

# SECTION 5 - ELECTRICAL SYSTEM

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## Specifications

| IGNITION                                                        |                                                                                                                       |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Spark Plug Type                                                 | NGK CR7E                                                                                                              |
| Spark Plug Gap                                                  | 0.7-0.8 mm<br>(0.028-0.032 in.)                                                                                       |
| Spark Plug Cap                                                  | 4750-6250 ohms                                                                                                        |
| Ignition Coil Resistance<br>(primary)<br><br>(secondary)        | 0.09-0.13 ohm<br>(terminal (+) to terminal (-))<br>3800-5800 ohms<br>(high tension - plug cap<br>removed - to ground) |
| Ignition Coil Peak Voltage<br>(primary/CDI)                     | 100 volts or more<br>(wrie (+) to ground)                                                                             |
| MAGNETO                                                         |                                                                                                                       |
| Magneto Coil Resistance<br>(trigger)<br><br>(charging)          | 110-140 ohms (blue to<br>black/white)<br>0.33-0.49 ohm (black to black)                                               |
| Magneto Coil Peak<br>Voltage<br><br>(trigger)<br><br>(charging) | 3.6 volts or more (blue to<br>black/white)<br>14-15 volts (battery (+) to<br>battery (-))                             |

## Battery

### ⚠ WARNING

Anytime service is performed on a battery, the following must be observed: keep sparks, open flame, cigarettes, or any other flame away. Always wear safety glasses. Protect skin and clothing when handling a battery. When servicing battery in enclosed space, keep the area well-ventilated. Make sure venting tube of battery is always open once battery is filled with electrolyte.

1. Remove the battery from the ATV.

### ⚠ WARNING

Remove the negative cable first; then remove the positive cable.

### ⚠ CAUTION

Do not charge the battery while it is in the ATV with the battery terminals connected.

2. Remove the vent plugs; then fill the battery with electrolyte to the UPPER level indicated on the battery.

■ **NOTE:** Electrolyte should be at room temperature before filling. Do not use water or any other liquid to activate a battery.

### ⚠ WARNING

Electrolyte is a sulfuric acid solution. Avoid spillage and contact with skin, eyes, and clothing.

3. Allow the battery to stand for 15-30 minutes after filling. Electrolyte level may fall during this time. Refill with electrolyte to UPPER level line.
4. Trickle-charge the battery at 1.4 amps for 8-10 hours.
5. After charging, check electrolyte level and fill with DISTILLED WATER as necessary; then install the vent plugs. Wash off acid spillage with water and dry the battery.

### ⚠ CAUTION

Before installing the battery, make sure the ignition switch is in the OFF position.

6. Place the battery into position in the ATV and secure; then connect the vent hose to the battery.
7. Connect cables to the proper terminals: positive cable to the positive terminal (+) and negative cable to the negative terminal (-). Connect the negative cable last.

### ⚠ CAUTION

Connecting cables in reverse (positive to negative and negative to positive) can cause serious damage to the electrical system.

8. Check the vent tube to make sure it is not pinched or obstructed in any way and that it is properly routed down through the frame.

## Testing Electrical Components

All of the electrical tests should be made using the Fluke Model 73 Multimeter (p/n 0644-191) and when testing peak voltage, the Peak Voltage Reading Adapter (p/n 0644-307) must be used. If any other type of meter is used, readings may vary due to internal circuitry. When troubleshooting a specific component, always verify first that the fuse(s) are good, that the bulb(s) are good, that the connections are clean and tight, that the battery is fully charged, and that all appropriate switches are activated.

■ **NOTE:** For absolute accuracy, all tests should be made at room temperature of 68° F.

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## Accessory Receptacle/Connector

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■ **NOTE:** This test procedure is for either the receptacle or the connector.

### VOLTAGE

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to the red/white wire or the positive connector; then connect the black tester lead to ground.



AR606D

3. The meter must show battery voltage.

■ **NOTE:** If the meter shows no battery voltage, troubleshoot the battery, fuse, receptacle, connector, or the main wiring harness.

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## Brakelight Switch (Auxiliary)

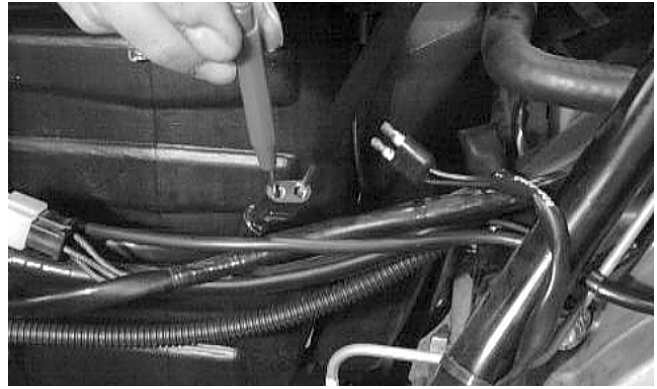
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The switch connector is the two-prong connector on the right side of the engine directly above the brake cable adjuster.

■ **NOTE:** The ignition switch must be in the ON position.

### VOLTAGE (Wiring Harness Side)

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester to the orange wire; then connect the black tester lead to ground.



AR627D

3. The meter must show battery voltage.

■ **NOTE:** If the meter shows no battery voltage, troubleshoot the battery, fuse, switch, or the main wiring harness.

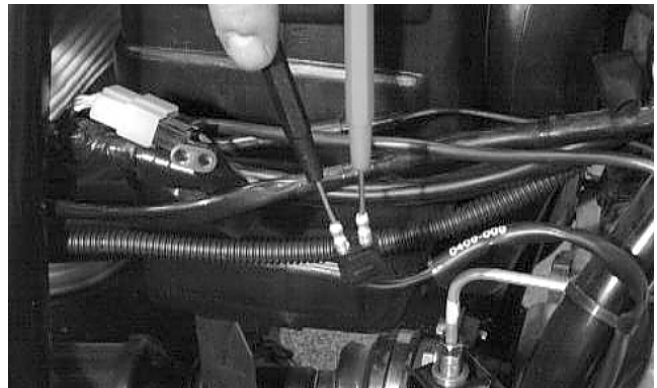
■ **NOTE:** If the meter shows battery voltage, the main wiring harness is good; proceed to test the switch/component, the connector, and the switch wiring harness for resistance.

### RESISTANCE (Switch Connector)

#### CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one black wire; then connect the black tester lead to the other black wire.



AR626D

3. When the brake pedal is depressed, the meter must show less than 1 ohm.

■ **NOTE:** If the meter shows more than 1 ohm of resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

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## Brakelight Switch (Handlebar Control)

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The switch connector is the two-prong black connector in front of the steering post. To access the connector, the front rack and front fenders must be removed (see Section 8).

■ **NOTE:** The ignition switch must be in the ON position.

### VOLTAGE (Wiring Harness Connector)

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to the orange wire; then connect the black tester lead to ground.



AR622D

3. The meter must show battery voltage.

■ **NOTE:** If the meter shows no battery voltage, troubleshoot the battery, fuse, switch, or the main wiring harness.

■ **NOTE:** If the meter shows battery voltage, the main wiring harness is good; proceed to test the switch/component, the connector, and the switch wiring harness for resistance.

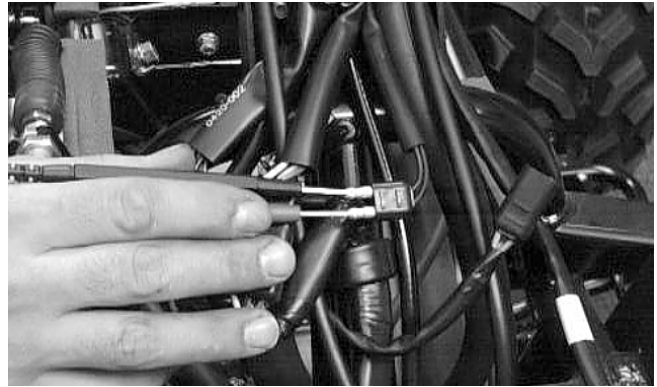
### RESISTANCE (Switch Connector)

 **CAUTION**

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

■ **NOTE:** The brake lever must be compressed for this test. Also, the ignition switch must be in the OFF position.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one black wire; then connect the black tester lead to the other black wire.



AR621D

3. When the lever is compressed, the meter must show less than 1 ohm.

■ **NOTE:** If the meter shows more than 1 ohm of resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

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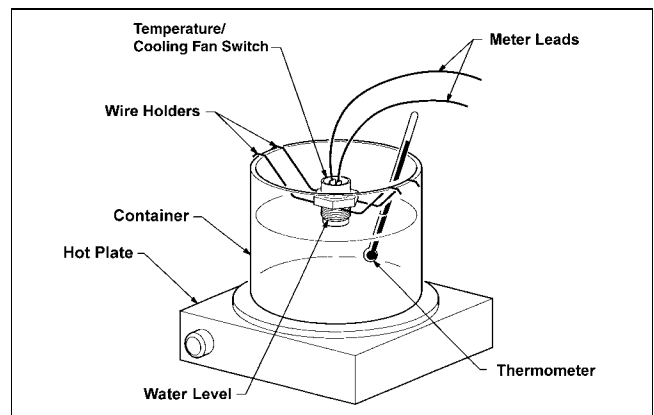
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## Coolant Temperature and Cooling Fan Switches

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1. Connect the meter leads (selector in the OHMS position) to the switch contacts.
2. Suspend the switch and a thermometer in a container of water; then heat the water.

■ **NOTE:** Neither the switch nor the thermometer should be allowed to touch the bottom of the container or inaccurate readings will occur. Use wire holders to suspend switch and thermometer.

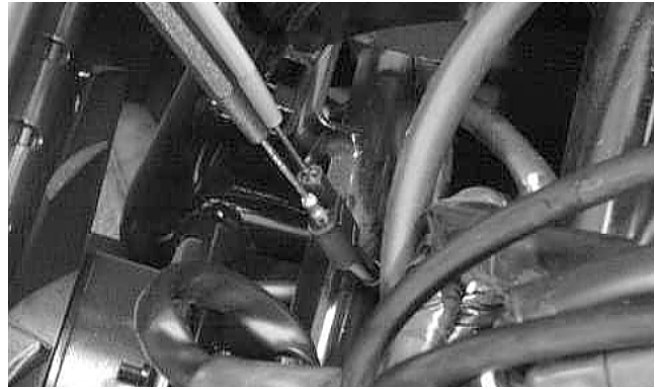


733-554E

3. On the coolant temperature switch when the water temperature reaches 112°-118° C (234°-244° F) the meter should read a closed circuit.

4. On the coolant temperature switch, allow the water to cool, and when the temperature is at (or just before) a temperature of 108°-111° C (226°-232° F), the meter should read an open circuit.
5. On the cooling fan switch when the temperature reaches 66°-68° C (150°-155° F), the meter should read a closed circuit.
6. On the cooling fan switch, allow the water to cool, and when the temperature is at (or just before) a temperature of 62°-65° C (145°-149° F), the meter should read an open circuit.
7. If the readings are not as indicated, the switch must be replaced.
8. Install the switch and tighten securely.
9. Connect the switch leads.

2. Connect the red tester lead to the red wire; then connect the black tester lead to the black wire.



AR645D

3. The meter must show less than 1 ohm.

■ **NOTE:** If the meter shows more than 1 ohm of resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

■ **NOTE:** To determine if the fan motor is good, connect the red wire from the fan connector to a 12 volt D.C. power supply; then connect the black wire from the fan connector to ground. The fan should operate.

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## Fan Motor

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To access the connector (located directly behind the fan), the front rack and front fenders must be removed (see Section 8).

■ **NOTE:** The ignition switch must be in the ON position.

### VOLTAGE (Main Harness Connector to Fan Motor)

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to the black/red wire (the black 2-prong at the fan motor); then connect the black tester lead to ground.
3. The meter must show battery voltage.

■ **NOTE:** If the meter shows no battery voltage, troubleshoot the battery, fuse, motor, or the main wiring harness.

■ **NOTE:** If the meter shows battery voltage, the main wiring harness is good. The connector should be checked for resistance.

### RESISTANCE (Fan Motor Connector)

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|----------------|
| <b>CAUTION</b> |
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|                                                                                                         |
|---------------------------------------------------------------------------------------------------------|
| <p>Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.</p> |
|---------------------------------------------------------------------------------------------------------|

1. Set the meter selector to the OHMS position.

|                |
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| <b>CAUTION</b> |
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|--------------------------------------------------------------|
| <p>Care should be taken to keep clear of the fan blades.</p> |
|--------------------------------------------------------------|

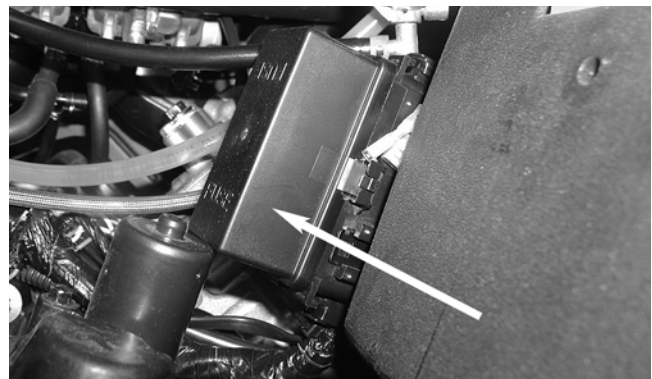
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## Power Distribution Module

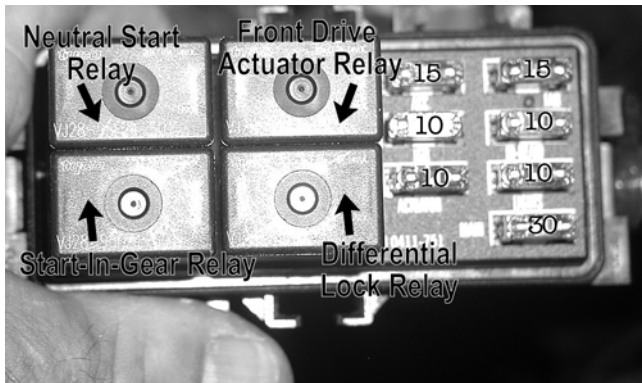
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The fuses are located on the power distribution module above the footrest behind the right front fender. To remove the cover, compress the locking tabs on either side of the cover and lift off.



