A DANGER

- GASOLINE FLAMMABLE! EXPLOSIVE! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY FROM THE AREA OF THE VEHICLE.
- NEVER ATTEMPT TO DRAIN GASOLINE WHEN THE ENGINE IS HOT OR WHILE IT IS RUNNING. BE SURE TO CLEAN UP ANY SPILLED GASOLINE BEFORE OPERATING THE VEHICLE.
- STORE GASOLINE IN AN APPROVED GASOLINE CONTAINER ONLY. STORE IN A WELL-VEN-TILATED AREA AWAY FROM SPARKS, OPEN FLAME, HEATERS, OR HEAT SOURCES.
- DO NOT SERVICE, REPAIR, OR OPERATE IN AN ENCLOSED AREA WITHOUT PROPER VENTILATION. THE ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POISON.
- KEEP GASOLINE OUT OF THE REACH OF CHILDREN.
- DO NOT SIPHON GASOLINE FROM THE VEHICLE.

A WARNING

• DO NOT ATTEMPT TO CHARGE A BATTERY IF IT IS FROZEN OR IF THE CASE IS BULGED. DISCARD THE BATTERY, FROZEN BATTERIES CAN EXPLODE.

A CAUTION

- BATTERIES IN A LOW STATE OF CHARGE WILL FREEZE AT LOW TEMPERATURES.
- 2. Drain carburetor and seal the fuel tank.
 - 2.1. Place the Forward and Reverse Lever in the NEUTRAL position and the neutral lock-out cam in the SERVICE position. Disconnect the fuel line from the fuel pump and run the engine until fuel remaining in the carburetor and fuel lines is used up and the engine stalls. Return the neutral lock-out cam to OPERATE position.
 - 2.2. Loosen (do not remove) the carburetor drain screw and drain fuel remaining in bowl into a small container, then pour the fuel from the container into vehicle fuel tank.
 - 2.3. Reconnect fuel line to fuel pump.
 - 2.4. Disconnect fuel vent line from fuel tank vent nipple.
 - 2.5. Plug the fuel tank vent nipple so that it is air tight. We recommend using a slip-on vinyl cap.
- 3. To protect the engine, remove the spark plug and pour 1/2 ounce of SAE 10 weight oil into the engine through the spark plug hole. Rotate the engine crank shaft several times and then re-install the spark plug.

A WARNING

- TURN THE KEY SWITCH TO *OFF*, REMOVE THE KEY, AND LEAVE THE FORWARD AND REVERSE LEVER IN THE *NEUTRAL* POSITION DURING STORAGE. THIS IS TO PREVENT UNINTENTIONAL STARTING OF THE VEHICLE.
- 4. Increase tire pressure to 20 psi.
- 5. Grease front suspension and do all quarterly periodic lubrication (See Periodic Lubrication Schedule, Section 4, Page 4-2).
- 6. Thoroughly clean front body, rear body, seats, engine compartment, and underside of vehicle.
- 7. Do not latch the park brake. Block tires to prevent the vehicle from rolling.

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TO RETURN THE STORED VEHICLE TO SERVICE:

- 1. Restore fuel system to operation.
 - 1.1. Remove plug from the fuel tank vent nipple and reconnect fuel vent line to tank.
 - 1.2. Place the Forward and Reverse Lever in the NEUTRAL position and the neutral lock-out cam in the SERVICE position. Crank the engine until fuel is pumped into the carburetor and fuel lines and the engine starts. Turn engine off and return neutral lock-out cam to the OPERATE position.
- 2. Readjust tire pressure to 12-14 psi (83-96 kPa).
- 3. Perform the Pre-Operation Checklist (See Page 3-2).

NOTE

• WHEN RUNNING THE ENGINE FOR THE FIRST TIME AFTER STORAGE, IT MAY SMOKE EXCESSIVELY DUE TO THE OIL ADDED TO THE ENGINE IN PREPARATION FOR STORAGE.

STORAGE - ELECTRIC VEHICLE

A WARNING

- TURN THE KEY SWITCH TO *OFF*, REMOVE THE KEY, AND LEAVE THE FORWARD AND REVERSE LEVER IN THE *NEUTRAL* POSITION DURING STORAGE. THIS IS TO PREVENT UNINTENTIONAL STARTING OF THE VEHICLE.
- DO NOT ATTEMPT TO CHARGE FROZEN BATTERIES OR BATTERIES WITH BULGED CASES; DISCARD BATTERIES. FROZEN BATTERIES CAN EXPLODE.

A CAUTION

- BATTERIES IN A LOW STATE OF CHARGE WILL FREEZE AT LOW TEMPERATURES.
- WHEN WASHING THE VEHICLE, DO NOT DIRECT WATER STREAM AT THE SPEED SWITCH.
- IF BATTERY WIRE TERMINALS ARE DAMAGED OR CORRODED, THEY SHOULD BE REPLACED OR CLEANED AS NECESSARY. FAILURE TO DO SO MAY CAUSE THEM TO OVERHEAT DURING OPERATION.
- 1. Fully charge batteries (See Section 22, Page 7).
- 2. Wash off any corrosion around the terminals with a solution of baking soda and water, then rinse (NOTE: Do not allow this solution to enter the batteries). Let the terminals dry and coat them with CLUB CAR battery terminal spray, Part No. 1014305.
- 3. Store in a cool, dry place. This will prevent self-discharge of the batteries.
- 4. Adjust tire pressure to 20 psi.
- 5. Grease front suspension and do all quarterly periodic lubrication (See Periodic Lubrication Schedule, Section 4, Page 4-3).
- 6. Thoroughly clean front body, rear body, seats, battery compartment, and underside of vehicle.
- 7. Do not latch the park brake. Block tires to prevent the vehicle from rolling.
- 8. Keep batteries fully charged during storage (See Section 22, Page 7).
 - Recharge 36 volt vehicles with Accu-Power battery chargers every 6-8 weeks as necessary.
 - Leave PowerDrive System 48 and PowerDrive Plus vehicles with PowerDrive chargers plugged in during storage. The PowerDrive storage charge feature will automatically charge the batteries as needed (See Off-season Storage Charge, Section 23, Page 28). See NOTE at the top of Page 3-13.

NOTE

- A POWERDRIVE SYSTEM 48 VEHICLE WILL NOT OPERATE WHILE PLUGGED TO A CHARGER.
- E
- 9. If PowerDrive System 48 and PowerDrive Plus vehicles cannot be connected to a charger during storage, disconnect the batteries as shown (**Figure 3-13**).

TO RETURN THE STORED VEHICLE TO SERVICE:

1. Fully charge the batteries (See Battery Charging, Section 22, Page 7).

NOTE

- POWERDRIVE SYSTEM 48 VEHICLES WILL NOT REQUIRE CHARGING IF THEY REMAINED PLUGGED IN DURING STORAGE.
- 2. Readjust tire pressure to 18-20 psi.
- 3. Perform the Pre-Operation Checklist (See Pages 3-2 and 3-3).

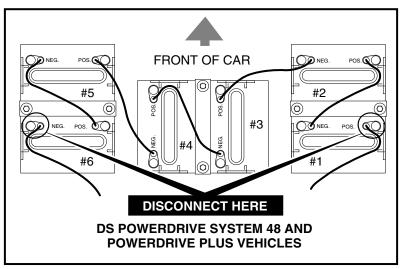


FIGURE 3-13

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SECTION 4 - PERIODIC MAINTENANCE

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It is important to implement and follow a *Preventive Maintenance* program for your vehicle(s). Preventive Maintenance consists of the regular performance of scheduled vehicle service and maintenance procedures, and is the only way to insure that the vehicle provides the safe, reliable, and economical service that it is

designed to deliver. The following charts provide recommended service intervals for the lubrication and maintenance of DS vehicles. Note that critical areas such as brake operation, accelerator operation, steering and tires should be performed daily. Any car that is not functioning properly should be removed from use until it is properly repaired.

A WARNING

- IF ANY PROBLEMS ARE FOUND DURING SCHEDULED INSPECTION OR SERVICE, DO NOT OPERATE THE VEHICLE UNTIL REPAIRS ARE MADE. FAILURE TO MAKE NECESSARY REPAIRS COULD RESULT IN FIRE, PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE SWITCH IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT MOTOR, RESISTORS, ENGINE, OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CONNECTIONS.

GASOLINE VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5, PAGE 22-5 FOR V-GLIDE VEHICLES, OR FIGURE 22-6, PAGE 22-5 FOR POWERDRIVE VEHICLES, AND THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO "ON" AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

LUBRICATION - GASOLINE VEHICLES

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PERIODIC LUBRICATION SCHEDULE - GASOLINE VEHICLES			
REGULAR INTERVAL	SERVICE	PLACE*	RECOMMENDED LUBRICANT
Quarterly by Owner	Brake shaft bearings	1.	Dry Moly Lube - Club Car Part No. 1012151
or Trained Technician	Brake Linkage and Pivots	2.	Dry Moly Lube - Club Car Part No. 1012151
	Accelerator push rod pivots and shifter cable pivots	3.	Dry Moly Lube - Club Car Part No. 1012151
	Front Suspension (5 fittings)	4.	Chassis Lube - EP NLGI 2
Anually by Trained Technician Only (Every 200 rounds or 100 hours of operation)	Check/fill transaxle to plug level	5.	22 oz. (.67 liter) SAE 30 WT. API Class SE, SF, or SG Oil (or higher)
	Inspect front wheel bearings (Repack as necessary)	6.	Chassis Lube - EP NLGI 2
	Check/fill transmission to plug level	7.	80-90 WT. API Class GL-3 or 80-90 WT. AGMA Class EP Gear Lube
First Change 100 Hours - Additional Change Every 400 Rounds or Every 200 Hours of Operation, or Anually - Whichever Comes First	Change engine oil and oil filter	8.	32 oz. (.97 liter) without filter; 38 oz. (1.16 liters) with filter. SAE30 WT. above 32°F (0°C) or SAE 5W20 below 32°F (0°C) API Class SE, SF, or SG Oil (or higher)

^{*}See Figure 4-1 below.

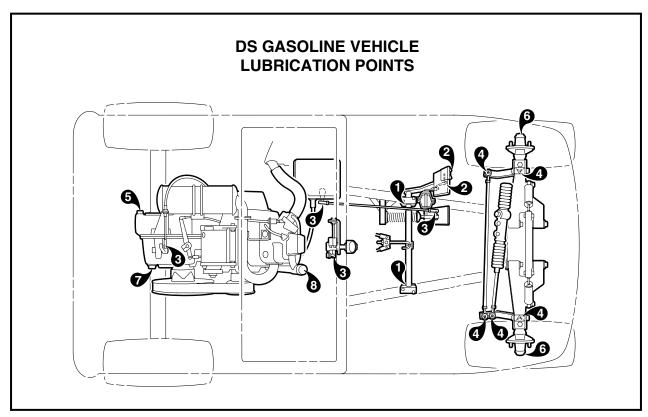


FIGURE 4-1

PERIODIC LUBRICATION SCHEDULE - ELECTRIC VEHICLES				
REGULAR INTERVAL	SERVICE	PLACE*	RECOMMENDED LUBRICANT	
Quarterly by Owner or Trained Technician	Brake shaft bearings	1.	Dry Moly Lube - Club Car Part No. 1012151	
or trained technician	Brake Linkage and Pivots	2.	Dry Moly Lube - Club Car Part No. 1012151	
	Accelerator pivots	3.	Dry Moly Lube - Club Car Part No. 1012151	
	Forward and reverse switch contacts and charger receptacle	4.	WD-40®	
	Front Suspension (5 fittings)	5.	Chassis Lube - EP NLGI 2	
Anually by Trained Technician Only (Every 200 rounds or	Check/fill drive unit to plug level	6.	22 oz. (.67 liter) SAE 30 WT. API Class SE, SF, or SG Oil (or higher)	
100 hours of operation)	Inspect front wheel bearings (Repack as necessary)	7.	Chassis Lube - EP NLGI 2	

^{*}See Figure 4-2 below, and Figure 4-3 on Page 4-4.

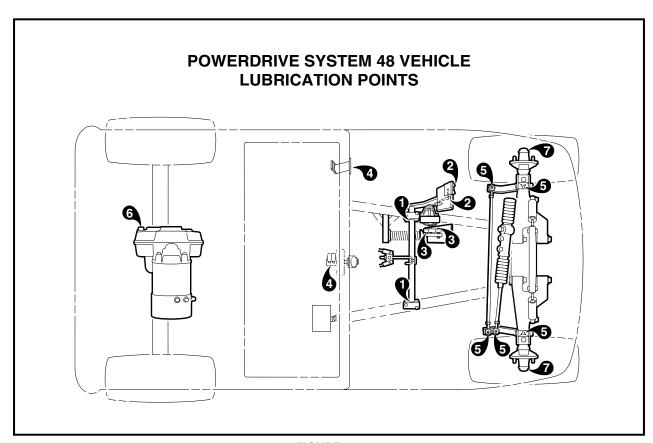


FIGURE 4-2

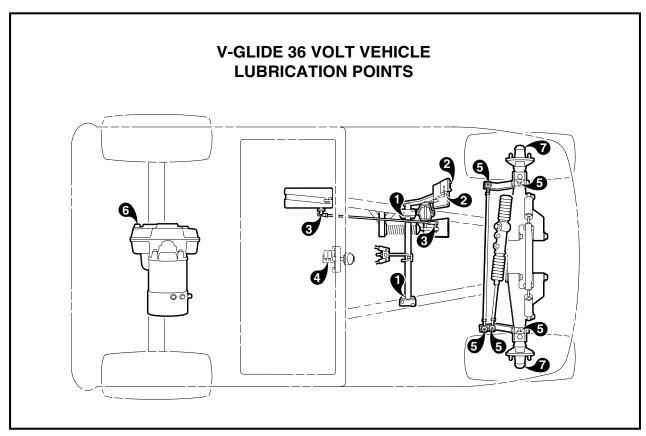


FIGURE 4-3

VEHICLE CAPACITIES

CAPACITIES		
	GASOLINE	ELECTRIC
Engine Crankcase without filter	32 oz. (.98 liters)	
Engine Crankcase with filter	38 oz. (1.16 liters)	
Transmission	20 oz. (.61 liters)	
Drive Unit	22 oz. (.67 liters)	22 oz. (.67 liters)
Gasoline Tank	7 gallons (26.5 liters)	
Tire Pressure	12-14 psi (83-96 kPa)	18-20 psi (124-138 kPa)

A WARNING

• IF ANY PROBLEMS ARE FOUND DURING SCHEDULED INSPECTION OR SERVICE, DO NOT OPERATE THE VEHICLE UNTIL REPAIRS ARE MADE. FAILURE TO MAKE NECESSARY REPAIRS COULD RESULT IN FIRE, PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.

A WARNING

- IF ANY PROBLEMS ARE FOUND DURING SCHEDULED INSPECTION OR SERVICE, DO NOT OPERATE VEHICLE UNTIL REPAIRS ARE MADE. FAILURE TO MAKE NECESSARY REPAIRS COULD RESULT IN FIRE, PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.
- ALL SERVICE, REPAIRS, AND ADJUSTMENTS MUST BE MADE PER INSTRUCTIONS IN THIS MANUAL.

PERIODIC SERVICE SCHEDULE - GASOLINE VEHICLES		
REGULAR INTERVAL	SERVICE	
	Accelerator pedal/rod	Check for proper operation (See Section 6). Adjust as necessary.
	Accelerator/governor linkage and cables	Check for proper operation (See Section 14, Page 8). Adjust as necessary.
	Brake System	Check for proper operation (See Performance Inspection, Page 3-2). Adjust as necessary.
	Choke	Check for proper operation (See Section 14).
	Engine	Check for proper operation (See Section 13)
	Engine air intake system	Check air filter element, clean as necessary.
	Engine cooling air intake	Check for clogging, clean as necessary.
Daily Service by Owner	Fuel System	Check fuel tank, lines, cap, pump, and carburetor for fuel leakage.
	Park Brake	Check for proper operation. (See Section 3, Page 2). Adjust as necessary.
	Reverse Warning Buzzer	Check for proper operation (See NOTE, Page 3-4).
	Steering and linkages	Check for proper operation (See Section 8, Page 6). Adjust as necessary.
	Tires	Check for wear and damage.
	Transmission	Check shift linkage for proper operation.
	Vehicle warning decals	Make sure all are in place (See Gasoline Vehicle Feature Identification, in DS Owner's Manual).
Weekly Service by Owner	Battery	Clean terminals and wash dirt from casing, check electrolyte level (See Section 22).
	Electrical wiring and connections	Check for tightness and damage.
	Torque Converter	Rinse with water.
		Check for loose hardware and tighten as required.
	General Vehicle	Check maximum speed of vehicle. Maximum vehicle speed should be 12-15 mph (19-24 kph).
		Wash engine compartment and underside of vehicle.
	Check all daily items listed above.	
Periodic Service Schedule C	Continued on Next Page.	

PERIODIC SERVICE SCHEDULE - GASOLINE VEHICLES			
REGULAR INTERVAL	SERVICE		
	Battery	Wash battery top with baking soda/water solution (See Section 22).	
		Check brake cables for damage; replace as required.	
	Brake System	Check for proper operation (See Performance Inspection, Page 3-2). Check brake pedal free play. Adjust as necessary (See Section 6).	
Monthly Service by Owner or Trained Mechanic	Engine	Make sure that both ground wires are tight and properly connected.	
or trained wechanic		Check engine oil level - change as required (See Gas Vehicle Lubrication Chart, Page 4-2).	
	Exhaust System	Check for leaks.	
		Check for wear and damage.	
	Tires	Check air pressure and adjust as necessary (See Vehicle Capacities Chart on Page 4-4).	
	Check all daily and weekly items listed al	bove.	
	Engine	Check engine oil level - change as required (See Gas Vehicle Lubrication Chart, Page 4-2).	
	Engine air intake hose	Check clamps for tightness; check hose for cracks.	
	Accelerator pedal/rod	Check for proper operation, adjust as necessary (See Section 6).	
Quarterly Service by Owner or Trained Mechanic	Accelerator/governor linkage and cables	Check for proper operation, adjust as necessary (See Section 14).	
	Steering	Lubricate per Gas Vehicle Lubrication Chart on Page 4-2.	
	General Vehicle	Lubricate per Gas Vehicle Lubrication Chart on Page 4-2.	
	Check all daily, weekly, and monthly items listed above.		
	Brake System	Check for proper operation (See Performance Inspection, Page 3-2). Check brake pedal free play. Clean, and adjust as necessary (See Section 6).	
		Check brake shoes, replace if necessary.	
Semi-annual Service by Trained Mechanic Only (Every 100 rounds or 50 hours of operation)		Lubricate slide plates with graphite (See Section 7, Page 7-4).	
	Drive Belt	Check for cracks, wear, or glazing, replace if necessary.	
	Electrical Wiring	Check for cracked or worn insulation.	
	Engine	Check spark plug wire and boot for damage and proper routing (See Section 13).	
	Exhaust System	Check head and exhaust/header pipe flange connection gasket for leaks.	
		Check muffler condition.	
	Front Wheel Alignment and Camber	Check and adjust as required (See Section 8, Page 8-18).	
Periodic Service Schedule C	ontinued on Next Page.		

PERIODIC SERVICE SCHEDULE - GASOLINE VEHICLES			
REGULAR INTERVAL	SERVICE	SERVICE	
Semi-annual Service by Trained Mechanic Only (Every 100 rounds or 50 hours of operation),	Torque Converter/Drive Belt	Check for proper operation. Inspect belt and replace as required (See Section 16).	
	Starter/Generator Belt	Check for cracks, wear, and glazing, replace if necessary.	
		Check belt tension, adjust as required (Section 12).	
Continued:	General Vehicle	Lubricate per Gas Vehicle Lubrication Chart on Page 4-2.	
	Check all daily, weekly, monthly, and	Check all daily, weekly, monthly, and quarterly items listed above.	
	Engine	Check engine oil level - change as required (See Gas Vehicle Lubrication Chart, Page 4-2).	
		Check for leaks around gaskets, fill plugs, etc.	
		Inspect, clean, and regap spark plug; replace if necessary.	
	Engine Air Intake	Check air filter element, clean or replace.	
Annual Camina hu	Fuel Filters	Replace.	
Annual Service by Trained Mechanic Only (Every 200 rounds or 100 hours of operation)	Front Wheel Bearings	Check front wheels for free play. Inspect and replace or repack wheel bearings with chassis lube as necessary (See Section 8, Page 8-25).	
	Starter/Generator	Check brush length (remove excess carbon dust); replace as necessary (See Section 12).	
	Transaxle	Check/fill transaxle to plug level (See Gas Vehicle Lubrication Chart on Page 4-2).	
	General Vehicle	Lubricate per Gas Vehicle Lubrication Chart on Page 4-2.	
	Check all daily, weekly, monthly, quarterly, and semi-annual items listed above.		

PERIODIC SERVICE - ELECTRIC VEHICLES

A WARNING

- IF ANY PROBLEMS ARE FOUND DURING SCHEDULED INSPECTION OR SERVICE, DO NOT OPERATE THE VEHICLE UNTIL REPAIRS ARE MADE. FAILURE TO MAKE NECESSARY REPAIRS COULD RESULT IN FIRE, PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH.
- ALL SERVICE, REPAIRS, AND ADJUSTMENTS MUST BE MADE PER INSTRUCTIONS IN THIS MANUAL.

PERIODIC SERVICE SCHEDULE - ELECTRIC VEHICLES		
REGULAR INTERVAL	SERVICE	
Daily Service by Owner	Accelerator pedal/rod	Check for proper operation (See Section 6). Adjust as necessary.
	Accelerator Switch (Wiper Switch or Continuously Variable Potentiometer)	Check for proper operation (See Performance Inspection, Section 3, Page 2).
Periodic Service Schedule Continued on Next Page.		

		EHICLES		
REGULAR INTERVAL	SERVICE			
Daily Service by Owner, Continued:	Batteries	Charge batteries.		
	Brake System	Check for proper operation (See Performance Inspection, Page 3-2). Adjust as necessary.		
	Charger and Receptacle	Check for damage and snug fit.		
	Park Brake	Check for proper operation (See Section 6). Adjust as necessary.		
	Reverse Warning Buzzer	Check for proper operation (See NOTE, Section 3, Page 4).		
	Steering and linkages	Check for proper operation (See Section 8).		
	Tires	Check for wear and damage.		
	Vehicle warning decals	Make sure all are in place (See Electric Vehicle Feature Identification, DS Owner's Manual).		
	Batteries	Clean terminals and wash dirt from casing, check electrolyte level (See Section 22, Page 6).		
	Electrical wiring and connections	Check for tightness and damage.		
Weekly Service by Owner	General Vehicle	Check for loose hardware and tighten as required.		
		Check maximum speed of vehicle. Maximum vehicle speed should be 12-15 mph (19-24 kph).		
	Check all daily items listed above.	Check all daily items listed above.		
	Batteries	Wash battery tops with baking soda/water solution.		
	Brake System	Check for proper operation (See Performance Inspection, Page 3-2). Check brake pedal free play. Adjust as necessary (See Section 6).		
		Check brake cables for damage and replace as required.		
Monthly Service by Owner or Trained Mechanic		Check for wear and damage.		
or trained mechanic	Tires	Check air pressure and adjust as necessary (See Vehicle Capacities Chart on Page 4-4).		
	Accelerator Switch (Wiper Switch or Continuously Variable Potentiometer)	Check for cracks or other damage; make sure switch is securely fastened to frame.		
	Check all daily and weekly items listed above.			
Quarterly Service by Owner or Trained Mechanic	Accelerator pedal/rod	Check for proper operation, adjust as necessary (See Section 6).		
	Steering	Lubricate per Electric Vehicle Lubrication Chart on Page 4-3.		
	General Vehicle	Lubricate per Electric Vehicle Lubrication Chart on Page 4-3.		
	Check all daily, weekly, and monthly items listed above.			

PERIODIC SERVICE SCHEDULE - ELECTRIC VEHICLES			
REGULAR INTERVAL	SERVICE		
Semi-annual Service by Trained Mechanic Only (Every 100 rounds or 50 hours of operation)	Batteries	Check specific gravity, electrolyte level, and on- charge voltage (See Section 22).	
	Brake System	Check for proper operation (See Performance Inspection, Page 3-2). Check brake pedal free play. Clean, and adjust as necessary (See Section 6).	
		Check brake shoes, replace if necessary.	
		Lubricate slide plates with graphite (See Section 7).	
	Electrical Wiring	Check for cracked or worn insulation.	
	Forward and Reverse Switch	Check condition of contacts and wire connections; Make sure connections are tight.	
	Front Wheel Alignment and Camber	Check and adjust as required (See Section 8, Page 8-18).	
	General Vehicle	Lubricate per Electric Vehicle Lubrication Chart on Page 4-3.	
	Check all daily, weekly, monthly, and quarterly items listed above.		
Annual Service by Trained Mechanic Only (Every 200 rounds or 100 hours of operation)	Accelerator Switch (Wiper Switch or Continuously Variable Potentiometer)	Check for proper operation (See Performance Inspection, Section 3, Page 2). Wiper switch type only: Remove cover and check contacts for burns, excessive heat, or arcing; check brush for wear.	
	Batteries	Perform discharge test (See Section 22, Page 13).	
	Motor	Check motor brushes; replace as necessary (See Section 24).	
	Front Wheel Bearings	Check front wheels for free play. Inspect and replace or repack wheel bearings with chassis lube as necessary (See Section 8, Page 8-25).	
	Transaxle	Check/fill transaxle to plug level (See Electric Vehicle Lubrication Chart on Page 4-3).	
	General Vehicle	Lubricate per Electric Vehicle Lubrication Chart on Page 4-3.	
	Check all daily, weekly, monthly, quarterly, and semi-annual items listed above.		



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SECTION 5 - BODY AND TRIM

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A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING THE VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- ALWAYS WEAR A RESPIRATOR APPROVED FOR DUST AND MIST WHEN CUTTING, SANDING, PAINTING, OR REPAIRING BODY PANELS.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WITH THE ENGINE/MOTOR RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT MOTOR, RESISTORS, ENGINE, OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING CAN RESULT IN SEVERE BURNS.
- GASOLINE VEHICLE: TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT THE SPARK PLUG WIRE FROM THE PLUG.
- ELECTRIC VEHICLE: TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR FIGURE 22-6, PAGE 22-5. THEN DISCHARGE THE CONTROLLER ON POWERDRIVE VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO **ON** AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

A CAUTION

- DO NOT USE DETERGENTS OR CLEANING SOLVENTS THAT CONTAIN AMMONIA, AROMATIC SOLVENTS, OR ALKALI MATERIALS ON BODY PANELS OR SEATS.
- DO NOT ALLOW BATTERY ACID TO DRIP ON BODY PANELS. BATTERY ACID WILL CAUSE PERMANENT BLEMISHES. WASH ACID OFF BODY PANELS IMMEDIATELY.

GENERAL INFORMATION

Each vehicle is equipped with an injection molded Armorflex® front and rear body. Use a mild soap or detergent with a sponge or soft cloth for normal cleaning. Battery acid, fertilizers, tars, asphalt, creosote, paint, or chewing gum should be removed immediately to prevent possible stains. Because the finish on the vehicle is the same as the finish on today's automobiles, commercial automotive cleaning products should be used.

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FRONT AND REAR BODY REPAIR

STRESS LINES OR STREAKS

Repeated flexing of the body can cause white stress lines or streaks to appear. To remove them:

- 1. Hold a heat gun twelve inches (30 centimeters) away from the affected area, with the gun on its lowest heat setting.
- 2. Slowly wave the heat gun back and forth over the affected area until the streak fades.
- 3. It may be necessary to move the gun closer to the body to fade the streak, but under no circumstances should the gun be held closer than six inches (15 centimeters) to the body.

A CAUTION

 HOLDING THE HEAT GUN TOO CLOSE TO THE BODY COULD MELT THE BODY OR DAMAGE THE CLEAR COAT.

DEFORMATION

Deformations in the body can be repaired using a procedure similar to the one used to remove stress lines. To remove deformations:

- 1. Hold a heat gun 12 inches (30 centimeters) away from the affected area, with the gun on its lowest heat setting.
- 2. Periodically remove the heat gun and bend the body in the opposite direction of the deformation.
- 3. Continue heating and bending the body until the original shape returns. Under no circumstances should the gun be held closer than six inches (15 centimeters) to the body.

Minor scratches or blemishes in the front body that do not penetrate the clear coat can be buffed out using most commercially available automotive polishing compounds and polishes.

LARGE SCRATCHES AND ABRASIONS

To repair large scratches that penetrate through the clear coat:

- Water sand the body.
- 2. Clean and dry the body thoroughly.
- 3. Apply a light coat of adhesion promoter (Club Car Part No. 1016985) to the affected area.

A CAUTION

- DO NOT SPRAY ADHESION PROMOTER ON EXISTING CLEARCOAT. MASK BODY PANEL AROUND THE AREA TO BE SPRAYED, THEN REMOVE EXISTING CLEARCLOAT IN THE DAM-AGED AREA BEFORE APPLYING ADHESION PROMOTER. ADHESION PROMOTER APPLIED ON CLEARCOAT WILL CAUSE THE CLEARCOAT TO WRINKLE.
- 4. Spray the body with a commercially available clear coat per the manufacturer's instructions.

GOUGES, PUNCTURES, AND TEARS

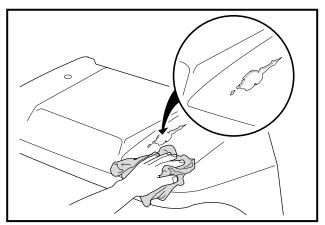
To repair gouges, punctures, and tears:

- 1. To determine the extent of the damage, use clean rags to clean a considerable distance in every direction around the damaged area (Figure 5-1).
- 2. If the damaged area has ragged edges, cut or grind away all loose material. Undercut the perimeter of the gouge or hole in order to promote adhesion (Figure 5-2). Sand all of the area to be repaired with sandpaper. Apply less pressure as you get closer to damaged area.

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A DANGER

- CONTAINS EPOXY-RESIN, TERTIARY-AMINES, POLYMERCAPTANS, AND POLYAMIDES.
- EPOXY RESINAMINE HARDENER MIXTURE CAUSES EYE IRRITATION, MAY CAUSE SKIN IRRITATION, AND IS HARMFUL IF SWALLOWED. DO NOT GET IN EYES, ON SKIN, OR IN MOUTH!
 - FLUSH EYES WITH RUNNING WATER FOR FIFTEEN MINUTES CALL A PHYSICIAN!
 - WIPE OFF SKIN AND WASH THOROUGHLY WITH SOAP AND WATER.
 - IF SWALLOWED, INDUCE VOMITING CALL A PHYSICIAN! RINSE MOUTH WITH WATER.
- KEEP AWAY FROM CHILDREN!



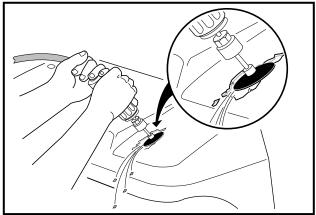
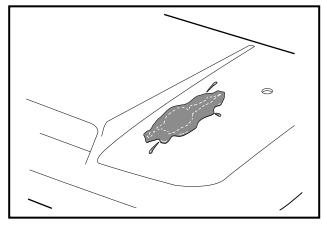


FIGURE 5-1 FIGURE 5-2



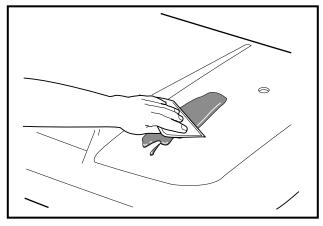
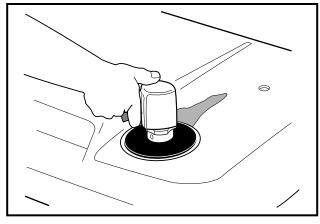


FIGURE 5-3 FIGURE 5-4

5. After the epoxy has cured for a minimum of thirty minutes, use 80 grit sandpaper to rough the epoxy to the proper contour (Figure 5-5, Page 5-4). If needed, apply additional resin and hardener mixture to fill in any low spots or pinholes (Figure 5-6, Page 5-4). Allow twenty-four hours for the epoxy to cure thoroughly before finish sanding.

Gouges, Punctures, and Tears, Continued:



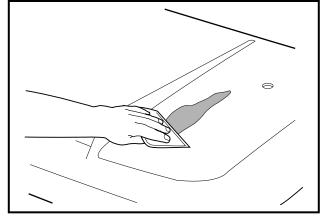
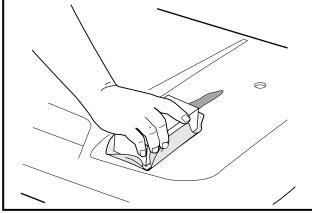


FIGURE 5-5

FIGURE 5-6



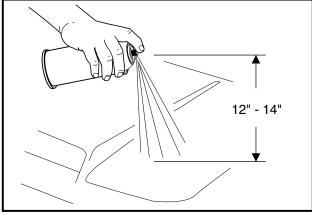


FIGURE 5-7

FIGURE 5-8

- 6. To smooth the finish, sand the final filler application by hand with 240 grit sandpaper on a block (Figure
- 7. Apply a light coat of adhesion promoter and let it air dry for 30 minutes.
- 8. Paint the repaired area with matching spray paint (available from Club Car). Hold the can about 12 to 14 inches (30-35 cm) from the repaired surface and coat with light, even strokes (Figure 5-8). Additional coats may be required.
- 9. Apply any commercially available clear coat. Follow the manufacturer's instructions.

SEAT

Proper cleaning of the seat will make it last longer. Mild soap or detergent applied with a sponge or soft cloth is recommended for normal cleaning. For stubborn or imbedded dirt, a soft bristle brush may be used.

FRONT BODY

FRONT BODY REMOVAL

WARNING

 ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING THIS VEHICLE.

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR A RESPIRATOR APPROVED FOR DUST AND MIST WHEN CUTTING, SANDING, PAINTING, OR REPAIRING BODY PANELS.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION. AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WITH THE ENGINE/MOTOR RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT MOTOR, RESISTORS, ENGINE, OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING CAN RESULT IN SEVERE BURNS.
- GASOLINE VEHICLE: TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT THE SPARK PLUG WIRE FROM THE PLUG.
- **ELECTRIC VEHICLE**: TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURES 22-5 AND 22-6, PAGE 22-5. THEN DISCHARGE THE CONTROLLER ON POWERDRIVE VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO **ON** AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.
- 1. Remove screws (Item 3) and nylon lock hex nuts (Item 4) to remove front bumper from car frame. Remove blind rivets (Item 5) (Figure 5-9, Page 5-6).
- 2. Remove carriage bolts (Item 10), lock nuts (Item 4), and washers (Item 11) from front body trim. Remove screws (Item 3) from top of front body (Figure 5-9, Page 5-6).
- 3. Loosen (do not remove) T-nuts (Item 13) holding front body trim (Item 9) against front body (Figure 5-9, Page 5-6).
- 4. Pull front body from under front body trim (Item 9) and lift it from the vehicle (Figure 5-9, Page 5-6).

FRONT BODY INSTALLATION

1. Reverse removal procedure.

REAR BODY

REAR BODY REMOVAL

NOTE

- REAR BUMPER DOES NOT HAVE TO BE REMOVED TO REMOVE REAR BODY.
- 1. Remove the seat from the rear body.

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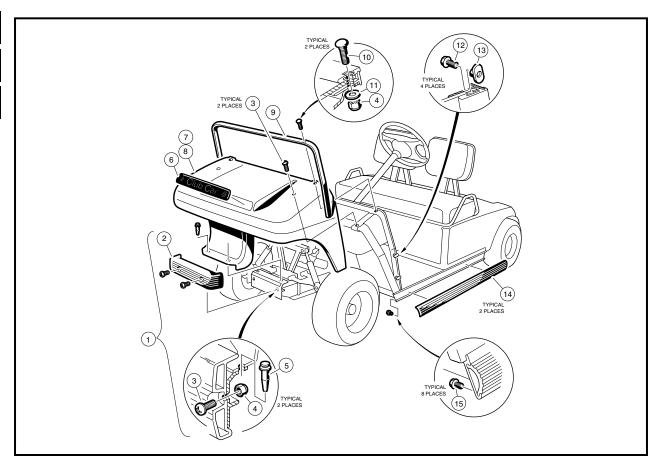
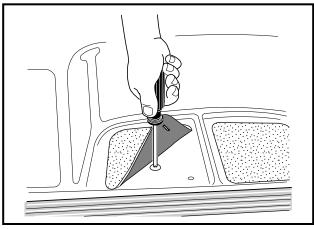


FIGURE 5-9

Rear Body Removal, Continued:

- Remove two screws and lock nuts located under the mats (one under each mat) in the bagwell floor (Figure 5-10).
- 3. Remove two screws located at the bottom edge of the seat support panel (below the Forward and Reverse shift lever just above the floormat) (Figure 5-11).
- 4. Remove the screw securing the Forward and Reverse Lever and slide the lever from the shaft.
- 5. Remove/disconnect vehicle controls:
 - Electric vehicles
 - Remove the wire tie binding the 10 gauge red wire (from charger receptacle to battery) to Forward and Reverse Switch wires.
 - Remove three screws, hex nuts, and lock washers securing the Forward and Reverse Switch to the rear body, then pull the Forward and Reverse Switch from the rear body and place it on the vehicle frame I-beam (with wiring intact).
 - Disconnect the three wires from the rear of the charger receptacle (inside the battery compartment) (See Figure 5-12). The receptacle does not have to be removed from the body.
 - · Gasoline vehicles
 - Remove four screws, hex nuts, and lock washers securing the Forward and Reverse Switch to the rear body. Pull the Forward and Reverse Switch from the rear body and place it on the vehicle frame I-beam.
 - Remove the shifter cable from the slotted mounting bracket on the rear body.
 - Remove the air intake expansion chamber.



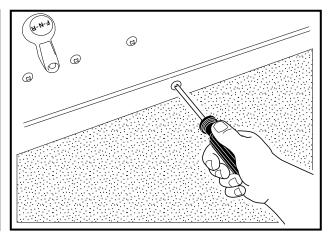


FIGURE 5-10

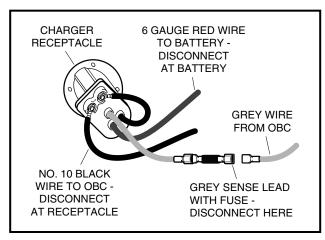


FIGURE 5-11

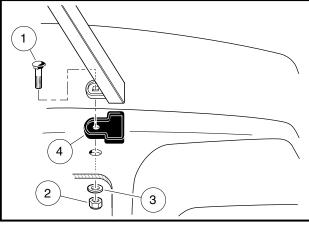


FIGURE 5-12

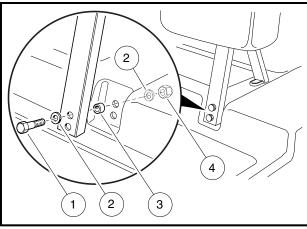


FIGURE 5-13

FIGURE 5-14

- 6. Remove two carriage bolts (Item 1), nuts (Item 2), and washers (Item 3) attaching the rear legs of the seat back support assembly to the rear body (Figure 5-13).
- 7. Remove four bolts (Item 1), eight flat washers (Item 2), four spacers (Item 3), and four lock nuts (Item 4) attaching the front legs of the seat back support assembly to the rear body (Figure 5-14).
- 8. Lift the seat back assembly from the vehicle. Retain seat back assembly mounting pads (Item 4) (Figure 5-13).
- 9. Lift the rear body from the vehicle.

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REAR BODY INSTALLATION

1. Install the rear body by reversing the removal procedure.

NOTE

• INSTALL THE MOUNTING PADS (ITEM 4, FIGURE 5-13) BETWEEN THE REAR BODY AND THE SEAT BACK ASSEMBLY.

REAR BODY SOUND INSULATION - GASOLINE VEHICLES

Removal Of Insulation

- 1. Remove the rear body as instructed on Pages 5-5 through 5-7.
- 2. Inspect the sound insulation foam for integrity and adhesion to rear body.
- 3. If the insulation is damaged or loose, remove it from the rear body by scraping with a putty knife or with a wide paint scraper.

Installation of Insulation

- 1. Be sure that the rear body is thoroughly clean and dry before installing new insulation.
- 2. Remove the protective backing paper from the insulation's adhesive surface.
- 3. Position the insulation on the rear body and press firmly to adhere it.
- 4. Install the rear body as instructed above.

FLOORMAT

FLOORMAT REMOVAL

- 1. Remove the brake and accelerator pedals (See Section 6 of this manual).
- 2. Loosen two screws in the rear body kick-plate (Figure 5-11, Page 5-7) and pull the rear edge of the floormat from between the rear body and the floor panel.
- 3. Remove the top edge of the floormat from the overlapping flange under the dash.
- 4. Lift the mat from the vehicle.

FLOORMAT INSTALLATION

1. Reverse the removal procedure to install the floormat.

SECTION 6 - ACCELERATOR AND BRAKE PEDAL GROUP

GENERAL INFORMATION

In February of 1995 (Serial No. A9529 445799 and greater on electric vehicles, and Serial No. AG9529 445519 and greater on gasoline vehicles), a new accelerator/brake pedal group was introduced. Adjustment procedures for the older and later pedal groups differ significantly, so it is important to make sure that you use the correct procedure. **For late 1995 and 1996 vehicles, see page 6-13.**

PEDAL GROUP ADJUSTMENT - EARLY 1995 VEHICLES

A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.

GASOLINE VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, OR OTHER METAL COMPONENT.

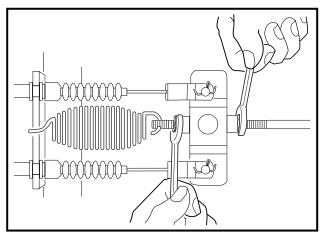
ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR FIGURE 22-6, PAGE 22-5, AND THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO **ON** AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

Pedal Group Adjustment - Early 1995 Vehicles, Continued:

WARNING

- TO PROPERLY ADJUST BRAKE PEDAL AND CABLE ASSEMBLY, CHECK, AND ADJUST IF NEC-ESSARY, THE FOLLOWING ITEMS IN THE ORDER LISTED:
 - BRAKE PEDAL AND CABLE ADJUSTMENT. BEGINNING THIS PAGE.
 - ACCELERATOR ROD ADJUSTMENT. SEE PAGE 6-3 THROUGH PAGE 6-6.
 - ACCELERATOR PEDAL STOP ADJUSTMENT. SEE PAGE 6-6 THROUGH PAGE 6-8.
 - PARK BRAKE ADJUSTMENT. SEE PAGE 6-8.
- IF ANY OF THE ITEMS ABOVE REQUIRE ADJUSTMENT, THE OTHER ITEMS MUST ALSO BE CHECKED, AND ADJUSTED IF NECESSARY, IN THE ORDER LISTED ABOVE.
- FAILURE TO CHECK ALL ADJUSTMENTS IN THE ORDER LISTED COULD RESULT IN IMPROPER VEHICLE OPERATION, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY.



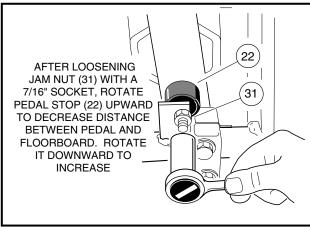
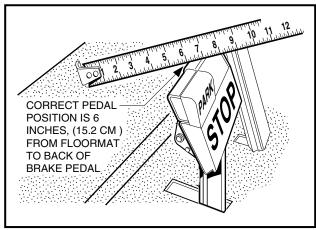


FIGURE 6-1

FIGURE 6-2

- 1. ADJUST BRAKE PEDAL HEIGHT
 - 1.1. To provide slack in the brake cables, loosen the hex nuts on the brake equalizer rod (Figure 6-1).
 - 1.2. Loosen the jam nut (31) on the rubber pedal stop (22) (Figure 6-2) and rotate the stop until the pedal is 6 inches (15.2 cm) from the floormat (Figure 6-3).



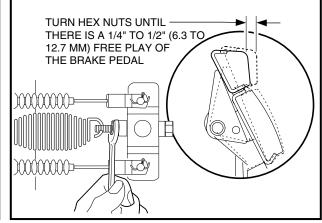


FIGURE 6-3 FIGURE 6-4

- 2. ADJUST THE BRAKE CABLES ALL VEHICLES:
 - 2.1. Turn jam nut on the brake equalizer rod until brake pedal free play (the distance the brake pedal can be depressed before brake actuator arm moves) is from 1/4 to 1/2 inch (6.3 to 12.7 mm) (Figure 6-4). With the brake pedal fully released, the vehicle should roll freely without brake drag.
 - 2.2. Using two wrenches, tighten the jam nuts on the brake equalizer rod (Figure 6-1).
- 3. ADJUST THE ACCELERATOR ROD (See page 6-5 for electric vehicles).
- Adjust the Accelerator Rod Early 1995 Gasoline Vehicles Only:

A DANGER

- BEFORE SERVICING, TURN THE KEY SWITCH TO OFF AND PLACE THE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION.
- TO PREVENT ACCIDENTAL STARTING OF THE ENGINE, DISCONNECT THE BATTERY CABLES, NEGATIVE (-) FIRST. THIS WILL PREVENT THE POSSIBILITY OF THE VEHICLE RUNNING OVER YOU WHEN YOU ARE ADJUSTING THE ACCELERATOR ROD.

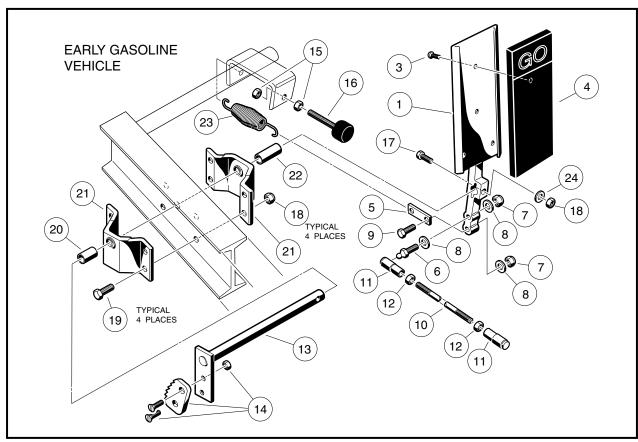


FIGURE 6-5

- 3.1. Remove the electrical component box cover. The electrical component box is located under the seat next to the battery. Retain the cover and the screw for later installation.
- 3.2. Disconnect the accelerator rod (10) at the accelerator pedal (1), then loosen the jam nuts (12) (Figure 6-5) and adjust the length of the rod to obtain a throttle cable cam position of 15°-17° as shown (See Figure 6-6, Page 6-4). See CAUTION on the next page.

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Adjust the Accelerator Rod - Early 1995 Gasoline Vehicles Only, Continued:

A CAUTION

- AFTER ACCELERATOR ROD ADJUSTMENT, MAKE SURE THAT APPROXIMATELY THE SAME NUMBER OF THREADS IS EXPOSED AT EACH END OF THE ROD.
- IF THE LEVER ON THE LIMIT SWITCH IN THE ELECTRICAL BOX IS BENT, REPLACE THE LIMIT SWITCH.
- WHEN LOOSENING OR TIGHTENING JAM NUTS ON THE ACCELERATOR ROD WHEN ONE END IS DISCONNECTED, HOLD THE DISCONNECTED BALL JOINT SLEEVE WITH PLIERS.
 - 3.3. Reconnect the accelerator rod (10) at the accelerator pedal (1) (Figure 6-5, Page 6-3).

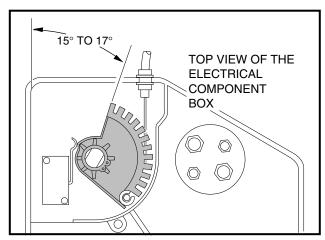


FIGURE 6-6

3.4. Before tightening the jam nuts on the accelerator rod, set the park brake to the first ratchet and pawl position. Depress the accelerator pedal and make sure that the following events occur in the exact order shown:

ADDDOVIMATE DEDAL TOAVE

EVENT	APPROXIMATE PEDAL TRAVEL	
EVENI	(REFERENCE ONLY)	

Park Brake Release 2° - 4° Solenoid Activation 4° - 8° Carburetor Throttle Actuation 8° - 12°

NOTE

- **AFTER** THE PEDAL GROUP AND ACCELERATOR ROD ARE PROPERLY ADJUSTED, THE FINAL GOVERNED ENGINE RPM SHOULD BE SET PER THE SPECIFICATIONS IN SECTION 13, PAGE 13-50.
 - 3.5. If the events above occur as they should, hold the ball joint (11) at each end of the accelerator rod (10) with pliers and tighten the accelerator rod jam nut (12) against it (Figure 6-5, Page 6-3).
 - 3.6. Again, check that events occur as described in step 3.4.
 - 3.7. Install the electrical component box cover and screw.

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A DANGER

- BEFORE SERVICING, TURN THE KEY SWITCH TO OFF AND PLACE THE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION.
- TO PREVENT ACCIDENTAL STARTING OF THE VEHICLE, DISCONNECT THE BATTERIES (AND DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES) AS INSTRUCTED IN WARNING ON PAGE 6-1. THIS WILL PREVENT THE POSSIBILITY OF THE VEHICLE RUNNING OVER YOU WHEN YOU ARE ADJUSTING THE ACCELERATOR ROD. FOR V-GLIDE VEHICLES SEE FIGURE 22-5, PAGE 22-5. FOR POWERDRIVE AND POWERDRIVE PLUS VEHICLES SEE FIGURE 22-6, PAGE 22-5.

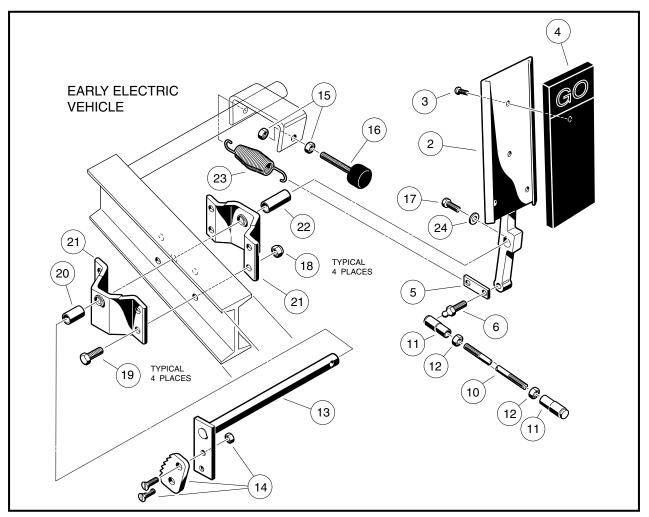


FIGURE 6-7

3.1. Remove the wiper switch cover.

A CAUTION

 THE ACCELERATOR ROD/WIPER SWITCH ARM MUST BE ADJUSTED EXACTLY AS STATED IN STEP 3.2 OR THE WIPER SWITCH COULD BECOME DAMAGED AND NOT OPERATE PROP-ERLY.

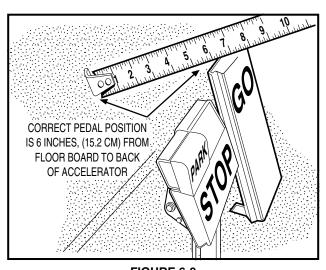
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Adjust the Accelerator Rod - Early 1995 Electric Vehicles, Continued:

- 3.2. Slowly depress the accelerator pedal fully to the floor and hold it in this position. With the accelerator pedal fully depressed, the wiper switch arm brush should be positioned entirely on the last fixed contact. It is acceptable for the wiper switch arm to come into contact with the wiper switch housing provided there is no excessive pressure against the housing. To check wiper arm pressure against the housing, keep the accelerator pedal fully depressed and disconnect the accelerator rod from the wiper switch ball stud. Then try to reconnect it. If the accelerator pedal must be released in order to reconnect the accelerator rod, then the wiper switch arm is exerting excessive pressure against the housing proceed to step 3.3. If the accelerator rod can be easily connected, it is correctly adjusted proceed to Accelerator Pedal Stop Adjustment.
- 3.3. If the accelerator rod is not adjusted correctly, disconnect it from the ball stud at the wiper switch and manually rotate the bell crank until the wiper switch arm brush is positioned *entirely* on the last fixed contact.
- 3.4. While holding the accelerator rod with pliers, loosen the jam nut and adjust the ball joint sleeve so that it will fit onto the wiper switch ball stud, with approximately the same number of threads showing at each end of the rod. Then tighten the jam nut against the sleeve.
- 3.5. Depress the accelerator pedal several times and then check to be sure that the wiper switch arm brush is positioned entirely on the eighth fixed contact, without the wiper switch arm exerting excessive pressure against the wiper switch housing.
- 3.6. Install the wiper switch cover.
- 4. ADJUST THE ACCELERATOR PEDAL STOP (See page 6-7 for electric vehicles).

A WARNING

- WHEN ADJUSTING THE ACCELERATOR PEDAL STOP, FOLLOW EACH STEP EXACTLY. OTH-ERWISE THE PARK BRAKE AND/OR WIPER SWITCH MAY NOT OPERATE PROPERLY.
- Adjust the Accelerator Pedal Stop Early 1995 Gasoline Vehicles:
 - 4.1. Disconnect the accelerator rod ball joint (11) at the accelerator pedal (1) (Figure 6-5, Page 6-3).



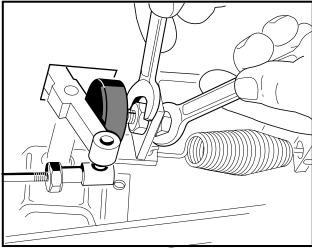


FIGURE 6-8

FIGURE 6-9

4.2. Measure the distance from the floormat to the top of the accelerator pedal (Figure 6-8). The measurement should be 6 inches (15.2 cm). If pedal distance from the floormat is not correct, adjust it by turning the nuts (15) on the accelerator pedal stop (16) (Figure 6-5, Page 6-3) away from the rubber stop to decrease distance, or turn the nuts toward the rubber bumper to increase distance. See NOTE at top of next page.

NOTE

 AS ACCELERATOR PEDAL DISTANCE FROM THE FLOORBOARD IS INCREASED, THE BRAKE PEDAL RATCHET AND PAWL GAP IS DECREASED, AND AS THE PEDAL DISTANCE IS DECREASED, THE RATCHET AND PAWL GAP IS INCREASED. IF THE ACCELERATOR PEDAL DISTANCE FROM THE FLOORMAT IS ADJUSTED, CHECK AND ADJUST THE RATCHET AND PAWL GAP AS INSTRUCTED IN SECTION 5. ADJUST THE PARK BRAKE AS SHOWN, PAGE 6-8. 0

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• Adjust the Accelerator Pedal Stop - Early 1995 Electric Vehicles:

A DANGER

- BEFORE SERVICING, TURN THE KEY SWITCH TO *OFF* AND PLACE THE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION.
- TO PREVENT ACCIDENTAL STARTING OF THE VEHICLE, DISCONNECT THE BATTERIES (AND DISCHARGE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES) AS INSTRUCTED IN WARNING ON PAGE 6-1 (SEE FIGURE 22-5 OR 22-6, PAGE 22-5). THIS WILL PREVENT THE POSSIBILITY OF THE VEHICLE RUNNING OVER YOU WHEN YOU ARE ADJUSTING THE ACCELERATOR ROD.

NOTE

- ADJUSTING THE ACCELERATOR PEDAL STOP BUMPER WILL CHANGE BOTH THE PARK BRAKE RATCHET/PAWL GAP AND THE WIPER SWITCH ARM/WIPER SWITCH STOP BUMPER GAP. IF ONE OF THESE GAPS IS SUBSEQUENTLY ADJUSTED TO SPECIFICATIONS, THEN THE OTHER WILL CHANGE AND SHOULD BE CHECKED. AS ONE GAP IS MADE SMALLER, THE OTHER WILL ALSO BECOME SMALLER; AND IF ONE IS MADE LARGER, THEN THE OTHER WILL BE ENLARGED.
 - 4.1. Remove the wiper switch cover.
 - 4.2. With the accelerator pedal in free state (not depressed), the wiper switch arm must rest within .100" (2.5 mm) of the wiper switch stop bumper (Figure 6-10, Page 6-8). It is acceptable for the wiper switch arm to come into contact with the stop bumper, provided there is no excessive pressure on the arm. To check pressure on the wiper switch arm, disconnect the accelerator rod from the wiper switch ball stud. This will allow the accelerator pedal (2) to rest against the accelerator pedal stop bumper (16) (Figure 6-7, Page 6-5). With the pedal against the bumper, try to reconnect the accelerator rod to the ball stud. If the accelerator rod has to be pulled or if the accelerator pedal has to be pushed in order to reconnect the rod, then excessive pressure is being exerted on the wiper switch stop by the wiper switch arm, and further adjustment is necessary at the accelerator pedal stop bumper (Figure 6-9).
 - 4.3. If the gap between the wiper switch arm and the wiper switch stop bumper is greater than .100" (2.5 mm), adjust the pedal stop bumper (16) away from the accelerator pedal (2). If the wiper switch arm is exerting excessive pressure against the wiper switch stop, adjust the pedal stop (16) toward the accelerator pedal (2) (Figure 6-7, Page 6-5).
 - 4.4. With the key switch OFF and the forward and reverse lever in NEUTRAL, depress the accelerator pedal and note the amount of pedal travel before the limit switch in the wiper switch is activated. There should be at least 1/2" (1.27 cm) of travel measured from the top of the accelerator pedal at rest position to the point where the limit switch is activated. An audible "click" can be heard when the switch is activated. If pedal travel is not at least 1/2" (1.27 cm), the wiper switch arm is too far from the wiper switch stop bumper and must be readjusted as instructed in Step 4.3. This is a final check to ensure that all accelerator pedal stop bumper adjustments have been made correctly thus far.

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Adjustment the Accelerator Pedal Stop - Early 1995 Electric Vehicles, Continued:

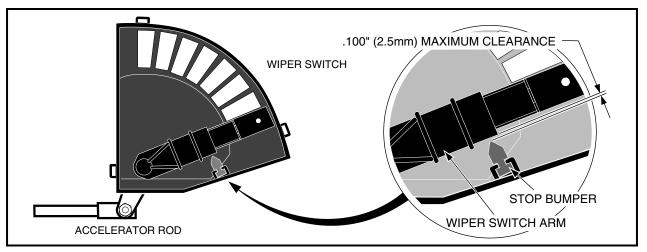


FIGURE 6-10

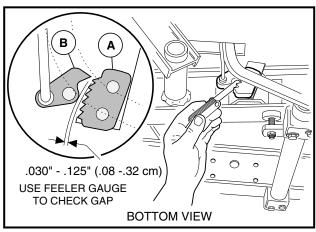
4.5. Check the park brake ratchet/pawl gap. It should be between .030 and .125 inches (.08-.32 cm) (Figure 6-11). If the gap is not at least .030"(.08 cm), adjust the accelerator pedal stop bumper to widen the gap to between .030" and .050" (.08-1.27 cm). If the gap is greater than .125" (.32 cm), adjust the accelerator pedal stop bumper to decrease the gap to between .110" and .125" (.28-.32 cm). If it was necessary to adjust the ratchet/pawl gap, then it will be necessary to repeat steps 4.2, 4.3, and 4.4. See NOTE below.

NOTE

- FOR SOME VEHICLES, IT MAY BE NECESSARY TO ADJUST THE ACCELERATOR PIVOT ROD SUPPORTS (21) (FIGURE 6-7, PAGE 6-5) FORWARD OR BACKWARD TO ACHIEVE THE PROPER ADJUSTMENTS. AFTER MOVING THE PIVOT ROD SUPPORTS, ALL ADJUSTMENTS, STARTING WITH THE ACCELERATOR ROD ADJUSTMENT, MUST BE DONE AGAIN.
- IF THE GAPS CANNOT BE BROUGHT WITHIN THE LIMITS, CHECK FOR BENT, DAMAGED, OR EXCESSIVELY WORN PARTS. BENT, DAMAGED, OR WORN PARTS MUST BE REPLACED IN ORDER TO ACHIEVE THE PROPER ADJUSTMENTS.
- 5. ADJUST THE PARK BRAKE (See page 6-9 for electric vehicles).
 - Adjust the Park Brake Early 1995 Gasoline Vehicles:
 - 5.1. Inspect the park brake pawl and latch for excessive wear, grooves, cracks, or chipping. If either the pawl or latch is damaged, both must be replaced.
 - 5.2. Make sure the brake pedal and cable are adjusted as instructed in steps 1 and 2 (Pages 6-2 and 6-3).
 - 5.3. Disconnect the push rod (10) from the accelerator pedal (1) (Figure 6-5, Page 6-3). See DAN-GER below.

A DANGER

- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.



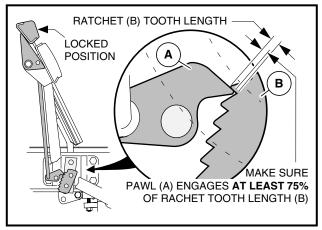


FIGURE 6-11 FIGURE 6-12

- 5.4. Using a 1/2" wrench, adjust the accelerator stop until there is a .030" to .125" (0.8 to 3.2 mm) gap between the brake latch and the pawl. Use a feeler gauge to verify the gap (Figure 6-11).
- 5.5. Measure and record the distance from the floormat to the top of the accelerator pedal, then lock the park brake. With the park brake locked, make sure that at least 75% of ratchet tooth length engages the pawl (Figure 6-12).
- 5.6. With the park brake still locked, measure the distance from the top of the accelerator to the floor-board again. If the measurement has changed, ratchet tooth engagement is too deep.
- 5.7. If ratchet/pawl engagement must be adjusted, separate the ball joint at the top of the park brake rod and thread the ball joint sleeve clockwise to increase engagement or counterclockwise to decrease engagement. Reconnect the ball joint.
- 5.8. Reconnect the accelerator push rod.

Adjust the Park Brake - All Electric Vehicles:

- 5.1. Inspect the park brake pawl and latch for excessive wear, grooves, cracks, or chipping. If either the pawl or latch is damaged, both must be replaced.
- 5.2. Use a feeler gauge to check gap between the ratchet and pawl. If the gap is not between .030" and .125" (0.8 to 3.2 mm), (Figure 6-11) See Adjust the Accelerator Pedal Stop, Page 6-7.
- 5.3. Lock the park brake. With the park brake locked, make sure that at least 75% of ratchet tooth length engages the pawl (Figure 6-12).

PEDAL GROUP DISASSEMBLY AND ASSEMBLY - EARLY 1995 VEHICLES

REMOVING THE BRAKE PEDAL ASSEMBLY

- 1. Disconnect the brake cables from the equalizer rod (26) (Figure 6-13, Page 6-10).
- 2. Remove the pedal return spring (27) from the equalizer rod (26) (Figure 6-13, Page 6-10).
- 3. Remove the nuts (24), flat washers (25), bolts (28), and bearing blocks (23) (Figure 6-13, Page 6-10).
- 4. Loosen the brake equalizer rod hex nut (24) five turns, then disconnect the rod (26) from the pedal shaft (Figure 6-13, Page 6-10).
- 5. Remove the nut (31) and brake stop (22) (Figure 6-13, Page 6-10).
- 6. Lift the pedal assembly (6) up through the floorboard (Figure 6-13, Page 6-10).

INSTALLING THE BRAKE PEDAL ASSEMBLY

1. From the top side of the floorboard, insert the brake pedal weldment assembly (6) (Figure 6-13, Page 6-10) through the opening in the floor as shown (Figure 6-14, Page 6-11), and install the pedal stop (22) (Figure 6-13, Page 6-10) on the weldment.

Installing the Brake Pedal Assembly - Early 1995 Vehicles, Continued:

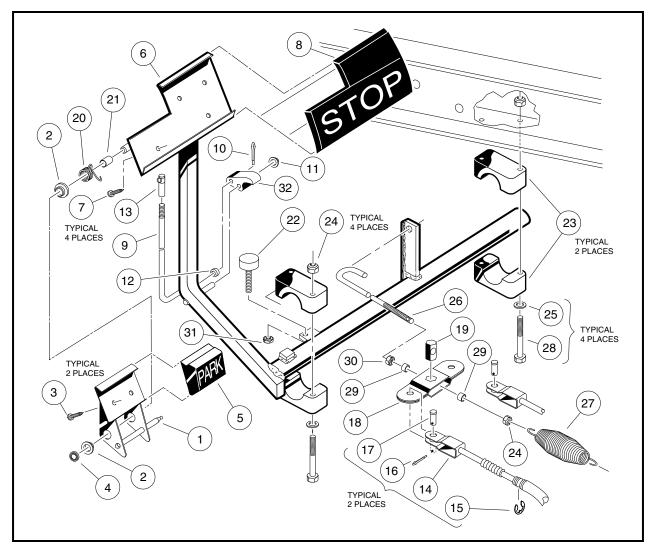


FIGURE 6-13

- 2. Attach the equalizer rod (26) to the brake pedal weldment assembly (6) as shown (Figure 6-13).
- 3. Position and attach the brake pedal assembly and mounting blocks (23) to the vehicle frame as shown. Tighten the bolts and nuts to 40-60 in.lbs. (4.5/7 N-m) (Figure 6-13). See NOTE below.

NOTE

- EACH HALF OF EACH MOUNTING BLOCK ASSEMBLY IS MARKED WITH AN A OR B. THE
 HALVES MARKED A SHOULD BE ORIENTED TO THE TOP LEFT HAND AND BOTTOM RIGHT
 HAND SIDES OF THE BRAKE PEDAL ASSEMBLY, AND THE HALVES MARKED B SHOULD BE
 ORIENTED TO THE TOP RIGHT HAND SIDE AND BOTTOM LEFT HAND SIDE OF THE BRAKE
 PEDAL ASSEMBLY (FIGURE 6-13).
- 4. Install the brake cables (14) on the equalizer rod using the clevis pins (17) and cotter pins (16) that were removed when the brake pedal assembly was disassembled (Figure 6-13). Tighten the nut (24) on the equalizer rod so that brake pedal free-play is 1/4 inch to 1/2 inch (6.35 mm to 12.7 mm) (Figure 6-4, Page 6-2). See NOTE at top of next page.

• BRAKE PEDAL FREE PLAY IS THE DISTANCE THE BRAKE PEDAL CAN BE DEPRESSED BEFORE THE BRAKE ACTUATOR ARM MOVES.

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REMOVING THE PARK BRAKE ASSEMBLY

1. To remove the park brake rod and pawl assembly (9 through 13 and 32), remove the push-on nut (11) and disconnect the ball joint sleeve (13) from the park brake pedal (1). Remove the ball joint sleeve (13) from the rod and pawl assembly (Figure 6-13). See NOTE below.

NOTE

- A NEW PUSH-ON NUT (11) **(FIGURE 6-15)** MUST BE USED WHEN REASSEMBLING THE PARK BRAKE.
- 2. To remove the park brake pedal (1), remove the push-on retainer nut (4), disconnect the torsion spring (20) (Figure 6-15) and slide the pedal off of the shaft. See NOTE below.

NOTE

- A NEW PUSH-ON NUT (4) (Figure 6-15) MUST BE USED WHEN REASSEMBLING THE PARK BRAKE.
- 3. Inspect all parts for wear or damage and replace as necessary.

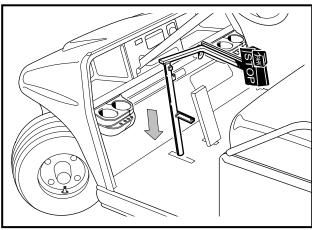
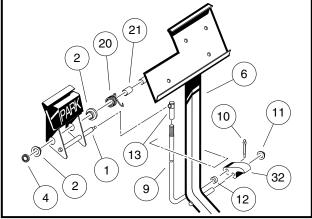


FIGURE 6-14 FIGURE 6-15



INSTALLING THE PARK BRAKE ASSEMBLY - EARLY 1995 VEHICLES

- 1. From the bottom side of the floorboard, insert the park brake rod (9) through the brake pedal assembly opening as shown in Figure 6-15. Then install the park brake pawl (32) onto the shaft on the brake pedal assembly weldment (6) and also the park brake rod (9) into the park brake pawl (Figure 6-15).
- 2. Install the push nut (11) onto the park brake pawl shaft (Figure 6-15).
- 3. Install the spacer (21) and torsion spring (20) on the park brake pedal shaft on the brake pedal weldment (Figure 6-15).
- 4. Install the two bushings (2) in the park brake pedal and position the park brake pedal on the shaft on the brake pedal assembly weldment (Figure 6-15). Then attach the ends of the spring to the park brake pedal and to the brake pedal weldment as shown (See Figure 6-16, Page 6-12).
- 5. Install the push nut (4) on the park brake pedal shaft (Figure 6-15).
- 6. Connect park brake rod (9) ball joint to the ball stud on the park brake pedal assembly (Figure 6-15).

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Installing the Park Brake Assembly - Early 1995 Vehicles, Continued:

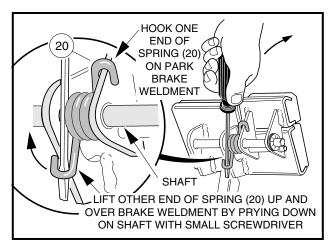


FIGURE 6-16

REMOVING THE ACCELERATOR PEDAL ASSEMBLY - EARLY 1995 VEHICLES

- Removing the Accelerator Pedal Assembly Early 1995 Gasoline Vehicles:
- 1. Remove the accelerator rod by sliding back the ball joint sleeve and disconnecting the ball joint (11) from the ball joint stud (6) (Figure 6-5, Page 6-3).
- 2. Remove the nut (18), washer (24), and bolt (17) that secures the accelerator pivot rod to the pedal (Figure 6-5, Page 6-3).
- 3. Disconnect the spring (23) from the hanger (5) (Figure 6-5, Page 6-3).
- 4. Remove the pivot rod (13) from the pedal (1) and lift the pedal up through the floorboard (Figure 6-5, Page 6-3).
- 5. Remove the four 1/4 20 x 1 1/4 hex head bolts (19) and nuts (18). Pull the accelerator bearing brackets away from each side of the I-beam frame (Figure 6-5, Page 6-3).
- 6. Remove the spacer (22) and then pull the pivot rod (13) and spacer (20) from the mounts. To clear the vehicle frame's outer I-beam, the accelerator pivot rod must be angled as it is removed. Inspect all parts for wear or damage and replace as necessary (Figure 6-5, Page 6-3).
- Removing the Accelerator Pedal Assembly Early 1995 Electric Vehicles:
- 1. Remove the accelerator rod by sliding back the ball joint sleeve and disconnecting the ball joint (11) from the ball joint stud (6) (Figure 6-7, Page 6-5).
- 2. Remove the bolt (17) and lock washer (24) that secures the accelerator pivot rod to the pedal (Figure 6-7, Page 6-5).
- 3. Disconnect the spring (23) from the hanger (5) (Figure 6-7, Page 6-5).
- 4. Remove the pivot rod (13) from the pedal (2) and lift the pedal up through the floorboard (Figure 6-7, Page 6-5).
- 5. Remove the four 1/4 20 x 1 1/4 hex head bolts (19) and nuts (18). Pull the accelerator bearing brackets away from each side of the I-beam frame (Figure 6-7, Page 6-5).
- 6. Remove the spacer (22) and then pull the pivot rod (13) and spacer (20) from the mounts. Inspect all parts for wear or damage and replace as necessary (Figure 6-7, Page 6-5).

INSTALLING THE ACCELERATOR PEDAL ASSEMBLY - EARLY 1995 VEHICLES

- Installing the Accelerator Pedal Assembly Early 1995 Gasoline Vehicles:
- 1. Install the 1/2 inch spacer (20) onto the accelerator pivot rod (13) (Figure 6-5, Page 6-3).
- 2. Slide the accelerator pivot rod through the outside bearing bracket (21), I-beam frame, and the inside

- bearing bracket (21) (Figure 6-5, Page 6-3).
- 3. Secure the bearing brackets to the I-beam frame using the existing four 1/4 20 hex head bolts (19) and nuts (18). Tighten the bolts and nuts to 70-80 in.lbs. (8/9 N-m) (Figure 6-5, Page 6-3).
- 4. Place the plastic spacer (22) on the accelerator pivot rod. Push the pivot rod into the spacer until the end of the rod is even with the end of the spacer (Figure 6-5, Page 6-3).
- 5. Install the accelerator pedal assembly (1) down through the floorboard. Slide the accelerator pivot rod into the accelerator pedal assembly (Figure 6-5, Page 6-3).
- 6. Align the hole in the end of the rod with the hole that runs through the pedal assembly. Install the 1/4 inch bolt (17) through the hole. Secure the flatwasher (24) and locknut (18) onto the end of the bolt. Tighten the bolt and nut to 50 in.lbs. (6 N-m) (Figure 6-5, Page 6-3).
- 7. Install the accelerator return spring (23) through the mounting hole in the hanger (5) at the bottom of the accelerator pedal (Figure 6-5, Page 6-3).
- 8. Install the ball joint socket (11) with the accelerator rod to the ball stud (6) on the accelerator pedal (Figure 6-5, Page 6-3).
- Installing the Accelerator Pedal Assembly Early 1995 Electric Vehicles:
- 1. Install the 1/2 inch spacer (20) onto the accelerator pivot rod (13) (Figure 6-7, Page 6-5).
- 2. Slide the accelerator pivot rod through the outside bearing bracket (21), I-beam frame, and the inside bearing bracket (21) (Figure 6-7, Page 6-5).
- 3. Secure the bearing brackets to the I-beam frame using the existing four 1/4 20 hex head bolts (19) and nuts (18). Tighten the bolts and nuts to 70-80 in.lbs. (8/9 N-m) (Figure 6-7, Page 6-5).
- 4. Place the plastic spacer (22) on the accelerator pivot rod. Push the pivot rod into the spacer until the end of the rod is even with the end of the spacer (Figure 6-7, Page 6-5).
- 5. Install the accelerator pedal assembly (2) down through the floorboard. Slide the accelerator pivot rod into the accelerator pedal assembly (Figure 6-7, Page 6-5).
- 6. Install the pivot rod into the pedal. Secure the pivot rod to the pedal with a 1/4 inch bolt (17) and a lockwasher (24). Tighten the bolt to 50 in.lbs. (6 N-m) (Figure 6-7, Page 6-5).
- 7. Install the accelerator return spring (23) through the mounting hole in the hanger (5) at the bottom of the accelerator pedal (Figure 6-7, Page 6-5).
- 8. Install the ball joint socket (11) with the accelerator rod to the ball stud (6) on the accelerator pedal (Figure 6-7, Page 6-5).

PEDAL GROUP ADJUSTMENT - LATE 1995 AND 1996 VEHICLES

A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.

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Pedal Group Adjustment - Late 1995 and 1996 Vehicles, Continued:

A WARNING

 ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.

GASOLINE VEHICLES ONLY:

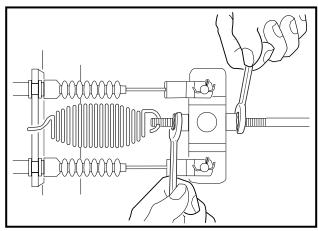
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

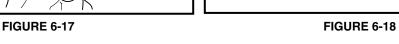
ELECTRIC VEHICLES ONLY:

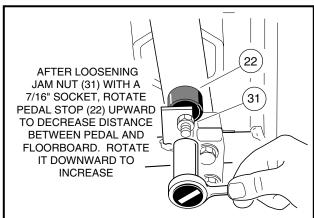
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR 22-6, PAGE 22-5. THEN DISCHARGE THE CONTROLLER ON POW-ERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO **ON** AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

1. ADJUST BRAKE PEDAL HEIGHT - ALL LATE 1995 AND 1996 VEHICLES

- 1.1. To provide slack in the brake cables, loosen the hex nuts on the brake equalizer rod (Figure 6-17).
- 1.2. Using a 7/16" socket, loosen the brake stop jam nut (31), then relieve pedal pressure on the stop by pushing down slightly on the pedal. Then adjust the brake stop bumper (22) up or down (Figure 6-18). Adjusting the bumper upward decreases distance between pedal and floorboard. Adjusting the bumper downward increases distance between pedal and floorboard. Proper brake pedal height is 5-3/4 inches (14.6 cm) plus or minus 1/4 inch (.6 cm) (Figure 6-19).









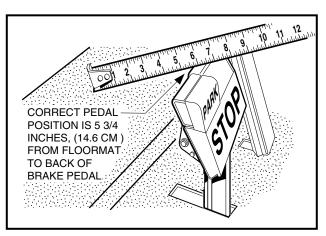


FIGURE 6-19

- 1.3. Tighten the jam nut (31) to 7-9 ft.lbs. (9/10 N-m) (Figure 6-18).
- 2. ADJUST PARK BRAKE RATCHET/PAWL GAP AND PAWL ENGAGEMENT ALL VEHICLES
 - 2.1. Using a 1/2" wrench, adjust the retaining nut (7) on the spring support rod until there is a .060 plus or minus .030 inch gap between the pawl and the tips of the ratchet teeth. Use a feeler gauge to verify the gap (Figure 6-20). Read NOTE before proceeding to Step 2.2.

NOTE

- ON ALL POWERDRIVE SYSTEM 48 AND POWERDRIVE PLUS VEHICLES, THE ACTUATOR LEVER MUST ALSO BE ADJUSTED IF THE RATCHET/PAWL GAP IS ADJUSTED (SEE STEP 4, PAGE 6-19).
- ON DS V-GLIDE 36 VOLT ELECTRIC AND ON DS GASOLINE POWERED VEHICLES, THE ACCELERATOR ROD ADJUSTMENT MUST ALSO BE CHECKED IF THE RATCHET/PAWL GAP IS ADJUSTED (SEE STEP 4, PAGE 6-17, OR STEP 4, PAGE 6-18).
- ON DS V-GLIDE 36 VOLT ELECTRIC AND ON DS GASOLINE POWERED VEHICLES, THE ACCELERATOR ROD MUST BE DISCONNECTED BEFORE PROCEEDING TO STEP 2.2.
 - 2.2. With the park brake unlocked, measure and note the distance from the top of the accelerator pedal to the floorboard, and then lock the park brake (See Figure 6-21, Page 6-16).

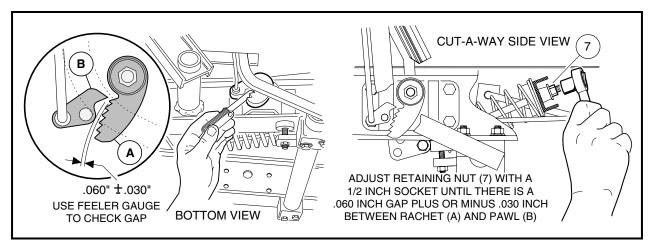


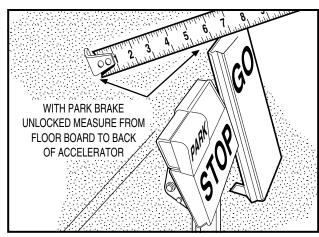
FIGURE 6-20

Adjust Park Brake Ratchet/Pawl Gap and Pawl Engagement - All Vehicles, Continued:

- 2.3. With the park brake locked, make sure that at least 75% of ratchet tooth length engages the pawl (Figure 6-22).
- 2.4. With the park brake still locked, again measure the distance from the top of the accelerator pedal to the floorboard. If the measurement has changed, ratchet tooth engagement is too deep and must be adjusted.
- 2.5. If ratchet/pawl engagement must be adjusted, disconnect the ball joint at the top of the brake brake rod and rotate the ball joint sleeve clockwise to increase engagement or counterclockwise to decrease engagement. Reconnect ball joint (Figure 6-23).
- 2.6. If the accelerator push rod was disconnected from the accelerator pedal, reconnect it.

3. ADJUST ACCELERATOR PEDAL HEIGHT - ALL VEHICLES

- 3.1. Using a 1/2" socket and 1/2" wrench, loosen the nut and bolt (Figure 6-24) securing the accelerator pedal to the pivot plate. Clamp the accelerator pedal adjustment tool (Club Car Part No. 1018710-01) to the accelerator pedal, with the end marked accelerator pedal height toward the floorboard, then depress the accelerator pedal until the end of the tool rests against the floorboard (pedal height should be 5-5/8" plus or minus 1/8"). Use a rubber strap to hold the pedal in position against the floorboard and then tighten the nut to 12-15 ft.lbs. (16/20 N-m) (Figure 6-25).
 - For gasoline vehicles, proceed to Step 4 below.
 - For V-Glide 36 volt vehicles, proceed to Page 6-18.
 - For PowerDrive System 48 and PowerDrive Plus vehicles, proceed to Page 6-19.



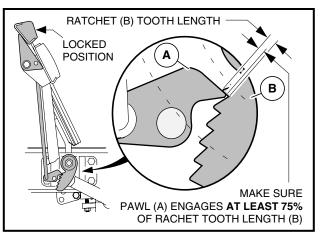
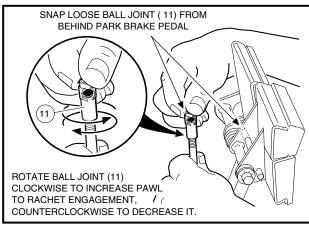


FIGURE 6-21

FIGURE 6-22



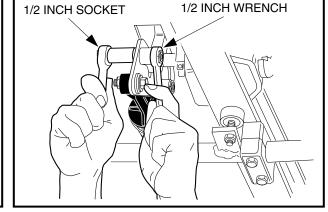


FIGURE 6-23 FIGURE 6-24

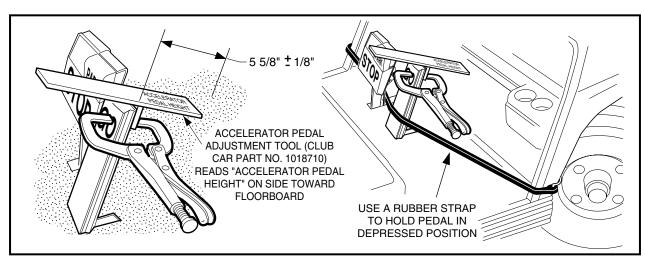


FIGURE 6-25

- 4. ADJUST THE ACCELERATOR ROD (See page 6-18 for V-Glide 36 volt electric vehicles, or page 16-19 for PowerDrive System 48 and PowerDrive Plus 48 volt vehicles).
- Adjust the Accelerator Rod Gasoline Vehicles Only:

A DANGER

- BEFORE SERVICING, TURN THE KEY SWITCH TO *OFF* AND PLACE THE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION.
- TO PREVENT ACCIDENTAL STARTING OF THE ENGINE, DISCONNECT THE BATTERY CABLES, NEGATIVE (-) FIRST. THIS WILL PREVENT THE POSSIBILITY OF THE VEHICLE RUNNING OVER YOU WHEN YOU ARE ADJUSTING THE ACCELERATOR ROD.
 - 4.1. Remove the electrical box cover.
 - 4.2. Disconnect the accelerator rod at the accelerator pedal, then loosen the jam nuts (20) and adjust the length of the rod (19) (Figure 6-27, Page 6-19) to obtain a throttle cable cam position of 15°-17° as shown (Figure 6-26, Page 6-18). See CAUTION below.

A CAUTION

- AFTER ACCELERATOR ROD ADJUSTMENT, MAKE SURE THAT APPROXIMATELY THE SAME NUMBER OF THREADS IS EXPOSED AT EACH END OF THE ROD.
- IF THE LEVER ON THE LIMIT SWITCH IN THE ELECTRICAL BOX IS BENT, REPLACE THE LIMIT SWITCH.
- WHEN LOOSENING OR TIGHTENING JAM NUTS ON THE ACCELERATOR ROD WHEN ONE END IS DISCONNECTED, HOLD THE DISCONNECTED BALL JOINT SLEEVE WITH PLIERS.
 - 4.3. Reconnect the accelerator rod at the accelerator pedal.
 - 4.4. Before tightening the jam nuts on the accelerator rod, set the park brake to the first ratchet and pawl position. Depress the accelerator pedal and make sure that the following events occur in the *exact order shown*:

EVENT APPROXIMATE PEDAL TRAVEL (REFERENCE ONLY)

Park Brake Release 2° - 4°
Solenoid Activation 4° - 8°
Carburetor Throttle Actuation 8° - 12°

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Adjust the Accelerator Rod - Gasoline Vehicles Only, Continued:

NOTE

- AFTER THE PEDAL GROUP AND ACCELERATOR ROD ARE ADJUSTED, THE FINAL GOVERNED ENGINE RPM SHOULD BE SET PER SPECIFICATIONS IN SECTION 13, PAGE 13-50.
 - 4.5. If the events above occur as they should, hold the ball joint at each end of the accelerator rod with pliers and tighten the accelerator rod jam nut against it
 - 4.6. Again, check that events occur as described in step 4.4.
 - 4.7. Install the electrical box cover.

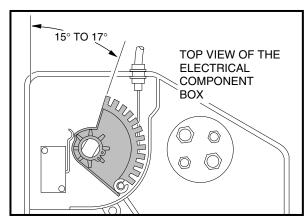


FIGURE 6-26

• Adjust the Accelerator Rod - V-Glide 36 Volt Vehicles Only

A DANGER

- BEFORE SERVICING, TURN THE KEY SWITCH TO *OFF* AND PLACE THE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION.
- TO PREVENT ACCIDENTAL STARTING OF THE VEHICLE, DISCONNECT THE BATTERIES (AND DISCHARGE THE CONTROLLER ON POWERDRIVE VEHICLES) AS INSTRUCTED ON PAGE 6-1 (SEE FIGURE 22-5, PAGE 22-5). THIS WILL PREVENT THE POSSIBILITY OF THE VEHICLE RUNNING OVER YOU WHEN YOU ARE ADJUSTING THE ACCELERATOR ROD.
 - 4.1. Remove the wiper switch cover.

A CAUTION

- ADJUST THE ACCELERATOR ROD/WIPER SWITCH ARM EXACTLY AS STATED IN STEP 4.2
 OR THE WIPER SWITCH COULD BECOME DAMAGED AND NOT OPERATE PROPERLY.
 - 4.2. Slowly depress the accelerator pedal fully to the floor and hold it in this position. With the accelerator pedal fully depressed, the wiper switch arm brush should be positioned entirely on the last fixed contact. It is acceptable for the wiper switch arm to come into contact with the wiper switch housing provided there is no excessive pressure against the housing. To check wiper arm pressure against the housing, keep the accelerator pedal fully depressed and disconnect the accelerator rod from the wiper switch ball stud. Then try to reconnect it. If the accelerator pedal must be released in order to reconnect the accelerator rod, then the wiper switch arm is exerting excessive pressure against the housing proceed to step 4.3. If the accelerator rod can be easily connected, it is correctly adjusted.

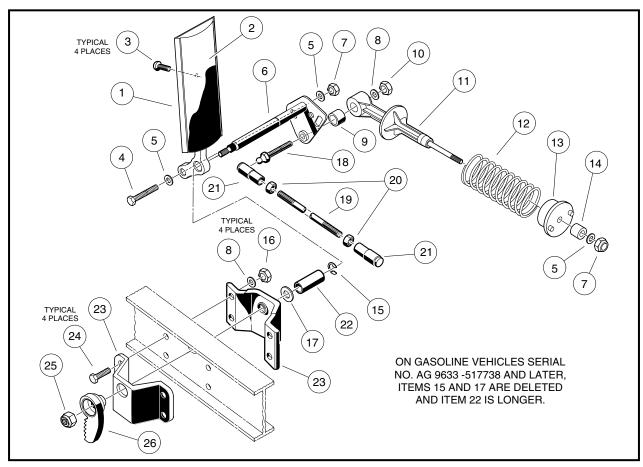


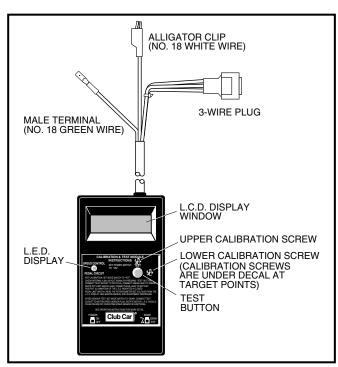
FIGURE 6-27

- 4.3. If the accelerator rod is not adjusted correctly, disconnect it from the ball stud at the wiper switch and manually rotate the bell crank until the wiper switch arm brush is positioned *entirely* on the last fixed contact.
- 4.4. While holding the accelerator rod with pliers, loosen the jam nut (20) and adjust the ball joint (21) sleeve to fit on the wiper switch ball stud, with approximately the same number of threads showing at each end of the rod. Then tighten jam nut (20) against the sleeve (**Figure 6-27**).
- 4.5. Depress the accelerator pedal several times and then check to be sure that the wiper switch arm brush is positioned entirely on the eighth fixed contact, and that the wiper switch arm is not exerting excessive pressure against the wiper switch housing.
- 4.6. Install the wiper switch cover.
- PowerDrive System 48 and PowerDrive Plus Vehicles Only -Adjust the Actuator Lever (There is no accelerator rod on PowerDrive vehicles):
 - 4.1. Connect the Calibration Test Module (Club Car Part No. 1018871-01) (Figure 6-28, Page 6-20) to the vehicle.
 - 4.1.1. Disconnect the 3-wire connector to the potentiometer from the wire harness as shown (Figure 6-29, Page 6-20).
 - 4.1.2. Connect the 3-wire plug of the Calibration Test Module to the 3-wire connector from the potentiometer (Figures 6-28 and 6-29, Page 6-20). Vehicles with serial numbers 9628-508740 and greater need an adapter plug assembly (Club Car Part No. 1018945-01).
 - 4.1.3. Disconnect the green/white wire from the potentiometer housing assembly (Figure 6-29, Page 6-20) at the Forward and Reverse Limit Switch No. 1 on standard PowerDrive System 48 vehicles, or at the main wire harness (under the charger receptacle) on Power-Drive Plus vehicles with motor braking.

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Adjust the Actuator Lever - PowerDrive System 48 and PowerDrive Plus Vehicles, Continued:

- 4.1.4. Connect the green/white wire from the potentiometer housing to the green lead from the Calibration Test Module (Figure 6-29).
- 4.1.5. If it is not already disconnected, disconnect the 6 gauge red wire from the positive (+) post of battery No. 6. Connect the Calibration Test Module's alligator clip to the end of the 6 gauge red wire.
- 4.2. Reposition and clamp the Accelerator Pedal Adjustment tool on the accelerator pedal with the end marked *micro break point* toward the floorboard, then depress the pedal until the end of the tool rests against the floorboard (pedal height should be 4-5/8"). Use a rubber strap to hold the pedal in depressed position and proceed to step 4.3. (Figure 6-30)
- 4.3. Use a 1/4" socket or nut driver to remove two screws (20) and detach the potentiometer housing cover (Figure 6-31).



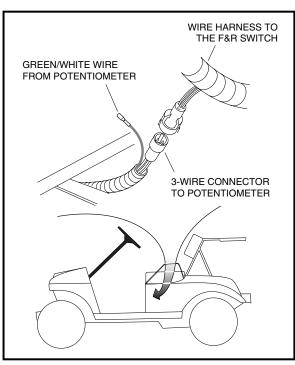


FIGURE 6-28 FIGURE 6-29

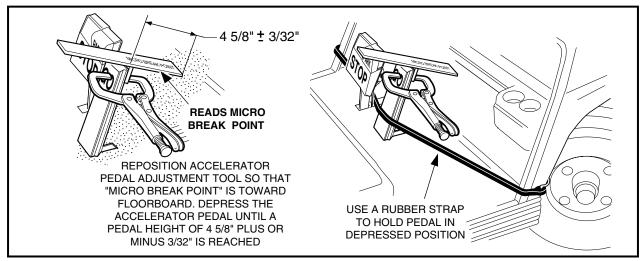
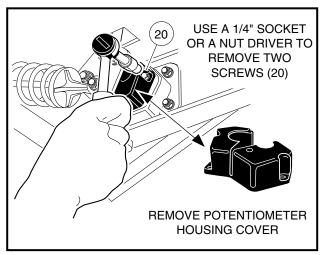


FIGURE 6-30

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- 4.5. Rotate the actuator lever (17) on the pivot rod weldment (6) **(Figure 6-35, Page 6-22)** counter-clockwise until the red LED on the test module goes out (limit switch clicks off). Then slowly rotate the actuator lever clockwise until the red LED is illuminated again (limit switch clicks on).
- 4.6. With the actuator in this position, tighten the actuator bolt slightly.
- 4.7. Using a 5/16" wrench, loosen the potentiometer adjustment lock nut (See Figure 6-33).
- 4.8. Using a potentiometer adjustment tool or very small flat blade screwdriver (electronics type), turn the potentiometer adjustment screw until the test module reads from 3.38 to 3.42 volts. Then tighten the potentiometer lock nut to 4-6 in.lbs (.45/.68 N-m)(See Figure 6-34).
- 4.9. Again loosen the actuator lever bolt and rotate the actuator lever counterclockwise until the red LED goes off.
- 4.10. With the actuator lever in this position, tighten the actuator lever bolt to 70-80 in.lbs. This step sequence ensures that the solenoid will not engage with the accelerator pedal in the up position and the park brake set. If the red LED is illuminated at this point, repeat step 4.9.
- 4.11. Repeat the checking procedure.



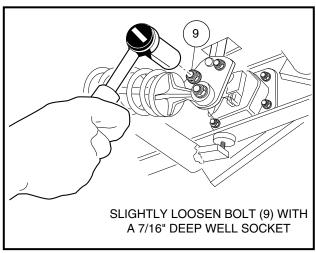
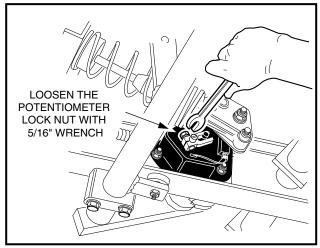


FIGURE 6-31 FIGURE 6-32



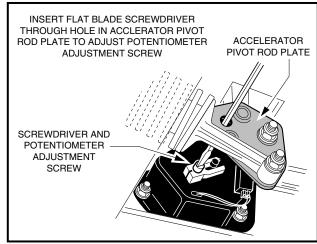


FIGURE 6-33 FIGURE 6-34

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Adjust the Actuator Lever - PowerDrive System 48 and PowerDrive Plus Vehicles, Continued:

- 4.12. Disconnect the Calibration Test Module from the vehicle and reconnect the three-wire connector (from the potentiometer) to the wire harness. Reconnect the green/white wire to the Forward and Reverse Limit Switch No. 1 on standard PowerDrive System 48 vehicles, or to the wiring harness on PowerDrive Plus vehicles.
- 4.13. Check potentiometer adjustment (See Section 20A, Page 20-17).
- 4.14. Install the potentiometer housing cover.

NOTE

• THE POTENTIOMETER IS PRESET AT THE FACTORY AND SHOULD NOT REQUIRE ADJUST-MENT. IF A PROBLEM IS SUSPECTED, SEE SECTION 20A, PAGE 20-17 IN THIS MANUAL.

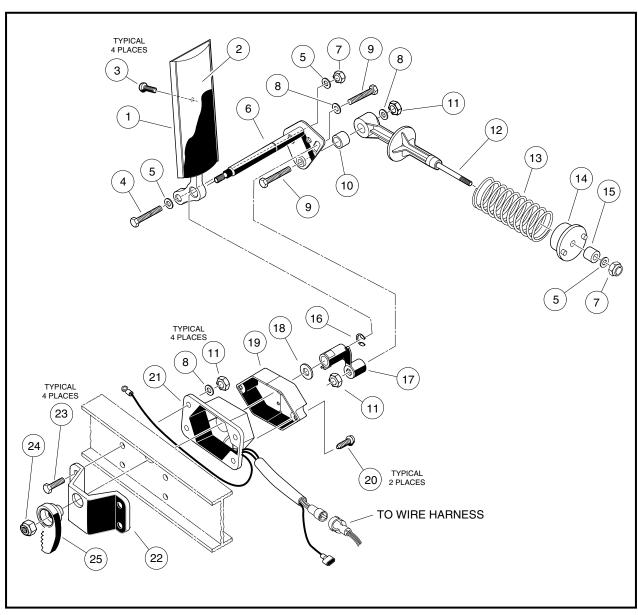


FIGURE 6-35

PEDAL GROUP DISASSEMBLY AND ASSEMBLY - LATE 1995 AND 1996 VEHICLES

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ALL VEHICLES

Removing the Brake Pedal Assembly

1. Make sure the key switch is off and that the Forward and Reverse Switch is in neutral, then disconnect the battery or batteries as shown (Figure 12-1, Page 12-2 for gasoline vehicles, or Figure 22-5 or 22-6, Page 22-5 for electric vehicles). See CAUTION below.

A CAUTION

- DISCHARGE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES PER INSTRUCTIONS ON PAGE 6-1.
- Place chocks under the rear wheels and lift the front end of the vehicle with a chain hoist or floor jack. Place jackstands under the front cross tube of the vehicle frame and lower the vehicle onto the jackstands. See WARNING below.

WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 3. Remove the brake pedal assembly (See Page 6-9). See NOTE below.

NOTE

• THE PROCEDURE FOR REMOVING THE BRAKE PEDAL ASSEMBLY IS THE SAME AS IT IS FOR EARLY 1995 VEHICLES. SEE PAGE 6-9.

Installing the Brake Pedal Assembly

1. Install the brake pedal assembly (See Page 6-9). See NOTE below.

NOTE

• THE PROCEDURE FOR INSTALLING THE BRAKE PEDAL ASSEMBLY IS THE SAME AS IT IS FOR EARLY 1995 VEHICLES. SEE PAGE 6-9.

Removing the Park Brake Assembly

1. Make sure the key switch is off and that the Forward and Reverse Switch is in neutral, then disconnect the battery or batteries as shown (Figure 12-1, Page 12-2 for gasoline vehicles, or Figure 22-5 or 22-6, Page 22-5 for electric vehicles). See CAUTION below.

A CAUTION

 DISCHARGE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES PER INSTRUCTIONS ON PAGE 6-1.

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Removing the Park Brake Assembly, Continued:

Place chocks under the rear wheels and lift the front end of the vehicle with a chain hoist or floor jack. Place jackstands under the front cross tube of the vehicle frame and lower the vehicle onto the jackstands. See WARNING below.

A WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 3. Remove the park brake assembly (See Page 6-11). See NOTE below.

NOTE

• THE PROCEDURE FOR REMOVING THE PARK BRAKE ASSEMBLY IS THE SAME AS IT IS FOR EARLY 1995 VEHICLES (SEE PAGE 6-11).

Installing the Park Brake Assembly

1. Install the park brake assembly (See Page 6-11). See NOTE below.

NOTE

• THE PROCEDURE FOR INSTALLING THE PARK BRAKE ASSEMBLY IS THE SAME AS IT IS FOR EARLY 1995 VEHICLES.

REMOVING THE ACCELERATOR PEDAL ASSEMBLY

DS V-Glide Electric Vehicles (Serial Number 9529 445799 and Later) and DS Gasoline Vehicles (Serial Number 9529 445519 and Later).

(For PowerDrive System 48 and PowerDrive Plus vehicles, see page 6-27).

- 1. Make sure the key switch is off and that the Forward and Reverse Switch is in neutral, then disconnect the battery(ies):
- DS V-Glide vehicle disconnect the batteries as shown (Figure 22-5, Page 22-5).
- DS Gasoline powered vehicle disconnect both battery cables, negative first.
- Place chocks under the rear wheels and lift the front end of the vehicle with a chain hoist or floor jack. Place jackstands under the front cross tube of the vehicle frame and lower the vehicle onto the jackstands. See WARNING below.

A WARNING

 LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.

- 4. Disconnect the accelerator rod assembly (19, 20, and 21) (Figure 6-27, Page 6-19) at the front and rear ball studs and remove it from the vehicle.
- П
- 5. Remove the nut (10), flat washer (8), ball stud (18), and pivot support bearing (9) from the accelerator pivot rod assembly (6) (Figure 6-27, Page 6-19).
- 6. Slide the spring retainer (11) off of the accelerator pivot rod.
- 7. Use a scribe to mark the position of the park brake ratchet (26) on the accelerator pivot rod (6) (Figure 6-27, Page 6-19). See NOTE below.

NOTE

- FAILURE TO MARK POSITION OF THE RATCHET COULD CAUSE IT TO BE REINSTALLED IMPROPERLY, RESULTING IN IMPROPER ADJUSTEMT AND POSSIBLE FAILURE OF THE PARK BRAKE.
- 8. Remove the lock nut (25) from the accelerator pivot shaft (Figure 6-27, Page 6-19).
- 9. Depress the brake pedal slightly and then slide the park brake ratchet (26) **(Figure 6-27, Page 6-19)** toward the end of the accelerator pivot rod. Rotate the ratchet and remove it from the pivot rod.
- 10. Remove the crescent retaining ring (15) from the accelerator pivot rod (Figure 6-27, Page 6-19). See NOTE below.
- 11. Remove the four bolts (24), washers (8), and nuts (16) that secure the accelerator pivot rod supports (23) to the frame. Remove the pivot rod (6), the plastic washer (17), and spacer (22) from the accelerator pivot rod supports (23) (Figure 6-27, Page 6-19). See NOTE below.

NOTE

- ON GASOLINE VEHICLES SERIAL NO. AG 9633-517738 AND LATER, ITEMS (15) AND (17) ARE DELETED AND ITEM (22) IS LONGER.
- 12. Pull accelerator pedal (1) out of vehicle from the top side of the floorboard (Figure 6-27, Page 6-19).

INSTALLING THE ACCELERATOR PEDAL ASSEMBLY

DS V-Glide Electric Vehicles (Serial Number 9529 445799 and Later) and DS Gasoline Vehicles (Serial Number 9529 445519 and Later)

- 1. Position the accelerator pivot rod supports (23) on the vehicle frame and install the four bolts (24), flat washers (8), and lock nuts (16). Tighten the nuts with fingers only at this time (Figure 6-27, Page 6-19).
- 2. Insert the lower end of the accelerator pedal (1) through the floorboard and install the accelerator pivot rod (6) through the uppermost hole in the pedal. Install the bolt (4), two washers (5), and nut (7) through the lower hole in the pedal and through the pivot rod. Tighten the nut with fingers only at this time (Figure 6-27, Page 6-19).
- 3. Install the plastic spacer (22), then the plastic washer (17) on the pivot rod (Figure 6-27, Page 6-19). See NOTE below.

NOTE

• ON GASOLINE VEHICLES SERIAL NO. AG 9633-517738 AND LATER, ITEMS (15) AND (17) ARE DELETED AND ITEM (22) IS LONGER.

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Installing the Accelerator Pedal Assembly - DS V-Glide Electric Vehicles (Serial Number 9529 445799 and Later) and DS Gasoline Vehicles (Serial Number 9529 445519 and Later), Continued:

- 4. Insert the pivot rod through the pivot rod supports on the vehicle frame.
- 5. Tighten the four bolts (24) **(Figure 6-27, Page 6-19)** attaching the pivot rod supports to the frame to 70-80 in.lbs. (8/9 N-m).
- 6. Install the ball stud (18) through the pivot rod. Using needle-nose pliers, install the pivot support bearing (9) and the spring retainer (11) onto the ball stud. Secure these parts with the washer (8) and nut (10) (Figure 6-27, Page 6-19). Tighten the nut to 45-55 in.lbs. (5/6.2 N-m). See CAUTION below.

A CAUTION

- MAKE SURE THAT THE HARDWARE IS INSTALLED WITH THE FLAT WASHER POSITIONED ON THE PASSENGER SIDE OF THE SPRING RETAINER. FAILURE TO DO SO COULD RESULT IN THE ACCELERATOR BECOMING DISCONNECTED.
- 7. Depress the brake pedal slightly, and with the park brake ratchet oriented so that the tip of the ratchet is pointed toward the rear of vehicle, slide the ratchet onto the pivot rod (do not slide the ratchet onto the pivot rod splines). Release the brake pedal and allow the ratchet to rotate until its tip is pointed downward (Figure 6-37, Page 6-28). The ratchet should now rotate freely on the rod.
- 8. Rotate the ratchet clockwise until it touches the park brake pawl, then slide the ratchet onto the splines of the pivot rod (it may be necessary to push the pivot rod toward the driver side of the vehicle to make the splines accessible). The ratchet may have to be rotated counterclockwise slightly to align the splines.
- 9. Move the pivot rod back toward the driver side of the vehicle and line up the scribed match marks on the pivot rod and ratchet. Rotate the pivot rod back and forth slightly to align the splines and slide the ratchet onto the splines.
- 10. Install the nylon lock nut (25) on the pivot rod. Install the crescent retaining ring (15) on the accelerator pivot rod (Figure 6-27, Page 6-19). Tighten the nut to 16-20 ft.lbs. (22/27 N-m). See NOTE below.

NOTE

- ON GASOLINE VEHICLES SERIAL NO. AG 9633-517738 AND LATER, ITEMS (15) AND (17) ARE DELETED AND ITEM (22) IS LONGER.
- 11. Install the accelerator rod assembly (19, 20, and 21) (Figure 6-27, Page 6-19).
- 12. Adjust the accelerator pedal height. See NOTE below.

NOTE

- THE PROCEDURE FOR ADJUSTING THE ACCELERATOR PEDAL HEIGHT IS ON PAGE 6-16.
- 13. Adjust the accelerator rod. See NOTE below.

NOTE

• THE PROCEDURE FOR ADJUSTING THE ACCELERATOR ROD IS ON PAGE 6-17 FOR GASO-LINE VEHICLES, OR PAGE 6-18 FOR V-GLIDE 36 VOLT VEHICLES.

REMOVING THE ACCELERATOR PEDAL ASSEMBLY

DS PowerDrive System 48 Vehicles and DS PowerDrive Plus Vehicles (Serial Number A9529 445799 and Later)

1. Make sure the key switch is off and that the Forward and Reverse Switch is in neutral, then disconnect the batteries as shown (Figure 22-6, Page 22-5). See CAUTION below.

A CAUTION

- DISCHARGE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES PER INSTRUCTIONS IN WARNING ON PAGE 6-1.
- Place chocks under the rear wheels and lift the front end of the vehicle with a chain hoist or floor jack. Place jackstands under the front cross tube of the vehicle frame and lower the vehicle onto the jackstands. See WARNING below.

WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 3. Remove the two hex head screws (20) attaching the potentiometer housing cover (Figure 6-31, Page 6-21) to the potentiometer and remove the cover.
- 4. Remove the bolt (9), washer (8), and lock nut (11) from the spring retainer (12) with the pivot support bearing (10) (Figure 6-35, Page 6-22).
- 5. Remove the hex head cap screw (4), two flat washers (5), and lock nut (7) from the accelerator pedal and pivot rod assembly (6) (Figure 6-35, Page 6-22).
- 6. Remove the bolt (9), flat washer (8), and captured lock nut (11) from the actuator lever (17) and pivot rod assembly (Figure 6-35, Page 6-22).
- 7. Remove the brake ratchet retaining nut (24) from the pivot rod assembly (6) (Figure 6-35, Page 6-22).
- 8. Disconnect the spring retainer (12) from the accelerator pivot rod assembly (6) **(Figure 6-35, Page 6-22)**.
- 9. Remove the crescent retaining ring (16) from the accelerator pivot rod (Figure 6-35, Page 6-22).
- 10. Depress the brake pedal slightly and then slide the park brake ratchet (25) toward the end of the accelerator pivot rod (Figure 6-35, Page 6-22). Rotate the ratchet towards the rear of the vehicle and remove it from the pivot rod.
- 11. Hold the actuator lever (17) and accelerator pedal (1) in place and remove the accelerator pivot rod and plastic washer (18) (Figure 6-35, Page 6-22).
- 12. Pull the accelerator pedal (1) **(Figure 6-35, Page 6-22)** out of the vehicle from the top side of the floor-board.
- 13. Remove the four hex head cap screws (23), flat washers (8), and lock nuts (11) attaching the accelerator pivot rod support (22) and potentiometer assembly (21) to the vehicle frame (Figure 6-35, Page 6-22), and remove the pivot rod support and the potentiometer assembly.

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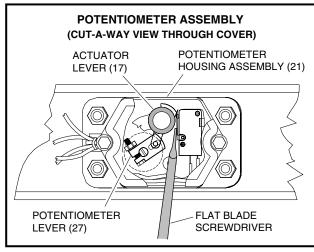
INSTALLING THE ACCELERATOR PEDAL ASSEMBLY

DS PowerDrive System 48 Vehicles and DS PowerDrive Plus Vehicles (Serial Number A9529 445799 and Later)

- 1. Position the accelerator pivot rod support (22) and the potentiometer assembly (21) on the vehicle frame and install the four hex head cap screws (23), flat washers (8), and lock nuts (11). Tighten the nuts with fingers only at this time (Figure 6-35, Page 6-22).
- 2. Insert the lower end of the accelerator pedal (1) through the floorboard and install the accelerator pivot rod (6) through the uppermost hole in the pedal. Install the bolt (4), two washers (5), and nut (7) through the lower hole in the pedal and through the pivot rod. Tighten the nut with fingers only at this time. Install the actuator lever (17) (Figure 6-35, Page 6-22) on the pivot rod and position the pedal and actuator lever on the rod so that about one-half of the total length of the pivot rod is protruding out of the actuator lever.
- 3. Place the plastic washer (18) on the end of the accelerator pivot rod and align the pivot rod and washer with the hole in the potentiometer housing (21), then insert the pivot rod through the potentiometer, vehicle frame, and pivot rod support until the end of the pivot rod is flush with the outside surface of the pivot rod support (22) (Figure 6-35, Page 6-22).
- 4. Rotate the potentiometer lever (27) clockwise until lever fork is at the two o'clock position (**Figure 6-36**). The lever must be at approximately two o'clock in order for it to mate with the alignment pin on the actuator lever.
- 5. Rotate the actuator lever until its alignment pin is aligned with the slot in the potentiometer lever fork (Figure 6-36), then slide the actuator lever toward the potentiometer housing. See CAUTION below.

A CAUTION

- DO NOT BEND THE LIMIT SWITCH LEVER. THE CAM ON THE ACTUATOR LEVER SHOULD BE AT THE TWELVE O'CLOCK POSITION WHEN THE ACTUATOR LEVER IS IN POSITION TO MATE WITH THE POTENTIOMETER LEVER, ALLOWING THE ACTUATOR LEVER TO SLIDE PAST THE LIMIT SWITCH LEVER. IT MAY BE NECESSARY TO HOLD THE LIMIT SWITCH LEVER BACK WITH A FLAT BLADE SCREWDRIVER (FIGURE 6-36).
- 6. Push the accelerator pivot rod (6) through the potentiometer housing until the groove in the pivot rod is even with the end of the actuator lever (Figure 6-35, Page 6-22).
- 7. Install the spring retainer (12) on the pivot rod (Figure 6-35, Page 6-22).



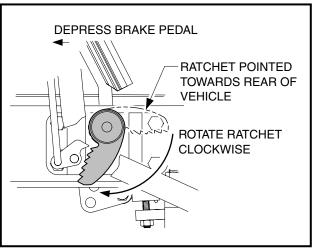


FIGURE 6-36 FIGURE 6-37

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- 9. Depress the brake pedal slightly, and with the park brake ratchet oriented so that the tip of the ratchet is pointed toward the rear of vehicle, slide the ratchet onto the pivot rod (do not slide the ratchet onto the pivot rod splines). Release the brake pedal and allow the ratchet to rotate until its tip is pointed downward (Figure 6-37). The ratchet should now rotate freely on the rod.
- 10. Rotate the ratchet clockwise until it touches the park brake pawl, then slide the ratchet onto the splines of the pivot rod (it may be necessary to push the pivot rod toward the driver side of the vehicle to make the splines accessible). The ratchet may have to be rotated counterclockwise slightly to align the splines.
- 11. Tighten the four bolts that secure the potentiometer assembly and pivot rod support to the vehicle frame to 70-80 in.lbs. (8/9 N-m).
- 12. Use a feeler gauge to check the gap between the ratchet and the pawl. The gap should be .060" plus or minus .030". Turn the nut (7) on the spring retainer (12) clockwise to widen the gap or counterclockwise to reduce the gap (**Figure 6-35**, **Page 6-22**). If the gap is .125" or more, slide the ratchet off the splines, rotate the ratchet clockwise one spline, and then slide the ratchet back onto the splines before adjusting with the spring retainer nut.
- 13. Install the nut (24) **(Figure 6-35, Page 6-22)** on the accelerator pivot rod and tighten it to 16-20 ft.lbs. (22/27 N-m). **See NOTE below**.

NOTE

- MAKE SURE THE ACTUATOR LEVER AND THE POTENTIOMETER LEVER ARE STILL MATED BEFORE TIGHTENING THE ACCELERATOR PIVOT ROD RETAINING NUT.
- 14. Using needle-nose pliers, install the crescent retaining ring (16) on the pivot shaft (Figure 6-35, Page 6-22).
- 15. Install the hex head cap screw (9), flat washer (8), and lock nut (11) that secure the spring retainer (12) to the pivot rod (Figure 6-35, Page 6-22), and tighten to 45-55 in.lbs. (5/6.2 N-m).

A CAUTION

- MAKE SURE THAT THE HARDWARE IS INSTALLED WITH THE FLAT WASHER POSITIONED ON THE PASSENGER SIDE OF THE SPRING RETAINER.
- 16. Install the hex head cap screw (4), two flat washers (5), and lock nut (7) that attach the accelerator pedal to the pivot rod (Figure 6-35, Page 6-22), and tighten with fingers only at this time.
- 17. Adjust the accelerator pedal height. See NOTE below.

NOTE

- THE PROCEDURE FOR ADJUSTING THE ACCELERATOR PEDAL HEIGHT IS ON PAGE 6-16.
- 18. Adjust the actuator lever. See NOTE below.

NOTE

• THE PROCEDURE FOR ADJUSTING THE ACTUATOR LEVER IS ON PAGE 6-19.

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SECTION 7 - WHEEL BRAKE ASSEMBLIES

All 1995 and 1996 model DS Golf Cars, both gasoline and electric, are equipped with *self-adjusting*, mechanically expanding shoe drum brakes on each rear wheel.

A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- SOME BRAKE SHOES CONTAIN ASBESTOS FIBER, AND ASBESTOS DUST IS CREATED WHEN THESE BRAKE MECHANISMS ARE HANDLED. WEAR APPROVED EYE AND RESPIRA-TORY PROTECTION WHEN DISASSEMBLING AND CLEANING BRAKE MECHANISMS. INHALA-TION OF ASBESTOS COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH. DO NOT USE COMPRESSED AIR OR AEROSOL SPRAYS TO CLEAN THE BRAKE MECHANISM. CLEAN BRAKE MECHANISMS USING THE NEGATIVE PRESSURE ENCLOSURE/HEPA VACUUM SYS-TEM OR LOW PRESSURE/WET CLEANING METHOD PER OSHA/29 CFR - 1910.1001.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.

GASOLINE VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 AND FIGURE 22-6, PAGE 22-5. THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${\bf ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

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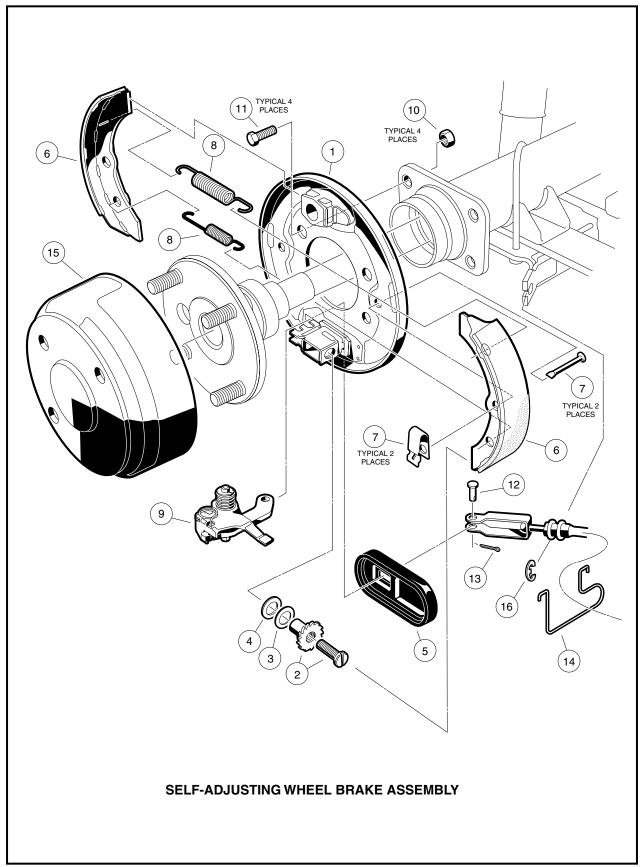
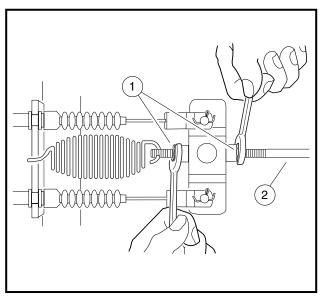


FIGURE 7-1

REMOVE THE BRAKE SHOES AND CLEAN THE BRAKE ASSEMBLY

WARNING

SOME BRAKE SHOES CONTAIN ASBESTOS FIBER AND ASBESTOS DUST IS CREATED WHEN
THESE BRAKE MECHANISMS ARE HANDLED. WEAR APPROVED EYE AND RESPIRATORY
PROTECTION WHEN DISASSEMBLING AND CLEANING BRAKE MECHANISMS. INHALATION
OF ASBESTOS COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH. DO NOT USE
COMPRESSED AIR OR AEROSOL SPRAYS TO CLEAN THE BRAKE MECHANISM. CLEAN
BRAKE MECHANISMS USING THE NEGATIVE PRESSURE ENCLOSURE/HEPA VACUUM SYSTEM OR LOW PRESSURE/WET CLEANING METHOD PER OSHA/29 CFR - 1910.1001.



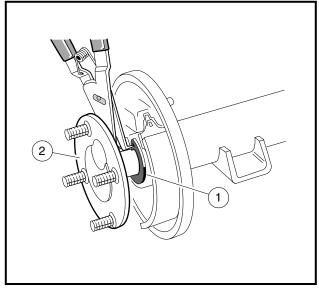


FIGURE 7-2

FIGURE 7-3

1. Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or floor jack. Place jackstands under the axle tubes to support the vehicle. See WARNING below.

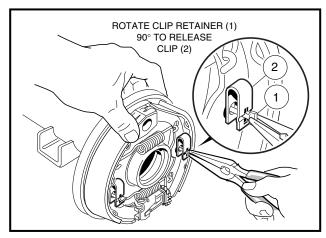
A WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 2. Loosen the equalizer retaining nuts (1) on the equalizer rod (2) to slightly loosen the brake cable (Figure 7-2).
- 3. Remove the rear wheels and then the brake drums.
- 4. Remove the axle. See CAUTION at top of page 7-4.

Removal of Brake Shoes and Cleaning of Wheel Brake Assemblies, Continued:

A CAUTION

- AFTER INSTALLING AXLE SHAFT, CLEAN ANY RESIDUAL OIL FROM THE EXPOSED END OF THE AXLE SHAFT AND FROM THE OIL SEAL AREA.
 - 4.1. Using snap ring pliers, remove the axle retaining ring (1) (Figure 7-3, Page 7-3).
 - 4.2. Pull the axle shaft (2) from the axle tube (Figure 7-3, Page 7-3).



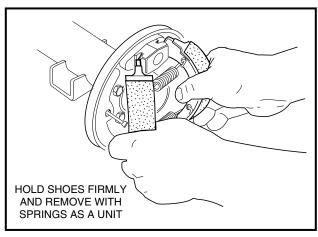


FIGURE 7-4

FIGURE 7-5

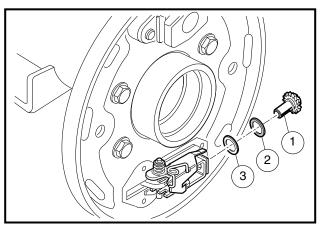
- 5. Using needle nose pliers, turn the clip retainer (1) 90° to remove the shoe retainer clip (2) (Figure 7-4).
- 6. Grasp both brake shoes and pull them, together with the springs, out of the brake assembly as shown (Figure 7-5).
- 7. Remove the adjuster wheel (1) with two washers (2 and 3) from the backing plate (Figure 7-6).
- 8. Carefully clean the brake backing plate and all its mechanical components. See WARNING below.

WARNING

- SOME BRAKE SHOES CONTAIN ASBESTOS FIBER AND ASBESTOS DUST IS CREATED WHEN
 THESE BRAKE MECHANISMS ARE HANDLED. WEAR APPROVED EYE AND RESPIRATORY
 PROTECTION WHEN DISASSEMBLING AND CLEANING BRAKE MECHANISMS. INHALATION
 OF ASBESTOS COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH. DO NOT USE
 COMPRESSED AIR OR AEROSOL SPRAYS TO CLEAN THE BRAKE MECHANISM. CLEAN
 BRAKE MECHANISMS USING THE NEGATIVE PRESSURE ENCLOSURE/HEPA VACUUM SYSTEM OR LOW PRESSURE/WET CLEANING METHOD PER OSHA/29 CFR 1910.1001.
- 9. Lubricate the slide (1) and slide plate (2) with dry graphite lubricant. After lubricating, work the slide back and forth to ensure that it slides smoothly and easily (Figure 7-7).

A WARNING

APPLY GREASE CAREFULLY WHEN PERFORMING THE FOLLOWING STEPS. DO NOT ALLOW
ANY GREASE TO GET ONTO THE FRICTION SURFACES OF THE BRAKE SHOE PADS. FAILURE TO HEED THIS WARNING COULD CAUSE DIMINISHED BRAKE PERFORMANCE, POSSIBLY RESULTING IN PROPERTY DAMAGE OR SEVERE PERSONAL INJURY.



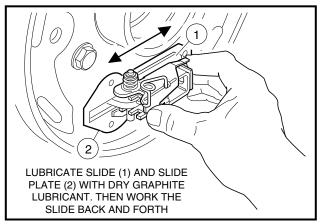
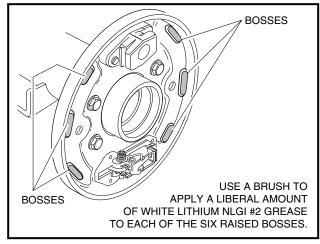


FIGURE 7-6 FIGURE 7-7



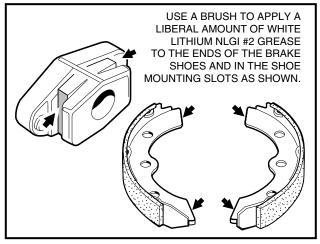
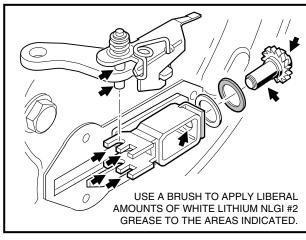


FIGURE 7-8 FIGURE 7-9



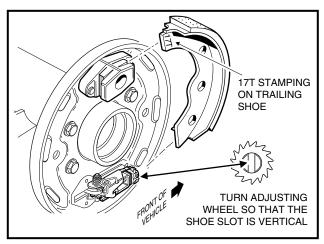


FIGURE 7-10 FIGURE 7-11

- 10. **Use a brush** to apply a liberal amount of white lithium NLGI #2 grease (Dow Corning BR2-Plus or equivalent) on each of the six raised bosses on the brake backing plate (See Figure 7-8). See WARN-ING at bottom of page 7-4.
- 11. **Use a brush** to apply a liberal amount of white lithium NLGI #2 grease (Dow Corning BR2-Plus or equivalent) to each end of both brake shoes and into the slots in the brake shoe mounting block as shown (See Figure 7-9). See WARNING at bottom of page 7-4.

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Removal of Brake Shoes and Cleaning of Wheel Brake Assemblies, Continued:

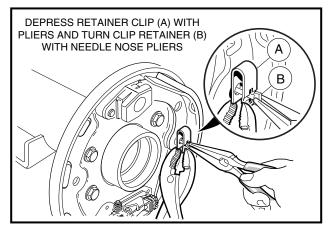
- 12. **Use a brush** to apply a liberal amount of white lithium NLGI #2 grease (Dow Corning BR2-Plus or equivalent) to the brake adjuster assembly, adjuster wheel shoe slots, and the shaft of the adjuster wheel as shown (**Figure 7-10**, **Page 7-5**). See WARNING at bottom of page 7-4.
- 13. Install the adjuster wheel into the adjuster assembly (Figure 7-11, Page 7-5).

INSTALLING THE BRAKE SHOES

1. Turn the adjusting wheel so that the shoe slot is vertical, then position the trailing shoe in the slots in the shoe mounting block and adjuster assembly. **See NOTE below.**

NOTE

- THE TRAILING SHOE HAS 17T STAMPED INTO THE TIP OF THE SHOE FLANGE (Figure 7-11). THE LEADING SHOE IS STAMPED 17L. WHEN INSTALLING THE SHOES, THE STAMPINGS ON BOTH SHOES SHOULD BE ORIENTED TO THE TOP OF THE BRAKE ASSEMBLY. WHEN INSTALLING THE SHOES ON THE PASSENGER SIDE OF THE VEHICLE, THE SIDE OF THE TRAILING SHOE FLANGE MARKED 17T SHOULD BE FACING OUT AND BE VISIBLE. ON THE DRIVER SIDE, THE 17L ON THE LEADING SHOE SHOULD BE FACING OUT AND BE VISIBLE.
- WHEN INSTALLED ON THE BACKING PLATE, THE *LEADING* SHOE (STAMPED 17L) IS *ALWAYS* ORIENTED TOWARD THE *REAR* OF THE VEHICLE.



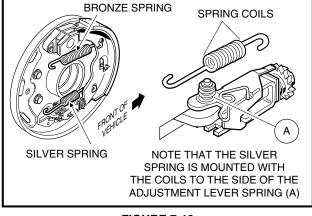
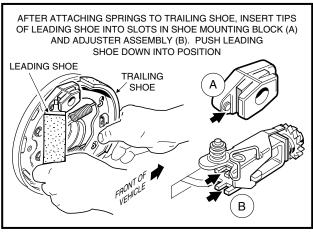


FIGURE 7-12

FIGURE 7-13



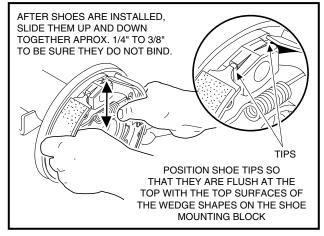


FIGURE 7-14 FIGURE 7-15

- Attach the springs onto the trailing shoe already installed. Then hold the leading shoe next to the trailing shoe, correctly oriented, and attach the springs to it (Figure 7-13).
- While maintaining spring attachment on both shoes, position the tips of the leading shoe in the mounting slots and then push the shoe into place. Hold the shoe in position and install the retaining clip (Figure 7-14).
- 5. After the shoes are installed, move them together up and down and side to side to make sure that they will easily slide approximately 1/4" to 3/8"(6.3 to 9.5 mm) without binding. Make sure that the shoes are positioned vertically so that the tips of the shoes are positioned flush at the top with the top surfaces of the wedge shapes on the shoe mounting blocks as shown (Figure 7-15).
- 6. Place a flatblade screwdriver under the adjusting arm and raise the arm off of the adjusting wheel. While holding the arm up, turn the wheel upward until it stops (Figure 7-16). Remove the screwdriver.
- 7. Install the axle shaft into the axle tube and install the retaining ring (Figure 7-3, Page 7-3).
- 8. Install the brake drum, and make sure that it is properly seated. See NOTE below.

NOTE

- IF DRUM INSTALLATION IS DIFFICULT, THE BRAKE SHOES MAY NEED TO BE ADJUSTED VERTICALLY IN THE MOUNTING SLOTS.
- 9. After the drum is installed, make sure that the axle and drum turn freely and then install the wheel.

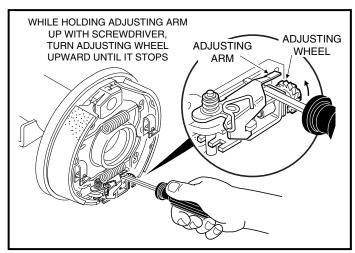


FIGURE 7-16

ADJUSTING THE BRAKES

- 1. When cleaning or repair on both wheels is complete, and with the brake cable still loose, lower the vehicle to the floor.
- 2. Depress and release the brake pedal repeatedly until an audible clicking can no longer be heard.
- 3. Adjust brake pedal free play by tightening the brake cables at the equalizer rod (See Section 6, Page 6-3).

BRAKE ASSEMBLY

Removal of Brake Assembly From Axle Tube

1. Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or floor jack. Place jackstands under the axle tubes to support the vehicle. **See WARNING at top of Page 7-8**.

Brake Assembly Removal, Continued:

A WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- SOME BRAKE SHOES CONTAIN ASBESTOS FIBER, AND ASBESTOS DUST IS CREATED WHEN THESE BRAKE MECHANISMS ARE HANDLED. WEAR APPROVED EYE AND RESPIRATORY PROTECTION WHEN DISASSEMBLING AND CLEANING BRAKE MECHANISMS. INHALATION OF ASBESTOS COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH. DO NOT USE COMPRESSED AIR OR AEROSOL SPRAYS TO CLEAN THE BRAKE MECHANISM. CLEAN BRAKE MECHANISMS USING THE NEGATIVE PRESSURE ENCLOSURE/HEPA VACUUM SYSTEM OR LOW PRESSURE/WET CLEANING METHOD PER OSHA/29 CFR 1910.1001.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- 2. Loosen the equalizer retaining nuts (1) on the equalizer rod (2) to slightly loosen the brake cable (Figure 7-2, Page 7-3).
- 3. Remove the rear wheels and then the brake drums.
- 4. Remove the axle. See CAUTION below.

A CAUTION

- REMOVE ONLY ONE AXLE SHAFT AT A TIME. COMPLETE BRAKE CLEANING OR REPAIR
 PROCEDURE ON ONE SIDE OF THE VEHICLE AND INSTALL THE AXLE SHAFT BEFORE
 BEGINNING PROCEDURE ON THE OTHER SIDE OF THE VEHICLE.
 - 4.1. Using snap ring pliers, remove the axle retaining ring (1) (Figure 7-3, Page 7-3).
 - 4.2. Pull the axle shaft (2) from the axle tube (Figure 7-3, Page 7-3).
- 5. Remove cotter pin (13) and clevis pin (12) from brake cable (Figure 7-1, Page 7-2).
- 6. Remove 4 bolts (11) (Club Car Part No. 1014153) and lock nuts (10) (Club Car Part No. 1013924) that mount the brake assembly to the transaxle.
- 7. Brake assembly can now be removed from transaxle.

Installation of Brake Assembly On Axle Tube

- 1. Install in reverse order of disassembly.
- 2. Be sure bolts (11) (Club Car Part No. 1014153) and lock nuts (10) (Club Car Part No. 1013924) are used to mount the brake assembly (Figure 7-1, Page 7-2).
- 3. Torque bolts to 27-33 ft.lbs. (36/45 N-m).

WARNING

- BE SURE RETAINING RING IS PROPERLY SEATED IN GROOVE. IF RING IS NOT PROPERLY INSTALLED, THE AXLE ASSEMBLY WILL SEPARATE FROM THE TRANSAXLE AND DAMAGE THE AXLE ASSEMBLY AND OTHER COMPONENTS. LOSS OF CONTROL OF THE VEHICLE COULD RESULT IN SEVERE PERSONAL INJURY OR DEATH.
- 4. Adjust brakes as previously described in this section.

