

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

NOTE

If the motorcycle is ridden hard, under dusty conditions, or in cold weather, the engine oil and filter should be changed more often.

PROCEDURE

- Ride motorcycle until engine is at normal operating temperature.
- Locate oil filler plug/dipstick on right side of motorcycle at top of transmission case. To remove the oil filler plug, pull steadily while moving plug back and forth.
- Locate oil drain plug at front left side of the oil pan. Remove the oil drain plug and allow oil to drain completely.
- Inspect the oil drain plug O-ring for cuts, tears or signs of deterioration. Replace as necessary.
- Remove the oil filter as follows:
 - Obtain the OIL FILTER WRENCH (HD-42311). The tool allows easy removal of the oil filter without risk of damage to the CKP sensor or cable.
 - Place the jaws of the wrench over the oil filter with the tool oriented vertically. See Figure 1-1.
 - Using a 3/8 inch drive with a 4 inch extension, turn wrench in a counterclockwise direction. Do not use with air tools.

NOTE

Use OIL FILTER WRENCH (HD-44067) if HD-42311 is not available.

- Clean the oil filter mount flange of any old gasket material.
- Lubricate gasket with clean engine oil and install **new** oil filter on filter mount. Hand tighten oil filter 1/2-3/4 turn after gasket first contacts filter mounting surface. Do **NOT** use OIL FILTER WRENCH for oil filter installation.

NOTE

Use of the Premium 5 micron synthetic media oil filter is highly recommended, Part No. 63798-99A (Chrome) or 63731-99A (Black).

- Install engine oil drain plug and tighten to 14-21 ft-lbs (19-28 Nm).

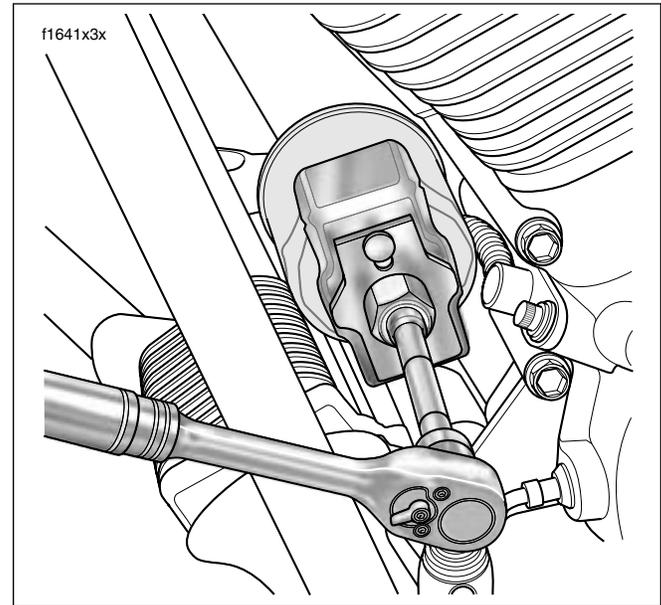


Figure 1-1. Remove Engine Oil Filter

- With motorcycle resting on jiffy stand, add 3-1/2 quarts (3.3 liters) engine oil as specified in Table 1-3. Use the proper grade of oil for the lowest temperature expected before the next oil change.

Table 1-3. Recommended Engine Oils

Harley-Davidson Type	Viscosity	Harley-Davidson Rating	Lowest Ambient Temperature	Cold Weather Starts Below 50°F (10°C)
HD Multi-grade	SAE 10W40	HD 360	Below 40°F (4°C)	Excellent
HD Multi-grade	SAE 20W50	HD 360	Above 40°F (4°C)	Good
HD Regular Heavy	SAE 50	HD 360	Above 60°F (16°C)	Poor
HD Extra Heavy	SAE 60	HD 360	Above 80°F (27°C)	Poor

CAUTION

Oil level cannot be accurately measured on a cold engine. For pre-ride inspection, with motorcycle leaning on jiffy stand on level ground, oil should register on dipstick between arrows when engine is cold. Do not add oil to bring the level to the FULL mark on a COLD engine. (00185a)

- Perform engine oil level **COLD CHECK** as follows:

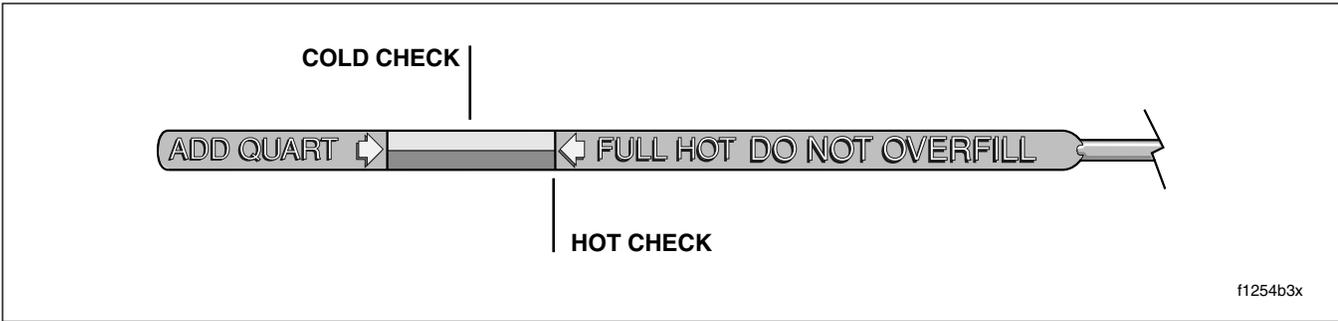


Figure 1-2. Engine Oil Dipstick

- a. With the motorcycle resting on the jiffy stand on level ground, wipe off the dipstick and insert it back into the oil pan with the plug pushed completely into the fill spout.
 - b. Remove the dipstick and note the level of the oil. Oil level should register between the two arrows on the dipstick. See [Figure 1-2](#). If oil level is at or below the lower arrow, add only enough oil to bring the level between the two arrows on the dipstick.
 - c. Wipe off the dipstick and insert it back into the oil pan with the plug pushed completely into the fill spout.
 - d. Remove the dipstick and note the level of the oil. Add only enough oil to bring the level to the FULL mark on the dipstick. See [Figure 1-2](#). Do not overfill.
11. Perform engine oil level **HOT CHECK** as follows:
- a. Ride motorcycle until engine is at normal operating temperature.
 - b. With the motorcycle resting on the jiffy stand on level ground, allow engine to idle for 1-2 minutes. Turn engine off.
12. Start engine and carefully check for leaks around hoses, drain plug and oil filter.

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See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

1. Remove large allen head socket screw in center of air cleaner cover. Remove air cleaner cover with rubber seal. See Figure 1-3.
2. Remove three T27 TORX screws to release cover bracket from filter element.

CAUTION

Never run the engine with the filter element removed. The filter prevents dirt and dust from entering the engine.

3. Remove filter element pulling two breather tubes from holes on inboard side.
4. Remove gasket from sleeve on inboard side of filter element. Discard gasket.
5. Remove breather tubes from fittings on two cylinder head breather bolts.
6. Thoroughly clean air cleaner cover, breather tubes and backplate with warm, soapy water.

7. Inspect the breather tubes and rubber seal for cuts, tears, holes or signs of deterioration. Replace as necessary. Direct compressed air through the breather tubes to be sure that they are not plugged.
8. Clean the filter element as follows:
 - a. Wash the filter element in warm, soapy water. To remove soot and carbon, soak element for 30 minutes in warm water with mild detergent.

WARNING

Do not use gasoline or solvents to clean filter element. Flammable cleaning agents can cause an intake system fire, which could result in death or serious injury. (00101a)

WARNING

Compressed air can pierce the skin and flying debris from compressed air could cause serious eye injury. Wear safety glasses when working with compressed air. Never use your hand to check for air leaks or to determine air flow rates. (00061a)

- b. Dry the filter element using low pressure compressed air (32 psi/221 kPa maximum). Rotate the element while moving air nozzle up and down the element interior. Do not rap the element on a hard surface.

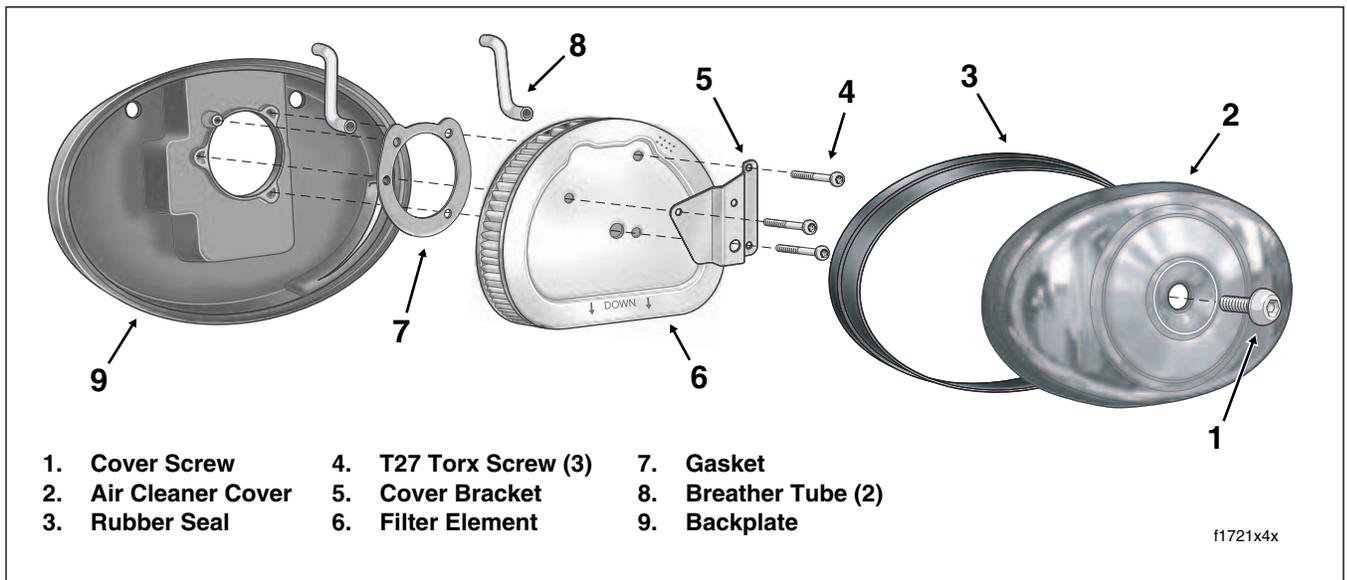


Figure 1-3. Air Cleaner Assembly

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

NOTE

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

- 9. Slide **new** gasket over sleeve on inboard side of filter element. Be sure holes in gasket are aligned with those in filter.
- 10. Insert breather tubes about 1/4 inch (6.4 mm) into holes on inboard side of filter element.
- 11. Install breather tubes onto fittings of two cylinder head breather bolts.

NOTE

Air cleaner mounting without installation of the breather tubes allows crankcase vapors to be vented into the atmosphere in violation of legal emissions standards.

- 12. Place filter element onto backplate with the flat side down, so that hole on inboard side of element fits over molded boss in backplate.
- 13. Align holes in cover bracket with those in filter element and start three T27 TORX screws. Stamp on cover bracket points to downside. Alternately tighten screws to 40-60 **in-lbs** (4.5-6.8 Nm) in a crosswise pattern.
- 14. Verify that rubber seal is properly seated around perimeter of air cleaner cover.
- 15. Fit air cleaner cover into backplate. Apply a small dab of Loctite Medium Strength Threadlocker 243 (blue) to threads of large allen head socket screw. Install screw in center of air cleaner cover. Tighten screw to 36-60 **in-lbs** (4.1-6.8 Nm).

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See Section 1.2 [MAINTENANCE SCHEDULE](#) for the required service interval.

PROCEDURE

1. Inspect for wear as follows:
 - a. Locate the arrows on the tire sidewalls. The arrows point to location of the tread wear indicator bars. See upper frame of [Figure 1-4](#).
 - b. Immediately replace tires if any tread wear indicator bar is on the tire tread surface, indicating that 1/32 inch (0.8 mm) or less of tire tread pattern remains. See lower frame of [Figure 1-4](#).

