

Table 2-1. Dimensions

ITEM	MM	IN
Wheel base	1713.2	67.5
Overall length	2375.6	93.6
Overall width	838.2	33.0
Road clearance	142.1	5.6
Overall height	1244.6	49.0
Saddle height	659.9	26.0

Table 2-2. Weights

ITEM	KG	LBS
Dry weight	270.4	595.7
GVWR	464.2	1022.4
GAWR - front	162.4	358.0
GAWR - rear	301.4	664.4

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 left front frame cross tube.

Table 2-3. Fluid Capacities

ITEM	LITERS	U.S.
Fuel tank total	14.0	3.7 gal
Oil tank w/filter	4.3	4.5 qts
Coolant	2.4	2.54 qts

Table 2-4. Wheel/Brake Disc/Tire Runout

RUNOUT	MM	IN
Wheel - rim lateral	1.02	0.040
Wheel - rim radial	0.76	0.030
Front brake disc - lateral	0.3	0.012
Rear brake disc - lateral	0.3	0.012
Tire - lateral	1.52	0.060
Tire - radial	2.29	0.090

Table 2-5. Tires

WHEEL	DUNLOP SPORTMAX™ SIZE
Front	120/70Z/R-19
Rear	180/55Z/R-18

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)

Table 2-6. Tire Pressures

DUNLOP TIRES (ONLY)	FRONT		REAR	
	kPa	PSI	kPa	PSI
Solo rider	248	36	262	38
Rider & passenger	248	36	276	40

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)

NOTE

See 1.11 TIRES AND WHEELS for important information regarding tires.

WARNING

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

- Use tubeless tires on all Harley-Davidson disc wheels.
- Do not use inner tubes in radial tires.
- Always use the correct size tires. Tire sizes are molded on the tire sidewall.

ITEM	TORQUE		NOTES
Auxiliary volume fasteners	23 Nm	17 ft-lbs	page 2-12, 2-21
Belt drive sprocket cover fasteners	6-10 Nm	53-88 in-lbs	page 2-21
Belt guard grommet bolt	6-10 Nm	53-88 in-lbs	page 2-91
Brake caliper bleeder valve, front and rear	9-11 Nm	80-100 in-lbs	page 2-54
Brake caliper bridge bolts, front	38-52 Nm	28-38 ft-lbs	page 2-54
Brake disc bolts, front	21-31 Nm	16-23 ft-lbs	page 2-62
Brake disc bolts, rear	41-53 Nm	30-38 ft lbs	page 2-67
Brake pad pins	20-23 Nm	180-200 in-lbs	page 2-54
Clutch fluid line flare nut	9-13 Nm	80-115 in-lbs	page 2-35
Compensator bowl screws	61-75 Nm	45-55 ft-lbs	page 2-67
Coolant air bleed plug	9-11 Nm	80-97 in-lbs	page 2-22
Cross member fasteners	20-26 Nm	15-19 ft-lbs	page 2-21
Debris deflector fastener	6-10 Nm	53-88 in-lbs	page 2-91
Debris deflector	6-10 Nm	53-88 in-lbs	page 2-68
Drive sprocket cover	6-10 Nm	53-88 in-lbs	page 2-12
Drive sprocket locking bolts	88-102 Nm	65-75 ft-lbs	page 2-21
Engine mount bracket	34-41 Nm	25-30 ft-lbs	page 2-8
Engine mount double threaded studs	34-41 Nm	25-30 ft-lbs	page 2-8
Engine mount to bracket	34-41 Nm	25-30 ft-lbs	page 2-8
Engine mounting bolt thru travel limiting washer	34-41 Nm	25-30 ft-lbs	page 2-8
Exhaust clamp nut	32-37 Nm	24-27 ft-lbs	page 2-12, 2-21
Exhaust flange hex-nuts	8-12 Nm	71-106 in-lbs	page 2-12, 2-21
Exhaust system support pin	23 Nm	17 ft-lbs	page 2-12, 2-21
Fender bracket to front fork bolts	20-26 Nm	15-19 ft-lbs	page 2-81
Fender fasteners w/grabstrap	8-12 Nm	71-106 in-lbs	page 2-100
Fender support bracket	34-41 Nm	25-30 ft-lbs	page 2-101
Footrest axle retaining bolt	11-17 Nm	9-12 ft-lbs	page 2-25
Footrest support mounting bolts	19-27 Nm	14-20 ft-lbs	page 2-25
Fork stem nut	61-75 Nm	45-55 ft-lbs	page 2-89
Fork tube caps	22-58 Nm	16-43 ft-lbs	page 2-86
Front and rear heat shield worm drive clamps	10 Nm	88 in-lbs	page 2-21
Front axle holder pinch bolts	16 Nm	11 ft-lbs	page 2-63
Front axle nut	68-75 Nm	50-55 ft-lbs	page 2-63
Front brake caliper top mounting bolt	38-52 Nm	28-38 ft-lbs	page 2-43
Front brake hose bracket bolt	6-10 Nm	53-89 in-lbs	page 2-89
Front brake master cylinder banjo bolt	23-31 Nm	17-23 ft-lbs	page 2-39

ITEM	TORQUE		NOTES
Front cylinder coolant drain plug	9.7 Nm	86 in-lbs	page 2-17
Front engine mount	34-41 Nm	25-30 ft-lbs	page 2-7, 2-8
Front fender bracket fasteners	4.1 -6.8 Nm	36-60 in-lbs	page 2-81
Grabstrap	11-17 Nm	97-150 in-lbs	page 2-99
Handlebar (VRSCB) clamp fasteners	16-20 Nm	144-180 in-lbs	page 2-59
Handlebar bolts	41-47 Nm	31-35 ft-lbs	page 2-57, 2-59
Handlebar clamp screws	8-9 Nm	71-80 in-lbs	page 2-31
Headlamp mounting bracket bolts	11-18 Nm	9-13 ft-lbs	page 2-57
Heat shield screws	10 Nm	88 in-lbs	page 2-12
Inner fender fasteners	20-26 Nm	15-19 ft-lbs	page 2-101
Jiffy stand anchor	7-9 Nm	62-79 in-lbs	page 2-24
Lower frame rail bolts	61-75 Nm	45- 55 ft-lbs	page 2-20
Lower handlebar cover	6-10 Nm	54-88 in-lbs	page 2-57
Lower muffler clamp	65 Nm	48 ft-lbs	page 2-21
Lower muffler fasteners	23 Nm	17 ft-lbs	page 2-12
Lower muffler fasteners	23 Nm	17 ft-lbs	page 2-21
Master cylinder clamp screw	38-72 Nm	28-53 ft-lbs	page 2-39
Mud flap stud plate fasteners	8-12 Nm	70-106 in-lbs	page 2-101
Oil drain plug	35 Nm	25 ft-lbs	page 2-14
P-clamp	6-10 Nm	53-88 in-lbs	page 2-21
Pillion mounting bolt	11-17 Nm	97-150 in-lbs	page 2-99
Pipe clamp	6.5 Nm	57 in-lbs	page 2-21
Pipe connecting clamp	6-10 Nm	53-88 in-lbs	page 2-21
Pivot shaft nut	61-75Nm	45-55 ft-lbs	page 2-96
Radiator drain plug	2.3-2.8 Nm	21-24 in-lbs	Hand tighten, page 2-16
Radiator hose clamps	3-4 Nm	27-35 in-lbs	page 2-21
Rear axle nut	129 Nm-142 Nm	95-105 ft-lbs	page 2-21
Rear brake reservoir cover screws	0.7-0.9 Nm	6-8 in-lbs	page 2-50
Rear caliper banjo bolt	23-31 Nm	17-23 ft-lbs	page 2-55
Rear engine mount bracket	34-41 Nm	25-30 ft-lbs	page 2-13
Rear master cylinder banjo bolt	23-31 Nm	17-23 ft-lbs	page 2-50
Rear master cylinder cartridge retaining nut	41-54 Nm	30-40 ft-lbs	page 2-50
Seat latch	6-10 Nm	53-88 in-lbs	page 2-97
Seat pipe screw	12-18 Nm	106-159 in-lbs	page 2-86
Secondary clutch actuator cover	6-10 Nm	53-88 in-lbs	page 2-35
Secondary clutch actuator	10 Nm	88 in-lbs	page 2-35
Shift linkage to foot shift lever bolt	9-15 Nm	7-11 ft-lbs	page 2-25
Shifter arm clamp bolt	14-16 Nm	11-12 ft-lbs	page 2-21
Shifter linkage to shifter arm bolt	9-15 Nm	80-132 in-lbs	page 2-21
Shock mount bolts	41-68 Nm	31-50 ft-lbs	page 2-92

ITEM	TORQUE		NOTES
Solenoid bracket nuts	6-10 Nm	53- 88 in-lbs	page 2-6
Solenoid cable terminal ring	6-10 Nm	53-88 in-lbs	page 2-21
Stabilizer link to frame tab	34-41 Nm	25-30 ft-lbs	page 2-80, 2-6
Throttle body clamps	1.25 Nm	11 in-lbs	page 2-22
Throttle housing screws	4-5 Nm	35-45 in-lbs	page 2-28
Top handlebar cover fasteners	1.3-1.9 Nm	12-16 in-lbs	page 2-57
Top radiator mounting nuts	19-27 Nm	15-20 ft-lbs	page 2-21
Triple clamp pinch bolts	41-47 Nm	31-34 ft-lbs	page 2-89
Turn signal and license plate bracket	8-12 Nm	71-106 in-lbs	page 2-101
Upper muffler clamp	65 Nm	48 ft-lbs	page 2-12, 2-21
Upper muffler fasteners	23 Nm	17 ft-lbs	page 2-12, 2-21
Valve stem nut	1.4-1.7 Nm	12-15 in-lbs	page2-75

GENERAL

See Figure 2-1. The full 17 digit serial or Vehicle Identification Number (VIN) is stamped on the steering head. An abbreviated VIN is stamped on the left side crankcase.

NOTE

See Figure 2-2. Always give the complete 17 digit VIN, when ordering parts or making inquiries about your motorcycle.

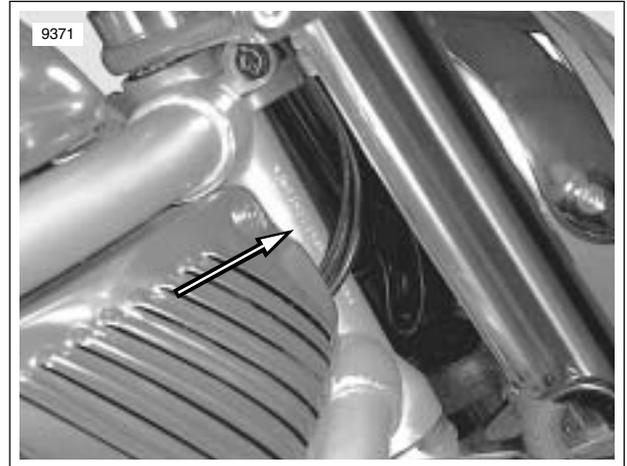


Figure 2-1. VIN Location

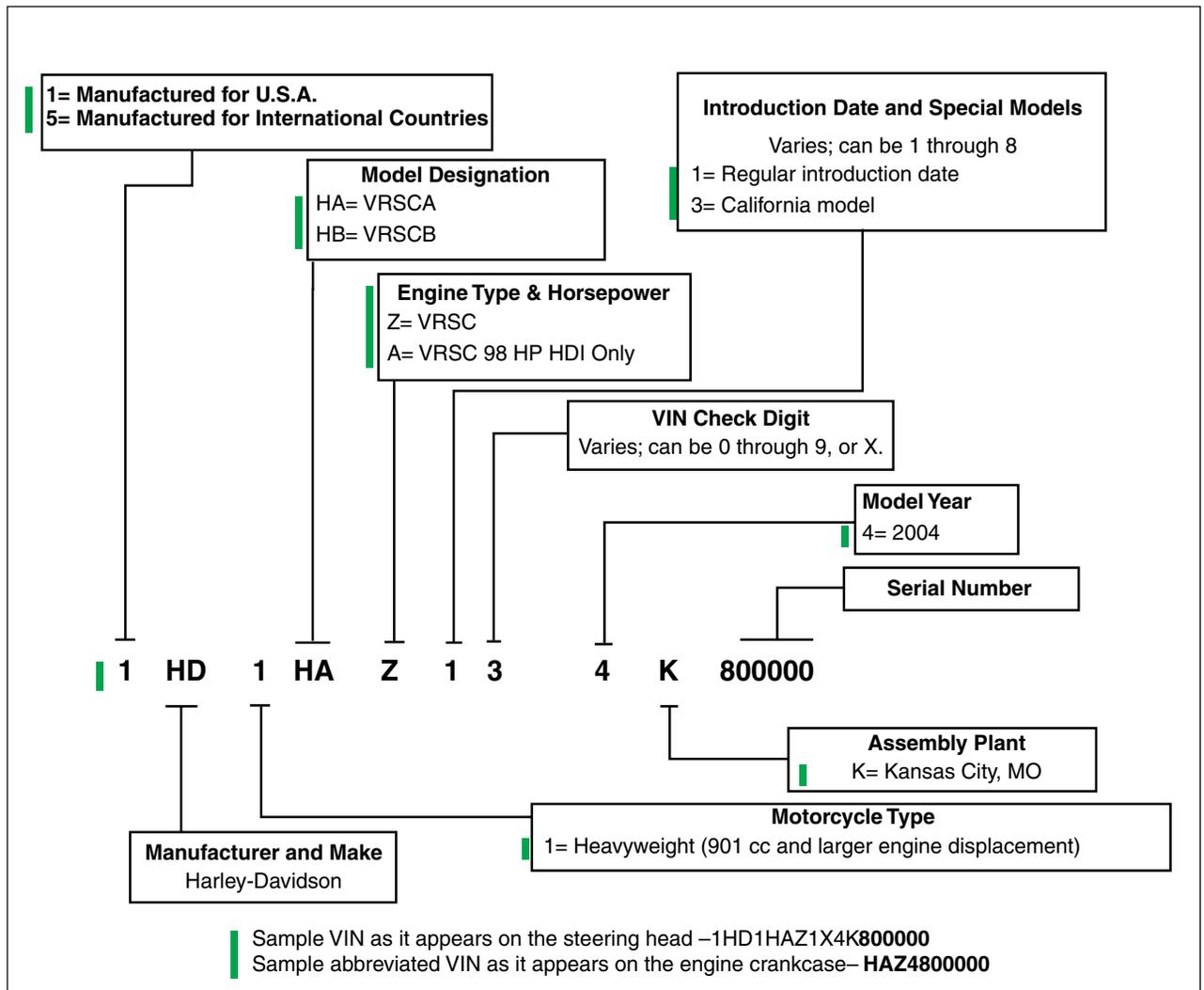


Figure 2-2. Vehicle Identification Number (VIN)

GENERAL

The steel upper hydroformed main rails, joined with stamped sheet metal weldments for the steering head, seat, rear fork pivots, fuel tank shield, and rear fender, are bolted to left and right lower frame rails that complete the frame perimeter.

The rider footrests and foot controls are mounted on the lower frame rails. The passenger footrests are mounted on the rear fork.

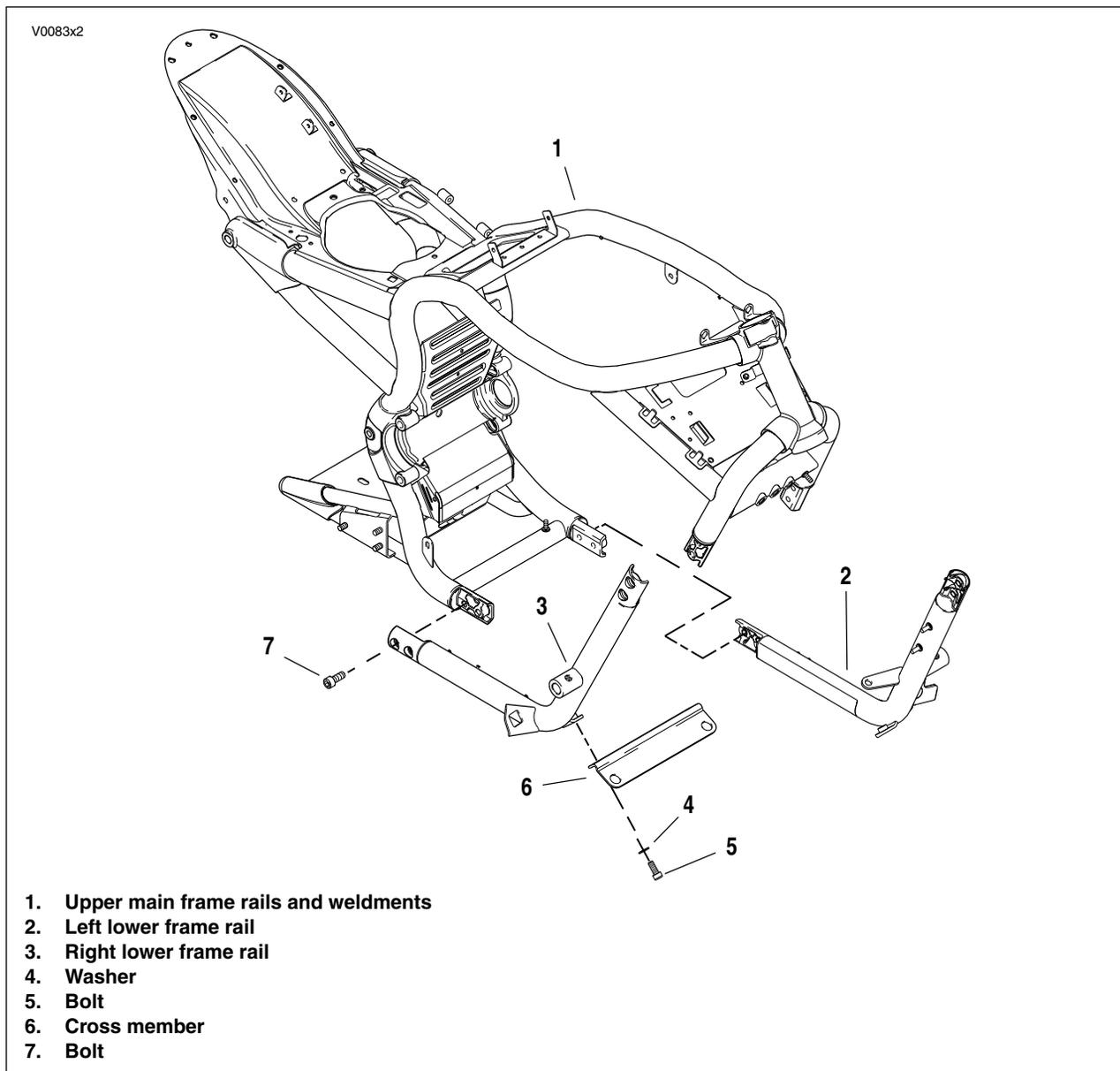


Figure 2-3. Steel Perimeter Frame and Bolt-on Lower Frame Rails

REMOVAL

1. Support motorcycle under fuel tank frame weldment and/or lock wheels so that frame rails and/or engine can be removed.
2. Remove right side cover and maxi-fuse. See [8.5 MAXI-FUSE](#).
3. Unlock and open seat.
4. Remove airbox cover. See [1.4 AIRBOX AND AIR FILTER](#).

WARNING

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

5. Disconnect negative battery cable.
6. See [Figure 2-3](#). Remove two cross member bolts (5) and washers (4). Pull bottom of radiator assembly forward with cross member or remove the radiator assembly as required. See [6.8 RADIATOR/OIL COOLER](#).
7. Remove shift lever linkage, right foot rest axle and foot shift lever from frame rail. See [2.11 FOOTRESTS/FOOT CONTROLS](#).
8. Remove left foot rest axle. See [2.11 FOOTRESTS/FOOT CONTROLS](#).
9. Remove rear brake master cylinder and rear brake pedal. See [2.19 REAR BRAKE MASTER CYLINDER/RESERVOIR](#).
10. Remove clutch fluid line from clips on right lower frame rail. See [2.15 CLUTCH FLUID LINE](#).
11. Remove starter solenoid bracket nuts and remove starter solenoid from right lower frame rail. See [5.5 STARTER SOLENOID](#).
12. Remove engine mount stabilizer link from frame rail bracket. See [2.5 FRONT ENGINE MOUNT](#).

NOTE

Maintain stabilizer link length for reinstallation. Do not loosen jam nuts on stabilizer link.

13. Remove bolts (7) holding on the right and left lower frame rails (2, 3). Remove the frame rails.

INSTALLATION

1. See [Figure 2-3](#). Install left and right lower frame rails (2 & 3) and finger tighten mounting bolts (7).
2. Using clips, attach clutch fluid line to right lower frame rail. See [2.15 CLUTCH FLUID LINE](#).
3. Attach the engine mount stabilizer link to the frame tab. Tighten to 34-41 Nm (25-30 ft-lbs). See [2.5 FRONT ENGINE MOUNT](#).
4. Attach starter solenoid bracket to right lower frame rail with nuts. Tighten to 6-10 Nm (53-88 **in-lbs**).
5. Attach right foot rest axle and foot shift lever to frame rail. Attach shift lever linkage. See [2.11 FOOTRESTS/FOOT CONTROLS](#).
6. Attach rear brake master cylinder to bracket on left lower frame rail. See [2.19 REAR BRAKE MASTER CYLINDER/RESERVOIR](#).
7. Install left foot rest axle with rear brake pedal. Attach rear brake pedal master cylinder to brake pedal. See [2.11 FOOTRESTS/FOOT CONTROLS](#).
8. Reinstall radiator/oil cooler assembly as required or pull radiator/oil cooler assembly into position and install and finger tighten cross member mounting bolts (5) and washers (4). Tighten cross member bolts (5) to 20-26 Nm (15-19 ft-lbs). See [6.8 RADIATOR/OIL COOLER](#).
9. Tighten lower frame rail bolts (7) to 61-75 Nm (45-55 ft-lbs).
10. Fill and bleed rear brake. See [1.9 BLEEDING BRAKES](#).
11. Connect negative battery cable. Tighten to 6.8-10.8 Nm (60-96 **in-lbs**).
12. Reinstall airbox cover.

CAUTION

When closing the seat, make sure the ignition switch is in the FUEL position. If the ignition switch is in any other position when the seat is closed, the seat latch mechanism could be damaged. (00196a)

13. Turn ignition switch to FUEL and close seat. Then turn ignition switch to LOCK.
14. Install maxi-fuse and right side cover.

REPLACEMENT

1. Support engine with a scissors jack under the oil pan.
2. Remove the right side cover and maxi-fuse. See 8.5 [MAXI-FUSE](#).
3. Unlock and open seat.
4. Remove airbox cover. See 1.4 [AIRBOX AND AIR FILTER](#).

WARNING

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

5. Disconnect negative battery cable.
6. See Figure 2-4. Loosen and remove nut (2) and travel limiting washer (1) from center mounting bolt (5).
7. Loosen and remove nuts (3) from engine mount bolts (4) (Left side requires using a 8 mm ball Allen with a 2 in. extension).
8. By lifting up the center mounting bolt (5) slightly, the engine mount pivots down and out away from the fan shroud.
9. Install **new** engine mount and left and right engine mounting bolts (4).
10. Install travel limiting washer (1) and center mounting bolt nut (2).
11. Tighten all fasteners to 34-41 Nm (25-30 ft-lbs).
12. Connect negative battery cable. Tighten to 6.8-10.8 Nm (60-96 **in-lbs**).
13. Reinstall airbox cover.

CAUTION

When closing the seat, make sure the ignition switch is in the **FUEL** position. If the ignition switch is in any other position when the seat is closed, the seat latch mechanism could be damaged. (00196a)

14. Turn ignition switch to **FUEL** and close seat. Then turn ignition switch to **LOCK**.
15. Install maxi-fuse and right side cover.

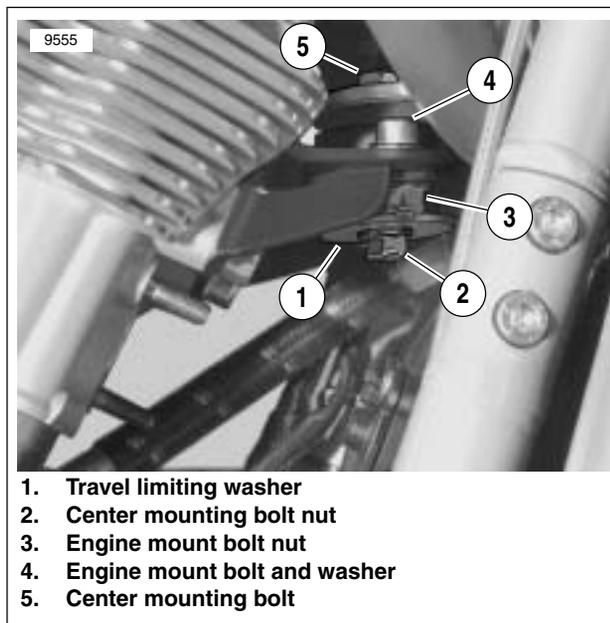


Figure 2-4. Engine Mount (exhaust removed for clarity)

REMOVAL

1. Remove right side cover and maxi-fuse. See [8.5 MAXI-FUSE](#).
2. Unlock and open seat.
3. Remove airbox cover. See [1.4 AIRBOX AND AIR FILTER](#).

WARNING

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

4. Disconnect negative battery cable.
5. Remove radiator assembly as required. See [6.8 RADIATOR/OIL COOLER](#).
6. See [Figure 2-5](#). Loosen and remove double threaded studs (11) that hold front engine mount bracket (3) to frame.
7. Remove bolts (10) that hold front engine mount bracket (4) to engine and work assembly out of frame between two lower frame rails.
8. Loosen and remove stabilizer link hold down bolt (12) to lower frame rail bracket.
9. Loosen and remove bolt (16), spacer (17) and stabilizer link (15) from front of engine case.

NOTE

Maintain stabilizer link length for a correctly aligned reinstallation. Do not loosen jam nuts and turn rod ends.

DISASSEMBLY AND ASSEMBLY

1. See [Figure 2-5](#). Loosen and remove nut (8) from center mounting bolt (2) holding engine mount (6), travel limiting washer (7) and the two brackets (3, 4) together.
2. Remove two bolts (1) holding engine mount (6) to engine mount bracket (4). Remove engine mount (6).
3. Inspect for worn or damaged parts, replace as necessary.
4. Align engine mount bolt (2) through the frame bracket (4) and the engine mount (6) with the flange of the engine mount under the engine bracket and the large end up through the engine bracket. Slide on the travel limiting washer (7) and loosely install the flanged hex-nut (8).
5. Install and tighten fasteners (1), washers (5) and nuts (8) holding engine mount (6) to bracket to 34-41 Nm (25-30 ft-lbs).

INSTALLATION

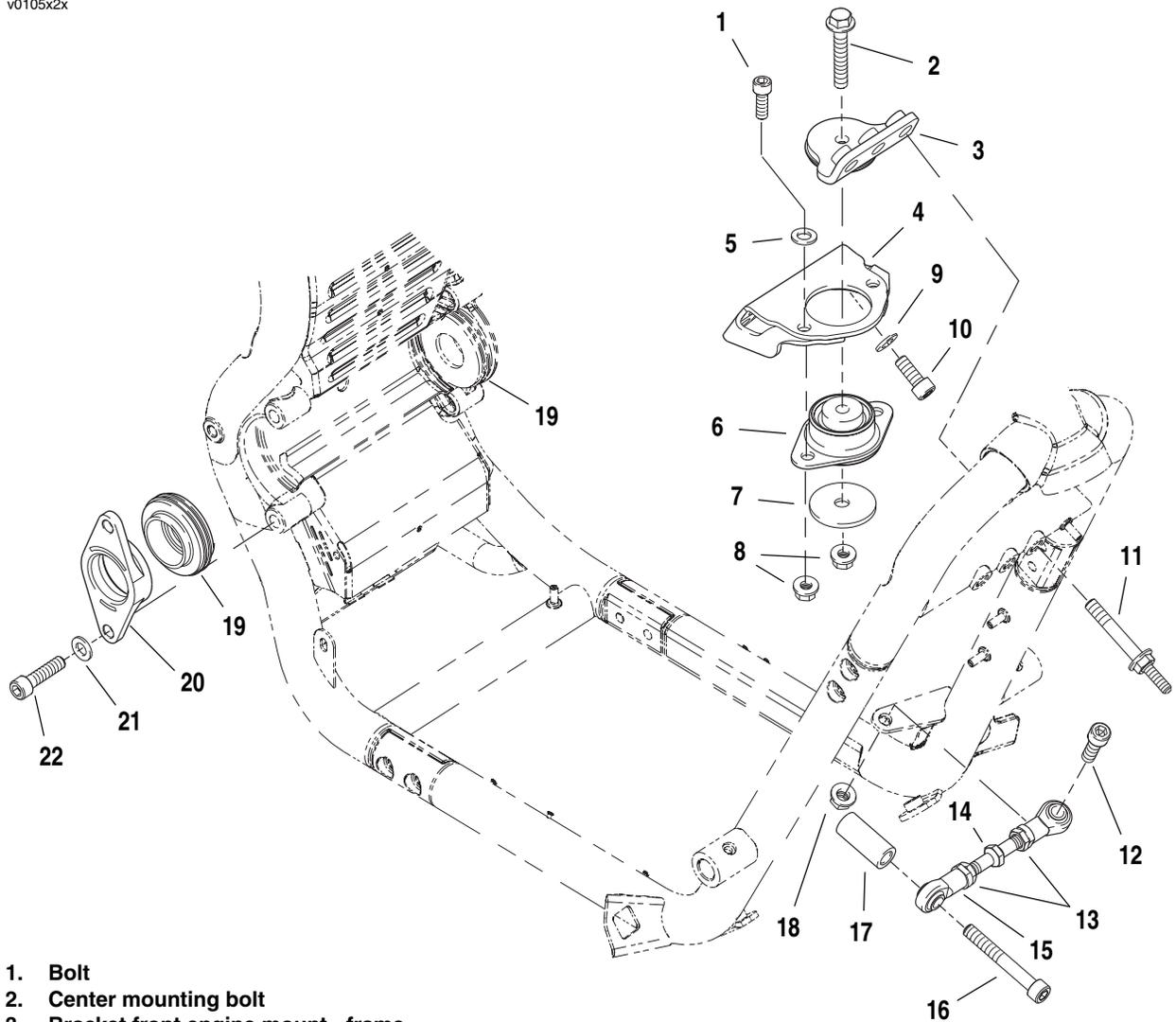
1. See [Figure 2-5](#). Start, but do not tighten bolts (10) and washers (9) fastening engine mount bracket (4) to engine cylinder head.
2. Attach frame bracket to frame with double threaded studs.
3. Alternately tighten and loosen engine mount bolts (10) and the two threaded studs (11). Tighten the engine bolts (10) and the two threaded studs (11) to 34-41 Nm (25-30 ft-lbs).
4. Tighten center mounting bolt (2) and travel limiting washer to 34-41 Nm (25-30 ft-lbs).
5. Install frame end of stabilizer link (15) to frame bracket. Tighten to 34-41 Nm (25-30 ft-lbs).
6. Insert bolt through stabilizer link (15) and spacer (17) and thread into engine crankcase. Tighten bolt to 34-41 Nm (25-30 ft-lbs).
7. Reinstall radiator assembly. See [6.8 RADIATOR/OIL COOLER](#).
8. Connect negative battery cable. Tighten to 6.8-10.8 Nm (60-96 in-lbs).
9. Install airbox cover.

CAUTION

When closing the seat, make sure the ignition switch is in the FUEL position. If the ignition switch is in any other position when the seat is closed, the seat latch mechanism could be damaged. (00196a)

10. Turn ignition switch to FUEL and close seat. Then turn ignition switch to LOCK.
11. Install maxi-fuse and right side cover.

v0105x2x



1. Bolt
2. Center mounting bolt
3. Bracket front engine mount - frame
4. Bracket front engine mount - engine
5. Washer
6. Front engine mount
7. Washer - travel limiting
8. Nut
9. Washer
10. Bolt
11. Double threaded stud
12. Bolt
13. Jam nut
14. Fixed nut
15. Stabilizer Link
16. Bolt
17. Spacer
18. Nut
19. Rear engine mount
20. Bracket - rear engine mount
21. Washer
22. Fasteners

Figure 2-5. Engine Mounts

REMOVAL

⚠ WARNING

To avoid accidental start-up of vehicle and possible personal injury, remove the maxi-fuse before proceeding. Inadequate safety precautions could result in death or serious injury.

1. Remove right side cover and remove maxi-fuse. See 8.5 **MAXI-FUSE**.
2. See [Figure 2-6](#). Loosen upper muffler clamp (11).

