

GENERAL

The charging system consists of the alternator and regulator. Charging system circuits are shown in [Figure 7-25](#).

NOTE

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. 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.

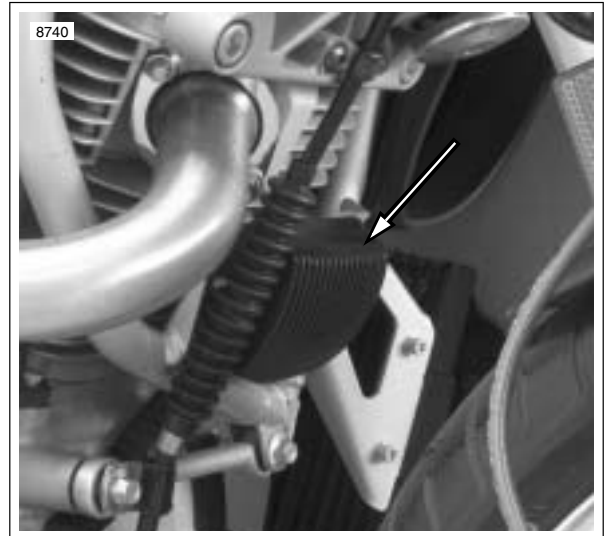


Figure 7-23. Voltage Regulator

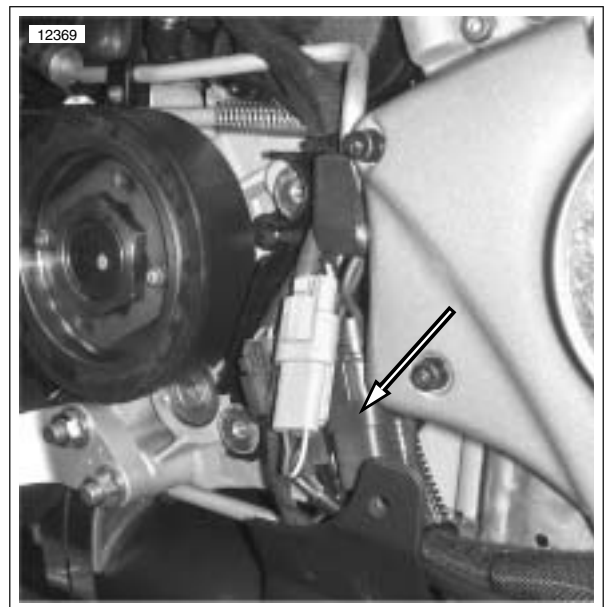
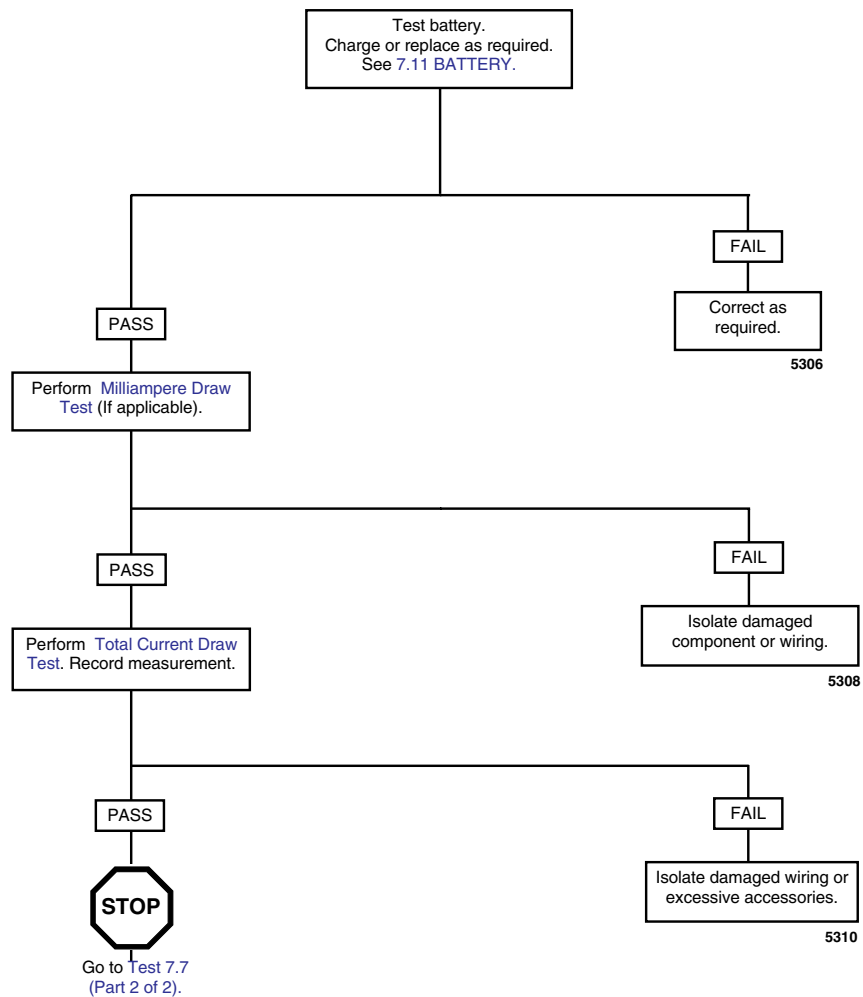


Figure 7-24. Stator Connector [46]

Test 7.7 (Part 1 of 2)

SYMPTOM: BATTERY BECOMES DISCHARGED

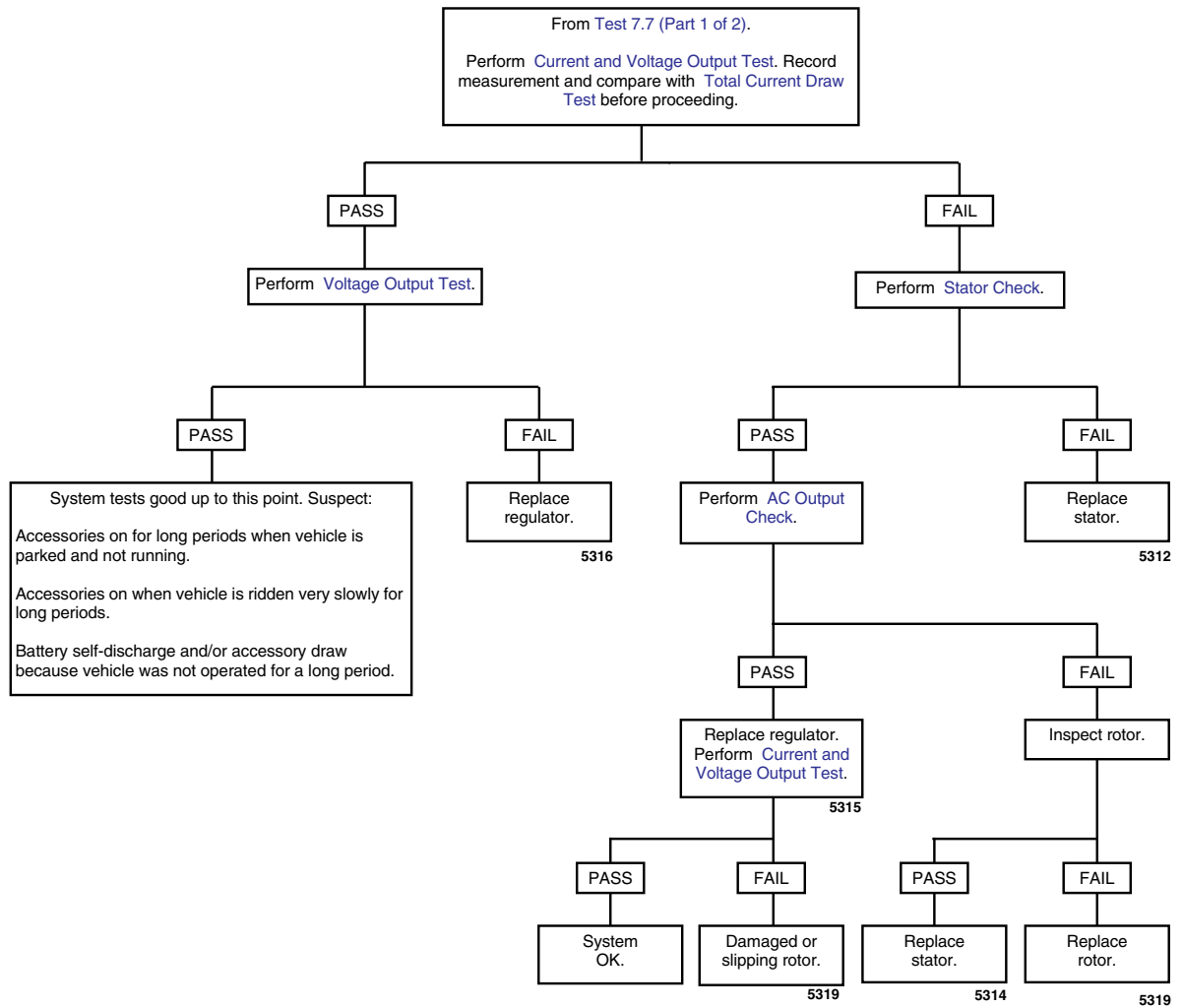


NOTE

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.

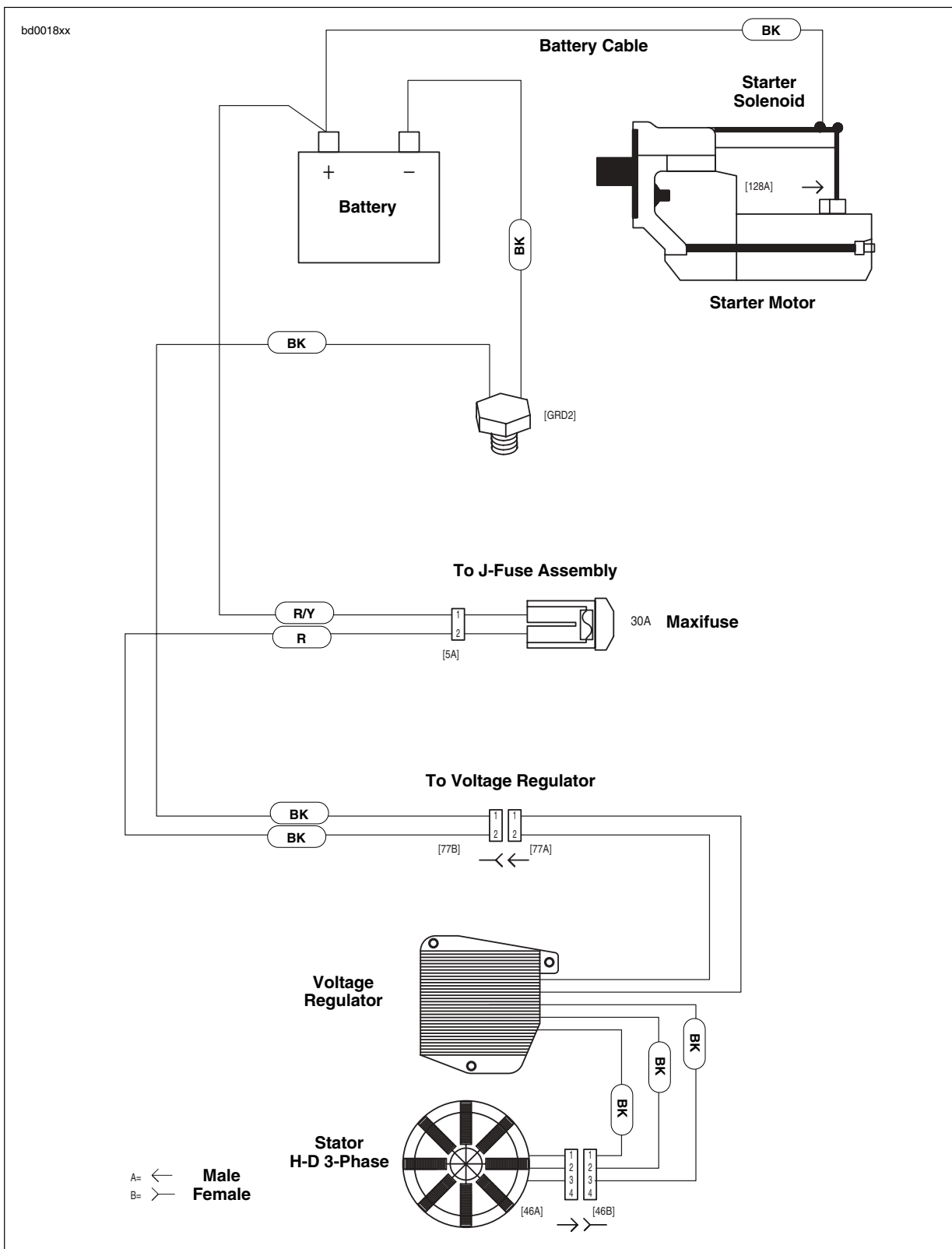


Figure 7-25. Charging System Circuit

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 2.0 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

Turn battery load tester OFF before connecting tester cables to battery terminals. Connecting tester cables with load tester ON can cause a spark and battery explosion, which could result in death or serious injury. (00252a)

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 7.25 SPROCKET COVER WIRING. 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.

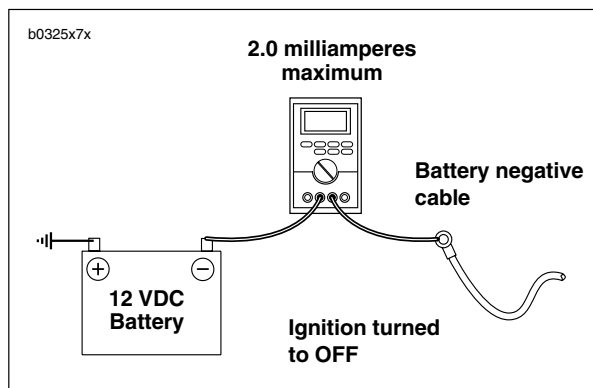


Figure 7-26. Milliampere Draw Test

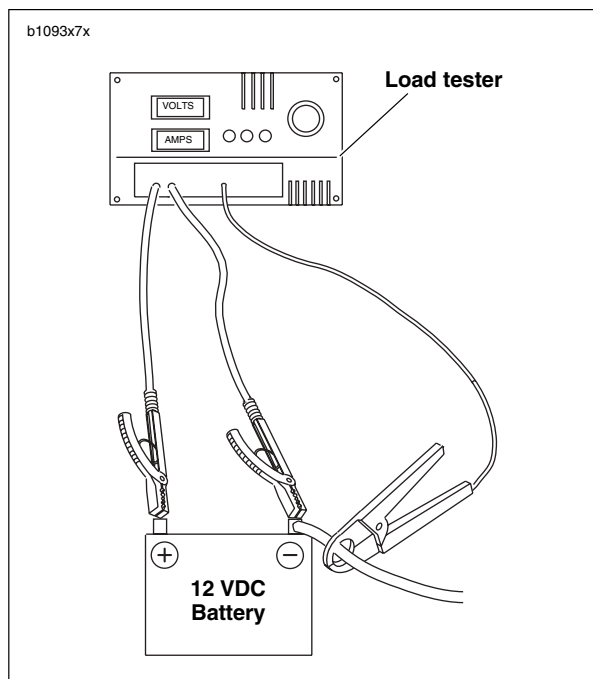


Figure 7-27. Check Current Draw (Ignition Switch On)

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.

NOTE

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 [7.25 SPROCKET COVER WIRING](#). 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.

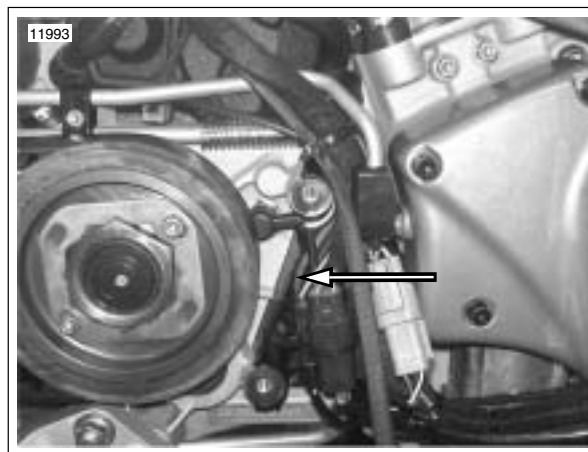


Figure 7-28. Positive Regulator Cable (red wire)

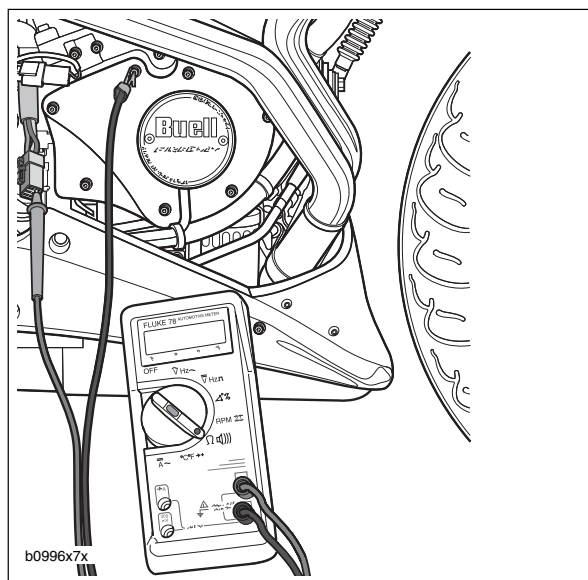


Figure 7-29. Test for Grounded Stator

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 7-28](#).