NOTE

*Harley-Davidson recommends that the tires be replaced **BEFORE** the tread wear indicator bars are on the tire tread surface.*

2. Inspect for damage. Replace tires if:
 - Cords or fabric become visible through cracked sidewalls, snags or deep cuts.
 - Bump, bulge or split line is observed.
 - Puncture, deep cut or other damage is present that is not repairable.
3. Check tire pressure.

Table 1-4. Tire Pressure (Cold)

DUNLOP TIRES ONLY	FRONT		REAR	
	PSI	BARS	PSI	BARS
Solo Rider	36	2.5	36	2.5
Rider & One Passenger	36	2.5	40	2.8

WARNING

Do not inflate tire beyond maximum pressure as specified on sidewall. Over inflated tires can blow out, which could result in death or serious injury. (00027a)

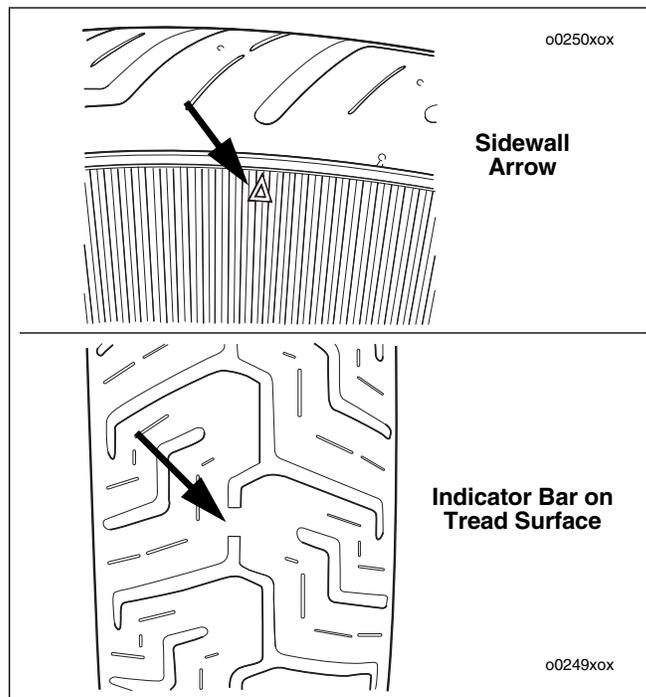


Figure 1-4. Tread Wear Indicator Bars

GENERAL

See Section [1.2 MAINTENANCE SCHEDULE](#) for the required service interval.

2. Lightly tap each spoke with a spoke wrench. Loose spokes will sound dull and must be tightened. Tighten spokes to 40-50 **in-lbs** (4.5-5.6 Nm). If more than a few spokes are loose, true the entire wheel following the procedure under Section [2.7 TRUING LACED WHEEL](#).

PROCEDURE

1. Raise wheel off the ground.

CAUTION

If nipples require more than one full turn to tighten spoke, remove tire to check that spoke protrusion has not damaged tube.

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

PRIMARY CHAIN ADJUSTMENT

1. Remove seat. See Section 2.25 SEAT, REMOVAL.

⚠ WARNING

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

2. Unthread bolt and remove battery negative cable (black) from battery negative (-) terminal.
3. See Figure 1-5. Remove four T27 TORX screws to free the primary chain inspection cover from the primary chaincase cover.
4. Check the primary chain tension. Push on the upper strand to verify that it has free up and down movement midway between the engine compensating sprocket (front) and the clutch sprocket (rear).
5. Measure the free play to be sure that it falls within the range specified for a hot or cold engine. Refer to Table 1-5.

Table 1-5. Primary Chain Adjustment

(Free Play)	Inches	Millimeters
COLD ENGINE	5/8-7/8 inch	15.9-22.2 mm
HOT ENGINE	3/8-5/8 inch	9.5-15.9 mm

6. If the chain is too tight or too loose, then adjust as follows:
 - a. Locate the primary chain tensioner assembly and loosen the top center nut a maximum of two turns. See Figure 1-6.
 - b. Raise or lower the chain tensioner assembly as necessary to obtain the specified free play.

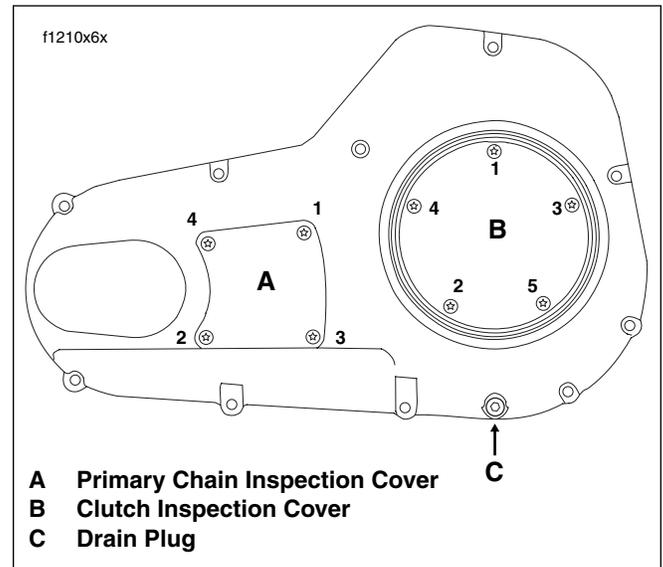


Figure 1-5. Primary Chaincase Cover

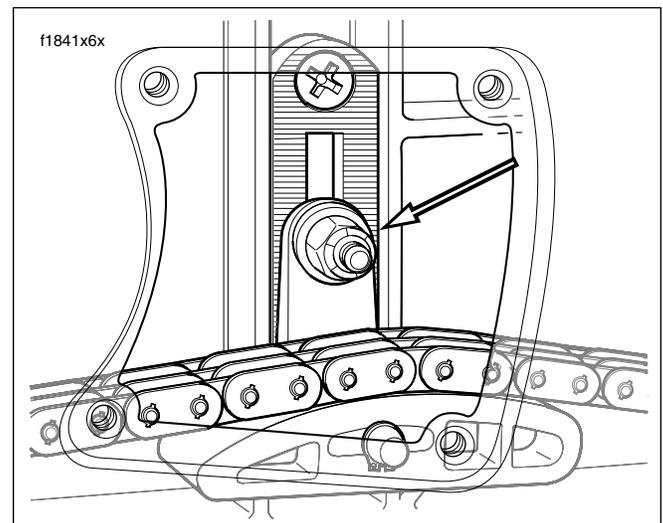


Figure 1-6. Primary Chain Tensioner Assembly

NOTE

As chains stretch and wear, they run tighter at one spot than another. Always adjust the free play at the tightest spot in the chain. Replace the primary chain if it is worn to the point where it cannot be properly adjusted.

CAUTION

Always keep the primary chain properly adjusted. Allowing the chain to run too tight or too loose will result in excessive chain and sprocket wear.

- c. Tighten the top center nut of the chain tensioner assembly to 21-29 ft-lbs (29-39 Nm).
7. Align holes in **new** gasket with holes in the primary chaincase cover. Install four T27 TORX screws to secure primary chain inspection cover to primary chaincase cover. Alternately tighten screws to 84-108 **in-lbs** (10-12 Nm) in a crosswise pattern. See [Figure 1-5](#).
8. Insert bolt through battery negative cable (black) into threaded hole of battery negative (-) terminal. Tighten bolt to 60-96 **in-lbs** (6.8-10.9 Nm).
9. Install seat. See Section [2.25 SEAT, INSTALLATION](#).

PRIMARY CHAIN LUBRICANT

1. Remove five T27 TORX screws (with captive washers) to free clutch inspection cover from primary chaincase cover.
2. Remove magnetic drain plug at bottom of primary chaincase cover. Drain lubricant into suitable container. See [Figure 1-5](#).
3. Clean drain plug. If plug has accumulated a lot of debris, inspect the condition of chaincase components.
4. Inspect drain plug O-ring for cuts, tears or signs of deterioration. Replace as necessary.
5. Install drain plug back into primary chaincase cover. Tighten plug to 36-60 **in-lbs** (4.1-6.8 Nm).

CAUTION

Do not overfill the primary chaincase with lubricant. Overfilling can cause rough clutch engagement, incomplete disengagement, clutch drag and/or difficulty in finding neutral at engine idle. (00199b)

WARNING

Be sure that no lubricant gets on tires, wheels or brakes when changing fluid. Traction can be adversely affected, which could result in loss of control of the motorcycle and death or serious injury. (00047c)

6. Pour 32 ounces (946 ml) of Harley-Davidson FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT through the clutch inspection cover opening, Part No. 99851-05 (quart). See [Figure 1-7](#).
7. To avoid punching holes in the clutch inspection cover gasket or enlarging existing holes, install clutch inspection cover and **new** gasket as follows:
 - a. Align the triangular shaped hole in the gasket with the top hole in the clutch inspection cover. Be sure the rubber molding and the words "towards clutch" face the motorcycle.

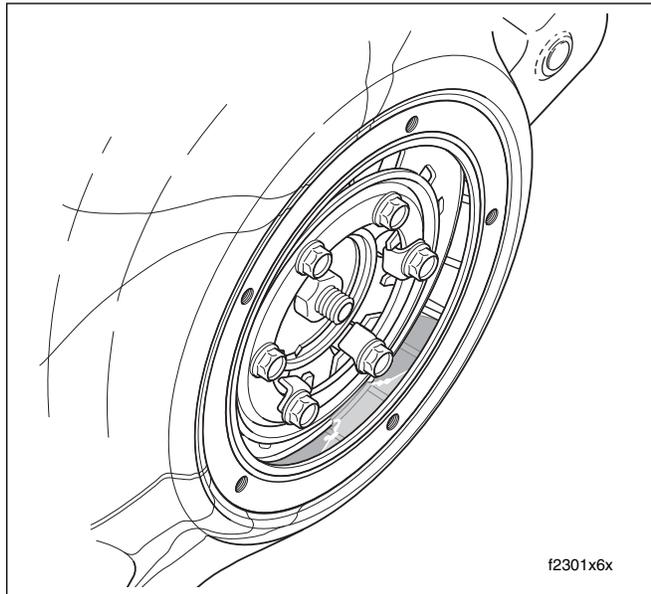


Figure 1-7. Add Primary Chaincase Lubricant

- b. Insert screw (with captive washer) through clutch inspection cover and carefully thread it all the way through triangular shaped hole in gasket. Do not push screw through hole.
- c. Hang the clutch inspection cover on the primary chaincase cover flange by starting the top cover screw.
- d. Start the remaining four screws (with captive washers).
- e. Using a T27 TORX drive head, alternately tighten screws to 84-108 **in-lbs** (10-12 Nm) in the pattern shown in [Figure 1-5](#).

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See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

CAUTION

Perform the clutch adjustment with the motorcycle at room temperature. The clearance at the adjuster screw will increase as the powertrain temperature increases. If adjuster screw is adjusted while the powertrain is hot, clearance at push rod bearing could be insufficient with powertrain cold and clutch slippage could occur.

NOTE

Perform adjustment procedure whenever any clutch components are replaced. Then repeat adjustment after first 500 miles (800 km) of use.

1. Stand motorcycle upright and level.
2. Remove five T27 TORX screws (with captive washers) to free clutch inspection cover from primary chaincase cover.
3. See Figure 1-8. Slide rubber boot off cable adjuster. Holding cable adjuster with 1/2 inch wrench, loosen jam nut using a 9/16 inch wrench. Back jam nut away from cable adjuster. Move adjuster toward jam nut to introduce a large amount of free play at hand lever.