SECTION 8 - STEERING AND FRONT SUSPENSION

E

GENERAL INFORMATION - STEERING

Steering is controlled through a rack and pinion steering assembly that is connected by a steering column to a steering wheel.

No manual adjustment to the rack and pinion gear assembly is required. A spring loaded self-adjusting mechanism is incorporated into the assembly.

A CAUTION

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- MOVING PARTS! DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CONNECTIONS.

GASOLINE VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR 22-6, PAGE 22-5, AND THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO **ON** AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

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STEERING WHEEL REMOVAL

- 1. Remove the mounting screws (30) and scorecard plate (28) (Figure 8-2, Page 8-4).
- 2. Match mark the steering wheel and steering column so that when the steering wheel is removed it can be placed back in exactly the same position on the steering shaft.
- 3. Loosen the steering wheel nut (27) and back it off approximately 1/4" (6 mm). Do not remove it (Figure 8-2).
- 4. Pull the steering wheel until it breaks free from the shaft splines (Club Car recommends using a steering wheel puller) (Figure 8-1).
- 5. Remove the steering wheel nut (27) and washer (26) from the shaft and then remove the steering wheel (Figure 8-2, Page 8-4).

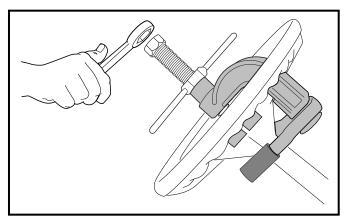


FIGURE 8-1

STEERING WHEEL INSTALLATION

NOTE

- TO MINIMIZE CORROSION AND FACILITATE FUTURE REMOVAL OF STEERING WHEEL, APPLY A SMALL AMOUNT OF OIL OR ANTI-SEIZE COMPOUND TO STEERING SHAFT SPLINES AND TAPER BEFORE INSTALLING THE STEERING WHEEL.
- 1. Install the steering wheel on the splines of the steering shaft, making sure to align the match marks placed on the wheel and steering column in Step 2 of Steering Wheel Removal.
- 2. Install the washer and steering wheel nut. Tighten the nut to 12-14 ft.lbs. (16.3/19 N-m) minimum.
- 3. Install the scorecard plate and scorecard plate mounting screws.

STEERING COLUMN

STEERING COLUMN REMOVAL

- 1. Remove the steering wheel as instructed above.
- 2. Remove the front body as instructed in Section 5.
- 3. Remove the center dash panel.
 - 3.1. Remove the plastic cap covering the screw on each side of the center dash.
 - 3.2. Loosen (but do not remove) the screw on each side of the center dash panel.
 - 3.3. Insert screwdriver at the top center of the dash between dash and cowl brace. Gently pry center dash out slightly from under edge of cowl brace.

3.4. Pull center dash out approximately one inch from the frame and then bend the top right corner of the center dash inward while pulling the top of the panel out and down.

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NOTE

- BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.
 - 3.5. Disconnect the wires from the electrical components mounted on the dash panel. Do not allow wires to touch.
 - 3.6. Slide center dash panel up the steering column.
- 4. Remove the driver side dash pocket.
 - 4.1. Remove cup holder hardware and cup holder.
 - 4.2. Remove the flange lock screw from the top of the dash pocket.
 - 4.3. Drill out the two pop rivets holding the dash pocket in place.
 - 4.4. Slide dash pocket out of vehicle.
- 5. Remove the upper bolt (2) and lock washer (3) from the universal joint (Figure 8-2, Page 8-4).
- 6. Remove the nuts (9), bolts (8 and 10), and washers (7 and 11) from the steering column mount (4 and 5) (Figure 8-2, Page 8-4).
- 7. Remove the steering column from the car.

STEERING COLUMN DISASSEMBLY

- 1. Remove screws (6) and mount (4 and 5) from the steering column (Figure 8-2, Page 8-4).
- 2. While supporting the steering shaft (19) on a workbench, remove the snap ring (13) from the shaft.

NOTE

- PREVENT THE STEERING SHAFT FROM SLIDING OUT OF THE STEERING TUBE WHILE REMOVING THE SNAP RING.
- 3. Remove the washer (14), spring (15), and wedge (16) (Figure 8-2, Page 8-4).
- 4. Turn the steering column over and insert a flat blade screwdriver between the seal (23) and the shaft. Pry the seal out of the bearing seat (18) (Figure 8-2, Page 8-4).

NOTE

- A NEW SEAL WILL BE REQUIRED FOR REASSEMBLY.
- 5. Slide the shaft out of the tube to expose the retaining ring (22). Use pliers to twist the retaining ring until it breaks off, then remove the wedge (16) (Figure 8-2, Page 8-4).

NOTE

- DO NOT ATTEMPT TO REUSE THE RETAINING RING FOR REASSEMBLY.
- 6. Remove the shaft from the bottom of the tube.
- 7. Use the steering shaft to push out the bearing seat (18) from the opposite end of the steering tube (20).

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Steering Column Disassembly, Continued:

8. Insert a flat blade screwdriver between the bottom of the outer race of the bearing and the bottom lip of the bearing seat (18) and remove the bearing (17) **(Figure 8-2)**.

A CAUTION

• DO NOT DAMAGE THE BEARING OR BEARING SEAT WHILE REMOVING THE BEARING.

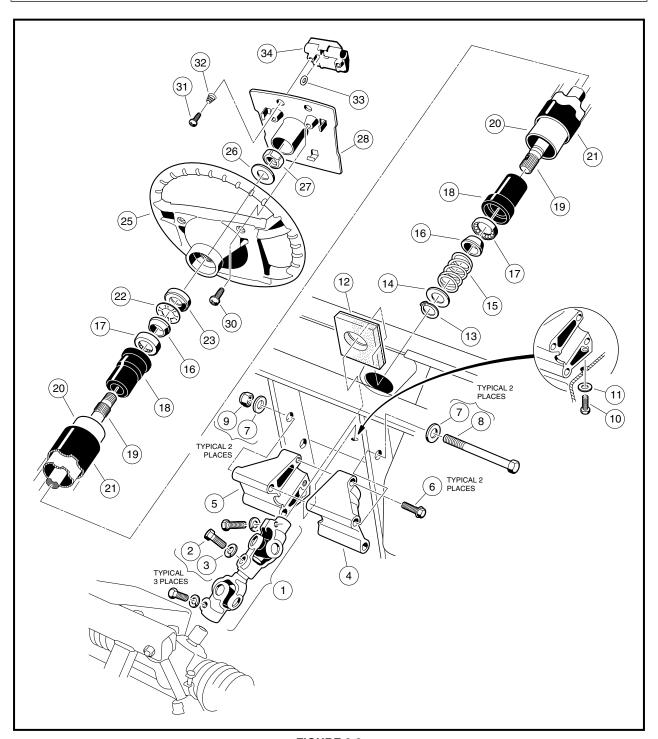


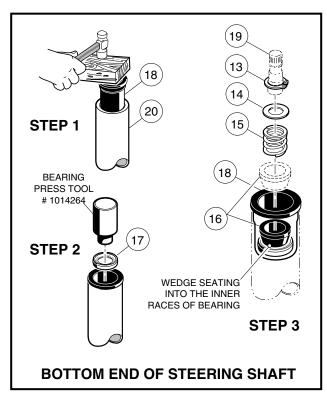
FIGURE 8-2

STEERING COLUMN ASSEMBLY

- 1. Insert the bearing seat (18) into the steering tube (20). Place a block of wood on the bearing seat and tap lightly on the block until the bearing seat is fully seated in the steering tube (**Figure 8-3**).
- 2. Press the bearing (17) all the way into the bearing seat (18) using a steering column bearing press tool (Club Car Part No. 1014264) or a metal tube approximately six inches (15-24 cm) long with a maximum outer diameter of 1-3/16 inches (3.3 centimeters) and a minimum inside diameter of 7/8 of an inch (2.2 centimeters). Be sure the bearing is installed in the bearing seat as shown (Figure 8-3), so that the wedge (16) will ride against the inner race of the bearing.
- 3. Install the wedge (16), spring (15), washer (14), and snap ring (13) onto the bottom end of the steering shaft (19) (Figure 8-3).
- 4. Insert the shaft from the bottom of the steering tube.
- 5. Turn the assembly over and place the shaft on a bench. Install the wedge (16) and retaining ring (22) onto the top of the shaft. Be sure that the prongs on the retaining ring face up and away from the wedge. Use a steering column retaining ring tool (Club Car Part No. 1014259) to seat the retaining ring to the proper depth. If you do not have the recommended tool, use the same tube as was used in Step 2 to press the retaining ring onto the top of the shaft. The retaining ring should be pressed onto the shaft until 2 to 2.12 inches (5.1-5.4 centimeters) of the shaft extends from the top of the bearing seat in the steering tube (Figure 8-4).
- 6. Press the seal (23) into the bearing seat (18) until it is flush with the end of the seat (**Figure 8-2**). When pressing the seal into the seat, set the steering tube on a bench so that all the pressure is exerted on the steering tube and not on the steering shaft.

STEERING COLUMN INSTALLATION (FIGURE 8-2)

- 1. Reinstall mount (4 and 5) onto the end of steering column. Tighten bolts (6) to 18-22 ft.lbs (25/30 N-m).
- 2. For ease of assembly and prevention of corrosion, apply a light coat of anti-seize and lubricating compound to both splined ends of the steering shaft.



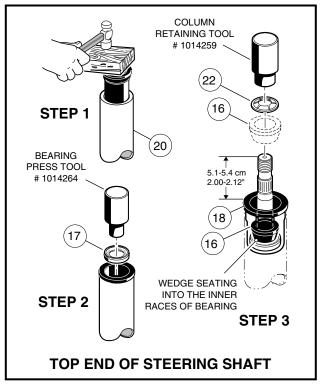


FIGURE 8-3 FIGURE 8-4

Page 8-5

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Steering Column Installation, Continued:

- 3. Position the steering column assembly in the vehicle while inserting the steering column shaft into the upper universal joint. The flat portion of the steering shaft spline must be aligned with the bolt hole in the universal joint before sliding the spline into the universal joint. While holding the steering column in place, attach it to the frame using bolts (8), washers (7) and nuts (9) (Figure 8-2, Page 8-4). Thread the nuts onto the bolts but do not tighten them.
- 4. Reinstall washer (11) and screw (10). Torque to 18-22 ft.lbs. (25/30 N-m).
- 5. Install the bolt (2) and lock washer (3) on the upper universal joint and tighten with fingers only.
- 6. Tighten the two nuts (9) to 15-20 ft.lbs. (20/27 N-m).
- 7. Tighten the bolt (2) on the upper universal joint to 13-17 ft.lbs. (18/23 N-m).
- 8. Reinstall center dash panel in reverse order of disassembly.
- 9. Reinstall dash pocket and related hardware.

STEERING ADJUSTMENT

- 1. Stand on the driver side of the vehicle and turn the steering wheel to the left until travel stops. Note the distance between the driver side spindle stop and the driver side A-plate. Turn the steering wheel to the right and note the distance between the passenger side spindle stop and the passenger side A-plate.
- 2. Loosen the nuts (11 and 16) and turn the drag link (17) (Figure 8-7, Page 8-8) to adjust the length of the drag link rod so that, with the rack at its limit of travel in a right hand turn, the passenger side spindle just touches the passenger side A-plate. The internal stop on the rack must reach its limit of travel against the rack and pinion housing at exactly the same time the spindle stops against the passenger side A-plate (vehicle wheels are turned to the right). Straighten the wheels, and then turn the steering wheel from lock to lock. No extraordinary amount of physical exertion should be required to turn the wheels to any point. If the steering wheel is difficult to turn, inspect the steering assemblies and front suspension assemblies and repair or replace components as necessary.

A CAUTION

- THE DRAG LINK HAS BOTH LEFT AND RIGHT HAND THREADS. THE END OF THE DRAG LINK TOWARD THE SPINDLE HAS LEFT HAND THREADS, AND THE END TOWARD THE RACK HAS RIGHT HAND THREADS. TO PREVENT DAMAGE TO THREADED PARTS, CARE SHOULD BE TAKEN WHEN SERVICING THE DRAG LINK ROD.
- 3. When all adjustments have been completed, tighten the nuts (11 and 16) on the drag link assembly with an open end wrench (Figure 8-7, Page 8-8).

NOTE

• WHEN TIGHTENING THE NUTS, MAKE SURE THAT THE DRAG LINK ROD (17) DOES NOT TURN (FIGURE 8-7, PAGE 8-8).

RACK AND PINION

RACK AND PINION REMOVAL

WARNING

 ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.

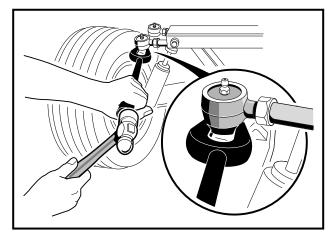
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.

GASOLINE VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR 22-6, PAGE 22-5, AND THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${
 m ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.



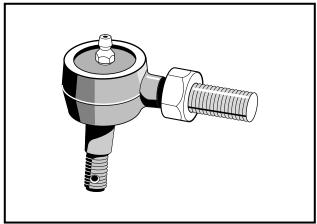


FIGURE 8-5 FIGURE 8-6

Page 8-7

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Rack and Pinion Removal, Continued:

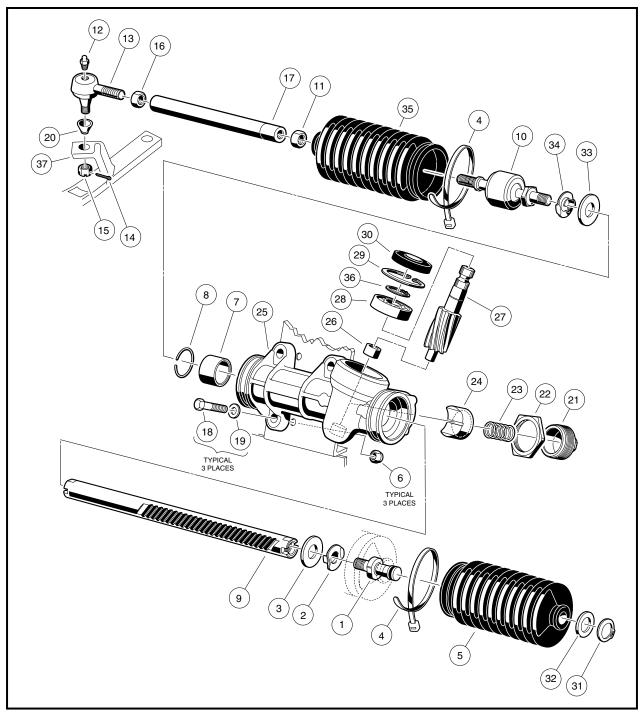


FIGURE 8-7

- 1. Remove the front body as instructed in Section 5.
- 2. Remove the cotter pin (14) and ball joint retaining nut (15) (Figure 8-7).
- 3. Using a ball joint removal tool, remove the ball joint (13) (Figure 8-7) from the spindle assembly (See Figures 8-5 and 8-6, Page 8-7).
- 4. Remove the bolts (18), washers (19), and nuts (6) from the steering rack assembly mounting bracket (Figure 8-7).

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RACK AND PINION DISASSEMBLY (SEE NOTE BELOW)

NOTE

 DURING THE 1996 MODEL YEAR, CLUB CAR INCORPORATED A NEW RACK AND PINION ASSEMBLY. FOR DS GASOLINE VEHICLES PRIOR TO SERIAL NO. AG9633-517735, AND FOR DS ELECTRIC VEHICLES PRIOR TO SERIAL NO. A9640-533437, FOLLOW THE INSTRUCTIONS BELOW. FOR DS VEHICLES WITH THESE OR HIGHER SERIAL NUMBERS, SEE PAGE 8-13.

WARNING

• THE RACK AND PINION MUST BE SERVICED EXACTLY AS INSTRUCTED IN THIS MANUAL. FAILURE TO FOLLOW PROPER PROCEDURES COULD CAUSE A LOSS OF STEERING WHICH COULD RESULT IN PROPERTY DAMAGE, SEVERE PERSONAL INJURY, OR DEATH!

A CAUTION

- THE BALL JOINT (13) (FIGURE 8-7) HAS LEFT HAND THREADS.
- 1. Remove the ball joint (13) (Figure 8-7) and inspect it for excessive wear (See Figure 8-6, Page 8-7).
- 2. Remove the drag link (17) (Figure 8-7).
- 3. Remove both bellows clamps (4) (Figure 8-7).
- 4. Remove the hex nut (11) and slide off the dust seal bellows (35) (Figure 8-7).
- 5. Remove the snap ring (31) and washer (32), then slide off dust seal bellows (5) (Figure 8-7).
- 6. Remove the rack guide screw (21), rack screw lock nut (22), rack guide pressure spring (23), and the rack guide (24) (Figure 8-7).
- 7. Remove the universal joint assembly from the pinion (27) by fully removing the bolt and then sliding off the universal joint.
- 8. Using an awl or other suitable tool, remove the dust seal (30) (Figure 8-7, Page 8-8) (See Figure 8-8, Page 8-10).

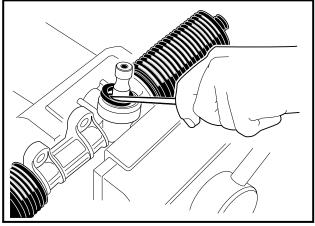
NOTE

- IF THE DUST SEAL (30) IS REMOVED, REPLACE IT WITH A NEW ONE.
- 9. Using snap ring pliers, remove the internal snap ring (29) (Figure 8-7) (See Figure 8-9, Page 8-10).
- 10. Install the universal joint onto the pinion (27) (Figure 8-7) and place a large open end wrench under the universal joint. Use the wrench as a lever to pull the pinion from the housing (Figure 8-10, Page 8-10).
- 11. If the ball bearing (28) (Figure 8-7) has been damaged, remove the external snap ring (36) (Figure 8-7) and press the bearing off (See Figure 8-11, Page 8-10).
- 12. Bend the edges of the washer (2) down and remove the rack (9) from the housing (25) (Figure 8-7) (See Figure 8-12, Page 8-11).
- 13. Using two wrenches, one wrench on the rack (9) and one on the stopper bolt (1) (Figure 8-7), remove the stopper bolt from the rack (See Figure 8-13, Page 8-11).
- 14. Remove the tie rod lock washer (2) and the washer (3), then slide the rack out (Figure 8-7).

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Rack and Pinion Disassembly, Continued:



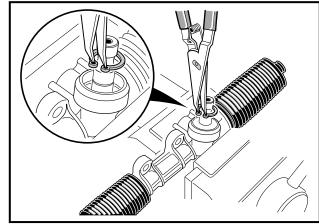
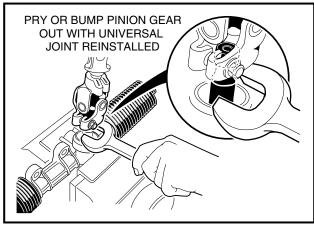


FIGURE 8-8 FIGURE 8-9



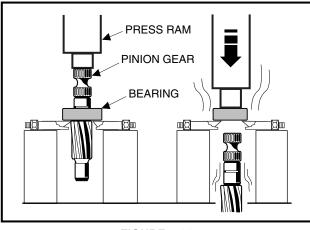


FIGURE 8-10 FIGURE 8-11

15. If the ball joint (10) is excessively worn, remove the ball joint from the rack using two wrenches (Figure 8-7, Page 8-8).

A CAUTION

- THE SNAP RING (8) (FIGURE 8-7) MAY SPRING OUT WHEN IT IS BEING REMOVED.
- 16. Inspect the bushing (7) for excessive wear. If wear is excessive, remove the snap ring (8) and then remove the bushing by pressing it from the opposite end of the housing (25) (Figure 8-7, Page 8-8).

RACK AND PINION ASSEMBLY (SEE NOTE BELOW)

NOTE

- THESE ASSEMBLY INSTRUCTIONS FOR THE RACK AND PINION PERTAIN TO DS GASOLINE VEHICLES **PRIOR TO** SERIAL NUMBER AG9633-517735, AND TO DS ELECTRIC VEHICLES **PRIOR TO** SERIAL NUMBER A9640-533437. FOR LATER VEHICLES, GO TO PAGE 8-15.
- 1. If the bushing (7) (Figure 8-7, Page 8-8) was removed, install a new one. Make sure that it is pressed in evenly (See Figure 8-14, Page 8-12). Install the snap ring (8) (Figure 8-7, Page 8-8).

2. Install the washer (33), a new tie rod lock washer (34), and a new ball joint (10). Tighten using two wrenches, one on the ball joint and one on the rack (9). Tighten the ball joint to 50-55 ft.lbs. (68/75 N-m) (Figure 8-7, Page 8-8). See NOTE below.

A CAUTION

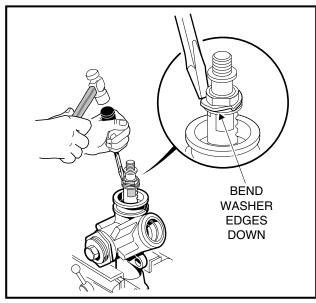
- MAKE SURE THAT THE TIE ROD LOCK WASHER (2) **(FIGURE 8-7, PAGE 8-8)** ALIGNS WITH THE SLOTS IN THE RACK.
- 3. Bend the edges of the tie rod lock washer (34) up against the ball joint (Figure 8-7, Page 8-8).
- 4. Apply a liberal amount of grease to the teeth of the rack (9), then slide the rack through the bushing (7) and housing (25). Install the washer (3), tie rod lock washer (2), and stopper bolt (1) to the end of the rack. Using two wrenches, one on the rack and one on the stopper bolt, tighten the stopper bolt to 50-55 ft.lbs. (68/75 N-m) (Figure 8-7).
- 5. Bend the edges of the lock washer (2) up against the stopper bolt (Figure 8-7, Page 8-8).

A CAUTION

- IN STEP SIX, DO NOT PRESS AGAINST OUTER RACE OF THE BEARING.
- 6. If the bearing (28) was removed, press on a new bearing, exerting all pressure on the inner race (grease the bearing before installing it). Then install the external snap ring (36) (Figure 8-7, Page 8-8).
- 7. If the bearing (26) is damaged, the bearing and housing (25) must be replaced as an assembly (**Figure 8-7**, **Page 8-8**).
- 8. Install the pinion (27) and bearing (28) assembly into the housing (25). Make sure the rack gear teeth will mesh with the gear teeth on the pinion. The rack may need to be rotated slightly while lightly tapping on the pinion-bearing assembly with a rubber mallet (See CAUTION below).

A CAUTION

• DO NOT FORCE THE PINION-BEARING ASSEMBLY INTO THE HOUSING. GEAR TEETH OR THE SMALL NEEDLE BEARINGS COULD BE DAMAGED.



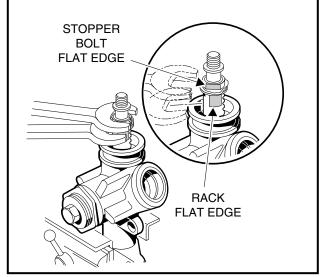
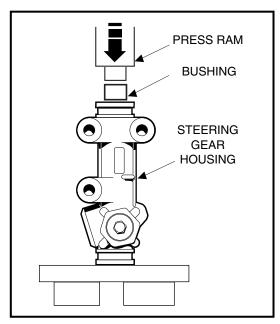


FIGURE 8-12 FIGURE 8-13

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Rack and Pinion Assembly, Continued:



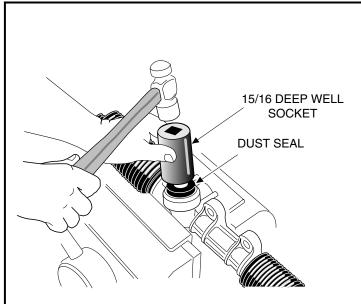


FIGURE 8-14

FIGURE 8-15

- 9. Install the internal snap ring (29) (Figure 8-7, Page 8-8).
- 10. Using a 15/16 deep well socket to apply pressure evenly, lightly tap in a new dust seal (30) (Figure 8-7, Page 8-8) (See Figure 8-15).
- 11. Apply a small amount of grease to the rack guide where it comes into contact with the rack (9) **(Figure 8-7, Page 8-8).**
- 12. Install a few drops of Loctite® 222 to the threads of the screw (21) (Figure 8-7, Page 8-8).
- 13. Install the rack guide (24), pressure spring (23), and screw (21). The screw should be threaded in until tight and then backed off 1/8 of a turn. Install the lock nut (22) on the screw and tighten it to 40 ft.lbs. (54 N-m) (Figure 8-7, Page 8-8).
- 14. Install the dust seal bellows (5), washer (32), and snap ring (31) (Figure 8-7, Page 8-8).
- 15. Install the dust seal bellows (35) and hex nut (11) (Figure 8-7, Page 8-8).
- 16. Install the universal joint on the pinion. Tighten the bolt to 21-25 ft.lbs. (28/34 N-m).
- 17. Install new bellows clamps (4) (Figure 8-7, Page 8-8).
- 18. Install the drag link (17) (Figure 8-7, Page 8-8). See CAUTION below.

A CAUTION

- THE TIE ROD AND DRAG LINK HAVE RIGHT HAND THREADS ON ONE END AND LEFT HAND THREADS ON THE OTHER END. RIGHT HAND THREADS ARE IDENTIFIED BY A GROOVE IN THE TIE ROD OR DRAG LINK.
- 19. Install the ball joint (13) (Figure 8-7, Page 8-8). See CAUTION below and NOTE at top of page 8-13.

A CAUTION

• THE BALL JOINT (13) (FIGURE 8-7, PAGE 8-8) HAS LEFT HAND THREADS.

NOTE

• TO BE SURE THAT THE RACK AND PINION IS WORKING PROPERLY, TURN THE UNIVERSAL JOINT ASSEMBLY BY HAND. IF IT IS TOO TIGHT, LOOSEN THE LOCK NUT (22) AND BACK THE SCREW (21) OFF 1/4 TURN. THEN TIGHTEN THE LOCK NUT (22) TO 40 FT.LBS. (54 N-M) (FIGURE 8-7, PAGE 8-8).

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20. Adjust the steering gear (See Page 8-6).

RACK AND PINION DISASSEMBLY (SEE NOTE BELOW)

NOTE

• THESE INSTRUCTIONS FOR RACK AND PINION DISASSEMBLY PERTAIN TO GASOLINE VEHICLES SERIAL NUMBER AG9633-517735 AND LATER AND TO ELECTRIC VEHICLES SERIAL NUMBER A9640-533437 AND LATER. FOR EARLIER VEHICLES, GO TO PAGE 8-9.

A CAUTION

- THE BALL JOINT (23) (FIGURE 8-17, PAGE 8-14) HAS LEFT HAND THREADS.
- 1. Remove the ball joint (23) (Figure 8-17, Page 8-14) and inspect it for excessive wear (See Figure 8-6, Page 8-7).
- 2. Remove the drag link (28) (Figure 8-17, Page 8-14).
- 3. Remove both bellows clamps (2) (Figure 8-17, Page 8-14).

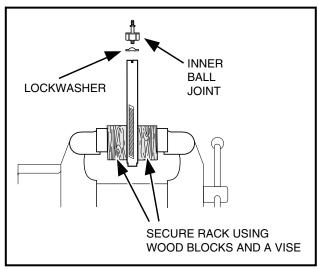


FIGURE 8-16

- 4. Remove the hex nut (29) and slide off the dust seal bellows (1) (Figure 8-17, Page 8-14).
- 5. Remove the retaining ring (21), then slide off dust seal bellows (20) (Figure 8-17, Page 8-14).
- 6. Remove the rack guide screw (16), rack screw lock nut (15), rack guide pressure spring (14), and the rack guide (13) (Figure 8-17, Page 8-14).
- 7. Remove the universal joint assembly from the pinion (8) by fully removing the bolt and then sliding off the universal joint.

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Rack and Pinion Disassembly, Continued:

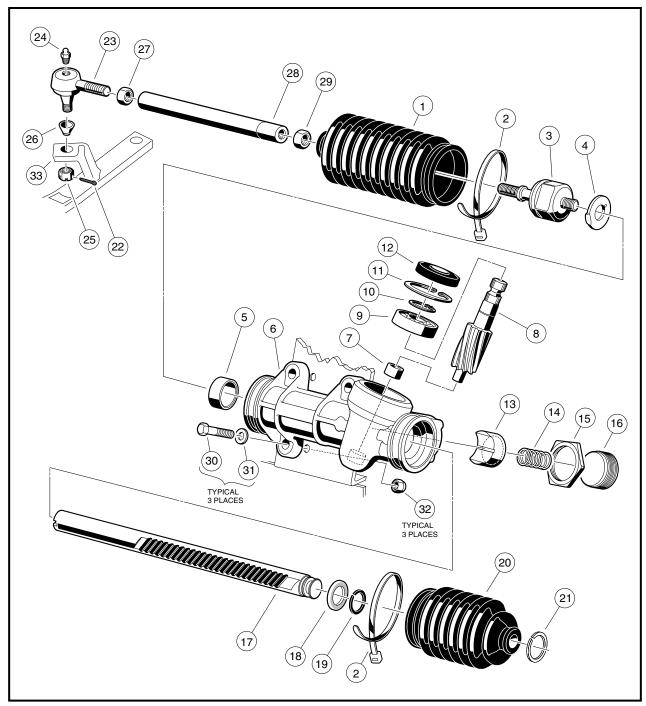


FIGURE 8-17

8. Remove the dust seal (12) (Figure 8-17) with a cotter key puller (See Figure 8-8, Page 8-10).

NOTE

- IF THE DUST SEAL (12) IS REMOVED, REPLACE WITH A NEW ONE.
- 9. Using snap ring pliers, remove the internal snap ring (11) (Figure 8-17) (See Figure 8-9, Page 8-10).

- 10. Install the universal joint onto the pinion and place a large open end wrench under the universal joint (Figure 8-10, Page 8-10). Use the wrench as a lever to pull the pinion from the housing.
- 11. If the ball bearing (9) has been damaged, remove the external snap ring (10) (Figure 8-17) and press the bearing off (See Figure 8-11, Page 8-10).
- 12. Remove the retaining ring (19) and stop washer (18), then remove the rack (17) from the housing (6) (Figure 8-17).
- 13. If the inner ball joint (3) is excessively worn, remove the ball joint from the rack by securing the rack in a vise. Using wood blocks between the rack and the jaws of the vise to protect the rack from damage, loosen and remove the inner ball joint with a wrench (Figure 8-16, Page 8-13).
- 14. Inspect the bushing (5) for excessive wear. If wear is excessive, replace the housing (6) **(Figure 8-17)**. The bushing should not be replaced and is not available as a Service Part.

RACK AND PINION ASSEMBLY (SEE NOTE BELOW)

NOTE

- THESE ASSEMBLY INSTRUCTIONS FOR THE RACK AND PINION PERTAIN TO DS GASOLINE VEHICLES SERIAL NO. AG9633-517735 AND LATER, AND DS ELECTRIC VEHICLES SERIAL NUMBER A9640-533437 AND LATER. FOR EARLIER VEHICLES, GO TO PAGE 8-10.
- 1. Install a new tab washer (4) and a new inner ball joint (3) (Figure 8-17). Install the ball joint onto the rack by securing the rack in a vise using wood blocks between the rack and the jaws of the vise to protect the rack from damage (Figure 8-16, Page 8-13). Tighten the ball joint to 57 ft.lbs. (77.3 N-m).
- 2. Bend the edges of the tab washer (4) up against the ball joint (Figure 8-17).
- 3. Apply a liberal amount of grease to the teeth of the rack (17), then slide the rack through the bushing (5) and housing (6). Install the stop washer (18) and retaining ring (19) to the end of the rack.

A CAUTION

- IN STEP FOUR, DO NOT PRESS AGAINST OUTER RACE OF THE BEARING.
- 4. If the bearing (9) was removed, press on a new bearing, exerting all pressure on the inner race (grease the bearing before installing it). Then install the external snap ring (10) (Figure 8-17).
- 5. If the bearing (7) is damaged, the bearing and housing must be replaced as an assembly (Figure 8-17).
- 6. Install the pinion (8) and bearing (9) assembly into the housing (6). Make sure the rack gear teeth will mesh with the gear teeth on the pinion. The rack may need to be rotated slightly while lightly tapping on the pinion-bearing assembly with a rubber mallet. See CAUTION below.

A CAUTION

- DO NOT FORCE THE PINION-BEARING ASSEMBLY INTO THE HOUSING. GEAR TEETH OR THE SMALL NEEDLE BEARINGS COULD BE DAMAGED.
- 7. Install the internal snap ring (11) (Figure 8-17).
- 8. Using a socket to apply pressure evenly, press in a new dust seal (12) (Figure 8-17) (See Figure 8-15, Page 8-12).
- 9. Apply a small amount of grease to the rack guide where it comes into contact with the rack (17) **(Figure 8-17).**
- 10. Install a few drops of Loctite® 222 to the threads of the screw (16) (Figure 8-17).

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Rack and Pinion Assembly, Continued:

- 11. Install the rack guide (13), pressure spring (14), and screw (16). The screw should be threaded in until tight and then backed off 1/8 of a turn. Install the lock nut (15) on the screw and tighten it to 29 ft.lbs. (39.3 N-m) (Figure 8-17, Page 8-14).
- 12. Install the dust seal bellows (20) and retaining ring (21) (Figure 8-17, Page 8-14).
- 13. Install the hex nut (29) and dust seal bellows (1).
- 14. Install the universal joint on the pinion. Tighten the bolt to 13-17 ft.lbs. (18/23 N-m).
- 15. Install new bellows clamps (2) (Figure 8-17, Page 8-14).
- 16. Install the drag link (28) (Figure 8-17, Page 8-14).

A CAUTION

- THE BALL JOINT (23) (FIGURE 8-17, PAGE 8-14) HAS LEFT HAND THREADS.
- THE TIE ROD AND DRAG LINK HAVE RIGHT HAND THREADS ON ONE END AND LEFT HAND THREADS ON THE OTHER END. RIGHT HAND THREADS ARE IDENTIFIED BY A GROOVE IN THE TIE ROD OR DRAG LINK.
- 17. Install the ball joint (23) (Figure 8-17, Page 8-14).

NOTE

- TO BE SURE THAT THE RACK AND PINION IS WORKING PROPERLY, TURN THE UNIVERSAL JOINT ASSEMBLY BY HAND. IF IT IS TOO TIGHT, LOOSEN THE LOCK NUT (15) AND BACK THE SCREW (16) OFF 1/8 TURN. THEN TIGHTEN THE LOCK NUT (15) TO 29 FT.LBS. (39.3 N-M) (FIGURE 8-17, PAGE 8-14).
- 18. Adjust the steering gear (See Page 8-6).

RACK AND PINION INSTALLATION

- 1. Position the steering rack on the steering rack mounting bracket and install the bolts (30), washers (31), and nuts (32). Do not tighten the mounting bolts (Figure 8-17, Page 8-14).
- 2. For ease of assembly and prevention of corrosion, apply a light coat of anti-seize and lubricating compound to the splined end of the steering column shaft.
- 3. Align the flat portion of the steering shaft spline with the bolt hole in the universal joint and then slide the shaft into the upper universal joint. Install the bolt on the upper universal joint and tighten it to 13-17 ft.lbs. (18/23 N-m).
- 4. Tighten the steering rack mounting bolts (30) to 20-24 ft.lbs. (27/33 N-m) (Figure 8-17, Page 8-14).
- 5. Adjust steering (See Page 8-6).

TIE ROD AND DRAG LINK

TIE ROD AND DRAG LINK REMOVAL

A WARNING

 ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.

- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.

GASOLINE VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR 22-6, PAGE 22-5, AND THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${\bf ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.
- 1. Remove the cotter pins (22) and ball joint retaining nuts (20) (Figure 8-22, Page 8-21).
- 2. Use a ball joint removal tool to remove the ball joints (Figure 8-5, Page 8-7).
- 3. Unscrew the drag link (28) from the inner ball joint assembly (3) (Figure 8-17, Page 8-14). Remove the ball joints from the tie rod (11) (Figure 8-22, Page 8-21).

TIE ROD AND DRAG LINK INSTALLATION

1. Thread the ball joints into the tie rod to thread depth of 1/2 inch (12.5 mm).

A WARNING

• THE BALL JOINTS MUST BE THREADED INTO THE ROD AT LEAST 5/16 OF AN INCH (8 MM). FAILURE TO THREAD BALL JOINTS IN DEEP ENOUGH MAY CAUSE A BALL JOINT TO SEPARATE FROM THE ROD DURING ADJUSTMENT OR WHILE BEING OPERATED, POSSIBLY RESULTING IN SEVERE PERSONAL INJURY.

A CAUTION

- THE TIE ROD AND DRAG LINK HAVE RIGHT HAND THREADS ON ONE END AND LEFT HAND THREADS ON THE OTHER END. RIGHT HAND THREADS ARE IDENTIFIED BY A GROOVE IN THE TIE ROD OR DRAG LINK.
- 2. Install the ball joint ends (6 and 13) into the spindle arms (23) (Figure 8-22, Page 8-21).

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Tie Rod and Drag Link Installation, Continued:

- 3. Thread the drag link rod (28) all the way onto the threaded stud of the inner ball joint assembly (right hand threads) (Figure 8-17, Page 8-14).
- 4. Thread the ball joint (23) into the drag link rod (28) (left hand threads) to full thread depth (Figure 8-17).
- 5. Install the ball joint (23) on the spindle arm riser (33), then install the retaining nut and cotter pin (Figure 8-17, Page 8-14).
- 6. Adjust wheel toe-in (See below).

FRONT SUSPENSION

LUBRICATION

Five grease fittings are provided (one in each spindle housing, one in the ball joint on each end of the tie rod, and one in the ball joint of the steering drag link). Lubricate at these fittings every ninety days with a good lubricant. See the Lubrication Chart in Section 4 of this manual.

A CAUTION

• TO ENSURE PROPER LUBRICATION OF THE FRONT SUSPENSION AND STEERING LINKAGES, RAISE THE FRONT OF THE VEHICLE TO LUBRICATE. SEE WARNING ON PAGE 8-7.

WHEEL ALIGNMENT

Wheel alignment is limited to equalizing the camber angle of each front wheel and adjusting toe-in of the front wheels. There is also a drag link adjustment to equalize the turning radius in both directions (See Steering Adjustment, Page 8-6).

Camber Adjustment

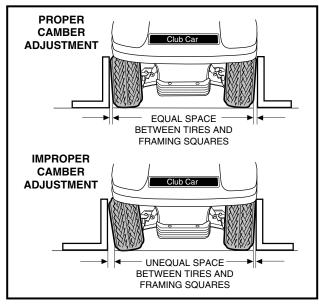
- 1. Check each front wheel with a framing square. At the floor (or ground), there should be an equal amount of space between each tire and the framing square (See Figure 8-18).
- 2. Loosen (do not remove) the four bolts (30) that secure the leaf spring (6) to the bottom spring plate (29) (Figure 8-23, Page 8-23).
- 3. Loosen (do not remove) the hex nut (8) on the adjustment eccentric (7) in the center of the spring (Figure 8-19).
- 4. Use a 9/32 deep well socket to rotate the eccentric (Figure 8-19).
- 5. After aligning the front wheels, tighten the four spring retaining bolts (30) (Figure 8-23, Page 8-23) to 20-25 ft.lbs. (27/34 N-m). Then roll the vehicle backward one full tire revolution and recheck the camber (See Figure 8-18).
- 6. Tighten the hex nut (8) on the adjustment eccentric (7) to 10 ft.lbs. (13.5 N-m) (Figure 8-19).

Toe-in Adjustment

- 1. With the vehicle on a level surface, turn the steering wheel so that the front wheels point straight ahead.
- 2. Measure the distance between the exact centers (vertical centerline on tread) on the forward faces of the front wheels, and at the same height, the rear faces of the front wheels (Figure 8-20).
- 3. Subtract the measurement on the front of the tires from the measurement on the rear of the tires. The difference is the toe-in. Proper toe-in is 1/8 to 3/8 of an inch (3.2 to 9.5 mm).

NOTE

THE FRONT MEASUREMENT SHOULD BE LESS THAN THE REAR MEASUREMENT.



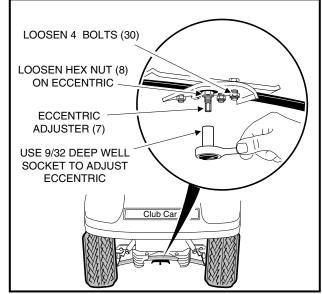


FIGURE 8-18

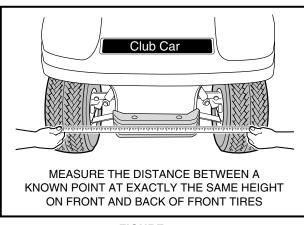


FIGURE 8-19

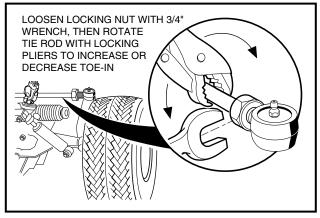


FIGURE 8-20

FIGURE 8-21

4. If adjustment is necessary, loosen the lock nut on each tie rod ball joint and rotate the tie rod to increase or decrease toe-in (Figure 8-21).

A CAUTION

- THE TIE ROD HAS RIGHT HAND THREADS ON ONE END AND LEFT HAND THREADS ON THE OTHER END. RIGHT HAND THREADS ARE IDENTIFIED BY A GROOVE IN THE TIE ROD.
- 5. Roll car backward one full tire revolution and recheck toe-in. If toe-in is incorrect, go back to Step 4.
- 6. Tighten lock nuts (loosened in Step 4) to 18-24 ft.lbs. (24/34 N-m) and recheck toe-in.
- 7. After toe-in adjustment is made, with the wheels in the straight ahead position, the steering wheel should be at the center of its travel. There should be equal travel to the left and to the right. See NOTE below and at the top of page 8-20.

NOTE

• IF THE MINIMUM TURNING RADIUS IS NOT THE SAME FOR BOTH LEFT AND RIGHT TURNS, ADJUST THE STEERING (SEE PAGE 8-6).

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Toe-In Adjustment, Continued:

NOTE

 IF THE VEHICLE IS EQUIPPED WITH THE PERMANENT TOWING OR DELUXE ON-BOARD TOWING OPTION, ADJUST BY LOOSENING THE THE BALL JOINT HEX NUT ON THE TOW ASSEMBLY AND ROTATING THE STEERING ARM TO ACHIEVE 16-1/2 INCHES (42 CM) FROM CENTERLINE OF RIGHT FRONT TIRE TO THE CLOSEST EDGE OF THE HOLE IN THE TOWING LUG.

FRONT SUSPENSION COMPONENTS

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.

GASOLINE VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR 22-6, PAGE 22-5, AND THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO "ON" AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

TAPERED LEAF SPRING REMOVAL

1. Raise the front of the vehicle with a chain hoist or a jack. Place jackstands under the front cross tube of the vehicle frame and lower the vehicle onto the jackstands. **See WARNING on page 8-21.**

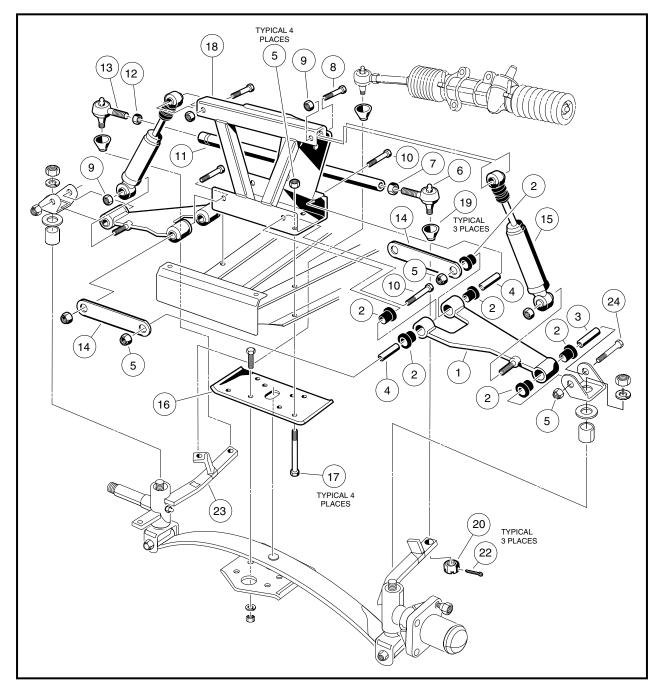


FIGURE 8-22

WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 2. Remove both front wheels.
- 3. Remove the nuts (14) and bolts (25) from each king pin clevis (26) (Figure 8-23, Page 8-23).

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Tapered Leaf Spring Removal, Continued:

- 4. Remove the four bolts (30), four nuts (32), four lock washers (31), and bottom spring plate (29) **(Figure 8-23)**.
- 5. Remove tapered leaf spring (6) (Figure 8-23).
- Check the condition of the bushings (27) and spacers (28) (Figure 8-23). Replace any that are worn or damaged.

TAPERED LEAF SPRING INSTALLATION

- 1. Install the bushings (27) and spacers (28) into the tapered leaf spring eyes (Figure 8-23).
- 2. Install the tapered leaf spring, bottom spring plate (29), four bolts (30), four lock washers (31), and four nuts (32) (Figure 8-23). Using an "X" pattern sequence, tighten the bolts to 20-25 ft.lbs. (27/34 N-m).
- 3. Install the spring in the king pin clevis with the bolt (25) and nut (14) **(Figure 8-23)**. Tighten the bolt to 15-18 ft.lbs. (20/25 N-m).
- 4. Install the wheels and tighten the lug nuts to 50-60 ft.lbs. (68/81 N-m).
- 5. Adjust camber and toe-in as instructed on Pages 8-18 and 8-19 of this manual.

KING PIN AND STEERING SPINDLE REMOVAL

- 1. Remove the front hub (See Page 8-24).
- 2. Remove cotter pins (34) and nuts (33), then remove ball joints from the spindles (Figure 8-23) (See Tie Rod and Drag Link Removal, Page 8-16).
- 3. Remove the nut (17) and lock washer (18) from the top of the king pin (26) (Figure 8-23).
- 4. Raise the A-Plate clevis (16) from the the king pin (Figure 8-23).
- 5. Remove the thrust washer (19) (Figure 8-23).
- 6. Slide the spindle off of the king pin.
- 7. Remove the wave washer (20) and inspect it (Figure 8-23). If the washer is broken or has a wave bottom to wave crest height dimension of less than .040, it must be replaced.
- 8. Remove the bolt (25) and nut (14) from the king pin clevis (Figure 8-23).
- 9. Remove the king pin.
- 10. Inspect the king pin and spindle. If either is worn or damaged, it must be replaced.
- 11. Inspect the bushings (3 and 4) (Figure 8-23). If the bushings are worn or damaged, remove them and press in new ones (See NOTE below).

NOTE

IF THE BUSHINGS ARE REPLACED, REAM NEW BUSHINGS TO .750-.752 INCHES (19.05/19.10 MM) IN DIAMETER. THE REAMER SHOULD BE LONG ENOUGH TO REAM BOTH BUSHINGS FROM ONE DIRECTION.

KING PIN AND STEERING SPINDLE INSTALLATION

- 1. Inspect all parts and replace them as necessary.
- 2. Install the king pin clevis over the tapered leaf spring eye. Insert the bolt (25) and install the nut (14) (Figure 8-23). Tighten the bolt to 15-18 ft.lbs. (20/24 N-m).
- 3. Install the wave washer (20) (Figure 8-23).

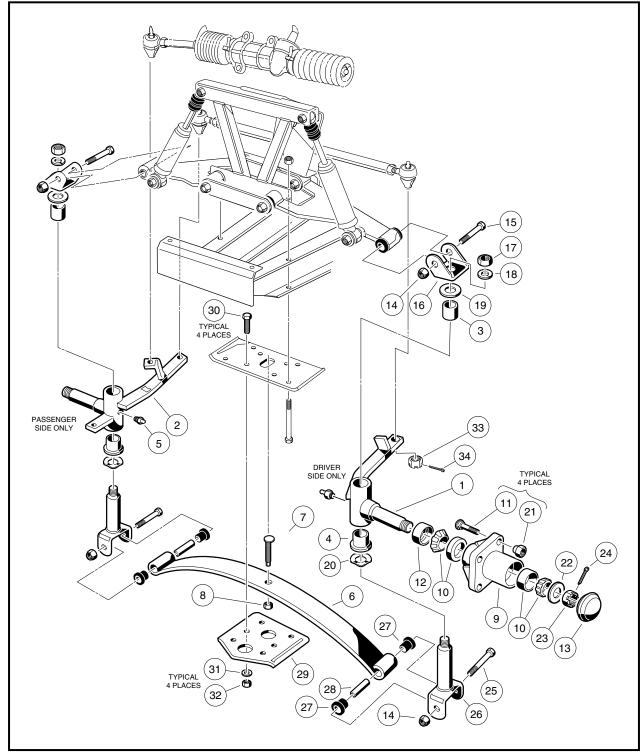


FIGURE 8-23

- 4. Install the steering spindle on the king pin. Then install the thrust washer (19), A-Plate clevis (16), lock washer (18), and nut (17). Tighten the nut to 35-45 ft.lbs. (47/61 N-m) (Figure 8-23).
- 5. Attach the ball joints to the spindle arm, install and tighten the nut (33), and install the cotter pin (34) (Figure 8-23).
- 6. Install the front hub and wheel (See Page 8-25).

G

DELTA A-PLATE REMOVAL

- 1. Remove the wheel and tire.
- 2. Remove the bolts (10 and 24), A-Plate straps (14), and nuts (5) (Figure 8-22, Page 8-21).
- 3. Remove the lower shock absorber mounting nut (9), then slide the shock absorber free of the Delta A-Plate (Figure 8-22, Page 8-21).
- 4. Remove the Delta A-Plate (1) (Figure 8-22, Page 8-21).
- 5. Inspect the bushings in the Delta A-Plate and replace them if necessary.

DELTA A-PLATE INSTALLATION

- 1. Install the A-Plate in reverse order of removal. Tighten the A-Plate suspension bolts (10 and 24) to 18-22 ft.lbs. (24/30 N-m) (Figure 8-22, Page 8-21).
- 2. Install the wheel and adjust the camber as instructed on Page 8-18 of this manual.

SHOCK ABSORBER REMOVAL

- 1. Inspect the shock absorbers for fluid leakage at the point where the shaft enters the shock absorber body. Leaking shock absorbers should be replaced.
- 2. Remove the nut (9) attaching the shock absorber to the A-Plate (Figure 8-22, Page 8-21).
- 3. Remove the nut (9) and bolt (8) attaching the shock absorber to the vehicle frame (Figure 8-22, Page 8-21).
- 4. Remove the shock absorber.

SHOCK ABSORBER INSTALLATION

- 1. Install the shock absorber by reversing the removal procedure.
- 2. Tighten the nuts to 18-22 ft.lbs. (24/30 N-m).

FRONT WHEEL BEARINGS AND HUBS

CHECK FRONT WHEEL FREE PLAY

1. Raise the front of the vehicle.

WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 2. Using hands, attempt to rock the wheel back and forth on the hub. If there is any observable rocking of the wheel on the hub, tighten the axle nut (3) and test again for rocking. If rocking continues, repack or replace the wheel bearings (5) as required (Figure 8-24).

FRONT WHEEL BEARINGS AND HUB REMOVAL

- 1. Remove the front wheels.
- 2. Remove the front wheel hubs.
 - 2.1. Remove the dust cover (1), cotter pin (2), axle nut (3), and flat washer (8) (Figure 8-24).
 - 2.2. Remove the hub assembly (4) from the axle (Figure 8-24).



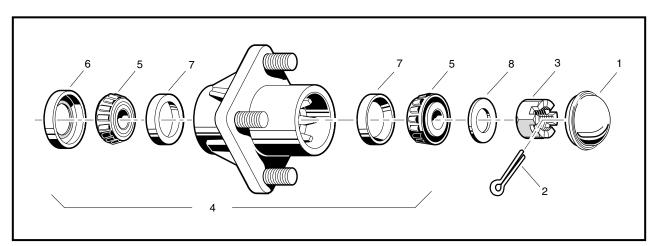


FIGURE 8-24

- 3. Remove the seal (6) and the bearings (5) from the hub (Figure 8-24).
- 4. Inspect the bearing cups (7). If they are worn or pitted, remove the cups by inserting a drift punch from the opposite end of the hub and tapping lightly around them (**Figure 8-24**).
- 5. Clean all parts and inspect them for wear. Replace any damaged or worn parts.
- 6. Inspect the surface of spindle where the oil seal (6) seats. It should be clean and smooth.

FRONT WHEEL BEARINGS AND HUB INSTALLATION

- 1. Pack the wheel bearings (5) with wheel bearing grease or chassis lube. Make sure that the grease is forced between the rollers (Figure 8-24).
- 2. If the bearing cups (7) were removed, press new ones in squarely against the stop in the hub.

NOTE

- ALWAYS INSTALL NEW CUPS WHEN NEW BEARINGS ARE INSTALLED.
- 3. Install the wheel bearings (5) into the hub and install a new seal (6), with the metal edge toward the hub (See NOTE below).

NOTE

- APPLY GREASE AROUND DUST SEAL LIP BEFORE INSTALLING IT.
- 4. Install the hub assembly (4) and flat washer (8) on the axle and start the axle nut (3).
- 5. Tighten the axle nut until the hub is hard to turn, then back the nut off until the hub turns freely. Install the cotter pin (2) **(Figure 8-24)**.

NOTE

- WHEN THE COTTER PINS ARE BENT OVER, MAKE SURE THAT THEY DO NOT CONTACT THE HUB OR DUST CAP.
- 6. Install the dust cap (1) (Figure 8-24).
- 7. Repeat the procedure for the opposite wheel. Install the wheels and then tighten the lug nuts to 50-60 ft.lbs. (68/81 N-m).

C

LUBRICATION

There are two plugs located on the lower half of the transaxle housing. The upper one, when the transaxle is in a horizontal position, is used as a lubricant level indicator. The lubricant level should be even with the bottom of the hole. The lower plug is for draining the lubricant. When draining the lubricant, the level plug should be removed so that the lubricant will drain faster. Be sure that the drain plug is installed before filling.

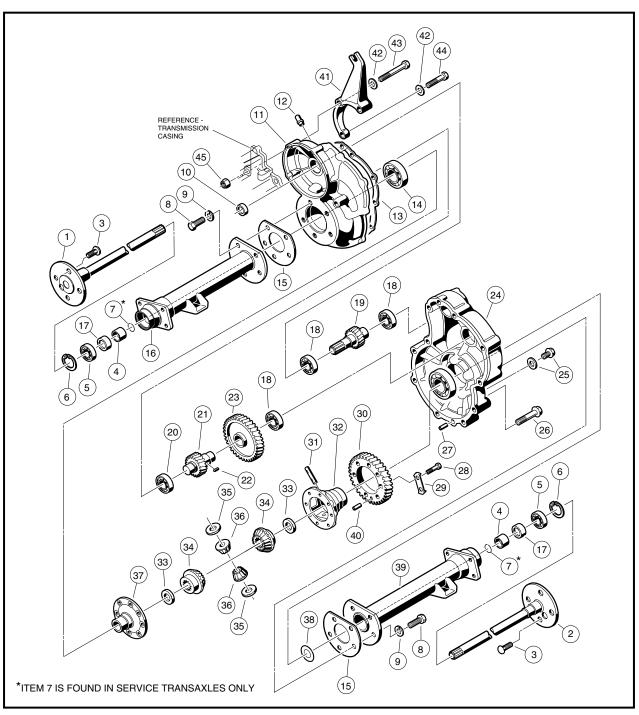


FIGURE 9-1

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A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.

GASOLINE VEHICLES ONLY:

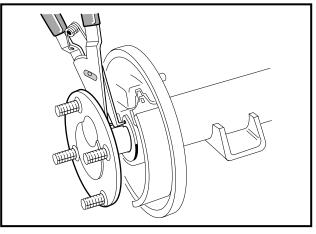
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR 22-6, PAGE 22-5. THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${
 m ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

REMOVING THE AXLE SHAFT

- 1. Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or floor jack. Place jackstands under the axle tubes to support the vehicle.
- 2. Remove the rear wheel and brake drum.
- 3. Using 90° internal snap ring pliers, remove the internal retaining ring (6) (Figure 9-1, Page 9-1) from the axle tube (See Figure 9-2).
- 4. Remove the axle, retaining ring, and bearing assembly by pulling the axle straight out of the housing.



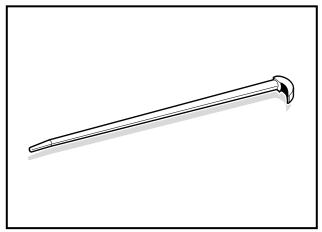


FIGURE 9-2

FIGURE 9-3

5. Use a 16 inch (40 centimeter) rolling wedge bar (Figure 9-3) to remove the oil seal (17) (Figure 9-1, Page 9-1). Insert the wedge bar underneath the seal lip and pry it out (Figure 9-4).

A CAUTION

- DO NOT SCAR OR DAMAGE THE INSIDE SURFACES OF THE TUBE WHEN REMOVING THE OIL SEAL. A DAMAGED TUBE MIGHT HAVE TO BE REPLACED.
- 6. Inspect the axle shaft assembly to be sure that the bearing and collar have not slipped and are still seated against the shoulder on the axle shaft.
- 7. Inspect the bearing (5) (Figure 9-1, Page 9-1). If the bearing is damaged or worn, replace it.

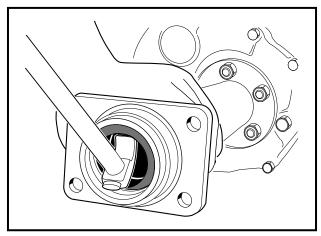


FIGURE 9-4

AXLE BEARING

Removing the Axle Bearing

1. Place a bearing puller wedge attachment (Club Car Part No. 1012812) on the axle shaft between the wheel mounting flange and the bearing.

A CAUTION

• DO NOT TIGHTEN THE BEARING PULLER WEDGE ATTACHMENT AGAINST THE AXLE SHAFT. IT COULD DAMAGE THE AXLE SHAFT WHEN PRESSING THE BEARING AND COLLAR OFF.

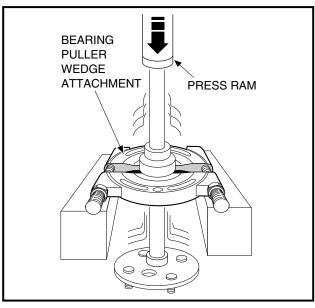
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Removing The Axle Bearing, Continued:

2. Press the bearing (5) and collar (4) (Figure 9-1, Page 9-1) off together (See Figure 9-5).

NOTE

• IT MAY BE NECESSARY TO HEAT THE COLLAR TO REMOVE IT.



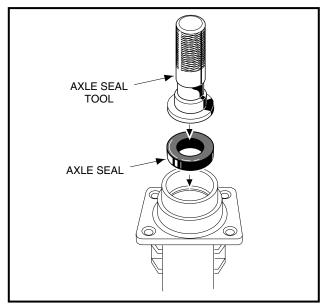


FIGURE 9-5

FIGURE 9-6

Installing the Axle Bearing

- 1. If it was removed, place the retaining ring (6) on the axle shaft (1 or 2) (Figure 9-1).
- 2. Apply two drops of Loctite® 271 to inside of collar.

A CAUTION

- APPLY LOCTITE 271 TO THE INSIDE OF THE COLLAR ONLY, NOT TO THE SHAFT, SO THAT THE LOCTITE WILL BE PUSHED AWAY FROM THE BEARING AS THE COLLAR AND BEARING ARE PRESSED ON. IF LOCTITE GETS ON OR IN THE BEARING, THE BEARING MUST BE REPLACED.
- THE COLLAR SHOULD BE REMOVED NO MORE THAN TWO TIMES. IF A BEARING IS REMOVED A THIRD TIME, THE SHAFT AND COLLAR WILL NOT GIVE A PROPER FIT.
- 3. Place the bearing (note that this is a sealed bearing) and the collar on the shaft.

A CAUTION

- IF THE BEARING WAS REMOVED FROM THE SHAFT, REPLACE IT WITH A NEW ONE.
- DO NOT TIGHTEN THE BEARING PULLER WEDGE ATTACHMENT AGAINST THE AXLE SHAFT IN STEP 4. THIS COULD DAMAGE THE AXLE SHAFT WHEN THE BEARING AND COLLAR ARE PRESSED ON.
- 4. Place the bearing puller wedge attachment against the collar and press both the bearing and collar on.

INSTALLING THE AXLE SHAFT

- 1. Clean the bearing and seal seats in the axle tube (16 or 39) (Figure 9-1, Page 9-1).
- 2. Place a new seal (17) (Figure 9-1) in the axle tube with the seal lip facing away from the bearing. Use an axle seal tool (Club Car Part No. 1014162) and mallet to tap it in until it seats firmly in position (Figure 9-6). A hydraulic press may also be used with the axle seal tool.
- 3. Clean the shaft splines and then insert the shaft, splined end first, through the seal and into the axle tube. Be careful not to damage the seal. Then advance the shaft through the inner bearing and rotate it to align the shaft splines with the splined bore of the differential side gear. Continue advancing the shaft until the bearing seats against the axle tube shoulder.
- 4. Using snap ring pliers, install the retaining ring (6) (Figure 9-1) in the axle tube.
- 5. Place a 1/4" to 3/8" (6 to 10 millimeter) diameter rod against the retaining ring and tap lightly at four to five locations to ensure that it is properly seated.

A WARNING

 BE SURE THAT THE RETAINING RING IS PROPERLY SEATED IN ITS GROOVE. IF THE RING IS NOT PROPERLY INSTALLED, THE AXLE ASSEMBLY WILL SEPARATE FROM THE TRANSAXLE AND DAMAGE THE AXLE ASSEMBLY AND OTHER COMPONENTS. LOSS OF VEHICLE CON-TROL COULD RESULT, CAUSING SEVERE PERSONAL INJURY.

REMOVING THE TRANSAXLE

REMOVING THE TRANSAXLE - DS GASOLINE

WARNING

- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERY OR ELECTRICAL CONNECTIONS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- 1. Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or floor jack. Position jackstands under the frame cross-member between the spring mount and the side stringer, just forward of each rear wheel. Lower the vehicle to let the jackstands support the vehicle (Figure 9-7, Page 9-6).

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Removing the Transaxle - DS Gasoline, Continued:

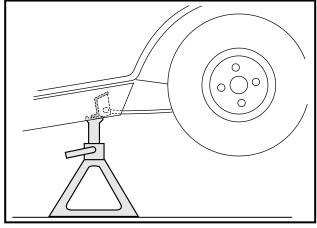
- 2. Disconnect, at the starter, the braided ground wire from the starter to the frame.
- 3. Remove the rear wheels, then thread one lug nut onto a stud on each rear hub. This will keep the brake drums on the hubs.
- 4. Remove the cotter pins (1), brake cable clevis pins (2), and cable retaining "E" clips (3). Disconnect the brake cables (4) (Figure 9-8).
- 5. Position the floor jack under the inner frame rear cross-member and raise the vehicle enough to relieve pressure on the rear shocks (Figure 9-9).
- 6. Disconnect the shock absorbers from their top mounts by holding the retaining nut with a wrench and turning the upper shock casing counterclockwise until it is free. Then remove the retaining nuts from the lower shock mounts and pull the shocks from the vehicle.
- 7. Disconnect the transmission shifter cable rod end (1) from the shift lever, and then remove the shifter cable assembly from the cable bracket (2) (Figure 9-10).
- 8. Remove the drive belt (See Section 16, Page 16-3).
- 9. Remove governor arm (3), governor cable (4), and accelerator cable (5), as an assembly, from the transmission governor arm shaft (Figure 9-10).
- 10. Remove the accelerator cable from the accelerator cable mounting bracket (6) and the governor cable from the governor cable mounting bracket (7) (Figure 9-10).
- 11. Remove the transmission support strap from the transmission (Figure 9-11). See CAUTION below.

A CAUTION

- POSITION A JACKSTAND UNDER THE INNER FRAME TUBING JUST BEHIND THE REAR CROSS-BRACE ON EACH SIDE OF THE VEHICLE, AS SHOWN IN FIGURE 9-11.
- 12. Remove the lower spring shackle nuts and bolts, then rotate the shackles up and to the rear so that they are clear of the springs (Figure 9-12).
- 13. Remove the nuts, lock washers, and the "U" bolts from the transaxle. See CAUTION below.

A CAUTION

• THE TRANSAXLE ASSEMBLY MAY ROTATE WHEN BOTH "U" BOLTS HAVE BEEN REMOVED (STEP 13).





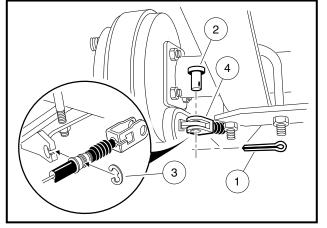
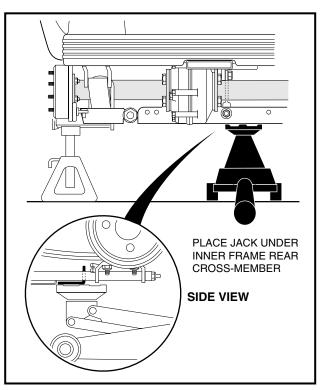


FIGURE 9-8



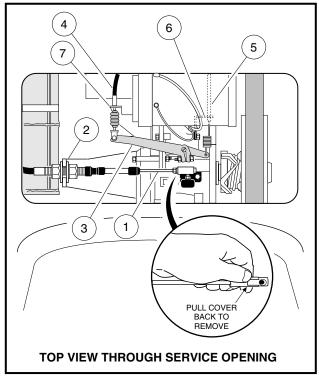
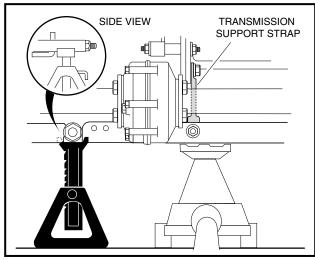


FIGURE 9-9 FIGURE 9-10



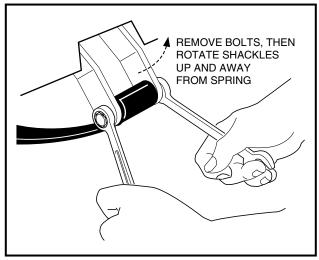


FIGURE 9-11 FIGURE 9-12

- 14. Remove the jackstands from under the inner frame and, using the floor jack, carefully lower the transaxle as far as possible without exerting stress on wires or hoses.
- 15. Carefully lift each end of the transaxle off of its positioning pin (on the leaf spring) and slide the transaxle to the rear and out of the vehicle.
- 16. Remove the driven clutch from the transmission (See Section 16, Page 16-14).
- 17. Remove the transmission from the transaxle (See Section 17, Page 17-4).
- 18. Drain lubricant from the transaxle as instructed on Page 9-1.
- 19. Remove the axle shaft as instructed on Page 9-2.
- 20. If removal of brake assemblies is required, refer to Section 7, Page 7-7.

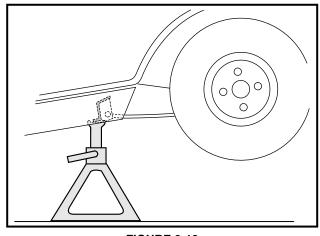
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REMOVING THE TRANSAXLE - DS ELECTRIC

WARNING

- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING. ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR 22-6, PAGE 22-5. THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${
 m ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.
- Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or with a floor jack placed under the transaxle. Position jackstands under the frame cross-member between the spring mount and the side stringer, just forward of each rear wheel. Lower the vehicle to let the jackstands support the vehicle (Figure 9-13).
- 2. Remove the rear wheels, then thread one lug nut onto a stud on each rear hub. This will keep the brake drums on the hubs.
- 3. Remove the cotter pins (1), brake cable clevis pins (2), and cable retaining "E" clips (3). Disconnect the brake cables (4) (Figure 9-14).
- 4. Disconnect the shock absorbers from their lower mounts (Figure 9-15).





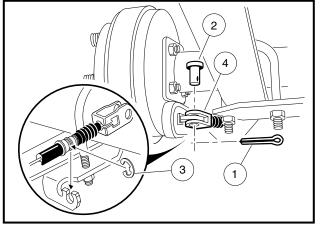
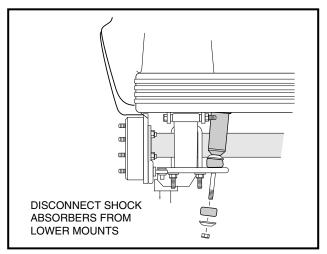


FIGURE 9-14



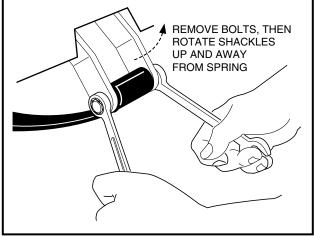


FIGURE 9-15

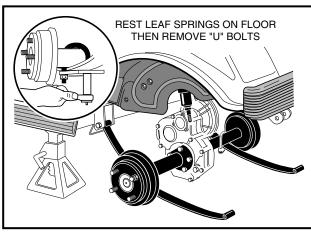


FIGURE 9-16

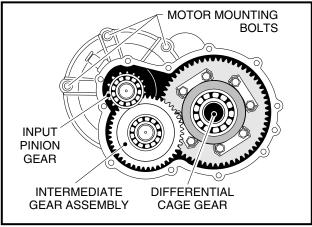


FIGURE 9-17

FIGURE 9-18

- 5. Disconnect the four motor wires. Use two wrenches in order to prevent the studs from turning.
- 6. Remove the lower spring shackle nuts and bolts, then rotate the shackles up and to the rear so that they are clear of the springs (Figure 9-16).
- 7. If a chain hoist was used to raise the vehicle, lift the vehicle high enough to permit easy access to the motor, as well as adequate clearance for its removal.
 - If a floor jack was used to raise the vehicle, lower the transaxle enough to permit easy access to the motor, as well as adequate clearance for its removal.
- 8. Remove the three bolts (Figure 9-18), and the motor positioning bolt (Figure 9-26, Page 9-15), mounting the motor to the transaxle.

A WARNING

- DO NOT HOLD FINGERS UNDER MOTOR WHEN SLIDING OFF PINION IN STEP 9. FINGERS MAY GET PINCHED WHEN MOTOR DISENGAGES.
- 9. Carefully remove the motor from the transaxle. Slide the motor away from the transaxle until the motor spline becomes disengaged from the pinion, then lift it out.
- 10. If a floorjack was used, pull it from beneath the transaxle and allow the springs to rest on the floor.
- 11. Remove the "U" bolts attaching the transaxle to the leaf springs (Figure 9-17).

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Removing the Transaxle - DS Electric, Continued:

- 12. Carefully lift each end of the transaxle off of its positioning pin (on the leaf spring) and slide the transaxle to the rear and out of the vehicle.
- 13. Drain the lubricant from the transaxle as instructed on Page 9-1.
- 14. Remove the axle shaft as instructed on Page 9-2.
- 15. If removal of the brake assemblies is required, see Section 7 of this manual.

DISASSEMBLY, INSPECTION, AND ASSEMBLY OF THE TRANSAXLE

DISASSEMBLY AND INSPECTION OF THE TRANSAXLE

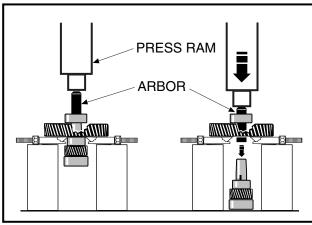
1. To detach the axle tubes (16 and 39) (Figure 9-1, Page 9-1) from the transaxle housing, remove the bolts and lock washers (8 and 9) (Figure 9-1). See NOTE below.

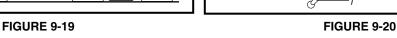
NOTE

- SHIMS ARE LOCATED BETWEEN THE AXLE TUBE AND DIFFERENTIAL CAGE BEARING. CARE SHOULD BE USED TO AVOID DAMAGING THE SHIMS. IF THE SHIMS ARE REMOVED, SET THEM ASIDE FOR REINSTALLATION.
- 2. Remove the ten bolts (26) (Figure 9-1) that hold the housing together.
- 3. Pull the halves of the housing apart. If necessary, tap lightly with a rubber mallet on the spline of the input pinion.

A CAUTION

• TO PREVENT DAMAGE TO THE MATING SEAL SURFACES OF THE HOUSING, USE CARE WHEN SEPARATING THE HALVES.





REMOVE KEY

4. Remove the input pinion gear by pulling it out while rocking the intermediate gear assembly. Lift out the intermediate gear assembly and the differential cage gear unit simultaneously (Figure 9-18, Page 9-9).

A CAUTION

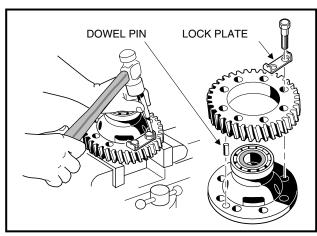
• TO AVOID DAMAGING GEARS, USE EXTREME CARE WHEN HANDLING THEM.

A CAUTION

- DO NOT REUSE BEARINGS AFTER REMOVING THEM. REPLACE THEM WITH NEW ONES.
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- 6. To disassemble the intermediate gear assembly, press off together the bearing (18) and the gear (23) (Figure 9-1, Page 9-1) (See Figure 9-19).
- 7. Remove the key (22) (Figure 9-1, Page 9-1)(See Figure 9-20).
- 8. Press the bearing (20) (Figure 9-1, Page 9-1) off of the intermediate gear assembly.
- 9. Disassemble the differential cage gear:

A CAUTION

- SEVERAL DIFFERENTIAL CAGE GEAR CONFIGURATIONS WERE MANUFACTURED IN 1995 AND 1996. IF YOU DISASSEMBLE THE CAGE GEAR ASSEMBLY, IT IS IMPORTANT THAT YOU NOTE ITS CONFIGURATION. POSSIBLE GEAR ASSEMBLY CONFIGURATIONS ARE:
 - THRUST WASHERS (1, 2, 3, AND 4) **(FIGURE 9-24, PAGE 9-12)**, AND THE LOCK PLATES (FIGURE 9-21) ARE INCLUDED.
 - THRUST WASHERS (1, 2, AND 3) **(FIGURE 9-24, PAGE 9-12)**, AND THE LOCK PLATES (FIGURE 9-21) ARE **NOT** INCLUDED.
 - THRUST WASHER (3) **(FIGURE 9-24, PAGE 9-12)** AND THE LOCK PLATE (FIGURE 9-21) ARE **NOT** INCLUDED.



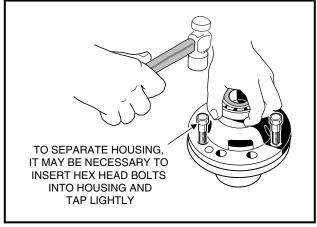


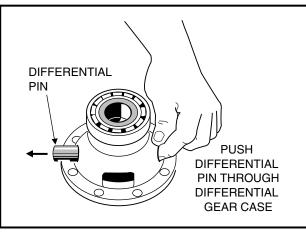
FIGURE 9-21

FIGURE 9-22

- 9.1. Bend down the bolt lock plates (29) (Figure 9-1, Page 9-1) on the ring gear (30) (Figure 9-1) (See Figure 9-21).
- 9.2. Remove the eight hex bolts (28) (Figure 9-1) that secure the ring gear to the differential cage.
- 9.3. Remove the ring gear. Retain the dowel pin from between the ring gear and differential cage for reassembly.
- 9.4. Separate the differential cage gear housing. If necessary, screw two of the hex bolts (removed in step 9.2.) back into the differential gear unit and, while holding the unit slightly above the workbench, tap lightly on the bolt heads (**Figure 9-22**). Remove the two bolts.
- 9.5. Remove the differential pin (31) (Figure 9-1, Page 9-1) by pushing it through from one side (Figure 9-23, Page 9-12).

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Disassembly and Inspection of the Transaxle, Continued:



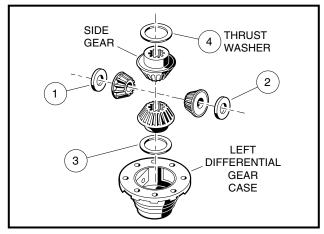


FIGURE 9-23

FIGURE 9-24

- 9.6. Remove the idler gears and thrust washers (36 and 35) (Figure 9-1, Page 9-1).
- 9.7. Remove the differential side gears and thrust washers (34 and 33) (Figure 9-1, Page 9-1) (See Figure 9-24). See CAUTION on Page 9-11.
- 9.8. Inspect the bearings (14) **(Figure 9-1, Page 9-1)** of the differential cage and replace them if they are damaged. To remove them, press them off.

A CAUTION

- DO NOT REUSE BEARINGS AFTER REMOVING THEM. REPLACE THEM WITH NEW ONES.
- 10. Inspect all parts for wear or damage. Any worn or damaged parts should be replaced.

NOTE

DAMAGED OR WORN GEARS SHOULD BE REPLACED AS SETS.

TRANSAXLE ASSEMBLY

A CAUTION

- DO NOT PRESS AGAINST THE BEARING OUTER RACE (STEP 1 BELOW).
- GASKET FACES OF THE HOUSING MUST BE CLEAN AND SMOOTH. USE ONLY A NEW GAS-KET THAT IS NOT TORN OR DAMAGED IN ANY WAY. THE GASKET MUST LIE FLAT AGAINST THE HOUSING FACES.
- THE HOUSING AND ALL PARTS MUST BE WIPED CLEAN AND DRY BEFORE REASSEMBLY.
- 1. If bearings (14) (Figure 9-1, Page 9-1) were removed during disassembly, install new bearings using an arbor press.
- 2. Assemble the differential cage gear. See CAUTION below.

A CAUTION

 IF A NEW DIFFERENTIAL GEAR CAGE SERVICE KIT IS BEING INSTALLED, THE ORIGINAL CONFIGURATION OF THE CAGE GEAR ASSEMBLY WILL DETERMINE WHICH PARTS OF THE KIT SHOULD BE INSTALLED. READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

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- If three thrust washers (1, 2, and 3) (Figure 9-24) and the lock plates (Figure 9-21) were *not* included in the original configuration, use the original thrust washer (4) (Figure 9-24), both new thrust washers (1 and 2) (Figure 9-24), and the new left differential gear case from the kit.
- If the thrust washer (3) (Figure 9-24) and lock plates (Figure 9-21) were *not* included in the original configuration, use the two new thrust washers (1 and 2) and the new left differential gear case included in the kit.
- 3. Install the pin (31) (Figure 9-1, Page 9-1).
- 4. Apply a small amount of oil to all thrust washers and to both ends of the pin installed in Step 3.
- 5. While aligning the dowel pin, assemble the two halves of the differential cage gear (32 and 37) and reinstall the ring gear (30) (Figure 9-1, Page 9-1).
- 6. Reinstall eight hex bolts and the bolt lock plates (if lock plates were included in original assembly) (28 and 29) (Figure 9-1, Page 9-1). Tighten the bolts to 16-20 ft.lbs. (21/27 N-m).
- 7. Bend up the edges of the bolt locking tabs securely against the flats of the bolt heads to prevent the bolts from loosening and possibly causing damage.
- 8. Press a new bearing (20) (Figure 9-1, Page 9-1) onto the intermediate gear assembly.
- 9. If the large gear (23) was removed from the intermediate gear, insert the key (22) into the keyway in the shaft and then press the large gear and the bearing (18) (Figure 9-1, Page 9-1) onto the shaft. Be sure that the key is properly positioned in the keyway before attempting to press on the large gear and bearing.
- 10. Press a new bearing (18) (Figure 9-1, Page 9-1) onto the input pinion gear.
- 11. Apply grease to the lip of the new oil seal (10) (Figure 9-1, Page 9-1) and install the seal using a transaxle pinion seal tool (Club Car Part No. 1014161). The lip of the oil seal should face to the inside of the transaxle housing. Make sure that the seal is firmly seated.
- 12. Install the differential assembly, the intermediate gear assembly, and the input pinion gear simultaneously. Be sure that all bearings are seated properly in the housing. Rotate the input shaft to check for smooth gear operation (Figure 9-18, Page 9-9).
- 13. Install both dowel pins (27) in the transaxle housing (11) and place a new gasket (13) (Figure 9-1, Page 9-1) in position on the mating face of the housing. Use the dowel pins to position the gasket, making sure that all holes are aligned.
- 14. Apply a gasket adhesive, if necessary, to one side of the gasket and install the other half of the housing.
- 15. Install the ten bolts (26) (Figure 9-1, Page 9-1) and tighten to 60-78 in.lbs. (7/9 N-m).
- 16. If the axle tube (16 and 39) was removed, install the shims (38) (Figure 9-1, Page 9-1), if they were removed also, and a new gasket with gasket sealing compound on one side. Install the axle tube with five lock washers and bolts (9 and 8) (Figure 9-1). Tighten the bolts to 20-24 ft.lbs. (27/32 N-m).

NOTE

- IF THE DIFFERENTIAL CAGE (32 AND 37) (FIGURE 9-1), THE TRANSAXLE HOUSING (11 AND 24) (FIGURE 9-1) OR AXLE TUBE (16 AND 39) (FIGURE 9-1) WAS REPLACED, SEE SHIMMING PROCEDURE ON PAGE 9-14.
- 17. Install the brake assemblies as instructed in Section 7, Page 8 in this manual.
- 18. Apply a small amount of grease to the lip of the oil seal (17) (Figure 9-1, Page 9-1).

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Transaxle Assembly, Continued:

- 19. Clean the splines on the axle shaft (1 and 2) (Figure 9-1) and insert the shaft, splined end first, through the seal. Be very careful not to damage the seal. Advance the shaft through the inner bearing and then rotate it to align the shaft splines with the splined bore of the differential side gear. Push the shaft in until the bearing seats against the shoulder in the axle tube.
- 20. Install the retaining ring (6) (Figure 9-1, Page 9-1) in the axle tube using snap ring pliers.

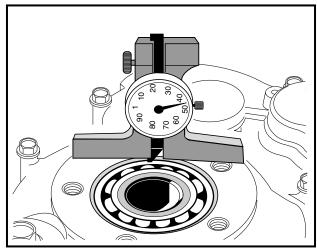
A WARNING

- BE SURE THAT THE RETAINING RING IS PROPERLY SEATED IN ITS GROOVE. IF THE RING IS
 NOT PROPERLY INSTALLED, THE AXLE ASSEMBLY WILL SEPARATE FROM THE TRANSAXLE
 AND DAMAGE THE AXLE ASSEMBLY AND OTHER COMPONENTS. LOSS OF VEHICLE CONTROL COULD RESULT, CAUSING SEVERE PERSONAL INJURY.
- 21. Make sure that the drain plug is installed in the transaxle and tightened to 18-25 ft.lbs. (24/34 N-m). Using a funnel, fill the transaxle through the level indicator hole, with 22 ounces of SAE 30 API Class SE, SF, or SG oil (a higher grade may be used). Install and tighten the level indicator hole plug to 18-25 ft.lbs. (24/34 N-m).

SHIMMING THE TRANSAXLE

If the differential cage (32 and 37) (Figure 9-1), transaxle housing (11 and 24) (Figure 9-1), or axle tube (16 and 39) (Figure 9-1) has been replaced, the transaxle may need new shims. To determine whether new shims are necessary, the transaxle must be completely assembled except for the short axle tube (16) (Figure 9-1) and both axle shafts (1 and 2) (Figure 9-1).

- 1. Stand the transaxle on end, on the axle tube.
- 2. Using a depth gauge, measure the distance from the gasket seal surface of the axle tube (gasket must be removed) to the outer race of the bearing (14) (Figure 9-1) on the differential cage (32) (Figure 9-1) (See Figure 9-25).
- 3. Use the chart below to determine whether shimming is required and, if so, how many shims (Club Car Part No. 1013781) should be used.



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Distance from gasket seal surface to outer race or bearing - INCHES (MM)	SHIMS REQUIRED
Up to .134 inches (3.4 mm)	0
.134142 inches (3.4 - 3.6 mm)	1
.142150 inches (3.6 - 3.8 mm)	2
.150155 inches (3.8 - 3.9 mm)	3

INSTALLATION OF THE TRANSAXLE

INSTALLING THE TRANSAXLE - DS GASOLINE VEHICLE

- 1. Install the transmission and Forward and Reverse shifter cable bracket on the transaxle as instructed in Section 17, Page 17-23 in this manual.
- 2. Install the driven clutch as instructed in Section 16, Page 16-17 in this manual.
- 3. With the rear of the vehicle raised, set the transaxle assembly on the leaf springs and slide it up and into position on the alignment pins on the springs.
- 4. Align the center hole in the spring saddle with the pilot bolt in the spring assembly.
- 5. Install the two "U" bolts, lock washers, and nuts. Tighten to 22-27 ft.lbs. (30/37 N-m).
- 6. Raise the transaxle with the floorjack while guiding the leaf springs into the rear spring shackles.
- 7. Insert the bolts through the spring shackles and bushings in the leaf spring eyes and secure with locknuts.
- 8. Install the transmission support strap.
- 9. If the brake assemblies were removed, see Section 7, Page 7-8 for installation instructions.
- 10. Reconnect the brake cables.
- 11. Install the shock absorbers.
- 12. Install the rear wheels.
- 13. Install the governor cable, accelerator cable, and governor arm. Adjust the governor linkage as instructed in Section 14, Page 14-11.
- 14. Connect the transmission shift cable assembly to the shift lever on the transmission.
- 15. Install the drive belt on the clutches as instructed in Section 16, Page 16-4.
- 16. Raise the vehicle enough to remove the jackstands, then lower the vehicle to the floor. Connect the plug wire to the spark plug and connect the battery cables, (+) positive cable first.
- 17. Start the engine and test drive the vehicle for proper operation.

INSTALLING THE TRANSAXLE - DS ELECTRIC VEHICLE

- 1. If using a chain hoist, raise the vehicle and place the transaxle in position on the jackstands. If using a floor jack, lower the jackstands to their lowest settings and place the transaxle in position on them.
- 2. Align the center hole in the saddle of the transaxle with the pilot bolt in the leaf spring assembly.
- 3. Install the two "U" bolts, lockwashers, and nuts. Tighten the nuts to 22-27 ft.lbs. (30-37 N-m). Tighten the "U" bolt nuts so that an equal amount of thread is left on each leg of the bolt.
- 4. Install the motor. See Motor Installation, page 24-13.
- 5. If using a chain hoist, lower the vehicle while guiding the leaf springs into the rear spring shackles. If using a floor jack, raise the differential while guiding the leaf springs into the rear spring shackles. Then raise the jackstands to support the transaxle.
- 6. Reconnect the four motor wires. When tightening the retaining nuts, use two wrenches to keep the motor studs from turning.

NOTE

 IF THE MOTOR WIRES WERE NOT TAGGED WHEN DISCONNECTED, SEE SECTION 19, PAGE 19-3 FOR PROPER CONNECTION OF V-GLIDE 36 VOLT VEHICLE; SEE SECTION 20, PAGE 20-3 OR 20-5 FOR POWERDRIVE SYSTEM 48 VEHICLE; SEE SECTION 21, PAGE 21-2 FOR POW-ERDRIVE PLUS VEHICLE.

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Installing the Transaxle - DS Electric Vehicle, Continued:

- 7. Insert bolts through the spring shackles and bushings in the leaf spring eyes. Secure them with lock nuts.
- 8. Connect the brake cables.
- 9. Install the shock absorbers. Tighten shock absorber retaining nuts until the rubber bushings expand to the same size as the cup washers.
- 10. Install the rear wheels.
- 11. Lift the vehicle, remove the jackstands, and test drive the vehicle to check for proper operation.

SECTION 10 - WHEELS AND TIRES

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WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.

GASOLINE VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

ELECTRIC VEHICLES ONLY:

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR 22-6, PAGE 22-5. THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 AND POWERDRIVE PLUS VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${
 m ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

GENERAL INFORMATION

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

- Keep tires inflated to 12-14 psi (83-96 kPa) for gasoline vehicles; 18-20 psi (124-138 kPa) for electric vehicles.
- Keep axle nuts and wheel mounting nuts properly torqued.
- · Keep the front end properly aligned and properly adjusted.

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WHEEL REMOVAL

- 1. Slightly loosen the wheel rim mounting nuts on the wheel to be removed.
- 2. Raise the end of the vehicle from which the wheel is to be removed. Make sure that the wheels are off of the ground. See WARNING below.

A WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 3. Remove the wheel mounting nuts and remove the wheel.

WHEEL INSTALLATION

- 1. To install wheel(s), reverse the removal procedure.
- 2. Tighten the wheel rim mounting nuts to 50-60 ft.lbs. (68/81 N-m).

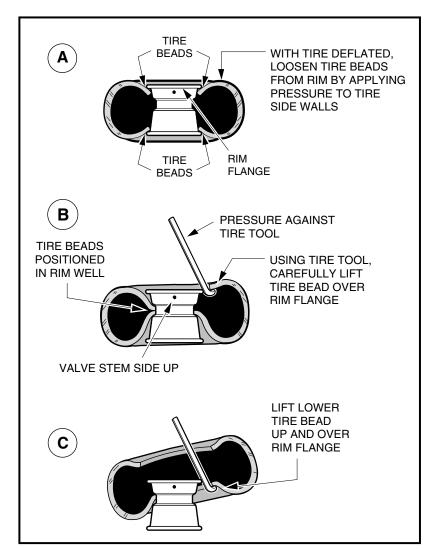


FIGURE 10-1

REMOVING THE TIRE FROM THE RIM

NOTE

- TIRE MUST BE REMOVED OR INSTALLED FROM THE VALVE STEM SIDE OF THE RIM.
- 1. Remove the tire and wheel assembly from the vehicle as instructed above.
- 2. Remove the valve cap and valve core and allow air to escape from the tire.
- 3. If possible, use a tire machine to remove the tire from the rim.
 - 3.1. If a tire machine is not available, loosen both tire beads by applying pressure to the tire side walls and pushing the tire bead away from the rim flange and into the rim well (Figure 10-1).
 - 3.2. With the valve stem side of the wheel up, use a tire tool to carefully start the upper bead over the edge of the wheel rim (Figure 10-1).

A CAUTION

- TO AVOID DAMAGE TO THE TIRE, DO NOT USE EXCESSIVE FORCE WHEN SARTING THE BEAD OVER THE EDGE OF THE RIM.
 - 3.3. When the top bead is free of the rim, pull the bead from the bottom side of the rim up into the upper part of the rim well. Insert the tire tool under the lower bead as shown (Figure 10-1) and carefully pry the lower bead over the rim flange.
 - 3.4. Once the lower bead is started over the rim flange, the tire can be removed from the rim by hand.

REPAIRING A TIRE

- 1. Determine the location and cause of the air leak:
 - 1.1. Remove the wheel as instructed above and inflate the tire to no more than 20 psi (138 kPa).
 - 1.2. Immerse the tire in water and then mark the point where bubbles are formed by escaping air.
 - 1.3. Determine the cause of the air leak. See NOTE below.

NOTE

- AN AIR LEAK COULD BE DUE TO A PUNCTURED CASING, FAULTY VALVE CORE, IMPROPERLY SEATED VALVE STEM, OR IMPROPERLY SEATED TIRE BEAD.
- SMALL HOLES IN THE CASING CAN BE PLUGGED USING A STANDARD AUTOMOTIVE TUBE-LESS TIRE REPAIR KIT AVAILABLE AT AUTO SUPPLY STORES.
- 2. When the cause of the air leak has been determined, remove the tire from the rim as instructed above and repair as required.

INSTALLING THE TIRE ON THE RIM

WARNING

- WHILE MOUNTING OR INFLATING TIRE, KEEP HANDS, FINGERS, ETC. FROM EXPOSED AREAS BETWEEN THE TIRE BEAD AND RIM.
- 1. Clean both tire beads to remove dirt or other foreign matter.

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Installing The Tire On The Rim, Continued:

2. Where the tire beads seat, clean the wheel rim with a wire brush.

NOTE

- BECAUSE TUBELESS TIRES REQUIRE A PERFECT SEAL IN ORDER TO SEAT, CLEANING OF THE TIRE AND RIM IS VERY IMPORTANT.
- 3. Apply a liberal amount of tire mounting lubricant (soap and water solution) to both tire beads and rim flanges.
- 4. Install the tire on the rim from the valve stem side. If there is no tire machine available, use a rubber mallet and tire iron.
- 5. Remove the valve core and position the tire so that both beads are on the rim flange narrow bead seats.
- 6. Place the tire and wheel assembly against a wall in an upright position and push it against the wall while inflating the tire to 30-35 psi (207-242 kPa). The three-point contact (wall, floor, and hand) will help ensure that beads snap into place and form a proper seal as the tire is inflated (See Figure 10-2). See WARNING below.

WARNING

DO NOT USE A COMPRESSED AIR SOURCE WITH PRESSURE OVER 100 PSI (690 KPA). DUE
TO THE LOW PRESSURE REQUIREMENTS OF A SMALL TIRE, OVER-INFLATION COULD BE
REACHED ALMOST INSTANTLY WHEN USING A HIGH PRESSURE AIR SUPPLY. OVER-INFLATION COULD CAUSE THE TIRE TO EXPLODE, POSSIBLY RESULTING IN PERSONAL INJURY.

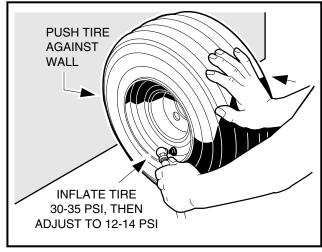


FIGURE 10-2

- 7. Quickly remove the air nozzle and install the valve core.
- 8. Adjust air pressure in the tire to 12-14 psi (83-96 kPa) for gas vehicles, or 18-20 psi (124-138 kPa) for electric vehicles, and then immerse the wheel and tire assembly in water to make sure there are no leaks.

SECTION 11 - TROUBLESHOOTING THE GASOLINE VEHICLE



Your Club Car DS vehicle will operate for a longer period of time without repairs if it is given proper care and preventive maintenance. The following check list will be helpful in identifying operating difficulties should they occur. The check list includes the symptom, probable causes, and suggested checks to make. The procedures used in making these checks can be found in the sections of the Service Manual that are referred to.

WARNING

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- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

TROUBLESHOOTING GUIDE

Spark plug is partially fouled or in poor condition	Section 13, Engine
Spark plug wire is damaged	Section 13, Engine
Loose wire connection at igniter unit	Section 12, Gasoline Vehicle Electrical System
-	Loose wire connection at

SYMPTOM	POSSIBLE CAUSES	REFER TO
Engine does not start easily, continued:	4. Igniter failed	Section 12, Gasoline Vehicle Electrical System
	Low cylinder compression	Section 13, Engine
	Water or dirt in the fuel system and/or carburetor; dirty or clogged fuel filter	Section 14, Fuel System
	Carburetor improperly adjusted	Section 14, Fuel System
	Starter/generator belt is slipping	Section 12, Gasoline Vehicle Electrical System
Engine starts but does not run smoothly.	Spark plug is fouled or in poor condition	Section 13, Engine
	2. Spark plug wire is damaged	Section 13, Engine
	3. Igniter failed	Section 12, Gasoline Vehicle Electrical System
	Water or dirt in the fuel system and/or carburetor; dirty or clogged fuel filter	Section 14, Fuel System
	5. Fuel pump malfunction, fuel pressu to engine too low	ure Section 14, Fuel System
Engine turns but fails	Fuel tank is empty	Section 14, Fuel System
to start.	Fuel line or filters clogged	Section 14, Fuel System
	Fouled spark plug	Section 13, Engine
	4. Spark plug wire damaged	Section 13, Engine
	5. Loose wire connection at igniter	Section 12, Gasoline Vehicle Electrical System
	6. Igniter failed	Section 12, Gasoline Vehicle Electrical System
	Engine flooded with fuel as result of over-choking	Section 3, General Information
	8. Kill circuit grounded	Section 12, Gasoline Vehicle Electrical System
	Fuel pump malfunction or failure	Section 14, Fuel System
Engine overheats.	Fan screen is partially blocked or plugged	Section 13, Engine
	Improper governor adjustment	Section 14, Fuel System
	Carburetor is too lean, check main size	jet Section 14, Fuel System
Engine pre-ignites.	Excessive carbon deposits on piston head or in combustion chamber	on Section 13, Engine
	Spark plug heat range is incorrect for the engine	Section 13, Engine
	Unsuitable or contaminated fuel	Section 14, Fuel System

SYMPTOM	POSSIBLE CAUSES	REFER TO			
Loss of engine power.	Exhaust valve is restricted with carbon deposit	Section 13, Engine			
	Muffler or exhaust pipe restricted with carbon or other substance	Section 15, Exhaust System			
	3. Igniter failed	Section 12, Gasoline Vehicle Electrical System			
	4. Air filter is dirty or clogged	Section 14, Fuel System			
	5. Governor is improperly adjusted	Section 14, Fuel System			
	Throttle linkage out of adjustment	Section 14, Fuel System			
	7. Low cylinder compression	Section 13, Engine			
	8. Spark plug failed	Section 13, Engine			
	9. Restricted fuel flow	Section 14, Fuel System			
	Torque converter is not backshifting properly	Section 16, Torque Converter			
Spark plug fouls repeatedly.	1. Incorrect plug	Section 13, Engine			
	Spark plug wire is damaged	Section 13, Engine			
	Unsuitable fuel, or incorrect (rich) fuel mixture	Section 14, Fuel System			
	4. Igniter failed	Section 12, Gasoline Vehicle Electrical System			
	Dirt entering combustion chamber	Section 14, Fuel System			
	Rings worn out, low cylinder pressure	Section 13, Engine			
Carburetor floods.	Inlet valve or seat is leaking, dirty, worn, or damaged	Section 14, Fuel System			
	Float is damaged and filled with gasoline	Section 14, Fuel System			
Starter fails to operate.	Neutral lock-out cam is in the wrong 1. position	Section 12, Gasoline Vehicle Electrical System - Neutral lock-out circuit			
	Fuse is blown 2.	Section 12, Gasoline Vehicle Electrical System - Starter circuit			
	3. Battery is dead	Section 12, Gasoline Vehicle Electrical System			
	Starter control circuit is 4. not operating	Section 12, Gasoline Vehicle Electrical System - Starter circuit			
	Starter/generator failed 5.	Section 12, Gasoline Vehicle Electrical System - Starter/generator			
Troubleshooting Guide Continued or	Troubleshooting Guide Continued on Next Page.				

SYMPTOM	POSSIBLE CAUSES		REFER TO	
Starter fails to operate, continued:	6.	Starter solenoid failed	Section 12, Gasoline Vehicle Electrical System - Starter circuit	
	7.	Accelerator limit switch failed	Section 12, Gasoline Vehicle Electrical System - Starter circuit	
	8.	Key switch failed	Section 12, Gasoline Vehicle Electrical System - Starter circuit	
	9.	Neutral lock-out limit switch failed	Section 12, Gasoline Vehicle Electrical System - Neutral lock-out circuit	
	10.	Loose or broken wire in starter/generator circuit	Section 12, Gasoline Vehicle Electrical System - Starter/generator	
Starter/generator does not charge battery.	1.	Loose or broken wire in the starter/generator circuit	Section 12, Gasoline Vehicle Electrical System - Starter/generator	
	2.	Generator field coil is shorted	Section 12, Gasoline Vehicle Electrical System - Starter/generator	
	3.	Brushes are worn or commutator is dirty	Section 12, Gasoline Vehicle Electrical System - Starter/generator	
	4.	Starter/generator belt is loose or slipping	Section 12, Gasoline Vehicle Electrical System - Starter/generator	
	5.	Voltage regulator failed	Section 12, Gasoline Vehicle Electrical System - Generator circuit	
	6.	Battery failed	Section 12, Gasoline Vehicle Electrical System	
Transmission does not engage or disengage smoothly.	1.	Transmission shifter linkage is binding or is out of adjustment	Section 17, Transmission	
	2.	Insufficient (low) level of lubricant, or wrong type of lubricant in transmission	Section 17, Transmission	
	3.	Internal gears are damaged or worn	Section 17, Transmission	
	4.	Synchronizer rings are worn, damaged or jammed	Section 17, Transmission	
Excessive vehicle vibration.	1.	Engine mounting nuts or bolts are loose	Section 13, Engine	
	2.	Defective or worn engine mounts	Section 13, Engine	
	3.	Rubber snubber on inner-frame is worn or damaged	Section 13, Engine	
	4.	Misaligned muffler mounting clamp	Section 15, Exhaust System	
	5.	Damaged drive belt or starter belt	Section 16, Torque Converter	
	6.	Damaged drive clutch	Section 16, Torque Converter	
	7.	Damaged driven clutch	Section 16, Torque Converter	

2	

G

SYMPTOM		POSSIBLE CAUSES	REFERTO
Excessive vehicle vibration, continued:		Damaged starter/generator pulley	Section 12, Gasoline Vehicle Electrical System - Starter/generator
	9.	Misaligned clutches	Section 16, Torque Converter
	10.	RPM setting is incorrect	Section 14, Fuel System
Torque converter does not shift smoothly.	1.	Drive belt is worn, cracked, glazed, or frayed	Section 16, Torque Converter
	2.	Drive clutch malfunction	Section 16, Torque Converter
	3.	Driven clutch malfunction	Section 16, Torque Converter
	4.	Governor is sticking	Section 17, Transmission
Engine won't stop running.	1.	Kill circuit wire is disconnected from the igniter	Section 12, Gasoline Vehicle Electrical System

SECTION 12 - ELECTRICAL SYSTEM GASOLINE VEHICLES



A DANGER

- GASOLINE VAPORS FLAMMABLE DO NOT SMOKE! KEEP SPARKS, FLAMES, CIGARETTES AWAY. TOOLS, WIRES AND METAL OBJECTS CAN CAUSE SPARKS WHEN "SHORTED" ACROSS A BATTERY. INSULATED TOOLS SHOULD BE USED. EXTREME CARE SHOULD BE TAKEN WHEN DISCONNECTING OR CONNECTING BATTERY. WHEN WIRES ARE DISCONNECTED, BE SURE TO KEEP THEM AWAY FROM BATTERY POSTS AND OTHER WIRES. SERVICE ONLY IN WELL-VENTILATED AREAS.
- DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERY.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERY OR ELECTRICAL CONNECTIONS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- HOT! DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST. CAN CAUSE SEVERE BURNS. ALWAYS ALLOW ENGINE AND EXHAUST TO COOL PRIOR TO SERVICING.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE. ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

A CAUTION

• BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE. ANY DIRT ENTERING THE ENGINE, CARBURETOR, OR OTHER PARTS WILL WORK AS AN ABRASIVE AND SHORTEN THE LIFE OF THE ENGINE. FOR THE SAME REASON, BEFORE INSTALLING A NEW PART, CLEAN OFF ANY DUST OR METAL FILINGS.

GENERAL INFORMATION

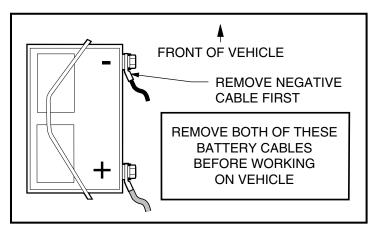


FIGURE 12-1

The electrical system on the DS Gasoline is a 12 volt DC negative ground to frame system. The electrical system consists of seven readily-identifiable circuits. They are:

- Starter Circuit
- Generator Circuit
- Engine Ignition Circuit
- Engine Kill Circuit
- Reverse Buzzer Circuit
- · Low Oil Warning Circuit
- · Neutral Lock-out Circuit

Recognizing and understanding the function of each of these circuits will help to quickly isolate the source of an electrical problem.

FE 290 GASOLINE VEHICLE ELECTRICAL CIRCUIT (FIGURE 12-2)

THE STARTER CIRCUIT (FIGURE 12-3, PAGE 12-4)

NOTE

• THE STARTER CIRCUIT IS COMPLETELY INDEPENDENT OF THE IGNITION CIRCUIT. THE BATTERY DOES NOT SUPPLY POWER FOR IGNITION. THE BATTERY SUPPLIES POWER TO THE STARTER WHICH IN TURN STARTS THE ENGINE COMPONENTS ROTATING. ONCE THE ENGINE IS RUNNING, THE IGNITION CIRCUIT SUPPLIES POWER TO THE SPARK PLUG (SEE ENGINE IGNITION CIRCUIT, PAGE 12-4).

The starter circuit consists of a twelve-volt battery, fuse, key switch, accelerator starter limit switch, neutral lock-out limit switch, solenoid, starter, and connecting wires.

The battery is the source of power for the system. The fuse provides protection to the solenoid activating circuit.

The starter circuit is activated when the key switch is turned to the ON position, the accelerator pedal is depressed and the forward and reverse lever is placed in forward or reverse position, thus actuating the neutral lock-out limit switch (See Neutral Lock-out Circuit, Page 12-6). Electrical current is then supplied to the solenoid, which completes the circuit between the positive post of the battery and the F2 post of the starter. The starter then turns and cranks the engine through belt-driven pulleys.

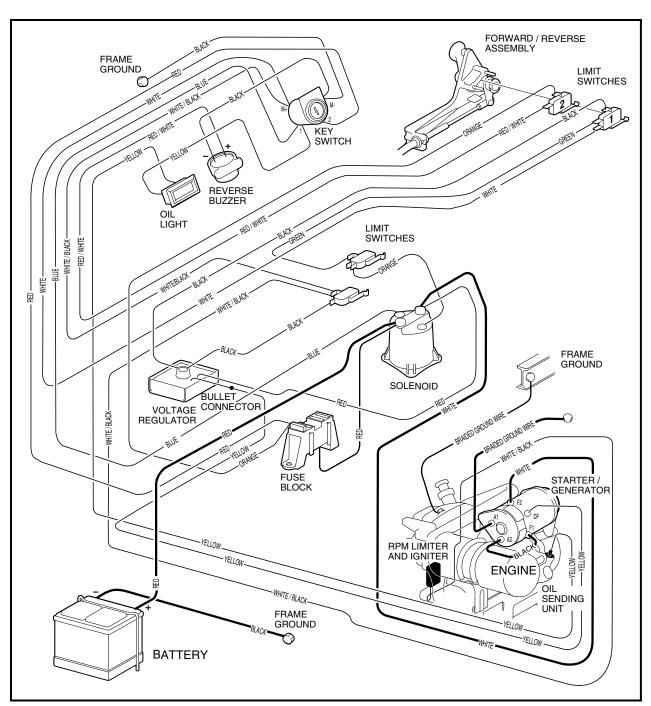


FIGURE 12-2

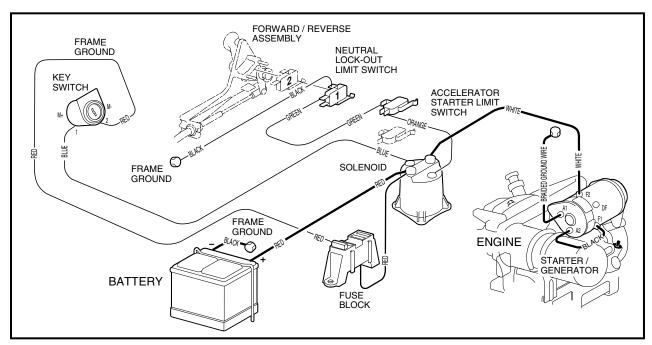


FIGURE 12-3

THE GENERATOR CIRCUIT (FIGURE 12-4)

The generator circuit consists of the starter/generator, voltage regulator, solenoid, the battery, and connecting wires.

When battery power is first supplied to the starter/generator, the starter/generator turns the engine at low RPM (approx. 700). Once the engine starts running, it then drives the starter/generator. At any engine RPM over 1215 (3000 starter/generator RPM), the starter/generator functions as a generator, supplying charging current to the battery. To prevent battery overcharging, the voltage regulator senses battery voltage, and by opening and closing an electronic switch, it controls the amount of charge going to the battery.

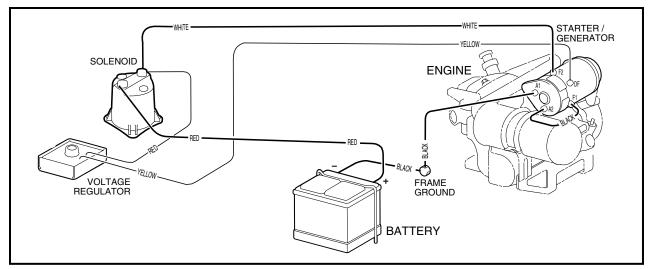
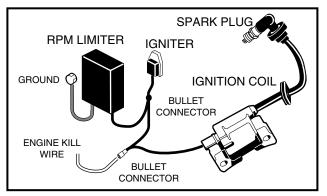


FIGURE 12-4

ENGINE IGNITION CIRCUIT

The engine ignition circuit is independent of all other circuits except the kill circuit. It consists of the igniter, ignition coil, spark plug, RPM limiter, and connecting wires (Figure 12-5). For vehicles serial no. 9624-502638 and later, the igniter is a part of the ignition coil (Figure 12-6).



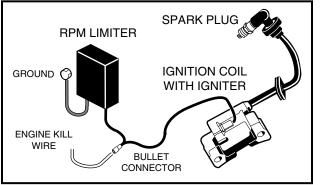


FIGURE 12-5 FIGURE 12-6

ENGINE KILL CIRCUIT (FIGURE 12-7)

The exciter coil in the ignition coil supplies electrical power for the spark plug, therefore the proper way to stop the engine is to run this electrical power to ground, by-passing the spark plug.

The engine kill circuit consists of the key switch, a kill limit switch that is activated by the accelerator pedal, a neutral lock-out limit switch that is activated by a cam located on the back of the forward and reverse assembly, and connecting wires. The engine can be stopped by releasing the accelerator pedal, turning the key switch to the OFF position, or by shifting the forward and reverse assembly to neutral (Figure 12-12, Page 12-6).

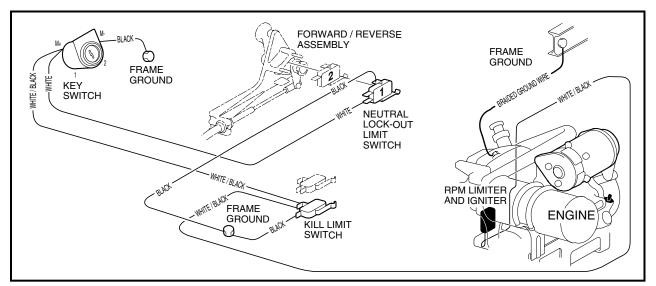


FIGURE 12-7

REVERSE BUZZER CIRCUIT (FIGURE 12-8, PAGE 12-6)

The reverse buzzer is a safety warning device that sounds when the vehicle is in reverse. Its functions are to remind the operator not to leave the vehicle in reverse and to warn anyone in the area that the vehicle is in reverse.

The reverse buzzer circuit consists of a reverse buzzer, reverse buzzer limit switch, key switch, the fuse block, and connecting wires.

The battery supplies power through the fuse block and is controlled by the reverse buzzer limit switch that is activated by a cam located on the back of the forward and reverse assembly. When the forward and reverse lever is placed in reverse, a cam depresses the reverse limit switch, closing the circuit. The reverse buzzer sounds.

LOW OIL WARNING CIRCUIT (FIGURE 12-9)

FORWARD / REVERSE ASSEMBLY

REVERSE BUZZER LIMIT SWITCH

REVERSE BUZZER

REVERSE BUZZER

BUZZER

BUZZER

REVERSE BUZZER

BUZZER

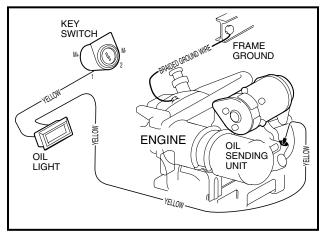


FIGURE 12-8 FIGURE 12-9

The low oil warning circuit consists of an oil sending unit in the engine, a dash mounted oil light, and connecting wires.

The light picks up power from the key switch when the key switch is turned to the ON position. When the oil level in the crankcase is low, the oil sending unit closes the circuit to the ground and illuminates the oil light.

NEUTRAL LOCK-OUT CIRCUIT (FIGURE 12-10)

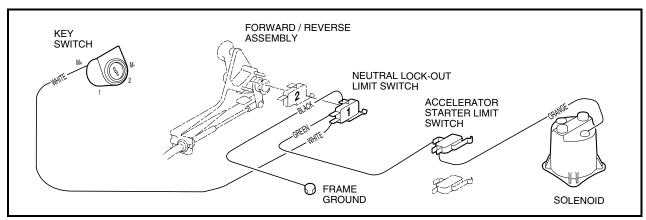


FIGURE 12-10

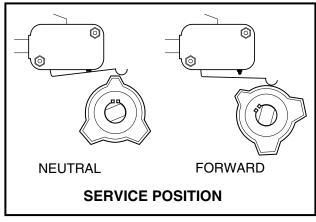
The neutral lock-out circuit prevents the operator from starting the vehicle in neutral. Also, if the vehicle is started in forward or reverse and then shifted to neutral, the engine automatically stops running.

The neutral lock-out circuit consists of a limit switch that is located on the forward and reverse assembly and is activated by a neutral-lock-out cam, a limit switch that is located in the electrical component box and is activated by the accelerator pedal, and the connecting wires.

The neutral lock-out cam is a feature included for the convenience of the trained and experienced mechanic.

If the neutral lock-out cam is pulled out approximately 3/8 inch (10 millimeters) and rotated one-half turn until it snaps back into place, the vehicle will be in the SERVICE position (Figure 12-11). This allows the mechanic to run the engine in neutral for certain maintenance procedures. With the cam in the SERVICE position, the engine will start in neutral. If the forward and reverse switch is shifted to either the forward or reverse position, the engine will stop running.

To put the vehicle back in the OPERATE position, pull the cam out approximately 3/8 inch (10 millimeters) and rotate one-half turn until it snaps back into place (Figure 12-12).



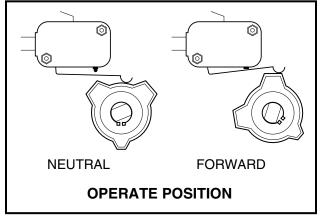


FIGURE 12-11 FIGURE 12-12

CIRCUIT TESTING

A DANGER

 DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

Before testing the electrical circuits to determine the source of an electrical problem, test the vehicle battery to determine whether or not it is the source of the problem. A hydrometer, multimeter, and 160 ampere load tester will be required.

Testing the Vehicle Battery

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Check for for loose or corroded battery terminal connections. Clean, tighten, and replace connections as necessary.
- 3. Take hydrometer readings of all six cells. If there is a 50 (or more) point difference between any two cells, recharge the battery and then check the specific gravity again. If there still a 50 point difference, replace the battery (See Hydrometer Testing, Page 12-49).

Testing the Vehicle Battery, Continued:

4. Place the red (+) probe of a multimeter, set at Volts - DC, 20 volt range, on the positive (+) post and place the black (-) probe on the negative (-) post of the battery and take a voltage reading. If it shows less than 12.4 volts, or if the lowest specific gravity reading from Step 1 is less than 1.225, recharge the battery. If battery voltage is greater than 12.4 volts and specific gravity is greater than 1.225, the problem is not with the battery. If the battery does not reach 12.4 volts, or if the specific gravity of a cell is still less than 1.225 after charging, replace the battery. See NOTE below.

NOTE

- A FULLY CHARGED BATTERY THAT IS IN GOOD CONDITION SHOULD HAVE A SPECIFIC GRAVITY OF AT LEAST 1.225 IN ALL CELLS, AND THE DIFFERENCE IN THE SPECIFIC GRAV-ITY OF ANY TWO CELLS SHOULD BE *LESS* THAN 50 POINTS. OPEN CIRCUIT VOLTAGE SHOULD BE AT LEAST 12.4 VOLTS.
- 5. Connect a 160 ampere load tester to the battery.
- 6. After 5 seconds, read the voltage and then disconnect the load tester from the battery. If the voltage reading is below the required minimum (See Load Test, Page 12-51), replace the battery.
- 7. If the battery is found to be good, or if the electrical problem continues after the battery has been replaced with a good one, test the electrical circuits.

TESTING THE STARTER CIRCUIT AND THE GENERATOR CIRUIT

Use the chart below (Figure 12-13) as a starting point for troubleshooting problems with the starter and generator circuits.

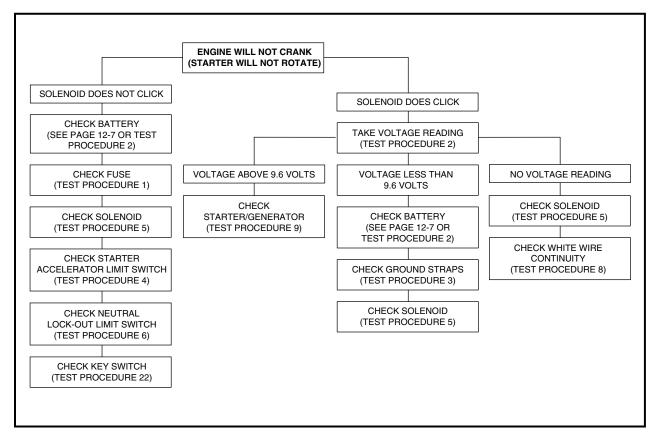


FIGURE 12-13

A DANGER

 DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

TESTING THE ENGINE IGNITION CIRCUIT

Use the chart below (**Figure 12-14**) as a starting point for troubleshooting problems with the engine ignition circuit.

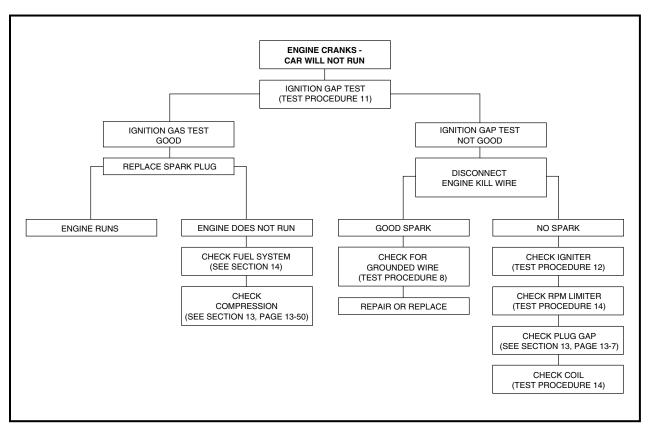


FIGURE 12-14

TESTING THE ENGINE KILL CIRCUIT

Use the chart page 12-10 (Figure 12-15) and the chart on page 12-11 (Figure 12-16) as starting points for troubleshooting problems with the engine kill circuit. See DANGER and WARNING at top of page 12-10.

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A DANGER

 DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

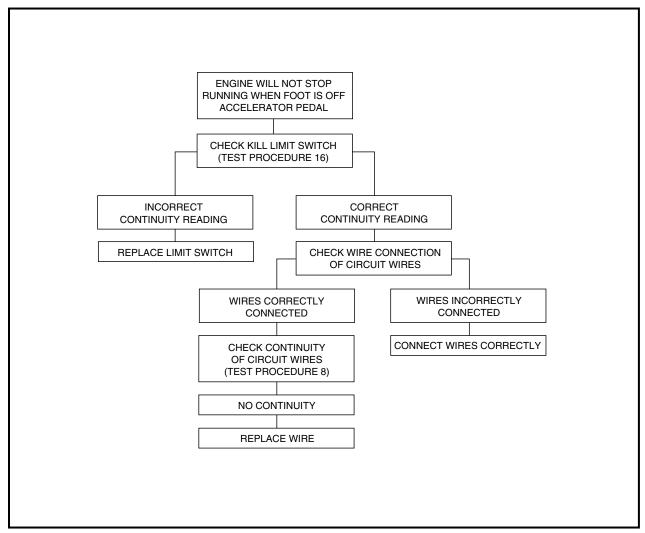


FIGURE 12-15

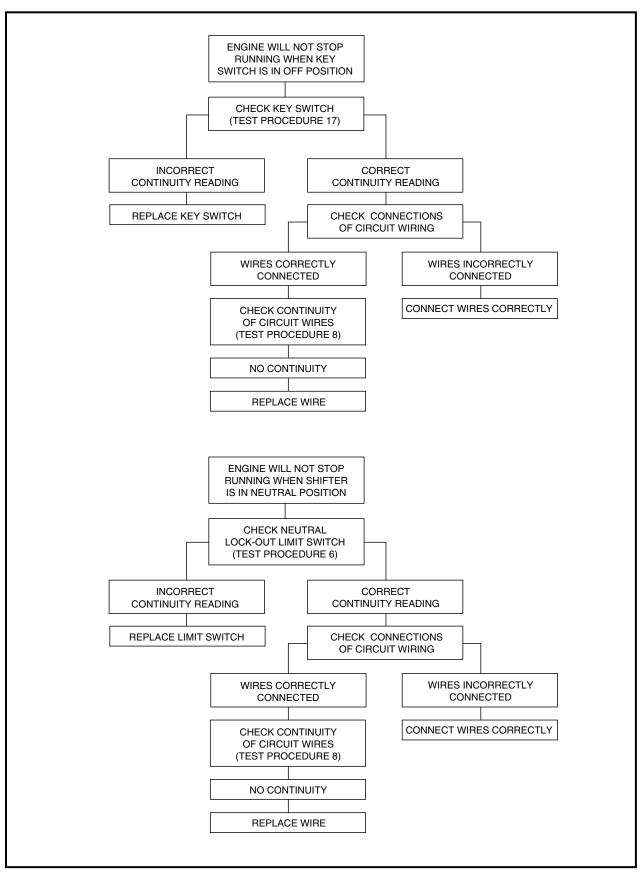


FIGURE 12-16

A DANGER

 DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

TESTING THE REVERSE BUZZER CIRCUIT

Use the chart below (Figure 12-17) as a starting point for troubleshooting the reverse buzzer circuit.

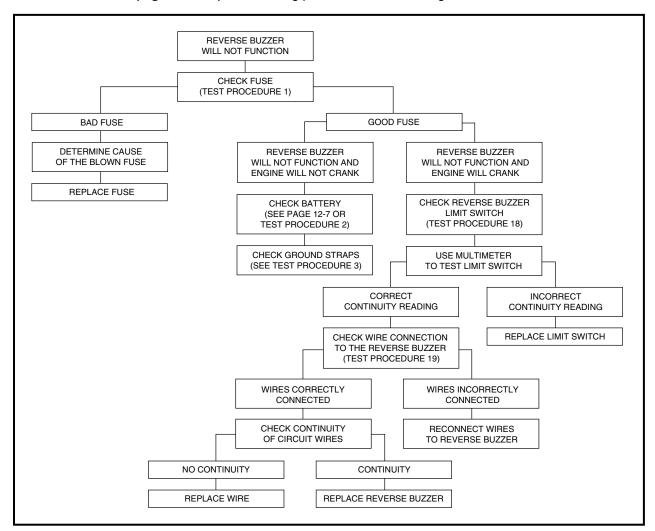


FIGURE 12-17

TESTING THE LOW OIL WARNING CIRCUIT

Use the chart below (Figure 12-18) as a starting point for troubleshooting the low oil warning circuit.

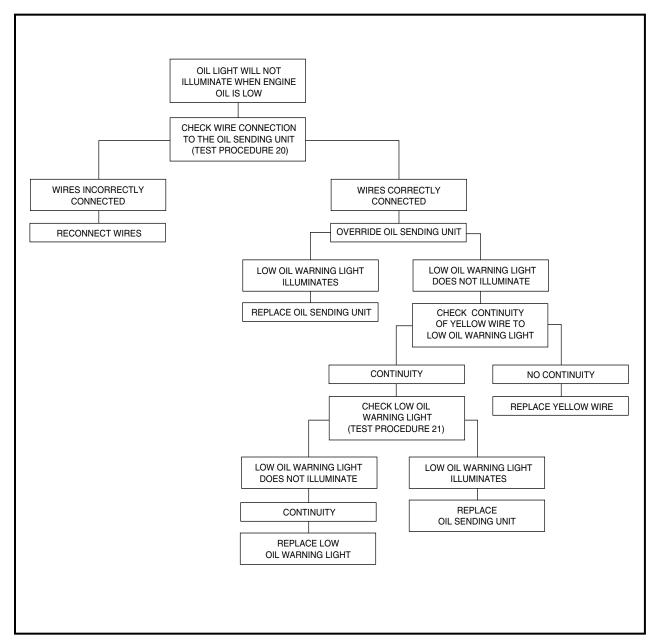


FIGURE 12-18

TESTING THE NEUTRAL LOCK-OUT CIRCUIT

Use the chart on page 12-14 (Figure 12-19) as a starting point for troubleshooting the neutral lock-out circuit. See DANGER below and WARNING at the top of page 12-14.

A DANGER

 DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON. G

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

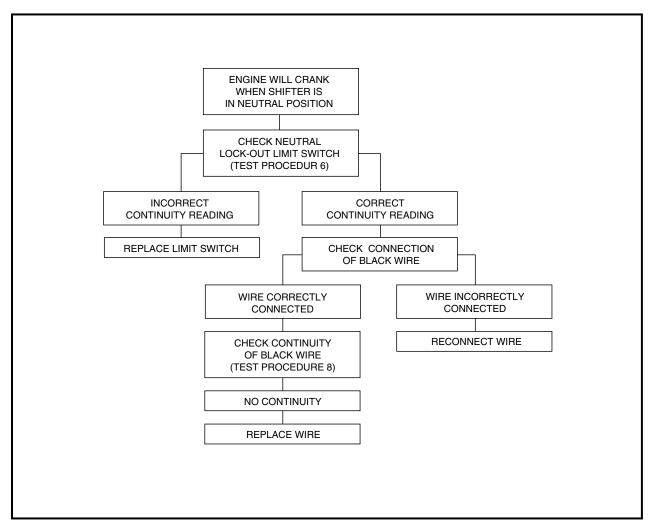


FIGURE 12-19

TEST PROCEDURES

Test Procedure 1 - Fuse:

The fuse (red 10 amp) is located in the electrical component box (Figure 12-2, Page 12-3).

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Check that the wires are connected correctly and are tight. If they are not, rewire or tighten as necessary.
- 3. Remove the fuse. Using a multimeter set on ohms (Ω) , place the red (+) probe on one terminal of the fuse and place the black (-) probe on the other terminal of the fuse. The reading should be continuity. If the reading is incorrect, replace the fuse with a new 10 amp fuse.

Test Procedure 2 - Battery Test (Under Load):

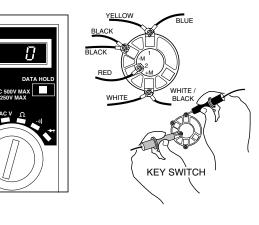
NOTE

- LEAVE THE BATTERY CONNECTED WHILE PERFORMING TEST PROCEDURE 10.
- 1. Place the neutral lockout cam in the SERVICE position, put the forward and reverse switch in NEU-TRAL, and chock the wheels.
- 2. Set a multimeter to volts and place the red (+) probe on the F2 (white wire) terminal on the starter/generator. Place the black (-) probe on the negative terminal post on the battery.
- 3. Turn the key switch to the ON position, leave the forward and reverse switch in the NEUTRAL position and depress the accelerator pedal (with the accelerator pedal depressed the battery is under load).
- If the voltage reading is over 9.6 volts, check the starter/generator (See Starter/Generator, Page 12-27).
- If the reading is below 9.6 volts, check the battery (See page 12-46). Voltages may vary according the the chart on Page 12-51.
- If the reading is zero, there may be no continuity across the large posts of the solenoid (See Test Procedure 5).
- 4. If all of the test results are good, there may be a broken or damaged white 6 gauge wire from the solenoid to the starter/generator (See Test Procedure 8).

Test Procedure 3 - Ground Straps:

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- Set the multimeter to ohms (Ω). Place the red (+) probe on the (A1) terminal of the starter/generator and place the black (-) probe on the frame of the vehicle. The reading should be continuity. If the reading is incorrect, clean and tighten wire connections. If the connections are okay, repair or replace the wire (See Figure 12-60, Page 12-54).
- 3. Place the red (+) probe of the multimeter on the ground strap terminal end located on the oil filler bracket on the engine. Place the black (-) probe on the frame of the vehicle. The reading should be continuity. If the reading is incorrect, clean and tighten wire connections. If the connections are good and the reading is incorrect, repair or replace the wire (See Figure 12-61, Page 12-54).
- 4. Open the electrical component box. Place the red (+) probe of the multimeter on the nut on top of the voltage regulator, place the black (-) probe on the frame of the vehicle (See Figure 12-62, Page 12-54). The reading should be continuity. If the reading is incorrect, check and tighten the bolt and nut that hold the voltage regulator to the electrical component box, as well as the bolts and nuts that hold the electrical component box to the frame. Make sure the connection is clean and tight.
- 5. Check the 6 gauge black wire that connects the negative post of the battery to the frame. The frame connection should be clean and tight. Visual inspection of the connection on the frame is very difficult. The best check for tightness is to pull on the black wire. If the wire moves at the connection end, disassemble the frame connection, clean off the bolt, ring terminal, and nut. Then reinstall the frame connection.

Test Procedure 3 - Ground Straps, Continued:



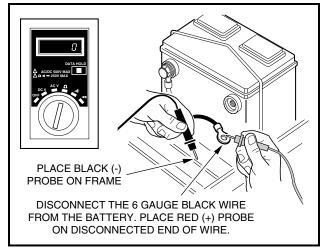


FIGURE 12-20

FIGURE 12-21

6. Set the multimeter to ohms (Ω) . Place the red (+) probe on the unconnected end of the 6 gauge black wire, and place the black (-) probe on the frame of the vehicle. The reading should be continuity. If the reading is incorrect, check that terminals connections are clean and tight. If the connections are good and the reading is incorrect, repair or replace the wire (Figure 12-21).

Test Procedure 4 - Accelerator Starter Limit Switch:

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

The accelerator starter limit switch is the top switch located in the electrical component box. There are an 18 gauge green wire and an 18 gauge orange wire connected to this limit switch.

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Check for proper wiring and tight connections (Figure 12-3, Page 12-4).
- 3. Set the multimeter to ohms (Ω) . Place the red (+) probe on the common (COM) terminal (green wire) of the limit switch and place the black (-) probe on the normally closed (NC) terminal (orange wire) of the limit switch.
- 4. Make sure the battery is disconnected. With the key switch in the OFF position, the forward and reverse lever in NEUTRAL, and the accelerator pedal in the UP position, the reading should be no continuity. With the accelerator pedal depressed, the reading should be continuity. If readings are incorrect, replace the switch.

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Remove the electrical component box cover.
- 3. Check that the wires are connected correctly and are tight. If they are not, rewire or tighten as necessary.
- 4. Set a multimeter to ohms (Ω) . Place the red (+) probe on one of the small posts of the solenoid and place the black (-) probe on the other small post. The reading should be 14 to16 ohms. If the reading is not within limits, replace the solenoid.
- 5. Disconnect the black (-) battery cable from the battery. Do not allow the cable to touch the frame or other components of the vehicle.
- 6. Remove the 6 gauge white wire and the 16 gauge red wire from the large post of the solenoid. Do not allow the wires to touch the frame or other components of the vehicle (Figure 12-22).
- 7. Set the multimeter to ohms (Ω) . Connect the red (+) probe to one of the large posts of the solenoid and connect the black (-) probe to the other large post **(Figure 12-23, Page 12-18)**.