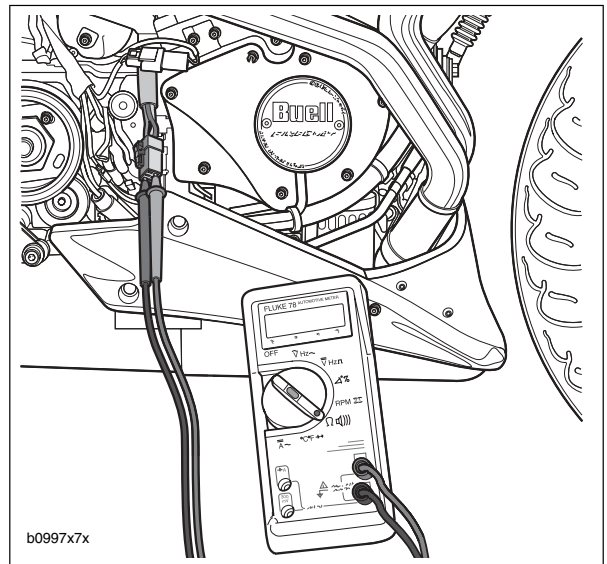


Figure 7-30. Check for Stator Resistance

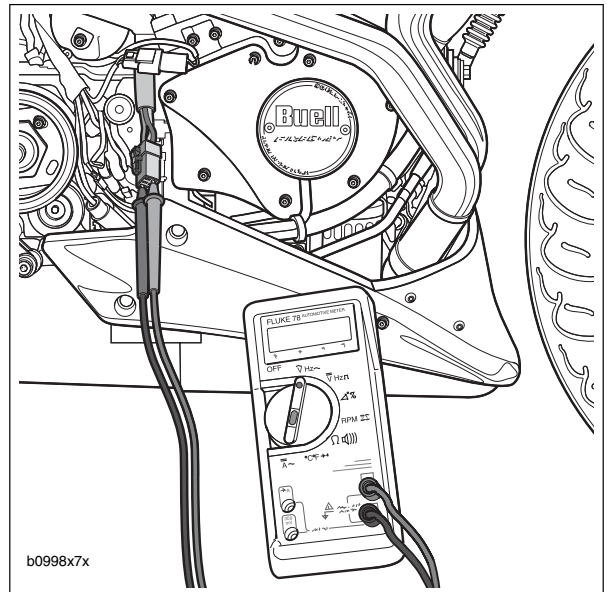


Figure 7-31. Check Stator AC Voltage Output

REMOVAL/DISASSEMBLY

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

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 [6.5 PRIMARY CHAIN](#).
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 [7.25 SPROCKET COVER WIRING](#).
2. Remove cable straps holding stator wire to wire harness.

NOTE

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.

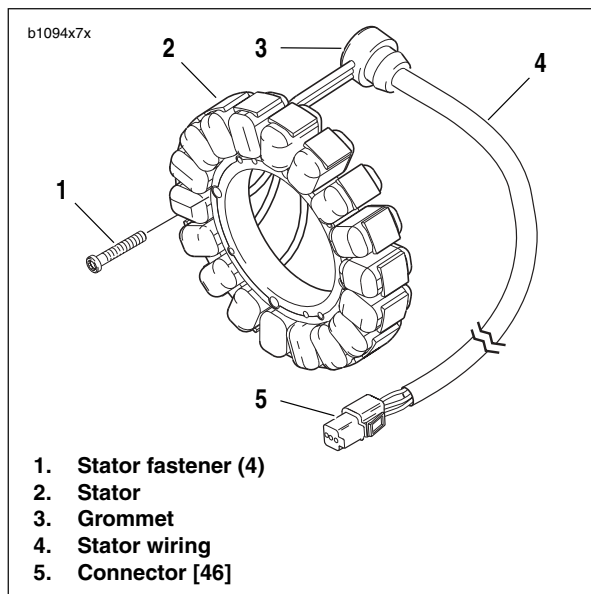
3. See [Figure 7-34](#). Remove connector (5) [46] from the stator wiring (4). See [B.2 DEUTSCH ELECTRICAL CONNECTORS](#) for additional information.
4. Remove and discard the four TORX screws (1) which secure stator (2) to left crankcase half.
5. Remove retainer plate fasteners.
6. Remove stator wiring grommet (3) from left crankcase half.
7. 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.

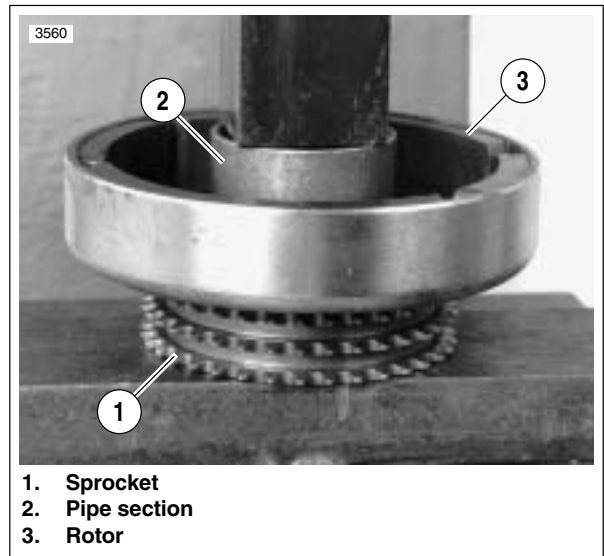
NOTE

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. Install retainer plate with **new** fasteners and tighten to 56 **in-lbs** (6.3Nm).
5. See [Figure 7-34](#). Route stator wiring (4) behind rear cylinder and in front of transmission breather hose.
 - a. Route stator wire (4) between The vent oil line and the return oil line.
 - b. Install connector (5) [46] onto the stator wiring (4) using cavities 1, 2, 3 of connector (5) [446]. See [B.2 DEUTSCH ELECTRICAL CONNECTORS](#) for additional information.

NOTE

See [7.25 SPROCKET COVER WIRING](#) for remaining wire routing information.



1. Sprocket
2. Pipe section
3. Rotor

Figure 7-35. Pressing Rotor onto Sprocket

6. 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 eight **new** 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 120-140 **in-lbs** (13.5-15.8 Nm).
7. Install clutch assembly, primary chain and engine sprocket/rotor assembly as a unit. See [6.5 PRIMARY CHAIN](#).
8. Install primary cover. See [6.2 PRIMARY COVER](#).
9. Connect negative battery cable.
10. Test charging system. See [7.7 CHARGING SYSTEM](#).

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 prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a).

2. Disconnect negative battery cable from battery.

IMPORTANT NOTE

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 [7.25 SPROCKET COVER WIRING](#).
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 fasteners (5) to 60-72in-lbs (6.7-8 Nm).
2. Connect stator connector [46] (1) and voltage regulator connector [77] (2) located under sprocket cover. See [7.25 SPROCKET COVER WIRING](#).
3. Connect negative battery cable to battery terminal.

WARNING

After installing seat, pull upward on front of seat to be sure it is in locked position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070a)

4. Install seat. See [2.38 SEAT](#).
5. Test charging system. See [7.7 CHARGING SYSTEM](#).

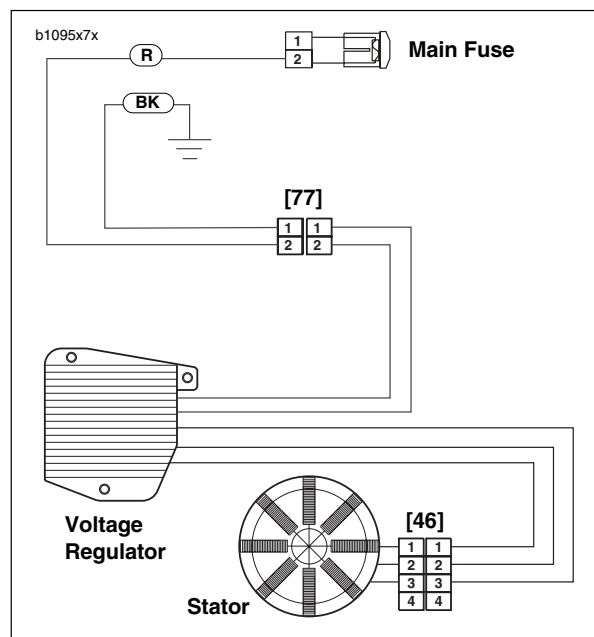


Figure 7-36. Voltage Regulator Connector [77]

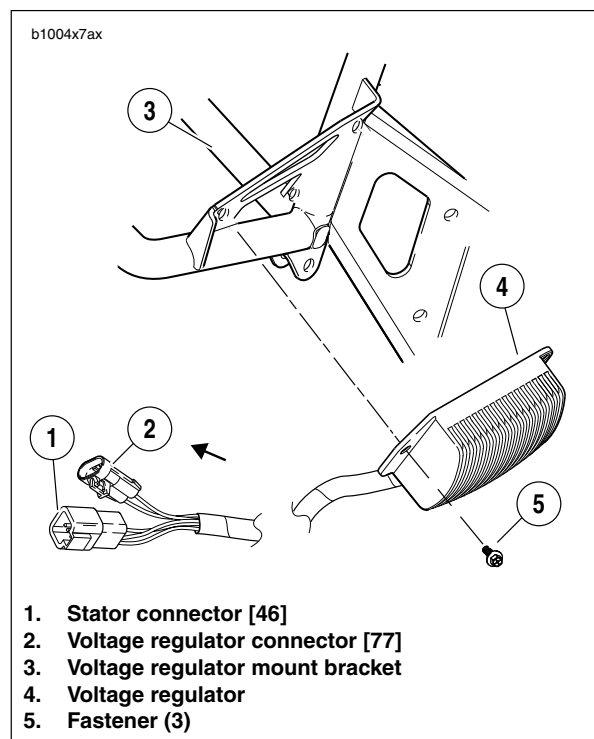


Figure 7-37. Voltage Regulator

REMOVAL

⚠ WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

⚠ WARNING

Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)

- See Figure 7-38. Disconnect negative and positive cables from battery, negative cable first.
 - Remove fastener holding negative cable to negative terminal.
 - Remove fastener holding positive cable to positive battery terminal.
- See Figure 7-39. Remove fastener to detach negative battery cable from frame.
- See Figure 7-40. Remove protective rubber boot from starter fastener. Remove fastener with washer to detach positive battery cable from starter.
- Cut 14 gauge wire, Red/Yellow, approximately 6 in. (152.4 mm) below the positive battery terminal.

INSTALLATION

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

⚠ WARNING

Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

CAUTION

Connect the cables to the correct battery terminals. Failure to do so could result in damage to the motorcycle electrical system. (00215a)

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

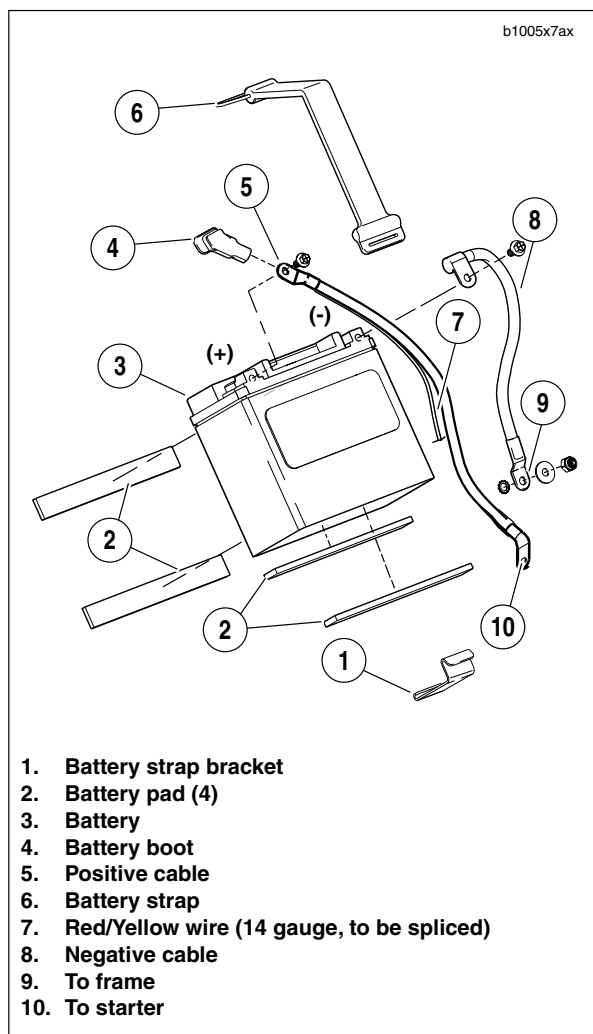


Figure 7-38. Battery

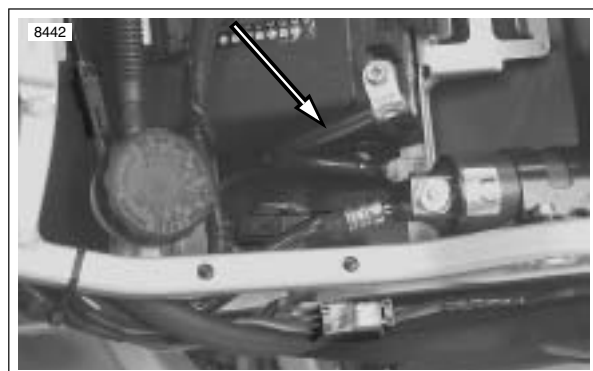
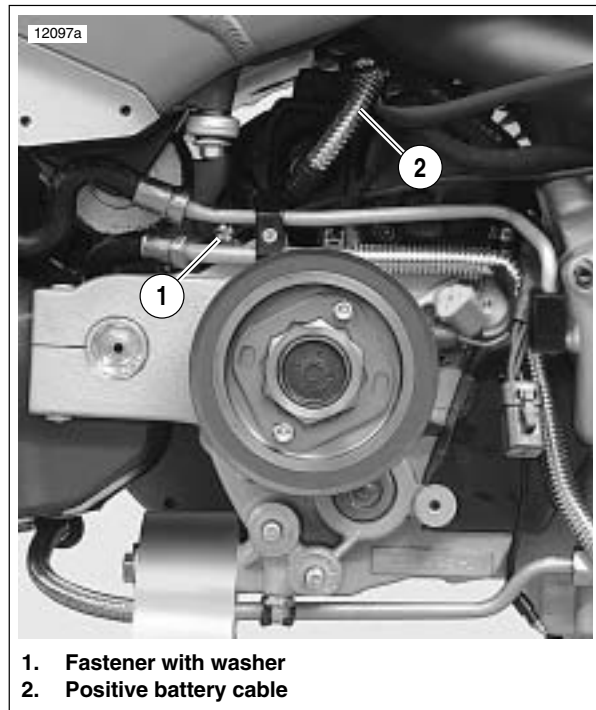


Figure 7-39. Negative Battery Cable

4. Connect cables to battery.
 - a. See [Figure 7-38](#). Positive battery cable runs from starter to positive battery terminal.
 - b. Splice 14 gauge Red/Yellow wire from positive battery cable to main fuse wire.
 - c. Connect positive cable to positive (+) battery terminal using fastener.
 - d. Connect negative cable to negative (-) battery terminal using fastener.
 - e. Tighten terminal fasteners to 72-96 **in-lbs** (8-11 Nm).



**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

Batteries contain sulfuric acid, which could cause severe burns to eyes and skin. Wear a protective face shield, rubberized gloves and protective clothing when working with batteries. KEEP BATTERIES AWAY FROM CHILDREN. (00063a)

⚠ WARNING

Figure 7-41. Never remove warning label attached to top of battery. Failure to read and understand all precautions contained in warning, could result in death or serious injury. (00064a)

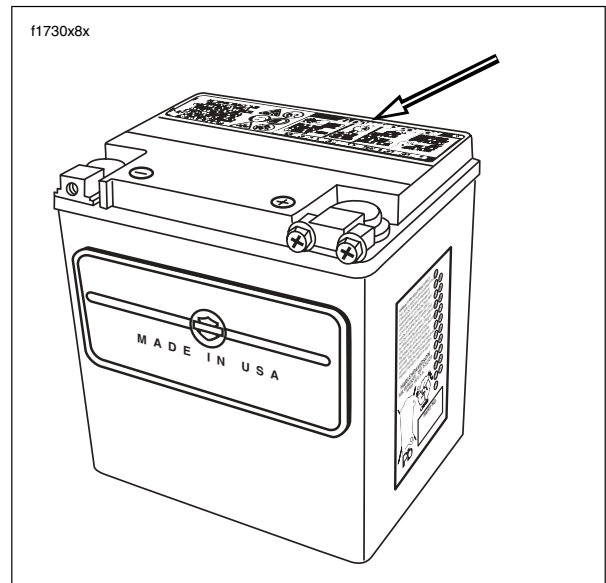


Figure 7-41. Battery Warning Label Location

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.
Eyes	Flush with water, get immediate medical attention.

