# SPORTSTER® MODELS

## 2011 HARLEY-DAVIDSON® SERVICE MANUAL



99484-11A

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## Punches/Chisels

- Never use a punch or chisel with a chipped or mushroomed end. Dress mushroomed chisels and punches with a grinder.
- Hold a chisel or a punch with a tool holder if possible.
- When using a chisel on a small piece, clamp the piece firmly in a vise and chip toward the stationary jaw.
- Always wear approved eye protection when using these tools.
- Protect bystanders with approved eye protection.

## Screwdrivers

- Do not use a screwdriver for prying, punching, chiseling, scoring or scraping.
- Use the right type of screwdriver for the job; match the tip to the fastener.
- Do not interchange POZIDRIV, PHILLIPS or REED AND PRINCE screwdrivers.
- Screwdriver handles are not intended to act as insulation. Do not use them on live electrical circuits.
- Do not use a screwdriver with rounded edges because it will slip. Redress with a grinder.

## Ratchets and Handles

- Periodically clean and lubricate ratchet mechanisms with a light grade oil. Do not replace parts individually; ratchets should be rebuilt with the entire contents of service kit.
- Never hammer on a ratchet or put a pipe extension on a ratchet handle for added leverage.
- Always support the ratchet head when using socket extensions, but do not put your hand on the head or you may interfere with the action of its reversing mechanism.
- When breaking a fastener loose, apply a small amount of pressure as a test to be sure the ratchet's gear wheel is engaged with the pawl.

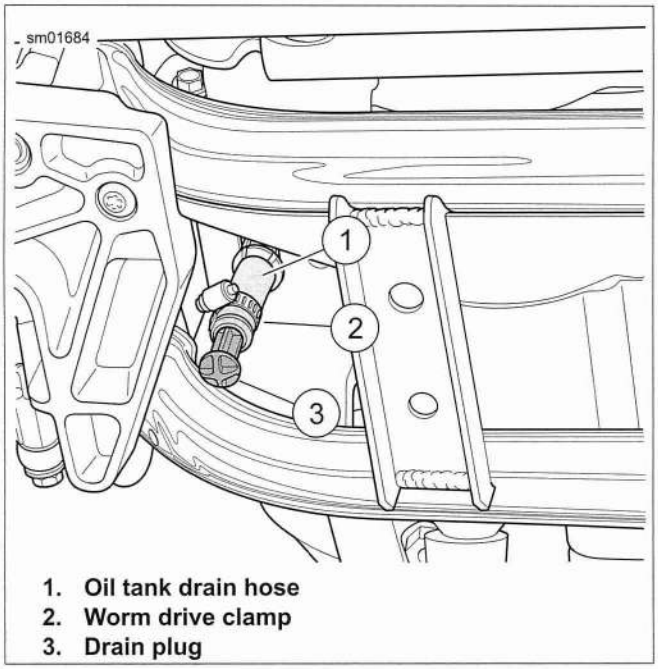
## Sockets

- Never use hand sockets on power or impact wrenches. Select only impact sockets for use with air or electric impact wrenches.
- Select the right size socket for the job.
- Always keep the wrench or socket squarely on the fastener.
- Replace sockets showing cracks or wear.
- Keep sockets clean.
- Always use approved eye protection when using power or impact sockets.

## Storage Units

- Do not open more than one loaded drawer at a time. Close each drawer before opening another to prevent the cabinet from unexpectedly tipping over.
- Close lids and lock drawers and doors before moving storage units.
- Do not pull on a tool cabinet; push it in front of you.
- Set the brakes on the locking casters after the cabinet has been rolled into position.

3. See Figure 1-4. Place a suitable container directly under the drain hose (1) at the bottom rear of the engine crankcase. The container must be able to hold approximately 3.0 qt (2.8 L).
4. Loosen worm drive clamp (2) and pull drain plug (3) from end of drain hose. Completely drain engine oil from oil tank. It is not necessary to drain engine crankcase.
5. Install drain plug into end of drain hose and tighten worm drive clamp securely.




1. **Oil tank drain hose**
2. **Worm drive clamp**
3. **Drain plug**

**Figure 1-4. Oil Tank Drain Hose**

## Removing Oil Filter

1. Place a drain pan beneath front of engine crankcase.

***NOTICE***

**Use Harley-Davidson oil filter wrench for filter removal. This tool can prevent damage to crankshaft position sensor and/or sensor cable. (00192b)**

2. See Figure 1-5 and Figure 1-6. Remove oil filter using HARLEY-DAVIDSON OIL FILTER WRENCH (Part No. HD-42311) or HARLEY-DAVIDSON OIL FILTER WRENCH (Part No. HD-44067-A). Turn oil filter counterclockwise to remove from filter mount.
3. Drain oil filter into drain pan. Discard oil filter.
4. Clean any oil spills off crankcase and frame.

*NOTE*

*Dispose of oil and oil filter in accordance with local regulations.*

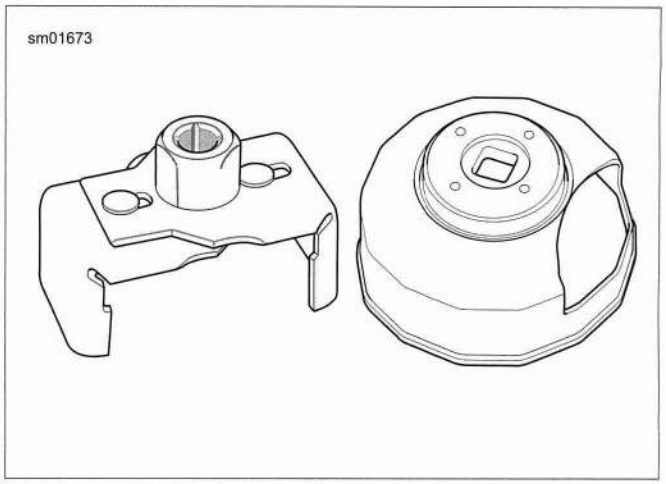
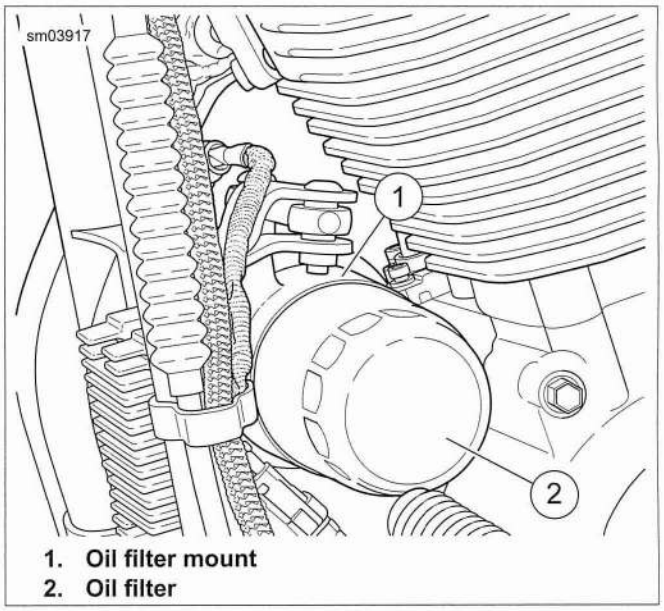



**Figure 1-5. Oil Filter Wrenches**




1. **Oil filter mount**
2. **Oil filter**

**Figure 1-6. Oil Filter**

## Installing Oil Filter

*NOTE*

*Partially fill oil filter before installation to minimize the time required for buildup of oil pressure when engine is first started.*

1. Pour about 4 fl oz (120 mL) of fresh, clean engine oil into **new** oil filter. Allow time for oil to soak into filter element.
2. See Figure 1-7. Wipe filter gasket contact surface of oil filter mount with a clean cloth. Surface should be smooth and free of any debris or old gasket material.
3. Apply a thin film of oil to gasket contact surface on crankcase (3), gasket and **new** oil filter.

*NOTE*

*Do not use oil filter wrench to install new oil filter.*

4. Install **new** oil filter. Screw filter clockwise onto adapter until gasket contacts the filter mount surface. Then hand tighten an additional 1/2-3/4-turn to secure the oil filter.

**NOTICE**

**D.O.T. 4 brake fluid will damage painted and body panel 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. (00239b)**

*NOTES*

- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *Rear brake master cylinder reservoir must be in a level position when filling and checking fluid level.*
- *See Figure 1-20. Reservoir cover (5) may be removed from rear brake master cylinder reservoir (1) to more easily verify fluid level in reservoir.*

15. See Figure 1-20. If desired, remove rear brake master cylinder reservoir cover (5) by grasping cover and gently pulling it straight away from reservoir (1).
16. Check brake fluid level in master cylinder reservoir. If necessary, add HARLEY-DAVIDSON DOT 4 BRAKE FLUID to reservoir until fluid reaches upper fluid level (3).
17. Replace master cylinder reservoir cap (2). Replace reservoir cover (5), if removed.

**⚠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)**

18. Test brake system.
    a. Turn ignition switch ON. Pump brake pedal to verify operation of the rear brake lamp.
    b. Test ride motorcycle at low speed. If the brakes feel spongy, bleed the system. See 2.16 BLEEDING BRAKES.

*NOTE*

*Avoid making hard stops for the first 100 mi (160 km). This allows the **new** pads to become conditioned to the brake discs.*

## FREEPLAY ADJUSTMENT

**⚠WARNING**

**To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)**

1. Remove the main fuse.
2. See Figure 1-37. Remove the primary chain inspection cover (1).

*NOTE*

*Rotate the engine to measure free play at several chain positions.*

3. See Figure 1-38. Through the inspection opening, measure chain freeplay at the tightest position.

*NOTE*

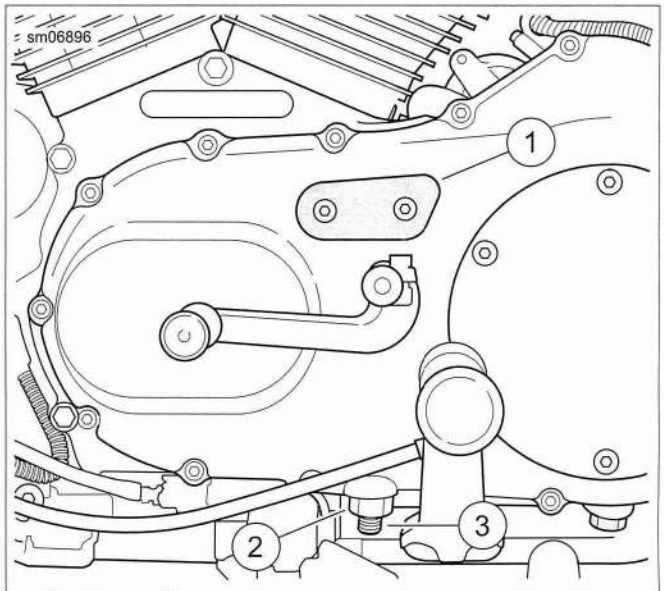
***Factory Setting:** The factory sets initial cold engine freeplay to 1/4-3/8 in (6.35-9.53 mm). With the engine cold, measure freeplay on a primary chain that has never been adjusted:*

- *Less than 1/4 in (6.35 mm): Adjust to specification.*
- *Between 1/4 in (6.35 mm) and 3/8 in (9.53 mm): Do NOT adjust.*

***NOTICE***

**Do not adjust the primary chain tighter than specified. Running chain too tight will result in excessive wear. (00202a)**

4. If the measurement is not in specification, adjust the primary chain. Refer to Table 1-11.
   a. See Figure 1-37. Loosen the locknut (2).
   b. With a hex key, turn the adjuster screw (3) clockwise to reduce freeplay or counterclockwise to increase freeplay.
   c. When freeplay is within specification, hold the adjuster screw with a hex key and tighten the locknut to 20-25 ft-lbs (27.1-33.9 Nm).
5. If the primary chain cannot be adjusted to specification, replace the chain. See 5.4 PRIMARY DRIVE AND CLUTCH: XL MODELS or 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X.
6. Install a **new** gasket and the primary chain inspection cover. Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
7. Install the main fuse.




**1. Inspection cover**
**2. Locknut**
**3. Adjuster screw**

**Figure 1-37. Primary Chain Inspection Cover and Adjuster**

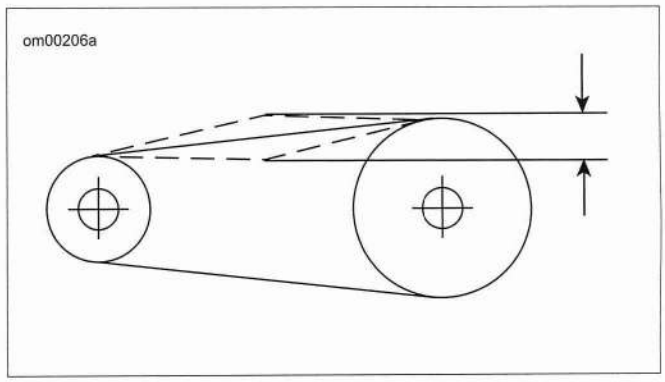
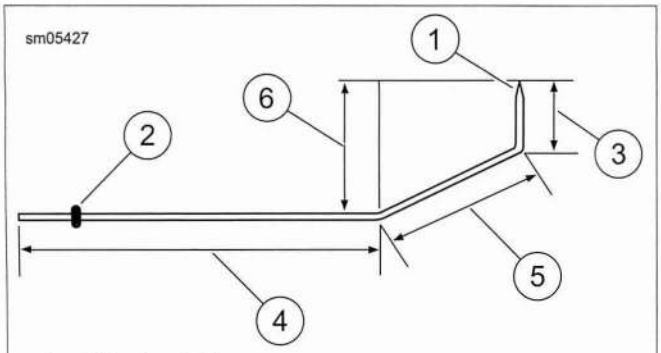



**Figure 1-38. Primary Chain Freeplay**

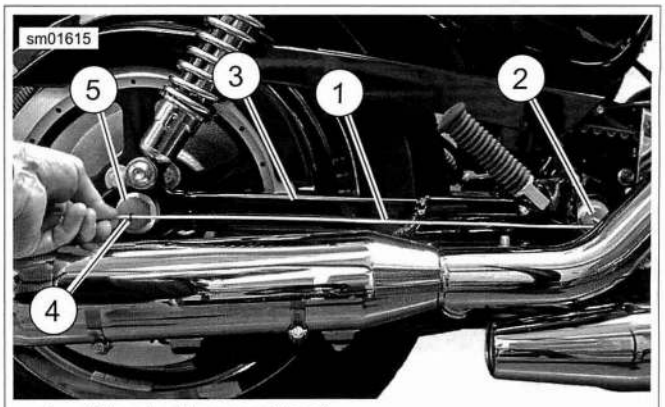
**Table 1-11. Primary Chain Freeplay Specifications**

| ENGINE | in | mm |
|---|---|---|
| Cold | 3/8-1/2 | 9.5-12.7 |
| Hot | 1/4-3/8 | 6.3-9.5 |




1. **Blunt point**
2. **Rubber grommet**
3. **5/8 in (16 mm)**
4. **15-1/4 in (387 mm)**
5. **6-1/2 in (165 mm)**
6. **3-7/8 in (98 mm)**

**Figure 1-56. Wheel Alignment Tool: XR 1200X**




1. **Wheel alignment tool**
2. **Rear fork pivot bolt dimple**
3. **Rear fork**
4. **Rubber grommet**
5. **Axle alignment plug**

**Figure 1-57. Checking Wheel Alignment Using Wheel Alignment Tool: XL Models**

## Adjusting Wheel Alignment

1. See Figure 1-53. Remove and discard E-clip (1).
2. Loosen rear axle nut (4).
3. On side of rear fork that has longer distance from pivot bolt to axle center, turn nut (2) on axle adjuster (3) counterclockwise to shorten distance. Adjust axle until left and right side alignment measurements are equal.

*NOTES*

- *Keep axle adjuster mechanisms firmly seated (under tension) on each side of rear fork during wheel alignment procedures above. Do so by applying moderate upward force on lower span of drive belt. This tensions drive belt, which holds rear axle forward against both adjuster mechanisms.*
- *Do not tighten rear axle nut or install **new** E-clip until after checking drive belt tension.*

4. Verify drive belt deflection after aligning rear wheel; adjust if required. See 1.14 DRIVE BELT AND SPROCKETS, Belt Deflection Adjustment.

*NOTE*

*Rear brake line is clamped tightly to rear fork to avoid chafing of brake line in clamp. If rear axle has been moved forward or back, make sure there is a small amount of slack in rear brake line between clamp and rear caliper. If necessary, loosen clamp screw, reposition brake line, then tighten screw. See 1.14 DRIVE BELT AND SPROCKETS, Belt Deflection Adjustment.*

**⚠WARNING**

**Do not exceed specified torque when tightening axle nut. Exceeding torque can cause wheel bearings to seize during vehicle operation, which could result in death or serious injury. (00408e)**

5. Tighten axle nut to 95-105 ft-lbs (129-142 Nm) and install **new** E-clip.

## FRONT FORK: XR 1200X

**⚠WARNING**

**Adjust both forks equally. Improper fork adjustment can lead to loss of control, which could result in death or serious injury. (00124c)**

***NOTICE***

**Compression and rebound adjusting valves may be damaged if too much force is used at either end of the adjustment range. (00237a)**

*NOTE*

*Do not force adjusters beyond mechanical stops.*

### Spring Preload

1. See Figure 1-69. With a hex key, turn the preload adjuster counterclockwise until it stops. This is the minimum preload setting.
2. Calculate the total load and turn the adjuster clockwise to specification. Refer to Table 1-21.

### Rebound Damping

1. See Figure 1-70. Turn the rebound damping adjuster (1) clockwise H (hard) until it stops. This is the maximum rebound setting.
2. Turn adjuster counterclockwise S (soft) to specification. Refer to Table 1-22.

### Compression Damping

1. See Figure 1-70. Turn the compression damping adjuster (2) clockwise H (hard) until it stops. This is the maximum compression setting.
2. Turn the adjuster counterclockwise S (soft) to specification. Refer to Table 1-22.


**Figure 1-69. Spring Preload Adjuster: XR 1200X**

**Table 1-21. Recommended Fork Preload: XR 1200X**

| LOAD* | | TURNS** FROM MINIMUM |
|---|---|---|
| lb | kg | |
| Less than 165 | 75 | 0-4 |
| 165-195 | 75-89 | 4-6 |
| 195-225 | 89-102 | 6-8 |
| 225-255 | 102-116 | 8-10 |
| Greater than 255 | 116 | More than 10 |

*Add the weight of the rider, passenger, riding gear, accessories, and cargo.
**Turns are clockwise turns in from minimum.
- To increase preload, turn the adjuster clockwise.
- To decrease preload, turn the adjuster counterclockwise.

## CABLE INSPECTION AND LUBRICATION

1. See Figure 1-83. Remove two screws (1) to separate the upper handlebar housing from the lower housing.
2. Unhook each ferrule and cable from the throttle grip and remove the throttle sleeve.
3. Inspect each cable. Replace cable assembly if cable is frayed or kinked.
4. Inspect entire cable outer sheath from throttle grip to induction module for damage. Replace if necessary.
5. Apply a light coat of graphite to the handlebar and replace throttle grip.
6. Pour one or two drops of HARLEY LUBE (Part No. 94968-09) into the housing of each cable.
7. Assemble handlebar housing. Tighten both screws (1) to 35-45 **in-lbs** (4.0-5.1 Nm).

## CABLE ADJUSTMENT

### Operation

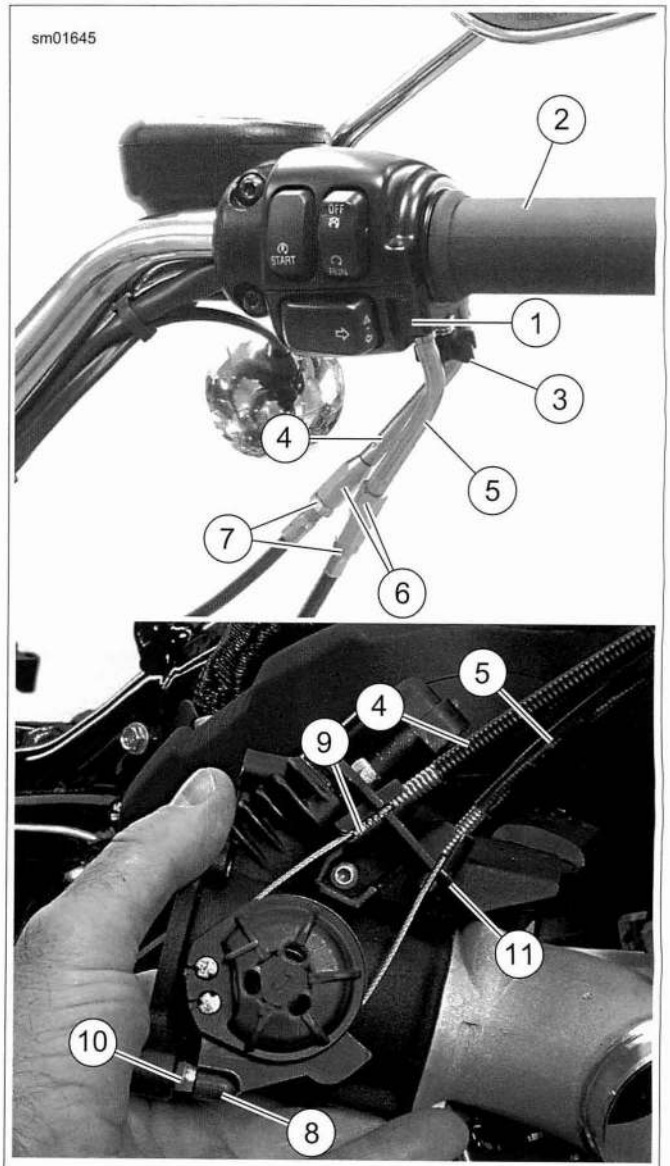
**⚠WARNING**

**Before starting engine, be sure throttle control will snap back to idle position when released. A throttle control that prevents engine from automatically returning to idle can lead to loss of control, which could result in death or serious injury. (00390a)**

1. See Figure 1-83. Back off the throttle friction screw (3), roll on the throttle and release the throttle grip. If the induction module throttle does not return to closed (idle) position, inspect and adjust the throttle cable.
2. With the engine idling, turn the handlebar stop to stop. If the engine speed changes, adjust the control cables.

### Adjustment

1. Loosen throttle friction screw (3).
2. Slide rubber boot off each control cable adjuster (6).
3. Loosen jamnut (7) on each cable adjuster.
4. Turn cable adjusters in direction which will shorten cable housings to minimum length.
5. Point front wheel straight ahead. With engine OFF, gently turn throttle control grip (2) to fully open position (fully counterclockwise) and hold in position.
6. Gently turn adjuster (6) on throttle control cable (4) counterclockwise until throttle cam (8) touches throttle cam stop (10). Release throttle control grip and turn adjuster counterclockwise an additional 1/2-1 turn. Tighten jamnut on throttle control cable adjuster.
7. Turn handlebar to right stop. Turn adjuster (6) on idle control cable (5), lengthening sleeve until end of cable housing just touches spring (9) within cable guide (11).
8. Check adjustment. With throttle friction screw loosened, twist and release throttle control grip two or three times. Induction module throttle wheel must return to idle position each time throttle grip is released. If throttle does not return to idle, turn idle adjuster, shortening sleeve until correct adjustment is reached. Tighten jamnut.
9. Slide rubber boot over each cable adjuster.




1. **Screw (2)**
2. **Throttle control grip**
3. **Throttle friction screw**
4. **Throttle control (pull open) cable**
5. **Idle control (pull close) cable**
6. **Control cable adjuster (2)**
7. **Jamnut (2)**
8. **Throttle cam**
9. **Spring**
10. **Throttle cam stop**
11. **Cable guide**

**Figure 1-83. Throttle Cable Adjustment (typical)**

3. Fuel mixture too rich.
4. Valve guides or seals badly worn or damaged.

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

1. Excessive carbon deposit on piston head or in combustion chamber.
2. Incorrect heat range spark plug.
3. Faulty spark plug(s).
4. Ignition timing advanced. ECM or sensors (CKP, ET or TMAP) defective.
5. Fuel octane rating too low.
6. Intake manifold vacuum leak.

## Check Engine Light Illuminates During Operation

Fault detected. See the electrical diagnostic manual for this motorcycle.

## Overheating

1. Insufficient oil supply or oil not circulating.
2. Insufficient air flow over engine.
3. Leaking valve(s).
4. Heavy carbon deposits.
5. Ignition timing retarded. ECM or sensor (CKP, TMAP) defective.

## Valve Train Noise

1. Low oil pressure caused by oil feed pump not functioning properly or oil passages obstructed.
2. Faulty hydraulic lifter(s).
3. Bent push rod(s).
4. Incorrect push rod length.
5. Cam(s), cam gear(s), or cam bushing(s) worn.
6. Rocker arm binding on shaft.
7. Valve sticking in guide.

## Excessive Vibration

1. Stabilizer links worn or loose, or stabilizer link brackets loose or damaged.
2. Isolators worn or isolator bolts loose or damaged.
3. Isolator mounting brackets (left side of vehicle) loose or damaged.
4. Rubber mounts loose or worn.
5. Rear fork pivot shaft fasteners loose.
6. Front engine mounting bolts loose.
7. Exhaust system binding or hitting frame.
8. Engine/transmission and rear wheel not aligned properly.
9. Damaged frame.
10. Ignition timing advanced due to faulty sensor inputs (CKP, TMAP)/poorly tuned engine.
11. Primary chain badly worn or links tight as a result of insufficient lubrication or misalignment.
12. Wheels not aligned, rims bent, or tires worn or damaged.
13. Internal engine problem.

# LUBRICATION SYSTEM

| PART NUMBER | TOOL NAME |
|---|---|
| HD-35457 | BLACK LIGHT LEAK DETECTOR |

## Oil Does Not Return To Oil Tank

1. Oil tank empty.
2. Oil pump gerotors damaged; oil pump not functioning.
3. Restricted oil hoses or fittings.
4. Restricted oil filter.

## Engine Uses Too Much Oil Or Smokes Excessively

1. Piston rings badly worn or broken.
2. Valve guide(s) or seal(s) worn or damaged.
3. Restricted oil filter.
4. Oil tank overfilled.
5. Restricted oil return hose to tank.
6. Restricted breather operation.
7. Plugged crankcase scavenge port.
8. Oil diluted with gasoline.

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

1. Loose parts.
2. Imperfect seal at gaskets, push rod cover, washers, etc.

*NOTE*

*To aid locating leaks, use BLACK LIGHT LEAK DETECTOR (Part No. HD-35457).*

3. Restricted oil return hose to tank.
4. Restricted breather passage(s) to air cleaner.
5. Restricted oil filter.
6. Oil tank overfilled.
7. Porosity.

## Low Oil Pressure

1. Oil tank underfilled.
2. Faulty low oil pressure switch.
3. Worn oil pump gerotor(s).
4. Worn pinion shaft drive gear.
5. Restricted feed hose from oil tank.
6. Restricted high-pressure feed hose to oil filter housing.
7. Oil diluted with gasoline.
8. Oil bypass plunger stuck open.

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Rear fender support screw | 132-216 **in-lbs** | 14.9-24.4 Nm | 2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200N/X, Assembly and Installation |
| Rear fork pivot/engine mount bolt | 60-70 ft-lbs | 81.4-95.0 Nm | 2.23 REAR FORK, Installation |
| Rear fork pivot/engine mount bolt | 60-70 ft-lbs | 81.4-95.0 Nm | 2.27 REAR ENGINE MOUNT/ISOLATOR, Installation |
| Rear sprocket cover screw: XR 1200X | 30-33 ft-lbs | 40.7-44.7 Nm | 2.27 REAR ENGINE MOUNT/ISOLATOR, Installation |
| Rear turn signal stalk nut | 132-216 **in-lbs** | 14.9-24.4 Nm | 2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200N/X, Assembly and Installation |
| Rider footrest bracket mounting screw | 45-50 ft-lbs | 61-68 Nm | 2.29 CLUTCH CONTROL, Assembly and Installation |
| Rider footrest support bracket mounting screw | 45-50 ft-lbs | 61-68 Nm | 2.37 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Right Footrest and Rear Brake Pedal Assembly |
| Rider footrest support bracket mounting screw | 45-50 ft-lbs | 61-68 Nm | 2.37 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Left Footrest and Shift Lever Assembly |
| Rider footrest support bracket mounting screw | 45-50 ft-lbs | 61-68 Nm | 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Right Footrest and Rear Brake Pedal Assembly |
| Rider footrest support bracket mounting screw | 45-50 ft-lbs | 61-68 Nm | 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly |
| Rod guide case to inner tube: XR 1200X | 66 ft-lbs | 90 Nm | 2.20 FRONT FORK: XR 1200X, Assembly |
| Seat mounting screw | 20-40 **in-lbs** | 2.3-4.5 Nm | 2.36 SEAT, Seat Installation: XL Models |
| Seat post bolt | 96-156 **in-lbs** | 10.9-17.6 Nm | 2.32 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200N/X, XL 883R/L and XL 1200L |
| Seat post bolt | 96-156 **in-lbs** | 10.9-17.6 Nm | 2.32 REAR FENDER: ALL XL MODELS EXCEPT XL 883N, XL 1200N/X, XL 1200C/CP |
| Seat post mounting screw | 96-156 **in-lbs** | 10.9-17.6 Nm | 2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200N/X, Assembly and Installation |
| Shifter peg: XR 1200X | 96-144 **in-lbs** | 10.9-16.3 Nm | 2.39 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly |
| Shifter peg screw | 96-144 **in-lbs** | 10.9-16.3 Nm | 2.37 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS, Left Footrest and Shift Lever Assembly |
| Shifter peg screw | 96-144 **in-lbs** | 10.9-16.3 Nm | 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly |
| Shifter rod lock nuts | 84-132 **in-lbs** | 9.5-14.9 Nm | 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Adjusting Shift Pedal |
| Shifter rod-to-shift lever screw | 120-180 **in-lbs** | 13.6-20.4 Nm | 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly |
| Shifter rod-to-shift lever screw | 120-180 **in-lbs** | 13.6-20.4 Nm | 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Left Footrest and Shift Lever Assembly |
| Shifter rod-to-shift lever screw | 120-180 **in-lbs** | 13.6-20.4 Nm | 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS, Adjusting Shift Pedal |
| Shift linkage fastener | 120-180 **in-lbs** | 13.6-20.3 Nm | 2.39 RIDER FOOT CONTROLS: XR 1200X, Left Footrest and Shift Lever Assembly |

**⚠WARNING**

**Be sure tires are properly inflated, balanced and have adequate tread. Inspect your tires regularly and see a Harley-Davidson dealer for replacements. Riding with excessively worn, unbalanced or under-inflated tires can adversely affect stability and handling, which could result in death or serious injury. (00014a)**

**⚠WARNING**

**Use only Harley-Davidson approved tires. See a Harley-Davidson dealer. Using non-approved tires can adversely affect stability, which could result in death or serious injury. (00024a)**

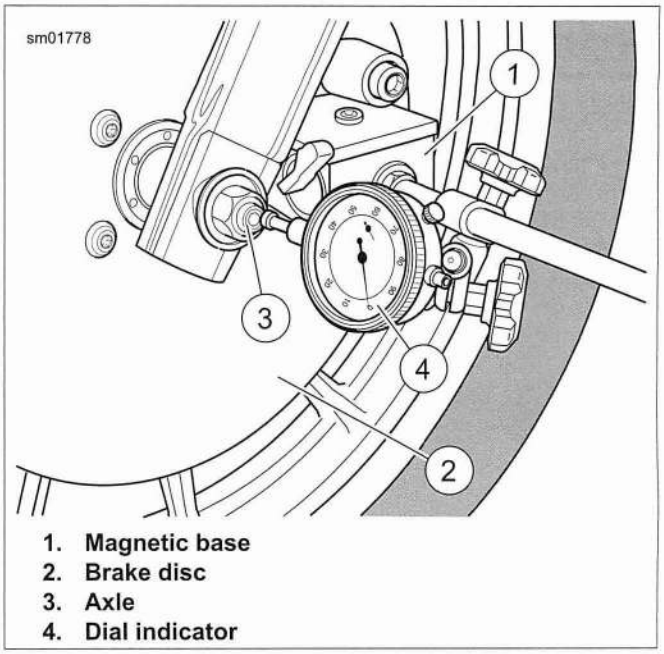
*NOTE*

*Use the following guidelines when installing a **new** tire or repairing a flat.*

- *Always locate and eliminate the cause of the original tire failure.*
- *Do not patch or vulcanize a tire casing. These procedures weaken the casing and increase the risk of a blowout.*
- *Only patch an inner tube as an emergency measure. Replace the damaged tube as soon as possible.*
- *Be sure the inner tube is the correct size for the tire casing. Any stretching or wrinkling within the casing will weaken the tube and result in premature failure.*
- *The use of tires other than those specified can adversely affect handling resulting in death or serious injury.*
- *Tires, tubes and wheels are critical safety items. Since the servicing of these components requires special tools and skills, Harley-Davidson recommends that you see your dealer for these services.*

## WHEEL BEARING END PLAY

1. Raise the wheel off the ground.
2. See Figure 2-4. Mount a magnetic base dial indicator on the brake disc.
3. Set the indicator contact point on the end of the axle.
4. Move the wheel back as far as it will go. Hold the wheel in position and zero the dial indicator.
5. Move the wheel forward as far as it will go. Note the reading of the dial indicator. Verify the reading.
6. If end play is greater than specification, remove the wheel and replace both wheel bearings. Refer to Table 2-16.




