VICTORY MOTORCYCLES
POLARIS®
Est. 1954

THE NEW AMERICAN MOTORCYCLE™

2003 - 2006

Vegas®
Vegas Eight Ball™
Kingpin™
Ness Signature Series Vegas™
Ness Signature Series Kingpin™

THE NEW AMERICAN MOTORCYCLE™

POLARIS
The Way Out.

2003-2006
Vegas®
Vegas Eight Ball™
Kingpin™
Ness Signature Series Vegas® & Kingpin™

SERVICE MANUAL

Part Number 9920337

Foreword

This manual is designed primarily for use by Victory service technicians in a properly equipped shop and should be kept available for reference in the shop area. All references to left (LH) and right (RH) side of the motorcycle are from the operator's perspective when seated in a normal riding position.

Some procedures outlined in this manual require a sound knowledge of mechanical theory, tool use, and shop procedures in order to perform the work safely and correctly. Read the text and be familiar with the service procedures before starting the work. Certain procedures will require the use of special tools. Use only the proper tools as specified. If you have any doubt as to your ability to perform any of the procedures outlined in this service manual, contact an authorized Victory dealer for service.

This manual includes procedures for maintenance, component identification and repair, along with service specifications for the models listed above. Comments or suggestions about this manual may be directed to: Service Publications Dept. @ Polaris Sales Inc. 2100 Hwy 55 Medina, Minnesota 55340. Victory dealers can also use the on-line feedback forum located at:www.polarisdealers.com under News, Forms & Links/Service & Warranty/Polaris Manual Feedback link and fill out the information on the form.

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GENERAL INFORMATION

TRADEMARKS

Victory acknowledges the following products mentioned in this manual:

FLEXLOC, Registered Trademark of SPS Technologies
Loctite, Registered Trademark of the Loctite Corporation
STA-BIL, Registered Trademark of Gold Eagle
Nyogel, Trademark of Wm. F. Nye Co.
Fluke, Registered Trademark of John Fluke Mfg. Co.
Mity Vac, Registered Trademark of Neward Enterprises, Inc.
Torx, Registered Trademark of Textron

SERVICE RULES

In order to perform service work efficiently and prevent costly errors, technicians should read the text in this manual and familiarize themselves with the procedures before beginning. Notes, Cautions and Warnings have been included for clarification of text and safety concerns. Knowledge of mechanical theory, tool use and shop procedures are necessary to perform some procedures in this manual safely and correctly.

Use only genuine Victory service parts, including fasteners that require replacement if removed. Do NOT substitute fasteners or hardware.

Cleanliness of parts and tools as well as the work area is of primary importance. Dirt and foreign matter will cause damage to precision parts. Clean the motorcycle before beginning service. Clean all parts before installing.

If difficulty is encountered in removing or installing a component, look to see if a cause for the difficulty can be found. If it is necessary to tap the part into place, use a soft face hammer and tap lightly.

Always follow torque specifications as outlined throughout this manual. Incorrect torquing may lead to serious machine damage or in the case of steering, driveline, and chassis components, can result in loss of control during operation of the motorcycle, which may result in severe personal injury or death.

If a torquing sequence is indicated for nuts, bolts or screws of a certain component, start all fasteners and hand tighten. Following the method and sequence indicated, tighten evenly to the specified torque value. When removing nuts, bolts or screws from a component with several fasteners, loosen them all about 1/4 turn before removing them to prevent distortion of that component.

Replace all oil seals, sealing washers, gaskets, and O-rings with new ones during assembly. Be sure the mating surfaces for the gasket are clean and smooth to avoid leaks and maintain specified tolerances.

Some procedures require removal of retaining rings or clips. Removal can weaken and deform these parts, therefore, they should always be replaced with new parts. When installing new retaining rings and clips, use care not to expand or compress them beyond what is required for installation.

Victory lubricants and greases have been specially formulated to provide maximum performance and protection when applied properly. In some applications, warranty coverage may be void if improper lubricants are used.

Parts requiring grease should be cleaned thoroughly and fresh grease applied before reassembly. Deteriorating grease loses lubricity and may contain abrasive foreign matter.

Always replace locking hardware such as lock nuts or lock washers, fasteners that have pre-applied locking agent, or any other fasteners as noted in this service manual with genuine Victory hardware from an authorized Victory dealer.

Working with batteries can be hazardous. Review all battery warnings and cautions. See “BATTERY SAFETY” on page 16.2.

SAFETY INFORMATION

UNDERSTANDING SAFETY LABELS & INSTRUCTIONS

READ AND BECOME FAMILIAR WITH ALL WARNING AND CAUTION SYSMBOLS AND STATEMENTS LISTED BELOW AND IN THE TEXT OF THIS MANUAL BEFORE YOU BEGIN WORK.

DANGER, WARNINGS, & CAUTION SYMBOLS

This is the safety alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury. Your safety is involved!

⚠WARNING

Indicates a potential hazard which could result in severe injury or death.

⚠CAUTION

Indicates a potential hazard which may result in minor personal injury or damage to the motorcycle.

CAUTION

Indicates a situation that can result in damage to the motorcycle.

NOTE:

The word “NOTE:”in this manual will alert you to key information or instructions.

⚠WARNING

Gasoline is extremely flammable and explosive under certain conditions.

- Always stop the engine and refuel outdoors or in a well ventilated area.
- Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.
- Do not overfill the tank. Do not fill the tank neck above the fuel tank insert. Leave air space to allow for fuel expansion.
- If you get gasoline in your eyes or if you swallow gasoline, see your doctor immediately. Never try to syphon gasoline using mouth suction.
- If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.
- Never start the engine or let it run in an enclosed area. Engine exhaust fumes are poisonous and can cause loss of consciousness or death in a short time.

⚠WARNING

The engine exhaust from this product contains chemicals known to cause cancer, birth defects or other reproductive harm.

⚠WARNING

Improper repairs or service can create unsafe conditions that may cause severe personal injury or death.

⚠WARNING

The engine and exhaust components on this product become very hot during operation and remain so for a period of time after the engine is stopped.

⚠WARNING

Never run the engine in an enclosed area without a properly functioning exhaust gas evacuation system connected to the product.

⚠WARNING

Modifications to this motorcycle not approved by Victory may cause loss of performance, excessive emissions, and make the machine unsafe for use.

⚠WARNING

Brake fluid is poisonous.

KEEP OUT OF REACH OF CHILDREN.

⚠WARNING

Wear insulated protection for hands and arms or wait until hot components have cooled sufficiently before working on the product.

⚠WARNING

Brake fluid is poisonous. Do not ingest or allow brake fluid to contact eyes. Always wear eye protection when working with brake fluid.

⚠WARNING

Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing.

CAUTION

Brake fluid will damage plastic, painted and rubber parts. Protect these surfaces whenever the brake system is being serviced.

California Proposition 65 Warning

This product contains or emits chemicals known to the state of California to cause cancer and birth defects or other reproductive harm.

REFINISHING

VICTORY TOUCH-UP AND REFINISHING PAINT

Service Paint products are available in three different sizes and applications. Some paint colors require up to 3 components to create a color. Prices subject to change without notice. Dealer is responsible for freight on paint and paint products.

.6 ounce bottle: (Order Multiple of 2) For brush touch-up of small nicks.

10 ounce aerosol can: (Order Multiple of 2)
Apply light even coats for best results. Recoat time is from 30-60 minutes or after 4 days of drying to prevent lifting.

Quarts: (Sold as each)
For repaint of properly prepared plastic components or metal substrates.
Paint is a high quality acrylic urethane manufactured by U.S. Paint.
Mix as indicated on back of paint can. Paint can be recoated after paint is tack free or has ”flashed off”.
Paint finish may be wet sanded and buffed after coating has cured.

How to order:
Authorized Victory Dealers only. Place your order via the dealer web site at :
www.polarisdealers.com / News Forms & Links / Pure Polaris
Note: There will be a 25% service fee charged for all returns. Polaris dealer will be responsible for return freight.

VICTORY DETAIL AND FINISH RESTORER KITS

A Detail Kit (polish, wax, and dressing) and a Restore Kit (polish, and swirl / scuff remover) is available from the Victory parts department for painted surface protection and to remove minor surface imperfections.

Detail Kit: 2872195 (Includes Non-Abrasive Wash, Swirl Remover / Polish, Polywax Final Finish, Vinyl / Rubber Protector, Applicator and Cloth.

Restore / Polish: 2872192 (12 oz. Aerosol)

PAINTING TERMS

The following terms describe the general operations referred to in the Paint Color Code notes on page 1.9-1.10.

E-Coat (Factory Applied): This material is used as a rust protection. It is also used to form a bond between bare metal and the primer or base coat. Full-hide colors (such as black) do not require primer.

Primer: Primer is necessary when applying some colors such as Flame Yellow, Sonic Blue, Solar Red, etc. The purpose of a primer coat is to prevent bleed-through or transparency in subsequent color coats.

Base Coat: A color paint layer applied under another color or under the clear topcoat to improve color matching and consistency.

Top Coat: Outermost layer of paint or clear coat.

PAINT COLORS BY MODEL

NOTE: Refer to www.polarisdealers.com for more information.

NOTE: The 9th letter of the model number designate the color. “P” in the 10th position indicates Premium model. Refer to page 1.9-1.10 for paint color code. Detailed paint ordering information is available on the dealer web site at News, Forms & Links / Pure Polaris / Paint Codes & Part Numbers.

MODEL YEAR 2003		
Model Number	**Model**	**Description / Color**
V03G116 / V03G216	Vegas	All Were Feature / Option (G116 or 216)
Color Suffix: CA, DA, LA, UA = Cruiser Black; CB, DB, LB = Sonic Blue; CC, DC, LC = Solar Red; CD, DD, LD = Flame Yellow; CE, DE, LE, UE = Vogue Silver		
*The last letter of the model number is the color designator. Detailed paint ordering information is available on the dealer web site at News, Forms & Links / Pure Polaris / Paint Codes & Part Numbers		

MODEL YEAR 2004		
Model Number	**Model**	**Description / Color**
V04G116 / 216	Vegas	Feature / Option
V04GB16CA, DA, LA , UA	Vegas	Cruiser Black
V04GB16CB, DB, LB, UB	Vegas	Sonic Blue
V04GB16CC, DC, LC, UC	Vegas	Solar Red
V04GB16CE, DE, LE, UE	Vegas	Vogue Silver
V04GB16CG, DG, LG, UG	Vegas	Solar Red / Vogue Silver
V04GB16CJ, DJ, LJ, UJ	Vegas	Cosmic Sunburst / Vogue Silver
V04GB16CK, DK, LK, UK	Vegas	Black W/ Tribal Fade Flames
V04GB16CL, DL, LL, UL	Vegas	Sonic Blue W/ Tribal Fade Flames
V04NC16 CN / DN / LN	Ness Vegas	Black Cherry Fade
V04C116 / 216	Kingpin	Feature / Option
V04CB16CA, DA, LA , UA	Kingpin	Cruiser Black
V04CB16CB, DB, LB, UB	Kingpin	Sonic Blue
V04CB16CC, DC, LC, UC	Kingpin	Solar Red
V04CB16CD, DD, LD, UD	Kingpin	Black / Bronze Mist
V04CB16CF, DF, LF, UF	Kingpin	Bronze Mist / Pearl White
V04CB16CK, DK, LK, UK	Kingpin	Black W/ Tribal Fade Flames
V04CB16CL, DL, LL, UL	Kingpin	Sonic Blue W/ Tribal Fade Flames
V04CB16CM, DM, LM, UM	Kingpin	Purple Thunder
* The 8th letter of the model number designates the series: C (Canada), D (49 State), L (California), U (United Kingdom) See page 1.11. The 9th letter of the model number designates the color. “P” in the 10th position indicates Premium model. Detailed paint ordering information is available on the dealer web site at News, Forms & Links / Pure Polaris / Paint Codes & Part Numbers. Refer to www.polarisdealers.com for more information.		

MODEL YEAR 2005		
Model Number	**Model**	**Description / Color**
V05G116	Vegas	Feature / Option
V05GB16 CA, DA, LA	Vegas	Cruiser Black
V05GB16 CG, CGP, DG, DGP, LG, LGP	Vegas	50th Anniversary 2-Tone
V05GB16 CH, DH, LH	Vegas	Solar Red
V05GB16 CJ, DJ, LJ	Vegas	Sonic Blue
V05GB16 CK, DK, LK	Vegas	Flame Yellow
V05GB16 CPP, DPP, LPP	Vegas	Black w/ Tribal Fade Flames
V05GB16 CR, CRP, DR, DRP, LR, LRP	Vegas	Pearl White / Vogue Silver
V05GB16 CWP, DWP, LWP	Vegas	Indy Red w/ Tribal Fade Flames
V05AB16 CA, DA, LA, UA	Vegas 8 Ball	Cruiser Black
V05EC16 CU, DU, LU	Ness Vegas	Cruiser Black & Cory Blue
V05C116	Kingpin	Feature / Option
V05CB16 CA, CAP, DA, DAP, LA, LAP	Kingpin	Cruiser Black
V05CB16 CE, CEP, DE, DEP, LE, LEP	Kingpin	Cruiser Black / Vogue Silver
V05CB16 CG, CGP, DG, DGP, LG, LGP	Kingpin	50th Anniversary 2-Tone
V05CB16 CH, CHP, DH, DHP, LH, LHP	Kingpin	Solar Red
V05CB16 CJ, CJP, DJ, DJP, LJ, LJP	Kingpin	Sonic Blue
V05CB16 CNP, DNP, LNP	Kingpin	Pearl White / Vogue Silver Flames
V05CB16 CPP, DPP, LPP	Kingpin	Black w/ Tribal Fade Flames
V05CB16 CR, CRP, DR, DRP, LR, LRP	Kingpin	Pearl White / Vogue Silver
V05DC16 CT, DT, LT	Ness Kingpin	Purple Haze

* The 8th letter of the model number designates the series: C (Canada), D (49 State), L (California), U (United Kingdom) See page 1.11. The 9th letter of the model number designates the color. “P” in the 10th position indicates Premium model. Detailed paint ordering information is available on the dealer web site at News, Forms & Links / Pure Polaris / Paint Codes & Part Numbers. Refer to www.polarisdealers.com for more information.

MODEL YEAR 2006		
Model Number	**Model**	**Description / Color**
V06G126	Vegas	Feature & Option
V06GB26 CA, DA, LA	Vegas	Cruiser Black
V06GB26 CB, DB, LB	Vegas	Indy Red
V06GB26 CD, CDP, DD, DDP, LD, LDP	Vegas	Super Graphite / Turbo Silver
V06GB26 CG, CGP, DG, DGP, LG, LGP	Vegas	Flame Yellow / Turbo Silver
V06GB26 CHP, DHP, LHP	Vegas	Cruiser Black w/ Red Pinstripe
V06GB26 CIP, DIP, LIP	Vegas	Nuclear Sunset w / Flames
V06GB26 CJ, DJ, LJ	Vegas	Supersonic Blue
V06AB26 CA, DA, LA, UA	Vegas 8 Ball	Cruiser Black
V06C126	Kingpin	Feature / Option
V06CB26 CA, CAP, DA, DAP, LA, LAP	Kingpin	Cruiser Black
V06CB26 CB, CBP, DB, DBP, LB, LBP	Kingpin	Indy red
V06CB26 CC, CCP, DC, DCP, LC, LCP	Kingpin	Sedona / Stone Beige
V06CB26 CD, CDP, DD, DDP, LD, LDP	Kingpin	Super Graphite / Turbo Silver
V06CB26 CEP, DEP, LEP	Kingpin	Pearl White / Stone Beige w/ Cosmic Flame
V06CB26 CFP, DFP, LFP	Kingpin	Turbo Silver / Cruiser Black w/ Cosmic Flame
V06CB26 CJ, CJP, DJ, DJP, LJ, LJP	Kingpin	Supersonic Blue

* The 8th letter of the model number designates the series: C (Canada), D (49 State), L (California), U (United Kingdom) See page 1.11. The 9th letter of the model number designates the color. “P” in the 10th position indicates Premium model. Detailed paint ordering information is available on the dealer web site at News, Forms & Links / Pure Polaris / Paint Codes & Part Numbers. Refer to www.polarisdealers.com for more information.

PAINT COLOR CODES

(Refer to dealer web www.polarisdealers.com for current or updated paint information)

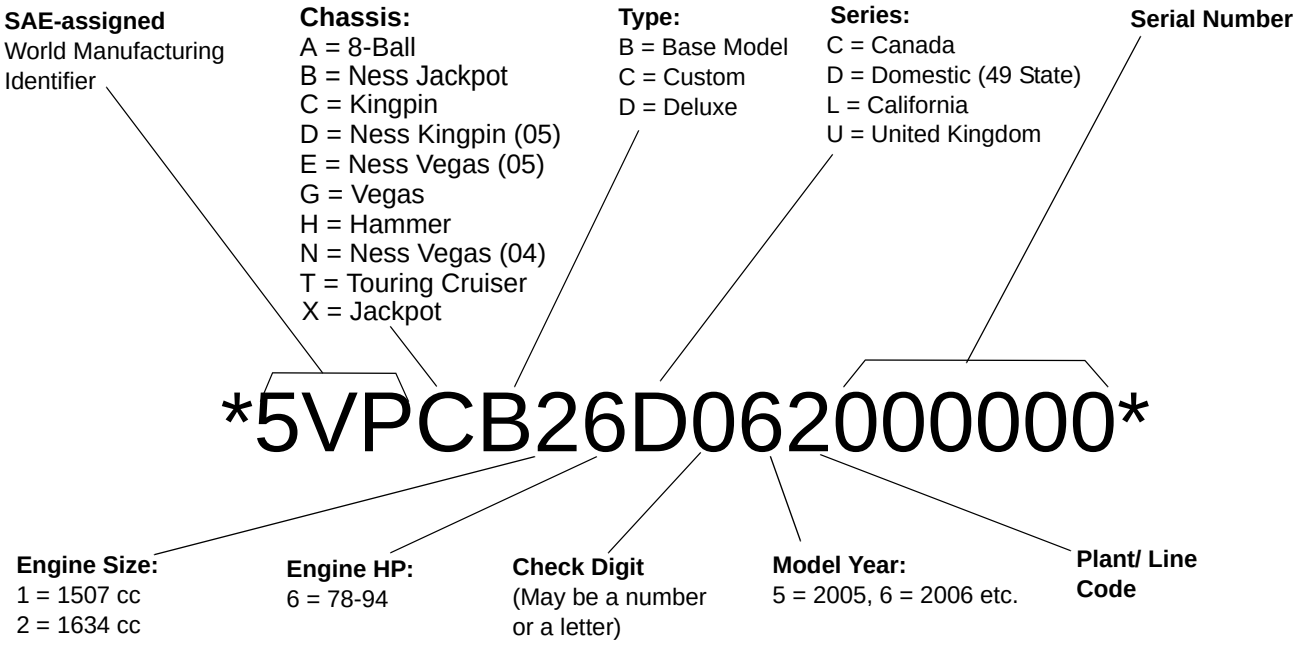
PAINT COLOR (2003 - 2006)	PAINT CODE	NOTES
Gloss Black	P-070	
KYSO Blue	P-264	
Antares Red	P-265	
Cruiser Black (PHAT)	P-266	
Indy Red	P-293	Aerosols and Touch-Ups require base coat of Indy Red with topcoat of Clear Metallic (CM). Paint kits require white undercoater (WU).
Champion Red	P-301	
Steel Grey	P-302	
Navy Blue Metallic	P-321	
Cashmere Metallic	P-322	
Speed Yellow	P-323	Paint Kits and Touch-Ups have an off-white base (F8245) with the Yellow applied as the topcoat.
Vanilla Cream	P-324	
Carmen Metallic	P-325	
Money Green	P-326	
Sparkle Silver (Fork Legs, Triple Clamp)	P-339	
Sonic Blue	P-341	Requires Clear coat
Solar Red	P-342	Requires Clear coat
Graphite Metallic	P-347	
Stone White	P-351	
Pearl White	P-352	Paint Kits and Touch-Ups have a pearl white base (PWU) with the Pearl applied as the topcoat.
Cobalt Green	P-353	
Vogue Silver	P-354	
Champagne	P-355	
Champagne Metallic	P-370	
Purple Thunder	P-381	Paint Kits require base coat with topcoat of Clear Metallic (CM).
Flame Yellow	P-388	
Retro Turquoise	P-389	
Daytona Orange	P-393	Used in Flame paint jobs
Turbo Silver	P-402	Clear only
Black W/ Tribal Fade Flames	P-423	P351 base, fade with P388, P393, P293
Turbo Silver Clear Metallic	P-445	Paint kits require base coat with a topcoat of Clear Metallic (CM)
Cosmic Sunburst	P-446	Clear coat (C) required
Bronze Mist	P-451	
Anniversary Gold Metallic	P-462	
Midnight Blue Metallic	P-469	Aerosols, Touch-ups and Paint Kits require base coat with topcoat of Clear Metallic (CM).
Purple Haze (2005 Ness Kingpin)	P-484	Aerosols, Kits, and Touch-Ups require Victory Violet base (VVU), Victory Violet (VV) and Black.
Cory Blue (Ness Vegas 2005)		P-266 Cruiser Black and P-483 Carey Blue
Toxic Green Pearl	P-491	Aerosols, Kits, and Touch-Ups require a white base (WU). Toxic Green Pearl.
Nuclear Sunset	P-493	

PAINT CODES (CONT.)		
PAINT COLOR (2003 - 2006)	**PAINT CODE**	**NOTES**
Tribal Tattoo Graphic	P-500	
Stone Beige	P-505	
Competition Yellow	P-517	
Sunset Red	P-520	
Black / Bronze Mist	P-1163	P-266 / P-451
Bronze Mist / Pearl White	P-1164	P-451 / P-352
Blue / Hot Rod Flames	P-1167	P-341 Sonic Blue w/ Masked P-393, P-323, & P-293 Flames
Solar Red / Vogue Silver	P-1168	P-342 Solar Red with P-354 Vogue Silver
Cosmic Sunburst / Vogue Silver	P-1169	P-446 Cosmic Sunburst with P-354 Vogue Silver
Purple Thunder / Vogue Silver	P-1170 / P-1175	P-381 Purple Thunder with P-354 Vogue Silver Tribal Flames
Sonic Blue / Hot Rod Flames	P-1171	P-341 Sonic Blue with HOT ROD Flames
Cruiser Black / Bronze Mist	P-1172	P-266 Cruiser Black with P-451 Bronze Mist
Bronze Mist / Pearl White	P-1173	P-451 Bronze Mist with P-352 Pearl White
Sonic Blue Tribal Fade Flames	P-1174	P-341 Sonic Blue w/ Tribal Fade Flames
50th Anniversary 2-Tone	P-1179 / P-1180	P-469 Midnight Blue Metallic over P-354 Vogue Silver
Pearl White / Vogue Silver	P-1187	P-352 Pearl White with P-354 Vogue Silver
Indy Red w/ Fade Flames	P-1188	P-293 Indy Red w/ P-490 Tri-Color Fade Flames
Toxic Green w/ Tribal Tattoo	P-1202	P-491 with P-500 Tattoo Graphic
Indy Red w/ Tribal Tattoo	P-1203	P-293 with P-500 Tattoo Graphic
Nuclear Sunset w/ Tribal Tattoo	P-1210	P-493 w/ X Graphic
Flame Yellow w/ Tribal Tattoo	P-1214	P-388 w/ Tribal Tattoo
Sunset Red w/ X Graphics	P-1223	P-520 w/ X Graphic
Black w/ X Graphics	P-1224	P-266 w/ X Graphic
Competition Yellow w/ X Graphics	P-1227	P-517 w/ X Graphic
Supersonic Blue / Clear Pearl	P-1231	Aerosols, Kits, and Touch-Ups require a white base (WU). Supersonic Blue (P-499) and Clear Pearl topcoat (CP).
Hot Rod Flames	HOT ROD	P351 base, fade with P388, P393, P293
2004 Arlen Ness Signature Series Vegas (Black Cherry Fade)	NESS	P070 Black base with P265 Antares Red fogged on the edges. No Gold undercoat (RU)
Metallic Flake Additive	METALLIC	Add vial of flake to quart of clear base
Silver Undercoater	SU	Base coat only
Antares Red Undercoater	RU	Base coat only
Clear	C	
Clear Metallic	CM	Clear with metal flake added
Clear Pearl	CP	Clear with pearl flake added
UNDERCOATERS (Base Coat Only)	WU, OWU, PWU, VVU	WU=White Undercoater; OWU=Off-White Undercoater; PWU=Pearl White Undercoater; VVU=Victory Violet Undercoater

VEHICLE INFORMATION

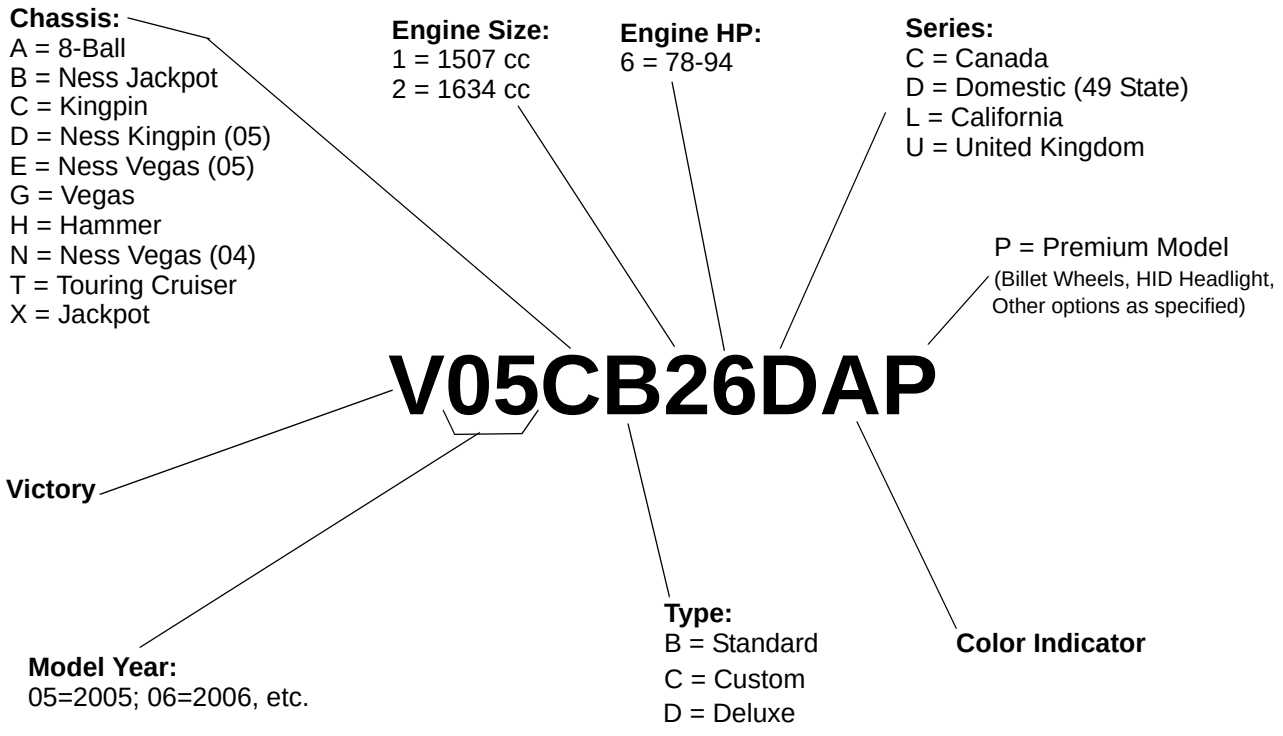
VEHICLE IDENTIFICATION NUMBER (VIN)

See "VIN NUMBER LOCATION" on page 1.12 for location on the vehicle.



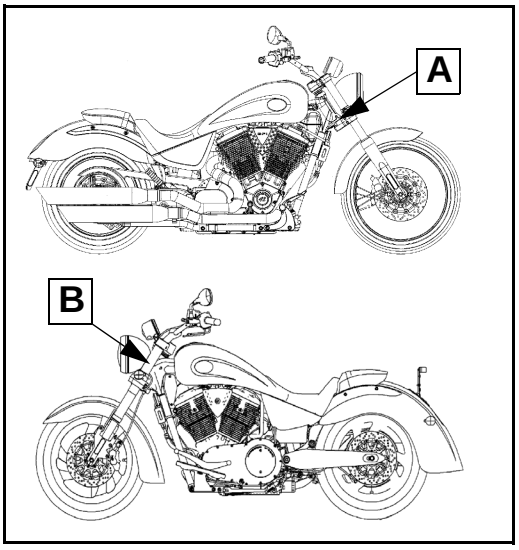
MODEL NUMBER

See "MODEL NUMBER LOCATION" on page 1.12 for location on vehicle. See "PAINT COLORS BY MODEL" on page 1.6 for color.



VIN NUMBER LOCATION

The Vehicle Identification Number (A).

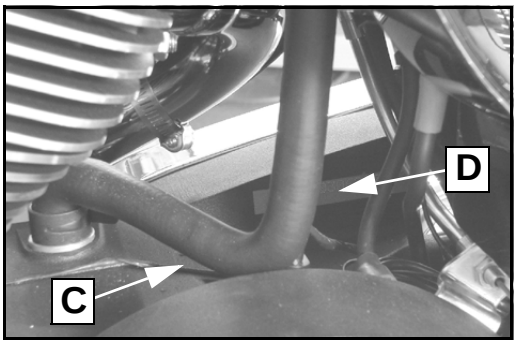


MODEL NUMBER LOCATION

Model label (B).

ENGINE NUMBER LOCATION

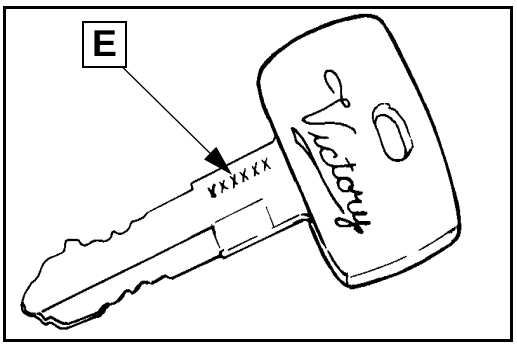
Engine number label (C) 2003-2004 models.
Engine number stamping (D) 2005 and later).



KEY IDENTIFICATION NUMBER

A key identification number (E) is stamped on the key shaft. If the key is lost and the identification number had not been recorded, the lock set (ignition switch / fuel cap set) must be replaced.

Key blanks are available from service parts. Locksmiths familiar with the motorcycle industry will be able to cut a replacement key with the key I.D. number and a Victory key blank.



PUBLICATIONS & TECHNICAL LITERATURE

PUBLICATION PART NUMBERS

The following chart lists the part numbers for Owner's Manuals, parts books, and parts microfiche.

OTHER VICTORY PUBLICATIONS			
Year / Model	**Publication Part Numbers U.S. and (Canada)**		
	Owner's Manual	**Parts Book**	**Microfiche**
2003 Vegas	9918231 (Canada 9918232)	9918368	9918369
2004 Vegas / Ness Vegas	9918115 (Canada 9918116)	9918954	9918955
2004 Kingpin	9918948 (Canada 9918949)	9918956	9918957
2005 Vegas / Ness Vegas	9919441 (Canada 9919442)	9919623	9919624
2005 Kingpin / Ness Kingpin	9919441 (Canada 9919442)	9919625	9919626
2005 Vegas 8-Ball	9919441 (Canada 9919442)	9919623	9919624
2005 Hammer	9919443 (Canada 9919444)	9919629	9919630
2006 Vegas	9920119 (Canada 9920120) (California 9920563)	9920335	9920336
2006 Kingpin	9920119 (Canada 9920120) (California 9920563)	9920308	9920339
2006 8-Ball	9920119 (Canada 9920120) (California 9920563)	9920335	9920336
2006 Touring Cruiser	9920117 (Canada 9920118)	9920343	9920344
2006 Hammer	9920121 (Canada 9920122) (California 9920564)	9920341	9920342
2006 Vegas Jackpot / 2006 Ness Signature Series Jackpot	9920327 (Canada 9920328)	9920345	9920346
OTHER VICTORY SERVICE MANUALS			
2005-2006 Hammer, Vegas Jackpot, and Ness Signature Series Vegas Jackpot	9920340 Service Manual		
2002 - 2006 Classic & Touring Cruiser	9919632 Service Manual		

MATERIAL SAFETY DATA SHEET (MSDS)

To review or print a Material Safety Data Sheet for Victory maintenance products, chemicals or lubricants visit:
www.polarisdealers.com / news forms & links / pure polaris
OR: Contact Dealer Support (Victory Dealers)
Non-Dealers contact Customer Service at 763-417-8650

BREAK IN PERIOD

BREAK-IN PROCEDURE

There is never a more important period in the life of a new Victory motorcycle than the period between zero and 500 miles (805 km). A Victory motorcycle is manufactured using the best possible materials and manufacturing techniques, but the final machining process is the break-in. During break-in period, many parts in the engine wear and polish to correct operating clearances. During this time, the operator should:

- Avoid prolonged full throttle operation.
- Avoid operation which might result in excessive heating of the engine.

The general break-in guidelines are as follows:

BREAK-IN GUIDELINES		
Miles/km	**Throttle Position**	**Notes**
0-90 miles	0-1/3	Avoid prolonged operation above 1/3 throttle. Stop engine and let it cool following every hour of operation. Vary speed of motorcycle. Do not operate machine at one set throttle position.
90-300 miles	0-1/2	Avoid prolonged operation above 1/2 throttle. Stop engine and let it cool following every hour of operation. Vary speed of the motorcycle. Do not operate machine at one set throttle position.
300-500 miles	0-3/4	Avoid cruising speeds above 3/4 throttle.
500 miles	**Replace the engine oil and engine oil filter.** Perform 500 mile service on the machine. See chapter 2 for more information.	
500 +	Avoid prolonged full-throttle operation. Vary the engine speed occasionally. Follow the pre-ride inspection outlined in the owner's manual.	

EMISSIONS

EMISSION CONTROL SYSTEMS

The U.S. Environmental Protection Agency and California Air Resources Board (CARB) require manufacturers to certify that their motorcycles comply with applicable exhaust emissions standards during their useful life, and that motorcycles built after January 1, 1983 comply with applicable noise emission standards for one year or 6,000 km (3,730 mi) after the time of sale to the ultimate purchaser, when operated and maintained according to the instructions provided.

EMISSION SOURCES

An internal combustion engine produces carbon monoxide and hydrocarbons during operation. Hydrocarbons must be controlled because under some conditions hydrocarbons react with sunlight to produce photochemical smog. Carbon monoxide must be controlled because it is toxic.

EXHAUST EMISSION CONTROL

Victory Motorcycles have an electronic engine management system which controls fuel delivery and ignition timing to control hydrocarbon and carbon monoxide emissions. Except for TPS adjustments as required by the Periodic Maintenance Interval Table on page 2.11, or if components are replaced that affect idle speed, no adjustments should be made to the system.

NOISE EMISSION CONTROL SYSTEM

Tampering with Noise Control Systems is Prohibited. Federal law prohibits the following acts or causing thereof:

1. The removal or rendering inoperative by any person other than for purposes of maintenance, repair or replacement, any device or element of design incorporated into the motorcycle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use, or
2. The use of the motorcycle after such device or element of design has been removed or rendered inoperative.

Among those acts presumed to constitute tampering are the acts listed below:

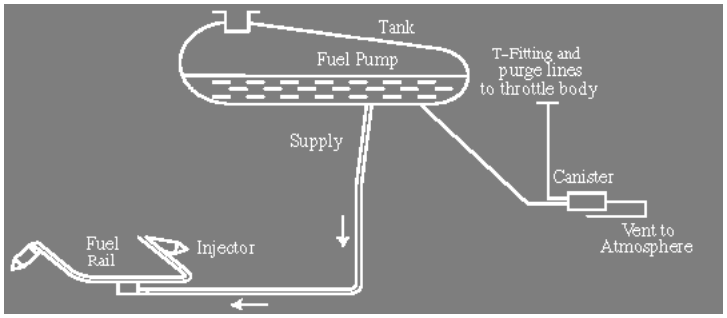
1. Removal of, or puncturing the muffler, baffles, header pipes or any other component which conducts exhaust gases.
2. Removal or puncturing of any part of the intake system.
3. Lack of proper maintenance.
4. Replacing any moving part of the motorcycle or parts of the exhaust / intake system with parts other than those specified by the manufacturer.

CRANKCASE EMISSION CONTROL

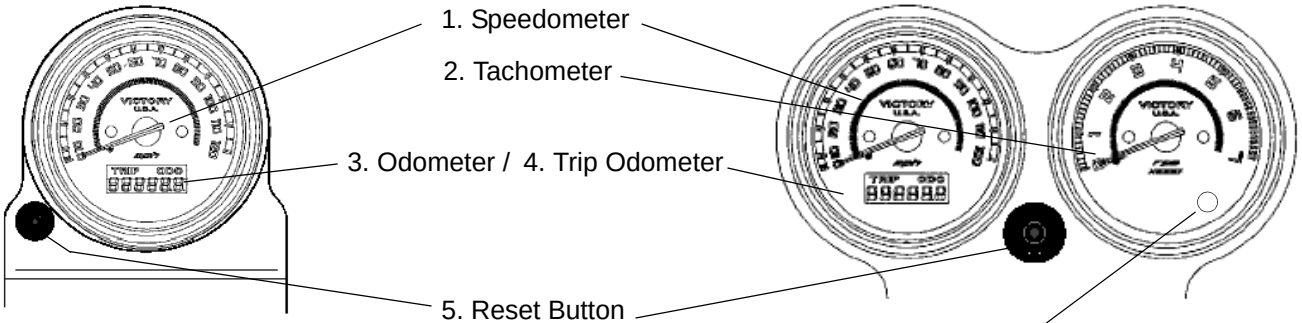
The crankcase emission control system is comprised of a closed system that routes crankcase emissions through the air cleaner into the combustion chamber.

EVAPORATIVE EMISSION CONTROL (CALIFORNIA MODELS)

A vacuum hose connects the purge port manifold to the charcoal canister. Evaporated fuel vapor passes from the fuel tank, along the vent hose , and to the charcoal canister. Activated charcoal in the canister filters the regulated elements of the vapor for storage until the engine is started and the motorcycle is driven. The canister and liquid trap are cleaned as part of the engine's ordinary combustion cycle. Inspect the evaporative control system clamps, hoses, fittings, canister and other hardware for wear or damage during each maintenance period of the motorcycle. Refer to the owner's manual for emission system warnings and instructions.



INSTRUMENTS



STANDARD SPEEDOMETER

ACCESSORY TACH

SPEEDOMETER (1)

The speedometer receives an input signal from the speed sensor located on top of the crankcase behind the rear cylinder. Pulse signals from the speed sensor are converted inside the speedometer to speed and distance outputs in miles (kilometers in Canada). These outputs are displayed by the analog needle (speed) or in the LCD window (distance). The speedometer operates only when the ignition switch is in the On position and the speed sensor has an input (vehicle is moving). Refer to Chapter 19 for speedometer or sensor diagnostics.

TACHOMETER (2)

The tachometer reports current engine speed in revolutions per minute (RPM). A red line on the gauge indicates maximum safe engine RPM. The tachometer may be standard equipment or an accessory on some models.

⚠ WARNING
Do not operate the engine over 5600 RPM. Excessive RPM could cause engine damage or failure that could result in you losing control of the motorcycle.

ODOMETER (3)

The odometer is the default mode of the speedometer LCD after starting the engine and displays the total miles traveled (km in Canada).

To toggle the display between Odometer and TRIP Odometer, the ignition switch must be in the ON position. Press the reset button (5). The display changes to TRIP".

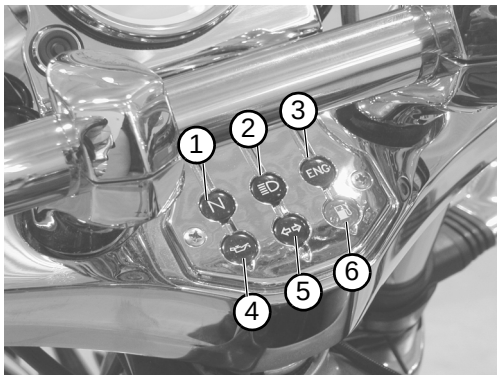
TRIP ODOMETER (4)

The trip odometer shows total distance traveled since the trip odometer was reset.

To toggle the display between Odometer and TRIP Odometer, the ignition switch must be in the ON position. Press the reset button. The display changes to TRIP".

To reset the trip odometer, the ignition switch must be in the ON position with the display in trip odometer mode. Press and hold the reset button (5) until the TRIP odometer display resets to zero.

INDICATOR LIGHTS



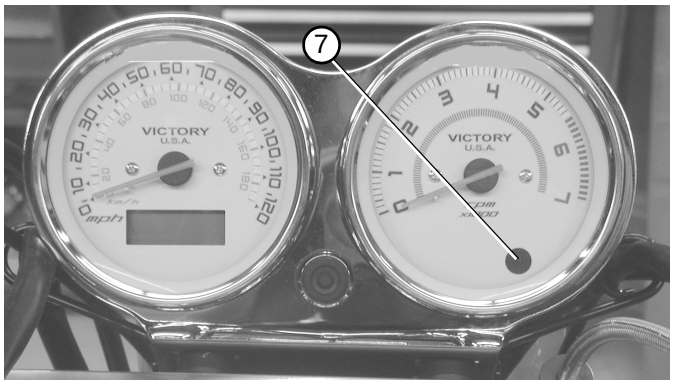


Table 1-1:

#	Symbol / Function	Operation
1	NEUTRAL INDICATOR	The neutral indicator illuminates when the transmission is in Neutral, and the ignition key is ON.
2	HEADLAMP HIGH BEAM	The headlamp high beam indicator illuminates when the headlamp switch is set to High and the ignition key is ON.
3	CHECK ENGINE INDICATOR	The check engine indicator will illuminate any time the ignition key is ON and the engine control module sensors report abnormal sensor or engine operation. The check engine indicator will continue to illuminate as long as the fault condition exists. It also illuminates momentarily when the ignition key is ON and the engine is not running. This demonstrates that the indicator is functioning properly.
4	LOW OIL PRESSURE INDICATOR	The low oil pressure indicator illuminates when engine oil pressure drops below safe operating pressure. If this indicator illuminates while the engine is running, turn the engine off immediately and check the oil level. Add oil if necessary. If the oil level is correct and the indicator remains illuminated after the engine is restarted, turn the engine off immediately. The low oil pressure indicator also illuminates when the ignition key is ON and the engine is not running. This demonstrates that the indicator is functioning properly.
5	TURN SIGNAL INDICATOR	The turn signal indicator flashes when the left, right, or both turn signals are active. If a turn signal bulb has failed, or if there is a short circuit in the turn signal system, the turn signal indicator flashes at more than twice the normal rate. This indicator is also used as the output display for the diagnostic “blink codes” when using the self-diagnostic feature of the Auto-Cancel Turn Signal system. Refer to Chapter 9 for more information on the self diagnostic feature.
6	LOW FUEL INDICATOR	The low fuel indicator illuminates when approximately 0.6 gallons (2.27 liters) of fuel remains in the fuel tank and the ignition key is ON.
7	OVERDRIVE INDICATOR	On vehicles equipped with a tachometer, the overdrive indicator is illuminated when the transmission is in Overdrive (6th gear) and the ignition key is ON.

