2003 Harley-Davidson®

DYNA
MODELS

SERVICE MANUAL

P/N 99481-03A

Hammers

- Never strike one hammer against a hardened object, such as another hammer.
- Always grasp a hammer handle firmly, close to the end.
- Strike the object with the full face of the hammer.
- Never work with a hammer which has a loose head.
- Discard hammer if face is chipped or mushroomed.
- Wear approved eye protection when using striking tools.
- Protect bystanders with approved eye protection.

Punches/Chisels

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

Screwdrivers

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

Ratchets and Handles

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

Sockets

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

Storage Units

- Don't open more than one loaded drawer at a time. Close each drawer before opening up another.
- Close lids and lock drawers and doors before moving storage units.
- Don't pull on a tool cabinet; push it in front of you.
- Set the brakes on the locking casters after the cabinet has been rolled to your work.

DISCONNECTION AND REMOVAL

1. Remove seat.

⚠WARNING

Always disconnect the negative 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.

2. See Figure 1-8. Remove nut (12) from ground stud (13) on frame (11).
3. Remove battery negative cable (black, 14) from ground stud (13).
4. Unbolt and remove battery positive cable (red, 10) from battery positive (+) terminal (7).
5. Remove lower rear bolt (6).
6. Remove upper rear bolt (5). Battery tray (4) will swing down allowing battery tray to be removed.
7. Remove top cover assembly (9).
8. Remove side cover (1) if present.
9. Lift battery from tray.
10. If battery is to be replaced, unbolt and remove battery negative cable (black, 14) from battery negative (–) terminal (3).

INSTALLATION AND CONNECTION

1. See Figure 1-8. If battery has been replaced, Insert bolt through battery negative cable (black, 14) into threaded hole of battery negative (–) terminal (3). Tighten bolt to 60-96 **in-lbs** (6.8-10.9 Nm).
2. Place the fully charged battery into the battery tray (4), terminal side facing primary cover.

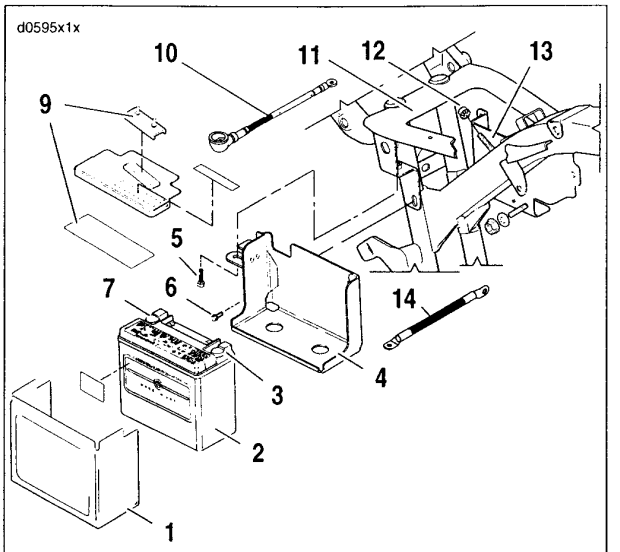
CAUTION

Attach the cables to the correct battery terminals using the proper torque. Overtightening bolts can damage battery terminals and incorrect connections may damage the motorcycle's electrical system.

⚠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.

3. Insert bolt through battery positive cable (red,10) into threaded hole of battery positive (+) terminal (7). Tighten bolt to 60-96 **in-lbs** (6.8-10.9 Nm).
4. Place battery negative cable (black, 14) connection over ground stud (13) on frame (11).
5. Bolt nut (12) onto ground stud (13). Tighten nut (12) to 10-15 ft-lbs (13-20 Nm).
6. Apply a light coat of petroleum jelly or corrosion retardant material to both battery terminals.
7. Install battery side cover (1) if present. Make sure the bottom of the cover's outboard side is properly seated inboard of the retaining lip on the base of the battery tray.



1. **Side cover**
2. **Battery**
3. **Negative battery terminal**
4. **Battery tray**
5. **Mounting bolt**
6. **Mounting bolt**
7. **Positive battery terminal**
8. **Pad**
9. **Top cover assembly**
10. **Battery positive cable**
11. **Frame**
12. **Nut w/washer**
13. **Ground Stud**
14. **Battery negative cable**

Figure 1-8. Battery Assembly

8. Install top cover assembly (9) over side cover and battery.
9. Install upper rear bolt (5).
10. Install lower rear mounting bolt (6).

⚠WARNING

After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift position during vehicle operation causing loss of control which could result in death or serious injury.

11. Install seat.

INSPECTION

Check primary chain tension:

- At the 1000 mile (1600 km) service interval.
- At every 5000 mile (8000 km) service interval thereafter.

⚠WARNING

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

⚠WARNING

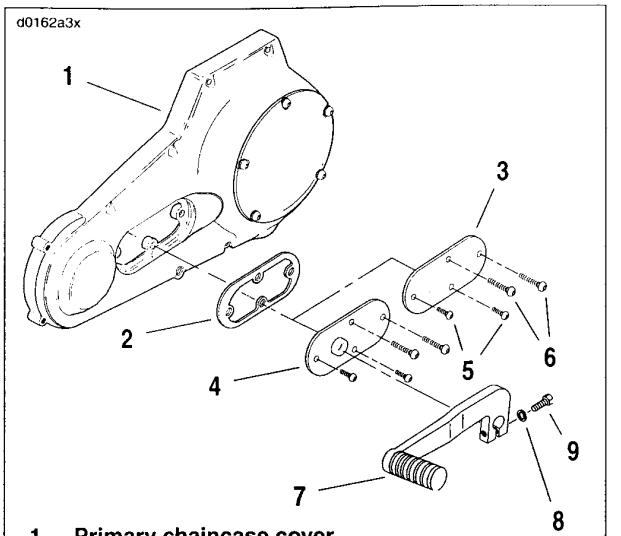
Always disconnect the negative cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.

1. Set motorcycle upright and level.
2. See Figure 1-21. On all models except FXDWG, remove screw (9), washer (8) and foot shifter lever (7).
3. Remove two short screws (5), two long screws (6) and primary chain inspection cover (3 or 4).

CAUTION

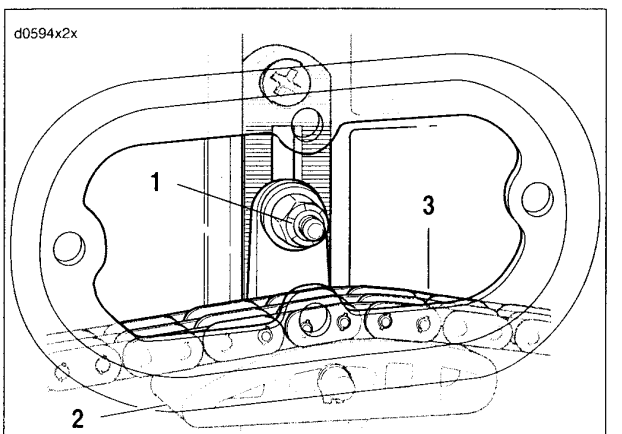
Adjust the primary chain at the tightest spot in the chain. Do not adjust chain tighter than specified play. Running chains too tight will result in excessive wear.

4. Check the primary chain tension. Push on the upper strand on the chain to verify that it has free movement midway between the engine compensating sprocket in the front and the clutch sprocket in the rear.
   a. With the engine cold, upward (not total) freeplay in upper strand should be 5/8-7/8 in. (15.9-22.3 mm).
   b. With the engine hot, upward (not total) freeplay in upper strand should be 3/8-5/8 in. (9.5-15.9 mm).
5. If freeplay adjustment is required, see Figure 1-22.
   a. Loosen, but do not remove, the center bolt nut (1).
   b. Move the shoe assembly (2) up or down to obtain the specified free play.
   c. Tighten center bolt nut to 21-29 ft-lbs (28.5-39.3 Nm). Replace the primary chain (3) if it is worn to the point where it cannot be properly adjusted.



1. **Primary chaincase cover**
2. **Gasket**
3. **Primary chain inspection cover (FXDWG)**
4. **Primary chain inspection cover (all except FXDWG)**
5. **Short screws (2)**
6. **Long screws (2)**
7. **Foot shifter lever (all except FXDWG)**
8. **Washer (all except FXDWG)**
9. **Screw (all except FXDWG)**

Figure 1-21. Inspection Cover



1. **Center bolt nut @ 21-29 ft-lbs (28.5-39.3 Nm)**
2. **Shoe assembly**
3. **Primary chain**

Figure 1-22. Primary Chain Adjustment

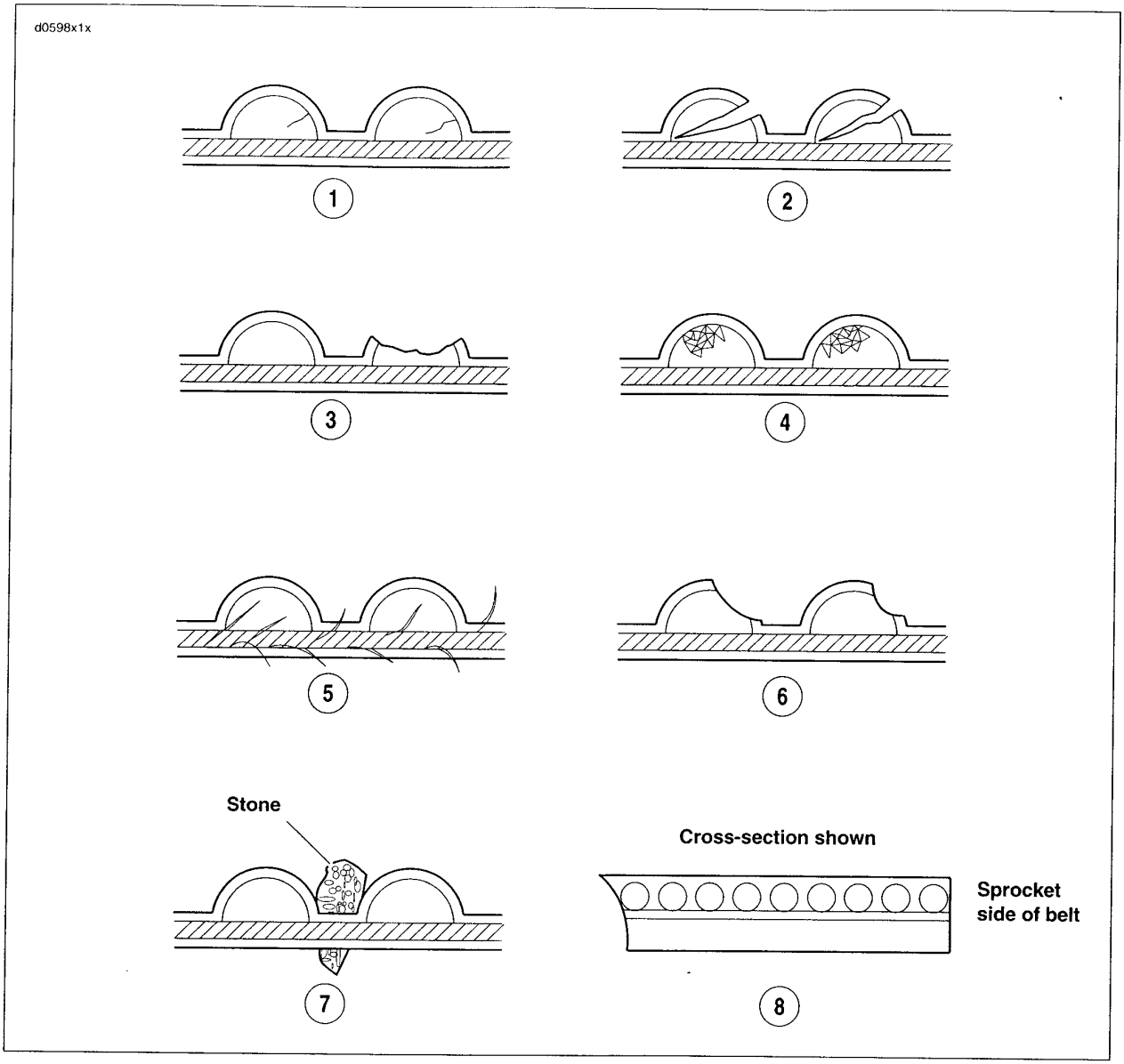


Figure 1-40. Drive Belt Wear Patterns

Table 1-4. Drive Belt Wear Analysis

PATTERN	CONDITION	REQUIRED ACTION
1	Internal tooth cracks (hairline)	OK to run, but monitor condition
2	External tooth cracks	Replace belt
3	Missing teeth	Replace belt
4	Chipping (not serious)	OK to run, but monitor condition
5	Fuzzy edge cord	OK to run, but monitor condition
6	Hook wear	Replace belt
7	Stone damage	Replace belt if damage is on the edge
8	Bevel wear (outboard edge only)	OK to run, but monitor condition

CABLE INSPECTION, LUBRICATION AND ADJUSTMENT

Inspect the throttle and clutch cables:

- At the 1000 mile (1600 km) service interval.
- At every 5000 mile (8000 km) service interval thereafter.

Inspection and Lubrication

1. See Figure 1-55. Remove two screws (1) to separate the upper handlebar housing from the lower housing.
2. Unhook each ferrule and cable from the throttle grip and remove the throttle sleeve.
3. Apply a light coat of graphite to the handlebar and replace throttle grip.
4. Put one or two drops of SUPER OIL (Part No. 94968-85TV) into the housing of each cable.
5. When assembling the handlebar housing, tighten both screws (1) to 35-45 **in-lbs** (4.0-5.1 Nm).

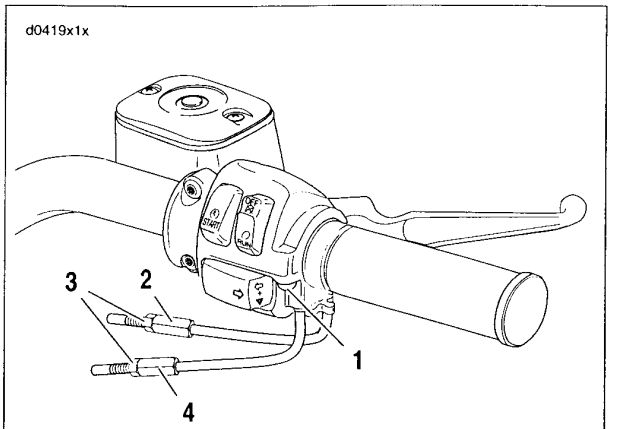
Adjustment

1. See Figure 1-55. Turn the cable adjusters (2, 4) and jamnuts (3) as short as they will go. Both cables should have zero adjustment at the start of this procedure.
2. Point the front wheel straight ahead.
   a. Turn the throttle grip wide open and hold it there.
   b. Turn the throttle cable adjuster (2), lengthening the sleeve, until the throttle cam just touches the cam stop. See Figure 1-56.
   c. Tighten the adjuster jamnut and release the throttle.
3. Turn the front wheel full right.
4. Turn the idle cable adjuster, lengthening the sleeve until the cable housing just touches the spring in the cable support sleeve.

⚠WARNING

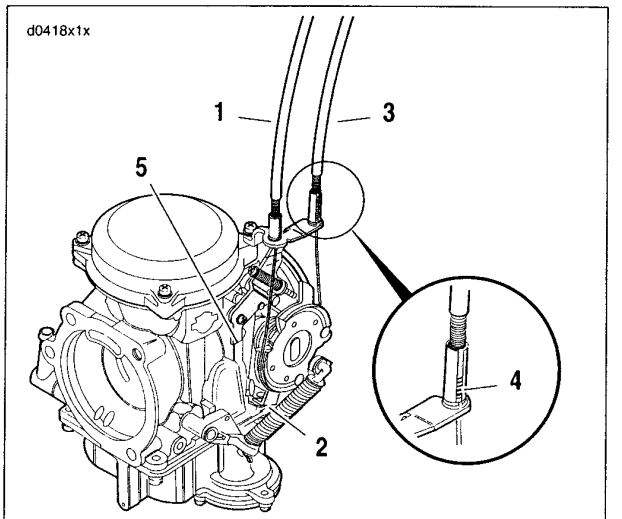
The throttle control must operate freely without binding. Irregular or sticking throttle response could cause a loss of control, leading to an accident which could result in death or serious injury.

5. Check adjustment.
   a. Work the throttle grip to be sure the cable returns to idle position when released.
   b. If the cable does not return to idle, turn idle adjuster, shortening the sleeve until correct adjustment is reached. Tighten the jamnut.



1. **Screws (2)**
2. **Throttle cable adjuster**
3. **Jamnuts (2)**
4. **Idle cable adjuster**

Figure 1-55. Throttle Cable Adjusters



1. **Throttle cable**
2. **Throttle cam**
3. **Idle cable**
4. **Spring**
5. **Cam stop**

Figure 1-56. Idle Cable Connection

⚠WARNING

- **Always unplug or turn off battery charger before connecting or disconnecting charger clamps at battery. Always disconnect the negative side first. Connecting or disconnecting clamps with charger on could cause a spark and a possible battery explosion. A battery explosion may rupture the battery case and spray sulfuric acid onto the surrounding area and personnel. This could result in death or serious injury.**
- **Batteries produce explosive hydrogen gas at all times, especially when being charged. Keep cigarettes, open flame and sparks away from the battery at all times. Ventilate area when charging battery. Battery contains sulfuric acid which can cause severe burns to eyes, skin and clothing. Always protect hands and protect eyes with shield or goggles when working near a battery or acid. KEEP BATTERIES AND ACID OUT OF THE REACH OF CHILDREN! Inadequate safety precautions could result in death or serious injury.**

12. Remove battery from vehicle. Charge battery until the correct voltage is obtained. Charge the battery every other month if it is stored at temperatures below 60° F (16° C). Charge battery once a month if it is stored at temperatures above 60° F (16° C). See 1.5 BATTERY MAINTENANCE.
13. If the motorcycle is to be covered, use a material that will breathe, such as light canvas or Part No. 98716-87. Plastic materials that do not breathe promote the formation of condensation, which leads to corrosion.

REMOVAL FROM STORAGE

⚠WARNING

After extended periods of storage and prior to starting vehicle, place transmission in gear, disengage clutch by pulling in clutch hand lever completely, and push vehicle back and forth a few times to ensure proper clutch disengagement. Improper clutch disengagement could result in death or serious injury.

1. Charge and install the battery.
2. Remove and inspect the spark plugs. Replace if necessary.
3. Clean the air cleaner element.
4. If fuel tank was drained, fill fuel tank with fresh gasoline.
5. Start the engine and run until it reaches normal operating temperature.
6. Check engine oil level. Check the transmission lubricant level. Fill to proper levels with correct fluids, if required.
7. Perform all of the checks in the PRE-RIDING CHECKLIST in the Owner's Manual.

REMOVAL

1. Block motorcycle underneath frame so front wheel is raised off the ground.
2. Inspect wheel bearing end play and service bearings if necessary. See 2.6 SEALED WHEEL BEARINGS.

NOTE

The FXDX and FXDXT have dual front brake calipers; both calipers must be removed before removing the front wheel. All other models have a single front brake caliper.

3. See Figure 2-3. Remove brake caliper(s). Support caliper(s) using a rubber bungee cord.

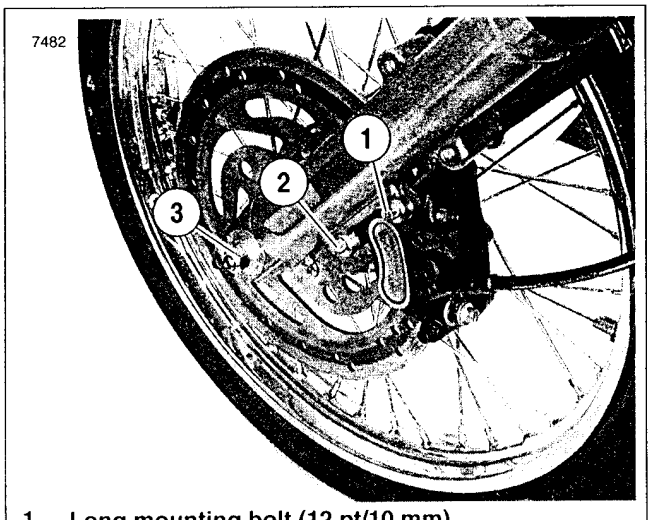
CAUTION

Be careful not to scratch the fender paint.

NOTE

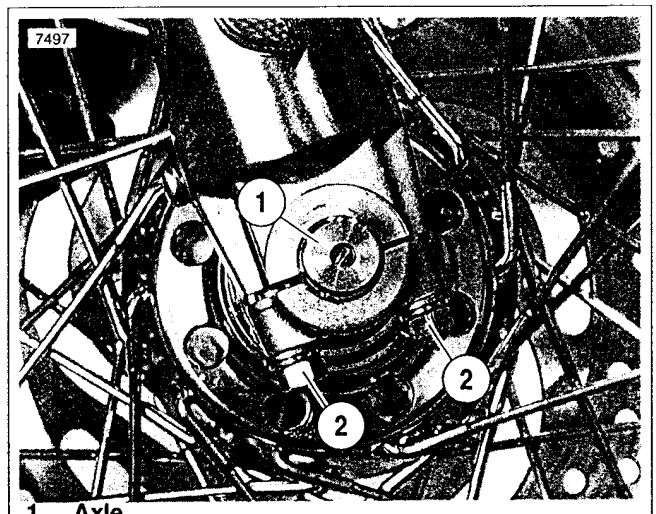
Do not operate front brake lever with the front wheel removed or the caliper piston may be forced out of piston bore. Reseating the piston requires disassembly of the caliper.

4. Remove axle nut, lockwasher and washer (3).
5. Remove wheel from forks.
   a. See Figure 2-4. For FXDWG models, loosen the slider cap nuts (2) and pull the axle (1) free.
   b. See Figure 2-5. For all other models, loosen pinch bolt nut (2) and pull the axle (1) free from the wheel.



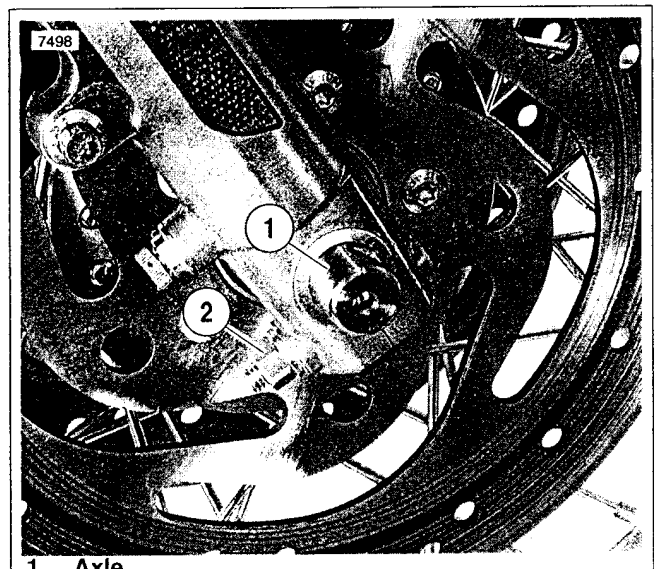
1. Long mounting bolt (12 pt/10 mm)
2. Short mounting bolt (12 pt/10 mm)
3. Axle nut, lockwasher and washer

Figure 2-3. Caliper Mounting Bolts (Left Side)



1. Axle
2. Slider cap nuts and washers

Figure 2-4. Front Wheel Mounting: FXDWG (Right Side)



1. Axle
2. Pinch bolt nut

Figure 2-5. Front Wheel Mounting: All But FXDWG (Right Side)

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

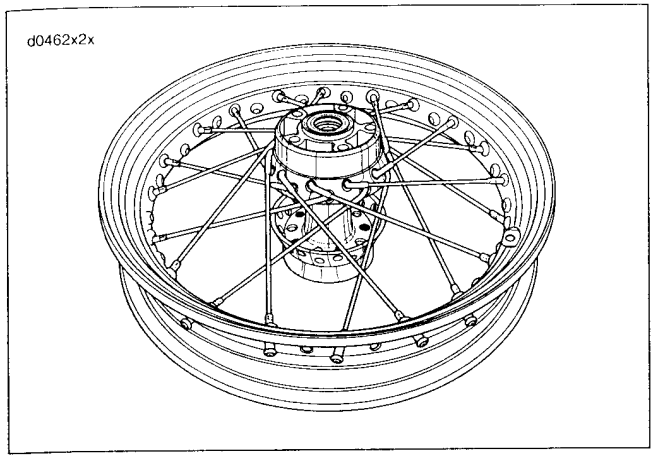


Figure 2-24.