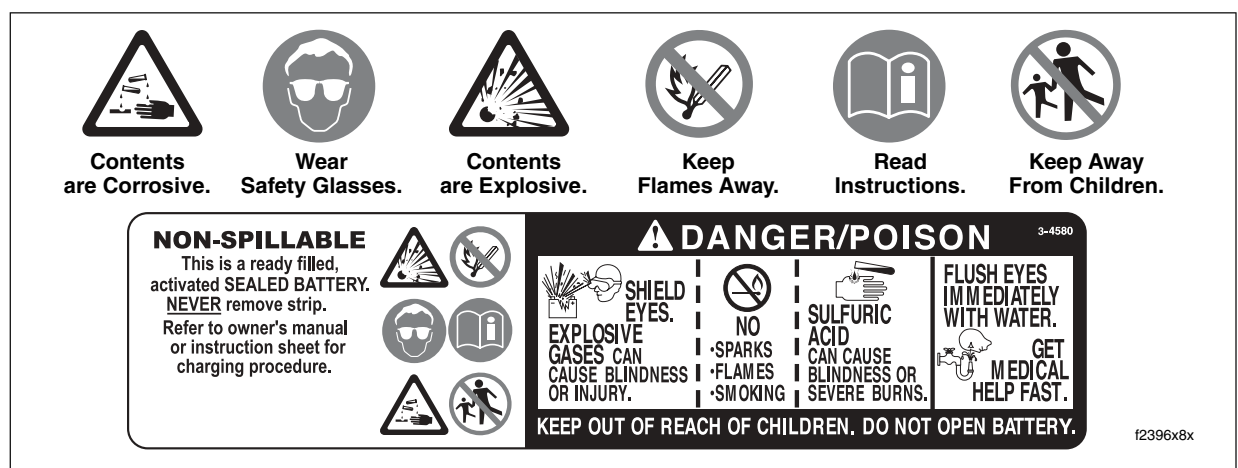


Figure 7-42. Battery Warning Label

BATTERY TESTING

GENERAL

Three different procedures may be performed to provide a good indicator of battery condition: a voltage test, a conductance test, or a load test.

A battery may be tested, whether fully charged or not, via conductance test. In order to perform a load test, however, the battery must be fully charged.

Voltmeter Test

Refer to [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 For Battery Charge Conditions

VOLTAGE (OCV)	STATE OF CHARGE
12.7	100%
12.6	75%
12.3	50%
12.0	25%
11.8	0%

CONDUCTANCE TEST

Test the battery using the MCR-101 HD ADVANCED BATTERY CONDUCTANCE AND ELECTRICAL SYSTEM ANALYZER. Perform a battery test as follows:

1. Connect the MCR-101 HD analyzer leads to the vehicle's battery.
2. Follow the instructions in the analyzer's instruction manual to perform a battery test.

The test results will include a decision on the battery's condition, the measured state of charge and the measured CCA.

See [Figure 7-43](#). The analyzer's printer will provide you with a printout including one of five possible test results:

- GOOD BATTERY—return the battery to service.
- GOOD-RECHARGE—fully charge the battery and return to service.
- CHARGE & RETEST—Fully charge the battery and retest.
- REPLACE BATTERY—replace the battery and retest.
- BAD CELL-REPLACE—replace the battery and retest.

NOTE

A REPLACE BATTERY test result may also mean a poor connection between the battery cables and the vehicle. After disconnecting the battery cables from the battery, retest the battery using the out-of-vehicle test before replacing.

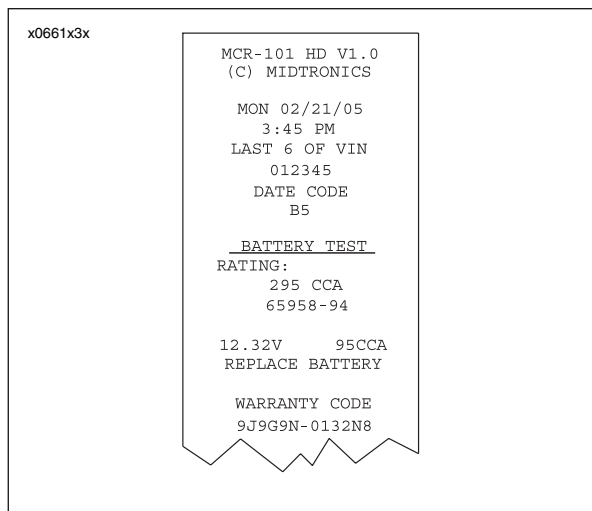


Figure 7-43. Battery Test Results—Printout

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:

NOTE

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

Turn battery load tester OFF before connecting tester cables to battery terminals. Connecting tester cables with load tester ON can cause a spark and battery explosion, which could result in death or serious injury. (00252a)

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

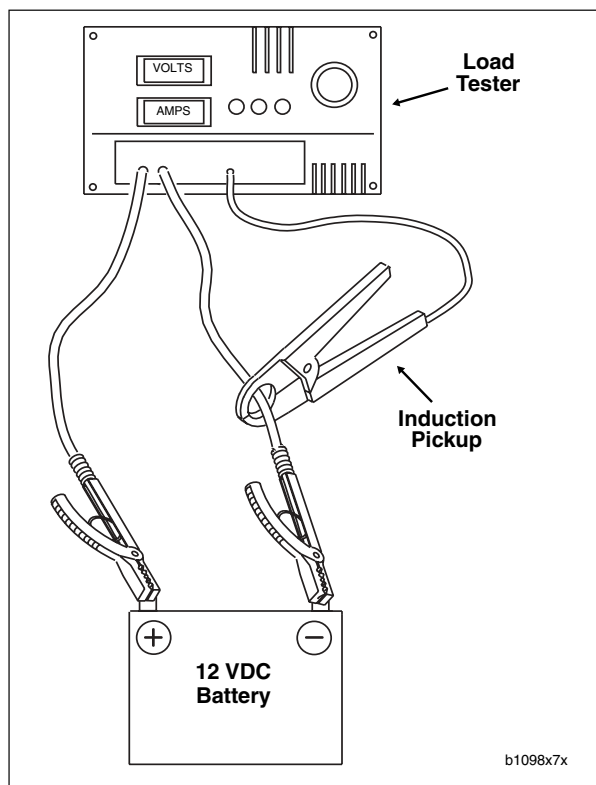


Figure 7-44. Load Test

NOTE

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

Turn battery load tester OFF before disconnecting tester cables to battery terminals. Disconnecting tester cables with load tester ON can cause a spark and battery explosion, which could result in death or serious injury. (00253a)

5. Install the battery on the motorcycle. See [BATTERY INSTALLATION AND CONNECTION](#).

DISCONNECTION AND REMOVAL

1. Remove seat. See [2.38 SEAT](#).

⚠ WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

⚠ WARNING

Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)

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

Explosive hydrogen gas, which escapes during charging, could cause death or serious injury. Charge battery in a well-ventilated area. Keep open flames, electrical sparks and smoking materials away from battery at all times. KEEP BATTERIES AWAY FROM CHILDREN. (00065a)

NOTE

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

Remove battery from motorcycle before charging. Electrolyte leakage will damage motorcycle parts. (00213a)

2. Remove the battery from the motorcycle. See [DISCONNECTION AND REMOVAL](#). Place the battery on a level surface.

WARNING

Unplug or turn OFF battery charger before connecting charger cables to battery. Connecting cables with charger ON can cause a spark and battery explosion, which could result in death or serious injury. (00066a)

WARNING

Do not reverse the charger connections described in the following steps or the charging system of the motorcycle could be damaged. (00214a)

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

Unplug or turn OFF battery charger before disconnecting charger cables from battery. Disconnecting clamps with charger ON can cause a spark and battery explosion, which could result in death or serious injury. (00067a)

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 (Approximate)

Battery Amp-Hour	State of Charge		3 Amp Charger	6 Amp Charger	10 Amp Charger	20 Amp Charger
	Voltage Reading	% of Charge				
12	12.7 V	100%	-	-	-	-
	12.6 V	75%	1 hour, 10 minutes	34 minutes	20 minutes	10 minutes
	12.3 V	50%	2 hours, 20 minutes	1 hour, 10 minutes	40 minutes	20 minutes
	12.0 V	25%	3 hours, 20 minutes	1 hour, 40 minutes	1 hour	30 minutes
	11.8 V	0%	4 hours, 30 minutes	2 hours, 14 minutes	1 hour, 20 minutes	40 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 7-46](#).

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. Failure to do so could result in damage to the motorcycle electrical system. (00215a)

⚠ WARNING

Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

CAUTION

Do not over-tighten bolts on battery terminals. Use recommended torque values. Over-tightening battery terminal bolts could result in damage to battery terminals. (00216a)

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).

NOTE

See [Figure 7-45](#). Tighten fastener for positive battery cable so that battery cable is at a 45° angle from top of battery.

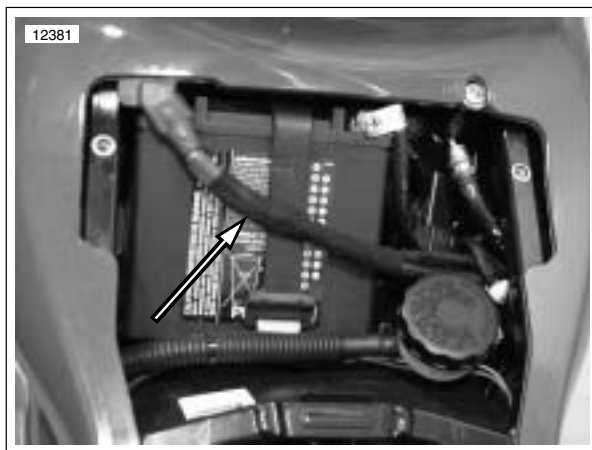


Figure 7-45. Positive Battery Cable 45° to Top of Battery

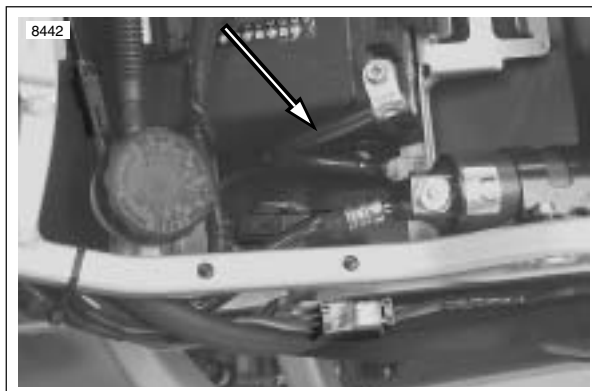


Figure 7-46. Negative Battery Cable

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 in locked position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070a)

6. Install seat. See [2.38 SEAT](#).

STORAGE

⚠ WARNING

Batteries contain sulfuric acid, which could cause severe burns to eyes and skin. Wear a protective face shield, rubberized gloves and protective clothing when working with batteries. KEEP BATTERIES AWAY FROM CHILDREN. (00063a)

CAUTION

Do not allow battery to completely discharge. The electrolyte in a discharged battery will freeze. The more discharged a battery is, the more easily it can freeze and crack the battery case. (00218a)

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 7-47](#).

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](#).

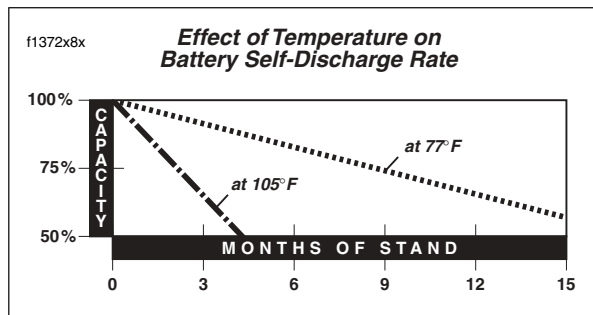


Figure 7-47. Battery Self-Discharge Rate

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 prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

1. Disconnect negative battery cable.

CAUTION

Handle bulb carefully and wear eye protection. Bulb contains Halogen gas under pressure, which, if not handled carefully, could cause serious eye injury. (00062a)

CAUTION

Never touch the quartz bulb. Fingerprints will etch the glass and decrease bulb life. Grab the bulb with paper or a clean, dry cloth. Failure to do so could result in bulb damage. (00210a)

2. See [Figure 7-48](#). Disconnect headlight connection (1).
3. Remove rubber boot from headlight housing.
4. Release wire retaining latch (5) from headlight housing clips.
5. Pull bulb housing from headlight housing.

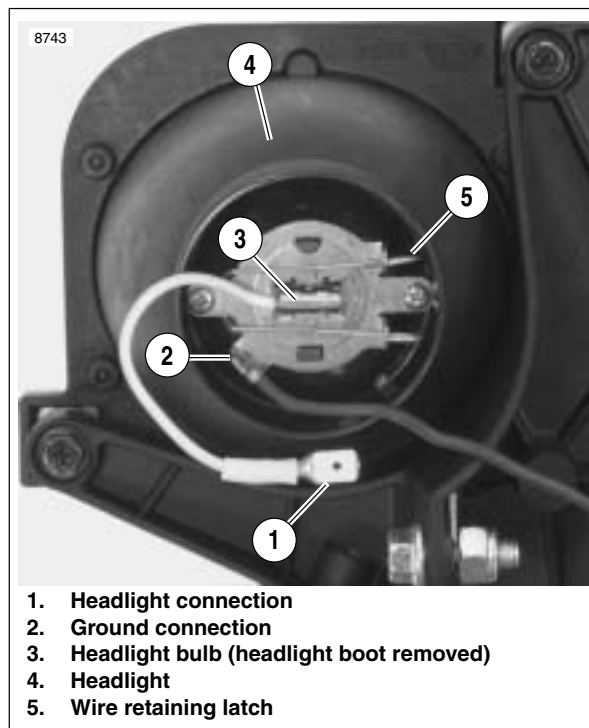


Figure 7-48. Headlight Bulb

Installation

NOTE

Not using the specified bulb may cause charging system problems.

CAUTION

Handle bulb carefully and wear eye protection. Bulb contains Halogen gas under pressure, which, if not handled carefully, could cause serious eye injury. (00062a)

CAUTION

Never touch the quartz bulb. Fingerprints will etch the glass and decrease bulb life. Grab the bulb with paper or a clean, dry cloth. Failure to do so could result in bulb damage. (00210a)

1. See [Figure 7-48](#). Align tabs on bulb (3) with tabs on headlight (4). Insert bulb.
2. Close the wire retaining latch (5).
3. Install rubber boot on headlight housing.
4. Connect the headlight bulb connector.
5. Connect negative battery cable and tighten fastener to 72-96 in-lbs (8-11 Nm).

WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

6. 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 7-49](#). 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.
7. Align headlight. See [1.19 HEADLIGHTS](#).

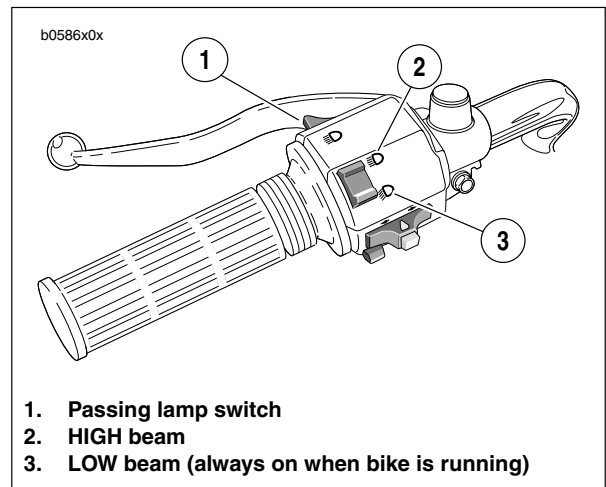


Figure 7-49. Headlight Controls

REMOVAL/DISASSEMBLY

1. See [Figure 7-50](#). Remove two screws (3) to detach tail light lens (4) and tail light (5). If replacing bulb (2), turn counterclockwise and remove.
2. Disconnect two connectors [93] from tail lamp harness (6).

ASSEMBLY/INSTALLATION

1. See [Figure 7-50](#). 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) and tighten to 6-7 **in-lbs** (0.7-0.8 Nm).