SPECIAL SERVICE TOOLS

GENERAL & PRECISION MEASUREMENT

TOOL	PART NUMBER
Bearing & Seal Driver Set	PV-43558
Bore Gauge Set, 50-100mm	PV-3017
Decal, Service Bulletin Completion	7170107 (Order from Victory Parts Dept.)
Dial Caliper (Metric, 0-150mm)	PV-26900-7
Dial Caliper (Electronic Conversion. English 0-6” / Metric 0-150mm)	PV-39776
Dial Indicator, Adjustable (Metric. 10mm travel)	PV-26900-12
Dial Indicator Stand, Flexible. Magnetic Base	PV-34481
Engine Ear Listening Device	PV-39565
Feeler Gauge Set	PV-26900-8 or PV-26900-9
Outside Micrometer (0-25 & 25-50mm)	PV-3006, PV-3007
Outside Micrometer Set (0-100mm)	PV-3009
Plastigauge®	Commercially Available
Small Hole Gauge Set	Commercially Available
Straight Edge, Precision	PV-34673
Surface Plate	Commercially Available
Telescoping Gauge Set	PU-45423
Torque Wrench (3/8” Drive 0-50 in-lb. beam type)	PV-43543
Torque Wrench (1/2” Drive 0-150 lb-ft. beam type)	PV-43552
Torque Wrench (3/8” Drive 15-100 lb-ft. click type)	PV-43564

TUNE UP & MAINTENANCE

TOOL	PART NUMBER
Belt Tension Gauge	PV-43532
Cylinder Leakdown Tester	PV-35667-A
Compression Gauge Set	PV-33223
Oil Pressure Gauge Set	PV-43531
Oil Filter Wrench	65mm/2.5in. Commercially available

ELECTRICAL

TOOL	PART NUMBER
Ammeter Inductive Clamp for Fluke 73™ Multimeter	PV-39617
Electrical Connector Test Adapter Kit	PV-43526
Inductive Timing Light	PV-43537
Multimeter, Fluke 73™	PV-43546
Speedometer Signal Tester (Requires Adaptor PV-47303)	PV-43544
Speedometer Signal Test Adapter 2001-Current	PV-47303

ENGINE, CLUTCH, & TRANSMISSION

TOOL		PART NUMBER
Clutch Hub Holding Tool		PV-43518
Clutch Shaft Holder		PV-45028
Clutch Shaft Bearing Support (for clutch shaft installation)		PV-47331
Crankcase Assembly Tool (Same as Mainshaft / Crankcase Installer)		PV-46299 (Must be used with PV-45030). NOTE: Adaptor (Extension) PVX-47429 is also required on models with 250mm rear tire.
Crankcase Assembly Tool Adaptor (for 6 Speed)		PVX-47429
Crankshaft Bearing Protector	2003-2005	PV-43504
	2006	PV-47207
Crankshaft Rotation Socket		PV-46988
Crankcase Separator (Crankcase Removal)		PV-47332
Engine Hoist or Lift		Commercially Available
Engine Lock Tool		PV-43502-A
Engine Stand		Commercially Available
Flywheel Puller		PV-43533
Mainshaft / Crankcase Installer (Crankcase Assembly)		PV-46299 (Must be used with PV-45030)
Moly Assembly Paste (Premium Starter Grease)		PN 2871460 (Order from Victory Parts Dept.)
Mainshaft (Output Shaft) Seal Installation Tool		PV-43505
Piston Ring Compressor (97mm +)		Includes PV-43570-1 Pliers, PV-43570-2 Band (3 5/8” to 3 7/8”)
Split Gear Line-Up Tool		Any 1/4” shaft: Example: 1/4” drill bit shank.
Valve Spring Compressors (Adapter is PV-43513-A)		PV-1253 or PV-4019 (Quick Release)

STEERING & SUSPENSION

TOOL	PART NUMBER
Blind Bearing Remover Set	PV-43551
Cartridge Shaft Holder (Kingpin)	PV-47060
Damper Rod Holder (Vegas)	PV-43517
Fork Oil Level Gauge	PV-59000-A
Fork Seal Driver 43mm, Inverted (Kingpin)	PV-47035
Fork Seal Driver, 43mm, Conventional (Vegas)	PV-47036
Fork Seal Guide Tool, 43mm (KP & Vegas)	PV-47037
Steering Bearing, Wheel Bearing Installation Set	PV-43515
Steering Stem Bearing Removal Tool (Lower)	PV-44683
Steering Stem Bearing Adjustment Socket	PV-43508
Steering Stem Bearing Spanner Wrench	PV-43509
Shock Absorber Pre-Load Adjustment Spanner	PV-46993
Shock Spring Compressor	PV-43571

WHEEL & TIRE

TOOL	PART NUMBER
Air Pressure Gauge	Commercially Available
Tire Bead Breaker (May be part of the tire removal equipment being used)	Commercially Available
Tire Mounting Lubricant	Commercially Available
Tire Removal Equipment	Commercially Available
Rim Protector	PV-43536
Wheel Balancing/Truing Stand	TBA

FUEL SYSTEM & FUEL INJECTION

SPECIAL TOOLS- FUEL SYSTEM/ FUEL INJECTION	PART NUMBER
Victory/Polaris Diagnostic Tool Kit w/ Diagnostic Software	PV-46085 (See Chapter 5)
PV-46085 Kit Contents (The items at right are included in main kit above and can also be ordered separately)	Interface Cable PU-47151 Victory Interface Cable Adapter PV-46085-2
Kit - Air / Fuel Ratio Monitor (Includes components below)	PV-45410 (See Chapter 5)
Tube, Air / Fuel Monitor Sensor	PV-45410-1 (not required for 2006 that have O_2 sensor plug in head pipe)
O_2 Sensor (with wire harness and connector)	PV-45410-2
Cable, Air/Fuel Monitor Power & Volt Meter	PV-45410-3
Instruction Sheet, Air/Fuel Monitor	PV-45410-4
Fuel Pressure Gauge	PV-43506
Laptop Computer (Refer to diagnostic software user manual or HELP section for minimum specifications	Commercially Available

TOOL ORDERING INFORMATION

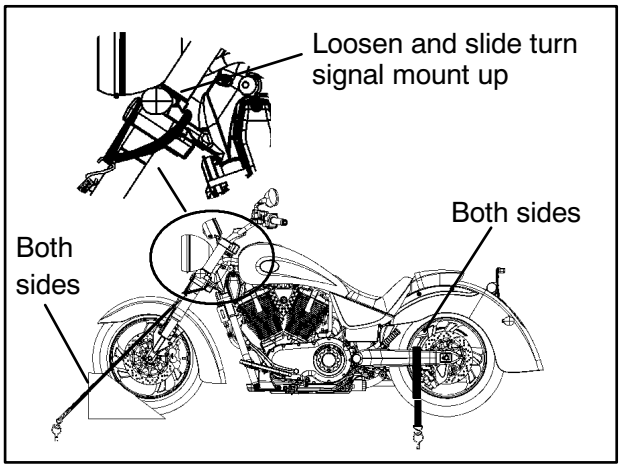
NOTE: Not all special tools listed here are applicable to models covered in this manual. Order Special Service Tools from SPX Corp. (Phone 800-328-6657 / FAX 586-578-7375) except where noted to order from Victory or as “Commercially Available”.

TRANSPORTING AND SECURING THE MOTORCYCLE

GENERAL GUIDELINES

If you must transport the motorcycle or secure it to a lift table:

- Use a truck, trailer, or lift table designed or equipped properly for motorcycles. Review truck, trailer or lift manufacturer's recommendations.
- Do not tow the motorcycle with another vehicle, as towing will impair the motorcycle's steering and handling, which can cause a loss of control.
- Position and restrain the motorcycle so it remains upright on the truck, trailer, or lift table as gasoline may leak out of the fuel tank vent if the motorcycle is transported at extreme angles. Gasoline is a fire hazard and it can also damage the motorcycle's finish.
- Do not restrain the motorcycle using the handlebars. Loosen the turn signals and slide them up the fork tube as shown, enough to make room for a soft tie-down extension strap (no buckles). Place tie downs around the lower triple clamp as shown, around the fork tube below the turn signal mount and above the lower triple clamp.
- Secure the rear of the motorcycle with tiedowns around the swingarm, being careful to avoid brake lines, exhaust, drive belt, or drive belt guards.

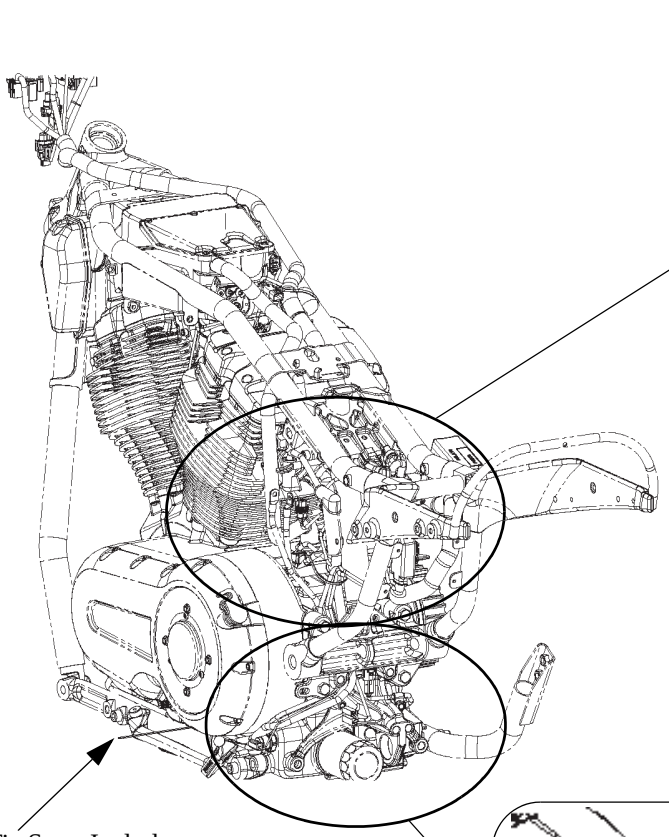


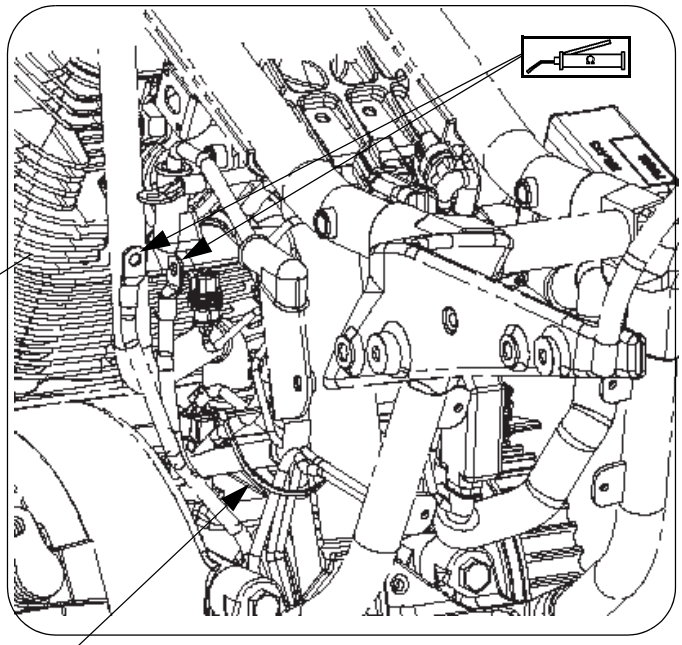
Example: Kingpin

Example: Vegas

ROUTING DIAGRAMS

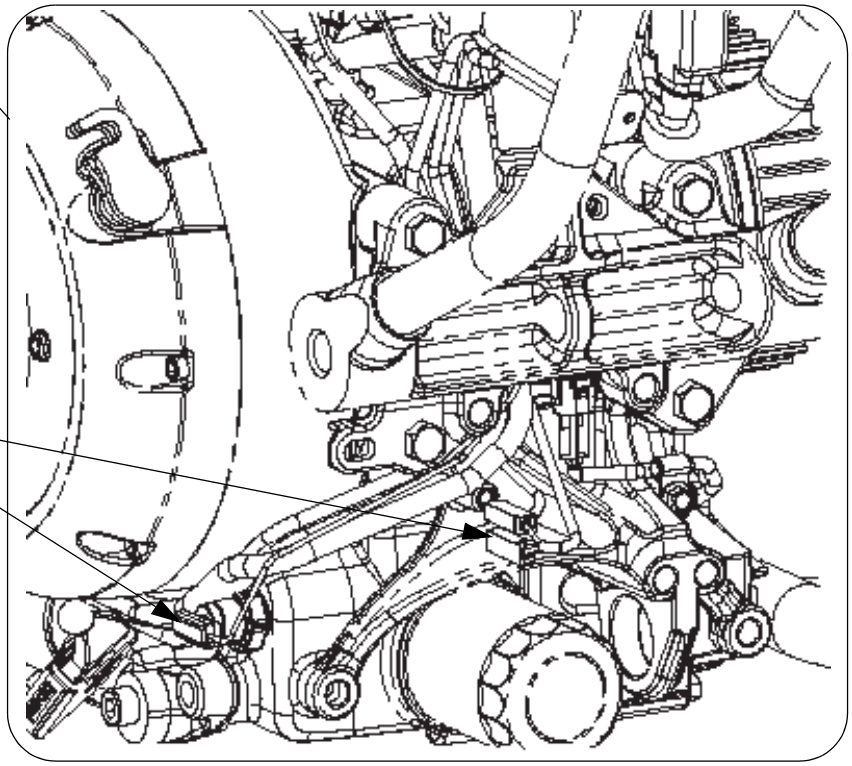
WIRE HARNESS - LEFT REAR FRAME





Tie Strap Includes:
Frame Tube
Main Bundle
Regulator / Rectifier Harness
Crankshaft Position Sensor (CPS) Harness

Tie Strap Includes:
Starter Cable
Regulator / Rectifier Harness
Crankshaft Position Sensor (CPS) Harness
! Starter cable to be routed on outside of CPS and Voltage Regulator wiring

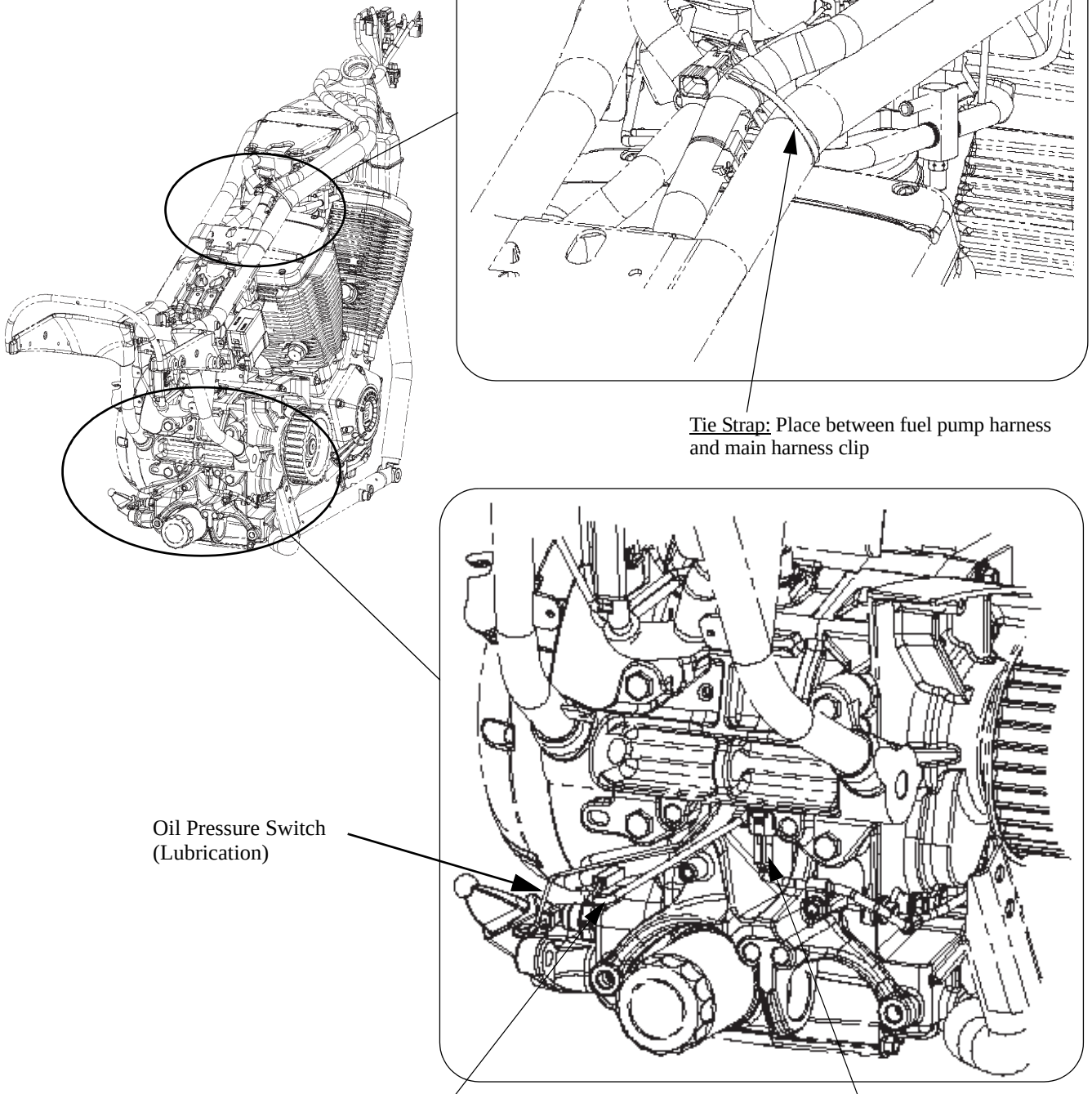


Rear Brake Light Switch

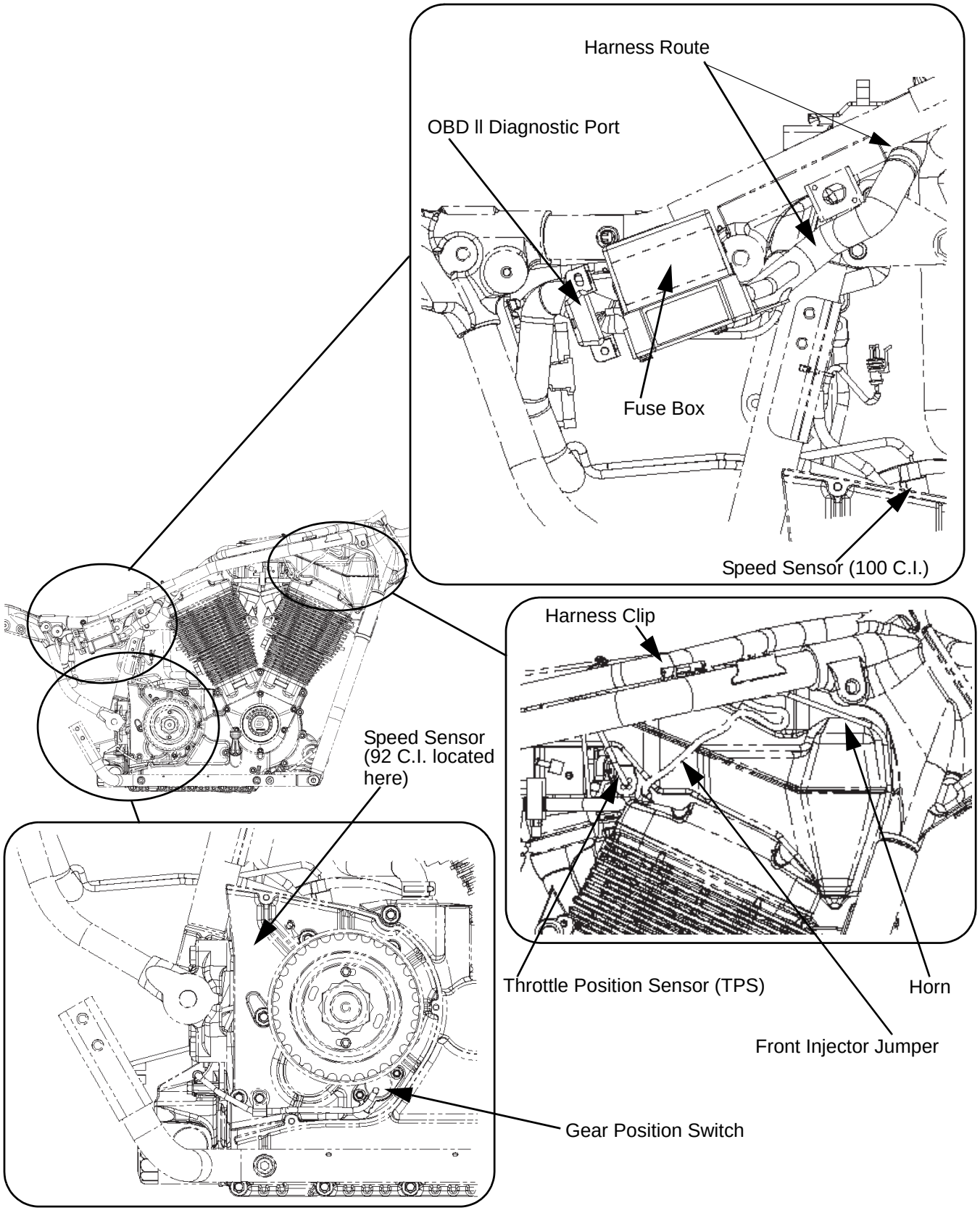
Oil Pressure Switch

= Apply Dielectric Grease
P/N 2871329

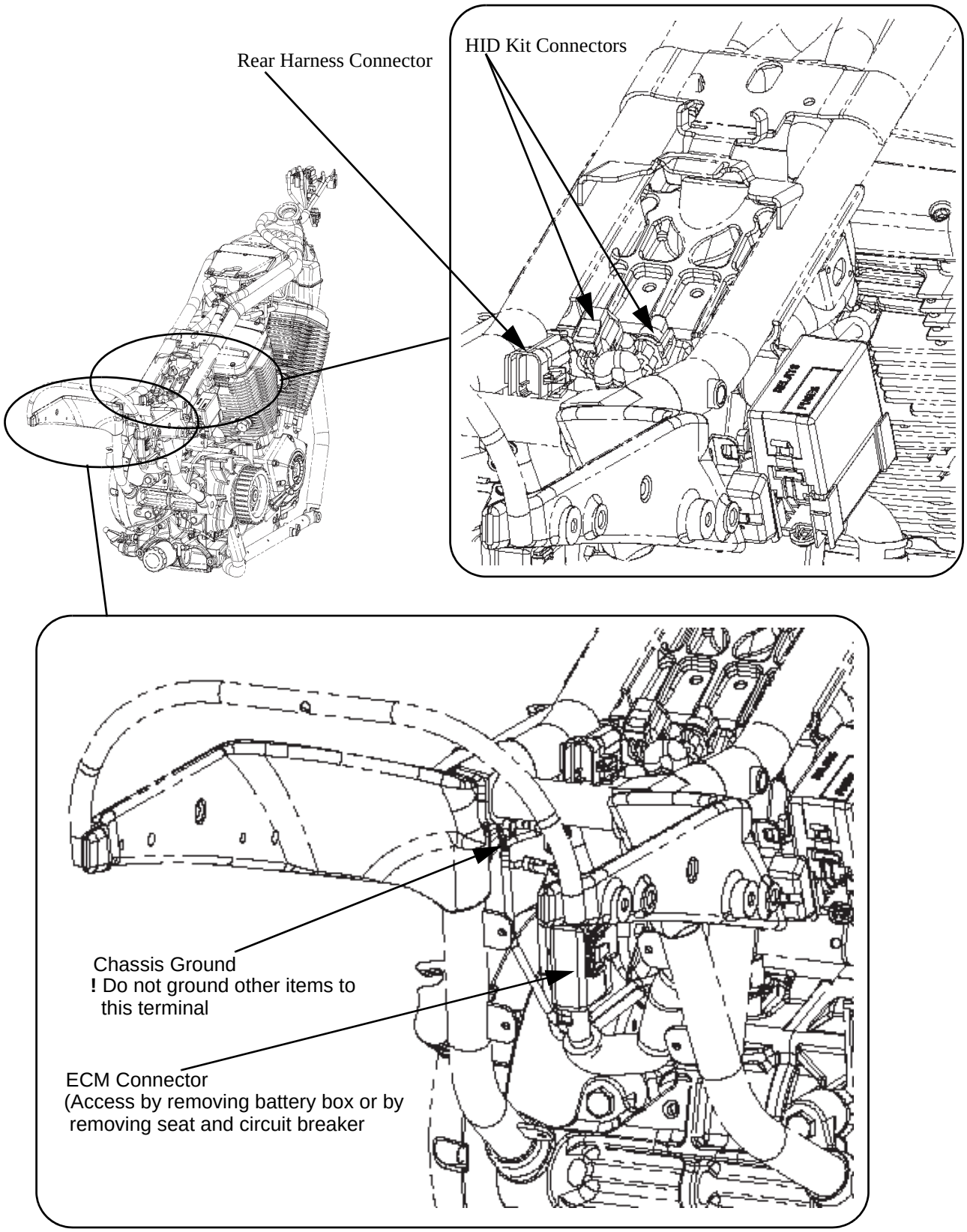
WIRE HARNESS - RIGHT REAR FRAME



WIRE HARNESS - RIGHT SIDE

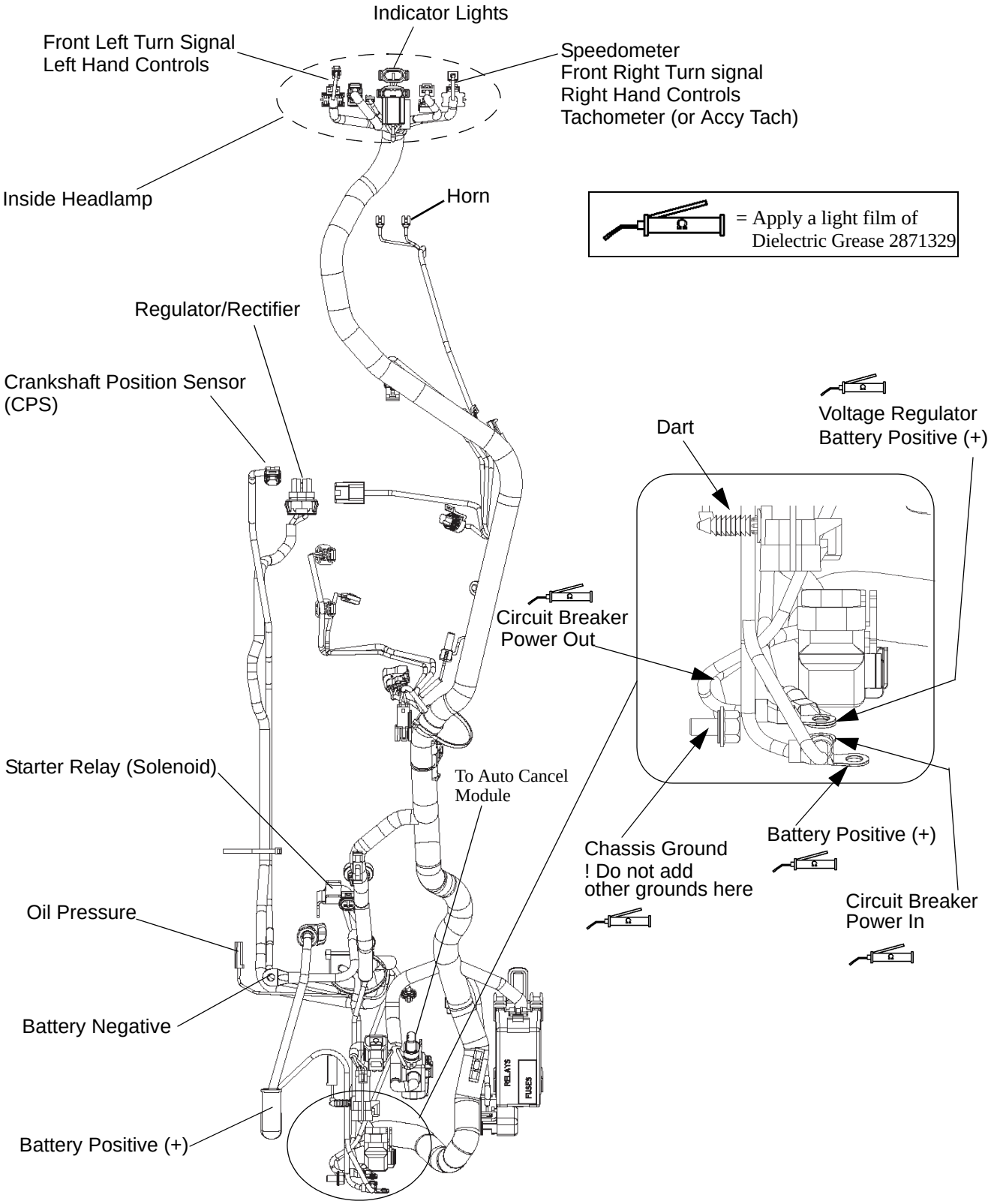


WIRE HARNESS - UNDER SEAT

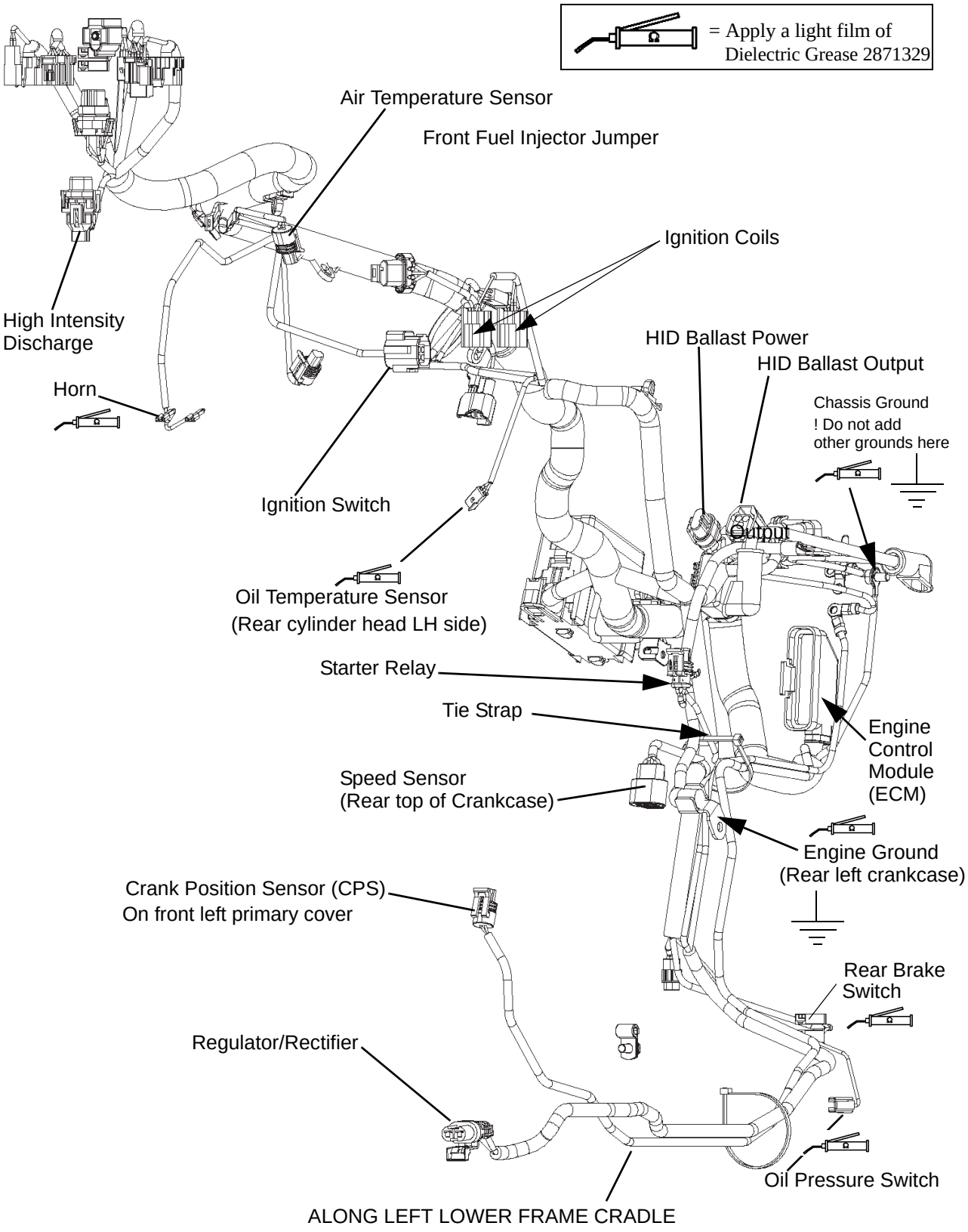


WIRE HARNESS CONNECTOR LOCATIONS

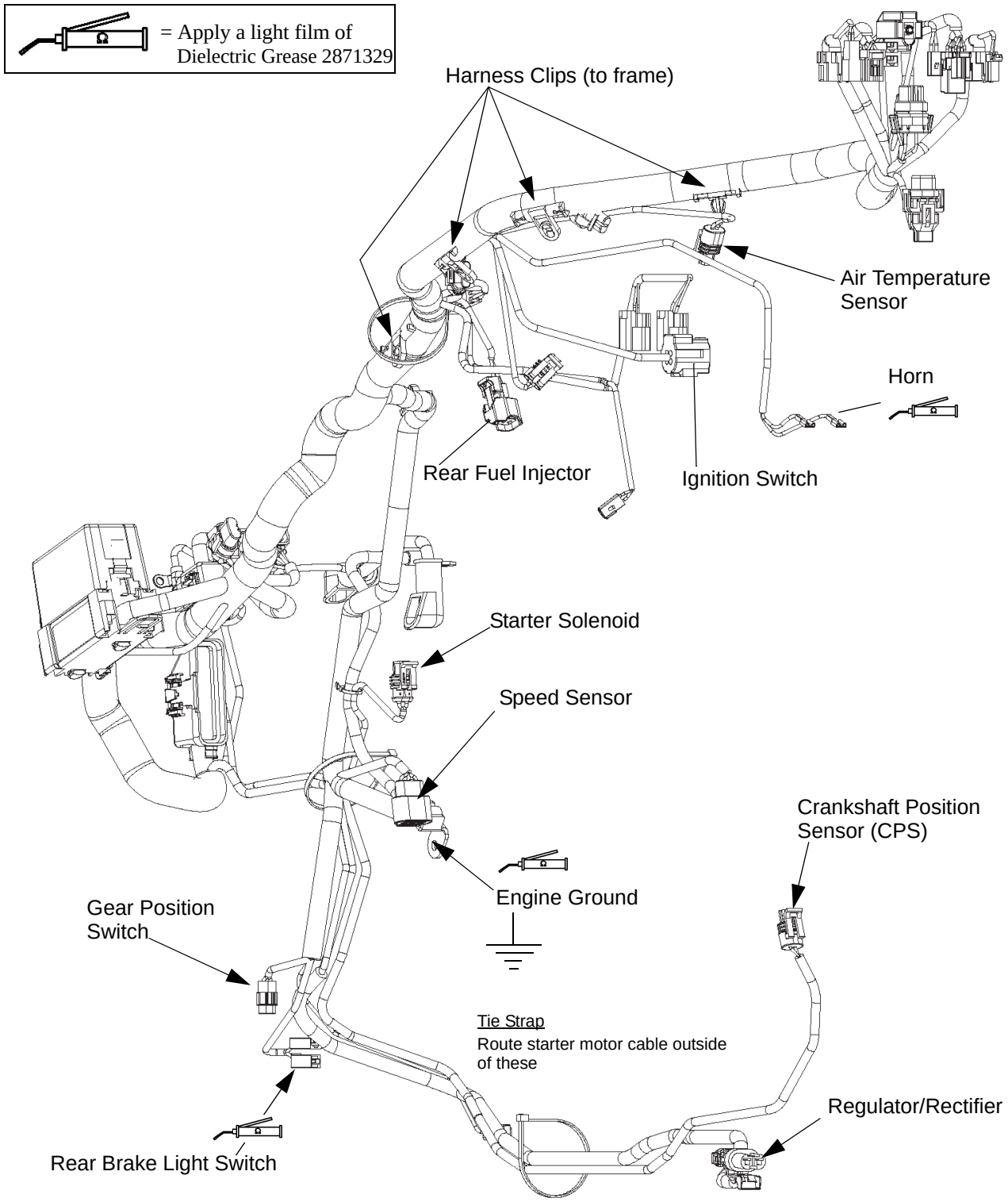
TOP VIEW



LEFT SIDE VIEW

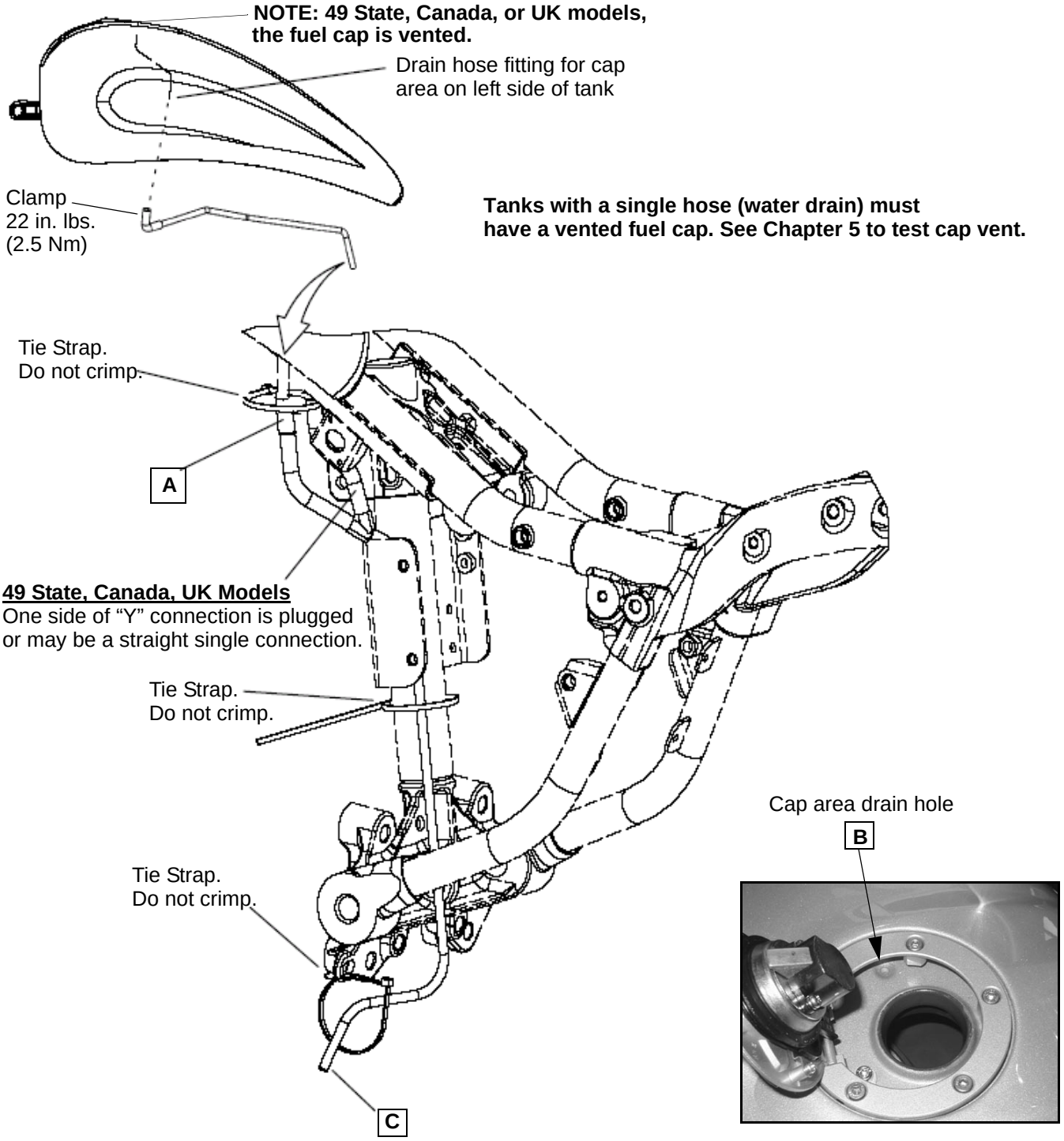


RIGHT SIDE VIEW



FUEL TANK VENT AND DRAIN HOSE ROUTING

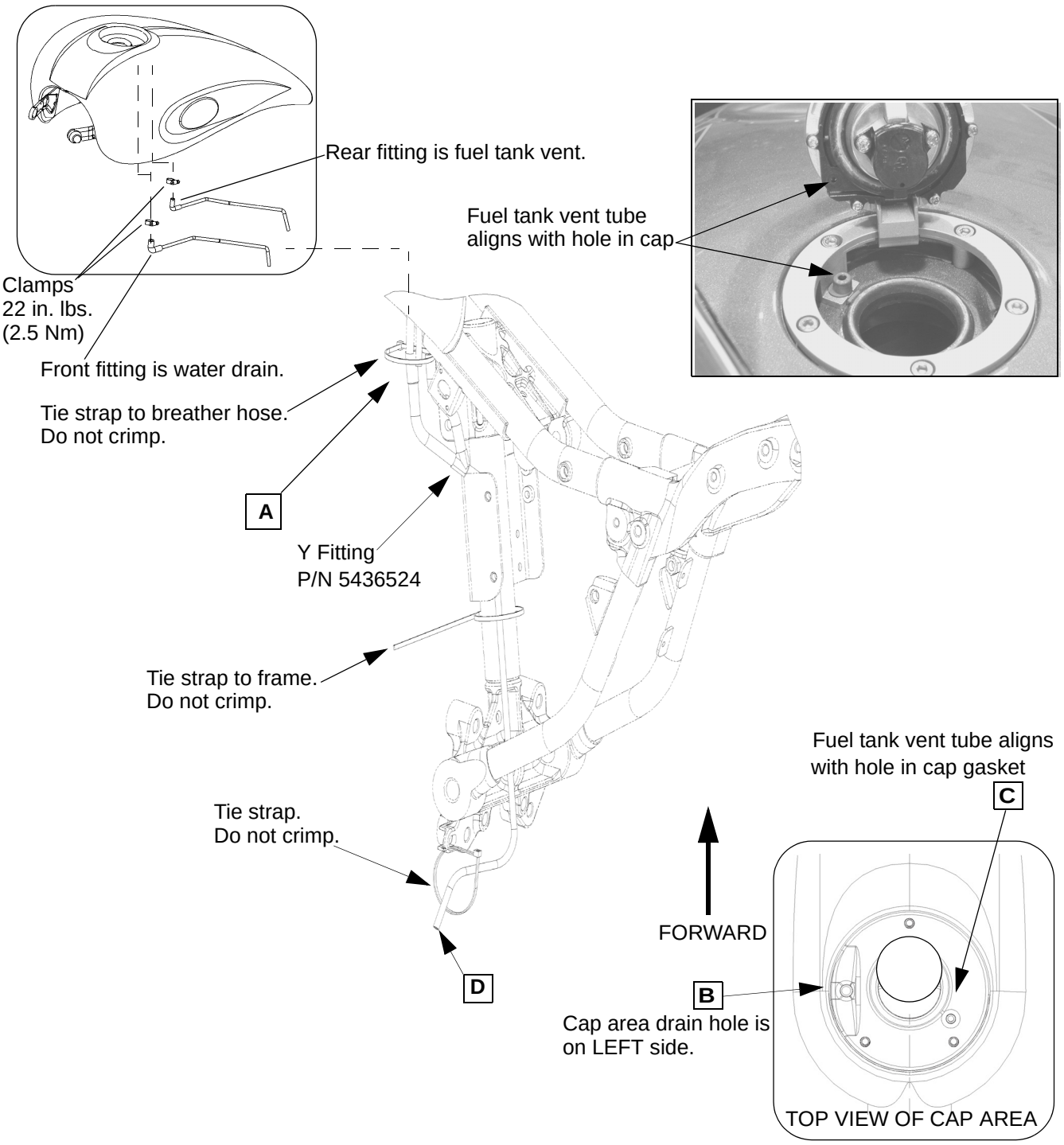
2003-2005 49 STATE, CANADA, UK



Water Drain/Hose Inspection

1. Disconnect drain hose from junction at rear left side of fuel tank (A). Open fuel cap and inspect drain hole (B). Pump low pressure air into bottom of drain hose at the junction and listen for air escaping from the drain hole. Verify drain hose below "Y" fitting at (A) is clear to the end of hose at (C).

