

# **G19E GOLF CAR SERVICE MANUAL SUPPLEMENT**

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## **FOREWORD**

This Supplement Service Manual has been prepared to introduce new service and new data for the G19E. For complete information on service procedures, it is necessary to use this Supplement Service Manual together with following manual:

<b>G14A/G14E SERVICE MANUAL</b>
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<p><b>G19E SERVICE MANUAL SUPPLEMENT 1999 by Yamaha Motor Manufacturing Corporation of America 2nd edition, June 1999 Printed in U.S.A. P/N/ LIT-19616-00-00</b></p>
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# INTRODUCTION

This manual has been written by Yamaha Motor Manufacturing Corporation of America for use by Authorized Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into a manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha golf cars have a basic understanding of the mechanical concepts and procedures inherent to these products. Without such knowledge, attempted repairs or service to this golf car may render it unfit to use and/or unsafe.

Yamaha Motor Manufacturing Corporation of America is continually striving to further improve all models manufactured by the company. Modifications are therefore inevitable and will, where applicable, appear in future editions of this manual.

**TECHNICAL SERVICE DEPT  
GOLF CAR SALES GROUP  
YAMAHA MOTOR  
MANUFACTURING CORP OF  
AMERICA**

## HOW TO USE THIS MANUAL

### Read This Important Information!

Particularly important information in this manual is distinguished by the following notations:



The Safety Alert Symbol means **ATTENTION! BE ALERT! YOUR SAFETY IS INVOLVED!**

#### **WARNING**

Failure to follow **WARNING** instructions could result in severe injury or death to golf car occupants, a bystander, or a person inspecting or repairing the golf car.

#### **CAUTION**

This message describes special precautions that must be taken to avoid damage to the golf car.

#### **NOTE:**

This message provides additional key information.

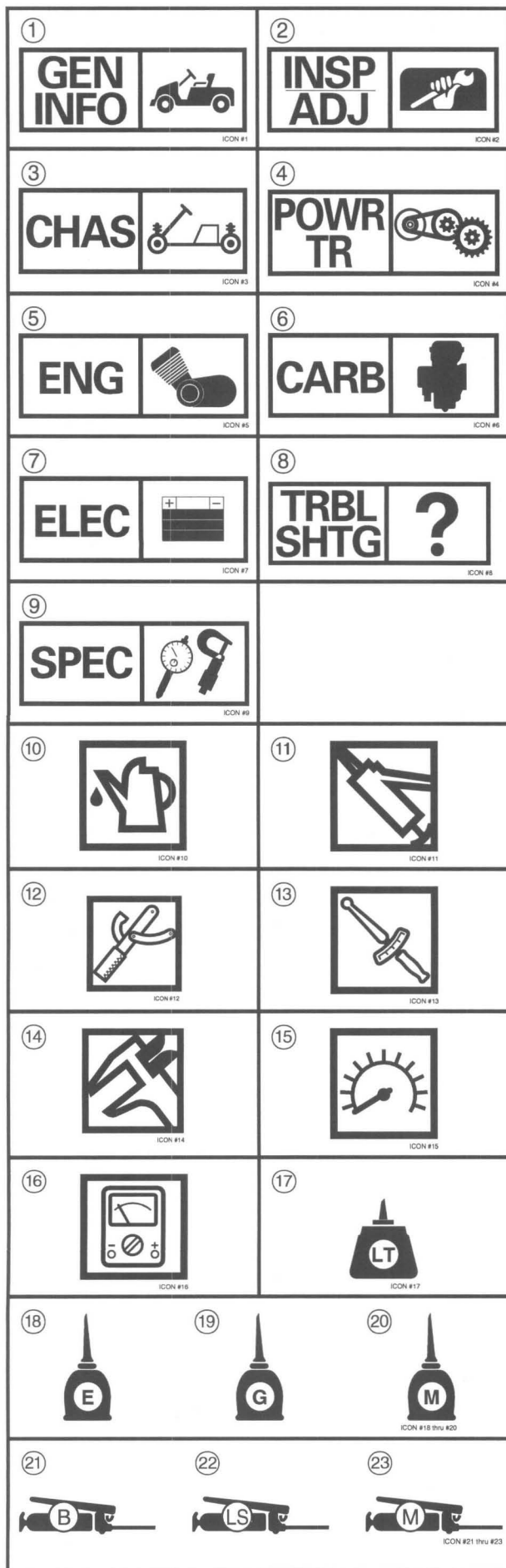
### MANUAL FORMAT

All of the procedures in this manual are organized in a sequential, step-by-step format. The information has been compiled to provide the mechanic with an easy to read, handy reference that contains comprehensive explanations of all disassembly, repair, assembly, and inspection operations. In this revised format, the condition of a faulty component will precede an arrow symbol and the course of action required will follow the symbol, e.g.,

- Bearings  
Pitting/Damage → Replace.

### EXPLODED DIAGRAM

Each chapter provides exploded diagrams before each disassembly section for ease of identifying correct disassembly and assembly procedures.



## Symbol Identification

Symbols ① to ⑨ are designed as thumb tabs to indicate the contents within a chapter.

- ① General information
- ② Periodic inspection and adjustment
- ③ Chassis
- ④ Power train
- ⑤ Engine overhaul
- ⑥ Carburetion
- ⑦ Electrical
- ⑧ Troubleshooting
- ⑨ Specifications

Symbols ⑩ to ⑯ are used to identify specifications within the text.







- ⑩ Filling fluid
- ⑪ Lubricant
- ⑫ Special tool
- ⑬ Tightening torque
- ⑭ Wear limit, clearance
- ⑮ Engine speed
- ⑯  $\Omega$ , V, A

Symbols ⑰ to ㉓ are used in the exploded diagrams to indicate the grade and location of lubricant.

- ⑰ Apply locking agent
- ⑱ Apply engine oil
- ⑲ Apply gear oil
- ㉑ Apply molybdenum disulfide oil
- ㉒ Apply wheel bearing grease
- ㉓ Apply lightweight lithium soap base grease
- ㉔ Apply molybdenum disulfide grease



# INDEX

<b>GENERAL INFORMATION</b>	
	<b>GEN INFO</b> <b>1</b>
<b>PERIODIC INSPECTION AND ADJUSTMENT</b>	
	<b>INSP ADJ</b> <b>2</b>
<b>CHASSIS</b> (Refer to G14A, G14E Service Manual)	
	<b>CHAS</b> <b>3</b>
<b>POWER TRAIN</b> (Refer to G14A, G14E Service Manual)	
	<b>POWR TR</b> <b>4</b>
<b>ELECTRICAL</b>	
	<b>ELEC</b> <b>7</b>
<b>TROUBLESHOOTING</b>	<b>?</b>
	<b>TRBL SHTG</b> <b>8</b>
<b>SPECIFICATIONS</b>	
	<b>SPEC</b> <b>9</b>

---

# TABLE OF CONTENTS

## CHAPTER 1 – GENERAL INFORMATION

<b>SAFETY PRECAUTIONS</b> .....	1-1
<b>GENERAL SERVICE INFORMATION</b> .....	1-2
FRAME SERIAL NUMBER.....	1-2
SPECIAL TOOLS .....	1-2

## CHAPTER 2 – PERIODIC INSPECTION AND ADJUSTMENT

MAINTENANCE CHART .....	2-1
<b>ELECTRICAL (FOR G19E)</b> .....	2-2
BATTERY CHARGING .....	2-2
48V BATTERY CHARGER.....	2-3
48V CHARGER FEATURES .....	2-4
48V CHARGER OPERATING INSTRUCTIONS .....	2-4
<b>BATTERY INSPECTION</b> .....	2-6
<b>CHARGE RECEPTACLE INSPECTION</b> .....	2-9
<b>CHARGING CIRCUIT FUSIBLE LINK</b> .....	2-9
<b>CONTROLLER CONNECTOR INSPECTION</b> .....	2-9
<b>BATTERY LOAD TESTING</b> .....	2-10
DISCHARGE CHARTS .....	2-12

## CHAPTER 3 – CHASSIS

REFER TO G14A, G14E  
SERVICE MANUAL LIT-19616-00-70

## CHAPTER 4 – POWER TRAIN

REFER TO G14A, G14E  
SERVICE MANUAL LIT-19616-00-70

## CHAPTER 7 – ELECTRICAL FOR G-19E

<b>G19E WIRING DIAGRAM</b> .....	7-1
<b>ELECTRICAL COMPONENT LOCATIONS</b> .....	7-2
<b>ELECTRICAL COMPONENTS</b> .....	7-3
<b>TRACTION MOTOR</b> .....	7-4
<b>TRACTION MOTOR</b> .....	7-5
REMOVAL .....	7-5
DISASSEMBLY .....	7-6
INSPECTION AND TESTING .....	7-8
ASSEMBLY .....	7-11
INSTALLATION.....	7-12
<b>MOTOR CONTROLLER</b> .....	7-13

## CHAPTER 8 – TROUBLESHOOTING

<b>ELECTRICAL</b> .....	8-1
<b>ACCELERATION BECOMES ROUGH, UNEVEN OR JERKY</b> .....	8-1
VISUAL INSPECTION .....	8-1
TEST THROTTLE POSITION SENSOR .....	8-1
<b>CAR DOES NOT SLOW ON DOWN HILL GRADE AND/OR CAR WILL ROLL AWAY WITHOUT SLOWING</b> .....	8-2
VISUAL INSPECTION .....	8-2
<b>SPEED SENSOR WIRE HARNESS CHECK</b> .....	8-2

<b>SPEED SENSOR TEST</b> .....	8-3
<b>SPEED SENSOR MAGNET CHECK</b> .....	8-3

## CAR HAS NO REVERSE WARNING

<b>BEEPER</b> .....	8-3
BUZZER WIRING CHECK .....	8-3
GROUND WIRE CHECK .....	8-4

## THE CAR'S TOP SPEED SLOWS

<b>CHECK BRAKE AND CHASSIS</b> .....	8-4
<b>VISUAL INSPECTION</b> .....	8-4
<b>CHECK BATTERIES</b> .....	8-4
<b>TEST THROTTLE POSITION SENSOR</b> .....	8-4
<b>CHECK TRACTION MOTOR</b> .....	8-4

## CAR ONLY RUNS IN ONE DIRECTION

<b>CHECK FORWARD/REVERSE DIRECTION SWITCH</b> .....	8-4
---	-----

## CAR WON'T RUN EITHER DIRECTION,

<b>SOLENOID DOES NOT CLICK</b> .....	8-5
RESET CONTROLLER .....	8-5
VISUAL INSPECTION .....	8-5
CHECK BATTERIES .....	8-5
FUSE CHECK .....	8-5
TOW SWITCH TEST .....	8-6
WIRE CHECK SOLENOID TO TOW SWITCH .....	8-6
CONTROLLER GROUND WIRE CHECK ..	8-6
SOLENOID GROUND BYPASS.....	8-6
WIRE CHECK - SOLENOID TO CONTROLLER.....	8-7
SOLENOID RELAY BENCH TEST .....	8-7

## CAR WON'T RUN EITHER DIRECTION,

<b>SOLENOID DOES CLICK</b> .....	8-8
VISUAL INSPECTION .....	8-8
CHECK BATTERIES .....	8-8
THROTTLE POSITION SENSOR CHECK.....	8-8
MAIN SWITCH CHECK.....	8-9
ACCELERATOR STOP SWITCH CHECK.....	8-9
DIRECTION SWITCH CHECK .....	8-10
SOLENOID RELAY BENCH TEST .....	8-10
CHECK TRACTION MOTOR.....	8-10
<b>TRACTION MOTOR</b> .....	8-11

## CHAPTER 9 – SPECIFICATIONS

<b>MAINTENANCE SPECIFICATION FOR G19E</b> .....	9-1
ELECTRICAL .....	9-1
<b>CABLE/WIRE ROUTING</b> .....	9-4
<b>WIRING DIAGRAM</b> .....	9-6

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## SAFETY PRECAUTIONS

### WARNING

Follow these safety precautions and those in Chapter 1 of the G14A/E SERVICE MANUAL "SAFETY PRECAUTIONS" section (P/N LIT-19616-00-70). Exercise caution when performing service work to prevent serious accidents.

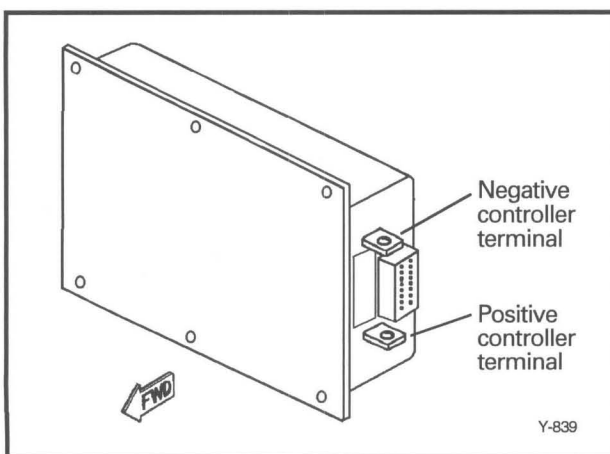
Before performing any service related to the speed controller, or any action requiring or allowing physical contact with electrical power components:

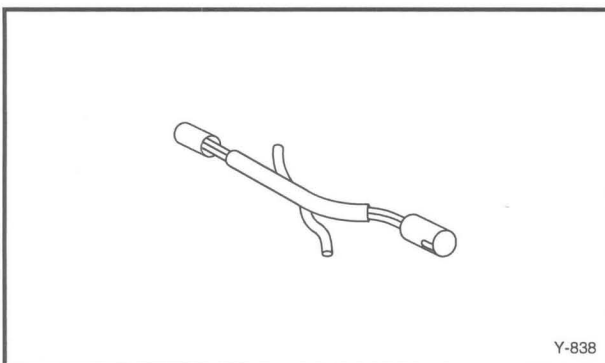
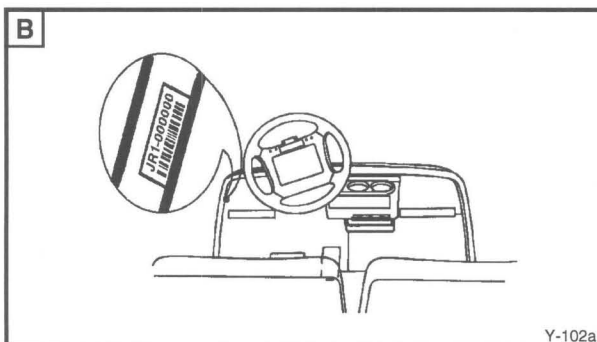
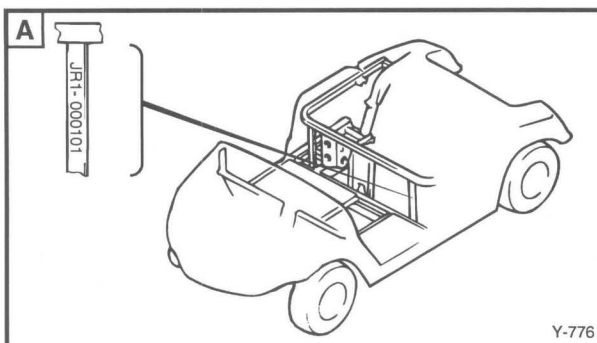
### SECURE THE VEHICLE

- Block the front wheels.
- Raise both rear wheels off the ground to a free wheeling position.
- Do not allow anyone to stand in front of or behind the vehicle during service.