KX054A

If there is any type of electrical system failure, always check the fuses first.



KX202A

■ **NOTE:** The ignition switch must be in the LIGHTS position.

1. Remove all fuses from the power distribution module.
2. Set the meter selector to the D.C. Voltage position.
3. Connect the black tester lead to ground.
4. Using the red tester lead, contact each end of the fuse holder connector terminals individually.
5. The meter must show battery voltage from one side of the connector terminal ends.

■ **NOTE:** Battery voltage will be indicated from only one side of the fuse holder connector terminal; the other side will show 0 volts.

■ **NOTE:** When testing the HI-Beam fuse holder, the headlight dimmer switch must be in the HI position; when testing the LIGHTS fuse holder, the headlight dimmer switch must be in the LO position.

■ **NOTE:** If the meter shows no battery voltage, troubleshoot the battery, switches, or the power distribution module/main wiring harness.

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## Fuses

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### ⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one spade end of the fuse; then connect the black tester lead to the other spade end.
3. The meter must show less than 1 ohm resistance. If the meter reads open, replace the fuse.

■ **NOTE:** Make sure the fuses are returned to their proper position according to amperage. Proper fuse locations are embossed on the power distribution module.

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## Ignition Coils

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The ignition coils are attached to the upper frame behind the left side panel. To access the coils, the left side panel must be removed (see Section 8).

### ⚠ WARNING

Most voltages generated by the ignition system are sufficient to interrupt pacemakers! All technicians, especially those using pacemakers, must avoid contact with all electrical connections when making these tests.

### PEAK VOLTAGE (Primary Side)

■ **NOTE:** The ignition switch must be in the ON position; the emergency stop switch must be in the RUN position. Also, the front coil wire must be disconnected from the rear coil.

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to the white/blue wire (front coil) or white/green wire (rear coil); then connect the black tester lead to ground.
3. The meter must show  $31V \pm 20\%$ .
4. With the tester leads connected, depress the starter button.
5. The meter must show 100V or more.

■ **NOTE:** If the voltage is not as specified in one or both of the above tests, inspect the main wiring harness, connectors, charge coil, magneto rotor and magnets, magneto rotor key, or the CDI unit.

## RESISTANCE

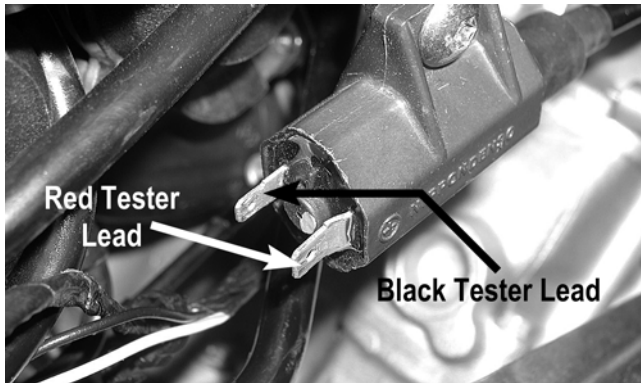
### CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

■ **NOTE:** For these tests, the meter selector should be set to the OHMS position.

### Primary Winding

1. Connect the red tester lead to the (+) terminal (with the wire removed); then connect the black tester lead to the (-) terminal.

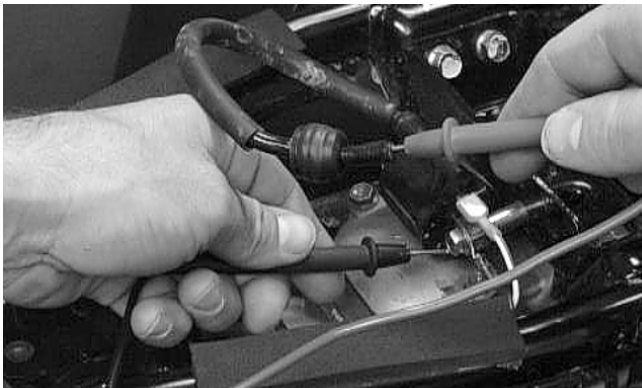


KX201A

2. The meter reading must be within specification.

### Secondary Winding

1. Connect the red tester lead to the high tension lead (plug cap removed); then connect the black tester lead to ground.



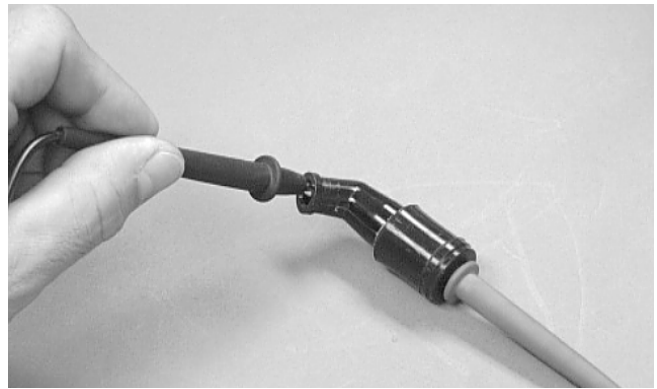
AR601D

2. The meter reading must be within specification.

■ **NOTE:** If the meter does not show as specified, replace ignition coil.

### Spark Plug Cap

1. Connect the red tester lead to one end of the cap; then connect the black tester lead to the other end of the cap.



AR603D

2. The meter reading must be within specification.

■ **NOTE:** If the meter does not read as specified, replace the spark plug cap.

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## Ignition Switch

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The connector is beneath the front fenders. To access the connector, the front rack, front fenders, and instrument pod must be removed.

### VOLTAGE

■ **NOTE:** Perform this test on the lower side of the connector.

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red meter lead to the red wire; then connect the black meter lead to ground.
3. Meter must show battery voltage.

■ **NOTE:** If the meter shows no battery voltage, troubleshoot the battery or the main wiring harness.

### RESISTANCE

### CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

■ **NOTE:** Perform this test on the upper side of the connector.

1. Turn the ignition switch to the ON position.
2. Set the meter selector to the OHMS position.
3. Connect the red tester lead to the red wire; then connect the black tester lead to the brown wire.
4. The meter must show 980-1020 ohms.

5. Turn the ignition switch to the LIGHTS position.
6. Connect the red tester lead to the red wire; then connect the black tester lead to the brown wire.
7. The meter must show 980-1020 ohms.
8. Connect the red tester lead to the red wire; then connect the black tester lead to the gray wire.
9. The meter must show less than 1 ohm.
10. With the switch in the OFF position, connect the red tester lead to the red wire and the black tester lead to each of the remaining wires (brown, red/black, and gray). The meter must show an open circuit on all wires.

■ **NOTE:** If the meter does not show the specified values, replace the ignition switch assembly.

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## Handlebar Control Switches

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The connector is in front of the steering post. To access the connector, the front rack and front fenders must be removed (see Section 8).

■ **NOTE:** These tests should be made on the top side of the connector.

### ⚠ CAUTION

**Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.**

#### RESISTANCE (HI Beam)

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the yellow wire; then connect the black tester lead to the gray wire.
3. With the dimmer switch in the HI position, the meter must show less than 1 ohm.

■ **NOTE:** If the meter shows more than 1 ohm of resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

#### RESISTANCE (LO Beam)

1. Connect the red tester lead to the white wire; then connect the black tester lead to the gray wire.
2. With the dimmer switch in the LO position, the meter must show an open circuit.

■ **NOTE:** If the meter reads resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

#### RESISTANCE (Starter Button)

1. Set the meter selector to the Diode position.
2. Connect the red tester lead to the orange wire; then connect the black tester lead to the yellow/green wire.
3. With the starter button depressed, the meter must show less than 1 ohm.
4. With the starter button released, the meter must show an open circuit.
5. Connect the red tester lead to the yellow/green wire; then connect the black tester lead to the orange wire.
6. With the starter button depressed, the meter must show an open circuit.

■ **NOTE:** If the meter does not show as specified, replace the switch/component, connector, or switch harness.

#### RESISTANCE (Emergency Stop)

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the orange wire; then connect the black tester lead to the orange/white wire.
3. With the switch in the OFF position, the meter must show an open circuit.
4. With the switch in the RUN position, the meter must show less than 1 ohm.

■ **NOTE:** If the meter shows more than 1 ohm of resistance, troubleshoot or replace the switch/component, the connector, or the switch wiring harness.

#### RESISTANCE (Reverse Override)

The connector is the four-prong white one in front of the steering post. To access the connector, the front rack and front fenders must be removed (see Section 8).

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to one red/yellow wire; then connect the black tester lead to the other red/yellow wire. The meter must show less than 1 ohm.
3. Depress and hold the reverse override button. The meter must show an open circuit.



4. Connect the red tester lead to the blue wire; then connect the black meter lead to the black wire. The meter must show an open circuit.
5. Depress and hold the reverse override button. The meter must show less than 1 ohm.

■ **NOTE:** If the meter does not show as specified, replace the switch/component, connector, or switch harness.

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## Front Drive Selector Switch

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The connector is the two-wire black snap-lock one in front of the steering post. To access the connector, the front rack and front fenders must be removed (see Section 8).

■ **NOTE:** Resistance tests should be made with the connector disconnected and on the selector-side of the connector.

### RESISTANCE

|                                                                                                  |
|--------------------------------------------------------------------------------------------------|
|  <b>CAUTION</b> |
|--------------------------------------------------------------------------------------------------|

|                                                                                                                |
|----------------------------------------------------------------------------------------------------------------|
| <p><b>Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.</b></p> |
|----------------------------------------------------------------------------------------------------------------|

1. Set the meter selector to the OHMS position.
2. Connect the red tester lead to the red wire; then connect the black tester lead to the white wire.
3. With the selector switch in the 2WD position, the meter must show a closed circuit.
4. With the selector switch in the 4WD position, the meter must show an open circuit.

■ **NOTE:** If the meter does not show as specified, replace the front drive selector switch.

### VOLTAGE

■ **NOTE:** The battery must be connected when performing voltage tests.

1. Set the meter selector to the D.C. Voltage position.
2. Connect the black tester lead to the negative battery terminal.
3. Connect the red tester lead to the orange wire on the harness side of the connector.
4. Turn the ignition switch to the RUN position.
5. The meter must show 12 D.C. volts.

■ **NOTE:** If the meter shows other than specified, check the harness, connector, 30 amp fuse, and battery connections.

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## Front Drive Selector Actuator

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■ **NOTE:** With the engine stopped and the ignition switch in the ON position, a momentary “whirring” sound must be noticeable each time the selector switch is moved to 2WD and 4WD. Test the switch, 30 amp fuse, and wiring connections prior to testing the actuator.

### VOLTAGE

1. Select the 2WD position on the front drive selector switch; then disconnect the four-prong connector on the actuator wiring harness.
2. With the ignition switch in the OFF position, connect the black tester lead to the black wire in the supply harness; then connect the red tester lead to the orange wire in the supply harness.
3. Turn the ignition switch to the ON position. The meter must show 12 D.C. volts.
4. Connect the red tester lead to the white/red wire in the supply harness. The meter must show 12 D.C. volts.
5. Select the 4WD position on the front drive selector switch; then connect the red tester lead to the white/red wire in the supply harness. The meter must show 0 D.C. volts.
6. Connect the red tester lead to the orange wire in the supply harness. The meter must show 12 D.C. volts.

■ **NOTE:** If the voltage readings are as specified and the actuator does not function correctly, replace the actuator (see Section 6).

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## Differential Lock Switch

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1. Remove the left front inner fender panel.
2. Select D.C. Voltage on the multimeter; then connect the red tester lead to the switch terminal (leaving the wire connected) and the black tester lead to ground.

- Turn the ignition switch to the ON position and select 2 WD on the front drive selector switch; then while watching the meter (12 D.C.volts), select the lock position on the differential lock. The meter should drop to 0 volts.

■NOTE: It may be necessary to rock the ATV slightly to engage the differential lock fully.

## Magneto Coils

### VOLTAGE (Charging Coil - Output)

- Set the meter selector to the D.C. Voltage position.
- Connect the red tester lead to the positive battery post; then connect the black tester lead to the negative battery post.
- With the engine running at a constant 5000 RPM (with the headlights on), the meter must show 14-15 D.C. volts.

#### ⚠ CAUTION

Do not run the engine at high RPM for more than 10 seconds.