7. Turn rim over so brake disc side (narrow flange) faces down. Place any **lower** row spoke into hub. Angle spoke clockwise and place into rim hole angled to accept it.

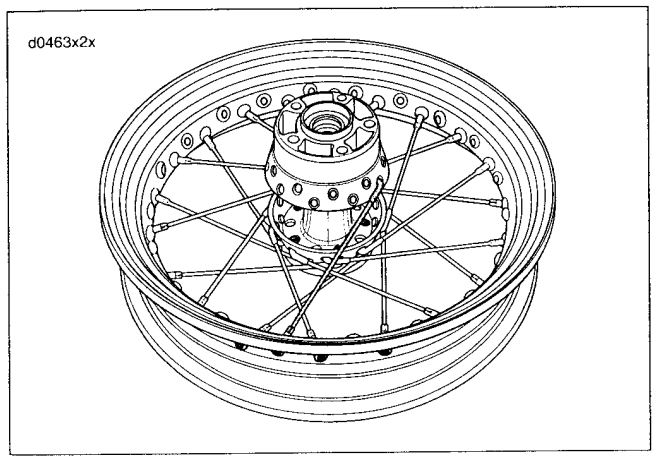


Figure 2-25.

8. Place the remaining nine lower row spokes, angled clockwise, into hub and rim.

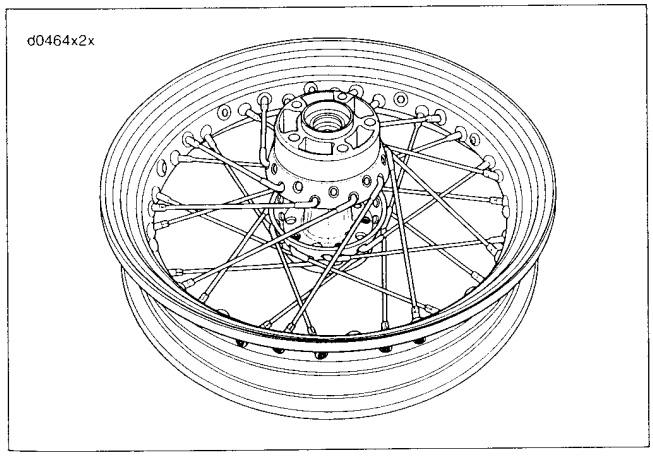


Figure 2-26.

9. Insert any **upper** row spoke into hub and angle spoke counterclockwise. Place spoke into appropriate rim hole.

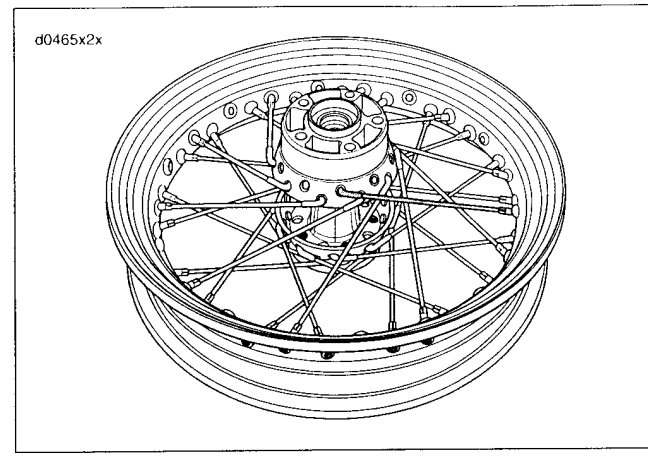


Figure 2-27.

10. Install remaining nine upper row spokes.

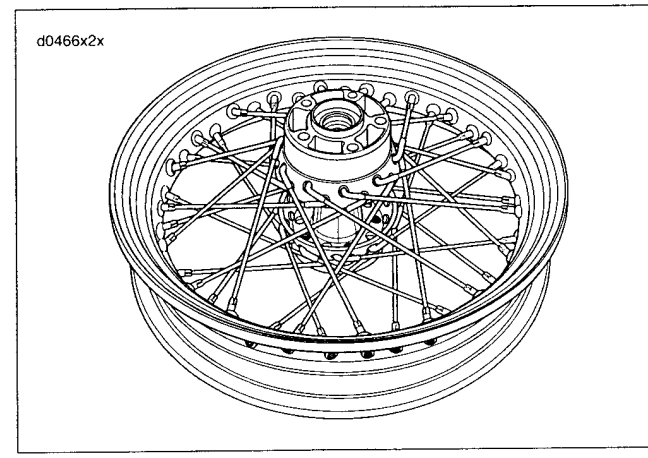


Figure 2-28.

11. Tighten spoke nipples to 40-50 **in-lbs** (4.5-5.6 Nm).
12. True wheel. See 2.10 TRUING LACED WHEEL.

GENERAL

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

⚠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 demounted tire by your Harley-Davidson dealer. Speed should not exceed 50 mph (80 km/h) for the first 24 hours after repair and the repaired tire should NEVER be used over 80 mph (130 km/h). 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 1/4 in. (6.4 mm) 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 tubeless tires, use TIRE SPREADER (Part No. HD-21000) to spread the tire sidewalls.

⚠WARNING

- **Never repair a tire with less than 1/16 in. (1.6 mm) tread depth. Inadequate tread depth can cause an accident which could result in death or serious injury.**
- **Always check both tire sidewalls for arrows indicating proper forward tire rotation. Some tires require different tire rotation depending on whether tire is used on front or rear wheel. Improper mounting can result in premature tire failure and handling problems, which could cause an accident resulting in death or serious injury.**

REMOVAL

1. Remove wheel from motorcycle.
2. Let the air out of the tire.
3. Loosen both tire beads from rim flange. In most cases, a bead breaker machine will be required to loosen the bead from the rim.
4. See Figure 2-55. Using tire tools (not sharp instruments), and RIM PROTECTORS (Part No. HD-01289) start upper bead over edge of rim at valve. Do not use excessive force when starting bead over rim. Bead wires may be damaged ruining the tire. Repeat all around rim until first bead is over rim.

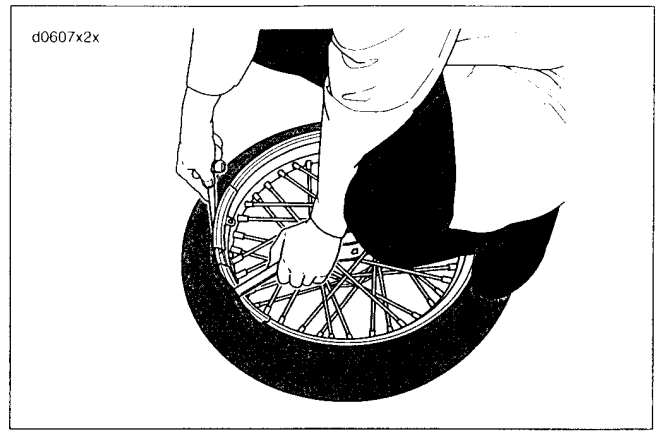


Figure 2-55. Starting Tire Off Rim

NOTE

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

CAUTION

If tire tools are used, take care not to damage the tire and rim sealing surfaces. Use RIM PROTECTORS (Part No. HD-01289) to protect rims.

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

NOTE

It is not always necessary to completely remove tire from rim. Removing one side allows the tire to be inspected.

CLEANING AND INSPECTION

1. Clean the inside of tire and rim.
2. If rim is dirty or rusty, clean with a stiff wire brush.
3. Inspect the tire for wear.

REPLACEMENT

Always replace tires when 1/32 inch (0.8 mm) or less of tire tread remains, determined by the appearance of tire wear indicator bars. See TIRE REPLACEMENT under 1.9 TIRES AND WHEELS.

DISASSEMBLY

1. Clean exterior of master cylinder/reservoir with a clean, nonflammable solvent. Lubricate all internal parts with lubricant provided in kit.

CAUTION

The banjo bolt will protect the sealing surface on the cartridge body from damage during the disassembly.

2. See Figure 2-69. Thread banjo bolt (21) into the cartridge body (11).
3. Remove boot (3) from groove in master cylinder/reservoir (13). Set master cylinder/reservoir upright with banjo bolt resting on bench and push master cylinder/reservoir down and off the cartridge body.
4. Protect cartridge body from dirt or grease.
5. Press down on large washer (2) to compress spring (5), keep spring compressed and remove retaining ring (1) from groove in push rod (9).
6. Carefully release spring and remove washer, boot, spring retainer (4) (inside boot) and spring.
7. Remove and discard retaining ring (7) from bore of cartridge body and remove push rod and washer (8).

NOTE

Do not disassemble cartridge body (11). The cartridge body contains the piston and associated components. These parts are not sold; therefore, replace the cartridge body if piston seal leakage is evident.

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 exterior of master cylinder/reservoir with a clean, nonflammable solvent. Lubricate all internal parts with lubricant provided in kit.
2. See Figure 2-69. Inspect reservoir bore (13) for scratches. Replace if scratches are present.
3. Check boot (3) for tears and replace if any exist.
4. Inspect threads on cartridge body (11), push rod (9) and banjo bolt (21). Replace any part with damaged threads. Inspect spring for cracks or broken coils – replace if any exist.
5. Carefully remove large O-rings (12) from cartridge body. Do not scratch O-ring grooves. Clean grooves with soft cotton cloth moistened with alcohol. Inspect grooves for scratches and dirt. Remove dirt or replace cartridge body if grooves are scratched.

ASSEMBLY

1. See Figure 2-69. Lubricate O-rings (12) with D.O.T. 5 brake fluid and install in O-ring grooves on cartridge body (11).
2. Lubricate bore of master cylinder/reservoir (13) with D.O.T. 5 brake fluid.
3. Insert cartridge body into reservoir. Using hand-pressure only, press cartridge body into adapter making sure notch on cartridge body engages lug inside bore of the adapter.
4. Thread banjo bolt (21) into cartridge body and stand master cylinder upright with banjo bolt resting on bench.
5. Place washer (8) on push rod (9).
6. Place a **new** retaining ring (7) on push rod. Insert ball-end of push rod into piston. Push piston downward with push rod until washer is properly seated in the cartridge bore.
7. Install the **new** retaining ring in groove inside cartridge bore. Make certain retaining ring is fully seated in groove.
8. Release downward pressure on push rod and check that push rod rotates freely.
9. Install retaining ring (6) in groove on cartridge body.
10. Install on push rod, spring (5), spring retaining washer (4) (large cupped side toward spring), boot (3) with drain hole down, and washer (2).
11. Press down on washer and install retaining ring (1) in push rod groove.
12. Seat sealing lip of boot into groove on master cylinder/reservoir adapter.

NOTE

See Figure 2-84. The front left, front right (not present on all vehicles) and rear brake calipers use the same exact brake pad set. Install pad with two tabs (1) on the inboard side of the rear 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. Install pad pins. Pad pins will give an audible click when inserted into inside housing. Tighten both pad pins to 15-16 ft-lbs (20.3-22.6 Nm).

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 2-83.*

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

INSTALLATION

1. See Figure 2-78. Place caliper on rear axle with notch (4) inside rear fork tab. Verify that the rubber bumper is contacting the underside of the caliper mount for the full length of the bumper. Install rear axle and check drive belt tension. See 2.5 REAR WHEEL.

CAUTION

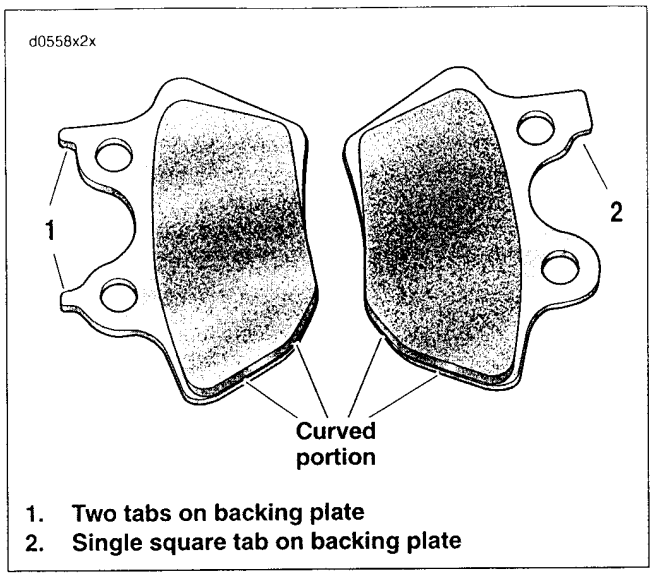
To avoid leakage, verify that the washers, banjo bolt, brake line and caliper bore are completely clean.

2. Lubricate **new** steel/rubber washers with D.O.T. 5 SILICONE BRAKE FLUID. Connect the brake line (3) to caliper using two **new** washers (2) and banjo bolt (1). Tighten to 17-22 ft-lbs (23.0-29.8).
3. Remove cover from rear brake master cylinder. Fill master cylinder with D.O.T. 5 SILICONE BRAKE FLUID. Verify that fluid level is 1/8 in. (3.2 mm) below top of reservoir with master cylinder in a level position.

⚠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.

4. Bleed brake system. See 1.7 BLEEDING BRAKES.



1. **Two tabs on backing plate**
2. **Single square tab on backing plate**

Figure 2-84. Brake Pad Alignment

⚠WARNING

Verify proper operation of the master cylinder relief port. A plugged or covered relief port can cause brake drag or lockup, which may result in loss of vehicle control and death or serious injury.

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

8. Test brake system.
   a. Turn ignition switch ON. Pump brake pedal to verify operation of the brake lamp.
   b. Test ride the motorcycle. If the brakes feel spongy, bleed the system again. See 1.7 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.*

9. Install the stopper ring and dust seal.

10. If the rebound adjuster was removed from the damper rod follow the steps below, otherwise proceed to step 11.

    a. Bottom lock nut on threaded portion of damper rod.

    b. See Figure 2-95. Holding thumb on detent spring and ball, back out (turn counterclockwise) rebound adjuster to last "click." Turn down (clockwise) 17 "clicks".

    c. Thread rebound adjuster onto damper rod until adjuster stops at maximum thread engagement (Do not force).

    d. See Figure 2-96. Thread locknut on damper rod up to contact base of rebound adjuster and tighten in place.

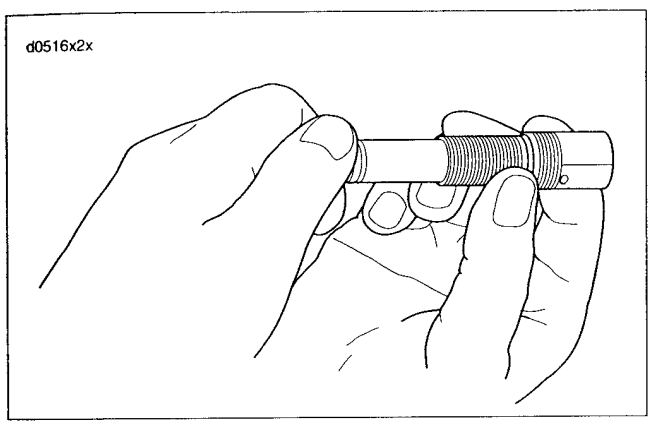


Figure 2-95.

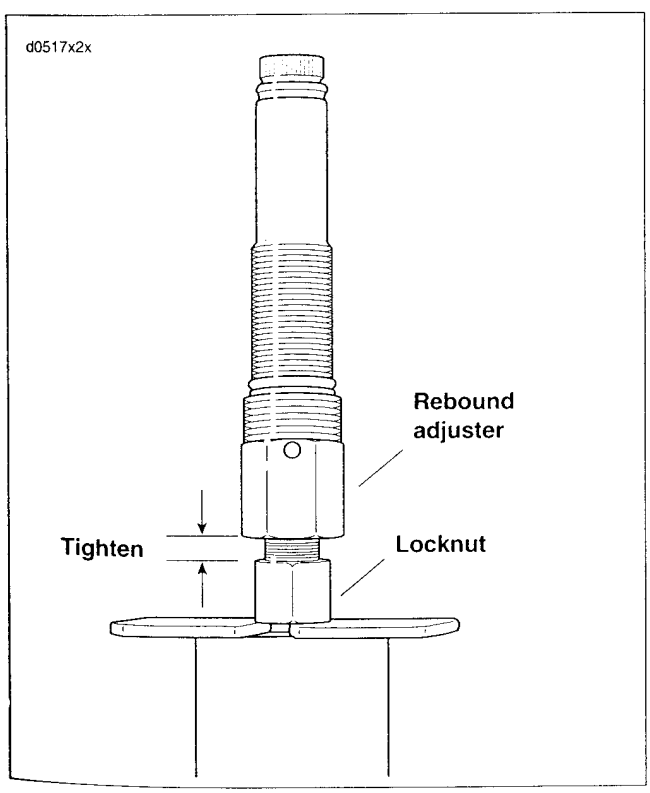


Figure 2-96.

11. See Figure 2-92. Hold slider in vise taking precautions to avoid damage. Install damper tube into the fork tube. Tighten socket screw and washer. Torque to 22-29 ft-lbs (29.8-39.3 Nm).

12. Pour half the TYPE E FORK OIL into fork tube.

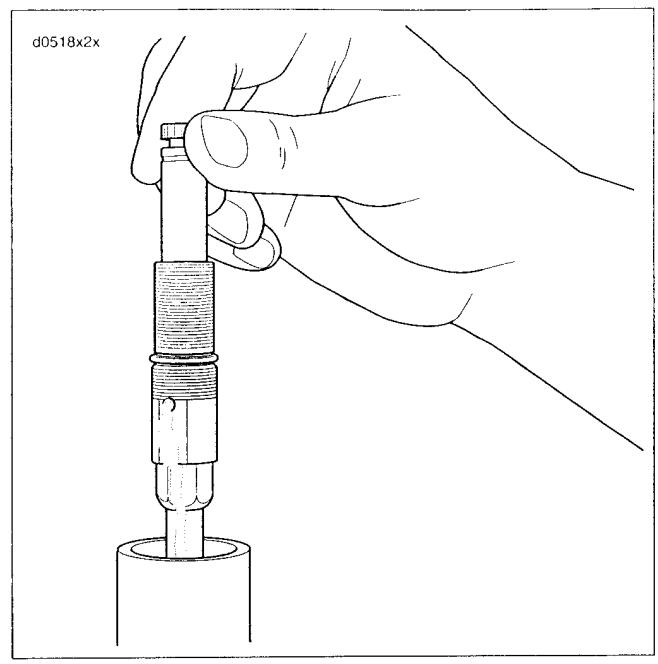


Figure 2-97. Pumping Damper Rod

13. See Figure 2-97. Slowly pump the damper rod 10 or more times.

14. Position the damper rod in the fully bottomed position.

15. Pour the remaining amount of TYPE E FORK OIL into the fork tube.

16. See Figure 2-98. Using the PRO-LEVEL OIL GAUGE (Part No. HD-59000-A) adjust the oil level to 5.04 in. (128 mm).

17. See Figure 2-91. Carefully clean and install spring (6), spring collar (20), and spacers (19).

NOTE

Spacers are stamped parts. Sharp edge created by stamping process must face collar.

18. See Figure 2-99. Using FORK SPRING COMPRESSION TOOL (Part No. HD-41549-A) push spring collar down and place SPRING PLATE (Part No. HD-41551) between spacer and spring collar.

19. Install fork cap and tighten against rebound adjuster. Tighten to 22-29 ft-lbs (29.8-39.3 Nm).

20. Tighten fork cap on fork tube. Torque to 11-22 ft-lbs (14.9-29.8 Nm).

21. Install the spring adjuster plate.

22. Replace O-rings on spring preload adjuster and lubricate with fork oil.

23. Install the spring preload adjuster.

24. Install the stopper ring.

25. Carefully drive slider cover into slider.

REMOVAL

See Figure 2-109. Remove three screws to detach debris deflector from rear fork.

INSTALLATION

See Figure 2-109. Attach debris deflector to rear fork using three screws. Tighten to 40-60 **in-lbs** (4.5-6.8 Nm).

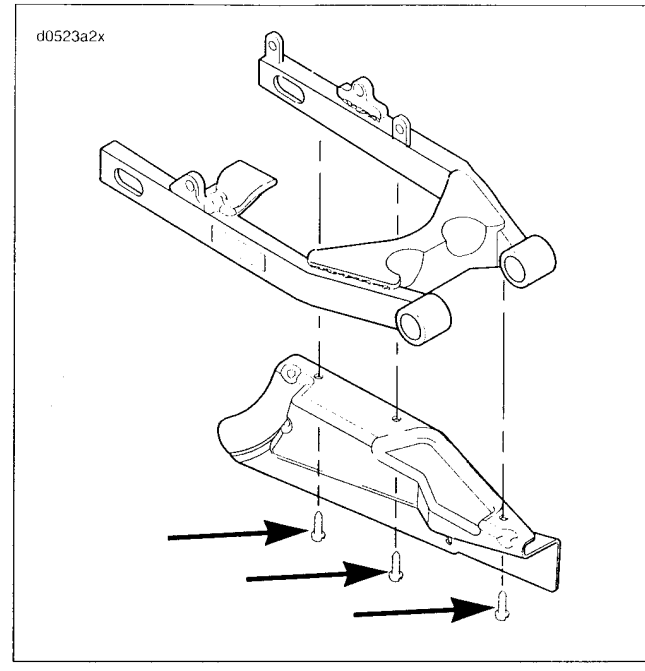


Figure 2-109. Debris Deflector Screws

REMOVAL

CAUTION

See Figure 2-126. There is a nylon retaining clip (3) between the rear seat bracket and the fender. DO NOT lose this clip, substitute a clip of different material or install the seat without this clip. Any of the above actions will result in scratched fender paint.

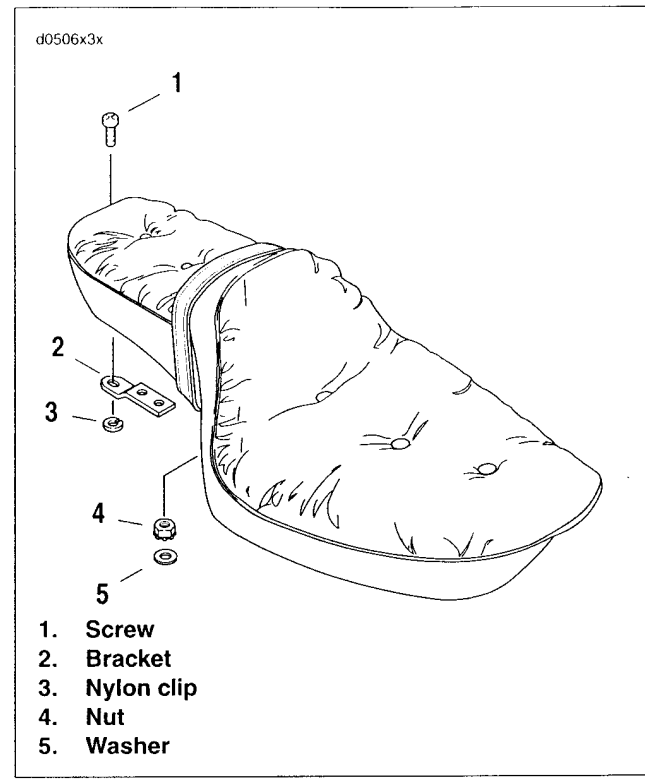
1. See Figure 2-126. Remove screw (1) from rear seat bracket (2). (Nylon clip remains with fender assembly).