### DISCHARGE THE SPEED CONTROLLER CAPACITOR.

- Turn the main switch to the "OFF" position.
- Turn the tow switch to the "TOW" position. When turned to "TOW", the controller capacitor should discharge within 5 seconds.
- Disconnect the black wire leads at the negative battery terminal.
- Wait 30 seconds, then attach a 48 volt test light between the positive and negative controller terminals to confirm that the capacitor is discharged (test light will not illuminate).
- If required for component testing, reconnect the battery and turn on main and tow switch for specific measurements after required meters are in place.





## GENERAL SERVICE INFORMATION

### FRAME SERIAL NUMBER

The machine serial number plate is attached in the location shown.

- (A) G19E (JR1-000101~299999)
- (B) G19E (JR1-300101~)

### SPECIAL TOOLS

The proper special tools are necessary for complete and accurate tune-up and assembly. Using the correct special tool will help prevent damage caused by the use of improper tools or improvised techniques.

#### FOR SPEED SENSOR TEST

1. Speed Sensor Test Cord  
YG-42221

This tool is needed to test the traction motor speed sensor voltage output.



## PERIODIC INSPECTION AND ADJUSTMENT

### PERIODIC MAINTENANCE

Regular maintenance is most important for best performance and safe operation.

#### **⚠ WARNING**

**Be sure to turn off the main switch and apply the parking brake when you perform maintenance unless otherwise specified.**

#### FOR G19E

C - CHECK CA - CHECK AND ADJUST R - REPLACE S - SERVICE CL - CLEAN AND LUBRICATE L - LUBRICATE

	Remarks	Pre-Operation	20 Rounds 20 hours 100 miles 160 kms (Every month)	125 rds 125 hrs 600 mls 1000 kms (Every 6 months)	250 rds 250 hrs 1200 mls 2000 kms (Every year)	500 rds 500 hrs 2500 mls 4000 kms (Every 2 years)	1000 rds 1000 hrs 5000 mls 8000 kms (Every 4 years)
PRE-OPERATION CHECKS	Charge	S	S	S	S	S	S
	Clean battery tops, check for tightness of hold-down screws and terminals	S	S	S	S	S	S
	Check brake pedal freeplay and adjust if necessary	C	CA	CA	CA	CA	CA
	Check steering operation	C	C	C	C	C	
	Check tire pressure, tread depth, tire surface for damage	C	CA	CA	CA	CA	CA
	Check body and chassis for damage	C	C	C	C	C	C
	Check tightness of all bolts, nuts, and screws	C	C	C	C	C	C
	Check reverse buzzer operation	C	C	C	C	C	C
EVERY MONTH	Check electrolyte level		C	C	C	C	C
	Check for loose or broken connections		C	C	C	C	C
	Clean/lube pedal control area		CL				
EVERY 6 MONTHS	Check all wire insulation for cracks and/or worn spots			C	C	C	C
	Check shock absorbers for oil leaks and damaged spring			C	C	C	C
EVERY YEAR	Perform a discharge test				S	S	S
	Apply terminal protectant				S	S	S
	Check shoe lining thickness and rear axle bearing play				C	C	C
	Check kingpin play, seal, and cap / Adjust wheel alignment				CA	CA	CA
	Check wheel nut tightness, front wheel bearing play				C	C	C
	Check gear box oil level and leakage				C	C	C
	Check operation and adjust pedal stop if necessary				CA	CA	CA
EVERY 4 YEARS	Replace gear box oil						R
	Check for grease leakage; adjust gear box if necessary						CA

**ELECTRICAL (FOR G19E)****BATTERY CHARGING**

The batteries must be charged properly before using for the first time. This initial charge will prolong the life of the batteries.

**CAUTION**

To insure maximum battery performance be sure to:

- Charge a new battery before use.
- Maintain proper electrolyte level.

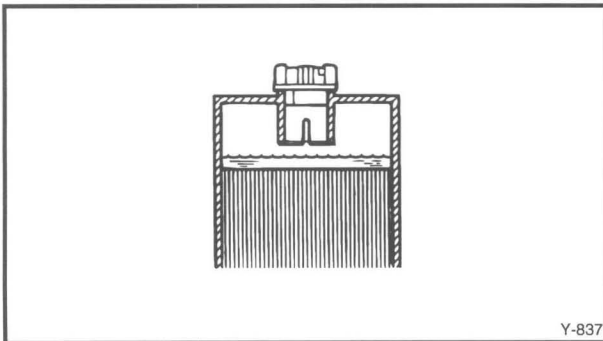
Be especially careful not to overfill the batteries, or allow the electrolyte level to drop below the top of the plates.

- Do not overcharge the batteries.

Failure to observe these points will result in a shortened battery life.

**NOTE:**

Periodic charging is necessary during extended storage.

**Battery charging steps:**

- Before charging: only add distilled water if fluid is below the top of the plates, and then add just enough to cover plates.
- After charging: check that the fluid level is approximately 1/4 to 1/2 inch above the plates and 1/4 to 3/8 inch below the level indicator. If the fluid level is low, carefully add distilled water. Adding distilled water after charging prevents boil over.
- Add only distilled water after a battery has been placed in service, never add more acid to battery.

**⚠ WARNING**

Battery electrolyte is dangerous; it contains sulfuric acid and is therefore poisonous and highly caustic.

Always follow these precautionary measures:

- Avoid bodily contact with electrolyte as it can cause severe burns or permanent eye injury.





- Wear protective eye gear when handling or working near batteries.

**Antidote (EXTERNAL):**

- SKIN - Flush with water.
- EYES - Flush with water for 15 minutes and get immediate medical attention.

**Antidote (INTERNAL):**

- Do not induce vomiting.
- Drink large quantities of water or milk, follow with milk of magnesia, beaten egg, or vegetable oil. Get immediate medical attention.

Batteries also generate explosive hydrogen gas. Therefore you should always follow these precautionary measures:

- Charge batteries in a well-ventilated area.
- Keep batteries away from fire, sparks, or open flames (e.g., welding equipment, lighted cigarettes, etc.)
- DO NOT SMOKE when charging or handling batteries.

**KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.**

**48V BATTERY CHARGER**

The following is a summary of the 48V charger features, operating instructions, LED light monitoring system and preferable charging recommendations. Do not attempt to recharge the golf car's batteries without thoroughly reading and understanding this section and the owner's manual provided with the 48V charger.

**48V CHARGER FEATURES**

1. When the charger completes a charging cycle, an internal relay turns the charger off automatically, preventing any additional power consumption.
2. If AC power is lost during charging and DC charging cord stays plugged into car, the charge cycle will resume from the same point in the cycle when AC power is restored.
3. If AC power is lost after a complete charge cycle, the charger will remain off when AC power is restored.
4. For winter or extended storage, leave the charger connected. After 2 weeks and when battery voltage drops to 2.05 volts per cell (48 Volts), a refresh charge cycle will occur automatically.
5. The charger has reverse polarity protection.
6. If the charge cycle does not complete within 16 hours, the charger will turn off and the LED will signal an abnormal charge cycle.

**48V CHARGER OPERATING INSTRUCTIONS**

1. Turn golf car main switch to off position.
2. Plug AC cord into grounded receptacle.
3. Plug DC cord into car's charge receptacle.
4. The charger will go through a self diagnostic test (each of the five LED lights will flash).

**NOTE:**

If charger fails to display the diagnostic test, check the charging circuit fusible link, located in the charge receptacle negative lead wire. A fuse failure indicates damage and/or short circuit of the DC charge cord, plug or the charge receptacle on the vehicle. Refer to Chapter 2, "CHARGING CIRCUIT FUSIBLE LINK".

5. When the car is ready for service, disconnect the DC outlet plug from the golf car receptacle by grasping the plug body and pulling the plug straight out of the receptacle.

**LED READINGS - NORMAL CHARGE CYCLE**

INITIAL STAGE	
LED Color illuminated	Charging status
* Red "INCOMPLETE"	Below 80% (less than 2.38V per cell)
* Yellow "CHARGER ON"	Charging in progress.

READY STAGE	
LED Color illuminated	Charging status
* Yellow "80% CHARGE"	80% charged, above 2.38V per cell
* Yellow "CHARGER ON"	Charging in progress

FINAL STAGE	
LED Color illuminated	Charging status
* Green "CHARGE COMPLETE"	Charge complete



## LED READING - ABNORMAL CYCLE

LED Color illuminated	PROBLEM	REMEDY
* Red "ABNORMAL"	Charge cycle did not complete in 16 hours.	Check batteries. Refer to Chapter 2, "BATTERY INSPECTION" section.
*—* Red "ABNORMAL" Flashes on 2 seconds, off 1 second	Open battery cells detected.	Check open circuit voltage on each battery. Low reading indicates open cells. Replace battery(s) as required.
NONE: (ALL LED's off)	Batteries were disconnected from charger during charge cycle.	Reconnect and charge again.
* Red "ABNORMAL" * Yellow "80% CHARGE" -OR- * Red "ABNORMAL" * Red "INCOMPLETE"	AC Power to charger is off.	<p>1. Check AC cord. If unplugged, plug it back in. If it was already plugged in, unplug it. Restore power to AC receptacle.</p> <p>2. Plug the charger into the grounded receptacle.</p> <p><b>NOTE:</b> _____ If DC cord was left plugged in during AC power outage, the previous charge cycle will continue when power is restored. Otherwise the charge cycle will restart from "INITIAL STAGE" cycle.</p>
* * Red "ABNORMAL" Flashes * Yellow "80% CHARGE" -OR- * * Red "ABNORMAL" Flashes * Red "INCOMPLETE"	Output over-current condition. (Short circuit in charger DC cord, car's receptacle, or battery wiring.)	Unplug AC charger cord from receptacle. Repair short circuit as necessary.

**Preferable charging:**

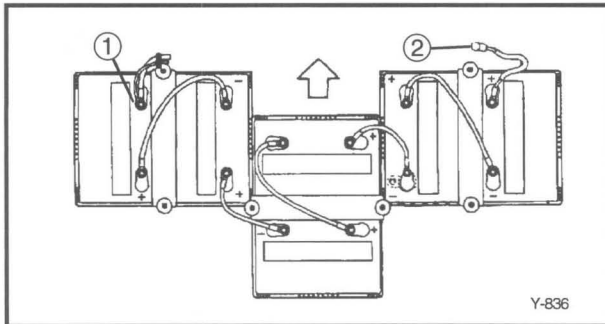
- Connect car to same charger every night.
- Recharge batteries as soon after usage as possible.
- For the first ten rounds, new batteries should go only 18 holes between charges.
- A 20 minute charge between rounds helps extend battery life.
- Organize and store the cars so that they can be used equally.
- The batteries should be charged every day if used. If they are not used and checking shows that catch-up charging is not required, they should not be charged.



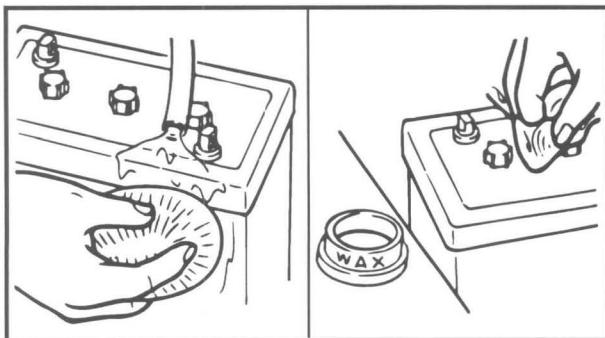
## BATTERY INSPECTION

**⚠ WARNING**

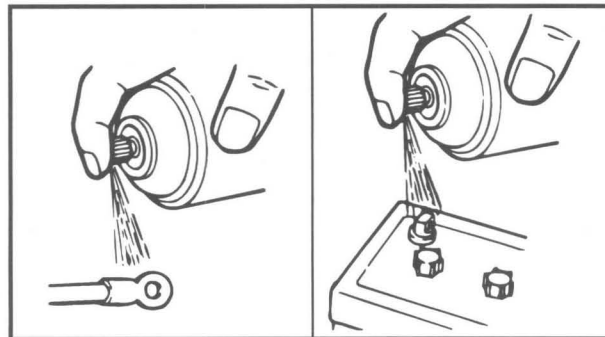
Secure vehicle and discharge the controller capacitor. Refer to Chapter 1, "SAFETY PRECAUTIONS" section.



Y-836



Y-694



Y-695

## 1. Remove:

- Battery leads
- Batteries

**⚠ WARNING**

- Always disconnect the negative lead ① first.
- Insulate wrenches with tape to avoid short circuiting of the batteries.

## ② To solenoid relay.

2. Wash the battery tops, sides, and surrounding area. Use a 100/1 mixture of water and baking soda. Be careful not to get this solution into the batteries. After drying, coat the battery tops with a car wax.

## 3. Inspect:

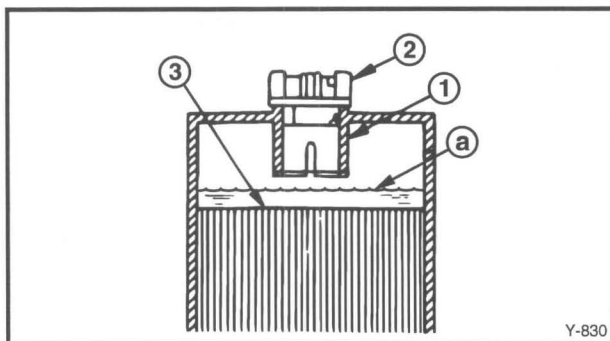
- Lead terminals
- Battery terminals
- Corrosion → Clean.

**Terminal cleaning steps:**

- Spray the terminals with a mixture of baking soda and water, then allow a few minutes for the solution to work.
- Rinse with low pressure water.
- Allow terminals to dry and coat with anti-corrosion spray.

## 4. Inspect:

- Hold-downs
- Use a wire brush.
- Corrosion → Clean with baking soda and water/Replace.
- After cleaning, rinse with water. Then repaint with a corrosion resistant paint.



Y-830

## 5. Check:

- Electrolyte level (a)  
Below level → Add distilled water.

## (a) Proper fill level - DO NOT OVER FILL!

- **Before charging:** only add distilled water if fluid is below the top of the plates, and then add just enough to cover plates.
- **After charging:** check that the fluid level is approximately 1/4 to 1/2 inch above the plates and 1/4 to 3/8 inch below the level indicator. If the fluid level is low, carefully add distilled water. Adding distilled water **after** charging prevents boil over.