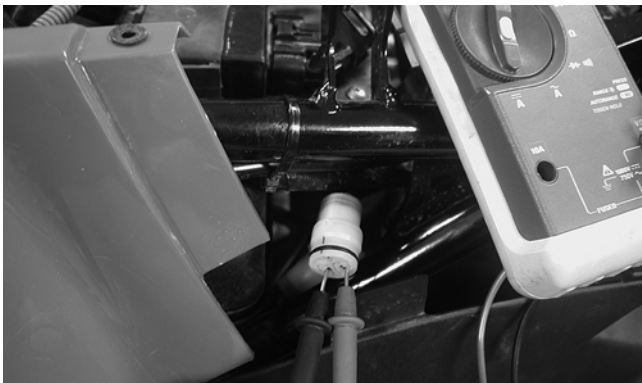
■NOTE: If voltage is lower than specified, test charging coil - no load.

### VOLTAGE (Charging Coil - No Load)

The connector is the white one on the right side behind the engine.

■NOTE: Test the connector that comes from the engine.

- Set the meter selector to the A.C. Voltage position.
- Test between the three black wires for a total of three tests.



KX387

- With the engine running at a constant 3000 RPM, all wire tests must show 39-59 A.C. volts.

#### ⚠ CAUTION

Do not run the engine at high RPM for more than 10 seconds.

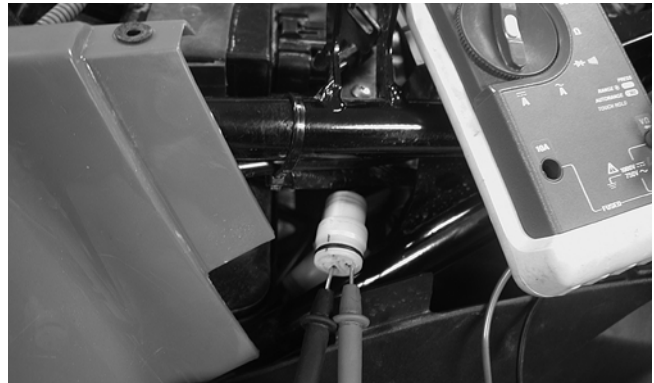
■NOTE: If both charging coil tests failed, check all connections, etc., and test again. If no voltage is present, replace the stator assembly.

### RESISTANCE (Charging Coil)

#### ⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

- Set the meter selector to OHMS position.
- Test between the three black wires for a total of three tests.



KX387

- The meter reading must be within specification.

### RESISTANCE (Trigger Coil)

#### ⚠ CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

- Set the meter selector to the OHMS position.
- Connect the red tester lead to the black/white wire; then connect the black tester lead to the blue wire. The meter reading must be within specification.

### PEAK VOLTAGE

■NOTE: All of the peak voltage tests should be made using the Fluke Model 73 Multimeter (p/n 0644-191) with Peak Voltage Reading Adapter (p/n 0644-307). If any other type of tester is used, readings may vary due to internal circuitry.

■NOTE: The battery must be at full charge for these tests.

### Magneto Coil (Trigger)

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to the black/white wire; then connect the black tester lead to the blue wire.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

### Magneto Coil (Charging)

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to the black wire; then connect the black tester lead to black wire #1.
3. Crank the engine over using the electric starter.
4. The meter reading must be within specification.

■ **NOTE:** Repeat steps 2-4 for black wire #2.

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## Starter Motor

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### REMOVING/DISASSEMBLING

1. Disconnect the battery.

**⚠ CAUTION**

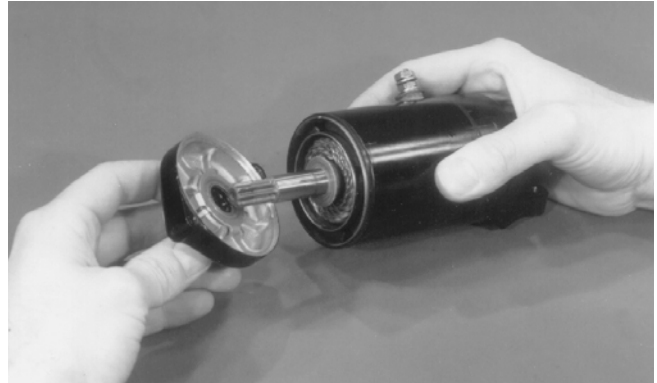
**Always disconnect the negative battery cable from the battery first; then disconnect the positive cable.**

2. Remove the nut securing the positive cable to the starter; then remove the cable from the starter.
3. Remove the two cap screws securing the starter to the crankcase; then remove the starter. Account for the wiring forms and an O-ring.
4. For assembly purposes, scribe a line across the outside of the starter assembly.



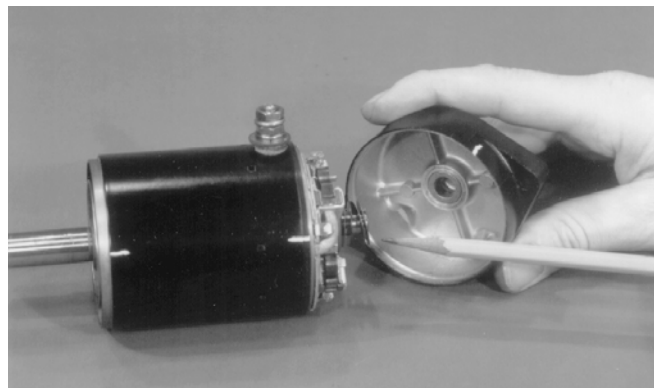
AR652D

5. Remove the two long starter cap screws securing the starter components.
6. Remove the front cover from the starter housing and armature shaft. Account for a seal protector and three washers.



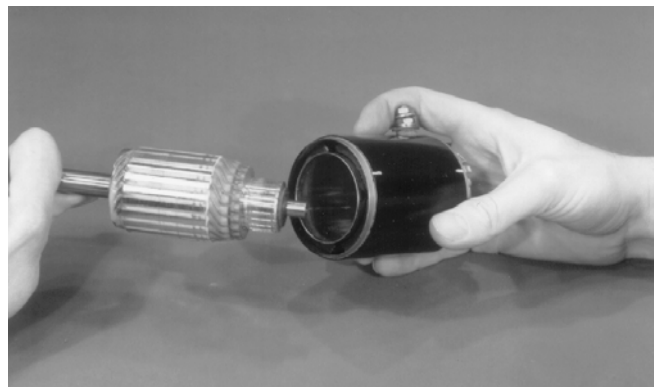
BC003

7. Remove the rear cover.



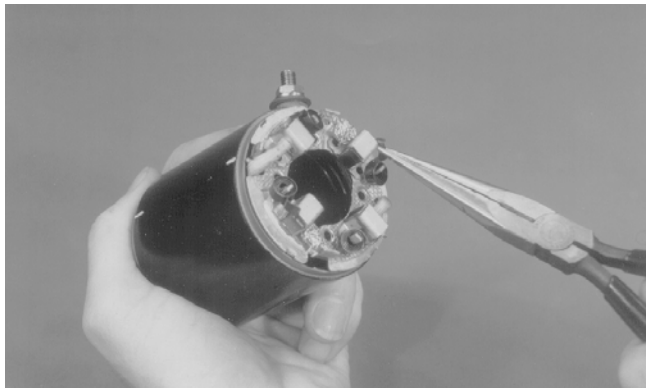
BC005

8. Slide the armature free of the starter housing.



BC006

9. Bend the two positive brushes outward; then remove the brush holder.

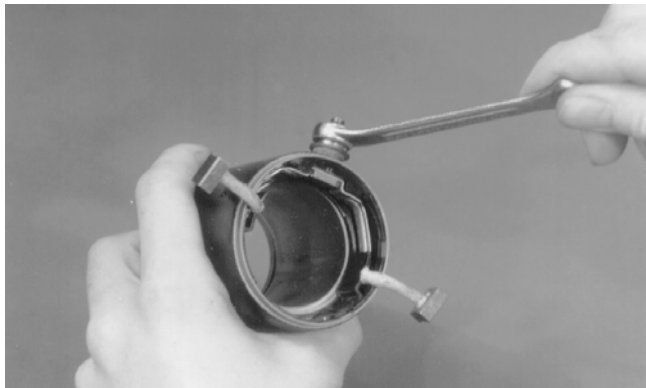


BC007



BC010

10. Remove the nut from the positive post. Account for the lock washer, flat washer, a fiber washer, and an O-ring.



BC008

11. Remove the positive brush assembly from the starter housing.



BC009

## CLEANING AND INSPECTING

■ **NOTE:** Whenever a part is worn excessively, cracked, or damaged in any way, replacement is necessary.

1. Thoroughly clean all components except the armature and brushes in parts-cleaning solvent; then dry with compressed air.

### CAUTION

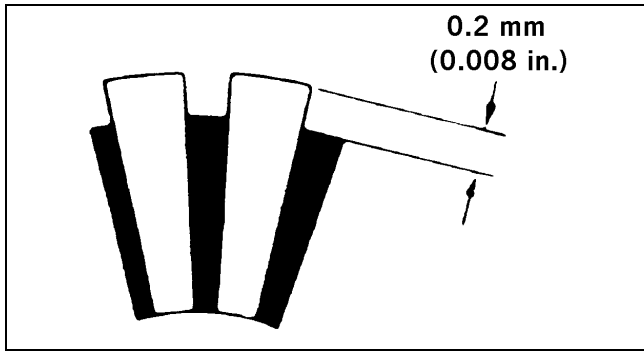
**Do not wash the armature and brushes in any kind of solvent. Use only compressed air and a clean dry, lint-free cloth.**

2. Inspect all threaded areas for damage or stripped threads.
3. Inspect the brush holder assembly and brushes for damage or wear. Using a caliper, measure the length of the brushes. If brush measurement is less than 10.1 mm (0.40 in.), replace with new brushes and brush springs as a set.
4. Inspect the brush leads for cracks, wear, or fraying. If any of these conditions exist, replace with new brushes and brush springs as a set.
5. Inspect the rear cover bushing for wear.
6. Inspect the front cover bearing for wear.
7. Inspect the brass commutator end of the armature for any burned spots or damage. If the commutator is lightly burned or damaged, the armature must be replaced. This is a molded commutator and turning it down in a lathe should not be attempted.

### CAUTION

**Do not use emery cloth to clean the commutator as emery particles will become imbedded in the brass commutator resulting in a short circuit. Use only #200 grit sandpaper.**

8. Inspect the commutator end of the armature for buildup in the grooves. Carefully remove any buildup by undercutting using a thinly ground hacksaw blade. Do not undercut any deeper than the original groove which can be seen by looking at the end of the commutator.
9. Using a caliper, measure the undercut. Maximum undercut groove must be 0.2 mm (0.008 in.).

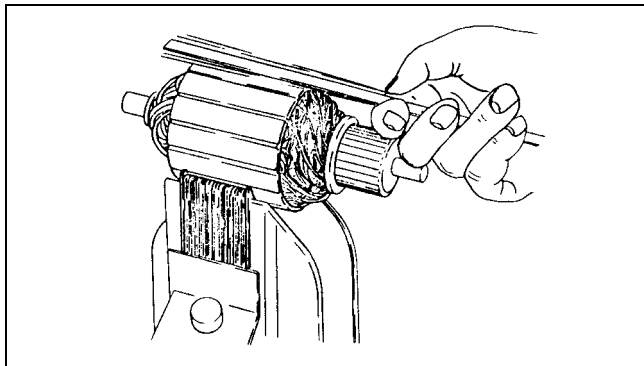


ATV-1054

**CAUTION**

**Buildup in the grooves must be removed to prevent any chance of an electrical arc between individual sections of the commutator.**

10. Inspect the commutator for shorting using a multimeter and the following procedure.
  - A. Set the selector to the OHMS position.
  - B. Touch the black lead to the armature shaft.
  - C. Using the red tester lead, probe the commutator end of the armature. The meter indicator should not change. If the indicator shows resistance, the armature is shorted and must be replaced.
11. Inspect the armature for shorting using a “growler” and the following procedure.
  - A. Place the armature in the “growler.”
  - B. While holding a metal strip on the armature, rotate the armature an entire revolution. If the metal strip vibrates at any point on the armature, the armature is shorted and must be replaced.



0725-653

12. Inspect the ground brushes to make sure they are properly grounded. Use a multimeter and the following procedure.
  - A. Set the selector to the OHMS position.
  - B. Touch the black tester lead to a ground brush.

- C. Touch the red tester lead to the brush holder assembly.

■ **NOTE:** If no resistance is indicated, check the ground connection for tightness and for cleanliness. If there is still no meter indication, replace the brush assembly.