1. **Magnetic base**
2. **Brake disc**
3. **Axle**
4. **Dial indicator**

**Figure 2-4. Check Wheel Bearing End Play**

**Table 2-16. Wheel Bearing End Play**

| DIRECTION | in | mm |
|---|---|---|
| Lateral | 0.002 | 0.05 |

## FRONT WHEEL

### Removal

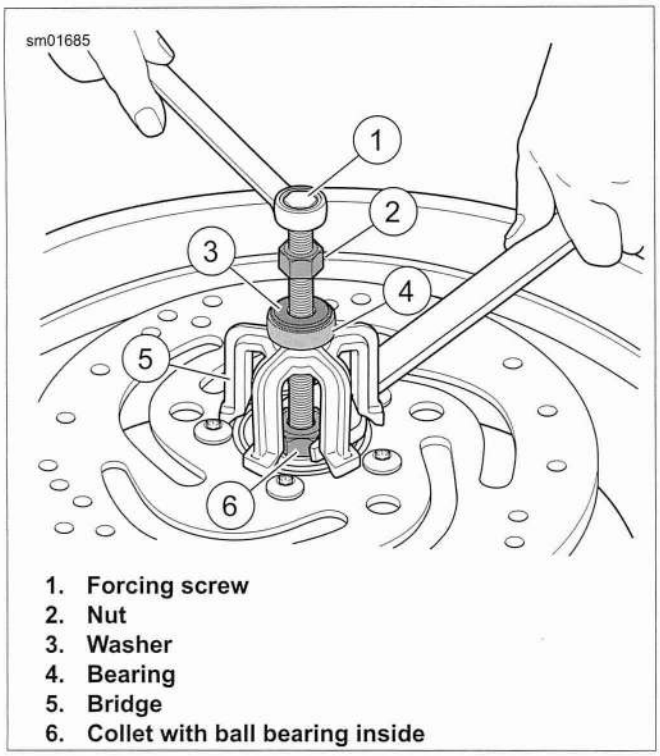
1. Raise the front wheel off the ground.

*NOTES*

- *Do not operate the front brake lever with the front wheel removed or the caliper pistons may be forced out. Seating the pistons requires disassembly of the caliper.*
- *On models with dual disc brakes, remove both calipers.*

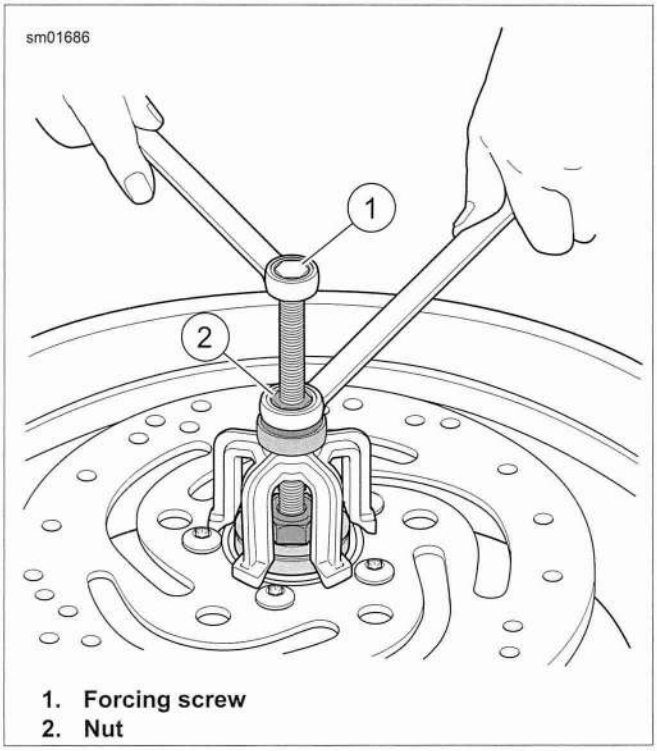
2. See Figure 2-5. Remove brake caliper mounting screws (3). Slide caliper (4) off brake disc and secure caliper out of the way.
3. **XL 1200X/C/CP:** Remove the front fender. See 2.31 FRONT FENDER.
4. Remove axle nut (1) and flat washer (2) from axle on left side of vehicle.
5. See Figure 2-6. On right side of vehicle, loosen nut (4) on pinch screw (1). Pull axle out of hub while supporting wheel.
6. Remove spacer and front wheel assembly.

5. Remove spacer from inside wheel hub.
6. Repeat procedure for opposite side bearing. Discard both bearings upon removal.




1. **Forcing screw**
2. **Nut**
3. **Washer**
4. **Bearing**
5. **Bridge**
6. **Collet with ball bearing inside**

**Figure 2-15. Wheel Bearing Removal Tool**




1. **Forcing screw**
2. **Nut**

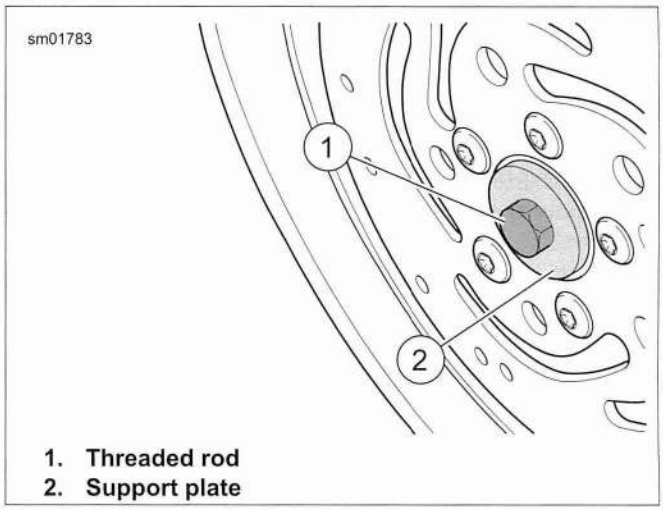
**Figure 2-16. Removing Bearing**

## Installation

*NOTES*

- *When installing wheel bearings, use specialty tool WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060-C).*
- *Always install first bearing on primary brake disc side. If front wheel has two brake discs, install bearing on the left side first.*

1. Obtain WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060-C) and assemble.
   a. Sparingly apply graphite lubricant to threads of threaded rod for prolonged service life and smooth operation.
   b. See Figure 2-17. Place threaded rod (1) through support plate (2). Insert assembly through wheel.
   c. See Figure 2-18. Place **new** bearing on rod (1) with lettered side facing out.
   d. Assemble installer (5), bearing (4), washer (3) and nut (2) over rod.
2. Hold hex end of threaded rod and turn nut to install wheel bearing. Bearing is fully seated when nut can no longer be turned. Remove tool.
3. Install spacer inside wheel hub.
4. Reverse tool and install opposite side wheel bearing.
5. Install hub plate opposite brake disc and secure with **new** screws. Tighten to 16-24 ft-lbs (21.7-32.6 Nm).




1. **Threaded rod**
2. **Support plate**

**Figure 2-17. Assembling Installation Tool**

## GENERAL

The front brake master cylinder designed for dual disc (two caliper) operation has a larger bore than the master cylinder designed for single disc (one caliper) operation.

See Figure 2-36. The bore size is cast into the side of the master cylinder body facing the handlebar.

- The single disc master cylinder has "11" (11 mm) cast into the body.
- The dual disc master cylinder has "1/2" (1/2 in) cast into the body.

*NOTE*

*Use only CCI #20 BRAKE GREASE to lubricate master cylinder bores, pistons, and primary and secondary cups. Use only KS62F assembly grease on caliper pistons and piston seals. Use only G40M BRAKE GREASE on sliding areas outside caliper and master cylinder: caliper pins and boots, pivot hole front brake lever, end of piston that contacts brake lever.*

**⚠WARNING**

**Do not use parts from single caliper repair kits (9/16 inch bore) on dual caliper models. Likewise, do not use parts from dual caliper repair kits (11/16 inch bore) on single caliper models. Using incorrect parts can cause brake failure, which could result in death or serious injury. (00278a)**

***NOTICE***

**D.O.T. 4 brake fluid will damage painted and body panel 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. (00239b)**

*NOTE*

*If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*

## INSPECTION

1. Check the level of fluid in the front brake reservoir. If it is low, refill and bleed brake system. See 2.16 BLEEDING BRAKES.
2. Check for fluid leaks in the brake line, around banjo fittings or front brake caliper pistons or bleeder valve. Repair and bleed brake system.
   a. For brake line replacement procedure, see 2.15 BRAKE LINES.
   b. To repair front brake caliper, see procedure in 2.8 FRONT BRAKE CALIPER: XL MODELS or 2.9 FRONT BRAKE CALIPER: XR 1200X.
   c. See 2.16 BLEEDING BRAKES for hydraulic brake system bleeding procedure.
3. Check front brake friction pads and disc(s) for excessive wear or damage. Replace worn or damaged items.
   a. See 1.8 BRAKE PADS AND DISCS: XL MODELS or1.9 BRAKE PADS AND DISCS: XR 1200X for specifications and brake pad replacement procedure.
   b. See 2.4 WHEELS for brake disc replacement procedure.
4. Eliminate any air in the hydraulic brake assembly by bleeding the system. See 2.16 BLEEDING BRAKES.

If none of these conditions exist but the front brake system does not operate properly, the front brake master cylinder is most likely defective and must be repaired or replaced.

## REMOVAL

1. See Figure 2-37. Loosen turn signal clamp screw (3) and remove turn signal assembly (5) from front brake master cylinder housing (1).
2. Loosen and remove locknut and washer (4), and lift mirror (2) from master cylinder housing.

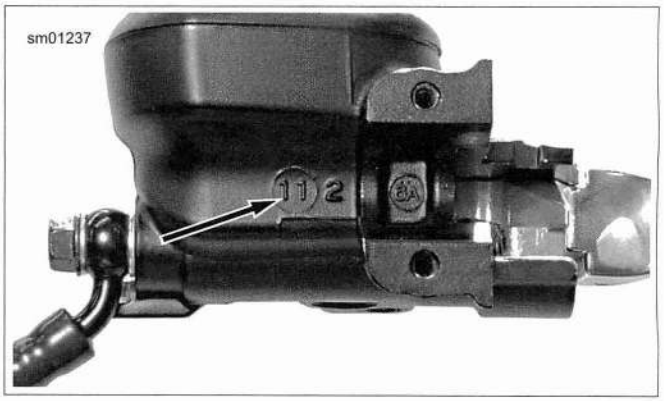



**Figure 2-36. Verifying Front Brake Master Cylinder Bore Size (single disc master cylinder)**

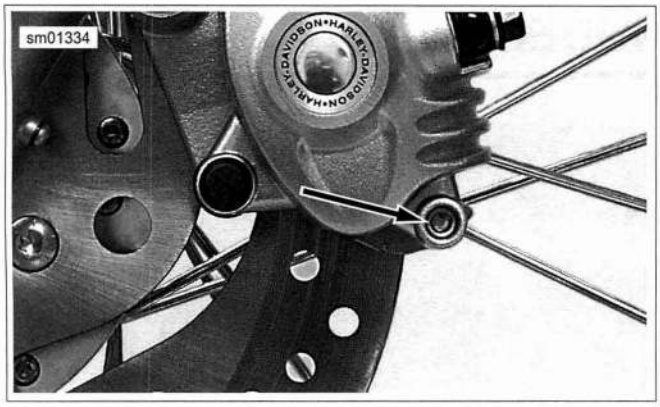



**Figure 2-52. Brake Pad Pin (Plug Removed)**

## DISASSEMBLY

1. See Figure 2-53. Remove brake pad pin (14) and brake pads (8) from caliper body (15).
2. Slide brake caliper off mounting bracket (1).
3. Remove pad spring (16). Do not remove bleeder valve (10) at this time.
4. See Figure 2-54. Install a discarded brake pad in the caliper (1) with the backing plate (4) facing the pistons. Position the brake pad so the friction material (3) is against the back of the caliper, as shown.
5. Loosely install brake pad pin (2) to hold brake pad in place.

**⚠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)**

*NOTE*

*Be careful not to damage banjo bolt sealing surface or threads of banjo bolt hole in brake caliper. It is recommended that you use an air nozzle with a rubber tip to perform the next step in this procedure.*

**⚠CAUTION**

**When removing piston with compressed air, piston can develop considerable force and fly out of caliper bore. Keep hands away from piston to avoid possible injury. (00530b)**

6. See Figure 2-55. Gently apply low pressure compressed air to banjo bolt hole (3) to force pistons from caliper bores.
7. Remove brake pad pin and brake pad.
8. See Figure 2-53. Remove both pistons (17) from caliper bores by hand. If necessary, wiggle pistons gently to completely remove.

*NOTE*

*Damaged piston bores will leak when reassembled. Do not use metal objects to remove or install objects from piston bores. Prevent damage to pistons, seals and bores by only using a wooden toothpick when servicing calipers.*

9. See Figure 2-56. Using a wooden toothpick (1), remove dust seal (2) and piston seal (3) from each caliper bore. Discard seals.
10. See Figure 2-53. If necessary, remove bleeder valve (10).

*this area as a measurement point to determine pad pin wear.*

c. Inspect pad pin for grooving and wear at the pad contact points. Measure the pad pin diameter in an unworn area, and then in an area of any grooving or wear. If wear is more than 0.011 in (0.28 mm), replace pad pin.

d. Inspect pad spring for wear or cracks. If worn or damaged, replace.

e. Always replace all seals after disassembly.

**⚠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)**

4. Inspect brake pads and brake disc. Replace if necessary.
   a. See 1.9 BRAKE PADS AND DISCS: XR 1200X for specifications.
   b. See 2.4 WHEELS for brake disc replacement procedure.

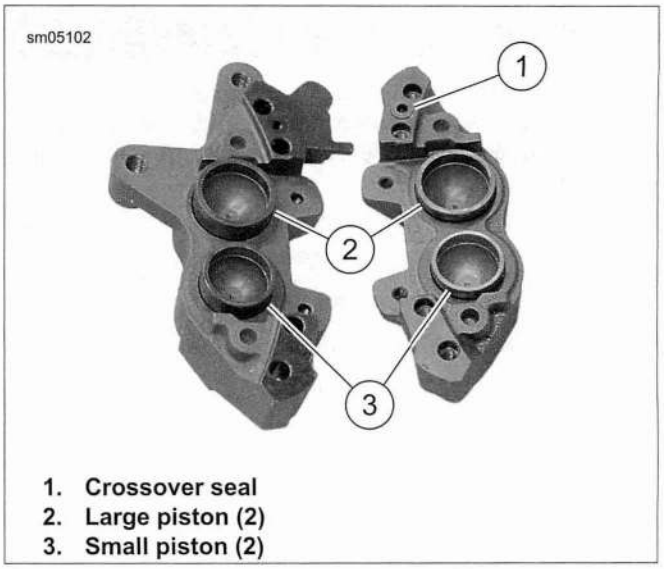
## ASSEMBLY

1. Lubricate the following parts prior to assembly using a light coat of G40M BRAKE GREASE. All other surfaces must be dry for assembly.
   a. Nose radius of pistons.
   b. All surfaces of piston seals and dust seals.

*NOTES*

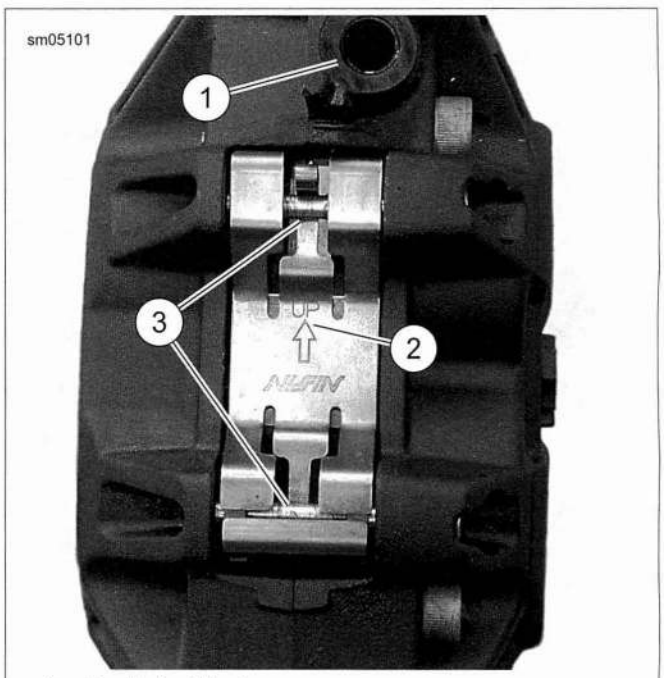
- *Damaged piston bores will leak when reassembled. Do not use metal objects to remove or install objects in piston bores. Prevent damage to bores by only using a wooden toothpick when servicing calipers.*
- *Pistons and bores differ slightly in diameter; one large and one small in each housing.*

2. See Figure 2-68. Install a **new** piston seal (3) and a **new** dust seal (2) into each piston bore.
3. See Figure 2-69.Carefully insert pistons (2, 3) by hand, nose radius first, into caliper bores. If installation shows resistance, remove piston(s) and check that seals are properly installed and fully seated in grooves. Press pistons completely into bores.
4. Install **new** crossover seal (1).
5. See Figure 2-67. Apply a drop of LOCTITE 569 Sealant to the threads of the bridge bolts (5, 6). Assemble caliper housings and secure with bridge bolts. Verify the bridge bolts are in the correct locations based on length. Tighten bridge bolts to 12-18 ft-lbs (16.9-24.5 Nm).
6. See Figure 2-70. Install brake pads and pad spring. Verify the spring is oriented as shown with the arrow and word "UP" (2) facing the banjo bolt hole (1). Secure with pad pins (3).
7. Tighten pad pins to 132-168 **in-lbs** (14.7-19.6 Nm).
8. Install bleeder valve on caliper housing if removed. Tighten bleeder valve to 35-61 **in-lbs** (4.0-6.9 Nm).




1. **Crossover seal**
2. **Large piston (2)**
3. **Small piston (2)**

**Figure 2-69. Caliper Housings and Pistons**



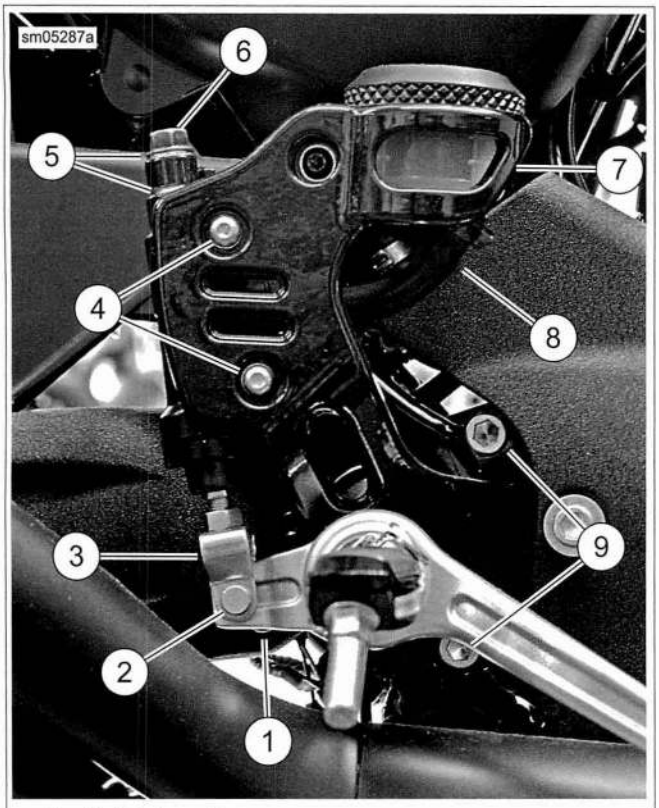

1. **Banjo bolt hole**
2. **Arrow and word "UP"**
3. **Pad pins (2)**

**Figure 2-70. Front Caliper Pad Spring Orientation**

## INSTALLATION

**⚠CAUTION**

**Direct contact of D.O.T. 4 brake fluid with eyes can cause irritation. Avoid eye contact. In case of eye contact flush with large amounts of water and get medical attention. Swallowing large amounts of D.O.T. 4 brake fluid can cause digestive discomfort. If swallowed, obtain medical attention. Use in well ventilated area. KEEP OUT OF REACH OF CHILDREN. (00240a)**




1. **Retaining ring**
2. **Clevis pin**
3. **Yoke**
4. **Screw and washer (2)**
5. **Washer (2)**
6. **Banjo bolt**
7. **Reservoir**
8. **Feed hose**
9. **Fastener (2)**

**Figure 2-80. Rear Brake Master Cylinder and Reservoir**

## DISASSEMBLY

*NOTES*

- *Do not disassemble the rear master cylinder unless problems are being experienced. Discard all seals during the disassembly procedure. Install a complete rebuild kit when the unit is reassembled.*
- *Clamp rear brake master cylinder in a vise by its mounting bosses only. Use brass or aluminum jaw covers or other protective device on vise jaws to prevent damage to master cylinder.*

1. See Figure 2-81. Clamp rear brake master cylinder in a vise with yoke pointing up.

*NOTE*

*Grip yoke by the edges with an adjustable wrench. Do not grip yoke by the flats or the yoke may become deformed.*

2. Hold yoke with an adjustable wrench. Using an open-end wrench, loosen shoulder nut. Remove yoke.
3. See Figure 2-82. Remove nut (4) from push rod (5).
4. Remove and discard boot (6).

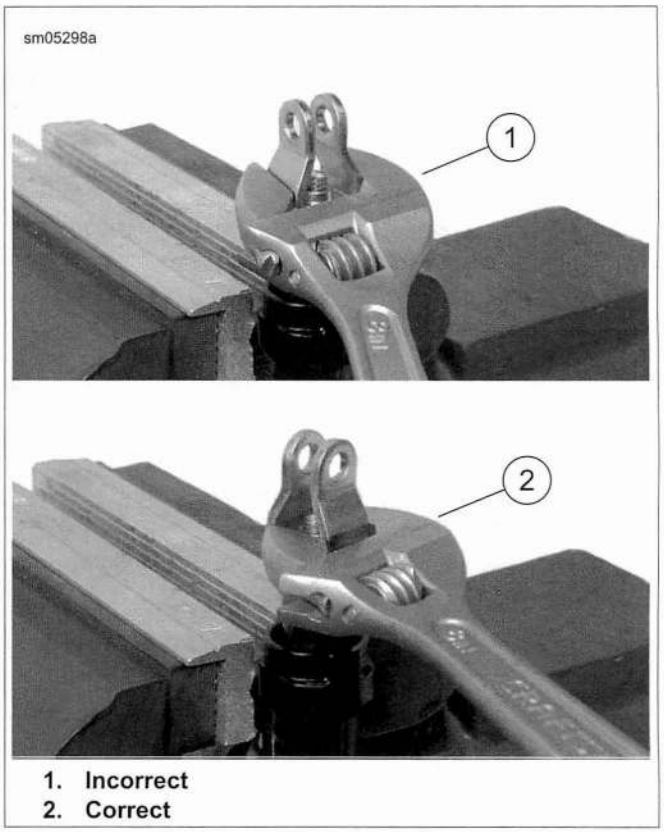
**⚠WARNING**

**Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)**

*NOTES*

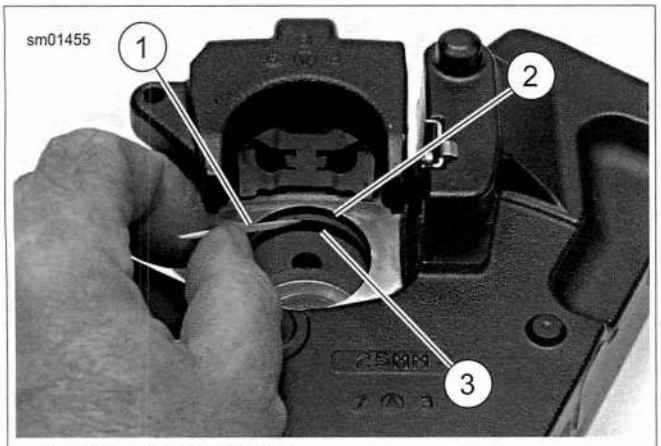
- *Do not remove boot collar nut from push rod.*
- *Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.*

5. Thread nut (4) back onto push rod several turns, to protect push rod threads.
6. Press down on push rod to compress piston spring (10). Remove retaining ring (7), push rod (5) with boot collar nut, piston (8) with secondary cup, primary cup (9) and piston spring (10). Discard retaining ring, piston/cup assembly and piston spring.
7. Remove dust cover (12), retaining ring (13), feed port fitting (15) and O-ring (14). Discard retaining ring and O-ring.




1. **Incorrect**
2. **Correct**

**Figure 2-81. Holding Yoke**




1. **Wooden toothpick**
2. **Dust seal**
3. **Piston seal**

**Figure 2-94. Caliper Seals**

## CLEANING, INSPECTION AND REPAIR

**⚠WARNING**

**Use denatured alcohol to clean brake system components. Do not use mineral-based solvents (such as gasoline or paint thinner), which will deteriorate rubber parts even after assembly. Deterioration of these components can cause brake failure, which could result in death or serious injury. (00291a)**

1. Clean piston bore with denatured alcohol.
2. Clean all rubber parts with HARLEY-DAVIDSON DOT 4 BRAKE FLUID. Do not contaminate with mineral oil or other solvents. Wipe parts dry with a clean, lint free cloth.

**⚠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)**

3. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply. Do not use a wire or similar instrument to clean drilled passages.
4. Carefully inspect all components. Replace any parts that appear damaged or worn.
   a. Check piston for pitting, scratching or corrosion on outside surfaces.
   b. Inspect caliper piston bore. Do not hone bore. If bore shows pitting or corrosion, replace caliper.
   c. Inspect pad pin for grooving and wear. Measure the pad pin diameter in an unworn area, and then in the area of any grooving or wear. If wear is more than 0.011 in (0.28 mm), replace pad pin.
   d. Always replace all seals after disassembly.

**⚠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)**

5. Inspect brake pads and brake disc. Replace if necessary.
   a. See 1.8 BRAKE PADS AND DISCS: XL MODELS for specifications.
   b. See 2.4 WHEELS for brake disc replacement procedure.

## LUBRICATING REAR CALIPER BOLT PINS AND BOOTS

1. Apply approximately 0.4 g of G40M BRAKE GREASE inside caliper bushing boot and caliper pin boot.
2. See Figure 2-95. Apply G40M BRAKE GREASE inside boot lip (8) to prevent sticking between boots (3, 4) and bolt pins (5, 6).
3. Insert mounting bracket bolt pin (6) into caliper bushing boot (3).

## FRONT BRAKE LINE: ALL MODELS

**⚠CAUTION**

**Direct contact of D.O.T. 4 brake fluid with eyes can cause irritation. Avoid eye contact. In case of eye contact flush with large amounts of water and get medical attention. Swallowing large amounts of D.O.T. 4 brake fluid can cause digestive discomfort. If swallowed, obtain medical attention. Use in well ventilated area. KEEP OUT OF REACH OF CHILDREN. (00240a)**

***NOTICE***

**D.O.T. 4 brake fluid will damage painted and body panel 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. (00239b)**

*NOTE*

*If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*

### Removal

1. See Figure 2-112 or Figure 2-113. Remove bleeder nipple cap (3) from bleeder valve (2) on front brake caliper (1). Install end of a length of 5/16 in (7.9 mm) I.D. clear plastic tubing over caliper bleeder valve (3), while placing free end in a suitable container. Open bleeder valve about 1/2 turn. Pump brake hand lever to drain brake fluid. Close bleeder valve.

*NOTE*

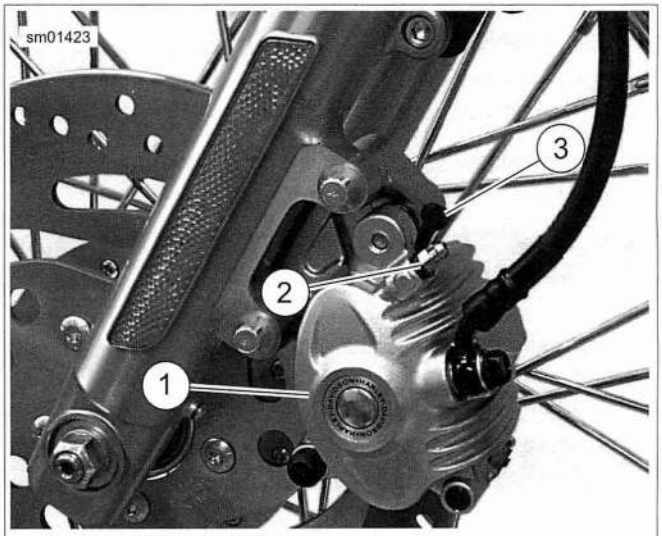
*Dispose of brake fluid in accordance with local regulations.*

2. See Figure 2-116. Remove screw (5) to detach brake line clamp (4) from front fork upper bracket (XL models) or lower fork bracket (XR 1200X).
3. Detach brake line from stem at bottom of front fork lower bracket.
   a. Dual front disc models: Remove screw with captive washer (8) and clamp (9) to detach brake line manifold (11).
   b. Single front disc models: Remove screw with captive washer (8) and clamp (7) to detach brake line.

*NOTE*

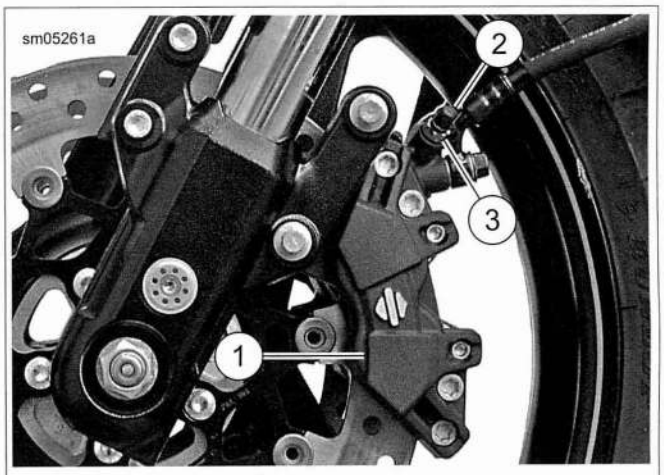
*Damaged banjo bolt surfaces will leak when reassembled. Prevent damage to seating surfaces by carefully removing brake line components.*

4. Remove banjo bolt (2) and washers (1) to detach brake line from master cylinder body. Discard washers.
5. Remove banjo bolt (2, 3) and washers (1) to detach brake line from front brake caliper(s). Discard washers.
6. Carefully inspect brake line for dents, cuts or other defects. Replace brake line if any damage is found.




1. Front brake caliper
2. Bleeder valve
3. Bleeder cap

**Figure 2-112. Front Brake Caliper: XL Models**




1. Front brake caliper
2. Bleeder valve
3. Bleeder cap

**Figure 2-113. Front Caliper Assembly: XR 1200X**

## REMOVAL

*NOTE*

*Care must be taken when removing and installing tire to prevent cosmetic damage to wheel. This is especially true with wheels that feature painted surfaces.*

1. Remove wheel from motorcycle:
   a. **Front wheel:** See 2.4 WHEELS, Front Wheel.
   b. **Rear wheel:** See 2.4 WHEELS, Rear Wheel.
2. Deflate tire.

*NOTE*

*On tube type wheels, it is not necessary to completely remove tire from rim to replace the tube only. Removing one side allows the tube to be replaced and allows for inspection of tire.*

3. Loosen both tire beads from rim flange. In most cases, a bead breaker machine will be required to loosen the beads from the rim.
4. Remove tire.

## CLEANING, INSPECTION AND REPAIR

1. Clean the inside of tire and outer surface of tube.
2. If rim is dirty or rusty, clean with a stiff wire brush.
3. Check wheels for lateral and radial runout before installing a **new** tire. See 2.6 CHECKING AND TRUING WHEELS.
4. Inspect the tire for wear and damage. Inspect tread depth. Replace worn tires. Replace tube prior to reinstalling tire.

**⚠WARNING**

**Replace punctured or damaged tires. In some cases, small punctures in the tread area may be repaired from within the demounted tire by a Harley-Davidson dealer. Speed should NOT exceed 50 mph (80 km/h) for the first 24 hours after repair, and the repaired tire should NEVER be used over 80 mph (130 km/h). Failure to follow this warning could result in death or serious injury. (00015a)**

5. Tubeless tires may be repaired in the tread area only if the puncture is 1/4 in (6.4 mm) or smaller. All repairs must be made from inside the tire.
6. Acceptable repair method involves the use of a patch and plug combination.

## INSTALLATION

**⚠WARNING**

**Harley-Davidson front and rear tires are not the same. Interchanging front and rear tires can cause tire failure, which could result in death or serious injury. (00026a)**

**⚠WARNING**

**Do not exceed manufacturer's recommended pressure to seat beads. Exceeding recommended bead seat pressure can cause tire rim assembly to burst, which could result in death or serious injury. (00282a)**

**⚠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)**

For tire pressures, see 1.10 TIRES AND WHEELS, Tires.

Some tires have arrows molded into the tire sidewall. These tires should be mounted on the rim with the arrow pointing in the direction of forward rotation. The colored dot on the sidewall is a balance mark and should be located next to the valve stem hole.

### Tube Type Tires

**⚠WARNING**

**Match tires, tubes, rim seals, air valves and caps to the correct wheel rim. Contact a Harley-Davidson dealer. Mismatching can result in damage to the tire bead, allow tire slippage on the rim or cause tire failure, which could result in death or serious injury. (00023b)**

**⚠WARNING**

**Use inner tubes on laced (wire spoked) wheels. Using tubeless tires on laced wheels can cause air leaks, which could result in death or serious injury. (00025a)**

*NOTES*

- *For correct tire and tube types, see 2.2 SPECIFICATIONS.*
- *Whenever a tube type tire is replaced, the tube should also be replaced. Inner tubes should be patched only as an emergency measure. Replace a damaged or patched tube as soon as possible. Rim bands must be used on all laced wheels.*

1. See Figure 2-130. On laced wheels, install a rim strip into the rim well. Make sure no spokes protrude through nipples, and be sure to align the valve stem hole in rim strip with valve stem hole in rim.
2. Install tube and tire.