## ① Level indicator

## ② Cap

## ③ Plate

## 6. Inspect:

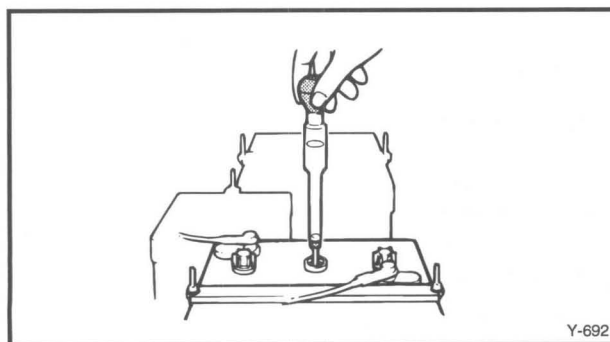
- Cap vent  
Contamination → Clean.

## 7. Measure:

- Specific gravity  
Use a Hydrometer.  
Less than 1.260 → Charge battery.



**Hydrometer:**  
YU-03036, 90890-03036

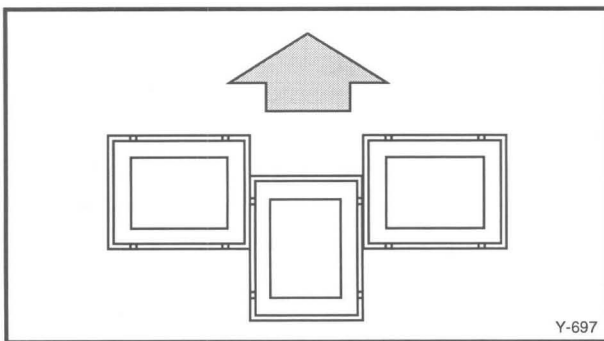


Y-692

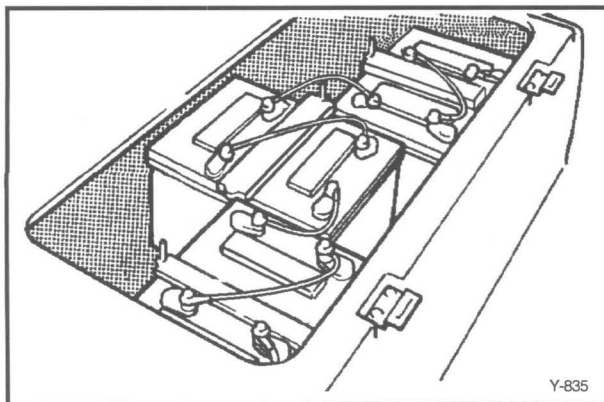
- Check the specific gravity of each cell with a hydrometer. If the hydrometer reading is below the specification, additional charging is necessary.

Temperature		Satisfactory Uncorrected Hydrometer Reading
°F	°C	
120	48.9	1.244
110	43.3	1.248
100	37.8	1.252
90	32.2	1.256
80	26.7	1.260
70	21.1	1.264
60	15.6	1.268
50	10.0	1.272
40	4.4	1.276
30	-1.1	1.280

- Install the filler caps, and thoroughly wipe off the fluid around the filler caps.



8. Install the battery trays in place as shown.

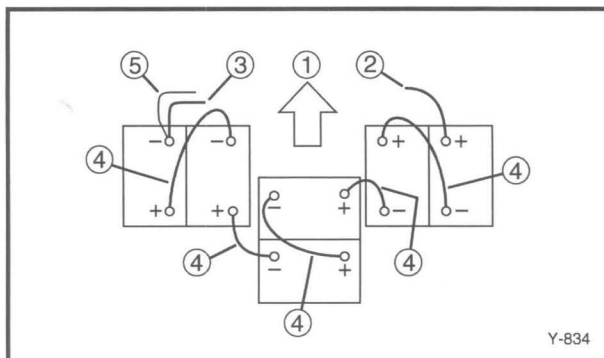


9. Install:

- Batteries



**Battery Holder:**  
2 Nm (0.2 m • kg, 1.4 ft • lb)



10. Connect:

- Battery leads  
See illustration

- ① Forward
- ② To solenoid relay
- ③ To controller
- ④ Between batteries
- ⑤ To receptacle



**Terminal Nut:**  
6 Nm (0.6 m • kg, 4.3 ft • lb)

### ⚠ WARNING

Connect the negative lead ③ last.

### CAUTION

Using a wire brush, clean both the contact surface of the battery terminal and lead clamp until both have a bright metallic shine for good electrical contact.

Apply specially treated felt washers, an anti-corrosion spray, or grease, to prevent corrosion.



## CHARGE RECEPTACLE INSPECTION

### **⚠ WARNING**

Secure vehicle and discharge the controller capacitor. Refer to Chapter 1, "SAFETY PRECAUTIONS" section.

#### 1. Inspect

- Receptacle contacts  
Damage/Loose/Burned → Replace receptacle.

### **⚠ WARNING**

Damaged receptacle contacts can cause excessive resistance (heat) and lead to fire.

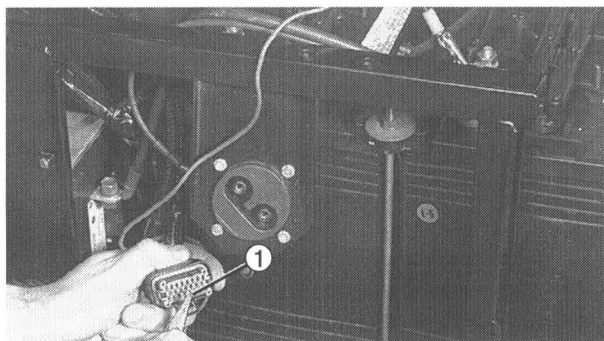
## CHARGING CIRCUIT FUSIBLE LINK

Inspect:

- Check receptacle negative lead wire (with fusible link) for continuity  
No continuity → Replace lead wire and check for source of failure.

Inspect:

- DC charge cord, plug, car receptacle  
Damage / Burned → Replace



Y-682

## CONTROLLER CONNECTOR INSPECTION

### **⚠ WARNING**

Secure vehicle and discharge the controller capacitor. Refer to Chapter 1, "SAFETY PRECAUTIONS" section.

#### 1. Inspect

- Controller pins
- Female connector terminals ①. Lubricate with light mechanical lube every three years.

### **CAUTION**

Use care when probing the female connectors inside the wire harness controller plug. The terminals are easily damaged which can cause failure symptoms.

**⚠ WARNING**

Batteries also generate explosive hydrogen gas. Therefore you should always follow these precautionary measures:

- Charge batteries in a well-ventilated area.
- Keep batteries away from fire, sparks, or open flames (e.g., welding equipment, lighted cigarettes, etc.)
- **DO NOT SMOKE** when charging or handling batteries.

**KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.**

### 1. Battery Discharge Testing - Why

The purpose of the discharge load test is to determine how many minutes it will take to bring the total voltage of a freshly charged 48 or 36 volt battery pack to 42 or 31.5 volts respectively. This test represents the maximum work or run time capability of a 48-volt battery pack at 80°F to fall to 42 volts. A good set of 36-volt batteries should also take approximately 70 minutes to drop to 31.5 volts. Seventy minutes should deliver 36 holes of golf for most courses. A shorter time period will indicate that one or more batteries need service or replacement.

When you are load testing, you will need a load tester and a high quality digital voltmeter capable of reading at least 55 volts DC. Use the voltmeter to monitor the overall voltage decrease of the pack and the decreasing voltage of each individual battery during testing. Individual batteries that decrease at a faster rate are the weaker ones. Note the weak batteries. The weaker batteries will require careful measurement after the discharge tester shuts off. Once the weaker batteries are identified they need to be replaced with ones of comparable age and strength of the remaining pack.

### 2. Battery Discharge Testing - Things to Be Aware Of

Non-functioning chargers (or just unplugged chargers) can create frustrating problems, especially if cars are not returned to the same charger every night. Look for tripped circuit breakers, damaged cords and plugs. Battery problems may be charger induced.

Design a schedule that allows discharge testing on one car per day or at least every other day. Follow your plan faithfully. Test each car once the first year and twice each succeeding year. If your course exceeds the national average of 250 rounds each year then your discharge testing schedule must be increased accordingly. Consult your Yamaha service representative for help with schedule adjustments. If you start out discharge testing an older fleet with suspicious batteries then at least 10% (i.e. 10 cars out of 100) should be tested. These results will give you a feel for your replacement battery needs.

Obtain a good quality discharge tester such as the Lester 17770. Carefully follow the procedure found in the Section 3 "Step by Step" Testing.

Remember that seventy minutes is the industry standard considered adequate for 36 holes of play but as cars enter their third and fourth years of service, it is normal for a few batteries to fail. Widespread failures or lack of 36-hole performance in the second year is not normal.

Ambient temperature has an effect on discharge times. When temperatures are low, discharge times decrease. The chart on page 2-11 is helpful in predicting the effects of temperature on discharge testing.

Be sure that you do the **loaded individual battery measurements** with the battery pack fully charged to 42 (48-volt) or 31.5 (36-volt). If you **do not** do this part of the test immediately after the tester shuts off, the batteries will "recover" as they sit. Recovered batteries will give false readings. If more than a few minutes elapse before you do individual battery measurements, turn the discharge tester back on. Allow the tester to run until the total battery pack voltage is again approaching the shut off point (**31.5 volts** for 36-volt cars and **42 volts** for 48-volt cars). This will prevent a false "good" voltage measurement from a recovered battery. **Be certain you understand this paragraph before you turn your discharge tester on for the first time. You cannot achieve accurate results without a complete understanding of the testing process.**

### 3. Battery Discharge Testing "Step by Step"

Before you start testing do the following preliminary checks.

- a. Fully charge the batteries (a full charger cycle).
- b. Inspect all cables and connections.
- c. Check the water level in each cell and add water as necessary.





- d. Start the charger and let it finish charging again.
- e. Let the batteries cool for 5 minutes.

**⚠ WARNING**

Batteries also generate explosive hydrogen gas. Therefore you should always follow these precautionary measures:

- Charge batteries in a well-ventilated area.
- Keep batteries away from fire, sparks, or open flames (e.g., welding equipment, lighted cigarettes, etc.)
- **DO NOT SMOKE** when charging or handling batteries.

**KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.**

The following instructions are specifically for the Lester 17770 Discharge Tester. You will need a thermometer, discharge tester and a digital voltmeter for the following tests. Attach the discharge tester, be sure to observe polarity. Heavily coated battery terminals may not provide good electrical connections. Clean if necessary.

1. Record surface voltage from the discharge tester readout panel. Record the ambient temperature.
2. Turn on the discharge tester. Wait at least 3 minutes. If you have a bad connection (or reverse polarity) the tester will shut off in 3 minutes. Correct any problems.
3. Let the tester run until it shuts off and **immediately** record the surface voltage from the discharge tester readout. Restart the charger and let it run until the voltage reaches 42 volts (48-volt car) or 31.5 volts (36-volt car).
4. While the tester is still connected measure and record each individual battery voltage. Look over the voltage measurements you just recorded. A difference of 0.5 volts from the highest to lowest measurement indicates a weak battery.
5. Turn off the discharge tester. Wait until the fan stops and then disconnect the battery leads.

**CAUTION**

**If the fan is running and you disconnect the unit a spark will be produced. The chart on 2-12 is a handy place to record your measurements.**



## DISCHARGE MINUTES ADJUSTED FOR TEMPERATURE

		Temperature (F°)										
		80	75	70	65	60	55	50	45	40	35	30
Discharge Minutes	105	105										
	100	100	103	107								
	95	95	98	101	105							
	90	90	93	96	100	103	107					
	85	85	88	91	94	97	101	105				
	80	80	83	85	88	92	95	99	103			
	75	75	77	80	83	86	89	93	97	101	105	
	70	70	72	75	77	80	83	87	90	94	98	103
	65	65	67	69	72	75	77	80	84	87	91	96
	60	60	62	64	66	69	71	74	77	81	84	88
	55	55	57	59	61	63	65	68	71	74	77	81
	50	50	52	53	55	57	60	62	64	67	70	74
	45	45	46	48	50	52	54	56	58	60	63	66
	40	40	41	43	44	46	48	50	52	54	56	59
	35	35	36	37	39	40	42	43	45	47	49	51
	30	30	31	32	33	34	36	37	39	40	42	44
25	25	26	27	28	29	30	31	32	34	35	37	
20	20	21	21	22	23	24	25	26	27	28	29	
15	15	15	16	17	17	18	19	19	20	21	22	
10	10	10	11	11	11	12	12	13	13	14	15	

$$\text{ADJUSTED DISCHARGE MINUTES} = \frac{\text{DISCHARGE MINUTES}}{1 - (((80 - \text{TEMP}) / 100) * .64)}$$



## BATTERY DISCHARGE CHART

CAR# _____	DATE    /    /	<p style="text-align: center; font-weight: bold; font-size: 1.2em;">FRONT</p>
Record Battery Voltage For Each Battery In The Blank		Tester Ran _____ Minutes

CAR# _____	DATE    /    /	<p style="text-align: center; font-weight: bold; font-size: 1.2em;">FRONT</p>
Record Battery Voltage For Each Battery In The Blank		Tester Ran _____ Minutes

CAR# _____	DATE    /    /	<p style="text-align: center; font-weight: bold; font-size: 1.2em;">FRONT</p>
Record Battery Voltage For Each Battery In The Blank		Tester Ran _____ Minutes

Record test results including Individual battery voltages immediately after discharge test.

Restart the Discharge Tester after it reaches 42 volts or 31.5 volts (48 V car or 36 V car) immediately measure and record each battery's voltage in the boxes provided above.

