## GENERAL

The charging system consists of the alternator and regulator. Charging system circuits are shown in Figure 7-25.

**CAUTION**

**Never install accessory wiring between battery post and battery cable. Installing wire between battery post and battery cable could cause damage to electrical system.**

When installing electrical accessories, install longer battery post fasteners. Install wiring between battery cable and fastener.

### Alternator

The alternator consists of two main components:

- The rotor which mounts to the engine sprocket shaft.
- The stator which bolts to the engine crankcase.

### Voltage Regulator

See Figure 7-23. The voltage regulator is a series regulator with shunt control. The voltage regulator combines the functions of rectifying (converting AC voltage to DC) and regulating (controlling voltage output).

## TROUBLESHOOTING

When the charging system fails to charge or does not charge at a satisfactory rate, check the following:

### Battery

Check for a weak or dead battery. See 7.11 BATTERY. Battery must be fully charged in order to perform any electrical tests.

### Wiring

Check for corroded or loose connections in the charging circuit. See Figure 7-25.

### Voltage Regulator Inspection

See Figure 7-24. The plug connector to stator must be clean and tight.

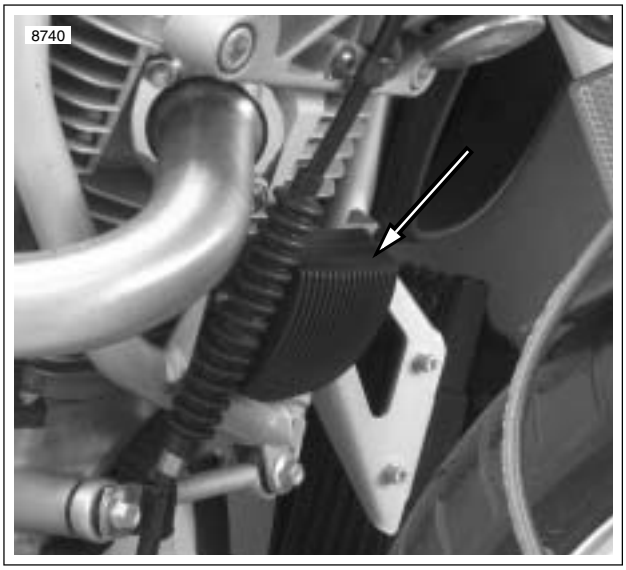



**Figure 7-23. Voltage Regulator**

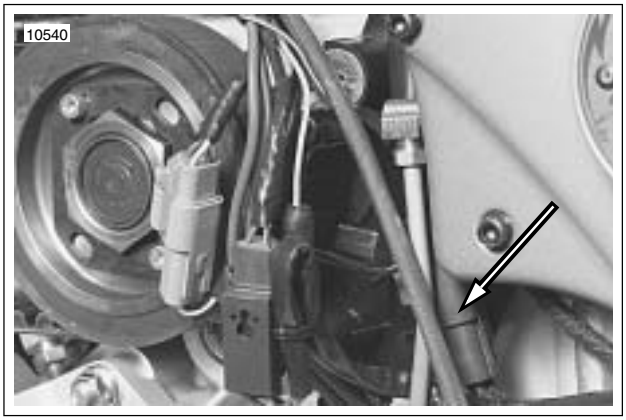
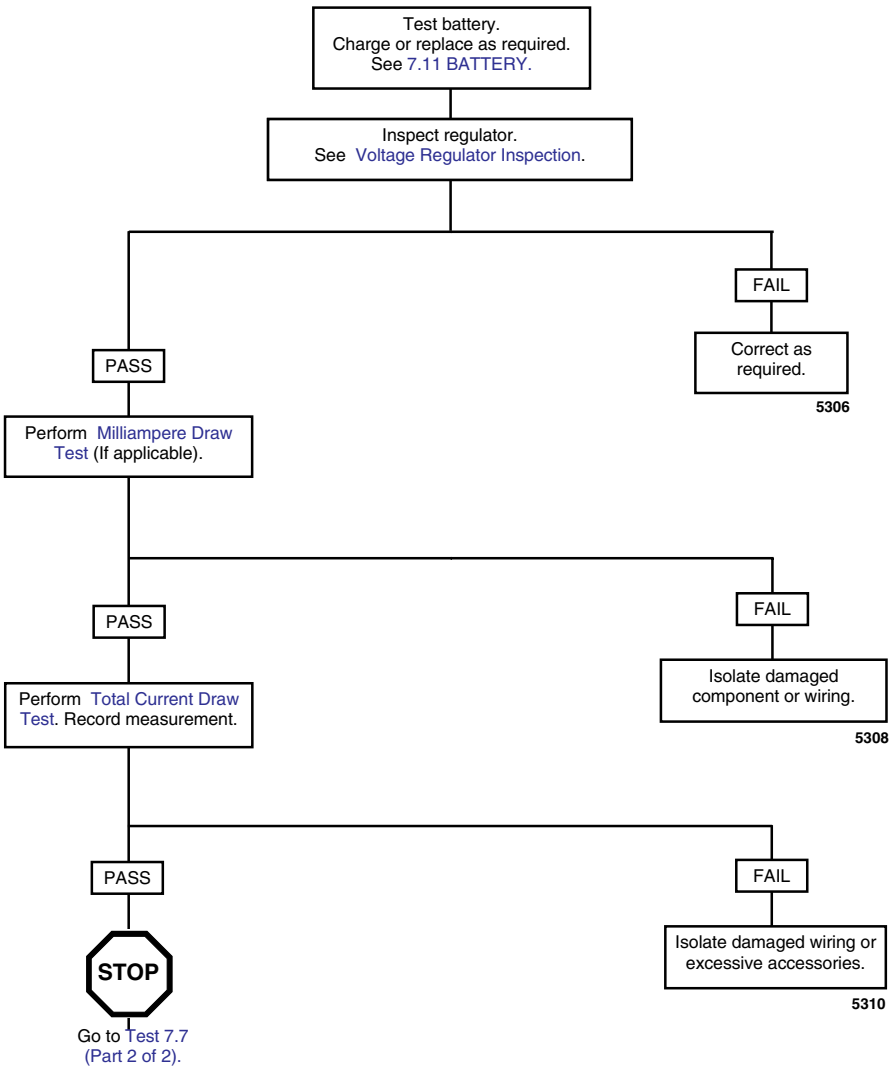



**Figure 7-24. Stator Connector [46]**

## Test 7.7 (Part 1 of 2)

### SYMPTOM: BATTERY BECOMES DISCHARGED

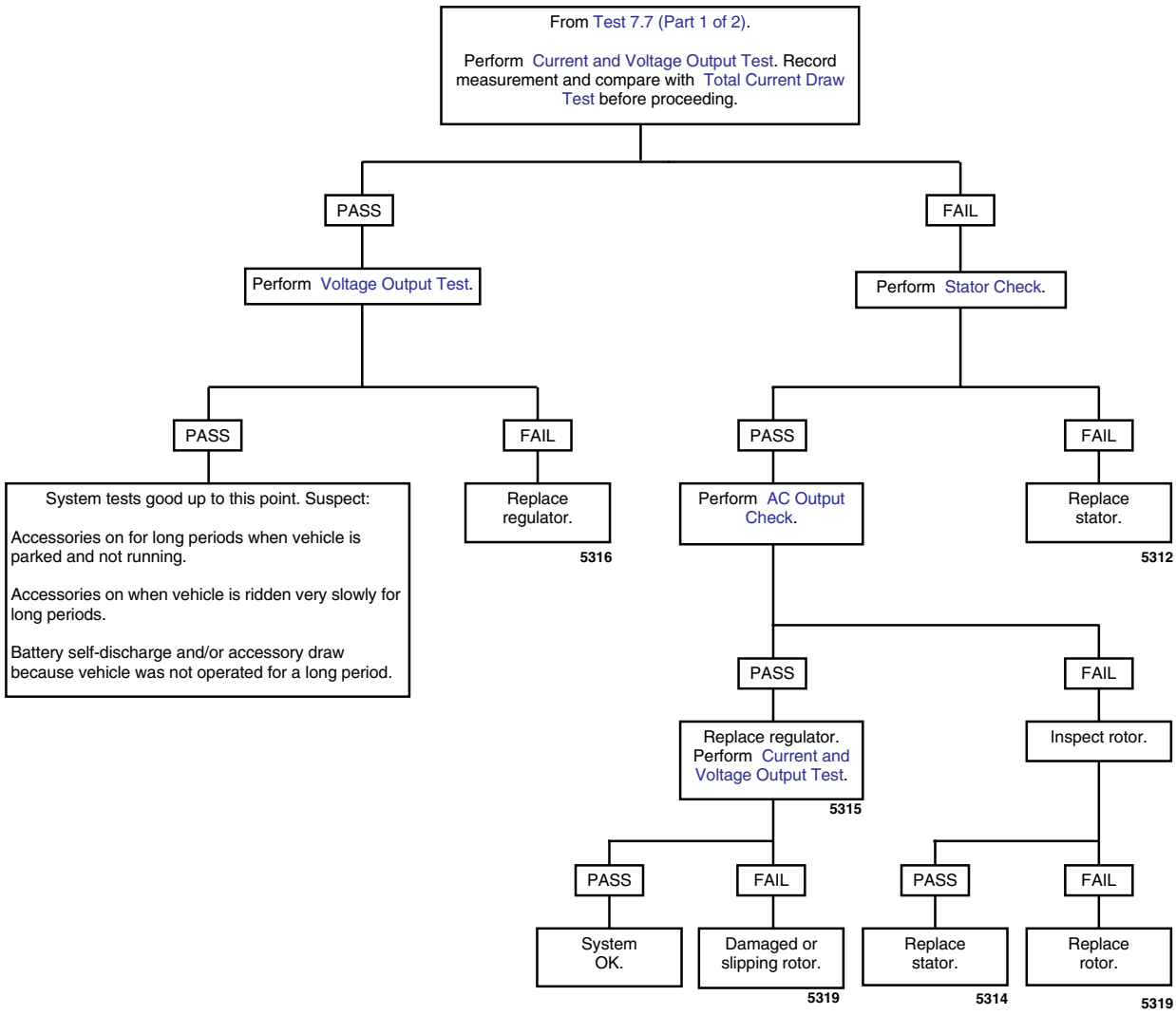



*NOTE*

*Whenever a charging system component fails a test and is replaced, re-test the system to be sure the problem has been corrected.*

# Test 7.7 (Part 2 of 2)

## SYMPTOM: BATTERY BECOMES DISCHARGED




*NOTE*

*Whenever a charging system component fails a test and is replaced, re-test the system to be sure the problem has been corrected.*

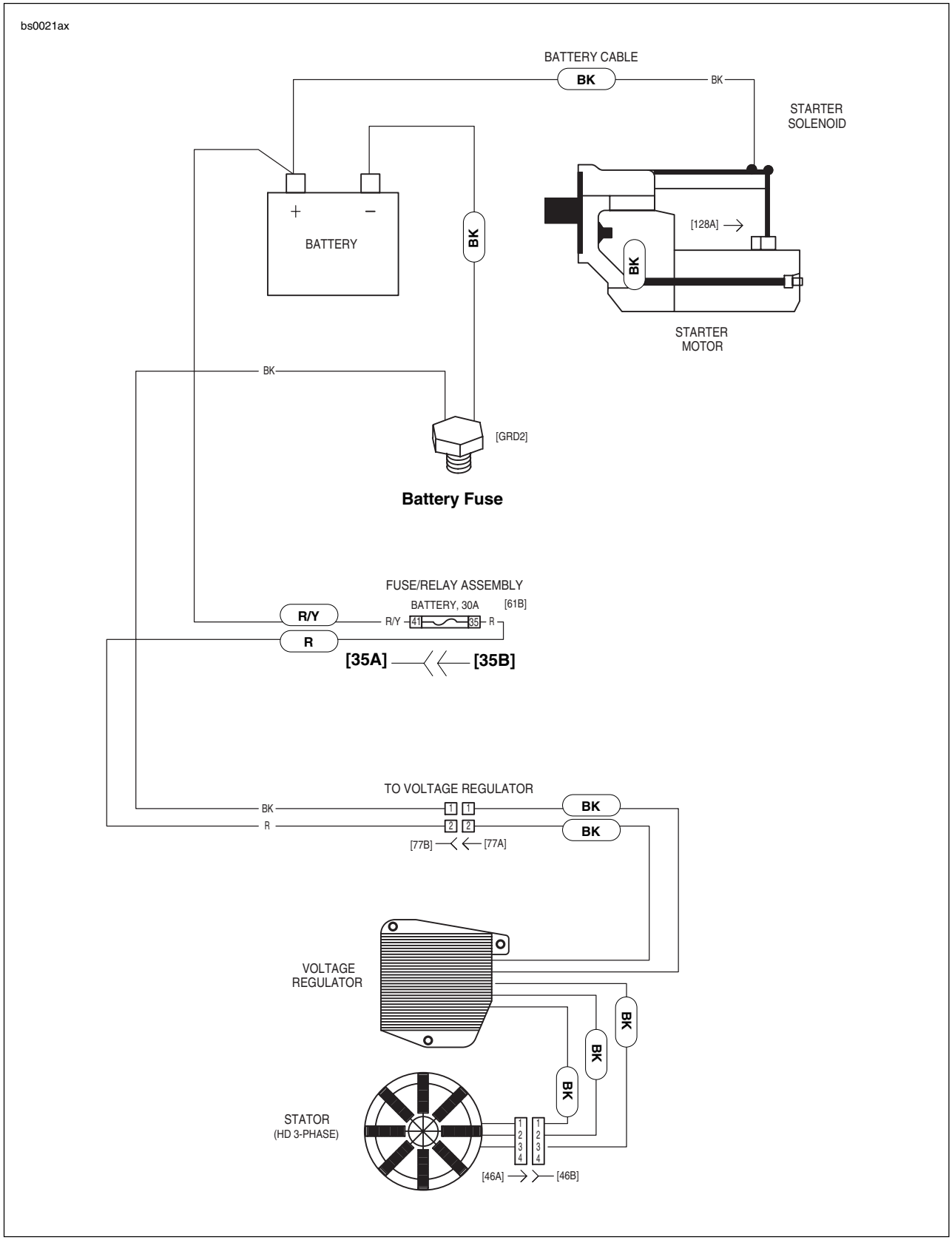



**Figure 7-25. Charging System Circuit**

# TESTING

## Milliampere Draw Test

*NOTE*

*Be sure accessories are not wired so they stay on at all times. This condition could drain battery completely if vehicle is parked for a long time. Check for this by connecting ammeter between negative battery terminal and battery.*

1. See Figure 7-26. Connect ammeter between negative battery terminal and battery. With this arrangement, you will also pick up any regulator drain.

2. With ignition key switch turned to OFF and all lights and accessories off, observe amperage reading.

   a. Maximum reading should be 1.0 milliamperes.

   b. A higher reading indicates excessive current draw. Any accessories must be considered and checked for excessive drain.

*NOTE*

*A battery with a surface discharge condition could suffer a static drain. Correct by cleaning battery case.*

## Total Current Draw Test

If battery runs down during use, the current draw of the motorcycle components and accessories may exceed output of the charging system.

**⚠WARNING**

**Always turn the battery load tester OFF before connecting tester cables to the battery terminals. Connecting tester cables with the load tester ON could cause a spark resulting in a battery explosion which could result in death or serious injury.**

1. See Figure 7-27. To check for this condition, place load tester induction pickup or current probe pickup over battery negative cable.

2. Disconnect stator wiring from voltage regulator wiring at the connector [46] under front sprocket cover See 7.24 INTERACTIVE EXHAUST HARNESS (XB12R). Start the motorcycle and run the engine at 3000 RPM.

3. With ignition and all continuously running lights and accessories turned on (headlight on high beam), read the total current draw.

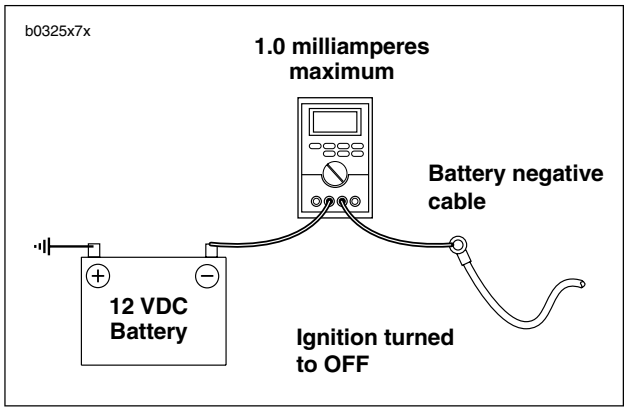



**Figure 7-26. Milliampere Draw Test**

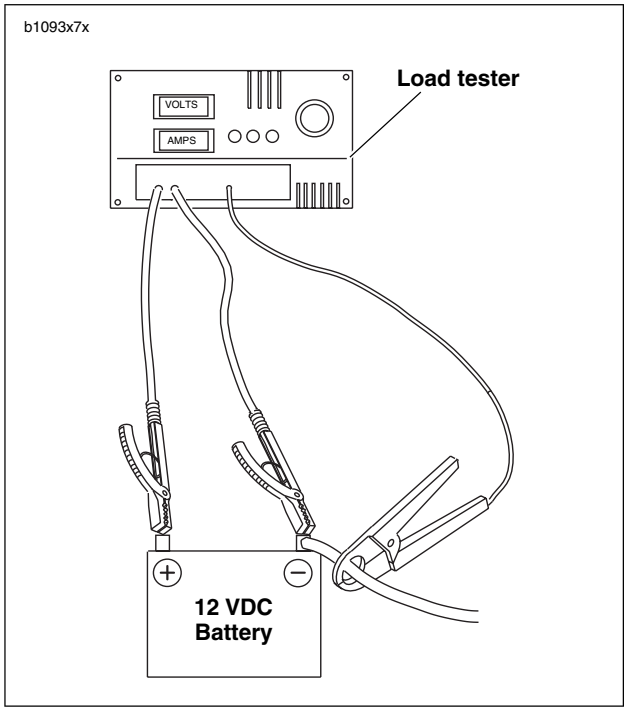



**Figure 7-27. Check Current Draw (Ignition Switch On)**

4. Compare this reading to the reading obtained after performing the CURRENT AND VOLTAGE OUTPUT TEST.
   a. The current output should exceed current draw by 3.5 amps minimum.
   b. If output does not meet specifications, there may be too many accessories for the charging system to handle.
5. Reconnect regulator after testing.

## Current and Voltage Output Test

1. Connect load tester.
   a. Connect negative and positive leads to battery terminals.
   b. See Figure 7-28. Place load tester induction pickup over positive regulator cable.

**CAUTION**

**Do not leave any load switch turned on for more than 20 seconds or overheating and tester damage are possible.**

2. Run the engine at 3000 RPM. Increase the load as required to obtain a constant 13.0 VDC.
3. The current output should be 34-38 amps. Make note of measurement for use in TOTAL CURRENT DRAW TEST.

*NOTE*

*Rider's habits may require output test at lower RPM.*

## Voltage Output Test

1. See Figure 7-28. After removing the load, read the load tester voltage meter.
   a. If voltage to the battery is not more than 15 VDC, voltage output is within specifications. Investigate other possible problems. See TROUBLESHOOTING in this section.
   b. If voltage is higher, regulator is not functioning properly.

## Stator Check

1. Turn ignition key switch to OFF.
2. See Figure 7-29. Connect an ohmmeter.
   a. Locate voltage regulator connector [46] under sprocket cover. See 7.24 INTERACTIVE EXHAUST HARNESS (XB12R). Disconnect from alternator stator wiring.
   b. Insert one ohmmeter lead into a stator socket.
   c. Attach the other lead to a suitable ground.
3. Test for continuity with ohmmeter set on the RX1 scale.
   a. A good stator will show no continuity (∞ ohms) across **all** stator sockets and ground.
   b. Any other reading indicates a grounded stator which must be replaced.
4. See Figure 7-30. Remove ground lead. Check resistance across stator sockets 1-2, 2-3 and 3-1.
5. Test for resistance with ohmmeter set on the RX1 scale.
   a. Resistance across the stator sockets should be 0.1-0.3 ohms.
   b. If the resistance is lower, the stator is damaged and must be replaced.

