

DIMENSIONS (IN.)

	FLHX FLHT/C/U	FLHR/C/S	FLTR
Wheel Base	63.5	63.5	63.5
Overall Length	94.5 93.7/97.5/98.3	93.7	93.7
Overall Width	39.0	34.5/34.5/39.4	35.8
Road Clearance	4.7 5.1/5.1/5.1	5.1/5.1/4.7	5.1
Overall Height	52.2 61.0/61.0/61.0	55.1/55.1/46.4	55.0
Saddle Height*	26.3 27.3/27.3/27.3	27.3/26.9/26.1	26.9

* With 180 Lb. Rider

WEIGHT (LBS.)

	FLHX FLHT/C/U	FLHR/C/S	FLTR
DRY WEIGHT**	745 758/776/788	723/710/721	731
GVWR	1259	1259	1259
GAWR – Front	500	500	500
GAWR – Rear	827	827	827

** As shipped from the factory

NOTE

Gross Vehicle Weight Rating (GVWR) (maximum allowable loaded vehicle weight) and corresponding Gross Axle Weight Ratings (GAWR) are given on a label located on the inside of the right front frame downtube.

CAPACITIES (U.S.)

	FLHX FLHT/C/U	FLHR/C/S	FLTR
Fuel Tank (gallons) Total*** Reserve	5 0.9	5 0.9	5 0.9
Oil Tank (quarts) with filter	4	4	4
Transmission (Ounces, approximate)	20-24	20-24	20-24
Primary Chaincase (Ounces, approximate)	32	32	32
Front Fork (Ounces)	Left Right 10.8 10.8	Left Right 11.1 11.1	Left Right 10.8 10.8

*** Includes Reserve on Carbureted Models

DIMENSIONS (MM)

	FLHX FLHT/C/U	FLHR/C/S	FLTR
Wheel Base	1613	1613	1613
Overall Length	2400 2380/2476/2497	2380	2380
Overall Width	991	876/876/1001	909
Road Clearance	119 130/130/130	130/130/119	130
Overall Height	1326 1549/1549/1549	1399/1399/1179	1397
Saddle Height*	668 693/693/693	693/683/663	683

* With 81.6 kg Rider

WEIGHT (KG)

	FLHX FLHT/C/U	FLHR/C/S	FLTR
DRY WEIGHT**	338 344/352/358	328/322/327	332
GVWR	571	571	571
GAWR – Front	227	227	227
GAWR – Rear	375	375	375

** As shipped from the factory

CAPACITIES (METRIC)

	FLHX FLHT/C/U	FLHR/C/S	FLTR
Fuel Tank (liters) Total*** Reserve	18.9 3.4	18.9 3.4	18.9 3.4
Oil Tank (liters) with filter	3.78	3.78	3.78
Transmission (Milliliters)	591-710	591-710	591-710
Primary Chaincase (Milliliters)	946	946	946
Front Fork (Milliliters)	Left Right 319 319	Left Right 328 328	Left Right 319 319

*** Includes Reserve on Carbureted Models

TIRE DATA

⚠ WARNING

Match tires, tubes, 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. (00023a)

⚠ WARNING

Using tires in ways other than those specified below may adversely affect motorcycle stability. Instability may lead to loss of vehicle control, which could result in death or serious injury.

- Use tubeless tires on all Harley-Davidson cast and disc wheels.
- Tubeless tires fitted with the correct size inner tubes also may be used on all Harley-davidson laced wheels, but protective rubber rim strips must be installed to prevent damage to the inner tubes.
- Do not use inner tubes in radial tires. Do not use radial tires on laced wheels.
- Always use the correct size tires and tubes. Tire sizes are molded on the tire sidewall. Tube sizes are printed on the tube.

⚠ 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)

Dunlop Tires Only	Tire Pressure (Cold)			
	Front		Rear	
	PSI	BARS	PSI	BARS
Solo Rider	36	2.5	36	2.5
Rider & One Passenger	36	2.5	40	2.8

REAR WHEEL SPROCKET

70 teeth

TORQUE VALUES

Item	ft/in-lbs	Nm
Front brake disc TORX screws	16-24 ft-lbs	22-33 Nm
Front axle nut	50-55 ft-lbs	68-75 Nm
Front axle holder nuts	132-180 in-lbs	14.9-20.3 Nm
Front brake caliper mounting bolts	28-38 ft-lbs	37.9-51.5 Nm
Rear brake disc TORX screws	30-45 ft-lbs	41-61 Nm
Rear wheel sprocket bolts	55-65 ft-lbs	75-88 Nm
Rear axle cone nut	95-105 ft-lbs	129-142 Nm
Wheel spokes	40-50 in-lbs	4.5-5.6 Nm
Front engine mount to frame bolts	15-20 ft-lbs	20-27 Nm
Front engine mounting bracket to rubber mount bolt	15-20 ft-lbs	20-27 Nm
Voltage regulator locknuts	70-100 in-lbs	7.9-11.3 Nm
Handlebar clamp to master cylinder housing TORX screws	60-80 in-lbs	6.8-9.0 Nm
Brake caliper bleeder valve	80-100 in-lbs	9.0-11.3 Nm
Rear brake pedal shaft locknut	15-20 ft-lbs	20-27 Nm
Brake pedal/master cylinder assembly to mounting bracket hex nut	30-40 ft-lbs	41-54 Nm
Banjo bolt to master cylinder	17-22 ft-lbs	23-30 Nm
Banjo bolt to brake caliper	17-22 ft-lbs	23-30 Nm
Fairing lower U-bolt retainer locknuts	35-40 in-lbs	4.0-4.5 Nm
Fairing lower to engine guard clamp TORX screw	90-100 in-lbs	10.2-11.3 Nm
Fairing lower cap screws	10-15 in-lbs	1.1-1.7 Nm
Front brake master cylinder reservoir cover screws	6-8 in-lbs	0.7-0.9 Nm
Rear brake master cylinder reservoir cover screws	6-8 in-lbs	0.7-0.9 Nm
Brake caliper pad pins	180-200 in-lbs	20-23 Nm
Brake caliper bridge bolts	28-38 ft-lbs	38-52 Nm
Mirror stem acorn nut	60-96 in-lbs	6.8-10.8 Nm
Mirror flange nut (FLHX)	20-30 in-lbs	2.3-3.4 Nm
Rear bumper fender weld stud flange nut	45-85 in-lbs	5.1-9.6 Nm
Continued ...		

TORQUE VALUES (CONT.'D)

Item	ft/in-lbs	Nm
Fork oil drain plugs	72-96 in-lbs	8-11 Nm
Fork pinch bolts	30-35 ft-lbs	41-48 Nm
Fork stem nut	60-80 ft-lbs	81-109 Nm
Fork tube plug	22-58 ft-lbs	30-79 Nm
Fork cap bolt	50-60 ft-lbs	68-81 Nm
Damper rod 6mm screw	132-216 in-lbs	14.9-24.4 Nm
Shock bottom mounting bolt	35-40 ft-lbs	47-54 Nm
Shock top mounting bolt	33-35 ft-lbs	45-48 Nm
Rear swingarm bracket bolts	34-42 ft-lbs	46-57 Nm
Rear swingarm pivot shaft locknut	40-45 ft-lbs	54-61 Nm
Handlebar switch housing TORX screws	35-45 in-lbs	4-5 Nm
Handlebar clamp to clutch lever bracket screws	60-80 in-lbs	6.8-9.0 Nm
Clutch release cover socket head screws	84-132 in-lbs	9.5-14.9 Nm
Clutch cable fitting	36-60 in-lbs	4-7 Nm
Transmission lubricant drain plug	14-21 ft-lbs	19-28 Nm
Transmission filler plug/dipstick	25-75 in-lbs	2.8-8.5 Nm
Battery cable bolt	60-96 in-lbs	6.8-10.9 Nm
Tour-Pak mounting bolts	96-108 in-lbs	10.8-12.2 Nm
Tour-Pak speaker box bolts	25-35 in-lbs	2.8-4.0 Nm
Tour-Pak metal plate flange nuts	65-70 in-lbs	7.3-7.9 Nm
Side marker light TORX screws	25-35 in-lbs	2.8-4.0 Nm
Inner fairing screws	20-30 in-lbs	2.3-3.4 Nm
Outer fairing screws (below windshield)	25-30 in-lbs	2.8-3.4 Nm
Fairing cap TORX screws	25-30 in-lbs	2.8-3.4 Nm
Speedometer/tachometer bracket socket screws	10-20 in-lbs	1.1-2.3 Nm
2 inch diameter gauge nuts	10-20 in-lbs	1.1-2.3 Nm
Auxiliary lamp bracket to fork bracket TORX bolts	15-20 ft-lbs	20-27 Nm
Windshield wellnut screws (FLTR)	6-13 in-lbs	0.7-1.5 Nm
Front turn signal lamp bracket stud acorn nuts (FLTR)	40-50 in-lbs	4.5-5.7 Nm
Short fairing screws (FLTR)	6-12 in-lbs	0.7-1.4 Nm
Long fairing screws (FLTR)	10-15 in-lbs	1.1-1.7 Nm
Instrument bezel TORX screws (FLTR)	25-35 in-lbs	2.8-4.0 Nm
Continued ...		

Item	ft/in-lbs	Nm	
Instrument nacelle to fork bracket TORX bolts (FLTR)	15-20 ft-lbs	20-27 Nm	
Fairing bracket/steering head thru bolt (FLTR)	20-30 ft-lbs	27.1-40.7 Nm	
Radio bracket/inner fairing to fairing bracket stud locknuts (FLTR)	96-144 in-lbs	10.9-16.3 Nm	
Headlamp nacelle handlebar clamp shroud Phillips screw	10-20 in-lbs	1.1-2.3 Nm	
Headlamp nacelle trim strip flange nut	15-20 in-lbs	1.7-2.3 Nm	
Auxiliary lamp bracket to fork bracket stud acorn nuts	72-108 in-lbs	8.1-12.2 Nm	
Front fender mounting bolts	16-20 ft-lbs	22-27 Nm	
Rear fender TORX bolts	15-20 ft-lbs	20-27 Nm	
Jiffy stand leg stop flange nut	43-53 ft-lbs	58-72 Nm	
Intake flange adapter screws	96-144 in-lbs	10.9-16.3 Nm	
Exhaust flange adapter nuts	100-120 in-lbs	11.3-13.6 Nm	
Exhaust pipe TORCA clamps	45-60 ft-lbs	61-81 Nm	
Heat shield worm drive clamps	20-40 in-lbs	2.3-4.5 Nm	
Transmission exhaust bracket clamp bolt	60-96 in-lbs	6.8-10.8 Nm	
Passenger footboard/footrest socket screws	30-35 ft-lbs	40.7-47.5 Nm	
Rider footboard pivot bolt nut	84-108 in-lbs	9.5-12.2 Nm	
Air valve mount hex nut	40-50 in-lbs	4.5-5.6 Nm	
Handlebar upper clamp screws	12-16 ft-lbs	16.3-21.7 Nm	
Handlebar lower clamp bolts (risers)	30-40 ft-lbs	40.7-54.2 Nm	
Ignition switch nut	125-150 in-lbs	14.1-16.9 Nm	
Throttle cable J-clamp screw to wellnut (FLHR/C)	9-18 in-lbs	1.0-2.0 Nm	
Frame tube cover screw	25-40 in-lbs	2.8-4.5 Nm	
Seat screw	20-40 in-lbs	2.3-4.5 Nm	
Seat strap bracket screw (FLHT/C/U)	48-72 in-lbs	5.4-8.1 Nm	
Rear facia flange nuts (FLHX)	New Stud Plate	80 in-lbs	9.0 Nm
	Used Stud Plate	20-30 in-lbs	2.3-3.4 Nm
Rear facia lamp TORX screws (FLHX)	18-22 in-lbs	2.0-2.5 Nm	

NOTES

VEHICLE IDENTIFICATION NUMBER (V.I.N.)

See [Figure 2-1](#). The full 17-digit serial number, or Vehicle Identification Number (V.I.N.), is stamped on the right side of the frame backbone at the rear of the steering head (and under the main harness conduit). A label bearing the V.I.N. code is also affixed to the left side of the steering head. An abbreviated V.I.N. is stamped between the front and rear cylinders on the left side of the crankcase.

Sample V.I.N. as it appears on the steering head – **1HD1DJV136Y110000**

Sample abbreviated V.I.N. as it appears on the crankcase – **DJV6110000**

NOTE

Always give the complete V.I.N. when ordering parts or making an inquiry about your motorcycle.

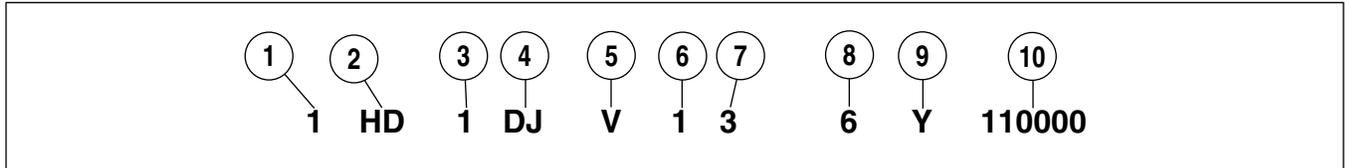


Figure 2-1. Vehicle Identification Number (V.I.N.)

Table 2-1. V.I.N. Description

ITEM	DESCRIPTION	VALUE
1	Market destination	1=Domestic 5=International
2	Manufacturer	HD=Harley-Davidson
3	Motorcycle type	1=Heavyweight
4	Model designation	See Table 2-2 .
5	Engine type	V=Carbureted W=Fuel injected
6	Introduction	1=Regular 2=Mid-year 3=California 4=Anniversary
7	V.I.N. check digit	Can be 0-9 or X
8	Model year	6=2006
9	Assembly plant	K=Kansas City, MO Y=York, PA
10	Sequential number (last 6 digits)	Varies

Table 2-2. Model Designation

CODE	MODEL	CODE	MODEL
DD	FLHT	FS	FLTRI
FB	FLHRI	FV	FLHTI
FC	FLHTCUI	FW	FLHRI Shrine
FD	FLHR	FX	FLHRS
FF	FLHTCI	FY	FLHRSI
FG	FLHTCUI W/SC	KA	FLHX
FL	FLHTCUI Shrine	KB	FLHXI
FR	FLHRCI		

GENERAL

Maximum tire mileage and good handling qualities are directly related to care given wheels and tires. Wheels and tires should be regularly inspected for wear. If handling problems occur, see Section 1.21 TROUBLESHOOTING, HANDLING, for possible causes.

Always keep tires inflated to the recommended pressure and balance the wheel whenever a tire or tube is replaced.

PRELIMINARY INSPECTION

1. Measure brake disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc. Also replace discs if warped or badly scored. Obtain **new** T40 TORX screws if brake discs were removed.
2. Whenever the wheel is removed for tire replacement or any other purpose, inspect the wheel bearings as follows:
 - a. Insert finger into wheel bearing and rotate the inner race in both directions. Repeat step on opposite side of wheel.
 - b. Replace the wheel bearings if there is rough rotation, abnormal noise or anything unusual. Always replace wheel bearings as a set. Never replace just one wheel bearing.

REMOVAL

1. Use shop rag or tape to protect fender area adjacent to caliper, as incidental contact can occur during caliper removal.



Figure 2-2. Inspect Wheel Bearings

2. Remove both the upper and lower mounting bolts from lugs of front fork leg to release brake caliper assembly.
3. Lift caliper upward to remove from brake disc. Allow the caliper to hang loose.
4. Repeat steps 1 thru 3 to release caliper on opposite side of wheel.

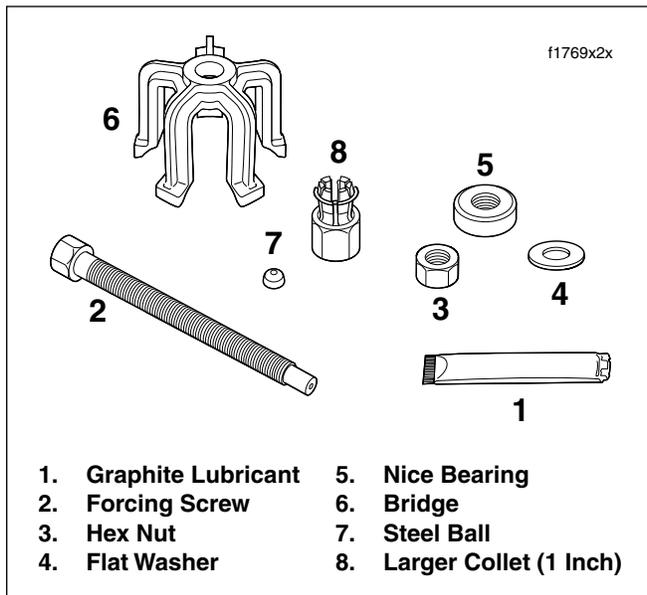
NOTE

Do not operate the front brake hand lever with the front wheel removed or the caliper pistons may be forced out. Reseating pistons requires disassembly of the caliper.

5. Insert screwdriver or steel rod through hole in axle on right side of vehicle. While holding axle stationary, remove the axle nut, lockwasher and flat washer on the left side.
6. Loosen the two axle holder nuts at bottom of right side fork leg.
7. With soft mallet, tap axle toward right side of vehicle until loose. Catching external spacers on left and right side, pull axle from hub while supporting wheel.
8. Move wheel to bench area and inspect bearings. See [PRELIMINARY INSPECTION](#) on this page.

DISASSEMBLY

1. If wheel bearing replacement is necessary, proceed as follows:
 - a. Obtain the WHEEL BEARING REMOVER/INSTALLER (HD-44060). Pick out the wheel bearing remover tools for the front wheel. See [Figure 2-3](#).
 - b. To prolong service life and ensure smooth operation, sparingly apply graphite lubricant to threads of forcing screw.
 - c. Install hex nut, flat washer and Nice bearing on forcing screw. Insert end of forcing screw through hole in bridge.
 - d. Install steel ball inside **larger** collet. Install collet at end of forcing screw.
 - e. Insert collet into bearing ID. Feel for inside edge of bearing using lip at end of collet and then back off slightly.
 - f. Holding forcing screw to prevent rotation, turn hex on collet until lip makes firm contact with inside edge of bearing. See upper frame of [Figure 2-4](#).

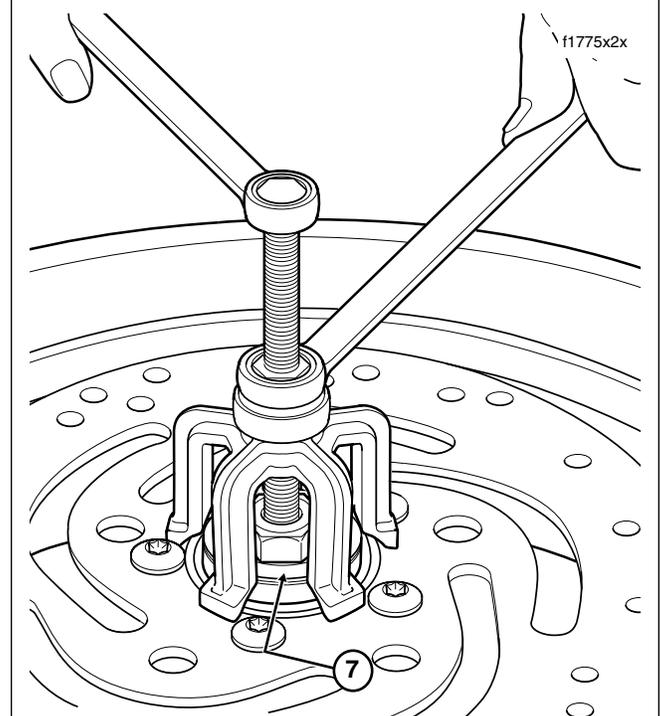
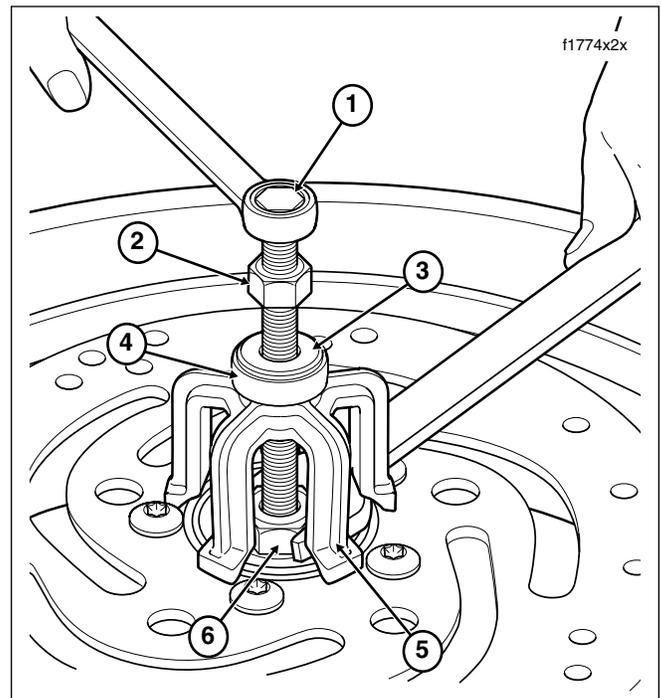


**Figure 2-3. Front Wheel Bearing Remover Tools
(Part No. HD-44060)**

- g. Holding forcing screw, turn hex nut until bearing is free. See lower frame of [Figure 2-4](#).
 - h. Remove spacer sleeve from wheel hub.
 - i. Repeat procedure to remove bearing on opposite side of wheel. Discard bearings.
2. If necessary, remove five T40 TORX screws to release brake disc from hub. Discard screws. Repeat procedure to remove disc on opposite side of wheel. If the wheel is to be assembled with the same discs, mark both the wheel and discs, so that they can be installed in their original positions.
 3. If tire replacement is necessary, see Section [2.8 TIRES AND TUBES](#).
 4. If the wheel is laced, and hub, spoke or rim replacement is necessary, loosen all spoke nipples and disassemble hub from rim.

CLEANING AND INSPECTION

1. Thoroughly clean all parts in solvent.
2. Inspect all parts for damage or excessive wear.
3. Always replace bearing assemblies as a complete set.
4. Inspect brake discs. Replace discs if warped or badly scored. Measure disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc.



1. Forcing Screw
2. Hex Nut
3. Flat Washer
4. Nice Bearing
5. Bridge
6. Larger Collet (1 Inch)
7. Wheel Bearing

Figure 2-4. Remove Sealed Wheel Bearings

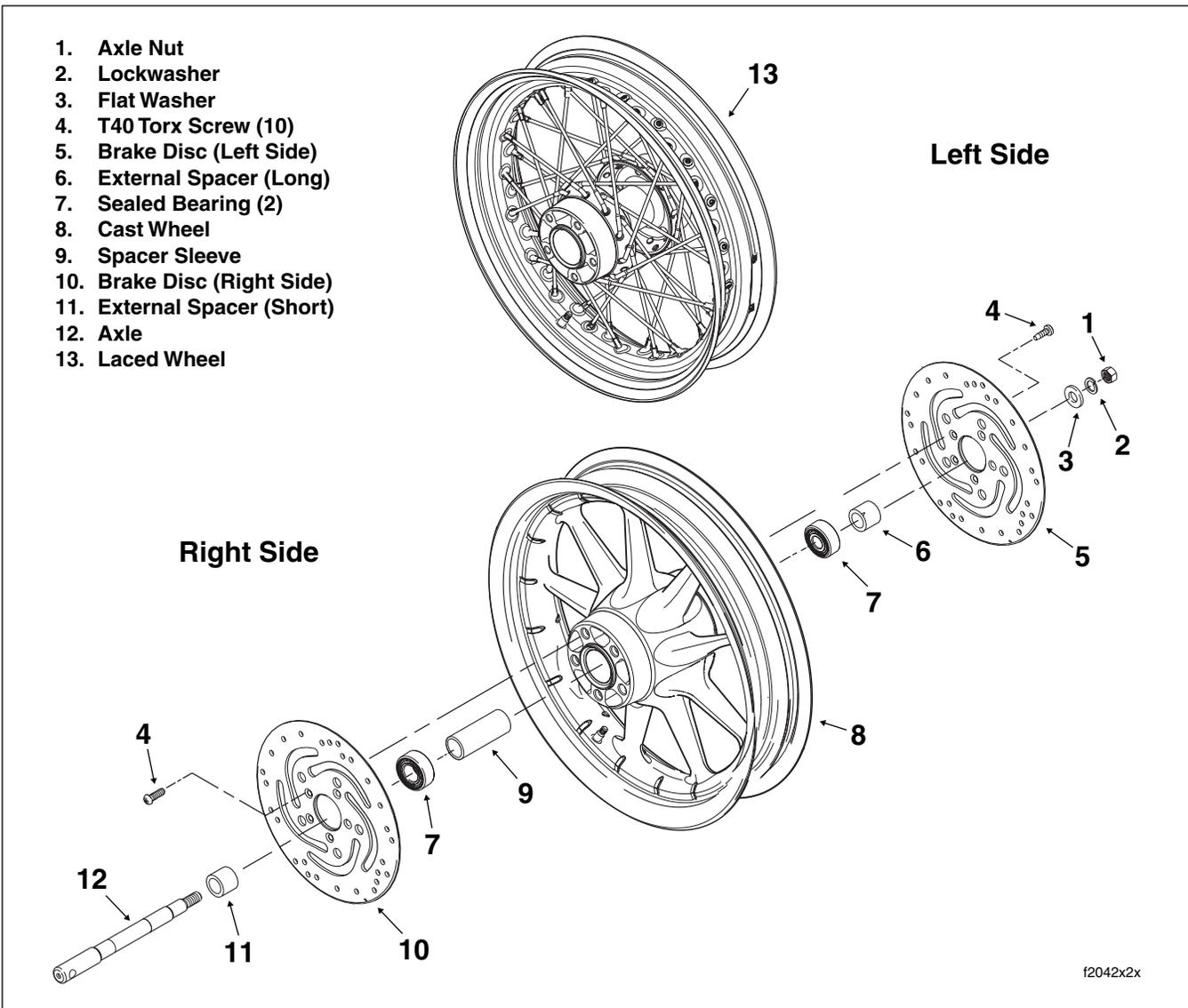


Figure 2-5. Front Wheel (Exploded View)

ASSEMBLY

1. On laced wheels, if the hub and rim were disassembled, assemble the hub, spokes and rim. See Section 2.6 [WHEEL LACING—16 INCH RIM](#).

⚠ WARNING

Be sure that brake fluid or other lubricants do not contact brake pads or discs. Such contact can adversely affect braking ability, which could cause loss of control, resulting in death or serious injury. (00290a)

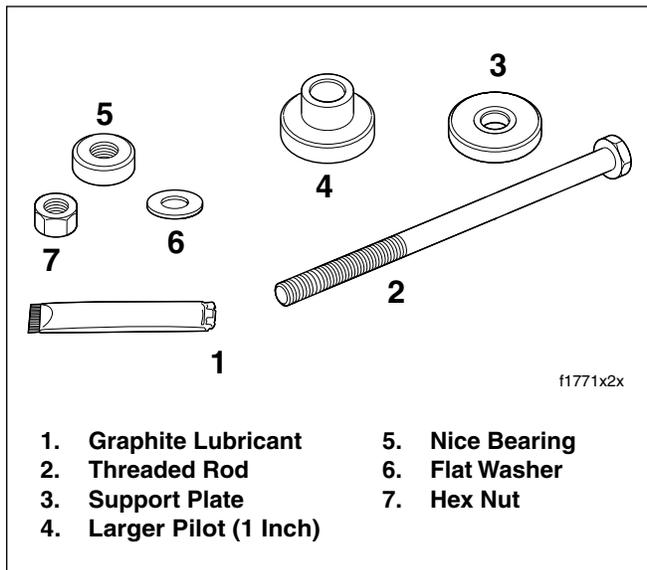
2. If removed, install **new** T40 TORX screws to fasten brake discs to hub. Be sure to install discs in their original positions. Alternately tighten screws to 16-24 ft-lbs (22-33 Nm).

3. Install **new** wheel bearings as follows:

NOTE

Always install first of two bearings on the left side (opposite the valve stem side of the wheel).

- a. Obtain the WHEEL BEARING REMOVER/INSTALLER (HD-44060). Pick out the wheel bearing installer tools for the front wheel. See [Figure 2-6](#).
- b. To prolong service life and ensure smooth operation, sparingly apply graphite lubricant to threads of threaded rod.
- c. Slide support plate onto threaded rod. Slide rod through hub on the valve stem side of the wheel. See upper frame of [Figure 2-7](#).



**Figure 2-6. Front Wheel Bearing Installer Tools
(Part No. HD-44060)**

- d. On opposite side of wheel, slide bearing onto threaded rod with lettered side facing outboard.
 - e. Install **larger** pilot, Nice bearing, flat washer and hex nut onto rod.
 - f. Holding threaded rod on opposite side of wheel to prevent rotation, turn hex nut to install bearing. See lower frame of [Figure 2-7](#). Bearing is fully seated when it makes firm contact with the counterbore.
 - g. Disassemble and remove tool, but leave support plate on threaded rod.
 - h. Slide threaded rod through installed wheel bearing and hub of wheel.
 - i. On the valve stem side of the wheel, slide spacer sleeve down threaded rod until it contacts installed wheel bearing.
 - j. Repeat steps 3(d) through 3(g) to complete installation of second wheel bearing. Bearing is fully seated when hex nut can no longer be turned.
4. Verify that wheel is true. See CHECKING CAST RIM RUNOUT or TRUING LACED WHEEL, whichever applies.
 5. Install rim strip on wheel rim, if applicable. Install tube and tire, if applicable. Verify that wheel is balanced.

INSTALLATION

1. Place wheel into position between forks with the valve stem on the right side of the vehicle.
2. Coat the axle with ANTI-SEIZE LUBRICANT.

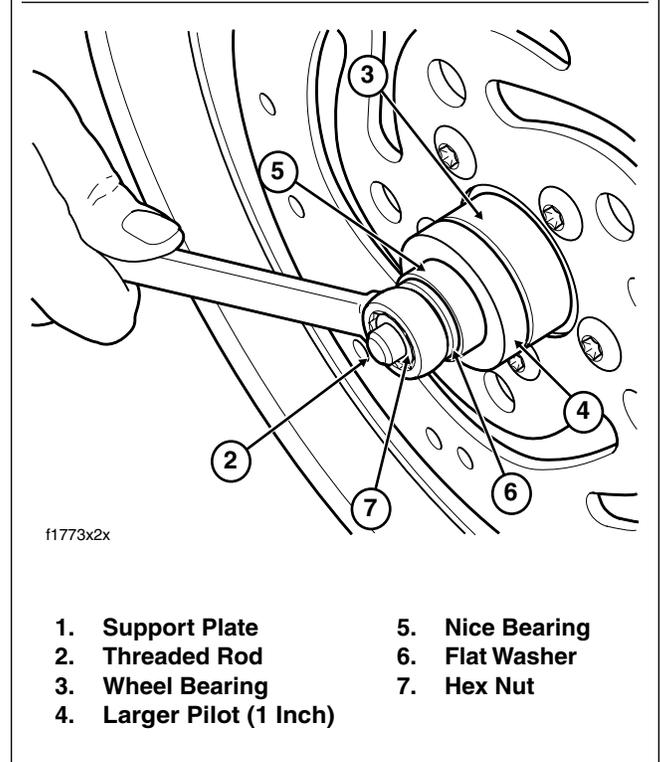
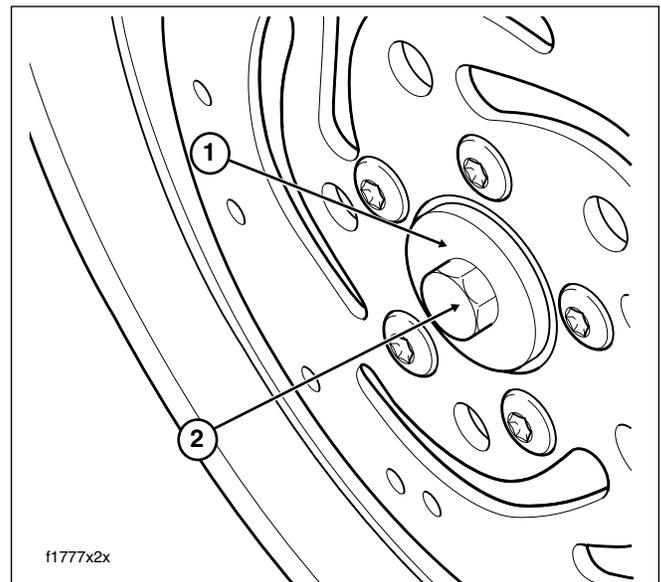


Figure 2-7. Install Sealed Wheel Bearings

3. Supporting wheel, insert threaded end of axle through right fork leg. Push axle through fork, **short** external spacer and wheel hub until it begins to emerge from left side.
4. With the three notches on the bearing side, push axle through **long** external spacer and left fork leg until axle shoulder contacts external spacer on right fork side.
5. Install flat washer, lockwasher and axle nut.

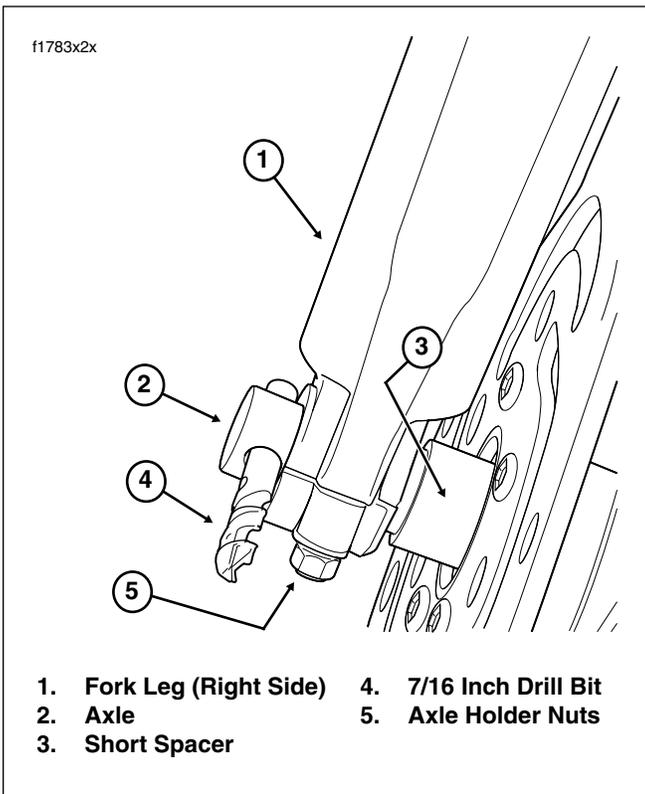


Figure 2-8. Align Front Wheel

- e. Tighten upper caliper mounting bolt to 28-38 ft-lbs (37.9-51.5 Nm).
- f. Repeat step 10 to install caliper on opposite side of wheel.

⚠ WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

11. Depress front brake hand lever several times to set brake pads to proper operating position within caliper.

6. Insert screwdriver or steel rod through hole in axle on right side of vehicle. While holding axle stationary, tighten axle nut to 50-55 ft-lbs (68-75 Nm).
7. Insert 7/16 inch drill bit into hole in axle. See [Figure 2-8](#).
8. Pull fork leg so that it just contacts drill bit, and then tighten axle holder nuts to 132-180 **in-lbs** (14.9-20.3 Nm).
9. Remove drill bit from axle hole.
10. Install brake caliper as follows:
 - a. Use shop rag or tape to protect fender area adjacent to caliper, as incidental contact can occur during caliper installation.
 - b. With the bleeder valve topside, position caliper so that brake disc is situated between friction pads. Pry inner and outer brake pads back for additional clearance, if necessary.
 - c. Align upper mounting hole in caliper with upper mounting lug on fork leg. Loosely install long caliper mounting bolt into upper lug of fork leg.
 - d. Install short caliper mounting bolt into lower lug of fork leg. Tighten lower mounting bolt to 28-38 ft-lbs (37.9-51.5 Nm).

GENERAL

Maximum tire mileage and good handling qualities are directly related to care given wheels and tires. Wheels and tires should be regularly inspected for wear. If handling problems occur, see Section [1.21 TROUBLESHOOTING, HANDLING](#), for possible causes.

Always keep tires inflated to the recommended pressure and balance the wheel whenever a tire or tube is replaced.

PRELIMINARY INSPECTION

1. Measure brake disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc. Also replace disc if warped or badly scored.
2. Whenever the wheel is removed for tire replacement or any other purpose, inspect the wheel bearings as follows:
 - a. Insert finger into wheel bearing and rotate the inner race. Repeat step on opposite side of wheel.
 - b. Replace the wheel bearings if there is rough rotation, abnormal noise or anything unusual. Always replace wheel bearings as a set. Never replace just one wheel bearing.

REMOVAL

1. Remove saddlebags. See Section [2.26 SADDLEBAG, REMOVAL](#).
2. Remove left side muffler as follows:
 - a. Open worm drive clamps to remove heat shield from crossover pipe.
 - b. Using a bungee cord, tie the muffler to the lower saddlebag support rail.
 - c. Loosen TORCA clamp between crossover pipe and muffler.

NOTE

To facilitate removal, spray PB Blaster or other suitable penetrating oil in and around joint of exhaust pipes. For best results, be sure to allow sufficient time for the penetrating oil to work.

- d. Remove two screws (with lockwashers) to detach muffler from lower saddlebag support rail.
- e. Remove bungee cord to release muffler from lower saddlebag support rail.