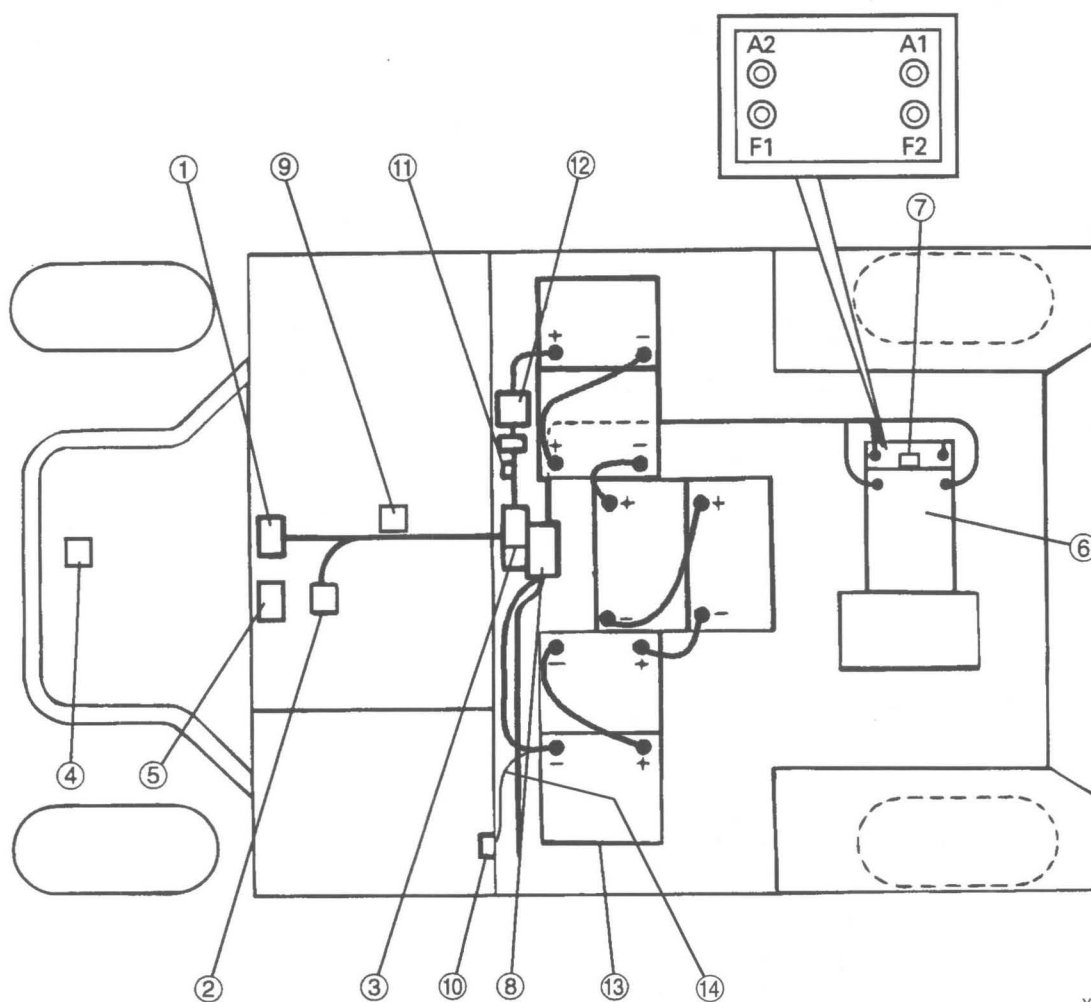
[illegible]





## ELECTRICAL COMPONENT LOCATIONS

- |                           |  |
|---------------------------|--|
| ① Main switch             | ⑧ Speed controller                                 |
| ② Accelerator stop switch | ⑨ Throttle sensor                                  |
| ③ Tow/storage switch      | ⑩ Charging receptacle                              |
| ④ Back-up buzzer          | ⑪ Fuse   |
| ⑤ Forward-reverse switch  | ⑫ Solenoid relay                                   |
| ⑥ Traction motor          | ⑬ Batteries (8V x 6)                               |
| ⑦ Speed sensor            | ⑭ Negative wire with charging circuit fusible link |

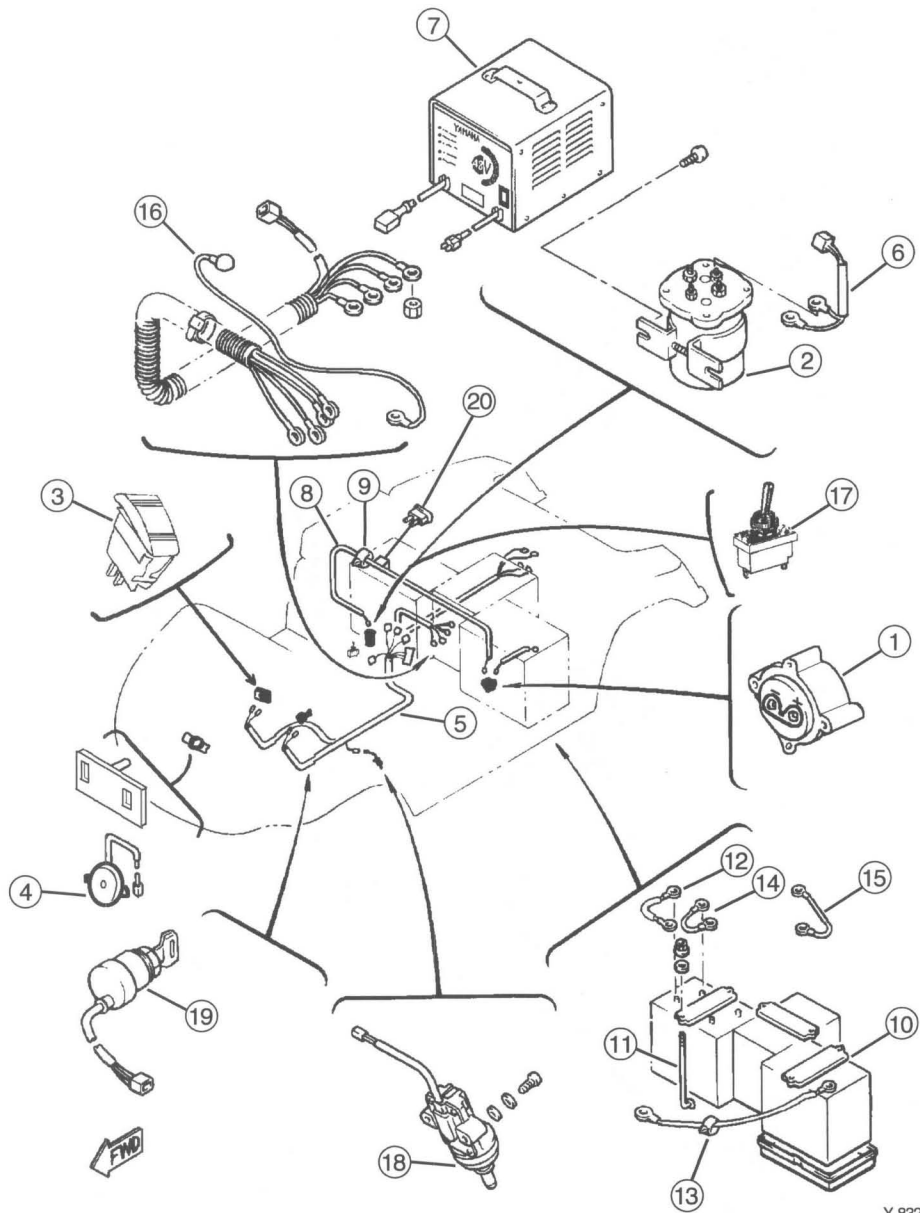


Y-833



## ELECTRICAL COMPONENTS

- |                          |                                  |                                 |
|--------------------------|----------------------------------|---------------------------------|
| ① Receptacle             | ⑧ Wire harness                   | ⑮ Wire lead, battery set (long) |
| ② Relay assy             | ⑨ Clamp                          | ⑯ Relay plus lead               |
| ③ Forward/reverse switch | ⑩ Battery fitting plate.         | ⑰ Tow switch                    |
| ④ Buzzer                 | ⑪ Fitting screw                  | ⑱ Accelerator stop switch       |
| ⑤ Wire harness           | ⑫ Wire lead                      | ⑲ Main switch                   |
| ⑥ Wire harness           | ⑬ Wire lead, minus               | ⑳ Fuse (3A)                     |
| ⑦ Battery charger        | ⑭ Wire lead, battery set (short) |                                 |



Y-832



## TRACTION MOTOR

- ① Front bracket
- ② Armature assembly
- ③ Stator assembly
- ④ Brush set
- ⑤ Brush holder
- ⑥ Bracket
- ⑦ Grommet
- ⑧ Speed sensor
- ⑨ Speed sensor magnet

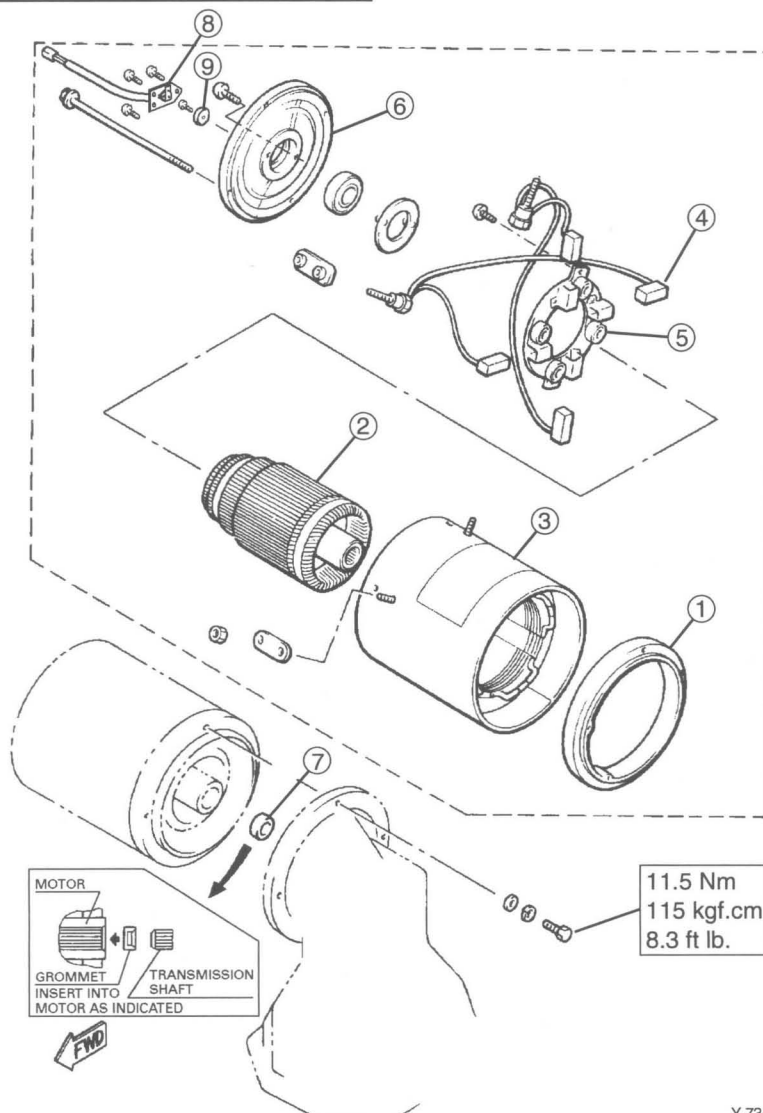
### SPECIFICATIONS

Model	5BC58JBS6272A
Voltage	48V DC
Rated output KW/HP	2.0 KW 2.7 HP (30 min.)
Performance	
Current	44A
Voltage	48V
Set Torque	5.4 Nm (0.54 m • kg, 3.9 lb • ft)
Revolution	3,650 r/min
Weight	16.5 kg (36.4 lb)

A BRUSH LENGTH:  
Limit: 14.5 mm (0.57 in)  
Standard: 34.3 mm (1.35 in)

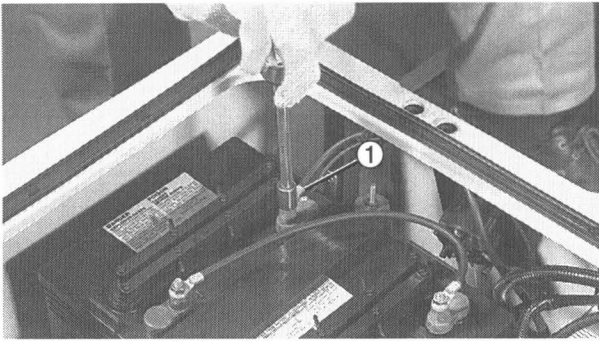
B BRUSH SPRING FORCE:  
New brush:  
720 ~ 1,080 g (24.3 ~ 39.2 oz)  
Worn brush:  
450 g (15.2 oz)

C COMMUTATOR DIAMETER:  
Wear limit:  
66.55 mm (2.62 in)

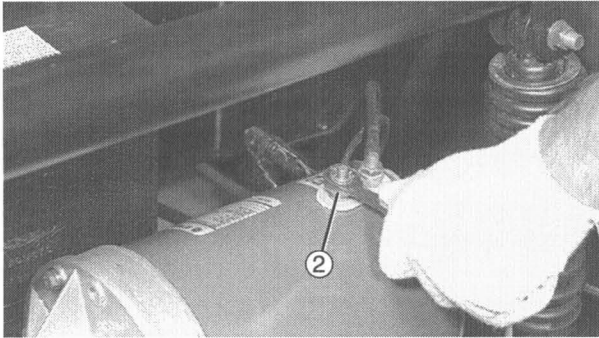


Y-734

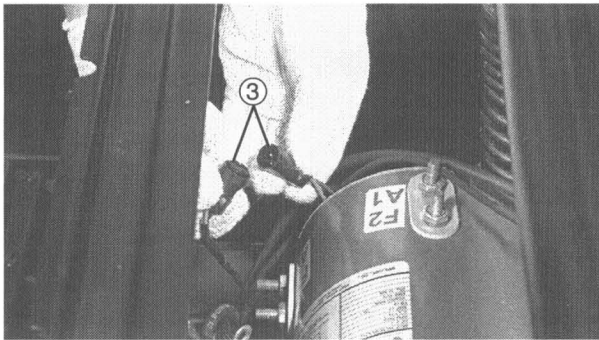




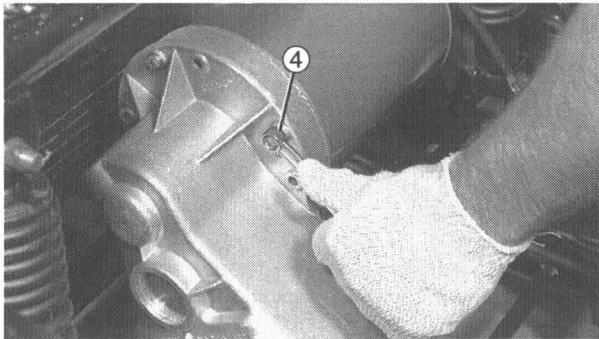
Y-630



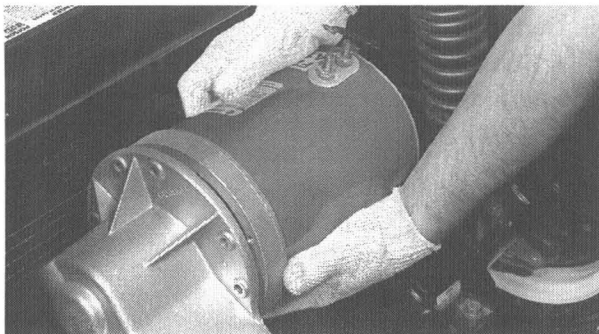
Y-B13



Y-B14



Y-B15



Y-634

## TRACTION MOTOR

### ⚠ WARNING

Secure vehicle and discharge the controller capacitor. Refer to Chapter 1, "SAFETY PRECAUTIONS" section.

### REMOVAL

1. Remove:
  - Seat
  - Service access panel
2. Disconnect:
  - Negative battery lead ①.
3. Disconnect:
  - All four leads ② from the motor terminals. Mark leads for installation.
  - Speed sensor leads ③

#### 4.Remove:

- Motor securing bolts ④.

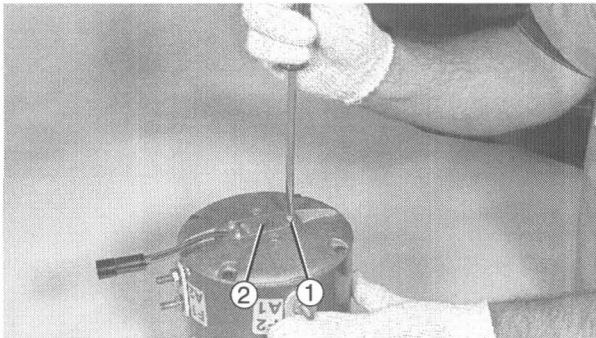
5. Remove:
  - Traction motor.



