

# BATTERY

## GENERAL

### **⚠ WARNING**

- Batteries contain sulfuric acid which can cause severe burns. Avoid contact with skin, eyes or clothing.
- Batteries produce explosive hydrogen gas at all times, especially when being charged. Keep cigarettes, open flame and sparks away from the battery at all times. Ventilate area when charging battery. Always protect hands and protect eyes with shield or goggles when working near a battery or acid. **KEEP BATTERIES AND ACID OUT OF THE REACH OF CHILDREN!**

The battery is below the seat in the center of the vehicle. The battery can be removed from the left side of the motorcycle without removing the tail section or fuel tank.

The battery requires no additional fluid at any time.

Check the battery:

- At every scheduled service interval.
- When storing or removing the motorcycle for the season.

## CHARGING

The sealed, low maintenance battery has a very slow discharge rate. See [Figure 1-6](#). If you suspect a battery problem, test as described below.

1. Remove battery from motorcycle. See [BATTERY, REMOVAL](#) on [page 1-14](#).
2. Test battery voltage using a multimeter.
3. If battery voltage is below 12.66 Volts, use a 1-100 Amp, 12 Volt charger on battery. See [Table 1-3](#).

### **⚠ DANGER - EXPLOSIVE GASES**

Cigarettes, flames or sparks could cause battery to explode resulting in personal injury. Always shield eyes and face from battery. Do not charge without proper instruction and training. Securely connect cables to the proper terminals.

### **POISON - CAUSES SEVERE BURNS**

Contains sulfuric acid. Avoid contact with skin, eyes, and clothing. In event of accident, flush with water and call a physician immediately.

### **KEEP OUT OF REACH OF CHILDREN**

Figure 1-5. Battery Warnings

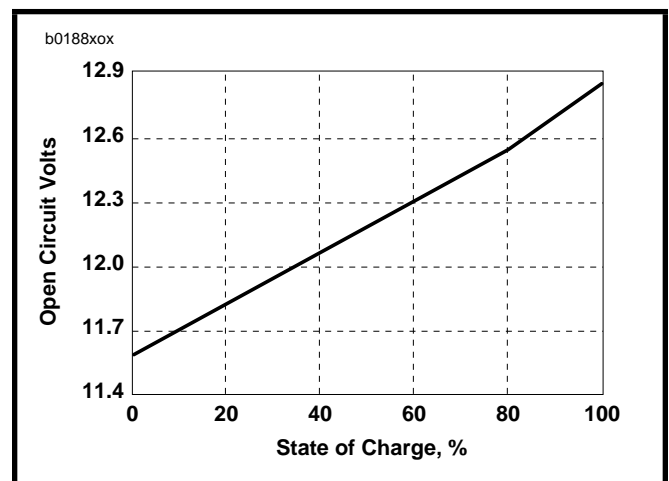


Figure 1-6. Open Circuit Voltage vs. State of Charge (No Charge Last 24 Hours)

Table 1-3. Charging Rates

| CHARGER OUTPUT CURRENT RATE | OPEN CIRCUIT VOLTAGE |                      |                       |
|-----------------------------|----------------------|----------------------|-----------------------|
|                             | 12.00 to 12.66 Volts | 11.40 to 11.99 Volts | Less than 11.40 Volts |
| 1 Amp                       | 32 hours             | 48 hours             | 96 hours              |
| 2-5 Amps                    | 16 hours             | 24 hours             | 48 hours              |
| 6-10 Amps                   | 8 hours              | 12 hours             | 24 hours              |

## REMOVAL

### **⚠️WARNING**

To avoid accidental start-up of vehicle and possible personal injury, disconnect the battery cables before proceeding. Always disconnect the negative cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion producing personal injury.

### **⚠️CAUTION**

See **Figure 1-8**. Hold battery cable when loosening battery terminal hardware. Failure to hold cable will cause battery damage.

1. Disconnect battery cables, negative cable first.
2. Remove battery strap locknut using 7/16 in. flex socket (SNAP-ON Part No. TMU141) and handle (SNAP-ON Part No. TM62B).

### *NOTE*

*On California models, detach carbon canister from bracket before removing battery.*

3. Remove battery from left side.

## INSTALLATION

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

### **⚠️WARNING**

Always connect positive battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion resulting in personal injury.

### **⚠️CAUTION**

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

2. Connect positive cable to positive (+) battery terminal. Then, after positive cable has been connected to positive terminal, connect negative cable to negative (-) battery terminal.

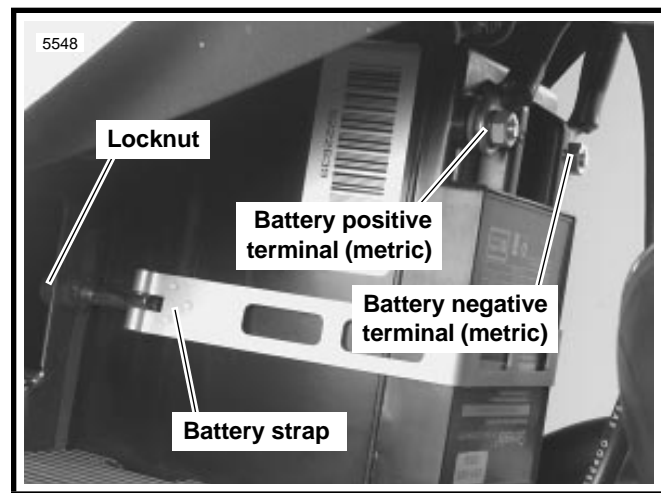
### **⚠️CAUTION**

See **Figure 1-8**. Hold battery cable when tightening battery terminal hardware. Failure to hold cable will cause battery damage.

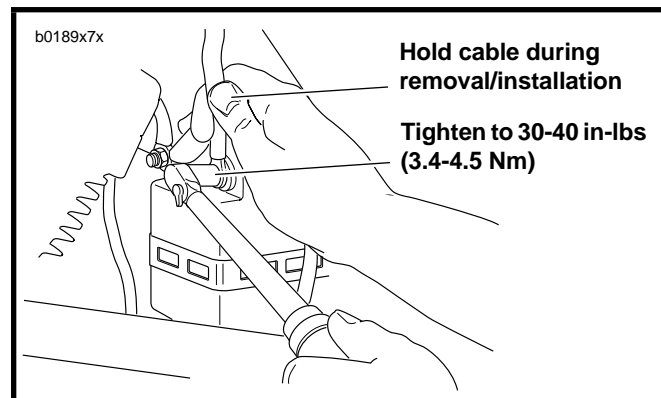
3. Tighten battery hardware to 30-40 **in-lbs** (3.4-4.5 Nm).
4. Apply light coat of petroleum jelly or corrosion-retardant material to both terminals.

### *NOTE*

*On California models, attach carbon canister to bracket after installing battery.*



**Figure 1-7. Battery**



**Figure 1-8. Checking Battery Terminals**

# ENGINE LUBRICATION SYSTEM

## CHECKING ENGINE OIL LEVEL

Check engine oil level:

- At least once every 500 miles (800 km).
- At every service interval.

### NOTE

*If engine uses more oil than normal or if vehicle is operated under harsh conditions, check oil more frequently.*

When checking or changing engine oil:

- Warm vehicle to normal operating temperature.
  - Turn engine off.
  - Hold motorcycle upright (not leaning on side stand) on a level surface.
1. Remove seat.
  2. See [Figure 1-10](#). Remove filler cap/dipstick from oil tank. Wipe dipstick clean.
  3. Install filler cap onto oil tank. Make sure cap is fully seated on tank.

### CAUTION

**Do not switch oil brands indiscriminately because some oils interact chemically when mixed. Use of inferior oils or non-detergent oils can damage the engine.**

4. Remove filler cap again and check oil level on dipstick.

Oil level should be between lower and upper dipstick level marks. If oil level in tank is below lower mark of dipstick, add oil to tank. Install filler cap/dipstick.

Recommended viscosity depends upon ambient temperature. See [Table 1-4](#).

### NOTE

*Difference between upper and lower dipstick marks is 0.5 quart (0.47 liter).*

### WARNING

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

5. Install seat.

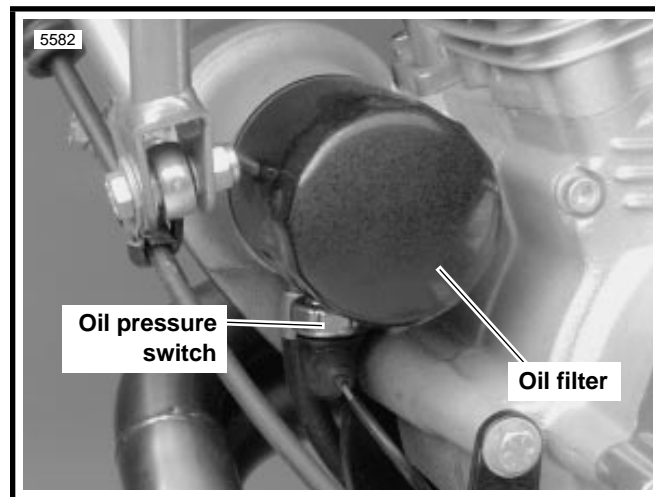


Figure 1-9. Oil Filter and Mount

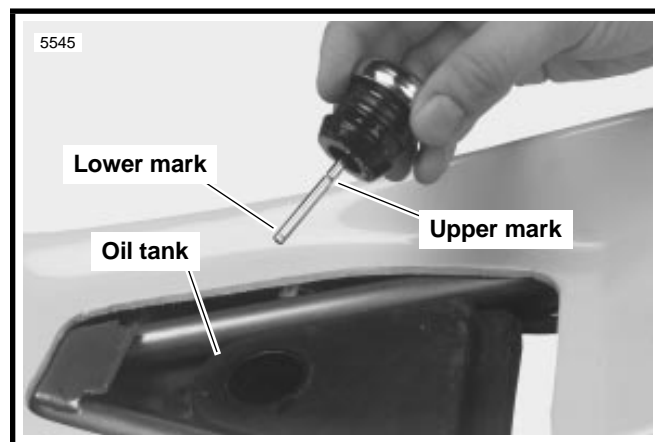


Figure 1-10. Checking Oil Tank Level

Table 1-4. Recommended Oil Grades

| HARLEY-DAVIDSON TYPE | VISCOSITY | HARLEY-DAVIDSON RATING | LOWEST AMBIENT TEMP. | COLD WEATHER STARTS BELOW 50° F |
|----------------------|-----------|------------------------|----------------------|---------------------------------|
| H.D. Multi-Grade     | SAE 10W40 | HD 240                 | Below 40° F (4°C)    | Excellent                       |
| H.D. Multi-Grade     | SAE 20W50 | HD 240                 | Above 40° (4°C)      | Good                            |
| H.D. Regular Heavy   | SAE 50    | HD 240                 | Above 60° (16°C)     | Poor                            |
| H.D. Extra Heavy     | SAE 60    | HD 240                 | Above 80° (27°C)     | Poor                            |

## CHANGING ENGINE OIL AND FILTER

Change engine oil:

- At the 500 mile (800 km) service interval.
- At every 5000 mile (8000 km) service interval thereafter.
- When storing or removing the motorcycle for the season.

### NOTE

*The colder the weather, the shorter the recommended oil change interval. A vehicle used only for short runs in cold weather must have the engine oil drained more frequently.*

1. Place a suitable container under the motorcycle.
2. See [Figure 1-11](#). Compress clamp. Remove hose from drain plug by pulling hose forward. Direct hose to container and completely drain oil tank.
3. Install drain hose on drain plug. Tighten clamp.
4. Remove oil filter using [OIL FILTER WRENCH \(Part No. HD-41215\)](#).
5. Clean filter gasket contact surface on crankcase. Surface should be smooth and free of any debris or old gasket material.
6. See [Figure 1-12](#). Apply a thin film of oil to gasket contact surface on crankcase mounting plate and to **new** oil filter.
7. Pour 4.0 ounces (0.12 liter) of clean oil into **new** filter when changing oil.
8. Screw filter onto adapter until gasket contacts mounting plate surface. Apply another 1/2-3/4 turn by hand.

### WARNING

**Be sure no oil gets on tires when changing oil and filter. Traction will be adversely affected which may lead to a loss of control and personal injury.**

9. Fill oil tank with an oil from [Table 1-4](#). Oil tank capacity is 2.0 quarts (1.90 liters) plus the 4.0 ounces (0.12 liter) added in Step 7.
10. Install filler cap onto oil tank. Make sure filler cap is fully seated.

### WARNING

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

11. Install seat.
12. Start engine. Verify that oil pressure signal light on dash panel turns off when engine speed is 1000 RPM or above.
13. Check for oil leaks at oil filter and drain hose.
14. Check oil level as described on [page 1-15](#).