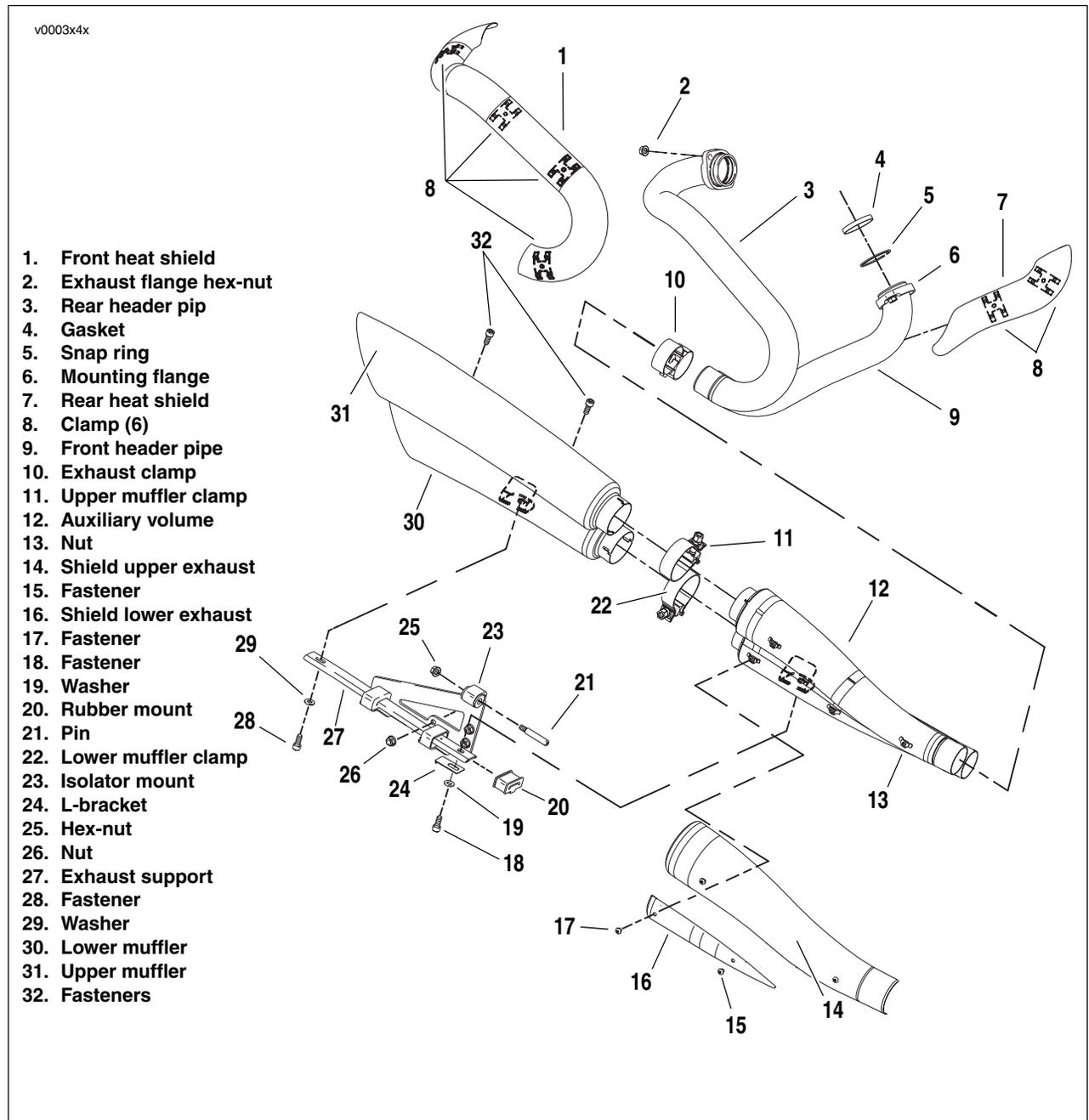


Figure 2-6. Exhaust System

3. Remove the two fasteners (32) holding the upper muffler (31) to the bottom muffler (30).
4. Slide upper muffler rearward to disconnect from the auxiliary volume (12).
5. Remove both heat shields (1, 7) from front and rear header pipes. It's not necessary to remove the heat shield (14) from the auxiliary volume (12).
6. Remove the auxiliary volume fastener (18) and the lower muffler fastener (28) from the lower part of the exhaust support bracket. Save the L-bracket (24) found under the exhaust support.

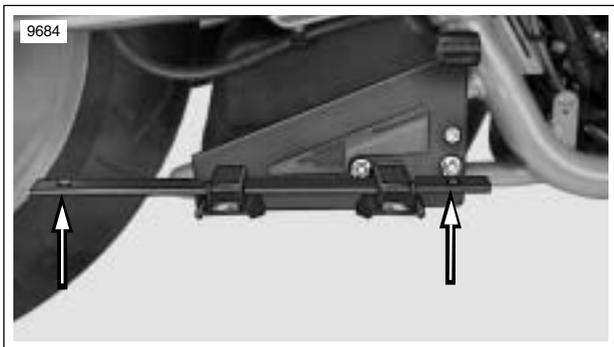


Figure 2-7. Exhaust Support Fastener Locations (exhaust system removed)

NOTE

Remove the left side drive sprocket cover for easier access to rear cylinder lower exhaust flange bolt.

7. Remove flanged hex-nuts (2) holding exhaust flange to front and rear cylinders.
8. Remove hex-nut (25) and pin (21) on exhaust support bracket.
9. Remove header pipes with the auxiliary volume and lower muffler attached. Lift and adjust assembly until header pipes slide out and away from the cylinder heads.

NOTE

To maintain the alignment of these components, keep the lower muffler, the auxiliary volume, the exhaust clamp, and the front and rear header pipes firmly connected.

INSTALLATION

NOTE

Do not torque fasteners until required to do so by the following installation instructions. Hand tightening each fastener will pull the exhaust system into a position that will allow the crush of the exhaust gaskets during the torquing sequence to draw the exhaust system up to the engine.

1. Install **new** exhaust header gaskets.
2. See [Figure 2-6](#). Gently lift the lower muffler, auxiliary volume, and header pipe assembly into position.

NOTE

A second technician may be required to hold the header pipes when aligning the exhaust header flanges with the studs in the cylinder heads.

3. Slip both front and rear header flanges over the studs in the cylinder heads. Thread hex-nuts (2) on header flange studs. Do not tighten.
4. Install support pin (21) in isolator mount (23) on the exhaust support. Thread on the hex-nut (25). Do not tighten.
5. Hold a 1/2 in. spacer between the frame rail and the header pipe exhaust clamp.
6. Thread in the lower muffler fastener (28) through the exhaust support.
7. Thread in the auxiliary volume fastener (18) through the L-bracket (24) and the exhaust support. Do not tighten.
8. Torque the pin hex-nut to 23 Nm (17 ft-lbs).
9. Place clamp (11) on upper muffler (31). Slide muffler over upper opening of auxiliary volume (12). Position clamp with compression fastener to inboard with tightening nut upward.
10. Thread upper muffler fasteners (32) into the lower muffler (30). Do not tighten.
11. Torque the fasteners to the indicated torque in the following order:
 - a. Upper muffler clamp - 65 Nm (48 ft-lbs).
 - b. Upper muffler fasteners - 23 Nm (17 ft-lbs).
 - c. Lower muffler and auxiliary volume fasteners to support bracket - 23 Nm (17 ft-lbs).
 - d. Exhaust flange hex-nuts - 8-12 Nm (71-106 **in-lbs**).
12. Check the tightness of the exhaust clamp by tightening the clamp nut to 32-37 Nm (24-27 ft-lbs).
13. Reinstall front and rear heat shields. Tighten the heat shield fasteners to 10 Nm (88 **in-lbs**).
14. If removed, reinstall drive sprocket cover. Tighten to 6-10 Nm (53-88 **in-lbs**).
15. Reinstall the maxi-fuse and the right side cover.

REMOVAL

PART NO.	SPECIALTY TOOL
HD-45317	Engine assembly support fixture

- Support motorcycle under fuel tank frame weldment and lock the front wheel so that the engine can be removed.

NOTE

To provide clearance and alignment, locate a scissors style jack under the fuel tank frame extensions to raise or lower the motorcycle throughout the procedure.

- Remove right side cover and maxi-fuse. See [8.5 MAXI-FUSE](#).
- Unlock and open seat.
- Remove airbox cover. See [1.4 AIRBOX AND AIR FILTER](#).

WARNING

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

- Disconnect negative battery cable.
- With ENGINE ASSEMBLY SUPPORT FIXTURE (HD-45317) positioned under engine, remove engine from motorcycle and roll far enough from frame to remove left rear engine mount. See [2.9 ENGINE REPLACEMENT](#).
- See [Figure 2-5](#). Remove fasteners (22) holding right rear engine mount bracket (20) to the frame.
- Remove both rear engine mounts (19) with left and right pivot shaft spacers. See [2.35 REAR FORK](#).
- Clean as necessary the right rear engine mount frame weldment, and the rear engine mount bracket.

INSTALLATION

- See [Figure 2-5](#). Install left rear engine mount (19) in left side frame weldment.
- Install pivot shaft spacer in left rear engine mount. See [2.35 REAR FORK](#).
- Orient flanged side of right rear engine mount (19) toward outside of the rear engine mount bracket (21), and thread fasteners (22) with narrow washers (21) through rear engine mount bracket into frame bosses.
- Install pivot shaft spacer in right engine mount.
- Tighten mounting bolts (23) to 34-41 Nm (25-30 ft-lbs).

NOTE

The left and right rear fork pivot shaft spacers are inserted into the engine mounts. Verify that the pivot shaft spacers are in position before installation of the pivot shaft.

- Reinstall engine. See [2.9 ENGINE REPLACEMENT](#).
- Connect negative battery cable. Tighten to 6.8-10.8 Nm (60-96 in-lbs).
- Install airbox cover.

CAUTION

When closing the seat, make sure the ignition switch is in the FUEL position. If the ignition switch is in any other position when the seat is closed, the seat latch mechanism could be damaged. (00196a)

- Turn ignition switch to FUEL and close seat. Then turn ignition switch to LOCK.
- Reinstall maxi-fuse and right side cover.

GENERAL

Removal and replacement of the engine may be required for either replacement engines or for engine overhaul.

REMOVAL

PART NO.	SPECIALTY TOOL
HD-45317	Engine assembly support fixture

- See [Figure 2-8](#). On a table lift with a lift side extension, position a scissors jack under the fuel tank.

NOTE

To provide clearance and alignment, locate a scissors style jack under the fuel tank frame extensions to raise or lower the motorcycle throughout the procedure.

WARNING

The gasoline in the fuel supply line downstream of the fuel pump is under high pressure (400 kPa, 58 psi). To avoid an uncontrolled discharge or spray of gasoline, always purge the system of high pressure gas before removing the fuel supply line from the fuel tank. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions could result in death or serious injury.

- Open seat and remove or lift fuel filler boot.
- Purge fuel supply line of high pressure gasoline.
 - Disconnect fuel module connector from top plate.
 - In neutral, start engine and allow engine to run.
 - When engine stalls, operate starter for 3 seconds to remove any remaining fuel from fuel lines.
- Place a suitable container under engine, loosen oil drain plug and drain oil.
- Install and tighten oil drain plug to 35 Nm (25 ft-lbs).
- Allow engine to cool.
 - For replacement engines, leave oil filter threaded into its mounting plate.
 - For engine overhaul, remove oil filter as necessary.

IMPORTANT NOTE

Dispose of oil in accordance with local regulations.

- Remove right side cover and maxi-fuse. See [8.5 MAXI-FUSE](#).
- Remove air filter cover. See [1.4 AIRBOX AND AIR FILTER](#).

WARNING

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

- See [Figure 2-9](#). Disconnect negative (1) and positive (2) battery cables from battery.

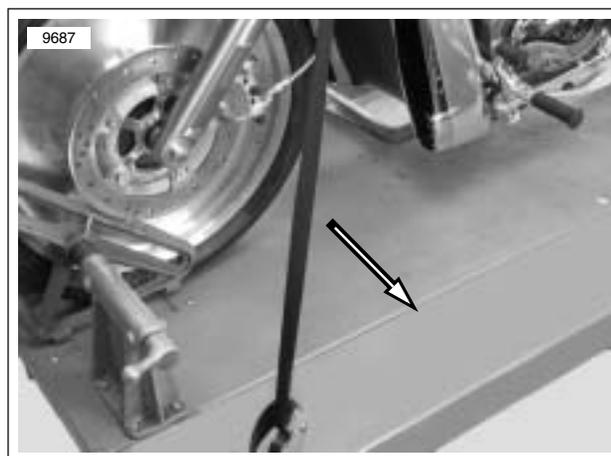
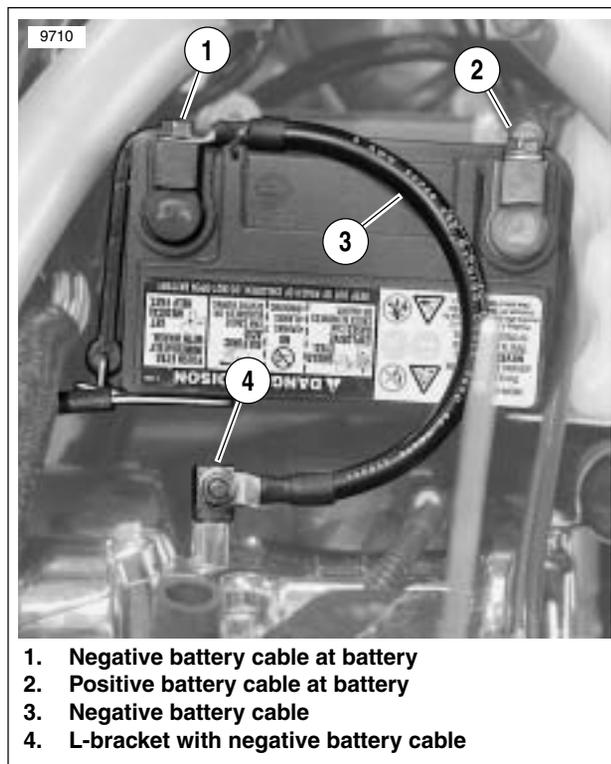


Figure 2-8. Lift Side Extension



- Negative battery cable at battery
- Positive battery cable at battery
- Negative battery cable
- L-bracket with negative battery cable

Figure 2-9. Battery Cable Connections

10. Remove air filter top, air filter, breather hose, velocity stacks, and air filter bottom. Unscrew threaded air filter hold down rod from throttle body. See [1.4 AIRBOX AND AIR FILTER](#).
11. At the fuel rail, disconnect pressure fuel line and return fuel line by pressing blue buttons with thumb and first finger.
12. See [Figure 2-9](#). Disconnect copper L-bracket (4) with negative battery cable (3) from front cylinder head.
13. See [Figure 2-11](#). Remove fastener on rear cylinder head and remove GND 1 (8), GND 2 (9) and horn ground wire (10). Replace fastener.
14. Remove fastener on front cylinder head and remove regulator ground (3). Replace fastener.
15. Separate wiring connectors from horn. Unbolt and remove horn from rubber grommet on frame. See [8.24 HORN](#).
16. Separate:
 - a. Front (2) and rear coil connectors [83F, 83R].
 - b. Main engine connector [45] (7).
 - c. Throttle position sensor [88] (4).
 - d. Idle air control actuator [87] (5).
17. For a California model, pull the purge solenoid hose (6) off throttle body.
18. Perform throttle body procedure:
 - a. For a replacement engine, loosen throttle cable adjuster jam nuts. Turn throttle cable adjuster until cable is as short as possible. Remove throttle cable housings from guides at the throttle body and remove cable barrels from throttle cam. See [2.12 THROTTLE CABLES](#).
 - b. See [Figure 2-10](#). For engine overhaul, loosen clamps at each intake and lift throttle body straight up. With throttle cables attached, wrap a shop towel around body for protection and secure away from engine. Cover intake openings to prevent objects from falling into intake bore.

NOTE

For replacement engines, the engine wiring harness is left attached to the engine. The engine wiring harness will include connectors to the manifold air pressure sensor [80], the intake air temperature sensor [89], the coolant temperature sensor [90], the oil pressure sending unit [120], and both fuel injectors [84] [85].

19. Remove lower left and right side radiator covers. See [6.8 RADIATOR/OIL COOLER](#).
20. See [Figure 2-12](#). Separate:
 - a. Crank position sensor connector [79] (3).
 - b. Top and bottom cooling fan connectors [97T] [97B] (2).
 - c. Stator-to-regulator connector [46] (1).
 - d. Wiring frame clip (4).

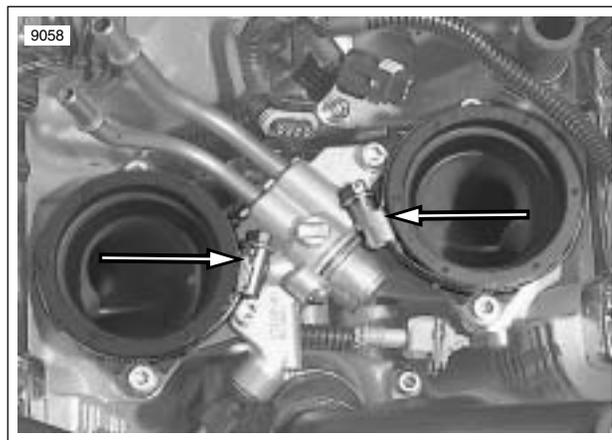


Figure 2-10. Intake Clamps (throttle body removed)

NOTE

Note the position of the clamps for assembly.

21. See [Figure 2-13](#). Cover front fender with a shop towel or protective cover. On right side, pull rear brake fluid reservoir from radiator cover.
22. Remove two fasteners and washers (2) on each side of radiator cover and remove radiator cover. The radiator cover includes two chrome inlet bezels.
23. Place a suitable container under radiator and open pressure cap.
24. See [Figure 2-13](#). Loosen but do not remove radiator drain plug. Orient radiator drain plug so that slot in threads is open to container.

WARNING

Do not remove radiator filler cap when engine is hot. The cooling system is under pressure and hot coolant and steam can escape, which could cause severe burns. Allow engine to cool before servicing the cooling system. (00091a)

25. Loosen radiator cap and allow coolant to drain from the radiator.
26. Place a container under engine and remove front engine coolant drain plug. Allow remaining coolant to drain from engine.

NOTE

With the motorcycle in normal orientation, there is no need to remove the rear engine coolant drain plug.

27. Hand tighten radiator drain plug.

NOTE

Correct torque on the radiator drain plug is 2.3-2.8 Nm (21-24 in-lbs). See [6.3 ENGINE COOLANT](#).

28. Use a long thin screwdriver (Snap-on Part No. SDD1410) to loosen worm drive clamps on radiator hoses.

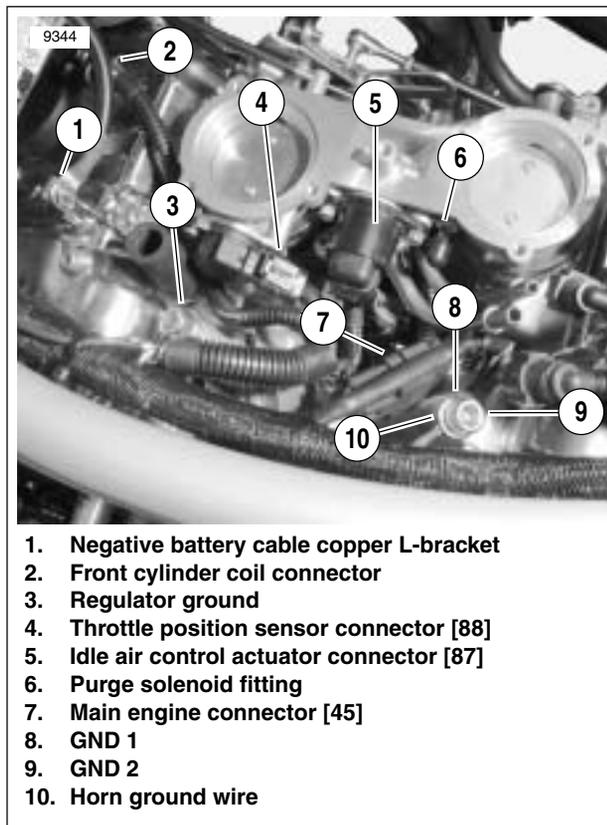


Figure 2-11. Wiring Connections

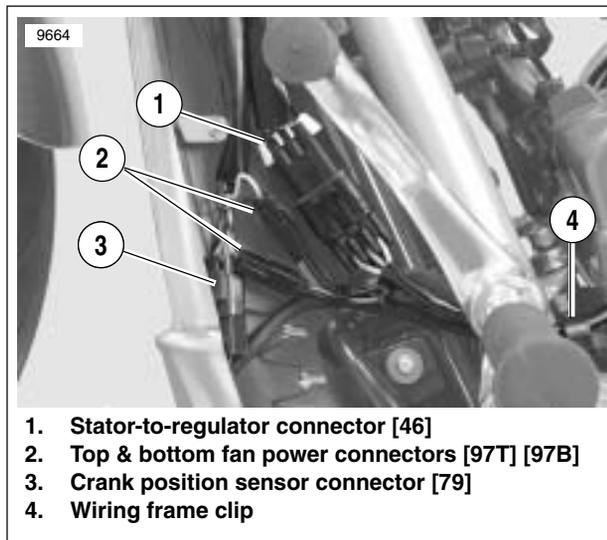


Figure 2-12. Left Side Wiring Connectors

29. Loosen and remove cross member fasteners holding the bottom of the radiator/oil cooler assembly on both sides.
30. Put radiator/oil cooler assembly forward at the bottom. Separate oil lines from crankcase (oil in) and oil filter (oil out) fittings. See 6.7 OIL LINE FITTINGS.
31. Remove radiator/oil cooler assembly. See 6.8 RADIATOR/OIL COOLER.
32. See Figure 2-14. Finish draining coolant by removing front cylinder coolant drain plug. Reinstall front cylinder coolant drain plug and tighten to 9.7 Nm (86 in-lbs).
33. Remove engine coolant pipes. See 6.6 COOLANT PIPES AND HOSES.

IMPORTANT NOTE

Dispose of antifreeze in accordance with local regulations.

34. Remove drive sprocket cover.
35. Remove debris deflector/belt guard, if required, for clearance. See 2.33 BELT GUARD/DEBRIS DEFLECTOR.
36. See Figure 2-15. Loosen retaining bolts (3) holding drive sprocket (1) to sprocket mounting flange.

NOTE

Do not remove the output shaft flange nut (4).

37. Remove snap ring and loosen rear wheel axle nut. Move wheel forward and slip belt off wheel sprocket. Pull belt off of drive sprocket.
38. See Figure 2-15. Remove retaining bolts (3) from drive sprocket. Discard bolts (3).
39. Rotate sprocket (1) to fit spoke pattern of mounting flange (2) and remove sprocket (1).
40. Remove exhaust system. See 2.7 EXHAUST SYSTEM.
41. Remove secondary clutch actuator cover and secondary clutch actuator. See 2.16 SECONDARY CLUTCH ACTUATOR.

NOTE

It is not necessary to loosen flare nut or to remove clutch fluid line from the secondary clutch actuator. Allow secondary clutch actuator to hang from clutch fluid line.

42. At front of engine, pull back solenoid cable protective boot from starter post and loosen and remove nut. Remove solenoid cable terminal ring. See 5.4 STARTER.
43. Remove nuts holding starter solenoid to frame and pull solenoid off of frame studs. See 5.5 STARTER SOLENOID.

NOTE

To avoid strain on solenoid green and black wire leads, locate connector under left side cover and press on release square to separate connector halves.

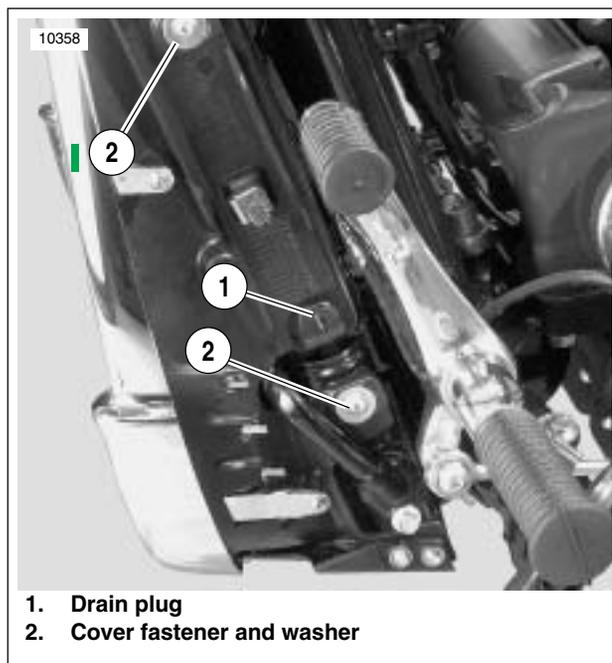


Figure 2-13. Radiator Cover Left Side

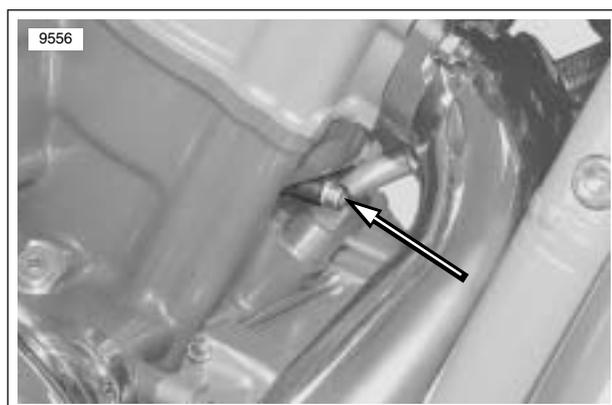


Figure 2-14. Front Cylinder Coolant Drain Plug

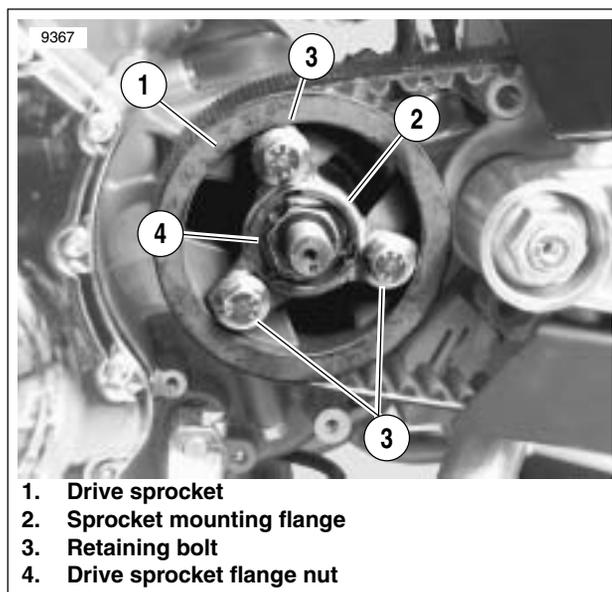


Figure 2-15. Drive Sprocket

44. See [Figure 2-16](#). Position ENGINE ASSEMBLY SUPPORT FIXTURE (Part No. HD-45317) under engine. Align the two hex socket-head bolts (2) at rear of fixture with mounting screw detents (4) at bottom rear of oil pan. Align the two separated hex head bolts (1) on each side of front of fixture with corresponding mounting screw detents (3) on sides of oil pan. Using scissors jack, lower motorcycle until engine oil pan screw detents rest on hex socket-head bolts.
45. Remove nut and travel limiting washer from center engine mount bolt. Remove center mounting bolt.
46. Remove fasteners holding front engine mount bracket to engine.
47. Remove studs securing frame engine mount bracket to frame. Pull front engine mount assembly forward through frame rails.
48. Remove stabilizer link bolt and spacer from engine case. See [2.5 FRONT ENGINE MOUNT](#).

NOTE

Maintain stabilizer link length for reinstallation. Do not loosen jam nuts on stabilizer link.

49. Remove rear fork pivot nut and slide out pivot shaft. Rear fork can be left in place.
50. Loosen fasteners holding rear engine mount bracket. See [2.8 REAR ENGINE MOUNTS](#).
51. Remove shifter arm with linkage attached from engine shifter shaft.
52. Remove engine ground cable from frame.
53. Remove lower left frame rail with footrest, foot shift lever/linkage, and stabilizer link attached. See [2.4 FRAME/LOWER FRAME RAILS](#).

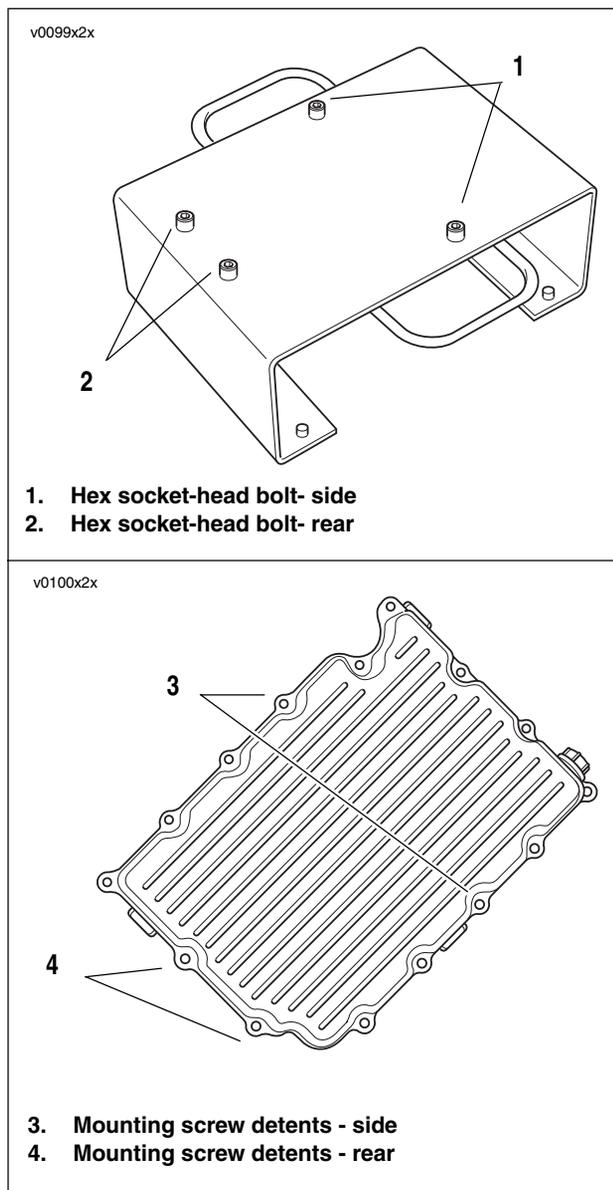


Figure 2-16. Engine Assembly Support Fixture Alignment

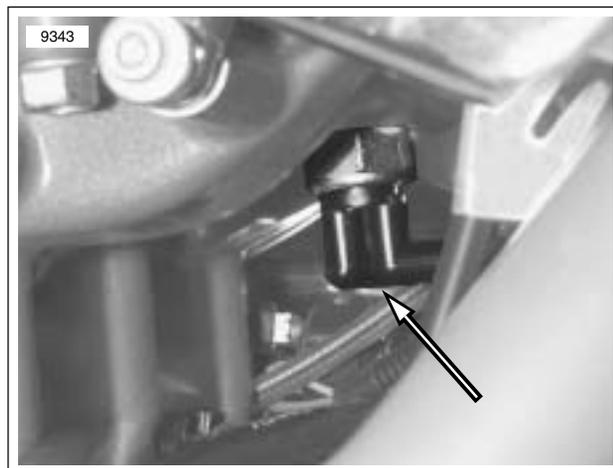


Figure 2-17. Neutral Light Sender Connectors [131]

CAUTION

Do not push on the engine to move the engine. Support the engine and pull on the fixture handles.

54. With engine resting in ENGINE ASSEMBLY SUPPORT FIXTURE (HD-43517), gently pull on handles to work engine partially out of left side of frame.
55. See [Figure 2-17](#). Pull connectors to neutral light sender [131] under drive sprocket.

NOTE

The neutral light sender stays in the engine.

56. Pull purge solenoid hose off of charcoal canister (California models only).
57. See [Figure 2-18](#). Pull connectors from stoplamp switch [121].
58. Pull electrical harness to stoplamp switch and purge solenoid hose (California models only) through top of the cavity in engine cases.
59. See [Figure 2-19](#). Disconnect vehicle speed sensor wire from connector [65] at top of frame under relay block and pull wire and connector down out of frame.

NOTE

The vehicle speed sensor and wire connector [65] stay attached to the engine.

60. With fixture handles, pull engine out of frame onto left side extension.
61. See [Figure 2-20](#). Engine may be secured with straps for hoisting.

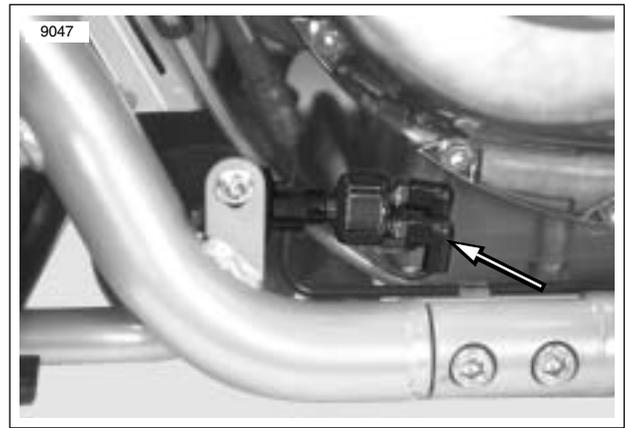


Figure 2-18. Stoplamp Switch Connectors [121]

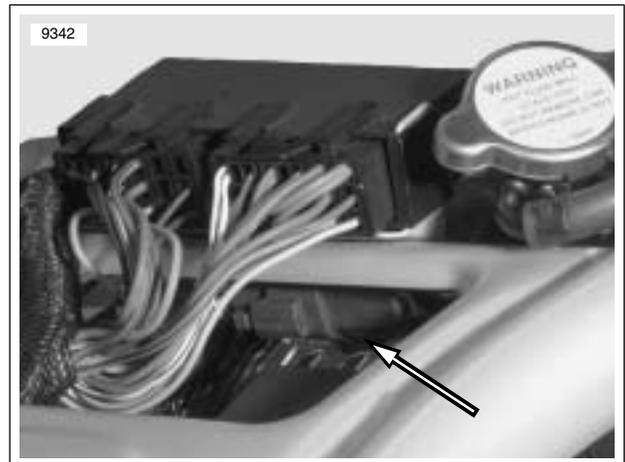


Figure 2-19. Vehicle Speed Sensor Connector [65]



Figure 2-20. Engine Strapped for Hoisting

INSTALLATION

PART NO.	SPECIALTY TOOL
HD-45317	Engine assembly support fixture

1. Verify VIN. of replacement engine.
2. Check replacement/overhauled engine for:
 - a. Vehicle speed sensor and wiring.
 - b. Neutral sending switch.
 - c. Ground cable.
3. Verify that engine wiring harness is connected to:
 - a. Manifold air pressure sensor [80].
 - b. Intake air temperature sensor [89].
 - c. Coolant temperature sensor [90].
 - d. Oil pressure sending unit [120].
 - e. Injector connectors [84, 85].
4. Check oil filter tightness. See [1.6 ENGINE OIL AND FILTER](#).
5. Install rear engine mount in left side frame weldment. Pull engine partially into frame capturing left rear engine mount.

NOTE

The left and right rear fork pivot shaft spacers are inserted into the engine mounts. Verify that the pivot shaft spacers are in position before installing the pivot shaft.

6. With engine oil pan screw detents resting on hex socket-head bolts of the ENGINE ASSEMBLY SUPPORT FIXTURE (HD-45317), pull engine into frame with fixture handles.
7. Thread stoplamp electrical wires and connectors and purge solenoid hose (California models only) through cavity in engine cases.
8. See [Figure 2-18](#). Push on stoplamp switch wires.
9. Push purge solenoid hose onto charcoal canister (California models only).
10. See [Figure 2-21](#). Fasten ground cable (1) terminal ring (4) with washer (5) to frame. Tighten to 6-10 Nm (53-88 in-lbs) and reinstall rubber boot.
11. See [Figure 2-17](#). Push on neutral light sender wires.
12. See [Figure 2-19](#). Thread vehicle speed sender connector [65] wire up through frame and connect to wiring harness.
13. Install rear engine mounting bracket and engine mount to right side frame weldment. Thread mounting bolts with narrow washers through bracket into frame bosses.
14. Raise or lower frame with scissor jack to align pivot shaft bores of rear fork to rear engine mounts and engine case mounting bosses. Apply LOCTITE® ANTI-SEIZE and slide in rear fork pivot shaft.
15. Apply LOCTITE® 243 (blue) to threads of pivot shaft nut.
16. Install upper engine mounting bracket to engine with fasteners and engine mounting bracket to frame with double threaded studs.
17. Install left frame rail with stabilizer link and footrest, and shifter linkage attached.