2006 - ALL EXCEPT CALIFORNIA MODELS

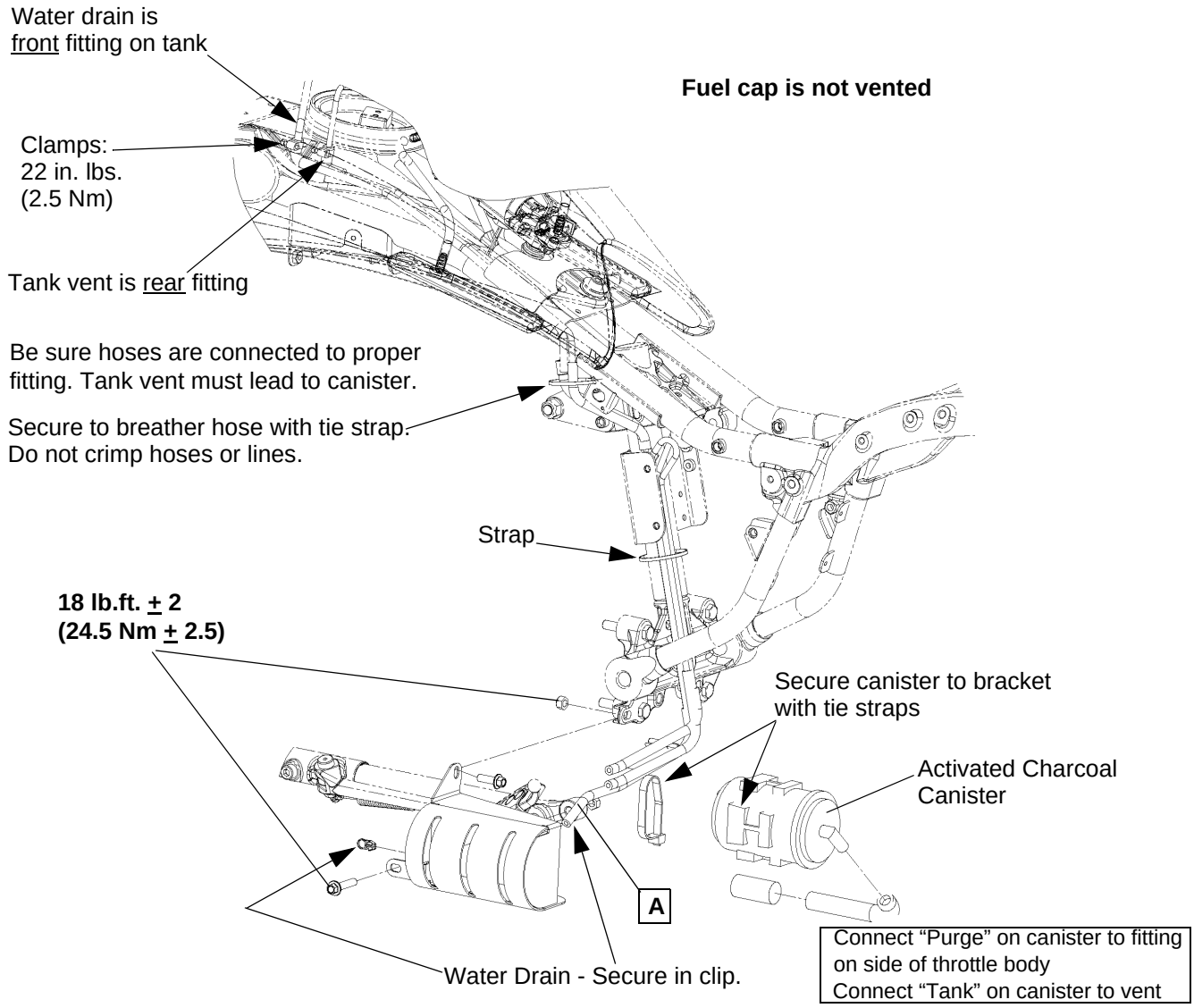


Water Drain Hose and Fuel Tank Vent Inspection

1. Disconnect hoses from junction at rear left side of fuel tank (A).
2. Open fuel cap. Verify hoses are clear between cap and rear left side of tank. The WATER DRAIN hose (B) is connected to the front-most fitting under the fuel tank. The VENT tube (C) is connected to the rear-most fitting under the fuel tank.
3. Verify hose is clear from rear left side of tank, through "Y" fitting, to the bottom of drain hose (D).

CALIFORNIA MODELS (ALL)

EVAPORATIVE EMISSION SYSTEM HOSE ROUTING



Tank Vent Inspection (California Models)

1. Remove LH side cover.
2. Open fuel cap.
3. Disconnect line from fitting on charcoal canister marked "TANK".
4. Pump low pressure air into canister end of vent hose. Verify air escapes from vent tube in gas cap area (right side) that aligns with hole in fuel cap seal. Be sure all hose connections are secure between canister and fuel tank fitting.

Water Drain Inspection

1. Remove LH side cover and disconnect drain hose from junction at rear left side of fuel tank. Open fuel cap and inspect drain hole in filler neck opening. Pump low pressure air into bottom of drain hose at junction and listen for air escaping from drain hole.
2. Pump low pressure air into bottom of drain hose at (A) to check lower hose for obstruction.

REFERENCE

SAE TAP DRILL SIZES

Thread Size/ Drill Size		Thread Size / Drill Size	
#0-80	3/64	1/2-13	27/64
#1-64	53	1/2-20	29/64
#1-72	53	9/16-12	31/64
#2-56	51	9/16-18	33/64
#2-64	50	5/8-11	17/32
#3-48	5/64	5/8-18	37/64
#3-56	45	3/4-10	21/32
#4-40	43	3/4-16	11/16
#4-48	42	7/8-9	49/64
#5-40	38	7/8-14	13/16
#5-44	37	1-8	7/8
#6-32	36	1-12	59/64
#6-40	33	1 1/8-7	63/64
#8-32	29	1 1/8-12	1 3/64
#8-36	29	1 1/4-7	1 7/64
#10-24	24	1 1/4-12	1 11/64
#10-32	21	1 1/2-6	1 11/32
#12-24	17	1 1/2-12	1 27/64
#12-28	4.6mm	1 3/4-5	1 9/16
1/4-20	7	1 3/4-12	1 43/64
1/4-28	3	2-4 1/2	1 25/32
5/16-18	F	2-12	1 59/64
5/16-24	I	2 1/4-4 1/2	2 1/32
3/8-16	O	2 1/2-4	2 1/4
3/8-24	Q	2 3/4-4	2 1/2
7/16-14	U	3-4	2 3/4
7/16-20	25/64		

METRIC TAP DRILL SIZES

Tap Size	Drill Size	Decimal Equivalent	Nearest Fraction
3x.50	#39	0.0995	3/32
3x.60	3/32	0.0937	3/32
4x.70	#30	0.1285	1/8
4x.75	1/8	0.125	1/8
5x.80	#19	0.166	11/64
5x.90	#20	0.161	5/32
6x1.00	#9	0.196	13/64
7x1.00	16/64	0.234	15/64
8x1.00	J	0.277	9/32
8x1.25	17/64	0.265	17/64
9x1.00	5/16	0.3125	5/16
9x1.25	5/16	0.3125	5/16
10x1.25	11/32	0.3437	11/32
10x1.50	R	0.339	11/32
11x1.50	3/8	0.375	3/8
12x1.50	13/32	0.406	13/32
12x1.75	13/32	0.406	13/32

DECIMAL EQUIVALENTS

1/64	.0156	
1/32	.0312	.1 mm= .0394"
3/64	.0469	
1/16	.0625	
5/64	.0781	.2 mm = .0787"
3/32	.0938	
7/64	.1094	.3 mm =.1181"
1/8	.1250	
9/64	.1406	
5/32	.1563	.4 mm = .1575"
11/64	.1719	
3/16	.1875	.5mm= .1969"
13/64	.2031	
7/32	.2188	
15/64	.2344	.6 mm = .2362"
1/4	.25	
17/64	.2656	.7 mm = .2756"
9/32	.2813	
19/64	.2969	
5/16	.3125	.8mm= .3150"
21/64	.3281	
11/32	.3438	.9 mm = .3543"
23/64	.3594	
3/8	.375	
25/64	.3906	.10 mm = .3937"
13/32	.4063	
27/64	.4219	.11 mm =.4331"
7/16	.4375	
29/64	.4531	
15/32	.4688	.12 mm = .4724"
31/64	.4844	
1/2	.5	.13mm = .5118"
33/64	.5156	
17/32	.5313	
35/64	.5469	.14 mm = .5512"
9/16	.5625	
37/64	.5781	.15 mm = .5906"
19/32	.5938	
39/64	.6094	
5/8	.625	.16mm=. 6299"
41/64	.6406	
21/32	.6563	.17 mm =.6693"
43/64	.6719	
11/16	.6875	
45/64	.7031	.18 mm = .7087"
23/32	.7188	
47/64	.7344	.19 mm = .7480"
3/4	.75	
49/64	.7656	
25/32	.7813	.20 mm = .7874"
51/64	.7969	
13/16	.8125	.21 mm =.8268"
53/64	.8281	
27/32	.8438	
55/64	.8594	.22 mm = .8661"
7/8	.875	
57/64	.8906	.23 mm = .9055"
29/32	.9063	
59/64	.9219	
15/16	.9375	.24 mm = .9449"
61/64	.9531	
31/32	.9688	.25 mm = .9843"
63/64	.9844	
1	1.0	

FAHRENHEIT TO CELSIUS

^{o}C to ^{o}F: 9 (^{o}C + 40) ÷ 5 - 40 = ^{o}F

^{o}F to ^{o}C: 5 (^{o}F + 40) ÷ 9 - 40=^{o}C

DEGREES F	DEGREES C
32	0
41	5
50	10
59	15
68	20
77	25
86	30
95	35
104	40
113	45
122	50
131	55
140	60
149	65
158	70
167	75
176	80
185	85
194	90
203	95
212	100

MEASUREMENT CONVERSION CHART

Unit of Measure	Multiplied by	Converts to
ft-lb	x 12	= in-lb
in-lb	x.0833	= ft-lb
ft-lb	x 1.356	= Nm
in-lb	x.0115	= kg-m
Nm	x.7376	= ft-lb
kg-m	x 7.233	= ft-lb
kg-m	x 86.796	= in-lb
kg-m	x 10	= Nm
in	x 25.4	= mm
mm	x.03937	= in
in	x 2.54	= cm
mile	x 1.6	= km
km	x.6214	= mile
Ounces (oz)	x 28.35	= grams (g)
grams (g)	x.035	= Ounces (oz)
cc's	x.03381	= Fluid Ounces (oz)
lbs	x.454	= kg
kg	x 2.2046	= lbs
Cubic Inches	x 16.387	= Cubic Centermeters
Cubic Centimeters	x.061	= Cubic Inches
Imperial pints	x.568	= liters (l)
liters (l)	x 1.76	= Imperial pints
Imperial quarts	x 1.137	= liters (l)
liters (l)	x.88	= Imperial quarts
Imperial quarts	x 1.201	= US quarts
US quarts	x.833	= Imperial quarts
US quarts	x.946	= liters
liters	x 1.057	= US quarts
US gallon	x 3.785	= liter
liter	x.264	= US gallon
Pounds force per square inch (psi)	x 6.895	= Kilo pascals (kPa)
Kilo pascals (kPa)	x.145	= Pounds force per square inch (psi)

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MAINTENANCE

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GENERAL SPECIFICATIONS

2003 - 2005 SPECIFICATIONS

All specifications are for standard Victory models. Specifications may change with addition of custom order options. Victory reserves the right to change specifications without notice.

		2003-2005 Vegas / Ness Vegas / Vegas Eight Ball	2004-2005 Kingpin / Ness Kingpin
CAPACITIES - DIMENSIONS	Oil Capacity	6.5 Qt (6.15 ltr) (Approximately 6.0 qts. at change [5.7ltr])	
	Fuel Capacity	4.5 US Gal (17 ltr) (Reserve: .6 - .8 U.S. gal / 2.25 - 3.0 ltr)	
	Wheelbase	66.5 in (169 cm)	65.6 in (167 cm)
	Seat Height	26.5 in (67.3 cm) [with 180 lb. rider]	26.5 in (67.3 cm) [with 180 lb. rider]
	Dry Weight	620 lbs (281.6 kg)	639 lbs (290 kg)
	Wet Weight	666 lbs (302 kg)	685 lbs (311 kg)
	Overall Length	96.3 in (244.5 cm)	99.1 in (251.9 cm)
	Overall Width	38 in (97 cm)	38 in (97 cm)
	Overall Height	50.75 (129 cm)	50.75 (129 cm)
	Ground Clearance	5.8 in (14.8 cm)	5.8 in (14.8 cm)
	Passenger Capacity	1 (Except Eight Ball - No Passenger)	1
	Maximum Load Capacity	469 lbs (213 kg)	485 lbs (220 kg)
	Gross Vehicle Weight Rating	1135 lbs. (515 kg)	1170 lbs. (531 kg)
	Rake / Trail	33.1 Degrees / 5.28 in. (13.4 cm)	32.8 Degrees / 5.43 in. (13.8 cm)
ENGINE	Engine Type / Model Number	Freedom® V-Twin 92-5 / MCVT1507D (2003) (2004) (2005)	Freedom® V-Twin 92-5 / MCVT1507D (2004) (2005)
	Engine Configuration	50^{o} V-Twin / SOHC 4 Stroke	
	Engine Displacement	1507cc / 92 cubic inch 5 speed (92/5)	
	Engine Cooling System	Air / Oil	
	Compression Ratio	9.2:1	
	Compression	180 psi + 20 (1241 kPa + 138)	
	Valves Train	4 Valves per cylinder. Hydraulic Lifters (No Adjustment)	
	Bore x Stroke	97 x 102 mm	
	Starter	Electric / Direct Drive	
	Throttle Body Bore Size	Dual 44 mm	
	Exhaust System Type	Dual - Large bore slash cut with common volume	
	Lubrication System	Wet Sump	
	Engine RPM @ 60 mph	2540 (Approx)	
	Spark Plug Type (Gap)	NGK CPR6EB-9 (.032 in. / 0.8 mm)	
	Dry Weight (Engine)	244 lbs. (111 Kg)	
BRAKES	Brake Type (Front / Rear)	Disc / Disc	
	Front Brake	Single 300 x 5 mm Floating Disc with 4 Piston Caliper	
	Rear Brake	Single 300 x 5 mm Floating Disc with 2 Piston Caliper	

2003 - 2005 SPECIFICATIONS (Cont.)

All specifications are for standard Victory models. Specifications may change with addition of custom order options. Victory reserves the right to change specifications without notice.

		2003-2005 Vegas / Ness Vegas / Vegas Eight Ball	2004-2005 Kingpin / Ness Kingpin
DRIVE SYSTEM	Transmission Type	Manual, 5 Speed, Constant Mesh	Manual, 5 Speed, Constant Mesh
	Clutch Type	Wet, Multi-Plate Diaphragm Spring	Wet, Multi-Plate Diaphragm Spring
	Primary Drive Type	Wet, Gear Drive w/ Torque Compensator	Wet, Gear Drive w/ Torque Compensator
	Primary Reduction Ratio	1.5:1	1.5:1
	Final Drive Type / Final Drive Ratio	36mm Kevlar Reinforced Belt / 2.13:1	36mm Kevlar Reinforced Belt / 2.13:1
	Gear Shift Pattern	1 Down, 4 Up	1 Down, 4 Up
	Internal Gear Ratios 1st	3.20:1	3.20:1
	2nd	2.19:1	2.19:1
	3rd	1.53:1	1.53:1
	4th	1.24:1	1.24:1
	5th	1:1	1:1
TIRES	Front Wheel (Size / Type)	21x2.15 / Cast, Billet, or 40 Spoke Laced	18 x 3.00 / Cast, Billet, or 40 Spoke Laced
	Rear Wheel (Size / Type)	Cast, Billet, or 40 Spoke Laced 2003 - 4.5 x 18 After 2003 - 5.00 x 18	Cast, Billet, or 40 Spoke Laced 5.00 x 18
	Front Tire	Dunlop CRUISEMAX 80/90 - 21 48H	Dunlop 491 Elite ll 130/70-B18 63H
	Rear Tire	2003-Dunlop K591 170/60 B 18 After 2003-Dunlop D417 180/55-B18 74V	Dunlop D417 180/55-B18 74V
	Minimum Tread Depth	.063 in. (1.6mm)	.063 in. (1.6mm)
SUSPENSION	Front Type	Conventional Telescopic	43mm Inverted Telescopic Cartridge Fork
	Front Travel	5.1 in. (13 cm)	5.1 in. (13 cm)
	Front Tube Diameter	43 mm (1.7 in.)	43 mm (1.7 in.)
	Rear Shock Type	Single, Monotube Gas w/Adjustable Preload	
	Rear Swingarm Type	Forged and Cast Aluminum with Rising Rate Linkage	
	Rear Travel (inches)	3.9 in (10 cm)	3.9 in (10 cm)
LIGHTS	Headlamp (Intl)	High: H-8 55W Low: H-11 35W (UK Headlamp is H4 55/60) UK High Beam is 55W + 35W = 90W total	
	Brake / Tail Light	Non-Serviceable LED	
	Turn Signal Light	R10W (10W)	
	Instrument Cluster	Indicator Lights: W2.3W (2.3 Watt Wedge Base) Backlighting: T10 (1.7 Watt) Tach (if equipped): T6.5 (1.7 Watt)	
	Alternator / Battery	38 amp (Approx 450 Watts) / 12V 18AH 320 CCA	
FUSES	Brake/Headlamp	15 amp fuse	
	Tail Lamp / Flashers / Indicator Lamps / Horn	15 amp fuse	
	Engine / ECM	15 amp fuse	
	Brake/Headlamp	15 amp fuse	
	Ignition / Gauges	15 amp fuse	
	Fuel Pump	10 amp fuse	
	Spare	15 amp fuse	
	Main Circuit Breaker	40 amp circuit breaker	

GENERAL SPECIFICATIONS

2006 SPECIFICATIONS

All specifications are for standard Victory models. Specifications may change with addition of custom order options. Victory reserves the right to change specifications without notice.

		2006 Vegas / Vegas Eight Ball	2006 Kingpin
CAPACITIES - DIMENSIONS	Oil Capacity	5.0 Qt (4.75 ltr) (Approximately 4.65 qts. at change)	
	Fuel Capacity	4.5 US Gal (17 ltr) (.8 U.S. gal / 3.0 ltr reserve)	
	Wheelbase	66.5 in (169 cm)	65.6 in (167 cm)
	Seat Height	26.5 in (67.3 cm) [with 180 lb. rider]	26.5 in (67.3 cm) [with 180 lb. rider]
	Dry Weight	620 lbs (281.6 kg)	639 lbs (290 kg)
	Wet Weight	666 lbs (302 kg)	685 lbs (311 kg)
	Overall Length	96.3 in (244.5 cm)	99.1 in (251.9 cm)
	Overall Width	38 in (97 cm)	38 in (97 cm)
	Overall Height	50.75 (129 cm)	50.75 (129 cm)
	Ground Clearance	5.8 in (14.8 cm)	5.8 in (14.8 cm)
	Passenger Capacity	1 (Except Eight Ball - No Passenger)	1
	Maximum Load Capacity	469 lbs (213 kg)	485 lbs (220 kg)
	Gross Vehicle Weight Rating	1135 lbs. (515 kg)	1170 lbs. (531 kg)
	Rake / Trail	33.1 Degrees / 5.28 in. (13.4 cm)	32.8 Degrees / 5.43 in. (13.8 cm)
ENGINE	Engine Type	Freedom® V-Twin 100 / 6 (Eight Ball 100 / 5)	Freedom® V-Twin 100 / 6
	Engine Configuration	50° V-Twin / SOHC 4 Stroke	
	Engine Displacement	1634cc / 100 cubic inch	
	Engine Cooling System	Air / Oil	
	Compression Ratio	9.8:1	
	Compression	205-215 psi + 20 (1413-1482 kPa + 138)	
	Valves Train	4 Valves per cylinder. Hydraulic Lifters 7 Hydraulic Cam Chain Tensioners (No Adjustment)	
	Bore x Stroke	101 x 102 mm	
	Starter	Electric / Direct Drive	
	Throttle Body Bore Size	Dual 44 mm	
	Exhaust System Type	Dual - Large bore slash cut with common volume	
	Lubrication System	Wet Sump	
	Engine RPM @ 60 mph	2220 (Approx) [Eight Ball: 2540 (Approx)]	
	Spark Plug Type (Gap)	NGK CPR6EB-9 (.032 in. / 0.8 mm)	
	Dry Weight (Engine)	244 lbs. (111 Kg)	
BRAKES	Brake Type (Front / Rear)	Disc / Disc	
	Front Brake	Single 300 x 5 mm Floating Disc with 4 Piston Caliper	
	Rear Brake	Single 300 x 5 mm Floating Disc with 2 Piston Caliper	

2006 SPECIFICATIONS (Cont.)

All specifications are for standard Victory models. Specifications may change with addition of custom order options. Victory reserves the right to change specifications without notice.

		2006 Vegas / Vegas Eight Ball	2006 Kingpin
DRIVE SYSTEM	Transmission Type	Manual, 6 Speed Overdrive, Constant Mesh (Eight Ball: 5 Speed)	Manual, 6 Speed Overdrive, Constant Mesh
	Clutch Type	Wet, Multi-Plate Diaphragm Spring	Wet, Multi-Plate Diaphragm Spring
	Primary Drive Type	Wet, Gear Drive w/ Torque Compensator	Wet, Gear Drive w/ Torque Compensator
	Primary Reduction Ratio	1.5:1	1.5:1
	Final Drive Type / Final Drive Ratio	28mm Carbon Fiber Reinforced Belt / 2.13:1	28mm Carbon Fiber Reinforced Belt / 2.13:1
	Gear Shift Pattern	1 Down, 5 Up (Eight Ball: 1 Down, 4 Up)	1 Down, 5 Up
	Internal Gear Ratios 1st	3.20:1	3.20:1
	2nd	2.19:1	2.19:1
	3rd	1.53:1	1.53:1
	4th	1.24:1	1.24:1
	5th	1:1	1:1
	6th	.92:1 (Eight Ball: N/A)	.92:1
TIRES	Front Wheel (Size / Type)	21x2.15 / Cast, Billet, or 40 Spoke Laced	18 x 3.00 / Cast, Billet, or 40 Spoke Laced
	Rear Wheel (Size / Type)	Cast, Billet, or 40 Spoke Laced 5.00 x 18	Cast, Billet, or 40 Spoke Laced 5.00 x 18
	Front Tire	Dunlop CRUISEMAX 80/90 - 21 48H	Dunlop 491 Elite ll 130/70-B18 63H
	Rear Tire	Dunlop D417 180/55-B18 74V	Dunlop D417 180/55-B18 74V
	Minimum Tread Depth	.063 in. (1.6mm)	.063 in. (1.6mm)
SUSPENSION	Front Type	Conventional Telescopic	43mm Inverted Telescopic Cartridge Fork
	Front Travel	5.1 in. (13 cm)	5.1 in. (13 cm)
	Front Tube Diameter	43 mm (1.7 in.)	43 mm (1.7 in.)
	Rear Shock Type	Single, Monotube Gas w/Adjustable Preload	
	Rear Swingarm Type	Forged and Cast Aluminum with Rising Rate Linkage Linkage	
	Rear Travel (inches)	3.9 in (10 cm)	3.9 in (10 cm)
LIGHTS	Headlamp (Intl)	High: H-8 55W Low: H-11 35W (UK Headlamp is H4 55/60) UK High Beam is 55W + 35W = 90W total	
	Brake / Tail Light	Non-Serviceable LED	
	Turn Signal Light	R10W (10W)	
	Instrument Cluster	Indicator Lights: W2.3W (2.3 Watt Wedge Base) Backlighting: T10 (1.7 Watt) Tach (if equipped): T6.5 (1.7 Watt)	
	Alternator / Battery	38 amp (Approx 450 Watts) / 12V 18AH 320 CCA	
FUSES	Brake/Headlamp	15 amp fuse	
	Tail Lamp / Flashers / Indicator Lamps / Horn	15 amp fuse	
	Engine / ECM	15 amp fuse	
	Brake/Headlamp	15 amp fuse	
	Ignition / Gauges / Spare	15 amp fuse	
	Fuel Pump	10 amp fuse	
	Main Circuit Breaker	40 amp circuit breaker	

VEHICLE LOADING

LOADING EXAMPLES FOR GROSS VEHICLE WEIGHT RATING (GVWR) - VEGAS

Example 1: Vegas® with no accessories or cargo (GVWR 1135 lbs / 515 kg)

Item	Weight
Vegas® - with full capacity of all fluids	666 lbs (302 kg)
Operator - with recommended riding apparel	230 lbs (104 kg)
Passenger - with recommended riding apparel.	165 lbs (75 kg)
Total Weight	**1061 lbs (481 kg)**

Example 2: Vegas® with accessory saddlebags

Item	Weight
Vegas® - with full capacity of all fluids	666 lbs (302 kg)
Weight of leather saddlebags and brackets	12 lbs (5.5 kg)
Cargo - optional saddlebags at capacity	14 lbs (6 kg)
Operator - with recommended riding apparel	230 lbs (104 kg)
Passenger - with recommended riding apparel	165 lbs (75 kg)
Total Weight	**1087 lbs (492.5 kg)**

NOTE: As shown in Example 2, the weight of any accessory items (leather saddlebags and brackets) in addition to the cargo, must be added to the wet weight of the motorcycle. NEVER exceed GVWR.

LOADING EXAMPLES FOR GROSS VEHICLE WEIGHT RATING (GVWR) - KINGPIN

Example 3: Kingpin™ with no accessories or cargo (GVWR 1170 lbs / 531 kg)

Item	Weight
Kingpin™ - with full capacity of all fluids	685 lbs (311 kg)
Operator - with recommended riding apparel	230 lbs (104 kg)
Passenger - with recommended riding apparel.	165 lbs (75 kg)
Total Weight	**1080 lbs (490 kg)**

Example 4: Kingpin™ with touring package and cargo (GVWR 1170 lbs / 531 kg)

Item	Weight
Kingpin™ - with full capacity of all fluids	685 lbs (311 kg)
Weight of touring package (hard bags and brackets)	33 lbs (15 kg)
Cargo - saddlebags at capacity	14 lbs (6 kg)
Operator - with recommended riding apparel	230 lbs (104 kg)
Passenger - with recommended riding apparel	165 lbs (74 kg)
Total Weight	**1127 lbs (511 kg)**

NOTE: As shown in Example 2, the weight of any accessory items (leather saddlebags and brackets) in addition to the cargo, must be added to the wet weight of the motorcycle. NEVER exceed GVWR.

SERVICE SPECIFICATIONS

TUNE UP

ITEM		SPECIFICATION
Brake Pedal Freeplay		4.5-7mm (.175-.275")
Clutch Lever Freeplay		.5 - 1.5mm (.020-.060")
Compression Pressure (Cylinder)		205-215 psi ± 20 (1413-1482 kPa ± 138)
Drive Belt Deflection *(After 500 Miles)* (See page 2.36 for new belt adjustment)	2003-2005	11 mm (7/16") with 10 lb force +/- .5mm (+/- 1/64)
	2006	12 mm (15/32") with 10 lb force +/- .5mm (+/- 1/64)
Drive Belt Frequency (*After 500 Miles*) (Using Sonic Tension Meter) (See page 2.36 for required data)	2003-2005	30 Hz +/- 1 Hz
	2006	32 Hz +/- 1 Hz
Fast Idle Speed		1500-3000 RPM (Engine cold, Handlebars straight)
Fast Idle Lever Freeplay		3-6mm (1/8-1/4")
Oil Pressure, Lubrication @ 3000 rpm		552 kPa (80 psi) (Minimum 40 psi)
Oil Pressure, Cooling @ 3000 rpm		414 kPa (60 psi) (Minimum 40 psi)
Spark Plug Type / Gap		NGK CPR6EB-9 / .8mm (.032")
Ride Height (Rear Shock Spring Pre-Load)		See page 2.40
Throttle Cable Freeplay		3mm +/- 1.5mm (1/8" +/- 1/16")
Throttle Position Sensor (TPS) Adjustment Factor		-1
Tire Pressure		Refer to chart on page 2.14 or decal on motorcycle

OIL CHANGE

Start the engine and warm it up for several minutes. While warming up, check for oil leaks. If any leaks are found, stop the engine immediately and determine the source of the problem before starting the engine again.

NOTE: After the engine is started, the oil indicator light should go off. If the indicator light flickers or remains on, immediately stop the engine and diagnose the problem before continuing.

TIGHTENING TORQUE	
Drain Plug (Inspect / replace sealing washer)	20 Nm (15 ft. lbs.)
Oil Filter	3/4 full turn after contacting the sealing surface

OIL TYPE / QUANTITY		
Oil Type		Victory Semi-Synthetic 20W40 Engine Oil
Oil Capacity (Oil & Filter Change)	2003-2005	Approximately 5.6 liters (6.0 quarts)
	2006	Approximately 4.45 liters (4.7 quarts)
Oil Capacity (Dry)	2003-2005	Approximately 6.15 liters (6.5 quarts)
	2006	Approximately 4.75 liters (5.0 quarts)

Use Victory 20W40 engine oil for all temperatures. If Victory oil is not available, use 20W40 SG or equivalent.

⚠ CAUTION

Do not put chemical additives in the oil. Victory motorcycle oil has been specially designed for this application. Additional additives are not necessary and have not been approved by Victory Engineering.

FASTENER TORQUE SPECIFICATIONS

MAINTENANCE ITEMS

DESCRIPTION	TORQUE		APPLY / NOTES
	N-m	Lb-ft (Lb-in)	
Air Box to Throttle Body	-	(25)	
Air Box Cover	-	(10)	
Air Filter Cover	-	(10)	
Axle Nut, Rear	88	65	
Axle Adjuster Lock Nut, Rear (Where Applicable)	-	-	Tighten securely after axle is tightened
Battery Terminal Bolts	4.5	(40)	Dielectric Grease
Battery Cover Nuts	4.5	(40)	
Battery Cable To Solenoid / Starter Motor Terminal	6.8	(60)	Dielectric Grease
Brake Lever Pivot Screw and Nut (Front)	6	(52)	
Clutch Lever Pivot Nut	6	(52)	
Drive Sprocket Nut (2006)	244	180	Loctite™ 262
Drive Sprocket Nut (2003-2005)	170	125	Loctite™ 262
Drive Sprocket Nut Retainer Plate Screws	10	(85)	
Exhaust / Muffler	Refer to Chapter 3		
Foot Peg Assembly to Frame	47.5	35	
Foot Peg Feeler	9.5	(84)	
Fuel Tank Mounting Screws	47.5	35	
Oil Drain Plug	20	15	12x1.5mm
Oil Filter	3/4 Turn Past Gasket Contact		
Seat	24.5	18	
Side Stand Pivot Bolt & Nut	47.5	35	
Spark Plug (new, with anti-seize applied)	11	8.5	
Swingarm Pivot Shaft (Nut)	88	65	
Strut Covers (on rear fender)	24.5	18	
Switch Cube Screws (Left and Right Handlebar)	3	(25)	Tighten Top Screw First

SPECIAL TOOLS

MAINTENANCE TOOLS

- Belt Tension Gauge PV-43532
- Spanner Wrench - PV-46993
- Compression Gauge Set PV-33223

MAINTENANCE PRODUCTS

LUBRICANTS / CHEMICALS

Maintenance Product Part Numbers

All Purpose Grease	2872187
Moly Assembly Paste	2871460
Semi-Synthetic 20W/40 Engine Lubricant	2872176
Oil Change Kit	2873551
Lubricant, Cable	2872861
Lubricant, Multi-Purpose	2872863
Carb and Throttle Body Cleaner, 13 oz. Aerosol	2872890
Electrical Contact Cleaner	2872864
Fuel Additive, Carbon Clean	2872190
Fuel Stabilizer	2872280
Vinyl and Rubber Dressing	2872194
Brake Fluid, DOT 4	2872189
Brake Cleaner	2872191
Nyogel™ Dielectric Grease	2871329
Paint Restore Polish, 12 oz. Aerosol	2872192
Paint Wax and Final Finish	2872193
Paint Detail Kit (Polish, Wax, and Dressing)	2872195
Loctite 262™ (50cc Tube)	2871951
Primer N™ (25g Aerosol)	2870585
Hand Grip Adhesive (Three Bond 1501) (10ml tube)	2872575
Fork Oil - Inverted Cartridge Forks (Kingpin)	2874828
Fork Oil - Conventional Telescopic Forks (Vegas)	2874568

PERIODIC MAINTENANCE

PERIODIC MAINTENANCE INTERVAL TABLE

ENGINE	ODOMETER READING in MILES (KILOMETERS)																						
Component (see operation codes below)	**PAGE**	500 (800)	2,500 (4,000)	5000 (8,000)	7,500 (12,000)	10,000 (16,000)	12,500 (20,000)	15,000 (24,000)	17,500 (28,000)	20,000 (32,000)	22,500 (36,000)	25,000 (40,000)	27,500 (44,000)	30,000 (48,000)	32,500 (52,000)	35,000 (52,000)	37,500 (60,000)	40,000 (64,000)	42,500 (68,000)	45,000 (72,000)	47,500(76,000)	50,000 (80,000)
Air Filter	**2.12**	**I**	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**	**I**	**R**
Crankcase Ventilation System	**2.28**	**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**
Drive Belt	**2.35**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**R**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
Drive Sprocket and Sprocket Nut	**2.38**							**I**						**I**						**I**		
Engine Compression	**2.32**	**I**				**I**				**I**				**I**				**I**				**I**
Engine Oil*	**2.12**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**
Engine Oil Filter*	**2.13**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**
Evaporative Emission Control System (CA. Only)	**2.28**	**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**
Exhaust System	**Ch 3**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
Fast Idle Lever	**2.18**	**I**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**
Fuel Filter	**2.27**											**R**										**R**
Fuel System	**2.27**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
Spark Plugs	**2.29**	**I**		**I**		**I**		**I**		**I**		**I**		**R**		**I**		**I**		**I**		**I**
Throttle Cable	**2.15**	**I**	**I**	**I**	**I**	**L**	**I**	**I**	**I**	**L**	**I**	**I**	**I**	**L**	**I**	**I**	**I**	**L**	**I**	**I**	**I**	**L**
Throttle Position Sensor Calibration (Except California)	**5.38**			**P**																		
Throttle Position Sensor Calibration (California models)	**5.38**		P	**P**																		

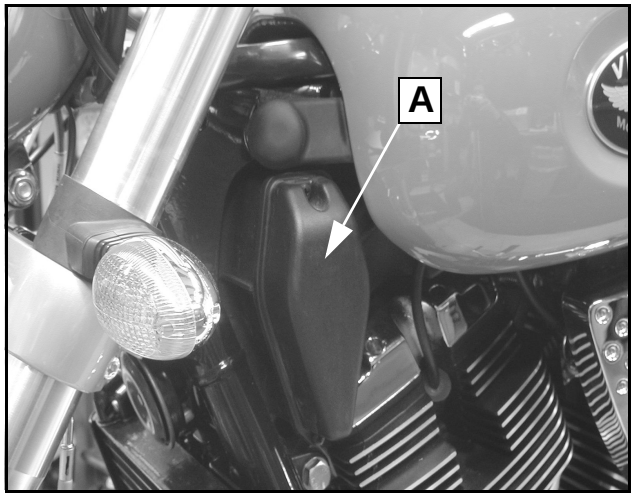
CHASSIS	ODOMETER READING in MILES (KILOMETERS**)**																						
Auxiliary Lights	**-**	**N/A**																					
Battery	**2.30**	**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**
Brake Fluid**	**2.23**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**R**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
Brake Pads	**2.24**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**
Clutch Lever	**2.17**	**I**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**
Control Cables	**2.15**	**I**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**
Fasteners	**2.41**	**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**
Front Brake Lever	**2.17**	**I**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**
Front Fork Oil**	**2.42**	**I**		**I**		**I**		**R**		**I**		**I**		**R**		**I**		**I**		**R**		**I**
Front Forks and Front Axle	**2.42**	**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**
Gear Shift Pedal	**2.19**	**I**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**
Headlamp	**2.28**	**I**				**I**				**I**				**I**				**I**				**I**
Rear Brake Pedal	**2.19**	**I**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**
Rear Shock Absorber	**2.38**	**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**R**
Rear Wheel Alignment	**2.37**	**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**
Road Test	**-**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**
Sidestand / Sidestand Pad	**2.25**	**I**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**		**I**		**L**
Steering Bearings	**2.42**	**I**	**I**	**I**	**I**	**I**	**I**	**L**	**I**	**I**	**I**	**I**	**I**	**L**	**I**	**I**	**I**	**I**	**I**	**L**	**I**	**I**
Suspension Linkage, Rear	**2.38**	**I**		**I**		**I**		**L**		**I**		**I**		**L**		**I**		**I**		**L**		**I**
Swing Arm and Rear Axle	**2.38**	**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**		**I**
Tires Pressure/ Tires / Wheels	**2.14**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**	**I**

Operation Codes:
I-Inspect (tighten, clean, adjust, correct or replace if necessary) **R-**Replace/Rebuild *Replace at specified interval or annually
L-Lubricate with proper lubricant **P-**Perform **Replace at specified interval or every 2 years

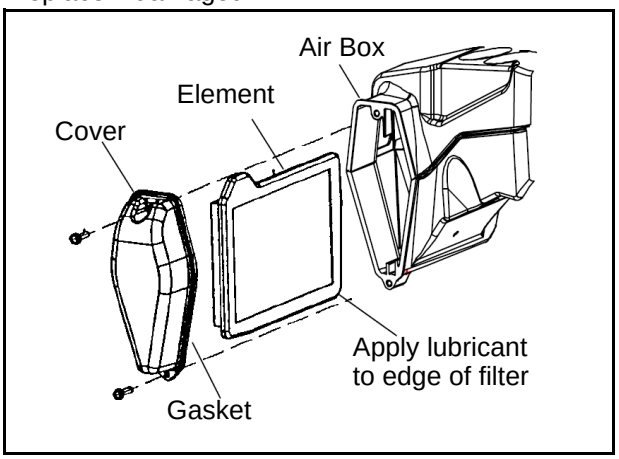
AIR FILTER

NOTE: In wet or dusty conditions, more frequent service is required.

NOTE: The element is not serviceable Replace if dirty or contaminated.