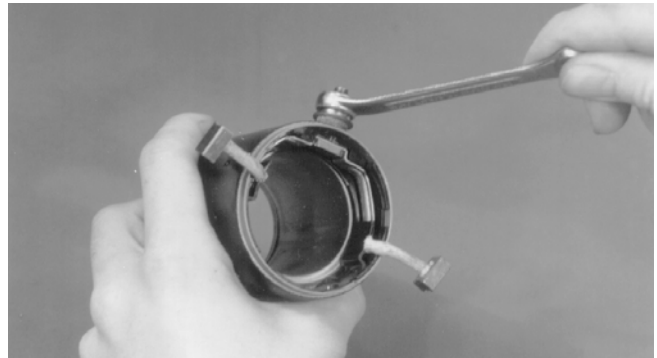
**ASSEMBLING/INSTALLING**

1. Install the positive post on the positive brush assembly; then install on the starter housing.



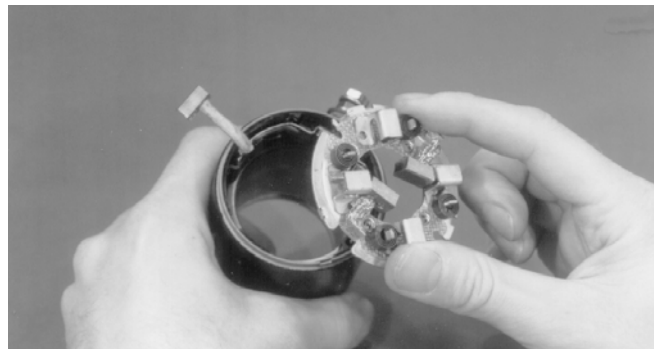
BC009

2. On the positive post, install an O-ring washer, a fiber washer, a flat washer, and a lock washer. Secure with the nut.



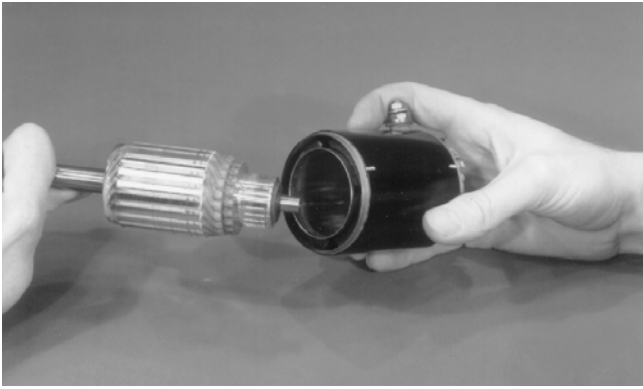
BC008

3. Align the tab on the brush holder with the notch in the starter housing; then install.



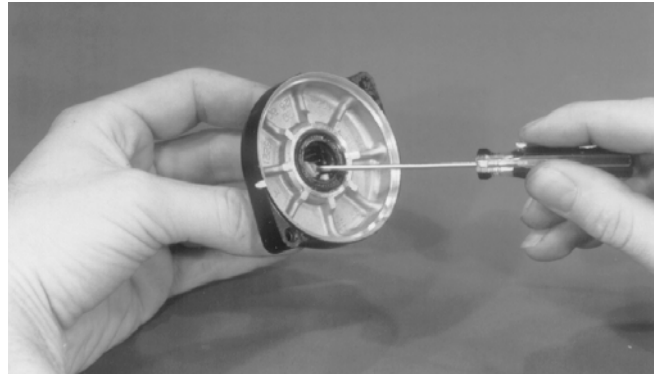
BC010

4. Install the armature into the starter housing; then while holding the brushes out, slide the commutator into the brush holder.

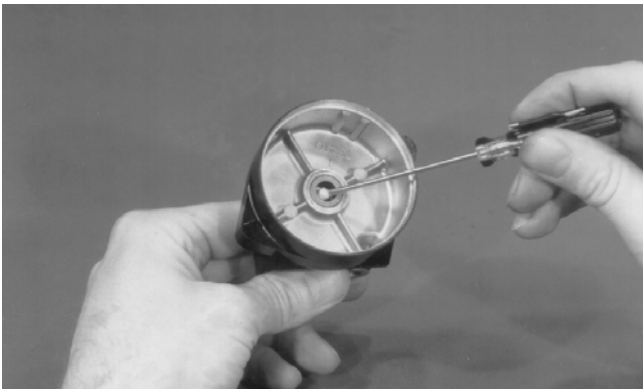


BC006

5. Apply a small amount of grease to the rear cover bushing; then install the cover on the starter housing making sure the reference marks align.

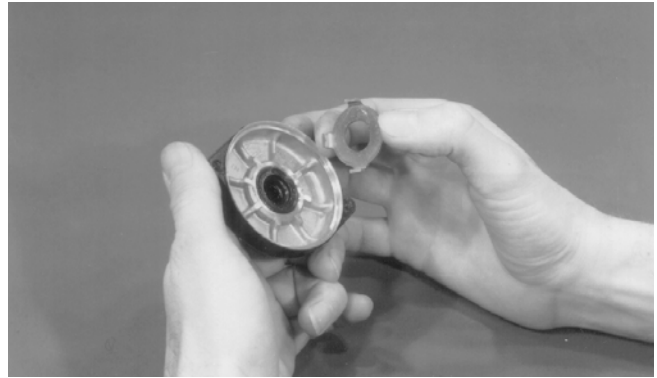


BC015



BC013

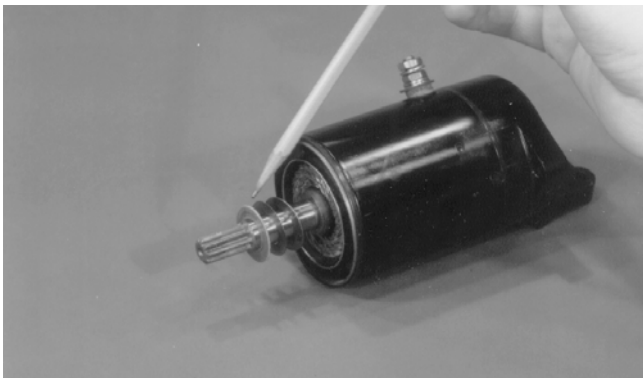
6. In order, install the thick metal washer, thin metal washer, and the fiber washer on the armature shaft; then install the housing O-ring on the starter housing.



BC004

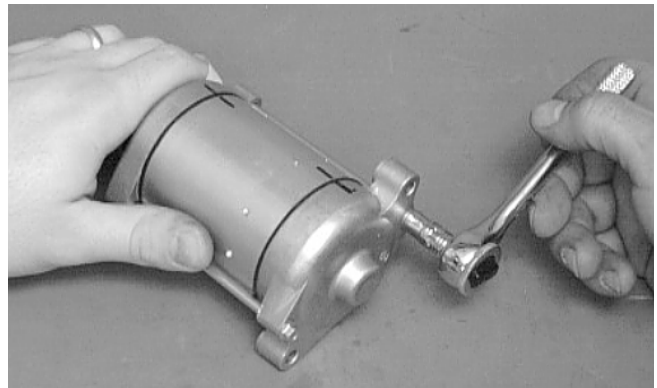
8. Place the front cover onto the starter housing making sure it seats properly.

9. Apply red Loctite #271 to the threads of the two long cap screws and install. Tighten to 0.8-1.2 kg-m (6-9 ft-lb).



BC014

7. Apply a small amount of grease to the front cover bearing and seal; then install the seal protector.



AR653D

10. Apply a small amount of grease to the O-ring seal on the starter; then install the starter into the crankcase. Secure with two cap screws and wiring forms.

11. Secure the positive cable to the starter with the nut.

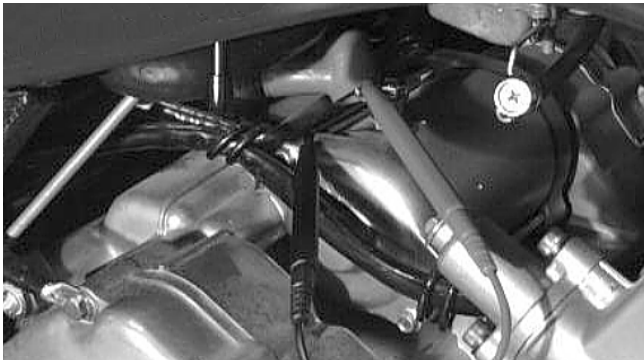
12. Connect the battery.

## TESTING VOLTAGE

Perform this test on the starter motor positive terminal. To access the terminal, slide the boot away.

■ **NOTE:** The ignition switch must be in the ON position, the emergency stop switch in the RUN position, and the shift lever in the NEUTRAL position.

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to the starter terminal; then connect the black tester lead to ground.
3. With the starter button depressed, the meter must show a drop in battery voltage and the starter motor should operate.



AR607D

■ **NOTE:** If the meter showed no battery voltage, inspect the main fuse, ground connections, starter motor lead, battery voltage (at the battery), switches, starter relay, or neutral start relay.

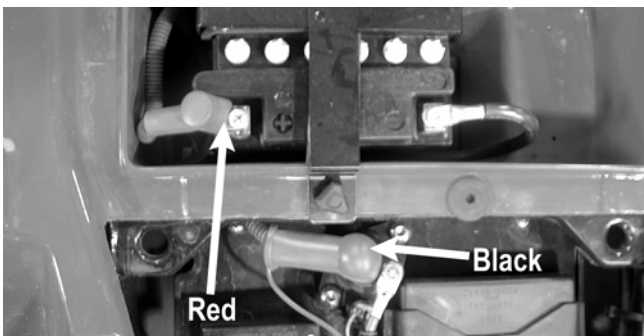
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## Starter Relay

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1. Remove the seat; then using the multimeter set to the D.C. Voltage position, check the relay as follows.
2. Connect the red tester lead to the positive battery terminal; then connect the black tester lead to the starter cable connection on the starter relay. The meter must show battery voltage.



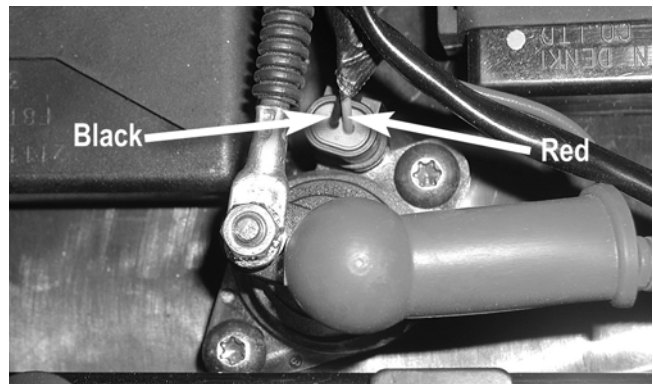
KX206A

■ **NOTE:** Make sure that the ignition switch is in the ON position, transmission in neutral, brake lock released, and the emergency stop switch in the RUN position.

3. Depress the starter button while observing the multimeter. The multimeter should drop to 0 volts and a “click” should be heard from the relay.

■ **NOTE:** If a “click” is heard and any voltage is indicated by the multimeter, replace the starter relay. If no “click” is heard and the multimeter continues to indicate battery voltage, proceed to step 4.

4. Disconnect the two-wire plug from the starter relay; then connect the red tester lead to the green wire and the black tester lead to the black wire.



KX059A

5. Depress the starter button and observe the multimeter.

■ **NOTE:** If battery voltage is indicated, replace the starter relay. If no voltage is indicated, proceed to Neutral Start Relay check.

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## Neutral Start Relay

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■ **NOTE:** Make sure that the ignition switch is in the ON position, transmission in neutral, brake lock released, and the emergency stop switch in the RUN position.

Compress the hand brake lever or depress the auxiliary brake pedal and observe the multimeter.

■ **NOTE:** If battery voltage is indicated on the multimeter, replace the neutral start relay. If no voltage is indicated, check the starter button or wiring harness. Connect the two-wire plug into the neutral start relay.

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## CDI Unit

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The CDI is located beneath the seat near the battery.

■ **NOTE:** The CDI unit is not a serviceable component. If the unit is defective, it must be replaced.

The CDI is rarely the cause for electrical problems; however, if the CDI is suspected, substitute another CDI unit to verify the suspected one is defective.

■ **NOTE:** Prior to replacing the CDI unit to assure the CDI unit is defective, it is advisable to perform a CDI peak voltage test (see Ignition Coils in this section) and/or perform a continuity test of the wiring harness from the CDI connector to the CDI unit.

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## Regulator/Rectifier

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The regulator/rectifier is located under the rear rack and rear fenders. Try to verify all other charging system components before the regulator/rectifier is replaced.

### TESTING

1. Start engine and warm up to normal operating temperatures; then connect a multimeter to the battery as follows.
2. Select the D.C. Voltage position; then connect the red tester lead to the positive battery post and the black tester lead to the negative battery post.
3. Start the engine and slowly increase RPM. The voltage should increase with the engine RPM to a maximum of 15.5 D.C. volts.

■ **NOTE:** If voltage rises above 15.5 D.C. volts, the regulator is faulty or a battery connection is loose or corroded. Clean and tighten battery connections or replace the regulator/rectifier. If voltage does not rise, check Voltage (Charging Coil - No Load) in this section. If charging coil voltage is normal, replace the regulator/rectifier.

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## Neutral Start/Front Drive Actuator/Start-in-Gear/Differential Lock Relays

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The relays are identical plug-in type located on the power distribution module. Relay function can be checked by switching relay positions. The relays are interchangeable.

■ **NOTE:** The relay schematic is embossed on the relay housing for testing continuity.

■ **NOTE:** The module and wiring harness are not a serviceable component and must be replaced as an assembly.

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## Headlights

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The connectors are the four 2-wire ones secured to the front bumper supports (two on each side) with cable ties.

### BULB VERIFICATION (Low and High Beam)

■ **NOTE:** Perform this test on each headlight bulb. Also, a 12-volt external power supply w/jumpers will be needed.