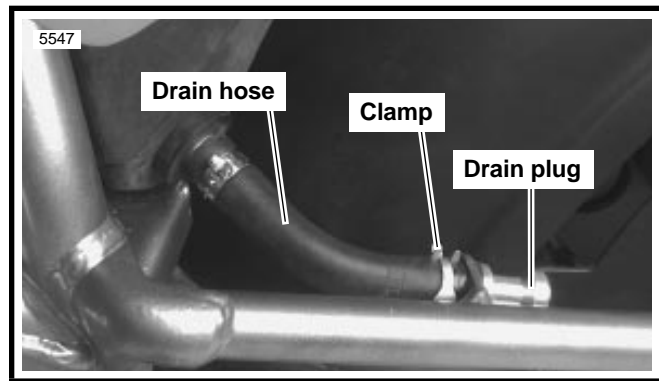


Figure 1-11. Oil Tank Drain Line



Figure 1-12. Oil Filter

# BRAKES

## GENERAL

### WARNING

Brake fluid can cause irritation of eyes and skin, and may be harmful if swallowed. If fluid is swallowed, induce vomiting by administering two tablespoons of salt in a glass of warm water. Call a doctor. In case of contact with skin or eyes, flush with plenty of water. Get medical attention for eyes. **KEEP BRAKE FLUID OUT OF THE REACH OF CHILDREN.**

Check brake fluid level and condition:

- At the 500 mile (800 km) service interval.
- At every 5000 mile (8000 km) service interval thereafter.
- When storing or removing the motorcycle for the season.

Front brake hand lever and rear brake foot pedal must have a firm feel when brakes are applied. If not, bleed system as described.

## BLEEDING BRAKES

### NOTE

Hydraulic brake fluid bladder-type pressure equipment can be used to fill brake master cylinder through the bleeder valve. Remove master cylinder reservoir cover so that system cannot pressurize. Do not use pressure bleeding equipment when the hydraulic system is sealed with master cylinder reservoir cover and gasket in place.

1. Install end of a length of plastic tubing over caliper bleeder valve; place other end in a clean container. Stand motorcycle upright.
  - a. Front brake caliper-[Figure 1-13](#).
  - b. Rear brake caliper-[Figure 1-14](#).
2. Add D.O.T. 5 SILICONE HYDRAULIC BRAKE FLUID to master cylinder reservoir. Do not reuse brake fluid.
  - a. Bring fluid level to within 1/8 in. (3.2 mm) of molded boss for front master cylinder reservoir.
  - b. Bring fluid level between upper and lower marks for rear master cylinder reservoir.
3. Depress and hold brake lever/pedal to build up hydraulic pressure.
4. Open bleeder valve about 1/2-turn counterclockwise; brake fluid will flow from bleeder valve and through tubing. When brake lever/pedal has moved 1/2-3/4 of its full range of travel, close bleeder valve (clockwise). Allow brake lever/pedal to return slowly to its released position.
5. Repeat Steps 2-4 until all air bubbles are purged.
6. Tighten bleeder valves.
  - a. Front bleeder valve to 4-6 ft-lbs (5.4-8.1 Nm).
  - b. Rear bleeder valve to 6-9 ft-lbs (8.1-12.2 Nm).
7. Verify master cylinder fluid level as described in Step 2.
8. Tighten master cylinder reservoir cover screws to 9-13 **in-lbs** (1.0-1.5 Nm). Install cover on rear reservoir.

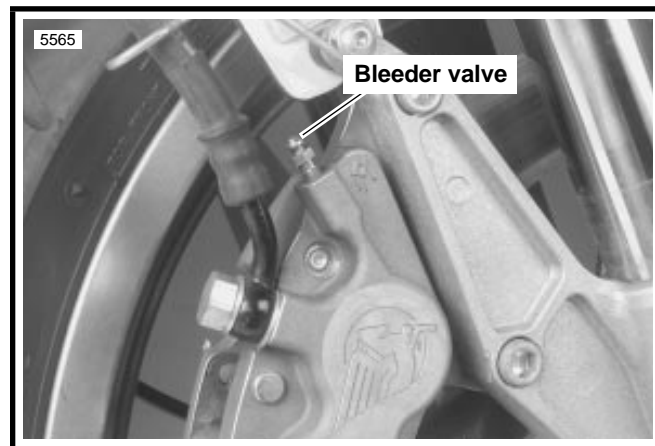


Figure 1-13. Front Brake Caliper Bleeder Valve

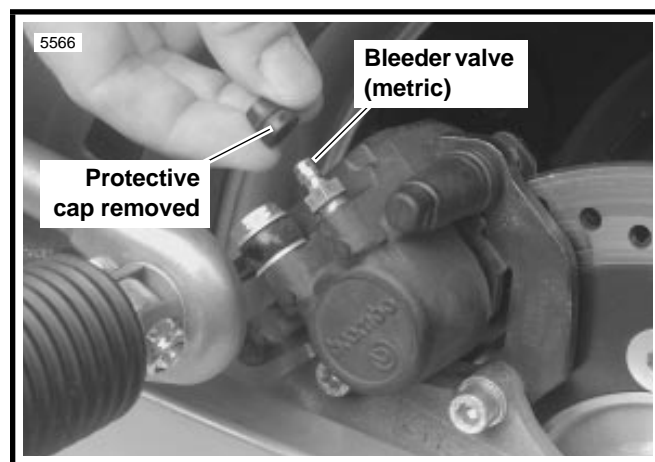


Figure 1-14. Rear Brake Caliper Bleeder Valve

## PADS, ROTORS AND LINKAGE

Check brake pads and rotors for minimum thickness. See [Table 1-5](#). See Section 2 for replacement procedures.

- At the 500 mile (800 km) service interval.
- At every service interval thereafter.

Check rear brake pedal height and freeplay. See [Table 1-5](#). See Section 2 for adjustment procedures.

- Before every ride.
- At the 500 mile (800 km) service interval.
- At every 5000 mile (8000 km) service interval thereafter.

Table 1-5. Brake System Components

| SPECIFICATION             | FRONT                    | REAR                 |
|---------------------------|--------------------------|----------------------|
| Minimum rotor thickness   | 0.17 in.<br>(4.4 mm)     | 0.19 in.<br>(4.8 mm) |
| Minimum pad thickness     | 1/16 in. (1.6 mm)        |                      |
| Hand lever/pedal freeplay | 1/8 in. (3.2 mm) maximum |                      |

# TIRES AND WHEELS

## TIRE INFLATION

### WARNING

Do not inflate any tire beyond its maximum inflation pressure as specified on tire sidewall. Overinflation may cause tire to suddenly deflate leading to personal injury.

Check tire pressure and tread:

- Before every ride.
- At the 500 (800 km) mile service interval.
- At every scheduled service interval.

Check for proper front and rear tire pressures when tires are cold. Compare pressure against [Table 1-6](#).

**Table 1-6. Tire Pressures**

| TIRE AND POSITION                            | PRESSURE FOR SOLO RIDING | PRESSURE AT GVWR    |
|--|--------------------------|---------------------|
| Front-Dunlop Sportmax Radial II 120/70 ZR 17 | 32 PSI<br>(2.2 bar)      | 36 PSI<br>(2.5 bar) |
| Rear-Dunlop Sportmax Radial II 170/60 ZR 17  | 36 PSI<br>(2.5 bar)      | 38 PSI<br>(2.8 bar) |

## WHEEL BEARINGS

Check wheel bearings:

- Every time the wheel is removed.
- At every 10,000 mile (16,000 km) service interval.
- When storing or removing the motorcycle for the season.

Check wheel bearings and axle spacers for wear and corrosion. Excessive play or roughness indicates worn bearings. Replace bearings in sets only.

## SPEEDOMETER CABLE

Check speedometer cable:

- Inspect before every ride.
- Lubricate at every 5000 mile (8000 km) service interval.

Examine speedometer cable housing (outer sheath) for kinks or other damage. Replace entire cable assembly if any damage is noted.

Lubricate inner cable with a good quality graphite grease. Wipe off excess grease.

# CLUTCH

## TRANSMISSION FLUID

Check transmission fluid:

- Replace at the 500 mile (800 km) service interval.
- Inspect level at every 2500 mile (4000 km) service interval.
- Replace at every 5000 mile (8000 km) service interval.

Primary chaincase lubricant capacity is approximately 1.0 quart (0.95 liter). For best results, drain lubricant while hot.

1. Raise rear of vehicle off the floor using [REAR WHEEL SUPPORT STAND \(Part No. B-41174\)](#) to prevent chaincase lubricant from draining out of clutch cover opening when refilled.
2. Remove muffler. See [EXHAUST SYSTEM](#) in Section 2.
3. See [Figure 1-15](#). Position a suitable container under transmission lubricant drain plug. Remove drain plug and drain lubricant.
4. Remove foreign material from magnetic drain plug. Reinstall plug and tighten to 14-21 ft-lbs (19-28 Nm).
5. Remove four TORX screws with washers from clutch inspection cover. Remove clutch inspection cover from primary cover. Do not damage or dislodge Quad ring from primary cover.

### ⚠ CAUTION

**Do not overfill the primary chaincase with lubricant. Overfilling may cause rough clutch engagement and incomplete disengagement (or clutch drag).**

6. Add SPORT-TRANS FLUID (Part No. 98854-96 quart size; Part No. 98855-96 gallon size) as required until lubricant is even with bottom of clutch diaphragm spring. See [Figure 1-16](#).
7. Install clutch inspection cover using four TORX screws with washers. Tighten screws in a crosswise pattern to 7-9 ft-lbs (9-12 Nm).
8. Install muffler. See [EXHAUST SYSTEM](#) in Section 2.

## PRODUCTION CHANGE

See [Figure 1-17](#). Beginning with motorcycles built in early January 1996, the outer clutch release ramp has been changed. The clutch adjustment and lever freeplay procedures remain the same. The change was made to prevent any possible contact between the coupler and the primary cover.

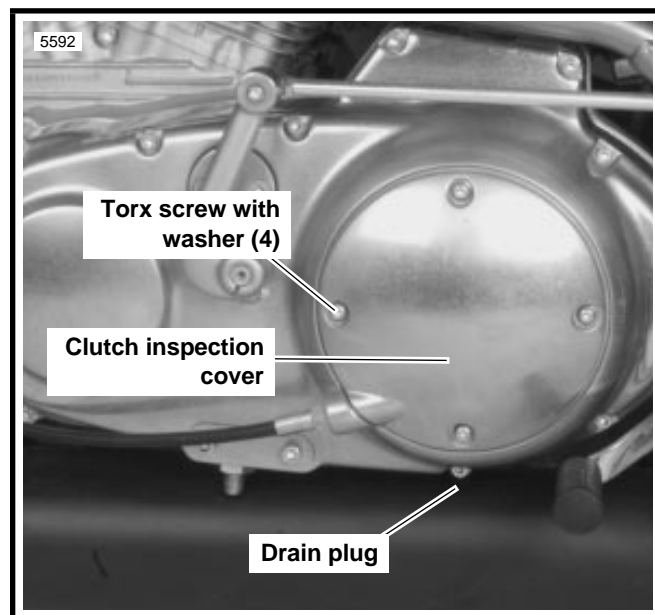


Figure 1-15. Primary Cover

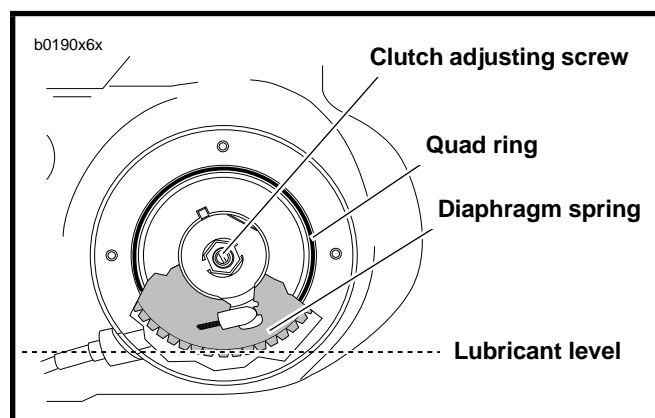


Figure 1-16. Lubricant Level

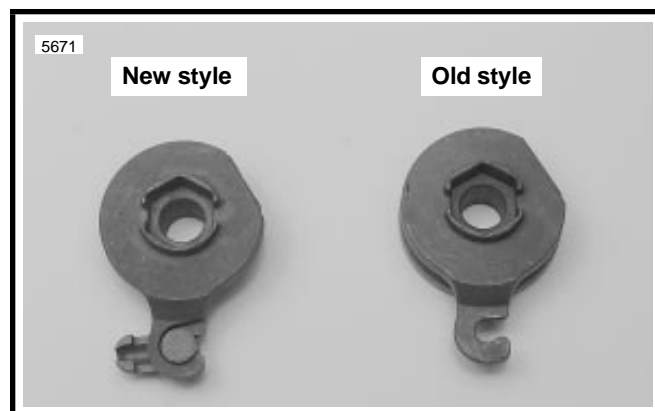


Figure 1-17. Ramp Change

## ADJUSTMENT

Check clutch adjustment:

- At the 500 mile (800 km) service interval.
- At every 5000 mile (8000 km) service interval thereafter.

If clutch slips under load or drags when released, first check control cable adjustment. If cable adjustment is within specifications, adjust clutch mechanism as described below.