3. On models equipped with low profile shock absorbers (FLHS and FLHX), remove left side lower saddlebag support rail as follows:
 - a. Remove outside T40 TORX screw (and flange nut) to release saddlebag support rail from saddlebag support bracket.
 - b. Remove T40 TORX screw to release opposite end of saddlebag support rail from frame weldment.
4. Standing on right side of vehicle, remove E-clip from groove at end of axle.
5. Remove cone nut and adjuster cam from axle.
6. Using a soft mallet, gently tap end of axle towards left side to loosen. Catching external spacers on right and left side of hub, pull axle free of wheel and rear swingarm.
7. Pull wheel to release brake disc from caliper. Pry inner and outer brake pads back for additional clearance, if necessary. Use a putty knife with a wide thin blade to avoid scoring or scratching the brake disc.
8. Remove caliper from anchor weldment on rear swingarm, and carefully hang over lower saddlebag support rail.
9. Move wheel forward and slip belt off sprocket.
10. Move wheel to bench area and inspect bearings. See [PRELIMINARY INSPECTION](#) on this page.

NOTE

Do not operate the rear brake pedal with the rear wheel removed or the caliper pistons may be forced out. Reseating pistons requires disassembly of the caliper.

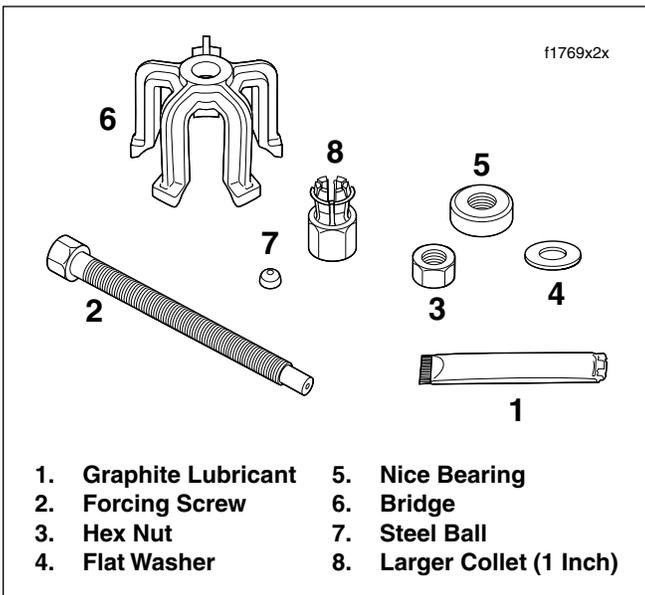
DISASSEMBLY

1. If wheel bearing replacement is necessary, proceed as follows:
 - a. Remove five bolts (with flat washers) securing belt sprocket to hub.
 - b. Obtain the WHEEL BEARING REMOVER/INSTALLER (HD-44060). Pick out the wheel bearing remover tools for the rear wheel. See [Figure 2-9](#).

NOTE

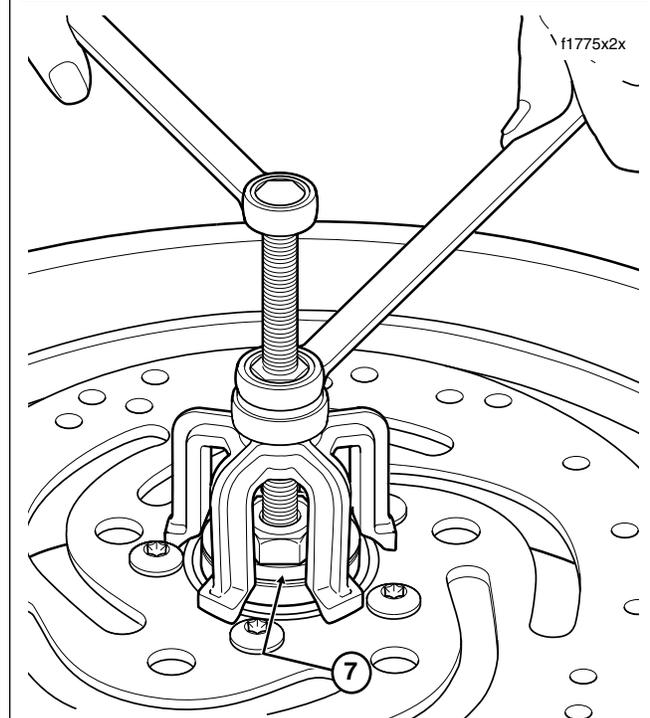
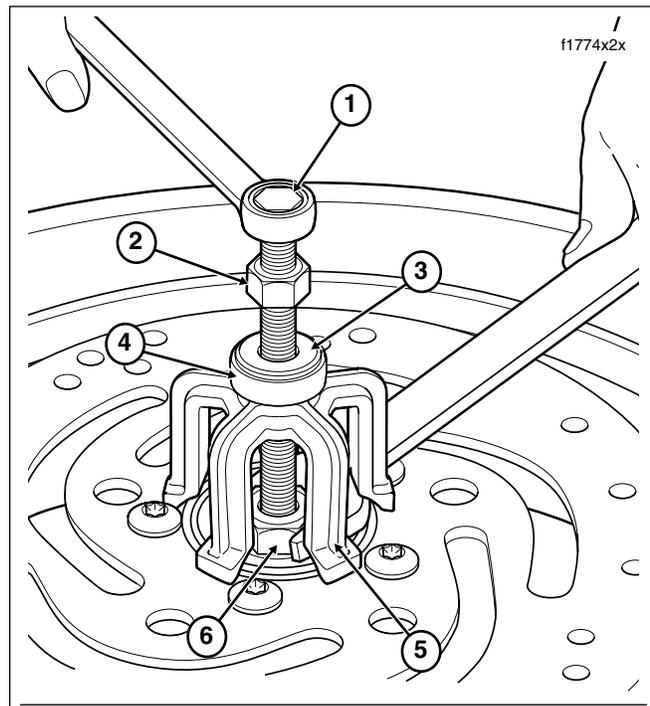
The smaller 3/4 inch collet (and pilot) is only used to replace the rear wheel bearings on 2000-01 Touring models.

- c. To prolong service life and ensure smooth operation, sparingly apply graphite lubricant to threads of forcing screw.



**Figure 2-9. Rear Wheel Bearing Remover Tools
(Part No. HD-44060)**

- d. Install hex nut, flat washer and Nice bearing on forcing screw. Insert end of forcing screw through hole in bridge.
 - e. Install steel ball inside **larger** collet. Install collet at end of forcing screw.
 - f. Insert collet into bearing ID. Feel for inside edge of bearing using lip at end of collet and then back off slightly.
 - g. Holding forcing screw to prevent rotation, turn hex on collet until lip makes firm contact with inside edge of bearing. See upper frame of [Figure 2-10](#).
 - h. Holding forcing screw, turn hex nut until bearing is free. See lower frame of [Figure 2-10](#).
 - i. Remove spacer sleeve from wheel hub.
 - j. Repeat procedure to remove bearing on opposite side of wheel. Discard bearings.
2. If necessary, remove five T45 TORX screws to release brake disc from hub. If the wheel is to be assembled with the same disc, mark both the wheel and disc, so that it can be installed in its original position.
 3. Remove tire, if necessary. Remove tube from the rim, if applicable. See Section [2.8 TIRES AND TUBES](#).
 4. If it is necessary to remove the hub from a laced wheel, loosen all spoke nipples and remove the rim and spokes.



- | | |
|------------------|---------------------------|
| 1. Forcing Screw | 5. Bridge |
| 2. Hex Nut | 6. Larger Collet (1 Inch) |
| 3. Flat Washer | 7. Wheel Bearing |
| 4. Nice Bearing | |

Figure 2-10. Remove Sealed Wheel Bearings

CLEANING AND INSPECTION

1. Thoroughly clean all parts in solvent.

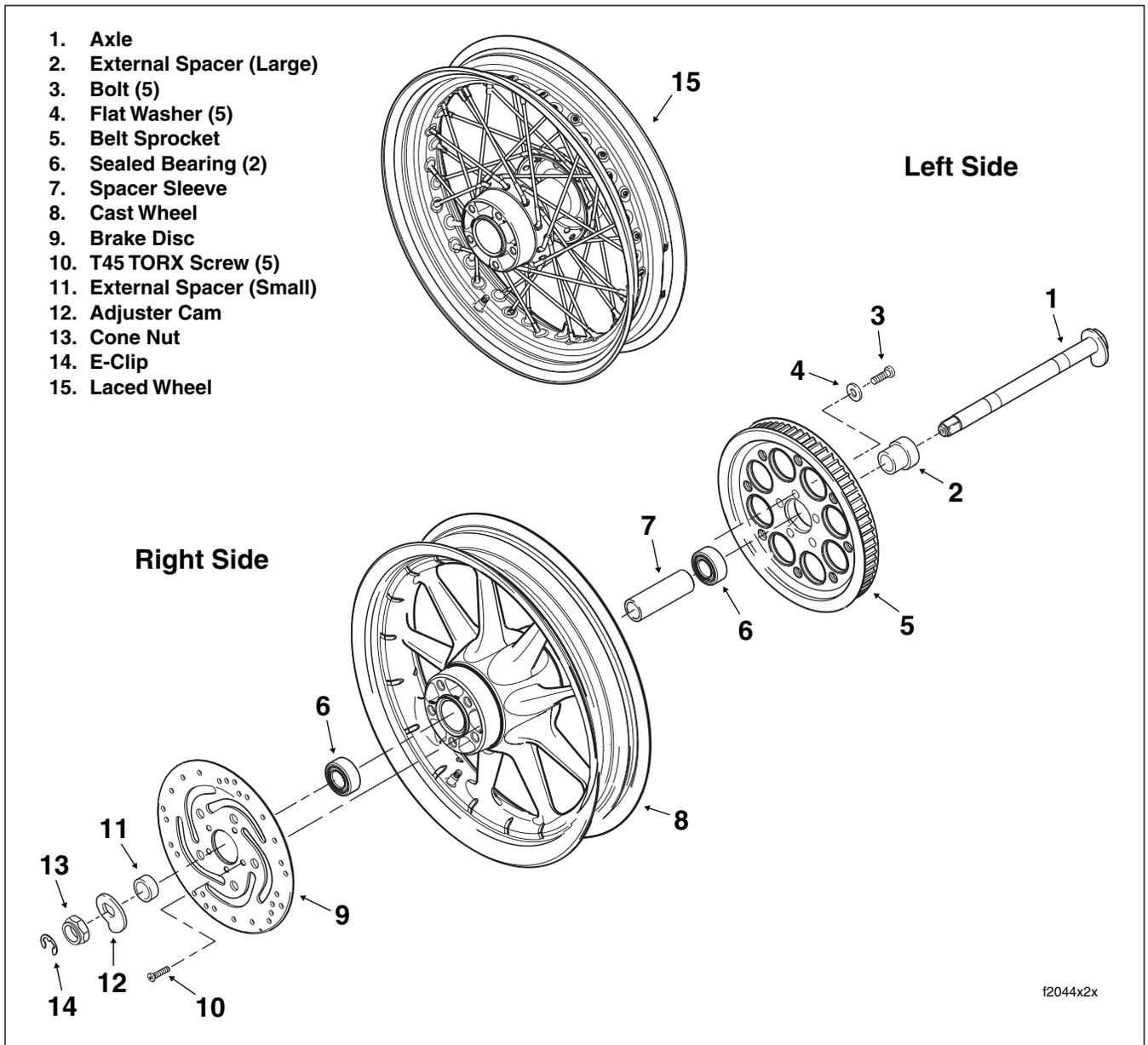


Figure 2-11. Rear Wheel (Exploded View)

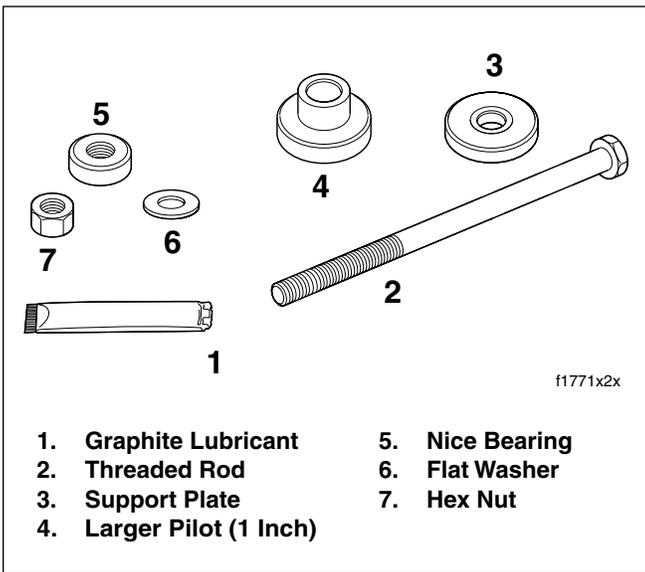
2. Inspect all parts for damage or excessive wear.
3. Always replace bearings as a complete set.
4. Inspect brake disc. Replace disc if warped or badly scored. Measure disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc.
5. Check the belt sprocket for wear, tooth damage, cracks or pitting. Replace if necessary.
6. On laced wheels, replace spokes, rim or hub if damaged.

ASSEMBLY

1. On laced wheels, if the hub and rim were disassembled, assemble the hub, spokes and rim. See Section 2.6 [WHEEL LACING—16 INCH RIM](#).
2. Verify that wheel is true. See Section 2.5 [CHECKING RIM RUNOUT](#) or Section 2.7 [TRUING LACED WHEEL](#), whichever applies.

WARNING

Be sure that brake fluid or other lubricants do not contact brake pads or discs. Such contact can adversely affect braking ability, which could cause loss of control, resulting in death or serious injury. (00290a)



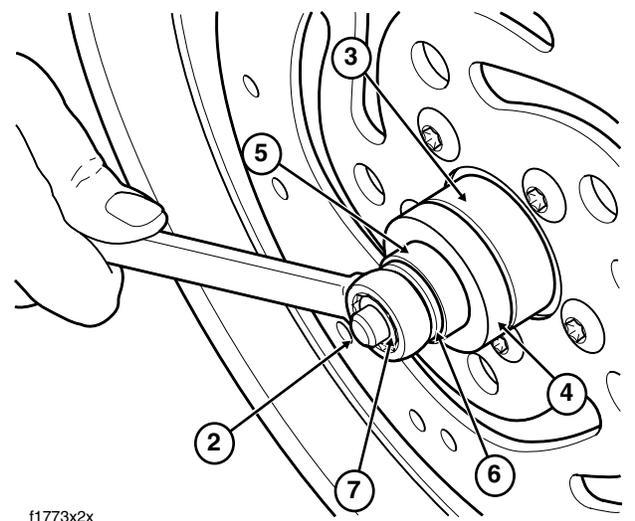
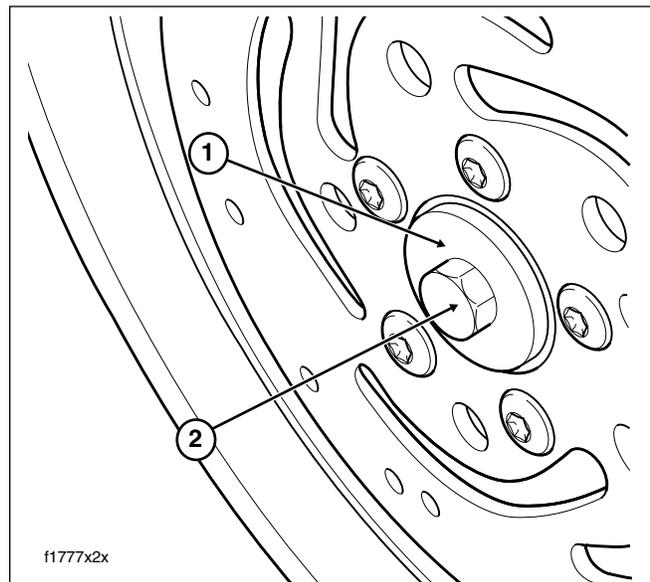
**Figure 2-12. Rear Wheel Bearing Installer Tools
(Part No. HD-44060)**

3. If removed, install five T45 TORX screws (and locknuts on laced wheels) to fasten brake disc to hub. Always install brake disc in its original position. Use **new** screws after three use cycles. Alternately tighten screws to 30-45 ft-lbs (41-61 Nm).
4. Install **new** wheel bearings as follows:

NOTE

Always install first of two bearings on the right side (the valve stem side of the wheel).

- a. Obtain the WHEEL BEARING REMOVER/INSTALLER (HD-44060). Pick out the wheel bearing installer tools for the rear wheel. See [Figure 2-12](#).
- b. To prolong service life and ensure smooth operation, sparingly apply graphite lubricant to threads of threaded rod.
- c. Slide support plate onto threaded rod. Slide rod through hub on the sprocket side of the wheel. See upper frame of [Figure 2-13](#).
- d. On the valve stem side of the wheel, slide bearing onto threaded rod with lettered side facing out-board.
- e. Install **larger** pilot, Nice bearing, flat washer and hex nut onto rod.
- f. Holding threaded rod on opposite side of wheel to prevent rotation, turn hex nut to install bearing. See lower frame of [Figure 2-13](#). Bearing is fully seated when it makes firm contact with the counterbore.
- g. Disassemble and remove tool, but leave support plate on threaded rod.
- h. Slide threaded rod through installed wheel bearing and hub of wheel.



- | | |
|--------------------------|-----------------|
| 1. Support Plate | 5. Nice Bearing |
| 2. Threaded Rod | 6. Flat Washer |
| 3. Wheel Bearing | 7. Hex Nut |
| 4. Larger Pilot (1 Inch) | |

Figure 2-13. Install Sealed Wheel Bearings

- i. On the other side of the wheel, slide spacer sleeve down threaded rod until it contacts installed wheel bearing.
 - j. Repeat steps 4(d) through 4(g) to complete installation of second wheel bearing. Bearing is fully seated when hex nut can no longer be turned.
5. Install rim strip on wheel rim, if applicable. Install tube and tire, if applicable. Verify that wheel is balanced.

- Apply two drops of Loctite High Strength Threadlocker 271 (red) to threads of five belt sprocket bolts. Always use **new** bolts after three use cycles. Install bolts with flat washers to secure sprocket to hub. Alternately tighten bolts to 55-65 ft-lbs (75-88 Nm).

INSTALLATION

- Place wheel in rear swingarm. Slide wheel far enough forward to slip belt over sprocket and then slide the wheel back.

CAUTION

Do not bend or fold belt backward or into loops smaller than 5 inches (127 mm) in diameter. Sharp bending can weaken the belt and cause premature failure.

- Seat caliper on anchor weldment of rear swingarm. Position wheel in swingarm, so that brake disc is centered between brake pads.
- Coat the axle with ANTI-SEIZE LUBRICANT.
- With the larger OD on the outboard side, hold external spacer between rear swingarm and belt sprocket. Slide axle through left side of rear swingarm, external spacer, and belt sprocket into wheel hub.
- When axle emerges from hub on brake disc side of wheel, push axle through **short** external spacer, caliper bracket and right side of rear swingarm.
- Rotate axle so that the flat on the threaded end is top-side. With the thumb down and the cam forward, install adjuster cam on end of axle.
- Apply a thin film of ANTI-SEIZE LUBRICANT to the inboard side of the cone nut avoiding contact with threads. Install cone nut on axle, but finger tighten only.
- Obtain torque wrench with 1/2 inch drive head and AXLE NUT TORQUE ADAPTER (HD-47925). Proceed as follows:

NOTE

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

- Install torque adapter perpendicular to torque wrench as shown in [Figure 2-14](#).
- Insert tool up between rear wheel and muffler to capture cone nut. For best clearance with muffler, be sure torque adapter is on the outboard side.

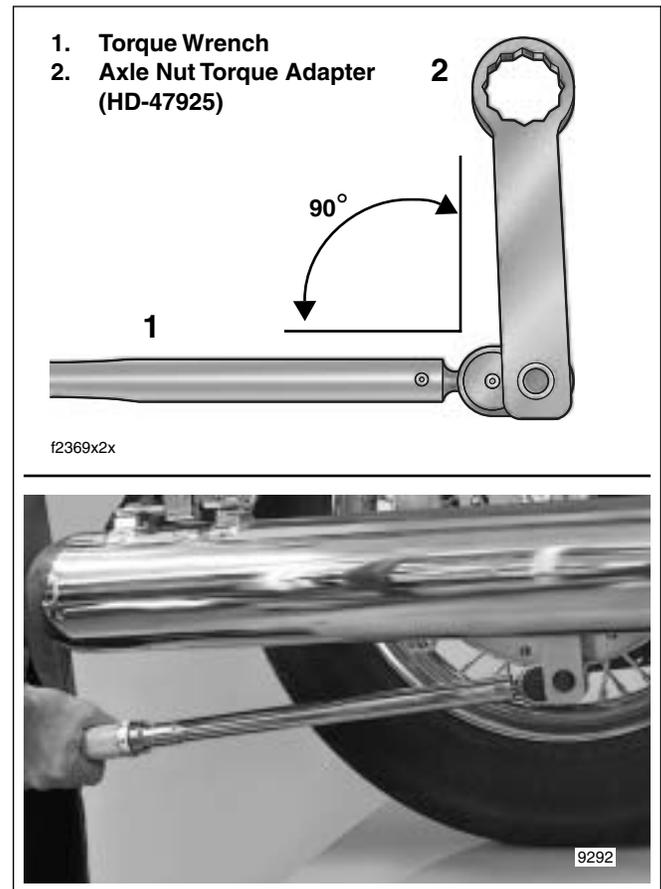


Figure 2-14. Install Tool Perpendicular to Torque Wrench

CAUTION

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

- Verify that adjuster cam just contacts weld nub on both sides of rear swingarm. If necessary, push wheel forward slightly to achieve the desired result. Snug the cone nut to 15-20 ft-lbs (20-27 Nm). See [Figure 2-15](#).
- Check deflection at the loosest spot in the belt. Use BELT TENSION GAUGE (HD-35381A), or install adapter (HD-35381-3) on old style gauge, and apply 10 lbs. (4.5 kg) of force at the midpoint of the bottom belt strand. Belt deflection should be as follows:

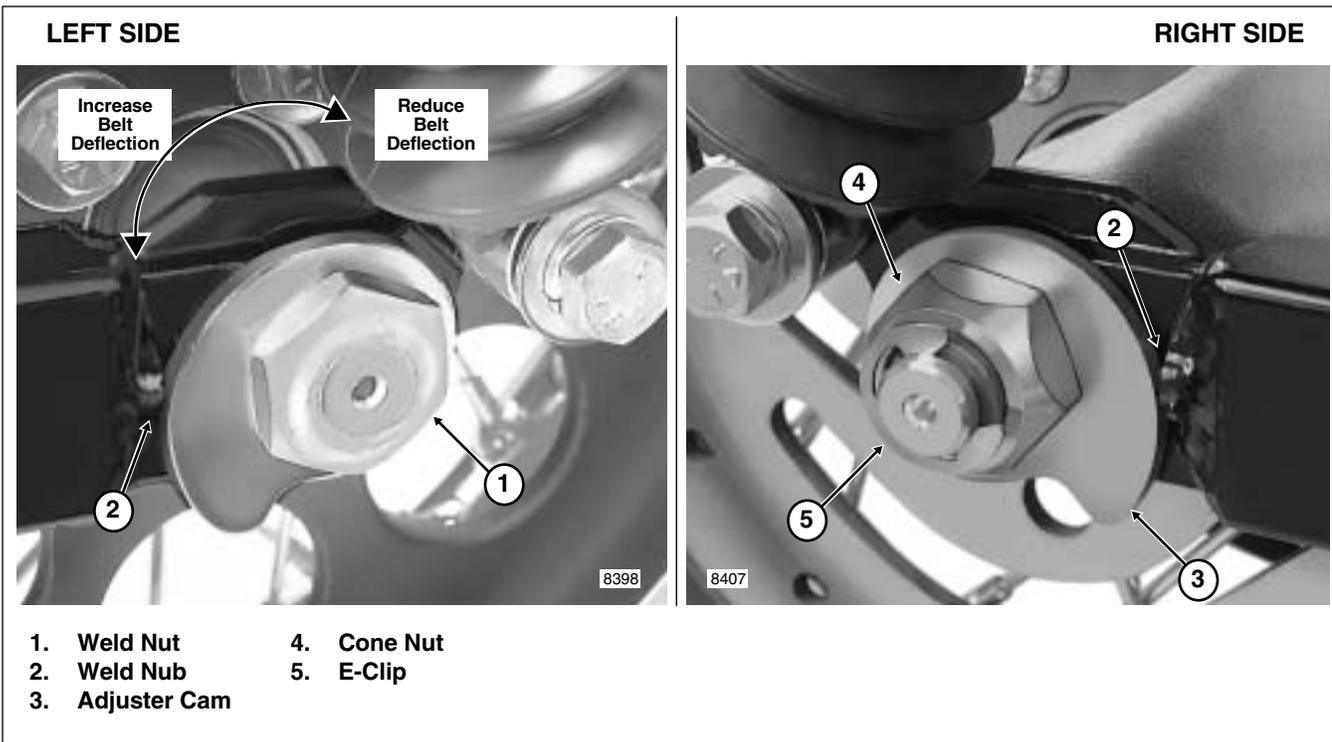


Figure 2-15. Move Rear Wheel Forward Until Adjuster Cams Just Contact Weld Nubs

Table 2-3. Belt Deflection in the Air

Orientation	Inches	Millimeters
Motorcycle Upright With Rear Wheel in the Air	3/16 - 1/4	4.8 - 6.4
<small>NOTE</small> See Section 1.10 <i>DRIVE BELT</i> for belt deflection specification with motorcycle on jiffy stand.		

10. If belt is too tight, move to step 11 to increase belt deflection. If belt is too loose, reduce belt deflection as described below:
- Rotate weld nut on left side of axle in a clockwise direction.
 - Check belt deflection. Apply 10 lbs. (4.5 kg) of force at the midpoint of the bottom belt strand. Belt deflection should be within the range specified in [Table 2-3](#).
 - If belt is still too loose, repeat steps 10(a) through 10(b). If belt is now too tight, move to step 11.
11. If belt is too tight, increase belt deflection as follows:
- Rotate weld nut on left side of axle in a counter-clockwise direction.
 - Push wheel forward slightly so that adjuster cam just contacts weld nub on both sides of rear swing-arm. See [Figure 2-15](#).

- Check belt deflection. Apply 10 lbs. (4.5 kg) of force at the midpoint of the bottom belt strand. Belt deflection should be within the range specified in [Table 2-3](#).
- If belt is still too tight, repeat steps 11(a) through 11(c). If belt is now too loose, move to step 10.

12. **Holding** weld nut on left side of axle, tighten cone nut on right side to 95-105 ft-lbs (128.8-142.4 Nm).

NOTE

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

13. Recheck belt deflection to verify that it is still within specification.
- If the belt deflection is not within specification, loosen cone nut and then snug to 15-20 ft-lbs (20-27 Nm) before returning to step 10.
14. With the flat side out, install **new** E-clip in groove on right side of axle.
15. On models equipped with low profile shock absorbers (FLHS and FLHX), install left side lower saddlebag support rail as follows:
- At rear left side of motorcycle, start outside T40 TORX screw (and flange nut) to fasten saddlebag support rail to saddlebag support bracket.

- b. Start T40 TORX screw to fasten opposite end of saddlebag support rail to frame weldment.
- c. Alternately tighten screws to 15-20 ft-lbs (20-27 Nm).

16. Install left side muffler as follows:

NOTE

TORCA clamps have eliminated the need for silicone or graphite tape during assembly. To ensure sealing integrity and prevent the possibility of leakage, always discard TORCA clamps whenever they are removed.

- a. Slide **new** TORCA clamp onto free end of crossover pipe.
- b. Using a bungee cord, tie muffler to lower saddlebag support rail. Install muffler on crossover pipe. Place TORCA clamp into position between crossover and muffler.
- c. Install two screws (with lockwashers) to fasten the muffler to the lower saddlebag support rail. Alternately tighten screws to 96-144 **in-lbs** (10.8-16.3 Nm).
- d. Verify that exhaust pipes are in alignment and do not contact the vehicle frame or mounted components.
- e. Tighten the TORCA clamp to 45-60 ft-lbs (61-81 Nm).
- f. Open worm drive clamps and install heat shield on crossover pipe. Position each worm drive clamp so that screw is on the outboard side in the most accessible position and then tighten to 20-40 **in-lbs** (2.3-4.5 Nm).
- g. Remove bungee cord from muffler.

 **WARNING**

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

17. Depress rear brake pedal several times to set brake pads to proper operating position within caliper.
18. Install saddlebags. See Section [2.26 SADDLEBAG, INSTALLATION](#).

INSPECTION

Check wheels for lateral and radial runout before installing a new tire or tube.

1. Install truing arbor in wheel hub and place wheel in WHEEL TRUING STAND, Part No. HD-99500-80.
2. See [Figure 2-16](#). To check rim lateral runout, place a gauge rod or dial indicator near the rim bead. If lateral runout exceeds 0.040 inch (1.02 mm), replace the wheel if cast. Retrue the wheel if laced.
3. See [Figure 2-17](#). Check the rim radial runout as shown. If radial runout exceeds 0.030 inch (0.76 mm), replace the wheel if cast. Retrue the wheel if laced.

NOTE

Rim lateral and radial runout is adjustable on laced wheels.
See [Section 2.7 TRUING LACED WHEEL](#).

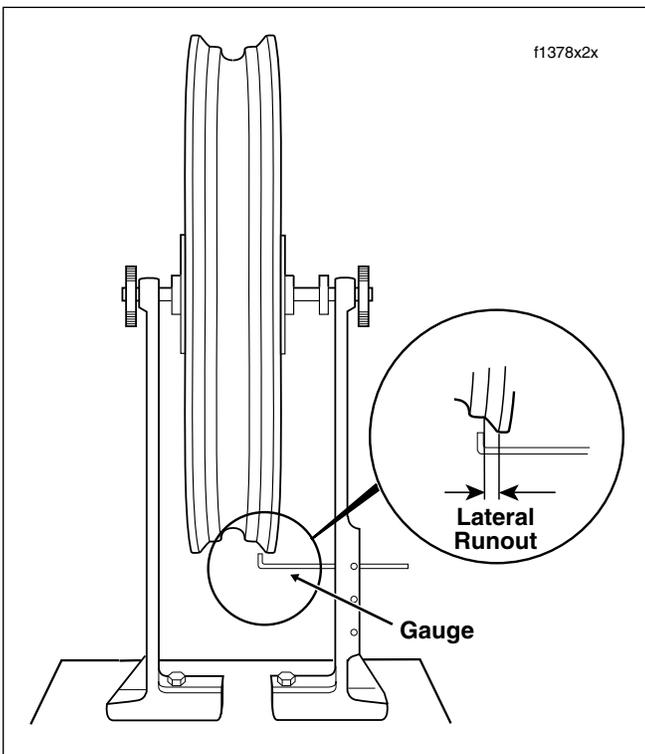


Figure 2-16. Checking Rim Lateral Runout

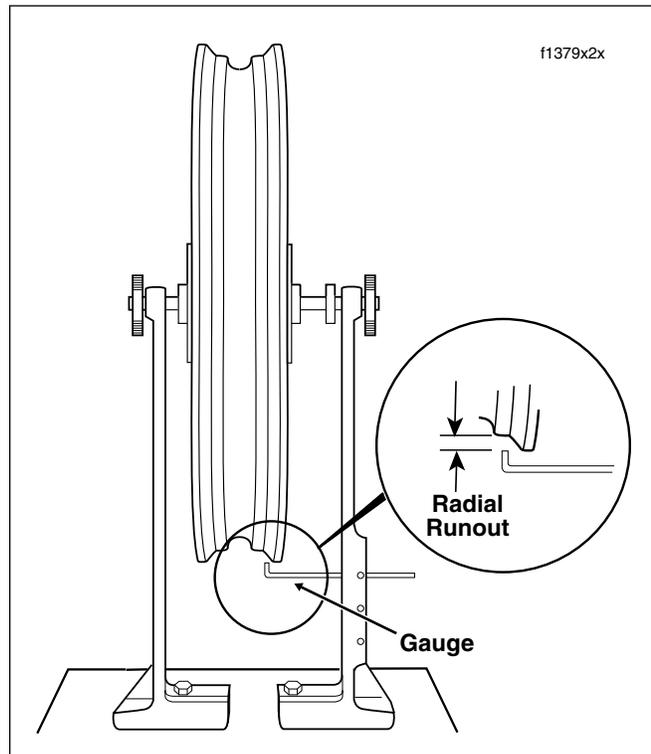


Figure 2-17. Checking Rim Radial Runout

4. If working with a laced wheel, proceed to [Section 2.7 TRUING LACED WHEEL](#) to check the wheel offset dimension.

GENERAL

CAUTION

While the steel laced and chrome aluminum laced profile wheels use the same hub, exercise caution to avoid mixing or interchanging any other parts. Do not install the chrome plated spokes and/or spoke nipples on a steel rim. Likewise, do not install the zinc plated spokes and/or spoke nipples on a chrome plated rim. Mixing or interchanging parts can result in wheel damage.

The spoke nipple fittings use a TORX style fastener and requires a special T-30 I.P. (TORX Plus) driver (HD-42135) for removal and installation. See A of Figure 2-18. Use of a standard T-30 TORX bit will result in nipple damage.

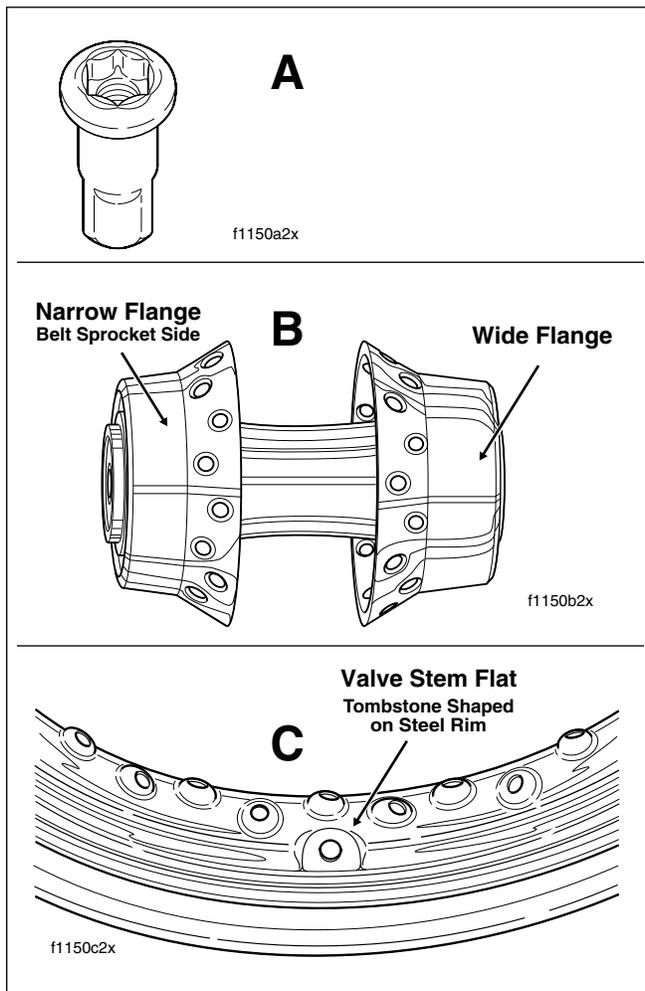


Figure 2-18. Spoke Nipple, Hub and Rim

WHEEL LACING

1. If front wheel, place the hub on a table with the wider flange side up. If rear wheel, place hub so that brake disc side is up. Insert a spoke in each hole of the lower row as shown below. Angle the spokes in a clockwise direction.

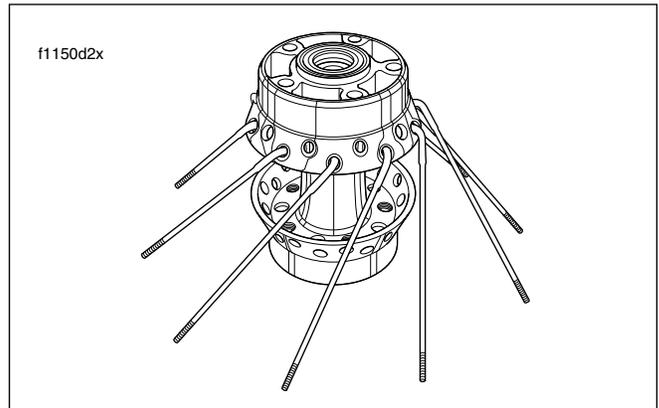


Figure 2-19.

2. Center rim over hub with the valve stem side up. Using any lower row spoke, place the first spoke into the rim hole to the left of the valve stem hole on the upper half of the rim centerline.

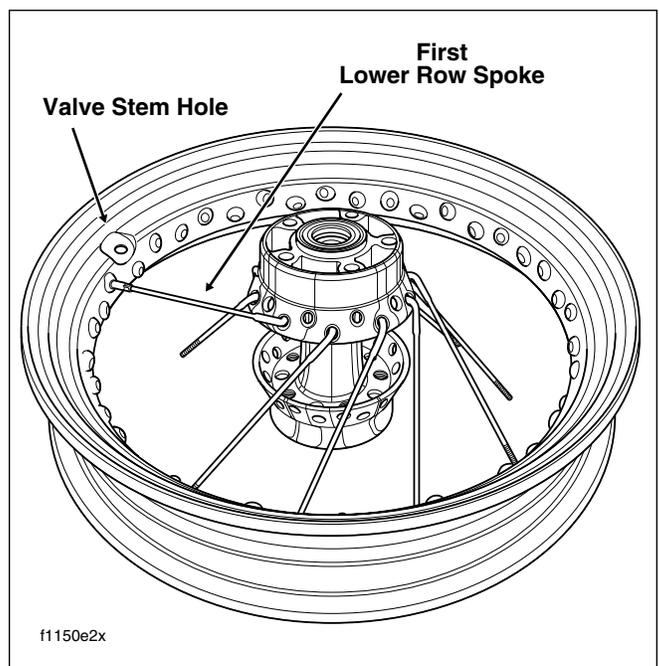


Figure 2-20.