1. Disconnect the wiring harness from the bulb to be tested.
2. Connect the power supply (positive) to one bulb contact; then connect the power supply (negative) to the remaining bulb contact.
3. The bulb should illuminate.
4. If the bulb fails to illuminate, it must be replaced.

### VOLTAGE

■ **NOTE:** Perform this test in turn on the main harness side of all four connectors. Also, the ignition switch must be in the LIGHTS position.

■ **NOTE:** The LO beam is the outside bulb, and the HI beam is the inside bulb.

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to one wire; then connect the black tester lead to the other wire.
3. With the dimmer switch in the LO position, test the two outside connectors (LO beam). The meter must show battery voltage.



4. With the dimmer switch in the HI position, test the two inside connectors (HI beam). The meter must show battery voltage.

■ **NOTE:** If battery voltage is not shown in any test, inspect the fuses, battery, main wiring harness, connectors, or the left handlebar switch.

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## Taillight - Brakelight

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The connector is the 3-prong one located under the rear fender assembly.

### BULB VERIFICATION

■ **NOTE:** Perform this test on the taillight-brakelight side of the connector. Also, a 12-volt external power supply (jumper) will be needed.

1. Connect the power supply (positive) to the yellow wire; then connect the power supply (negative) to the brown wire.
2. The taillight should illuminate.
3. With the negative power supply still connected, connect the positive supply wire to the red wire.
4. The brakelight should illuminate.

■ **NOTE:** If either the taillight or brakelight fails to illuminate, inspect the bulb, the connectors, or the component wiring harness.

### VOLTAGE (Taillight)

■ **NOTE:** Perform this test on the main harness side of the connector. Also, the ignition switch should be in the LIGHTS position.

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to the pink wire; then connect the black tester lead to the black wire.
3. With the ignition key in the LIGHTS position, the meter must show battery voltage.

■ **NOTE:** If the meter shows no voltage, inspect fuses, wiring harness, connectors, and switches.

### VOLTAGE (Brakelight)

■ **NOTE:** Perform this test on the main harness side of the connector. Also, the ignition switch should be in the ON position and the brake (either foot pedal or hand lever) must be applied.

■ **NOTE:** Make sure the brake lever (hand) and brake pedal (auxiliary) are properly adjusted for this procedure.

1. Set the meter selector to the D.C. Voltage position.
2. Connect the red tester lead to the red/blue wire; then connect the black tester lead to the black wire.
3. With either brake applied, the meter must show battery voltage.

■ **NOTE:** If the meter shows no voltage, inspect bulb, fuses, wiring harness, connectors, and switches.

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## Ignition Timing

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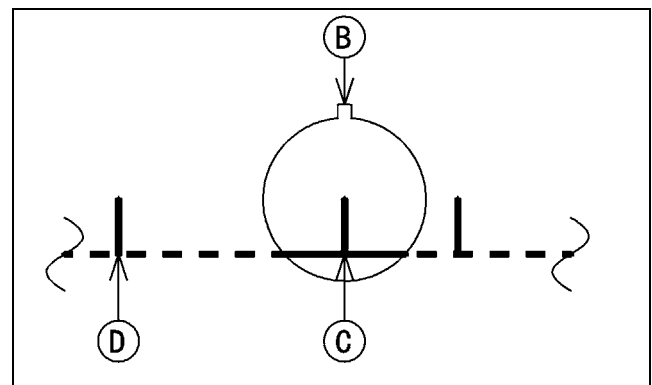
The ignition timing cannot be adjusted; however, verifying ignition timing can aid in troubleshooting other components. To verify ignition timing, use the following procedure.

### ⚠ WARNING

Oil will spray out of the timing inspection hole when the engine is running. Cover or shield the ATV around the inspection plug. Always wear protective glasses when doing timing checks.

1. Attach the engine Timing Light (p/n 0644-197) to the front spark plug high tension lead; then remove the timing inspection plug from the left-side crankcase cover.
2. With the Arctic Cat Engine Tachometer (p/n 0644-275) connected, start the engine and run at the specified RPM.
3. Ignition timing should be according to the following chart and illustration.

| Engine Speed<br>r/min (RPM) | Slot (B) Aligned With                 |
|-----------------------------|---------------------------------------|
| 1100 and below              | Advanced mark (C) on alternator rotor |
| 5000 and above              | Advanced mark (D) on alternator rotor |



ATV2119A

4. Install the timing inspection plug.

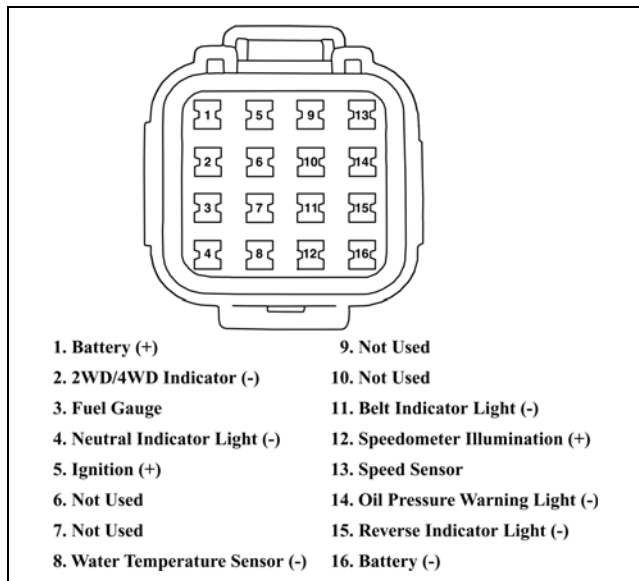
If ignition timing is incorrect, replace the CDI and pick-up coil.

## Electronic Speedometer/Indicator Lights

### REMOVING

1. Remove the four nylon fasteners securing the instrument pod; then remove the ignition switch retaining nut.
2. Remove the front rack and front fenders; then disconnect the multi-pin connector.
3. Remove the three nuts securing the mounting studs; then remove the speedometer.

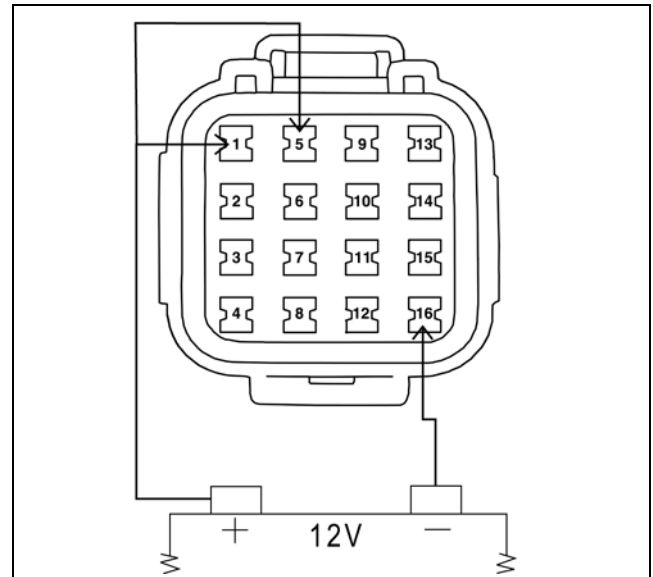
### TESTING



ATV2208A

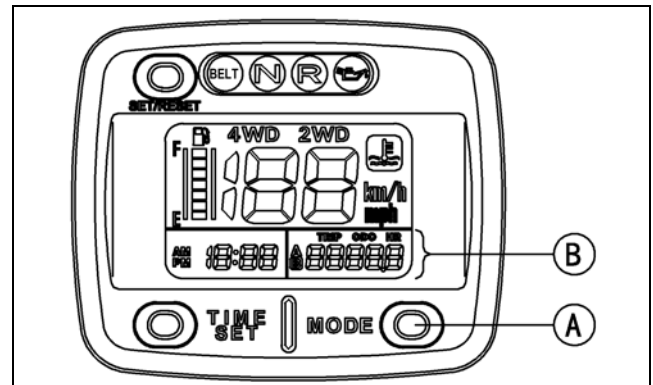
1. Connect a 12-volt battery with the positive wire to terminal (1) and the negative wire to terminal (16); then connect a jumper wire from terminal (1) to terminal (5). All LCD displays on the speedometer should appear for one second.

■ **NOTE:** If any functions (segments or displays) are not normal or display as indicated, the speedometer must be replaced.



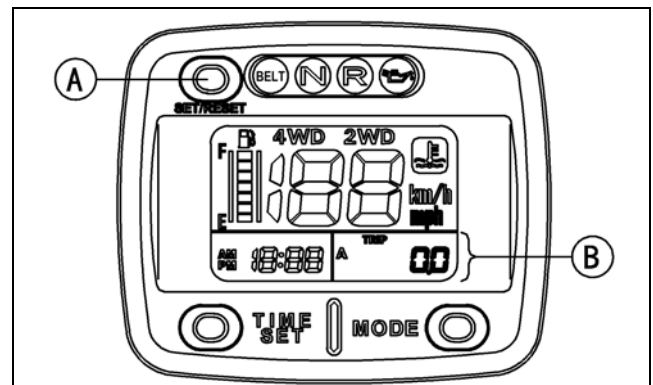
ATV2208B

2. Connect the positive wire to terminals (1) and (5) and the negative wire to terminal (16); then depress and hold the mode button (A). The display (B) should cycle through the four modes CDO-ODO-TRIPA-TRIPB-HOUR.



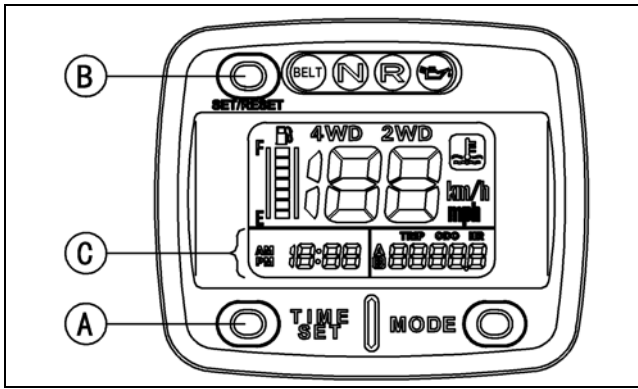
ATV2121

3. Cycle the speedometer to TRIPA or TRIPB mode; then check that when the SET/RESET button (A) is depressed, the display shows 0.0 (B).



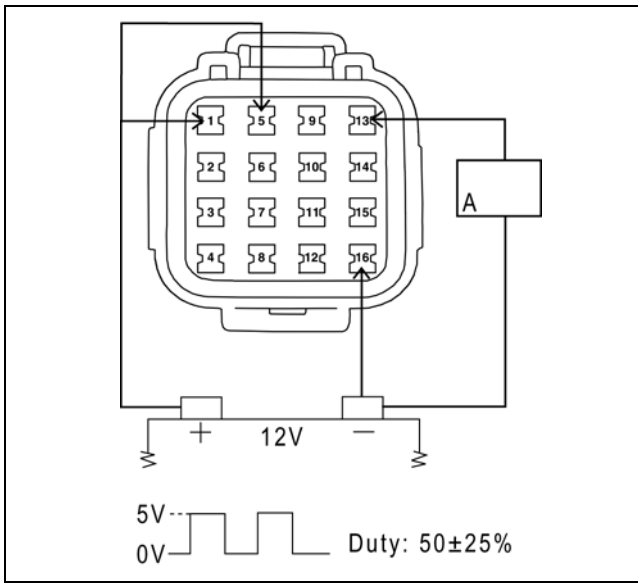
ATV2122

4. Check that when the TIME SET (A) and the SET/RESET (B) buttons are depressed, the time (C) will reset.



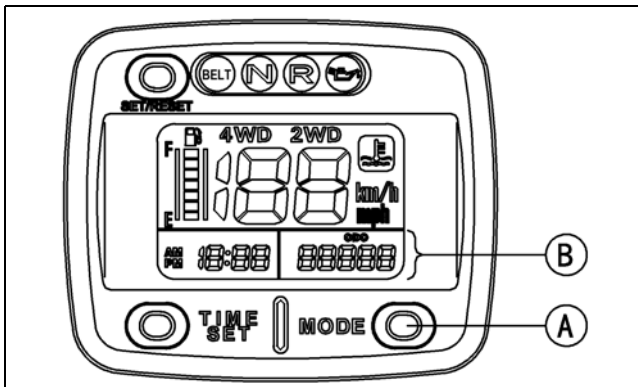
ATV2123

5. Connect a signal oscillator (A) to the battery negative post and the output to terminal (13); then set the oscillator frequency to 620 Hz. The speedometer should read approximately 40 mph.



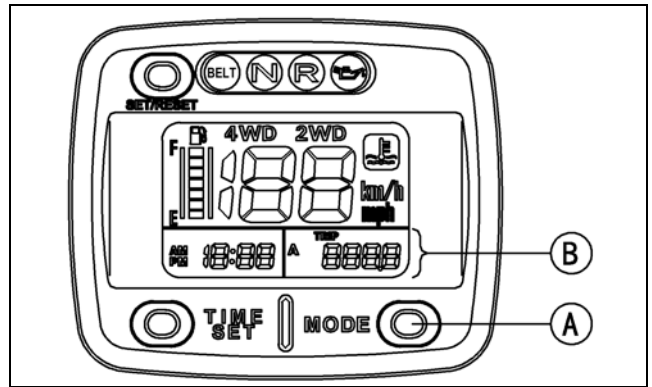
ATV2208C

6. Leave the wires connected as in step 5 and press the MODE button (A) to cycle to the odometer (B); then increase the frequency of the oscillator. The odometer should start to count faster.