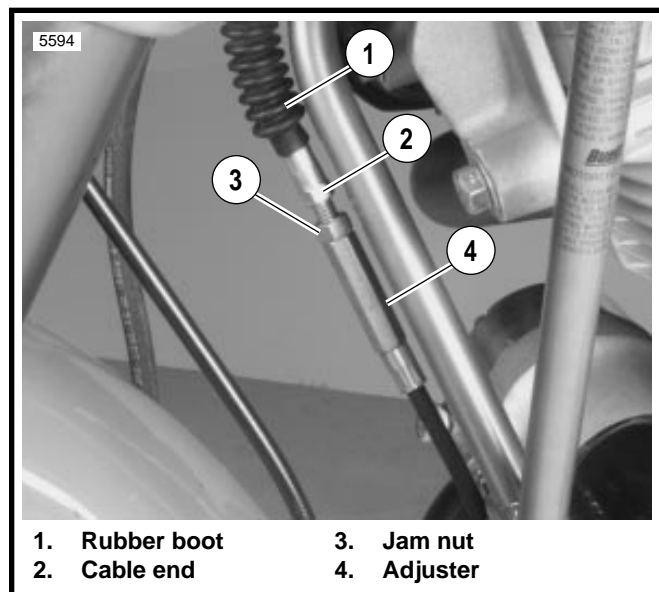
When necessary, lubricate cable with LUBIT-8 TUFOIL® CHAIN AND CABLE LUBE (Part No. HD-94968-85TV).

1. Raise rear of vehicle off the floor using [REAR WHEEL SUPPORT STAND \(Part No. B-41174\)](#).
2. See [Figure 1-18](#). Slide rubber boot (1) upward to expose adjuster mechanism. Loosen jam nut (3) from adjuster (4). Turn adjuster to shorten cable housing until there is a large amount of freeplay at clutch hand lever.
3. See [Figure 1-19](#). Remove TORX screws with washers (1) from clutch inspection cover (2). Remove clutch inspection cover from primary cover, but leave Quad ring (3) in place.

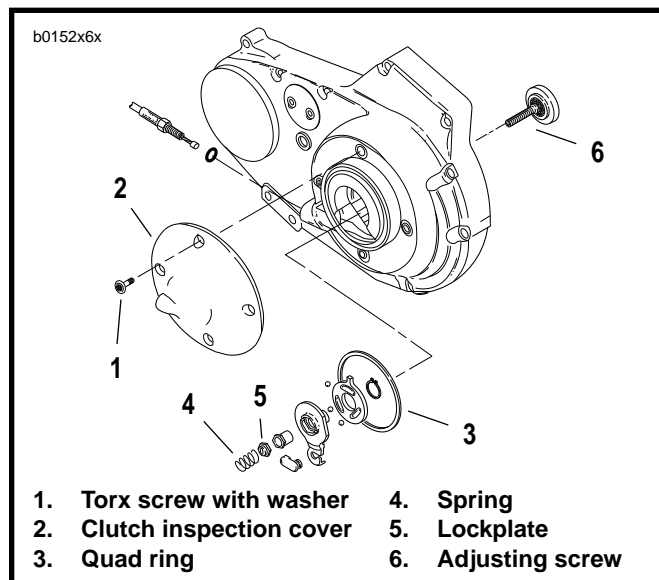
### NOTE

*Quad ring removed from primary cover for illustrative purposes only in [Figure 1-19](#).*

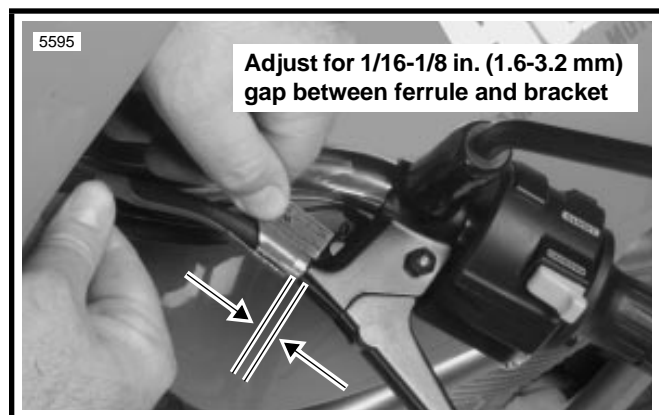
4. Remove spring (4) and adjusting screw lockplate (5). Turn adjusting screw counterclockwise until it lightly bottoms.
5. Turn clutch adjusting screw (6) clockwise 1/4 turn. Install lockplate (5) and spring (4) on adjusting screw flats. If hex on lockplate does not align with recess in outer ramp, rotate adjusting screw clockwise until it aligns.
6. Squeeze clutch lever to maximum limit three times to set ball and ramp mechanism. Pull outer cable conduit and at the same time adjust cable adjuster to provide 1/16-1/8 in. (1.6-3.2 mm) freeplay at hand lever. Adjust as follows.
  - a. See [Figure 1-20](#). Pull clutch cable ferrule (end of cable housing) away from clutch hand lever bracket. Gap between ferrule and bracket should be 1/16-1/8 in. (1.6-3.2 mm).
  - b. See [Figure 1-18](#). Adjust freeplay by turning cable adjuster (4).
  - c. Tighten jam nut (3) against adjuster (4).
  - d. Slide boot (1) over cable adjuster mechanism.
7. Change or add transmission fluid if necessary.
8. Install clutch inspection cover (2). Tighten TORX screws with washers (1) in a crosswise pattern to 7-9 ft-lbs (9-12 Nm).
9. Check clutch cable freeplay. See Step 6 above.



**Figure 1-18. Clutch Cable Adjuster Mechanism**



**Figure 1-19. Clutch Release Mechanism**



**Figure 1-20. Adjusting Clutch Freeplay**



# REAR BELT DEFLECTION

## INSPECTION

Check rear belt deflection:

- Inspect before every ride.
- Adjust at the 500 mile (800 km) service interval.
- Adjust at every 5000 mile (8000 km) service interval thereafter.

The secondary drive belt should be checked for unusual wear, cracking or loss of teeth. Check the belt sprocket for unusual wear, broken teeth or damaged flange. When checking deflection, have:

- No rider or cargo weight on motorcycle.
  - Transmission in neutral.
  - Belt and sprockets at room temperature.
  - Motorcycle upright (not on side stand).
1. See [Figure 1-21](#). At the lower strand, position "A", midway between transmission sprocket and rear wheel sprocket, apply 10 lbs (4.5 kg) of upward force on lower span of rear belt using [BELT TENSION GAUGE \(Part No. HD-35381\)](#).
  2. Measure belt deflection "B" several times, each time with belt moved (by rotating rear wheel) to a different position on sprockets. With sprockets rotated to tightest belt position, belt deflection "B" (measured at position "A") should be 7/8-1 in. (22.2-25.4 mm).

## ADJUSTMENT

1. Adjust shock absorber spring preload. See [REAR PRE-LOAD ADJUSTMENT](#) on [page 1-23](#).
2. See [Figure 1-22](#). Loosen rear axle nut (metric), if not already performed.

### NOTE

*After you loosen the axle nut, turn the axle and nut so the rear-most flat on each side is parallel with the ends of the swingarm.*

Check to be sure rear wheel axle is parallel with swingarm pivot shaft.

3. See [Figure 1-23](#). Measure each side from the flat to the end of the swingarm, to be sure rear axle is correctly located.
4. Turn axle adjuster nuts (metric) on **each** side of swingarm to adjust belt deflection.
  - a. Turn clockwise to decrease deflection (increase tension).
  - b. Turn counterclockwise to increase belt deflection (decrease tension).

Turn each adjuster nut exactly the same number of turns to maintain rear wheel alignment

5. Tighten axle nut (metric) to 66-73 ft-lbs (89.5-98.9 Nm).

## CLEANING

Keep dirt, grease, oil, and debris off the belt and sprockets. Clean the belt with a rag which is slightly damp with light cleaning agent.

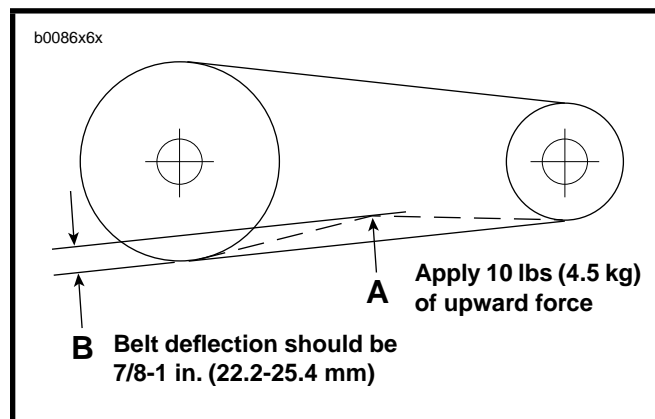


Figure 1-21. Checking Belt Deflection

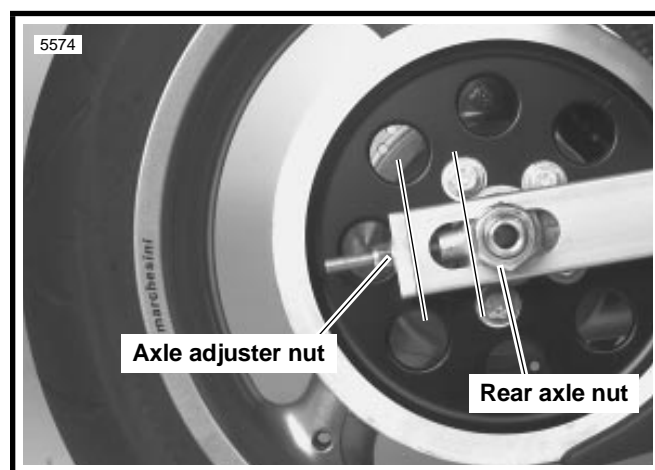


Figure 1-22. Rear Axle

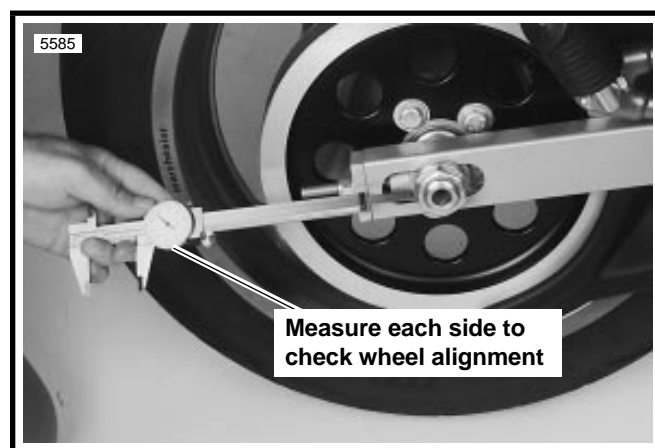


Figure 1-23. Checking Rear Wheel Alignment, Right Side Shown

# PRIMARY CHAIN

## INSPECTION

Check primary chain:

- At the 500 mile (800 km) service interval.
- At every 5000 mile (8000 km) service interval thereafter.

Check primary chain for correct tension by measuring its vertical freeplay through the primary chain inspection cover opening located near the top of the primary cover.

1. See [Figure 1-24](#). Remove two screws from primary chain inspection cover.
2. Remove primary chain inspection cover.
3. See [Figure 1-25](#). Check primary chain tension by measuring vertical freeplay (measuring midway between sprockets) several times, each time with primary chain moved (by rotating engine) to a different position on sprockets.
4. Check primary chain tension against [Table 1-7](#). If necessary, adjust as described below.

### NOTE

- Measurements are taken with sprockets rotated to tightest chain position.
- The initial primary chain vertical freeplay specification used at the assembly plant is 1/4-1/2 in. (6.3-12.7 mm) with a cold engine. The 1/4 in. (6.3 mm) minimum is only allowed at the absolute tightest point in the drive, as measured with specialized factory equipment. If a chain has less than 1/4 in. vertical freeplay (with a cold engine), adjust freeplay to the "field" specification of 3/8-1/2 in. (9.5-12.7 mm). The looser specification will avoid overtightening, which might otherwise occur during adjustment using "non-factory" equipment and methods.

**Table 1-7. Primary Chain Tension**

| ENGINE TEMPERATURE               | FREEPLAY                     |
|----------------------------------|------------------------------|
| Cold                             | 3/8-1/2 in.<br>(9.5-12.7 mm) |
| Hot (normal running temperature) | 1/4-3/8 in.<br>(6.4-9.5 mm)  |

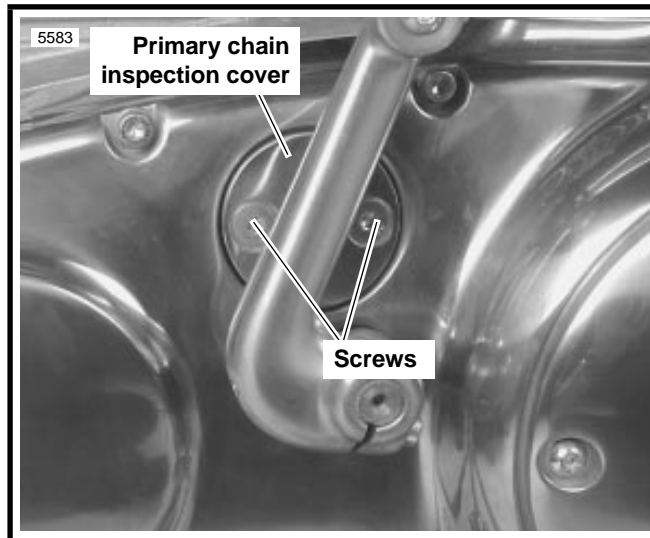
5. Install primary chain inspection cover. Tighten screws to 40-60 in-lbs (4.5-6.8 Nm).