2-20 2004 VRSC: Chassis

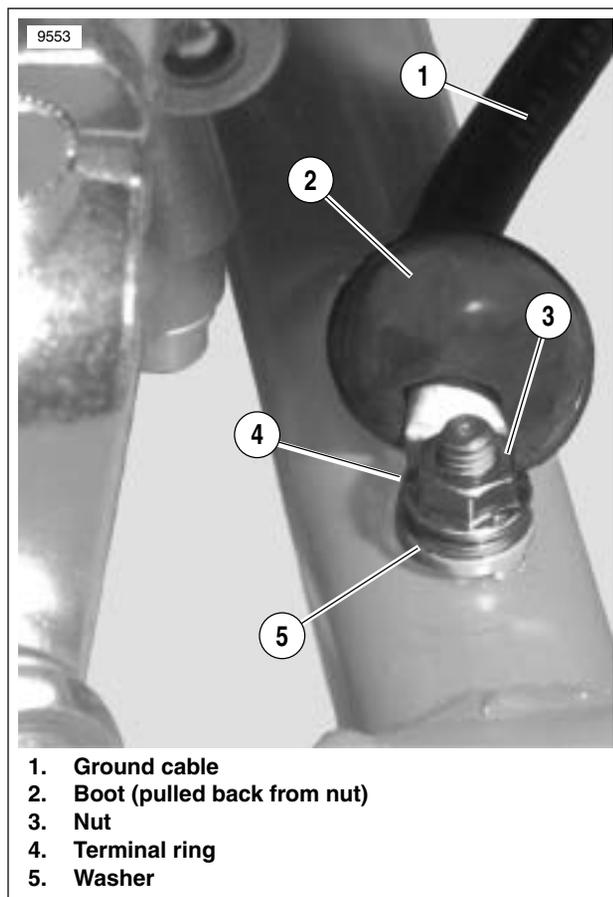


Figure 2-21. Ground Cable Installation

18. Assemble spacer and stabilizer link and thread into crankcase.
19. Tighten fasteners in following order:
 - a. Pivot shaft nut to 61-75 Nm (45-55 ft-lbs).
 - b. Rear engine mount bracket fasteners (including stabilizer link fasteners) to 34-41 Nm (25-30 ft-lbs).
 - c. Front engine mount fasteners to 34-41 Nm (25-30 ft-lbs).
 - d. Lower frame rail fasteners to 61-75 Nm (45-55 ft-lbs).
 - e. Engine crankcase end of stabilizer link to 34-41 Nm (25-30 ft-lbs).

20. See [Figure 2-22](#). Install shifter arm perpendicular to frame rail for correct operation. Tighten clamp bolt to 14-16 Nm (11-12 ft-lbs).
21. If removed, attach shifter linkage to shifter arm and tighten to 9-15 Nm (80-132 **in-lbs**).
22. Install starter solenoid to frame posts. If separated, mate black and green wire lead connectors [128].
23. Install solenoid cable terminal ring to starter post.
24. Tighten solenoid fasteners to the following torques:
 - a. Solenoid cable terminal ring to starter post to 6-10 Nm (53-88 **in-lbs**).
 - b. Starter solenoid to frame posts to 6-10 Nm (53- 88 **in-lbs**).
25. Install exhaust system. After loosely attaching lower muffler, auxiliary volume, and header pipes tighten the support pin nut to 23 Nm (17 ft-lbs). See [2.7 EXHAUST SYSTEM](#).
26. Loosely fasten upper muffler to lower and torque fasteners in the following order:
 - a. Upper muffler clamp to 65 Nm (48 ft-lbs).
 - b. Upper muffler fasteners to 23 Nm (17 ft-lbs).
 - c. Lower muffler and auxiliary volume fasteners to support bracket to 23 Nm (17 ft-lbs).
 - d. Exhaust flange nuts to 8-12 Nm (71-106 **in-lbs**).
 - e. Exhaust clamp nut to 32-37 Nm (24-27 ft-lbs).
 - f. Front and rear heat shield worm drive clamps to 10 Nm (88 **in-lbs**).
27. Install drive sprocket by matching spokes of drive sprocket to open spaces of mounting flange and rotating sprocket to align sprocket bolt holes behind mounting flange bolt holes.
28. Install and tighten three **new** locking bolts to 88-102 Nm (65-75 ft-lbs).
29. Route drive belt over wheel sprocket and drive sprocket.
30. If removed, install and belt guard and debris deflector. See [2.33 BELT GUARD/DEBRIS DEFLECTOR](#).
31. Adjust drive belt. See [1.14 REAR BELT DEFLECTION](#).

⚠ WARNING

Do not exceed 142.4 Nm (105 ft-lbs) when tightening the axle nut. Exceeding 142.4 Nm (105 ft-lbs) may cause the wheel bearings to seize during operation, which could result in death or serious injury.

32. Tighten axle nut to 129-142.4 Nm (95-105 ft-lbs) and install snap ring.
33. Install belt drive sprocket cover. Tighten cover fasteners to 6-10 Nm (53-88 **in-lbs**). If necessary, install debris deflector and belt guard.
34. Install engine coolant pipes and hoses. Fasten p-clamp to cylinder head, pipe clamp, and worm drive clamps to both coolant pipe hoses. See [6.6 COOLANT PIPES AND HOSES](#).



Figure 2-22. Shifter Arm Perpendicular to Frame Rail

35. Fit radiator/oil cooler assembly to top mounting studs. Fit coolant out and in hoses to radiator beaded pipes. See [6.8 RADIATOR/OIL COOLER](#).
 36. Install oil line quick connects to crankcase and oil filter mount oil fittings. See [6.7 OIL LINE FITTINGS](#).
 37. Push radiator/oil cooler assembly mounting pins and grommets into cross member. Thread cross member mounting bolts into frame.
- NOTE*
- Route hose to remote rear brake reservoir behind brake pedal above the clevis pin before installing cross member. Be sure remote hose is not pinched during installation of radiator/oil cooler assembly and cross member.*
38. Tighten cooling system fasteners:
 - a. Cross member fasteners to 20-26 Nm (15-19 ft-lbs).
 - b. Top mounting flange nuts to 19-27 Nm (15-20 ft-lbs).
 - c. Pipe clamp to 6.5 Nm (57 **in-lbs**).
 - d. Pipe connecting clamp to 6-10 Nm (53-88 **in-lbs**).
 - e. P-clamp to 6-10 Nm (53-88 **in-lbs**).
 - f. Hose worm drive clamps to 3-4 Nm (27-35 **in-lbs**).
 39. Route drain hose to overflow bottle.
 40. Install radiator cover.

41. See [Figure 2-12](#). Connect:
 - a. Crank position sensor connector [79] (3).
 - b. Top and bottom cooling fan connectors [97T] [97B] (2).
 - c. Stator to voltage regulator connector [46] (1).
 - d. Wiring frame clip (4).
42. Push rear brake fluid reservoir onto radiator cover and install both lower radiator covers.
43. Install throttle body/cables:
 - a. For replacement engines: Insert throttle cable barrels into throttle cam, route cable around throttle cam and insert cable housing in cable guides. Adjust cables. See [1.22 THROTTLE CABLES](#).
 - b. For engine overhaul: Install throttle body and tighten clamps to 1.25 Nm (11 **in-lbs**).
44. See [Figure 2-11](#). Connect:
 - a. Front (2) and rear coils [83F] [83R].
 - b. Main engine harness [45] (7).
 - c. Throttle position sensor [88] (4).
 - d. Idle speed control actuator [87] (5).
 - e. Regulator ground (3).
45. Install horn to rubber grommet and bracket on engine. Connect horn wire to main harness. See [8.24 HORN](#).
46. Connect GND 2 (9), GND 1 (8) and horn ground wire (10) to rear engine cylinder head.
47. Connect negative battery copper L-bracket and cable to front cylinder head.
48. Install air filter bottom, velocity stacks, O-rings, breather hose, threaded air filter hold down rod, and air filter. See [1.4 AIRBOX AND AIR FILTER](#).
49. Fill engine with oil. See [CHANGING OIL AND FILTER](#) under [1.6 ENGINE OIL AND FILTER](#).
50. Open radiator air bleed plug and fill cooling system with GENUINE HARLEY-DAVIDSON EXTENDED LIFE ANTIFREEZE & COOLANT through coolant pressure cap. See [6.3 ENGINE COOLANT](#).
51. Tighten radiator air bleed plug to 9-11 Nm (80-97 **in-lbs**).

 **WARNING**

Always connect the positive battery cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion that could result in death or serious injury.

52. Connect positive battery cable to battery and then connect negative battery cable to battery. Tighten to 6.8-10.8 Nm (60-96 **in-lbs**).
53. With the spark plugs removed, use the starter to turn the engine over to prime the engine with oil. The engine oil pressure indicator lamp should not illuminate. See [3.5 OIL PRESSURE](#).

54. Install air filter, air filter top and airbox cover.

 **WARNING**

When closing the seat, make sure the ignition switch is in the FUEL position. If the ignition switch is in any other position when the seat is closed, the seat latch mechanism could be damaged. (00196a)

55. Turn ignition switch to FUEL and close seat. Then turn ignition switch to LOCK.
56. Install maxi-fuse and right side cover.
57. Test ride motorcycle and adjust as required.

CLEANING

⚠ WARNING

Without the weight of the motorcycle resting on the jiffy stand, any vehicle movement could cause the jiffy stand to retract slightly from the full forward position. If the jiffy stand is not in the full forward or lock position when vehicle weight is rested on it, the vehicle could fall over which could result in death or serious injury.

⚠ WARNING

Always park the vehicle on a firm, level surface. The weight of the vehicle can cause it to fall over, which could result in death or serious injury.

⚠ WARNING

Be sure jiffy stand is fully retracted before riding. If jiffy stand is not fully retracted during vehicle operation, unexpected contact with the road surface can distract the rider. While the jiffy stand will retract upon contact, the momentary disturbance and/or rider distraction can lead to loss of vehicle control which could result in death or serious injury.

1. Block motorcycle underneath frame so both wheels are raised off ground.
2. See [Figure 2-24](#). Inspect leg stop and lock slot in jiffy stand weldment. If covered or plugged with dirt, wipe dirt off with a shop towel and spray catch and mating surface with LOCTITE® AEROSOL ANTI-SEIZE.
3. Move jiffy stand leg forward and back while spraying anti-seize to infuse LOCTITE® AEROSOL ANTI-SEIZE into mating parts.
4. Lubricate jiffy stand with LOCTITE® LUBRIPLATE.
5. Check condition of rubber bumper.



Figure 2-23. Jiffy Stand

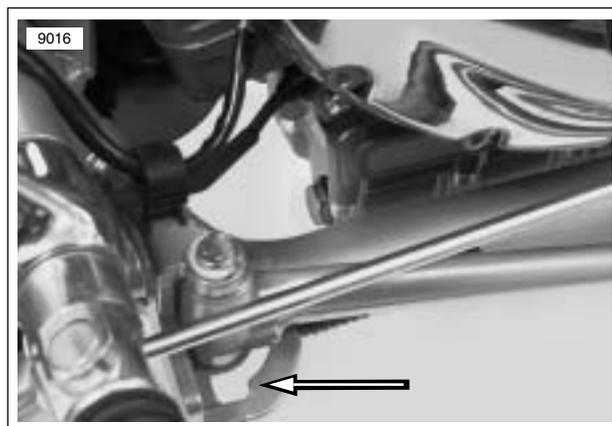


Figure 2-24. Jiffy Stand Catch and Lock Slot

REMOVAL

⚠ WARNING

Failure to support motorcycle with proper blocking equipment could result in death or serious injury.

1. Block motorcycle underneath frame so both wheels are raised off ground. Jiffy stand should be able to move through its full range of travel without the weight of motorcycle resting on it.
2. See [Figure 2-26](#). Remove cotter pin (3) from clevis pin (2).

⚠ WARNING

Wear gloves and protective eyeglasses (or face shield) when performing the following procedure. The jiffy stand spring tension could cause the spring, attached components and/or hand tools to fly outward at great speed and could cause death or serious injury.

3. With leg in the retracted position, detach spring (6) from jiffy stand leg (5), and anchor (7).
4. Remove clevis pin (2) by gently tapping on pin from bottom to drive pin up through mounting bracket.
5. Pull out jiffy stand leg and remove upper and lower bushings.
6. Loosen and remove the anchor (7).
7. Remove rubber bumper (1), if necessary.

NOTE

Jiffy stand brackets can be replaced by replacing the left lower frame rail. See [2.4 FRAME/LOWER FRAME RAILS](#).

INSTALLATION

⚠ WARNING

Wear gloves and protective eyeglasses (or face shield) when performing the following procedure. The jiffy stand spring tension could cause the spring, attached components and/or hand tools to fly outward at great speed and could cause death or serious injury.

1. See [Figure 2-26](#). Apply **LOCTITE® 243** (blue) to anchor (7). Install and tighten anchor to 7-9 Nm (62-79 in-lbs).
2. Apply **LOCTITE® AEROSOL ANTI-SEIZE** to both bushings (4) and install bushings in position for a retracted leg.
3. Orient leg retracted in mounting bracket, and install **new** clevis pin (2) through the upper bushing (4), leg (5), and lower bushing (4).
4. Install **new** cotter pin (3).
5. Attach spring (6) to the anchor and to jiffy stand leg (5). When properly installed, spring open hook on anchor faces outward and open hook on jiffy stand leg faces down when jiffy stand leg is extended.
6. Replace rubber bumper (1) if required.
7. Check that jiffy stand operates correctly before supporting the weight of the motorcycle on the leg.

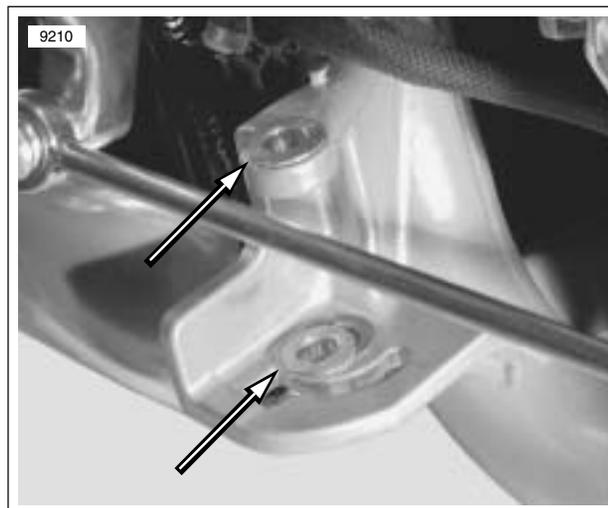


Figure 2-25. Bushings in Retracted Position

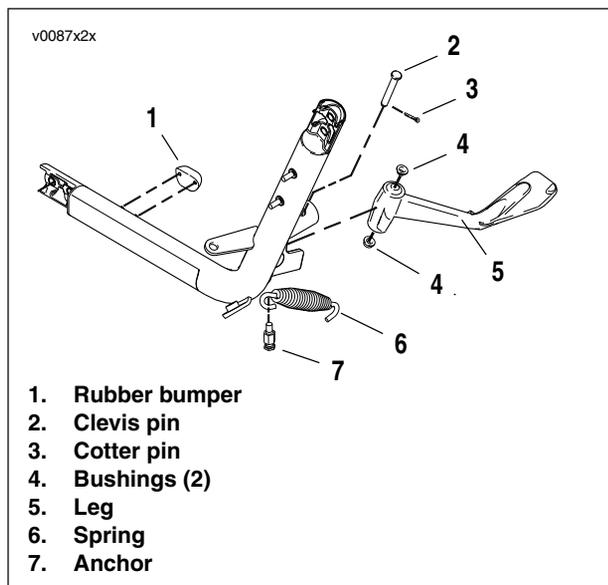


Figure 2-26. Jiffy Stand Components

RIDER FOOTRESTS

Removal

1. With motorcycle in neutral, remove fastener from shift linkage to foot shift lever.
2. See [Figure 2-27](#). Remove retaining ring (1) from clevis pin (4) holding left side footrest (3) to footrest axle (7). Remove clevis, footrest, and spring washer (5).

NOTE

Shift lever toe peg unthreads from shift lever. Remove and replace as required.

3. Remove retaining bolt (9) holding left side footrest axle (7) to frame. Remove footrest axle (7) and foot shift lever (8).
4. Remove left side radiator cover.
5. Remove the cotter key from the clevis pin connecting brake pedal (10) to master cylinder brake rod.
6. Cover outside face of clevis pin with cardboard and using a large pliers, squeeze pin until pin shoulder pops out of interference fit in the clevis. Remove clevis pin and brake rod.
7. Remove retaining ring (1) from clevis pin (4) holding right side footrest (3) to footrest axle (7). Remove clevis, footrest, and spring washer.
8. Remove retaining bolt (9) holding right side footrest axle (7) to frame. Pull footrest axle (7) from frame and rear brake pedal (10).

Installation

1. See [Figure 2-27](#). Install left side footrest axle (7) and foot shift lever (8). Tighten retaining bolt to 11-17 Nm (9-12 ft-lbs).
2. Install fastener holding shift linkage to foot shift lever (8). Tighten to 9-15 Nm (7-11 ft-lbs).

WARNING

Footpegs must fold upward and rearward. This will allow footpeg to fold, if by accident, it strikes ground surface when making a sharp turn. Failure to set footpeg to the proper fold-up angle could result in death or serious injury.

3. Orient footrest (3) to fold upwards on contact with ground.
4. Install clevis pin (4) through left side footrest axle (7), footrest (3), and spring washer (5). Secure with a **new** retaining ring (1).
5. Install right side footrest axle (7) through rear brake pedal (10). Using LOCTITE® 243 (blue), thread in and tighten retaining bolt to 11-17 Nm (9-12 ft-lbs).
6. Install clevis pin (4) through right side footrest axle (7), footrest (3), and spring washer (5). Secure with a **new** retaining ring (1).

7. Install clevis pin through rear brake pedal clevis and master cylinder brake rod.
8. Cover the face of clevis pin and clevis with cardboard. Holding the brake pedal (10) firmly, tap on a rod to seat shoulder of clevis pin into clevis. Install **new** cotter pin.

PASSENGER FOOTRESTS

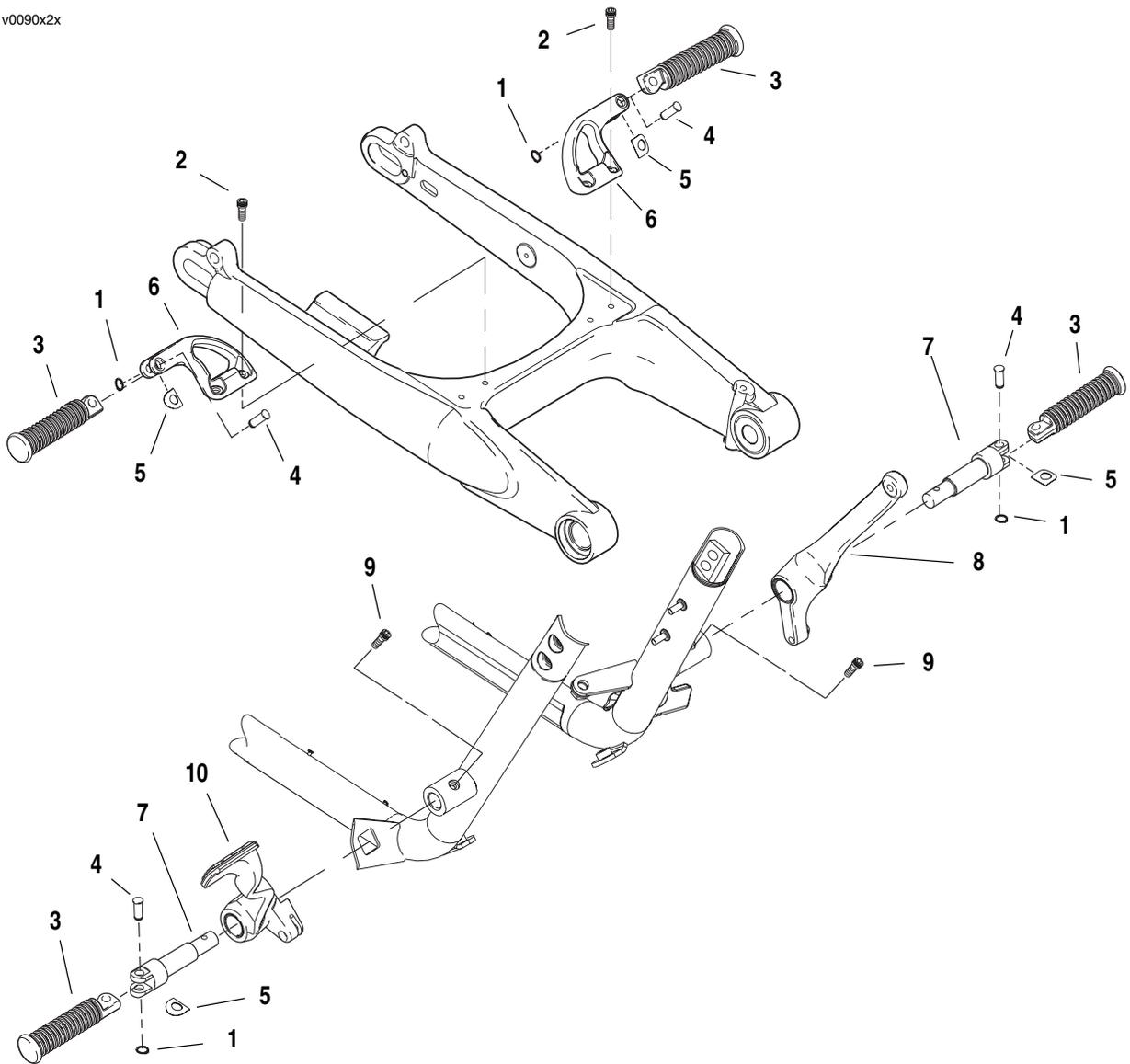
Removal

1. See [Figure 2-27](#). Remove the retaining ring (1) from the clevis pin (4) holding the footrest (3) to the footrest support (6). Remove the clevis pin, footrest, and spring washer (5).
2. Loosen and remove the two fasteners (2) holding the footrest support (6) to the rear fork. Remove the footrest support.
3. Repeat for opposite side passenger footrest assembly.

Installation

1. See [Figure 2-27](#). Mount the footrest support (6) to the rear fork. Tighten the two fasteners (2) to 19-27 Nm (14-20 ft-lbs).
2. Orient footrest (3) to fold upwards on contact with ground.
3. Install clevis pin (4) through the support (6), footrest (3), and spring washer (5). Secure with a **new** retaining ring (1).
4. Repeat for the opposite side passenger footrest assembly.

v0090x2x



1. Retaining ring
2. Fastener
3. Footrest
4. Clevis pin
5. Spring washer
6. Footrest support
7. Footrest axle
8. Shift lever
9. Retaining bolt
10. Brake pedal

Figure 2-27. Rider and Passenger Foot Rests

REMOVAL/DISASSEMBLY

1. See [Figure 2-28](#). Loosen cable adjuster jam nuts (1). Screw throttle cable adjuster until it is as short as possible.
2. Remove screws that hold handlebar housing together to separate the upper and lower housings.
3. Use a screwdriver to rotate cable ferrules in throttle grip notches. Remove cables from notches on inboard side of throttle grip and remove cables from throttle grip and lower housing.
4. Remove airbox. See [1.4 AIRBOX AND AIR FILTER](#).
5. Remove throttle cable housings from guides at throttle body and remove cable barrels from throttle cam.
6. See [Figure 2-29](#). Pull cables from housing by placing a drop of oil on retaining ring that holds cable in housing, then firmly pull bent tubing portion of cable out of housing using a rocking motion.

CLEANING AND INSPECTION

WARNING

Low pressure compressed air can blow debris into your face and eyes. Always wear eye protection and a face shield when using pressurized air. Failure to take adequate safety precautions could result in death or serious injury.

1. Wash all components in non-flammable cleaning solvent. Blow parts dry with low pressure compressed air.
2. Replace control cables if frayed, kinked or bent.
3. Put one or two drops of oil into housing of each cable.

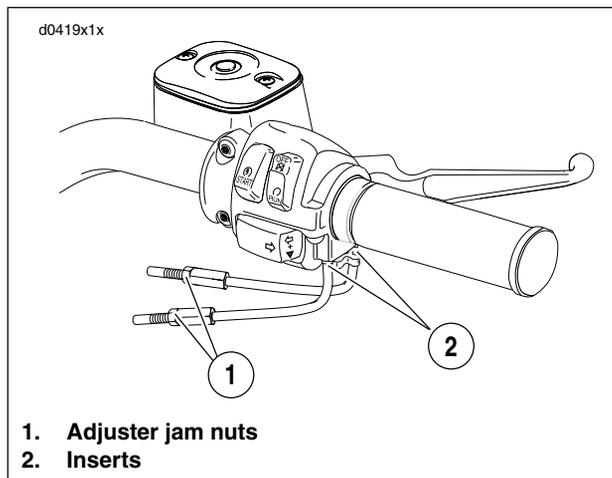


Figure 2-28. Handlebar Throttle Control

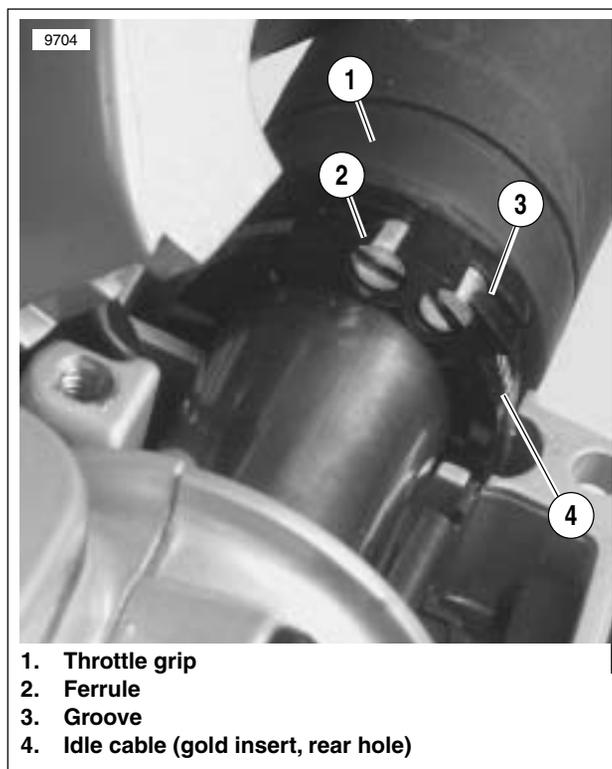


Figure 2-29. Throttle Cable Attachment

ASSEMBLY AND INSTALLATION

1. Apply a light coating of graphite to handlebar and inside surface of housings.
2. See [Figure 2-29](#). Attach control cable assemblies to lower housing.
 - a. Push silver insert of the cable housing into hole in front of tension adjuster screw. Snap in retaining ring.
 - b. Push gold insert of idle cable housing into hole at rear of tension adjuster screw. Snap in retaining ring.
 - c. Install adjusting screw, spring and friction pad in lower housing if they were removed.
3. Position throttle grip on the handlebar. Place lower housing on throttle grip.
4. Fit ferrules (2) over cable balls. Slide ferrules into throttle notches and rotate so cables fit grooves (3) in throttle grip.
5. Fasten upper housing to lower housing using two screws. Tighten to 4-5 Nm (35-45 in-lbs).
6. Route throttle cables through right side hole in upper fork clamp and behind radiator cover along side battery.

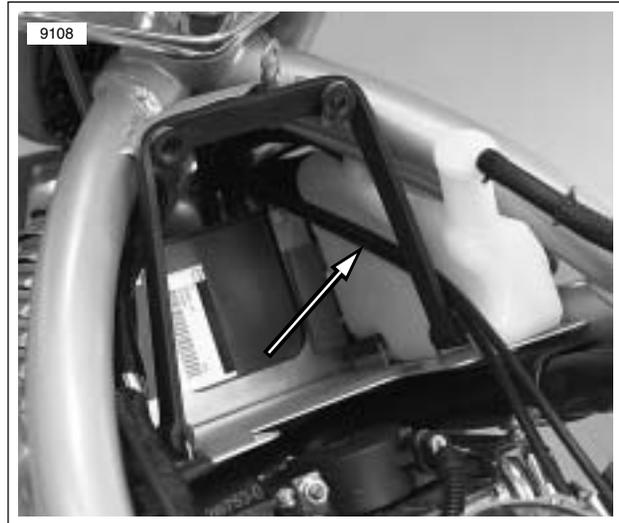


Figure 2-30. Throttle Cable Routing

CAUTION

Throttle cables must be routed alongside battery between hold down strap and coolant overflow bottle. Routing throttle cables over battery and/or under battery hold down strap can cause damage to cable coverings and cables.

7. Insert throttle cable barrels on throttle cam and fit cables into guides.

WARNING

Do not tighten the friction adjustment screw to the point where the engine will not return to idle automatically. This could lead to an accident which could result in death or serious injury.

8. Adjust cables for correct throttle opening and closing. See [1.22 THROTTLE CABLES](#).
9. Install airbox. See [1.4 AIRBOX AND AIR FILTER](#).

GENERAL

The clutch is hydraulically actuated. Squeezing the clutch hand lever causes the clutch master cylinder to apply pressure via the clutch fluid in the clutch line to the secondary clutch actuator mounted to the engine right side cover. The secondary clutch actuator piston extends and contacts the clutch release bearing which disengages the clutch.

A bleeder screw at the secondary clutch actuator allows bleeding air from the clutch lines. D.O.T. 5 SILICONE BRAKE FLUID is used in the clutch system.

Check the clutch fluid level in the clutch fluid reservoir on left handlebar. If the sight gauge is dark, the fluid level in the reservoir is above the sight gauge prism and the reservoir is full. If the sight gauge appears clear, the fluid level is below the sight gauge prism and the fluid level should be checked. Fluid level should be level with the internal shelf marked **FILL LEVEL** with the motorcycle upright.

CAUTION

D.O.T. 5 SILICONE BRAKE FLUID is used for the hydraulic clutch and is referred to as clutch fluid in this manual. Do not use other types of fluid as they are not compatible.

REMOVAL

1. While holding turn signal locknut underneath clutch lever/master cylinder assembly, unthread mirror (counterclockwise). Remove mirror and turn signal.
2. Remove electrical controls.

CAUTION

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

3. See [Figure 2-31](#). Loosen, but do not remove, screws (10) with flat washers (9) that detach handlebar clamp (8) from clutch master cylinder/reservoir.
4. Loosen both screws (3) on cover (1) to relieve pressure in master cylinder reservoir.

WARNING

Be sure NO clutch fluid gets on tires, wheels, or brakes when draining clutch fluid. Traction will be adversely affected which could result in loss of control of the motorcycle and death or serious injury.

NOTE

Place a large cup under the banjo fitting. Hydraulic fluid will begin draining from the reservoir as the banjo bolt is removed.

CAUTION

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

5. Slowly loosen banjo bolt (6) and allow clutch fluid from reservoir to drain into cup.

IMPORTANT NOTE

Dispose of clutch fluid in accordance with local regulations.

6. Remove banjo bolt (6) and two steel/rubber washers (7) to disconnect fitting of hydraulic clutch fluid line (5) from clutch reservoir and master cylinder. Discard steel/rubber washers.

NOTE

To prevent the rest of the clutch fluid from draining from the clutch line and secondary clutch actuator, support the banjo fitting and clutch fluid line upright. Plug the banjo bolt hole with a finger to transfer the assembly to a workbench without spilling clutch fluid.

7. Remove handlebar clamp screws and take clamp and clutch master cylinder/reservoir assembly to a workbench.

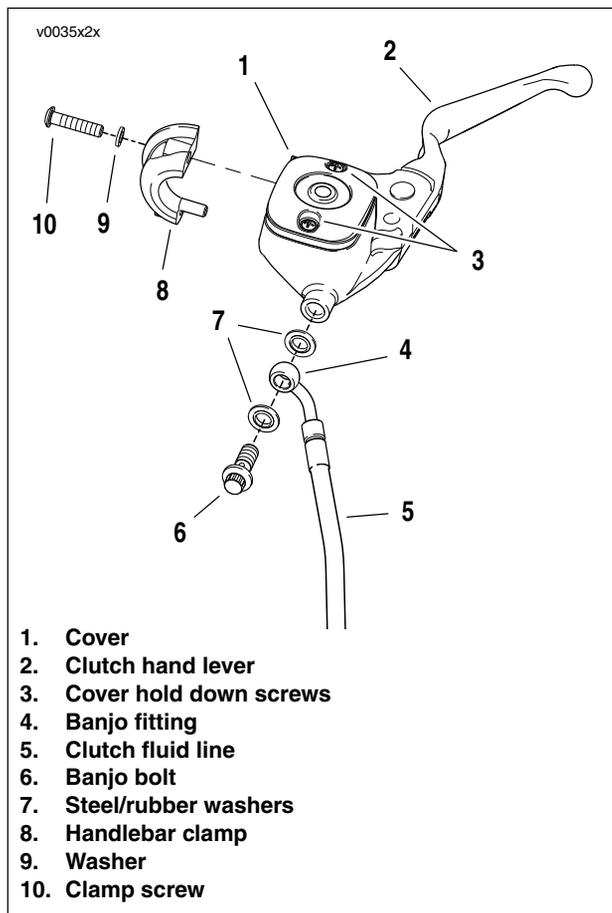


Figure 2-31. Clutch Master Cylinder/Reservoir

DISASSEMBLY

CAUTION

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

1. Drain additional clutch fluid from master cylinder/reservoir.
2. Remove screws securing master cylinder cover. Remove cover and gasket. Turn housing upside down to remove remaining clutch fluid from reservoir.

WARNING

Always wear proper eye protection when removing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause death or serious injury.

3. Remove retaining ring from pivot pin groove.

NOTE

To take the piston spring load off the pin and remove the pivot pin, gently force the clutch lever toward the piston (as if operating the clutch).

4. Remove pivot pin through top of housing. Remove and save pivot pin and clutch lever.
5. See Figure 2-32. Using a toothpick or small screwdriver, gently pry outer edge of piston boot (1) out of piston bore.
6. Remove piston (2) and spring (4).