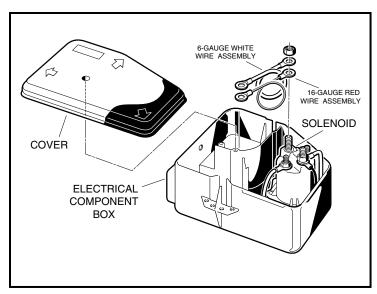
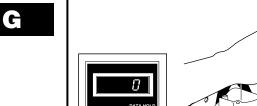
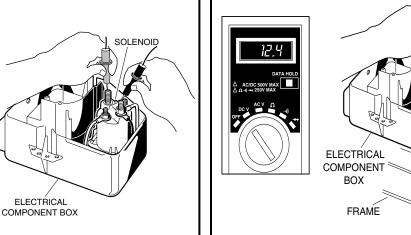


FIGURE 12-22

- 8. Connect the black (-) cable to the battery negative post.
- 9. Place the forward and reverse lever in NEUTRAL, and place the neutral lock-out cam in the SERVICE position. Turn the key switch to the ON position. With the accelerator in the up position, the reading on the multimeter should be **no** continuity. Depress the accelerator pedal and listen for the audible solenoid click. There should be continuity. If either reading is incorrect, replace the solenoid.
- 10. With the forward and reverse lever still in NEUTRAL, and the neutral lock-out cam in the SERVICE position, set the multimeter to DC volts (DC V) and place the red (+) probe on the large post that does not have wires connected to it. Place the black (-) probe on the frame of the vehicle. Turn key switch to ON position, depress accelerator pedal, and listen for solenoid click. The meter should read full battery voltage. If the reading is incorrect, replace the solenoid (Figure 12-24, Page 12-18).
- 11. Disconnect the 6 gauge black wire from the negative post of the battery before reconnecting the wires to the solenoid.

Test Procedure 5, Continued:





SOLENOID

FIGURE 12-23 FIGURE 12-24

Test Procedure 6 - Cam-Activated Neutral Lock-out Limit Switch:

This switch is located on the forward and reverse switch assembly. There are a black wire, a green wire, and a white wire connected to this limit switch.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

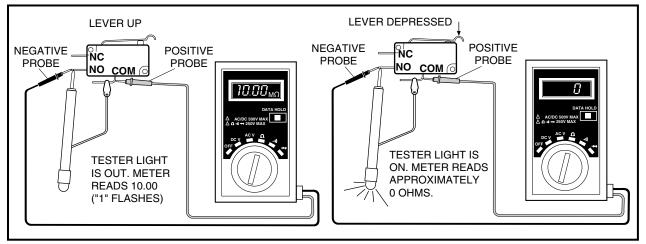


FIGURE 12-25

1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.

- 2. Check for proper wiring and tight connections.
- 3. Place the red (+) probe of the multimeter on the common (COM) terminal of the limit switch. Place the black (-) probe on the normally open (NO) terminal of the limit switch. Without the lever depressed, the reading should be no continuity. Depress the lever, and the reading should be continuity. If either reading is incorrect, replace the limit switch (Figure 12-25).
- 4. Check to be sure the lobes on the cam are depressing the neutral lock-out limit switch as the forward and reverse lever is being shifted. The limit switch should make an audible click as it is depressed. If it does not, check for wear on the cam lobes. Be sure the cam snaps fully back into place. If the cam lobes still do not activate the limit switch, replace the cam.

Test Procedure 7 - Starter/Generator (Starter Function) (Figure 12-26, Page 12-20):

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.
- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Check that wires are connected correctly and are tight. If they are not, rewire or tighten as necessary.
- 3. Disconnect the wires from all the terminals on the starter/generator. Then place the black (-) probe of a multimeter, set to ohms (Ω), on the starter/generator housing (scratch through the paint to ensure a good ground). While holding the black probe against the housing, place the red (+) probe (one at a time) on the A1, A2, F1, F2 and DF terminals respectively (Figure 12-26, Page 12-20). The readings should be *no* continuity. If the readings are incorrect, the starter/generator will need to be removed from the vehicle and disassembled by a qualified technician (See Removal of the Starter/Generator, Page 12-27).

An incorrect reading from A1 or A2 terminal indicates three possible problems: 1) a grounded A1 or A2 terminal, 2) a grounded wire in the brush area, or 3) a grounded armature/commutator.

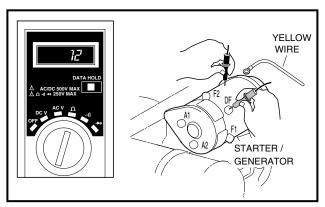
If the F1 or F2 reading is incorrect, it indicates a possible grounded F1 or F2 terminal or a grounded field coil.

If the DF reading is incorrect, it indicates a possible grounded DF terminal or a grounded field coil.

- Disconnect the ground wire from the A1 terminal and the black wire from the A2 terminal on the starter/ generator. Using a multimeter set to ohms (Ω), place the red (+) probe on the A1 terminal and the black (-) probe on the A2 terminal. The reading should be continuity.
 If the reading is incorrect, a possible open or poor contact in a brush assembly and/or open armature.
 - If the reading is incorrect, a possible open or poor contact in a brush assembly and/or open armature windings maybe the cause. The starter/generator will need to be removed from the vehicle and disassembled by a qualified technician (See Removal of the Starter/Generator, Page 12-27).
- 5. Disconnect the black wire from the F1 terminal and the white wire from the F2 terminal on the starter/ generator. Using a multimeter set on ohms (Ω) , place the red (+) probe on the F1 terminal and the black (-) probe on the F2 terminal. The reading should be continuity.
 - If the reading is incorrect, a possible open field coil or bad connections at terminals may be the cause. The starter/generator will need to be removed from the vehicle and disassembled by a qualified technician (See Removal of the Starter/Generator, Page 12-27).

Test Procedure 7, Continued:

6. Disconnect the yellow wire from the DF terminal and the black wire from the F1 terminal on the starter/ generator. Using a multimeter set on ohms (Ω) , place the red (+) probe on the DF terminal and the black (-) probe on the F1 terminal. The reading should be between 4.5 to 5.5 ohms (Ω) . If the reading is incorrect, a possible grounded DF terminal and/or grounded field coil may be the cause. The starter/generator will need to be removed from the vehicle and disassembled by a qualified technician (See Removal of the Starter/Generator, Page 12-27).



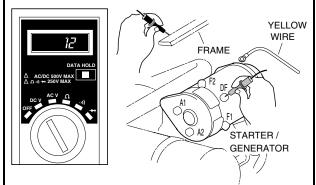


FIGURE 12-26

FIGURE 12-27

Test Procedure 8 - Wire Continuity:

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. To test a wire for continuity, disconnect either end from the electrical component it is attached to.
- 3. Set the multimeter to ohms (Ω) and place the red (+) probe on the terminal at one end of the wire. Place the black (-) probe on the other terminal end of the wire. The reading should be continuity. If the reading is incorrect, repair or replace the wire.

Test Procedure 9 - Starter/Generator (Generator Function) (Figure 12-27):

A DANGER

 DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

NOTE

- LEAVE THE BATTERY CONNECTED WHILE PERFORMING TEST PROCEDURE 9.
- Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Check that the wires are connected correctly and are tight. If they are not, rewire or tighten as necessary.
- 3. Disconnect the yellow wire from the DF terminal on the starter/generator. Cover the connector on the yellow wire to make sure yellow wire will not short to ground. Then, using a jumper wire, ground the DF terminal to the A1 terminal. Using a multimeter set to Volts DC (20v range), place the red (+) probe on the positive (+) post of the battery, and place black (-) probe on the negative (-) post. Turn the key switch to the ON position, and depress the accelerator to start the engine. Run the engine at full governed speed. The reading should show voltage rising on the meter. If the voltage rises, see Test Procedure 10 Voltage Regulator. If the voltage does not rise, see Starter/Generator Repair, Page 12-27.

4. Reconnect the yellow wire to the (DF) terminal on the starter/generator.

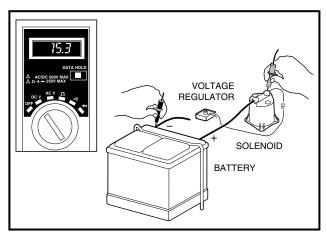
Test Procedure 10 - Voltage Regulator:

A DANGER

 DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

NOTE

- LEAVE THE BATTERY CONNECTED WHILE PERFORMING TEST PROCEDURE 10.
- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Check that the wires are connected correctly and are tight. If they are not, rewire or tighten as necessary.
- 3. Check the engine-governored RPM. The reading should be between 2625-2725 RPM. If it is not, adjust the accelerator cable at the electrical component box (See Fuel System Section 14).
- 4. With the battery in good condition and fully charged, with proper ventilation run the engine for several minutes to bring the voltage regulator to operating temperature. Using a multimeter set to DC volt (DCV), place the red (+) probe on the large post of the solenoid with the red wire from the voltage regulator attached. Place the black (-) probe on the negative (-) post of battery. Turn the key switch to the ON position. Depress the accelerator to start the engine, and run it at full governed speed. If the reading is between 14.7 and 15.3 volts, the regulator is good. If the reading is lower than 14.7 volts but rising steadily, check battery condition (See Hydrometer Testing, Page 12-49). If the reading is lower than 14.7 volts and not rising, and the starter/generator is good; or if the reading is over 15.3 volts and continues to rise, replace voltage regulator (Figure 12-28).



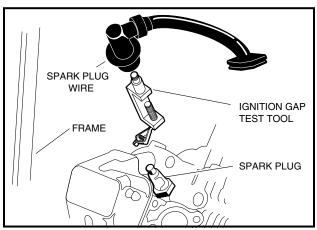


FIGURE 12-28

FIGURE 12-29

Test Procedure 11 - Ignition Spark (Figure 12-28):

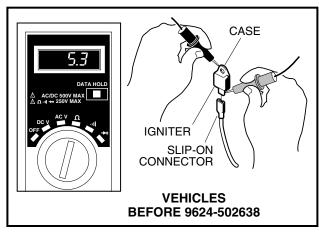
NOTE

LEAVE THE BATTERY CONNECTED WHILE PERFORMING TEST PROCEDURE 11.

Test Procedure 11, Continued:

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Remove the plug wire from the spark plug. Using an ignition spark gap test tool (Thexton 404® or equivalent), check for correct spark (Figure 12-29, Page 12-21).
 - 2.1. Adjust the tester probes to approximately to 18,000 volts (18 Kv) setting. Connect the tester to the spark plug wire, and connect the alligator clip to the frame.
 - 2.2. Turn the key switch to the ON position and crank the engine by depressing the accelerator. There should be a strong blue spark between the probes of the spark gap tester. If there is no spark, or if the spark is a faint yellow or white color, test components of the ignition circuit.
- 3. If the spark gap tester tool indicates a strong blue spark, it is possible the spark plug has failed internally. Replace the spark plug with a new part and test the engine for proper operation.

Test Procedure 12 - Igniter (Vehicles before AG9624-502638):



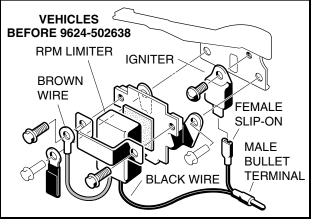


FIGURE 12-30

FIGURE 12-31

NOTE

- TO TEST IGNITERS ON VEHICLES WITH SERIAL NUMBERS GREATER THAN AG9624-502638, SEE IGNITION COIL TEST PROCEDURE 14.
- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Using a multimeter set on ohms (Ω) , place the red (+) probe on the terminal. Place the black (-) probe on the case. The reading should be between 2 6 ohms (Ω) . If the reading is not correct, replace the igniter **(Figure 12-30)**.
- 3. The first test will find 90% of the bad igniters. Some igniters may bench test okay but fail under a load due to heat while operating. Another method of testing is to replace the igniter and then run the engine. If the engine runs properly, keep the new igniter in the circuit.

Test Procedure 13 - RPM Limiter (Figure 12-31):

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Disconnect the female slip-on connector from the igniter (on some vehicles the igniter is located in the ignition coil and on other vehicles the igniter is behind the RPM limiter, against the engine block). Disconnect the bullet terminal. Using a multimeter set on ohms (Ω) , place the red (+) probe on the brown ground wire and place the black (-) probe on the black wire male bullet connector. The reading should be between 4.5 to 7 ohms (Ω) . If the reading is not correct, replace the RPM Limiter.

- 3. Using a multimeter set to ohms (Ω) , place the red (+) probe on the black wire male bullet connector and place the black (-) probe on the black wire female slip-on connector. The reading should be continuity. If the reading is not correct, replace the RPM Limiter.
- 4. The first two tests will find 90% of bad RPM Limiters. Some of them may bench test okay but fail under a load due to heat while operating. Another method of testing is to replace the RPM Limiter and then run the engine. If the engine runs properly, keep the new RPM Limiter in the circuit.

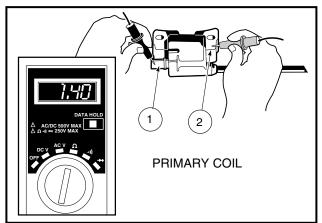
Test Procedure 14 - Ignition Coil:

A DANGER

 DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.



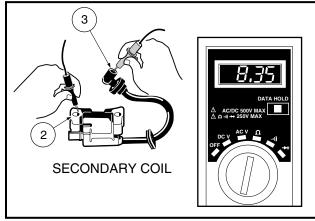


FIGURE 12-32

FIGURE 12-33

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Using a multimeter set on ohms (Ω) , measure the primary coil resistance. Place the black (-) probe of the meter on the primary wire terminal connector (1), and place the red (+) probe on the core (2) **(Figure 12-32)**.
- 3. If the resistance is not within 0.6 1.4 ohms (Ω), replace the coil.
- 4. Using a multimeter set on ohms (Ω) , measure the secondary coil resistance. Place the red (+) probe of the meter on the plug lead (3) and place the black (-) probe on the core (2) (Figure 12-33).
- 5. If the resistance is not within 6.0 11.0 k ohms (Ω), replace the coil.
- 6. The first five steps will find 90% of the bad coils. Some coils may bench test okay but fail under a load due to heat while operating. Another method of testing is to replace the coil and then run the engine. If the engine runs properly, keep the new coil in the circuit.

Test Procedure 15 - Disconnected Kill Wire:

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Remove the spark plug wire from the spark plug. Using an ignition spark-gap test tool (Thexton 404® or equivalent), check for correct spark to plug. Adjust the tester probes to approximately to 18,000 volts (18 Kv) setting. Connect the tester to the spark plug wire, and connect the alligator clip to the top of the spark plug (Figure 12-29, Page 12-21).
- 3. Disconnect the engine-kill white/black wire at the bullet connector located by the RPM limiter (**Figure 12-34**).
- 4. With the neutral lock-out cam placed in the SERVICE position and the wheels chocked, connect the 6 gauge red wire to the positive post on the battery, then connect the 6 gauge black wire to the negative post. Turn the key switch to the ON position. In a well-ventilated area, depress the accelerator to start the engine.
- 5. If there is a strong blue spark across the spark gap tester tool and the engine begins to run, test the engine kill circuit for a shorted wire or other failed components in the engine kill circuit (See Testing the Engine Kill Circuit) (See Warning Below).

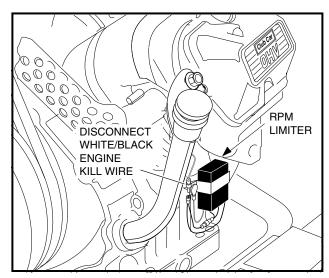
WARNING

- WHEN THE WHITE/BLACK ENGINE KILL WIRE IS DISCONNECTED, THE ENGINE WILL NOT STOP RUNNING AFTER THE ACCELERATOR PEDAL IS RELEASED. IT WILL BE NECESSARY TO DEPRESS AND HOLD THE CHOKE COVER CLOSED UNTIL THE ENGINE STOPS RUNNING.
- 6. If there is no spark, or the spark is a faint yellow or white color, test the ignition circuit components.

Test Procedure 16 - Kill Limit Switch:

The kill limit switch is located inside the electrical component box. The accelerator kill switch is the lower of the two limit switches and has a white/black wire and black wire connected to it.

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Check for proper wiring and tight connections.



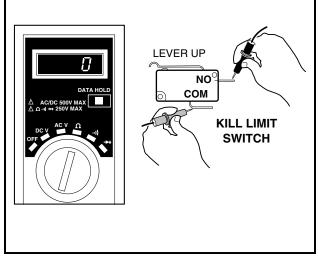


FIGURE 12-34

FIGURE 12-35

3. Place the red (+) probe of the multimeter on the common (COM) terminal (white/black wire) of the limit switch. Place the black (-) probe on the normally open (NO) terminal (black wire) of the limit switch.

Without the lever depressed, the reading should be no continuity. Depress the lever, and the reading should be continuity. If either reading is incorrect, replace the limit switch (Figure 12-35).

Test Procedure 17 - Key Switch (Engine Kill Circuit):

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Remove the center dash assembly (See Removing the Key Switch, Page 12-39).
- 3. Check that the wires are connected correctly and are tight. If they are not, rewire or tighten as necessary.
- 4. Place the red (+) probe of the multimeter on the (M+) terminal of the key switch and the black (-) probe on the (M-) terminal. With the key switch turned OFF, the reading should be continuity. With the key switch turned ON, the reading should be no continuity. If the either reading is incorrect, replace the key switch (Figure 12-36, Page 12-26).

Test Procedure 18 - Reverse Buzzer Limit Switch:

This limit switch is located on the forward and reverse assembly; red/white and orange wires are connected to it.

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. If the buzzer does not function and the engine also does not start, see Testing the Vehicle Battery, Page 12-7.
- 3. If the engine will start but the reverse buzzer does not function, move the forward and reverse lever to reverse and listen for an audible click from the limit switch. If there is no click, check the switch for proper alignment and switch arm movement.
- 4. If the switch is being activated but the buzzer does not function, place the red (+) probe of the multimeter on one terminal and the black(-) probe on the other terminal of the limit switch. Without the lever depressed, the reading should be no continuity. Depress the lever and the reading should be continuity. If either reading is incorrect, replace the limit switch (Figure 12-8, Page 12-6).

Test Procedure 19 - Reverse Buzzer:

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Remove the center dash assembly (See Removing the Reverse Buzzer, Page 12-44).
- 3. Check for proper wiring and tight connections. Using a multimeter, check for continuity through each wire that connects to the reverse buzzer (See Figure 12-8, Page 12-6). If the buzzer will not function when properly wired, replace the buzzer.

Test Procedure 20 - Oil Sending Unit:

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Check that the yellow 18 gauge on the oil sending unit is connected correctly and is tight. If it is not, rewire or tighten as necessary (Figure 12-9, Page 12-6).
- 3. Disconnect the yellow wire from the oil sending unit connector terminal at the rear of the engine crank-case on the passenger's side. Using an alligator clip jumper wire, connect the wire to the frame. Turn the key switch ON, closing the circuit. The oil light should illuminate. If not, check the yellow wire for continuity. If there is no continuity, replace the wire. If the wire tests okay then check the oil light (See Test Procedure 21). If the oil light does illuminate with the jumper wire, the oil sending unit needs to be replaced (See Crankcase Cover Removal, Section 13, Page 13-24).

Test Procedure 21 - Oil Warning Light:

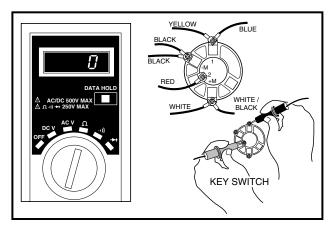
- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Remove the center dash assembly (See Removing the Oil Light, Page 12-46).
- 3. Check that the wires are connected correctly and are tight. If they are not, rewire or tighten as necessary (Figure 12-9, Page 12-6).
- 4. Disconnect the yellow wire (to the oil sending unit) from the terminal on the oil light. Using an alligator clip jumper wire, connect the terminal to the frame of the vehicle. Connect the red (+) battery cable to the postive (+) post of the battery, then attach the black (-) cable to the negative (-) post of the battery.
- 5. Turn the key switch ON. The oil light should illuminate. If it does not, check continuity of the yellow wire that runs from the key switch to the oil light. If there is no continuity in the wire, replace the wire. Then test the key switch (See Test Procedure 22). If the yellow wire and the key switch test okay, then replace the oil light.

Test Procedure 22 - Key Switch (Starter Circuit):

- 1. Place the neutral lock-out cam in the SERVICE position, put the forward and reverse lever in the NEU-TRAL position, and chock the wheels.
- 2. Remove the center dash assembly (See Removing the Key Switch, Page 12-39).
- 3. Check that the wires are connected correctly and are tight. If they are not, rewire or tighten as necessary.
- 4. Insert the key and turn the switch to ON. Place the red (+) probe of the multimeter on the No. 2 terminal and the black (-) probe on the No. 1 terminal of the key switch. The reading should be continuity. If the reading is incorrect, replace the key switch (Figure 12-36).

Test Procedure 23 - Neutral Lock-out Cam:

Check to be sure the lobes on the cam are depressing the neutral lock-out limit switch lever as the forward and reverse lever is being shifted. The limit switch should make an audible click as it is depressed. If it does not, check for wear on the cam lobes. Be sure the cam has snapped fully back into place. If the cam lobes still do not actuate the limit switch, replace the cam.



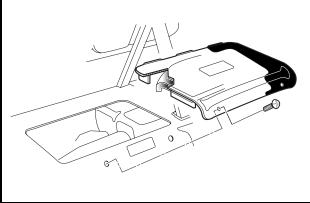


FIGURE 12-36

FIGURE 12-37

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

STARTER/GENERATOR

Removal of the Starter/Generator

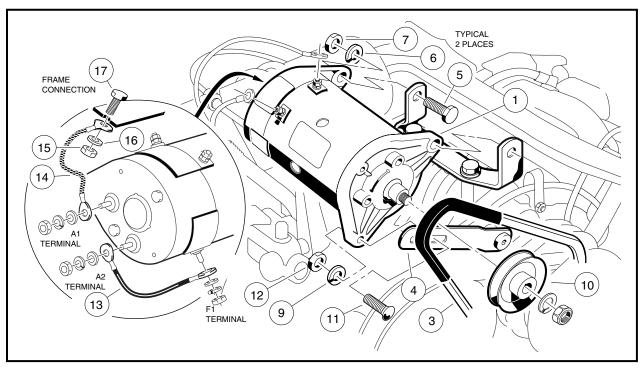


FIGURE 12-38

- 1. Remove access panel from the body (Figure 12-37).
- 2. Disconnect the wires from the starter/generator (1). Mark wires before disconnecting. Loosen the pivot nuts (7) and bolts (5) (Figure 12-38).
- 3. Remove the mounting/adjustment nut (12), washer (9) and bolt (11). Lower the starter/generator and slip the belt (3) off the pulley (10) (Figure 12-38).
- 4. Support the starter/generator so that when the pivot bolts are removed the starter/generator will not fall to the ground. Remove the two pivot nuts (7), lockwashers (6), and bolts (5) from the mounting bracket.
- 5. Remove the starter/generator up through the access opening.

Disassembly of the Starter/Generator to Service the Brushes

1. Remove the two bolts (20) and washers (21 and 22) and pull commutator end cover (23) free of starter housing (24) (Figure 12-39, Page 12-28). See NOTE at the top of page 12-28.

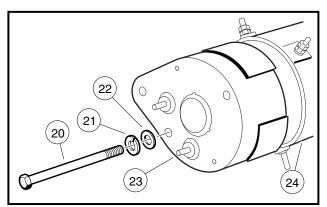
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NOTE

- IF THE BRUSHES ARE NOT REMOVED, CONTACT BETWEEN THE BRUSHES AND COMMUTATOR AS THE COMMUTATOR END COVER IS BEING REMOVED OR INSTALLED COULD POSSIBLY DAMAGE THE BRUSHES. LIFT THE BRUSH SPRINGS OUT OF THE NOTCHES IN THE BRUSHES AND PULL THE BRUSHES BACK FROM THE CENTER OF THE COMMUTATOR END COVER. THE SPRINGS WILL REST ON THE SIDES OF THE BRUSHES AND HELP PREVENT THEM FROM SLIDING TOWARDS THE CENTER OF THE COVER (FIGURE 12-43, PAGE 12-30).
- 2. Remove brush covers (29 and 30), screws (25) and lockwashers (26), brush springs (28), and brushes (27) (Figure 12-41) (See Note below).

NOTE

• CLEAN AND INSPECT THE ARMATURE/COMMUTATOR AND THE BEARINGS (SEE DISASSEM-BLY OF THE STARTER/GENERATOR TO SERVICE THE ARMATURE/ COMMUTATOR, PAGE 12-30).



BRUSH
BRUSH
HOLDER
WEAR LINE

FIGURE 12-39

FIGURE 12-40

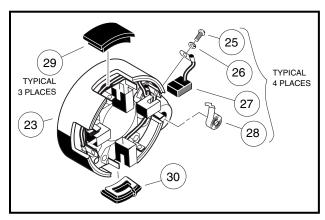


FIGURE 12-41

Cleaning, Inspection, and Replacement of Brushes

- 1. Visually inspect brushes. Replace brushes which are cracked or severely chipped.
- 2. There is a wear line on the side of the brush. If the end of the brush is within 1/16 inch (1.6 millimeters) of the wear line, replace all four brushes (Figure 12-40).

Cleaning, Inspection, and Replacement of Brush Springs

- 1. Visually inspect springs. Replace all four springs if any spring is discolored from heat (straw or bluish in color).
- 2. Install the four brushes (27) into their holders and insert the four brush springs (28) (Figure 12-41). Using a spring scale, test brush spring tension. If the any spring has a tension less than 24 ounces, replace all four springs (Figure 12-42) (See Caution below).

A CAUTION

 WHEN CHECKING BRUSH SPRING TENSION, DO NOT PULL SPRINGS BEYOND THE POINT THEY WOULD NORMALLY BE IF THERE WERE NEW BRUSHES INSTALLED. EXERTING EXCES-SIVE FORCE OR PULLING BRUSH SPRINGS BEYOND THEIR NORMAL RESTING POINT WILL DAMAGE SPRINGS.

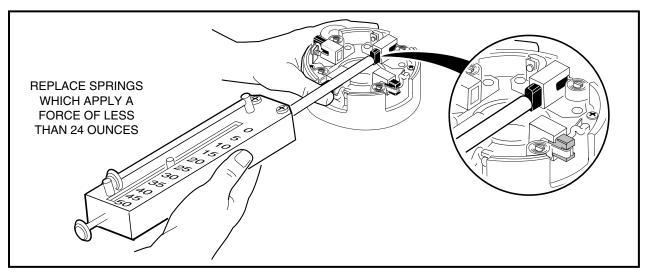


FIGURE 12-42

Assembly of the Starter/Generator

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.
- 1. Connect the brush wires to the holders using the four lockwashers (26) and four screws (25), making sure the crossover leads are connected also. Apply 26-35 in.lbs. (2.9/3.9 N-m) of torque to the screws (Figure 12-41).
- To prevent contact between the brushes and commutator as the commutator is installed, and possible damage to the brushes, lift the brush springs out of the notches in the brushes and pull the brushes back from the center of the commutator end cover. The springs will rest on the sides of the brushes and help prevent them from sliding towards the center of the cover (Figure 12-43, Page 12-30).

Assembly of the Starter/Generator, Continued:

- 3. Install the commutator end cover (23) onto the armature shaft. Align the locating pin with the pin hole in the cover. Install the two M6 x 180mm screws (20) (for vehicles prior to serial number 9533-452031 the generators have lockwashers and flat washers with the screws) and tighten to 95-104 in.lbs. (10.6/11.6 N-m) (Figure 12-39, Page 12-28).
- 4. Install the brushes into the holders. Place springs into the notches in the brushes. Install the brush cover (30) that has the drain hole in it next to the A2 terminal. Install the remaining three brush covers (29) in the openings in the commutator end cover (23) (Figure 12-41, Page 12-28).

Disassembly of the Starter/Generator to Service the Armature/Commutator

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

NOTE

• IF THE BRUSHES ARE NOT REMOVED, CONTACT BETWEEN THE BRUSHES AND COMMUTATOR AS THE COMMUTATOR END COVER IS BEING REMOVED OR INSTALLED COULD POSSIBLY DAMAGE THE BRUSHES. LIFT THE BRUSH SPRINGS OUT OF THE NOTCHES IN THE BRUSHES AND PULL THE BRUSHES BACK FROM THE CENTER OF THE COMMUTATOR END COVER. THE SPRINGS WILL REST ON THE SIDES OF THE BRUSHES AND HELP PREVENT THEM FROM SLIDING TOWARDS THE CENTER OF THE COVER (FIGURE 12-43).

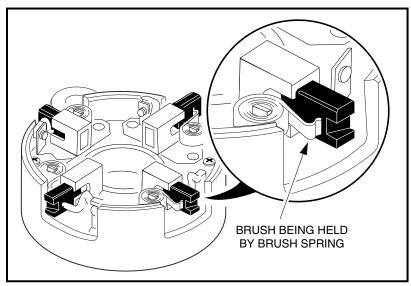


FIGURE 12-43

1. Remove two bolts (20) and washers (21 and 22), and pull commutator end cover (23) free of the starter housing (24) (Figure 12-39, Page 12-28).

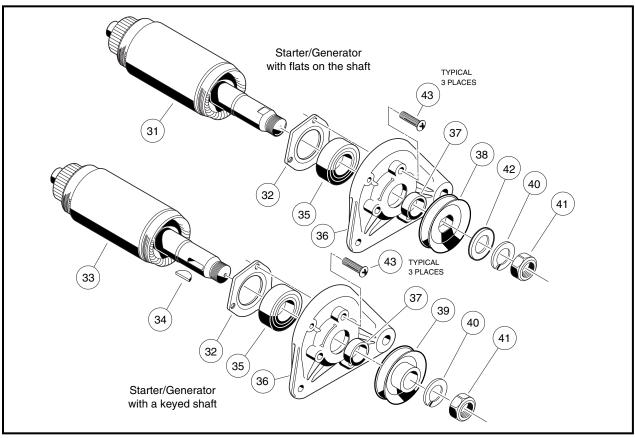


FIGURE 12-44

2. There are two types of generators. Some use a shaft key; others use a shaft with flats to hold the pulley. The shaft with flats also uses a flat washer against the pulley. To separate armature (31 or 33) from output end cover (36), remove nut (41), lockwasher (40), pulley (38 or 39), shaft key (34), spacer (37), bearing retainer screws (43) and washers (for vehicles prior to serial number 9533-452031, the generators use washers and lockwashers with the bearing retaining screws) (Figure 12-44).

Clean and Inspect the Bearings

- 1. Using a clean cloth, wipe the carbon dust off of the two bearings. Inspect bearings by spinning them by hand and checking for both axial (A) and radial (B) play (Figure 12-45).
- 2. Replace the bearing if it is noisy, does not spin smoothly, or has excessive play. Check the bearings and replace if rusted, worn, cracked, or if there is an abnormal color change in the metal of the bearing. Bearings should be replaced if there is extreme wear or pitting on the balls or on the rolling surfaces. Do not remove the bearings unless they are to be replaced.

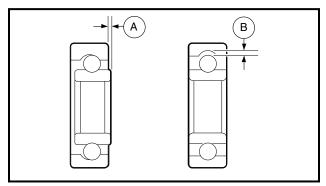


FIGURE 12-45

Removing the Bearings

- Place the wedge attachment tool (Club Car Part No. 1012812) between the bearing and the armature.
 Make sure the wedge attachment tool is supporting the inner race of the bearing. If a press is not available, secure a bearing puller (Club Car Part No. 1012811) to the wedge attachment tool and pull the bearing off of the end of the armature shaft. Support the armature so that it will not drop when the bearing is removed (Figure 12-46)
- 2. Discard the bearings.
- 3. Slide the bearing retainer (32) off of the output end of the shaft (Figure 12-44, Page 12-31).

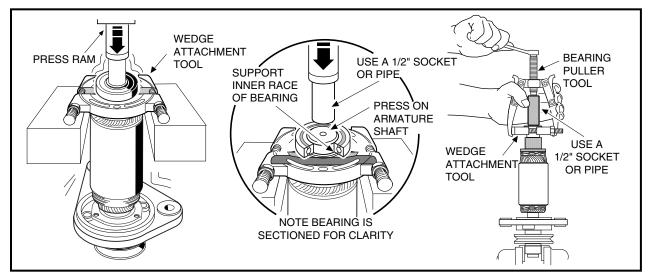


FIGURE 12-46

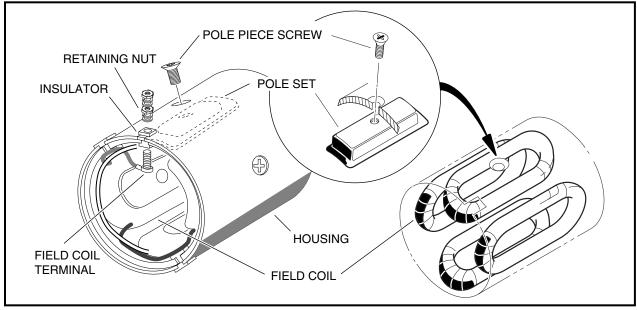


FIGURE 12-47

Removing the Field Coils

 Remove the retaining nut from each field coil terminal and slide the insulator out of the slots in the housing. Remove the four pole piece screws from the housing. Remove the four pole set from inside the housing. Remove the field coils from the inside of the housing (Figure 12-47). See NOTE at the top of page 12-33.

NOTE

• DO NOT REMOVE THE INSULATORS OR THE FIELD COILS UNLESS ELECTRICAL TEST INDI-CATES THAT IT IS NECESSARY (FIGURE 12-47). SEE TEST PROCEDURE NO. 7, PAGE 12-19.

Visual Inspection of Armature

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

Obvious defects can be seen by examining the armature. If an armature has frayed or charred insulation, broken wires or thrown solder, it is obvious without testing that it should be replaced. Faults seen during the visual inspection can aid in diagnosing the original cause of the failure. Items to look for are listed below.

- Burned, charred, or cracked insulation.
- Improperly cured varnish.
- · Thrown solder.
- · Flared armature windings.
- Worn, burned, or glazed commutator.
- Loose or raised commutator bars.
- Bruised or damaged armature core laminations.
- Worn armature bearing or shaft.
- Dirty or oily commutator.

Slight roughness of the commutator can be polished away with 400 or finer sandpaper.

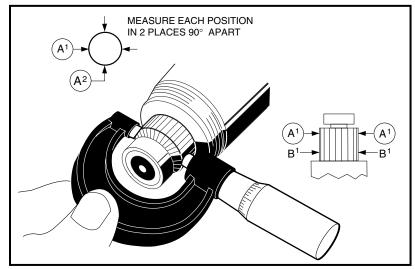


FIGURE 12-48

G

Cleaning, Inspection, and Replacement of the Commutator

1. Clean the carbon dust, dirt and oil from the commutator. Visually inspect the commutator for worn, burned or glazed areas. Check for loose or raised commutator bars. Slight roughness of the commutator can be polished away with 400 or finer sandpaper (See Caution below).

A CAUTION

- NEVER USE EMERY CLOTH ON THE COMMUTATOR. PARTICLES OF EMERY ARE CONDUCTIVE AND MAY SHORT-CIRCUIT THE COMMUTATOR BARS. NEVER USE OIL OR LUBRICANTS ON THE COMMUTATOR OR BRUSHES.
- 2. Using a micrometer, measure the outside diameter at two points along the commutator. If the commutator outside diameter is less than 1.535 inches (39 millimeters), replace the armature and bearings (Figure 12-48, Page 12-33).

Armature Ground Test

A CAUTION

• DO NOT SUBMERGE ARMATURE IN SOLVENT.

NOTE

• BEFORE TESTING, WIPE THE ARMATURE WITH A CLEAN CLOTH AND REMOVE CARBON DUST AND METAL PARTICLES FROM BETWEEN COMMUTATOR BARS.

Using a multimeter set on ohms (Ω) , place the positive probe on the commutator bars and the negative probe on the armature core. The reading should be no continuity. If the reading is incorrect, replace the armature and the two bearings (Figure 12-49).

Visual Inspection of Field Coils

If the insulation on the field coils appears blackened or charred, the serviceability of the coils is questionable. Burned or scorched coil insulation indicates the motor has overheated due to overloads or grounded or shorted coil windings. Be sure the insulators are tight in the housing.

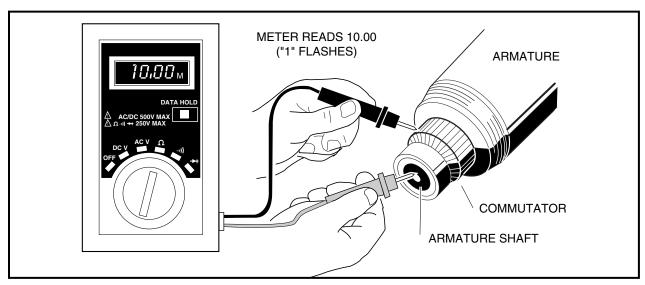


FIGURE 12-49

Reworking the Starter/Generator

Any rework must be performed by a qualified technician. Starter/Generator service specifications are listed in the table below.

ITEM	SERVICE LIMIT
Commutator diameter (minimum)	1.535 inches (39 millimeters)
Concentric with armature shaft within	.002 inch (0.051 millimeter)
Limit depth of cut when machining commutator (For Vehicles prior to Serial No. 9625-505061)	.005 inch (0.127 millimeter)
Limit depth of cut when machining commutator (For Vehicles Serial No. 9625-505061 and later)	.007 inch (0.2 millimeter)
If under cut of segment insulator is less than .016 (0.406 millimeter), then it should be undercut to	.031 inch (0.8 millimeter)
Dielectric strength	500 VAC for one minute
Armature insulation resistance	0.2MΩ at 500 VDC
Starter field coil resistance (For Vehicles prior to Serial No. 9625-505061)	0.1-0.3 Ω
Starter field coil resistance (For Vehicles Serial No. 9625-505061 and later)	0.006-0.01 Ω
Generator field coil resistance	4.5-5.5 Ω

Assembly of the Starter/Generator

1. Place the field coil into the inside of the housing. The two insulators that look the same fit into the slots next to the F1 and F2 markings on the outside of the housing. The insulator that looks different slides into the slot next to the DF marking. After the insulators are seated in the slots, install the threaded terminals through the wire connectors and then through the insulators. Install a flat washer and a lockwasher onto each threaded terminal (on the outside of the housing). Use a nut to secure the washers and insulator to the housing. Tighten nuts to 43-52 in.lbs. (4.8/5.9 N-m) (Figure 12-47, Page 12-32).

A CAUTION

- ROUTE THE FIELD TERMINAL WIRES SO THAT THEY WILL NOT CONTACT THE ARMATURE.
- 2. Install the four pole pieces into the housing. Use the four screws to secure pole pieces to the inside of the housing to maintain the field wires. Tighten screws to 9 ft.lbs. (12 N-m) (Figure 12-47, Page 12-32).
- 3. Slide the bearing retainer onto the output end of the armature shaft (31 or 33) so that it will hold the outside of the bearing (35) only. Press a new ball bearing (35) onto the output end of the armature (Figure 12-44, Page 12-31). Press a new ball bearing onto the commutator end of the armature shaft.

CAUTION

- TO PREVENT DAMAGE TO THE RETAINER USE CARE WHILE PRESSING NEW BEARING ON TO THE OUTPUT END OF THE SHAFT.
- PRESS AGAINST THE INNER RACE OF THE NEW BEARING UNTIL IT IS FULLY SEATED.
- 4. Install the output end cover (36) into the armature. Secure the bearing retainer (32) to the cover using the three M5 x 18mm screws (43) (for vehicles prior to serial number 9533-452031, the generators use washers and lockwashers with the bearing retaining screws). Tighten the screws to 35-43 in.lbs. (3.9/4.8 N-m) (Figure 12-44, Page 12-31).

Starter/Generator Assembly, Continued:

5. Slide the housing with field coils over the armature. Use the locating pin to align housing to the cover.

NOTE

- THE TERMINAL INSULATORS SHOULD BE ON THE COMMUTATOR END OF THE HOUSING.
- 6. To prevent contact between the brushes and commutator as the commutator cover is installed, and possible damage to the brushes, lift the brush springs out of the notches in the brushes and pull the brushes back from the center of the commutator end cover. The springs will rest on the sides of the brushes and help prevent them from sliding towards the center of the cover (Figure 12-43, Page 12-30).
- 7. Install the commutator end cover (23) onto the armature shaft. Align the locating pin with the pin hole in the cover. Install the two M6 x 180mm screws (20) (for vehicles prior to serial number 9533-452031, the generators have lockwashers and flat washers with the screws) tighten to 95-104 in.lbs. (10.6/11.6 N-m) (Figure 12-39, Page 12-28).
- 8. Install the brushes into the holders. Place springs into the notches in the brushes. Install the brush cover (30) that has the drain hole in it next to the A2 terminal. Install the remaining three brush covers (29) in the openings in the commutator end cover (23) (Figure 12-41, Page 12-28).
- 9. Slide the spacer (37) onto the end of the shaft. Insert the shaft key (34) (if your generator has one) into the shaft. Install the belt pulley (38 or 39) onto the shaft, install the flat washer (42) (if your generator has one) and slide on the lockwasher (40) and M14 nut (41). Tighten the nut to 25-30 ft. lbs. (34/41 Nm) of torque (Figure 12-44, Page 12-31).

Installing the Starter/Generator (Figure 12-50)

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.
- Install the two 3/8 hex head pivot screws (5) into the mounting bracket with the heads of the screws facing towards the passenger's side of the vehicle. Position the starter/generator in the mounting bracket so that the screws will go through the bracket before going through the starter/generator. Install a lockwasher (6) and 3/8 nut (7) onto each screw. Tighten the screws and nuts to finger tight (Figure 12-50, Page 12-37).
- 2. Install the adjustment screw (11) through the adjusting bracket (4) and then through the starter/generator. Install a lockwasher (9) and 5/16 nut (12) onto the end of the adjustment screw (11). Tighten to finger tight (Figure 12-50, Page 12-37).
- 3. Install the belt (3) then tighten the mounting screws (See Belt Adjustments on Next Page).
- 4. Connect the yellow wire from the voltage regulator to the DF terminal on the starter/generator (Figure 12-2, Page 12-3). Install a flat washer, lockwasher, and nut onto the terminal. Torque the nut to 26-35 in.lbs. (3.0/4.0 N-m).
- 5. Install the white wire from the solenoid to the F2 terminal on the starter/generator. Install the black wire from the frame to the A1 terminal on the starter/generator. Install the black wire from the F1 to the A2 terminal on the starter/generator (Figure 12-2, Page 12-3). Install a flat washer, lockwasher, and nut onto each terminal. Torque the nut to 43-52 in.lbs. (4.8/5.9 N-m).

- 6. Reinstall the access panel (Figure 12-37, Page 12-26).
- 7. Install the seat on the rear body.

BELT ADJUSTMENTS

Belt tension should be checked periodically. If the starter/generator slips when starter motor operates, adjust belt to correct tension.

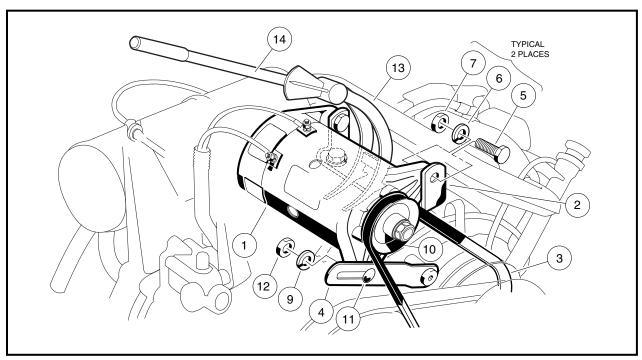


FIGURE 12-50

Belt Tension Adjustment

- 1. Remove the access panel from the rear body (Figure 12-37, Page 12-26).
- 2. Make sure the two pivoting screws (5) on the mounting bracket are finger tight. The adjustment screw (11) and nut (12) are to be finger tight also (Figure 12-50).
- 3. Push the starter down so it is at the lowest part of its adjustment travel. With the starter belt fully in place around the drive clutch pulley (this pulley is the one closest the crankcase cover on the engine), install the starter belt (3) around the pulley (10) on the end of the starter/generator (1). Place the tension tool (13) (Club Car Part No. 1016867) between the starter/generator and the starter/generator mounting bracket (2) so that the tension tool will lift up the starter/generator.
- 4. Install a standard 1/2 inch (12.7 millimeter) drive torque wrench (14) into the tension tool (13). Through the access opening in the rear body, position the wrench tension tool as shown (Figure 12-50). Pull up on the wrench and tension tool until 70 ft. lbs. (95 N-m) of torque has been applied for a new belt. Apply only 40 ft. lbs. (54 N-m) for a previously used belt.
- 5. Tighten the adjustment nut (12) to 12 ft. lbs. (16 N-m) of torque. Tighten the two pivot screws (5) and torque nuts (7) to 21-25 ft. lbs. (28.4/34 N-m) (Figure 12-50) (See CAUTION below and NOTE at the top of page 12-38).

A CAUTION

• REMOVE TENSION TOOL BEFORE STARTING ENGINE.

Belt Adjustment, Continued:

NOTE

 IF A BURROUGHS GAUGE IS USED, TENSION SHOULD BE ADJUSTED TO 120 LBS. FOR A NEW BELT OR 80-100 LBS FOR A PREVIOUSLY USED BELT.

Reinstall the access panel (Figure 12-37, Page 12-26).

VOLTAGE REGULATOR

Removing the Voltage Regulator

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

Vehicles Manufactured prior to week 9544 (Figure 12-51).

- 1. Remove the seat from the rear body.
- 2. Disconnect battery cables as shown (Figure 12-1, Page 12-2).
- 3. Remove the electrical component box cover.
- 4. Disconnect the red wire from the solenoid and unplug the yellow wire from wire harness.
- 5. Remove locknut (4) from the regulator mounting bracket. Disconnect the black ground wire (9) from the bottom of the electrical component box.
- 6. Remove hex nut (5). Remove and discard the screw (6).
- 7. Remove locknut (2) from the regulator (1).
- 8. Remove regulator (1).

Vehicles Manufactured during week 9544 and later (Figure 12-52).

- 1. Remove the seat from the rear body.
- 2. Disconnect battery cables as shown (Figure 12-1, Page 12-2).
- 3. Remove the electrical component box cover.
- 4. Remove locknut (2) from the regulator (1) (Figure 12-52).
- 5. Disconnect the red wire from the solenoid and unplug the yellow wire from wire harness.
- 6. Remove 18 gauge black wires (9 and 3).
- 7. Remove the two hex nut (5).
- 8. Remove regulator (1).

Installing the Voltage Regulator (FIGURE 12-52) See NOTE at top of page 12-39

- 1. Place the voltage regulator (1) into the electrical component box with the 1/4 inch screw (8) thorough the regulator. Install hex nut (5) to regulator and tighten to 6 ft.lbs. (8 N-m) of torque.
- 2. Connect regulator red wire to solenoid, and plug in yellow wire to the harness.
- 3. Install black wire (3) and black wire (9) to regulator mounting screw (8).
- 4. Install nylon lock hex nut (2), tighten to 6 ft. lbs. (8 N-m) of torque.

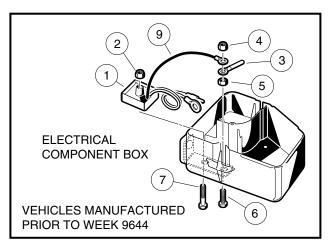
NOTE

- IF A THREE-WIRE REGULATOR IS BEING REPLACED WITH A TWO-WIRE REGULATOR (1), ON A VEHICLE MANUFACTURED PRIOR TO WEEK 9544, IT IS NECESSARY TO REMOVE AND DISCARD THE EXISTING GROUND WIRE MOUNTING BOLT (6) AND LOCK NUT (4) LOCATED IN THE ELECTRICAL COMPONENT BOX (FIGURE 12-51). ATTACH THE 18-GAUGE BLACK WIRE (9) AND BLACK WIRE (3) TO THE REGULATOR USING THE NEW MOUNTING BOLT (8) (CLUB CAR PART NO. 1013509) DURING INSTALLATION (FIGURE 12-52).
- 5. Install snap-on electrical component box cover. Be sure to firmly press down all corners. Install screw.
- 6. Connect battery cables, positive (+) cable first.
- 7. Place forward and reverse assembly in neutral position, and place the neutral lock-out cam in the service position. Start the engine and check regulator for proper functioning as described under voltage regulator testing (See Test Procedure 10, Page 12-21).

KEY SWITCH

Removing the Key Switch

- 1. Disconnect battery cables as shown (Figure 12-1, Page 12-2).
- 2. Remove the plastic cap covering the screw on each side of the center dash.
- 3. Loosen (but do not remove) the screw on each side of the center dash panel.



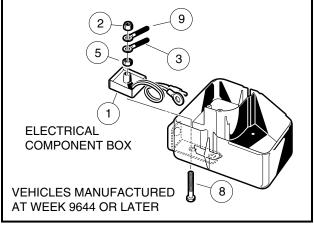


FIGURE 12-51

FIGURE 12-52

- 4. Insert screwdriver at the top center of the dash between dash and cowl brace. Gently pry center dash out slightly from under edge of cowl brace.
- 5. Pull center dash out approximately one inch from the frame and then bend the top right corner of the center dash inward while pulling the top of the panel out and down.

NOTE

- BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.
- 6. Slide center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 7. Disconnect the wires from the key switch. Do not allow wires to touch.

Removing the Key Switch, Continued:

- 8. Remove the key switch:
 - On vehicles prior to Serial No. 9522-436452, remove the key switch from the dash by holding the key switch and turning the nut on the outside of the dash with the key switch tool (Club Car Part No. 1012801)
 - On Vehicles Serial No. 9522-436452 and later, remove the cover over the key switch with a small, flatblade screwdriver.
 - 8.1. Remove key switch from the dash by holding the key switch and turning the nut on the outside of the dash with a one-inch socket wrench. Remove the keyed washer with key switch.

Installing the Key Switch

Reconnect wires to key switch (See Figure 12-2, Page 12-3). Coat the connectors with Battery Protector Spray (Club Car Part No. 1014305) to ward off corrosion. Reverse removal procedures to install key switch in the dash. Be sure that key switch terminals cannot touch the frame and that panel is properly seated and snapped in place.

Testing the Key Switch

See Test Procedure 17, Page 12-25.

SOLENOID

Removing the Solenoid

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.
- 1. Remove seat from body.
- 2. Disconnect battery wires as shown (Figure 12-1, Page 12-2).
- 3. Remove electrical component box cover (Figure 12-53, Page 42).
- 4. Disconnect all the wires from the solenoid.
- 5. Remove the two screws that secure the solenoid in place.
- 6. Remove the solenoid.

Installing the Solenoid

- 1. Install the solenoid in the electrical component box. Use two screws to secure the solenoid to the box.
- 2. Connect the 6 gauge white wire and the 16 gauge red wire from the voltage regulator on the large post on the solenoid. Connect the 6 gauge red wire and the 10 gauge red wire from the fuse block on the other large post on the solenoid. Connect the 18 gauge blue wire from the key switch to the small post on the solenoid. Connect the 18 gauge orange wire from the accelerator starter limit switch to the other small post on the solenoid (Figure 12-2, Page 12-3).
- 3. Install the snap-on electrical box cover by firmly pressing down on all corners and install the screw. Reconnect the battery wires.
- 4. Install the seat on the rear body.

FUSE

Removing the Fuse

- 1. Remove seat from body.
- 2. Disconnect battery wires as shown (Figure 12-1, Page 12-2).
- 3. Remove electrical component box cover.
- Remove the fuse from the fuse block.

Installing the Fuse

1. Install the fuse. Use a 10 amp fuse only.

A WARNING

- IF THE FUSE IS BLOWN, DETERMINE THE CAUSE OF THE FAILURE AND MAKE NECESSARY REPAIRS BEFORE INSTALLING A NEW FUSE. USE 10 AMP FUSES ONLY; IF A FUSE WITH A HIGHER AMP RATING IS USED, DAMAGE TO THE VEHICLE ELECTRICAL SYSTEM MAY OCCUR.
- 2. Install the snap-on electrical box cover by firmly pressing down on all corners and install the screw. Reconnect the battery wires.
- 3. Install the seat on the rear body.

ACCELERATOR STARTER LIMIT SWITCH

Removing the Accelerator Starter Limit Switch (Figure 12-53, Page 12-42)

- 1. Remove seat from body.
- 2. Disconnect battery wires as shown (Figure 12-1, Page 12-2).
- 3. Remove electrical component box cover (1).
- 4. Disconnect the green wire and the orange wire from the accelerator starter limit switch (11).
- 5. Remove the two nuts (9) and washers (10) that secure the accelerator limit switch in place.
- 6. Remove the accelerator starter limit switch.

Installing the Accelerator Starter Limit Switch (Figure 12-53, Page 12-42)

1. Install the accelerator starter limit switch (11) onto the two screws (16) and secure the switch in place using the two washers (10) and the two nuts (9). Torque to 5 in.lbs. (0.6 N-m).

WARNING

- DO NOT OVER-TIGHTEN THE RETAINING NUTS. IF THE NUTS ARE OVER-TORQUED, LIMIT SWITCHES COULD BE DAMAGED.
- 2. Connect green wire to common (COM) terminal and the orange wire to the normally closed (NC) terminal of the accelerator starter limit switch (Figure 12-53).
- 3. Depress the accelerator pedal to make sure that the switch is being actuated when the pedal is released.
- 4. Connect battery cables, positive cable first.
- 5. Install the seat on the rear body.

Removing the Kill Limit Switch (Figure 12-53)

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.
- 1. Remove seat from body.
- 2. Disconnect battery wires as shown (Figure 12-1, Page 12-2).
- 3. Remove electrical component box cover (1).
- 4. Remove the two nuts (9) and washers (10) that secure the accelerator starter limit switch (11). Do not disconnect the wires.
- 5. Disconnect the two white/black wires and the black wire from the kill limit switch (12).
- 6. Remove the kill limit switch (12).

Installing the Kill Limit Switch (Figure 12-53)

1. Install the kill limit switch (12) onto the two screws (16).

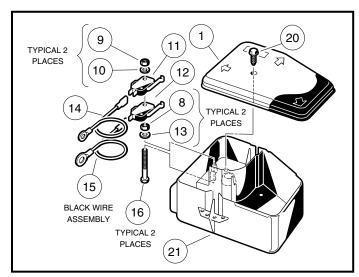


FIGURE 12-53

- 2. Connect the two white/black wires to the common (COM) terminal and the black wire to the normally open (NO) terminal of the kill limit switch (12).
- 3. Install the accelerator starter limit switch (11) onto the two screws (16). Secure the switch in place using the two washers (10) and the two nuts (9). Torque to 5 in.lbs. (0.6 N-m).

WARNING

 DO NOT OVER-TIGHTEN THE RETAINING NUTS. IF THE NUTS ARE OVER-TORQUED, LIMIT SWITCHES COULD BE DAMAGED.

- 4. Depress and release the accelerator pedal to make sure that both switches are being actuated when the pedal is released.
- 5. Connect battery cables, positive cable first.
- 6. Install the seat on the rear body.

NEUTRAL LOCK-OUT LIMIT SWITCH

Removing the Neutral Lock-out Limit Switch (Figure 12-54)

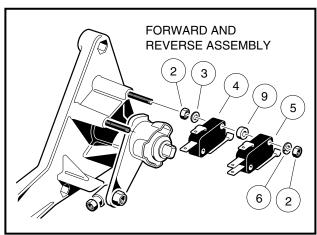
- 1. Remove seat from rear body.
- 2. Disconnect the battery wires as shown (Figure 12-1, Page 12-2).
- 3. Disconnect the green, white and black wires from the neutral lock-out limit switch (5) located on the back of the forward and reverse assembly.
- 4. Remove the two nuts (2) and washers (6) from the neutral lock-out limit switch (5) and slide the neutral lock-out limit switch off the screws.

Installing the Neutral Lock-out Limit Switch (Figure 12-54)

1. Install the neutral lock-out limit switch (5) and install the two washers (6) and the two nuts (2). Torque to 5 in.lbs. (0.6 N-m). Place the forward and reverse lever in REVERSE position to make sure that both switches are actuated.

A WARNING

- DO NOT OVER-TIGHTEN THE RETAINING NUTS. IF THE NUTS ARE OVER-TORQUED, LIMIT SWITCHES COULD BE DAMAGED.
- 2. Connect the black wire to common (COM) terminal, the green wire to the normally open (NO) terminal and the white wire to the normally closed (NC) terminal of the neutral lock-out limit switch.
- 3. Connect battery cables, positive cable first.



FORWARD AND REVERSE ASSEMBLY

FIGURE 12-54

FIGURE 12-55

- 4. Place the forward and reverse lever in the NEUTRAL position. The neutral lock-out cam should be in the OPERATE position. Make sure everyone is clear of the moving parts of the vehicle. Turn the key switch to the ON position. The engine should not crank when depressing the accelerator. If the engine does crank, turn off the key switch, and re-adjust the shift linkage.
- 5. Install the seat on the rear body.
- 6. Test drive the vehicle in both forward and reverse for proper operation.

NEUTRAL LOCK-OUT CAM

If the cam lobes have worn to the point where they will no longer actuate the neutral lock-out limit switch, the cam must be replaced.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

Removing the Neutral Lock-out Cam (Figure 12-55, Page 12-43)

- 1. Remove the seat from the rear body.
- 2. Disconnect the battery wires as shown (Figure 12-1, Page 12-2).
- 3. Remove the external snap ring (14).
- 4. Remove the plastic washer (12) and the spring (13).
- 5. Remove the cam (11).

Installing the Neutral Lock-out Cam (Figure 12-55, Page 12-43)

- 1. Install the cam (11).
- 2. Install the spring (13) and the plastic washer (12).
- 3. Install the external snap ring (14) onto the shaft.
- 4. Be sure the snap ring is installed in the groove on the shaft.
- 5. Connect battery cables, positive cable first.
- 6. Install the seat on the rear body.

REVERSE WARNING BUZZER

Removing the Reverse Warning Buzzer

- 1. Disconnect the battery cables as shown (Figure 12-1, Page 12-2).
- 2. Remove the plastic cap covering the screw on each side of the center dash.
- 3. Loosen (but do not remove) the screw on each side of the center dash panel.
- Insert screwdriver at the top center of the dash between dash and cowl brace. Gently pry center dash out slightly from under edge of cowl brace.
- 5. Pull center dash out approximately one inch from the frame and then bend the top right corner of the center dash inward while pulling the top of the panel out and down (See NOTE below).

NOTE

 BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.

- 6. Slide center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 7. Disconnect the wires from the reverse warning buzzer. Do not allow wires to touch (Figure 12-56).
- 8. Remove the two mounting screws that secure the buzzer to the center dash.

Testing the Reverse Warning Buzzer

See Test Procedure 19, Page 12-25.

Installing the Reverse Warning Buzzer (Figure 12-56)

- 1. Install the two screws through the buzzer bracket tabs and tighten to a torque of 3-4 in.lbs. (0.35/0.45 N-m).
- 2. Connect black wire from key switch to the negative (-) terminal on the buzzer.
- 3. Connect the red/white wire from the wire harness to the positive (+) terminal on the buzzer.
- 4. Reverse removal procedures to reinstall the center dash in the vehicle. Be sure that the key switch terminals cannot touch the frame and that the panel is properly seated and snapped in place.

REVERSE BUZZER LIMIT SWITCH

Removing the Reverse Buzzer Limit Switch (Figure 12-54, Page 12-43)

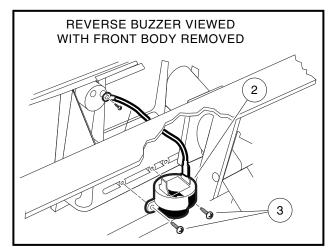
- 1. Remove seat from the rear body.
- 2. Disconnect the battery wires as shown (Figure 12-1, Page 12-2).
- 3. Disconnect the orange and red/white wires from the reverse buzzer limit switch (4) located on the back of the forward and reverse assembly.
- 4. Remove the two nuts (2) and washers (6) from the neutral lock-out limit switch (5) and slide the neutral lock-out limit switch off the screws. Do not disconnect the wires.
- 5. Remove the two spacers (9) from the reverse buzzer limit switch (4) and slide the reverse buzzer limit switch off the screws.

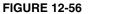
Installing the Reverse Buzzer Limit Switch (Figure 12-54, Page 12-43)

1. Install the reverse buzzer limit switch (4), and then install the two spacers (9) up against the limit switch. Torque to 5 in.lbs. (0.6 N-m).

A WARNING

• DO NOT OVER-TIGHTEN THE RETAINING NUTS. IF THE NUTS ARE OVER-TORQUED, LIMIT SWITCHES COULD BE DAMAGED.





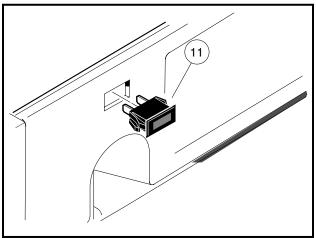


FIGURE 12-57

Installing the Reverse Buzzer Limit Switch, Continued:

- 2. Install the neutral lock-out limit switch (5) and install the two washers (6) and the two nuts (2). Torque to 5 in.lbs. (0.6 N-m). Place the forward and reverse lever in reverse to make sure that both switches are actuated.
- 3. Connect the orange wire to common (COM) terminal and the red/white wire to the normally open (NO) terminal of the reverse buzzer limit switch (4).
- 4. Connect battery cables, positive cable first.
- 5. Turn the key switch to the ON position. Shift the forward and reverse lever to the reverse position. The buzzer should sound.
- 6. Install the seat on the rear body.

OIL WARNING LIGHT

Removing the Oil Warning Light (Figure 12-57)

- 1. Disconnect the battery wires as shown (Figure 12-1, Page 12-2).
- 2. Remove the plastic cap covering the screw on each side of the center dash.
- 3. Loosen (but do not remove) the screw on each side of the center dash panel.
- Insert screwdriver at the top center of the dash between dash and cowl brace. Gently pry center dash out slightly from under edge of cowl brace.
- 5. Pull center dash out approximately one inch from the frame and then bend the top right corner of the center dash inward while pulling the top of the panel out and down.

NOTE

- BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.
- 6. Slide center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 7. Disconnect the wires from the oil warning light (11). Do not allow wires to touch.
- 8. Depress the two retaining tabs and remove the light from the center dash.

Testing the Oil Warning Light

See Test Procedure 21, Page 12-26.

Installing the Oil Warning Light (Figure 12-57)

- 1. Push a new unit into hole in dash until plastic locks engage dash.
- 2. Connect yellow wire from the key switch and yellow wire from the oil sending unit to the oil light (11).
- 3. Reinstall the center dash in reverse order of removal. Be sure that key switch terminals cannot touch the frame and that panel is properly seated and snapped in place.
- 4. Connect battery cables, positive cable first.
- 5. Install the seat on the rear body.

BATTERY

General Information

 The battery on the DS gasoline car is a 12-volt, low maintenance battery. When changing a 12-volt battery in any Club Car gasoline-powered vehicle, the same size battery with adequate amperage ratings should be used as a replacement. 2. Club Car recommends a group 70, side-post battery (Club Car Part No. 1012328), with a 460 coldcranking amp rating and a reserve capacity of 85 minutes. The group 70 classification indicates battery size (8 1/4 inches W x 6 1/2 inches D x 7 1/4 inches H). It is important to use the proper size to ensure that the battery hold-down will fit correctly and secure the battery in the vehicle's main frame.

Preventive Maintenance

DANGER

- WEAR A FULL FACE SHIELD WHEN WORKING AROUND A BATTERY BECAUSE OF THE DAN-**GER OF AN EXPLODING BATTERY.**
- BATTERY-EXPLOSIVE GASES. KEEP SPARKS, FLAMES, CIGARETTES AWAY. VENTILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR EYE PROTECTION WHEN WORKING ON OR NEAR BATTERY. FOR ADDED PROTECTION, COVER TOP OF THE BATTERY WHEN SERVICING THE VEHICLE.
- BATTERY-POISON/DANGER. CONTAINS ACID-CAUSES SEVERE BURNS- AVOID CONTACT WITH SKIN, EYES, OR CLOTHING.
 - EXTERNAL: FLUSH WITH WATER. CALL PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAG-NESIA OR VEGETABLE OIL. CALL PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR 15 MINUTES. CALL PHYSICIAN IMMEDIATELY.

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

To keep the battery in good operating condition, follow these steps on a regular basis.

- 1. Any corrosion build-up on or around the battery should be removed immediately. Post connections should be clean and tight. Any frayed or worn wires should be replaced. After all cables have been connected, coat all connectors with Battery Protector Spray (Club Car Part No. 1014305) to ward off future corrosion.
- 2. The battery should be kept clean and dry to prevent self-discharge. Any dirt, grime or acid spillage should be removed. Wash the battery with a bristle brush using water and bicarbonate of soda (baking soda-1 cup per gallon). Rinse with water. Do not allow solution to enter battery through the vent cap holes (See Self-Discharge below).
- 3. Maintain proper water level (See Water Level, Figure 12-58, Page 12-50).
- 4. Check the battery periodically to see that it is in a full state of charge (See Battery Charging, Page 12-52).
- 5. Keep hold-downs tight (See Vibration Damage).

Self-Discharge

1. Dirt and battery acid can provide a path for a small current draw that can slowly discharge the battery. To prevent self-discharge, the battery should always be kept clean.

Self-Discharge, Continued:

2. Hot weather also has an effect on a battery's self-discharge rate. The higher the temperature, the quicker a battery will discharge. In hotter climates, therefore, the battery should be checked more often. When storing the battery, keep in a cool place (See Battery Storage, Page 12-53).

Water Level

Add water only after charging unless the water is below the level of the plates. Filling a battery before charging will result in overfilling, because the electrolyte level will rise during charging and some of the electrolyte may bubble out of the cap. This reduces the battery capacity and corrodes the metal parts around it.

The water level should be checked weekly to be sure water is at its proper level (Figure 12-58, Page 12-50). Never allow the water level to fall below the tops of the plates because this will cause the exposed part of the plate to become permanently inactive. Check the water level more frequently in hot weather or when the battery becomes old.

Mineral Content

For the longest battery life, distilled water should be used in the battery. However, if tap water is going to be used, contact your local water department to be sure the mineral contents are below the levels listed in the table.

IMPURITY	ALLOWABLE CONTENT IN PARTS PER MILLION
SUSPENDED MATTER	TRACE
TOTAL SOLIDS	100.0
CALCIUM AND MAGNESIUM OXIDES	40.0
IRON	5.0
AMMONIA	8.0
ORGANIC MATTER	50.0
NITRATES	10.0
NITRITES	5.0
CHLORIDE	5.0

NOTE

Contact your local water department for mineral content analysis.

Vibration Damage

The battery hold-down should always be tight enough to keep the battery from bouncing. Battery life may be severely shortened if the battery hold-down is too loose. Excessive vibration shortens the life of the battery. It may also cause acid to leak out of the vent caps and corrosion to build up on surrounding metal parts. The acid which is lost reduces the capacity of the battery and cannot be replaced.

The battery hold-down should NOT be so tight as to crack or buckle the battery case. This may cause leaks which would dry up a cell or cause internal shorts.

Inspect the hold-down bracket for rust, corrosion or damage. If both ends of the bracket cannot be fastened securely to the main frame, replace it with a new stainless steel battery hold-down, (Club Car Part No. 1013882), stainless steel flat washers (Club Car Part No. 1011964), and stainless steel nylon insert locknuts (Club Car Part No. 1015068).

HYDROMETER TEST

A hydrometer measures the specific gravity. The higher the specific gravity, the higher the state of charge of the battery. A fully charged battery should read between 1.250 and 1.280 at 80°F. Never add acid to the battery to obtain a higher specific gravity (**Figure 12-59**, **Page 12-50**).

Performing the Hydrometer Test

A DANGER

- WEAR A FULL FACE SHIELD WHEN WORKING AROUND A BATTERY BECAUSE OF THE DAN-GER OF AN EXPLODING BATTERY.
- BATTERY-EXPLOSIVE GASES. KEEP SPARKS, FLAMES, CIGARETTES AWAY. VENTILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR EYE PROTECTION WHEN WORKING ON OR NEAR BATTERY. FOR ADDED PROTECTION, COVER TOP OF THE BATTERY WHEN SERVICING THE VEHICLE.
- BATTERY-POISON/DANGER. CONTAINS ACID-CAUSES SEVERE BURNS- AVOID CONTACT WITH SKIN, EYES, OR CLOTHING.
 - EXTERNAL: FLUSH WITH WATER. CALL PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR 15 MINUTES. CALL PHYSICIAN IMMEDIATELY.

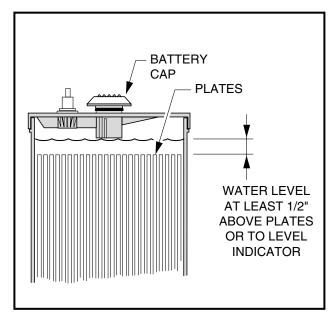
WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.
- 1. Be sure that the battery has sufficient water to cover the plates by approximately .5 inch (12.7 millimeters) and is fully charged prior to beginning the test. If water must be added, recharge the battery before performing the hydrometer test.
- 2. Remove the vent cap.
- 3. Using a battery thermometer (Club Car Part No.1011767), record the electrolyte temperature of the No. 2 cell.
- 4. Squeeze the rubber bulb of the hydrometer and insert into the cell. Slowly release the bulb, drawing electrolyte up into the glass tube of the hydrometer.
- 5. When the float rises off the bottom, adjust the electrolyte level so that the float rides free of the bottom but does not strike the top of the glass tube. Remove the hydrometer from the cell and release the pressure from the bulb.
- 6. Hold the hydrometer vertically, insuring that the float is not contacting the sides of the barrel. Hold the hydrometer at eye level and read the scale at the level of electrolyte (Figure 12-59, Page 12-50).

Performing the Hydrometer Test, Continued:

- 7. Record the reading.
- 8. Return the electrolyte to the cell from which it was taken. Replace vent cap.
- 9. Repeat steps 2-8 on all cells.

Hydrometer Calibration



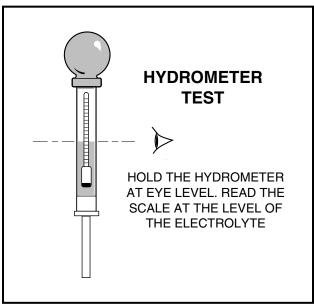


FIGURE 12-58 FIGURE 12-59

Most hydrometers are calibrated to read correctly at 80°F. The readings obtained as described above must be corrected for temperature. For each 10°F above 80°F, add .004 to the reading. For each 10°F below 80°F, subtract .004 from the reading.

Interpreting the Results of the Hydrometer Test

The approximate state of charge can be determined from the following table:

SPECIFIC GRAVITY AT 80°	STATE OF CHARGE
1.250-1.280	100%
1.220-1.240	75%
1.190-1.210	50%
1.160-1.180	25%

If the difference between the cells is .020 or more, the low cell should be suspected. It may require a catchup charge or it may be a weak cell. When the variations between cells reach .050 or more, the battery should be replaced (See Caution Below).

A CAUTION

 DO NOT ALLOW BATTERY ACID FROM BATTERY CAPS OR HYDROMETER TO DRIP ONTO THE FRONT OR REAR BODY. BATTERY ACID WILL CAUSE PERMANENT BLEMISHES. WASH OFF IMMEDIATELY.

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Load Test

- 1. Using a 160 ampere load tester, connect the load tester to the battery posts.
- 2. Read the battery voltage after the load tester has been on the battery for 5 seconds. Compare the battery's voltage reading with the table below. Make sure you have the correct ambient temperature.

IF TEMPERATURE IS	MINIMUM VOLTAGE REQUIRED IS
70°F (20°C and above)	9.6V
60°F (16°C)	9.5V
50°F (10°C)	9.4V
40°F (4°C)	9.3V
30°F (-1°C)	9.1V
20°F (-7°C)	8.9V
10°F (-12°C)	8.7V
0°F (-18°C)	8.5V

REMOVING THE BATTERY

A DANGER

- WEAR A FULL FACE SHIELD WHEN WORKING AROUND A BATTERY BECAUSE OF THE DAN-GER OF AN EXPLODING BATTERY.
- BATTERY-EXPLOSIVE GASES. KEEP SPARKS, FLAMES, CIGARETTES AWAY. VENTILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR EYE PROTECTION WHEN WORKING ON OR NEAR BATTERY. FOR ADDED PROTECTION, COVER TOP OF THE BATTERY WHEN SERVICING THE VEHICLE.
- BATTERY-POISON/DANGER. CONTAINS ACID-CAUSES SEVERE BURNS- AVOID CONTACT WITH SKIN, EYES, OR CLOTHING.
 - EXTERNAL: FLUSH WITH WATER. CALL PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR 15 MINUTES. CALL PHYSICIAN IMMEDIATELY.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.

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Removing the Battery, Continued:

- 1. Remove the seat from the rear body.
- 2. Disconnect the air hose that is clamped to the carburetor. Remove the retention strap and lift the intake expansion chamber out of the vehicle. Make sure the O-ring is kept with the intake expansion chamber.
- 3. Disconnect the battery wires as shown (Figure 12-1, Page 12-2).
- 4. Remove the two locknuts and washers and lift the hold-down off of the battery.
- 5. Use a battery strap to lift the battery out of the vehicle (See WARNING below).

WARNING

 KEEP THE BATTERY IN AN UPRIGHT POSITION TO PREVENT ELECTROLYTE LEAKAGE. TIP-PING THE BATTERY BEYOND A 45° ANGLE IN ANY DIRECTION CAN ALLOW A SMALL AMOUNT OF ELECTROLYTE TO LEAK OUT THE VENT HOLE. DO NOT EXCEED THIS 45° ANGLE WHEN LIFTING, CARRYING OR INSTALLING THE BATTERY. THE BATTERY ACID COULD CAUSE SEVERE PERSONAL INJURY WHEN ACCIDENTALLY COMING IN CONTACT WITH THE SKIN OR EYES, OR COULD DAMAGE CLOTHING.

CHARGING THE BATTERY

▲ DANGER

- WEAR A FULL-FACE SHIELD WHEN WORKING AROUND A BATTERY BECAUSE OF THE DAN-GER OF AN EXPLODING BATTERY.
- BATTERY-EXPLOSIVE GASES. KEEP SPARKS, FLAMES, CIGARETTES AWAY. VENTILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR EYE PROTECTION WHEN WORKING ON OR NEAR BATTERY. FOR ADDED PROTECTION, COVER TOP OF THE BATTERY WHEN SERVICING THE VEHICLE.
- BATTERY-POISON/DANGER. CONTAINS ACID-CAUSES SEVERE BURNS- AVOID CONTACT WITH SKIN, EYES, OR CLOTHING.
 - EXTERNAL: FLUSH WITH WATER. CALL PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR 15 MINUTES. CALL PHYSICIAN IMMEDIATELY.
- 1. Charge the battery using an automotive type 12-volt battery charger. Follow all warnings and procedures supplied by the battery charger manufacturer.
- 2. Attach the positive charger cable (+) to the positive (+) post on the battery.
- 3. Attach the negative charger cable (-) to the negative (-) post on the battery.
- 4. The battery may be charged with a slow charge (3-10 amps) or a fast charge (20-30 amps). Charge until the specific gravity reaches 1.250 (See WARNING below).

A WARNING

• IF THE BATTERY CASE FEELS HOT (APPROXIMATELY 125° F OR MORE) AND/OR EMITS GASES AND/OR FLUID BOILS FROM VENTS, STOP CHARGING AT ONCE. FAILURE TO STOP CHARGING BATTERY WHEN THESE CONDITIONS ARE PRESENT COULD RESULT IN AN EXPLOSION, PERSONAL INJURY AND/OR DAMAGE TO THE BATTERY. DO NOT DISCONNECT THE D.C. LEADS AND BATTERY WHEN THE CHARGER IS ON. THE RESULTING ARCING BETWEEN THE D.C. LEADS AND BATTERY POST COULD CAUSE AN EXPLOSION.

WARNING continued at top of next page...

A WARNING

WARNING, continued:

• IF THE CHARGER MUST BE STOPPED, DISCONNECT THE AC SUPPLY CORD FROM THE WALL OUTLET BEFORE DISCONNECTING THE D.C. LEADS FROM THE BATTERY. ALLOW THE BATTERY TO COOL TO ROOM TEMPERATURE AND RESUME CHARGING BATTERY AT A LOWER AMP RATE.

INSTALLING THE BATTERY

- 1. Place the battery into the vehicle. Make sure the battery posts are facing the engine.
- 2. Secure the battery to the vehicle with the hold-down, washers and the two locknuts. Tighten both nuts finger tight, then torque to 14-20 in lbs. (1.6/2.3 N-m).
- 3. Connect battery cables, positive cable first. Tighten the posts to 9-10 ft. lbs. (12/13 N-m) of torque.
- 4. Reinstall the intake expansion chamber.
- 5. Install the seat on the rear body.

BATTERY STORAGE

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 12-1.
- 1. Keep the battery clean and free of corrosion as outlined in the Preventive Maintenance section, Page 12-47.
- 2. The battery should be disconnected so it can be connected to the charger. The battery can be left in the car
- 3. Fully charge the battery prior to storage.
- 4. Store in a cool area. The colder the area in which the battery is stored, the less the battery will self-discharge. A battery stored at 0°F will discharge very little over a four-month period. A battery stored at 80°F will have to be recharged every few weeks.
- 5. Check the state of charge periodically. A battery that is discharged and left in a cold environment can freeze and crack. If the specific gravity drops below 1.220, the battery should be recharged.

A WARNING

- IF THE BATTERY IS FROZEN OR THE CONTAINER IS BULGED, DISCARD BATTERY. A FROZEN BATTERY CAN EXPLODE.
- 6. The frequency of recharging required will depend on the temperature of the storage area, but it is recommended that the battery be monitored for state of charge every month. Also, if the storage area is unheated in a cold climate and recharge is required, it is recommended that the area be heated to at least 60°F prior to charge. The battery will not charge effectively in cold temperatures for the same reasons that it does not discharge as rapidly in cold temperatures.

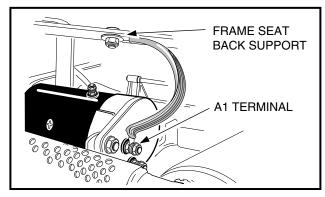
JUMP-STARTING THE BATTERY

The vehicle is equipped with a starter/generator. The generator is not designed to charge a dead battery. If the vehicle battery has become discharged, it must be charged using a properly-rated automotive type charger.

A WARNING

• DO NOT JUMP-START A VEHICLE WITH A DEAD BATTERY USING ANOTHER BATTERY AND JUMPER CABLES.

GROUND STRAPS



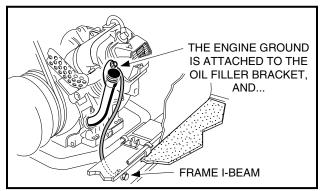


FIGURE 12-60

FIGURE 12-61

A WARNING

• IF GROUND STRAPS ARE NOT SECURELY CONNECTED TO FRAME AND IN THE PROPER ORI-ENTATION, A POTENTIAL FIRE HAZARD WILL EXIST. BE SURE ALL GROUND CONNECTIONS ARE SECURELY CONNECTED AT ALL TIMES.

There are three ground straps on the DS Gasoline which ground the electrical system to the frame.

- 1. One of the straps is attached to the A1 terminal of the starter/generator and to the frame seat support (Figure 12-60).
- 2. The engine ground is attached to the oil filler bracket on the engine and to the frame (Figure 12-61).
- 3. A third ground plate is in the bottom of the electrical component box where the bolt secures the voltage regulator to the box. The other end of this ground plate attaches through the side of the electrical box and is bolted into the frame (Figure 12-62). Be sure all these ground straps are securely connected at both ends of each strap.

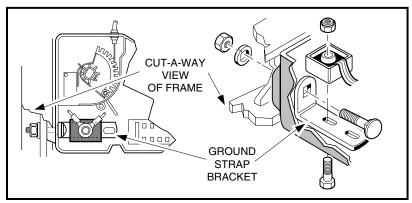


FIGURE 12-62

SECTION 13 - FE 290 ENGINE



A DANGER

- GASOLINE VAPORS FLAMMABLE DO NOT SMOKE! KEEP SPARKS, FLAMES, CIGARETTES AWAY. TOOLS, WIRES AND METAL OBJECTS CAN CAUSE SPARKS WHEN "SHORTED" ACROSS A BATTERY. INSULATED TOOLS SHOULD BE USED. EXTREME CARE SHOULD BE TAKEN WHEN DISCONNECTING OR RECONNECTING THE BATTERY. WHEN WIRES ARE DISCONNECTED, BE SURE TO KEEP THEM AWAY FROM BATTERY TERMINALS AND OTHER WIRES. SERVICE ONLY IN WELL-VENTILATED AREAS.
- DO NOT OPERATE GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT THE BATTERY CABLES, NEGATIVE (-) FIRST AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

GENERAL INFORMATION

The CLUB CAR DS Gasoline golf car is powered by a 4-cycle, overhead valve, single cylinder, air cooled engine. The 4-cycle engine has an oil reservoir (crankcase) similar to automobiles, trucks, aircraft, heavy equipment, machinery and other applications designed for reliable heavy duty service. The engine has two major component assemblies: cylinder assembly and crankcase assembly.

General Information, Continued:

SPECIAL TOOLS

DESCRIPTION	PART NUMBER
Gear Yoke	1016418
Compression Gauge and Adapter	1016410-02
Valve Spring Compressor	1016411-01
Valve Guide Reamer	1016412-01
Valve Guide Reamer Arbor	1016412-02
Piston Ring Compressor Grip	1016414-01
Piston Ring Compressor Belt	1016414-02
Piston Ring Pliers	1016415
Bearing Driver Set	1016416
Flywheel Puller Set	1016627
Valve Clearance Adjuster Screw Holder	1016413
Bearing and Seal Remover Assembly	1016417
Valve Seat Cutter Holder Bar	1016551
Exhaust Valve Seat Cutter 45°-32 mm Diameter	1016553
Intake Valve Seat Cutter 45°-35 mm Diameter	1016554
Valve Seat Cutter Holder	1016552
Valve Seat Cutter 32°-35 mm Diameter	1016555

BEFORE SERVICING

To eliminate unnecessary work, carefully read the applicable information and instructions before beginning engine service. Diagrams, notes, cautions, warnings, and detailed descriptions have been included wherever necessary. Nevertheless, even a detailed account has limitations, and a certain amount of basic knowledge is required for successful work. This is especially true for servicing the engine.

MECHANICAL SYSTEMS

Adjustments

Adjustments shall be made in accordance with the Periodic Maintenance Chart, when troubleshooting, or when symptoms indicate that adjustments may be required.

Edges

WARNING

• WATCH FOR SHARP EDGES, ESPECIALLY DURING MAJOR ENGINE DISASSEMBLY AND ASSEMBLY. PROTECT YOUR HANDS WITH GLOVES OR A PIECE OF THICK CLOTH WHEN LIFTING THE ENGINE OR TURNING IT OVER.

Dirt

Clean the engine thoroughly before servicing it.

WARNING

• BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE. ANY DIRT ENTERING THE ENGINE, CARBURETOR, OR OTHER PARTS WILL WORK AS AN ABRASIVE AND SHORTEN THE LIFE OF THE ENGINE. FOR THE SAME REASON, BEFORE INSTALLING A NEW PART, CLEAN OFF ANY DUST OR METAL FILINGS.

Tightening Sequence

Where there is a tightening sequence indicated in this Service Manual, the bolts, nuts, or screws must be tightened in the order and by the method indicated. When installing a part that is secured with several bolts, nuts, or screws, they should all be snug fit first, then tightened to specified torque in the proper sequence. This is to avoid distortion of the part and/or causing gas or oil leakage. Conversely, when loosening the bolts, nuts or screws, loosen all of them about a quarter of a turn and then remove them.

Torque

The torque values given in this Service Manual should always be adhered to. Either too little or too much torque may lead to serious damage. Use a good quality, reliable torque wrench.

Force

Common sense should dictate how much force is necessary in assembly and disassembly. If a part seems especially difficult to remove or install, stop and determine what may be causing the problem. Whenever tapping is necessary, tap lightly using a wooden or plastic-faced mallet. Use an impact driver for screws (particularly for the removal of screws held by a locking agent) in order to avoid damaging the heads.

Lubricant

Some oils and greases in particular should be used only in certain applications and may be harmful if used in an application for which they are not intended.

Lubrication

Engine wear is generally at its maximum while the engine is warming up and before all the rubbing surfaces have an adequate lubricative film. During assembly, oil or grease (whichever is more suitable) should be applied to any rubbing surface which has lost its lubricative film. Old grease and dirty oil should be removed. Deteriorated grease has lost its lubricative quality and may contain abrasive foreign particles.

Press

A part installed using a press or driver, such as a seal, should first be coated with oil on its outer or inner circumference (contact surface) so that it will go into place smoothly.

Oil Seal, Grease Seal

Replace with new ones any oil or grease seals that were removed, as removal generally damages seals. To avoid damaging the seal lips, a seal guide is required for installing certain oil or grease seals. Before a shaft passes through a seal, apply a small amount of lubricant, preferably high temperature grease, to the lip to reduce rubber-to-metal friction.

Gasket, O-Ring

When in doubt as to the condition of a gasket or O-Ring, replace it with a new one. To avoid leaks, the mating surface around the gasket or O-Rings should be free of foreign matter and perfectly smooth.

Liquid Gasket and Non-permanent Locking Agent

Follow manufacturer's directions for cleaning and preparing surfaces where these compounds will be used. Apply sparingly. Excessive amounts may block engine oil passages and cause serious damage. An example of a non-permanent locking agent commonly available in North America is Loctite ®, Lock'n Seal (Blue).

Ball Bearing Installation

When installing a ball bearing, the bearing race which has the press fit should be pushed by a suitable driver. This prevents severe stress on the balls and races, and prevents races and balls from being damaged. Press a ball bearing until it is seated against the shoulder in the hole or on the shaft.

Circlip, Retaining Ring

Replace with new ones any circlips and retaining rings that were removed, as removal weakens and deforms them. When installing circlips and retaining rings, take care to compress or expand them only enough to install them.

High Flash-point Solvent

To reduce fire danger a high flash-point solvent is recommended. A commercial solvent commonly available in North America is Stoddard solvent (generic name). Always follow manufacturer and container directions regarding the use of any solvent.

Molybdenum Disulfide (MoS2) Grease

A WARNING

 THIS MANUAL MAKES REFERENCE TO MOLYBDENUM DISULFIDE GREASE IN THE ASSEM-BLY OF CERTAIN ENGINE AND CHASSIS PARTS. ALWAYS CHECK MANUFACTURER RECOM-MENDATIONS BEFORE USING SUCH SPECIAL LUBRICANTS.

Engine Rotation

When turning the crankshaft by hand, always turn it counterclockwise as viewed from the front (flywheel end) of the engine. This will ensure proper adjustments.

ELECTRICAL SYSTEM

- Always minimize shock hazards when working on electrical equipment. Work in a clean, dry environment with dry hands.
- 2. The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock can damage an electrical part.
- Never replace a defective electrical component without first determining what caused the failure. If the failure was brought on by some other item or items, they too must be repaired or replaced before using the vehicle.
- 4. Make sure all connectors in the circuit are clean and tight, and examine wires for signs of overheating, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- 5. Measure coil and winding resistance when the part is cold (at room temperature).
- 6. All the electrical leads are either single-color or two-color and, with only a few exceptions, must be connected to leads of the same color. On any of the two-color leads, there is a greater amount of one color and a lesser amount of a second color, so a two-color lead is identified by first the primary color and then the secondary color. For example, a yellow wire with a thin red stripe is referred to as a "yellow/red" wire; it would be a "red/yellow" wire if the colors were reversed to make red the main color.

LUBRICATION SYSTEM (FIGURES 13-1, 13-2, AND 13-3)



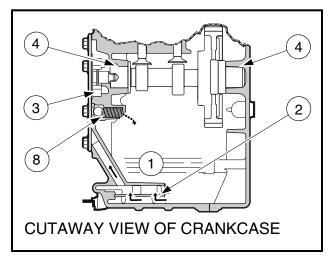
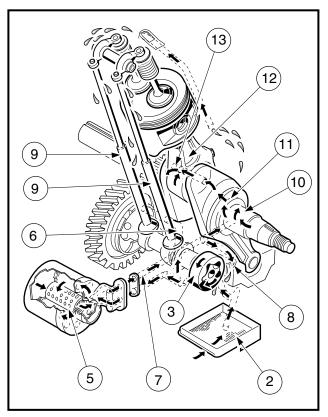


FIGURE 13-1

The DS OHV is equipped with a pressurized lubrication system which consists of these components (Figure 13-2):

- Inlet filter (2)
- Trochoid pump (3)
- Cartridge filter (5)
- Pressure relief valve (8)



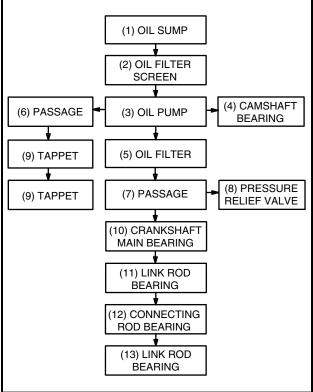


FIGURE 13-2 FIGURE 13-3

Lubrication System, Continued:

The pump draws oil from the sump and forces it under pressure into the crankcase passages as shown (Figures 13-2 and 13-3, Page 13-5). Oil can build up excess pressure in the lubrication system. Excess oil pressure could force the oil past seals and cause engine damage. Because this pressure must be relieved, the pump is fitted with the pressure relief valve (8) (Figure 13-2) that is made of a ball and a spring. When the pressure increases beyond the pressure of the spring, the ball is forced off its seat against the spring pressure and excess oil is routed back into the sump (crankcase), thus relieving the pressure. When the pressure drops below the preset limit, the spring holds the ball against its seat to keep the oil from draining back into the sump (crankcase).

SPARK PLUG

Spark plugs are selected to suit specific engine design and vehicle operating conditions. The spark plug is designed to give maximum life and efficient combustion of fuel. Original equipment plug number is Club Car Part Number 1018811-01. An acceptable replacement is a Champion N11YC. The spark gap is .027-.031 inches (0.69-0.79 millimeter).

Removing the Spark Plug

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.

Remove all dirt from plug base in head before removing plug. Use a 13/16 inch deep well socket wrench or 13/16 inch plug wrench to loosen the plug.

Spark Plug Cleaning, Inspection and Repair

Examine the plug (Figure 13-4). The deposit on the plug base and electrode is an indication of the correct heat range and efficiency as well as a guide to the general condition of the engine, fuel and air mixture and ignition system. If all of the above conditions are proper, the spark plug should be a light brown color. There should be no bridging between the electrode and base. The electrode should not be eroded. Black color, excessive carbon, and/or a wet plug indicate a too rich condition. White, burned or melted electrodes indicate a too lean condition or pre-ignition. Also examine the spark plug wire. Remove rubber boot and inspect internal spring for damage. Inspect spark plug wire for damage and be sure spring coil is securely attached to spark plug.

WARNING

 REMOVE SPARK PLUG WIRE TO AVOID ACCIDENTAL START UP OF THE ENGINE WHEN SER-VICING VEHICLE. TO AVOID IGNITION OF FUEL AND SEROUS PERSONAL INJURY, NEVER TRY TO START ENGINE WITH PLUG CONNECTED TO SPARK PLUG WIRE AND PLUG REMOVED FROM ENGINE. (See Section 12, Test Procedure 11 - Ignition Spark, Page 12-21.

Setting the Spark Gap

- 1. Before setting the spark gap on a used plug, pass a contact point file between the electrodes to produce flat, parallel surfaces to facilitate accurate gauging.
- 2. Use a wire type gauge. Bend the outside or ground electrode so only a slight drag on the gauge is felt when passing it between the electrode. Never make an adjustment by bending the center electrode. Set gap (A) at .027-.031 inches (0.69-0.79 millimeters) (Figure 13-4).

Installing the Spark Plug

NOTE

- BEFORE INSTALLING THE PLUG, CHECK THE CONDITION OF THE THREADS IN THE CYLIN-DER HEAD. SOFTEN DEPOSITS IN CYLINDER HEAD THREADS WITH PENETRATING OIL AND CLEAN OUT WITH A TAP.
- 1. Install the plug gasket onto the plug, then install the plug and thread it in until finger tight. Tighten the spark plug to 20 ft.lbs. (27 N-m) torque.

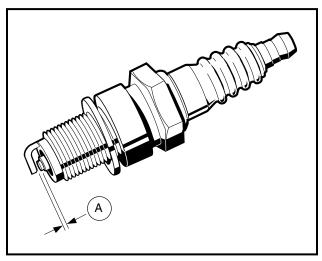


FIGURE 13-4

ENGINE MOUNTING PLATE AND INNER FRAME

(See Rear Suspension - Section 18.)

CYLINDER HEAD

GENERAL INFORMATION

Prior to attempting time-consuming repairs to the cylinder assembly, a cylinder compression test should be performed using a standard compression tester. Low compression would normally indicate a problem in the cylinder assembly such as rings, gaskets, etc. At a cranking speed of 550-600 rpm, the compression should be 156-185 psi.

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Remove seat and access panel from rear body.
- 2. Remove spark plug wire from spark plug.
- 3. Loosen air intake hose clamp (7) from the intake manifold (5) and remove hose (6) (Figure 13-6).
- 4. Disconnect the fuel line (9) and vent tube (10) from the carburetor (4) (Figure 13-5).

A WARNING

- PLUG FUEL LINE TO PREVENT GAS FROM DRAINING FROM LINE.
- 5. Remove governor guard (1) (Figure 13-6).
- 6. Remove clevis pin (2) from throttle lever (Figure 13-6).
- 7. Remove nuts at carburetor intake manifold (5) and remove manifold (Figure 13-6).

A CAUTION

• DISCONNECT THE GOVERNOR LINKAGE FROM THE CARBURETOR BEFORE ATTEMPTING TO REMOVE THE CARBURETOR. FAILURE TO DO SO COULD DAMAGE THE LINKAGE.

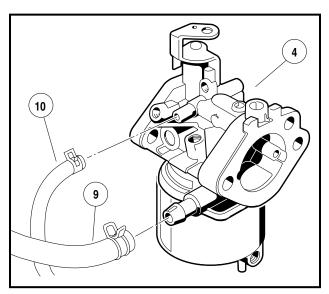


FIGURE 13-5

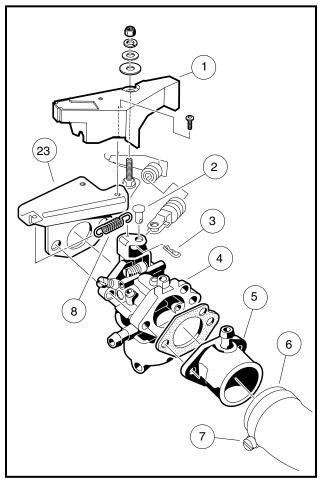
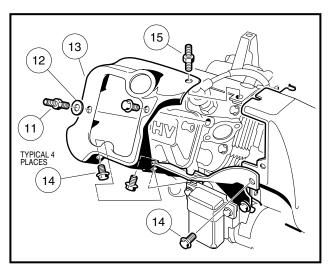


FIGURE 13-6

- 8. Remove carburetor (4) along with throttle spring (8) and throttle spring bracket (23) (Figure 13-6).
- 9. Remove muffler (See Exhaust System Section 15).
- 10. If the engine is to be totally disassembled, drain oil and remove the oil filter. If only the cylinder head is to disassembled, proceed without draining the oil or removing the oil filter.



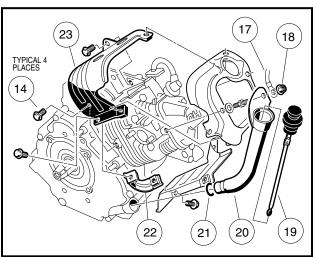
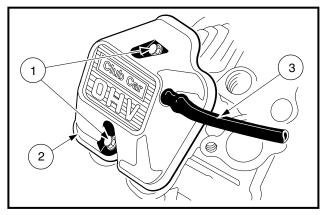


FIGURE 13-7 FIGURE 13-8

Cylinder Shroud Removal, Continued:



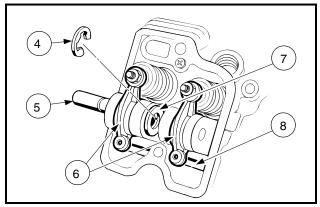


FIGURE 13-9

FIGURE 13-10

11. Disconnect oil filler tube (20) from cylinder shroud by first removing nut (18) and pulling oil filler tube out of the crankcase (Figure 13-8, Page 13-9).

NOTE

- IF THE CAR IS NOT LEVEL, THEN OIL WILL SPILL WHEN OIL FILLER TUBE IS REMOVED.
- 12. Remove the eight bolts (14) and the two-ended bolts (11 and 15) (Figures 13-7 and 13-8, Page 13-9).
- 13. Take off the head shroud (13), the upper shroud (23) and the bracket (22) (Figures 13-7 and 13-8, Page 13-9).

ROCKER ARMS AND PUSH RODS REMOVAL

A WARNING

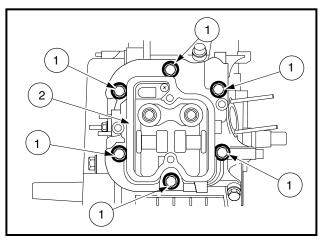
- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Remove the two bolts (1) and remove the rocker cover (2) along with breather tube (3) (Figure 13-9).

NOTE

- MARK THE ROCKER ARMS (6) AND THE PUSH RODS (8) SO THEY CAN BE PUT BACK IN THEIR ORIGINAL POSITIONS (FIGURE 13-10).
- 2. Remove the E-ring (4) and pull the rocker shaft (5) out of the cylinder head (Figure 13-10).
- 3. Lift out the rocker arms (6), washer (7), and push rods (8) (Figure 13-10).

CYLINDER HEAD / VALVES REMOVAL

1. Remove the six head bolts (1) and take off the cylinder head assembly (2) (Figure 13-11).



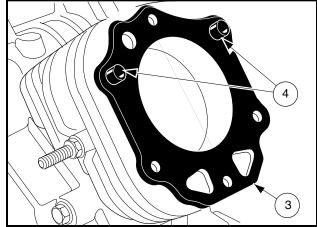


FIGURE 13-11

FIGURE 13-12

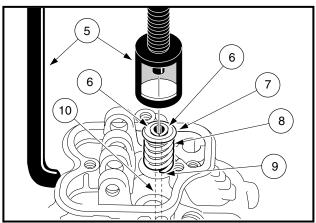
- 2. Remove head gasket (3). Note the position of the two dowels (4) as shown (Figure 13-12).
- 3. Compress the valve spring with the valve spring compressor (5) (CLUB CAR Part Number 1016411-01) and remove the collet halves (6) (Figure 13-13).
- 4. Remove spring compressor, take out the upper retainer (7), the spring (8) and the spring seat (9) (Figure 13-13).

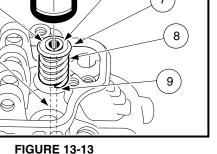
NOTE

- THE SPRINGS SEATS (9) CAN ONLY BE REMOVED WITH THE VALVE STEM SEALS (11) REMOVED (FIGURE 13-14).
- 5. Remove valve (10) (Figure 13-13).
- 6. If necessary, remove valve stem seal with a screwdriver and replace seal.

A CAUTION

- TO KEEP THE SCREWDRIVER FROM DAMAGING THE CYLINDER HEAD FLANGE SURFACE, PUT A PIECE OF HEAVY CARDBOARD OR WOOD BETWEEN THEM (FIGURE 13-14).
- REMOVAL WILL DAMAGE THE STEM SEAL, IF STEM SEAL DOES NOT NEED REPLACEMENT. DO NOT REMOVE IT.





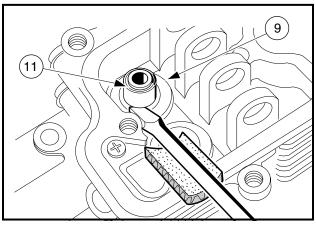


FIGURE 13-14

G

BREATHER VALVE (REED VALVE)

General Information

The function of the breather is to create a vacuum in the crankcase, which prevents oil from being forced out of the engine through the piston rings, oil seals or gaskets.

The breather has a reed valve, which limits the direction of air flow caused by the piston moving up and down.

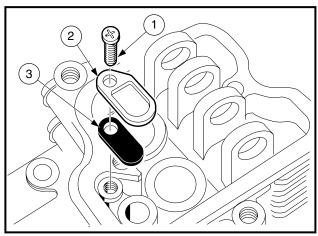
Air can flow out of the crankcase, but the one way reed valve blocks return flow. It thus maintains a vacuum in the crankcase.

Oil laden air in the crankcase passes through the reed valve and expands into the rocker chamber. In the rocker chamber most oil separates from the air and drains back to the crankcase. The air passes through a tube and vents to the intake manifold.

Breather Valve (Reed Valve) Removal

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Unscrew the mounting screw (1) and remove the back plate (2) and reed valve (3) (Figure 13-15). (See Page 13-21 for Installation.)



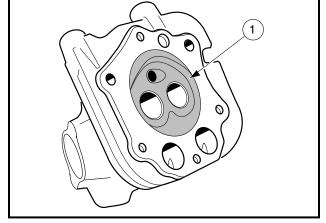


FIGURE 13-15

FIGURE 13-16

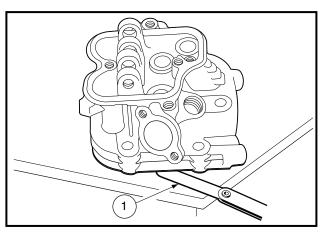
CLEANING AND INSPECTION OF CYLINDER HEAD

- 1. Clean the head with a non-flammable solvent and dry thoroughly.
- 2. Bead blast or scrape carbon deposits from head. When scraping carbon deposits, be careful to avoid scratching or nicking the cylinder head.
- 3. Inspect the spark plug port threads for damage. If threads are damaged, replace the head.
- 4. Place the cylinder head on a surface plate (Figure 13-17).

- 5. Measure the space between the surface plate and the head with a feeler gauge (1) to check the flatness of the head surface (Figure 13-17).
- 6. If the head is warped more than 0.002 inches (0.05 millimeters), replace it.

A CAUTION

- SMOOTH OUT ANY DAMAGED SPOTS IN THE COMBUSTION CHAMBER (1) USING A SMALL GRINDER. SHARP EDGES IN THE COMBUSTION CHAMBER MAY CAUSE PREIGNITION. DO NOT REMOVE ANY MORE MATERIAL THAN IS NECESSARY OR CHANGE THE SHAPE OF THE COMBUSTION CHAMBER (FIGURE 13-16).
- DO NOT GRIND THE VALVE SEATS OR THE GASKET SURFACE.



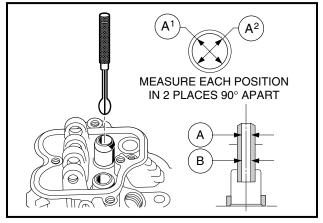


FIGURE 13-17

FIGURE 13-18

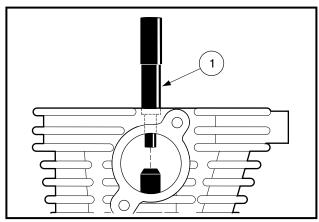
VALVE GUIDES

Valve Guide Inspection

- 1. Measure the inside diameter of each guide with a telescoping gauge (Figure 13-18).
- 2. If the inside diameter exceeds 0.2781 inch (7.065 millimeters), replace the guide.

Valve Guide Replacement

- 1. With the combustion chamber side of the head facing up, drive the guide out of the head with the valve guide arbor (1) (CLUB CAR Part Number 1016412-02) (Figure 13-19).
- 2. Install the snap ring (2) on the new valve guide (Figure 13-20).
- 3. Coat the guide with a light film of engine oil.





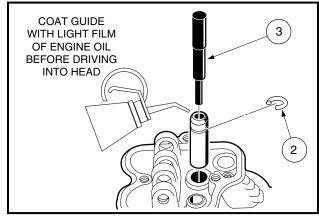


FIGURE 13-20

Valve Guides Inspection, Continued:

- 4. With the rocker arm side of the head facing up, drive the new valve guide into the head with the valve guide arbor (3) until the snap ring (2) just seats on the head (Figure 13-20, Page 13-13).
- 5. Ream the guide with a stanisol or kerosene lubricant and a valve guide reamer (CLUB CAR Part Number 1016412-01). Valve guide inside diameter should be 0.2756-0.2762 inches (7.000-7.015 millimeters) (Figure13-21).
- 6. Install the spring seat (9) and a new stem seal (11). Be careful not to damage the seal lip when installing (Figure 13-14, Page 13-11).

VALVE SEATS

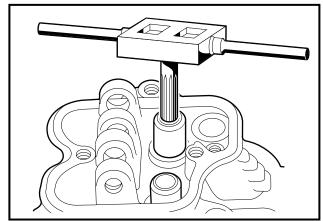
Inspection

A WARNING

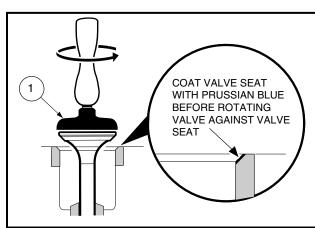
- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Inspect the valve seats for damage. If the seats are warped or distorted beyond reconditioning, replace the cylinder head.
- 2. Using Prussian Blue, coat the valve seat.
- 3. Push the valve into the guide.
- 4. Rotate the valve against the seat with a lapping tool (1) (Figure 13-22).
- 5. Pull the valve out, and check the mark on the valve head. It must be 0.0197 0.0433 inch (.50 1.10 millimeters) in width, and even all the way around the seat and valve (Figure 13-23).

NOTE

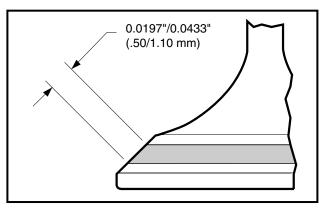
- THE VALVE STEM AND GUIDE MUST BE IN GOOD CONDITION OR STEP NUMBER 5 WILL NOT BE VALID.
- 6. If the valve seating surface is not correct, repair the seat.







Pitted or worn valve seats can be resurfaced (See Repair). Make sure to lap the valves to the seats after refacing.



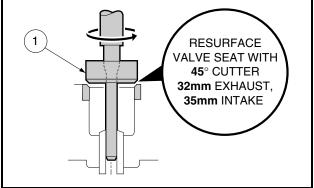


FIGURE 13-23

FIGURE 13-24

Valve Seat Repair

A CAUTION

- IF YOU ARE UNFAMILIAR WITH THE FOLLOWING PROCEDURES, CLUB CAR SUGGESTS THAT THE CYLINDER HEAD BE TAKEN TO A PROFESSIONAL ENGINE MACHINE SHOP FOR RECONDITIONING.
- 1. Clean the cylinder head thoroughly (See Cylinder Cleaning, Page 13-12).
- 2. Recondition the valve seats with the valve seat cutters (45°-32 mm Exhaust Seat, 45°-35 mm Intake Seat).
 - 2.1. Using Prussian Blue, check the seats for good contact all the way around (See Valve Seat Inspection).
 - 2.2. Measure the seat width of the 45° angle portion of the seat at several places around the seat (Figure 13-25, Page 13-16).
 - 2.3. If the seat width is more than 0.079 inch (2.0 millimeters), the seating surface should be resurfaced.
 - 2.4. Resurface the valve seat with a 45° cutter (1) (32mm Exhaust Valve Seat Cutter, CLUB CAR Part Number 1016553, and 35mm Intake Valve Seat Cutter, CLUB CAR Part Number 1016554), removing only enough material to produce a smooth and concentric seat (Figure 13-24).

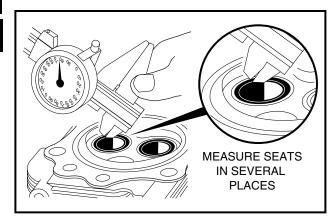
A CAUTION

- USE CARE NOT TO DULL THE CUTTER. DO NOT TURN THE CUTTER COUNTERCLOCKWISE OR ALLOW IT TO HIT A METAL OBJECT.
 - 2.5. Use a 32° seat cutter (1) (CLUB CAR Part Number 1016555) to narrow the seat width to the standard width (Figure 13-24) (See Caution Below and Note on Page 13-16).
 - 2.6. Turn the seat cutter (1) clockwise one turn at a time while pressing down very lightly. Recheck the width after each cutter revolution (Figure 13-24) (See Caution Below and Note on Page 13-16).

A CAUTION

• THE 32° SEAT CUTTER REMOVES MATERIAL VERY QUICKLY. CHECK THE SEAT OUTSIDE DIAMETER FREQUENTLY TO PREVENT OVER-CUTTING.

Valve Seat Repair, Continued:



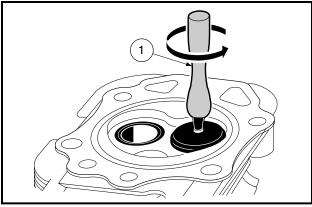


FIGURE 13-25

FIGURE 13-26

NOTE

- KEEP THE SEAT WIDTH AS CLOSE AS POSSIBLE TO 0.031 INCH (0.8 MILLIMETERS).
 - 2.7. Make a light pass with the 45° cutter (1) (32mm Exhaust Valve Seat Cutter, CLUB CAR Part Number 1016553, and 35mm Intake Valve Seat Cutter, CLUB CAR Part Number 1016554) to remove any possible burrs at the edge of the seat.
- 3. After applying a coat of Prussian Blue to the valve face, insert the valve, and snap it closed against the seat several times. The valve surface should show good contact all the way around. Be sure the valve seat is centered on the valve face. The position of the valve in the seat is evident after lapping the valve.
- 4. If the seat does not make proper contact, lap the valve into the seat with a vacuum cup tool.
 - 4.1. Coat the surface of the valve sparingly with a fine lapping compound.
 - 4.2. Use the vacuum cup lapping tool (1) to grip the top of the valve. Rotate the valve as shown to lap the valve to the seat (Figure 13-26).
 - 4.3. Lift the valve slightly from the seat every 8 to 10 strokes, continuing the lapping operation until a uniform ring appears around the entire surface of the valve face.
- 5. When lapping is completed, wash all parts in solvent to remove lapping compound. Dry the parts thoroughly.
- 6. Note the position of the lapping mark on the valve face. The lapping mark should appear on or near the center of the face.
- 7. When the engine is assembled, be sure to adjust the valve clearance (See Valve Clearance Adjustment, Page 13-21).

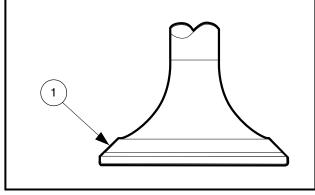


FIGURE 13-27

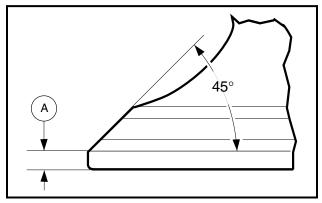


FIGURE 13-28

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.

Visual Inspection

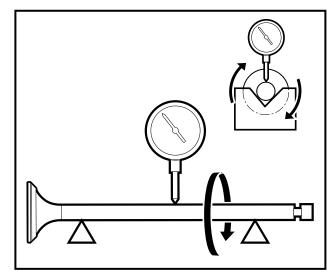
- 1. Inspect the valve head seating area (1) for erosion, nicks and warpage, etc. (Figure 13-27).
- 2. If the valve head seating area is worn, replace the valve.
- If the valve head seating area is eroded or nicked, it may be possible to repair the valve on a valve refacing machine. Follow the refacing machine manufacturer's instructions. The valve seating surface angle for the FE 290 is 45° (Figure 13-28).
- 4. Inspect the stem for obvious wear, discoloration, and stem end damage.
- 5. If the stem is obviously worn or discolored, replace the valve.

Valve Head Thickness

- 1. Measure the thickness of the valve head, as shown (Figure 13-28).
- 2. If the valve head thickness (A) is less than 0.024 inches (0.610 millimeters), replace the valve.

Valve Stem Bend

- 1. Support the valve in V blocks at each end of the stem (Figure 13-29).
- 2. Position a dial gauge perpendicular to the stem.
- 3. Turn the valve and read the variation on the dial gauge.
- 4. If stem bend is greater than the service limit of 0.0012 inches (0.0305 millimeters), replace the valve.



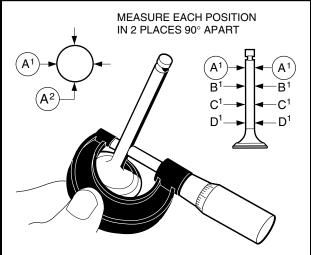
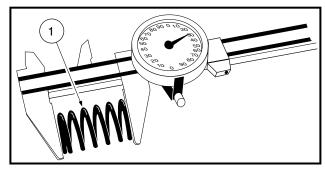


FIGURE 13-29 FIGURE 13-30

G



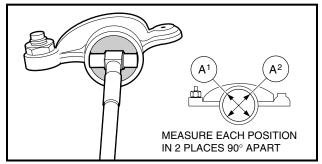


FIGURE 13-31

FIGURE 13-32

- Using a micrometer, measure the diameter of the stem at several points along its length (Figure 13-30, Page 13-17).
- 2. If the outside diameter is less than the service limit of 0.2728 inch (6.930 millimeters) intake, 0.2722 inches (6.915 millimeters) exhaust, replace the valve.

Valve Springs

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Inspect the valve springs (1) for pitting, cracks, rusting, and burrs. Replace the springs if necessary (Figure 13-31).
- 2. Measure the free length of the spring. If the measurement is less than the service limit of 1.29 inches (32.77 millimeters), replace the spring (Figure 13-31).

Rocker Arms and Rocker Shaft

1. Using a telescoping gauge, measure the inside diameter of each rocker arm bearing at several points along its length. If the inside diameter is more than the service limit of 0.4754 inch (12.075 millimeters), replace the rocker arm (Figure 13-32).

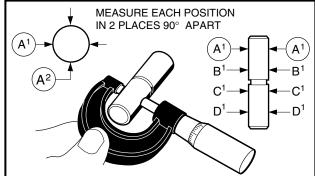


FIGURE 13-33

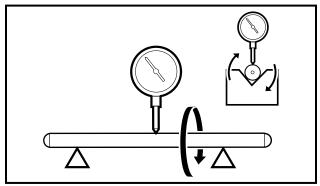


FIGURE 13-34

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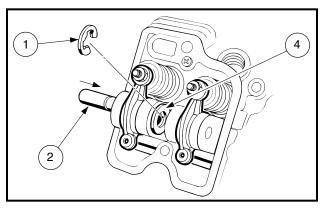


FIGURE 13-35

3. If the outside diameter is less than the service limit of 0.4704 inch (11.949 millimeters), replace the shaft.

Push Rods

- 1. Support the rod in V blocks at each end of the rod. Position a dial gauge perpendicular to the rod (Figure 13-34).
- 2. Turn the rod slowly and read the variation on the gauge.
- 3. If the push rod is bent more than 0.012 inch (0.3 millimeter), replace the push rod.

CYLINDER HEAD INSTALLATION

- 1. Installation is the reverse of removal (See Page 13-10).
- 2. Making sure that each push rod (5) is in place between the rocker arm (3) and the tappet (6) as shown, put the rocker shaft (2) into the posts through the rocker arm (3) and washer (4) (Figures 13-35 and 13-36).

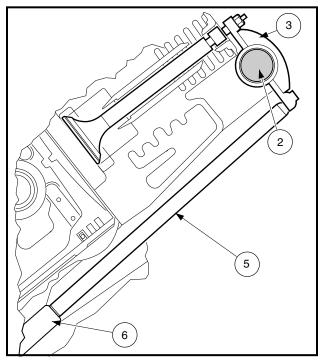
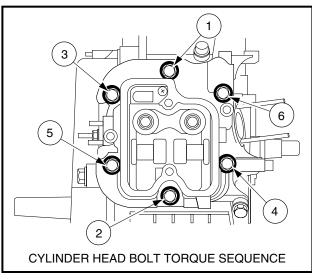


FIGURE 13-36

Cylinder Head Installation, Continued:

3. Slide the washer (4) against the exhaust rocker, and fit the E-ring (1) into the groove in the rocker shaft (2) **(Figure 13-35, Page 13-19)**.



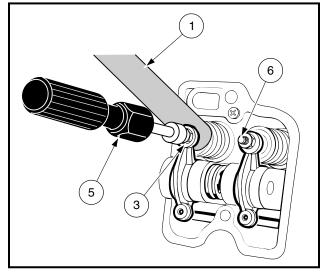


FIGURE 13-37

FIGURE 13-38

- 4. Install cylinder head assembly to engine.
- 5. Tighten the bolts down evenly with hand.

CAUTION

- DO NOT TURN ONE BOLT DOWN COMPLETELY BEFORE THE OTHERS. DOING SO MAY CAUSE THE CYLINDER HEAD TO WARP.
- 6. Use a torque wrench to tighten the six head bolts in the sequence shown (Figure 13-37).
- 7. Increase the torque in four increments of 50 in.lbs. (6 N-m) and then tighten to final torque of 220 in.lbs. (25 N-m).
- 8. Adjust valve clearances.

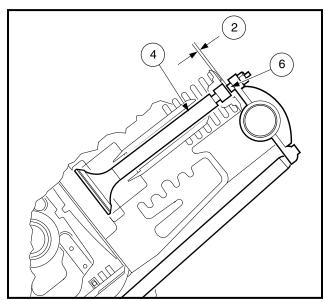


FIGURE 13-39

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Check and adjust clearance when the engine is cold.
- 2. Turn the crankshaft until the piston is at the top of the compression stroke.
- 3. Using a feeler gauge (1), measure the clearance (2) between the adjuster (3) and the top of the valve stem (4) (Figures 13-38 and 13-39).
- 4. If necessary, loosen the locknut (3) and turn the adjuster (6) up or down to adjust the clearance to 0.005 inches (0.127 millimeters) for both intake and exhaust (Figure 13-38).
- 5. While keeping the adjuster from turning with the screw holder (5) (CLUB CAR Part Number 1016413), tighten the locknut (3) to 90 in-lbs. (10 N-m) (Figure 13-38).
- 6. Recheck the clearance on both valves.

BREATHER VALVE

Visual Inspection

- 1. Inspect the reed valve (1) for sticking or binding. Replace if necessary (Figure 13-40).
- 2. Inspect the reed valve for hairline cracks, distortion or breakage. Replace if necessary.
- 3. Inspect the reed valve (1) seating surface. It must not have any nicks or burrs.

Installation

1. Installation is the reverse of removal (See Page 13-12).

NOTE

• PLACE THE REED VALVE ON THE SEAT SO THERE IS A SLIGHT GAP (2) .008 INCHES MAXIMUM (0.203 MILLIMETER) BETWEEN THE VALVE AND THE SEAT (FIGURE 13-40).

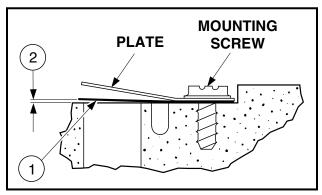


FIGURE 13-40

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A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.

INSTALLATION OF REMAINING ENGINE COMPONENTS

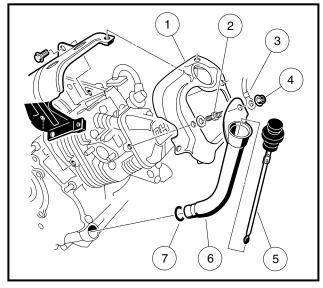
- REMOVE KEY.
- DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
- DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
- REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- Install rocker cover.
- 2. Install lower, upper and head shrouds (1) along with two-ended bolt (2) (Figure 13-41).

NOTE

- THE SHORTER END OF THE TWO-ENDED BOLT (2) GOES THROUGH WASHER AND UPPER SHROUD.
- TO PREVENT LEAKS, APPLY A LIGHT COAT OF CLEAN ENGINE OIL TO THE O-RING SEAL (7) BEFORE INSTALLATION. CARE SHOULD BE TAKEN DURING INSTALLATION TO AVOID CUTTING OR NICKING THE O-RING SEAL (FIGURE 13-41).
- 3. Install oil filler tube (6) and O-Ring (7) into the large hole in the crankcase cover. Install the upper end of the oil filler tube (6) onto the two-ended bolt (2). Connect the ground wire (3) to the two-ended bolt and install the nut (4). Insert the dip stick (5) (Figure 13-41).
- 4. Connect muffler (See Exhaust System Section 15).
- 5. Install carburetor (11) along with throttle spring bracket (13). Torque to 45-55 in.lbs (5.0/6.2 N-m) (Figure 13-42).
- 6. Connect fuel lines (See Fuel System Section 14). Torque fuel line hose clamps to 8-10 in.lbs. (0.9/11 N-m) (Figure 13-5, Page 13-8).
- 7. Install the plug and thread it in until finger tight. Tighten spark plug to 20 ft.lbs. (27 N-m) torque.

NOTE

- BEFORE INSTALLING THE PLUG, CHECK THE CONDITION OF THE THREADS IN THE CYLIN-DER HEAD. SOFTEN DEPOSITS IN CYLINDER HEAD THREADS WITH PENETRATING OIL AND CLEAN OUT WITH A TAP.
- 8. Install governor cable clevis pin (9) through cable clevis and throttle valve, and install cotter pin (10). Install spring (12) onto the throttle spring bracket (13) and the throttle valve. Mount the governor guard (8) (Figure 13-42).
- 9. Apply a light film of clean engine oil onto the seal of the new oil filter and install the filter. Fill crankcase with the correct level of oil (See Periodic Maintenance Section 4) (Figure 13-101, Page 13-46).



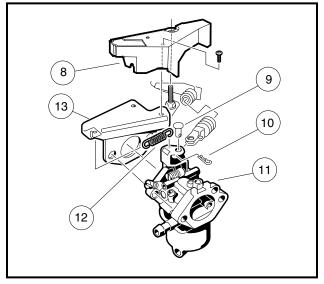


FIGURE 13-41 FIGURE 13-42

CRANKCASE

ENGINE REMOVAL

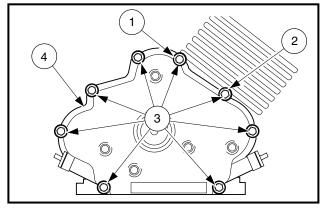
A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.

NOTE

- ENGINE REMOVAL IS REQUIRED FOR REPAIR OF PARTS THAT ARE INSIDE THE CRANKCASE.
- 1. Remove seat from rear body.
- 2. Remove air intake box (See Fuel System Section 14).
- 3. Remove rear body, seat back/bag rack support (See Body and Trim Section 5).
- 4. Remove fuel lines (See Fuel System Section 14).
- 5. Remove accelerator cable from engine (See Fuel System Section 14).
- 6. Remove governor cable (See Fuel System Section 14).
- 7. Disconnect starter-generator wires (See Electrical System Section 12).
- 8. Remove starter-generator (See Electrical System Section 12).
- 9. Remove drive belt (See Torque Converter Section 16).
- 10. Remove drive clutch (See Torque Converter Section 16).

G



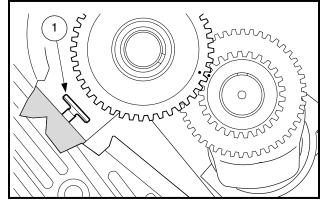


FIGURE 13-43

FIGURE 13-44

- 11. Remove muffler (See Exhaust System Section 15).
- 12. Disconnect oil sending unit wire from engine crankcase.
- 13. Remove engine mounting hardware.
- 14. Lift engine from car.
- 15. Remove crankcase oil drain plugs and filler tube. Tip the engine slightly to allow all of the oil to drain from the crankcase. Dispose of engine oil properly.

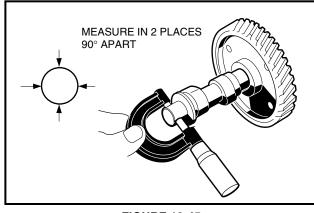
CRANKCASE COVER REMOVAL

- 1. Remove nuts and clamps at two-ended bolts (1 and 2) (Figure 13-43).
- 2. Remove the eight bolts (3) and take off the crankcase cover (4) (Figure 13-43).

NOTE

- IF THE CRANKCASE COVER STICKS, TAP LIGHTLY WITH A PLASTIC HAMMER ON ALTERNATE SIDES NEAR THE DOWEL PINS.
- 3. Disconnect the oil sending wire from the cord connection. Remove the two mounting screws from the inside of the cover. Remove the oil sending unit from the cover. To inspect and replace the oil sending unit (See Test Procedure 21 Section 12, Page 12-25).
- 4. Remove the crankcase cover gasket completely. It may stick to the flange surface of the crankcase.

CAMSHAFT AND TAPPETS



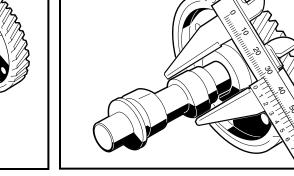


FIGURE 13-45 FIGURE 13-46

Removal (Figure 13-44)

- 1. Turn the engine upside down to keep the tappets (1) from catching the cam lobes.
- 2. Take the camshaft out of the engine block. Pull both tappets out.

Inspection

- 1. Inspect the camshaft for wear or broken gear teeth.
- Measure the camshaft journals and camlobes with a micrometer at the points shown (Figures 13-45 and 13-46).
- 3. If the camshaft journal diameter is less than 0.9026 inch (22.927 millimeters) at either end of the shaft, replace the camshaft.
- 4. If the lobe height is less than 1.287 inches (32.690 millimeters) for either lobe, replace the camshaft.

Installation - See Page 13-44

PISTON/CONNECTING ROD

Removal

WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.

NOTE

- THE CONNECTING ROD AND CAP MUST STAY TOGETHER AS A SET. DO NOT MIX WITH PARTS FROM ANY OTHER ENGINE.
- 1. Turn crankshaft to expose the two connecting rod cap bolts (1) (Figure 13-47, Page 13-26).
- 2. Loosen the cap bolts and take them out together with the connecting rod cap (2).
- 3. Push the piston/connecting rod assembly out of the cylinder.

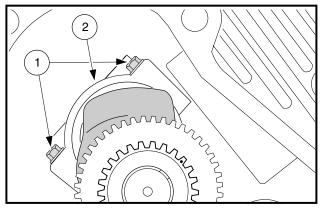
PISTON

Inspection and Repair

- 1. Remove all deposits from the piston.
- 2. Clean the carbon from the piston ring grooves.

A CAUTION

• NEVER CLEAN THE PISTON HEAD WITH THE ENGINE ASSEMBLED. CARBON PARTICLES WILL FALL BETWEEN THE PISTON AND CYLINDER WALL, AND MAY CAUSE SEVERE CYLINDER WEAR.



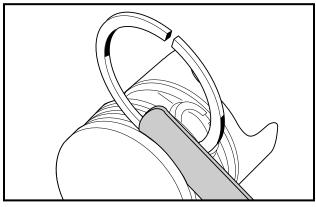


FIGURE 13-47

FIGURE 13-48

- 3. Be sure the oil return passages in the ring grooves are open.
- 4. Visually inspect the piston rings and grooves for uneven wear or damage. Replace them if uneven wear or damage is excessive.
- 5. Using a new piston ring and a feeler gauge, measure the clearance between the grooves and ring at several points around the grooves (Figure 13-48).
- 6. If the top groove has a clearance greater than 0.0063 inches (0.16 millimeters), replace the piston.
- 7. If the second groove has a clearance greater than 0.0055 inches (0.14 millimeters), replace the piston.
- 8. The oil ring is made of three pieces: upper and lower rails and expander. It is difficult to measure the ring groove clearance and thickness. Inspect visually.

PISTON RING

1. Insert the ring squarely into the cylinder bore to a point approximately 1 inch (25 millimeters) down from the top the cylinder. See Note below.

NOTE

- USE THE TOP OF THE PISTON TO PUSH THE RING INTO THE BORE TO BE SURE IT IS SQUARE.
- 2. Using a feeler gauge, measure the ring end-gap (Figure 13-49).
- 3. If the end-gap of any ring is greater than 0.0472 inches (1.199 millimeters), replace the entire set of
- 4. Using a micrometer, measure the thickness of both piston rings at several points around the rings (Figure13-50).

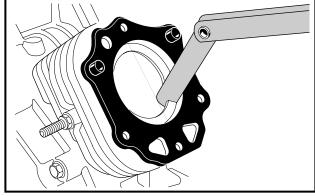


FIGURE 13-49

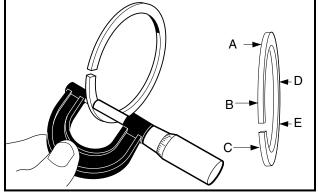


FIGURE 13-50

5. If either ring thickness is less than 0.0566 inches (1.438 millimeters), replace the entire set of rings.

NOTE

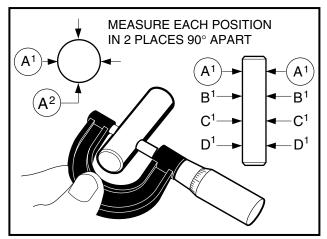
• IT IS DIFFICULT TO MEASURE EXACTLY THE OIL RING THICKNESS. REPLACE THE OIL RING WHENEVER THE COMPRESSION RINGS (TOP AND SECOND) ARE REPLACED.

PISTON PIN

Inspection

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Using a micrometer, measure the outside diameter of the piston pin at several points along its length (Figure 13-51).
- 2. If the pin diameter is smaller than 0.747 inch (18.974 millimeters), replace the piston pin.
- 3. Using an inside micrometer or telescoping gauge, measure the inside diameter of the piston pin hole in the piston at several points (Figure 13-52).
- 4. If the inside diameter exceeds 0.7439 inch (18.895 millimeters), replace the piston.



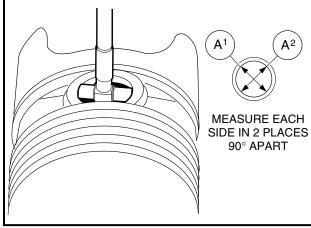


FIGURE 13-51

FIGURE 13-52

CONNECTING ROD

NOTE

• THE CONNECTING ROD AND CAP MUST STAY TOGETHER AS A SET. DO NOT MIX WITH PARTS FROM ANY OTHER ENGINE.

Connecting Rod Inspection

- 1. Clean and inspect the bearing surfaces of the connecting rod and cap. Replace parts if scored.
- 2. Using an inside micrometer or a telescoping gauge, measure the inside diameter of the connecting rod small bore at several points along its length (Figure 13-53).
- 3. If the inside diameter exceeds 0.7500 inch (19.050 millimeters), replace the connecting rod.
- 4. Remount the connecting rod cap to the connecting rod at the large bore end, aligning the pilot groove on the rod. Screw in the connecting rod bolts and tighten them to 16.5 ft.lbs. (23 N-m).
- 5. Using a telescoping gauge or an inside micrometer, measure the inside diameter of the large bore at several points along its length (Figure 13-54).
- 6. If the inside diameter exceeds 1.4003 inches (35.568 millimeters), replace the connecting rod.