NOTES

- *There is a bracket at the front of the seat that slips under a u-shaped frame bracket.*
- *The strap is secured to the fender under the seat by a nut (4) and washer (5).*

2. Slide seat to the rear of the motorcycle and lift seat.
3. Remove nut (4) and washer (5).
4. Remove seat strap.

There is no need to remove the seat bracket and its fasteners from the seat pan.



1. **Screw**
2. **Bracket**
3. **Nylon clip**
4. **Nut**
5. **Washer**

Figure 2-126. Seat

INSTALLATION

1. Install seat strap.
   a. Fasten nut (4) and washer (5) above seat strap on frame.
   b. Tighten nut (4) to 60-90 **in-lbs** (6.78-10.17 Nm)
2. Slide back of seat through seat strap loop.
3. Slide bracket below front seat under the u-shaped frame bracket.

⚠WARNING

After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift position during vehicle operation causing loss of control of vehicle and death or serious injury.

4. Install screw (1) and bracket (2) to fender. Verify nylon retaining clip (3) is in position on fender.

PISTONS	IN.	MM
Fit in cylinder:		
Early Piston*	0.0006-0.0017	0.015-0.043
Late Piston*	0.0014-0.0025	0.036-0.064
Ring end gap:		
Top compression ring	0.010-0.020	0.254-0.508
2nd compression ring	0.014-0.024	0.356-0.610
Oil control ring	0.010-0.050	0.254-1.27
Ring side clearance:		
Top compression ring	0.0012-0.0037	0.030-0.094
2nd compression ring	0.0012-0.0037	0.030-0.094
Oil control ring	0.0031-0.0091	0.079-0.231
Piston pin fit (loose)	0.0002-0.0005	0.005-0.013

* Late style pistons can be identified by two small oval-shaped openings in the piston coating, one on each thrust face of the piston skirt. Early style pistons have no openings in the piston coating. For more information, see 3.25 PISTON.

CONNECTING RODS	IN.	MM
Piston pin fit (loose)	0.0003-0.0007	0.008-0.018
Side play between flywheels	0.005-0.015	0.13-0.38
Connecting rod to crankpin (loose)	0.0004-0.0017	0.0102-0.0432

FLYWHEELS	IN.	MM
Runout (flywheels at rim)	0.000-0.010	0.0-0.254
Runout (shaft at flywheel)	0.000-0.002	0.0-0.051
End play	0.003-0.010	0.076-0.254

CRANKSHAFT (ROLLER) BEARINGS	IN.	MM
Roller bearing fit (loose)	0.0002-0.0015	0.005-0.038
Crankshaft runout	0.0-0.003	0.0-0.076
Bearing fit in crankcase (tight)	0.0038-0.0054	0.097-0.137
Bearing inner race on crankshaft (tight)	0.0004-0.0014	0.010-0.036

OIL RETURN

The "dual kidney" designation given to the oil pump refers to its two scavenging functions, whereby it simultaneously draws oil from both the cam and flywheel compartments.

Oil sucked up by the scavenge lobes passes through the scavenge gerotors of the oil pump and is directed through a return channel in the cam support plate (A36). See 3.5 OIL PUMP OPERATION.

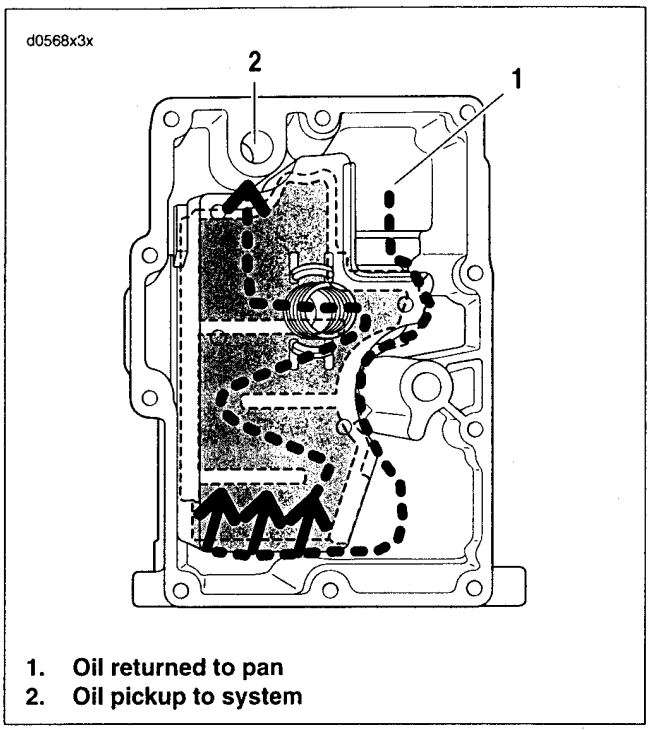
Exiting a hole on the inboard side of the cam support plate, the oil enters a hole in the crankcase flange (B37).

The oil flows through a passageway in the crankcase and exits the upper fitting at the rear right side of the crankcase (A38). Passing through a flexible hose connection, the flow of oil runs through a passageway at the front of the transmission housing (Q39) before emptying into the oil pan at the front of the baffle (R40).

The oil flows to the rear of the oil pan along each side of the baffle. Spring tension holds the unit tight against the bottom of the pan to prevent oil from entering or escaping around the perimeter of the baffle. At the back of the oil pan, the oil enters the open side of the baffle where it is redirected forward. The baffle plates slow the circulation of the oil through the pan to enhance cooling.

Oil pickup occurs in the front compartment of the baffle where a passageway in the casting (S41) directs the flow upward. Passing through a second passageway in the transmission housing (Q42), the flow of oil enters the flexible hose connection (A1) to repeat the circuit.

Also note that a third flexible hose clamped to a fitting behind the rear lifter cover connects the cam compartment with the oil pan via a third drilling in the transmission case. This crankcase breather connection provides the pressure balance necessary for oil circulation.



1. **Oil returned to pan**
2. **Oil pickup to system**

Figure 3-7. Oil Pan Baffles

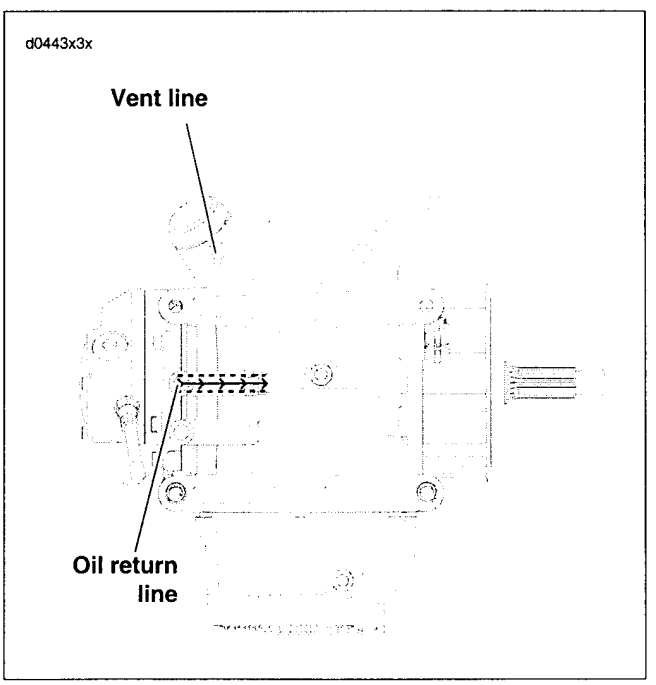


Figure 3-8. Oil Return Lines

CYLINDER LEAKAGE TEST

The cylinder leakage test will pinpoint engine problems including leaking valves, worn, broken or stuck piston rings and blown head gaskets. The cylinder leakage tester applies compressed air to the cylinder at a controlled pressure and volume and measures the percent of leakage from the cylinder.

Use CYLINDER LEAKDOWN TESTER (Part No. HD-35667A) and 12 mm adapter and follow the specific instructions supplied with the tester.

The following are some general instructions that apply to Harley-Davidson V-twin engines:

1. Run engine until it reaches normal operating temperature.
2. Stop engine. Clean dirt from around spark plugs and remove the spark plugs.
3. Remove the air cleaner and set the carburetor choke and throttle in the wide open position.
4. The piston in the cylinder being tested must be at top dead center of compression stroke (both valves closed) during the test.
5. To keep the engine from turning over when air pressure is applied to the cylinder, engage transmission in fifth gear and lock the rear brake.

NOTE

Before performing the cylinder leakage test, verify that the tester itself is free from leakage to obtain the most accurate test results. With a soap solution [applied around all tester fittings], connect the cylinder leakdown tester to the compressed air source and look for any bubbles that would indicate leakage from the tester.

6. Following the manufacturer's instructions, perform a cylinder leakage test on the front cylinder. Make a note of the percent of leakage. Leakage greater than 10% indicates internal engine problems.
7. Listen for air leaks at carburetor intake, exhaust pipe, and head gasket. Air escaping through the carburetor indicates a leaking intake valve. Air escaping through the exhaust pipe indicates a leaking exhaust valve.

NOTE

If air is escaping through valves, check for correct pushrod length.

8. Repeat procedure on rear cylinder.

NOTE

After installing spark plugs, be sure that throttle plate is in the closed position before starting the engine.

DIAGNOSING SMOKING ENGINE OR HIGH OIL CONSUMPTION

Perform COMPRESSION TEST or CYLINDER LEAKAGE TEST as described. If further testing is needed, remove suspect head(s) and inspect for the following:

Check Prior To Cylinder Head Removal

1. Oil tank overfilled.
2. Oil carryover.
3. Breather hose restricted.
4. Restricted oil filter.

Check After Cylinder Head Removal

1. Oil return passages for clogging.
2. Valve guide seals.
3. Valve guide to valve stem clearance.
4. Gasket surface of both head and cylinder.
5. Cylinder head casting's porosity allowing oil to drain into combustion chamber.
6. O-ring damaged or missing from oil pump/crankcase junction.

PISTON

PART NO.	SPECIALTY TOOL
HD-42317	Piston pin circlip remover/installer
HD-42320-A	Piston pin remover

1. Verify that clean shop towels are properly positioned over the crankcase bore to prevent the piston pin circlip from falling into the crankcase.

⚠WARNING

Always wear proper eye protection when removing circlips. Slippage may propel the ring with enough force to cause an accident. This could result in death or serious injury.

2. See Figure 3-27. Remove the piston pin circlip.
   a. Insert the PISTON PIN CIRCLIP REMOVER/INSTALLER (1) (Part No. HD-42317) into the piston pin bore. Position claw on tool in slot of piston (2) (directly under circlip).
   b. Hold a shop towel over the piston pin bore in case a circlip should fly out during removal. Squeeze the handles of the tool together and pull from bore. Remove circlip from claw and discard.

NOTE

It is not necessary to remove both piston pin circlips during piston removal. Leave the second circlip in the pin bore.

3. See Figure 3-28. Remove the piston pin. If piston pin is difficult to remove, use PISTON PIN REMOVER (Part No. HD-42320-A).
   a. Remove acorn nut and spacer from rod end of tool.
   b. Slide rod end through piston pin. Install spacer and acorn nut (1) on end of rod.
   c. Position rubber-coated tips (2) of tool on flat each side of pin bore.
   d. Turn handle (3) in a clockwise direction until piston pin is pulled free of bore.
4. Remove the piston. Be sure to hold the connecting rod shank upright to prevent it from striking the crankcase. Place a 3.0 in. (76.2 mm) long piece of foam-type water pipe insulation around each connecting rod. Use material with an O.D. of 2.25 in. (57.1 mm) and an I.D. of 1.0 in. (25.4 mm) to prevent damage.
5. Turn the piston over. Mark the pin boss with the letters "F(ront)" or "R(ear)" to identify location.

1. **Piston pin circlip remover/installer**
2. **Piston**
3. **Protective material over cylinder studs**
4. **Cylinder deck dowel (O-ring not shown)**

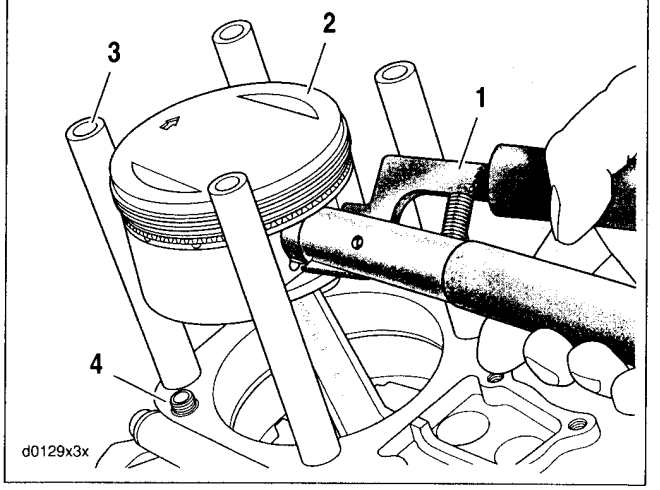


Figure 3-27. Piston Pin Circlip Removal (Part No. HD-42317)

1. **Spacer and acorn nut**
2. **Rubber coated tip**
3. **Handle**

d0371x3x

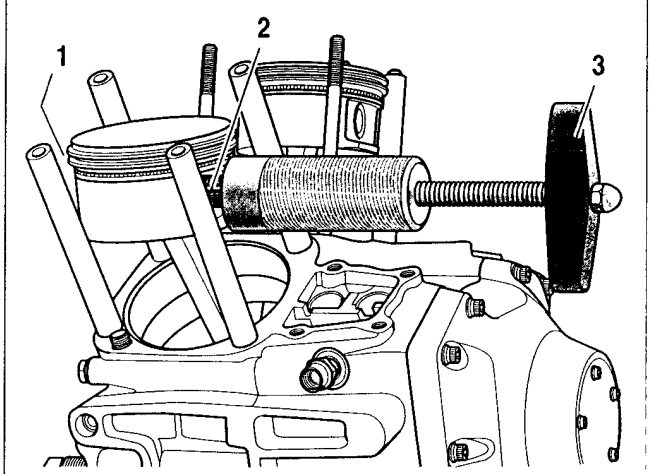


Figure 3-28. Piston Pin Remover (Part No. HD-42320-A)

6. Service as needed. See the following topics for inspection and repair information.
   a. See 3.25 PISTON.
   b. See 3.26 UPPER CONNECTING ROD.
7. Complete engine work.
   a. If performing a top end overhaul only, see 3.17 TOP END OVERHAUL: ASSEMBLY.
   b. If performing a complete engine overhaul, see 3.18 BOTTOM END OVERHAUL: DISASSEMBLY.

GENERAL

To perform a complete bottom end overhaul, follow all steps listed in this section including inspection and repair procedures.

COVER AND CAM SUPPORT PLATE

PART NO.	SPECIALTY TOOL
HD-42313	Cam chain tensioner unloader

1. Prepare engine for bottom end service.
   a. If performing a complete engine overhaul, perform all steps under 3.16 TOP END OVERHAUL: DISASSEMBLY.
   b. If only servicing cam compartment components, partial top end disassembly is required. See appropriate topics under 3.16 TOP END OVERHAUL: DISASSEMBLY. Remove breather assembly, rocker arm support plate, pushrods and pushrod covers. Do not remove lifters. Instead, support lifters using improvised tool as described under 3.27 COVER AND CAM SUPPORT PLATE.

NOTE

The cam support plate, lifter cover and crankshaft position sensor mount all use the same short allen head socket screw (1/4 x 1 in.). Only the cam cover uses the longer screw (1/4 x 1-1/4 in.). For ease of assembly, do not mix the short and long screws. Store the long screws inside the cam cover to avoid confusion. The short screws are interchangeable.

2. See Figure 3-50. Remove the ten allen head socket screws with captive washers to release the cam cover. Remove and discard the cam cover gasket.
3. See Figure 3-52. Using a colored marker, mark one of the links (1) of the primary cam chain. Maintaining the original direction of rotation during assembly may prolong service life.

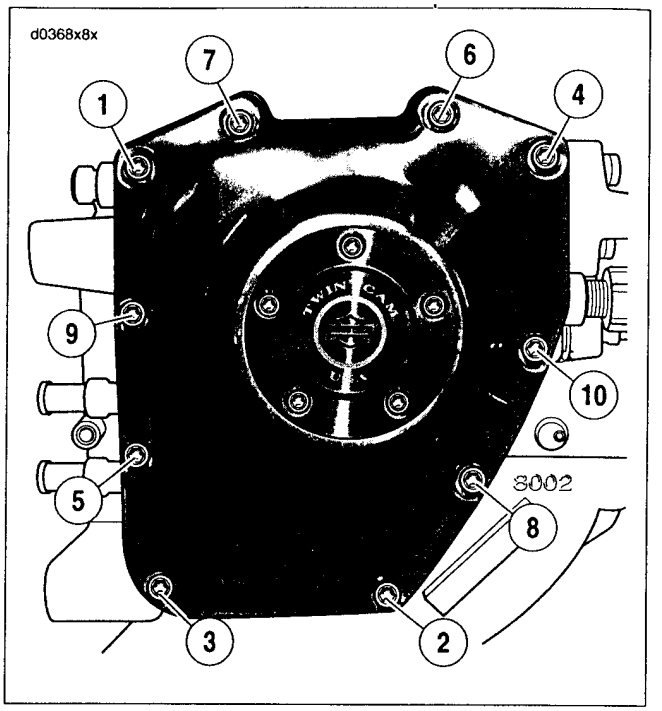
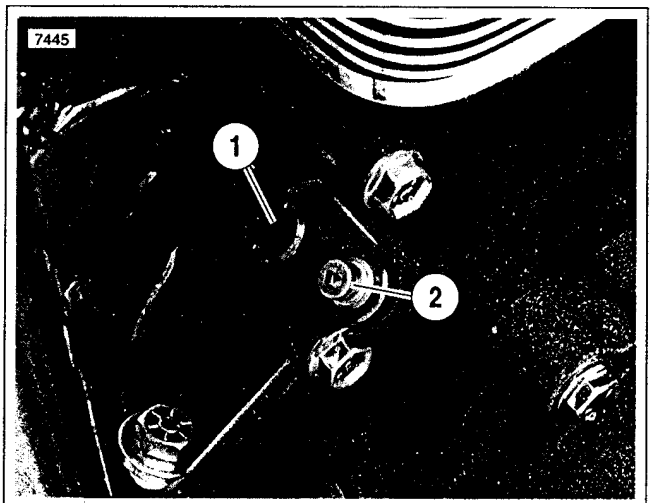


Figure 3-50. Cam Cover Screws



1. **Sensor mount**
2. **Screw**

Figure 3-51. Crank Position Sensor

12. See Figure 3-73. Apply a light amount of clean H-D 20W50 oil to splines on rear cam. Install the primary cam chain and sprocket assembly.
    a. Place the rear cam sprocket (3) in the cam chain. Hold the sprocket allowing the chain to hang loose. Rotate the sprocket so that the punch mark on the sprocket root faces straight downward.

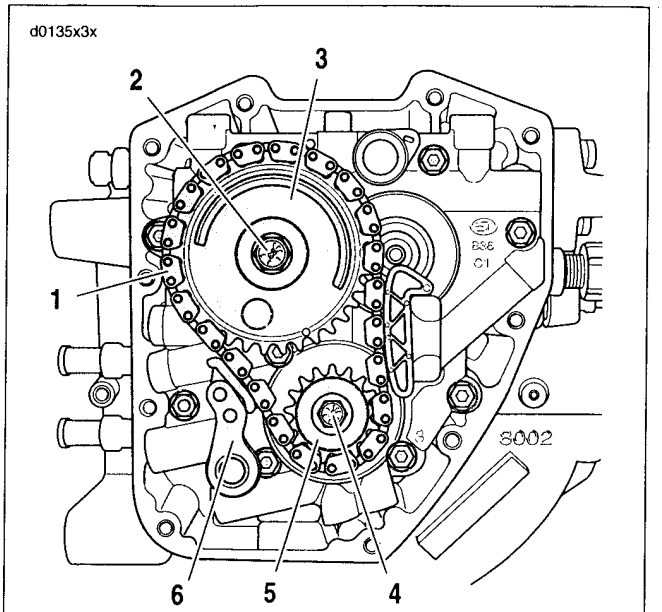
NOTE

To maintain the original direction of rotation, verify that the colored mark placed on the chain link and crank sprocket is facing away from the cam support plate during installation.

    b. Place the crank sprocket (5) in the opposite end of the chain with the punch mark on the sprocket tooth facing straight upward.
    c. Maintaining the position of the sprockets on the chain with the punch marks in alignment, start the rear cam sprocket onto the end of the rear camshaft. Note that the sprocket has an integral key that must be aligned with the keyway in the camshaft.
    d. Maintaining the position of the crank sprocket on the chain, rotate the rear cam sprocket in a clockwise direction until the flat on the crank sprocket is aligned with the flat on the crankshaft. Install the crank sprocket.
13. See Figure 3-74. Rotate the rear cam sprocket in a clockwise direction until the punch mark on the root is aligned with the punch mark on the crank sprocket tooth. Lay a straightedge across the centerline of the crank and rear cam sprocket flange bolt holes to verify that the punch marks are in alignment.

NOTE

If the punch marks are not in alignment, then the sprockets must be removed and reinstalled. Misalignment by one tooth will cause engine to run erratically.



1. **Link**
2. **Rear cam sprocket bolt (large) and flat washer**
3. **Rear cam sprocket**
4. **Crank sprocket bolt (small) and flat washer**
5. **Crank sprocket**
6. **Primary cam chain tensioner**

Figure 3-73. Cam Support Plate Assembly

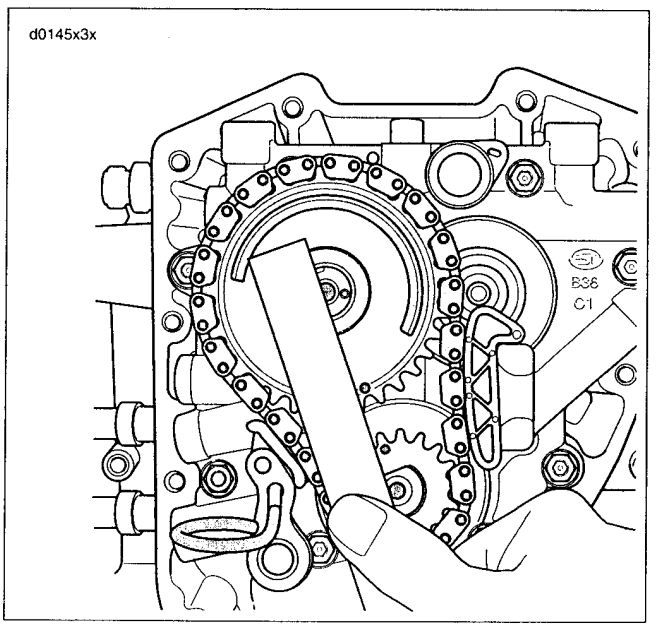


Figure 3-74. Verify Alignment of Crank and Rear Cam Sprocket Punch Marks

6. Using pliers, twist and remove the valve stem seal (5) from the top of the valve guide. Discard valve stem seal.
7. Remove the spring seat (6) from the cylinder head.
8. Mark the bottom of the valve "F(rónt)" or "R(ear)" for identification. Also, separate and tag tapered keepers, valve springs, spring retainers and spring seats so that they are installed on the same valve at time of assembly.
9. Repeat steps 3-8 to remove the other valve components.
10. Release the cylinder head holding fixture from the vise. Remove fixture tool from spark plug hole.