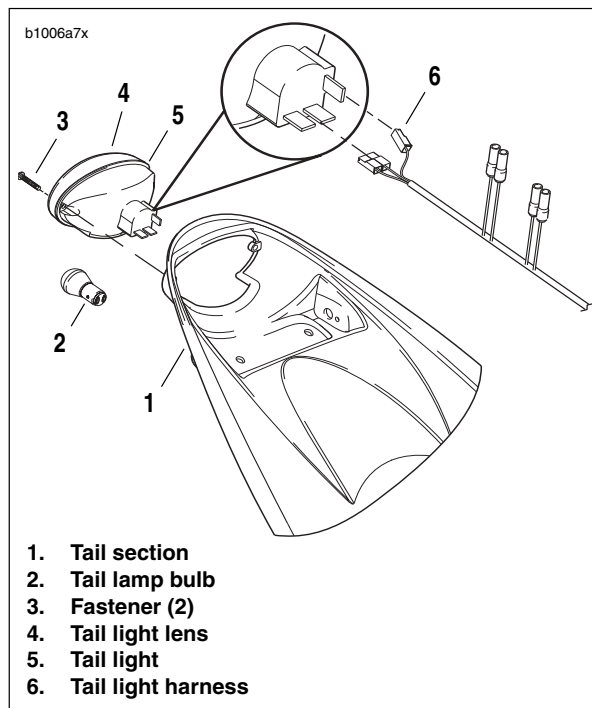


Figure 7-50. Tail Lamp Assembly

WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

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.

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 7-51](#). Disconnect bullet connectors on turn signal wires.
2. See [Figure 7-52](#). 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 7-54](#). Disconnect bullet connectors on turn signal wires.
4. See [Figure 7-53](#). 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).

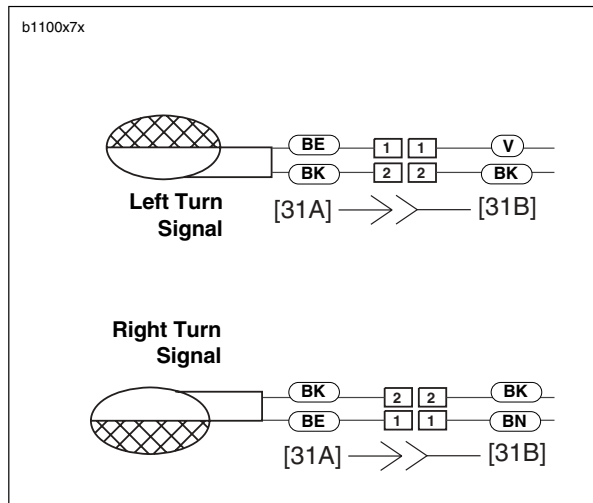


Figure 7-51. Front Turn Signal Connections

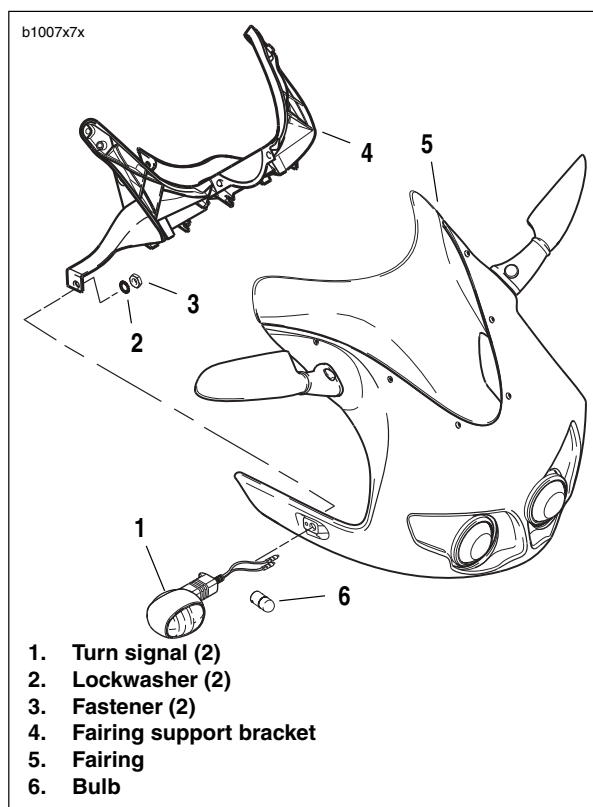
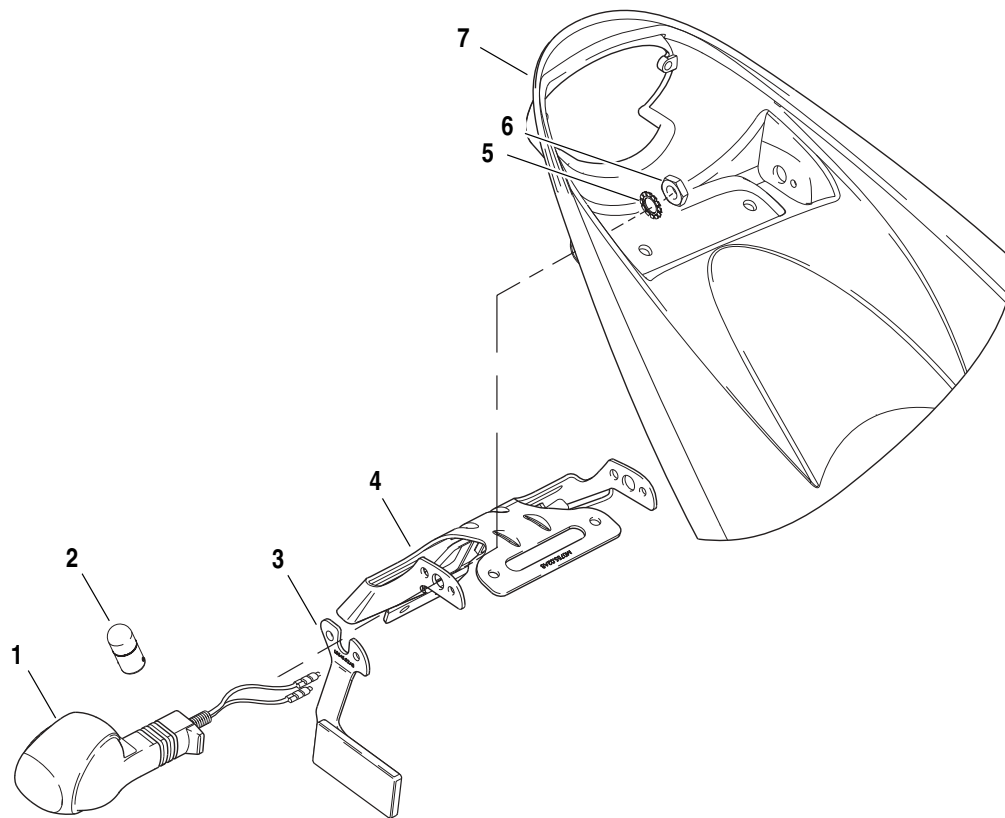


Figure 7-52. Front Turn Signals

b1008a7x



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

Figure 7-53. Rear Turn Signals

INSTALLATION

Front

1. See [Figure 7-52](#). 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 7-51](#).

WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

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. Insert bullet connectors through license plate bracket (4) and tail section.
2. Install reflector bracket.
 - a. Place license plate bracket into position over threads on turn signal.
 - 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 and fastener. Tighten fastener to 25-28 **in-lbs** (2.8-3.2 Nm).
4. Attach bullet connectors on turn signal wires as shown in [Figure 7-54](#).

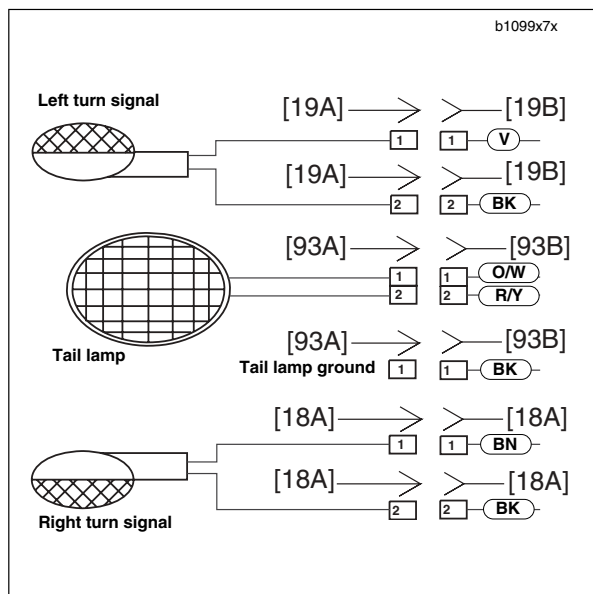


Figure 7-54. Rear Turn Signal Connections

WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

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 in locked position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070a)

6. Install tail frame upper bodywork. See [2.36 SUBFRAME TAIL ASSEMBLY AND BODY WORK](#).
7. Install seat. See [2.38 SEAT](#).

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 5-place connector [30] from flasher body.

INSTALLATION

1. See [Figure 7-55](#). Attach 5-place connector [30] to flasher.
2. Install turn signal flasher to headlight support bracket. Tighten fastener to 36.60 **in-lbs** (4-6.7 Nm).
3. Install front fairing. See [2.37 FRONT FAIRING, WINDSHIELD, AND MIRRORS](#).

⚠ WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

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 7-56](#). 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.

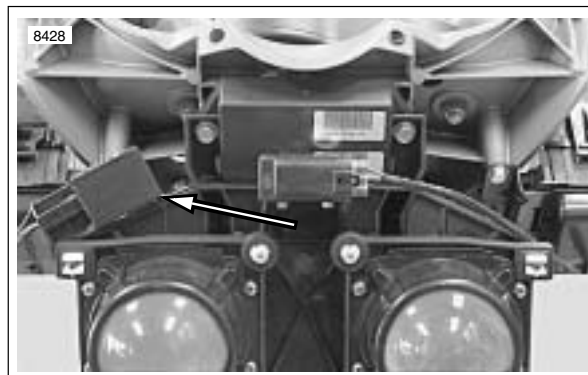


Figure 7-55. Turn Signal Flasher

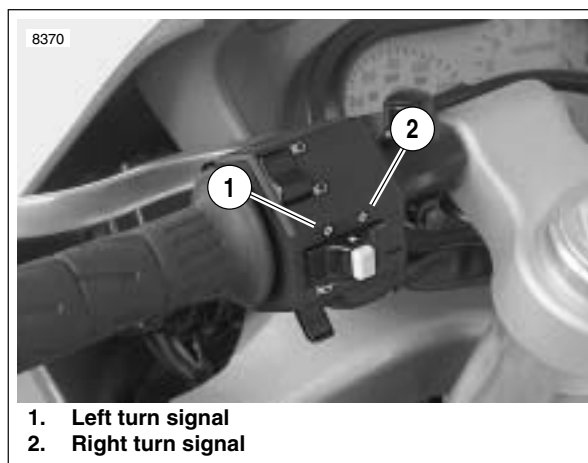


Figure 7-56. Turn Signal Controls

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.

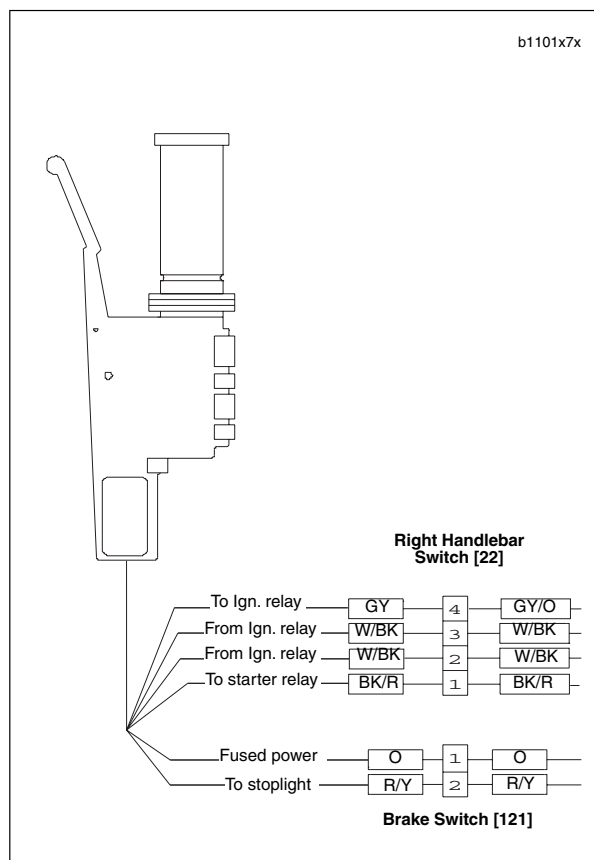


Figure 7-57. Right Handlebar Switch Connection

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.

WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

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.

WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

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.

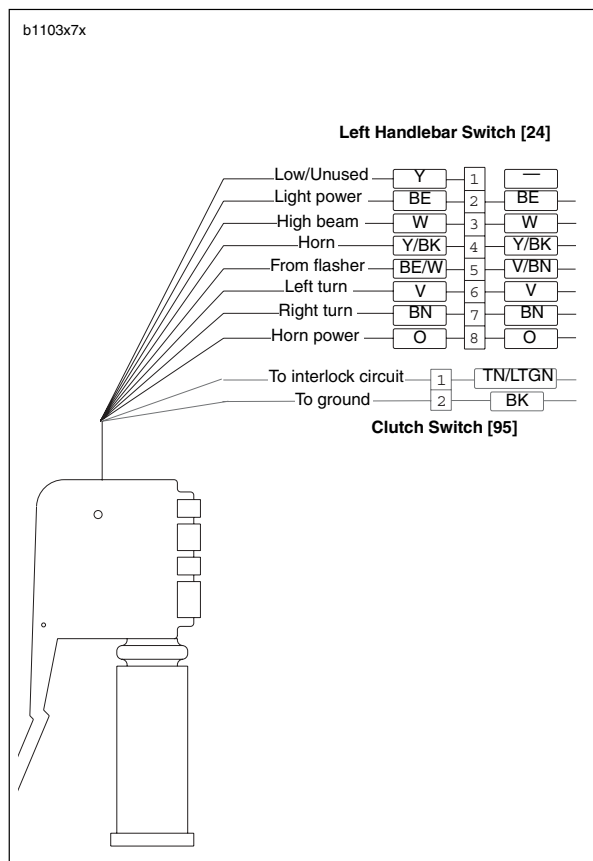


Figure 7-58. Left Handlebar Switch Connection

REMOVAL

1. See Figure 7-59. Remove fastener (1) to detach vehicle speed sensor (2) from crankcase.
2. Disconnect 3-place Deutsch connector [65] under sprocket cover. See 7.25 SPROCKET COVER WIRING.

INSTALLATION

1. See Figure 7-59. Lube o-ring with engine oil and install fastener (1) to attach vehicle speed sensor (2) to crankcase and tighten to 90-110 in-lbs (10-12.4).
2. Connect vehicle speed sensor connector [65] to wiring harness. See 7.25 SPROCKET COVER WIRING.

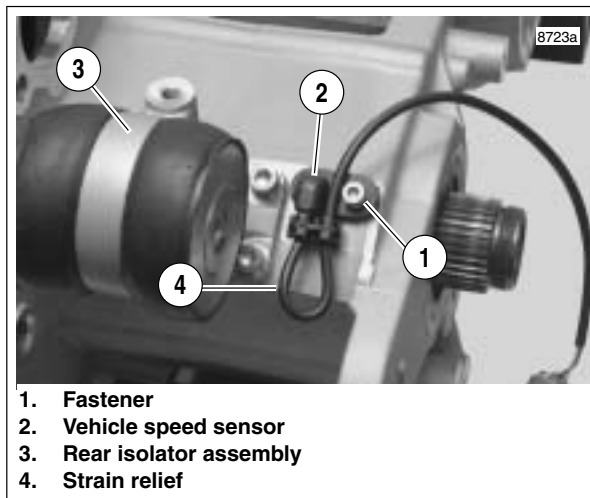


Figure 7-59. Speedometer Sensor

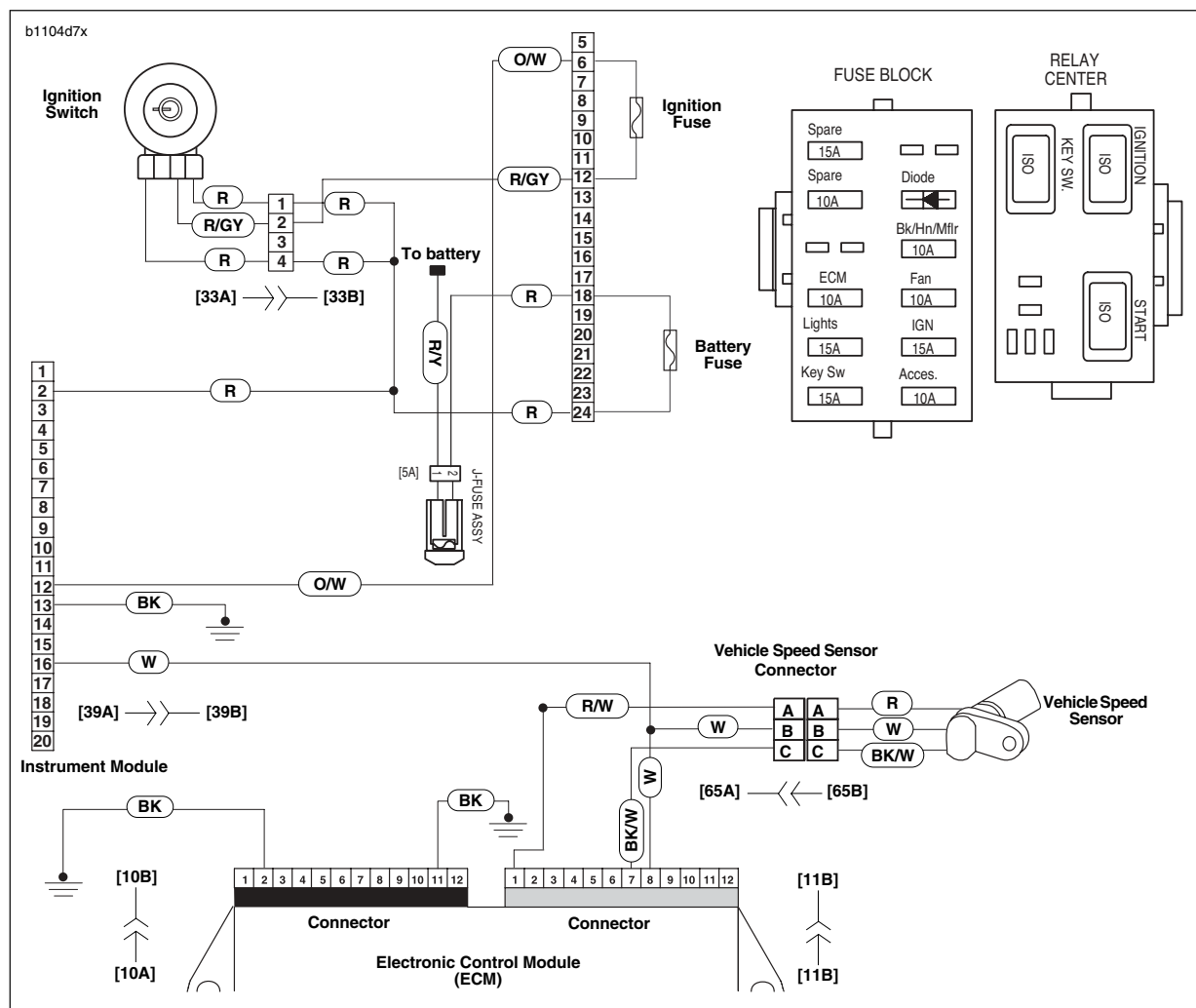


Figure 7-60. Vehicle Speed Sensor Wiring

GENERAL

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

NOTE

- Replacement bulbs are available for indicator, check engine light and backlights.
- Replace instrument module if low fuel warning indicator fails.