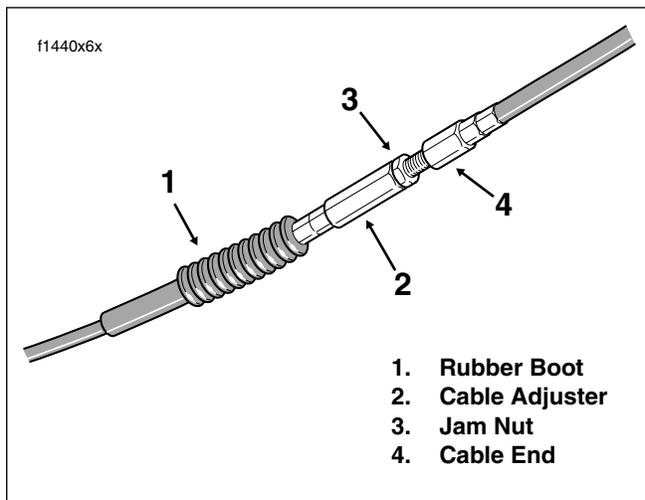


Figure 1-8. Clutch Cable Adjuster Mechanism

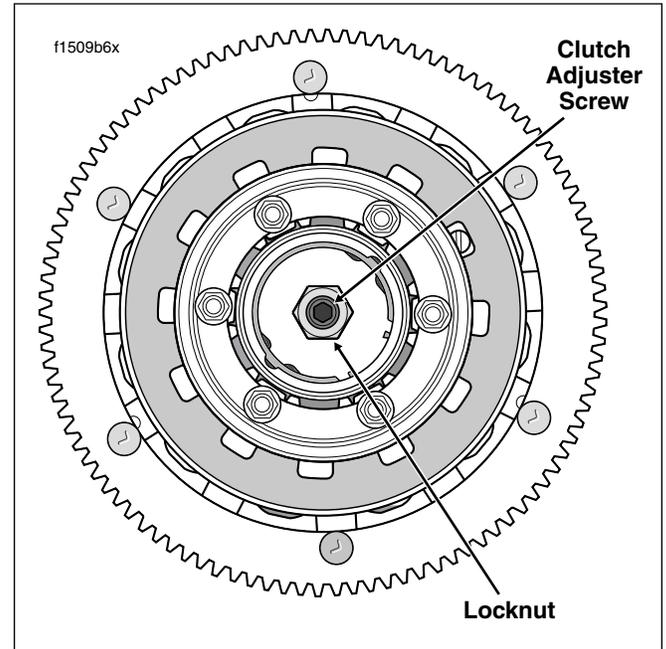


Figure 1-9. Clutch Assembly

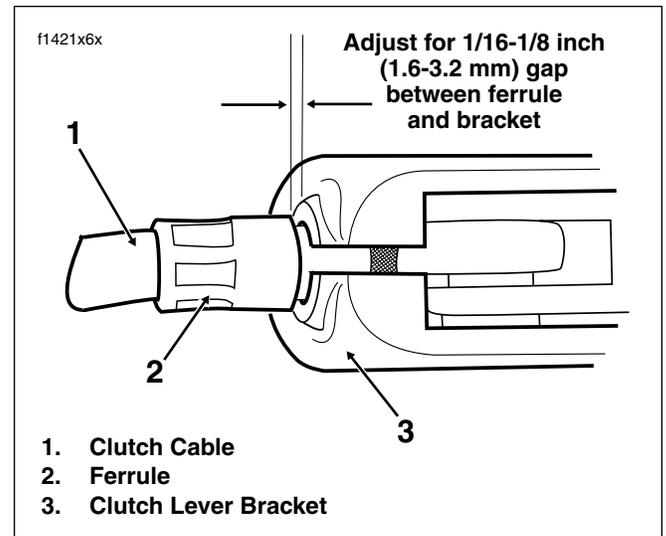


Figure 1-10. Adjust Clutch Free Play

4. See Figure 1-9. Loosen locknut on clutch adjuster screw. To take up all free play in push rods, turn screw inward (clockwise) until lightly seated.
5. Back out adjuster screw 1/2 to 1 turn. While holding adjuster screw with an allen wrench, tighten locknut to 72-120 in-lbs (8-14 Nm).
6. Squeeze clutch lever to maximum limit three times to set ball and ramp release mechanism.

7. Turn cable adjuster away from jam nut until slack is eliminated at hand lever. Pull clutch cable ferrule away from clutch lever bracket to check free play. Turn cable adjuster as necessary to obtain 1/16 to 1/8 inch (1.6-3.2 mm) free play between end of cable ferrule and clutch lever bracket, as shown in [Figure 1-10](#).
8. Hold adjuster with 1/2 inch wrench. Using 9/16 inch wrench, tighten jam nut against cable adjuster. Cover cable adjuster mechanism with rubber boot.
9. To avoid punching holes in the clutch inspection cover gasket or enlarging existing holes, install clutch inspection cover and **new** gasket as follows:
 - a. Align the triangular shaped hole in the gasket with the top hole in the clutch inspection cover. Be sure the rubber molding and the words "towards clutch" face the motorcycle.
 - b. Insert screw (with captive washer) through clutch inspection cover and carefully thread it all the way through triangular shaped hole in gasket. Do not push screw through hole.
 - c. Hang the clutch inspection cover on the primary chaincase cover flange by starting the top cover screw.
 - d. Start the remaining four screws (with captive washers).
 - e. Using a T27 TORX drive head, alternately tighten screws to 84-108 **in-lbs** (10-12 Nm) in the pattern shown in [Figure 1-5](#).

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

1. Remove the filler plug from the clutch release cover on the right side of the transmission case. See Figure 1-11. Check the O-ring for tears, cuts or general deterioration. Replace as necessary. See Figure 1-12.
2. Locate transmission drain plug on the right side of the oil pan. Remove the magnetic plug and drain the transmission lubricant into a suitable container.
3. Remove any foreign material from the drain plug. Check the O-ring on the drain plug for tears, cuts or general deterioration. Replace as necessary.
4. Install the transmission lubricant drain plug and tighten to 14-21 ft-lbs (19-28 Nm).

WARNING

When adding lubricant, do not allow dirt, debris or other contaminants to enter the transmission case. Exercise caution so that lubricant does not contact rear wheel, tire and brake components. Such contact can adversely affect traction and may lead to loss of vehicle control, which could result in death or serious injury.

5. Fill the transmission with 20-24 oz. (590-710 ml) of transmission lubricant or until the lubricant level on the dipstick of the filler plug is at the F(ULL) mark with the motorcycle in a level, upright position and the filler plug resting on the threads.

Use only Harley-Davidson FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT, Part No. 99851-05 (quart).

6. Install the transmission filler plug/dipstick in the clutch release cover. Tighten the plug to 25-75 in-lbs (2.8-8.5 Nm).

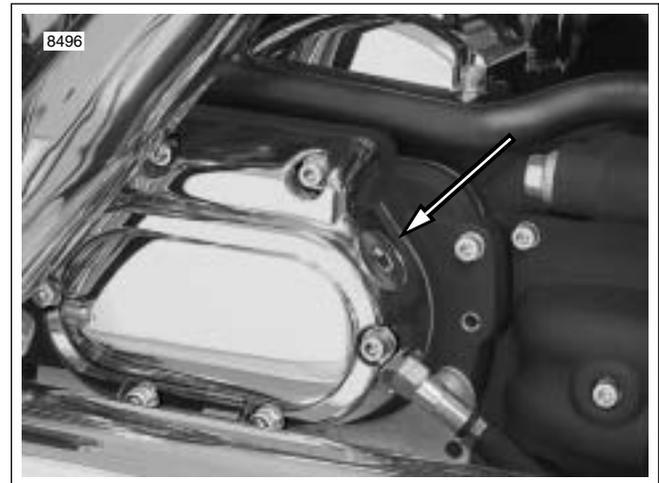


Figure 1-11. Clutch Release Cover

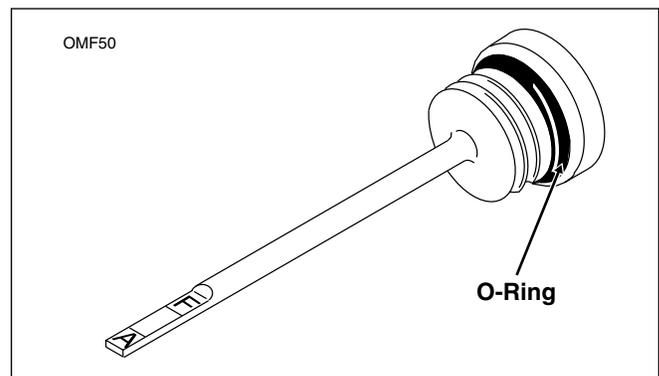


Figure 1-12. Transmission Lubricant Filler Plug/Dipstick

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

1. Remove left side saddlebag. See Section 2.26 SADDLEBAG, REMOVAL.
2. Obtain BELT TENSION GAUGE (HD-35381A), or install adapter (HD-35381-3) on old style gauge. See Figure 1-13.
3. Apply 10 lbs. (4.5 kg) of force at the midpoint of the bottom belt strand. See Figure 1-14. Check deflection at the loosest spot in the belt with the transmission in neutral and the motorcycle cold. Belt deflection should be as follows:

Table 1-6. Belt Deflection

Orientation	Inches	Millimeters
On Jiffy Stand Without Rider or Luggage 10 psi (69 kPa) in Rear Shocks	1/4 - 5/16	6.4 - 7.9
Motorcycle Upright With Rear Wheel in the Air	3/16 - 1/4	4.8 - 6.4

If belt deflection is within specification, install left side saddlebag. If adjustment is necessary, move to step 4.

4. Remove right side saddlebag. See Section 2.26 SADDLEBAG, REMOVAL.
5. Standing on right side of motorcycle, remove E-clip from groove at end of axle.
6. Obtain torque wrench with 1/2 inch drive head and AXLE NUT TORQUE ADAPTER (HD-47925). Proceed as follows:

NOTE

The Axle Nut Torque Adapter simplifies the belt adjustment procedure by allowing the cone nut to be properly tightened without having to remove the right side muffler. The tool also can be used to loosen the cone nut, as well as rotate the weld nut on the left side.

- a. Install torque adapter perpendicular to torque wrench as shown in Figure 1-15.
- b. Insert tool up between rear wheel and muffler to capture cone nut. For best clearance with muffler, be sure torque adapter is on the outboard side.

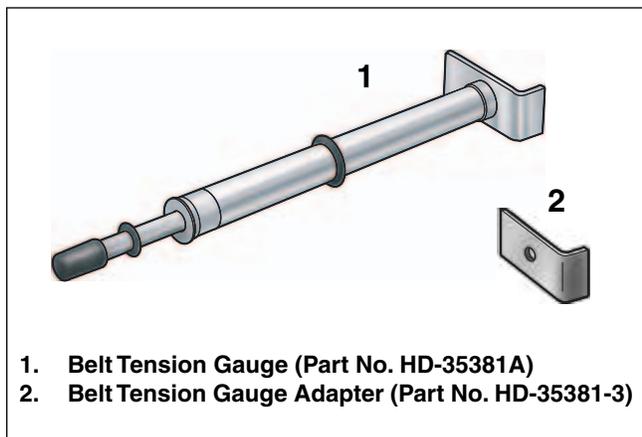


Figure 1-13. Obtain Belt Tension Gauge

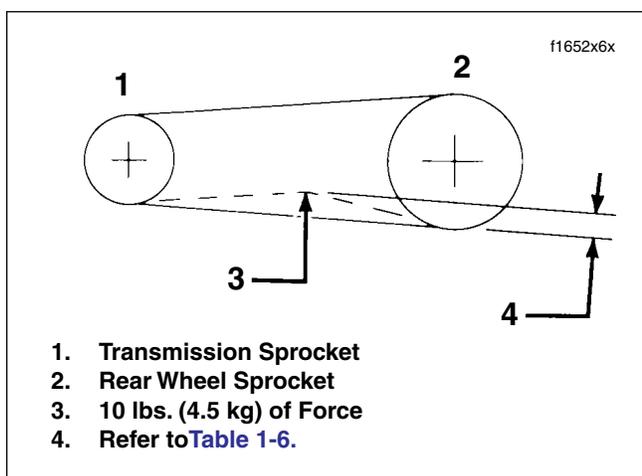


Figure 1-14. Check and Adjust Belt Deflection

CAUTION

Since any extension can act as a torque multiplier, the torque wrench must be perpendicular to the torque adapter when the cone nut is tightened. The 90 degree orientation between the tools cancels the multiplier effect and prevents the cone nut from being over-tightened. If the torque adapter is kept in line with the torque wrench, the multiplier effect is in force and parts damage will occur.