*NOTE*

*Verify that meter reads 0 ohms when probes are shorted together. If not, subtract lowest value to resistance value of stator.*

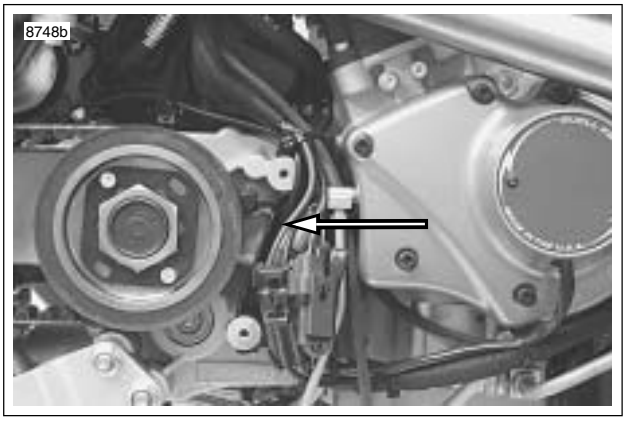



**Figure 7-28. Positive Regulator Cable (red wire)**

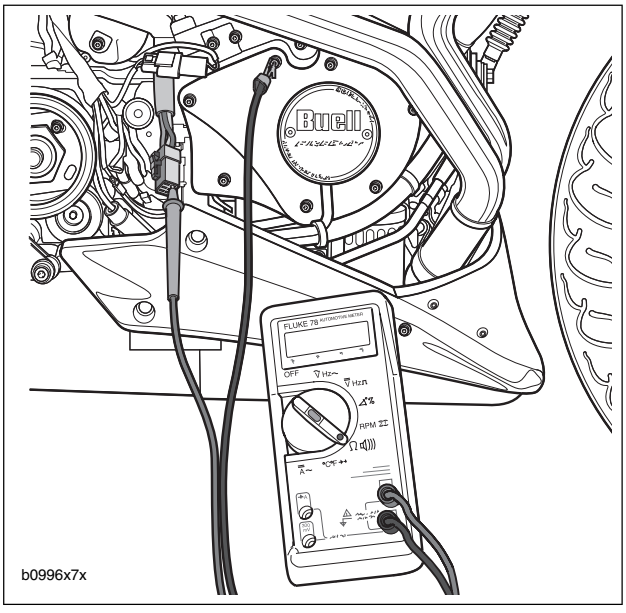



**Figure 7-29. Test for Grounded Stator**

## AC Output Check

1. See Figure 7-31. Test AC output.
   a. Locate voltage regulator connector [46] under sprocket cover. See 7.25 SPROCKET COVER WIRING. Disconnect from alternator stator wiring.
   b. Connect an AC voltmeter across stator sockets 1-2.
   c. Run the engine at 2000 RPM. The AC output should be 32-40 volts AC. (approximately 16-20 volts per 1000 RPM).
   d. Repeat test across stator sockets 2-3 and 1-3.
2. Compare test results to specifications.
   a. If the output is below specifications, charging problem could be a faulty rotor or stator.
   b. If output is good, charging problem might be faulty regulator/rectifier. Replace as required.
3. Check the output again as described under CURRENT AND VOLTAGE OUTPUT TEST on page 7-30.

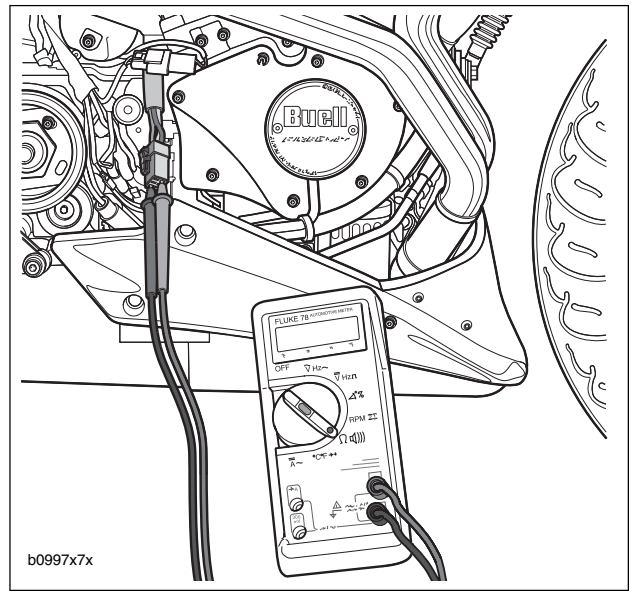



**Figure 7-30. Check for Stator Resistance**

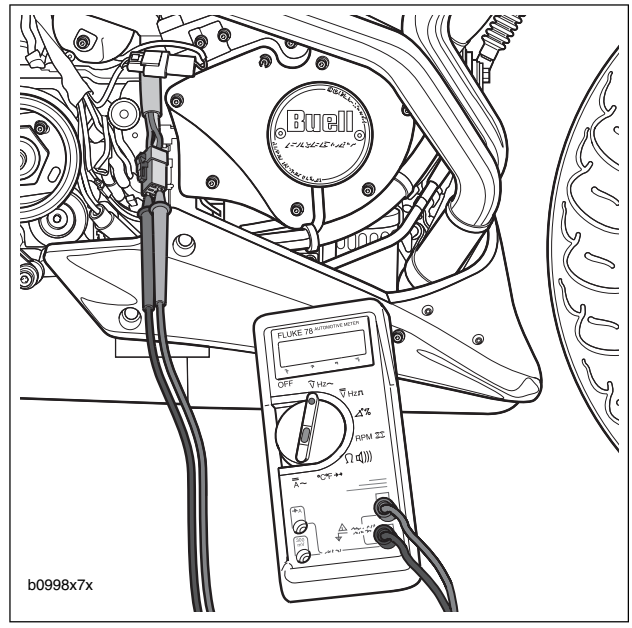



**Figure 7-31. Check Stator AC Voltage Output**

## REMOVAL/DISASSEMBLY

**⚠WARNING**

**To protect against accidental start-up of vehicle, disconnect the negative battery cable before proceeding. Inadequate safety precautions could result in death or serious injury.**

1. Disconnect negative battery cable.
2. Remove primary cover. See 6.2 PRIMARY COVER.
3. Remove clutch assembly, primary chain and engine sprocket/rotor assembly as a unit. See 6.4 CLUTCH.
4. Remove/disassemble rotor and/or stator, as required. Refer to the following procedures.

### Rotor

1. See Figure 7-32. Remove the eight fasteners which secure alternator rotor to engine sprocket.
2. See Figure 7-33. Position blocking under rotor. Press sprocket free of rotor.

*NOTE*

*Resistance to sprocket/rotor disassembly is due in part to the magnetic force of the permanent rotor magnets.*

### Stator

1. See Figure 7-34. Disconnect stator wiring (4) from voltage regulator wiring at connector (5) [46] under sprocket cover. See 7.24 INTERACTIVE EXHAUST HARNESS (XB12R).
2. Remove cable straps holding stator wire to wire harness.

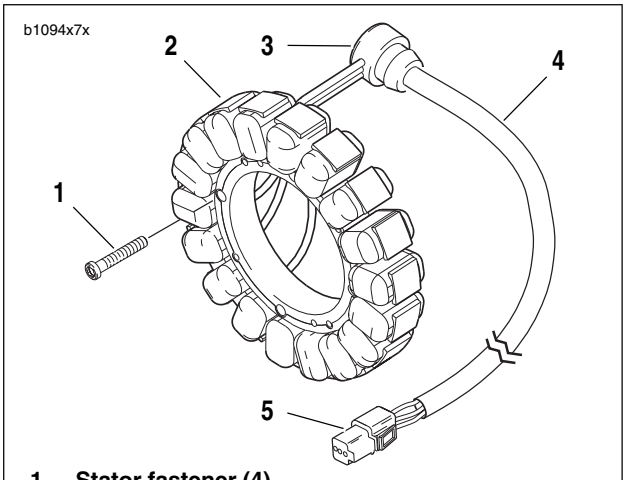
**CAUTION**

**Stator TORX screws contain a thread locking compound. Do not reuse existing screws. Always use new screws with the proper thread locking compound. Loss of torque on TORX fasteners could result in alternator damage.**

3. Remove and discard the four TORX screws (1) which secure stator (2) to left crankcase half.
4. Remove stator wiring grommet (3) from left crankcase half.
5. Withdraw stator wiring (4) from grommet hole in left crankcase half. Remove stator.


**Figure 7-32. Rotor Assembly**


**Figure 7-33. Removing Rotor From Sprocket**




1. **Stator fastener (4)**
2. **Stator**
3. **Grommet**
4. **Stator wiring**
5. **Connector [46]**

**Figure 7-34. Stator Assembly**

# CLEANING AND INSPECTION

**CAUTION**

**Do not strike or drop alternator rotor or damage to magnet adhesive may occur. Magnet adhesive damage can result in rotor failure.**

1. Clean rotor with a petroleum-base solvent. Remove all foreign material from rotor magnets. Replace rotor if rotor magnets are cracked or loose.
2. Clean stator by wiping with a clean cloth.
3. Examine stator leads for cracked or damaged insulation.

*NOTE*

*The rotor and stator can be replaced individually if either is damaged.*

# ASSEMBLY/INSTALLATION

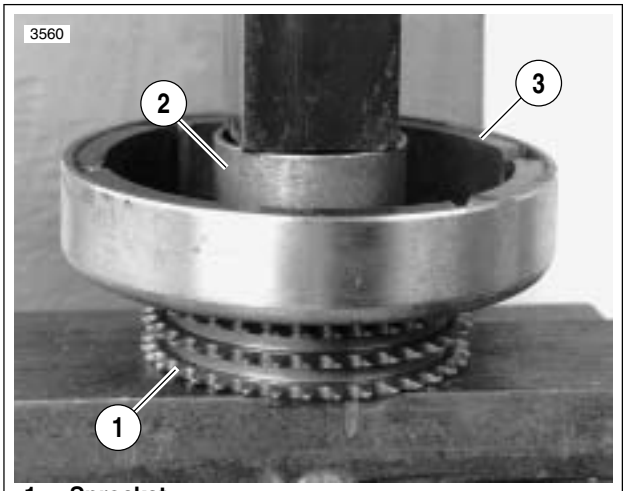
Depending on whether the rotor, the stator, or both the rotor and stator were removed/disassembled, perform the applicable procedures which follow:

1. See Figure 7-34. Feed stator wiring (4) with attached grommet (3) into open grommet hole in left crankcase half.
2. Apply a light coating of clean engine oil or chaincase lubricant to grommet. Install grommet into hole in left crankcase half.

**CAUTION**

**Stator TORX screws contain a thread locking compound. Do not reuse existing screws. Always use new screws with the proper thread locking compound. Loss of torque on TORX fasteners could result in alternator damage.**

3. Position stator (2) on left crankcase half. Secure stator using four **new** TORX screws (1). Tighten TORX screws to 30-40 **in-lbs** (3-4 Nm).
4. Route stator wiring (4) behind rear cylinder and in front of transmission breather hose. See 7.24 INTERACTIVE EXHAUST HARNESS (XB12R) for remaining wire routing information.




1. **Sprocket**
2. **Pipe section**
3. **Rotor**

**Figure 7-35. Pressing Rotor onto Sprocket**

5. See Figure 7-35. Attach rotor to sprocket.
   a. Position rotor (3) on sprocket (1). Align holes in sprocket with holes in rotor.
   b. Insert the **new** eight mounting fasteners through rotor and start fasteners into tapped holes in sprocket.
   c. Position a section of pipe (2) with an inside diameter larger than the sprocket mounting hub over center of rotor. Press rotor onto sprocket. Tighten fasteners to 90-110 **in-lbs** (10-12 Nm).
6. Install clutch assembly, primary chain and engine sprocket/rotor assembly as a unit. See 6.4 CLUTCH.
7. Install primary cover. See 6.2 PRIMARY COVER.
8. Connect negative battery cable.
9. Test charging system. See 7.7 CHARGING SYSTEM.

# VOLTAGE REGULATOR 7.9

## GENERAL

The voltage regulator is mounted to the front of the crankcase. The voltage regulator is not repairable. Replace the unit if it fails.

## REMOVAL

1. Remove seat. See 2.38 SEAT.

**⚠WARNING**

**To protect against shock and accidental start-up of vehicle, disconnect the negative battery cable before proceeding. Inadequate safety precautions could result in death or serious injury.**

2. Disconnect negative battery cable from battery.

**CAUTION**

**When disconnecting the alternator stator wiring, pull apart the connector by firmly grasping both connector halves. Do not pull on leads or damage to the wires and/or terminals may result.**

3. See Figure 7-37. Disconnect stator connector [46] (1) and voltage regulator connector [77] (2) located under sprocket cover. See 7.24 INTERACTIVE EXHAUST HARNESS (XB12R).
4. Remove fasteners (5) and voltage regulator (4) from bracket (3).

## INSTALLATION

1. See Figure 7-37. Attach **new** voltage regulator (4) to bracket (3). Tighten **new** fasteners (5) to 48-60 **in-lbs** (5.4-6.8 Nm).
2. Connect stator connector [46] (1) and voltage regulator connector [77] (2) located under sprocket cover. See 7.24 INTERACTIVE EXHAUST HARNESS (XB12R).
3. Connect negative battery cable to battery terminal.

**⚠WARNING**

**After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift during vehicle operation and startle the rider, causing loss of control which could result in death or serious injury.**

4. Install seat. See 2.38 SEAT.
5. Test charging system. See 7.7 CHARGING SYSTEM.

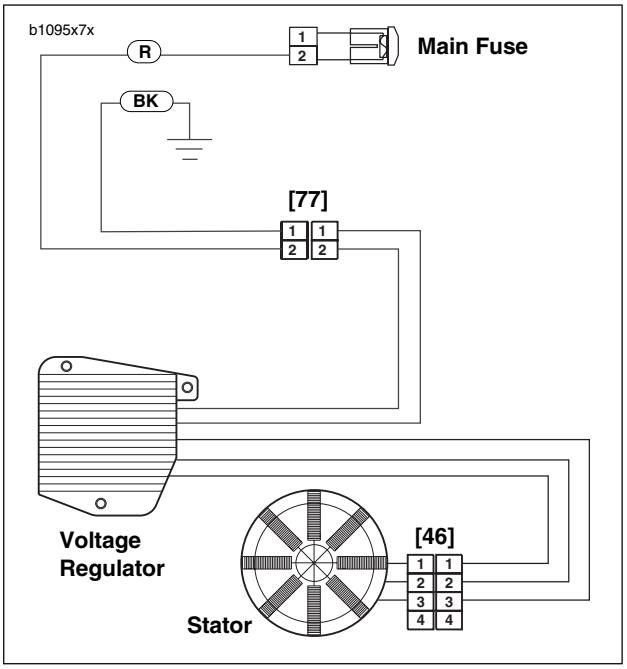
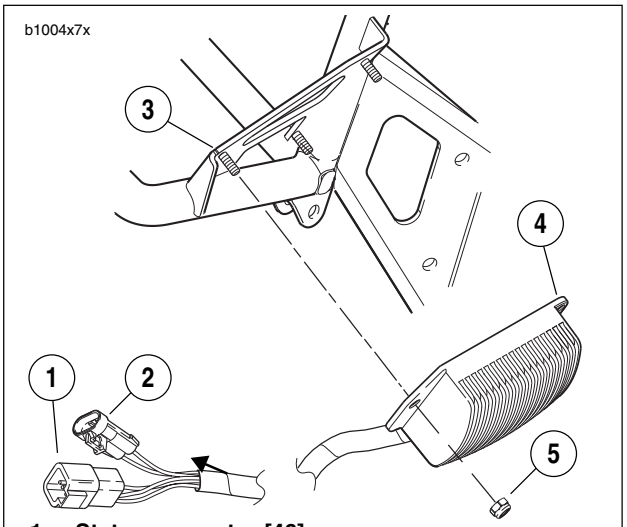



**Figure 7-36. Voltage Regulator Connector [77]**




1. **Stator connector [46]**
2. **Voltage regulator connector [77]**
3. **Voltage regulator mount bracket**
4. **Voltage regulator**
5. **Fastener (3)**

**Figure 7-37. Voltage Regulator**

# BATTERY CABLES 7.10

## REMOVAL

**WARNING**

**To protect against shock and accidental start-up of vehicle, disconnect the negative battery cable before proceeding. Inadequate safety precautions could result in death or serious injury.**

**WARNING**

**Always disconnect the negative battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.**

1. See Figure 7-38. Disconnect negative and positive cables from battery, negative cable first.
   a. Remove fastener holding negative cable to negative terminal.
   b. Remove fastener holding positive cable to positive battery terminal.
2. See Figure 7-39. Remove fastener to detach negative battery cable from frame.
3. See Figure 7-40. Remove protective rubber boot from starter fastener. Remove fastener with washer to detach positive battery cable from starter.

## INSTALLATION

1. Clean cable connectors and battery terminals using a wire brush or sandpaper to remove any oxidation.

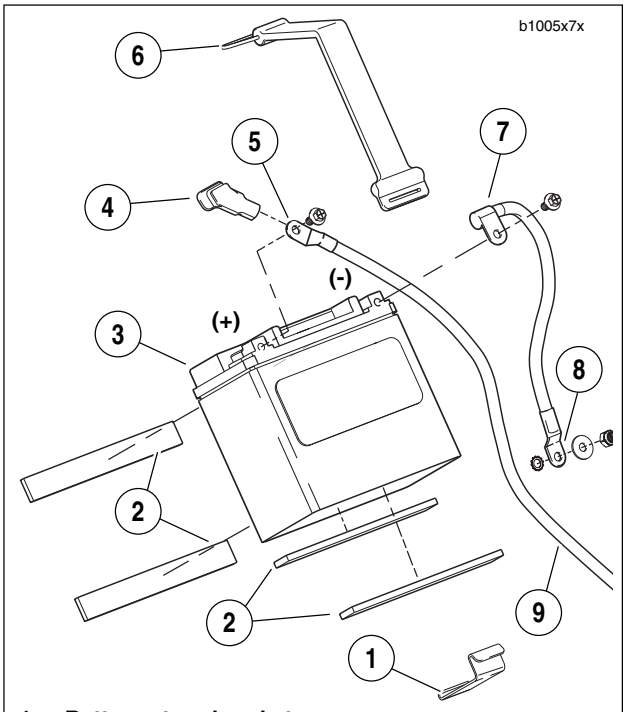
**WARNING**

**Always connect positive battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.**

**CAUTION**

**Connect cables to correct terminals of battery or serious damage to motorcycle electrical system will occur.**

2. Connect cables to battery.
   a. See Figure 7-38. Positive battery cable runs from starter to positive battery terminal.
   b. Connect positive cable to positive (+) battery terminal using fastener.
   c. Connect negative cable to negative (-) battery terminal using fastener.
   d. Tighten terminal fasteners to 72-96 **in-lbs** (8-11 Nm).




1. **Battery strap bracket**
2. **Battery pad (4)**
3. **Battery**
4. **Battery boot**
5. **Positive cable**
6. **Battery strap**
7. **Negative cable**
8. **To frame**
9. **To starter**

**Figure 7-38. Battery**

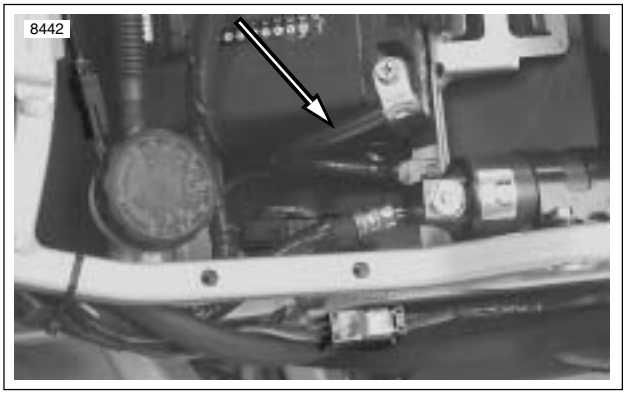
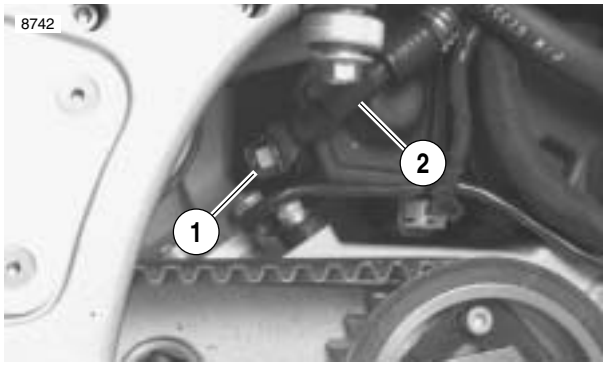



**Figure 7-39. Negative Battery Cable**

3. Connect cables to frame and starter.
   a. See Figure 7-40. First, connect positive cable to starter using fastener with washer. Tighten fastener to 60-85 **in-lbs** (7-10 Nm).
   b. See Figure 7-39. Attach negative cable to frame. Tighten to 48-72 **in-lbs** (5.4-8.1 Nm).
4. Apply light coat of petroleum jelly or corrosion-retardant material to both battery terminals.