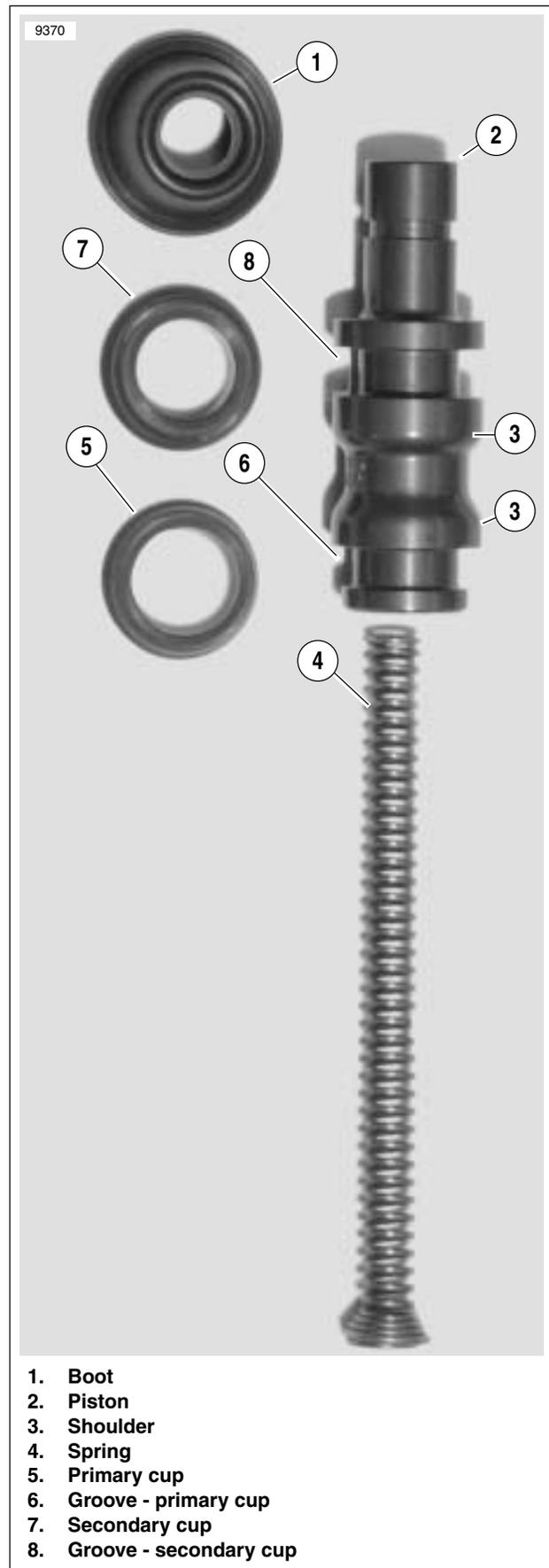
WARNING

Always use denatured alcohol or D.O.T. 5 SILICONE BRAKE FLUID to clean clutch system components. Do not use mineral base solvents (such as gasoline or paint thinner) or deterioration of rubber parts may occur after assembly. Deterioration of components may result in premature brake failure and death or serious injury. Wipe the housing with a lint free cloth. With a clean air supply, blow out drilled passages and bore in the master cylinder housing.

NOTE

Do not use a wire or sharp instrument to clean drilled oil passages.

7. Inspect cylinder housing bore for scoring, pitting or corrosion. Also check outlet port for damage. Replace housing if necessary.
8. Inspect the cover, sight glass, and gasket for cuts, tears or general deterioration.



1. Boot
2. Piston
3. Shoulder
4. Spring
5. Primary cup
6. Groove - primary cup
7. Secondary cup
8. Groove - secondary cup

Figure 2-32. Clutch Master Cylinder Components

ASSEMBLY

To rebuild clutch master cylinder, use the components found in the SERVICE PARTS KIT No. 46244-01.

1. See [Figure 2-32](#). Lightly lubricate inside of primary cup (5) and fit over lip on spring end of piston (2) so the closed end (small ID) contacts evenly with the shoulder (3) in primary cup groove (6).
2. Lightly lubricate inside of secondary cup (7) (steep taper from center to outside diameter) and fit over the lip on outboard end of piston (2) so that flared end is open toward the shoulder (3) of the secondary cup groove (8).
3. Install boot (1), large sealing ID first, on piston (2) until seal on smaller ID fits snugly into thin groove in piston.

NOTE

See [Figure 2-33](#). The flared ends of the primary cup and the secondary cup face the spring end of the piston.

4. Using lubricant in SERVICE PARTS KIT (Part No. 46244-01) thoroughly coat outside diameters of primary and secondary cups. Coat master cylinder piston bore.
5. With tapered end out, install spring (4) into opening on inboard side of piston assembly.
6. Align and install piston assembly into bore. Firmly press on flat end of piston, compressing spring, until the entire assembly slides into cylinder bore.

NOTE

When fitting the piston sealing boot, be careful not to tear, perforate or damage the piston sealing boot.

7. Compress piston until it is even with the end of bore. Using a small dull bladed screwdriver or similar tool, gently work around sealing edges of boot until entire circumference of boot is seated in cylinder bore groove.
8. If cover 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 lubrication is necessary, use clean D.O.T. 5 SILICONE BRAKE FLUID.
9. Install cover with gasket on master cylinder reservoir. Install two screws to fasten the cover to reservoir, but do not tighten.

⚠ WARNING

Always wear proper eye protection when installing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause death or serious injury.

10. To install existing clutch hand lever, install clutch hand lever, pivot pin, and a **new** retaining ring.
11. To install a replacement clutch hand lever, use SERVICE PARTS KIT (Part No. 46243-01). See [2.14 CLUTCH HAND LEVER](#).

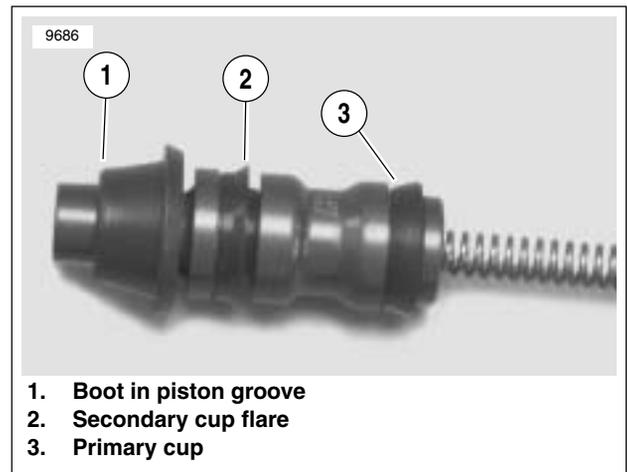


Figure 2-33. Assembled Cups and Piston

INSTALLATION

1. See [Figure 2-31](#). Attach master cylinder/reservoir to handlebars with handlebar clamp (8). Orient lever to rider position and tighten two clamp screws (10) to 8-9 Nm (71-80 in-lbs).
2. Attach banjo fitting (4) of clutch fluid line to master cylinder with **new** steel/rubber washers. Install electrical controls.
3. Remove secondary clutch actuator cover and loosen bleeder screw.
4. Fill reservoir with D.O.T. 5 SILICONE BRAKE FLUID. Allow fluid to fill clutch line until a steady flow of clutch fluid flows from bleeder screw. Finger tighten bleed screw.
5. Bleed clutch line. See [1.13 BLEEDING CLUTCH FLUID LINE](#).
6. Verify that fluid level in clutch fluid reservoir is at FILL LEVEL with motorcycle upright.

NOTE

Clutch fluid volume increases with clutch wear. Do not overfill clutch reservoir.

7. Verify pressure by squeezing clutch hand lever.
8. Tighten fasteners as follows:
 - a. Banjo bolt (6) to 23-31 Nm (17-23 ft-lbs).
 - b. Bleeder screw to 9-11 Nm (80-100 in-lbs).
 - c. Reservoir cover screws to 0.7-0.9 Nm (6-8 in-lbs).
 - d. Secondary clutch actuator cover mounting bolts to 6-10 Nm (53-88 in-lbs).

⚠ WARNING

Check for proper turn signal lamp operation before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have proper lamp operation could result in death or serious injury.

9. Install rear view mirror and turn signals.
10. Test ride motorcycle.

INSTALLATION

To install a **new** clutch hand lever, use components found in SERVICE PARTS KIT (Part No. 46243-01).

1. See Figure 2-34. Slide bushing cups (3) onto pins of roller with cup flanges against roller.

NOTE

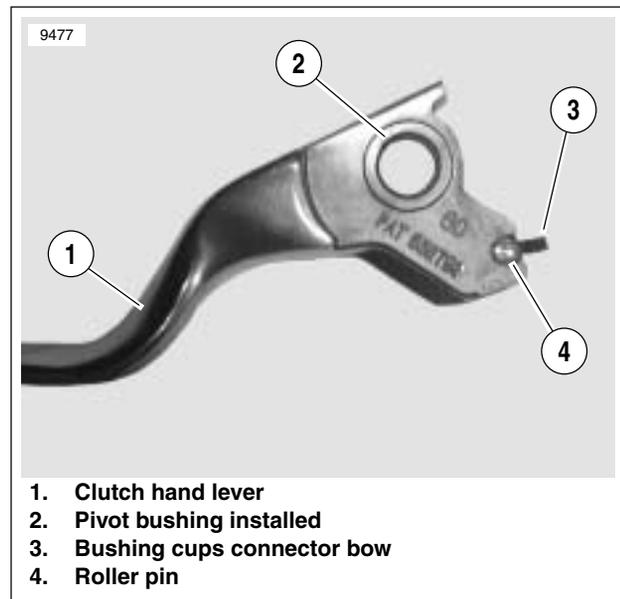
Be careful when handling the bushing cups. The bushing cups are hard plastic and can be easily broken.

2. With connector bow (3) portion of the bushing cups parallel with groove in clutch handle, snap roller pin (4) with the bushing cups installed into clutch lever roller groove. If bushing is positioned correctly, roller/bushing assembly will install with a snap and will be held securely.
3. Lightly grease pivot bushing (2) and install into clutch hand lever (1) pivot hole. Position bushing until it is flush with both sides of lever.

NOTE

If the clutch master cylinder/reservoir is full of clutch fluid under pressure, it may be necessary to apply force to the hydraulic piston (in the clutch hand lever mount) in order to align the clutch hand lever and to allow the pivot pin to be inserted.

4. Orient clutch lever in lever mounting bracket. Insert pivot pin from top and tap into place.
5. Install retaining ring on pivot pin.



1. Clutch hand lever
2. Pivot bushing installed
3. Bushing cups connector bow
4. Roller pin

Figure 2-34. Clutch Hand Lever

REMOVAL

Inspect the clutch fluid line for wear, damage, and leaks. Replace if necessary.

1. Remove secondary clutch actuator cover from left side clutch cover.

⚠ WARNING

Be sure **NO** clutch fluid gets on rear tire, wheel or brakes when draining clutch fluid. Traction will be adversely affected which could result in loss of control of the motorcycle and death or serious injury.

2. Place a suitable container under secondary clutch actuator. Loosen flare nut and allow clutch fluid to drain from clutch line.

IMPORTANT NOTE

Dispose of clutch fluid in accordance with local regulations.

3. Remove banjo bolt and two steel/rubber washers to disconnect fitting of hydraulic clutch fluid line from clutch reservoir and master cylinder. Discard washers.
4. See [Figure 2-35](#). Remove clutch fluid line from clips on frame.
5. Carefully thread banjo fitting end of clutch line out through upper triple clamp. Thread flare nut end of clutch line out through bottom of motorcycle and remove clutch line through front down tubes.

INSTALLATION

1. Route clutch line banjo fitting up through upper triple clamp, then route line behind steering head over to right frame rail and along inside of rail under engine and back up between bottom frame rails to loop out and forward to secondary clutch actuator mounted on clutch cover.
2. Thread in and finger tighten flare nut fastening clutch fluid line to secondary clutch actuator.
3. Attach banjo fitting of the clutch fluid line to master cylinder with **new** steel/rubber washers.
4. Reinstall all clutch line clips in corresponding locations along frame.

⚠ WARNING

Be sure **NO** clutch fluid gets on rear tire, wheel or brakes when adding clutch fluid. Traction will be adversely affected which could result in loss of control of the motorcycle and death or serious injury.

⚠ WARNING

Do **NOT** allow foreign matter to enter the clutch master cylinder reservoir. Dirt or debris in the reservoir may cause improper operation of the clutch and equipment damage.

⚠ WARNING

Direct contact of D.O.T. 5 SILICONE BRAKE FLUID with eyes may cause eye irritation, swelling, and redness. Avoid eye contact. In case of eye contact flush with large amounts of water and seek medical attention immediately. Swallowing large amounts of D.O.T. 5 SILICONE BRAKE Fluid may cause digestive discomfort. If swallowed, seek medical attention immediately. Use in well ventilated area. **KEEP OUT OF REACH OF CHILDREN.**

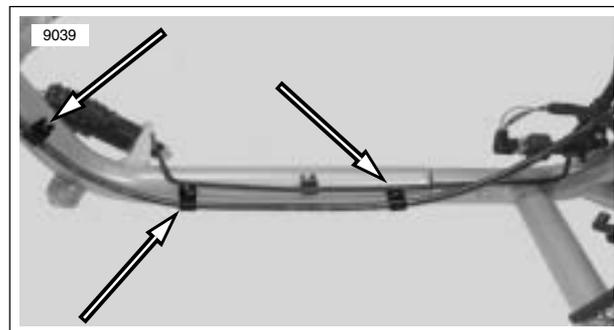


Figure 2-35. Clutch Fluid Line Clips

5. Remove secondary clutch actuator cover and loosen bleeder screw.
6. Fill reservoir with D.O.T. 5 SILICONE BRAKE FLUID. Allow fluid to fill clutch line until a steady flow of clutch fluid flows from bleeder screw. Finger tighten bleed screw.

NOTE

A Snap-on BASIC VACUUM BRAKE BLEEDER with a fitting that mates to the bleed screw threads can be used to draw the fluid down the clutch line.

7. Bleed clutch line. See [1.13 BLEEDING CLUTCH FLUID LINE](#).
8. Verify that fluid level in clutch fluid reservoir is at **FILL LEVEL** with motorcycle upright.

NOTE

Clutch fluid volume increases with clutch wear. Do not overfill clutch reservoir.

9. Test pressure by squeezing clutch hand lever.
10. Tighten fasteners as follows:
 - a. Banjo bolt (6) to 23-31 Nm (17-23 ft-lbs).
 - b. Clutch line flare nut to 9-13 Nm (80-115 in-lbs).
 - c. Bleeder screw to 9-11 Nm (80-100 in-lbs).
 - d. Reservoir cover screws to 0.7-0.9 Nm (6-8 in-lbs).
 - e. Secondary clutch actuator cover mounting bolts to 6-10 Nm (53-88 in-lbs).
11. Test ride motorcycle.

REMOVAL

1. Remove secondary clutch actuator cover.
2. See Figure 2-36. Remove mounting bolts (2) holding secondary clutch actuator (4) to clutch cover.

⚠ WARNING

The piston in the secondary clutch actuator is under pressure. Squeezing the clutch hand lever could push the piston out of its housing with sufficient force to cause death or serious injury.

3. See Figure 2-37. Inspect O-ring (2). Replace if necessary and re-install actuator.

IMPORTANT NOTE

Dispose of clutch fluid in accordance with local regulations.

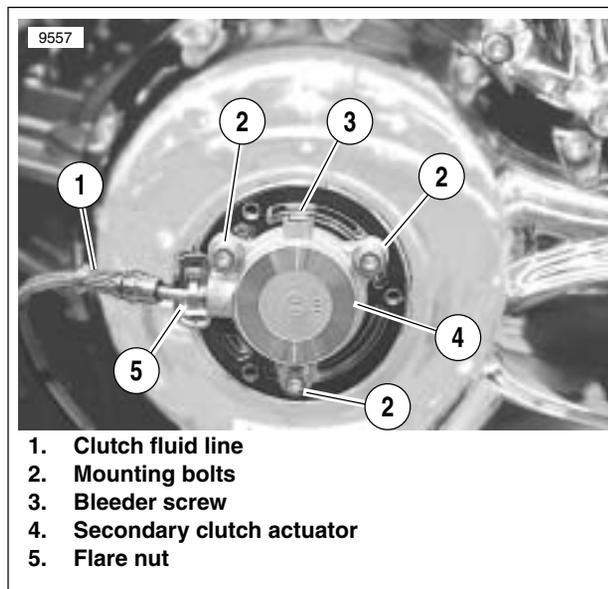
4. See Figure 2-36. If condition indicates replacement of secondary actuator:
 - a. Place a suitable container under secondary clutch actuator (4). Loosen flare nut (5) and allow clutch fluid to drain from clutch line (1).
 - b. Remove flare nut and remove actuator.
 - c. Remove bleeder screw and drain remaining clutch fluid.

DISASSEMBLY

1. See Figure 2-38. Remove O-ring (3) from bleeder screw (2).
2. Pull off boot (8), piston (7), seal (6), and spring (5) from housing (1). Slip O-ring (4) off housing.
3. Clean with denatured alcohol or D.O.T. 5 SILICONE BRAKE FLUID only.
4. Use air hose to clean inlet and bleeder ports.
5. Inspect cylinder housing bore for scoring, pitting or corrosion. Inspect inlet and bleeder ports. Replace housing if necessary.

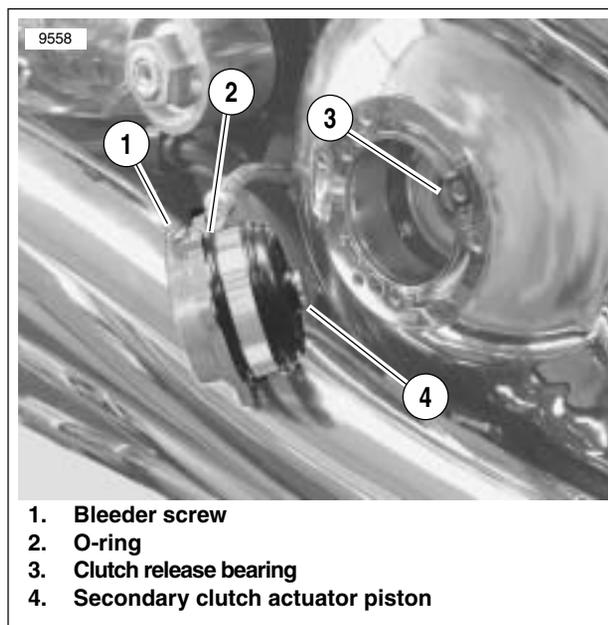
ASSEMBLY

1. See Figure 2-38. Coat cylinder bore, piston, O-ring, boot, and bleeder screw with lubricant from service kit.
2. Orient a **new** seal (6) with square split lip toward rider side of actuator and fit to piston (7).
3. Insert spring into cylinder bore and insert piston into cylinder bore. Compress and guide seal lip as piston is pressed into bore.
4. Install a **new** O-ring (4) into groove at base of secondary clutch actuator housing (1).
5. Fit boot (8) to piston (7) and push edge of boot over machined lip around housing (1).
6. Fit new O-ring (3) to bleeder screw (2) and loosely install into housing.



1. Clutch fluid line
2. Mounting bolts
3. Bleeder screw
4. Secondary clutch actuator
5. Flare nut

Figure 2-36. Secondary Clutch Actuator Installed



1. Bleeder screw
2. O-ring
3. Clutch release bearing
4. Secondary clutch actuator piston

Figure 2-37. Secondary Clutch Actuator

INSTALLATION

1. Install clutch fluid line flare nut to secondary clutch actuator. Tighten to 9-13 Nm (80-115 **in-lbs**).
2. Loosen bleeder screw.

⚠ WARNING

Be sure **NO** clutch fluid gets on rear tire, wheel or brakes when adding clutch fluid. Traction will be adversely affected which could result in loss of control of the motorcycle and death or serious injury.

⚠ WARNING

Do **NOT** allow foreign matter to enter the clutch master cylinder reservoir. Dirt or debris in the reservoir may cause improper operation of the clutch and equipment damage.

⚠ WARNING

Direct contact of **D.O.T. 5 SILICONE BRAKE FLUID** with eyes may cause eye irritation, swelling, and redness. Avoid eye contact. In case of eye contact flush with large amounts of water and seek medical attention immediately. Swallowing large amounts of **D.O.T. 5 SILICONE BRAKE Fluid** may cause digestive discomfort. If swallowed, seek medical attention immediately. Use in well ventilated area. **KEEP OUT OF REACH OF CHILDREN.**

⚠ WARNING

The piston in the secondary clutch actuator is under pressure. Squeezing the clutch hand lever could force the piston out of its housing with sufficient force to cause death or serious injury.

3. Fill reservoir with **D.O.T. 5 SILICONE BRAKE FLUID**. Allow fluid to fill clutch line until a steady flow of clutch fluid flows from bleeder screw. Tighten bleeder screw.

NOTE

When filling an empty clutch fluid line, a Snap-on **BASIC VACUUM BRAKE BLEEDER** with a fitting that mates to the bleeder screw threads can be used to initially draw the fluid down the clutch line with little or no air in the line.

4. Bleed clutch fluid line. See [1.13 BLEEDING CLUTCH FLUID LINE](#).
5. Tighten fasteners as follows:
 - a. Banjo bolt to 23-31 Nm (17-23 **ft-lbs**).
 - b. Bleeder screw to 9-11 Nm (80-100 **in-lbs**).
 - c. Reservoir cover screws to 0.7-0.9 Nm (6-8 **in-lbs**).

6. Determine sufficient piston travel.

NOTE

Insufficient piston travel may indicate a fluid or pressure leak somewhere in the actuator, clutch fluid line, or clutch master cylinder.

7. Press secondary clutch actuator into its mounting flange on crankcase cover. Install fasteners and tighten to 10 Nm (88 **in-lbs**).
8. Install secondary clutch actuator cover. Tighten to 6-10 Nm (53-88 **in-lbs**).

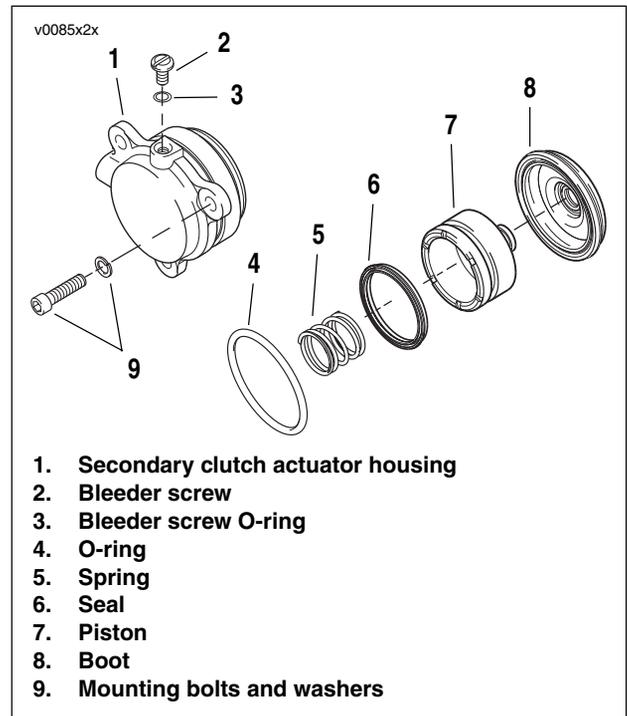


Figure 2-38. Secondary Clutch Actuator Components

REMOVAL AND DISASSEMBLY

NOTE

Master cylinders designed for dual disc (two caliper) operation have an 17.5 mm (11/16 in.) bore.

1. Open bleeder nipple caps on front brake calipers. Install clear plastic tubing over each caliper bleeder valve, while placing free ends in a suitable container. Open bleeder valves about 1/2-turn. Pump brake hand lever to drain brake fluid from reservoir. Close bleeder valve. See 1.9 BLEEDING BRAKES.

CAUTION

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

2. See Figure 2-40. Remove banjo bolt (8) and two steel/rubber washers (7) to disconnect fitting of hydraulic brake line from front brake master cylinder. Discard banjo washers.

CAUTION

Do not remove the master cylinder assembly without first placing a 4 mm (5/32 inch) thick cardboard insert between the brake lever and lever bracket. Removal without the insert may result in damage to the rubber boot and plunger of the front stoplight switch.

3. See Figure 2-39. Place cardboard insert (2) between brake lever and lever bracket.
4. See Figure 2-40. Remove screw and washer (21) to detach handlebar clamp (20) from master cylinder reservoir (5).

WARNING

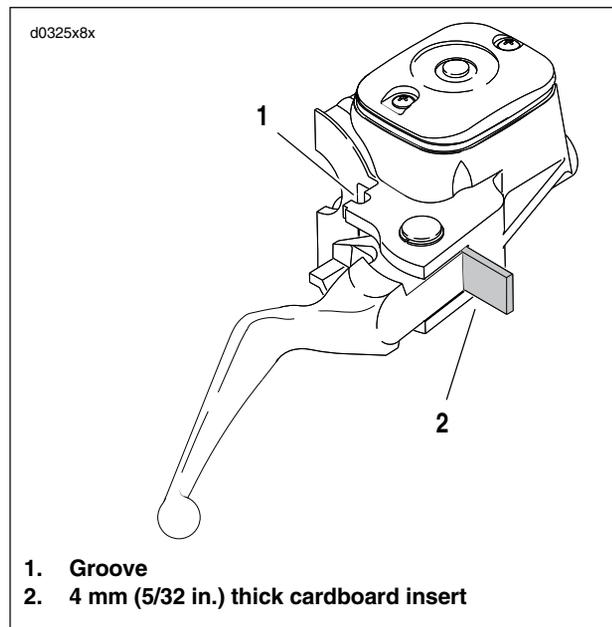
Always wear proper eye protection when removing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause serious eye injury.

5. Remove retaining ring (12) from pivot pin (22) groove.
6. Remove pivot pin (22) and brake hand lever (11).
7. Carefully remove wiper (18) with pick or similar tool.
8. Remove piston cup (19).
9. Remove piston (16) with O-ring (17) and primary cup (15).
10. Remove spring (14).

CAUTION

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

11. Remove both screws (1), cover (3) and the cover gasket (4).



1. Groove
2. 4 mm (5/32 in.) thick cardboard insert

Figure 2-39. Front Brake Master Cylinder and Reservoir

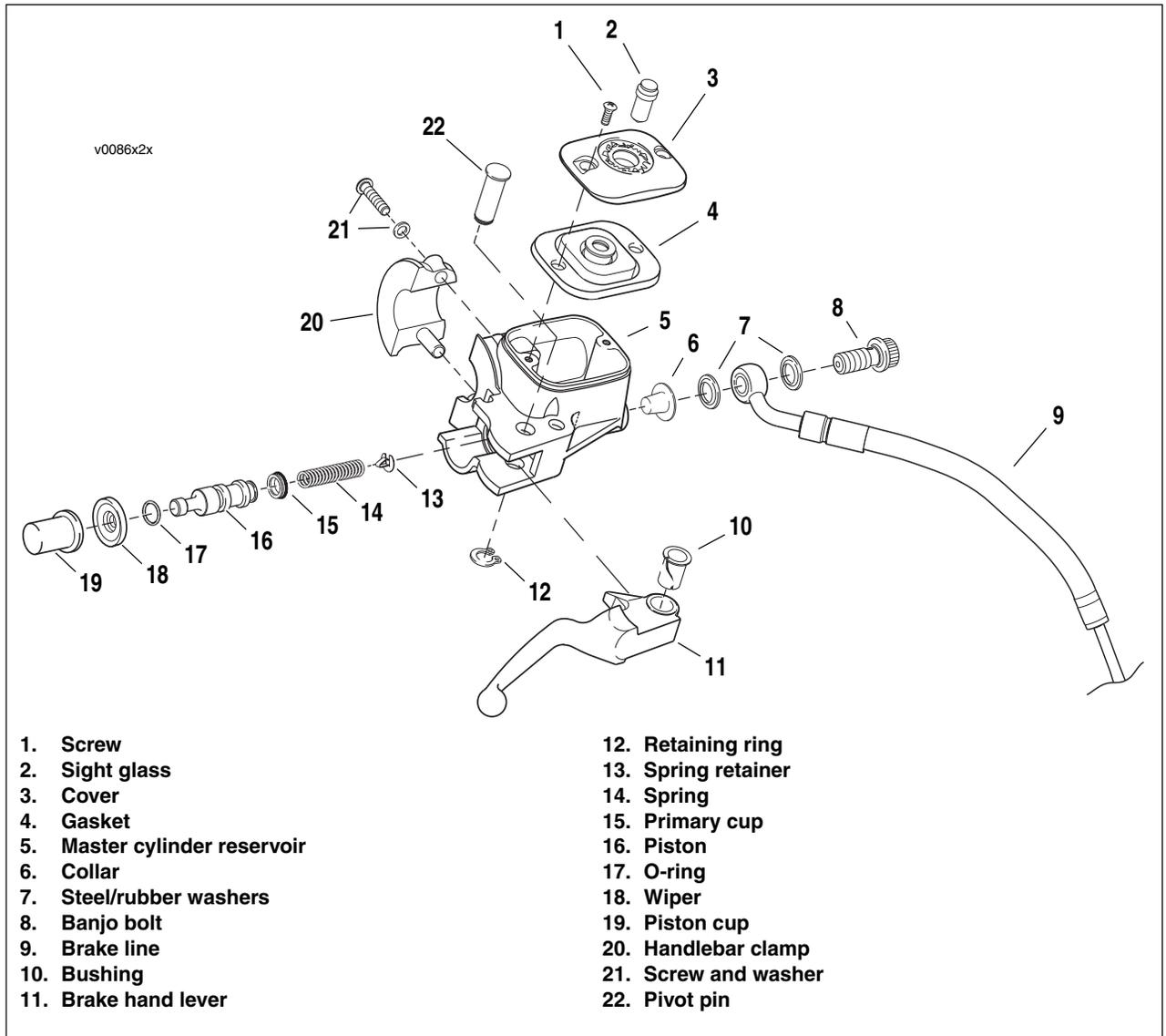


Figure 2-40. Front Brake Master Cylinder

CLEANING AND INSPECTION

1. Always assemble master cylinder using **new** parts from repair kit.

WARNING

Clean brake system components using denatured alcohol. Do not use mineral-base cleaning solvents, such as gasoline or paint thinner. Use of mineral-base solvents causes deterioration of rubber parts that continues after assembly. This may result in improper brake operation which could result in death or serious injury.

2. Clean all parts with denatured alcohol or D.O.T. 5 SILICONE BRAKE FLUID. Do not contaminate with mineral oil or other solvents. Wipe dry with a clean, lint free cloth.

WARNING

Low pressure compressed air can blow debris into your face and eyes. Always wear eye protection and a face shield when using pressurized air. Failure to take adequate safety precautions could result in death or serious injury.

3. 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.
4. Carefully inspect all parts for wear or damage and replace as necessary.
5. Inspect piston bore in master cylinder housing for scoring, pitting or corrosion. Replace housing if any of these conditions are found.
6. Inspect outlet port that mates with brake line fitting. If any scratches, dents or other damage is found on this critical sealing surface, replace housing.
7. Inspect cover, sight glass and 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 lubrication is necessary, use clean brake fluid.

ASSEMBLY

To rebuild front brake master cylinder, use the components found in the SERVICE PARTS KIT No. 45072-96C.

1. See [Figure 2-40](#). Fit O-ring (17) into groove at front of piston (16).
2. Fit primary cup (15) over lip at back of piston (16) so that closed side (smaller OD) contacts shoulder.
3. Coat piston bore of housing with special lubricant supplied in the service parts kit. Also apply the lubricant to OD of installed O-ring (17) and primary cup (15).
4. Clip spring retainer (13) onto end of spring and insert spring (14) into master cylinder bore so that spring retainer snaps into the recess at bottom.
5. Slide piston (16) over spring.
6. Fit wiper (18) over piston cup (19) so that the flat side of wiper contacts cup shoulder.
7. Fit piston cup (19) over piston (16).
8. Press down on wiper (18) until it contacts counterbore. Larger OD of wiper must be completely seated in groove on outlet side of piston bore.
9. Install cover (3) with gasket (4) on master cylinder reservoir. Install two screws (1) to fasten the cover to reservoir, but do not tighten at this time.
10. Align hole in brake hand lever (11) with hole in master cylinder reservoir (5). From top of assembly, slide pivot pin (22) through reservoir (5) and hand lever (11).

WARNING

Always wear proper eye protection when installing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause death or serious injury.

11. Install retaining ring (12) in pivot pin groove. Verify that retaining ring is completely seated in groove.

INSTALLATION

CAUTION

See [Figure 2-39](#). Do not install the master cylinder assembly without first placing the 4 mm (5/32 in.) thick cardboard insert (or cable strap eyelet) between the brake lever and lever bracket. Installation without the insert may result in damage to the rubber boot and plunger of the front stoplight switch.

1. See [Figure 2-41](#). Position brake lever/master cylinder assembly inboard of switch housing assembly engaging tab (2) on lower switch housing (1) in groove (3) at top of brake lever bracket (4).
2. Align holes in handlebar clamp with those in master cylinder housing and start both screws with flat washers. Position for rider posture. Beginning with top screw, tighten to 38-72Nm (28-53 ft-lbs).

CAUTION

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

3. Lubricate **new** steel/rubber washers with D.O.T. 5 SILICONE BRAKE FLUID. Position **new** steel/rubber washers on each side of hydraulic brake line fitting. Insert bolt through washers and fitting. Thread banjo bolt into master cylinder housing and tighten to 23-31 Nm (17-22 ft-lbs).
4. Install length of clear plastic tubing over caliper bleeder valve, if removed. Place free end of tube in a clean container.
5. Stand the motorcycle upright so that master cylinder is level. Remove master cylinder cover.

CAUTION

Direct contact of D.O.T. 5 brake fluid with eyes may cause eye irritation, swelling, and redness. Avoid eye contact. In case of eye contact flush with large amounts of water and get medical attention. Swallowing large amounts of D.O.T. 5 brake fluid may cause digestive discomfort. If swallowed, obtain medical attention. Use in well ventilated area. **KEEP OUT OF REACH OF CHILDREN.**

6. Add D.O.T. 5 SILICONE BRAKE FLUID to master cylinder reservoir until fluid level is 1/8 inch (3.2 mm) from top. Do not reuse old brake fluid. Use only D.O.T. 5 SILICONE BRAKE FLUID from a sealed container.

WARNING

Whenever the brake line is reconnected, **BEFORE** moving motorcycle, you must pump brake fluid until the pistons push the pads against the brake disc. If you don't pump fluid pressure up again, the brakes will not be available to stop the motorcycle which could result in death or serious injury.