CLEANING

1. See Figure 3-92. Remove old gasket material from cylinder head (10). Gasket material left on sealing surfaces will cause leaks.

CAUTION

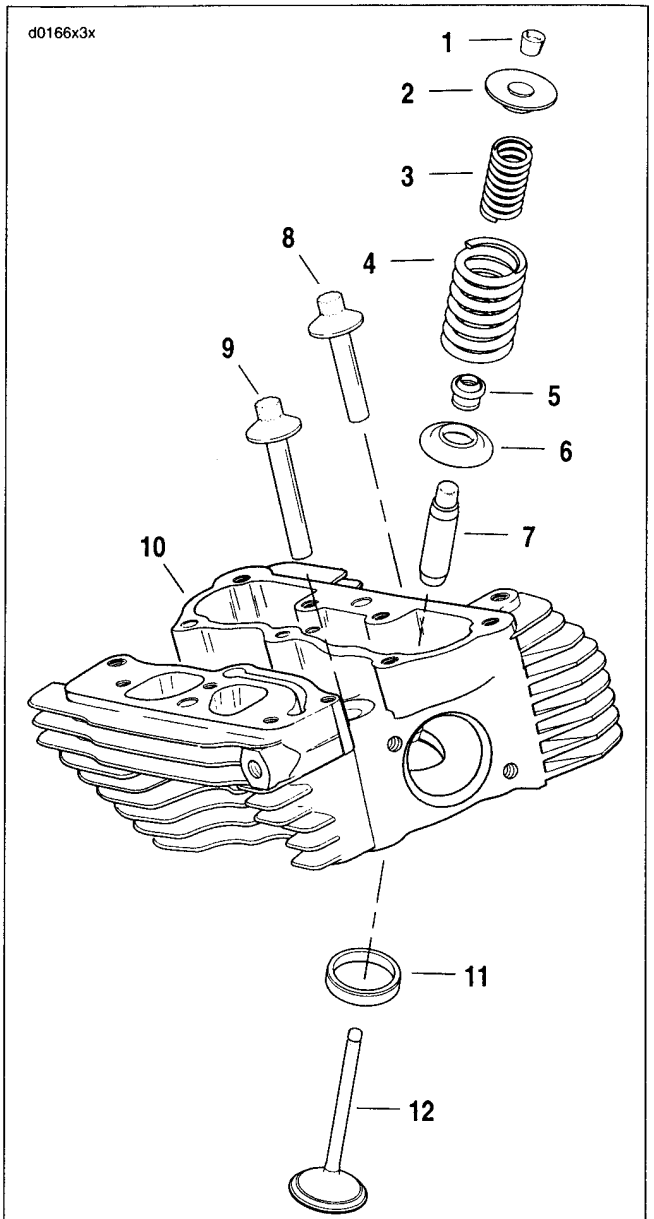
- **Do not use glass or sand to bead blast surfaces exposed to the engine oil. Bead blasting materials become lodged in the pores of the casting where they cannot be removed through ordinary cleaning methods. Only after the engine is put into use will heat expansion cause this material to be released, and the resulting oil contamination will accelerate wear and lead to engine failure. If bead blasting must be employed, use walnut shells or other soft non-damaging abrasive that can be digested in the engine oil.**
- **Be aware that bead blasting materials may also enter threaded holes adversely affecting fastener engagement and torque indication. Carefully cover all threaded holes if bead blasting is employed.**

2. Remove all carbon deposits from combustion chamber and machined surfaces of cylinder head. Exercise caution to avoid removing any metal material. For best results, use an air tool with a **worn** wire brush. Scraping may result in scratches or nicks.
3. To soften stubborn deposits, soak the cylinder head in a chemical solution, such as GUNK HYDRO-SEAL or other carbon and gum dissolving agent. Repeat step 2 as necessary.
4. Thoroughly clean the cylinder head, spring retainers, tapered keepers, valves, inner and outer valve springs and spring seats in a non-volatile cleaning solution or solvent. Follow up with a thorough wash in hot soapy water.

⚠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.

5. Blow parts dry with low pressure compressed air.



1. **Tapered keepers**
2. **Spring retainer**
3. **Inner spring**
4. **Outer spring**
5. **Valve stem seal**
6. **Spring seat**
7. **Valve guide**
8. **Cylinder head bolt, short**
9. **Cylinder head bolt, long**
10. **Cylinder head**
11. **Valve seat**
12. **Valve**

Figure 3-92. Cylinder Head Assembly

CAUTION

Removing the valve after seal installation will cause the valve stem seal to catch the edge of the valve stem keeper groove. The resulting damage will lead to leakage around the valve stem, excessive oil consumption and valve sticking.

14. See Figure 3-107. Apply a liberal amount of assembly lube to valve stem tip and keeper groove (1).
15. Install the inner (3) and outer (4) valve springs over the valve guide (7). Fit the spring retainer (2) on top of the inner and outer valves springs. Like the spring seat, the smaller diameter flange fits inside the inner valve spring. The larger diameter flange separates the inner and outer springs.
16. Obtain the VALVE SPRING COMPRESSOR (Part No. HD-34736-B) and proceed as follows:
    a. Place tool over cylinder head so that the blunt end is centered on the valve head and adapter at end of forcing screw is seated on the valve spring retainer.

CAUTION

Over-compressing the valve spring can damage the valve stem seal resulting in leakage around the valve stem, excessive oil consumption and valve sticking.

    b. Rotate forcing screw to compress valve springs.
    c. With the tapered side down, fit the keepers into the valve stem groove. For best results, apply a dab of grease to the inboard side of the keepers before installation and use a magnetic rod for easy placement.
    d. Arranging tapered keepers so that the gaps are evenly spaced, turn forcing screw to release valve spring compression.
17. Tap the end of the valve stem once or twice with a soft mallet to ensure that tapered keepers are tightly seated in the valve stem groove.
18. Repeat steps 1-17 to install the other valve components.
19. Release the cylinder head holding fixture from the vise. Remove fixture tool from spark plug hole.
20. Cover the cylinder head to protect it from dust and dirt until time of installation.

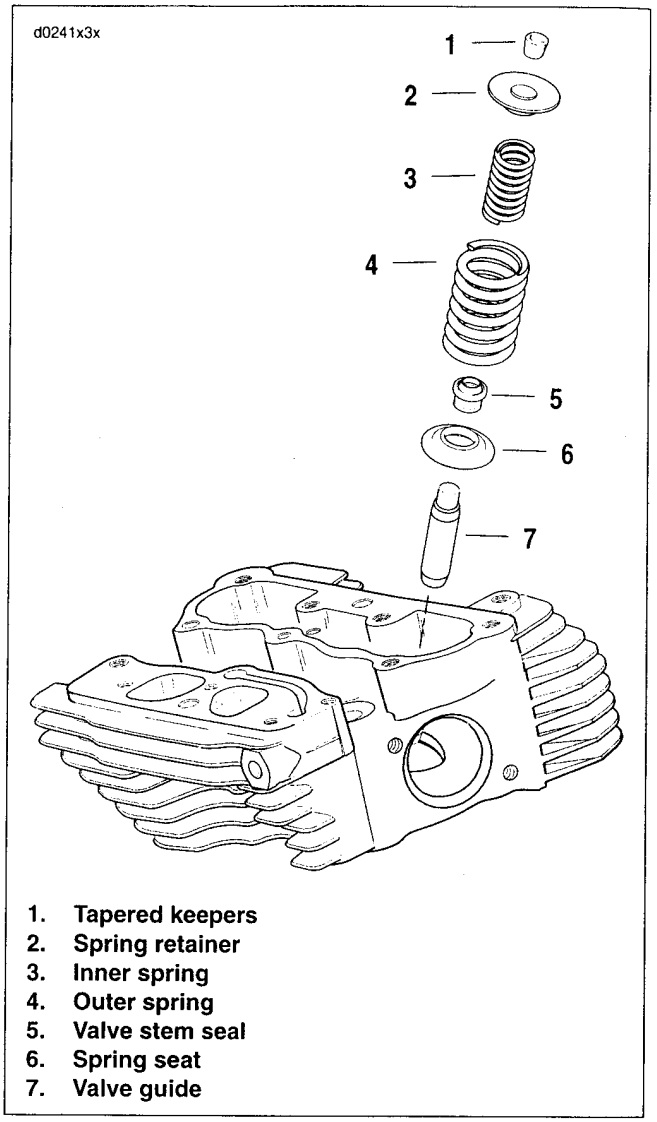
NOTE

See Figure 3-108. Since carbureted models are not equipped with a temperature sensor, a screw is used to plug the temperature sensor hole in the front cylinder head. If this screw is removed for any reason, it should be reinstalled before placing the vehicle in service. Tighten to 10-15 ft-lbs (13.6-20.3 Nm).

INSTALLATION OVERVIEW

See 3.17 TOP END OVERHAUL: ASSEMBLY.

1. Install cylinder head.
2. Install push rod covers and push rods.
3. Install rocker arm support plate.
4. Install breather assembly.
5. Continue with vehicle assembly as directed.



1. **Tapered keepers**
2. **Spring retainer**
3. **Inner spring**
4. **Outer spring**
5. **Valve stem seal**
6. **Spring seat**
7. **Valve guide**

Figure 3-107. Valve Assembly

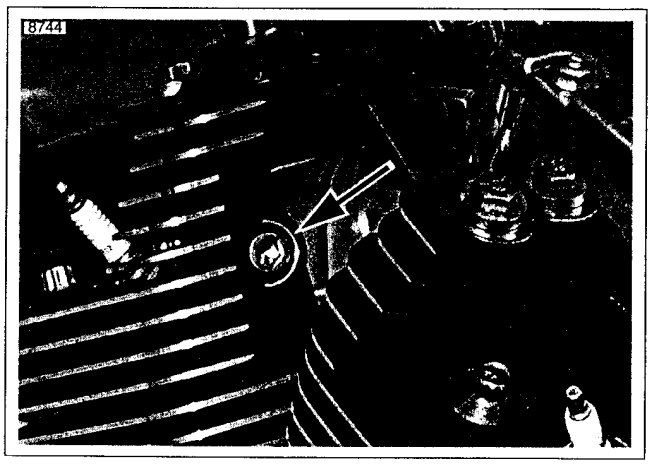


Figure 3-108. Temperature Sensor Hole Screw

REMOVAL OVERVIEW

See 3.16 TOP END OVERHAUL: DISASSEMBLY.

1. Remove breather assembly.
2. Remove rocker arm support plate.
3. Remove push rods and push rod covers. Do not remove lifters or lifter covers.
4. Remove cylinder head.
5. Remove cylinder.
6. Remove piston.
7. Service upper connecting rod bushing.

NOTE

Service of connecting rods is limited to replacement of the upper bushing. Damage to connecting rods or lower bushing service requires replacement of the flywheel assembly.

DISASSEMBLY/ASSEMBLY

Removing Upper Connecting Rod Bushing

PART NO.	SPECIALTY TOOL
HD-95952-33C	Connecting rod clamping tool
HD-95970-32D	Connecting rod bushing remover/ installer

NOTE

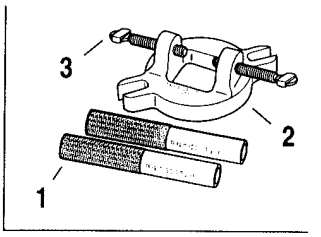
Replace the upper rod bushing if the piston pin to rod bushing clearance exceeds 0.001 in. (0.025 mm).

CAUTION

Place clean shop towels in and around the crankcase bore to prevent chips and shavings from falling into the crankcase.

1. See Figure 3-121. Obtain the CONNECTING ROD CLAMPING TOOL (Part No. HD-95952-33C).
   a. Slide clamp (2) over connecting rod so that slots engage cylinder head studs. Exercise caution to avoid scratching or bending studs.
   b. With the knurled side up, install threaded cylinders (1) onto studs to secure position of clamp.
   c. Alternately turn each clamp thumbscrew (3) a few turns to gradually fix position of connecting rod. Turning only one thumbscrew will move rod off-center, while tightening second thumbscrew can cause rod to flex or bend.

1. **Threaded cylinders**
2. **Clamp**
3. **Thumbscrew**



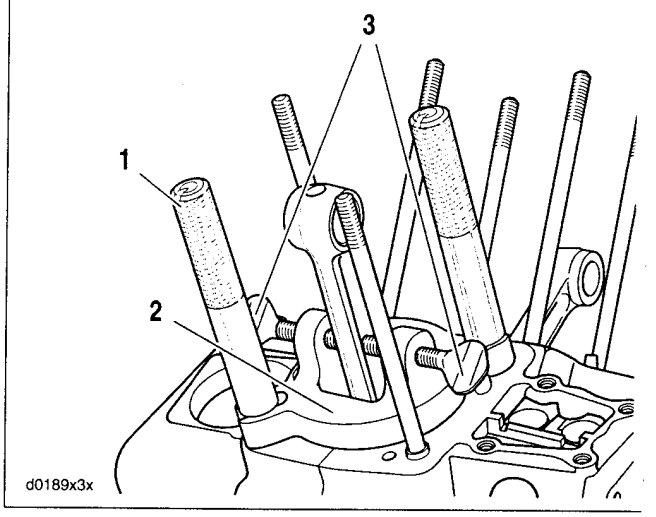


Figure 3-121. Connecting Rod Clamping Tool (Part No. HD-95952-33C)

2. See Figure 3-122. Obtain the CONNECTING ROD BUSHING REMOVER/INSTALLER (Part No. HD-95970-32D).
   a. Sparingly apply graphite lubricant to threads of rod to prolong service life and ensure smooth operation.
   b. Slide receiver cup (6) onto threaded rod (2) with the closed side facing nut (7).
   c. Insert threaded rod through upper rod bushing.
   d. See Figure 3-123. Slide remover side of driver down threaded rod. The driver is stamped to ensure proper orientation.
   e. See Figure 3-122. Slide Nice bearing (4) and flat washer (3) down threaded rod until it contacts driver.
   f. Thread the hex cylinder onto rod until assembly is snug.
   g. Holding nut (7) with a 5/8 in. box wrench, turn hex cylinder (1) with a 5/8 in. socket until bushing is free. See Figure 3-125.
   h. Unthread hex cylinder from rod. Remove flat washer, Nice bearing and driver. Remove threaded rod from bushing bore.
   i. Remove bushing from receiver cup and discard.

11. If reusing rear camshaft, remove roller bearing assembly as follows:
    a. Slide roller bearing from end of rear camshaft. Since bearing is a loose fit on cam, no pressing tools are required.
    b. Install tools as you would to remove the bearing from the front camshaft, but position cup of wedge inboard of the thrust washer.
    c. Wrap a shop rag around camshaft to get a firm grip and also to protect hand from sharp edges of sprocket.
    d. See A of Figure 3-134. Using a 5/8 in. box wrench (1), turn forcing screw until bearing inner race (2) and thrust washer (3) are pulled free of camshaft. A light interference fit allows the parts to be removed with little effort. Discard inner race and thrust washer.
    e. If present, remove O-ring from grinding relief groove in camshaft. Groove is on the splined end between the machined area and the secondary cam sprocket. Discard O-ring.

NOTE

Since the O-ring is not used in production, it will only be found if the cams were serviced at the dealer level.

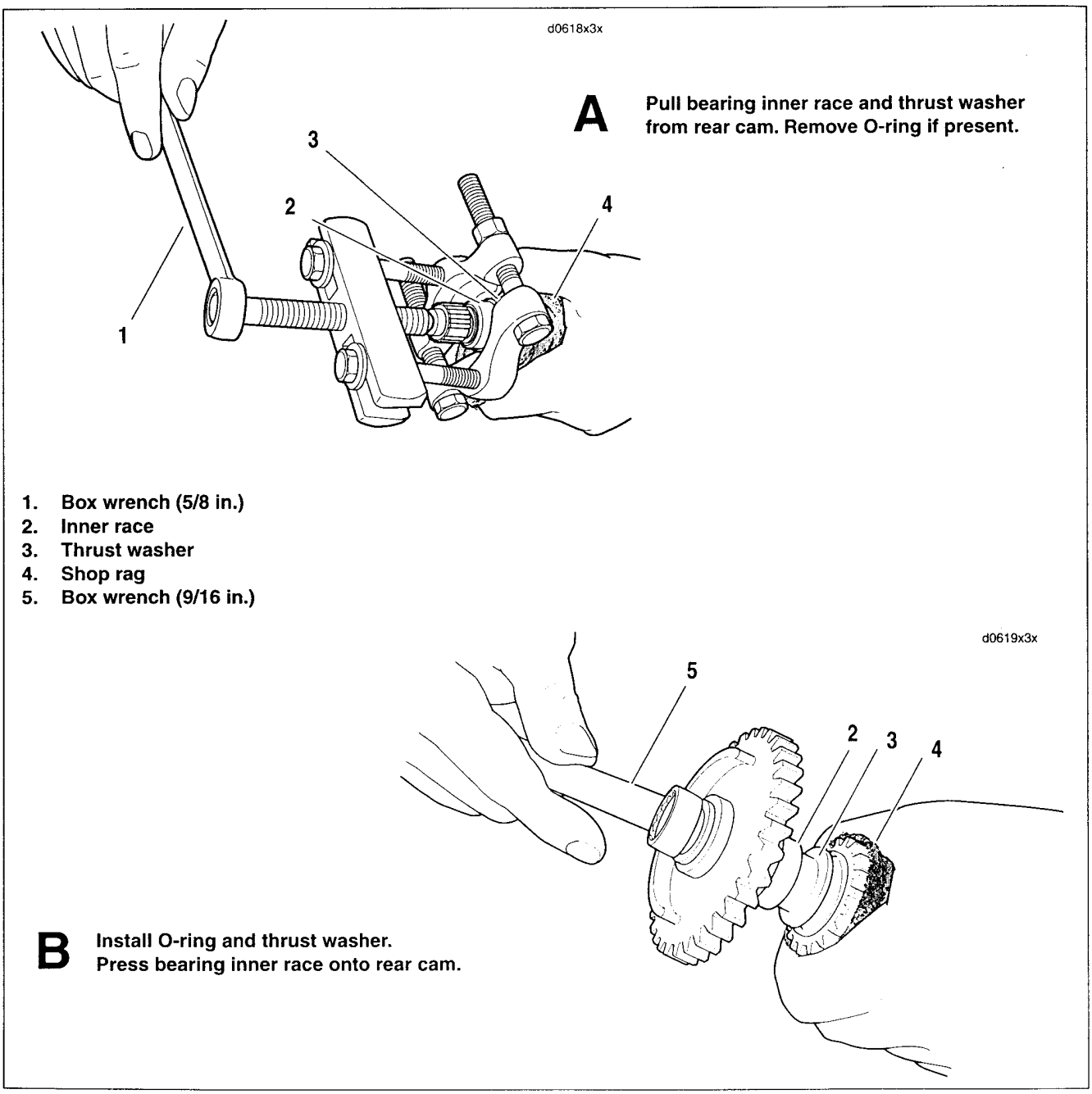


Figure 3-134. Remove/Install Bearing Inner Race (With O-Ring and Thrust Washer) Onto Rear Camshaft

REMOVAL OVERVIEW

1. See 3.16 TOP END OVERHAUL: DISASSEMBLY.
   a. Remove breather assembly.
   b. Remove rocker arm support plate.
   c. Remove push rods and push rod covers. Do not remove lifters or lifter covers.
2. See 3.27 COVER AND CAM SUPPORT PLATE. Fashion lifter holding tool to prevent the hydraulic lifters from dropping into the cam compartment during cam support plate removal.
3. See beginning of 3.18 BOTTOM END OVERHAUL: DISASSEMBLY to remove cover and cam support plate. Remove oil pump after removing cam support plate.

CLEANING AND INSPECTION

1. Clean all parts in a non-volatile cleaning solution or solvent.

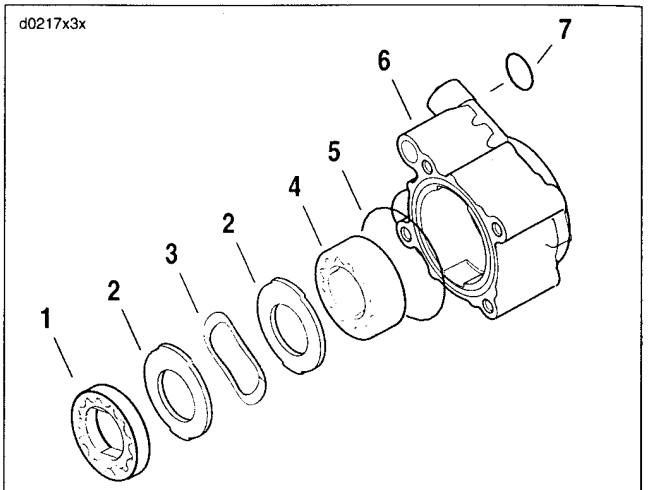
⚠WARNING

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.

2. Blow parts dry with low pressure compressed air. Verify that all oil passages are clean and open.
3. Look for scoring, gouging or cracking caused by foreign material that may have passed through the oil pump.
4. Look for grooves or scratches on the cam support plate, which serves as the outboard side of the oil pump.
5. Check for excessive wear or damage on lobes of outer gerotor gears and between lobes on inner gerotor gears.
6. See Figure 3-150. Check gerotor wear.
   a. Mesh pieces of one gerotor set together.
   b. Use a feeler gauge to determine clearance between tips of lobes on inner and outer gerotors.
   c. Replace gerotors as a set if clearance exceeds 0.004 in. (0.10 mm). Inspect second gerotor set in the same manner.
7. Measure thickness of inner gerotor of one set with a micrometer. Measure the outer gerotor of the same set. Replace the gerotor set if the difference exceeds 0.001 inch (0.025 mm). Inspect second gerotor set in the same manner.
8. Assemble the oil pump. Verify that feed gerotors stand proud of the oil pump surface 0.080-0.090 inch (2.03-2.29 mm). If measurement is less than 0.080 inch (2.03 mm), remove feed gerotor set and reassemble using **new** wave washer. Repeat measurement and replace oil pump body if still not within specification.

INSTALLATION OVERVIEW

1. See 3.19 BOTTOM END OVERHAUL: ASSEMBLY. Begin with COVER AND CAM SUPPORT PLATE instructions on page 3-49.
2. Continue with 3.17 TOP END OVERHAUL: ASSEMBLY.