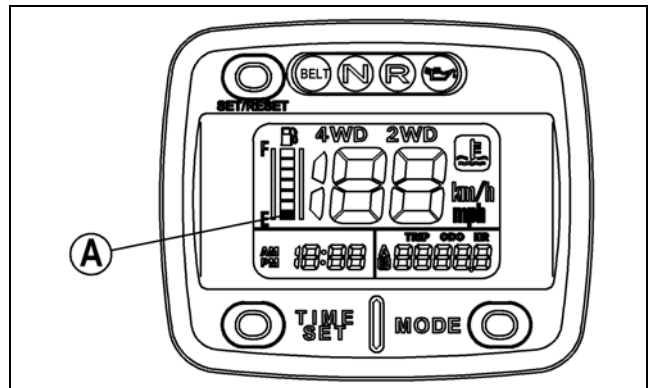
ATV2125

7. Depress the MODE button (A) and cycle to trip meters A and B (B); then check the function of both trip meters in the same manner as the odometer. Disconnect the oscillator.



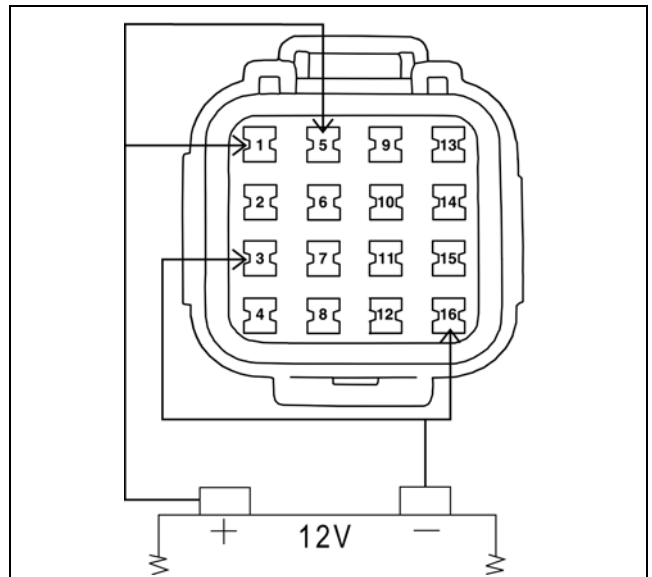
ATV2126

8. Connect the wires in the same manner as step 1; the first segment LCD (A) should flash.

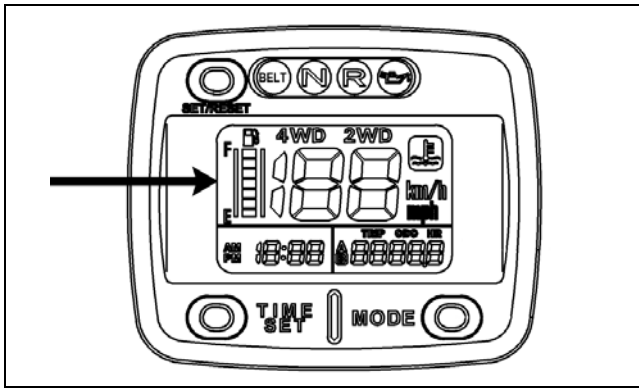


ATV2127

9. Connect a jumper wire from the negative battery terminal to terminal (3) on the connector. When connected, one segment in the fuel gauge should appear every 15 seconds.



ATV2208D

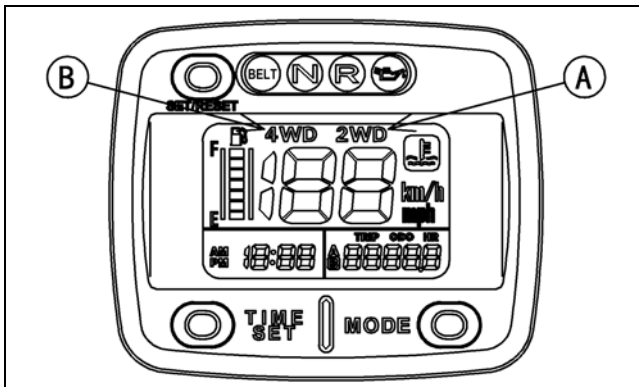


ATV2121A

**CAUTION**

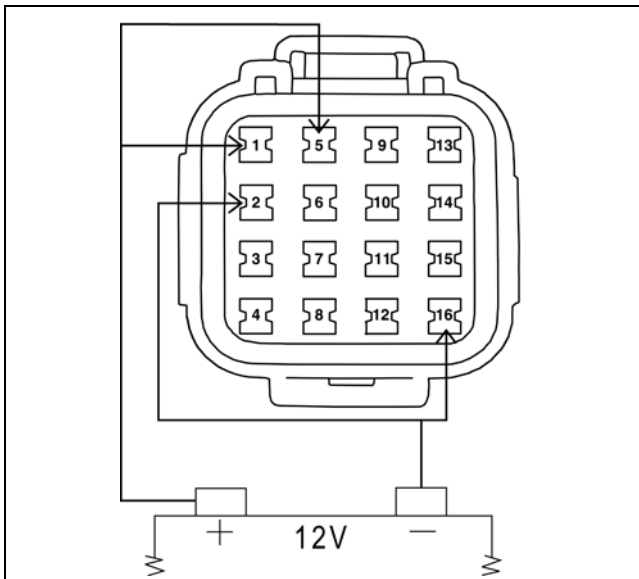
Remove the jumper wire after all segments have appeared or meter damage will occur.

10. With wires connected in the same manner as step 1, the 2WD indicator (A) should appear.



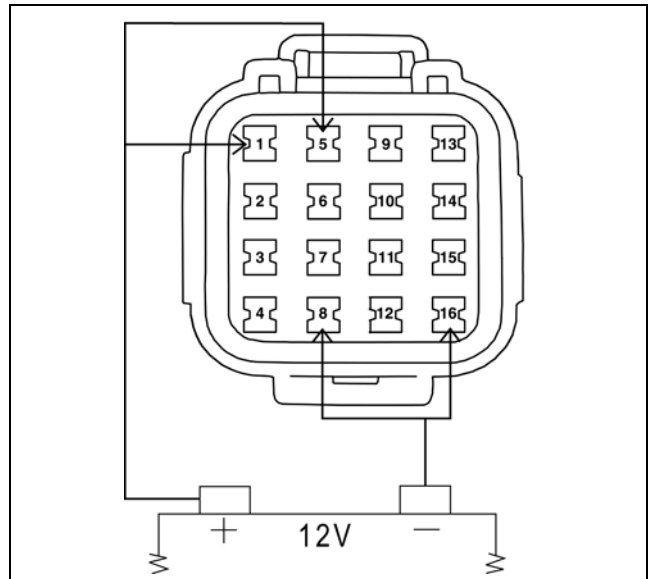
ATV2129

11. Connect the jumper wire from the negative battery terminal to terminal (2) of the connector. The 4WD indicator (B) should appear.

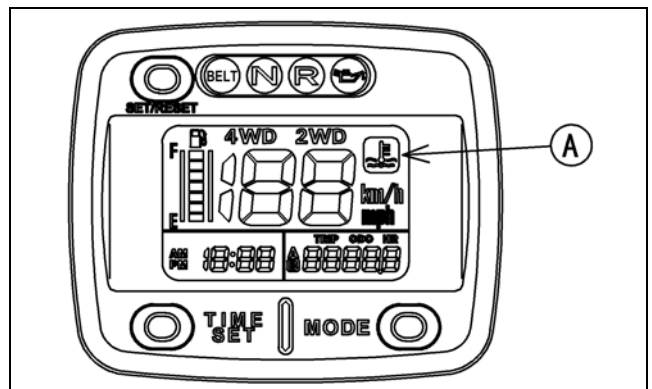


ATV2208E

12. Connect a jumper wire from the negative battery terminal to terminal (8) of the connector. The water temperature warning light (A) should appear.

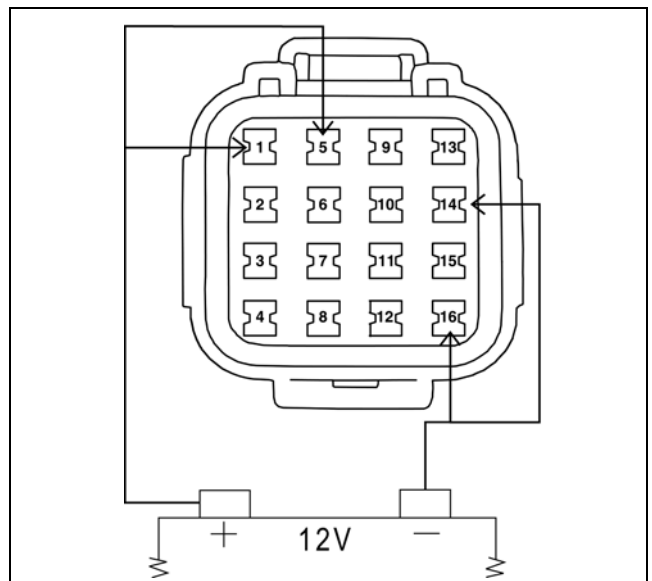


ATV2208F

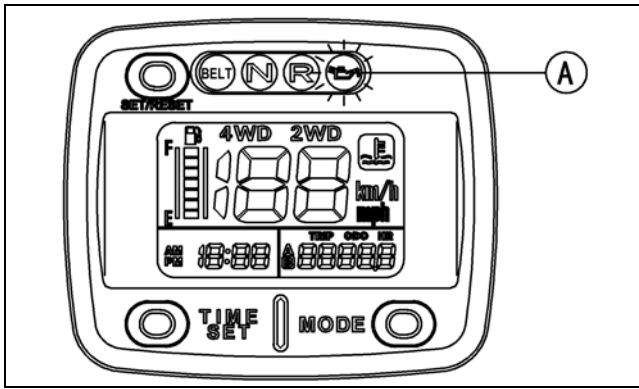


ATV2132

13. Connect a jumper wire from the negative battery terminal to terminal (14) of the connector. The oil pressure warning light (A) should flash.

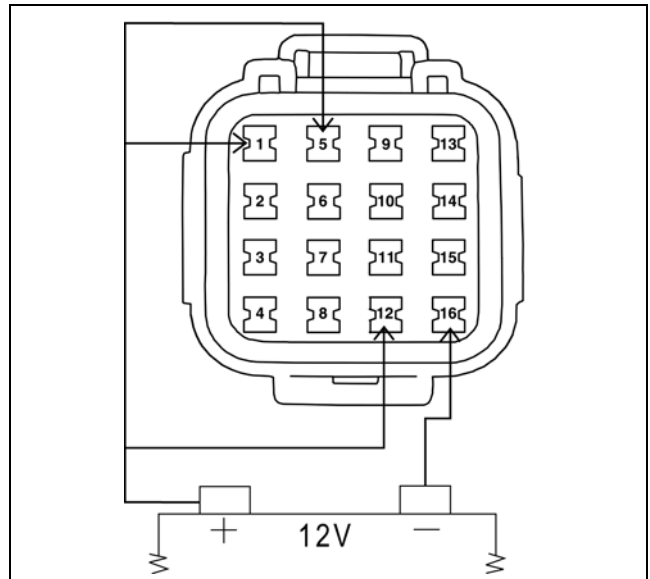


ATV2208G

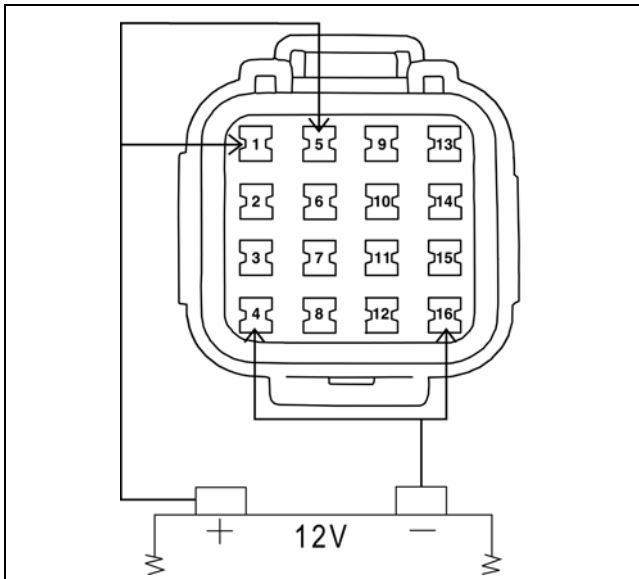


ATV2134

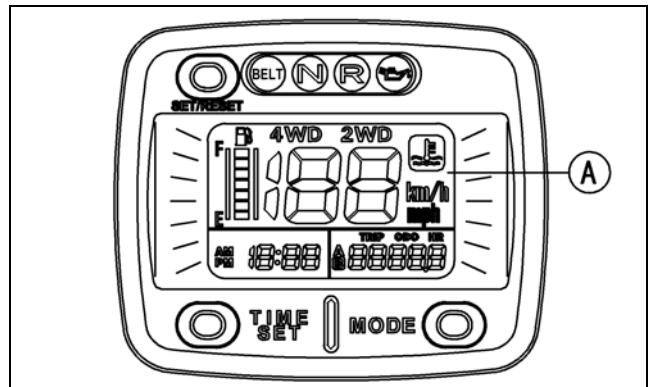
14. Connect a jumper wire from the negative battery terminal to terminal (4) in the connector. The neutral indicator light (A) should illuminate.