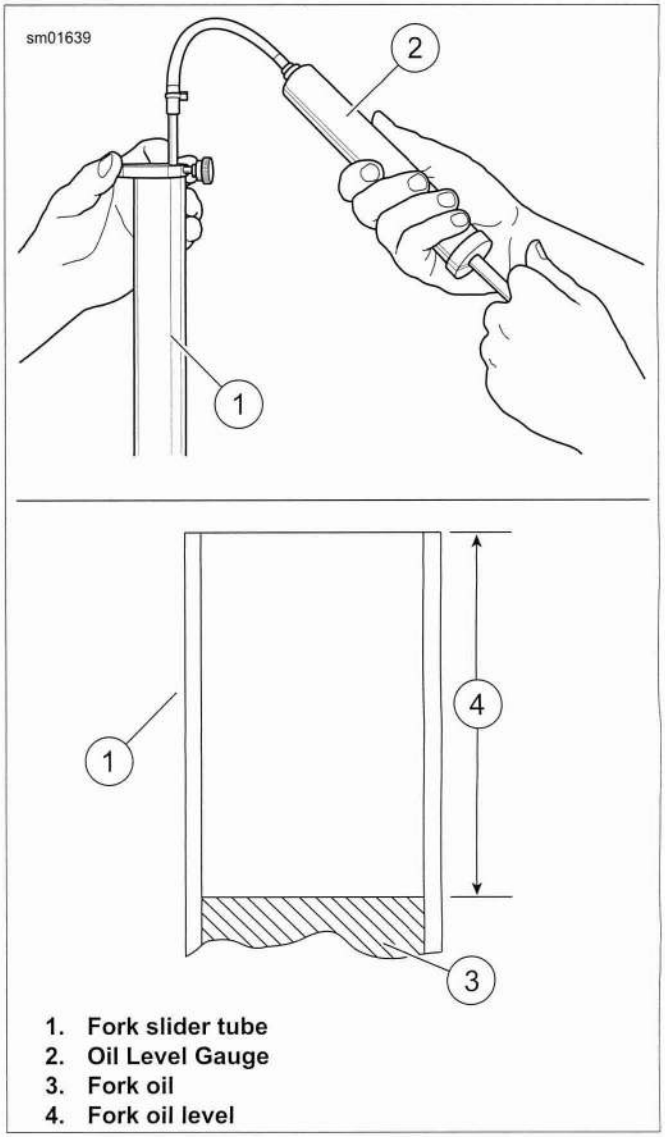
## FILL WITH FORK OIL

| PART NUMBER | TOOL NAME |
|---|---|
| HD-59000-B | OIL LEVEL GAUGE |

1. Position fork tube assembly upright. Remove the spring and compress the assembly fully.
2. Pour approximately 14 fl oz (414 mL) of HARLEY-DAVIDSON FORK OIL Type E into fork.
3. Pump the slider tube 8-10 times to expel air and compress the assembly fully.
4. See Figure 2-143. Use the OIL LEVEL GAUGE (Part No. HD-59000-B) to draw off excess fork oil until it reaches the level specification. Refer to Table 2-21.
5. Install spring and other components.
6. Install slider tube cap with O-ring. Screw tube cap all the way into slider tube. Finger-tighten only.
7.

**Table 2-21. Fork Oil Level Specifications: XL Models**

| MODEL | in | mm |
|---|---|---|
| XL 883N/XL 1200N | 3.11 | 79 |
| XL 883L/XL 1200L | 4.80 | 122 |
| XL 1200X | 6.34 | 161 |
| XL 883R | 4.92 | 125 |
| XL 1200C/CP | 4.72 | 120 |




1. **Fork slider tube**
2. **Oil Level Gauge**
3. **Fork oil**
4. **Fork oil level**

**Figure 2-143. Refilling Front Fork Oil**

## INSTALLATION

1. See Figure 2-141. Insert each fork assembly (12) through front fork lower (1) and upper (6) brackets. Position slider tubes so that top of each tube cap (11) extends 0.42-0.50 in (10.7-12.7 mm) above top surface of front fork upper bracket.
2. Tighten front fork upper and lower bracket pinch screws (11 and 14) to 30-35 ft-lbs (40.7-47.5 Nm).
3. Now tighten slider tube caps to 22-58 ft-lbs (29.9-78.7 Nm).
4. **XL 883N/XL 1200N:** See Figure 2-144. Slide upper end of each fork gaiter (2) up until it contacts underside of front fork lower bracket (4).
5. Install front fender. See 2.31 FRONT FENDER. Tighten fasteners to 96-156 **in-lbs** (10.9-17.6 Nm).
6. Install front wheel assembly and front brake caliper. See 2.4 WHEELS.

## BELT GUARD: XL MODELS

### Removal

1. See Figure 2-160. Remove right side lower shock absorber mount locknut (1). Pull shock absorber mounting screw (2) out slightly until it clears mounting hole in belt guard (4).
2. Remove screw (5), washer (6) and nut (7) securing front of belt guard to rear fork (10).
3. Remove belt guard from vehicle.

### Installation

1. See Figure 2-160. Slide belt guard (4) into place on vehicle. Tab on front of belt guard mounts outboard of mounting bracket on rear fork.
2. Secure front of belt guard to rear fork (10) with screw (5), washer (6) and nut (7). Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).
3. Push lower shock absorber mounting screw (2) through rear belt guard mounting hole. Thread locknut (1) on screw. Tighten to 45-50 ft-lbs (61-68 Nm).

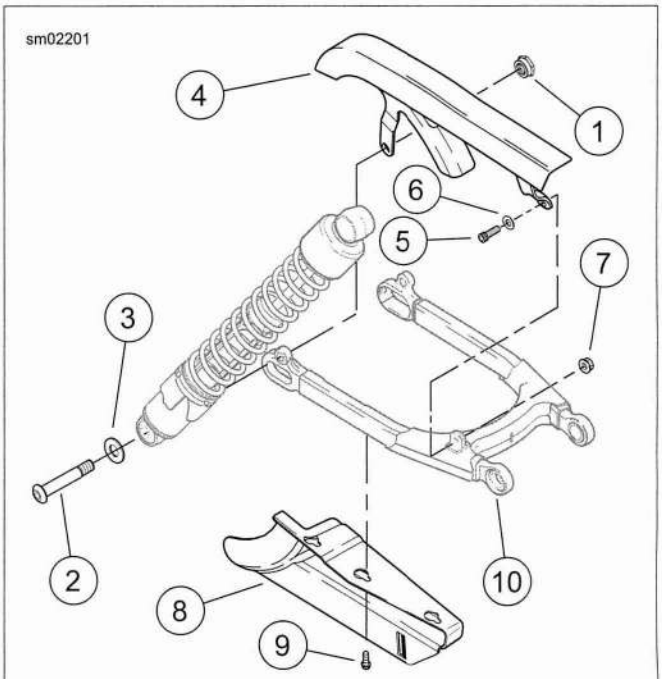
## DEBRIS DEFLECTOR: XL MODELS

### Removal

1. See Figure 2-160. Loosen, but do not remove, three screws with captive washers (9) securing debris deflector (8) to underside of rear fork (10).
2. Slide debris deflector forward until keyway slots in deflector clear screw heads. Remove debris deflector.

### Installation

1. See Figure 2-160. Position debris deflector (8) in place on underside of rear fork (10).
2. Fit large end of keyway slots in deflector over screw heads and captive washers (9). Slide deflector rearward to lock screws in slots. Tighten screws to 36-60 **in-lbs** (4.1-6.8 Nm).




1. **Lock nut**
2. **Screw**
3. **Washer**
4. **Belt guard**
5. **Screw**
6. **Washer**
7. **Nut**
8. **Debris deflector**
9. **Screw w/captive washer (3)**
10. **Rear fork**

**Figure 2-160. Belt Guard/Debris Deflector: XL Models**

## BELT GUARD: XR 1200X

### Removal

1. See Figure 2-161. Remove two screws with captive washers (2) securing belt guard to top of rear fork (5).
2. Remove belt guard from vehicle.

### Installation

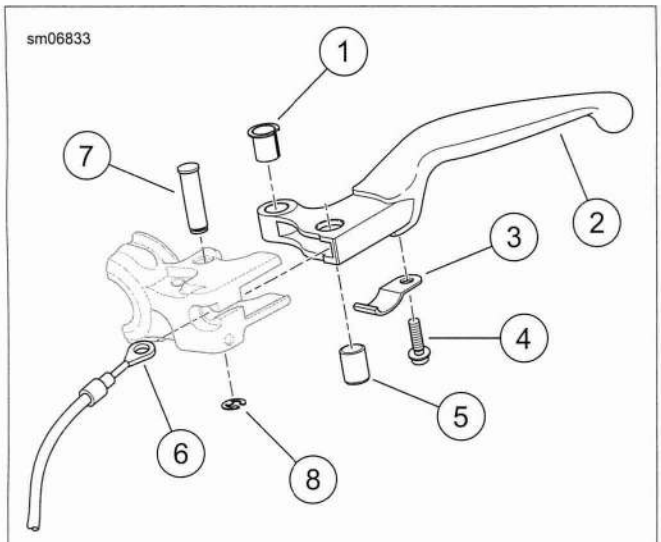
1. See Figure 2-161. Slide belt guard (1) into place on top of rear fork (5).
2. Secure belt guard using two screws with captive washers (2). Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).

## DEBRIS DEFLECTOR: XR 1200X

### Removal

1. See Figure 2-161. Remove three screws with captive washers (4) securing debris deflector (3) to underside of rear fork (5). Note that front screw is located inboard of debris deflector.
2. Remove debris deflector from vehicle.

9. **XL Models with Forward Mount Controls:** Install both forward foot control assemblies. See 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
10. Install the exhaust system. See 4.14 EXHAUST SYSTEM: XL MODELS or 4.15 EXHAUST SYSTEM: XR 1200X.
11. **XR 1200X:** Install the air box assembly. See 4.4 AIR BOX: XR 1200X.
12. Adjust the drive belt and tighten the rear axle. See 5.6 DRIVE BELT.




1. **Bushing**
2. **Lever**
3. **Anti-rattle spring**
4. **Screw**
5. **Clutch cable pin**
6. **Clutch cable**
7. **Pivot pin**
8. **Retaining ring**

**Figure 2-181. Clutch Lever and Cable**

## Clutch Hand Control

*NOTE*

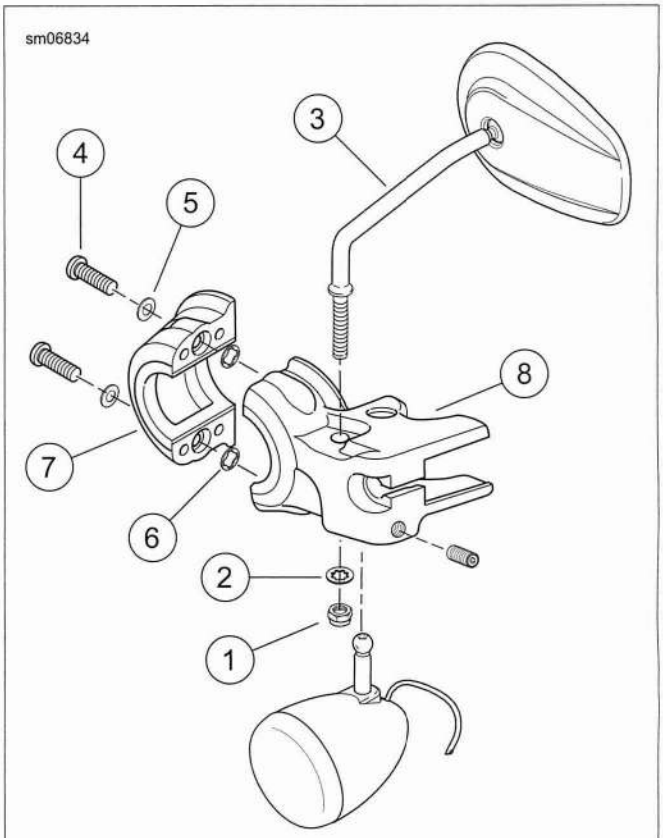
***XL 1200X:*** *Leave the turn signals and brackets installed.*

1. **All Models except XL 1200X:** Loosen the set screw and remove the turn signal assembly from the clutch lever bracket. See 6.20 FRONT TURN SIGNALS, All Except XL 1200X.
2. See Figure 2-182. Loosen and remove the locknut (1), lock washer (2) and mirror (3).

*NOTE*

*Loosen the two screws of the left handlebar switch housing to remove clutch control clamp and clutch lever bracket from left handlebar.*

3. See Figure 2-182. Loosen the two screws (4) and washers (5) with nylon retainers (6) to remove the clutch control clamp (7).
4. Remove the clutch lever bracket (8).




1. **Locknut**
2. **Washer**
3. **Mirror**
4. **Fastener**
5. **Washer**
6. **Nylon retainer**
7. **Clamp**
8. **Bracket**

**Figure 2-182. Clutch Hand Control Clamp and Bracket**

# ASSEMBLY AND INSTALLATION

## Clutch Hand Control

1. Position clutch control clamp and clutch lever bracket onto left handlebar. Hold clamp and bracket assembly firmly against left handlebar switch housing.
2. Secure components to left handlebar using two screws and washers and retainers. Tighten to 108-132 **in-lbs** (12.2-14.9 Nm).

*NOTE*

***XL 1200X:*** *See Figure 2-183. Adjust mirrors for rider vision and so that the mirrors do not strike the fuel tank on lock to lock handlebar turns.*

3. Install mirror, secure with locknut and lock washer. Position mirror for rider vision. Tighten locknut to 96-144 **in-lbs** (10.9-16.3 Nm).
4. **All Models except XL 1200X:** Install turn signal and secure with set screw. See 6.20 FRONT TURN SIGNALS, All Except XL 1200X.
5. Position so turn signal lens faces directly forward and turn signal does not strike fuel tank when the handlebar is

10. In sequence, tighten all fender mounting hardware:
    a. Tighten bolt and seat post to 96-156 **in-lbs** (10.9-17.6 Nm).
    b. Tighten turn signal stalk locknuts to 132-216 **in-lbs** (14.9-24.4 Nm).
    c. Tighten fender mounting fasteners to 132-216 **in-lbs** (14.9-24.4 Nm).
11. Install the tail lamp assembly.
    a. Route turn signal wiring harnesses through wire retention brackets.
    b. Pull turn signal wiring harnesses through holes in rear fender and tail lamp base.
    c. See Figure 2-196. Connect tail lamp connector [94] (3) and left [18] (1) and right [19] (2) turn signal connectors.
    d. Install the tail lamp lens and bulb. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200N/X, Base Replacement: XL 883R/L, XL 1200L and XR 1200X.
12. Install main fuse.

**⚠WARNING**

**Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)**

**⚠WARNING**

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

13. Install seat.
14. Verify license plate lamp, tail lamps, brake lamps and turn signals.

## XL 1200C/CP

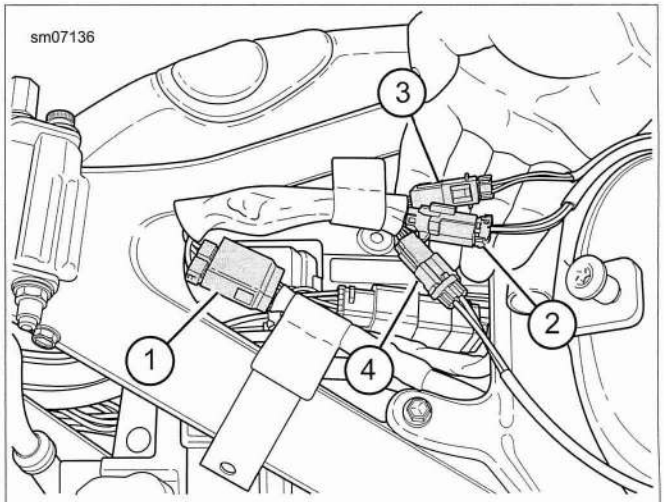
### Removal

1. Remove seat.

**⚠WARNING**

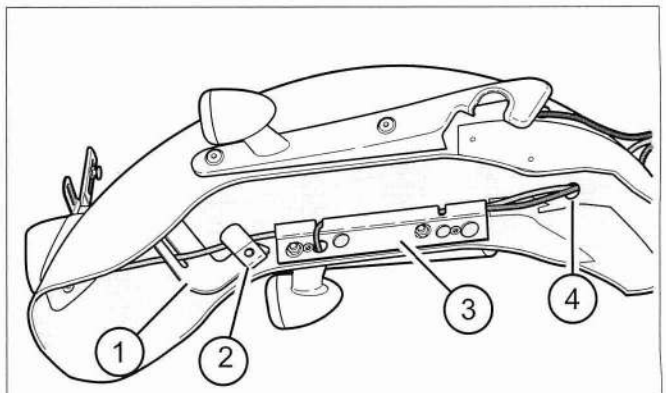
**To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)**

2. Unplug the main fuse.
3. See Figure 2-199. Disconnect the right [18] (3) and left [19] (4) turn signal connectors and the tail lamp connector [40] (2).
4. Remove the lower shock bolts and lower the rear wheel to access the fender hardware.
5. See Figure 2-200. Route the turn signal wire harness through the openings (4) in the fender and from the retention bracket (3).
6. See Figure 2-201. Remove rear turn signal stalk nuts (1) from inside rear fender on both sides.
7. Support the fender and remove the front (4) and rear (2) fender fasteners with washers (3) and strut covers with attached turn signal assemblies from rear fender struts.
8. Remove bolt (11), seat post (7) and flat washer (8) to detach top of rear fender from frame cross member tab.
9. Carefully remove rear fender from motorcycle.




1. **Main harness connector [7]**
2. **Tail lamp connector [40]**
3. **RH turn signal connector [18]**
4. **LH turn signal connector [19]**

**Figure 2-199. Turn Signal Wire Harness: XL 1200C/CP**




1. **Fender brace**
2. **Retention clip**
3. **Retention bracket**
4. **Fender opening**

**Figure 2-200. Inner Rear Fender: XL 1200C/CP**

2. Apply a small amount of ANTI-SEIZE LUBRICANT (Part No. 98960-97) to pivot holes of jiffy stand leg (5) and yoke, groove of anchor pin and O.D. of clevis pin (1).

## INSTALLATION

1. See Figure 2-214. Coat the ramp of the jiffy stand yoke with ANTI-SEIZE LUBRICANT (Part No. 98960-97).

*NOTE*

*See Figure 2-215. When installing jiffy stand spring, make sure open ends of spring hooks face inward toward centerline of vehicle.*

**⚠WARNING**

**Wear safety glasses or goggles when removing or installing spring. Spring tension can cause spring, attached components and/or hand tools to fly out which could result in death or serious injury. (00477c)**

2. Hook either end of spring (6) into spring mounting hole on jiffy stand leg (5). Install other end of spring over frame mounted anchor pin (7).
3. Install bushing (2) onto clevis pin (1) with shoulder of bushing facing head of clevis pin.
4. While holding end of spring in groove of anchor pin and holding jiffy stand leg in its retracted position, place pivot end of jiffy stand leg into yoke (4) on motorcycle frame. Insert clevis pin (1) up through lower pivot hole of yoke and halfway into pivot hole of jiffy stand leg.
5. See Figure 2-213. Lift jiffy stand leg (4) upward, aligning pivot hole of jiffy stand leg with slotted upper hole of yoke (7). Push clevis pin through upper hole in yoke. Make certain that shank of lower bushing (3) fits inside lower pivot hole in yoke.
6. Install upper bushing with shoulder facing up, over end of clevis pin and against upper surface of yoke. Insert **new** pretzel clip (2) through hole in end of clevis pin.

*NOTE*

*See Figure 2-216. Make sure the loop of the pretzel clip snaps over the end of the clevis pin.*

7. See Figure 2-213. Press rubber bumper (5) onto mounting stud on motorcycle frame.
8. Extend and retract jiffy stand leg several times to check for proper operation. In retracted position (up), jiffy stand leg should be securely seated against frame-mounted rubber bumper.
9. Place jiffy stand in its full forward position (down). Carefully remove support blocking from beneath motorcycle frame. Rest motorcycle on jiffy stand.

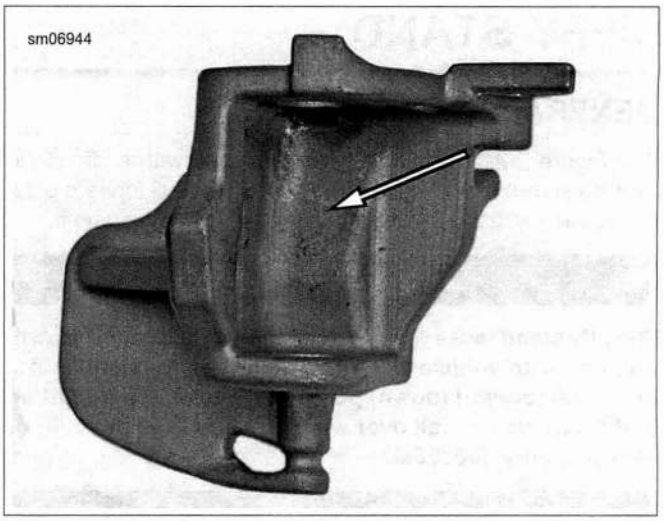
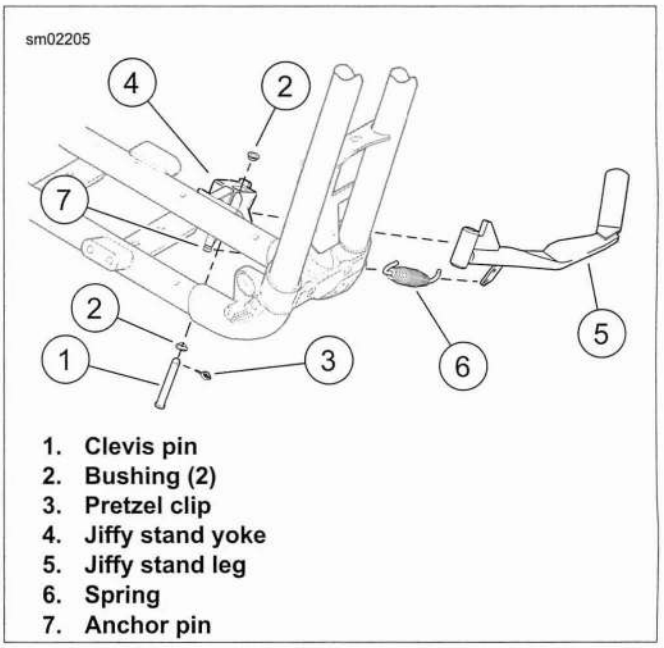


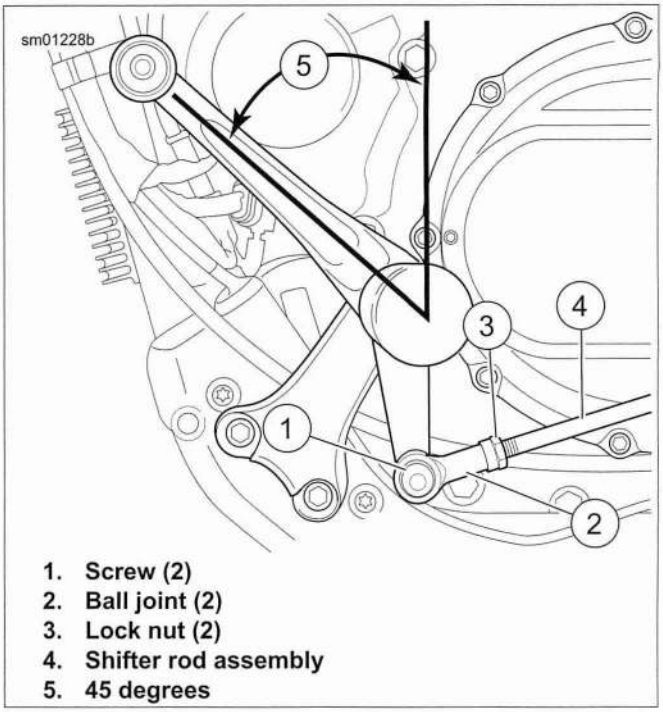

**Figure 2-214. Jiffy Stand Yoke Ramp**




1. **Clevis pin**
2. **Bushing (2)**
3. **Pretzel clip**
4. **Jiffy stand yoke**
5. **Jiffy stand leg**
6. **Spring**
7. **Anchor pin**

**Figure 2-215. Jiffy Stand**

5. Holding shifter rod so that it does not turn, tighten lock nuts on both ends to 84-132 **in-lbs** (9.5-14.9 Nm) .




1. **Screw (2)**
2. **Ball joint (2)**
3. **Lock nut (2)**
4. **Shifter rod assembly**
5. **45 degrees**

**Figure 2-227. Adjusting Shift Pedal: Models with Forward Controls**

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Fuel tank mounting screw | 15-20 ft-lbs | 20.4-27.1 Nm | 3.17 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair |
| Gearcase cover fastener | 90-120 **in-lbs** | 10.2-13.6 Nm | 3.22 OIL PUMP: XR 1200X, Assembly |
| Gearcase cover fastener | 90-120 **in-lbs** | 10.2-13.6 Nm | 3.23 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XL Models |
| Gearcase cover fastener | 90-120 **in-lbs** | 10.2-13.6 Nm | 3.23 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X |
| Gearcase cover fastener | 90-120 **in-lbs** | 10.2-13.6 Nm | 3.23 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover: XR 1200X |
| Gearcase housing plug | 108-156 **in-lbs** | 12.2-17.6 Nm | 3.22 OIL PUMP: XR 1200X, Assembly |
| High pressure feed hose fitting (to crankcase) | 60-90 **in-lbs** | 6.8-10.2 Nm | 3.21 OIL PUMP: XL MODELS, Installation |
| High pressure feed hose fitting nut | 85-105 **in-lbs** | 9.6-11.8 Nm | 3.21 OIL PUMP: XL MODELS, Installation |
| Ignition switch mounting screw | 34-45 **in-lbs** | 4.0-5.1 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models |
| Ignition switch mounting screw | 34-45 **in-lbs** | 4.0-5.1 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X |
| Induction module cover-to-cylinder head fastener | 20-24 ft-lbs | 27.1-32.5 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X |
| Induction module cover-to-induction module fastener | 84-108 **in-lbs** | 9.5-12.2 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X |
| Induction module cover-to-wire form fastener | 84-108 **in-lbs** | 9.5-12.2 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X |
| Inner rocker cover bolt, large | 18-22 ft-lbs | 24.4-29.8 Nm | 3.17 TOP END OVERHAUL: ASSEMBLY, Rocker Covers |
| Inner rocker cover bolt, small | 135-155 **in-lbs** | 15.3-17.5 Nm | 3.17 TOP END OVERHAUL: ASSEMBLY, Rocker Covers |
| Inner rocker cover screw | 135-155 **in-lbs** | 15.3-17.5 Nm | 3.17 TOP END OVERHAUL: ASSEMBLY, Rocker Covers |
| Isolator mount screw, front | 25-35 ft-lbs | 33.9-47.5 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models |
| Isolator mount screw, front | 25-35 ft-lbs | 33.9-47.5 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X |
| Isolator mount screw, rear | 25-35 ft-lbs | 33.9-47.5 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XL Models |
| Isolator mount screw, rear | 25-35 ft-lbs | 33.9-47.5 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X |
| Lower front retainer plate fastener | 45-50 ft-lbs | 61.0-67.8 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X |
| Lower shock absorber fastener | 45-50 ft-lbs | 61.0-67.8 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X |
| Oil cooler fastener | 36-60 **in-lbs** | 4.1-6.8 Nm | 3.12 INSTALLING ENGINE IN CHASSIS, Procedure: XR 1200X/Apply LOCTITE THREADLOCKER 243 (blue) |
| Oil cooler fastener | 36-60 **in-lbs** | 4.1-6.8 Nm | 3.13 PRECISION COOLING SYSTEM: XR 1200X, Oil Cooler/Apply LOCTITE THREADLOCKER 243 (blue) |
| Oil deflector plate screw | 25-35 **in-lbs** | 2.8-3.9 Nm | 3.23 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase |

**Table 3-20. Oil Lamp Troubleshooting**

| OIL PRESSURE INDICATOR LAMP | PROBABLE CAUSES |
|---|---|
| Does not glow when ignition is turned on (prior to operating engine). | Malfunctioning signal switch. |
| | Malfunction in wiring. |
| | Burned-out signal bulb. |
| | Dead battery. |
| | See NOTE before this table. |

## CHECKING OIL PRESSURE

| PART NUMBER | TOOL NAME |
|---|---|
| HD-41675 | OIL PRESSURE SENDING UNIT WRENCH |
| HD-96921-125 | OIL PRESSURE GAUGE ADAPTER |
| HD-96921-52D | OIL PRESSURE TEST GAUGE KIT |
| HD-96925-58 | OIL PRESSURE GAUGE ADAPTER |

Check operating oil pressure as follows:

1. Fill oil tank to proper level. See 1.6 ENGINE OIL AND FILTER.
2. Place a container under vehicle to catch any oil that may leak out.
3. Obtain OIL PRESSURE TEST GAUGE KIT (Part No. HD-96921-52D).

### Connecting Gauge: XL Models

1. See Figure 3-2. Unplug connector [120] (3) from oil pressure indicator lamp switch (2) located under oil filter (1) by pulling elbow connector straight down from stud on oil pressure switch.
2. Using OIL PRESSURE SENDING UNIT WRENCH (Part No. HD-41675), remove oil pressure switch.
3. See Figure 3-3. Install OIL PRESSURE GAUGE ADAPTER (Part No. HD-96925-58) (2) in oil pressure indicator lamp switch mounting hole. Tighten adapter snugly. DO NOT OVERTIGHTEN.

### Connecting Gauge: XR 1200X

1. See Figure 3-5. Disconnect the quick connect fitting from the inlet side of the oil cooler (4). See 3.13 PRECISION COOLING SYSTEM: XR 1200X, General.
2. Connect OIL PRESSURE GAUGE ADAPTER (Part No. HD-96921-125) (5) to the oil hose (6).
3. Connect the other end of the adapter to the oil cooler fitting (4).

### Testing Pressure

1. See Figure 3-4 or Figure 3-5. Assemble banjo bolt (2), washer (3), OIL PRESSURE GAUGE banjo fitting (1) and second washer onto adapter and tighten snugly.

*NOTE*

*For an accurate reading, engine oil should be at normal operating temperature: 230 °F (110 °C).*

2. Temporarily secure oil pressure gauge and hose to motorcycle frame with cable straps. Make sure gauge and hose assembly do not interfere with normal operation of the vehicle. Start engine and ride motorcycle at least 20 mi (32 km) at or above 50 mph (80 km/h) to allow engine to reach operating temperature.
3. Check and record the pressure readings at normal idle (approximately 1000 rpm) and again at 2500 rpm. Compare the readings with the specifications in Table 3-21.

**Table 3-21. Oil Pressure: At OperatingTemperature**

| rpm | XL MODELS* | | XR 1200X** | |
|---|---|---|---|---|
| | psi | kPa | psi | kPa |
| 1000 | 7-12 | 43.3-82.7 | 16-20 | 110.3-137.9 |
| 2500 | 10-17 | 68.9-117 | 40-44 | 275.8-303.4 |
| * Pressure reading taken at oil pressure switch fitting.<br>** Pressure reading taken at oil cooler inlet. | | | | |

### Removing Gauge: XL Models

1. Stop engine. Remove OIL PRESSURE GAUGE assembly from oil pressure indicator lamp switch mounting hole in crankcase. Cut cable straps securing gauge and hose. Remove banjo bolt, gauge assembly, washers and adapter from vehicle.
2. See Figure 3-2. Coat threads of oil pressure switch (2) with LOCTITE 565 HIGH PERFORMANCE PIPE SEALANT with TEFLON. Replace the oil pressure switch. Using OIL PRESSURE SENDING UNIT WRENCH, tighten switch snugly. DO NOT OVERTIGHTEN.
3. Plug in connector [120] (3) by pushing elbow connector straight up onto stud on oil pressure switch.

### Removing Gauge: XR 1200X

1. Stop engine. Cut cable straps securing gauge and hose. Remove banjo bolt, gauge assembly, washers and adapter from vehicle.
2. Connect oil hose to oil cooler fitting, making sure it is securely latched.