7. Bleed brake system. See [1.9 BLEEDING BRAKES](#).

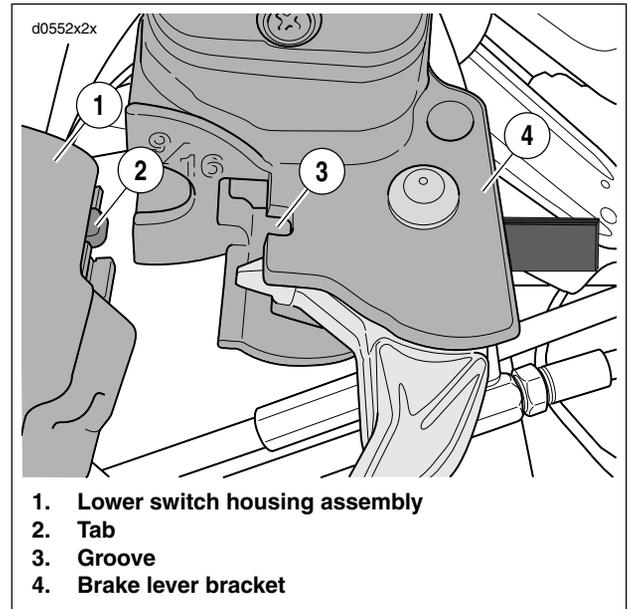


Figure 2-41. Master Cylinder and Brake Lever Bracket To Handlebar Switch Housing

WARNING

A plugged or covered relief port can cause brake drag or lockup, which may result in loss of vehicle control which could result in death or serious injury.

8. Verify operation of master cylinder relief port. Actuate brake hand lever with cover removed. A slight spurt of fluid will break the surface if all internal components are working properly.
9. Install gasket and cover on master cylinder. Tighten cover screws to 0.7-0.9 Nm (6-8 in-lbs).

WARNING

After completing repairs or bleeding the system, always test motorcycle brakes at low speed. If brakes are not operating properly or braking efficiency is poor, testing at high speeds could result in death or serious injury.

10. Test brake system.
 - a. Turn ignition switch ON. Pump brake hand lever to verify operation of brake lamp.
 - b. Test ride motorcycle. If the brakes feel spongy, bleed the system again. See [1.9 BLEEDING BRAKES](#).

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

NOTE

If only replacing brake pads, see [1.10 BRAKE PADS AND DISCS](#).

CAUTION

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

1. See [Figure 2-42](#). Remove banjo bolt (1) and both steel/rubber washers (2) to detach front brake line (3) from caliper. Discard washers.
2. Remove both upper (4) and lower (5) mounting bolts. Lift caliper upward to remove from brake disc.
3. Repeat for opposite side caliper.

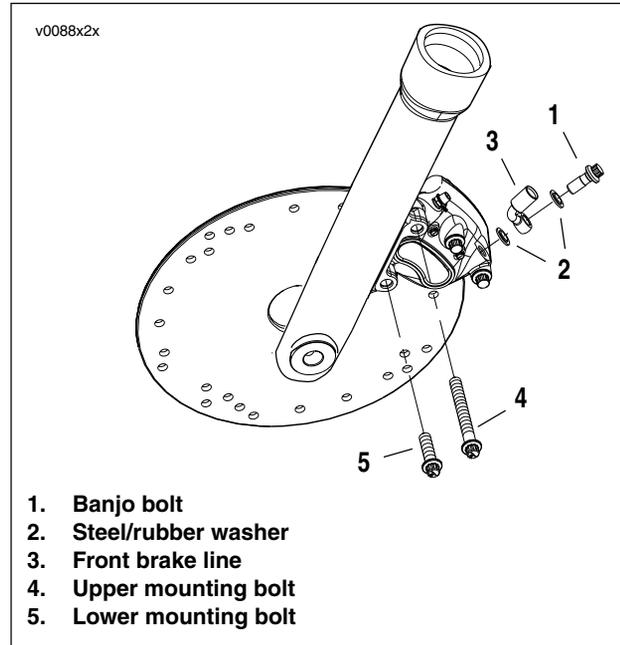


Figure 2-42. Front Brake Caliper Mounting

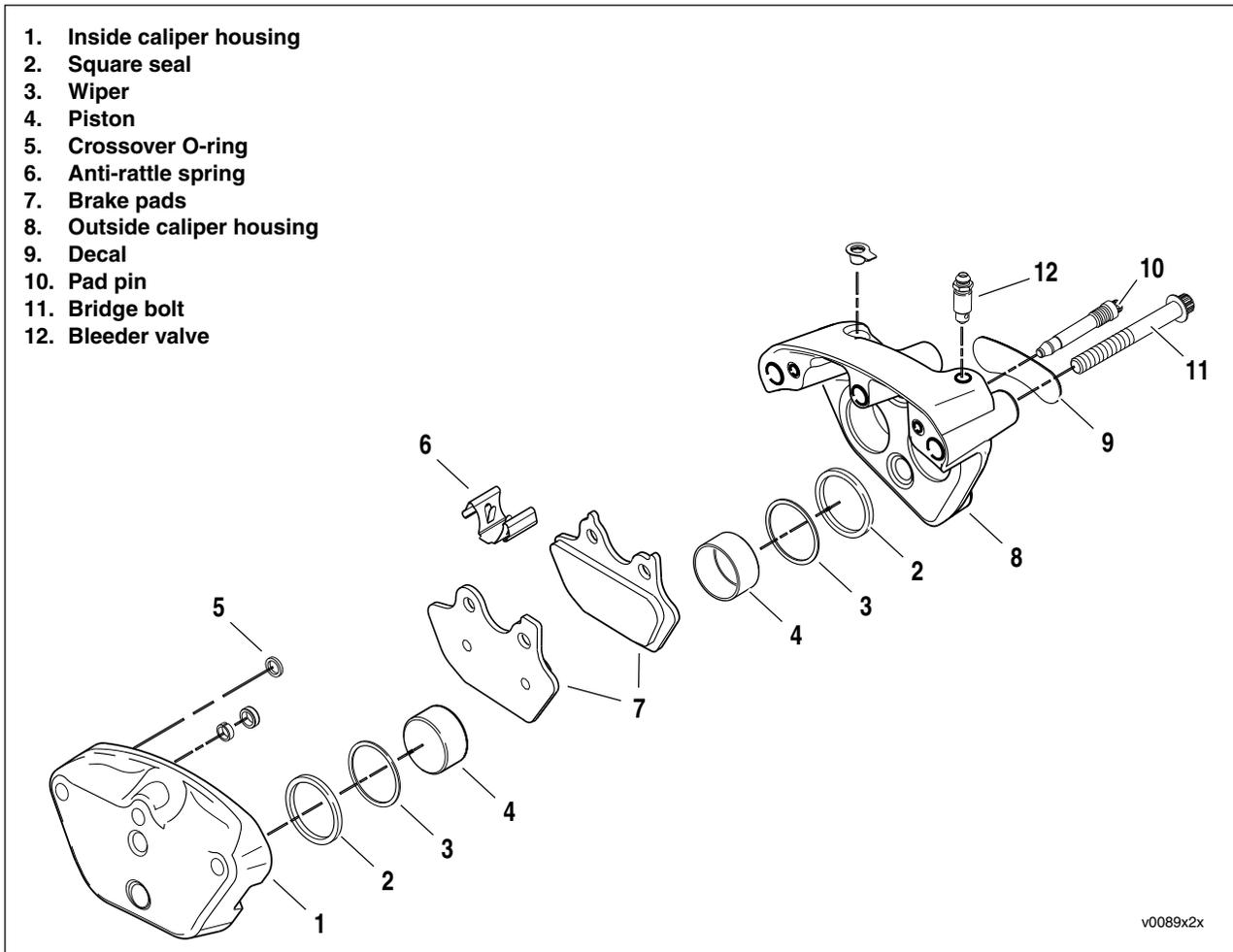


Figure 2-43. Front Brake Caliper

DISASSEMBLY

PART NO.	SPECIALTY TOOL
HD-43293	Brake caliper piston remover

- See [Figure 2-43](#). Remove pad pins (10), brake pads (7) and bridge bolts (11) to separate caliper housings (1, 8).
- Remove anti-rattle spring (6). If necessary, remove bleeder valve (12).
- See [Figure 2-45](#). Remove pistons.
 - Place BRAKE CALIPER PISTON REMOVER (Part No. HD-43293) between caliper housings.
 - Insert two bridge bolts (2) and tighten securely.
 - If the bleeder valve was removed, loosely reinstall or place a gloved finger over the bleeder valve hole on the outside caliper housing.

WARNING

Low pressure compressed air can blow debris into your face and eyes. Always wear eye protection or a face shield when using pressurized air. Failure to take adequate safety precautions could result in death or serious injury.

- Apply low pressure compressed air (1) to banjo bolt hole to remove pistons from caliper bores.
 - Remove bridge bolts and remove tool.
- See [Figure 2-46](#). Remove and discard both crossover O-rings (1) from inside caliper housing.
 - If necessary, wiggle pistons (2) from caliper bores to completely remove.

CAUTION

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

- See [Figure 2-44](#). Using a wooden toothpick (1), remove a wiper (2) and square seal (3) from each caliper bore. Discard all removed parts.
- Repeat for opposite caliper.

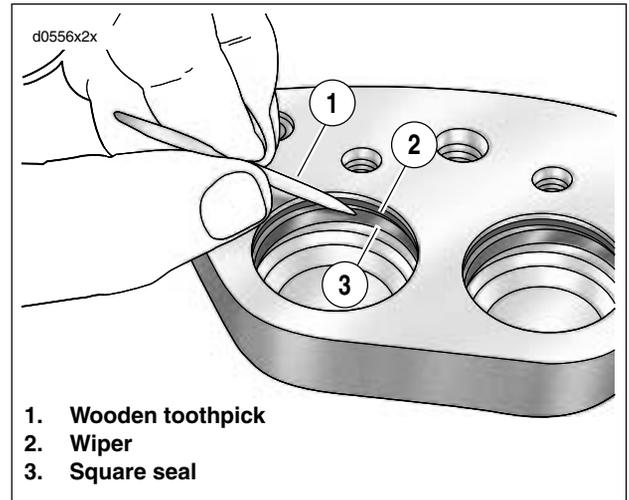


Figure 2-44. Wipers and Square Seals

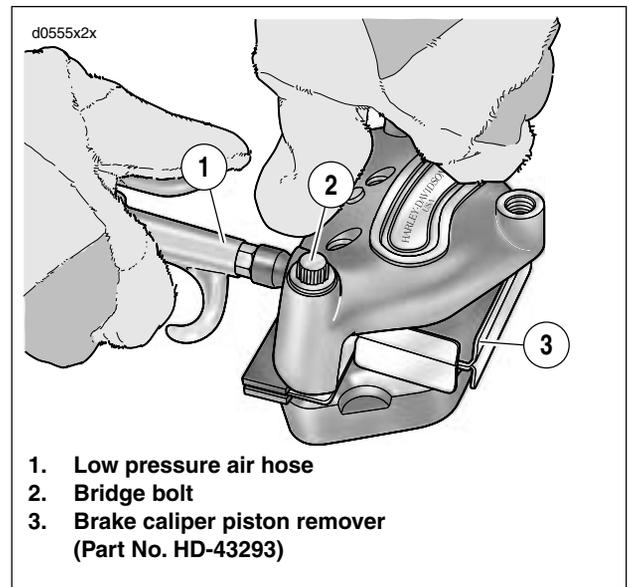


Figure 2-45. Unseating Pistons

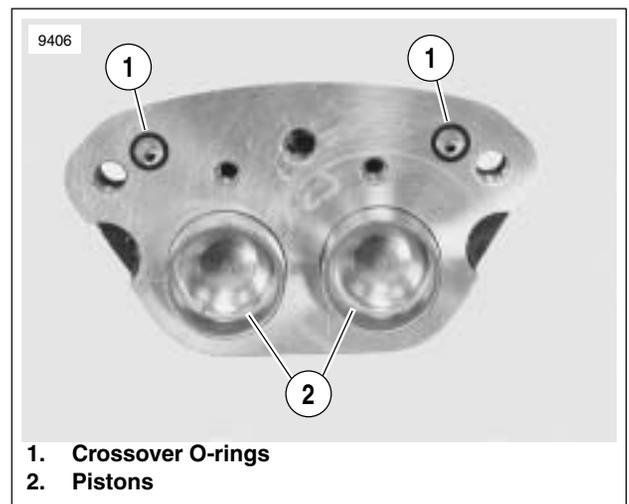


Figure 2-46. Crossover O-rings and Pistons

CLEANING, INSPECTION AND REPAIR

WARNING

Clean brake system components using denatured alcohol. Do not use mineral-base cleaning solvents, such as gasoline or paint thinner. Use of mineral-base solvents causes deterioration of rubber parts that continues after assembly. This may result in improper brake operation which could result in death or serious injury.

1. Clean all parts with denatured alcohol or D.O.T. 5 SILICONE BRAKE FLUID. Do not contaminate with mineral oil or other solvents. Wipe parts 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.
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. Do not hone bore. If bore should show pitting or corrosion, replace caliper.
 - c. Always replace wipers, square seals and crossover O-rings after disassembly.
 - d. Inspect pad pins for wear and grooving. If wear is more than 0.38 mm (0.015 in.), replace both pins.
3. If decal on outside housing is removed, scrape remaining adhesive from surface with a razor blade.

WARNING

Always replace brake pads in complete sets for correct brake operation. Never replace just one brake pad. Failure to install brake pads as a set could result in death or serious injury.

4. Inspect brake pads and brake disc. See [1.10 BRAKE PADS AND DISCS](#).
5. Repeat for opposite caliper.

ASSEMBLY

CAUTION

Do not use D.O.T. 5 SILICONE BRAKE FLUID for lubrication. Use of D.O.T. 5 brake fluid will result in increased lever travel.

1. Lubricate the following parts prior to assembly using a light coat of G.E. VERSILUBE® #G322 L SILICONE GREASE (marked "Piston Lube") from the service parts kit. All other surfaces must be dry for assembly.
 - a. Lubricate nose radius and outside diameter of piston. Apply lube to inside of caliper piston bores.
 - b. Apply lube to inside diameter of seals and wipers.

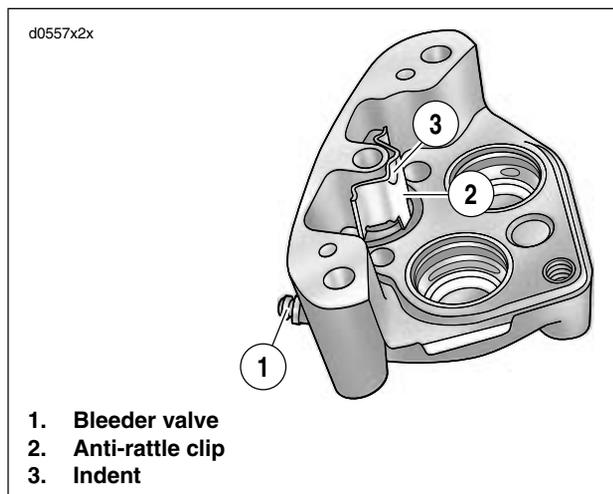


Figure 2-47. Front Caliper Anti-rattle Clip

CAUTION

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

2. See [Figure 2-44](#). Install a **new** square seal (3) and a **new** wiper (2) into each piston bore.
3. Carefully insert pistons by hand into bores of inside and outside caliper housings. If installation shows resistance, remove piston and check that seals and wipers are properly installed.
4. See [Figure 2-46](#). Place two **new** crossover O-rings (1) on inside caliper housing.

5. Assemble caliper housings.
 - a. See [Figure 2-47](#). Install bleeder valve (1) on outside caliper housing if removed. Tighten bleeder valve to 9-11 Nm (80-100 **in-lbs**).
 - b. Place outside caliper housing on workbench with decal side down. Install anti-rattle clip (2) in channel with indent (3) facing upwards.
 - c. Verify that **new** crossover O-rings are installed on inside caliper housing.
 - d. Mate inside and outside caliper housings using bridge bolts. Place one bridge bolt in the middle hole and one next to the bleeder valve. Loosely install bridge bolts.
 - e. Check that anti-rattle spring is still seated between caliper housings.
 - f. Tighten bridge bolts to 38-52 Nm (28-38 ft-lbs).

NOTE

See [Figure 2-48](#). The front and rear brake calipers use the same brake pad set.

- On the right side of the vehicle, the pad with two tabs (1) installs on the inboard side of the caliper.
 - On the left side of the vehicle, the pad with two tabs (1), installs on the outboard side of the caliper.
6. Insert one set of brake pads into caliper with friction material on pad facing opening for brake disc. Curved portion of pad must face rear of motorcycle when caliper is installed.
 7. If necessary, install **new** pad pins. Pad pins will give an audible click when inserted into inside housing. Tighten both pad pins to 20-23 Nm (180-200 **in-lbs**).
 8. Repeat for opposite caliper.

NOTE

If pad pins do not fit, check the following:

- You are using a set of pads, not two identical pads.
- Anti-rattle clip orientation matches [Figure 2-47](#).

Pads must be pushed tight against the anti-rattle clip before the pad pins can be installed.

INSTALLATION

1. See [Figure 2-42](#). Attach calipers to fork legs.
 - a. Place caliper over brake disc with bleeder valve facing upwards.
 - b. Loosely install long upper mounting bolt (4) into top hole on fork leg.
 - c. Install short lower mounting bolt (5) into bottom hole on fork leg. Tighten bottom mounting bolt to 38-52 Nm (28-38 ft-lbs).
 - d. Final tighten the top mounting bolt to 38-52 Nm (28-38 ft-lbs).

CAUTION

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

2. Lubricate **new** steel/rubber washers (2) with D.O.T. 5 SILICONE BRAKE FLUID. Connect the brake line (3) to caliper using two **new** steel/rubber washers (2) and banjo bolt (1). Tighten to 23-31 Nm (17-23 ft-lbs).
3. Repeat for opposite side caliper.

CAUTION

Direct contact of D.O.T. 5 SILICONE BRAKE FLUID with eyes may cause eye irritation, swelling, and redness. Avoid eye contact. In case of eye contact flush with large amounts of water and get medical attention. Swallowing large amounts of D.O.T. 5 SILICONE BRAKE FLUID may cause digestive discomfort. If swallowed, obtain medical attention. Use in well ventilated area. KEEP OUT OF REACH OF CHILDREN.

4. Remove cover from front brake master cylinder. Fill master cylinder with D.O.T. 5 SILICONE BRAKE FLUID. Verify that fluid level is at FILL LEVEL when the motorcycle is level.
5. Tighten cover screws to 0.7-0.9 Nm (6-8 **in-lbs**).

WARNING

Whenever brake calipers are installed, BEFORE moving motorcycle, you must pump brake fluid until the pistons push the pads against the brake disc. If you don't pump fluid pressure up again, the brakes will not be available to stop the motorcycle which could result in death or serious injury.

6. Bleed brake system and tighten bleeder valve. See [1.9 BLEEDING BRAKES](#).

WARNING

A plugged or covered relief port can cause brake drag or lockup, which may result in loss of vehicle control which could result in death or serious injury.

7. Verify proper operation of the master cylinder relief port. Actuate the brake lever with the cover removed. A slight spurt of fluid will break the surface if all internal components are working properly.
8. Install gasket and cover on reservoir. Tighten to 0.7-0.9 Nm (6-8 in-lbs).

WARNING

After completing repairs or bleeding the system, always test motorcycle brakes at low speed. If brakes are not operating properly or braking efficiency is poor, testing at high speeds could result in death or serious injury.

9. Test brake system.
 - a. Turn ignition switch ON. Pump brake hand lever to verify operation of the brake lamp.
 - b. Test ride motorcycle. If brakes feel spongy, bleed the system again. See [1.9 BLEEDING BRAKES](#).

NOTE

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

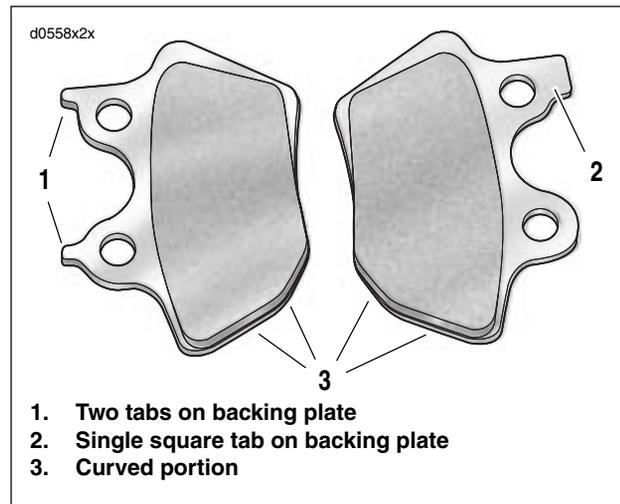


Figure 2-48. Brake Pad Alignment

REMOVAL

CAUTION

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

1. Remove right side cover and maxi-fuse. See 8.5 MAXI-FUSE.
2. Remove radiator left side cover.
3. See Figure 2-49. With a suitable container under the master cylinder, remove the banjo bolt (1). Discard the two steel/rubber washers (7).
4. Remove the cotter key from the clevis pin (4).
5. See Figure 2-50. Cover the outside face of clevis pin with cardboard and using a large pliers, squeeze the pin until the pin shoulder pops out of its interference fit with the clevis. Remove the clevis pin.
6. See Figure 2-49. Remove the brake rod (5) from the clevis.
7. Pull remote reservoir from slot on radiator cover.
8. Remove jam nut (6) to free master cylinder from mounting bracket.
9. Remove master cylinder with the remote reservoir.

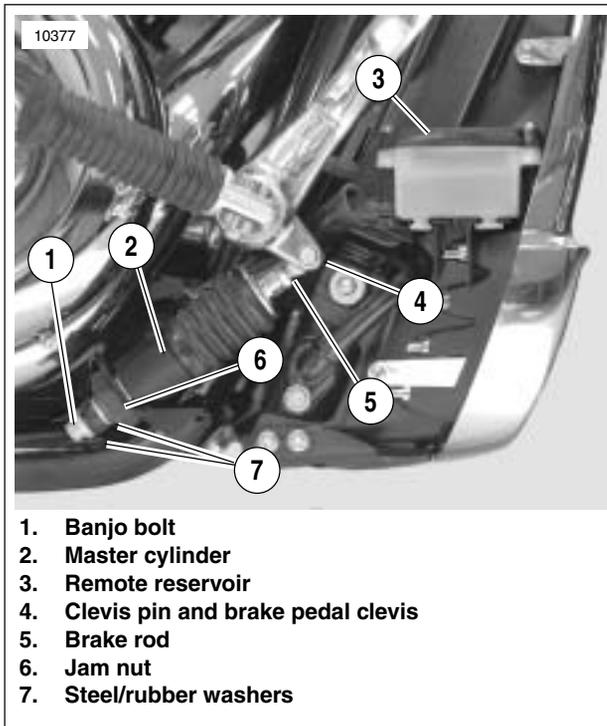


Figure 2-49. Rear Brake Master Cylinder & Reservoir



Figure 2-50. Releasing Clevis Pin
(brake pedal removed from motorcycle for clarity)

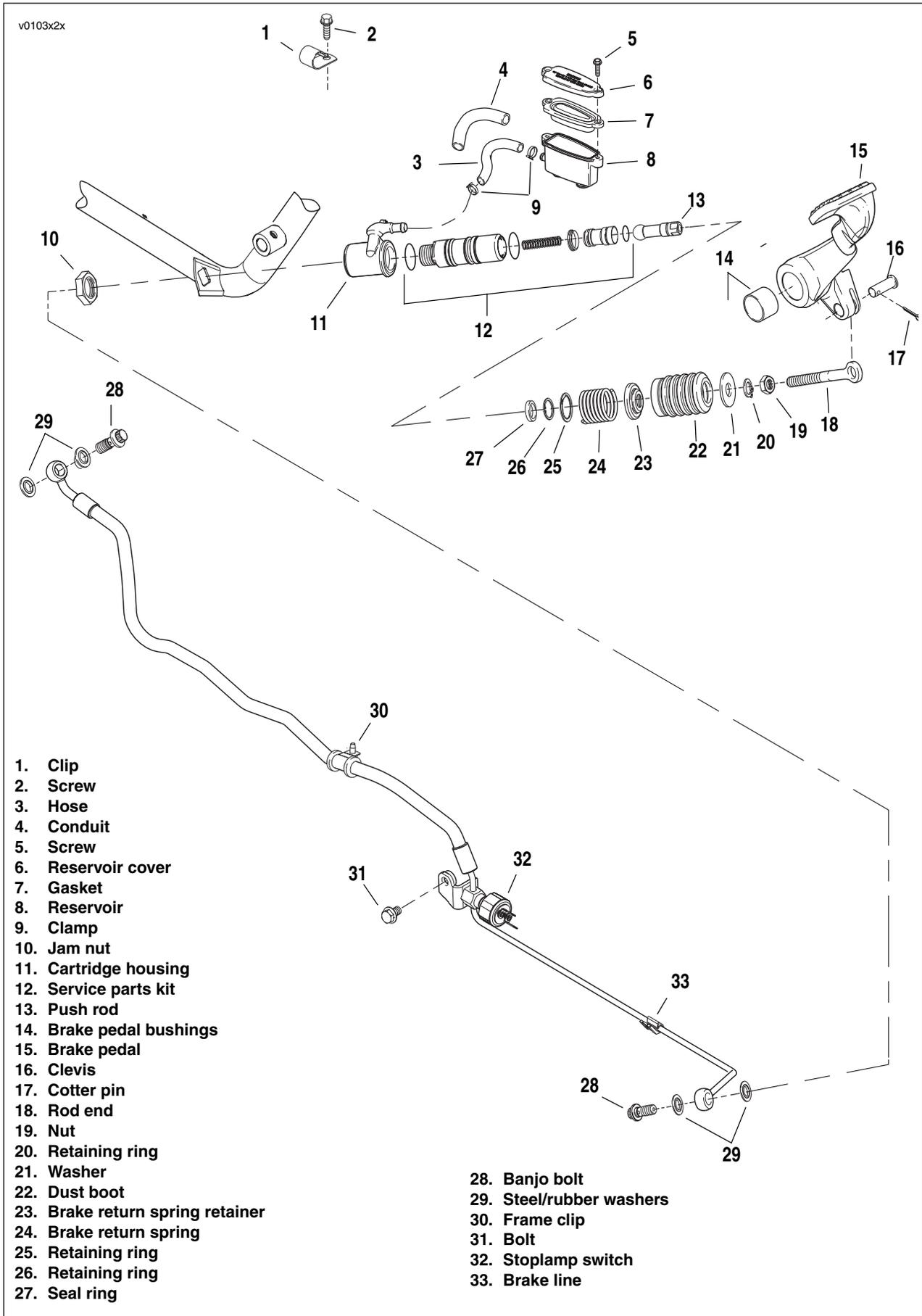


Figure 2-51. Rear Brake Master Cylinder/Reservoir

DISASSEMBLY

PART NO.	SPECIALTY TOOL
HD-41137	Hose clamp pliers

1. See [Figure 2-51](#). Remove the reservoir cover (6) and gasket (7).
2. Over suitable container, separate and drain the reservoir (8) and hose (3).
3. Using HOSE CLAMP PLIERS (HD-41137), remove the hose clamps (9) from the remote reservoir hose (3).
4. Thoroughly clean exterior of master cylinder assembly with denatured alcohol.

NOTE

Measure and record the length of threads showing on the rod end.

- The master cylinder can be assembled to this dimension to return the brake pedal to its original operating position.
 - Rod end thread engagement of the push rod should be at least 11.5 mm (0.450 in).
5. Turning push rod (13) with wrench, break jam nut (19) loose. Remove rod end (18) with jam nut (19).
 6. Push on cartridge housing (11) to separate from cartridge. Use hand pressure only.
 7. Stand master cylinder assembly upright on banjo sealing surface. Be sure to lay down a clean shop cloth to protect the sealing surface from damage.

⚠ WARNING

Always wear proper eye protection when removing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause death or serious injury.

8. Push down on large flat washer (21) to compress spring (24).
9. While holding the spring (24) in a compressed state, remove the retaining ring (20). Carefully release spring tension.
10. Remove the large flat washer (21), dust boot (22), spring retainer (23), and spring (24).
11. Push on cartridge housing (11) to separate from cartridge. Use hand pressure only.

⚠ WARNING

Always wear proper eye protection when removing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause death or serious injury.

12. See [Figure 2-52](#). Push down on push rod to compress piston spring and remove retaining ring inside cartridge.

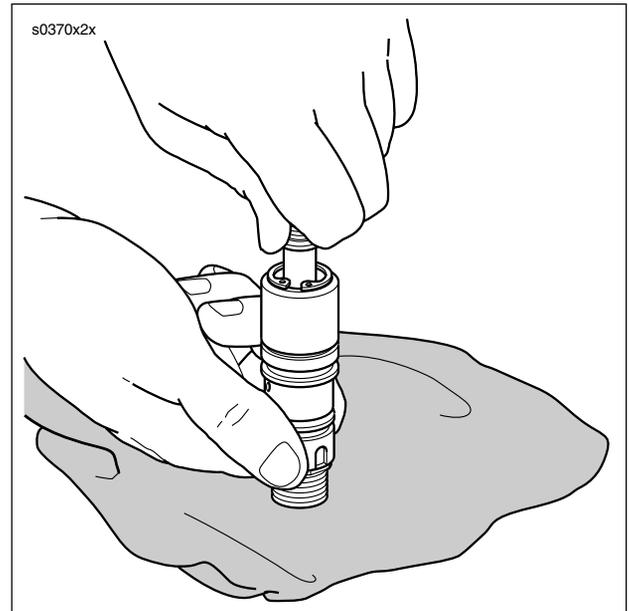


Figure 2-52. Compressing Piston Spring

13. See [Figure 2-51](#). Remove pushrod (13) and seal ring (27).
14. Remove piston and piston spring.

⚠ WARNING

Always wear proper eye protection when removing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause death or serious injury.

15. Remove large retaining ring (25) from cartridge.

⚠ WARNING

Always wear proper eye protection when removing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause death or serious injury.

CLEANING AND INSPECTION

WARNING

Clean brake system components using denatured alcohol. Do not use mineral-base cleaning solvents, such as gasoline or paint thinner. Use of mineral-base solvents causes deterioration of rubber parts that continues after assembly. This may result in improper brake operation which could result in death or serious injury.

1. Clean all rubber parts using denatured alcohol. Check dust boot for cuts or tears. Replace as necessary.
2. Inspect threads on the cartridge body, push rod and brake rod. Replace if threads are damaged.
3. Inspect spring for cracks or broken coils. Replace as necessary.
4. Wipe bore of cartridge housing with D.O.T. 5 SILICONE BRAKE FLUID.
5. Inspect reservoir cover gasket for cuts, tears or general deterioration. Replace as necessary.

ASSEMBLY

To rebuild rear brake master cylinder, use the components found in the SERVICE PARTS KIT No. 42383-87C.

PART NO.	SPECIALTY TOOL
HD-41137	Hose clamp pliers

WARNING

Always wear proper eye protection when removing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause death or serious injury.

1. See [Figure 2-53](#). Lubricate **new** O-rings (1) with D.O.T. 5 SILICONE BRAKE FLUID and carefully install in grooves on **new** cartridge (3).
2. Install **new** primary cup (5) with the flared end toward the threaded end of the cartridge and **new** O-ring (7) on **new** piston (6).
3. Slide **new** spring (4) into piston (6) and slide into cartridge (3).

WARNING

Always wear proper eye protection when removing retaining rings. Use the correct retaining ring pliers. Verify that the tips of the pliers are not damaged or excessively worn. Slippage could propel the ring with force which could cause death or serious injury.

4. Lay down a clean shop cloth to protect the banjo sealing surface from damage. Stand master cylinder assembly upright on banjo sealing surface.
5. See [Figure 2-51](#). Insert ball end of push rod (13) with seal ring (27) around rod into piston cup. Pushing down to compress spring, install small retaining ring (26) in groove of cartridge body bore. Verify that retaining ring is completely seated in groove capturing seal ring and that push rod rotates freely.
6. Install large retaining ring (25) in groove closest to push rod end of cartridge body.
7. Insert cartridge into cartridge housing (11).

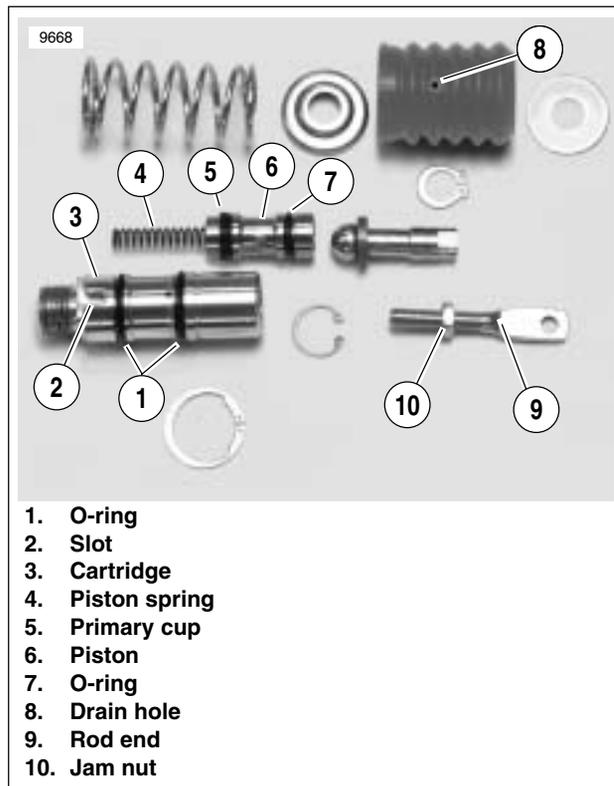


Figure 2-53. Master Cylinder Components

8. See [Figure 2-53](#). Verify that tab inside of housing mates to slot (2) on threaded end of cartridge (3).
9. See [Figure 2-51](#). Install brake return spring (24), brake return spring retainer (23), boot (22), and large washer (21) over push rod (13).
10. Push down on large flat washer (21) to compress brake return spring. While holding the spring in a compressed state with brake return spring (24) seated on large retaining ring (25), install retaining ring (20) on push rod.
11. See [Figure 2-53](#). Rotate boot so that drain hole (8) is at bottom. Bottom is side opposite tab in housing and mating slot in cartridge. Pull down dust boot to seat over lip on housing.
12. See [Figure 2-51](#). With jam nut (19) in original location, thread in brake rod (18) until jam nut bottoms on the push rod (13).

NOTE

Normal brake pedal adjustment range is 18-22 mm (0.69-0.89 in.) from center of clevis to backside of jam nut. See [REAR BRAKE PEDAL](#) in [1.8 BRAKES](#).

13. Tighten jam nut to push rod.
14. Using **new** clamps (9) and HOSE CLAMP PLIERS (Part No. HD-41137), install **new** hose (3) covered with conduit (4) connecting master cylinder to reservoir.
15. Reinstall cover (6) and gasket (7).