Figure 7-61. Instrument Module

REMOVAL

1. Remove seat. See 2.38 SEAT.

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

2. Disconnect negative battery cable.
3. Remove headlight support bracket. See 2.25 HEADLIGHT ASSEMBLY AND SUPPORT BRACKET.
4. See Figure 7-64. Disconnect instrument module connector [39].
5. See Figure 7-65. Remove fasteners (5) and washers (4).
6. Pull instrument module (2) from headlight support bracket (1).

Bulb Replacement

1. Once the instrument module has been removed from the vehicle place face down on a work surface.
2. Remove the nine fasteners securing the back of the module housing to the display and remove back cover.

NOTE

Do not turn display over. Speedometer and Tachometer will fall out possibly causing damage to instruments.

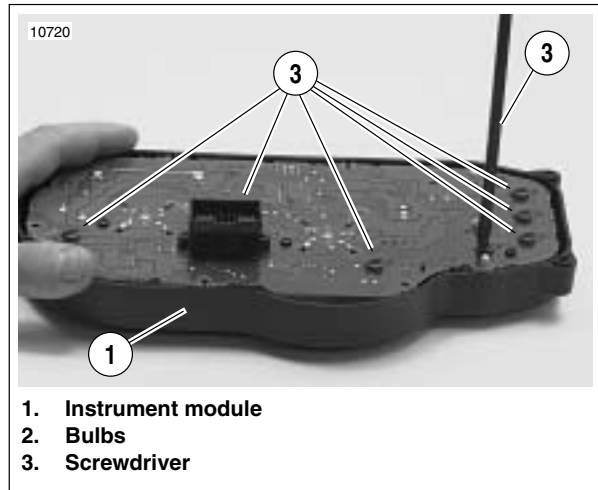


Figure 7-62. Bulb Replacement for Instrument Module

3. See Figure 7-62. Insert screwdriver blade into the slot on the back of the bulb to be replaced and lightly turn counterclockwise and remove bulb.

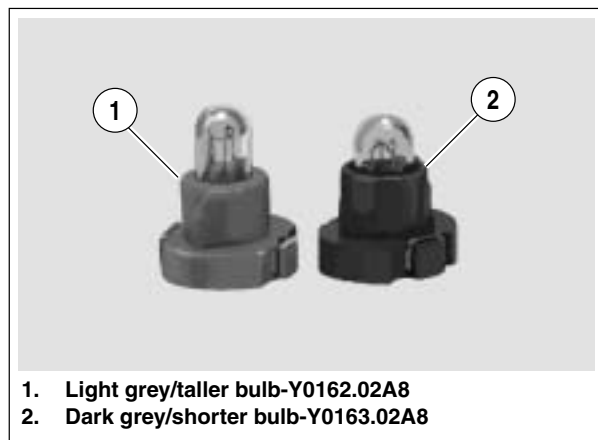


Figure 7-63. Instrument Module Bulbs

NOTE

See Figure 7-63. Bulbs are identified both by color and length.

4. Select correct replacement bulb and install into back of instrument cluster.
5. Reinstall back cover and insert and tighten the nine fasteners originally removed.

INSTALLATION

1. See [Figure 7-65](#). 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 7-64](#). Connect instrument module connector [39].
4. Install headlight support bracket. See [2.25 HEADLIGHT ASSEMBLY AND SUPPORT BRACKET](#).
5. Install negative battery cable.

WARNING

After installing seat, pull upward on front of seat to be sure it is in locked position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070a)

6. Install seat. See [2.38 SEAT](#).

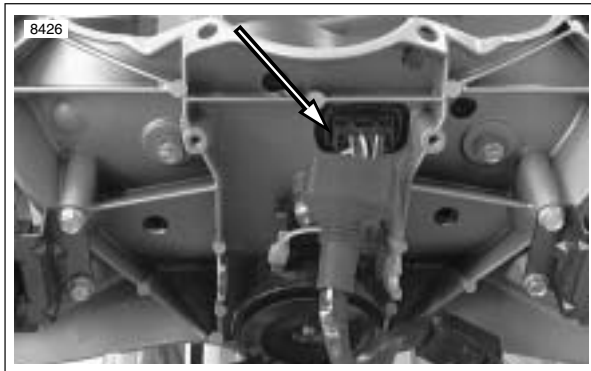


Figure 7-64. Instrument Module Connector [39]

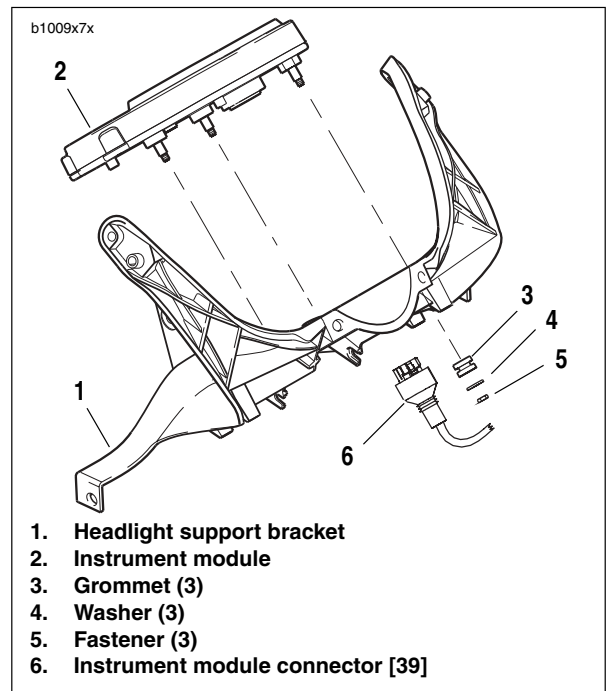


Figure 7-65. Instrument Module

GENERAL

See [Figure 7-66](#). 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.

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 [7.25 SPROCKET COVER WIRING](#).

1. See [Figure 7-67](#). Locate the 3-place vehicle speed sensor connector [65] under the sprocket cover. See [7.25 SPROCKET COVER WIRING](#).
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).

HD41354

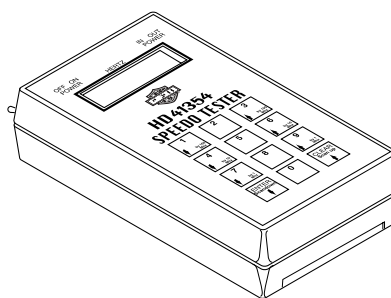


Figure 7-66. Speedometer Tester (Part No. HD-41354)

12369

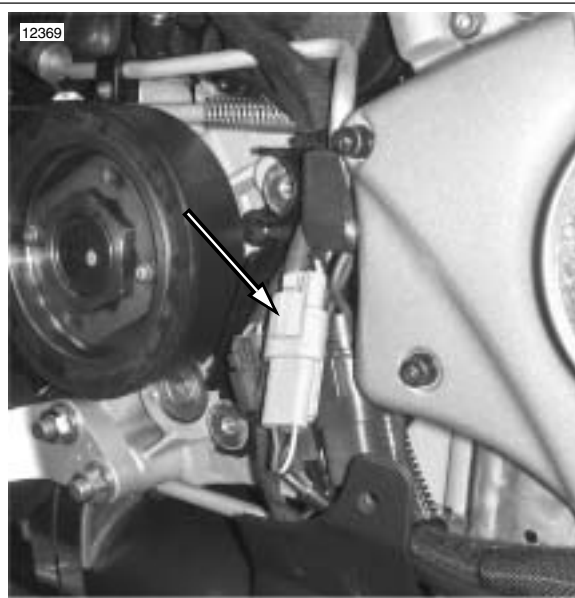


Figure 7-67. Vehicle Speed Sensor Connector [65]

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

MARKET	SPEED	FREQUENCY
USA	20 MPH	531
	40 MPH	1062
	60 MPH	1593
	80 MPH	2124
ENG, AUS, EUR, CAN, JPN	40 KPH	660
	60 KPH	990
	80 KPH	1320
	100 KPH	1650

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 7-67](#). 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 7-68](#). 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.

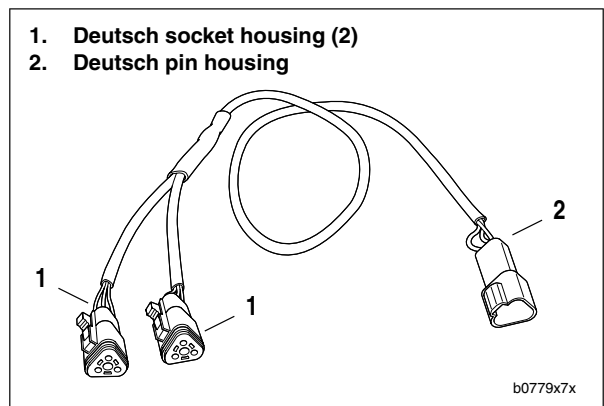
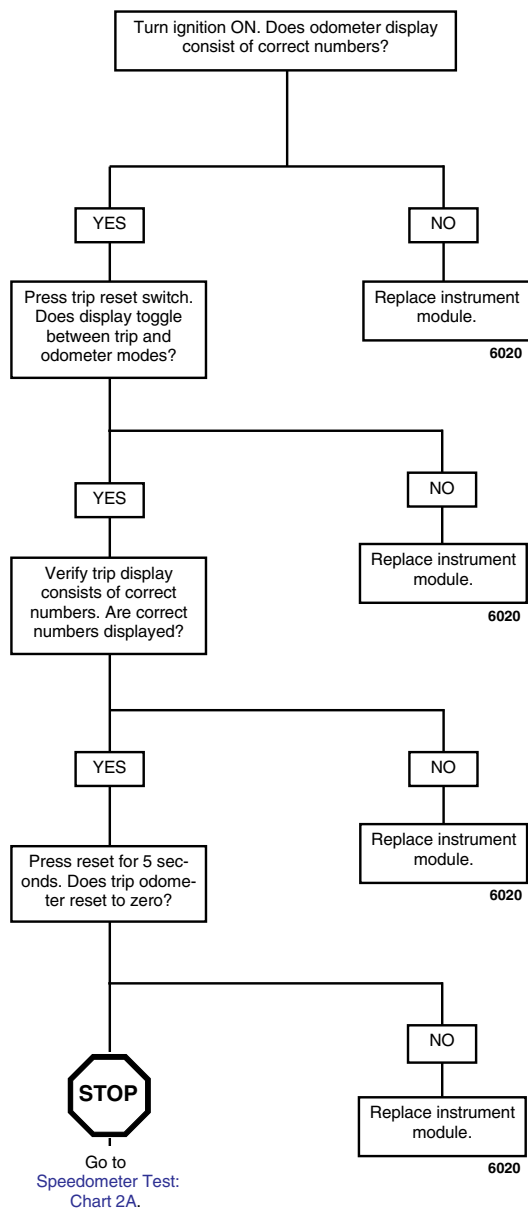


