

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.

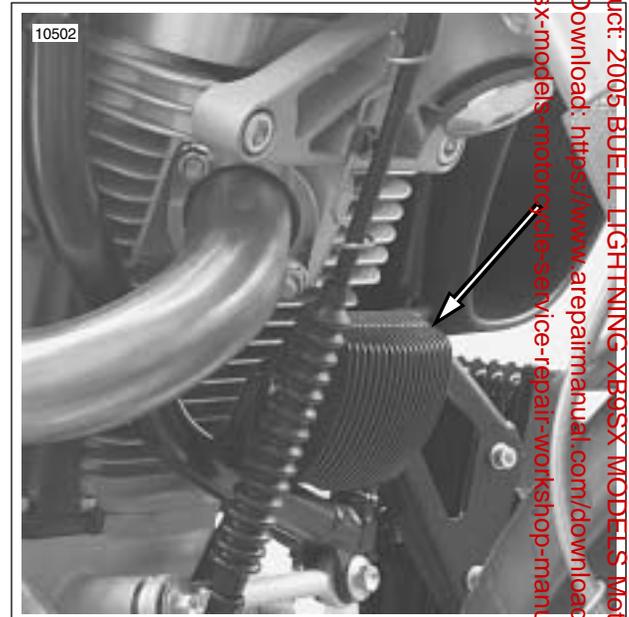


Figure 7-23. Voltage Regulator

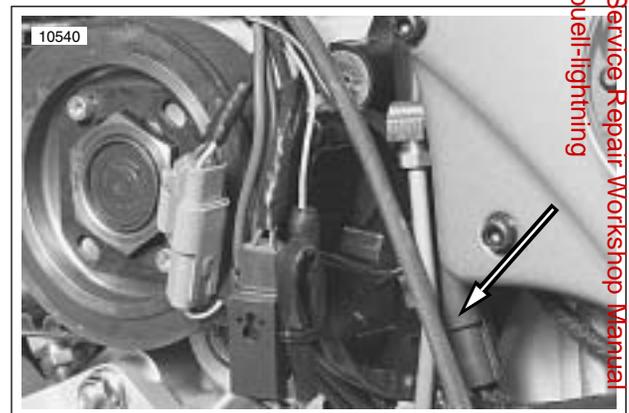
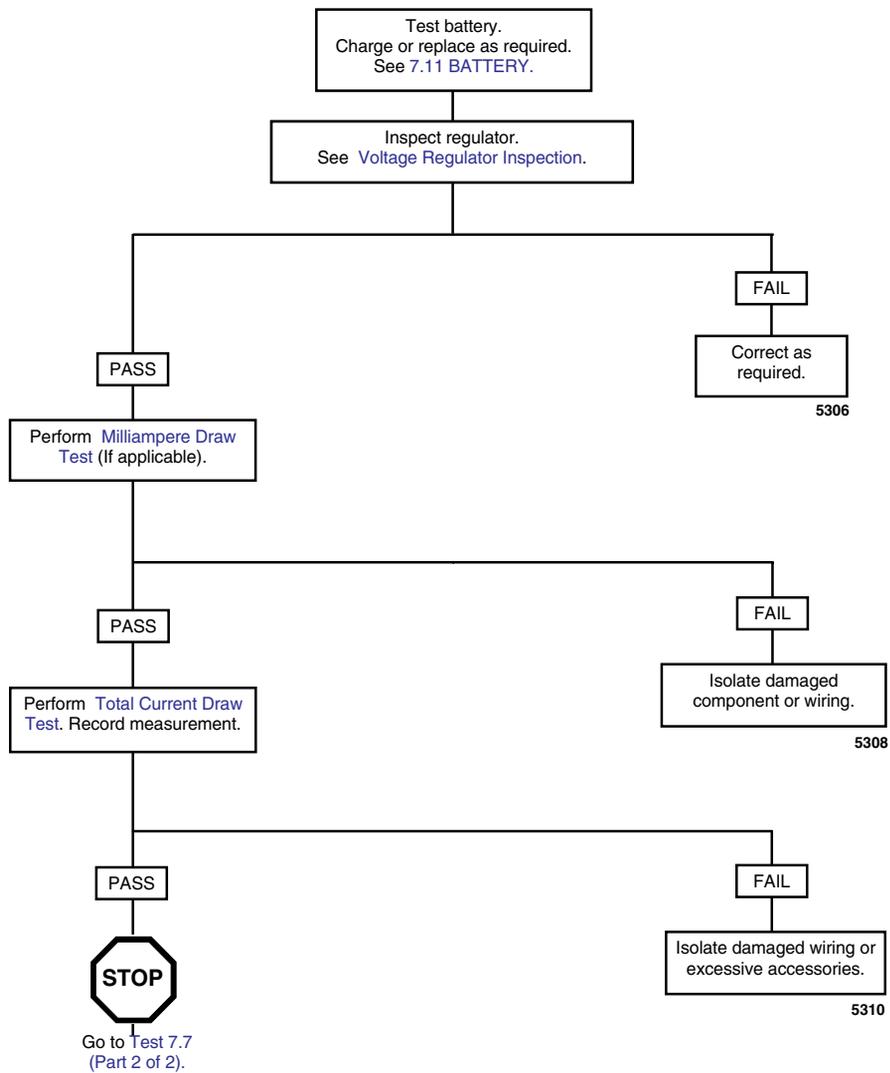


Figure 7-24. Stator Connector [46]

Test 7.7 (Part 1 of 2)

SYMPTOM: BATTERY BECOMES DISCHARGED

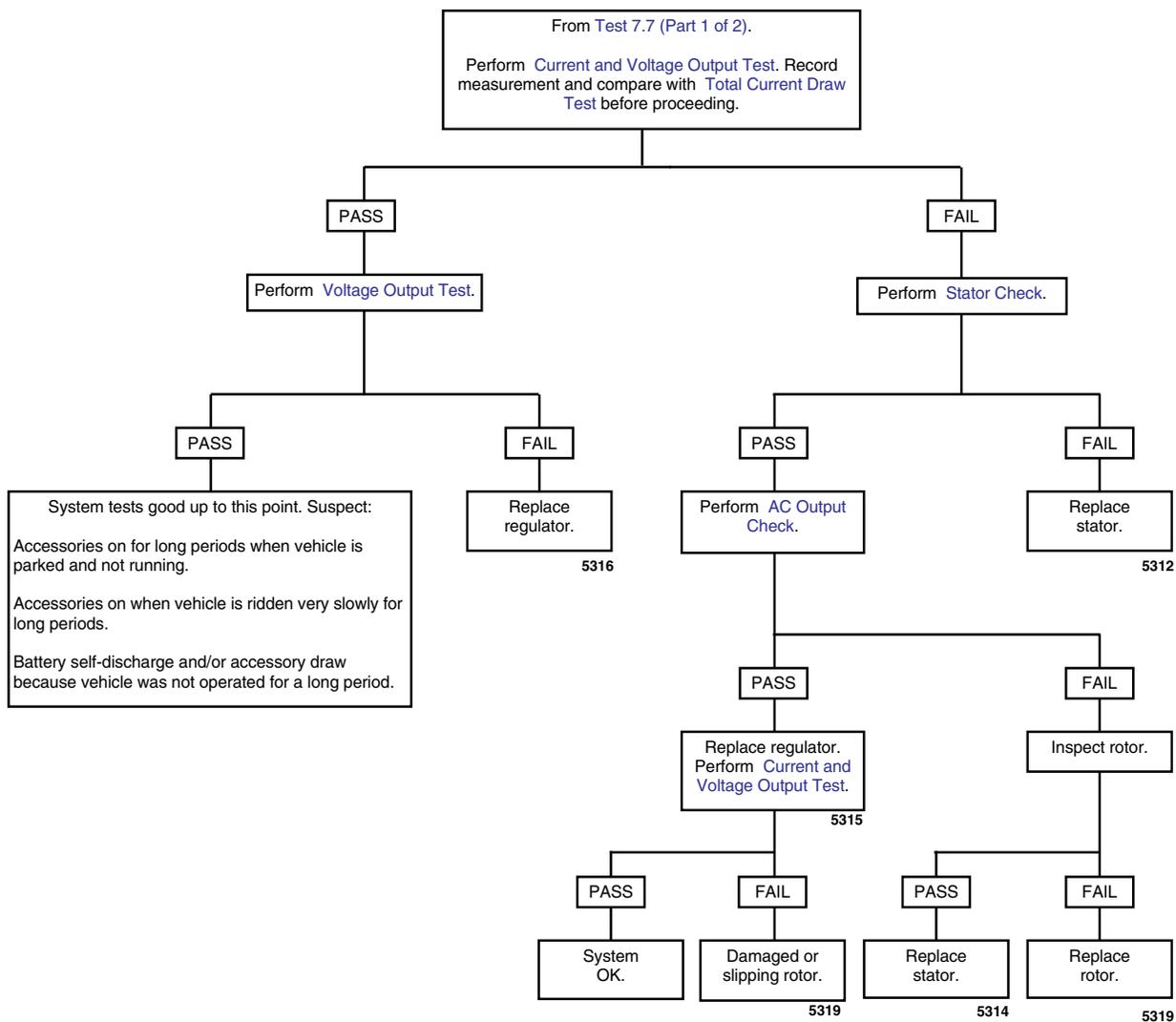


NOTE

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.