3. Install the rest of the lower row spokes in every fourth hole.

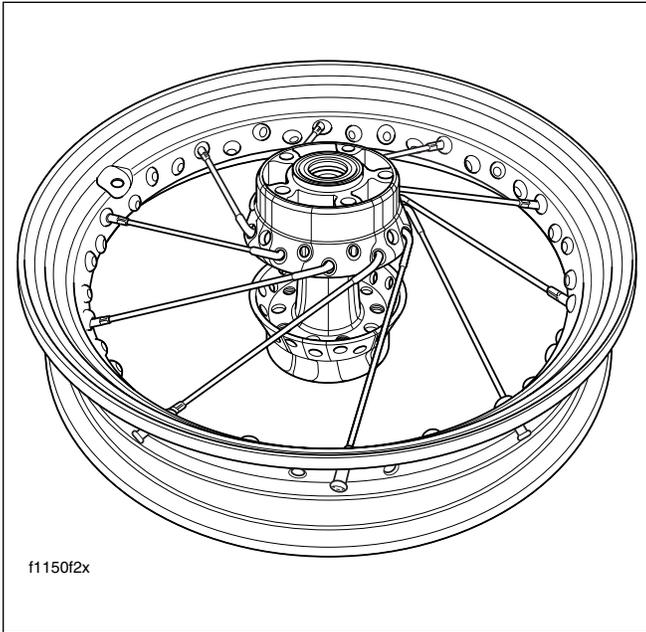


Figure 2-21.

5. Install the nine remaining upper row spokes into every fourth hole remaining above the rim centerline.

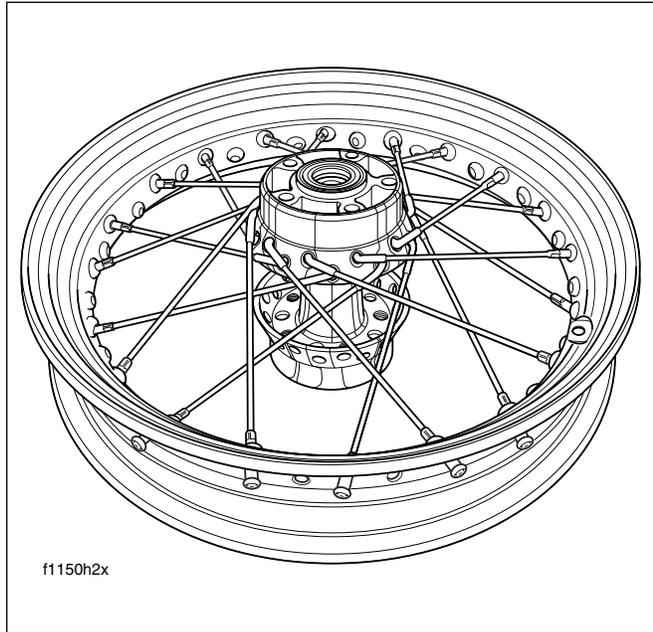


Figure 2-23.

4. Place the first upper row spoke into the hub as shown below. Angle the spoke counterclockwise crossing four lower row spokes. The spoke must enter the hole to the left of the valve stem hole.

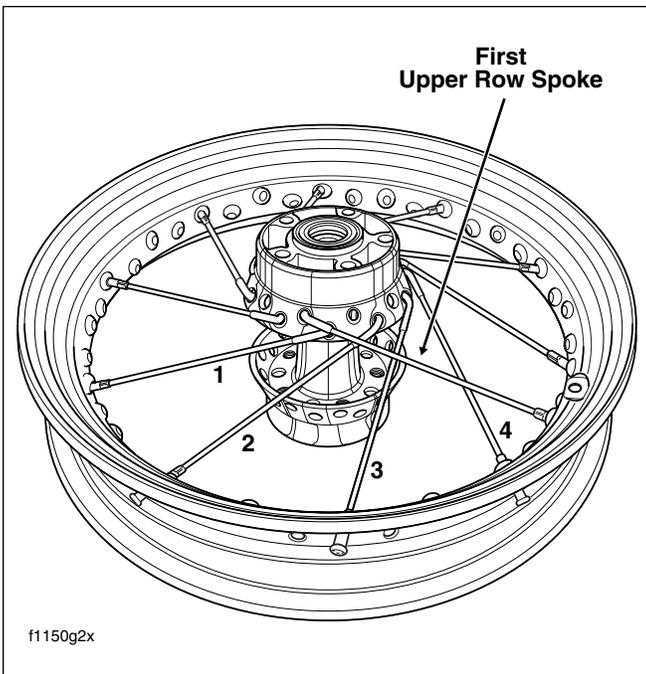


Figure 2-22.

6. Turn the wheel over. Place any lower row spoke into the hub. Angle the spoke clockwise and place into rim hole angled to accept it.

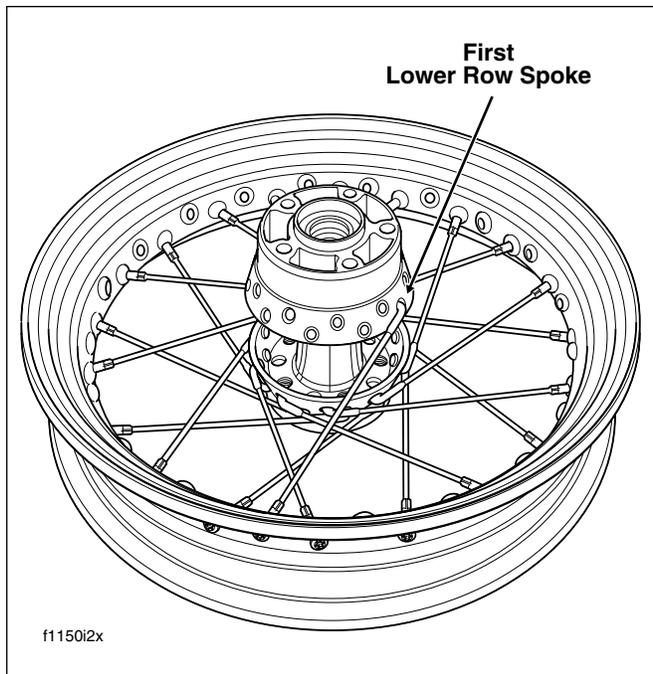


Figure 2-24.

- Angled clockwise, place the nine remaining lower row spokes into hub and rim.

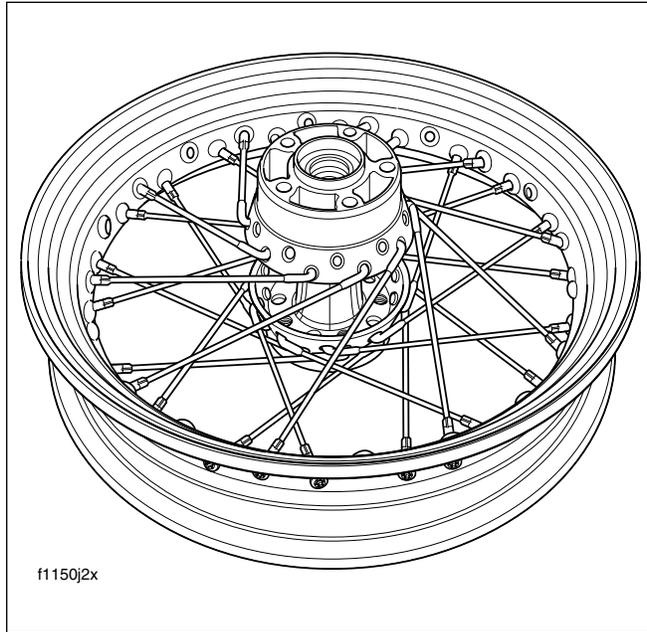


Figure 2-25.

- Install the nine remaining upper row spokes into hub and rim.

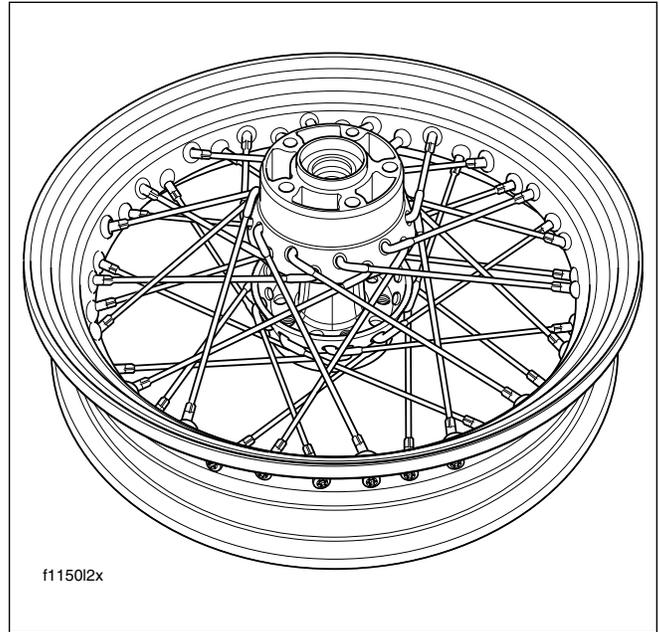


Figure 2-27.

- Insert any upper row spoke into the hub and angle spoke counterclockwise. Place spoke into appropriate rim hole crossing four lower row spokes.

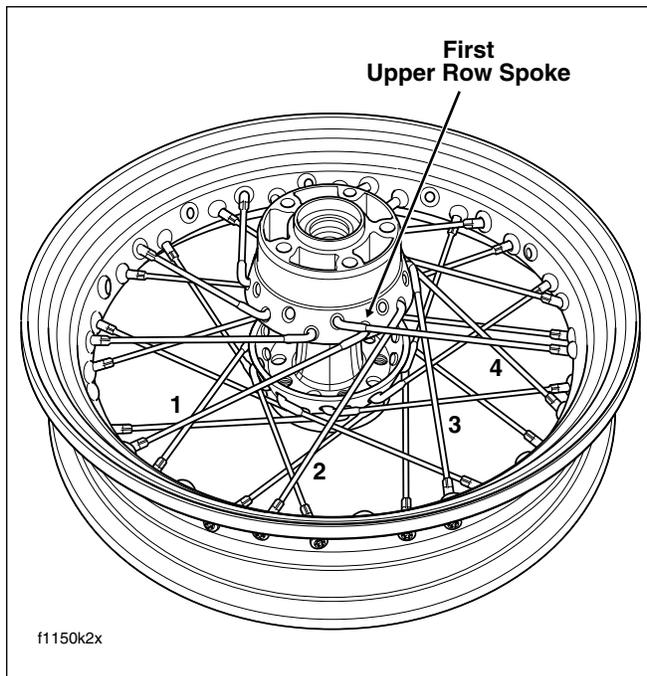


Figure 2-26.

CAUTION

The hub is made of aluminum alloy and should not be clamped in a vise or gripped with pliers, or the hub material may be damaged.

- Verify that wheel is true. See Section [2.7 TRUING LACED WHEEL](#) for truing procedure and spoke torque specification.

SPOKE TIGHTNESS

See Section [1.6 WHEEL SPOKES](#).

PROCEDURE

1. Divide the wheel spokes into ten groups of four and mark the center of each group with a piece of tape. The groups should be directly across from one another and approximately 90° apart. Tighten the spokes in these four groups finger tight, leaving all others loose.
2. See [Figure 2-29](#). Install truing arbor in wheel hub and place wheel in WHEEL TRUING STAND, Part No. HD-99500-80. Tighten arbor nuts so hub will turn on its bearings.
3. Lay a straightedge across the hub brake disc flange (valve stem side of dual disc front wheel) and one of the marked spoke groups. Measure the distance from the straightedge to the edge of the rim as shown in [Figure 2-28](#). Be sure to subtract the thickness of the straightedge.
See [Figure 2-30](#). The offset dimension must be as follows:

Table 2-4. Offset Dimensions

RIM TYPE	RIM SIZE	IN.	MM.
Steel Laced			
Front	16	1.555–1.575	39.5–40.0
Rear	16	1.472–1.492	37.4–37.9
Chrome Aluminum Laced Profile			
Front	16	1.270–1.290	32.3–32.8
Rear	16	1.190–1.210	30.2–30.7

If the dimension is not correct, tighten the four spokes accordingly. Use the special T-30 I.P. (TORX Plus) driver (HD-42135). For example, if the measurement on the right rim edge side is less than it should be, loosen the two spokes attached to the hub right side and tighten the two spokes attached to the hub left side. Turn all four spokes an equal number of turns until offset dimension is correct.

CAUTION

Always loosen the appropriate spokes before tightening the other two. Reversing this procedure will cause the rim to become out-of-round.

4. Repeat Step 3 for all four groups on the wheel.
5. See [Figure 2-29](#). After rim has been trued sideways it must be checked and trued radially. Adjust truing stand gauge to the rim's tire bead seat as shown. The rim should be trued within 1/32 inch (0.79 mm).

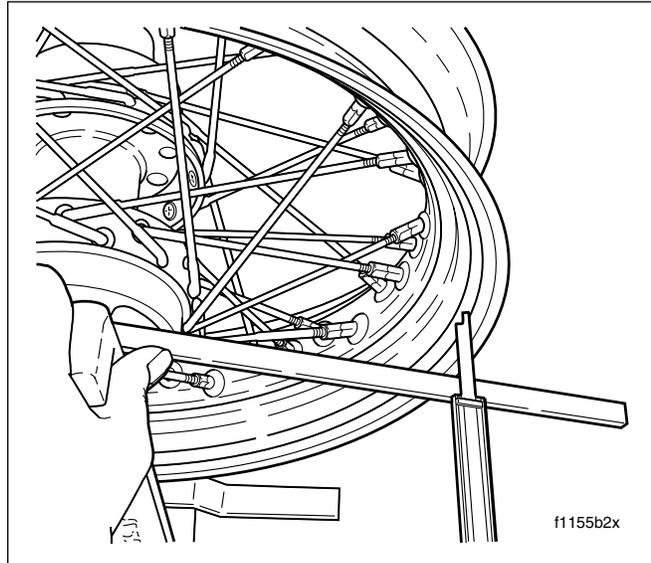


Figure 2-28. Checking Steel Laced Hub Offset Dimension

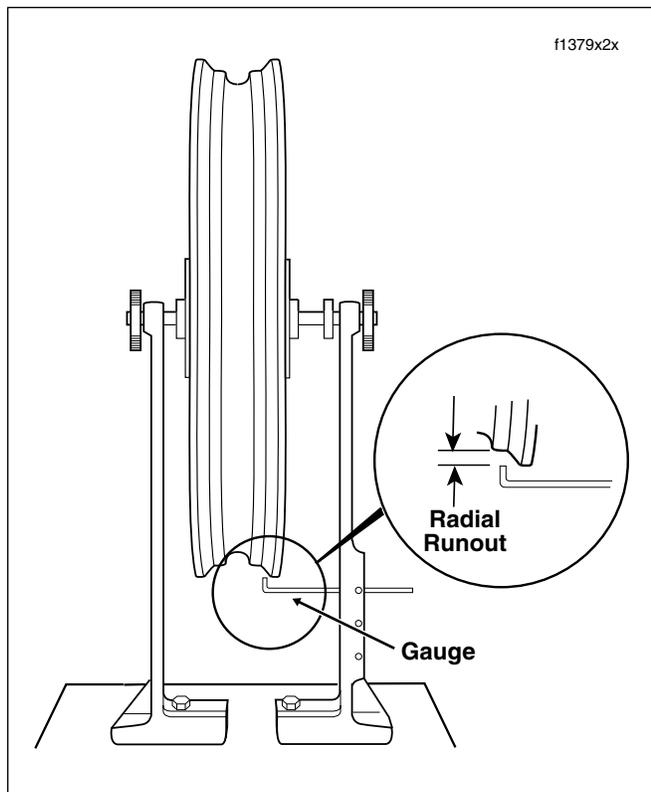


Figure 2-29. Truing Steel Laced Rim Radially

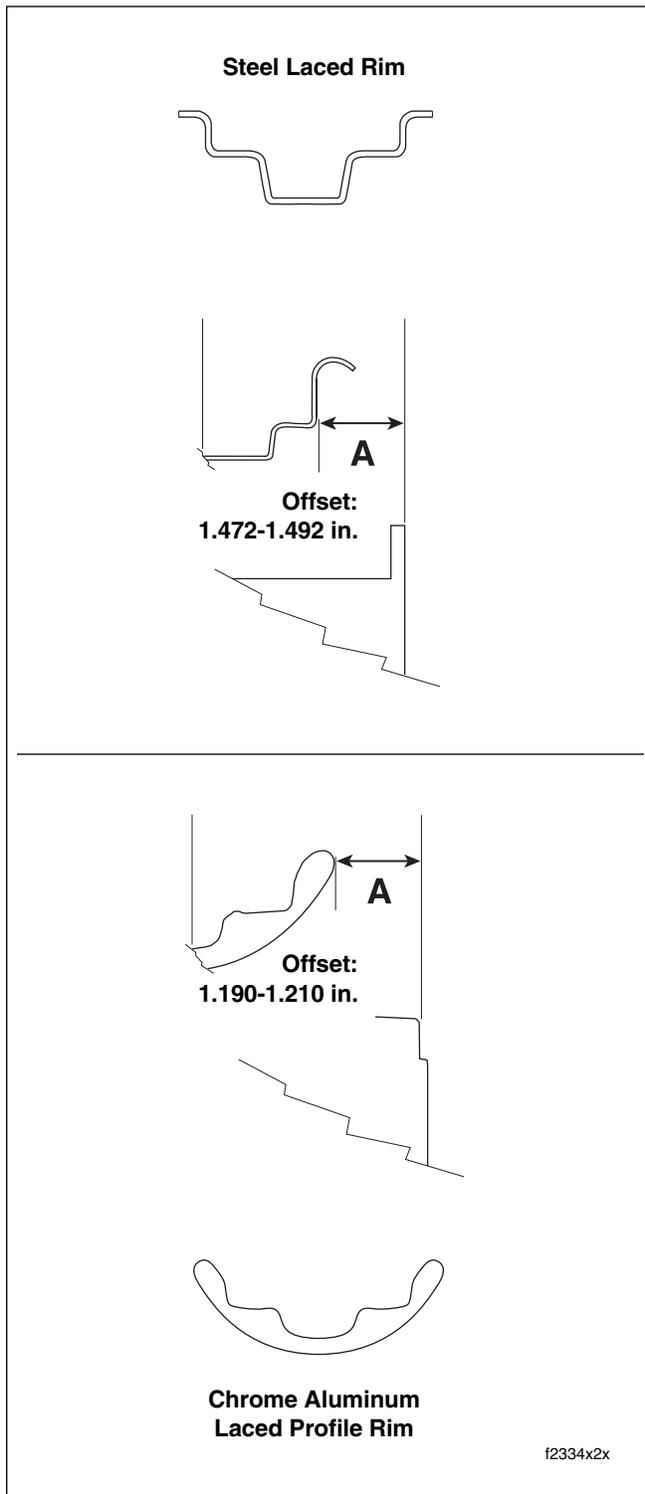


Figure 2-30. Laced Hub Offset Dimension (16 Inch Rear)

6. Spin the rim slowly. If the rim contacts the gauge on or near a marked group of spokes, loosen the spokes in the marked group on the opposite side of the rim. Now tighten the spokes in the group where the rim makes contact. Loosen and tighten spokes an equal number of turns.
7. If the rim contacts the gauge between two marked groups, loosen the spokes in both opposite groups and tighten the spoke groups on the side of the rim that makes contact.
8. When the wheel is centered and trued, start at the valve stem hole and tighten the rest of the spoke nipples one turn at a time until they are snug. Repeat step tightening each spoke nipple to 40-50 **in-lbs** (4.5-5.6 Nm).

WARNING

Spokes that are too tight can draw nipples through the rim or distort hub flanges. Spokes that are too loose can continue to loosen when put in service. Either condition can adversely affect stability and handling, which could result in death or serious injury. (00286a)

9. File or grind off ends of spokes protruding through nipples to prevent puncturing tube when tire is mounted.
10. Check the rim lateral and radial runout as described under Section 2.5 **CHECKING RIM RUNOUT**.

NOTE

After installation of front wheel, visually check the relationship of the front wheel to the fork fender bosses. The front wheel should be approximately centered between the bosses.

GENERAL

Tires should be inspected for punctures, cuts, breaks and wear at least weekly.

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 tube as soon as possible. Inner tubes must be used on all Harley-Davidson laced wheels.

⚠ WARNING

Excessively worn tires are more susceptible to penetrations. Always remove tires from service before they reach the tread wear indicator bars, which indicates that 1/32 inch (0.79 mm) tread pattern depth remains. Worn/unworn tire combinations and worn tires used in wet conditions can adversely affect handling and lead to loss of vehicle control, which could result in death or serious injury.

⚠ WARNING

Tubeless tires may be repaired in the tread area only and then the puncture must be 1/4 inch (6.4 mm) or smaller. Never repair a tire with less than 1/16 inch (1.6 mm) tread depth. All repairs must be made from inside the tire. Use of faulty or defective tires can adversely affect handling and lead to loss of vehicle control, which could result in death or serious injury.

NOTE

Acceptable repair methods include a patch and plug combination, chemical or hot vulcanizing patches or head-type plugs.

When repairing tubeless tires, use TIRE SPREADER, Part No. HD-21000 to spread the tire sidewalls.

⚠ WARNING

Always check both tire sidewalls for arrows indicating proper forward tire rotation. Some tires require different tire rotation depending on whether tire is used on front or rear wheel. Improper mounting can result in poor tire mileage. In wet weather, improper mounting can adversely affect handling and lead to loss of vehicle control, which could result in death or serious injury.

REMOVAL

1. Remove wheel from motorcycle. Let the air out of the tube or tire.



Figure 2-31. Starting Bead Off Rim

2. Loosen both tire beads from rim flange. See Figure 2-31. In most cases, a bead breaker machine will be required to loosen the bead from the rim.
3. Using tire tools (not sharp instruments), and RIM PROTECTORS, Part No. HD-01289, start upper bead over edge of rim at valve. Do not use excessive force when starting bead over rim. Bead wires may be damaged ruining the tire. Repeat all around rim until first bead is over rim. Remove the tube.

NOTE

It is not necessary to use tools to remove tubeless tires. Make sure beads are well lubricated before removing from rim.

4. Push lower bead into rim well on one side and insert tire tool underneath bead from opposite side. Pry bead over rim edge. Remove tire from rim.

NOTE

It is not always necessary to completely remove tire from rim. Removing one side allows the tube to be replaced and allows for inspection of tire.

CLEANING AND INSPECTION

1. Clean the inside of tire, rim and tube. If rim is dirty or rusty, clean with a stiff wire brush.

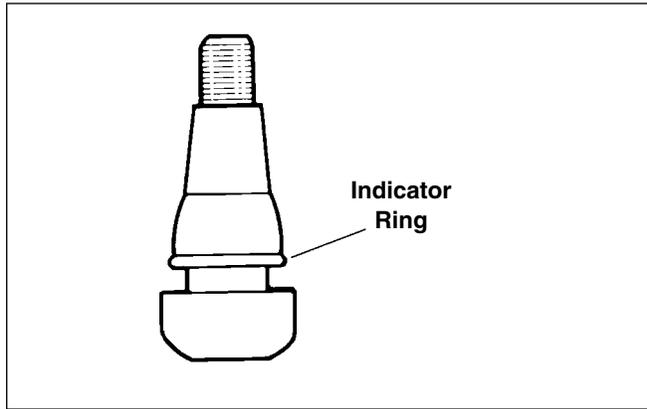


Figure 2-32. Snap-in Tubeless Tire Valves

2. Inspect the tire and tube for wear.

INSTALLATION

⚠ WARNING

Use the correct inner tube and tire. See **TIRE DATA** in **SPECIFICATIONS**. Use of incorrect tires or tubes can adversely affect handling or result in tire failure, which could result in death or serious injury.

⚠ WARNING

Only install original equipment tire valves and valve caps. A valve, or valve and cap combination, that is too long or too heavy can strike adjacent components and damage the valve, causing rapid tire deflation. Rapid tire deflation can cause loss of vehicle control, which could result in death or serious injury. (00281a)

1. On tubeless wheels, damaged or leaking valves must be replaced. To replace a snap-in type valve proceed as follows:
 - a. See [Figure 2-32](#). Moisten the valve with water and insert valve stem through rim hole.
 - b. Thread plug tool on valve stem and pull valve through rim until all of the indicator ring is visible.
2. 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 hole in rim.
3. Thoroughly lubricate the rim flanges and both beads of the tire with tire lubricant. Install **RIM PROTECTORS**, Part No. HD-01289 to prevent scarring rims.
4. See [Figure 2-33](#). Starting at the valve stem, start the first bead into the rim well. Work the bead on as far as possible by hand. Use the tire tool to pry the remaining bead over the rim flange. If tire has colored dot on sidewall, it



Figure 2-33. Starting Bead on Rim



Figure 2-34. Starting Second Bead on Rim

is a balance mark and should be located next to valve stem hole.

5. Inflate tube just enough to round it out. Lubricate thoroughly 360° around the tube base. Insert tube in tire with valve stem in hole.
6. See [Figure 2-34](#). Starting 180° from valve stem, start the second bead onto the rim. Work the bead onto the rim with tire tools, working toward valve in both directions. Remove the valve core from the rim hole before prying the remaining bead over the rim flange.

Make sure inner tube valve stem moves in and out freely, then inflate the tire to recommended pressure to seat the bead. See **TIRE DATA** at the beginning of this section. Deflate tire to allow inner tube to smooth out, and then inflate again to recommended pressure to seat the bead.

NOTE

Do not inflate tire over 40 psi (2.8 bars) to seat beads. If the beads fail to seat, deflate and relubricate the bead and rim. Reinflate to seat beads, but do not exceed 40 psi (2.8 bars).

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)

CAUTION

When mounting tire and tube on the rim, use extreme care so the inner tube is not pinched.

- Use the BEAD EXPANDER (Part No. HD-28700) to seat beads on tubeless tires.

Checking Tire Radial Runout

- Check runout by turning wheel on axle, measuring amount of radial displacement from a fixed point near the tire. See Figure 2-35.
- Tire tread runout should be no more than 0.090 inch (2.28 mm). If tire tread runout exceeds this specification, remove tire from rim and check rim runout to see if rim is at fault. (See Section 2.5 CHECKING RIM RUNOUT).

NOTE

Make sure bead is properly seated on rim. Deflate and reseal tire if necessary.

- If rim runout is less than 1/32 inch (0.79 mm), tire is at fault and should be replaced. If rim runout exceeds this specification, correct by replacing cast wheel or truing laced wheel.

Checking Tire Lateral Runout

- Check runout by turning wheel on axle, measuring tread runout. See Figure 2-36.
- Tire tread runout should be no more than 0.080 inch (2.03 mm). If tire tread runout exceeds this specification, remove tire from rim and check rim bead runout to see if rim is at fault (see Section 2.5 CHECKING RIM RUNOUT).

NOTE

Make sure bead is properly seated on rim. Deflate and reseal tire if necessary.

- If rim bead runout is less than 1/32 inch (0.79 mm), tire is at fault and should be replaced. If rim bead runout exceeds this specification, correct by replacing cast wheel or truing laced wheel.

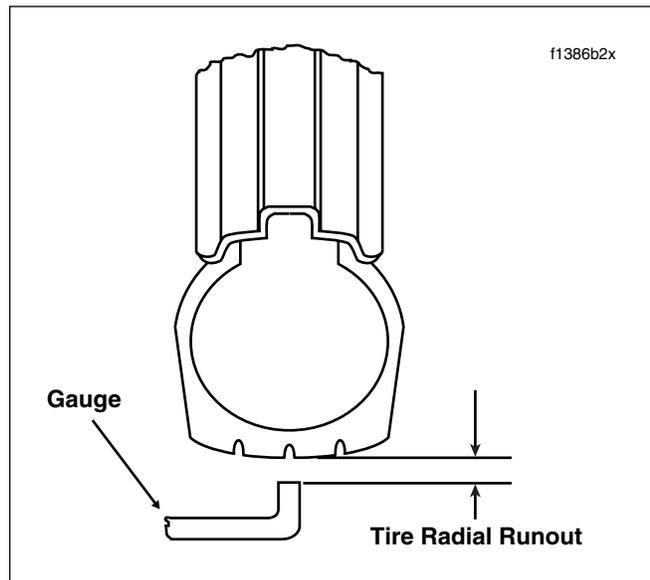


Figure 2-35. Checking Tire Radial Runout

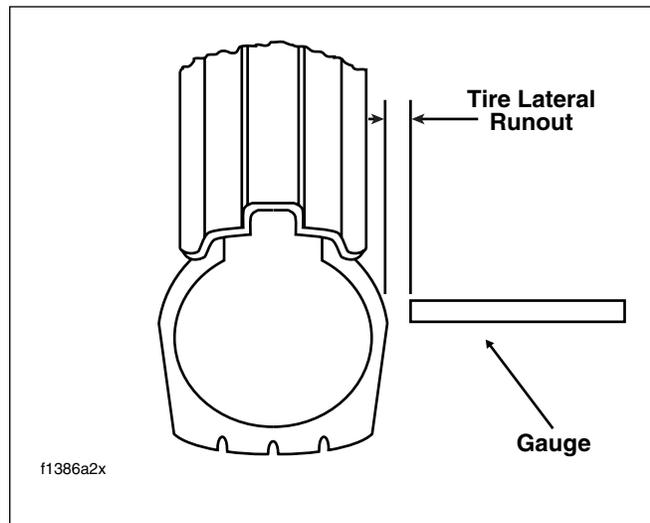


Figure 2-36. Checking Tire Lateral Runout

Wheel Balancing

Wheel balancing is recommended to improve handling and reduce vibration, especially at high road speeds. Cast aluminum wheels require special self-adhesive weights. Gold Color – 1 oz. (28g) weight, 1/2 oz. (14g) weight, Silver Color 1/2 oz. (14g) and 1/4 oz. (7g), and Black 1/4 oz. (7g) weight.

Laced wheels use balance weights which press over the spoke nipples. 1 oz. (28g), 3/4 oz. (21g) and 1/2 oz. (14g) weights are available.

- Self adhesive wheel weights should be applied to the flat surface of the rim. Make sure that area of application is completely clean, dry and free of oil and grease.

NOTE

If 1 oz. (28g) or more weight must be added at one location, split the amount so that half is applied to each side of the rim.

2. Remove paper backing from weight and apply three drops of Loctite® SUPERBONDER® 420 to the adhesive side of the weight. Place the weight on rim, press firmly in place and hold for 10 seconds. Full adhesive cure takes 8 hours.
3. In most cases, static balancing using WHEEL TRUING STAND, Part No. HD-99500-80, will produce satisfactory results. However, dynamic balancing, utilizing a wheel spinner, should be used to produce finer tolerances for best high and low speed handling characteristics. Follow the instructions supplied with the balance machine you are using. Wheels should be balanced to within 1/2 oz. (14g) at 60 mph (96 km/h). The maximum permissible weight to accomplish balance is 3-1/2 oz. (99g) total.

⚠ WARNING

Check vehicle alignment according to following procedures. Incorrect alignment can adversely affect stability and handling, which could result in death or serious injury. (00287a)

METHOD A**NOTE**

Use this procedure to realign the powertrain to the frame whenever major disassembly or engine replacement occurs. For acceptable results, a careful inspection should be performed (wheel and tire runout, laced wheel offset, rubber mount condition, etc.) to ensure that it is conducted with serviceable components. See **INSPECTION** for more information.

1. Place the motorcycle on a hydraulic center stand or place blocking under the frame to support the vehicle and lift the rear wheel off the ground. Be sure the motorcycle is positioned as level as possible.
2. Remove socket screw with lockwasher to remove left passenger footboard from rear swingarm bracket. Tighten both rear swingarm bracket bolts to 34-42 ft-lbs (46-57 Nm). Repeat step on right side of motorcycle.
3. Remove the decorative chrome plug from both rear swingarm brackets. While holding the left side pivot shaft locknut, tighten the right side locknut to 40-45 ft-lbs (54-61 Nm). Then hold the right side pivot shaft locknut and tighten the left side locknut to 40-45 ft-lbs (54-61 Nm).
4. Verify that belt deflection is within specification and that adjuster cams are tight against rear swingarm weld nubs. **Holding** weld nut on left side of axle, tighten cone nut on right side to 95-105 ft-lbs (128.8-142.4 Nm).
5. Remove seat. See Section 2.25 SEAT, REMOVAL.
6. Partially remove fuel tank to gain access to top engine mounting bracket and stabilizer link. See Section 4.7 FUEL TANK (CARBURETED), PARTIAL REMOVAL, FLHX, FLHT, or FLHR/S. For fuel injected models, see Section 9.4 FUEL TANK (FUEL INJECTED), PARTIAL REMOVAL, FLHXI, FLHT/C/U/I, FLTRI, or FLHR/C/S/I.
7. Top Engine Mount:
 - a. On left side of motorcycle, tighten the two top engine mounting bracket to front and rear cylinder head bolts to 35-40 ft-lbs (48-54 Nm). See A of Figure 2-39.
 - b. Moving to right side of motorcycle, tighten the top stabilizer link eyelet to frame weldment bolt to 18-22 ft-lbs (24-30 Nm). See C of Figure 2-39.

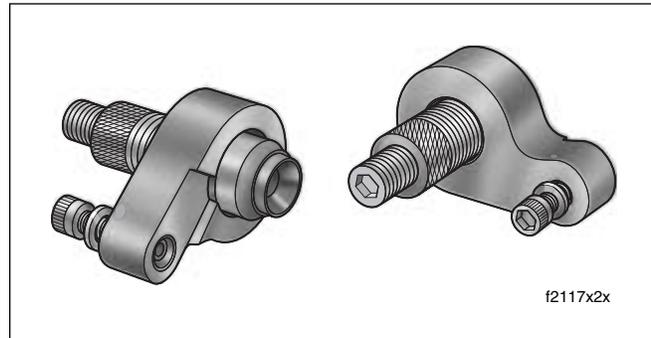


Figure 2-37. Vehicle Alignment Tool (Part No. HD-46247)

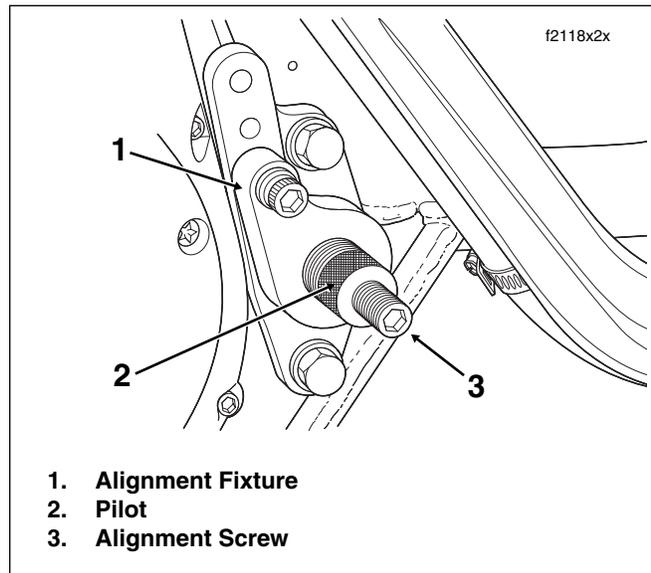


Figure 2-38. Install Vehicle Alignment Tool (Left Side)

- c. Loosen both top stabilizer link jam nuts.
- d. Remove the top stabilizer link eyelet to top engine mounting bracket bolt. See B of Figure 2-39.
8. Front Engine Mount:
 - a. Remove flange locknuts from studs on lower frame crossmember. Remove voltage regulator from studs and allow to hang by cables at front of motorcycle.
 - b. Tighten two engine to front engine mounting bracket bolts to 33-38 ft-lbs (45-52 Nm). See H of Figure 2-39.
 - c. Tighten front stabilizer link eyelet bolt to block on front engine mounting bracket to 18-22 ft-lbs (24-30 Nm). See E of Figure 2-39.
 - d. Loosen both front stabilizer link jam nuts.