1. **Narrow gerotor set (feed)**
2. **Separator plate**
3. **Wave washer**
4. **Wide gerotor set (scavenge)**
5. **Outer body O-ring**
6. **Oil pump housing**
7. **Scavenge port O-ring**

Figure 3-149. Assembling Oil Pump

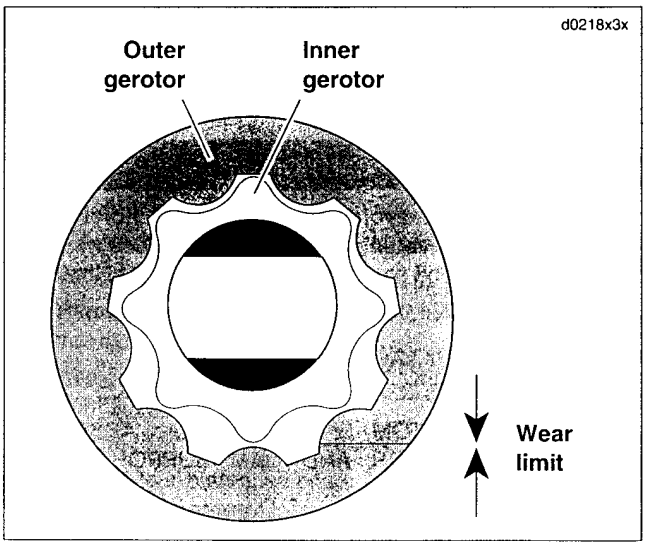
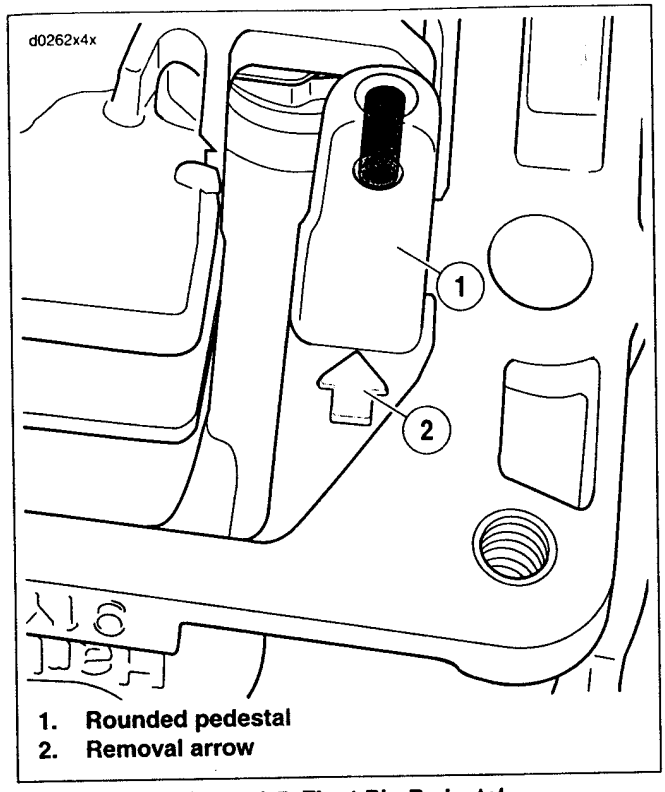


Figure 3-150. Measure Gerotor Sets for Wear

NOTES



1. **Rounded pedestal**
2. **Removal arrow**

Figure 4-5. Float Pin Pedestal

Float Replacement

CAUTION

When removing or installing the float pin, be careful not to break the pedestal. If the pedestal is broken, the carburetor will have to be replaced.

See Figure 4-5. A cast-in arrow (2) points at the rounded pedestal (1) that has the interference fit float pin. The pin is a uniform width throughout its entire length, so it can be installed starting from either end.

The arrow indicates direction of removal.

- Tap pin out from INTERFERENCE SIDE pedestal (direction of arrow).
- Install pin from LOOSE SIDE pedestal (opposite arrow).

Accelerator Pump

1. See Figure 4-3. Inspect the accelerator pump diaphragm (35) for holes, cracks or deformation. Replace as necessary.
2. Replace the pump rod (32) if it is bent and replace the boot (31) if it is cracked.

ASSEMBLY

Vacuum Piston Chamber

1. See Figure 4-3. Place needle (5) through center hole in vacuum piston (6). Place spring seat (4) over top of needle.
2. Insert vacuum piston into carburetor body. The slides on the piston are off-center and the piston will fit into the slide track grooves only one way. If piston does not fit, rotate 180 degrees.
3. Check to be sure diaphragm is seated evenly into groove at top of carburetor body.
4. Place spring (3) over spring seat and carefully lower top (2). Keep spring straight while lowering top.
5. After top is seated, hold top while lifting up on vacuum piston. Piston should rise to top smoothly. If piston movement is restricted, spring is cocked. Lift up on top and lower carefully, keeping spring coils straight.
6. Once top is installed correctly, install screws (1) and washers. Place bracket (15) in position with idle screw (11) resting on top of throttle cam stop. Install body screw (16) and washer (18) first, then top screw (14), to prevent bending bracket or throttle cam.

Carburetor Body

CAUTION

Slow fuel jets from fixed venturi carburetors look the same as the slow jet of the C.V. carburetor. However, the air bleed hole sizes are different on fixed venturi carburetors and they must not be installed on C.V. carburetors.

1. See Figure 4-3. Screw slow jet (28) into slow jet passage with narrow bladed screwdriver.
2. Turn carburetor upside down. Place needle jet (45) in main jet passage with needle passing through center hole. Be sure end of jet with larger opening and chamfered surface enters passage first.
3. Insert needle jet holder (44) into main jet passage with needle inserted into center of holder. Thread holder into passage and tighten. Thread main jet (43) into tapped hole in holder and tighten.
4. Place float assembly (30) into position with fuel inlet valve (46) inserted into valve seat and pivot arm aligned with holes in mounting posts at bottom of carburetor body. Insert pin (29) through float pivot arm and float mounting posts.
5. Place float bowl over float and onto carburetor body flange. Bowl will only fit in one position. Install screws (42) and tighten.
6. Install enrichener valve (49) and spring (50). Install enrichener cable (51, 52, and 53) on carburetor.

Accelerator Pump

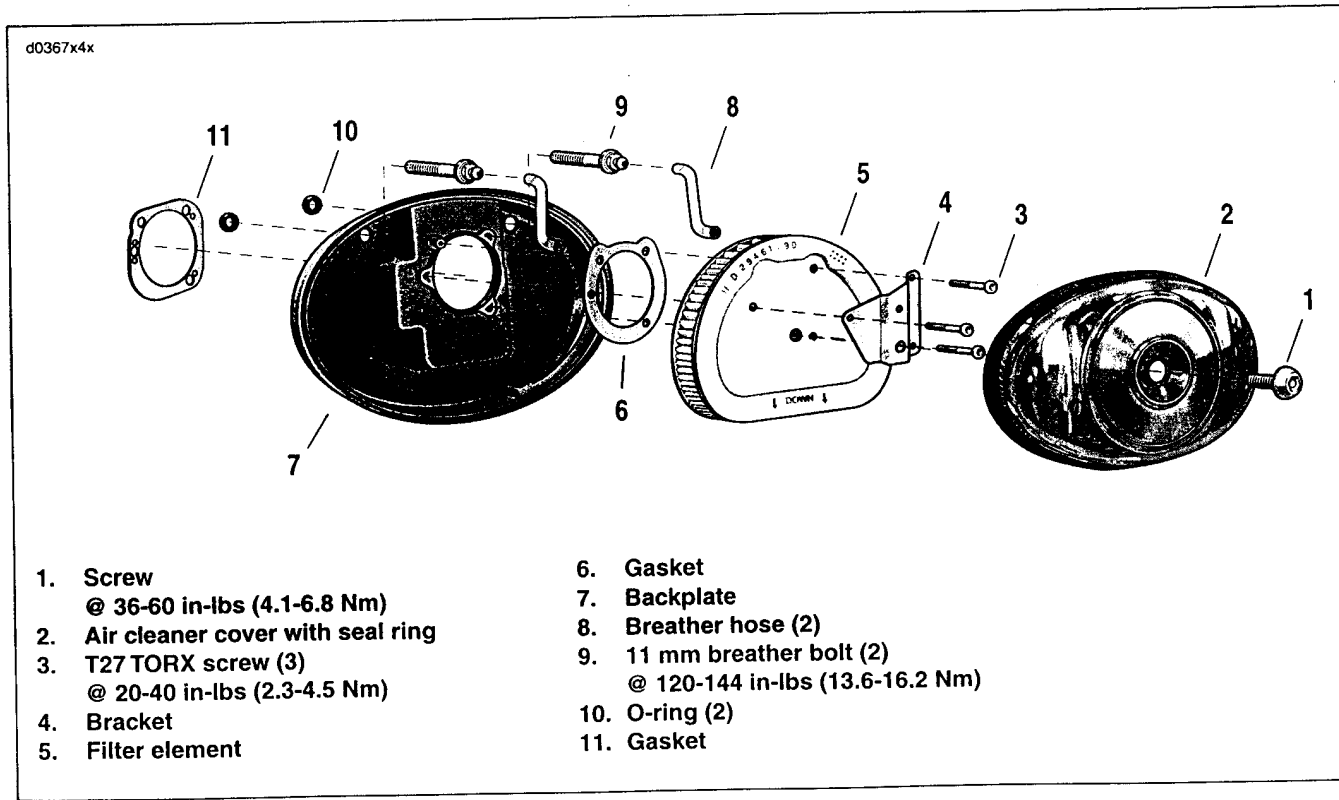
See Figure 4-3. Install diaphragm (35), spring (36), O-ring (40) and housing (37). Secure with three screws (39) and lockwashers (38).

REMOVAL

1. See Figure 4-14. Remove screw (1) and air cleaner cover (2).
2. Remove three TORX screws (3) and bracket (4) from filter element (5).
3. Gently pull both rubber breather tubes (8) from the back of the element. Remove filter element and gasket (6).
4. Replace the filter element if damaged or if filter media cannot be adequately cleaned.
5. Gently pull breather tubes (8) from breather bolts (9) on the backplate.
6. Check filter element. See 1.20 AIR CLEANER FILTER.
7. Inspect seal ring on cover (2) for cracks or tears. Verify that it seals tightly to backplate. Replace as required.
8. Alternately back out both breather bolts (9) (metric) a few turns a time while pulling backplate (7) away from carburetor.
9. Continue previous step until breather bolts are clear. Remove backplate (7), O-rings (10) and gasket (11). Discard gasket. On California models, disconnect clean air hose from backplate.
10. Wipe inside of air cleaner cover (2) and backplate (7) with damp cloth to remove dust.
11. On California models, make sure trap door swings freely. See Figure 4-15.

INSTALLATION

1. See Figure 4-14. Position **new** gasket (11) and two **new** O-rings (10) on backplate.
2. On California models, attach clean air hose to rear of backplate.
3. Insert two breather bolts (9) (metric) into backplate. Thread bolts loosely into each cylinder head. Tighten bolts to 120-144 **in-lbs** (13.6-16.2 Nm).
4. Insert two breather tubes (8) into the holes in back of the filter element. Place the element back into position and attach breather tubes to breather bolts.
5. Install air filter element (5) and bracket (4).
   a. Make sure gasket (6) holes are aligned with backplate holes.
   b. Use three TORX screws (3) to secure bracket and filter element. Tighten to 20-40 **in-lbs** (2.3-4.5 Nm).
6. Install air filter cover (2).
   a. Apply a drop of LOCTITE THREADLOCKER 243 (blue) to threads of air cleaner cover screw (1).
   b. Install screw to secure air cleaner cover. Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).



1. Screw @ 36-60 in-lbs (4.1-6.8 Nm)
2. Air cleaner cover with seal ring
3. T27 TORX screw (3) @ 20-40 in-lbs (2.3-4.5 Nm)
4. Bracket
5. Filter element
6. Gasket
7. Backplate
8. Breather hose (2)
9. 11 mm breather bolt (2) @ 120-144 in-lbs (13.6-16.2 Nm)
10. O-ring (2)
11. Gasket

Figure 4-14. Air Cleaner Assembly

GENERAL

The starter is made up of an armature, field winding assembly, solenoid, drive assembly, idler gear and drive housing.

The starter motor torque is increased through gear reduction. The gear reduction consists of the drive pinion on the armature, an idler gear and a clutch gear in the drive housing. The idler gear is supported by rollers. The clutch gear is part of the overrunning clutch/drive assembly.

The overrunning clutch is the part which engages and drives the clutch ring gear. It also prevents the starter from overrunning. The field windings are connected in series with the armature through brushes and commutator segments.

Wiring Diagrams

See Figure 5-2. The starting circuit wiring diagram contains information about wiring configuration. For additional information concerning the starting system circuit, see the wiring diagrams in Appendix B.

Starter Relay

The starter relay is not repairable. Replace the unit if it fails.

OPERATION

See Figure 5-1. When the starter switch is pushed, the starter relay is activated, then the starter solenoid is activated allowing current to flow into the pull-in winding (10) and the hold-in winding (11), to ground.

The magnetic forces of the pull-in and hold-in windings in the solenoid push the plunger (7) causing it to shift to the left. This action engages the pinion gear (1) with the clutch ring gear (13). At the same time, the main solenoid contacts (8) are closed, so battery current flows directly through the field windings (3) to the armature (4) and to ground. Simultaneously, the pull-in winding (10) is shorted.

The current continues flowing through the hold-in winding (11) keeping the main solenoid contacts (8) closed. At this point, the starter begins to crank the engine.

After the engine has started, the pinion gear (1) turns freely on the pinion shaft through the action of the overrunning clutch (12). The overrunning clutch prevents the clutch ring gear (13) (which is now rotating under power from the engine) from turning the armature (4) too fast.

When the starter switch is released, the current of the hold-in winding (11) is fed through the main solenoid contacts (8) and the direction of the current in the pull-in winding (10) is reversed. The solenoid plunger (7) is returned to its original position by the return spring, which causes the pinion gear (1) to disengage from the clutch ring gear (13).

1. Field wire
2. Thru-bolt (2)
3. Starter yoke assembly
4. Starter end frame
5. Screw w/O-ring (2)
6. Brush spring (4)
7. Brushes
8. Brush holder assembly
9. Armature
10. Armature bearings (2)
11. Starter housing mounting bolt (2)
12. Lockwasher (2)
13. Starter housing
14. Switch assembly
15. Starter clutch
16. Idler gear
17. Idler gear bearing & cage
18. O-ring
19. Spring
20. Output shaft
21. Return spring
22. Ball
23. O-ring (2)
24. Drain vent
25. Nut
26. Insulating boot
27. Screw (2)
28. Lockwasher (2)
29. Cover bracket
30. Nut w/washer
31. Cover
32. Cover screw

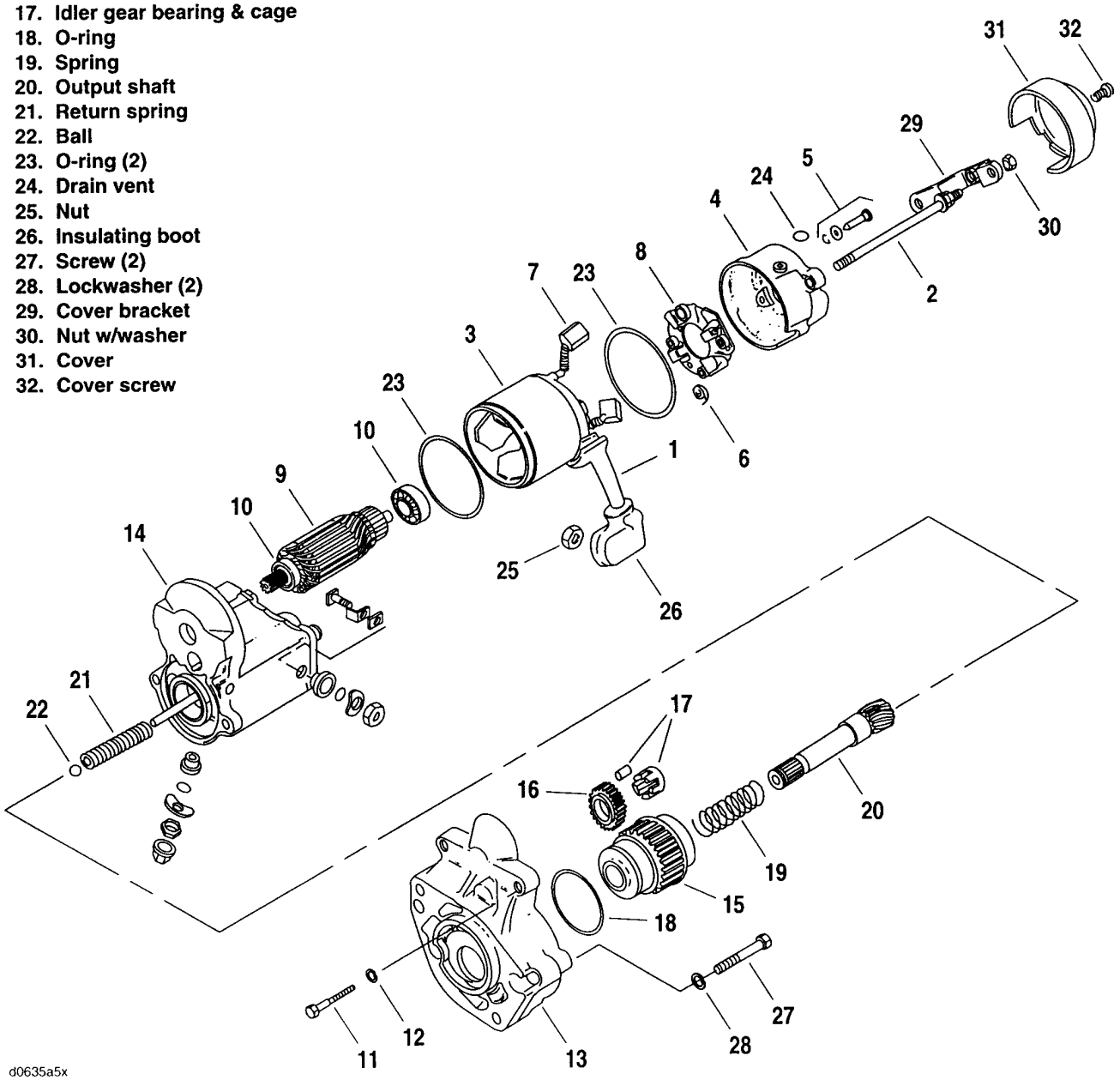


Figure 5-25. Starter Assembly

Installation

CAUTION

Cover mainshaft clutch hub splines with tape to prevent the splines damaging the inner primary cover oil seal.

1. Be sure the O-ring is in position on the crankcase around the alternator surface.
2. Oil both seal lips and install primary case. Be careful not to damage mainshaft seal when installing chaincase over the primary bearing inner race on the mainshaft. Lay a bead of silicone sealant on the backside mating surfaces. Place the primary chaincase in position on the motorcycle.
3. See Figure 6-3. Attach the inner primary-to-the-engine using the original bolts and washers. Tighten bolts to 17-21 ft-lbs (23.0-28.5 Nm). Bend up the locktabs of the inner primary-to-engine bolts.
4. See Figure 6-4. Tighten primary-to-the-transmission bolts to 17-21 ft-lbs (23.0-28.5 Nm) and bend locktabs into place.
5. Install starter. See 5.4 STARTER.
6. Install starter jackshaft. See 5.6 STARTER JACKSHAFT.
7. Install the primary chain, clutch, and compensating sprocket as an assembly. See 6.3 DRIVE COMPONENTS.

CAUTION

The Print-O-Seal gasket between the primary chaincase cover and chaincase must be replaced each time the cover is removed. Failure to replace this gasket may cause primary chaincase leaks.

8. Install primary chaincase cover and fill with lubricant.
9. Connect battery cable, negative cable only.

REMOVAL

PART NO.	SPECIALTY TOOL
HD-41184	Transmission sprocket tool
HD-94660-37B	Mainshaft locknut wrench

1. Remove primary chaincase cover. See PRIMARY CHAINCASE COVER under 6.2 PRIMARY CHAINCASE.
2. Remove transmission sprocket.
   a. See Figure 6-25. Remove both screws (1) and lockplate (2).
   b. See Figure 6-26. Secure sprocket using TRANSMISSION SPROCKET TOOL (Part No. HD-41184).
   c. Remove the sprocket nut using MAINSHAFT LOCKNUT WRENCH (Part No. HD-94660-37B).

NOTE

Sprocket nut has a left hand thread.

3. See Figure 6-27. Loosen rear axle and adjusters so rear wheel can be moved all the way forward. Remove belt from sprocket as you remove sprocket.

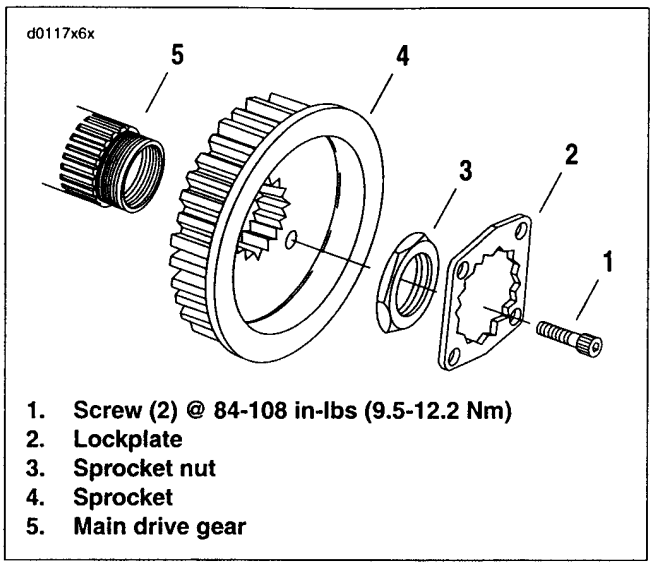
CLEANING AND INSPECTION

1. Clean sprocket of all grease and dirt using solvent. Clean and prime sprocket threads.
2. Inspect belt and sprocket. See 1.15 REAR BELT AND SPROCKETS.
3. Inspect both seals.

INSTALLATION

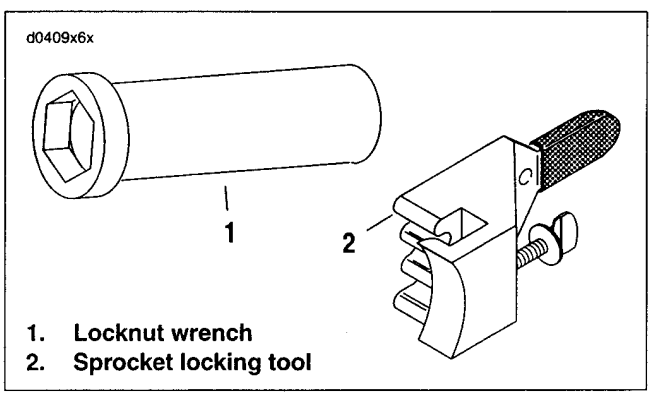
PART NO.	SPECIALTY TOOL
HD-41184	Transmission sprocket tool
HD-94660-37B	Mainshaft locknut wrench

1. Place transmission sprocket in position.
2. See Figure 6-25. Apply LOCTITE THREADLOCKER 262 (red) to sprocket nut (3) threads. Thread the sprocket nut counterclockwise onto main drive gear, with flanged side facing transmission sprocket.
3. See Figure 6-26. Lock transmission sprocket with the TRANSMISSION SPROCKET LOCKING TOOL (2) (Part No. HD-41184). Attach tool to sprocket with tool handle below pivot shaft. Snug thumbscrew to lock tool on sprocket.
4. Screw pilot of MAINSHAFT LOCKNUT WRENCH (1) (Part No. HD-94660-37B) onto threaded end of mainshaft.