**1. Fastener with washer**
**2. Positive battery cable**

**Figure 7-40. Positive Battery Cable (Protective Boot Not Shown)**

## GENERAL

All Buell batteries are permanently sealed, maintenance-free, valve-regulated, lead/calcium and sulfuric acid batteries. The batteries are shipped pre-charged and ready to be put into service. Do not attempt to open these batteries for any reason.

**⚠WARNING**

**All batteries contain electrolyte. Electrolyte is a sulfuric acid solution that is highly corrosive and can cause severe chemical burns. Avoid contact with skin, eyes, and clothing. Avoid spillage. Always wear protective face shield, rubberized gloves and protective clothing when working with batteries. A warning label is attached to the top of the battery (00063a).**

**⚠WARNING**

**See Figure 7-41. Never remove warning label from battery. Failure to read and understand all precautions contained in warning label before performing any service on batteries could result in death or serious injury. (00064a)**

### Table 7-12. Battery Electrolyte Antidotes

| CONTACT | SOLUTION |
|---|---|
| External | Flush with water. |
| Internal | Drink large quantities of milk or water, followed by milk of magnesia, vegetable oil or beaten eggs. Call doctor immediately. |

### Table 7-12. Battery Electrolyte Antidotes

| CONTACT | SOLUTION |
|---|---|
| Eyes | Flush with water, get immediate medical attention. |

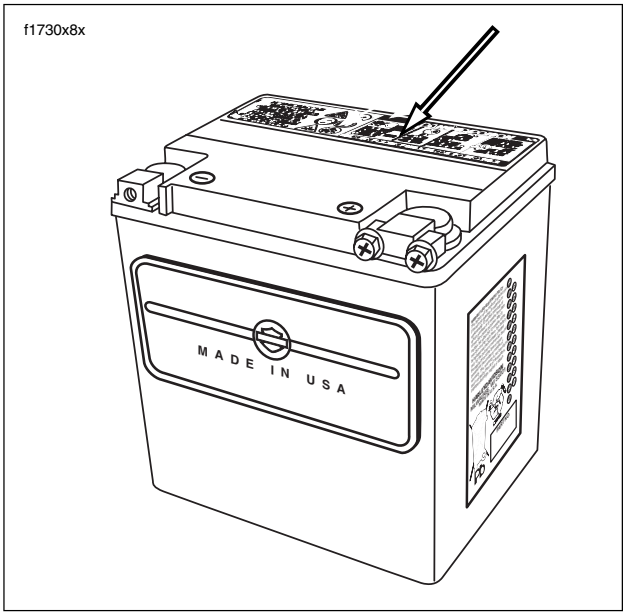
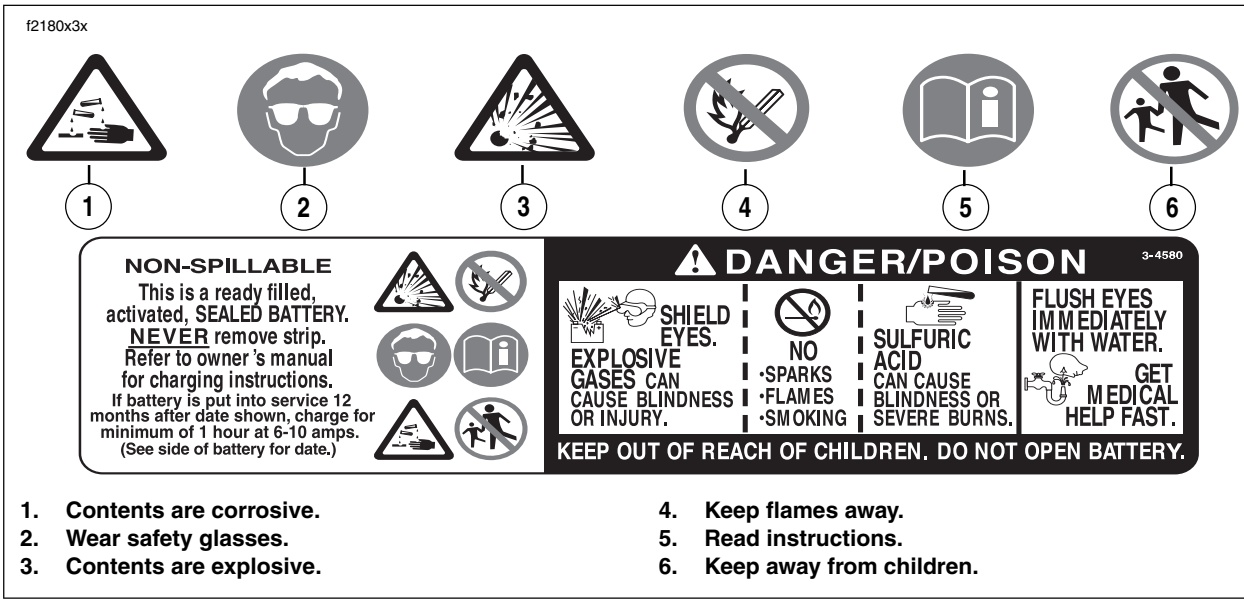



**Figure 7-41. Battery Warning Label Location**




1. **Contents are corrosive.**
2. **Wear safety glasses.**
3. **Contents are explosive.**
4. **Keep flames away.**
5. **Read instructions.**
6. **Keep away from children.**

**Figure 7-42. Battery Warning Label**

# BATTERY TESTING

## Voltmeter Test

See Table 7-13. The voltmeter test provides a general indicator of battery condition. Check the voltage of the battery to verify that it is in a 100% fully charged condition. If the open circuit (disconnected) voltage reading is below 12.6V, charge the battery and then recheck the voltage after the battery has set for one to two hours. If the voltage reading is 12.8V or above, perform the load test.

### Table 7-13. Voltmeter Test

| BATTERY CHARGE CONDITIONS | |
|---|---|
| 12.8 | 100% |
| 12.6 | 75% |
| 12.3 | 50% |
| 12.0 | 25% |
| 11.8 | 0% |

## Load Test

The load test measures battery performance under full current load and is the best indicator of battery condition. To load test the battery, proceed as follows:

**CAUTION**

**Load testing a discharged battery can result in permanent battery damage.**

1. Always fully charge the battery before testing or test readings will be incorrect. See BATTERY INSTALLATION AND CONNECTION. Load testing a discharged battery can also result in permanent battery damage.
2. After charging, allow battery to stand for at least one hour before testing.

**⚠WARNING**

**Always turn the battery load tester OFF before connecting the tester cables to the battery terminals. Connecting tester cables with the load tester ON could cause a spark resulting in a battery explosion which could result in death or serious injury.**

3. Connect tester leads to battery posts and place induction pickup over negative (black) cable. See Figure 7-44.

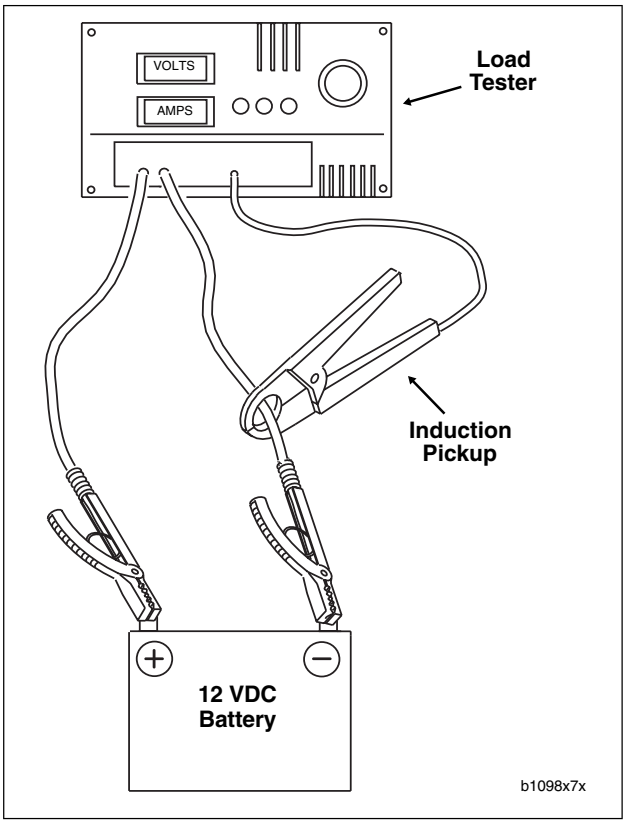



**Figure 7-43. Load Test**

**CAUTION**

**To avoid load tester and/or battery damage, do not leave the load tester switch turned ON for more than 20 seconds.**

4. See Table 7-14. Load battery at 50% of CCA rating using the load tester. Voltage reading after 15 seconds should be 9.6V or more at 70° F. (21° C).

### Table 7-14. Battery Load Test

| COLD CRANKING AMPERAGE (CCA) | 100% | 50% |
|---|---|---|
| XB9R/XB12R | 200 | 100 |

**⚠WARNING**

**Always turn the battery load tester OFF before disconnecting the tester cables from the battery terminals. Disconnecting tester cables with the load tester ON could cause a spark resulting in a battery explosion which could result in death or serious injury.**

5. Install the battery on the motorcycle. See BATTERY INSTALLATION AND CONNECTION.

## DISCONNECTION AND REMOVAL

1. Remove seat. See 2.38 SEAT.

**⚠WARNING**

**To protect against accidental start-up of vehicle, disconnect the negative battery cable before proceeding. Inadequate safety precautions could result in death or serious injury.**

**⚠WARNING**

**Always disconnect the negative battery cable first. If the positive battery cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.**

2. Unthread fastener and remove battery negative cable (black) from battery negative (-) terminal.
3. Unthread fastener and remove battery positive cable (red) from battery positive (+) terminal.
4. Unhook battery strap from frame.
5. Remove battery.

## CLEANING AND INSPECTION

1. Battery top must be clean and dry. Dirt and electrolyte on top of the battery can cause battery to self-discharge. Clean battery top with a solution of baking soda (sodium bicarbonate) and water (5 teaspoons baking soda per quart or liter of water). When the solution stops bubbling, rinse off the battery with clean water.
2. Clean cable connectors and battery terminals using a wire brush or sandpaper. Remove any oxidation.
3. Inspect the battery screws and cables for breakage, loose connections and corrosion. Clean clamps.
4. Check the battery posts for melting or damage caused by overtightening.
5. Inspect the battery for discoloration, raised top or a warped or distorted case, which might indicate that the battery has been frozen, overheated or overcharged.
6. Inspect the battery case for cracks or leaks.

# BATTERY CHARGING

## Safety Precautions

Never charge a battery without first reviewing the instructions for the charger being used. In addition to the manufacturer's instructions, follow these general safety precautions:

- **Always wear proper eye, face and hand protection.**
- **Always charge batteries in a well-ventilated area.**
- **Turn the charger "OFF" before connecting the leads to the battery to avoid dangerous sparks.**
- **Never try to charge a visibly damaged or frozen battery.**
- **Connect the charger leads to the battery; red positive (+) lead to the positive (+) terminal and black negative (–) lead to the negative (–) terminal. If the battery is still in the vehicle, connect the negative lead to the chassis ground. Be sure that the ignition and all electrical accessories are turned off.**
- **Make sure that the charger leads to the battery are not broken, frayed or loose.**
- **If the battery becomes hot, or if violent gassing or spewing of electrolyte occurs, reduce the charging rate or turn off the charger temporarily.**
- **Always turn the charger "OFF" before removing charger leads from the battery to avoid dangerous sparks.**

## Charging Battery

Charge the battery if any of the following conditions exist:

- Vehicle lights appear dim.
- Electric starter sounds weak.
- Battery has not been used for an extended period of time.

**⚠WARNING**

**Charge the battery in a well ventilated area. Explosive hydrogen gas escapes from the battery during charging. Keep open flames, electrical sparks and smoking materials away from the battery at all times. Inadequate safety precautions could result in death or serious injury.**

**CAUTION**

**If the battery releases an excessive amount of gas during charging, decrease the charging rate. If the battery gets hotter than 110˚F. (43˚C) during charging, discontinue charging and allow the battery to cool. Overheating may result in plate distortion, internal shorting, dryout or other damage.**

1. Perform a voltmeter test to determine the state of charge. See BATTERY TESTING. If battery needs to be charged, proceed to step 2.

**CAUTION**

**Always remove the battery from the motorcycle before charging. Accidental electrolyte leakage will damage motorcycle parts.**

2. Remove the battery from the motorcycle. See DISCONNECTION AND REMOVAL. Place the battery on a level surface.

**⚠WARNING**

**Always unplug or turn OFF the battery charger before connecting the charger clamps to the battery. Connecting clamps with the charger ON could cause a spark resulting in a battery explosion which could result in death or serious injury.**

**CAUTION**

**Do not reverse the charger connections described in the following steps or the charging system of the motorcycle could be damaged.**

3. Connect the red battery charger lead to the positive (+) terminal of the battery.
4. Connect the black battery charger lead to negative (-) terminal of the battery.

*NOTE*

*If the battery is still in the vehicle, connect the negative lead to the chassis ground. Be sure that the ignition and all electrical accessories are turned off.*

5. Step away from the battery and turn on the charger. See the charging instructions in Table 7-15.

**⚠WARNING**

**Always unplug or turn OFF the battery charger before disconnecting the charger clamps from the battery. Disconnecting clamps with the charger ON could cause a spark resulting in a battery explosion which could result in death or serious injury.**

6. After the battery is fully charged, disconnect the black battery charger lead to the negative (–) terminal of the battery.
7. Disconnect the red battery charger lead to the positive (+) terminal of the battery.
8. Mark the charging date on the battery.
9. Perform a load test to determine the condition of the battery. See BATTERY TESTING.

**Table 7-15. Battery Charging Rates/Times**

| Battery Amp-Hour | State of Charge | | 3 Amp Charger | 6 Amp Charger | 10 Amp Charger | 20 Amp Charger |
|---|---|---|---|---|---|---|
| | Voltage Reading | % of Charge | | | | |
| 12 | 12.8 V | 100% | - | - | - | - |
| | 12.6 V | 75% | 1 hour 20 minutes | 40 minutes | 25 minutes | 12 minutes |
| | 12.3 V | 50% | 2 hours 40 minutes | 1 hour 20 minutes | 40 minutes | 25 minutes |
| | 12.0 V | 25% | 4 hours | 2 hours | 1 hour 10 minutes | 40 minutes |
| | 11.8 V | 0% | 5 hours, 20 minutes | 2 hours, 40 minutes | 1 hour 40 minutes | 50 minutes |

The figures listed above assume that the battery is charging at room temperature. If warmer than room temperature, use a slightly shorter charging time. If colder, use a slightly longer charging time.

The use of constant current chargers to charge sealed maintenance-free batteries is not recommended. Any overcharge will cause dry-out and premature battery failure. If a constant current charger is the only type available, do **not** exceed the charge times listed above and do **not** continue charging the battery if it gets hot. When charging, never exceed 15 volts for more than 30 minutes.

## BATTERY CABLE ROUTING

Positive battery cable runs from starter post to positive battery terminal. Negative battery cable runs from frame to negative battery terminal. See Figure 7-44.

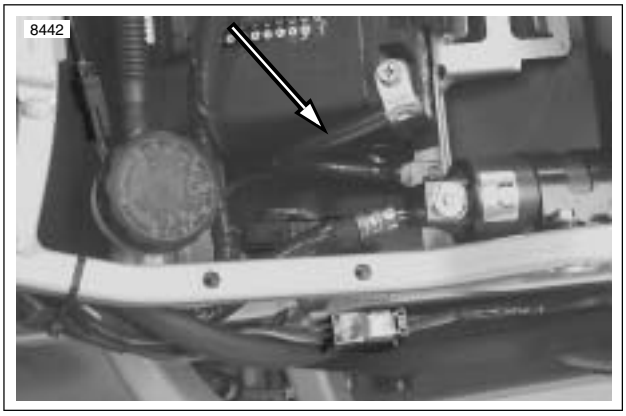



**Figure 7-44. Negative Battery Cable**

## BATTERY INSTALLATION AND CONNECTION

1. Place the fully charged battery into the battery box, terminal side up.

**CAUTION**

**Connect the cables to the correct battery terminals or damage to the motorcycle electrical system will occur.**

**⚠WARNING**

**Always connect the positive battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.**

**CAUTION**

**Overtightening fasteners can damage battery terminals.**

2. Insert fastener through battery positive cable (red) into threaded hole of battery positive (+) terminal. Tighten fastener to 72-96 **in-lbs** (8-11 Nm).

3. Insert fastener through battery negative cable (black) into threaded hole of battery negative (-) terminal. Tighten fastener to 72-96 **in-lbs** (8-11 Nm).

4. Apply a light coat of petroleum jelly or corrosion retardant material to both battery terminals.

5. Install battery strap.

**⚠WARNING**

**After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift during vehicle operation and startle the rider, causing loss of control which could result in death or serious injury.**

6. Install seat. See 2.38 SEAT.

# STORAGE

**⚠WARNING**

**Always store batteries where they cannot be reached by children. Contact with the battery's sulfuric acid could result in death or serious injury.**

**CAUTION**

**The electrolyte in a discharged battery will freeze if exposed to freezing temperatures. Freezing may crack the battery case and buckle battery plates.**

If the motorcycle will not be operated for several months, such as during the winter season, remove the battery from the motorcycle and fully charge. See BATTERY CHARGING.

Self-discharge is a normal condition and occurs continuously at a rate that depends on the ambient temperature and the battery's state of charge. Batteries discharge at a faster rate at higher ambient temperatures. To reduce the self-discharge rate, store battery in a cool (not freezing), dry place. See Figure 7-45.

Charge the battery every month if stored at temperatures below 60˚ F. (16˚ C). Charge the battery more frequently if stored in a warm area above 60˚ F. (16˚ C).

*NOTE*

*The H-D Battery Tender Automatic Battery Charger (Part No. 99863-93TA) may be used to maintain battery charge for extended periods of time without risk of overcharging or boiling.*

When returning a battery to service after storage, refer to the instructions under BATTERY CHARGING.

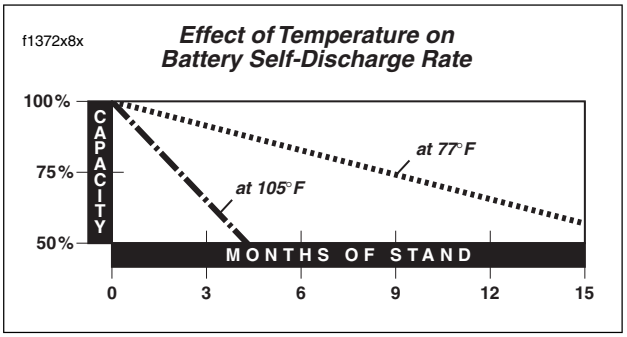



**Figure 7-45. Battery Self-Discharge Rate**

# HEADLIGHT 7.12

## GENERAL

Dual headlights are equipped with replaceable bulbs. High beam headlight is located on the left side of vehicle.

- High beam headlight turns on and off with headlight switch.
- Low beam headlight is located on the right side of vehicle.
- Adjustment of individual headlight projection is accomplished by adjusting two screws located in the headlight support.

For information on headlight housing and bracket disassembly/assembly see 2.25 HEADLIGHT ASSEMBLY AND SUPPORT BRACKET.

## HEADLIGHT BULBS

### Removal

**⚠WARNING**

**To protect against accidental start-up of vehicle, disconnect the negative battery cable before proceeding. Inadequate safety precautions could result in death or serious injury.**

1. Disconnect negative battery cable.

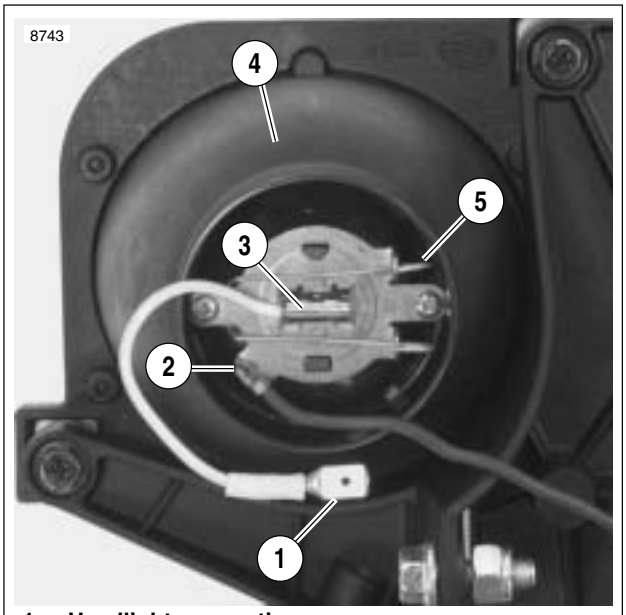
**⚠CAUTION**

**The bulb contains Halogen gas under pressure. Handle bulb carefully and wear eye protection. Failure to follow adequate safety precautions could result in minor or moderate injury. (62)**

**CAUTION**

**Never touch the bulb with your fingers. Fingerprints will etch the glass and cause the bulb to fail. Always wrap the bulb in paper or a clean, dry cloth during handling.**

2. See Figure 7-46. Disconnect headlight connection (1).
3. Release wire retaining latch (5) from headlight housing clips.
4. Pull bulb housing from headlight housing.