Y-635

**DISASSEMBLY**

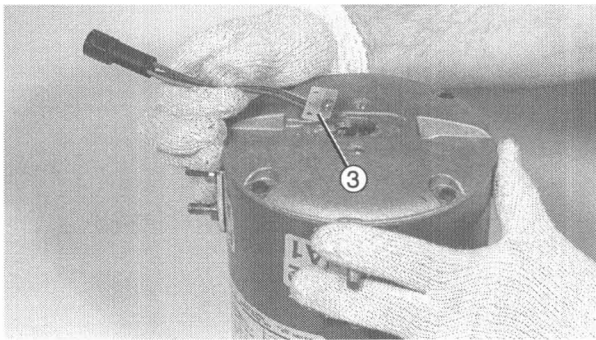
1. Mark cover for installation.



Y-636

2. Remove:

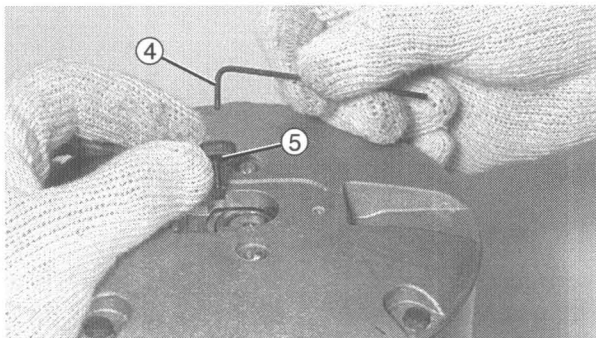
- Cover plate screw ①
- Cover plate ②.



Y-816

3. Remove:

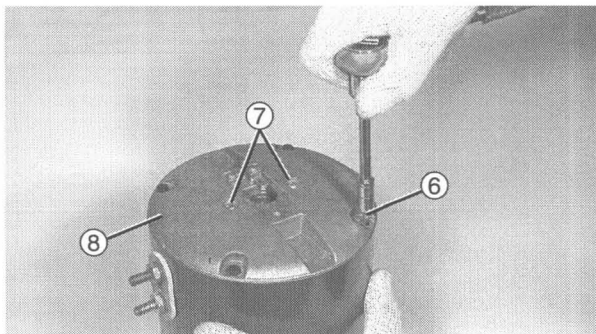
- Speed sensor ③.



Y-817

4. Remove:

- Set screw ④
- Speed sensor magnet ⑤



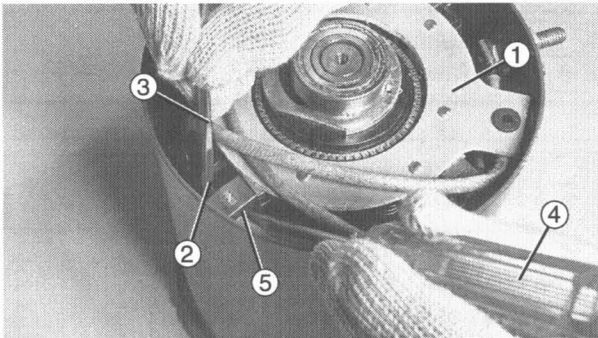
Y-818

5. Remove:

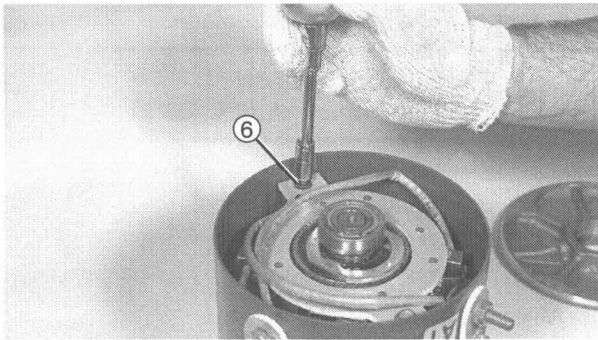
- Bolts ⑥
- Bearing holder screws ⑦
- Cover ⑧



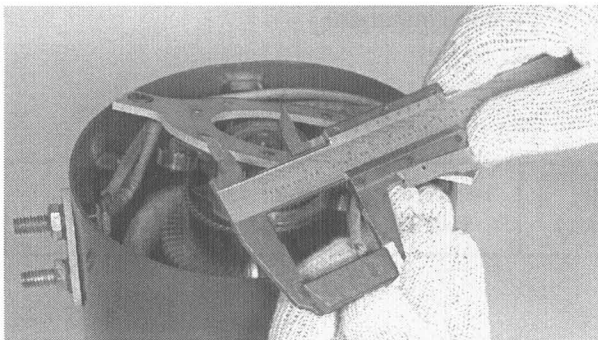
Y-819



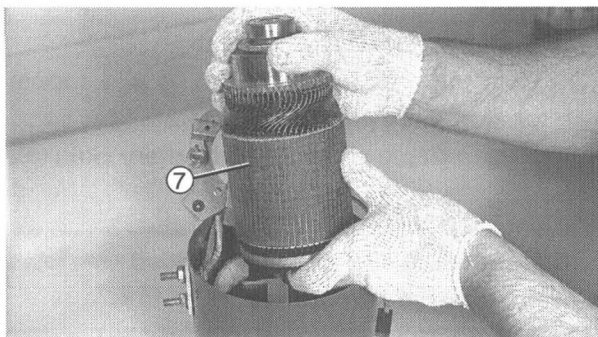
Y-642



Y-643



Y-644



Y-820

## 6. Remove:

- Brush holder ①.

**NOTE:**

Pull back on spring ② with one screw driver ③ and with other ④ get under wire and pull back on brush ⑤ to pull it away from rotor. There are four brushes.

- Remove brush holder bolts ⑥.

## 7. Check:

- Brush length  
Length of new brush is 36 mm.  
Out of specification → Replace.



**Minimum Brush Length:**  
14.5 mm (0.57 in)

**NOTE:**

Leave brush leads attached to yoke while checking brush length.

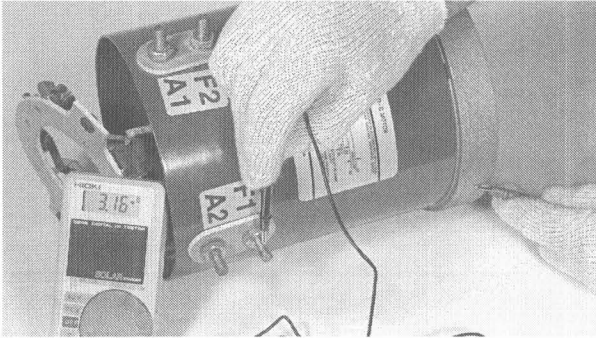
## 8. Remove:

- Armature ⑦.



## INSPECTION AND TESTING

1. Clean the interior of the yoke and bracket with compressed air.
2. Inspect:
  - Outer surface  
Cracks/Damage → Replace.
3. Measure:
  - Insulation resistance (F1 and ground, F2 and ground).  
Defective → Replace.



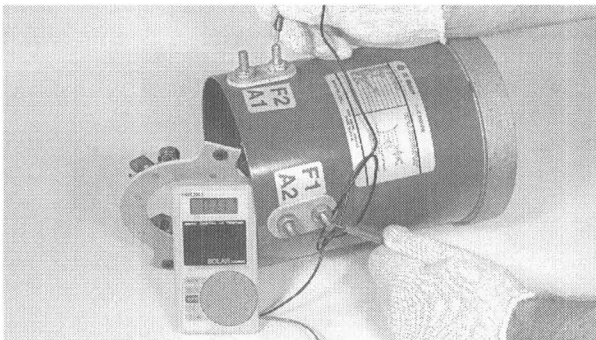
Y-646



**Insulation Resistance:**  
More than 1 M ohms at 20°C (68°F)



**Low Reading Ohmmeter:**  
YU-91026, 90890-03064



Y-647

4. Measure:
  - Field coil resistance (F1 to F2)  
Use the Low Reading Ohmmeter.  
Out of specification → Replace.



**Field Coil Resistance:**  
0.9 ~ 1.1 ohms at 20°C (68°F)

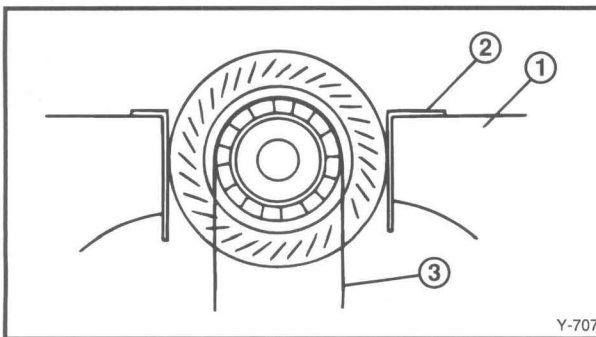


Y-649

5. Measure:
  - Armature coil resistance (Armature and brushes installed)  
(A1 to A2)  
Use the Low Reading Ohmmeter.  
Out of specification → Replace.



**Armature Coil Resistance:**  
0.0228 ~ 0.0232 ohms at 20°C (68°F)



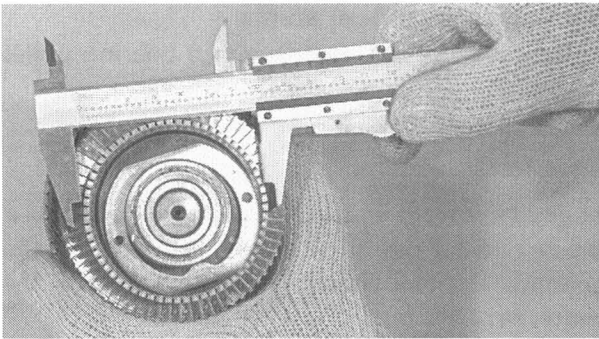
Y-707

6. Inspect:
  - Commutator (Outer surface)  
Hold the armature in a vise ① and copper or aluminum plate ②.  
Dirty → Clean with #600 grit emery cloth ③.

**CAUTION**

Hold armature lightly between padded vise jaws to avoid damaging armature.





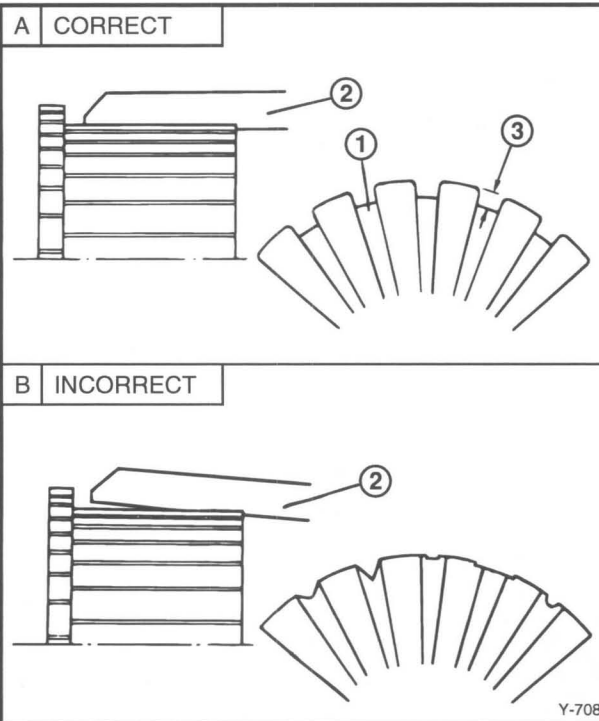
Y-650

## 7. Measure:

- Commutator (Diameter)  
Out of specification → Replace.  
Measure the diameter of the commutator as shown.  
Out of specification → Replace.



**Wear Limit (Minimum Diameter):**  
**66.55 mm (2.62 in)**



Y-708

## 8. Measure:

- Mica ① (Insulation depth)  
(between commutator segments)  
Out of specification → Scrape mica to proper limits.  
Use a hacksaw blade ② that is ground to fit.

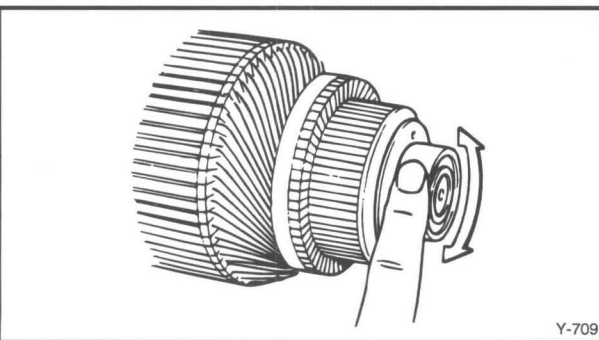


**Mica Undercut (3):**  
**Limit: 0.25 mm (0.0098 in)**

**NOTE:**

The mica insulation of the commutator must be undercut to ensure proper operation of the commutator.

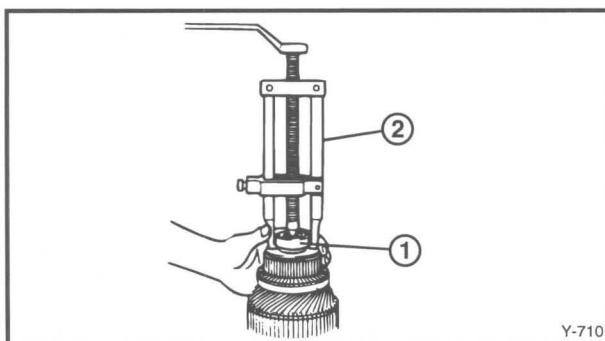
Carefully clean between the segments after the above steps.



Y-709

## 9. Check:

- Bearing movement  
Rotate with fingers.  
Roughness/Wear → Replace



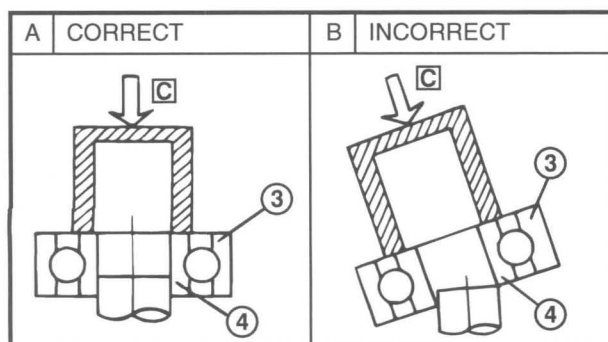
Y-710

**Bearing replacement steps:**

- Remove the bearing ① with a bearing puller ②.
- Install the new bearing.

**CAUTION**

Do not strike the outer race ③ or balls of the bearing. Contact should be made only with the center race ④.

**ⓐ PRESS**

Y-711

## 10. Install:

- Armature coil into the brush holder.

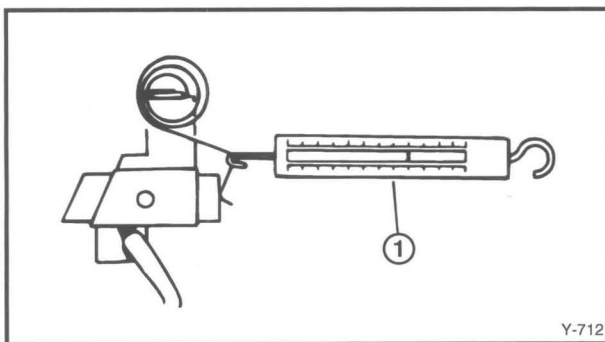
## 11. Measure:

- Brush spring force

Use a spring scale ①.