INSTALLATION

1. See [Figure 2-49](#). Route remote reservoir (3) and hose behind rear brake pedal. Press reservoir mounting studs into slots on radiator cover.
2. Fit square on bottom of master cylinder cartridge housing (2) into square hole of mounting bracket.
3. See [Figure 2-51](#). Install the clevis pin (16) through the brake pedal (15) clevis and master cylinder brake rod (18).
4. Cover the face of clevis pin (16) and clevis with cardboard. Holding the brake pedal firmly, tap on a rod to seat shoulder of clevis pin into clevis. Install **new** cotter pin (17).
5. Apply LOCTITE® 243 (blue) to threads of jam nut (10). Thread jam nut (10) on cartridge housing and tighten to 41-54 Nm (30-40 ft-lbs).

NOTE

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

6. Lubricate **new** steel/rubber washers (29) with D.O.T. 5 SILICONE BRAKE FLUID. Position **new** steel/rubber washers on each side of brake line (33). Insert the banjo bolt (28) through washers and fitting. Tighten to 23-31 Nm (17-23 ft-lbs).
7. Stand the motorcycle upright so that the reservoir is in a level position. Clean and remove reservoir cover.

CAUTION

Direct contact of D.O.T. 5 SILICONE BRAKE FLUID with eyes may cause eye irritation, swelling, and redness. Avoid eye contact. In case of eye contact flush with large amounts of water and get medical attention. Swallowing large amounts of D.O.T. 5 SILICONE BRAKE FLUID may cause digestive discomfort. If swallowed, obtain medical attention. Use in well ventilated area. KEEP OUT OF REACH OF CHILDREN.

8. See [Figure 2-54](#). Add D.O.T. 5 SILICONE BRAKE FLUID to the master cylinder reservoir until the fluid level is 12.7 mm (1/2 in.) below top of reservoir and is visible in sight window at rear of reservoir. Use only D.O.T. 5 SILICONE BRAKE FLUID from a sealed container.

WARNING

Whenever the brake line is reconnected, BEFORE moving motorcycle, you must pump brake fluid until the pistons push the pads against the brake disc. If you don't pump fluid pressure up again, the brakes will not be available to stop the motorcycle which could result in death or serious injury.

9. Bleed brake system. See [1.9 BLEEDING BRAKES](#).
10. Install gasket and cover on master cylinder. Tighten cover screws to 0.7-0.9 Nm (6-8 in-lbs).
11. Reinstall radiator side cover.
12. Reinstall maxi-fuse and right side cover.

WARNING

After completing repairs or bleeding the system, always test motorcycle brakes at low speed. If brakes are not operating properly or braking efficiency is poor, testing at high speeds could result in death or serious injury.

13. Test brake system.
 - a. Turn ignition switch ON. Pump brake foot pedal to verify operation of brake lamp.
 - b. Test ride motorcycle. If the brakes feel spongy, bleed the system again. See [1.9 BLEEDING BRAKES](#).



Figure 2-54. Rear Brake Reservoir Sight Window (removed from motorcycle)

REMOVAL

NOTE

If only replacing brake pads, do not remove rear brake caliper. Should pad replacement be necessary, see 1.10 BRAKE PADS AND DISCS.

1. Remove saddlebag if necessary to gain access to rear brake caliper.

CAUTION

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

2. Remove banjo bolt and both steel/rubber washers to detach rear brake line from caliper. Discard washers.
3. With motorcycle supported from underneath, remove axle nut and rear axle adjuster. Pull axle from the left side through right side rear fork arm and caliper only. Do not pull axle all the way out. See 2.24 REAR WHEEL.
4. Lift rear caliper away from axle and rear fork.

DISASSEMBLY

PART NO.	SPECIALTY TOOL
HD-43293	Brake caliper piston remover

1. See Figure 2-55. Remove pad pins (10), brake pads (7) and bridge bolts (11) to separate caliper housings (1, 8).
2. Remove anti-rattle spring (6). If necessary, remove bleeder valve (12).
3. If necessary, cut rubber bumper (13) to remove.

WARNING

Low pressure compressed air can blow debris into your face and eyes. Always wear eye protection or a face shield when using pressurized air. Failure to take adequate safety precautions could result in death or serious injury.

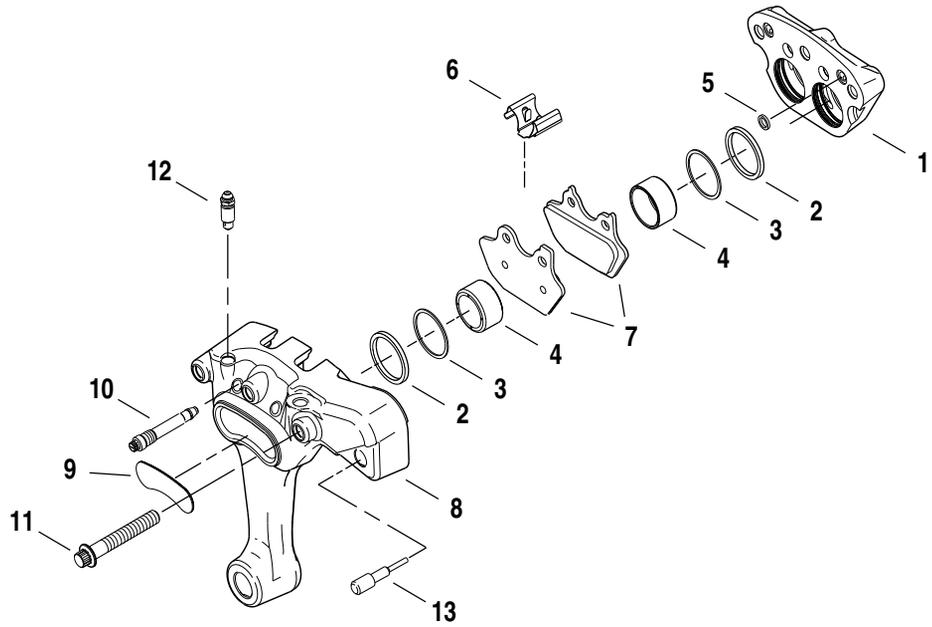
4. See Figure 2-56. Remove and discard both crossover O-rings (1) from inside caliper housing.
5. See Figure 2-57. Remove pistons.
 - a. Place BRAKE CALIPER PISTON REMOVER (HD-43293) between caliper housings.
 - b. Insert three bridge bolts and tighten securely.
 - c. If the bleeder valve was removed, loosely reinstall or place a gloved finger over the bleeder valve hole on outside caliper housing.
 - d. Apply low pressure compressed air to banjo bolt hole to remove pistons from caliper bores.
 - e. Remove bridge bolts and remove tool.
6. If necessary, wiggle pistons from caliper bores to completely remove. Discard all removed parts.

CAUTION

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

7. See Figure 2-58. Using a wooden toothpick (1), remove wiper (2) and square seal (3) from each caliper bore.

d0402x2x



- 1. Inside caliper housing
- 2. Square seal
- 3. Wiper
- 4. Piston
- 5. Crossover O-ring
- 6. Anti-rattle spring
- 7. Brake pads
- 8. Outside caliper housing
- 9. Decal
- 10. Pad pin
- 11. Bridge bolt
- 12. Bleeder valve
- 13. Rubber bumper

Figure 2-55. Rear Brake Caliper

CLEANING, INSPECTION AND REPAIR

WARNING

Clean brake system components using denatured alcohol. Do not use mineral-base cleaning solvents, such as gasoline or paint thinner. Use of mineral-base solvents causes deterioration of rubber parts that continues after assembly. This may result in improper brake operation which could result in death or serious injury.

1. Clean all parts with denatured alcohol or D.O.T. 5 SILICONE BRAKE FLUID. Do not contaminate with mineral oil or other solvents. Wipe parts dry with a clean, lint free cloth. Blow out drilled passages and bore with a clean air supply. Do not use 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, scratches or corrosion on face and also on ground surfaces.
 - b. Inspect caliper piston bore. Do not hone bore. If bore should show pitting or corrosion, replace caliper.
 - c. Inspect rubber damper for cuts, tears, or signs of deterioration.
 - d. Always replace wipers, square seals and crossover O-rings after disassembly.
 - e. Inspect brake pads and brake disc. See [1.10 BRAKE PADS AND DISCS](#).
 - f. Inspect pad pins for wear and grooving. If wear is more than 0.38 mm (0.015 in.), replace both pins.
 - g. If decal on outside housing is removed, scrape remaining adhesive from surface with a razor blade.

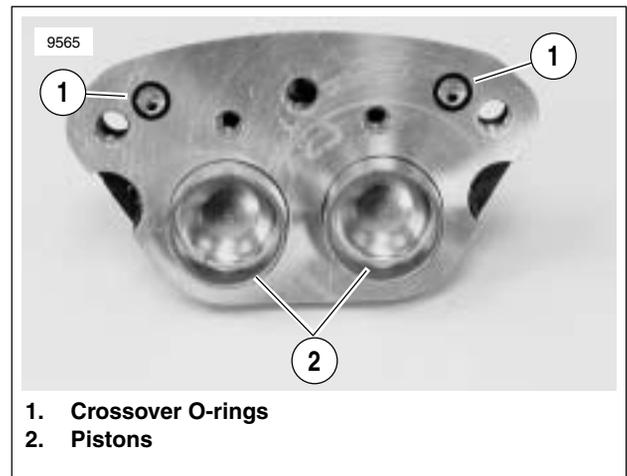


Figure 2-56. Crossover O-rings and Pistons

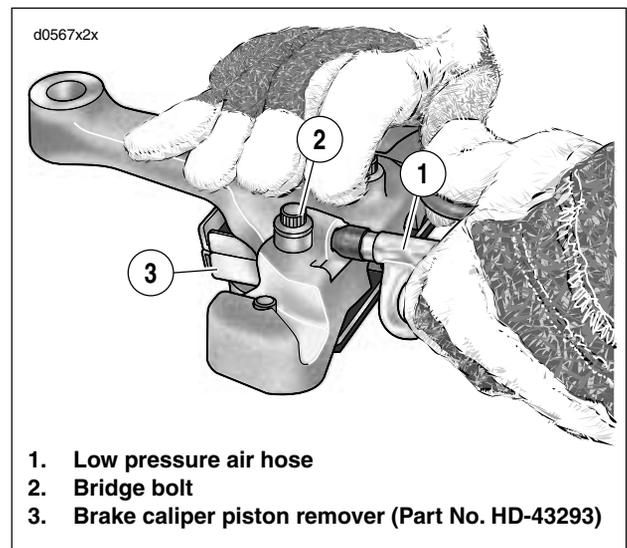


Figure 2-57. Removing Pistons

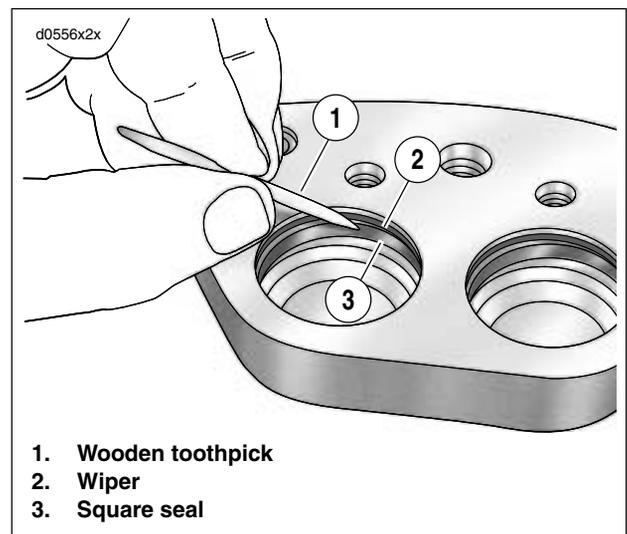


Figure 2-58. Wipers and Square Seals

ASSEMBLY

CAUTION

Do not use D.O.T. 5 SILICONE BRAKE FLUID for lubrication. Use of D.O.T. 5 SILICONE BRAKE FLUID will result in increased lever travel.

- Lubricate the following parts prior to assembly using a light coat of G.E. VERSILUBE® #G322 L SILICONE GREASE (marked "Piston Lube") from the SERVICE PARTS KIT. All other surfaces must be dry for assembly.
 - Lubricate nose radius and outside diameter of piston. Apply lube to inside of caliper piston bores.
 - Apply lube to inside diameter of **new** seals and wipers.

CAUTION

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

- See Figure 2-55. Install a **new** square seal (2) and a **new** wiper (3) into each piston bore.
- Carefully insert pistons (4) by hand into bores of inside and outside caliper housings (1, 8). If resistance is felt, remove piston and check that seal and wiper are properly installed.
- Assemble caliper housings.
 - If removed, install bleeder valve (12) on outside caliper housing (8). Tighten bleeder valve to 9-11 Nm (80-100 in-lbs).
 - Place outside caliper housing (8) on workbench with decal side down. Install anti-rattle clip (6) in channel with indent facing upwards.
 - Place two **new** crossover O-rings (5) into grooves on inside caliper housing (1).
 - Mate inside and outside caliper housings (1, 8) using three bridge bolts (11). Loosely install bridge bolts.
 - Check that anti-rattle clip is still seated between caliper housings.
 - Tighten bridge bolts to 38-52 Nm (28-38 ft-lbs).
 - If rubber bumper (13) on outside housing was removed, lubricate **new** part before installation.

WARNING

Always replace brake pads in complete sets for correct brake operation. Never replace just one brake pad. Failure to install brake pads as a set could result in death or serious injury.

- See Figure 2-59. Insert **new** set of brake pads into caliper with friction material on pad facing opening for brake disc. Curved portion of pad must face upward when caliper is installed.

NOTE

Install pad with the two tabs on the backing plate on the inboard side of the rear caliper.

- See Figure 2-55. If necessary, Install **new** pad pins (10). Pad pins will give an audible click when inserted into inside housing. Tighten to 20-23 Nm (180-200 in-lbs).

NOTE

If pad pins do not fit, check the following:

- You are using a set of pads, not two identical pads.
- Anti-rattle clip orientation matches Figure 2-60.

Pads must be pushed tight against the anti-rattle clip before the pad pins can be installed.

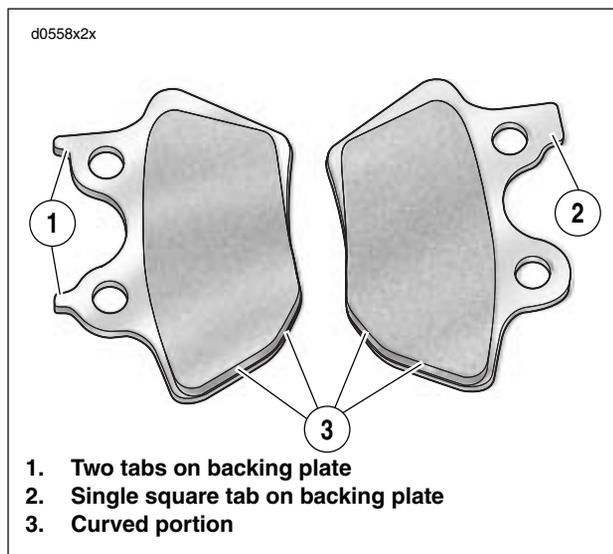


Figure 2-59. Brake Pads

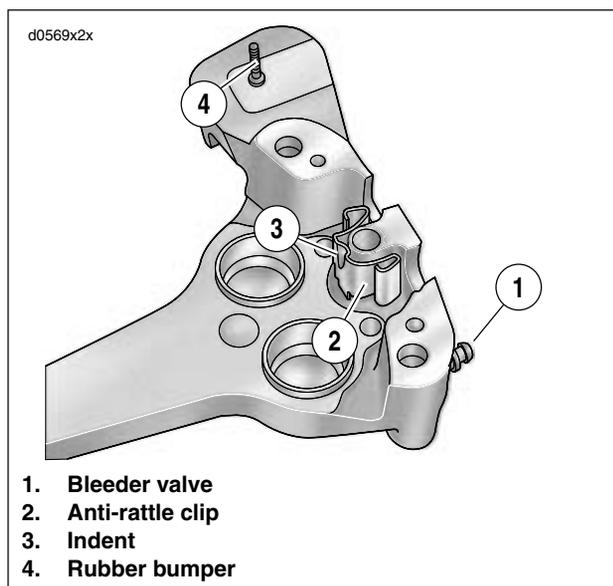


Figure 2-60. Anti-rattle Clip

INSTALLATION

- Place caliper on rear axle with notch inside rear fork weldment. Verify that rubber bumper is contacting underside of the caliper weldment for the full length of bumper. Install rear axle and check drive belt tension. See [2.24 REAR WHEEL](#).

CAUTION

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

- Lubricate **new** steel/rubber washers with D.O.T. 5 SILICONE BRAKE FLUID. Connect brake line to caliper using two **new** washers and banjo bolt. Tighten to 23-31 Nm (17-23 ft-lbs).

CAUTION

Direct contact of D.O.T. 5 brake fluid with eyes may cause eye irritation, swelling, and redness. Avoid eye contact. In case of eye contact flush with large amounts of water and get medical attention. Swallowing large amounts of D.O.T. 5 brake fluid may cause digestive discomfort. If swallowed, obtain medical attention. Use in well ventilated area. **KEEP OUT OF REACH OF CHILDREN.**

- Remove radiator side cover to access master cylinder. See [2.19 REAR BRAKE MASTER CYLINDER/RESERVOIR](#). Remove cover from rear brake master cylinder. Fill master cylinder with D.O.T. 5 SILICONE BRAKE FLUID. Verify that fluid level is at the FILL LEVEL boss when the motorcycle is level.

WARNING

Whenever brake calipers are installed, **BEFORE** moving motorcycle, you must pump brake fluid until the pistons push the pads against the brake disc. If you don't pump fluid pressure up again, the brakes will not be available to stop the motorcycle which could result in death or serious injury.

- Bleed brake system. See [1.9 BLEEDING BRAKES](#).

WARNING

A plugged or covered relief port can cause brake drag or lockup, which may result in loss of vehicle control which could result in death or serious injury.

- Verify proper operation of master cylinder relief port. Actuate brake pedal with cover removed. A slight spurt of fluid will break surface if all internal components are working properly.
- Install gasket and cover on master cylinder. Tighten cover screws to 0.7-0.9 Nm (6-8 in-lbs).
- Install radiator side cover.
- Install right saddlebag if necessary.

WARNING

After completing repairs or bleeding the system, always test motorcycle brakes at low speed. If brakes are not operating properly or braking efficiency is poor, testing at high speeds could result in death or serious injury.

- Test brake system.
 - Turn ignition switch ON. Pump brake foot pedal to verify operation of brake lamp.
 - Test ride motorcycle. If brakes feel spongy, bleed the system again. See [1.9 BLEEDING BRAKES](#).

NOTE

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

REMOVAL

1. Remove right side cover and maxi-fuse. See 8.5 MAXI-FUSE.
2. Remove rear view mirrors and turn signals.
3. Remove throttle cables from throttle control. See 2.12 THROTTLE CABLES.
4. Remove front brake master cylinder/reservoir, turn signal assembly, and throttle control from right handlebar. See 2.17 FRONT BRAKE MASTER CYLINDER/RESERVOIR.
5. Remove switch housing from right handlebar. See 8.15 RIGHT HANDLEBAR SWITCH.
6. Cut clip holding wiring harness to right handlebar.
7. Remove clutch master cylinder/reservoir, turn signal assembly from left handlebar. See 2.13 CLUTCH MASTER CYLINDER/RESERVOIR.
8. Remove switch housing from left handlebar. See 8.16 LEFT HANDLEBAR SWITCH.
9. Cut clip holding wiring harness to left handlebar.
10. See Figure 2-61. To free lower end of top handlebar cover, loosen mounting bolts (3) holding headlamp bracket (2) to upper triple clamp (1).
11. See Figure 2-62. Without removing cover, remove fasteners (7) holding top handlebar cover (2) and instrument bezel (1) to lower handlebar cover (6).

CAUTION

See Figure 2-62. Snap and hook at bottom of bezel holding top cover to lower handlebar cover can be damaged if forced during removal or installation.

12. From headlamp bracket end of cover, gently tilt top handlebar cover (2) and instrument bezel (1) up and back to remove cover and bezel.

NOTE

Bezel can remain snapped to upper handlebar cover.

13. Remove wiring harness connector to instrument cluster (9) and remove instrument cluster.
14. Remove fasteners (7) holding lower handlebar cover (6) to handlebars (8).
15. If necessary, remove the handgrip (10).
16. Remove fasteners (5) holding handlebars to upper triple clamp (4). Remove handlebars.

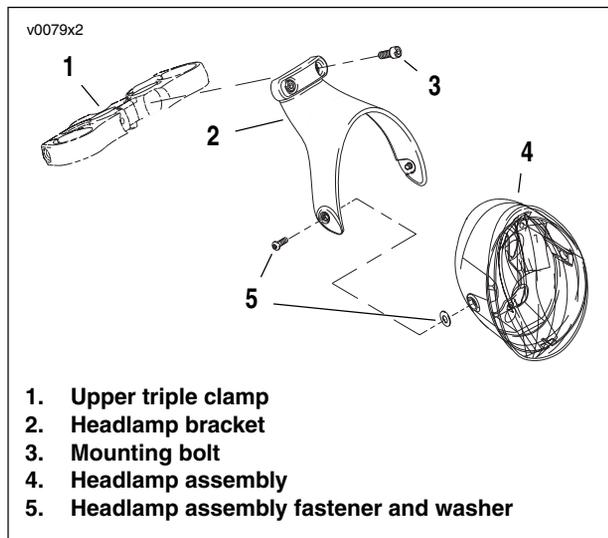


Figure 2-61. Headlamp Bracket and Headlamp Assembly

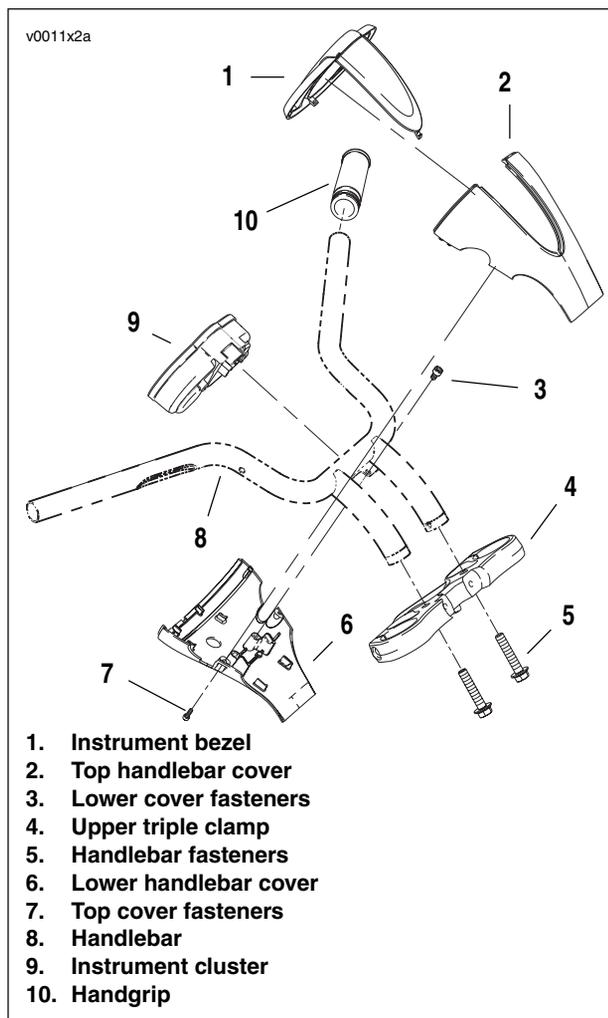


Figure 2-62. Handlebar Assembly

INSTALLATION

1. See [Figure 2-62](#). Mount handlebars (8) on upper triple clamp (4). Tighten handlebar fasteners (5) to 41-47 Nm (31-35 ft-lbs).
2. Mount lower handlebar cover (6) to handlebar (8). Tighten fasteners (3) to 6-10 Nm (53-88 in-lbs).
3. Mount instrument cluster (9). Connect wiring harness to instrument cluster.

CAUTION

Snap holding bottom of bezel and top cover to lower handlebar cover can be damaged if forced during removal or installation.

4. Orient instrument bezel and fit bezel hook over tab on lower handlebar cover. Gently tilt bezel (1) and top handlebar cover (2) until bezel hook snaps onto tab.
5. Fit top cover (2) under headlamp bracket. Bezel edge should fit snugly to grooved rim of lower and upper cover.
6. Install fasteners (7) that hold top handlebar cover (2), instrument bezel (1), and capture instrument cluster (9). Tighten fasteners to 1.3-1.9 Nm (12-16 in-lbs).
7. See [Figure 2-61](#). Tighten headlamp bracket (2) fasteners (3) to 11-18 Nm (9-13 ft-lbs).
8. Install left handgrip:
 - a. Using emery cloth, rough grip end of left handlebar.

NOTE

Before applying adhesive, clean the left handlebar with acetone.

- b. Apply LOCTITE PRISM PRIMER (770) to inside of **new** handgrip. Remove any excess PRIMERS PRIMER with a clean cloth. Wait two minutes for PRISM PRIMER to set before attempting the next step.
- c. Apply LOCTITE PRISM SUPERBONDER (411) to inside of handgrip. Install handgrip on left handlebar.

NOTE

SUPERBONDER will set in four minutes and be fully cured in 24 hours.

9. Install left turn signal assembly, front brake master cylinder/reservoir, and brake hand lever, and throttle control handgrip. See [2.17 FRONT BRAKE MASTER CYLINDER/RESERVOIR](#).
10. Install a **new** clip to hold the wiring harness to the left handlebar.
11. Install left handlebar switch housing. See [8.16 LEFT HANDLEBAR SWITCH](#).
12. Install throttle cable to throttle control handgrip. See [2.12 THROTTLE CABLES](#).
13. Install right turn signal assembly, clutch master cylinder/reservoir, and clutch hand lever assembly. See [2.13 CLUTCH MASTER CYLINDER/RESERVOIR](#).
14. Install a **new** clip to hold wiring harness to the right handlebar.
15. Install right handlebar switch housing. See [8.15 RIGHT HANDLEBAR SWITCH](#).
16. Install rear view mirrors and turn signals.
17. Install maxi-fuse and right side cover.

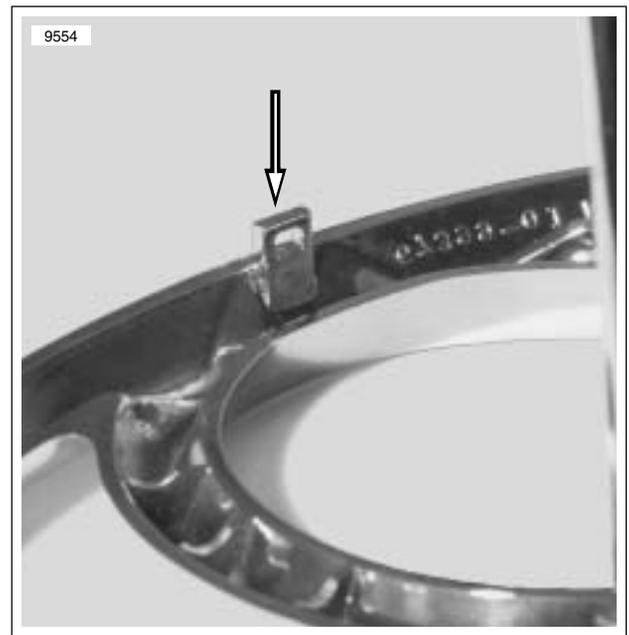


Figure 2-63. Bezel Hook

REMOVAL

1. Remove right side cover and maxi-fuse. See 8.5 MAXI-FUSE.
2. Remove rear view mirrors and turn signals.
3. Remove throttle cables from throttle control. See 2.12 THROTTLE CABLES.
4. Remove front brake master cylinder/reservoir, turn signal assembly, and throttle control from right handlebar. See 2.17 FRONT BRAKE MASTER CYLINDER/RESERVOIR.
5. Remove switch housing from right handlebar. See 8.15 RIGHT HANDLEBAR SWITCH.
6. Cut clip holding wiring harness to right handlebar.
7. Remove clutch master cylinder/reservoir, turn signal assembly from left handlebar. See 2.13 CLUTCH MASTER CYLINDER/RESERVOIR.
8. Remove switch housing from left handlebar. See 8.16 LEFT HANDLEBAR SWITCH.
9. Cut clip holding wiring harness to left handlebar.
10. Remove the instrument cluster from the handlebar top clamp. See 8.19 INSTRUMENT CLUSTER: VRSCB.
11. See Figure 2-65. Supporting the handlebars (3), loosen and remove the 4 fasteners (1) holding the top clamp (2).
12. Remove the handlebars (3).
13. If necessary, remove the handgrip.
14. If necessary, loosen and remove the two fasteners (5) securing riser (4) to upper fork clamp and remove the riser (4).

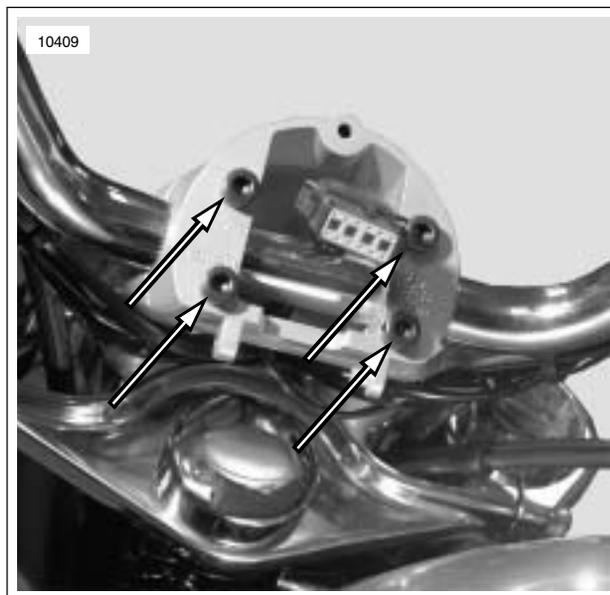


Figure 2-64. Handlebar Top Clamp Fasteners

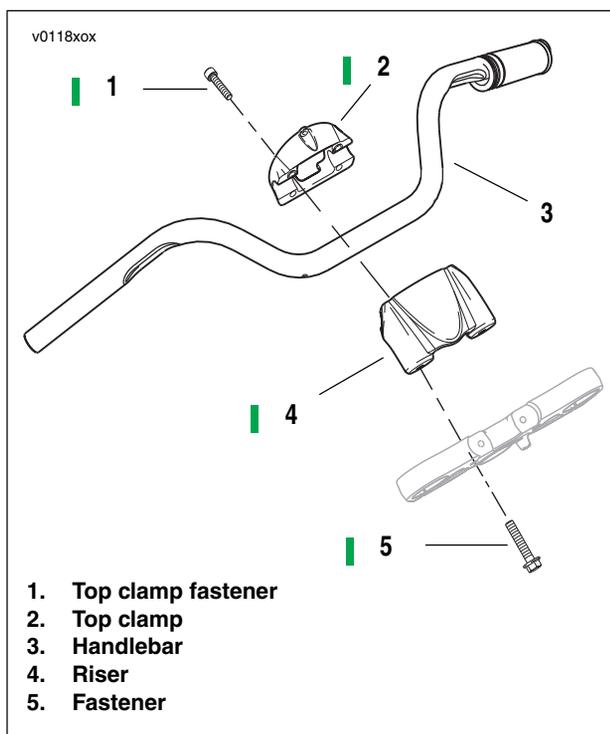


Figure 2-65. Top Clamp, Handlebar, and Riser

INSTALLATION

1. Install cast riser on upper triple clamp (4). Tighten fasteners to 41-47 Nm (31-35 ft-lbs).
2. Mount handlebar on riser with top clamp. Thread in and tighten fasteners to hold handlebar.
3. Center handlebars. Verify that equal amounts of knurled areas on handlebar protrude from sides of upper handlebar clamp.
4. [Figure 2-65](#). Position handlebars for rider posture and hold in position.
5. Tighten two front fasteners until cast-in spacers of upper clamp contact handlebar lower clamp.
6. Tighten rear fasteners to 16-20 Nm (144-180 **in-lbs**).
7. Final tighten front fasteners to 16-20 Nm (144-180 **in-lbs**). Slight gap between upper and lower clamps should exist at rear.
8. Install instrument cluster. See [8.19 INSTRUMENT CLUSTER: VRSCB](#).
9. If removed, install left handgrip:
 - a. Using emery cloth, rough grip end of left handlebar.

NOTE

Before applying adhesive, clean the left handlebar with acetone.

- b. Apply LOCTITE PRISM PRIMER (770) to inside of **new** handgrip. Remove any excess PRISM PRIMER with a clean cloth. Wait two minutes for PRISM PRIMER to set before attempting the next step.
- c. Apply LOCTITE PRISM SUPERBONDER (411) to inside of handgrip. Install handgrip on left handlebar.

NOTE

SUPERBONDER will set in four minutes and be fully cured in 24 hours.

10. Install left turn signal assembly, front brake master cylinder/reservoir, and brake hand lever, and throttle control handgrip. See [2.17 FRONT BRAKE MASTER CYLINDER/RESERVOIR](#).
11. Install a **new** clip to hold the wiring harness to the left handlebar.
12. Install left handlebar switch housing. See [8.16 LEFT HANDLEBAR SWITCH](#).
13. Install throttle cable to throttle control handgrip. See [2.12 THROTTLE CABLES](#).
14. Install right turn signal assembly, clutch master cylinder/reservoir, and clutch hand lever assembly. See [2.13 CLUTCH MASTER CYLINDER/RESERVOIR](#).
15. Install a **new** clip to hold wiring harness to the right handlebar.
16. Install right handlebar switch housing. See [8.15 RIGHT HANDLEBAR SWITCH](#).
17. Install rear view mirrors and turn signals.

GENERAL

Maximum tire mileage and good handling qualities are directly related to wheel and tire care. Wheels and tires should be inspected regularly for wear. If handling problems occur, check [1.28 TROUBLESHOOTING](#) for possible causes.

Preliminary Inspection - Brake Discs

1. Measure brake disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc.
2. If warped, replace disc. Maximum allowable lateral runout of a spring washer mounted brake disc is 0.3 mm (0.012 in.).
3. If scored, replace disc.

Preliminary Inspection - Wheel/Tire

1. Block motorcycle underneath frame so front wheel is raised off the ground.
2. Inspect tire for wear and wear pattern. Replace tire as necessary.
3. Inspect air valve. Replace as necessary.
4. Inspect wheel bearing end play and service bearings if necessary. If end play is 0.051 mm (0.002 in.) or more, replace the wheel bearings. See [2.25 SEALED WHEEL BEARINGS](#).