1. Remove air filter access cover (A). Inspect gasket and replace if damaged.

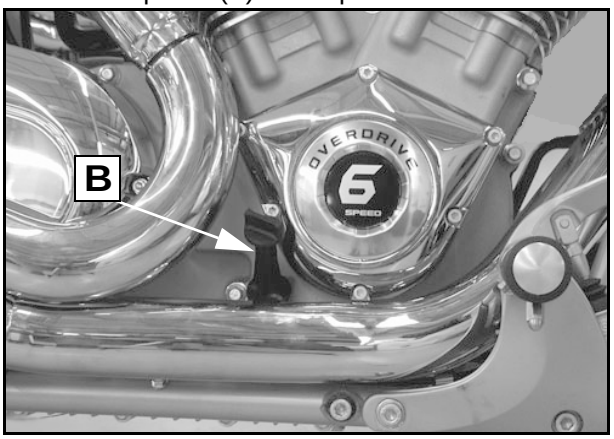


2. Grasp the air filter frame and pull straight outward.
3. Inspect filter element visually and replace if dirty or contaminated with oil or water.
4. Reverse Steps to install filter. Lubricate top and bottom edges of element. Arrows on filter point to the FRONT of the vehicle.
5. Torque cover fasteners to 10 lb-in.

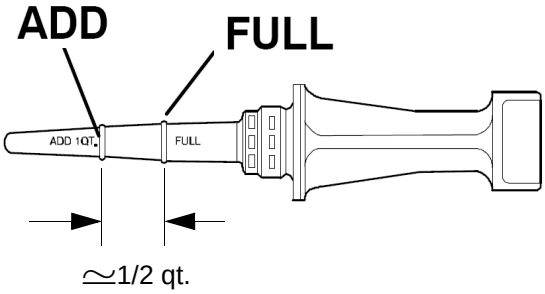
> **⚠ CAUTION**
>
> A loose fitting cover or improperly installed filter may allow debris to enter the engine which may cause premature engine wear.

ENGINE OIL LEVEL

1. Warm the engine for several minutes until operating temperature is reached.
2. Stop engine. Wait for 3-5 minutes.
3. Place vehicle on level surface and hold it in an upright position.
4. Remove dipstick (B) and wipe clean.



5. **Screw dipstick in until seated.**
6. Remove dipstick and view oil level.
7. Oil level should be between ADD and FULL lines on dipstick. If low, add Victory 20-40 Semi-Synthetic engine oil to FULL mark. DO NOT overfill.



Screw in to check

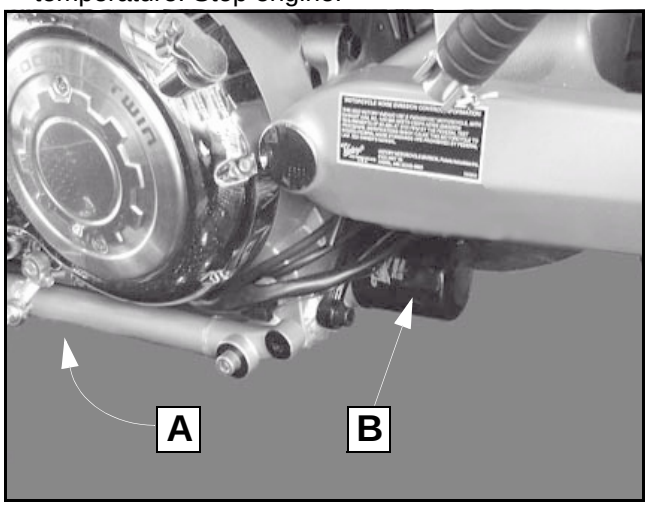
ENGINE OIL & FILTER CHANGE

Oil Change Kit: P/N 2873551

Change engine oil and filter with the motorcycle on its side stand, engine warm.

> **WARNING**
>
> **HOT COMPONENTS Wear insulated gloves and/or allow engine and exhaust to cool before handling these parts.**

1. Start and run engine until it reaches normal operating temperature. Stop engine.



2. Securely support the motorcycle on the sidestand.
3. Place an oil drain pan under drain plug (A) and oil filter (B).
4. Remove drain plug and sealing washer using a good quality 6mm Allen socket.
5. Allow oil to drain completely.
6. Remove filter with a filter wrench, strap wrench, or adjustable pliers.
7. Clean drain plug sealing surface and reinstall drain plug with a new sealing washer.

   Drain Plug Torque: 20 Nm (15 ft-lbs)

8. Clean any residue or debris from oil filter sealing surface and threads.
9. Make sure filter gasket is properly seated in new oil filter. Apply a thin film of clean engine oil to gasket. Screw filter on until gasket contacts the sealing surface. Tighten filter *by hand* an additional 3/4 turn.
10. Remove dipstick and install a funnel or filler spout.
11. Fill crankcase through dipstick hole with specified amount of Victory Semi-Synthetic 20W-40 Motor Oil, or an equivalent.

Oil & Filter Change Initial Fill	
2003-2005	**5.5 qts**
2006	**4.2 qts**

12. Reinstall dipstick. Start and run engine until it reaches normal operating temperature.

> **CAUTION**
>
> After an oil change, the low oil pressure indicator remains illuminated longer than usual before going out. Do not increase engine RPM above idle until oil pressure indicator is not illuminated or engine may be damaged.

13. Stop engine.
14. Wait 3-5 minutes before checking oil level.
15. Adjust oil level as required.
16. Check for leaks around drain plug and oil filter.

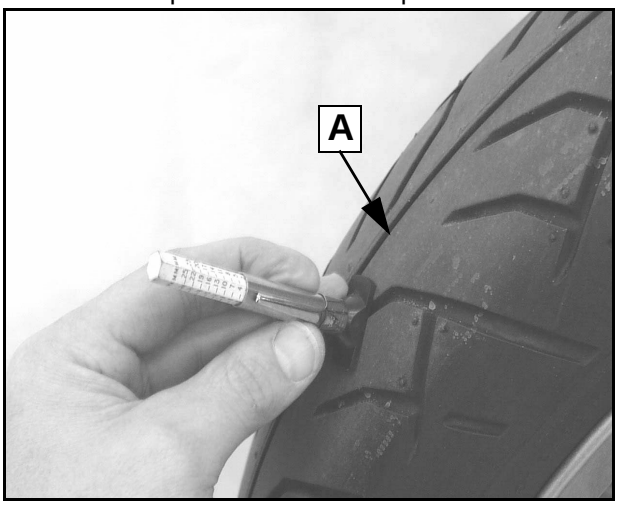
NOTE: Recycle used oil and oil filter in accordance with local regulations.

TIRES

⚠ WARNING

Victory motorcycles are produced using the designated tires listed below as original equipment. This includes field testing to ensure stability and superior handling. The use of tires other than original equipment may cause instability. A review of all tire related warnings can be found in Chapter 14.

1. Inspect tires for weather checking, cuts, imbedded foreign objects, etc.
2. Inspect front and rear wheels for damage / runout. Refer to Chapters 12 and 13 for procedure.



3. Measure tread depth at center of tread (A). Measure in 3-4 places equally spaced around the tire and record the smallest measurement.

NOTE: Raised areas at the base of the tread, known as wear bars; act as easily visible tread depth indicators. When the road contact surface has worn to the top of the wear bars, replace the tire.

⚠ WARNING

It is dangerous to ride with a worn tire. When a tire reaches the minimum tread depth listed below, replace the tire immediately.

MINIMUM TIRE TREAD DEPTH	
FRONT TIRE MINIMUM TREAD DEPTH	**REAR TIRE MINIMUM TREAD DEPTH**
1.6mm (.063") (1/16 inch)	1.6mm (.063") (1/16 inch)

TIRE PRESSURE TABLE

NOTE: Also refer to the Manufacturing Information decal located on the motorcycle.

VEGAS / VEGAS EIGHT BALL / NESS VEGAS		
	Up to 200 lbs (91 kg) load	200-465 lbs (91-211 kg) load
FRONT	36 psi (248 kPa)	38 psi (262 kPa)
REAR	36 psi (248 kPa)	41 psi (283 kPa)

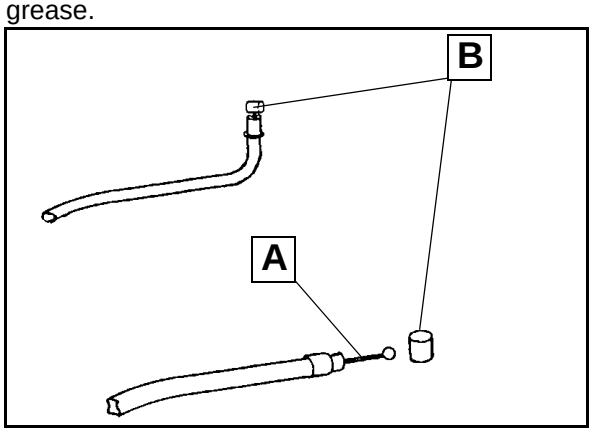
KINGPIN / NESS KINGPIN		
	Up to 200 lbs (91 kg) load	200-465 lbs (91-211 kg) load
FRONT:	32 psi (222 kPa)	36 psi (248 kPa)
REAR:	36 psi (248 kPa)	41 psi (283 kPa)

WHEEL SPOKES

Inspect spoked wheels by grasping each spoke and try to move it side to side or up and down. All spokes should be equally tight and have the same amount of flex. Tighten loose spokes according to the procedures in Chapter 12.

CABLE LUBRICATION / INSPECTION

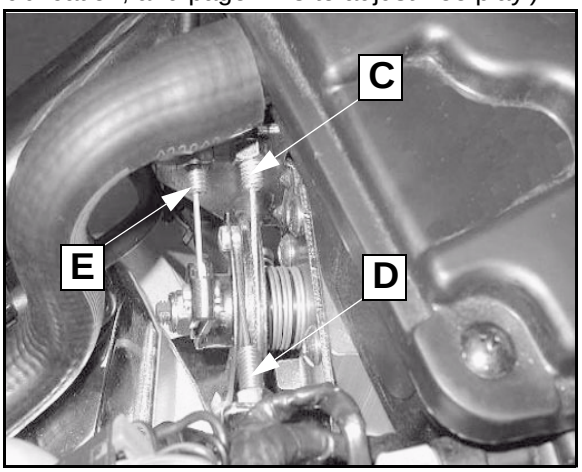
1. Inspect cables for proper routing, smooth movement, and for damage to the external casing. Inspect the exposed inner cable (A) for fraying, kinks, or corrosion. Replace any damaged cables.
2. Disconnect one end of the cable to be lubricated. Use Victory Cable Lubricant or a commercially available cable lubricant. The end of the cable (B) should also be lubricated at this time with Victory all purpose grease.



Refer to Chapter 5 for fuel tank removal and installation procedure.

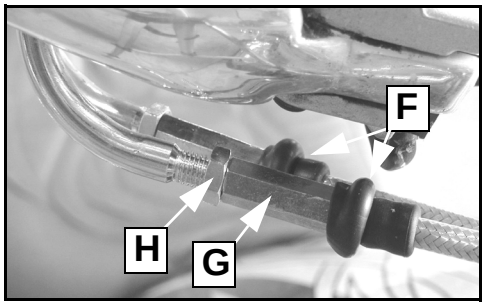
- Throttle cable (opening) (C). Refer to page 2.16 for throttle cable adjustment.
- Throttle cable (closing) (D). Refer to page 2.16 for throttle cable adjustment.
- Fast idle cable (E). Refer to page 2.18 for fast idle cable adjustment.
- Clutch cable

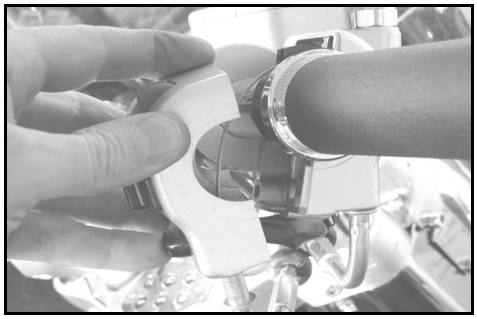
(Refer to page 2.17 for clutch lever removal & lubrication, and page 2.18 to adjust free play.)



THROTTLE CABLE LUBRICATION

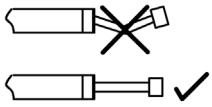
1. Roll dust boots (F) back to expose cable adjusters at handlebar.
2. Hold adjuster (G) and loosen lock nut (H) on each cable. Loosen lock nuts completely and turn adjusters in (toward lock nut) to gain maximum cable free play.





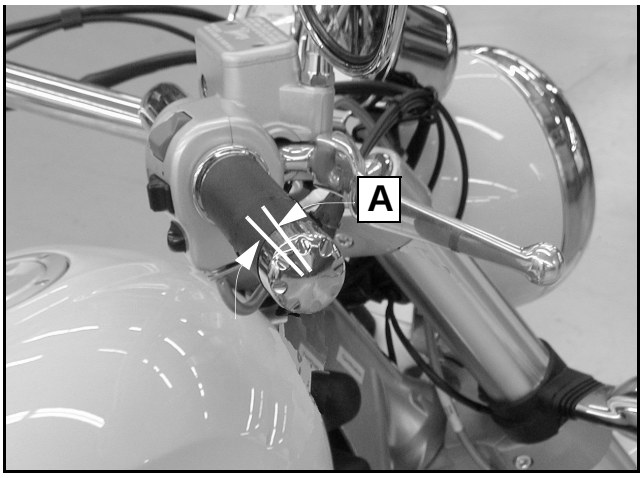
CAUTION

Do not kink, bend or twist inner cable or cable casing during installation.



3. Remove right handlebar switch cube screws and separate the halves to expose throttle cables and throttle grip reel for lubrication and inspection.
4. Inspect cables for frayed ends or kinks. Replace if kinked or frayed.
5. Thoroughly lubricate cable with Victory Cable Lubricant. Lubricate cable ends with Victory all purpose grease.
6. Assemble switch cube. Torque top screw first to 3 Nm (25 in. lbs.).
7. Adjust throttle cable free play (page 2.16) and check for proper operation (Step 13 - 15 on page 2.16)

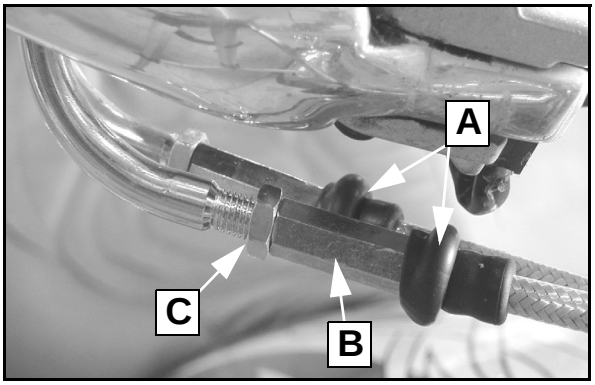
THROTTLE FREE PLAY ADJUSTMENT



1. Measure free play at throttle grip (A) and compare to specification.

Specification: 3mm ± 1.5mm (1/8 ± 1/16″)

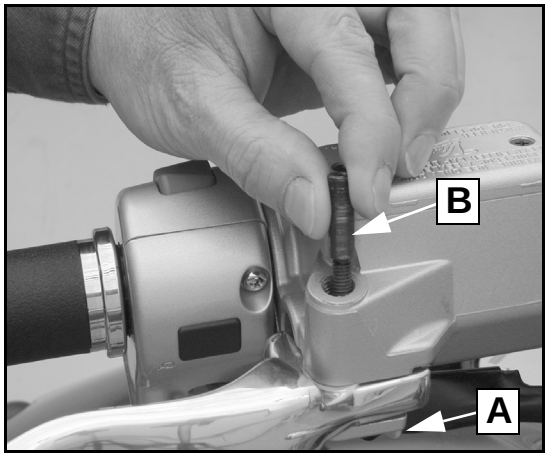
2. Adjustments to free play are made at upper throttle cable adjusters.
3. Be sure fast idle lever is OFF (low idle).
4. Roll protective boots (A) back to expose adjusters (B) and lock nuts (C) on both cables.



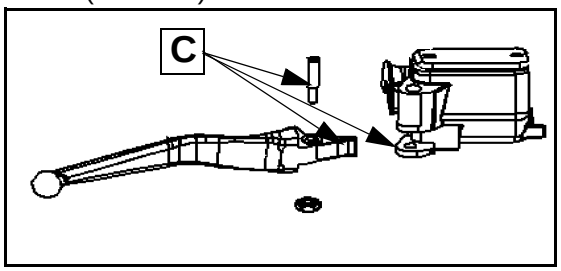
5. Hold adjusters and loosen lock nut on both cables.
6. Turn lock nuts away from adjusters as far as possible.
7. Turn adjusters toward lock nuts as far as possible to gain maximum cable free play in both cables.
8. Turn adjuster on throttle opening (front) cable away from lock nut until free play is within specified range.
9. Adjust closing cable (rear most cable on housing) by moving throttle grip back and forth constantly while slowly turning adjuster out until free play is removed.
10. Turn adjuster back in one full turn to add free play.
11. Tighten lock nuts against adjusters securely while holding adjuster.
12. Slide protective boots back into place over adjusters and lock nuts when adjustment is complete.
13. Shift transmission into neutral.
14. Start engine and let it idle. If fast idle lever was used, be sure lever is returned to OFF (idle) position.
15. Turn handlebars all the way to the right and left. The engine idle speed should not change in any steering position. If engine idle speed changes, re-check throttle grip free play, inspect cables for proper routing, and be sure cables are attached properly. Replace cable(s) if damaged.
    - Be sure the throttle opens and closes smoothly in all steering positions, and returns to the fully closed position when throttle grip is released.
    - If throttle grip does not return properly, re-check cable free play, inspect cables for proper routing, and be sure cables are attached properly to the throttle body (under fuel tank).
    - Inspect condition of cables for kinks, damage, or frayed ends.
    - Be sure switch cube and grip are located properly on handlebar, and that screws are properly torqued (top screw first) to 3 Nm (25 in. lbs.).

FRONT BRAKE LEVER LUBRICATION

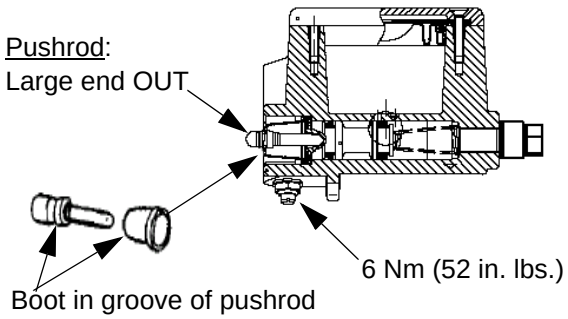
1. Remove right side mirror, nut (A), lever pivot pin (B) (4mm hexagonal socket), and lever.



2. Clean pivot pin, lever and lever perch.
3. Lubricate areas (C) on with Victory All Purpose Grease (2872187).



4. If removed, install brake master cylinder push rod with large diameter end oriented toward lever, and small diameter end toward master cylinder. Install boot into groove on pushrod.

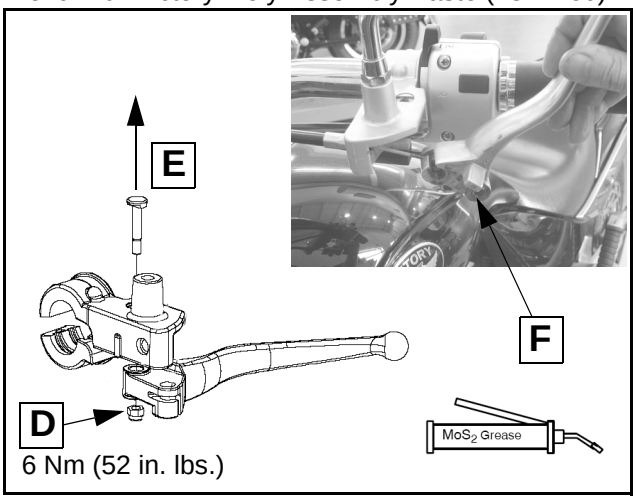


5. Reinstall brake lever, lever pivot pin, and nut.
6. Torque lever pivot pin first to 6 Nm (52 in. lbs.).
7. Hold pivot pin stationary and torque nut to 6 Nm (52 in. lbs.)
8. Check front brake lever movement.
9. Front brake lever is self-adjusting. Refer to page 2.21 to inspect freeplay.
10. Install and adjust RH mirror.

CLUTCH LEVER LUBRICATION

1. Disconnect the clutch cable at the primary cover by rotating the lever arm inward with an adjustable wrench. Protect the finish of the arm with a shop towel or tape.

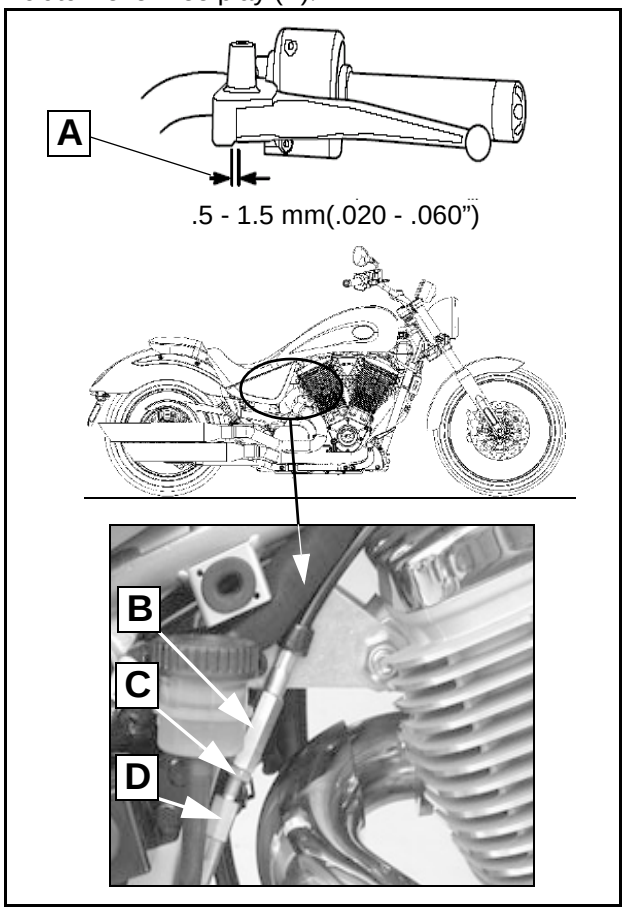
2. Remove nut (D), and push the pivot pin (E) upward to remove.
3. Release lever from cable, and remove barrel from the end of the cable.
4. Push bushing (F) out of lever.
5. Clean all parts.
6. Lubricate lever, bushing (inside and out) and barrel end with Victory Moly Assembly Paste (2871460).



7. Reinstall lever with bushing, lever pivot pin, and nut.
8. Torque nut to 6 Nm (53 in. lbs.). Attach clutch cable to lever arm on primary cover.
9. Adjust clutch lever freeplay as shown on page 2.18.

CLUTCH LEVER FREEPLAY

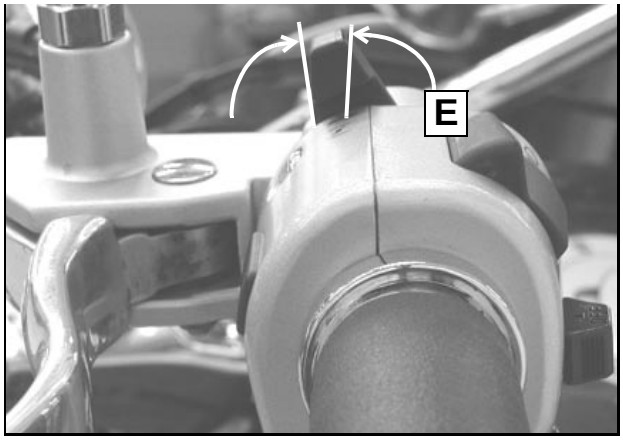
1. With handlebars pointing straight ahead, measure the clutch lever free play (A).



2. Compare measurement to specification. If adjustment is required, proceed to Step 3.
3. Remove the right side cover.
4. Hold cable (B) and loosen the adjuster jam nut (C).
5. Turn the cable adjuster (D) in or out until the clutch freeplay is correct.
6. Tighten adjuster jam nut to cable securely.

If the operation of the clutch cable is not smooth, inspect and determine if any repair or lubrication is needed, or replace the cable. Refer to page 2.17.

FAST IDLE LEVER FREEPLAY

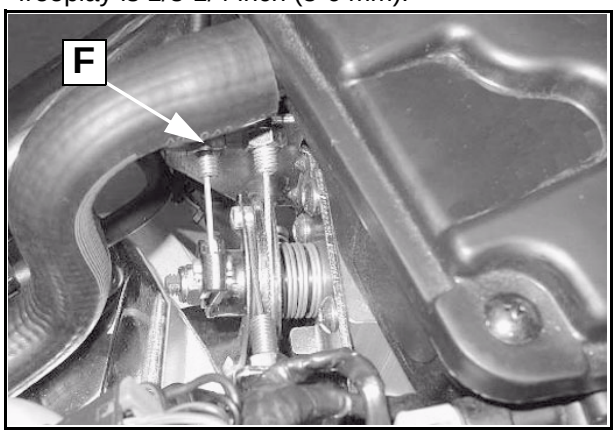


1. Measure fast idle lever freeplay (E) with handlebars straight ahead.

Specification: 3-6mm, 1/8-1/4″

Specification: Fast Idle Speed: 1500-3000 RPM

2. If adjustment is necessary; remove seat and fuel tank.
3. Loosen the fast idle cable adjuster jam nut (F).
4. Turn the cable adjuster in or out until the fast idle lever freeplay is 1/8-1/4 inch (3-6 mm).



5. Tighten the adjuster jam nut securely and reinstall the fuel tank and operator's seat.
6. Start engine and check fast idle speed.
7. Repeat procedure if fast idle speed is not within specified RPM.

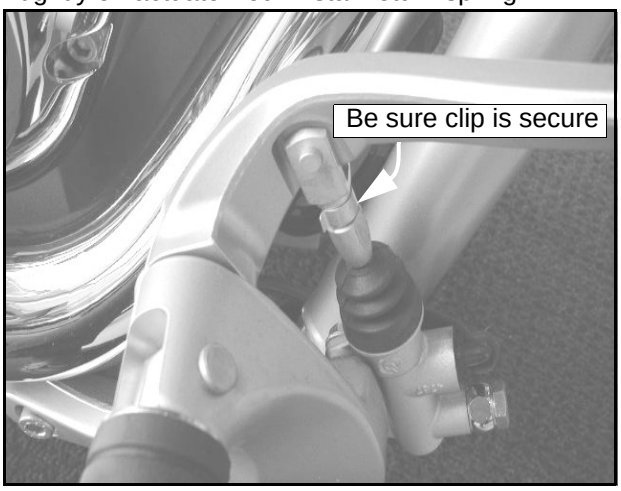
- Reduce freeplay to increase fast idle speed
- Increase freeplay to reduce fast idle speed
- Both speed and freeplay must be within specified range

SHIFT PEDAL & BRAKE PEDAL PIVOT LUBRICATION (FOOTPEG MODELS)

Lubricate brake pedal and shift lever at intervals listed on periodic maintenance table on page 2.11.

1. See Fig. 1. Remove right or left foot rest assembly (A).
2. **Brake Pedal Only:** Remove master cylinder screws. Open clip pin and remove it to disconnect pedal from master cylinder actuator rod.

3. Remove return spring. Remove snap ring (B), flat washer (C), brake or shift pedal and wave washer (D) from the support.
4. Clean off old lubricant and dirt from pivot shaft on the support post and from the pedal bushing.
5. Lubricate pivot shaft with Victory All-Purpose Grease.
6. Reassemble wave washer, pedal, flat washer, and snap ring. Be sure snap ring is seated properly in groove on support post. Replace snap ring if it does not fit tightly in the groove.
7. **Brake Pedal Only:** Install master cylinder actuator rod clevis onto pedal and insert the clip pin. Press clip onto actuator rod to secure the pin. Be sure clip fits tightly on actuator rod. Install return spring.



8. Install master cylinder screws (E). Torque to 10 Nm (84 in. lb.).
9. Reassemble foot peg assembly to frame torque the fasteners to specification.
10. Replace foot peg feeler (F) if worn. Torque to specification.

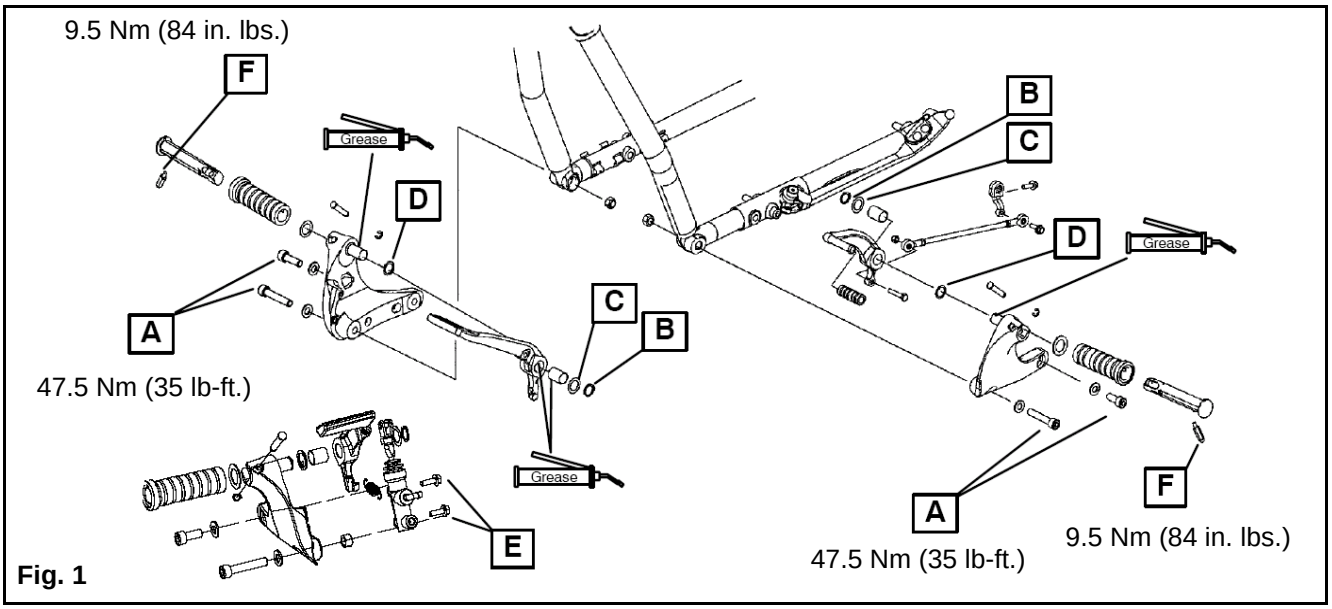
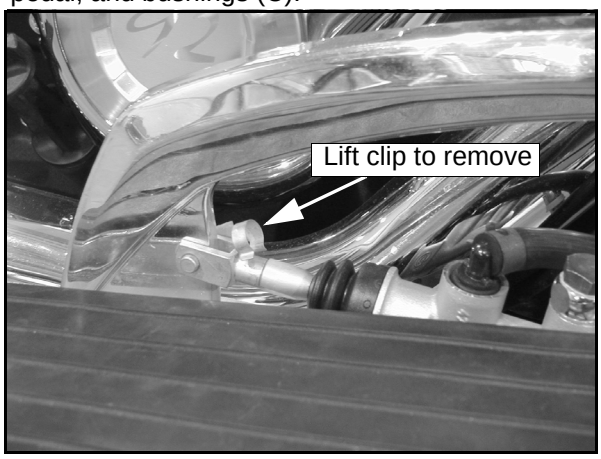


Fig. 1

SHIFT PEDAL & BRAKE PEDAL PIVOT LUBRICATION (FLOORBOARD MODELS)

Lubricate brake pedal and shift pedal at intervals listed on page 2.11.

1. See Fig. 2. Remove right or left floor board mount (A).
2. **Brake Pedal:** Open the clip pin and remove it to disconnect pedal from master cylinder actuator rod. Remove brake lever return spring, pivot bolt (B), brake pedal, and bushings (C).



3. **Shift Pedal:** Remove snap ring (D), flat washer (E), shift pedal with bushing, and wave washer (F) from the support.
4. Clean off old lubricant and dirt from pivot shaft or pivot bolt and from pedal bushing(s).
5. Lubricate pivot shaft with Victory All-Purpose Grease.
6. **Shift Pedal Only:** Reassemble wave washer, pedal, bushing, flat washer, and snap ring. Be sure snap ring is seated properly in groove on support post. Replace snap ring if it does not fit tightly in the groove.
7. **Brake Pedal Only:** Reassemble bushings in pedal and install pedal between support bracket. Install master cylinder actuator rod clevis onto pedal and insert pin. Press clip onto the actuator rod to secure the pin.
8. Install pedal bolt and nut and torque to specification.
9. Install return spring.

10. Reassemble floor board assembly to frame torque the fasteners to specification.
11. Replace floorboard feeler (G) if worn. Torque to specification.

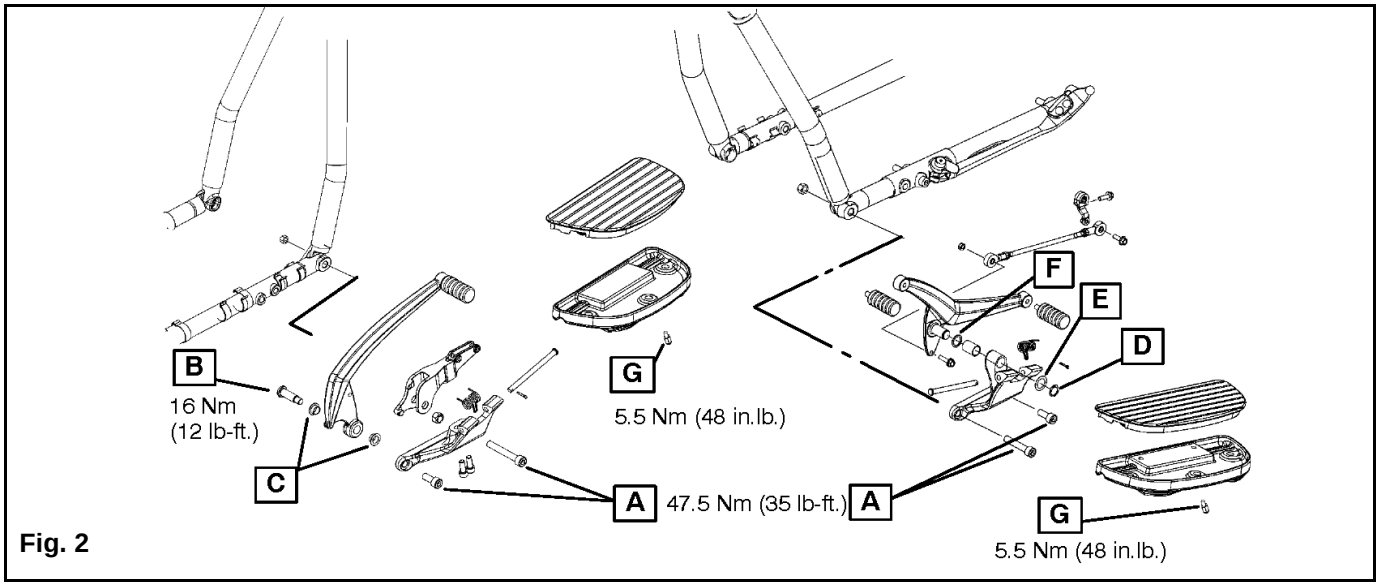


Fig. 2

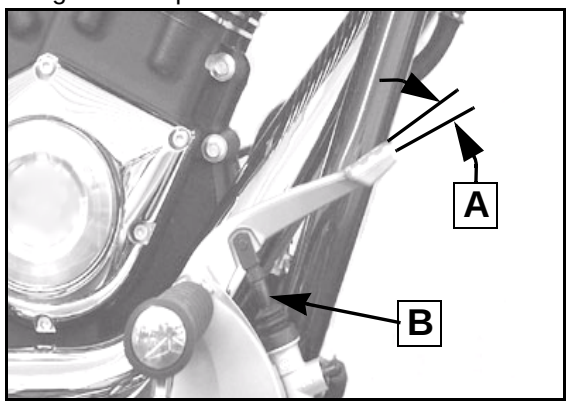
REAR BRAKE PEDAL FREEPLAY

> **⚠ WARNING**
>
> Operating a motorcycle with inadequate or faulty brakes could cause an accident, resulting in serious injury or death.

A soft or spongy feeling in the brake lever or pedal can indicate the presence of air in the brake system. This air must be removed by bleeding the brake system before the motorcycle is operated. Air in the system will cause greatly diminished braking capability and can result in loss of control of the motorcycle. Inspect and bleed the brake system if necessary.

1. Measure brake pedal freeplay as follows:

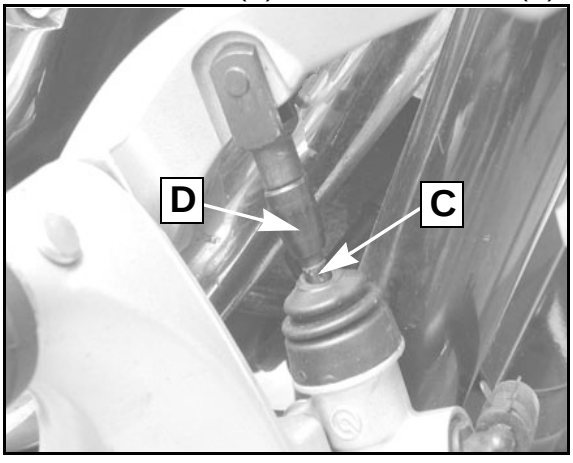
Apply light downward pressure to the pedal and measure the amount of movement at (A) before the actuator rod (B) contacts the master cylinder piston. If necessary, lift the boot up off the master cylinder body to view the end of the rod against the piston.



NOTE: No movement of the master cylinder piston should occur until pedal (at A) travels at least 4.5mm.

2. If pedal freeplay is incorrect, push dust boot down to expose top of actuator rod.

3. Hold actuator rod at (C) and loosen lock nut (D).



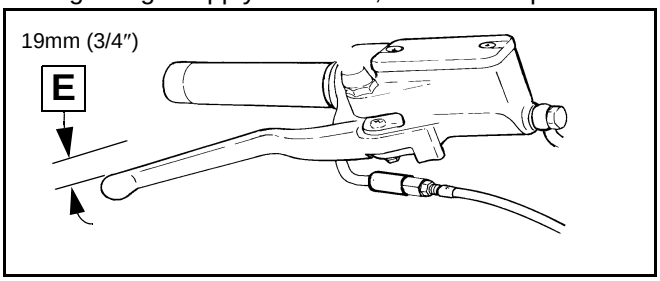
4. Rotate actuator rod as necessary to achieve correct brake pedal freeplay.

5. Tighten lock nut securely and replace boot.

> **⚠ WARNING**
>
> Elevate the rear wheel. Verify the rear wheel rotates freely without drag or binding through the full range of pedal freeplay. If brake drag is evident, repeat adjustment procedure or refer to Chapter 15 to inspect the brake system for the cause. Do not operate the vehicle if brake drag is evident.

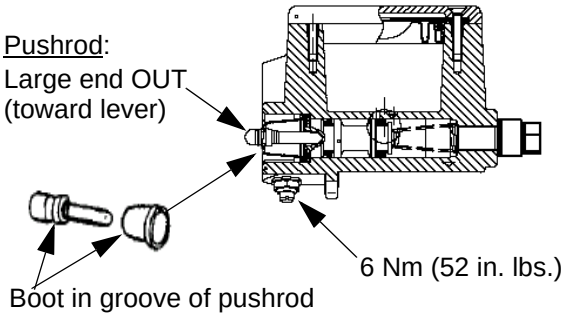
FRONT BRAKE LEVER FREEPLAY

1. Measure brake lever freeplay (E). It should move freely and smoothly and should return to its rest position quickly when released. You should feel a firm resistance in the lever within the first 3/4-inch (19 mm) of lever travel. If brake lever travels too far before beginning to apply the brake, refer to Chapter 15.



2. Elevate the front wheel and verify that the wheel rotates freely without drag when the lever is released.

3. The front brake lever freeplay is not adjustable. Refer to Chapter 15 and inspect the front brake system if lever freeplay is incorrect or if brake drags. If lever was removed be sure push rod is installed with large diameter end toward the lever.

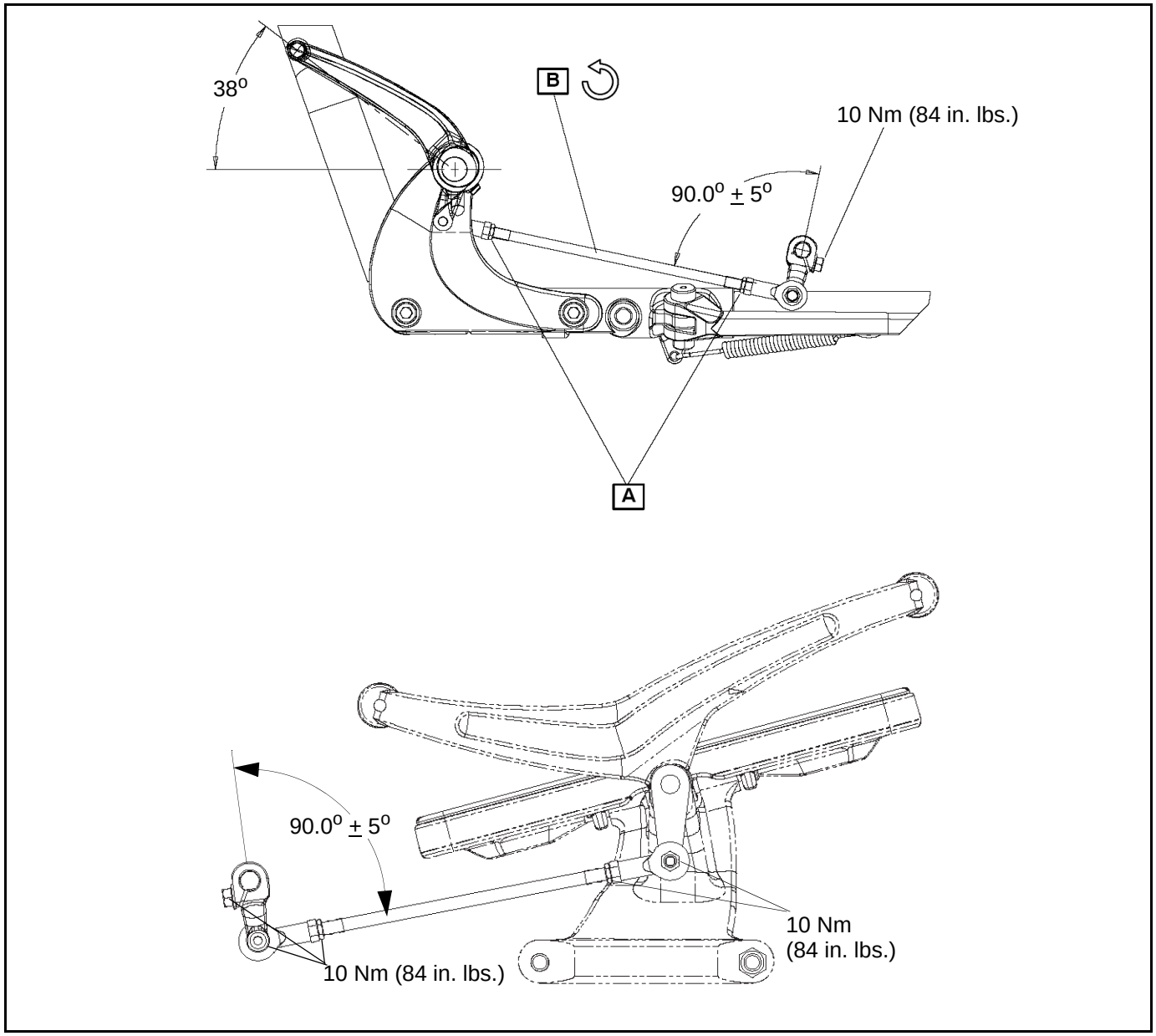


GEAR SHIFT PEDAL ADJUSTMENT

1. Loosen lock nuts (A).
2. Rotate linkage rod (B) until pedal angle is correct.
3. Tighten (A).

⚠ CAUTION

Do not remove and reposition the shift arm on the shift shaft to adjust gear shift pedal height. A 90 degree angle between the shift arm and the linkage rod must be maintained to ensure correct shift linkage operation.