Pull the scale and check reading as the brush spring just comes off the brush.

Out of specification → Replace



Y-712

**Brush Spring Force:**

**New Brush:** 720 ~ 1,080 g  
(24.3 ~ 36.5 oz)

**Limit:** 450 g (15.2 oz)

**ASSEMBLY**

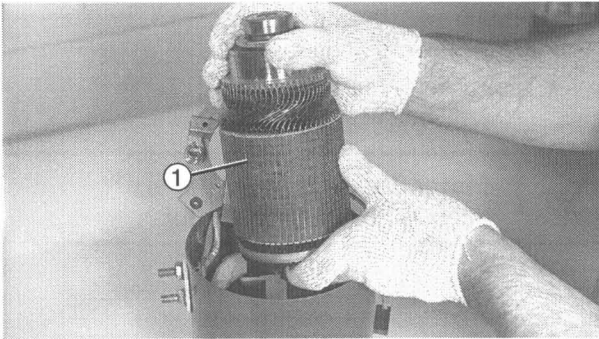
Reverse the "Disassembly" procedure.  
Note the following points.

## 1. Install:

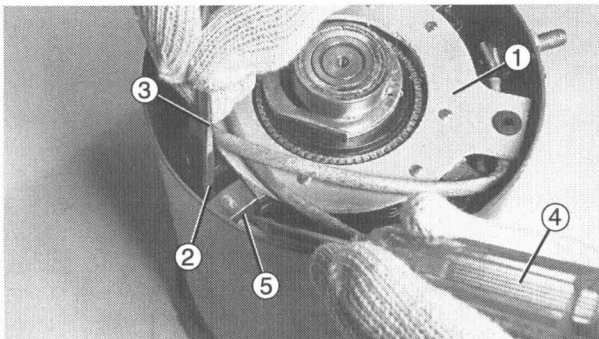
- Armature ①

**CAUTION**

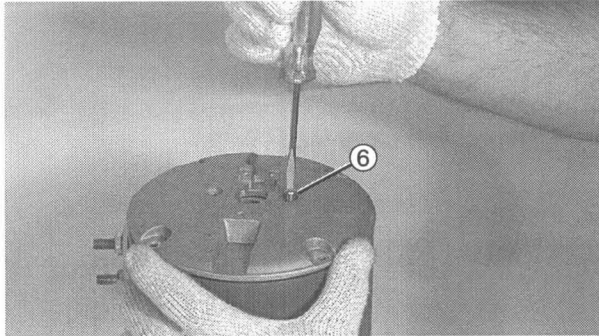
When installing armature into yoke, use care not to damage brushes.



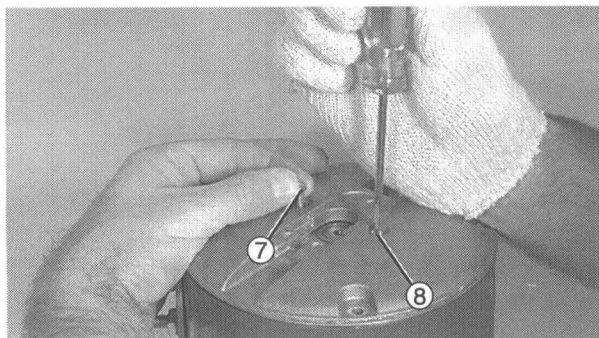
Y-645



Y-642



Y-821



Y-822

**NOTE:**

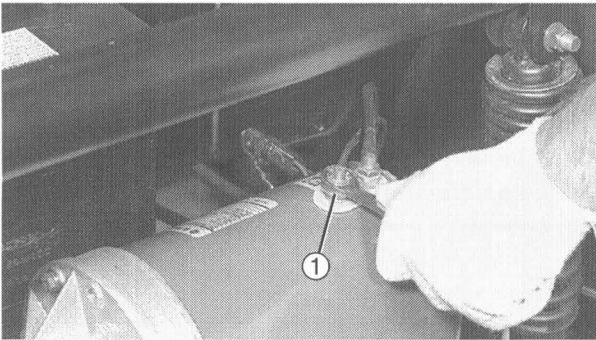
When installing cover, install a pilot screw (8-32 x 1-1/4") ⑥ first to hold the bearing retainer. Pull up on pilot screw ⑦ and install screw ⑧. Remove pilot screw and install second screw.

**INSTALLATION**

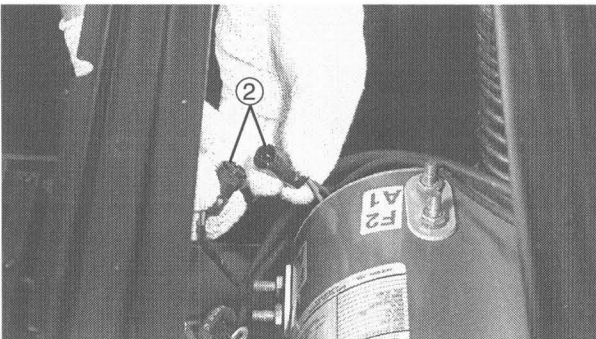
Reverse the "Removal" procedure.  
Note the following points.

**1. Connect:**

- Motor terminal leads ①
- Tachometer leads ②



Y-631



Y-632



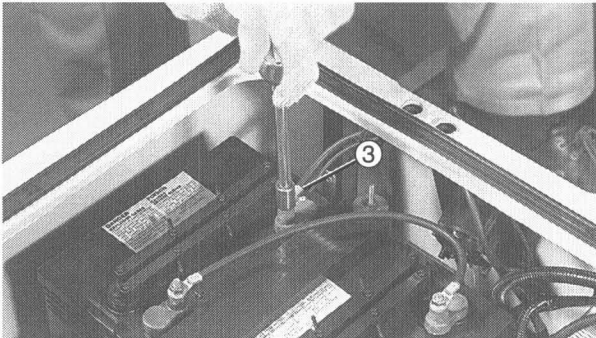
**Motor Securing Bolt: (Upper)**  
**5 Nm (0.5 m•kg, 3.6 ft•lb)**

**2. Connect:**

- Negative battery lead ③.

**3. Install:**

- Seat



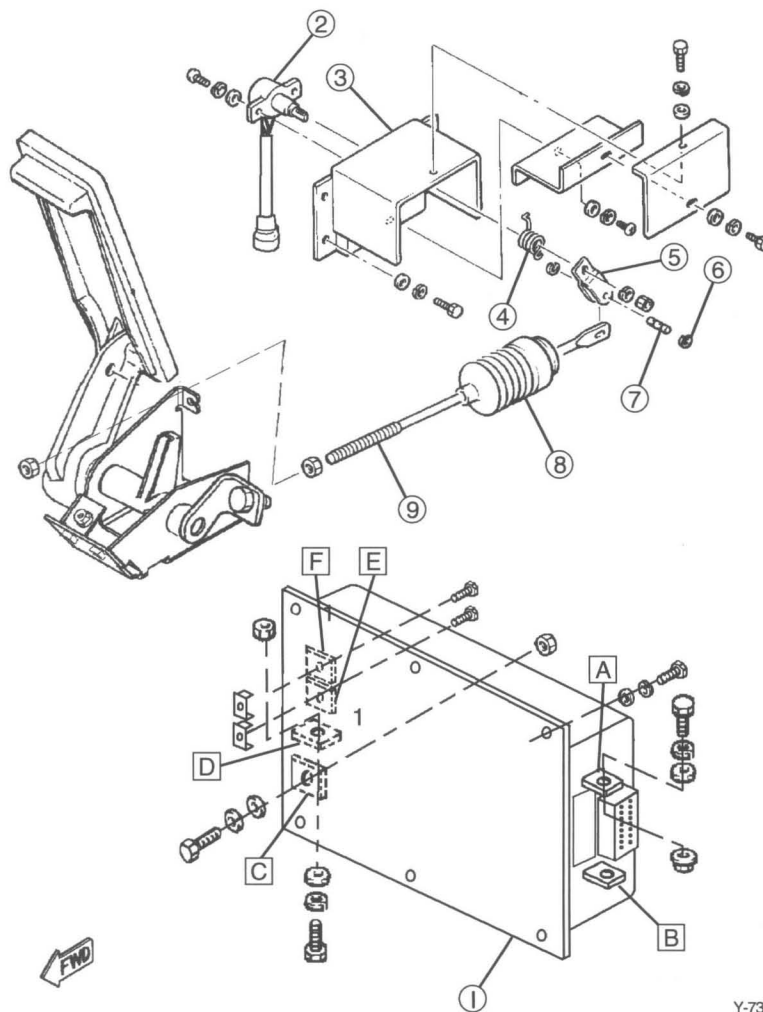
Y-823





## MOTOR CONTROLLER

- |                      |                                  |
|----------------------|----------------------------------|
| ① Motor control unit | [A] To Battery (Negative)        |
| ② Throttle sensor    | [B] To Solenoid relay (Positive) |
| ③ Throttle bracket   | [C] To Traction motor A2         |
| ④ Return spring      | [D] To Traction motor A1         |
| ⑤ Throttle arm       | [E] To Traction motor F2         |
| ⑥ Circlip            | [F] To Traction motor F1         |
| ⑦ Pedal crank pin    |                                  |
| ⑧ Cover              |                                  |
| ⑨ Joint rod          |                                  |



Y-735



## ELECTRICAL TROUBLESHOOTING

Should any one of the troubles below occur, it is advisable to check for the possible cause in the order specified.

Before performing any tests in this chapter, reset the Controller as follows:

1. Turn main switch "OFF" and Tow switch ① to "Tow" position. Wait 30 seconds.
2. Turn main switch "ON", and Tow switch to "RUN" position.

Test the reported malfunction. If the problem is now corrected, the controller needed to reset internally. There are two potential causes of this condition.

1. The user operated the tow switch without allowing the system to reset. Educate the user that the tow switch is to be used by service personnel only for vehicle towing or long term storage.
2. If this kind of malfunction occurs more frequently, there may be a fault caused by a poor or intermittent wire connection.

### WARNING

**Secure vehicle and discharge the controller capacitor. Refer to Chapter 1, "SAFETY PRECAUTIONS" section.**

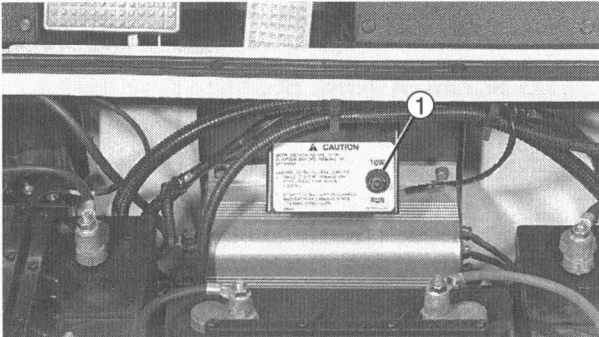
## ACCELERATION BECOMES ROUGH, UNEVEN OR JERKY

### VISUAL INSPECTION

1. Check for loose or separated connections between the speed controller and solenoid relay.
2. Check for loose terminals and connections.

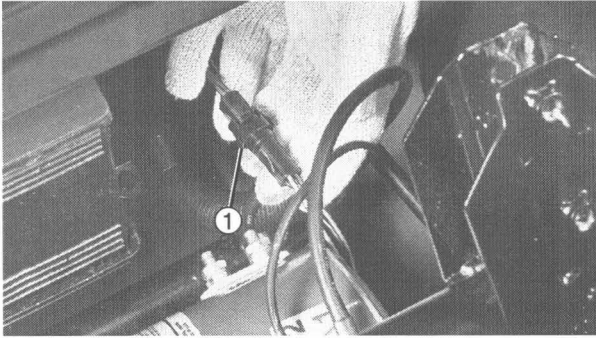
### TEST THROTTLE POSITION SENSOR

3. Test the throttle position sensor. Refer to page 8-8, "THROTTLE POSITION SENSOR CHECK".



Y-675

## CAR DOES NOT SLOW ON DOWN HILL GRADE AND/OR CAR WILL ROLL AWAY WITHOUT SLOWING



Y-687

### VISUAL INSPECTION.

1. Check the speed sensor connector pins ①.
  - A. If OK, go to step 2.
  - B. If not OK, repair.

### SPEED SENSOR WIRE HARNESS CHECK

2. Disconnect the speed sensor harness connector. Using a voltmeter, test the wire harness side red and black wires for voltage supply of  $5 \text{ VDC} \pm 10\%$ . (Touch voltmeter red (+) probe to harness red wire, black (-) probe to harness black wire.)
  - A. If OK, go to step 5.
  - B. If no voltage, go to step 3.
3. Using an ohmmeter or self powered test light, check the continuity of the red, green and black wires from the speed sensor connector to the controller.

### CAUTION

Use care when probing the female connectors inside the wire harness controller plug. The terminals are easily damaged which can cause failure symptoms.

- A. If not OK, repair wiring.
  - B. If OK, reset the controller with tow switch again and perform step 3 again. If still no voltage, replace controller.
4. Using a voltmeter, test controller terminal pin numbers 15 (positive) and 16 (negative) for voltage supply of  $5 \text{ VDC} \pm 10\%$ .
  - A. If OK, reconnect controller connector and go to step 5.
  - B. If no voltage, reset the controller with tow switch again and perform step 3 again. If still no voltage, replace controller.

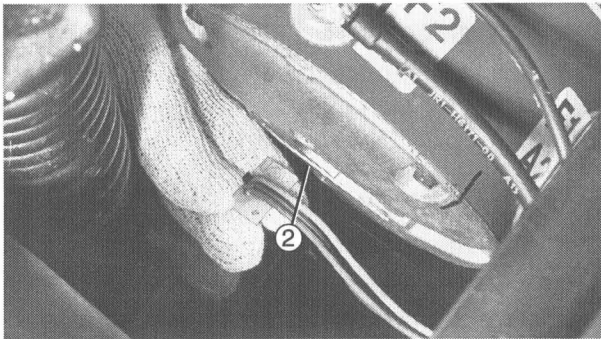
**SPEED SENSOR TEST**

5. Using an analog voltmeter, check the speed sensor output using the test cord (YG-42221).



**Speed Sensor Test Cord:  
YG-42221**

- Block the front wheels. Raise one rear wheel off the ground using a jack and stand.
- Attach test cord between harness and sensor leads.
- Touch voltmeter red (+) probe to test cord green wire, black (-) probe to test cord black wire.
- Slowly rotate the rear wheel and check for a voltage reading that swings from zero VDC up to 5 VDC  $\pm$  10%.
  - A. If OK, replace controller.
  - B. If not OK, go to step 6.