- a. Loosen cone nut, and then snug to 15-20 ft-lbs (20-27 Nm). See Figure 1-16.
7. If belt is too tight, move to step 8 to increase belt deflection. If belt is too loose, reduce belt deflection as follows:
 - a. Rotate weld nut on left side of axle in a clockwise direction.

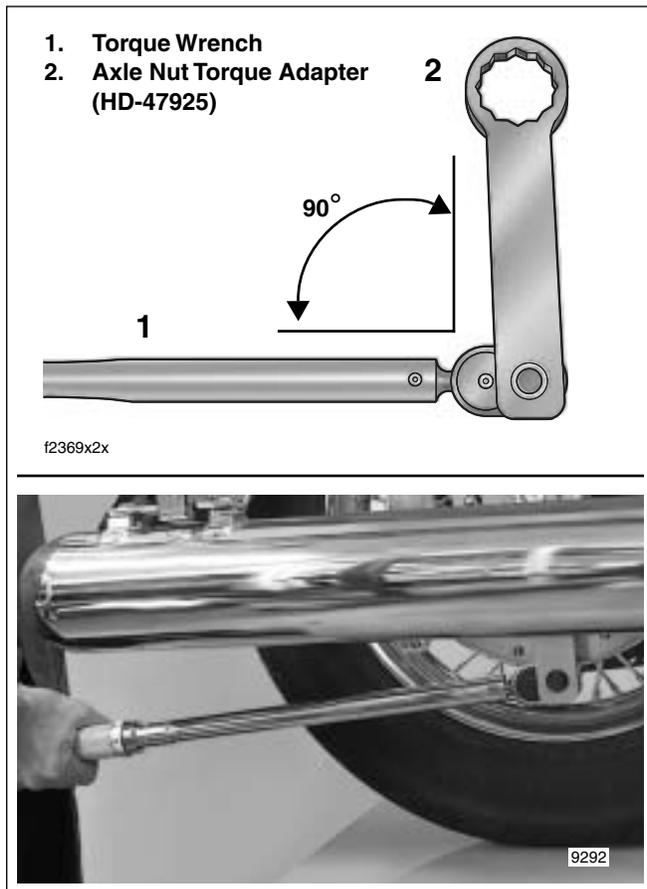


Figure 1-15. Install Tool Perpendicular to Torque Wrench

- b. Check belt deflection. Apply 10 lbs. (4.5 kg) of force at the midpoint of the bottom belt strand. Belt deflection should be within the range specified in [Table 1-6](#).
 - c. If belt is still too loose, repeat steps 7(a) through 7(b). If belt is now too tight, move to step 8.
8. If belt is too tight, increase belt deflection as follows:
 - a. Using a hydraulic center stand, raise motorcycle so that the rear wheel is off the ground.
 - b. Rotate weld nut on left side of axle in a counter-clockwise direction.
 - c. Push wheel forward slightly so that adjuster cam just contacts weld nub on both sides of rear swing-arm. See [Figure 1-16](#).
 - d. Check belt deflection. Apply 10 lbs. (4.5 kg) of force at the midpoint of the bottom belt strand. Belt deflection should be within the range specified in [Table 1-6](#).
 - e. If belt is still too tight, repeat steps 8(b) through 8(d). If belt is now too loose, move to step 7.
9. **Holding** weld nut on left side of axle, tighten cone nut on right side to 95-105 ft-lbs (128.8-142.4 Nm).

NOTE

If the axle moves during tightening of the cone nut, then the belt deflection procedure must be restarted.

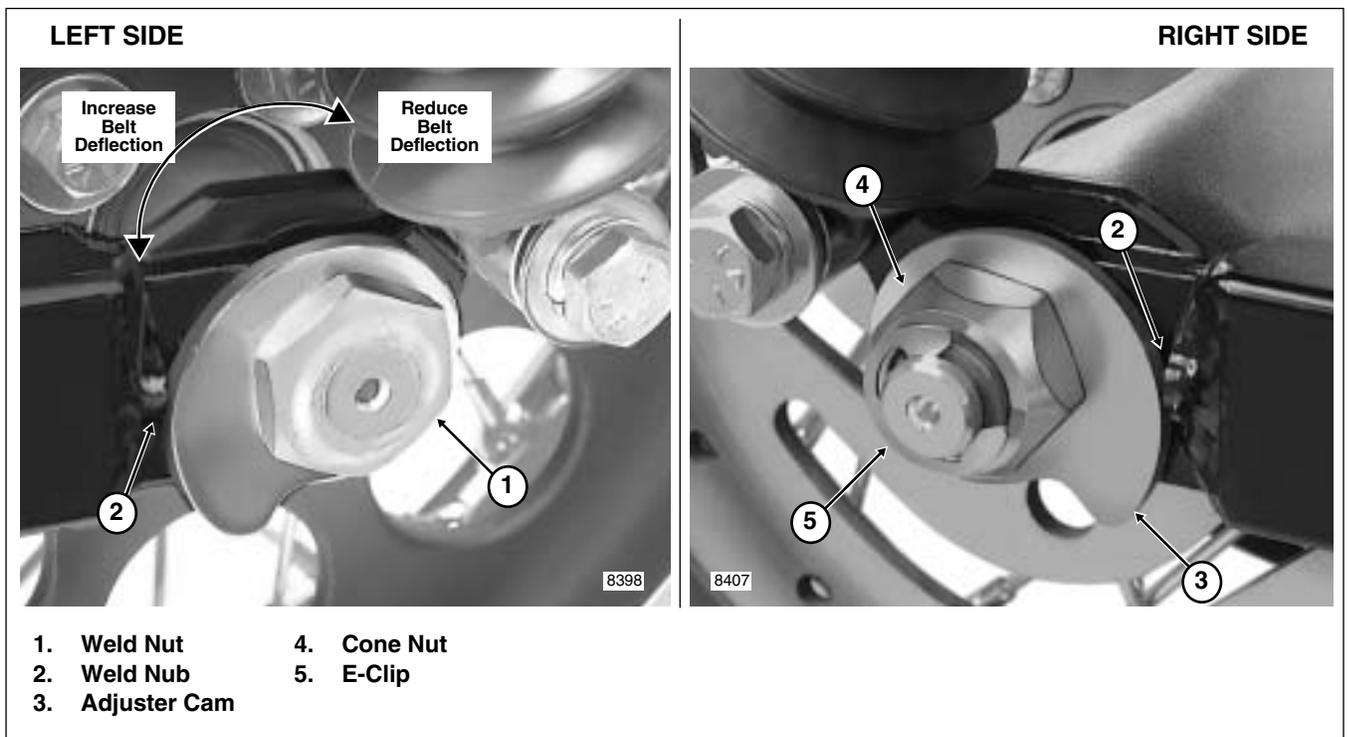


Figure 1-16. Move Rear Wheel Forward Until Adjuster Cams Just Contact Weld Nubs

10. Recheck belt deflection to verify that it is still within specification.

If the belt deflection is not within specification, loosen cone nut and then snug to 15-20 ft-lbs (20-27 Nm) before returning to step 7.

11. With the flat side out, install **new** E-clip in groove on right side of axle.

12. Install saddlebags. See Section [2.26 SADDLEBAG, INSTALLATION](#).

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See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

LUBRICATION

CAUTION

Do not remove the switch housing assembly without first placing the 5/32 inch (4.0 mm) cardboard insert between the brake lever and lever bracket. Removal without the insert may result in damage to the rubber boot and plunger of the Front Stoplight Switch.

NOTE

Use the eyelet of an ordinary cable strap if the cardboard insert is not available.

1. Place the cardboard insert between the brake lever and lever bracket. See Figure 1-17.
2. Using a T25 TORX drive head, remove the upper and lower switch housing screws.
3. Using a T27 TORX drive head, loosen the upper screw securing the handlebar clamp to the master cylinder housing. Remove the lower clamp screw with flat washer.
4. Remove the brass ferrules from the notches on the inboard side of the throttle grip. Remove the ferrules from the cable end fittings. See Figure 1-18.

NOTE

On non cruise equipped models, remove the friction shoe from the end of the tension adjuster screw. The friction shoe is a loose fit and may fall out or become dislodged if the lower switch housing is turned upside down or shaken.

5. Remove the throttle grip from the end of the handlebar.
6. Move upper switch housing to the side in order to access lower housing.

CAUTION

Lubit-8 Tufoil Chain and Cable Lube contains detergents. Avoid contact with eyes. Keep out of reach of children.

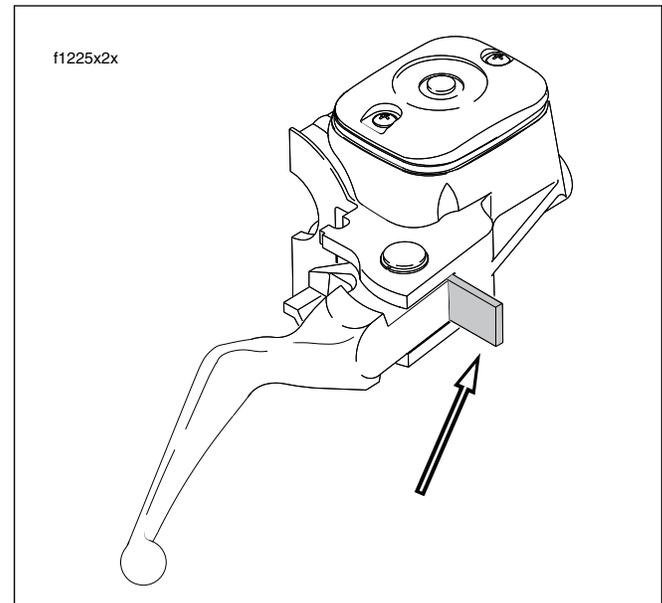


Figure 1-17. Install Cardboard Insert

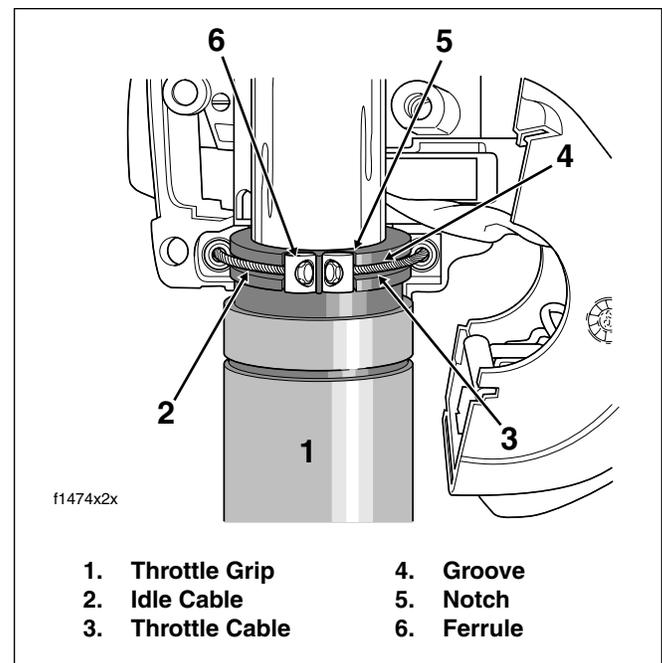


Figure 1-18. Remove Throttle/Idle Cables

7. Obtain tube of Lubit-8 Tufoil Chain and Cable Lube (HD Part No. 94968-85TV- 1/4 fl. oz.). Insert pin of tube between throttle cable and cable housing inside lower switch housing. Squeeze tube to squirt a quantity of lubricant into cable housing moving pin around cable OD. See Figure 1-19.