NOTE

• IF THE CONNECTING ROD IS BENT OR TWISTED, IT MUST BE REPLACED.

Piston and Connecting Rod Installation - See Page 13-42.

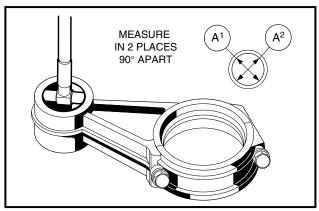
CYLINDER BLOCK

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.

While the engine is disassembled, inspect the cylinder block for cracks, stripped bolt holes, broken fins, or cylinder wall scoring.

1. Use an inside micrometer or telescoping gauge, together with a micrometer, to measure the cylinder bore.





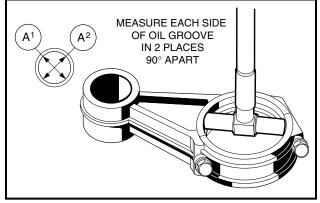


FIGURE 13-54

2. Make the first measurement parallel with the crankshaft and the second at right angles to the crankshaft at three different locations in the bore. The first measurement location is 0.4 inch (10 millimeters) from the top of the cylinder. The second location is in the center or 2.4 inches (60 millimeters) from the top, and the third location is 0.3 inch (8 millimeters) from the bottom of the cylinder or bottom of ring travel (See locations 1, 2, and 3 in Figure 13-55). The standard bore diameter is 3.0700 - 3.0708 inches (77.980 - 78.000 mm). The maximum cylinder bore diameter wear limit is 3.0735 inches (78.067 mm). The maximum acceptable out of round cylinder bore is 0.0022 inch (0.056 millimeter). If the cylinder bore is not within these measurements, the cylinder bore will need to be resized.

To Resize Bore to Next Oversize

Always resize either to exactly 0.010 inch (0.25 millimeter) or to exactly 0.020 inch (0.50 millimeter) over standard size.

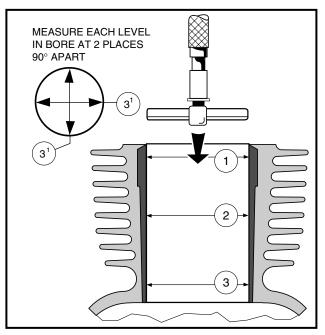
1. When the bore is resized to 0.010 inch over standard size, the new bore dimension is 3.0791 - 3.0799 inches (78.210 - 78.230 millimeters). When the bore is resized to 0.020 inch over standard size, the new bore dimension is 3.0890 - 3.0898 inches (78.460 - 78.480 millimeters) (See Specifications for Resizing Cylinder Bore Table, Page 13-49).

NOTE

- ALLOW FOR A SHRINKAGE (FROM THE FINAL SIZE) OF 0.0003-0.0004 INCH (0.007-0.009 MIL-LIMETERS) WHICH WILL OCCUR WHEN THE CYLINDER COOLS DOWN.
- Hone the cylinder that is to be 0.010 inch over standard size so that the final bore size diameter is 3.0799 - 3.0807 inches (78.230 - 78.250 millimeters). The final honed bore diameter for a 0.020 inch over standard size bore is 3.0898 - 3.0906 inches (78.480 - 78.500 millimeters) (See Specification for Resizing Cylinder Bore Table, Page 13-49).

NOTE

- IMPORTANT: THE CYLINDER WALL FINISH SHOULD HAVE A 40° TO 60° CROSS-HATCH PATTERN. DO NOT USE SOLVENTS OR GASOLINE (FIGURE 13-56).
- 3. After honing, clean the cylinder wall thoroughly using soap, warm water and clean rags.



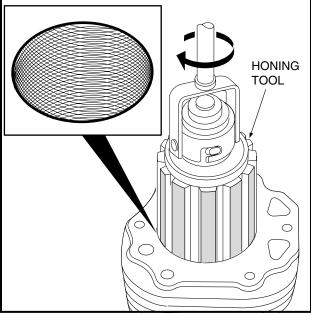
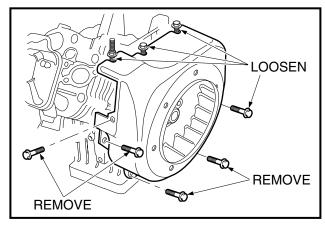


FIGURE 13-55 FIGURE 13-56

(C



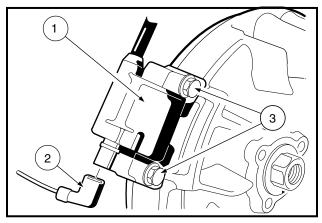


FIGURE 13-57

FIGURE 13-58

4. Dry the cylinder and coat with engine oil.

A CAUTION

• THE CYLINDER MUST BE THOROUGHLY CLEANED AFTER HONING TO ELIMINATE ALL GRIT.

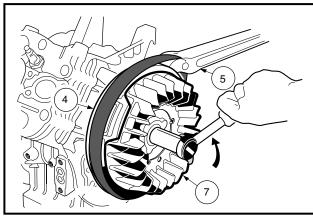
IGNITION COIL AND FLYWHEEL

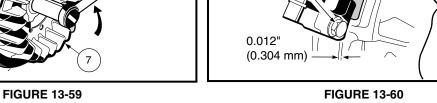
Removal

- 1. Loosen four screws and remove the remaining four screws attaching the flywheel housing as shown, then remove the housing (Figure 13-57).
- 2. Disconnect the ignition coil (1) from its primary lead wire at the connector (2). Remove the two bolts (3) and take out the ignition coil (Figure 13-58).

A CAUTION

- DO NOT DAMAGE THE FAN BLADES WITH THE STRAP WRENCH. DO NOT PLACE SCREW-DRIVER OR PRY BAR IN THE FAN BLADES.
- 3. Hold the flywheel (4), *not the fan* (7), with a strap wrench (5) and remove the flywheel nut (6) by turning it counterclockwise (Figure 13-59).





3

- 4. Pull off the flywheel with a puller (CLUB CAR Part Number 1016627).
- 5. Take the flywheel key out of its groove.

Ignition Coil Inspection and Repair

See Testing the Engine Ignition Circuit - Section 12, Page 12-9.

Installation

- 1. Installation is the reverse of removal.
- 2. While tightening the two bolts (3), use a bronze feeler gauge to adjust the ignition coil air gap to 0.012 inch (0.304 millimeter) (Figure 13-60).
- 3. Torque the two ignition coil bolts to 30 in.lbs. (3.4 N-m).

OIL PUMP

Removal

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Remove the six screws (1) and take off the oil pump cover (2) (Figure 13-61).
- 2. Peel off the oil pump cover gasket (3).
- 3. Take out the pump gear cover plate (4).

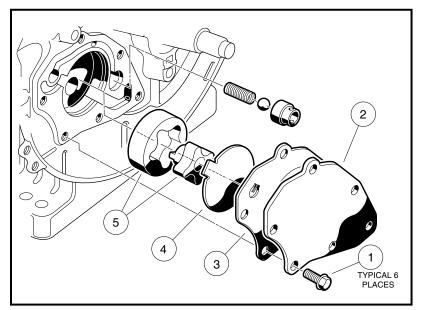
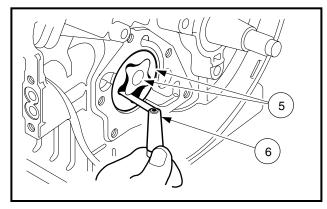


FIGURE 13-61



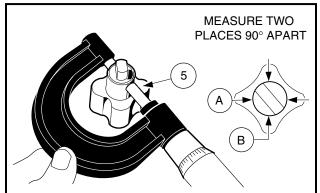


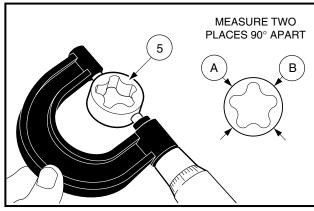
FIGURE 13-62

FIGURE 13-63

- 1. Check the clearance between the inner and outer rotors (5) with a feeler gauge (6). Measure the clearance between the high point of the inner rotor and the high point of the outer rotor (Figure 13-62).
- 2. Replace both rotors as a set if the measurement exceeds 0.012 inch (0.3 millimeter).
- 3. Remove inner and outer rotors (5).
- 4. Inspect the inner and outer oil pump rotors. If the rotors are worn or damaged, replace them.
 - 4.1. Measure the pump shaft bearing surface. Replace both rotors as a set if the measurement is less than 0.447 inch (11.4 millimeters) (Figure 13-63).
 - 4.2. Using a micrometer, measure the diameter of the outer rotor at several points (Figure 13-64).
 - 4.3. If the rotor diameter is less than 1.5923 inches (40.444 millimeters), replace both rotors.
 - 4.4. Using a micrometer, measure the thickness of the outer rotor (Figure 13-65).
 - 4.5. If the rotor thickness is less than 0.3905 inch (9.920 millimeters), replace both rotors.

Oil Pump Installation

- DO NOT ALLOW ANY DUST OR OTHER FOREIGN MATTER INTO THE OIL PUMP.
- 1. Installation is the reverse of removal.
- 2. Install the inner rotor with its tang in the slot in the end of the camshaft (Figure 13-66).





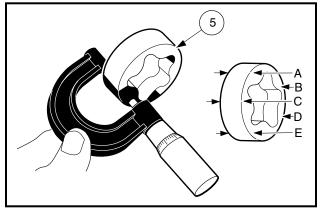
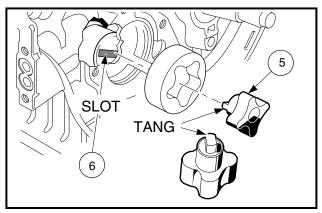


FIGURE 13-65

Removal

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.



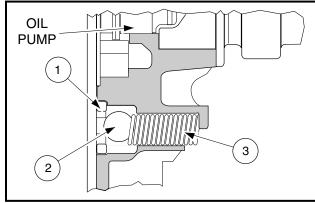


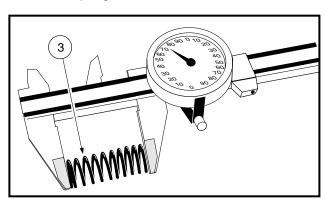
FIGURE 13-66

FIGURE 13-67

- 1. Remove the oil pump (See Oil Pump Removal, Page 13-31).
- 2. Remove the valve seat (1), ball (2) and spring (3) (Figure 13-67).

Oil Pressure Relief Valve Inspection

- 1. Note the condition of the ball (2) and the valve seat (1). They must not have any nicks or burrs.
- 2. If necessary, put the ball in position and lightly tap the ball with a plastic hammer to form a perfect seat.
- 3. Inspect the relief valve spring (3) for pitting, cracks, rusting and burrs. Replace it if necessary.
- 4. Measure free length of the spring (3) with a vernier caliper (Figure 13-68).
 - 4.1. If the free length of the relief valve spring is less than 0.748 inch (19.00 millimeters), replace the spring.



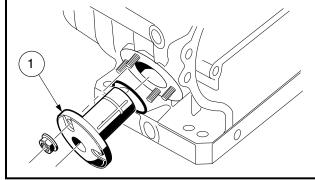


FIGURE 13-68

FIGURE 13-69

Oil Pressure Relief Valve Installation

1. Installation is the reverse of removal.

CRANKSHAFT AND BALANCER

Removal

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Remove the four nuts and pull out the balancer guide pin (1) and the O-Ring (Figure 13-69, Page 13-33).
- 2. Pull out the crankshaft and the balancer together as an assembly (Figure 13-70).

Crankshaft and Balancer Disassembly

- 1. Slide the spacer (2) and the link rod (3) off the flywheel end of the crankshaft. Remove the balancer from the remaining link rod (Figure 13-70).
- 2. Place the gear yoke (CLUB CAR Part Number 1016418) under the spur gear with the small end of the connecting rod opposite the crankpin (Figure 13-71).
- 3. Position the gear yoke with the side blocks positioned as close to the crankshaft as possible as shown (Figure 13-71).
- 4. Using a press, push on the end of the crankshaft to pull the spur gear and the helical gear off of the crankshaft (Figure 13-72). See WARNING below and at top of page 35.

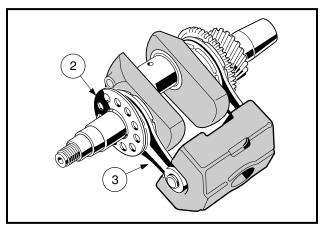


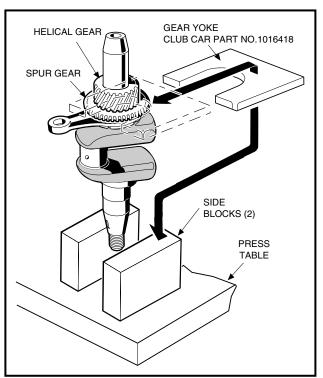
FIGURE 13-70

WARNING

• SUPPORT THE CRANKSHAFT WHILE PRESSING. THIS WILL PREVENT THE CRANKSHAFT FROM DROPPING TO THE FLOOR AFTER THE GEAR HAS BEEN REMOVED.

A CAUTION

- ALWAYS USE A PRESS WHEN REMOVING THE SPUR GEAR AND HELICAL GEAR FROM, OR INSTALLING THEM ON THE CRANKSHAFT.
- 5. Remove the woodruff key. Slide the remaining link rod off of the crankshaft.



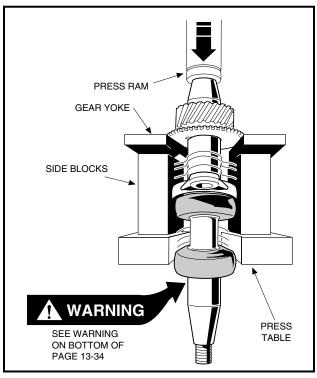


FIGURE 13-71

FIGURE 13-72

LINK ROD INSPECTION

- 1. Clean and inspect the link rod (3) bearing surfaces (Figure 13-70). If the bearing surface of the small end is scored or damaged, replace the link rod. If the large-end bushing is scored or damaged, the bushing must be replaced.
 - 1.1. Using a telescoping gauge, measure both inside bearing surfaces at several points (Figures 13-73 and 13-74).
 - 1.2. If the inside diameter of the small end is greater than 0.4746 inch (12.057 millimeters), replace the link rod (Figure 13-73).

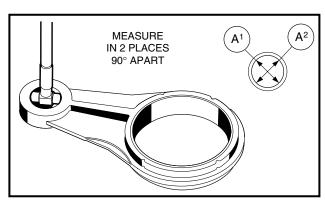


FIGURE 13-73

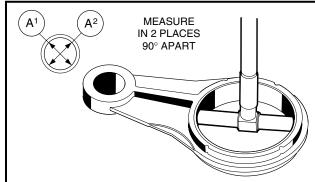
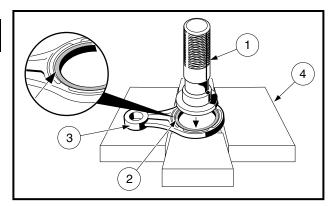


FIGURE 13-74

G



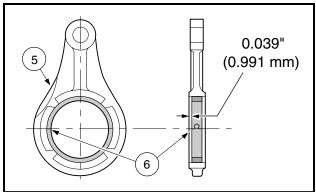


FIGURE 13-75

FIGURE 13-76

1.3. If the inside diameter of the large end is greater than 1.8554 inches (47.127 millimeters), replace the bushing (Figure 13-74, Page 13-35).

Link Rod Bushing Replacement

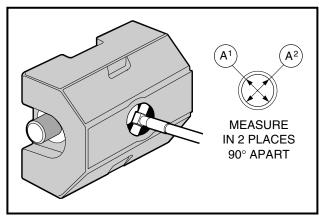
- 1. Support the link rod around the entire big end, and using a 1.97 inch (50 millimeters) bearing driver (1), drive the bushing (2) out of the rod (3), as shown (Figure 13-75).
- 2. Clean the parts thoroughly in a high flash-point solvent and dry them.
- 3. Coat the new bushing with new engine oil.
- 4. Using a 1.97 inch (50 millimeters) bearing driver, press the new bushing into the link rod with its seam (6) toward the side of the link rod with the hollow (5) and at right angles to the rod center, to a depth of 0.039 inches (0.991 millimeters) from the surface (Figure 13-76).

NOTE

 THE WRIST PINS NORMALLY REQUIRE NO MAINTENANCE AND ARE TIGHTLY PRESSED INTO THE WEIGHT.

COUNTERBALANCE WEIGHT

- 1. Clean the bearing surface and inspect it for wear or damage. Replace weight if necessary.
- 2. Using a telescoping gauge, measure the inside diameter of the bearing bore. If the inside diameter is greater than 1.0283 inches (26.119 millimeters), replace the counterbalance weight (Figure 13-77).



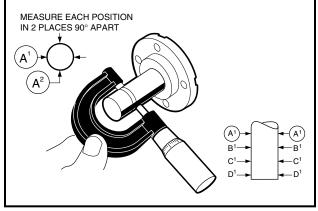


FIGURE 13-77

FIGURE 13-78

BALANCER GUIDE PIN (FIGURE 13-78)

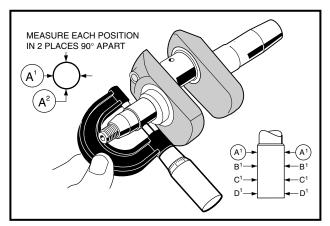
- 1. Clean the pin surface and inspect it for wear or damage. Replace balancer guide pin if necessary.
- 2. With an outside micrometer, measure the outside diameter of the balancer guide pin surface.
- 3. If the outside diameter is smaller than 1.0199 inch (25.907 millimeters), replace the guide pin.
- 4. Check the O-Ring seal to make sure the O-Ring is not damaged. Replace if necessary.

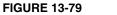
CRANKSHAFT

Inspection

WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Clean and inspect the journals for scoring. Inspect the crankshaft gear for cracks, scoring or broken teeth. Replace parts if necessary.
- 2. Using a micrometer, measure both main journals (PTO side and flywheel side) at several points along their lengths (Figure 13-79).
- 3. If either journal diameter is less than 1.1783 inches (29.929 millimeters), replace the crankshaft.
- 4. Using a micrometer, measure connecting rod journal at several points along its length (Figure 13-80).
- 5. If the journal diameter is less than 1.3954 inches (35.443 millimeters), replace the crankshaft.
- 6. Using a micrometer, measure the crankshaft link rod journals at several points (Figure 13-81, Page 13-38).
- 7. If the diameter of either journal is less than 1.8474 inches (46.924 millimeters), replace the crankshaft.
- 8. Check the crankshaft alignment.
 - 8.1. Place the crankshaft in an alignment jig.





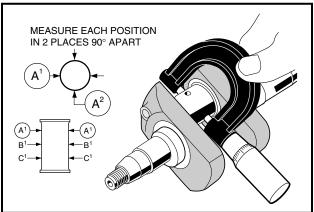
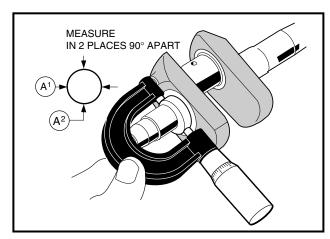


FIGURE 13-80

Crankshaft Inspection, Continued:

- 8.2. Turn the crankshaft (1) slowly and measure total indicated run-out at the location shown (2) (Figure 13-82).
- 8.3. If total run-out exceeds 0.002 inch (0.051 millimeter), replace the crankshaft.



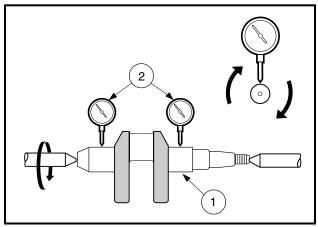


FIGURE 13-81

FIGURE 13-82

UNDERSIZED CONNECTING ROD

The connecting rod journal can accept an undersized connecting rod having a 1.3779 inches (35.0 millimeters) inside diameter. Grinding the crankshaft is required before using the undersized connecting rod.

- 1. Have a reliable repair shop grind the crankshaft journal (A) (Figure 13-83).
- 2. The final finishing dimensions are as follows (Figure 13-83).
 - (A) 1.3775 1.3779 inches (34.989 35.00 millimeters)
 - (B) 0.110 0.126 inch (2.80 3.20 millimeters) radius two places
 - (C) 1.12 inches maximum (28.4 millimeters)
 - (D) 1.1811 1.1831 inches (30.0 30.05 millimeters)
- 3. The connecting rod journal (A) must be concentric and cylindrical within 0.0002 inch (0.005 millimeter) at full indicator reading (Figure 13-83).
- 4. Finish should be very smooth. Use a super fine finishing stone.

OIL SCREEN

Removal

1. Remove the two bolts (1) to take out the oil screen plate (2) and the oil screen (3) (Figure 13-84).

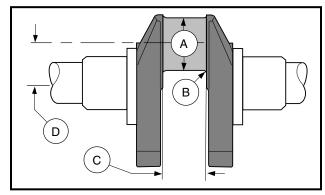
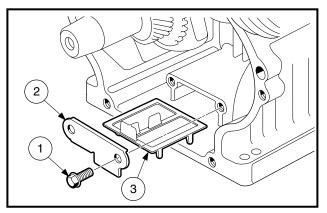


FIGURE 13-83

Oil Screen Installation

1. To install the oil screen, reverse the removal procedure.



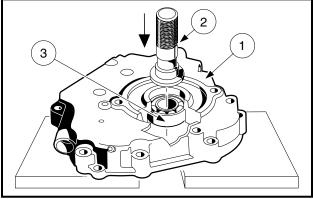


FIGURE 13-84

FIGURE 13-85

BALL BEARING

Removal

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Remove the oil seal in the crankcase cover (See Oil Seals Below).

NOTE

- NEVER REUSE AN OIL SEAL. REPLACE THE OIL SEAL WITH A NEW ONE.
- 2. Place the crankcase cover (1) on a bench with its outside up (gasket surface against the bench) (Figure 13-85).
- 3. Using a bearing driver (2) (Part of CLUB CAR Bearing Driver Kit, Part Number 1016416), drive out the ball bearing (3) as shown.

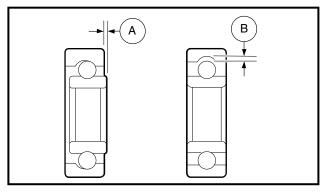
Ball Bearing Inspection

- 1. Clean the ball bearing thoroughly in high flash-point solvent and dry it.
- 2. Spin the ball bearing by hand and check for (A) axial play and (B) radial play. Replace the ball bearing if it is noisy, does not spin smoothly, or if it has any play (Figure 13-86, Page 13-40).

OIL SEALS

Oil seals are used on both ends of the crankshaft. Any time the crankshaft is removed from the seals, the seals must be replaced with new ones.

C



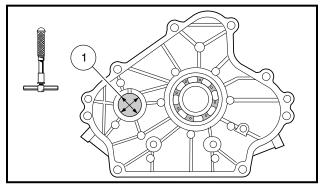


FIGURE 13-86

FIGURE 13-87

Oil Seal Removal

Use an oil seal remover to press or drive the seal out of the casing.

Oil Seal Installation

NOTE

- NEVER REUSE AN OIL SEAL. ALWAYS REPLACE THE OIL SEAL WITH A NEW ONE.
- 1. Put a light coating of clean engine oil on the outside edge of the oil seal to assist installation.
- 2. Using the 1.37 inch (35 millimeters) seal driver, press the oil seal into the flywheel side of the crank-case until it is flush with the hole.
- 3. Using the 1.97 inch (50 millimeters) seal driver, press the oil seal into the crankcase cover until it is 0.157 inch (4 millimeters) below the outside surface.
- 4. Install all oil seals with their lips facing the center of the engine.

PLAIN BEARING SURFACE

Plain bearing surfaces are used for both ends of the camshaft and the flywheel end of the crankshaft.

Inspection

- 1. Inspect the camshaft surfaces, one in the crankcase (3) and the other in the crankcase cover (1). Using an inside micrometer or telescoping gauge, measure the inside diameter of each bearing surface. If the inside diameter is greater than 0.9080 inch (23.063 millimeters), replace the crankcase and/or the crankcase cover (Figures 13-87 and 13-88).
- 2. Inspect the crankshaft bearing surface (2) in the crankcase. Using an inside micrometer or telescoping gauge, measure the inside diameter of the bearing surface. If the inside diameter is greater than 1.1841 inch (30.075 millimeters), replace the crankcase (**Figure 13-88**).

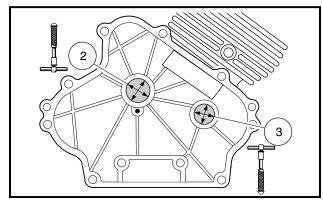


FIGURE 13-88

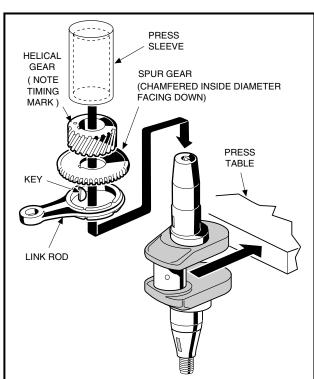
CRANKSHAFT INSTALLATION (FIGURES 13-89 AND 13-90)

WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Installation is the reverse of removal (See Page 13-34).

A CAUTION

- ALWAYS USE A PRESS WHEN REMOVING OR INSTALLING THE SPUR GEAR AND HELICAL GEAR ON THE CRANKSHAFT.
- 2. When reassembling the crankshaft and the balancer, apply a light film of engine oil to the crankshaft journals, weight pin and weight guide bushing.



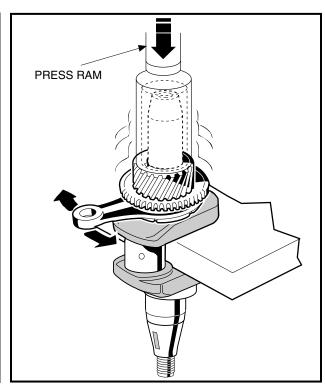


FIGURE 13-89

FIGURE 13-90

NOTE

- MAKE SURE THE CHAMFERED INSIDE DIAMETERS OF THE SPUR GEAR AND HELICAL GEAR ARE ORIENTED DOWNWARD ON THE CRANKSHAFT AS SHOWN (Figure 13-89).
- MAKE SURE THE LINK RODS ROTATE SMOOTHLY AFTER THE GEARS ARE PRESSED ON.

G

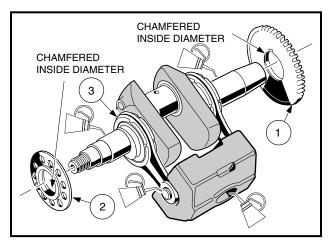


FIGURE 13-91

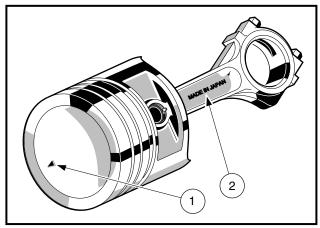
 With the crankweb supported as shown, slide the link rod onto the PTO side of the crankshaft, and install the key. Press the spur gear and helical gear onto the crankshaft (Figures 13-89 and 13-90, Page 13-41). See CAUTION below.

CAUTION

- IF THE SPUR GEAR BECAME WARPED WHILE BEING REMOVED, INSTALL A NEW ONE.
- 4. Slide the link rod, then the spacer, onto the flywheel end of the crankshaft.

PISTON/CONNECTING ROD INSTALLATION

- 1. Installation is the reverse of removal.
- 2. Reassemble the piston and the connecting rod into a unit, if disassembled.
- 3. Align the arrow mark (1) on the piston head opposite the lettering MADE IN JAPAN (2) on the connecting rod. Insert the piston pin thorough the piston holes and the connecting rod. Install the two retaining rings to hold the pin in place. The gap in the retaining rings should be facing towards the crankshaft. Make sure the retaining rings are seated in their grooves. Make sure the connecting rod moves freely (Figure 13-92).
- 4. Apply a light film of engine oil to the connecting rod bearing surfaces and the two connecting rod bolts.



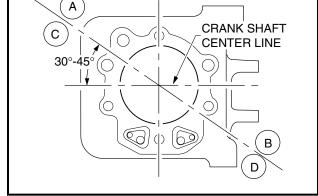


FIGURE 13-92 FIGURE 13-93

5. Put the piston/connecting rod into the cylinder bore with the lettering MADE IN JAPAN on the connecting rod oriented toward the clutch side of the engine (Figure 13-92). Position piston ring gaps so that they are oriented toward the corresponding letters in: (A) Top Ring Gap, (B) Second Ring Gap, (C) Upper Side Rail Gap installed in the lowest ring groove, (D) Lower Side Rail Gap installed in the lowest ring groove. Compress the rings on the piston and finish sliding the piston into the cylinder (Figure 13-93).

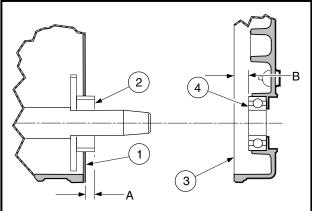
NOTE

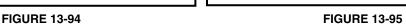
- THE LETTER **R** MARKED ON THE TOP TWO PISTON RINGS SHOULD BE FACING UP WHEN THE RINGS ARE INSTALLED.
- INSTALL THE CHROME EDGED RING INTO THE TOP RING GROOVE.
- 6. Tighten the two connecting rod bolts to 16.5 ft.lbs. (23 N-m).

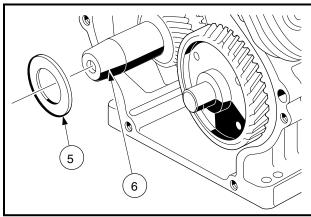
CRANKSHAFT AXIAL PLAY ADJUSTMENT

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN IN FIGURE 12-1, PAGE 12-2.
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. With the gasket installed on the crankcase, measure from the gasket surface (1) to the helical gear surface (2). Record measurement (A) (Figure 13-94).
- 2. Measure from the crankcase cover (3) mounting face to the crankshaft bearing inner end (4). Record measurement (B) (Figure 13-94).
- 3. Locate the measurements on the Crankshaft Shim Table. Follow lines to where the recorded measurements intersect (Figure 13-96, Page 13-44).
- 4. Choose the next smaller shim from the table. Example: Measurement A is 15.87 mm and B is 17.66 mm. The correct crankshaft shim (5) is 1.53 mm.
- 5. Install the shim (5) on the crankshaft (6) (Figure 13-95).







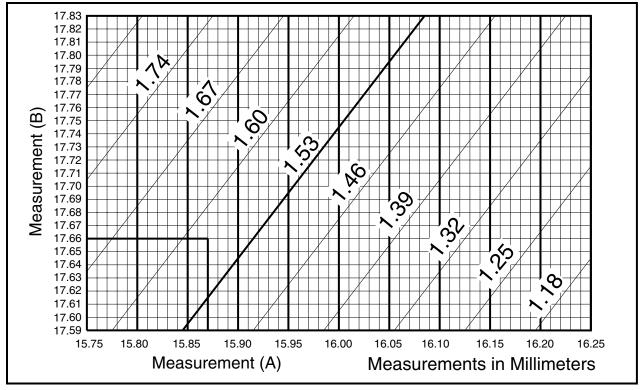
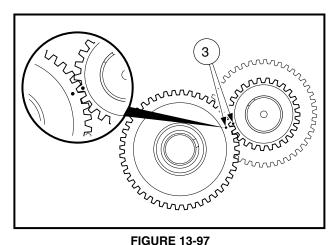


FIGURE 13-96



1 2

FIGURE 13-97

FIGURE 13-98

CAMSHAFT INSTALLATION

- WHEN INSTALLING THE CAMSHAFT, MAKE SURE THAT THE TANG (1) ON THE OIL PUMP ROTOR SEATS IN THE SLOT (2) IN END OF THE CAMSHAFT (FIGURE 13-98). IF THE OIL PUMP TANG IS NOT SEATED IN THE SLOT IN THE CAMSHAFT, SERIOUS ENGINE DAMAGE WILL RESULT. SEE NOTE AT TOP OF PAGE 13-45.
- 1. Installation is the reverse of removal (See Page 13-24).
- 2. Apply a light film of engine oil to the camshaft journals and cam lobes.

3. Align the timing marks (3) (Figure 13-97).

NOTE

• IF THE OUTSIDE EDGES OF THE CAMSHAFT AND CRANKSHAFT GEARS ARE NOT FLUSH, AND THE CRANKCASE COVER WILL NOT EASILY MAKE FULL CONTACT WITH THE CRANKCASE, MAKE SURE THE TANG ON THE OIL PUMP ROTOR IS SEATED IN THE CAMSHAFT SLOT.

CRANKCASE COVER

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.

Crankcase Cover Installation

- DO NOT REUSE THE GASKET. INSTALL A NEW ONE.
- INSTALL AND TIGHTEN CRANKCASE COVER BOLTS AS INSTRUCTED BELOW. FAILURE TO DO SO COULD CAUSE THE COVER TO BECOME WARPED.
- 1. Clean the gasket surfaces on the crankcase cover, and inspect the oil seal for wear and damage.
- 2. Install crankcase cover. Using HANDS ONLY, seat cover completely against the crankcase. If the cover will not seat, the camshaft is not installed correctly.
- 3. Install and, with fingers, tighten down evenly the eight cover mounting bolts (Figure 13-99).
- 4. Tighten the cover mounting bolts to final torque in two steps. First, in the sequence shown, tighten all eight bolts to approximately 130 in.lbs. (14 N-m). Then, repeating the sequence, tighten them to 240-260 in.lbs. (26 N-m) torque (See Figure 13-99).

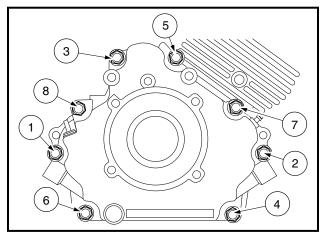


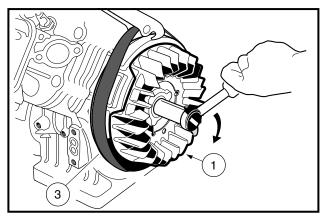
FIGURE 13-99

ENGINE ASSEMBLY

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- BEFORE REMOVAL AND DISASSEMBLY, CLEAN THE ENGINE.
- SEE SAFETY WARNINGS, PAGE 13-1.
- 1. Install cylinder head as described in Cylinder Head Installation (See Page 13-19).
- 2. Insert the flywheel key into the keyway in the crankshaft. Then align the keyway in the flywheel to the key and push the flywheel and fan assembly onto the crankshaft until it seats.
- 3. Use a strap wrench (3) to keep the flywheel and fan assembly (1) from turning while tightening the flywheel nut to 60-65 ft.lbs. (81/88 N-m) (Figure 13-100).

- THE FLYWHEEL NUT HAS RIGHT HAND THREADS. TURN IT CLOCKWISE TO TIGHTEN, OR COUNTERCLOCKWISE TO LOOSEN.
- BE CAREFUL NOT TO DAMAGE THE FAN BLADES. USE A STRAP WRENCH TO HOLD FLY-WHEEL. DO NOT PLACE SCREWDRIVER OR PRY BAR BETWEEN FAN BLADES.
- 4. Install cylinder head shrouds (See Cylinder Shroud, Page 13-8).
- 5. Install carburetor (See Fuel System Section 14).
- 6. Install drive clutch (See Torque Converter Section 16).
- 7. Install engine in car, install mounting bolts and tighten to 20-22 ft.lbs. (27/30 N-m) torque.
- 8. Install drive belt (See Torque Converter Section 16).
- 9. Install muffler (See Exhaust System Section 15).
- 10. Install starter/generator and belt (See Electrical System Section 12).
- 11. Connect starter/generator wires and the spark plug wire (See Electrical System Section 12).
- 12. Connect fuel lines (See Fuel System Section 14).





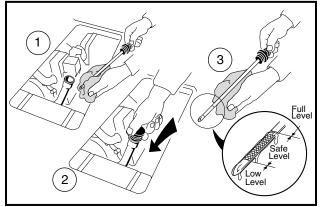


FIGURE 13-101

- 13. Connect impulse line of fuel pump to engine.
- 14. Install air intake hose (See Fuel System Section 14).
- 15. Install throttle cable and governor linkages (See Fuel System Section 14, Engine Control Linkage).
- 16. Connect wire to the oil sending unit on the crankcase cover.
- 17. Connect engine kill switch wire.
- 18. Install oil drain plug in the crankcase. Apply a light film of oil on the seal of a new oil filter and install the filter on the crankcase. Fill crankcase to the proper level with the correct type of oil. This engine should be regarded as a new engine for next scheduled oil change (See Periodic Maintenance Section 4).

NOTE

- BOTH DRAIN PLUGS ARE TO BE TIGHTENED TO 18 25 FT. LBS. (24/34 N-M) OF TORQUE.
- 19. Install rear body, trim, seatback, etc. (See Body and Trim Section 5).
- 20. Check all hardware for proper torque/tightness.
- 21. Check engine oil level (Figure 13-101).

A CAUTION

- ENGINE MUST BE IN LEVEL POSITION. REMOVE OIL LEVEL DIP STICK BY PULLING FROM OIL
 FILLER TUBE. WIPE OFF OIL FROM DIP STICK. CHECK OIL BY INSERTING THE DIP STICK
 AND FULLY SEATING DIP STICK INTO OIL FILLER TUBE. IF OIL LEVEL IS AT OR BELOW ADD
 MARK ON THE DIP STICK, ADD OIL UNTIL LEVEL IS BETWEEN ADD AND FULL (SAFE LEVEL).
 DO NOT OVERFILL WITH OIL.
- 22. Install a new or cleaned spark plug, gap .027-.031 inch (.686-.787 millimeter), and connect plug wire to plug.
- 23. Connect battery cables (positive cable first).
- 24. Place forward/reverse lever in the NEUTRAL position. Place neutral lock-out cam in SERVICE position.
- 25. Start engine, and adjust RPM.

A DANGER

- ENGINE PRODUCES A CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POISON. **DO NOT OPERATE IN AN ENCLOSED AREA WITHOUT PROPER VENTILATION**.
- 26. If initial checks indicate engine is functional, place neutral lock-out cam in OPERATE position.
- 27. Test drive car to insure all systems are functional and correctly adjusted.

SERVICE SPECIFICATIONS

ITEM	SPEC.	SERVICE LIMIT
Crankshaft Axial Play		0.0137 in. (0.35 mm)
Crankshaft Crankpin Journal	O.D. (MIN.)	1.3954 in. (35.444 mm)
Crankshaft PTO-Side Journal	O.D. (MIN.)	1.1783 in. (29.930 mm)
Crankshaft Flywheel-Side Journal	O.D. (MIN.)	1.1783 in. (29.930 mm)
Crankshaft Balancer- Link-Rod Journals	O.D. (MIN.)	1.8474 in. (46.924 mm)
Service Specifications Chart Continued Next Page.		

ITEM	SPEC.	SERVICE LIMIT	
Camshaft Axial Play		0.0137 in. (0.35 mm)	
Camshaft PTO-Side Journal	O.D. (MIN.)	0.9026 in. (22.927 mm)	
Camshaft Flywheel-Side Journal	O.D. (MIN.)	0.9026 in. (22.927 mm)	
Camshaft Cam Lobes (IN. and EX.)	O.D. (MIN.)	1.287 in. (32.70 mm)	
Connecting Rod Big-End Bearing	I.D. (MAX.)	1.4003 in. (35.567 mm)	
Connecting Rod Small-End Bearing	I.D. (MAX.)	0.7500 in. (19.051 mm)	
Counterbalancer Rod Big-End Bearing	I.D. (MAX.)	1.8554 in. (47.126 mm)	
Counterbalancer Rod Small-End Bearing	I.D. (MAX.)	0.4750 in. (12.064 mm)	
Piston Top Ring Groove Clearance (with NEW ring)	(MAX.)	0.0063 in. (0.16 mm)	
Piston Second Ring Groove Clearance (with NEW ring)	(MAX.)	0.0055 in. (0.14 mm)	
Piston Oil-Ring Groove Clearance and End Gap		Visual inspection only	
Piston Pin	O.D. (MIN.)	0.7470 in. (18.975 mm)	
Piston Pin Hole	I.D. (MAX.)	0.7493 in. (19.033 mm)	
Crankcase Cover Camshaft bearing	I.D. (MAX.)	0.9079 in. (23.063 mm)	
Cylinder Bore	I.D. Standard	3.0700 to 3.0708 in. (77.980 to 78.000 mm)	
Cylinder Bore	I.D. (MAX.)	3.0735 in. (78.067 mm)	
Cylinder Bore (out of round)	(MAX.)	0.0022 in. (0.056 mm)	
Crankshaft Bearing	I.D. (MAX.)	1.1841 in. (30.075 mm)	
Camshaft Bearing	I.D. (MAX.)	0.9080 in. (23.063 mm)	
Oil Pump Housing	I.D. (MAX.)	1.6050 in. (40.766 mm)	
Oil Pump Housing	Depth (MAX.)	0.4004 in. (10.170 mm)	
Oil Pump Shaft Bearing	I.D. (MAX.)	0.5028 in. (12.770 mm)	
Rocker Shaft	O.D. (MIN.)	0.4704 in. (11.949 mm)	
Rocker Arm Bearing	I.D. (MAX.)	0.4754 in. (12.074 mm)	
Valve Seat Angle (IN. EX.)	Standard	45°	
Valve Seat Width	Standard	0.0197 to 0.0433 in. (0.50 to 1.10mm)	
Valve Seat Width	(MAX.)	0.075 in. (1.9 mm)	
Valve Face Angle (IN. EX.)	Standard	45°	
Valve Margin (IN. EX.)	(MAX.)	0.024 in. (0.6 mm)	
Valve Clearance (IN. EX.)	Standard	0.0047 in. (0.12 mm)	
Intake Valve Stem	O.D. (MIN.)	0.2728 in. (6.930 mm)	
Exhaust Valve Stem	O.D. (MIN.)	0.2722 in. (6.915 mm)	
Valve Guide Hole (Intake)	I.D. (MAX.)	0.2781 in. (7.065 mm)	
Service Specifications Chart, Continued Next Page.			

ITEM	SPEC.	SERVICE LIMIT
Valve Guide Hole (Exhaust)	I.D. (MAX.)	0.2781 in. (7.065 mm)
Valve Spring (Free Length)	(MIN.)	1.2894 in. (32.75 mm)
Oil Pump Shaft	O.D. (MIN.)	0.4971 in. (12.627 mm)
Outer Rotor	O.D. (MIN.)	1.5932 in. (40.467 mm)
Outer Rotor Width	(MIN.)	0.3905 in. (9.92 mm)
Relief Valve Spring (Free Length)	(MIN.)	0.748 in. (19.0 mm)
Counterbalancer Weight Bearing	I.D. (MAX.)	1.0283 in. (26.118 mm)
Support Shaft	O.D. (MIN.)	1.0199 in. (25.907 mm)
Breather Reed Valve (Valve Tip Air Gap)	(MAX.)	0.008 in. (0.2 mm)
Valve Stem (IN. and EX.) (Stem Bend)	(MAX.)	0.0012 in. (0.03 mm)
Push Rod (Rod Bend)	(MAX.)	0.012 in. (0.30mm)
Valve Guide (IN. and EX.)	I.D. Standard	0.2756 to 0.2762 in. (7.00 to 7.015 mm)

SPECIFICATIONS FOR RESIZING CYLINDER BORE

ITEM	OVER SIZE	LIMITS
Final Boring Bore Diameter	0.010 in. (0.25 mm) 0.020 in. (0.50 mm)	3.0791 to 3.0799 in. (78.210 to 78.230 mm) 3.0890 to 3.0898 in. (78.460 to 78.480 mm)
Final Bore Diameter	0.010 in. (0.25 mm) 0.020 in. (0.50 mm)	3.0799 to 3.0807 in. (78.230 to 78.250 mm) 3.0898 to 3.0906 in. (78.480 to 78.500 mm)

TORQUE SPECIFICATIONS

ITEM	SIZE	LIMITS
Cylinder Head Bolts	M8	220 in. lbs. (24 N-m)
Valve Clearance Adjustment Nuts	M5	90 in. lbs. (10 N-m)
Connecting Rod Bolts (Coat Threads with Engine Oil)	M7	180 in. lbs. (20 N-m)
Flywheel Retaining Nut	M16	63 ft. lbs. (86 N-m)
Crankcase Cover Bolts	M8	240 - 260 in. lbs. (26 N-m)
Starter/Generator Bracket Bolts	M8	200 in. lbs. (23 N-m)
Oil Drain Plug	M14	18 to 25 ft. lbs. (24/34 N-m)
Fan Housing and Fan Shroud Screws	M6	90 in. lbs. (10 N-m)
General Bolts with Number 4 and Nuts	M8 M6 M5	130 in. lbs. (15 N-m) 50 in. lbs. (5.9 N-m) 30 in. lbs. (3.4 N-m)

ADJUSTMENT AND SETTINGS

ITEM	LIMITS
Spark Plug Gap (Standard)	0.027 to 0.031 in. (0.7 to 0.8 mm)
Ignition Coil Air Gap (Standard)	0.012 in. (0.304 mm)
Oil Pressure (MIN.) at governed speed	45.5 psi. (314 kPa)
Oil Filter: bypass-valve opening pressure	11.4 to 17.0 psi. (78 to 118 kPa)
Compression Pressure (MIN.)	156 psi. (1076 kPa)
Crankcase Vacuum (MIN.) at governed speed	1.18 in. (30 mmHg)
Cylinder Head-Gasket Surface Flatness (MAX.)	0.002 in. (0.05 mm)
Valve Clearance (IN. and EX.) when engine is cold	0.006 in. (0.15 mm)
Engine RPM @ 12-15 MPH (Vehicle Ground Speed)	2675 R.P.M.

SECTION 14 - FUEL SYSTEM

A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

GENERAL INFORMATION

The engine is equipped with a float bowl type carburetor with fixed jets that require no adjustment. The carburetor atomizes the fuel, mixes it with air, and feeds the combustible mixture into the cylinder.

HOW THE CARBURETOR WORKS

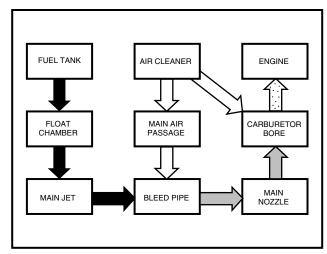
MAIN SYSTEM

The main system of the carburetor consists of the main jet, the main nozzle, and the main air passage. The main system meters fuel to the engine during moderate to heavy load conditions. Fuel flows through the main jet and into the main nozzle, where it is meets air from the main air passage. The resulting mixture flows out the end of the main nozzle and into the carburetor bore, where it is atomized by the high speed air flow and then carried into the engine (Figure 14-1, Page 14-2 and Figure 14-3, Page 14-3).

During the intake stroke of the engine, a negative pressure (vacuum) is created in the venturi of the carburetor. In this venturi tube, the intake air has high velocity and low static pressure. Subsequently, fuel is drawn out of the carburetor float chamber, atomized to fine particles, and then drawn into the cylinder as a combustible mixture (Figure 14-2, Page 14-2).

C

Main System, Continued:



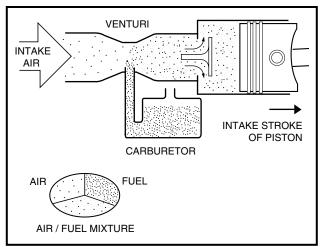


FIGURE 14-1 FIGURE 14-2

Trouble in the main system is usually indicated by poor running, or lack of power under heavy load conditions. A dirty or clogged main jet will cause the mixture to become too lean. An overly rich mixture could be caused by clogging of the air passage or the air holes in the main nozzle, by a loose main jet, or by a loose main nozzle.

If the engine exhibits symptoms of overly rich or lean carburetion after all maintenance and adjustments are correctly performed, the main jet can be replaced by a smaller or a larger one. A smaller numbered jet gives a leaner mixture and a larger numbered jet gives a richer mixture. It is recommended that any change be limited to one jet size difference from the standard jet.

SLOW SPEED SYSTEM

The slow speed system supplies fuel during low speed running. Low speed running without load requires very low intake airflow. The throttle valve (2) is almost closed when this is the case, and as high negative pressure is created on the back side of the throttle valve, intake air is drawn in and metered through the pilot air jet. The intake air draws fuel, metered by the pilot jet (6), from the carburetor float chamber. The combustible mixture of air and fuel is then delivered into the venturi through the pilot outlet and bypass. When the engine is operating at low speed, fuel is supplied mainly through the pilot outlet (Figure 14-4, Page 14-4).

The air/fuel mixture is adjusted by the pilot screw (needle valve) (8) (Figure 14-4, Page 14-4).

Standard Jetting

Pilot Air Screw 1 Turn Open
Pilot Jet 45 (x1/100 mm)
Main Jet 80 (x1/100 mm)
Throttle Valve Stop Screw 3/4 Turn Open
Pilot Air Jet 110 (x1/100 mm)
Main Air Jet 160 (x1/100 mm)

CHOKE AND FRESH AIR SYSTEM

The choke system aids in starting the engine in cold weather. When starting a cold engine, the spring loaded choke cover (1) **(Figure 14-4, Page 14-4)** is pushed in by hand. This restricts the air flow to the venturi, causing a very high vacuum that draws fuel into the venturi at a high rate and thus creating a "fuel rich" mixture. The choke cover is held in until the engine starts, and then is released.

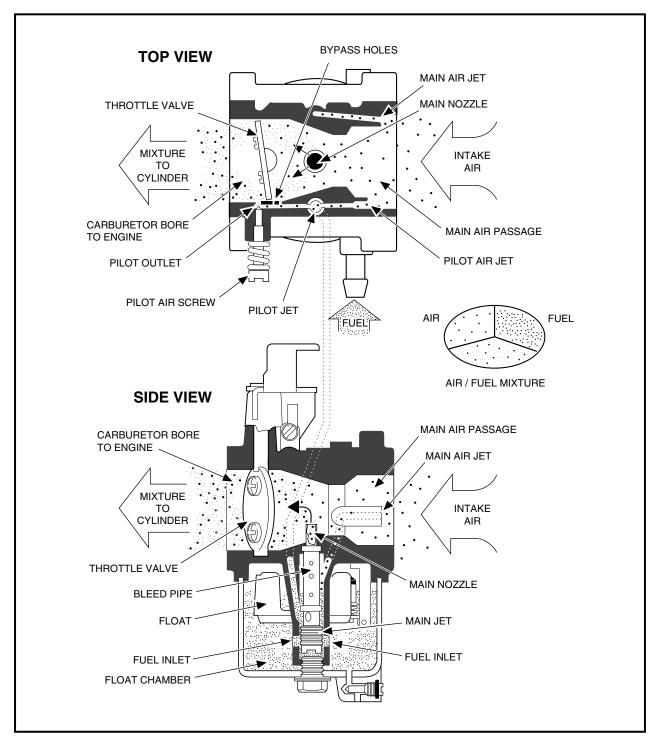


FIGURE 14-3

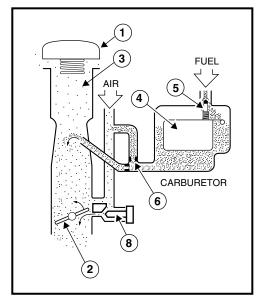
FLOAT SYSTEM

The carburetor is a float bowl type, with the float chamber located just below the carburetor body. The float system keeps the fuel in the float chamber at the correct level while the engine is running (**Figure 14-5**).

Fuel is supplied to the carburetor float chamber by an external impulse pump that draws fuel from the fuel tank and through the fuel filters. The fuel then passes through the inlet valve (5) (Figure 14-4, Page 14-4) and into the float bowl. The fuel entering the bowl causes the float (4) (Figure 14-4) to rise until it shuts off the inlet valve, preventing the fuel from exceeding a level predetermined by the float level setting.

Float System, Continued:

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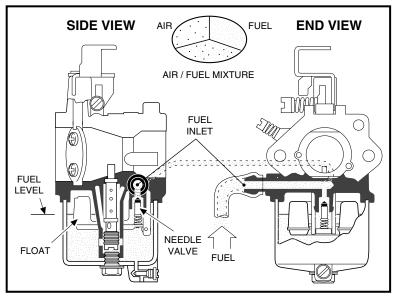


FIGURE 14-4

FIGURE 14-5

CARBURETOR

Before suspecting the carburetor as the cause of poor engine performance, make sure that the fuel and ignition systems are in proper operating condition. Check the following items:

- Spark plug and gap condition (See Section 13, Page 13-6).
- Air cleaner element (See Page 14-15).
- Fuel Filters (See Page 14-17).
- Choke and air intake system (for restriction of air flow) (See Page 14-14).
- Fuel Pump (See Page 14-19).
- Fuel Lines (from fuel tank to filter to pump to filter to carburetor) (See Page 14-24).
- Exhaust System (for restrictions) (See Section 15).

If the carburetor floods or leaks fuel at the float bowl gasket or carburetor vent tube, the fuel inlet valve could be worn or the valve may be dirty. Another cause of this condition may be a damaged float that has filled with fuel and sinks.

For elevations above 3000 feet, main jets other than standard operate more effectively. Therefore, the following chart lists the elevation ratings for various jet sizes. No adjustment is required for the pilot jet. If the vehicle idles roughly, turn the pilot screw (8) **(Figure 14-4)** out until the vehicle runs smoothly. Usually, not more than one turn of the screw is necessary.

MAIN JET ELEVATION/SIZE CHART

ALTITUDE (FEET ABOVE SEA LEVEL)	MAIN JET SIZE	ALTITUDE (FEET ABOVE SEA LEVEL)	MAIN JET SIZE
0 - 3000	80	8000 - 10000	72
3000 - 5000	78	10000 AND OVER	70
5000 - 8000	75		

A DANGER

- GASOLINE! FLAMMABLE! EXPLOSIVE! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY FROM THE AREA OF THE VEHICLE.
- THE ENGINE PRODUCES CARBON MONOXIDE, WHICH IS AN ODORLESS AND DEADLY POI-SON. DO NOT OPERATE THE ENGINE IN AN ENCLOSED AREA WITHOUT PROPER VENTILA-TION.

A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.
- 1. Remove the carburetor (Figure 14-6, Page 14-6).
 - 1.1. Remove the seat from the rear body. Loosen the intake hose clamp (22) and disconnect the intake hose (23) at the carburetor end only.
 - 1.2. Remove the governor guard (6).
 - 1.3. Remove the governor cable clevis pin (24) and spring cotter (25) (carburetor end only).
 - 1.4. Disconnect the carburetor vent line (14).
 - 1.5. Disconnect the fuel supply line (26) at the carburetor end only. Temporarily plug the end of the fuel line to prevent leakage of fuel.
 - 1.6. Remove the carburetor retaining nuts (19), intake manifold (17), and carburetor (12). See CAUTION below and NOTE at the top of page 14-6.

A CAUTION

• DO NOT REMOVE THE VALVE/SPRING ASSEMBLY FROM THE FLOAT ASSEMBLY. DOING SO WILL DAMAGE THE SPRING.

Procedure for Changing Main Jet, Continued:

NOTE

- NOTE THE ORIENTATION OF THE GASKET (16), BETWEEN THE CARBURETOR INTAKE MANIFOLD (17) AND THE CARBURETOR BODY (12), SO THAT IT CAN BE REPLACED WITH THE SAME ORIENTATION.
- WHEN REMOVING THE CARBURETOR BODY, THE THROTTLE RETURN SPRING (11) MUST BE DISCONNECTED. NOTE ITS PROPER ORIENTATION SO THAT IT CAN BE REPLACED WITH THE SAME ORIENTATION.
- THE CARBURETOR MUST BE KEPT UPRIGHT DURING REMOVAL.

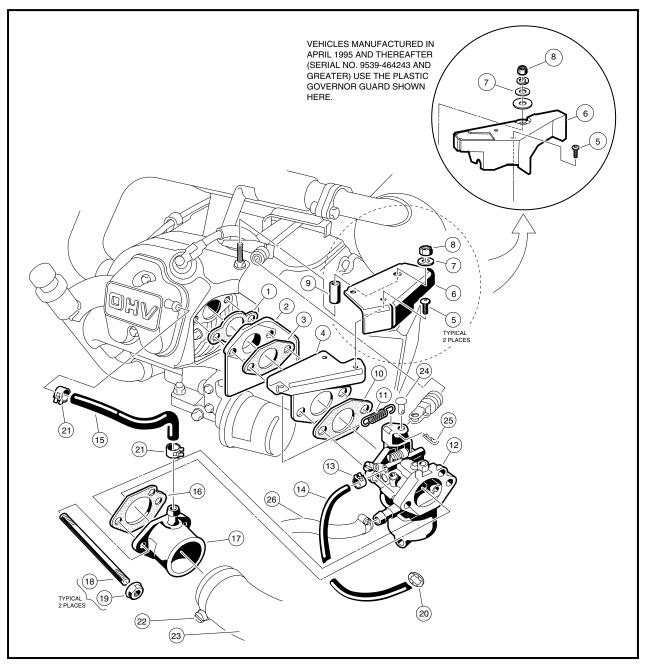


FIGURE 14-6

- 2. Position the carburetor with the drain screw (11) over a catch basin (Figure 14-7).
- 3. Turn the carburetor bowl drain screw counterclockwise two or three turns and drain all of the fuel from the bowl into the catch basin (Figure 14-7). Tighten the drain screw to 6-13 in.lbs. (0.7/1.5 N-m).
- 4. Mark the body of the carburetor and the carburetor fuel bowl with an indelible ink marker so that, after removal, the bowl can be installed again in the same position (Figure 14-7).
- 5. Remove the carburetor fuel bowl retaining screw and washer (12), then remove the fuel bowl (10) and clean it with a nonflammable solvent (Figure 14-7).

NOTE

- MAKE SURE THAT THE FUEL BOWL GASKET (9) REMAINS PROPERLY SEATED IN THE CARBURETOR BODY WHEN THE FUEL BOWL IS REMOVED.
- DURING NORMAL OPERATION, THE FUEL BOWL RETAINS THE FLOAT PIVOT PIN (6). MAKE SURE THAT THE FLOAT PIVOT PIN DOES NOT FALL OUT OF THE CARBURETOR BODY AFTER THE FUEL BOWL IS REMOVED.
- 6. Remove the main jet (8) from the carburetor body and discard it (Figure 14-7).

NOTE

• MAKE SURE THAT THE FUEL NOZZLE (ITEM 7) DOES NOT FALL OUT OF THE CARBURETOR BODY AFTER REMOVAL OF THE MAIN JET. THIS IS BEST ACCOMPLISHED BY POSITIONING THE CARBURETOR UPSIDE DOWN DURING MAIN JET REMOVAL.

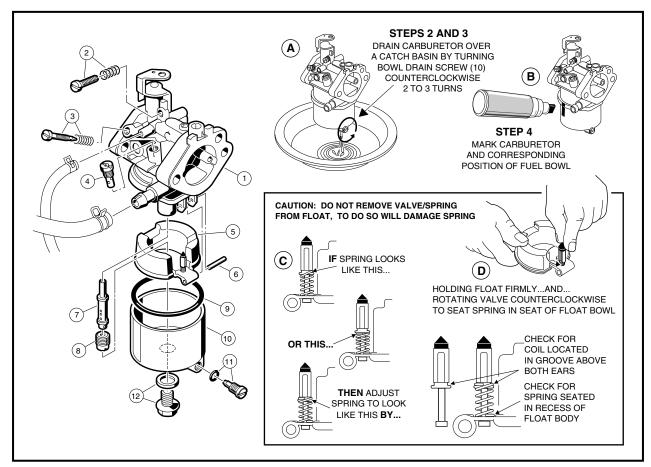


FIGURE 14-7

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Procedure for Changing Main Jet, Continued:

- 7. Select the proper size main jet. Check the size designation marking on the jet to insure that it is the correct part.
- 8. Install the new main jet and tighten it to 11-13 in.lbs. (1.2/1.5 N-m).

NOTE

- INSPECT THE MAIN JET NOZZLE (ITEM 7), AND PILOT JET (4) TO INSURE THAT THEY ARE FREE FROM CONTAMINATION. REPLACE ANY PART THAT IS CLOGGED WITH CONTAMINATION. REPLACE THE FLOAT IF IT IS DAMAGED, OR IF THE FLOAT VALVE IS DAMAGED OR WORN. EXAMINE THE FLOAT VALVE/SPRING ASSEMBLY TO MAKE SURE THAT THE SPRING IS INSTALLED CORRECTLY (FIGURE 14-7).
- 9. Install the fuel bowl. Make sure that it is positioned properly by aligning the marks applied in step 4.

CAUTION

- MAKE SURE THAT THE FUEL BOWL IS PROPERLY SEATED AGAINST THE CARBURETOR FUEL BOWL GASKET, AND THAT THE GASKET IS NOT PINCHED.
- 10. Install the fuel bowl retaining screw and tighten it to 55-67 in.lbs. (1.2/1.5 N-m).
- 11. Write the size of the main jet on the fuel bowl with an indelible ink marker. This should be written in a location that will be visible when the carburetor is installed on the engine.
- 12. Install the carburetor on the engine (Figure 14-6).
 - 12.1. Attach the throttle return spring (11) to the carburetor and then to the throttle bracket (4) just before positioning the carburetor and securing it to the engine.
 - 12.2. Install the inlet manifold gasket (16) and inlet manifold (17).
 - 12.3. Install the carburetor retaining nuts (19) and tighten them to 45-55 in.lbs. (5.0/6.2 N-m).
- 13. Connect fuel supply line and tighten to 8-10 in.lbs. (0.90/1.13 N-m).
- 14. Install carburetor vent line (14) and clamp (13).
- 15. Install the governor cable clevis pin (24) and spring cotter (25).
- 16. Install the governor guard (6). Tighten the mounting screws to 14-16 in.lbs. (1.6/1.8 N-m).
- 17. Install the intake hose (23). Tighten the hose clamp to 15-18 in.lbs. (1.7/2.0 N-m).

NOTE

- MAKE SURE THAT THE INTAKE HOSE IS NOT TWISTED DURING INSTALLATION.
- 18. Connect the battery cables, positive (+) post first, and then test drive the vehicle.

ENGINE CONTROL LINKAGE

GENERAL INFORMATION

For proper vehicle operation, it is important that the accelerator switch, governor linkage, and throttle adjustments are done correctly and in the proper sequence.

A CAUTION

• IMPROPER ADJUSTMENT CAN RESULT IN POOR VEHICLE PERFORMANCE AND/OR DAMAGE TO THE ENGINE COMPONENTS.

A DANGER

- TO INSURE THAT THE VEHICLE DOES NOT RUN OVER YOU WHILE YOU DISCONNECT OR ADJUST THE ACCELERATOR PUSH ROD, DO THE FOLLOWING:
 - TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

A WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

Accelerator Rod Removal

- 1. Raise the front of the vehicle. Place chocks at the rear wheels and lift the front of the vehicle with a chain hoist or floor jack. Place jackstands under the round frame cross tube to support the vehicle. See WARNING above.
- 2. Be sure the key switch is OFF before disconnecting the accelerator rod. Remove the accelerator rod by disconnecting the ball joint (1) from the ball stud (2) on the accelerator pedal (Figure 14-8) and from the bell crank at the electrical box (See Figure 14-10, Page 14-10).

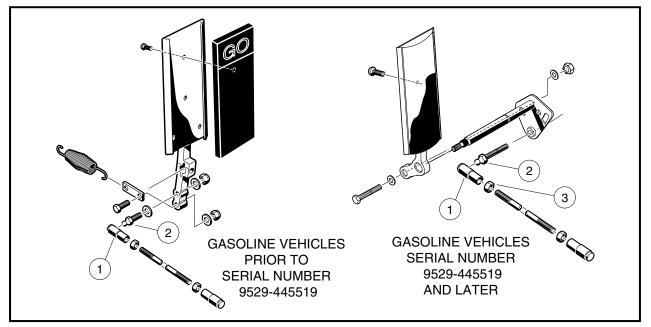


FIGURE 14-8

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Accelerator Rod Installation and Adjustment

- 1. Before installing the accelerator rod, adjust accelerator pedal position (See Section 6).
- 2. Install the ball joint on the ball stud at the accelerator pedal (Figure 14-8, Page 14-9).
- 3. If the seat is in place on the rear body, remove it.
- 4. Remove the electrical box cover (Figure 14-9).
- 5. With the ball joint jam nuts (3) (Figures 14-8 and 14-10) loose, adjust the length of the accelerator rod to obtain a throttle cable cam position of 15°-17° as shown (Figure 14-9).

A CAUTION

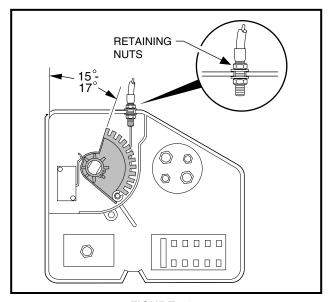
- BE SURE THAT APPROXIMATELY AN EQUAL NUMBER OF THREADS IS EXPOSED AT EACH END OF THE ACCELERATOR ROD.
- 6. Install the accelerator rod on the bell crank ball joint on the electrical box (Figure 14-10).

A CAUTION

- INSPECT THE LIMIT SWITCH INSIDE THE ELECTRICAL BOX. IF THE LIMIT SWITCH LEVER IS BENT, REPLACE THE SWITCH.
- 7. Before tightening the jam nuts, set the park brake to the first latch and pawl position and check for proper activation of switches.
- 8. While pressing the accelerator pedal, the following events should occur in *exactly the order shown*:

EVENT	APPROXIMATE PEDAL TRAVEL
Park Brake Release	0° - 4°
Solenoid Activation	4° - 8°
Carburetor Throttle Actuation	8° - 12°

AFTER the pedal group and accelerator rod are properly adjusted, the final governed engine RPM should be set per the specifications on Page 13-50.



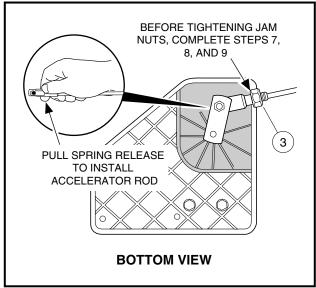


FIGURE 14-9 FIGURE 14-10

- 9. While holding the accelerator ball joint with pliers, tighten the jam nuts against the ball joints, accelerator ball joint first, at each end of the accelerator rod.
- 10. Again check rod adjustment for proper switch activation.
- 11. Install the electrical box cover.
- 12. Return the seat to the vehicle.

GOVERNOR CABLE

WARNING

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- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

Removing the Governor Cable

- 1. Remove the seat from the vehicle.
- 2. Remove the governor guard (6) (Figure 14-6, Page 14-6).
- 3. Remove the spring cotter (25) and clevis pin (24) at the carburetor throttle bracket (Figure 14-6, Page 14-6).
- 4. Remove the "E" ring (7) at the governor cable engine bracket (13), and governor cable transmission bracket (10) (Figure 14-11, Page 14-12).
- 5. Remove the spring cotter (9) and clevis pin (8) at the rear governor lever arm (Figure 14-11).
- 6. Remove the cable (2) (Figure 14-11, Page 14-12).

Governor Cable Installation and Adjustment

- 1. Install the cable onto the governor cable transmission bracket (10) and the engine bracket (13) and attach an "E" ring (7) at each end (Figure 14-11, Page 14-12).
- 2. Install the cable dust shield on each end of the cable conduit.
- 3. Install the clevis pin (15) and spring cotter (14) through the clevis and carburetor throttle at the carburetor (Figure 14-11, Page 14-12).
- 4. Install the clevis pin (Item 8) and spring cotter (9) through the rear clevis and governor lever arm.
- 5. With the governor lever arm loose on the governor shaft, use a flat blade screwdriver to turn the governor arm shaft counterclockwise until it stops. Then pull the governor lever arm rearward until the carburetor throttle is in the "wide open throttle" (WOT) position.

Governor Cable Installation and Adjustment, Continued:

- 6. While holding the arm and shaft in the fully counterclockwise position, tighten the governor arm lever nut to 36 in.lbs. (4.0 N-m).
- 7. Check governed speed adjustment as instructed on Page 14-14.

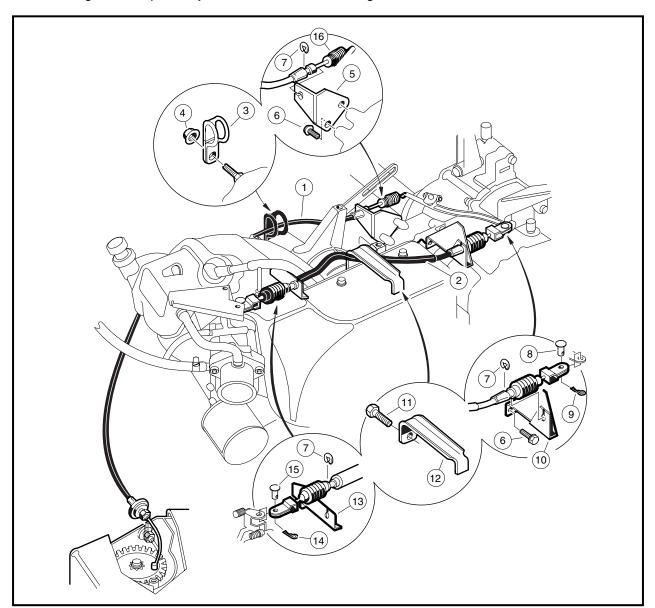


FIGURE 14-11

ACCELERATOR CABLE

A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE SOME KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL AND MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.

- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

Accelerator Cable Removal

- 1. Remove the seat from the vehicle.
- 2. Remove the electrical box cover and loosen the cable housing retaining nuts (See Figure 14-9).
- 3. Disconnect the cable (1) (Figure 14-11) from the cam in the electrical box (See Figure 14-9).
- 4. Remove the "E" ring (7) on the spring end of the cable at the accelerator cable bracket (5) **(Figure 14-11)**. Pull the cable housing out of the bracket.
- 5. Disconnect the spring (16) from the engine governor arm by rotating it counterclockwise one-half turn. Remove the cable assembly from the vehicle (Figure 14-11).

Accelerator Cable Installation

- 1. Connect the cable to the cam in the electrical box.
- 2. Insert the cable housing into the mounting slot in the wall of the electrical box, with approximately the same number of threads visible between the jam nuts as are visible from the nut inside the box to the end of the cable housing (Figure 14-9, Page 14-10). Tighten the nuts finger tight.
- 3. Connect the spring (16) to the engine governor arm (Figure 14-11).
- 4. Install the cable in the accelerator cable bracket and secure it with the "E" ring (7) (Figure 14-11).
- 5. Install the cable dust shield on the spring end of the cable conduit (Figure 14-11).
- 6. Before tightening the cable housing retaining nuts, make sure the governed speed adjustment is correct. See Engine RPM Adjustment on Page 14-14.
- 7. Install the electrical box cover.

WARNING

BECAUSE THE ENGINE MUST BE RUN TO CONDUCT TESTS AND MAKE ADJUSTMENTS, THE FOLLOWING SAFETY PROCEDURES MUST BE STRICTLY FOLLOWED. FAILURE TO DO SO COULD RESULT IN DAMAGE TO THE VEHICLE OR PERSONAL INJURY.

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD FOLLOW THE CORRECT PROCEDURES AND HEED THE WARNINGS IN THIS AND ALL APPLICABLE PUBLICATIONS.
- ALWAYS WEAR APPROVED EYE PROTECTION WHEN SERVICING THIS VEHICLE.
- CHOCK BOTH THE FRONT AND REAR WHEELS TO PREVENT VEHICLE MOVEMENT.
- HOT!! AVOID TOUCHING THE ENGINE AND EXHAUST WHEN WORKING ON THE VEHICLE. A HOT ENGINE OR EXHAUST CAN CAUSE SEVERE BURNS.
- MOVING PARTS! KEEP HANDS, CLOTHING, AND ALL OTHER OBJECTS AWAY FROM MOVING PARTS. DO NOT WEAR JEWELRY OR LOOSE CLOTHING.

CLOSED THROTTLE ADJUSTMENT

When the accelerator pedal is released, the engine will stop. Therefore, it is not possible to measure the idling speed under normal vehicle operating conditions.

Idle Adjustment

- 1. Loosen the carburetor idle screw so that it is not touching the throttle lever.
- 2. Slowly tighten the idle screw until it lightly touches the throttle lever, then tighten it an additional 3/4 turn.

ENGINE RPM ADJUSTMENT

- 1. Make sure that the governor is properly adjusted. See Pages 14-11and 14-12.
- 2. Connect the battery cables, positive (+) cable first.

A DANGER

- THE ENGINE PRODUCES CARBON MONOXIDE, WHICH IS AN ODORLESS AND DEADLY POISON. DO NOT OPERATE THE ENGINE IN AN ENCLOSED AREA WITHOUT PROPER VENTILATION.
- 3. Place the forward and reverse lever in the NEUTRAL position and place the neutral lockout cam in the SERVICE position.
- 4. Connect a tachometer (Club Car Part No. 1016112) to the spark plug lead.
- 5. With the tachometer connected, check high speed RPM. With the accelerator pedal pressed to the floor, the tachometer should read 2675 ±50 RPM.
- 6. To *reduce* RPM, loosen the accelerator cable retaining nut on the outside the electrical box wall and tighten the retaining nut on the inside of the wall until the desired RPM is reached (Figure 14-9, Page 14-10). To *increase* RPM, loosen the cable retaining nut inside the electrical box and tighten the nut outside the box until the desired RPM is reached.
- 7. Be sure both retaining nuts are locked against the electrical box and then check the RPM again. If the RPM needs to be adjusted, repeat step 6.
- 8. If more adjustment is required than the cable housing will allow, make sure that the spring on the other end of the cable is properly positioned. Excessive belt and torque converter wear can also prevent proper RPM adjustment. Check these for excessive wear (See Section 16).

CHOKE AND INTAKE SYSTEM

GENERAL INFORMATION

The choke system is a simple mechanism that does not use a cable. This means that very little or no maintenance is required on the choke. The system consists of a choke assembly that is attached to the driver's side of the front body, and an air filter housing with a hose that is attached to the carburetor. Clean, cool air from outside the engine compartment is drawn through the choke assembly and into the air cleaner intake. This feature increases engine horsepower and greatly extends air filter life.

The choke system aids in starting the engine in cold weather. When starting a cold engine, the spring loaded choke cover is pushed in by hand. This restricts the air flow, creating a "fuel rich" mixture in the carburetor. The choke cover is held in until the engine starts, and then is released. The air flow to the engine is no longer restricted, and the engine operates normally.

The choke assembly is adjusted at the factory and does not require field adjustment. However, if the choke assembly is subjected to abuse or damaged, it may become necessary to replace the assembly.

WARNING

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- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

CHOKE AND INTAKE SYSTEM REMOVAL

- 1. Remove the seat from the vehicle.
- 2. Disengage the rubber retaining cord (20) that holds the intake expansion chamber (1 through 12) to the choke assembly (13) (Figure 14-12, Page 14-16).
- 3. Remove the intake expansion chamber from the choke assembly by sliding it toward the rear of the vehicle.
- 4. Remove the intake hose (19) from the filter housing (Figure 14-12, Page 14-16).
- 5. Pull the sound insulation, inside the vehicle body, from around the choke assembly enough to expose the choke assembly mounting screws.
- 6. Remove the mounting screws (12) from the back side of the choke. Remove the choke assembly from the vehicle body (Figure 14-12, Page 14-16).

CHOKE AND INTAKE SYSTEM INSTALLATION

- 1. Position the choke assembly (13) on the vehicle body and install the mounting screws (12) from inside the vehicle body (Figure 14-12, Page 14-16).
- 2. Install the intake expansion chamber onto the choke assembly by sliding it toward the front of the vehicle.
- 3. Attach the rubber retaining cord (Item 20) to secure the intake expansion chamber to the vehicle (Figure 14-12, Page 14-16).
- 4. Check for proper operation.

AIR FILTER ELEMENT

General Information

The air cleaner should be checked every year or 150 hours, and replaced every two years or 300 hours. More frequent service may be required in extremely dirty operating environments. Need for immediate servicing will be indicated by a loss of power, sluggish acceleration, or an engine which runs roughly with excessive exhaust smoke.

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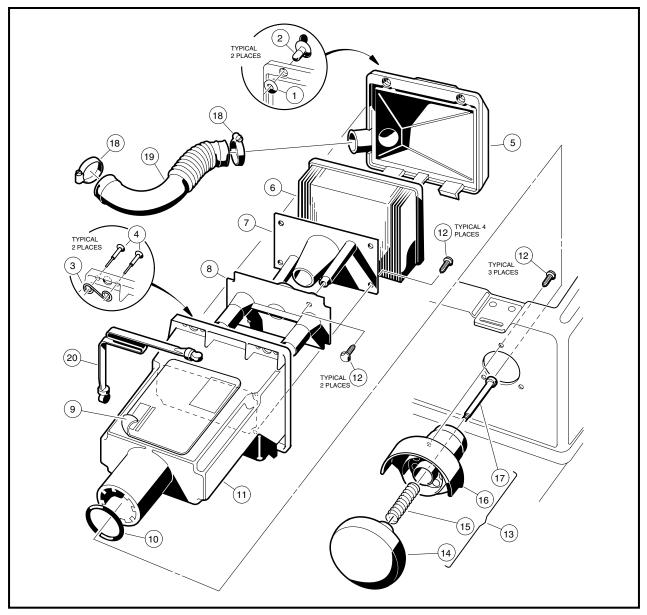


FIGURE 14-12

A WARNING

- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE, WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

Replacing the Air Filter Element

- 1. Remove the seat from the vehicle.
- 2. Turn the wing nuts (2) 1/4 turn and remove the filter housing cover (Figure 14-12).
- 3. Remove the filter element (6) and then, using a clean cloth, wipe away any dust or dirt from inside the housing (Figure 14-12).
- 4. Install a new filter element and then install the filter housing cover. See the CAUTION below.

A CAUTION

- BE SURE THAT THE FEET OF THE FILTER HOUSING COVER ARE BOTH FULLY ENGAGED WITH THE HOUSING DURING INSTALLATION. ENGINE DAMAGE WILL OCCUR IF THE AIR BOX COVER IS NOT PROPERLY SECURED.
- USE ONLY CLUB CAR REPLACEMENT AIR FILTER ELEMENTS (CLUB CAR PART NO. 1015426). THE USE OF OTHER AIR CLEANER ELEMENTS MIGHT RESULT IN ENGINE DAM-AGE. IF THE AIR CLEANER ELEMENT IS TOO THIN, THE COVER WILL SEAT BEFORE THE ELEMENT CAN SEAL, LEAVING SPACE FOR DIRT TO PASS INTO THE ENGINE ON ALL SIDES OF THE ELEMENT. THIS WILL DAMAGE THE ENGINE AND VOID THE WARRANTY.

FUEL FILTERS

GENERAL INFORMATION

Fuel is supplied to the fuel pump and carburetor through flexible lines. Two in-line filters are installed between the fuel tank and the carburetor. Fuel filters, fuel lines, and the fuel tank vent should be inspected periodically for leaks. The primary fuel filter has a white element inside it, and the secondary filter has a blue element inside it.

The fuel filters should be replaced when necessary, but under no circumstances should the period of time between filter changes exceed two years or 300 hours.

A DANGER

• GASOLINE! FLAMMABLE! EXPLOSIVE! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY FROM THE AREA OF THE VEHICLE.

REMOVING THE FUEL FILTERS

- 1. Remove the seat from the vehicle.
- 2. Remove the primary fuel filter (17) (Figure 14-13, Page 14-18):
 - 2.1. Remove the clamps (16) and fuel lines (18 and 19) from the filter (Figure 14-13, Page 14-18).
 - 2.2. To prevent draining of gasoline, plug the fuel lines (18 and 19) (Figure 14-13, Page 14-18).
- 3. Remove the secondary filter (24) (Figure 14-13, Page 14-18):
 - 3.1. Remove the clamps (16 and 20) and fuel lines (23 and 25) from the filter (Figure 14-13).
 - 3.2. To prevent draining of gasoline, plug the fuel lines (23 and 25) (Figure 14-13).

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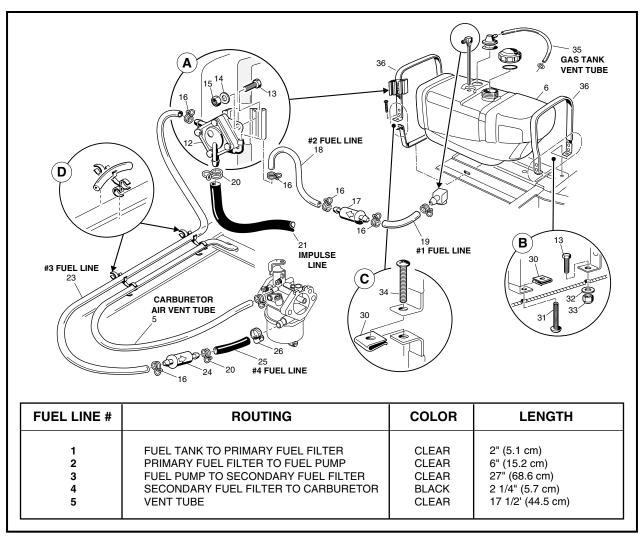


FIGURE 14-13

INSTALLING THE FUEL FILTERS

A CAUTION

- FUEL FILTERS ARE MARKED WITH FLOW DIRECTION ARROWS. MAKE SURE THAT FILTERS ARE INSTALLED WITH ARROWS POINTING IN THE DIRECTION OF FUEL FLOW FROM TANK TO CARBURETOR.
- 1. Install the primary fuel filter (17) in the fuel line. Use new clamps (16) (Figure 14-13).
- 2. Install the secondary fuel filter (24) in the fuel line. Use new clamps (16 and 20) (Figure 14-13).
- 3. Connect the spark plug wire to the spark plug and connect the battery cables, positive (+) cable first.

A DANGER

 THE ENGINE PRODUCES CARBON MONOXIDE, WHICH IS AN ODORLESS AND DEADLY POI-SON. DO NOT OPERATE THE ENGINE IN AN ENCLOSED AREA WITHOUT PROPER VENTILA-TION. 4. Place the forward and reverse lever in the NEUTRAL position and place the neutral lockout cam in the SERVICE position. Start the engine and check for fuel leaks.

A WARNING

- CORRECT ANY FUEL LEAKS BEFORE OPERATING THE VEHICLE.
- 5. Place the neutral lockout cam in the OPERATE position.

FUEL PUMP

GENERAL INFORMATION

The DS gasoline vehicle is equipped with an impulse fuel pump. If the fuel pump is not operating properly, perform the following tests:

- Make sure that all hose clamps are tight.
- Inspect the impulse line and fuel lines for damage or clogging.
- Make sure that the air vent on the fuel pump is not clogged with dirt.

To clean the air vent, the fuel pump must be disassembled.

A DANGER

• GASOLINE! FLAMMABLE! EXPLOSIVE! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY FROM THE AREA OF THE VEHICLE.

WARNING

- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRICAL WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

FUEL PUMP REMOVAL

- 1. Remove the nuts (15) and lock washers (14) attaching the fuel pump (12) and lift the fuel pump out of the engine compartment (Figure 14-13).
- 2. Remove the clamp (20) and remove the impulse line (21) from the fuel pump (Figure 14-13).
- 3. Disconnect the fuel lines (23 and 18) from the pump and plug them to prevent gasoline leaking.

A WARNING

• CAREFULLY DRAIN INTO A CONTAINER ANY FUEL REMAINING IN THE PUMP. PROPERLY DISPOSE OF THE FUEL.

NOTE

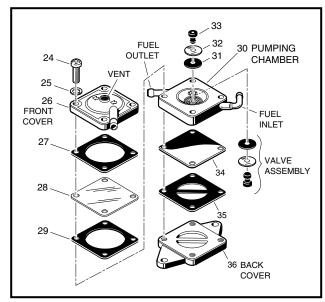
- A FUEL PUMP REBUILD KIT IS AVAILABLE FROM CLUB CAR (CLUB CAR PART NO. 1014524). THIS KIT INCLUDES ALL GASKETS, DIAPHRAGMS, AND VALVES.
- 1. Remove four screws (24) and lock washers (25) from front of the fuel pump (Figure 14-14).
- 2. Remove the front cover (26) of the fuel pump while holding the rest of the pump intact.
- 3. Note the orientations of the impulse gasket (27), the diaphragm (28), and the gasket (29); then remove them from the pump (Figure 14-14).

A CAUTION

- THE GASKETS AND DIAPHRAGMS MUST BE REINSTALLED IN FUEL PUMP IN EXACTLY THE SAME POSITIONS AND ORIENTATIONS THAT THEY WERE IN BEFORE DISASSEMBLY, OR THE PUMP MIGHT LEAK. IF LEAKING OCCURS, ALL NEW GASKETS AND DIAPHRAGMS MUST BE INSTALLED.
- 4. If the impulse gasket (27) and the diaphragm (28) come off with the front cover, note their orientations and remove them (Figure 14-14).
- 5. Remove the pumping chamber (30) (Figure 14-14).
- 6. Remove the back cover (36), the fuel diaphragm (34), and gasket (35) (Figure 14-14).

CLEANING AND INSPECTION OF THE FUEL PUMP

- 1. Using a non-flammable solvent, clean the front cover, pumping chamber, and back cover. Be sure that the vent on the front cover is clean both inside and outside (Figure 14-14).
- 2. Inspect the valve assemblies (31, 32, and 33) and all gaskets and diaphragms for tears or other damage.
- 3. If a valve assembly is damaged, the rubber retaining plug (33) and valve assembly must be replaced (Figure 14-14).



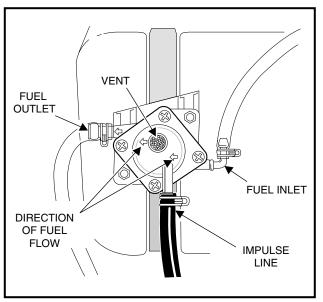


FIGURE 14-14 FIGURE 14-15

FUEL PUMP ASSEMBLY

- 1. Install the fuel gasket (35) and diaphragm (34) on the back cover (36) (Figure 14-14).
- 2. Install the valve assembly in the pumping chamber (Figure 14-14).

A CAUTION

- IF THE VALVE ASSEMBLY IS NOT INSTALLED EXACTLY AS SHOWN, THE IMPULSE FUEL PUMP WILL NOT OPERATE PROPERLY.
- 3. Install the pumping chamber (30) on top of the fuel diaphragm. Be sure that the fuel inlet and the fuel outlet align with the arrows on the back of the back cover (Figure 14-14).
- 4. Install the gasket (29), clear impulse diaphragm (28), and the paper impulse gasket (27) to the pumping chamber (Figure 14-14).
- 5. Install the front cover (Item 26) and then the four screws (24) and lock washers (25) on the assembly (Figure 14-14). Be sure that the arrows on the front cover point from the fuel inlet to the fuel outlet. Tighten the screws to 26 in.lbs. (3.0 N-m) (Figure 14-15).

FUEL PUMP INSTALLATION

1. Connect to the fuel pump the fuel line (18) that comes from the primary fuel filter (17). Install a new clamp (16) (Figure 14-13, Page 14-18). See Page 14-18 for proper routing of fuel lines.

NOTE

- BE SURE TO CONNECT THE FUEL LINE (18), THAT COMES FROM THE PRIMARY FUEL FILTER (17), TO THE INLET NIPPLE ON THE PUMP. THE DIRECTION OF FUEL FLOW IS INDICATED BY THE ARROWS ON THE FUEL PUMP (FIGURE 14-13, PAGE 14-18) (SEE FIGURE 14-15).
- 2. Connect the fuel line (23), that goes to the carburetor, to the output side of the fuel pump (Figure 14-13, Page 14-18).
- 3. Connect the impulse line (21) to the bottom nipple on the fuel pump. Use a new clamp (20) (Figure 14-13, Page 14-18).
- 4. Install the fuel pump on the fuel tank and tighten the mounting bolts to 16-21 in.lbs. (1.8/2.4 N-m) (Figure 14-13, Page 14-18).
- 5. Connect the fuel lines to the primary filter (Figure 14-13, Page 14-18).
- 6. Place the forward and reverse lever in the NEUTRAL position and place the neutral lockout cam in the SERVICE position. Start the engine and check for fuel leaks. If the fuel pump leaks, a rebuild kit must be installed to replace all gaskets and diaphragms.

A DANGER

- THE ENGINE PRODUCES CARBON MONOXIDE, WHICH IS AN ODORLESS, DEADLY POISON. DO NOT OPERATE THE ENGINE IN AN ENCLOSED AREA WITHOUT PROPER VENTILATION.
- CORRECT ANY FUEL LEAKS BEFORE USING THE VEHICLE.
- 7. Place the neutral lockout cam in the OPERATE position.

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GENERAL INFORMATION

The DS gasoline is equipped with a high impact plastic, seven gallon (26.5 liter) fuel tank. If the vehicle is to be placed in extended off-season storage, prepare the vehicle as follows:

- Place the forward and reverse lever in the NEUTRAL position and the neutral lockout cam in the SER-VICE position. Disconnect the fuel line (19) (Figure 14-13, Page 14-18) from the fuel pump and run the engine until fuel remaining in the carburetor and fuel lines is used up and the engine stalls. Return the neutral lockout cam to the OPERATE position.
- 2. Loosen (do not remove) the carburetor drain screw (11) (Figure 14-7, Page 14-7) and drain fuel remaining in the carburetor bowl into an approved container, then pour the fuel from the container into the fuel tank.
- 3. Reconnect the fuel line to the fuel pump.
- 4. Disconnect the fuel vent line (35) (Figure 14-13, Page 14-18) from the fuel tank vent nipple.
- 5. Plug the fuel tank vent nipple so that it is air tight. We recommend using a slip-on vinyl cap.

DANGER

- GASOLINE! FLAMMABLE! EXPLOSIVE! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY FROM THE AREA OF THE VEHICLE.
- SERVICE OR REPAIR IN A WELL-VENTILATED AREA ONLY.
- DISPOSE OF GASOLINE PROPERLY.

WARNING

• IF THE FUEL TANK IS DAMAGED, REPLACE IT. DO NOT ATTEMPT TO REPAIR IT. FOLLOW THE TANK REMOVAL AND DISPOSAL PROCEDURE BELOW.

A CAUTION

ADD ONLY UNLEADED GASOLINE TO THE TANK. DO NOT PUT OIL INTO THE FUEL TANK.

FUEL TANK REMOVAL

- 1. Remove the seat, the seat back support, and rear body from the vehicle. See Section 5.
- 2. Place the forward and reverse lever in the NEUTRAL position and the neutral lockout cam in the SER-VICE position. Disconnect the fuel line (19) **(Figure 14-13, Page 14-18)** from the fuel tank nipple and run the engine until fuel remaining in the carburetor, fuel pump, and fuel lines is used up and the engine stalls. Return the neutral lockout cam to the OPERATE position.
- 3. Loosen (do not remove) the carburetor drain screw (11) (Figure 14-7, Page 14-7) and drain fuel remaining in the carburetor bowl into an approved container.
- 4. Using a siphon with a suction device, siphon all fuel out of the tank and into an approved container. See the WARNINGS below.

A WARNING

- NEVER ATTEMPT TO SIPHON FUEL USING A HOSE THAT DOES NOT HAVE A BUILT-IN SUCTION DEVICE.
- NEVER ATTEMPT TO SIPHON FUEL USING YOUR MOUTH.

- 5. Remove the nuts (15) and lock washers (14) and remove the fuel pump from the tank (Figure 14-13, Page 14-18).
- 6. Loosen the straps (36) as follows:
 - 6.1. Remove the screws (31 and 34) from the speed nuts (30) (Figure 14-13, Page 14-18).
 - 6.2. Remove the screws (13), nuts (33), and washers (32) (Figure 14-13, Page 14-18).
- 7. Lift the fuel tank out of the vehicle.

FUEL TANK DISPOSAL

- 1. Remove the cap from the tank and thoroughly rinse it with water. The cap may be discarded or kept as a spare.
- 2. In a well-ventilated area, flush the fuel tank with water to remove any remaining gasoline.
- 3. In a well-ventilated area, set the tank upside down so that the water can drain out of it. To make sure that the tank dries completely, allow the tank to sit for 24 hours.
- 4. Dispose of or recycle the tank in accordance with all applicable laws and regulations.

FUEL TANK STORAGE

- 1. Remove the cap from the tank and thoroughly rinse it with water.
- 2. In a well-ventilated area, flush the fuel tank with water to remove any remaining gasoline.
- 3. In a well-ventilated area, set the tank upside down so that the water can drain out of it. To make sure that the tank dries completely, allow the tank to sit for 24 hours.
- 4. Store the tank upside down, with the cap installed, in a well-ventilated area.

FUEL TANK INSTALLATION

- 1. Place the fuel tank in position in the vehicle.
- 2. Secure the tank with the retaining straps (36) (Figure 14-13, Page 14-18).
 - 2.1. Position the straps in the indentions on the tank as shown (Figure 14-13, Page 14-18).
 - 2.2. Install the screws (31 and 34) into the speed nuts (30), and install the screws (13), nuts (33), and washers (32). Tighten the screws and nuts to 8-10 in.lbs. (.91/1.1 N-m) (Figure 14-13, Page 14-18).

WARNING

- DO NOT OVERTIGHTEN THE NUTS IN STEP 3. OVERTIGHTENING THE NUTS MAY DAMAGE THE FUEL PUMP BRACKET.
- 3. Install the fuel pump on the tank and tighten the mounting nuts to 16-21 in.lbs. (1.8/2.4 N-m).
- 4. Connect the fuel line (19) to the fuel tank nipple. Use a new clamp (Figure 14-13, Page 14-18).
- 5. Install the rear body, seat back support, and seat on the vehicle (See Section 5 of this manual).
- 6. Add gasoline to the tank.

A WARNING

 AFTER INSTALLING THE FUEL TANK AND ADDING GASOLINE, CAREFULLY CHECK ALL FUEL LINES AND CONNECTIONS FOR LEAKS. FIX ANY LEAKS BEFORE USING THE VEHICLE.

FUEL LINES

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The fuel lines on the DS gasoline vehicle must be properly routed, and all hose clamps must be tight. The fuel lines should be kept clean.

A WARNING

MAKE SURE THAT THE FUEL LINES ARE THE RIGHT LENGTH AND ARE PROPERLY ROUTED.
 FAILURE TO HEED THIS WARNING COULD RESULT IN DAMAGE TO THE FUEL LINES AND FIRE.

Fuel line No. 1 runs directly from the fuel tank to the primary fuel filter. The primary fuel filter has an arrow indicating fuel flow direction and has a white filter element inside of it (Figure 14-13, Page 14-18).

Fuel line No. 2 runs directly from the primary fuel filter to the fuel inlet of the fuel pump.

Fuel line No. 3 runs directly from the fuel outlet of the fuel pump to the secondary fuel filter. The secondary fuel filter has an arrow indicating fuel flow direction and has a blue filter element inside of it.

Fuel line No. 4, a black 2 1/4 inch fuel line, runs from the outlet of the secondary fuel filter to the carburetor.

Small round dual wire clamps or spring steel band clamps are used on all hose connections except at the carburetor. A screw band clamp is used at the carburetor (Figure 14-13, Page 14-18).

FUEL TANK VENT

WARNING

 TO PREVENT VENT TUBE FROM BEING CRIMPED AGAINST THE VEHICLE BODY, THE FUEL TANK VENT AND TUBE MUST BE ORIENTED AS SHOWN IN FIGURE 12-16.

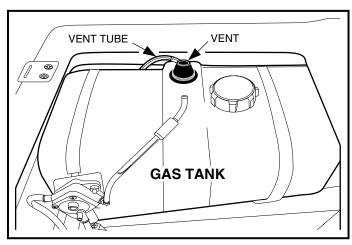


FIGURE 14-16

SECTION 15 - EXHAUST SYSTEM



GENERAL INFORMATION

The exhaust system on the DS gasoline vehicle is designed to provide quiet vehicle operation. If the muffler should ever need to be removed for repairs or replacement, follow the instructions below.

MUFFLER

A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSI-TION, AND REMOVE KEY PRIOR TO SERVICING.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- HOT! DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERY OR ELECTRICAL CON-NECTIONS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

Removing The Muffler

- 1. Remove the service access panel from the rear body. It is located between the seat and bag well.
- 2. Remove the seat from the vehicle.
- 3. Disconnect the spark plug wire from the spark plug and disconnect the battery cables, negative (-) cable first.
- 4. Remove the retaining bolts (5), lock washers (4), and flat washers (3) from the muffler bracket (2) (Figure 15-1, Page 15-2).
- 5. Remove the hex nuts (10) and lock washers (11) (Figure 15-1, Page 15-2).
- 6. Remove the hex head cap screw (7), lock washer (8), and flat washer (9) (Figure 15-1, Page 15-2).
- 7. Remove the muffler and bracket assembly from the vehicle.

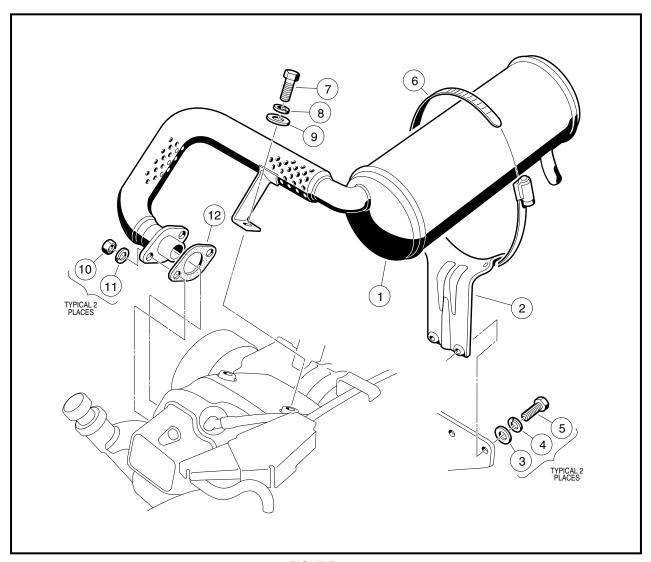


FIGURE 15-1

Installing The Muffler

NOTE

- ANYTIME THE MUFFLER IS REMOVED FROM THE VEHICLE, REPLACE THE MUFFLER CLAMP, ITEM 6, FIGURE 15-1 (CLUB CAR PART NO. 1017689) WITH A NEW ONE.
- 1. Use the muffler clamp (6) to attach the muffler bracket (Item 2) to the muffler as shown (Figure 15-1). Leave the muffler clamp loose enough to allow the muffler to move as the mounting hardware is tightened. If installing a new muffler, use the old one as a positioning guide for the clamp and bracket.
- 2. Place a new gasket (12) on the exhaust manifold mounting flange as shown.
- 3. Position the muffler and bracket assembly and install the bolts (5), lock washers (4), and flat washers (3). Thread the bolts in only enough to support the muffler and bracket assembly. Do not tighten them.
- 4. Install the hex nuts (10) and lock washers (11). Tighten the nuts fingertight.
- 5. Install the hex head cap screw (7), lock washer (8), and flat washer (9). Tighten the cap screw finger-tight.

- 6. Tighten the hex nuts (10) to 10-12 ft.lbs (13.5/16 N-m).
- 7. Tighten the hex cap screw (7) to 12-15 ft.lbs (16/20 N-m).
- 8. Tighten the muffler clamp (6).
- 9. Tighten the muffler bracket mounting bolts (5) to 70-80 in.lbs. (8/9 N-m).
- 10. Connect the spark plug wire and then the battery cables, positive (+) cable first.
- 11. Place the forward and reverse lever in the NEUTRAL position and the neutral lock-out cam in the SER-VICE position. Start the engine and check for exhaust leaks and proper engine operation. See DAN-GER below.

A DANGER

- GASOLINE! FLAMMABLE! EXPLOSIVE! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY FROM THE AREA OF THE VEHICLE.
- THE ENGINE PRODUCES CARBON MONOXIDE, WHICH IS AN ODORLESS AND DEADLY POISON. DO NOT OPERATE THE ENGINE IN AN ENCLOSED AREA WITHOUT PROPER VENTILATION.

NOTE

• AFTER THE EXHAUST AND ENGINE CHECK, RETURN THE NEUTRAL LOCK-OUT CAM TO THE **OPERATE** POSITION.

SECTION 16 - TORQUE CONVERTER



WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERY.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSI-TION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

GENERAL INFORMATION

The torque converter consists of a drive clutch, a driven clutch, and a drive belt. The drive clutch, which is mounted to the engine, is in the open position when the engine is at idle. At this point, the belt is riding at a low position (smaller diameter) on the drive clutch. The driven clutch is mounted on the transmission. It is in the closed position, and the drive belt is riding at a high position (large diameter) on it when the engine is at idle.

At the point of clutch engagement, the speed ratio of the drive clutch to the driven clutch is 3.5 to 1. This ratio provides excellent starting and low speed torque.

As engine speed increases, centrifugal force on internal weights closes the drive clutch, pushing the belt up to a higher position on the clutch (increasing belt loop diameter). As the belt loop diameter increases at the drive clutch, the driven clutch is forced open as its belt loop diameter decreases. At governed top speed, the ratio of drive clutch to driven clutch is .92 to 1.

On steep grades, or when the vehicle is heavily loaded, higher torques at higher speeds are acheived through the use of a torque-sensing ramp device on the driven clutch. This device overcomes the force of the centrifugal weights to close the driven clutch and open the drive clutch, thus increasing axle torque with little or no change in engine RPM.

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General Information, Continued:

To provide optimum performance for the OHV engine and powertrain, Club Car has developed a series of tuned clutches. When ordering replacement clutches or clutch parts for a DS vehicle with an OHV engine, the following part numbers should be specified:

- Drive Clutch Assembly Club Car Part No. 1016378-02
- Driven Clutch Assembly Club Car Part No. 1016360-01
- Drive Clutch Weight Kit Club Car Part No. 1016801

To properly disassemble and assemble the torque converter, the following tools are required:

- Drive Clutch Puller Club Car Part No. 1014496
- Drive Clutch Hub Puller Club Car Part No. 1014497
- Drive Clutch Holder Tool Club Car Part No. 1015524
- Clutch Alignment Tool Club Car Part No. 1014498
- Driven Clutch Puller Plug Club Car Part No. 1014507
- Driven Clutch Cam Puller Club Car Part No. 1014508
- Press Weldment Club Car Part No. 1018091-01

All of the tools listed above are available in a torque converter tool kit, Club Car Part No. 1014510 (Figure 16-1).

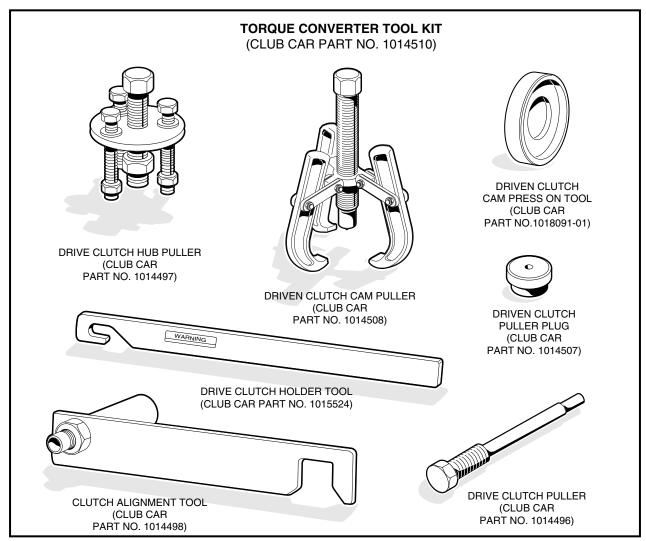


FIGURE 16-1

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH THE BATTERY.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERY OR ELECTRICAL CON-NECTIONS.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

Maintaining proper adjustment of the engine and governor, as well as the torque converter, is essential to the troubleshooting process. If these adjustments are within Club Car specifications and, when climbing a steep hill, the engine begins to bog before the drive belt reaches the top of the driven clutch, there is a torque converter problem.

If the torque converter is not operating properly:

- 1. Check the governor and throttle settings (See Section 14).
- 2. Inspect the driven clutch for dirt and dust buildup on its component parts. Wash the driven clutch off with water to remove any dust or dirt, then drive the vehicle and check for proper operation.
- 3. If washing the driven clutch does not solve the problem, disassemble and thoroughly clean all parts of the drive clutch. Be sure to clean the plastic drive buttons (10) (Figure 16-5, Page 16-7).

DRIVE BELT

The drive belt should be inspected semi-annually for wear and (or) glazing. If it is excessively worn, frayed, or glazed, replace the belt.

NOTE

 AS THE DRIVE BELT WEARS, THE ENGINE RPM WILL INCREASE TO COMPENSATE FOR THE CHANGE IN TORQUE CONVERTER RATIO. THIS WILL KEEP THE VEHICLE'S MAXIMUM GROUND SPEED AT 12-15 MPH (19/24 KPH).

 ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR.

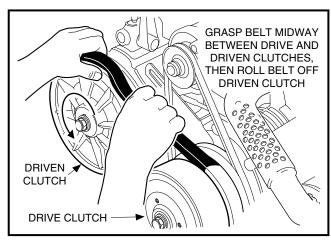


FIGURE 16-2

 Grasp the belt midway between the drive and driven clutches. Lift upward on the belt to force the sheaves of the DRIVEN clutch apart, then roll the belt off of the DRIVEN clutch (Figure 16-2). See CAUTION below.

A CAUTION

- MAKE SURE THAT FINGERS ARE NOT UNDERNEATH THE BELT WHEN ROLLING IT OFF OF THE DRIVEN CLUTCH IN STEP 1.
- 2. Remove the belt from the drive clutch.

INSTALLING THE DRIVE BELT

- 1. Position the new belt on the DRIVE clutch, then start the belt over the driven clutch.
- 2. With the belt started onto the driven clutch, rotate both clutches and roll the belt over the driven clutch sheaves and onto the clutch.

DRIVE CLUTCH

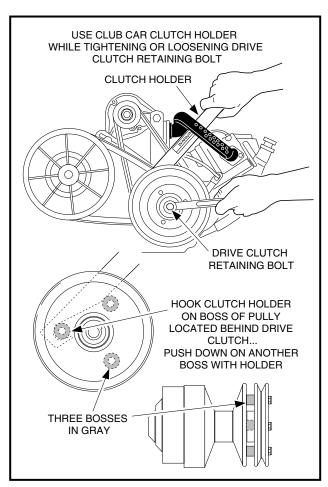
A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH THE BATTERY.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.

- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERY OR ELECTRICAL CON-NECTIONS.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

A CAUTION

• BE VERY CAREFUL WHEN HANDLING THE CLUTCHES. A CLUTCH THAT HAS BEEN DROPPED WILL NOT BE PROPERLY BALANCED. IF EITHER CLUTCH IS DROPPED, ASSUME THAT IT IS DAMAGED AND REPLACE IT.





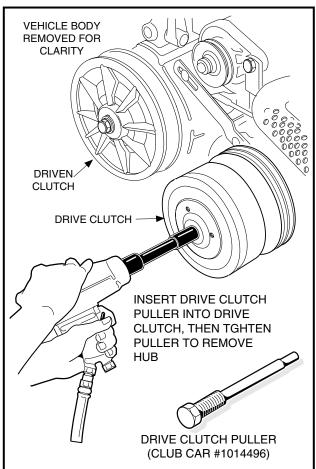


FIGURE 16-4

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DRIVE CLUTCH REMOVAL

- 1. Remove the seat from the vehicle.
- 2. Remove the drive belt as instructed on page 16-4.
- Remove the service panel from rear body.
- 4. Loosen the starter/generator mounting and adjusting hardware and then remove the starter belt.
- 5. Remove the drive clutch retaining bolt (17), lock washer (18), and flat washer (19) (Figure 16-5).
- 6. Use a Drive Clutch Puller (Club Car Part No. 1014496) to remove the entire drive clutch assembly (See CAUTION below):
 - 6.1. Insert the Drive Clutch Puller into the clutch retaining bolt hole and tighten the bolt. As the bolt is tightened, the drive clutch assembly will come free of the crankshaft.
 - 6.2. While supporting the drive clutch assembly in your hand, back the clutch puller bolt out of the crankshaft.

A CAUTION

• DO NOT HIT OR TAP THE CLUTCH WITH A HAMMER. DO NOT PRY THE CLUTCH. THESE ACTIONS WILL DAMAGE THE CLUTCH.

CLEANING AND INSPECTION OF THE DRIVE CLUTCH

1. Use a brush or a lint free cloth to clean clutch parts.

A CAUTION

- DO NOT LUBRICATE THE DRIVE CLUTCH. LUBRICANTS ATTRACT DIRT AND DUST WHICH INTERFERE WITH PROPER OPERATION OF THE CLUTCH.
- USE ONLY A DRY CLOTH TO LIGHTLY WIPE THE SHAFT OF THE FIXED FACE ASSEMBLY (7)
 (FIGURE 16-5). DO NOT USE A BRUSH OR STEEL WOOL. THESE WILL DAMAGE THE SURFACE
 OF THE SHAFT.
- DO NOT USE SOLVENTS. SOLVENTS WILL DAMAGE THE LUBRICATING CHARACTERISTICS OF THE BUSHINGS.
- 2. Inspect the belt contact surfaces of the clutch sheaves for wear. If any area of a sheave contact surface has wear of .060 inch (1.52 mm) or more, the clutch should be replaced.

DRIVE CLUTCH DISASSEMBLY

A CAUTION

- THE DRIVE CLUTCH IS BALANCED AS AN ASSEMBLY. BEFORE DISASSEMBLY, MAKE MATCH MARKS ON THE CLUTCH COVER AND ON THE MOVEABLE FACE ASSEMBLY SO THAT THEY CAN BE REASSEMBLED IN SAME RELATIVE POSITIONS (FIGURE 16-6, PAGE 16-8).
- 1. Make match marks on the clutch cover and on the moveable face casting (Figure 16-6, Page 16-8).
- 2. Remove the clutch cover (1) (Figure 16-5):
 - 2.1. Thread the center bolt of a Drive Clutch Hub Puller (Club Car Part No. 1014497) into the clutch until the stop nut touches the clutch, then back the bolt out one-half of a turn (Figure 16-7, Page 16-8).
 - 2.2. Thread the three small bolts of the puller into the corresponding holes in the clutch. Tighten bolts evenly, making sure that the face of the puller plate is parallel to the face of clutch (**Figure 16-7**).
 - 2.3. Screw the puller center bolt out of the clutch to pull clutch cover off.

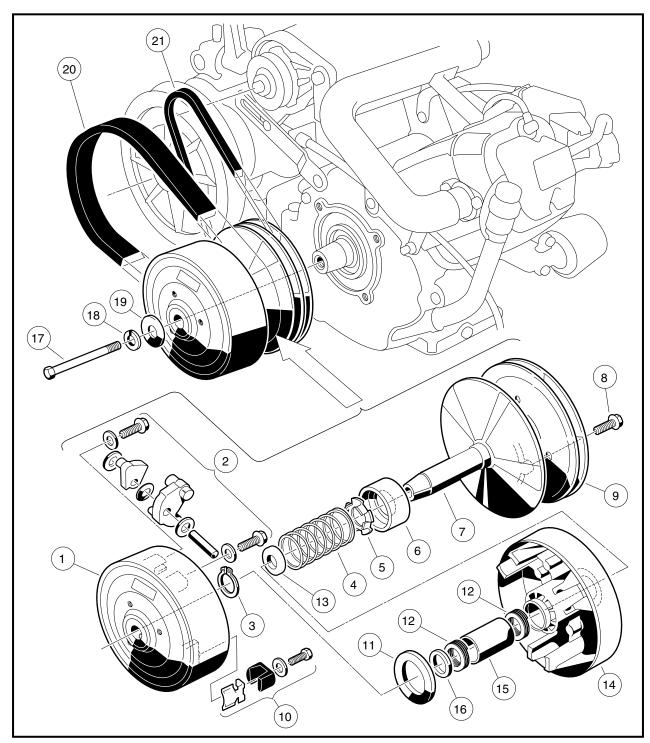


FIGURE 16-5

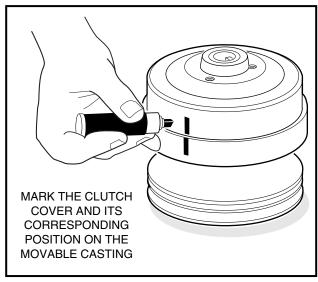
- 3. Remove the thrust washer (11) from the moveable face (14) (Figure 16-5).
- 4. Remove the clutch buttons (Figure 16-8, Page 16-9):
 - 4.1. Remove the screws, flat washers, drive button take-up springs, and drive buttons as shown (Figure 16-8).
- 5. Remove the clutch weights (Figure 16-9, Page 16-9):
 - 5.1. Remove the screws and flat washers attaching the weight assemblies, as shown (Figure 16-9).

Drive Clutch Disassembly, Continued:

- 5.2. Pull the weight assemblies, with pins, from the clutch.
- 5.3. Note the orientations of the wave washer and of the primary and secondary weights to one another (Figures 16-12 and 16-13, Page 16-10). Then remove the plastic washers, the weights, and the wave washer from the pin. Retain all parts. See CAUTION below.

A CAUTION

• BEFORE REMOVING THEM, NOTE THE ORIENTATIONS OF THE WAVE WASHER AND OF THE PRIMARY AND SECONDARY WEIGHTS TO ANOTHER.



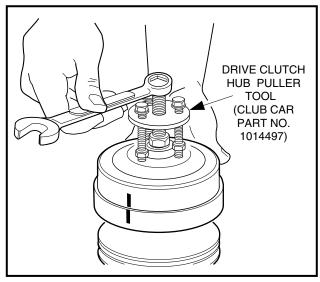


FIGURE 16-6

FIGURE 16-7

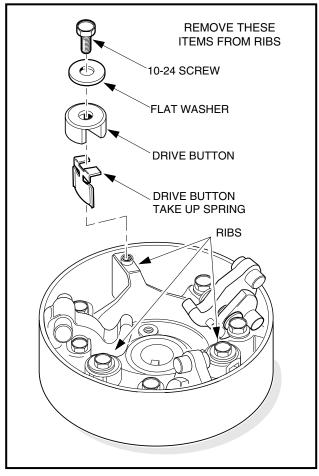
6. Remove the retaining ring (3) from the hub (7) of the fixed face assembly and slide the moveable face (14) off the hub (Figure 16-5, Page 16-7). See NOTE below.

NOTE

- IF THE MOVEABLE FACE IS REMOVED FROM THE HUB OF THE FIXED FACE, THE SPIRAL WIPERS (12) (FIGURE 16-5) MUST BE REPLACED WITH NEW ONES.
- 7. Remove the spacer (16), and spring (4) and retainer (5). The spring retainer can be removed from the spring if necessary (Figure 16-5).
- 8. If necessary, remove the idler bearing. Use a press to remove the bearing (Figure 16-10). See NOTE below.

NOTE

- DO NOT REMOVE THE IDLER BEARING UNLESS IT NEEDS TO BE REPLACED. IF IS REMOVED, REPLACE IT WITH A NEW BEARING.
- 9. Use a scribe to remove the spiral back-up ring (12) (Figure 16-5, Page 16-7) from each end of the bore in the fixed face assembly (See Figure 16-11). Discard the spiral back-up rings.



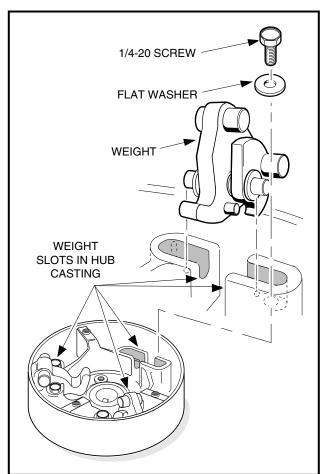
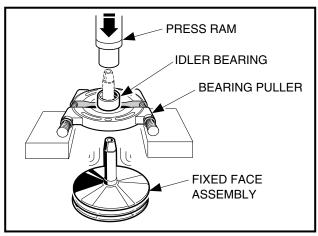


FIGURE 16-8



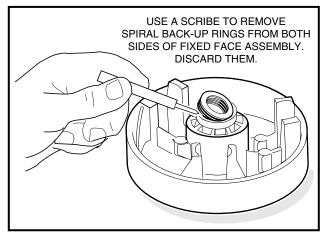


FIGURE 16-9

FIGURE 16-10 FIGURE 16-11

INSPECTION OF DRIVE CLUTCH PARTS

1. Inspect the idler bearing (6) for smooth rotation or seal damage (Figure 16-5, Page 16-7).

NOTE

• IT IS NORMAL FOR A SMALL AMOUNT OF GREASE TO BE PRESENT AT THE EDGE OF THE SEAL.

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Inspection of Drive Clutch Parts, Continued:

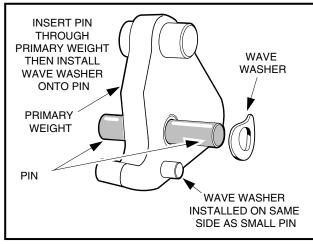
- 2. Inspect the bore of the moveable face assembly (14) **(Figure 16-5, Page 16-7)** for scarring or wear. The moveable face assembly must be replaced if the bore is worn to a diameter of .883 inches (22.4 mm) or larger.
- 3. Inspect the steel shaft on the fixed face assembly. There should be no measurable wear anywhere on the shaft. Replace the shaft if it is worn, scratched, or damaged (Figure 16-5).
- 4. Inspect the thrust washer (11) for wear. If it is worn more than .030 inches (0.76 mm), turn it over or replace it with a new one (Figure 16-5).
- 5. Inspect the primary weights (2) and the hub casting for wear. If the primary weights show signs that they are touching the casting, the tips of the weights have worn beyond specification and the primary weights must be replaced (**Figure 16-5**).
- 6. Inspect the pins on the primary weights (2). There should be no measurable wear. Replace them if they are worn, scratched, or damaged (**Figure 16-5**).
- 7. Inspect the drive belt pulley sheaves for excessive wear or damage. If the sheaves are excessively worn or damaged, replace the entire fixed face drive assembly.

DRIVE CLUTCH ASSEMBLY

- 1. Press idler bearing (6) onto the hub of the fixed face assembly (7). Press on the inner race of the bearing only. Make sure that the cup side of the bearing is facing away from the fixed face (Figure 16-5).
- 2. Using needle nose pliers, install the spring retainer (5) onto the spring (4) (Figure 16-5).
- 3. Install the spring and retainer into the cup of the idler bearing (Figure 16-5).
- 4. Install the spacer (13) onto the shaft of the fixed face (Figure 16-5).
- 5. Install a new spiral back-up ring (12) in each end of the bore of the moveable face assembly (14) **(Figure 16-5)**.
- 6. Install the moveable face assembly onto the shaft of the fixed face assembly (7) (Figure 16-5).

A CAUTION

- TO AVOID DAMAGING THE SPIRAL WIPERS, BE VERY CAREFUL WHEN INSTALLING THE MOVEABLE FACE.
 - 6.1. Rotate the moveable face assembly clockwise while installing it onto the shaft.
 - 6.2. Install the retaining ring (3) (Figure 16-5).
- 7. Install the primary weights on the mounting pins (2) (Figure 16-12).



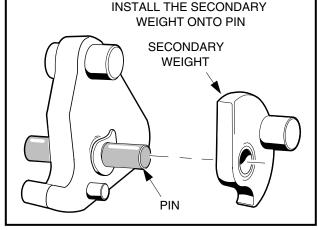


FIGURE 16-12

FIGURE 16-13

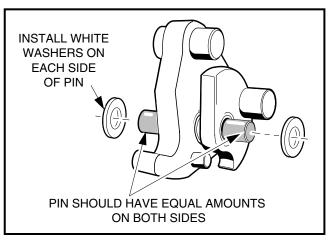


FIGURE 16-14

- 8. Install a wave washer on each mounting pin. Make sure that the concave side of the washer faces the side of the primary weight with the small guide pin protruding from it (Figure 16-12).
- Install the secondary weights onto the mounting pins with the weight pins on the secondary weights pointing away from the primary weights. The wave washers should be between the primary and secondary weights (Figure 16-13).
- 10. Install white plastic flat washers on each end of the mounting pins and push them against the outside surfaces of the weights. Center the weights and washers on the mounting pins (Figure 16-14).
- 11. Install the weight assemblies into the slots in the hub casting (Figure 16-9, Page 16-9). Make sure that the mounting pin protrudes an equal amount on each side of the weights when the assemblies are in position (Figure 16-14).

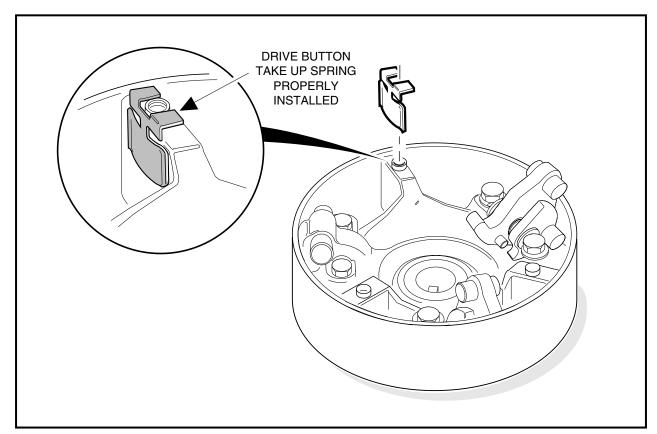


FIGURE 16-15

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Drive Clutch Assembly, Continued:

12. Install the 1/4-20 screws and washers (2) and tighten them to 10 ft.lbs. (13 N-m). See NOTE below (Figure 16-5, Page 16-7).

NOTE

- MAKE SURE THAT THERE IS AT LEAST A (MINIMUM) GAP OF .020 INCHES (0.51 MM) BETWEEN EACH END OF THE MOUNTING PIN AND THE MOUNTING SCREW.
- 13. Install one drive button take-up spring.
 - 13.1. Install spring on left side of any one of the three button mounting posts (when looking into the interior of the clutch cover with the rib at the twelve o'clock posiiton) as shown (See Figure 16-15, Page 16-11).
- 14. While compressing the take-up spring, install a drive button over the rib and take-up spring as shown. Install remaining two buttons. (Figure 16-15, Page 16-11).
- 15. Install a No. 10-24 button retaining screw with flat washer (10) (Figure 16-5, Page 16-7) through each button and into the rib. Tighten the screws to 30-60 in.lbs. (3.39/4.07 N-m) (Figure 16-15, Page 16-11).
- 16. Install the thrust washer (11) onto the moveable face assembly (Figure 16-5, Page 16-7).
- 17. Install the hub assembly (1) into the moveable face assembly and align the match marks made before disassembling the clutch. Press the hub assembly on by hand (Figure 16-5, Page 16-7).

INSTALLATION OF THE DRIVE CLUTCH

- 1. Place the drive clutch assembly on the crankshaft taper. Position the lock washer (18) and the mounting washer (19) on the bolt (17) and start the bolt into the crankshaft. Tighten the bolt to 23-28 ft.lbs. (31/38 N-m) (Figure 16-5, Page 16-7).
- 2. Install the starter/generator belt and adjust belt tension as instructed on Page 12-37. Tighten the mounting hardware to 21-25 ft.lb. (28.4/40 N-m) and adjusting hardware to 12-14 ft. lbs. (16/19 N-m).
- 3. Install the drive belt as instructed on Page 16-4.
- 4. Connect the battery cables, positive (+) cable first.
- 5. Connect the spark plug wire to the plug.
- 6. Drive the vehicle and check for proper operation.

DRIVEN CLUTCH

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERY.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERY OR ELECTRICAL CON-NECTIONS.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.

WARNING

- HOT! DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

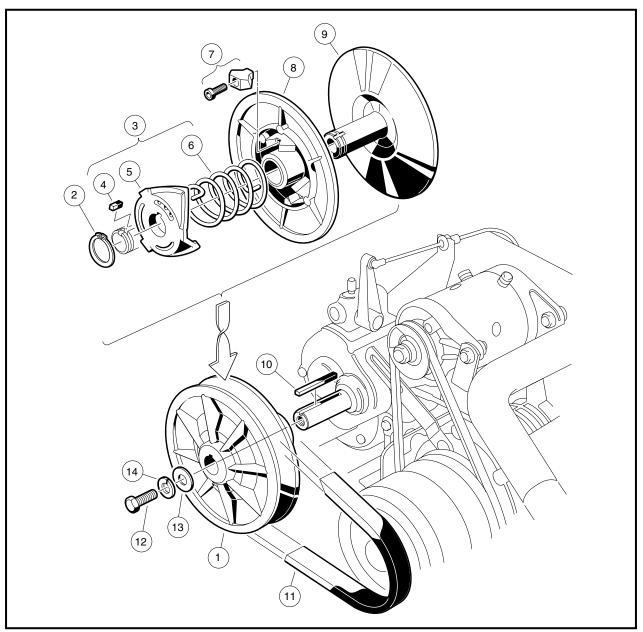
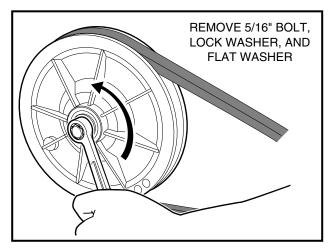


FIGURE 16-16



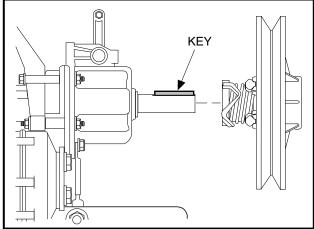


FIGURE 16-17

FIGURE 16-18

REMOVING THE DRIVEN CLUTCH

- 1. Remove the seat from the vehicle.
- 2. Remove the drive belt as instructed on Page 16-4.
- 3. Remove the center bolt, lock washer, and flat washer from the clutch shaft (Figure 16-17).
- 4. Grasp the driven clutch assembly and slide it off of the shaft.
- 5. Leave the key in the keyway (Figure 16-18).

DISASSEMBLY OF THE DRIVEN CLUTCH

1. Using external snap ring pliers, remove the retaining ring (4) (Figure 16-19).

A CAUTION

- DO NOT PLACE FINGERS UNDER THE CAM WHEN REMOVING IT. THE MOVEABLE FACE MAY SPIN WHEN THE CAM BUTTONS RELEASE FROM THE CAM RAMPS, RESULTING IN SEVERE PERSONAL INJURY.
- 2. Insert a puller plug (Club Car Part No. 1014507) into the shaft bore and use a driven clutch cam puller (Club Car Part No. 1014508) to remove the cam (5) from the fixed face hub (9). Retain the key (4) (Figure 16-16, Page 16-13) (See Figure 16-20).

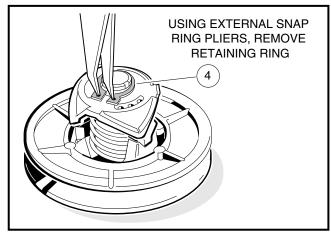


FIGURE 16-19

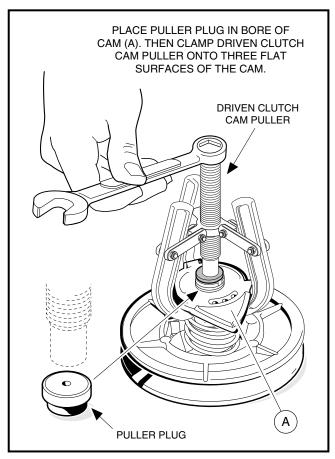


FIGURE 16-20

- 3. Remove the spring (6) (Figure 16-16, Page 16-13).
- 4. Slide the moveable face (8) off of the fixed face hub (9) (Figure 16-16).

INSPECTION OF THE DRIVEN CLUTCH

- 1. Inspect the cam (5) for excessive wear. Replace it if necessary (Figure 16-16, Page 16-13).
- 2. Inspect the drive buttons (7) for excessive wear. Replace if necessary. To remove the drive buttons, remove the socket head cap screws and then the buttons (Figure 16-16, Page 16-13).
- 3. Inspect the sheaves on the fixed and moveable face assemblies. Sheaves must be replaced if they are worn more than .060 of an inch (1.5 mm).
- 4. Inspect the bearing in the moveable face. If the bearing bore diameter is more than 1.384 inches (35.15 mm), the entire moveable face assembly must be replaced.
- 5. Inspect the shaft of the fixed face assembly. There should be no measurable wear. Replace the shaft if it is worn, scratched, or damaged.

ASSEMBLY OF THE DRIVEN CLUTCH

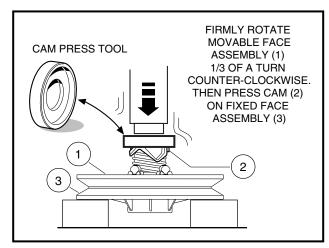
- 1. Place the three drive buttons (7) in position. Apply one drop of Loctite® 222 to each of the #8-32 socket head cap screws and then install and tighten them to 7-9 in.lbs. (0.80/1.02 N-m) (Figure 16-16, Page 16-13).
- 2. Slide the moveable face assembly (8) onto the fixed face hub (9) (Figure 16-16).
- 3. Place the end of the spring (4) into the hole in the moveable face assembly.
- 4. Install the key (4) into the keyway of the fixed face assembly (9) shaft (Figure 16-16).

Assembly of the Driven Clutch, Continued:

- 5. Holding the cam (5) in position for assembly on the shaft, install the other end of the spring (6) into the center spring hole of the cam. Rotate the cam until the keyway is aligned with the key (4) on the fixed face assembly, and then start the cam onto the shaft approximately 1/4 to 3/8 of an inch (6.3/9.5 mm) (Figure 16-16, Page 16-13).
- 6. Place the clutch assembly in a press and position the cam press tool (Club Car Part No. 1018091-01) on the cam as shown (Figure 16-21). Hold the fixed face assembly and rotate the moveable face assembly (1) one third of a turn counterclockwise, then press the cam (2) onto the fixed face assembly.
- 7. Install the retaining ring (2) (Figure 16-16, Page 16-13).
- 8. While holding onto the cam, tap the end of the fixed face hub lightly with a plastic mallet until the cam seats against the retaining ring. See CAUTION below.

A CAUTION

 DO NOT USE A METAL HAMMER TO TAP THE FIXED FACE HUB. A METAL HAMMER WILL DAM-AGE THE SHAFT.



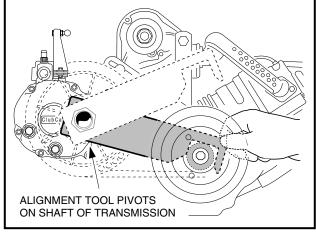


FIGURE 16-21

FIGURE 16-22

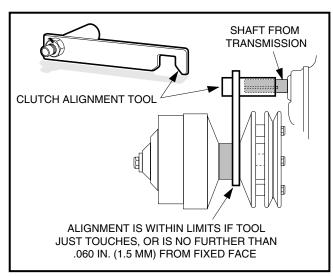


FIGURE 16-23

1. To install the driven clutch, reverse the removal procedure. Before tightening the center bolt to 14 ft.lbs. (16/19 N-m), make sure that the flat washer (13), is installed between the center bolt and the clutch (Figure 16-16, Page 16-13).