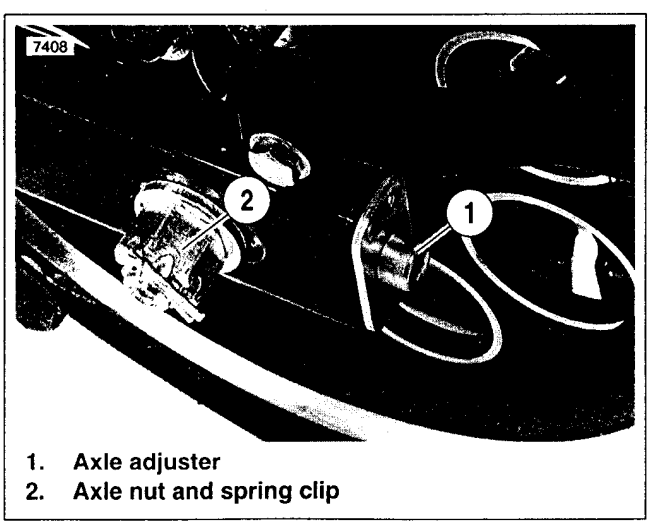
1. **Screw (2) @ 84-108 in-lbs (9.5-12.2 Nm)**
2. **Lockplate**
3. **Sprocket nut**
4. **Sprocket**
5. **Main drive gear**

Figure 6-25. Transmission Sprocket



1. **Locknut wrench**
2. **Sprocket locking tool**

Figure 6-26. Transmission Sprocket Tools



1. **Axle adjuster**
2. **Axle nut and spring clip**

Figure 6-27. Axle Adjusters (Left Side Shown)

REMOVAL/DISASSEMBLY

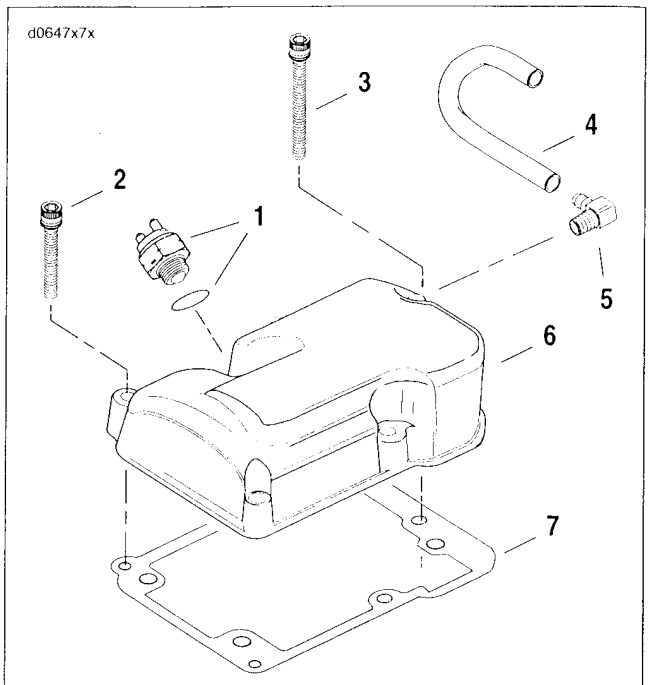
⚠WARNING

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

⚠WARNING

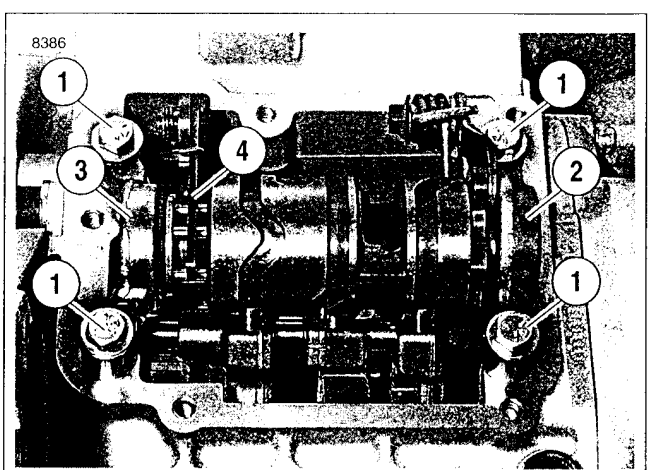
Always disconnect the negative cable first. If the positive cable should contact ground with the negative cable installed, the resulting sparks may cause a battery explosion which could result in death or serious injury.

1. Disconnect battery cables, negative cable first.
2. Remove battery and oil tank. See 3.32 OIL PAN.
3. Remove starter. See 5.4 STARTER.
4. See Figure 7-3. Disconnect neutral indicator switch (1). See 8.29 NEUTRAL SWITCH.
5. Remove vent hose (4) from fitting (5) on cover to provide additional clearance for removal if needed.
6. Remove top cover.
   a. Remove the screws and washers (2, 3).
   b. Remove the top cover (6) and cover gasket (7).
   c. Discard gasket.
7. See Figure 7-4. Remove four bolts and washers (1) to free the right (2) and left (3) support blocks.
8. Lift shifter cam pawl (4) over cam pins to free assembly.



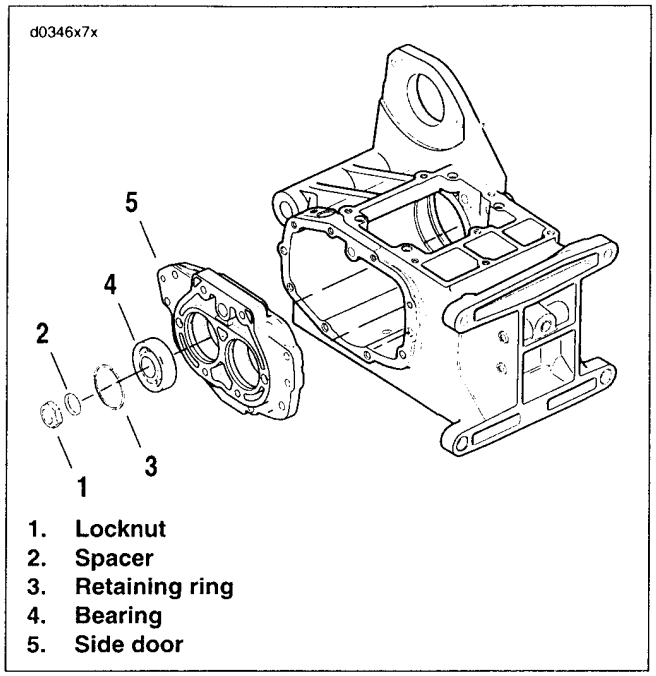
1. Neutral indicator switch and O-ring
2. Screws (short) and washers (4)
3. Screw (long) and washer
4. Vent hose
5. Vent hose fitting
6. Top cover
7. Gasket

Figure 7-3. Cover Assembly



1. Bolts and washers
2. Right support block
3. Left support block
4. Shifter cam pawl

Figure 7-4. Support Block Fasteners



1. **Locknut**
2. **Spacer**
3. **Retaining ring**
4. **Bearing**
5. **Side door**

Figure 7-24. Side Door Bearings

DISASSEMBLY

PART NO.	SPECIALTY TOOL
J-5586-A	Retaining ring pliers

1. See Figure 7-25. Remove the 2-piece push rod (21) from the hole in the mainshaft. Use RETAINING RING PLIERS (Part No. J-5586-A) to remove retaining rings (12).
2. With access door on end (shafts pointing upward), remove the retaining ring (12) from the countershaft (6). Remove the countershaft 5th gear (19) and countershaft 2nd gear (18).
3. Remove the bearings (9), retaining ring (12) and countershaft 3rd gear (16).
4. Remove mainshaft 2nd gear (20) and leave 4th and 1st gear respectively on each shaft.

NOTE

To remove the mainshaft 3rd gear (17), move the retaining ring on the access door side of 3rd gear out of the slot and slide it on the shaft away from 3rd gear. The gear will move down the shaft for easy access to the upper retaining ring.

5. Remove the upper retaining ring, thrust washer (11), mainshaft 3rd gear (17), bearings and retaining ring.

CAUTION

Supporting the gears in the following step is necessary to provide support for the inner bearing races. Failure to support the gears will damage the bearings.

6. Support countershaft 1st gear and press out countershaft.
7. Support mainshaft 4th gear and press out mainshaft.
8. Remove the remaining spacers and retaining rings.

CLEANING AND INSPECTION

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.

1. Clean all parts with solvent. Blow parts dry with low pressure compressed air.
2. Check gear teeth for damage. If gears are pitted, scored, rounded, cracked or chipped, they should be replaced.
3. Inspect the engaging dogs on the gears. Replace the gears if dogs are rounded, battered or chipped.
4. See Figure 7-24. Inspect the bearings (4) in the side door (5). If bearings are pitted or grooved or feel rough when turned or have any end play, replace the bearings.

Replacing Side Door Bearings

1. See Figure 7-24. Remove the retaining rings (3) and press the bearings out of the side door.

CAUTION

To perform the next step, you must use a plate for support or the bearing door will be damaged.

2. When pressing **new** bearings into side door, press on the outside diameter of the bearing side with the numbers stamped on it. This side should face toward the outside of the door. Support the door from the opposite side at the bearing bores with a flat plate.
3. Install beveled retaining ring (3) with the flat side next to the bearing.

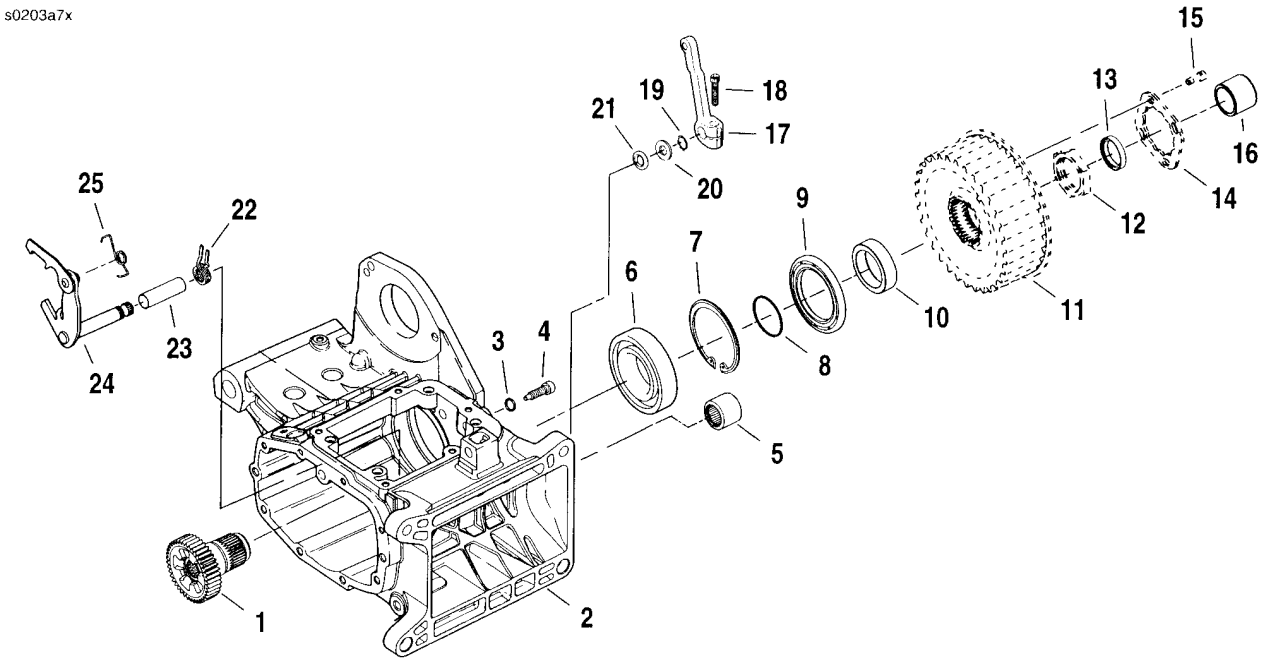
ASSEMBLY

PART NO.	SPECIALTY TOOL
J-5586-A	Retaining ring pliers

NOTE

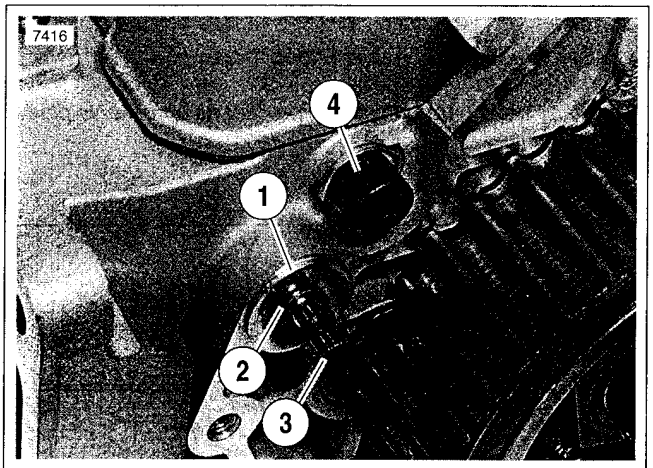
*Replace all retaining rings and gear roller bearings with **new** parts during assembly.*

1. See Figure 7-25. Slip thrust washers (11) and retaining rings (12) on mainshaft and countershaft. Slip mainshaft 4th gear on mainshaft and countershaft 1st gear on countershaft.
2. Lightly coat bearings (9) with oil and install the bearings on the mainshaft (5) bottom race. Slide mainshaft 4th gear (10) over the bearings. Install one thrust washer (11) on top of the gear and secure with a retaining ring (12). Install mainshaft 1st gear (13) with the shifter fork slot facing the side door.



1. Main drive gear
2. Transmission case
3. Washer
4. Screw (not an adjuster)
5. Bearing
6. Bearing
7. Bevelled retaining ring
8. Quad seal
9. Oil seal
10. Spacer
11. Sprocket
12. Sprocket nut
13. Oil seal, fifth gear
14. Lockplate
15. Allen screws
16. Bearing, inner race
17. Shifter rod lever
18. Screw
19. Retaining ring
20. Washer
21. Seal
22. Shifter lever centering spring
23. Sleeve (inside transmission case)
24. Shifter pawl lever assembly
25. Shifter shaft lever spring

Figure 7-34. Transmission Case, Sprocket and Main Drive Gear



1. Washer (with seal behind)
2. Retaining ring
3. Shifter shaft lever
4. Screw (not an adjuster)

Figure 7-35. Shifter Shaft Lever, Exterior View

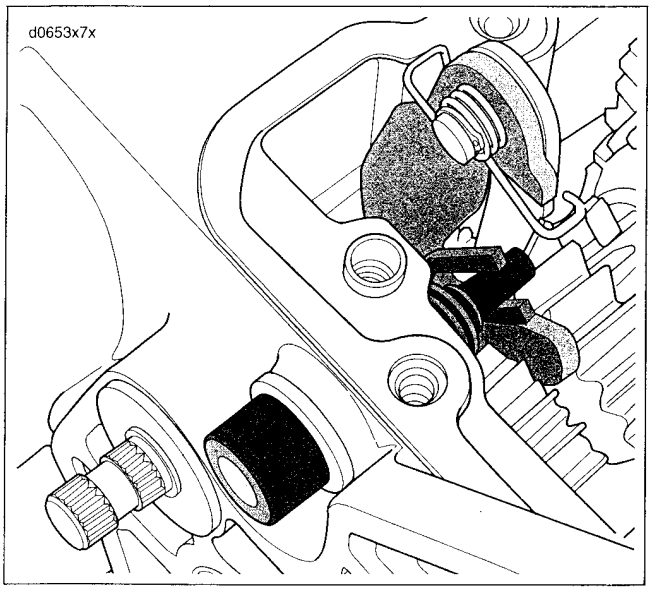


Figure 7-36. Shifter Shaft Lever Spring

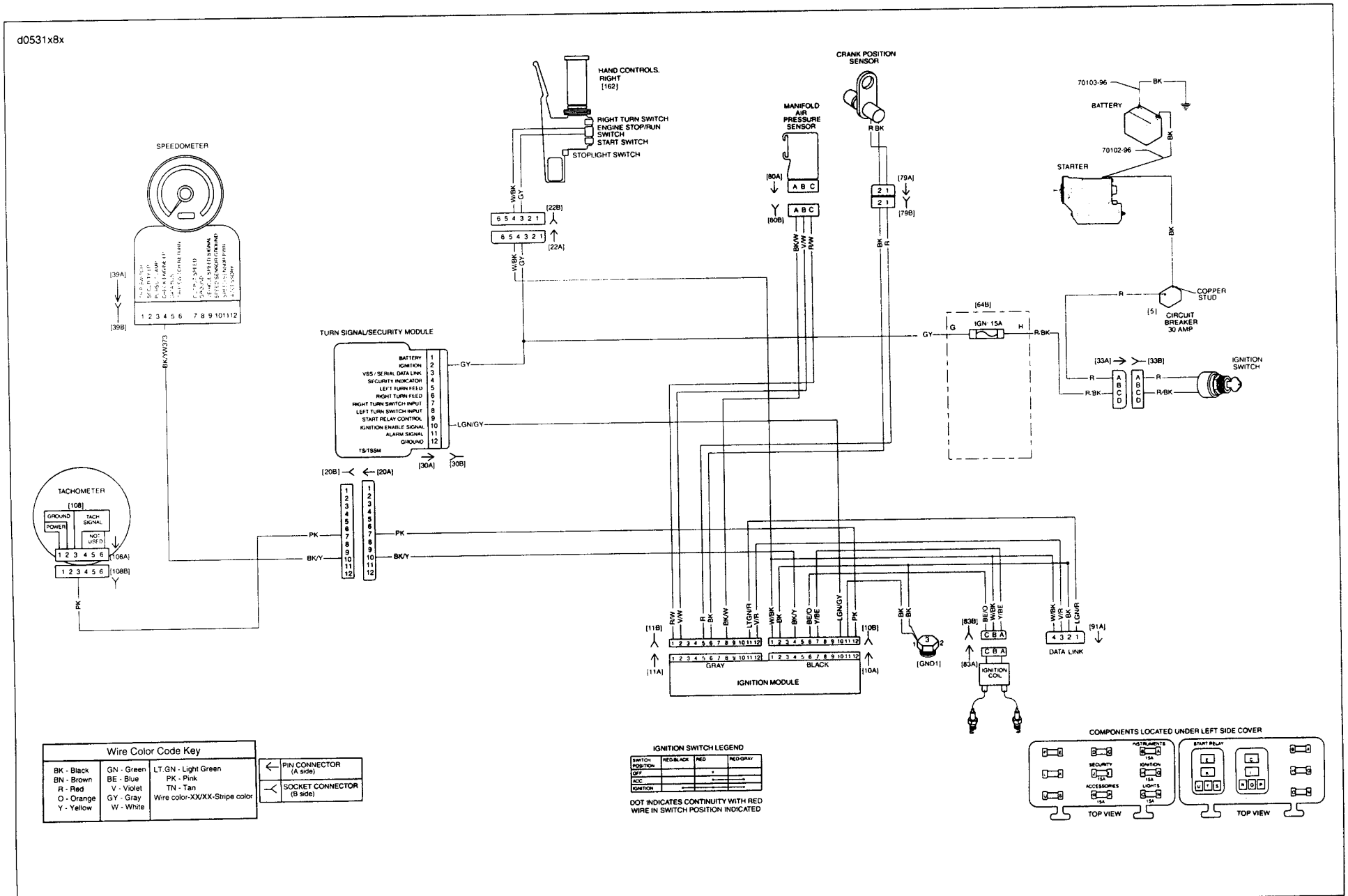


Figure 8-1. Ignition System Circuit: All But FXDWG

GENERAL

See Figure 8-19. The fuse block is on the left side of the motorcycle, behind the electrical panel cover. The block contains four 15 ampere replaceable fuses. Additional spare fuses may be carried if the rider chooses to do so.

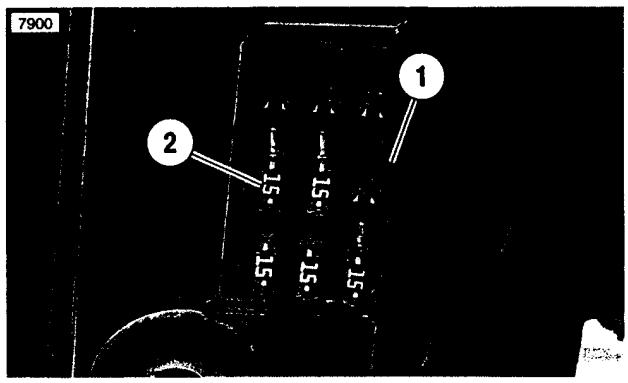
REPLACEMENT

1. See Figure 8-20. Pull electrical panel cover (1) away from grommets (3). No tools are necessary for this step.
2. See Figure 8-21. Replace suspect fuse.

NOTE

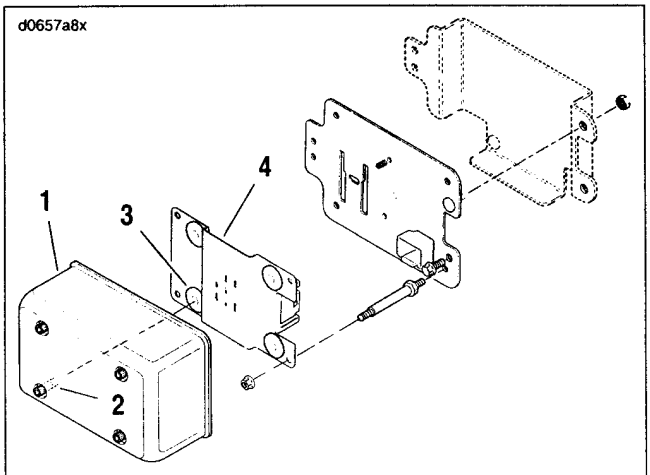
Electrical panel cover has a drain hole. Make sure drain hole is on bottom when installing cover.

3. Push electrical panel cover onto the four grommets.



1. **Fuse block**
2. **Spare fuses (not on all models)**

Figure 8-19. Fuse Location



1. **Electrical panel cover**
2. **Cover mounting pin (4)**
3. **Grommet (4)**
4. **Electrical panel top plate assembly**

Figure 8-20. Accessing Fuse Block

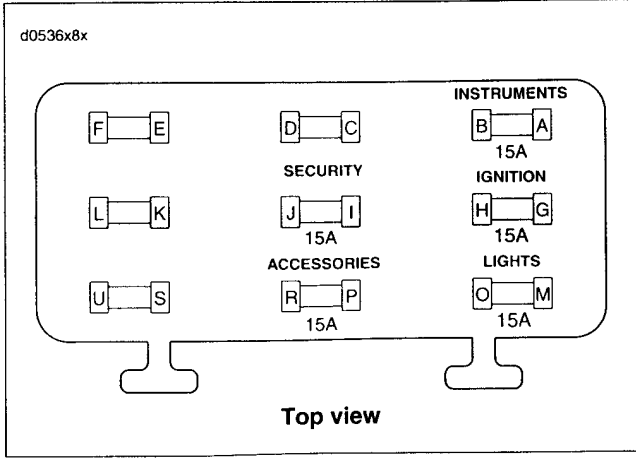


Figure 8-21. Fuse Functions

CAUTION

Always remove the battery from the motorcycle before charging. Accidental electrolyte leakage will damage motorcycle parts.

2. Remove the battery from the motorcycle and place on a level surface.

⚠WARNING

Always unplug or turn OFF the battery charger before connecting the charger clamps to the battery. Connecting clamps with the charger ON could cause a spark resulting in a battery explosion which could result in death or serious injury.

CAUTION

Do not reverse the charger connections described in the following steps or the charging system of the motorcycle could be damaged.

3. Connect the red battery charger lead to the positive (+) terminal of the battery.
4. Connect the black battery charger lead to the negative (–) terminal of the battery.