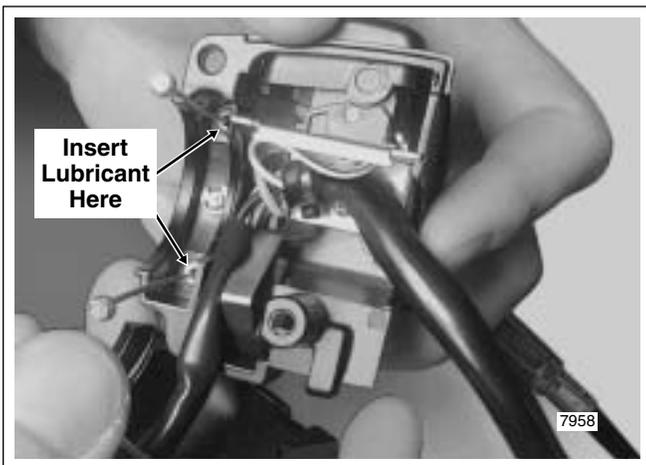


Figure 1-19. Lubricate Throttle/Idle Cables

8. Repeat the procedure squirting a quantity of lubricant between the idle cable and cable housing.

NOTE

On non cruise equipped models, install the friction shoe with the concave side up so that the pin hole is over the point of the adjuster screw. The friction shoe is a loose fit and may fall out or become dislodged if the lower switch housing is turned upside down or shaken.

9. Apply a light coating of graphite to the handlebar.
10. Slide the throttle grip over the end of the right handlebar until it bottoms against the closed end. Rotate the grip so that the ferrule notches are at the top. To prevent binding, pull the grip back about 1/8 inch (3.2 mm).
11. Position the lower switch housing beneath the throttle grip. Install the brass ferrules onto the cables so that the end fittings seat in the ferrule recess. Seat the ferrules in their respective notches on the throttle grip. Verify that the cables are captured in the grooves molded into the grip. See [Figure 1-18](#).
12. Position the upper switch housing over the handlebar and lower switch housing. Verify that the wire harness conduit runs in the depression at the bottom of the handlebar.
13. Start the upper and lower switch housing screws, but do not tighten.
14. Position the brake lever/master cylinder assembly inboard of the switch housing assembly engaging the tab on the lower switch housing in the groove at the top of the brake lever bracket.
15. Align the holes in the handlebar clamp with those in the master cylinder housing and start the lower screw (with flat washer). Position for rider comfort. Beginning with the top screw, tighten the screws to 60-80 **in-lbs** (6.8-9.0 Nm) torque using a T27 TORX drive head.

16. Using a T25 TORX drive head, tighten the lower and upper switch housing screws to 35-45 **in-lbs** (4-5 Nm).

NOTE

Always tighten the lower switch housing screw first so that any gap between the upper and lower housings is at the front of the switch assembly.

17. Remove the cardboard insert between the brake lever and lever bracket.
18. Turn the Ignition/Light Key Switch to IGNITION and apply brake lever to test operation of brake lamp.

ADJUSTMENT

NOTE

For throttle and idle cable adjustment on cruise equipped models, see [Section 8.31 CRUISE CONTROL \(FLHRC, FLHTCU, FLTR\)](#).

1. Slide rubber boot off throttle cable adjuster mechanism. See [Figure 1-20](#). Holding cable adjuster with a 3/8 inch wrench, loosen jam nut turning in a clockwise direction. Back jam nut away from cable adjuster until it stops. Turn cable adjuster clockwise until it contacts jam nut. Repeat procedure on idle cable adjuster.
2. Point the front wheel straight ahead. Gently turn the throttle grip so that the throttle is wide open (fully counterclockwise) and then hold in position. Now turn the cable adjuster counterclockwise until the throttle cam stop just touches the stop plate on the carburetor/induction module. See [Figure 1-21](#). Release the throttle grip, turn cable adjuster counterclockwise an additional 1/2-1 full turn, and then tighten the jam nut against the cable adjuster. Cover cable adjuster mechanism with rubber boot.

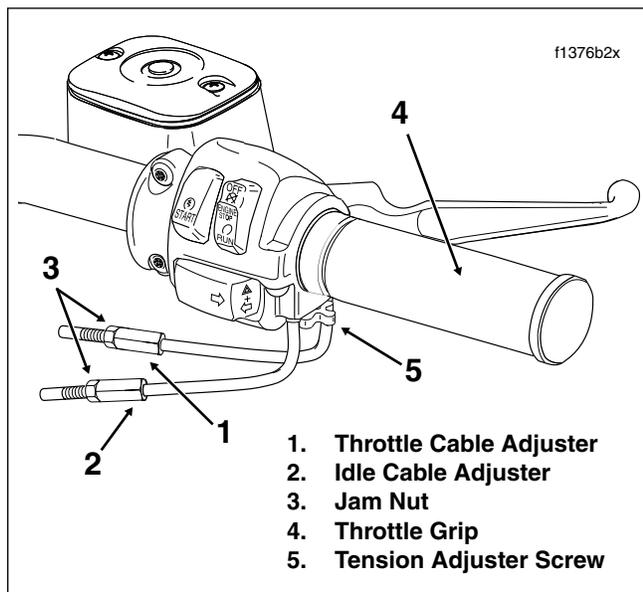


Figure 1-20. Throttle Cable Assembly - Throttle Side (FLHR/S)

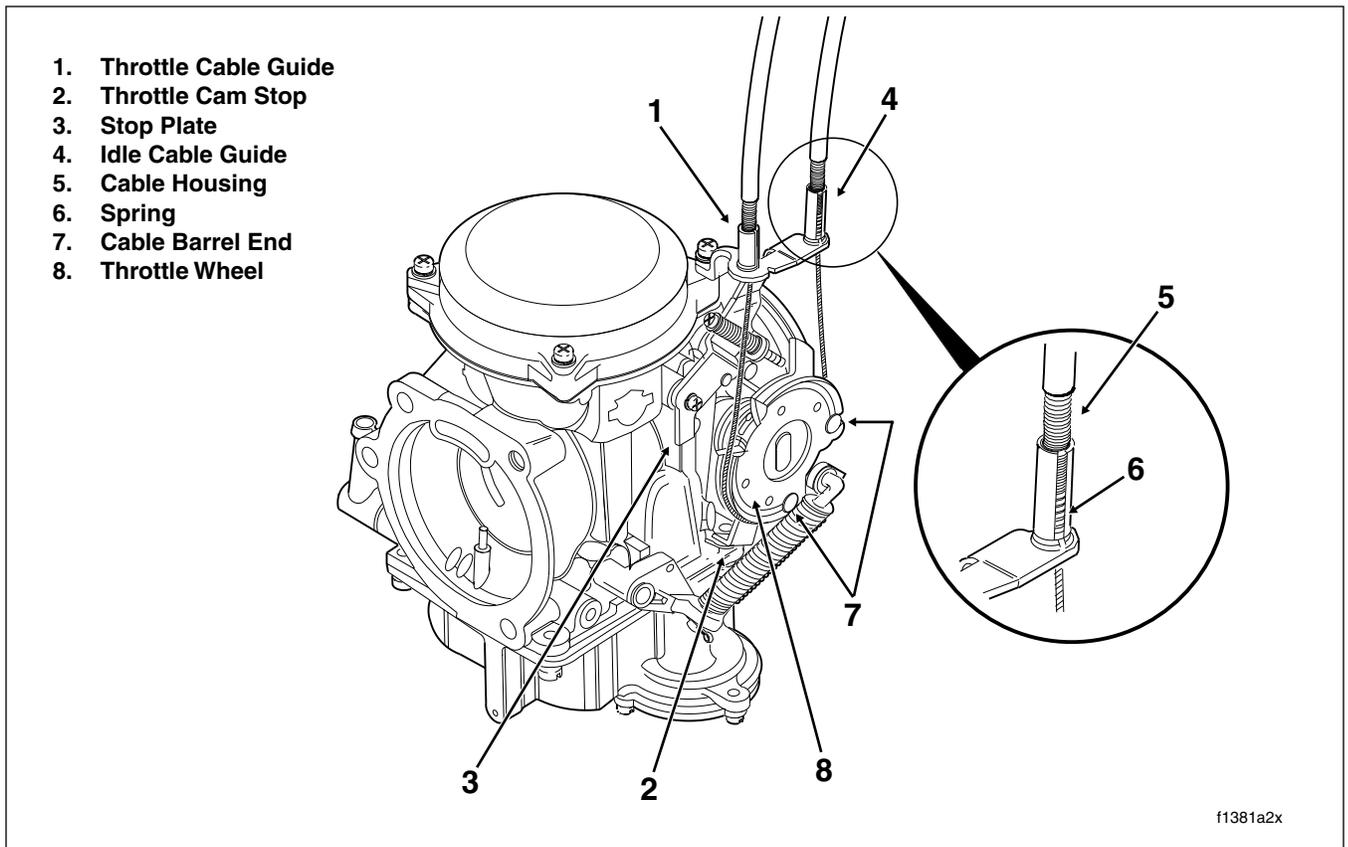


Figure 1-21. Throttle Cable Assembly - Carburetor Side

3. Turn the front wheel full right. Turn the idle cable adjuster counterclockwise until the cable housing just touches the spring in the cable guide (as seen through slot). Work the throttle grip to verify that the throttle cable returns to the idle position when released. If the cable does not return to idle, turn the cable adjuster clockwise slightly until the correct response is achieved. Tighten jam nut against the cable adjuster and cover cable adjuster mechanism with rubber boot.
4. Verify that the throttle control operates freely without binding. With the tension adjuster screw backed off, the throttle grip must freely return to the closed (idle) position. The throttle control also must open and close freely when the front wheel is turned to both the right and left fork stops. If the throttle grip does not return to the idle position freely, check the adjuster screw tension (if present). If the adjuster screw is backed off, inspect the cables for short bends.

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

NOTE

The fuel enrichener knob should open, remain open and then close without binding. The knurled plastic nut next to the enrichener knob controls the ease at which the cable slides within the conduit.

If adjustment is needed, proceed as follows:

1. See Figure 1-22. Loosen hex nut at backside of mounting bracket.
2. Move cable assembly free of slot in mounting bracket.
3. Hold cable assembly at flat with adjustable wrench. Hand turn knurled nut counterclockwise to reduce sliding resistance until knob slides inward unaided.
4. Turn knurled nut clockwise to increase sliding resistance until knob remains fully out without holding and then closes with relative ease.
5. Slide enrichener cable into slot of mounting bracket. Flat on threads must face rear of motorcycle for script on enrichener knob to be right side up. With external tooth lockwasher and hex nut positioned on the inboard side of the mounting bracket, tighten hex nut to 20-35 **in-lbs** (2.3-4.0 Nm).

CAUTION

Do not lubricate the cable or inside of conduit. The cable must have sliding resistance to work properly.

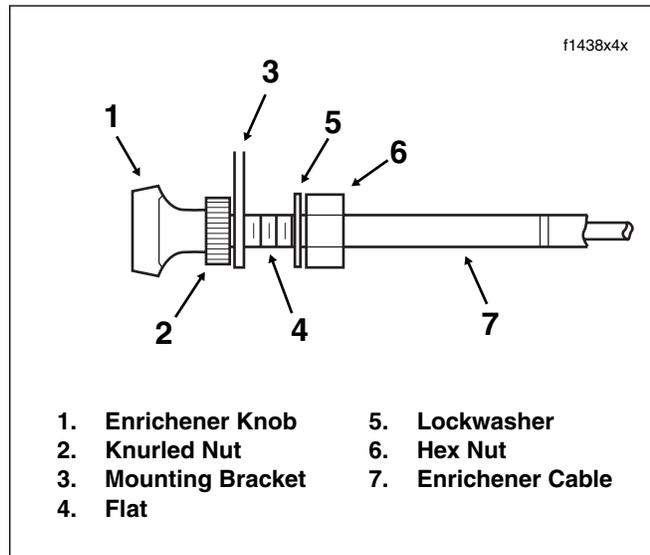


Figure 1-22. Enrichener Control

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

LINES AND FITTINGS

Carefully inspect fuel system lines and fittings for leaks or damage.