CLUTCH ALIGNMENT

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERY.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERY OR ELECTRICAL CONNECTIONS.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

If the engine or transaxle has been removed from the vehicle, or the engine mounts loosened, or if the vehicle seems to vibrate excessively, the clutch alignment should be checked. Use a clutch alignment tool (Club Car Part No. 1014498) to check clutch alignment as follows:

- 1. Remove the drive belt from the clutches (See Page 16-4).
- 2. Remove the driven clutch from the transmission (See Page 16-14).
- 3. Slide the clutch alignment tool onto the shaft of the transmission until it seats against the transmission.
- 4. Swing the clutch alignment tool around and position the other end on the shaft of the drive clutch as shown (Figure 16-22).
- 5. Although slight grazing of front or rear edge of the slot in the tool against the center shaft bearing is acceptable, the alignment tool should come down over the center shaft bearing of the drive clutch without having to be forced. The alignment is within limits if the tool just touches the fixed face of the drive clutch or if it is no further than .060 of an inch (1.5 mm) from the fixed face (Figure 16-23).
- 6. If the clutches are out of alignment, the engine mounting bolts must be loosened and the engine moved to bring the clutches into alignment per Step 6.

NOTE

- THE ENGINE MOUNTING BOLTS THAT CAN BE ADJUSTED ARE THE FOUR BOLTS WHICH SECURE THE ENGINE TO THE ENGINE MOUNTING PLATE. THE ENGINE ISOLATOR BOLTS CANNOT BE ADJUSTED.
- 7. Tighten the engine mounting bolts to 22-25 ft.lbs. (30/34 N-m).
- 8. Check clutch alignment again.

SECTION 17 - TRANSMISSION AND GOVERNOR



A DANGER

- GASOLINE VAPORS FLAMMABLE DO NOT SMOKE! KEEP SPARKS, FLAMES, CIGARETTES AWAY. TOOLS, WIRES AND METAL OBJECTS CAN CAUSE SPARKS WHEN "SHORTED" ACROSS A BATTERY. INSULATED TOOLS SHOULD BE USED. EXTREME CARE SHOULD BE TAKEN WHEN DISCONNECTING OR CONNECTING BATTERY. WHEN THE WIRES ARE DISCONNECTED, BE SURE TO KEEP THEM AWAY FROM BATTERY POSTS AND OTHER WIRES. SERVICE ONLY IN WELL-VENTILATED AREAS.
- DO NOT OPERATE A GASOLINE VEHICLE IN AN ENCLOSED AREA WITHOUT PROPER VENTI-LATION. ENGINE PRODUCES CARBON MONOXIDE WHICH IS AN ODORLESS, DEADLY POI-SON.

A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE SOME KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE, WEAR A FULL-FACE SHIELD WHEN WORKING WITH THE BATTERY.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION. AND REMOVE KEY BEFORE SERVICING THE VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR THE BATTERY OR ELECTRICAL CONNECTIONS.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, ALWAYS BEFORE SERVICING:
 - DISCONNECT THE BATTERY CABLES, NEGATIVE (-) FIRST AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

A CAUTION

 CLEAN TRANSMISSION BEFORE DISASSEMBLY. ANY DIRT ENTERING THE TRANSMISSION OR OTHER PARTS WILL WORK AS AN ABRASIVE AND SHORTEN THE LIFE OF THE TRANS-MISSION. FOR THE SAME REASON, BEFORE INSTALLING A NEW PART, CLEAN OFF ANY DUST OR METAL FILINGS. G

On the DS Gasoline vehicle, power is transferred from the engine to the transaxle and then to the wheels through a drive clutch, drive belt, driven clutch, and transmission. The transmission is mounted directly to the transaxle. The engine, drive clutch, belt, and driven clutch rotate in one direction only, and the transmission is used to reverse vehicle direction. Because a transmission is used to reverse vehicle direction, the engine and clutches are not subjected to reversing loads. This reduces maintenance requirements on the engine and clutches. The transmission changes vehicle direction through fully synchronized internal gearing. A shifter lever, connected by cable to a shifter arm on the transmission, is used to place the transmission gears in one of three shift positions: forward (F), neutral (N) and reverse (R) (Figure 17-1). During normal vehicle operation, a neutral lock-out cam prevents the engine from running when the transmission is in the neutral position (See Neutral Lock-out Circuit, Section 12, Page 12-6).

NOTE

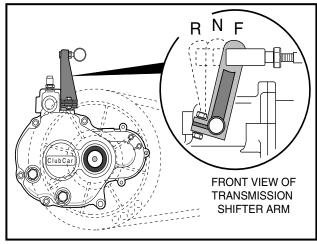
A SPECIAL NEUTRAL LOCK-OUT CAM IS PROVIDED TO ALLOW MAINTENANCE PERSONNEL
TO RUN THE ENGINE IN NEUTRAL FOR CERTAIN TESTS AND MAINTENANCE PROCEDURES.
WHEN THE NEUTRAL LOCK-OUT CAM IS IN THE SERVICE POSITION, THE VEHICLE WILL NOT
RUN WHEN THE FORWARD AND REVERSE SHIFT LEVER IS IN THE FORWARD OR REVERSE
POSITION.

The transmission is extremely durable and should require very little service under normal operating conditions. The vehicle should always be stopped before changing the vehicles direction. The only service required on the transmission is to maintain a proper lubrication level (See Lubrication Chart, Section 4). Under normal operating conditions, periodic adjustment to the system should not be required. The top speed of the vehicle should be checked on a weekly basis to ensure proper operation of the governor.

The governor system is a flyweight type. It is mounted inside the transmission and driven by the transmission gears. This type governor system measures ground speed of the vehicle. Because the governor is inside the transmission, it is protected from abuse and damage that is common to externally mounted governor systems. If any of the governor linkage is removed for servicing other components, readjustment of the governor linkage is required (See Governor Adjustment, Section 14 - Fuel System).

LUBRICATION

There are two plugs located on the input shaft side of the transmission. When the transmission is in position, the upper plug is used as a level indicator. The lubricant level should be even with the bottom of this upper hole. The lower plug is for draining the lubricant. When draining the lubricant, the upper plug should be



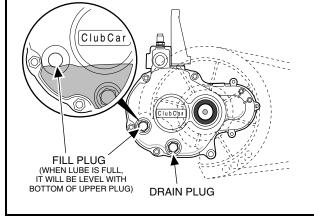


FIGURE 17-1 FIGURE 17-2

removed also to allow the lubricant to drain faster. Be sure the drain plug is cleaned and reinstalled before filling. Torque plug to 18-25 ft.lbs. (24/34 N-m). Use a funnel when filling the transmission with lubricant through level indicator hole. Fill with 20 oz. 80-90 WT. API Class GL-3 or 80-90 WT. AGMA Class 5 EP gear lubricant (Figure 17-2).

TRANSMISSION (FIGURE 17-3)

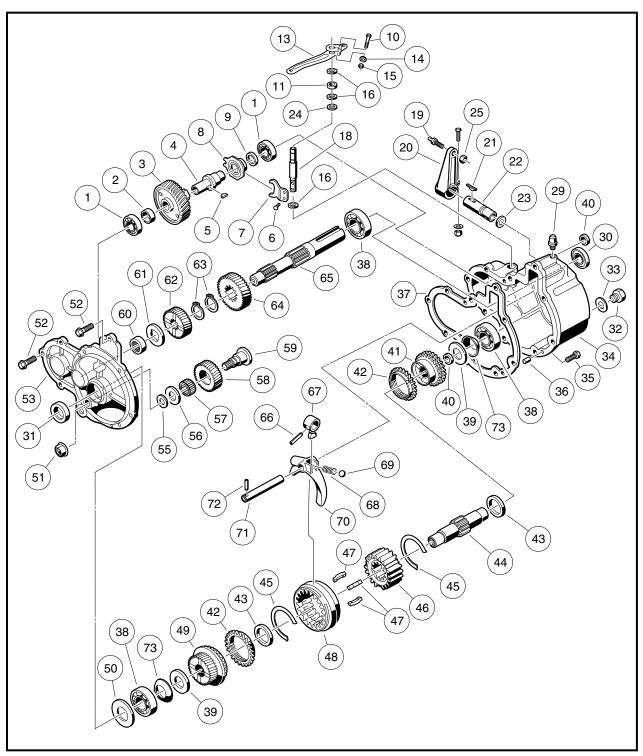
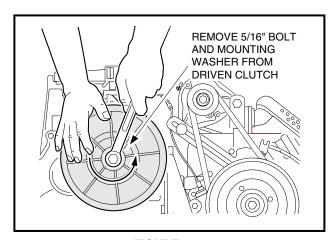


FIGURE 17-3

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- CLEAN TRANSMISSION BEFORE DISASSEMBLY.
- SEE SAFETY WARNINGS, PAGE 17-1.



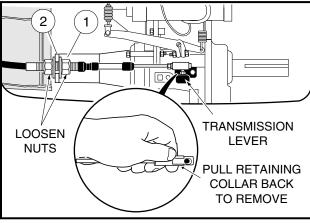


FIGURE 17-4

FIGURE 17-5

REMOVE FOUR

RETAINING BOLTS HOLDING TRANSMISSION

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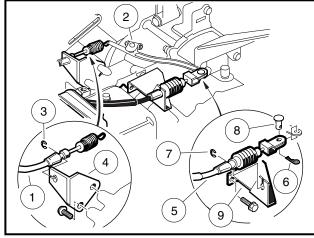
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DRIVERS SIDE

В

С

- 1. Remove seat and access panel from the rear body. Retain the two screws that secure the access panel to the rear body.
- 2. Remove drive belt (See Torque Convertor Section 16, Page 16-4).
- 3. With transmission in forward or reverse, remove retaining bolt on driven clutch (Figure 17-4). Put transmission back in neutral after bolt removal.
- 4. Remove driven clutch and key from transmission shaft (See Torque Convertor Section 16 Removing the Driven Clutch, Page 16-14).





Page 17-4

5. Disconnect forward/reverse shift cable from transmission shifter lever by sliding the retaining collar back and then pulling the socket away from the ball joint (**Figure 17-5**).



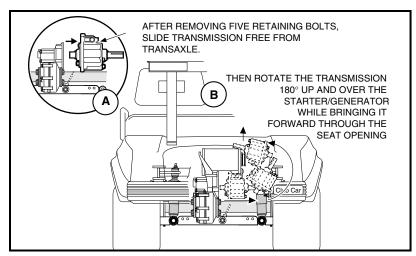


FIGURE 17-8

- 6. Disconnect accelerator cable by removing the retaining E-ring (3) and then slipping the cable off the short end of the governor arm. Remove governor cable from transmission by removing the cotter pin (6) and clevis pin (8) from the long end of the governor arm (2) (Figure 17-6).
- 7. Remove external governor arm (13) by loosening nut (15) and sliding up and off governor arm shaft (18). Use care not to bend the governor arm during removal (Figure 17-3, Page 17-3).
- 8. Remove the three 1/4 x 4" bolts and nuts. Remove the transmission cable support bracket. Remove the 5/16" bolt and slide the transmission free from the transaxle and governor cable (**Figure 17-7**).

NOTE

- IF THE TRANSMISSION STICKS, TAP LIGHTLY WITH A PLASTIC HAMMER ON ALTERNATE SIDES.
- 9. Rotate the transmission 180° from its mounted position so that the input shaft is facing the transaxle (Figure 17-8). Raise input shaft of transmission up and over the starter/generator while bringing the transmission towards the front of the vehicle. Remove the transmission from the vehicle through seat opening.

DISASSEMBLY OF THE TRANSMISSION

- 1. Remove the drain plug and gasket. Drain and dispose of the oil properly (Figure 17-2, Page 17-2).
- 2. Secure transmission in a vise by clamping onto the input shaft. Use wood V-blocks between the shaft and the jaws of the vise to protect the shaft from damage (**Figure 17-9**).

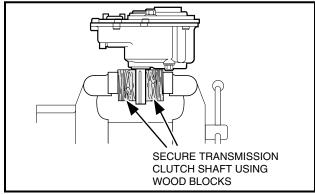
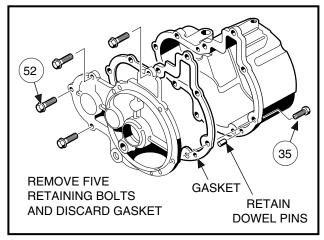


FIGURE 17-9

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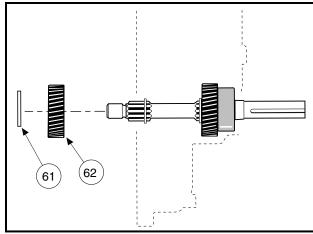


FIGURE 17-10

FIGURE 17-11

3. Remove four retaining bolts (52) from the cover of the transmission. Make sure the mounting screw (35) from the reverse side is removed and remove the cover (Figure 17-10).

WARNING

 DO NOT USE A SCREWDRIVER TO PRY THE COVER OFF THE TRANSMISSION. THIS WILL DAMAGE THE GASKET SURFACE.

NOTE

- IF THE TRANSMISSION COVER STICKS, TAP LIGHTLY WITH A PLASTIC HAMMER ON ALTERNATE SIDES NEAR THE DOWEL PINS.
- 4. Remove gasket and discard. Clean the gasket surfaces of both the housing and the cover (Figure 17-10).
- 5. Remove the input shaft thrust washer (61) and the input shaft reverse gear (62) (Figure 17-11).
- 6. Remove the main cluster and the shifter arm sub-assembly (Figure 17-12).

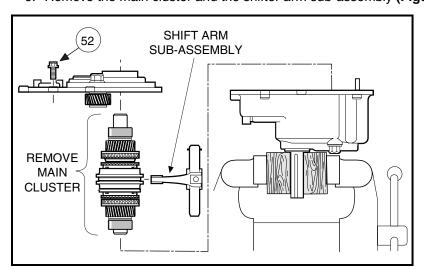


FIGURE 17-12

Governor Disassembly

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- CLEAN TRANSMISSION BEFORE DISASSEMBLY.
- SEE SAFETY WARNINGS, PAGE 17-1.
- 1. Remove entire governor gear assembly (1-5, 8, 9) (Figure 17-14, Page 17-8), by placing finger under governor gear (3) and pushing on weights to hold governor sleeve (8) (Figure 17-13).
- 2. Remove spacer (9) and governor sleeve (8) (Figure 17-14, Page 17-8).
- 3. Use a press to remove the bearing (1), spacer (2) and governor gear (3) from governor shaft (4).

A CAUTION

- DO NOT PRESS AGAINST BEARING OUTER RACE.
- 4. Remove key (5) from governor shaft (4) (Figure 17-14, Page 17-8).
- 5. Remove bearing (1) by tapping on transmission housing with a plastic hammer (Figure 17-14, Page 17-8).
- 6. Remove two screws (6) from governor arm shaft (18) and remove internal governor arm (7) **(Figure 17-14, Page 17-8)**.
- 7. Remove lower retaining ring (14) from governor arm shaft (18) (Figure 17-14, Page 17-8).

A CAUTION

• USE CARE WHEN REMOVING LOWER RETAINING RING (14) TO AVOID CAUSING BURRS ON GOVERNOR ARM SHAFT (18).

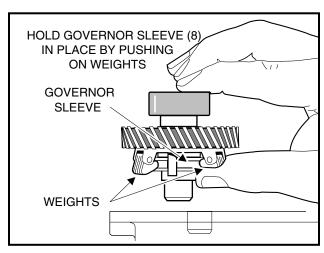


FIGURE 17-13

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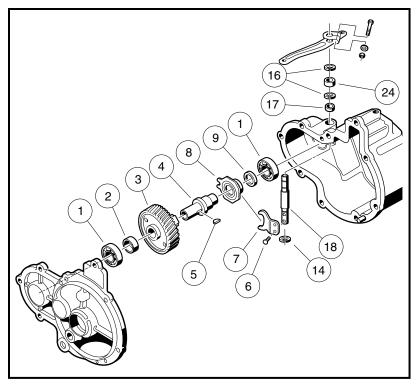
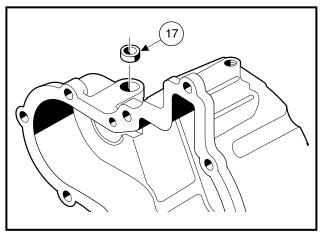


FIGURE 17-14

8. Remove governor arm shaft (18) by rotating back and forth. Oil seal (24), upper retaining ring (16) and middle retaining rings (16) will be removed with shaft (**Figure 17-14**).

A CAUTION

- DO NOT USE EXCESSIVE FORCE WHEN REMOVING GOVERNOR ARM SHAFT. PULLING SIDE-WAYS MAY DAMAGE OR BEND THE SHAFT.
- 9. Remove upper washer (17) from governor arm shaft bore (Figure 17-15).
- 10. Remove upper two retaining rings from governor arm shaft (18) (Figure 17-3, Page 17-3).
- 11. Remove and discard oil seal (24).



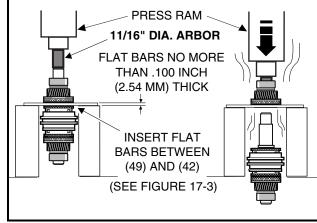


FIGURE 17-15 FIGURE 17-16

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- CLEAN TRANSMISSION BEFORE DISASSEMBLY.
- SEE SAFETY WARNINGS, PAGE 17-1.
- 1. Place two flat steel bars no more than .100 inch (2.54 millimeters) thick between the reverse gear (49) and synchronizer ring (42). Using a press ram and an 11/16 inch diameter arbor, press against the end of the shaft to remove bearing (38), Belleville spring (73), thrust washer (39), reverse gear (49), synchronizer ring (42) and thrust washer (43) (Figure 17-3, Page 17-3) (See Figure 17-16).

WARNING

- PREVENT THE OUTPUT SHAFT FROM DROPPING TO THE FLOOR AFTER PRESSING ON IT.
- MAKE SURE THE FLAT STEEL BARS ARE AGAINST THE REVERSE GEAR AND NOT THE SYN-CHRONIZER.
- 2. Slide clutch hub assembly (45-48) off shaft (44). Slide the synchronizer ring (42) that is a part of the forward gear assembly off the shaft (Figure 17-18, Page 17-10).
- 3. Place the two flat steel bars under the forward gear (41). Using a press ram with an 11/16 inch diameter arbor, press against the end of the shaft to remove the bearing (38), thrust washer (39), forward gear (41), and thrust washer (43) (Figure 17-3, Page 17-3) (See Figure 17-17).

A WARNING

• PREVENT THE OUTPUT SHAFT FROM DROPPING TO THE FLOOR AFTER PRESSING ON IT.

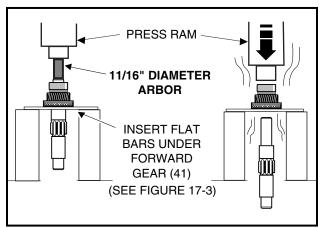


FIGURE 17-17

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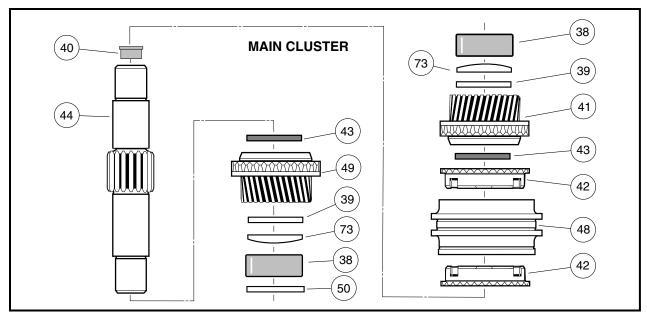


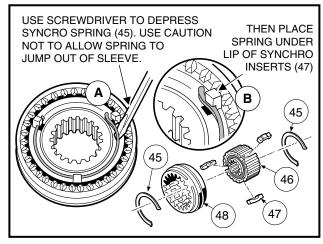
FIGURE 17-18

4. Discard thrust washers (39) (Figure 17-18).

Clutch Hub Disassembly

WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- CLEAN TRANSMISSION BEFORE DISASSEMBLY.
- SEE SAFETY WARNINGS, PAGE 17-1.



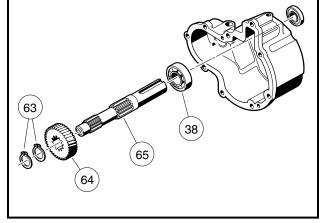


FIGURE 17-19

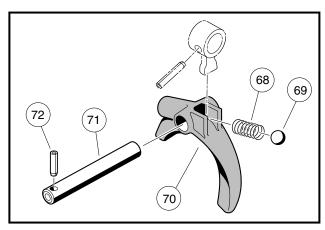
FIGURE 17-20

- 1. Remove the two synchro springs (45) from both sides of the clutch hub assembly (Figure 17-19).
- 2. Slide the sleeve (48) off the clutch hub (46) (Figure 17-19).
- 3. Remove the synchro inserts (47) (Figure 17-19).

Input Shaft Disassembly

- 1. Use external snap ring pliers to remove two snap rings (63) from the input shaft (65) (Figure 17-20).
- 2. Remove the input gear (64) (Figure 17-20).
- 3. Press the bearing (38) off the shaft (65) (Figure 17-20).

Shift Arm Disassembly



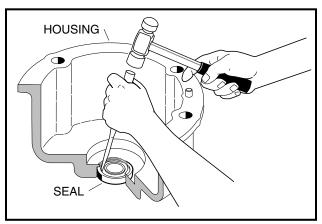


FIGURE 17-21

FIGURE 17-22

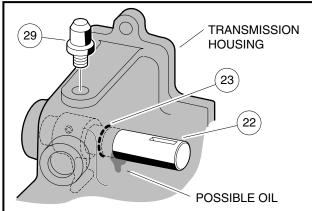
- 1. Slide the shift rod (71) out of the sleeve shift arm (70) (Figure 17-21). The shift rod has three detent locations for the ball to rest. As the shift rod is coming out, be prepared for the ball and spring to fly out of the sleeve shift arm because the spring will be compressed as the rod is moving out of the way.
- 2. Remove shifter ball (69) and shifter spring (68 (Figure 17-21)).
- 3. Remove roll pin (72) out of the shift rod (Figure 17-21).

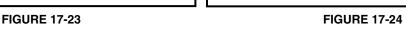
Transmission Housing Disassembly

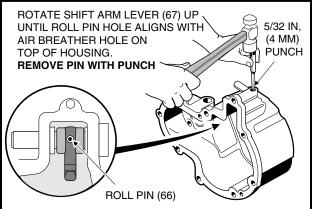
1. Remove the oil seal (30) from input shaft bore using a punch and light hammer (Figure 17-3, Page 17-3). Tapping from the inside of the housing, drive the seal out of the bore. (Figure 17-22).

NOTE

DO NOT ALLOW THE PUNCH TO TOUCH THE INSIDE DIAMETER OF THE BORE.







Transmission Housing Disassembly, Continued:

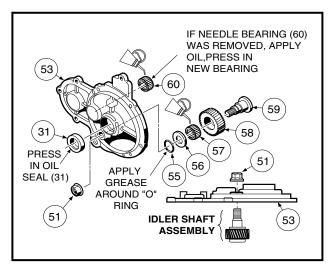
- 2. Remove air breather (29) and use a high flash-point solvent to clean the air breather (Figure 17-23, Page 17-11).
- 3. Inspect the shifter shaft (22). If there is oil around the opening, the O-ring (23) should be replaced. If there is no oil, disregard steps 4, 5, and 6 below (Figure 17-23, Page 17-11).
- 4. Mark the inside shifter arm lever with paint or a punch an orientation mark so it can be reinstalled facing correctly. Rotate the shaft until the roll pin can be seen through the breather hole. Remove roll pin (66) by using a 5/32 inch (4 millimeters) punch through the breather hole, driving the roll pin into the open area of the transmission housing (Figure 17-24, Page 17-11).

A CAUTION

- USE OF ANOTHER SIZE PUNCH MAY DAMAGE THE ROLL PIN. THIS COULD MAKE THE REMOVAL OF THE ROLL PIN VERY DIFFICULT.
- USE CARE WHEN DRIVING THE ROLL PIN TO MAKE SURE THE PUNCH DOES NOT DAMAGE THE THREADS IN THE BREATHER HOLE.
- 5. Remove shifter shaft (22) and O-ring (23) from shifter shaft.
- 6. Remove inside shifter arm lever (67).

Cover Disassembly

- 1. Inspect the gear (58) and bearing (57) on the idler shaft (59). If the bearing has abnormal play or the gear has wear, replace both the gear and the bearing (Figure 17-25).
 - 1.1. Remove flange nut (51) from cover (53) (Figure 17-25).
 - 1.2. Press idler shaft (59) out (Figure 17-25).
 - 1.3. Remove O-ring (55), thrust washer (56), needle bearing (57) and reverse idler gear (58) from idler shaft (59).
- 2. Remove the oil seal (31) (Figure 17-3, Page 17-3) from output shaft bore using a punch and light hammer. Tapping from the inside of the cover, drive the seal out of the bore (Figure 17-22, Page 17-11).
- 3. If the needle bearing (60) (Figure 17-3, Page 17-3) that supports the input shaft is damaged, insert a small chisel between the outer race and retainer of the needle bearing and drive it into the bearing by tapping on it with a light hammer (Figure 17-26). Then use the chisel to pry the retainer out of the bearing (Figure 17-27). Discard the retainer and rollers.



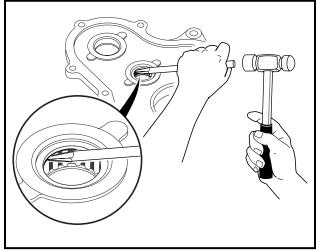
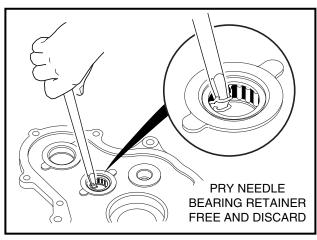


FIGURE 17-25 FIGURE 17-26

3.1. To remove the outer race, apply a few drops of a loosening agent between the outer race and bearing seat. Use a slide hammer to remove the outer race and discard (Figure 17-28).

A CAUTION

- IF TRANSMISSION COVER IS DAMAGED OR OUTER RACE OF BEARING CANNOT BE REMOVED, A NEW COVER AND BEARING MUST BE INSTALLED.
- 4. Check the dowel pins (one pin is in the cover and the other pin is in the transmission housing) to see if the pins are loose. If the pins are loose, remove the pins.



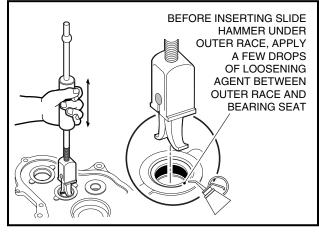


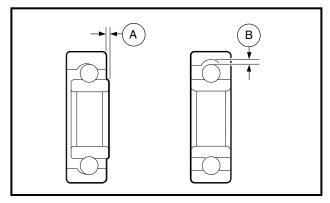
FIGURE 17-27 FIGURE 17-28

INSPECTION OF THE TRANSMISSION

WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- CLEAN TRANSMISSION BEFORE DISASSEMBLY.
- SEE SAFETY WARNINGS, PAGE 17-1.
- 1. Clean all the component parts in a high flash-point solvent and dry them. Inspect all components. Damaged or worn parts must be replaced.
- 2. Inspect all bearings by spinning the bearing by hand. Check the bearings for excessive axial (A) and radial (B) play (Figure 17-29, Page 17-14). Replace the bearings if they are noisy, do not spin smoothly, or have excessive play. Check the bearings and replace if they are rusted, worn, if there is a crack, or there is an abnormal color change in the metal of the bearing. The bearing should be replaced if there is wear or pitting on the needle, ball, or rolling surface.
- 3. Gears should be inspected for tooth surface damage or fractures.
- 4. Synchronizer teeth should be inspected for fractures, severe wear or damage.
- 5. Synchronizer cone on forward and reverse gear should be checked for a rough or damaged surface.

Inspection of the Transmission, Continued:



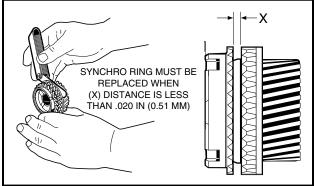


FIGURE 17-29

FIGURE 17-30

- 6. Using a feeler gauge, measure the distance X at several points around the assembly by pushing the synchronizer ring (42 and 43) onto the respective gear (49 and 41) (Figure 17-3, Page 17-3). The synchronizer ring should be replaced when X is .020 inch (0.51 millimeter) or less (Figure 17-30).
- 7. Thrust washer (43) clearance between shaft and inner diameter must be less than .008 inch (0.20 millimeter). Replace if greater than .008 inch (0.20 millimeter) (Figure 17-3, Page 17-3).
- 8. The governor sleeve (8) should be inspected at several points around the sleeve. If the thickness, T, is less than .040 inch (1.02 millimeter), replace the sleeve (Figure 17-31).
- 9. Inspect clutch hub (46), inserts (47) and sleeve (48) and replace if wear or damage exists (Figure 17-3, Page 17-3).
- 10. Use a micrometer to measure the outside diameter of the shift rod (71) at several points along its length and replace if the diameter is less than .276 inch (7.01 millimeters) (Figure 17-32).
- 11. All oil seals that have been removed should be replaced. Carefully press the new seals into the housing and cover (Figure 17-33).

COMPONENT ASSEMBLY

Assembly Tools (Figure 17-34)

If the transmission is disassembled, the following tools will be required for reassembly:

- 1. Transmission oil seal tool (Club Car Part No. 1014160)
- 2. Governor shaft cap jig (Club Car Part No. 1014104)
- 3. Oil seal press jig (Club Car Part No. 1014105)
- 4. Internal governor arm alignment tool (Club Car Part No. 1014107)

All of these tools are available in a transmission tool kit (Club Car Part No. 1014115) (Figure 17-34).

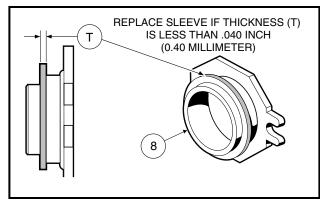


FIGURE 17-31

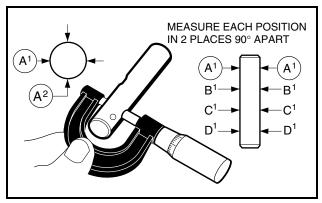


FIGURE 17-32

WARNING

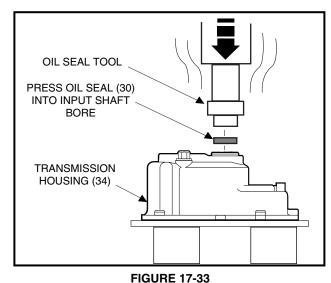
- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- CLEAN TRANSMISSION BEFORE DISASSEMBLY.
- SEE SAFETY WARNINGS, PAGE 17-1.
- 1. Put a light coating of clean transmission oil on the outside edge of the seal to assist installation. Press oil seal (30) (Figure 17-3, Page 17-3) into the input shaft bore using transmission oil seal tool (Club Car Part No. 1014160) until tool contacts housing surface (Figure 17-33).
- 2. If dowel pins (36) were removed, clean the dowel pins, the cover, and the transmission housing with a high flash-point solvent. Use a drop of locking adhesive on the expanded end of the dowel pins and install them into holes until the pin protrudes from the gasket surface .275 inch (7.0 millimeters) (Figure 17-3, Page 17-3).

NOTE

ANY EXCESSIVE LOCKING ADHESIVE MUST BE WIPED OFF.

Cover Assembly

- 1. Put a light coating of clean transmission oil on the outside edge of the seal to assist installation. Press oil seal (31) into the output shaft bore using transmission oil seal tool (Club Car Part No. 1014160). Oil seal should be flush with the outside cover surface (**Figure 17-3**, **Page 17-3**).
- 2. Install the reverse idler gear (58), new needle bearing (57), thrust washer (56) and new O-ring (55) onto the idler shaft (Figure 17-3, Page 17-3).



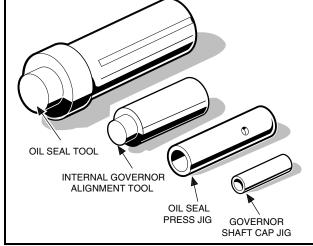


FIGURE 17-34

Cover Assembly, Continued:

3. If input shaft needle bearing (60) was removed, press in a new bearing (Figure 17-25, Page 17-12).

A CAUTION

• PRESS ONLY AGAINST OUTER RACE OF BEARING.

NOTE

- APPLY CLEAN TRANSMISSION OIL TO NEEDLE BEARING AND APPLY GREASE AROUND THE O-RING.
- 4. Install the idler shaft assembly into the cover. Torque nut to 36-50 ft. lbs. (49/68 N-m). Be sure reverse idler gear rotates freely (**Figure 17-25**, **Page 17-12**).

Input Shaft Assembly (Figure 17-20, Page 17-10)

1. Install the input gear (64) on input shaft (65). Install the two snap rings (63) onto the input shaft.

NOTE

- THE FLAT SURFACE OF THE INPUT GEAR SHOULD FACE THE SNAP RING.
- 2. Press bearing (38) up against the input gear (64) on the input shaft.

Clutch Hub Assembly (Figure 17-19, Page 17-10)

- 1. Install the clutch hub (46) into the sleeve (48).
- 2. Install the three synchro inserts (47) with the lip of the synchro inserts facing the center of the hub. Hold the synchro inserts in place from underneath.
- 3. Install the synchro spring (45) under the lip of all three synchro inserts (Figure 17-19, Page 17-10). Install the other synchro spring on the other side of the clutch hub.

NOTE

- THE HOOKED END OF THE SYNCHRO SPRING SHOULD TOUCH THE INSIDE OF THE SLEEVE.
- CHECK TO BE SURE THE SLEEVE (48) CAN SLIDE ON THE CLUTCH HUB (46).

Main Cluster Assembly (Figure 17-18, Page 17-10)

A WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- CLEAN TRANSMISSION BEFORE DISASSEMBLY.
- SEE SAFETY WARNINGS, PAGE 17-1.

NOTE

- APPLY CLEAN TRANSMISSION LUBRICANT TO THE INSIDE DIAMETERS OF GEARS (49 AND 41) AND SYNCHRONIZER RINGS (42).
- 1. Slide the thrust washer (43) onto the end of the output shaft with the inner spline. Place the gear assembly (49) (wider gear), new thrust washer (39), Belleville spring washer (73) and the ball bearing (38) onto the end of the output shaft. Using a press ram and a press sleeve that will only apply pressure to the inner race of the bearing, press the main cluster components parts onto the shaft until the bearing is fully seated against Belleville spring and thrust washer. Be sure gear rotates freely.
- 2. Turn the shaft around so the other end is facing up. Install the synchronizer ring (42) onto the reverse gear (49) that has been reinstalled onto the shaft in the preceding step.
- 3. Install the assembled clutch hub and sleeve onto the output shaft (44).
- 4. Install thrust washer (43), synchronizer ring (42), forward gear (41), new thrust washer (39), Belleville spring washer (73) and ball bearing (38) onto the other end of the output shaft. Using a press ram and a press sleeve that will only apply pressure to the inner race of the bearing, press until bearing (38) is fully seated against Belleville spring and thrust washer.

NOTE

MAKE SURE THAT BOTH GEARS ON THE OUTPUT SHAFT CAN ROTATE FREELY.

Shifter Arm Assembly (Figure 17-21, Page 17-11)

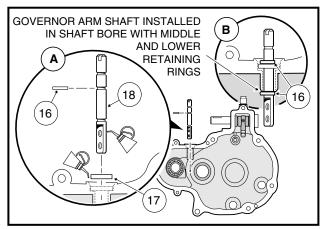
- 1. Install roll pin (72) into shift rod (71) bore with pin protruding equally on both sides of rod, approximately .100 inch (2.54 millimeters).
- 2. Install shifter spring (68) and shifter ball (69) into bore of the shifter arm (70). With long arm of shifter arm on your right, push the shift rod (71) into the bore of the shifter arm (70). Using a punch to depress the shifter ball, insert the shift rod (71) to the center (Neutral) detent position.

Governor Assembly

- 1. Place lower washer (17) into governor shaft bore (Figure 17-15, Page 17-8).
- 2. Install middle retaining ring (16) in the center groove on the governor arm shaft (18) (Figure 17-35).
- 3. Apply a light film of new transmission lubricant to the governor arm shaft (18) and governor shaft bore.

NOTE

DO NOT USE ANY LUBRICANT OTHER THAN TRANSMISSION OIL ON THE GOVERNOR SHAFT.



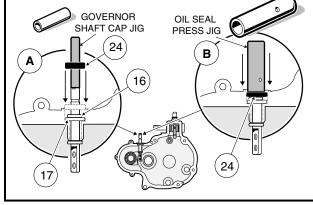
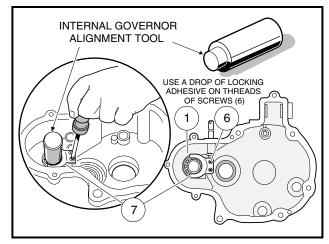


FIGURE 17-35 FIGURE 17-36

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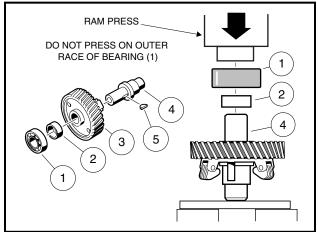


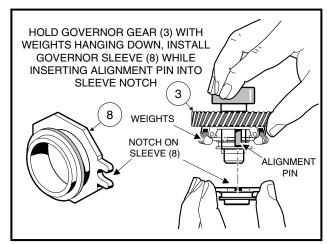
FIGURE 17-37

FIGURE 17-38

- 4. Insert the governor arm shaft (18) down through governor shaft bore (Figure 17-35, Page 17-17).
- 5. Install the lower retaining ring (16) in the lower groove on the governor arm shaft. Check to be sure the governor arm shaft rotates freely (Figure 17-36, Page 17-17).
- 6. To install the oil seal (24), a governor shaft cap jig (Club Car Part No. 1014105) is required. Place the governor shaft cap jig on the governor arm shaft. Slide the new oil seal (24) over the tool until the oil seal contacts the transmission housing. Remove governor shaft cap jig and use the oil seal press jig to push the oil seal (24) into place (Figure 17-36, Page 17-17).
- 7. Install the top retaining ring (16) in the upper most groove on the governor arm shaft.
- 8. Apply a light film of new transmission lubricant to the outer race of the bearing. Then, using a press sleeve that will apply pressure to only the outer race, press the ball bearing (1) into the bearing surface for the governor shaft in the housing (34) (Figure 17-3, Page 17-3).

A CAUTION

- DO NOT PRESS AGAINST INNER RACE OF BEARING.
- 9. Install the internal governor arm alignment tool (Club Car Part No. 1014107) into the inner race of ball bearing (1) (Figure 17-37).





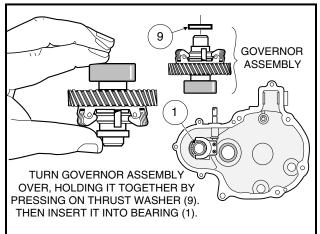


FIGURE 17-40

10. Place the internal governor arm (7) around the internal governor arm alignment tool. Install the two screws (6) with a drop of thread locking adhesive. Torque screws to 26 in.lbs. (35 N-m). Remove the internal governor arm alignment tool (Figure 17-37).

NOTE

- ANY EXCESS THREAD LOCKING ADHESIVE MUST BE WIPED OFF.
- 11. Install key (5) onto governor shaft (4) and install governor gear (3), and thick spacer (2). Then, using a press sleeve that will only apply pressure to the inner race, press bearing (1) onto shaft (4) (Figure 17-38, Page 17-17).

A CAUTION

- DO NOT PRESS ON OUTER RACE OF BEARING.
- 12. Hold the governor gear (3) with weights hanging down and install governor sleeve (8) so that the notches on the interior contours of the weights engage the flange of the governor sleeve. Also make sure the alignment pin on the governor gear engages the alignment slot in the governor sleeve (Figure 17-39). Turn gear (3) over, holding sleeve (8) in position, and slide thrust washer (9) onto governor shaft (Figures 17-39 and 17-40).

NOTE

• CHECK TO BE SURE THAT ALL OF THE WEIGHTS ARE ENGAGED WITH THE FLANGE OF THE GOVERNOR SLEEVE AND THAT THE GOVERNOR GEAR ALIGNMENT PIN IS IN THE ALIGNMENT SLOT IN THE SLEEVE.

ASSEMBLY OF THE TRANSMISSION

WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- CLEAN TRANSMISSION BEFORE ASSEMBLY.
- SEE SAFETY WARNINGS, PAGE 17-1.
- 1. If the existing O-ring has been removed, install a new O-ring (23) in the groove on the shifter shaft (22) (Figure 17-41, Page 17-20).
- 2. Hold shifter arm lever (67) inside the housing so that the orientation mark that was made during removal is in the proper location. Install shifter shaft (22) and O-ring through the transmission housing and the shifter arm lever. Line up the pin hole in the lever with the pin hole in the shaft (Figure 17-41).

NOTE

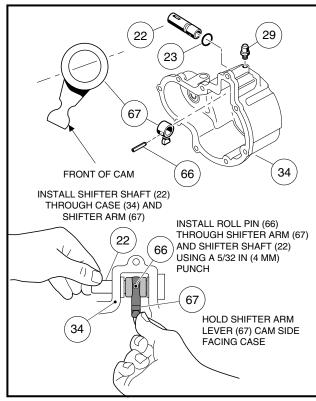
• THE KEY WAY IN THE SHAFT SHOULD BE FACING UP WHEN THE PIN HOLES ARE ALIGNED.

Assembly of the Transmission, Continued:

3. Use a 5/32 inch (4 millimeters) punch to carefully drive the roll pin (66) through shifter arm lever (67) and shifter shaft (22) (Figure 17-41).

A CAUTION

- DO NOT ALLOW THE PUNCH TO STRIKE THE TRANSMISSION HOUSING.
- 4. Install breather (29). Use care not to cross thread when installing the breather (Figure 17-41).
- 5. Apply a light film of new transmission lubricant to the inner lip of the seal (30) in the transmission housing and on the outer race of the bearing (68). Install input shaft assembly into housing. Be sure bearing is fully seated into housing (Figure 17-42).
- 6. Secure transmission in a vise by clamping onto the input shaft. To protect the shaft from damage use wood V-blocks between the shaft and the jaws of the vise (Figure 17-9, Page 17-5).
- 7. With output spline of main cluster assembly facing up or away from the housing, install the assembled shift arm onto the sleeve of the main cluster so that the roll pin end of the shift arm assembly is facing up or away from the housing also (**Figure 17-42**).
- 8. Apply a light film of transmission lubricant to three locations on the following component assemblies; the outer race of the bearing, on the end of the shaft without a spline in it, and the end of the rod of the shift arm assembly without the roll pin (Figure 17-42).
- 9. When installing the main cluster into the housing, three steps must happen at the same time. First align the main cluster ball bearing (38) with the bearing bore in transmission housing, and at the same time align the shift rod with its bore in the housing. Also seat the end of the shifter arm lever (67) into the socket of the shifter arm. Make sure the bearing is fully seated in the housing and the shift rod is fully installed also (Figure 17-42).
- 10. Apply a light film of new transmission lubricant to the input shaft spline and the gear. Install the gear (62) onto the input shaft with the depressions facing up (towards the cover) (Figure 17-42).



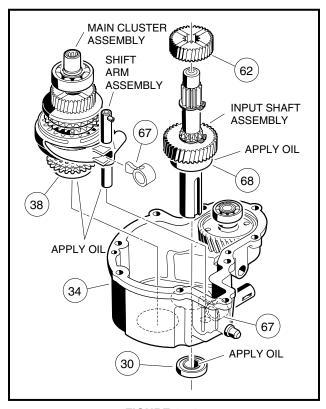
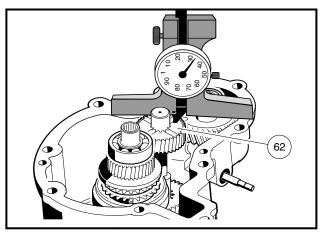


FIGURE 17-41

FIGURE 17-42





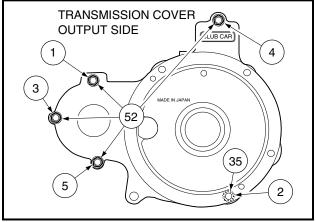


FIGURE 17-43

FIGURE 17-44

11. Using a depth gauge, measure the distance from the gasket surface of the housing to the side of gear (62) on the input shaft (Figure 17-43). Use the table to determine which thrust washer to use.

MEASURED DISTANCE INCHES (MILLIMETERS)	THRUST WASHER CLUB CAR PART NO.	
Less than .1260 inches (3.2 millimeters)	1012723	
More than .1260 inches (3.2 millimeters) but less than .1378 inches (3.5 millimeters)	1012724	
More than .1378 inches (3.5 millimeters)	1012725	

12. Clean the gasket surface on the cover and housing. Install a new gasket on the housing (Figure 17-10, Page 17-6).

NOTE

- BE SURE GASKET SURFACE ON THE COVER AND HOUSING HAS BEEN THOROUGHLY CLEANED AND IS DRY. DO NOT USE GASKET SEALERS.
- 13. Install assembled cover to housing. Seat the cover completely against the housing with HANDS ONLY. If the cover will not seat, check if the gear teeth are meshing properly. The reverse idler gear will mesh with gears on both the input and output shafts.
- 14. Install bolts (52 and 35), first tightening the bolts down evenly with fingers. Torque the bolts in proper sequence to 5-7 ft. lbs. (6.7/9.5 N-m). If the bolts are not tightened in this sequence, it may cause the cover to warp (Figure 17-44).
- 15. Install the lower drain plug and gasket and torque to 25 ft. lbs. (34 N-m) (Figure 17-2, Page 17-2).

INSTALLATION OF THE TRANSMISSION

- 1. Install transmission into the vehicle. Rotate the transmission so the output shaft lines up with the spline shaft on the transaxle.
- 2. Install the three 1/4 x 4" retaining bolts (A,B,C) and three washers through the forward and reverse shifter cable bracket (1), the transaxle and the transmission. Use three nylon locknuts and three washers to secure the three components together. Torque nuts to 75-95 in. lbs. (8.5/10.7 N-m) (Figure 17-7, Page 17-4).
- 3. Install the lower 5/16 x 1" bolt (D) through the support bracket then the transmission into the transaxle. Torque the bolt to 17 ft. lbs. (23 N-m) (Figure 17-7, Page 17-4).
- 4. Attach the shift cable to the bracket and tighten the two adjustment nuts (1). Connect the forward and reverse shift cable to the transmission shifter arm (Figure 17-5, Page 17-4). Adjust the cable (See Forward And Reverse Shifter Cable Adjustment, Page 17-24).

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Installation of the Transmission, Continued:

- 5. Install driven clutch and key on transmission input shaft (See Torque Converter Section 16).
- 6. Install 5/16 x 1" bolt with lockwasher and flatwasher and torque to 12-14 ft. lbs. (16/19 N-m) (Figure 17-4, Page 17-4).
- 7. Install drive belt (See Torque Converter Section 16).
- 8. Install bolt (10), washer (14) and nut (15) to external governor arm (13) (Figures 17-3, Page 17-3) (Figure 17-6, Page 17-4).
- 9. Place the external governor arm (13) on to the governor arm shaft (18) so the arm seats against the top retaining ring. Do not tighten nut (15) (Figures 17-3, Page 17-3) (Figure 17-6, Page 17-4).
- 10. Install accelerator cable (1) to transmission bracket (4) and reattach retaining E-ring (3) (Figure 17-6, Page 17-4).
- 11. Install clevis (8) and cotter pin (6) through governor cable rear clevis and governor lever arm (Figure 17-6, Page 17-4).
- 12. Adjust governor (See Governor Adjustment Section 14 Fuel System).
- 13. Install 20 ounces of 80-90 wt. API class AGMA 5 EP gear lubricant to transmission (Figure 17-2, Page 17-2).
- 14. Install upper fill plug and gasket and torque to 25 ft. lbs. (4.0 N-m) (Figure 17-2, Page 17-2).
- 15. Install seat and secure access panel.

FORWARD AND REVERSE SHIFTER CABLE

If the forward and reverse shifter cable is jammed or is damaged in any way, it must be replaced.

WARNING

- WHEN MAKING TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE KEY.
 - DO NOT ATTEMPT TO SERVICE HOT ENGINE OR EXHAUST.
 - DISCONNECT BATTERY AS SHOWN (FIGURE 12-1, PAGE 12-2).
 - REMOVE SPARK PLUG WIRE.
- CLEAN FORWARD AND REVERSE SHIFTER CABLE CONNECTIONS BEFORE DISASSEMBLY.
- SEE SAFETY WARNINGS, PAGE 17-1.

REMOVAL OF THE FORWARD AND REVERSE SHIFTER CABLE (FIGURE 17-46)

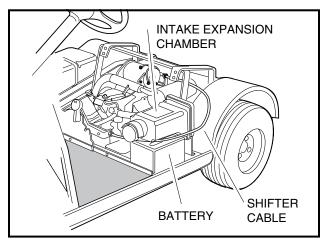


FIGURE 17-45

- 1. Remove the ball joint socket (2) from the forward and reverse shifter assembly ball stud (3).
- 2. Remove the ball joint socket (2) from the shifter arm ball stud (19) on the transmission (Figure 17-46) (See Figure 17-5, Page 17-4).
- 3. Loosen the retaining nuts (22) on both ends of the cable (Figure 17-46).
- 4. Remove cable from car.

INSTALLATION OF THE FORWARD AND REVERSE SHIFTER CABLE

- 1. Position the cable so it goes over the battery and under intake expansion chamber. The cable continues on between the rear body and the back part of the expansion chamber to the transmission (Figure 17-45).
- 2. Install cable with retaining nut (22) and washer (23) on each side of the shifter cable support bracket at the transaxle (Figure 17-5, Page 17-4, and Figure 17-46).
- 3. Install cable with retaining nut (22) and washer (23) on each side of the shifter cable support bracket at the forward and reverse assembly (Figure 17-46).
- 4. Install the ball joint socket (2) on the shifter lever ball stud (19) on the transmission (Figure 17-46).

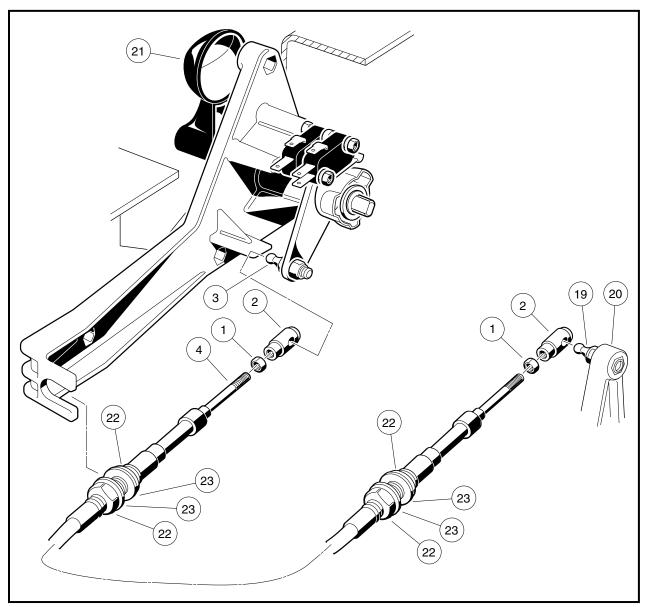


FIGURE 17-46

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Installation of the Forward and Reverse Shifter Cable, Continued:

5. Install the ball joint socket (2) on the forward and reverse shifter assembly ball stud (3) (Figure 17-46, Page 17-23).

ADJUSTMENT OF THE FORWARD AND REVERSE SHIFTER CABLE

With the shifter lever of the transmission (20) in neutral (straight up), the forward and reverse handle (21) should be straight up. For minor adjustments, the nut (1) may be loosened and the ball joint (2) rotated in the proper direction to get the proper adjustment (Figure 17-46, Page 17-23).

A CAUTION

• BE SURE THREADS OF CABLE ARE ENGAGED IN BALL JOINT AT LEAST .25 INCH (6.35 MILLIMETERS). IF BALL JOINT COMES LOOSE FROM THE CABLE, THE FORWARD AND REVERSE SHIFTER WILL NOT OPERATE PROPERLY.

For major adjustments, the cable retaining nuts (22) must be loosened and adjusted. When the cable is properly adjusted, with the forward and reverse handle (21) in the neutral (straight up) position, the shift lever (20) of the transmission will be in the neutral (straight up) position (Figure 17-46, Page 17-23).

SECTION 18 - REAR SUSPENSION GASOLINE VEHICLE

GENERAL INFORMATION

The rear suspension of the DS gasoline vehicle is completely independent. It consists of two mono-leaf springs controlled by two shock absorbers mounted between the springs and the vehicle frame. The engine is mounted on an inner-frame that moves with the rear suspension. A snubber, mounted on the front of the inner-frame and contained by brackets on the vehicle frame, controls inner-frame motion.

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT MOTOR, RESISTORS, ENGINE, OR EXHAUST SYSTEM. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- FRAME GROUND DO NOT ALLOW WRENCH OR OTHER METAL OBJECTS TO CONTACT FRAME WHEN DISCONNECTING BATTERY CABLES OR OTHER ELECTRIC WIRING. NEVER ALLOW A POSITIVE WIRE TO TOUCH THE VEHICLE FRAME, ENGINE, INNER FRAME, OR OTHER METAL COMPONENT.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE; ALWAYS, BEFORE SERVICING:
 - DISCONNECT BATTERY CABLES, NEGATIVE (-) FIRST.
 - DISCONNECT THE SPARK PLUG WIRE FROM THE SPARK PLUG.

SHOCK ABSORBERS

INSPECTING AND REMOVING SHOCK ABSORBERS

1. Check shock absorbers (8) for fluid leakage at the point where the shaft enters the shock absorber body. Replace leaking shock absorbers (Figure 18-1, Page 18-2).

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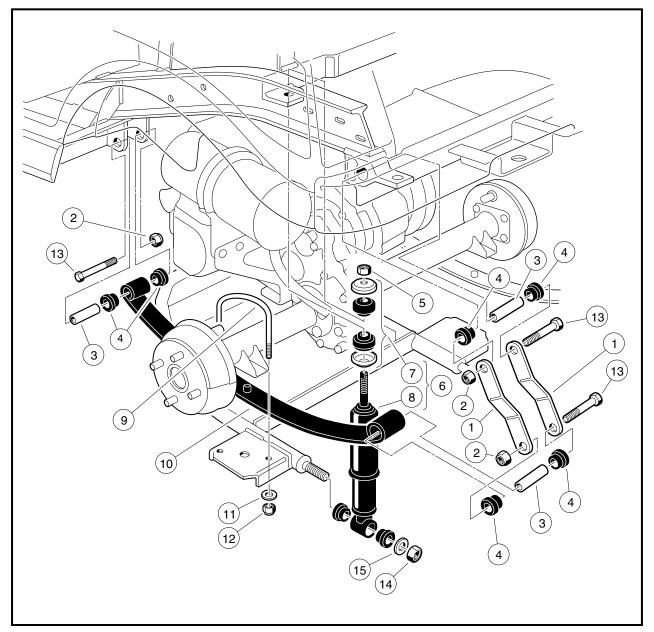


FIGURE 18-1

- 2. To remove a shock absorber, remove the nut (5), cup washer and rubber bushing (Item 7) from the shock absorber stem (Figure 18-1).
- 3. Remove the nut (14) and washer (15) from the lower mounting stud (Figure 18-1).
- 4. Compress the shock absorber to remove it.

INSTALLING SHOCK ABSORBERS

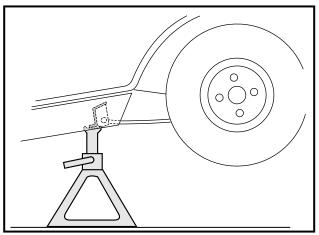
- 1. To install, reverse the removal procedure.
- 2. On the upper shock absorber mount, tighten the nut until the rubber bushing expands to the size of the cup washer.
- 3. On the lower mounts, tighten the nuts to 50-60 ft.lbs. (68/81 N-m).

REMOVING THE MONO-LEAF SPRINGS

1. Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or floor jack. Position jackstands under the frame cross-member between the spring mount and the side stringer, just forward of each rear wheel. Lower the vehicle to let the jackstands support the vehicle (Figure 18-2). See WARNING below.

WARNING

 LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.



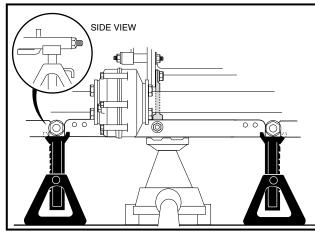
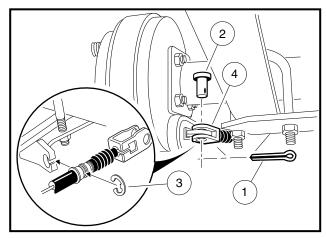


FIGURE 18-2

FIGURE 18-3

- 2. Place jackstands under both ends of the inner frame to the rear of the inner frame cross brace as shown (Figure 18-3).
- 3. Remove the tire and wheel assembly on the side from which the spring is to be removed.
- 4. Remove the bolt (13) and nut (2) from the lower rear spring shackle (1) (Figure 18-1, Page 18-2).
- 5. Remove the cotter pin (1) and the clevis pin (2) at the brake lever and brake cable connection and pull the clevis (4) away from the lever (Figure 18-4, Page 18-4).
- 6. Remove the upper nut (5), cup washer and rubber bushing (7) from the shock absorber (Figure 18-1, Page 18-2).
- 7. Remove the nuts (12) and lock washers (11) attaching the U-bolt (9) to the retainer plate on the inner-frame (Figure 18-1, Page 18-2).
- 8. Remove the nut (2) and bolt (13) attaching the front of the spring to the vehicle frame (Figure 18-1, Page 18-2).
- 9. Position a small pry bar under the brake cluster with its tip resting on the spring retainer plate. Lift on the pry bar to raise the axle tube off of the spring (Figure 18-5, Page 18-4).
- 10. While holding the axle tube up, remove the spring.
- 11. Inspect the bushings (4) and spacers (3) in the spring eyes and replace them if they are worn or damaged (Figure 18-1, Page 18-2).



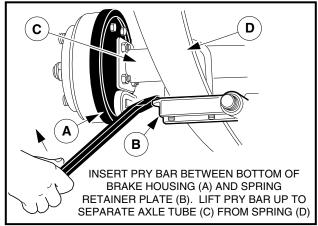


FIGURE 18-4

FIGURE 18-5

INSTALLING THE MONO-LEAF SPRINGS

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

A CAUTION

- WHEN PLACING THE TRANSAXLE ON THE SPRING, BE SURE TO POSITION THE LOCATING BOLT ON THE SPRING IN THE LOCATING HOLE IN THE TRANSAXLE SADDLE.
- 2. Tighten the nuts on the U-bolts to 22-27 ft.lbs. (30/37 N-m).

THE SNUBBER

REMOVING THE SNUBBER

Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or floor jack. Position
a jackstand under each vehicle frame member, near the end just beneath the rear bumper, one on
each side of the vehicle. Lower the vehicle to let the jackstands support the vehicle. See WARNING
below.

A WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 2. Place the jack under the front of the inner-frame (5) and raise it until the snubber (21) is centered between the snubber brackets on the frame (Figure 18-6).
- 3. Remove the front mounting bolts and nuts (13 and 2) on both leaf springs (Figure 18-1, Page 18-2).
- 4. Push the inner-frame to the rear enough to allow removal of the snubber.

INSTALLING THE SNUBBER

- 1. Position new snubber on inner-frame mounting tab, and then reverse the removal procedure to complete the installation.
- 2. Tighten the leaf spring front mounting bolts to 20-25 ft.lbs. (27/34 N-m).

- 3. Place the jack under the transaxle and raise the vehicle enough to remove the jackstands. Lower the vehicle.
 - Keep axle nuts and wheel mounting nuts properly torqued.
 - Keep the front end aligned and properly adjusted.

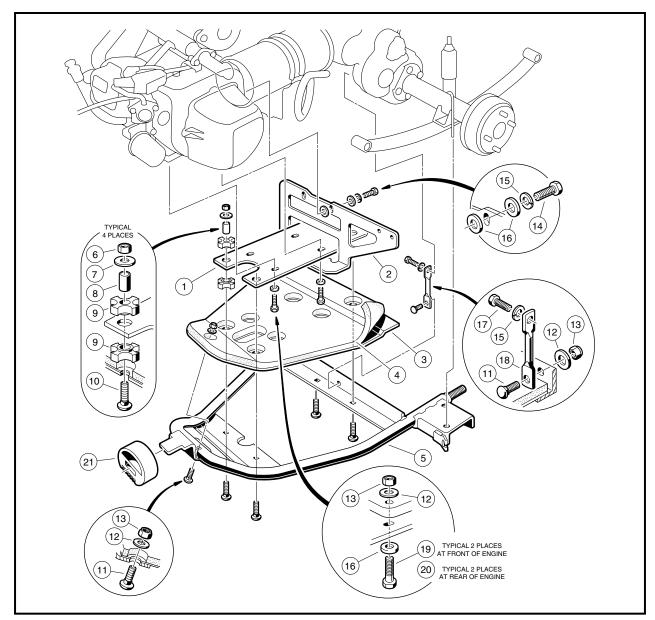


FIGURE 18-6

SECTION 19 A - ELECTRICAL SYSTEM V-GLIDE 36 VOLT VEHICLE

A DANGER

- BATTERIES RELEASE EXPLOSIVE GASES! KEEP ALL SOURCES OF IGNITION (CIGA-RETTES, SPARKS, FLAMES) AWAY FROM CHARGING AND SERVICE AREAS. CHARGING AND SERVICE AREAS SHOULD BE WELL-VENTILATED TO PREVENT BUILDUP OF EXPLO-SIVE GASSES.
- USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERIES CONTAIN ACID THAT IS POISONOUS AND CAN CAUSE SEVERE BURNS! BATTERY ACID ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF WATER OR MILK. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR 15 MINUTES. CALL A PHYSICIAN IMMEDIATELY.

WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE, WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 19-1, PAGE 19-2.

GENERAL INFORMATION

To properly service and maintain this vehicle, it is necessary to understand the electrical circuitry and the functions of all the electrical components. On the V-Glide 36 volt vehicle, there are three separate circuits in operation: 1) the control circuit, 2) the power circuit, and 3) the charge circuit. A reverse buzzer is also included on every vehicle (See Page 19-21). When working on the electrical system, refer to the appropriate electrical wiring diagram (Figures 19-4 and 19-5, Pages 19-7 and 19-9) for more detailed information.

V-GLIDE ELECTRICAL CIRCUITS

THE CONTROL CIRCUIT

The control circuit consists of the key switch, F&R (Forward and Reverse) anti-arcing limit switch, accelerator pedal limit switch, solenoid, and connecting wires.

19A

The Control Circuit, Continued:

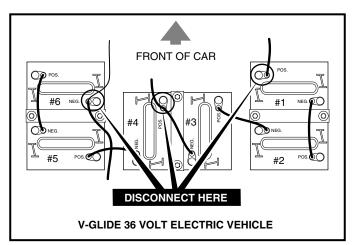


FIGURE 19-1

The key switch is an ON-OFF type, the function of which is to disable (open the control circuit) when the vehicle is not in use. With the key in the OFF position, the vehicle will not run.

The function of the F&R anti-arcing limit switch is to prevent arcing on the contacts of the Forward and Reverse Switch. When the vehicle is in neutral, the limit switch is open. The F&R anti-arcing limit switch closes only after full contact has been made on the Forward and Reverse Switch. As the Forward and Reverse Switch is being disengaged, the F&R anti-arcing limit switch opens the power circuit by opening the control circuit before the contacts are separated. By using the F&R anti-arcing limit switch to control power to the Forward and Reverse Switch, arcing is prevented on the contacts of the Forward and Reverse Switch.

As the accelerator pedal is depressed, the lever of the accelerator pedal limit switch is released by the V-Glide wiper arm. This closes that portion of the control circuit. When the accelerator pedal is not depressed, the V-Glide wiper arm depresses the accelerator pedal limit switch lever and keeps that portion of the control circuit open.

When the accelerator pedal is depressed (which closes the accelerator pedal limit switch) and the Forward and Reverse Switch is in the forward or reverse position (which closes the F&R anti-arcing limit switch), and the key switch is in the ON position, the control circuit is complete. The solenoid coil (enclosed in the solenoid) will then be activated and the solenoid power contacts will close, allowing power to reach the V-Glide wiper switch.

The reverse buzzer is a warning device that is activated when the Forward and Reverse Switch is placed in reverse. The reverse buzzer will sound continuously until the vehicle is shifted to neutral or forward.

THE POWER CIRCUIT

The power circuit consists of the V-Glide wiper switch contacts, resistors, forward and reverse (F&R) switch, solenoid power contacts, motor, batteries, and all connecting wires. The motor and batteries will be discussed in separate sections in this manual (Motor - Section 24, and Batteries - Section 22).

When the control circuit is closed, the vehicle will start off in first speed. As the accelerator pedal is depressed further, the brush on the speed controller arm moves across the contacts until the last contact is reached and full speed is attained. The speed controller brush and contacts conduct the motor current through or around each resistor, thus controlling the speed (Figure 19-3, Page 19-4).

The Forward and Reverse Switch changes the direction of vehicle movement by changing the direction of electrical current through the motor, and thus the direction that the motor turns. By limiting maximum voltage available in reverse to one-half that available in forward, maximum vehicle speed in reverse is limited to one-half of maximum vehicle speed in forward.

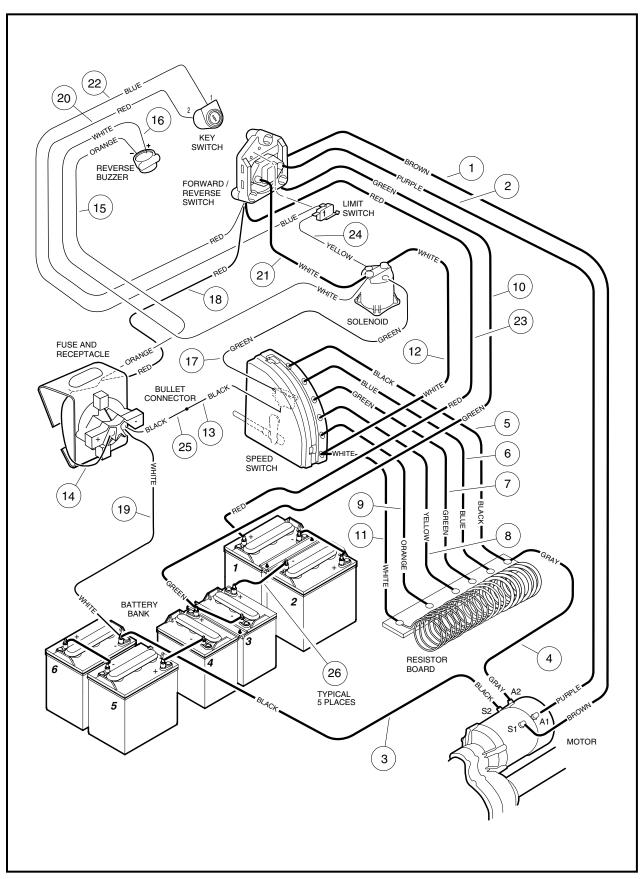


FIGURE 19-2

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THE CHARGE CIRCUIT

The charge circuit consists of the battery charger, charger plug, charger receptacle, on-board fuse link, and the batteries. The batteries and the battery charger are discussed in separate sections in this manual (Batteries - Section 22, and Accu-Power Battery Charger - Section 23A).

The charger plug and receptacle connection is the most critical between the charger and the vehicle battery circuit. The contacts in the receptacle must grip the plug blades well enough to create enough pressure or drag for an adequate electrical connection. If little or no drag is felt, the receptacle or plug must be replaced. If either the plug or receptacle is damaged or feels hot when charging, one or both must be replaced (See Accu-Power Battery Charger - Section 23A).

The on-board receptacle fuse link provides additional protection for the vehicle charging circuit. The fuse is rated for use with a Club Car Accu-Power Charger only. If it is blown, the cause should be determined before the fuse is replaced. A vehicle with a blown fuse will not charge (See Page 23-21, Accu-Power Battery Charger - Section 23A).

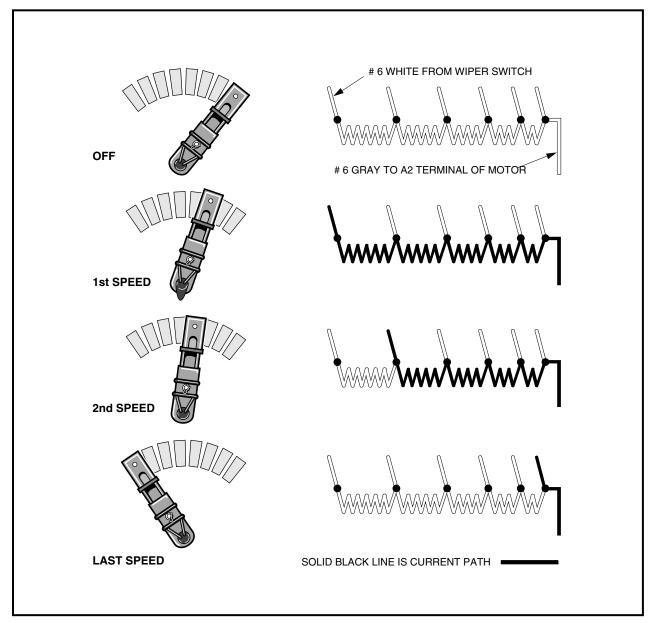


FIGURE 19-3

	V	-GLIDE TROUBI	LES	HOOTING GUIDE	
SY	МРТОМ	PROBLEM	PC	DSSIBLE CAUSES	REFER TO
1.	Vehicle will not run -	Batteries	1)	Battery connections.	Test Procedure 1
	no solenoid click.		2)	Batteries discharged.	
		Key Switch	1)	Loose wires.	Test Procedure 2
			2)	Failed switch.	
		F&R Anti-arcing Limit Switch	1)	Loose wires.	
			2)	Failed switch.	F&R Anti-arcing Limit Switc Page 19-1
			3)	Cam is not activating switch.	F&R Anti-arcing Limit Switc Page 19-19
		Accelerator	1)	Accelerator rod disconnected.	Accelerator and Brake Peda Group, Section 6
		Accelerator Pedal Limit	1)	Loose wire.	
		Switch	2)	Disconnected or improperly connected wires.	Accelerator Pedal Limit Switch, Page 19-20
			3)	Failed switch.	Accelerator Pedal Limit Switch, Page 19-20
		Solenoid	1)	Loose wires.	
			2)	Failed coil.	Solenoid, Page 19-22
2.	Vehicle will not run - solenoid clicks.	F&R Switch	1)	Loose wires.	
			2)	Failed contacts.	Test Procedure 7
		Solenoid	1)	Failed contacts.	Test Procedure 10
		V-Glide Wiper Switch	1)	Loose or broken wire connections.	
			2)	Brush or contacts are dirty, burned, corroded, shorted, or worn.	Test Procedure 11 and Electrical Components, Page 19-25
			3)	Improperly wired.	Electrical Components, Page 19-25
		Motor	1)	Loose wires.	
			2)	Open circuits.	Test Procedure 8 and Motor, Section 24
			3)	Worn brushes.	
3.	Vehicle skips one or more speeds.	V-Glide Wiper Switch	1)	Loose or broken wire connections.	
			2)	Brush or contacts are dirty, burned, corroded, shorted, or worn.	Test Procedure 11 and Electrical Components, Page 19-25
			3)	Improperly wired.	Electrical Components, Page 19-25
		Resistors	1)	Loose or broken resistor.	Test Procedure 6
1.	Vehicle runs slow.	V-Glide Wiper Switch	1)	Poor wire connections.	
			2)	Dirty or worn contact points.	Test Procedure 11

	V-GLIDE TROUBLESHOOTING GUIDE						
SYMPTOM		PROBLEM	POSSIBLE CAUSES		REFER TO		
4.	Vehicle runs slow, continued:	Batteries	1)	Loose terminals or corrosion.	Test Procedure 1 and Batteries, Section 22, Page 22-5		
			2)	Improperly wired.			
			3)	Batteries failed.			
			4)	Batteries not fully charged.			
		Accelerator Push Rod	1)	Accelerator rod is improperly adjusted.	V-Glide Wiper Switch, Page 19-25		
		Motor	1)	Loose wires.			
			2)	Worn or misaligned brushes.	Motor, Section 24, Page 24-8		
			3)	Dirty or rough commutator.			
		Brakes	1)	Dragging brakes.	Brakes, Section 6, and Accelerator, Section 7		
		Tires	1)	Under-inflated or flat tires.	Wheels and Tires, Section 10, Page 10-1		
5.	Vehicle runs in first speed when the F&R Switch is put in forward or reverse with the keyswitch OFF.	Solenoid	1)	Solenoid contacts are welded closed.	Test Procedure 9		
6.	Vehicle runs in first speed when the F&R Switch is put in forward or reverse with the key switch ON.	Accelerator Pedal Limit Switch	1)	V-Glide wiper switch is wired wrong.	Accelerator Pedal Limit Switch, Page 19-20		
			2)	Accelerator Pedal limit switch failed in the closed position.	Accelerator Pedal Limit Switch, Page 19-20		
		Accelerator Rod	1)	Accelerator rod is bent or improperly adjusted.	Accelerator and Brake Pedal Group, Section 6		
		V-Glide Wiper Switch	1)	Wiper switch brush or accelerator pedal is stuck.	Accelerator and Brake Pedal Group, Section 6		
			2)	Wiper switch is improperly adjusted.	Accelerator and Brake Pedal Group, Section 6		
7.	Vehicle will run in forward but not in reverse, or will run in reverse but not forward.	F&R Anti-arcing Limit Switch	1) 2)	Broken 6 gauge green wire. Dirty or corroded contacts on the F&R switch.	Test Procedure 3 and Electrical Components, Page 19-19		
		Battery Wires	1)	Improperly wired			
8.	Vehicle not being fully charged.	Charger Connections	1)	Loose wires at receptacle, batteries, or F&R switch.	Accu-Power Charger, Section 23A		
			2)	Improper engagement of charger plug and receptacle.			
		On-board Receptacle Fuse Link	1)	Fuse is blown.	Accu-Power Charger, Section 23A		
		Charger	1)	Incorrect incoming AC voltage.	Accu-Power Charger, Section 23A		
			2)	Charger output is low.	Accu-Power Charger, Section 23A		
			3)	Charger cord and plugs.	Accu-Power Charger, Section 23A		

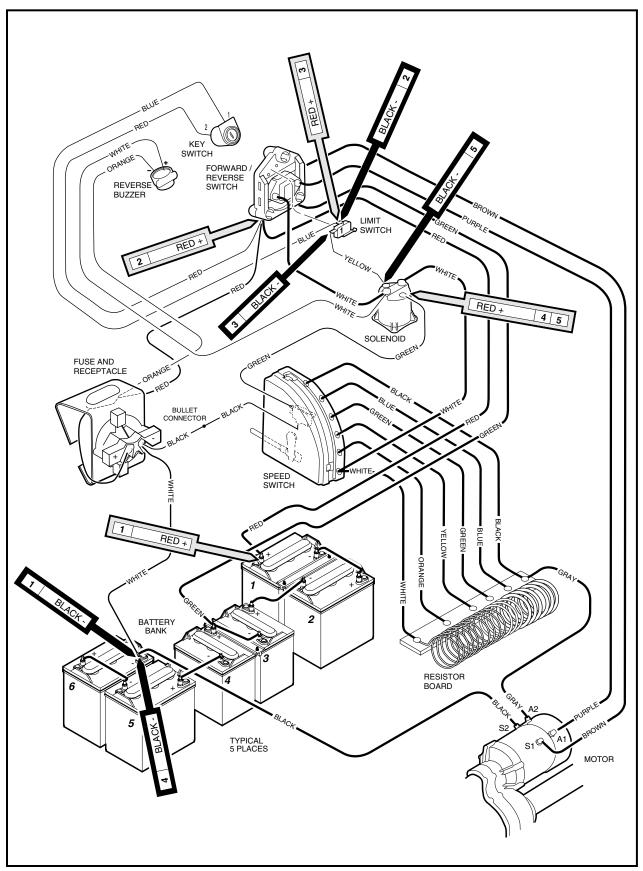


FIGURE 19-4

CIRCUIT TESTING

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.

Using the following procedures, the entire electrical system of the V-Glide vehicle can be tested without major disassembly of the vehicle:

- Refer to Figure 19-4, Page 19-7 for testing the control circuit, and to Figure 19-5 for testing the power circuit.
- The red (+) and black (-) probe symbols in Figures 19-4 and 19-5 (wiring diagrams) indicate points where the probes should be placed for tests. The numbers on the probe symbols indicate test procedure numbers.
- A volt-ohm meter (VOM) (Club Car Part No. 1011480) or a continuity tester (Club Car Part No. 1011273) is needed in order to make these tests.
- Continuity, or a closed circuit, is indicated by zero ohms on the VOM or by a lighted indicator on the continuity tester. No continuity, or an open circuit, is indicated by infinite ohms, or no light.
- The tests in this section are made in order to check individual components and the wires to and from the components. The probes will often be placed at points removed from the component being tested.

CONTROL CIRCUIT

Test Procedure 1 - Batteries/Voltage Check

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
 - FOLLOW ALL PROCEDURES EXACTLY AS STATED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.
- 1. With the VOM set at Volts DC, place the red (+) probe on the positive post of battery No. 1, and the black (-) probe on the negative post of battery No. 6. If you don't read at least 36 volts with the battery fully charged, check for loose battery connections or perhaps a battery installed in reverse polarity. Refer to Batteries, Section 22 for further details on battery testing.

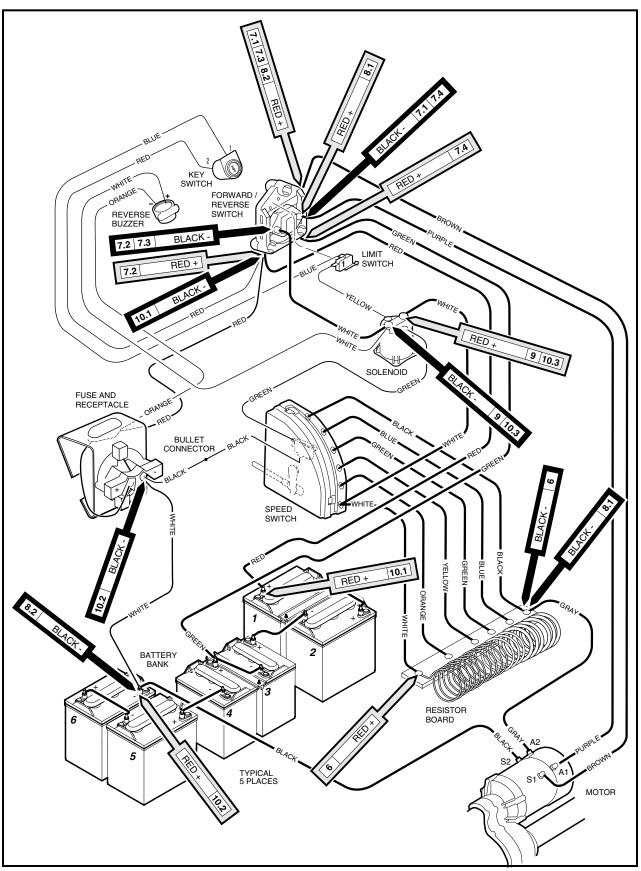


FIGURE 19-5

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.

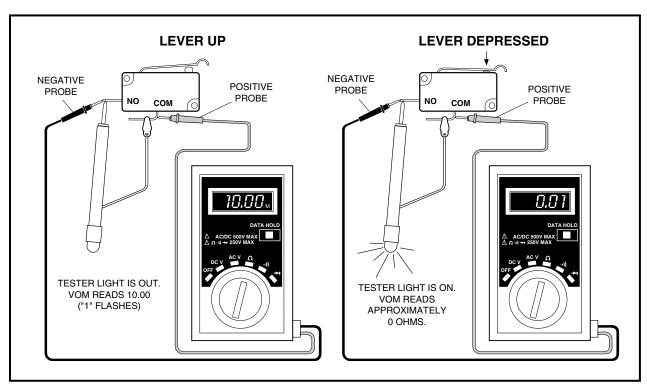


FIGURE 19-6

Test Procedure 2 - Key Switch

- Place the red (+) probe of the VOM (set at Ω) or the continuity tester on the *forward* terminal of the Forward and Reverse Switch (Figure 19-7, Page 19-12), and place the black (-) probe on the upper (COM) terminal of the Forward and Reverse anti-arcing limit switch (Figure 19-4). With the key in the *off* position, the reading should be no continuity.
- 2. Insert the key and turn the key switch to the *on* position. The reading should be continuity.
- 3. If the reading is incorrect at either of steps one and two, check the wires and terminals. If no problems are found with the wires or terminals, replace the key switch (See Key Switch, Page 19-18).

Test Procedure 3 - Forward and Reverse Anti-Arcing Limit Switch

 Place the red (+) probe of the VOM (set at Ω) or continuity tester on the common terminal of the limit switch, and place the black (-) probe on the normally open (NO) terminal. The reading should be continuity when the lever is depressed and no continuity when the lever is released (Figure 19-4) (See Figure 19-6). If the reading is incorrect at either lever position, check the wires and terminals. If no problems are found with the wires or terminals, replace the switch (See Forward and Reverse Anti-arcing Limit Switch, Page 19-19).



Test Procedure 4 - Accelerator Pedal Limit Switch

- Place the red (+) probe of the VOM (set at Ω) or continuity meter on the terminal of the green wire at its connection on the activating coil post of the solenoid, and place the black (-) probe on the *negative (-)* post of battery number 6 (Figure 19-4, Page 19-7). With the accelerator pedal fully up (not depressed), the reading should be no continuity.
- 2. Depress the accelerator pedal. The reading should be continuity.
- 3. If either reading is incorrect, remove the V-Glide wiper switch housing cover and check for proper activation of the limit switch by the wiper arm.
- 4. Also make sure that the 18 gauge green wire is connected to the normally closed (NC) terminal of the limit switch, and that the 18 gauge black wire is connected to the common (COM) terminal. There should be no wire attached to the normally open (NO) terminal.

Test Procedure 5 - Solenoid Activating Coil

- 1. Place the red probe (+) of the VOM (set at Ω) on one of the small activating coil posts of the solenoid, and place the black (-) probe on the other small post. A reading of 55-60 ohms should be obtained.
- 2. If the reading is incorrect, replace the solenoid.

POWER CIRCUIT

Test Procedure 6 - Resistors

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.

WARNING

- DO NOT TOUCH HOT RESISTORS! HOT RESISTORS CAN CAUSE SEVERE BURNS.
- 1. Inspect the resistors for loose connections, damaged coils or wiring, or problems of any kind.
- 2. If there are no problems, place the red (+) probe of the VOM (set to Ω) or continuity tester on the first resistor connection, and place the black (-) probe on the last resistor connection. The reading should be continuity or approximately .6 ohms.
- 3. If the reading is incorrect, check the resistors again for loose connections or damage. Replace any damaged parts.

19A

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Test Procedure 7 - Forward and Reverse Switch

- 1. Use a continuity tester or a VOM set to Ω to test the forward and reverse switch in both directions:
 - 1.1. With the forward and reverse switch in the forward position, place the red (+) probe on the *common* terminal of the switch, and place the black (-) probe on the terminal of the heavy purple wire on the forward and reverse rotor (**Figure 19-7**). The reading should be continuity.
 - 1.2. With the forward and reverse switch in the forward position, place the red (+) probe on the *forward* terminal post of the forward and reverse switch, and place the black (-) probe on the terminal of the heavy white wire on the forward and reverse rotor. The reading should be continuity.
 - 1.3. With the forward and reverse switch in the reverse position, place the red (+) probe on the *common* terminal of the forward and reverse switch, and place the black (-) probe on the terminal of the heavy white wire on the forward and reverse rotor.
 - 1.4. With the forward and reverse selector in the reverse position, place the red (+) probe on the *reverse* terminal of the forward and reverse switch, and place the black (-) probe on the terminal of the heavy purple wire on the forward and reverse rotor.
- 2. If the reading is incorrect at any position in Step 1, see Forward and Reverse Switch, Page 19-32.

Test Procedure 8 - Motor

- 1. Use a continuity tester or a VOM set to Ω to test the motor armature and motor stator as follows.
 - 1.1. To test the motor armature: with the forward and reverse switch in the neutral position, place the red (+) probe on the terminal of the heavy purple wire on the forward and reverse rotor, and place the black (-) probe on the last resistor coil connection (black and grey wires). The reading should be continuity.
 - 1.2. To test the motor stator: with the forward and reverse switch in the neutral position, place the red (+) probe on the *common* terminal of the forward and reverse switch (brown wire), and place the black (-) probe on the negative post of battery No. 6. The reading should be continuity.
- 2. If either reading in Step one is incorrect, check for loose wires or terminals. Then refer to Motor, Section 24, for further testing and repair procedures.

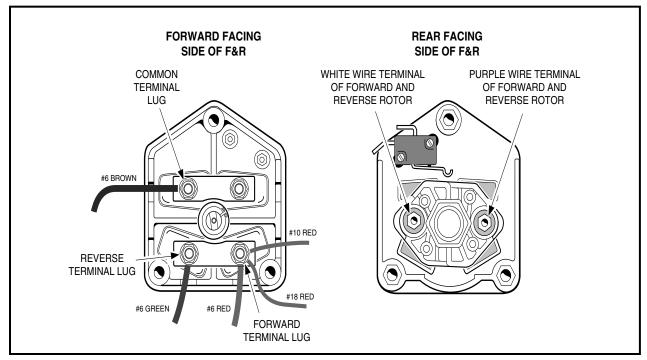


FIGURE 19-7

Test Procedure 9 - Solenoid Contacts (Power Off)

19A

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.

If the vehicle begins to move as soon as the forward and reverse switch is placed in forward or reverse, without having depressed the accelerator pedal, the solenoid is probably welded closed. Test the solenoid as follows:

- 1. Heed all WARNINGS above. Failure to do so could result in unexpected vehicle acceleration.
- 2. Place the red (+) probe of a VOM (set at Ω) or continuity tester on one of the large terminal posts on the solenoid, and place the black (-) probe on the other large terminal post on the solenoid. The reading should be *no* continuity.
- 3. If the reading is incorrect, replace the solenoid.

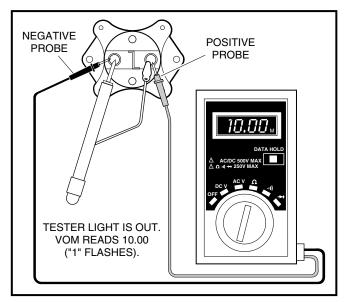


FIGURE 19-8

Test Procedure 10 - Solenoid Contacts (Power On)

A DANGER

• BEFORE CONNECTING THE BATTERIES, DISCONNECT THE GREY WIRE FROM THE RESISTOR BOARD TO THE A2 MOTOR TERMINAL AND REMOVE THE WIRE FROM THE VEHICLE, AND THEN RAISE THE REAR END OF THE VEHICLE UNTIL THE REAR WHEELS ARE OFF THE FLOOR (SEE WARNING AT TOP OF PAGE 19-14). WITH THE GREY WIRE REMOVED, THE SOLENOID CAN BE ACTIVATED WITHOUT SUPPLYING POWER TO THE REAR WHEELS. FAILURE TO DISCONNECT THE WIRE CAN CAUSE THE VEHICLE TO START ABRUPTLY.

Test Procedure 10, Continued; See DANGER on preceding page:

WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 1. If the battery cables were disconnected, reconnect them. See DANGER at the bottom of Page 19-13.
- 2. With the forward and reverse switch in the neutral position, place the red (+) probe of a VOM (set to Ω) or continuity tester on the positive post of battery No. 1, and place the black (-) probe on the *forward* terminal on the forward and reverse switch. If the reading is no continuity, inspect the wire assembly between these two positions and replace the wire assembly if it is defective.
- 3. With the key switch in the ON position and the forward and reverse switch in the forward position, depress the accelerator pedal to the floor (you should hear the solenoid click). With the accelerator depressed, place the red (+) probe of a VOM (set to Ω) or continuity tester on the one of the large posts on the solenoid, and place the black (-) probe on the other large post on the solenoid. The reading should be continuity. If the reading is incorrect, replace the solenoid. See WARNING below.

A WARNING

 REMOVE THE KEY, PLACE THE FORWARD AND REVERSE SWITCH IN NEUTRAL, AND DIS-CONNECT THE BATTERIES AS SHOWN ON PAGE 19-2 BEFORE REPLACING THE SOLENOID OR INSTALLING THE GREY WIRE FROM THE RESISTOR BOARD TO THE A2 MOTOR TERMI-NAL.

Test Procedure 11 - V-Glide Wiper Switch

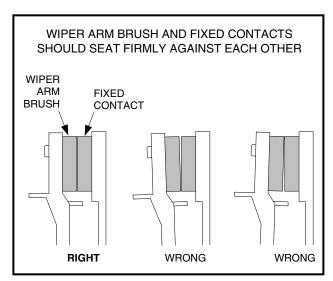
A DANGER

• DISCONNECT THE BATTERIES AS SHOWN ON PAGE 19-2, TURN THE KEY SWITCH TO THE OFF POSITION, AND PUT THE FORWARD AND REVERSE SWITCH IN THE NEUTRAL POSITION, OR THE VEHICLE WILL ENGAGE IN FORWARD OR REVERSE AND RUN OVER YOU, CAUSING SEVERE PERSONAL INJURY OR DEATH.

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.
- 1. Read and heed the **DANGER** and **WARNING** boxes above.

- Remove the V-Glide Wiper Switch cover and observe the wiper arm brush as it moves across the fixed
 contacts. There should be sufficient spring pressure in the arm to keep the wiper arm brush firmly
 against each of the fixed contacts as it travels across them. There should also be proper surface contact between the wiper arm brush and each of the fixed contacts as shown (Figure 19-9).
- 3. Inspect both the wiper arm brush and fixed contacts for excessive pitting, burns, or wear. If the wiper arm brush is worn to the wear limit line (Figure 19-10), it must be replaced. If the wiper arm brush is replaced, see V-Glide Wiper Switch Arm Adjustment, Page 19-26.
- 4. Make sure that all of the contacts are tight and that the wiper switch housing is not melted or burned around the contacts. If the V-Glide wiper switch housing or fixed contacts are damaged, the entire wiper switch housing with contacts must be replaced.
- 5. Make sure that the nuts attaching the wires to the backs of the fixed contacts are tightened to 35-45 in.lbs. (4/5 N-m).



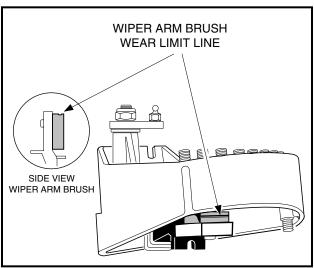


FIGURE 19-9 FIGURE 19-10

19A E

SECTION 19B - ELECTRICAL COMPONENTS V-GLIDE 36 VOLT VEHICLE

A DANGER

- WEAR A FULL FACE SHIELD WHEN WORKING AROUND BATTERIES BECAUSE OF THE DANGER OF AN EXPLODING BATTERY.
- BATTERY EXPLOSIVE GASSES DO NOT SMOKE! KEEP SPARKS, FLAMES, CIGARETTES AWAY. TOOLS, WIRES, AND METAL OBJECTS CAN CAUSE SPARKS WHEN "SHORTED" ACROSS A BATTERY. INSULATED TOOLS SHOULD BE USED. EXTREME CARE SHOULD BE TAKEN WHEN DISCONNECTING OR RECONNECTING BATTERIES. WHEN WIRES ARE DISCONNECTED, BE SURE TO KEEP THEM AWAY FROM BATTERY POSTS AND OTHER WIRES. TO PREVENT EXPLOSIVE GAS BUILD-UP, MAKE SURE AREA IS WELL-VENTILATED WHEN CHARGING IN AN ENCLOSED SPACE.
- BATTERIES CONTAIN ACID POISON CAUSES SEVERE BURNS! AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. BATTERY ACID ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY!
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIAELY!
 - EYES: FLUSH WITH WATER FOR 15 MINUTES. CALL A PHYSICIAN IMMEDIATELY!

WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE SOME KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- MOVING PARTS! DO NOT ATTEMPT TO SERVICE THE VEHICLE WHILE IT IS RUNNING.
- HOT! DO NOT ATTEMPT TO SERVICE HOT RESISTORS. FAILURE TO HEED THIS WARNING COULD RESULT IN SEVERE BURNS.
- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.

WARNING

• TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 19-1, PAGE 9-2.

KEY SWITCH

The key switch is mounted just to the right of the steering column on the center dash panel.

Testing the Key Switch

See Test Procedure 2, Page 19-10.

Removing the Key Switch

- 1. Disconnect the batteries (Figure 19-1, Page 19-2).
- 2. Remove the center dash.
 - 2.1. Remove the plastic cap covering the screw on each side of the center dash.
 - 2.2. Loosen (but do not remove) the screw on each side of the center dash panel.
 - 2.3. Insert a screwdriver at the top center of the center dash between the dash and cowl brace. Gently pry the center dash out slightly from under the edge of the cowl brace.
 - 2.4. Pull the center dash out approximately one inch from the frame and then bend the top right corner of the center dash panel inward while pulling the top of the panel out and down.

NOTE

• BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.

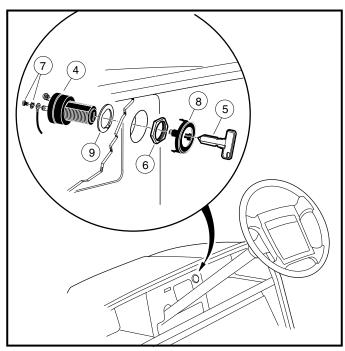


FIGURE 19-11

- 3. Slide the center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 19B
 - П

- 4. Disconnect the wires from the key switch. Do not allow the wires to touch.
- 5. Remove the key switch from the dash:
 - On vehicles manufactured prior to December 19, 1994 (serial numbers lower than 9522-436452), hold the key switch and use the switch tool (Club Car Part No. 1012801) to turn the switch retaining nut on the outside of the dash panel.
 - On vehicles manufactured on December 19, 1994 and later (serial numbers 9522-436452 and greater), from the back of the dash panel, push down on the retaining tabs surrounding the key switch and remove the key switch cap (8) (Figure 19-11). Hold the key switch and use a 1 inch deep well socket to remove the switch retaining nut from the outside of the dash panel.

Installing the Key Switch

- 1. Position the key switch in the center dash and install the switch retaining nut. If you have the later model key switch, press the plastic cap into place on the outside of the center dash (Figure 19-11).
- 2. Connect the wires to the key switch terminals (See Figure 19-2, Page 19-3), and then coat the terminals with Battery Protector Spray (Club Car Part No. 1014305).
- Install the center dash into the vehicle by reversing the removal procedure. Make sure that the key switch terminals cannot touch the frame and that the panel is properly seated and snapped into place.

NOTE

 BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE INSTALLING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.

FORWARD AND REVERSE ANTI-ARCING LIMIT SWITCH

A DANGER

• DISCONNECT THE BATTERIES AS SHOWN ON PAGE 19-2, TURN THE KEY SWITCH TO THE OFF POSITION, AND PUT THE FORWARD AND REVERSE SWITCH IN THE NEUTRAL POSITION, OR THE VEHICLE WILL ENGAGE IN FORWARD OR REVERSE AND RUN OVER YOU, CAUSING SEVERE PERSONAL INJURY OR DEATH.

A WARNING

- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.
- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).

Forward and Reverse Anti-arcing Limit Switch, Continued:

See DANGER and WARNING on previous page.

The Forward and Reverse Anti-arcing Limit Switch is located on the forward and reverse switch and is activated by a cam on the forward and reverse switch rotor.

Testing the Anti-arcing Limit Switch

See Test Procedure 3, Page 19-10.

Removing the Anti-arcing Limit Switch

1. Remove the nuts, lock washers, and screws attaching the anti-arcing limit switch to the forward and reverse switch.

Installing the Anti-arcing Limit Switch

- 1. Position the anti-arcing switch on the forward and reverse switch housing and install the screws, lock washers, and nuts. Tighten the screws to 5 in.lbs. (0.6 N-m).
- 2. Connect the blue wire to the common (COM) terminal and the yellow wire to the normally open (NO) terminal.
- 3. After installation, make sure that the switch makes an audible click (makes and breaks contact) when the forward and reverse rotor is turned. If it does not click, inspect the forward and reverse rotor and limit switch for damage.

ACCELERATOR PEDAL LIMIT SWITCH

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.

Testing the Accelerator Pedal Limit Switch

See Test Procedure 4, Page 19-11.

Removing the Accelerator Pedal Limit Switch

- 1. Remove the No. 5 and No. 6 batteries from the vehicle.
- 2. Remove the cover from the V-Glide wiper switch housing.
- 3. Disconnect the accelerator rod from the ball stud on the wiper switch.
- 4. Remove and retain the screws, lock washers, and nuts attaching the limit switch to the wiper switch.
- 5. Disconnect the green and black wires from the limit switch.

Installing the Accelerator Pedal Limit Switch

- 1. Position the Accelerator Pedal Limit Switch on the V-Glide wiper switch body and install the mounting screws, lock washers, and nuts. Tighten the screws to 5 in.lbs. (0.6 N-m).
- 2. Connect the accelerator rod ball joint to the ball stud on the wiper switch.

Installing the Accelerator Pedal Limit Switch, Continued:

- 3. Connect the green wire to the normally closed (NC) terminal and the black wire to the common (COM) terminal of the limit switch. The normally open (NO) terminal should have *no* wire attached to it.
- 4. Install the cover on the V-Glide wiper switch (make sure all three tabs snap into place).
- 5. Install the No. 5 and No. 6 batteries into the vehicle and connect the battery cables (Figure 19-1, Page 19-2).

THE REVERSE BUZZER

The reverse buzzer is located on the rear of the center dash panel, under the front body (Figure 19-12).

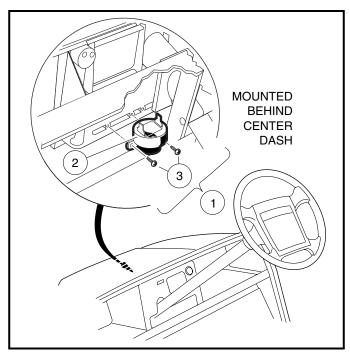


FIGURE 19-12

Testing the Reverse Buzzer Circuit

- Place the black (-) probe of a VOM (set at volts) on the negative (-) post of battery No. 6, and place the
 red (+) probe on the receptacle fuse assembly at the No. 10 red wire and 18 gauge orange wire connection. The VOM should read battery voltage. If it does not, check battery pack voltage, battery wire
 connections, and check continuity of the 10 gauge red wire.
- 2. Place the black (-) probe of a VOM (set at volts) on the large post of the solenoid (with the 6 gauge and 18 gauge white wires attached), and place the red (+) probe on the positive post of battey No. 1. With the key switch in the OFF position, put the forward and reverse lever in the reverse position. The VOM should read battery voltage. If it does not, check battery pack voltage, battery wire connections, and check the continuity of the 6 gauge white wire from the forward and reverse switch to the solenoid.
- 3. Disconnect the batteries (Figure 19-1, Page 19-2).
- 4. Remove the center dash.
 - 4.1. Remove the plastic cap covering the screw on each side of the center dash.
 - 4.2. Loosen (but do not remove) the screw on each side of the center dash panel.
 - 4.3. Insert a flat blade screwdriver at top center of the center dash between the dash and the cowl brace. Gently pry the center dash out slightly from under the edge of the cowl brace.

Testing the Reverse Buzzer Circuit, Continued:

4.4. Pull center dash out approximately one inch from the frame and then bend the top right corner of the dash panel inward while pulling the top of the panel out and down.

NOTE

- BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.
- 5. Slide the center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 6. Disconnect the 18 gauge white wire at the reverse buzzer. Place the black (-) probe of a VOM (set at Ω) or continuity tester on the large post of the solenoid (with the 6 gauge and the 18 gauge white wires attached), and place the red (+) probe on the terminal end of the 18 gauge white wire at the reverse buzzer. The reading should be continuity. If it is not, replace the 18 gauge white wire.
- 7. Disconnect the 18 gauge orange wire at the reverse buzzer. Place the black (-) probe of a VOM (set at Ω) or a continuity meter on the receptacle fuse assembly at the 10 gauge red wire and 18 gauge orange wire connection, and place the red (+) probe on the terminal end of the 18 gauge orange wire at the reverse buzzer. The reading should be continuity. If it is not, replace the 18 gauge orange wire.
- 8. If there is continuity in both wires, but the buzzer will not sound, replace the buzzer.

Removing the Reverse Buzzer

- 1. Disconnect the batteries (Figure 19-1, Page 19-2).
- 2. Remove the center dash.
 - 2.1. Remove the plastic cap covering the screw on each side of the center dash.
 - 2.2. Loosen (but do not remove) the screw on each side of the center dash panel.
 - 2.3. Insert a flat blade screwdriver at top center of the center dash between the dash and the cowl brace. Gently pry the center dash out slightly from under the edge of the cowl brace.
 - 2.4. Pull center dash out approximately one inch from the frame and then bend the top right corner of the dash panel inward while pulling the top of the panel out and down.

NOTE

- BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.
- 3. Slide the center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 4. Remove the orange and white wires from the buzzer terminals (Figure 19-2, Page 19-3).
- 5. Remove the screws attaching the buzzer to the center dash.

Installing the Reverse Buzzer

1. Install reverse buzzer and center dash by reversing removal procedures.

THE SOLENOID

The solenoid is mounted just in front of the No. 3 and No. 4 batteries (Figure 19-1, Page 19-2). It has two sets of terminal posts on it. The two large terminal posts (5/16" diameter) are power contact terminals, and the two small posts (No. 10) are activating coil terminals.

The Solenoid, Continued:

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.

Testing the Solenoid

See Test Procedures 5, Page 19-11, and 9 and 10, Page 19-13.

Removing the Solenoid

- 1. Disconnect all wires from the solenoid.
- 2. Remove the two screws, washers, and nuts attaching the solenoid to the vehicle.

Installing the Solenoid

- 1. Position the solenoid and install the two mounting screws, washers, and nuts. Tighten the screws to 66 in.lbs. (7.5 N-m).
- 2. Connect the wires as shown in the wiring diagram on Page 19-3 (Figure 19-2). See CAUTION below.

A CAUTION

• MAKE SURE THE WIRES ARE ROUTED SO THAT THE WIRE FROM THE FORWARD AND REVERSE ROTOR DOES NOT PULL ON OTHER WIRES AS THE FORWARD AND REVERSE LEVER IS SHIFTED.

RESISTORS

The resistors are attached to the resistor mounting board which is located behind the batteries.

Testing the Resistors

See Test Procedure 6, Page 19-11.

Removing the Resistors

1. Loosen (do not remove) the nuts (1) that secure the resistors (R1 - R5) to the mounting board and then slide the resistors out from under the washers (3) (Figure 19-13, Page 19-24).

Installing the Resistors

1. Position the resistor ends under the washers (3) and tighten the nuts to 90-100 in.lbs. (10/11 N-m). See the CAUTION below and at the top of page 19-24, and the NOTE at the top of page 19-25. See the chart on page 19-25.

A CAUTION

• BE SURE THE MOTOR WIRES ARE SECURED IN WIRE TIES SO THAT THEY CANNOT COME INTO CONTACT WITH THE RESISTORS.

19B

Installing the Resistors, Continued:

A CAUTION

- BE SURE THE RESISTORS ARE NO CLOSER THAN ONE INCH TO THE RESISTOR SHIELD. IF THE RESISTORS ARE CLOSER THAN ONE INCH TO THE RESISTOR SHIELD, ADJUST THE RESISTORS.
- IF A 3 1/2 HORSEPOWER MOTOR IS BEING USED IN CONJUNCTION WITH A V-GLIDE WIPER SWITCH, THE FOURTH AND FIFTH SPEED RESISTOR COILS MUST BE REPLACED WITH NEW COILS (CLUB CAR PART NO.S 1014654 AND 1014655).

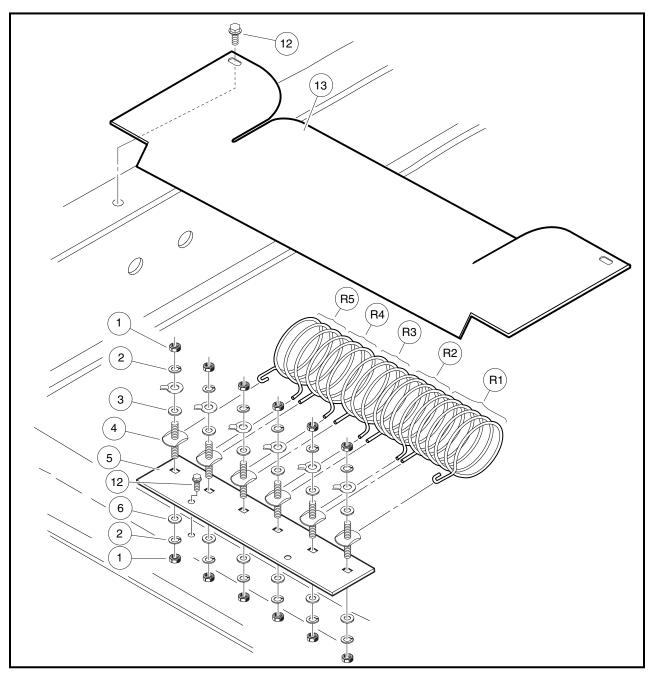


FIGURE 19-13

NOTE

- MAKE SURE THAT NO RESISTOR COIL IS TOUCHING ANOTHER ONE. THE VEHICLE WILL NOT RUN PROPERLY IF ANY COILS ARE TOUCHING.
- MAKE SURE THAT THE RESISTOR COILS ARE INSTALLED IN THE PROPER ORDER (FIGURE 19-13, PAGE 19-24). RESISTOR 1 HAS THE SMALLEST DIAMETER WIRE AND THE GREATEST NUMBER OF COILS. RESISTOR 5 HAS THE LARGEST DIAMETER WIRE AND THE SMALLEST NUMBER OF COILS. SEE THE CHART BELOW.

RESISTOR NUMBER	NUMBER OF COILS	DIAMETER			
R-1	6	.128"			
R-2	4	.128"			
R-3	3	.144"			
R-4	3	.162"			
R-5	3	.182"			
FOR 3 1/2 HORSEPOWER MOTORS					
R-4	4	.182"			
R-5	4	.204"			

V-GLIDE WIPER SWITCH

The V-Glide wiper switch is located in the battery compartment next to battery No. 6. The wiper switch arm adjustment needs to be checked if the brush on the V-Glide wiper switch is replaced. The pedal group adjustments (See Section 6, Accelerator and Brake Pedal Group) need to be checked if any of the pedal group or the accelerator rod has been adjusted, removed, or replaced.

The V-Glide wiper switch assembly should be inspected on a monthly basis for cracks or damage. It should also be inspected on a monthly basis to be sure it is securely fastened to the frame.

A WARNING

- BE SURE THE V-GLIDE WIPER SWITCH ARM SHAFT ROTATES FREELY IN THE HOUSING. IF THE WIPER SWITCH ARM SHAFT BINDS OR STICKS, IT MUST BE REPLACED.
- MAKE SURE THE V-GLIDE WIPER SWITCH ASSEMBLY IS SECURELY FASTENED TO THE FRAME AFTER INSTALLATION.

A CAUTION

- INSPECT THE V-GLIDE WIPER SWITCH HOUSING FOR CRACKS OR DAMAGE BEFORE INSTALLING IT. IF THE HOUSING IS CRACKED OR DAMAGED, THE ENTIRE HOUSING WITH FIXED CONTACTS MUST BE REPLACED.
- WHEN WASHING THE VEHICLE, DO NOT DIRECT THE WATER STREAM AT THE WIPER SWITCH.
- DO NOT OPERATE THE VEHICLE WITHOUT THE V-GLIDE WIPER SWITCH COVER IN PLACE.

V-Glide Wiper Switch, Continued:

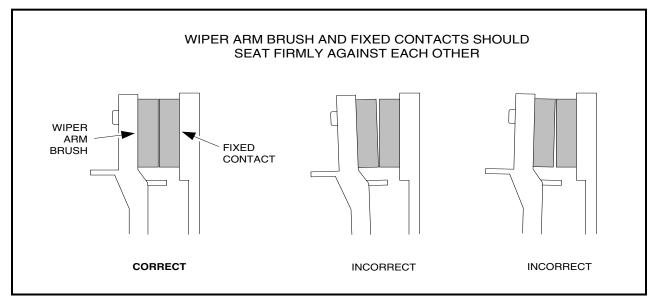


FIGURE 19-14

V-Glide Wiper Switch Arm Adjustment

The contact surfaces on the wiper switch arm brush and the fixed contacts must be parallel to ensure efficient operation of the V-Glide wiper switch (See Figure 19-14). Adjust arm contact as follows:

- Remove the No. 5 and No. 6 batteries from the vehicle (Figure 19-1, Page 19-2) and remove the cover from the V-Glide wiper switch.
- 2. Test the wiper switch arm and fixed contacts for proper adjustment:
 - Completely coat the contact surfaces of the wiper arm brush and fixed contacts with removable ink
 - 2.2. Sweep the V-Glide wiper switch arm brush back and forth across the fixed contacts. Scraping of the ink should show contact on at least 30% of the surface of the wiper switch arm brush and on each fixed contact. If 30% contact is not shown, surface contact needs to be adjusted.
- 3. To adjust surface contact, remove the spring cotter pin (24) and turn the adjustment screw (14) until the surfaces of the wiper switch arm brush and fixed contacts are parallel (Figure 19-15).
- 4. After adjustment has been made, apply one drop of Loctite® 290 thread locking compound to the adjustment screw (14) at the hex nut (11). Then install the spring cotter pin (24) through the hole in the adjustment screw (Figure 19-15). See NOTE below.

NOTE

- IF THE WIPER SWITCH ARM BRUSH IS WORN TO OR BEYOND THE WEAR LIMIT LINE, IT SHOULD BE REPLACED. IF ANY OF THE FIXED CONTACTS ARE EXCESSIVELY WORN, PITTED, OR BURNED, THE ENTIRE WIPER SWITCH HOUSING WITH FIXED CONTACTS MUST BE REPLACED.
- A THREAD LOCKING COMPOUND HAS BEEN PLACED ON THE THREADS OF THE CONTACT STUDS TO PREVENT REMOVAL OF THE FIXED CONTACTS. IF REMOVAL OF A CONTACT STUD IS ATTEMPTED, THE STUD OR THE HOUSING WILL BREAK BEFORE THE NUT COMES LOOSE.

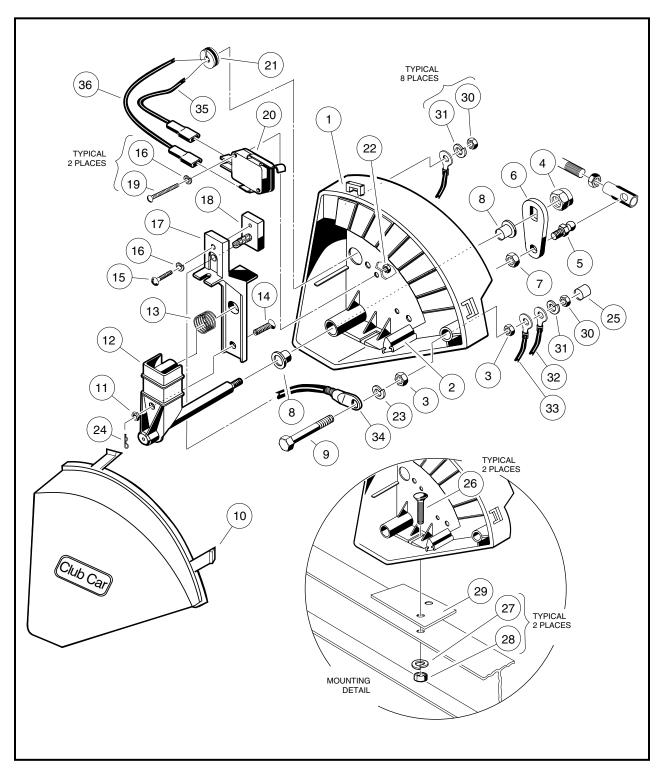


FIGURE 19-15

V-Glide Wiper Switch Adjustment

Each of the adjustments in the following WARNING (top of page 19-28) affects V-Glide wiper switch adjustment. To ensure proper wiper switch adjustment, all of these items must be properly adjusted. If any one of them requires adjustment, all of them must be checked, and also adjusted if necessary, in the order listed in the WARNING at the top of page 19-28.

V-Glide Wiper Switch Adjustment, Continued:

WARNING

- TO PROPERLY ADJUST YOUR WIPER SWITCH, CHECK, AND ADJUST IF NECESSARY, THE FOLLOWING ITEMS IN THE ORDER LISTED:
 - BRAKE PEDAL AND CABLE ADJUSTMENT. SEE SECTION 6.
 - ACCELERATOR ROD ADJUSTMENT. SEE SECTION 6.
 - ACCELERATOR PEDAL STOP ADJUSTMENT. SEE SECTION 6.
 - PARK BRAKE ADJUSTMENT. SEE SECTION 6.
- FAILURE TO CHECK ALL ADJUSTMENTS IN THE ORDER LISTED COULD RESULT IN IMPROPER VEHICLE OPERATION, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY.

V-Glide Wiper Switch Arm Brush Replacement

- 1. Remove batteries No. 5 and No. 6 from the vehicle (Figure 19-1, Page 19-2).
- 2. Disconnect the accelerator rod from the V-Glide wiper switch ball stud and place the wiper switch arm on the eighth fixed contact.
- 3. Remove the cap protector (25), brass nut (30), and lock washer (31) from the brass bolt (9) and remove the two 6 gauge white wires (32 and 33) (Figure 19-15, Page 19-27).
- 4. Remove the second brass nut (3) from the brass bolt (9) and then remove the brass bolt from the V-Glide wiper switch housing (1) (Figure 19-15, Page 19-27).
- 5. Remove the third brass nut (3) from the brass bolt (9) (Figure 19-15).
- 6. Replace the wiper switch arm brush (18) as follows (Figure 19-15):
 - 6.1. Remove the screw (15) and lock washer (16), and then pull the arm assembly away from the fixed contacts.
 - 6.2. Remove the brush by pulling the wire through the hole in the wiper switch arm.
 - 6.3. Install the new wiper switch arm brush assembly (18) into the wiper switch arm assembly.
 - 6.4. Install the screw (15) and lock washer (16) through the wiper switch arm into the brush. Tighten the screw to 6-8 in.lbs. (0.7/0.9 N-m).
- 7. Install the arm brush wire terminal (34) onto the bolt (9) and then install the brass nut (3). Thread the nut against the arm brush wire terminal and tighten it to 35-45 in.lbs. (4/5 N-m).
- 8. Install the brass bolt (9) through the wiper switch housing (1) and then install the brass nut (3) onto the bolt. Tighten the nut to 35-45 in.lbs. (4/5 N-m).
- 9. Install the 6 gauge white wire from the first resistor and the 6 gauge white wire from the solenoid onto the brass bolt (9) and then install the lock washer (31) and brass nut (30). Tighten the nut to 35-45 in.lbs. (4/5 N-m).
- 10. Check wiper switch arm brush contact for proper adjustment. See Page 19-26.
- 11. Connect the accelerator rod to the V-Glide wiper switch ball stud.
- 12. Install the V-Glide wiper switch cover.
- 13. Install the No. 5 and No. 6 batteries in the vehicle (Figure 19-1, Page 19-2).

V-Glide Wiper Switch Removal

WARNING

- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
- 1. Remove batteries No. 5 and No. 6 from the vehicle (Figure 19-1, Page 19-2).
- 2. Remove the nuts (30) and lock washers (31), then remove the resistor wires from the wiper switch (Figure 19-15, Page 19-27).
- 3. Remove the cover (10) from the wiper switch.
- 4. Disconnect the black wire (36) from the charger receptacle.
- 5. Disconnect the green wire (35) from the small post on the solenoid.
- 6. Remove the nuts (28) and lock washers (27) securing the V-Glide wiper switch to the vehicle frame and then remove the wiper switch from the vehicle.

V-Glide Wiper Switch Disassembly

- 1. Remove the brass nut (3) and slide the brass bolt (9) out of the wiper switch housing (Figure 19-15).
- 2. Remove the nut (4) and bell crank (6) (Figure 19-15).
- 3. Slide the wiper switch arm assembly out of the V-Glide wiper switch housing (1) (Figure 19-15).
- 4. Remove the spring cotter pin (24) and disassemble the wiper switch arm assembly. Unscrew the adjustment screw (14), retainer nut (11), and spring (13). Remove all thread locking compound from the threads using gasket remover (Figure 19-15).
- 5. To remove the bearings (8) (Figure 19-15), tap them out from the back side with a punch. Tap lightly.

V-Glide Wiper Switch Assembly

- 1. Install bearings (8) into the wiper switch housing by tapping them lightly with a plastic hammer. Make sure that the collars of the bearings are flush against the wiper switch housing (Figure 19-15).
- 2. With the spring (13) in place, hold the V-Glide wiper switch arm shaft (17) and carrier (12) together (Figure 19-15). See CAUTION below.

A CAUTION

- MAKE SURE THE SPRING IS IN THE GROOVE ON THE WIPER SWITCH. IF IT IS NOT IN PLACE, THE ARM MAY BREAK IF IT IS FORCED.
- 3. Install the adjustment screw (14) and nut (11).

NOTE

- THE WIPER SWITCH ARM WILL HAVE TO BE ADJUSTED AFTER THE WIPER SWITCH IS FULLY ASSEMBLED.
- 4. Slide the wiper switch arm assembly into the wiper switch housing and install the bell crank with the ball stud down and away from the housing.
- 5. While holding the bell crank so that the arm does not exert a load on the wiper switch housing, install the nut (4) and tighten it to 8-10 ft.lbs. (11/13 N-m) (Figure 19-15, Page 19-27).

V-Glide Wiper Switch Assembly, Continued:

- 6. If the ball stud (5) was removed, insert it through the bell crank with the ball facing away from the wiper switch housing and install the lock nut (7). While holding the ball stud with a wrench, tighten the lock nut to 4-5 ft.lbs. (5/7 N-m) (Figure 19-15, Page 19-27).
- 7. Install the brass bolt (9) with the wire terminal, lock washer, and brass nut through the wiper switch housing (Figure 19-15, Page 19-27).
- 8. Install the brass nut (3) onto the brass bolt and tighten to 35-45 in.lbs. (4/5 N-m).

A WARNING

- MAKE SURE THE WIPER SWITCH ARM ROTATES FREELY IN THE HOUSING. IF THE ARM BINDS OR STICKS, IT MUST BE REPLACED.
- 9. Adjust the wiper switch. See Page 19-26.

Installing the V-Glide Wiper Switch

A CAUTION

 BEFORE INSTALLING THE WIPER SWITCH IN THE VEHICLE, INSPECT THE HOUSING FOR CRACKS OR DAMAGE. IF THE HOUSING IS DAMAGED, THE ENTIRE HOUSING WITH FIXED CONTACTS MUST BE REPLACED.

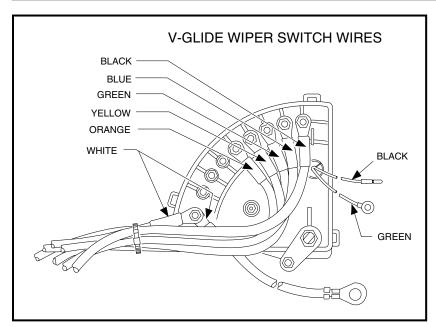


FIGURE 19-16

 Position shim plate (29) on the I-beam and then place the V-Glide wiper switch assembly in position on the shim plate. Install the mounting bolts (26), lock washers (27), and nuts (28) (Figure 19-15, Page 19-27). Make sure the square shoulders on bolts fit squarely into the wiper switch housing. Tighten nuts to 33-39 in.lbs. (2.0/2.5 N-m).

A WARNING

• AFTER INSTALLING THE V-GLIDE WIPER SWITCH, MAKE SURE THAT IT IS SECURELY FASTENED TO THE VEHICLE FRAME.



- 2. Install the accelerator rod onto the ball stud.
- 3. Connect the 18 gauge green wire from the limit switch to the rear small post on the solenoid (Figure 19-2, Page 19-3).
- 4. Connect the 18 gauge black wire to black lead from charger receptacle (Figure 19-16, Page 19-30).
- 5. Connect the 6 gauge white wire from the resistor coil and the 6 gauge white wire from the solenoid to the brass bolt (9) in the wiper switch housing. Install the lock washer (31) and brass nut (30) onto the brass bolt and tighten to 35-45 in.lbs. (4/5 N-m). Install cap protector (25) (Figure 19-15, Page 19-27).
- 6. Connect the 6 gauge orange wire to the fourth contact from the bottom and tighten the nut to 35-45 in.lbs. (4/5 N-m). See NOTE below.

NOTE

- THE FIRST THREE CONTACTS HAVE NO WIRES ATTACHED TO THEM.
- 7. Connect the 6 gauge yellow wire to the fifth contact from the bottom and tighten the nut to 35-45 in.lbs. (4/5 N-m).
- 8. Connect the 6 gauge green wire to the sixth contact from the bottom and tighten the nut to 35-45 in.lbs. (4/5 N-m).
- 9. Connect the 6 gauge blue wire to the seventh contact from the bottom and tighten the nut to 35-45 in.lbs. (4/5 N-m).
- 10. Connect the 6 gauge black wire to the eighth contact from the bottom and tighten the nut to 35-45 in.lbs. (4/5 N-m). See WARNING and CAUTION below.

A WARNING

 MAKE SURE THAT THE WIRES ARE CONNECTED TO THE V-GLIDE WIPER SWITCH CON-TACTS EXACTLY AS STATED ABOVE. IF THEY ARE NOT, THE VEHICLE COULD START OFF IN A SPEED OTHER THAN FIRST.

A CAUTION

- DO NOT OPERATE THE VEHICLE WITHOUT HAVING THE V-GLIDE WIPER SWITCH COVER IN PLACE. OPERATING THE VEHICLE WITHOUT THE COVER ALLOWS DIRT, DUST, AND WATER TO GET INTO THE WIPER SWITCH, WHICH COULD CAUSE THE SWITCH TO FAIL OR MALFUNCTION.
- 11. Make sure the wiper switch and pedal group are properly adjusted. See Section 6, Accelerator Pedal and Rod Adjustment. See WARNING below.

A WARNING

- TO PROPERLY ADJUST YOUR WIPER SWITCH, CHECK, AND ADJUST IF NECESSARY, THE FOLLOWING ITEMS *IN THE ORDER LISTED*:
 - BRAKE PEDAL AND CABLE ADJUSTMENT. SEE SECTION 6.
 - ACCELERATOR ROD ADJUSTMENT. SEE SECTION 6.
 - ACCELERATOR PEDAL STOP ADJUSTMENT. SEE SECTION 6.
 - PARK BRAKE ADJUSTMENT. SEE SECTION 6
- FAILURE TO CHECK ALL ADJUSTMENTS IN THE ORDER LISTED COULD RESULT IN IMPROPER VEHICLE OPERATION, PROPERTY DAMAGE, OR SEVERE PERSONAL INJURY.
- 12. Drive the vehicle and inspect it for proper operation.

FORWARD AND REVERSE SWITCH

П

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 19-1, PAGE 19-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 19-1.

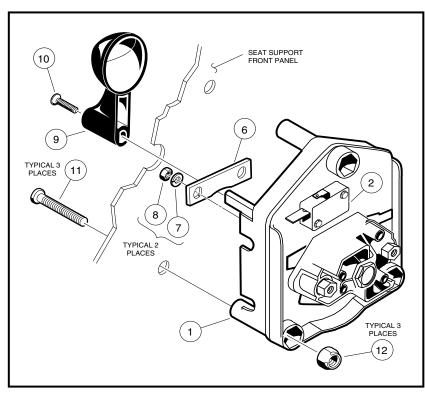


FIGURE 19-17

The forward and reverse switch is mounted on the front panel of the rear body, in front of the two center batteries.

Testing the Forward and Reverse Switch

Visually inspect the forward and reverse rotor and bar contacts. Make sure the bar contacts are in good condition. If they are not, replace the whole forward and reverse assembly. If severe arcing has occurred, check the forward and reverse anti-arcing limit switch (2) (Figure 19-17) for proper operation (See Test Procedure 3, Forward and Reverse Anti-arcing Limit Switch, Page 19-10).

See Test Procedure 7, Page 19-11.

Removing the Forward and Reverse Switch

1. Remove the forward and reverse lever mounting screw (10) and then the lever (9) (Figure 19-17).

2. Remove the screws (11) and nuts (12) that mount the forward and reverse switch to the body (**Figure 19-17**).



- 3. Pull the forward and reverse switch away from the body and out of the battery compartment for ease of service.
- 4. If wires must be disconnected from the forward and reverse switch, label them so they will be reconnected properly.

Servicing the Forward and Reverse Switch

1. Keep the switch clean.

A WARNING

- DO *NOT* GREASE CONTACTS. THIS COULD CAUSE THE SWITCH TO MALFUNCTION OR BURN.
- 2. If the forward and reverse switch is stiff or binds in operation, lubricate the contact face of the switch with WD-40® spray lubricant.

Installing the Forward and Reverse Switch

1. Install the forward and reverse switch by reversing the removal procedure.

19A E

SECTION 20 A - ELECTRICAL SYSTEM, POWERDRIVE SYSTEM 48



A DANGER

- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VEN-TILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR FULL FACE SHIELD WHEN WORKING ON OR NEAR BATTERIES.
- USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE, WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CONNECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 20-1, AND THEN DISCHARGE THE CONTROLLER AS FOLLOWS:
 - TURN THE KEY SWITCH TO **ON** AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

GENERAL INFORMATION

Club Car has manufactured two versions of the PowerDrive System 48 vehicle. The earlier version used a multi-step (wiper switch) potentiometer in the speed control circuit, whereas the current version, beginning with serial number A9529-445799, uses a continuously variable potentiometer. Both versions feature a 48 volt electrical system, including an on-board computer that controls the battery charger, monitors vehicle energy usage, and provides test data to the optional Communication Display Module.

General Information, Continued:

To properly service and maintain this vehicle, it is necessary to understand the electrical circuitry and the functions of all the electrical components. On any PowerDrive System 48 vehicle, there are four separate circuits in operation: 1) the control circuit, 2) the speed control circuit, 3) the power circuit, and 4) the charge circuit. A reverse buzzer is also included on every vehicle (See Page 20-29). When working on the electrical system, refer to the appropriate electrical wiring diagram (Figures 20-2 and 20-3, Pages 20-3 and 20-4) for more detailed information.

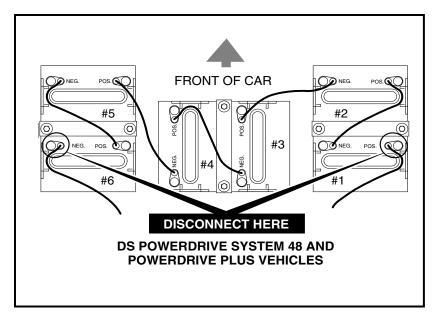


FIGURE 20-1

THE ON-BOARD COMPUTER (OBC)

Each PowerDrive System 48 vehicle is equipped with an on-board computer (OBC). The primary function of the on-board computer is to control the battery charger. By continuously monitoring battery state of charge, as well as the amount of energy consumed as the vehicle is used, the OBC is able to direct the battery charger to replace exactly the amount of energy needed to replenish the batteries. The OBC uses this data also to indicate possible battery or charging problems by illuminating a warning light in the dash (For more information on the Battery Warning Light, see Section 23, Page 23-28). OBC data can also be useful in performing electrical system diagnostics. A digital readout of OBC data can be obtained using the Club Car Communication Display Module (CDM)(Club Car Part No. 1018318-01)(See page 20-22).

The chart in Figure 20-4, Page 20-6 is a quick reference guide to troubleshooting vehicle symptoms that might be OBC related.

POWERDRIVE VEHICLE ELECTRICAL CIRCUITS

NOTE

TO SERVICE THE ELECTRICAL SYSTEM, IT IS NECESSARY TO HAVE A CONTINUITY TESTER
OR A VOLT/OHM METER (VOM) CAPABLE OF READING FROM 0-48 VOLTS DC. THE VOM
(CLUB CAR PART NO. 1011480) AND CONTINUITY TESTER (CLUB CAR PART NO. 1011273)
ARE AVAILABLE FROM YOUR LOCAL AUTHORIZED DEALER OR FROM CLUB CAR SERVICE
PARTS.



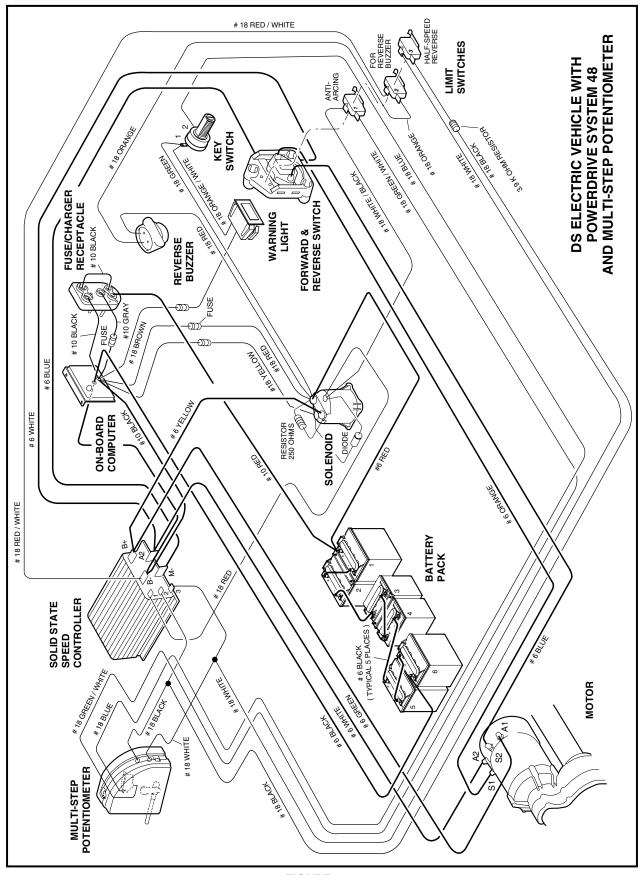


FIGURE 20-2

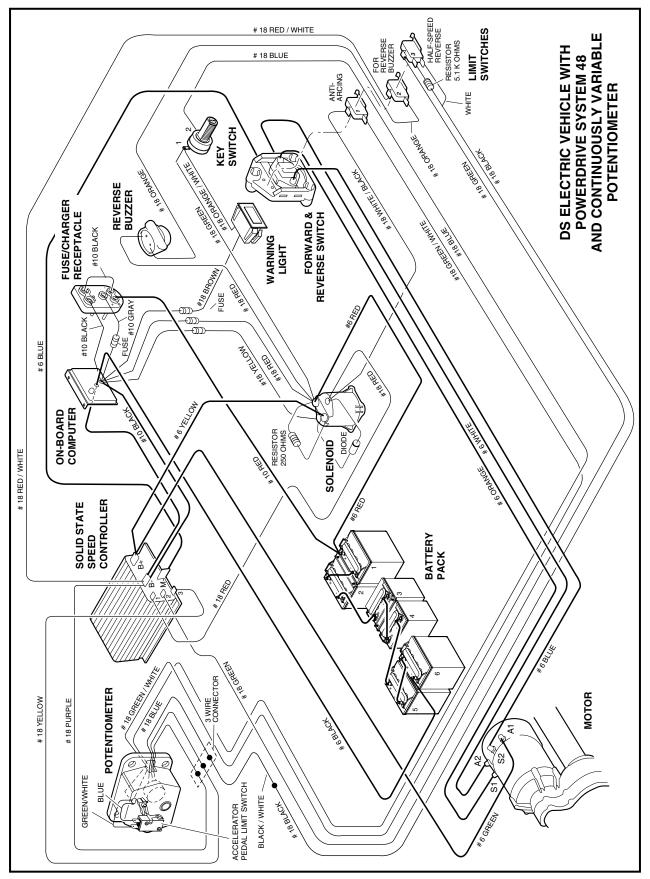


FIGURE 20-3

THE CONTROL CIRCUIT

The control circuit consists of the key switch, F&R (Forward and Reverse) anti-arcing limit switch, accelerator limit switch, solenoid, and connecting wires.