1. **Headlight connection**
2. **Ground connection**
3. **Headlight bulb**
4. **Headlight**
5. **Wire retaining latch**

**Figure 7-46. Headlight Bulb**

]

## Installation

*NOTE*

*Not using the specified bulb may cause charging system problems.*

**⚠CAUTION**

**The bulb contains Halogen gas under pressure. Handle bulb carefully and wear eye protection. Failure to follow adequate safety precautions could result in minor or moderate injury.**

**CAUTION**

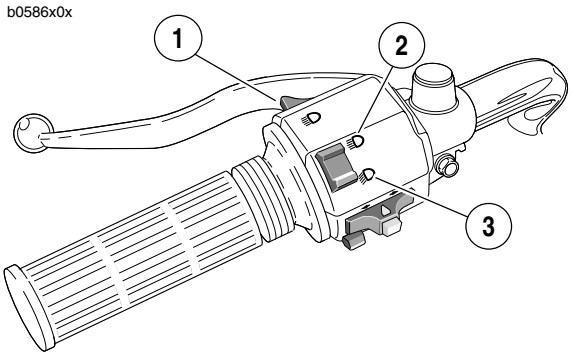
**Never touch the bulb with your fingers. Fingerprints will etch the glass and cause the bulb to fail. Always wrap the bulb in paper or a clean, dry cloth during handling.**

1. See Figure 7-46. Align tabs on bulb (3) with tabs on headlight (4). Insert bulb.
2. Close the wire retaining latch (5).
3. Connect the headlight bulb connector.
4. Connect negative battery cable.

**⚠WARNING**

**Check for proper headlight operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper headlight operation could result in death or serious injury.**

5. Check headlight for proper operation. If operation fails, reread procedure and verify that all steps were performed.
   a. Turn ignition key switch to ON.
   b. See Figure 7-47. Check headlight LOW (3) and HIGH beam (2) settings.
   c. Set headlight to LOW beam. Press passing lamp switch (1). Headlight should flash HIGH beam for as long as the switch is pressed.
   d. Turn ignition key switch to OFF.
6. Align headlight. See 1.19 HEADLIGHTS.




1. **Passing lamp switch**
2. **HIGH beam**
3. **LOW beam (always on when bike is running)**

**Figure 7-47. Headlight Controls**

# TAIL LAMP 7.13

## REMOVAL/DISASSEMBLY

1. See Figure 7-48. Remove two screws (3) to detach tail light lens (4) and tail light (5). If replacing bulb (2), turn counterclockwise and remove.
2. Remove pillion seat. See 2.38 SEAT.
3. Disconnect two connectors [93] from tail lamp harness (6).

## ASSEMBLY/INSTALLATION

1. See Figure 7-48. Attach the two tail light harness connectors [93] (6).
   a. Single wire connector connects to single spade of tail lamp.
   b. Dual wire connector connects to dual spades of tail lamp with red wire facing left side of vehicle.
2. If removed, install tail lamp bulb (2).
   a. Turn bulb clockwise to install.
   b. Install tail light lens (4) and tail light (5) with two fasteners (3).

**⚠WARNING**

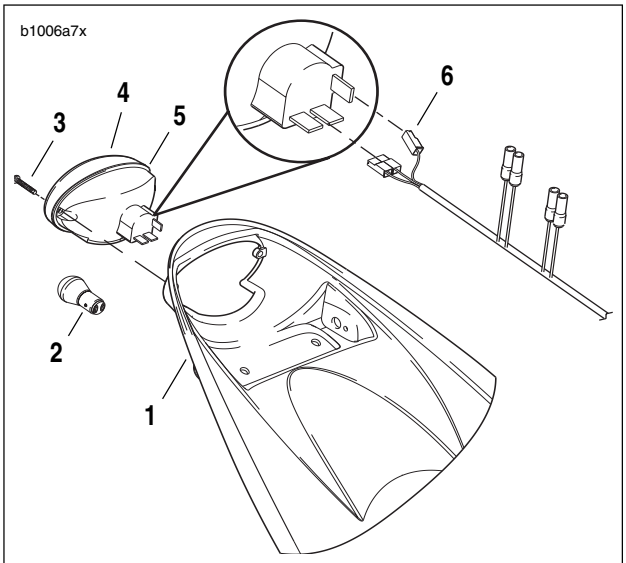
**Check for proper tail lamp operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper tail lamp operation could result in death or serious injury.**

3. Check tail lamp for proper operation. If operation fails, reread procedure and verify that all steps were performed.
   a. Turn ignition key switch to ON.
   b. Check for tail lamp illumination.
   c. Squeeze front brake hand lever. Check for brake lamp illumination. Release front brake hand lever.
   d. Press rear brake pedal. Check for brake lamp illumination. Release rear brake pedal.
   e. Turn ignition key switch to OFF.

**⚠WARNING**

**After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift during vehicle operation and startle the rider, causing loss of control which could result in death or serious injury.**

4. Install pillion seat. See 2.38 SEAT.




1. **Tail section**
2. **Tail lamp bulb**
3. **Fastener (2)**
4. **Tail light lens**
5. **Tail light**
6. **Tail light harness**

**Figure 7-48. Tail Lamp Assembly**

## REMOVAL

*NOTE*

*To ensure correct installation, make note of wire routing and cable strap locations before removing turn signals.*

### Bulbs

Remove screw on back of housing to access turn signal bulbs.

### Front

1. See Figure 7-49. Disconnect bullet connectors on turn signal wires.
2. See Figure 7-50. Remove fastener (3) and lockwasher (2) from fairing support bracket (4).
3. Pull bullet connectors and wiring through hole in fairing support bracket (4) and fairing (5).

### Rear

1. Remove seat See 2.38 SEAT.
2. Remove tail frame upper body work. See 2.36 SUB-FRAME TAIL ASSEMBLY AND BODY WORK.
3. See Figure 7-52. Disconnect bullet connectors on turn signal wires.
4. See Figure 7-51. Remove fastener (6) and lockwasher (5).

*NOTE*

*In next step, reflector bracket (3) will be removed with turn signal (1).*

5. Remove turn signal from tail section (7) and license plate bracket (4).

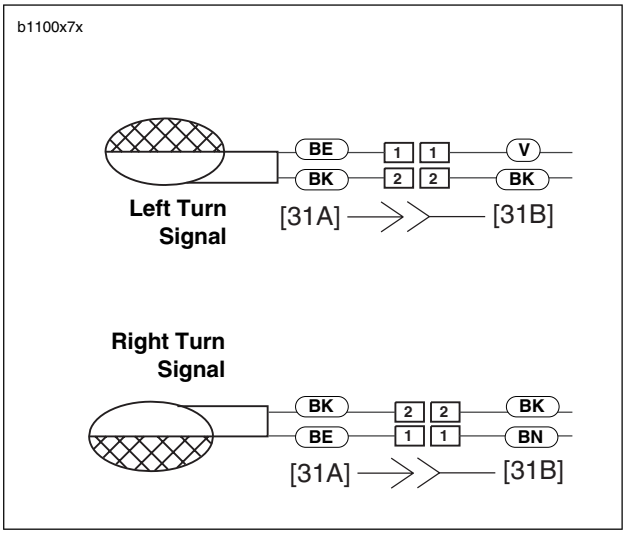
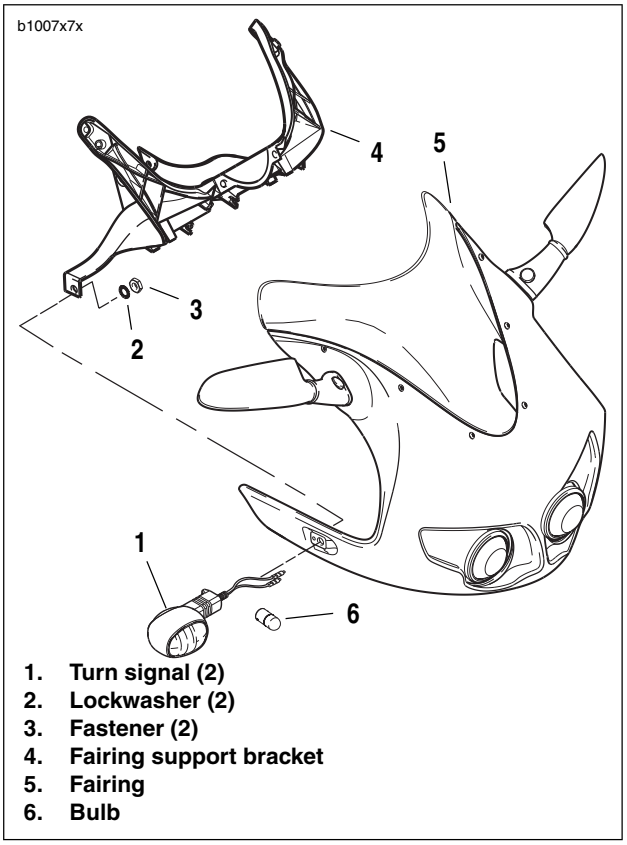



**Figure 7-49. Front Turn Signal Connections**




1. **Turn signal (2)**
2. **Lockwasher (2)**
3. **Fastener (2)**
4. **Fairing support bracket**
5. **Fairing**
6. **Bulb**

**Figure 7-50. Front Turn Signals**

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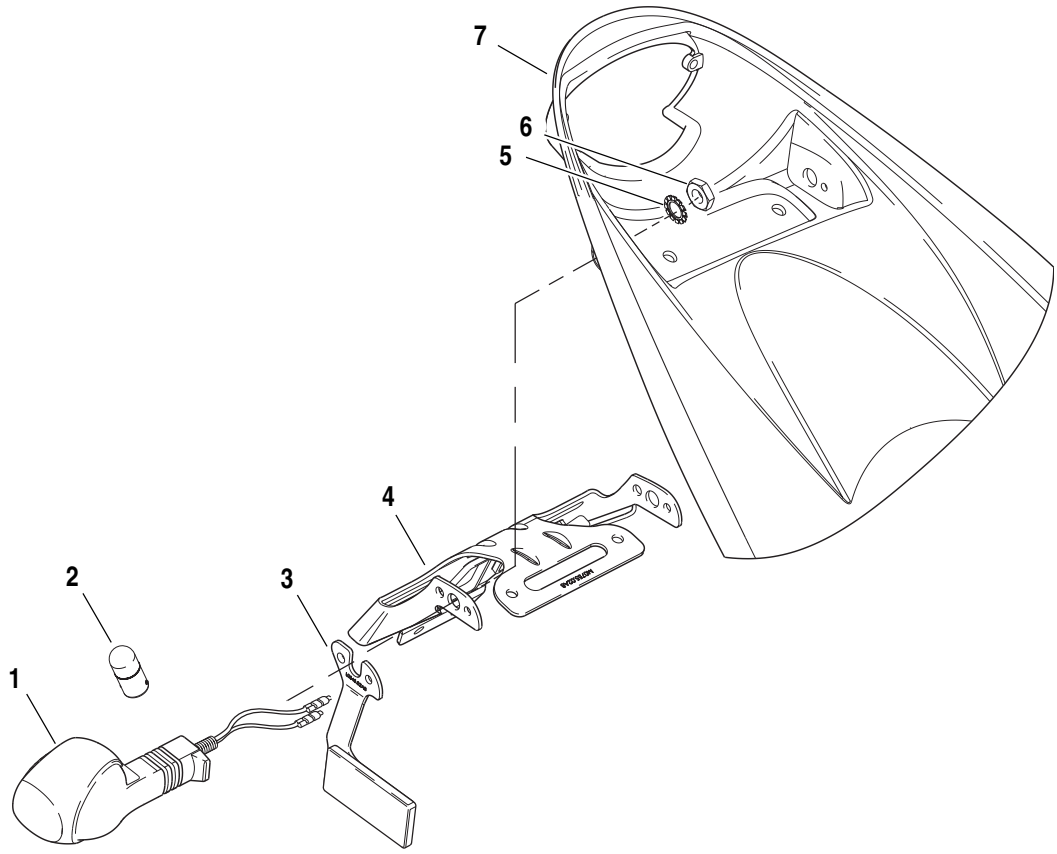



1. Turn signal
2. Turn signal bulb
3. Reflector bracket
4. License plate bracket
5. Washer (2)
6. Fastener (2)
7. Tail section

**Figure 7-51. Rear Turn Signals**

# INSTALLATION

## Front

1. See Figure 7-50. Insert bullet connectors and wiring through hole in fairing (5) and fairing support bracket (4).
2. Install turn signal (1) using lockwasher (2) and fastener (3). Tighten fastener to 25-28 **in-lbs** (2.8-3.2 Nm).
3. Attach bullet connectors on turn signal wires as shown in Figure 7-49.

**⚠WARNING**

**Check for proper turn signal operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper turn signal operation could result in death or serious injury.**

4. Check turn signals for proper operation. If operation fails, reread procedure and verify that all steps were performed.
   a. Turn ignition key switch to ON.
   b. Activate left turn signals using switch on left handlebar. Front and rear left turn signals must flash.
   c. Activate right turn signals using switch on left handlebar. Front and rear right turn signals must flash.
   d. Turn ignition key switch to OFF.

## Rear

1. See Figure 7-52. Insert bullet connectors through license plate bracket (4) and tail section (7).
2. Install reflector bracket (3).
   a. Place license plate bracket into position over threads on turn signal (1).
   b. Be sure tab on turn signal fits into hole in reflector bracket and tab on reflector bracket fits into hole in license plate bracket.
3. Attach turn signal using lockwasher (5) and fastener (6).Tighten fastener to 25-28 **in-lbs** (2.8-3.2 Nm).
4. Attach bullet connectors on turn signal wires as shown in Figure 7-52.

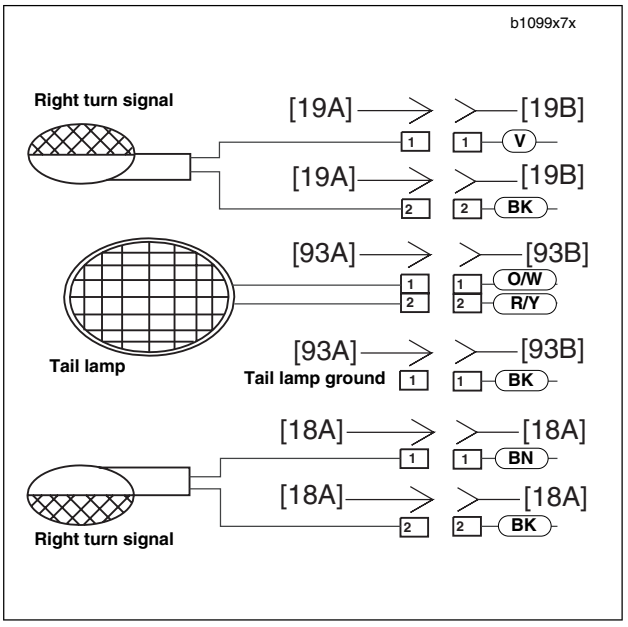



**Figure 7-52. Rear Turn Signal Connections**

**⚠WARNING**

**Check for proper turn signal operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper turn signal operation could result in death or serious injury.**

5. Check turn signals for proper operation. If operation fails, reread procedure and verify that all steps were performed.
   a. Turn ignition key switch to ON.
   b. Activate left turn signals using switch on left handlebar. Front and rear left turn signals must flash.
   c. Activate right turn signals using switch on left handlebar. Front and rear right turn signals must flash.
   d. Turn ignition key switch to OFF.

**⚠WARNING**

**After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift during vehicle operation and startle the rider, causing loss of control which could result in death or serious injury.**

6. Install seat. See 2.38 SEAT.

# TURN SIGNAL FLASHER 7.15

## REMOVAL

*NOTE*

*The turn signal flasher is not repairable. Replace flasher upon failure.*

1. Remove front fairing. See 2.37 FRONT FAIRING, WINDSHIELD, AND MIRRORS.
2. Remove fastener securing turn signal flasher to headlight support bracket.
3. Detach 3-place connector [30] from flasher body.

## INSTALLATION

1. See Figure 7-53. Attach 3-place connector [30] to flasher.
2. Install turn signal to headlight support bracket. Tighten fastener to 30-40 **in-lbs** (3.4-4.5 Nm).
3. Install front fairing. See 2.37 FRONT FAIRING, WINDSHIELD, AND MIRRORS.

**⚠WARNING**

**Check for proper turn signal operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper turn signal operation could result in death or serious injury.**

4. Check turn signals for proper operation. If operation fails, reread procedure and verify that all steps were performed.
   a. Turn ignition key switch to IGN.
   b. See Figure 7-54. Activate left turn signals using switch on left handlebar. Front and rear left turn signals must flash.
   c. Activate right turn signals using switch on left handlebar. Front and rear right turn signals must flash.
   d. Turn ignition key switch to OFF.

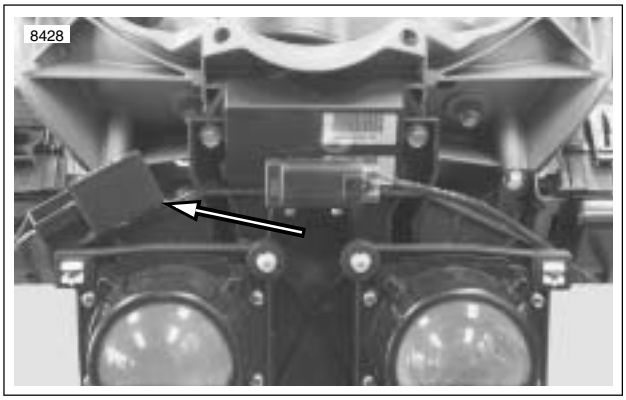
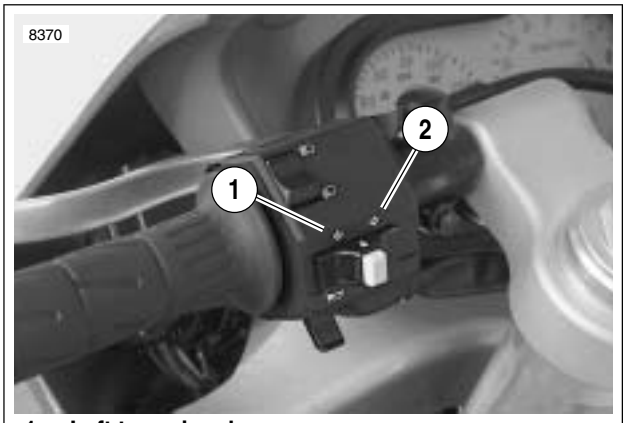



**Figure 7-53. Turn Signal Flasher**




**1. Left turn signal**
**2. Right turn signal**

**Figure 7-54. Turn Signal Controls**

## REMOVAL

*NOTE*

*The individual handlebar switches are not repairable. Replace switch assembly upon switch failure.*

### Right Side

1. Remove throttle cables. See 2.23 THROTTLE CONTROL.
2. Access right handlebar switch connector [22] under fairing. Remove cable straps. Detach connector [22] from wiring harness.
3. Detach brake switch connector [121].

### Left Side

1. Remove left switch housing mounting fasteners.
2. Unplug the clutch switch [95].
3. Access left handlebar switch connector [24] under fairing. Remove cable straps. Detach connector [24] from wiring harness.