Figure 7-68. Test Harness

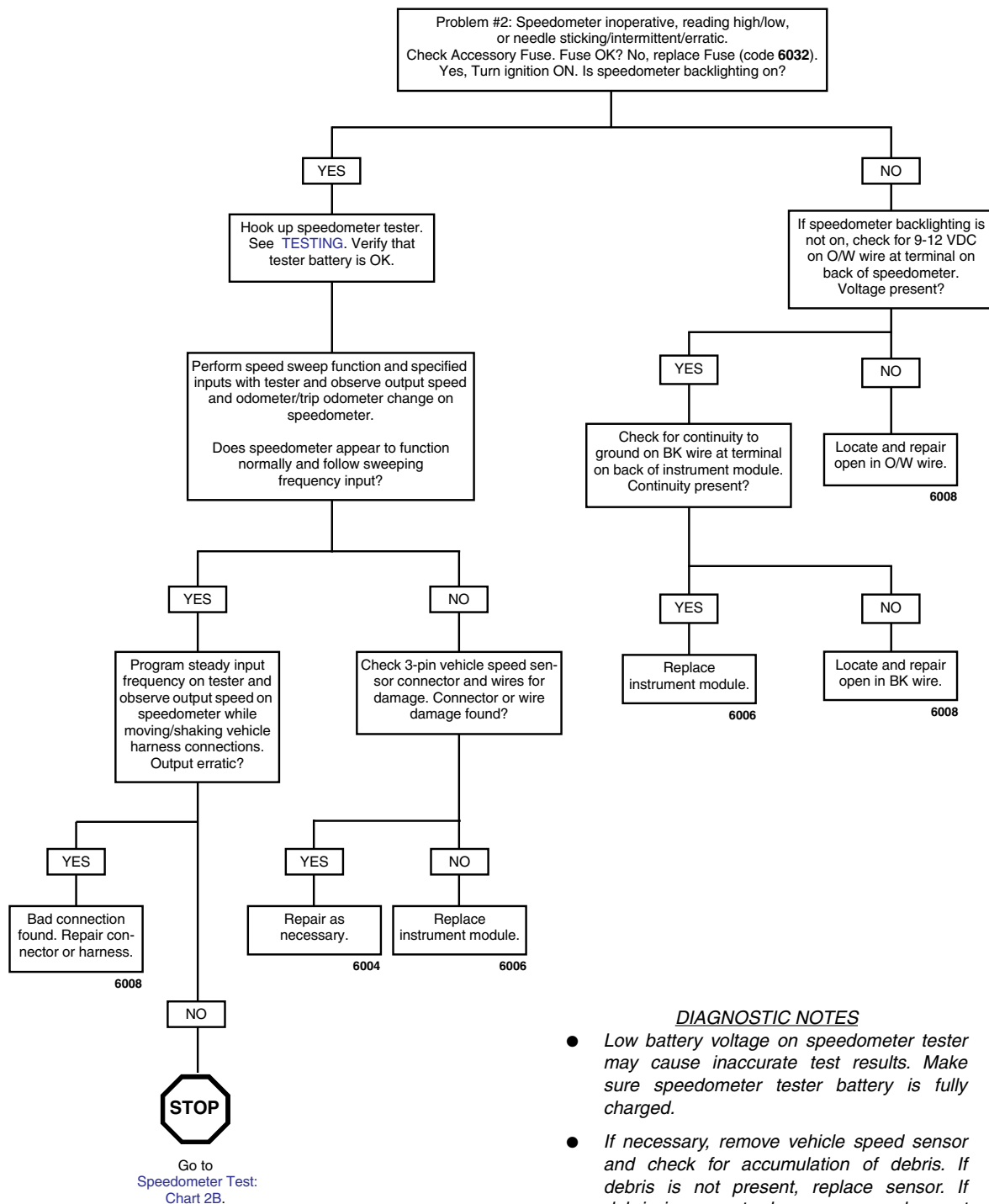
Speedometer Test: Chart 1

ODOMETER, TRIP ODOMETER AND RESET SWITCH TESTING



Speedometer Test: Chart 2A

INOPERATIVE, INACCURATE OR ERRATIC SPEEDOMETER

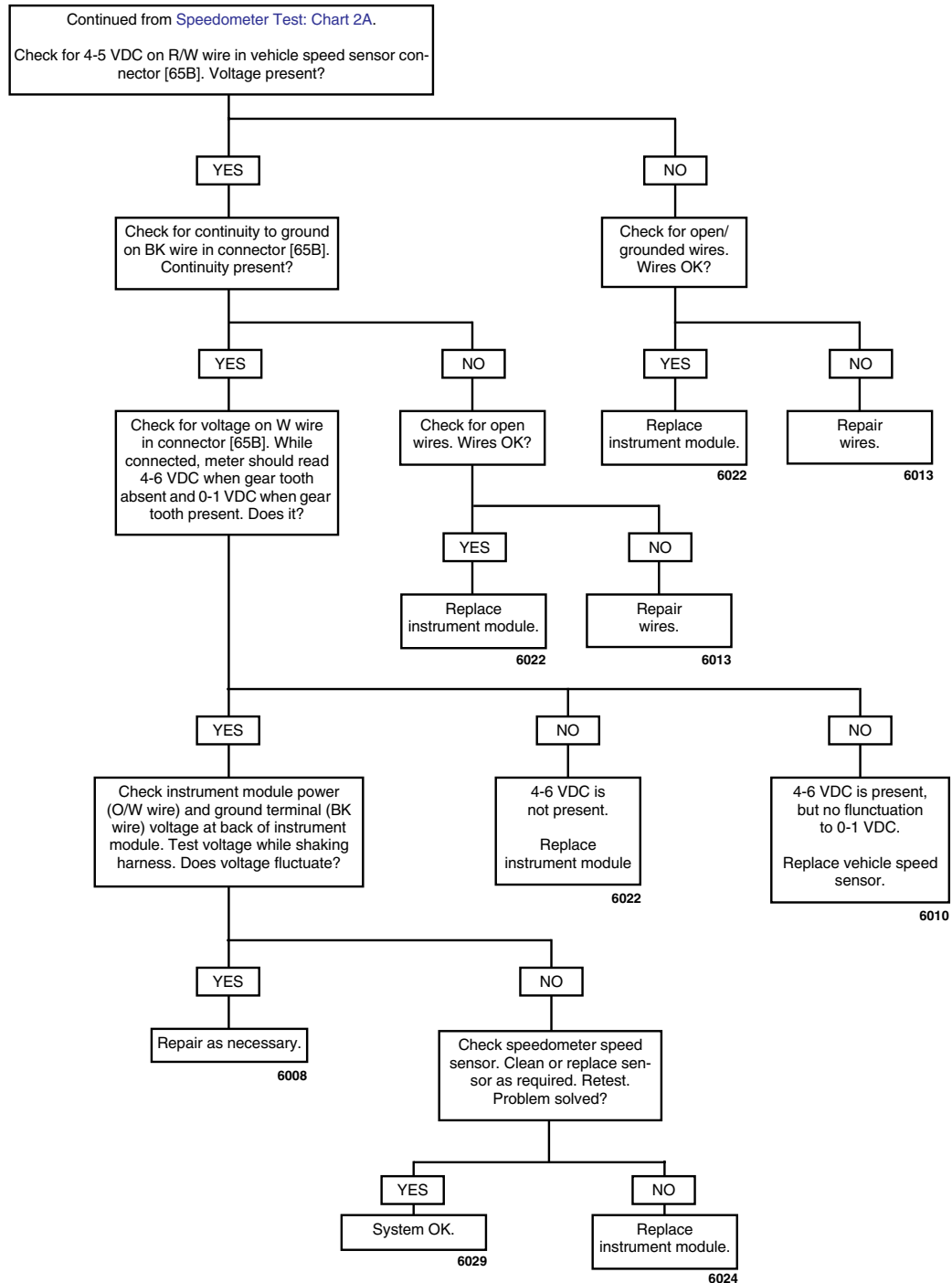


DIAGNOSTIC NOTES

- 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 prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

2. Disconnect negative battery cable.
3. Remove headlight support bracket. See [2.25 HEADLIGHT ASSEMBLY AND SUPPORT BRACKET](#).
4. See [Figure 7-69](#). Remove fastener (3).
5. Remove horn (1) from fairing support bracket (4).
6. See [Figure 7-70](#). Detach Y/BK power wire and BK ground wire from terminal clips on horn.

INSTALLATION

1. See [Figure 7-70](#). Connect Y/BK power wire and BK ground wire to terminal clips on horn.
2. See [Figure 7-69](#). Attach horn (1) to fairing support bracket (4) using fastener (3). Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
3. Install negative battery cable.
4. 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.

⚠ WARNING

After installing seat, pull upward on front of seat to be sure it is in locked position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070a)

5. Install seat. See [2.38 SEAT](#).

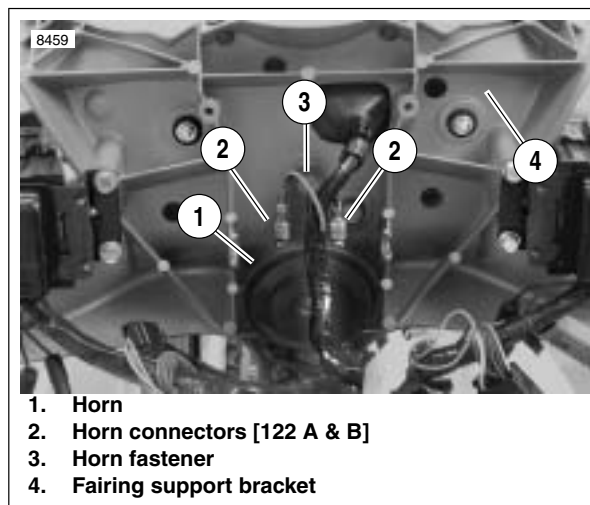


Figure 7-69. Horn Assembly

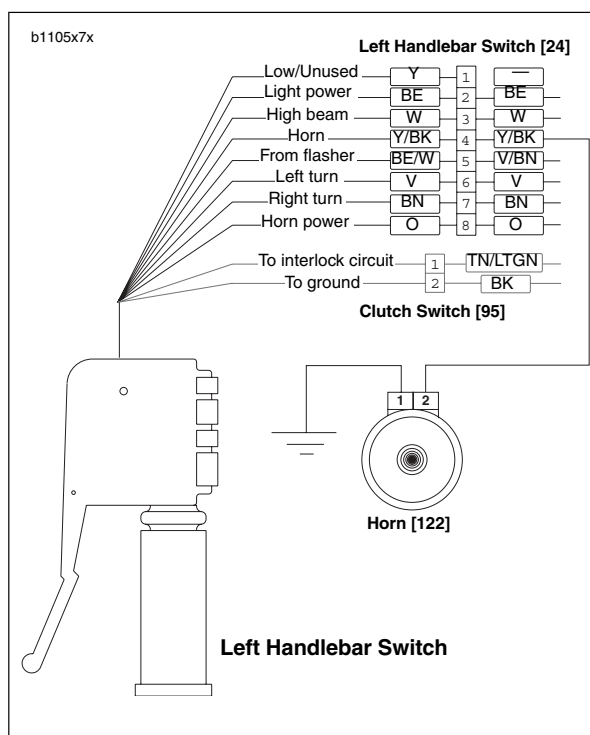


Figure 7-70. Horn Wiring

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.
 - c. Verify horn is not making contact with wiring or components.
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 7-70](#). 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 7-71](#). 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](#).

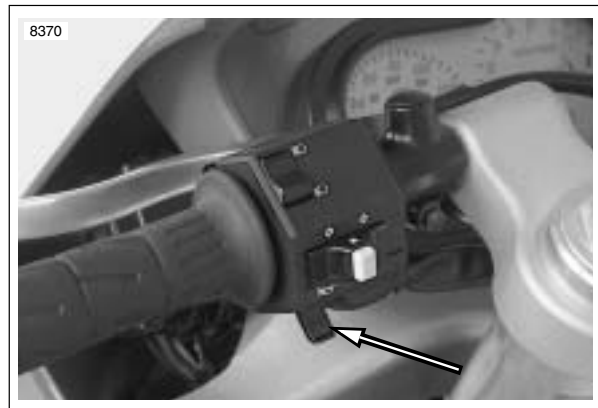


Figure 7-71. Horn Switch

GENERAL

See [Figure 7-72](#). 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 7-72](#). Disconnect wire lead from neutral indicator switch (2). See [7.25 SPROCKET COVER WIRING](#).
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 [7.25 SPROCKET COVER WIRING](#) for correct wire routing.

3. See [Figure 7-73](#). 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 60-84 **in-lbs** (6.7-9.5 Nm).
 - d. Connect wire lead (1) to switch.
6. Install sprocket cover. See [2.30 SPROCKET COVER](#).

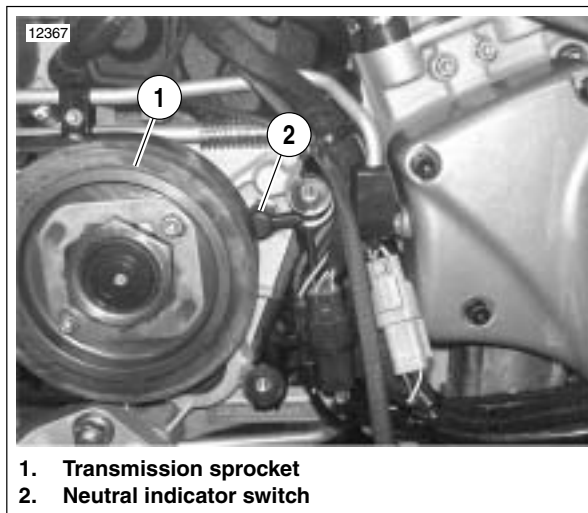


Figure 7-72. Neutral Indicator Switch Location

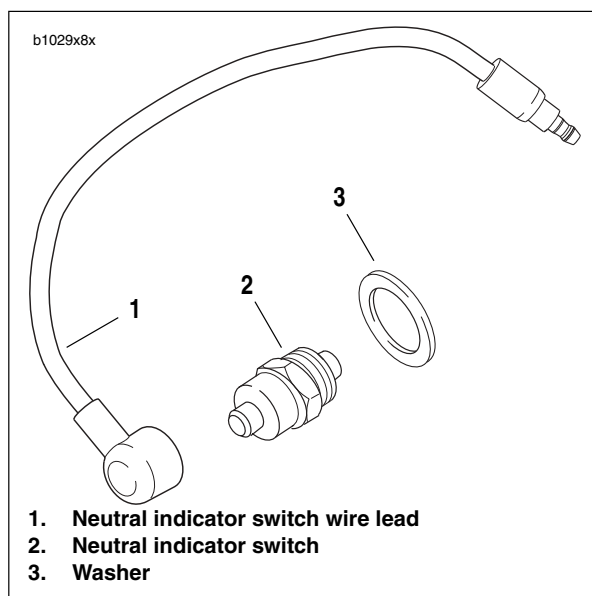


Figure 7-73. Neutral Indicator Switch

GENERAL

Buell motorcycles feature two components which protect the electrical system.

Fuses

See [Figure 7-74](#). The covered fuse block is behind the fairing on the right hand side of the motorcycle.

See [Figure 7-75](#). The lights, key switch and ignition fuses are rated at 15 Amps. The ECM, cooling fan, brake/horn/muffler and accessory fuses are rated at 10.0 Amps.

Always investigate the cause of blown fuses before replacing them.

Main Fuse

See [Figure 7-76](#). 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.

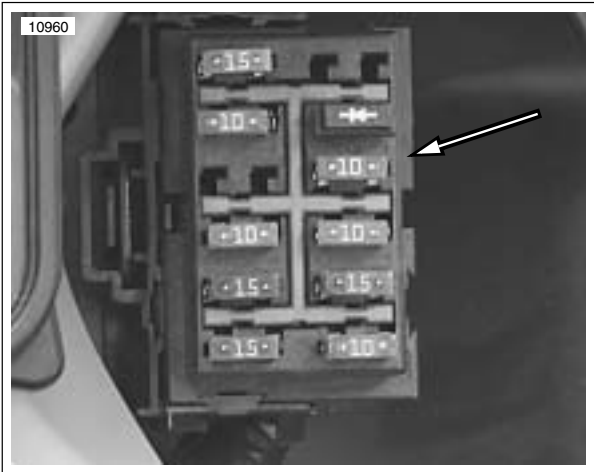


Figure 7-74. Fuse Block

b1165x4x

Spare	Empty
19 13	7 1
Spare	Diode
20 14	8 2
Empty	Bk/Hn/Mflr
21 15	9 3
ECM	Fan
22 16	10 4
Lights	IGN
23 17	11 5
Key Sw	Acces.
24 18	12 6

Figure 7-75. Fuse Block

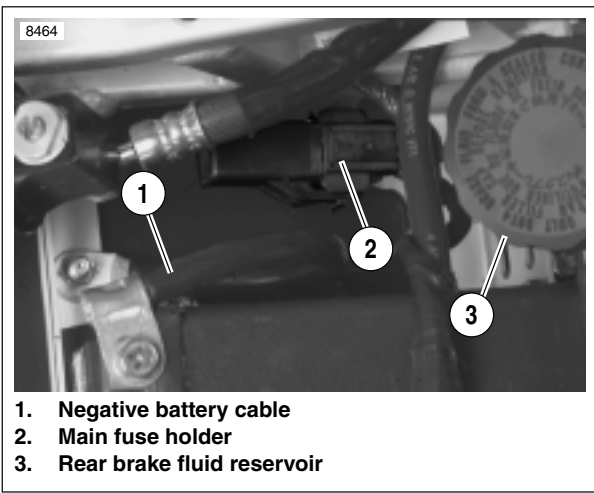


Figure 7-76. 30 A Main Fuse Location

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 fasteners 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

Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)

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 and solenoid connector [128] from starter.
6. Remove tail frame upper body work. [2.36 SUBFRAME TAIL ASSEMBLY AND BODY WORK](#).
7. See [Figure 7-77](#). Disconnect tail harness connector [7] (3).
8. See [Figure 7-78](#). Remove wire harness ground (2).
9. Remove main fuse case (3).
10. Disconnect interactive exhaust connector [165B] from main harness (XB12 models only).
11. Disconnect foot brake light switch connector [121] (5).
12. Remove the rear shock absorber assembly and reservoir. See [2.22 REAR SHOCK ABSORBER](#).
13. Remove fan. See [4.38 COOLING FAN](#).

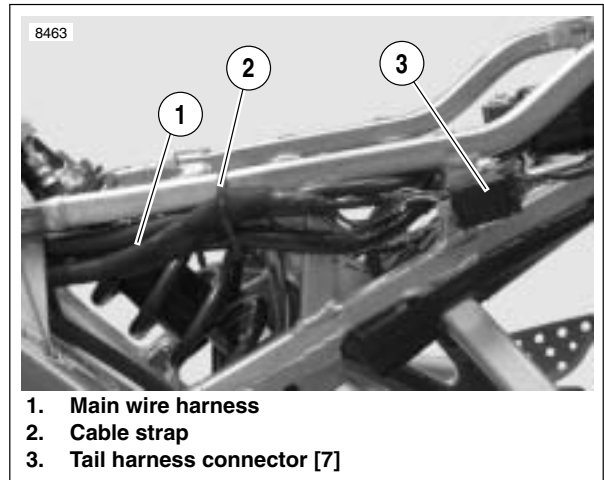


Figure 7-77. Tail Harness Connector

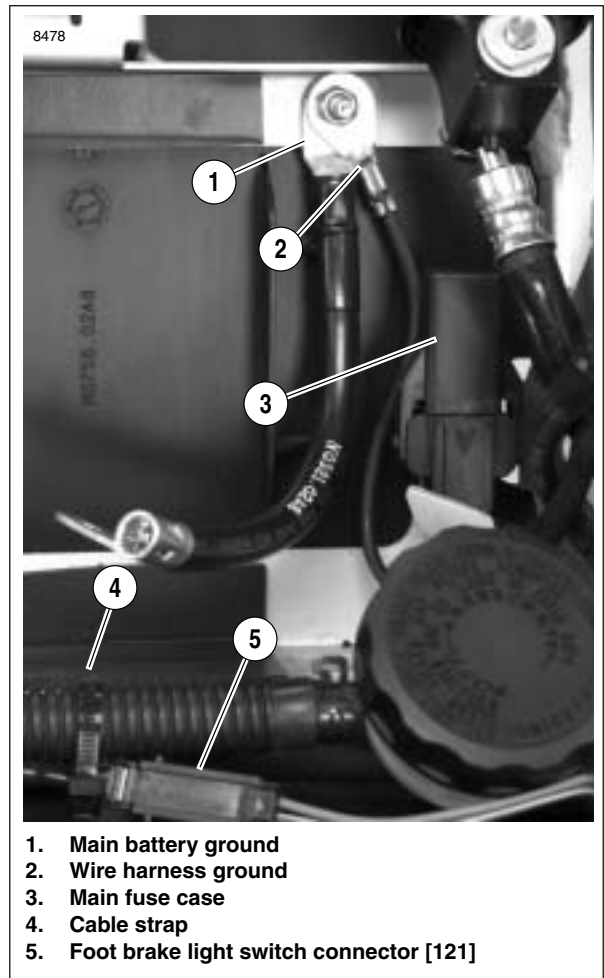


Figure 7-78. Battery Tray Wiring

14. Disconnect wiring located under sprocket cover. See [7.25 SPROCKET COVER WIRING](#).
15. Remove connector from oil pressure switch [120]. Oil pressure switch is located on front of engine.
16. See [2.34 INTAKE COVER ASSEMBLY](#). Disconnect:
 - a. Intake air temperature sensor [89]
 - b. Throttle position sensor [88].
 - c. Disconnect O2 sensor [137].
 - d. Disconnect temperature sensor [90].
 - e. Fuel injectors [84] & [85].
 - f. Ignition coil and remove. See [4.32 IGNITION COIL](#).
 - g. Fuel pump connector [86].
17. Remove fairing. See [2.37 FRONT FAIRING, WINDSHIELD, AND MIRRORS](#).
18. Disconnect:
 - a. Flasher connector [30].
 - b. Bank angle sensor connector [134].
 - c. Electronic control module (ECM). See [4.30 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]
 - k. Ignition switch [33].
19. Remove fuse block and relay block by removing fasteners securing them to fairing support bracket.
20. Remove fuse and relay bundle clamps.
21. Remove fuse block and relay block from their brackets.
22. Remove any remaining cable straps and clamps securing wire harness and remove harness from front of vehicle.
23. Remove all tree fasteners from frame.