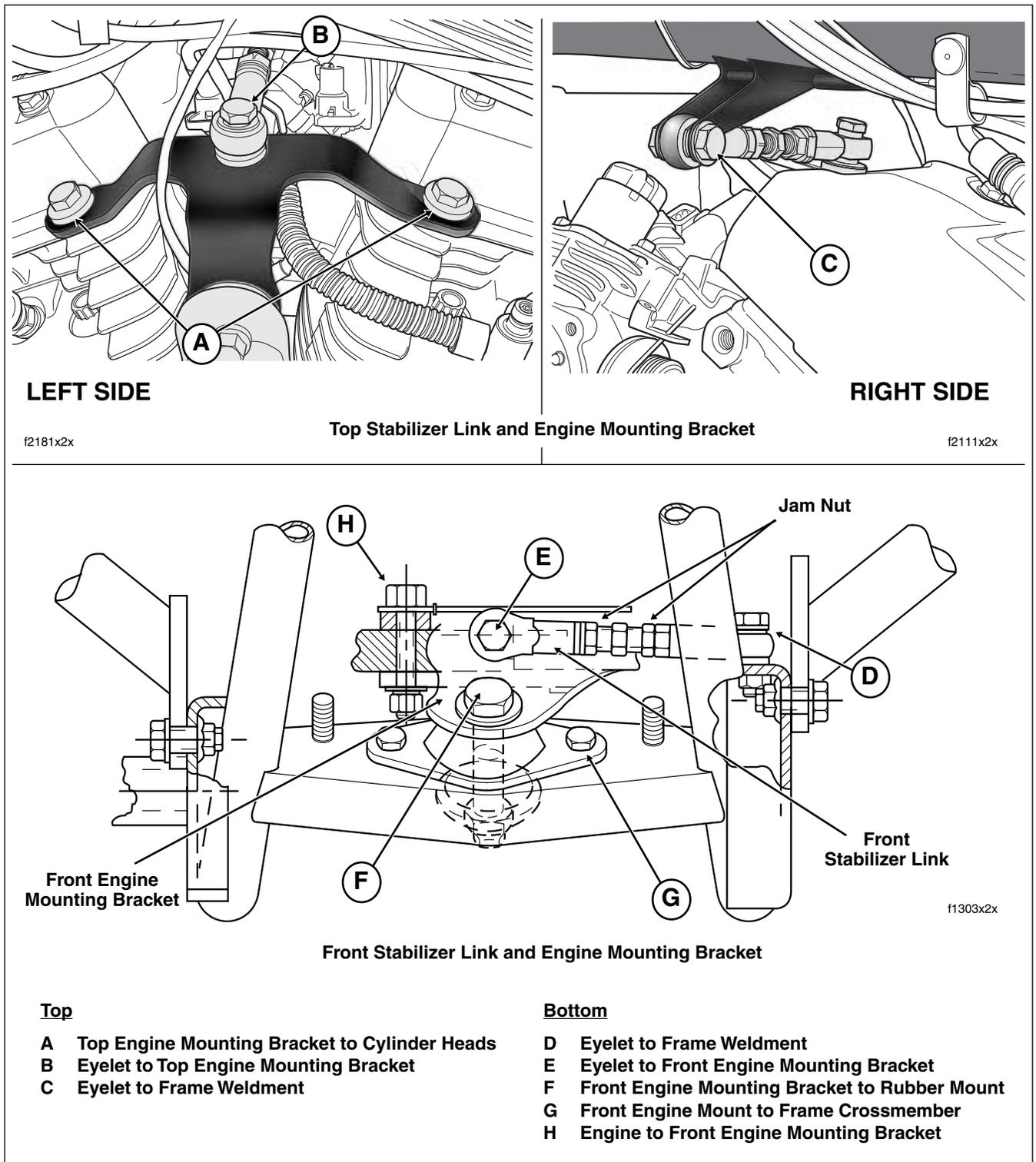


Figure 2-39. Engine Mounting Bracket Bolts

- e. Remove front stabilizer link eyelet to frame weldment bolt. See D of [Figure 2-39](#).
- f. Remove the center front engine mounting bracket to rubber mount bolt (with washers and nut). See F of [Figure 2-39](#).

9. Obtain Vehicle Alignment Tool (HD-46247). See [Figure 2-37](#). Proceed as follows:
 - a. Back off alignment screws and pilot so that no contact is made with pivot shaft during initial installation.
 - b. Position alignment fixture so that pilot begins to engage hole in rear swingarm bracket and then start 5/16 allen head screw (with flat washer) into lower hole of passenger footboard mount. Leave fixture loosely installed. Repeat step on other side of motorcycle.

NOTE

Alignment fixtures are stamped L(left) and R(right) for easy identification. When installing alignment fixture on right side of motorcycle, first remove hex screw to free brake hose P-clamp from rear swingarm bracket. The relief in right side fixture accommodates hex screw boss.

- c. Holding alignment fixture tight against rear swingarm bracket, use knurling to rotate pilot until it bottoms in rear swingarm bracket. Without disturbing setting of pilot, tighten allen head screw to passenger footboard mount to 18-22 ft-lbs (24-30 Nm). Repeat step on other side of motorcycle.
 - d. Hand turn alignment screw until it bottoms against end of pivot shaft. Repeat step on other side of motorcycle.
 - e. Tighten alignment screw to 60-80 **in-lbs** (6.8-9.0 Nm). Repeat step on other side of motorcycle. See [Figure 2-38](#).
10. Adjust each stabilizer link as follows:
 - a. Install bolts removed under steps 7(d) and 8(e), and using the center hex to maintain equal thread engagement at both eyelets, adjust stabilizer links so that bolts thread in without any stress or engine movement. See B and D of [Figure 2-39](#).
 - b. Alternately tighten bolts to 18-22 ft-lbs (24-30 Nm).
 - c. Holding the stabilizer link adjuster and mounting eyelets to prevent movement or binding, tighten jam nuts on top and front stabilizer links.
11. Remove vehicle alignment tool from rear swingarm brackets.
12. Snap the chrome plugs back into the rear swingarm brackets.
13. Install socket screw with lockwasher to fasten passenger footboard to rear swingarm bracket. Tighten screw to 30-35 ft-lbs (40.7-47.5 Nm). Repeat step on other side of motorcycle.
14. Verify that front rubber mount is centered under the front mounting plate bolt hole and has not been bound by the plate dragging across the isolator.
 - a. If the front rubber mount is centered and free of binding, proceed as follows:

- Tighten the two front engine mount to frame cross-member bolts to 15-20 ft-lbs (20-27 Nm). See G of [Figure 2-39](#).
 - Install center front engine mounting bracket to rubber mount bolt (with washers and nut) and tighten to 15-20 ft-lbs (20-27 Nm). See F of [Figure 2-39](#).
 - b. If centering or relaxation of the mount is required, proceed as follows:
 - Loosen the two front engine mount to frame cross-member bolts. See G of [Figure 2-39](#).
 - Push on the rubber mount to center it with the thru bolt hole in the mounting plate. It may be necessary to bounce or wiggle the engine to unload any binding of the rubber mount on the mounting plate.
 - After the mount is centered, tighten the two front engine mount to frame crossmember bolts to 15-20 ft-lbs (20-27 Nm). See G of [Figure 2-39](#).
 - Install center front engine mounting bracket to rubber mount bolt (with washers and nut) and tighten to 15-20 ft-lbs (20-27 Nm). See F of [Figure 2-39](#).
15. Slide voltage regulator over studs on lower frame cross-member at front of vehicle. Install flange locknuts on studs and tighten to 70-100 **in-lbs** (7.9-11.3 Nm).
 16. Install fuel tank. For carbureted models, see Section 4.7 [FUEL TANK \(CARBURETED\), INSTALLATION \(AFTER PARTIAL REMOVAL\), INSTALLATION \(AFTER PARTIAL REMOVAL\)](#), or [FLHR/S](#). For fuel injected models, see Section 9.4 [FUEL TANK \(FUEL INJECTED\), INSTALLATION \(AFTER PARTIAL REMOVAL\), FLHXI, FLHT/C/U/I, FLTRI, or FLHR/C/S/I](#).
 17. Verify **minimum clearance** between the powertrain and the following frame mounted components:
 - a. Top Engine/Horn Mounting Bracket to Fuel Tank: 0.328 inch (8.3 mm).
 - b. Rocker Covers to Fuel Tank: 0.375 inch (9.5 mm).
 - c. Carburetor Top Cover to Fuel Tank: 0.375 inch (9.5 mm).
 - d. Rear Spark Plug Boot to Fuel Valve: 0.250 inch (6.4 mm).
 - e. Top Stabilizer Link to Induction Module: 0.375 inch (9.5 mm).
 - f. Front Stabilizer Link to Voltage Regulator: 0.375 inch (9.5 mm).
 - g. Inner Primary Chaincase to Lower Frame Tube: 0.187 inch (4.8 mm).
 - h. Exhaust Crossover Pipe to Primary Housing: 0.125 inch (3.2 mm).
 - i. Tire to Rear Fender: 0.100 inch (2.5 mm).
 - j. Perform the procedure under Method B to troubleshoot clearance problems and to identify offending component(s).

18. Install seat. See Section [2.25 SEAT, INSTALLATION](#).
19. Test ride the motorcycle.

NOTE

Vehicle leads that require more than 2-lbs pull to correct need further diagnosis. Perform the procedure under Method B in this section.

METHOD B

NOTE

Use this procedure to determine the cause of vehicle misalignment and to locate clearance problems, or as an alternative to use of the Vehicle Alignment Tool (HD-46247) described under Method A. For acceptable results, a careful inspection should be performed (wheel and tire runout, laced wheel offset, rubber mount condition, etc.) to ensure that it is conducted with serviceable components. See [INSPECTION](#) for more information.

1. Place the motorcycle on a hydraulic center stand or place blocking under the frame to support the vehicle and lift the rear wheel off the ground. Be sure the motorcycle is positioned as level as possible.
2. Remove socket screw with lockwasher to remove left passenger footboard from rear swingarm bracket. Tighten both rear swingarm bracket bolts to 34-42 ft-lbs (46-57 Nm). Repeat step on right side of motorcycle.
3. Remove the decorative chrome plug from both rear swingarm brackets. While holding the left side pivot shaft locknut, tighten the right side locknut to 40-45 ft-lbs (54-61 Nm). Then hold the right side pivot shaft locknut and tighten the left side locknut to 40-45 ft-lbs (54-61 Nm).
4. Verify that belt deflection is within specification and that adjuster cams are tight against rear swingarm weld nubs. **Holding** weld nut on left side of axle, tighten cone nut on right side to 95-105 ft-lbs (128.8-142.4 Nm).
5. Remove seat. See Section [2.25 SEAT, REMOVAL](#).
6. Partially remove fuel tank to gain access to top engine mounting bracket and stabilizer link. See Section [4.7 FUEL TANK \(CARBURETED\)](#), [PARTIAL REMOVAL, FLHX, FLHT, or FLHR/S](#). For fuel injected models, see Section [9.4 FUEL TANK \(FUEL INJECTED\)](#), [PARTIAL REMOVAL, FLHXI, FLHT/C/U/I, FLTRI, or FLHR/C/S/I](#).
7. Top Engine Mount:
 - a. On left side of motorcycle, tighten the two top engine mounting bracket to front and rear cylinder head bolts to 35-40 ft-lbs (48-54 Nm). See A of [Figure 2-39](#).
 - b. Moving to right side of motorcycle, tighten the top stabilizer link eyelet to frame weldment bolt to 18-22 ft-lbs (24-30 Nm). See C of [Figure 2-39](#).

- c. Loosen both top stabilizer link jam nuts.
 - d. Remove the top stabilizer link eyelet to top engine mounting bracket bolt. See B of [Figure 2-39](#).
8. Front Engine Mount:
 - a. Remove flange locknuts from studs on lower frame crossmember. Remove voltage regulator from studs and allow to hang by cables at front of motorcycle.
 - b. Tighten two engine to front engine mounting bracket bolts to 33-38 ft-lbs (45-52 Nm). See H of [Figure 2-39](#).
 - c. Tighten front stabilizer link eyelet to frame weldment bolt to 18-22 ft-lbs (24-30 Nm). See D of [Figure 2-39](#).
 - d. Tighten front stabilizer link eyelet bolt to block on front engine mounting bracket to 18-22 ft-lbs (24-30 Nm). See E of [Figure 2-39](#).
 - e. Remove the center front engine mounting bracket to rubber mount bolt (with washers and nut). See F of [Figure 2-39](#).
9. To verify alignment, install alignment bars or other suitable device on both the left and right side of motorcycle. Proceed as follows:

NOTE

If the front tire is wider than the rear, then the alignment bars must either be shimmed out equally at the points of contact on the rear tire, notched at the front to clear the front tire, or attached to the front tire with all measurements performed at the rear. For explanatory purposes, the following procedure assumes the alignment bars are secured to the rear tire.

- a. Place a set of straightedges on both the left and right sides of the motorcycle alongside the front and rear tires.
- b. Verify that both alignment bars firmly contact the rear wheel at two points. Use clamp or bungee cords to hold the bars in place. Tension should be equal to avoid spreading or pinching the bars.
- c. Verify that the bars are straight by matching the width measurements at both ends.
- d. Straighten the front end and verify that the measurements from the front wheel to the bar on one side of the motorcycle are equal at two points, both fore and aft.
- e. Measure the front wheel to the bar on the other side of the motorcycle, both fore and aft, and compare the results to the measurements obtained under step 9(d). Measurements from left to right should be equal +/- 0.030 inch (0.76 mm).
- f. Loosen jam nuts, and using the center hex, adjust the front stabilizer link as required to obtain equal measurements at all four points (+/- 0.030 inch or 0.76 mm). See [Figure 2-40](#).

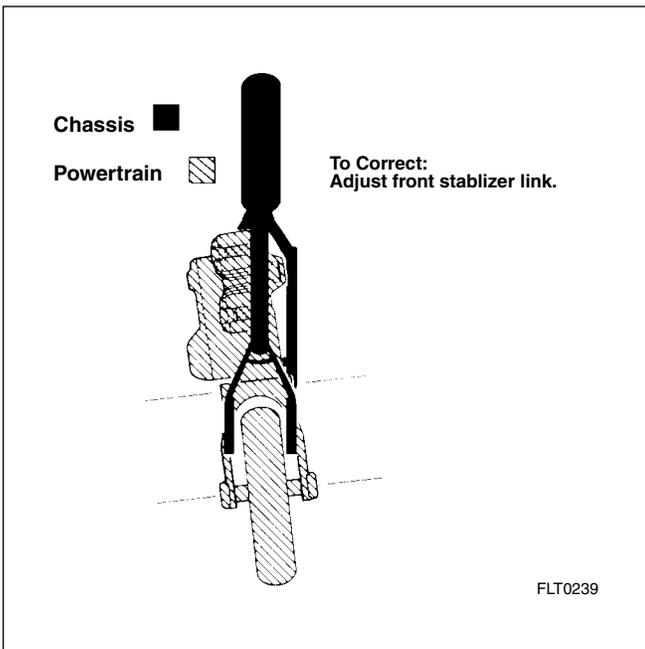


Figure 2-40. Horizontally Misaligned

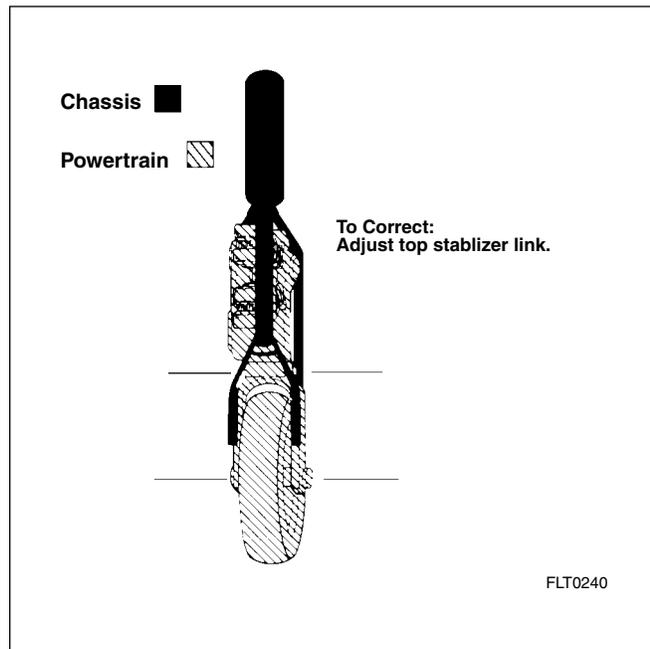


Figure 2-41. Vertically Misaligned

NOTE

After each adjustment, unload any binding of the front rubber mount and verify that the alignment bars and front wheel are still correctly positioned.

- g. Holding the front stabilizer link adjuster and mounting eyelets to prevent movement or binding, tighten both jam nuts.
 - h. Verify that the front rubber mount is centered under the thru bolt hole in the mounting plate.
 - i. If the front rubber mount is centered and free of binding, proceed as follows:
 - Tighten the two front engine mount to frame cross-member bolts to 15-20 ft-lbs (20-27 Nm). See G of [Figure 2-39](#).
 - Install center front engine mounting bracket to rubber mount bolt (with washers and nut) and tighten to 15-20 ft-lbs (20-27 Nm). See F of [Figure 2-39](#).
 - j. If centering or relaxation of the mount is required, proceed as follows:
 - Loosen the two front engine mount to frame cross-member bolts. See G of [Figure 2-39](#).
 - Push on the rubber mount to center it with the thru bolt hole in the mounting plate. It may be necessary to bounce or wiggle the engine to unload any binding of the rubber mount on the mounting plate.
10. Slide voltage regulator over studs on lower frame cross-member at front of vehicle. Install flange locknuts on studs and tighten to 70-100 **in-lbs** (7.9-11.3 Nm).
 11. Adjust the top stabilizer link as follows:
 - a. Using the center hex to maintain equal thread engagement at both eyelets, adjust stabilizer link so that bolt removed under step 7(d) threads in without any stress or engine movement.
 - b. Tighten the stabilizer link eyelet to top engine mounting bracket bolt to 18-22 ft-lbs (24-30 Nm). See B of [Figure 2-39](#).
 - c. Holding the top stabilizer link adjuster and mounting eyelets to prevent movement or binding, tighten both jam nuts.
 12. Lower motorcycle to floor and remove hydraulic center stand or blocking.
 13. After verifying that the motorcycle is level, check vertical alignment placing an inclinometer on both front and rear brake rotors. Front and rear lean angles should be equal +/- 1/2 degree. See [Figure 2-41](#). If vertical alignment exceeds specification, proceed as follows:

- a. Loosen the top stabilizer link eyelet to top engine mounting bracket bolt. See B of [Figure 2-39](#). Verify that bolt is unloaded and threads freely in and out of the mounting bracket hole. If necessary, loosen jam nuts and adjust stabilizer link to achieve a free state. Tighten bolt to 18-22 ft-lbs (24-30 Nm) and then tighten jam nuts before rechecking vertical alignment.
 - b. Look for components that are worn, damaged or out of specification. See [INSPECTION](#) on the next page.
14. Remove the alignment bars from both the left and right side of the motorcycle.
 15. Snap the chrome plugs back into the rear swingarm brackets.
 16. Install socket screw with lockwasher to fasten passenger footboard to rear swingarm bracket. Tighten screw to 30-35 ft-lbs (40.7-47.5 Nm). Repeat step on other side of motorcycle.
 17. Install fuel tank. For carbureted models, see [Section 4.7 FUEL TANK \(CARBURETED\), INSTALLATION \(AFTER PARTIAL REMOVAL\), INSTALLATION \(AFTER PARTIAL REMOVAL\)](#), or [FLHR/S](#). For fuel injected models, see [Section 9.4 FUEL TANK \(FUEL INJECTED\), INSTALLATION \(AFTER PARTIAL REMOVAL\), FLHXI, FLHT/C/U/I, FLTRI, or FLHR/C/S/I](#).
 18. Verify **minimum clearance** between the powertrain and the following frame mounted components:
 - a. Top Engine/Horn Mounting Bracket to Fuel Tank: 0.328 inch (8.3 mm).
 - b. Rocker Covers to Fuel Tank: 0.375 inch (9.5 mm).
 - c. Carburetor Top Cover to Fuel Tank: 0.375 inch (9.5 mm).
 - d. Rear Spark Plug Boot to Fuel Valve: 0.250 inch (6.4 mm).
 - e. Top Stabilizer Link to Induction Module: 0.375 inch (9.5 mm).
 - f. Front Stabilizer Link to Voltage Regulator: 0.375 inch (9.5 mm).
 - g. Inner Primary Chaincase to Lower Frame Tube: 0.187 inch (4.8 mm).
 - h. Exhaust Crossover Pipe to Primary Housing: 0.125 inch (3.2 mm).
 - i. Tire to Rear Fender: 0.100 inch (2.5 mm).
 19. Install seat. See [Section 2.25 SEAT, INSTALLATION](#).
 20. Test ride the motorcycle.

NOTE

Vehicle leads that require more than 2-lbs pull to correct need further diagnosis. See [INSPECTION](#) on this page.

INSPECTION

See [Section 1.2 MAINTENANCE SCHEDULE](#) for the required service interval. Perform inspection sooner if any sag in the powertrain is observed or abnormal handling characteristics/vibrations are experienced.

Front Rubber Mount

1. Verify condition and torque of the mounting hardware. Visually inspect for wear, damage or improper installation. Replace hardware as necessary.
2. Examine carefully at the bottom of the motorcycle paying special attention to the area between the large flat metal washer and the bracket on the frame. There should be a gap between the mounting plate and the cushion portion of the rubber mount.
3. Replace the rubber mount if there are any signs of cracking or shearing.

Rear Swingarm Mounts

1. Verify condition and torque of the mounting hardware. Visually inspect for wear, damage or improper installation. Replace hardware as necessary.
2. Examine rubber mount to be sure there is no twisting or binding at the parting line.

Engine Stabilizer Links

1. Verify condition and torque of the mounting hardware. Visually inspect for wear, damage or improper installation. Replace hardware as necessary.
2. Using flats machined into the stabilizer eyelet, gently rock the link and check for separation of the molded-in sleeve. Replace as necessary.

Wear in the link also can be measured with a dial indicator by hand compressing and then releasing the link. Replace any link that exceeds 0.025 inch (0.64 mm) of play or wear.

GENERAL

Master cylinders designed for dual disc (two caliper) operation have an 11/16 inch bore, while those that are designed for single disc (one caliper) operation have a 9/16 inch bore. The bore size is stamped on the master cylinder assembly inboard of the handlebar clamp bracket. See [Figure 2-42](#).

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)

REMOVAL/DISASSEMBLY

CAUTION

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

IMPORTANT NOTE

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

1. Remove banjo bolt and two steel/rubber washers to disconnect fitting of hydraulic brake line from master cylinder housing. Hold suitable container under banjo bolt bore to allow reservoir to drain. Discard steel/rubber washers.

CAUTION

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)

NOTE

Use the eyelet of a small cable strap if the cardboard insert is not available.

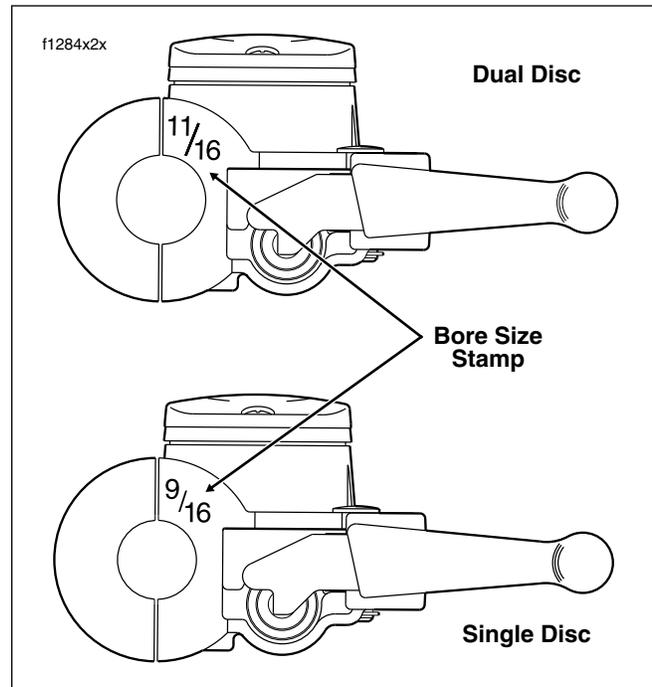


Figure 2-42. Verify Correct Bore Size Before Use

2. Place the cardboard insert between the brake lever and lever bracket. See [Figure 2-43](#).
3. Remove two T27 TORX screws with flat washers to release handlebar clamp from the master cylinder housing. Remove the clamp and brake lever/master cylinder assembly from the handlebar. See [Figure 2-44](#).
4. Remove the cardboard insert (or cable strap eyelet) between the brake lever and lever bracket.

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)

5. Remove retaining ring from pivot pin groove at bottom of master cylinder bracket. Discard retaining ring.
6. Remove pivot pin and brake hand lever from master cylinder assembly.
7. Carefully remove wiper with pick or similar tool.
8. Remove piston cap.
9. Remove piston with O-ring and primary cup.



Figure 2-43. Install Cardboard Insert

10. Remove spring.

CAUTION

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

11. Remove two Phillips screws to release cover from master cylinder reservoir.

CLEANING AND INSPECTION

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)

1. Always reassemble the master cylinder using **new** parts from the correct repair kit.
2. Clean all parts with denatured alcohol or DOT 4 BRAKE FLUID. Do not contaminate with mineral oil or other solvents. Wipe dry with a clean, lint free cloth. Blow out drilled passages and bore with a clean air supply. Do not use a wire or similar instrument to clean drilled passages in bottom of reservoir.

WARNING

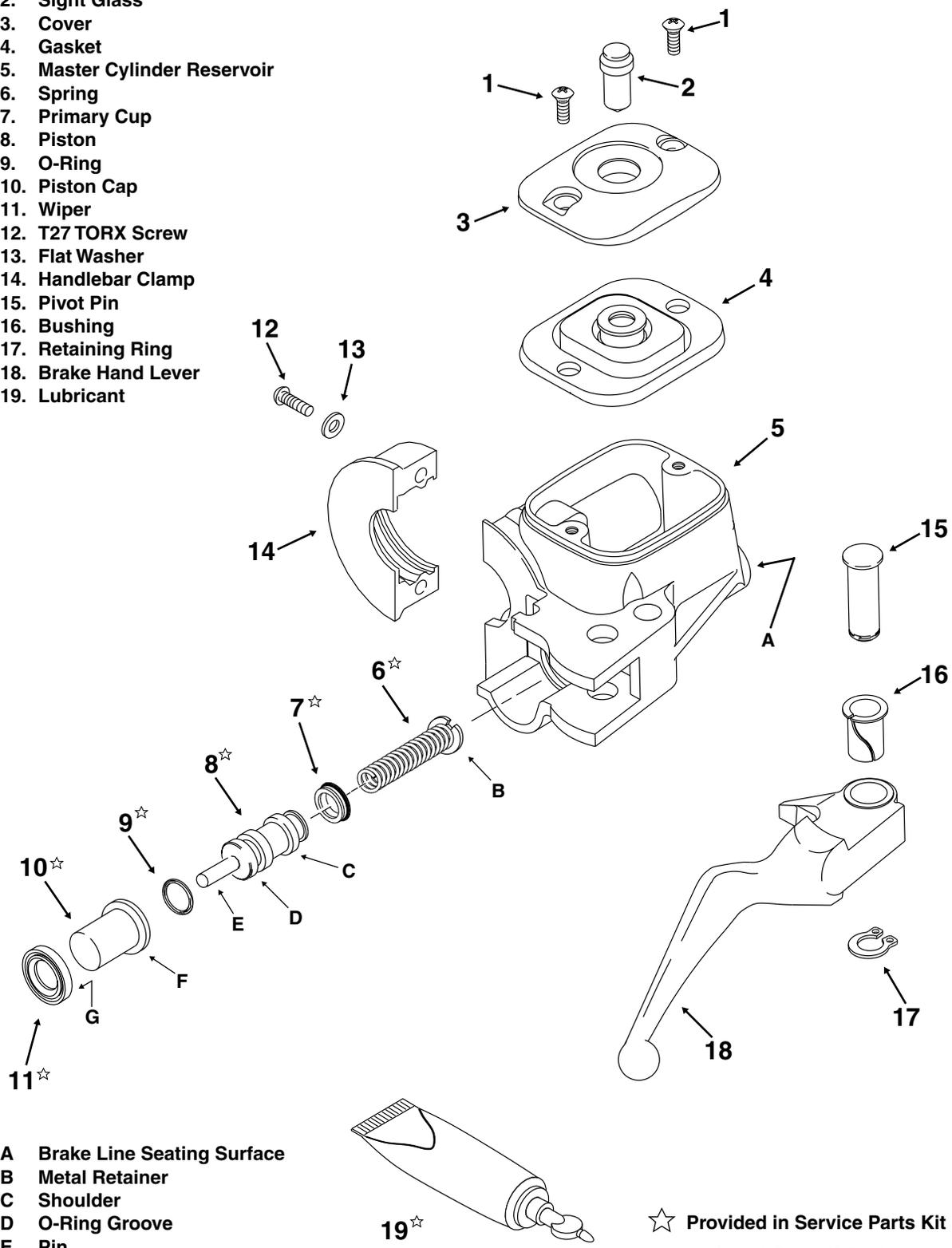
Use denatured alcohol to clean brake system components. Do not use mineral-based solvents (such as gasoline or paint thinner), which will deteriorate rubber parts even after assembly. Deterioration of these components can cause brake failure, which could result in death or serious injury. (00291a)

3. Carefully inspect all parts for wear or damage and replace as necessary.
4. Inspect the piston bore in the master cylinder housing for scoring, pitting or corrosion. Replace the housing if any of these conditions are found.
5. Inspect the outlet port that mates with the brake line fitting. As a critical sealing surface, replace the housing if any scratches, dents or other damage is noted.
6. Inspect the cover gasket for cuts, tears or general deterioration. If gasket and/or sight glass replacement is necessary, proceed as follows:
 - a. From inboard side, push sight glass toward top of cover until free.
 - b. Pull rubber gasket from cover.
 - c. Fit nipple of **new** gasket into hole of cover aligning gasket and cover thru holes.
 - d. From bottom of gasket, push flat end of sight glass through nipple until top of glass is flush with top of gasket. Verify that glass is square in bore. If some lubrication is necessary, use a small quantity of clean brake fluid.

ASSEMBLY/INSTALLATION

1. Fit O-ring into groove on outboard side of piston (pin side). See [Figure 2-44](#).
2. Fit primary cup over lip on inboard side of piston, so that closed side (smaller OD) contacts shoulder.
3. Coat piston bore of master cylinder reservoir with special lubricant supplied in the service parts kit. Also apply the lubricant to OD of installed O-ring and primary cup.
4. Insert metal retainer end of spring into piston bore, so that it seats against counterbore (recess) at bottom.
5. Slide piston over spring.
6. Fit wiper over piston cap so that flat side of wiper contacts cap shoulder.
7. Fit piston cap over piston pin.
8. Press down on wiper until it contacts the counterbore. Larger OD of wiper must be completely seated in groove on outlet side of piston bore.

1. Phillips Screw
2. Sight Glass
3. Cover
4. Gasket
5. Master Cylinder Reservoir
6. Spring
7. Primary Cup
8. Piston
9. O-Ring
10. Piston Cap
11. Wiper
12. T27 TORX Screw
13. Flat Washer
14. Handlebar Clamp
15. Pivot Pin
16. Bushing
17. Retaining Ring
18. Brake Hand Lever
19. Lubricant



- A Brake Line Seating Surface
- B Metal Retainer
- C Shoulder
- D O-Ring Groove
- E Pin
- F Shoulder
- G Flat Side

☆ Provided in Service Parts Kit

11/16 Inch Bore - HD Part No. 45072-96C

Figure 2-44. Front Brake Master Cylinder Assembly

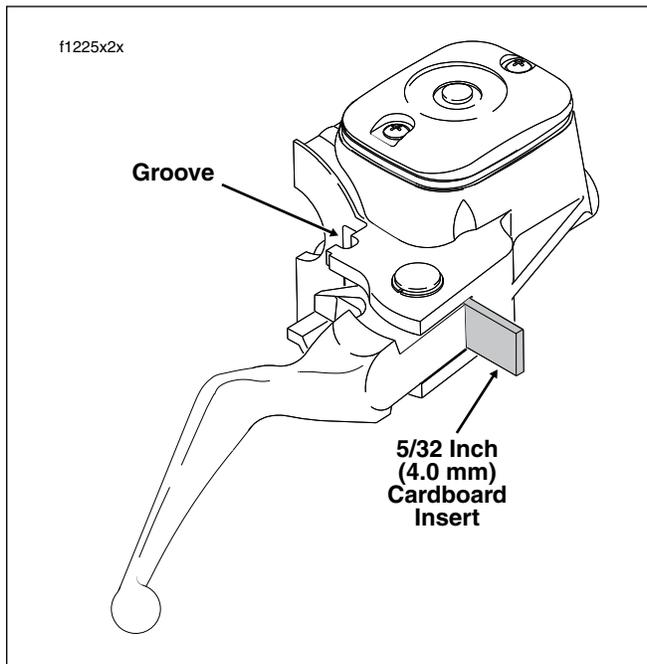


Figure 2-45. Install Cardboard Insert Before Installing Master Cylinder Assembly

9. Install the master cylinder reservoir cover. Install two Phillips screws to fasten cover to the reservoir, but do not tighten at this time.
10. Align hole in brake hand lever with hole in master cylinder bracket. From the top of the assembly, slide pivot pin through bracket and hand lever.

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)

11. Install **new** retaining ring in pivot pin groove. Verify that retaining ring is completely seated in groove.

CAUTION

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)

12. Place the cardboard insert between the brake lever and lever bracket. Use the eyelet of an ordinary cable strap if the cardboard insert is not available. See [Figure 2-45](#).

13. Position the brake lever/master cylinder assembly inboard of the switch housing assembly engaging the tab on the lower switch housing in the groove at the top of the brake lever bracket. See [Figure 2-46](#).
14. Align the holes in the handlebar clamp with those in the master cylinder housing and start the two T27 TORX screws (with flat washers). Position for rider comfort. Beginning with the top screw, tighten the screws to 60-80 **in-lbs** (6.8-9.0 Nm).

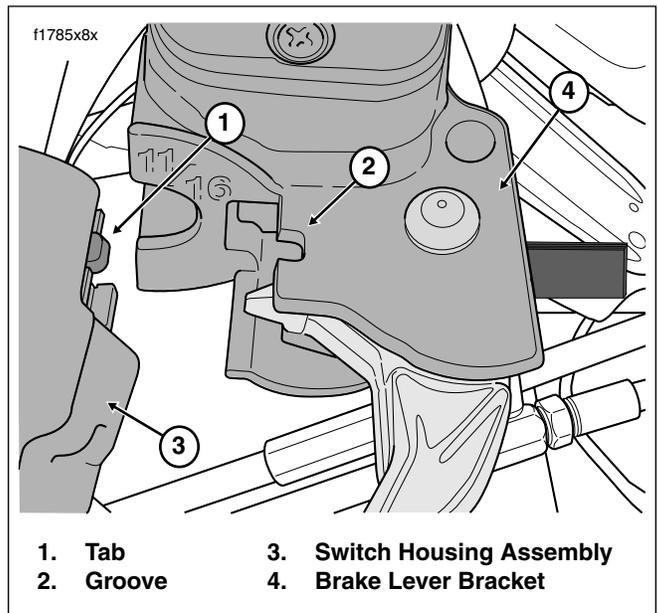
CAUTION

To avoid leakage, verify that the steel/rubber washers, banjo bolt, brake line fitting and master cylinder bore are completely clean.

15. Position **new** steel/rubber washers on each side of hydraulic brake line fitting. Insert banjo bolt through washers and fitting. Thread bolt into master cylinder housing and tighten to 17-22 ft-lbs (23-30 Nm).
16. Remove the master cylinder reservoir cover. If the motorcycle is resting on jiffy stand, turn front wheel as necessary until the master cylinder reservoir is level.

WARNING

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



- | | |
|-----------|----------------------------|
| 1. Tab | 3. Switch Housing Assembly |
| 2. Groove | 4. Brake Lever Bracket |

Figure 2-46. Fit Brake Lever/Master Cylinder to Right Handlebar Switch Housings

IMPORTANT NOTE

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

17. Add DOT 4 BRAKE FLUID to the master cylinder reservoir until the fluid level is 1/4 inch (6.4 mm) from the top.

NOTE

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

WARNING

A plugged or covered relief port can cause brake drag or lock-up, which could lead to loss of control, resulting in death or serious injury. (00288a)

18. Verify proper operation of the master cylinder relief port. Actuate the brake hand lever. A slight spurt of fluid will break the fluid surface in the reservoir compartment if all internal components are working properly.
19. Remove cap from bleeder valve on front brake caliper. Install end of a length of clear plastic tubing over caliper bleeder valve, while placing free end in a suitable container.
20. Depress and hold the brake hand lever to build up hydraulic pressure.
21. Open bleeder valve about 1/2-turn. Brake fluid will flow from bleeder valve through tubing. Close bleeder valve when brake hand lever has moved 1/2 to 3/4 of its full range of travel. Allow brake hand lever to return slowly to its released position.
22. Add brake fluid to the master cylinder reservoir until the fluid level is about 1/4 inch (6.4 mm) from the top.

23. Repeat steps 20-22 until all air bubbles are purged.
24. Final tighten the bleeder valve to 80-100 **in-lbs** (9.0-11.3 Nm). Install the bleeder valve cap.
25. Install the master cylinder reservoir cover, but first verify that the cover gasket bellows is not extended or brake fluid will be ejected from the reservoir. Install two Phillips screws and alternately tighten to 6-8 **in-lbs** (0.7-0.9 Nm).

NOTE

Note that one side of the master cylinder reservoir cover is thicker than the other. Install the cover with the thicker side closest to the brake line fitting.

26. With the Ignition/Light Key Switch turned to IGNITION, actuate the front brake hand lever to verify operation of the brake lamp.

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)

27. Test ride the motorcycle. If the brake feels spongy, repeat the bleeding procedure.

NOTE

A sight glass enables the rider to visually check the brake fluid level without removing the master cylinder cover. When the reservoir is full, the sight glass is dark. As the fluid level drops, the glass lightens up to indicate this condition to the rider.

REMOVAL

PRELIMINARY INSTRUCTIONS

1. Remove right fairing lower, if present. See Section 2.29 LOWER FAIRING/ENGINE GUARD, LOWER FAIRING (FLHTCU), REMOVAL.
2. Remove two allen head socket screws (with lock washers and flat washers) to release right side front footboard brackets from frame weldment. For best results, approach from left side of vehicle using a 3/8 inch ball allen with extension.
3. Remove right side saddlebag. See Section 2.26 SADDLEBAG, REMOVAL.
4. Gently pull side cover from frame downtube (no tools required).

CAUTION

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

IMPORTANT NOTE

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

5. Remove bleeder valve cap on rear brake caliper. Install end of a length of clear plastic tubing over caliper bleeder valve, while placing free end in a suitable container. Open bleeder valve about 1/2-turn. Pump brake pedal to drain brake fluid. Close bleeder valve.

BRAKE PEDAL/MASTER CYLINDER ASSEMBLY, REMOVAL

1. See PRELIMINARY INSTRUCTIONS on this page.
2. Remove banjo bolt and two steel/rubber washers to disconnect brake line front fitting from master cylinder assembly. Discard washers.
3. Release rear brake line as needed to move front fitting forward far enough to access hex nut. For further instructions See REAR BRAKE LINE, REMOVAL, steps 3-6, in this section.
4. Using 1-1/8 inch wrench, remove hex nut to free brake pedal/master cylinder assembly from mounting bracket.