## ADJUSTMENT

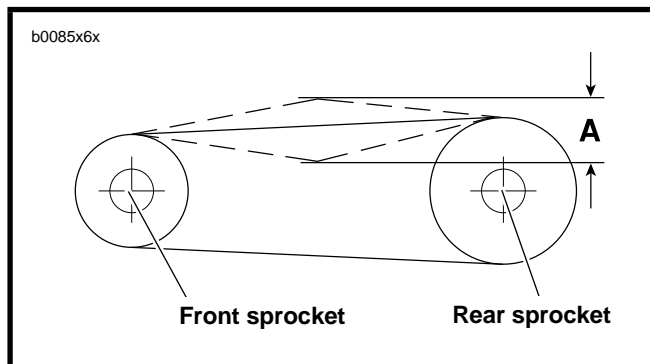
### NOTE

If vertical freeplay cannot be set within the limits specified, then primary chain and/or chain adjuster are worn beyond adjustment limits. Replace parts as necessary. See Section 6.

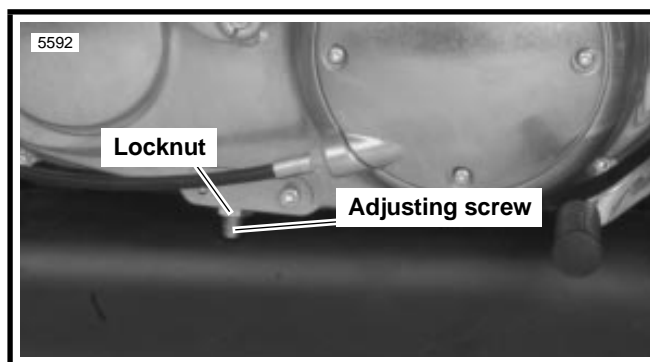
1. See [Figure 1-26](#). Loosen locknut and turn adjusting screw:
  - a. Turn clockwise (inward) to reduce freeplay.
  - b. Turn counterclockwise (outward) to increase freeplay.
2. Tighten locknut to 20-25 ft-lbs (27.1-33.9 Nm).



**Figure 1-24. Primary Chain Inspection Cover**



**Figure 1-25. Measuring Primary Chain Tension**



**Figure 1-26. Primary Chain Adjustment**

# REAR PRELOAD ADJUSTMENT

## GENERAL

Adjust rear preload:

- When a new rider buys the motorcycle.
- When there is a change in load (luggage, etc.)
- Before changing front fork or rear shock suspension settings.

Rear suspension spring preload assures that the rear suspension has the proper amount of travel.

Spring preload is the most important suspension adjustment on the S1 Lightning. Improper preload will adversely affect both the handling and motorcycle ride. Correct preload setting will result in motorcycle handling that suits the rider's size and weight.

## ADJUSTMENT

You will need three people to carry out this adjustment.

1. Verify correct front and rear tire pressure. See [TIRES AND WHEELS](#) on [page 1-18](#).
2. Remove all accessories from motorcycle including tank bag and/or saddlebags.
3. Take the motorcycle off the side stand and bounce the rear up and down a few times to be sure the suspension is free and not binding.
4. See [Figure 1-27](#). Measure the distance from the center of the rear axle nut to the rear turn signal mounting bolt without rider/passenger/cargo/accessories on the motorcycle.
5. Install items removed in Step 2. Load all cargo.
6. Bounce a few times on the seat to be sure the suspension is free and not binding.
7. With the help of an assistant, take the same measurement with the vehicle fully loaded (rider/passenger/luggage/cargo). The assistant should help balance the motorcycle so the rider can keep both feet on the footrests.
8. Subtract the second measurement from the first. The difference, which is the squat, should be 0.25-0.75 in. (6.4-19.1 mm). If it is not, you will have to adjust the spring preload.

### CAUTION

- **Be sure to apply the same number of turns to each mechanical preload adjusting nut to ensure that the end plates do not become misaligned. Misaligned end plates will cause the shock absorber spring to bind against the adjustment rods.**
  - **Be sure the plates are parallel within 1/64 in. (0.4 mm). Misaligned end plates will cause the shock absorber spring to bind against the adjustment rods.**
9. See [Figure 1-28](#). Change the spring preload by adjusting the mechanical preload adjusting nuts (metric) on the rods that connect the end plates.
    - a. Increase the preload by tightening the nuts.
    - b. Decrease the preload by loosening the nuts.

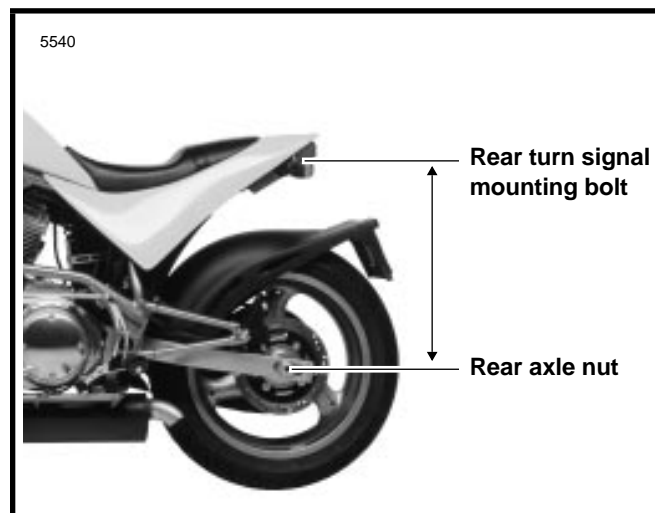


Figure 1-27. Checking Rear Preload

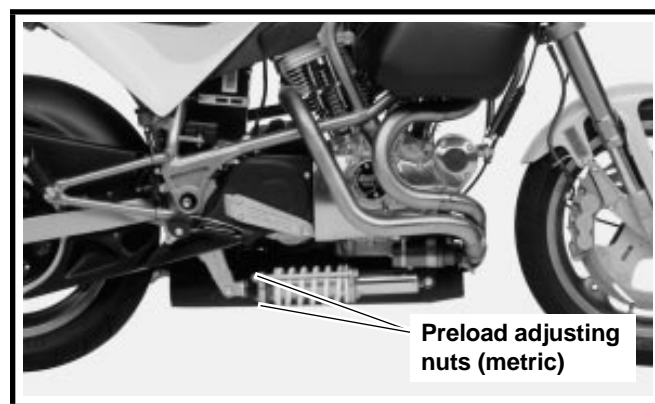


Figure 1-28. Adjusting Rear Preload

# SUSPENSION

## ADJUSTMENT

Adjust front forks by first turning the slotted dial clockwise with a screwdriver until it stops. Then turn the dial counterclockwise the recommended 12 or 20 positions. A higher number of clicks increases damping.

### NOTE

Rear spring preload must be set before adjusting any other suspension settings. See [REAR PRELOAD ADJUSTMENT](#) on [page 1-23](#).

**Table 1-8. Suspension Settings**

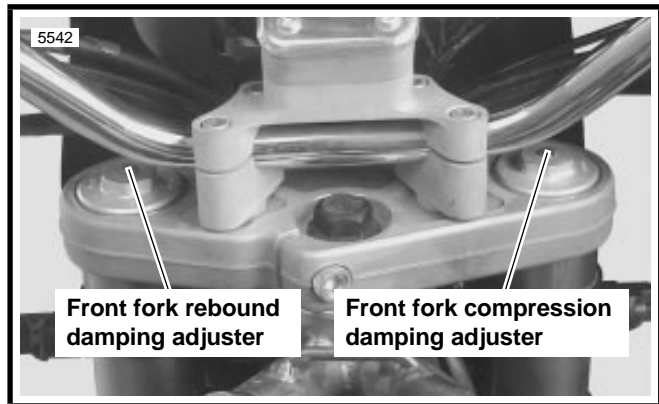
| ADJUSTMENT             | RANGE IN CLICKS | FACTORY SETTING | SEE FIGURE           |
|------------------------|-----------------|-----------------|----------------------|
| Front fork compression | 28              | 20              | <a href="#">1-29</a> |
| Front fork rebound     | 28              | 12              | <a href="#">1-29</a> |
| Rear shock rebound     | 7               | 3               | <a href="#">1-30</a> |
| Rear shock compression | 11              | 5               | <a href="#">1-31</a> |

## REAR SHOCK

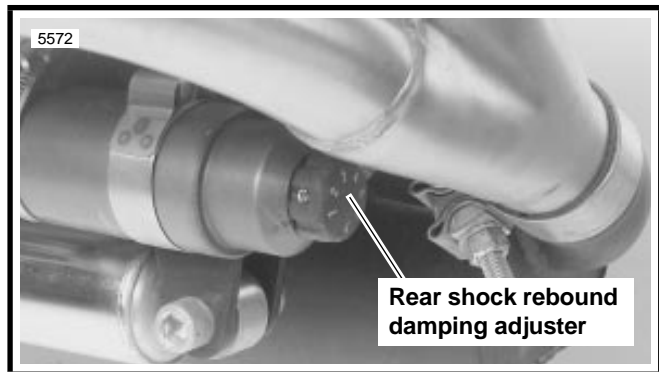
Check rear shock:

- At the 500 mile (800 km) service interval.
- At every 5000 mile (8000 km) service interval thereafter.

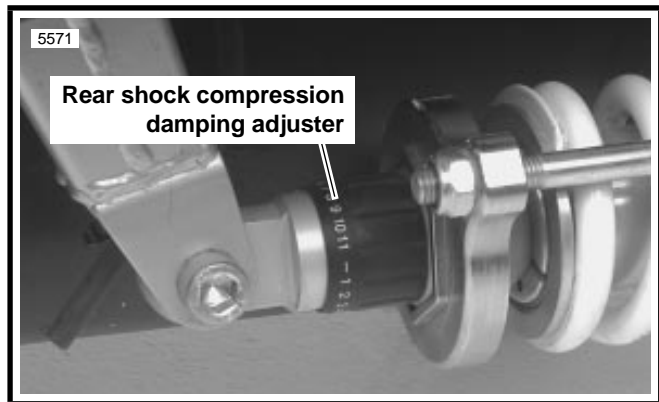
Inspect the rear shock absorber for loose mounting hardware, leaks or rod-to-spring contact. Tighten the front and rear mounts 40-45 ft-lbs (54.2-61.0 Nm).



**Figure 1-29. Front Fork Adjustments**



**Figure 1-30. Rear Shock Rebound Adjuster**



**Figure 1-31. Rear Shock Compression Adjuster**

# FRONT FORK

## STEERING HEAD BEARINGS

Check steering head bearings:

- At the 500 mile (800 km) service interval.
- At every 5000 mile (8000 km) service interval thereafter.
- Lubricate every 10,000 mile (16,000 km) service interval.

1. See [Figure 1-32](#). Lift motorcycle using [FRONT WHEEL SUPPORT STAND \(Part No. B-41395\)](#) and [S1 LIFT ADAPTER \(Part No. B-41686\)](#) so front wheel is off the ground.
2. Turn front wheel to full right lock.
3. Hook a spring scale into the axle hole and pull front wheel to center position.

It should take 3.5-5.5 lbs (1.6-2.5 kg) to pull front wheel to center.

### NOTE

*Check that clutch and throttle cables do not bind when measuring bearing resistance.*

## Lubrication

At 10,000 miles (16,000 km) and every 10,000 miles (16,000 km) thereafter, grease the steering head bearings with [WHEEL BEARING GREASE \(Part No. 99855-89\)](#).

See [FORK STEM AND BRACKET ASSEMBLY](#) in Section 2 for lubrication procedure.

## ADJUSTMENT

1. Raise front wheel off floor using [FRONT WHEEL SUPPORT STAND \(Part No. B-41395\)](#) and [S1 LIFT ADAPTER \(Part No. B-41686\)](#).
2. Turn front wheel to full right lock.
3. See [Figure 1-32](#). Hook spring scale into front axle hole. Pull front wheel to center position. It should take 3.5-5.5 lbs (1.6-2.5 kg) to pull front wheel to center.
4. Loosen pinch screws (7) on upper and lower triple clamps.
5. See [Figure 1-33](#). Tighten or loosen fork stem bolt (1) to set proper tension.
6. Recheck tension using spring scale. See Step 3.
7. Tighten triple clamp pinch screws (7) to 18-20 ft-lbs (24.4-27.1 Nm).