### Finalize Test

*NOTE*

*If an appreciable amount of oil leaked out when oil pressure switch was removed, it will have to be replaced with fresh oil.*

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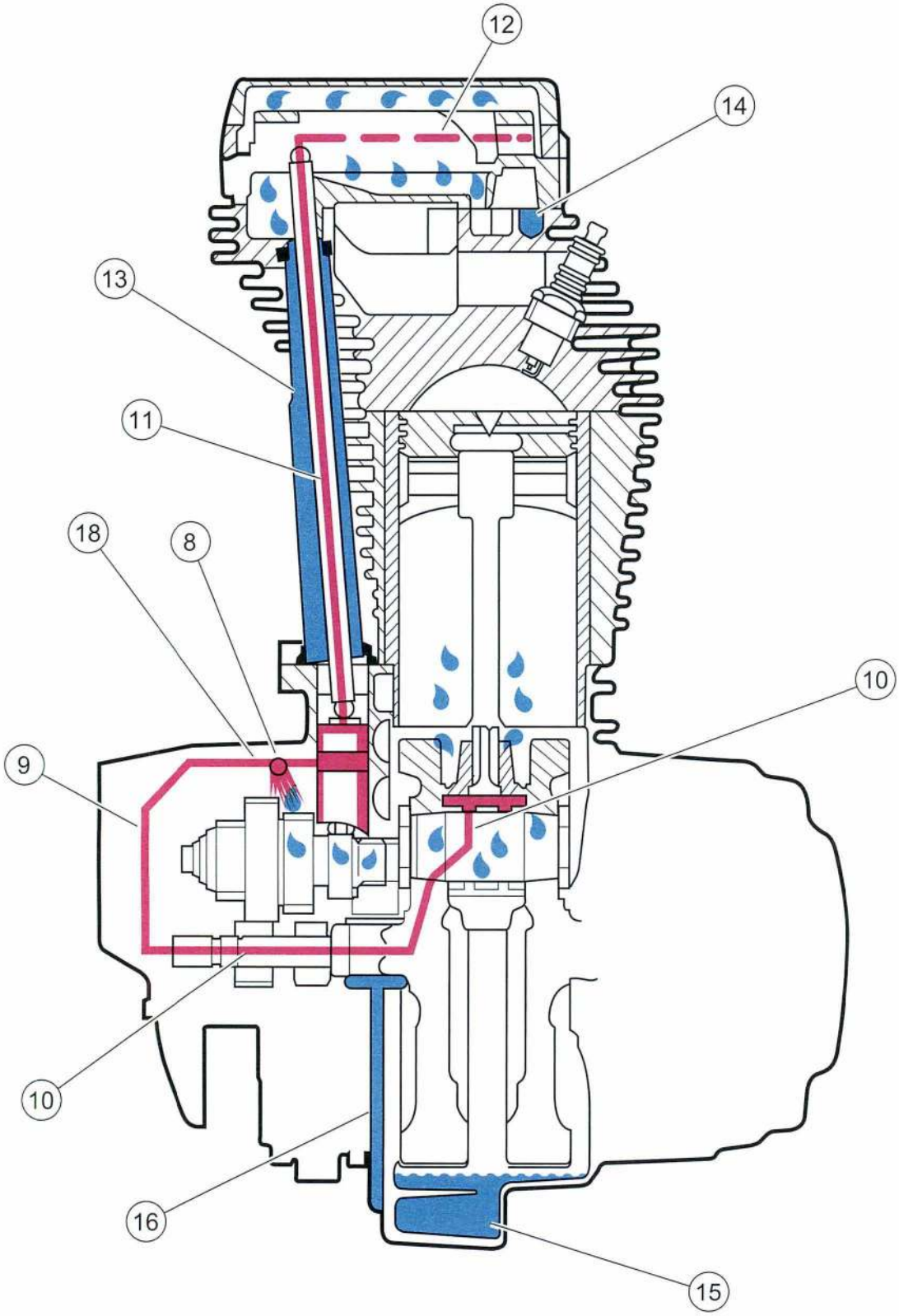


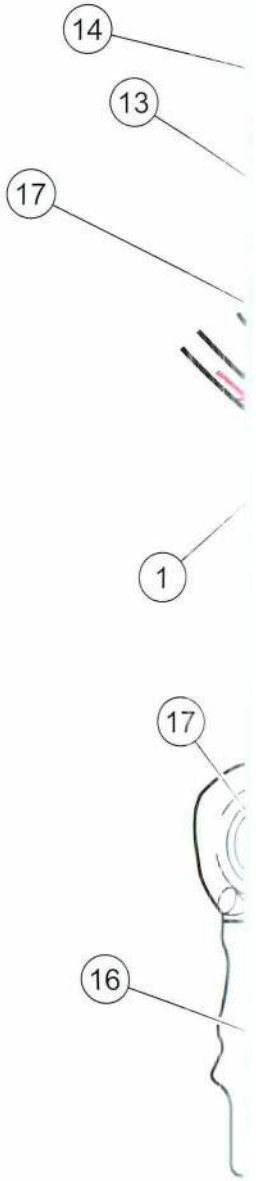




**Figure 3-12. Lubrication Diagram: XL**

## GENERAL

If it becomes necessary to remove the engine from the motorcycle, follow the step-by-step procedure below. It is important to follow the procedure as outlined, particularly in the areas of stabilizer link and engine mount disassembly.

## PROCEDURE: XL MODELS

| PART NUMBER | TOOL NAME |
|---|---|
| HD-45967 | SHOP DOLLY |
| HD-45968 | FAT JACK |
| HD-46284 | ENGINE HOOK |

**⚠WARNING**

**To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)**

1. Position vehicle upright. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.5 FUEL TANK: XL MODELS.
2. Remove seat.
3. Remove left side cover. See 2.18 LEFT SIDE COVER.

**⚠WARNING**

**Prevent accidental vehicle start-up, which could cause death or serious injury. First disconnect negative (-) battery cable at engine and then positive (+) cable from battery. (00280b)**

4. Disconnect negative (-) battery cable from ground stud on crankcase. Disconnect positive (+) battery cables at battery. See 1.16 BATTERY MAINTENANCE.
5. Drain primary chaincase/transmission fluid. See 1.13 TRANSMISSION LUBRICANT.
6. Drain oil tank. See 1.6 ENGINE OIL AND FILTER. Do not install drain plug back in end of drain hose at this time.
7. Unplug O2 sensor connectors [137], [138] and remove exhaust pipes and mufflers. See 4.14 EXHAUST SYSTEM: XL MODELS.
8. Remove right front footrest assembly and rear brake linkage.
   a. **Models Equipped with Mid-mount Foot Controls:** See 2.37 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
   b. **Models Equipped with Forward Foot Controls:** See 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
9. Remove screw, washer and exhaust pipe clamp bracket from sprocket cover. Remove two screws securing sprocket cover to engine case. Remove sprocket cover.
10. Loosen rear axle nut and move rear axle all the way forward. Tighten axle nut enough to hold the axle and wheel in position in the rear fork. Remove rear drive belt from transmission sprocket. See 5.6 DRIVE BELT.
11. Remove transmission sprocket. See 5.15 TRANSMISSION SPROCKET.
12. Remove exhaust system interconnect. See 4.14 EXHAUST SYSTEM: XL MODELS.
13. Disconnect oil tank feed, drain and return hoses from oil tank. Pull drain hose up through drain hose sleeve in rear of engine crankcase and remove hose from vehicle. See 3.25 OIL TANK.
14. Drain and remove fuel tank. See 4.5 FUEL TANK: XL MODELS.
15. Unplug horn connectors and remove horn from horn bracket. See 6.33 HORN.
16. Remove air cleaner cover, air filter and air cleaner backing plate. See 4.3 AIR CLEANER: XL MODELS.

    **California Models:** Remove EVAP purge hose from induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
17. Unplug the following connectors from the induction module:
    a. Fuel injector connectors [84], [85].
    b. Temperature/Manifold absolute pressure (TMAP) sensor connector [80].
    c. Idle Air Control (IAC) connector [87].
    d. Throttle Position (TP) sensor connector [88].
18. Unplug the following electrical connectors from the engine:
    a. Ground wire at powertrain ground stud on crankcase.
    b. Spark plug wires.
    c. Oil pressure switch connector [120]. See 6.32 OIL PRESSURE SWITCH.
    d. Crank position (CKP) sensor connector [79]. See 6.24 CRANK POSITION SENSOR (CKP).
    e. Alternator AC connector [46]. See 6.3 VOLTAGE REGULATOR.
    f. Neutral indicator switch connector [136]. See 6.27 NEUTRAL INDICATOR SWITCH.
    g. Vehicle speed sensor (VSS) connector [65]. See 6.26 VEHICLE SPEED SENSOR (VSS).
    h. Starter relay wire (GN) at starter motor. See 6.12 STARTER.
    i. Engine Temperature (ET) sensor connector [90]. Cut and remove barbed cable strap securing sensor harness to ECM caddy. See 4.8 ENGINE TEMPERATURE (ET) SENSOR.
19. Disconnect clutch cable and remove from clutch lever on left handlebar. Remove cable clips securing clutch cable to frame left front downtube. See 2.29 CLUTCH CONTROL.

25. Position left and right wire harness caddies on either side of frame backbone. Plug in the following connectors, located in the caddies:
    a. Instruments connector [20].
    b. Headlamp connector [38].
    c. Right hand control connector (black) [22].
    d. Left hand control connector (gray) [24].
    e. Front turn signal connector [31].
26. Mount caddies together. Make sure tabs on caddies engage each other and frame backbone bracket. Secure with screw. See 6.28 MAIN WIRING HARNESS.
27. Position ignition coil and bracket on frame behind steering head. Be certain all wiring harnesses from front end of motorcycle, as well as right wire harness caddy mounting boss and throttle cables are positioned properly between coil bracket uprights.
28. Plug ignition coil harness connector [83] into coil. See 6.15 IGNITION COIL. Mount ignition switch to coil bracket with screw. Tighten screw to 34-45 **in-lbs** (4.0-5.1 Nm). Secure right wire harness caddy to coil bracket with new push-in fastener.
29. Connect clutch cable to clutch lever on left handlebar. Attach clutch cable (along with wiring harness and front O2 sensor harness) to frame front left downtube with cable clips. Adjust clutch. See 2.29 CLUTCH CONTROL.
30. Plug the following electrical connectors into the engine:
    a. Engine Temperature (ET) sensor connector [90]. Secure sensor harness to ECM caddy with barbed cable strap. To avoid damage to sensor when vehicle is in operation, position cable strap on harness so there is a loop in harness between sensor and ECM caddy. Press barbed prong of cable strap into hole in boss in ECM caddy. See 4.8 ENGINE TEMPERATURE (ET) SENSOR.
    b. Starter relay wire (GN) at starter motor. See 6.12 STARTER.
    c. Vehicle speed sensor (VSS) connector [65]. See 6.26 VEHICLE SPEED SENSOR (VSS).
    d. Neutral indicator switch connector [136]. See 6.27 NEUTRAL INDICATOR SWITCH.
    e. Alternator AC connector [46]. See 6.3 VOLTAGE REGULATOR.
    f. Crank position (CKP) sensor connector [79]. See 6.24 CRANK POSITION SENSOR (CKP).
    g. Oil pressure switch connector [120]. See 6.32 OIL PRESSURE SWITCH.
    h. Spark plug wires.
    i. Ground wire at powertrain ground stud on crankcase.
31. See 4.9 INDUCTION MODULE: XL MODELS and plug the following connectors into the induction module:
    a. Throttle position (TP) sensor connector [88].
    b. Idle air control (IAC) connector [87].
    c. Temperature/manifold absolute pressure (TMAP) sensor connector [80].
    d. Fuel injector connectors [84], [85].
32. Install horn. See 6.33 HORN.
33. Install air cleaner backing plate, air filter and air cleaner cover. See 4.3 AIR CLEANER: XL MODELS.

    **CA Models:** Install EVAP purge hose on induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL.

**⚠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)**

34. Install fuel tank. Tighten screws to 15-20 ft-lbs (20.4-27.1 Nm). Attach quick-connect fitting on fuel line to fuel tank fitting. Gently tug on quick-connect fitting to make sure it is securely locked in place. See 4.5 FUEL TANK: XL MODELS.
35. Feed oil drain hose down through drain hose sleeve in rear of engine crankcase. Using new hose clamps, Install oil tank feed, drain and return hoses onto oil tank. Install drain plug in end of drain hose and secure with worm drive clamp. Tighten clamp securely. See 3.25 OIL TANK.
36. Install exhaust system interconnect. See 4.14 EXHAUST SYSTEM: XL MODELS.
37. Install transmission sprocket. See 5.15 TRANSMISSION SPROCKET.
38. Install rear drive belt and hand-tighten rear axle. Final belt adjustment will be performed later. See 5.6 DRIVE BELT.
39. Install sprocket cover. Secure with two screws. Note that long screw goes in top hole, short screw in bottom hole. Do not tighten screws at this time.
40. Install exhaust pipe clamp bracket, washer and screw to sprocket cover. Tighten to 30-33 ft-lbs (40.7-44.8 Nm). Now tighten other two sprocket cover screws to 80-120 **in-lbs** (9.0-13.6 Nm).
41. Install right front footrest assembly and rear brake linkage.
    a. **Models with Mid-mount Foot Controls:** See 2.37 RIDER FOOT CONTROLS: XL MID-MOUNT CONTROLS.
    b. **Models with Forward Foot Controls:** See 2.38 RIDER FOOT CONTROLS: XL FORWARD CONTROLS.
42. Install exhaust pipes and mufflers. Plug in O2 sensor connectors [137], [138]. Make sure rear O2 sensor harness is routed toward left side of motorcycle before looping back to harness connector so that harness does not contact exhaust pipe or port. See 4.14 EXHAUST SYSTEM: XL MODELS.

## GENERAL

This section describes disassembling the top end of the engine, from the cylinder deck up. To perform a complete top end overhaul, follow all steps listed in this section.

Then follow all steps listed in the following sections, including inspection and repair procedures: See 3.15 CYLINDER HEAD and 3.16 CYLINDER AND PISTON.

*NOTE*

*Dirt caked on cooling fins and other areas of engine can fall into crankcase bore or stick to subassemblies as parts are removed. Abrasive particles can damage machined surfaces or plug oil passageways. Remove all dirt and particles before disassembly to prevent component damage.*

## STRIPPING MOTORCYCLE FOR TOP END REPAIR

**⚠WARNING**

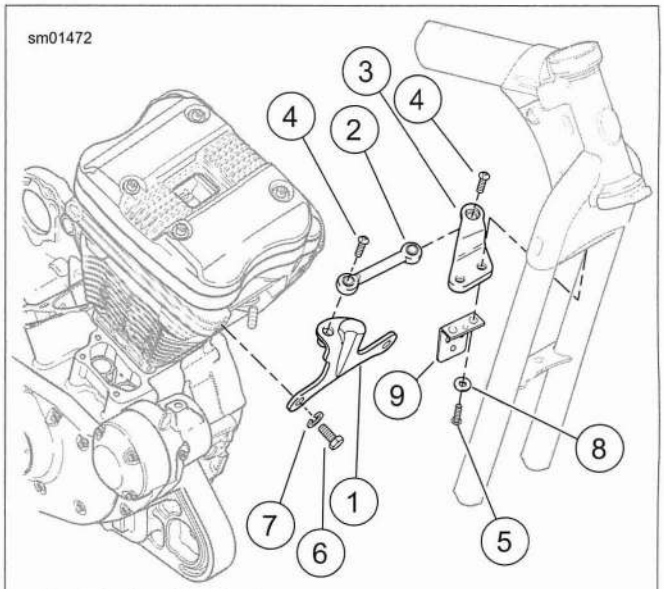
**When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)**

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.5 FUEL TANK: XL MODELS or 4.6 FUEL TANK: XR 1200X.
2. Remove seat.

**⚠WARNING**

**To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)**

3. Unplug main fuse. See 6.34 MAIN FUSE.
4. Unplug O2 sensor connectors [137], [138] and remove exhaust pipes and mufflers. See 4.14 EXHAUST SYSTEM: XL MODELS or 4.15 EXHAUST SYSTEM: XR 1200X.
5. Disconnect spark plug cables from spark plugs.
6. Drain and remove fuel tank. See 4.5 FUEL TANK: XL MODELS or 4.6 FUEL TANK: XR 1200X.
7. Unplug horn connectors and remove horn from horn bracket. See 6.33 HORN.
8. Remove air cleaner assembly:
   a. **XL Models:** Remove cover, air filter and air cleaner backing plate. See 4.3 AIR CLEANER: XL MODELS.
   b. **CA Models:** Remove EVAP purge hose from induction module. See 4.20 EVAPORATIVE EMISSIONS CONTROL.
9. Unplug the connectors from the induction module and remove induction module. See 4.9 INDUCTION MODULE: XL MODELS or 4.10 INDUCTION MODULE: XR 1200X.
   a. Fuel injector connectors [84], [85].
   b. Temperature/Manifold absolute pressure (TMAP) sensor connector [80].
   c. Idle Air Control (IAC) connector [87].
   d. Throttle Position (TP) sensor connector [88].
10. Secure induction module assembly and throttle cables out of the way.
11. See Figure 3-40. Remove upper front stabilizer link and frame bracket:
    a. Remove screw (4) securing stabilizer link (2) to engine bracket (1).
    b. Remove screws (5) and washers (8). Remove horn bracket (9) (models with front mounted horn) and frame bracket (3) with stabilizer link.




1. **Engine bracket**
2. **Upper stabilizer link**
3. **Upper frame bracket**
4. **Screw**
5. **Screw (2)**
6. **Screw (2)**
7. **Lock washer (2)**
8. **Washer (2)**
9. **Horn bracket**

**Figure 3-40. Upper Front Stabilizer Link Assembly**

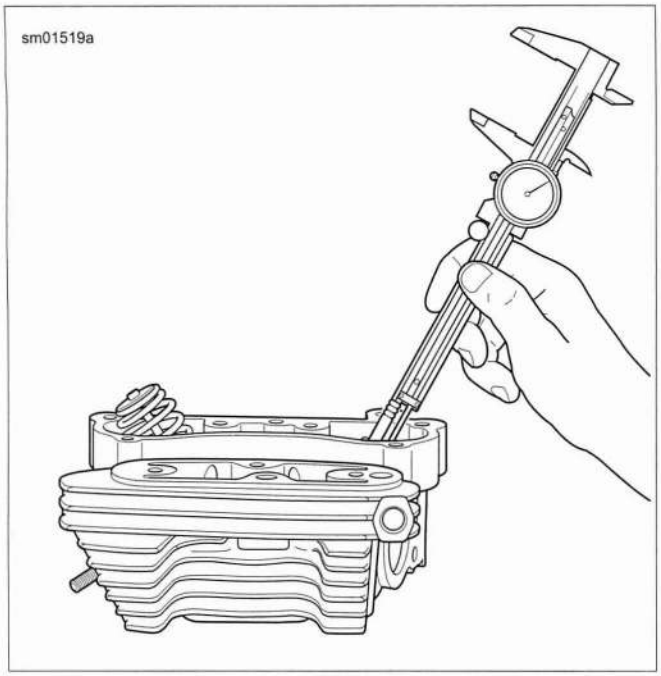



**Figure 3-57. Measuring Valve Stem Protrusion**

2. See Figure 3-57. Check valve seats for recession by measuring valve stem protrusion.
   a. Wipe valve seats and valve faces clean. Insert valve into valve guide.
   b. Measure valve stem protrusion from end of valve stem to machined surface of head upon which the lower valve collar sits, as shown. If valve stem protrudes more than 2.082 in (52.883 mm), replace valve seat or cylinder head.

*NOTE*

*If the valve seat is loose or is not fully seated in the head, seat movement will prevent the proper transfer of heat from the valve. The valve seat surface must be flush with (or below) the head surface. See 3.2 SPECIFICATIONS for valve seat-to-cylinder head fit.*

## Valve Guides

1. Clean valve guides by lightly honing with VALVE GUIDE HONE (Part No. B-45525).
2. Scrub valve guides with VALVE GUIDE CLEANING BRUSH (Part No. HD-34751) and hot soapy water. Measure valve stem outer diameter and valve guide inner diameter. Check measurements against See 3.2 SPECIFICATIONS.

## Valve Springs

1. Inspect valve springs for damaged or discolored coils.

*NOTE*

*A single valve spring is used for each valve. The inner and outer springs are combined into one progressively wound, tapered spring.*

2. See Figure 3-58. Check free length of each spring with caliper as shown. Test compression force of spring using VALVE SPRING TESTER (Part No. HD-96796-47). Compare with 3.2 SPECIFICATIONS. If spring length is shorter than specification, or if spring compression force is below specification, replace spring.

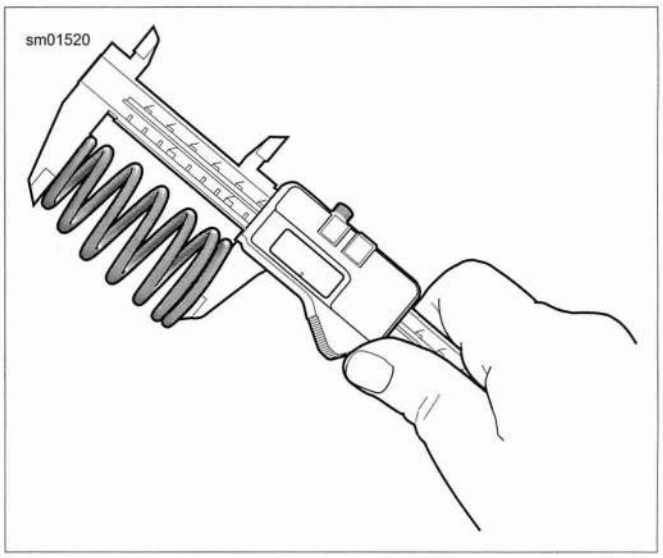



**Figure 3-58. Checking Spring Free Length**

## Spark Plug Threads

Inspect spark plug threads for damage. If threads in cylinder head are damaged, a special plug type insert can be installed using a 12 mm spark plug repair kit.

## Push Rods

Examine push rods, particularly the ball ends. Replace any rods that are bent, worn, discolored, or damaged.

## REPLACING ROCKER ARM BUSHINGS

| PART NUMBER | TOOL NAME |
|---|---|
| HD-94804-57 | ROCKER ARM BUSHING REAMER |

1. See Figure 3-59. To replace worn bushings, press or drive them from the rocker arm. If bushing is difficult to remove, turn a 9/16-18 tap into bushing. From opposite side of rocker arm, press out bushing and tap using a discarded rocker arm shaft.
2. Press replacement bushing into rocker arm, flush with rocker arm end, and split portion of bushing towards top of rocker arm.
3. Using remaining old bushing as a pilot, line ream **new** bushing with ROCKER ARM BUSHING REAMER (Part No. HD-94804-57).
4. Repeat for other end of rocker arm.

**Table 3-30. Cylinder Bore Service Wear Limits**

| BORE SIZE | XL 883 | | XL 1200* | |
|---|---|---|---|---|
| | in | mm | in | mm |
| 0.010 in (0.25 mm) OS bore | 3.0128 | 76.525 | 3.5100 | 89.154 |
| ***XR 1200X:** Oversized pistons are not available. Replace piston and/or cylinder if exceeds wear limits. | | | | |

*NOTE*

*If piston clearance exceeds service limit, cylinders should be re-bored and/or honed to next standard oversize, and refitted with the corresponding piston and rings. Do not fit piston tighter than 0.0007 in (0.018 mm). See 3.2 SPECIFICATIONS.*

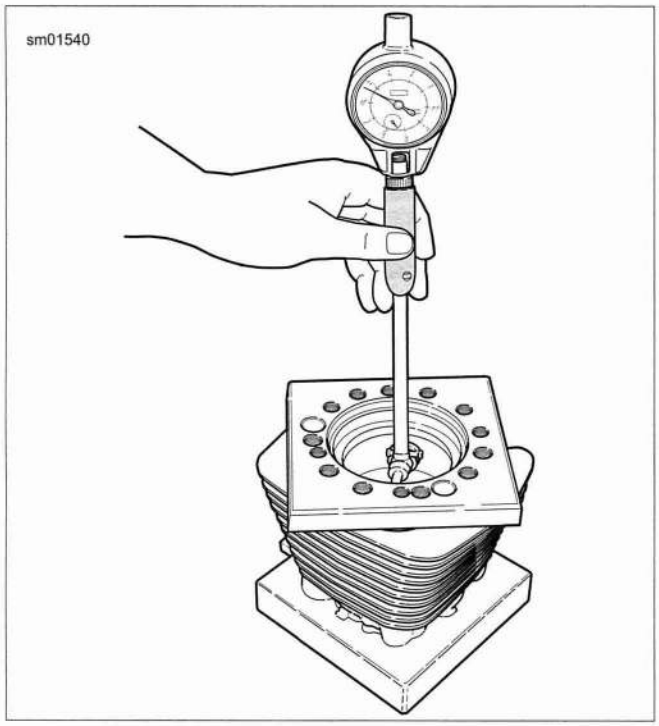



**Figure 3-74. Measuring Cylinder Bore**

## Measuring Piston to Cylinder Fit

*NOTES*

- *This measurement is heat sensitive. Both piston and cylinder must be at room temperature. Holding the piston in your hand for too long can cause measurements to vary by as much as 0.002 in (0.051 mm).*
- *See Figure 3-75. the measurement is taken on bare aluminum to avoid measuring errors. An oval-shaped opening in the coating is present on each side of the piston for placement of the micrometer.*
- *See Figure 3-76. The oval openings are too small for a standard flat anvil micrometer. Use a 3-4 inch blade or ball anvil style micrometer, or a 4-5 inch micrometer with spherical ball anvil adapters.*

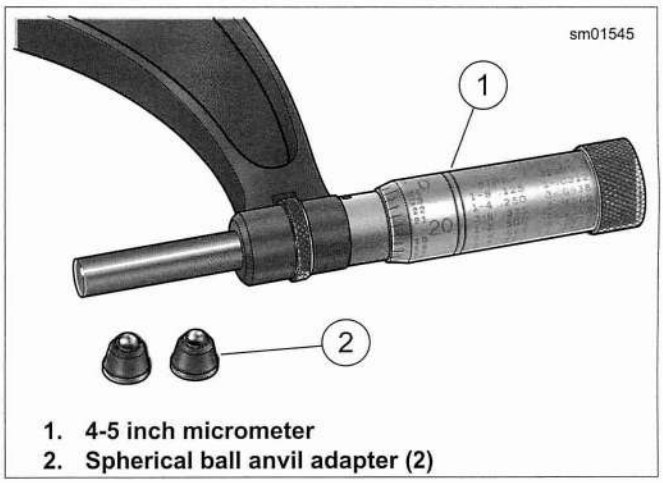
1. Measure the piston skirt at the oval openings and then transfer that measurement to a dial bore gauge.

*NOTE*

*The torque plates must be installed on the cylinder.*

2. Using a grease pencil, mark the top, middle and bottom of the piston ring travel zone in the cylinder bore. Measure at markings in cylinder parallel and perpendicular to crankshaft.
3. Replace piston and/or cylinder if running clearance exceeds 0.003 in (0.076 mm).


**Figure 3-75. Measurement Area (typical)**




1. **4-5 inch micrometer**
2. **Spherical ball anvil adapter (2)**

**Figure 3-76. Micrometer with Anvil Adapters**

## CYLINDER HEAD

*NOTES*

- *Push rod covers and lower cover retainers MUST be installed prior to installing cylinder heads. See 3.17 TOP END OVERHAUL: ASSEMBLY, Push Rods, Covers, and Retainers.*
- *Thoroughly clean and lubricate threads of cylinder head screws before installation. Friction caused by dirt and grime will result in a false torque indication.*

1. Coat mating surfaces of cylinder base studs and head bolts with parts cleaning solution.
2. Scrape old oil and any carbon deposits from threads by using a back-and-forth motion, threading each head screw onto its mating cylinder stud.
3. Remove head bolts from studs. Wipe or blow dry thread surfaces.
4. Thoroughly clean and dry gasket surfaces of cylinder and cylinder head.

*NOTE*

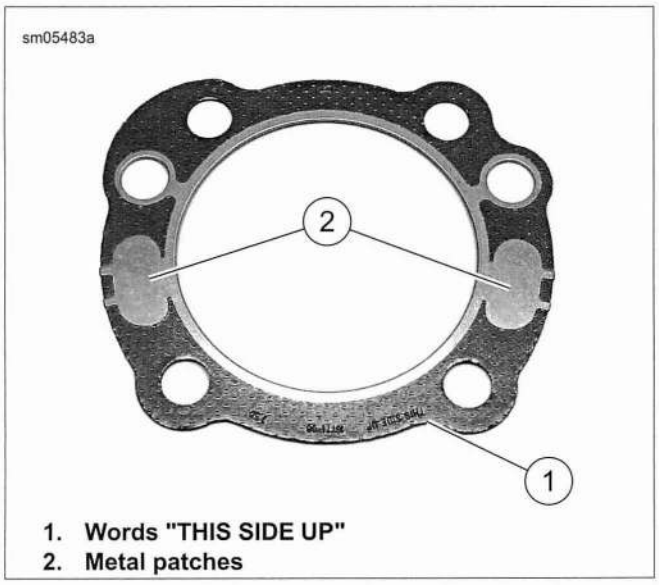
***XR 1200X:*** *See Figure 3-94. The cylinder head gasket has metal patches (2) that must be installed against the cylinder head. When installing the gasket on the cylinder, be sure the words "THIS SIDE UP" (1) and the metal patches (2) are visible.*

5. See Figure 3-95. Install a **new** head gasket to cylinder.
6. Carefully lower cylinder head over studs and position on dowels. Use great care so as not to disturb head gasket.

*NOTE*

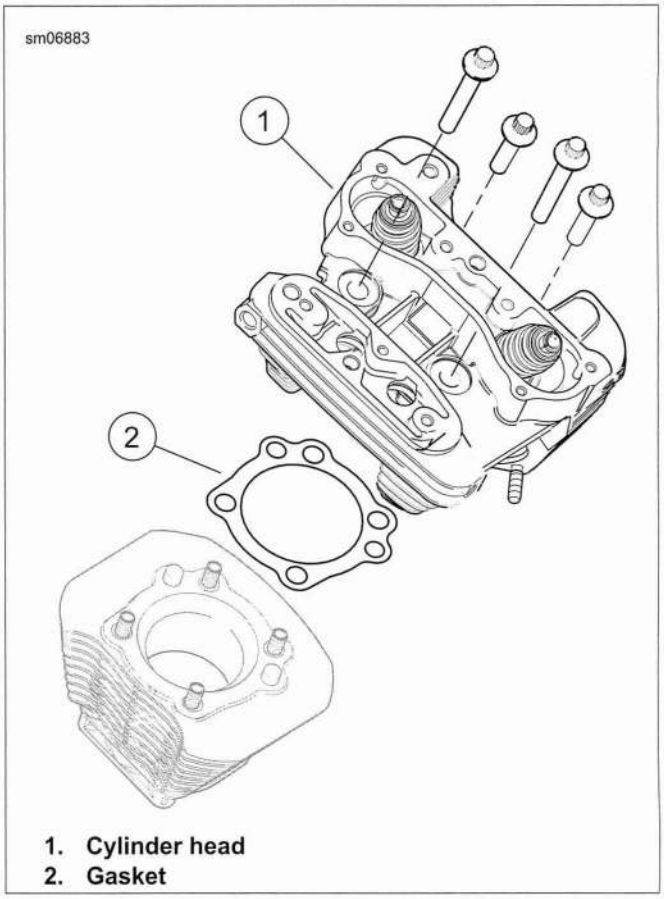
*Only oil film must remain on the cylinder head screw surfaces. Too much oil will pool in the head screw sleeve preventing full thread engagement.*

7. Lightly coat threads, underside of flange and bottom face of cylinder head bolts in clean Harley-Davidson 20W50 engine oil. Wipe off excess oil.
8. Start cylinder head bolts onto cylinder studs, two short bolts on left side of engine, two long bolts on right. Tighten all bolts only finger tight at this time.




1. **Words "THIS SIDE UP"**
2. **Metal patches**

**Figure 3-94. Cylinder Head Gasket: XR 1200X**



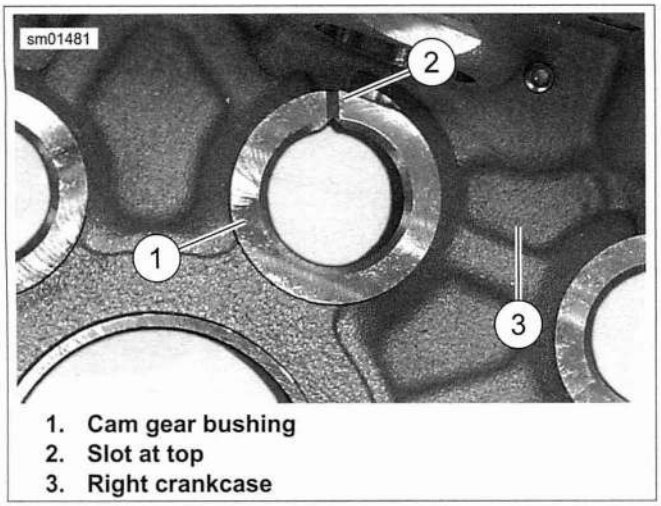

1. **Cylinder head**
2. **Gasket**

**Figure 3-95. Cylinder Head Installation**

*NOTE*

*The procedure for tightening the head screws is critical to proper distribution of pressure over gasket area. It prevents gasket leaks, stud failure, and head and cylinder distortion.*

9. See Figure 3-96 and Figure 3-97. For each cylinder head, start with bolt numbered one, as shown. In increasing numerical sequence (i.e.: 1, 2, 3, 4), tighten head bolts in the following steps:
   a. Tighten each bolt to 96-120 **in-lbs** (11-14 Nm).
   b. Tighten each bolt to 13-15 ft-lbs (18-20 Nm).
   c. **Loosen all bolts.**
10. After head bolts are loosened from initial torque, tighten bolts in three stages. Tighten in increasing numerical sequence (i.e.: 1, 2, 3, 4), as follows:
    a. Tighten each bolt to 96-120 **in-lbs** (11-14 Nm).
    b. Tighten each bolt to 13-15 ft-lbs (18-20 Nm).
    c. See Figure 3-98. Mark cylinder head and head bolt shoulder with a line (1).
    d. Tighten each bolt an additional 85-95 degrees (2).
11. **XR 1200X:** Install Precision Cooling oil lines. See 3.13 PRECISION COOLING SYSTEM: XR 1200X, Cylinder Head Oil Return Lines.




1. Cam gear bushing
2. Slot at top
3. Right crankcase

**Figure 3-113. Cam Gear Bushing Installed in Crankcase**

## Cam Gear Bushings (Except Rear Intake Bushing) in Gearcase Cover

1. Using an arbor press, install each bushing in its gearcase cover bore so that bushing shoulder contacts cover boss. There is no need to orient these particular bushings in any specific position of rotation within gearcase cover bores.
2. After you install a **new** bushing in gearcase cover, line-ream the bushing to correct size. See 3.19 GEARCASE, Bushing Reaming: XL Only.