The key switch is an ON-OFF type, the function of which is to disable, or open, the control circuit when the vehicle is not in use. With the key switch in the OFF position, the vehicle will not run.

The function of the F&R anti-arcing limit switch is to prevent arcing on the F&R contacts. When the vehicle is in neutral, the limit switch is open. The F&R anti-arcing limit switch closes only after full contact has been made on the F&R switch. As the F&R switch is being disengaged, the F&R anti-arcing limit switch opens the power circuit by opening the solenoid before the F&R contacts are separated. By using the F&R anti-arcing limit switch to control power through the F&R switch, arcing is prevented on the F&R contacts.

When the accelerator is depressed (which closes the potentiometer limit switch), and the F&R switch is in forward or reverse (which closes the anti-arcing limit switch), and the key is in the ON position, the control circuit is complete. The solenoid coil (enclosed in solenoid) will then be activated, closing the solenoid power contacts and activating the controller.

The reverse buzzer is a warning device that is activated when the F&R switch is placed in reverse. The reverse buzzer will sound continuously until the vehicle is shifted to neutral or forward.

THE POWER CIRCUIT

The power circuit consists of the solid state speed controller, solenoid contacts, forward and reverse (F&R) switch, motor, batteries, and all power wiring. The motor and batteries will be discussed in separate sections in this manual (Motor - Section 24, and Batteries - Section 22).

The solid state speed controller provides smooth and efficient vehicle acceleration and deceleration by precisely controlling voltage input (corresponding to accelerator position) to the motor.

The F&R switch changes the direction of vehicle movement by changing the direction of electrical current through the motor, and thus the direction that the motor turns.

THE SPEED CONTROL CIRCUIT

Multi-step Potentiometer (Wiper Switch) Models:

The speed control circuit consists of the multi-step potentiometer with discrete resistors. With the car in forward, the potentiometer resistance varies from 0 ohms with the accelerator pedal up (at rest position) to approximately 4940 ohms with pedal fully depressed (for full-speed operation, resistance must be above 4600 ohms and below 7000 ohms). When the vehicle is put into reverse, a limit switch is engaged that brings an additional resistor into the circuit at the F&R limit switch No. 3. This reduces vehicle top speed in reverse to approximately half of forward top speed.

Continuously Variable Potentiometer Models:

The speed control circuit consists of a solid state three-wire potentiometer. With the car in forward, the potentiometer resistance varies from approximately 0 to 300 ohms with the accelerator pedal up (at rest position) to approximately 5500 ohms with pedal fully depressed (for full-speed operation, resistance must be above 4600 ohms and below 7000 ohms). When the vehicle is put into reverse, a limit switch is engaged that brings an additional resistor into the circuit at the F&R limit switch No. 3. This reduces vehicle top speed in reverse to half of forward top speed.

THE CHARGE CIRCUIT

The charge circuit consists of the on-board computer, battery charger, DC charger plug, charger receptacle, receptacle fuse link, and the 8-volt batteries. The batteries and the battery charger will be discussed in separate sections in this manual (Batteries - Section 22, and Battery Charger - Section 23).

The charger plug and receptacle connection is the most critical between the charger and the vehicle's battery circuit. The contacts in the receptacle must grip the plug pins well enough to create enough pressure or drag for an adequate electrical connection. If little or no drag is felt, the receptacle or plug must be replaced. If the plug or receptacle is damaged, or feels hot when charging, one or both must be replaced (See Plug and Receptacle Replacement, Section 23, Page 23-46).



The Charge Circuit, Continued:

The on-board fuse link provides additional protection to the vehicle charging circuit. The fuse is rated for use only with a Club Car PowerDrive charger. If it is blown, the cause should be determined before it is replaced. A vehicle with a blown fuse will not charge (See Receptacle Fuse Link, Page 20-36).

TROUBLESHOOTING GUIDE

DIAGNOSTIC REFERENCE CHARTS

Use these charts as a starting point for system troubleshooting. More detailed system testing instructions follow these charts.

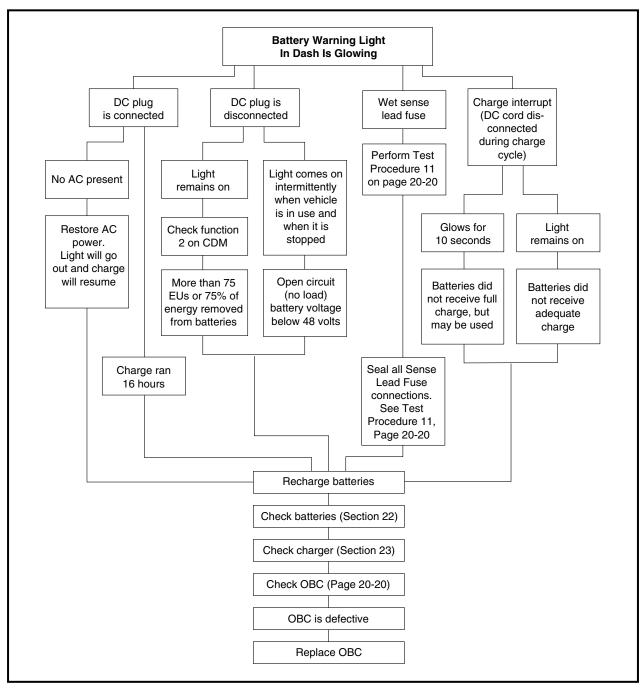


FIGURE 20-4

POWERDRIVE SYSTEM 48 TROUBLESHOOTING GUIDE				
SYMPTOM	PROBLEM	POSSIBLE CAUSES	REFER TO	
Vehicle will not run - no solenoid click.	Batteries	Battery connections.	Test Procedure 1	
		2) Batteries discharged.		
	Key Switch	1) Loose wires.	Test Procedure 2	
		2) Failed switch.		
	F&R Anti-arcing Limit Switch	1) Loose wires.		
		2) Failed switch.	F&R Anti-arcing Limit Switch, Section 20, Page 20-28	
		3) Cam is not activating switch.	F&R Anti-arcing Limit Switch, Section 20, Page 20-28	
	Accelerator	Accelerator rod disconnected.	Accelerator and Brake Pedal Group, Section 6	
	Accelerator Pedal Limit	1) Loose wire.		
	Switch	Disconnected or improperly connected wires.	Figure 20-2 or 20-3, Page 20-3 or 20-4	
		3) Failed switch.	Test Procedure 4	
	Solenoid	1) Loose wires.		
		2) Failed coil.	Test Procedure 5	
	Diode	1) Failed diode.	Diode, Electrical Components, Section 20, Page 20-32	
	Controller Electrical Leakage	Dirt or acid residue on the controller.	Test Procedure 10	
	On-board Computer	Battery connections.	Figure 20-1, Page 20-2	
		On-board computer solenoid lockout failure.	Test Procedure 11	
2. Vehicle will not run -	Batteries	Battery connections.	Test Procedure 1	
solenoid clicks.		2) Batteries discharged.	Test Procedure 1	
	Solenoid	1) Loose wires.	Figure 20-2 or 20-3, Page 20-3 or 20-4	
		2) Failed contacts.	Test Procedure 7	
	Foward and Reverse Switch	1) Loose wires.	Test Procedure 6	
		2) Failed contacts.		
	Potentiometer	1) Loose wires.	Figure 20-2 or 20-3, Page 20-3 or 20-4	
		2) Improperly wired.		
		3) Short or open circuit.	Test Procedure 9	
		4) Improperly adjusted.		
	Controller	1) Loose wires.	Test Procedure 10	
		2) Defective Controller.		
	Motor	1) Loose wires.	Motor, Section 24, Page 24-14	
		2) Open/shorted windings.		

POWERDRIVE SYSTEM 48 TROUBLESHOOTING GUIDE				
SYMPTOM	PROBLEM	POSSIBLE CAUSES	REFER TO	
3. Vehicle runs slowly.	Wiring	1) Improperly wired.	Figure 20-2 or 20-3, Page 20-3 or 20-4	
	Batteries	Loose terminals or corrosion.	Test Procedure 1, and Batteries, Section 22	
		2) Improperly wired.	Test Procedure 1 and Batteries, Section 22	
		3) Batteries failed.		
		4) Batteries not fully charged.		
	Motor	1) Loose wires.	Motor, Section 24	
		2) Defective motor.		
	Potentiometer	1) Improperly adjusted.	Test Procedure 9	
		2) Defective potentiometer.		
	Half-speed Reverse Limit	1) Failed in the closed postion.	Test Procedure 12	
	Switch	2) Improperly wired.	Figure 20-2 or 20-3, Page 20-3 or 20-4	
	Controller	1) Vehicle overload.	Let controller cool, remove part of load.	
		2) Defective controller.	Test Procedure 10	
	Brakes	1) Dragging brakes.	Brakes, Section 6	
	Tires	Under-inflated or flat tires.	Wheels and Tires, Section 10	
Vehicle runs full speed in reverse.	Forward and Reverse Half- speed Reverse Limit Switch	Loose or disconnected wires.	Electrical Components, Section 20 B, Page 20-28	
		2) Failed switch.	Electrical Components, Section 20 B, Page 20-28	
	5100 ohm Resistor	Resistor is disconnected or has failed.	Test Procedure 13	
Vehicle will run in forward but not in reverse, or will run in reverse but not forward.	Forward and Reverse Anti- arcing Limit Switch	1) Loose or broken wires.	Test Procedure 3 and Electrical Components, Section 20 B, Page 20-28	
		2) Improper actuation of switch.		
		3) Improperly wired.		
	Forward and Reverse Switch	Poor continuity of switch contacts.	Test Procedure 6	
Vehicle not being fully charged.	Charger Connections	Loose wires at receptacle or batteries.	PowerDrive Charger, Section 23 B	
		Improper engagement of charger plug and receptacle.		
	On-board Receptacle Fuse Link	1) Fuse is blown.	PowerDrive Charger, Section 23-B	
	Charger	Incorrect incoming AC voltage.	PowerDrive Charger, Section 23-B	
		2) Charger output is low.	PowerDrive Charger, Section 23-B	
		3) Charger cord and plugs.	PowerDrive Charger, Section 23-B	

	POWERDRIVE SYSTEM 48 TROUBLESHOOTING GUIDE					
S١	/МРТОМ	PROBLEM	POSSIBLE CAUSES REFER TO			
6.	Vehicle not being fully charged, continued		4) Charger relay. PowerDrive Charger, Section 23-B			
			5) Charger fuse is blown. PowerDrive Charger, Section 23-B			
		Charger/On-board Computer	1) Improper charging. PowerDrive Charger, Section 23-B			
7.	Vehicle runs without pressing the accelerator when the key is on and the Forward and Reverse Switch is in forward or reverse.	Accelerator	Improper pedal adjustment. Accelerator and Brake Pe Group, Section 6	dal		
	Solenoid clicks when the key is turned on.	Accelerator Limit Switch	1) Defective switch. Test Procedure 4			
			2) Improper pedal adjustment. Accelerator and Brake Pe Group, Section 6	dal		

CIRCUIT TESTING

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.

Using the following procedures, the entire electrical system of the PowerDrive vehicle can be tested without major disassembly of the vehicle:

Refer to Figure 20-5 or 20-7 for testing the control circuit, and to Figure 20-6 or 20-8 for testing the power circuit.

- The red (+) and black (-) probe symbols in Figures 20-5, 20-6, 20-7, and 20-8 (wiring diagrams) indicate points where the probes should be placed for tests. The numbers on the probe symbols indicate test procedure numbers.
- A volt-ohm meter (VOM)(Club Car Part No. 1011480) or a continuity tester (Club Car Part No. 1011273) is needed in order to make these tests.
- Continuity (a closed circuit) is indicated by zero ohms on the VOM or by a lighted indicator on the continuity tester. No continuity (an open circuit) is indicated by infinite ohms (no light).
- The tests on this section are made in order to check a component and the wire to and from the component. The probes will often be placed at points removed from the component being tested.

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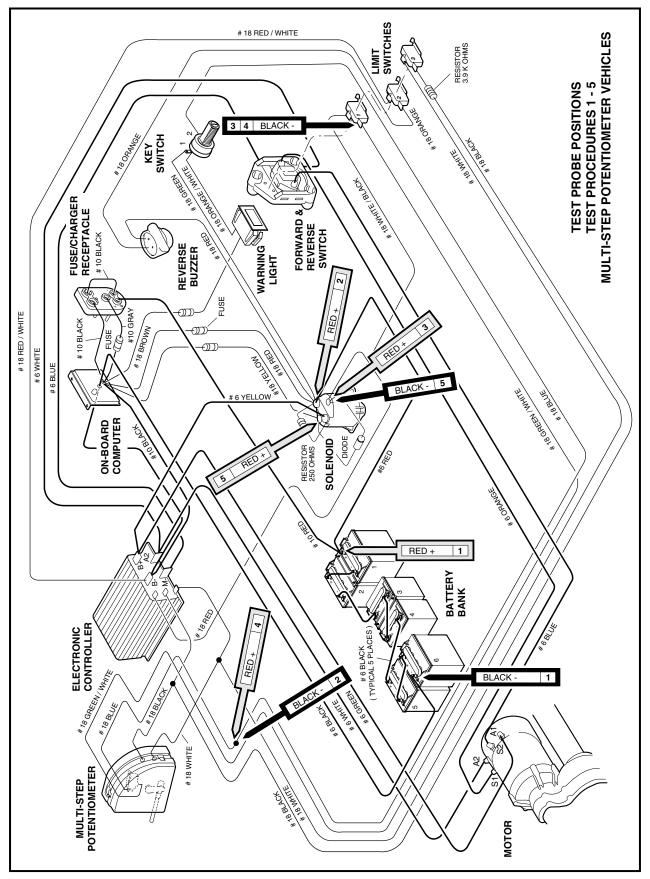


FIGURE 20-5



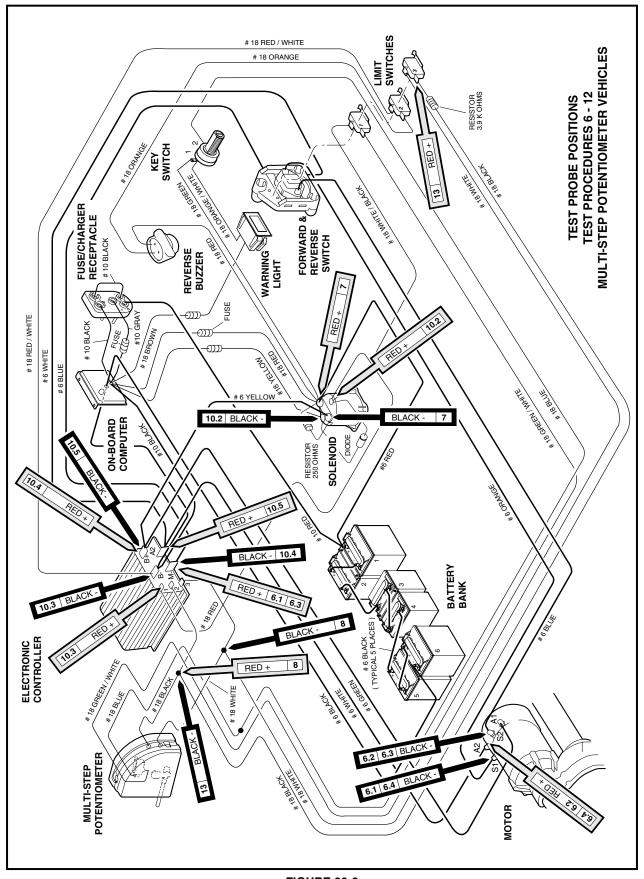


FIGURE 20-6

CONTROL CIRCUIT

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.

Test Procedure 1 - Batteries / Voltage Check:

1. With VOM set at Volts DC, place red (+) probe on the positive post of battery No. 1, and the black (-) probe on the negative terminal of battery No. 6. If you don't read at least 48 volts with the batteries fully charged, check for loose battery connections or a battery installed in reverse polarity. Refer to Batteries, Section 22, for further details on battery testing.

Test Procedure 2 - Key Switch:

Vehicle with Multi-step (wiper switch) Potentiometer -

- 1. Place the red (+) probe of the VOM or continuity tester on the large terminal of the solenoid (with red wire attached) and place the black (-) probe at the blue wire disconnect terminal on the key switch side.
- 2. With the key switch off, the reading should be no continuity. If continuity is shown, perform Test Procedure 4. If a correct reading is not obtained for Test Procedure 4, check the key switch, wires and terminals, and then replace defective parts.
- 3. Insert the key and turn the switch on. The reading should be continuity.
- 4. If the reading is incorrect, check the key switch, wires and terminals, and then replace defective parts.

Vehicle with Continuously Variable Potentiometer -

1. Place the red (+) probe of the VOM or continuity tester on the large terminal of the solenoid (with red wire attached) and place the black (-) probe at the green/white wire from the Forward/Reverse limit switch No. 1.

A WARNING

- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 20-1, PAGE 20-2, AND THEN DISCHARGE THE CONTROLLER AS FOLLOWS:
 - TURN THE KEY SWITCH TO **ON** AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.
- 2. Depress and hold the accelerator pedal to the floor to activate the accelerator pedal limit switch.
- 3. With the key switch off, the reading should be no continuity.
- 4. Insert the key and turn the switch on while continuing to hold the accelerator pedal down. The reading should be continuity.
- 5. If the reading is incorrect, check the key switch, wires and terminals, and replace defective parts.

Test Procedure 3 - Forward/Reverse Anti-Arcing Limit Switch:

NOTE

- THERE ARE THREE LIMIT SWITCHES ON THE FORWARD AND REVERSE SWITCH. THE FORWARD AND REVERSE ANTI-ARCING LIMIT SWITCH IS THE ONE CLOSEST TO THE VEHICLE BODY.
- 1. Place the red (+) probe of the VOM or continuity tester on the small activating coil stud of the solenoid that has the white/black and red wires connected to it. Place the black (-) probe on the No. 1 anti-arcing limit switch at the normally open (NO) terminal.
- Reading should show continuity when the Forward/Reverse lever is shifted to forward position and to reverse position (should show no continuity when in neutral and when in forward or reverse until the rotor contacts are in contact with contact bars). If not, check wires and terminals, then replace switch.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.

Test Procedure 4 - Accelerator Pedal Limit Switch:

Vehicle with Multi-step (wiper switch) Potentiometer -

- 1. Place the black (-) probe of the VOM on the green/white wire terminal from limit switch No. 1 and the red (+) probe on the wiper switch side of the blue wire disconnect.
- 2. With the accelerator pedal fully up (not depressed), the reading should be NO continuity.
- 3. With the key switch off, depress the accelerator pedal. The reading should be continuity.
- 4. If the readings for steps 2 and 3 are not correct, check for proper wire connection at the normally closed (NC) and the common (COM) terminals. Check accelerator pedal adjustment (See Section 6).
- 5. If the wires are connected correctly and the accelerator pedal is properly adjusted, but the readings still are not correct, replace the switch.

Vehicle with Continuously Variable Potentiometer -

- 1. With the key switch on, connect the red lead of the VOM to the large post of the solenoid (with 6 gauge red wire attached), and connect the black lead of the VOM to the green/white wire from limit switch No. 1 on the Forward/Reverse switch (Figure 20-7).
 - 1.1. With the accelerator pedal not depressed, the reading should be no continuity.
 - 1.2. Depress the accelerator pedal and the reading should be continuity.
- 2. If these reading are not obtained, check to be sure that the wires are connected properly to the normally open (NO) and the common (COM) terminals. Check accelerator pedal adjustment (See Section 6).
- 3. If wires are connected correctly and the accelerator pedal is properly adjusted, but the readings are incorrect, replace the switch.



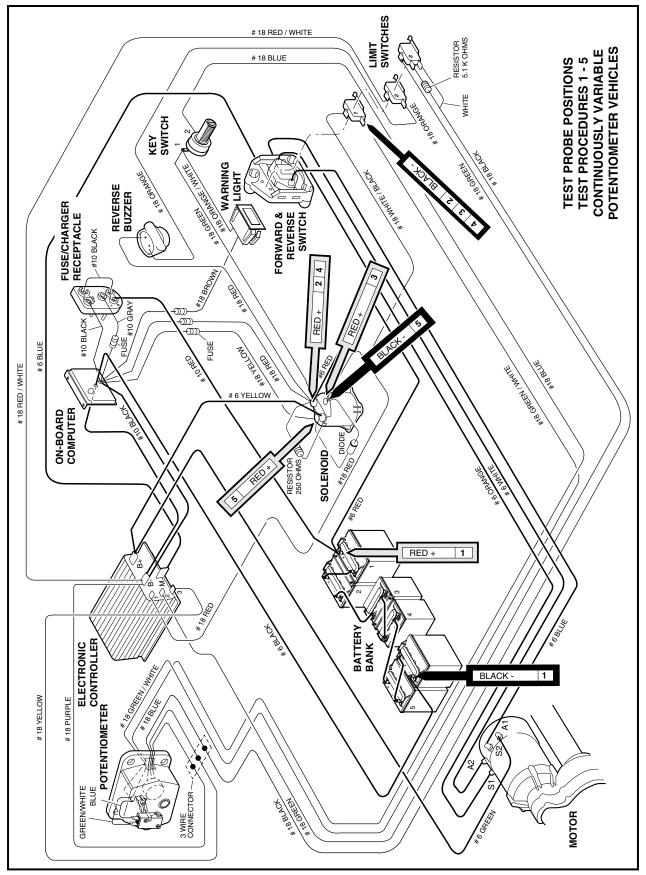


FIGURE 20-7



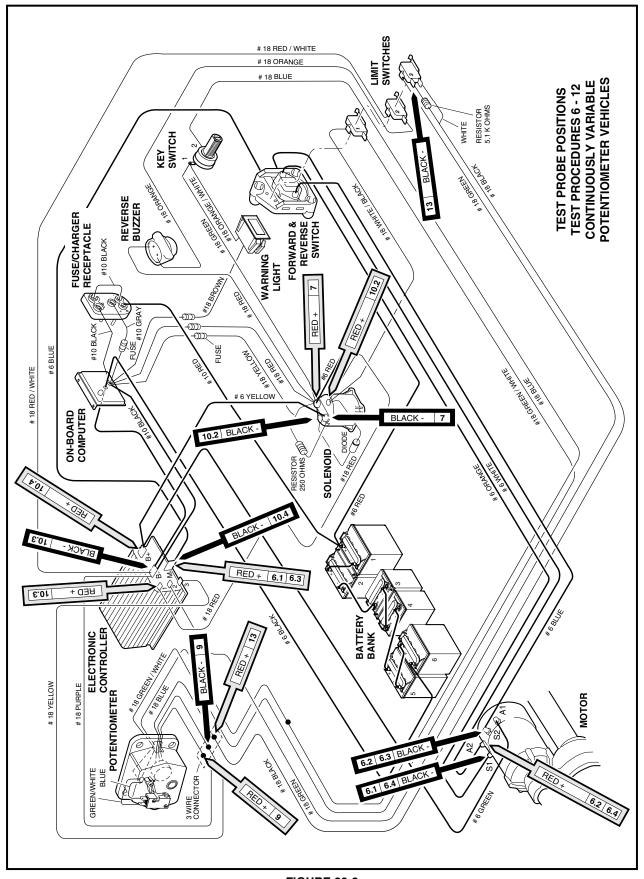


FIGURE 20-8

20A

Test Procedure 5 - Solenoid Activating Coil:

- 1. Remove Diode terminal end from the small post on solenoid (with 18 gauge yellow wire attached).
- Make sure that the diode direction is correct (Figure 20-2, Page 20-3, or Figure 20-3, Page 20-4). The
 red terminal end of Diode attaches to small post on solenoid (with 18 gauge red wire and 18 gauge
 white/black striped wire attached).
- 3. Using a VOM or continuity tester, check for continuity between both diode terminals. Reverse the tester leads and again check for continuity. A diode is designed to conduct current in one direction only. If a diode shows continuity in both directions or does not show continuity in either direction, replace the diode assembly.
- 4. Remove the diode assembly and the yellow wire from the small activating coil post of the solenoid and place the red (+) probe of the VOM on the post. Place the black (-) probe on the other small activating coil post on the solenoid. A reading of 190 to 250 ohms should be obtained. If not, replace the solenoid. If the ohm reading is correct, reconnect the diode assembly and yellow wire.

POWER CIRCUIT

Test Procedure 6 - Forward/Reverse Switch:

- 1. With the Forward/Reverse selector in the forward position, place the red (+) probe of VOM or continuity tester on the M- terminal lug of the speed controller and place the black (-) probe on the S1 motor terminal. Meter should read continuity.
- 2. With the Forward/Reverse selector in the forward position, place the red (+) probe on the A2 motor terminal, and place the black (-) probe on the S2 motor terminal. Meter should read continuity.
- 3. With Forward/Reverse selector in the reverse position, place the red (+) probe on the speed controller M- terminal and place the black (-) probe on the S2 motor terminal. Meter should read continuity.
- 4. With the Forward/Reverse selector in the reverse position, place the red (+) probe on the A2 motor terminal and place the black (-) probe on the S1 motor terminal. Meter should read continuity.

If continuity reading cannot be obtained, and all wires and connections are correct, see Forward/Reverse Switch, Page 20-27.

Test Procedure 7 - Solenoid Contacts (Power Off):

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.

As stated in WARNING above, follow procedures exactly.

- Remove the yellow wire and red wire from the large posts of the solenoid. Remove resistor assembly.
 Place the red (+) probe of the VOM on one of the large posts of the solenoid and the black (-) probe of
 the meter on the other large post on the solenoid. It should show no continuity. If the VOM shows continuity, replace the solenoid.
- 2. Using a VOM, check for continuity between both resistor terminals. If reading is not approximately 250 ohms, replace the resistor.

SPEED CONTROL CIRCUIT

Test Procedure 8 - Multi-step Potentiometer:

- 1. Disconnect the black and white 18 gauge wires that are attached to controller terminals "2" and "3" (terminals "B" and "C" on early model vehicles) (see wiring diagram Figure 20-2, Page 20-3 to identify terminals) and connect ohm meter to wires.
- 2. Disconnect half-speed reverse resistor from the half-speed reverse limit switch.
- 3. Measure resistance while pressing the accelerator pedal. The measured resistance should increase in six steps:

 1st Step:
 300 ohms (approx.)

 2nd Step:
 690 ohms (approx.)

 3rd Step:
 990 ohms (approx.)

 4th Step:
 1740 ohms (approx.)

 5th Step:
 2740 ohms (approx.)

 6th Step:
 4940 ohms (approx.)

NOTE

- IT MAY BE DIFFICULT TO DETECT THESE STEPS. HOWEVER, IF AN INCREASE IN RESISTANCE FROM 0 TO (APPROXIMATELY) 5000 OHMS IS OBTAINED WHEN THE ACCELERATOR PEDAL IS DEPRESSED FROM THE REST POSITION TO FULL SPEED POSITION WITHOUT EXCEEDING (APPROXIMATELY) 7000 OHMS DURING OR AT THE END OF ACCELERATOR TRAVEL, THEN THE SPEED SWITCH RESISTOR ASSEMBLY IS IN GOOD CONDITION.
- 4. If the resistance steps were not correct and the accelerator pedal is properly adjusted, then replace multi-step potentiometer.
- 5. Reconnect black and white wires to terminals "2" and "3" ("B" and "C") as shown (Figure 20-6).
- 6. Reconnect half-speed reverse resistor to half-speed reverse limit switch on the Forward/Reverse switch.

Test Procedure 9 - Continuously Variable Potentiometer:

To test the potentiometer, perform the actuator adjustment procedure on page 6-19. If the readings are not correct after the adjustment has been made, the potentiometer assembly will need to be replaced.

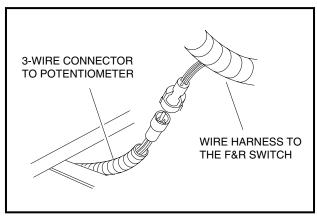


FIGURE 20-9

Test Procedure 10 - Solid State Speed Controller:

A DANGER

• TURN THE KEY TO OFF, PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL, AND DISCONNECT THE BATTERY CABLES AS SHOWN IN FIGURE 20-1, PAGE 20-2. FAILURE TO DO SO MAY CAUSE THE VEHICLE TO RUN OVER YOU, RESULTING IN SEVERE INJURY OR DEATH.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION. FOLLOW ALL PROCEDURES EXACTLY AS STATED.
- TO AVOID ELECTRICAL SHOCK, DISCHARGE THE CONTROLLER AS FOLLOWS:
 - TURN THE KEY TO ON AND PLACE THE FORWARD AND REVERSE SWITCH IN THE REVERSE POSITION.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.
 - TURN THE KEY SWITCH TO OFF AND PLACE THE FORWARD AND REVERSE SWITCH IN THE NEUTRAL POSITION.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.
- 1. Because the solid state speed controller is a sealed solid state unit, it requires almost no maintenance. It is recommended, however, that the following 2 operations be done occasionally.
 - 1.1. Make sure that the electrical connections to the controller (as well as those to the motor, batteries, etc.) are tight. When checking the controller bus bar connections for tightness, be sure to use the double-wrench technique to avoid stressing the bus bars and cracking the seals.
 - 1.2. Remove from the terminal area any corrosion or accumulation of dirt, acid, fertilizer, etc. It is especially important that the controller terminal face be free of these substances. Their presence could lead to electrical leakage and cause faulty operation.
- 2. Check for solenoid input. See NOTE and WARNING below.

NOTE

• BEFORE ATTEMPTING THE FOLLOWING TESTS, THE REAR OF THE VEHICLE MUST BE RAISED AND SECURED ON JACKSTANDS WITH THE DRIVE WHEELS OFF THE GROUND.

WARNING

 LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.

- 2.1. Remove 6 gauge white wire from A2 motor terminal and secure it so that it will not make contact with any live components or connections.
- 2.2. Reconnect batteries (Figure 20-1, Page 20-2).
- 2.3. Place the Forward/Reverse Switch in either forward or reverse, turn the key on, and depress the accelerator pedal until limit switches turn on. This should cause the solenoid to operate with an audible click.
- 2.4. Connect the VOM across the solenoid small activating posts. You should read full battery voltage.
- 3. Check for controller input voltage.
 - 3.1. Place the Forward/Reverse Switch in either forward or reverse, turn the key on, and depress the accelerator pedal until limit switches turn on. This should cause the solenoid to operate with an audible click.
 - 3.2. Remove the 18 gauge red wire from controller input terminal "1" ("A" on early controllers) (Figure 20-6 or 20-8).
 - 3.3. Place the VOM black probe (-) on the "B-" terminal of the controller (with 6 gauge black wire attached) and the red probe (+) into the terminal end of the red wire removed from the controller terminal "1". You should read full battery voltage.
 - 3.4. If the controller input terminal is not getting full battery voltage, then check wire and connections between the solenoid small post and controller "1" ("A" on early controllers) terminal. Replace defective parts.
 - 3.5. Disconnect battery wires (See Figure 20-1, Page 20-2). Reconnect the 6 gauge white wire to the A2 motor terminal.
 - 3.6. Reconnect batteries.
- 4. Check for controller output.
 - 4.1. Make sure the batteries are connected.
 - 4.2. Remove the 6 gauge white wire from A2 motor terminal and secure it so that it cannot make contact with any live components or connections.
 - 4.3. Connect the VOM red probe (+) to the controller B+ terminal and the black probe (-) to the controller M- terminal. The VOM will display 48 volts, which is controller capacitor voltage.
 - 4.4. Turn on the key switch, shift the Forward & Reverse Switch to forward and watch the VOM as you depress the accelerator pedal. With the accelerator fully depressed, the VOM should show full battery voltage. If the VOM reading does not rise to full battery voltage (with a properly functioning potentiometer and correct pedal adjustment), then the controller is defective.
- 5. Early 1995 vehicles with multi-step potentiometers only check for diode output.
 - 5.1. Disconnect battery wires as shown (Figure 20-1, Page 20-2), and discharge the controller as instructed in WARNING on Page 20-1.
 - 5.2. Remove wires from controller A2 and B+ terminals.
 - 5.3. Use an ohm meter to check the resistance between the controller A2 and B+ terminals. You are testing for presence of a diode inside the controller, so swap the two meter leads and look for a low resistance when the (+) probe is on controller A2 terminal and the (-) probe is on B+ terminal and a much higher resistance when the probes are reversed. If your meter has a diode test function, use that. If you find the diode to be shorted or open, the controller is defective.
 - 5.4. Attach the 6 gauge white wire to A2 motor terminal.
 - 5.5. Reconnect wires to controller A2 and B+ terminals.



20A

Test Procedure 11 - On-board Computer Lockout Circuit:

1. Inspect the charger receptacle for water in the contacts. If water is found, proceed as follows:

NOTE

- IF THE BATTERY PACK IS WET, MAKE SURE THAT THE 10 GAUGE GREY WIRE FROM THE RECEPTACLE IS NOT TOUCHING ANY OF THE BATTERIES. TIE WRAP THE 10 GAUGE GREY LEAD AND 18 GAUGE GREY WIRE TO THE WIRE HARNESS IF NECESSARY.
 - 1.1. Disconnect the batteries as shown (Figure 20-1, Page 20-2).
 - 1.2. Discharge the controller (See instructions in the WARNING on page 20-1).
 - 1.3. Remove the receptacle from the vehicle (See Page 20-35).
 - 1.4. Dry the receptacle by wiping it with a clean dry cloth and by blowing into the contacts with compressed air.
 - 1.5. Inspect the black butyl material that seals the entrance of the grey sense lead into the charger receptacle (See Figure 20-15, Page 20-34). If lead is not sealed, remove butyl material and seal with new butyl material. Use butyl tape windshield sealer only (NAPA part no. 4196-3/8" round).
 - 1.6. Re-install the charger receptacle into the vehicle.
- 2. Inspect the sense lead fuse in the grey wire from charger receptacle to the OBC. Replace the fuse if it is blown.

NOTE

- THE SENSE LEAD FUSE ASSEMBLIES ON EARLY POWERDRIVE VEHICLES WERE EITHER UNSEALED OR WRAPPED WITH BLACK SEALING MATERIAL. THESE EARLY FUSE ASSEM-BLIES SHOULD BE CHECKED FOR MOISTURE CONTAMINATION.
- IT IS STRONGLY RECOMMENDED THAT THESE EARLY FUSE CONFIGURATIONS BE REPLACED WITH THE CURRENT WATERPROOF FUSE HOLDER ASSEMBLY (CLUB CAR PART NO. 1018963-02).
- 3. It is possible that the On-board Computer can become "locked up", causing the OBC solenoid lockout circuit to malfunction. If this condition is suspected, "reboot" the computer as follows:
 - 3.1. Make sure that the batteries are disconnected as shown (Figure 20-1, Page 20-2) and that the controller has been discharged (See instructions in the WARNING on page 20-1).
 - 3.2. Reconnect the batteries.
 - 3.3. To determine if the computer was "locked up" and that it is now functioning properly, attempt to drive the vehicle. If the problem has been corrected, the vehicle will function normally.
- 4. If it is determined that computer "lock-up" is not the problem, it will be necessary to bypass the OBC solenoid lockout circuit in order to isolate the problem. Follow the procedures below:
 - 4.1. Make sure that the batteries are disconnected as shown (Figure 20-1, Page 20-2) and that the controller has been discharged (See instructions in the WARNING on page 20-1).
 - 4.2. Connect one end of a jumper wire to the small (coil) post of the solenoid (with18 gauge yellow wire attached). Connect the other end of the jumper wire to the negative post of battery No. 6.
 - 4.3. Reconnect the batteries.
 - 4.4. If the vehicle can be driven with the jumper wire attached, then the on-board computer has failed and must be replaced. If the vehicle cannot be driven with the jumper wire attached, then study the Troubleshooting Guide on pages 20-7 through 20-9 to find and check the other circuits that could cause the same symptoms.

Test Procedure 12 - Half-speed Reverse Limit Switch (F&R Limit Switch No. 3):

- 1. Check for proper wiring (Figure 20-6 or 20-8) and tight connections.
- 2. Using a continuity tester or VOM set to ohms, check continuity across common (COM) and normally open (NO); and across common (COM) and normally closed (NC) (See Figure 20-10). With the limit switch lever up (not depressed), readings should be:



COM to NC: Zero (or continuity tester is illuminated)

COM to NO: Infinity (or continuity tester is not illuminated)

With the limit switch lever depressed, readings should be:

COM to NC: Infinity (or continuity tester is not illuminated)

COM to NO: Zero (or continuity tester is illuminated)

3. If meter readings are not correct, replace limit switch.

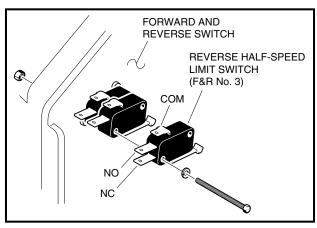


FIGURE 20-10

Test Procedure 13 - Half-speed Reverse Resistor:

- 1. Disconnect the black lead from the half-speed reverse limit switch located on the Forward/Reverse Switch (See Figure 20-2, Page 20-3, or Figure 20-3, Page 20-4).
- 2. Measure resistance.

Multi-step Potentiometer Vehicle:

- 2.1. Disconnect the 18 gauge black wire (from the Half-speed Reverse Limit Switch) at its connection with the 18 gauge black wire from the multi-step potentiometer (See Figure 20-2, Page 20-3).
- 2.2. With a multimeter set to ohms, measure the resistance through the 18 gauge black wire from the end disconnected from the half-speed reverse limit switch to the end disconnected from terminal with the gauge18 black wire from the multi-step potentiometer. Resistance should measure approximately 3900 ohms (±10%).

Continuously Variable Potentiometer Vehicle:

- 2.1. Disconnect the three-wire connector (connects the potentiometer to the Foward/Reverse wire harness) from the Forward/Reverse wire harness. The connector emerges from under the floor-board into the battery compartment below the charger receptacle on the front seat support panel (Figure 20-9, Page 20-17).
- 2.2. With a multimeter set to ohms, measure the resistance through the 18 gauge black wire from Forward/Reverse wire harness (at disconnect from three-wire connector) to the end disconnected from the Half-speed Reverse Limit Switch. Resistance should measure approximately 5100 ohms (±10%).
- 3. If the meter reading is not correct, replace the wire assembly to the limit switch.

THE COMMUNICATION DISPLAY MODULE (CDM)

The CDM can be used to retrieve from the On-board Computer four important items of information that can be useful in troubleshooting a DS Electric vehicle with PowerDrive System 48. To access one of these items, the item's corresponding Function Code must be selected on the CDM. This is done by pressing the Function Button until the desired function code is displayed in the window (See Figure 20-11 for CDM features). Releasing the button when the desired code is displayed will display the desired data. Function codes and corresponding data are as follows:

• F1 - Battery voltage:

This displays the battery pack's current state of charge. A reading of less than 48 volts indicates that the batteries need to be charged. If a reading of less than 48 volts is obtained immediately after a charge cycle, there may be a problem in the charge circuit.

• F2 - Energy units removed since last charge cycle:

If the display reads over 75 (the vehicle Battery Trouble Light should be illuminated), the vehicle batteries need to be recharged before being used again. This data can be used to make sure that all vehicles in a fleet receive equal usage on a short term basis.

• F3 - Total accumulated energy units removed since initial vehicle start-up:

This information is most useful in making sure that all vehicles in a fleet receive equal usage over long periods of time.

F4 - Last charge termination type (1 = incomplete, 2 = DVDT, 4 = normal, 8 = max. timer):

A 1, 2, 4, or 8 will be displayed.

- 1 Indicates that the last charge cycle was incomplete and that the batteries were not fully charged.Batteries should be charged again at the earliest opportunity.
- 2 Indicates that a back-up charge program was employed by the OBC to complete the charge cycle. A DVDT charge may be displayed the first few times a new set of batteries is charged, and also the first time a set of batteries is charged after the batteries have been disconnected and reconnected. A problem may exist if persistent DVDT readings are obtained.
- 4 Indicates that the last charge cycle was normal.
- **8** Indicates that the charger ran for sixteen hours and shut itself off without completing the charge cycle. This means that there may be a problem in the charge circuit.

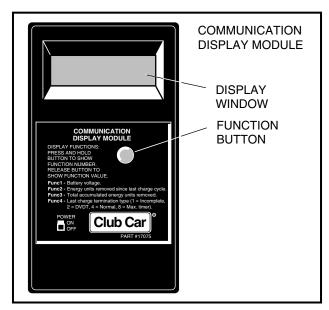


FIGURE 20-11

USING THE CDM TO RETRIEVE DATA FROM THE ON-BOARD COMPUTER

- 1. Turn the CDM on and press and release the function button until desired function appears.
- 2. Position the CDM under the rear of the vehicle so that it is aligned directly behind the on-board computer (Figure 20-12). Make sure the CDM infra-red LED receiver is pointed at the on-board computer LED, and that there is a clear path between them (See NOTE below).

20A E

NOTE

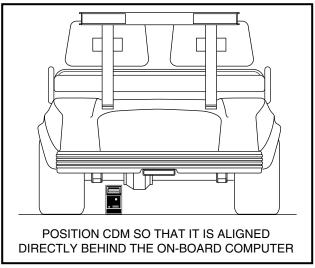
- FOR BEST RESULTS, THE CDM BODY SHOULD BE POSITIONED AT APPROXIMATELY 45° TO GRADE (FIGURE 20-13). THE CDM MAY NOT PICK UP THE ON-BOARD COMPUTER DATA STREAM IF THE CDM IS NOT POSITIONED PROPERLY WITH A CLEAR AND DIRECT PATH FROM THE ON-BOARD COMPUTER TO THE CDM.
- 3. Wait approximately 30 seconds for a value to appear in the display window.
- 4. If a value does not appear in the display window after 30 seconds, try adjusting the aim of the CDM slightly and repeating step 4 until a value appears. If there is still no reading, check for weak batteries in the CDM.

Once a value has been obtained in the display window, the CDM may be removed from its receiving position and the data reviewed. The CDM will hold the values for F1, F2, F3, and F4 until the CDM is turned off or it receives another line of data from the same or another on-board computer. Use the following procedure to review the data stored in the CDM:

- 1. The value currently displayed will be F1 (battery voltage).
- 2. To view F2, press and hold the button on the CDM. When "Func 2" appears in the display window, release the button. The value for F2 will then be displayed.
- 3. To view F3, press and hold the button on the CDM until "Func 3" appears in the display window. Release the button. The value for F3 will be displayed.
- 4. To view F4, press and hold the button on the CDM until "Func 4" appears in the display window. Release the button. The value for F4 will be displayed.

NOTE

• THE VALUES OF ALL FOUR FUNCTIONS CAN BE RECALLED BY PRESSING AND RELEASING THE CDM BUTTON.



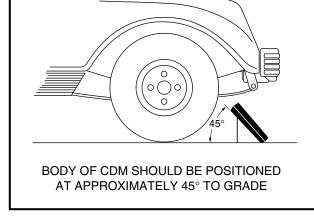
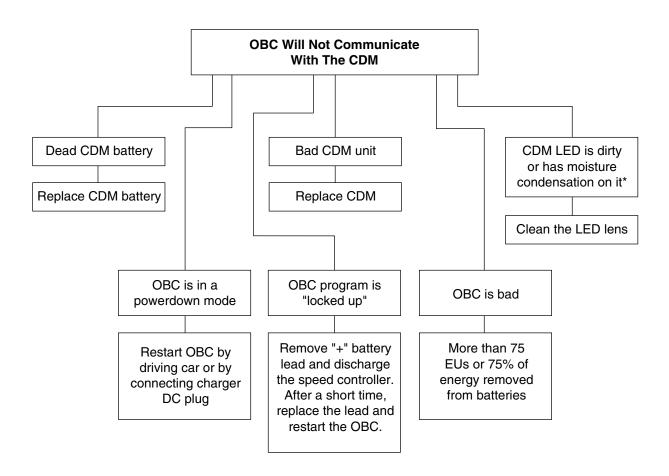


FIGURE 20-12 FIGURE 20-13



COMMUNICATION DISPLAY MODULE TROUBLESHOOTING GUIDE

Use this chart as a starting point for troubleshooting problems with communications between the CDM and on-board computer. Contact your Club Car representative for more comprehensive information.



* On some 1995 PowerDrive System 48 vehicles manufactured between weeks 9526 and 9546, the infra-red light projection lens (LED) in the on-board computer may be partially covered by a clear sealant used when assembling the computer. If this occurs, the communication display module (CDM) may not receive information from the computer. This condition may be corrected by using a razor knife or a small cutting tool to remove any excess sealant material from the area around the projection lens. Use CAUTION. Do not damage the lens when removing the sealant. See Club Car Service Bulletin No. 95-12 for complete information.

SECTION 20 B - ELECTRICAL COMPONENTS, POWERDRIVE SYSTEM 48 VEHICLE



A DANGER

- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VEN-TILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR FULL FACE SHIELD WHEN WORKING ON OR NEAR BATTERIES.
- USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 20-1. AND THEN DISCHARGE THE CONTROLLER AS FOLLOWS:
 - TURN THE KEY SWITCH TO **ON** AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

THE KEY SWITCH

The key switch is mounted just to the right of the steering column on the center dash panel.

Testing the Key Switch

See Test Procedure 2, Page 20-12.



The Key Switch, Continued:

Removing the Key Switch

- 1. Disconnect batteries (Figure 20-1, Page 20-2).
- 2. Discharge the speed controller (See instructions in WARNING box on Page 20-25).
- 3. Remove center dash.
 - 3.1. Remove the plastic cap covering the screw on each side of the center dash.
 - 3.2. Loosen (but do not remove) the screw on each side of the center dash panel.
 - 3.3. Insert screwdriver at top center of center dash between dash and cowl brace. Gently pry center dash out slightly from under edge of cowl brace.
 - 3.4. Pull center dash out approximately one inch from the frame and then bend the top right corner of the center dash panel inward while pulling the top of the panel out and down. See NOTE below.

NOTE

- BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUNG THE DASH.
- 4. Slide center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 5. Disconnect the wires from the key switch. Do not allow wires to touch.
- 6. Remove key switch from the dash:
 - On vehicles manufactured prior to December 19, 1994 (serial numbers lower than 9522-436452), hold the key switch and use the switch tool (Club Car Part No. 1012801) to turn the switch retaining nut on the outside of the dash panel.
 - On vehicles manufactured on December 19, 1994 and later (serial numbers 9522-436452 and greater), from the back of the dash panel, push down on the retaining tabs surrounding the key switch and remove the key switch cap (Item 8, Figure 19-11, Page 19-17). Hold the key switch and use a 1 inch deep well socket to remove the switch retaining nut from the outside of the dash panel.

Installing the Key Switch

- Position the key switch in the center dash, then install and tighten the switch retaining nut. If you have the later model key switch, press the plastic cap into place on the outside of the center dash (Figure 19-11, Page 19-17).
- 2. Connect the wires to the key switch terminals (See Figure 20-2, Page 20-3, or Figure 20-3, Page 20-4), and then coat the terminals with Battery Protector Spray (Club Car Part No. 1014305).
- Install the center dash into the vehicle by reversing the removal procedure. Make sure that the key switch terminals can not touch the frame and that the center dash panel is properly seated and snapped into place. See NOTE below.

NOTE

 BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE INSTALLING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.

A DANGER

• TURN THE KEY TO OFF, PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL, DISCONNECT THE BATTERY CABLES AS SHOWN IN FIGURE 20-1, PAGE 20-2, AND DISCHARGE THE CONTROLLER (SEE WARNING ON PAGE 20-1). FAILURE TO DO SO MAY CAUSE THE VEHICLE TO RUN OVER YOU, RESULTING IN SEVERE INJURY OR DEATH.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.

Testing the Forward and Reverse (F&R) Switch

- 1. Refer to Power Circuit Testing Test Procedure 6, Page 20-16.
- 2. Visually inspect rotor and contacts; be sure contacts are in good condition. If they are not, replace the whole F&R switch. If severe arcing has occurred, check F&R anti-arcing limit switch for proper operation. See Test Procedure 3, Page 20-13, and F&R Limit Switches, on page 20-28.

Removing the Forward and Reverse (F&R) Switch

- 1. Remove F&R handle (6) by removing screw (7) (Figure 20-14, Page 20-28).
- 2. Remove screws (8) and nuts (9) that mount the F&R switch to the rear body.
- 3. Pull the F&R switch away from rear body and out of the battery compartment for ease of service.
- 4. If wires must be disconnected from F&R switch, label them so they will be reconnected properly.

Servicing the Forward and Reverse (F&R) Switch

- 1. Keep the switch clean.
- 2. If the switch is hard to turn or sticks, a light spray of WD-40® may be applied to the contacts.

A WARNING

• **DO NOT** GREASE CONTACTS. THIS COULD CAUSE THE FORWARD AND REVERSE SWITCH TO MALFUNCTION OR BURN.

Installing the Forward and Reverse (F&R) Switch

Install switch in reverse order of disassembly. See CAUTION below.

A CAUTION

• BE SURE THE WIRES ARE ROUTED SO THAT THE FORWARD AND REVERSE ROTOR DOES NOT PULL ON OTHER WIRES WHEN THE FORWARD AND REVERSE LEVER IS SHIFTED.



FORWARD AND REVERSE (F&R) LIMIT SWITCHES

The F&R anti-arcing limit switch, reverse buzzer limit switch, and reverse half-speed limit switch are located on the F&R switch and are activated by a cam on the F&R switch rotor (Figure 20-14).

Testing the Limit Switches

- 1. F&R Anti-Arcing Limit Switch: See Test Procedure 3, Page 20-13.
- 2. Reverse Buzzer Limit Switch: See Testing The Reverse Buzzer Circuit, Page 20-30.
- 3. Half-Speed Reverse Limit Switch: See Test Procedure 12, Page 20-21.

Removing the Limit Switches

1. Remove all three limit switches from F&R switch by removing two screws (5), lock washers (4) and nuts (3). Label each wire prior to disconnecting wire terminals from each switch.

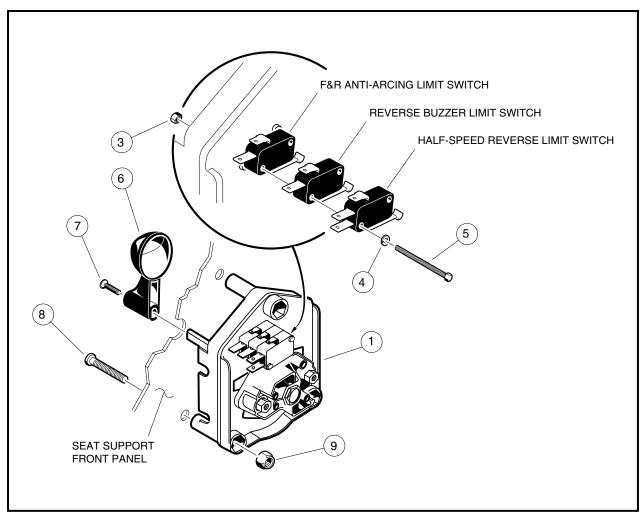


FIGURE 20-14

Installing Limit Switches

Install in reverse order of disassembly. Insert labeled wires on the common (COM) terminal and labeled wires on the normally open (NO) terminal of each switch. Torque screws to 5 in.lbs. (0.6 N-m). (If wires were not labeled during removal, see Figure 20-2, Page 20-3, or Figure 20-3, Page 20-4 for proper wiring.)

After installation, be sure that when the rotor is turned, the lever arm of each switch is pressed and released per chart at the top of page 20-29. If not correct, inspect the Forward and Reverse rotor and limit switches for damage.

LIMIT SWITCH	FORWARD AND REVERSE LEVER POSITION	
	FORWARD	REVERSE
Forward and Reverse Anti-arcing	Depressed	Depressed
Half-speed Reverse	Released	Depressed
Reverse Buzzer	Released	Depressed

HALF-SPEED RESISTOR - (TO HALF-SPEED REVERSE LIMIT SWITCH)

The half-speed resistor assembly is connected to the half-speed reverse limit switch on the Forward and Reverse switch (Figure 20-14).

Testing the Half-speed Resistor

See Test Procedure 13, Page 20-21.

Removing the Half-speed Resistor

Tool to be used: Wire Stripper/Crimper

- 1. Cut the 18 gauge black wire between the failed resistor and wire harness.
- 2. Remove the failed resistor from the limit switch.

Installing the Half-speed Resistor

- 1. Using the wire stripper/crimper, strip the wire from the harness back 1/4 inch (5.6 mm).
- 2. Insert wire end into butt connector on new resistor wire assembly (CLUB CAR Part No. 1018830-01).
- 3. Using the wire crimper, crimp the butt connector to permanently attach it to the wire from the harness.
- 4. Install the terminal of the resistor wire assembly onto the the half-speed reverse limit switch.

ACCELERATOR ADJUSTMENT - See Section 6 of this manual.

THE REVERSE BUZZER

The reverse buzzer is mounted on the rear of the center dash panel, under the front body.

A DANGER

• TURN THE KEY TO OFF AND REMOVE THE KEY, PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL, DISCONNECT THE BATTERY CABLES AS SHOWN IN FIGURE 20-1, PAGE 20-2, AND DISCHARGE THE CONTROLLER (SEE WARNING ON PAGE 20-1). FAILURE TO DO SO MAY CAUSE THE VEHICLE TO RUN OVER YOU, RESULTING IN SEVERE INJURY OR DEATH!

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.



The Reverse Buzzer, Continued:

Testing the Reverse Buzzer Circuit

- Disconnect the red/white wire from F&R limit switch No. 2 and connect the black probe of a multimeter (set to volts) to the wire. Place the red probe of the multi-meter on the positive post of battery No. 1. The multimeter should show battery voltage. If it doesn't, replace the red/white wire.
- 2. Disconnect both wires from F&R limit switch No. 2 and place the probes of a continuity tester on the wire terminals of the limit switch. With the limit switch lever up (open circuit), the tester should not be illuminated. With the limit switch lever down (closed circuit), the tester should be illuminated. If this is not the case, replace the limit switch.
- 3. Disconnect the batteries (Figure 20-1, Page 20-2) and discharge the speed controller (See WARNING box on Page 20-25).
- 4. Remove center dash:
 - 4.1. Remove the plastic cap covering the screw on each side of the center dash.
 - 4.2. Loosen (but do not remove) the screw on each side of the center dash panel.
 - 4.3. Insert screwdriver at top center of center dash between dash and cowl brace. Gently pry center dash out slightly from under edge of cowl brace.
 - 4.4. Pull center dash out approximately one inch from the frame and then bend the top right corner of the center dash panel inward while pulling the top of the panel out and down.

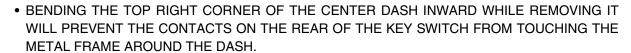
NOTE

- BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.
- 5. Slide center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 6. Disconnect the orange wire from the reverse buzzer and also from F&R limit switch No. 2. Connect the red probe of a continuity tester to the orange wire at the F&R end, and connect the black probe to the orange wire at the reverse buzzer end. The continuity tester should illuminate. If it doesn't, replace the orange wire.
- 7. Disconnect the red wire from the reverse buzzer. Connect the red probe of a continuity tester to the red wire and connect the black probe to the large stud (with 6 gauge red wire attached) on the solenoid. If the tester does not illuminate, replace the red wire. If the tester does illuminate, replace the buzzer.

Removing the Reverse Buzzer

- Disconnect the batteries (Figure 20-1, Page 20-2) and discharge the speed controller (See WARNING box on Page 20-25).
- 2. Remove center dash.
 - 2.1. Remove the plastic cap covering the screw on each side of the center dash.
 - 2.2. Loosen (but do not remove) the screw on each side of the center dash panel.
 - 2.3. Insert screwdriver at top center of center dash between dash and front body brace. Gently pry center dash out slightly from under edge of cowl brace.
 - 2.4. Pull center dash out approximately one inch from the frame and then bend the top right corner of the center dash panel inward while pulling the top of the panel out and down. See NOTE at the top of page 20-31.

NOTE





- 3. Slide center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 4. Disconnect the 18 gauge red and orange wires from reverse buzzer.
- 5. Remove the two screws from the reverse buzzer.
- 6. Remove the reverse buzzer from the center dash panel.

Installing the Reverse Buzzer

Install the reverse buzzer in the reverse order of removal.

THE SOLENOID

The solenoid is located on the passenger's side fender well behind the battery compartment. The solenoid has two sets of posts; two 5/16 inch posts (power contact posts) and two small No. 10 posts (activating coil posts).

A DANGER

• TURN THE KEY TO OFF AND REMOVE THE KEY, PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL, DISCONNECT THE BATTERY CABLES AS SHOWN IN FIGURE 20-1, PAGE 20-2, AND DISCHARGE CONTROLLER (SEE WARNING ON PAGE 20-1). FAILURE TO DO SO MAY CAUSE THE VEHICLE TO RUN OVER YOU, RESULTING IN SEVERE INJURY OR DEATH!

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.

Testing the Solenoid

See Test Procedure 7, Page 20-16.

Removing the Solenoid

- 1. Disconnect batteries (Figure 20-1, Page 20-2).
- 2. Discharge the controller (See instructions in Warning Box on Page 20-25).
- 3. Disconnect all wires from solenoid. Remove resistor assembly and diode assembly.

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The Solenoid, Continued:

Installing the Solenoid

- 1. Install the solenoid to the mounting plate and torque to 66 in.lbs. (7.5 N-m). The solenoid does not have to be oriented in any particular manner.
- 2. Install wires on the solenoid as shown in the wiring diagram (Figure 20-2, Page 20-3, or Figure 20-3, Page 20-4).
- 3. Install diode and resistor as shown in wiring diagram (Figure 20-2 or 20-3).

THE DIODE - (SOLENOID)

A diode is placed across the solenoid activating coil to allow the field to collapse and prevent limit switch failures. If limit switches are failing, the diode should be checked for correct orientation.

Removing the Diode

The diode assembly is connected to (and positioned between) the two small No. 10 posts (activating coil posts) on the solenoid.

- 1. Disconnect batteries (Figure 20-1, Page 20-2).
- 2. Discharge the controller (See instructions in Warning Box on the Page 20-25).

A WARNING

- FAILURE TO DISCHARGE THE CONTROLLER COULD RESULT IN A SHORT CIRCUIT SHOULD THE WRENCH OR RATCHET TOUCH THE LARGE POST DURING REMOVAL OR INSTALLA-TION OF THE DIODE ASSEMBLY.
- 3. Remove the two nuts attaching diode assembly to the solenoid.
- 4. Remove diode assembly.

Testing the Diode

- 1. Using a VOM, check for continuity between both diode terminals. Reverse the tester leads and again check for continuity.
- 2. A diode is designed to conduct current in one direction only. If a diode shows continuity in both directions or does not show continuity in either direction, replace diode assembly.

Installing the Diode

- 1. Install diode assembly to small No. 10 solenoid studs.
- 2. Ensure that the direction of the diode is correct. The red insulated terminal of the diode assembly should be installed on the same stud to which the 18 gauge red wire (with insulated terminal) is attached, and the uninsulated terminal of the diode assembly should be installed on the same stud to which the 18 gauge yellow wire is attached (Figure 20-2, Page 20-3, or Figure 20-3, Page 20-4).
- 3. Install remaining wires to stude as shown (Figure 20-2 or 20-3). Install and tighten two No.10 nuts to posts. Torque to 17-20 in.lbs. (2.0/2.3 N-m).

RESISTOR - (SOLENOID)

A 250 ohms resistor is placed across the contacts to keep the capacitors in the controller charged. This reduces arcing on the contacts of the solenoid. Whenever a solenoid fails, this 250 ohms resistor should be checked.

Removing the Resistor

1. Disconnect batteries (Figure 20-1, Page 20-2).

2. Discharge the controller (See instructions in Warning Box on Page 20-25).

A WARNING

- FAILURE TO DISCHARGE THE CONTROLLER COULD RESULT IN A SHORT CIRCUIT SHOULD THE WRENCH OR RATCHET TOUCH THE LARGE POST DURING REMOVAL OR INSTALLATION OF THE RESISTOR ASSEMBLY.
- 3. Remove the two large nuts that attach the resistor to the solenoid.
- 4. Remove the resistor from the solenoid.

Testing the Resistor

- 1. Using a VOM, check for continuity between both resistor terminals. Reverse the tester leads and again check for continuity.
- 2. If measurement is different from approximately 250 ohms, replace the resistor.

Installing the Resistor

1. Install in reverse order of removal (See Figure 20-2, Page 20-3, or Figure 20-3, Page 20-4 for proper wiring).

ON-BOARD COMPUTER (OBC)

Testing the On-board Computer

See Test Procedure 11, Page 20-20.

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.

Removing the On-board Computer

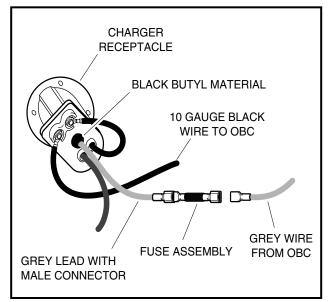
- 1. Disconnect batteries (Figure 20-1, Page 20-2).
- 2. Discharge the controller (See instructions in Warning Box on Page 20-25).

A WARNING

- FAILURE TO DISCHARGE THE CONTROLLER COULD RESULT IN A SHORT CIRCUIT SHOULD THE WRENCH OR RATCHET TOUCH THE LARGE POST OF THE SOLENOID.
- 3. Disconnect the 10 gauge black wire (to OBC) from the back of the charger receptacle (Figure 20-15).
- 4. Disconnect the gray wire (from OBC) at the sense lead fuse, leaving the sense lead fuse connected to the grey lead from the charger receptacle (Figure 20-15).







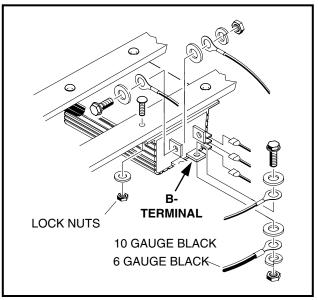


FIGURE 20-15 FIGURE 20-16

- 5. Remove the 18 gauge red and yellow wires on the solenoid.
- 6. Disconnect the 6 gauge and 10 gauge black wires from B- of the controller (Figure 20-16).
- 7. Disconnect the 18 gauge brown wire from OBC.
- 8. Remove the two 1/4 20 lock nuts holding the OBC.
- 9. Remove the OBC from the car.

Installing the On-board Computer

Install the OBC in reverse order of removal.

SOLID STATE SPEED CONTROLLER

Testing the Speed Controller

See Test Procedure 10, Page 20-18.

Removing the Speed Controller

- 1. Disconnect the batteries (Figure 20-1, Page 20-2).
- 2. Discharge the controller (See instructions in Warning Box on Page 20-25).
- 3. Remove all the 6 gauge wires connected to the controller (Figure 20-16).
- 4. Unplug the three 18 gauge wires plugged into the controller (Figure 20-16).
- 5. Remove the four 1/4 20 lock nuts holding the controller (Figure 20-16).
- 6. Remove the controller from the vehicle.

Installing the Solid State Speed Controller

Install in reverse order of disassembly.

CHARGER RECEPTACLE

Testing the Charger Receptacle

See Section 23, Page 23-38, Test Procedure 1.

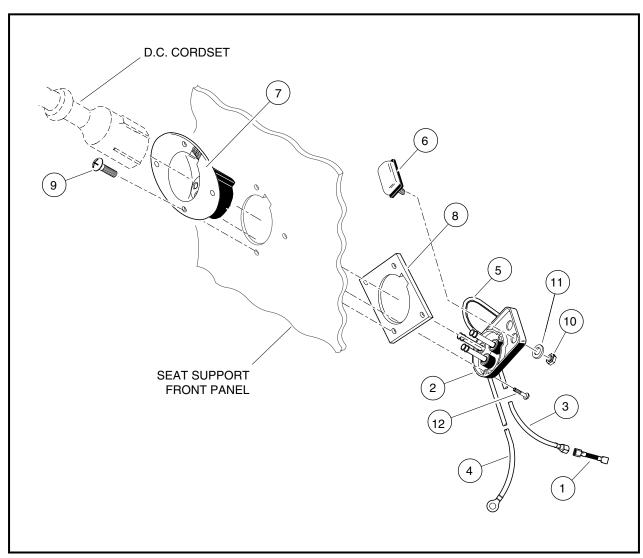


FIGURE 20-17

Removing the Receptacle

- 1. Remove the 10 gauge red wire (4) from the positive post of battery No. 1, and then pull the 10 gauge red wire to the receptacle (2) (Figure 20-17).
- 2. Locate the 1/4" "quick disconnect" terminal on the 10 gauge grey wire from the charger receptacle. Disconnect the 10 gauge grey wire (3) at this terminal, leaving the sense lead fuse (1) attached to the grey wire from the on-board computer (Figure 20-17).
- 3. Remove the 10 gauge black wire (5) from the charger receptacle using a ratchet and a 3/8" socket.
- 4. Use a phillips screwdriver to remove the four screws (9) from the bezel (7), and the three screws (12) from receptacle (2).

Installing a New Receptacle (Figure 20-17)

- 1. Install the bezel (7) with four screws (9) through the bezel and body and into the receptacle backing plate (8). Torque screws to 9-13 in.lbs. (1.0/1.5 N-m) (Figure 20-17).
- 2. Insert the fuse and receptacle assembly (2) through the receptacle backing plate and into the bezel as shown, then install the three mounting screws (12).
- 3. Thread the 10 gauge red wire (4) through the tie wraps on the front body support and attach the connector to the positive post of battery No. 1 (See Figure 23-20, Page 23-29).

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Installing a New Receptacle, Continued:

- 4. Attach the 10 gauge black wire from the on-board computer to the fuse assembly using a ratchet and a 3/8" socket (See Figure 23-20, Page 23-29).
- 5. Connect 1/4" connector on the 10 gauge grey wire (3) from the charger receptacle to the 18 gauge grey wire from the on-board computer. Make sure that the fuse is installed between the 10 gauge grey wire from the receptacle and the 18 gauge grey wire from the on-board computer (See Figure 23-20, Page 23-29).

WARNING

• DO NOT BY-PASS THE SENSE LEAD FUSE.

RECEPTACLE FUSE LINK

If the fuse link has blown, the vehicle will not charge until the fuse has been replaced. The fuse link is located behind the charger receptacle in the battery compartment. See circuit diagram (Figure 23-20, Page 23-29).

A DANGER

• TURN THE KEY TO OFF AND REMOVE THE KEY, PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL, DISCONNECT THE BATTERY CABLES AS SHOWN IN FIGURE 20-1, PAGE 20-2, AND DISCHARGE CONTROLLER (SEE WARNING ON PAGE 20-1). FAILURE TO DO SO MAY CAUSE THE VEHICLE TO RUN OVER YOU, RESULTING IN SEVERE INJURY OR DEATH!

WARNING

- THE FUSE SHOULD NEVER BLOW UNDER NORMAL OPERATING CONDITIONS. IF THE FUSE HAS BLOWN, DETERMINE THE SOURCE OF THE ELECTRICAL PROBLEM AND CORRECT IT BEFORE REPLACING THE FUSE.
- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.

Removing the Receptacle Fuse Link (Figure 20-17, Page 20-35)

- 1. Remove the fuse link assembly and lens (6) from the charger receptacle (2) by removing the two nuts (10) and washers also used to secure the 10 gauge black wire from the computer and the 10 gauge black wire (5) to the receptacle.
- 2. Remove the fuse link (6) from the charger receptacle.

Installing a New Receptacle Fuse Link (Figure 20-17, Page 20-35)

- 1. Insert the two fuse link mounting studs into the mounting holes in the charger receptacle.
- 2. Place two flat washers (11) on the studs.
- Place the two 10 gauge black wires in their original positions on the fuse link mounting studs.
- 4. Install the nuts (10) on the fuse link mounting studs and torque to 20-25 in.lbs. (2.3/32.8 N-m).

CONTINUOUSLY VARIABLE POTENTIOMETER

Testing the Continuously Variable Potentiometer

See Test Procedure 9, Page 20-17.

Removing the Continuously Variable Potentiometer (Figure 20-18, Page 20-38)

- 1. Disconnect batteries (Figure 20-1, Page 20-2).
- Discharge the controller (See instructions in Warning Box on Page 20-25).

WARNING

- FAILURE TO DISCHARGE THE CONTROLLER COULD RESULT IN A SHORT CIRCUIT SHOULD THE WRENCH OR RATCHET TOUCH THE LARGE POST OF THE SOLENOID.
- 3. Remove center dash.
 - 3.1. Remove the plastic cap covering the screw on each side of the center dash.
 - 3.2. Loosen (but do not remove) the screw on each side of the center dash panel.
 - 3.3. Insert screwdriver at top center of center dash between dash and front body brace. Gently pry center dash out slightly from under edge of front body brace.
 - 3.4. Pull center dash out approximately one inch from the frame and then bend the top right corner of the center dash panel inward while pulling the top of the panel out and down.

NOTE

- BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.
- 4. Slide the center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 5. Disconnect the 18 gauge blue wire (1) from the key switch.
- 6. Unplug the three pin connector (2) which connects the potentiometer to the wire harness (**Figure 20-18**).
- 7. Unplug the 18 gauge green/white wire (3) from F&R limit switch No.1.
- 8. Remove the crescent retaining ring (4), which is located between the accelerator pedal (5) and the actuator lever (6), from the pivot rod (7).
- 9. Remove the potentiometer housing cover (8) by removing the two No. 4 screws (9) (Figure 20-18).
- 10. Remove the 3/8 lock nut (10) on the ratchet (11) (Figure 20-18).
- 11. Remove the 5/16 bolt (12), two washers, and nut attaching the accelerator pedal (5) to the accelerator pivot rod (7) (Figure 20-18).
- 12. Remove the 1/4 bolt (13) and nut attaching the spring retainer (14) to the accelerator pivot rod.
- 13. Remove the 1/4 bolt (15), washer, and nut attaching the actuator lever (6) to the accelerator pivot rod (Figure 20-18).
- 14. Remove the pivot rod.

NOTE

• THERE IS A NYLON WASHER (16) BETWEEN THE ACTUATOR LEVER AND THE POTENTIOMETER HOUSING.



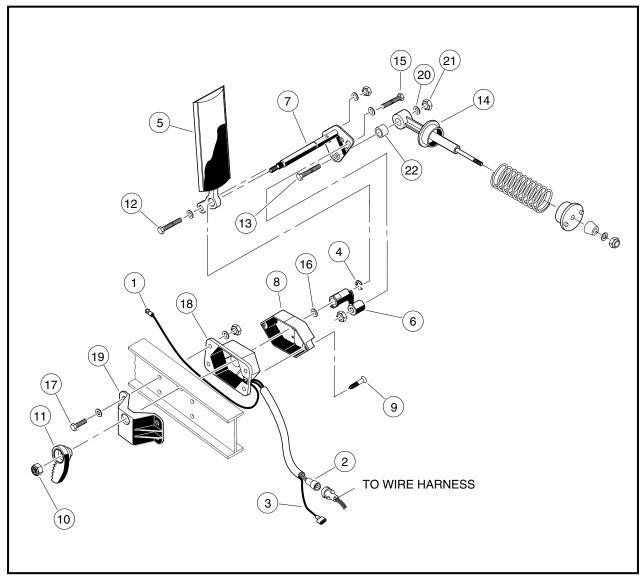


FIGURE 20-18

- 15. Remove the four 1/4 inch bolts (17), washers, and nuts attaching the potentiometer housing (18) and the pivot rod support (19) to the frame (Figure 20-18).
- 16. Remove the potentiometer housing and pivot rod support from the I-Beam.

Installing the Continuously Variable Potentiometer (Figure 20-18)

1. Position the potentiometer housing (18) and pivot rod support (19) on the frame and install the four 1/4 bolts (17) with washers and nuts. See NOTE below.

NOTE

- DO NOT TIGHTEN BOLTS AT THIS TIME.
- 2. Install the pivot rod (7), with accelerator pedal (5), actuator lever (6), and the nylon washer (16), into the potentiometer housing. See NOTE at the top of the next page.

NOTE

• MAKE SURE THAT THE ACTUATOR LEVER PIN IS INSERTED INTO THE POTENTIOMETER LEVER. SEE FIGURE 20-19.



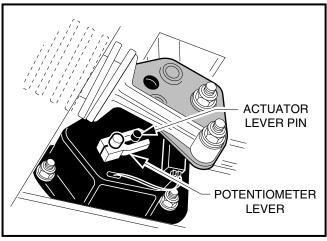


FIGURE 20-19

- 3. Now tighten the four 1/4 inch potentiometer housing mounting bolts to between 70 and 80 in.lbs (8.0/9.0 N-m).
- 4. Install the spring retainer (14) on the pivot rod.

A CAUTION

- WHEN REASSEMBLED, THE BOLT (13), SPACER (22), WASHER (20), AND NUT (21) MUST BE ORIENTED EXACTLY AS SHOWN (FIGURE 20-18). FAILURE TO DO SO COULD RESULT IN UNEXPECTED ACCELERATION OF THE VEHICLE.
- 5. Position the ratchet (11) on the end of the pivot rod so that there is approximately an .030 to .090 inch gap between the pawl and the ratchet teeth (this can be verified with a feeler gauge).
- 6. Install and tighten nut (10) to between 16 and 20 ft.lbs. (21.7/27.1 N-m).
- 7. Install the crescent retaining ring (4) between the accelerator pedal (5) and the actuator lever (6) on the pivot rod (7).
- 8. Route and connect the 18 gauge blue wire (1) to the key switch.
- 9. Install the center dash panel in reverse order of removal.

NOTE

- WHEN INSTALLING THE CENTER DASH, MAKE SURE TO BEND THE TOP RIGHT CORNER OF THE DASH PANEL INWARD TO GIVE THE WIRES AND TERMINALS CLEARANCE.
- 10. Connect the three pin connector (2) from potentiometer to the lead from the wire harness.
- 11. Plug the 18 gauge green/white wire (3) to F&R limit switch No. 1.
- 12. Adjust the pedal group per instructions in Section 6 Accelerator and Brake Pedal Group.

MULTI-STEP POTENTIOMETER

A DANGER

• TURN THE KEY TO OFF AND REMOVE THE KEY, PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL, DISCONNECT THE BATTERY CABLES AS SHOWN IN FIGURE 20-1, PAGE 20-2, AND DISCHARGE THE CONTROLLER (SEE WARNING ON PAGE 20-1). FAILURE TO DO SO MAY CAUSE THE VEHICLE TO RUN OVER YOU, RESULTING IN SEVERE INJURY OR DEATH!

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 20-1, PAGE 20-2).
- FOLLOW ALL PROCEDURES EXACTLY AS INSTRUCTED.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.

Testing the Multi-step Potentiometer

See Test Procedure 8, Page 20-17.

Removing the Multi-step Potentiometer

- 1. Disconnect the batteries (Figure 20-1, Page 20-2) and discharge the controller (See WARNING on page 20-1).
- 2. Remove the battery wire connecting batteries No. 5 and No. 6 and the battery wire connecting batteries No. 5 and No. 4 (Figure 20-1, Page 20-2).
- 3. Using a 1/2 inch wrench, remove the hold-down brackets from the No. 5 and No. 6 batteries and then remove the No. 5 and No. 6 batteries from the vehicle (**Figure 20-1**, **Page 20-2**).
- 4. Slide back the ball stud retainer on the potentiometer end of the accelerator rod (1) and disconnect the accelerator rod from the multi-step potentiometer (Figure 20-20).
- 5. Disconnect the 18 gauge black (2), white (3), and blue (4) wires from the multi-step potentiometer (Figure 20-20).
- 6. Disconnect the 18 gauge green/white wire (5) at the F&R limit switch No. 1 (Figure 20-20).
- 7. Using a 3/8 inch wrench, remove the nuts (6) and lock washers (7) from underneath the I-Beam and lift the multi-step potentiometer assembly from the frame. Remove the shim plate (8) (Figure 20-20).

Installing the Multi-step Potentiometer (Figure 20-20)

- 1. Position the shim plate (8) on the frame I-Beam with the mounting holes properly aligned.
- 2. Use a flat-blade screwdriver to push the locking tabs out of the retainers, and remove the potentiometer cover (9).
- 3. Position the potentiometer on the shim plate and frame with mounting holes aligned and insert the mounting bolts (10) through the potentiometer base, the shim plate, and the frame as shown.
- 4. Hold the mounting bolts in place while installing the lock washers (7) and nuts (6). Tighten nuts to between 18 and 22 in.lbs. (2.0/2.5 N-m).

- 5. Connect the 18 gauge green/white wire to F&R limit switch No. 1. Connect the 18 gauge black (2), white (3), and blue (4) wires to the multi-step potentiometer. See Figure 20-2, Page 20-3 for proper wiring connections.
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- 6. Connect the accelerator rod (1) to the potentiometer.
- 7. Install and connect the No. 5 and No. 6 batteries.

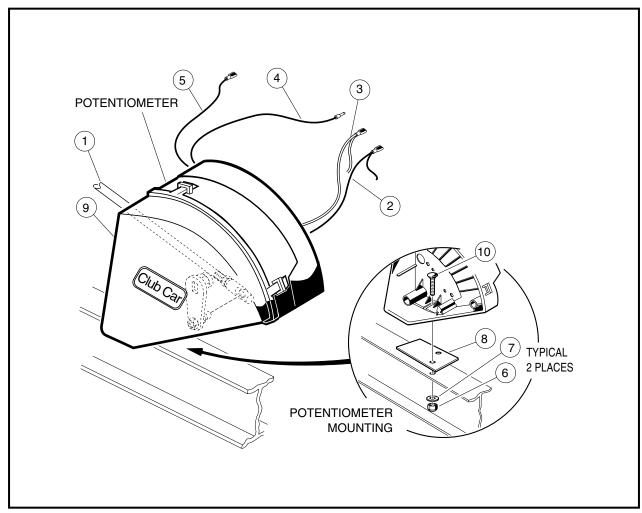


FIGURE 20-20

BATTERY WARNING LIGHT

Removing the Battery Warning Light

- 1. Disconnect the battery wires as shown (Figure 20-1, Page 20-2).
- 2. Remove center dash.
 - 2.1. Remove the plastic cap covering the screw on each side of the center dash.
 - 2.2. Loosen (but do not remove) the screw on each side of the center dash panel.
 - 2.3. Insert screwdriver at the top center of the dash between dash and cowl brace. Gently pry center dash out slightly from under edge of cowl brace.
 - 2.4. Pull center dash out approximately one inch from the frame and then bend the top right corner of the center dash inward while pulling the top of the panel out and down. See Note at top of Page 20-42.

Removing the Battery Warning Light, Continued:

NOTE

- BENDING THE TOP RIGHT CORNER OF THE CENTER DASH INWARD WHILE REMOVING IT WILL PREVENT THE CONTACTS ON THE REAR OF THE KEY SWITCH FROM TOUCHING THE METAL FRAME AROUND THE DASH.
 - 2.5. Slide center dash panel up the steering column by snapping out the top and then rotating the panel out and up. There is sufficient slack in the wiring to allow for this.
- 3. Disconnect the wires from the battery warning light. Do not allow wires to touch.
- 4. Depress the two retaining tabs and remove the light from the center dash.

Testing the Battery Warning Light

- Turn the key switch off and place the forward and reverse switch in neutral. Leave battery cables connected.
- 2. Disconnect the 18 gauge brown wire from the on-board computer at the spade connector (located near the on-board computer).
- 3. Disconnect the batteries. Then connect one end of a jumper wire to the male side of the spade connector, and connect the other end of the jumper wire to the negative (-) post of battery number 2. The battery warning light should illuminate. If it does not, proceed to step 4.

A WARNING

- DISCONNECT THE BATTERIES AS SHOWN IN FIGURE 20-1, PAGE 20-2)
- TO AVOID ELECTRICAL SHOCK, DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY TO ON AND PLACE THE FORWARD AND REVERSE SWITCH IN THE REVERSE POSITION.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.
 - TURN THE KEY SWITCH TO OFF AND PLACE THE FORWARD AND REVERSE SWITCH IN THE NEUTRAL POSITION.
- SEE THE SAFETY WARNINGS ON PAGE 20-1.
- 4. Remove the center dash (See Battery Warning Light Removal, Page 20-41).
- 5. Disconnect the 18 gauge brown wire from the battery warning light.
- 6. Set the multimeter to ohms (Ω) , connect the black (-) probe to the male side of the brown wire spade connector. Connect the red (+) probe to the brown wire female spade that was disconnected from the battery warning light. Reading should be continuity. If reading is incorrect, repair or replace the wire.
- 7. Disconnect the 18 gauge orange/white wire from the battery warning light.
- 8. Set the multimeter to ohms (Ω) , connect the black (-) probe to the female spade connector on the orange/white wire and connect the red (+) probe to the key switch terminal with the orange/white wire. The reading should be continuity. If the reading is incorrect, repair or replace the wire.
- 9. If both wires test good, then replace the battery warning light.

Installing the Battery Warning Light

1. Install in reverse order of removal.

SECTION 21A - ELECTRICAL SYSTEM, POWERDRIVE PLUS VEHICLES

A DANGER

- THE BATTERY WIRES MUST REMAIN CONNECTED WHILE PERFORMING SOME TEST PRO-CEDURES. RAISE THE REAR END OF THE VEHICLE AND SUPPORT IT ON JACKSTANDS, WITH THE REAR WHEELS OFF THE GROUND, WHILE PERFORMING ALL TEST PROCE-DURES.
- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VEN-TILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR FULL FACE SHIELD WHEN WORKING ON OR NEAR BATTERIES.
- USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL AND ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE ROCKER SWITCH IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS. WHEN BATTERIES ARE CONNECTED, USE EXTREME CAUTION TO AVOID SHORTING OF COMPONENTS OR WIRING.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 21-2, PAGE 21-3 WHEN PERFORMING TESTS THAT DO NOT REQUIRE THE ELECTRICAL SYSTEM TO BE ENERGIZED.

GENERAL INFORMATION

Like the PowerDrive System 48 vehicle, the PowerDrive Plus vehicle features a 48 volt electrical system that is powered by six eight-volt lead acid batteries, and includes an on-board computer that controls the battery charger, monitors vehicle usage, and provides test data to the optional Communication Display Module, and actuates a solenoid lock-out function when the battery charger DC cord is plugged into the receptacle (Figure 21-1, Page 21-2) (See Section 20 for complete details). The PowerDrive Plus vehicle, however, uses a "shunt wound" 3.2 hp motor, and includes several additional features:

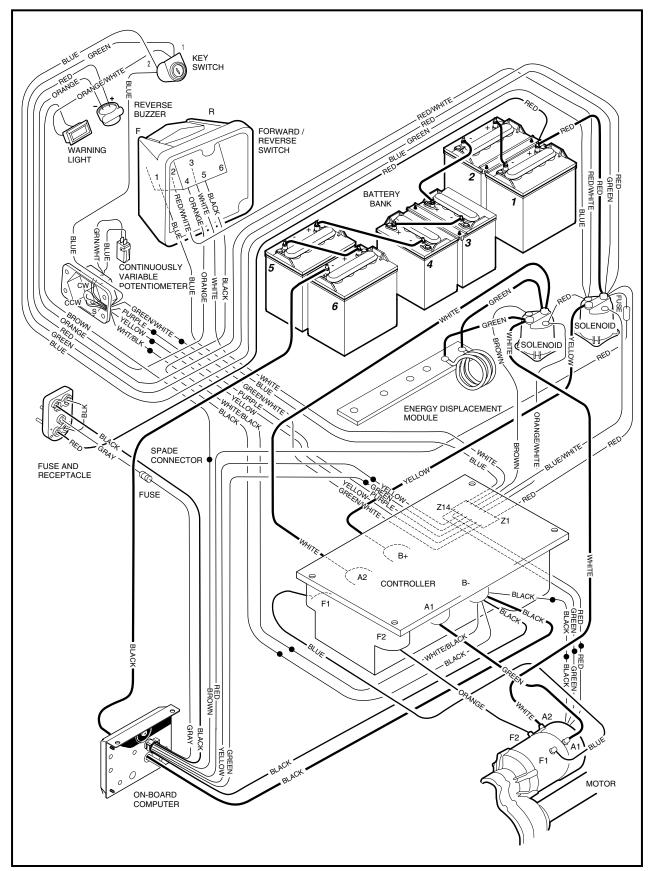


FIGURE 21-1

General Information, Continued:

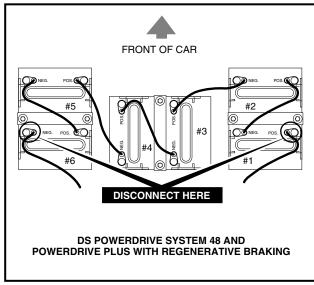
- "Zero Speed Detect": This prevents the vehicle from rolling away uncontrolled should a driver park on a slope and leave the vehicle without locking the park brake. When the vehicle is in use with the key switch ON, the zero speed detect function will resist vehicle rolling.
- E E
- "Pedal Down" Motor Braking: This feature helps to control downhill speeds. When vehicle speed exceeds approximately 15 mph with the accelerator depressed, an electronic sensor automatically engages motor braking (the motor generates current) which holds top speed to approximately 15 mph. Braking is automatically disengaged when the speed slows below approximately 15 mph. While descending hills, motor braking force regulates maximum speed to approximately 15 mph.
- "Pedal Up" Motor Braking: When vehicle speed is above 12 mph, releasing the accelerator pedal will activate motor braking and cause the motor to generate current and slow the vehicle to approximately 9 mph, no matter what the terrain. Once vehicle speed slows to below approximately 9 mph with the accelerator pedal still released, motor braking will be deactivated.

Zero Speed Detect, Pedal Down Motor Braking, and Pedal Up Motor Braking can be either *Regenerative Braking* or *Dynamic Braking*.

Regenerative Braking: When driving downhill, the vehicle motor acts as a generator, slowing the vehicle as it creates energy that is used to replenish the batteries when the on-board computer senses that the batteries are in a state of charge that can accept the extra energy.

Dynamic Braking: If the batteries are already at or near full charge and cannot accept a charge, the energy created as the motor slows the vehicle is harmlessly disposed of through the energy displacement module.

The Forward and Reverse Switch on the PowerDrive Plus vehicle is a "rocker" type (Figure 21-3), and is located in the same place as on all other DS vehicles. The Forward (F) and Reverse (R) positions are clearly marked on the switch. Push down the F (forward) side of the switch to run the vehicle in the forward direction, or push down the R (reverse) side of the switch to run the vehicle in reverse. When the switch is positioned with neither side down, the vehicle is in the neutral position and the vehicle will not run if the accelerator is depressed.



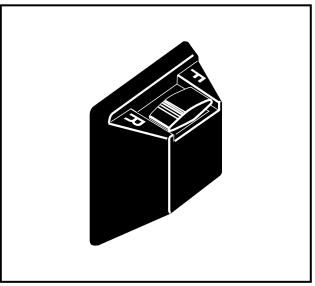


FIGURE 21-2

FIGURE 21-3

To properly service and maintain this vehicle, it is necessary to understand the electrical circuitry and the functions of all components in the system. There are three circuits that are in operation on the vehicle: 1) the control circuit, 2) the power circuit, 3) and the charge circuit. See NOTE at the top of Page 21-5.

Z PLUG CONNECTIONS DIRECTION OF CURRENT Positive (+) To Negative (-) Green/White Wire from With key switch ON and accelerator pedal depressed, Z8 Z transistor completes the circuit from potentiometer limit switch Potentiometer Limit through green/white wire to controller, which actuates the 8 controller and starts the vehicle. Yellow Wire from Controller varies vehicle speed depending on voltage input Z Potentiometer Movable from the potentiometer through the yellow wire as the accelerator pedal is depressed. contact Purple Wire to Potentio-Varies voltage input to the controller through purple wire from meter Stationary potentiometer. High Pedal Detect is activated if input is below Contact 3 volts when the key switch is turned ON. 10 Green Wire from On-When batteries can accept a regenerative charge, the onboard Computer board computer turns off a transistor in the controller, which causes the controller to change from dynamic braking to regenerative braking. Yellow Wire from On-When the battery charger DC cord is plugged into the board Computer receptacle, the Z12 transistor inside the controller shuts off voltage to the main solenoid, thus activating the solenoid lock-Red Wire to Motor Supplies a constant voltage input from controller through the Z Speed Sensor red wire to the motor speed sensor. Z10 Z11 Z12 Z13 Green Wire from Motor Motor speed sensor acts as an electronic tachometer that Z Speed Sensor pulses a voltage signal through the green wire to the controller. This signal tells the controller the vehicle's speed. 14 Blue Wire from Forward Z7 transistor completes circuit from the forward and reverse Z and Reverse Switch switch through the blue wire to the controller when the vehicle is operated in reverse. White Wire from Forward Z6 transistor completes circuit from the forward and reverse Z and Reverse Switch switch through the white wire to the controller when the vehicle is operated in forward. 6 Brown Wire to Dynamic Z5 transistor completes circuit from controller through the Z Braking Solenoid Small brown wire to solenoid. Controller turns off the solenoid during Post dynamic braking to allow current to to go through the resistor coil until batteries can accept a regenerative charge. Blue/White Wire to Main Z4 transistor completes circuit from controller through Z Solenoid Small Post blue/white wire to main solenoid. Controller turns off the solenoid after 2 seconds if vehicle is left inactive (20 seconds on some early model cars). Orange/White Wire from Z3 transistor completes the circuit to controller through Z Dynamic Braking orange/white wire when key switch is on. Actuates speed control functions such as Zero Speed Detect, Pedal-up Solenoid Small Post Braking, and downhill braking. Turn key switch off to disable. Red Wire from Main Supplies constant 48 volt input to controller through the red Solenoid Large Post wire to keep capacitors inside the controller charged. Supplies voltage when the key switch is either on or off.

FIGURE 21-4 Z PLUG CHART

General Information, Continued:

NOTE

TO SERVICE THE ELECTRICAL SYSTEM, IT IS NECESSARY TO HAVE A CONTINUITY TESTER
OR A VOLT/OHM METER (VOM) CAPABLE OF READING FROM 0-48 VOLTS DC. THE VOLT
OHM METER (CLUB CAR PART NO. 1011480), CALIBRATION TEST MODULE (CTM) (CLUB CAR
PART NO. 1018871-01) AND CONTINUITY TESTER (CLUB CAR PART NO. 1011273) ARE AVAILABLE FROM YOUR LOCAL AUTHORIZED DEALER OR FROM CLUB CAR SERVICE PARTS.

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THE CONTROL CIRCUIT

The control circuit consists of eleven individual circuits:

- 1. Capacitor Charge Circuit
- 2. Main Solenoid Control Circuit
- 3. Forward and Reverse Control Circuit
- 4. Controller Activation Circuit
- 5. Regenerative Braking Functions Circuit
- 6. Speed Control Circuit
- 7. Motor Speed Sensor Control Circuit
- 8. Dynamic Braking Solenoid Control Circuit
- 9. On-board Computer Control Circuit
- 10. Battery Warning Light Circuit
- 11. Reverse Buzzer Control Circuit

THE Z PLUG (FIGURE 21-5, PAGE 21-6)

Inside the solid-state controller there is a series of transistors that serve as on-off switches to activate or deactivate many of the control circuits, and these transistors are connected to the electrical components that they control through the Z Plug. The connectors in the Z plug are labeled (Z1, Z2, etc.) to identify which transistors they are connected to. The functions of these transistors are listed in the chart on Page 21-4 (Figure 21-4), and will be discussed in the paragraphs addressing the circuits and components to which the transistors are applicable.

CAPACITOR CHARGE CIRCUIT (FIGURE 21-6, PAGE 21-7)

The capacitor charge circuit maintains a constant voltage supply to the three capacitors located inside the solid-state speed controller. This is a very low current that keeps the capacitors charged so that the controller can respond immediately when it is activated. This voltage, typically .8 (8/10) below full battery voltage, is supplied to the capacitors even when the vehicle key switch is off, the forward and reverse rocker switch is in neutral, and the accelerator pedal is in the fully returned (not depressed) position.

The Capacitor Charge Circuit consists of:

- Three capacitors located inside the solid-state speed controller.
- The 18 gauge red wire from the main solenoid small post to the Z1 terminal of speed controller.
- The Z1 transistor located inside the speed controller.

Voltage is supplied to the Z1 terminal of the speed controller through the red wire from the large post of the main solenoid. See NOTE at the bottom of Page 21-6.

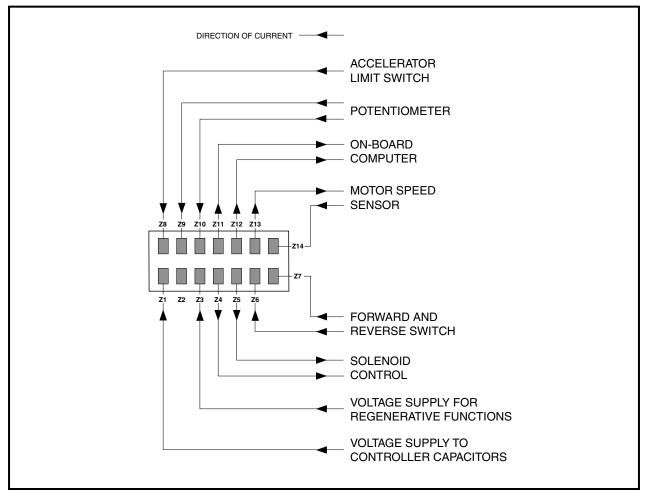


FIGURE 21-5

NOTE

- THE FOLLOWING CONDITIONS MUST EXIST FOR THE CAPACITOR CHARGE CIRCUIT TO WORK PROPERLY:
 - THE 6 GAUGE BLACK WIRE FROM THE NEGATIVE (-) TERMINAL OF BATTERY NO. 6 TO THE B- TERMINAL OF THE SPEED CONTROLLER MUST BE CONNECTED AND IN GOOD CONDITION.
 - THE 6 GAUGE RED WIRE FROM THE POSITIVE (+) TERMINAL OF BATTERY NO. 1 TO THE LARGE POST OF THE MAIN SOLENOID MUST BE CONNECTED AND IN GOOD CONDITION.
 - THE BATTERIES MUST BE IN GOOD CONDITION AND HAVE ENOUGH VOLTAGE TO RUN THE VEHICLE. BATTERY TERMINALS AND WIRES MUST BE CLEAN AND PROPERLY CONNECTED.
- IT IS NOT NECESSARY TO PUT THE FORWARD AND REVERSE SWITCH IN REVERSE AND DEPRESS THE ACCELERATOR TO DISCHARGE THE CAPACITORS; THE CAPACITORS WILL DISCHARGE EACH TIME A BATTERY WIRE IS DISCONNECTED. WHEN THE BATTERY WIRES ARE RECONNECTED, THE CAPACITORS WILL IMMEDIATELY BE RECHARGED. BECAUSE THE CAPACITORS RECHARGE DURING THE BATTERY CONNECTION PROCEDURE, THERE MAY BE A SMALL SPARK WHEN THE WIRE IS TOUCHED TO THE BATTERY TERMINAL.

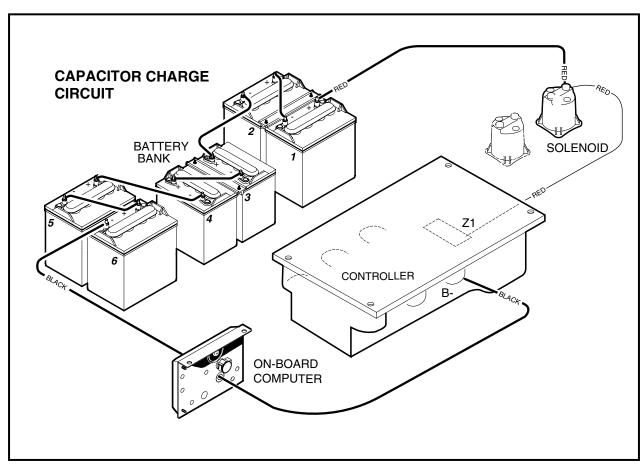


FIGURE 21-6

MAIN SOLENOID CONTROL CIRCUIT (FIGURE 21-7, PAGE 21-8)

The Main Solenoid Control Circuit supplies voltage to the solenoid activating coil. When the key switch is turned to the ON position and the two second (20 seconds on some early models) time delay transistor in the speed controller is on, the circuit is complete and the main solenoid coil is activated, closing the solenoid power contacts.

The Main Solenoid Control Circuit consists of:

- The Solenoid Activating Coil.
- The Key Switch.
- The 18 Gauge Green Wire From the Large Post of the Solenoid to the Key Switch.
- The 18 Gauge Blue Wire From the Key Switch to the Small Post of the Solenoid.
- The 2 Second Time-delay (20 seconds on some early models) Solenoid Shut-off Transistor Located at the Z4 Position on the controller.
- The 18 Gauge Blue/White Wire From the Z4 Z Plug Position to the Small Post on the Solenoid.

When the key switch is turned to the ON position, the solenoid is activated and there should be an audible click. If the accelerator pedal is not depressed within 2 seconds (20 seconds on some early models) to activate the controller, the controller will shut off the main solenoid. The controller disables the solenoid by turning off the transistor at the Z4 position.

While the vehicle is in operation, the controller will turn off the Z4 transistor and deactivate the solenoid if the accelerator pedal is released and is not depressed again within 2 seconds (20 seconds on some early models). If the solenoid is shut off by the controller, it will activate when the accelerator is depressed.

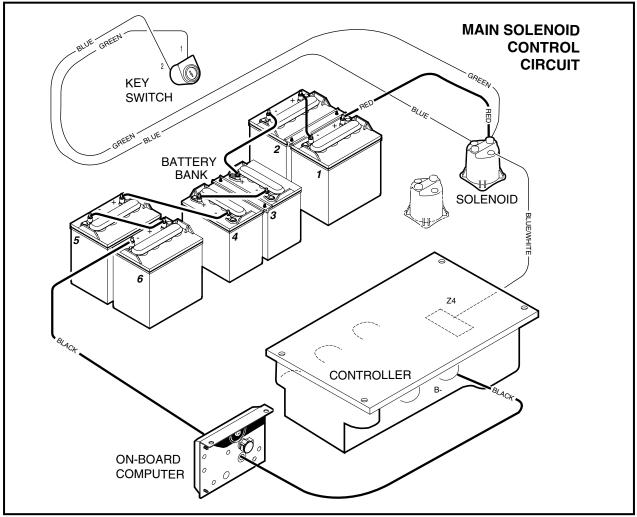


FIGURE 21-7

FORWARD AND REVERSE CONTROL CIRCUIT (FIGURE 21-8)

The Forward and Reverse Control Circuit controls the selection of either forward or reverse vehicle movement.

The Forward and Reverse Control Circuit consists of:

- The Forward and Reverse Rocker Switch.
- The 18 gauge white wire from the Forward and Reverse Rocker Switch No. 3 terminal to the Z6 position on the Z plug/controller.
- The 18 gauge red/white wire from the small post on the main solenoid to the Forward and Reverse Rocker Switch No. 2 terminal.
- The 18 gauge blue wire from the Forward and Reverse Rocker Switch No. 1 terminal to the Z7 position on the Z plug/controller.
- The Z6 transistor located inside the controller.
- The Z7 transistor located inside the controller.

Voltage is supplied from the small post of the main solenoid, through the red/white wire, and to the Forward and Reverse Rocker Switch No. 2 terminal. Voltage is then supplied to the controller either through the white

wire or blue wire, depending on the position of the rocker switch. When operating the vehicle in forward, the white wire supplies voltage from the rocker switch No. 3 terminal to the Z6 position on the Z plug/controller. When operating the vehicle in reverse, the blue wire supplies voltage from the rocker switch No. 1 terminal to the controller Z7 position.

NOTE

• THE REVERSE BUZZER SHOULD SOUND WHEN THE FORWARD AND REVERSE ROCKER SWITCH IS IN THE REVERSE POSITION.

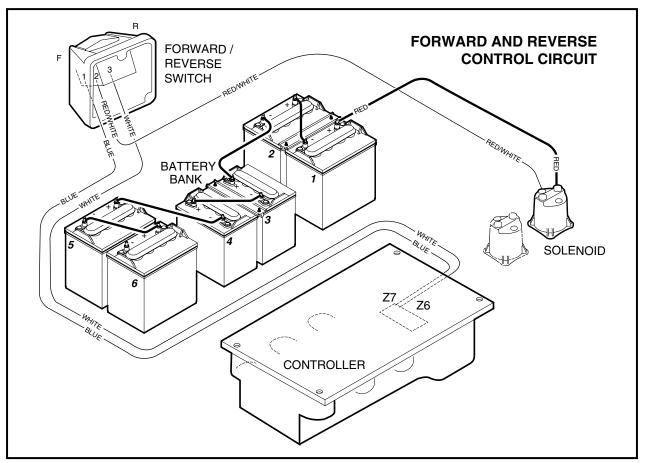


FIGURE 21-8

CONTROLLER ACTIVATING CIRCUIT (FIGURE 21-9, PAGE 21-10)

The Controller Activation Circuit supplies voltage to the Z8 position on the Z plug/controller. This will activate the controller to operate the vehicle.

The Controller Activating Circuit consists of:

- The Key Switch
- The Accelerator Pedal Limit Switch
- Z8 Transistor located inside the controller.
- The 18 gauge green wire from the large post of the Main solenoid to the key switch No. 1 terminal.
- The 18 gauge blue wire from the key switch No. 2 terminal to the accelerator pedal limit switch.
- The 18 gauge green/white wire from the accelerator pedal limit switch to the Z8 position on the Z Plug/controller.



Controller Activating Circuit, Continued:

With the key switch in the ON position, the forward and reverse rocker switch in forward or reverse, and the accelerator pedal depressed, voltage is supplied to the Z8 position in the controller. This activates the controller which completes the circuit, supplying voltage to the motor.

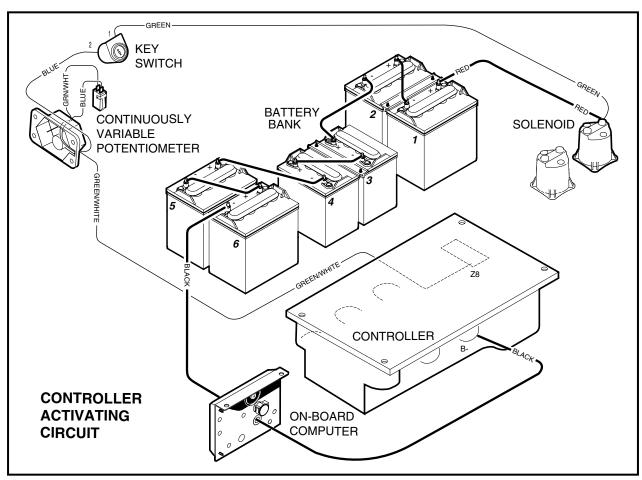


FIGURE 21-9

MOTOR BRAKING CONTROL CIRCUIT (FIGURE 21-10)

The motor braking functions are activated by supplying 48 volt input from the dynamic braking solenoid to the Z3 position in the Z plug through the orange/white wire.

The motor braking functions, including zero speed detect, may be disabled by turning the key switch to OFF. When the key switch is turned off, voltage is discontinued to the dynamic braking solenoid, consequently shutting off voltage to the Z3 position in the Z Plug. **The motor braking functions must be disabled before towing a PowerDrive Plus vehicle.**

The Motor Braking Control Circuit consists of:

- The 6 gauge red wire from the positive post of battery No. 1 to the large post of the main solenoid.
- The 18 gauge green wire from the large post of the main solenoid to the key switch.
- The 18 gauge blue wire from the key switch to the small post on the main solenoid.
- The 18 gauge red wire from the small post on the main solenoid to the small post on the dynamic braking solenoid.
- The 18 gauge orange/white wire from the small post on the dynamic braking solenoid to the Z3 position on the Z plug/controller.

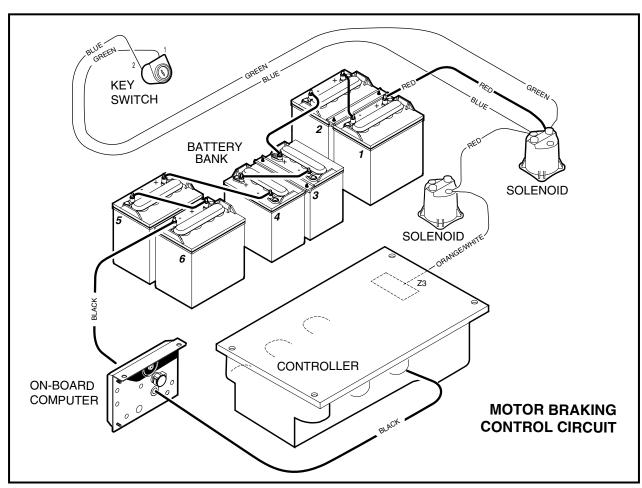


FIGURE 21-10

SPEED CONTROL CIRCUIT (FIGURE 21-11)

The ground speed of the vehicle is regulated by the input voltage supplied to the motor by the controller. Although the motor operates on 48 volt input at both low and high speeds, the controller regulates ground speed of the vehicle by shortening or lengthening the pulses to the motor. Shorter pulses result in lower speeds and longer pulses result in higher speeds.

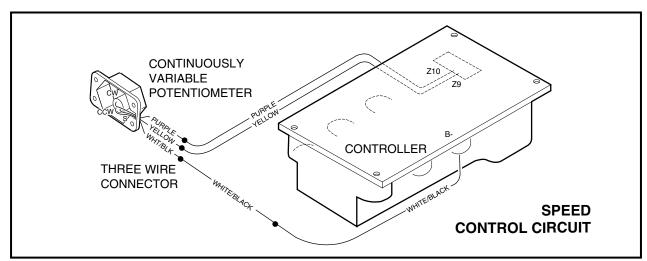


FIGURE 21-11

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Speed Control Circuit, Continued:

The potentiometer detects accelerator pedal position and sends a corresponding voltage signal to the controller. As the accelerator pedal is depressed, voltage from the potentiometer changes, causing the controller to send longer pulses to the motor and thereby increasing vehicle speed.

The Speed Control Circuit Consists of:

- The potentiometer.
- The controller.
- The Z9 Transistor located inside the controller.
- The Z10 Transistor located inside the controller.
- The 18 gauge yellow wire from the potentiometer to Z9 position on the Z plug/controller.
- The 18 gauge white/black wire from the potentiometer to the B- terminal on the controller.
- The 18 gauge purple wire from the potentiometer to Z10 position on the Z Plug/controller.

MOTOR SPEED SENSOR CONTROL CIRCUIT (FIGURE 21-12)

The Motor Speed Sensor Control Circuit monitors motor rpm to determine vehicle ground speed, and based on vehicle ground speed, it determines when motor braking will be activated.

The Motor Speed Sensor Control Circuit consists of:

- The motor speed sensor located inside the motor.
- The Z13 transistor located inside the controller.
- The Z14 transistor located inside the controller.
- The 18 gauge red wire from the motor speed sensor to the Z13 position on the Z plug/controller.
- The 18 gauge green wire from the motor speed sensor to the Z14 position on the Z plug/controller.
- The 18 gauge black wire from the motor speed sensor to the B- terminal on the controller.

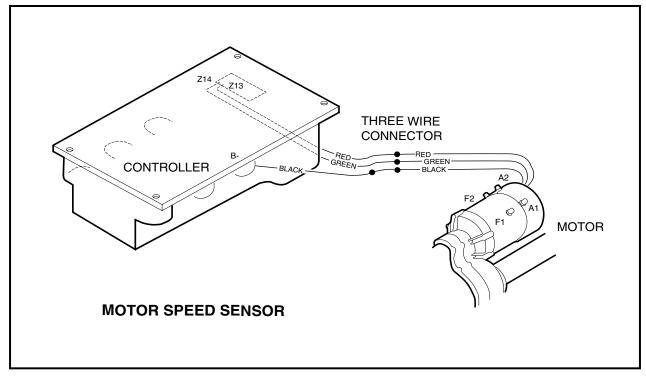


FIGURE 21-12

DYNAMIC BRAKING SOLENOID CONTROL CIRCUIT (FIGURE 21-13)

The Dynamic Braking Control Circuit directs the current that is generated by the motor to either the batteries or the dynamic braking resistor coil (energy displacement module). When the batteries are at or near full charge, the dynamic braking solenoid will shut off when the motor is generating energy, sending the current to the resistor coil. After the batteries have discharged to the point that they can accept a regenerative charge, the dynamic braking solenoid will stay on when the motor is generating energy, sending current directly to the batteries.

21A E

The Dynamic Braking Solenoid Activating Coil Circuit consists of:

- The D.B. solenoid activating coil.
- The 18 gauge red wire from the small post of the main solenoid to the small post of the dynamic braking solenoid.
- · The key switch.
- The potentiometer limit switch
- The dynamic braking transistor located in the Z5 Z plug/controller position.
- The forward and reverse rocker switch.
- The connecting wires

When the key switch is in the ON position, the forward and reverse switch is in forward or reverse, and the accelerator pedal is depressed, the Z5 transistor completes the circuit to the DB solenoid activating coil and closes the power contacts.

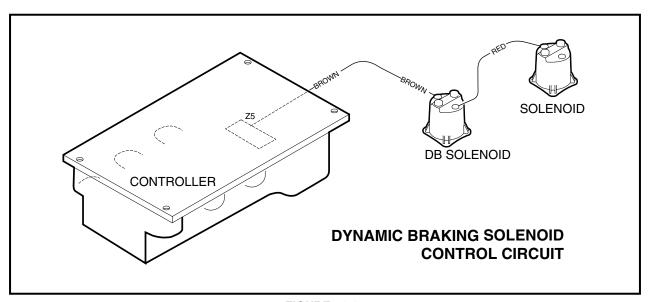


FIGURE 21-13

ON-BOARD COMPUTER (OBC) CONTROL CIRCUIT (FIGURE 21-14, PAGE 21-14)

The On-board Computer performs the following functions:

- Monitors battery energy units (EU) consumed as the vehicle is operated.
- Monitors battery energy units returned by regenerative braking.
- Determines the number of energy units that need to be returned during the charge cycle. The OBC will activate the charger, monitor the number of energy units returned to the batteries during the charge cycle, and shut off the charger when the batteries have reached a full state of charge.

On-Board Computer (OBC) Control Circuit, Continued:

- When the batteries can accept a regenerative charge, the OBC sends a signal through the Z 11 (green wire) position to the controller, to switch from dynamic braking to regenerative braking.
- When the battery charger DC cord is plugged into the charger receptacle, the OBC will shut off current to the Z12 (yellow wire) transistor in the controller, and this activates the solenoid lock-out feature.
- If there is a problem with batteries or the charge cycle, the OBC completes the circuit through the OBC brown wire to illuminate the battery warning light that is located on the vehicle center dash.

Power is supplied to the OBC through the 18 gauge red wire from the large post on the main solenoid. There is a 3/8 amp replaceable in-line fuse in the red wire from the solenoid. The on-board computer is not a field serviceable item. If it fails, the entire unit must be replaced.

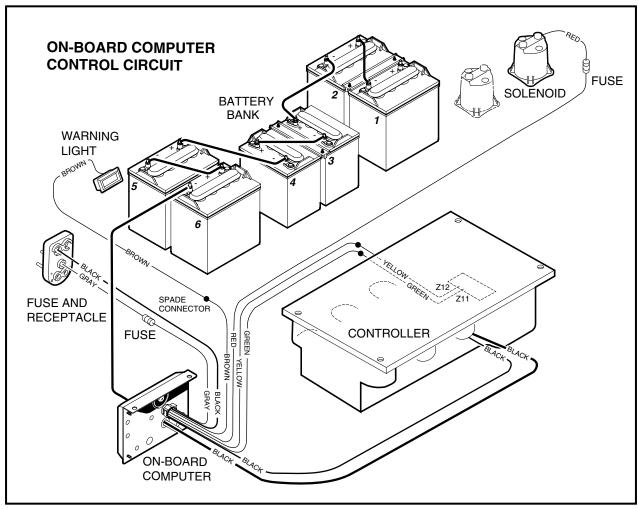


FIGURE 21-14

BATTERY WARNING LIGHT CIRCUIT (FIGURE 21-15)

The PowerDrive Plus vehicle features a dash mounted warning light (above the steering column) that, when the vehicle is in operation, indicates low battery voltage, or, when the vehicle is being charged, indicates a charging problem. The battery warning light is controlled by the on-board computer.

The battery warning light will illuminate under the following conditions:

• Battery voltage drops below 48 when there is no load on the batteries (the vehicle is stopped and there are no accessories on).

- Batteries have discharged to less than 25% of rated capacity.
- If AC power is interrupted during the charge cycle, the light will turn on and remain on as long as the DC cord is plugged in. This indicates that the batteries did not receive a full charge. The light will go out when AC power is restored or the DC cord is unplugged.
- The warning light will come on and remain illuminated if the charger times out at 16 hours (see charger owner's manual) and the batteries are not sufficiently charged. This indicates an abnormal charge cycle and that the batteries or charger should be tested. The warning light will remain illuminated as long as the DC cord is plugged in. The light will go off when the DC cord is unplugged.
- When the DC cord is unplugged before the charger times out, the warning light will come on and remain illuminated for 10 seconds if the charge is less than 90% complete but the vehicle has enough power to complete 36 holes of golf. If the charge is more than 90% complete, the light will not come on.
- After batteries have been disconnected and then reconnected, the warning light will come on for 10 seconds when either the accelerator pedal is depressed or the charger DC cord is plugged in.

The Battery Warning Light Circuit consists of:

- The warning light.
- The brown wire from the on-board computer to the warning light.
- The orange/white wire from the warning light to the key switch.
- The green wire from the key switch to the large post on the main solenoid.

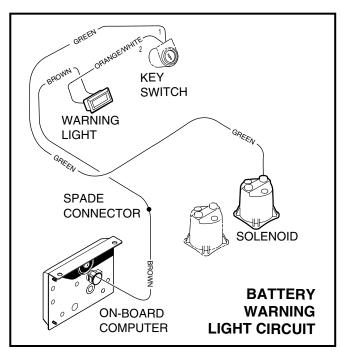


FIGURE 21-15

REVERSE BUZZER CONTROL CIRCUIT (FIGURE 21-16, PAGE 21-16)

The reverse buzzer is to alert the operator and anyone near the vehicle that the vehicle is in reverse. The buzzer is mounted behind the center dash panel under the vehicle's front body.

The Reverse Buzzer Control Circuit consists of:

- The reverse buzzer.
- The forward and reverse rocker switch.
- The 18 gauge red wire from the reverse buzzer to the large post of the main solenoid.
- The 18 gauge orange wire from the reverse buzzer to the forward and reverse rocker switch.
- The 18 gauge black wire from the forward and reverse rocker switch to the B- terminal on the controller.

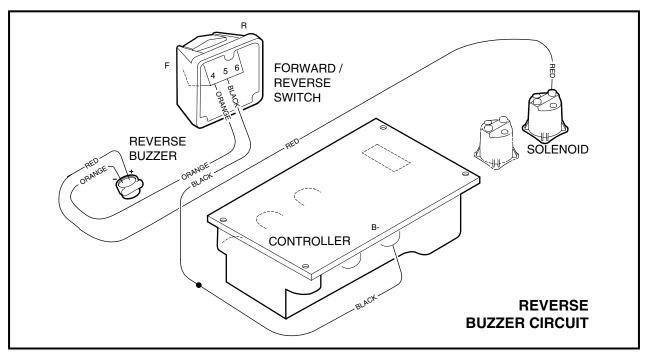


FIGURE 21-16

THE POWER CIRCUIT

During normal vehicle operation, the function of the power circuit is to supply electrical current from the battery pack to the motor. When motor braking is activated, the power circuit will direct motor generated current to either the batteries or the energy displacement module, depending on the battery pack state of charge (See Figure 21-17).

The Power Circuit consists of:

- 1. The battery pack (six eight-volt batteries).
- 2. The electric motor armature circuit.
- 3. The electric motor field circuit.
- 4. The solid state speed controller.
- 5. The main solenoid contacts.
- 6. The dynamic braking solenoid contacts.
- 7. The energy displacement module.
- 8. All six-gauge power wires.

BATTERIES

See Section 22 in this manual.

SOLID STATE SPEED CONTROLLER

Unlike other speed control systems which control vehicle ground speed by varying the amount of voltage to the motor, the PowerDrive Plus solid-state controller always supplies 48 volts to the motor. It regulates vehicle ground speed by lengthening or shortening voltage pulses to the motor. The lengths of the pulses correspond to accelerator pedal position and change accordingly.

The PowerDrive Plus solid-state speed controller also changes forward/reverse direction of vehicle travel. When the forward and reverse rocker switch setting is changed, the speed controller changes the direction of electrical current through the motor - changing the direction that the motor turns and thus forward/reverse movement of the vehicle.

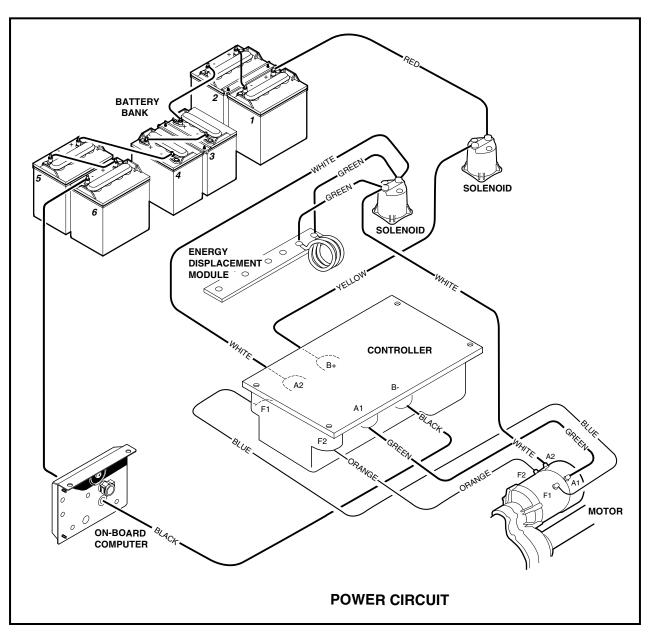


FIGURE 21-17

ELECTRIC MOTOR

The PowerDrive Plus vehicle uses a 48 volt *shunt wound* motor rather than the *series wound* motor that is standard in other vehicles. A shunt wound motor is able to vary the amount of current passing through its field coils while, at the same time, maintaining a constant current flow through its armature. This provides not only more efficient use of battery energy, but also superior hill climbing ability. **See Section 24 in this Manual (Figure 24-8, Page 24-7).**

MOTOR BRAKING

When the vehicle is in motor braking mode, the electric motor acts as a generator and produces an electrical current that is sent either to the batteries (Regenerative Braking) or to the energy displacement module (Dynamic Braking). While the motor is generating current, additional drag is created within the motor. This drag is used to slow the vehicle as described in General Information about PowerDrive Plus vehicles, on pages 21-1 through 21-5.

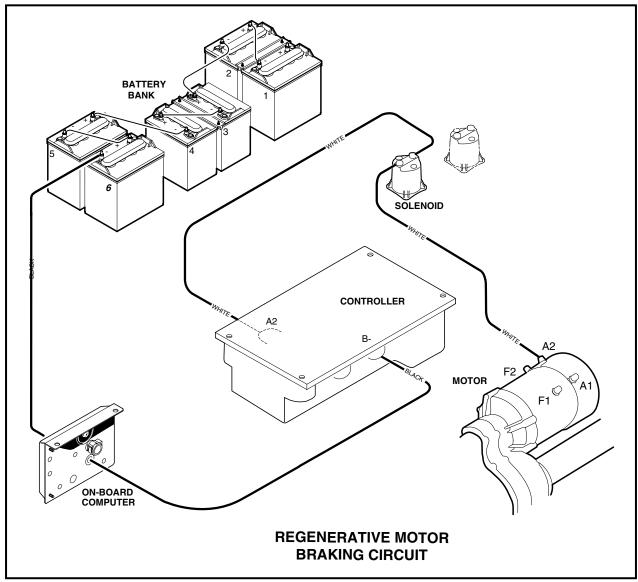


FIGURE 21-18

Regenerative Braking

Current produced by the motor travels from the A2 terminal on the motor through a 6 gauge white wire to the dynamic braking solenoid. If the batteries have discharged to the point that they can accept a regenerative charge from the motor, the dynamic braking solenoid will remain closed (there will be continuity across the large posts) and the current will continue from the dynamic braking solenoid to the controller through another 6 gauge white wire, and then on to the batteries through a 6 gauge black wire (See Figure 21-18).

Dynamic Braking

Current produced by the motor from the A2 terminal on the motor travels through a 6 gauge white wire to the dynamic braking solenoid. If the batteries are at or near full charge and cannot accept a regenerative charge from the motor, the dynamic braking solenoid contacts will open (no continuity across the large posts) and the current will be diverted from the batteries to the energy displacement module through a 6 gauge green wire (See Figure 21-19).

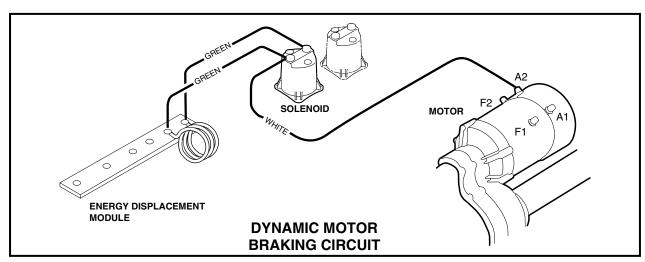


FIGURE 21-19

THE CHARGE CIRCUIT

The charge circuit consists of the on-board computer, battery charger, DC charger plug, charger receptacle, receptacle fuse link, and the 8-volt batteries (Figure 21-20). The batteries and the battery charger will be discussed in separate sections in this manual (Batteries - Section 22, and Battery Charger - Section 23).

The charger plug and receptacle connection is the most critical between the charger and the vehicle's battery circuit. The contacts in the receptacle must grip the plug pins well enough to create enough pressure or drag for an adequate electrical connection. If little or no drag is felt, the receptacle or plug must be replaced. If the plug or receptacle is damaged, or feels hot when charging, one or both must be replaced (See Plug and Receptacle, Section 23, Page 23-46).

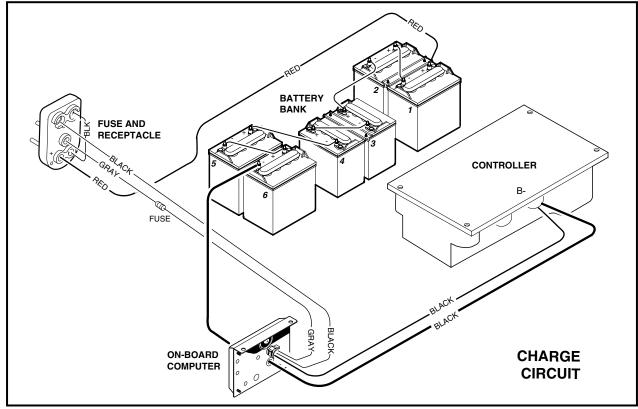


FIGURE 21-20

TROUBLESHOOTING GUIDE

TESTING THE Z-PLUG FOR CONTINUITY AND VOLTAGE INPUT AND OUTPUT

Test procedures begin on page 21-25.

TEST		Z-PLUG POSITION
4	Z1	Red wire voltage input to controller
5	Z 1	Red wire continuity
22	Z 3	Orange/white wire voltage input to controller
23	Z 3	Orange/white wire continuity
10	Z 4	Blue/white wire voltage output from controller
11	Z 4	Blue/white wire continuity
26	Z 5	Brown wire voltage output from controller
27	Z 5	Brown wire continuity
16	Z 6	White wire and Z7 blue wire voltage input to controller
18	Z 6	White wire and Z7 blue wire continuity
19	Z8	Green/white wire voltage input to controller
20	Z8	Accelerator limit switch wire continuity (green/white wire and blue wire)
33	Z 9	Yellow wire and Z10 purple wire voltage output from potentiometer
34	Z 9	Yellow wire and Z10 purple wire continuity
43	Z11	Green wire and Z12 yellow wire continuity
40	Z13	Red wire and Z14 green wire voltage output from controller
41	Z13	Red wire and Z14 green wire continuity

DIAGNOSTIC REFERENCE CHARTS

The following flow charts, pages 21-21 through 21-24, can be used as guides to assist in diagnosing specific failures in the electrical system. There are four separate charts, and each will address different symptoms that the vehicle might exhibit.

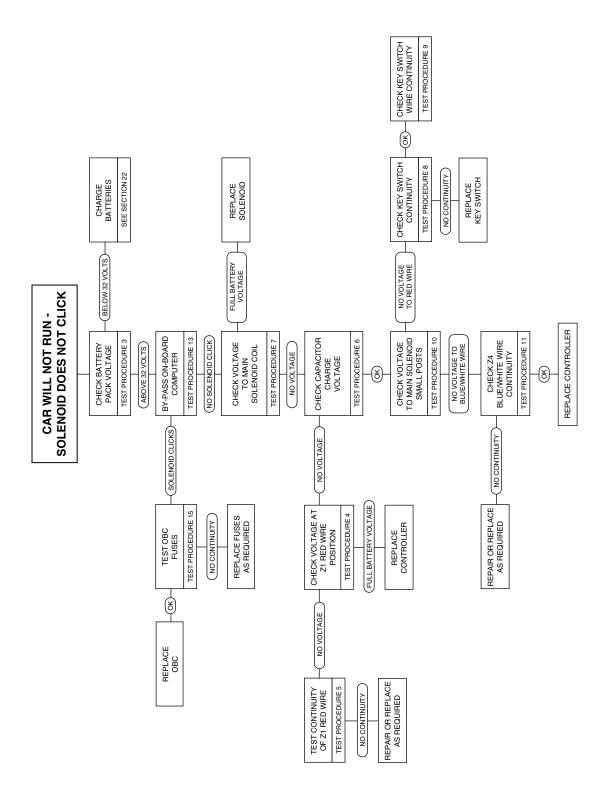
The tests specified in the flow charts are tagged with test numbers that correspond to the numbers of detailed test procedures following the charts. When the chart specifies that a certain test should be performed, the corresponding test procedure should be performed exactly as instructed.

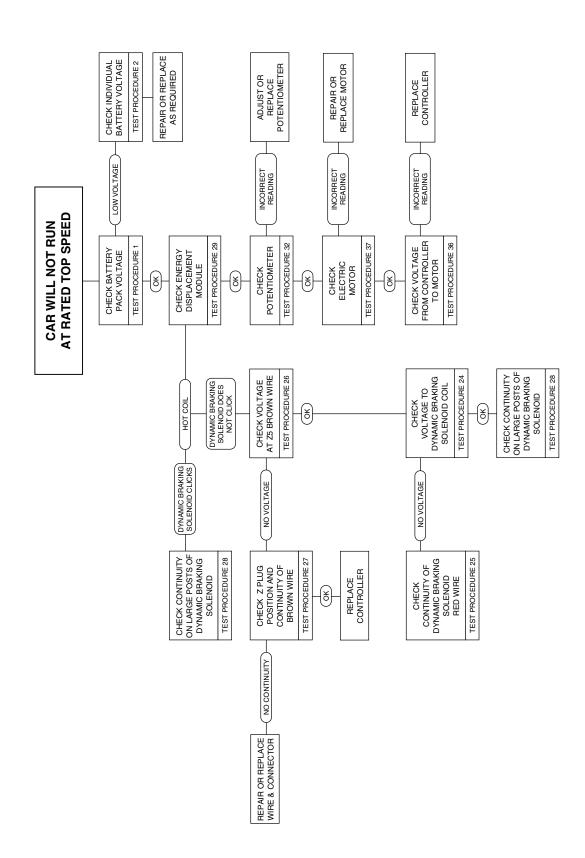
These detailed test procedures will tell how to test specific components, what the test results should be, and what further action should be taken. **Test procedures begin on page 21-25.**

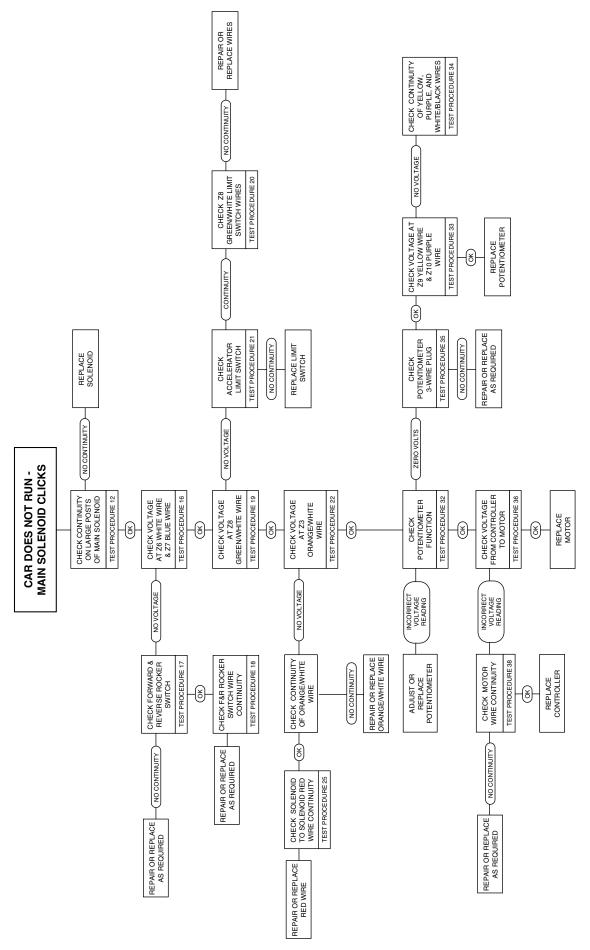
In addition to the comprehensive vehicle wiring diagram on page 21-2, wiring diagrams illustrating specific circuits can be found along with the general description of each specific circuit on pages 21-5 through 21-19.