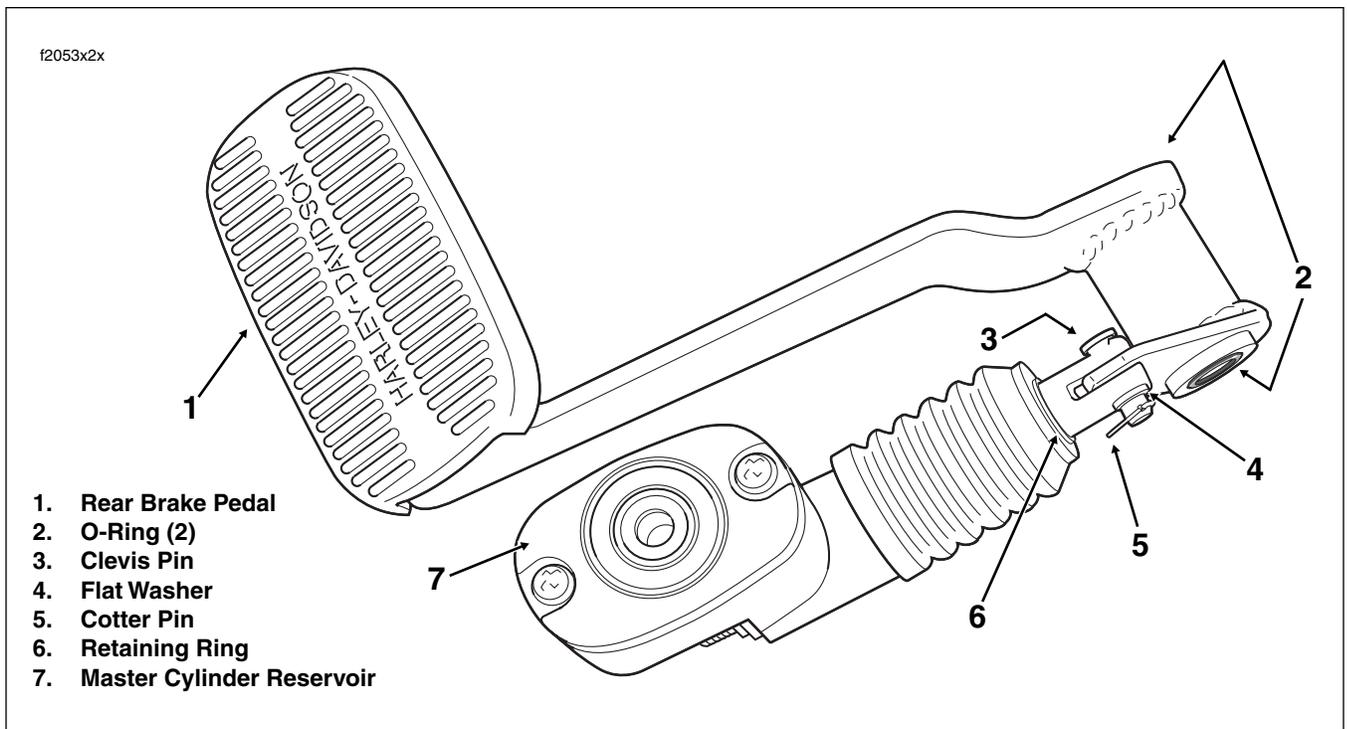


Figure 2-47. Rear Brake Pedal/Master Cylinder Assembly

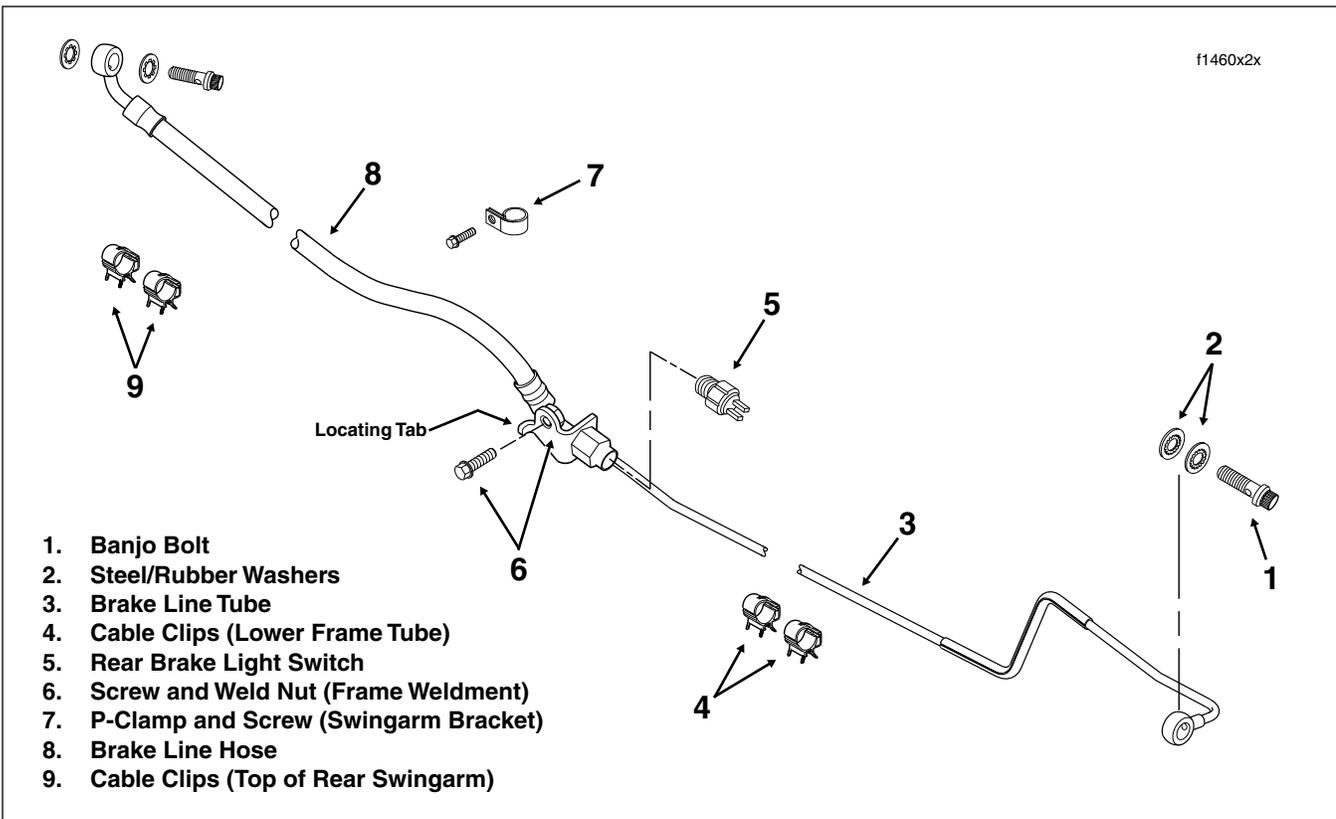


Figure 2-48. Rear Brake Line Assembly

5. Remove locknut with flat washer to free brake pedal/master cylinder assembly from pedal shaft. Remove assembly from vehicle. Remove and discard O-ring on each side of brake pedal shaft bore. See [Figure 2-47](#).
6. Remove cotter pin and flat washer from clevis pin. Supporting rear brake pedal/master cylinder assembly in vise, tap out clevis pin using a brass drift. Remove master cylinder assembly from brake pedal flange.
7. For further instructions, see [MASTER CYLINDER, DISASSEMBLY](#), in this section.

BRAKE PEDAL/MASTER CYLINDER ASSEMBLY, INSTALLATION

1. If master cylinder was disassembled, see [MASTER CYLINDER, ASSEMBLY](#), in this section, for instructions.
2. Install master cylinder assembly on brake pedal flange. Supporting assembly in vise, tap in clevis pin using a brass drift. Install flat washer and cotter pin on clevis pin. See [Figure 2-47](#).
3. Install **new** O-ring on each side of brake pedal shaft bore.
4. Apply a light coat of *Wheel Bearing Grease (Part No. 99855-89)* to the brake pedal shaft and bore. Install brake pedal/master cylinder assembly on the pedal shaft

fitting collar on cartridge body into square-shaped hole in mounting bracket. Install flat washer and **new** locknut on pedal shaft and tighten to 15-20 ft-lbs (20-27 Nm).

5. Apply Loctite Medium Strength Threadlocker 243 (blue) to threads of hex nut. Install hex nut on threaded end of cartridge body and tighten to 30-40 ft-lbs (41-54 Nm).
6. Position **new** steel/rubber washers on each side of brake line fitting. Insert banjo bolt through washers and fitting. Thread bolt into master cylinder assembly and tighten to 17-22 ft-lbs (23-30 Nm).
7. Secure rear brake line if released during master cylinder removal. For further instructions, see [REAR BRAKE LINE, INSTALLATION](#), steps 4-7, in this section.
8. See [FINAL INSTRUCTIONS](#) on the next page.

REAR BRAKE LINE, REMOVAL

1. See [PRELIMINARY INSTRUCTIONS](#) on the previous page.
2. Remove banjo bolt and two steel/rubber washers to disconnect brake line front fitting from master cylinder assembly. Discard washers. See [Figure 2-48](#).
3. Open two cable clips on lower frame tube T-studs. Free rear brake line from cable clips.

NOTE

For best results, insert blade of small screwdriver into gap at side of clip and gently rotate end of screwdriver to pop open.

4. Remove hex screw to free brake hose P-clamp from rear swingarm bracket (passenger footboard bracket).
5. Remove socket terminals from rear brake light switch spade contacts. Cut cable strap to free rear brake light switch wires from lower frame tube, if necessary.
6. Remove hex screw to free brake light switch bracket from frame weldment. Push on bracket to release locating tab from slot in frame weldment.
7. Open two cable clips on rear swingarm T-studs. Free rear brake line hose from cable clips.

NOTE

For best results, insert blade of small screwdriver into gap at side of clip and gently rotate end of screwdriver to pop open.

8. Remove banjo bolt and two steel/rubber washers to disconnect brake line fitting from rear brake caliper. Discard washers.
9. Feed rear brake line hose forward to area in front of rear swingarm bracket. Remove rear brake line assembly from vehicle.

REAR BRAKE LINE, INSTALLATION

1. Place rear brake line into approximate position along top of lower right frame tube. From area in front of rear swingarm bracket, feed brake line hose rearward following top of rear swingarm.
2. Position **new** steel/rubber washers on each side of brake line rear fitting. Insert banjo bolt through washers and fitting. Thread bolt into rear brake caliper and tighten to 17-22 ft-lbs (23-30 Nm).
3. Capture rear brake line hose in two cable clips on rear swingarm T-studs. Snap cable clips closed. See [Figure 2-49](#).
4. Index locating tab on brake light switch bracket in slot of frame weldment. Install hex screw to secure brake light switch bracket to frame weldment.
5. Install socket terminals onto rear brake light switch spade contacts. If removed, install **new** cable strap to secure rear brake light switch wires (and main harness conduit) to lower frame tube.
6. Install hex screw to secure brake hose P-clamp to rear swingarm bracket (passenger footboard bracket).
7. Capture rear brake line in two cable clips on lower frame tube T-studs. Snap cable clips closed.

NOTE

Cable clips also capture main harness conduit (to oil pressure sender, voltage regulator and CKP sensor connectors).

8. Position **new** steel/rubber washers on each side of brake line front fitting. Insert banjo bolt through washers and fitting. Thread bolt into master cylinder assembly and tighten to 17-22 ft-lbs (23-30 Nm).
9. See [FINAL INSTRUCTIONS](#) on this page.

INSTALLATION

FINAL INSTRUCTIONS

1. Insert two allen head socket screws (with lockwashers and flat washers) through frame weldment into right side front footboard brackets. For best results, approach from left side of vehicle using a 3/8 inch ball allen with extension. Alternately tighten socket screws to 30-35 ft-lbs (41-48 Nm).
2. Install length of clear plastic tubing over caliper bleeder valve, if removed. Place free end of tube in a suitable container.
3. Remove the master cylinder cover, if installed. Stand the motorcycle upright so that the master cylinder is in a level position.

WARNING

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

IMPORTANT NOTE

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

CAUTION

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

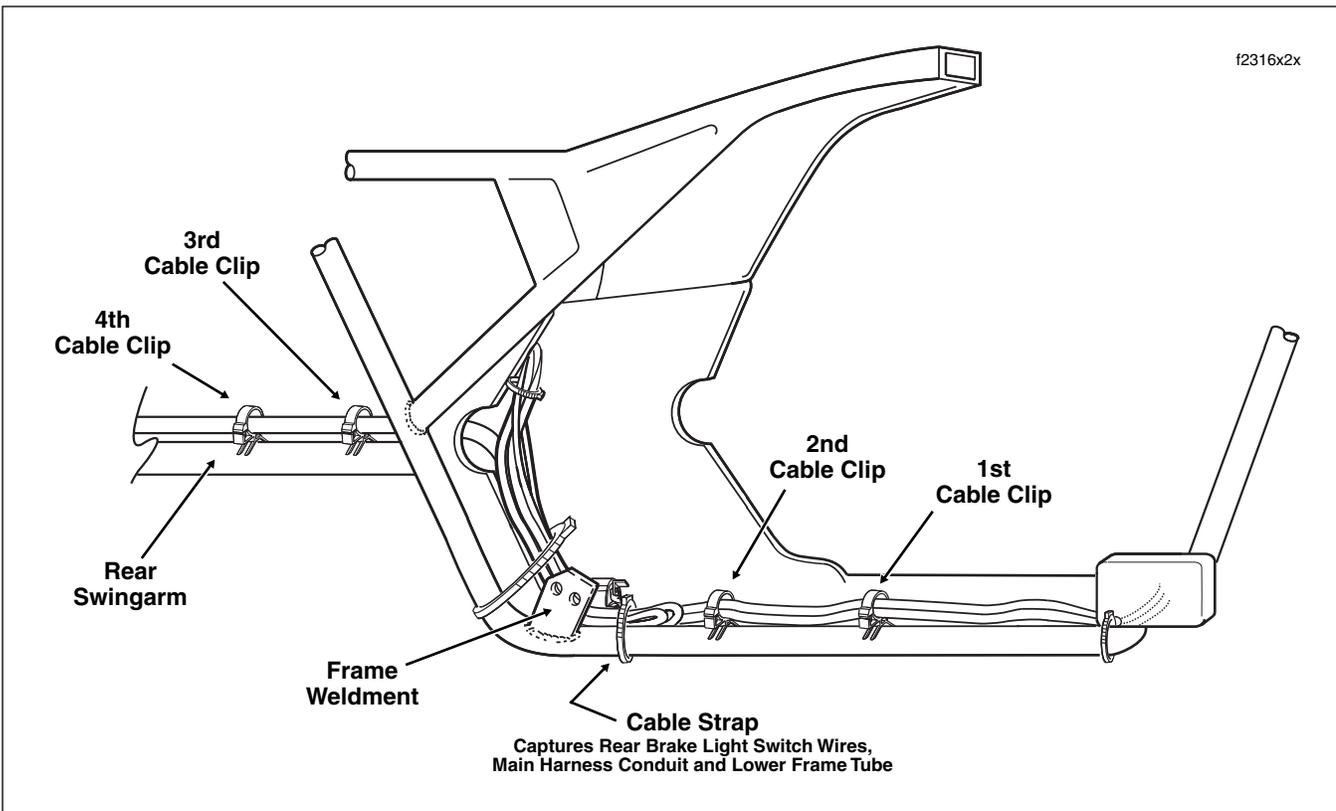


Figure 2-49. Rear Brake Line Routing (Right Side View)

IMPORTANT NOTE

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

4. Add DOT 4 BRAKE FLUID to the master cylinder reservoir until the fluid level is 1/4 inch (6.4 mm) from the top.

NOTE

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

5. Depress and hold the rear brake pedal to build up hydraulic pressure.
6. Open bleeder valve about 1/2-turn. Brake fluid will flow from bleeder valve through tubing. Close bleeder valve when rear brake pedal has moved 1/2 to 3/4 of its full range of travel. Allow rear brake pedal to return slowly to its released position.
7. Repeat steps 4-6 until all air bubbles are purged.
8. Final tighten the bleeder valve to 80-100 in-lbs (9.0-11.3 Nm). Install the bleeder cap.
9. Add brake fluid to the master cylinder reservoir until the fluid level is about 1/4 inch (6.4 mm) from the top.

10. Install the master cylinder reservoir cover, but first verify that the cover gasket bellows is not extended or brake fluid will be ejected from the reservoir. Install two Phillips screws and alternately tighten to 6-8 in-lbs (0.7-0.9 Nm).

11. With the Ignition/Light Key Switch turned to IGNITION, actuate the rear brake pedal to verify operation of the brake lamp.

12. Install right fairing lower, if present. See Section [2.29 LOWER FAIRING/ENGINE GUARD, LOWER FAIRING \(FLHTCU\), INSTALLATION](#).

13. Align barbed studs in side cover with grommets in frame downtubes and push firmly into place (no tools required).

14. Install right side saddlebag. See Section [2.26 SADDLE-BAG, INSTALLATION](#).

⚠ 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)

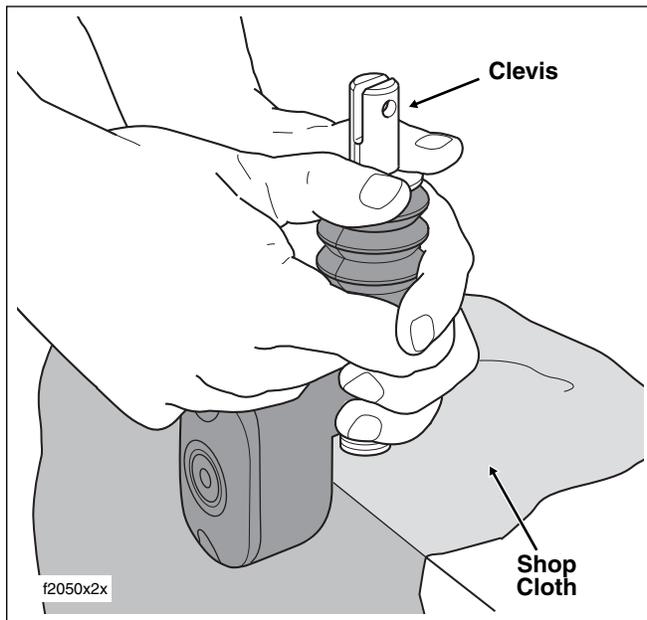


Figure 2-50. Compress Spring and Remove Retaining Ring

15. Test ride the motorcycle. If the brake feels spongy, repeat the bleeding procedure.

NOTE

A sight glass enables the rider to visually check the brake fluid level without removing the master cylinder cover. The sight glass is dark when the reservoir is full, but as the fluid level drops, the glass lightens to alert the rider of this condition.

MASTER CYLINDER

DISASSEMBLY

NOTE

If installing the Master Cylinder Reservoir Kit (Part No. 42454-99A), see steps 1-7 below. If installing the Push Rod Kit (Part No. 41957-97A) or the assembled cartridge body from the Master Cylinder Repair Kit (Part No. 42382-87C), see steps 1-9.

1. See [BRAKE PEDAL/MASTER CYLINDER ASSEMBLY, REMOVAL](#), in this section.
2. Thoroughly clean exterior of master cylinder assembly with denatured alcohol.
3. Stand master cylinder assembly upright on banjo sealing surface. For best results, suspend reservoir over edge of table. Be sure to lay down a clean shop cloth to protect the sealing surface from damage.

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)

4. Push down on large flat washer to compress spring. While holding the spring in a compressed state, remove retaining ring from groove in clevis and then carefully release spring. See [Figure 2-50](#). Discard retaining ring.

NOTE

The push rod, clevis and spacer washer are a one-piece assembly.

5. Remove the large flat washer, dust boot and spring from the cartridge body. Remove spring and spring retainer from dust boot.
6. Push on threaded end of cartridge body to remove from reservoir adapter. Use hand pressure only. Exercise caution to keep cartridge body free of dirt and grease. See [Figure 2-51](#).
7. Carefully remove two O-rings from cartridge body. Exercise caution to avoid scratching O-ring grooves.
8. Remove small retaining ring from groove in cartridge body bore. Piston assembly is spring loaded so be sure to hold parts together as retaining ring is removed.

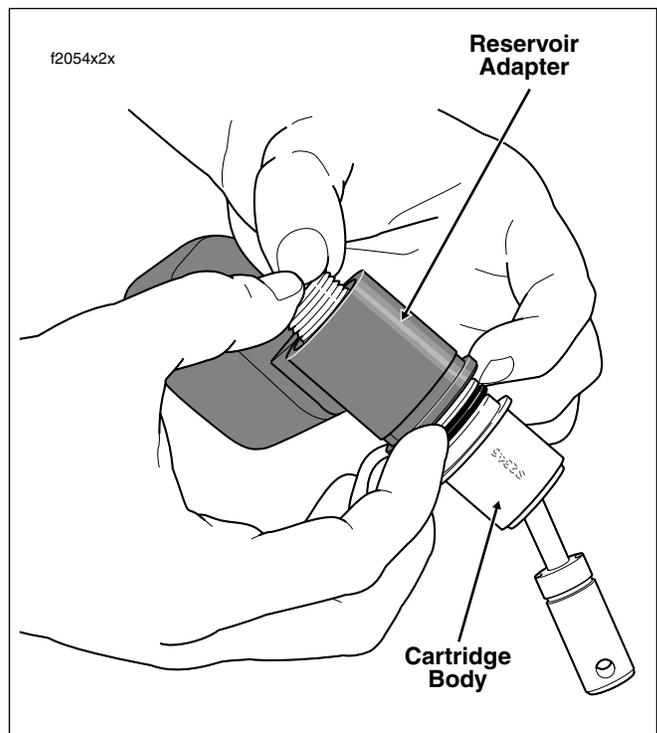


Figure 2-51. Remove Cartridge From Reservoir Adapter

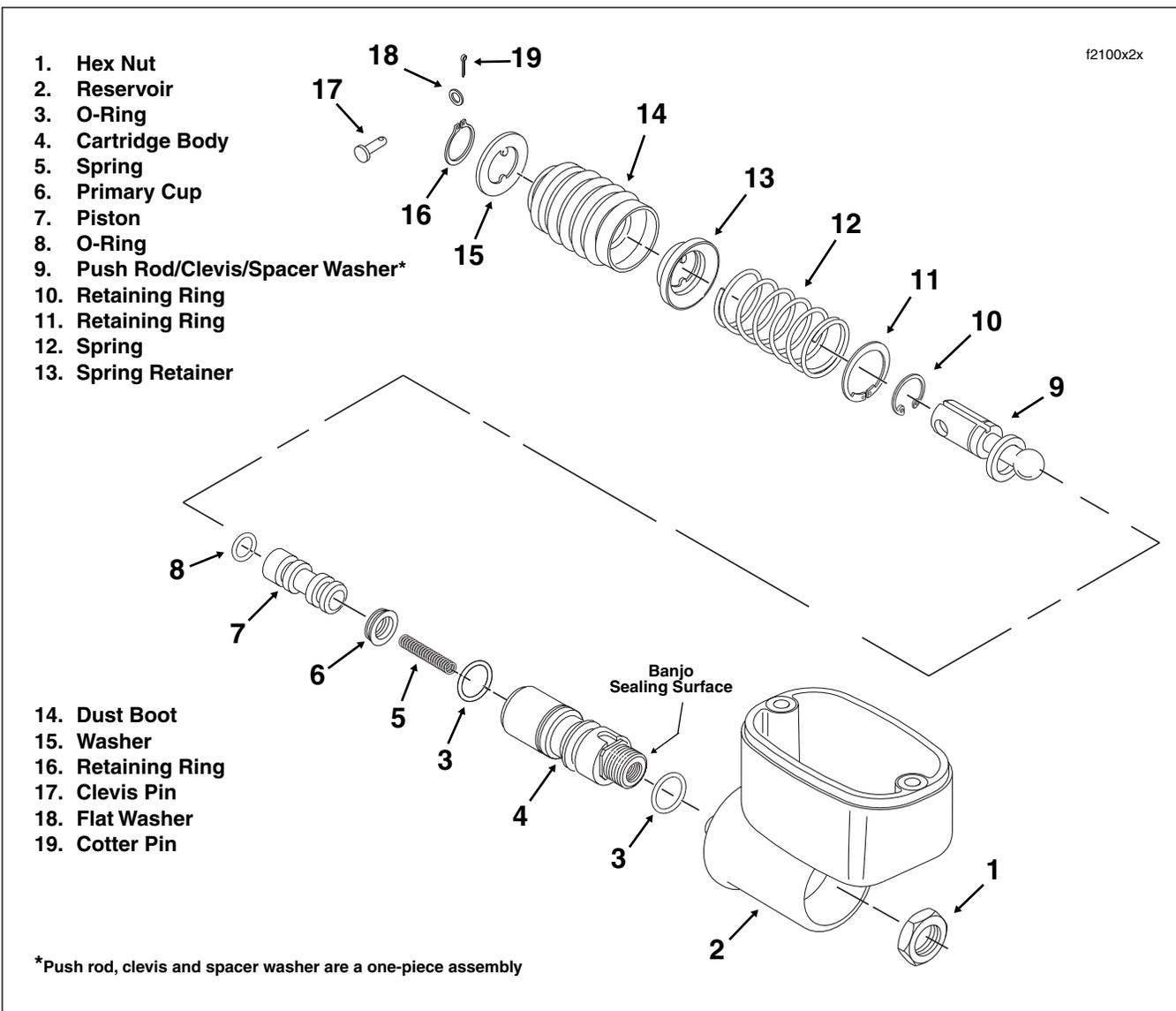


Figure 2-52. Rear Brake Master Cylinder Assembly (Exploded View)

9. Remove push rod with captured spacer washer from cartridge body. Remove small retaining ring from push rod, if attached. Discard retaining ring.

NOTE

Do not disassemble the cartridge body. The cartridge body components are not sold separately. If piston seal leakage is evident, replace the entire cartridge body assembly.

CLEANING AND INSPECTION

⚠ 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 all metal parts, except the cartridge body assembly, and blow dry with compressed air. Clean all rubber parts using denatured alcohol.

2. Inspect the reservoir adapter bore for scratches. Replace the reservoir if scratches are present.
3. Check the dust boot for cuts or tears. Replace as necessary.
4. Inspect the threads on the cartridge body. Replace if threads are damaged.
5. Inspect the spring for distortion, cracks or broken coils. Replace as necessary.
6. Inspect O-ring grooves on the cartridge body for dirt. Carefully clean grooves using a soft cotton cloth moistened with alcohol and allow to dry. Inspect O-ring grooves for scratches. Replace cartridge body if grooves are scratched.
7. Inspect the reservoir cover gasket for cuts, tears or general deterioration. If gasket and/or sight glass replacement is necessary, proceed as follows:
 - a. From inboard side, push sight glass toward top of cover until free.
 - b. Pull rubber gasket from cover.
 - c. Fit nipple of **new** gasket into hole of cover aligning gasket and cover thru holes.
 - d. From bottom of gasket, push flat end of sight glass through nipple until top of glass is flush with top of gasket. Verify that glass is square in bore. If some lubrication is necessary, use a small quantity of clean brake fluid.

ASSEMBLY

NOTE

If installing assembled cartridge body from Master Cylinder Repair Kit (Part No. 42382-87C), begin at step 2 below. If installing the Push Rod Kit (Part No. 41957-97A), begin at step 3. If installing the Master Cylinder Reservoir Kit (Part No. 42454-99A), start at step 7.

1. To install piston in cartridge body, proceed as follows:
 - a. Install small spring into cartridge body making sure that spring is seated in counterbore.
 - b. Lightly lubricate primary cup and O-ring on piston with DOT 4 BRAKE FLUID.
 - c. Install piston over spring.
2. Install **new** large retaining ring in groove on push rod side of cartridge body.
3. Position **new** retaining ring on push rod between spacer washer and clevis, or on clevis inboard of the retaining ring groove.

NOTE

The push rod, clevis and spacer washer are a one-piece assembly.

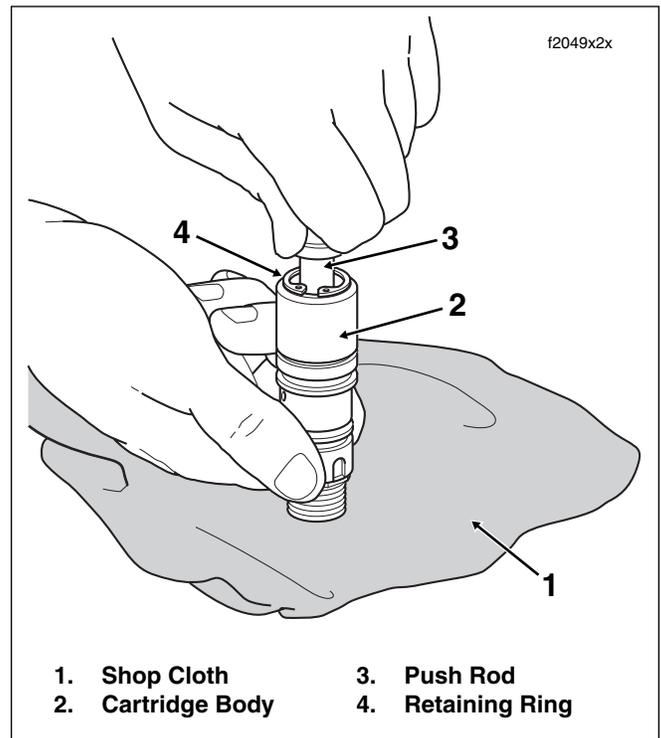


Figure 2-53. Compress Spring and Install Retaining Ring

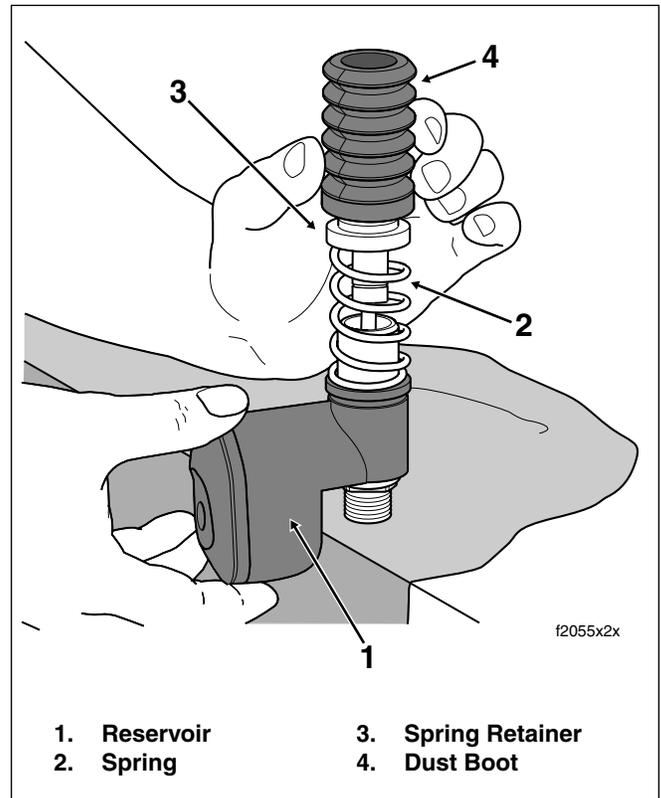
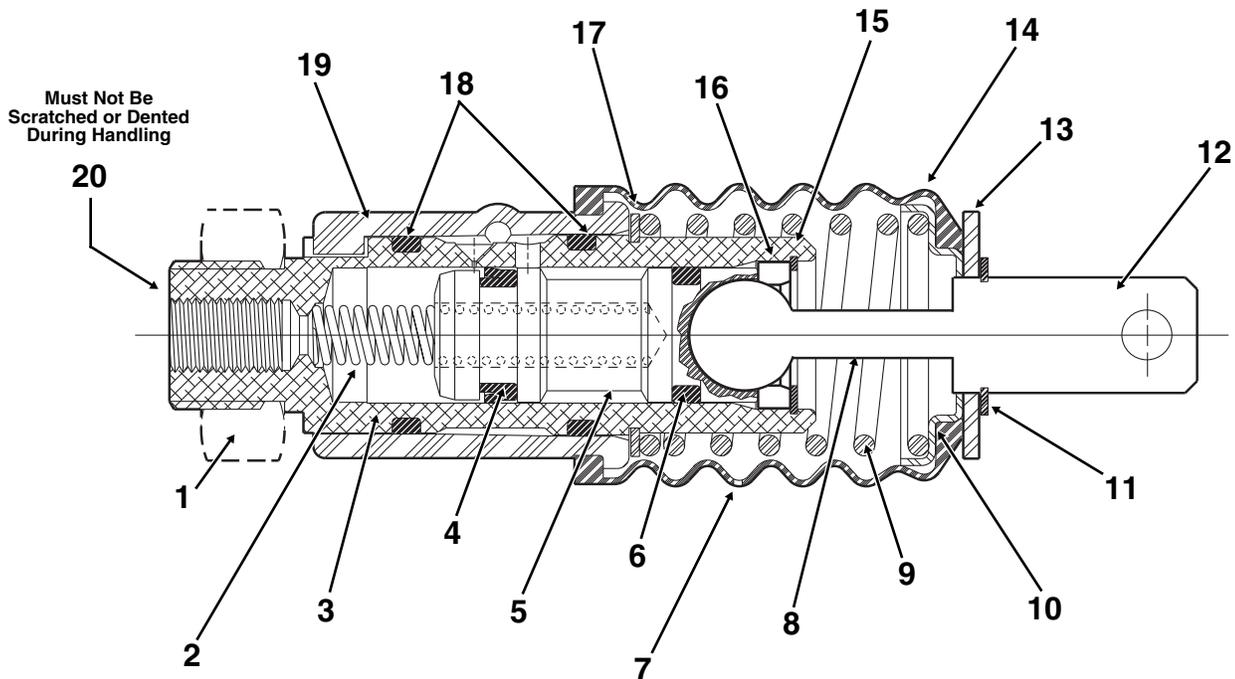


Figure 2-54. Install Spring, Spring Retainer and Dust Boot

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*Push rod, clevis and spacer washer are a one-piece assembly



- | | |
|--------------------------------|--------------------------------|
| 1. Mounting 1-1/8 Inch Hex Nut | 11. Retaining Ring |
| 2. Spring | 12. Clevis* |
| 3. Cartridge Body | 13. Flat Washer |
| 4. Primary Cup | 14. Dust Boot |
| 5. Piston | 15. Retaining Ring |
| 6. O-Ring | 16. Spacer Washer* |
| 7. Drain/Air Hole | 17. Retaining Ring |
| 8. Push Rod* | 18. O-Ring |
| 9. Spring | 19. Reservoir Adapter |
| 10. Spring Retainer | 20. Brake Line Seating Surface |

Figure 2-55. Rear Brake Master Cylinder Assembly (Cross Sectional View)

4. Stand cartridge body upright on banjo sealing surface. Lay down a clean shop cloth to protect the sealing surface from damage. See [Figure 2-53](#).
5. Insert ball end of push rod into piston cup. Pushing down on push rod to compress spring, fit captured spacer washer into cartridge body. Further compressing spring as necessary, install retaining ring positioned in step 3 in groove of cartridge body bore.
6. Verify that retaining ring is completely seated in groove and that push rod rotates freely.
7. Lubricate **new** O-rings with DOT 4 BRAKE FLUID and carefully install in grooves on outside of cartridge body.
8. Wipe bore of reservoir adapter with DOT 4 BRAKE FLUID.
9. Insert cartridge body into reservoir adapter indexing tab on adapter in slot on threaded end of cartridge. Use hand pressure only. Cartridge body is fully installed when reservoir adapter contacts large retaining ring.
10. Stand master cylinder assembly upright on banjo sealing surface. For best results, suspend reservoir over edge of table. Be sure to lay down a clean shop cloth to protect the sealing surface from damage.

⚠ 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)

11. Install spring over push rod and cartridge body until it contacts side of large retaining ring. See [Figure 2-54](#).
12. Place concave side of spring retainer over end of spring fitting inside tabs in slot of clevis.
13. Slide dust boot over spring and spring retainer.
14. Place large flat washer on top of dust boot fitting inside tabs in slot of clevis.
15. Push down on large flat washer to compress spring. While holding spring in a compressed state, install **new** retaining ring in groove of clevis.
16. Pull down dust boot as necessary to seat over lip on reservoir adapter.
17. Rotate boot so that drain/air hole is at the bottom.
18. See [BRAKE PEDAL/MASTER CYLINDER ASSEMBLY, INSTALLATION](#), in this section.

INSPECTION

Check brake pads and discs:

- At every scheduled service interval.
- Whenever the components are removed during normal service procedures.

BRAKE DISC THICKNESS/WARPAGE

The minimum brake disc thickness is stamped on the side of the disc. Replace disc if excessively worn or badly scored. Maximum brake disc lateral runout or warp is 0.008 inch (0.20 mm) when measured near the outside diameter. Replace disc if warped beyond specification. For replacement instructions, see Section 2.3 FRONT WHEEL, DISASSEMBLY.

BRAKE PADS

NOTE

Brake pad inspection can be performed without removing the caliper.

1. Look up at the back of the right side caliper. See Figure 2-56.
2. Place a thin plastic 6 inch rule against the brake disc and measure the friction material of the brake outer pad. Using a small hand mirror, visually check the friction material of the inner pad.
3. Repeat above checks at the front of the right side caliper. Replace both pads if the friction material above the backing plate on either pad is 0.04 inch (1.02 mm) thick or less.
4. Repeat steps 1-3 on the left side of the vehicle.