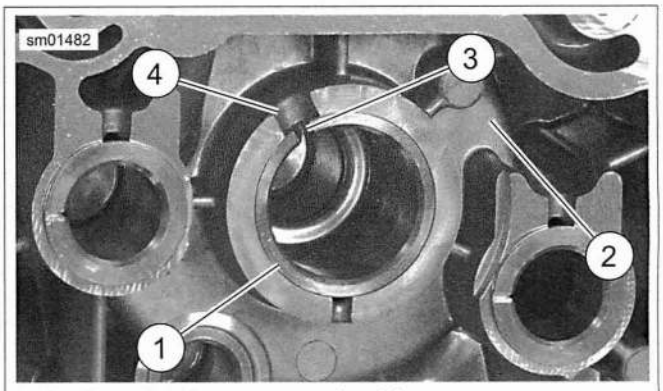
## Rear Intake Cam Gear Bushing in Gearcase Cover

Rear intake cam gear bushing must be installed in its gearcase cover bore using an arbor press. You will need to orient the bushing in a specific position of rotation within the cover bore.

1. See Figure 3-114. Position bushing (1) over bore of gearcase cover (2) with chamfered edge downward and slot upward. Align slot in bushing with slot in gearcase cover boss. Press bushing into cover bore until bushing is flush with cover boss.
2. After you install the **new** bushing in the gearcase cover, line-ream the bushing to the correct size. See 3.19 GEARCASE, Bushing Reaming: XL Only.

## Pinion Shaft Bushing in Gearcase Cover

1. See Figure 3-111. Using an arbor press, install pinion shaft bushing (16) in gearcase cover (17) so that bushing is flush with cover boss. There is no need to orient this particular bushing in any specific position of rotation within the gearcase cover bore.
2. See Figure 3-115. Although the original pinion shaft bushing is not "pinned," the replacement bushing must be secured from possible rotation within the cover bore, by installation of a dowel pin Drill a No. 31 hole, 0.281 in (7.14 mm) deep, at top side of boss (side toward top of gearcase cover), centering the drill bit on the cover bore circle (hole is drilled half in bushing O.D. and half in cover bore I.D.).
3. Drive a **new** dowel pin no more than 0.20 in (5.1 mm) below the bushing face. Carefully peen edges of hole to lock the pin in place.
4. After you install a **new** bushing in gearcase cover, line-ream the bushing to the correct size. See 3.19 GEARCASE, Bushing Reaming: XL Only.




1. Rear intake cam gear bushing
2. Gearcase cover
3. Cam bushing slot
4. Gearcase cover slot

**Figure 3-114. Rear Intake Cam Gear Bushing Installed in Gearcase Cover**

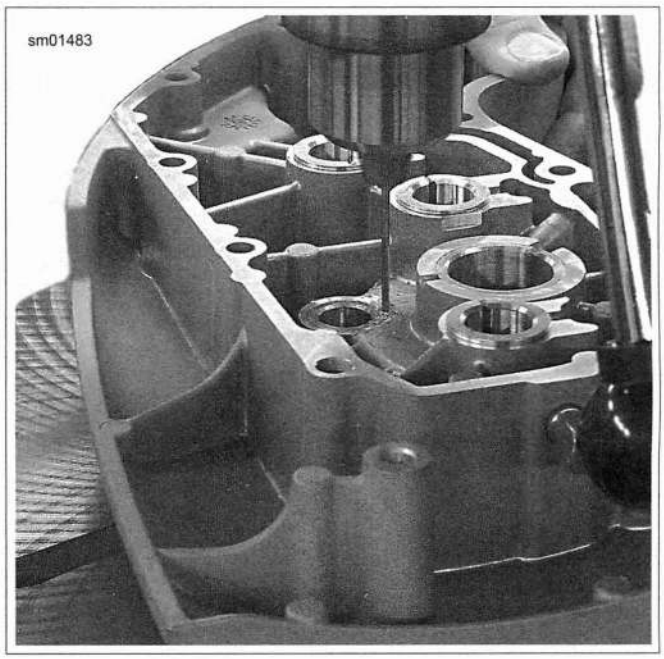


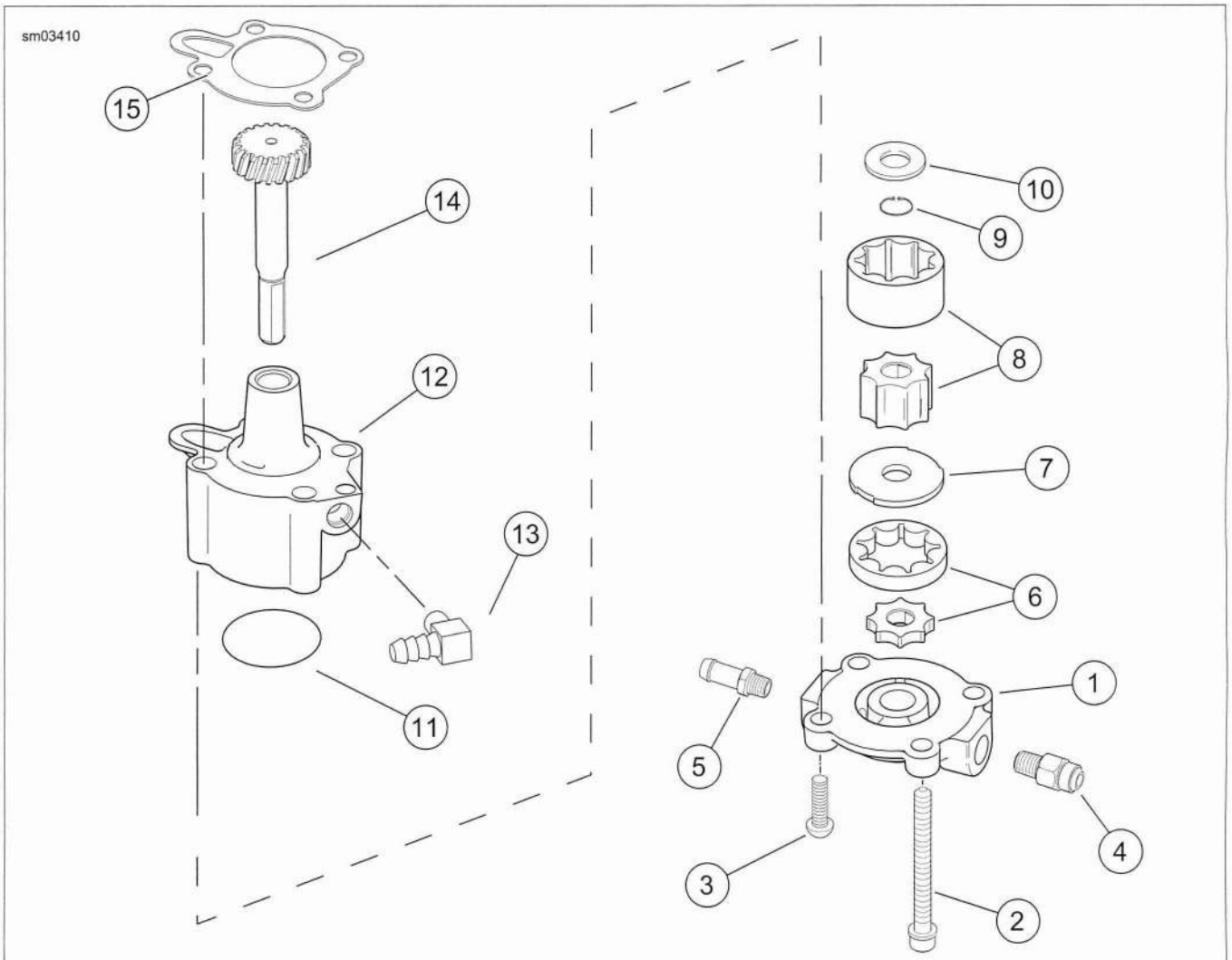

**Figure 3-115. Drilling Pinion Bushing Dowel Pin Hole in Gearcase Cover**

## GENERAL

The oil pump seldom needs servicing. Before you disassemble an oil pump suspected of not producing adequate oil pressure, be sure that all possible related malfunctions have been eliminated.

1. Make sure all oil line connections are tight and that lines are not pinched or damaged.
2. Check level and condition of oil in tank. Pressure will be affected if oil is diluted. In freezing weather, proper circulation of oil can be affected if the oil feed line becomes clogged with ice or sludge.
3. Check for a grounded oil pressure switch wire [120] or faulty switch if oil pressure indicator light fails to go out with engine running.

See 3.7 ENGINE LUBRICATION SYSTEM, 3.25 OIL TANK and 6.32 OIL PRESSURE SWITCH.




1. Oil pump cover
2. Screw w/ washer (2)
3. Torx screw (2)
4. Connector
5. Hose fitting
6. Feed gerotor set
7. Gerotor separator plate
8. Scavenge gerotor set
9. Retaining ring
10. Thrust washer
11. O-ring
12. Oil pump body
13. Elbow fitting
14. Gear shaft
15. Gasket

**Figure 3-131. Oil Pump: XL Models**

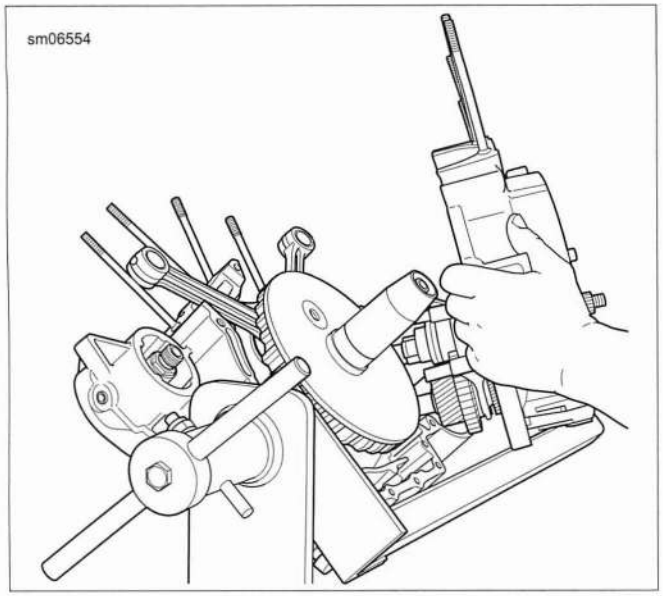



**Figure 3-148. Assembling Crankcases with Crankshaft Guide Tool (Part No. HD-42326-B)**

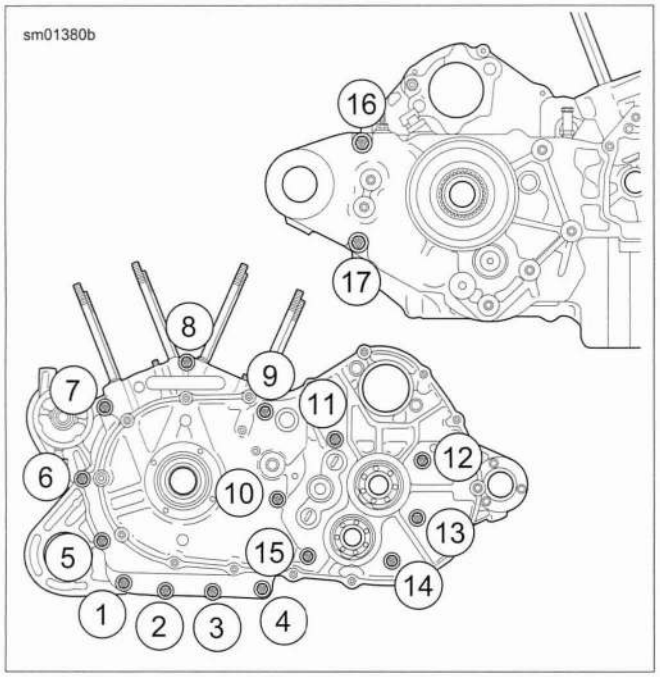



**Figure 3-149. Crankcase Fastener Torque Sequence**

7. See Figure 3-150 and Figure 3-151. Install spacer in I.D. of **new** seal. With the open (lipped) side of seal facing outward, center seal/spacer assembly over bearing bore.

*NOTES*

- *Do not remove the spacer after installation or the new seal will have to be discarded and the procedure repeated.*
- *The XR 1200X requires the use of the SPROCKET SHAFT ADAPTER (Part No. HD-42579-6).*

8. See Figure 3-152. Install bearing seal and spacer.
   a. Center seal/spacer driver (2) over seal, so that the sleeve (smaller O.D.) seats between seal wall and garter spring.
   b. Assemble SPROCKET SHAFT BEARING/SEAL INSTALLATION TOOL (Part No. HD-42579-A) (1) and SPROCKET SHAFT SEAL/SPACER INSTALLER (Part No. B-45676-A) onto sprocket shaft.
   c. Rotate handle clockwise until the spacer makes contact with the bearing. Remove tool from sprocket shaft.
9. Install retaining ring into groove in sprocket shaft bearing bore.

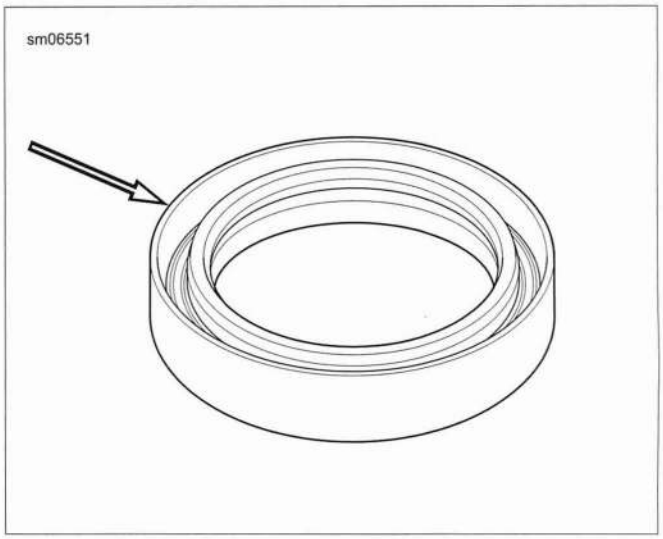



**Figure 3-150. Open Side of Seal Faces Out**

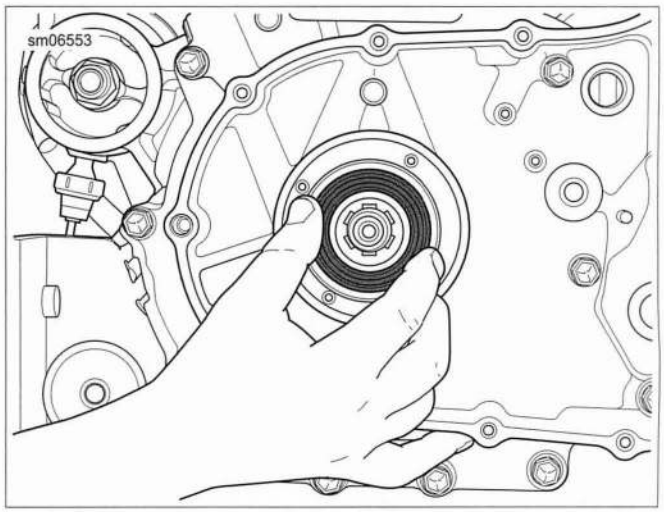



**Figure 3-151. Install Spacer and Seal**

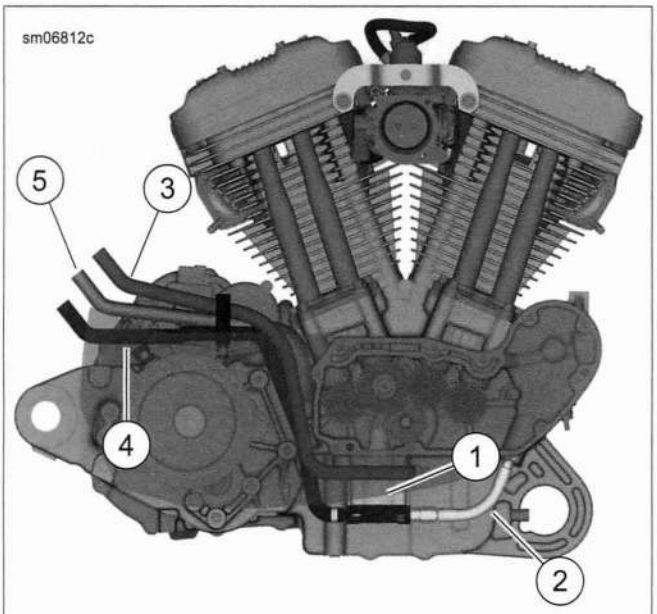
## PRESSURE RELIEF VALVE

The oil tank has a pressure relief valve in the top of the tank. If the vent line is pinched, restricted or if the tank is overfilled, excessive pressure is created in the oil tank. The valve opens if the pressure in the tank exceeds 10 psi (68.9 kPA).

## OIL LINE ROUTING: XL MODELS

See Figure 3-170. The feed, vent and return ports are located on the bottom of the oil tank to reduce under seat congestion An oil line routes the oil from the feed port at the lower right front corner to a fitting on the oil pump.

From the feed section of the oil pump, another feed line directs the flow up to the oil filter mount. Eventually, oil drains to the sump where it collects in the scavenge section of the oil pump. The return line routes the oil back to the tank where the cycle is repeated.



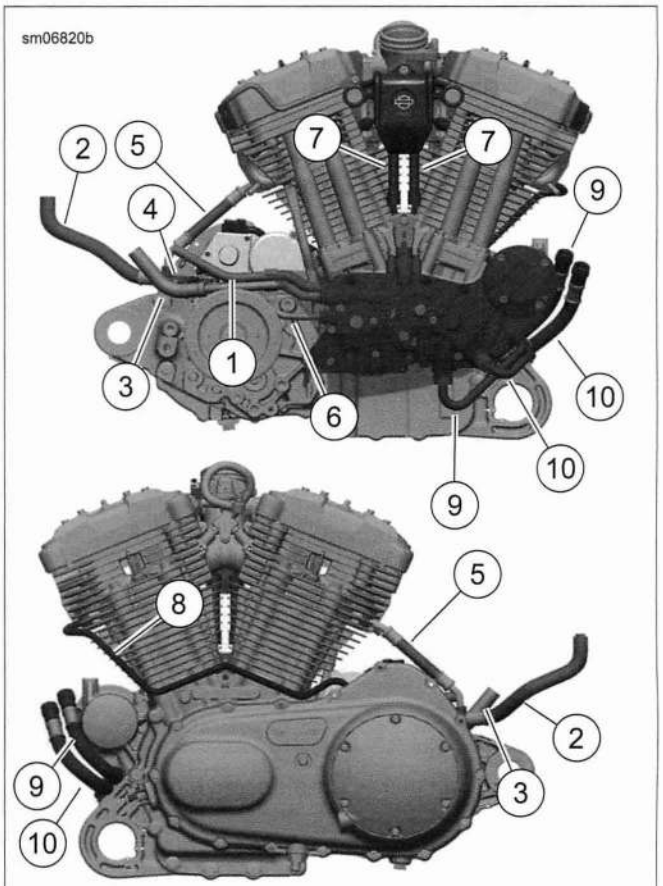

1. Oil pump
2. Oil feed line
3. Return oil line
4. Feed oil line
5. Vent line

**Figure 3-170. Engine Hose Routing: XL Models**

## OIL LINE ROUTING: XR 1200X

See Figure 3-171. The feed, vent and return ports are located on the bottom of the oil tank to reduce under seat congestion. An oil line routes the oil from the feed port at the lower right front corner to a fitting on the oil pump.

Oil travels to the feed pump through an internal passage in the pump housing. The feed pump pushes oil to the oil cooler, oil filter, and cylinder heads. Oil used for lubricating internal engine components eventually drains into the sump where the scavenge pump collects it and routes it back to the oil tank. Oil used to cool the cylinder heads joins with return oil from the scavenge pump and is also returned to the oil tank. See 3.7 ENGINE LUBRICATION SYSTEM, Oil Flow: XR 1200X.




1. Vent line
2. Return oil to tank
3. Oil feed line
4. Return oil manifold
5. Rear cylinder head return oil line
6. Return oil from pump
7. Cylinder head feed oil lines
8. Front cylinder head return oil line
9. Oil from oil cooler
10. Oil to oil cooler

**Figure 3-171. Engine Oil Line Routing: XR 1200X**

## REMOVAL

1. Remove seat.
2. Remove left side cover. See 2.18 LEFT SIDE COVER.

**⚠WARNING**

**Prevent accidental vehicle start-up, which could cause death or serious injury. First disconnect negative (-) battery cable at engine and then positive (+) cable from battery. (00280b)**

3. Disconnect negative (-) battery cable from ground stud on crankcase. Disconnect positive (+) battery cables at battery.

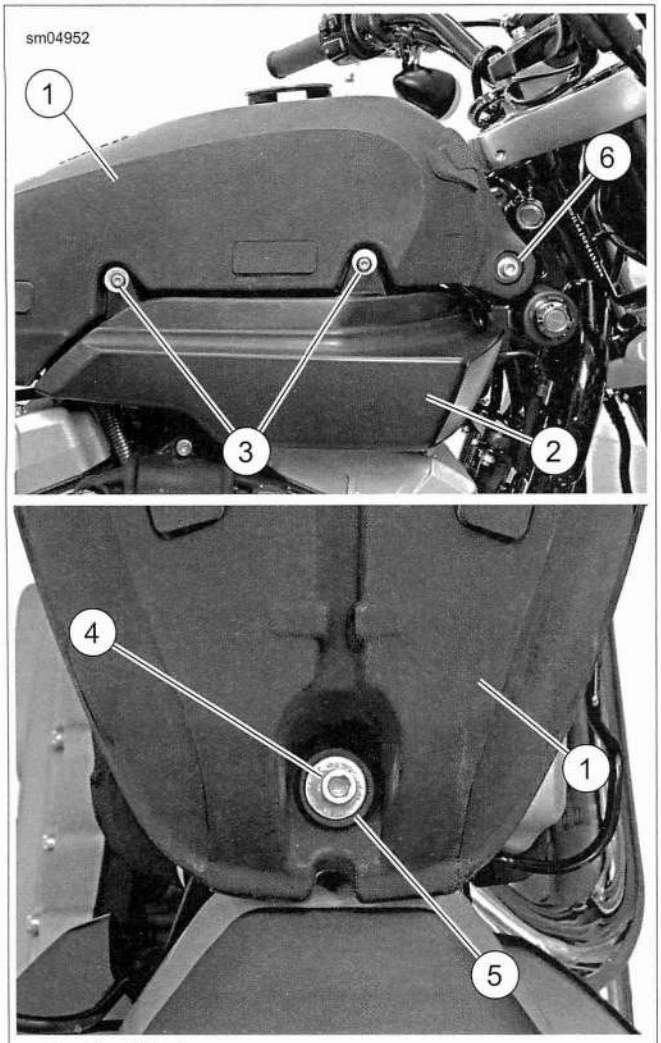
## SPECIFICATIONS

**Table 4-1. Capacities: XL 883 Models**

| ITEM | XL 883R | | XL 883L | | XL 883N | |
|---|---|---|---|---|---|---|
| | U.S. | METRIC | U.S. | METRIC | U.S. | METRIC |
| Fuel tank (total) | 3.3 gal | 12.5 L | 4.5 gal | 17.0 L | 3.3 gal | 12.5 L |
| Oil tank with filter | 2.8 qt | 2.6 L | 2.8 qt | 2.6 L | 2.8 qt | 2.6 L |
| Transmission (approximate) | 1.0 qt | 0.95 L | 1.0 qt | 0.95 L | 1.0 qt | 0.95 L |
| Low fuel warning light on | 0.8 gal | 3.0 L | 1.0 gal | 3.8 L | 0.8 gal | 3.0 L |

**Table 4-2. Capacities: XL 1200 Models and XR 1200X**

| ITEM | XL 1200C | | XL 1200L | | XL 1200N | | XL 1200X | | XR 1200X | |
|---|---|---|---|---|---|---|---|---|---|---|
| | U.S. | METRIC | U.S. | METRIC | U.S. | METRIC | U.S. | METRIC | U.S. | METRIC |
| Fuel tank (total) | 4.5 gal | 17.0 L | 4.5 gal | 17.0 L | 3.3 gal | 12.5 L | 2.1 gal | 7.9 L | 3.5 gal | 13.2 L |
| Oil tank with filter | 2.8 qt | 2.6 L | 2.8 qt | 2.6 L | 2.8 qt | 2.6 L | 2.8 qt | 2.6 L | 2.8 qt | 2.6 L |
| Transmission (approximate) | 1.0 qt | 0.95 L | 1.0 qt | 0.95 L | 1.0 qt | 0.95 L | 1.0 qt | 0.95 L | 1.0 qt | 0.95 L |
| Low fuel warning light on | 1 gal | 3.8 L | 1.0 gal | 3.8 L | 0.8 gal | 3.0 L | 0.65 gal | 2.5 L | 0.8 gal | 3.0 L |




1. **Fuel tank**
2. **Airbox**
3. **Screw w/washer (2)**
4. **Screw w/washer**
5. **Rubber grommet**
6. **Screw w/washers and locknut**

**Figure 4-15. Fuel Tank and Airbox Mounting Fasteners**

12. Lift fuel tank off motorcycle.

*NOTE*

*See Figure 4-18. Metal bushings (4) inside the grommets (3) may fall when fuel tank is lifted off vehicle. Make sure they do not fall out and become lost.*

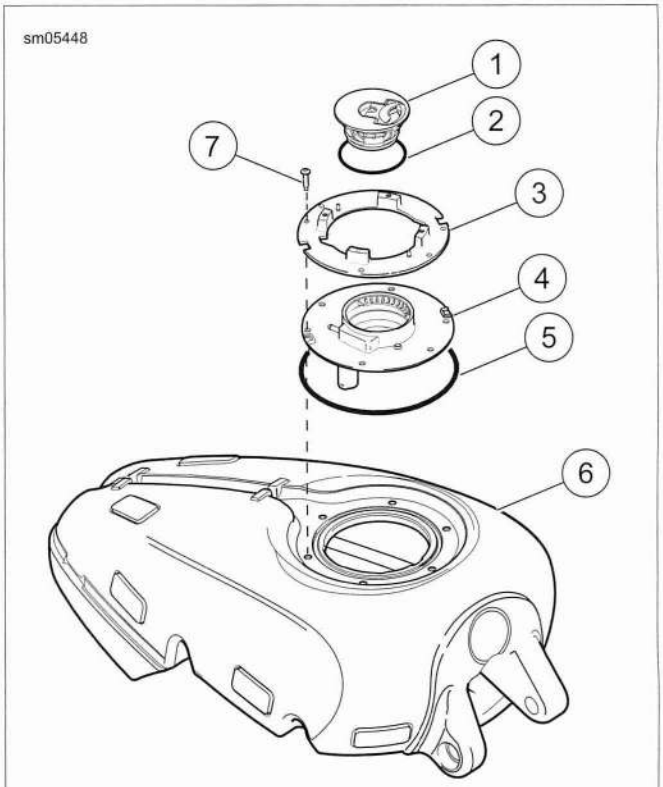
13. Remove fuel pump assembly from fuel tank. See 4.17 FUEL PUMP.

## DISASSEMBLE FUEL TANK

**⚠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. See Figure 4-16. Remove filler cap (1) with O-ring (2).
2. Remove screws (7) and clamp ring (3).
3. Remove top ring (4).
4. Remove O-ring (5).




1. **Filler cap**
2. **O-ring**
3. **Clamp ring**
4. **Top ring**
5. **O-ring**
6. **Fuel tank**
7. **Screw (6)**

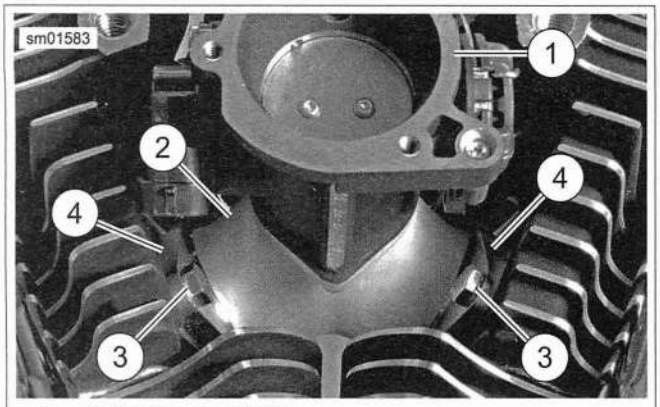
**Figure 4-16. Fuel Tank Assembly**

## CLEANING AND INSPECTION

**⚠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)**

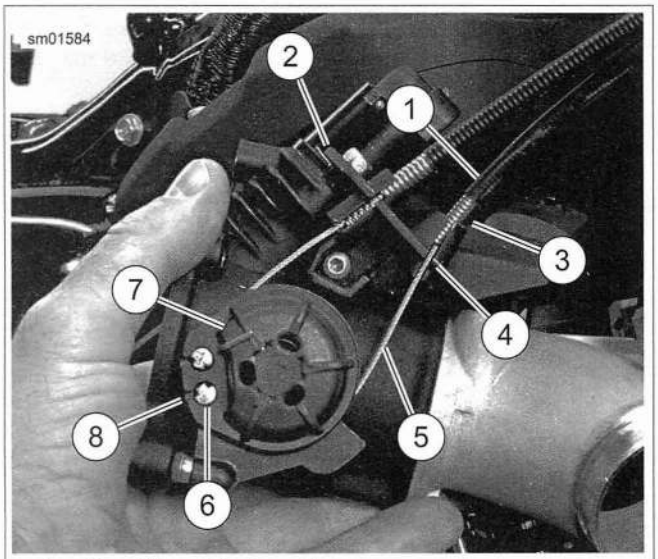
1. Clean fuel tank interior with commercial cleaning solvent or a soap and water solution. Shake fuel tank to agitate cleaning agent.
2. Thoroughly flush fuel tank after cleaning. Allow fuel tank to air dry.
3. Carefully inspect fuel hose and vent hose for damage, cuts, cracks, holes, wear or general deterioration. Replace as necessary.
4. Inspect the fuel tank for leaks or other damage. If a damaged fuel tank cannot be successfully repaired, replace it.




1. **Induction module**
2. **Intake manifold**
3. **Screw (2)**
4. **Mounting flange (2)**

**Figure 4-34. Intake Manifold Mounting Screws: Right Side**

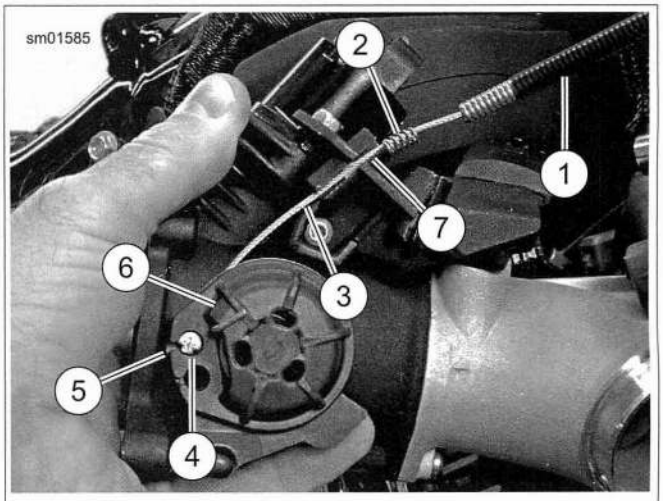
15. See Figure 4-35. Remove throttle cable (5) from throttle wheel (7)
    a. Lift throttle cable housing (1) up out of cable guide (3) in throttle/idle cable bracket (2).
    b. Slide throttle cable (5) out through slot (4) in cable guide.
    c. Unwind throttle cable from groove in throttle wheel (7).
    d. Slide cable out through slot (8) and remove throttle cable barrel (6) from throttle wheel.




1. **Throttle cable housing**
2. **Throttle/idle cable bracket**
3. **Cable guide**
4. **Slot**
5. **Throttle cable**
6. **Cable barrel**
7. **Throttle wheel**
8. **Slot**

**Figure 4-35. Removing/Installing Throttle Cable**

16. See Figure 4-36. In a similar fashion, remove idle cable (3) from throttle wheel (6):
    a. Lift idle cable housing (1) and spring (2) up out of cable guide (7) in throttle/idle cable bracket.
    b. Slide idle cable (3) out through slot in cable guide.
    c. Unwind idle cable from groove in throttle wheel (6).
    d. Slide cable out through slot (5) and remove idle cable barrel (4) from throttle wheel.
17. Remove induction module and intake manifold from vehicle.




1. **Idle cable housing**
2. **Spring**
3. **Idle cable**
4. **Cable barrel**
5. **Slot**
6. **Throttle wheel**
7. **Cable guide**

**Figure 4-36. Removing/Installing Idle Cable**

## DISASSEMBLY

| PART NUMBER | TOOL NAME |
|---|---|
| HD-25070 | HEAT GUN |

**⚠WARNING**

**Gasoline can drain from the fuel line when disconnected from induction module. 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. (00269a)**

1. Remove fuel hose, fuel rail and fuel injectors. See 4.16 FUEL INJECTORS.
2. See Figure 4-37. Remove screws (1, 2) and cable bracket (3) from induction module (4).

*NOTE*

*When removing the IAC, the mounting screws MUST be heated to soften the thread sealant and avoid breakage during removal. Use ONLY HEAT GUN (Part No. HD-25070) to heat the screws. NEVER use an open flame.*

11. Install main fuse and close left side cover. See 6.34 MAIN FUSE.
12. Road test vehicle.


1. IAC
2. O-ring
3. Pintle

**Figure 4-52. IAC and O-ring**

## REMOVAL: XR 1200X

| PART NUMBER | TOOL NAME |
|---|---|
| HD-25070 | HEAT GUN |

*NOTE*

*It is not necessary to remove the fuel tank, airbox or induction module from the vehicle in order to replace the IAC.*

**⚠WARNING**

**Gasoline can drain from quick-connect fitting when removing fuel line. 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. (00267a)**

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.6 FUEL TANK: XR 1200X.