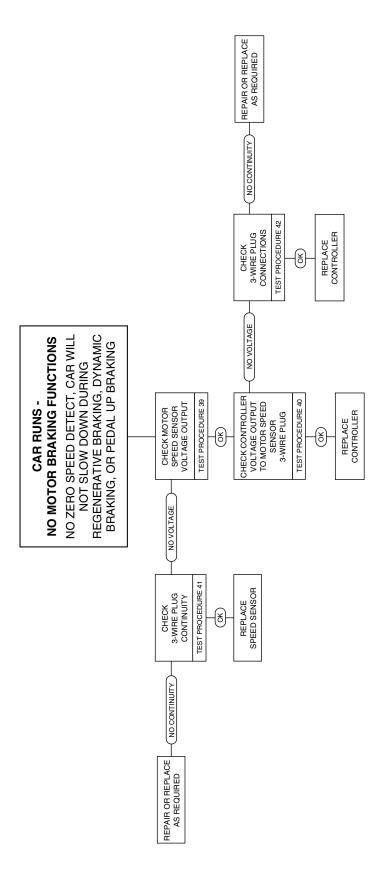
A WARNING

 THE BATTERY WIRES MUST REMAIN CONNECTED WHILE PERFORMING SOME TEST PRO-CEDURES. RAISE THE REAR END OF THE VEHICLE AND SUPPORT IT ON JACKSTANDS, WITH THE REAR WHEELS OFF THE GROUND, WHILE PERFORMING ALL TEST PROCE-DURES.









TEST PROCEDURES

NUMERICAL LISTING OF TEST PROCEDURES

(Test Procedures begin on page 21-26.)

- 1. Battery Pack Voltage
- 2. Individual Battery Voltage
- 3. Battery Pack with Low Voltage
- 4. Voltage at Z1 Position in Z Plug
- 5. Z1 Red Wire Continuity
- 6. Capacitor Charge Voltage at 6 Gauge Yellow Wire
- 7. Voltage to Main Solenoid Coil
- 8. Key Switch Continuity
- 9. Key Switch Wire Continuity
- 10. Voltage from Z4 (Blue/White Wire) to Main Solenoid Coil
- 11. Z4 Blue/White Wire Continuity
- 12. Main Solenoid Large Post Continuity
- 13. On-board Computer Bypass
- 14. Reverse Buzzer Circuit
- 15. On-board Computer Red and Yellow Fuse Continuity
- 16. Voltage from Forward and Reverse Switch to the Z6 (White Wire) and Z7 (Blue Wire) Positions on the Z plug
- 17. Forward and Reverse Rocker Switch Continuity
- 18. Forward and Reverse Rocker Switch (Z6 White Wire and Z7 Blue Wire) Continuity
- 19. Voltage to Z8 Position (Green/White Wire) in Z plug
- 20. Accelerator Limit Switch Wire Continuity (Green/White and Blue Wires)
- 21. Accelerator Limit Switch Continuity
- 22. Voltage at Z3 (Orange/White Wire) Position in Z plug
- 23. Continuity of the Z3 Orange/White Wire
- 24. Voltage to Dynamic Braking Solenoid Coil
- 25. Solenoid to Solenoid Red Wire Continuity
- 26. Voltage From Z5 (Brown Wire) to Dynamic Braking Solenoid Coil
- 27. Dynamic Braking Solenoid Brown Wire Continuity
- 28. Dynamic Braking Solenoid Large Post Continuity
- 29. Energy Displacement Module
- 30. Energy Displacement Module Condition and 6 Gauge Green Wire Continuity
- 31. Battery Warning Light Circuit
- 32. Potentiometer Voltage Output Test
- 33. Voltage at Z9 (Yellow Wire) and Z10 (Purple Wire) Positions
- 34. Z9 (Yellow Wire) and Z10 (Purple Wire) Continuity
- 35. 3-Wire Plug on the Potentiometer
- 36. Voltage From Controller to Motor
- 37. Voltage to Motor F1 and F2 Terminals
- 38. Continuity of Motor Wires
- 39. Motor Speed Sensor Voltage Output
- 40. Controller Voltage to Speed Sensor Plug (Z13 Red Wire and Z14 Green Wire)
- 41. Z13 (Red Wire) and Z14 (Green Wire) Continuity



21A

Numerical Listing of Test Procedures, Continued:

- 42. Motor Sensor 3-Wire Plug Connection
- 43. Z11 (Green Wire) and Z12 (Yellow Wire) Continuity

TEST PROCEDURES

Test Procedure 1 - Battery Pack Voltage

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or floor jack. Place jackstands under the axle tubes to support the vehicle. The rear wheels must be off the ground.

A WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 3. Set a multimeter to Volts DC, then place the black (-) probe on the negative (-) post of battery No. 6 and the red (+) probe on the positive (+) post of battery No. 1 (Figure 21-21).
- 4. Record the reading for reference (this reading will be useful when performing other test procedures also). This reading will be referred to as *Full Battery Voltage*.

Battery Pack Voltage (Under Load)

- 1. Place alligator clips (Radio Shack Catalog No. 270-354A or equivalent) on the multimeter test leads: Connect the red (+) alligator clip to the positive post of battery No. 1 and the black (-) alligator clip to the negative post of battery No. 6.
- 2. Put seat bottom in place and set the multimeter on the seat.
- 3. With the multimeter set on DC Volts (DCV), drive the vehicle and note the voltage reading.
- A fully charged set of batteries in good condition should read between 46-48 volts while under load.
- A reading of 36-46 volts indicates discharged or defective batteries.
- A reading of 32 volts or lower will not activate the solenoid and the car will not move.

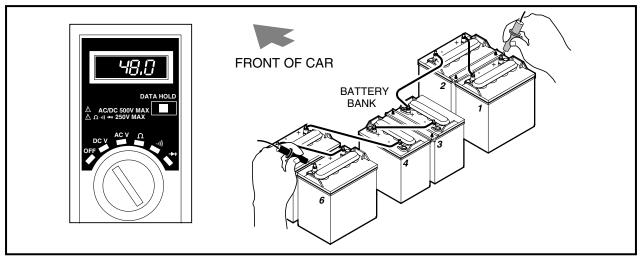


FIGURE 21-21

Test Procedure 2 - Individual Battery Voltage

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Place black (-) probe of a multimeter, set to Volts DC (DCV), on the negative (-) post of battery No. 1 and place red (+) probe on the positive (+) post of battery No. 1 (Figure 21-22). Record the reading for battery No. 1.
- 3. Repeat this test on batteries 2 through 6.
- 4. If the voltage readings are within .4 volts of each other, recharge the batteries.

NOTE

- IF TOTAL BATTERY PACK VOLTAGE IS BELOW 32 VOLTS, SEE TEST PROCEDURE 3. IF BATTERY PACK VOLTAGE IS ABOVE 32 VOLTS, FOLLOW NORMAL CHARGING PROCEDURES.
- 5. If any battery has a voltage reading that is more than .4 volts below the other batteries, replace the battery with a good used battery of approximately the same age or with a new one.

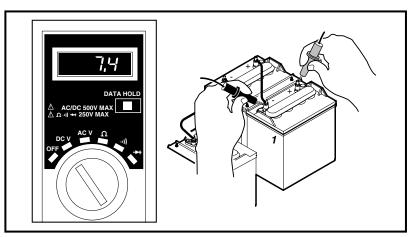


FIGURE 21-22

Test Procedure 3 - Battery Pack with Low Voltage

WARNING

- ONLY TRAINED TECHNICIANS SHOULD ATTEMPT TO REPAIR OR SERVICE THIS CHARGER.
 ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD FOLLOW THE CORRECT PROCEDURES AND HEED THE WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE CAR.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPLAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FROM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.
- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Set a multimeter to Volts DC, then place the black (-) probe on the negative post of battery No. 6 and place the red (+) probe on the positive (+) post of battery No. 1 (Figure 21-21). The reading must be above 32 volts to activate the solenoid. If the reading is below 32 volts, charge the batteries. Because the battery charger will not turn on when battery voltage is below 32 volts, it will be necessary to bypass the charger relay in order to activate the charger (See Section 22, Page 22-18).

Test Procedure 4 - Z Plug Position Z1 Voltage Check

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the Z plug from the controller. Leave the batteries connected.
- 2. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe in the Z1 connector position in the Z Plug. The reading should be Full Battery Voltage with the key switch in either the ON or OFF position (Figure 21-23).
- 3. If there is no voltage reading, check battery condition and voltage. Check the battery wires and terminals for corrosion and proper connections. Check continuity of the 18 gauge red wire from the large post of the main solenoid to the Z1 position in the Z plug (See Test Procedure 5).

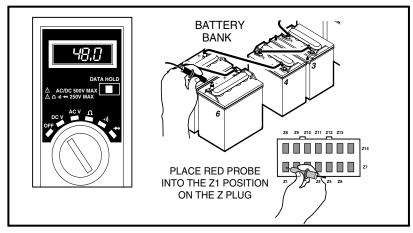


FIGURE 21-23

Test Procedure 5 - Red Wire Z1 Continuity Check

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the Z plug from the controller and disconnect the batteries.
- 2. Place the black (-) probe of a multimeter, set to ohms (Ω), on the large post of the main solenoid and place the red (+) probe in the Z1 connector position in the Z Plug. The reading should be continuity. If the reading is incorrect, repair or replace the wire (Figure 21-24).

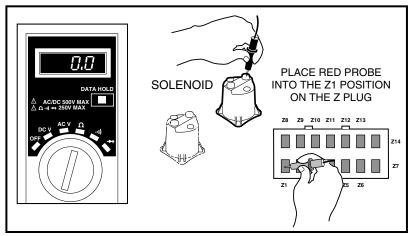


FIGURE 21-24

Test Procedure 6 - Capacitor Charge Voltage

With the key switch either on or off, capacitors inside the controller should receive constant voltage input. This test will determine if voltage is present in the controller.

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries
- 2. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe on the large post of the main solenoid (with 6 gauge yellow wire attached) (Figure 21-25). With the key switch OFF, the reading should be Capacitor Charge Voltage (approximately .8 volt below Full Battery Voltage). Turn the key switch to ON; the reading should be Full Battery Voltage.
- 3. If there is a no voltage reading, check batteries and battery wires. Check voltage to the Z1 position in the Z plug. If all these components are good and still there is no voltage reading, replace the controller.

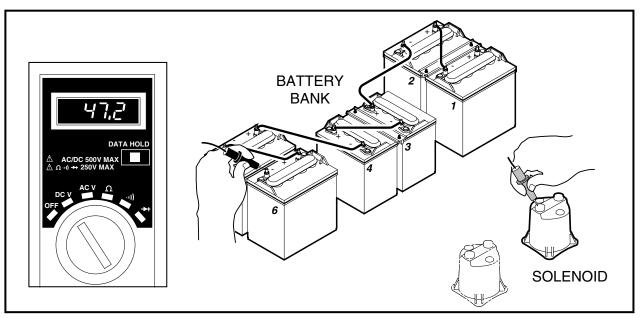


FIGURE 21-25

Test Procedure 7 - Voltage to Main Solenoid Coil

connected and leave the Z plug connected to the controller.

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Place the black (-) probe of a multimeter, set to Volts DC, to one of the small posts on the main solenoid and place the red (+) probe on the other small post on the main solenoid (Figure 21-26). With the key switch OFF, voltage reading should be zero. Turn the key switch to ON, the reading should be full battery voltage. If the reading is full battery voltage and the solenoid does not click, replace the solenoid.

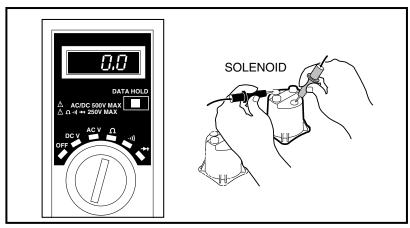
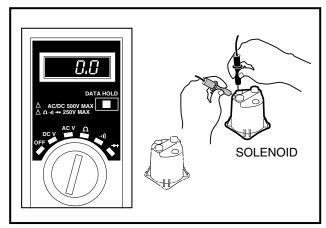


FIGURE 21-26

Test Procedure 8 - Key Switch Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries. Leave the Z plug connected to the controller.
- 2. Place the black (-) probe of a multimeter, set to ohms (Ω), on the small post of the main solenoid (with the blue, red, and red/white wires attached) and place the red (+) probe on the large post of the main solenoid (with 6 gauge yellow wire attached) (Figure 21-27). With the key switch OFF, the reading should be no continuity. Turn the key switch to ON; the reading should be continuity. If the readings are correct, the key switch is good. If the readings are not correct, proceed to step 3.
- 3. Remove the center dash. See Page 20-26.
- 4. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the key switch terminal with the green wire attached, and place the red (+) probe on the key switch terminal with the blue wire attached. With the key switch OFF, the reading should be *no* continuity. Turn the key switch to ON; the reading should be continuity. If the readings are not correct, replace the key switch. If the readings are correct, test continuity of the key switch wires (Test Procedure 9) (Figure 21-28).



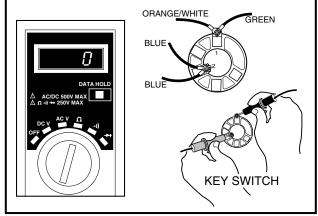


FIGURE 21-27

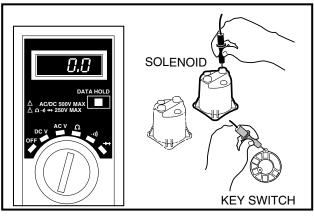
FIGURE 21-28

Test Procedure 9 - Key Switch Wire Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries. Leave the Z plug connected to the controller.
- 2. Remove the center dash. See Page 20-26.
- 3. Place the black (-) probe of a multimeter, set to ohms (Ω), on the large post of the main solenoid (with the 6 gauge red wire attached), and place the red (+) probe on the key switch terminal with the green wire attached (Figure 21-29). The reading should be continuity. If the reading is incorrect, repair or replace the 18 gauge green wire from the solenoid to the key switch.
- 4. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the small post of the main solenoid (with the red, blue, and red/white wires attached), and place the red (+) probe on the key switch terminal with the blue wire attached (**Figure 21-30**). The reading should be continuity. If the reading is incorrect, repair or replace the blue wire from the key switch to the solenoid.

Test Procedure 10 - Voltage from Z4 (Blue/White Wire) to Main Solenoid Coil

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe on the small post of the main solenoid (with the blue, red, and red/white wires attached) (Figure 21-31). With the key switch OFF, the reading should be zero (0) volts. Turn the key switch to ON; the reading should be Full Battery Voltage. If either reading is incorrect, test the key switch and wires (See Test Procedures 8 and 9).



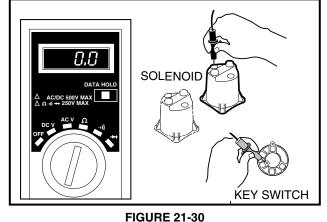


FIGURE 21-29

- 3. Place the black (-) probe of a multimeter, set to Volts DC, on the small post of the main solenoid (with the blue/white wire attached) and place the red (+) probe on the positive (+) post of battery No. 1 (Figure 21-31). With the key switch OFF, the reading should be Full Battery Voltage.
- 4. With the key switch OFF, the reading should be Full Battery Voltage. Turn the key switch to ON. The solenoid should make an audible click and the reading should remain Full Battery Voltage. If the accelerator pedal is not depressed (to activate the vehicle) within 2 seconds (20 seconds on some early models) after turning the key switch on, the controller will shut off voltage to the solenoid, and the reading should be zero volts.
- 5. If there is a zero voltage reading with the key switch in the OFF postion, or the solenoid does not click and there is no voltage when the key switch is turned on, check the batteries and connections. Check continuity of the blue/white wire and Z4 terminal in the Z plug (Test Procedure 11). If the readings are good, replace the controller.

With the key switch OFF, there should be constant voltage to the main solenoid activating coil. With the key switch ON, there should be a Full Battery Voltage reading through the blue/white wire until the 2 second (20 seconds on some early models) time delay function in the controller is activated and turns off the solenoid.

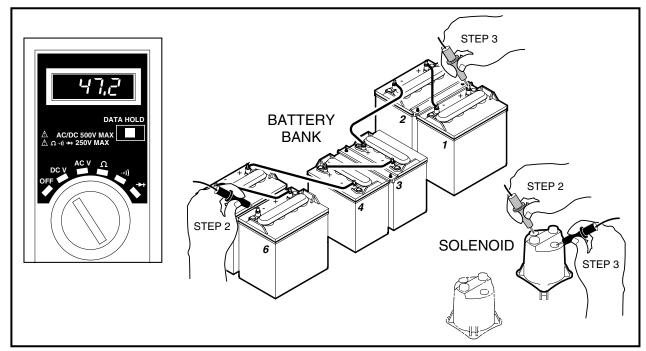
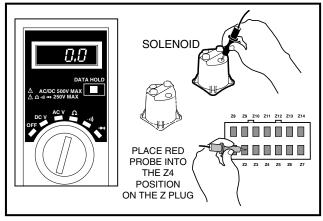


FIGURE 21-31

Test Procedure 11 - Z4 (Blue/White Wire) Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and disconnect the Z plug from the controller.
- 2. Make sure the blue/white wire is in the Z4 position in the Z plug. Make sure the blue/white wire is connected to the terminal and that the terminal is properly inserted into the Z plug.
- 3. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the small post of the main solenoid (with the blue/white wire attached), and place the red (+) probe in the Z4 connector position in the Z plug (Figure 21-32). The reading should be continuity. If the reading is incorrect, repair or replace the wire.



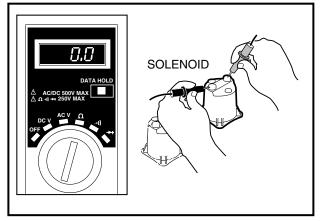


FIGURE 21-32

FIGURE 21-33

Test Procedure 12 - Main Solenoid Large Post Continuity

- Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries
 connected and leave the Z plug connected to the controller. Disconnect the green wire (from the controller) at the A1 terminal on the motor, and tape the disconnected end to prevent an accidental short
 circuit.
- Place the black (-) probe of a multimeter, set to ohms (Ω), on the large post of the main solenoid (with the 6 gauge yellow wire attached), and place the red (+) probe on the large post of the main solenoid (with the 6 gauge red wire attached) (Figure 21-33). The reading should be no continuity. If the reading is incorrect, replace the solenoid
- 3. Turn the key switch to ON. The solenoid should click and the reading should be continuity. If the solenoid clicks and the reading is no continuity, replace the solenoid.
- 4. If there is no solenoid click, check for voltage to the solenoid coil (See Test Procedures 9 and 10).

Test Procedure 13 - On-board Computer By-pass

If test procedures 1 through 12 show proper operation (no malfunction), but the solenoid will not actuate, then the problem may be in the on-board computer solenoid lock-out circuit. By-pass the computer and test the solenoid as follows:

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Locate the yellow wire at the Z12 position on the Z plug. Unplug the bullet connector in the yellow wire approximately three inches (7.6 cm) from the Z plug.
- 3. Connect an 18 gauge jumper wire to the female bullet connector on the end of the yellow wire coming from the Z plug. Connect the other end of the jumper wire to the negative (-) post of battery No. 6 (Figure 21-34).
- 4. Turn the key switch to ON. If the solenoid clicks, test the OBC and OBC fuses. If the solenoid does not click, test the Z4 blue/white wire and the controller.

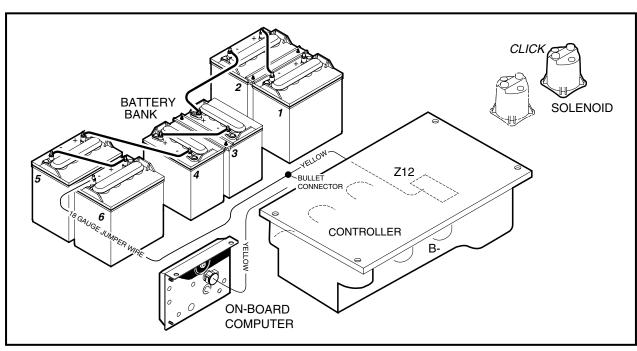
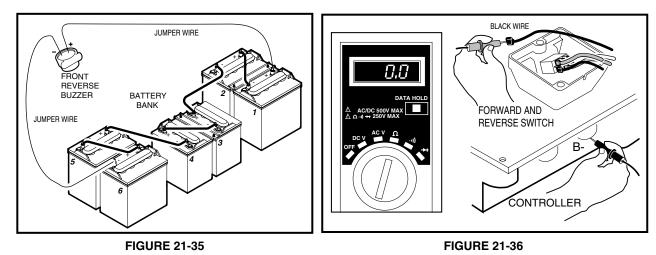


FIGURE 21-34

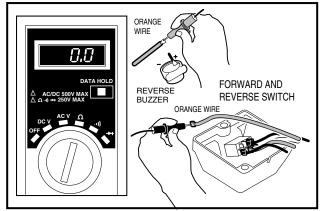


Test Procedure 14 - Reverse Buzzer Circuit

- 1. Turn the key switch to OFF, place the forward and reverse switch into the neutral position. Disconnect the Z plug from the controller and disconnect the battery wires, negative wire first (Figure 21-2, Page 21-3).
- 2. Remove the center dash (See Removing the Reverse Buzzer, Page 20-30).
- 3. Secure the center dash to the vehicle so that the terminals on the key switch will not touch the cowl or aluminum frame of the vehicle in next couple of steps.
- 4. Disconnect the 18-gauge red wire from the positive (+) terminal of the reverse buzzer and disconnect the 18-gauge orange wire from the negative (-) terminal of the reverse buzzer.
- 5. Connect a 18-gauge jumper wire to the positive (+) terminal the reverse buzzer and connect the other end of the jumper wire to the positive post on battery number 1.
- 6. Connect a 18-gauge jumper wire to the negative (-) terminal the reverse buzzer and connect the other end of the jumper wire to the negative post on battery number 6 (Figure 21-35). The buzzer should sound. If it does not, replace the buzzer. If the buzzer does sound, proceed to step 7.

Test Procedure 14 - Reverse Buzzer Circuit, Continued:

- Remove the three mounting screws from the forward and reverse switch case and remove the case from the rear body.
- 8. Disconnect the 18 gauge black wire from the center terminal on the forward and reverse switch.
- 9. Set the multimeter to ohms (Ω). Connect the black (-) probe to the B- terminal on the controller. Connect the red (+) probe to the end of the black wire that was disconnected from the forward and reverse switch. The reading should be continuity. If the reading is incorrect, check the bullet connector located in the black wire approximately 4 inches from the controller to ensure the connector is securely fastened. If connector is OK, repair or replace the wire (Figure 21-36, Page 21-33).
- 10. Disconnect the 18 gauge orange wire from the driver's side terminal on the forward and reverse switch.
- 11. Set the multimeter to ohms (Ω) . Connect the black (-) probe to the end of the orange wire that was disconnected from the forward and reverse switch. Connect the red (+) probe to the end of the orange wire that was disconnected from the reverse buzzer. The reading should be continuity. If the reading is incorrect, repair or replace the wire **(Figure 21-37)**.
- 12. Set the multimeter to ohms (Ω) . Connect the black (-) probe to the end of the red wire that was disconnected from the reverse buzzer. Connect the red (+) probe to the large post of the main solenoid with the 6 gauge red wire. The reading should be continuity. If the reading is incorrect, repair or replace the 18 gauge red wire **(Figure 21-38)**.
- 13. Place the black (-) probe of a multimeter, set to ohms (Ω), on the center terminal of the rocker switch (black wire position) and place the red (+) probe on the terminal oriented toward the driver side of the vehicle (orange wire position). With the forward and reverse switch in NEUTRAL, the reading should be *no* continuity. Place the rocker switch in FORWARD; the reading should be *no* continuity. Pace the rocker switch in REVERSE; the reading should be continuity. If the readings are incorrect, replace the rocker switch (Figure 21-39).



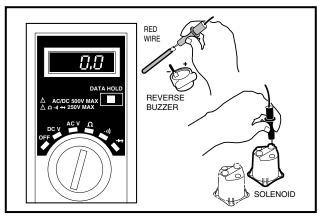


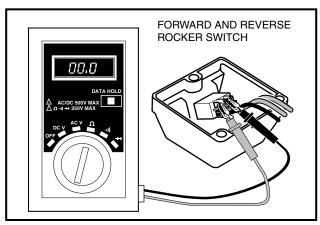
FIGURE 21-37

FIGURE 21-38

Test Procedure 15 - On-board Computer Red and Yellow Wire Fuses

- For vehicles prior to serial number A9615-494279 (See Page 21-34 for later vehicles):
- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and leave the Z plug connected to the controller.
- 2. Fuses are located in the red and yellow wires approximately 6 to 10 inches from the on-board computer. Cut the wire ties that secure the gray conduit containing the wires and pull the wires out enough to gain access to the fuses.
- 3. Disconnect the bullet connecter in the yellow wire at the Z12 position on the Z plug. Place the black (-) probe of a continuity tester (Radio Shack #22-105 or equivalent) on the male bullet terminal end of the yellow wire going back to the on-board computer. At a location between the fuse and the on-board computer, puncture the insulation on the yellow wire with the point of the red (+) probe (Figure 21-40). The tester should show continuity. If there is no continuity, replace the fuse.





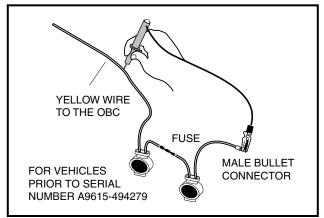
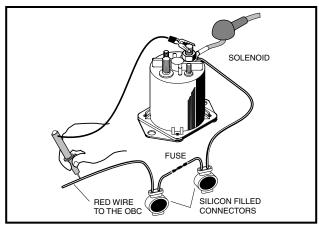


FIGURE 21-39 FIGURE 21-40



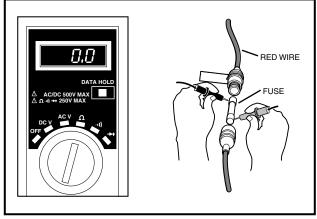


FIGURE 21-41 FIGURE 21-42

4. Place the black (-) probe of a continuity tester on the large post (with the 6 gauge red wire attached) of the main solenoid. At a location between the fuse and the on-board computer, puncture the insulation on the red wire with the point of the red (+) probe (Figure 21-41). The tester should show continuity. If there is no continuity, replace the fuse.

NOTE

- IF THE RED FUSE IS BLOWN, THE VEHICLE WILL NOT RUN OR CHARGE.
 - IF THE CHARGER DC CORD IS PLUGGED INTO THE RECEPTACLE, AND THE KEY SWITCH IS OFF, THE CHARGER WILL "CLICK" ONCE AND THE AMMETER WILL GO TO 17 AMPS. THEN IT WILL IMMEDIATELY RETURN TO ZERO, AND THE CHARGER WILL NO LONGER FUNCTION.
 - IF THE CHARGER DC CORD IS PLUGGED INTO THE RECEPTACLE, AND THE KEY SWITCH IS ON, THE CHARGER WILL "CLICK" ON AND OFF CONTINUOUSLY AT ONE SECOND INTERVALS, AND THE AMMETER WILL GO TO 17 AMPS AND RETURN TO ZERO AMPS AT ONE SECOND INTERVALS.
- IF THE YELLOW FUSE IS BLOWN, THE VEHICLE WILL CHARGE, BUT WILL NOT RUN.
- IF BOTH FUSES ARE BLOWN, THE VEHICLE WILL NOT RUN, WITH THE KEY SWITCH ON OR OFF. WHEN THE DC CORD IS PLUGGED IN, THE CHARGER WILL "CLICK" ONE TIME AND THE AMMETER WILL GO TO 17 AMPS. THEN IT WILL IMMEDIATELY RETURN TO ZERO, AND THE CHARGER WILL NO LONGER FUNCTION.

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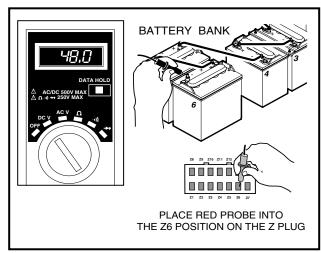
Test Procedure 15 - On-board Computer Red and Yellow Wire Fuses, Continued:

For vehicles with serial number A 9615-4942279 and later:

The fuse that was on the yellow wire has been incorporated into the circuitry of the on-board computer. The fuse on the red wire is now located approximately six inches (15 cm) from the main solenoid and is in a yellow rubber housing. This fuse can be easily removed from the rubber housing and tested with a continuity tester or with a multimeter set to ohms (Ω). To test the fuse, place the black (-) probe on one end of the fuse and place the red (+) probe on the other end (**Figure 21-42**, **Page 21-35**). The reading should be continuity. If the reading is incorrect, replace the fuse.

Test Procedure 16 - Voltage from the Forward and Reverse Switch to the Z6 (White Wire) and Z7 (Blue Wire) Positions on the Z Plug

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and disconnect the Z plug from the controller.
- 2. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe in the Z6 (white wire) connector position in the Z plug (Figure 21-43). Turn the key switch to ON and place the forward and reverse rocker switch in *forward;* the reading should be Full Battery Voltage. If the reading is zero volts, check the forward and reverse rocker switch and wiring (See Test Procedures 17 and 18).



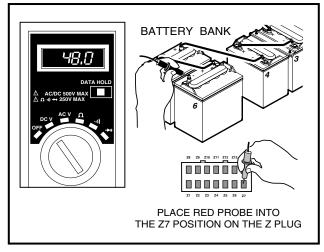
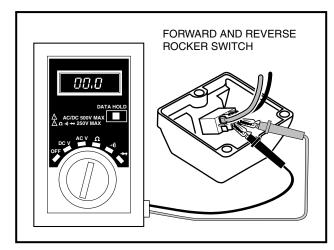


FIGURE 21-43

FIGURE 21-44



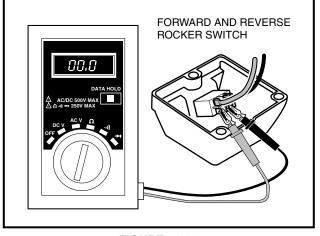


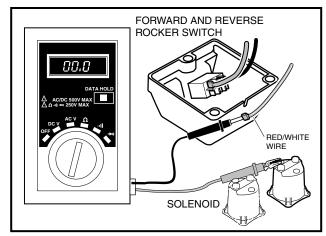
FIGURE 21-45 FIGURE 21-46

Test Procedure 17 - Forward and Reverse Rocker Switch Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and leave the Z plug connected to the controller.
- 2. Remove the three screws that attach the forward and reverse rocker switch to the vehicle body.
- 3. Disconnect the 18 gauge red/white, blue, and white wires from the rocker switch terminals. **Do not** disconnect the black and orange wires.
- 4. Place the black (-) probe of a multimeter, set to ohms (Ω), on the center terminal of the rocker switch (red/white wire position) and place the red (+) probe on the terminal oriented toward the passenger side of the vehicle (white wire position). With the forward and reverse switch in Neutral, the reading should be *no* continuity. Place the rocker switch in Forward; the reading should be continuity. Place the rocker switch in Reverse; the reading should be *no* continuity. If the readings are incorrect, replace the rocker switch (Figure 21-45, Page 21-35).
- 5. Place the black (-) probe of a multimeter, set to ohms (Ω), on the center terminal of the rocker switch (red/white wire position) and place the red (+) probe on the terminal oriented toward the driver side of the vehicle (blue wire position). With the forward and reverse switch in Neutral, the reading should be no continuity. Place the rocker switch in Forward; the reading should be no continuity. Place the rocker switch in Reverse; the reading should be continuity. If the readings are incorrect, replace the rocker switch (Figure 21-46).

Test Procedure 18 - Forward and Reverse Rocker Switch (Z6 White Wire and Z7 Blue Wire) Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and disconnect the Z plug from the controller.
- 2. Remove the three screws that attach the forward and reverse rocker switch to the vehicle body.
- 3. Disconnect the 18 gauge red/white, blue, and white wires from the rocker switch terminals. **Do not** disconnect the black and orange wires.



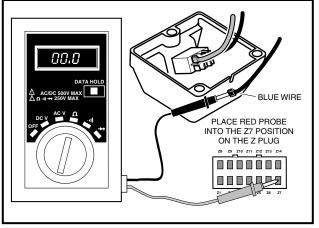


FIGURE 21-47

FIGURE 21-48

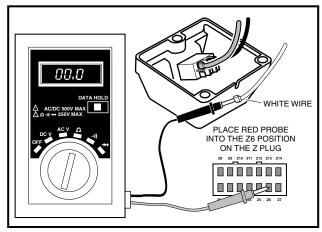
4. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the red/white wire terminal end (that was removed from the rocker switch) and place the red (+) probe on the small post of the main solenoid (with red/white, blue, and red wires attached). The reading should be continuity. If the reading is incorrect, repair or replace the red/white wire (Figure 21-47).

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Test Procedure 18 - Forward and Reverse Rocker Switch Continuity, Continued:

- 5. Place the black (-) probe of a multimeter, set to ohms (Ω), on the blue wire terminal end (that was removed from the rocker switch) and place the red (+) probe in the Z7 (blue wire) connector position in the Z plug. The reading should be continuity. If the reading is incorrect, repair or replace the blue wire. Make sure that the blue wire is in the Z7 position on the Z plug, and that the wire terminal pin is secure in the Z plug (Figure 21-48, Page 21-37).
- 6. Place the black (-) probe of a multimeter, set to ohms (Ω), on the white wire terminal end (that was removed from the rocker switch) and place the red (+) probe in the Z6 (white wire) connector position in the Z plug. The reading should be continuity. If the reading is incorrect, repair or replace the white wire. Make sure that the white wire is in the Z6 position on the Z plug, and that the wire terminal pin is secure in the Z plug (Figure 21-49).



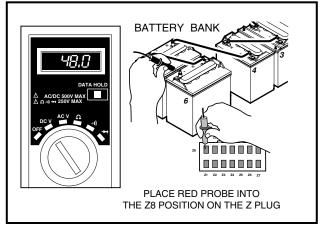
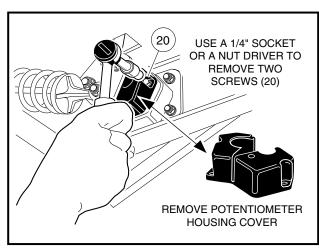


FIGURE 21-49

FIGURE 21-50

Test Procedure 19 - Voltage to Z8 Position (Green/White Wire) in Z Plug

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected. Disconnect the Z plug from the controller.
- 2. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe in the Z8 (green/white wire) connector position in the Z plug (Figure 21-50). Turn the key switch to ON, place the forward and reverse rocker switch in *forward*, and depress the accelerator pedal until the limit switch clicks. The reading should be Full Battery Voltage. If the reading is zero volts, check the accelerator limit switch and wiring. (See Test Procedures 20 and 21).



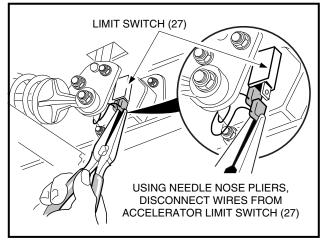
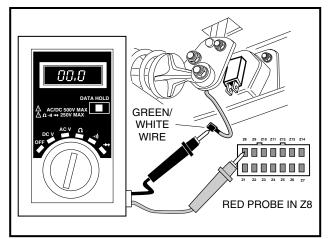


FIGURE 21-51

FIGURE 21-52

Test Procedure 20 - Accelerator Limit Switch Wire Continuity (Green/White and Blue Wires)

- 21A E
- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and disconnect the Z plug from the controller.
- 2. Remove the two hex head screws (20) attaching the potentiometer cover and remove the cover (Figure 21-51).
- 3. Disconnect the green/white wire and the blue wire from the accelerator limit switch (Figure 21-52).
- 4. Place the black (-) probe of a multimeter, set to ohms (Ω), on the green/white wire terminal end (that was removed from the limit switch) and place the red (+) probe in the Z8 (green/white wire) connector position on the Z plug (Figure 21-53). The reading should be continuity. If the reading is incorrect, repair or replace the green/white wire. Make sure that the green/white wire is in the Z8 position on the Z plug, and that the wire terminal pin is secure in the Z plug.
- 5. Remove the center dash. See Page 20-26.
- 6. Place the black (-) probe of a multimeter, set to ohms (Ω), on the blue wire terminal end (that was removed from the limit switch) and place the red (+) probe on the key switch terminal with the blue wire attached. The reading should be continuity. If the reading is incorrect, repair or replace the blue wire (Figure 21-54).



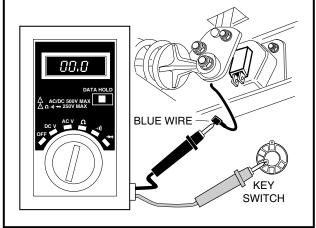


FIGURE 21-53

FIGURE 21-54

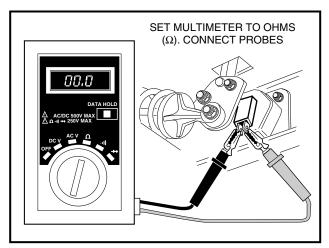
Test Procedure 21 - Accelerator Limit Switch Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and leave the Z plug connected to the controller.
- 2. Remove the two potentiometer cover mounting screws (20) and remove the potentiometer cover (Figure 21-51).
- 3. Disconnect the blue wire and the green/white wire from the potentiometer limit switch (Figure 21-52).
- 4. Place the black (-) probe of a multimeter, set to ohms (Ω) , on one terminal of the limit switch and place the red (+) probe on the other terminal of the limit switch (**Figure 21-55**, **Page 21-40**). The reading should be *no* continuity. If the reading is incorrect, replace the limit switch.
- 5. With the key switch OFF, and the forward and reverse switch in NEUTRAL, slowly depress the accelerator pedal to the floor. The limit switch should click and the reading should be continuity. The limit switch should be replaced if either of these conditions exists:
 - The limit switch clicks and there is no continuity.
 - The limit switch does not click.

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Test Procedure 22 - Voltage at Z3 (Orange/White Wire) Position In Z Plug

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected. Disconnect the Z plug from the controller.
- 2. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe in the Z3 (orange/white wire) connector position in the Z plug. (Figure 21-56) Turn the key switch to ON; the reading should be Full Battery Voltage. If the reading is incorrect, check continuity of the orange/white wire (See Test Procedure 23). Test positive input to the main solenoid (See Test Procedure 9).



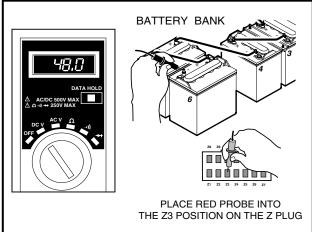
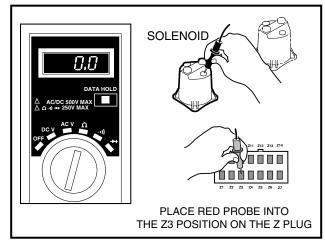


FIGURE 21-55

FIGURE 21-56

Test Procedure 23 - Continuity of the Z3 Orange/White Wire

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and disconnect the Z plug from the controller.
- 2. Place the black (-) probe of a multimeter, set to ohms (Ω), on the small post of the dynamic braking solenoid (with the red and orange/white wires attached) and place the red (+) probe in the Z3 (orange/white wire) connector position on the Z plug (Figure 21-57). The reading should be continuity. If the reading is incorrect, repair or replace the orange/white wire.
- 3. Make sure that the orange/white wire is in the Z3 position on the Z plug, and that the wire terminal pin is secure in the Z plug.



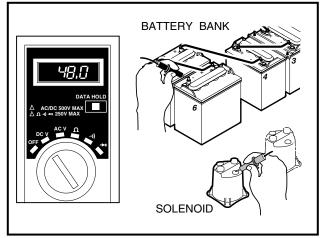
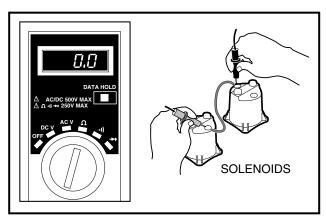


FIGURE 21-57 FIGURE 21-58

Test Procedure 24 - Voltage to Dynamic Braking Solenoid Coil

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe on the small post on the dynamic braking solenoid (with 18 gauge red and orange/white wires attached) (Figure 21-58). Turn the key switch to ON; the reading should be Full Battery Voltage. If the reading is incorrect, check positive input to the main solenoid (Test Procedure 7). Check continuity of the 18 gauge red wire from the dynamic braking solenoid to the main solenoid (Test Procedure 25).

Test Procedure 25 - Solenoid to Solenoid Red Wire Continuity



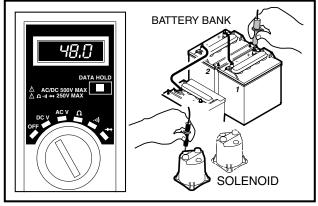


FIGURE 21-59

FIGURE 21-60

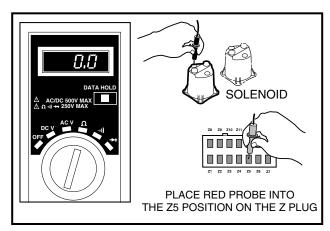
- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries. Leave the Z plug connected to the controller.
- 2. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the small post of the main solenoid (with the red, blue, and red/white wires attached) and place the red (+) probe on the small post of the dynamic braking solenoid (with the red and orange/white wires attached) (**Figure 21-59**). The reading should be continuity. If the reading is incorrect, repair or replace the red wire.

Test Procedure 26 - Voltage from Z5 (Brown Wire) to the Dynamic Braking Solenoid Coil

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Place the black (-) probe of a multimeter, set to Volts DC, on the small post of the dynamic braking sole-noid (with 18 gauge brown wire attached) and place the red (+) probe on the positive (+) post of battery No. 1 (Figure 21-60). Turn the key switch to ON, place the forward and reverse rocker switch in forward, and depress the accelerator pedal. The dynamic braking solenoid should click when the accelerator limit switch is activated. The reading should be Full Battery Voltage. If the reading is incorrect, check continuity of the brown wire (Test Procedure 27).

Test Procedure 27 - Dynamic Braking Solenoid Brown Wire Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and disconnect the Z plug from the controller.
- 2. Make sure that the brown wire is in the Z5 position on the Z plug.
- 3. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the small post of the dynamic braking solenoid (with the brown wire attached) and place the red (+) probe in the Z5 (brown wire) connector position in the Z plug (Figure 21-61, Page 21-42). The reading should be continuity. If the reading is incorrect, repair or replace the wire.



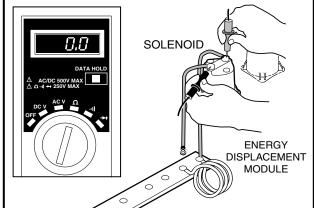


FIGURE 21-61

FIGURE 21-62

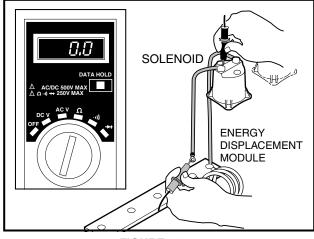
Test Procedure 28 - Dynamic Braking Solenoid Large Post Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Disconnect the 6 gauge green wire and 6 gauge white wire from one of the large posts on the dynamic braking solenoid. To prevent the possibility of shorting against another part of the vehicle, cover the terminals on the ends of the disconnected wires with electrical tape.
- 3. Place the black (-) probe of a multimeter, set to ohms (Ω) , on one large post of the dynamic braking solenoid and place the red (+) probe on the other large post **(Figure 21-62)**. Turn the key switch to ON; the reading should be **no** continuity. If the reading is incorrect, replace the solenoid.
- 4. With the key switch ON and the forward and reverse rocker switch in FORWARD, slowly depress the accelerator pedal until the accelerator limit switch is activated. The dynamic braking solenoid should click, and the reading should be continuity.
- 5. If the reading is incorrect, replace the dynamic braking solenoid.
- 6. Connect the 6 gauge green wire to the energy displacement module.

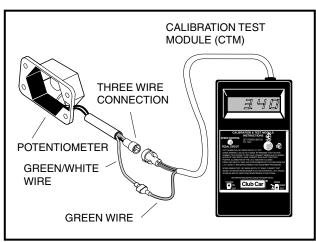
Test Procedure 29 - Energy Displacement Module

A WARNING

• DO NOT TOUCH THE ENERGY DISPLACEMENT MODULE; IT MAY BE EXTREMELY HOT. A HOT ENERGY DISPLACEMENT MODULE COULD CAUSE SEVERE BURNS.







The energy displacement module is mounted on the vehicle frame, directly behind the batteries.

1. Raise the rear of the vehicle.

WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 2. With the key switch ON and the forward and reverse rocker switch in FORWARD, slowly depress the accelerator pedal halfway to the floor (the rear wheels will begin to turn). Hold the pedal in this position and allow the vehicle to run for approximately one minute.

A WARNING

- IF ALL ELECTRICAL COMPONENTS ARE FUNCTIONING PROPERLY, THE REAR WHEELS WILL TURN WHEN THE ACCELERATOR PEDAL IS DEPRESSED.
- 3. Release the accelerator pedal, turn the key switch OFF, and place the forward and reverse rocker switch in NEUTRAL. Carefully check the energy displacement module for heat build-up by placing a hand very close to, but not touching, the energy displacement module. If the module is warm or hot, the dynamic braking solenoid is not functioning properly; replace the solenoid.

Test Procedure 30 - Energy Displacement Module Condition and 6 Gauge Green Wire Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries. Leave the Z plug connected to the controller.
- 2. Inspect the energy displacement module for a broken or cracked coil or loose connections at the mounting plate.
- 3. Inspect the green wires from the resistor coil to the dynamic braking solenoid for loose connections, signs of overheating, or broken or loose terminals ends.
- 4. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the large post of the dynamic braking solenoid (with the 6 gauge green wire attached) and place the red (+) probe on the other end of the green wire (at the energy displacement module). The reading should be continuity. If the reading is incorrect, repair or replace the green wire (Figure 21-63).
- 5. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the other large post of the dynamic braking solenoid (with the other green wire attached) and place the red (+) probe on the other end of the green wire (at the resistor coil terminal). The reading should be continuity. If the reading is incorrect, repair or replace the green wire.

Test Procedure 31 - Battery Warning Light Circuit

- 1. Turn the key switch to OFF position and place the forward and reverse switch in Neutral. Disconnect Z plug from controller; the battery wire will remain connected.
- 2. Disconnect the 18 gauge brown wire from the computer at the spade connector (See Figure 21-15, Page 21-15).
- 3. Connect one end of a jumper wire to the male side of the spade connector, and connect the other end of the jumper wire to the negative post of battery number 2. The light should illuminate. If it does not, proceed to step 4.

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Test Procedure 31 - Battery Warning Light Circuit, Continued:

- 4. Disconnect the battery wires, negative wire first (Figure 21-2, Page 21-3).
- 5. Remove the center dash (See Removing the Battery Warning Light, Page 20-41).
- 6. Disconnect the 18-gauge brown wire from battery warning light.
- 7. Set the multimeter to ohms (Ω) , connect the black (-) probe to the male side of the brown wire spade connector. Connect the red (+) probe to the brown wire female spade that was disconnected from the battery warning light. Reading should be continuity. If reading is incorrect, repair or replace the wire.
- 8. Disconnect the 18-gauge orange/white wire from battery warning light.
- 9. Set the multimeter to ohms (Ω) , connect the black (-) probe to the female spade connector on the orange/white wire and connect the red (+) probe to the key switch terminal with the orange/white wire. The reading should be continuity. If the reading is incorrect, repair or replace the wire.
- 10. If both wires test good, then replace the battery warning light.

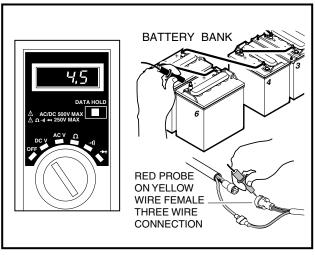
Test Procedure 32 - Potentiometer Voltage Output Test

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries. Leave the Z plug connected to the controller.
- 2. Disconnect the 3-wire plug at the potentiometer and disconnect the green/white wire at the spade connector near the 3-wire plug (Figure 21-64, Page 21-42).
- Connect the Calibration Test Module (CTM) (Club Car Part No. 1018871-01) to the 3-wire plug from the
 potentiometer, and connect the green wire from the Calibration Test Module to the green/white wire
 from the accelerator switch.
- 4. With the accelerator pedal in the up position (not depressed), the reading should be more than 3 volts. With the accelerator fully depressed, the reading should be zero volts. If either reading is incorrect, adjust (See Section 6, Page 6-19) or replace the potentiometer (See Section 20, Page 20-37).
- 5. Turn the key switch ON and slowly depress the accelerator pedal until the accelerator limit switch clicks on and the red light in the CTM illuminates. The reading should be 3.40 ±.02 volts when the red light first illuminates. If the reading is below 3.0 volts when the red light comes on, a high pedal detect function in the controller prevents the main solenoid from activating. If the reading is not 3.40 ±.02 volts when the red light comes on, adjust or replace the potentiometer.
- 6. If all readings are zero, check the 3-wire plug connection. If the connection is good, replace the potentiometer.

Test Procedure 33 - Voltage at the Z9 (Yellow Wire) and Z10 (Purple Wire) Positions

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Disconnect the 3-wire connector from the potentiometer.
- 3. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe in the yellow wire female terminal in the 3-wire plug (Figure 21-65). The reading should be 4.5 to 5.0 volts. If the reading is incorrect, check continuity of the yellow wire from the Z plug to the 3-wire plug.
- 4. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe in the purple wire female terminal in the 3-wire plug (**Figure 21-66**). The reading should be 4.5 to 5.0 volts. If the reading is incorrect, check continuity of the purple wire from the Z plug to the 3-wire plug.
- 5. Place the black (-) probe of a multimeter, set to Volts DC, in the white/black wire female terminal in the 3-wire plug and place the red (+) probe on the positive (+) post of battery No. 1 (Figure 21-67). The reading should be Full Battery Voltage. If the reading is incorrect, check the bullet connector located in the white/black wire approximately six inches from the controller. If the bullet connector is plugged in, repair or replace the white/black wire.





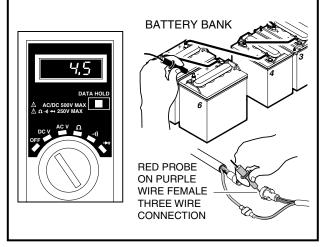
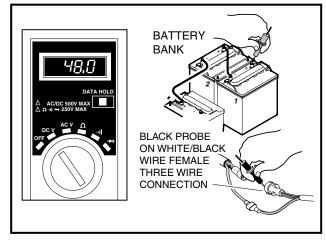


FIGURE 21-65

FIGURE 21-66



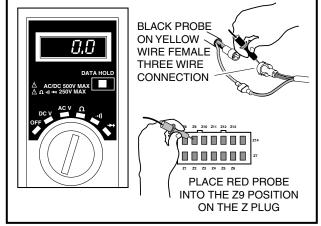


FIGURE 21-67

FIGURE 21-68

Test Procedure 34 - Z9 (Yellow Wire) and Z10 (Purple Wire) Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and disconnect the Z plug from the controller.
- 2. Disconnect the 3-wire connector (from potentiometer) at the connection below the charger receptacle.
- 3. Place the black (-) probe of a multimeter, set to ohms (Ω), in the yellow wire female terminal in the 3-wire plug and place the red (+) probe in the Z9 (yellow wire) connector position in the Z plug (Figure 21-68). The reading should be continuity. If the reading is incorrect, repair or replace the yellow wire. Make sure that the yellow wire is in the Z9 position on the Z plug, and that the wire terminals are secure in the 3-wire plug and in the Z plug.
- 4. Place the black (-) probe of a multimeter, set to ohms (Ω), in the purple wire female terminal in the 3-wire plug and place the red (+) probe in the Z10 (purple wire) connector position in the Z plug (Figure 21-69, Page 21-46). The reading should be continuity. If the reading is incorrect, repair or replace the purple wire. Make sure that the purple wire is in the Z10 position on the Z plug, and that the wire terminals are secure in the 3-wire plug and in the Z plug.

Test Procedure 35 - 3-Wire Plug on the Potentiometer

1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries. Leave the Z plug connected to the controller.

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Test Procedure 35 - 3-Wire Plug on the Potentiometer, Continued:

- 2. Inspect the wires in the 3-wire connector from the potentiometer. Make sure that wire connections are yellow to yellow, purple to purple, and black to white/black.
- 3. Disconnect the plug and inspect for broken wires at the pin terminals. Inspect the pins to make sure that they are secure in the plug. Inspect for dirt, moisture, or corrosion inside the plug housing.
- 4. Make sure that the pins make secure connections in the pin receptacles.
- 5. Connect the two halves of the plug and make sure that the outer ring of the female plug housing snaps securely over the notches on the male plug housing.
- 6. Pull gently on the two halves of the plug connection to ensure that they are fastened securely.

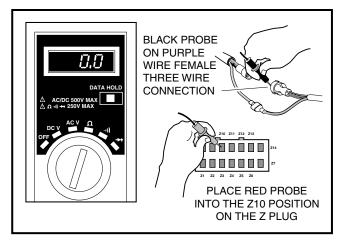


FIGURE 21-69

Test Procedure 36 - Voltage from Controller to Motor (Figure 21-70)

- 1. Lift rear axle and place vehicle on jackstands.
- 2. Connect positive (+) probe of voltmeter on the A1 terminal post of the motor and connect the negative (-) probe to the A2 terminal post of the motor (Figure 21-71).
- 3. Turn the keyswitch ON, and place the F&R switch in FORWARD.

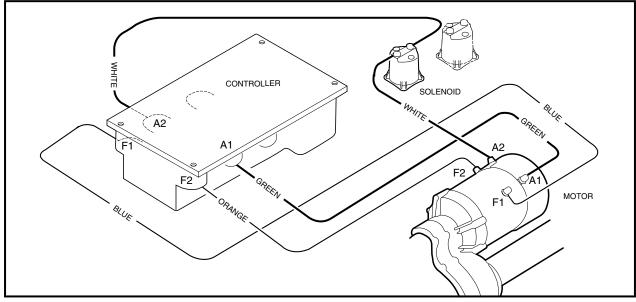


FIGURE 21-70



- 4. With the accelerator pedal in the UP position, the voltage reading should be zero.
- 5. Slowly depress the accelerator pedal. The first voltage reading should be approximately 5-10 volts and the rear wheels should turn slowly. As the accelerator pedal is depressed toward the floor, the voltage should continue to increase as the wheels turn faster.
- 6. When the accelerator pedal reaches the floor, the voltage reading should be approximately 48 volts.
- 7. If there is little (less than 10 volts) or no voltage output when the accelerator pedal is fully depressed, replace the controller.

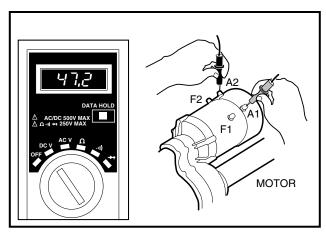


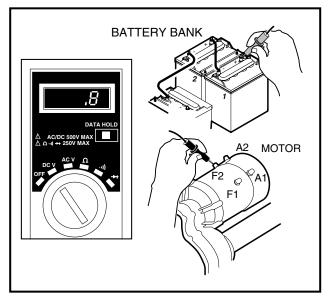
FIGURE 21-71

Test Procedure 37 - Voltage to Motor F1 and F2 Terminals

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Place chocks at the front wheels and lift the rear of the vehicle with a chain hoist or floor jack. Place jackstands under the axle tubes to support the vehicle. The rear wheels must be off the ground.

WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 3. Disconnect the 3-wire plug at the potentiometer.
- 4. Place the black (-) probe of a multimeter, set to Volts DC, on the F2 terminal (orange wire) on the motor and place the red (+) probe on the positive (+) post of battery No. 1 (Figure 21-72, Page 21-48). The reading should be less than one volt.
- Turn the key switch ON, place the forward and reverse rocker switch in FORWARD, and slowly depress the accelerator. The reading should be Full Battery Voltage. If the reading is zero volts, check continuity of the orange wire.
- 6. Turn the key switch OFF and place the forward and reverse rocker switch in NEUTRAL. Place the black (-) probe of a multimeter, set to Volts DC, on the F1 terminal (blue wire) on the motor and place the red (+) probe on the positive (+) post of battery No. 1 (Figure 21-73, Page 21-48). The reading should be less than one volt.
- 7. Turn the key switch ON, place the forward and reverse switch in REVERSE, and slowly depress the accelerator pedal. The reading should be Full Battery Voltage. If the reading is zero volts, check continuity of the blue wire.



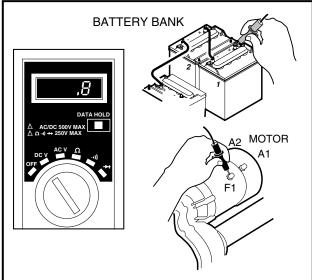


FIGURE 21-72 FIGURE 21-73

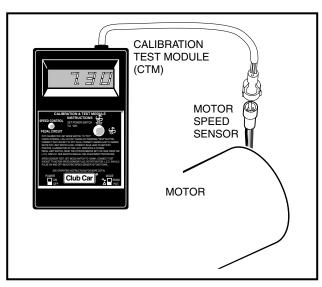
Test Procedure 38 - Continuity of Motor Wires (Figure 21-70, Page 21-46)

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries. Leave the Z plug connected to the controller.
- 2. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the A1 terminal (green wire) on the motor and place the red (+) probe on the A1 terminal (green wire) on the controller. The reading should be continuity. If the reading is incorrect, replace the green wire.
- 3. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the A2 terminal (white wire) on the motor and place the red (+) probe on the large post on the solenoid with the motor wire connected to it. The reading should be continuity. If the reading is incorrect, replace the white wire.
- 4. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the large post on the solenoid with the controller wire connected to it and place the red (+) probe on the A2 terminal (white wire) on the controller. The reading should be continuity. If the reading is incorrect, replace the white wire.
- 5. Place the black (-) probe of a multimeter, set to ohms (Ω), on the F1 terminal (blue wire) on the motor and place the red (+) probe on the F1 terminal (blue wire) on the controller. The reading should be continuity. If the reading is incorrect, replace the blue wire.
- 6. Place the black (-) probe of a multimeter, set to ohms (Ω) , on the F2 terminal (orange wire) on the motor and place the red (+) probe on the F2 terminal (orange wire) on the controller. The reading should be continuity. If the reading is incorrect, replace the orange wire.

Test Procedure 39 - Motor Speed Sensor Voltage Output

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries. Leave the Z plug connected to the controller.
- 2. Disconnect the 3-wire plug at the motor speed sensor.
- 3. Connect the Calibration Test Module (CTM) (Club Car Part No. 1018871-01) to the motor speed sensor plug. It is not necessary to connect the green wire from the CTM to another wire.
- 4. Turn on the CTM and set mode to SSAM (Figure 21-74).
- 5. Hold one rear wheel stationary and slowly turn the other one by hand. The CTM voltage reading should fluctuate from .04 to 7.30 volts and the red light should blink on and off. If the reading is incorrect, check the plug and connectors. If these are good, replace the motor speed sensor.





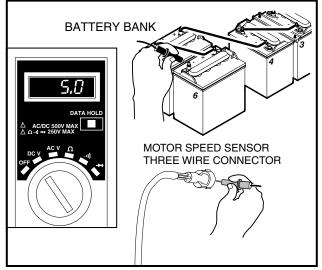


FIGURE 21-75

FIGURE 21-74

BATTERY

BANK

BLAMMOT THREE CONTINUES OF THE CONTINUES

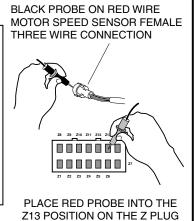


FIGURE 21-76

BLACK PROBE ON BLACK WIRE MOTOR SPEED SENSOR FEMALE THREE

WIRE CONNECTION

FIGURE 21-77

Test Procedure 40 - Controller Voltage to Speed Sensor Plug (Z13 Red Wire and Z14 Green Wire)

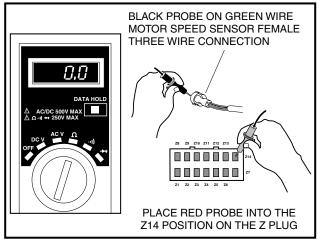
- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. Disconnect the 3-wire plug at the potentiometer and disconnect the 3-wire plug at the motor speed sensor.
- 3. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe in the female terminal of the red wire in the 3-wire plug at the motor speed sensor. The reading should be 4.5 to 5.0 volts (Figure 21-75).
- 4. Place the black (-) probe of a multimeter, set to Volts DC, on the negative (-) post of battery No. 6 and place the red (+) probe in the female terminal of the green wire in the 3-wire plug at the motor speed sensor. The reading should be 4.5 to 5.0 volts (Figure 21-75).
- 5. Place the black (-) probe of a multimeter, set to Volts DC, in the female terminal of the black wire in the 3-wire plug at the motor speed sensor, and place the red (+) probe on the positive (+) post of battery No. 1. The reading should be Full Battery Voltage (Figure 21-76).
- 6. If any reading is incorrect, inspect the motor speed sensor 3-wire plug and wires.

Test Procedure 41 - Z13 (Red Wire) and Z14 (Green Wire) Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and disconnect the Z plug from to the controller.
- 2. Disconnect the 3-wire plug at the motor speed sensor.
- 3. Place the black (-) probe of a multimeter, set to ohms (Ω), in the female terminal of the red wire in the 3-wire plug at the motor speed sensor, and place the red (+) probe in the Z13 (red wire) connector position in the Z plug (Figure 21-77, Page 21-49). The reading should be continuity. If the reading is incorrect, repair or replace the red wire.
- 4. Place the black (-) probe of a multimeter, set to ohms (Ω), in the female terminal of the green wire in the 3-wire plug at the motor speed sensor, and place the red (+) probe in the Z14 (green wire) connector position in the Z plug (Figure 21-78). The reading should be continuity. If the reading is incorrect, repair or replace the green wire.
- 5. Make sure that the red (Z13) and green (Z14) wires are in the correct positions in the Z plug and in the 3-wire plug. Make sure that the terminal ends are securely fastened in the plug housings.

NOTE

 IT IS POSSIBLE THAT THE VOLTAGE SIGNAL FROM THE CONTROLLER IS TOO LOW FOR THE SPEED SENSOR TO READ. IF CONTINUITY CHECKS SHOW THE WIRES TO BE GOOD, IT MAY BE NECESSARY TO REPLACE THE SPEED SENSOR IN ORDER TO GET MOTOR BRAK-ING FUNCTIONS OPERATING PROPERLY.



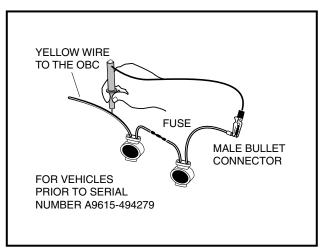


FIGURE 21-78

FIGURE 21-79

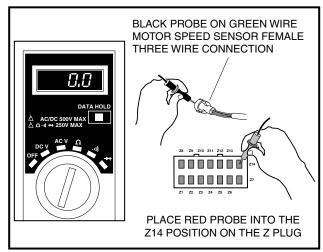
Test Procedure 42 - Motor Sensor 3-Wire Plug Connection

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries. Leave the Z plug connected to the controller.
- 2. Place the black (-) probe of a multimeter, set to ohms (Ω) , in the female terminal of the black wire in the 3-wire plug at the motor speed sensor, and place the red (+) probe on the B- terminal on the controller. The reading should be continuity. If the reading is incorrect, repair or replace the black wire.
- 3. Check for correct pin terminal position in the plug, and make sure the pins are securely pressed into the plug housing.
- 4. Inspect for dirt, moisture, or corrosion at the 3-wire plug housing and terminal pins.
- 5. Make sure that the pins make secure connections in the pin receptacles.
- 6. Connect the two halves of the plug and make sure that the outer ring of the female plug housing snaps securely over the notches on the male plug housing.

- 7. Pull gently on the two halves of the plug connection to ensure that they are fastened securely.
- 8. Check wire positions in the 3-wire plug and make sure that wires of the same color mate when the plug is connected.
- 9. Make sure that the red, green, and black wires are securely connected to the motor speed sensor located in the motor end shield.
- 10. Make sure that the bullet connector in the black wire approximately 4 inches from the controller is properly connected.

Test Procedure 43 - Z11 (Green Wire) and Z12 (Yellow Wire) Continuity

- 1. Turn the key switch to OFF and place the forward and reverse switch in NEUTRAL. Disconnect the batteries and disconnect the Z plug from the controller.
- Unplug the bullet connector in the Z12 yellow wire approximately 3 inches from the Z plug.
- 3. Connect the black (-) alligator clip of a continuity tester (Radio Shack #22-105 or equivalent) to the male terminal of the bullet connector. At approximately 2 inches from the on-board computer, puncture the insulation on the yellow wire with the point of the red (+) probe (Figure 21-79). The tester should show continuity.



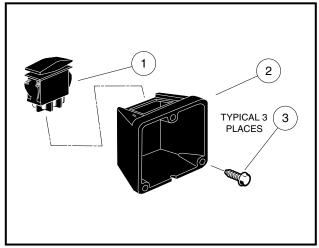


FIGURE 21-80

FIGURE 21-81

- 4. If the reading is incorrect, and there is a fuse in the wire between the two probes of the tester, replace the fuse and test again. If there is no fuse in the wire, repair or replace the wire. Disconnect the spade connector in the Z11 green wire approximately 3 inches from the Z plug.
- 5. Connect the black (-) alligator clip of a continuity tester to the female terminal on the end of the Z11 green wire. At approximately 2 inches from the on-board computer, puncture the insulation on the green wire with the point of the red (+) probe (Figure 21-80). The tester should show continuity. If the reading is incorrect, replace the green wire and test again.

SECTION 21B - ELECTRICAL COMPONENTS, POWERDRIVE PLUS VEHICLES

A DANGER

- THE BATTERY WIRES MUST REMAIN CONNECTED WHILE PERFORMING SOME TEST PROCE-DURES. RAISE THE REAR END OF THE VEHICLE AND SUPPORT IT ON JACKSTANDS, WITH THE REAR WHEELS OFF THE GROUND, WHILE PERFORMING ALL TEST PROCEDURES.
- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VEN-TILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR FULL FACE SHIELD WHEN WORKING ON OR NEAR BATTERIES.
- USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

A WARNING

- ONLY TRAINED MECHANICS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL AND ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE ROCKER SWITCH IN THE NEUTRAL POSITION. AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS. WHEN BATTERIES ARE CONNECTED, USE EXTREME CAUTION TO AVOID SHORTING OF COMPONENTS OR WIRING.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 21-2, PAGE 21-3 WHEN PERFORMING TESTS THAT DO NOT REQUIRE THE ELECTRICAL SYSTEM TO BE ENERGIZED.

KEY SWITCH

Testing the Key Switch:

See Test Procedure 2, Page 20-12.

Removing the Key Switch:

See Removing the Key Switch, Page 20-26.

Key Switch, Continued:

Installing the Key Switch:

See Installing the Key Switch, Page 20-26.

FORWARD AND REVERSE SWITCH

A DANGER

• TURN THE KEY TO OFF, PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL, AND DISCONNECT THE BATTERY CABLES AS SHOWN IN FIGURE 21-2, PAGE 21-3. FAILURE TO DO SO MAY CAUSE THE VEHICLE TO RUN OVER YOU, RESULTING IN SEVERE INJURY OR DEATH.

WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 21-2, PAGE 21-3).
 - FOLLOW ALL PROCEDURES EXACTLY AS STATED.
- SEE THE SAFTEY WARNINGS ON PAGE 21-53.

Testing the Forward and Reverse (F&R) Switch

See Test Procedure 17, Page 21-37

Removing the Forward and Reverse (F&R) Switch

- 1. Remove the seat from the rear body.
- 2. Disconnect the battery cables as shown (Figure 21-2, Page 21-3).
- 3. Remove the three mounting screws (3) from the inside of the rear body (Figure 21-81, Page 21-51).
- 4. Pull the F&R switch case away from the front of the rear body.
- 5. If the wires must be disconnected from the F&R switch, label them so they will be reconnected properly.
- 6. Remove the F&R switch (1) by depressing the two side locking tabs and sliding the switch out of the case (2) (Figure 21-81, Page 21-51).

Installing the Forward and Reverse (F&R) Switch

Install switch in reverse order of disassembly.

REVERSE BUZZER

Testing the Reverse Buzzer Circuit

See Test Procedure 14 - Reverse Buzzer, Page 21-33

Removing the Reverse Buzzer

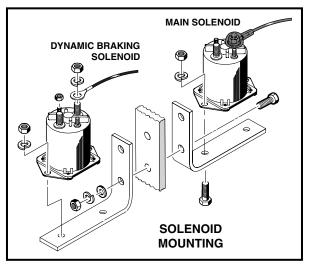
See Removing the Reverse Buzzer, Page 20-30.

Installing the Reverse Buzzer

See Installing the Reverse Buzzer, Page 20-31.

MAIN SOLENOID





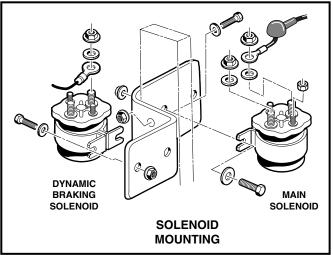


FIGURE 21-82

FIGURE 21-83

The solenoid is located on the passenger's side outside of the frame behind the battery compartment. The solenoid has two sets of posts; two 5/16 inch posts (power contact posts) and two small No. 10 posts (activating coil posts).

DANGER

• TURN THE KEY TO OFF, PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL, AND DISCONNECT THE BATTERY CABLES AS SHOWN IN FIGURE 21-2, PAGE 21-3. FAILURE TO DO SO MAY CAUSE THE VEHICLE TO RUN OVER YOU, RESULTING IN SEVERE INJURY OR DEATH.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 21-2, PAGE 21-3).
 - FOLLOW ALL PROCEDURES EXACTLY AS STATED.
- SEE THE SAFTEY WARNINGS ON PAGE 21-52.

Testing the Solenoid

See Test Procedures 9, 10, and 12, Page 21-30 and Page 21-32.

Removing the Solenoid

- 1. Disconnect the batteries (Figure 21-2, Page 21-3).
- 2. Disconnect all wires from the solenoid. Remove the two mounting screws, washers, and nuts (Figure 21-82 or 21-83).

Installing the Solenoid

1. Install the solenoid to the mounting bracket and torque to 66 in.lbs. (7.5 N-m). The solenoid does not have to be oriented in any particular manner (Figure 21-82 or 21-83).

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Installing the Solenoid, Continued:

2. Install the wires on the solenoid as shown in wiring diagram (Figure 21-1, Page 21-2).

DYNAMIC BRAKING SOLENOID

The solenoid is located on the passenger's side inside of the frame behind the battery compartment. The solenoid has two sets of posts; two 5/16 inch posts (power contact posts) and two small No. 10 posts (activating coil posts).

A DANGER

• TURN THE KEY TO OFF, PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL, AND DISCONNECT THE BATTERY CABLES AS SHOWN IN FIGURE 21-2, PAGE 21-3. FAILURE TO DO SO MAY CAUSE THE VEHICLE TO RUN OVER YOU, RESULTING IN SEVERE INJURY OR DEATH.

A WARNING

- WHEN MAKING ELECTRICAL TESTS OR REPAIRS, ALWAYS:
 - WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION.
 - REMOVE THE KEY.
 - PUT THE FORWARD AND REVERSE SWITCH IN NEUTRAL.
 - DISCONNECT THE BATTERIES AS SHOWN (FIGURE 21-2, PAGE 21-3).
 - FOLLOW ALL PROCEDURES EXACTLY AS STATED.
- SEE THE SAFTEY WARNINGS ON PAGE 21-53.

Testing the Solenoid

See Test Procedure 28, Page 21-42.

Removing the Solenoid

- 1. Disconnect the batteries (Figure 21-2, Page 21-3).
- 2. Disconnect all wires from the solenoid. Remove the two mounting screws, washers, and nuts (Figure 21-82 or 83, Page 21-55).

Installing the Solenoid

- 1. Install the solenoid to the mounting bracket and torque to 66 in.lbs. (7.5 N-m). The solenoid does not have to be oriented in any particular manner (Figure 21-82 or 83, Page 21-55).
- 2. Install the wires on the solenoid as shown in wiring diagram (Figure 21-1, Page 21-2).

ON-BOARD COMPUTER (OBC)

Testing the On-board Computer

See Test Procedures 13, and 15, on pages 21-32 and 21-34.

Removing the On-Board Computer

- 1. Disconnect the batteries (Figure 21-2, Page 21-3).
- 2. Disconnect the 10 gauge black wire (to the OBC) from the back of the charger receptacle (Figure 21-1, Page 21-2).

- 3. Disconnect the gray wire (from the OBC) at the sense lead fuse, leaving the sense lead fuse connected to the gray lead from the charger receptacle (Figure 21-1, Page 21-2).
- 4. Remove the 18 gauge red wire on the solenoid.
- 5. Disconnect the yellow wire and the green wire from the connectors three inches away from the Z plug on the controller (Figure 21-1, Page 21-2).
- 6. Remove the 6 gauge and 10 gauge black wires from the B- of the controller (Figure 21-1, Page 21-2).
- 7. Remove the two 1/4 lock nuts holding the OBC.
- 8. Remove the OBC from the vehicle.

Installing the On-Board Computer

Install the OBC in reverse order of removal.

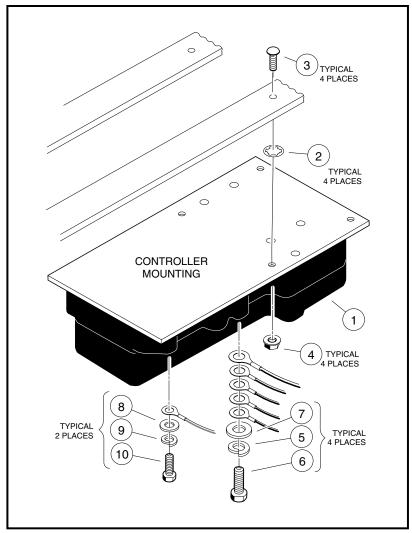


FIGURE 21-84

CONTROLLER

Testing the Controller

See Test Procedures 4 (Page 21-27), 37 (Page 21-47), and 40 (Page 21-49).

21B

П

Removing the Controller

- 1. Disconnect the Batteries (Figure 21-2, Page 21-3).
- 2. Remove all the 6 gauge wires connected to the controller. Remove the four wires from the B- on the controller. Remove the 10 gauge blue wire from the controller.
- 3. Unplug the Z plug from the controller.
- 4. Remove the four 1/4 lock nuts (4) holding the controller (Figure 21-84, Page 21-57).
- 5. Remove the controller from the vehicle.

Installing the Controller

Install in the reverse order of disassembly.

CHARGER RECEPTACLE

See Charger Receptacle, Page 20-34.

CONTINUOUSLY VARIABLE POTENTIOMETER

See Continuously Variable Potentiometer, Page 20-37.

BATTERY WARNING LIGHT

Testing the Battery Warning Light Circuit

See Test Procedure 31, Page 21-43

Removing the Battery Warning Light

See Removing the Battery Waning Light, Page 20-41.

Installing the Battery Warning Light

See Installing the Battery Warning Light, Page 20-42.

ENERGY DISPLACEMENT MODULE

The energy displacement module is mounted on a frame cross member located behind the batteries.

Testing the Energy Displacement Module

See Test Procedures 29 and 30, Pages 21-42 and 21-43.

Removing the Energy Displacement Module

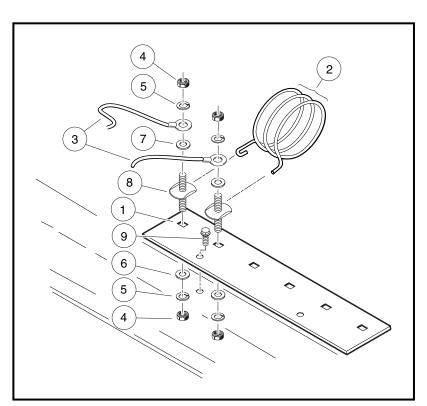
- 1. Disconnect the batteries (Figure 21-2, Page 21-3).
- 2. Loosen (do not remove) the nuts (4) that secure the coil (2) to the mounting board (1) and then slide the coil out from under the washers (7).

Installing the Energy Displacement Module

1. Position the coil ends (2) under the washers (7) and tighten the nuts (4) to 90-100 in.lbs. (10-11 N-m) (Figure 21-85).

A CAUTION

 BE SURE THE 6 GAUGE WIRES ARE SECURED IN PLACE SO THAT THEY CANNOT COME INTO CONTACT WITH THE COIL.









SECTION 22 - BATTERIES



A DANGER

- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VEN-TILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR FULL FACE SHIELD AND RUBBER GLOVES WHEN WORKING ON BATTERIES.
- USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

A WARNING

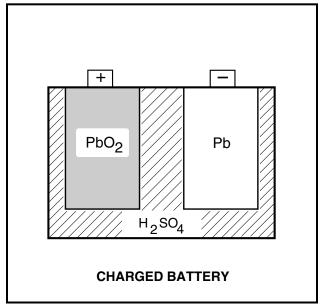
- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD AND RUBBER GLOVES WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN ON PAGE 22-5. DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO **ON** AND PLACE THE FORWARD AND REVERSE LEVER IN THE REVERSE POSITION .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

GENERAL INFORMATION

The batteries supplied with a golf car are different from those supplied with an automobile. The outward appearance of these two batteries is similar, but the operating characteristics are very different. The golf car battery is known as a "deep cycle" battery, and the automotive battery is known as a "starting, lighting and ignition" (SLI) battery. They should never be substituted for one another.

An automotive battery has to deliver high cranking currents of 300-400 amperes at a sufficient voltage for several seconds and maintain an accessory load of 10-25 amperes in stop and go driving. The energy removed from an automotive battery is immediately replaced by the alternator or generator of the car. As a result, the automotive battery operates at 90 to 100% of full charge at all times.

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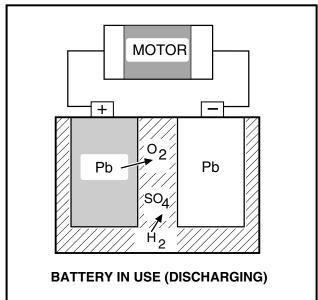
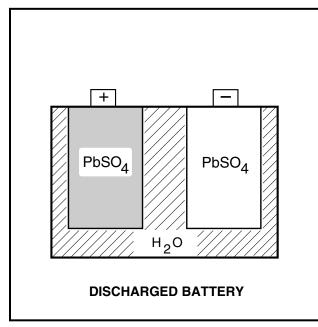


FIGURE 22-1 FIGURE 22-2



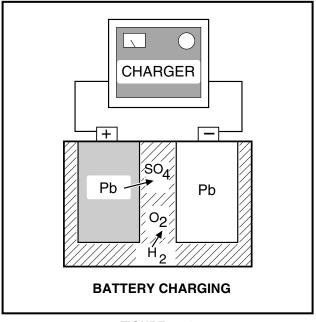


FIGURE 22-3 FIGURE 22-4

The batteries supplied with an electric vehicle must supply 100% of the energy required to move the vehicle. These batteries therefore receive deep discharge down to 30% to 40% of their full charge capacity. Then they must be recharged, hence their name "deep cycle." The average amperage draw is considered to be 75 amps on a 36 volt car, and 56 amps on a 48 volt car, although it varies greatly depending on the vehicle and how it is operated. Golf car batteries are specifically designed to handle this type of service.

The rechargeable lead-acid battery is a device for turning chemical energy into electrical energy and vice versa. The main active elements within a battery are the positive plates, the negative plates and the electrolyte (sulfuric acid). Another very important element (but inactive) is the separator. The separator does exactly what its name implies - it keeps the material of the positive and negative plates from touching each other and

creating electrical shorts. It must be porous enough to allow charged ions to pass through between the positive and the negative plates, but never allow the two materials to contact each other.

Whenever two unlike metals are immersed in an acid solution, an electric current is generated.

In a "deep cycle" battery, the negative plates contain lead (Pb) and the positive plates contain lead dioxide (PbO2). These plates are immersed in a sulfuric acid solution (H2SO4) (Figure 22-1).

During discharge, the chemical reaction inside the battery causes the sulfate (SO4) to break away from the H2 (Figure 22-2).

The sulfate (SO4) combines with the lead (Pb) on both plates, forming lead sulphate (PbSO4). The oxygen (O2) from the positive plates combines with the hydrogen (H) from the electrolyte to form water (H2O) (Figure 22-3).

The result is two similar metals, lead sulphate (PbSO4), immersed in water (H2O). This, of course, will not generate electricity. This battery is discharged.

When a discharged battery is connected to a charger, the process is reversed. The sulfate (SO4) is forced from the plates back into the electrolyte to make sulfuric acid (H2SO4). The oxygen returns to the positive plate to make lead dioxide (PbO2) (Figure 22-4).

The result is a charged battery that is again capable of generating electricity (Figure 22-1).

COMMON MISCONCEPTIONS ABOUT BATTERIES

This chart cannot and does not describe all problems which may be encountered with batteries, but it does identify some of the common misconceptions and problems.

	PROBLEM	MISCONCEPTION AND REALITY
1.	Deep Discharge	Misconception- "This car can handle another 9 holes; it has gone only 36 holes today." Reality- This statement is wrong. Avoid deep discharge of batteries whenever possible. See Battery Charging, Page 22-7.
2.	Early Excessive Discharging	Misconception- "These are new batteries. They can handle 45 holes." Reality- This statement is wrong also. New batteries do not reach their full capacity until they have been used and recharged 20 to 50 times.
3.	Mineral Content	Misconception- "Tap water will do for our batteries." Reality- Your tap water might be OK, but have it checked first. See Battery Care, Page 22-5
4.	Self-Discharge	Misconception- "Dirt and corrosion on the battery won't hurt anything." Reality- Wrong again. Dirt and corrosion might provide a path for current to flow and allow the batteries to self-discharge. See Battery Care, Page 22-5.
5.	Overwatering	Misconception- "Batteries can be filled to the level indicator at night, so it won't have to be done in the morning". Reality- Under most circumstances, water should be added after charging. See Battery Care, Page 22-5.
6.	Underwatering	Misconception- "Checking the water takes too much time; it can be checked once a month." Reality- Insufficient watering can ruin batteries. Water level should be checked weekly. See Battery Care, Page 22-5.
7.	Vibration Damage	Misconception- "You should tighten battery hold-downs as tight as you can". Reality- Battery hold-downs should be tightened to specification. Hold-downs that are too tight or too loose can cause battery damage. See Battery Care, Page 22-5.

REPLACING BATTERIES

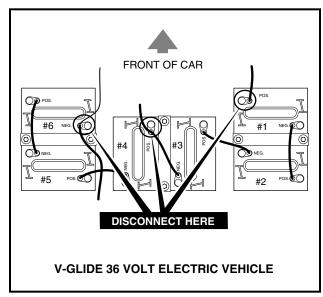
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A DANGER

- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VEN-TILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR FULL FACE SHIELD AND RUBBER GLOVES WHEN WORKING WITH BATTERIES.
- USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

A WARNING

- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-5 OR FIGURE 22-6, AND THEN DISCHARGE THE CONTROLLER ON POWERDRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${
 m ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.
- TO PREVENT ELECTROLYTE LEAKAGE FROM THE BATTERY VENTS, BATTERIES MUST BE KEPT IN AN UPRIGHT POSITION. TIPPING A BATTERY BEYOND A 45° ANGLE IN ANY DIRECTION CAN ALLOW A SMALL AMOUNT OF ELECTROLYTE TO LEAK OUT THE VENT HOLE. DO NOT EXCEED THIS 45° ANGLE WHEN LIFTING, CARRYING, OR INSTALLING BATTERIES. BATTERY ACID CAN CAUSE SEVERE PERSONAL INJURY TO SKIN OR EYES, AND CAN DAMAGE CLOTHING.
- Before removing batteries, note the orientation of the batteries and the connecting wires. First, disconnect the batteries and discharge the controller as described in the WARNING above. Then remove remaining wires and batteries.
- See Figure 22-5 for 36 volt V-Glide 36 volt Vehicle battery wiring.
- See Figure 22-6 for PowerDrive System 48 and PowerDrive Plus Vehicle battery wiring.
- 2. Visually inspect the new batteries for any damage that may have occurred in transit.
- 3. If the old battery wires are going to be reused, inspect them for broken or frayed wires, damaged terminals, or worn insulation. Remove any corrosion on the connectors. One cup of bicarbonate of soda (baking soda) in a gallon of water and a bristle brush do an excellent job of neutralizing and removing the corrosion. Be careful not to allow this baking soda solution to enter the battery.



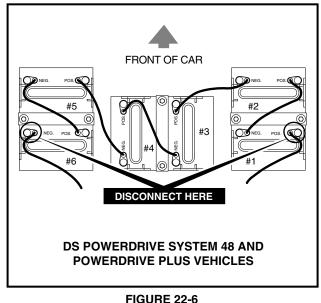


FIGURE 22-5

- 4. Check and clean the battery rack and hold-downs. The nuts and bolts on the hold-downs may corrode. It is therefore advised that they be cleaned periodically and replaced as necessary.
- 5. Install the batteries in the proper orientation (Figure 22-5 or Figure 22-6). Install the battery hold-downs. The hold-downs should be tight enough so the batteries do not move while the car is in motion, but not so tight as to crack or buckle the battery case. Torque to 40 in.lbs. (4.5 N-m), alternating between hold-down bolts.
- 6. Install wires in proper sequence (Figure 22-5 or Figure 22-6). Install black wire to negative post of battery No. 6 last. Make sure all connections are tight. Torque to 125-140 in.lbs. (14.1/16.4 N-m). Coat all terminals with Battery Protector Spray (CLUB CAR Part No.1014305) to minimize future corrosion.
- V-Glide 36 volt only Be sure wire on lower left of F&R switch goes to battery No.1 positive post. Wire
 on lower right of F&R switch goes to battery No. 4 positive post. This applies to vehicles equipped with
 resistor coil type speed controls only.
- 7. Give the batteries a full charge prior to sending them out on the golf course. This ensures that all the batteries are fully charged and the cells are equalized prior to use.

BATTERY CARE

Preventive Maintenance

To keep batteries in good operating condition, follow these steps on a regular basis.

- Any corrosion build-up on or around batteries should be removed immediately. Terminal connections should be clean and tight. Any frayed or worn wires should be replaced. After all cables have been connected, coat all terminals with Battery Protector Spray (CLUB CAR Part No.1014305) to ward off future corrosion.
- Batteries should be kept clean and dry to prevent self-discharge. Any dirt, grime or acid spillage should be removed. Wash batteries with a bristle brush using water and bicarbonate of soda (baking soda - 1 cup per gallon of water). Rinse with water. Do not allow solution to enter battery through the vent cap holes (See Self Discharge, Page 22-6).
- 3. Maintain proper water level (See Water Level, Figure 22-7, Page 22-6).
- 4. Batteries should be properly charged every day they are used. Check the batteries periodically to see that they are in a full state of charge (See Battery Charging, Page 22-7).
- 5. Keep hold-downs tight (See Vibration Damage, Page 22-7).

Battery Care, Continued:

Self-Discharge

Dirty batteries can provide a path for a small current draw that can slowly discharge batteries, thus wasting valuable energy. To prevent self-discharge, batteries should always be kept clean.

Hot weather also has an effect on a battery's self-discharge rate. The higher the temperature, the quicker a set of batteries will discharge. In hotter climates, therefore, batteries should be checked more often. When storing batteries, keep in a cool place (See Battery Storage, page 22-17).

Water Level

A CAUTION

 DO NOT ALLOW BATTERY ACID FROM BATTERY CAPS OR HYDROMETER TO DRIP ONTO THE FRONT OR REAR BODY OF THE VEHICLE. BATTERY ACID WILL CAUSE PERMANENT BLEMISHES. WASH OFF IMMEDIATELY.

Add water only after charging unless the water is below the level of the plates. If the water level is below the level of the plates, add just enough water to cover the plates and then charge the batteries. After charging, fill with water to the level indicator. Filling a battery to the level indicator before charging will result in overfilling because the electrolyte level will rise during charging and some of the electrolyte may bubble out of the cap. This reduces its capacity and corrodes the metal parts around it.

The water level should be checked weekly to be sure water is at its proper level (Figure 22-7). Never allow the water level to fall below the tops of the plates because this will cause the exposed part of the plate to become permanently inactive. The use of a battery watering gun is suggested for adding water. Check the water level more frequently in hot weather or when batteries become old.

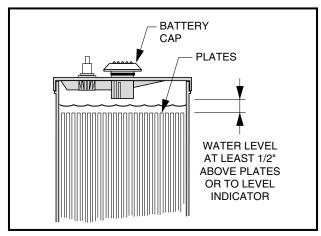


FIGURE 22-7

Mineral Content

For the longest battery life, distilled water should be used in batteries. However, if tap water is going to be used, be sure the mineral contents are below these levels:

IMPURITY	ALLOWABLE CONTENT IN PARTS PER MILLION
Suspended Matter	Trace
Total Solids	100.00
Calcium and Magnesium Oxides	40.0

IMPURITY	ALLOWABLE CONTENT IN PARTS PER MILLION				
Iron	5.0				
Ammonia	8.0				
Organic Matter	50.0				
Nitrates	10.0				
Nitrites	5.0				
Chloride	5.0				
Contact your local water department for this analysis.					

Vibration Damage

The battery hold-downs should always be tight enough to keep the battery from bouncing. Battery life may be severely shortened if the battery hold-downs are too loose. Excessive vibration causes the plates to shed prematurely and shortens the life of the battery. It may also cause acid to leak out of the vent caps and corrosion to build up on surrounding metal parts. The acid which is lost reduces the capacity of the battery and cannot be replaced.

Battery hold-downs should NOT be so tight as to crack or buckle the battery case. This may cause leaks which would dry up a cell or cause internal shorts (See Replacing Batteries, Page 22-4).

BATTERY CHARGING

General Information

The charger supplied with the CLUB CAR DS Electric Vehicle solves the most common problems in charging. Undercharging and overcharging are prevented provided the charger is allowed to shut off by itself. Also, all cells are automatically given an equalization charge at low current, which prolongs battery life. Batteries should never be left in a discharged state, as this too, affects the internal components and can reduce the capacity of the battery. The batteries should be charged every day they are used, even if only for ten minutes or after nine holes. However, the batteries should not be charged if they have not been used. When running 36 holes per day, it is wise to put the cars on charge after the first 18 holes. Even if the charger is only on for an hour or two, it will prevent the batteries from being discharged deeply.

V-Glide 36 volt vehicles only:

If a charger is still on in the morning and it becomes necessary to send the car out before charging is complete, be sure the car gets a catch-up charge between rounds. The following night this car must get a full charge.

• PowerDrive System 48 Vehicles only:

Do not charge between rounds if the charge cycle will be interrupted. Always allow the charger to shut itself off.

Charger Doesn't Shut Off (36 Volt Accu-Power) or Charger Shuts Off After 16 Hours (48 Volt PowerDrive)

This may be due to one of the following factors:

- 1. New batteries
- 2. Hard use more than 36 holes per day
- 3. Cold temperatures
- 4. 36 Volt Only: Short charging times in late at night, out early in the morning

Battery Charging, Continued:

A catch-up charge may be necessary when these conditions are present. On a rainy day or an off day, when all or some of the cars do not go out, check the batteries in the cars for state of charge. Any batteries with a specific gravity lower than 1.250 need a catch-up charge. If the problem continues after a catch-up charge has been performed, refer to Section 23 (Battery Chargers).

Deep Discharge

Never discharge a vehicle's batteries to the point that the vehicle will no longer run. This will shorten the cycle life of the batteries considerably, and may permanently damage the batteries. It is possible that the batteries will not accept a recharge if they are completely discharged. The deeper the discharge, the harder it is on the batteries. For this reason, it is recommended that cars be charged between rounds. Placing the batteries on charge between rounds reduces the depth of discharge and prolongs battery life.

Early Excessive Discharging

When golf car batteries are new, they do not reach their full capacity until they have been used and recharged 20 to 50 times. If they are excessively discharged early in their life, their effective service life will be shortened. It is advisable to limit the use of any car with new batteries to 18 holes per day (V-Glide 36 volt vehicle) or 36 holes per day (48 volt vehicle) for at least the first 4 weeks and then gradually increase their range.

Incoming AC Service

Insure that the incoming AC line service is sufficient. If circuit breakers are tripping, fuses blow during the night or the charger does not give the required starting rate when perfectly good batteries are put on charge, an AC line problem exists. The electrical service to your car storage facility should be sufficient to deliver 115 volts (minimum 105 volts, maximum 128 volts) and 10.7 amps per charger with all the chargers turned on. If not, consult your local power company or electrical contractor.

Fleet Rotation

Rotate your cars. Put a different set of cars out first each morning. It is very hard on batteries if the last cars in at night are the first ones out in the morning and also are required to go 36 holes. Spread the workload evenly, giving all cars the same amount of play. This will keep your fleet in balance and will not overwork certain sets of batteries.

NOTE

 WHEN A FLEET OF POWERDRIVE SYSTEM 48 VEHICLES IS BEING ROTATED, THE CLUB CAR CDM (COMMUNICATION DISPLAY MODULE) CAN BE A VERY HELPFUL SERVICE TOOL. BY MONITORING THE VALUE OF FUNCTION 3 WITH THE CDM, IT CAN BE DETERMINED WHICH CARS SHOULD BE USED (SEE PAGE 20-22). HOUR METERS CAN BE USED TO MONITOR USAGE OF V-GLIDE 36 VOLT VEHICLES.

Numbering Cars and Chargers

Return the cars to the same charger each night if possible. If the cars are put in a storage facility at random and a car dies on the course and testing shows the batteries are good, you know you may have a bad charger - you just don't know where. Numbering the cars and the chargers and returning each car to its designated charger each night can be a great aid in troubleshooting a problem.

BATTERY TESTING

Four tests have been developed to test a set of batteries that has not lived up to its expected performance. Each test becomes progressively more thorough and time-consuming. It is therefore suggested to begin with the first test and follow through with the other tests until the problem has been found as outlined in the Battery Troubleshooting Chart (Figure 22-8, Page 22-10). See DANGER at top of page 22-9.

A DANGER

- ALWAYS WEAR FULL FACE SHIELD AND GLOVES WHEN WORKING WITH BATTERIES.
- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VENTILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

A WARNING

• TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING.

BATTERY CHARGER TEST

The easiest way to monitor the condition of your batteries is simply to observe the reading of your battery charger ammeter at the end of the charge cycle. After a full charge, disconnect and reconnect the charger DC plug (PowerDrive System 48 vehicle only - Wait 20 to 30 seconds before reinserting the DC charger plug. Failure to do so will not allow the charger to turn on again). The ammeter needle will jump to 15 amps or more and then taper to below 6 amps within 10 to 20 minutes, indicating good, fully charged batteries.

Continued poor performance may indicate a problem in the golf car electrical system, brakes or battery charger. If the problem is not found in the golf car or charging system, proceed to the on-charge voltage test. Batteries that remain at 8 amps or higher should be tested further using the on-charge voltage test.

ON-CHARGE VOLTAGE TEST (V-GLIDE 36 VOLT)

When the batteries are fully charged, disconnect and reconnect the charger DC plug to restart the charger. After 5 minutes, record the voltage of the battery set as well as the individual batteries, using the VOM, (CLUB CAR part No.1011480). Set the meter on 50 VDC. Place the red (+) probe at the positive terminal and the black (-) probe at the negative terminal of each battery. Record reading. The on-charge voltage for the set should read between 42.0 volts and 47.4 volts depending on the make, size and age of the battery being tested. If individual batteries read above 7.0 volts and are within 0.5 volts of each other, go to hydrometer test. If any battery reads below 7.0 volts and is not within 0.5 volts of those batteries above 7.0 volts, replace battery. If readings are below 7.0 volts but within 0.5 volts of each other, the batteries are old. However, they may have enough capacity left to last several more months. Go to hydrometer test (See Trouble-Shooting Chart, Figure 22-8, Page 22-10 and examples on following pages).

ON-CHARGE VOLTAGE TEST (POWERDRIVE SYSTEM 48)

When the batteries are fully charged, disconnect the charger DC plug. Wait 20 to 30 seconds and reconnect the DC plug to restart the charger. After 5 minutes, record the voltage of the battery set as well as the individual batteries, using the VOM (CLUB CAR Part No.1011480). Set the meter on 100 VDC. Place the red (+) probe at the positive post of the battery No. 1 and the black (-) probe at the negative post of battery No. 6 (Figure 22-6, Page 22-5). Record reading. Then set VOM on 50 VDC and place the red (+) probe at the positive terminal and the black (-) probe at the negative terminal of each battery. Record the readings.

On-Charge Voltage Test (PowerDrive System 48), Continued:

The on-charge voltage for the set should read between 56.0 volts and 63.0 volts depending on the age and state of charge of the batteries being tested. If individual batteries read above 9.3 volts and are within 0.7 volts of each other, go to hydrometer test. If any battery reads below 9.3 volts and is not within 0.7 volts of those batteries above 9.3 volts, replace battery. If readings are below 9.3 volts but within 0.7 volts of each other, the batteries are old. Batteries may have enough capacity left to last several more months. Go to hydrometer test (See Troubleshooting Chart, Figure 22-8, and examples on following pages).

BATTERY TROUBLESHOOTING CHART - 36 AND 48 VOLT

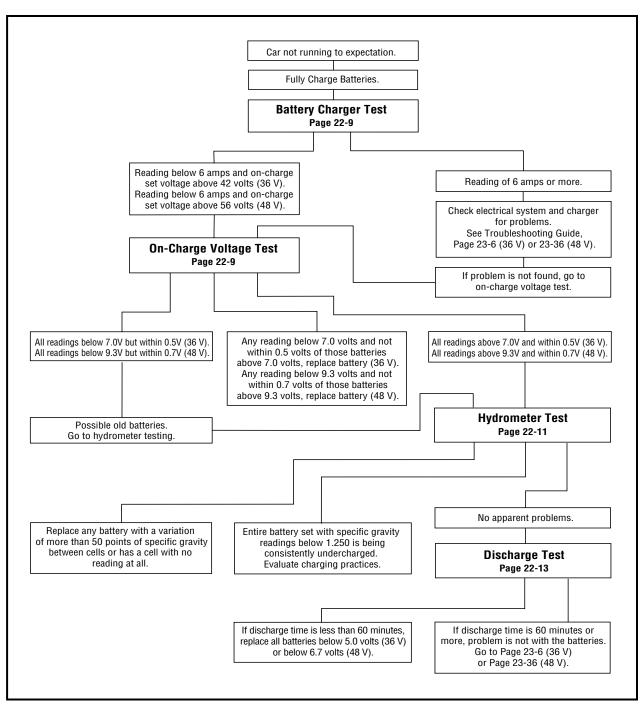


FIGURE 22-8

A hydrometer measures the specific gravity. The higher the specific gravity, the higher the state of charge of the batteries. A fully charged battery should read between 1.250 and 1.280 at 80°F. Never add acid to batteries to obtain a higher specific gravity.

Performing the Hydrometer Test

- 1. Be sure that the batteries have sufficient water to cover the plates by approximately 1/2 inch and are fully charged prior to beginning the test. If water must be added, recharge the batteries before performing the hydrometer test.
- 2. Remove the vent cap.
- 3. Using a battery thermometer (CLUB CAR part No.1011767), record the electrolyte temperature of the No. 2 cell.
- 4. Squeeze the rubber bulb of the hydrometer and insert into the cell. Slowly release the bulb, drawing electrolyte up into the glass tube of the hydrometer.
- 5. When the float rises off the bottom, adjust the electrolyte level so that the float rides free of the bottom but does not strike the top of the glass tube. Remove the hydrometer from the cell and release the pressure from the bulb.
- 6. Hold the hydrometer vertically, insuring that the float is not contacting the sides of the barrel. Hold the hydrometer at eye level and read the scale at the level of electrolyte (Figure 22-9).
- 7. Record the reading.
- 8. Return the electrolyte to the cell from which it was taken. Replace vent cap.
- 9. Repeat steps 2-8 on all cells.

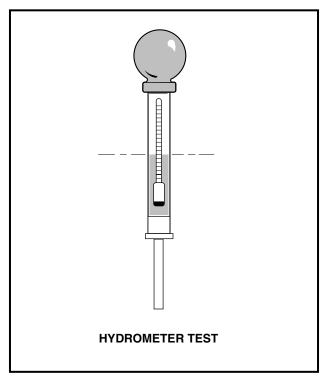


FIGURE 22-9

Hydrometer Calibration

Most hydrometers are calibrated to read correctly at 80°F. The readings obtained as described above must be corrected for temperature. For each 10°F above 80°F, add .004 to the reading. For each 10°F below 80°F, subtract .004 from the reading.

Hydrometer Test, Continued:

Interpreting the Results of the Hydrometer Test

The approximate state of charge can be determined from the following table:

SPECIFIC GRAVITY AT 80°	STATE OF CHARGE
1.250 - 1.280	100%
1.220 - 1.240	75%
1.190 - 1.210	50%
1.160 - 1.180	25%

If the difference between the cells is .020 or more, the low cell should be suspected. It may require a catchup charge or it may be a weak cell. When the variations between cells reach .050 or more, the battery with the low cell should be replaced.

V-Glide 36 Volt Vehicle

CAR	BATTERY	ELECTROLYTE	CORRECTION	COR	DECUIDED		
NO.	NO.	TEMP.	FACTOR	POSITIVE CELL	CENTER CELL	NEGATIVE CELL	REQUIRED Action
12	1	20°F	024	1.275024=1.251	1.280024=1.256	1.280024=1.256	Good Battery- Fully Charged
35	6	90°F	+.004	1.155+.004=1.159	1.165+.004=1.169	1.160+.004=1.164	Discharged Battery- Recharge
54	3	50°F	012	1.260012=1.248	1.200012=1.188	1.270012=1.258	Bad Center Cell
69	5	80°F	.000	1.250-0=1.250	1.255-0=1.255	1.230-0=1.230	Weak Negative Cell- Catch-up Charge
38	2	100°F	+.008	1.200+.008=1.208	1.180+.008=1.188	1.170+.008=1.178	Discharged Battery- Recharge and Recheck
22	4	80°F	.000	1.240-0=1.240	1.245-0=1.245	Float Does Not Rise	Negative Cell Dead- Replace Battery

PowerDrive System 48 and PowerDrive Plus Vehicles

CAR	BATTERY	ELECTROLYTE		CORRI	ECTED SPECIFIC G		REQUIRED	
NO.	NO.	TEMP.		CELL 1	CELL 2	CELL 3	CELL 4	ACTION
12	1	20°F	024	1.275024=1.251	1.280024=1.256	1.280024=1.256	1.280024=1.256	Good Battery- Fully Charged
35	6	90°F	+.004	1.155+.004=1.159	1.165+.004=1.169	1.160+.004=1.164	1.165=.004=1.169	Discharged Battery- Recharge
54	3	50°F	012	1.260012=1.248	1.200012=1.188	1.270012=1.258	1.270012=1.258	Bad No. 2 Cell
69	5	80°F	.000	1.250-0=1.250	1.255-0=1.255	1.230-0=1.230	1.250-0=1.250	Weak No. 3 Cell- Catch-up Charge
38	2	100°F	+.008	1.200+.008=1.208	1.180+.008=1.188	1.170+.008=1.178	1.180+.008=1.188	Discharged Battery- Recharge and Recheck
22	4	80°F	.000	1.240-0=1.240	1.245-0=1.245	Float Does Not Rise	1.250-0=1.250	No.3 Cell Dead- Replace Battery

A DANGER

• ALWAYS WEAR FULL FACE SHIELD AND GLOVES WHEN WORKING WITH BATTERIES.

A DANGER

- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VENTILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

A WARNING

• TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING.

DISCHARGE TEST

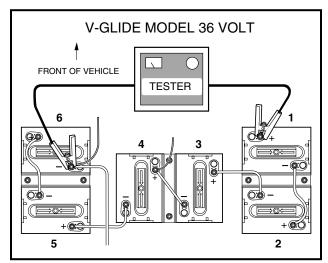
If the previous tests have failed to discover the problem with a set of batteries, conduct a discharge test. The discharge test comes closest to simulating the actual golf car operating conditions by continuously drawing amps from the batteries until voltage drops to 1.75 volts per cell.

- V-Glide 36 volt vehicle draws 75 amps until batteries drop to 31.5 volts.
- PowerDrive System 48 vehicle draws 56 amps until batteries drop to 42.0 volts.

The discharge test is the hardest test on the batteries and the most time-consuming to perform. Use the battery discharge tester (CLUB CAR Part No.1018319-01). This discharge tester can be used on both V-Glide 36 volt vehicles and PowerDrive System 48 vehicles.

Performing the Discharge Test

- 1. Be sure that the batteries are fully charged and that the electrolyte level is correct in all cells.
- 2. Connect the tester leads to the positive (+) post of battery No.1 and negative (-) post of battery No. 6 (See Figure 22-10 for V-Glide 36 volt vehicle; Figure 22-11 for PowerDrive System 48 vehicle).



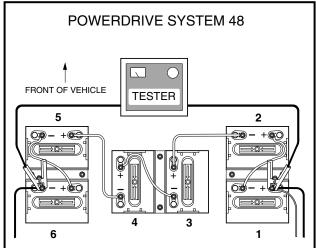


FIGURE 22-10 FIGURE 22-11

A DANGER

- ALWAYS WEAR FULL FACE SHIELD AND GLOVES WHEN WORKING WITH BATTERIES.
- BATTERY EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VENTILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.
- BATTERY POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:
 - EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.
 - INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.
 - EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.

A WARNING

- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY BEFORE SERVICING.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- 3. Check and record the electrolyte temperature of the battery packs.
- V-Glide 36 volt vehicle check center cell of each battery.
- PowerDrive System 48 vehicle check cell No. 2 of each battery.
- 4. Reset discharge machine (or reset timer if using older discharge machine with 36 volt vehicle)
- 5. Turn the tester on.
- 6. When the batteries have been discharging for approximately 60 minutes, set the discharge machine to function 3 and check voltage of the battery set. Check battery set voltage every 10 minutes from this point through the rest of the test. As soon as the battery set voltage reaches .50 volts above shut-off point (31.5 volts for V-Glide 36 volt vehicles, and 42.0 volts for PowerDrive System 48 vehicles), use a VOM to measure individual battery voltages. Measure and record the voltage of each battery to the nearest .01 volt.

NOTE

THE TESTER WILL SHUT OFF AUTOMATICALLY WHEN SHUT-OFF VOLTAGE IS REACHED.

Interpreting Discharge Test Results

- 1. If discharge time is 60 minutes or higher, the problem is not with the batteries.
- 2. If discharge times are low (less than 60 minutes), replace all batteries below 5.0 volts (36 V) or below 6.7 volts (48 V).

V-Glide 36 Volt Vehicle

BATT	BATTERY VOLTAGES					
1	1 2 3 4 5 6		6	BATTERY CONDITION		
5.25	5.25	5.25	5.25	5.25	5.25	EXCELLENT
5.3	5.3	5.4	4.9	5.3	5.3	BATTERY NO. 4 IS NEAR END OF USEFUL LIFE
5.4	5.4	5.0	5.5	4.7	5.5	BATTERIES NO. 3 AND NO. 5 ARE NEAR END OF USEFUL LIFE

PowerDrive System 48 and PowerDrive Plus Vehicles

BATTERY VOLTAGES						
1	1 2 3 4 5 6		6	BATTERY CONDITION		
7.00	7.00	7.00	7.00	7.00	7.00	EXCELLENT
7.07	7.07	7.22	6.50	7.07	7.07	BATTERY NO. 4 IS NEAR END OF USEFUL LIFE
7.20	7.20	6.67	7.33	6.27	7.33	BATTERIES NO. 3 AND NO. 5 ARE NEAR END OF USEFUL LIFE

3. In general, cars that discharge in less than 60 minutes at 78°F on the discharge test will not normally make 36 holes. However, discharge time is dependent on the electrolyte temperature. The table shown gives the discharge times at various temperatures of a set of batteries that delivers 62 minutes at 80°F.

ELECTROLYTE TEMP. °F	DISCHARGE TIME TO SHUT-OFF POINT	ELECTROLYTE TEMP. °F	DISCHARGE TIME TO SHUT-OFF POINT
40 - 49	40 Minutes	85 - 89	64 Minutes
50 - 59	45 Minutes	89 - 99	66 Minutes
60 - 64	50 Minutes	100 - 109	68 Minutes
65 - 69	54 Minutes	110 - 119	70 Minutes
70 - 74	57 Minutes	120 - 129	72 Minutes
75 - 79	60 Minutes	130 - 150	74 Minutes
80 - 84	62 Minutes		

Battery Troubleshooting Examples

A few examples of troubleshooting battery problems should clarify the procedure.

Example 1

Car No. 68 was suspected of having a bad battery due to its performance. As a result, the battery charger test was performed. After a full charge, the battery charger ammeter read 8.0 amps. Next, the on-charge voltage test was performed and the following results were recorded:

V-Glide 36 Volt Vehicle

BATTERY NO.	1	2	3	4	5	6
ON-CHARGE VOLTAGE	7.61	7.95	7.36*	7.62	7.92	7.96



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Battery Troubleshooting Examples, Continued:

PowerDrive System 48 Vehicle

BATTERY NO.	1	2	3	4	5	6
ON-CHARGE VOLTAGE	10.15	10.60	9.80*	10.16	10.56	10.61

^{*}Battery No. 3 appears to be suspect. Batteries No. 1 and No. 4 are also suspect. Next, a hydrometer test should be conducted on all batteries.

Hydrometer test results were as follows:

V-Glide 36 Volt Vehicle

BATTERY NO.	1	2	3	4	5	6
	SPECIFIC GRAVITY					
POSITIVE POST CELL	1.200*	1.265	1.300	1.250	1.280	1.260
CENTER CELL	1.285	1.275	1.290	1.270	1.295	1.265
NEGATIVE POST CELL	1.275	1.270	1.285	1.265	1.275	1.275

PowerDrive System 48 Vehicle

BATTERY NO.	1	2	3	4	5	6	
	SPECIFIC GRAVITY						
CELL 1 (POSITIVE POST)	1.200*	1.265	1.300	1.250	1.280	1.260	
CELL 2	1.285	1.275	1.290	1.270	1.295	1.265	
CELL 3	1.265	1.270	1.275	1.265	1.280	1.275	
CELL 4 (NEGATIVE POST)	1.275	1.270	1.285	1.265	1.275	1.275	

^{*}After the hydrometer test, it appears that battery No. 1 is the problem.

V-Glide 36 Volt Vehicle

BATTERY NO.	1	2	3	4	5	6
DISCHARGE VOLTAGE	4.08*	5.50	5.80	5.36	5.57	5.56

PowerDrive System 48 Vehicle

BATTERY NO.	1	2	3	4	5	6
DISCHARGE VOLTAGE	5.44*	7.33	7.73	7.15	7.43	7.41

^{*}After a discharge test which lasted 65 minutes, battery No. 1 is clearly shown to be the problem. Battery No. 4 should be watched a little more closely but appears to be okay. Battery No. 1 should be changed out with a battery that has about the same age and usage as the other batteries.

Example 2

Car No. 70 was also suspected of having a bad battery due to its performance. The battery charger test showed 7.0 amps after a full charge. After confirming that there were no problems with the electrical system, charger or brakes, the on-charge voltage was recorded as follows:

BATTERY NO.	1	2	3	4	5	6
ON-CHARGE VOLTAGE	7.86	7.33*	7.90	7.93	7.91	7.75

PowerDrive System 48 Vehicle

BATTERY NO.	1	2	3	4	5	6
ON-CHARGE VOLTAGE	10.48	9.77*	10.53	10.57	10.55	10.33

^{*}Battery No. 2 was immediately suspected as the problem. After checking No. 2 with a hydrometer, this was clearly the case with the negative post cell completely dead. Battery No. 2 should therefore be replaced with a battery that has the same age and usage as the other batteries.

BATTERY STORAGE

When storing batteries during the off-season or maintaining a replacement stock, follow these guidelines to keep batteries in good condition.

V-Glide 36 Volt Vehicles

- 1. Keep the batteries clean and free of corrosion as outlined in the Battery Care section.
- 2. Batteries should be wired in series so they can be connected to the charger. Batteries that are in cars for winter storage can be left in the cars.
- 3. Fully charge the batteries prior to storage.
- 4. Store in a cool area. The colder the area in which the batteries are stored, the less the batteries will self-discharge. Batteries stored at 0°F will discharge very little over a four-month period. Batteries stored at 80°F will have to be recharged every few weeks.
- Check the state of charge periodically. Batteries that are discharged and left in a cold environment can freeze and crack. If the specific gravity drops below 1.220, the batteries should be recharged. See the chart below.

SPECIFIC GRAVITY	FREEZING POINT		
1.260	-70°F		
1.230	-39°F		
1.200	-16°F		
1.170	-2°F		
1.110	+17°F		

6. The frequency of recharging required will depend on the temperature of the storage area, but it is recommended that the batteries be monitored for state of charge every month. Also, if the storage area is unheated in a cold climate and recharge is required, it is recommended that the area be heated to at least 60°F prior to charge. Batteries do not charge effectively in cold temperatures for the same reasons that they do not discharge as rapidly in cold temperatures.

PowerDrive System 48 and PowerDrive Plus Vehicles:

- 1. Keep the batteries clean and free of corrosion as outlined in the Battery Care Section.
- 2. Batteries should be wired in series so they can be connected to the charger. Batteries that are in cars for winter storage can be left in the cars.

PowerDrive System 48 and PowerDrive Plus Vehicle Storage, Continued:

- 3. Fully charge the batteries prior to storage.
- 4. Store in a cool area. The colder the area in which the batteries are stored the less the batteries will self-discharge. Batteries stored at 0°F will discharge very little over a four-month period. Batteries stored at 80°F will have to be recharged every few weeks.
- 5. DS Electric vehicles with PowerDrive System 48 and PowerDrive Chargers are designed to be left connected, with AC power to the charger on, during off-season storage. The PowerDrive storage charge feature will automatically charge the batteries as needed throughout the storage period.

CHARGING BATTERY PACK WITH LOW VOLTAGE

WARNING

- ONLY TRAINED TECHNICIANS SHOULD ATTEMPT TO REPAIR OR SERVICE THIS CHARGER.
 ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD FOLLOW THE CORRECT PROCEDURES AND HEED THE WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE CAR.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FORM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.
- TURN KEY OFF, PLACE FORWARD AND REVERSE SWITCH IN THE NEUTRAL POSITION, AND REMOVE THE KEY PRIOR TO SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- 1. Turn the key switch off and place the forward and reverse switch in neutral. Leave the batteries connected and leave the Z plug connected to the controller.
- 2. If battery pack voltage is reading below 34 volts, the charger will not activate. The charger relay will have to be by-passed in order for the charger to turn on.
- 3. Disconnect the DC cord from the charger receptacle and unplug the AC cord from the electrical outlet.
- 4. Remove the eight screws securing the charger cover and remove the cover from the charger.
- 5. Inside the charger, locate the black wire (3) that goes from the circuit breaker to the relay and disconnect it from the circuit breaker terminal. Make sure this wire does not touch the charger housing or any other charger components (Figure 23-31, Page 23-43 and Figure 23-36, Page 23-50).
- 6. Disconnect the transformer wire (4) from the relay and then connect this wire to the open terminal on the circuit breaker (Figure 23-31, Page 23-43 and Figure 23-36, Page 23-50).
- 7. Plug the DC cord into the charger receptacle first, and then plug the AC cord into an electrical outlet.
- 8. The charger should turn on and begin to charge the batteries. Allow the charger to operate for one or two hours.
- 9. After one or two hours, disconnect the charger AC cord from the electrical outlet *first*. Then disconnect the DC cord from the charger receptacle in the vehicle.
- 10. Disconnect the transformer wire from the circuit beaker and connect it to the relay. Reconnect the short black wire from the relay to the circuit breaker.
- 11. Install the charger cover and the eight retaining screws.
- 12. Plug the DC cord into the charger receptacle and plug the AC cord into an electrical outlet.
- 13. Allow the charger to continue charging the batteries until the charger shuts of automatically.

A WARNING

• DO NOT LEAVE THE VEHICLE UNATTENDED WHILE IT IS CHARGING. THE CHARGER OPERATING WITH A BYPASSED RELAY COULD SHORT AND POSSIBLY CAUSE A FIRE.

SECTION 23 A - ACCU-POWER BATTERY CHARGER

NOTE

• THIS SECTION APPLIES TO ALL 36 VOLT VEHICLES USING THE ACCU-POWER CHARGER. FOR 48 VOLT VEHICLES USING THE POWERDRIVE CHARGER, SEE PAGE 23-27.

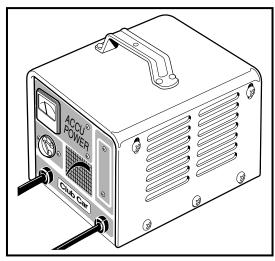


FIGURE 23-1

GENERAL INFORMATION

Each Club Car V-Glide 36 volt electric vehicle is equipped with a fully automatic Accu-Power battery charger. There are no knobs to turn or buttons to push. The charger will turn on two to five seconds after it is plugged in, and it will automatically shut off when the batteries are fully charged. The charger automatically compensates for a variable AC voltage between 105 to 128 volts supply and also tapers the charge rate for longer battery life.

Charging time depends on the age of the batteries and on the amount of use they have experienced. The charger compensates for these factors by measuring the voltage increase versus time, and shuts off when the batteries are fully charged. As long as the charger is allowed to shut off by itself, overcharging and undercharging should be prevented (**Figure 23-1**). See WARNING below and CAUTION at top of page 23-2.

WARNING

- STUDY AND BECOME FAMILIAR WITH THE WIRING AND TERMINOLOGY OF THE CHARGER BEFORE ATTEMPTING ANY REPAIR TO THE CHARGER (FIGURE 23-2 AND 23-3, PAGE 23-2).
- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING THE CHARGER.

A CAUTION

 DO NOT LEAVE THE DC CORD PLUGGED INTO A VEHICLE RECEPTACLE WHILE UNAT-TENDED FOR MORE THAN TWO DAYS IN A ROW. SEVERE OVERHEATING AND DAMAGE TO THE BATTERIES MAY RESULT IF THE CHARGER DOES NOT TURN OFF.

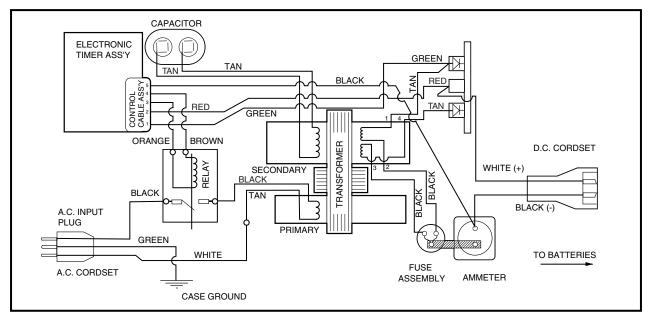


FIGURE 23-2

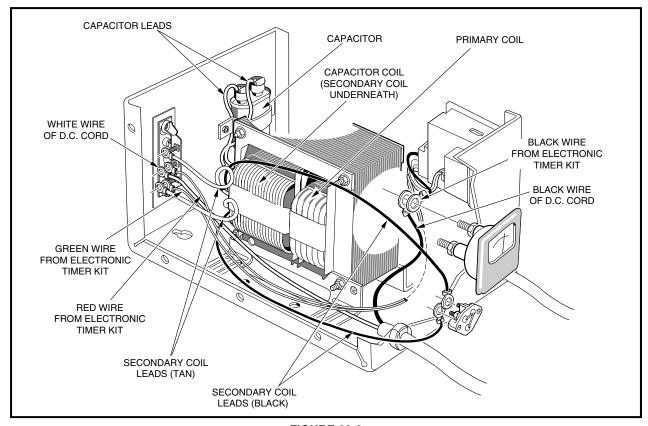


FIGURE 23-3

THE CHARGE CIRCUIT

23A

The charge circuit in the vehicle consists of the charger receptacle, receptacle fuse link, and the batteries. The negative terminal of the receptacle is connected to the No. 6 battery by a 10 gauge white wire, and the positive terminal of the receptacle is connected to the fuse link. A wire from the receptacle fuse link connects to a post on the forward and reverse switch where it joins a 6 gauge red wire from the No. 1 battery.

If the a charger operates properly with one vehicle, but will not operate properly with another, check this path to be sure that the receptacle fuse link is not blown and that all connections, including battery connections, are clean and tight (Figure 23-4).

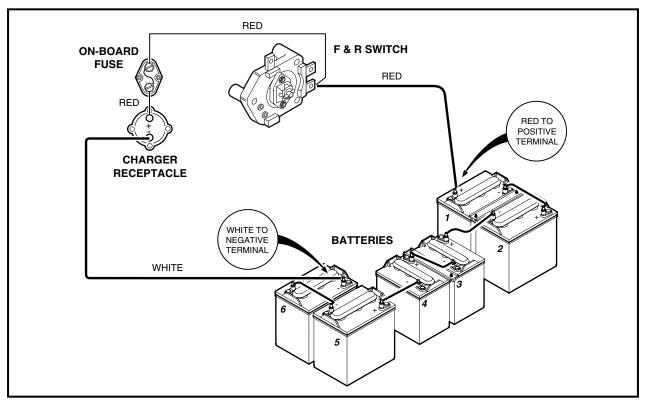


FIGURE 23-4

CHARGER INSTALLATION AND USE

The AC line to which the charger is to be connected must be capable of supplying at least 15 amperes to each charger.

A WARNING

 EACH CHARGER SHOULD HAVE ITS OWN 15 OR 20 AMPERE BRANCH CIRCUIT PROTECTION (CIRCUIT BREAKER OR FUSE), IN ACORDANCE WITH THE NATIONAL ELECTRICAL CODE ANSI/NFPA 70, AND LOCAL CODES AND ORDINANCES. IMPROPER AC SUPPLY CIRCUIT PROTECTION MAY RESULT IN A FIRE.

To reduce the risk of electric shock, this battery charger must be grounded. The charger is equipped with an AC electric cord having an equipment-grounding conductor and a grounding type plug. It is for use on a nominal 120 volt, 60 hertz circuit. The AC plug must be connected to an appropriate receptacle that is properly installed and grounded in accordance with the National Electric Code and all local codes and ordinances.



Charger Installation and Use, Continued:

The use of an extension cord with the charger is not recommended. If an extension cord must be used, use a three conductor No. 12 AWG cord with ground, properly wired and in good electrical condition. Keep it as short as possible (no more than twelve feet). Locate all cords so that they will not be stepped on, tripped over, or otherwise subject to damage or stress. See WARNING at the top of page 23-5.

A WARNING

- DO NOT USE AN ADAPTER TO PLUG THE CHARGER WITH A THREE-PRONG PLUG INTO A TWO-PRONG OUTLET. IMPROPER CONNECTION OF THE EQUIPMENT-GROUNDING CON-DUCTOR CAN RESULT IN A FIRE OR AN ELECTRICAL SHOCK.
- AN EXTENSION CORD OR ELECTRICAL OUTLET MUST ACCEPT A THREE-PRONG PLUG. THE USE OF IMPROPER EXTENSION CORD COULD RESULT IN FIRE OR AN ELECTRICAL SHOCK.
- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THE CHARGER. CONTACT YOUR NEAREST CLUB CAR DISTRIBUTOR/DEALER.
- DO NOT OPERATE THE CHARGER IF IT HAS RECEIVED A SHARP BLOW, WAS DROPPED, OR OTHERWISE DAMAGED IN ANY WAY. CHECK IT TO BE SURE THAT IT IS OPERATING PROP-ERLY BEFORE PUTTING IT BACK IN USE.

Provide adequate ventilation for the charger. Keep all charger ventilation openings at least two inches away from walls and other objects.

WARNING

- DO NOT ALLOW CLOTHING, BLANKETS, OR OTHER MATERIALS TO COVER THE CHARGER.
- DO NOT USE NEAR FUELS, GRAIN DUST, SOLVENTS, THINNER, OR OTHER FLAMMABLES. CHARGERS CAN IGNITE FLAMMABLE MATERIALS AND VAPORS.
- KEEP CHARGER DRY DO NOT EXPOSE TO RAIN OR ANY LIQUID. FOR STORAGE, KEEP THE CHARGER INDOORS.

NORMAL CHARGER OPERATION

WARNING

- DO NOT USE THIS CHARGER IF:
 - THE PLUG IS TOO LOOSE OR DOES NOT MAKE A GOOD CONNECTION.
 - THE PLUG AND/OR RECEPTACLE FEEL HOTTER THAN NORMAL DURING CHARGE.
 - THE PLUG BLADES OR RECEPTACLE CONTACTS ARE BENT OR CORRODED.
 - THE PLUG, RECEPTACLE, OR CORDS ARE CUT, WORN, HAVE ANY EXPOSED WIRES, OR ARE DAMAGED IN ANY WAY.
- USING THE CHARGER WITH ANY OF THE ABOVE CONDITIONS COULD RESULT IN A FIRE, PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH. REPAIR OR REPLACE WORN OR DAM-AGED PARTS BEFORE USING THE CHARGER.
- DO NOT ROCK OR BEND THE PLUG. TO CONNECT THE CHARGER PLUG TO THE VEHICLE RECEPTACLE, GRASP THE PLUG (NOT THE CORD) AND PUSH IT STRAIGHT INTO THE RECEPTACLE.
- TO DISCONNECT THE CHARGER PLUG FROM THE VEHICLE, GRASP THE PLUG (NOT THE CORD) AND PULL IT STRAIGHT OUT OF THE RECEPTACLE. DO NOT PULL ON THE CORD. DO NOT TWIST, ROCK, OR BEND THE PLUG SIDEWAYS.

A WARNING

- CHARGE BATTERIES ONLY IN A WELL-VENTILATED AREA.
- DO NOT LEAVE THE DC CORD PLUGGED INTO A VEHICLE RECEPTACLE WHILE UNATTENDED FOR MORE THAN TWO DAYS IN A ROW. SEVERE OVERHEATING AND DAMAGE TO THE BATTERIES MAY RESULT IF THE CHARGER DOES NOT TURN OFF. CONNECT CHARGER ONLY TO A PROPERLY GROUNDED SINGLE PHASE (3 WIRE) OUTLET.
- 1. With the charger DC output cord disconnected from the batteries, connect the power supply cord to a 120 volt, 60 hertz outlet.

A WARNING

- EACH CHARGER SHOULD HAVE ITS OWN 15 OR 20 AMPERE BRANCH CIRCUIT PROTECTION (CIRCUIT BREAKER OR FUSE), IN ACORDANCE WITH THE NATIONAL ELECTRICAL CODE ANSI/NFPA 70, AND LOCAL CODES AND ORDINANCES. IMPROPER AC SUPPLY CIRCUIT PROTECTION MAY RESULT IN A FIRE.
- Connect the charger DC plug to the charger receptacle located on the seat support panel near the driver's knee (Figure 23-5). The charger will turn on automatically within 2 to 5 seconds after the DC plug is connected.

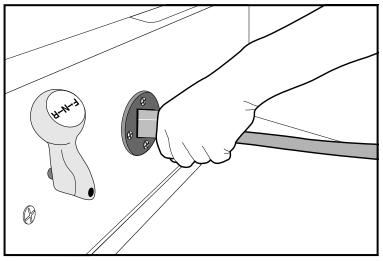


FIGURE 23-5

3. Monitor the ammeter for the correct charge rate. The initial charge rate will vary from 16 to 25 amps, depending upon the condition and depth of discharge of the batteries. Slight variations in the initial charge rate may also result from AC line input voltages which are higher or lower than 120 volts. Higher line voltages increase the initial charge rate and lower line voltages reduce the initial charge rate.

NOTE

• WHEN AIR TEMPERATURES FALL BELOW 65°F (18.3°C), BATTERIES CHARGED IN UNHEATED AREAS SHOULD BE PLACED ON CHARGE AS SOON AS POSSIBLE AFTER USE. BATTERIES ARE WARMEST IMMEDIATELY AFTER USE, AND COLD BATTERIES REQUIRE MORE TIME TO CHARGE FULLY.

A DANGER

 HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRICAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.

SYMPTOM		SSIBLE CAUSES	REFER TO	
Relay does not close, no transformer	1)	Batteries disconnected.	Figure 23-4, Page 23-3.	
hum and ammeter does not move.	2)	Battery voltage is too low.	Test Procedure 1.	
	3)	Poor connection between plug and receptacle.	Test Procedure 1.	
	4)	DC plug and cord.	Test Procedures 1 and 5.	
	5)	Electronic Timer Kit malfunction.	Test Procedure 2.	
	6)	On-board receptacle fuse link is blown.	Page 23-21.	
. Relay closes with an audible click but	1)	Improper AC outlet voltage.	Test Procedure 3.	
no transformer hum and ammeter does not move.	2)	Failed AC plug and cord.	Test Procedure 3.	
	3)	Improper wiring of Electronic Timer Kit.	Figure 23-2, Page 23-2.	
	4)	Transformer primary coil.	Test Procedure 7.	
	5)	Relay.	Test Procedure 9.	
Relay closes and transformer hums	1)	Blown charger fuse.	Test Procedure 4-B.	
but ammeter does not move.	2)	Both diodes failed.	Test Procedure 4-B.	
	3)	Failed capacitor.	Test Procedure 6.	
	4)	Failed transformer.	Test Procedure 7.	
	5)	Defective charger relay.	Test Procedure 8.	
	6)	Failed ammeter.	Test Procedure 9.	
Single charger fuse link blows.	1)	Diode failed.	Test Procedure 4-A.	
	2)	Loose internal fuse connection.		
tacle fuse link blows.	1)	Battery is wired in reverse polarity.	Test Procedure 4-B.	
	2)	DC cord is wired in reverse polarity.	Test Procedure 4-B.	
	3)	Both diodes failed.	Test Procedure 4-B.	

	ACCU-POWER BATTERY CHARGER TROUBLESHOOTING GUIDE						
SYMPTOM		PO	SSIBLE CAUSES	REFER TO			
6.	Charger output is low.	1)	One diode failed.	Test Procedure 4-A			
		2)	Transformer coil short-circuit failure.	Test Procedure 7			
7.	Charger turns off too soon.	1)	AC power supply was shut off.	Test Procedure 3			
		2)	Batteries may be fully charged.	Test Procedure 8			
8.	Charger does not turn off.	1)	Electronic Timer Kit has failed.	Test Procedure 2			
		2)	Electronic Timer Kit is improperly wired.	Test Procedure 2			
		3)	Bad battery.	Section 22, Batteries			
9.	AC line fuse or circuit breaker blows.	1)	Electronic Timer relay.	Test Procedure 2 or 9			
		2)	AC plug or cord is shorted.	Test Procedure 9			
		3)	Failed transformer.	Test Procedure 7			

TEST PROCEDURES

GENERAL

The charger uses DC battery voltage to close the charger relay that activates the charger AC circuit. When the charger is operating properly, there is a 2 to 5 second delay after the DC cord is plugged into the vehicle before the relay closes. This delay allows time for the DC plug to make a secure connection with the receptacle before the AC circuit is activated and AC power is supplied to the primary coil of the transformer. When the relay closes an audible "click" can be heard, and then as power is supplied, the transformer should hum and the ammeter should indicate the charge rate.