BRAKE FLUID LEVEL INSPECTION

> **⚠ WARNING**
>
> Low brake fluid levels may let air enter the brake system, possibly creating poor or non-existent braking. Before riding, check brake fluid level and add if necessary.

Observe the following precautions:

- When checking the level of the brake fluids, make sure the reservoir is level. It may be necessary to move the handlebars or stand the motorcycle upright.
- Use only DOT 4 brake fluid. Leakage or poor brake performance may result from the use of improper fluid. Do not use brake fluid from a container that has been open for an extended period of time. Brake fluid can attract moisture when exposed to the atmosphere.
- Refill with the same type brake fluid. Mixing different types of fluids may result in detrimental chemical reactions and lead to loss of braking performance.
- Do not let water enter the master cylinder when refilling. Water significantly lowers the boiling point of the fluid and may result in poor braking.
- Brake fluid attacks many painted surfaces and plastic parts. Always clean up spilled fluid immediately with large quantities of water and mild detergent.
- A lowering of the brake fluid level is normal as the brake pads wear. If you notice a constant or sudden lowering of the brake fluid level, refer to Chapter 15.

The front master cylinder reservoir (A) is located on the right handlebar (Fig. 2). The rear brake reservoir (B in photo) is located behind the RH side cover.

Front Brake Fluid

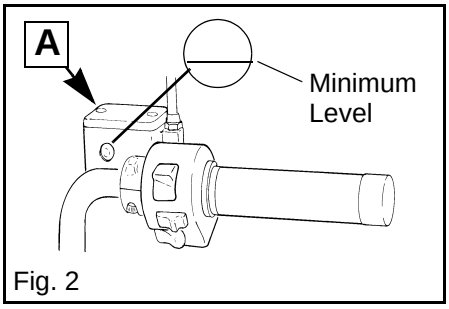
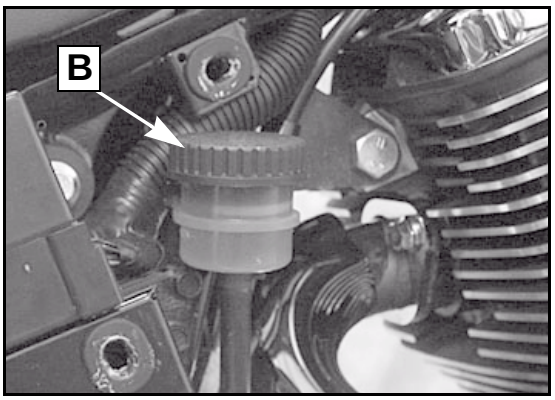


Fig. 2

1. Straddle motorcycle and bring it to a vertical position. Turn handlebars until reservoir (A) is horizontal.
2. View front brake fluid level through sight glass. The fluid should be clear and at a level in or above the sight glass.
3. Wipe area around reservoir cover with a clean cloth.
4. Wipe brake fluid container with a clean cloth.
5. Remove reservoir cover and gasket.
6. Carefully add enough DOT 4 brake fluid to bring level above sight glass.
7. Reinstall reservoir gasket and cover, and wipe reservoir clean.



Rear Brake Fluid

1. Remove right side cover. Straddle motorcycle and bring it to a vertical position or until reservoir (B) is horizontal.
2. View fluid level through side of reservoir. The fluid should be clear and at a level between MIN and MAX.
3. Wipe area around reservoir cover with a clean cloth.
4. Wipe brake fluid container with a clean cloth.
5. Remove reservoir cover and gasket.
6. Carefully add enough DOT 4 brake fluid to bring level between MIN and MAX marks. (Fig. 3)

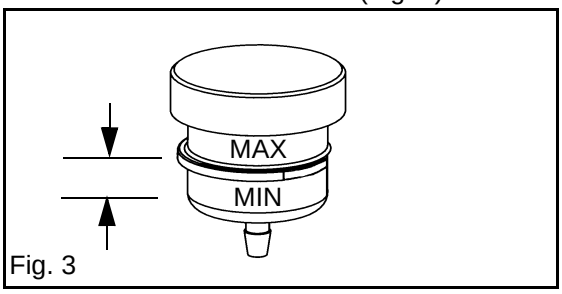


Fig. 3

7. Reinstall reservoir gasket and cover and wipe reservoir clean.

FRONT BRAKE PAD INSPECTION

Refer to Fig. 4. Wear indicator grooves (A) are provided on each front brake pad to allow for a visual inspection without pad removal. Inspect grooves by viewing pads from below the caliper (B). Replace pads if worn to bottom of grooves. Refer to Chapter 15 for pad replacement.

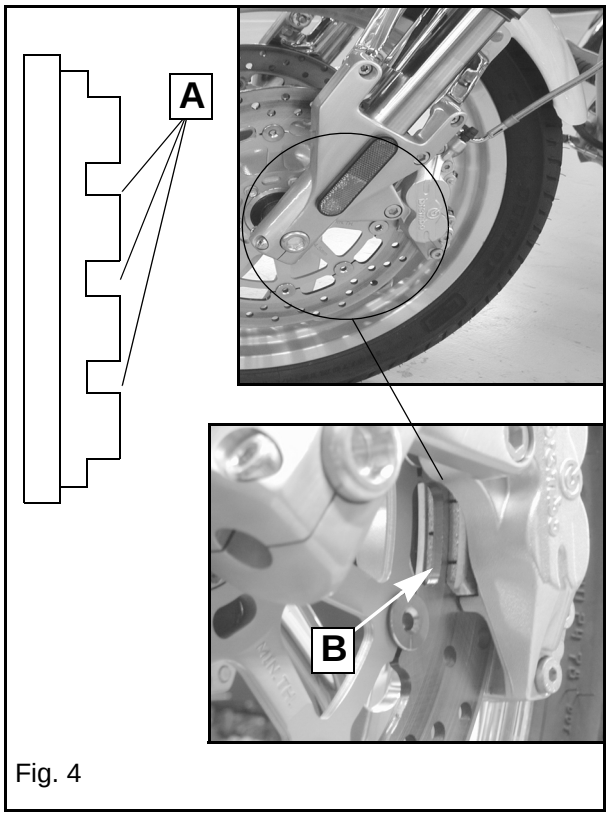


Fig. 4

REAR BRAKE PAD INSPECTION

Refer to Fig. 5. Wear indicator grooves (C) are provided on each rear brake pad to allow for a visual inspection of wear. Pads must be partially removed to make inspection easier. Refer to *Rear Brake Pad Replacement* in Chapter 15 to remove pads. Inspect pads and replace if worn to bottom of grooves.

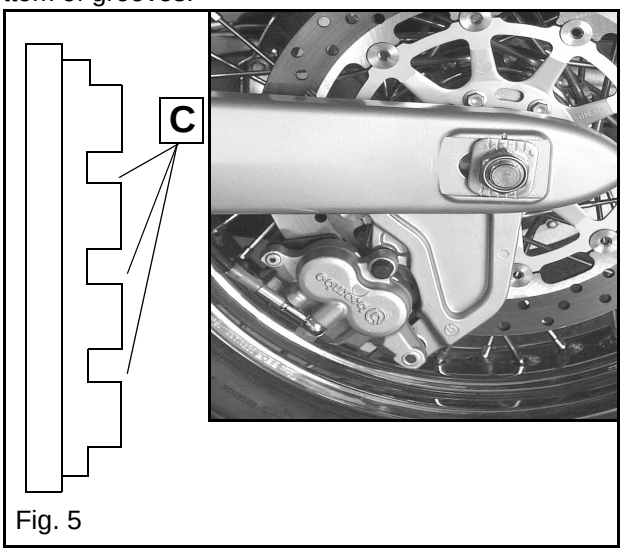
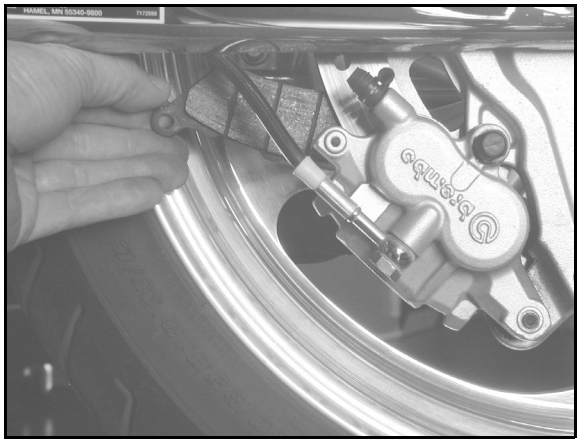
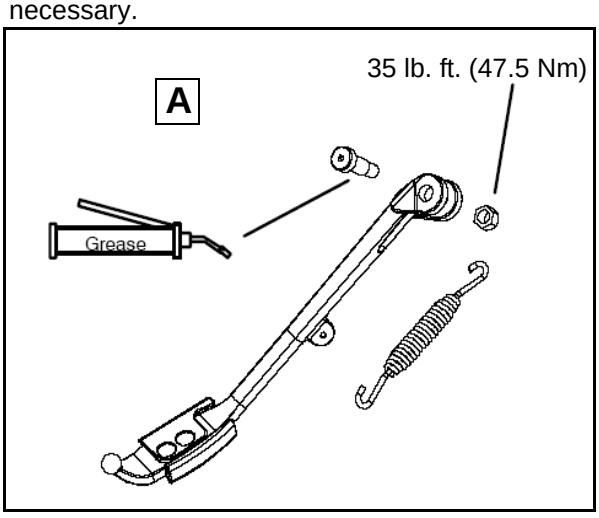


Fig. 5



SIDESTAND INSPECTION

1. Support the motorcycle in an upright position.
2. Inspect sidestand spring for damage or loss of tension. Be sure stand returns to fully retracted position.
3. Inspect sidestand for smooth movement. Lubricate if necessary.



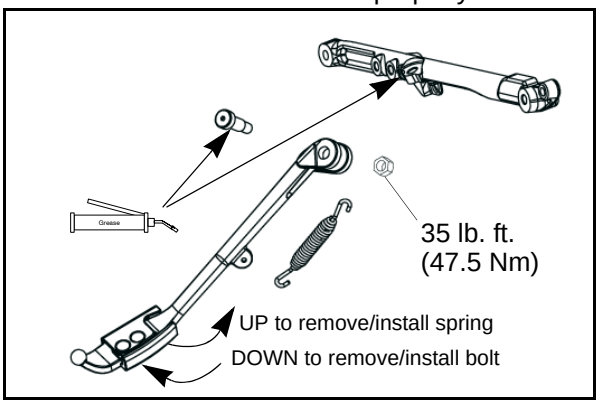
4. Inspect sidestand pivot bolt nut for proper torque.
5. Replace sidestand if it is bent. Do not attempt to straighten sidestand.
6. Inspect sidestand pad for wear.

SIDESTAND & SPRING REMOVAL

⚠ WARNING

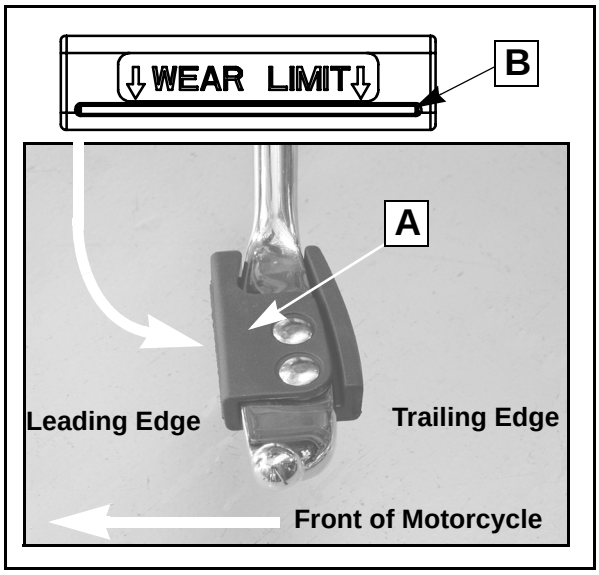
The sidestand spring is under tension. Wear eye and face protection when removing and installing the spring and sidestand. Be sure the vehicle is properly secured before you begin.

1. Sidestand will be moved between the UP (retracted) and DOWN (extended) position during removal and installation. Be sure vehicle is properly secured.



2. Remove sidestand pivot nut using a 15mm socket while holding bolt with a 6mm hex wrench.
3. Place sidestand in the DOWN position, then remove the bolt.
4. Grasp sidestand firmly and move it to the UP position.
5. Pull sidestand straight rearward against spring tension until mounting flange on sidestand is clear of the recessed mounting boss on the frame cradle.
6. Remove spring.
7. *Installation:* Attach spring to sidestand.
8. Lightly grease sidestand mounting boss on frame rail and the shouldered portion of the pivot bolt.
9. Place loose end of spring through hole in frame rail.
10. With sidestand in the retracted position (up), pull stand straight rearward against spring tension until the mounting flange on the sidestand drops into the recessed mounting boss on the frame cradle.
11. Swing sidestand to the extended position to align bolt hole and install bolt and nut.
12. Torque nut to 35 ft.lbs. (47.5 Nm) and wipe off any excess grease.Cycle the sidestand to be sure it moves freely, and returns to the fully retracted position.
13. Cycle the sidestand to be sure it moves freely, and returns to the fully retracted position.

SIDESTAND PAD INSPECTION / PAD REPLACEMENT



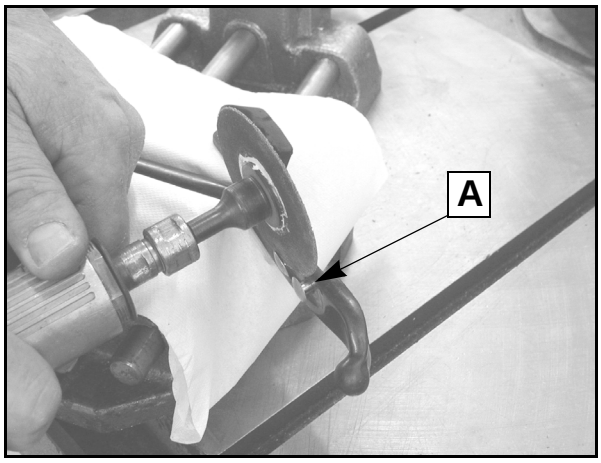
Sidestand Pad Inspection

1. Inspect the sidestand rubber pad (A) for wear. Be sure pad is secured in place and not damaged or torn. Replace pad if worn to or beyond the wear mark (B). See page 2.26 for replacement procedure.

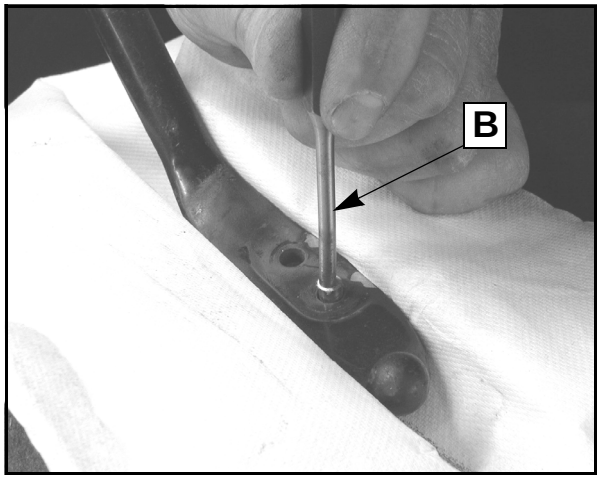
SIDESTAND PAD REPLACEMENT

Sidestand Pad Removal

1. Remove side stand from frame.



2. Place sidestand in a soft-jawed vise.
3. Remove rubber pad with a pliers to expose the rivets.
4. Using an angle grinder, cut off the head of both rivets on the top side of the sidestand foot (A). Be careful to avoid grinding wheel contact with the finished area of the stand.

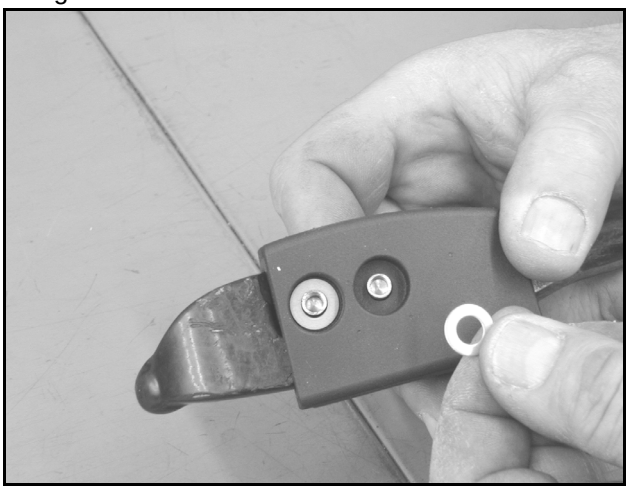


5. Drive rivets out of sidestand foot from top to bottom with a suitable drift punch (B).

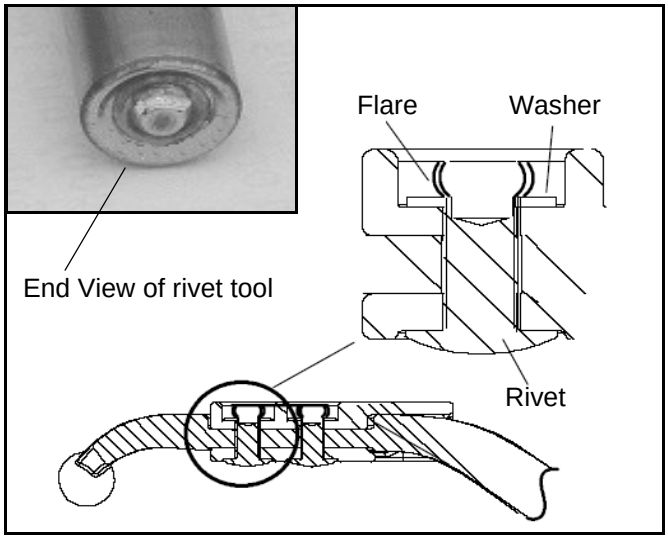
Sidestand Pad Installation

> **⚠ CAUTION**
>
> The sidestand pad is a safety component and must be installed properly.

1. Install new sidestand pad with open end on trailing edge of stand.



2. Install new rivets from top to bottom.
3. Invert sidestand and place washers over rivets.
4. Hold washers and rivets in place and set sidestand on a hard surface (such as the anvil of a vise) with hollow end of rivets facing upward. Push washers as far down as possible. Be sure washers are at least 1/16 - 1/8 inch (1.5-3mm) below hollow end of rivets.
5. Peen hollow end of rivets with a commercially available rivet tool. Be sure rivets, washers and pad are secure.



NOTE: An alternative method is to use a center punch to start a flare on hollow end of rivet, then use a 1/4 inch drift (flat) punch to complete the peening operation.

6. Apply touch up paint or primer to exposed bare metal.

FUEL PRE-FILTER INSPECTION

1. There are two pre-filters located inside fuel tank on fuel pump pickups. Scheduled maintenance is not required on these filters. (Fig. 7)

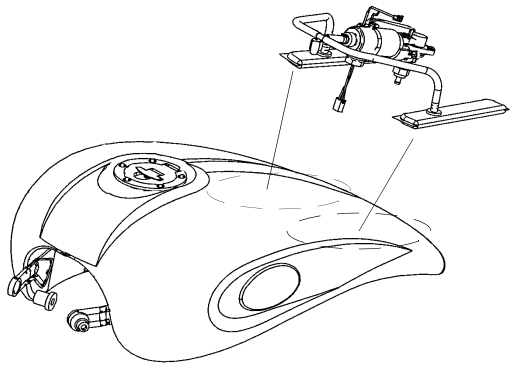
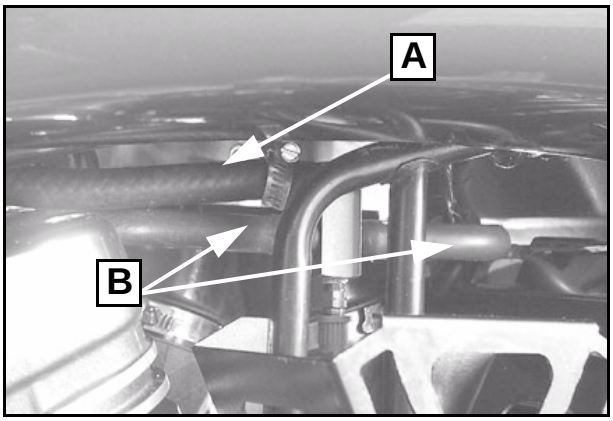


Fig. 7

NOTE: If fuel tank is extremely contaminated, refer to Fuel System Chapter 5 to remove fuel pump from tank.

NOTE: See *Priming The Fuel System* in Chapter 5 if fuel system is run completely dry.

FUEL SYSTEM INSPECTION



1. Remove seat.
2. Remove fuel tank (page 5.9).
3. Inspect fuel supply line (A) and fuel rail (B) for deterioration, damage, leakage, or kinked areas.
4. Replace any components that fail inspection with genuine Victory replacement parts.

⚠ WARNING

The fuel lines exiting fuel pump are subjected to high pressure. Replace with genuine Victory replacement parts to reduce the possibility of fuel line failure. Be sure fuel lines are routed properly and do not come in contact with sharp or hot objects, or anything that may cause wear or damage.

FUEL TANK VENT INSPECTION (49 State, Canada, UK)

NOTE: To inspect fuel cap vent refer to page 5.14.

1. Inspect fuel tank vent hose (C) in accordance with periodic maintenance schedule and any time fuel tank has been removed and installed. Be sure the hose is clear and not pinched or kinked, and that all connections are tight. (Fig. 8)
   Refer to Chapter 1 for fuel tank vent inspection procedure.

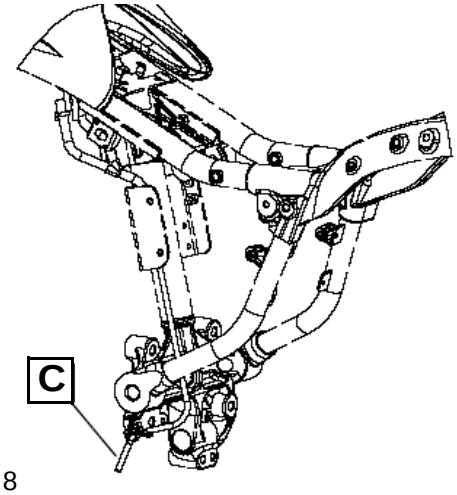
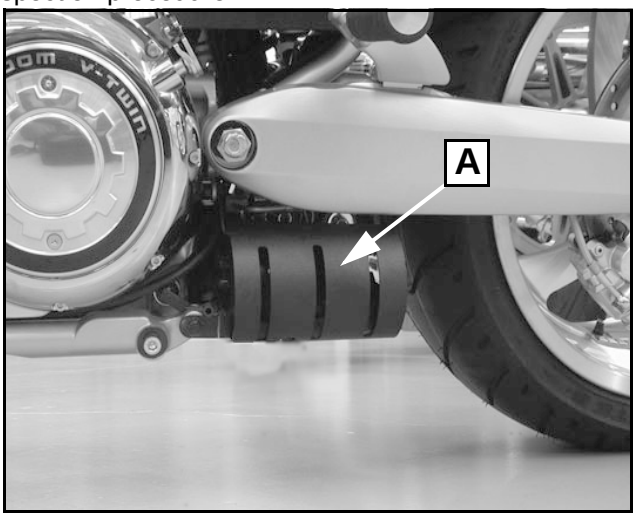


Fig. 8

EVAPORATIVE EMISSION CONTROL SYSTEM (California Models)

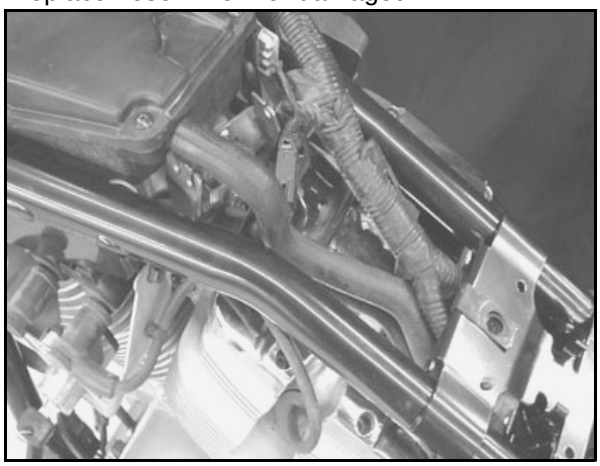
NOTE: The fuel tank vent is routed to evaporative canister. The canister (A) is located on lower left side of motorcycle. Be sure all hoses are clear and not pinched or kinked, and all connections are securely attached. Refer to page 1.31 for hose connection diagram and inspection procedure.



CRANKCASE VENTILATION (BREATHER) INSPECTION

1. Remove side covers.

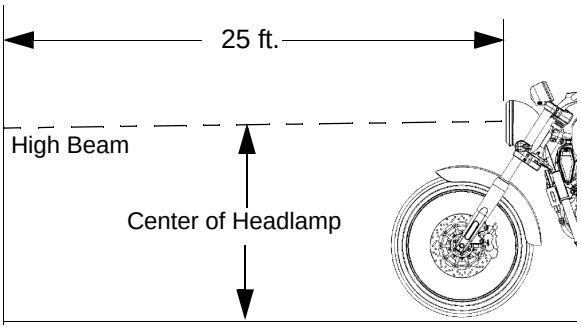
2. Remove operator's seat.
3. Remove fuel tank.
4. Inspect condition of rubber hose at crankcase ventilation fitting on engine and at air box connection.
5. Inspect entire length of crankcase ventilation hose for leaks or damage.
6. Be sure hose is not restricted or kinked.
7. Replace hose if worn or damaged.



HEADLIGHT AIM ADJUSTMENT

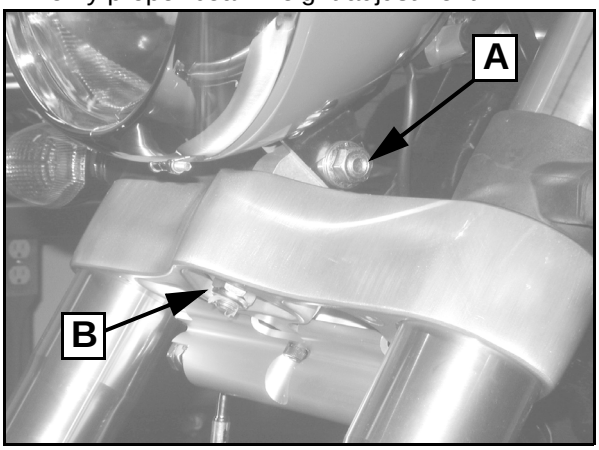
The headlamp should shine straight ahead of the motorcycle. The top of headlamp high beam must be just below center of lamp at a distance of 25 feet (7.62 m).

1. Check and adjust the tire pressure.



2. Verify suspension preload is set correctly before adjusting headlight. (Refer to page 2.40)
3. Straddle the motorcycle in an upright position and sit in the operator's seat.
4. Turn ignition switch ON. Set headlamp to High beam. Check headlamp for correct aim.

5. To adjust headlamp vertically:
   - Loosen headlamp pivot bolt (A)
   - Adjust beam to proper vertical height
   - Tighten nut (47.5 Nm / 35 lb.-ft.)
   - Verify proper beam height adjustment



6. To adjust headlamp horizontally:
   - Loosen headlamp mount nut (B)
   - Adjust beam to proper horizontal position (straight ahead)
   - Tighten nut (38 Nm / 28 lb.-ft.)
   - Verify proper horizontal adjustment

SPARK PLUG REMOVAL & INSPECTION

WARNING

HOT COMPONENTS Wear insulated gloves and/ or allow engine and exhaust to cool before handling these parts.

1. With the engine at room temperature, remove seat.

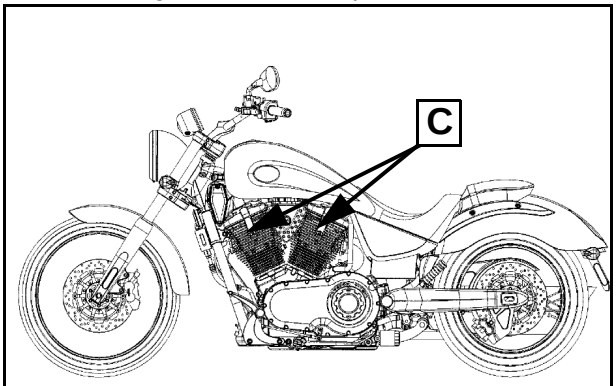


Fig. 9

2. Disconnect spark plug caps (C) and clean the area around spark plug base using compressed air. (Fig. 9)
3. Remove spark plugs.
4. Inspect spark plugs for:
   - Insulator damage
   - Worn electrodes
   - Color of insulator

NOTE: The color of the insulator gives a general indication of engine operation. Additional troubleshooting is necessary to determine if a problem exists:

Light to dark brown	**Good**
White	**Lean fuel mixture**
Wet or black sooty deposit	**Over-Rich mixture**
	Oil control problems

SPARK PLUG INSTALLATION

1. Inspect spark plug gap with a wire gauge. If gap adjustment is necessary, bend ground electrode carefully using a spark plug gap tool. (Fig. 10)

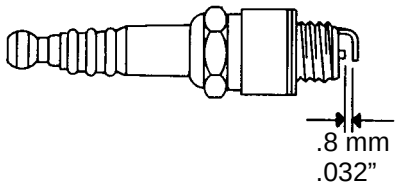


Fig. 10 11 mm (8.5 lb-ft.)

Specification:

NGK CPR6EB-9 **Gap: .8mm (.032in)**

2. Torque new spark plugs to 11 Nm (8.5 lb-ft.)

⚠ CAUTION

Do not over tighten spark plug. Damage to the cylinder head or spark plug may result.

BATTERY

This motorcycle is equipped with a maintenance free battery which is located under the left side cover. DO NOT remove cell caps or add distilled water to the battery. If the battery discharges, refer to Chapter 16 for diagnostic procedures.

⚠ WARNING

Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing. Antidote:

External: Flush with water.

Internal: Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

Eyes: Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries. **KEEP CHILDREN AWAY FROM BATTERY.**

⚠ CAUTION

Whenever removing the battery, disconnect the negative (black) cable first. When reinstalling the battery, connect the negative (black) cable last.

Do not remove the battery cables while the engine is running. Doing so may damage the Electronic Control Unit (ECM).

Take great care not to reverse the battery leads when installing the battery. Reverse power applied to the ECM will damage it instantly.

BATTERY CHARGING

Refer to page 16.7-16.10, Charging System and Battery.

BATTERY STORAGE

When the motorcycle is not used for periods of one month or longer, charge the battery using the charging plug harness or remove battery from motorcycle and charge it. Store battery in a cool, dry place.

Battery should be charged monthly using a 12 volt battery charger with a maximum charge rate of 1.8 amp-hr.

WARNING

Battery charging can create explosive gasses; keep sparks, flames, cigarettes or anything that could ignite the gasses away. Provide adequate ventilation when charging in an enclosed space. Batteries contain acid that is caustic. Wear protective clothing and a face shield or protective eyewear when working with the battery. KEEP OUT OF REACH OF CHILDREN.

BATTERY INSPECTION

Battery terminals and connections should be kept free of corrosion. If cleaning is necessary, remove the corrosion with a stiff wire brush. Wash with a solution of one tablespoon baking soda to one cup water. Rinse well with tap water and dry off with clean rags. Coat terminals with dielectric grease.

1. Visually inspect the exterior of the battery. Replace battery if housing is damaged, case is deformed, or if electrolyte is leaking.
2. To remove corrosion, remove battery from motorcycle and wash terminals with water and baking soda solution. Clean terminals, bolts, and cable ends with a brass wire brush and apply a thin film of dielectric grease.
3. Measure battery voltage. (Fig. 11)

Specification: 12.5V DC minimum

4. If battery voltage is below 12.5 V DC, remove battery from motorcycle and charge (refer to page 16.7). Replace battery if it will not accept a charge.

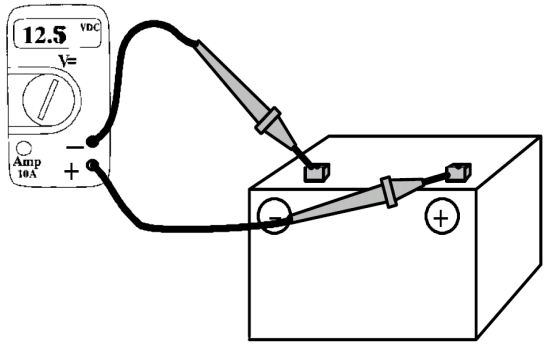
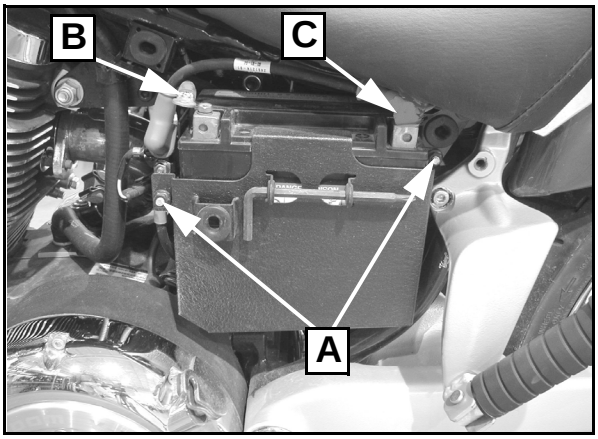


Fig. 11

BATTERY REMOVAL

1. Remove both side covers.

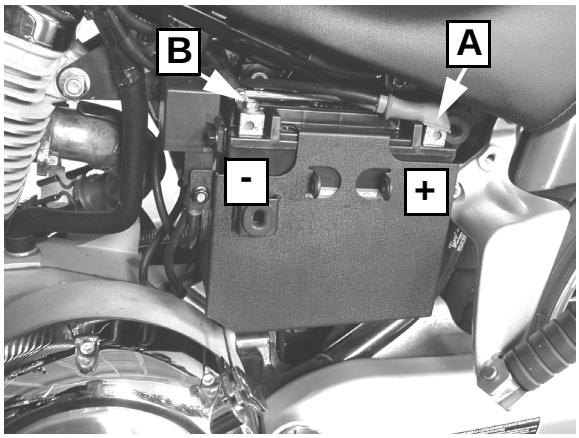


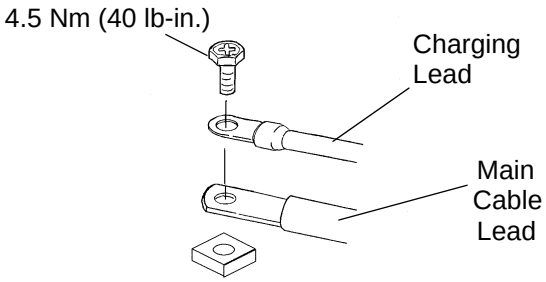
2. Remove operator's seat.
3. Remove battery cover nuts (A) and cover.
4. Remove negative battery terminal bolt and cable first (B).
5. Remove positive battery terminal bolt and cable last (C).
6. Remove battery.

BATTERY INSTALLATION

NOTE: Be sure cable ends and battery terminals are clean. Apply a light film of dielectric grease to terminal bolt threads.

1. Carefully install battery with negative (-) terminal toward front of vehicle.
2. Connect positive cable (+) and charging lead ring terminal (with red marking).

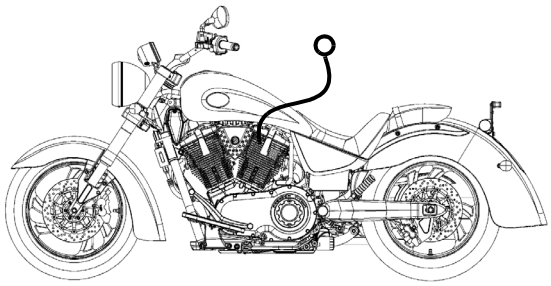




3. Apply dielectric grease over terminal area for corrosion protection.
4. Slide red protective boot (A) over the positive terminal.
5. Connect ground (negative) cable (B) and charging lead ring terminal.
6. Apply dielectric grease over terminal area for corrosion protection.
7. Install battery cover. Assemble two nuts to studs and torque to 4.5 Nm (40 lb.-in.).
8. Install seat and side cover.

ENGINE COMPRESSION TEST

1. Warm engine to operating temperature.



III. 1

2. Shift transmission into neutral and stop engine.
3. Disconnect spark plug caps and remove spark plugs one at a time. Connect a spark plug to each cap and connect center electrode of plug to a good engine ground during compression test.
4. Install compression tester in one spark plug hole (leave the spark plug in the other cylinder). (Ill. 1)
5. Open throttle and crank engine until needle on compression gauge stops rising (about 5 seconds).
6. Repeat procedure for other cylinder. Cylinder compression should be within 10% of each other.

Specification:
STD: 205-215 psi ± 20 psi (1413-1482 ± 138 kPa)
SERVICE LIMIT: Below 160 PSI

High engine compression may indicate:

- Carbon deposits on piston crown
- Carbon deposits on cylinder head
- Carbon deposits on valves
- Engine modification
- Addition of performance parts
- Faulty Gauge

Low engine compression may indicate:

- Worn piston and/or piston rings
- Piston ring stuck in the piston ring groove
- Leaking exhaust or intake valves
- Leaking head gasket
- Slow starter motor cranking speed
- Restricted exhaust system
- Valve timing incorrect
- Non-OEM camshafts or faulty gauge

Use Carbon Clean Fuel Additive to remove carbon deposits from cylinder head and piston crown. Follow the directions on the printed on the container.

Carbon Clean Fuel Additive: 2872190

If cylinder compression is below specification, perform a cylinder leakage test to determine where the leak is occurring. Follow the instructions provided with the leakdown tester.

Cylinder Leakdown Tester: PV-35667-A

ENGINE COMPRESSION TEST (Wet)

If a cylinder leakage tester is not available, perform a wet cylinder compression test.

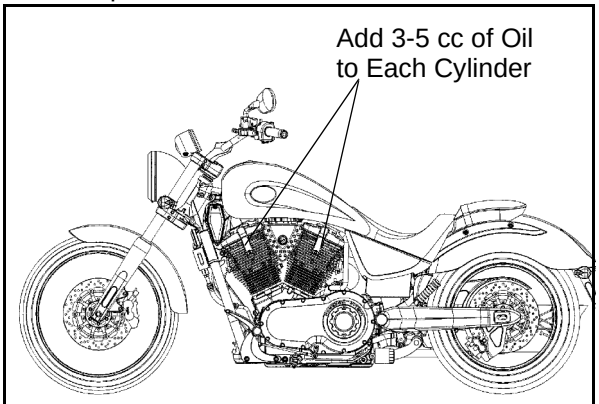


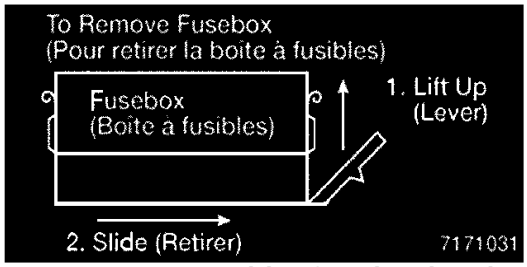
Fig. 12

1. Pour 3-5 cc of clean engine oil into each cylinder through spark plug hole. Repeat cylinder compression test. (Fig. 12)
2. If compression increases substantially, inspect cylinder, piston, and rings.
3. If compression does not increase, inspect valves and valve seats.

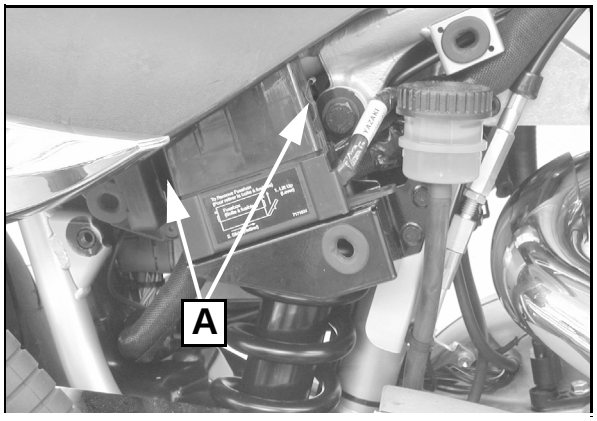
FUSE REPLACEMENT

Fuses and relays are located in the fuse box under the right side cover.

1. Remove right side cover.
2. Lift front tab of fuse box and slide fusebox forward and off bracket to gain access to cover tabs.



Fuse Box Removal (on fuse box base)



3. Push back tabs on each side of fuse box cover (A) and lift cover off.

If any fuse is blown, turn off main switch. Install new fuse of specified amperage. Turn on switches and see if system operates correctly. Repeat fuse failure indicates an electrical problem. Refer to electrical section (beginning at Chapter 16.)