**⚠WARNING**

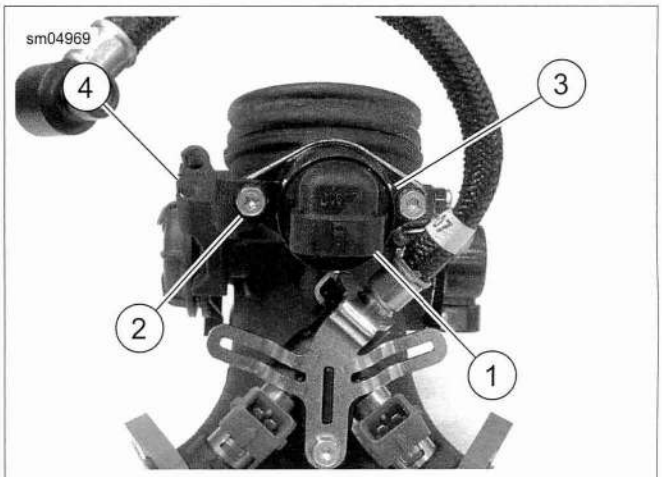
**To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)**

2. Unplug main fuse. See 6.34 MAIN FUSE.
3. See Figure 4-53. Unplug harness connector [87B] from IAC connector [87A] (1).

*NOTE*

*Screws (2) MUST be heated to soften the thread sealant and avoid breakage during removal. Use ONLY HEAT GUN (Part No. HD-25070) to heat the screws. NEVER use an open flame.*

4. Using a six-point socket (not a Torx wrench), remove two screws (2) in the following order:
   a. Heat fastener nearest to throttle bracket for two minutes using HEAT GUN (Part No. HD-25070). Remove screw.
   b. Heat remaining screw for one minute and remove.
5. See Figure 4-54. Grasp IAC and rotate counterclockwise until IAC mounting tab (1) clears throttle cable bracket (2).
6. With a gentle twisting motion, pull IAC straight out of induction module body.




1. IAC Connector [87A]
2. Screw (2)
3. IAC
4. Throttle cable bracket

**Figure 4-53. IAC Removal/Installation: XR 1200X**

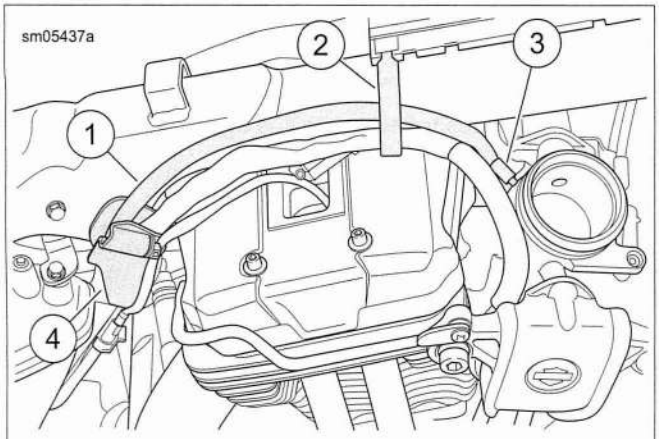
11. Install heat shields:
    a. Open worm drive clamps (13) and install heat shields (11, 12) on exhaust pipes. Position each clamp so that screw is on the outboard side in the most accessible position.
    b. **Models with Mid Controls:** See Figure 4-65. Tighten lower worm drive clamp (4) a few turns. Slide lower portion of bottom heat shield (2) into lower worm drive clamp. Engage upper portion of bottom heat shield into upper worm drive clamp (3).
    c. **All Models:** Tighten all exhaust pipe heat shield clamps securely.
    d. **HDI, England, Japan and Brazil Models:** Open worm drive clamps (15) and install muffler heat shields (14) on mufflers. Position each clamp so that screw is on the outboard side in the most accessible position. Tighten clamps securely.

7. Turn ignition switch ON and verify fuel pump is activated. Carefully inspect for leaks at quick-connect fitting. Turn ignition switch OFF.

**⚠WARNING**

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

8. **XL Models:** Install seat.




1. Purge hose
2. Clamp
3. Induction module fitting
4. Right wire harness caddy

**Figure 4-93. Purge Hose Routing**

## TROUBLESHOOTING

Refer to Table 5-4.

**Table 5-4. Clutch Troubleshooting**

| SYMPTOM | CHECK ORDER | CAUSE | REMEDY |
|---|---|---|---|
| Clutch slips | 1 | Incorrect clutch release adjustment | Check and adjust clutch release mechanism. |
| | 2 | Worn clutch plates | Check service wear limits. Replace plates. |
| Clutch drags | 1 | Incorrect clutch release adjustment | Check and adjust clutch release mechanism. |
| | 2 | Worn clutch release ramps or balls | Replace release ramps and/or balls. |
| | 3 | Warped clutch steel plates | Replace clutch steel plates. |
| | 4 | Blade worn or damaged clutch gear splines | Replace clutch gear or hub as required. |
| | 5 | Overfilled primary | Drain lubricant to correct level. |

## REMOVAL

| PART NUMBER | TOOL NAME |
|---|---|
| HD-38362 | SPORTSTER 5-SPEED SPROCKET LOCKING LINK |
| HD-46283 | PRIMARY DRIVE LOCKING TOOL |

**⚠WARNING**

**To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect battery cables (negative (-) cable first) before proceeding. (00307a)**

*NOTE*

*See Figure 5-10. If replacement of clutch pack (28) is the only service work required, perform REMOVAL Steps 1 and 4 only, and then proceed to the NOTES under DISASSEMBLY.*

1. Disconnect negative (-) battery cable from stud on engine crankcase behind starter motor assembly. See 1.16 BATTERY MAINTENANCE.
2. Open left side cover. See 2.18 LEFT SIDE COVER.
3. Remove positive (+) battery cable from battery positive (+) terminal. See 1.16 BATTERY MAINTENANCE.
4. Remove the primary cover. Discard the primary cover gasket. See 5.3 PRIMARY COVER.

*NOTE*

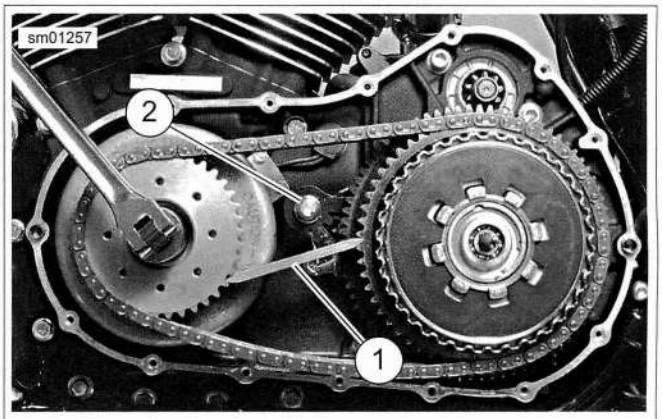
*See Figure 5-9. Do not position the sprocket locking link too close to the shifter shaft (2). If the sprocket locking link contacts the shifter shaft the sprocket locking link may damage the shifter shaft and/or the engine crankcase.*

5. Install a locking link:
   a. **XL 883 Models:** Use SPORTSTER 5-SPEED SPROCKET LOCKING LINK (Part No. HD-38362).
   b. **XL 1200 Models:** Use PRIMARY DRIVE LOCKING TOOL (Part No. HD-46283).
6. Remove the engine sprocket nut. Do not remove engine sprocket at this time.
7. See Figure 5-10. Remove large retaining ring (16). Remove adjusting screw assembly (12, 13, 14 and 15) from pressure plate (11).

*NOTE*

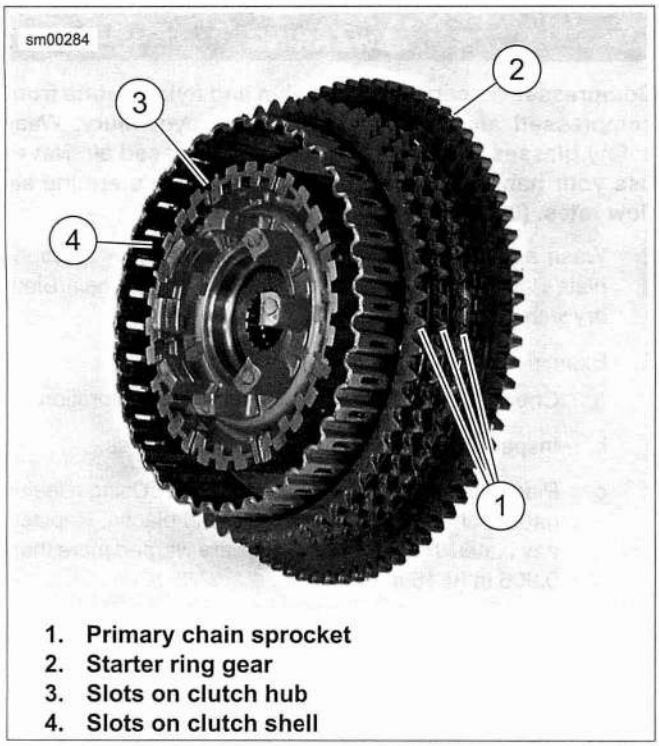
*Transmission mainshaft nut (7) has left-hand threads. Turn nut clockwise to loosen and remove from mainshaft.*

8. Remove mainshaft nut (7) and spring washer (6). Remove the clutch assembly, primary chain and engine sprocket as an assembly from the vehicle.
9. Inspect primary chain. Replace if worn or damaged.
10. Inspect stator and rotor. Replace if worn or damaged. See 6.25 ALTERNATOR.



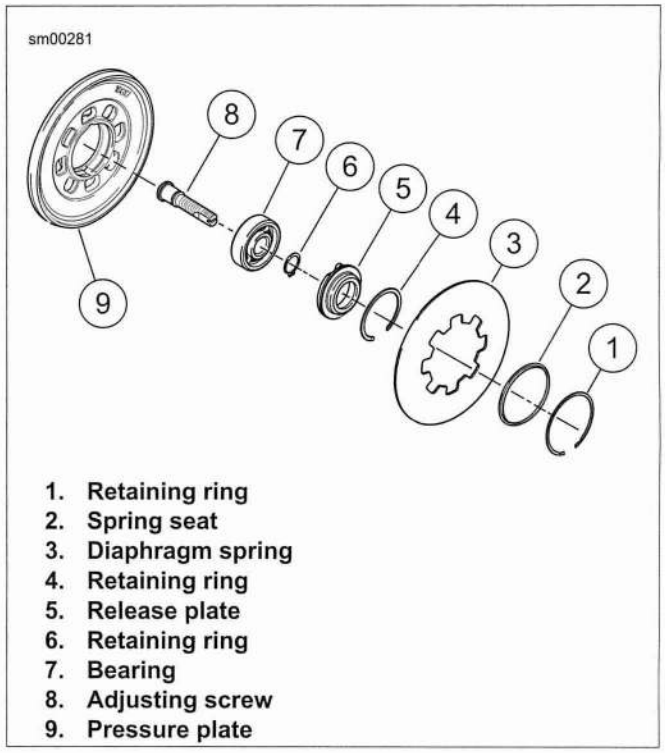

1. **Sprocket locking link**
2. **Shifter shaft**

**Figure 5-9. Using Sprocket Locking Link (Part No. HD-46283 or HD-38362) to Loosen Engine Sprocket Nut**




1. **Primary chain sprocket**
2. **Starter ring gear**
3. **Slots on clutch hub**
4. **Slots on clutch shell**

**Figure 5-23. Checking Clutch Shell (Shell Removed from Primary Shaft)**




1. **Retaining ring**
2. **Spring seat**
3. **Diaphragm spring**
4. **Retaining ring**
5. **Release plate**
6. **Retaining ring**
7. **Bearing**
8. **Adjusting screw**
9. **Pressure plate**

**Figure 5-24. Adjusting Screw Assembly**

## ADJUSTING SCREW DISASSEMBLY/ASSEMBLY

1. See Figure 5-24. Remove adjusting screw assembly.
   a. Remove large retaining ring (1).
   b. Remove adjusting screw assembly from pressure plate (9).
2. If necessary, disassemble adjusting screw assembly.
   a. Remove and discard small retaining ring (6).
   b. Separate the adjusting screw (8) from the bearing (7) and release plate (5).
   c. Remove bearing (7) from release plate (5).
3. Replace components as required and reassemble adjusting screw assembly in reverse order.
4. Install adjusting screw assembly into pressure plate.
   a. See Figure 5-37. Align two tabs on perimeter of release plate with corresponding recesses (3) in pressure plate.
   b. Secure the adjusting screw assembly with **new** retaining ring.

## CLUTCH SHELL/HUB INSPECTION

1. Inspect engine sprocket for damage or excessive wear. Replace as required.
2. Disassemble adjusting screw assembly and inspect bearing, release plate, and adjusting screw. See 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Adjusting Screw Disassembly/Assembly.
3. Remove clutch hub from clutch shell. Inspect primary chain sprocket and the starter ring gear on the clutch shell.
4. Inspect slots that mate with the clutch plates on both clutch shell and hub.
5. See Figure 5-25. Inspect the clutch shell compensating spring set.

*NOTE*

*It is possible for the compensating springs to float and move during inspection. This condition is normal.*

6. See Figure 5-26. Inspect clutch shell needle bearing for smoothness. Rotate the clutch shell while holding the clutch hub. If bearing is rough or binds, it must be replaced. See 5.5 PRIMARY DRIVE AND CLUTCH: XR 1200X, Clutch Shell Bearing Replacement.
7. See Figure 5-27. Inspect clutch shell bearing inner race on the back side of the clutch hub for pitting and wear. If the inner race shows any signs of damage, the complete hub assembly must be replaced.
8. Replace damaged parts as necessary.

## GENERAL

See Figure 5-44. The transmission is a five-speed constant-mesh type housed in an extension of the crankcase. The transmission permits the rider to vary the ratio of engine speed-to-rear driving wheel speed in order to meet the varying conditions of operation.

The transmission is foot-operated by the gear shifter lever, which transmits the force through a gear shifter shaft. The shifter shaft actuates a pawl and a shifter fork drum. The shifter fork drum moves shifter forks, which slide a series of shifter dogs on the mainshaft and countershaft, into and out of mesh with the other gears.

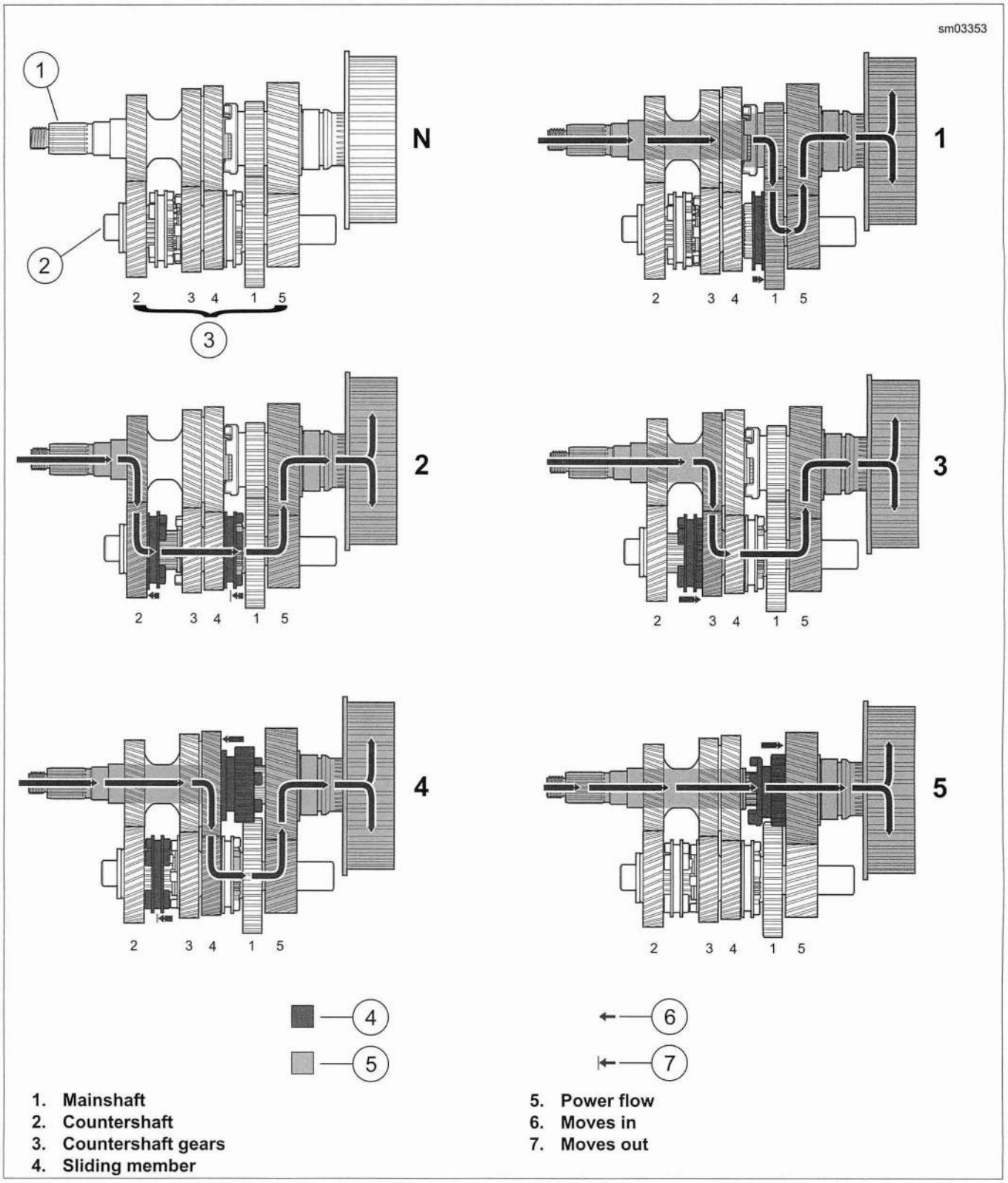
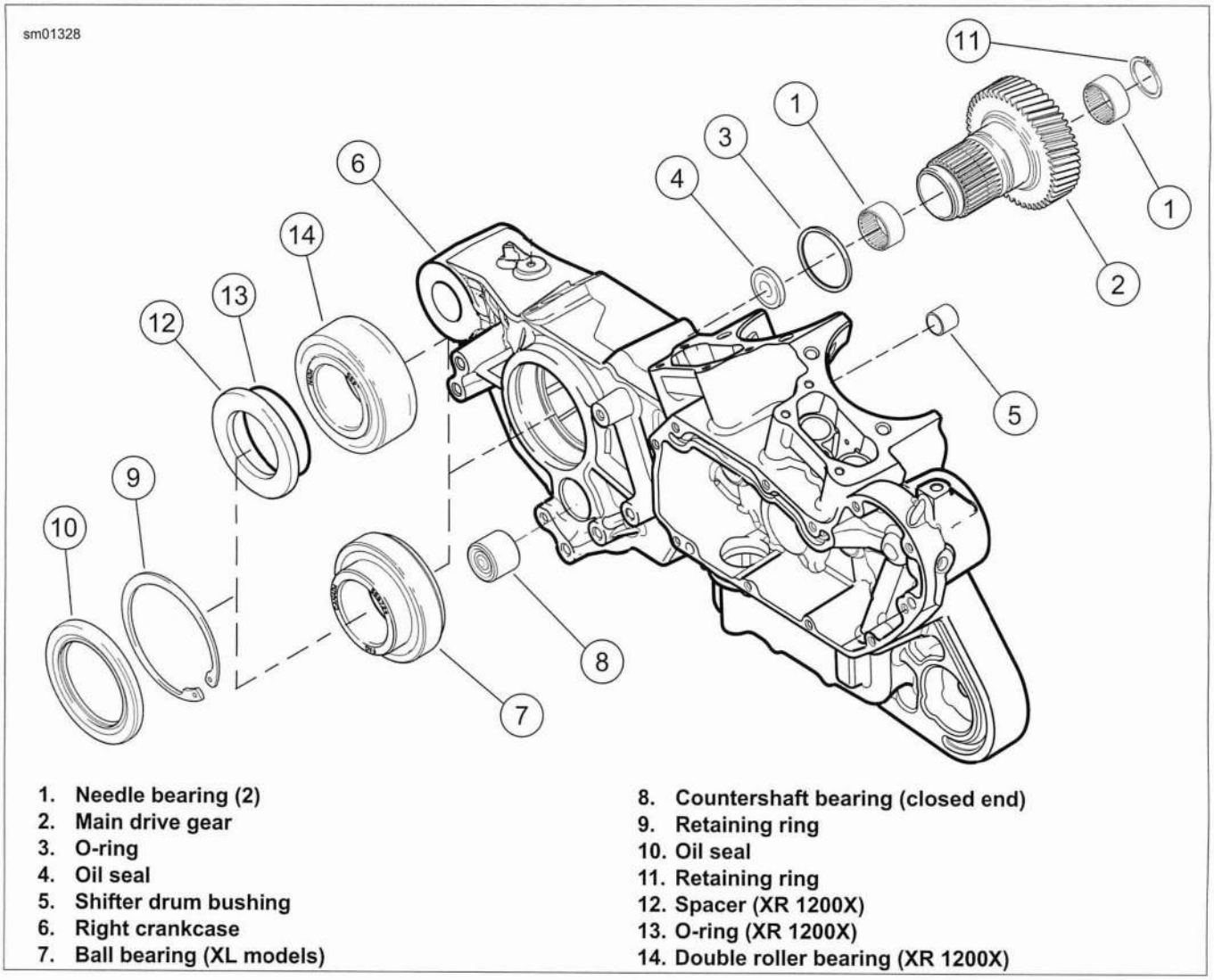



**Figure 5-44. Transmission Power Flow**

## GENERAL

*NOTE*

*See Figure 5-64. When removing the main drive gear (2), the gear is pressed out against the resistance of the bearing (7 or 14) inner race. Without any support at the inner race, the bearing is destroyed. Whenever the main drive gear is removed the main drive gear bearing must also be replaced.*




1. Needle bearing (2)
2. Main drive gear
3. O-ring
4. Oil seal
5. Shifter drum bushing
6. Right crankcase
7. Ball bearing (XL models)
8. Countershaft bearing (closed end)
9. Retaining ring
10. Oil seal
11. Retaining ring
12. Spacer (XR 1200X)
13. O-ring (XR 1200X)
14. Double roller bearing (XR 1200X)

**Figure 5-64. Main Drive Gear and Bearing Assembly**

## REMOVAL

| PART NUMBER | TOOL NAME |
|---|---|
| HD-95760-69A | BUSHING AND BEARING PULLER |
| HD-95765-69A | 1/2 INCH COLLET |

Split crankcases. See 5.8 CASE DISASSEMBLY FOR TRANSMISSION REMOVAL.

### Countershaft Needle Bearing

See Figure 5-86. From inside transmission case use appropriate bearing driver/puller to remove countershaft bearing (1) from crankcase bore.

### Shifter Drum Bushing

1. >See Figure 5-86. The shifter drum bushing (2) is a press fit in the right crankcase half. Inspect the bushing against the corresponding end of the shifter drum for proper fit and wear.
2. If bushing is to be replaced, use BUSHING AND BEARING PULLER (Part No. HD-95760-69A) with 1/2 INCH COLLET (Part No. HD-95765-69A) to remove bushing from crankcase bore.

## INSTALLATION

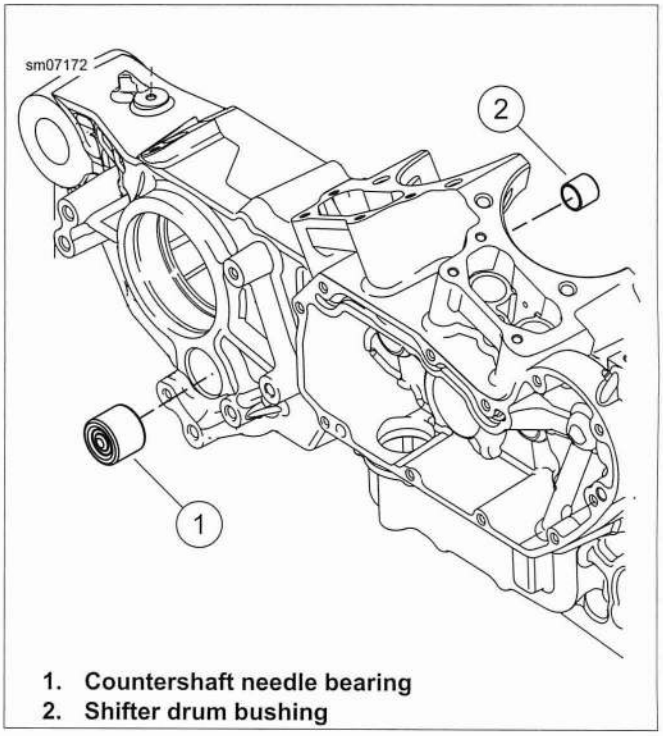
| PART NUMBER | TOOL NAME |
|---|---|
| A-157C | SNAP-ON BUSHING DRIVER SET |

### Countershaft Needle Bearing

1. Find a suitable bearing driver 1-1/4 inch in diameter.
2. See Figure 5-86. From the outside of the case place the countershaft bearing (1) open end first next to the bearing bore. Hold the driver squarely against the closed end of the bearing and tap the bearing into place. The bearing is properly positioned when it is driven flush or 0.030 in (0.762 mm) below the outside surface of the case.
3. Lubricate bearing with SCREAMIN' EAGLE ASSEMBLY LUBE (Part No. 94971-09).

### Shifter Drum Bushing

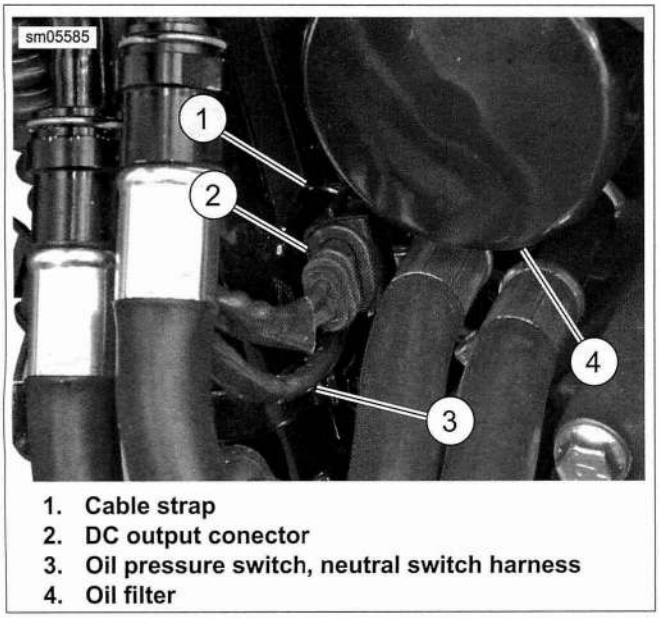
1. See Figure 5-86. Using SNAP-ON BUSHING DRIVER SET (Part No. A-157C) with a 1/2 inch adapter (Part No. A157-8), install a **new** shifter drum bushing (2).
2. Lubricate bushing with SCREAMIN' EAGLE ASSEMBLY LUBE (Part No. 94971-09).




1. **Countershaft needle bearing**
2. **Shifter drum bushing**

**Figure 5-86. Transmission Right Case Bearings**

# NOTES




1. Cable strap
2. DC output conector
3. Oil pressure switch, neutral switch harness
4. Oil filter

**Figure 6-9. DC Output Connector: XR 1200X**

# TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM) 6.9

## GENERAL

See Figure 6-20. The Turn Signal Module (TSM) has two major functions:

- Control turn signals.
- Serve as bank angle sensor.

The optional factory-installed security system provides the same functionality as the TSM, but also includes security and immobilization functions.

Two security system modules are available: The Turn Signal Security Module (TSSM) for Japan/Korea markets and the Hands Free Security Module (HFSM) for all other markets.

See the electrical diagnostic manual for complete details of the TSM/TSSM/HFSM features and functions.

*NOTE*

*The TSM/TSSM/HFSM cannot be repaired. Replace the unit if it fails.*

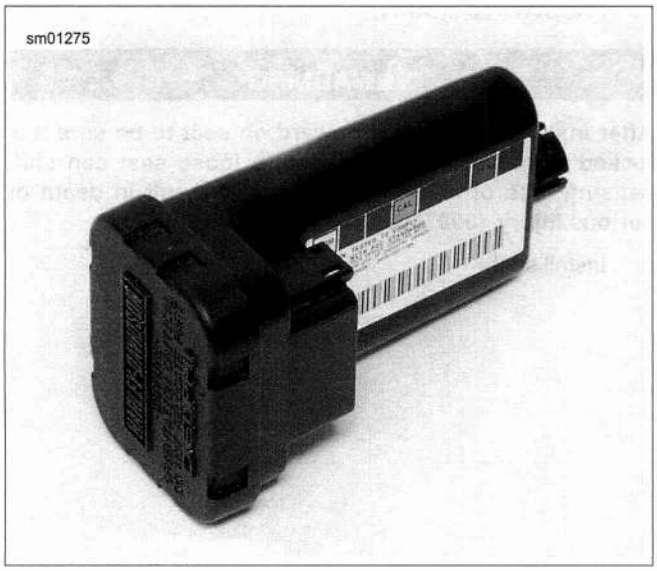
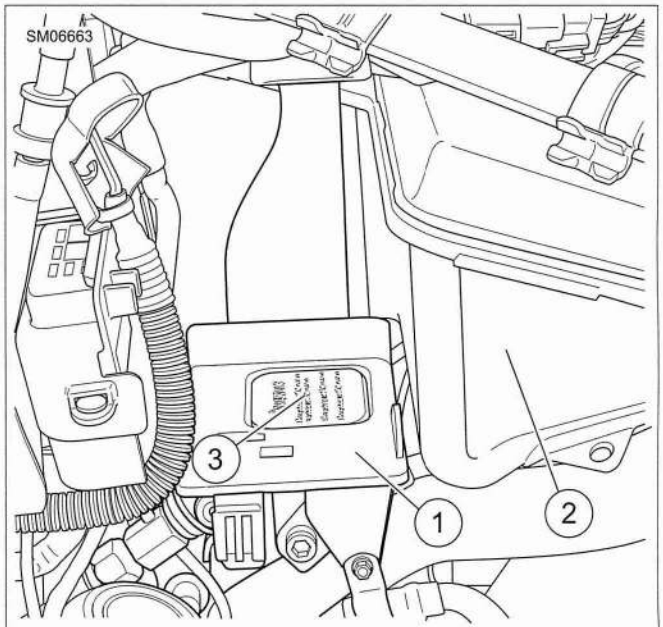



**Figure 6-20. TSM/TSSM/HFSM (TSM Shown)**

## TESTING

For diagnostic information, see the electrical diagnostic manual.




1. **Battery tray**
2. **Oil tank**
3. **TSM/TSSM/HFSM**

**Figure 6-21. TSM/TSSM/HFSM Location: All Models**

## REMOVAL

*NOTE*

*See Figure 6-21. The TSM/TSSM/HFSM (3) is located in a cavity in the bottom of the battery tray (1).*

1. Remove left side cover. See 2.18 LEFT SIDE COVER.
2. Remove battery. See 1.16 BATTERY MAINTENANCE.
3. Unplug wiring harness connectors: 4-pin connector [208] (HFSM only) has one latch. Unplug this connector first. Then unplug 12-pin connector [30B].
4. See Figure 6-22. Reach under the battery tray (1) and push upward on TSM/TSSM/HFSM (3) to lift it out of its cavity (2).
5. Remove TSM/TSSM/HFSM from vehicle.

## GENERAL

See Figure 6-34. A combination ignition and light switch is located on the right side of the frame in front of the fuel tank.

The motorcycle key unlocks the ignition/light switch. The rider rotates the key to select one of three positions. Refer to Table 6-9.

*NOTE*

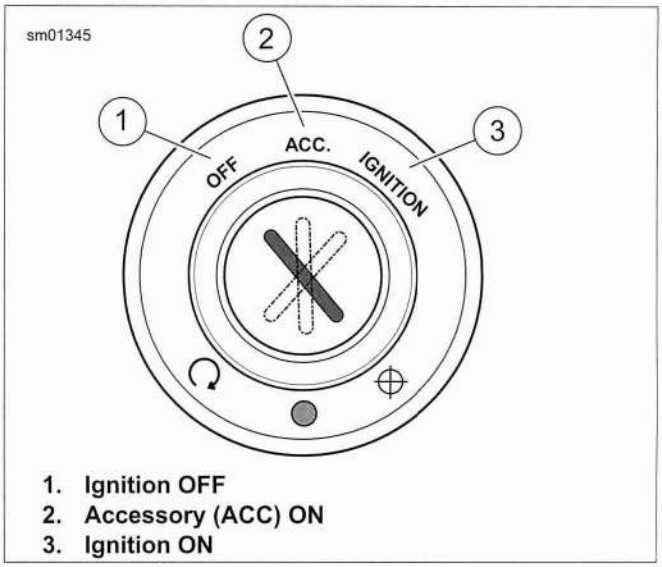
*The ignition/light switch cannot be repaired. Replace the unit if it fails.*

To lock the switch, the key is removed in either OFF or ACC.

To leave the 4-way flashers and the tail lamp on and lock the switch, the rider can remove the key in ACC. In ACC, the instrument (icon) lamps, 4-way flashers (front and rear directional), horn and brake lamp are on or can be activated. On HDI motorcycles the position lamp and taillight are on.

**⚠WARNING**

**The automatic-on headlamp feature provides increased visibility of the rider to other motorists. Be sure headlamp is on at all times. Poor visibility of rider to other motorists can result in death or serious injury. (00030b)**




1. **Ignition OFF**
2. **Accessory (ACC) ON**
3. **Ignition ON**

**Figure 6-34. Ignition/Light Switch**

**Table 6-9. Ignition Switch**

| SWITCH POSITION | FUNCTION |
|---|---|
| OFF | Ignition and lamps are off. Key may be removed. |
| ACC* | Instrument lamps are on. Brake lamp and horn can be activated. Key may be removed. |
| IGN | Ignition and lamps are on. |
| *International models have an additional function - position lamp and tail lamp are also on. | |

## REMOVAL

**⚠WARNING**

**To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)**

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.5 FUEL TANK: XL MODELS or 4.6 FUEL TANK: XR 1200X.