ATV2208I

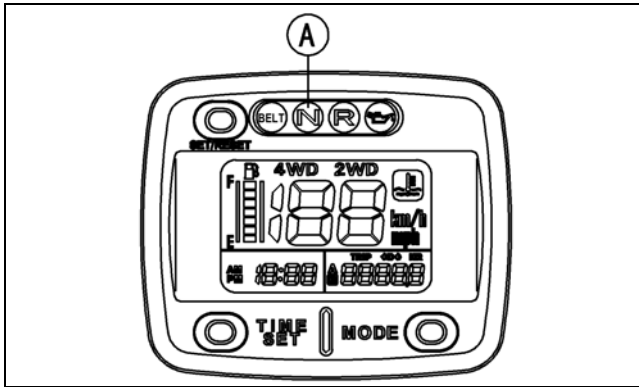


ATV2208H



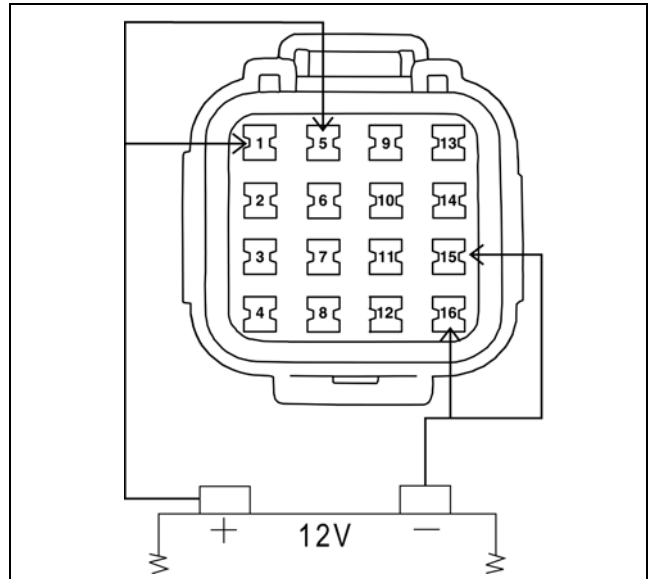
ATV2138

16. Connect a jumper wire from the negative battery terminal to terminal (15) of the connector. The reverse indicator light (A) should illuminate.

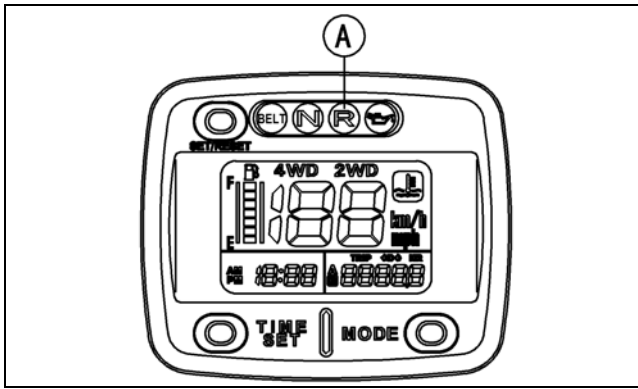


ATV2136

15. Connect a jumper wire from the positive battery terminal to terminal (12) of the connector. The speedometer backing light (A) should illuminate.

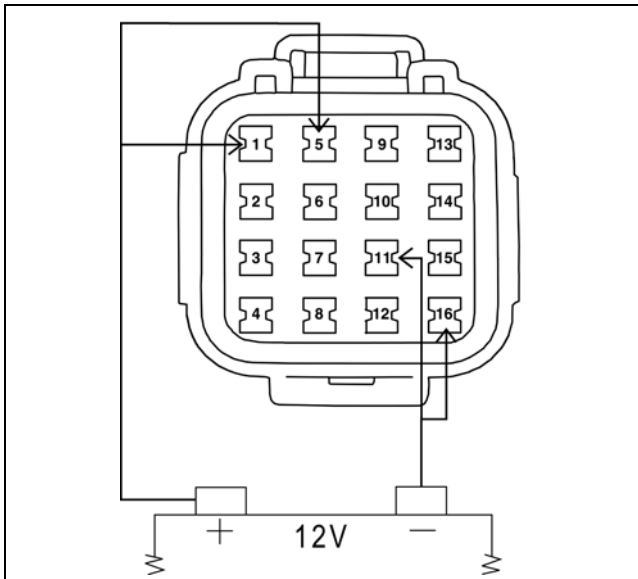


ATV2208J

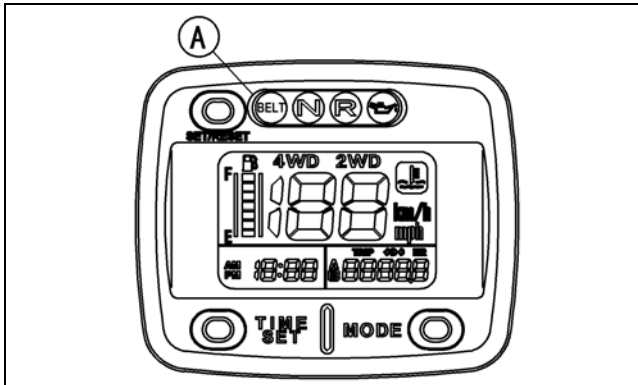


ATV2140

17. Connect a jumper wire from the negative battery terminal to terminal (11) in the connector. The belt indicator light (A) should illuminate.



ATV2208K



ATV2142

## INSTALLING

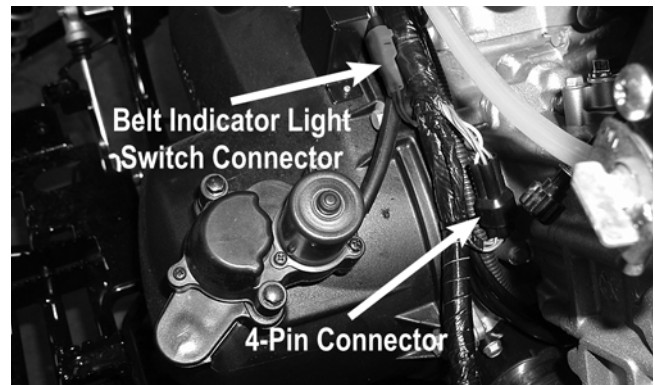
1. Route the new wiring harness down through the opening; then place the speedometer into position and secure with the three nuts. Connect the multi-pin connector.
2. Install the front fenders and front rack; then install the instrument pod and secure with the nylon fasteners.
3. Secure the ignition switch with the retaining nut.

## V-Belt Failure Mode Clearing

### PROCEDURE

■ **NOTE:** See Section 2 for V-belt inspection.

1. Turn the ignition switch to the OFF position; then disconnect the 4-pin connector and the belt indicator light switch connector.



KX098A

2. Install the Reset Connector (p/n 0486-161) into the forward 4-pin connector; then turn the ignition switch to ON. Allow the belt indicator light to flash for 10 seconds or more; then turn the ignition switch to OFF.

■ **NOTE:** The light will flash rapidly for 5 seconds; then it will flash slowly. Allow the light to flash slowly for at least 5 seconds before turning the ignition switch off.

3. Remove the reset connector and connect the 4-pin connectors and the belt indicator light switch connector.
4. Turn the ignition switch to the ON position and confirm that the belt indicator light goes off.

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## 100-Hour Belt Inspection Mode Clearing

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Every 100 hours, the belt indicator light will illuminate to alert for inspection. See Section 2 - Checking/Replacing V-Belt. To reset the belt indicator light use the following procedure.

### **WARNING**

V-belt inspection must be conducted in accordance with Section 2. Belt separation and lock-up could cause severe injury or death.

1. Turn the ignition switch to the OFF position; then disconnect the 4-pin connector.
2. Connect the Reset Connector (p/n 0486-161) into the forward 4-pin connector; then turn the ignition switch to the ON position. The belt indicator light should flash rapidly.
3. Disconnect the belt indicator light switch connector. The light should flash slowly. Allow the light to flash for 10 seconds before turning the ignition switch off.
4. Turn the ignition switch to the OFF position; then remove the reset connector.
5. Connect the 4-pin connector and the belt indicator light switch connector; then turn the ignition switch to the ON position. The belt indicator light should go off.

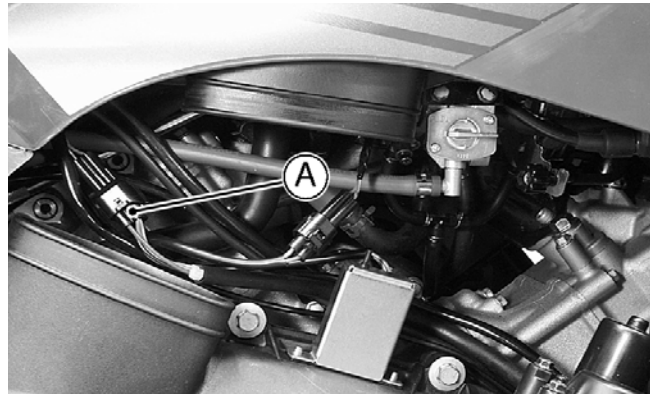
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## Engine Brake Actuator Resistance

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1. Remove the air duct boot; then disconnect the actuator lead connector (A).

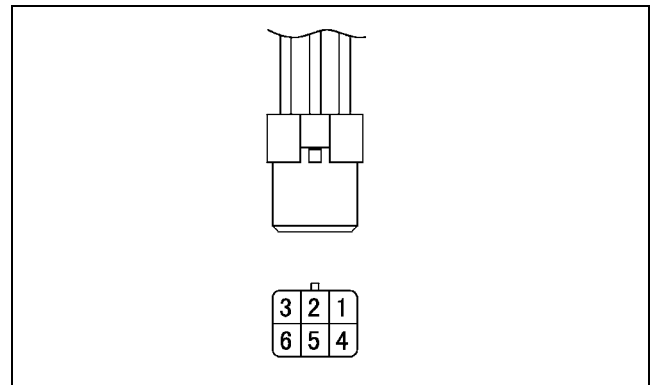


KX381

### **CAUTION**

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

2. Use the multimeter and select the ohms function; then measure resistance as follows: pins 4 (red) - 6 (black), 3-15 ohms; pins 1 (orange) - 3 (blue), 3500-6500 ohms; pins 2 (yellow) - 3 (blue), 630-5330 ohms. If readings are not as specified, replace the engine brake actuator.



ATV2143A

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## Engine Brake Controller Power Supply Voltage

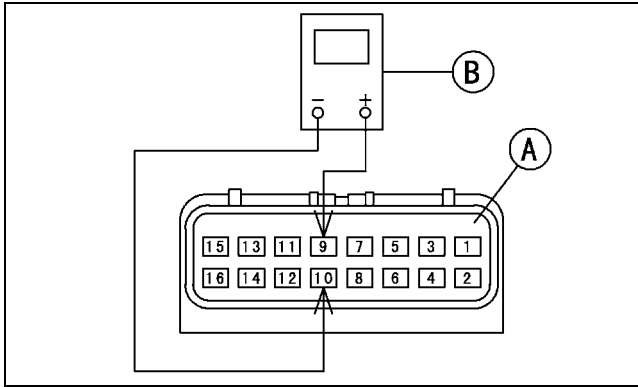
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■ **NOTE:** For the following tests, make sure the battery is fully charged.

■ **NOTE:** Needle adapters will be required on the multimeter leads as these tests are made with the controller connected.

1. Select D.C. Voltage on the multimeter (B); then turn the ignition switch ON.
2. In the brake controller (A), connect the red tester lead to the orange wire terminal (9) and the black tester lead to the black wire terminal (10). The meter should read battery voltage.

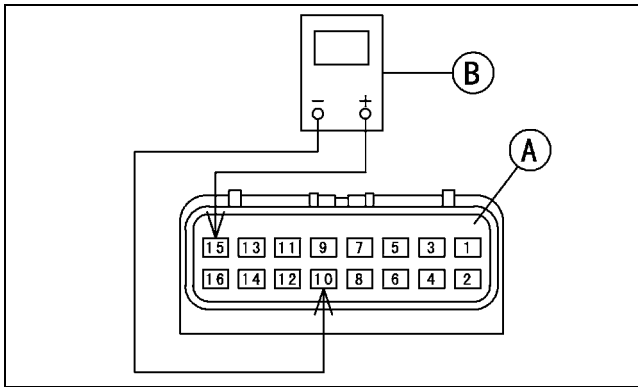
- If battery voltage is not present, check the 30-amp fuse, ignition switch, or wiring harness.



ATV2144

## Controller-to-Engine Brake Actuator Voltage

- Support the ATV on a stand or suitable jack so the wheels are off the ground; then select D.C. Voltage on the multimeter (B). Connect the red tester lead to the brown/white wire terminal (15) and the black tester lead to the black wire terminal (10) in the controller (A).