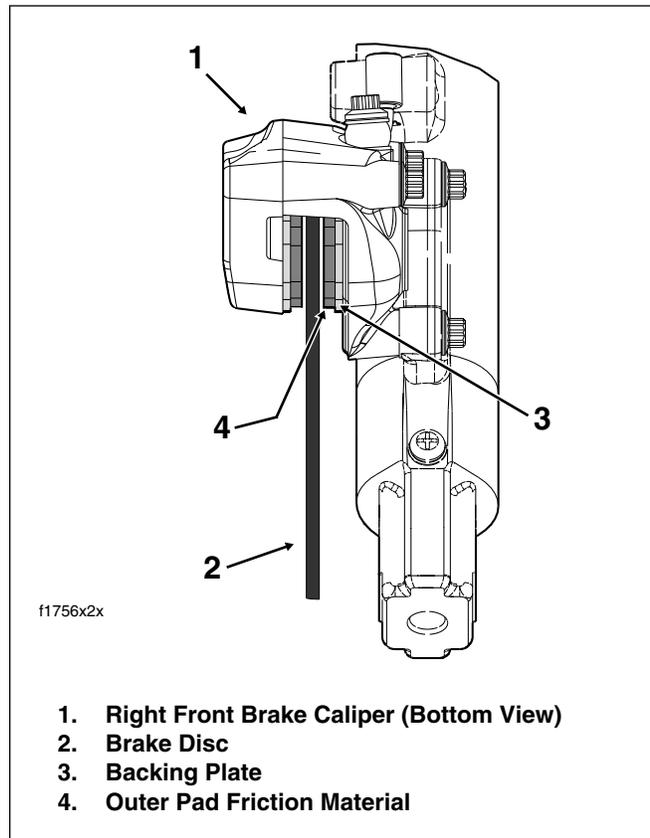
WARNING

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. See FRONT BRAKE PAD REPLACEMENT on this page.

BRAKE LINE/HOSE INSPECTION

When checking brake pads and discs, take the time to inspect the brake lines and hoses for damage or wear. Replace as necessary.



1. Right Front Brake Caliper (Bottom View)
2. Brake Disc
3. Backing Plate
4. Outer Pad Friction Material

Figure 2-56. Measure Brake Pad Wear

FRONT BRAKE PAD REPLACEMENT

PAD REMOVAL

1. Use shop rag or tape to protect fender area adjacent to caliper, as incidental contact can occur during caliper removal.
2. Loosen two pad pins, but do not remove. See Figure 2-57.
3. Remove upper and lower caliper mounting bolts from front fork mounting lugs. Lift caliper upward to remove from brake disc.

CAUTION

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

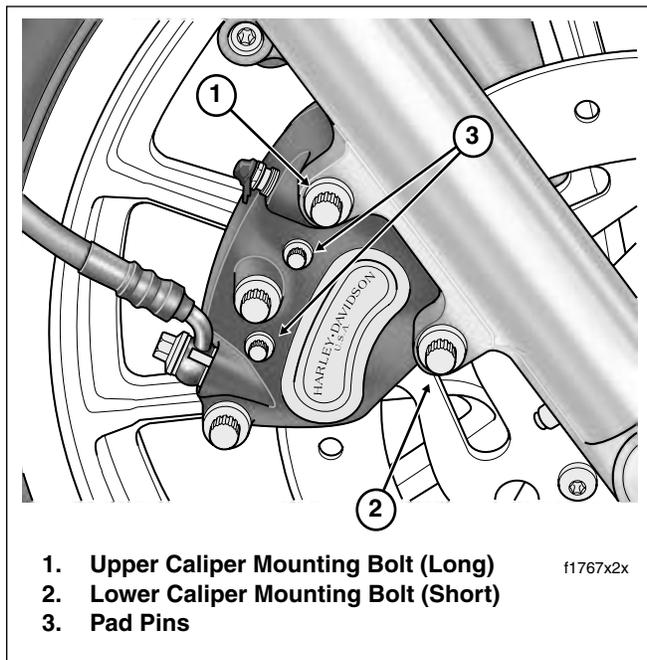


Figure 2-57. Loosen Pad Pins and Remove Caliper Mounting Bolts (Right Side View)

IMPORTANT NOTE

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

- If the motorcycle is resting on jiffy stand, turn front wheel as necessary until the master cylinder reservoir is level.

CAUTION

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

- Remove two Phillips screws to release cover from front master cylinder reservoir.

NOTE

As the pistons are pushed back into the caliper, fluid level may rise more than 1/4 inch (6.4 mm) and overflow the reservoir. Watch the fluid level as the pistons are retracted and remove fluid from the reservoir if necessary.

- Pry back inner and outer brake pads pushing the four pistons back into their bores.
- With the pistons retracted, remove two pad pins and both inner and outer brake pads. Inspect pad pins. See [CLEANING AND INSPECTION](#), step 4.

NOTE

Replacing one pad at a time keeps the anti-rattle spring in place. Remove both pads to remove or replace the spring.

PAD INSTALLATION

NOTE

Both front calipers (as well as the rear brake caliper) use the same brake pad set.

- Install **new** brake pads into caliper with the friction material facing the brake disc opening. Be sure that the pad is oriented so that the curved side faces the rear of the vehicle when the caliper is installed. See [Figure 2-58](#).

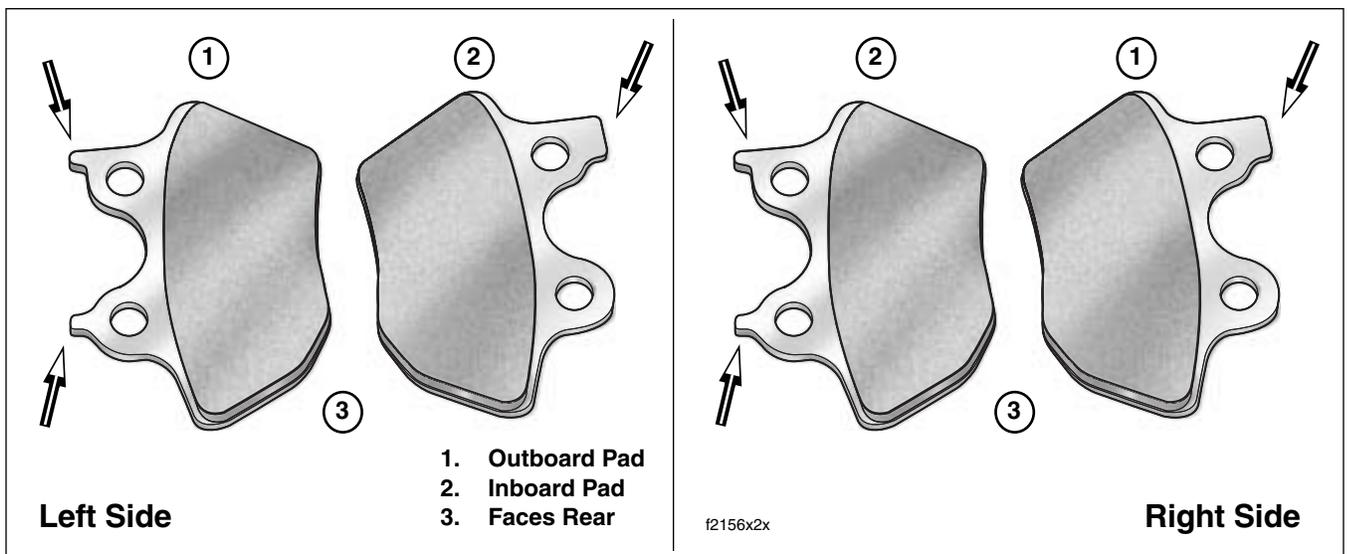


Figure 2-58. Front Brake Pad Locations

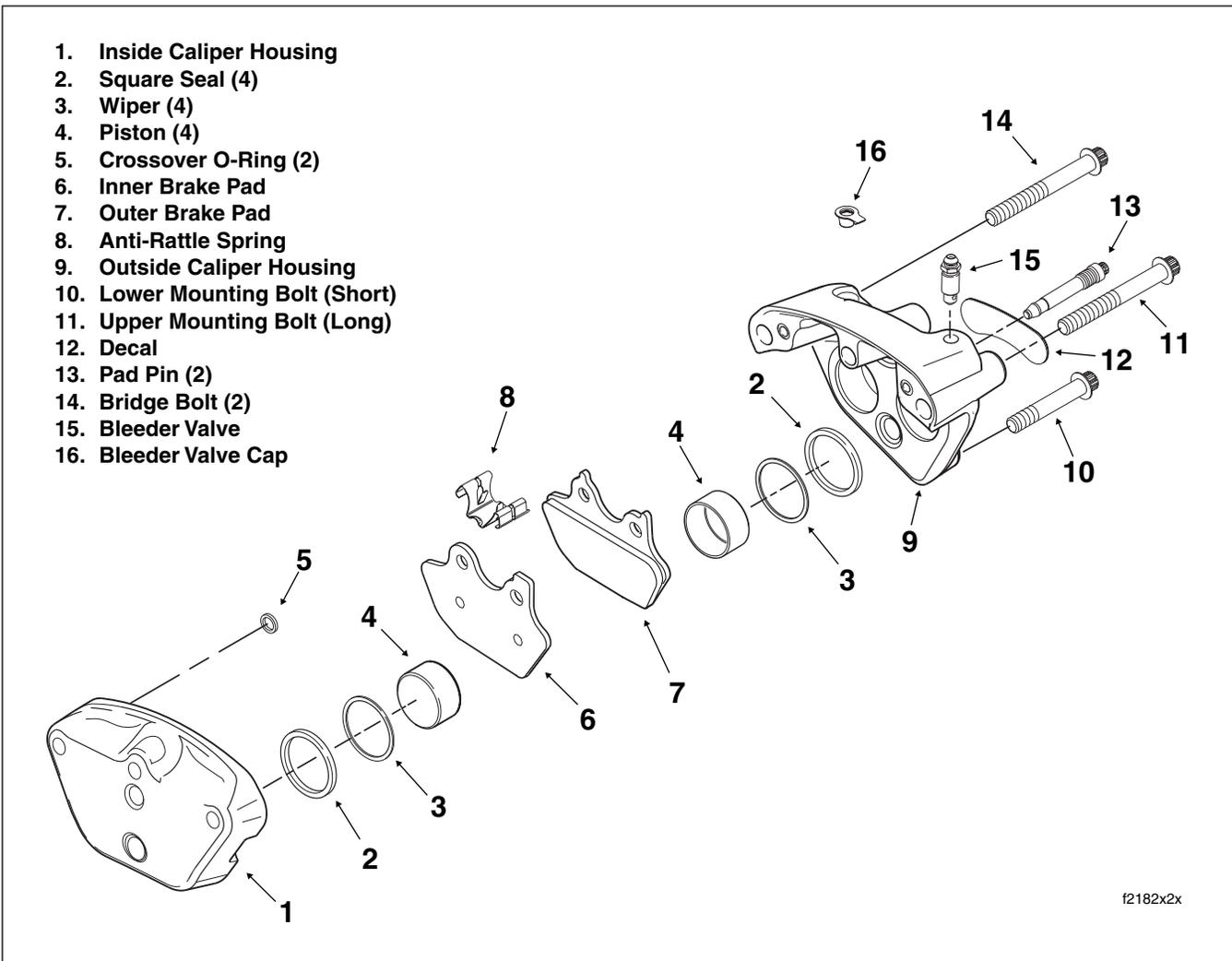


Figure 2-59. Front Brake Caliper Assembly (Left Side)

Furthermore, note that the backing plate of each brake pad has either one or two tabs. On the right side of the vehicle, the pad with two tabs is installed on the inboard side of the caliper, the pad with the single tab is installed on the outboard side.

On the left side of the vehicle, the pad location is reversed. Therefore, the pad with the single tab is installed on the inboard side of the caliper, while the pad with two tabs is installed on the outboard side.

2. Install pad pins, but do not fully tighten at this time.
3. Install calipers as follows:
 - a. Use shop rag or tape to protect fender area adjacent to caliper, as incidental contact can occur during caliper installation.
 - b. Place caliper over brake disc with bleeder valve top-side.

- c. Loosely install long caliper mounting bolt into upper lug of front fork leg.
- d. Install short caliper mounting bolt into lower lug of front fork leg. Tighten lower mounting bolt to 28-38 ft-lbs (37.9-51.5 Nm).
- e. Tighten upper caliper mounting bolt to 28-38 ft-lbs (37.9-51.5 Nm).
- f. Tighten pad pins to 180-200 **in-lbs** (20.3-22.6 Nm).

⚠ WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

4. Pump brake hand lever until pistons contact brake pads and pads contact brake discs. Verify piston location against pads. If the front wheel is off the ground, rotate wheel to check for excessive brake pad drag.
5. Verify that brake fluid level is 1/4 inch (6.4 mm) below top of reservoir with master cylinder in a level position. Add DOT 4 BRAKE FLUID, if necessary.
6. Install the master cylinder reservoir cover, but first verify that the cover gasket bellows is not extended or brake fluid will be ejected from the reservoir. Install two Phillips screws and alternately tighten to 6-8 **in-lbs** (0.7-0.9 Nm).

NOTE

Note that one side of the master cylinder reservoir cover is thicker than the other. Install the cover with the thicker side closest to the brake line fitting.

7. Test operation of brake lamp with the front brake applied and the Ignition/Light Key Switch turned to IGNITION.

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)

8. Test ride the motorcycle. If the brakes feel spongy, bleed the system. See Section 2.14 **BLEEDING HYDRAULIC BRAKES**.

NOTE

To allow new brake pads to “wear in” properly with the brake disc, avoid making hard stops for the first 100 miles (160 km).

CALIPER REMOVAL

NOTE

If only replacing brake pads, see [FRONT BRAKE PAD REPLACEMENT](#) in this section.

CAUTION

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

1. Remove banjo bolt and two steel/rubber washers to detach front brake line from caliper. Discard washers.
2. Use shop rag or tape to protect fender area adjacent to caliper, as incidental contact can occur during caliper removal.
3. Remove upper and lower caliper mounting bolts from front fork mounting lugs. Lift caliper upward to remove from brake disc.

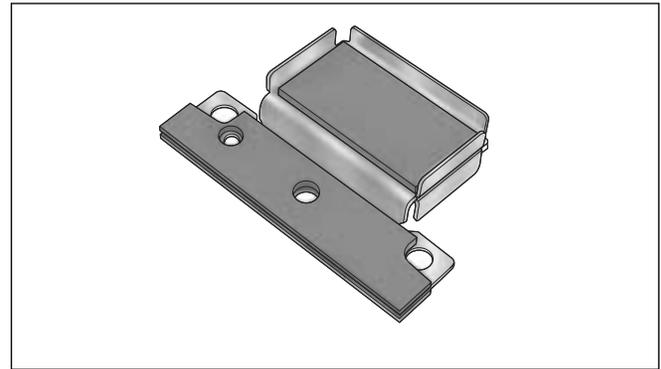


Figure 2-60. Brake Caliper Piston Remover (Part No. HD-43293A)

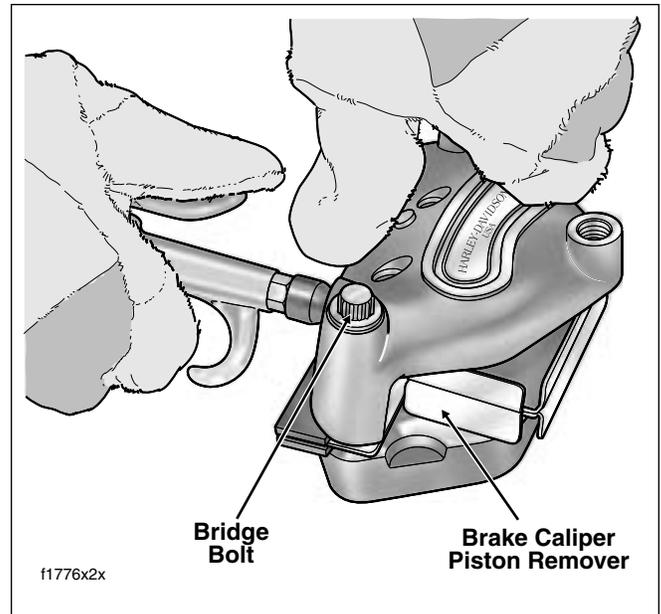


Figure 2-61. Direct Compressed Air Into Banjo Bolt Hole

CALIPER DISASSEMBLY

1. See [Figure 2-57](#). Remove two pad pins. Remove brake pads from caliper housings.
2. Remove two bridge bolts and separate inside and outside caliper housings.
3. Remove anti-rattle spring from channel around boss in outside caliper housing.
4. Remove bleeder valve, if damaged.

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)

5. Remove four pistons as follows:
 - a. Obtain BRAKE CALIPER PISTON REMOVER (Part No. HD-43293A). See [Figure 2-60](#).
 - b. Seat tool in outside caliper housing aligning outside holes in tool with bridge bolt holes in housing. Place inside caliper housing over tool aligning bridge bolt holes with outside holes in tool.
 - c. Install bridge bolts and tighten securely.
 - d. If the bleeder valve was removed, reinstall finger tight or place a gloved finger over the valve hole.

CAUTION

To prevent air from escaping through the banjo bolt hole, and to avoid scratching or nicking the banjo seating surface, use only a tapered, rubber tipped nozzle on air hose. Loss of air pressure will keep the pistons from moving, while any damage to the banjo seating surface requires caliper replacement.

- e. Using a tapered, rubber-tipped nozzle on the air hose, apply low pressure compressed air into the banjo bolt hole to force pistons into contact with cushion of tool. See [Figure 2-61](#).
 - f. Remove bridge bolts and separate caliper housings.
 - g. Remove pistons from caliper piston bores. For best results, wiggle pistons slightly while pulling.
6. Remove two crossover O-rings from inside caliper housing. Discard O-rings.

CAUTION

Do not use metal objects to remove parts from caliper piston bores or damage will occur. Damaged pistons or bores will leak when reassembled. Use a wooden toothpick to assist in the removal of parts, if necessary.

7. Using a wooden toothpick, remove wiper and square seal from each piston bore. Discard wipers and seals. See [Figure 2-62](#).

CLEANING AND INSPECTION

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 all parts with denatured alcohol or DOT 4 BRAKE FLUID. Wipe parts dry with a clean, lint free cloth. Blow out drilled passages and bores with a clean air supply. Do not use a wire or similar instrument to clean drilled passages.

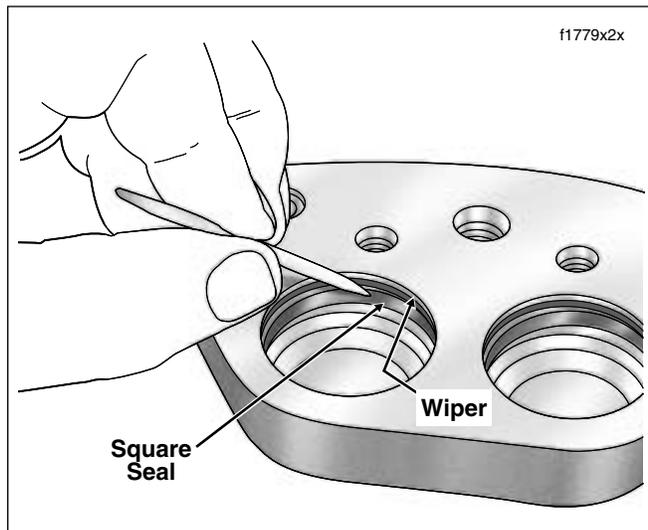


Figure 2-62. Remove Wipers and Square Seals From Piston Bores

2. Carefully inspect all components. Replace any parts that appear damaged or worn.
 - a. Check pistons for pitting, scratching or corrosion on face and also on ground surfaces.
 - b. Inspect caliper piston bore. Replace caliper if bore shows signs of pitting or corrosion. Do not hone bore for reuse.
 - c. Always replace wipers, square seals and crossover O-rings after caliper 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)

3. Inspect brake pads and discs. See [INSPECTION](#) at the beginning of this section.
4. Inspect pad pins for wear and grooving. Replace both pins if wear of either pin exceeds 0.015 inch (0.38 mm).

CALIPER ASSEMBLY

1. Install **new** square seals into caliper piston bores.
2. Install **new** wipers into caliper piston bores.

CAUTION

Do not use DOT 4 brake fluid for lubrication or increased lever travel will result.

3. Lubricate the following areas using a thin film of G.E. VERSILUBE® #G322L SILICONE GREASE (marked "Piston Lube" in the service parts kit):

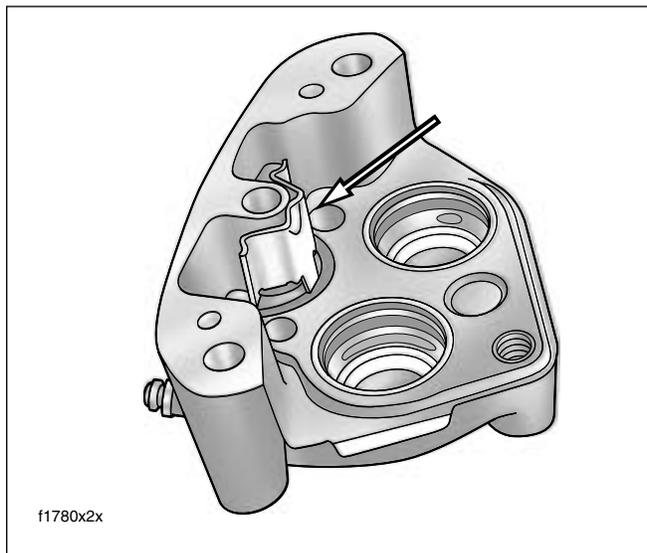


Figure 2-63. Install Anti-Rattle Spring

- Inside diameter of square seals and wipers.
- Caliper piston bores.
- Nose radius and outside diameter of piston.

NOTE

All other surfaces must be kept clean and dry for assembly.

4. Carefully insert pistons into bores by hand. If resistance is felt, remove piston and verify that both seal and wiper are properly installed.
5. Install **new** crossover O-rings into two grooves on inside caliper housing.
6. Assemble caliper housings as follows:
 - a. Install bleeder valve on outside caliper housing, if removed. Tighten valve to 80-100 **in-lbs** (9.0-11.3 Nm). Install bleeder valve cap.
 - b. Place outside caliper housing on workbench with decal side down. Place anti-rattle spring in channel around boss. Spring is not directional. See [Figure 2-63](#).
 - c. Mate inside and outside caliper housings and loosely install two bridge bolts.
 - d. Verify that anti-rattle spring is still seated.
 - e. Tighten bridge bolts to 28-38 ft-lbs (37.9-51.5 Nm).

NOTE

Both front calipers (as well as the rear brake caliper) use the same brake pad set.

7. Install **new** brake pads into caliper with the friction material facing the brake disc opening. Also, be sure that the pad is oriented so that the curved side faces the rear of the vehicle when the caliper is installed. See [Figure 2-58](#).

Furthermore, note that the backing plate of each brake pad has either one or two tabs. On the right side of the vehicle, the pad with two tabs is installed on the inboard side of the caliper, the pad with the single tab is installed on the outboard side.

On the left side of the vehicle, the pad location is reversed. Therefore, the pad with the single tab is installed on the inboard side of the caliper, while the pad with two tabs is installed on the outboard side.

8. Install pad pins and tighten to 180-200 **in-lbs** (20.3-22.6 Nm).

NOTE

If pad pins do not fit, verify the following: (1) Proper pad set is being used, not two identical pads. (2) Anti-rattle spring is installed as shown in [Figure 2-63](#). (3) Pads are pushed tight against anti-rattle spring.

CALIPER INSTALLATION

1. Install calipers as follows:
 - a. Use shop rag or tape to protect fender area adjacent to caliper, as incidental contact can occur during caliper installation.
 - b. Place caliper over brake disc with bleeder valve top-side.
 - c. Loosely install long caliper mounting bolt into upper lug of front fork leg.
 - d. Install short caliper mounting bolt into lower lug of front fork leg. Tighten lower mounting bolt to 28-38 ft-lbs (37.9-51.5 Nm).
 - e. Tighten upper caliper mounting bolt to 28-38 ft-lbs (37.9-51.5 Nm).
 - f. Repeat step to install second caliper.

CAUTION

To avoid leakage, verify that the washers, banjo bolt, brake line and caliper bore are completely clean.

2. Connect brake line to caliper using two **new** steel/rubber washers and banjo bolt. Tighten bolt to 17-22 ft-lbs (23.0-29.8).
3. Remove two Phillips screws to release cover from front brake master cylinder reservoir. Verify that brake fluid level is 1/4 inch (6.4 mm) below top of reservoir with master cylinder in a level position. Add DOT 4 BRAKE FLUID, if necessary.

WARNING

A plugged or covered relief port can cause brake drag or lock-up, which could lead to loss of control, resulting in death or serious injury. (00288a)

4. Actuate the brake lever. A slight spurt of fluid will break the surface if all internal components are working properly.

 **WARNING**

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

5. Depress front brake hand lever several times to set brake pads to proper operating position within caliper. Bleed brake system. See Section [2.14 BLEEDING HYDRAULIC BRAKES](#).
6. Install the master cylinder reservoir cover, but first verify that the cover gasket bellows is not extended or brake fluid will be ejected from the reservoir. Install two Phillips screws and alternately tighten to 6-8 **in-lbs** (0.7-0.9 Nm).

NOTE

Note that one side of the master cylinder reservoir cover is thicker than the other. Install the cover with the thicker side closest to the brake line fitting.

7. Test operation of brake lamp with the front brake applied and the Ignition/Light Key Switch turned to IGNITION.

 **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)

8. Test ride the motorcycle. If the brakes feel spongy, bleed the system again. See Section [2.14 BLEEDING HYDRAULIC BRAKES](#).

NOTE

To allow new brake pads to “wear in” properly with the brake disc, avoid making hard stops for the first 100 miles (160 km).

INSPECTION

Check brake pads and discs:

- At every scheduled service interval.
- Whenever the components are removed during service procedures.

BRAKE DISC THICKNESS/WARPAGE

The minimum brake disc thickness is stamped on the side of the disc. Replace disc if excessively worn or badly scored. Maximum brake disc lateral runout or warp is 0.008 inch (0.2 mm) when measured near the outside diameter. Replace disc if warped beyond specification. For replacement instructions, see Section 2.4 REAR WHEEL, DISASSEMBLY.

BRAKE PADS

NOTE

Brake pad inspection can be performed without removing the caliper.

1. Look down at the back of the rear caliper. See Figure 2-64.
2. Place a thin plastic 6 inch rule against the brake disc and measure the friction material of the brake outer pad. Using a small hand mirror, visually check the friction material of the inner pad.
3. Repeat above checks at the front of the rear caliper.

Replace both pads if the friction material above the backing plate on either pad is 0.04 inch (1.02 mm) thick or less.

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. See REAR BRAKE PAD REPLACEMENT on this page.

BRAKE LINE/HOSE INSPECTION

When checking brake pads and discs, take the time to inspect the brake lines and hoses for damage or wear. Replace as necessary.

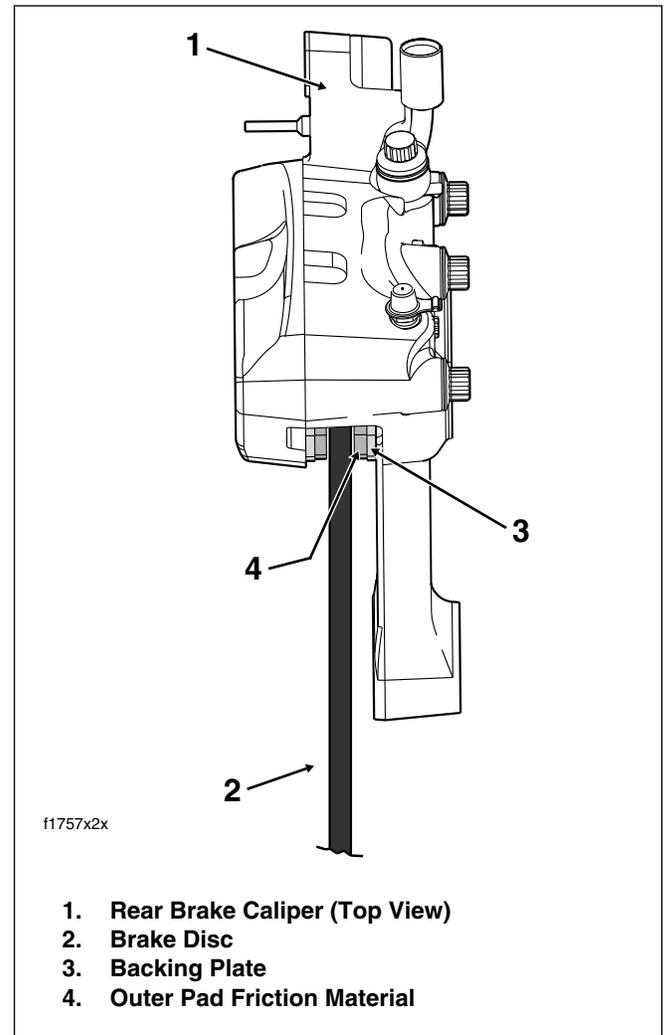


Figure 2-64. Measure Brake Pad Wear

REAR BRAKE PAD REPLACEMENT

PAD REMOVAL/INSTALLATION

1. Remove right side saddlebag. See Section 2.26 SADDLEBAG, REMOVAL.
2. Loosen both pad pins, but do not remove. See Figure 2-65.

CAUTION

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

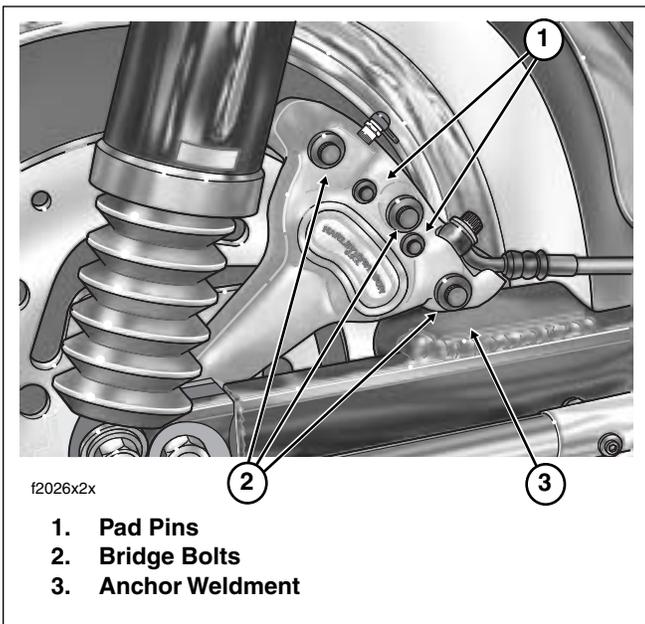


Figure 2-65. Loosen Both Pad Pins

IMPORTANT NOTE

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

CAUTION

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

3. Remove two Phillips screws to release cover from rear master cylinder reservoir.

NOTE

As the pistons are pushed back into the caliper, fluid level may rise more than 1/4 inch (6.4 mm) and overflow the reservoir. Watch the fluid level as the pistons are retracted and remove fluid from the reservoir if necessary.

4. Pry the inside pad back pushing the pistons into their bores. Use a putty knife with a wide thin blade to avoid scoring or scratching the brake disc.

NOTE

Do not completely pull pad pins from caliper during the next step. Completely removing pad pins at this time will make assembly difficult.

5. Once the pistons have been retracted, pull the pad pins part way out until the inside pad drops free. Note the orientation of the pad.
6. Install **new** inside brake pad using the same orientation. Curved portion of pad must face rear of motorcycle.

7. Install pad pins, but do not fully tighten.
8. Pump rear brake pedal to move inside pistons out until they contact inside brake pad.
9. Pry the outside pad back pushing the pistons into their bores. Use a putty knife with a wide thin blade to avoid scoring or scratching the brake disc.
10. Verify that inside pad is captured between brake disc and pistons. Completely remove pad pins to free outside brake pad. Note the orientation of the pad.
11. Install **new** outside brake pad using the same orientation. Curved portion of pad must face rear of motorcycle. If the inside pad moved during the previous step, reinstall.

NOTE

Replacing one pad at a time keeps the anti-rattle spring in place. Remove both pads to remove or replace the spring.

12. Inspect pad pins. See [CLEANING AND INSPECTION](#), step 4.
13. Install two pad pins and tighten to 180-200 **in-lbs** (20.3-22.6 Nm).

WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

14. Pump rear brake pedal to move pistons out until they contact both brake pads. Verify piston location against pads.

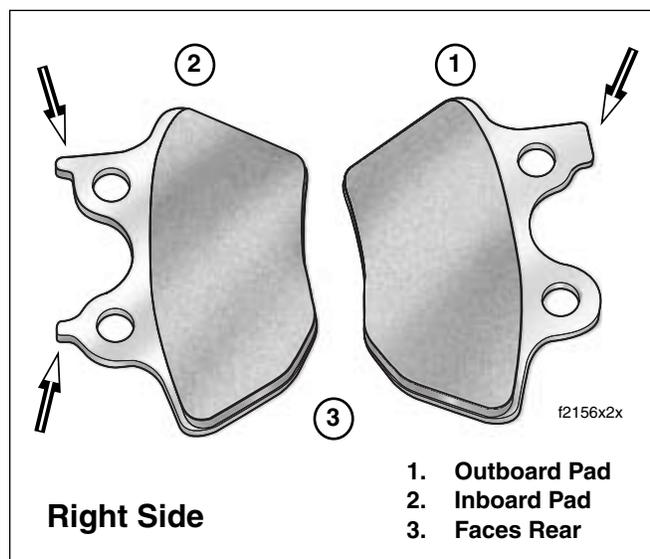


Figure 2-66. Rear Brake Pad Locations

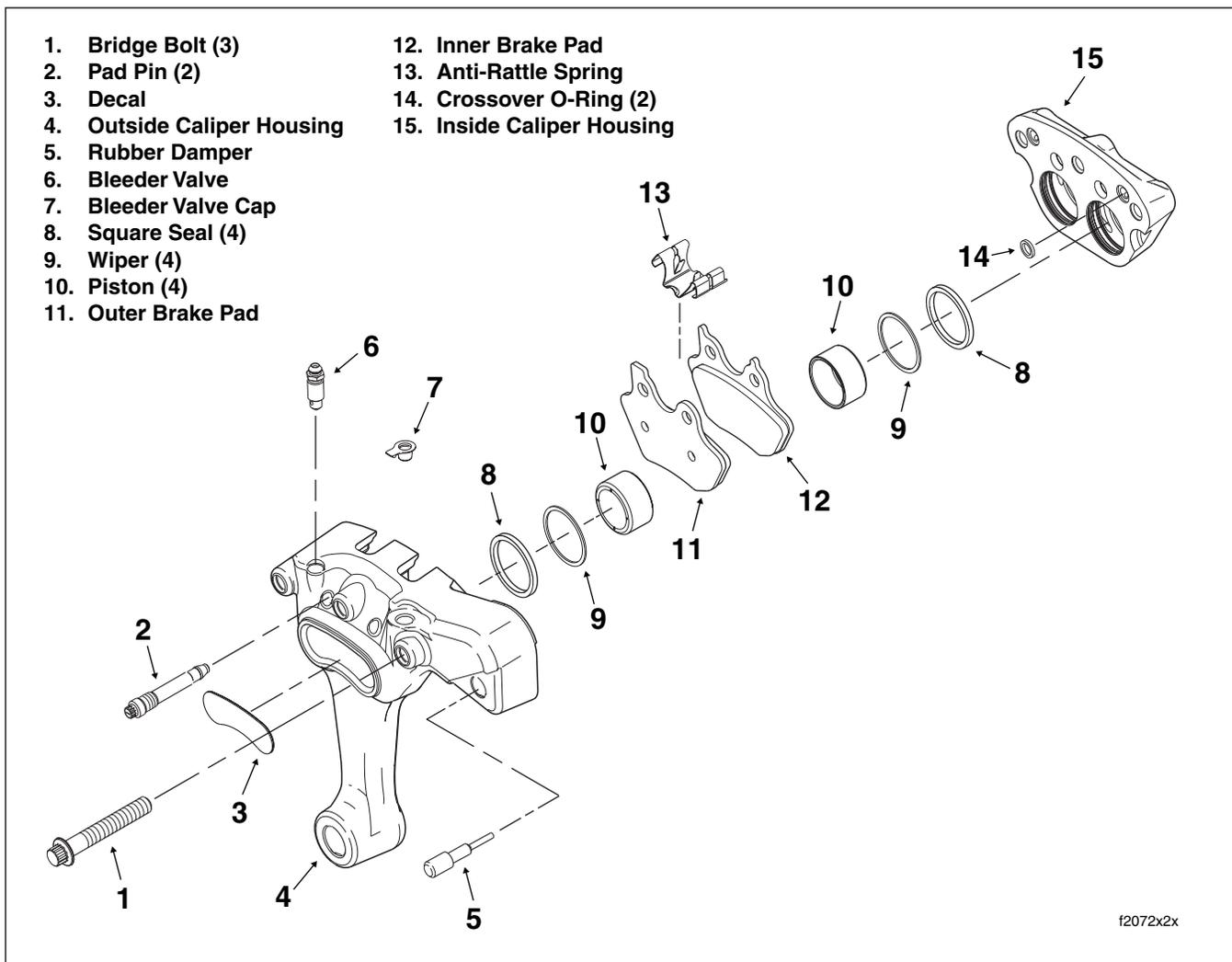


Figure 2-67. Rear Brake Caliper Assembly (Right Side)

15. Verify that brake fluid level is 1/4 inch (6.4 mm) below top of reservoir with master cylinder in a level position. Add DOT 4 BRAKE FLUID, if necessary.
16. Install the master cylinder reservoir cover, but first verify that the cover gasket bellows is not extended or brake fluid will be ejected from the reservoir. Install two Phillips screws and alternately tighten to 6-8 **in-lbs** (0.7-0.9 Nm).
17. Install master cylinder reservoir cover. Install two Phillips screws to fasten cover to reservoir and tighten to 6-8 **in-lbs** (0.7-0.9 Nm).
18. Install right side saddlebag. See Section 2.26 [SADDLE-BAG, INSTALLATION](#).
19. Test operation of brake lamp with the rear brake applied and the Ignition/Light Key Switch turned to IGNITION.