NOTE

If the battery is still in the vehicle, connect the negative lead to the chassis ground. Be sure that the ignition and all electrical accessories are turned off.

5. Step away from the battery and turn on the charger. See the charging instructions in Table 8-8.

⚠WARNING

Always unplug or turn OFF the battery charger before disconnecting the charger clamps from the battery. Disconnecting clamps with the charger ON could cause a spark resulting in a battery explosion which could result in death or serious injury.

6. After the battery is fully charged, disconnect the black battery charger lead to the negative (–) terminal of the battery.
7. Disconnect the red battery charger lead to the positive (+) terminal of the battery.
8. Mark the charging date on the battery.
9. Perform a load test to determine the condition of the battery. See Load Test under BATTERY TESTING.

INSTALLATION

1. See Figure 8-44. Install TSM/TSSM module (2) into module bracket (3).
2. See Figure 8-43. Plug in TSM/TSSM module connector.
3. Attach cover and four nuts. See 8.4 ELECTRICAL PANEL.

⚠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 which could result in death or serious injury.

4. Connect battery, positive cable first.

⚠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.

5. After replacing TSM/TSSM, perform all appropriate instructions under TSM/TSSM VEHICLE DELIVERY in the DYNA MODELS ELECTRICAL DIAGNOSTIC MANUAL.
6. Plug in connector and test for correct operation.

GENERAL

The speedometer speed sensor is a hall effect sensor that takes readings off 4th gear in the transmission.

The speedometer speed sensor is located on the transmission just behind the transmission top cover.

REMOVAL

1. Remove seat.

⚠WARNING

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

⚠WARNING

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

2. Disconnect battery cables, negative cable first.
3. See Figure 8-58. The 3-place speedometer sensor connector [65] is located on the frame beneath the seat. Remove connector from t-stud and disconnect.
4. See Figure 8-59. Remove sensor mounting bolt and lift sensor from crankcase.

NOTE

Before removing sensor wire, carefully note wire routing. It is a good idea to lay the new sensor wire next to the old wire and remove and replace the wires together, one cable strap at a time, to ensure proper routing.

INSTALLATION

1. See Figure 8-59. Install sensor into transmission case using mounting bolt. Tighten bolt to 84-108 **in-lbs** (9.5-12.2 Nm).
2. See Figure 8-58. Mate connector halves and attach 3-place connector [65] to t-stud on frame under seat.

⚠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 which could result in death or serious injury.

3. Connect battery cables, positive cable first.

Figure 8-58. Speedometer Sensor Connector [65]

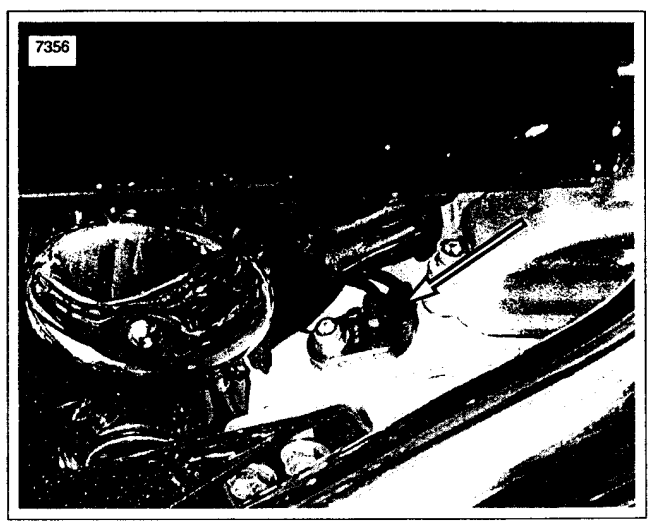


Figure 8-59. Speedometer Speed Sensor

⚠WARNING

After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift position during vehicle operation causing loss of control which could result in death or serious injury.

4. Install seat.

2. Install the electrical panel and coil and reconnect the following connectors/components:
   a. Data link.
   b. 30 amp main circuit breaker (disconnect regulator wire).
   c. Starter relay connector [123].
   d. Main fuse block.
   e. Coil connector [83].
3. Push wiring harness into rear of frame tube.
4. Guide wiring harness back into frame backbone. Pull the front of the harness through using the guide wire while pushing the harness through the frame tube opening. Pull harness forward through frame backbone far enough to gain access to front connectors.
5. Lower fuel tank and tighten front mounting bolt. Install rear fuel tank mounting bolt, washers and acorn nut.
6. For FXDWG Models, install odometer reset switch rubber boot and reconnect the following connectors:
   a. Right handlebar controls [22] (6-place Deutsch).
   b. Left handlebar controls [24] (6-place Deutsch).
   c. Front turn signals [31] (6-place Multilock).
   d. Headlamp [38] (4-place Multilock).
   e. Indicator lamps [21] (8-Place Mini-Deutsch).
   f. Key switch [33].
   g. Speedometer [39].
   h. Install console to fuel tank.
7. For all other models, connect the following connectors:
   a. Right handlebar controls [22] (6-place Deutsch).
   b. Left handlebar controls [24] (6-Place Deutsch).
   c. Instruments [20].
   d. Turn Signals [31].
   e. (FXDL Only) Instruments [21].
   f. Headlamp [38].
8. Pull harness to rear of motorcycle to conceal front connectors.
9. Install the rubber frame plug behind the right side of the frame neck and secure it to the harness with a cable tie.
10. Install vapor valve and hose from front of fuel tank and secure with clip.
11. Make a loop at the rear of the frame with the excess harness and push the loop into the frame tube.
12. Install fender flap to inside of rear fender (snaps in place).
13. Install belt guard.

⚠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 which could result in death or serious injury.

14. Connect battery cables, positive cable first.

⚠WARNING

After installing seat, pull upward on front of seat to be sure it is locked in position. If seat is loose, it could shift position during vehicle operation causing loss of control which could result in death or serious injury.

15. Install seat.

⚠WARNING

Check all lighting and switch operations before riding motorcycle. Visibility is a major concern for motorcyclists. Failure to have lighting and proper switch operations could result in death or serious injury.

16. Turn ignition ON. Test switches for correct operation.

Lower Housing Repair

1. From inside the switch housing, carefully cut cable strap to free conduit from the turn signal switch bracket.
2. Remove screw with lockwasher to release the turn signal switch bracket. Remove the bracket and switch assembly from the housing.
3. Cut wires 1.5 in. (38.1 mm) from old switch (Turn-L(eft) Signal Switch). Discard switch assembly.
4. See 8.34 HANDLEBAR SWITCH ASSEMBLIES for information on splicing and general repair practices.
5. Continue with ASSEMBLY which follows.

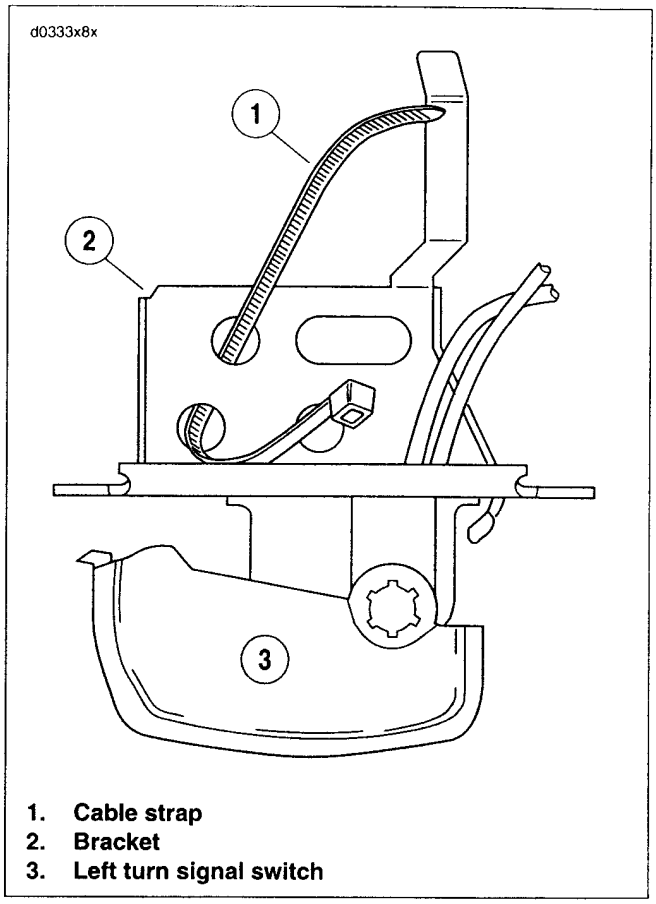
ASSEMBLY

1. See Figure 8-88. Insert tapered end of **new** 7.0 in. (177.8 mm) cable strap (1) into round hole in turn signal switch bracket (2) and then feed back through using the adjacent hole. Reserve the oblong hole for the bracket screw.

NOTE

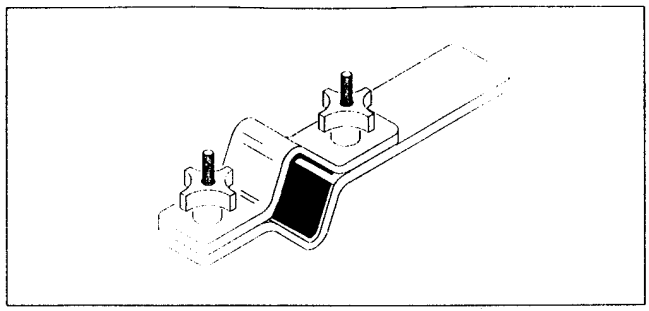
Be sure that all splices are positioned above the turn signal switch bracket.

2. Place the turn signal switch assembly (3) into the housing, aligning the oblong hole in the bracket with the threaded hole in the boss. Be sure that the bracket is fully seated. Tabs on each side of bracket are captured in slots cast into switch housing.
3. Start screw with lockwasher to secure bracket inside housing.
4. Loop switch wires so that spliced lengths are positioned across bracket.
5. Capturing conduit about 0.25 in. (6.4 mm) from end, securely tighten cable strap to draw conduit to bracket. Remove any excess cable strap material.
6. Tighten screw to secure bracket inside housing.
7. Route wire bundle to upper switch housing below and then forward of the main wire harness, positioning conduit in channel next to angular arm of bracket. Secure bundle to arm using **new** cable strap. Cut any excess cable strap material.
8. See INSTALLATION on page 8-63.
   a. If lower housing switches were replaced, perform the whole procedure.
   b. If upper housing switches were replaced, begin with step 7.

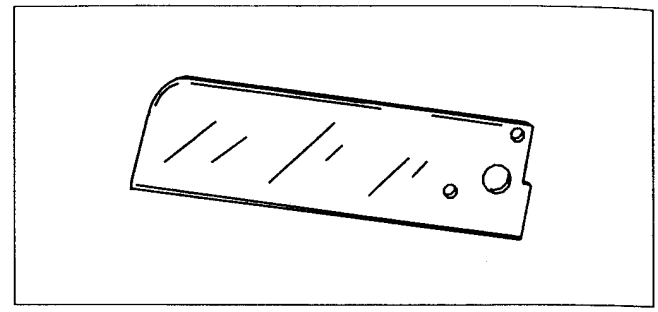


1. **Cable strap**
2. **Bracket**
3. **Left turn signal switch**

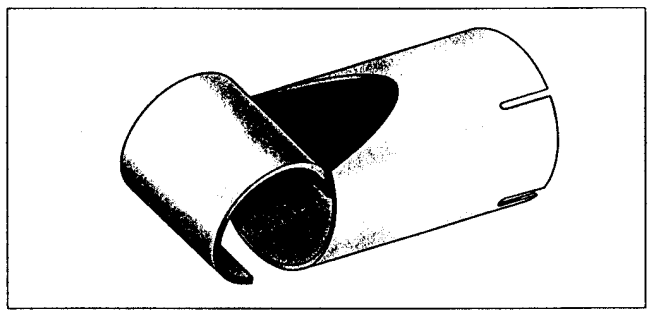
Figure 8-88. Insert Cable Strap in Switch Bracket



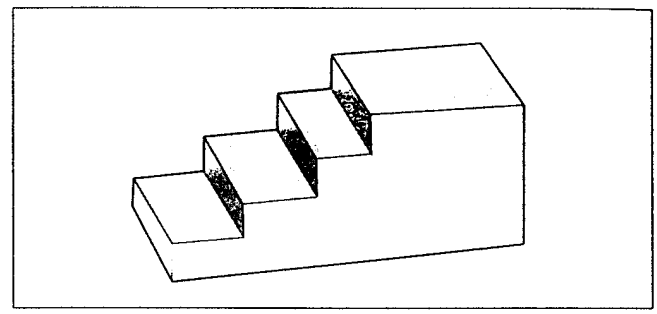
Part No. HD-41177 Fork Tube Holder



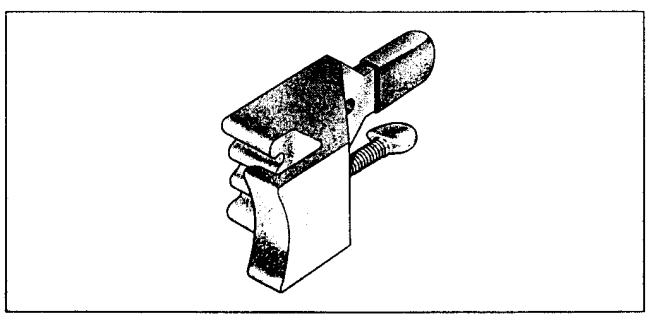
Part No. HD-41185-1 Hose Cutter Blade



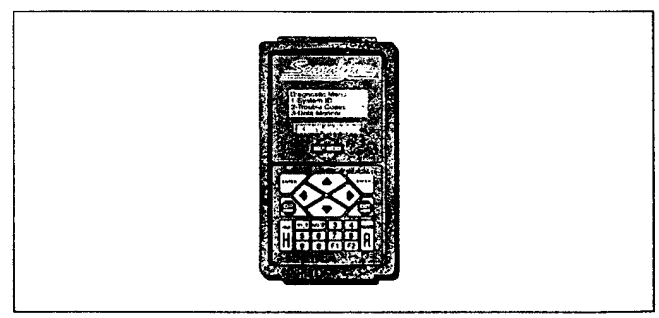
Part No. HD-41183 Robinair Heat Gun Shrink Tool Attachment (Use with HD-25070)



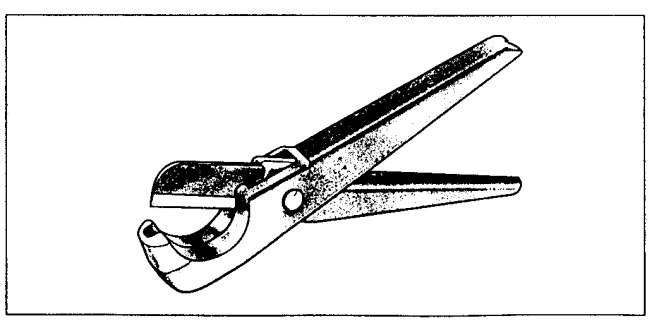
Part No. HD-41214 Primary Drive Locking Tool



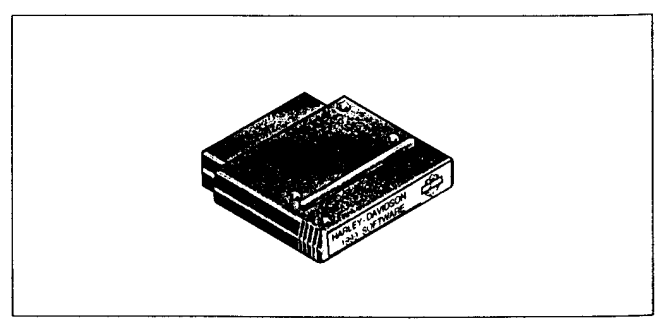
Part No. HD-41184 Final Drive Sprocket Holding Tool



Part No. HD-41325-D Scanalyzer



Part No. HD-41185 Hose Cutting Tool



Part No. HD-41325-95C Scanalyzer Cartridge

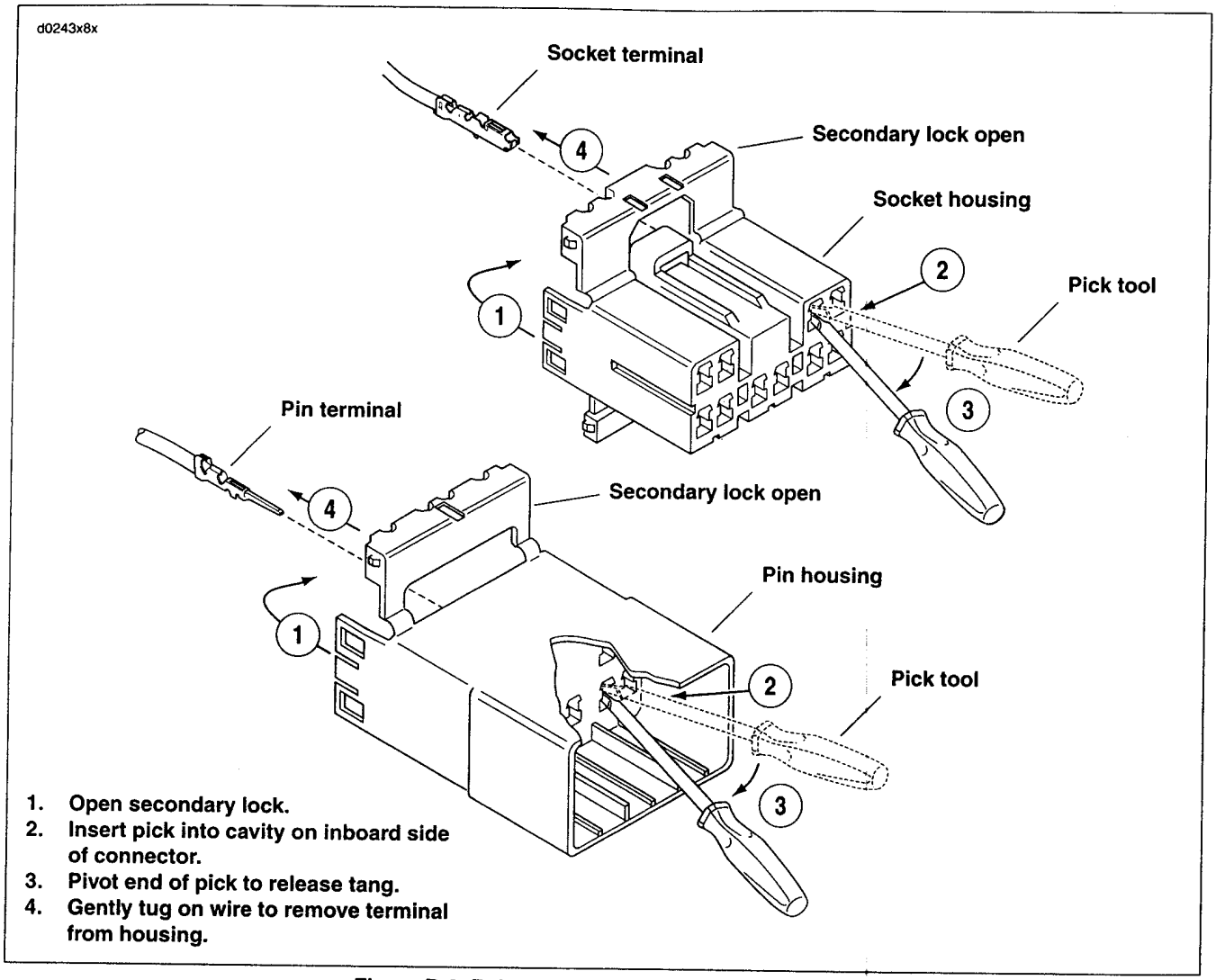


Figure B-2. Release Tang and Back Out Terminals

NOTES

- *See Figure B-3. The tang in the chamber engages the slot to lock the terminal in position.*
- *On the pin side of the connector, tangs are positioned at the bottom of each chamber, so the slot in the pin terminal (on the side opposite the crimp tails) must face downward.*
- *On the socket side, tangs are at the top of each chamber, so the socket terminal slot (on the same side as the crimp tails) must face upward.*
- *Up and down can be determined by the position of the release button (used to separate the pin and socket halves). Consider the button to always be on top of the connector.*

2. Gently tug on wire end to verify that the terminal is locked in place and will not back out of chamber.
3. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.
4. Insert the socket housing (plug) into the pin housing (receptacle) until it snaps in place.
5. Install connector on retaining device, either attachment or rosebud clip.

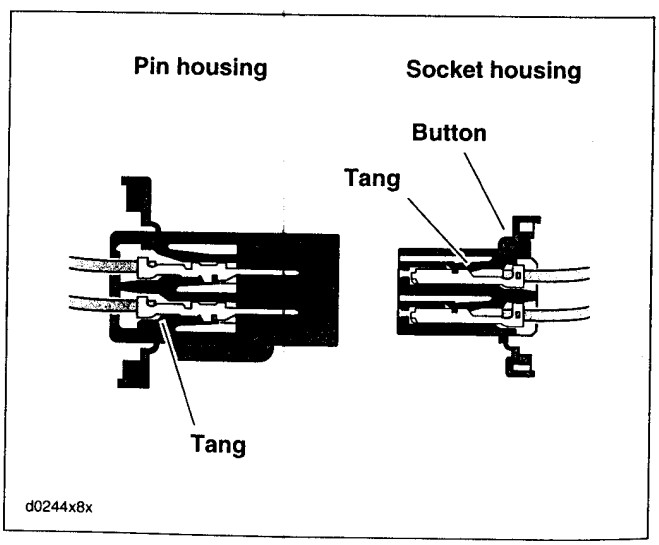


Figure B-3. Deutsch Connector Pick Tool (Part No. HD-41475-100)

INSTALLATION

Butt splicing may be a necessary procedure for the replacement of some components.

1. Strip 3/8 in. (9.5 mm) of insulation off the ends of the wires.
2. Compress the handles of the Packard Crimp Tool (HD-38125-8) until the ratchet automatically opens.
3. See Table B-1. Since the size of the connectors varies with the gauge of the wire, always used the correct components when creating sealed splices.
4. See Figure B-18. Determine the correct dye or nest for the crimping operation. Match the color or gauge wire marked on the butt splice connector with the corresponding crimp cavity on the crimp tool.
5. Gently apply pressure to the handles until the crimper lightly secures one side of the metal insert inside the butt splice connector. The connector must be crimped in two stages; one side then the other.
6. See Figure B-19. Feed the wire into the butt splice connector until the stripped end contacts the wire stop inside the metal insert.
7. Squeeze the handles of the crimp tool until tightly closed. The tool automatically opens when the crimping sequence is complete.
8. Repeat steps 5, 6, and 7 on the other side of the butt splice connector.

NOTE

If adjacent wires are being spliced, stagger the splices so that the butt splice connectors are spaced at different positions along the length of the wires.

⚠WARNING

Use caution when operating the UltraTorch UT-100 or any other radiant heating device. Read the manufacturers instructions carefully before use. Always keep hands away from tool tip area and heat shrink attachment. Avoid directing the heat toward any fuel system component. Extreme heat can cause fuel ignition or explosion. Avoid directing heat toward any electrical system component other than the connectors on which heat shrink work is being performed. Be sure to turn the "ON/OFF" switch to the "OFF" position after use. Improper handling could result in death or serious injury.

9. Using the UltraTorch UT-100 (Part No. HD-39969), Robinair Heat Gun (Part No. HD-25070) with heat shrink attachment (Part No. HD-41183) or other suitable radiant heating device, heat the crimped splice to encapsulate the butt splice connection. Apply heat from the center of the crimp out to each end until the meltable sealant exudes out both ends of the connector.