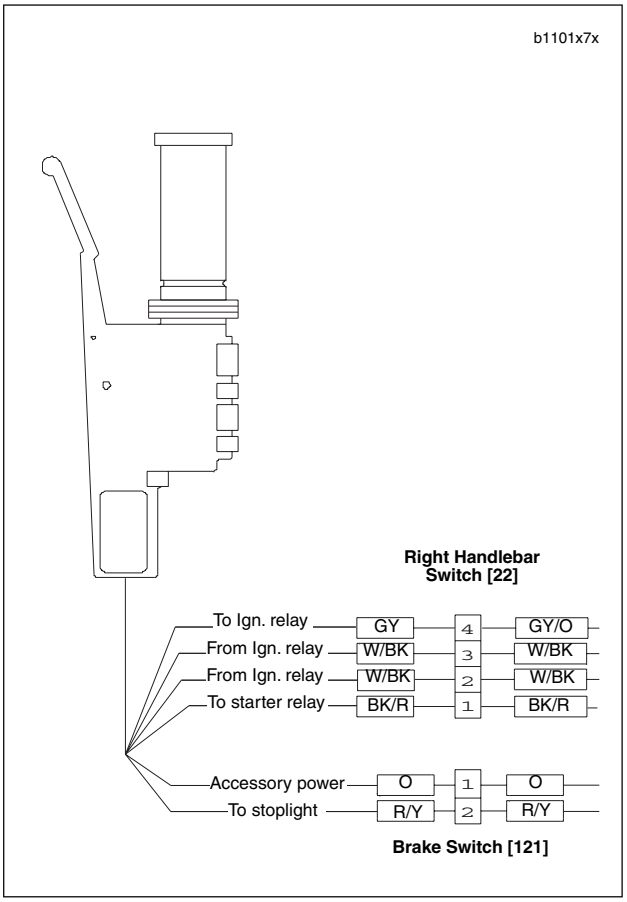



**Figure 7-55. Right Handlebar Switch Connection**

# INSTALLATION

## Right Side

1. Attach throttle cables to hand control. See 2.23 THROTTLE CONTROL.
2. Install right switch housing.
   a. Position housing on right handlebar by engaging alignment pin on front housing with hole in handlebar.
   b. Attach switch housing with two mounting fasteners and tighten to 25-33 **in-lbs** (3-4 Nm).
3. Attach brake switch connector [121].
4. Attach right handlebar switch connector [22] to wire harness. See D.1 HOSE AND WIRE ROUTING for wire routing information.

**⚠WARNING**

**Check all handlebar switch operations before riding motorcycle. Visibility is a major concern for motorcyclists. Handlebar switches not operating properly could result in death or serious injury.**

5. Check handlebar switch for proper operation. If operation fails, reread procedure and verify that all steps were performed.
   a. Turn ignition key switch to IGN.
   b. Start motorcycle.
   c. Turn ignition key switch to OFF.

## Left Side

1. Install left switch housing.
   a. Position housing on left handlebar by engaging alignment pin on front housing with hole in handlebar.
   b. Attach switch housing with three mounting fasteners and tighten to 25-33 **in-lbs** (3-4 Nm).
2. Connect clutch switch [95].
3. Attach right handlebar switch connector [24] to wire harness. See D.1 HOSE AND WIRE ROUTING for wire routing information.

**⚠WARNING**

**Check all handlebar switch operations before riding motorcycle. Visibility is a major concern for motorcyclists. Handlebar switches not operating properly could result in death or serious injury.**

4. Check handlebar switch for proper operation. If operation fails, reread procedure and verify that all steps were performed.
   a. Turn ignition key switch to ON.
   b. Check headlight LOW and HIGH beam settings.
   c. Set headlight to LOW beam. Press passing lamp switch. Headlight should flash HIGH beam for as long as the switch is pressed.
   d. Check left and right turn signals.
   e. Activate horn by pressing horn switch.
5. Turn ignition key switch to OFF.

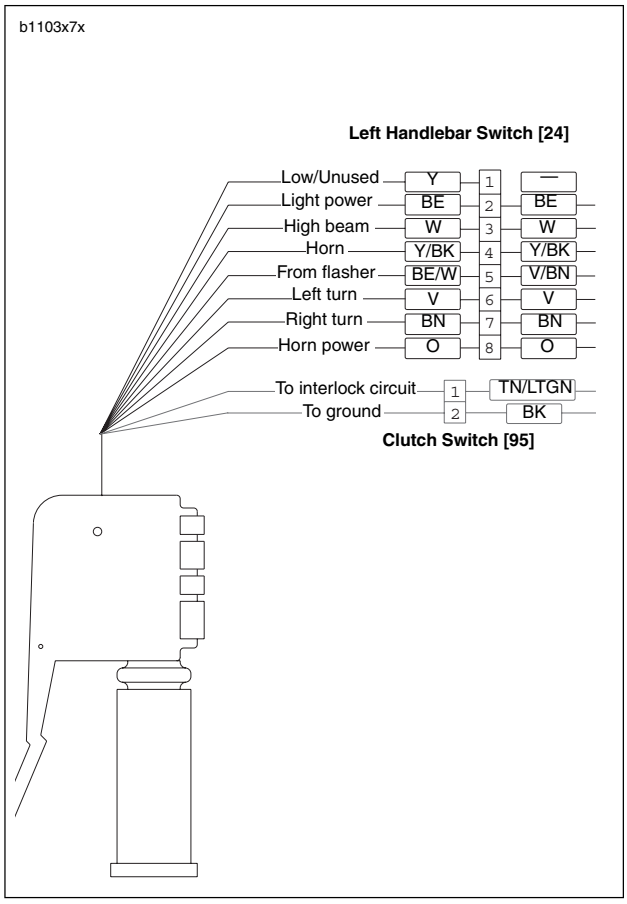



**Figure 7-56. Left Handlebar Switch Connection**

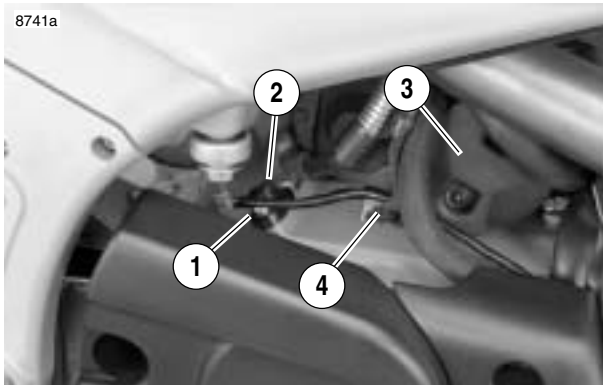
# VEHICLE SPEED SENSOR 7.17

## REMOVAL

1. See Figure 7-57. Remove fastener (1) to detach vehicle speed sensor (2) from crankcase.
2. Remove cable strap (4).
3. Disconnect 3-place Deutsch connector [65] under sprocket cover. See 7.24 INTERACTIVE EXHAUST HARNESS (XB12R).

## INSTALLATION

1. See Figure 7-57. Lube O-ring with engine oil and install fastener (1) to attach vehicle speed sensor (2) to crankcase.
2. Connect vehicle speed sensor connector [65] to wiring harness. See 7.24 INTERACTIVE EXHAUST HARNESS (XB12R).
3. Install cable strap (4).




1. **Fastener**
2. **Vehicle speed sensor**
3. **Starter**
4. **Cable strap**

**Figure 7-57. Speedometer Sensor**

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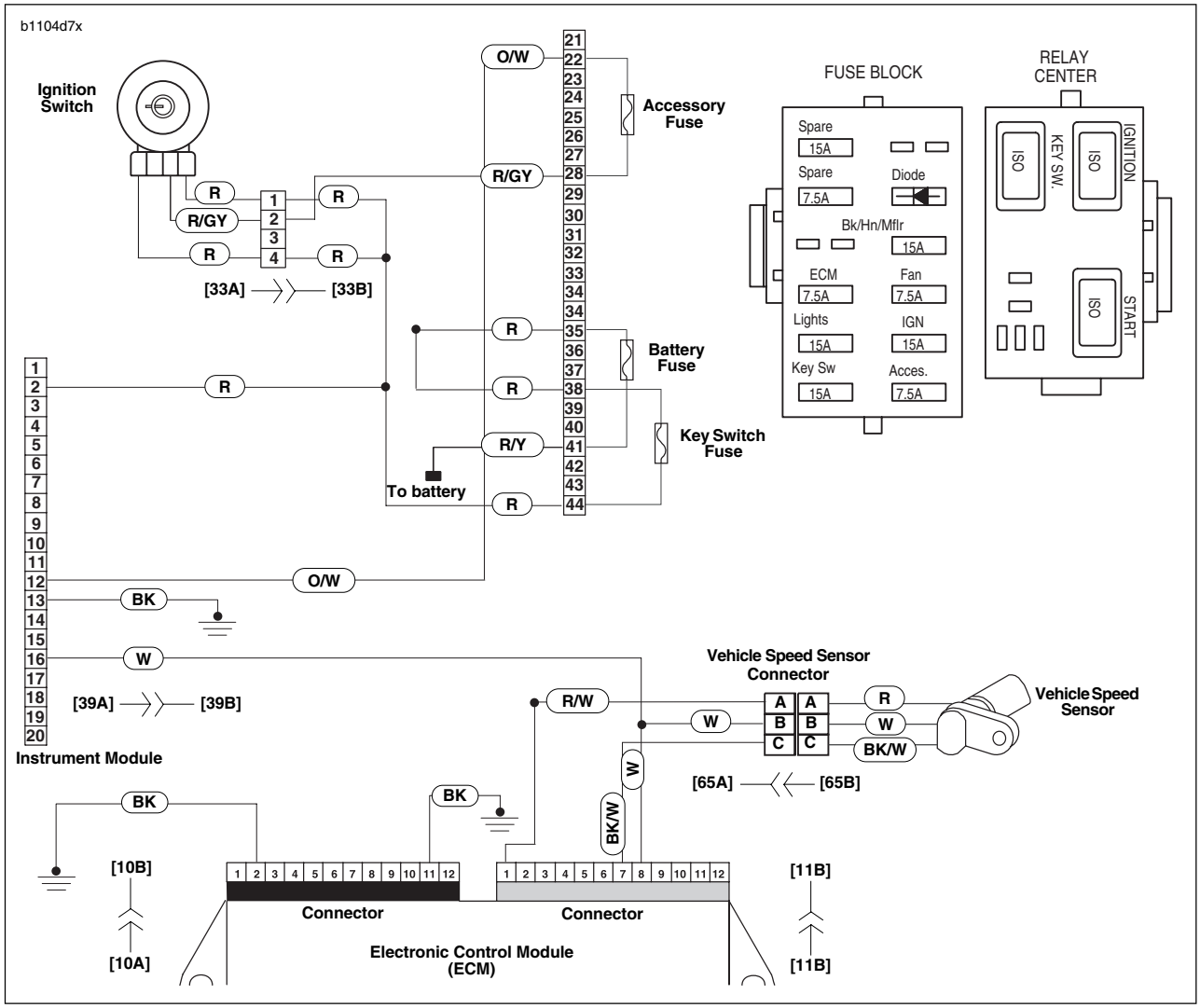


**Figure 7-58. Vehicle Speed Sensor Wiring**

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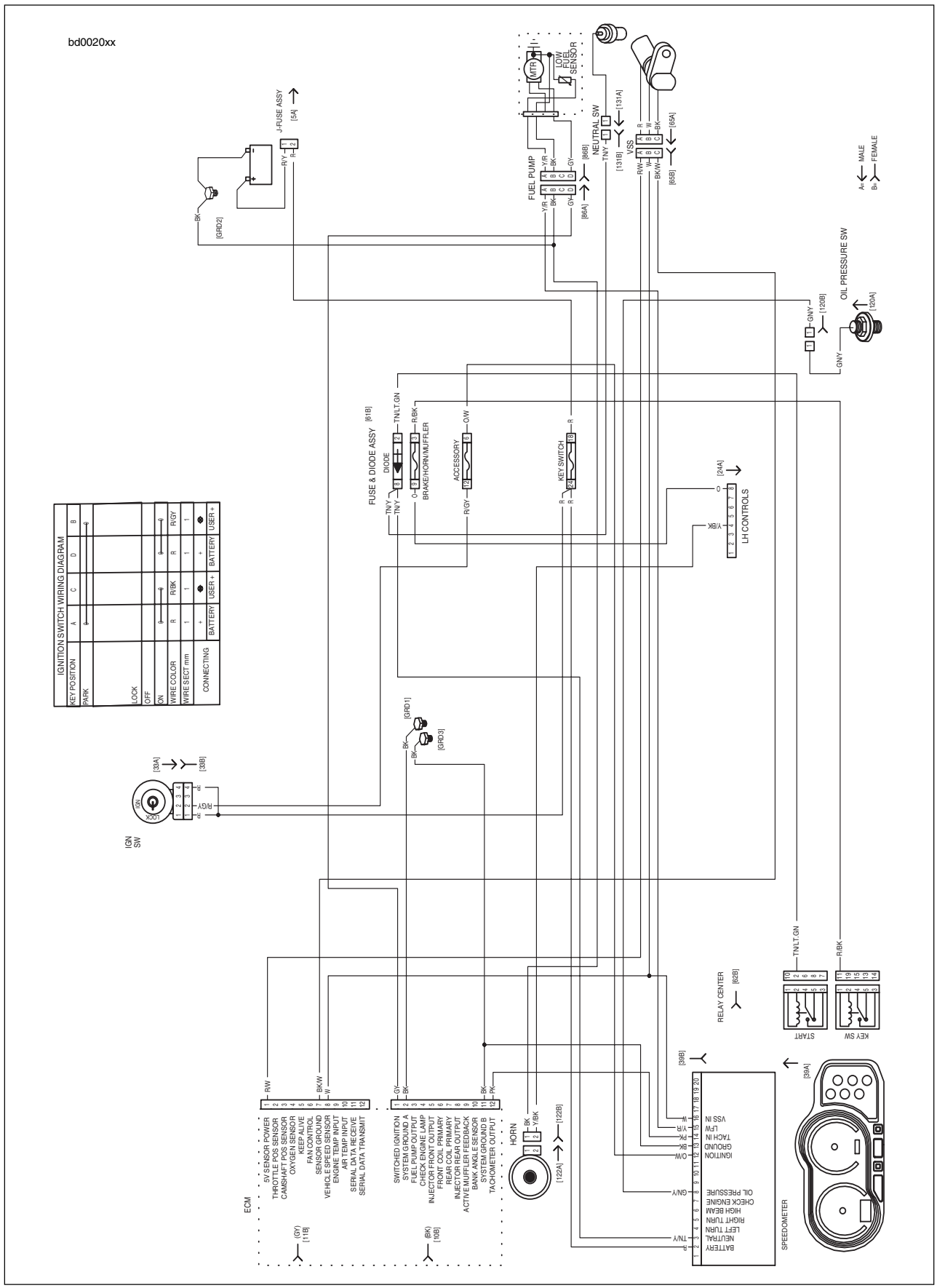



**Figure 7-59. Vehicle Speed Sensor Wiring**

# INSTRUMENT MODULE 7.18

## GENERAL

Replace the instrument module if the unit is not working properly or if a lamp is inoperative. The module is not repairable. However, before replacing a component, check that the problem is not caused by a loose wire connection.

## REMOVAL

**⚠WARNING**

**To protect against shock and accidental start-up of vehicle, disconnect the negative battery cable before proceeding. Inadequate safety precautions could result in death or serious injury.**

1. Disconnect negative battery cable.
2. Remove headlight support bracket. See 2.25 HEADLIGHT ASSEMBLY AND SUPPORT BRACKET.
3. See Figure 7-61. Disconnect instrument module connector [39].
4. See Figure 7-62. Remove fasteners (5) and washers (4).
5. Pull instrument module (2) from headlight support bracket (1).

## INSTALLATION

1. See Figure 7-62. Place instrument module (2) into position in headlight support bracket (1).
2. Install washers (4) and fasteners (5). Tighten fasteners to 12-36 **in-lbs** (1.4-4.0 Nm).
3. See Figure 7-61. Connect instrument module connector [39].
4. Install headlight support bracket. See 2.25 HEADLIGHT ASSEMBLY AND SUPPORT BRACKET.
5. Install negative battery cable.


**Figure 7-60. Instrument Module**

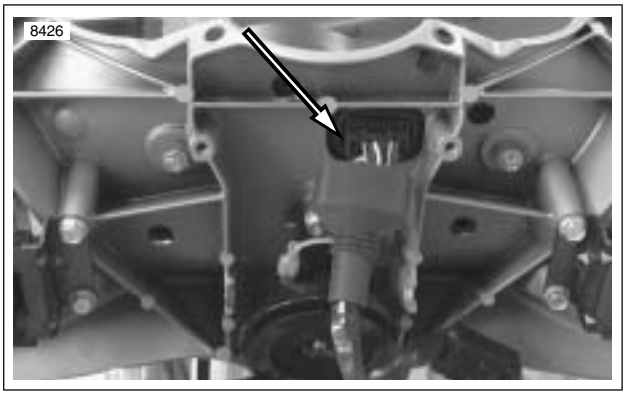
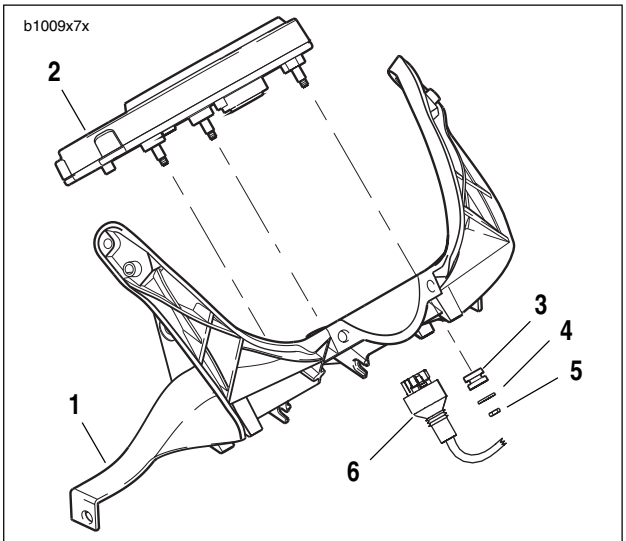



**Figure 7-61. Instrument Module Connector [39]**




1. **Headlight support bracket**
2. **Instrument module**
3. **Grommet (3)**
4. **Washer (3)**
5. **Fastener (3)**
6. **Instrument module connector [39]**

**Figure 7-62. Instrument Module**

# SPEEDOMETER PERFORMANCE CHECK 7.19

## GENERAL

See Figure 7-63. Use the SPEEDOMETER TESTER (Part No. HD-41354) for speedometer diagnostics. These diagnostics may include:

- Checking speedometer operation.
- Testing speedometer needle sweeping action.

The tester generates a simulated speedometer sensor signal. This signal aids in determining whether speedometer replacement is necessary. It can also be used to simulate running engine conditions for ignition system troubleshooting.

*NOTES*

- *Use the following procedures in conjunction with the manual supplied with the speedometer tester.*
- *Test results may be inaccurate if tester battery is low.*

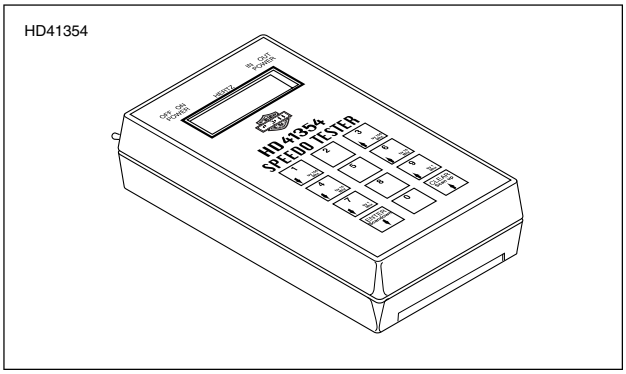



**Figure 7-63. Speedometer Tester (Part No. HD-41354)**

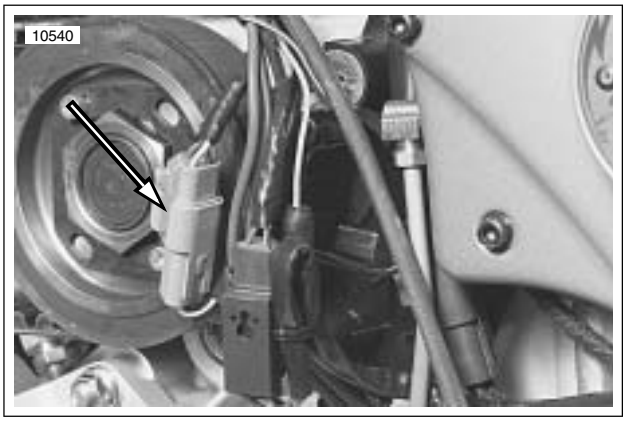



**Figure 7-64. Vehicle Speed Sensor Connector [65]**

## TESTING

*NOTE*

*The SPEEDOMETER TESTER (Part No. HD-41354) cannot be used to verify the calibration of a speedometer and it will not verify the speedometer's function to support legal proceedings. It's purpose is to verify speedometer function when performing service diagnosis or repair. It can also assist in determining if speedometer replacement is necessary.*

### Speedometer Operation Test

*NOTE*

*For information on the correct routing of vehicle speed sensor wiring see 7.24 INTERACTIVE EXHAUST HARNESS (XB12R).*

1. See Figure 7-64. Locate the 3-place vehicle speed sensor connector [65] under the sprocket cover. See 2.30 SPROCKET COVER.
2. Place speedometer tester power switch in the ON position. Place signal switch in the OUT position.
3. Turn vehicle ignition switch ON.
4. Begin test.
   a. Press ENTER on the tester keypad.
   b. Enter a frequency from Table 7-16. Note that different markets use different frequencies.
   c. Verify that speedometer display reads the corresponding speed. To change the test frequency, press CLEAR to cancel and enter the new frequency. Press ENTER to begin and reverify.