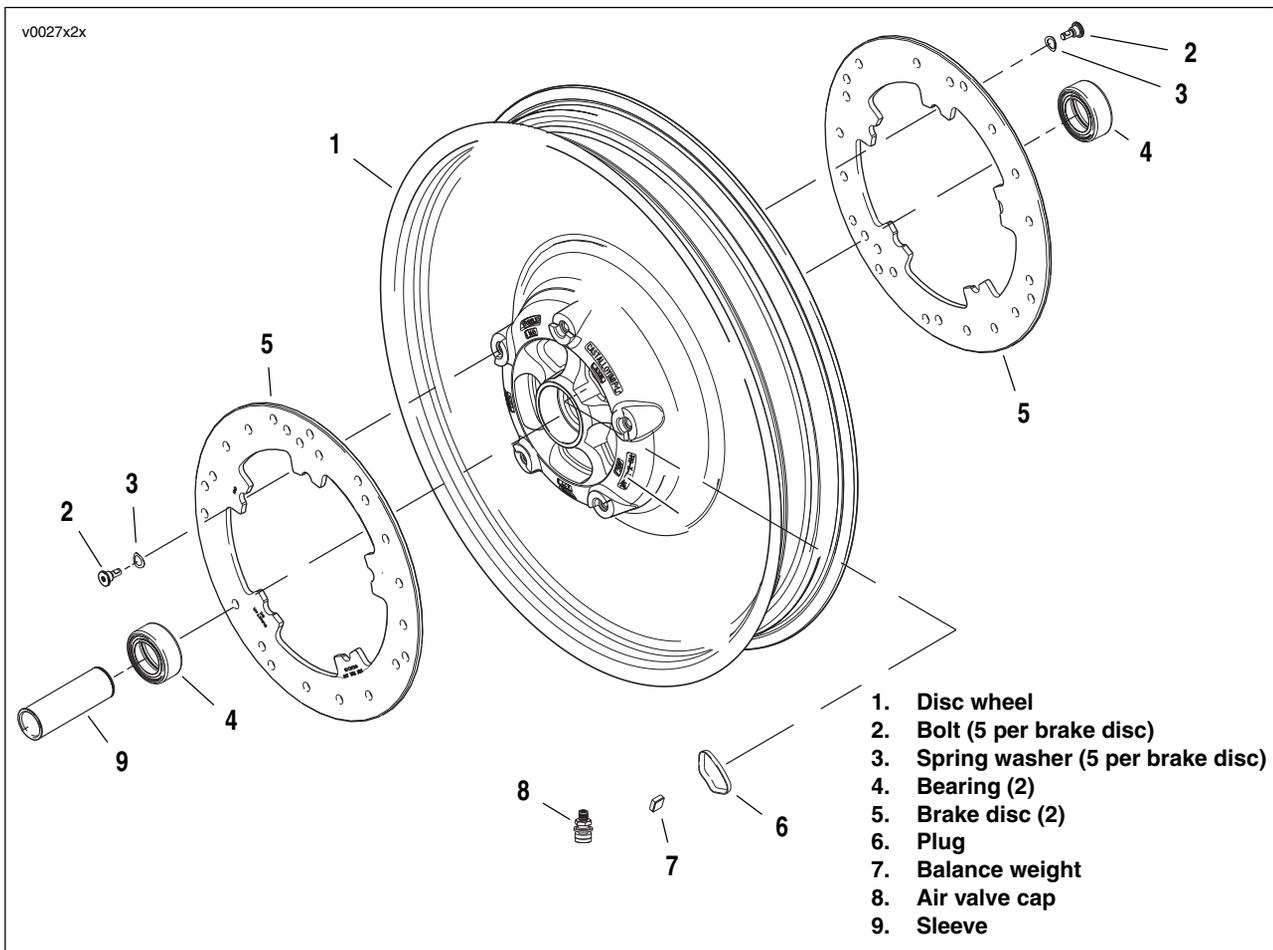


Figure 2-66. Front Wheel Components

REMOVAL

1. Block motorcycle underneath frame so front wheel is off the ground.

⚠ WARNING

To protect against shock and accidental start-up of vehicle, remove the maxi-fuse before proceeding. Inadequate safety precautions could result in death or serious injury.

2. Remove right side cover and maxi-fuse.
3. See [Figure 2-67](#). Remove both upper and lower mounting bolts to remove brake caliper assembly.
4. Support calipers using a rubber bungee cord. Be careful not to scratch fender or fork slider finish.
5. Repeat to remove opposite caliper.

NOTE

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

6. See [Figure 2-68](#). Loosen pinch bolts (2) in right side axle holder (4).
7. Insert screwdriver or steel rod through hole in axle (1) on right side. While holding axle stationary, remove axle nut (5).
8. Pull axle out while retaining the left and right wheel spacers (3).
9. Remove wheel assembly from forks.

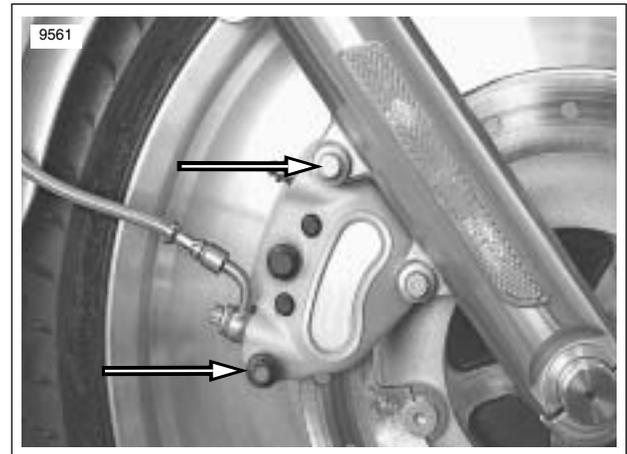
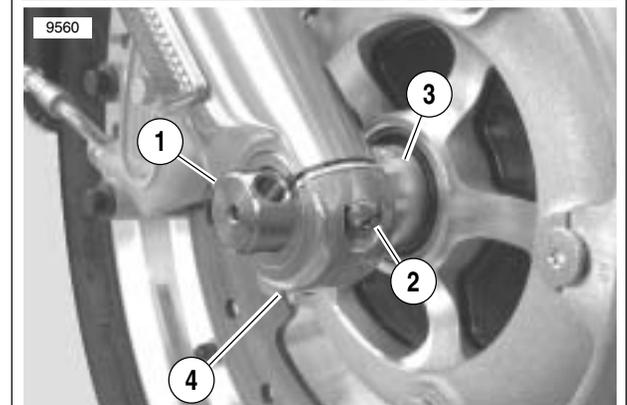
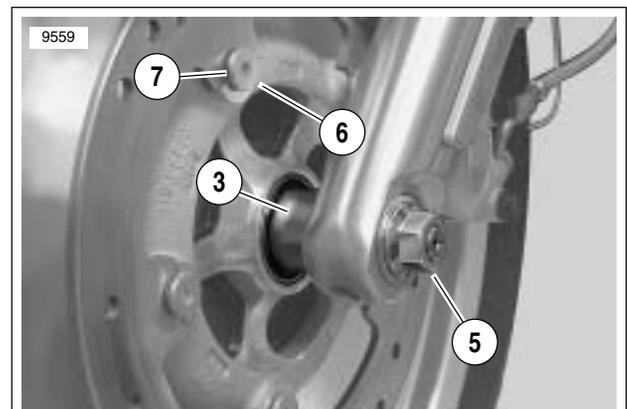


Figure 2-67. Caliper Mounting Bolts



1. Axle
2. Pinch bolts (screws)
3. Left and right wheel spacer
4. Axle holder (right side only)
5. Axle nut
6. Bolt
7. Spring washer

Figure 2-68. Front Wheel Mounting

DISASSEMBLY

NOTE

See [2.27 TIRES](#) to service tire or valve stem assembly.

1. Remove spacers from left and right sides.
2. If tire replacement is necessary, remove tire and valve stem. See [2.27 TIRES](#).
3. If wheel bearing replacement is necessary, remove the sleeve and press out the sealed wheel bearings. See [2.25 SEALED WHEEL BEARINGS](#).
4. If it is necessary to remove brake discs and if wheel is to be assembled with same discs, mark both wheel and discs, so they can be installed in their original locations.
5. See [Figure 2-66](#). If removing brake discs (5), remove five bolts (2) and spring washers (3) securing brake disc to the wheel (1). Repeat procedure to remove disc on opposite side of wheel. Discard bolts and spring washers.

CLEANING AND INSPECTION

1. Thoroughly clean all parts in solvent.
2. Inspect all parts for damage or excessive wear.

WARNING

Always replace brake pads in complete sets for correct brake operation. Never replace just one brake pad. Failure to install brake pads as a set could result in death or serious injury.

3. Inspect brake discs. Measure disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc. Also replace discs if warped or badly scored. See [1.10 BRAKE PADS AND DISCS](#).
4. Inspect brake pads. Minimum brake pad thickness is 1.6 mm (0.06 in.). See [1.10 BRAKE PADS AND DISCS](#).

ASSEMBLY

WARNING

Do not allow brake fluid, bearing grease, lubricants, etc. to contact brake rotor or reduced braking ability will occur which could result in death or serious injury.

NOTE

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

1. If sealed wheel bearings must be serviced, always replace bearings as a complete set. See [2.25 SEALED WHEEL BEARINGS](#).

WARNING

Do not exceed the maximum tire pressure listed on the sidewall. Incorrect tire pressure could lead to premature tire failure and possible death or serious injury.

2. If necessary, mount tire, valve stem and balance wheel assembly as required. See [2.27 TIRES](#).
3. Verify that wheel and tire are true. See [2.27 TIRES](#) and [2.26 DISC RIM RUNOUT](#).

WARNING

Do not allow brake fluid, bearing grease, lubricants, etc. to contact brake rotor or reduced braking ability will occur which could result in death or serious injury.

4. See [Figure 2-66](#). If necessary, install brake discs in their original positions. Verify that brake disc is clean.
 - a. On left side of wheel, install five **new** bolts (2) and five **new** spring washers (3) to attach left brake disc. Tighten bolts to 21-31 Nm (16-23 ft-lbs).
 - b. On right side of wheel, install five **new** bolts (2) and five **new** spring washers (3) to attach right brake disc. Tighten bolts to 21-31 Nm (16-23 ft-lbs).
5. After wheel is balanced, apply a coat of LOCTITE® ANTI-SEIZE LUBRICANT to entire surface of right side bearing race.

INSTALLATION

1. Apply a liberal coat of LOCTITE® ANTI-SEIZE LUBRICANT to the axle.
2. See Figure 2-69. Place wheel and spacers into front fork and install axle (5). Verify that axle spacers on right and left side are properly installed.
3. Thread on the axle nut. Insert drill bit, screwdriver or steel rod through hole in axle on right side of vehicle. While holding axle stationary, tighten axle nut to 68-75 Nm (50-55 ft-lbs).
4. Insert 7/16" drill bit (4) into hole in axle (5).
5. Pull fork leg so that it just contacts the drill bit, screwdriver or steel rod and then tighten axle holder pinch bolts (2) to 16 Nm (12 ft-lbs). Ensure that gap between the axle holder (3) and the fork slider (1) is equal at front and rear of axle holder.
6. Remove drill bit, screwdriver or steel rod from axle hole.

WARNING

Do not allow brake fluid, bearing grease, lubricants, etc. to contact brake rotor or reduced braking ability will occur which could result in death or serious injury.

7. Install the brake caliper to the fork legs.
 - a. Loosely install long mounting bolt into top hole on fork leg.
 - b. Install short mounting bolt into bottom hole on fork leg. Tighten bottom mounting bolt to 38-52 Nm (28-38 ft-lbs).
 - c. Final tighten top mounting bolt to 38-52 Nm (28-38 ft-lbs).
8. Repeat steps 6-7 to install brake caliper on other side of wheel.

WARNING

Whenever a wheel is installed, BEFORE moving motorcycle, you must pump brake fluid until the pistons push the pads against the brake disc. If you don't pump fluid pressure up again, the brakes will not be available to stop the motorcycle which could result in death or serious injury.

9. Pump brake hand lever to move pistons out until they contact both brake pads. Verify piston location against pads.

WARNING

Always test motorcycle brakes at low speed after completing repairs or bleeding the system. Failure to do so could result in death or serious injury.

10. Reinstall maxi-fuse and right side cover.

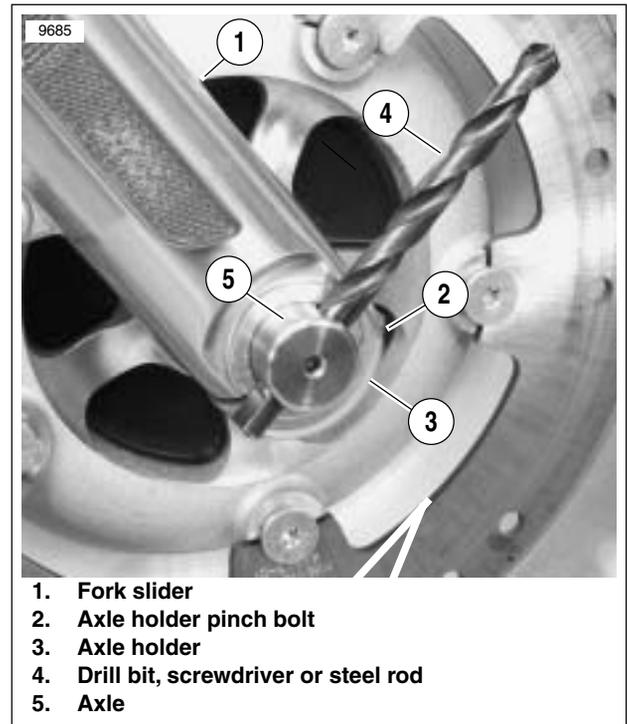


Figure 2-69. Aligning Fork to Wheel

GENERAL

Maximum tire mileage and good handling qualities are directly related to care given wheels and tires. Wheels and tires should be inspected regularly for wear. If handling problems occur, check [1.28 TROUBLESHOOTING](#) for possible causes.

Preliminary Inspection - Brake Disc

1. Measure brake disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc.
2. Replace disc if warped. Maximum allowable runout of a rear brake disc is 0.3 mm (0.012 in.).
3. If scored, replace disc.

Preliminary Inspection - Wheel/Tire

1. Block motorcycle underneath frame so front wheel is raised off the ground.
2. Inspect tire for wear and wear pattern. Remove wheel assembly and replace tire as necessary. See [2.27 TIRES](#).
3. Inspect air valve. Replace as necessary.
4. Inspect wheel bearing end play and service bearings if necessary. If end play is 0.051 mm (0.002 in.) or more, replace the wheel bearings. See [2.25 SEALED WHEEL BEARINGS](#).

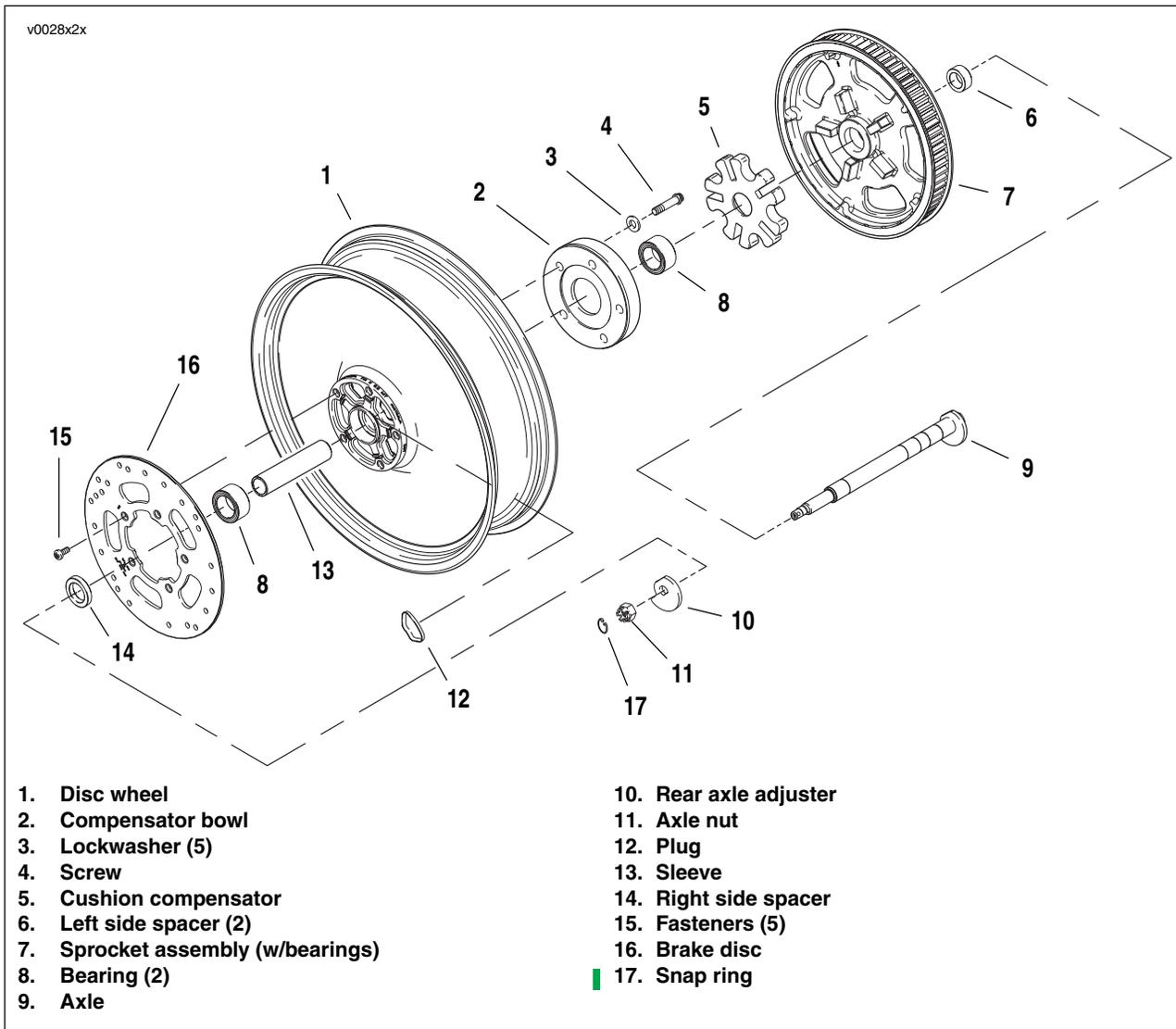


Figure 2-70. Rear Wheel Components

REMOVAL

1. Block motorcycle underneath frame so weight of motorcycle is off of rear wheel.

NOTE

A scissors style jack will allow you to raise or lower the motorcycle at different points throughout the procedure to provide both clearance and alignment during removal and installation.

2. Remove right side cover and maxi-fuse.
3. See Figure 2-71. Remove fasteners holding lower debris deflector (4) to rear fork. Remove debris deflector.
4. If necessary, remove fasteners holding belt guard (1) to rear fork. Back lower shock bolt (2) out until belt guard is free and remove belt guard. Shock bolt retaining threads are integral to belt guard. Leave shock bolt in place to maintain alignment.
5. See Figure 2-72. Remove snap ring (2), axle nut (1) and adjuster (3) from right side of axle.
6. Relieve belt tension by rotating axle adjusters.

CAUTION

Support rear tire from underneath during removal. Failure to support rear tire may cause damage to the motorcycle as the axle is removed.

7. Tap axle towards left side until rear brake caliper is free.
8. See Figure 2-73. Slide rear caliper up off of brake disc towards front of motorcycle. Using a bungee cord, secure caliper to right side shock. Be sure rubber bumper stays with caliper.
9. Remove axle. Identify and set aside right and left spacers, right side axle adjuster, axle nut, and snap ring.

CAUTION

Polished aluminum wheels can be scratched or damaged when slid out of and into the rear fork. Exercise caution to avoid dragging wheel and sprocket surfaces against rear fork components.

10. Move wheel forward and slip belt off sprocket. Adjust height of the scissors jack to allow removing wheel assembly without damaging components.

NOTE

Note the height of the license plate bracket. Pulling the rear wheel can break off the reflector brackets.

11. Pull wheel and drive belt sprocket assembly from rear fork.

NOTE

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

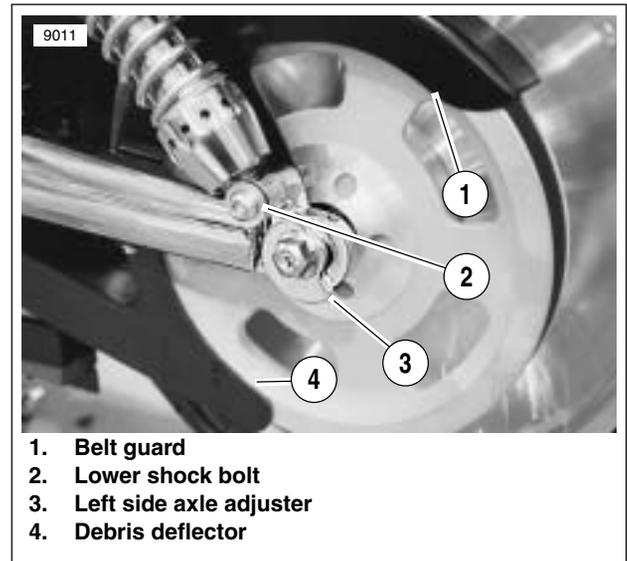


Figure 2-71. Rear Axle: Left Side

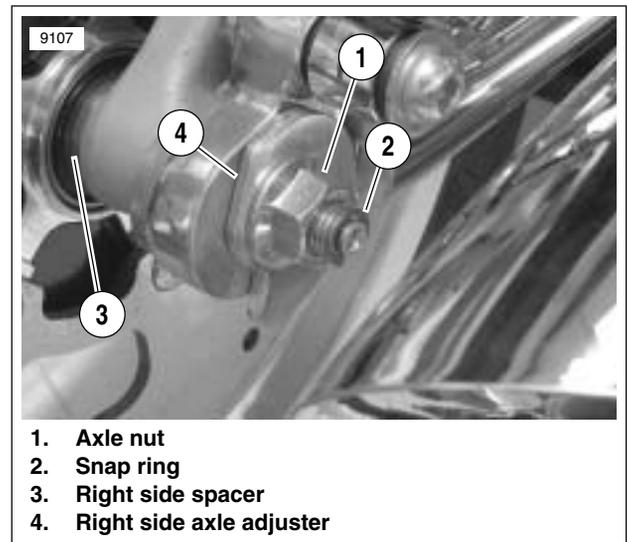


Figure 2-72. Rear Axle (right side)

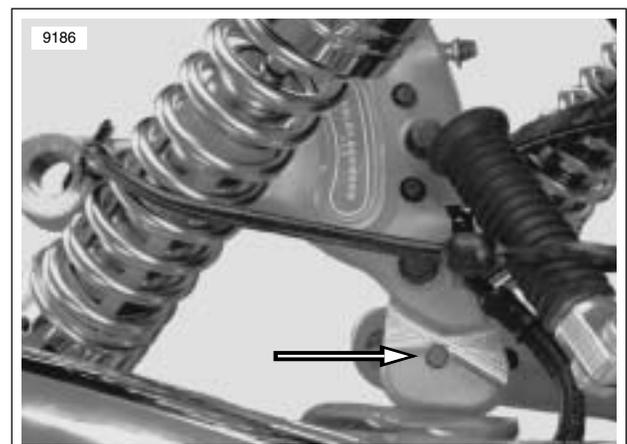


Figure 2-73. Secured Caliper with Rubber Bumper

DISASSEMBLY

1. See [Figure 2-74](#). Pull sprocket out of rubber compensator cushion (1) and compensator bowl (4) mounted to disc wheel.
2. Pull compensator spacer (2) and compensator cushion (1) from compensator bowl (4) mounted to disc wheel.
3. If tire replacement is necessary, remove tire and valve stem. See [2.27 TIRES](#).

NOTE

If drive sprocket bearing surface is rough or if bearing is leaking grease, replace bearing in [CLEANING AND INSPECTION](#) procedures.

4. See [Figure 2-70](#). If necessary, remove screws (4) and helical spring lockwashers (3) holding compensator bowl (2) to disc wheel (1). Remove compensator bowl (2).
5. If necessary, remove fasteners (15) that hold brake disc (16) to disc wheel (1) and remove brake disc (16).

CLEANING AND INSPECTION

1. Clean all parts in solvent and inspect all parts for damage or excessive wear.

NOTE

The wheels are aluminum and do not have a protective coating. Damage from harsh chemicals, acid based wheel cleaners, brake dust and lack of maintenance can occur. Use [HARLEY-DAVIDSON WHEEL & TIRE CLEANER](#) (Part No. 94658-98) to clean the wheels and tires and then use [HARLEY GLOSS](#) (Part No. 94627-98) to protect the aluminum wheel surfaces.

2. Inspect rear belt. See [1.15 Drive BELT AND Wheel SPROCKET](#).
3. Inspect sprocket bearing. If bearing surface is rough or if bearing was leaking grease, replace sprocket bearing as follows:
 - a. Supporting hub inside compensator dogs. use a suitable drift to press bearing out of sprocket hub.
 - b. Lubricate the bearing bore in the sprocket hub.
 - c. Supporting hub from cosmetic side in such a manner as to not damage machined surface, use a suitable drift to press in a **new** bearing. To avoid damaging bearing, drift should press on outside race of bearing.
4. Inspect compensator cushion for missing chunks or excessive debris beyond normal wear marks. Replace if necessary.
5. 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.
6. If sealed wheel bearings must be serviced, see [2.25 SEALED WHEEL BEARINGS](#)

WARNING

Always replace brake pads in complete sets for correct brake operation. Never replace just one brake pad. Failure to install brake pads as a set could result in death or serious injury.

7. Inspect brake pads, calipers, and brake lines. Replace pads and service calipers and brake lines as required. See [1.10 BRAKE PADS AND DISCS](#).

ASSEMBLY

1. If necessary, mount tire, valve stem and balance wheel assembly as required. See [2.27 TIRES](#).
2. Install brake disc, if removed, on valve stem side of wheel.
 - a. Apply a drop of LOCTITE® 243 (blue) to the five bolts that hold on rear brake disc.
 - b. Thread in and alternately tighten to 41-53 Nm (30-38 ft-lbs).
3. Install compensator bowl. Thread in screws and helical spring lockwashers. Tighten to 61-75 Nm (45-55 ft-lbs).
4. Verify that wheel and tire are true and balanced. See [2.26 DISC RIM RUNOUT](#) and [2.27 TIRES](#).
5. After wheel is balanced, apply LOCTITE® ANTI-SEIZE LUBRICANT to entire surface of left side (compensator bowl) bearing race only.
6. See [Figure 2-74](#). Lubricate compensator cushion (1) with a detergent spray like Windex™ and install compensator cushion. Be sure the PULLEY SIDE legend (3) is facing out.
7. Install the compensation spacer (2) with the grooved end in the cushion (1).
8. Insert sprocket dogs into compensator cushion to mate sprocket to rear wheel.

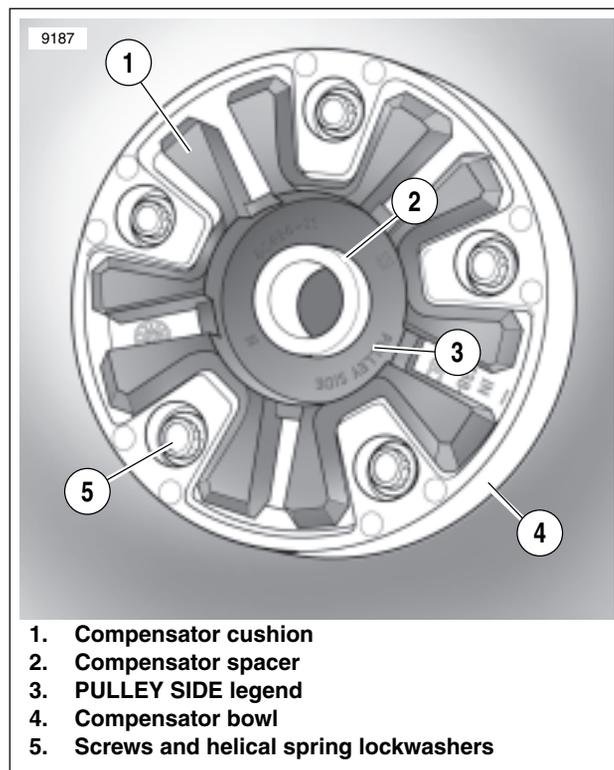


Figure 2-74. Compensator Cushion in Compensator Bowl

INSTALLATION

1. Install wheel into rear fork.
2. Slide drive belt over drive sprocket.
3. Slide brake calipers over front brake disc between brake pads. Lubricate rubber bumper with a detergent spray and slide slot in the caliper over brake anchor weldment on rear fork. Be sure rubber bumper is in place under weldment.
4. Coat axle liberally with LOCTITE® ANTI-SEIZE LUBRICANT and install.
 - a. From left side, carefully insert axle through rear fork, left side spacer, drive sprocket, compensator cushion, into wheel assembly.
 - b. Continue sliding axle through wheel assembly hub sleeve, right side spacer, brake caliper, and left rear fork. Center right side spacer on wheel bearing to allow axle to pass through. Axle is fully installed when left side cam is tight against rear fork.
 - c. Slip on right side axle adjuster. Right side axle adjuster will only fit in a manner that matches position of left side eccentric.
 - d. Coat flange of axle nut with LOCTITE® ANTI-SEIZE LUBRICANT and thread on and finger tighten axle nut.
5. Pump brake pedal to move pistons out until they contact both brake pads. Verify piston location against pads.
6. Verify axle alignment and then check belt deflection. See [1.14 REAR BELT DEFLECTION](#).
7. Use a wrench to rotate rear axle adjuster until drive belt deflection is within specifications.

WARNING

Do not exceed 142 Nm (105 ft-lbs) when tightening the axle nut. Exceeding 142 Nm (105 ft-lbs) will cause the wheel bearings to seize during vehicle operation, which could result in death or serious injury.

8. Tighten axle nut to 129-142 Nm (95-105 ft-lbs).
9. Install snap ring.
10. If belt guard was removed, slide belt guard slots onto rubber grommets. Thread shock mount bolt into belt guard and tighten shock mount bolt to 41-68 Nm (30-50 ft-lbs).
11. Slide debris deflector slots on to its corresponding rubber grommet. Install debris deflector bolt and tighten bolt to 6-10 Nm (53-88 in-lbs).
12. Measure belt guard to drive sprocket clearance.
13. If clearance is less than 5 mm (0.197 in.), protect guard/sprocket and adjust as required.
14. Install maxi-fuse and right side cover.

WARNING

Whenever a wheel is installed, BEFORE moving motorcycle, you must pump brake fluid until the pistons push the pads against the brake disc. If you don't pump fluid pressure up again, the brakes will not be available to stop the motorcycle which could result in death or serious injury.

GENERAL

Inspection for lateral end play, removal, and installation procedures for sealed wheel bearings are the same for both the front wheel and the rear wheel.

INSPECTION: LATERAL END PLAY

1. Block motorcycle underneath frame so wheel is raised off ground.
2. See [Figure 2-75](#). Mount a magnetic base dial indicator to brake disc with dial's contact point on end of axle.
3. To check for lateral end play, turn wheel through several rotations, then move wheel side to side.
 - a. If end play is less than service wear limit of 0.051 mm (0.02 in.), bearing passes inspection.
 - b. If end play exceeds service wear limit or feels rough, remove wheel and replace both wheel bearings.

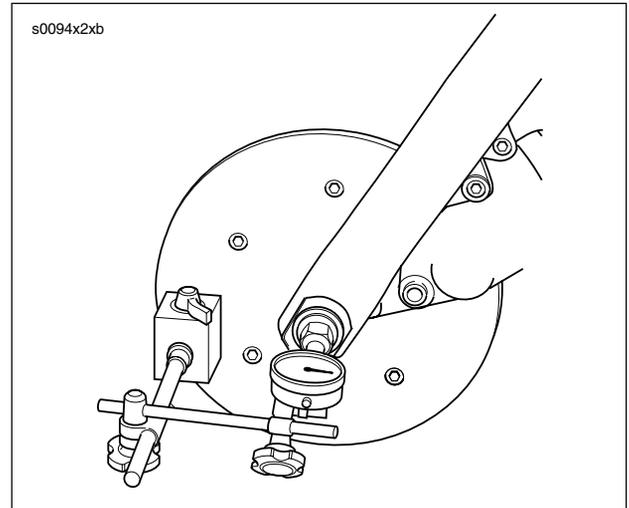


Figure 2-75. Measuring Lateral End Play (Front Wheel)

d0563x2x

Parts 1-7 common to removal/installation.
Parts 8-9 used for removal only.
Parts 10-13 used for installation only.

NO.	DESCRIPTION	PART NO.
1	Bridge	HD-44060-5
2	Steel ball	12547
3	Forcing screw	HD-44060-4
4	Nut	10210
5	Washer	12004
6	Nice bearing	RS25100-200
7	Lubricant	J-23444A
8	Collet, 3/4 in.	HD-44060-3
9	Collet, 1.0 in.	HD-44060-7
10	Pilot, 1.0 in.	HD-44060-8
11	Pilot, 3/4 in.	HD-44060-6
12	Support plate	HD-44060-1
13	Threaded rod	280856

Figure 2-76. HD-44060 Wheel Bearing Tools

REMOVAL

PART NO.	SPECIALTY TOOL
HD-44060	Wheel bearing installer/remover

- Remove wheel. See [2.24 REAR WHEEL](#) and [2.23 FRONT WHEEL](#).
- See [Figure 2-77](#). Obtain WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060) and assemble tools required for bearing removal.
 - Sparingly apply graphite lubricant to threads of forcing screw (1) to prolong service life and ensure smooth operation.
 - Install nut (2), washer (3) and Nice bearing (4) on screw. Insert assembly through hole in bridge (6).
 - Drop ball bearing inside collet (5). Fasten collet and ball bearing to forcing screw (1).
- Hold end of forcing screw (1) and turn collet (5) to expand edges of collet.
- See [Figure 2-78](#). When expanded collet has gripped bearing edges, hold end of forcing screw (1) and turn nut (2) to remove bearing from wheel.
- Remove spacer from inside wheel hub.
- Repeat procedure for opposite side bearing. Discard all bearings upon removal.