bs0021ax

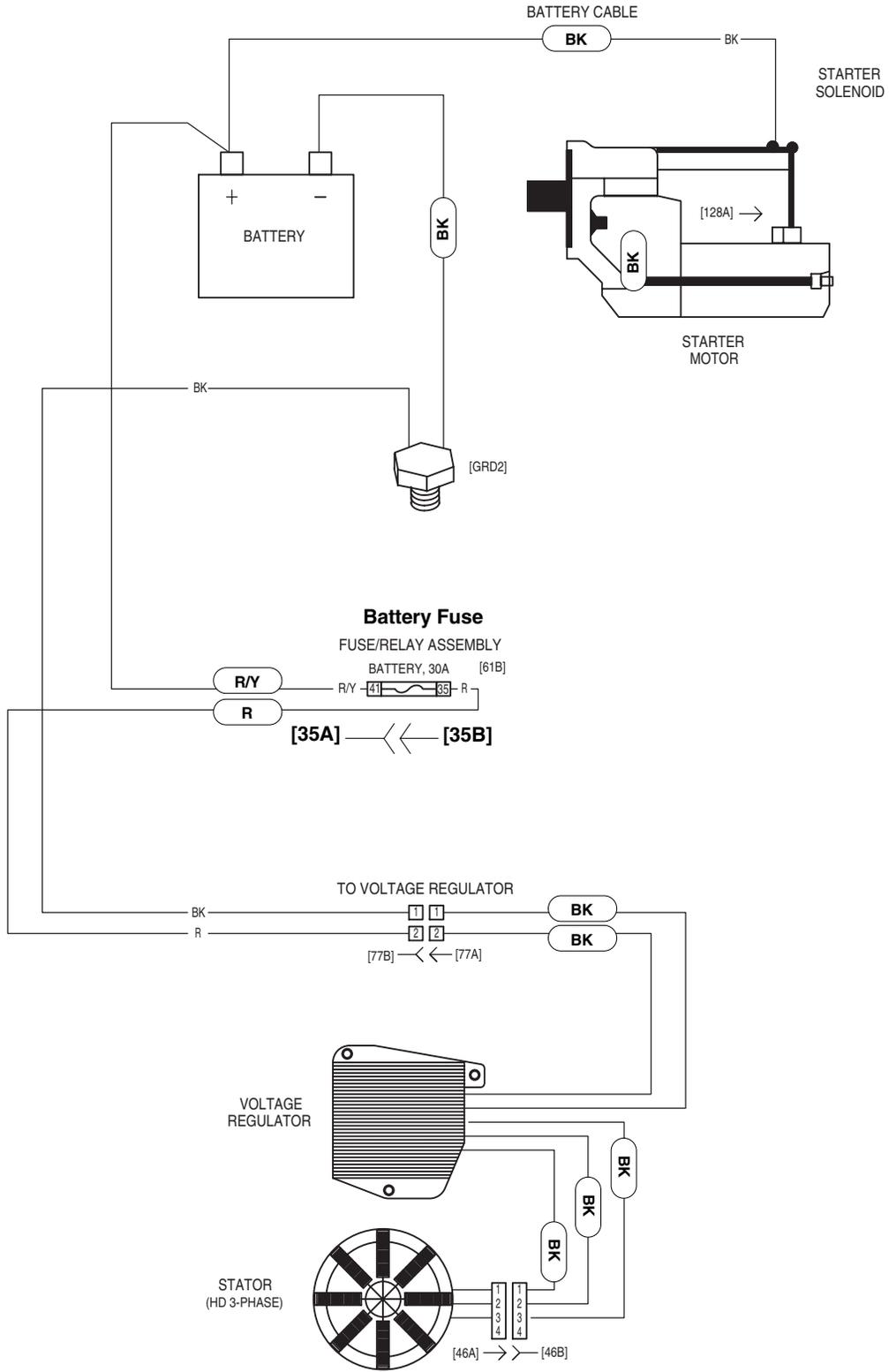


Figure 7-25. Charging System Circuit

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.

- See [Figure 7-26](#). Connect ammeter between negative battery terminal and battery. With this arrangement, you will also pick up any regulator drain.
- With ignition key switch turned to OFF and all lights and accessories off, observe amperage reading.
 - Maximum reading should be 2.0 milliamperes.
 - 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)

- See [Figure 7-27](#). To check for this condition, place load tester induction pickup or current probe pickup over battery negative cable.
- Disconnect stator wiring from voltage regulator wiring at the connector [46] under front sprocket cover See [7.26 SPROCKET COVER WIRING](#). Start the motorcycle and run the engine at 3000 RPM.
- With ignition and all continuously running lights and accessories turned on (headlight on high beam), read the total current draw.

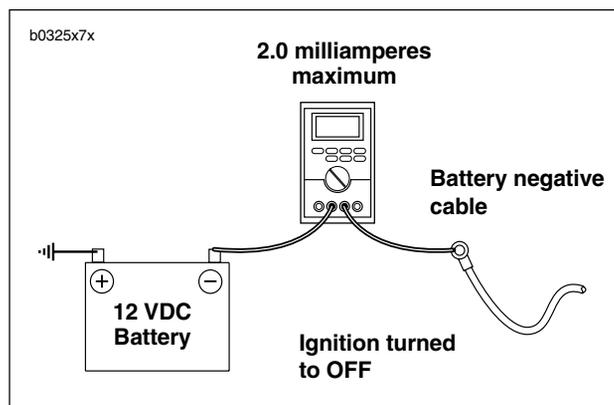


Figure 7-26. Milliampere Draw Test

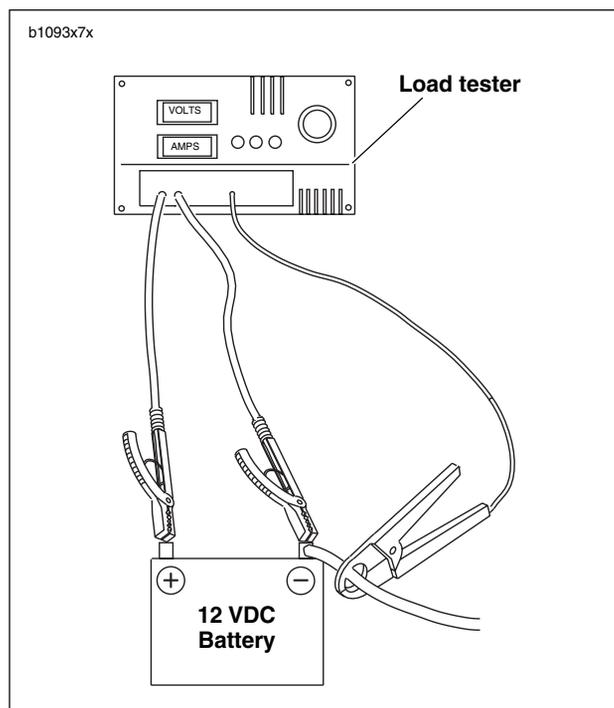


Figure 7-27. Check Current Draw (Ignition Switch On)

- Compare this reading to the reading obtained after performing the [CURRENT AND VOLTAGE OUTPUT TEST](#).
 - The current output should exceed current draw by 3.5 amps minimum.
 - If output does not meet specifications, there may be too many accessories for the charging system to handle.
- 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 [7.26 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)

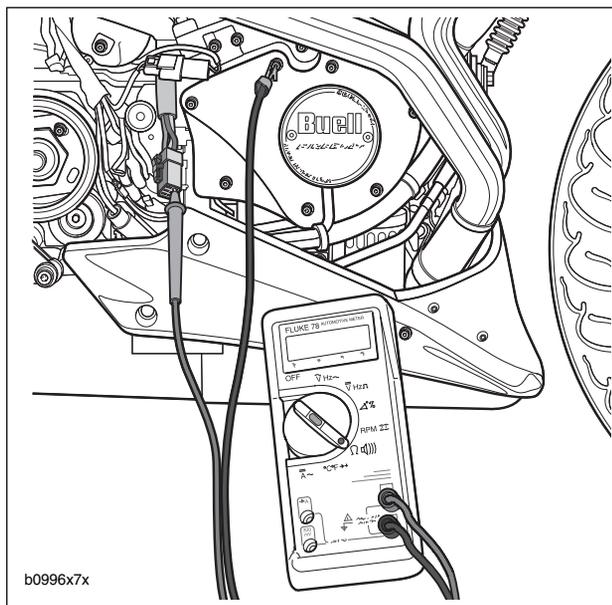


Figure 7-29. Test for Grounded Stator

AC Output Check

1. See [Figure 7-31](#). Test AC output.
 - a. Locate voltage regulator connector [46] under sprocket cover. See [7.26 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](#).