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE VEHICLE OR CHARGER.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FROM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.

TEST PROCEDURE 1

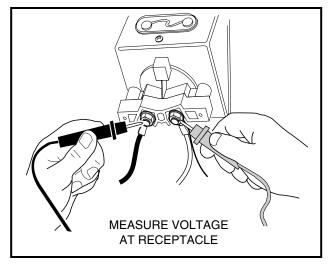
Battery Voltage is Too Low or Bad DC Plug Connection:

- 1. Check the DC plug and the receptacle for damage, dirt, corrosion, etc., that might prevent a good electrical connection.
- 2. Measure the voltage at the receptacle using a volt/ohm meter (Figure 23-6, Page 23-8).
- 3. Measure battery terminal voltage between the postive post on battery No. 1 and the negative post on battery No. 6 (Figure 23-7, Page 23-8). The voltage reading should be the same as at the receptacle.

NOTE

• TO CLOSE THE CHARGER RELAY, BATTERY VOLTAGE MUST BE BETWEEN 24 AND 50 VOLTS.

Test Procedure 1, Continued:



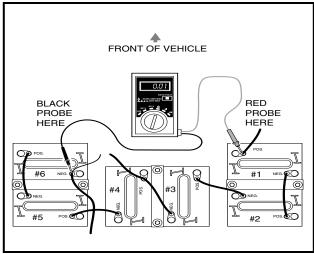


FIGURE 23-6 FIGURE 23-7

4. If the voltage readings obtained at the receptacle and at the batteries are not the same, check the wire connections at the receptacle and at the batteries. If the DC voltages are the same and within limits, make sure the AC cord is disconnected, then plug the DC cord into the charger receptacle, and remove the charger cover. If the charger is properly wired, you should read the same voltage inside the charger where the white and black wires of the DC cord are attached (Figures 23-2 and 23-3, Page 23-2). If the battery DC voltage measured inside the charger is below the limits or not present, the DC plug or cordset may have an internal break and should be replaced (See Test Procedure 9). See DANGER below.

A DANGER

 HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRI-CAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.

TEST PROCEDURE 2

Electronic Timer Kit:

Connect the charger AC plug to an outlet, then connect the DC plug to the vehicle. After a 2 to 5 second delay, the charger should start. If the charger starts immediately (no 2 to 5 second delay), the Electronic Timer Relay has failed.

WARNING

- UNPLUG THE ELECTRICAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE DC RECEPTACLE BEFORE PROCEEDING WITH THIS PROCEDURE.
 - 2.1. Remove the cover from the charger.
 - 2.2. Locate and carefully remove the two black wires connected to the contact terminals of the relay.
 - 2.3. Place a jumper wire (14 AWG minimum) between the two black wires (Figure 23-13, Page 14).
 - 2.4. The power supply cord is now connected directly to the primary transformer coil and the transformer should hum when the AC cord is plugged into a live outlet.
 - 2.5. Charger operation may now be checked by connecting the DC plug into the receptacle, and then connecting the AC cord into an outlet. If normal charging current is indicated on the ammeter, the electronic timer and/or the relay is defective and must be replaced (See Test Procedure 9 for relay testing).

A CAUTION

- DO NOT CHARGE BATTERIES WITH THE ELECTRONIC TIMER KIT BYPASSED. IF THE TIMER KIT IS BYPASSED, THE CHARGER WILL REMAIN ON AS LONG AS THE AC CORD IS PLUGGED INTO AN OUTLET. SEVERE OVERCHARGING AND EVENTUAL DAMAGE TO THE BATTERIES WILL RESULT.
 - 2.6. If the transformer does not hum and the ammeter still does not register with the relay bypassed, a continuity check of the charger AC circuit is necessary (See Test Procedure 3).

TEST PROCEDURE 3

AC Power and Continuity Check of AC Circuit:

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRICAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.
- 1. Check to be sure that the AC cord is securely plugged into a live AC outlet.
- 2. Check the AC line fuse or circuit breaker in the storage facility.
- 3. Insert the probes of a VOM, set at 500 VAC, into the AC outlet to check incoming AC voltage. A reading of 105 to 128 volts should be obtained.
- 4. If AC power is present, unplug AC power cord from the outlet and unplug the DC cord from the vehicle receptacle. If AC power is not present, have a licensed electrical contractor check the building wiring and service panel.



Test Procedure 3, Continued:

- 5. Check continuity of the AC circuit:
 - 5.1. Carefully disconnect the two black wires attached to the contact terminals of the relay.
 - 5.2. Connect a jumper wire between the two black wires.
 - 5.3. With the relay bypassed, check the circuit across the AC cord plug blades (Figure 23-8).
 - 5.4. If the reading is no continuity, check the wiring of the AC cord, the transformer primary coil leads, and the jumper wire. If the charger is wired correctly, check individually the continuity of the AC cord, the transformer primary coil, and the jumper wire.

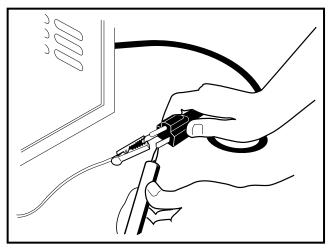


FIGURE 23-8

TEST PROCEDURE 4 - DIODES

A DANGER

• HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRI-CAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.

Use Test Procedure 4-A for single diode failures and testing of diodes. If both diodes have failed, use Test Procedure 4-B.

Test Procedure 4A - Single Diode Failure:

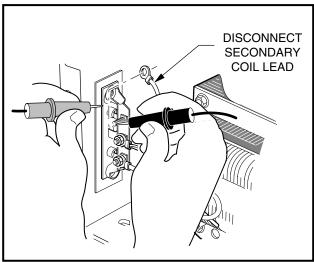
A single diode failure is indicated by the blowing of one fuse link (short circuited diode) or by low charger output (open circuit diode). If a diode has failed, the entire heat sink assembly must be replaced. To check the diodes:

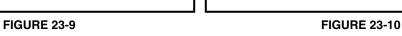
E

- 1. Unplug the AC cord from its outlet and unplug the DC cord from vehicle receptacle.
- 2. Disconnect one transformer secondary coil lead from the diode terminal (Figure 23-2, Page 23-2).
- 3. Using a low voltage continuity tester, place one tester probe on the diode mounting plate and the other probe on a diode terminal and note the reading (Figure 23-9).
- 4. Reverse the tester probes and check each diode again (Figure 23-10). A diode is designed to conduct current in only one direction. If a diode shows continuity in both directions, the complete heat sink assembly with diodes must be replaced. If a diode shows no continuity in either direction, the complete heat sink assembly must be replaced.
- 5. Check all three fuse connections inside the charger to be sure that they are clean and tight. It is possible that a loose internal fuse connection could create enough heat to cause a single fuse link to melt. The proper torque on all fuse link connections is 20 in.lbs. (2.3 N-m).
- 6. Be sure that the charger is wired properly and that all connections are clean and tight.

A CAUTION

• IF CONNECTIONS ARE NOT CLEAN AND TIGHT, EXCESSIVE HEAT WILL BE CREATED AND THE CHARGER MAY BE DAMAGED.

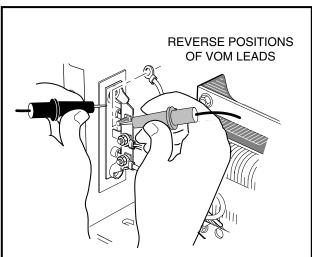




Test Procedure 4B - Both Diodes Failed:

Use Test Procedure 4A to test diodes. If both diodes have failed closed (shorted), both charger fuse links will be blown. If both diodes have failed open, the relay will close and the transformer will hum, but the ammeter will indicate *no* output. If both diodes have failed open or have shorted, the entire heat sink assembly must be replaced. The following steps should be used to determine why both diodes failed:

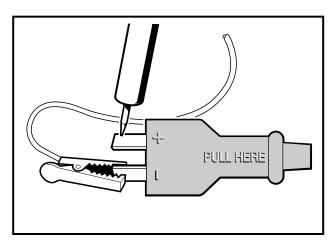
1. Check the batteries and the receptacle to be sure that they are wired in the correct polarity. Use a multimeter to check the voltage and polarity at the receptacle.





Test Procedure 4B, Continued:

- 2. Make sure the charger DC plug is wired correctly. The white wire should be connected to the center terminal of the heat sink assembly and the black wire should be connected to the left side of the ammeter when viewed from inside the charger. Whether the AC cord is plugged into an outlet or not, both fuse links will blow if a reversed polarity connection is made between the charger and the batteries.
- 3. Although it is a rare occurrence, both diodes may fail as the result of a lightning strike at the charging location.
- 4. Excessive heat due to a loose connection could also cause both fuse links to melt. Be sure fuse connections are tightened to 20 in.lbs. (2.2 N-m).
- 5. Make sure that the charger is wired properly and that all connections are clean and tight.



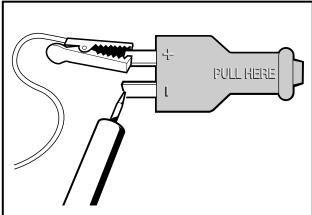


FIGURE 23-11

FIGURE 23-12

TEST PROCEDURE 5

Continuity Test of Charger DC Circuit:

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRI-CAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.
- 1. Connect the probes of a continuity tester (Club Car Part No. 1011273) to the blades of the charger DC plug and note the reading (Figure 23-11).
- 2. Reverse the probes (Figure 23-12) and note the reading.
- 3. Continuity should be observed in only one direction. If the circuit shows no continuity in either direction and the fuse is good, check individually the continuity of the DC plug and cord (Test Procedure 9), the ammeter (Test Procedure 9), the diodes (Test Procedure 4A), and all connections.
- 4. If the circuit shows continuity in both directions, a "short" exists in the charger DC circuit, probably caused by "shorted" diodes (See Test Procedure 4). If the diodes are not shorted, check the DC output cord for a "short" between the two wires (Test Procedure 9).
- 5. If the test shows that the charger DC circuit is good, check the capacitor (Test Procedure 6).

TEST PROCEDURE 6

Capacitor:

A DANGER

• HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.

A CAUTION

- TO AVOID BREAKING WIRES, DISCONNECT CAPACITOR LEADS CAREFULLY.
- 1. Disconnect both transformer coil leads from the capacitor terminals.
- 2. Place the probes of a multimeter, set to ohms (Ω) , on the capacitor terminals and note the reading.
- 3. Reverse the probes and note the reading.
- 4. Interpret the readings as follows:
- Good Capacitor When the multimeter probes are connected to the capacitor terminals, the meter needle jumps to mid-scale and rapidly moves to high resistance (∞).
- Open Capacitor When the multimeter leads are connected to the capacitor terminals, the meter needle does not move and stays at high resistance (∞). A bulge in the top of the capacitor may be visible if the capacitor has failed "open".
- **Shorted Capacitor** When the multimeter probes are connected to the capacitor terminals, the meter needle jumps immediately to zero ohms and remains there.
- 5. If the capacitor is open or shorted, it must be replaced.

WARNING

• USE A CLUB CAR CAPACITOR (PART NO. 1015910) ONLY. THE USE OF A DIFFERENT VALUE CAPACITOR MAY RESULT IN IMPROPER CHARGING, CAPACITOR FAILURE, TRANSFORMER BURNOUT, AND/OR BATTERY DAMAGE.

TEST PROCEDURE 7

Transformer:

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRI-CAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.



Test Procedure 7 - Transformer, Continued:

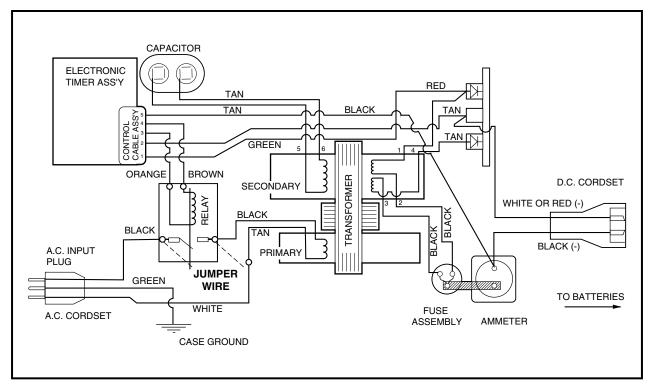


FIGURE 23-13

Failure of the transformer could be caused by natural aging or premature shorting of adjacent coil turns. If the transformer has failed, a low or complete absence of output would be observed on the ammeter even though the transformer might hum. A failed transformer could cause an AC line fuse to blow or a circuit breaker to trip in the storage facility. To check the transformer:

- Disconnect the transformer secondary coil leads No. 1 and No. 4 from the diode terminals (Figure 23-13). See DANGER below.
- Disconnect the transformer capacitor coil leads No. 5 and No. 6 from the capacitor terminals. See DAN-GER and CAUTION below.

DANGER

- DO NOT ALLOW THE SECONDARY COIL LEADS TO TOUCH EACH OTHER. THERE ARE APPROXIMATELY 61 VOLTS AC PRESENT.
- DO NOT ALLOW THE CAPACITOR COIL LEADS TO TOUCH EACH OTHER. THERE ARE APPROXIMATELY 650 VOLTS AC PRESENT.
- HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.

A CAUTION

- TO AVOID BREAKING WIRES, DISCONNECT CAPACITOR LEADS CAREFULLY.
- 3. In order to supply AC power directly to the transformer coil, the relay must be bypassed. Refer to the Test Procedure 2.

- 23A
- 4. Make sure that the capacitor coil leads and the secondary coil leads are not touching one another. Then, with the relay by-passed, plug the AC cord into an outlet. If the AC line fuse blows or the circuit breaker trips, the transformer is shorted internally and must be replaced.
- 5. If this does not occur, use a multimeter to check the transformer secondary voltage across leads No. 1 and No. 4, and the capacitor coil voltage across leads No. 5 and No. 6 (Figure 23-13). If the measured voltages are approximately 48 volts or lower for the secondary coil, or less than approximately 385 volts for the capacitor, the transformer is shorted internally and must be replaced.

A DANGER

- DO NOT ALLOW THE SECONDARY COIL LEADS TO TOUCH EACH OTHER. THERE ARE APPROXIMATELY 61 VOLTS AC PRESENT.
- DO NOT ALLOW THE CAPACITOR COIL LEADS TO TOUCH EACH OTHER. THERE ARE APPROXIMATELY 650 VOLTS AC PRESENT.
- 6. If the transformer output voltages are correct, disconnect the AC cord from the outlet and proceed as follows:
 - 6.1. Check the capacitor to be sure that its rating is 3 microfarads, 660 volts AC, and then carefully reconnect the capacitor coil leads No. 5 and No. 6 to the capacitor terminals.
 - 6.2. After making sure that the secondary coil leads are not touching one another, connect the AC cord to an outlet and measure the transformer secondary voltage across No. 1 and No. 4 leads.
 - 6.3. If the voltage reading is the same as the voltage reading in step 5 (which eliminates the capacitor from the circuit), the capacitor may be defective or the coil leads may not be making proper electrical contact (See Test Procedure 6). If the voltage readings are correct, both the transformer and the capacitor are good; refer to Test Procedure 5 for further tests of the DC circuit.

TEST PROCEDURE 8

Battery State of Charge Test:

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRICAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.
- When the charger has shut off after a charge cycle, disconnect and then reconnect the charger AC plug. The ammeter should jump to 18-22 amps and taper to below 12 amps within 15 minutes. If it tapers to below 12 amps within 15 minutes, the batteries are fully charged and the charger is functioning properly.
- 2. If the charger does not taper to below 12 amps within 15 minutes, the batteries may not be receiving a full charge and the Electronic Timer Kit should be checked (See Test Procedure 2).

NOTE

• OLD BATTERIES NEAR THE END OF THEIR USEFUL LIVES MAY NOT TAPER TO BELOW 12 AMPS (SEE BATTERIES, SECTION 22).

TEST PROCEDURE 9 - CONTINUITY TESTS

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRI-CAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.

AC Cord and Plug:

- 1. Disconnect the black wire of the AC cord from the contact terminal of the relay.
- 2. Disconnect the green wire from the charger case.
- 3. Connect the alligator clip of a continuity tester (Club Car Part No. 1011273) to the end of the black wire and check for continuity on both flat blades and on the ground blade of AC plug (Figure 23-14). Continuity should be shown on only one *flat* blade. If you read continuity on more than one blade or on *no* blade, the AC cord and plug must be replaced.
- 4. Attach the alligator clip to the end of the white wire and check for continuity on both flat blades and on the ground blade. Continuity should be shown on only one *flat* blade. If you read continuity on more than one blade or on no blade, the AC cord and plug must be replaced.
- 5. Attach the alligator clip to the end of the green wire and check for continuity on both flat blades and the ground blade of the AC plug. Continuity should be shown on only the *ground* blade. If you show continuity on the flat blades or show no continuity on the ground blade, the AC cord and plug must be replaced.

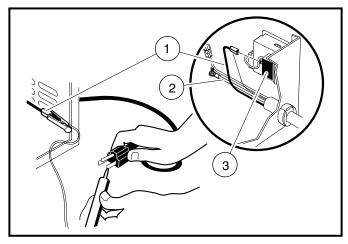


FIGURE 23-14

DC Cord and Plug:

- 1. Disconnect the black wire of the DC cord from the ammeter, and disconnect the white wire of the DC cord from the heat sink assembly.
- 2. Attach the alligator clip of the continuity tester to the white wire of the DC cord.
- 3. Place the probe of the continuity tester on the positive (+) blade of the DC plug (the positive and negative blades are identified on the plug). The reading should be continuity. If the reading is not continuity, the DC cord and plug must be replaced.

- 4. Place the probe of the tester on the negative (-) blade of the DC plug. The reading should be **no** continuity. If the reading is continuity, the cord and plug must be replaced.
- 5. Attach the alligator clip to the black wire of the DC cord and then place the probe on the negative (-) blade of the DC plug. The reading should be continuity. If reading shows no continuity, the cord and plug must be replaced.

23A E

Transformer:

The transformer has three coils that must be tested (Figure 23-16, Page 23-20).

- 1. Test the Primary Coil:
 - 1.1. Disconnect the transformer primary coil leads from the terminals.
 - 1.2. Place the continuity tester probes on the primary coil leads. The reading should be continuity. If the reading is *no* continuity, replace the transformer.
- 2. Test the Secondary Coil:
 - 2.1. Disconnect the transformer secondary coil lead from the upper terminal of the heat sink assembly.
 - 2.2. Disconnect the other transformer secondary coil lead from the upper terminal of the heat sink assembly, then place the tester probes on the secondary coil leads (tan wires). The reading should be continuity. If the reading is *no* continuity, replace the transformer. Be sure that the fuse is intact and not blown.

A DANGER

- DO NOT ALLOW THE SECONDARY COIL LEADS TO TOUCH EACH OTHER. THERE ARE APPROXIMATELY 61 VOLTS AC PRESENT.
- DO NOT ALLOW THE CAPACITOR COIL LEADS TO TOUCH EACH OTHER. THERE ARE APPROXIMATELY 650 VOLTS AC PRESENT.
- HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.
- 3. Test the Capacitor Coil:
 - 3.1. Disconnect the transformer capacitor coil leads from the capacitor terminals.
 - 3.2. Place the tester probes on the capacitor coil leads. The reading should be continuity. If the reading is *no* continuity, replace the transformer.

Relay:

WARNING

- BEFORE PERFORMING THIS TEST, MAKE SURE THAT THE AC PLUG IS **NOT** PLUGGED IN.
- 1. Disconnect the two black wires from the contact terminals of the relay.
- 2. Place the continuity tester probes on the contact terminals of the relay. The reading should be **no** continuity. If the tester shows continuity, the relay contacts are welded shut and the relay must be replaced.
- 3. Plug the DC cord into a vehicle receptacle (make sure the vehicle batteries are connected), then place the tester probes on the contact terminals of the relay. The reading should be continuity; if the tester shows *no* continuity, the relay must be replaced.

Ammeter:

- 1. Disconnect both black wires from the left (when viewed from inside the charger) ammeter post.
- 2. Attach the alligator clip of the tester to one of the ammeter posts.
- 3. Place the tester probe on the other ammeter post. The reading should be continuity. If the tester shows **no** continuity, the ammeter must be replaced.

PLUG AND RECEPTACLE REPLACEMENT

WARNING

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- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRI-CAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.

The charger DC cord and plug, and the charger receptacle on the vehicle are wear items that should be inspected daily. They *must* be replaced when worn or damaged. If the charger plug and receptacle show signs of corrosion or are becoming difficult to insert and remove, the receptacle contacts and plug blades can be cleaned with a good electrical contact cleaner or lightly sprayed with WD-40® brand spray lubricant.

TESTING THE RECEPTACLE

- 1. Inspect the receptacle for cracks, loose connections and frayed wiring.
- 2. Insert the tapered end of a test blade (Club Car Part No. 1013930) approximately 1-1/2 inches (38 mm) into one side of the receptacle, then withdraw the blade from the contact, pulling straight out from the receptacle.
- 3. Repeat for the other contact. Both contacts must grip the test blade well enough to create sufficient pressure (or drag) for an adequate electrical connection. If little or no drag is felt, the receptacle must be replaced.

CHARGER DC CORD REPLACEMENT

WARNING

- UNPLUG BOTH THE AC AND DC CORDS BEFORE WORKING ON THE CHARGER OR CHANG-ING CHARGER CORDS.
- DO NOT ROCK OR BEND THE PLUG. TO CONNECT THE CHARGER PLUG TO THE VEHICLE RECEPTACLE, GRASP THE PLUG (NOT THE CORD) AND PUSH IT STRAIGHT INTO THE RECEPTACLE.
- TO DISCONNECT THE CHARGER PLUG FROM THE VEHICLE, GRASP THE PLUG (NOT THE CORD) AND PULL IT STRAIGHT OUT OF THE RECEPTACLE. DO NOT PULL ON THE CORD. DO NOT TWIST, ROCK, OR BEND THE PLUG SIDEWAYS.
- FAILURE TO FOLLOW THESE INSTRUCTIONS COULD RESULT IN DAMAGE TO THE CHARGER CORD, THE PLUG, AND(OR) THE VEHICLE RECEPTACLE.
- DO NOT USE THIS CHARGER IF:
 - THE PLUG IS TOO LOOSE OR DOES NOT MAKE A GOOD CONNECTION.
 - THE PLUG AND/OR RECEPTACLE FEEL HOTTER THAN NORMAL DURING CHARGE.
 - THE PLUG BLADES OR RECEPTACLE CONTACTS ARE BENT OR CORRODED.
 - THE PLUG, RECEPTACLE, OR CORDS ARE CUT, WORN, HAVE EXPOSED WIRES, OR ARE DAMAGED IN ANY WAY.
- USING THE CHARGER WITH ANY OF THE ABOVE CONDITIONS COULD RESULT IN A FIRE, PROPERTY DAMAGE, OR PERSONAL INJURY. REPAIR OR REPLACE WORN OR DAMAGED PARTS BEFORE USING THE CHARGER.

Removing the DC Cord

- 1. Unplug the AC and DC cords.
- 2. Remove the charger cover.

A DANGER

- HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.
- 3. Disconnect the black lead of the DC cord from the ammeter by loosening the nut. Support the terminal as the nut is loosened to prevent rotation of the connection. Leave the black wire from the electronic timer on the terminal post.
- 4. Remove the nut that retains the white lead of the DC cord on the heat sink assembly. Leave the red wire from the electronic timer on the screw at the heat sink assembly.
- 5. Using pliers, squeeze the strain relief bushing and remove the cord set.

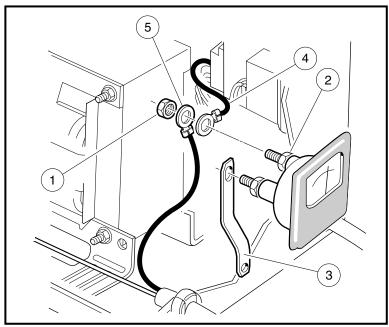


FIGURE 23-15

Installing the New DC Cord

- 1. Insert the leads of the new cord through the hole in the charger base.
- 2. Make sure the red wire of the electronic timer is on the middle terminal of the heat sink assembly, then place the white lead of the new cord on the terminal and tighten the nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 3. Make sure the black wire (4) of the electronic timer is on the ammeter post. Attach the black lead (5) of the new cord and start the nut on the post until finger tight (Figure 23-15).

A CAUTION

• IN STEP 4 (NEXT PAGE), DO NOT ALLOW AMMETER POST TO ROTATE AS NUT IS TIGHT-ENED. IF IT ROTATES, THE AMMETER COULD BE DAMAGED.

Installing the New DC Cord, Continued:

4. Install the nut (1) on the post of the ammeter and tighten it slightly more than finger tight. While holding the outside of the nut (1), turn the inside nut (2) counterclockwise 1/4 turn (Figure 23-15, Page 23-19). See CAUTION at bottom of page 23-19 and NOTE below.

NOTE

- CHECK THE POSITIONS OF THE TERMINALS TO MAKE SURE THAT THEY ARE NOT TOUCHING THE AMMETER BUS BAR (3) OR THE AMMETER POST (FIGURE 23-15, PAGE 23-19).
- 5. Place the strain relief bushing on the cord and use pliers to insert it into the charger base.
- 6. Place the charger cover in position and install the mounting screws, starting with the bottom holes. Tighten the screws to 10-12 in.lbs. (1.1/1.4 N-m).

RECEPTACLE REPLACEMENT

WARNING

- REMOVE KEY AND PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION.
- DISCONNECT THE BATTERIES AS SHOWN IN FIGURE 22-5, PAGE 22-6.
- ALWAYS WEAR APPROVED EYE PROTECTION WHEN SERVICING THE VEHICLE.

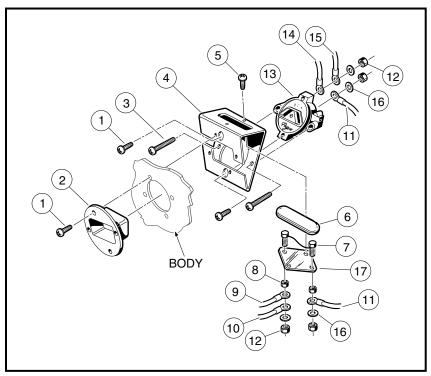


FIGURE 23-16

Removing the Receptacle (Figure 23-16)

- 1. Disconnect the small black wire (15) and the white wire (14) (to the negative battey post) from the negative terminal of the receptacle.
- 2. Disconnect the red wire (11) (to the fuse link) from the positive terminal of the receptacle.

3. Remove the four screws (1) from the bezel (2).

A WARNING

- MAKE SURE THAT THE BLACK AND WHITE WIRES DO NOT TOUCH.
- 4. Remove the four screws (3 and 1) attaching the receptacle to the fuse link bracket (4).

Installing the New Receptacle (Figure 23-16)

- 1. Install the four screws (1 and 3) which attach the receptacle (13) to the fuse link bracket (4). Tighten the screws to 15-25 in.lbs. (1.7/2.8 N-m).
- 2. Install the red wire of the fuse link to the positive (+) terminal of the receptacle (the positive (+) and negative (-) terminals are labeled on the face of the receptacle). Tighten nut to 20-25 in.lbs. (2.0/3.0 N-m).
- 3. Install the small black wire (from the wiper switch) and the white wire (from the negative battery post) on the negative (-) terminal of the receptacle. Tighten the nut to 20-25 in.lbs. (2.0/3.0 N-m).
- 4. Position the bezel (2) and fuse link bracket (4) and install the four mounting screws (1) through the bezel and into the fuse link bracket. Tighten the screws to 15-25 in.lbs. (1.7/2.8 N-m).

ON-BOARD RECEPTACLE FUSE LINK

If the receptacle fuse link is blown, the vehicle cannot be charged until the fuse has been replaced. The fuse link is located on fuse link bracket in the battery compartment (rear portion of the charger receptacle) (See Figure 23-4, Page 23-3).

A WARNING

- UNDER NORMAL OPERATING CONDITIONS, THE RECEPTACLE FUSE LINK SHOULD NEVER BLOW UNLESS THERE IS AN ELECTRICAL PROBLEM. IF THE FUSE BLOWS, DETERMINE THE CAUSE OF THE PROBLEM AND CORRECT IT. THEN REPLACE THE FUSE.
- ALWAYS WEAR APPROVED EYE PROTECTION WHEN SERVICING THE VEHICLE.

Receptacle Fuse Link Disassembly (Figure 23-16)

- 1. Remove the two screws (5) and then the lens (6).
- 2. Remove the outer nuts (12), lockwashers (16), and wires (9, 10, and 11).
- 3. Remove the remaining nuts (8).
- 4. Remove the fuse link (7) from the base (17).

Receptacle Fuse Link Assembly (Figure 23-16)

- 1. Install a new fuse link (7) (Club Car Part No. 1012085) into the base (17).
- 2. Install the nuts (8) which attach the fuse link to the base and tighten them to 15-20 in.lbs. (1.7/2.0 N-m).
- 3. Connect the red wire (9) (from the forward and reverse switch) and the orange wire (10) (from the reverse buzzer) to the passenger side of the fuse assembly and install the lock washer (16) and outer nut (12). Tighten the nut to 20-25 in.lbs. (2.0/3.0 N-m) (Figure 23-16) (See Figure 23-4, Page 23-3).
- 4. Connect the red wire (11) (from the charger receptacle) to the driver's side of the fuse assembly and install the lock washer (16) and nut (12). Tighten the nut to 20-25 in.lbs. (2.0/3.0 N-m).
- 5. Install the fuse link assembly and cover (6). Tighten the screws to 15-25 in.lbs. (1.7/3.0 N-m).

CHARGER REPAIRS

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRI-CAL CORDS. FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.

ELECTRONIC TIMER KIT

Removing the Electronic Timer Kit

- 1. Remove the two screws attaching the electronic timer assembly to the face of the charger.
- 2. Slide the electronic timer assembly from the charger and carefully remove the control cable connector from the timer.

Installing a New Electronic Timer Kit

- Carefully connect the control cable connector to the new timer and slide the timer assembly into the charger.
- 2. Install the two timer assembly retaining screws in the face of the charger.

Electronic Timer Relay Wiring

If the wires from the relay were disconnected, connect them to the numbered relay terminals as follows:

- 1. Attach the orange wire to terminal No. 6.
- 2. Attach the brown wire to terminal No. 1.
- 3. Attach the black wire from the AC cord to terminal No. 3.
- 4. Attach the black extension wire from the transformer primary coil to terminal No. 5.

A WARNING

 MAKE SURE THAT ALL CONNECTIONS ARE CLEAN AND TIGHT. ALSO MAKE SURE THAT ALL WIRES AND TERMINALS ARE POSITIONED SO THAT THEY DO NOT SHORT TOGETHER OR TO THE CHARGER BASE.

Checking Proper Operation of Electronic Timer Kit

- 1. With the DC plug disconnected from the receptacle, plug the AC cord into an outlet. The relay on the electronic timer kit should not close. A multimeter set to DC volts and connected across the DC plug should indicate zero volts. No transformer hum should be heard.
- 2. Unplug the AC cord from its outlet and connect the DC plug to the receptacle. The relay on the electronic timer kit should close with an audible "click" after a two to five second delay.
- 3. If the electronic timer kit does not operate as in step one or two above, refer to the wiring diagram (Figure 23-2, Page 23-2) and make sure that the charger is wired correctly. If the electronic timer kit operates properly, the charger is ready for use. Always monitor the first charge cycle to verify the charger is turning off properly.

CAPACITOR

A DANGER

• HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.

23A E

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRICAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.

A CAUTION

TO AVOID BREAKING WIRES, DISCONNECT CAPACITOR LEADS CAREFULLY.

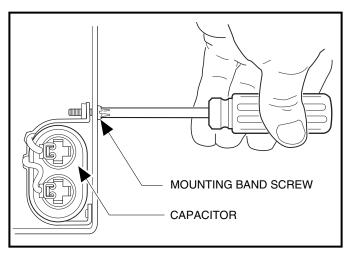


FIGURE 23-17

Removing the Capacitor

- 1. Remove the charger cover.
- 2. Loosen the mounting band screw (Figure 23-17).
- 3. Remove the connectors from the capactor terminals.
- 4. Pull the capacitor out of the band.

Installing the Capacitor

- 1. Route the capacitor wires through the band and then slide the capacitor into the band.
- 2. Tighten the mounting band screw.



Installing the Capacitor, Continued:

- 3. Connect the terminal connectors to the capacitor terminals.
- 4. Install the charger cover.
- 5. Check the charger for proper operation.

HEAT SINK ASSEMBLY

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRI-CAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.

Removing the Heat Sink Assembly

- 1. Remove the charger cover.
- 2. Disconnect both secondary transformer leads (tan) from the heat sink assembly.
- 3. Disconnect the red, green, and white wires from the heat sink assembly.
- 4. Remove the nuts and bolts which secure the heat sink assembly to the case.

Installing the Heat Sink Assembly

- 1. Position the heat sink assembly and install the nuts and bolts that secure it to the charger case. Tighten the bolts to 12-15 in.lbs. (1.4/1.7 N-m).
- 2. Connect the white wire from the DC cord and the red wire of the control cable to the center connector of the heat sink assembly. Tighten the nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 3. Connect the green wire of the control cable and one of the secondary transformer leads (tan) to the bottom connector of the heat sink assembly. Tighten the nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 4. Connect the other secondary transformer lead (tan) to the top connector of the heat sink assembly.
- 5. Install the charger cover.
- 6. Check the charger for proper operation.

TRANSFORMER

A DANGER

• HIGH VOLTAGE! WITH THE CHARGER UNPLUGGED AND NOT OPERATING, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS STILL APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.

Removing the Transformer

- 1. Remove the charger cover (Figure 23-3, Page 23-2).
- 2. Disconnect the black extension wire and the transformer primary coil lead, then disconnect the white wire in the AC cord and the transformer coil lead.
- 3. Disconnect the secondary transformer leads from the heat sink assembly.
- 4. Disconnect the secondary transformer leads from the fuse assembly.

5. Disconnect the capacitor coil leads from the capacitor. See DANGER below.

A DANGER

- HIGH VOLTAGE! WITH THE CHARGER UNPLUGGED AND NOT OPERATING, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS STILL APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.
- 6. Remove the plastic wire tie holding the red and green wires of the control cable and one secondary transformer lead (from the heat sink assembly) together.
- 7. Remove the four bolts and nuts from the transformer and remove the transformer.

Installing the Transformer

- 1. Position the transformer in the charger, oriented with the secondary coil lead to the rear. Install the four mounting bolts and nuts and tighten them to 25-30 in.lbs. (2.8/3.4 N-m).
- 2. Connect one secondary transformer lead (tan) to the top of the heat sink assembly. Tighten the nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 3. Connect the green wire of the control cable and the other secondary transformer lead (tan) to the bottom terminal of the heat sink assembly. Tighten the nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 4. Connect one secondary transformer lead (black) to one terminal of the fuse assembly. Tighten the nut to 20-24 in.lbs. (2.3/2.7 N-m).
- 5. Connect the other secondary transformer lead (black) to the remaining terminal of the fuse assembly. Tighten the nut to 20-24 in.lbs. (2.3/2.7 N-m).
- 6. Connect the capacitor coil leads to the capacitor.
- 7. With the wire tie removed in step 6 of *Removing the Transformer*, tie the wires together as they were before the wire tie was removed.
- 8. Install the charger cover.
- 9. Check the charger for proper operation.

AMMETER

A DANGER

• HIGH VOLTAGE! WITH THE CHARGER UNPLUGGED AND NOT OPERATING, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS STILL APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.

Removing the Ammeter

- 1. Remove the charger cover.
- 2. Disconnect all wires (4 and 5) and the bus bar (3) from the ammeter posts (Figure 23-18, Page 23-26).
- 3. Remove the nuts (2) attaching the ammeter to the charger face, and remove the ammeter.

Installing the Ammeter

- 1. Position the ammeter in the charger face and install the mounting nuts.
- 2. Install the ammeter bracket on the back of the ammeter.
- 3. Install the insulator on both posts of the ammeter.
- 4. Connect the black wire of the electronic timer kit and the black wire of the DC cord to the left post of the ammeter (when viewed from the rear of the charger).

Installing the Ammeter, Continued:

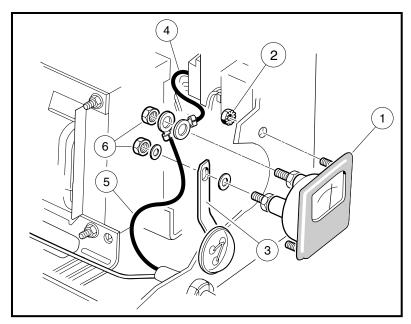


FIGURE 23-18

- 5. Connect the bus bar from the fuse links to the right post of the ammeter. Make sure there is a washer on each side of the bus bar.
- 6. Install the nuts on both posts of the ammeter and tighten slightly more than finger tight. Then while holding the outside nut, turn the inside nut counterclockwise 1/4 of a turn.
- 7. Install the charger cover.
- 8. Plug the charger into a vehicle and make sure the ammeter is operating properly.

CHARGER FUSE LINK ASSEMBLY

Removing the Fuse Link Assembly

- 1. Remove the charger cover.
- 2. Remove both secondary transformer leads and the bus bar from the back of the fuse link assembly.
- 3. Remove the fuse link retaining screws from the face of the charger and remove the fuse link assembly.

Installing the Fuse Link Assembly

- 1. Place the plastic cover over the fuse assembly and position the assembly on the charger face, then install the mounting screws from the front of the charger face.
- 2. Install the bus bar over the center branch of the fuse assembly and ammeter stud. Tighten to 24-30 in.lbs. (2.7/3.4 N-m).
- 3. Connect one of the secondary transformer leads (black) to one of the remaining terminals on the back of the fuse assembly. Connect the remaining secondary transformer lead (black) to the remaining terminal. Tighten to 24-30 in.lbs. (2.7/3.4 N-m).
- 4. Install the charger cover.

SECTION 23 B - POWERDRIVE BATTERY CHARGER



GENERAL INFORMATION

The PowerDrive Battery Charger is an integral part of Club Car's PowerDrive System 48, and one is included with every PowerDrive vehicle. Because it is controlled by the PowerDrive System 48 vehicle's on-board computer, it will work with only PowerDrive System 48 vehicles. The charger is totally automatic and has no external controls; when it is plugged in there is a 2 to 15 second delay, and then it comes on (Figure 23-19).

NOTE

• SHORTLY AFTER CHARGING BEGINS, THE CHARGER WILL SHUT OFF AGAIN IN ORDER TO RUN A SELF-DIAGNOSTIC PROGRAM (AMMETER WILL DROP TO ZERO). CHARGING WILL RESUME IN A FEW MOMENTS (AMMETER RETURNS TO CURRENT STATE OF CHARGE). THIS WILL BE REPEATED AT ONE HOUR AND AT TWO HOURS INTO THE CHARGE.

The vehicle on-board computer, having recorded the amount of energy consumed as the vehicle was used, directs the charger to replace exactly the amount of energy needed to fully replenish the batteries. The charger then shuts off automatically, preventing the possibility of either undercharging or overcharging. The computer accomplishes this by sensing when the exact amount of energy necessary has been returned to the batteries, rather than sensing voltage, rate or change of voltage, gassing point, or any other measurement parameter.

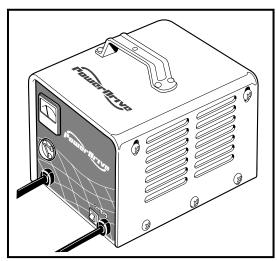


FIGURE 23-19

POWERDRIVE SYSTEM 48 CHARGING FEATURES INCLUDE:

Charge Interlock

PowerDrive Battery Charger DC plugs have three pins rather than the two blades that most standard charger plugs have. Two of these pins are the positive and negative leads as on standard chargers; the third pin is a sensing lead that is the communication link between the charger and the on-board computer. When the charger plug is plugged into the vehicle receptacle, the on-board computer senses its presence and locks out the vehicle's drive system. This prevents the possibility of driving the vehicle while the charger is plugged in and potential damage to the vehicle and charger.



PowerDrive System 48 Charging Features, Continued:

Off-Season Storage Charge

PowerDrive System 48 vehicles and PowerDrive Chargers are designed to be left connected, with AC power to the charger on, during off-season storage. The on-board computer will automatically analyze the batteries' state of charge every fifteen days, and if it finds the batteries low, will activate the charger as necessary. To return the vehicle to service, unplug the DC cord from the vehicle, wait 15 seconds and then plug the DC cord back in. The charger will come on. Allow the vehicle to complete one full charge cycle before putting it into service.

Charger Disconnect

The computer communication pin is shorter than the positive and negative pins in the charger DC plug. In the event that the charger plug is pulled from the receptacle while the charger is in operation, the computer communication link will be disconnected first and shut the charger off before the positive and negative pins disconnect. This will help to prevent possible damage to the plug and receptacle due to arcing.

BATTERY WARNING LIGHT

The PowerDrive System 48 vehicle features a dash mounted warning light (above steering column) which, when the vehicle is in operation, indicates low battery voltage, or, when the vehicle is being charged, indicates a charging problem. The Battery Warning Light is controlled by the PowerDrive System 48 on-board computer.

When the batteries receive an incomplete charge because 1) the DC power cord is disconnected, 2) AC power to the charger is interrupted, 3) automatic charger shut-off occurs after 16 hours of operation, or 4) the charger malfunctions, the trouble light will indicate as follows:

- The warning light will not come on if the charge is 90% or more complete. The on-board computer will retain in memory the amount of charge needed to fully replenish the batteries and will complete the charge during the next charge cycle.
- When the charger is unplugged, the warning light will come on and remain illuminated for 10 seconds if the charge is less than 90% complete but the car has enough power to complete 36 holes of golf. This will alert the fleet operator that the car may be used, but that it must be charged to completion as soon as possible.
- The warning light will come on and remain illuminated if the charger times out at 16 hours and the batteries are not sufficiently charged. This indicates an abnormal charge cycle. The charger and batteries should be checked by your Club Car distributor/dealer.
- The warning light will come on during a charge cycle (DC plug is still connected) if AC power to the charger is interrupted. The light will go out when AC power is restored.

THE CHARGE CIRCUIT

The vehicle charge circuit consists of the charger receptacle, fuse link, on-board computer, and the batteries. The negative terminal of the receptacle is connected to the on-board computer. The 10 gauge black wire from the on-board computer connects to the B- terminal on the speed controller, and the 6 gauge black wire also on the controller B- terminal goes through the on-board computer and connects to the negative (-) post of battery No. 6. The positive terminal of the charger receptacle is connected to the positive post of battery No. 1. The grey wire (sense lead) from the charger receptacle is connected to the sense lead fuse, which is connected to the grey wire from the on-board computer. If the charger works with one vehicle, but does not work with another, then it can be assumed that the problem is in the charge circuit of the vehicle. Check the connections between the 10 or 18 gauge grey wire from the charger receptacle, the sense lead fuse, and the 18 gauge grey wire from the on-board computer. Also check connections of the fuse link assembly located on the charger receptacle (Figure 23-20).

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE OR CHARGER. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURE 22-6, PAGE 22-5, AND THEN DISCHARGE THE CONTROLLER POWER-DRIVE SYSTEM 48 VEHICLES AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${\bf ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

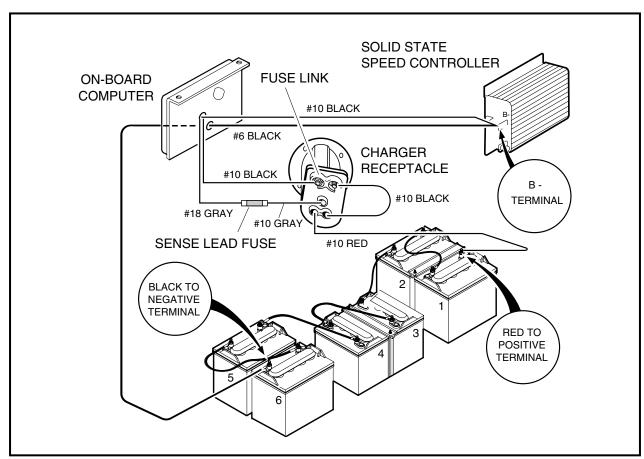


FIGURE 23-20

The Charge Circuit, Continued:

A WARNING

- DO NOT BY-PASS THE SENSE LEAD FUSE!
- UNPLUG BOTH THE AC AND DC PLUGS BEFORE WORKING ON THE CHARGER OR CHANG-ING THE CHARGER CORD.
- TO CONNECT THE CHARGER PLUG TO THE VEHICLE RECEPTACLE, GRASP THE PLUG AND PUSH IT STRAIGHT INTO THE RECEPTACLE. DO NOT ROCK OR BEND IT.
- TO DISCONNECT THE CHARGER FROM THE VEHICLE RECEPTACLE, GRASP THE PLUG AND PULL IT STRAIGHT OUT OF THE RECEPTACLE. DO NOT PULL ON THE CORD. DO NOT TWIST, ROCK, OR BEND THE PLUG.
- DO NOT CONNECT THE CHARGER TO BATTERY PACKS THAT ARE NOT COMPATIBLE WITH THE DC OUTPUT VOLTAGE SPECIFIED ON THE CHARGER. OVERHEATING AND TRANS-FORMER BURN-OUT WILL RESULT.
- DO NOT USE THE CHARGER IF THE PLUG, CORD, OR RECEPTACLE HAVE BEEN DAMAGED IN ANY WAY. USE OF THE CHARGER WITH ANY OF THESE CONDITIONS COULD RESULT IN A FIRE, PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH.
- DO NOT USE THE CHARGER IF:
 - THE DC PLUG DOES NOT MAKE A GOOD CONNECTION.
 - THE PLUG AND RECEPTACLE FEEL HOTTER THAN NORMAL.
 - THE PLUG PINS OR RECEPTACLE CONTACTS ARE BENT OR CORRODED.
 - THE PLUG, RECEPTACLE, OR CORDS ARE CUT, WORN, OR HAVE ANY EXPOSED WIRES.
 - THE PLUG, CORDS, CHARGER, OR RECEPTACLE ARE DAMAGED.
- USING THIS CHARGER WITH ANY OF THE ABOVE CONDITIONS COULD RESULT IN FIRE, PERSONAL INJURY, OR PROPERTY DAMAGE. THESE PARTS **MUST** BE REPLACED.

CHARGER INSTALLATION AND USE

The AC line to which the charger is to be connected must be capable of supplying at least 15 amperes to each charger.

WARNING

 EACH CHARGER SHOULD HAVE ITS OWN 15 OR 20 AMPERE BRANCH CIRCUIT PROTECTION (CIRCUIT BREAKER OR FUSE), IN ACORDANCE WITH THE NATIONAL ELECTRICAL CODE ANSI/NFPA 70, AND LOCAL CODES AND ORDINANCES. IMPROPER AC SUPPLY CIRCUIT PROTECTION MAY RESULT IN A FIRE.

To reduce the risk of electric shock, this battery charger must be grounded. This charger is equipped with an electric cord having an equipment-grounding conductor and a grounding type plug. It is for use on a nominal 120 volt, 60 hertz circuit. The AC plug must be connected to an appropriate receptacle that is properly installed and grounded in accordance with the National Electric Code and all local codes and ordinances.

The use of an extension cord with the charger is not recommended. If an extension cord must be used, use a three-conductor No. 12 AWG cord with ground, properly wired and in good electrical condition. Keep it as short as possible (no more than twelve feet). Locate all cords so that they will not be stepped on, tripped over, or otherwise subject to damage or stress. See WARNING at the top of page 23-31.

A WARNING

- IMPROPER CONNECTION OF THE EQUIPMENT-GROUNDING CONDUCTOR CAN RESULT IN RISK OF AN ELECTRICAL SHOCK.
- DO NOT USE AN ADAPTER TO PLUG THIS CHARGER INTO A TWO-PRONG OUTLET OR EXTENSION CORD. EXTENSION CORD OR OUTLET MUST ACCEPT GROUNDED THREE-PRONG PLUG.
- THE USE OF AN IMPROPER EXTENSION CORD COULD RESULT IN RISK OF FIRE OR ELECTRIC SHOCK.
- DO NOT OPERATE THIS CHARGER IF IT HAS RECEIVED A SHARP BLOW, WAS DROPPED, OR WAS OTHERWISE DAMAGED. CHECK IT TO BE SURE THAT IT IS OPERATING PROPERLY BEFORE PUTTING IT BACK IN USE.

Provide adequate ventilation for the charger. Keep all charger ventilation openings at least two inches away from walls and other objects.

A WARNING

- DO NOT ALLOW CLOTHING, BLANKETS, OR OTHER MATERIALS TO COVER THE CHARGER.
- CHARGERS CAN IGNITE FLAMMABLE MATERIALS AND VAPORS. DO NOT USE NEAR FUELS, GRAIN DUST, SOLVENTS, THINNER, OR OTHER FLAMMABLES.
- KEEP CHARGER DRY DO NOT EXPOSE TO RAIN. FOR STORAGE, KEEP THE CHARGER INDOORS.

NORMAL CHARGER OPERATION

A WARNING

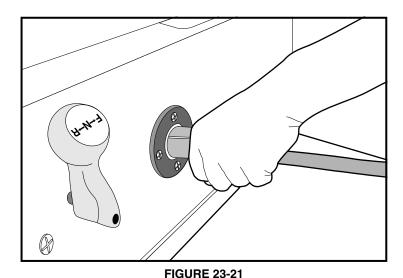
- CONNECT CHARGER ONLY TO A PROPERLY GROUNDED SINGLE PHASE (3 WIRE) OUTLET.
- CHARGE BATTERIES ONLY IN A WELL VENTILATED AREA.
- TO CONNECT THE CHARGER PLUG TO THE VEHICLE RECEPTACLE, GRASP THE PLUG AND PUSH IT STRAIGHT INTO THE RECEPTACLE. DO NOT ROCK OR BEND THE PLUG SIDEWAYS.
- TO DISCONNECT THE CHARGER PLUG FROM THE VEHICLE, GRASP THE PLUG AND PULL IT STRAIGHT OUT OF THE RECEPTACLE. DO NOT PULL ON THE CORD. DO NOT TWIST, ROCK, OR BEND THE PLUG SIDEWAYS.
- DO NOT USE THIS CHARGER IF:
 - THE PLUG IS TOO LOOSE OR DOES NOT MAKE A GOOD CONNECTION.
 - THE PLUG AND/OR RECEPTACLE FEEL HOTTER THAN NORMAL.
 - THE PLUG PINS OR RECEPTACLE CONTACTS ARE BENT OR CORRODED.
 - THE PLUG, RECEPTACLE, OR CORDS ARE CUT, WORN, OR HAVE ANY EXPOSED WIRES.
 - THE PLUG, CORDS, CHARGER, OR RECEPTACLE ARE DAMAGED.
- USING THE CHARGER WITH ANY OF THE ABOVE CONDITIONS COULD RESULT IN A FIRE, PROPERTY DAMAGE, OR PERSONAL INJURY. REPAIR OR REPLACE WORN OR DAMAGED PARTS BEFORE USING THE CHARGER.
- 1. With the charger DC output cord disconnected from the batteries, connect the power supply cord to a 120 volt, 60 hertz outlet.

Normal Charger Operation, Continued:

- Connect the charger DC plug to the charger receptacle located on the seat support panel near the driver's knee (Figure 23-21). The charger will turn on automatically within 2 to 15 seconds after the DC plug is connected.
- 3. Monitor the ammeter for the correct charge rate. The initial charge rate will vary from 15 to 19 amps, depending upon the condition and depth of discharge of the batteries. Slight variations in the initial charge rate may also result from AC line input voltages which are higher or lower than 120 volts. Higher line voltages increase the initial charge rate and lower line voltages reduce the initial charge rate.
- 4. Monitor the ammeter for about 30 seconds. Under normal operating conditions (when the charger is plugged into a vehicle with discharged batteries), the ammeter will drop to zero for 2 to 3 seconds at the beginning of each charge cycle in order to perform a self-diagnostic test. This test will be repeated at one hour and two hours into the charge.

NOTE

- IF THE BATTERIES ARE IN A FULLY CHARGED STATE AND THE VEHICLE HAS NOT BEEN DRIVEN, THE ON-BOARD COMPUTER WILL NOT PERFORM THE SELF-DIAGNOSTIC TEST.
- WHEN AIR TEMPERATURES FALL BELOW 65°F (18.3°C), BATTERIES CHARGED IN UNHEATED AREAS SHOULD BE PLACED ON CHARGE AS SOON AS POSSIBLE AFTER USE. COLD BATTERIES REQUIRE MORE TIME TO CHARGE FULLY.



CHECKING FOR PROPER OPERATION OF CHARGER

- With the DC plug disconnected from the receptacle, insert the AC cord into an outlet. The charger relay should **NOT** close. A multimeter set on DC volts and connected across the DC plug positive (+) and negative (-) pins should indicate zero volts. **NO** transformer hum should be heard.
- 2. Unplug the AC cord from its outlet and connect the DC plug to the receptacle. The charger relay should close with an audible "click" after a 2 to 15 second delay.
- 3. If the charger does not operate as in steps 1 or 2 above, refer to the wiring diagram (Figure 23-22), and check to be sure the charger is wired correctly. If the charger operates properly, then it is ready for use. Always monitor the first charge cycle to make sure that the charger turns off properly. If the DC cord is disconnected during a charge, the Battery Warning Light will come on if the batteries are less than 90% charged. (For more detailed information on the Battery Warning Light, See Battery Warning Light, Page 23-28).

It is common practice for golf car mechanics to check the condition of a set of batteries after they have charged in order to ensure that they have received a complete charge before the vehicle is used. With the PowerDrive System 48 this is not necessary; the vehicle on-board computer controls and monitors the charge cycle. If there is any problem during a charge cycle, the on-board computer will illuminate the Battery Trouble Light located above the steering column in the center dash panel. If the Battery Warning Light is on after a charge cycle, refer to the Troubleshooting Charts on pages 23-34 through 23-37. If the specified test procedures find no problems, plug the DC cord into the vehicle and let it charge until the charger shuts off automatically. If a problem is found, correct it and then charge the vehicle. Normal voltage toward the end of a charge cycle should be approximately 59 to 63 volts.

TO START CHARGE CYCLE

- 1. Remove the DC plug from the vehicle's charger receptacle.
- 2. WAIT 20 SECONDS, and then plug the DC cord back into the vehicle. See NOTE below.

NOTE

- THE CHARGER WILL NOT OPERATE UNLESS A 20 SECOND WAIT IS OBSERVED.
- 3. Monitor the ammeter for the charge rate. If the vehicle has not been driven, the on-board computer will not perform a self-diagnostic test, the ammeter will **NOT** drop to zero, and the charge cycle will begin. If the vehicle has been driven, even if only a few feet, the on-board computer will perform the self-diagnostic test; the ammeter will drop to zero for 2 to 3 seconds before the charge cycle begins.

A WARNING

• STUDY AND BECOME FAMILIAR WITH THE WIRING AND TERMINOLOGY OF THE CHARGER BEFORE ATTEMPTING ANY REPAIRS (FIGURES 23-22 AND 23-23).

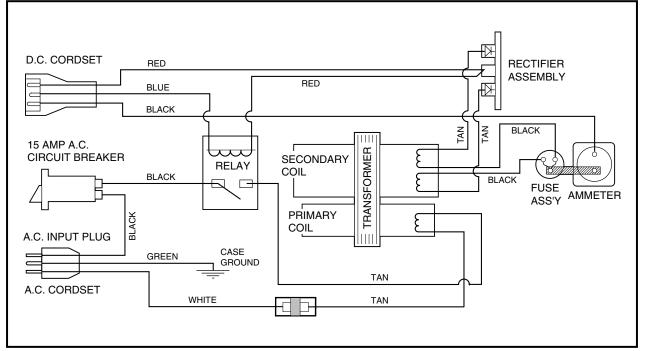


FIGURE 23-22

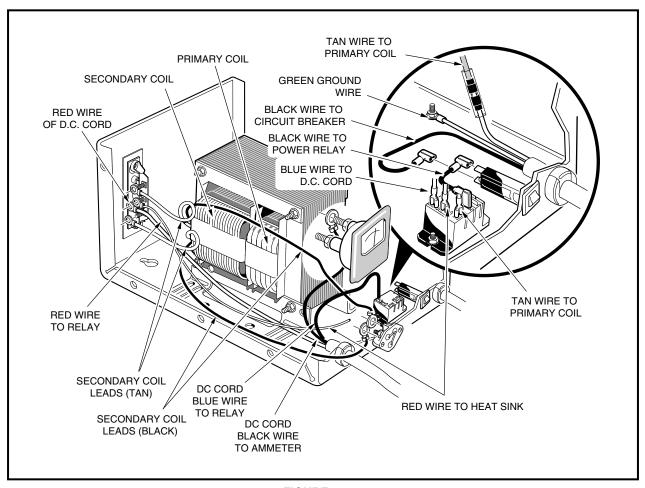
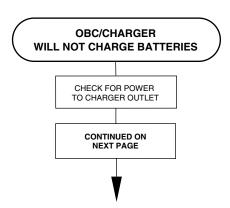
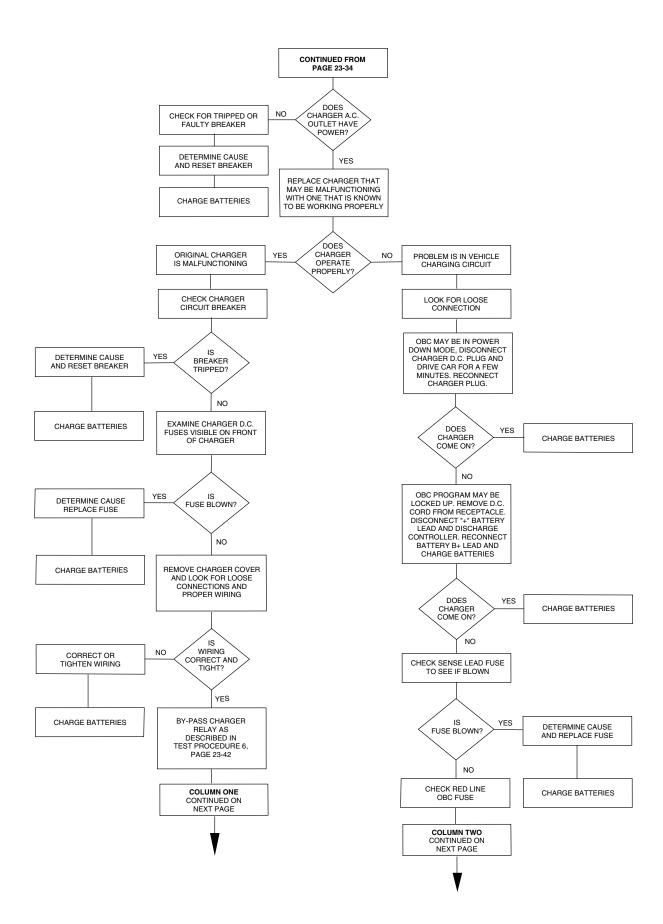


FIGURE 23-23

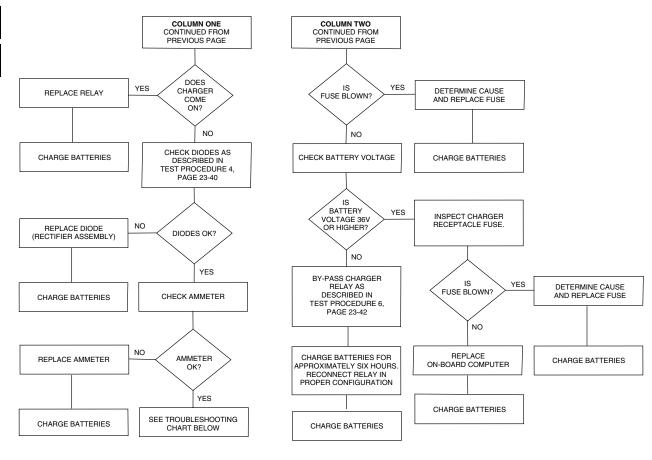
TROUBLESHOOTING

Use the following charts (Pages 23-34 through 23-37) as guides for troubleshooting PowerDrive System 48 vehicles. The chart (below) on pages 23-34 through 23-36 refers specifically to the on-board computer and battery charger. The chart on pages 23-36 and 23-37 encompasses the entire vehicle electrical system. Test procedures specified in these charts can be found on the pages immediately following the charts.









TROUBLESHOOTING CONTINUED:

	POWERDRIVE BATTERY CHARGER TROUBLESHOOTING GUIDE								
SYMPTOM		POSSIBLE CAUSES		REFER TO					
1.	Relay does not close, no transformer hum and ammeter does not move.	1)	Batteries disconnected.	Section 22, Page 20-5.					
		2)	Battery voltage is too low.	Test Procedure 1.					
		3)	Poor connection between plug and receptacle.	Test Procedure 1.					
		4)	DC plug and cord.	Test Procedures 1 and 5.					
		5)	On-board computer malfunction.	Test Procedure 2.					
		6)	Grey sense lead is blown.	Test Procedure 1.					
		7)	Receptacle fuse link is blown.	Section 20-B, Page 20-36.					
2.	Relay closes with an audible click but no transformer hum and ammeter does not move.	1)	Improper AC outlet voltage.	Test Procedure 3.					
		2)	Failed AC plug and cord.	Test Procedure 3.					
		3)	Internal AC breaker.	Test Procedure 3.					
		4)	Transformer primary coil.	Test Procedure 6.					
		5)	Relay	Test Procedure 8.					
3.	Relay closes and transformer hums but ammeter does not move.	1)	Blown charger fuse.	Test Procedure 4-B.					
		2)	Both diodes failed.	Test Procedure 4-B.					
		3)	On-board computer malfunction.	Test Procedure 2.					
			Failed transformer.	Test Procedure 6.					
Troubleshooting Guide Continued on Next Page.									

POWERDRIVE BATTERY CHARGER TROUBLESHOOTING GUIDE						
SYMPTOM		POSSIBLE CAUSES		REFER TO		
4.	Relay operates intermittently.	1)	Blown fuse on red lead from OBC.	Section 20 A, Pages 20-3 and 20-4.		
		2)	Defective charger relay.	Test Procedure 8		
5.	Single charger fuse link blows.	1)	Diode failed.	Test Procedure 4-A		
		2)	Loose internal fuse connection.	Tighten connection.		
6.	Both charger fuse links blow or receptacle fuse link blows.	1)	Battery is wired in reverse polarity.	Test Procedure 4-B		
		2)	DC cord is wired in reverse polarity.	Test Procedure 4-B		
		3)	Both diodes failed.	Test Procedure 4-B		
7.	Charger output is low.	1)	One diode failed.	Test Procedure 4-A		
		2)	Transformer coil short-circuit failure.	Test Procedure 6		
		3)	On-board computer malfunction.	Test Procedure 2		
8.	Charger turns off too soon.	1)	AC power supply was shut off.	Test Procedure 3		
		2)	On-board computer malfunction.	Test Procedure 2		
		3)	Batteries may be fully charged.	Test Procedure 7		
9.	Charger goes to 16 hour time out.	1)	On-board computer malfunction.	Test Procedure 2		
		2)	Extremely discharged batteries or cold temperature.	Recharge batteries.		
		3)	Bad battery.	Section 22, Batteries		
10.	AC line fuse or circuit breaker blows.	1)	AC cord is shorted.	Test Procedure 8		
		2)	Failed transformer.	Test Procedure 6		
11.	Battery trouble light remains on (with DC charger cord plugged in)	1)	AC power interrupted.	Test Procedure 3		
		2)	On-board computer malfunction.	Test Procedure 2		
		3)	Charger failure.	See page 23-32		
		4)	16 hour time out.	See page 23-28		
		5)	Battery or batteries need to be replaced.	Section 22, Batteries		
12.	Battery trouble light remains on (with DC charger cord unplugged)	1)	Batteries are getting close to full discharge capacity.	Recharge batteries immediately (golf round may be completed first).		
		2)	On-board computer malfunction.	Test Procedure 2		
			Battery or batteries need to be replaced.	Section 22, Batteries		

TEST PROCEDURES

GENERAL

The charger uses DC battery voltage through the on-board computer to close the charger relay that activates the charger AC circuit. When the charger is operating properly, there is a 2 to 15 second delay after the DC cord is plugged into the vehicle before the relay closes. This delay allows time for the DC plug to make a secure connection with the receptacle before the AC circuit is activated and AC power is supplied to the primary coil of the transformer. When the relay closes an audible "click" can be heard, and then as power is supplied, the transformer should hum and the ammeter should indicate the charge rate.

WARNING

• ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE CHARGER.

Test Procedures, Continued:

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FROM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.

TEST PROCEDURE 1

Battery Voltage Too Low or Bad Connection Between Plug and Receptacle:

- 1. Check the DC plug and receptacle for damage, dirt, corrosion, or any condition that might prevent a good electrical connection.
- 2. Inspect the receptacle contacts to insure that they are not damaged and that they are firmly seated within the receptacle.
- 3. Check the wire connections to the charger receptacle:
 - 3.1. Verify that the 10 gauge red wire from the charger receptacle is connected to the positive post of battery No. 1.
 - 3.2. Make sure that the two nuts that secure the two 10 gauge black wires to the receptacle fuse assembly are tight.
 - 3.3. Check the connections of the 10 or 18 gauge grey wire from the receptacle to the sense lead fuse, and from the sense lead fuse to the on-board computer wire harness (Figure 23-24).

A WARNING

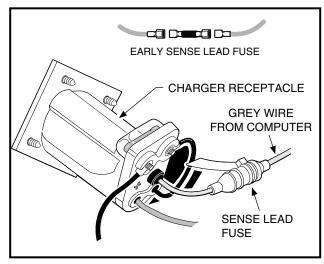
• DO NOT BY-PASS THE SENSE LEAD FUSE!

- 3.4. Remove the grey sense lead fuse assembly and check its continuity with an multimeter set to ohms (Ω) . The resistance should be less than 2 ohms.
- 4. Measure the voltage of the battery pack between the positive post of battery No. 1 and the negative post of battery No. 6; normal no-load voltage will be 50 to 52 volts for fully charged batteries. The voltage of the battery pack must be over 36 volts DC in order to allow the on-board computer to close the charger relay (Figure 23-25). If battery pack voltage is too low to start charger, see Charging Battery Pack With Low Voltage, Section 22, Page 22-18.

TEST PROCEDURE 2

On-Board Computer:

- 1. Check the circuit breaker on the front of the charger and reset if necessary.
- 2. Select a charger that is normally connected to another vehicle and that is known to operate properly. Leave the AC cord of the selected test charger connected to the AC outlet that it normally is connected to. This will insure that AC power is present.
- 3. Plug the DC cord from the selected test charger into the receptacle of the vehicle that is not charging properly.
- 4. If the test charger fails in the same manner as the charger normally used with the vehicle, then the vehicle charging circuit is not functioning properly (See Page 23-34, or Section 20, Page 20-5).



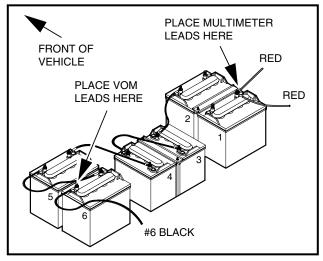


FIGURE 23-24 FIGURE 23-25

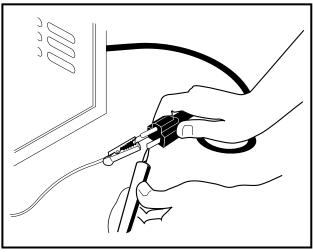


FIGURE 23-26

5. Plug the original charger (thought to be malfunctioning) into another vehicle that is known to be functioning properly. If the charger performs as it should, then the charger is not in need of repair.

TEST PROCEDURE 3

AC Power and Continuity Check of AC Circuit:

- 1. Check to be sure that the AC cord is securely plugged into a live AC outlet.
- 2. Check the AC circuit breaker on the front of the charger and reset it if necessary.
- 3. Check the AC line fuse or circuit breaker in the storage facility.
- 4. With a multimeter set at 500 VAC, check incoming AC voltage. Insert prongs into outlet; voltage should be 105 to 128 volts. If proper voltage is not present, have building wiring checked by a licensed electrical contractor.
- 5. Unplug the AC power supply cord from its outlet and the DC plug from the receptacle in the golf car.
- 6. Check continuity of the AC circuit:
 - 6.1. Disconnect the tan lead (from the primary coil) and the black lead (from the circuit breaker) from the charger relay. Connect the tan lead to the circuit breaker (Figure 23-31, Page 23-43).
 - 6.2. With the relay bypassed, check the continuity across the AC cord prongs (Figure 23-26).



Ξ

Test Procedure 3, Continued:

- 7. If the circuit is not complete, check the wiring of the AC cord, transformer primary coil leads, internal AC circuit breaker, and jumper wire (Figure 23-31, Page 23-43).
- 8. If the charger is wired correctly, check the continuity of the AC cord, transformer primary coil, and the jumper wire individually (**Test Procedure 8**).

A WARNING

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- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE CHARGER.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FROM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.

TEST PROCEDURE 4

Diodes:

Use test procedure 4A for single diode failures and testing of diodes. If both diodes have failed, use test procedure 4B.

Procedure 4A - Single Diode Failure:

A single diode failure is indicated by one fuse link blowing (closed circuit diode) or by the charger output being low (open circuit diode). If a diode has failed, the entire rectifier assembly must be replaced. To check diodes:

- 1. Unplug the AC cord from its outlet and the DC plug from the receptacle, then remove the charger cover.
- 2. Disconnect one transformer secondary coil lead from the diode terminal (Figure 23-27).
- 3. Using a low voltage continuity tester, connect the red (+) tester lead to the diode mounting plate and the other tester lead to a diode terminal and note the reading (Figure 23-27).
- 4. Reverse the tester leads and check each diode again and note the reading (Figure 23-28). A diode is designed to conduct current in one direction only; if a diode conducts current (shows continuity) in both directions, the complete rectifier assembly with diodes must be replaced. If a diode does not conduct current (does not show continuity) in either direction, the complete rectifier assembly must be replaced.
- 5. On rare occasions, a single fuse link may melt due to excessive heat. This can be caused by a loose internal fuse connection. Check all three fuse connections inside the charger to be sure that they are clean and tight. The proper torque on the fuse link connections is 20 in.lbs. (2.2 N-m).
- 6. Be sure that the charger is wired properly and that all connections are clean and tight. See WARNING below.

A WARNING

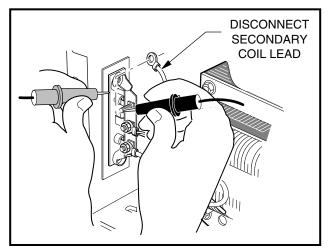
• IF CONNECTIONS ARE NOT CLEAN AND TIGHT, EXCESSIVE HEAT WILL BE CREATED AND THE CHARGER COULD BE DAMAGED.

Procedure 4B - Both Diodes Failed:

To check the diodes, use the diode test procedure 4A. If both diodes have failed closed, both charger links will be blown. If both diodes have failed open, the relay will close and the transformer will hum, but the ammeter will indicate that there is no output. If both diodes have failed open or closed, the entire rectifier assembly must be replaced. The following steps should be used to determine why both diodes failed:

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1. Check the batteries and the receptacle to be sure that they are wired in the correct polarity. Also check the voltage and polarity at the receptacle.



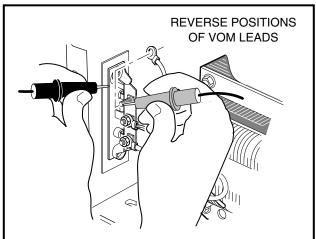


FIGURE 23-27

FIGURE 23-28

- 2. Check to be sure that the charger DC plug is wired correctly; the red wire should be connected to the center terminal of the rectifier assembly, the blue wire should be connected to the relay coil, and the black wire should be connected to the left side of the ammeter when viewed from inside the charger. If a reverse polarity connection is made between the charger and the batteries, both fuse links will blow whether or not the AC cord is plugged into an outlet.
- 3. Although this is rare, both diodes may fail as the result of a lightning strike at the charging location.
- 4. Excessive heat due to a loose connection may also cause both fuse links to melt. Be sure fuse connections are torqued to 20 in.lbs. (2.2 N-m).
- 5. Be sure that the charger is wired properly and that all connections are clean and tight.

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE CHARGER.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FROM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.

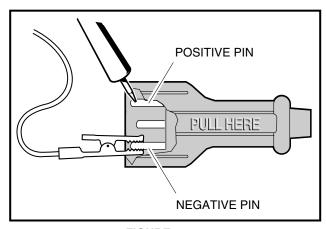
TEST PROCEDURE 5

Continuity Test of Charger DC Circuit:

1. Using the continuity tester (Club Car Part No. 1011273), connect the test leads to the pins marked (+) and (-) on the DC plug (Figure 23-29, Page 23-42), and note the readings.

Test Procedure 5, Continued:

- 2. Reverse the test leads and check the DC plug again (Figure 23-30). The circuit should show continuity in only one direction.
- 3. If the circuit does not show continuity in either direction and the charger fuse is good, individually check the continuity of the DC plug and cord (Test Procedure 8), ammeter (Test Procedure 8), diodes (Test Procedure 4A), and all connections.



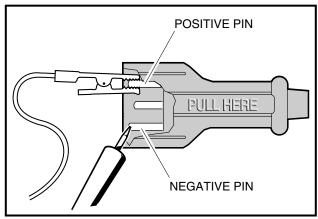


FIGURE 23-29

FIGURE 23-30

- 4. If the circuit shows continuity in both directions, a "short" exists in the charger DC circuit, usually caused by "shorted" diodes (See Test Procedure 4). If diodes are not "shorted", check the DC output cord for a "short" as described in Test Procedure 8.
- 5. Remove the blue wire from the charger relay and check the continuity between the positive and negative terminals and the middle pin on the DC plug (Figures 23-22 and 23-23, Pages 23-33 and 23-34). There should be *no* continuity.

TEST PROCEDURE 6

Transformer:

Failure of the transformer may be caused by natural aging or shorting of adjacent coil turns. If the transformer has failed, a low or complete lack of output would be observed on the ammeter; however, the transformer may hum. A blown AC line fuse or circuit breaker in the charger and/or storage facility may have been caused by a failed transformer. To test the transformer:

A WARNING

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- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE CHARGER.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FROM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.
- 1. Disconnect the transformer secondary coil leads No. 1 and No. 5 (Figure 23-31) from the diode terminals
- 2. In order to apply AC power directly to the transformer primary coil, the relay must be bypassed.

- 3. Remove the black wire (3) from the circuit breaker and disconnect the tan wire (4) from the relay. Connect the tan wire to the circuit breaker (Figure 23-31).
- 4. Be sure that secondary coil leads are not touching one another. With the relay bypassed, plug the AC plug into an outlet. If the AC line fuse or circuit breaker blows, the transformer is shorted internally and must be replaced (See Transformer, Page 23-24).
- 5. If the AC line fuse or circuit breaker does not blow, check the transformer secondary voltage across leads No.1 and No. 5 using a multimeter. If measured voltages are approximately 85 volts AC or lower for the secondary coil, the transformer is shorted internally and must be replaced (Figure 23-31).

A DANGER

- DO NOT ALLOW SECONDARY COIL LEADS TO TOUCH ONE ANOTHER. THERE ARE APPROXIMATELY 120 VOLTS PRESENT.
- 6. If the transformer output measurments are 86 volts or higher, disconnect the AC plug from its outlet.
- 7. If the voltage readings are normal, the transformer is good. Refer to Test Procedure 5 for further tests of the DC circuit.

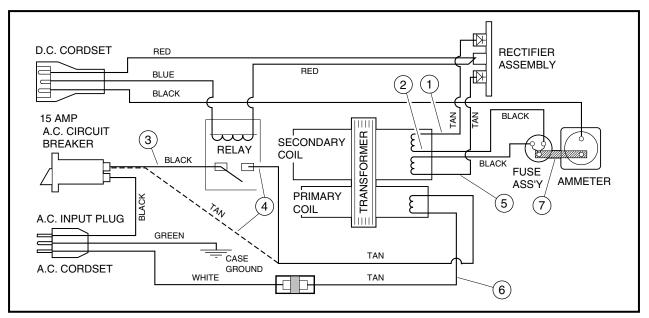


FIGURE 23-31

TEST PROCEDURE 7

Battery State of Charge Test:

- 1. After the charger has shut off, disconnect the DC charger plug for approximately 20 seconds and then reconnect it. The ammeter should jump to 14 to 18 amps and then taper to below 12 amps within 15 minutes. If it does taper to below 12 amps within 15 minutes, batteries are fully charged and the charger is functioning properly.
- 2. If the charger does not taper to below 12 amps within 15 minutes, batteries may not be receiving a full charge and the on-board computer should be checked (See Test Procedure 2).

NOTE

• OLD BATTERIES NEAR THE END OF USEFUL SERVICE MAY NOT TAPER TO BELOW 12 AMPS (SEE SECTION 22 - BATTERIES, IN THIS MANUAL).

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE CHARGER.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FROM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.

TEST PROCEDURE 8 - CONTINUITY CHECKS

AC Cord and Plug:

To check continuity of the AC cord (Figure 23-32):

- 1. Disconnect the black wire (1) of the AC cord from the charger AC circuit breaker (3).
- 2. Disconnect the green wire (2) from the charger case and position it so that it does not touch any metal part of the charger.
- 3. Using a continuity tester (Club Car Part No. 1011273), put alligator clip on the end of the black wire and check for continuity on both flat prongs and on the ground prong of the AC plug (Figure 23-32). Continuity should be shown on only one flat prong. If it is shown on more than one prong, or on no prongs, the AC cord and plug must be replaced.
- 4. Put alligator clip on the end of the green wire and check for continuity on both flat prongs and on the ground prong of the AC plug. Continuity should be shown on only the ground prong. If continuity is shown on either of the flat prongs, or is not shown on the ground prong, the AC cord and plug must be replaced.
- 5. Disconnect the white wire (5) from the tan wire (4). Put alligator clip on the white wire and check for continuity on both flat prongs and on the ground prong of the AC plug (Figure 23-32). Continuity should be shown on one flat prong. If it is shown on more than one prong, or on no prongs, the AC cord and plug must be replaced.

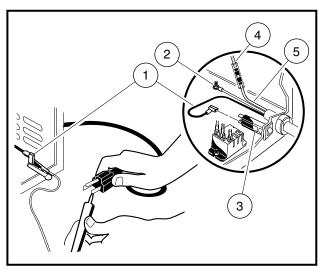


FIGURE 23-32

DC Cord and Plug

- 1. To check the continuity of the DC cord, disconnect the black wire of the DC cord from the ammeter.
- 2. Disconnect the red wire of the DC cord from the rectifier assembly.
- 3. Disconnect the blue wire from the relay.
- 4. Put the alligator clip of the continuity tester on the red wire of the DC cord.
- 5. Place the continuity tester probe on the positive (+) prong of the DC plug (the positive (+) prong and negative (-) prong are identified on the plug). If you do not register continuity (bulb does not light), cord and plug must be replaced.
- 6. Place the continuity tester probe on the negative (-) prong of the DC plug. You should register no continuity (bulb should not light). If you do register continuity, cord and plug must be replaced.
- 7. Place the continuity tester probe on the unmarked (middle) prong of the DC plug. You should register no continuity (bulb should not light). If you do register continuity, cord and plug must be replaced.
- 8. Move the continuity tester alligator clip to the black wire of the DC cord.
- 9. Place the continuity tester probe on the negative (-) prong of the DC plug. You should register continuity (bulb should light). If you do not register continuity, cord and plug must be replaced.
- 10. Place the continuity tester probe on the unmarked (middle) prong of the DC plug. You should register no continuity (bulb should not light). If you do register continuity, cord and plug must be replaced.
- 11. Move the alligator clip to the blue wire of the DC cord. Check for continuity at the middle prong; it should read continuity.

Transformer

The PowerDrive battery charger transformer has two coils; a primary coil and a secondary coil (Figure 23-31, Page 23-43).

Primary Coil

- 1. Disconnect terminals from transformer tan primary leads (4) and (6).
- 2. Touch the continuity tester leads on the primary coil leads. You should register continuity (bulb should light). If you do not register continuity, replace the transformer.

Secondary Coil

1. Remove the transformer secondary coil lead (tan) from the upper terminal (1) of the rectifier assembly. See DANGER below.

A DANGER

- HIGH VOLTAGE! DO NOT ALLOW SECONDARY COIL LEADS TO TOUCH EACH OTHER. THERE ARE APPROXIMATELY 120 VOLTS PRESENT.
- 2. Remove the other transformer secondary coil lead (tan) from the bottom terminal (5) of the rectifier assembly and place the alligator clip on the ammeter bus bar (7). Touch the continuity leads to each secondary coil lead (tan). You should register continuity (bulb should light). If you do not register continuity, replace transformer. Be sure that the fuse is intact and not blown.

Relay

A WARNING

- BEFORE PERFORMING THIS TEST, BE SURE THE AC PLUG IS NOT PLUGGED IN.
- Remove the black and tan wires from the contact terminals of the relay (Figure 23-31, Page 23-43).
 Place continuity tester leads on contact terminals of the relay. Tester should show NO continuity (bulb should not light). If it shows continuity, the relay contacts are welded shut and the relay must be replaced.

Relay Continuity Test, Continued:

2. With batteries connected, insert the DC plug into a receptacle. Place continuity leads on contact terminals of relay. Tester should show continuity (bulb should light). If tester does not show continuity, the relay must be replaced.

Ammeter

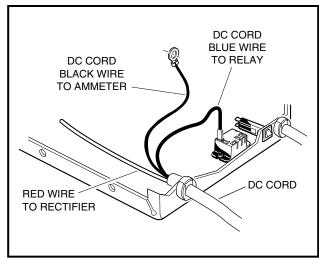
To check continuity of the ammeter:

- 1. Disconnect the black wire from the left ammeter post (as viewed from inside the charger).
- 2. Place the continuity tester alligator clip on one of the ammeter posts.
- 3. Place the continuity tester probe on the other ammeter post. The tester should show continuity (bulb should light). If the tester does not show continuity, the ammeter must be replaced.

PLUG AND RECEPTACLE REPLACEMENT

The charger cord, plug, and receptacle are wear items and should be inspected daily. Visually inspect them for cracks, loose connections, and frayed wiring; they MUST be replaced when worn or damaged. If charger plug and receptacle show signs of corrosion or are becoming difficult to insert and remove, the receptacle contacts and plug pins can be cleaned with a good electrical contact cleaner or lightly sprayed with WD-40® brand spray lubricant.

To replace receptacle, see page 20-35.



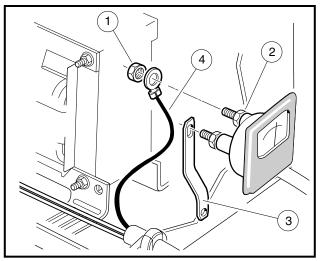


FIGURE 23-33

FIGURE 23-34

CHARGER CORD REPLACEMENT

Removal of Charger Cord and Plug

- 1. Unplug the AC and DC plugs.
- 2. Remove the charger cover.
- 3. Remove the black lead of the charger DC cord from the ammeter by loosening the nut. Support the terminal as the nut is loosened to prevent rotation of the connection.
- 4. Remove the nut that attaches the red lead of the charger DC cord on the rectifier assembly.
- 5. Remove the terminal on the blue charger DC cord lead at the relay.
- 6. Using pliers, squeeze the strain relief bushing and remove the cord set.

Installation of the New Charger Cord and Plug

1. Insert the leads of the new cord through the hole in the charger base.



- 3. Attach the blue lead of new cord set to the charger relay (coil) terminal (Figure 23-33).
- 4. Install nut (1) on post of ammeter slightly more than finger tight. While holding the outside nut (1), turn the inside nut (2) counterclockwise 1/4 of a turn (Figure 23-34).

WARNING

- DO NOT ALLOW AMMETER POST TO ROTATE AS THE NUT IS TIGHTENED. IF IT IS ALLOWED TO ROTATE, THE AMMETER COULD BE DAMAGED.
- 5. Put the strain relief bushing on the cord and insert it into the charger base using pliers.
- 6. Position the charger cover on the base. Starting at the bottom holes, install the attachment screws. Torque the screws to 10-12 in.lbs. (1.1/1.4 N-m).

CHARGER REPAIRS

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE CHARGER.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FROM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.

RECTIFIER ASSEMBLY

Removal of Rectifier Assembly (Figures 23-22 and 23-23, Pages 23-33 and 23-34)

- 1. Remove charger cover.
- 2. Remove both secondary transformer leads (tan) from the rectifier assembly.
- 3. Remove the two red wires from the rectifier assembly.
- 4. Remove the nuts and bolts that secure the rectifier assembly to the case.

Installation of Rectifier Assembly (Figures 23-22 and 23-23, Pages 23-33 and 23-34)

- 1. Install the nuts and bolts which secure the rectifier assembly to the case. Tighten the bolts to 12-15 in.lbs.(1.4/1.7 N-m).
- 2. Connect the red wire from the DC cord and the red wire from the charger relay to the center connector on the rectifier assembly. Torque nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 3. Connect one of the secondary transformer leads (tan) to the bottom connector of the rectifier assembly. Torque nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 4. Connect the other secondary transformer lead (tan) to the top connector of the rectifier assembly. Torque nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 5. Replace charger cover.
- 6. Check charger for proper operation.

TRANSFORMER

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS CHARGER. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHEN SERVICING THE CHARGER.
- ALWAYS UNPLUG THE ELECTRICAL CORDS BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER. FIRST UNPLUG THE AC CORD FROM THE OUTLET AND THEN UNPLUG THE DC CORD FROM THE VEHICLE.

Removal of the Transformer (Figures 23-22 and 23-23, Pages 23-33 and 23-34)

- 1. Remove the charger cover.
- Disconnect the tan primary coil lead from the charger relay, then disconnect the white wire from the AC cord.
- 3. Disconnect the secondary transformer leads from the rectifier assembly.
- 4. Disconnect the secondary transformer leads from the fuse assembly.
- 5. Remove the four bolts and nuts that mount the transformer to the case and remove the transformer.

Installation of the Transformer (Figures 23-22 and 23-23, Pages 23-33 and 23-34)

- 1. Install the transformer with secondary coil to the rear of the charger case. Torque the four bolts and nuts to 25-30 in.lbs. (2.8/3.4 N-m).
- 2. Connect one secondary transformer lead (tan) to the top of the rectifier assembly. Torque nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 3. Connect the other secondary transformer lead (tan) to the bottom terminal of the rectifier assembly. Torque nut to 12-15 in.lbs. (1.4/1.7 N-m).
- 4. Connect one secondary transformer lead (black) to one terminal of the fuse assembly. Torque nut to 20-24 in.lbs. (2.3/2.7 N-m).
- 5. Connect the other secondary transformer lead (black) to the remaining terminal of the fuse assembly. Torque nut to 20-24 in.lbs. (2.3/2.7 N-m).
- 6. Connect the tan primary lead to the charger relay.
- 7. Connect the other primary lead to the white wire from the AC cord.
- 8. Replace charger cover.
- 9. Check charger for proper operation.

AMMETER

Removal of Ammeter

- 1. Remove charger cover.
- 2. Disconnect black wire from the DC cord (5), and the bus bar (3) from the ammeter (Figure 23-35).
- 3. Remove the two nuts (2) that secure the ammeter to the charger face.
- 4. Remove the ammeter from the face of the charger.

Installation of Ammeter

- 1. Place the ammeter in position in the charger face.
- 2. Install the nuts and tighten until ammeter is firmly secured.

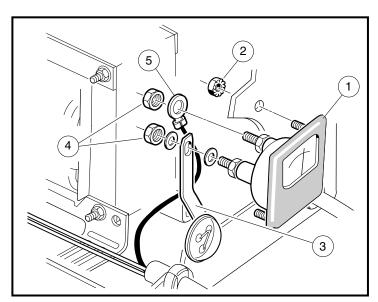


FIGURE 23-35

- Connect the black wire of the DC cord to the left (when viewed from inside the charger) post of the ammeter.
- 4. Connect the bus bar from the fuse link to the right post of the ammeter, placing washers on both sides of the bus bar.
- 5. Thread nuts onto both posts of the ammeter until just past finger tight. While holding the outside nut, turn the inside nut counterclockwise 1/4 of a turn.
- 6. Replace the charger cover.
- 7. Plug the charger into vehicle and check to be sure that ammeter is operating properly.

FUSE LINK

Removal of Fuse Link

- 1. Remove the charger cover.
- 2. Remove both secondary transformer leads and the bus bar from the back of the fuse link assembly.
- 3. Remove screws from the front of the charger and remove the fuse link assembly.

Installation of Fuse Link

- 1. Place plastic cover over fuse assembly and install mounting screws from front of charger face. Center branch of fuse assembly should be in the upper left corner when viewed from the front of the charger.
- 2. Install the bus bar over the center branch of the fuse assembly and ammeter stud. Torque to 24-30 in.lbs. (2.7/3.4 N-m).
- 3. Install a secondary transformer lead (black) to one of the two remaining terminals on the back of the fuse assembly. Install the remaining secondary transformer lead (black) to the remaining terminal. Torque to 24-30 in.lbs. (2.7/3.4 N-m).
- 4. Replace charger cover.

CHARGER RELAY

Removal of the Charger Relay (Figure 23-36, Page 23-50)

- 1. Unplug the AC and DC cords.
- 2. Remove the charger cover.

Charger Relay, Continued:

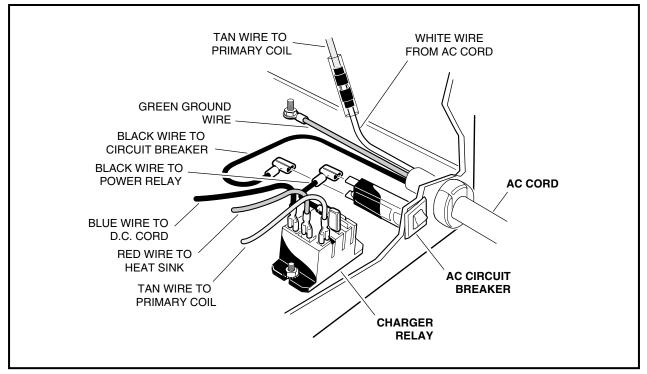


FIGURE 23-36

- 3. Disconnect the red, blue, black, and primary coil wires from the relay.
- 4. Remove the two 5/16 inch nuts and lock washers attaching the relay to the charger base.
- 5. Remove the relay.

Installation of the Charger Relay

1. Install in reverse order of removal. Connect wires as shown in Figure 23-36.

CHARGER AC CIRCUIT BREAKER

Removal of the AC Circuit Breaker (Figure 23-36)

- 1. Unplug the AC and DC cords.
- 2. Remove the charger cover.
- 3. Disconnect the two black wires attached to circuit breaker.
- 4. With a pair of pliers, squeeze in the retaining tabs on the sides of the circuit breaker and remove the circuit breaker through its mounting hole in the face of the charger.

Installation of the AC Circuit Breaker (Figure 23-36)

1. Install in reverse order of removal.

CHARGER AC CORD

Removal of the AC Cord (Figure 23-36)

- 1. Unplug the AC and DC cords.
- 2. Remove the charger cover.
- 3. Disconnect the AC cord black wire at the circuit breaker.

- 4. Disconnect the AC cord white wire at the primary coil.
- 5. Disconnect the AC cord green wire at the charger base.
- 6. Use a pair of pliers to grip the strain relief bushing and remove it and the AC cord from the charger.

Installation of the AC Cord (Figure 23-36)

- 1. Insert the black, white, and green leads of the new AC cord into the charger through the hole in the charger face.
- 2. Connect the black wire to the circuit breaker, the white wire to the primary coil, and the green wire to the charger base.

NOTE

- MAKE SURE THAT THE GREEN (GROUND) WIRE IS TIGHTLY SECURED TO THE CHARGER BASE.
- 3. Position the strain relief bushing on the AC cord.
- 4. Using pliers, install the strain relief bushing into the mounting hole in the charger face.
- 5. Install the charger cover.



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SECTION 24 - MOTOR



GENERAL INFORMATION

Club Car DS V-Glide vehicles are equipped with 36 volt DC, series wound, reversible traction motors; DS PowerDrive System 48 vehicles are equipped with 48 volt DC, series wound, reversible traction motors; and DS PowerDrive Plus vehicles are equipped with 48 volt DC, *shunt wound*, reversible traction motors. The information in this section applies to all three motors. Motors requiring major repair should be sent to a qualified motor repair shop. There are, however, many relatively easy repairs that can be made by the average mechanic.

EXTERNAL MOTOR TESTING

WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURES 22-5 AND 22-6, PAGE 22-5.
- ON POWERDRIVE SYSTEM 48 VEHICLES, AFTER DISCONNECTING BATTERIES DISCHARGE THE CONTROLLER AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${\bf ON}$ and place the forward and reverse lever in the reverse position.
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

Using a multimeter (Club Car Part No. 1011480) or a continuity tester (Club Car Part No. 1011273), the following tests can be performed without disassembling the motor.

TEST PROCEDURE 1 - CHECK FOR INTERNAL SHORT CIRCUIT

Disconnect the wires from all the terminals on the motor. Using a multimeter set on ohms (Ω), place the black (-) probe of the multimeter on the motor housing. Scratch through the paint to insure a good connection. Place the red (+) probe on the A1, A2, S1, and S2 terminals respectively (Figure 24-1, Page 24-2). The readings should be no continuity. If the readings are incorrect, the motor will need to be removed from the vehicle and repaired by a qualified technician (See Motor Removal, Page 24-3).

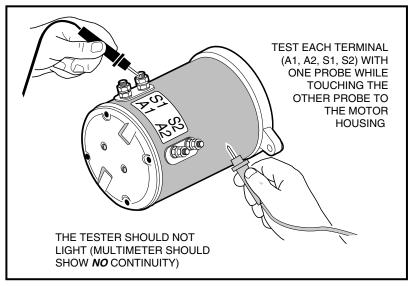


FIGURE 24-1

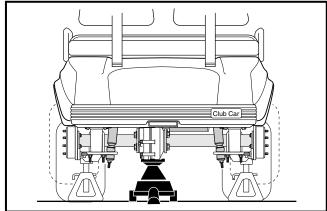
1.1. An incorrect reading from A1 or A2 terminal indicates three possible problems; a grounded A1 or A2 terminal, a grounded wire in the brush area, or a grounded armature/commutator. If the S1 or S2 reading is incorrect, it indicates a possible grounded S1 or S2 terminal or a grounded field coil.

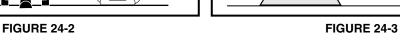
TEST PROCEDURE 2 - ARMATURE CIRCUIT OPEN

1. Disconnect the wire from the A1 terminal and the wire from the A2 terminal on the motor. Using a multimeter set on ohms (Ω) , place the red (+) probe on the A1 terminal and the black (-) probe on the A2 terminal (**Figure 24-1**). The reading should be continuity. If the reading is incorrect, a possible open or poor contact in a brush assembly and/or open armature windings may be the cause. The motor will need to be removed from the vehicle and repaired by a qualified technician (**See Motor Removal**, **Page 24-3**).

TEST PROCEDURE 3 - FIELD CIRCUIT OPEN

1. Disconnect the wire from the S1 terminal and the wire from the S2 terminal on the motor. Using a multimeter set on ohms (Ω), place the red (+) probe on the S1 terminal and the black (-) probe on the F2 terminal (**Figure 24-1**). The reading should be continuity. If the reading is incorrect, a possible open field coil or bad connections at terminals maybe the cause. The motor will need to be removed from the vehicle and repaired by a qualified technician (**See Motor Removal, Page 24-3**).





A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CONNECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT THE BATTERIES AS SHOWN IN FIGURES 22-5 AND 22-6, PAGE 22-5.
- ON POWERDRIVE SYSTEM 48 VEHICLES, DISCHARGE THE CONTROLLER AS INSTRUCTED IN THE WARNING ON PAGE 24-1
- 1. Disconnect the battery cables negative cable first (Figure 22-5 or 22-6, Page 22-5).
- 2. Using two wrenches to prevent the stud from turning, disconnect the motor wires. Label them so they will be reconnected properly.

NOTE

- TAG THE MOTOR WIRES FOR IDENTIFICATION BEFORE DISCONNECTING THEM.
- 3. Slightly loosen all the lug nuts on both rear wheels.
- 4. Place a floor jack under the transaxle and raise the rear of the vehicle (Figure 24-2), then place jack-stands under the frame cross-member between the spring mount and the side stringer, just forward of each rear wheel. Then lower the vehicle to let the jackstands support the vehicle (Figure 24-3). See WARNING below.

WARNING

- LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.
- 5. Remove both rear wheels.
- 6. Remove the nut, cup washer, and bushing from the bottom side of the shock absorber. Compress the shock absorber (pushing upwards) to move it out of the way.
- 7. Remove the nuts and bolts mounting the rear leaf springs to the shackles (Figure 24-4, Page 24-4).

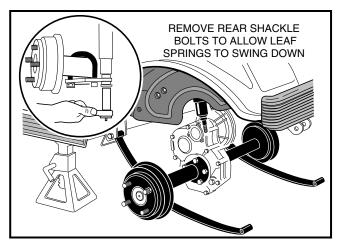


FIGURE 24-4

- 8. To gain easier access to the motor, lower the jack, with transaxle, as low as it will go. If more access room is needed, remove the jack from beneath the transaxle and allow the springs to rest on the floor (Figure 24-4).
- 9. Remove the four bolts that mount the motor to the transaxle.

A CAUTION

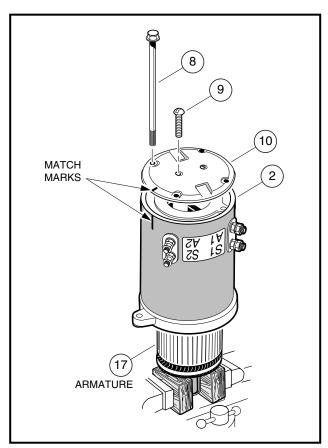
- DO NOT PLACE FINGERS UNDER THE MOTOR WHILE REMOVING IT. FINGERS PLACED UNDER THE MOTOR COULD BE PINCHED BETWEEN THE MOTOR AND THE AXLE TUBE.
- 10. Carefully slide the motor away from the transaxle until the motor spline disengages the pinion and then remove the motor from the vehicle.

MOTOR DISASSEMBLY

A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSITION. AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT THE BATTERIES AS SHOWN IN FIGURES 22-5 AND 22-6, PAGE 22-5.
- ON POWERDRIVE SYSTEM 48 VEHICLES, DISCHARGE THE CONTROLLER AS INSTRUCTED IN THE WARNING ON PAGE 24-1.

- 1. Before beginning disassembly, place match marks on the motor end shield and stator shell, and then place the motor in a vice with wooden blocks as shown (Figure 24-5).
- 2. Using a 5/16" socket, remove the four bolts (8) securing the end shield (10) to the housing with winding assembly (2) (Figure 24-5).
- 3. Using a medium flat blade screwdriver, remove the two screws (9) attaching the end shield to the bearing retainer (16) (Figure 24-5 and Figure 24-8, Page 24-7).
- 4. Slide the armature (17) out of the opposite end of the housing with winding assembly (Figure 24-5).



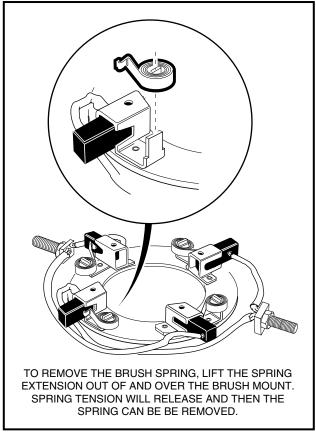


FIGURE 24-5 FIGURE 24-6

- 5. Using a 5/16" socket, remove the two screws (11) attaching the brush rigging (12) to the housing with winding assembly (Figure 24-8, Page 24-7).
- 6. Mark (A1 and A2) the brush terminal studs (27 and 28) to identify their positions in the stator shell and winding assembly, and then remove the nuts (6) and flat washers (5) (Figure 24-8, Page 24-7). From the outside, push the studs through the stator shell wall and into the interior of the stator shell and winding assembly.
- 7. Carefully remove the brush rigging and the terminal posts from the housing with winding assembly.
- 8. To remove the brush springs (14) (Figure 24-8, Page 24-7) from the rigging, lift the spring extensions out of and over the brush mounts and then slide the springs off of their mounting tabs (Figure 24-6).

TESTING AND INSPECTING INDIVIDUAL COMPONENTS

VISUAL INSPECTION OF THE ARMATURE

1. Disassemble the motor and carefully inspect the armature.

Visual Inspection of the Armature, Continued:

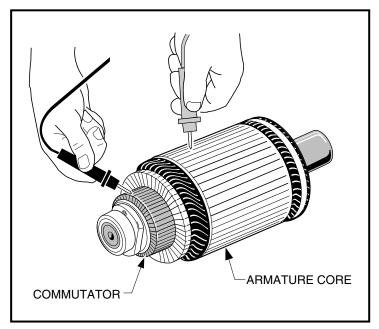


FIGURE 24-7

Look for these obvious defects:

- Burned, charred or cracked insulation.
- Improperly cured varnish.
- Thrown solder.
- Flared armature windings.
- Damaged armature core laminations.
- Worn, burned or glazed commutators.
- Dirty or oily commutators.
- · Loose commutator bars.
- Worn armature bearing or shaft.

A dirty or oily commutator should be cleaned and wiped dry. Faults seen during the inspection can aid in determining the original cause of failure. Slight roughness of the commutator can be polished smooth with 400 or finer sandpaper.

A CAUTION

 NEVER USE EMERY CLOTH TO SMOOTH THE COMMUTATOR. PARTICLES OF EMERY ARE CONDUCTIVE AND MAY SHORT-CIRCUIT THE COMMUTATOR BARS. NEVER USE OIL OR LUBRICANTS ON THE COMMUTATOR OR BRUSHES.

NOTE

 OIL ON THE COMMUTATOR INDICATES THE POSSIBILITY OF A BAD TRANSAXLE PINION OIL SEAL.

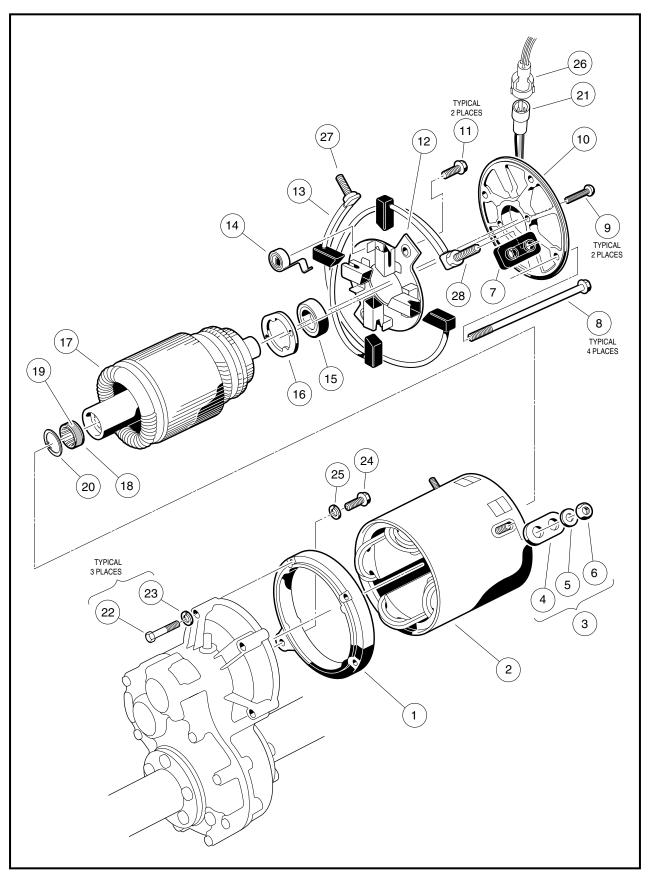


FIGURE 24-8

ARMATURE GROUND TEST

A CAUTION

• DO NOT SUBMERGE THE ARMATURE IN SOLVENT.

NOTE

- BEFORE TESTING THE ARMATURE, WIPE IT CLEAN WITH A CLEAN CLOTH. REMOVE ANY CARBON DUST AND METAL PARTICLES FROM BETWEEN THE COMMUTATOR BARS.
- 1. With a continuity tester or a multimeter set to ohms (Ω) , place one probe on the commutator and the other on the armature core. The continuity tester should **not** light. The multimeter should read no continuity (**Figure 24-7**, **Page 24-6**). If the reading is incorrect, replace the motor.

VISUAL INSPECTION OF WINDINGS

Burned or scorched insulation on the windings indicates that the motor has overheated due to overloads or to grounded or shorted coil windings. If the insulation on the windings is scorched, replace the motor or the housing with winding assembly.

INSPECTION OF MOTOR COMPONENTS

- 1. Inspect the insulators (4 and 7) for cracks or other damage (Figure 24-8, Page 24-7).
- 2. Inspect the brushes (13) for damage or excessive wear (Figure 24-8, Page 24-7). If brushes need to be replaced, See NOTE below.

NOTE

- WHEN INSTALLING NEW BRUSHES, BRUSH SETS CAN BE REMOVED AND REPLACED ONE AT A TIME. THIS METHOD ASSURES THAT THE TERMINALS AND BRUSHES WILL BE PROP-ERLY POSITIONED IN THE RIGGING. SEE PAGE 24-12 FOR BRUSH INSTALLATION.
- WHEN REPLACING BRUSHES, ALWAYS REPLACE ALL FOUR BRUSHES. NEVER REPLACE ONLY TWO.
- INSTALL THE BRUSHES 180° APART FROM THE OTHER BRUSH IN THE SAME RIGGING.
- 3. Inspect the brush springs (14) (Figure 24-8, Page 24-7). Replace springs that are discolored from heat (are straw colored or have a blue tint). Replace springs which apply a force of less than one pound at the position that the spring would be if a new brush were installed (Figure 24-9).

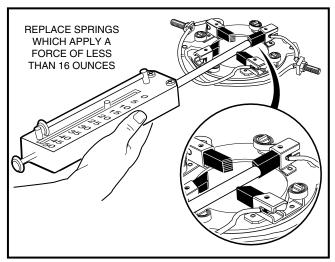
A CAUTION

 WHEN CHECKING BRUSH SPRING TENSION, IN STEP 3, DO NOT MOVE THE SPRING BEYOND THE POINT AT WHICH IT WOULD BE IF NEW BRUSHES WERE INSTALLED. EXERT-ING EXCESSIVE FORCE WILL DAMAGE THE SPRING.

Inspection of the Bearing

- 1. Using a clean cloth, wipe the carbon dust off of the bearing. Inspect the bearing by spinning it by hand and checking for both axial (A) and radial (B) play (Figure 24-10).
- 2. Replace the bearing if it is noisy, does not spin smoothly, or has excessive play. Check the bearing and replace if rusted, worn, cracked, or if there is an abnormal color change in the metal of the bearing. The

bearing should be replaced if there is wear or pitting on the balls or on the rolling surfaces. Do not remove the bearing unless it is to be replaced.



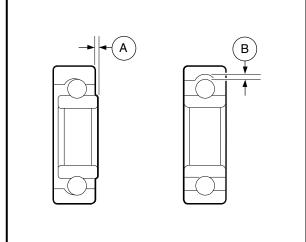
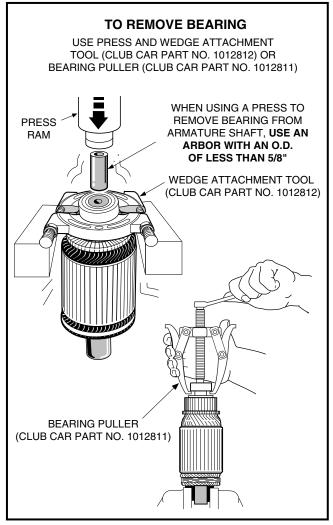


FIGURE 24-9

FIGURE 24-10



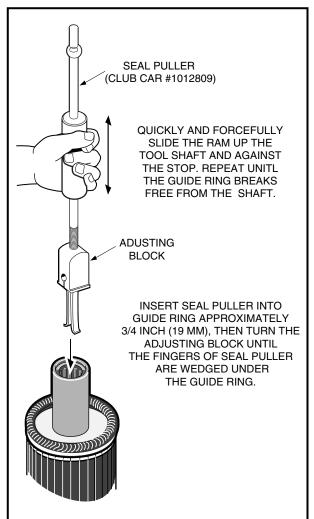


FIGURE 24-11 FIGURE 24-12

Remove the Bearing

1. Place the wedge attachment tool (Club Car Part No. 1012812) between the bearing (15) and the armature (Figure 24-8, Page 24-7). Make sure the wedge attachment tool is supporting the inner race of the bearing. If a press is not available, secure a bearing puller (Club Car Part No. 1012811) to the bearing and pull the bearing off of the end of the armature shaft. Support the shaft so that it will not drop when the bearing is removed (Figure 24-11, Page 24-9). Discard the bearing.

Inspection of the Guide Ring

 Insert the alignment and installation tool (See Figure 24-13) into the output end of the motor shaft and into the guide ring, stopping the tool before it reaches the armature splines. Turn the alignment tool in the shaft. If the guide ring moves and the armature does not move, the guide ring must be replaced.

Removal of the Guide Ring

- 1. Using snap ring pliers, remove the snap ring (20) (Figure 24-8, Page 24-7).
- 2. Insert the fingers of a seal puller (Club Car Part Number 1012809) through the guide ring (approximately 3/4 inch (19 mm) into the shaft). Turn the adjusting block to expand the fingers until they are wedged under the bottom edge of the guide ring. Remove the guide ring by quickly and forcefully sliding the ram up the tool shaft and against the stop (Figure 24-12, Page 24-9). See NOTE below.

NOTE

• THE GUIDE RING CAN BE REMOVED WITH A SMALL PRY BAR ALSO.

Installation of the Guide Ring

1. Apply adhesive (Club Car Part Number 1018132-02) around the outside of the guide ring. Install a new guide ring in the armature shaft. **See NOTE below**.

NOTE

- A GUIDE RING ALIGNMENT AND INSTALLATION TOOL CAN BE FABRICATED USING A TRAN-SAXLE INPUT SHAFT (CLUB CAR PART NUMBER 1013764) AND AN EXTRA GUIDE RING (CLUB CAR PART NUMBER 1017891-01). SEE FIGURE 24-13 FOR FABRICATION AND USE OF THIS TOOL.
- 2. After guide ring is installed, allow the glue to set for 24 hours before installing the snap ring (20) and installing the shaft into the motor (Figure 24-8, Page 24-7).

RECONDITIONING THE MOTOR

Motor reconditioning must be performed by a qualified motor repair technician. The use of proper tools and methods is absolutely essential for successful reconditioning of the motor. **See CAUTION below**.

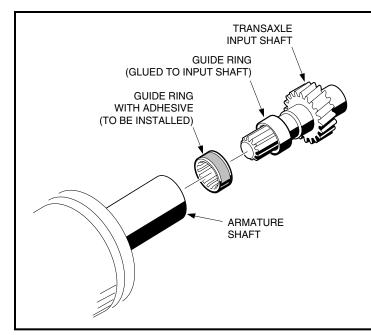
A CAUTION

 CLUB CAR STRONGLY RECOMMENDS THAT THE MOTOR BE TAKEN TO A PROFESSIONAL RECONDITIONING FACILITY.

MOTOR SPECIFICATIONS

Any rework must be performed by a qualified technician. Motor service specifications are listed in the table on page 24-11.

ITEM	SERVICE LIMIT		
Commutator diameter (minimum)	2.265 inches (66.675 millimeters)		
Commutator concentric with armature shaft within	.001 inch (0.0508 millimeter)		
Limit depth of cut when machining commutator	.005 inch (0.127 millimeter)		
Bar to bar run out should not exceed	.0002 inch (.00508 millimeter)		
If undercut of segment insulator is less than .016 inch (0.406 millimeter), it should be undercut to	.031 inch (0.8 millimeter)		
Machined face of Commutator	8-16 micro inches		
Field coil resistance (V-Glide 36 Volt, 2.97 Hp.)	.00711 Ω		
Field coil resistance (V-Glide 36 Volt, 3.50 Hp.)	.00514 Ω		
Field coil resistance (PowerDrive System 48, 3.10 Hp.)	0.02040 Ω		
Field coil resistance (PowerDrive System 48, 3.75 Hp.) (optional equipment)	0.00884 Ω		
Field coil resistance (PowerDrive Plus 48 Volt, 3.20 Hp.)	1.32353 Ω		



TO MAKE A GUIDE RING INSTALLATION TOOL, GLUE A GUIDE RING (CLUB CAR PART NO. 1017891-01) ONTO AN INPUT SHAFT (CLUB CAR PART NO. 1013764) AS SHOWN AND ALLOW THE GLUE TO SET.

TO INSTALL A NEW GUIDE RING IN THE ARMATURE SHAFT:

COAT THE ENTIRE OUTSIDE SURFACE OF THE NEW GUIDE RING WITH A THIN FILM OF GUIDE RING ADHESIVE (CLUB CAR PART NO. 1018132-01) AND THEN SLIDE IT ONTO THE INPUT SHAFT NEXT TO THE GUIDE RING THAT IS GLUED ON.

MATING THE SPLINES OF THE GUIDE RING INSTALLATION TOOL WITH THE SPLINES IN THE ARMATURE SHAFT, INSERT THE GUIDE RING INSTALLATION TOOL INTO THE ARMATURE SHAFT UNTIL THE NEW GUIDE RING IS SEATED AGAINST THE END OF THE ARMATURE SPLINES.

REMOVE THE GUIDE RING INSTALLATION TOOL FROM THE ARMATURE, MAKING SURE THAT THE GUIDE RING REMAINS SEATED. ALLOW THE NEW GUIDE RING TO SET FOR 24 HOURS BEFORE INSTALLING THE SNAP RING AND INSTALLING MOTOR ONTO THE TRANASAXLE.

FIGURE 24-13

MOTOR ASSEMBLY

- 1. If the bearing has been removed, replace the bearing:
 - 1.1. Press on a new bearing using an arbor press that exerts pressure on the inner race only. **See NOTE below**.

NOTE

- MAKE SURE THAT THE BEARING RETAINER (16) (FIGURE 24-8, PAGE 24-7) IS POSITIONED ON THE ARMATURE SHAFT BEFORE THE BEARING IS PRESSED ON.
- AN ARBOR WITH AN OUTSIDE DIAMETER OF LESS THAN 5/8 INCH (16MM) SHOULD BE USED TO PRESS THE BEARING ON.

Motor Assembly, Continued:

2. Install the brushes. See NOTE below.

NOTE

- WHEN INSTALLING NEW BRUSHES, BRUSH SETS CAN BE REMOVED AND REPLACED ONE AT A TIME. THIS METHOD ASSURES THAT THE TERMINALS AND BRUSHES WILL BE PROP-ERLY POSITIONED IN THE RIGGING.
- WHEN REPLACING BRUSHES, ALWAYS REPLACE ALL FOUR BRUSHES. NEVER REPLACE ONLY TWO.
- INSTALL THE BRUSHES 180° APART FROM THE OTHER BRUSH IN THE SAME RIGGING.
- 3. Position the brush rigging (12) on the mounting tabs in the housing with winding assembly (2) and secure with screws (11). Tighten the screws to 15-25 in.lbs. (1.6/2.8 N-m) (Figure 24-8, Page 24-7) (See Figure 24-14).
- 4. One at a time, pull the brush spring extensions back from the brushes and slide the brushes back until they are completely retracted into their mounting slots. Then position the brush springs against the sides of the brushes so that spring pressure will hold them in the retracted position.
- 5. Slide the armature, bearing end first, into the housing with winding assembly. Make sure the brushes are held back while positioning the armature for proper commutator/brush contact. Release the brushes and place the springs outside of the brushes so that the brushes are being held against the commutator. See CAUTION below.

CAUTION

- IF THE MOTOR IS BEING ASSEMBLED WITH THE ARMATURE STANDING ON END AS THE COMMUTATOR IS POSITIONED, MAKE SURE THE BRUSHES ARE HELD BACK. DO NOT ALLOW THE BRUSHES TO SUPPORT THE WEIGHT OF THE HOUSING WITH WINDING ASSEMBLY. THE BRUSHES CAN BE EASILY DAMAGED BY THIS WEIGHT.
- 6. Attach the bearing retainer (16) to the end shield (10) by aligning the screw holes in the bearing retainer with the two mating screw holes in the end shield and installing the screws (9) **(Figure 24-15)**. Tighten the screws to 14-20 in.lbs. (1.6/2.2 N-m). **See NOTE below**.

NOTE

- USE A LONG SCREW WITH THE SAME THREAD SPECIFICATIONS AS THE MOUNTING SCREWS TO MAINTAIN HOLE ALIGNMENT WHILE STARTING THE FIRST MOUNTING SCREW. **SEE FIGURE 24-15.**
- 7. Align the matching marks on the end shield and the housing with winding assembly, then install the four screws (8) (Figure 24-8, Page 24-7). Tighten the screws to 80-100 in.lbs. (9/11.3 N-m).

NOTE

- POWERDRIVE PLUS VEHICLES ONLY: MAKE SURE ON THAT THE MOTOR SPEED SENSOR LEAD THAT IS ON THE END SHIELD IS LINED UP WITH THE F2 AND A2 TERMINALS ON THE MOTOR HOUSING.
- 8. Make sure that the armature turns freely. If it doesn't turn freely, disassemble the motor again to find the problem. Make sure the bearing is properly seated in the end shield when assembling the motor.

WITH BRUSH RIGGING FACING DOWN AND HELD SLIGHTLY ABOVE THE STATOR SHELL AND WINDING ASSEMBLY, INSERT THE TWO TERMINAL POSTS (THESE SHOULD HAVE BEEN MARKED FOR POSITION) THROUGH THE INSULATORS IN THE STATOR SHELL WALL AT THE A1 AND A2 POSITIONS. INSERT THE RIGGING MOUNTING BOLTS THROUGH THE RUBBER SEALED HOLES IN THE RIGGING AND INTO THE THREADED HOLES IN THE MOUNTING BRACKETS. **RIGGING TERMINAL POST MOUNTING BRACKET**

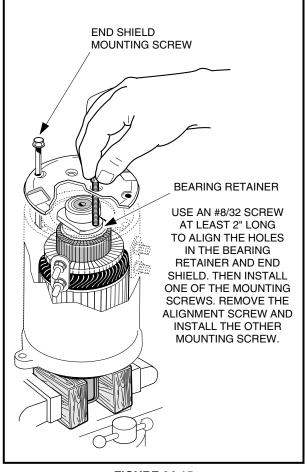


FIGURE 24-14 FIGURE 24-15

MOTOR INSTALLATION

- 1. Apply "Molykote G" lubricant to the female splines of the motor armature shaft.
- 2. Slide the motor onto the transaxle spline. Rotate the motor until the locating bolt mounting hole on the motor is aligned with its mounting hole in the transaxle casing and then install the bolt (24) (threading in only a few turns) with lock washer (25) (Figure 24-8, Page 24-7) (See Figure 24-16). Do not tighten the bolt at this time.
- 3. Install, but do not tighten (threading in only a few turns) the three 1/4-20 bolts (22) with lock washers (23) that mount the motor to the transaxle (Figure 24-8, Page 24-7). See CAUTION below.

A CAUTION

- MAKE SURE THAT THE MOTOR IS PROPERLY SEATED IN THE TRANSAXLE HOUSING.
- 4. Tighten the four screws with your fingers, moving from screw (C) to screws (A, B, D) until the motor is seated. With one wheel jacked up so that it is not on the ground, rotate the axle to make sure the motor is not binding on the transaxle spline shaft (Figure 24-17).
- 5. Using a torque wrench, tighten the lower 1/4 inch screw (C). Now tighten the screw (A) across from the first screw, then tighten the center screw (B) at the top. Tighten these screws to 60-70 in.lbs. (6.8/7.9 Nm). Tighten the 5/16 inch screw (D) to 140-170 in.lbs. (15.8/19.2 N-m) (Figure 24-17).

Motor Installation, Continued:

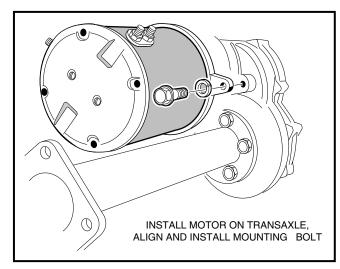
6. Install the motor wires, making sure that they are connected to the correct terminals. Tighten the terminal retaining nuts to 60-70 in.lbs. (6.8/7.9 N-m). **See CAUTION and NOTE below**.

A CAUTION

 ON V-GLIDE 36 VOLT VEHICLES, MAKE SURE MOTOR WIRES ARE ROUTED THROUGH THE WIRE TIE THAT PREVENTS THEM FROM MAKING CONTACT WITH THE RESISTORS.

NOTE

- THE MOTOR WIRES SHOULD HAVE BEEN TAGGED FOR IDENTIFICATION WHEN THEY WERE DISCONNECTED. IF THE WIRES WERE NOT TAGGED, SEE WIRING DIAGRAM (FIGURE 19-2, PAGE 19-3 FOR V-GLIDE 36 VOLT VEHICLES; FIGURE 20-2, PAGE 20-3 OR FIGURE 20-3, PAGE 20-4 FOR POWERDRIVE SYSTEM 48 VEHICLES; FIGURE 21-1, PAGE 21-2 FOR POWER-DRIVE PLUS VEHICLES).
- 7. If using a chain hoist, lower the vehicle and guide the leaf springs into the shackles. If using a floor jack, raise the transaxle until the leaf springs can be guided into the shackles.
- 8. Insert the mounting bolts through the spring shackles and the bushings in the leaf spring eyes and install lock nuts. Tighten the bolts to 23 ft.lbs. (31 N-m) (See Section 25, Page 25-3).
- 9. Install the shock absorbers (See Section 25, Page 25-2).
- 10. Install rear wheels and finger tighten the lug nuts.
- 11. Lower the vehicle and finish tightening lug nuts (using a criss-cross pattern) to 55 ft.lb. (74.6 N-m) (See Figure 22-5 or 22-6, Page 22-5).
- 12. Reconnect the battery cables, negative (-) first and tighten to 110 in.lb. (12.4 N-m). Coat terminals with Battery Protector Spray (Club Car Part No. 1014305) to minimize corrosion (Figure 22 5 or 22 6, Page 22 5).



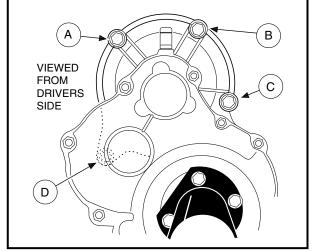


FIGURE 24-16 FIGURE 24-17

SECTION 25 - REAR SUSPENSION, ELECTRIC VEHICLE



GENERAL INFORMATION

The rear suspension consists of two leaf springs that are controlled by two shock absorbers mounted between the springs and the vehicle frame. No adjustment or alignment is required.

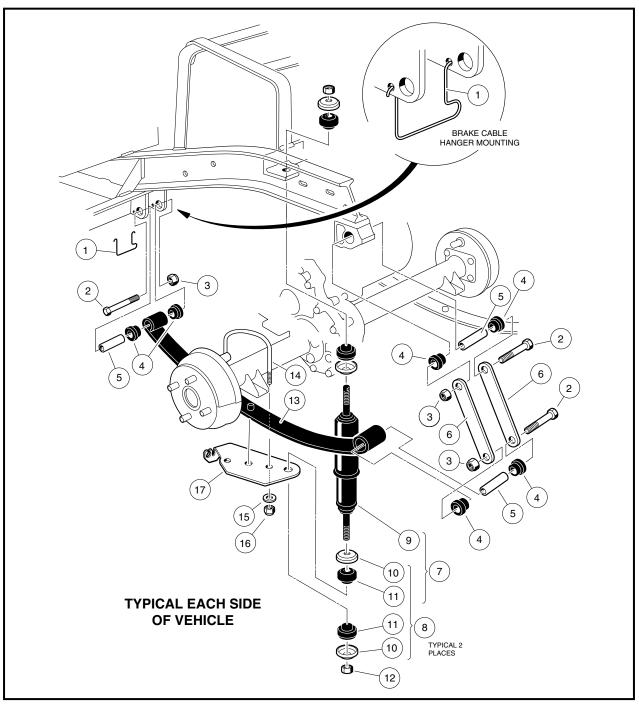


FIGURE 25-1

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A WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL MECHANICAL REPAIR. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNINGS STATED IN THIS MANUAL.
- ALWAYS WEAR SAFETY GLASSES OR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH OFF, PLACE FORWARD AND REVERSE LEVER IN THE NEUTRAL POSI-TION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CON-NECTIONS.
- TO AVOID UNINTENTIONAL STARTING OF THE VEHICLE, DISCONNECT BATTERIES AS SHOWN IN FIGURES 22-5 AND 22-6, PAGE 22-5.
- ON POWERDRIVE SYSTEM 48 VEHICLES, DISCHARGE THE CONTROLLER AS FOLLOWS:
 - TURN THE KEY SWITCH TO ${
 m ON}$ and place the forward and reverse lever in the reverse position .
 - SLOWLY DEPRESS THE ACCELERATOR PEDAL AND KEEP IT DEPRESSED UNTIL THE REVERSE WARNING BUZZER CAN NO LONGER BE HEARD. WHEN THE BUZZER STOPS SOUNDING, THE CONTROLLER IS DISCHARGED.

SHOCK ABSORBERS

INSPECTING AND REMOVING SHOCK ABSORBERS

- 1. Check shock absorbers (9) for fluid leakage at the point where the shaft enters the shock absorber body. Replace leaking shock absorbers (Figure 25-1, Page 25-1).
- 2. To remove a shock absorber, remove the nuts (12), cup washer (10), and rubber bushings (11) at each end of the shock absorber (Figure 25-1, Page 25-1).
- 3. Compress the shock absorber to remove it.

INSTALLING SHOCK ABSORBERS

1. To install, reverse the removal procedure.

NOTE

• TIGHTEN THE MOUNTING NUT (12) UNTIL THE RUBBER BUSHING (11) EXPANDS TO THE SAME SIZE AS THE CUP WASHER (10). **DO NOT** OVERTIGHTEN MOUNTING NUT.

REAR LEAF SPRINGS

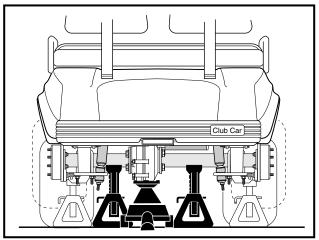
REMOVING THE REAR LEAF SPRINGS

1. Place chocks at the front wheels. If a chain hoist is available, lift the rear of the vehicle and position jackstands under the transaxle as shown (Figure 25-2). Then lower the vehicle onto the jackstands just enough to slightly compress the rear leaf springs. If a floor jack is used, place it under the transaxle and raise the rear of the vehicle, then place jackstands under the frame cross-member between the spring mount and the side stringer, just forward of each rear wheel (Figure 25-3). Also place jackstands under

the axle tubes (Figure 25-2), then lower the vehicle to let the jackstands support the vehicle. See WARNING below.

WARNING

 LIFT ONLY ONE END OF A VEHICLE AT A TIME. BEFORE LIFTING, LOCK THE BRAKES AND CHOCK THE WHEELS THAT REMAIN ON THE FLOOR. USE A SUITABLE LIFTING DEVICE (CHAIN HOIST OR HYDRAULIC FLOOR JACK) WITH 1000 LBS. (454 KG.) MINIMUM LIFTING CAPACITY. DO NOT USE LIFTING DEVICE TO HOLD VEHICLE IN RAISED POSITION. ALWAYS USE APPROVED JACKSTANDS OF PROPER WEIGHT CAPACITY TO SUPPORT THE VEHICLE.



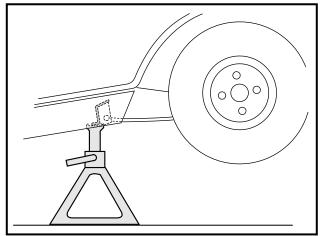


FIGURE 25-2

FIGURE 25-3

- 2. Remove the tire and wheel assembly on the side from which the leaf spring is to be removed.
- 3. Remove the lower nut (3) and bolt (2) from the rear shackle (6) (Figure 25-1, Page 25-1).
- 4. Remove the cotter pin (1) and then the clevis pin (2) at the brake lever/cable connection, and then pull the clevis (3) away from the brake lever (Figure 25-4, Page 25-4).
- 5. Remove the nut (12), cup washer (10), and bushing (11) from the bottom side of the shock absorber. Compress the shock absorber (pushing upwards) to move it out of the way (Figure 25-1, Page 25-1).
- 6. Remove the two nuts (16) and lock washers (15) from the U-bolts at the spring plate (17). Remove the spring plate, and then the leaf spring will swing down (Figure 25-5, Page 25-4).
- 7. Remove the nut (3) and bolt (2) attaching the front of the leaf spring to the vehicle frame. The spring can now be removed (Figure 25-1, Page 25-1).
- 8. Inspect the bushings (4) and spacers (5) in the leaf spring eyes and replace them if they are worn or damaged (Figure 25-1, Page 25-1).

INSTALLING THE REAR LEAF SPRINGS

1. To install the rear leaf springs, reverse the removal procedure. See CAUTION below and CAUTION and NOTE on page 25-4.

A CAUTION

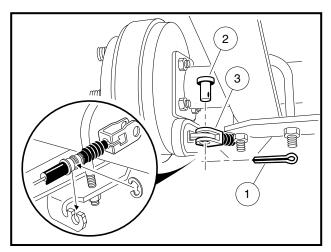
• WHEN PLACING THE TRANSAXLE ON THE LEAF SPRING, BE SURE TO POSITION THE LOCATING BOLT ON THE SPRING IN THE LOCATING HOLE IN THE TRANSAXLE SADDLE.

A CAUTION

• WHEN INSTALLING THE SPRING PLATE (17), ALIGN THE HOLE IN THE SPRING PLATE WITH THE BOLT HEAD ON THE LEAF SPRING. INSTALL THE U-BOLT (14), TWO LOCK WASHERS (15), AND TWO NUTS (16). TIGHTEN BOTH NUTS (16) FINGER TIGHT, THEN TIGHTEN THEM IN SEVERAL STEPS, ALTERNATING FROM ONE TO THE OTHER, TO 15-20 FT.LBS. (20/27 N-M).

NOTE

- TIGHTEN THE SHOCK ABSORBER MOUNTING NUT (12) UNTIL THE RUBBER BUSHING (11) EXPANDS TO THE SAME SIZE AS THE CUP WASHER (10). DO NOT OVERTIGHTEN MOUNTING NUT.
- 2. Tighten nut (3) to 23 ft.lbs. (31 N-m) (Figure 25-1, Page 25-1).



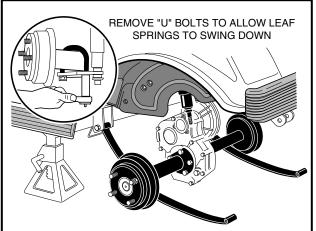


FIGURE 25-4 FIGURE 25-5