*NOTE*

*The speedometer should be accurate within 0-5 MPH (0-8 KPH).*

**Table 7-16. Speedometer Test Frequency in Hertz (Hz)**

| MARKET | SPEED | FREQUENCY |
|---|---|---|
| USA | 20 MPH | 461 |
| | 40 MPH | 923 |
| | 60 MPH | 1365 |
| | 80 MPH | 1847 |
| ENG, AUS, EUR, CAN, JPN | 40 KPH | 577 |
| | 60 KPH | 865 |
| | 80 KPH | 1154 |
| | 100 KPH | 1443 |

## Speedometer Needle Sweep Test

*NOTE*

*Speedometer needle sweep test works on the speedometer only. Use the diagnostics available with DIGITAL TECHNICIAN (Part No. HD-44750) to test a tachometer.*

The tester's sweep function moves the speedometer needle through the full range of movement. This allows for testing the smoothness of operation and checking for hesitancy or a stuck needle.

1. See Figure 7-64. Disconnect vehicle speed sensor connector [65]. Attach speedometer tester connector to vehicle speed sensor connector.
2. Place speedometer tester power switch in the ON position. Place signal switch in the OUT position.
3. Turn vehicle ignition switch ON.
4. Begin test by pressing 0 on the tester keypad, then pressing ENTER. The tester will scan for two seconds, then the tester will put out a 1 Hz signal.
5. Select a test range.
   a. Press 2 to select LO range (1-20 Hz).
   b. Press 5 to select CEN range (21-999 Hz).
   c. Press 8 to select HI range (1000-20,000 Hz).
6. After selecting a range, use the corresponding arrow keys to accelerate through the range. As you move through the speed range, check for smooth needle movement.
   a. If testing LO range, press 1 or 3.
   b. If testing CEN range, press 4 or 6.
   c. If testing HI range, press 7 or 9.

## Speedometer Sensor Test

If the speedometer is inoperative, but backlighting and odometer work, the speedometer sensor may not be working.

See Figure 7-65. Fabricate a test harness using the following parts. This harness can also be used to test the tachometer.

- Two Deutsch 3-place socket housings (Part No. 72113-94BK) and six socket terminals (Part No. 72191-94).
- Deutsch 3-place pin housing (Part No. 72103-94BK) and three pin terminals (Part No. 72080-99Y).
- Six lengths of 18 gauge wire, each 6.0 in. (15 cm) long.
- Test for voltage to sensor by checking for 4-6 VDC on red/white wire in connector [65].
- Then check for continuity to ground on black wire in connector [65].

1. Install the test harness between the vehicle speed sensor connector halves [65].
2. Raise rear wheel off floor using REAR WHEEL SUPPORT STAND (Part No. B-41174).
3. Place speedometer tester power switch in the ON position. Place signal switch in the IN position.
4. Plug the speedometer tester into the test harness. Turn vehicle ignition switch ON.
5. Press ENTER on the tester keypad.
6. Rotate the motorcycle's rear wheel.
   a. If reading on speedometer tester changes as wheel is rotated, speedometer sensor is OK.
   b. If reading does not change, vehicle speed sensor is suspect. Install a known, good vehicle speed sensor and test again.

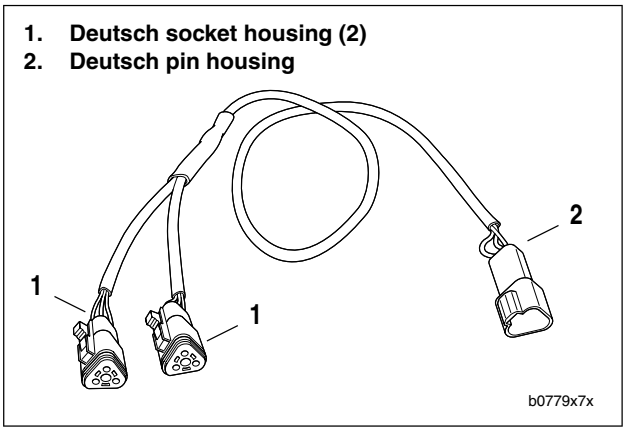
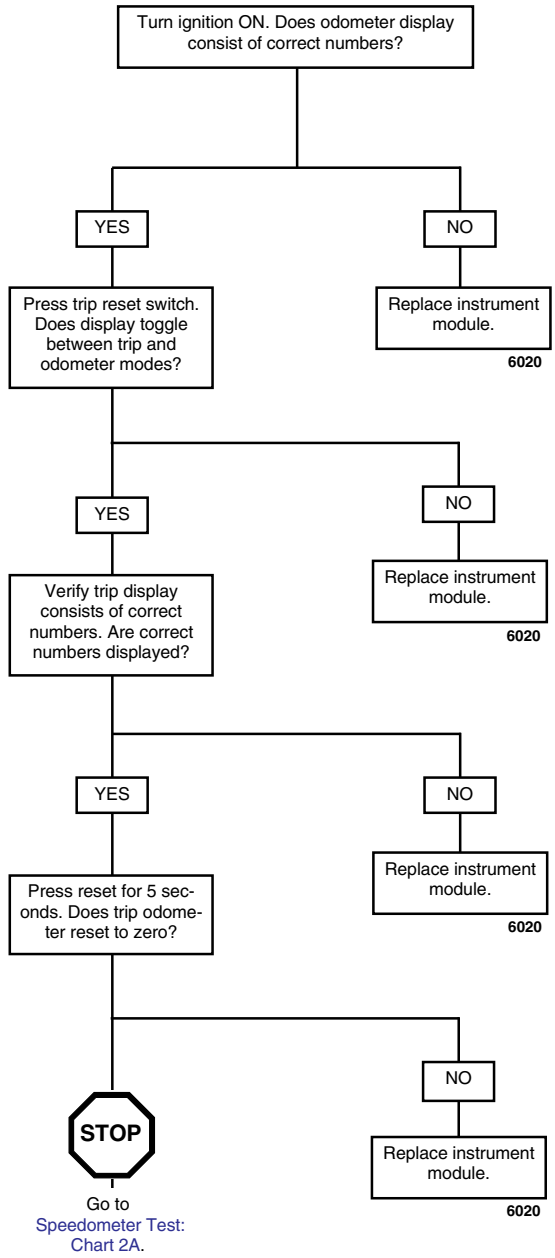



**Figure 7-65. Test Harness**

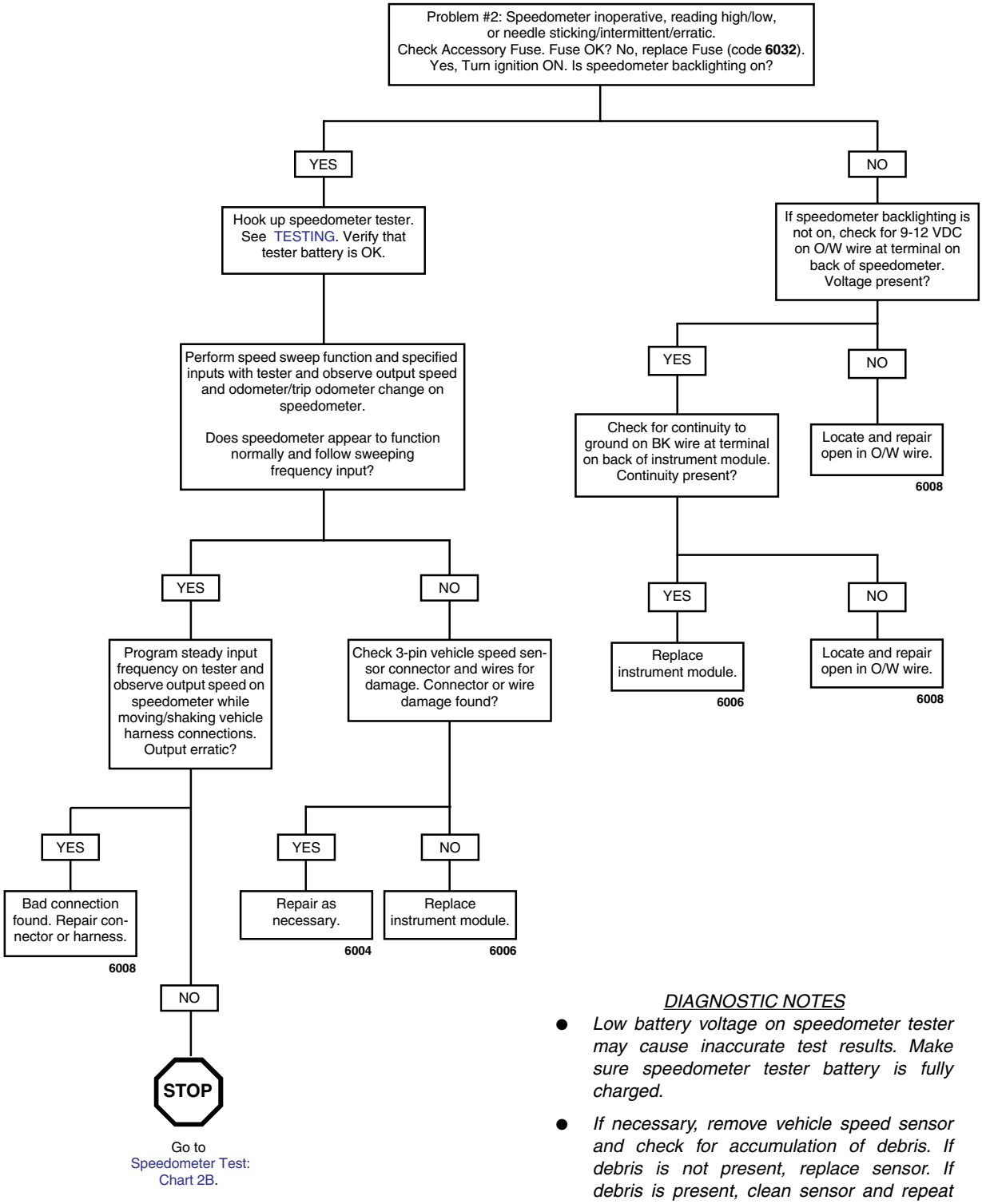
# Speedometer Test: Chart 1

## ODOMETER, TRIP ODOMETER AND RESET SWITCH TESTING



# Speedometer Test: Chart 2A

## INOPERATIVE, INACCURATE OR ERRATIC SPEEDOMETER

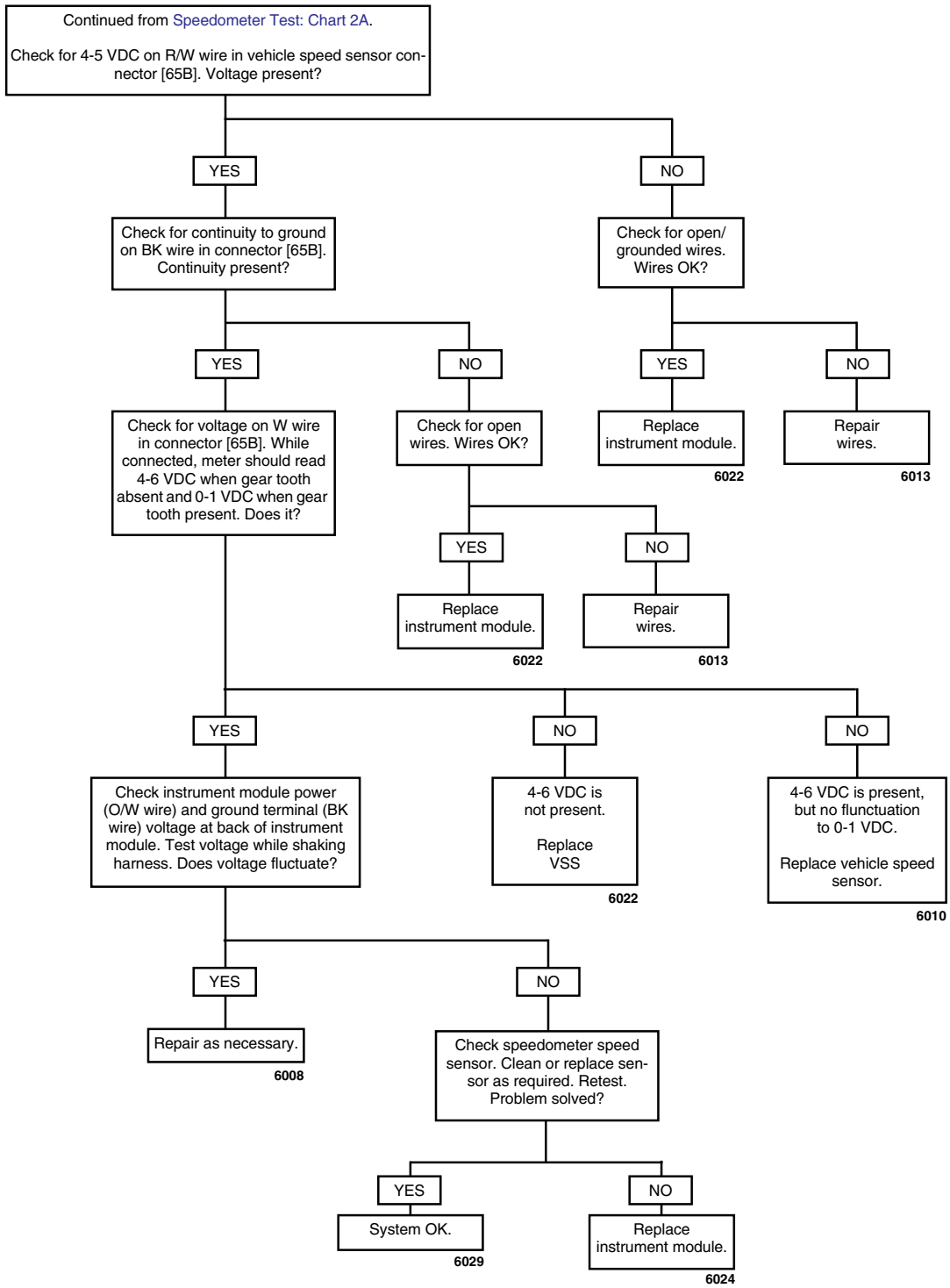



*DIAGNOSTIC NOTES*

- *Low battery voltage on speedometer tester may cause inaccurate test results. Make sure speedometer tester battery is fully charged.*
- *If necessary, remove vehicle speed sensor and check for accumulation of debris. If debris is not present, replace sensor. If debris is present, clean sensor and repeat test. Replace if necessary.*

# Speedometer Test: Chart 2B

## INOPERATIVE, INACCURATE OR ERRATIC SPEEDOMETER



## GENERAL

The horn is located inside fairing.

## REMOVAL

1. Remove seat. See 2.38 SEAT.

**⚠WARNING**

**To protect against shock and accidental start-up of vehicle, disconnect the negative battery cable before proceeding. Inadequate safety precautions could result in death or serious injury.**

2. Disconnect negative battery cable.
3. Remove headlight support bracket. See 2.25 HEADLIGHT ASSEMBLY AND SUPPORT BRACKET.
4. See Figure 7-66. Remove fastener (3).
5. Remove horn (1) from fairing support bracket (4).
6. See Figure 7-67. Detach Y/BK power wire and BK ground wire from terminal clips on horn.

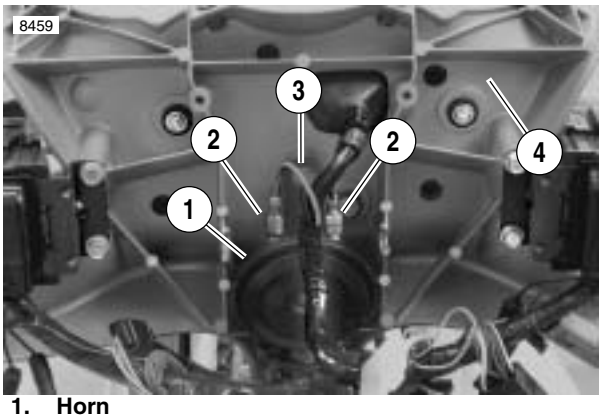
## INSTALLATION

1. See Figure 7-67. Connect Y/BK power wire and BK ground wire to terminal clips on horn.
2. See Figure 7-66. Attach horn (1) to fairing support bracket (4) using fastener (3). Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
3. Check horn operation. If horn does not sound or fails to function satisfactorily, see TROUBLESHOOTING.
   a. Turn ignition key switch ON.
   b. Press horn switch to activate horn.
   c. Turn ignition key switch OFF.
4. Install negative battery cable.

**⚠WARNING**

**After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift during vehicle operation and startle the rider, causing loss of control which could result in death or serious injury.**

5. Install seat. See 2.38 SEAT.




1. **Horn**
2. **Horn connectors [122 A & B]**
3. **Horn fastener**
4. **Fairing support bracket**

**Figure 7-66. Horn Assembly**

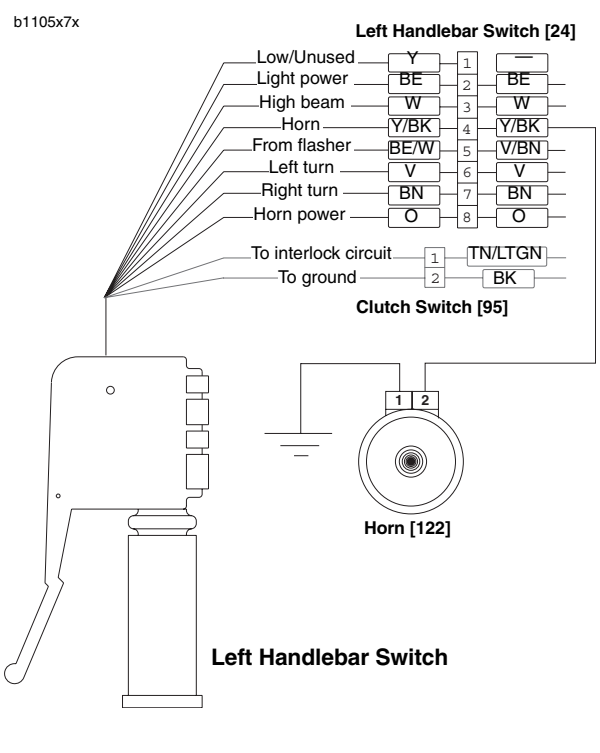



**Figure 7-67. Horn Wiring**

# TROUBLESHOOTING

1. If the horn does not sound or fails to function satisfactorily, check for the following conditions:
   a. Discharged battery.
   b. Loose, frayed or damaged wiring leading to horn terminal.
2. If battery has a satisfactory charge and wiring appears to be in good condition, test horn grounds and switch using voltmeter.
   a. See Figure 7-67. Remove Y/BK power and BK ground wires from terminal clips.
   b. Connect voltmeter positive (+) lead to Y/BK wire.
   c. Connect voltmeter negative (–) lead to ground.
   d. Turn ignition key switch ON.
3. See Figure 7-68. Depress horn switch and observe voltmeter reading.
   a. If battery voltage is present, horn or horn grounding is faulty. If horn is faulty, replace unit as an assembly. The horn is not repairable.
   b. If battery voltage is not present, either horn switch or wiring to horn is faulty. If horn switch is faulty, replace left handlebar switch. See 7.16 HANDLEBAR SWITCHES.