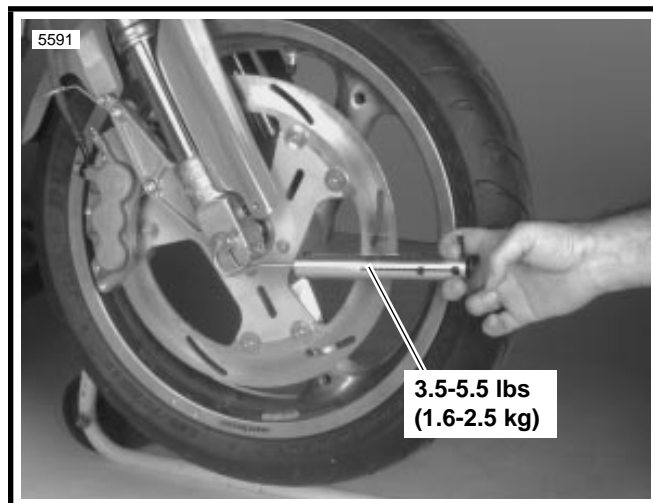


Figure 1-32. Checking Steering Head Bearings

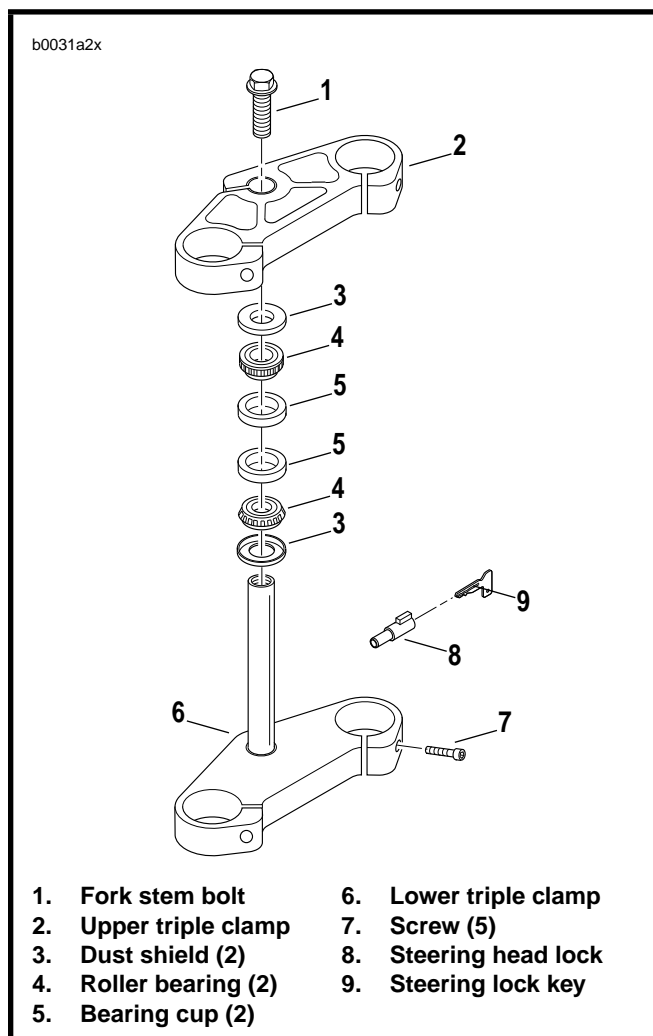


Figure 1-33. Steering Head Assembly

## FORK OIL CHANGE

Replace fork oil:

- At every 10,000 mile (16,000 km) service interval.
  - If fork should be submerged in water.
1. Remove and disassemble front forks. See [FRONT FORK](#) in Section 2.

### NOTE

*If fork oil is emulsified, aerated or light brown in color, then it has been contaminated by water. If this happens, replace the fork oil seals.*

2. Drain forks of oil.
3. With fork in fully compressed stage, add WP FORK OIL, 5 WEIGHT to above red retaining cap.

### CAUTION

See [Figure 1-34](#). Raise outer tube no higher than 9 in. (229 mm) or fluid loss will occur.

4. See [Figure 1-35](#). Grasp damper assembly by the adjuster. Pull damper assembly through several full strokes to bleed air from the fork.
5. With front fork fully compressed, clamp vertically in [FRONT FORK HOLDING TOOL](#) (Part No. B-41177).
6. Measure distance from fork oil surface to top of tube using [PRO-LEVEL OIL GAUGE](#) (Part No. B-59000A). Add or drain fork oil as needed until distance from top of fork tube to oil surface measures 4.33 in. (110 mm). See [Figure 1-36](#).
7. Assemble front fork and install. See [FRONT FORK](#) in Section 2.

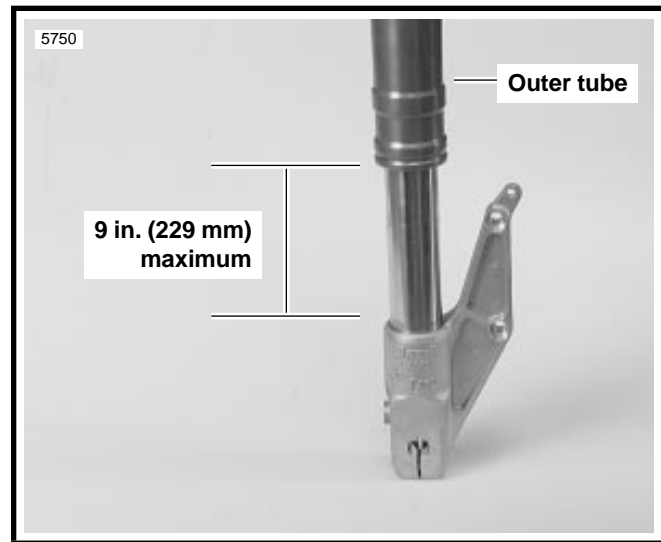


Figure 1-34. Maximum Outer Tube Lift

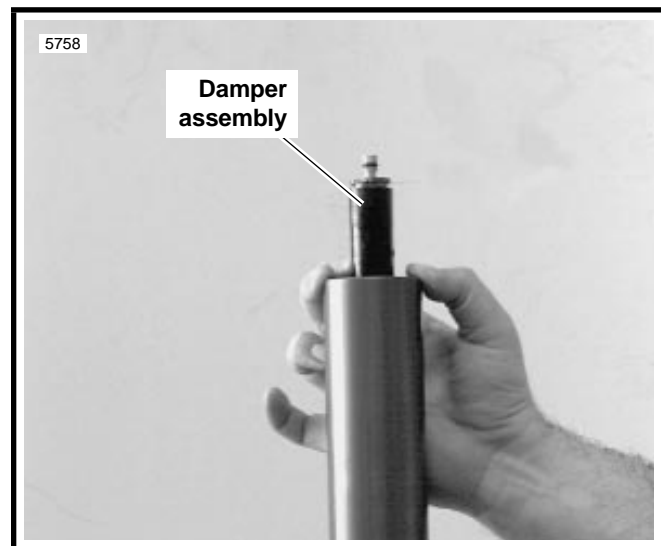


Figure 1-35. Bleeding Fork

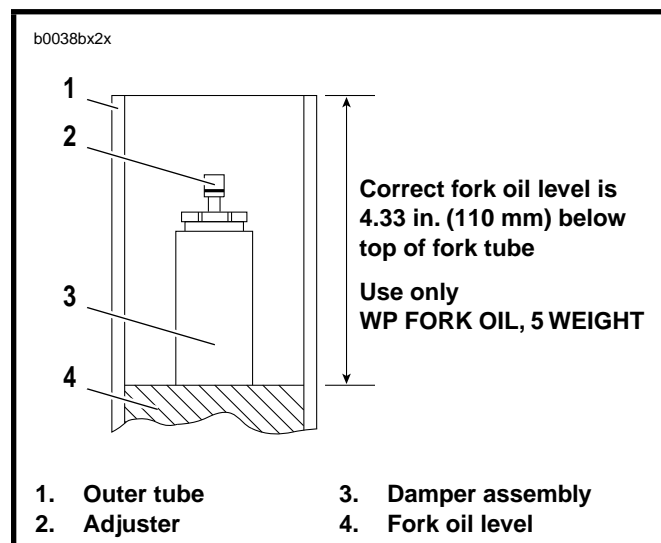


Figure 1-36. Correct Fork Oil Level

# SPARK PLUGS

## INSPECTION

Check spark plugs:

- Inspect at every 5000 mile (8000 km) service interval.
  - Replace every 10,000 mile (16,000 km) service interval.
1. Disconnect cables from both spark plugs.
  2. Remove spark plugs.
  3. See [Figure 1-37](#). Compare your observations of the plug deposits with the descriptions provided below.
    - a. A wet, black and shiny deposit on plug base, electrodes and ceramic insulator tip indicates an oil fouled plug. The condition may be caused by one or more of the following: worn pistons, worn piston rings, worn valves, worn valve guides, worn valve seals, a weak battery or a faulty ignition system.
    - b. A dry, fluffy or sooty black deposit indicates a carburetor air-fuel mixture that is too rich, engine idling for excessive periods of time and/or enrichener usage for excessive periods of time.
    - c. A light brown, glassy deposit indicates an overheated plug. This condition may be accompanied by cracks in the insulator or by erosion of the electrodes and is caused by an air-fuel mixture that is too lean, a hot-running engine, valves not seating or improper ignition timing. The glassy deposit on the spark plug is a conductor when hot and may cause high-speed misfiring. A plug with eroded electrodes, heavy deposits or a cracked insulator must be replaced.
    - d. A plug with a white, yellow, tan or rusty brown powdery deposit indicates balanced combustion. Clean off spark plug deposits at regular intervals.
  4. If the plugs require cleaning between tune-ups, proceed as follows:
    - a. Degrease firing end of spark plug using ELECTRICAL CONTACT CLEANER. Dry plug with compressed air.
    - b. Use a thin file to flatten spark plug electrodes. A spark plug with sharp edges on its electrodes requires 25%-40% less firing voltage than one with rounded edges.
  5. If the plugs cannot be cleaned, replace with No. 6R12 spark plugs.
  6. Check electrode gap with a wire-type feeler gauge. Gap should be 0.038-0.045 in. (0.96-1.14 mm).
  7. See [Figure 1-38](#). Apply LOCTITE ANTI-SEIZE to plugs. Install and tighten spark plugs to 11-18 ft-lbs (15-24 Nm).
  8. Connect spark plug cables. Verify that cables are securely connected to coil and spark plugs.

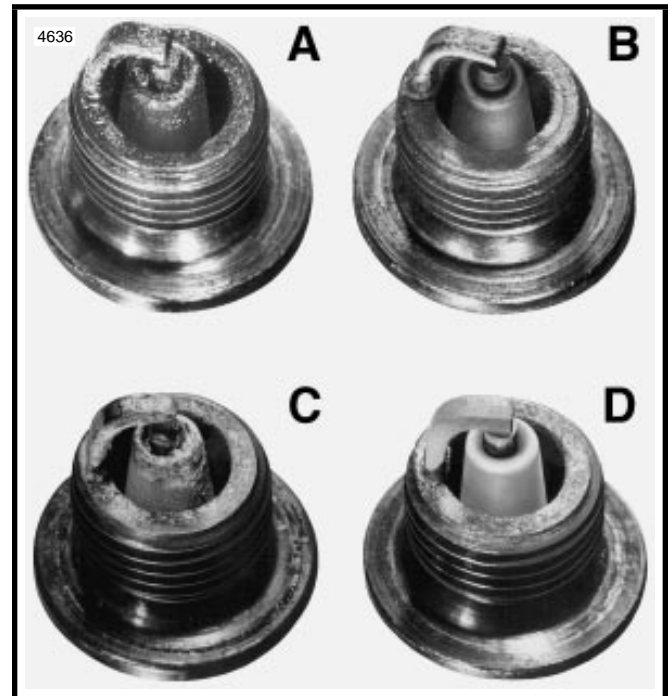


Figure 1-37. Typical Spark Plug Deposits

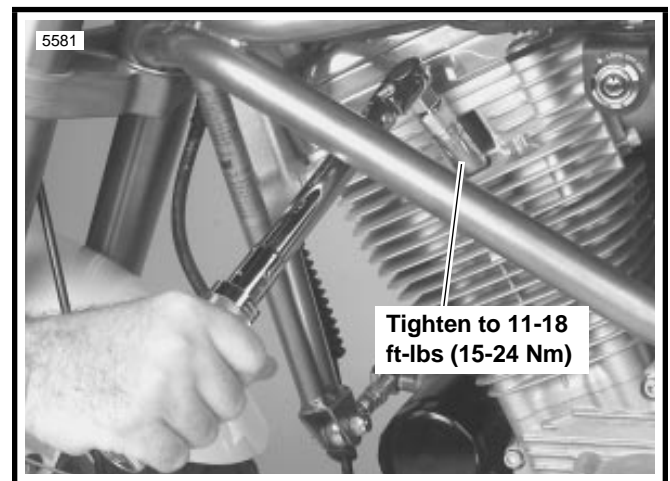


Figure 1-38. Spark Plugs

# AIR CLEANER FILTER

## REMOVAL

Check air cleaner filter:

- Inspect at the 500 mile (800 km) service interval.
- Replace at every 5000 mile (8000 km) service interval thereafter.

### NOTE

Service air cleaner more often if the motorcycle is run in a dusty environment.

### CAUTION

**Do not run engine without filter element in place. Debris could be drawn into the engine causing damage.**

1. See [Figure 1-39](#). Remove screw and nylon washer on top of air cleaner cover.
2. Remove screw, nylon washer and locknut at rear of air cleaner cover. Remove cover.
3. See [Figure 1-40](#). Remove filter box from snorkel tube.
4. Remove filter from filter box.

## INSTALLATION

1. Replace filter element if damaged or if filter media cannot be adequately cleaned.

### WARNING

- **Low pressure air can blow debris in your face and eyes. Not wearing eye protection or a face shield when using pressurized air may result in personal injury.**
- **Do not use gasoline or solvents to clean the filter element. Volatile/flammable cleaning agents may cause an intake system fire which may result in personal injury.**

2. Wash element in luke warm water with a mild detergent. Dry the filter element using low-pressure (32 psi/221 kPa maximum) compressed air. Rotate element while moving air nozzle up and down the element interior. Do not rap the element on a hard surface.

Hold filter element up to strong light source. The element can be considered sufficiently clean if light is uniformly visible through the element.

3. Thoroughly clean backplate, filter box and inside of cover.
4. See [Figure 1-40](#). Place filter in filter box. Attach filter box to snorkel tube.
5. See [Figure 1-39](#). Place cover over backplate assembly. Install top screw and nylon washer.
6. Install screw, nylon washer and locknut on rear mount. Tighten to 6-8 ft-lbs (8.1-10.8 Nm).