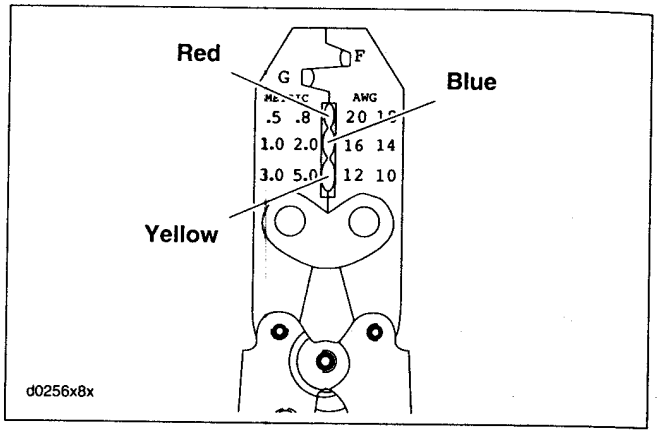


Figure B-18. Packard Crimp Tool (Part No. HD-38125-8)

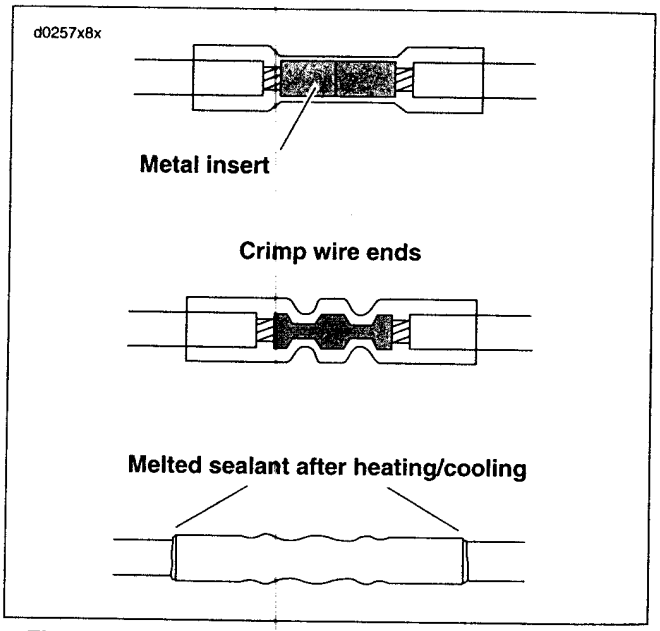


Figure B-19. Installing Sealed Butt Splice Connectors

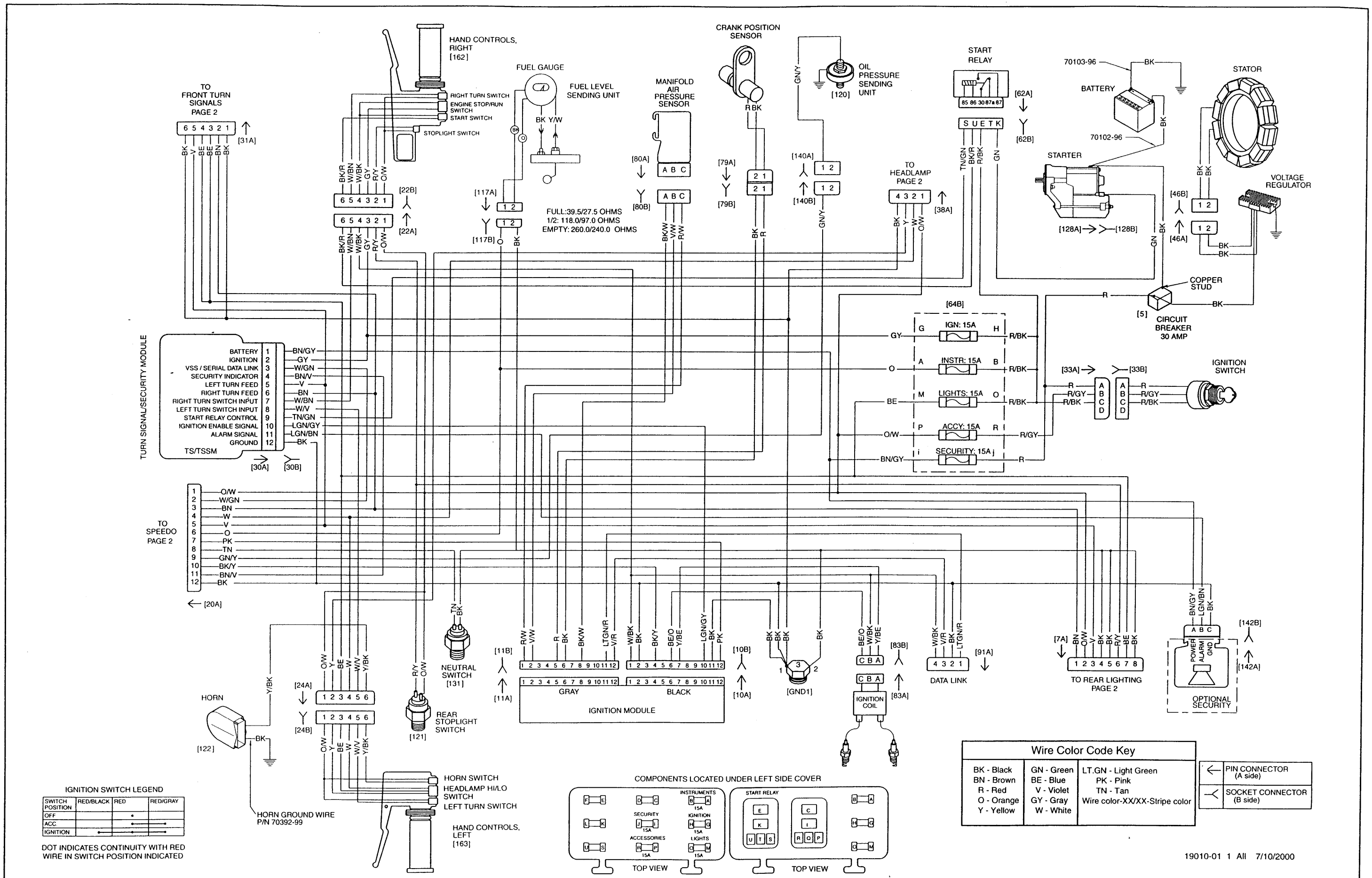
Table B-1. Common Sealed Splices

GAUGE WIRE	CONNECTOR COLOR	PART NO.
18-20	Red	70585-93
14-16	Blue	70586-93
10-12	Yellow	70587-93

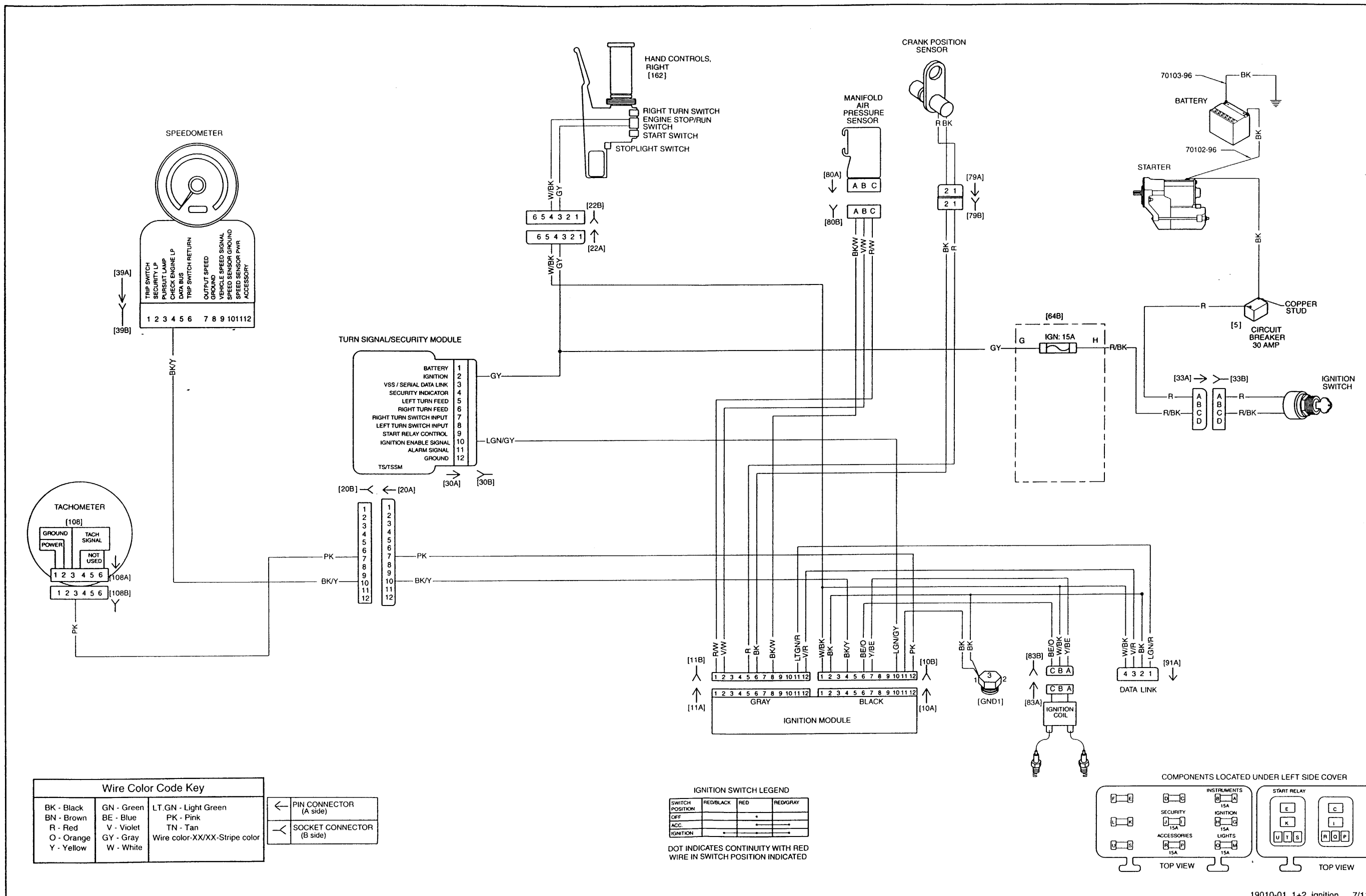
NOTE

It is acceptable for the splice to rest against the heat shrink tool attachment.

10. Heat the center of the splice until the crimp indentations disappear and the tubing assumes a smooth cylindrical appearance.



Dyna Glide Wiring Diagram (Domestic and International Models), Main Wiring Diagram (1 of 2)



Wire Color Code Key		
BK - Black	GN - Green	LT.GN - Light Green
BN - Brown	BE - Blue	PK - Pink
R - Red	V - Violet	TN - Tan
O - Orange	GY - Gray	Wire color-XX/XX-Stripe color
Y - Yellow	W - White	

← PIN CONNECTOR (A side)

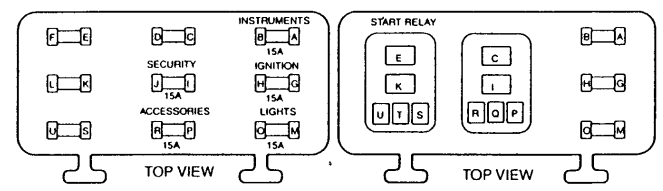
SOCKET CONNECTOR (B side)

IGNITION SWITCH LEGEND

SWITCH POSITION	RED/BLACK	RED	RED/GRAY
OFF		•	
ACC		•	—
IGNITION	•	•	—

DOT INDICATES CONTINUITY WITH RED WIRE IN SWITCH POSITION INDICATED

COMPONENTS LOCATED UNDER LEFT SIDE COVER



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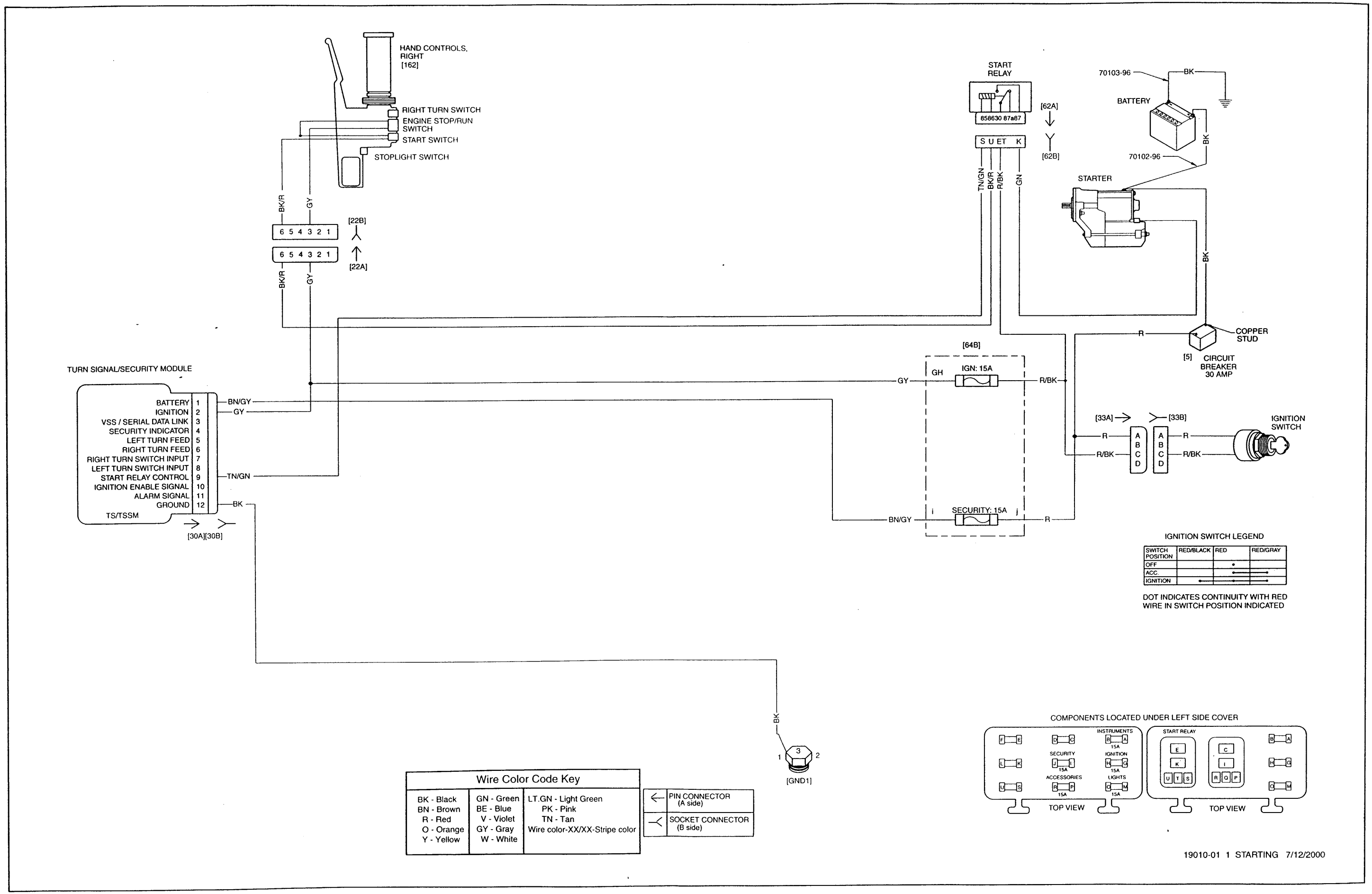
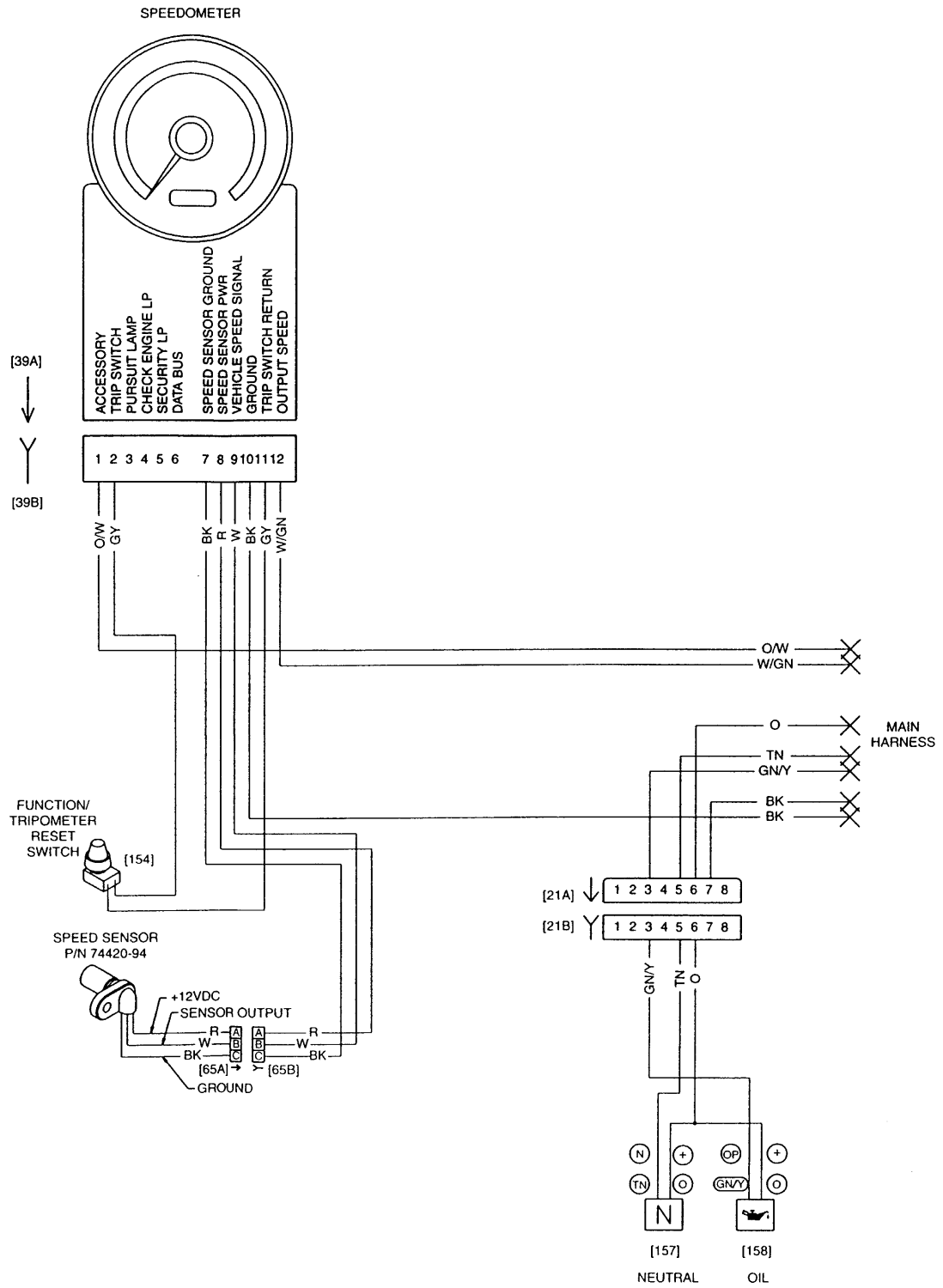
Dyna Glide Wiring Diagram (Domestic and International Models), Ignition

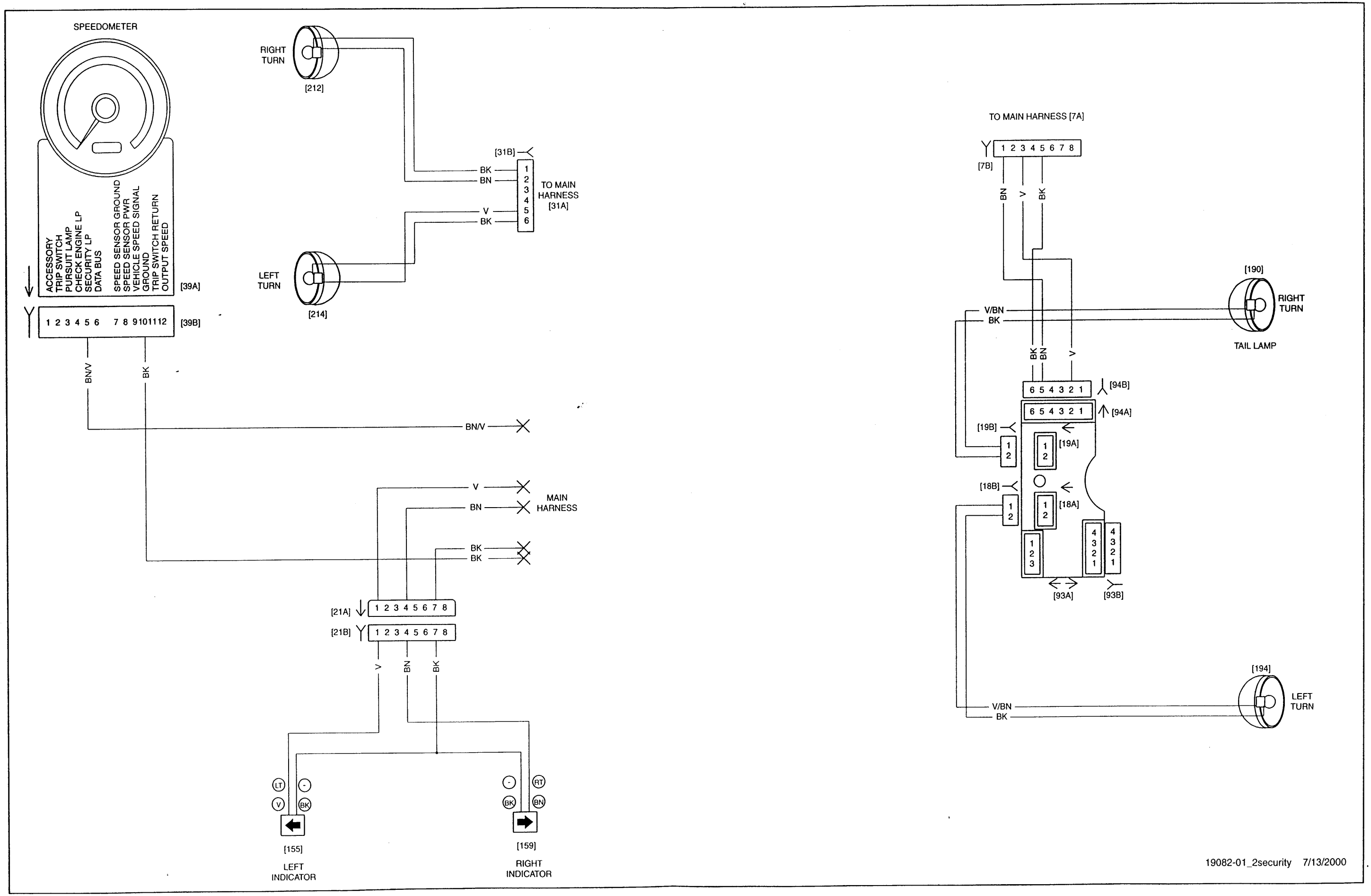


Dyna Glide Wiring Diagram (Domestic and International Models), Starting



19082-01_2horn_inst 7/13/2000

Dyna Wide Glide (FXDWG) Wiring Diagram (Domestic and International Models), Horn and Instruments (2 of 2)



Dyna Wide Glide (FXDWG) Wiring Diagram (Domestic and International Models), Security (2 of 2)