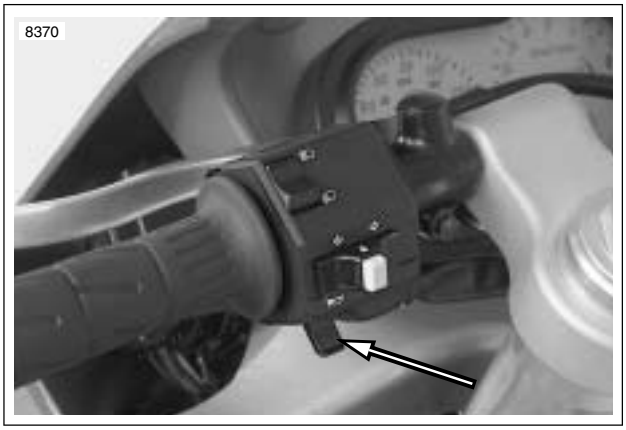



**Figure 7-68. Horn Switch**

# NEUTRAL INDICATOR SWITCH 7.21

## GENERAL

See Figure 7-69. The neutral indicator switch (2) is threaded into the transmission portion of the right crankcase half. It is immediately forward of the transmission sprocket (1). The sprocket cover must be removed to test the switch.

A pin on the shifter drum contacts the neutral indicator switch plunger, completing the neutral indicator circuit. The switch is not repairable. Replace the switch if it malfunctions.

## TESTING

1. Remove sprocket cover. See 2.30 SPROCKET COVER.
2. See Figure 7-69. Disconnect wire lead from neutral indicator switch (2).
3. Turn ignition key switch to ON. Touch the neutral indicator wire lead to a suitable ground.
   a. If indicator lamp lights, then problem is at indicator switch. Replace switch.
   b. If indicator lamp does not light, then problem is elsewhere in circuit. Check for loose connections, burned out indicator lamps or faulty wiring.
   c. After testing and repair, connect wire lead to indicator switch.
4. Install sprocket cover. See 2.30 SPROCKET COVER.

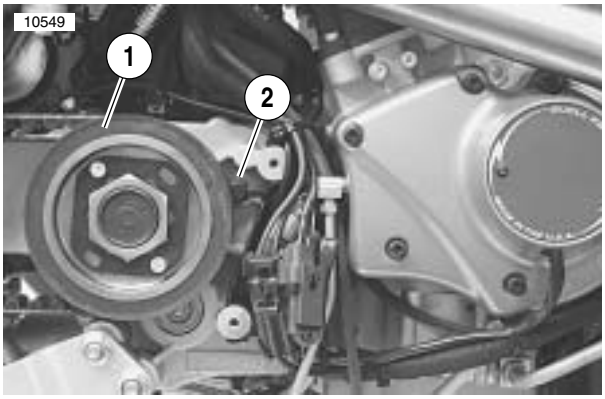
## REMOVAL/INSTALLATION

1. Verify that the ignition key switch is turned to OFF.
2. Remove sprocket cover. See 2.30 SPROCKET COVER.

*NOTE*

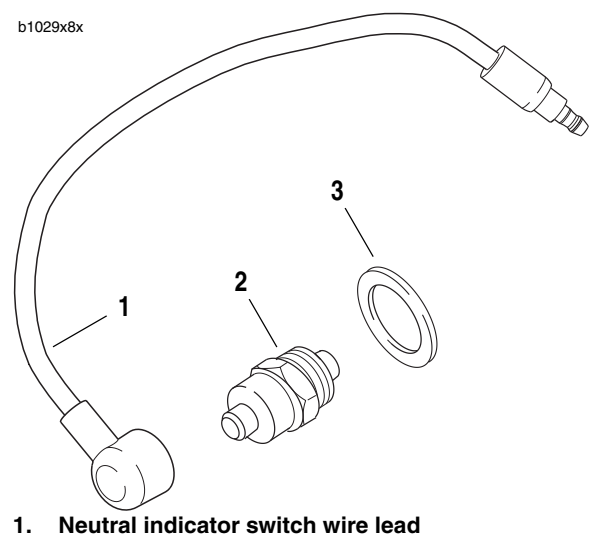
*If replacing neutral indicator switch wiring, see 7.24 INTERACTIVE EXHAUST HARNESS (XB12R) for correct wire routing.*

3. See Figure 7-70. Remove wire lead (1) from neutral indicator switch (2).
4. Remove neutral indicator switch and washer (3).
5. Install **new** neutral indicator switch.
   a. Apply a light coating of LOCTITE THREADLOCKER 243 (blue) to **new** neutral indicator switch (1) threads.
   b. Install washer (3) over neutral indicator switch (2) threads.
   c. Install switch in crankcase. Tighten switch to 36-60 **in-lbs** (4-6.8 Nm).
   d. Connect wire lead (1) to switch.
6. Install sprocket cover. See 2.30 SPROCKET COVER.




**1. Transmission sprocket**
**2. Neutral indicator switch**

**Figure 7-69. Neutral Indicator Switch Location**




**1. Neutral indicator switch wire lead**
**2. Neutral indicator switch**
**3. Washer**

**Figure 7-70. Neutral Indicator Switch**

## GENERAL

Buell motorcycles feature two components which protect the electrical system.

### Fuses

See Figure 7-71.The covered fuse block is behind the fairing on the right hand side of the motorcycle.

See Figure 7-72. The lights, key switch, brake/horn and ignition fuses are rated at 15 Amps. The ECM, cooling fan and accessory fuses are rated at 7.5 Amps.

Always investigate the cause of blown fuses before replacing them.

### Main Fuse

See Figure 7-73. The 30 Amp main fuse is located under the seat.

To disable the motorcycle's ignition system, pull the main fuse up and out of the main fuse holder.

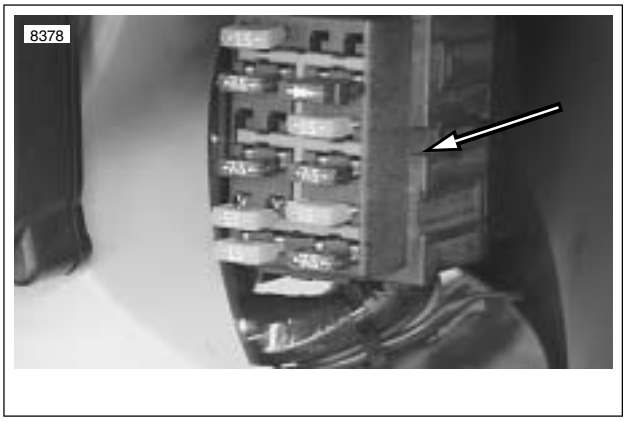



**Figure 7-71. Fuse Block**

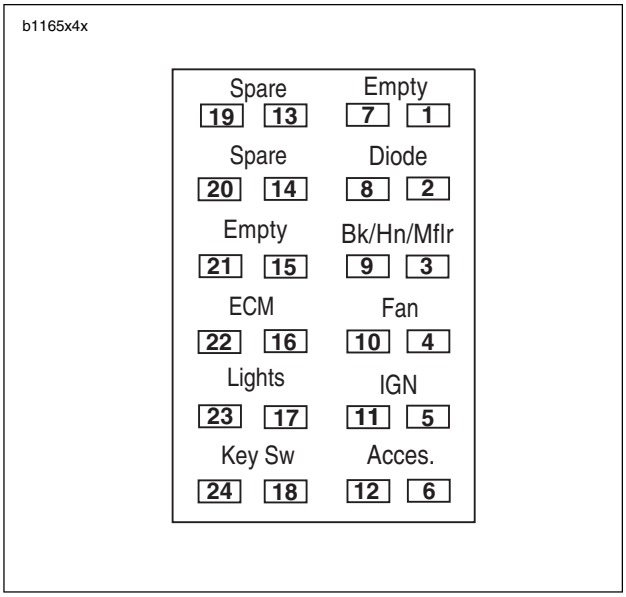
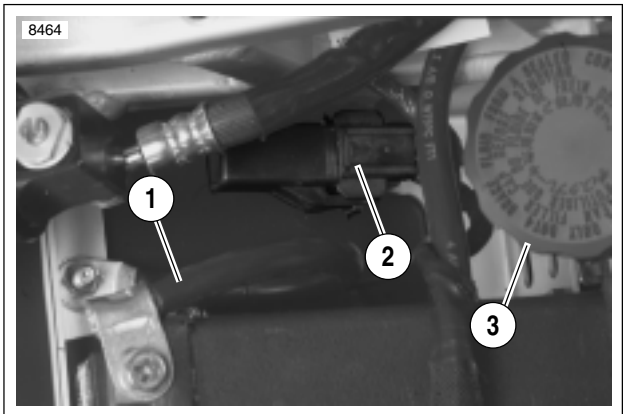



**Figure 7-72. Fuse Block**




1. **Negative battery cable**
2. **Main fuse holder**
3. **Rear brake fluid reservoir**

**Figure 7-73. 30 A Main Fuse Location**

## GENERAL

The main wire harness runs from the front of the motorcycle to the tail section where it connects to the tail section mini-harness.

Always replace plastic tree fasteners when replacing main wire harness. Remove tree fasteners carefully. do not leave any of fastener in frame.

## REMOVAL

*NOTES*

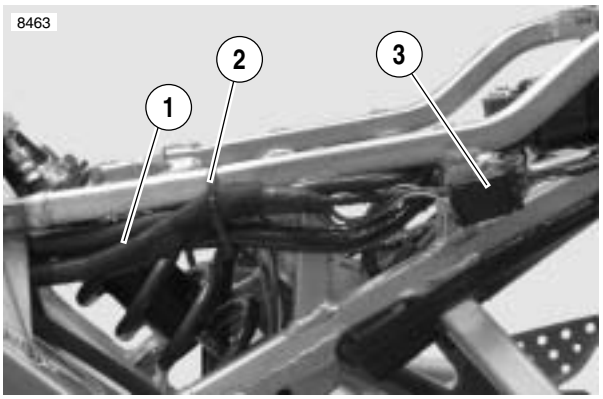
- *To ensure correct installation, make note of wire routing and cable strap locations before removing main wire harness.*
- *Main wire harness is removed from front of vehicle in between fork tube and frame.*

1. Remove seat. See 2.38 SEAT.

**⚠WARNING**

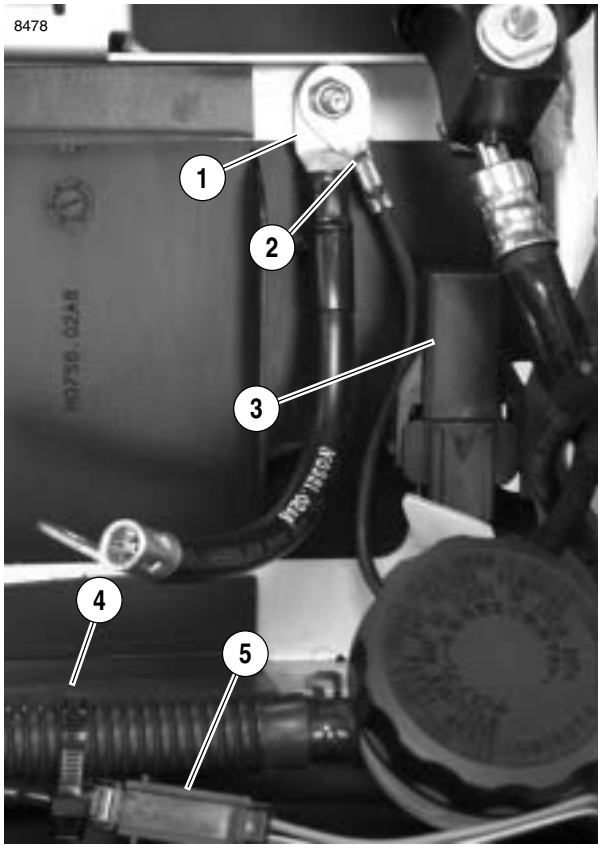
**Always disconnect the negative battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.**

2. Unthread fastener and remove battery negative cable (black) from battery negative (-) terminal.
3. Pull back terminal cover boot.
4. Unthread fastener and remove battery positive cable (red) from battery positive (+) terminal.
5. Disconnect positive battery cable from starter.
6. Remove tail frame upper body work. 2.36 SUBFRAME TAIL ASSEMBLY AND BODY WORK.
7. See Figure 7-74. Disconnect tail harness connector [7] (3).
8. See Figure 7-75. Remove wire harness ground (2).
9. Remove main fuse case (3).
10. Disconnect foot brake light switch connector [121] (5).
11. Remove the rear shock absorber assembly and reservoir. See 2.22 REAR SHOCK ABSORBER.
12. Remove fan. See 4.24 COOLING FAN.




1. **Main wire harness**
2. **Cable strap**
3. **Tail harness connector [7]**

**Figure 7-74. Tail Harness Connector**




1. **Main battery ground**
2. **Wire harness ground**
3. **Main fuse case**
4. **Cable strap**
5. **Foot brake light switch connector [121]**

**Figure 7-75. Battery Tray Wiring**

13. Disconnect wiring located under sprocket cover. See 7.25 SPROCKET COVER WIRING.
14. Remove connector from oil pressure switch [120]. Oil pressure switch is located on front of engine.
15. Rotate engine. See 3.3 ENGINE ROTATION FOR SERVICE.
16. Disconnect intake air temperature sensor [89].
17. Disconnect throttle position sensor [88].
18. Remove fan connector [97]. Fan connector is located behind rear cylinder.
19. Remove upper fork clamp. 2.17 FORK CLAMPS, UPPER AND LOWER.
20. Remove fairing. See 2.37 FRONT FAIRING, WINDSHIELD, AND MIRRORS.
21. Disconnect:
    a. Flasher connector [30].
    b. Bank angle sensor connector [134].
    c. Electronic control module (ECM). 4.16 ELECTRONIC CONTROL MODULE.
    d. Instrument module connector [39].
    e. Horn connectors [122].
    f. Ground terminals on front of steering head.
    g. Left switch housing connector [24] and right switch housing connector [22].
    h. Clutch switch [95] from left switch housing.
    i. Front brake switch [121] from right switch housing.
    j. headlight connector. [38].
22. Remove fuse block and relay block by removing fasteners securing them to fairing support bracket.
23. Remove fuse and relay bundle clamps.
24. Remove fuse block and relay block from their brackets.
25. Remove any remaining cable straps and clamps securing wire harness and remove harness from front of vehicle.

# INSTALLATION

*NOTE*

*For more information on wire harness and hose routing, see D.1 HOSE AND WIRE ROUTING.*

1. Feed rear portion of **new** harness between left front fork and frame.
2. Continue to feed rear and center portion of harness between left side of engine and frame.
3. Place connectors in general location of installation.
4. Secure plastic harness holder to left inside portion of frame using plastic tree fasteners.

*NOTE*

*Fuel line is installed under engine connector portion of wire harness.*

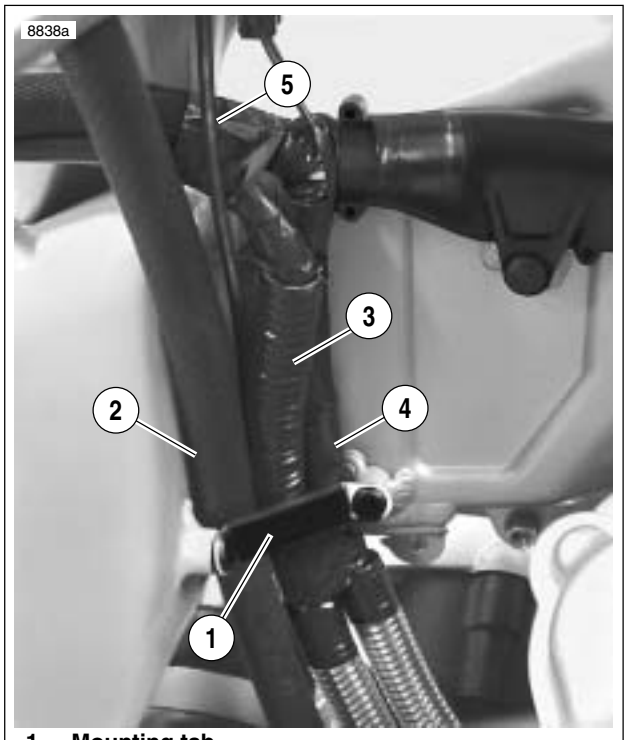
5. See Figure 7-76. Install clamp over portion of harness that leads to engine connectors. Install clamp as shown using new plastic tree fastener.
6. See Figure 7-77. Route portion of main wire harness that contains the positive battery cable (3), sprocket cover wiring (4) and transmission vent hose (2) through corner mounting tab (1) at rear of frame. Install **new** plastic tree fasteners.
7. Connect throttle position sensor [88].
8. Rotate motor into position. See REASSEMBLY under 3.3 ENGINE ROTATION FOR SERVICE.
9. Install sprocket cover wiring. See 7.25 SPROCKET COVER WIRING.
10. Install oil pressure switch connector to oil pressure switch.
11. See Figure 7-78. Install cable straps:
    a. Front cable strap (3) secures voltage regulator and oil pressure switch wiring.
    b. Middle cable strap (2) secures voltage regulator, oil pressure switch and cam position sensor wiring.
    c. Rear cable strap (1) secures conduit to voltage regulator wiring.

*NOTE*

*Snap fuse and relay blocks into mounting brackets before installing blocks to fairing mounting bracket.*

12. Place clamp (2) around fuse block wiring. Mount fuse block (1) and clamp to fairing support bracket using top fastener (4) and bottom fastener (3). Tighten fasteners to 72-96 **in-lbs** (8.1-10.8 Nm).
13. Repeat previous steps for relay block.
14. Install steering head clamp around wire harness and secure clamp to fairing support bracket with loop facing vehicle. Tighten fastener to 16-18 ft-lbs (21.7-24.4 Nm).


**Figure 7-76. Wire Harness Clip**




1. **Mounting tab**
2. **Transmission vent hose**
3. **Positive battery cable**
4. **Sprocket cover wiring**
5. **Interactive exhaust cable (XB12R only)**

**Figure 7-77. Corner Mounting Tab**

15. Install upper fork clamp. See INSTALLATION under 2.17 FORK CLAMPS, UPPER AND LOWER.
16. Connect:
    a. headlight connector [38].
    b. Front brake switch [121] to right switch housing.
    c. Clutch switch [95] to left switch housing.
    d. Left switch housing connector [24] and right switch housing connector [22].
    e. Ignition switch [33].
    f. Ground terminals on front of steering head.
    g. Horn connectors [122].
    h. Instrument module connector [39].
    i. Install electronic control module. See INSTALLATION under 4.16 ELECTRONIC CONTROL MODULE.
    j. Bank angle sensor connector [134].
    k. Flasher connector [30].
17. See Figure 7-80. Verify proper fairing wire routing and cable strap locations.
18. Verify that front forks can be turned from full left to full right lock without wire harness binding or pinching.
19. Install fairing. See INSTALLATION under 2.37 FRONT FAIRING, WINDSHIELD, AND MIRRORS.
20. Connect fan connector [97].
21. Install fan and tighten fasteners to 12-36 **in-lbs** (1.4-4.1 Nm). See 4.24 COOLING FAN.
22. Install rear shock absorber assembly. See 2.22 REAR SHOCK ABSORBER.
23. See Figure 7-75. Connect foot brake light switch connector [121] (5). Install cable strap (4).
24. Install main fuse case (3).
25. Install main battery ground (1) and wire harness ground (2). Tighten fastener to 48-72 **in-lbs** (5.4-8.1 Nm).
26. See Figure 7-74. Connect tail harness connector (3). Attach cable strap (2).
27. Install starter side of positive battery cable to starter.

**⚠WARNING**

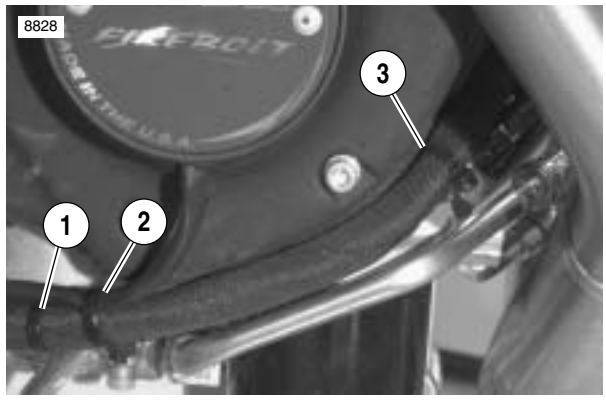
**Always connect the positive battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.**

28. Install positive battery cable (red) to positive terminal of battery. Tighten to 72-96 **in-lbs** (8-11 Nm).
29. Connect negative battery cable. Tighten to 72-96 **in-lbs** (8-11 Nm).
30. Install tail frame upper body work. See 2.36 SUBFRAME TAIL ASSEMBLY AND BODY WORK.