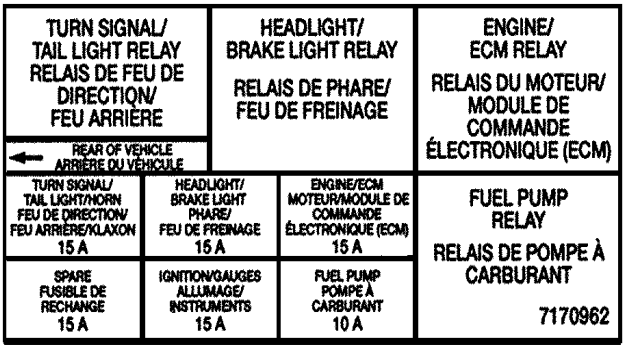
Fuse Application	Fuse Size
Engine/ECM	15 amp
Fuel Pump	10 amp
Headlamp / Brake Lamp	15 amp
Tail Lamp, Flashers, Indicator Lamp, Horn	15 amp
Ignition / Gauges	15 amp
SPARE FUSE	15 amp

⚠ CAUTION

Do not use fuses of a higher amperage rating than what is specified.

If the correctly rated fuse continues to blow, something is wrong and needs to be corrected. Substituting a higher amperage fuse can lead to extensive electrical system damage and possible fire.

FUSE BOX DIAGRAM



Under right side cover, on side of fuse box cover.

DRIVE BELT INSPECTION

NOTE: Inspect drive belt in accordance with Periodic Maintenance Interval Chart on page 2.11, and replace at specified intervals regardless of belt condition.

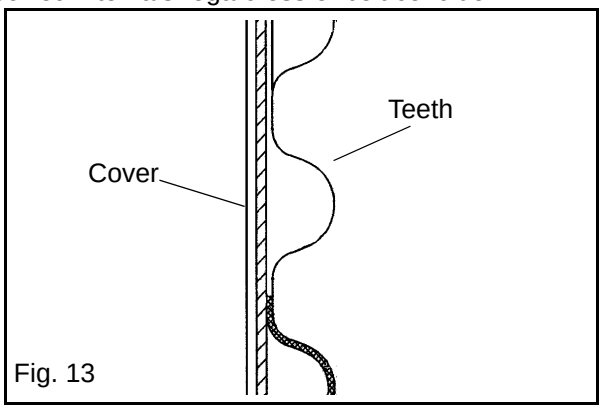
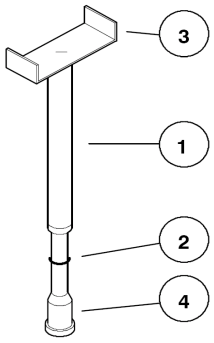


Fig. 13

1. Periodically inspect drive belt for cuts, excessive wear, foreign substance (oil, grit), missing teeth, or any other damage. (Fig. 13)
2. If any damage is found, belt should be replaced.
3. Adjust drive belt tension at intervals in accordance with the Periodic Maintenance Interval Chart on page 2.11.
4. If the drive belt or sprocket is being replaced due to damage, replace belt and both sprockets as a set if drive system has more than 5000 miles (Km) of use.

Belt Tension Gauge



Special Service Tool
PV-43532

1. Gauge Body
2. O-Ring
3. Base
4. Plunger

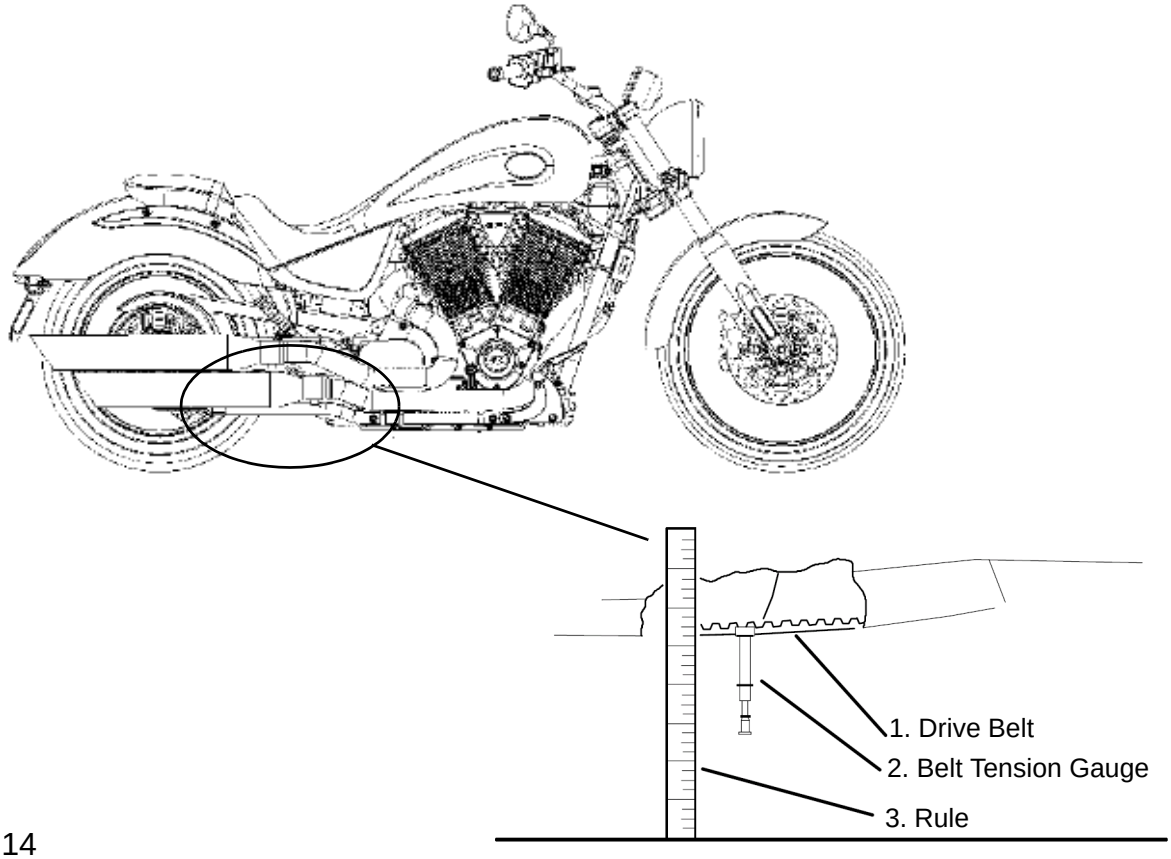


Fig. 14

DRIVE BELT TENSION INSPECTION

⚠ WARNING

Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

1. Secure motorcycle in an upright position (Fig. 14).
2. Shift transmission into NEUTRAL.
3. ELEVATE rear wheel off the ground when checking deflection or adjusting the belt.

Do not adjust the belt when wet, or immediately after riding. Belt must be dry and the drive system must be at ambient temperature (60-80° F). This is extremely important for accuracy.

Find Tight Spot In Belt

4. Use the tire valve stem as a reference and perform the following Steps:
   - Check / record belt deflection at 4 different points, 90 degrees apart. Rotate wheel in a CLOCKWISE rotation as viewed from belt side of motorcycle.
   - Place a mark on rear wheel at the tightest point (least deflection) to use as a reference.
   - Continue to rotate the wheel in normal drive direction (CLOCKWISE) 1-2 revolutions back to your reference mark (the tightest point).
   - Adjust belt deflection with wheel in this position.

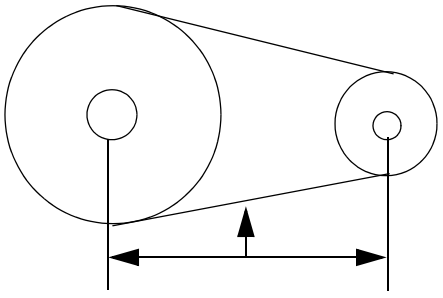


Fig. 15

5. Place tape measure or ruler next to drive belt or use the graduations on belt bracket for reference. (Fig. 14 page 2.35).
6. Slide O-ring on belt tension gauge to the 10 lb. mark.
7. Place belt tension gauge squarely against belt at center (Fig. 15) and keep it at a 90° angle to the belt surface (Fig. 16)

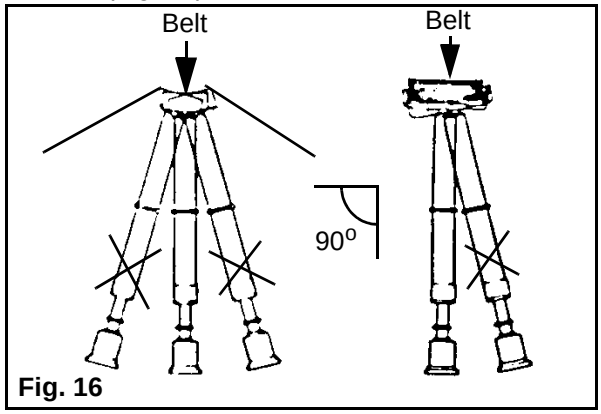


Fig. 16

8. Push up on gauge until O-ring just touches tool body.
9. If belt deflection is greater than specified distance with 10 lbs. of force, tighten the belt. If deflection is less than specified with 10 lbs. of force, loosen the belt. Refer to page 2.37 to adjust belt tension and maintain or adjust belt alignment.

Belt tension gauge: PV-43532

BELT DEFLECTION (All Vegas & Kingpin)		
@ 10 lbs. force	**2003-2005**	**2006**
After 500 miles on drive system	11.0 mm ± .5 (7/16″ ± 1/64)	12.0 mm ± .5 (15/32″ ± 1/64)
New drive systems (new belt & sprockets)	9.0 mm ± .5mm	10.0 mm ± .5mm

SONIC TENSION DATA		
The following data is provided for use with the Gates 507C Sonic Tension Meter. Follow instructions included with the meter.		
Required Data	**2003-2005**	**2006**
Span (mm)	656.50	658.30
Belt Width (mm)	36	28
Belt Mass Constant	7.9	7.9
Tension (Hz) [lbs] (∠ 500 miles)	(33 Hz) [120 lbs]	(36 Hz) [110 lbs]
Tension (Hz) [lbs] (after 500 miles)	**(30 Hz) [100 lbs]**	**(32 Hz) [90 lbs]**

DRIVE BELT TENSION ADJUSTMENT / WHEEL ALIGNMENT

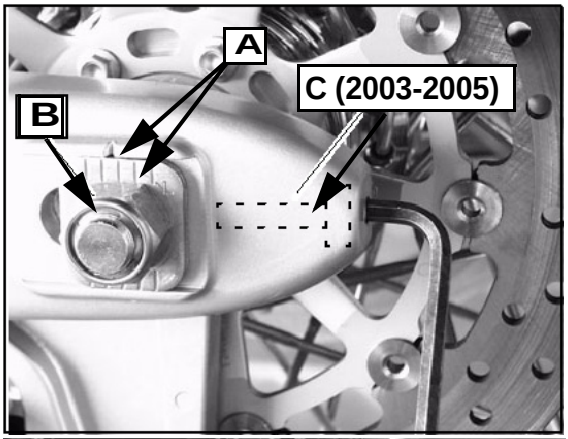
NOTE: Inspect wheel alignment before adjusting drive belt tension.

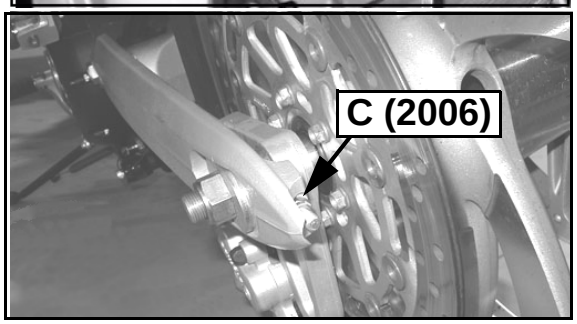
> ⚠ WARNING
>
> **Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.**

> ⚠ WARNING
>
> **A mis-aligned rear axle can damage the drive belt, causing it to fail and loss of control of the motorcycle**.

Rear Wheel Alignment

1. Secure the motorcycle on a solid surface or on a lift table and place the transmission in Neutral.
2. Inspect the position of the axle washer alignment marks (A) on each side in relation to the single mark on the swingarm. The marks should be in the same position on both sides.
3. Raise the rear tire off the floor with a suitable motorcycle lift placed securely under the frame.

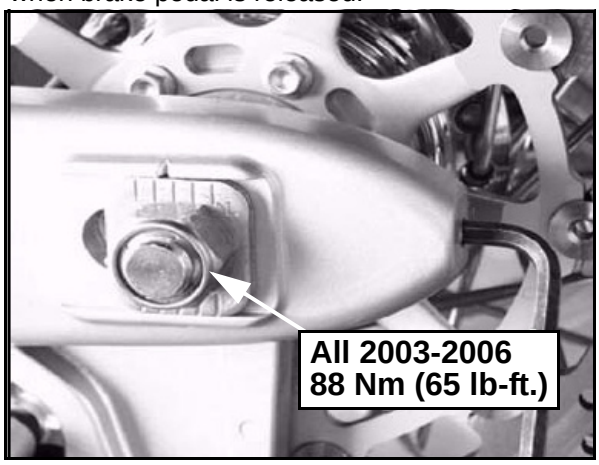




4. Loosen axle nut (B) about 1 1/2 turns.
5. Insert a hexagonal wrench through the access hole in the back of the swingarm (2003-2005) or use a deep well socket on the nut (2006) and turn both left and right adjusters (C) an equal amount (if wheel is in alignment) or as required to align wheel and achieve proper tension (see Drive Belt Tension Inspection" page 2.36.) Turning the screw or nut clockwise tightens the belt (draws axle rearward).

NOTE: Turn axle adjusters about 1/16 of a turn at a time and monitor wheel alignment and belt tension as you proceed.

6. When alignment and belt tension is correct, tighten rear axle nut to 65 ft. lbs (88 Nm).
7. Verify proper drive belt tension and alignment.
8. Pump rear brake pedal several times to reset brake pad distance.
9. Verify wheel rotates smoothly and freely without drag when brake pedal is released.



SPROCKET INSPECTION

1. Inspect rear sprocket teeth for wear or damage from foreign material. (Fig. 17)

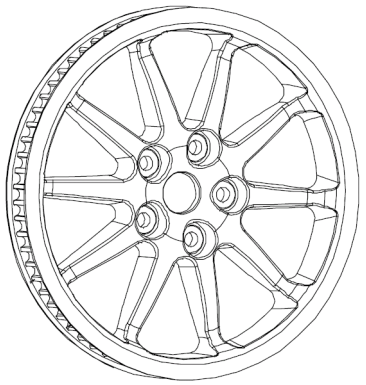


Fig. 17

2. Inspect drive sprocket for wear or damage from foreign material. Make sure the sprocket nut and lock plate screws are tight. (Fig. 18)

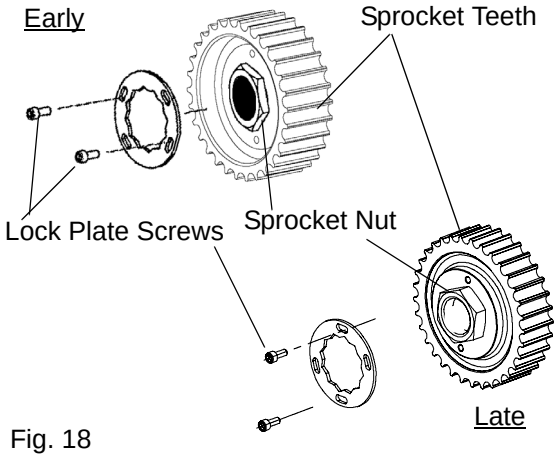


Fig. 18

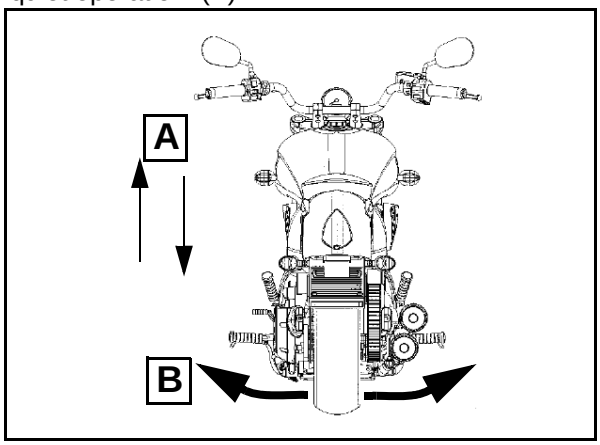
3. If the sprocket nut or lock plate is loose, refer to page 11.5 to remove, inspect, and reassemble the sprocket, sprocket spacer (seal sleeve), nut, and lock plate.
4. Check drive belt tension (page 2.36) and rear wheel alignment (page 2.37).

REAR SUSPENSION / SWINGARM INSPECTION

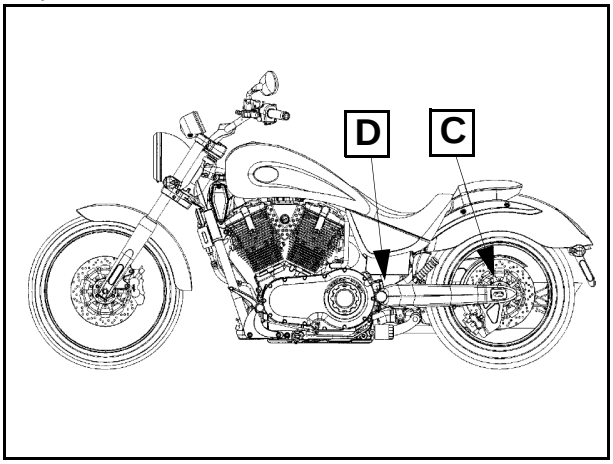
⚠ WARNING

Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

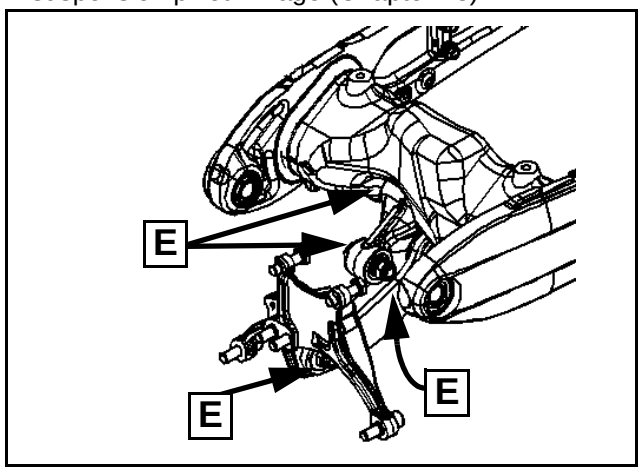
1. Sit astride the motorcycle. Compress the rear suspension several times and check for smooth and quiet operation. (A)



2. Secure motorcycle with rear wheel elevated.
3. Inspect for worn swing arm bearings by grasping the rear wheel and attempting to move wheel side-to-side (B).
4. If movement is detected, determine if movement is at axle area (C) or swingarm pivot area (D). Refer to Chapter 13 for wheel bearing and swingarm bearing replacement.



5. Rotate rear wheel and inspect for smooth rotation of rear wheel bearings. If roughness or unusual sounds are detected, inspect rear wheel bearings (page 13.7), belt tension and alignment (page 2.36 - 2.37), and brake pads (page 2.24).
6. Inspect rear shock for leakage and all rear suspension components for damage or loose fasteners.
7. Inspect suspension pivots and shock mounts for radial movement in all pivot joints (E). If a joint has radial movement, remove rear shock absorber and inspect suspension pivot linkage (Chapter 13).



8. Verify axle nut is tight.
9. Replace any worn or damaged parts.

RIDE HEIGHT MEASUREMENT (Rear Shock Spring Pre-Load)

Have an assistant help you complete the following procedure. Refer to Fig. 19 below.

1. Set front and rear tire pressure to specification (page 2.14). Place motorcycle on a level paved surface.
2. Load motorcycle with all cargo that will be carried. With motorcycle in upright position, have operator sit on the seat with riding gear on. If a passenger will be riding also, have the passenger sit on the passenger seat with riding gear on.
3. Compress rear suspension a few times by pushing on seat and slowly releasing. Make sure suspension moves freely without binding.
4. With as much rider weight on the seat as possible and the motorcycle upright and level, measure the distance (A) from floor to rearmost flat section of right side frame cradle as shown below.
5. Record measurement and compare to specification.
6. If ride height is not as specified, adjust shock spring pre-load. Refer to page 2.41.

SPECIFICATION: RIDE HEIGHT

Vegas / Ness / Eight Ball: 131mm (5.15") ±3mm (1/8″)
Kingpin / Ness Kingpin: 127mm (5.00") ±3mm (1/8″)

- **Motorcycle loaded & in upright position**
- **Operator, passenger, & Gear**
- **Tire Pressure set for load (page 2.14)**

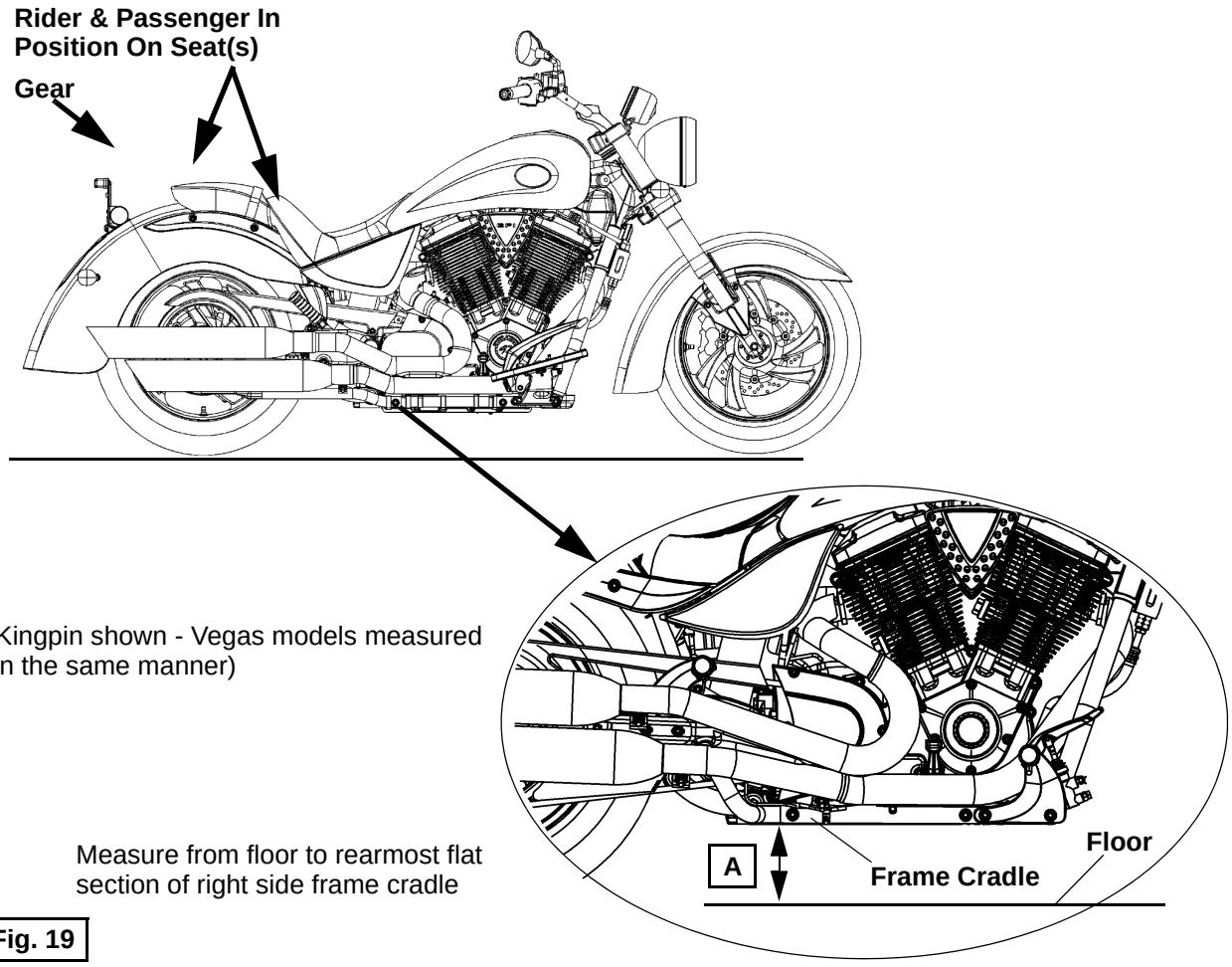
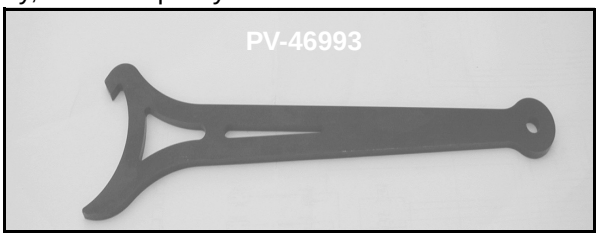


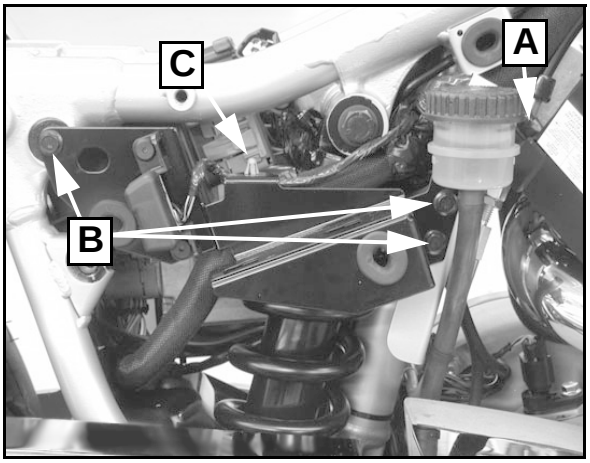
Fig. 19

RIDE HEIGHT ADJUSTMENT (Shock Spring Pre-Load)

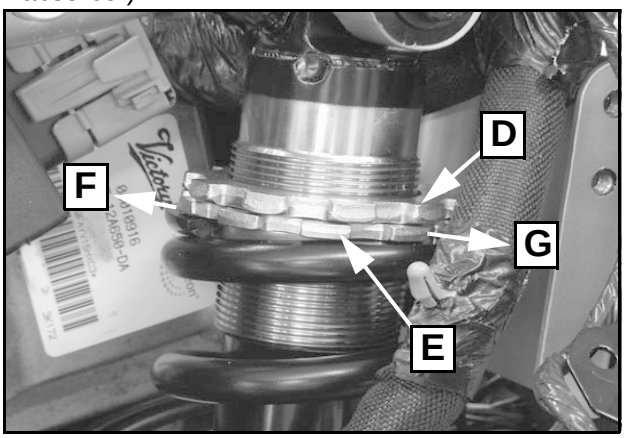
This procedure involves using the shock absorber preload wrench PV-46993. Ride height should be set for load conditions before riding to ensure optimum handling, safety, and ride quality.



1. Remove right side cover.
2. Remove fuse box (page 2.34).



3. Remove rear brake reservoir (A) from bracket. Secure reservoir in upright position.
4. Remove (3) bolts holding right side panel to chassis (B).
5. Release plastic wiring harness dart (C) from panel.
6. Move panel and harness to access spring adjuster nut.
7. The uppermost spanner nut on the shock is the locknut (D). The spanner nut closest to the spring is the adjustment nut (E). Loosen the locknut by turning it counterclockwise (as viewed from the top of shock absorber).



8. Spray a light lubricant (sparingly) on the shock spring where it contacts the adjuster nut. Do not allow spray to contact the drive belt or tire.
9. Adjust preload by rotating adjuster nut clockwise (as viewed from the top of shock absorber) to INCREASE the height measurement (firm) (F), or counterclockwise to DECREASE the height measurement (soft) (G).
10. Re-check height dimension after adjustment.
11. Tighten lock nut securely against adjuster nut when adjustment is complete. Wipe away any residual lubricant from shock, spring, adjuster nut, and lock nut.
12. Reinstall electrical harness to panel.
13. Install the (3) panel bolts and tighten securely.
14. Install rear brake reservoir to bracket.
15. Install fuse box and right side cover.

FASTENERS

1. Inspect all fasteners on the vehicle to be sure they are tight. Refer to the appropriate chapter as required for torque specifications.

FRONT SUSPENSION INSPECTION

⚠ WARNING

Damaged, worn, or loose suspension components may cause loss of control, increasing the chance of a crash or possible injury. Damaged, worn, or loose suspension components must be repaired before the motorcycle is operated. See Chapter 12.

1. Place motorcycle on sidestand and inspect front forks. Make sure no fork oil present on the outer fork tubes (A), fork seals (B), or around the sliders (C) (Fig. 20)

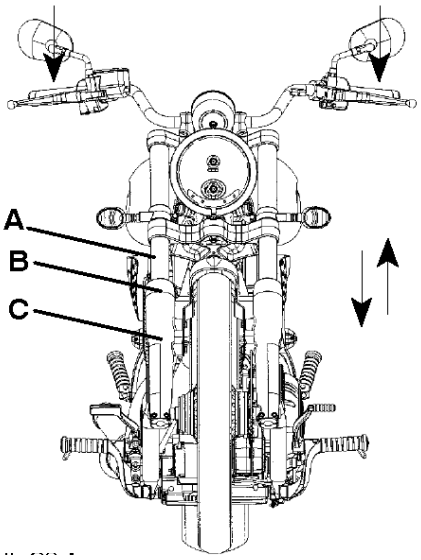


Fig. 20

2. Clean fork tubes with mild soap and water as required to remove bugs, tar, or buildup which may cause seal wear or leakage.
3. Inspect outer surfaces of inner fork tubes for scoring, scratches, and damage from foreign objects.
4. Inspect for any signs of oil leaking from fork seals. Refer to Chapter 12 if seals are leaking.
5. With motorcycle upright, apply front brake and pump forks through travel range several times. Fork operation should be smooth and quiet.
6. Verify all fasteners are tight. Refer to Chapter 12.
7. Replace worn or damaged parts.

STEERING HEAD / WHEEL BEARING INSPECTION

⚠ WARNING

Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.

NOTE: Be sure control cables, hoses and wiring are not interfering with handle bar rotation.

1. Secure motorcycle with front wheel off the floor.

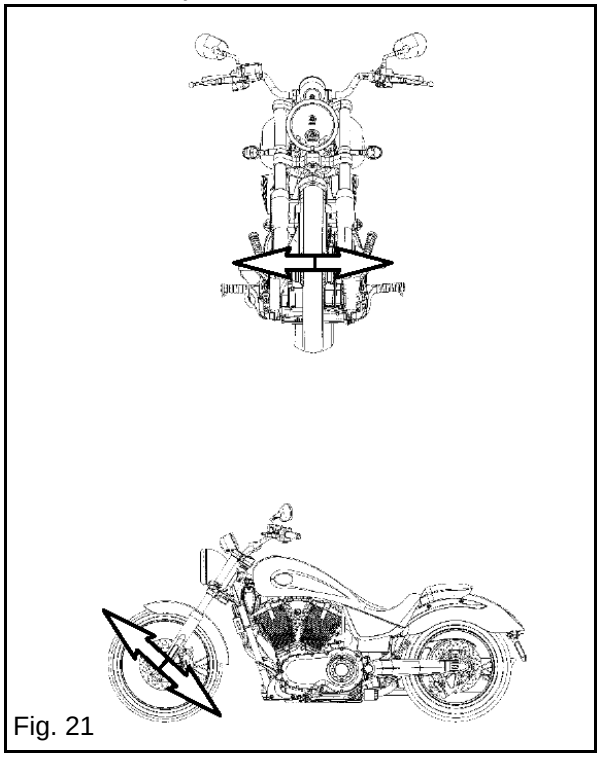


Fig. 21

2. Turn handle bars full right or left and hold against the fork stop. Attempt to move front wheel side-to-side (D, Fig. 21). If movement is observed, inspect front axle, wheel, and bearings (Chapter 12).
3. Turn handlebars from full left to full right and inspect for smooth, free movement. Point front wheel straight ahead, grasp fork tubes and pull/push fork tubes back and forth (E, Fig. 21). If steering binds, feels rough or uneven, or if movement is detected at steering stem, adjust or replace steering head bearings as necessary. (Chapter 12).
4. Rotate front wheel and inspect for smooth rotation of front wheel bearings. If roughness or unusual sounds are present, replace front wheel bearings (Chapter12).

CLEANING

NOTE: Refer to page 2.10 for cleaning product part numbers.

Before cleaning the motorcycle, do the following:

Be sure exhaust has cooled completely. Block off end of exhaust pipes to prevent water from entering exhaust system.

Make sure spark plugs, oil dipstick and all filler caps are securely installed.

Avoid spraying the air box / air filter area.

Degreaser may be applied to excessively greasy areas. **NOTE:** When using degreaser, do not apply to any cosmetically painted or plated areas. Also, do not apply to any areas that depend upon grease for proper functioning such as brake and shifting pivot points. If degreaser is necessary in these areas, make sure to re-apply grease in the appropriate areas after your cleaning is finished.

Pre-soak, removing excess dirt and degreaser off with a low pressure garden hose.

> ⚠ CAUTION
>
> High pressure washing may cause water seepage into bearings, pivoting or sliding areas. Electrical parts, electrical connectors, wheel bearings and seals can become damaged or contaminated with water if excessive pressure is used.

Once the bulk of the dirt has been rinsed off, wash all surfaces with warm water and a mild detergent.

Rinse the motorcycle off immediately with clean, low pressure water and dry the surfaces with a chamois cloth or clean soft absorbent cloth.

Do not use abrasive cleaners. Polishing and cleaning with them will accelerate the wear of your tank badge.

WAXING, POLISHING, APPLYING PROTECTANTS

(Items Other Than Windshields)

After washing and drying the motorcycle, you can help extend the life and appearance of its components by waxing painted surfaces, polishing chrome surfaces, and applying a protectant to exposed rubber, vinyl, and plastic parts. Avoid cleaning-waxing compounds, as they may contain abrasives that may damage the finish of painted parts. For chrome surfaces, use either a window-cleaning solution or a polish specifically designed for chrome. Follow manufacturer's instructions for proper application and use of wax, polish, or protectants.

After washing and drying the motorcycle, to help extend the life and appearance of its components:

- Wax painted surfaces. Avoid cleaning-waxing compounds, as they may contain abrasives that may damage the finish of painted surfaces.
- Polish chrome surfaces. Use either a window-cleaning solution or a polish specifically designed for chrome.
- Apply a protectant to exposed rubber, vinyl, and plastic components.

> ⚠ WARNING
>
> **Do not use a protectant on the seats, handgrips, or footpegs that leaves a slippery coating after it dries. If these surfaces are slippery, you may have difficulty holding your position on the motorcycle while riding, which may cause you to lose control of the motorcycle.**
>
> **Follow manufacturer's instructions and safety precautions on wax, polish, and protectant labels to prevent injury or damage.**

Windshield Care (Accessory)

A windshield is included with some Victory models or available as an accessory.

Wash the windshield using a clean soft flannel or chamois cloth or sponge soaked in a solution of mild detergent and warm water, applying minimal pressure as you wash. Let the detergent do the cleaning, not the pressure you apply. Excessive washing pressure may cause dirt, sand, or other foreign materials on the windshield to scratch it. Soak the cloth or sponge in the detergent and water solution frequently to provide plenty of soapy water for washing, and keep the cloth or sponge clean by rinsing it frequently.

- Minor scratches may be removed with a quality plastic polishing compound. Follow the manufacturer's instructions when using plastic polishing compounds.
- Insects, oil, tar, and tree sap may also damage the motorcycle's finish. If normal washing does not remove these materials, you may need to use a special cleaner. Choose a cleaner designed for use on clear plastic and follow the manufacturer's instructions when using special cleaners.

- Paint, glue residue, or grease removal: Moisten cotton with Naphtha or turpentine followed by a wash as stated above. Apply a high quality plastic cleaner such as McGuiar's Mirror-Glaze MG-17, or Novus #2 plastic polish to the windshield. This will leave a protective coating on the windshield, making future cleanings easier.

⚠ CAUTION

Do not use glass water and soil repellents, petroleum or alcohol based cleaners as these products can damage the windshield.

⚠ CAUTION

Windshield material is polycarbonate plastic. Do not use cleaners or rain protective products meant for glass surfaces on the windshield.

Repairing Painted Surface Damage

After cleaning the motorcycle, inspect it for damage to the painted surfaces. If you discover chips or scratches in the paint, apply genuine Victory touch-up paint as soon as possible to prevent corrosion. Refer to page 1.5 - 1.7.

STORAGE

NOTE: Refer to page 2.10 for cleaning product part numbers.

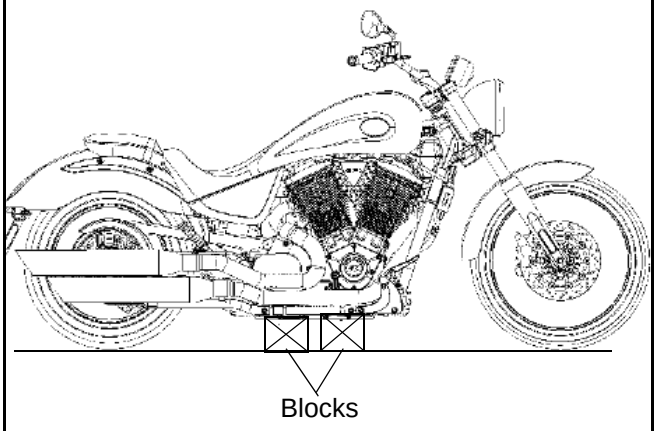
To prevent storage damage due to long-term storage (60 days or more) the following guidelines should be followed.

1. Top off fuel tank with fresh fuel and add fuel stabilizer to fuel.
2. Run motorcycle for 15 minutes or more to distribute fuel stabilizer throughout fuel system.
3. Clean motorcycle completely.
4. Dry machine thoroughly and wax all painted surfaces.
5. Change engine oil as outlined in Chapter 2.
6. Block frame to take some of the weight off of front and rear wheels.
7. Secure a plastic bag over the exhaust outlets to prevent moisture from entering the exhaust system.

IMPORTANT: Make certain exhaust system is cool prior to securing plastic.

8. Remove battery and charge it according to instructions on page 16.7-16.9, Charging System and Battery.
9. Store battery in a cool, dry area.
10. The battery should be charged monthly using a trickle charger.
11. Cover motorcycle with a genuine Victory cover, or a covering made of fabric that allows for adequate ventilation. Do not use plastic or tarps, as corrosion may result.

IMPORTANT: Starting the motorcycle periodically during storage is not recommended. Water vapor is a by-product of the combustion process and corrosion may result unless the engine is operated long enough to bring the oil and exhaust system to normal operating temperature.



Set floor jack under the center of the engine. Raise vehicle off the floor and set 2 blocks underneath the bike as shown. Set bike down on blocks.

CHAPTER 3
FRAME-BODY-EXHAUST

SAFETY 3.2
GENERAL PRECAUTIONS 3.2
SPECIAL TOOLS 3.3
TROUBLESHOOTING 3.3
PROCEDURES 3.3
SIDE COVER REMOVAL 3.3
IGNITION SWITCH OIL LINE COVER REMOVAL / INSTALLATION 3.3
SEAT REMOVAL & INSTALLATION 3.4
PASSENGER SEAT / SEAT BASE 3.4
REAR FENDER REMOVAL (VEGAS TYPICAL) 3.5
REAR FENDER INSTALLATION 3.5
REAR FENDER REMOVAL (KINGPIN TYPICAL) 3.6
REAR FENDER INSTALLATION 3.6
EXHAUST MUFFLER 3.7
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FRONT FENDER 3.9
SADDLEBAGS 3.10
WINDSHIELD 3.11

SAFETY

GENERAL PRECAUTIONS

This section covers the removal and installation of the frame body panels and exhaust system. Always replace exhaust system sealing gaskets when exhaust components are removed. Inspect the system for leaks after installation.

⚠ WARNING

Gasoline is extremely flammable and explosive under certain conditions.

Always stop the engine and refuel outdoors or in a well ventilated area.

Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.

Do not overfill the tank. Do not fill the tank neck above the fuel tank insert. Leave air space to allow for fuel expansion.

If you get gasoline in your eyes or if you swallow gasoline, see your doctor immediately. Never try to syphon gasoline using mouth suction.

If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.

Never start the engine or let it run in an enclosed area. Gasoline powered engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.

⚠WARNING

The engine exhaust from this product contains chemicals known to cause cancer, birth defects or other reproductive harm.

⚠WARNING

Improper repairs or service can create unsafe conditions that may cause serious injuries or death to your customers or others.

⚠WARNING

Never run the engine in an enclosed area without a properly functioning exhaust gas evacuation system connected to the product.

⚠WARNING

Engine and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wear insulated protective clothing or wait for components to cool sufficiently before working on the machine.

⚠WARNING

Engine exhaust from this product contains poisonous carbon monoxide gas that can cause loss of consciousness and may lead to death.

⚠WARNING

Modifications to this motorcycle not approved by Victory may cause loss of performance, excessive emissions, and make the machine unsafe for use.

SPECIAL TOOLS

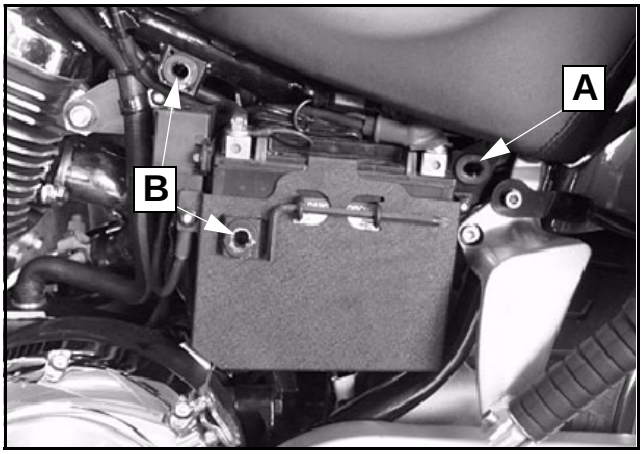
No special tools are required in this section.