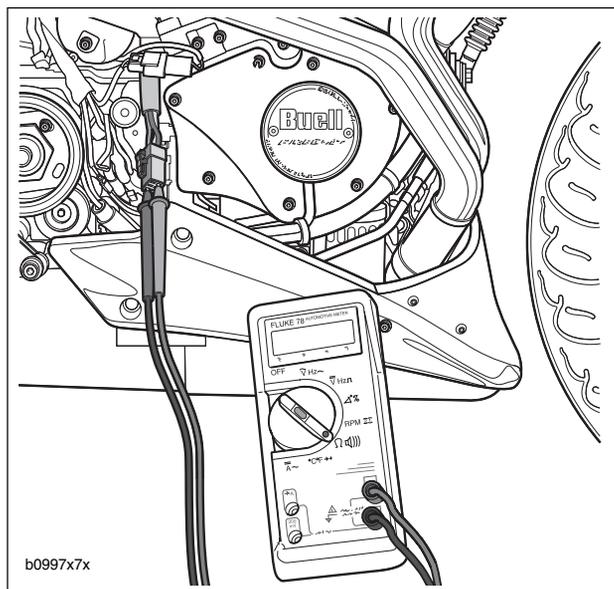


Figure 7-30. Check for Stator Resistance

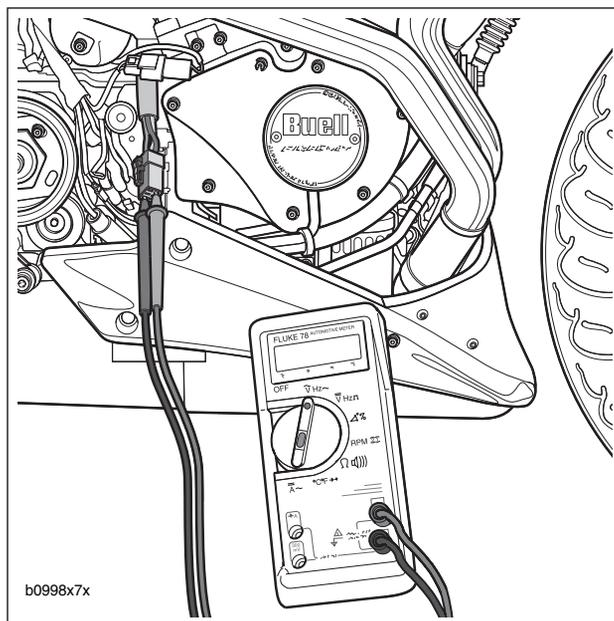


Figure 7-31. Check Stator AC Voltage Output

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 6.4 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 7.26 SPROCKET COVER WIRING.
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.

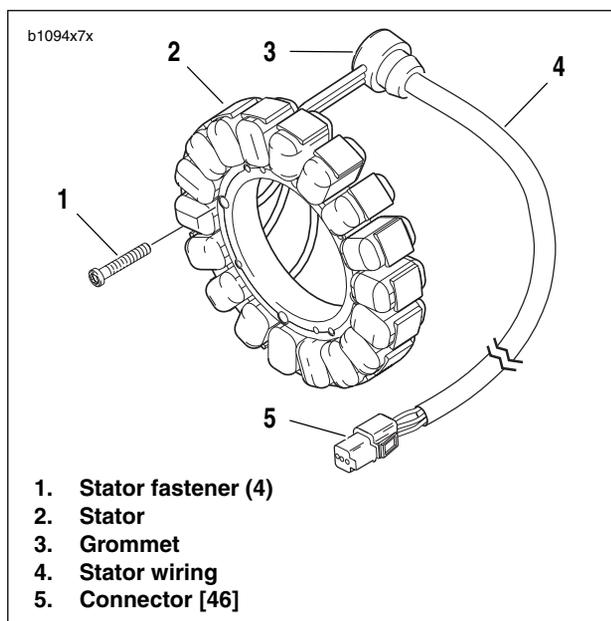
3. Remove and discard the four TORX screws (1) which secure stator (2) to left crankcase half.
4. Remove stator wiring grommet (3) from left crankcase half.
5. Withdraw stator wiring (4) from grommet hole in left crankcase half. Remove stator.



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

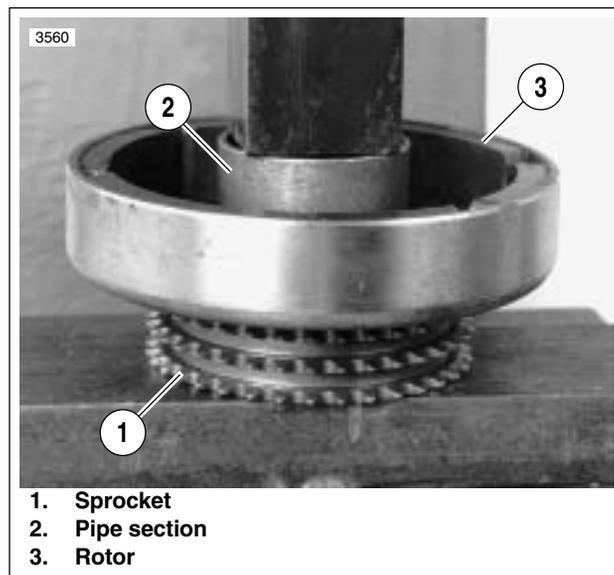
Depending on whether the rotor, the stator, or both the rotor and stator were removed/disassembled, perform the applicable procedures which follow:

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 [7.26 SPROCKET COVER WIRING](#) 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](#).

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 [2.43 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.

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 [7.26 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 **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 [7.26 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 [2.43 SEAT](#).
5. Test charging system. See [7.7 CHARGING SYSTEM](#).

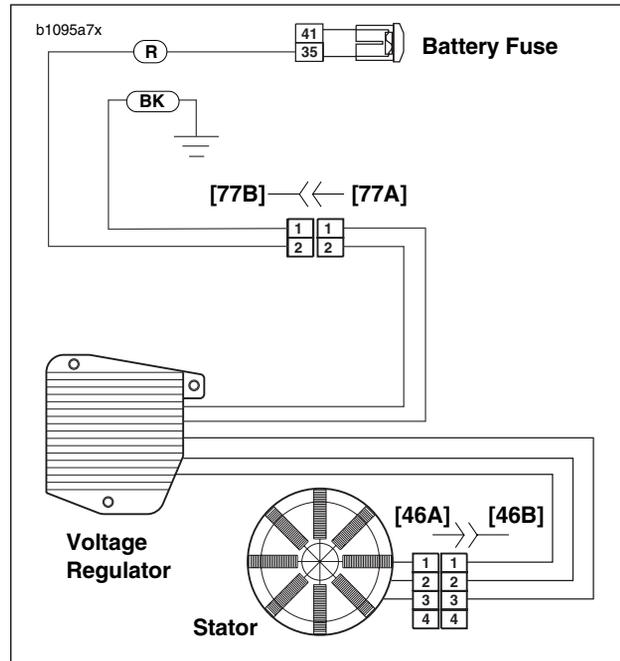
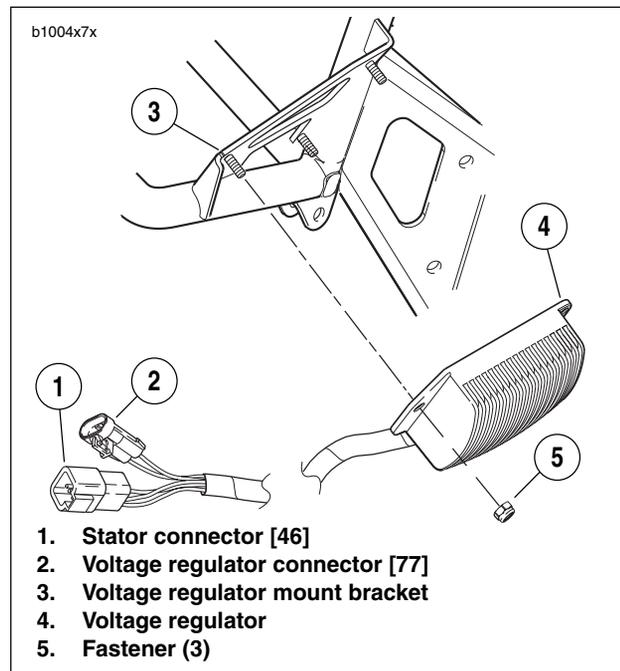


Figure 7-36. Voltage Regulator Connector [77]



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

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)

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.
4. Cut 14 gauge Red/Yellow wire approximately 6 in. (152.4 mm) above the point where it enters the main harness bundle.