**⚠WARNING**

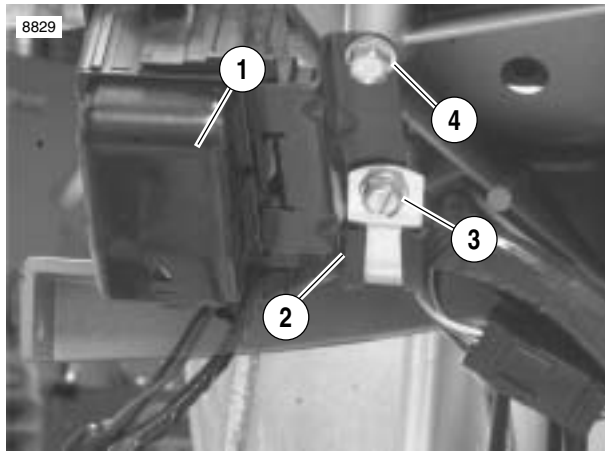
**After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift during vehicle operation and startle the rider, causing loss of control which could result in death or serious injury.**

31. Install seat. See 2.38 SEAT.



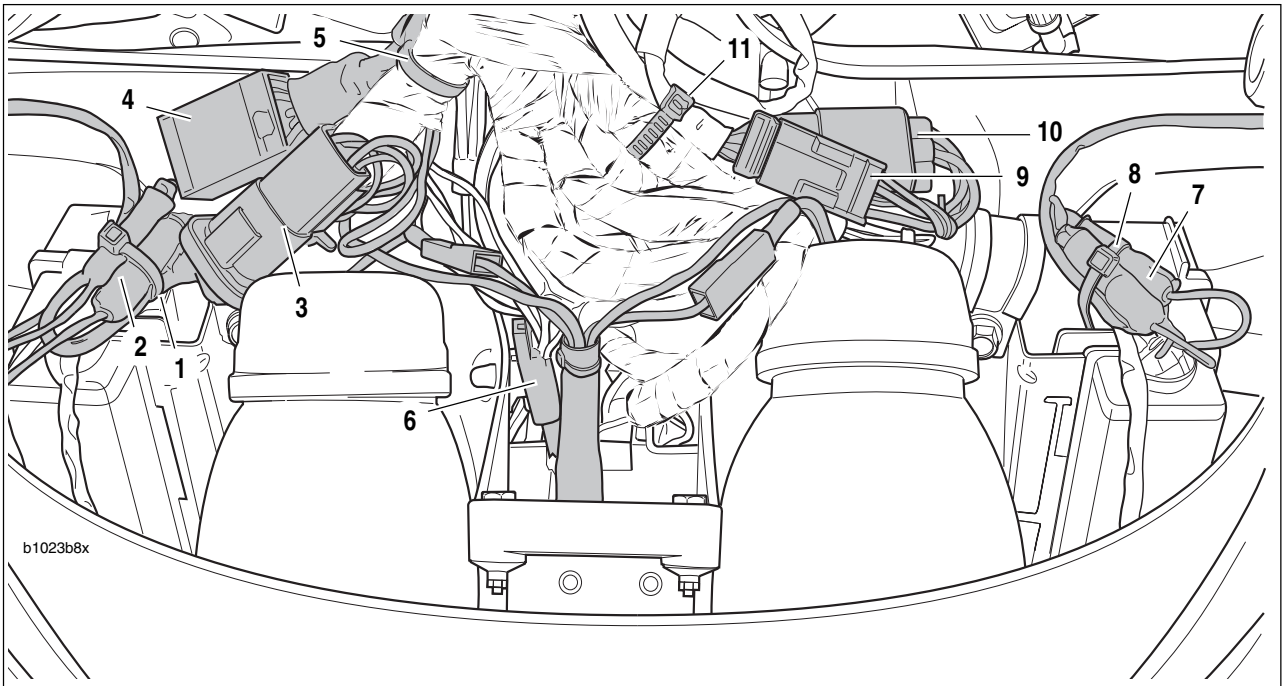

1. **Rear cable strap**
2. **Middle cable strap**
3. **Front cable strap**

**Figure 7-78. Cable Straps**




1. **Fuse block**
2. **Clamp**
3. **Bottom fuse block fastener**
4. **Top fuse block fastener**

**Figure 7-79. Fuse Block**



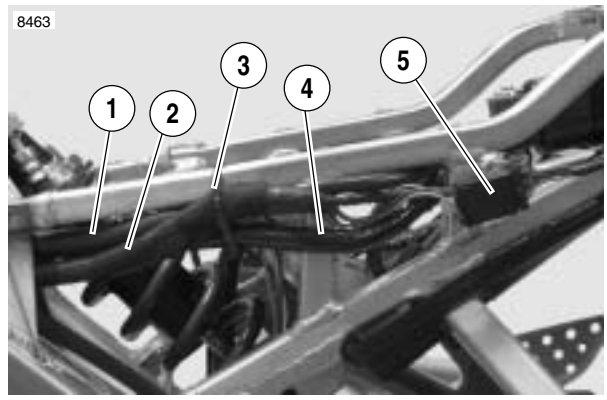

1. Cable strap
2. Left turn signal connectors
3. Data link [91]
4. Left switch housing connector [24]
5. Cable strap
6. Headlight connector [38]
7. Right turn signal connectors
8. Cable strap
9. Right switch housing connector [22]
10. Ignition switch connector [33]
11. Cable strap

**Figure 7-80. Fairing Wiring (viewed from underneath fairing)**

# INTERACTIVE EXHAUST HARNESS (XB12R) 7.24

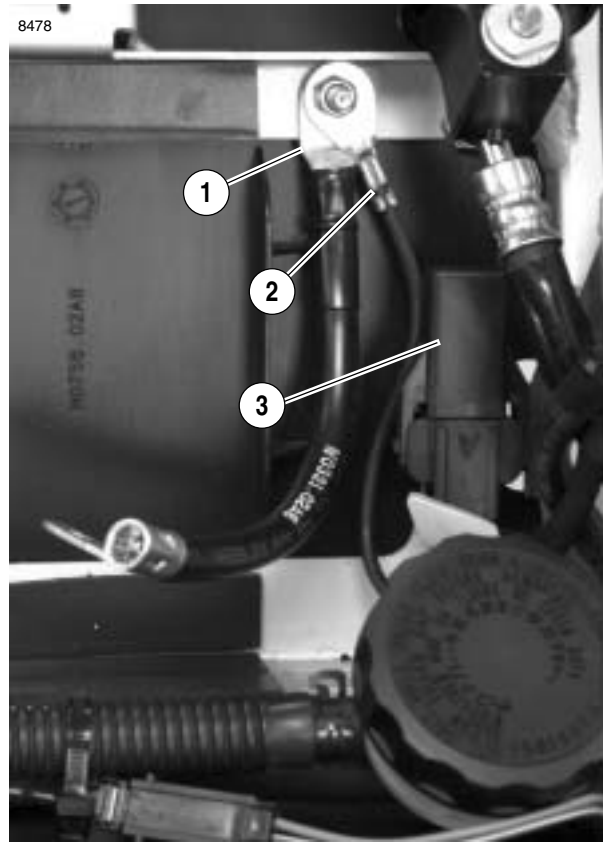
## REMOVAL

1. Remove seat and pillion. See 2.38 SEAT.
2. Remove four fasteners, nylon washers and intake cover assembly. See 2.34 INTAKE COVER ASSEMBLY.
3. Remove negative battery cable from battery.
4. Remove main battery ground and the exhaust actuator ground.
5. Remove the subframe tail body work. See 2.36 SUBFRAME TAIL ASSEMBLY AND BODY WORK.
6. See Figure 7-81. Separate exhaust actuator harness connector [165] (2) at main harness.
7. Note location of cable strap and cut as required.
8. Pull actuator harness through frame.
9. Move foam rubber isolator out of the way and disconnect connector [161B] from actuator.
10. If removing actuator:
    a. Add free play to interactive exhaust cable, loosen jam nut and remove cable from bracket. See 7.6 INTERACTIVE EXHAUST SYSTEM (XB12R).
    b. Remove interactive exhaust cable from cable wheel.
    c. Remove actuator.




1. **Fuel vent hose**
2. **Main wire harness**
3. **Cable strap**
4. **Rear shock reservoir hose**
5. **Main wire harness connection [165]**

**Figure 7-81. Left Side Subframe Hose and Wire Routing**




1. **Main battery ground**
2. **Wire harness ground**
3. **Main fuse case**

**Figure 2-82. Battery and Harness Ground (battery removed for clarity)**

# INSTALLATION

1. Mate actuator connector[161B] to actuator.
2. See Figure 7-83. If installing actuator:
   a. Attach interactive exhaust cable (4) to cable wheel (3) on actuator.
   b. Install foam rubber isolator (2) and actuator and fuel tank vent hose (1).
   c. Adjust cable (4). See 1.17 INTERACTIVE EXHAUST CABLE (XB12R).
3. Route harness along channel in airbox under frame and under main wiring harness.

**CAUTION**

**If cable is routed in front of the frame lug it will cause the muffler valve to stay open not allowing it to work properly.**

4. See Figure 1-84. Verify that the interactive exhaust cable (2) is routed behind the frame lug (1) before installing air intake cover.
5. Route under battery cables.
6. Mate exhaust actuator harness connector halves [165].
7. Cable wrap were noted.
8. Install ground bolt through main battery ground cable and actuator ground wire. Tighten to 48-60 **in-lbs** (5.4-6.7 Nm).

**⚠WARNING**

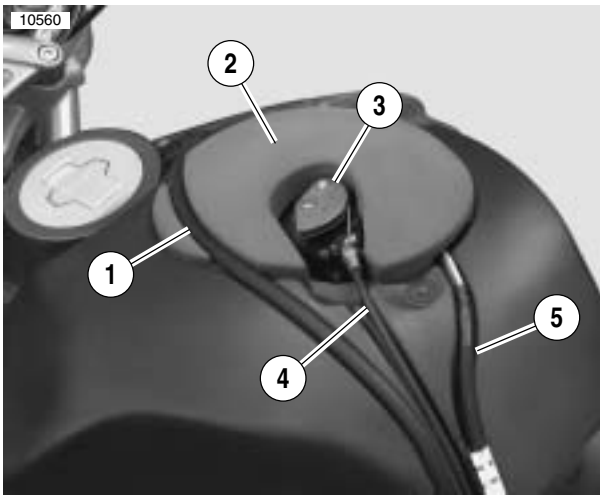
**Always connect positive battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.**

9. Connect negative battery cable to battery terminal. Tighten fastener to 72-96 **in-lbs** (8-11 Nm).
10. Install subframe tail body work.
11. Install intake cover. Tighten fasteners to 12-36 in-lbs (1.4-4.0 Nm).

**⚠WARNING**

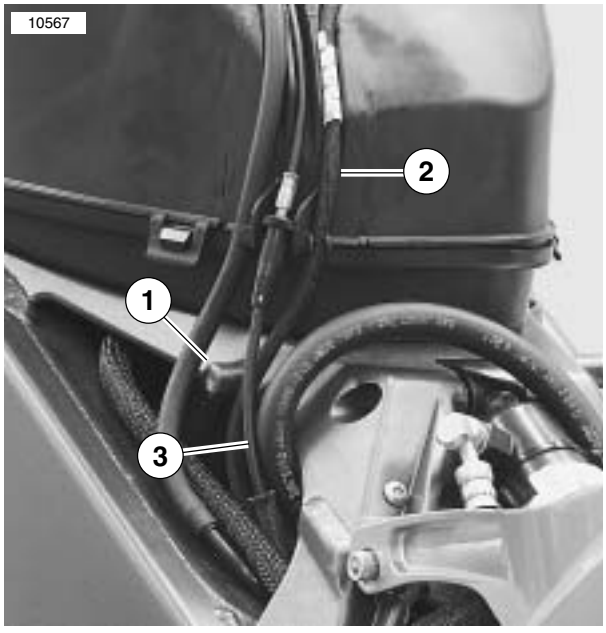
**Pull up on seat to verify that it is properly secured, front and rear. A loose seat may shift during vehicle operation and startle the rider, possibly causing loss of vehicle control resulting in death or serious injury.**

12. Install seat and pillion.




1. **Fuel tank vent hose**
2. **Foam rubber**
3. **Interactive exhaust actuator cable wheel**
4. **Cable**
5. **Wire harness**

**Figure 7-83. Interactive Exhaust Installation**




1. **Frame lug**
2. **Wire harness**
3. **Cable**

**Figure 1-84. Correct Cable Routing Behind Frame Lug**

# SPROCKET COVER WIRING 7.25

## GENERAL

Connectors for the stator [46], voltage regulator [77], vehicle speed sensor [65], cam position sensor [14] and neutral switch [131] are located under the sprocket cover.

## REMOVAL

1. Remove sprocket cover. See 2.30 SPROCKET COVER.
2. See Figure 7-85. Disconnect appropriate connector(s).

## INSTALLATION

*NOTE*

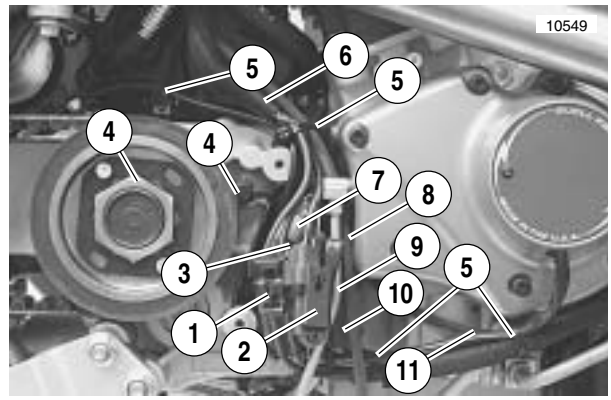
See *Figure 7-85. All wiring under sprocket cover that gets routed from sprocket area towards front of vehicle is routed behind cam cover breather hose (8).*

1. Route oil pressure switch wiring (10) from main harness (6), behind cam cover breather hose (8) to oil pressure switch located on front of engine.
2. Route sidestand switch wiring (not shown) from main harness, underneath engine and to sidestand switch [133].

*NOTE*

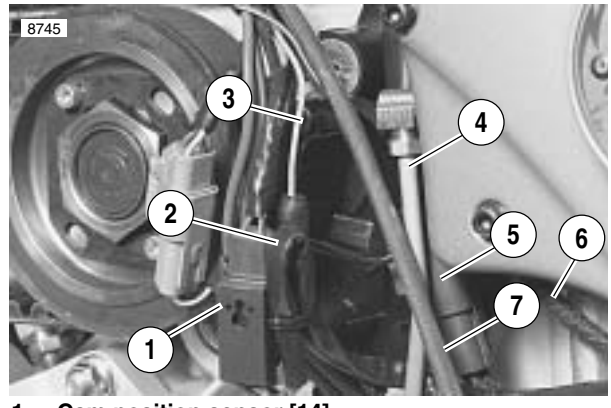
*Stator connector wiring is installed over oil pressure and sidestand switch wiring.*

3. Connect stator connector (9).
4. See Figure 7-86. Connect cam position sensor [14] (1). Form a loop (2) as shown using wiring leading to cam position sensor.
5. See Figure 7-87. Connect neutral switch connector.
6. See Figure 7-88. Form a loop (6) as shown using neutral switch wiring.




1. **Voltage regulator connector [77]**
2. **Cam position sensor connector [14]**
3. **Neutral switch connector [131] (approximate location)**
4. **Neutral switch location**
5. **Cable strap**
6. **Main harness**
7. **Vehicle speed sensor connector [65]**
8. **Interactive exhaust cable**
9. **Cam cover breather hose**
10. **Stator connector [46]**
11. **Oil pressure switch wiring**

**Figure 7-85. Sprocket Cover Wiring**




1. **Cam position sensor [14]**
2. **Loop in voltage regulator wiring**
3. **Neutral switch location**
4. **Cam cover breather hose**
5. **Stator connector [46]**
6. **Oil pressure switch wiring**
7. **Interactive exhaust cable**

**Figure 7-86. Cam Position Sensor Wiring**

*NOTE*

*In next step, be sure loops in cam position sensor and neutral switch wiring are intact.*

7. Use cable strap (5) to secure cam position sensor (1), cam position sensor wiring (3), neutral switch connector (4) and neutral switch connector wiring (6).
8. See Figure 7-89. Connect vehicle speed sensor connector.

*NOTE*

*See Figure 7-90. In next step, be sure main harness (4) is routed around sprocket cover boss (2).*

9. See Figure 7-90. Connect voltage regulator connector [77] (1). Be sure connector latch faces inward and voltage regulator wires are positioned behind other wires in harness at sprocket cover boss (2).
10. Install cable strap (3) securing vehicle speed sensor wiring to starter connector [128] wiring.
11. Install cable strap (5) securing main harness wiring.
12. Install cable strap (6) securing stator, cam position sensor and oil pressure switch wiring.
13. Add cable strap (7) to secure cam position sensor and voltage regulator wiring.

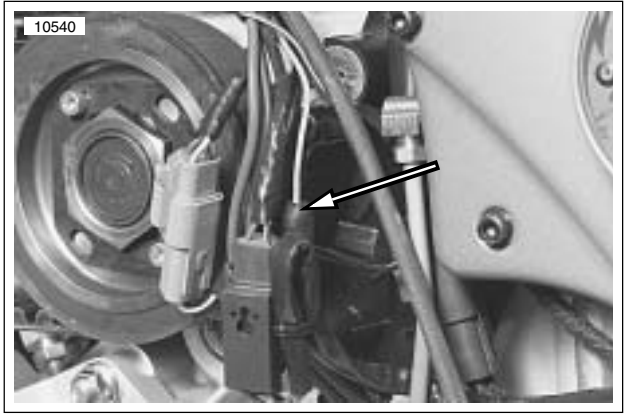
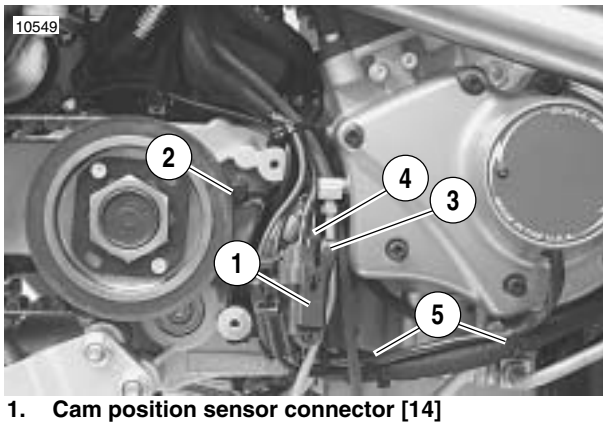



**Figure 7-87. Neutral Switch Connector [131]**




1. **Cam position sensor connector [14]**
2. **Neutral switch location**
3. **Cam position sensor wiring**
4. **Neutral switch connector [131]**
5. **Cable strap**

**Figure 7-88. Neutral Switch Wiring**

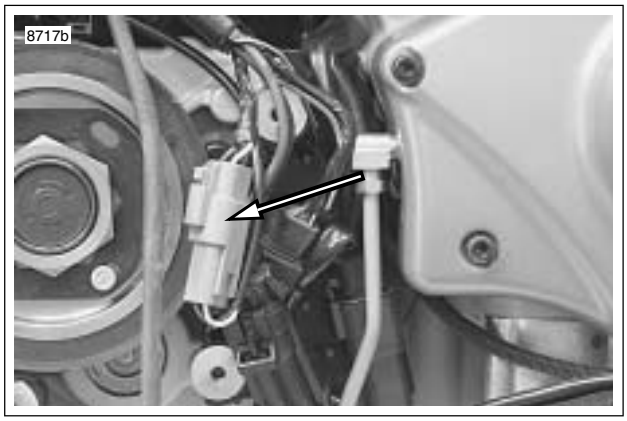
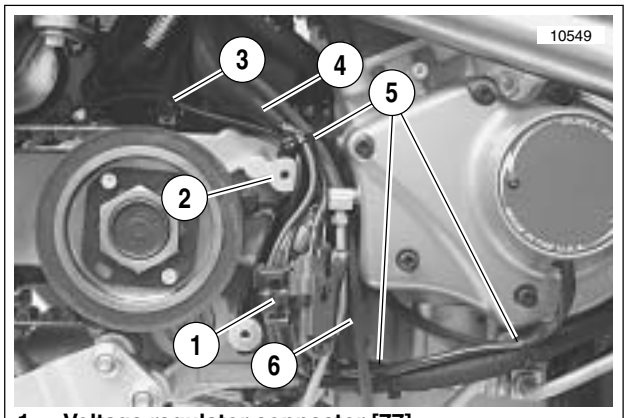



**Figure 7-89. Vehicle Speed Sensor Connector [65]**




1. **Voltage regulator connector [77]**
2. **Sprocket cover boss**
3. **Cable strap**
4. **Main harness**
5. **Cable strap**
6. **Interactive exhaust cable**

**Figure 7-90. Assembled Wiring**