TROUBLESHOOTING

EXHAUST SYSTEM TROUBLESHOOTING	
SYMPTOM	POSSIBLE CAUSE
Excessive Exhaust Noise	Broken or Leaking Exhaust System
Vibration	Loose Exhaust Mounts Exhaust Contacting Frame
Poor Performance	Bent or Damaged Exhaust Components Deformed Exhaust Components Leaking Exhaust System Plugged or Restricted Exhaust System

PROCEDURES

SIDE COVER REMOVAL



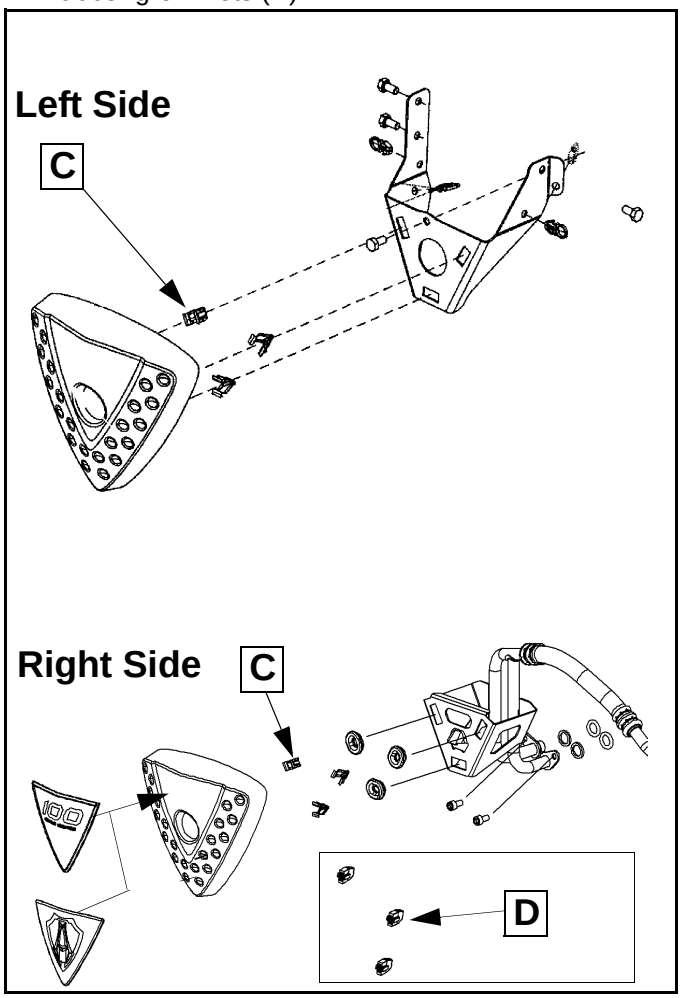
1. Grasp rear corner of cover and pull out slightly until tab (A) is disengaged.
2. Pull carefully on upper corner and lower edge of cover to disengage tabs (B).

Installation

1. Lubricate rubber grommets with mild soap and water solution. Push cover evenly inward to engage all 3 tabs.

IGNITION SWITCH OIL LINE COVER REMOVAL / INSTALLATION

1. Grasp ignition switch cover (left side) or oil line cover (right side) and pull outward to release 3 clips (C) or rubber grommets (D).



Installation

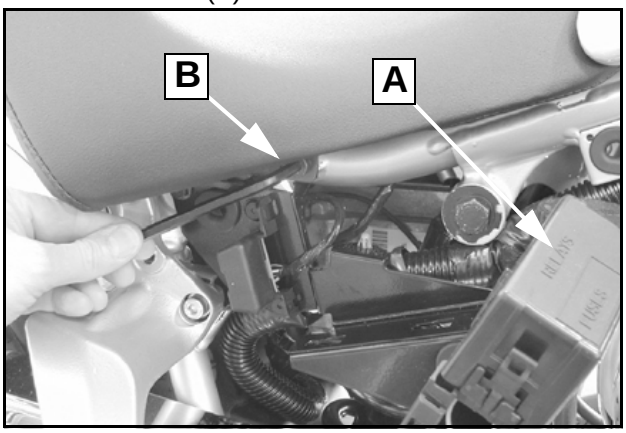
1. Push cover evenly inward to install. Lubricate rubber grommets with mild soap and water solution where applicable.

SEAT REMOVAL & INSTALLATION

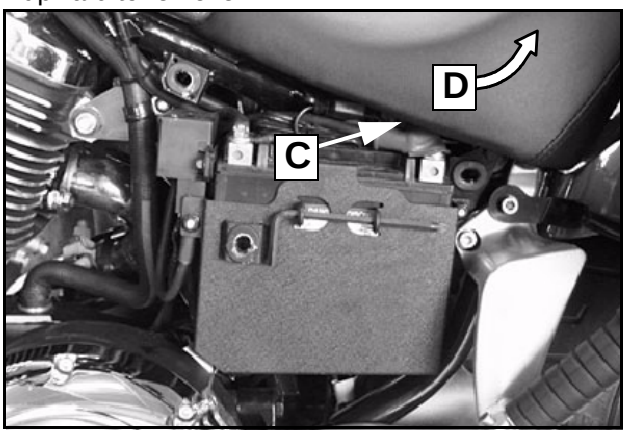
> **WARNING**
>
> **Always make sure the seat is securely fastened before riding the motorcycle. A loose seat could cause a sudden shift in riding position, causing you to lose control of the motorcycle.**

Operator Seat Removal

1. Remove left and right side covers.
2. Remove fuse box (A) from base.
3. Remove screw (B).



4. Remove screw (C).
5. Lift the rear of the seat (D) and pull rearward and upward to remove.



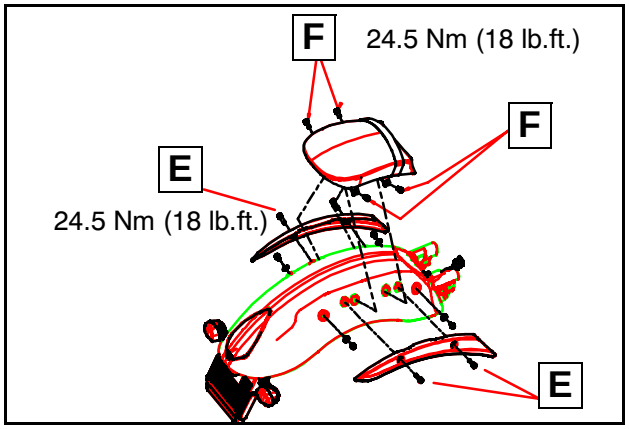
Seat Installation

1. Slide tongue of seat into rubber mount at rear of fuel tank.
2. Push down on rear of seat until screw holes align.
3. Ensure front seat tab is engaged in front rubber mount.
4. Reinstall screws. Tighten to 24.5 Nm (18 lb.ft.)

PASSENGER SEAT / SEAT BASE

Removal

1. Remove (4) rail cover screws (E).
2. Remove four seat fasteners (F).
3. Lift passenger's seat off frame with seat base attached.



Installation

1. Set seat base in place and align mounting holes.
2. Install fasteners and torque to specification.
3. Install rail covers and torque screws to specification.

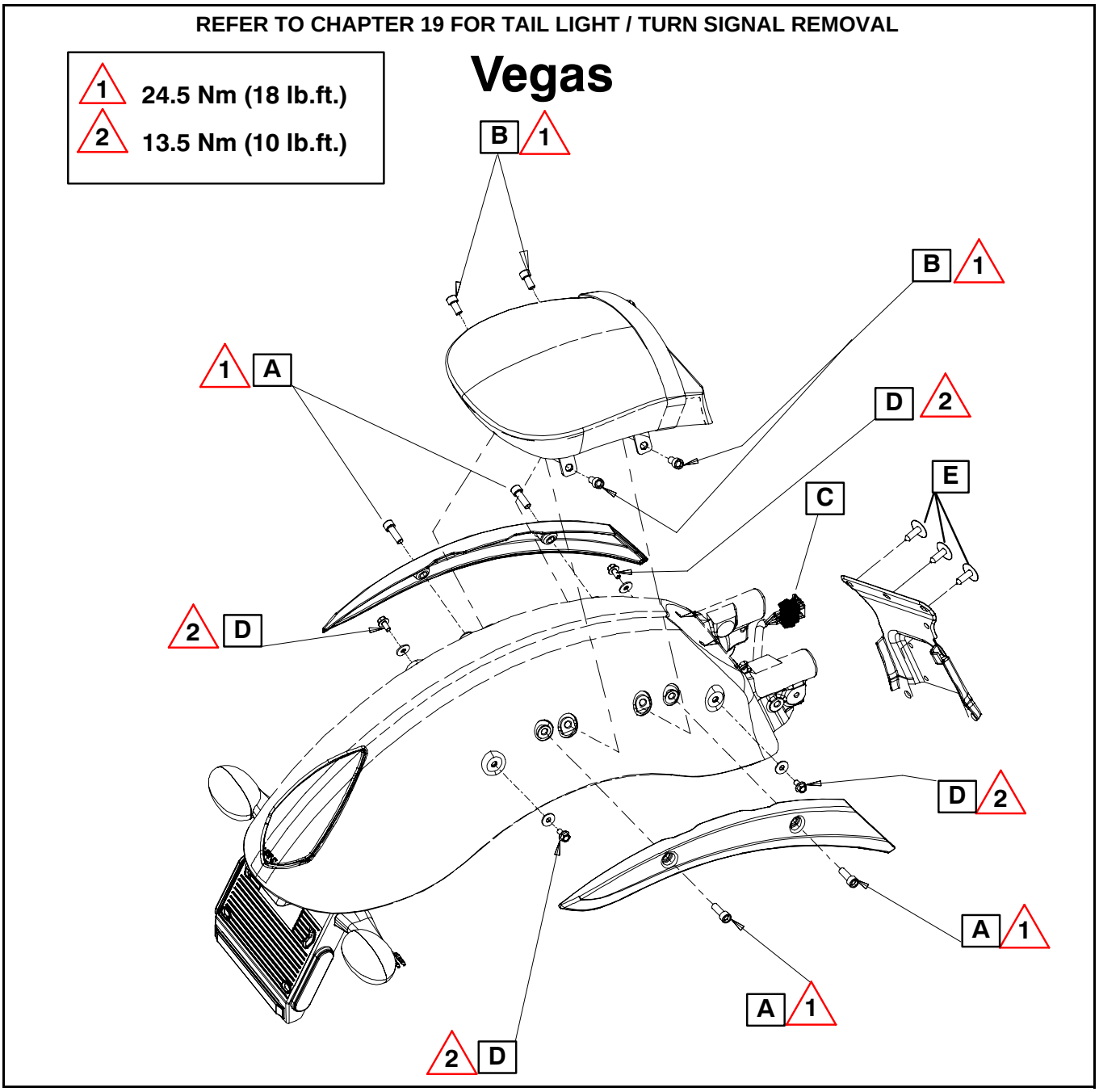
REAR FENDER REMOVAL (Vegas Typical)

1. Remove side covers.
2. Remove operator seat, strut covers (A), and passenger seat screws (B).
3. Separate connector for rear lights (C).
4. Remove screws (D) from each side of fender.
5. Remove 3 plastic darts (E) to release debris flap.
6. Remove dart from side of fender flap so harness can be removed between flap and frame.
7. Remove fender.

REAR FENDER INSTALLATION

1. Reverse the order of disassembly to install fender.
2. Torque all fasteners to specification.
3. Use new darts upon assembly.

REFER TO CHAPTER 19 FOR TAIL LIGHT / TURN SIGNAL REMOVAL

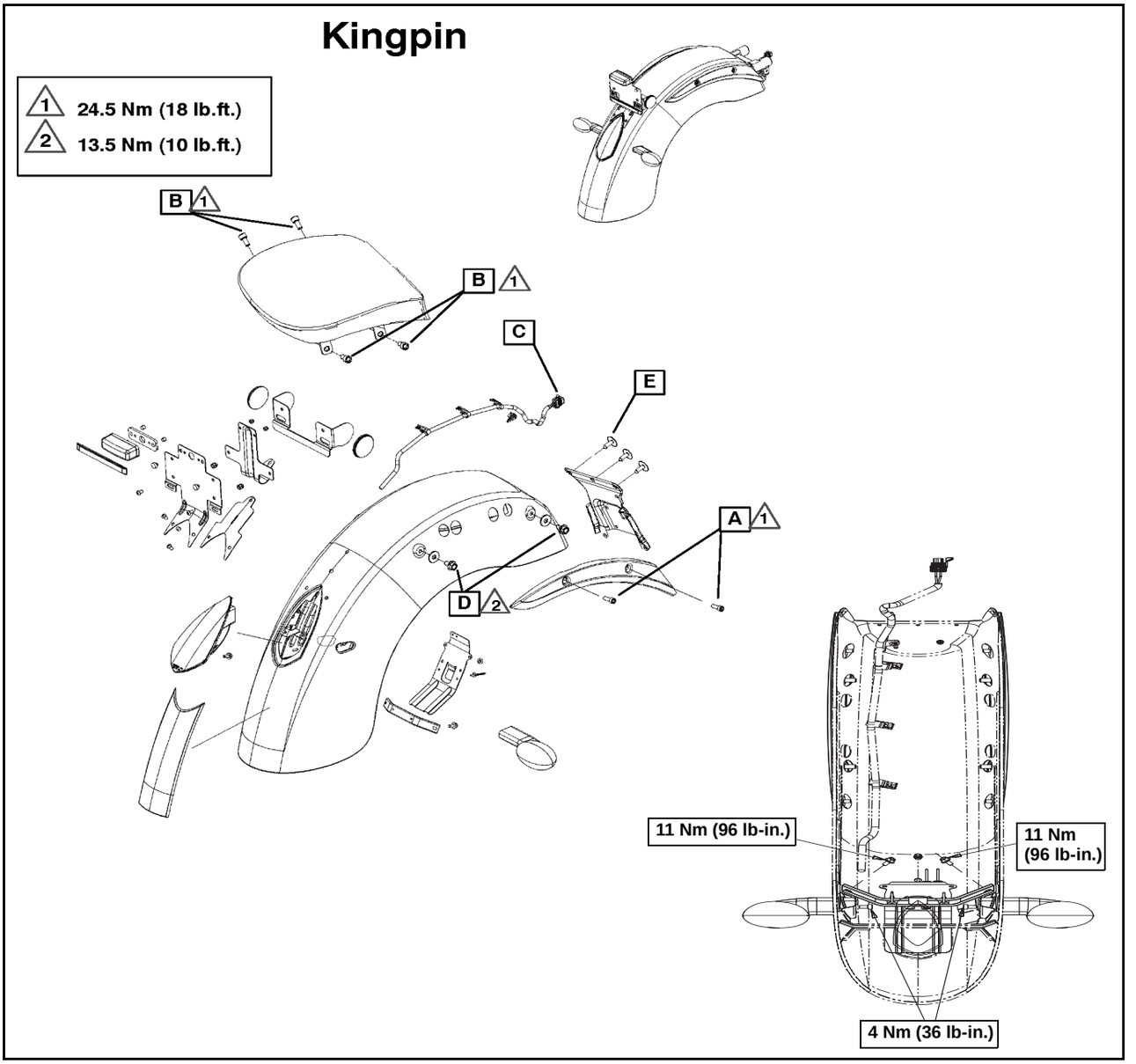


REAR FENDER REMOVAL (Kingpin Typical)

1. Remove side covers.
2. Remove operator seat, strut covers (A), and passenger seat screws (B).
3. Separate connector for rear lights (C).
4. Remove screws (D) from each side of fender.
5. Remove 3 plastic darts (E) to release debris flap.
6. Remove dart from side of fender flap so harness can be removed between flap and frame.
7. Remove fender.

REAR FENDER INSTALLATION

1. Reverse the order of disassembly to install fender.
2. Torque all fasteners to specification.
3. Use new darts upon assembly.



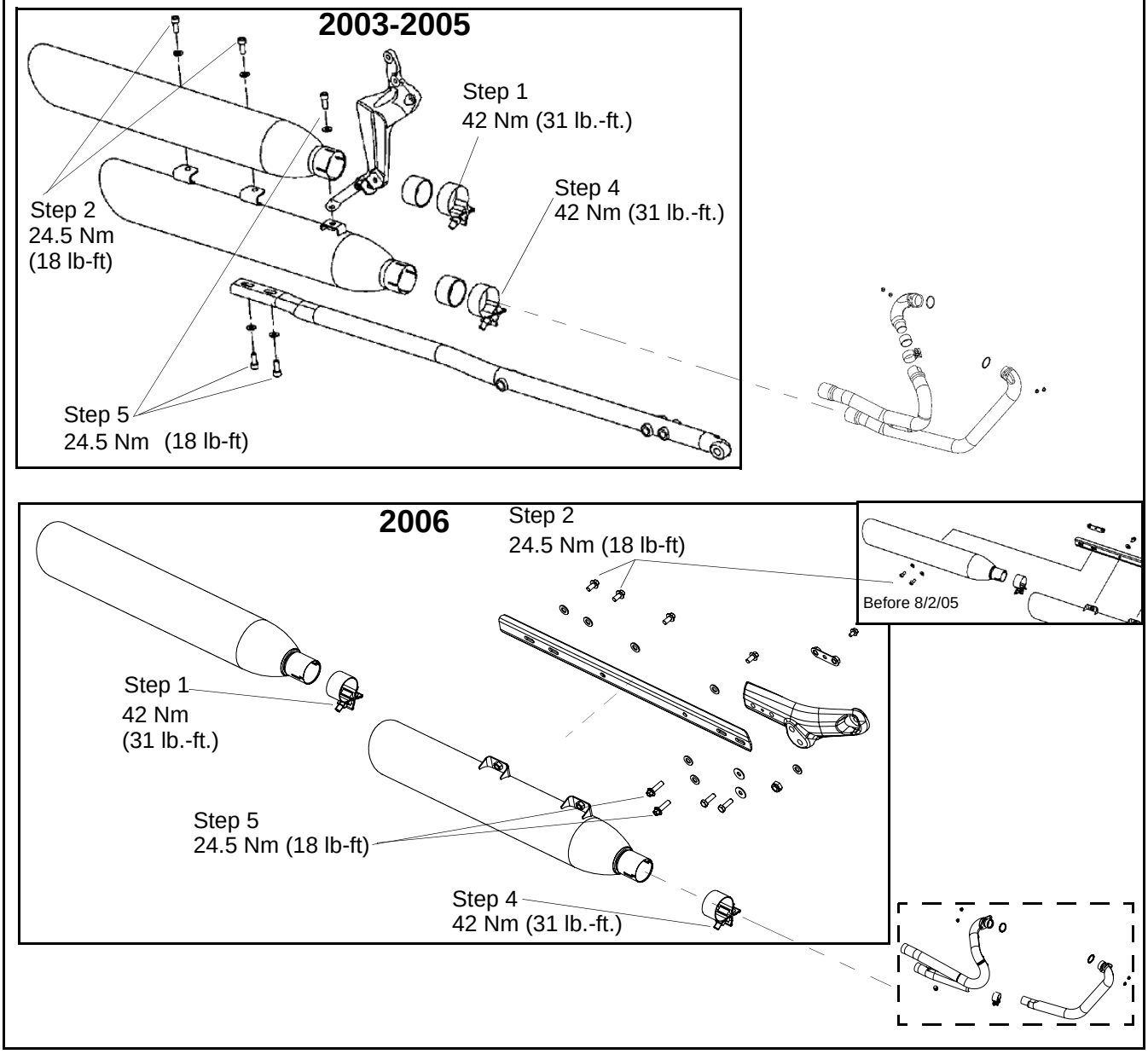
EXHAUST MUFFLER

Review all WARNINGS on page 3.2 before working on exhaust system. Clean any oil, grease, or fingerprints from the exhaust system before starting the engine to reduce the chance of chrome discoloration.

Removal

1. Loosen upper muffler clamp (15mm socket).
2. Remove two upper muffler mount bolts (2003-2005 use 6mm hex; 2006 use 13mm wrench).
3. Slide upper muffler rearward to remove.
4. Loosen lower muffler clamp (15mm socket).
5. 2003-2005 - Using a 6 mm hex tool, remove the 3 lower muffler screws with washers from the brackets. 2006 - Remove two bolts holding rear exhaust mount bracket to front support. Remove lower muffler and rear mount bracket as an assembly.
6. Reverse the above procedure to install mufflers.

Refer to page 3.7 for exhaust head pipe removal.



EXHAUST HEAD PIPE

Review all WARNINGS on page 3.2 before working on exhaust system.

Replace All Gaskets Upon Assembly (where applicable)

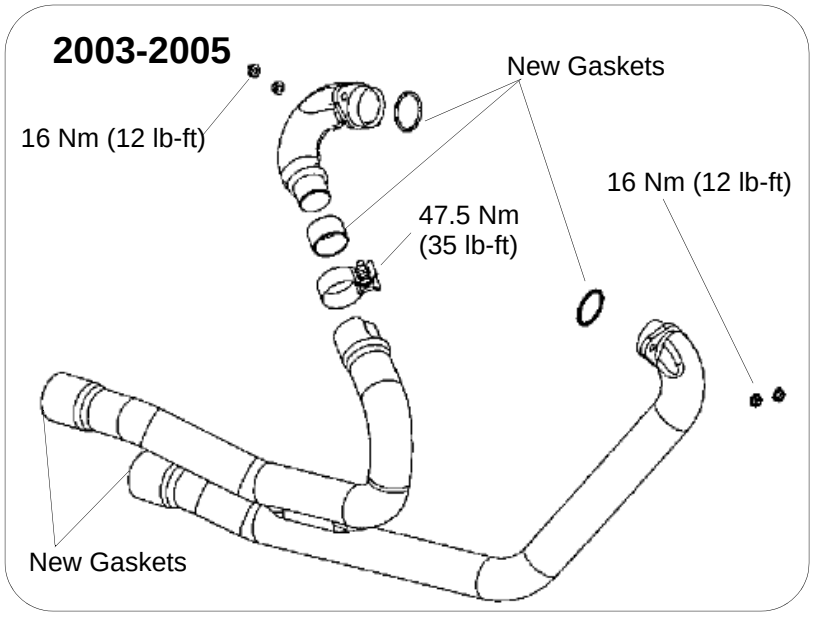
Clean any oil, grease, or fingerprints from the exhaust system before starting the engine to reduce the chance of chrome discoloration.

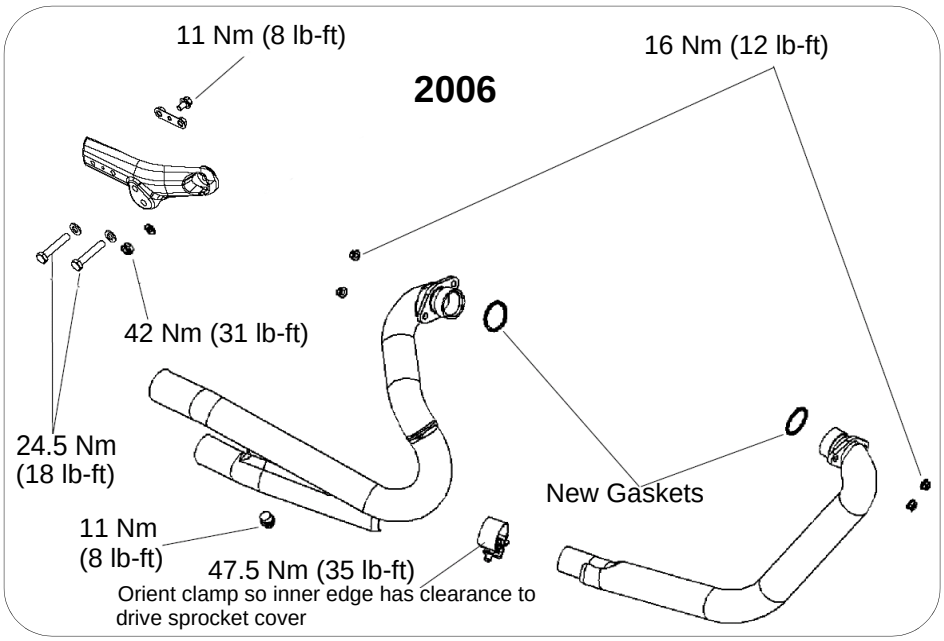
EXHAUST SYSTEM REMOVAL

1. Remove mufflers (page 3.7).
2. Loosen clamp on rear or front head pipe.
3. Remove flange nuts at cylinder head.
4. Move pipes and separate until pipes are clear of cylinder heads to remove.
5. 2006 Only - Remove nut (17mm) and two bolts (13mm) from front exhaust support and remove support.

EXHAUST SYSTEM INSTALLATION

1. Install new head pipe gaskets.
2. Reverse removal steps above.

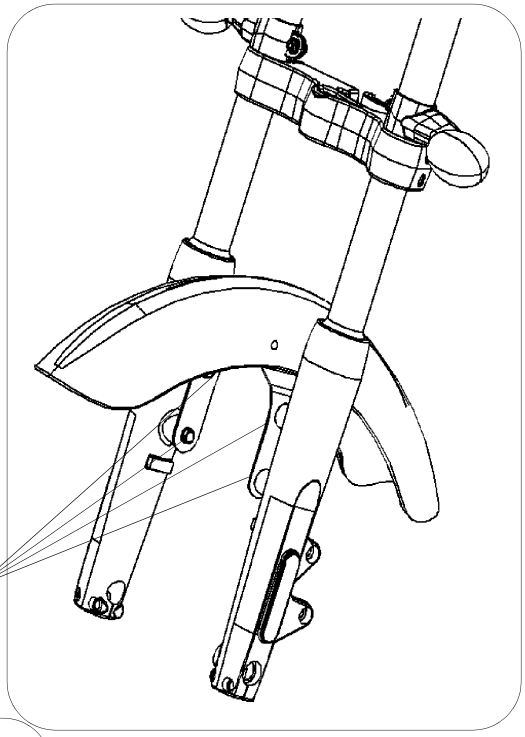


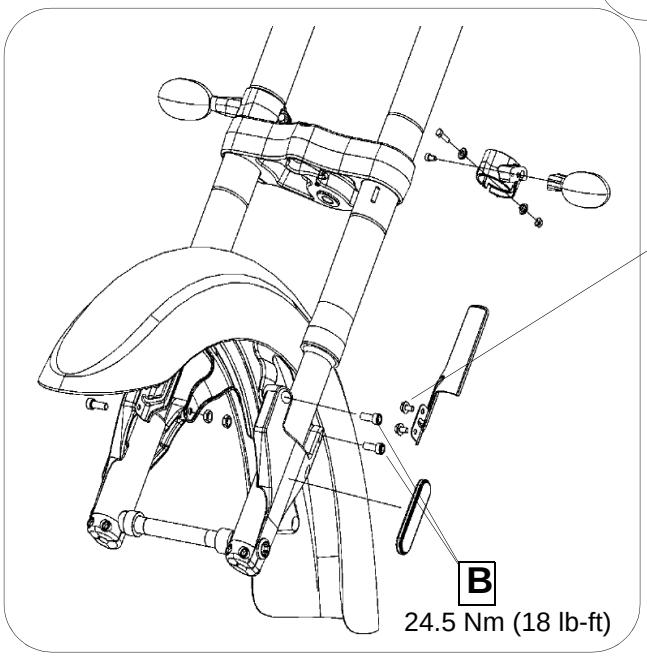


FRONT FENDER

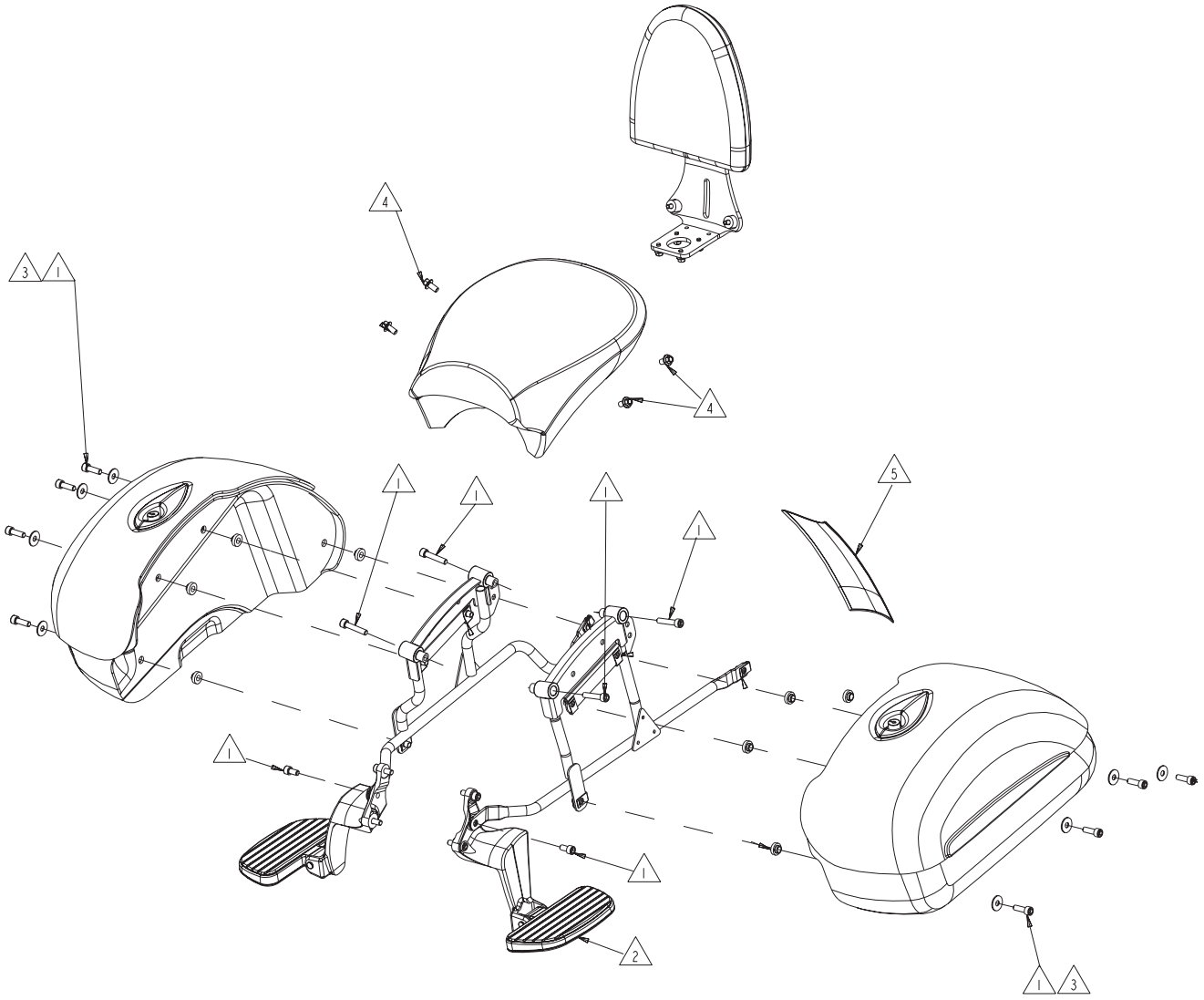
1. Remove front wheel.
2. Remove fender screws (A, Vegas) or (B, Kingpin).
3. Carefully remove fender.

Refer to Chapter 12 for front wheel removal.





SADDLEBAGS



1 24.5 Nm (18 lb-ft)

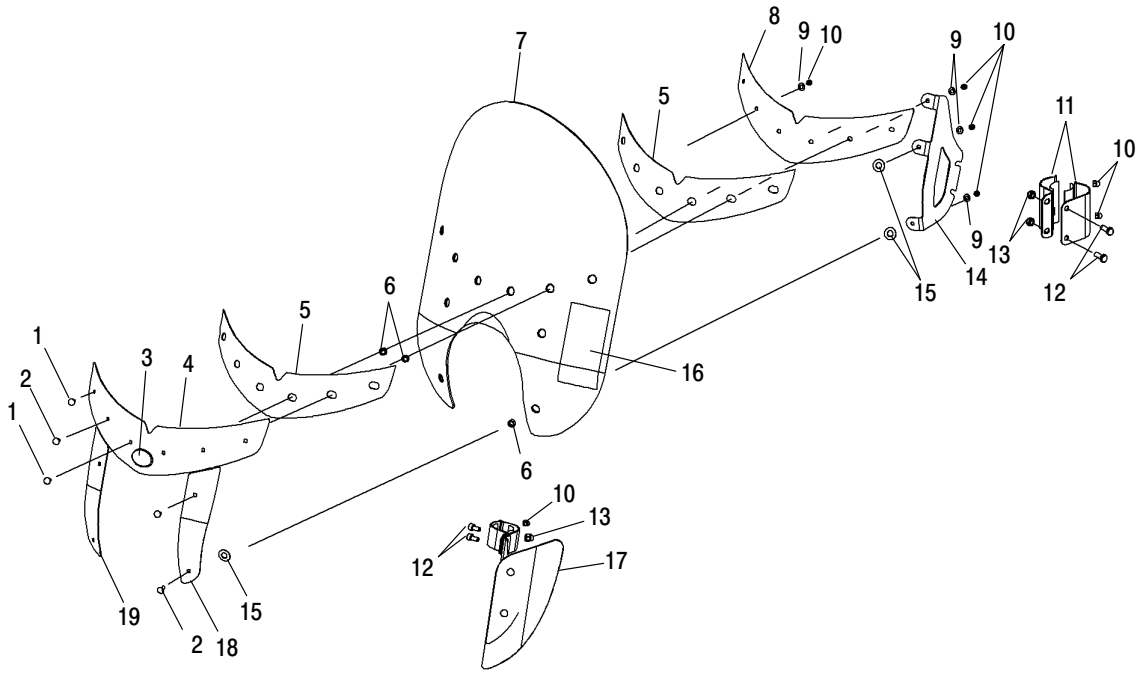
2 Lubricate detent ball and spring as required

3 Attach from inside bag into bracket

4 31 Nm (23 lb-ft)

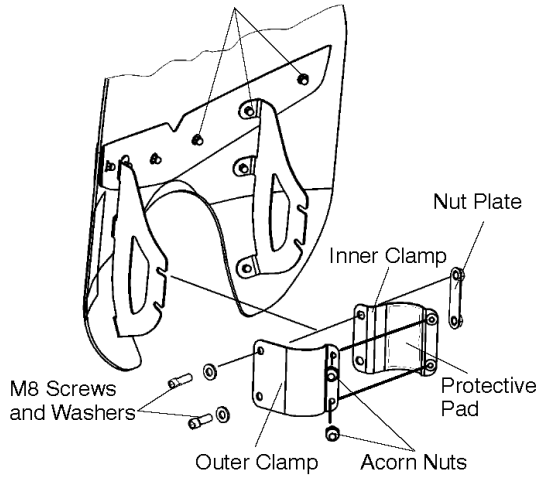
5 Apply 40 lbs. even pressure for minimum 5 seconds

WINDSHIELD

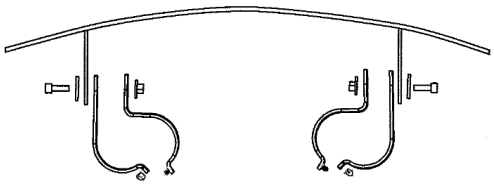


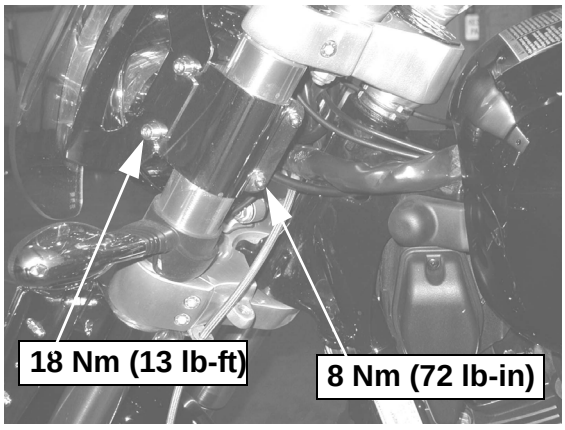
1		4	Bolt, Carriage
2		6	Bolt, Carriage
3		1	Badge, Windshield Stamp
4		1	Bracket, Windshield, Front, Top
5		2	Pad, Windshield
6		10	Spacer, Windshield
7		1 1	Windshield, Mid Windshield, Tall
8		1	Bracket, Windshield, Rear, Top
9		10	Washer ,Flat
10		16	Nut, Acorn
11		1	Asm., Windshield Clamp
12		4	Screw
13		8	Nut, Acorn
14		1 1	Bracket, Windshield, Rear, LH Bracket, Windshield, Rear, RH
15		8	Washer, Flat
16		1	Decal, Warning/Caution/Cleaning
17		1 1	Asm., Deflector, Lower, LH Asm., Deflector, Lower, RH
18		1	Bracket, Windshield, Front, LH
19		1	Bracket, Windshield, Front, RH

Torque all to 85 in.lb. (9.6 Nm) every 1,000 miles



Top View – Windshield and Clamps
(Assemble as shown)





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FUEL SYSTEM/FUEL INJECTION

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SAFETY PRECAUTIONS

GENERAL

Many hazards are present when working on or around the fuel injection system. Read and pay close attention to the following warnings and cautions when working on any component in this section.

⚠ WARNING

Gasoline is extremely flammable and explosive under certain conditions.

Always stop the engine and refuel outdoors or in a well ventilated area.

Do not smoke or allow open flames or sparks in or near the area where refueling is performed or where gasoline is stored.

Do not overfill the tank. Do not fill the tank neck above the fuel tank insert. Leave air space to allow for fuel expansion.

If you get gasoline in your eyes or if you swallow gasoline, see your doctor immediately. Never try to syphon gasoline using mouth suction.

If you spill gasoline on your skin or clothing, immediately wash it off with soap and water and change clothing.

Never start the engine or let it run in an enclosed area. Engine exhaust fumes are poisonous and can cause loss of consciousness and death in a short time.

⚠WARNING

Gasoline is extremely flammable and is explosive under certain conditions. Work in a well ventilated area. Open flames, sparks and cigarettes must be kept away from gasoline.
KEEP GASOLINE OUT OF THE REACH OF CHILDREN!

⚠WARNING

The engine exhaust from this product contains chemicals known to cause cancer, birth defects or other reproductive harm.

NOTE:
If the motorcycle will be stored for one month or longer, treat the fuel with fuel stabilizer according to the instructions listed on the product.
Victory Fuel Stabilizer (16 oz.): 2870652

⚠WARNING

Careless handling of the control cables can result in twisting or bending of the cables. This can cause the cables to stick or bind, resulting in loss of vehicle control.

⚠WARNING

The engine and exhaust system become very hot during operation and remains hot for a period of time after the engine is shut off. Wear insulated protection for hands and arms or wait until the engine and exhaust system have cooled before performing service work.

SPECIFICATIONS

FUEL SYSTEM SPECIFICATIONS

FUEL SYSTEM	
Item	**Specifications**
Fuel Pump Pressure	3.37 BAR (338 kPa) (49 psi)
Fuel Pump Volume	45 liters/hr 325 ml/30 seconds 11 oz./30 seconds 0.165 gal/min
Idle Speed	1000 rpm ± 50 rpm
Throttle Grip Free-Play	3-6 mm (1/8"-1/4")
Fast Idle Lever Freeplay	3-6 mm (1/8"-1/4")
Fast Idle Speed	1500-3000 RPM
Fuel Pump Amp Draw	5 amps maximum @ 13.8 VDC
Recommended Octane	92 Octane Minimum
Recommended Fuel Storage Additive	Victory Fuel Stabilizer 2870652

SPECIAL TOOLS

SPECIAL TOOLS

TOOL	SPX PART NUMBER
Diagnostic Tool Kit (with Software)	**PV-46085**
Interface Cable (Included in PV-46085 Diagnostic Tool Kit)	PU-47151
Interface Cable Adapter (Included in PV-46085 Diagnostic Tool Kit)	PV-47035
Air / Fuel Ratio Monitor Kit	**PV-45410**
O_2 Sensor Exhaust Tube (2003-2005 Models) (Included in PV-45410 Air / Fuel Monitor Kit)	PV-45410-1
O_2 Sensor with wire harness / connector (Included in PV-45410 Air / Fuel Monitor Kit)	PV-45410-2
Cable - Air / Fuel Monitor Power & Voltmeter (Included in PV-45410 Air / Fuel Monitor Kit)	PV-45410-3
Instruction Sheet - Air / Fuel Monitor (Included in PV-45410 Air / Fuel Monitor Kit)	PV-45410-4
Fuel Pressure Gauge	**PV-43506**
Fluke 73 Digital Multi Meter	**PV-43546**
Electrical Connector Test Adapter Kit	**PV-43526**
Laptop Computer (Commercially Available)	-

TROUBLESHOOTING

BASIC TROUBLESHOOTING

IMPORTANT:

Although every effort is made to compile a comprehensive chart, no chart can take the place of a methodical diagnostic process. Fuel injection problems may include (but are not limited to) the items listed in the troubleshooting charts. Avoid the temptation to "just start replacing parts" and hope that the problem will be corrected.

DO NOT OVERLOOK THE BASICS WHEN TROUBLESHOOTING:

1. Battery in a low state of charge can cause problems. Be sure the battery is in good condition and fully charged.
2. Air leaks in intake tract / air box - check for air leaks and repair to avoid mis-diagnosing the EFI system.
3. **Contaminated or improper fuel.**
4. **Restricted fuel flow / filters (low fuel pressure).**
5. Fuel tank vent line pinched or obstructed.
6. Faulty spark plug(s).
7. Corroded or disconnected wiring or poor ground connections - be sure they are clean and tight.
8. Incorrect TPS calibration.
9. Exhaust system restriction or improper exhaust.
10. Engine mechanical condition (compression).

NOTE: Exhaust evacuation systems (workshop ventilation hoses) can affect Lambda readings. Be sure to review TPS Calibration procedure completely prior to performing the procedure.

NOTE: Also refer to Fuel System Troubleshooting page 5.50 through page 5.53.

SERVICE PRECAUTIONS

EFI SYSTEM PRECAUTIONS

⚠ CAUTION

While electronic fuel injection is very durable and reliable, the components can be easily damaged or problems can be introduced if the following precautions are not adhered to.