NOTE

This is to allow a splice to be made for the new positive cable to be installed.

INSTALLATION

1. 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)

2. 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 coming from positive battery cable into main harness bundle.
 - 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).

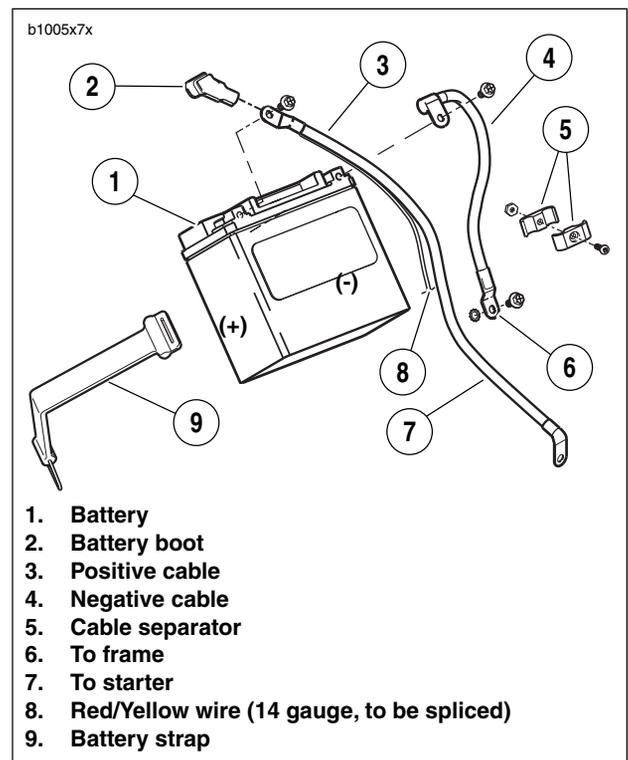
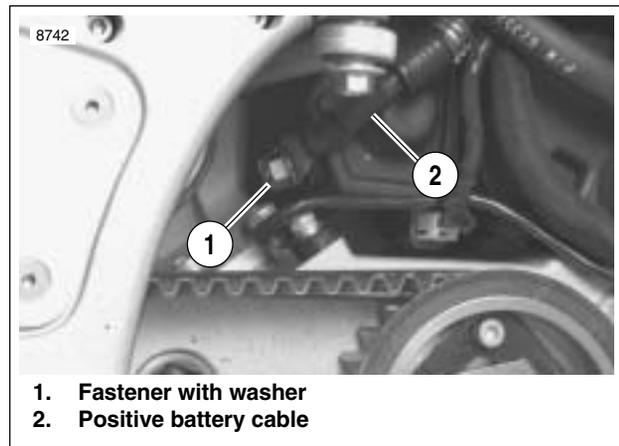


Figure 7-38. Battery



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.



**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)

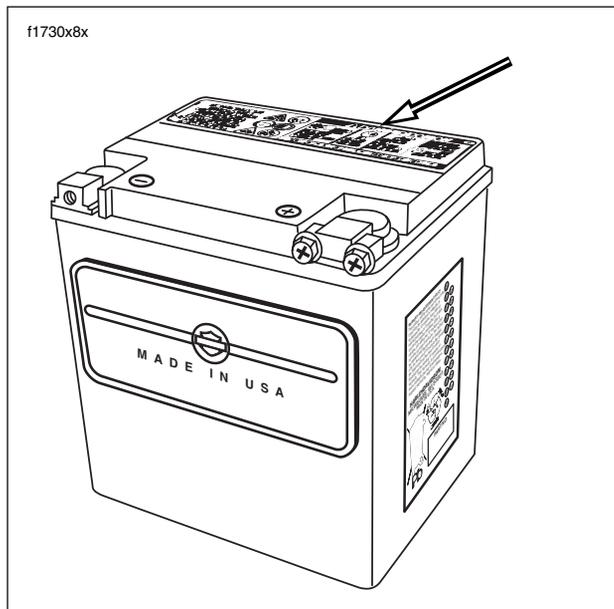


Figure 7-41. Battery Warning Label Location

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.

f2180x3x

1 **2** **3** **4** **5** **6**

NON-SPILLABLE
 This is a ready filled, activated, SEALED BATTERY. **NEVER** remove strip. Refer to owner's manual for charging instructions. If battery is put into service 12 months after date shown, charge for minimum of 1 hour at 6-10 amps. (See side of battery for date.)

⚠ DANGER/POISON 3-4580

EXPLOSIVE **SHIELD EYES.** **NO SPARKS** **SULFURIC ACID** **FLUSH EYES IMMEDIATELY WITH WATER.**
 GASES CAN CAUSE BLINDNESS OR INJURY. •FLAMES CAN CAUSE BLINDNESS OR SEVERE BURNS. GET MEDICAL HELP FAST.

KEEP OUT OF REACH OF CHILDREN. DO NOT OPEN BATTERY.

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

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 % of Charge

VOLTS	% of CHARGE
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

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](#).

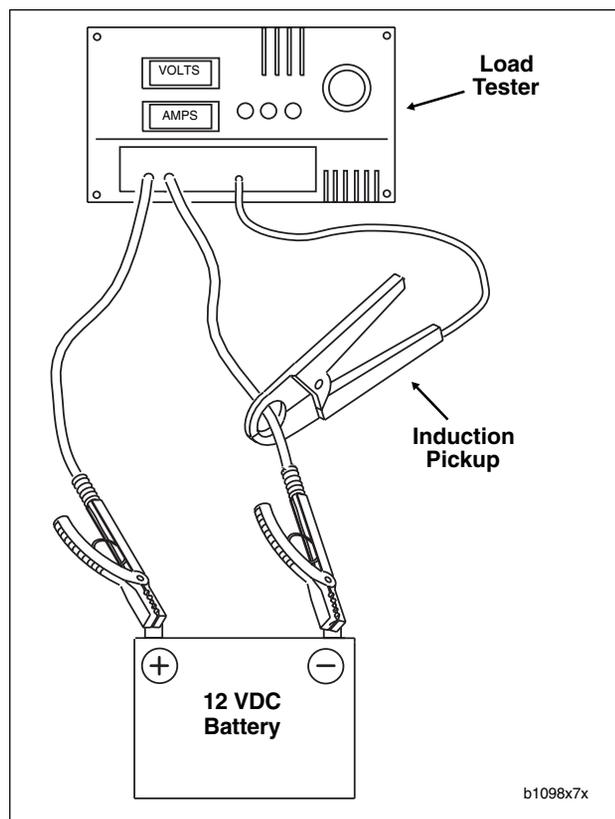


Figure 7-43. Load Test

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%
Buell Lightning	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 [2.43 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)

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

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)

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

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

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](#).

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



Figure 7-44. Negative Battery Cable

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 [2.43 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 7-45](#).

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 (P/N 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](#).

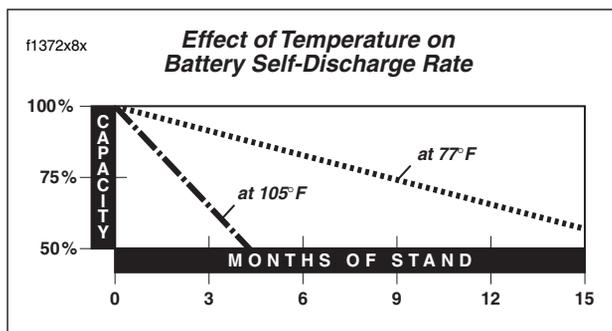


Figure 7-45. Battery Self-Discharge Rate

GENERAL

Dual headlights are equipped with replaceable bulbs.

- High beam headlight is located on the left side of vehicle, and 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 the entire headlight assembly.

- For information on headlight housing and bracket disassembly/assembly see [2.27 HEADLIGHT ASSEMBLY AND SUPPORT BRACKET](#).

NOTE

Low beam does not remain on when high beam is activated. Only one headlight remains on at any given time unless the passing lamp switch is depressed while low beam is activated causing the high beam to temporarily flash.