FUEL FILTER (CARBURETED)

⚠ WARNING

When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

1. Turn handle of fuel valve to OFF.

⚠ WARNING

Gasoline can drain from the carburetor fuel line when disconnected from fuel valve fitting. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00256a)

2. Using a side cutters, cut clamp and remove hose from fuel outlet fitting at front of fuel valve. See Figure 1-23. Drain free end of hose into a suitable container.
3. Remove elbow of intake manifold vacuum tube from fitting on inboard side of fuel valve.
4. Attach a length of fuel hose to the fuel outlet fitting. The hose must be long enough to reach a suitable gasoline container.
5. Turn handle of fuel valve to RES(ERVE).
6. Using the correct hose adapter, connect the Mity-Vac® Hand Pump (HD-23738A) to vacuum fitting.

CAUTION

To avoid damage to the diaphragm of the fuel valve, do not apply a vacuum greater than 25 inches of Mercury (Hg) to vacuum fitting.

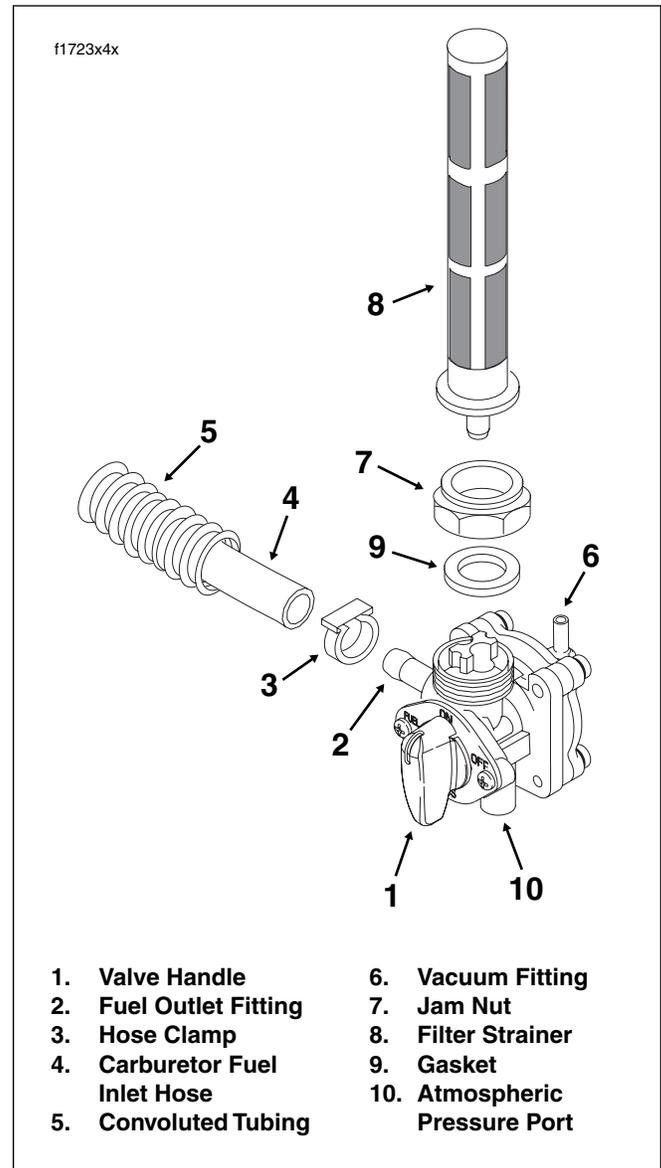


Figure 1-23. Vacuum Operated Fuel Valve

7. Gently apply a vacuum of 1-10 inches of Mercury (Hg) to vacuum fitting to get a good flow of gasoline through the valve.
8. When fuel tank is completely drained, remove Mity-Vac® Hand Pump from the vacuum fitting.
9. Holding fuel tank adapter, turn the hex jam nut in a clockwise direction to remove fuel valve assembly.
10. Remove fuel filter strainer from the valve head. Clean or replace.

11. Remove hex jam nut from the fuel valve.
12. Remove gasket from the valve head. Discard the gasket.
13. Install a **new** gasket on the valve head.
14. Install the fuel filter strainer fitting the internal tube into the larger hole in the valve head.
15. Clean threads and sealing surface of fuel tank adapter and inspect for damage. Replace if necessary.
16. With hex side down, turn jam nut two full turns in a counterclockwise direction to thread onto fuel tank adapter.
17. Insert fuel filter strainer into fuel tank. Holding hex jam nut to prevent rotation, turn fuel valve two full turns in a clockwise direction to thread onto hex jam nut.

 **WARNING**

Do not thread fuel valve onto hex jam nut more than two turns or nut may “bottom” on valve, a condition which may result in a gasoline leak. Any gasoline leak is a potential fire hazard that could result in death or serious injury.

18. Holding fuel valve to prevent rotation, turn hex jam nut in a counterclockwise direction until snug. Tighten hex jam nut to 15-20 ft-lbs (20.3-27.1 Nm).

CAUTION

Do not allow dirt or fluids to get into the vacuum tube that connects the fuel valve to the intake manifold. Contaminants can block the vacuum signal which could cause the fuel valve to malfunction.

19. Connect elbow of intake manifold vacuum tube to fitting on inboard side of fuel valve.
20. Slide **new** clamp onto free end of carburetor fuel inlet hose. Install hose onto fuel outlet fitting at front of fuel valve. Crimp clamp using HOSE CLAMP PLIERS (HD-97087-65B).
21. Turn handle of fuel valve to OFF and fill the fuel tank. Carefully inspect for leaks at fitting.
22. Turn valve handle to ON and start engine. No priming or special procedures are required to start fuel flow. Carefully inspect for leaks at fitting.
23. Stop engine and return valve to the OFF position.

**FUEL FILTER CANISTER
(FUEL INJECTED)**

See Section 9.4 [FUEL TANK \(FUEL INJECTED\)](#), [FUEL FILTER CANISTER](#), for replacement procedure.

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

BRAKE FLUID

Inspect the brake fluid condition and level. Proceed as follows:

CAUTION

DOT 4 brake fluid will damage painted and molded-in color surfaces it comes in contact with. Always use caution and protect surfaces from spills whenever brake work is performed. Failure to comply can result in cosmetic damage. (00239a)

IMPORTANT NOTE

Immediately wipe up any brake fluid spillage with a clean, dry, soft cloth. Follow up by thoroughly wiping affected area with a clean, damp, soft cloth (small spills) or washing with a large quantity of soapy water (large spills).

CAUTION

To prevent dirt and other contaminants from entering the master cylinder reservoir, thoroughly clean the cover before removal.

1. Remove two Phillips screws from cover of master cylinder reservoir. Remove cover (with gasket).

WARNING

Use only fresh, uncontaminated DOT 4 brake fluid. Fluid containers that have been opened may have been contaminated by dirt or moisture. Use of contaminated brake fluid may adversely affect braking ability and lead to brake failure which could result in death or serious injury.

IMPORTANT NOTE

The shelf life of a bottle of unopened DOT 4 brake fluid is one year. The shelf life of an uncontaminated bottle that has been opened and then resealed is one week.

2. Stand the motorcycle upright so that the master cylinder reservoir is in a level position. Fluid level should be 1/4 inch (6.4 mm) from the top. Add fluid as necessary.

NOTE

Use only Harley-Davidson DOT 4 BRAKE FLUID, Part No. 99953-99A (12 ounce bottle), from a sealed container.

3. Install cover (with gasket) on the master cylinder reservoir. Install two Phillips screws and tighten to 6-8 in-lbs (0.7-0.9 Nm).

WARNING

After repairing the brake system, test brakes at low speed. If brakes are not operating properly, testing at high speeds can cause loss of control, which could result in death or serious injury. (00289a)

BRAKE PADS AND DISCS

Inspect the brake pads and discs as follows:

Brake Pads

If brake pad friction material is worn to 0.04 inch (1.02 mm) or less, replace the entire set of pads.

WARNING

Always replace brake pads in complete sets for correct and safe brake operation. Improper brake operation could result in death or serious injury. (00111a)

Brake Discs

The minimum brake disc thickness is stamped on the side of the disc.

When checking the brake pads and discs, inspect the brake lines and hoses for damage or leaks.

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

WARNING

Never disconnect a spark plug cable with the engine running. Doing so will result in an electric shock from the ignition system that could result in death or serious injury.

1. Disconnect spark plug cables from spark plug terminals.
2. Remove spark plug using a 5/8 inch spark plug socket.
3. Examine plugs as soon as they have been removed. The deposits on the plug base are an indication of the plug efficiency and are a guide to the general condition of rings, valves, carburetor and ignition system.
 - a. A wet black and shiny deposit on plug base, electrodes and ceramic insulator tip indicate an oil fouled plug. The condition may be caused by worn rings and pistons, loose valves or seals, weak battery or faulty ignition.
 - b. A dry fluffy or sooty black deposit indicates a too rich carburetor air-fuel mixture or long periods of engine idling. Excessive use of the enrichener may also cause this condition.
 - c. An overheated plug can be identified by a light brown, glassy deposit. This condition may be accompanied by cracks in the insulator or by erosion of the electrodes. This condition is caused by too lean an air-fuel mixture, 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 should be replaced.
 - d. A plug with white, yellow or light tan to rusty brown powdery deposit indicates balanced combustion. The deposits may be cleaned off at regular intervals if desired.
4. Set the spark plug gap using a wire-type gauge. Bend the outside electrode so only a slight drag on the gauge is felt when passing it between electrodes. Never make adjustments by bending the center electrode. Set gap on all plugs at 0.038-0.043 in. (0.97-1.09 mm)
5. Before installing spark plugs, check condition of threads in cylinder head and on plug. If necessary soften deposits with penetrating oil and clean out with a thread chaser.
6. Apply a very light coating of ANTISEIZE LUBRICANT to spark plug threads.
7. Install spark plug finger tight and then torque to 12-18 ft-lbs (16-24 Nm).

NOTE

If a torque wrench is not available, finger tighten spark plug and then using a spark plug wrench, tighten plug an additional 1/4 turn.

Table 1-7. Spark Plug Data

SIZE	12 mm
GAP	0.038-0.043 in. (0.97-1.09 mm)
TYPE	HD-6R12 (No Substitute)

NOTE

The number 6R12 plug is supplied as original equipment and is the only plug that should be used. The resistor plug reduces radio interference created by the ignition system and will not adversely affect performance or fuel economy.

8. Install spark plug cable from left side coil tower onto front cylinder spark plug. Install spark plug cable from right side coil tower onto rear cylinder spark plug.

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

Inspect the engine idle speed as follows:

NOTES

- *The C.V. carburetor has an enrichener circuit that will cause the engine to idle at approximately 1500 rpm with the engine at normal operating temperature and the enrichener knob pulled fully out.*
 - *The increase in idle speed is intended to alert the rider that the engine is warmed up to normal operating temperature and the enrichener knob should be pushed all the way in.*
 - *Continuing to use the enrichener when the engine is at full operating temperature WILL CAUSE FOULED PLUGS.*
 - *TECHNICIAN – Be sure the engine is warmed up to normal operating temperature and the enrichener 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 enrichener knob pulled PARTIALLY OUT.*
1. See Figure 1-24. With the engine at normal operating temperature and the enrichener all the way in (enrichener valve closed) adjust the throttle stop screw so the engine idles at 950-1050 rpm.