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 **new** plastic tree fasteners.

NOTE

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

5. See [Figure 7-79](#). Install clamp over portion of harness that leads to engine connectors. Install clamp as shown using new plastic tree fastener.

NOTE

On XB12 models be sure to route the interactive exhaust cable behind the harness strap with the main harness.

6. See [Figure 7-80](#). 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:
 - a. Throttle position sensor [88]
 - b. Intake air temperature sensor [89].
 - c. O2 sensor [137]
 - d. Air temperature sensor [90]
 - e. Fuel injectors [84] & [85].
 - f. Ignition coil. See [4.32 IGNITION COIL](#).
8. Install sprocket cover wiring. See [7.25 SPROCKET COVER WIRING](#).
9. Install oil pressure switch connector to oil pressure switch.

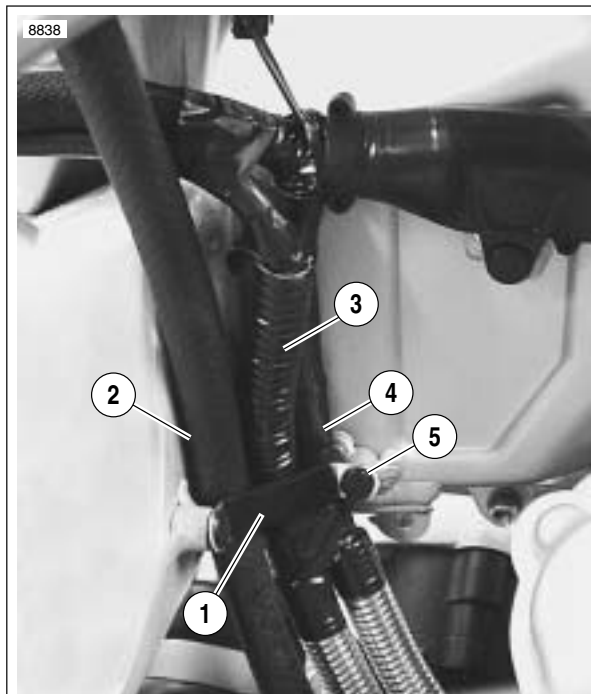
NOTE

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

10. Place clamp around fuse block wiring. Mount fuse block and clamp to fairing support bracket using top fastener and bottom fastener. Tighten fasteners to 72-96 in-lbs (8.1-10.8 Nm).
11. Repeat previous steps for relay block.
12. 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).
13. Install intake assembly. See [2.34 INTAKE COVER ASSEMBLY](#).



Figure 7-79. Wire Harness Clip



1. Mounting strap and guide
2. Transmission vent hose
3. Positive battery cable
4. Sprocket cover wiring
5. Tree fastener (2)

Figure 7-80. Wire Harness Strap and Guide

14. 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 [4.30 ELECTRONIC CONTROL MODULE](#).
 - j. Bank angle sensor connector [134].
 - k. Flasher connector [30].
15. See [Figure 7-83](#). Verify proper fairing wire routing and cable strap locations.
 16. Verify that front forks can be turned from full left to full right lock without wire harness binding or pinching.
 17. Install fairing. See [INSTALLATION](#) under [2.37 FRONT FAIRING, WINDSHIELD, AND MIRRORS](#).
 18. Connect fuel pump connector [86].
 19. Install fan and tighten fasteners to 12-36 **in-lbs** (1.4-4.1 Nm). See [4.38 COOLING FAN](#).
 20. Install rear shock absorber assembly. See [2.22 REAR SHOCK ABSORBER](#).
 21. See [Figure 7-78](#). Connect foot brake light switch connector [121] (5). Install cable strap (4).
 22. Install main fuse case (3).
 23. Install main battery ground (1) and wire harness ground (2). Tighten fastener to 48-72 **in-lbs** (5.4-8.1 Nm).
 24. See [Figure 7-77](#). Connect tail harness connector (3). Attach cable strap (2).
 25. Connect interactive exhaust connector [165] to main harness (XB12 models only).
 26. Install starter side of positive battery cable and connect starter solenoid [128] to starter.

⚠ WARNING

Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

27. Install positive battery cable (red) to positive terminal of battery. Tighten to 72-96 **in-lbs** (8-11 Nm).
28. Connect negative battery cable. Tighten to 72-96 **in-lbs** (8-11 Nm).
29. 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 in locked position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070a)

30. Install seat. See [2.38 SEAT](#).

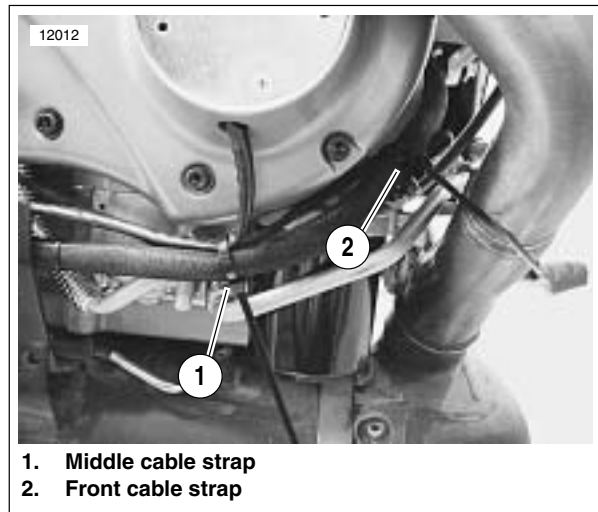


Figure 7-81. Cable Straps (Typical)

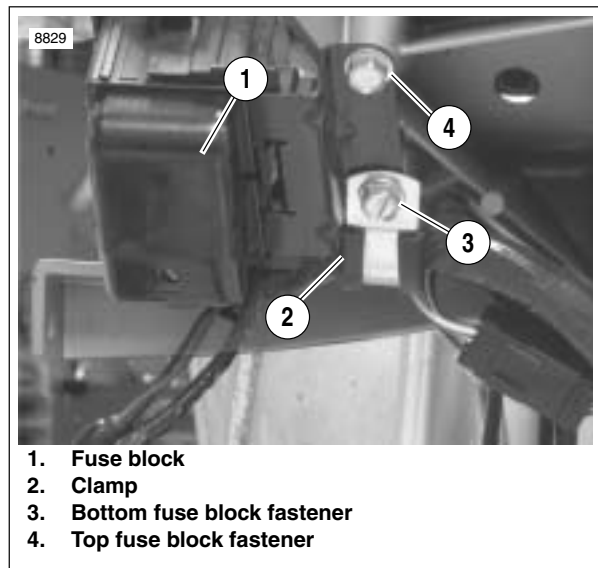


Figure 7-82. Fuse Block

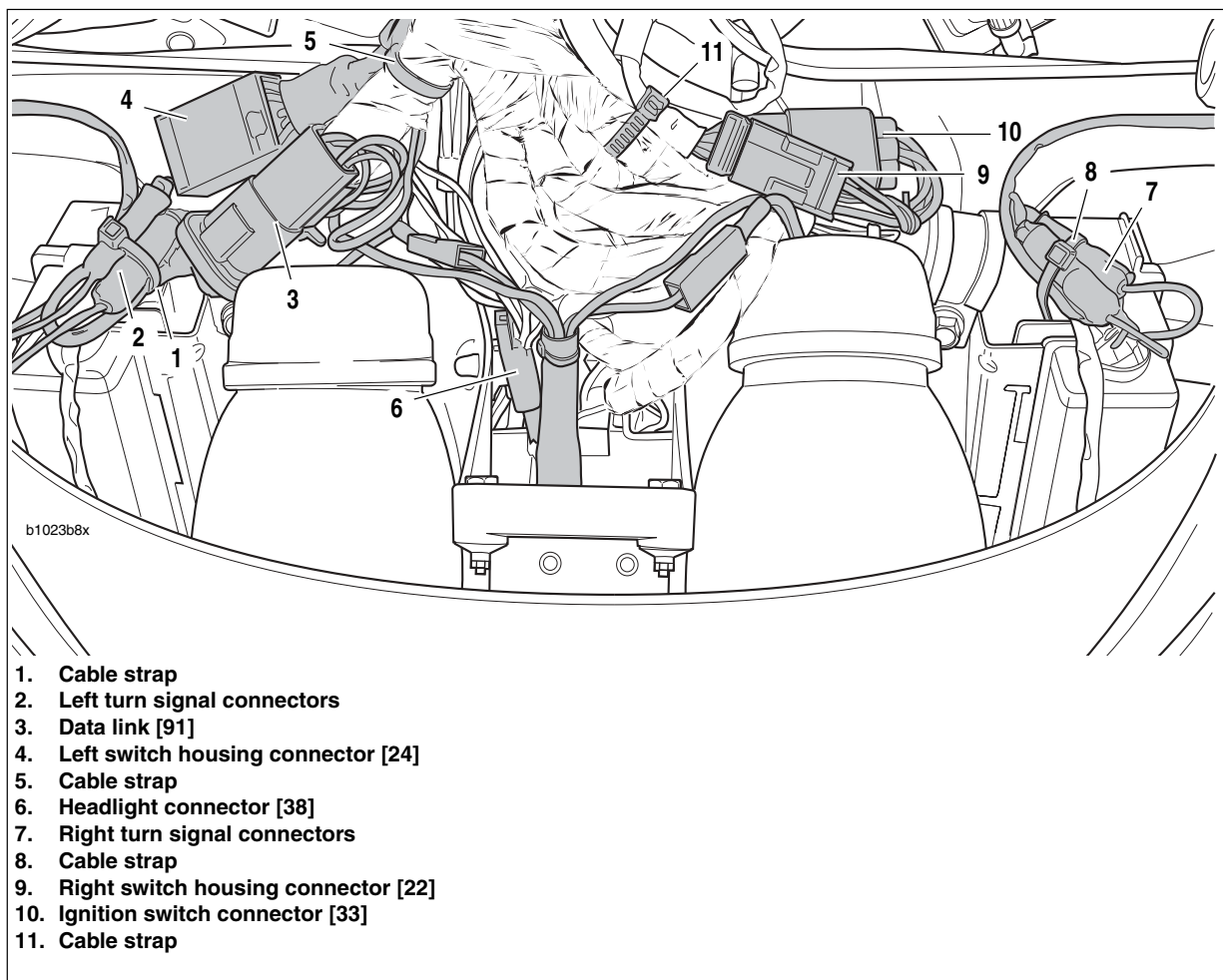


Figure 7-83. Fairing Wiring (viewed from beneath fairing)

INTERACTIVE EXHAUST HARNESS (XB12 MODELS) 7.24

REMOVAL

1. Remove seat and pillion. See [2.38 SEAT](#).
2. Remove 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 SUB-FRAME TAIL ASSEMBLY AND BODY WORK](#).
6. See [Figure 7-84](#). 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. Disconnect connector [161B] from actuator.

NOTE

For actuator and actuator cable replacement see [7.6 INTER-ACTIVE EXHAUST SYSTEM \(XB12 MODEL\)](#).

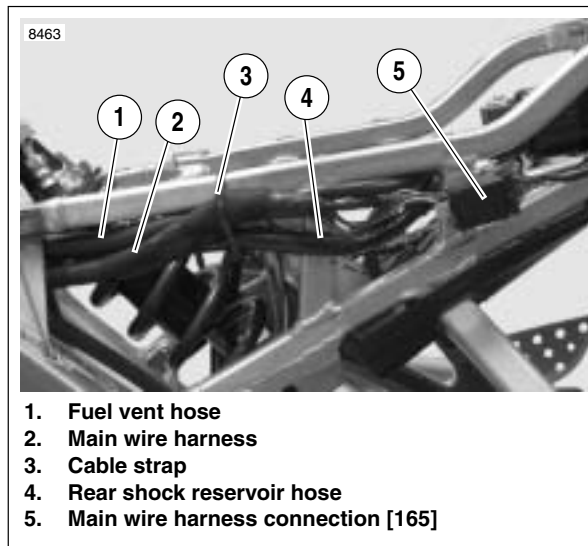


Figure 7-84. Left Side Subframe Hose and Wire Routing

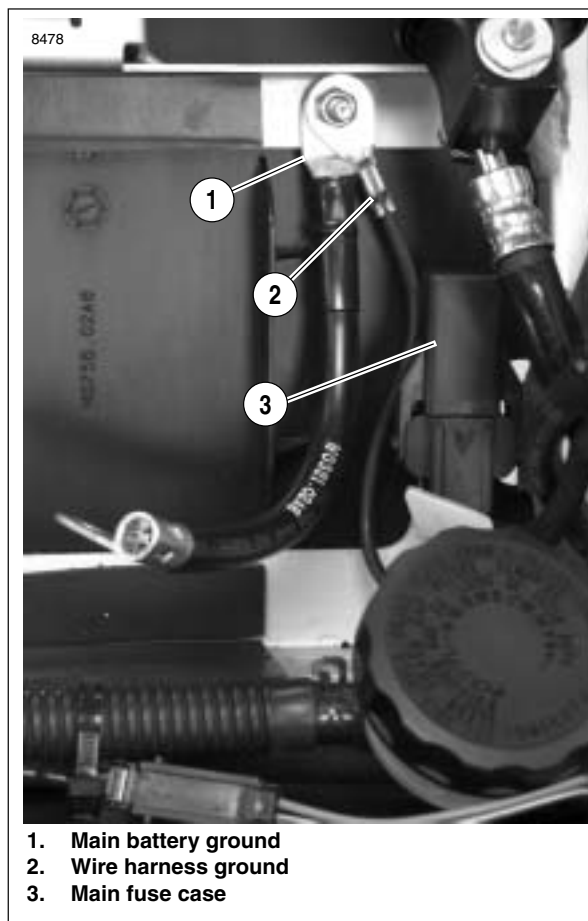


Figure 2-85. Battery and Harness Ground (battery removed for clarity)

INSTALLATION

1. Mate actuator connector[161B] to actuator.
2. Route harness along channel in air cleaner under frame and under main wiring harness.

NOTE

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.

3. See [Figure 7-86](#). Verify that the interactive exhaust cable (2) is routed behind the frame lug (1) before installing air intake cover.
4. Mate exhaust actuator harness connector halves [165].
5. Cable wrap were noted.
6. Install ground bolt through main battery ground cable and actuator ground wire. Tighten to 48-72 **in-lbs** (5.4-8.1 Nm).

⚠ WARNING

Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

7. Connect negative battery cable to battery terminal. Tighten fastener to 72-96 **in-lbs** (8-11 Nm).
8. Install subframe tail body work. See [2.36 SUBFRAME TAIL ASSEMBLY AND BODY WORK](#).
9. Install intake cover. Tighten fasteners to 12-36 **in-lbs** (1.4-4.0 Nm). See [2.34 INTAKE COVER ASSEMBLY](#).

⚠ WARNING

After installing seat, pull upward on front of seat to be sure it is in locked position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070a)

10. Install seat and pillion. See [2.38 SEAT](#).

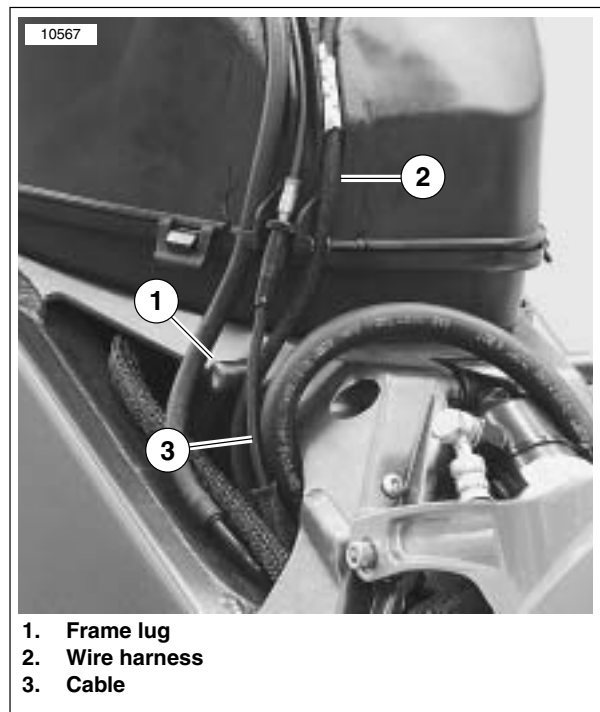


Figure 7-86. Correct Cable Routing Behind Frame Lug (Typical)

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.