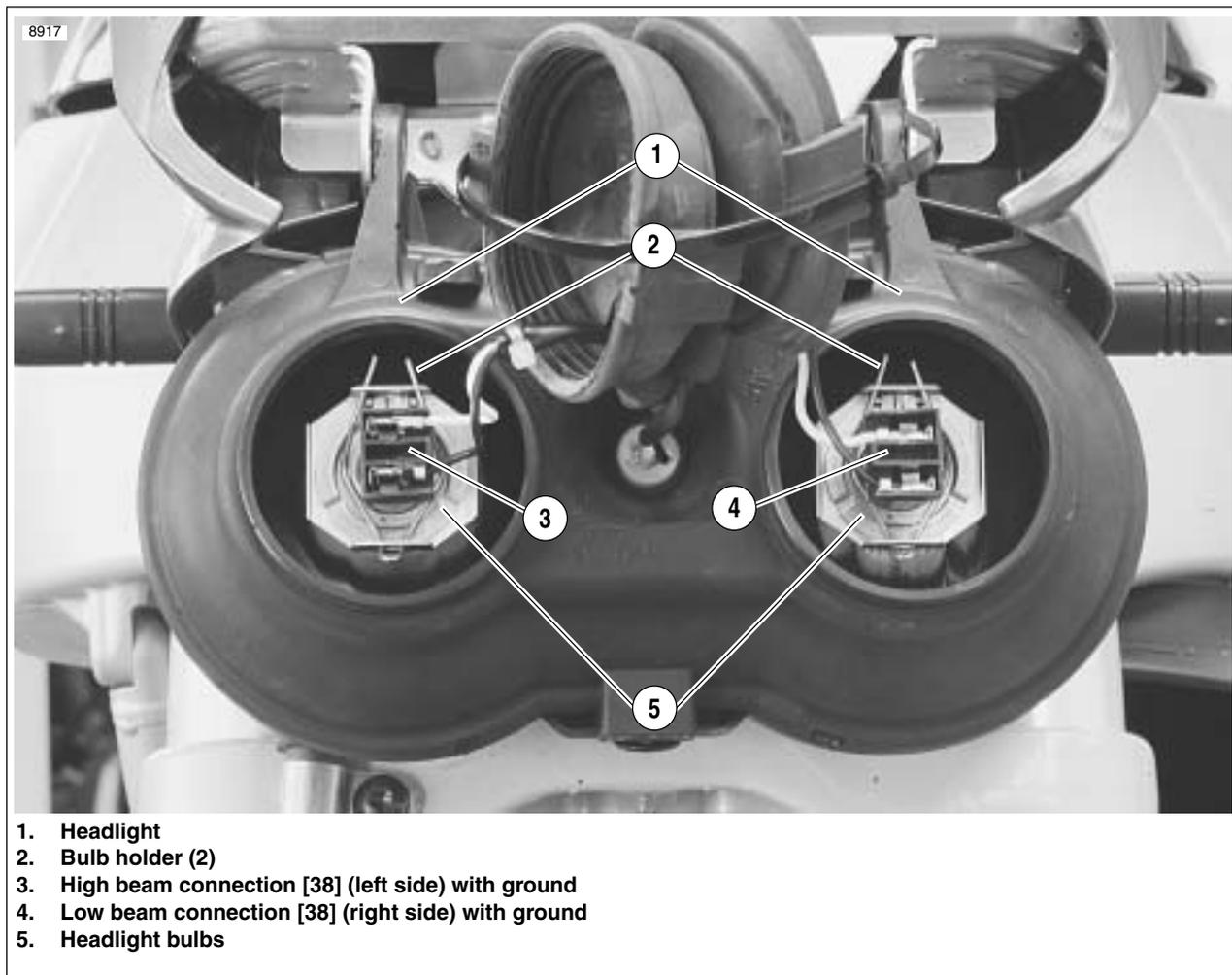


Figure 7-46. Headlight Assembly/Rear View

HEADLIGHT BULBS

Removal

1. Remove seat. See [2.43 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.

⚠ 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)

3. See [Figure 7-46](#). Remove rubber boot from headlight housing.
4. Unplug headlight bulb connectors (3) and/or (4).
5. Release bulb holder (2) from headlight housing clips.
6. Pull bulb housing from headlight housing.

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 7-46](#). Align tabs on bulb (5) with tabs on headlight (1). Insert bulb.
2. Close the bulb holder (2).
3. Connect the headlight bulb connector.

NOTE

If the rubber boots are not installed correctly the wiring harnesses can contact the edge of the forward frame mount. The wiring harness guides must be installed at a 20 degree angle.

4. See [Figure 7-48](#). Install rubber boot.
 - a. When installing the rubber boots on the back of the headlight housing be sure to align the harness guides or spigots with the casting marks on the headlight housing.
 - b. When the spigots are aligned with the casting marks the wiring harness will be at approximately 20 degrees.
5. Connect negative battery cable.

⚠ 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)

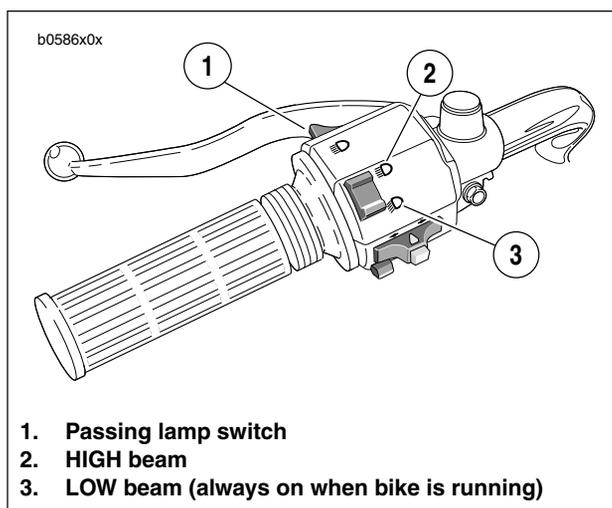


Figure 7-47. Headlight Controls

6. See [Figure 7-47](#). 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. 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 [1.20 HEADLIGHTS](#).

⚠ 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)

8. Install seat. See [2.43 SEAT](#).

10525



10526



Figure 7-48. Headlight Housing 20 Degree Alignment Marks for Rubber Boot Wiring Harness Guides or Spigots

REMOVAL/DISASSEMBLY

1. See [Figure 7-49](#). Remove two screws (2) to detach tail light lens (4) and tail light (5). If replacing bulb (3), turn counterclockwise and remove.
2. Remove seat. See [2.43 SEAT](#).
3. Disconnect three connectors [93] from tail lamp harness (6).

ASSEMBLY/INSTALLATION

1. See [Figure 7-49](#). Attach the three tail light harness connectors [93] (7).
2. If removed, install tail lamp bulb (3).
 - a. Turn bulb clockwise to install.
 - b. Install tail light lens (4) and tail light (5) with two fasteners (2).

⚠ 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.

⚠ 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 [2.43 SEAT](#).

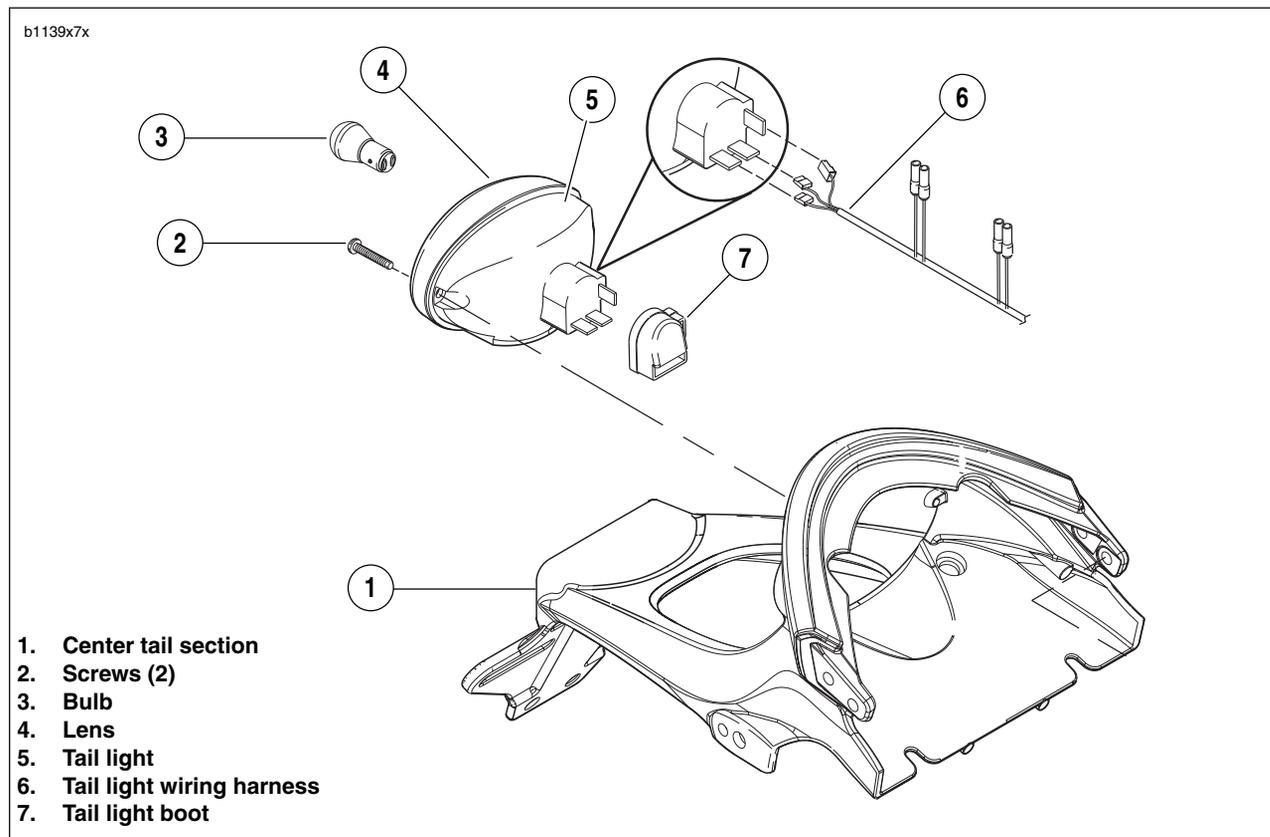


Figure 7-49. Tail Lamp Assembly

REMOVAL/DISASSEMBLY

1. Remove seat. See 2.43 SEAT.
2. See Figure 7-50. Disconnect the two connectors [45] from license plate lamp harness (2).
3. Remove two jam nuts and washers (1) to detach license plate lamp from center tail section (3).
4. Pull the lamp assembly away from center tail section pulling the harness out between the tail screen and the center tail section.