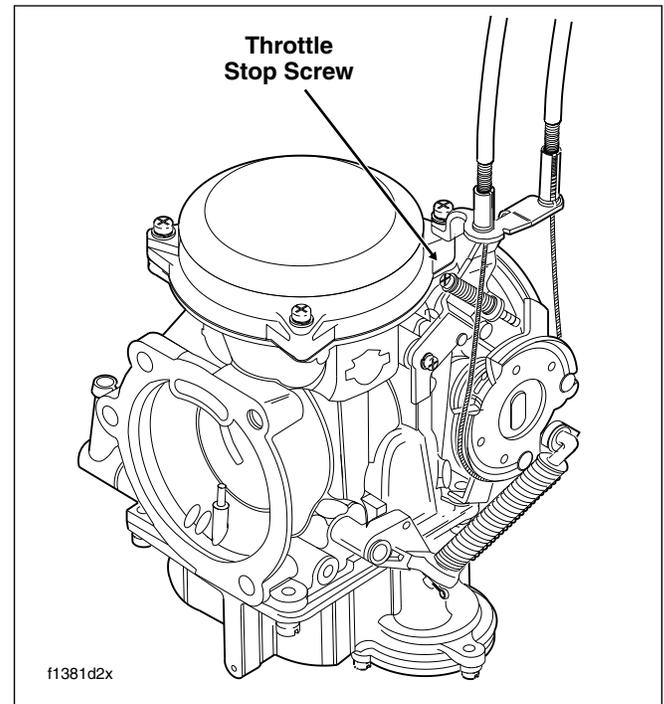


Figure 1-24. Idle Speed Adjustment

NOTE

To measure engine rpm on models without tachometers, use a test tachometer connected to the negative ignition coil terminal.

GENERAL

See Section [1.2 MAINTENANCE SCHEDULE](#) for the required service interval.

PROCEDURE

See Section [2.15 FRONT FORKS](#) for detailed instructions.

GENERAL

See Section [1.2 MAINTENANCE SCHEDULE](#) for the required service interval.

PROCEDURE

GREASING

1. Turn handlebar full right to access the grease fitting at the left side of the steering head. See [Figure 1-25](#).
2. Using SPECIAL PURPOSE GREASE (Part No. 99857-97), connect grease gun to fitting and inject grease until it exudes from top and bottom of steering head.

CHECKING

Check the swing-by and adjust as necessary. See Section [2.17 STEERING HEAD BEARINGS](#) for more information.

INSPECTING/REPLACING

Disassemble the steering head and inspect the bearings for brinelling, scoring, or other damage. Replace and/or repack the bearings as required. See Section [2.17 STEERING HEAD BEARINGS](#) for more information.

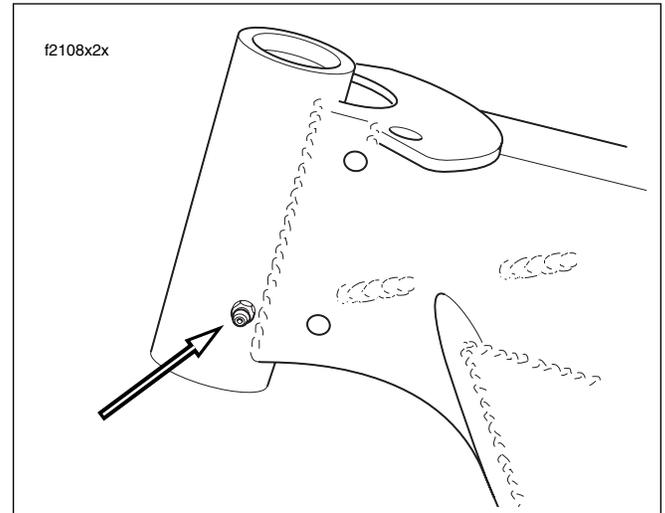


Figure 1-25. Steering Head Bearing Grease Fitting

GENERAL

See Section 1.2 MAINTENANCE SCHEDULE for the required service interval.

PROCEDURE

ENGINE MOUNTS

Inspect the condition and tightness of the stabilizer links and engine mounts. Replace fastener if damaged. Proceed as follows:

NOTE

Raise fuel tank to access top engine stabilizer bolts and jam nuts. For carbureted models, see Section 4.7 FUEL TANK (CARBURETED), PARTIAL REMOVAL, FLHX, FLHT, or FLHR/S. For fuel injected models, see Section 9.4 FUEL TANK (FUEL INJECTED), PARTIAL REMOVAL, FLHXI, FLHT/C/U/I, FLTRI, or FLHR/C/S/I.

Top

- On left side of motorcycle, tighten top engine mounting bracket bolts to front and rear cylinder heads to 35-40 ft-lbs (48-54 Nm). See A of Figure 1-26.
- Top stabilizer link - tighten eyelet bolt to top engine mounting bracket to 18-22 ft-lbs (24-30 Nm). See B of Figure 1-26.
- Moving to right side of motorcycle, tighten eyelet bolt to frame weldment to 18-22 ft-lbs (24-30 Nm). See C of Figure 1-26.
- Verify tightness of jam nuts on top stabilizer link.

Bottom

- Front stabilizer link - on left side of motorcycle, tighten eyelet bolt to frame weldment to 18-22 ft-lbs (24-30 Nm). See D of Figure 1-26.
- Moving to right side of motorcycle, tighten eyelet bolt to block on front engine mounting bracket to 18-22 ft-lbs (24-30 Nm). See E of Figure 1-26.
- Verify tightness of jam nuts on front stabilizer link.
- Tighten center front engine mounting bracket to rubber mount bolt to 15-20 ft-lbs (20-27 Nm). See F of Figure 1-26.
- Tighten the two front engine mount to frame crossmember bolts to 15-20 ft-lbs (20-27 Nm). See G of Figure 1-26.
- Tighten two engine to front engine mounting bracket bolts to 33-38 ft-lbs (45-52 Nm). See H of Figure 1-26.

- Tighten four engine to transmission bolts to 30-35 ft-lbs (41-48 Nm).

NOTE

Install fuel tank. For carbureted models, see Section 4.7 FUEL TANK (CARBURETED), INSTALLATION (AFTER PARTIAL REMOVAL), INSTALLATION (AFTER PARTIAL REMOVAL), or FLHR/S. For fuel injected models, see Section 9.4 FUEL TANK (FUEL INJECTED), INSTALLATION (AFTER PARTIAL REMOVAL), FLHXI, FLHT/C/U/I, FLTRI, or FLHR/C/S/I.

OTHER FASTENERS

Inspect the condition and tightness of other critical fasteners. Replace fastener if damaged. Proceed as follows:

Table 1-8. Critical Fastener Torque

Fastener	ft/in-lbs	Nm
Axle		
Front axle nut	50-55 ft-lbs	68-75 Nm
Rear axle cone nut	95-105 ft-lbs	129-142 Nm
Brakes		
Banjo Bolts	17-22 ft-lbs	23-30 Nm
Front Brake Disc Mounting Screws	16-24 ft-lbs	22-33 Nm
Front Brake Caliper Mounting Bolts	28-38 ft-lbs	38-52 Nm
Brake Caliper Pad Pins	180-200 in-lbs	20-23 Nm
Rear Brake Disc Mounting Screws	30-45 ft-lbs	41-61 Nm
Rear Master Cylinder Mounting Nut	30-40 ft-lbs	41-54 Nm
Reservoir Cover Screws	6-8 in-lbs	0.7-0.9 Nm
Front Forks		
Axle Holder Nuts	132-180 in-lbs	14.9-20.3 Nm
Hand Controls		
Clutch Lever/Handlebar Clamp	60-80 in-lbs	6.8-9.0 Nm
Master Cylinder/Handlebar Clamp Screws	60-80 in-lbs	6.8-9.0 Nm
Upper/Lower Switch Housing Screws	35-45 in-lbs	4-5 Nm
Handlebars		
Lower Clamp (Riser) Bolts	30-40 ft-lbs	40.7-54.2 Nm
Pivot Shaft		
Locknuts	40-45 ft-lbs	54-61 Nm
Swingarm Bracket Bolts	34-42 ft-lbs	46-57 Nm

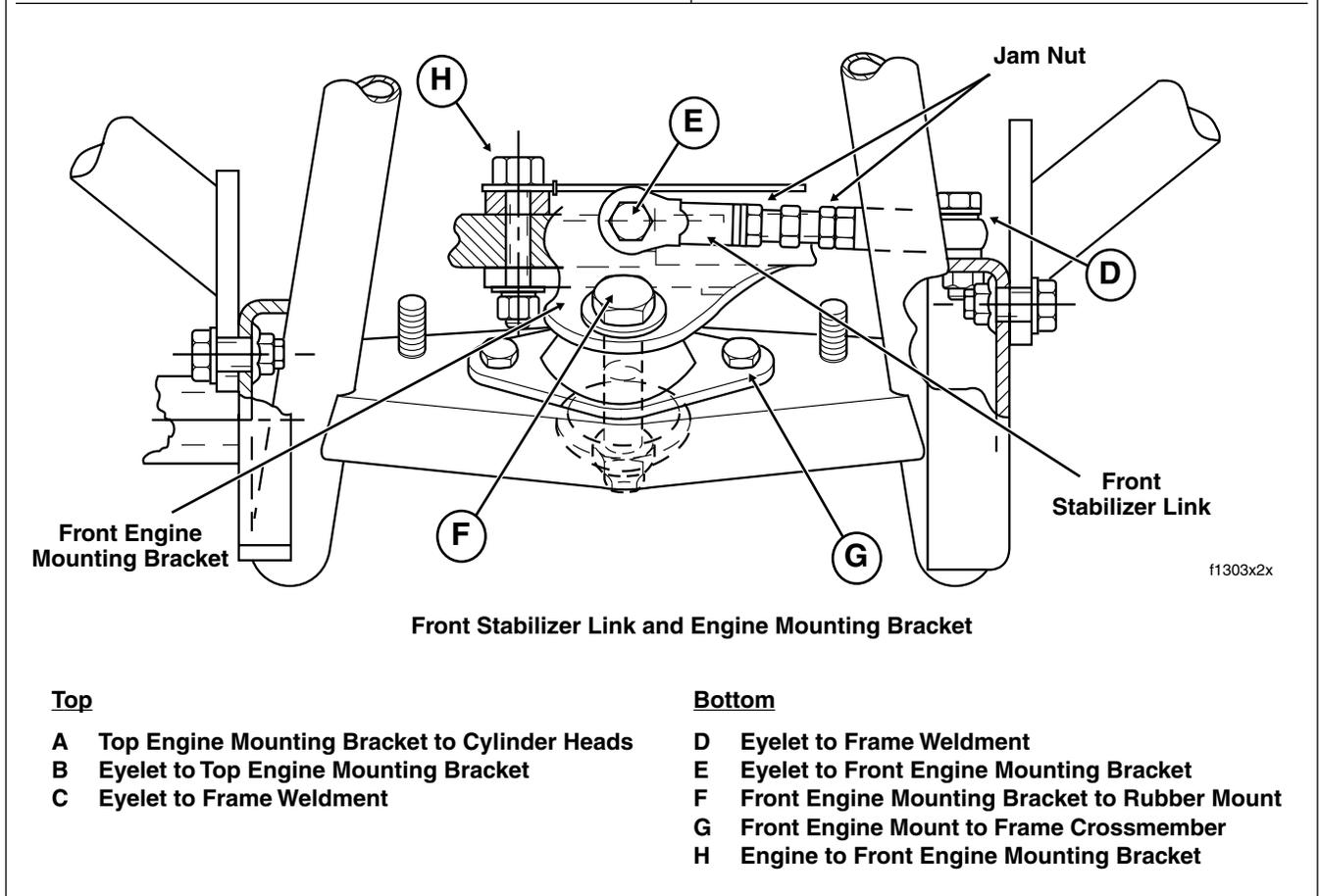
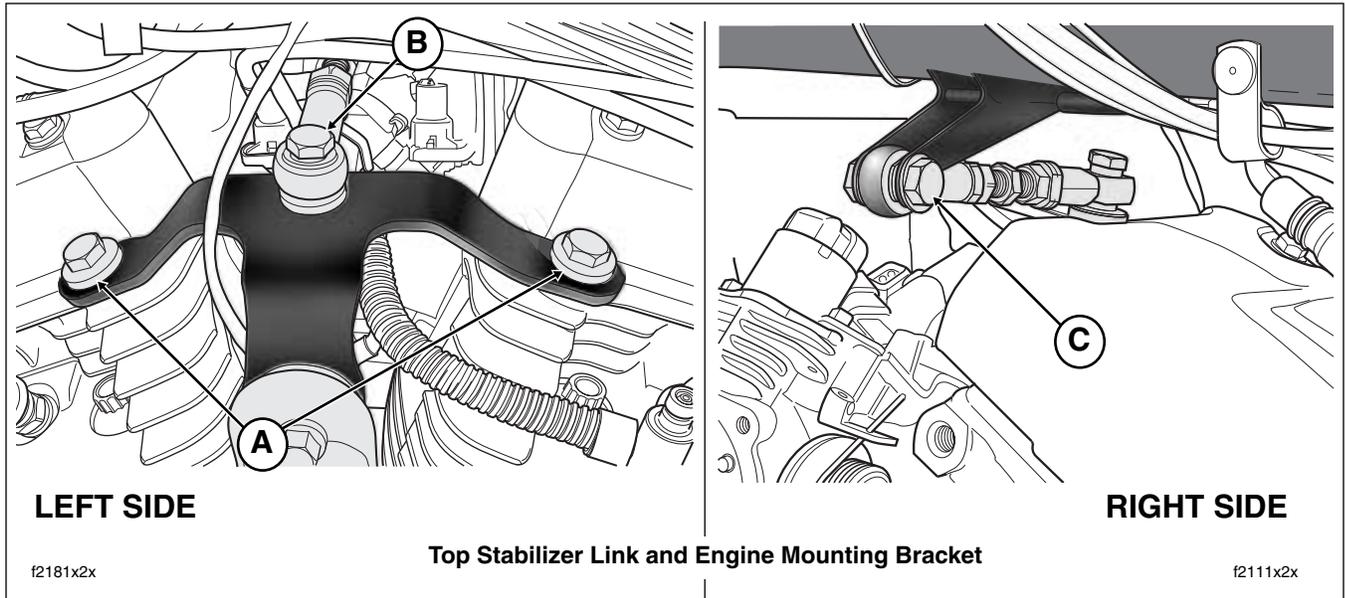