Y-690

**SPEED SENSOR MAGNET CHECK**

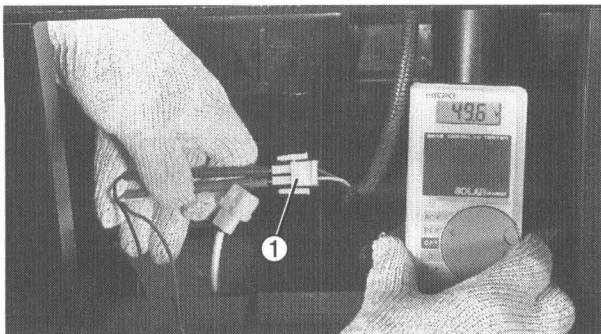
6. Remove the three screws holding the speed sensor into the traction motor end cap. Check the magnet ② on the shaft for foreign material.
  - A. If contaminated, clean, reinstall and perform step 5 again.
  - B. If step 5 fails again, replace sensor, magnet or traction motor as required.

**NOTE:**

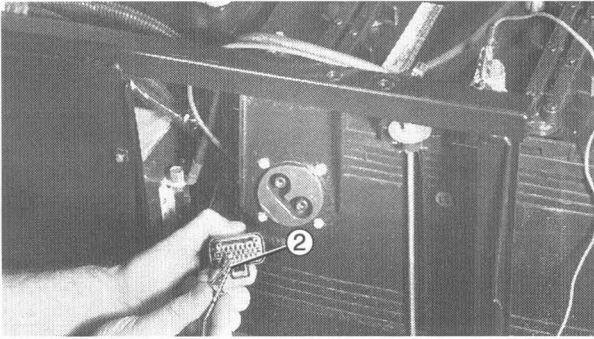
Be sure to verify the rollaway feature (including buzzer) is operating before releasing the car to the customer.

**CAR HAS NO REVERSE WARNING BEEPER****BUZZER WIRING CHECK**

1. Check for power and ground at buzzer connector ①, with F/R switch in reverse.
  - A. If both are present, replace buzzer.
  - B. If no power is present, check the fuse, tow switch and wiring. Repair as needed.
  - C. If no ground is present, go to step 2.



Y-688



Y-689

**GROUND WIRE CHECK**

2. Check the continuity of the black wire from controller terminal 10 ② to the reverse buzzer.

**CAUTION**

Use care when probing the female connectors inside the wire harness controller plug. The terminals are easily damaged which can cause failure symptoms.

- A. If OK, replace controller.
- B. If open circuit, repair and recheck operation.

**THE CAR'S TOP SPEED SLOWS****CHECK BRAKES AND CHASSIS**

1. Confirm that brakes are not dragging, chassis toe-in is within specification, and nothing is rubbing against the wheels.

**VISUAL INSPECTION**

2. Check the batteries, speed controller and traction motor for loose, shorted or separated connections.

**CHECK BATTERIES**

3. Check the batteries for sulfation and discharge capacity.

Check the battery electrolyte level and charged condition. Refer to Chapter 2, "BATTERY INSPECTION".

**TEST THROTTLE POSITION SENSOR**

4. Check the throttle position sensor. Refer to page 8-8, "THROTTLE POSITION SENSOR CHECK".

**CHECK TRACTION MOTOR**

5. Check the traction motor for worn or separated brushes, or dirty commutator. Refer to Chapter 7, "TRACTION MOTOR".

**CAR ONLY RUNS IN ONE DIRECTION****CHECK FORWARD/REVERSE DIRECTION SWITCH**

1. Check direction wiring and test direction switch. Refer to page 8-10, "DIRECTION SWITCH CHECK".

## CAR WON'T RUN EITHER DIRECTION, SOLENOID DOES NOT CLICK

### RESET CONTROLLER

1. Confirm that controller has been reset. Refer to page 8-1, "ELECTRICAL TROUBLESHOOTING".
2. Place Forward/Reverse direction switch in reverse position. If reverse warning sounds, go to step 9. If no warning sounds, go to step 3.

### VISUAL INSPECTION

3. Visually inspect for loose connections or broken wires.
  - A. If OK go to step 4.
  - B. If not OK, repair.

### CHECK BATTERIES

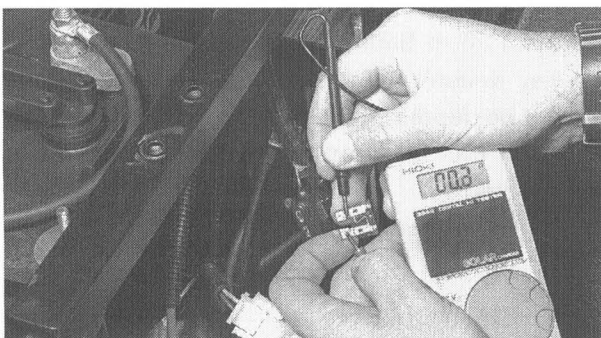
4. Check battery condition. Refer to Chapter 2, "BATTERY INSPECTION".
  - A. If OK go to step 5.
  - B. If not OK, service or replace batteries.

### FUSE CHECK

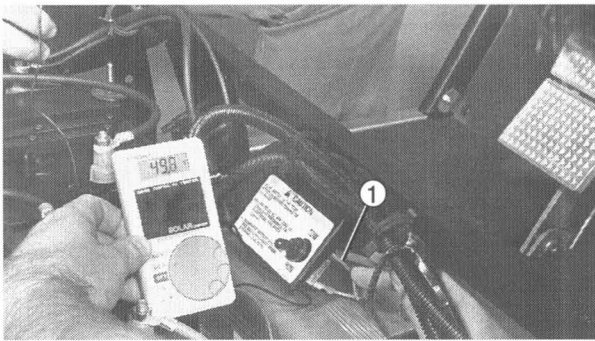
5. Check fuse. (Should have power on both red wires.)
  - A. Check for power to fuse holder ①.
  - B. If no voltage is present on either wire repair open circuit between fuse and charge receptacle.
  - C. If voltage is present on only one side of the fuse, replace the fuse.
  - D. If voltage is present on both wires fuse is OK, go to step 6.



Y-676



Y-677



Y-678

**TOW SWITCH TEST**

6. Test Tow switch. (It should have power on both red and red/yellow wires when in "RUN" position ①.) Jump these two circuits together to bypass the switch.
  - A. If car operates, replace tow switch.
  - B. If it doesn't, go to step 7.
  - C. If there is no power to the switch, repair the open circuit between the tow switch and the fuse.



Y-679

**WIRE CHECK SOLENOID TO TOW SWITCH**

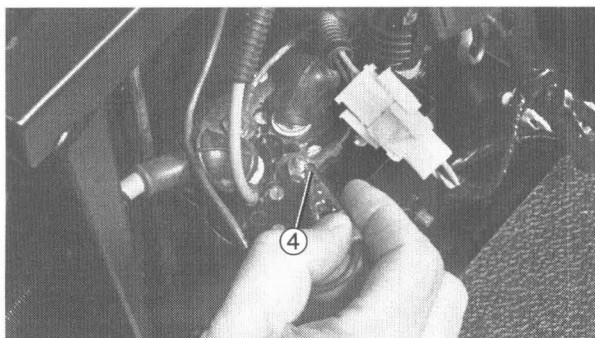
7. Check for voltage at red/yellow wire at solenoid (small wire) ②.
  - A. If no voltage is present, repair the open circuit between the tow switch and solenoid.
  - B. If voltage present, go to step 8.



Y-680

**CONTROLLER GROUND WIRE CHECK**

8. Test the ground wire ③ at the controller with a voltmeter to see if it is grounded. (Voltmeter from positive battery terminal to negative wire terminal at controller.)
  - A. If not repair the ground connection.
  - B. If OK, go to step 9.

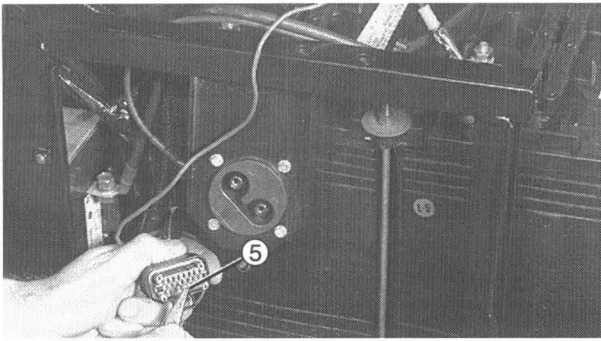


Y-681

**SOLENOID GROUND BYPASS**

9. Connect a temporary ground (jumper) from the red/black wire of the solenoid (small wire) ④ to battery pack ground side. Note: Key doesn't need to be ON and pedal need not be depressed.
  - A. If the solenoid still doesn't click, go to step 11.
  - B. If the solenoid now clicks go to step 10.





Y-824

**WIRE CHECK - SOLENOID TO CONTROLLER**

10. Check continuity of red/black wire from solenoid to controller. (Ground it from controller terminal #11 ① to controller main ground.) You must disconnect the controller connector for this test.

**CAUTION**

Use care when probing the female connectors inside the wire harness controller plug. The terminals are easily damaged which can cause failure symptoms.

- A. If the solenoid clicks reconnect components and test the car. If relay does not click, replace controller.
- B. If the relay does not click, repair the open in the red/black wire between the solenoid and controller.

**SOLENOID RELAY BENCH TEST**

11. Bench test the solenoid relay.
- A. Remove:
    - Seat
  - B. Turn the main switch to "ON".
  - C. Check:
    - Solenoid relay ① (clicking sound)  
Press accelerator pedal to close the accelerator stop switch.  
If clicking → Check for continuity between the two contact posts with Pocket Tester while the solenoid is activated. If there is no continuity, replace the relay.  
If not clicking → Measure coil resistance in solenoid.
  - D. Check:
    - Solenoid relay (no clicking sound)

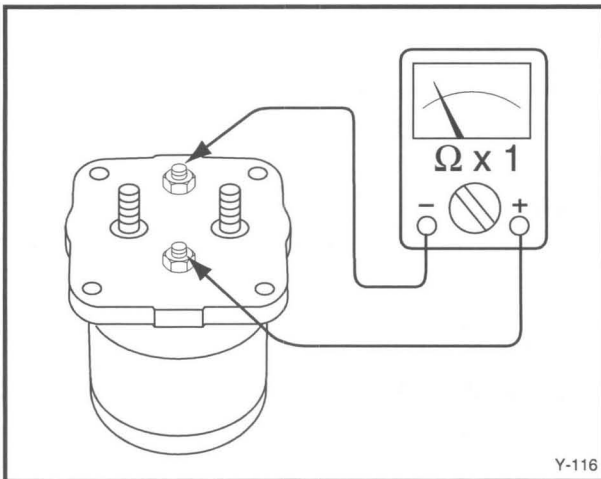
**CAUTION**

Disconnect battery negative lead before removing solenoid leads.

Disconnect solenoid leads.

Measure coil resistance use the Pocket Tester.

Out of specification → Replace.



Y-116



**Pocket Tester:**  
YU-3112-C, 90890-03112



**Solenoid Coil Resistance:**  
336Ω at 20° C (68° F)

### Installation

- E. Install:
  - Solenoid relay
- F. Connect:
  - Leads



**Nut (Terminal):**  
6 Nm (0.6 m • kg, 4.3 Ft • lb)

## CAR WON'T RUN EITHER DIRECTION, SOLENOID DOES CLICK

### VISUAL INSPECTION

1. Visually inspect for loose connections or broken wires.
  - A. If loose repair.
  - B. If OK go to step 2.

### CHECK BATTERIES

2. Test batteries to determine if they are installed correctly and with a hydrometer and voltmeter. Refer to Chapter 2, "BATTERY INSPECTION".
  - A. If OK go to step 3.
  - B. If not OK correct as necessary.



Y-825

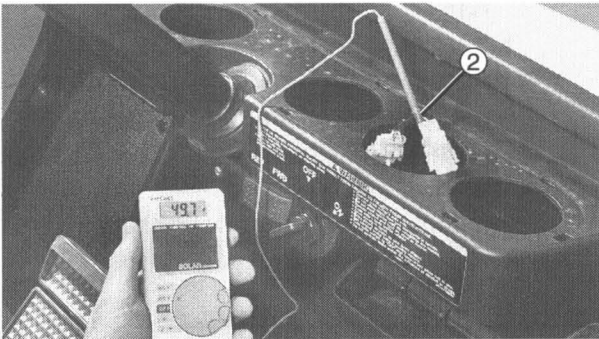
### THROTTLE POSITION SENSOR CHECK

3. Disconnect the three wire connector to the throttle position sensor (blue, black and orange harness wires.) Check the resistance across the sensor side of the connector ①. A good sensor will read the following:
  - Blue to Black - 5000 ohms (5K) pedal, any position
  - Orange to Black - Use an analog ohmmeter. The reading should vary from 0 ~ 150 ohms with accelerator pedal at rest, to up to 5000 (5K) ohms with pedal fully depressed.

**NOTE:**

Resistance should evenly sweep while slowly pressing the accelerator pedal. This is why an analog ohmmeter is preferable. If there is a dead spot, it could result in intermittent operation of the car.

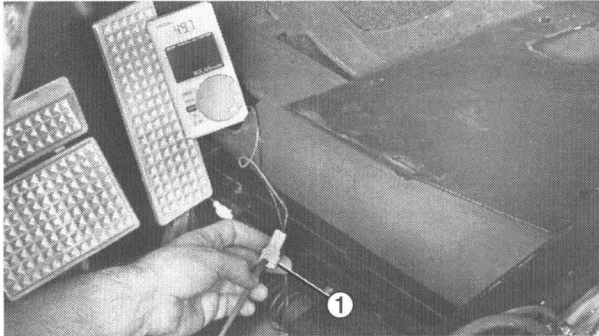
- A. If the sensor checks good, reconnect it and go to step 4.
- B. If the throttle position sensor is bad, replace it.



Y-826

**MAIN SWITCH CHECK**

- 4. Check for voltage on the red/yellow and red/white wires at the main switch ②. Key must be on and tow switch on.
  - A. If voltage is present on both, go to step 5.
  - B. If there is no voltage on red/yellow wire, repair open circuit between tow and main switch.
  - C. If there is voltage on the red/yellow but not the red/white, with key on, replace the main switch.



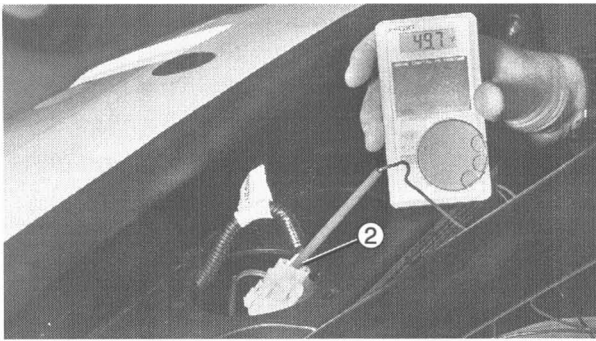
Y-685

**ACCELERATOR STOP SWITCH CHECK**

- 5. Check for voltage on the red/white at accelerator (stop) switch ① with key on.
  - A. If no voltage is present, repair the open circuit between the main switch and the accelerator stop switch.
  - B. If voltage is present on the red/white wire with accelerator pressed and key on, but is not present on the brown wire of the accelerator switch, replace the accelerator stop switch.
  - C. If voltage is present on both wires of the switch and terminal 3 at the controller go to step 6.