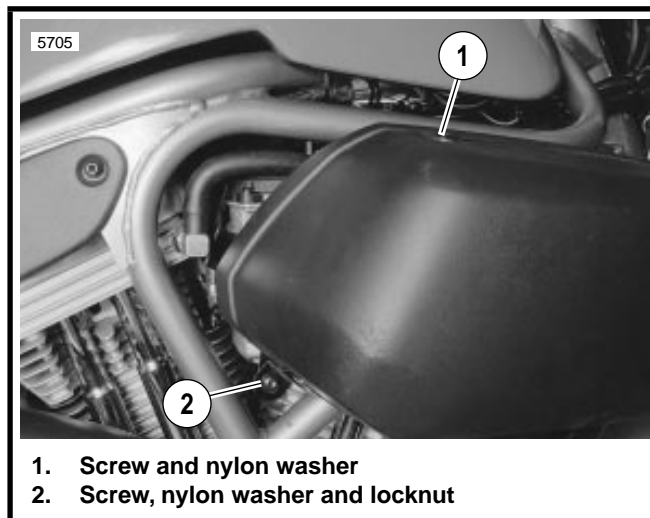


Figure 1-39. Air Cleaner Cover

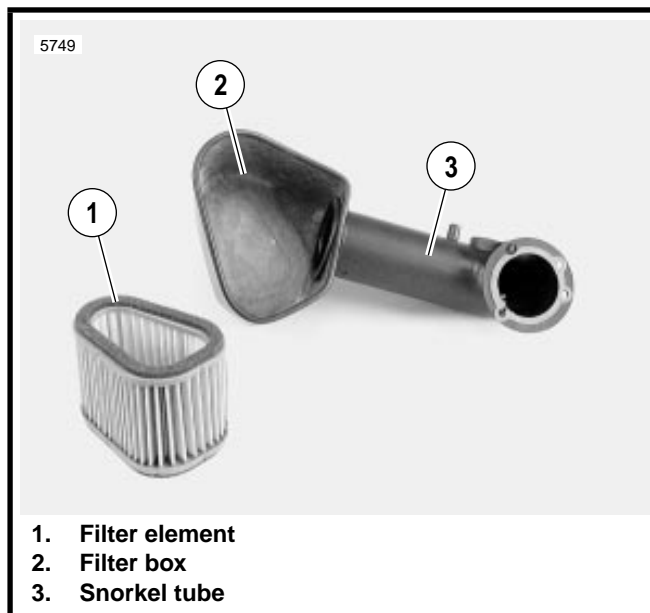


Figure 1-40. Snorkel Tube



# CARBURETOR

## CABLE ADJUSTMENT

### **⚠ WARNING**

Throttle cables must not pull tight when handlebars are turned fully to left or right fork stops. Be sure wires and throttle cables are clear of fork stops at steering head so they will not be pinched when fork is turned against stops. Steering must be smooth and free with no binding or interference. Anything interfering with carburetor operation may cause loss of vehicle control and personal injury.

Check throttle cable adjustment:

- Before every ride.
- At every scheduled service interval.

Check throttle cable adjustment with engine running. Turn handlebars through full range of travel. If engine speed changes during this maneuver, adjust throttle cables as follows:

1. Remove air cleaner. See [AIR CLEANER, REMOVAL](#) in Section 4.
2. See [Figure 1-41](#). Slide rubber boot (4) off cable adjusters (3).
3. Loosen jam nut on each adjuster.

### *NOTE*

*Cable adjusters (3) and jam nuts are metric.*

4. Turn adjusters in direction which will shorten cable housings to minimum length.
5. Point front wheel straight ahead. Twist throttle control grip to fully open position; hold in position.
6. Turn adjuster (3) on throttle control cable (1) until throttle cam stop (5) touches carburetor stop plate (6). Tighten jam nut on throttle control cable (1) adjuster (3); release throttle control grip.
7. Turn handlebars fully to right. Turn adjuster (3) on idle control cable (2) until end of cable housing just touches the carburetor cable guide.
8. Twist and release throttle control grip a few times. Carburetor throttle must return to idle position each time throttle grip is released. If this is not the case, turn adjuster (3) on idle control cable (2) (shortening cable housing) until throttle control functions properly.
9. Tighten jam nut on idle control cable (2) adjuster (3). Recheck operation of throttle control (Step 7).
10. Slide rubber boot (4) over each cable adjuster (3). Recheck engine slow idle speed; adjust if required.
11. Install air cleaner. See [AIR CLEANER, INSTALLATION](#) in Section 4.

## IDLE ADJUSTMENT

Check idle adjustment:

- Before every ride.
- At every scheduled service interval.

See [IGNITION TIMING](#) on page 1-30.

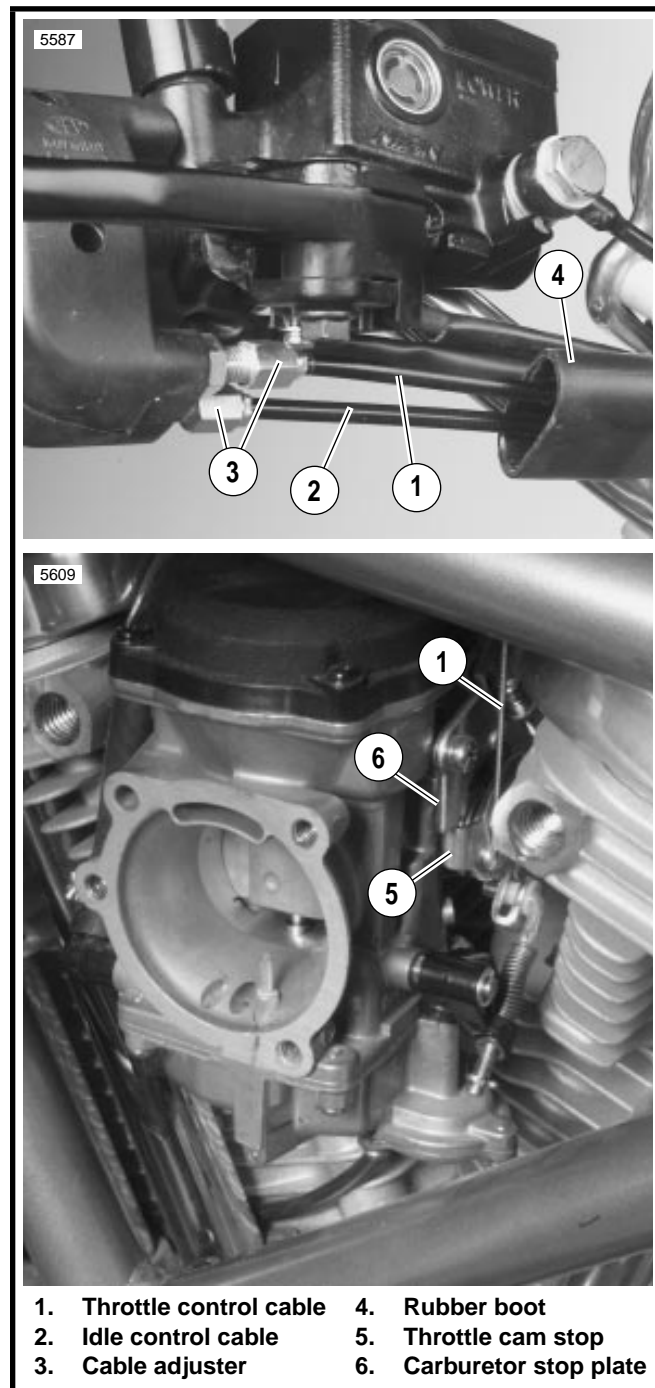


Figure 1-41. Carburetor

# IGNITION TIMING

## INSPECTION

Check ignition timing:

- At every 5000 mile (8000 km) service interval.

Check for proper RPM and ignition timing as follows:

1. See [Figure 1-42](#). Thread [TIMING MARK VIEW PLUG \(Part No. HD 96295-65D\)](#) into timing inspection hole. Be sure view plug does not touch flywheel.
2. Connect leads of [INDUCTIVE TIMING LIGHT \(Part No. HD-33813\)](#) to front spark plug cable, to battery positive terminal and to ground.
3. Be sure vacuum hose is properly installed at carburetor and at vacuum-operated electric switch (V.O.E.S.).
4. Start engine. Set engine speed by turning idle adjustment screw clockwise to increase speed or counterclockwise to decrease speed. Use [CARBURETOR IDLE ADJUSTMENT TOOL \(Part No. HD-33413\)](#) and [TIP \(SNAP-ON Part No. TMP23A\)](#) as shown in [Figure 1-43](#).
  - a. On world models, idle speed is 950-1050 RPM.
  - b. On California models, idle speed is 1150-1250 RPM.
5. Timing light will flash each time ignition spark occurs. Aim timing light into timing inspection hole. Front cylinder advance timing mark should be centered in timing inspection hole. If not, see [ADJUSTMENT](#) on [page 1-31](#).
6. Set engine slow idle speed as described in Step 4 with engine running at normal operating temperature and with enricher control knob pushed in fully.

### NOTE

- *Buells have an enricher circuit that will cause the engine to idle at approximately 2000 RPM with the engine at normal operating temperature and the enricher knob pulled out fully. The increase in idle speed is intended to alert the rider that the engine is warmed up to normal operating temperature and that the enricher knob should be pushed in all the way. Continuing to use the enricher circuit when the engine is at normal operating temperature will cause fouled plugs.*
- *Be sure the engine is warmed up to normal operating temperature and the enricher knob is pushed all the way in before adjusting engine idle speed. Be aware that, because there are variations in individual components, it is possible for a properly warmed-up engine to idle at 2000 RPM with the enricher knob pulled out partially.*

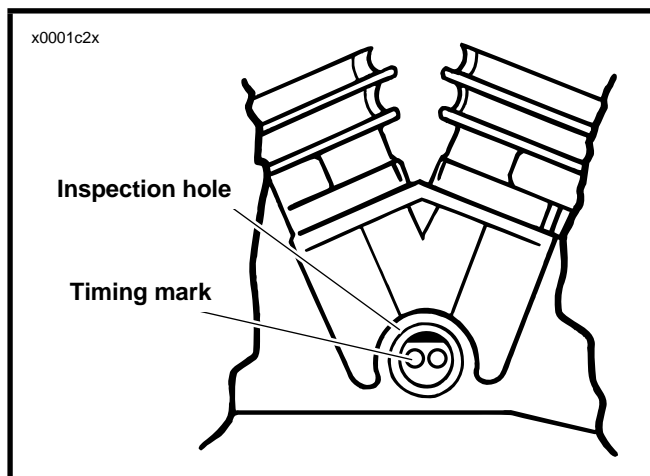
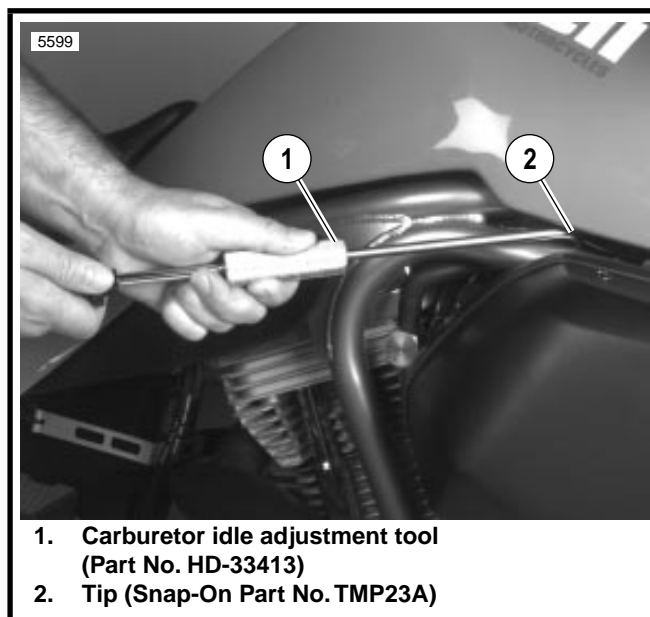