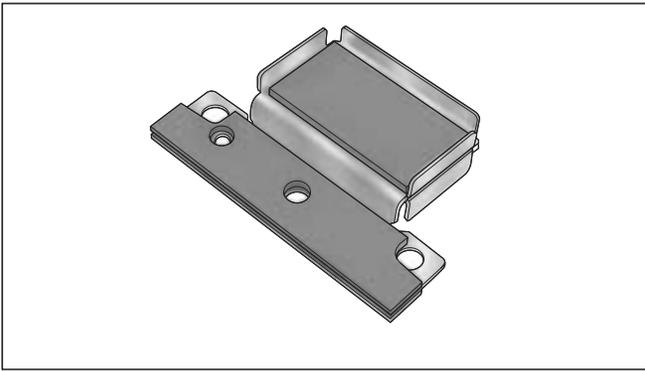
⚠ WARNING

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)

20. Test ride the motorcycle. If the brakes feel spongy, bleed the system again. See Section 2.14 [BLEEDING HYDRAULIC BRAKES](#).

NOTE

To allow new brake pads to “wear in” properly with the brake disc, avoid making hard stops for the first 100 miles (160 km).



**Figure 2-68. Brake Caliper Piston Remover
(Part No. HD-43293A)**

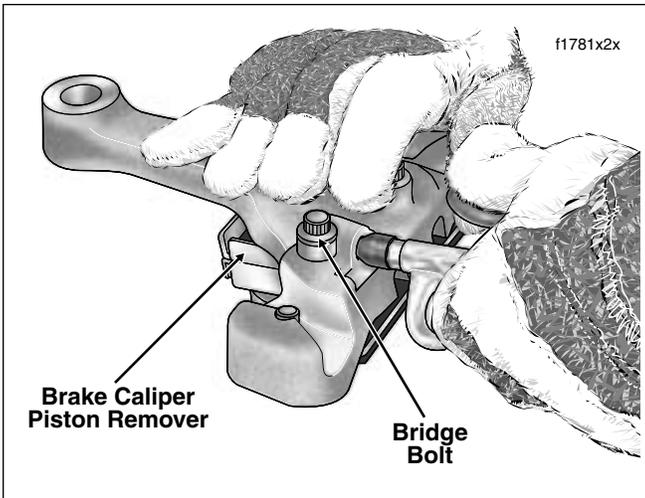


Figure 2-69. Direct Compressed Air Into Banjo Bolt Hole

CALIPER REMOVAL

NOTE

If only replacing brake pads, see [REAR BRAKE PAD REPLACEMENT](#) in this section.

1. Block motorcycle underneath frame so rear wheel is raised off the ground.
2. Remove saddlebags. See Section [2.26 SADDLEBAG, REMOVAL](#).

CAUTION

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

3. Remove banjo bolt and two steel/rubber washers to detach rear brake line from caliper. Discard washers.
4. Remove rear wheel. See Section [2.4 REAR WHEEL, REMOVAL](#), steps 2-7.

5. Remove caliper from anchor weldment on rear swing-arm.

CALIPER DISASSEMBLY

1. See [Figure 2-65](#). Remove two pad pins. Remove brake pads from caliper housings.
2. Remove three bridge bolts and separate inside and outside caliper housings.
3. Remove anti-rattle spring from channel around boss in outside caliper housing.
4. If damaged, cut anchor of rubber damper and remove.
5. Remove bleeder valve, if damaged.

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)

6. Remove four pistons as follows:
 - a. Obtain BRAKE CALIPER PISTON REMOVER (Part No. HD-43293A). See inset of [Figure 2-68](#).
 - b. Seat tool in outside caliper housing aligning holes in tool with three bridge bolt holes in housing. Place inside caliper housing over tool aligning bridge bolt holes with three holes in tool.
 - c. Install bridge bolts and tighten securely.
 - d. If the bleeder valve was removed, reinstall finger tight or place a gloved finger over the valve hole.

CAUTION

To prevent air from escaping through the banjo bolt hole, and to avoid scratching or nicking the banjo seating surface, use only a tapered, rubber tipped nozzle on air hose. Loss of air pressure will keep the pistons from moving, while any damage to the banjo seating surface requires caliper replacement.

- e. Using a tapered, rubber-tipped nozzle on the air hose, apply low pressure compressed air into the banjo bolt hole to force pistons into contact with cushion of tool. See [Figure 2-69](#).
 - f. Remove bridge bolts and separate caliper housings.
 - g. Remove pistons from caliper piston bores. For best results, wiggle pistons slightly while pulling.
7. Remove two crossover O-rings from inside caliper housing. Discard O-rings.

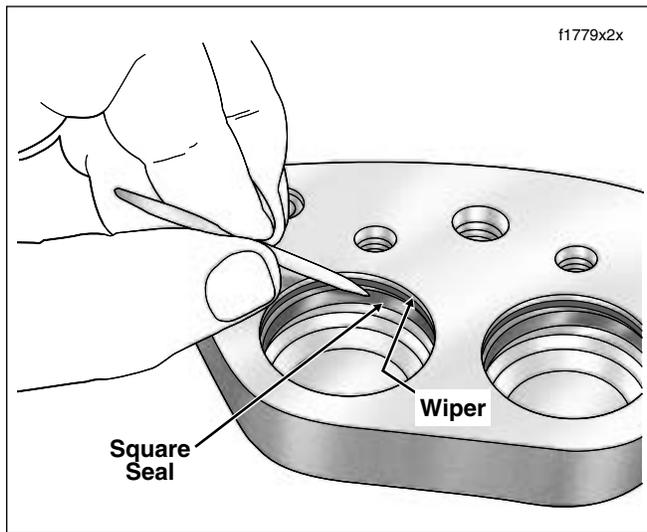


Figure 2-70. Remove Wipers and Square Seals From Piston Bores

CAUTION

Do not use metal objects to remove parts from caliper piston bores or damage will occur. Damaged pistons or bores will leak when reassembled. Use a wooden toothpick to assist in the removal of parts, if necessary.

8. Using a wooden toothpick, remove wiper and square seal from each piston bore. Discard wipers and seals. See [Figure 2-70](#).

CLEANING AND INSPECTION

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 all parts with denatured alcohol or DOT 4 BRAKE FLUID. Wipe parts dry with a clean, lint free cloth. Blow out drilled passages and bores with a clean air supply. Do not use a wire or similar instrument to clean drilled passages.
2. Carefully inspect all components. Replace any parts that appear damaged or worn.
 - a. Check pistons for pitting, scratching or corrosion on face and also on ground surfaces.
 - b. Inspect caliper piston bore. Replace caliper if bore shows signs of pitting or corrosion. Do not hone bore for reuse.

- c. Check rubber damper for cuts, tears or signs of deterioration.
- d. Always replace wipers, square seals and crossover O-rings after caliper 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)

3. Inspect brake pads and discs. See [INSPECTION](#) at the beginning of this section.
4. Inspect pad pins for wear and grooving. Replace both pins if wear of either pin exceeds 0.015 inch (0.38 mm).

CALIPER ASSEMBLY

1. Install **new** square seals into caliper piston bores.
2. Install **new** wipers into caliper piston bores.

CAUTION

Do not use DOT 4 brake fluid for lubrication or increased lever travel will result.

3. Lubricate the following areas using a thin film of G.E. VERSILUBE® #G322L SILICONE GREASE (marked "Piston Lube" in the service parts kit):
 - Inside diameter of square seals and wipers.
 - Caliper piston bores.
 - Nose radius and outside diameter of piston.

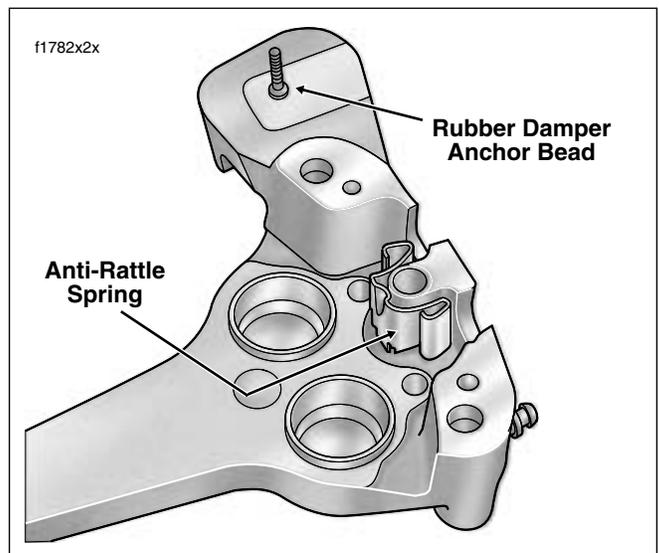


Figure 2-71. Install Anti-Rattle Spring

NOTE

All other surfaces must be kept clean and dry for assembly.

4. Carefully insert pistons into bores by hand. If resistance is felt, remove piston and verify that both seal and wiper are properly installed.
5. Install **new** crossover O-rings into two grooves on inside caliper housing.
6. Assemble caliper housings as follows:
 - a. Install bleeder valve on outside caliper housing, if removed. Tighten valve to 80-100 **in-lbs** (9.0-11.3 Nm). Install bleeder valve cap.
 - b. Place outside caliper housing on workbench with decal side down. Place anti-rattle spring in channel around boss. Spring is not directional. See [Figure 2-71](#).
 - c. Mate inside and outside caliper housings and loosely install two bridge bolts.
 - d. Tighten bridge bolts to 28-38 ft-lbs (37.9-51.5 Nm).
 - e. If rubber damper was removed, lubricate anchor of **new** damper with isopropyl alcohol or glass cleaner and install by pulling rubber bead through hole in outside caliper housing, as shown in [Figure 2-71](#).
 - f. Verify that anti-rattle spring is still seated.

NOTE

All calipers (both front and rear) use the same brake pad set.

7. Install **new** brake pads into caliper with the friction material facing the brake disc opening. Also, be sure that the pad is oriented so that the curved side faces the rear of the vehicle when the caliper is installed. See [Figure 2-66](#).

Furthermore, note that the backing plate of each brake pad has either one or two tabs. The pad with two tabs is installed on the inboard side of the caliper, the pad with the single tab is installed on the outboard side.
8. Install pad pins and tighten to 180-200 **in-lbs** (20.3-22.6 Nm).

NOTE

If pad pins do not fit, verify the following: (1) Proper pad set is being used, not two identical pads. (2) Anti-rattle spring is installed as shown in [Figure 2-71](#). (3) Pads are pushed tight against anti-rattle spring.

CALIPER INSTALLATION

1. Install rear wheel. See Section [2.4 REAR WHEEL, INSTALLATION](#), steps 1-16.

CAUTION

To avoid leakage, verify that the washers, banjo bolt, brake line and caliper bore are completely clean.

2. Connect brake line to caliper using two **new** steel/rubber washers and banjo bolt. Tighten bolt to 17-22 ft-lbs (23.0-29.8).

CAUTION

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

IMPORTANT NOTE

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

WARNING

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

IMPORTANT NOTE

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

3. Remove two Phillips screws to release cover from rear brake master cylinder reservoir. Verify that brake fluid level is 1/4 inch (6.4 mm) below top of reservoir with master cylinder in a level position. Add DOT 4 BRAKE FLUID, if necessary.

WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

4. Depress rear brake pedal several times to set brake pads to proper operating position within caliper. Bleed brake system. See Section [2.14 BLEEDING HYDRAULIC BRAKES](#).
5. Install the master cylinder reservoir cover, but first verify that the cover gasket bellows is not extended or brake fluid will be ejected from the reservoir. Install two Phillips screws and alternately tighten to 6-8 **in-lbs** (0.7-0.9 Nm).

6. Install saddlebags. See Section [2.26 SADDLEBAG, INSTALLATION](#).
7. Test operation of brake lamp with the rear brake applied and the Ignition/Light Key Switch turned to IGNITION.
8. Test ride the motorcycle. If the brakes feel spongy, bleed the system again. See Section [2.14 BLEEDING HYDRAULIC BRAKES](#).

NOTE

To allow new brake pads to “wear in” properly with the brake disc, avoid making hard stops for the first 100 miles (160 km).

 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)

GENERAL

Bleed the hydraulic brake system any time a brake line, master cylinder or brake caliper has been opened or disassembled, or whenever the brake lever/pedal operation feels "spongy." Bleeding evacuates air from the system leaving only incompressible hydraulic fluid.

NOTE

Harley-Davidson recommends that all brake service be performed by a Harley-Davidson dealer or other qualified technician.

NOTE

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

CAUTION

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

IMPORTANT NOTE

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

WARNING

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

IMPORTANT NOTE

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

1. Install end of a length of plastic tubing over caliper bleeder valve. Place free end of tube in a clean container. See Figure 2-72. Stand motorcycle upright.

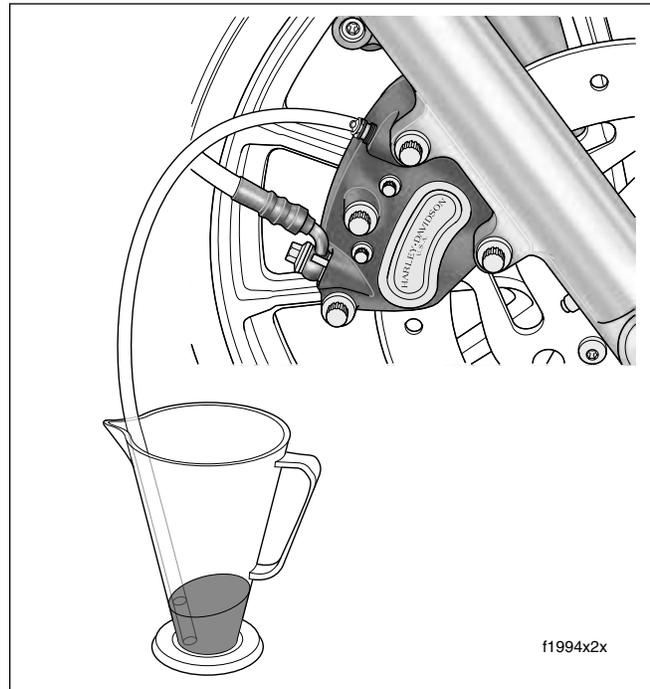


Figure 2-72. Bleeding Hydraulic System

CAUTION

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

2. Remove the two Phillips screws to release cover from the master cylinder reservoir.
3. Add DOT 4 BRAKE FLUID to the master cylinder reservoir until the fluid level is 1/4 inch (6.4 mm) from the top. Do not reuse old brake fluid. Use only DOT 4 fluid from a sealed container.
4. Depress and hold brake lever/pedal to build up hydraulic pressure.
5. Open bleeder valve about 1/2 turn. Brake fluid will flow from bleeder valve through tubing. Close bleeder valve when brake lever/pedal has moved 1/2 to 3/4 of its full range of travel. Allow brake lever/pedal to return slowly to its released position.
6. Repeat steps 3-5 until all air bubbles are purged.
7. Final tighten the bleeder valve to 80-100 in-lbs (9.0-11.3 Nm). Install the bleeder cap.
8. Add brake fluid to the master cylinder reservoir until the fluid level is about 1/4 inch (6.4 mm) from the top. Do not reuse brake fluid.

9. Install the master cylinder reservoir cover, but first verify that the cover gasket bellows is not extended or brake fluid will be ejected from the reservoir. Install two Phillips screws and alternately tighten to 6-8 **in-lbs** (0.7-0.9 Nm).

 **WARNING**

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

10. Test ride motorcycle. Repeat the bleeding procedure if brakes feel spongy.

CHANGING FORK OIL

NOTE

If changing the fork oil at the 50,000 mile (80,000 km) service interval, or if fork is leaking or fails visual inspection, see [REMOVAL](#) and [DISASSEMBLY](#), as complete disassembly and inspection of the fork is required. However, if a decision has been made to replace the fork oil before the recommended service interval, and the fork passes visual inspection, see steps 1-5 below.

1. Disassemble motorcycle and remove fork. See [REMOVAL](#).
2. Partially disassemble fork. See [DISASSEMBLY](#), steps 1-8.
3. Position fork assembly upside down over drain pan. Allow sufficient time for fork to thoroughly drain (about 10-15 minutes).
4. Fill and assemble fork. See [ASSEMBLY](#), steps 14-21.
5. Install fork and assemble motorcycle. See [INSTALLATION](#).

REMOVAL

1. Place suitable blocking under frame to raise front wheel several inches off the floor. For best results, use an hydraulic center stand on a level surface.
2. Remove the front wheel and fender. See Section [2.33 FRONT FENDER, REMOVAL](#).
3. Proceed as follows:

FLHR/C/S:

- a. Remove headlamp nacelle. See Section [2.32 WINDSHIELD/HEADLAMP NACELLE \(FLHR/C/S\), NACELLE REMOVAL \(FLHR/C\)](#) or [NACELLE REMOVAL \(FLHRS\)](#).

FLHX, FLHT/C/U:

- a. Loosen two outer fairing screws outboard of the speakers on the left and right side. Remove two outer fairing screws reaching in below the left and right sides of the fairing cap. If necessary, see Section [2.30 UPPER FAIRING/WINDSHIELD \(FLHX, FLHT/C/U\), OUTER FAIRING/WINDSHIELD, REMOVAL](#).
- b. Remove fairing cap. See Section [2.30 UPPER FAIRING/WINDSHIELD \(FLHX, FLHT/C/U\), FAIRING CAP, REMOVAL](#).

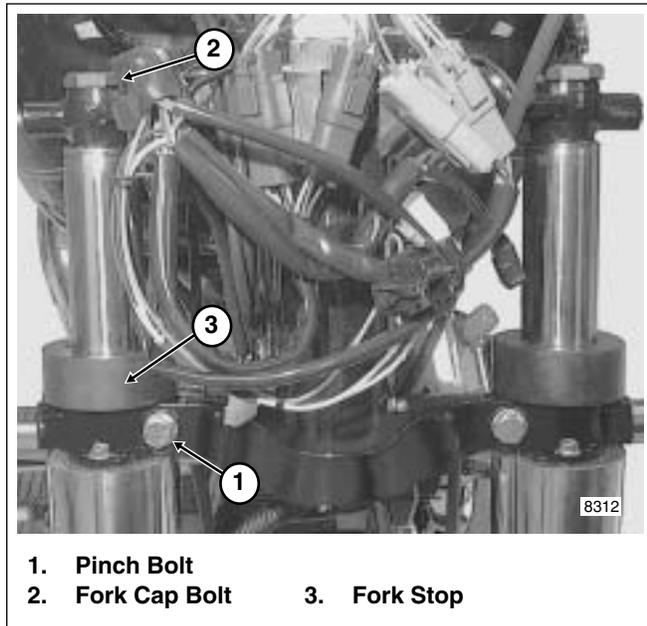


Figure 2-73. Remove Fork Cap Bolt (FLHR/C/S Shown)

- c. Remove two lower fork bracket screws to release front turn signal lamp/auxiliary lamp bracket, chrome skirt and inner fairing. If necessary, see Section [8.16 TURN SIGNAL LAMPS, FRONT TURN SIGNAL LAMP, FLHX, REMOVAL](#), or Section [8.13 AUXILIARY LAMPS, AUXILIARY LAMP BRACKET, REMOVAL](#).

FLTR:

- a. Remove instrument nacelle. See Section [2.31 UPPER FAIRING/WINDSHIELD \(FLTR\), INSTRUMENT NACELLE, REMOVAL](#).
4. Standing at front of motorcycle, loosen fork cap bolt from fork tube plug at top of fork tube, but do not remove.
 5. Loosen pinch bolt (with lockwasher) on left side of lower fork bracket, but do not remove. See [Figure 2-73](#).
 6. Spray glass cleaner on fork tube above the rubber fork stop. After lubricating surfaces, move fork stop up fork tube until it contacts bottom of upper fork bracket.
 7. Holding fork slider to prevent fork from dropping, remove fork cap bolt from fork tube plug. Slide fork tube down and out of upper fork bracket, fork stop, lower fork bracket, and slider cover.
 8. Thread fork cap bolt back into fork tube plug to prevent loss of fork oil while handling.
 9. Move front fork to bench area. Place suitable drain pan on floor beneath vise.
 10. Repeat steps 4-9 to remove right fork.

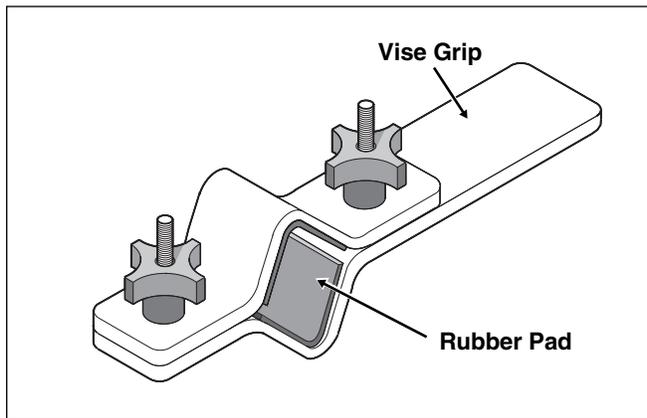


Figure 2-74. Fork Tube Holder (HD-41177)

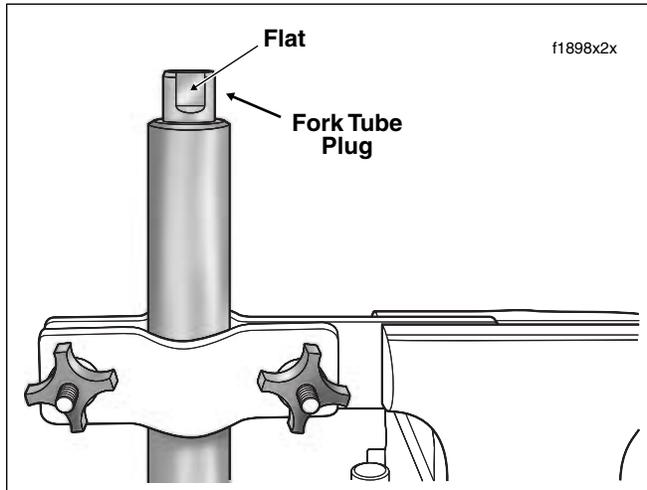


Figure 2-75. Install Fork Tube Into Fork Holder

DISASSEMBLY

1. Remove the fork assembly. See [REMOVAL](#) in this section.
2. On right side fork, remove nuts, lockwashers, flat washers and axle holder from studs at end of fork slider.

CAUTION

Exercise caution to avoid scratching or nicking fork tube. Damaging tube can result in fork oil leaks after assembly.

3. Obtain the FORK TUBE HOLDER (HD-41177). See [Figure 2-74](#). Proceed as follows:
 - a. Clamp end of tool in vise in a horizontal position with plastic knobs facing toward you.
 - b. With the fork cap bolt topside, clamp fork tube between rubber pads on inboard side of tool. Tighten knobs until fork tube is securely held. See [Figure 2-75](#).

4. Remove fork cap bolt from fork tube plug. Remove and discard quad ring seal.
5. Using flat, slowly unthread fork tube plug from fork tube. Be aware that fork tube plug is under spring pressure, so have a firm grasp on plug as the last thread is turned. Remove O-ring from fork tube plug. Discard O-ring.
6. Remove fork spring from fork tube.
7. Remove fork assembly from fork tube holder.
8. Turning fork upside down, drain fork oil into drain pan. For best results, slowly pump fork tube and slider at least ten times. Be aware that damper valve, if equipped, may fall out of inverted fork tube while draining. With the wear ring at the bottom (spring side up), slide damper valve back into fork tube when drained.

NOTE

If just changing the fork oil, continue procedure at [ASSEMBLY](#), step 14. If overhauling the fork assembly, continue with step below.

9. Install fork spring back into fork tube.
10. Place a shop rag on the floor, and turning fork assembly upside down, press end of spring against rag. While compressing spring to prevent rotation of damper tube, remove 6mm screw from end of fork slider. Use an air impact wrench for best results. Discard 6mm screw and copper crush washer.
11. Remove fork spring, damper valve (if equipped) and damper tube from fork tube.
12. Remove wear ring and rebound spring from damper tube. Remove wear ring from damper valve, if equipped.

CAUTION

Do not expand or stretch retaining clip to remove from fork tube or clip may become bent or distorted.

13. Using pick tool, remove retaining clip between fork slider and fork tube.
14. Remove fork tube from fork slider.

NOTE

To overcome any resistance, use the fork tube as a slide hammer, that is, first push fork tube into fork slider and then pull it outward with a moderate amount of force. Repeat this sequence until fork tube separates from fork slider.

15. Slide fork oil seal, slider spacer and slider bushing off end of fork tube. Discard fork oil seal and slider bushing.
16. Gently pry at split line to expand fork leg bushing, and then remove from groove at end of fork tube. Discard fork leg bushing.
17. Remove lower stop from fork slider.

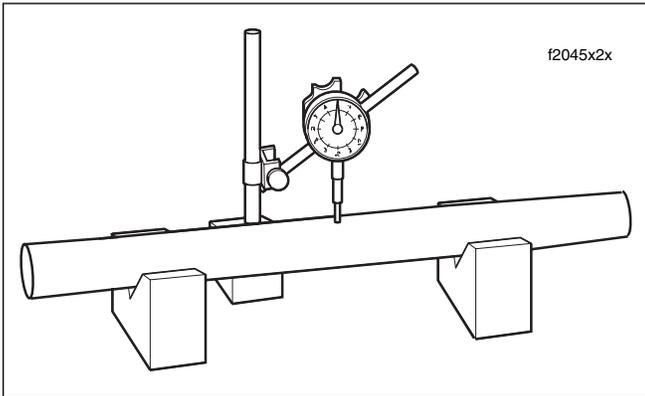


Figure 2-76. Measure Fork Tube Runout

CLEANING AND INSPECTION

1. Thoroughly clean and inspect all parts. Replace any parts that are bent, broken or obviously damaged.
2. Inspect fork cap bolt quad ring seal and fork tube plug O-ring for cuts, tears or signs of deterioration. Replace if necessary.
3. Replace the retaining clip if bent or distorted.
4. Check the slider and fork leg bushings for scratches or excessive wear. Always replace bushings in a set if either bushing is damaged or worn.
5. Check the fork tube and slider for scoring, scratches and excessive or abnormal wear. Replace parts as necessary. Set the fork tube on V-blocks and measure the runout using a dial indicator gauge. Replace fork if runout exceeds 0.008 inch (0.2 mm). See Figure 2-76.
6. Inspect upper fork spring and rebound spring for damage or distortion. Replace upper fork spring if free length is less than 18.4 inches (467.3 mm). Replace rebound spring if free length is less than 15/16 inches (23.8 mm) or whenever the upper fork spring requires replacement.

ASSEMBLY

CAUTION

Exercise caution to avoid scratching or nicking fork tube. Damaging tubes can result in fork oil leaks after assembly.

1. Coat fork leg bushing ID with clean fork oil. Expand fork leg bushing at split line only so far as required to slip over end and into groove of fork tube.
2. Install **new** wear ring in groove at top of damper tube. Install rebound spring on opposite end.

3. With the wear ring topside, slide damper tube into fork tube, so that tube end drops through hole at bottom of fork tube. Install lower stop at end of damper tube.
4. Install fork slider in fork tube holder. Slide fork tube into fork slider.
5. Coat slider bushing ID with clean fork oil. Slide slider bushing down fork tube.
6. Slide slider spacer down fork tube until it contacts slider bushing.
7. Obtain the FORK OIL SEAL INSTALLER (HD-34634). See Figure 2-77. Proceed as follows:
 - a. Slide the fork oil seal installer down the fork tube, and using the tool like a slide hammer, drive slider bushing into counterbore of fork slider. Remove tool.

NOTE

Place masking tape over edge of fork tube to avoid damaging lip of fork oil seal during installation.

- b. Coat **new** fork oil seal ID with clean fork oil. With the lip garter spring side facing down (toward the fork slider), slide seal down fork tube until it contacts slider spacer. Remove masking tape from edge of fork tube.



Figure 2-77. Fork Oil Seal Installer (HD-34634)

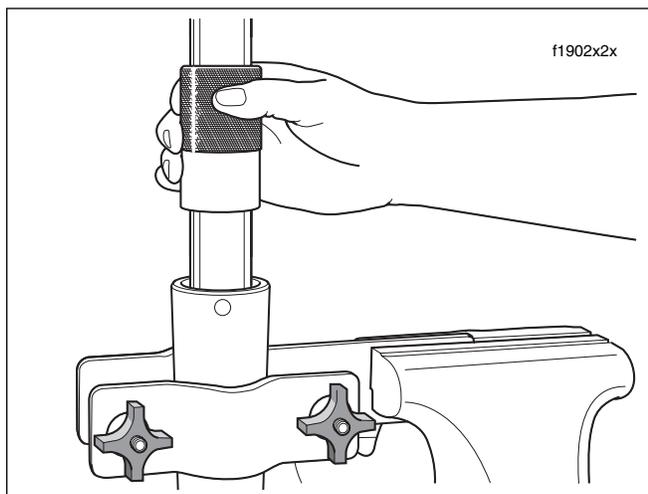


Figure 2-78. Install Fork Oil Seal

- c. Slide the fork oil seal installer down the fork tube until it contacts the fork oil seal.
- d. Using the tool like a slide hammer, drive fork oil seal down fork tube until retaining clip groove is visible in fork slider ID. See [Figure 2-78](#). Remove tool.

CAUTION

Do not expand or stretch retaining clip to install on fork tube or clip may become bent or distorted.

- e. Slide the retaining clip down the fork tube until it contacts the fork oil seal. Install retaining clip in the fork slider groove.
8. Install fork spring into fork tube.
 9. Remove fork assembly from fork tube holder.
 10. Place a shop rag on the floor, and turning fork assembly upside down, press end of spring against rag.
 11. Install **new** 6mm screw with copper crush washer. Slide screw through hole at bottom of fork slider and start into end of damper tube.
 12. While compressing spring to prevent rotation of damper tube, tighten 6mm screw to 132-216 **in-lbs** (14.9-24.4 Nm).
 13. Remove fork spring from fork tube.
 14. With the fork tube topside, clamp fork slider (not the fork tube) into fork tube holder.
 15. Install the drain plug at the bottom of the fork slider, if removed. Tighten plug to 72-96 **in-lbs** (8-11 Nm).

NOTE

All touring models with the exception of Road King have the damper valve type fork on both the left and right sides. Road King uses the conventional type fork on both sides. See step 16 to set fork oil level on a damper valve type fork; see step 17 to set fork oil level on a conventional type fork.

16. Set fork oil level on damper valve type fork as follows:

Damper Valve Type Fork: FLHX, FLHT/C/U, FLTR

- a. Pour slightly more than 10.8 ounces (319 ml) of Harley-Davidson Type E Fork Oil directly into the fork tube.
- b. Slowly pump fork tube until some resistance is felt and then pump a few more times.
- c. Install **new** wear ring in groove of damper valve. With the wear ring at the bottom (spring side up), slide damper valve into fork tube.
- d. Install fork spring into fork tube. Use fork spring to push damper valve to bottom of fork tube. Remove fork spring from fork tube.
- e. Slowly pump fork tube a few more times to discharge air from damper valve.
- f. See [Figure 2-79](#). Obtain the FRONT FORK OIL LEVEL GAUGE (HD-59000B).

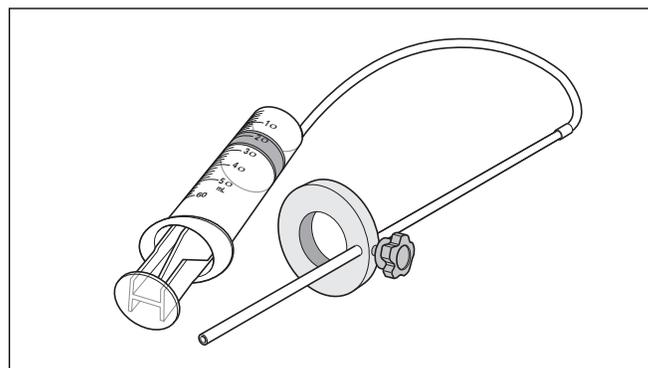


Figure 2-79. Front Fork Oil Level Gauge (HD-59000B)

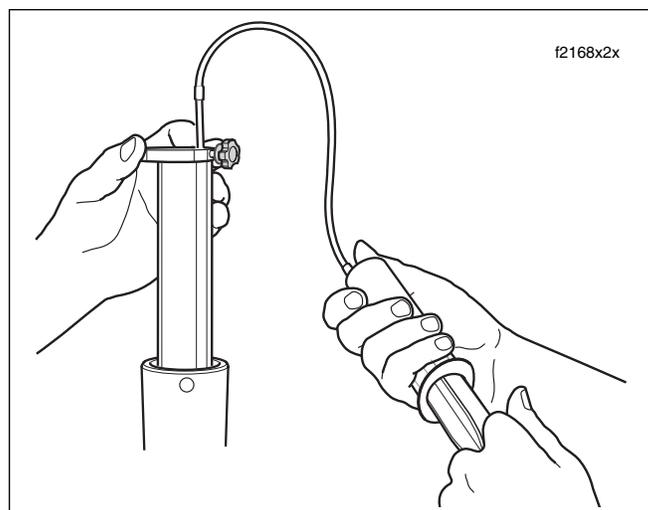


Figure 2-80. Remove Excess Fork Oil

Table 2-5. Fork Oil Requirements

MODEL	FORK TYPE	AMOUNT			
		OZ.	ML	IN.	MM
All models except Road King	Damper Valve	10.8	319	5.59	142
Road King	Conventional	11.1	328	5.24	133

- g. Loosen thumbscrew on metal ring of tool and move it up or down the rod until bottom of ring is 5.59 inches (142 mm) from end of rod. Tighten thumbscrew.
- h. Push the plunger on the cylinder all the way in.
- i. With the fork tube bottomed in the fork slider, insert rod until metal ring rests flat on top of fork tube. See [Figure 2-80](#).
- j. Pull out plunger to suck fork oil from fork tube. Observe fork oil through transparent tube as it is drawn into cylinder. If no oil is drawn through transparent tube, add enough oil so that tool usage sets fork oil level.

- k. Remove rod from fork tube. Push plunger into cylinder to eject excess fork oil into suitable container.
- l. If necessary, repeat steps 16(i) thru 16(k). Level is correct when no fork oil is observed being drawn through transparent tube.

WARNING

Be sure fork oil level is correct. The incorrect amount of fork oil can adversely affect handling and may lead to loss of vehicle control, which could result in death or serious injury.

17. Set fork oil level on conventional type fork as follows:

Conventional Type Fork: FLHR/C/S

- a. Pour slightly more than 11.1 ounces (328 ml) of Harley-Davidson Type E Fork Oil directly into the fork tube.
- b. Slowly pump fork tube until some resistance is felt and then pump a few more times.
- c. See Figure 2-79. Obtain the FRONT FORK OIL LEVEL GAUGE (HD-59000B).
- d. Loosen thumbscrew on metal ring of tool and move it up or down the rod until the bottom of ring is 5.24 inches (133 mm) from end of rod. Tighten thumbscrew.
- e. Push the plunger on the cylinder all the way in.
- f. With the fork tube bottomed in the fork slider, insert rod until metal ring rests flat on top of fork tube. See Figure 2-80.
- g. Pull out plunger to suck fork oil from fork tube. Observe fork oil through transparent tube as it is drawn into cylinder. If no oil is drawn through transparent tube, add enough oil so that tool usage sets fork oil level.
- h. Remove rod from fork tube. Push plunger into cylinder to eject excess fork oil into suitable container.
- i. If necessary, repeat steps 17(f) thru 17(h). Level is correct when no fork oil is observed being drawn through transparent tube.

WARNING

Be sure fork oil level is correct. The incorrect amount of fork oil can adversely affect handling and may lead to loss of vehicle control, which could result in death or serious injury.

- 18. With the closer spaced coils at the bottom, slide fork spring into fork tube.
- 19. Remove fork slider from fork tube holder. Clamp fork tube into fork tube holder.
- 20. Install new O-ring onto fork tube plug. Compressing fork spring with end of fork tube plug, thread fork tube plug into fork tube. Tighten fork tube plug to 22-58 ft-lbs (30-79 Nm).