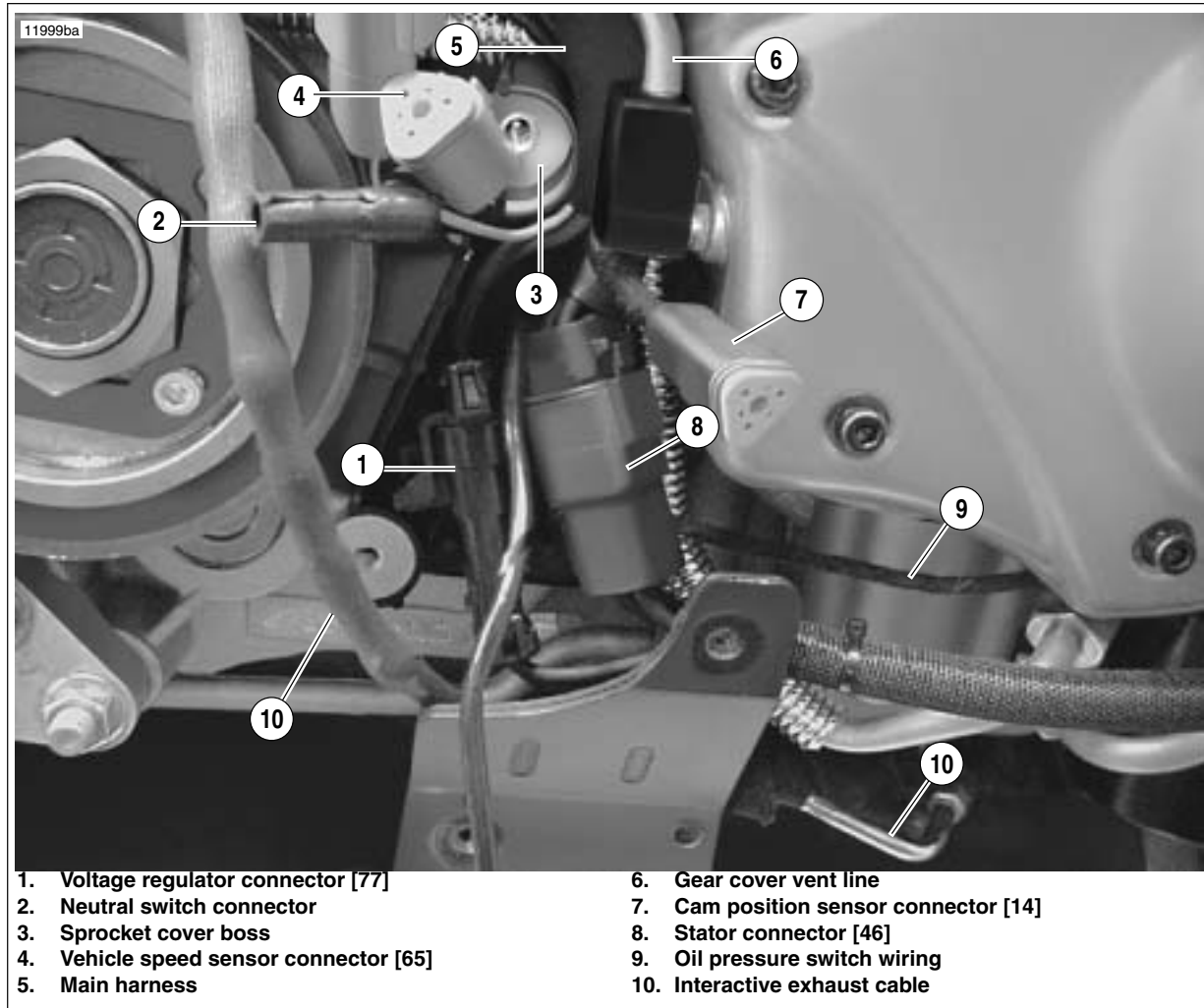


Figure 7-87. Sprocket Cover Wiring and Connections

REMOVAL

1. Remove sprocket cover. See [2.30 SPROCKET COVER](#).
2. See [Figure 7-87](#). Disconnect appropriate connector(s).

INSTALLATION

NOTES

- See [Figure 7-88](#). Convolute covering the return oil line should have the seam rotated to the back side of the oil line away from wiring.
 - If oil fitting cover was removed, install at this time.
1. Route the vehicle speed sensor wiring behind the starter trigger wire.
 2. See [Figure 7-87](#). Route stator wiring, main harness, vehicle speed sensor wiring, and actuator cable (XB12 models only) behind the vent line fitting (6) and to the right side of the sprocket cover boss (3).
 3. See [Figure 7-87](#). Route oil pressure switch wiring (9) from main harness (5), to oil pressure switch located on front of engine and connect to the oil pressure switch.
 4. Route the regulator wiring bundle over oil pressure switch wiring back to the sprocket cover area.
 5. See [Figure 7-87](#). Connect the (4 pin) stator connector (8) and position as shown.
 6. Connect the (2-pin) voltage regulator (1).
 7. See [Figure 7-87](#). Position the voltage regulator connector (1) as it is shown, with the connector latch to the back and above the bottom sprocket cover boss.

NOTE

Make sure that the voltage regulator connector is all the way back against the plastic wire guard.

8. See [Figure 7-90](#). At the oil pressure switch, use a cable strap to encircle the voltage regulator wire bundle and the oil pressure switch wire, and secure to the base of the oil pressure switch itself.
9. Then move back and cable strap that bundle with the cam position sensor wires. Orient the cam sensor wires on top and the oil pressure switch wire behind the voltage regulator bundle.
10. See [Figure 7-89](#). Connect the neutral safety switch (single bullet), and the cam position sensor (3-pin black).
11. Using a cable strap, secure the loop of the neutral safety wire to the cam position connector (13) under the attachment clip on the connector.

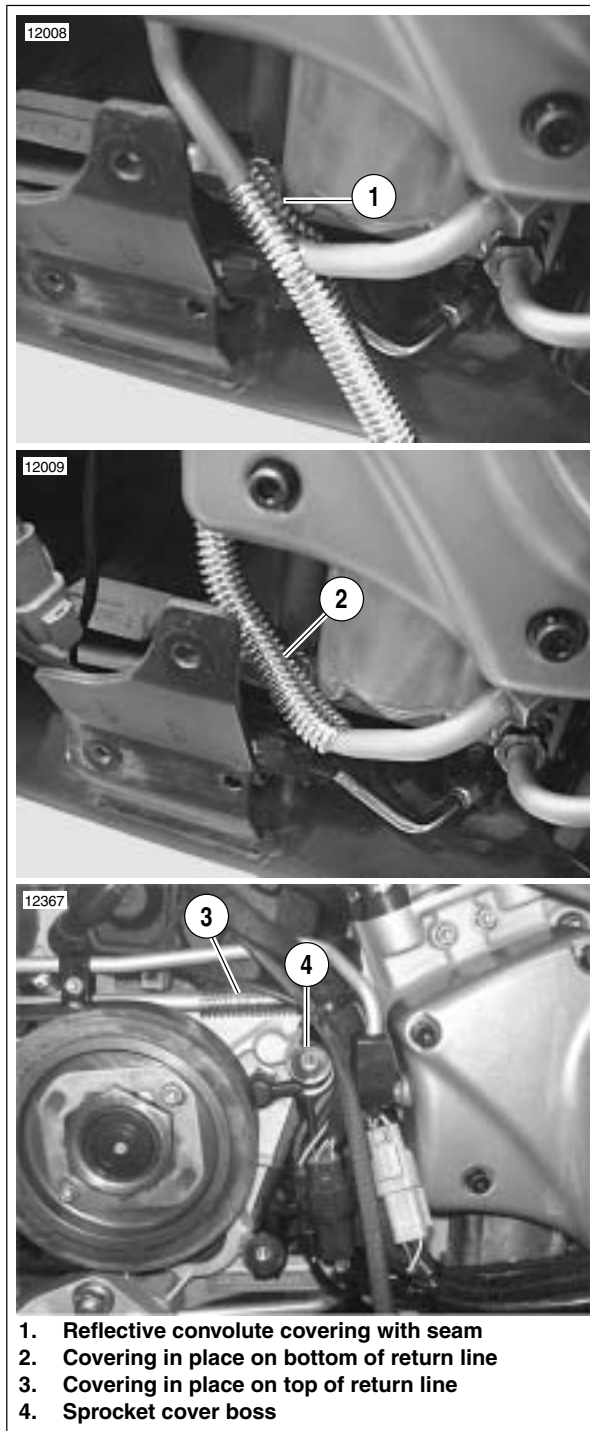


Figure 7-88. Convoluted Covering for Oil Return Line

12. See [Figure 7-90](#). Position the cam position sensor wire bundle, the voltage regulator wire bundle and the oil pressure switch wiring inboard, then push the wire bundle up against the return oil line and cable strap them to the return oil line.
13. See [Figure 7-92](#). Capture the main wire harness bundle, the vehicle speed sensor lead, the stator bundle, and the muffler actuator cable (if applicable) to the oil return line with a cable strap.
14. See [Figure 7-91](#). Connect the vehicle speed sensor last.

NOTE

- The vehicle speed sensor is positioned below the vent line filling in order for the front sprocket cover to conform to the additional components.
 - See [Figure 7-92](#). Make sure main harness (2) is routed around sprocket cover boss (1).
15. Install sprocket cover. See [2.30 SPROCKET COVER](#).

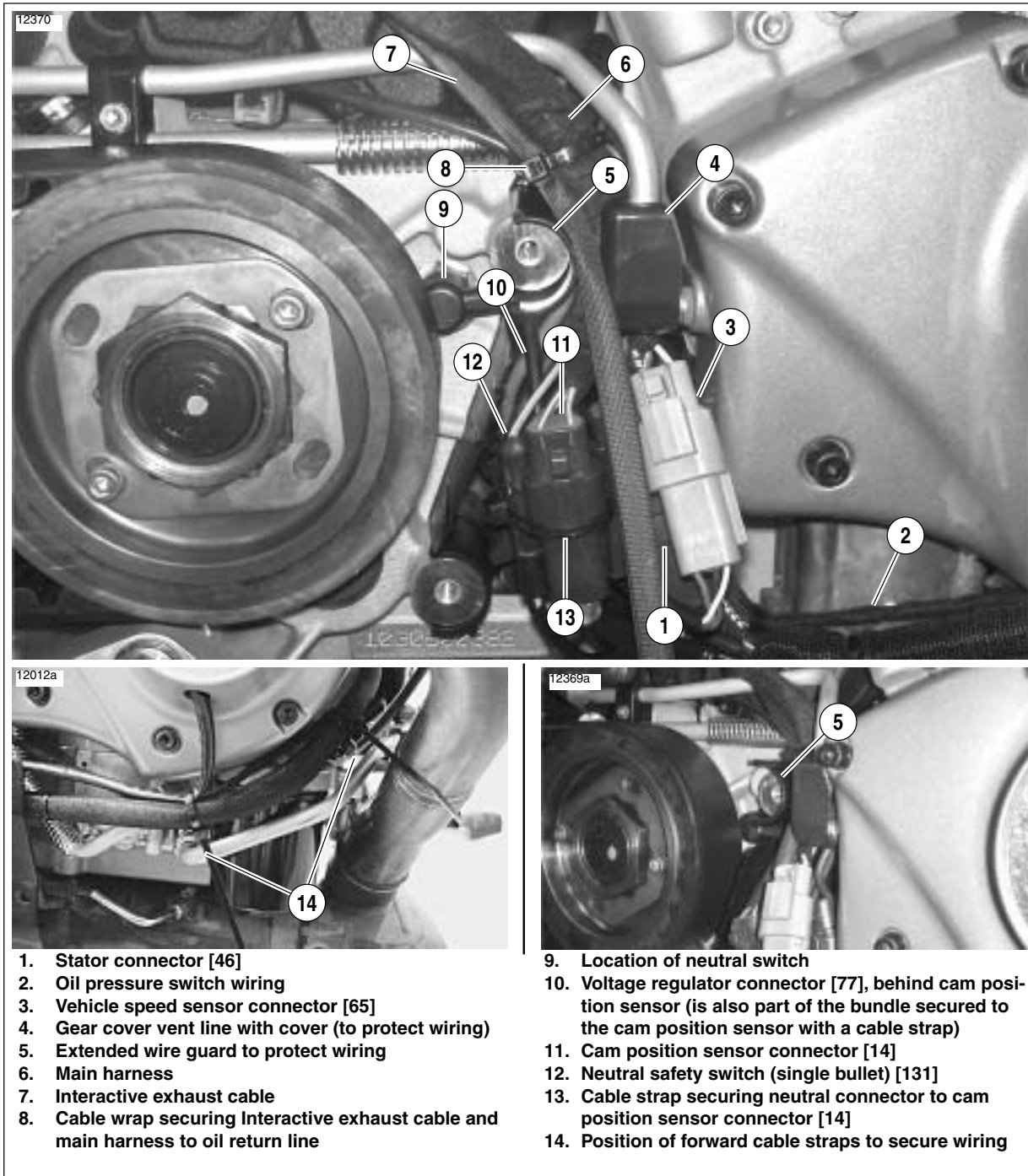


Figure 7-89. Sprocket Cover Wiring and Connections

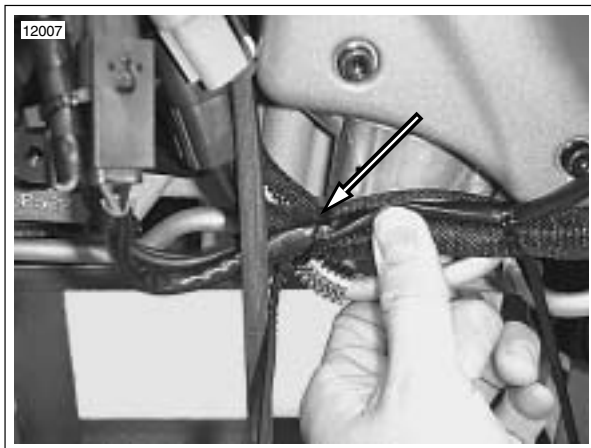


Figure 7-90. Cable Strap Wire Bundle to Return Oil Line

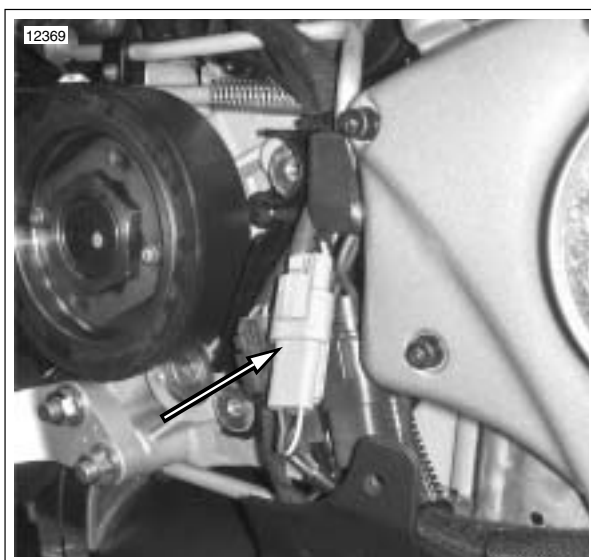
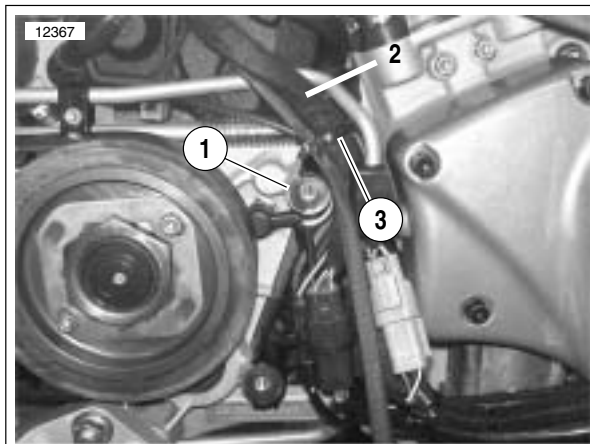


Figure 7-91. Vehicle Speed Sensor



1. Sprocket cover boss
2. Main harness
3. Cable strap securing main harness wiring to Return Oil Line, Upper Part of Sprocket Cover

Figure 7-92. Correct Location for Sprocket Cover Wiring

NOTES