**⚠WARNING**

**To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)**

2. Unplug main fuse. See 6.34 MAIN FUSE.
3. See Figure 6-35. Remove ignition switch face nut (5).
4. Remove seat.
5. Remove fuel tank. See 4.5 FUEL TANK: XL MODELS or 4.6 FUEL TANK: XR 1200X.
6. Remove mounting screw (7). Remove switch cover (3). Remove switch (2) from switch cover (3).
7. Cut and discard cable strap securing switch harness to wire harness caddy. Cut switch wires 3.0 in (76.2 mm) from switch. Remove harness covering.

## INSTALLATION

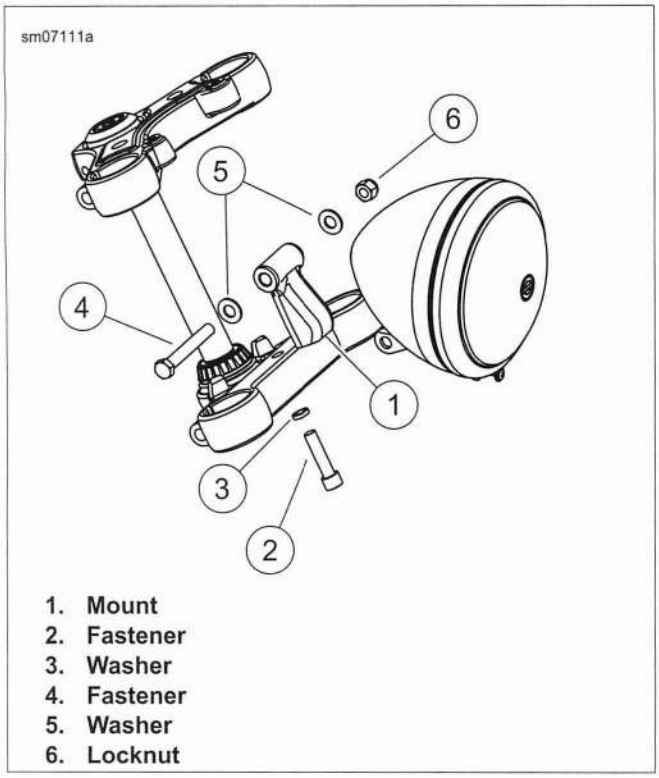
| PART NUMBER | TOOL NAME |
|---|---|
| HD-39969 | ULTRA TORCH UT-100 |

1. Slide replacement conduit on harness wires.

**⚠WARNING**

**Be sure to follow manufacturer's instructions when using the UltraTorch UT-100 or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00335a)**

2. Observing color codes, install seal splice connectors to harness wires. Complete sealed splice to **new** ignition

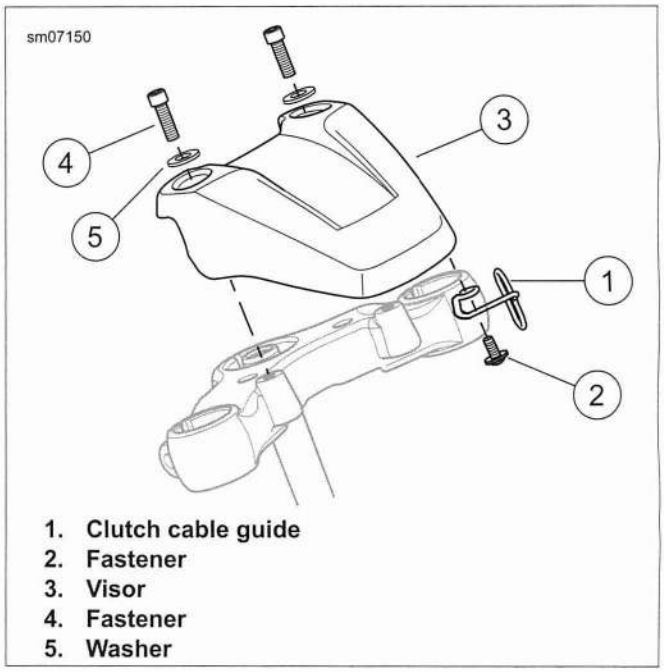



1. Mount
2. Fastener
3. Washer
4. Fastener
5. Washer
6. Locknut

**Figure 6-49. Headlamp Mount: XL 1200C/CP**

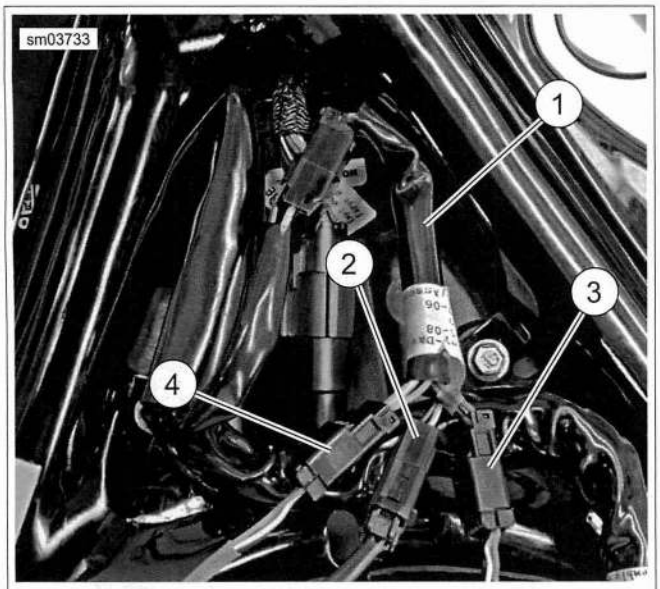
## Visor: XL 1200C/CP

1. See Figure 6-50. Install the clutch cable guide (1) with fastener (2) and tighten to 45-65 **in-lbs** (4.0-7.3 Nm).
2. Install the headlamp visor (3) with fasteners (4) and washers (5) and tighten to 120-192 **in-lbs** (13.6-21.7 Nm).



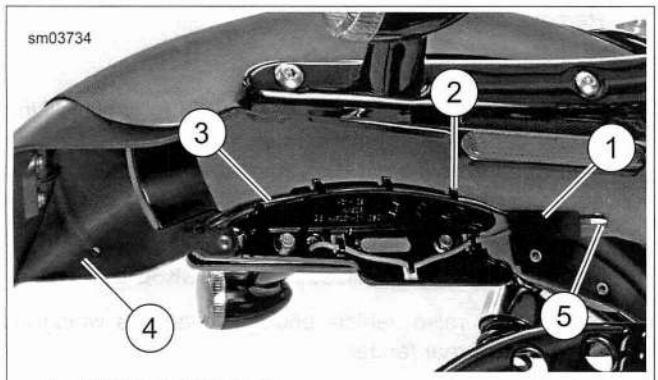

1. Clutch cable guide
2. Fastener
3. Visor
4. Fastener
5. Washer

**Figure 6-50. Headlamp Visor: XL 1200C/CP**



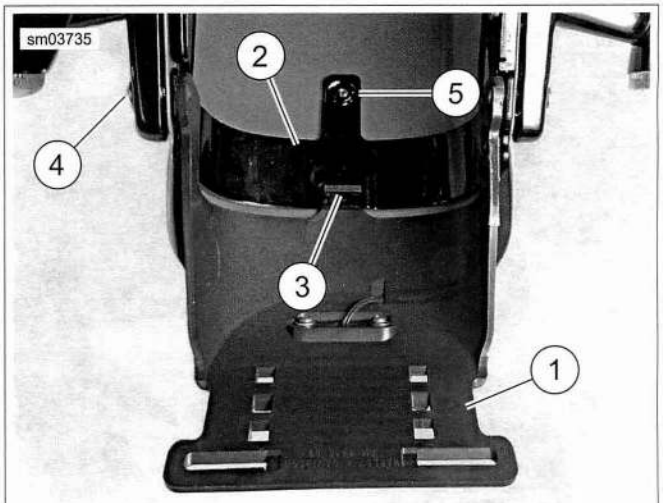

1. Interconnect harness
2. License plate lamp harness connector [40]
3. Right turn signal/brake/tail lamp harness connector [18]
4. Left turn signal/brake/tail lamp harness connector [19]

**Figure 6-66. Rear Lighting Interconnect Harness: XL 883N, XL 1200N/X (HDI)**




1. Harness bracket
2. Harness clip (3)
3. License plate lamp harness
4. License plate holder
5. Feedthrough hole

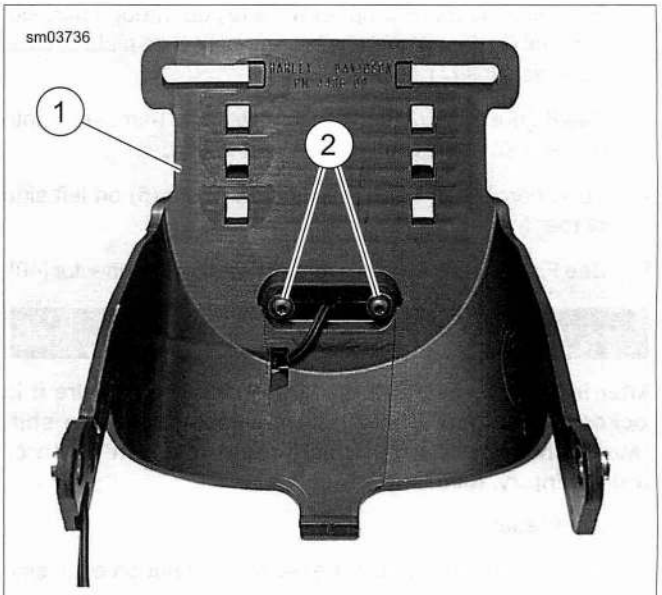
**Figure 6-67. License Plate Holder and Lamp Harness Mounting: XL 883N, XL 1200N/X (HDI)**




1. License plate holder
2. Rear fender brace
3. Tab
4. Fender support screw with washer (2)
5. Screw with washer

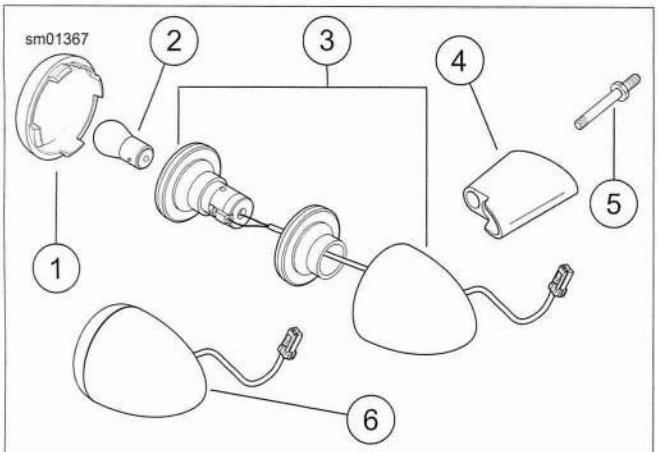
**Figure 6-68. License Plate Holder: XL 883N, XL 1200N/X (HDI)**

9. See Figure 6-69. Remove two screws with washers (2) securing license plate lamp housing to license plate holder (1). See Figure 6-70. Separate lamp housing (3) and gasket (2) from license plate holder (1).



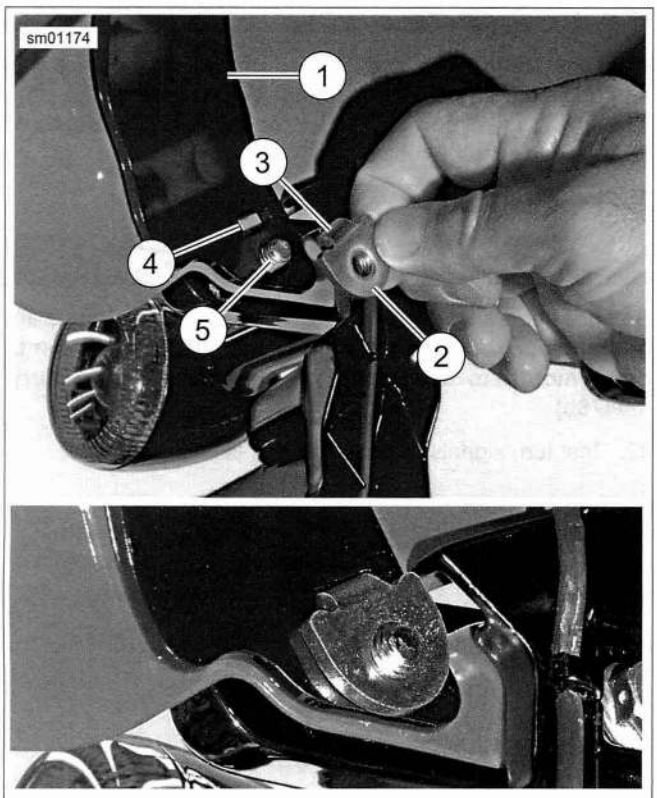

1. License plate holder
2. Screw with washer (2)

**Figure 6-69. License Plate Holder and Lamp Mounting Screws: XL 883N, XL 1200N/X (HDI)**




1. Lens
2. Bulb (element)
3. Rear turn signal housing
4. Mount
5. Turn signal stalk
6. Rear turn signal housing (sealed unit: XL 883N, XL 1200X, XL 1200N HDI)

**Figure 6-87. Rear Turn Signal Components**




1. Rear fender brace
2. Nut plate (2)
3. Tab
4. Slot
5. Mounting screw (2)

**Figure 6-88. Rear Fender Nut Plate: XL 883N/XL 1200N (DOM only)**

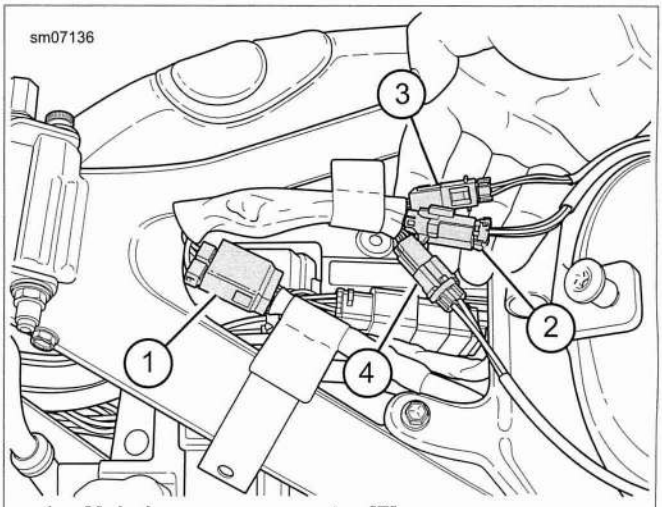
## XL 1200C/CP

### Removal

**⚠WARNING**

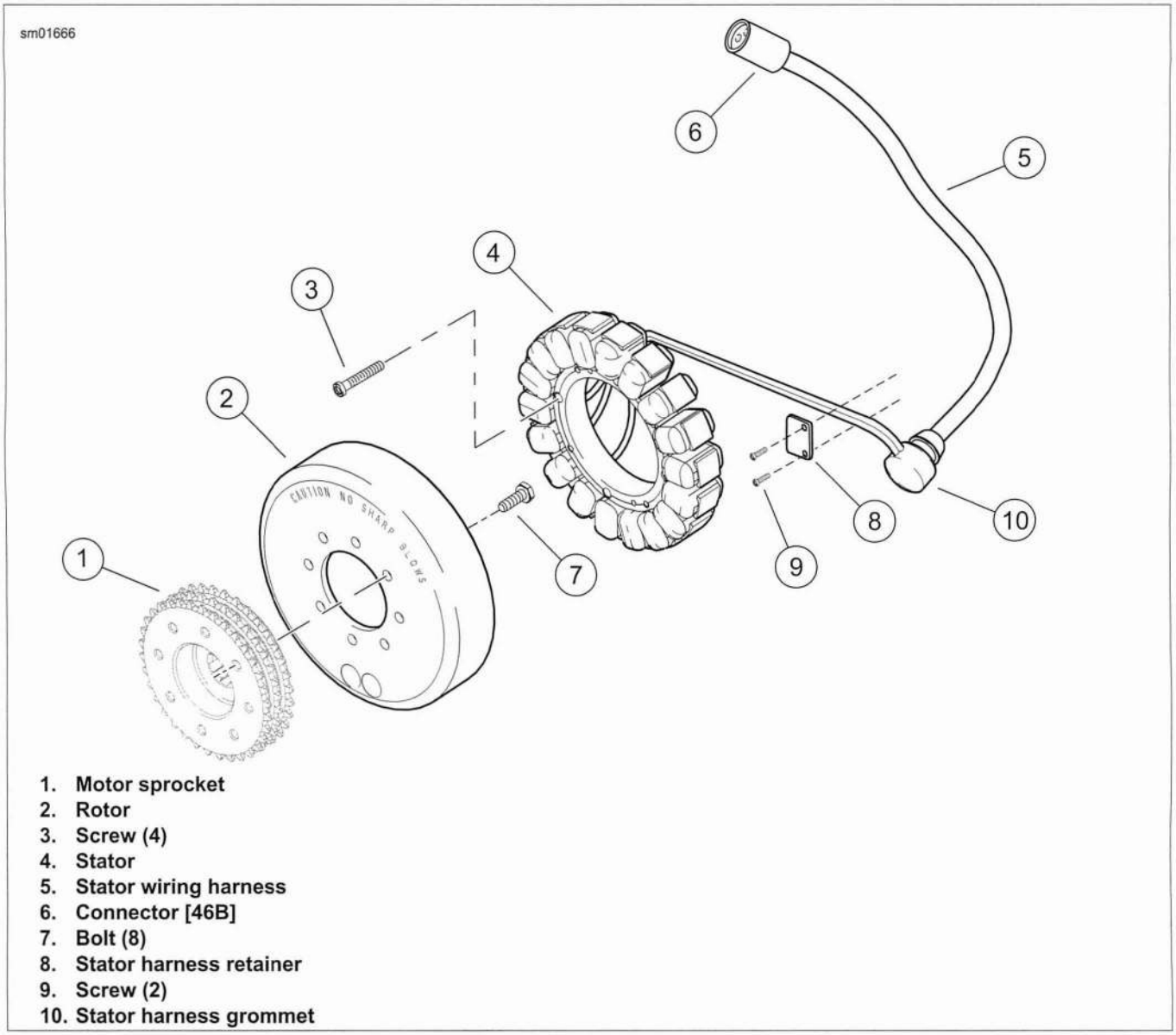
**To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)**

1. Remove main fuse.
2. Remove the seat.
3. Raise the rear wheel.
4. Remove the lower shock absorber mounting screws and nuts. See 2.24 SHOCK ABSORBERS.
5. Raise the motorcycle to access the underside of the rear fender.
6. See Figure 6-89. Separate the RH [18] (3) and LH [19] (4) turn signal connector housings.
7. Remove the turn signal wire harness from the RH and LH wire retention brackets.
8. Pull the harness connectors through the feed holes in the fender.
9. Remove screws, washers, nuts and nut plate.
10. Remove rear fender strut covers with attached turn signals.
11. Thread the wire harness through the holes in the fender and fender struts.
12. Unscrew and remove turn signal stalk and fender strut cover from each turn signal assembly.
13. Remove socket terminals from RH [18B] and LH [19B] turn signal connectors.




1. Main harness connector [7]
2. Tail lamp connector [40]
3. RH turn signal connector [18]
4. LH turn signal connector [19]

**Figure 6-89. Turn Signal Wire Harness: XL 1200C/CP**




1. **Motor sprocket**
2. **Rotor**
3. **Screw (4)**
4. **Stator**
5. **Stator wiring harness**
6. **Connector [46B]**
7. **Bolt (8)**
8. **Stator harness retainer**
9. **Screw (2)**
10. **Stator harness grommet**

**Figure 6-101. Alternator Components**

## CLEANING AND INSPECTION

1. Remove all foreign particles from rotor magnets. Clean rotor by wiping thoroughly with a clean cloth.
2. Replace rotor if magnets are cracked or loose, stator bolts have loosened and contacted rotor, or there is evidence of spline damage on the rotor center mounting bolt hole.
3. Clean stator, stator leads and grommet thoroughly with a clean cloth. Examine stator leads for cracked or damaged insulation.
4. Replace stator if there are any signs of contact with rotor, insulation is damaged or cracked, or stator fails any stator electrical tests. See the electrical diagnostic manual.

*NOTE*

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

## ASSEMBLY AND INSTALLATION

### Stator

1. See Figure 6-101. Feed stator wiring harness (5) with attached grommet (10) into open grommet hole in left crankcase half.
2. Apply a light coating of clean engine oil or chaincase lubricant to grommet. Press grommet into hole in left crankcase half.
3. Position stator (4) on left crankcase half. Secure stator using **new** TORX screws. Use TORX driver to tighten screws to 30-40 **in-lbs** (3.4-4.5 Nm).
4. Position stator harness retainer (8) over harness and onto engine crankcase with mounting holes facing aft. Secure with two screws (9). Make sure harness is not pinched. Tighten screws to 56 **in-lbs** (6.3 Nm) (maximum). Do not exceed torque specification.

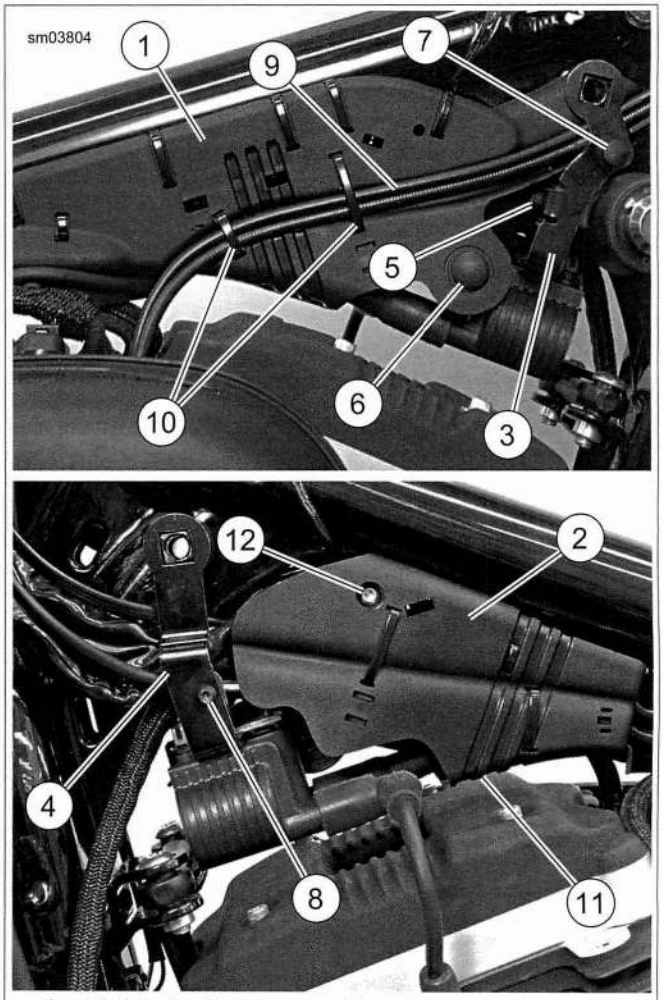
## GENERAL

The wire harness caddy consists of a matched pair of caddies located under the fuel tank. This assembly supports handlebar control harness connectors [22] and [24], instruments connector [20], headlamp connector [38] and front turn signals connector [31]. This caddy assembly also supports the rear spark plug cable, main harness, engine sub-harness and throttle cables.

## WIRE HARNESS CADDY: XL MODELS

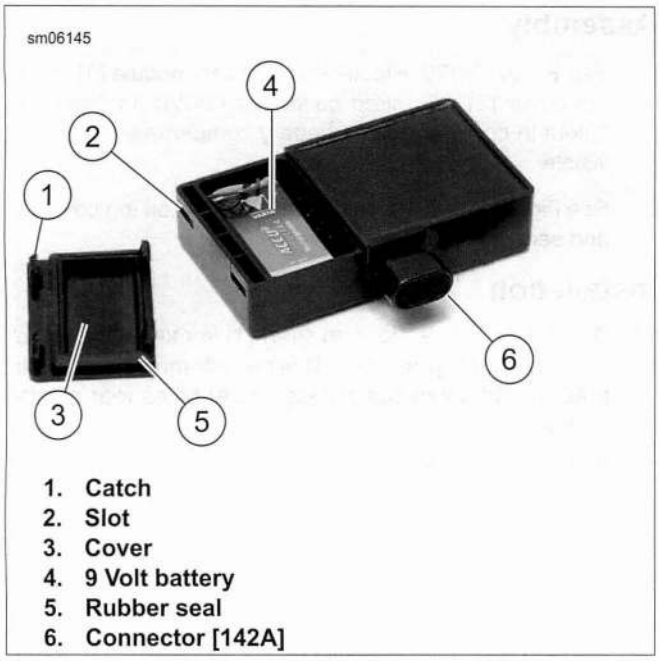
See Figure 6-111. The wire harness caddy assembly (1, 2) is secured to the ignition switch bracket (3) with two push-in fasteners (6, 7), and to the frame with mounting tabs hooked onto a bracket under the frame backbone tube.

See Figure 6-112. The left and right wire harness caddies are locked together with three tabs and secured with a screw.




1. Right wire harness caddy
2. Left wire harness caddy
3. Ignition switch bracket
4. Coil bracket
5. Screw w/lockwasher (lockwasher between bracket and switch housing)
6. Push-in fastener, large
7. Push-in fastener, small
8. Screw
9. Throttle cable (2)
10. Cable strap (2)
11. Tab (3) (engage left and right caddies)
12. Screw

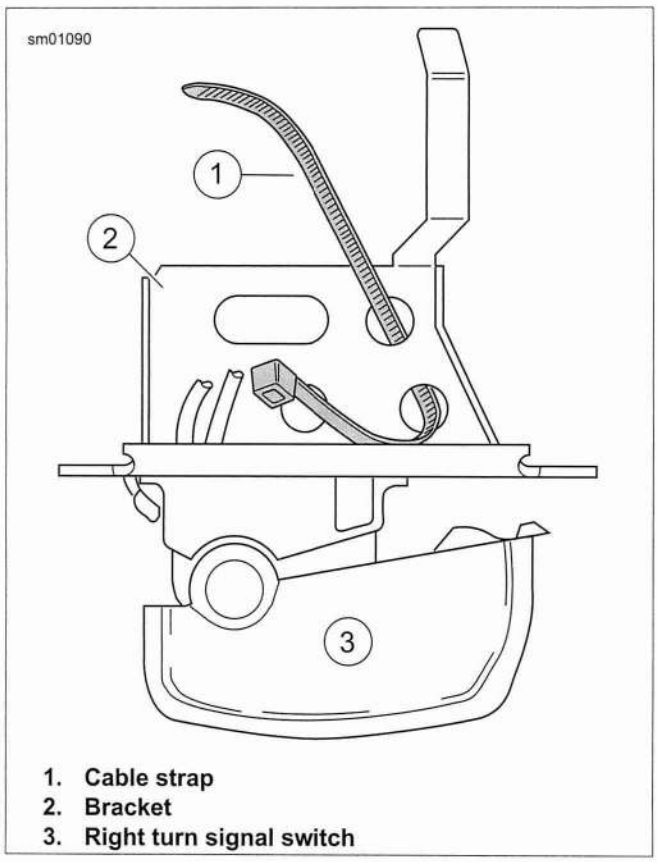
**Figure 6-111. Wire Harness Caddy Assembly**




1. Catch
2. Slot
3. Cover
4. 9 Volt battery
5. Rubber seal
6. Connector [142A]

**Figure 6-130. Siren Battery Compartment**

7. Tighten screw to secure bracket inside housing.
8. Route wire bundle to upper switch housing by gently pressing conduit into channel next to angular arm of bracket. Secure bundle to arm using third cable strap. Cut any excess cable strap material. If necessary, bend angular arm of bracket downward to firmly secure front stoplight switch in position.
9. See 6.36 RIGHT HANDLEBAR SWITCHES, Installation.
   a. If lower housing switches were replaced, perform the entire procedure.
   b. If upper housing switches were replaced, begin with step 11.




1. **Cable strap**
2. **Bracket**
3. **Right turn signal switch**

**Figure 6-143. Insert Cable Strap in Switch Bracket**

## INSTALLATION

1. See Figure 6-144. Push the throttle and idle control cables into the lower switch housing until they snap in place. Note the different diameter inserts crimped into the end of the throttle and idle cable housings.
   a. Push the silver insert (2) of throttle cable housing into the hole in front of tension adjuster screw (3).
   b. Push the gold insert (1) of idle cable housing into the hole at the rear of tension adjuster screw (3).

*NOTE*

*To aid assembly, place a drop of light oil on the retaining rings of the crimped inserts. Always replace the retaining rings if damaged or distorted.*

2. See Figure 6-145. Route the cable (2) to the upper switch housing as shown.
3. Slide the throttle control 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 in (3.2 mm).
4. With the concave side facing upward, install the friction shoe so that the pin hole is over the point of the adjuster screw.

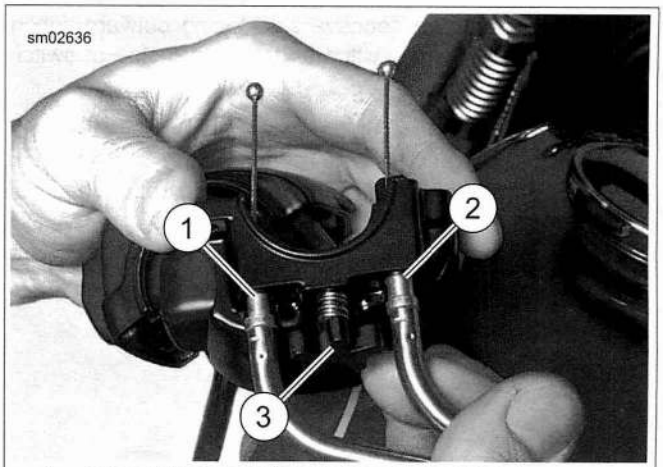
*NOTE*

*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. See Figure 6-146. Position lower switch housing beneath the throttle control grip. Install the brass ferrules (4) onto the cable so that the end fittings seat in the ferrule recess. Seat the ferrules in their respective notches (3) on the throttle control grip. Verify that the cables are captured in the grooves (2) molded into the grip.
6. Position the upper switch housing over the handlebar and lower switch housing.
7. Verify that the wire harness conduit runs in the depression at the bottom of the handlebar. Be sure that the upper switch housing harness will not be pinched under the handlebar when the switch housing screws are tightened.
8. Start the upper and lower switch housing screws, but do not tighten.

***NOTICE***

**Do not remove or install the master cylinder assembly without first positioning a 5/32-inch (4 mm) thick insert between the brake lever and lever bracket. Removing or installing the master cylinder assembly without the insert in place may result in damage to the rubber boot and plunger on the front stoplight switch. (00324a)**




1. **Idle cable insert (gold insert, rear hole)**
2. **Throttle cable insert (silver insert, front hole)**
3. **Tension adjuster screw**

**Figure 6-144. Right Lower Switch Housing**

## GENERAL

If the ECM or TSM/HFSM is faulty, replace the unit. See 6.8 ELECTRONIC CONTROL MODULE (ECM) or 6.9 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM). Then, to determine if password learn is necessary, refer to Table 6-14.

**Table 6-14. Password Learn**

| DEVICE REPLACED | IS PASSWORD LEARN NECESSARY? |
|---|---|
| ECM | Yes |
| TSM | No * |
| TSM/HFSM | Yes |
| * If a TSM has been replaced by a HFSM, or a HFSM has been replaced by a TSM, password learn is necessary. | |

## PASSWORD LEARN

| PART NUMBER | TOOL NAME |
|---|---|
| HD-48650 | DIGITAL TECHNICIAN II |

To perform the password learn procedure, refer to Table 6-15. When finished, continue with all instructions under 6.39 H-DSSS ACTUATION.

**TSM/HFSM:** Always perform all appropriate instructions under 6.39 H-DSSS ACTUATION after TSM/HFSM replacement or removal.

**TSM/TSSM (Japan/Korea markets):** Always perform all appropriate instructions under VEHICLE DELIVERY in the electrical diagnostic manual after TSM/TSSM replacement or removal.

*NOTES*

- ***HFSM:*** *Fob assignment must be performed at an authorized Harley-Davidson dealer using DIGITAL TECHNICIAN II (Part No. HD-48650).*
- ***TSSM:*** *Do not forget to enter a Personal Identification Number (PIN) for TSSM vehicles. If a code is not assigned and the key fob is lost or damaged while the vehicle is armed, the TSSM must be replaced.*

**Table 6-15. Setting TSM/TSSM/HFSM and ECM Password**

| NO. | ACTION | CONFIRMATION | NOTES |
|---|---|---|---|
| | Ignition must be turned off for at least 15 seconds. | With Ignition Switch turned off, Check Engine lamp and Security lamp will be off. | |
| 1 | Install **new** TSM/TSSM/HFSM or ECM. | | |
| 2 | Set Engine Stop Switch to **RUN.** | | |
| 3 | Turn Ignition Switch **ON.** | Verify Check Engine lamp and Security lamp illuminate and then turn off. | TSM/HFSM enables start relay. |
| 4 | Attempt normal start one time. | Engine starts and stalls. Check Engine lamp illuminates and stays on. | Password has not been learned. ECM sets DTC P1009. |
| 5 | Wait ten seconds. Security lamp will illuminate and stay on. | Security lamp illuminates. | ECM enters Password Learning mode for ten minutes. Do not cycle Ignition Switch or interrupt vehicle power or Password Learn will be unsuccessful. |
| 6 | Wait until Security lamp turns off. | | This takes ten minutes. |
| 7 | Quickly (within two seconds) turn Ignition Switch OFF-**ON.** | | ECM must not be allowed to shutdown. |
| 8 | Wait until Security lamp turns off. | | This takes ten minutes. |
| 9 | Quickly (within two seconds) turn Ignition Switch OFF-**ON.** | | ECM must not be allowed to shutdown. |
| 10 | Wait until Security lamp turns off. | | This takes ten minutes. |
| 11 | Quickly (within two seconds) turn Ignition Switch OFF-**ON.** | | ECM must not be allowed to shutdown. |

## FUSE BLOCK REPAIR

### Removing Socket Terminals

1. See Figure A-8. To remove secondary locks, insert end of small flat blade screwdriver (1) under lip of locking wedge (2) and gently pry up secondary lock.