**NOTE:**

If there is voltage on the brown wire at the stop switch but not on terminal 3 of the controller, repair the open circuit in the brown wire between the controller and accelerator stop switch.



Y-827

**DIRECTION SWITCH CHECK**

6. With tow switch "on" (run), check for voltage on the red/yellow wire at the direction switch ②.
  - A. If no voltage is present on the red/yellow wire repair open circuit between direction switch and tow switch.
  - B. If voltage is present, place direction switch in forward. Check for voltage on the white wire of the switch ② and at terminal 4, of the controller connector.
    - If voltage is present at terminal 4, replace the controller.
    - If voltage is not present on the white wire of the switch, replace the switch.
    - If voltage is present on the white wire of the switch but not terminal 4, repair the open circuit between the controller and the direction control switch.
    - If car still won't run, go to step 7.

**SOLENOID RELAY BENCH TEST**

7. Test solenoid. Refer to page 8-7, "SOLENOID RELAY BENCH TEST". If car still won't run, go to step 8.

**CHECK TRACTION MOTOR**

8. Test traction motor:
  - Insulation resistance
  - Field coil resistance
  - Armature resistance

Refer to Chapter 7, "INSPECTION AND TESTING".

- If traction motor tests good replace controller.

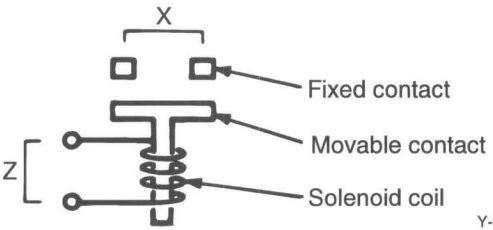
**TRACTION MOTOR**

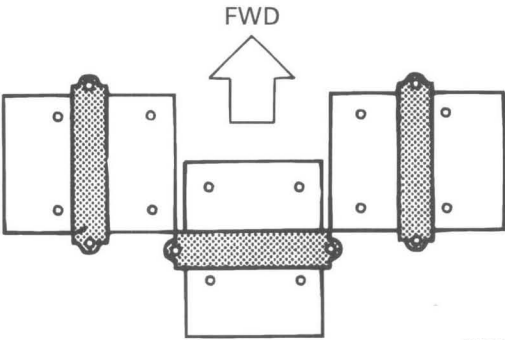
Condition	Possible Cause	Correction
MOTOR DOES NOT TURN	1. Brushes are off commutator.	1. Adjust properly or replace.
	2. Motor terminals are loose or corroded.	2. Tighten or clean.
	3. Leads are broken.	3. Check for breaks at bend or joint. Replace or repair leads.
	4. Field coil is open.	4. Repair or replace at a service shop.
	5. Armature coil is open	5. Repair or replace at a service shop.
MOTOR TURNS SLOWLY	1. Terminals are loose or corroded.	1. Retighten or clean.
	2. Leads are nearly broken or connections are faulty.	2. Check for any defect of leads at bend or joint. Replace leads or repair connections.
	3. Mechanical problem inside motor.	3. Check.
MOTOR IS NOISY	1. Bolts are loose.	1. Retighten.
	2. Motor has foreign matter inside.	2. Clean motor interior.
	3. Bearings are faulty.	3. Replace.
	4. Bearings contain foreign matter.	4. Replace.
	5. Bearings need grease.	5. Replace.
BEARING HEAT EXCESSIVE	1. Bearings are faulty or lack grease.	1. Replace.
	2. Improperly installed.	2. Adjust, replace if necessary.
POOR MOTOR PERFORMANCE	1. Load exceeds specification.	1. Adjust load to spec.
	2. Armature is out of round.	2. Repair or replace at service shop.
	3. Brushes are worn beyond limits.	3. Replace.
	4. Commutator is excessively rough.	4. Smooth with sandpaper (#500 ~ 600).
	5. High mica segment.	5. Recondition at service shop.
	6. Commutator is dirty with oil or dust.	6. Clean with a cleaner, and dry cloth.
	7. Armature coil is shorted or broken.	7. Repair or replace at service shop.
VIBRATION	1. Motor installed loosely.	1. Retighten.
	2. Motor turns irregularly.	2. Repair or replace at service shop.





# ELECTRICAL

Item	G19E
Voltage:	48V DC, 8V Battery x 6 pcs series (locally supplied)
Traction Motor: Model/Manufacturer Rated Voltage Power/Horsepower Current Voltage Set Torque Revolutions Allowable Maximum Revolutions Direction of Rotation Brush Length-Std/Min. Brush Spring Pressure-Max./Min. Mica Undercut-Std/Min. Armature Coil Resistance Field Coil Resistance Insulation Resistance (All measurements)	5BC58JBS6272A / GE 48V DC 2.0 kw/2.7 hp for 30 minutes 44A 48V 5.4 Nm (0.54 kg·m, 3.9 ft·lb) 3,650 r/min 5,500 r/min Clockwise and counter clockwise 34.3 mm (1.35 in)/14.5 mm (0.57 in) 720 ~ 1,080 g (24.3 ~ 36.5 oz)/450 g (15.2 oz) 0.79 mm (0.031 in)/0.25 mm (0.010 in) 0.0228 ~ 0.0232Ω at 20°C (68°F) 0.891 ~ 1.089Ω at 20°C (68°F) 1MΩ
Motor Controller: Model/Manufacturer	FET (Field Effect Transistor) chopper JRI-100 / GE
Solenoid Relay: Model/Manufacturer Amperage Rating Solenoid Coil Resistance (Z) Resistance (X) 	586-120111-3/ESSEX CONTROLS 100A, PEAK at 300A for 3 minutes Z: 336Ω ± 10% X: OFF ∞ ON 0Ω

Item	G19E
Shift Switch: Voltage/Maximum Current Capacity	125 VAC / 15A Rated Type-SPDT-2 position maintained contact
Battery: Type Quantity/Connection Minimum Recommended Output Specific Gravity Maximum difference (at 1.200 corrected min.) [Battery Arrangement and Terminal Connections]	Locally supplied 8V Electric vehicle deep cycle GC-2 6 pcs/Series 105 minutes at 56A at 80°F As specified by manufacturer at 80°F 0.050
 Y-831	
Tow Switch: Mfg Rated Load Volts Type	NKK 30 VDC / 20A 125 VAC / 15A SPST, 2 position maintained contact

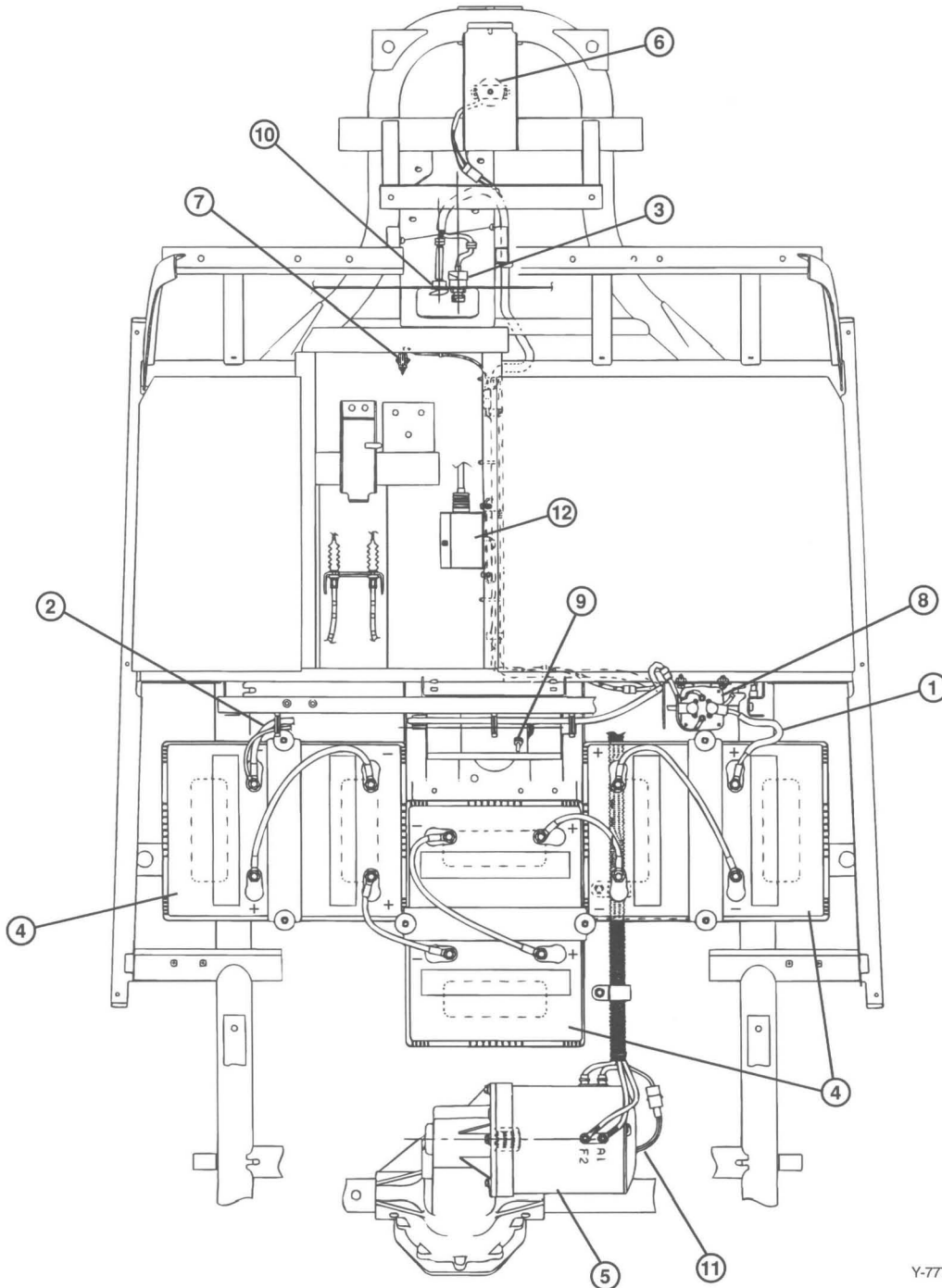




Item	G19E
Back Buzzer: Type Model/Manufacturer Frequency Current Sound Pressure Minimum Operating Voltage	Piezo Ceramic Buzzer JRI-00/YAMAHA 2.4 ~ 3.6 kHz Less than 25 mA 83 dB/1 min./36V 10VDC
Plus Fuse: Amperage Fusible Link Type	3A 14AWG / HYPALON INSULATION

**FOR G19E**

- |                  |                            |
|------------------|----------------------------|
| ① Positive lead  | ⑦ Accelerator stop switch  |
| ② Negative lead  | ⑧ Solenoid relay           |
| ③ Main switch    | ⑨ Tow switch               |
| ④ Batteries      | ⑩ Direction switch         |
| ⑤ Traction motor | ⑪ Speed sensor             |
| ⑥ Buzzer         | ⑫ Throttle position sensor |

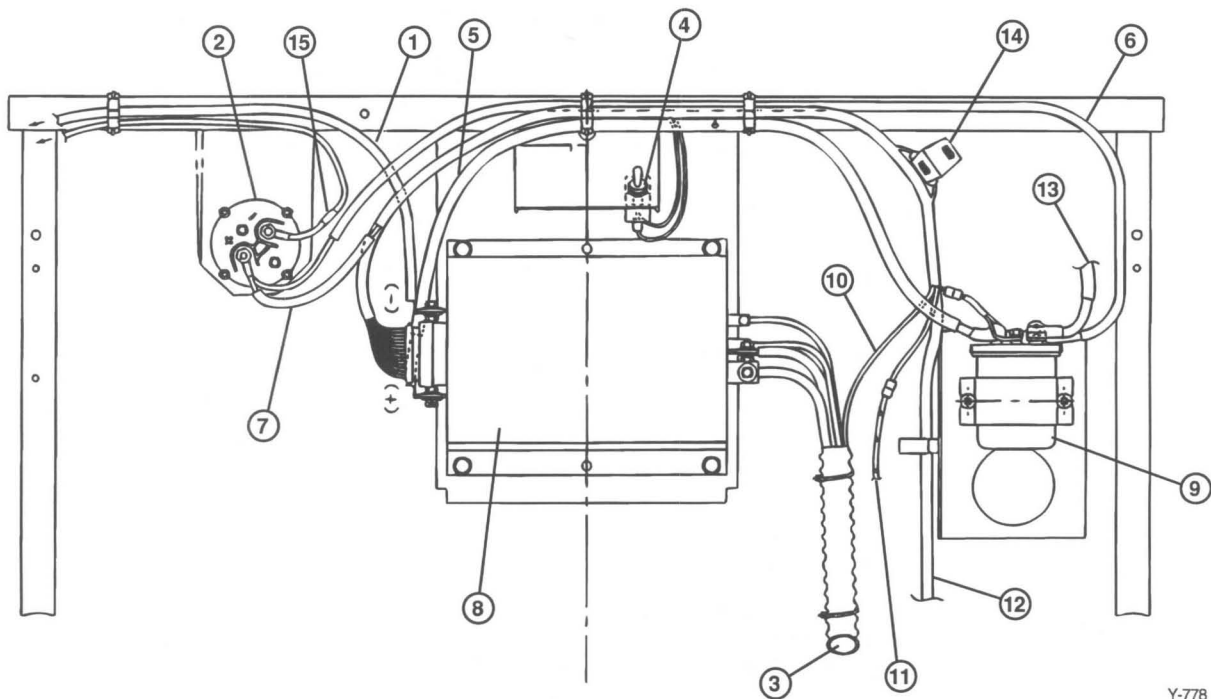


Y-777



- ① To battery (negative)
- ② Charging receptacle
- ③ To traction motor
- ④ Tow / storage switch
- ⑤ To solenoid relay (positive)
- ⑥ Receptacle to solenoid relay, battery side (positive)
- ⑦ Receptacle to fuse (3A) to tow / storage switch (positive)
- ⑧ Control unit
- ⑨ Solenoid relay
- ⑩ Control unit to speed sensor
- ⑪ Control unit to throttle position sensor
- ⑫ Control unit to main switch, accelerator stop switch, forward / reverse switch, buzzer
- ⑬ Battery to solenoid relay (positive)
- ⑭ Fuse holder and 3A fuse
- ⑮ Negative lead wire with charging circuit fusible link

A



Y-778

FOR G19E

- 1 Main switch
- 2 Tow/storage switch
- 3 Accelerator stop switch
- 4 Buzzer
- 5 Directional switch
- 6 DC motor
- 7 Controller
- 8 Throttle sensor
- 9 Relay
- 10 Receptacle
- 11 Fuse (3A)
- 12 Batteries (6 x 8V)

COLOR CODE

- B.....Black
- L.....Blue
- G.....Green
- Y.....Yellow
- R.....Red
- P.....Pink
- Br.....Brown
- W.....White
- B/R.....Black/Red
- Y/B.....Yellow/Black
- R/Y.....Red/Yellow
- R/W.....Red/White

Y-671