NOTE

See Figure 7-51. If replacing bulb only, remove both lamp lens screws (3), remove lamp lens (5) and remove bulb (4). Replace bulb and install lens and tighten screws.

ASSEMBLY/INSTALLATION

1. See Figure 7-50. Install license plate lamp assembly.
 - a. Insert license plate lamp wiring harness (2) through hole at rear of center tail section (3) and route between the tail section and the tail screen (4).
 - b. Attach lamp assembly to tail section using washers and jam nuts (1) and tighten to 12-36 in-lbs (1.4-4.1 Nm).
 - c. Attach the two connectors [45] from license plate lamp harness (2) to main harness.
2. Check 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 license plate lamp illumination.
 - c. 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)

3. Install seat. See 2.43 SEAT.

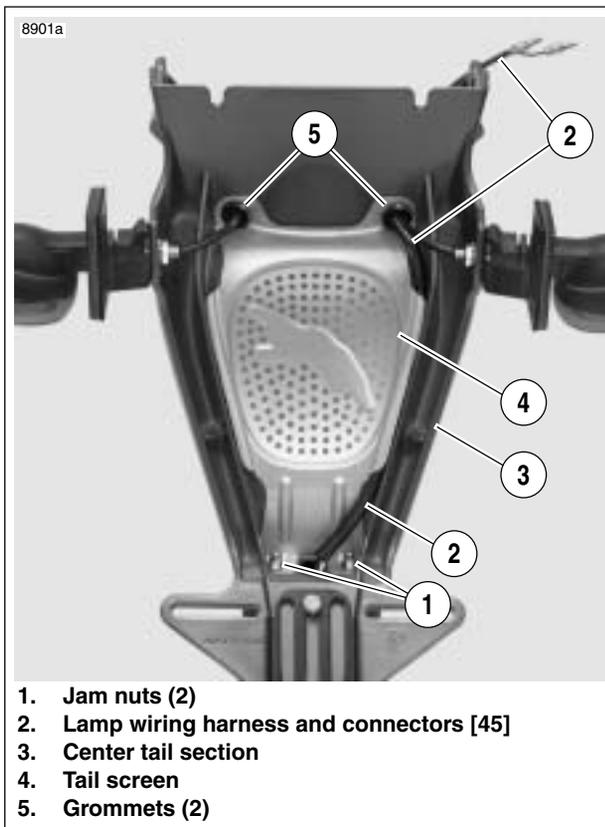


Figure 7-50. License Plate Lamp Mounting

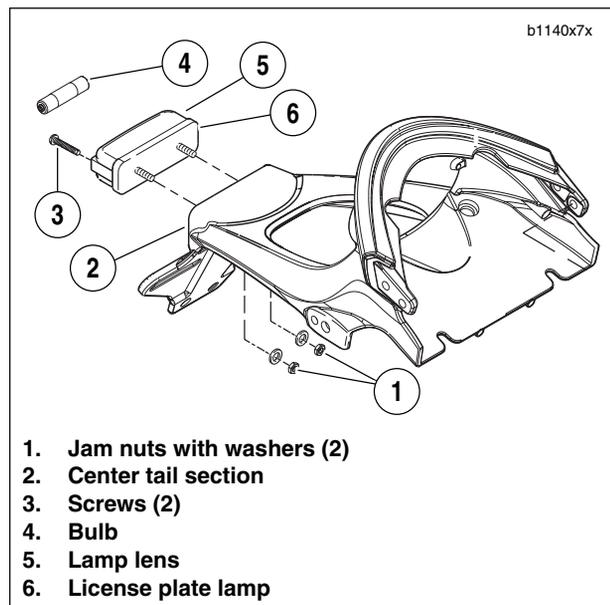


Figure 7-51. License Plate Lamp

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. Remove windscreen. See 2.42 WINDSCREEN.
2. See Figure 7-52. Disconnect bullet connectors on turn signal wires.
3. See Figure 7-53. Remove jam nut and lockwasher (2) from inside of front module (3).
4. Pull bullet connectors and wiring through hole in front module (3) and remove turn signal (1).

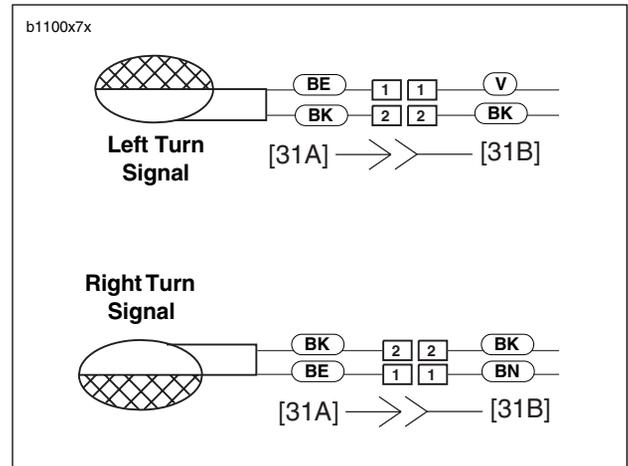


Figure 7-52. Front Turn Signal Connections

1. Turn signal (2)
2. Jam nut and lockwasher (2)
3. Front module, left and right
4. Windscreen

b1141x7x

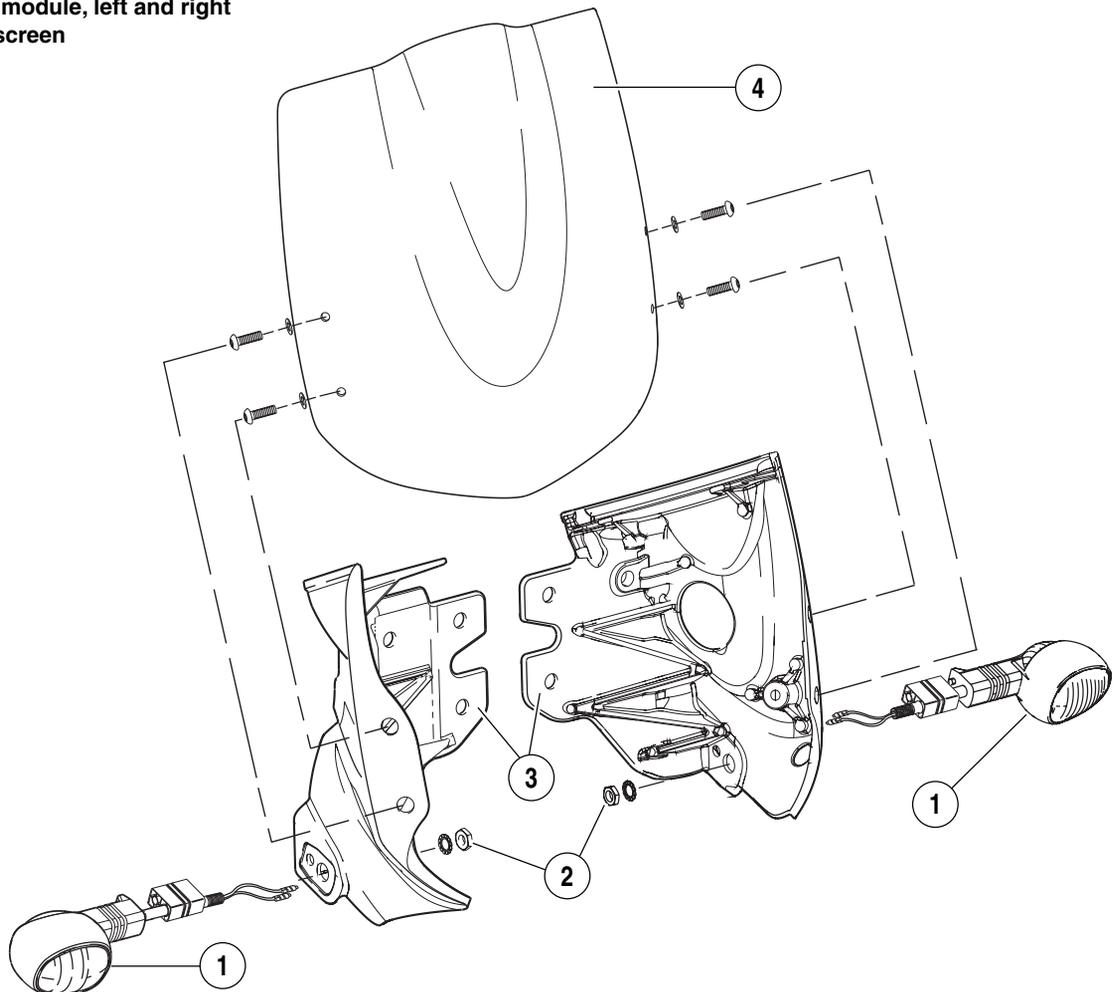


Figure 7-53. Front Turn Signals

Rear

1. Remove seat See 2.43 SEAT.
2. See Figure 7-54. Disconnect bullet connectors [18] & [19] on turn signal wires.
3. See Figure 7-55. Remove fastener and lockwasher (4).