*NOTE*

*For best results, start with locking wedge on outboard side of secondary lock.*

2. Looking into chamber at top of fuse block, note the tang next to each socket terminal.
3. Using a thin flat blade, like that on a hobby knife, gently push tang away from terminal, and then tug on wire to back terminal out.

### Installing Socket Terminals

1. Match the wire lead color to the fuse block terminal cavity.

*NOTES*

- *Refer to the main harness wiring diagram for wire lead color codes.*
- *See Figure A-9. The main fuse block terminal cavity is identified as alpha (1) and numeric (2) coordinates. Refer to the main harness wiring diagram for fuse block terminal cavity coordinates.*

2. With the open side of the socket terminal facing the tang, push lead into chamber at the wire end of the fuse block. A click is heard when the terminal is properly engaged.
3. Gently tug on the wire to verify that the terminal is locked in place and will not back out of the chamber.
4. Install the secondary locks. With the locking wedges positioned above the tangs in each chamber, slide flat side of secondary lock into slot (between rows), and push down until it bottoms.

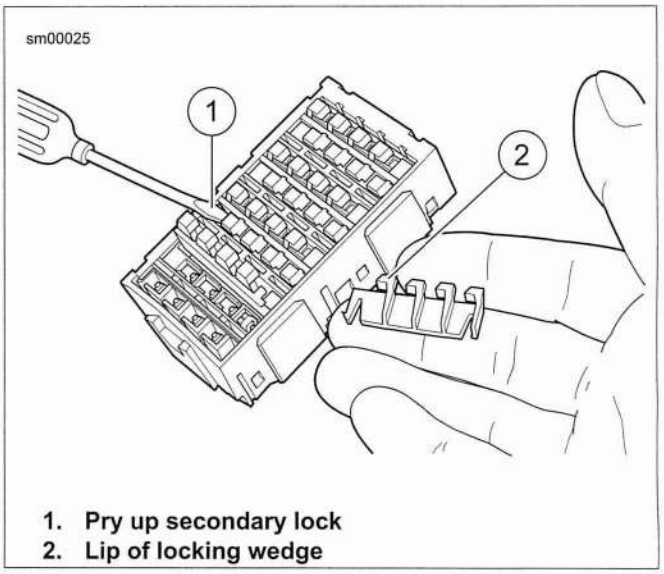
### Crimping Terminals

Terminals are crimped twice; once over the wire core and a second time over the insulation/seal.

A correctly crimped terminal may require different crimping dies found on separate crimpers.

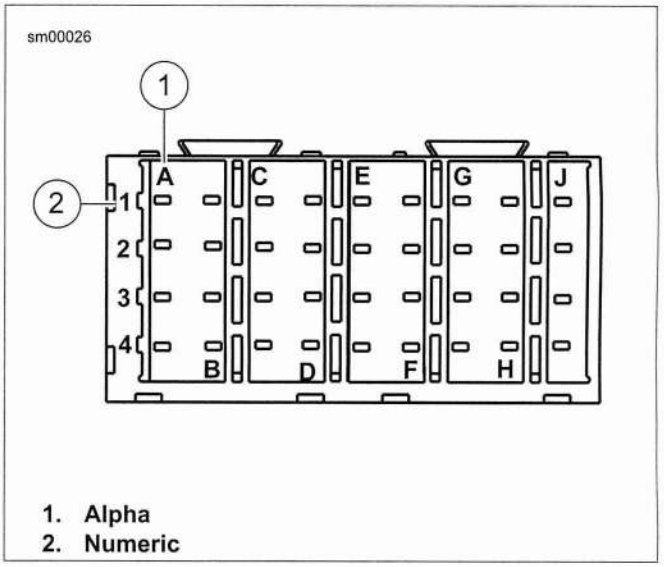
*NOTE*

*The wiring diagram indicates when one socket terminal is be crimped to two wire leads.*



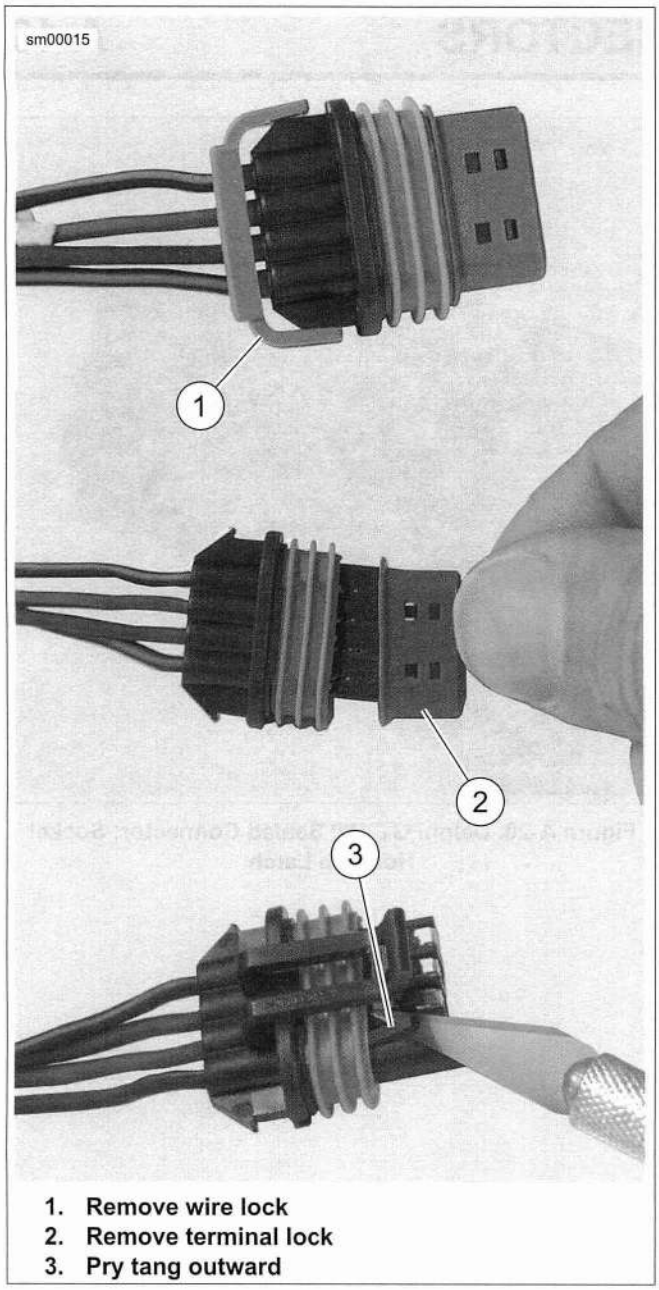

**1. Pry up secondary lock**
**2. Lip of locking wedge**

**Figure A-8. Fuse Block: Remove Secondary Locks**



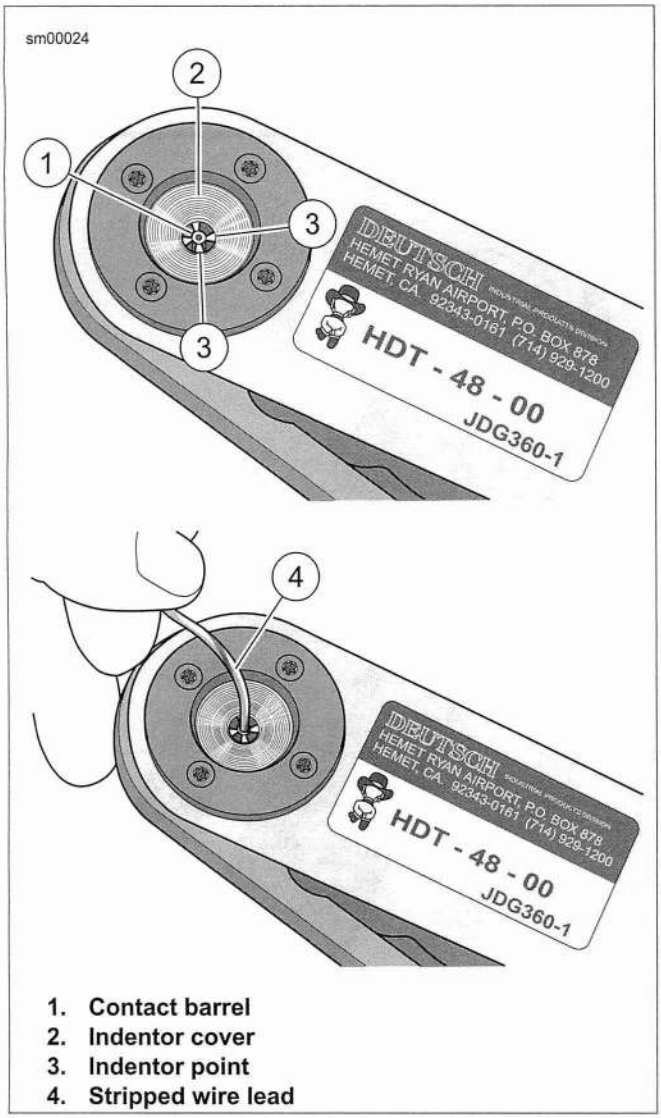

**1. Alpha**
**2. Numeric**

**Figure A-9. Fuse Block: Coordinates (typical)**




1. Remove wire lock
2. Remove terminal lock
3. Pry tang outward

**Figure A-21. Delphi GT 150 Sealed Connector: Removing Socket Terminals**



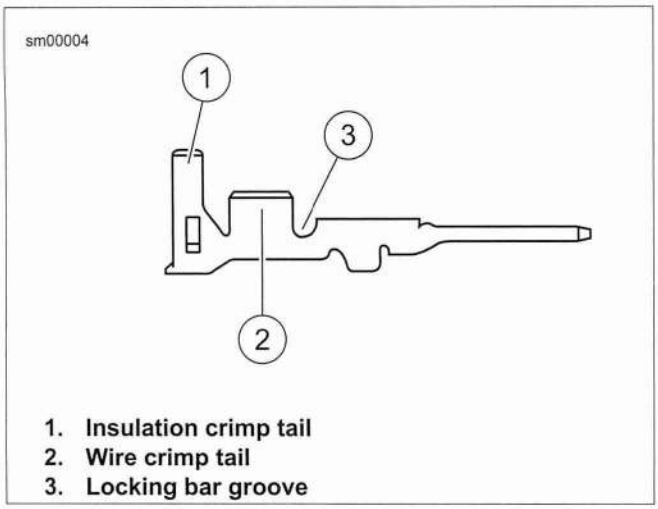

1. **Contact barrel**
2. **Indentor cover**
3. **Indentor point**
4. **Stripped wire lead**

**Figure A-35. Deutsch Solid Barrel**

2. See Figure A-58 and Figure A-59. Select the pin/socket terminals from the parts catalog and identify the insulation crimp tails (1) and the wire crimp tails (2) and the groove for the crimp tool locking bar (3).
3. Identify the wire lead gauge and the corresponding crimper tool and nesting die. Refer to Table A-4.

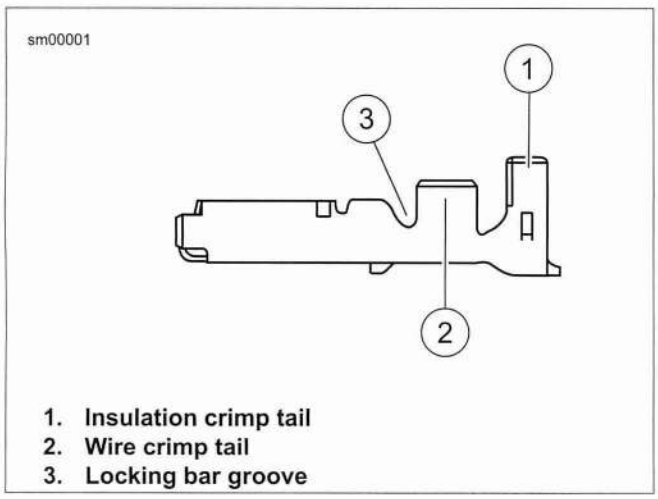
**Table A-4. AMP Multilock Connector: Crimp Tool Wire Gauge/Nest**

| WIRE GAUGE | NEST |
|---|---|
| 20 | Front |
| 16 | Middle |
| 18 | Rear |




1. **Insulation crimp tail**
2. **Wire crimp tail**
3. **Locking bar groove**

**Figure A-58. Tyco 070 Multilock Unsealed Connector: Pin Terminal**




1. **Insulation crimp tail**
2. **Wire crimp tail**
3. **Locking bar groove**

**Figure A-59. Tyco 070 Multilock Unsealed Connector: Socket Terminal**

## Crimping Terminals to Leads

*NOTE*

*Crimping with the AMP Multi-lock Crimper is a one step operation. One squeeze crimps both the wire core and the insulation tails.*

1. See Figure A-60. Squeeze the handles to cycle the AMP MULTI-LOCK CRIMPER (Part No. HD-41609) to the fully open position (1).
2. Raise locking bar by pushing up on bottom flange (2).

*NOTE*

*See Figure A-58 and Figure A-59. Hold the terminal with the insulation crimp tail (1) facing up. The tool will hold the terminal by the locking bar groove (3) and crimp the wire crimp tail (2) around the bare wire of the stripped lead and the insulation crimp tail around the insulation.*

3. See Figure A-60. With the insulation crimp tail facing upward, insert terminal (pin or socket) (3) through the locking bar, so that the closed side of the terminal rests on the nest of the crimp tool.
4. Release locking bar to lock position of contact (4). When correctly positioned, the locking bar fits snugly in the space at the front of the core crimp tails.
5. Insert stripped end of lead (5) until ends make contact with locking bar.
6. Verify that wire is positioned so that wire crimp tails squeeze bare wire strands, while insulation crimp tails fold over the wire lead insulation.
7. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.
8. Raise up locking bar (7) and remove crimped terminal.

## WIRING DIAGRAM INFORMATION

### Wire Color Codes

Wire traces on wiring diagrams are labeled with alpha codes. Refer to Table B-2.

**For Solid Color Wires:** See Figure B-1. The alpha code identifies wire color.

**For Striped Wires:** The code is written with a slash (/) between the solid color code and the stripe code. For example, a trace labeled GN/Y is a green wire with a yellow stripe.

### Wiring Diagram Symbols

See Figure B-1. On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets [ ]. The letter inside the brackets identifies whether the housing is a socket or pin housing.

**A=Pin:** The letter A and the pin symbol after a connector number identifies the pin side of the terminal connectors.

**B=Socket:** The letter B and the socket symbol after a connector number identifies the socket side of the terminal connectors. Other symbols found on the wiring diagrams include the following:

**Diode:** The diode allows current flow in one direction only in a circuit.

**Wire break:** The wire breaks are used to show option variances or page breaks.

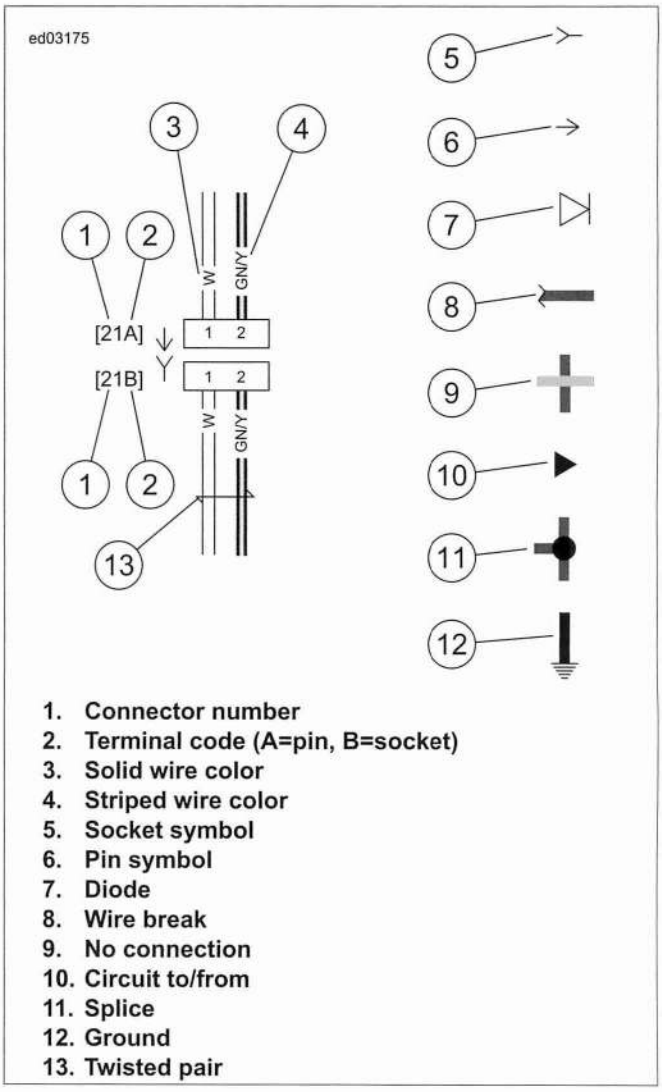
**No Connection:** Two wires crossing over each other in a wiring diagram that are shown with no splice indicating they are not connected together.

**Circuit to/from:** This symbol is used to identify there is a more complete circuit diagram on another page. The symbol is also identifying the direction of current flow.

**Splice:** Splices are where two or more wires are connected together along a wiring diagram. The location of the splice indicated in the wiring diagram is not the true location of the splice in the actual harness but to identify that the wires are spliced to that circuit.

**Ground:** Grounds can be classified as either clean or dirty grounds. Clean grounds are identified by a (BK/GN) wire and are normally used for sensors or modules. These grounds usually do not have electric motors, coils or anything that may cause electrical interference on the ground circuit. The dirty grounds are identified by a (BK) wire and are used for components that are not as sensitive to electrical interference.

**Twisted pair:** This symbol indicates the two wires are twisted together in the harness. This minimizes the circuit's electromagnetic interference from external sources. If repairs are necessary to these wires they should remain as twisted wires.




1. **Connector number**
2. **Terminal code (A=pin, B=socket)**
3. **Solid wire color**
4. **Striped wire color**
5. **Socket symbol**
6. **Pin symbol**
7. **Diode**
8. **Wire break**
9. **No connection**
10. **Circuit to/from**
11. **Splice**
12. **Ground**
13. **Twisted pair**

**Figure B-1. Connector/Wiring Diagram Symbols**

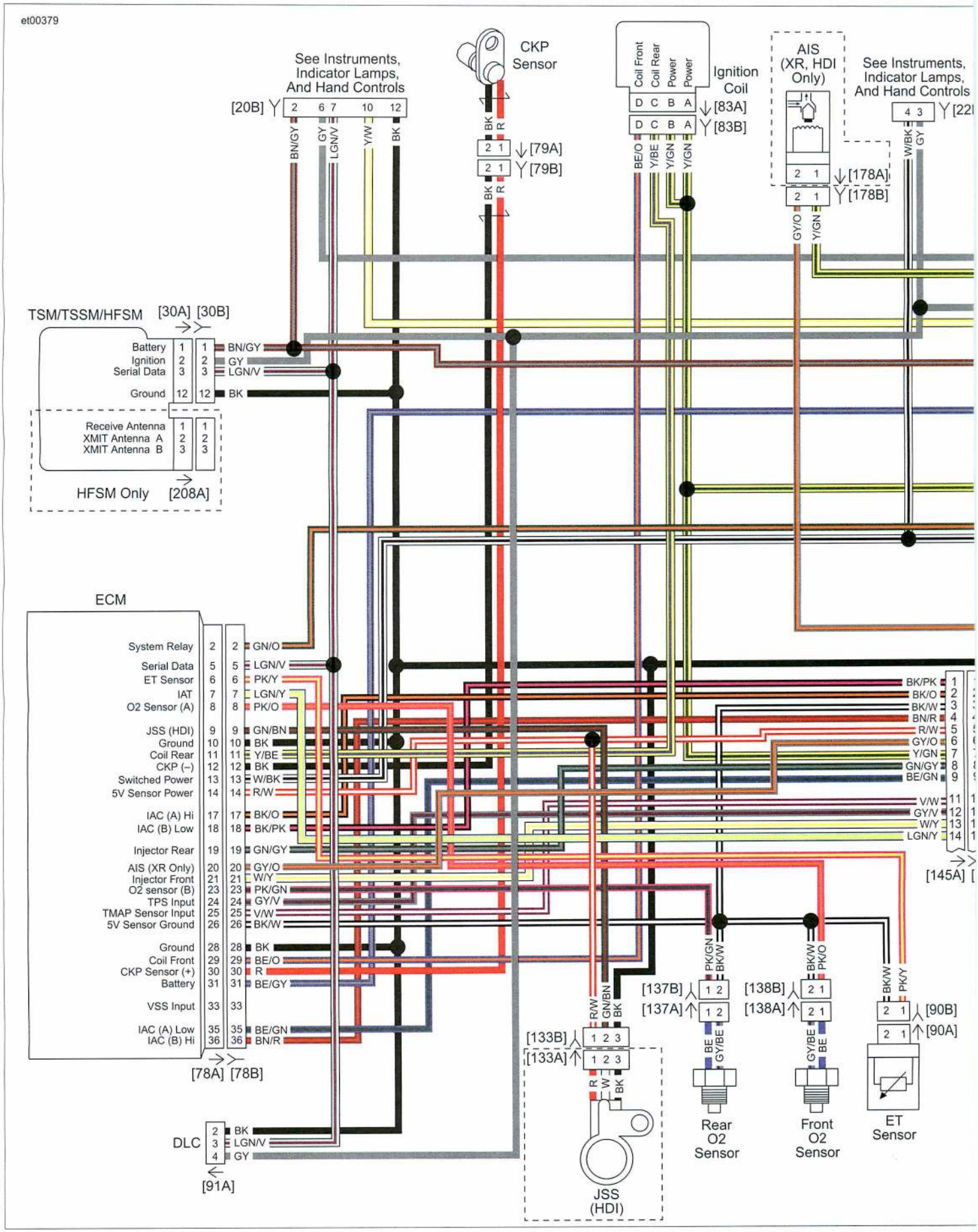



**Figure B-8. Engine Ma**

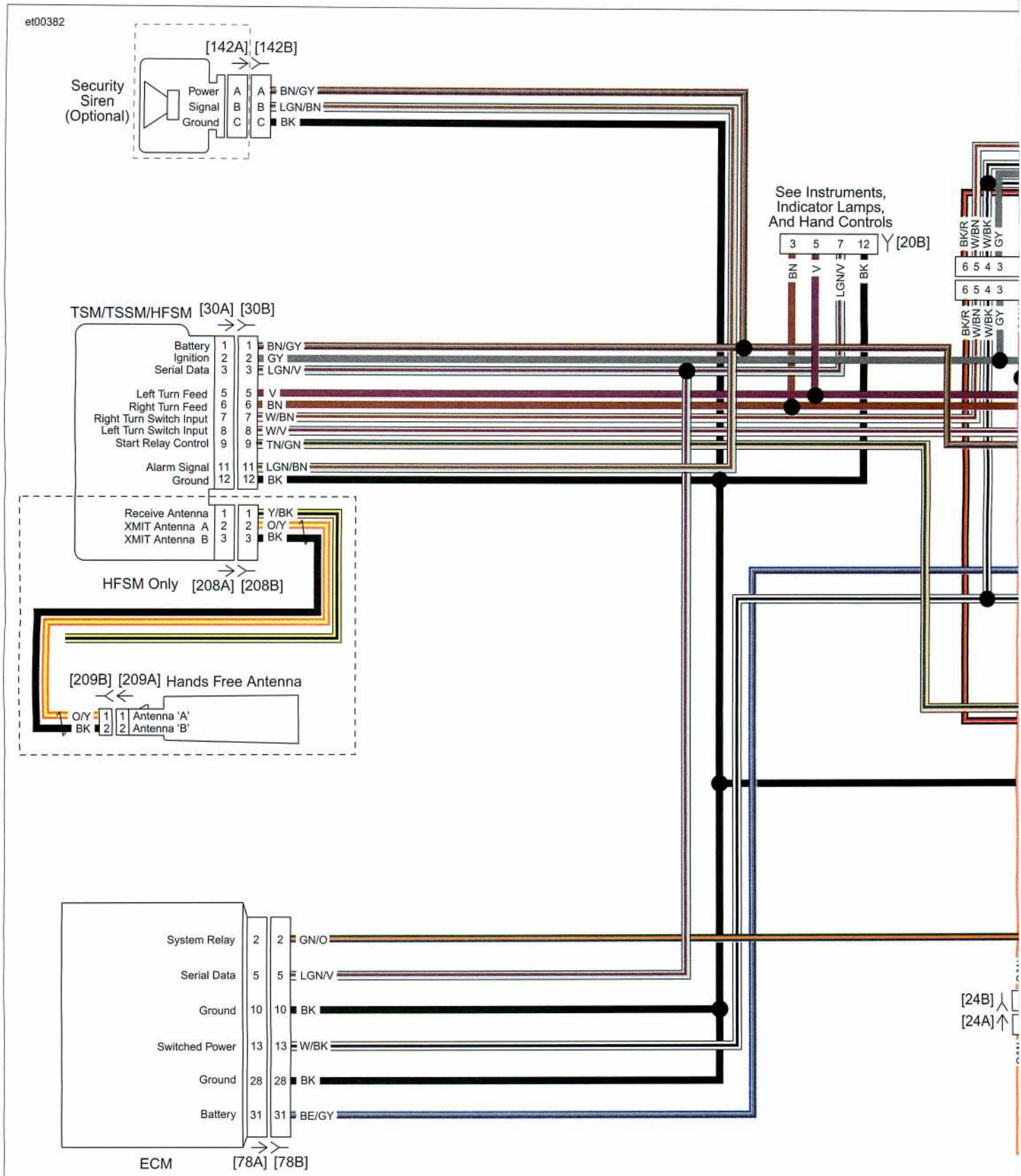



**Figure B-13. Security**

# NOTES

**Table E-1. Acronyms and Abbreviations**

| ACRONYM OR ABBREVIATION | DESCRIPTION |
|---|---|
| ft | Foot |
| ft-lbs | Foot pounds |
| fl oz | Fluid ounce |
| g | Gram |
| gal | Gallon |
| GAWR | Gross axle weight rating |
| GPS | Global positioning system |
| GND | Ground (electrical) |
| GVWR | Gross vehicle weight rating |
| HCU | Hydraulic control unit |
| HDI | Harley-Davidson International |
| H-DSSS | Harley-Davidson smart security system |
| HFSM | Hands-free security module |
| Hg | Mercury |
| H02S | Heated oxygen sensor |
| hp | Horsepower |
| hr | Hour |
| IAC | Idle air control |
| IAT | Intake air temperature |
| IC | Instrument cluster |
| ID | Inside diameter |
| IGN | Ignition light/key switch position |
| in | Inch |
| $in^3$ | Cubic inch |
| INJ PW | Injector pulse width |
| **in-lbs** | Inch pounds |
| JSS | Jiffy stand sensor |
| kg | Kilogram |
| km | Kilometer |
| kPa | Kilopascal |
| km/h | Kilometers per hour |
| kW | Kilowatt |
| L | Liter |
| lb | Pounds |
| LCD | Liquid crystal display |
| LED | Light emitting diode |
| LHCM | Left hand control module |
| mA | Milliampere |
| MAP | Manifold absolute pressure |
| max | Maximum |
| mi | Mile |
| min | Minimum |
| mL | Milliliter |
| mm | Millimeter |

# Tools Used in This Manual

| PART NUMBER | TOOL NAME | NOTES |
|---|---|---|
| J-7830-5 | BRIDGE | 3.20 CRANKCASE, Fitting Pinion Bearings |
| PFSX916 | SNAP-ON WRENCH | 4.14 EXHAUST SYSTEM: XL MODELS, General |
| PR-36 | SNAP-ON SNAP RING PLIERS | 5.13 TRANSMISSION LEFT CASE BEARINGS, Removal |
| SNAP-ON TOOLS STOCK NO. CJ950 | BEARING SEPARATOR | 3.20 CRANKCASE, Fitting Pinion Bearings |
| SNAP-ON TOOLS STOCK NO. CJ950 | BEARING SEPARATOR | 3.20 CRANKCASE, Fitting Pinion Bearings |
| SNAP-ON TT600-3 | SNAP-ON PICK | A.6 DELPHI 630 METRI-PACK UNSEALED CONNECTORS, Delphi 630 Metri-Pack Unsealed Connector Repair |
| SNAP-ON TT600-3 | SNAP-ON PICK | A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair |

| FASTENER | TORQUE VALUE | | NOTES |
|---|---|---|---|
| Handlebar clamp screws, rear XL 1200C | 12-18 ft-lbs | 16.3-24.4 Nm | 2.30 HANDLEBAR, Installation |
| Handlebar riser bolt | 30-40 ft-lbs | 40.7-54.3 Nm | 2.30 HANDLEBAR, Installation |
| Handlebar riser clamp screw | 12-18 ft-lbs | 16.3 -24.4 Nm | 6.17 INDICATOR LAMP MODULE, Replacement: XL 1200C/CP except w/Mini-Ape Handlebar/XL1200C |
| Handlebar riser clamp screw | 12-18 ft-lbs | 16.3 -24.4 Nm | 6.17 INDICATOR LAMP MODULE, Replacement: XL 1200C/CP except w/Mini-Ape Handlebar/XL1200C |
| Handlebar riser cover | 8-12 **in-lbs** | 0.9-1.4 Nm | 2.30 HANDLEBAR, Installation |
| Handlebar riser cover screw | 8-12 **in-lbs** | 0.9-1.4 Nm | 6.17 INDICATOR LAMP MODULE, Replacement: XL 1200C/CP except w/Mini-Ape Handlebar/XL1200C |
| Handlebar switch housing screw | 35-45 **in-lbs** | 4.0-5.1 Nm | 1.5 MAINTENANCE SCHEDULE, General |
| Handlebar switch housing screw | 35-45 **in-lbs** | 4.0-5.1 Nm | 1.23 THROTTLE CONTROL, Cable Inspection and Lubrication |
| Handlebar switch housing screw | 35-45 **in-lbs** | 4.0-5.1 Nm | 2.28 THROTTLE CABLES: ALL MODELS, Assembly and Installation |
| Handlebar switch housing screw | 35-45 **in-lbs** | 4.0-5.1 Nm | 2.29 CLUTCH CONTROL, Assembly and Installation |
| Handlebar switch housing screw | 35-45 **in-lbs** | 4.0-5.1 Nm | 2.30 HANDLEBAR, Installation |
| Handlebar switch housing screw | 35-45 **in-lbs** | 4.0-5.1 Nm | 2.30 HANDLEBAR, Installation |
| Handlebar switch housing screws | 35-45 **in-lbs** | 4.0-5.1 Nm | 6.36 RIGHT HANDLEBAR SWITCHES, Installation |
| Handlebar switch housing screws | 35-45 **in-lbs** | 4.0-5.1 Nm | 6.37 LEFT HANDLEBAR SWITCHES, Installation |
| Handlebar upper clamp screw | 12-18 ft-lbs | 16.3-24.4 Nm | 6.17 INDICATOR LAMP MODULE, Replacement: All Other Models |
| Headlamp Allen head capscrew | 30-35 ft-lbs | 40.7-47.5 Nm | 1.26 HEADLAMP ALIGNMENT, Headlamp Adjustment |
| Headlamp assembly: XL 1200X | 30-35 ft-lbs | 41-47 Nm | 6.16 HEADLAMP, Headlamp Mounts |
| Headlamp assembly: XL 1200X | 30-35 ft-lbs | 41-47 Nm | 6.16 HEADLAMP, Headlamp Mounts |
| Headlamp assembly: XL 883L/R/N, XL 1200L/N, XR 1200X | 120-240 **in-lbs** | 14-27 Nm | 6.16 HEADLAMP, Headlamp Mounts |
| Headlamp clamp nut | 120-240 **in-lbs** | 14-27 Nm | 1.26 HEADLAMP ALIGNMENT, Headlamp Adjustment |
| Headlamp mount: XL 1200C/CP | 30-35 ft-lbs | 41-47 Nm | 6.16 HEADLAMP, Headlamp Mounts |
| Headlamp mount: XL 1200X | 30-35 ft-lbs | 41-47 Nm | 6.16 HEADLAMP, Headlamp Mounts |
| Headlamp upper bracket fasteners: XL 883L/R/N, XL 1200N, XR 1200X | 120-192 **in-lbs** | 14-22 Nm | 6.16 HEADLAMP, Headlamp Mounts |
| Headlamp visor, XL 1200C/CP | 120-192 **in-lbs** | 13.6-21.7 Nm | 6.16 HEADLAMP, Headlamp Mounts |
| High pressure feed hose fitting (to crankcase) | 60-90 **in-lbs** | 6.8-10.2 Nm | 3.21 OIL PUMP: XL MODELS, Installation |
| High pressure feed hose fitting nut | 85-105 **in-lbs** | 9.6-11.8 Nm | 3.21 OIL PUMP: XL MODELS, Installation |
| Horn mounting screw | 72-108 **in-lbs** | 8.1-12.2 Nm | 6.33 HORN, Replacement |
| Hub plate mounting screw | 16-24 ft-lbs | 21.7-32.6 Nm | 2.4 WHEELS, Front Wheel/Cast front wheel |
| IAC mounting screw | 60 **in-lbs** | 6.8 Nm | 4.9 INDUCTION MODULE: XL MODELS, Assembly |
| IAC mounting screw | 60 **in-lbs** | 6.8 Nm | 4.10 INDUCTION MODULE: XR 1200X, Assembly |