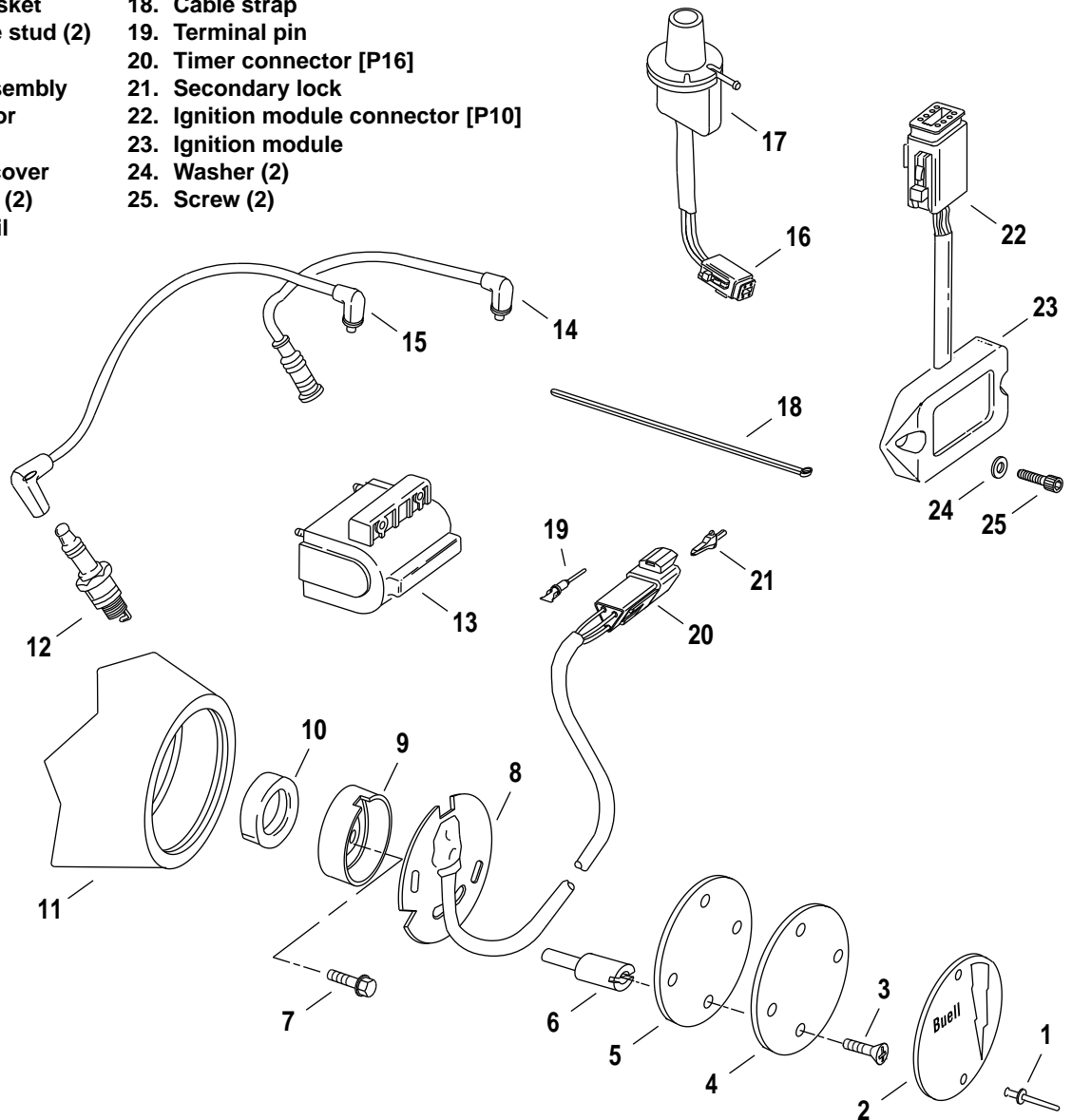
Figure 1-42. Timing Inspection Hole



1. Carburetor idle adjustment tool (Part No. HD-33413)
2. Tip (Snap-On Part No. TMP23A)

Figure 1-43. Adjusting Idle Speed

- |                         |                                     |
|-------------------------|-------------------------------------|
| 1. Pop rivet (2)        | 14. Front spark plug cable          |
| 2. Timer cover          | 15. Rear spark plug cable           |
| 3. Screw (2)            | 16. V.O.E.S. connector [P7]         |
| 4. Inner cover          | 17. V.O.E.S.                        |
| 5. Ignition gasket      | 18. Cable strap                     |
| 6. Timer plate stud (2) | 19. Terminal pin                    |
| 7. Bolt                 | 20. Timer connector [P16]           |
| 8. Sensor assembly      | 21. Secondary lock                  |
| 9. Trigger rotor        | 22. Ignition module connector [P10] |
| 10. Seal                | 23. Ignition module                 |
| 11. Gearcase cover      | 24. Washer (2)                      |
| 12. Spark plug (2)      | 25. Screw (2)                       |
| 13. Ignition coil       |                                     |



b0223x7x

Figure 1-44. Ignition System Components

## ADJUSTMENT

- See Figure 1-44. Remove outer cover pop rivets (1), outer timer cover (2), inner cover screws (3), inner cover (4) and gasket (5).
- Loosen timer plate studs (6) just enough to allow sensor assembly (8) to be rotated using a screwdriver in the plate's notch.
- With timing light aimed into inspection hole, rotate sensor assembly (8) until front cylinder advance timing mark is centered in timing inspection hole.
- Tighten timer plate studs (6).
- Install gasket (5), inner cover (4), inner cover screws (3), timer cover (2) and **new** outer cover rivets (1).
- Remove TIMING MARK VIEW PLUG from timing inspection hole. Install hex socket timing plug.

# VACUUM-OPERATED ELECTRIC SWITCH (V.O.E.S)

## ADJUSTMENT/TESTING

### Timing Mark Method

Verify engine ignition timing. See [IGNITION TIMING](#) on page 1-30. Adjust ignition timing, if necessary, and then perform the following V.O.E.S. check:

1. Run engine at regular idle. Disconnect V.O.E.S. vacuum hose from carburetor fitting. See [VACUUM-OPERATED ELECTRIC SWITCH \(V.O.E.S\)](#) in Section 7.
  - a. On world models, idle speed is 950-1050 RPM.
  - b. On California models, idle speed is 1150-1250 RPM.
2. Temporarily plug the open carburetor fitting. Ignition timing should retard (front cylinder advance timing mark disappears from view in timing inspection hole) and engine RPM should decrease.
3. Connect V.O.E.S. vacuum hose to carburetor fitting. Timing mark should reappear and engine speed should increase to previous RPM.

If speed does not first decrease and then increase as described, check V.O.E.S. wire connection to ignition module.

### Ohmmeter and Vacuum Pump Method

The V.O.E.S. can also be checked using an ohmmeter and a [VACUUM PUMP \(Part No. HD-23738\)](#).

1. Remove V.O.E.S. from vehicle. See [VACUUM-OPERATED ELECTRIC SWITCH \(V.O.E.S\)](#) in Section 7.
2. See [Figure 1-45](#). Connect two ohmmeter leads to the two V.O.E.S. leads.
3. Connect vacuum pump to V.O.E.S. vacuum fitting.
4. Slowly squeeze vacuum pump handle. Observe vacuum gauge and ohmmeter readings. Ohmmeter should indicate switch closed (zero ohms) with an applied vacuum of 5.0-6.0 in. (127.0-152.4 mm) mercury (Hg). If a vacuum reading of more than 6.0 in. (152.4 mm) Hg or less than 5.0 in. (127.0 mm) Hg is required to close the switch, then the switch must be replaced.
5. Install V.O.E.S. See [VACUUM-OPERATED ELECTRIC SWITCH \(V.O.E.S\)](#) in Section 7.

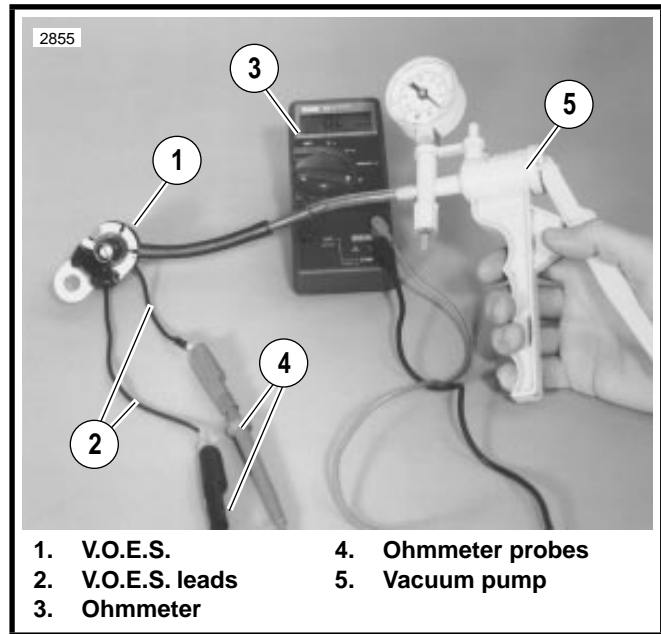


Figure 1-45. Checking V.O.E.S. Using Ohmmeter and Vacuum Pump

# HANDLEBARS

## INSPECTION

Check handlebar adjustment:

- Before every ride.
1. See [Figure 1-46](#). Check steering motion range to both fork stops. Each handlebar should be spaced equally between the windscreen and fuel tank and parts should not make contact.
  2. Handlebars should be equally spaced between outside edge of handlebar clamp and inside edge of mirror mounts.

If necessary, adjust handlebars as described below.

## ADJUSTMENT

### ⚠ CAUTION

**Never adjust handlebars using excessive force or damage to handlebars might result.**

#### NOTE

*Windscreen and instrument support must be removed to access front clamp screws.*

1. Remove windscreen. See [WINDSCREEN](#) in Section 2.
2. Remove instrument support. See [SPEEDOMETER AND TACHOMETER](#) in Section 2.
3. See [Figure 1-47](#). Loosen clamp screws.
4. Move handlebar to desired position.
5. Tighten clamp screws to 10-12 ft-lbs (13.6-16.2 Nm).

#### NOTE

*Tighten front clamp screws first.*

6. Install instrument support. See [SPEEDOMETER AND TACHOMETER](#) in Section 2.
7. Install windscreen. See [WINDSCREEN](#) in Section 2.
8. Check steering motion range to both fork stops. Each handlebar should be spaced equally between windscreen and fuel tank and parts should not make contact.

If handlebar needs further adjustment, repeat [ADJUSTMENT](#) beginning with Step 1.

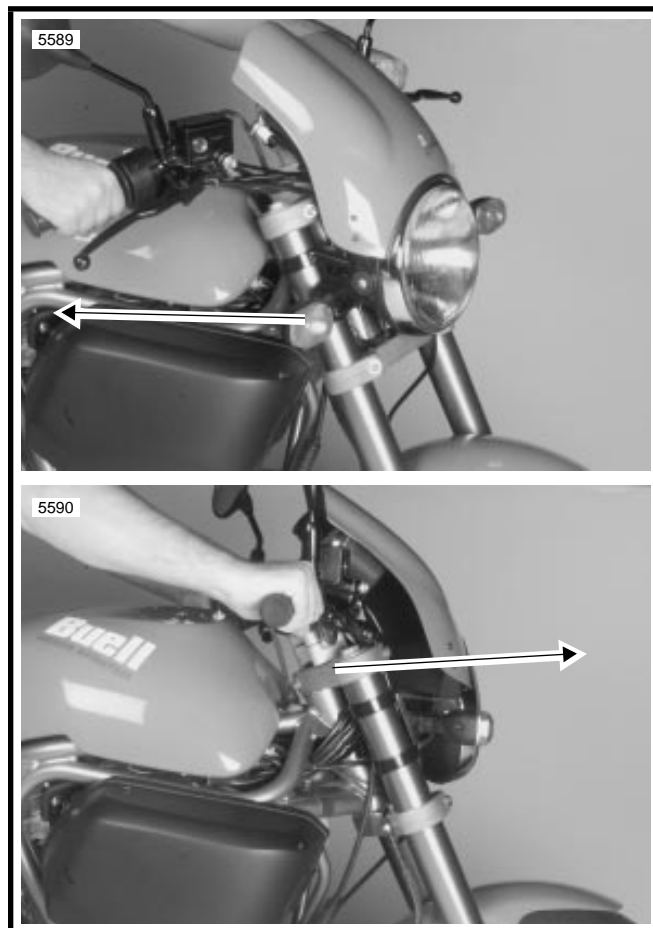


Figure 1-46. Testing Handlebars

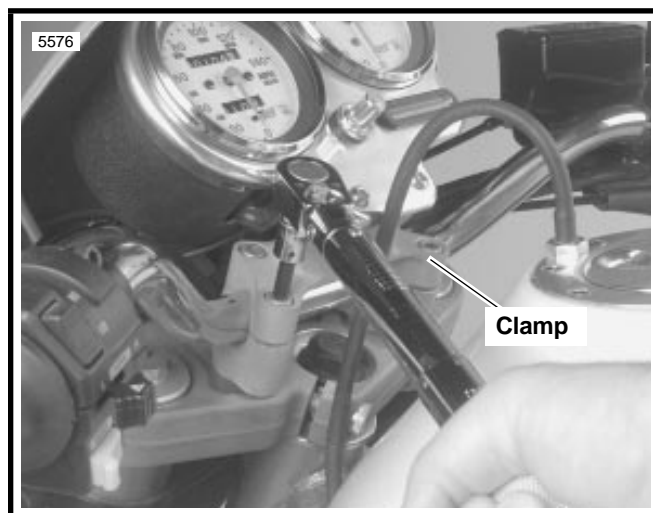


Figure 1-47. Adjusting Handlebars

# HEADLAMP

## INSPECTION

### **⚠ WARNING**

Do not modify ignition wiring to permit motorcycle operation with headlamp off. Operating with headlamp off may reduce your visibility to other motorists and could cause an accident resulting in personal injury.

Check headlamp alignment:

- When a new rider buys the motorcycle.
- When there is a change in load (luggage, etc.)