ATV2145

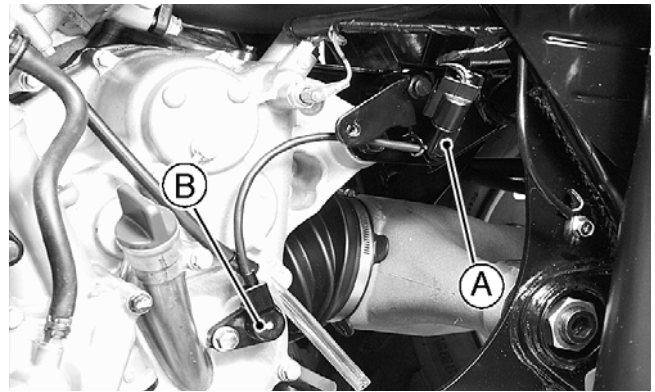
- Turn the ignition switch ON and spin a rear wheel in the forward direction; then allow the wheel to stop. After at least one second, turn the ignition switch OFF.
- After two seconds, observe the meter until the actuator stops. The controller output voltage should vary from 5-12 D.C. volts. If the voltage is not within specifications, check the forward/reverse detecting sensor. If the sensor is normal, replace the actuator controller.

## Forward/Reverse Detecting Sensor Resistance

### CAUTION

Always disconnect the battery when performing resistance tests to avoid damaging the multimeter.

- Disconnect the sensor lead wire connector (A); then select OHMS on the multimeter and check resistance between the sensor pins. The meter should read 1200-1600 ohms.
- Check each lead of the sensor to ground. The meter should show an open circuit or infinity ( $\infty$ ). If either test fails, replace the sensor (B).

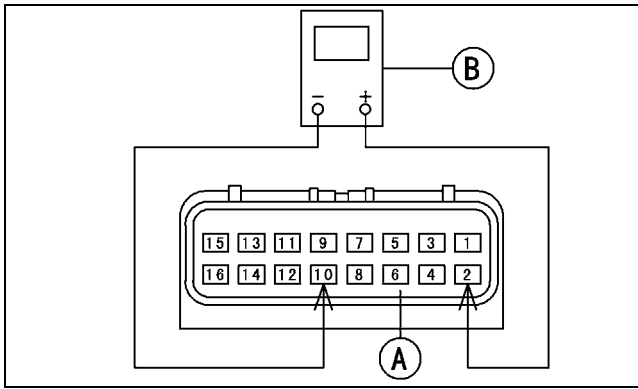


KX382

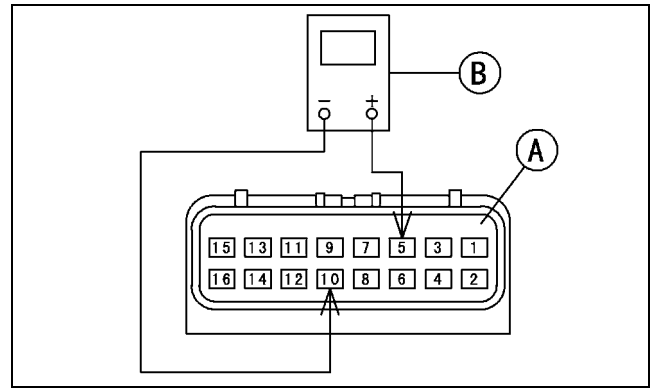
## Output-to-Actuator Voltage

Select D.C. Voltage on the multimeter (B) and turn the ignition switch ON; then connect the red tester lead to the black/green wire terminal (2) and the black tester lead to the black wire terminal (10) in the controller (A). The controller output voltage should be  $4.8 \pm 0.2$  D.C. volts. If the reading is not as specified, replace the actuator controller.





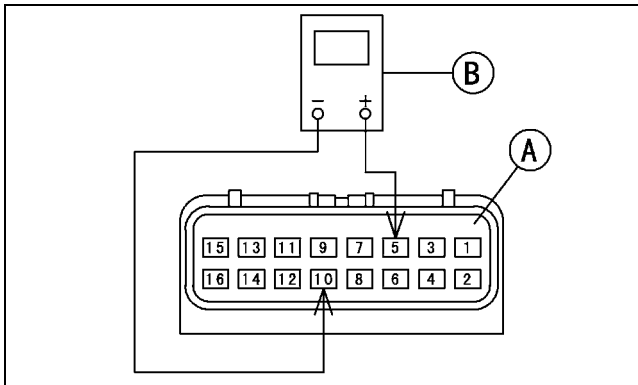
ATV2146



ATV2147

## Output-to-Speed Sensor Voltage

Select D.C. Voltage on the multimeter (B), disconnect the speed sensor connector, and turn the ignition switch ON; then connect the red meter lead to the pink/white wire terminal (5) and the black tester lead to the black wire terminal (10) in the controller (A). The meter should read  $5 \pm 0.25$  D.C. volts. If the reading is not as specified, replace the actuator controller.



ATV2147

## Speed Sensor Signal Voltage

1. Support the ATV on a stand or suitable jack so the wheels are off the ground; then turn the ignition switch ON.
2. Select D.C. Voltage on the multimeter (B); then connect the red tester lead to the pink/white wire terminal (5) and the black tester lead to the black wire terminal (10) in the controller (A).

3. Spin a rear wheel in the forward direction while observing the multimeter. The meter should alternately show 0 volts and 5 D.C. volts. If the reading is not as specified, replace the speed sensor.

## Tilt Sensor Voltage

### **WARNING**

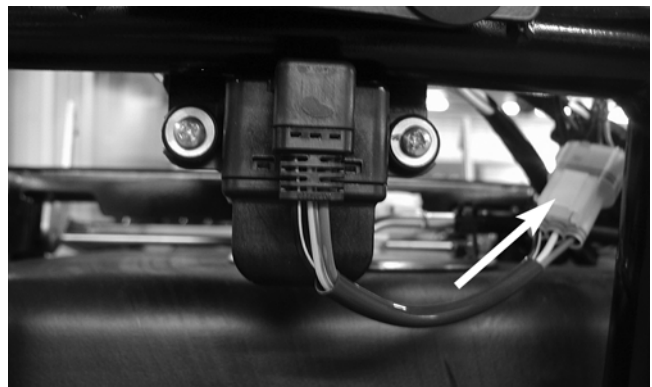
Incorrect installation of the tilt sensor could cause sudden loss of engine power which could result in loss of vehicle control resulting in injury or death.

### **CAUTION**

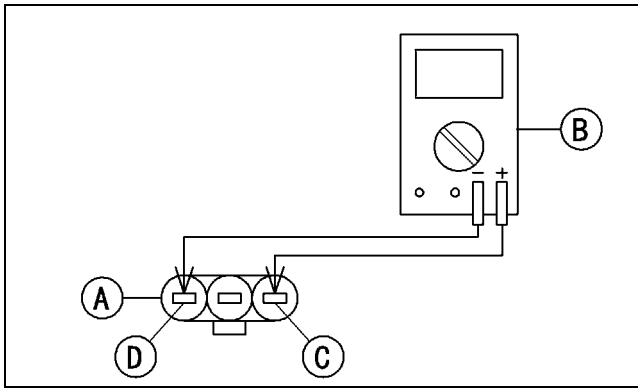
Do not drop the tilt sensor as shock can damage the internal mechanism.

### SUPPLY VOLTAGE

1. Disconnect the three-wire connector (A); then select D.C. Voltage on the multimeter (B) and connect the red tester lead to the orange wire terminal (C) and the black tester lead to the black wire terminal (D) (harness side).

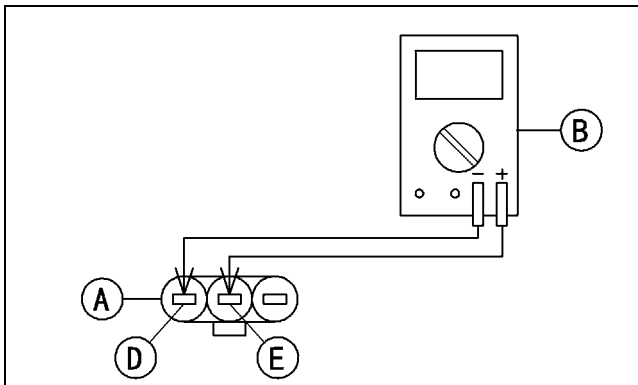


KX043A



ATV2148

2. Turn the ignition switch to the ON position. The multimeter should read battery voltage. If battery voltage is not indicated, check the 30-amp fuse, wiring harness, or the ignition switch.
3. Remove the red tester lead and connect to the blue wire terminal (E). The multimeter should read 5.0 D.C. volts. If the specified voltage is not indicated, check the CDI unit.



ATV2149

## OUTPUT VOLTAGE

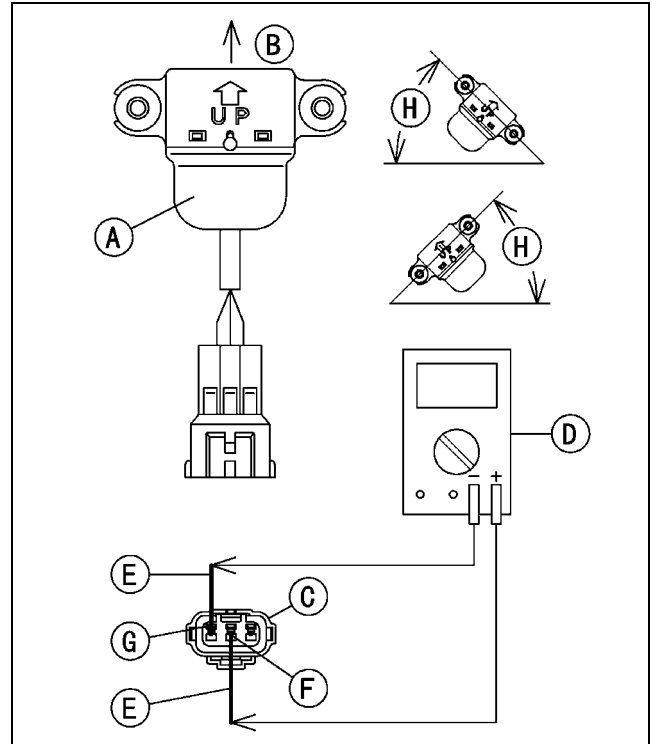
■ **NOTE:** Needle adapters will be required on the multimeter leads as the following tests are made with the sensor connected.

1. Connect the three-wire connector (C); then remove the two mounting screws securing the tilt sensor to the rear frame.



KX043

2. Install the needle adapters (E) to the multimeter leads; then select D.C. Voltage on the multimeter (D).
3. Connect the red tester lead to the yellow/green wire terminal (F) and the black tester lead black/yellow wire terminal (G); then turn the ignition switch ON and with the tilt sensor (A) held with the UP arrow as shown (B), observe the meter. The meter should read 0.4-1.4 D.C. volts.



ATV2150

4. Tilt the sensor (H) 60°-70° left and right observing the meter. The meter should read 3.7-4.4 D.C. volts after approximately one second in the tilted position. If the meter readings are not as specified, replace the tilt sensor.
5. Install the mounting screws making sure the sensor lead is directed toward the rear of the ATV and the UP arrow is directed up; then tighten the screws securely.

- 1 SWITCH, OIL PRESSURE
- 2 SWITCH, NEUTRAL
- 3 SWITCH, 2WD/4WD
- 4 SENSOR, SPEEDO
- 5 LCD, MULTIFUNCTION
- 6 SENSOR, FORWARD/REVERSE
- 7 CONTROL, LEFT HANDLE
- 8 REVERSE OVERRIDE
- 9 SWITCH, HAND BRAKE
- 10 SWITCH, KEY
- 11 ACCESSORY, REAR
- 12 TAILLIGHT
- 13 COIL, FRONT IGN.
- 14 COIL, REAR IGN.
- 15 CDI
- 16 CONTROLLER, ACTUATOR
- 17 GROUND, CHASSIS
- 18 RELAY, STARTER
- 19 MOTOR, STARTER
- 20 BATTERY, 12V
- 21 SENSOR, FUEL/PUMP
- 22 SENSOR, TILT
- 23 SENSOR, CRANK ANGLE
- 24 MAGNETO
- 25 REGULATOR/RECTIFIER
- 26 ACTUATOR, ENGINE BRAKE
- 27 ACCESSORY, SWITCHED
- 28 PDM
- 29 BELT FAILURE, RESET A
- 30 HARNESS, RESET CONNECTOR
- 31 SWITCH, BELT FAILURE
- 32 SWITCH, FOOT BRAKE
- 33 SWITCH, WATER TEMP
- 34 SWITCH, TEMP. FAN
- 35 FAN MOTOR
- 36 DIODE, FAN
- 37 ACTUATOR, 2WD/4WD SELECT
- 38 SWITCH, 4WD DIFF. LOCK
- 39 SWITCH, REVERSE
- 40 HEADLIGHT, LOW-BEAM LEFT
- 41 HEADLIGHT, HIGH-BEAM LEFT
- 42 ACCESSORY, FRONT
- 43 HEADLIGHT, HIGH-BEAM RIGHT
- 44 HEADLIGHT, LOW-BEAM RIGHT