NOTE

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

4. Remove turn signal from center tail section (5).

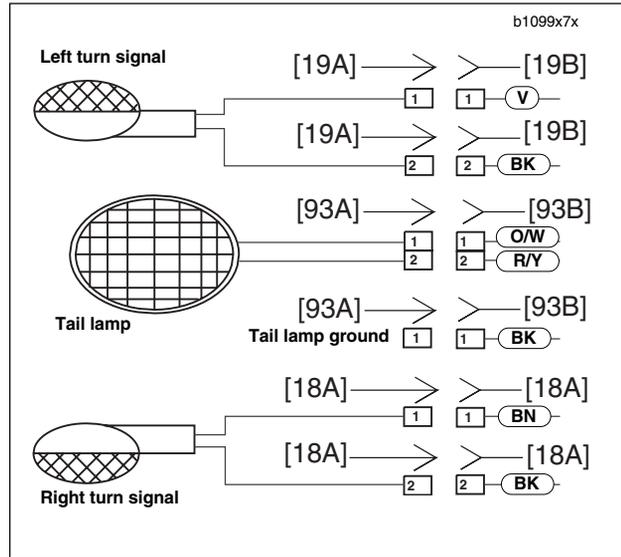


Figure 7-54. Rear Turn Signal Connections

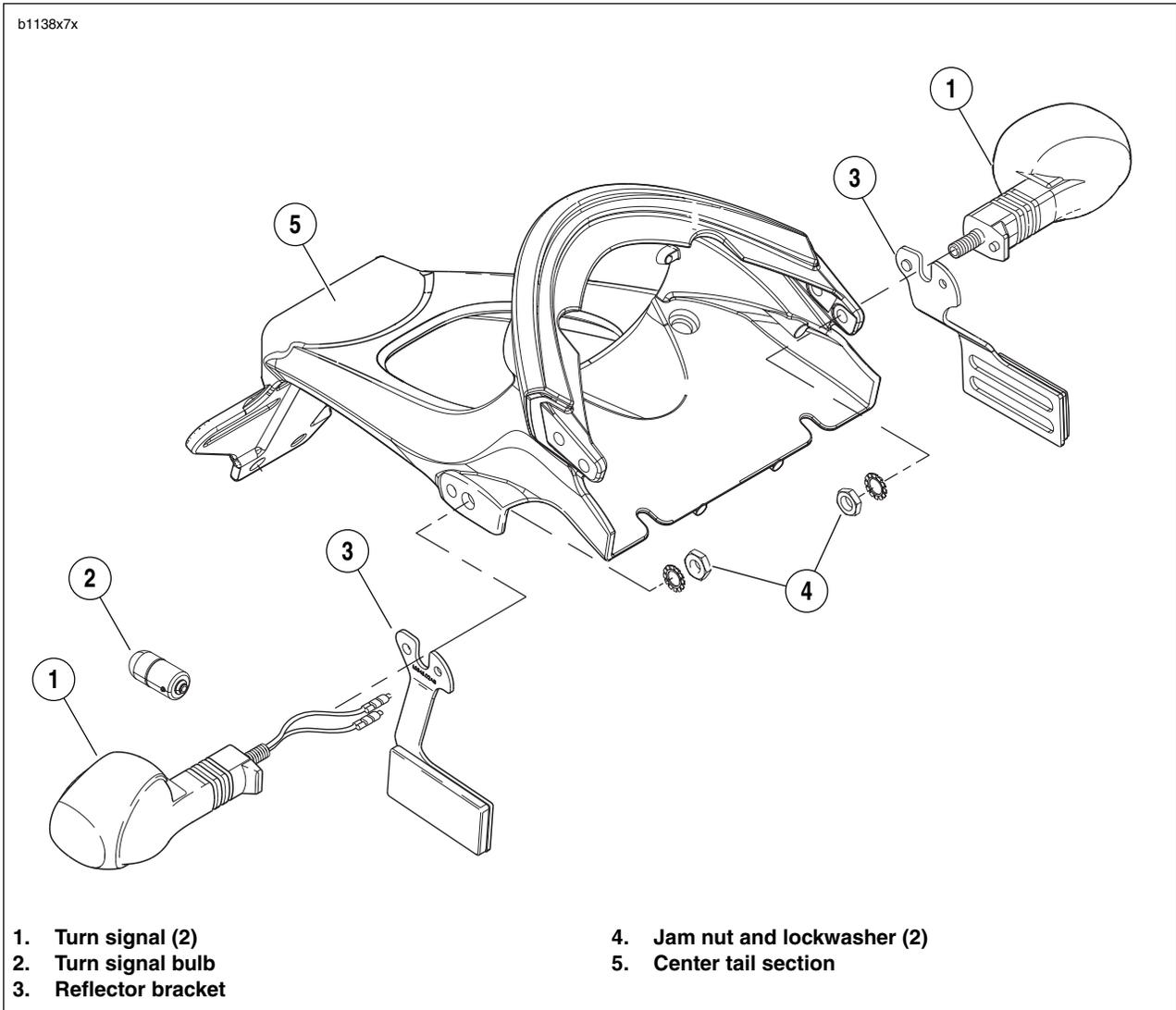


Figure 7-55. Rear Turn Signals

INSTALLATION

Front

- See [Figure 7-53](#). Insert bullet connectors and wiring through hole in front module.
- Install turn signal using lockwasher and jam nut. Tighten fastener to 25-28 **in-lbs** (2.8-3.2 Nm).

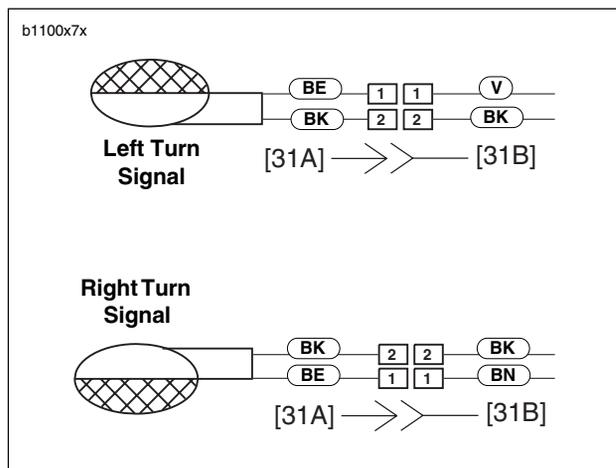


Figure 7-56. Front Turn Signal Connections

- Attach bullet connectors on turn signal wires as shown in [Figure 7-57](#).

⚠ 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)

- Check turn signals for proper operation. If operation fails, reread procedure and verify that all steps were performed.
 - Turn ignition key switch to ON.
 - Activate left turn signals using switch on left handlebar. Front and rear left turn signals must flash.
 - Activate right turn signals using switch on left handlebar. Front and rear right turn signals must flash.
 - Turn ignition key switch to OFF.
- Install windscreen. See [2.42 WINDSCREEN](#).

Rear

- See [Figure 7-57](#). Insert bullet connectors through center tail section.
- Install reflector bracket.

NOTE

Be sure tab on turn signal fits into hole in reflector bracket and tab on reflector bracket fits into hole in enter tail section.

- See [Figure 7-55](#). Attach turn signal using lockwasher and fastener (4). Tighten fastener to 25-28 **in-lbs** (2.8-3.2 Nm).