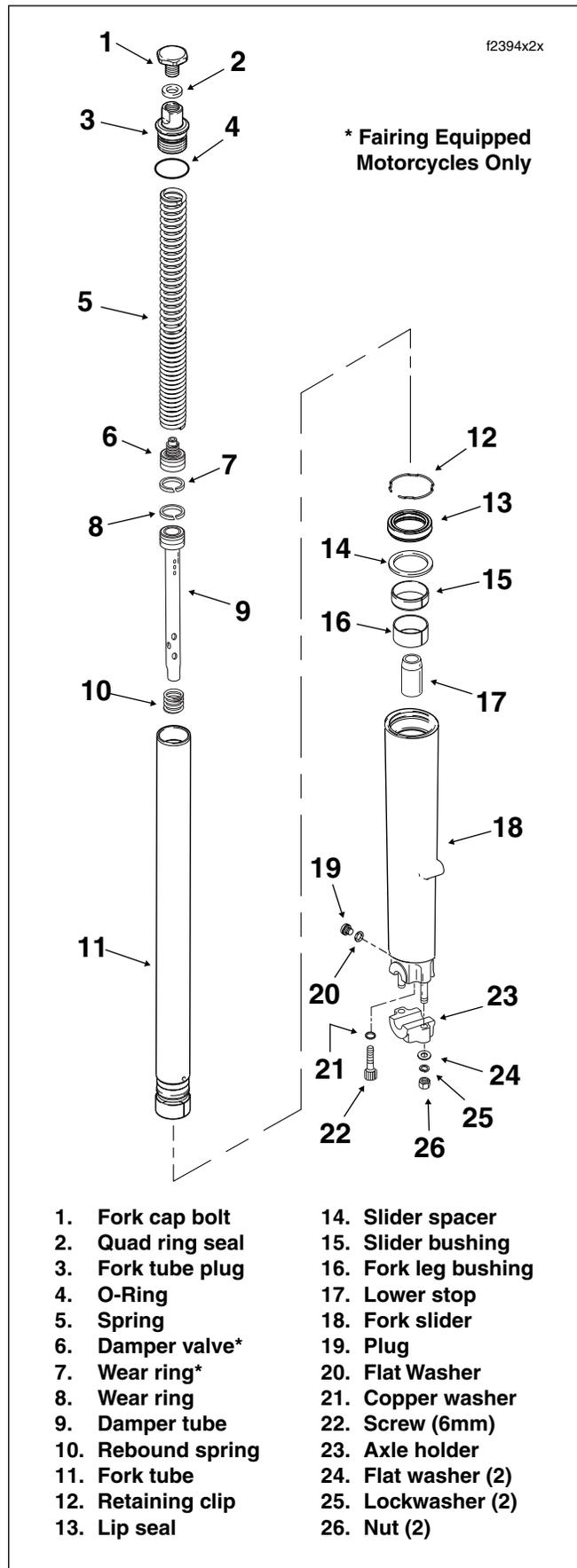


Figure 2-81. Right Side Fork

21. Install **new** quad ring seal onto fork cap bolt. Thread fork cap bolt into fork tube plug to prevent loss of fork oil while handling.
22. On right side fork, loosely install axle holder, flat washers, lockwashers and nuts on studs at end of fork slider.

INSTALLATION

1. Remove fork cap bolt.
2. Standing at front of motorcycle, slide fork tube up and into slider cover, lower fork bracket, fork stop, and upper fork bracket. Install fork cap bolt.
3. Move rubber fork stop down fork tube until it contacts top of lower fork bracket. Lubricate surfaces with glass cleaner, if necessary.
4. Install pinch bolt (with lockwasher) on left side of lower fork bracket. See [Figure 2-73](#). Tighten pinch bolt to 30-35 ft-lbs (41-48 Nm).
5. Tighten fork cap bolt to 50-60 ft-lbs (68-81 Nm).
6. Repeat steps 1-5 on other fork, if removed.
7. Install the front fender and wheel. See [Section 2.33 FRONT FENDER, INSTALLATION](#).
8. Proceed as follows:

FLHR/C/S:

- a. Install headlamp nacelle. See [Section 2.32 WINDSHIELD/HEADLAMP NACELLE \(FLHR/C/S\), NACELLE INSTALLATION \(FLHR/C\) or NACELLE INSTALLATION \(FLHRS\)](#).

FLHX, FLHT/C/U:

- a. Slide chrome skirt into position between the inner fairing and the front turn signal lamp/auxiliary lamp bracket. Install two screws to fasten auxiliary lamp/front turn signal lamp bracket, chrome skirt and inner fairing to lower fork bracket. If necessary, see [Section 8.16 TURN SIGNAL LAMPS, FRONT TURN SIGNAL LAMP, FLHX, INSTALLATION](#), or [Section 8.13 AUXILIARY LAMPS, AUXILIARY LAMP BRACKET, INSTALLATION](#).
- b. Install fairing cap. See [Section 2.30 UPPER FAIRING/WINDSHIELD \(FLHX, FLHT/C/U\), FAIRING CAP, INSTALLATION](#).
- c. Install two outer fairing screws reaching in below the left and right sides of the fairing cap. Tighten two outer fairing screws outboard of the speakers on the left and right side. If necessary, see [Section 2.30 UPPER FAIRING/WINDSHIELD \(FLHX, FLHT/C/U\), OUTER FAIRING/WINDSHIELD, INSTALLATION](#).

FLTR:

- a. Install instrument nacelle. See [Section 2.31 UPPER FAIRING/WINDSHIELD \(FLTR\), INSTRUMENT NACELLE, INSTALLATION](#).

LOWER FORK BRACKET COVER (FLHRS)

REMOVAL

1. Moving to the back of the lower fork bracket, remove two hex screws (with flat washers) to release cover flange.
2. Holding cover to prevent from dropping, remove T40 TORX screw at bottom.

INSTALLATION

1. With the concave side up, align holes in cover flange with holes at back of the lower fork bracket. Start two hex screws (with flat washers).

NOTE

Plastic plug(s) at back of lower fork bracket will prevent proper cover installation. Remove and discard plug(s), if present.

3. Start T40 TORX screw at bottom of cover engaging off-set hole in front brake line bracket.
4. Alternately tighten two hex screws to **70-110 in-lbs** (7.9-12.4 Nm).
5. Tighten T40 TORX screw to **120-180 in-lbs** (13.6-20.3 Nm).
6. Verify that cover does not contact brake lines to front brake calipers or master cylinder reservoir. Adjust either brake line bracket or cover if necessary.



Figure 2-82. Air Dam

AIR DAM (FLTR)

REMOVAL

NOTE

By allowing the flow of air to pass under the fuel tank and over the cylinder heads, removing the air dam evacuates heated air and provides some relief to the rider in warmer temperatures (70° F. or above).

1. Moving to the back of the lower fork bracket, remove two hex screws (with flat washers) to release air dam. See [Figure 2-82](#).
2. Reinstall two hex screws (with flat washers) to keep dirt and debris out of holes in lower fork bracket. Tighten screws to **120-144 in-lbs** (13.6-16.3 Nm).

INSTALLATION

NOTE

Reinstall air dam in colder weather.

1. With the concave side down, align holes in air dam with holes at back of the lower fork bracket. Start two hex screws (with flat washers).

NOTE

Plastic plug(s) at back of lower fork bracket will prevent proper cover installation. Remove and discard plug(s), if present.

2. Alternately tighten hex screws to **120-144 in-lbs** (13.6-16.3 Nm).

LUBRICATION

At the 1000 mile (1600 km) service interval, and at every 10,000 mile (16,000 km) service interval thereafter, grease the steering head bearings using *Special Purpose Grease, Part No. 99857-97*. Turn handlebar full right to access the grease fitting at the left side of the steering head. Connect grease gun to fitting and inject grease until it exudes from top and bottom of steering head. See [Figure 2-83](#).

At every 25,000 mile (40,000 km) service interval, check the swing-by following the CHECKING procedure below.

At every 50,000 mile (80,000 km) service interval, disassemble the steering head and inspect the bearings for brinelling, scoring, or other damage. Replace and/or repack the bearings as required.

CHECKING

- Using an hydraulic center stand on a level surface, raise the vehicle so that the front and rear tires are the same distance from the floor.
- Verify that motorcycle is in stock configuration. Remove all non-factory accessories, since they can influence front end swing momentum (and lead to improper adjustment).
- Turn the front wheel until contact is made with the left fork stop and then let go. The wheel should swing right, left, then right and stop. The wheel need not stop near the center or straight-forward position, but it must move to the right making a partial third swing. See frame C of [Figure 2-84](#).
- To correct a swing pattern that is too short or too long, see ADJUSTMENT below.

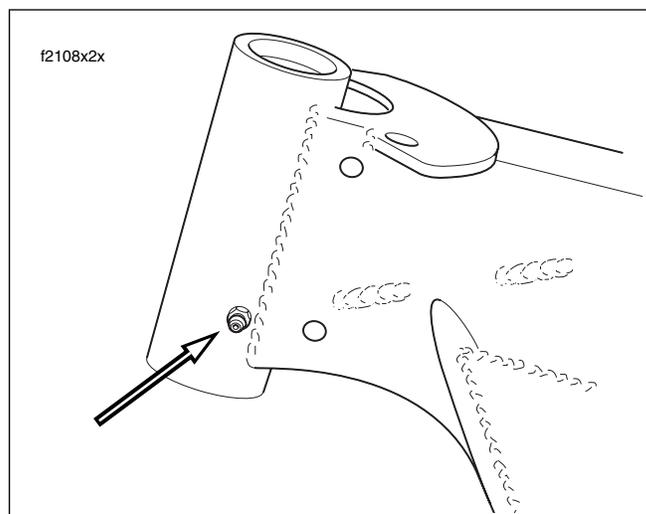


Figure 2-83. Steering Head Bearing Grease Fitting

ADJUSTMENT

- On FLHX, FLHT/C/U models, remove outer fairing and radio (storage box on FLHT). On FLHR/C/S, remove headlamp nacelle. On FLTR models, remove the instrument bezel.
- Loosen the pinch bolts on the lower fork bracket and slide the rubber fork stops up slightly on the fork tubes. This will prevent any binding of the front end when the adjustment is made. See [Figure 2-73](#).
- Bend tab on lock plate away from flat of fork stem nut. Loosen the fork stem nut. See [Figure 2-85](#).
- Fashion a bearing adjuster tool using a drill rod 16 inches long. See lower frame of [Figure 2-86](#).

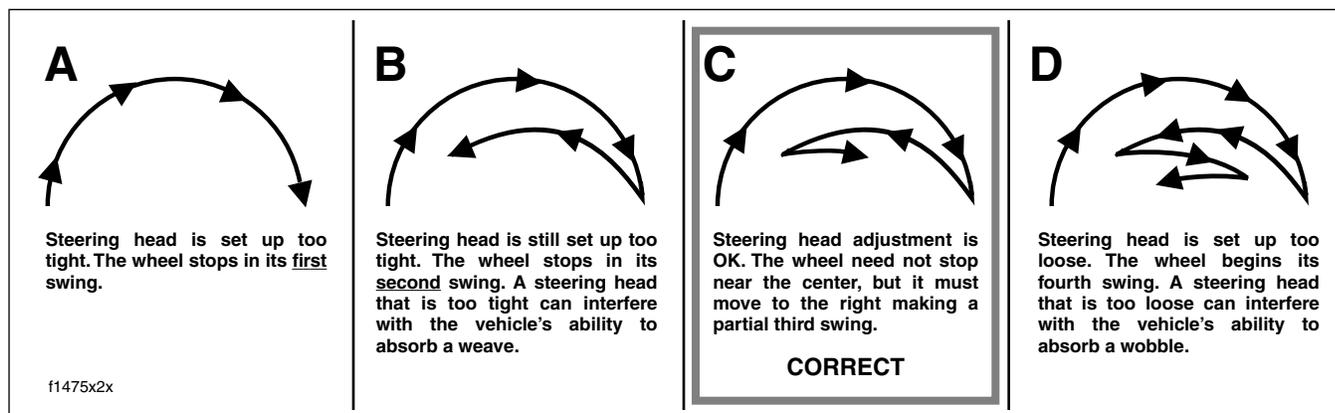


Figure 2-84. Check Steering Head Bearing Swing-By

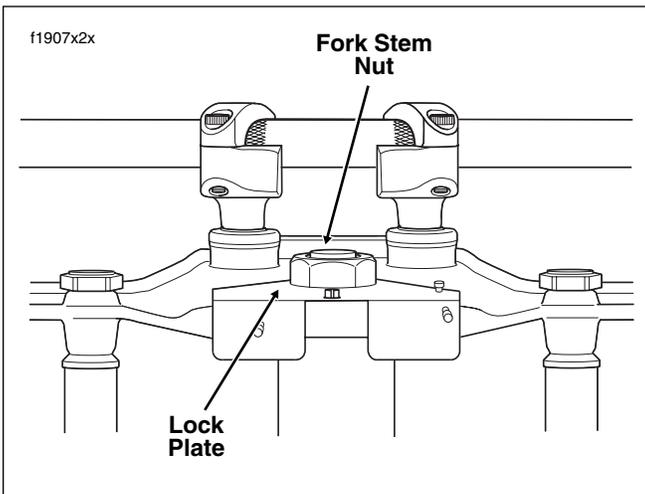


Figure 2-85. Fork Stem Nut

To decrease the number of swings, stand on the left side of the vehicle and insert the rod to engage the notches of the bearing adjuster (star) nut under the fork bracket. Push forward to rotate the nut clockwise.

NOTE

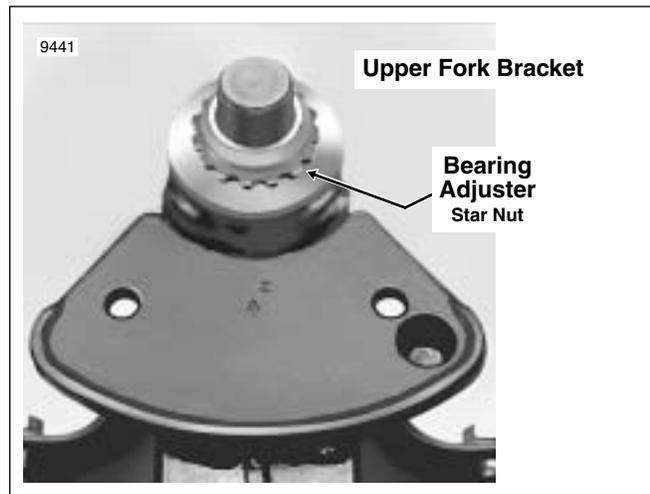
Turning the bearing adjuster nut as little as one notch will make a noticeable difference in the swing pattern.

To increase the number of swings, stand on the right side of the vehicle and insert the rod to engage the notches of the bearing adjuster nut. Push forward to rotate the nut counterclockwise.

5. Tighten the fork stem nut to 60-80 ft-lbs (81-109 Nm). The tightness of the nut will affect the swing pattern.
6. Recheck the swing pattern. See step 3 under **CHECKING**. Repeat steps 4-6 above until swing pattern is correct.
7. Tighten pinch bolts to 30-35 ft-lbs (41-48 Nm) and properly position the rubber fork stops.
8. Verify that the fork stem nut is tightened to 60-80 ft-lbs (81-109 Nm). Bend tab on lockplate against flat of fork stem nut.
9. On FLHX, FLHT/C/U models, install radio (storage box on FLHT) and outer fairing. On FLHR/C/S, install headlamp nacelle. On FLTR models, install the instrument bezel.
10. Recheck the swing pattern. See step 3 under **CHECKING**. Repeat **ADJUSTMENT** procedure if swing pattern is not correct.

REMOVAL

1. On FLHX, FLHT/C/U models, remove the auxiliary lamp bracket, outer fairing and radio (storage box on FLHT). On FLHR/ C, remove headlamp nacelle. On FLTR models, remove the instrument nacelle.



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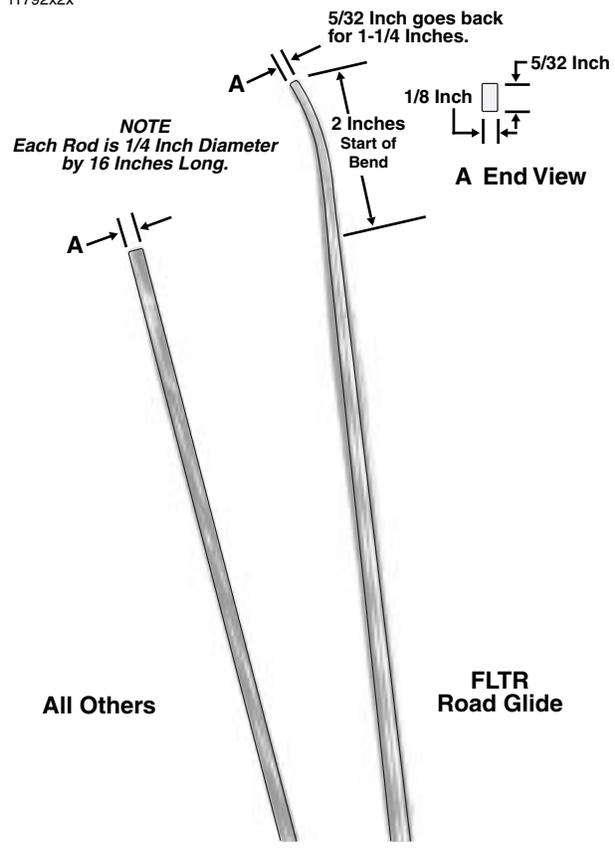


Figure 2-86. Fashion Steering Head Bearing Adjustment Tool From Drill Rod

2. Remove the front wheel and fork assemblies. Remove brake line from lower fork bracket.
3. Bend tab away from flat of fork stem nut. Remove nut.
4. Remove the bearing adjuster and fork stem assembly. See upper frame of **Figure 2-86**. Remove dust shield and bearing from top of steering head.

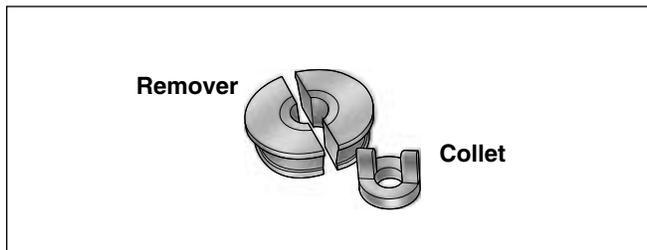


Figure 2-87. Steering Head Bearing Race Remover (Part No. HD-39301A)

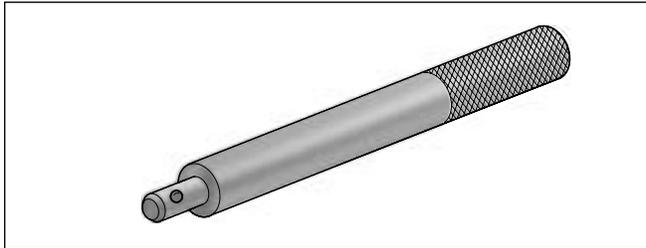


Figure 2-88. Universal Driver (Part No. HD-33416)

INSPECTION

1. Check the bearing races in the steering head. If pitted or grooved, replace both the bearings and races.
2. Turn bearings in races. Replace the bearings if they do not move freely and smoothly. Always replace both races and bearings even if one race and bearing appears good.

STEERING HEAD BEARING RACE REMOVAL

NOTE

To remove the upper and lower steering head bearing races, use the Steering Head Bearing Race Remover (Part No. HD-39301A) with the Universal Driver (Part No. HD-33416). See Figure 2-87 and Figure 2-88.

Proceed as follows:

1. With the tapered side down, seat the two-piece remover tool on the upper bearing race leaving a gap in the middle. See Figure 2-89.
2. Install the collet on the driver.
3. Insert the driver at the bottom of the steering head tube, and while holding the remover tool on the race, center the collet in the gap. Tap the driver to remove the upper race.
4. Reverse the tool and repeat the procedure to remove the lower bearing race.

REMOVING BEARING FROM FORK STEM

1. Chisel cage retaining rollers off bearing on fork stem.

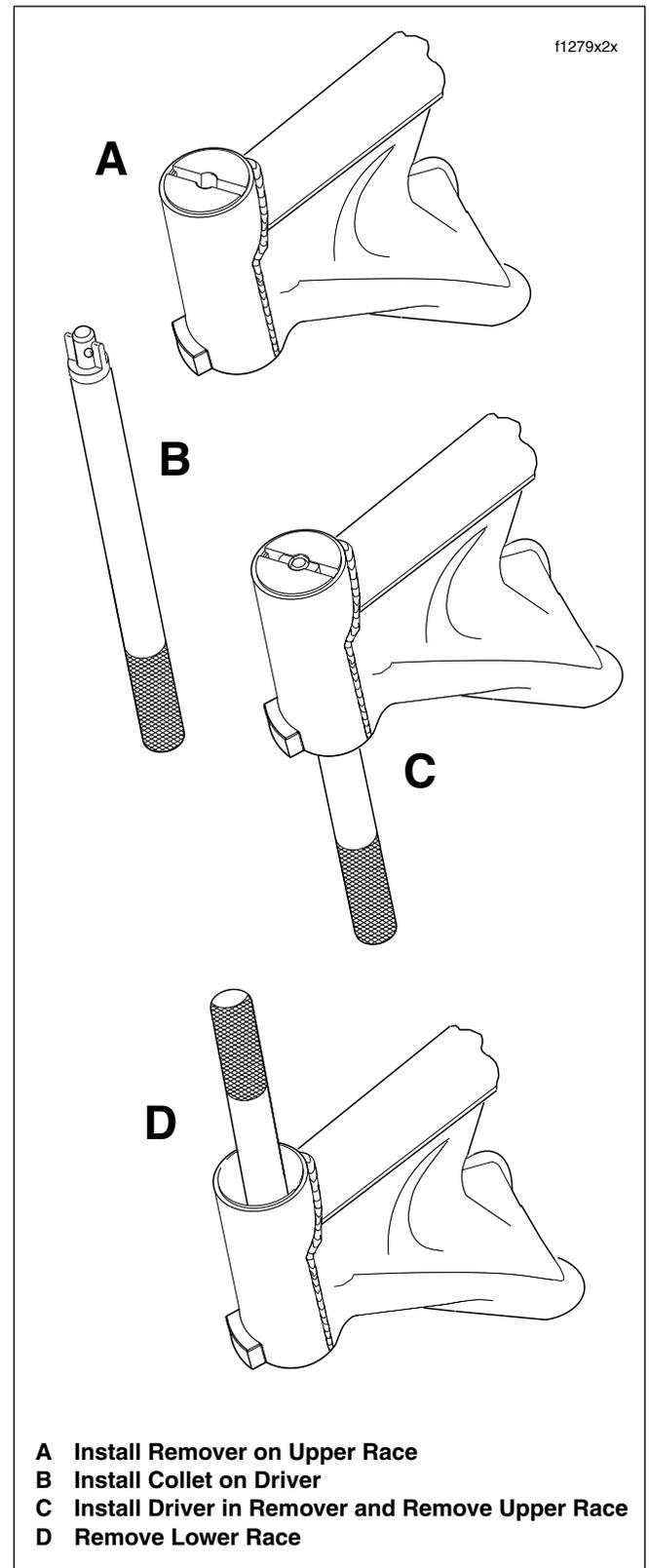


Figure 2-89. Remove Upper and Lower Steering Head Bearing Races

- A Install Remover on Upper Race**
- B Install Collet on Driver**
- C Install Driver in Remover and Remove Upper Race**
- D Remove Lower Race**

2. Turn the stem upside down while heating the inner race. Race will expand and fall free.

ASSEMBLY

1. Pack **new** bearings with Harley-Davidson SPECIAL PURPOSE GREASE, Part No. 99857-97.
2. Install dust shield on fork stem. Use a sleeve that will contact only the inner race of the new bearing, then press the bearing into place on fork stem.
3. Install new bearing races in steering head using STEERING HEAD BEARING RACE INSTALLATION TOOL, Part No. HD-39302.

INSTALLATION

1. Install the fork stem assembly into the steering head. Install the bearings and dust shield. Install the bearing adjuster nut. Snug the adjuster nut down until bearing play is taken up and the fork stem turns freely. Overtightening the nut will cause excessive bearing wear.

WARNING

Be sure fork stem nut adjustment is correct. An improperly adjusted nut can adversely affect handling and may lead to loss of vehicle control, which could result in death or serious injury.

2. Install upper fork bracket and fork stem nut. Tighten nut to 60-80 ft-lbs (81-109 Nm). Bend the lockplate tab against the nut flat. See [Figure 2-85](#).
3. Install fork assemblies, radio (storage box on FLHT), outer fairing and auxiliary lamp bracket. On FLHR/C/S, install headlamp nacelle. On FLTR models, install the instrument bezel.
4. Install the front wheel and bleed the front brake. Check swing-by under [CHECKING](#) in this section.

GENERAL

All models feature air-adjustable rear suspension. Air pressure may be varied to suit load conditions, riding style and personal comfort. Less initial pressure does not necessarily result in a softer ride. See the table below for the recommended air suspension pressures.

Table 2-6. Rear Air Suspension Pressures

Shock Loading	Recommended Pressures	
	PSI	kPa
All Models Except FLHRS, FLHX - Standard Shocks		
Solo rider up to 150 lbs. (68 kg), hereafter referred to as "Average"	0	0
Solo rider 150-200 lbs. (68-91 kg)	0-10	0-69
Solo rider 200-250 lbs. (91-113 kg)	5-15	35-103
Average rider with passenger up to 150 lbs. (68 kg)	10-15	69-103
Average rider with passenger up to 200 lbs. (91 kg)	20-25	138-172
Maximum GVWR (see Section 2.1 Specifications)	20-35	138-241
FLHRS, FLHX Only - Low Profile Shocks		
Solo rider up to 160 lbs. (73 kg), hereafter referred to as "Average"	0-5	0-35
Solo rider 160-200 lbs. (73-91 kg)	0-10	0-69
Solo rider over 200 lbs. (91 kg)	5-10	35-69
Average rider with passenger up to 150 lbs. (68 kg)	20-30	138-207
Average rider with passenger over 150 lbs. (68 kg)	25-35	172-241
Maximum GVWR (see Section 2.1 Specifications)	40-50	276-345

WARNING

Use this table as a starting point in determining suitable rear air suspension pressures. Do not exceed maximum GVWR when loading vehicle and do not pressurize system in excess of 50 psi (345 kPa) for FLHRS, FLHX models and 35 psi (241 kPa) for all others. Excessive load weight and/or air suspension pressure can adversely affect handling and lead to loss of vehicle control, which could result in death or serious injury.

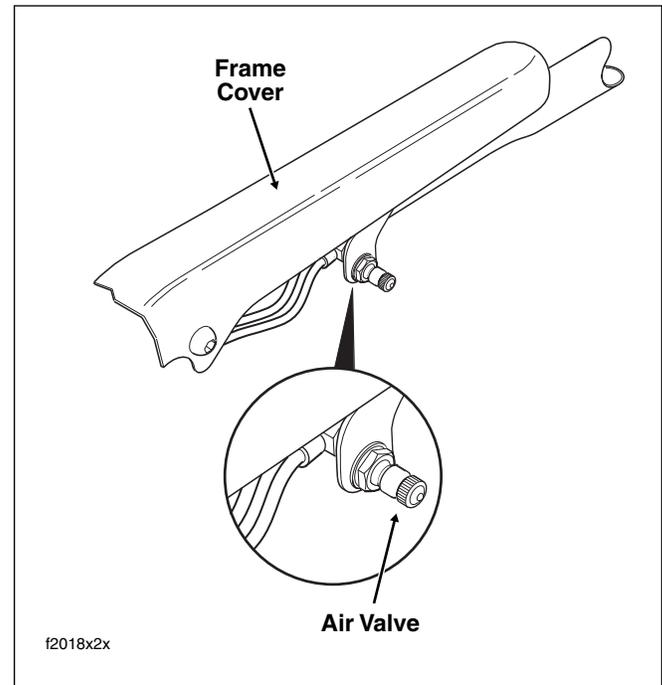


Figure 2-90. Rear Air Suspension Air Valve (Under Protective Cap)

CAUTION

Improper inflation of rear air suspension components also can result in a reduction of available suspension travel, reduced rider comfort and possible damage to shock absorbers.

CAUTION

All air components fill rapidly. Use low air line pressure to avoid possible damage. A small hand or foot operated air pump is the best way to add air to suspension components.

CAUTION

Use a no-loss air gauge to check air pressure. Check pressure in shocks weekly if in daily use or before each trip if only used occasionally.

NOTE

An AIR SUSPENSION PUMP AND GAUGE (Part No. HD-34633A) is available at your Harley-Davidson dealer.

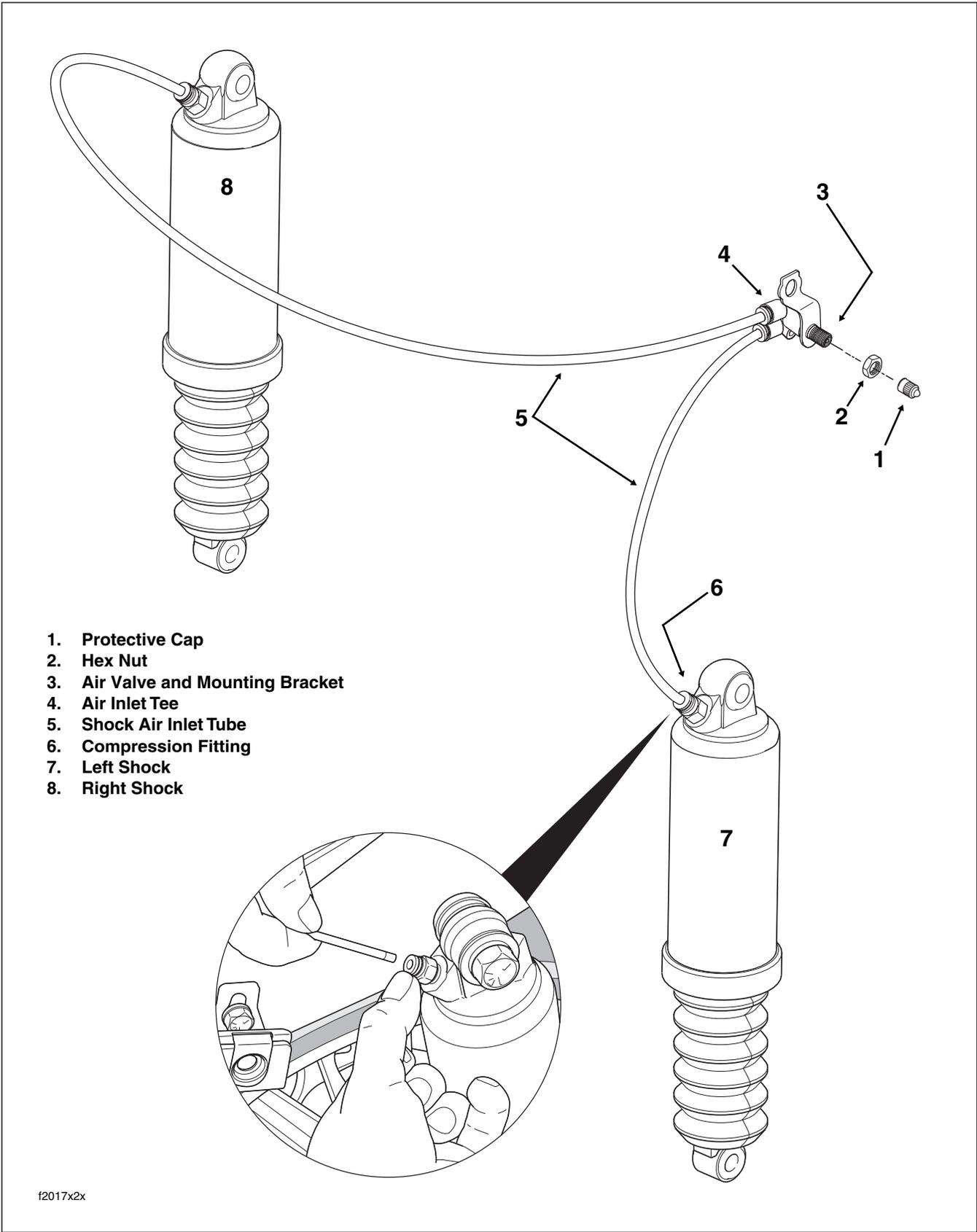


Figure 2-91. Rear Air Suspension System

WARNING

Exercise caution when bleeding air from the air valve. Moisture combined with lubricant (either from shock assembly or drip oiler in the air compressor lines) may be ejected onto the rear wheel, tire and/or brake components and adversely affect traction and/or braking efficiency, which could result in death or serious injury.

REAR AIR SUSPENSION

Adjust the rear shock air suspension pressure by adding or removing air from the air valve located just below the frame cover on the left side of the vehicle. See [Figure 2-90](#). Always adjust pressures with the vehicle on the jiffy stand.

REMOVAL/INSTALLATION

Remove and replace components as necessary. Check for air leaks as follows:

1. Remove left side saddlebag. See Section [2.26 SADDLEBAG, REMOVAL](#).
2. Remove protective cap from air valve. Install the no-loss air gauge and set to correct pressure. See [Table 2-6](#). Remove the gauge and wait overnight.
3. Recheck air pressure. If no leakage is observed, move to step 8. If a loss of 5-10 psi (34.5-68.9 kPa) is noted, then proceed to step 4.
4. Pressurize rear air suspension system and check for leaks as described below.

Compression Fitting

5. Spray or brush a light film of soapy water on the compression fitting at the top of each shock absorber. If no leakage is observed, move to step 6. If leakage is noted, proceed as follows:

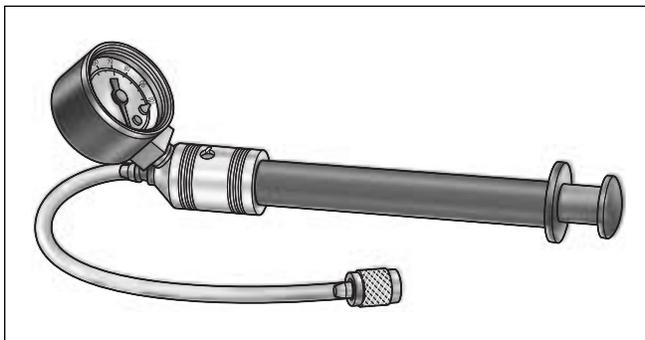


Figure 2-92. Air Suspension Pump and Gauge (Part No. HD-34633A)

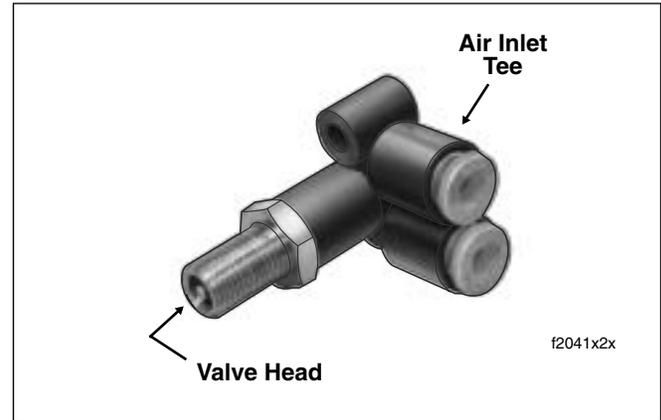


Figure 2-93. Air Valve Assembly

- a. Depress pin in valve to bleed air from shocks. To purge lines of any oil, add 3-5 psi (20.7-34.5 kPa) before releasing air.
- b. Depress collar on compression fitting and pull out air tube. See inset of [Figure 2-91](#). Inspect the tube end for burrs or damage. If either condition is observed, snip off the end of the tube and insert it back into the compression fitting until it bottoms. Gently tug on tube to verify that it is locked in place.
- c. Pressurize rear air suspension system and check for leaks. If leakage continues, proceed to step 5(d).
- d. Depress collar on compression fitting and pull out air tube. Remove compression fitting from shock absorber.
- e. Apply PIPE SEALANT WITH TEFLON to the threads of a **new** compression fitting and install in shock absorber.
- f. Insert air tube into the compression fitting until it bottoms. Gently tug on tube to verify that it is locked in place.
- g. Pressurize rear air suspension system and check for leaks. If no leakage is observed, move to step 8. If leakage continues, proceed to step 6.

Air Valve Assembly

6. Spray or brush a light film of soapy water into the valve head and where the air tubes exit the air inlet tee. If leakage is not observed at either location, move to step 7. If leakage is noted, proceed as follows:
 - a. If leakage is at the air inlet tee, proceed to step 6(b). If leakage is at the valve head, proceed to step 6(e).
 - b. Depress pin in valve to bleed air from shocks. To purge lines of any oil, add 3-5 psi (20.7-34.5 kPa) before releasing air.

- c. Depress collar on air inlet tee and pull out air tube. Inspect the tube end for burrs or damage. If either condition is observed, snip off the end of the tube and insert it back into the air inlet tee until it bottoms. Gently tug on tube to verify that it is locked in place. Repeat step with remaining tube.
 - d. Pressurize rear air suspension system and check for leaks. If no leakage is observed, move to step 8. If leakage continues, proceed to step 6(e).
 - e. Using a valve core tool, verify that valve core is properly tightened. If leakage continues, proceed to step 6(f).
 - f. Depress pin in valve to bleed air from shocks. To purge lines of any oil, add 3-5 psi (20.7-34.5 kPa) before releasing air.
 - g. Remove hex nut from valve head. See [Figure 2-91](#).
 - h. Push on valve head to free air valve assembly from mounting bracket. See [Figure 2-93](#).
 - i. Depress collars on air inlet tee and pull out air tubes.
 - j. Insert air tubes into air inlet tee of **new** air valve assembly.
 - k. From inboard side, insert valve head through hole in mounting bracket. Install hex nut on valve head (flat side facing inboard). Tighten nut to 40-50 **in-lbs** (4.5-5.6 Nm).
 - l. Pressurize rear air suspension system and check for leaks.
 - m. If no leakage is observed, move to step 8. If leakage continues, reinstall old air valve assembly and proceed to step 7.
- d. Cut bulk tube to proper length.
 - e. Insert **new** tubes into air inlet tee. Install opposite end of tubes into compression fittings.
 - f. Pressurize rear air suspension system.
 - g. Install seat. See Section [2.25 SEAT, INSTALLATION](#).
8. Install protective cap on air valve.
 9. Install left side saddlebag. See Section [2.26 SADDLE-BAG, INSTALLATION](#).

Air Tubes

7. Inspect air tubes for kinks, cuts, holes, chafing or other damage that may result in air leaks. If tube replacement is necessary, proceed as follows:
 - a. Remove seat. See Section [2.25 SEAT, REMOVAL](#).
 - b. Depress pin in valve to bleed air from shocks. To purge lines of any oil, add 3-5 psi (20.7-34.5 kPa) before releasing air.
 - c. Depress collars on air inlet tee and pull out air tubes. Remove opposite end of tubes from compression fittings. See [Figure 2-91](#).