Figure 1-26. Engine Mounting Bracket Bolts

GENERAL

See Section [1.2 MAINTENANCE SCHEDULE](#) for the required service interval.

PROCEDURE

1. Verify that battery top is clean and dry. Dirt on top of battery may cause it to self-discharge at a faster than normal rate.
2. Inspect battery clamp, screws and cables for breakage, loose connections and corrosion. Clean or replace as necessary.
3. Inspect battery for discoloration, raised top, or warped case, which may indicate that battery has been overheated or overcharged. Inspect battery case for cracks or leaks. Replace battery if any of these conditions are found.

NOTE

For testing or charging information, see Section [8.10 BATTERY](#).

4. Coat battery terminals with ELECTRICAL CONTACT LUBRICANT, Part No. 99861-02 (1 oz tube).

GENERAL

The following check list of possible operating troubles and their probable causes will be helpful in keeping your motorcycle in good operating condition. More than one of these conditions may be causing the trouble and all should be carefully checked.

WARNING

The troubleshooting section of this manual is a guide to diagnose problems. Read the appropriate sections of this manual before performing any work. Improper repair and/or maintenance could result in death or serious injury.

ENGINE

Starter Motor Does Not Operate or Does Not Turn Engine Over

1. Ignition/Light Key Switch not in IGNITION position.
2. Engine Stop switch in the OFF position.
3. Discharged battery, loose or corroded connections (solenoid chatters).
4. TSM/TSSM BAS tripped and Ignition/Light Key Switch not cycled to OFF and then back to IGNITION.
5. Starter control circuit, relay or solenoid faulty.
6. 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 to OFF.
3. Fouled spark plugs.
4. Engine flooded with gasoline as a result of over use of enrichener.
5. Fuel valve or filter clogged.
6. Vacuum hose to automatic fuel supply valve disconnected, leaking or pinched.
7. Discharged battery, loose or broken battery terminal connections.
8. Loose wire connection at coil, battery or plug between ignition sensor and module.
9. Spark plug cables in bad condition and shorting, cable connections loose, or cables connected to wrong cylinders.

10. Ignition timing incorrect due to faulty ignition coil, ignition module or sensors (MAP, CKP and/or TSM/TSSM).
11. Engine lubricant too heavy (winter operation).

NOTE

Always disengage clutch for cold weather starts.

12. Sticking or damaged valve or push rod wrong length.
13. Primary cam sprocket spline sheared or missing spacer.

Starts Hard

1. Spark plugs in bad condition, have improper gap or are partially fouled.
2. Spark plug cables in bad condition.
3. Battery nearly discharged.
4. Loose wire connection at one of the battery terminals, ignition coil or plug between ignition sensor and module.
5. Carburetor controls not adjusted correctly.
6. Water or dirt in fuel system and carburetor.
7. Intake air leak.
8. Fuel tank vent hose and vapor valve plugged, or carburetor fuel line closed off and restricting fuel flow.
9. Enrichener valve inoperative.
10. Engine lubricant too heavy (winter operation).

NOTE

Always disengage clutch for cold weather starts.

11. Ignition not functioning properly (possible sensor failure).
12. Faulty ignition coil.
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 leaking.
3. Spark plug gap too close or too wide.
4. Faulty ignition coil, module and/or sensor.
5. Battery nearly discharged.
6. Damaged wire or loose connection at battery terminals, ignition coil, or plug between ignition sensor and module.
7. Intermittent short circuit due to damaged wire insulation.
8. Water or dirt in fuel system, carburetor or filter.
9. Fuel tank vent system plugged or carburetor vent line closed off.
10. Carburetor controls misadjusted.
11. Damaged carburetor.

12. Loose or dirty ignition module connector at crankcase.
13. Faulty MAP and/or CKP Sensor.
14. Incorrect valve timing.
15. Weak or broken valve springs.
16. Damaged intake or exhaust valve.

A Spark Plug Fouls Repeatedly

1. Fuel mixture too rich or enrichener left out too long.
2. Incorrect spark plug for the kind of service.
3. Piston rings badly worn or broken.
4. Valve guides or seals badly worn.

Pre-Ignition or Detonation (Knocks or Pings)

1. Fuel octane rating too low.
2. Faulty spark plugs.
3. Incorrect spark plug for the kind of service.
4. Excessive carbon deposit on piston head or in combustion chamber.
5. Ignition timing advanced due to faulty sensor inputs (MAP, CKP).

Overheating

1. Insufficient oil supply or oil not circulating.
2. Insufficient air flow over engine.
3. Heavy carbon deposit.
4. Ignition timing retarded due to faulty MAP and/or CKP Sensor.
5. Leaking valve.

Valve Train Noise

1. Low oil pressure caused by oil feed pump not functioning properly or oil passages obstructed.
2. Faulty hydraulic lifters.
3. Bent push rod.
4. Incorrect push rod length.
5. Rocker arm binding on shaft.
6. Valve sticking in guide.
7. Chain tensioner spring or shoe worn.

Excessive Vibration

1. Wheels and/or tires worn or damaged.
2. Engine/transmission/motorcycle not aligned properly.
3. Primary chain badly worn or links tight as a result of insufficient lubrication or misalignment.

4. Engine to transmission mounting bolts loose.
5. Upper engine mounting bracket loose.
6. Ignition timing incorrect/poorly tuned engine.
7. Internal engine problem.
8. Broken frame.
9. Stabilizer links worn or loose.
10. Rubber mounts loose or worn.
11. Rear fork pivot shaft nuts loose.
12. Front engine mounting bolts loose.

Check Engine Lamp Illuminates During Operation

1. Fault detected. Check for trouble codes.

LUBRICATION SYSTEM

Oil Does Not Return To Oil Pan

1. Oil pan empty.
2. Oil pump not functioning.
3. Restricted oil lines or fittings.
4. Restricted oil filter.
5. Oil pump misaligned or in poor condition.
6. O-ring damaged or missing from oil pump/crankcase junction (also results in poor engine performance).

Engine Uses Too Much Oil Or Smokes Excessively

1. Oil pan overfilled.
2. Restricted oil return line to pan.
3. Restricted breather operation.
4. Restricted oil filter.
5. Oil pump misaligned or in poor condition.
6. Piston rings badly worn or broken.
7. Valve guides or seals worn.
8. O-ring damaged or missing from oil pump/crankcase junction (also results in poor engine performance).

Engine Leaks Oil From Case, Push Rods, Hoses, Etc.

1. Loose parts.
2. Imperfect seal at gaskets, push rod cover, washers, etc.
3. Restricted oil return line to pan.
4. Restricted breather hose to air cleaner.
5. Restricted oil filter.

6. Oil pan overfilled.
7. Rocker housing gasket (bottom) installed upside down.

Low Oil Pressure

1. Oil pan underfilled.
2. Faulty low oil pressure switch.
3. Oil pump O-ring(s) damaged or missing.
4. Oil pressure relief valve stuck in open position.
5. Ball missing from cam support plate.

High Oil Pressure

1. Oil pan overfilled.
2. Oil pressure relief valve stuck in closed position.

ELECTRICAL SYSTEM

Alternator Does Not Charge

1. Module not grounded.
2. Engine ground wire loose or broken.
3. Faulty regulator-rectifier module.
4. Loose or broken wires in charging circuit.
5. Faulty stator and/or rotor.

Alternator Charge Rate Is Below Normal

1. Weak or damaged battery.
2. Loose connections.
3. Faulty regulator-rectifier module.
4. Faulty stator and/or rotor.

Speedometer Operates Erratically

1. Contaminated speedometer sensor (remove sensor and clean off metal particles).
2. Loose connections.

CARBURETOR

Carburetor Floods

1. Dirt or other foreign matter between valve and its seat.
2. Inlet valve sticking.

3. Inlet valve and/or valve seat worn or damaged.
4. Float misadjusted.
5. Leaky or damaged float.
6. Excessive “pumping” of hand throttle grip.
7. See TROUBLESHOOTING CHART in Section 4.

TRANSMISSION

Transmission Shifts Hard

1. Clutch dragging slightly.
2. Primary chaincase overfilled with lubricant.
3. Corners worn off shifter clutch dogs.
4. Shifter return spring bent or broken.
5. Bent shifter rod.
6. Shifter forks sprung.
7. Transmission lubrication too heavy (winter operation).

Jumps Out Of Gear

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

Clutch Slips

1. Clutch controls improperly adjusted.
2. Insufficient clutch spring tension.
3. Worn friction discs.

Clutch Drags Or Does Not Release

1. Clutch controls improperly adjusted.
2. Lubricant level too high in primary chaincase.
3. Primary chain badly misaligned.
4. Clutch discs warped.
5. Insufficient clutch spring tension.

Clutch Chatters

1. Friction discs or steel discs worn or warped.

BRAKES

Brake Does Not Hold Normally

1. Master cylinder reservoir low on fluid.
2. Brake system contains air bubbles.
3. Master or wheel cylinder piston worn or parts damaged.
4. Brake pads contaminated with grease or oil.
5. Brake pads badly worn- friction material 0.04 inch (1.02 mm) thick or less.
6. Brake disc badly worn or warped.
7. Brake fades due to heat build up – brake pads dragging or excessive braking.
8. Brake drags – insufficient brake pedal free play.

HANDLING

Irregularities

1. Improperly loaded motorcycle. Non-standard equipment on the front end such as heavy radio receivers, extra lighting equipment or luggage tends to cause unstable handling.
2. Incorrect air suspension pressure.
3. Damaged tire(s) or improper front-rear tire combination.
4. Irregular or peaked front tire tread wear.
5. Incorrect tire pressure.
6. Shock absorber not functioning normally.
7. Loose wheel axle nuts. Tighten to recommended tightness.
8. Excessive wheel hub bearing play.
9. Improper vehicle alignment.
10. Steering head bearings improperly adjusted. Correct adjustment and replace pitted or worn bearings and races.
11. Tire and wheel unbalanced.
12. Rims and tires out-of-round or eccentric with hub.
13. Rims and tires out-of-true sideways.
14. Shock absorber improperly adjusted.
15. Worn engine stabilizer links.
16. Damaged rear engine isolation mounts.
17. Swingarm pivot shaft nut improperly tightened or assembled.