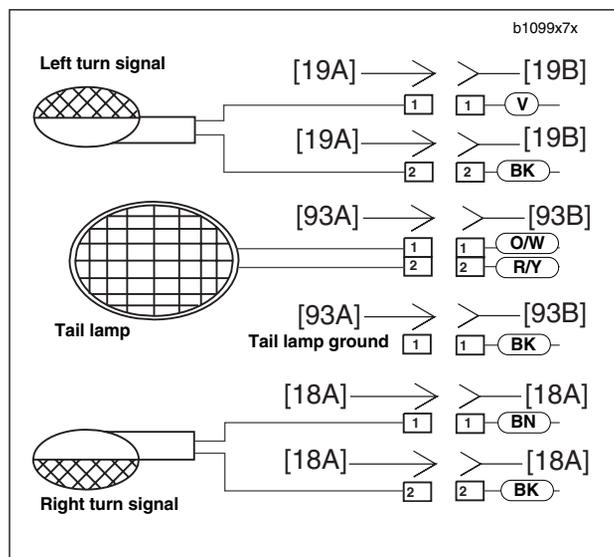


Figure 7-57. Rear Turn Signal Connections

- Attach bullet connectors on turn signal wires as shown in [Figure 7-57](#).

⚠ 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)

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

- Install seat. See [2.43 SEAT](#).

REMOVAL

NOTE

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

1. Remove windscreen. See [2.42 WINDSCREEN](#).
2. Remove fastener securing turn signal flasher to front module.
3. See [Figure 7-58](#). Detach 3-place connector [30] from flasher body.

INSTALLATION

1. See [Figure 7-58](#). Attach 3-place connector [30] to flasher.
2. Install turn signal to front module. Tighten fastener to 12-36 **in-lbs** (1.4-4.1 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)

3. 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. See [Figure 7-59](#). 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.
4. Install windscreen. See [2.42 WINDSCREEN](#).

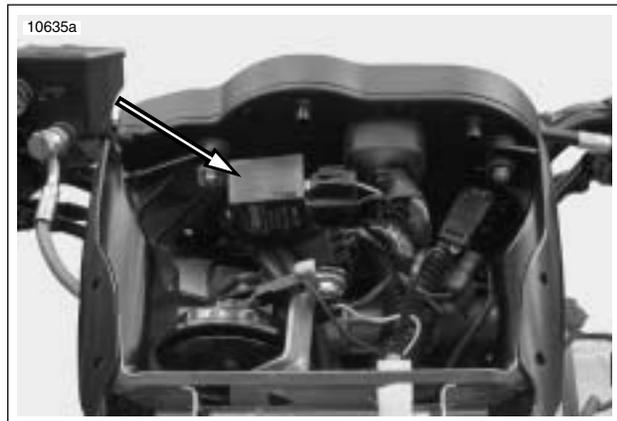
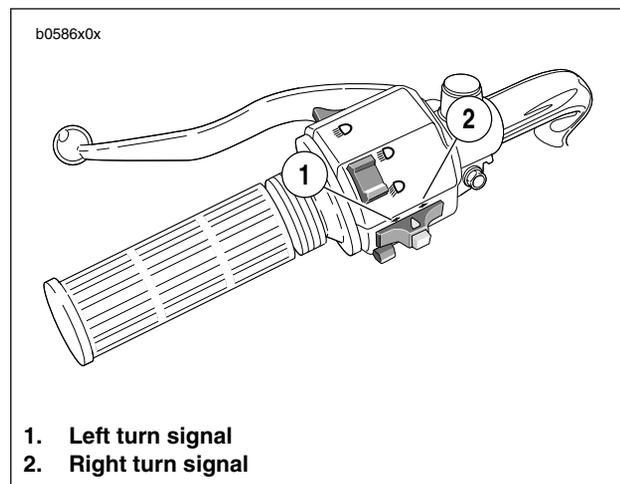


Figure 7-58. Turn Signal Flasher



1. Left turn signal
2. Right turn signal

Figure 7-59. 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 windscreen. 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 windscreen. Remove cable straps. Detach connector [24] from wiring harness.

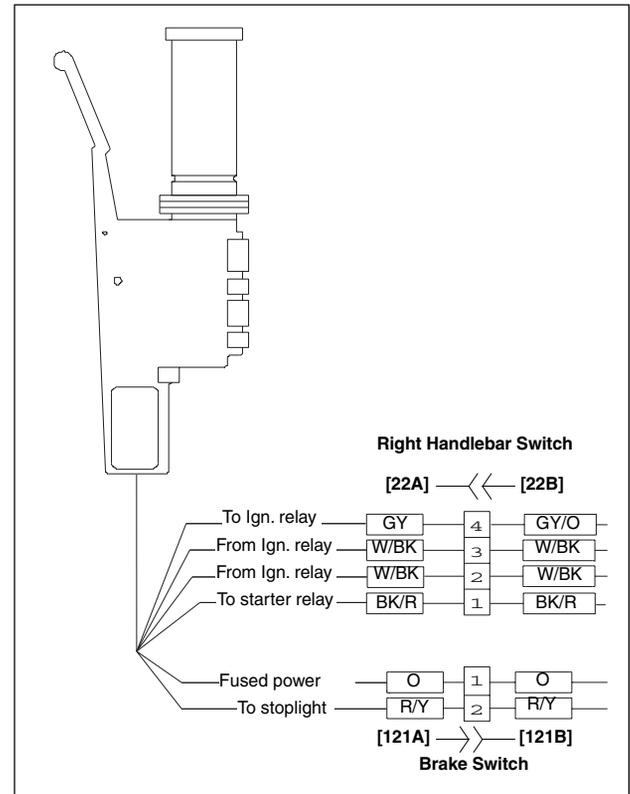


Figure 7-60. Right Handlebar Switch Connection

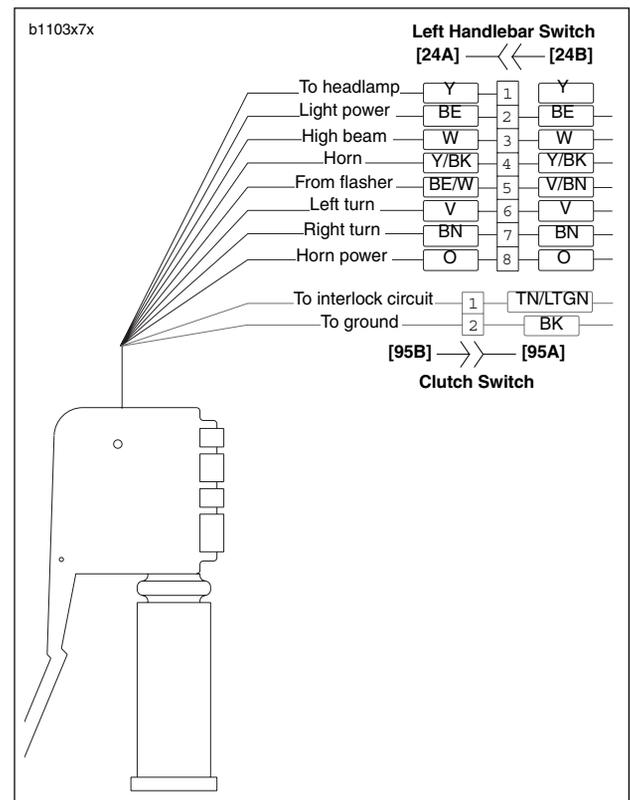


Figure 7-61. Left Handlebar Switch Connection

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

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 ON.
 - b. Set ENGINE STOP SWITCH to RUN.
 - c. Start motorcycle.
 - d. Turn ignition key switch to OFF.
6. Turn ignition key switch to OFF.

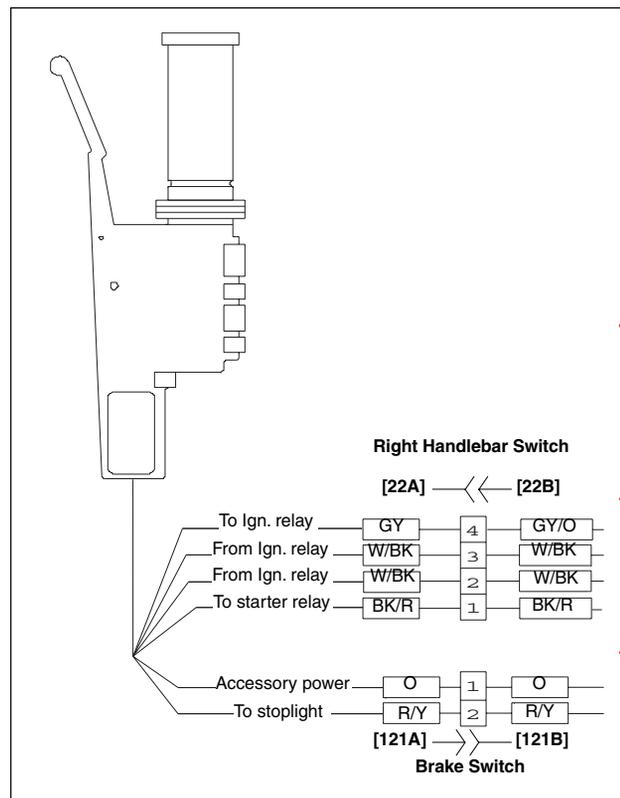


Figure 7-62. Right Handlebar Switch Connection