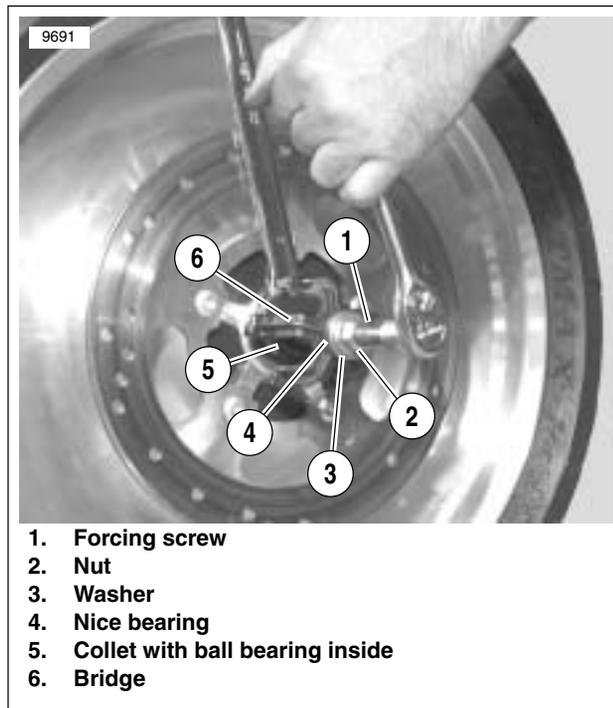


Figure 2-77. Gripping Bearing

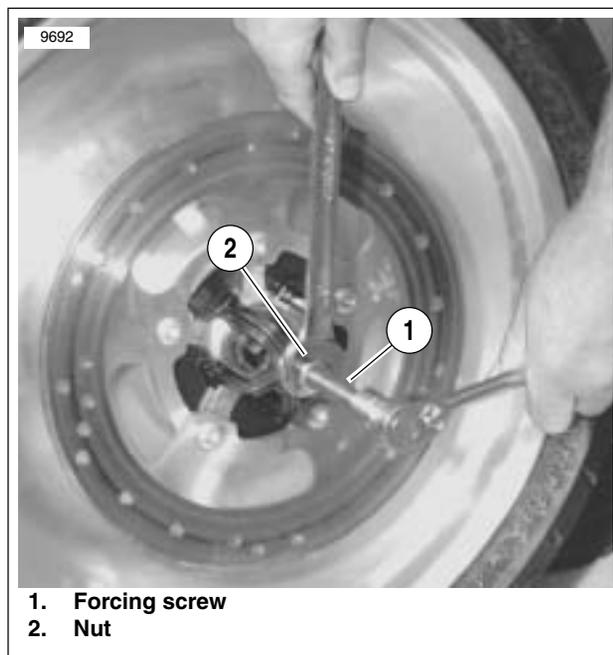


Figure 2-78. Removing Bearing

INSTALLATION

PART NO.	SPECIALTY TOOL
HD-44060	Wheel bearing installer/remover

NOTE

On a front wheel, install bearing on the left side first. On a rear wheel, install bearing on the brake disc or right side first.

1. Obtain WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060) and assemble tools required for bearing installation.
 - a. Sparingly apply graphite lubricant to threads of a draw down bolt or a suitable threaded rod with double locking nuts to prolong service life and ensure smooth operation.
 - b. See [Figure 2-79](#). Place threaded rod (1) through support plate (2).
 - c. Insert assembly through wheel.
 - d. Place the **new** bearing on threaded rod (1) with lettered side outward.
 - e. Install pilot (6), Nice bearing (5), washer (4) and nut (3) over rod.
2. Hold hex end of threaded rod (1) and turn nut (3) to install bearing. Bearing will be fully seated when nut can no longer be turned. Remove tool.
3. Install spacer sleeve inside wheel hub.
4. Reverse tool and install opposite side bearing.

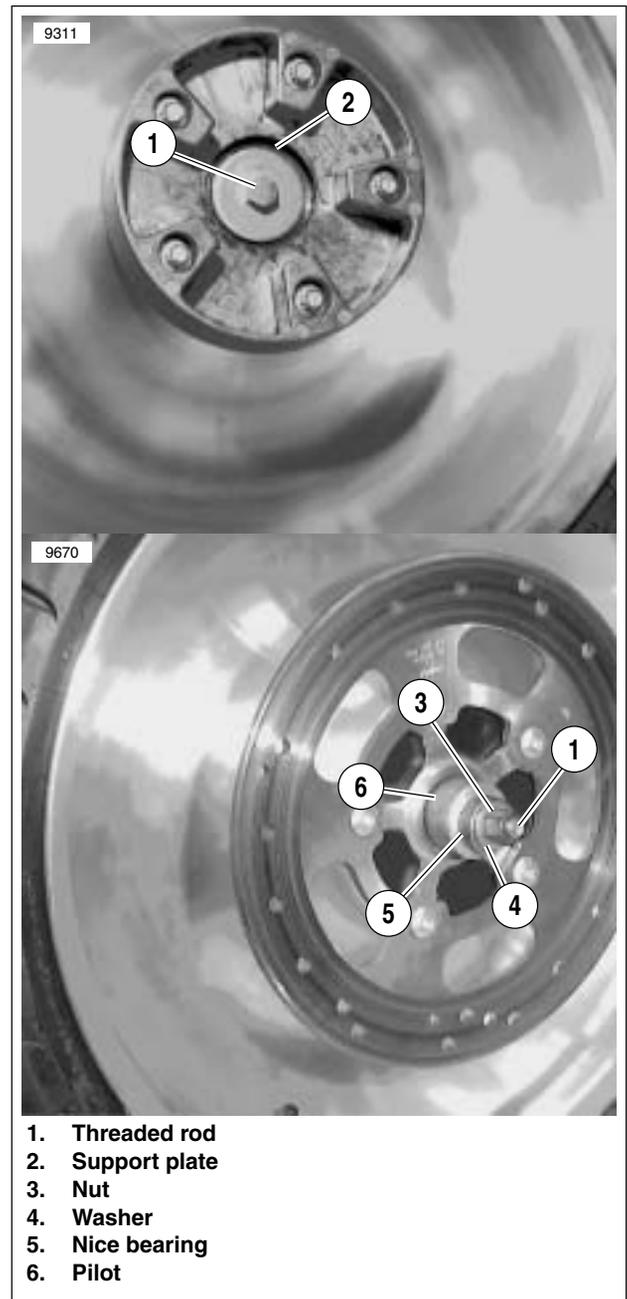


Figure 2-79. Installing Wheel Bearing

GENERAL

Disc wheels should be checked for lateral and radial runout before installing a new tire or tube.

Table 2-7. Rim Runout Maximums

RUNOUT	MM	IN
Lateral	1.02	0.040
Radial	0.76	0.030

LATERAL RUNOUT

See [Figure 2-80](#). Install arbor in wheel hub and place wheel in WHEEL TRUING STAND (Part No. HD-95599-80). To check rim lateral runout, place a gauge rod or dial indicator near rim bead. Spin wheel. If lateral runout exceeds 1.02 mm (0.040 in.), replace wheel.

PART NO.	SPECIALTY TOOL
HD-95599-80	Wheel truing stand

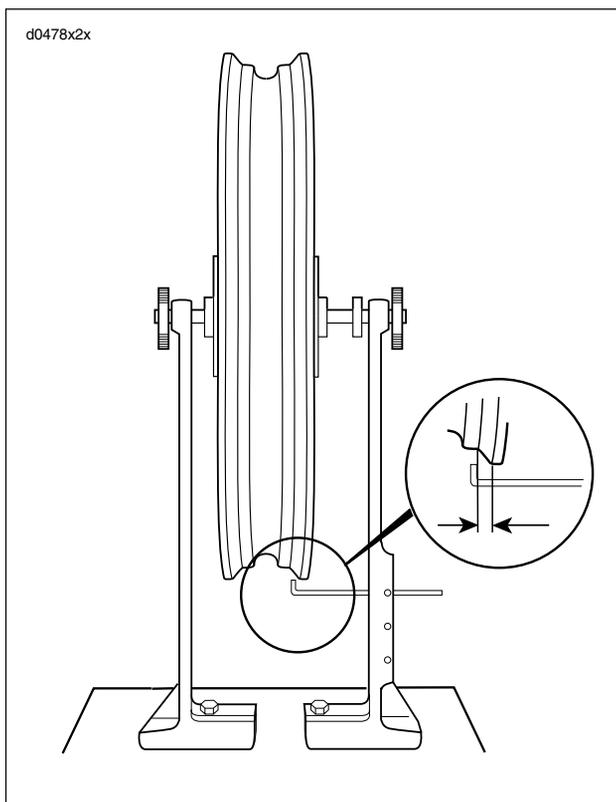


Figure 2-80. Rim Lateral Runout

RADIAL RUNOUT

See [Figure 2-81](#). Spin wheel to check for radial runout. Replace wheel if rim radial runout exceeds 0.76 mm (0.030 in.).

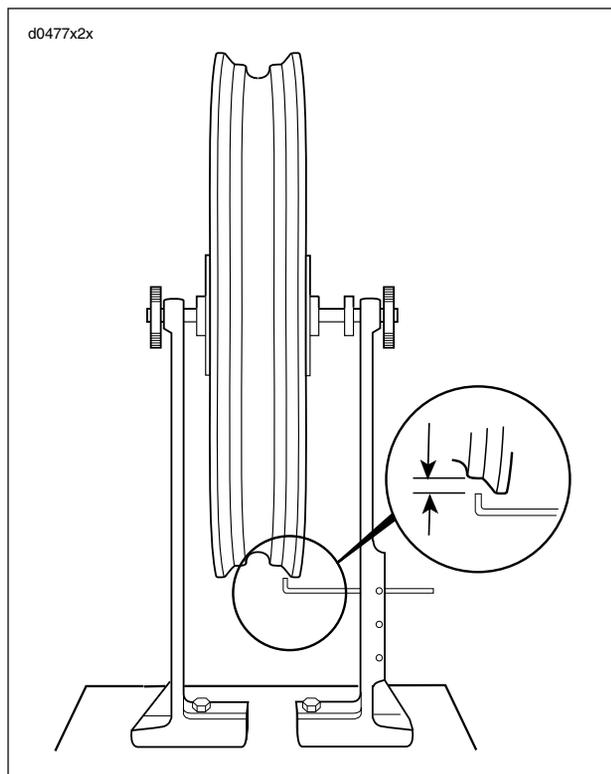


Figure 2-81. Rim Radial Runout

GENERAL

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

New tires should be stored in a horizontal tire rack. Avoid stacking new tires in a vertical stack. The weight of the stack compresses the tires and closes down the beads.

⚠ WARNING

Harley-Davidson recommends replacement of any tire punctured or damaged. In some cases small punctures in the tread area may be repaired from within the dismounted tire by your Harley-Davidson dealer. Speed should not exceed 80 km/h (50 mph) for the first 24 hours after repair and the repaired tire should **NEVER** be used over 130 km/h (80 mph). In emergency situations, if a temporary repair is made, ride slowly with as light a load as possible until the tire is permanently repaired or replaced. Failure to heed this warning could result in death or serious injury.

Tubeless tires may be repaired in the tread area only if the puncture is 6.4 mm (1/4 in.) or smaller. All repairs must be made from inside the tire.

Acceptable repair methods include a patch and plug combination, chemical or hot vulcanizing patches or head-type plugs. When repairing tires, use TIRE SPREADER (Part No. HD-21000) to spread the tire sidewalls.

⚠ WARNING

Never repair a tire with less than 1.6 mm (1/16 in.) tread depth. Inadequate tread depth can cause an accident which could result in death or serious injury.

DEMOUNTING TIRES

1. Remove wheel from motorcycle. See [2.23 FRONT WHEEL](#), and/or [2.24 REAR WHEEL](#). Remove drive sprocket from a rear wheel.
2. Deflate tire. Use a valve core tool to remove valve core from valve stem.

⚠ WARNING

Read the operating manual for the manufacturer and model of tire machine used. Failure to follow operational procedures or to heed any cautions/warnings in the manual for the tire machine could result in death or serious injury.

3. See [Figure 2-82](#). Use a pneumatic bead breaker to loosen bead. Rotate wheel and apply bead breaker at several points along circumference of the rim until entire bead drops into rim well.



Figure 2-82. Pneumatic Bead Breaker

4. Install wheel onto jaws of tire machine. Lubricate tire bead with soap solution.
5. Fit wedge over rim of wheel.
6. See [Figure 2-83](#). Pull bead up over rim in one spot and fit bead to wedge. Spin wheel to draw full length of bead over rim and off wheel. Do not use excessive force when starting bead over rim.



Figure 2-83. Tire Machine Pulling Bead Off Rim

CAUTION

Follow the tire machine manufacturer's recommendation for the correct placement of the bead on the mandrel. Incorrect mounting may damage the bead and ruin the tire.

7. If necessary, repeat for opposite bead and remove tire from wheel.

CLEANING AND INSPECTION

1. Clean inside of rim. If rim is dirty or corroded, clean with a stiff wire brush.
2. Wheels should be checked for lateral and radial runout before installing a new tire or tube. See [2.26 DISC RIM RUNOUT](#).
3. Inspect tire for wear. Measure tread depth.

PART NO.	SPECIALTY TOOL
HD-21000	Tire spreader

4. Use TIRE SPREADER (HD-21000) and inspect inside of tire for wear and damage.

TIRE REPLACEMENT

See [Figure 2-84](#). Tire wear indicator bars will appear on tire tread surfaces when 1/32 inch (0.8 mm) or less of tire tread remains. Arrows on tire sidewalls pinpoint location of wear bar indicators. Always remove tires from service before they reach the tread wear indicator bars (1/32 of an inch/0.8 mm tread pattern depth remaining).

New tires are needed if any of the following conditions exist.

1. Tire wear indicator bars become visible on the tread surfaces.
2. Tire cords or fabric become visible through cracked sidewalls, snags or deep cuts.
3. A bump, bulge or split in the tire.
4. Puncture, cut or other damage to the tire that cannot be repaired.

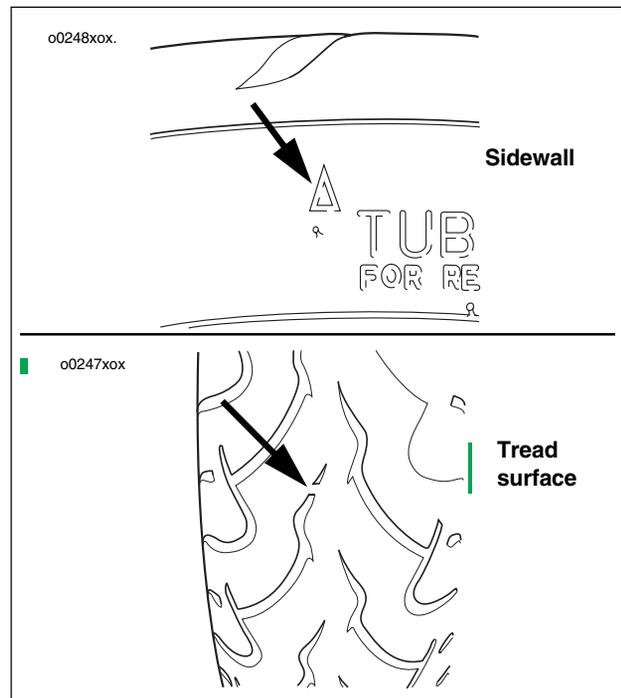


Figure 2-84. Tire Wear Indicators for VRSC

MOUNTING TIRES

⚠ WARNING

Only install original equipment (stock) tire valves and valve caps. A valve or valve and cap combination that is too long may interfere with (strike) adjacent components, damage the valve and cause rapid tire deflation. Rapid tire deflation could cause loss of control and could result in death or serious injury.

⚠ WARNING

Aftermarket valve caps that are heavier than the stock cap may have clearance at slow speeds; but, at high speed the valve/cap will be moved outward by centrifugal force. This outward movement could cause the valve/cap to strike the adjacent components, damage the valve and cause rapid tire deflation. Rapid tire deflation could cause loss of control and could result in death or serious injury.

⚠ WARNING

Damaged or leaking valves must be replaced.

NOTE

New radial tires are extremely stiff and tires stored near the bottom of a tire stack may take a compressed set.

NOTE

Warm radial tires mount easier than cold tires. Prior to mounting, store new tire in a warm area and/or in sun light. Tire temperature should not exceed 48° C (120° F).

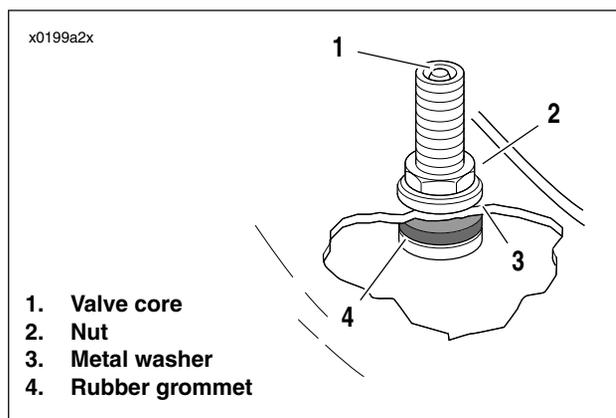


Figure 2-85. Valve Stem

- See Figure 2-85. Replace damaged or leaking valve stems.

NOTE

Leaving the valve core out of the valve stem will allow a sufficient volume of air to inflate the radial tire to seat the beads on the rim.

- Insert valve stem with rubber grommet (4) in place into rim hole.
- Install metal washer (3) over valve stem.
- Install nut (2). Tighten to 1.4-1.7 Nm (12-15 in-lbs).

- Thoroughly lubricate bead on both sides of tire with a rubber lubricant. Lubricate inside diameter of bead and side wall. Lubricate rim flanges and safety hump on wheel.

⚠ WARNING

Read the operating manual for the manufacturer and model of tire machine used. Failure to follow operational procedures or to heed any cautions/warnings in the manual for the brand/model of tire machine could result in death or serious injury.

- With rim installed in pneumatic tire machine jaws, orient tire with rotational arrow pointing in direction of forward rotation. Push one side off bottom bead into rim well and walk the bottom bead around until it is completely in the rim well.

NOTE

The tire has a colored dot on sidewall, it is a balance mark and should be located next to valve stem hole.

- Position yellow dot at valve stem and starting 180 degrees opposite valve stem, mount top bead to shoe of pneumatic tire machine.
- Rotate wheel to pull bead into rim well. Remove wheel from tire machine.

⚠ WARNING

Do not exceed more than the tire manufacturer's recommended pressure to seat the beads. Inflating the tire more than the manufacturer's recommended pressure to seat the beads can cause the tire rim assembly to burst with sufficient force which could result in death or serious injury.

- Center tire to wheel and inflate tire to trial seat bead on the rim. Identify any spot around rim where bead does not seat correctly before deflating the tire.
- While inflating a second time, press down on sidewall opposite spot where bead did not seat during first inflation.
- Continue to deflate and inflate tire while by pressing on side of tire opposite any spot on tire where bead is not seating. Continue procedure until tire is centered all the way around rim.
- Install a **new** valve core and adjust air pressure as required to match recommended pressures. See [1.11 TIRES AND WHEELS](#).
- Check tire for both radial and lateral runout. See [TIRE RUNOUT](#) in [2.27 TIRES](#).
- Balance tire as required. See [2.27 TIRES](#).
- Clean wheel and rim of any rubber lubricant or soap used in mounting tire.

NOTE

Lubricants or detergents can cause corrosion on the motorcycle's wheel if not removed immediately after mounting and balancing a tire.

TIRE RUNOUT

Mounted tires should be checked for both lateral and radial tire runout.

Table 2-8. Tire Runout Maximums

RUNOUT	MM	IN
Lateral	2.29	0.090
Radial	2.03	0.080

Lateral Runout

- See [Figure 2-86](#). Check tire runout by turning wheel on axle, measuring tire lateral runout.

NOTE

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

- Maximum tire lateral runout is 1.52 mm (0.060 in.). If tire tread runout exceeds 1.52 mm (0.060 in.), remove tire from rim and check wheel rim lateral runout to see if rim is at fault. See [2.26 DISC RIM RUNOUT](#).
- If rim lateral runout is less than 0.76 mm (0.030 in.), tire is at fault and should be replaced. If rim lateral runout is more than 0.76 mm (0.030 in.), correct by replacing disc wheel.

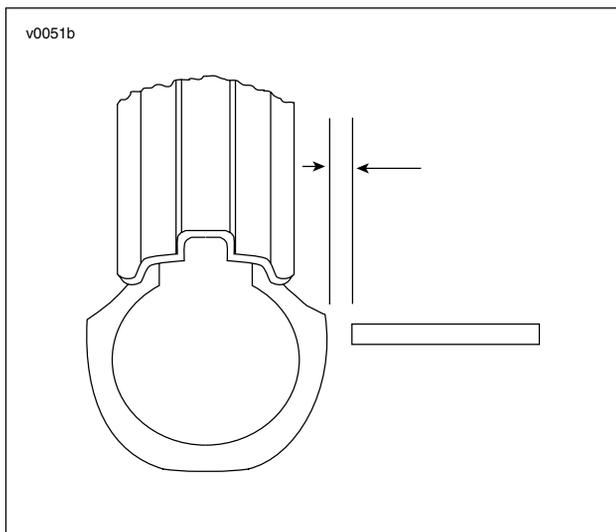


Figure 2-86. Lateral Tire Runout

Radial Runout

- See [Figure 2-87](#). With a tire centered and mounted on the rim, check runout by turning wheel on axle, measuring amount of radial displacement from a fixed point near the tire.

NOTE

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

- Maximum tire tread runout is 2.29 mm (0.090 in.). If tire tread runout exceeds 2.29 mm (0.090 in.), remove tire from rim and check rim radial runout to see if rim is at fault. See [2.26 DISC RIM RUNOUT](#).
- If rim radial runout is less than 0.76 mm (0.030 in.), tire is at fault and should be replaced. If rim radial runout is more than 0.76 mm (0.030 in.), correct by replacing wheel.

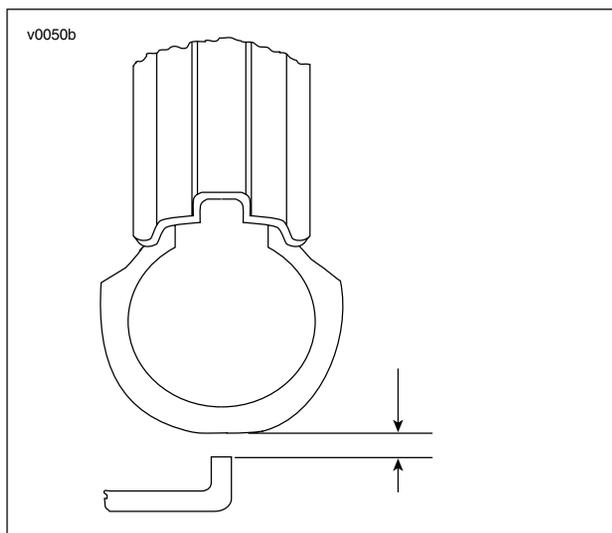


Figure 2-87. Radial Tire Runout

WHEEL BALANCING

Wheels must be balanced to improve handling and reduce vibration, especially at high road speeds.

PART NO.	SPECIALTY TOOL
HD-95599-80	Wheel truing stand

Static balancing using WHEEL TRUING STAND (HD-95599-80) will produce satisfactory results.

Dynamic balancing, utilizing a wheel spinner, should be used to produce finer tolerances for best high speed handling characteristics. Follow the instructions supplied with the balance machine you are using.

Cast aluminum wheels require the special self adhesive balance weights listed below.

Table 2-9. Balance Weights

COLOR	GRAMS	OZ.
Silver (HD-95595-84)	7	0.25
Black (HD-95594-84)	7	0.25

1. Use a balancing machine to determine amount of balance weight required to bring wheel within 7 g (0.25 oz.) at 97 km/h (60 mph).

NOTES

- *The maximum weight permissible to accomplish balance is 99 g (3.5 oz.) total weight applied on the rim.*
 - *Self adhesive wheel weights should be applied to the flat surface of the rim in increments of 7 g (0.25 oz.).*
 - *If 28 g (1.0 oz.) or more weight must be added at one location, split the amount so that half is applied to each side of the rim.*
2. To apply self adhesive wheel weights, make sure that area of application is completely clean, dry, and free of oil and grease.
 3. Remove paper backing from weight and apply 3 drops of LOCTITE® SUPERBONDER 420 to the adhesive side of weight.
 4. Place weight on rim, press firmly in place and hold for 10 seconds. Wheel should not be used for 8 hours to allow adhesive to cure completely.
 5. Recheck balance. Repeat procedures as necessary.

GENERAL

The alignment of the front wheel to the rear wheel is set at the factory. There are no adjustments for alignment. Alignment is maintained with quality components and with correct assembly procedures.

The stabilizer link between the engine and the frame is a horizontal engine locator only. The stabilizer link is **not** to be used to adjust the horizontal alignment of the rear wheel. See [2.6 FRONT ENGINE MOUNT ASSEMBLY](#).

Verification of front wheel to rear wheel alignment can be used to determine the cause of an ill-handling motorcycle or of a vibration/noise in the front engine mount.

INSPECTION

Before following the verification procedure, after engine removal and replacement, or after service that requires removing and replacing the front motor mounts or the rear fork and engine mounts, always inspect the front and rear engine mounts, the stabilizer link, the rear tire to the fender mounting hardware clearance and the lower left crankcase to frame rail clearance.

Front Engine Mount

1. Verify condition and torque of the front engine mount. Visually inspect for wear, damage or improper installation. Replace hardware as necessary.
2. Replace the rubber mount if there are any signs of bulging, cracking, or shearing. See [2.5 FRONT ENGINE MOUNT](#).

Rear Engine Mounts and Rear Fork Pivot

1. Verify condition and torque of the mounting hardware. Visually inspect for wear, damage or improper installation. Replace hardware as necessary.
2. Examine rubber rear engine mounts to be sure there is no twisting or binding. Replace as required. See [2.8 REAR ENGINE MOUNTS](#).

Engine Stabilizer Link

1. Verify condition and torque of the mounting hardware.
2. Visually inspect for wear, damage or improper installation. Replace hardware as necessary. See [2.6 FRONT ENGINE MOUNT ASSEMBLY](#).

Clearances

1. The rear wheel and tire must have adequate clearance through its suspension travel.
2. The engine crankcase should have a minimum 3.18 mm (0.125 in.) clearance from the lower left hand frame rail.

v0119xox

**When A = B and
the Difference Between B and C is
Less than +/- 6.35 mm (0.250 in.),
the Front Wheel is Aligned to the Rear.**

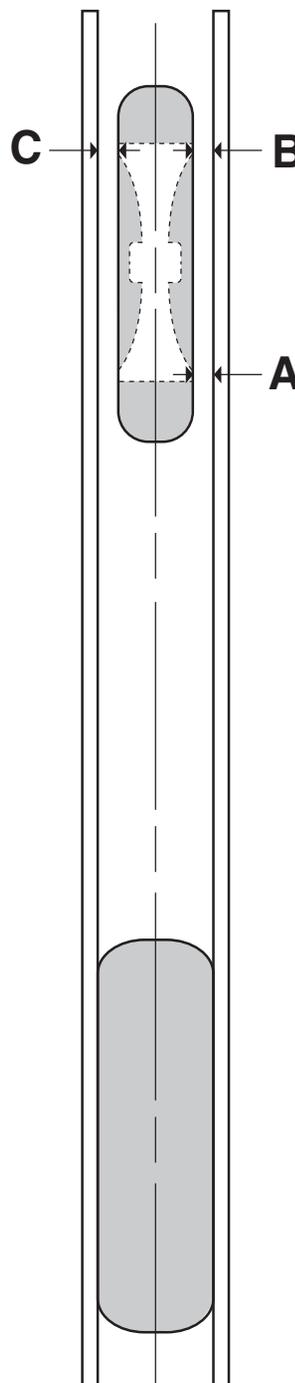


Figure 2-88. Wheel Alignment

VERIFICATION

WARNING

Vehicle alignment is very important to assure proper handling and vibration control. Improper alignment could lead to an accident which could result in death or serious injury.

1. Verification of wheel alignment requires that the motorcycle meet specifications for the following components:
 - a. Wheels. See 2.26 DISC RIM RUNOUT.
 - b. Tires. See 1.11 TIRES AND WHEELS.
 - c. Steering head bearing “fall-away.” See 1.18 STEERING HEAD BEARINGS.
 - d. Belt deflection. See 1.14 REAR BELT DEFLECTION.
2. Place the motorcycle on a center stand to support the vehicle and lift the rear wheel off the ground.
 - a. Place scissors jack under fuel tank mount with clearance for alignment bars.
 - b. Do **NOT** support engine on oil sump. The engine must be free to shift slightly in its mounts.
 - c. Be sure the motorcycle is as level as possible.
3. Identify the rear tire clearance to the rear fender and mounting hardware. The tire should appear to be centered and move through its travel without hitting other components.
4. Install a set of straightedges or alignment bars on both the left and right side of motorcycle alongside the front and rear tires.
 - a. Both alignment bars should firmly contact the rear tire at two points on both sides of the tire.
 - b. Use clamps 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 parallel by comparing the measurements between the bars at both ends.
5. See Figure 2-88. Straighten the front forks. From the front wheel rim, measure to the bar on one side of the motorcycle at the rear of the rim (A) and at the front of the rim (B) (two points). Straighten the front forks until the two measurements are equal (A = B).
6. See Figure 2-89. Measure vertical alignment by placing an inclinometer vertically on front and rear brake discs. Front and rear lean angles should be equal within +/- 1/2 degree.
7. See Figure 2-88. On the other side of the motorcycle, measure from the alignment bar to the front wheel rim (C) and compare measurement to that of the opposite side (B - C).
 - a. If opposing side measurements (B - C) are within +/- 6.35 mm (0.250 in.), the front and rear wheel are **in** alignment.
 - b. If the difference in opposing side measurements (B - C) is more than +/- 6.35 mm (0.250 in.), the front and rear wheel are **out** of alignment.

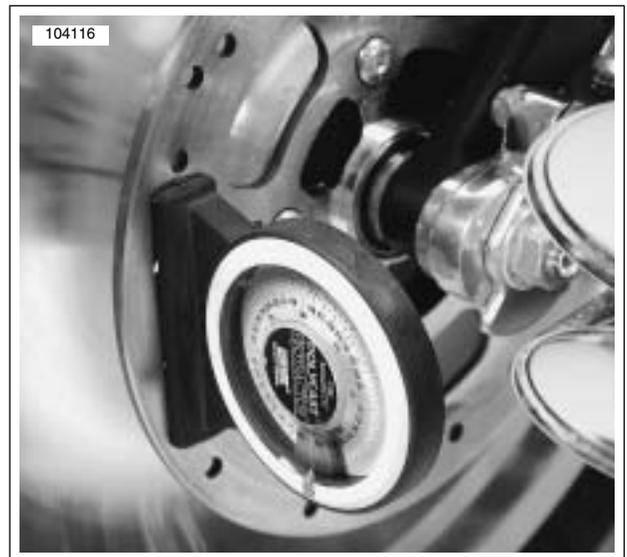


Figure 2-89. Measuring Vertical Alignment

CENTERING ENGINE

1. Verify wheel alignment. See [VERIFICATION](#) under [2.28 WHEEL ALIGNMENT](#).
2. See [Figure 2-90](#). If the front and rear wheels are out of alignment, loosen and remove the engine stabilizer link from the tab on the frame. This allows the engine to center itself to the front and rear engine mounts.
3. Repeat alignment verification:
 - a. See [Figure 2-88](#). To straighten the front wheel, measure from the front wheel rim to the bar on one side at two points (A, B) along the wheel rim. Straighten the front wheel until the measurements are the same (A = B).
 - b. Measure the front and rear brake disc vertical lean angles. The angles should be within +/- 1/2 degree.
 - c. On the other side, measure the from the rim to the bar (C) and compare (B - C) to the measurement from the opposite side. The measurements must be within +/- 6.35 mm (0.250 in.).
 - d. Check the left lower engine case to frame rail clearance. It should be at least 3.18 mm (0.125 in.).
 - e. Identify clearance between the rear tire and the rear fender mounting hardware. The tire should appear to be centered and move through its suspension travel without hitting other components.

CAUTION

Lengthening or shortening the stabilizer link can put stress on the crankcase mounting boss. The stress may break or crack the crankcase mounting boss after light impact.

4. See [Figure 2-90](#). The stabilizer link fastener (4) should fit freely through the ball end of the link (1) and the frame tab (5). If it does not, loosen lock nuts (2) on the ball ends (1) and use adjusting nut (3) and rod to adjust length of stabilizer link until stabilizer link bolt fits freely through ball end (1) of stabilizer link and frame tab (5).
5. Tighten stabilizer link to frame tab fastener (4) to 34-41 Nm (25-30 ft-lbs).

IMPORTANT NOTE

If installing the stabilizer link causes interference between the rear tire and fender mounting hardware or the lower left crankcase and frame rail, the stabilizer link can be shorten or lengthened a short distance while fastened to frame tab and crankcase. Rotate the adjusting nut and rod (no more than two turns) to provide clearance. It is recommended to never turn the adjusting nut and rod more than two turns in or out with the stabilizer link fastened to the crankcase and the frame tab.

6. Tighten lock nuts (2) on stabilizer link ball ends (1).

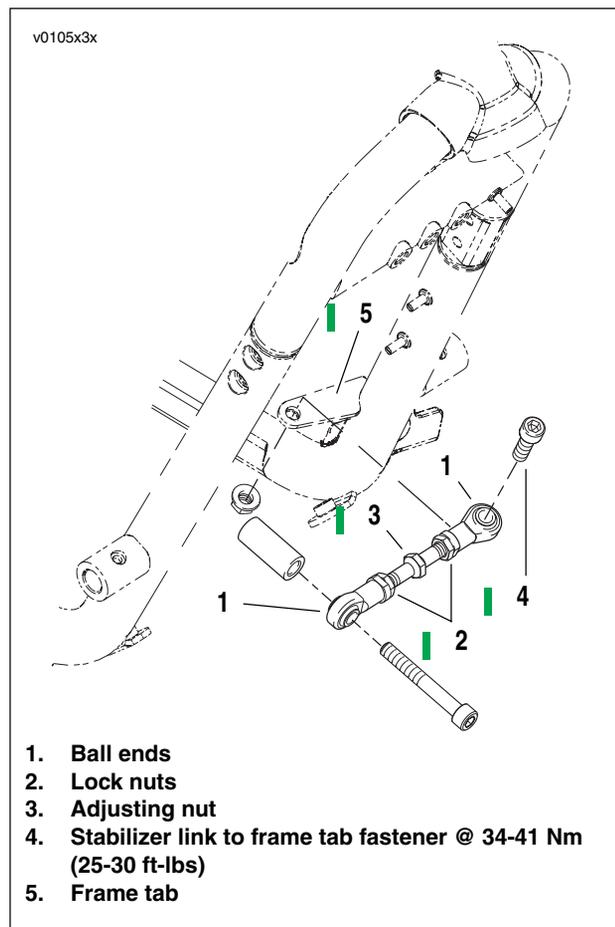


Figure 2-90. Engine Stabilizer Link