Check headlamp beam for proper height and lateral alignment as follows:

1. Verify correct front and rear tire inflation pressure. See [TIRES AND WHEELS](#) on [page 1-18](#).
2. Place motorcycle on level floor (or pavement) in an area with minimum light.
3. See [Figure 1-48](#). Point front of motorcycle toward a screen or wall which is 25 ft (7.62 M) away from front tire contact patch on floor (i.e., directly below front axle).
4. Draw a horizontal line, on screen or wall, which is 35 in. (889 mm) above floor.
5. Have a person whose weight is roughly the same as that of the principal rider sit on motorcycle seat. Weight of rider will compress vehicle suspension slightly.
6. Stand motorcycle upright with both tires resting on floor and with front wheel held in straight alignment (directly forward).
7. Turn ignition switch to IGN. Set handlebar headlamp switch to HIGH beam position.
8. Check light beam for proper height alignment. Main beam of light (broad, flat pattern of light) should be centered on horizontal line on screen or wall (i.e. equal area of light above and below line).
9. Check light beam for proper lateral alignment. Main beam of light should be directed straight ahead (i.e. equal area of light to right and left of center).

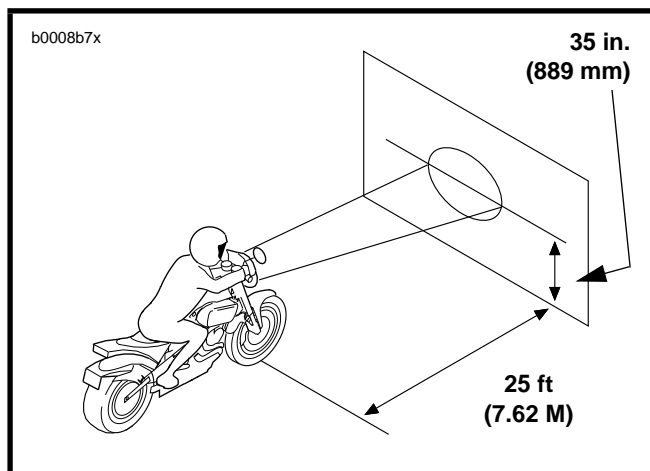


Figure 1-48. Checking Headlamp Alignment

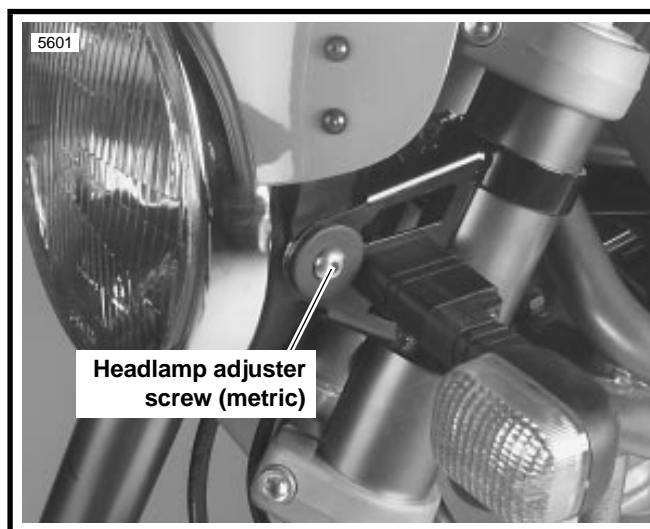


Figure 1-49. Adjusting Headlamp

## ADJUSTMENT

If headlamp requires adjustment, perform the following:

1. See [Figure 1-49](#). Loosen both adjuster screws (metric).
2. See [Figure 1-48](#). Tilt headlamp up or down to aim it in relation to the horizontal line. At the same time, turn headlamp right or left to direct light beam straight ahead.
3. Tighten both adjuster screws (metric) to 6-8 ft-lbs (8.1-10.8 Nm).

# STORAGE

## GENERAL

If the motorcycle will not be operated for several months, such as during the winter season, there are several things which should be done to protect parts against corrosion, to preserve the battery and to prevent the buildup of gum and varnish in the carburetor.

This work should be performed by your local Buell dealer following Service Manual procedures.

### WARNING

**Gasoline is flammable. Do not store motorcycle having gasoline in tank within the home or garage where open flames, pilot lights, sparks or electric motors are present. Inadequate safety precautions may cause an accident resulting in personal injury.**

1. Fill fuel tank and add a gasoline stabilizer. Use one of the commercially available gasoline stabilizers following the manufacturer's instructions. Run engine until gasoline has had a chance to reach carburetor float bowl. Turn fuel supply valve OFF.
2. Fill the oil tank. Pinch off (or remove and plug) the line leading from the oil tank bottom to the oil pump feed fitting. This prevents oil from seeping past the check ball into the oil pump and filling the engine flywheel compartment.
3. Remove the spark plugs, inject a few squirts of engine oil into each cylinder and crank the engine 5-6 revolutions. Reinstall spark plugs.
4. Adjust primary chain.
5. Adjust secondary drive belt.
6. Check tire inflation. If the motorcycle will be stored for an extended period of time, securely support the motorcycle under the frame so that all weight is off the tires.

### WARNING

**Do not apply any oil to brake rotors or brake pads. Oil on brake pads degrades braking efficiency and can result in an accident causing personal injury.**

7. Wash painted and chrome-plated surfaces. Apply a light film of oil to exposed unpainted surfaces.
8. If motorcycle is to be covered, use a material that will breathe, such as light canvas. Plastic materials that do not breathe promote the formation of condensation.

## REMOVAL FROM STORAGE

### WARNING

**After extended periods of storage and prior to starting vehicle, place transmission in gear, disengage clutch and push vehicle back and forth a few times to ensure proper clutch disengagement. Improper clutch disengagement could result in personal injury.**

1. Remove and inspect spark plugs. Replace if necessary.
2. Clean air filter element and lubricate if necessary.
3. If fuel tank was drained, fill fuel tank with fresh gasoline.
4. If oil feed line was pinched off or plugged, unplug it and reconnect.
5. Start the engine and run until it reaches normal operating temperature. Check fluids and refill to proper levels if required.
  - a. Check engine oil level.
  - b. Check the transmission lubricant level.
6. Perform all of the checks in the PRE-RIDING CHECK LIST in the Owner's Manual.

# TROUBLESHOOTING

## GENERAL

The following check list can be helpful in locating most operating troubles. Refer to the appropriate sections in this Service Manual for detailed procedures.

## ENGINE

### Starter Motor Does Not Operate or Does Not Turn Engine Over

1. Engine stop switch in OFF position.
2. Ignition key switch not ON.
3. Discharged battery or loose or corroded connections. (Solenoid chatters.)
4. Starter control relay or solenoid not functioning.
5. Electric starter shaft pinion gear not engaging or over-running clutch slipping.

### Engine Turns Over But Does Not Start

1. Fuel tank empty.
2. Fuel supply valve turned OFF.
3. Fuel supply valve or filter clogged.
4. Discharged battery, loose or broken battery terminal connections.
5. Fouled spark plugs.
6. Loose or shorting spark plug cables or connections.
7. Ignition timing badly out of adjustment.
8. Loose wire connection at coil or battery connection or plug between ignition sensor and module.
9. Ignition coil not functioning.
10. Ignition module not functioning.
11. Ignition sensor not functioning.
12. Sticking or damaged valve or valves.
13. Engine flooded with gasoline as a result of overchoking.
14. Engine oil too heavy (winter operation).

### Starts Hard

1. Spark plugs in bad condition, have improper gap or are partially fouled.
2. Spark plug cables in bad condition and shorting.
3. Battery nearly discharged.
4. Loose wire connection at one of the battery terminals, at coil or at plug between ignition sensor and module.
5. Carburetor controls not adjusted correctly.
6. Ignition coil not functioning.
7. Engine oil too heavy (winter operation).
8. Ignition not timed properly. See dealer.
9. Vapor vent valve plugged or carburetor fuel line closed off restricting fuel flow.
10. Water or dirt in fuel system and carburetor.
11. Enrichener valve inoperative.
12. Air leak at intake manifold.
13. Valves sticking.

### Starts But Runs Irregularly or Misses

1. Spark plugs in bad condition or partially fouled.
2. Spark plug cables in bad condition and shorting.
3. Spark plug gap too close or too wide.
4. Ignition coil not functioning.
5. Ignition module not functioning.
6. Ignition sensor not functioning.
7. Battery nearly discharged.
8. Damaged wire or loose connection at battery terminals or coil.
9. Intermittent short circuit due to damaged wire insulation.
10. Water or dirt in fuel system and carburetor or filter.
11. Fuel tank filler cap vent plugged or carburetor float bowl vent closed off.
12. Carburetor controls improperly adjusted.
13. Air leak at intake manifold or air filter.
14. Damaged intake or exhaust valve.
15. Weak or broken valve springs.
16. Incorrect valve timing.

### Spark Plug Fouls Repeatedly

1. Incorrect spark plug.
2. Piston rings badly worn or broken.
3. Fuel mixture too rich for conditions (see CARBURETOR TROUBLESHOOTING).
4. Valve stem seals worn or damaged.
5. Valve guides badly worn.

### Pre-Ignition or Detonation (Knocks or Pings)

1. Excessive carbon deposit on piston head or combustion chamber.
2. Incorrect heat range spark plug.
3. Spark plugs not firing.
4. Ignition timing advanced.
5. Fuel octane rating too low.
6. Intake manifold vacuum leak.

### Overheating

1. Insufficient oil supply or oil not circulating.
2. Leaking valves.
3. Heavy carbon deposit.
4. Ignition timing retarded.

### Valve Train Noise

1. Hydraulic lifter not functioning properly.
2. Bent push rod.
3. Cam, cam gears or cam bushings worn.
4. Rocker arm binding on shaft.
5. Valve sticking in guide.



## Excessive Vibration

1. Engine tie-bars loose, broken or improperly spaced.
2. Lower mounting bolts loose.
3. Broken frame.
4. Primary chain badly worn or links tight as a result of insufficient lubrication.
5. Wheels not aligned and/or tires worn.
6. Internal engine problem.

## ENGINE LUBRICATION SYSTEM

### Oil Does Not Return To Oil Tank

1. Oil tank empty.
2. Return pump gears damaged.
3. Oil feed pump not functioning.
4. Restricted oil lines or fittings.

### Engine Uses Too Much Oil or Smokes Excessively

1. Piston rings badly worn or broken.
2. Valve stem seals worn or damaged.
3. Valve guides worn.

### Engine Leaks Oil From Cases, Push Rods, Hoses, Etc.

1. Loose parts.
2. Imperfect seal at gaskets, push rod cover, washers, etc. To aid locating leaks, use [BLACK LIGHT LEAK DETECTOR \(Part No. HD-35457\)](#).
3. Restricted oil return line to tank.
4. Restricted breather passage(s) to air cleaner.

## ELECTRICAL SYSTEM

### Alternator Does Not Charge

1. Regulator-rectifier module not functioning.
2. Rectifier not grounded.
3. Engine ground wire loose or broken.
4. Loose or broken wires in charging circuit.
5. Stator not functioning.
6. Rotor not functioning.

### Alternator Charge Rate Is Below Normal

1. Regulator-rectifier module not functioning.
2. Stator not functioning.
3. Rotor not functioning.
4. Weak battery.
5. Loose connections.

## FUEL

### Carburetor Floods

1. Excessive "pumping" of throttle control grip.
2. Inlet valve sticking.
3. Inlet valve and/or valve seat worn or damaged.
4. Dirt or other foreign matter between valve and its seat.
5. Float misadjusted or filled with fuel.

## TRANSMISSION

### Shifts Hard

1. Clutch dragging slightly.
2. Shifter forks (inside transmission) damaged.
3. Corners worn off shifter clutch dogs (inside transmission).

### Jumps Out of Gear

1. Shifter pawl improperly adjusted.
2. Shifter engaging parts (inside transmission) badly worn and rounded.
3. Shifter forks bent.
4. Damaged gears.

## CLUTCH

### Slips

1. Clutch controls improperly adjusted.
2. Worn friction plates.

### Drags or Does Not Release

1. Clutch controls improperly adjusted.
2. Clutch plates excessively warped.

### Chatters

1. Friction or steel plates worn, warped or dragging.

## CHASSIS

### Irregular/Inadequate Brake Action

1. Master cylinder low on fluid.
2. Brake line contains air bubbles.
3. Master or wheel cylinder piston worn.
4. Brake pads covered with grease or oil.
5. Brake pads badly worn (1/16 in. (1.6 mm) minimum lining thickness).
6. Brake rotor badly worn or warped.
7. Brake pads dragging or excessive braking (brake fades due to heat buildup).
8. Insufficient brake pedal or hand lever freeplay (brake drags).

## Handling Irregularities

1. Tires improperly inflated. Check [TIRES AND WHEELS](#) on [page 1-18](#). Do not overinflate.
2. Loose wheel axle nuts. Tighten front nut to 48-53 ft-lbs (65.1-71.9 Nm). Tighten rear nut to 66-73 ft-lbs (90-99 Nm).
3. Excessive wheel hub bearing play.
4. Rear wheel out of alignment with frame and front wheel.
5. Rims and tires out-of-true sideways (tire runout should not be more than 0.080 in. (2.03 mm)).
6. Rims and tires out-of-round or eccentric with hub (tire runout should not be more than 0.090 in. (2.29 mm)).
7. Irregular or peaked front tire tread wear.
8. Tire and wheel unbalanced.
9. Steering head bearings improperly adjusted. Correct adjustment and replace pitted or worn bearings and races. See [FORK STEM AND BRACKET ASSEMBLY](#) in Section 2.
10. Shock absorber not functioning normally.
11. Heavy front end loading. Non-standard equipment on the front end (such as heavy radio receivers, extra lighting equipment or luggage) tends to cause unstable handling.

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HOME  
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