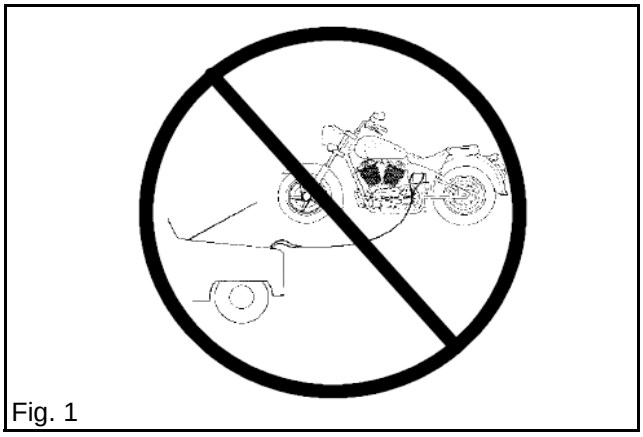


Fig. 1

It is not advisable to “jump start” the machine with another battery. Although problems are unlikely to occur if everything is done carefully, the possibility of permanent damage to expensive electrical component exists. Ill. 1.

Never charge the battery while it is connected to the machine. Ill. 2. Never disconnect the battery while the engine is running.

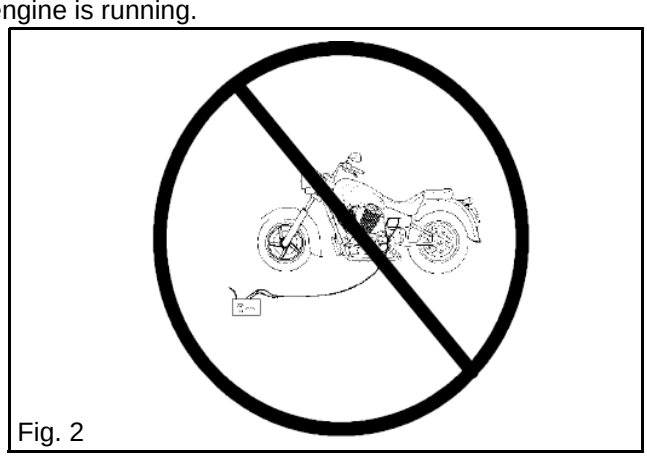


Fig. 2

Pay special attention when connecting the battery terminals. Inadvertently reversing the connections will permanently damage the ECM. Disconnect the negative battery lead first whenever removing the battery from the motorcycle. Connect the positive battery lead first when installing the battery.

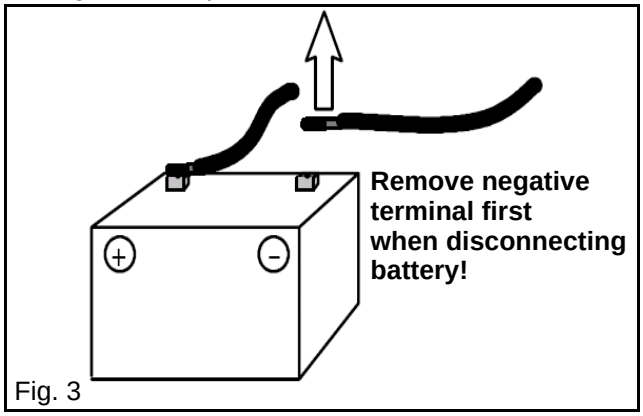


Fig. 3

Before disconnecting or connecting electrical connections, be sure the key switch is off. An even better practice is to disconnect the battery when disconnecting or connecting electrical connections.

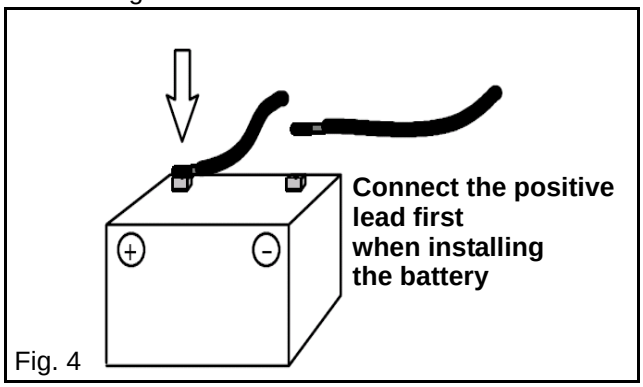


Fig. 4

Fuses protect critical electrical components and circuits. Investigate the cause, repair the problem, then replace the fuse. Never replace the fuse with a larger value fuse or “jumper” the fuse with wire, aluminum foil or any other means. Fig. 5.

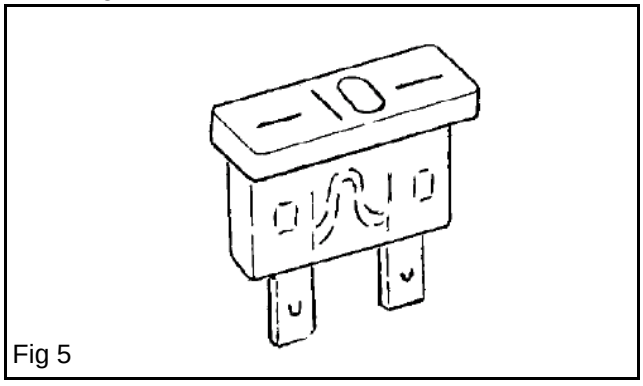
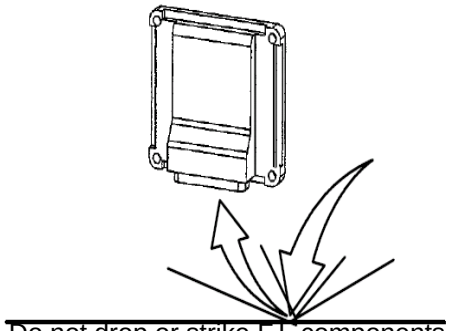


Fig 5

EFI SYSTEM PRECAUTIONS (Cont.)

The ECM is a sensitive piece of electronic equipment. Dropping it or hitting it may cause irreparable damage. This is also true for sensors used in the system. Fig. 6



Do not drop or strike F.I. components

Fig. 6

Static electricity can damage the ECM beyond repair. The human body can easily store enough static electricity to damage sensitive electronic components. Before working with any components of the Fuel Injection system, ground yourself to dissipate any static charge. Also take care not to touch any of terminal pins on the ECM. Fig. 7.

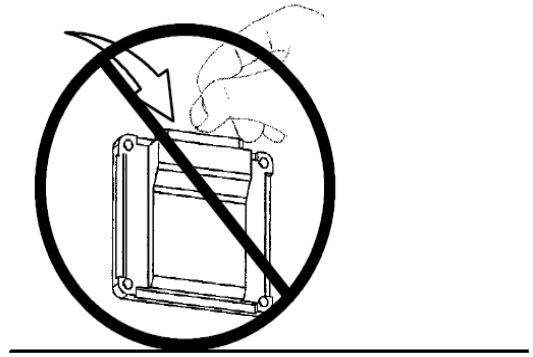


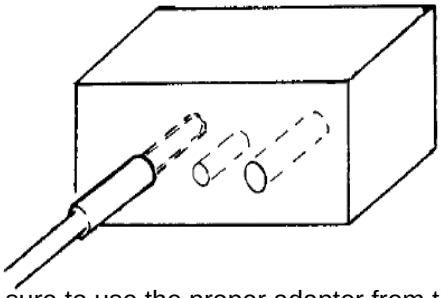
Fig. 7 Do not touch ECM connector pins

Anti-static wrist strap PV-43541

⚠ CAUTION

Some tests require probing of the **ECM wiring harness** connector. Do not touch or probe the exposed pins on the ECM. Static electricity from your body or the meter can easily damage the ECM.

Always use the proper adapter from the Connector Test Adapter Kit when probing the terminals. Most of the connectors are sealed and cannot be back probed. Be extremely careful not damage the connectors by forcing meter probes into the connectors. Fig. 8



Make sure to use the proper adapter from the Connector Test Adapter Kit to prevent damage to the terminals.

Fig. 8

Connector test adapter kit PV-43536

Poor connections are the most common cause of Electronic Fuel Injection malfunctions. Inspect connector and wiring connections carefully during troubleshooting.

Anti-static wrist strap PV-43541

Make sure that connectors “SNAP” in place when connected.

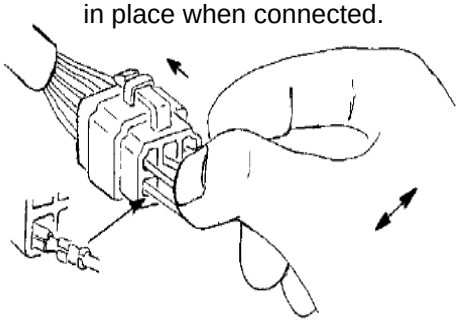
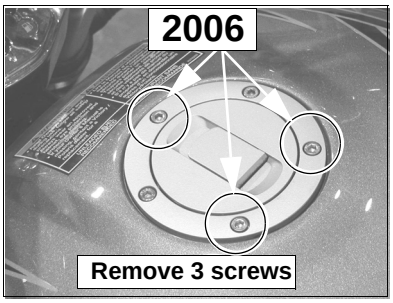


Fig. 9

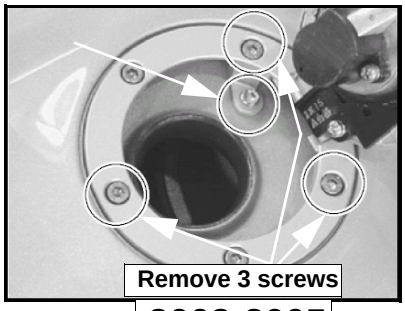
Carefully inspect the connections of the failed circuit before doing any other troubleshooting steps. Wire terminals should be corrosion free and fully seated into the connectors. Connector should snap together and lock. Replace connectors that do not snap and lock together. Fig. 9

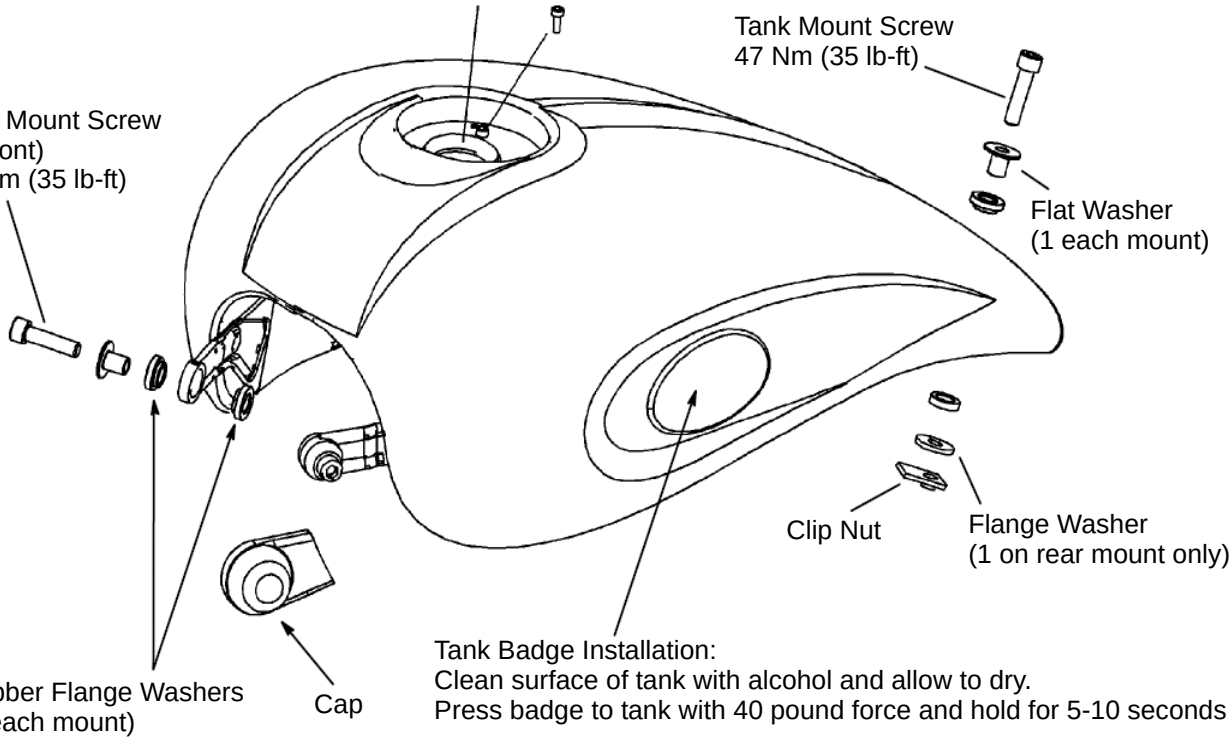
FUEL SYSTEM SERVICE PROCEDURES

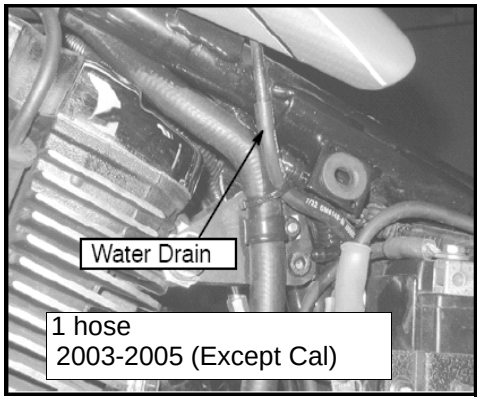
FUEL TANK / FUEL CAP MOUNTING



Torque: 5 ± .5 Nm (43 + 4 lb-in.)





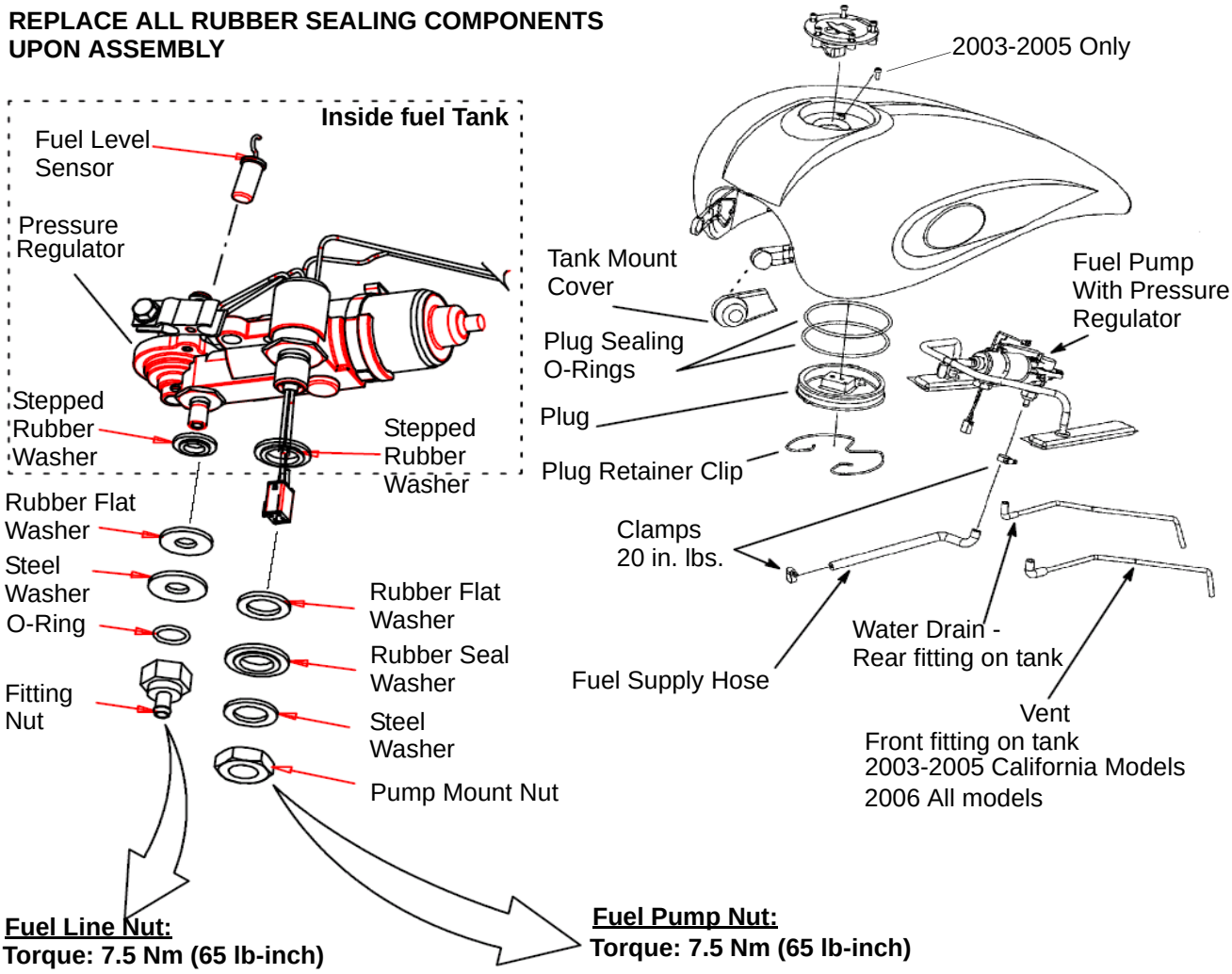


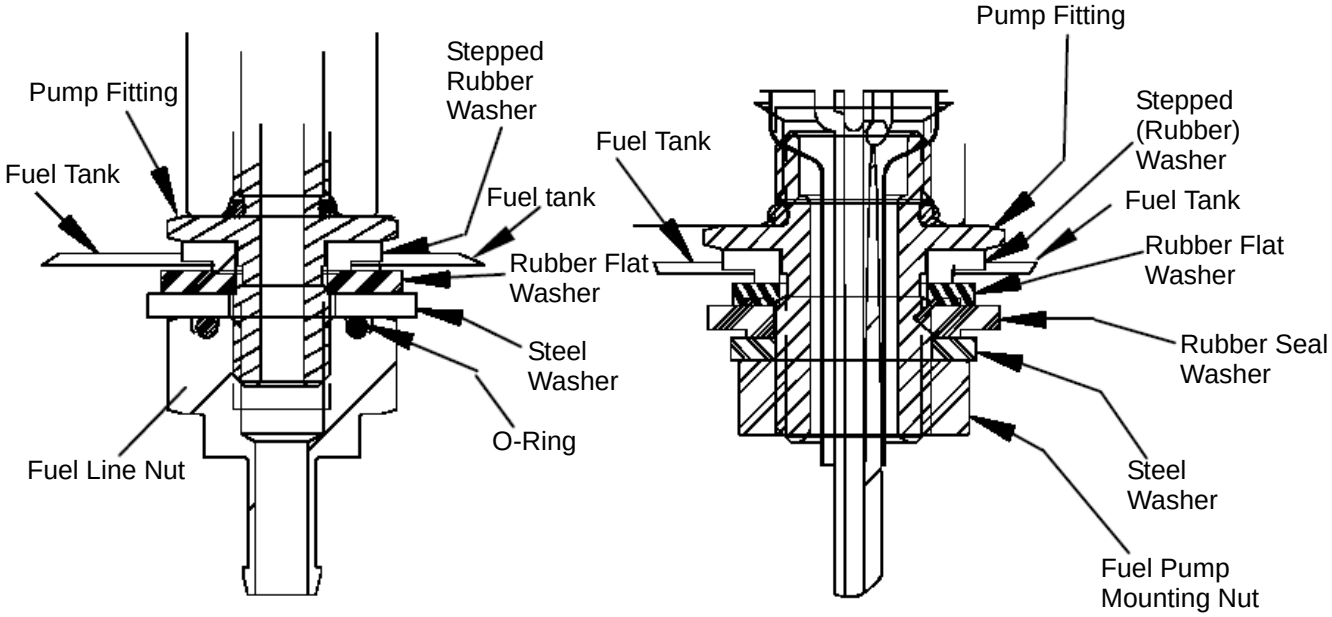
Tank Vent & Water Drain Routing Diagrams

Refer to Page 1.30-1.32 for routing diagrams.

FUEL LEVEL SENSOR / FUEL PUMP ASSEMBLY VIEW

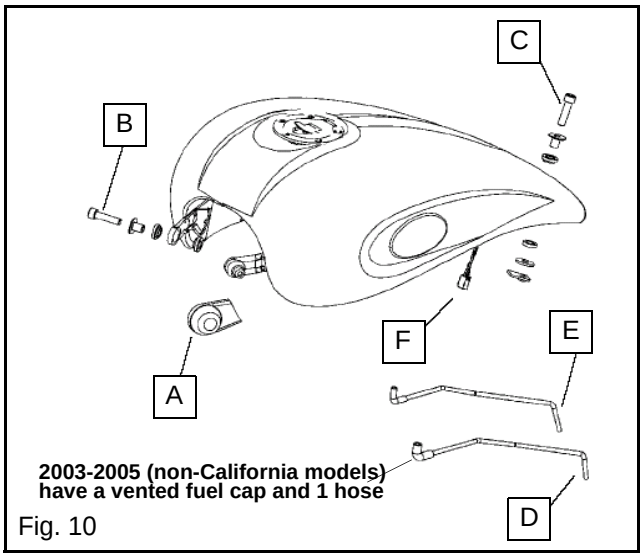
REPLACE ALL RUBBER SEALING COMPONENTS UPON ASSEMBLY





FUEL TANK REMOVAL

> **⚠ CAUTION**
>
> Review gasoline warnings on page 5.3. Protect fuel tank finish when removing, storing, and installing tank.



2003-2005 (non-California models) have a vented fuel cap and 1 hose

Fig. 10

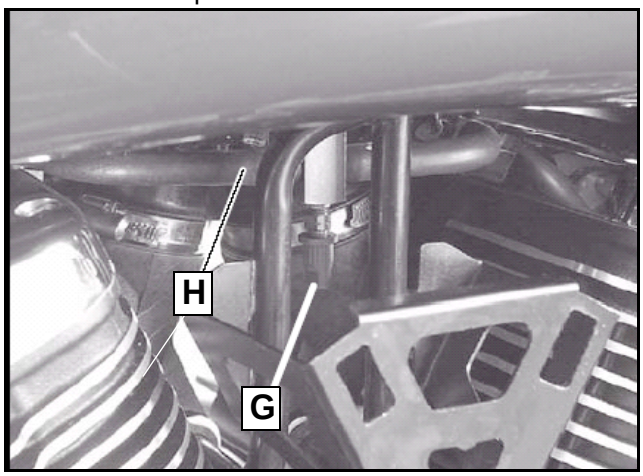
1. Refer to Fig. 10. Remove side covers and seat (Chapter 3).
2. Remove caps (A).
3. Remove two (2) screws (B) and rear screw (C).
4. Disconnect vent hose (D) and water drain (E).
5. Position front wheel straight ahead to gain adequate clearance between tank and triple clamps.
6. Lift rear of tank disconnect fuel level sensor / fuel pump wiring harness (F).

Fuel System De-Pressurization

> **⚠ CAUTION**
>
> Wear eye protection.

7. Remove cap (G) from fuel pressure inspection port on fuel rail (photo above right). Use one of the following methods to de-pressurize the system before removing fuel supply hose:
   - Attach Fuel Pressure Gauge PV-43506 to inspection port. Place a rag or fuel safe container under the discharge hose of the gauge. Press the pressure release button on the side of the gauge.

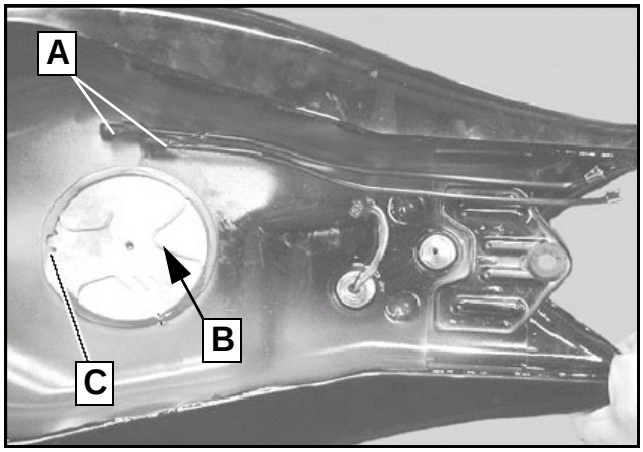
   or,
   - Wrap a clean rag around fitting and depress center of pressure inspection port Schrader valve to release the pressure.



8. Loosen clamp and remove fuel hose (H) from fuel rail.
9. Remove tank.

FUEL PUMP ACCESS PLUG REMOVAL

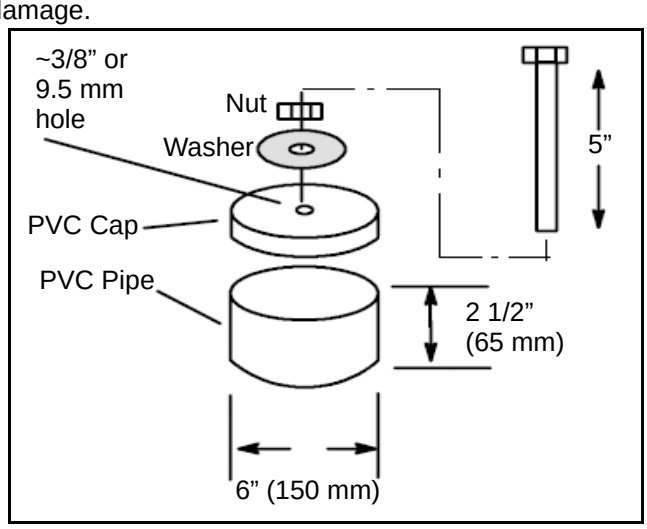
> **⚠ CAUTION**
>
> Review gasoline warnings on page 5.3. Refer to fuel pump assembly view on page 5.8.



1. Drain fuel from tank.
2. Invert tank and place on a soft protective mat.
3. Remove clamp(s) and hose(s) (A).
4. Remove fuel supply hose. Note orientation of hose on fitting for assembly.
5. Remove access plug retaining ring (B).
6. Be sure alignment tab (C) is positioned in center of notch in tank.

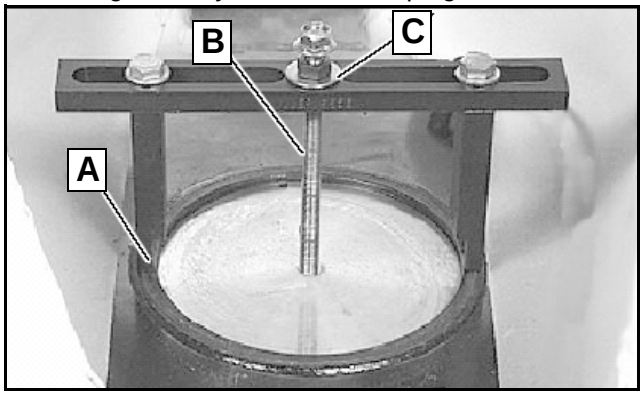
NOTE: There are 3 methods that can be used to remove the fuel pump access plug. All methods use the 8x1.25mm threaded hole in the center of the plug.

Use Special tool 2872621.
or...
An extractor can be made using a 2 1/2 inch length of 6 inch diameter PVC pipe as shown in Fig.
or...
Carefully use a slide hammer with an 8x1.25 bolt attached. Have an assistant hold the tank to prevent damage.



To use special tool 2872621:

7. Place tool on tank with legs adjusted to diameter of flange (A). Install an 8mm bolt, nut, and washer through center opening in tool. Screw bolt (B) into plug. Slowly turn nut (C) toward tool to draw plug out of tank. Be sure tab at front of plug does not catch in locating slot as you remove the plug.

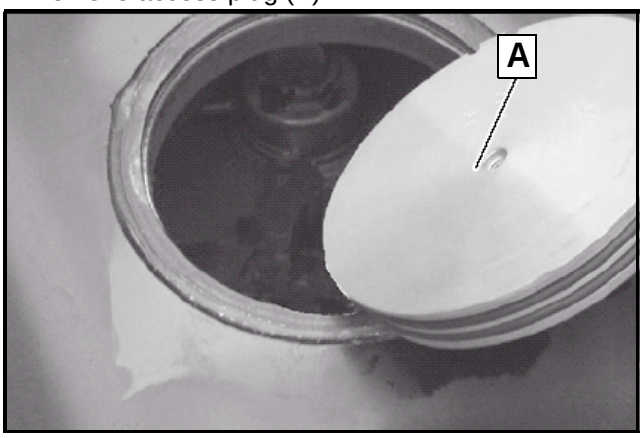


8. Draw plug out of tank until O-rings are clear of tank.

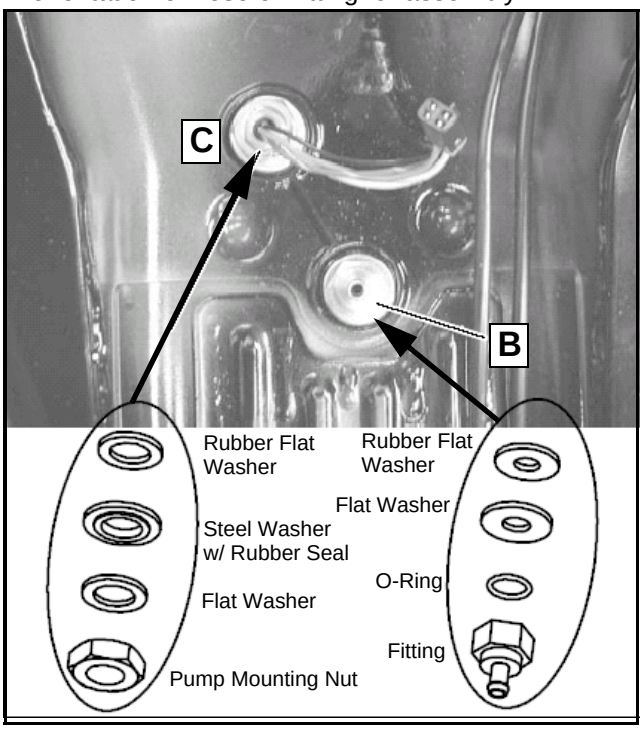
FUEL PUMP REMOVAL

> **⚠ CAUTION**
>
> Replace all sealing washers and O-rings upon assembly! Review gasoline warnings on page 5.3. Do not kink or bend fuel pickup hoses upon removal.

1. Refer to detail views on page 5.8, and note position of washers, O-rings and hardware during disassembly.
2. Remove access plug (A).

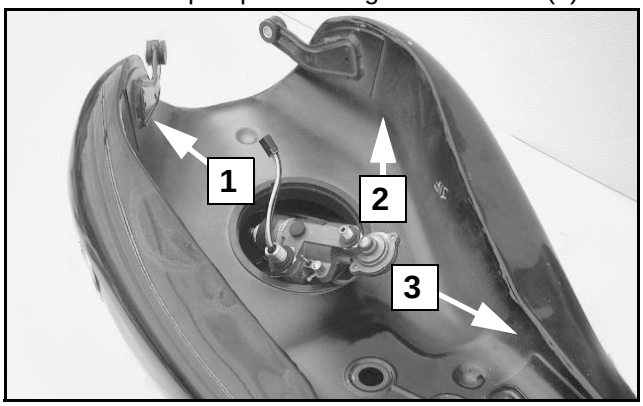


3. Remove fuel supply hose from fitting (B). Note orientation of hose on fitting for assembly.



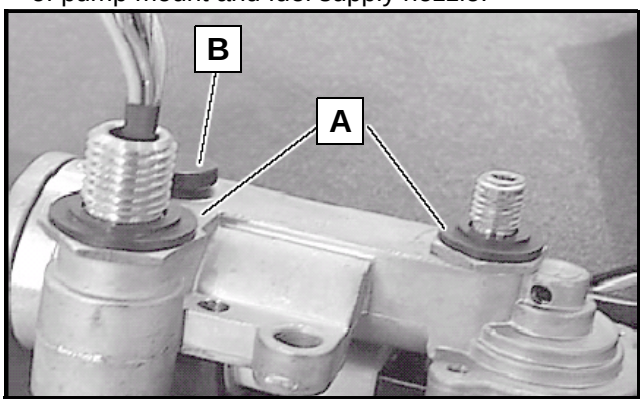
4. Remove fitting with O-ring, flat washer, and rubber flat washer.
5. Remove pump mounting nut (C), flat washer, steel washer with rubber seal, and rubber flat washer.

6. Move pump to access hole and push it carefully toward the front left corner of the tank (1). Lift the regulator end of the pump (2) out of the opening. Remove fuel pump toward right rear corner (3).



FUEL PUMP INSTALLATION

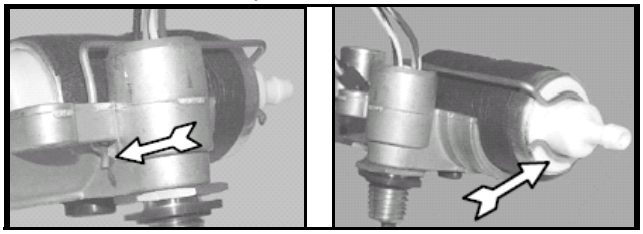
1. Be sure stepped rubber washers (A) are installed as shown with inner shoulder facing up, toward threads of pump mount and fuel supply nozzle.



2. Inspect support button on pump (B). Be sure it is in place as shown in photo above.

> ⚠ CAUTION
>
> REPLACE ALL RUBBER SEALING COMPONENTS UPON ASSEMBLY

3. Be sure retainer clip is installed as shown below.

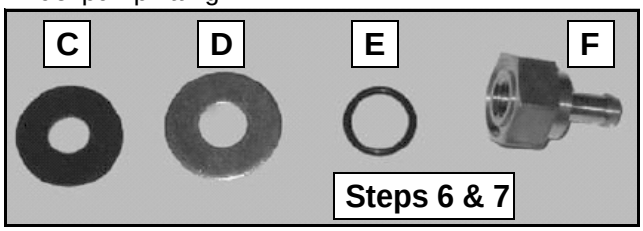


4. Prepare fuel tank for assembly by thoroughly cleaning all sealing surfaces, including the opening for the pump access plug.

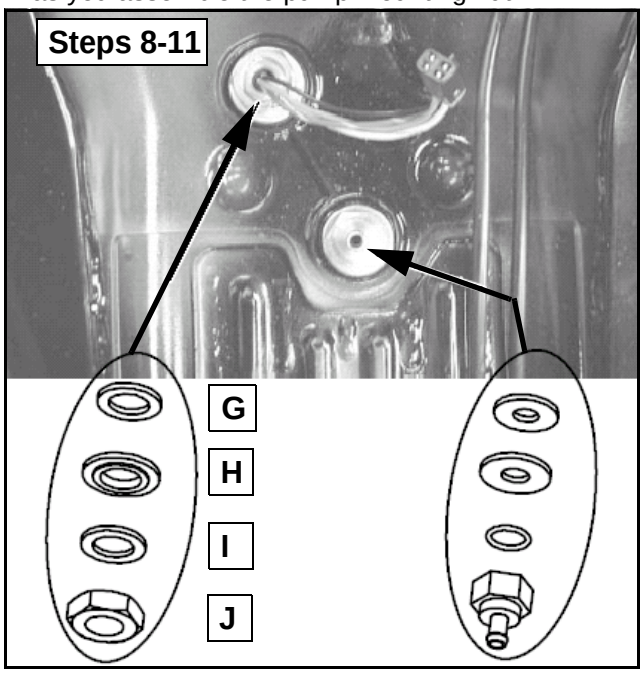
5. Install pickup filters through opening and angle the pump to carefully install the pickup lines. Use care not to kink the lines.
6. Push the pump toward the left front corner of the tank until regulator end of pump can be installed.
7. Position pump with stepped grommets centered in holes and flush with the tank surface.

Fuel Hose Fitting Assembly

8. Hold pump in place and install flat rubber washer (C) flat steel washer (D), and fitting (F) with O-ring (E) on fuel pump fitting.



9. Tighten fuel hose fitting (F) finger tight to hold in place as you assemble the pump mounting nut.



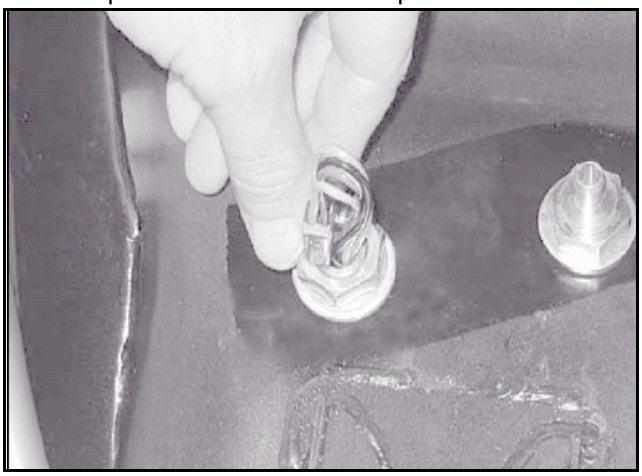
Fuel Pump Mounting Nut Assembly (See photo page 5.11)

10. Install the flat rubber washer (G), onto mount fitting.
11. Be sure stepped grommet for pump mount is centered in hole and flush with the tank surface.
12. Screw the sealing washer (H) onto the fitting with a clockwise rotating motion until seated against rubber washer. NOTE: Item “H” is a metal washer with a rubber seal ring bonded to the inside edge.

⚠ CAUTION

Do not *push* sealing washer into place on fitting or rubber sealing surface on washer may be damaged.

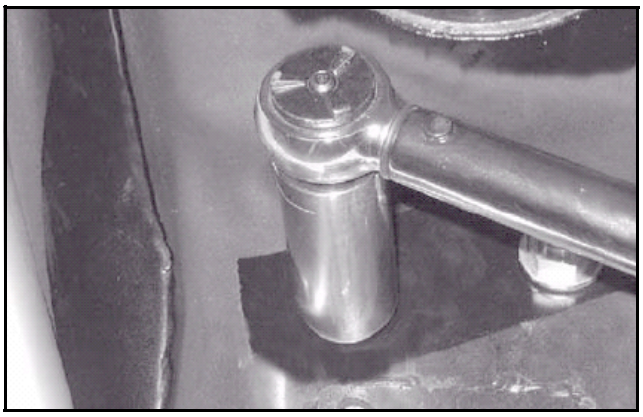
13. Install steel flat washer (I) and nut (J). Tighten nut finger tight to hold in place.
14. After installing nut, fold wires as shown so fitting can be torqued with a standard deep well socket.



15. Torque fuel fitting to specification first, then torque the pump nut to specification.

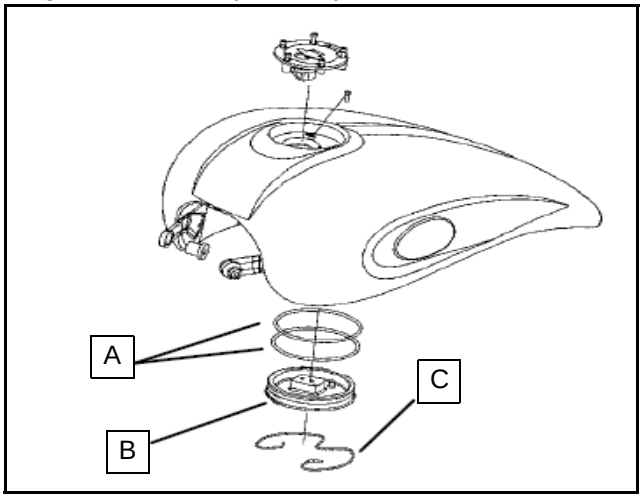
TORQUE: Fuel Line Fitting & Pump Mounting Nut

7.5 Nm (65 lb-inch)



FUEL PUMP ACCESS PLUG INSTALLATION

1. Install new O-rings (A) on plug and lubricate with a light film of Victory All Purpose Grease.

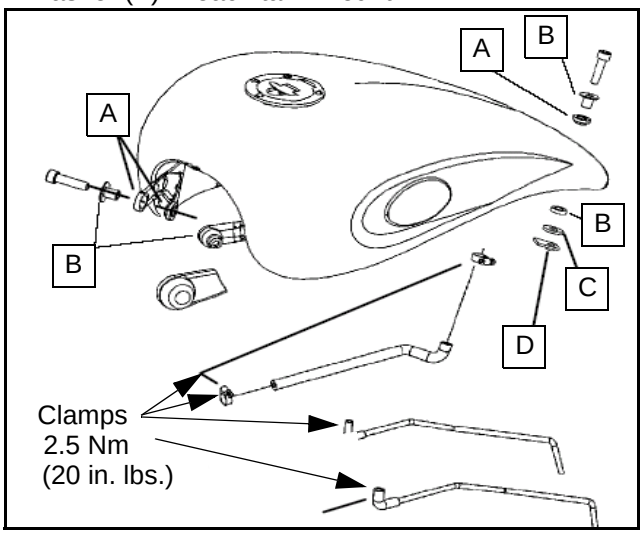


2. Install access plug in tank. Orient plug so tab (B) aligns with notch in tank.
3. Press plug evenly into tank as far as possible by hand.
4. Tap plug with a rubber mallet, keeping it square with opening until fully seated.
5. Install retaining ring (C). Be sure retaining ring is fully seated in the groove.
6. Install the fuel tank.
7. Add fuel.
8. Prime the fuel system. See page 5.14.
9. Inspect for leaks.

FUEL TANK INSTALLATION

Place a protective cloth on the front of the tank when assembling tank to frame.

1. Install (2) rubber flanged bushings (A) and a flange washer (B) in each tank mount.

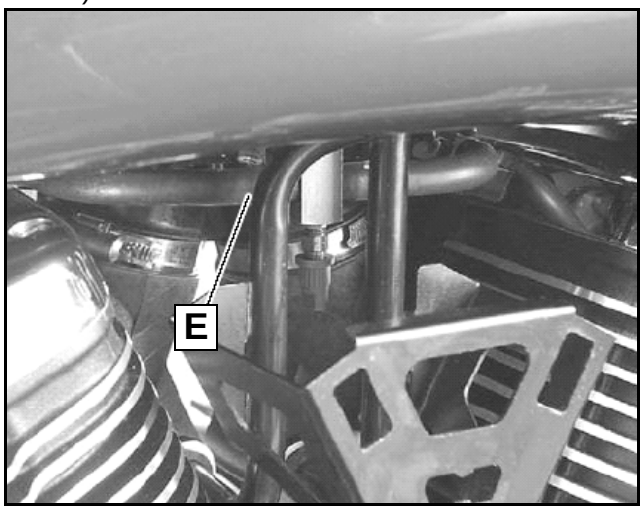


2. Install hose clamp on molded end of fuel hose and install hose onto pump fitting with hose oriented forward as shown. Install hose clamp and torque to specification.

TORQUE: Fuel Line, Drain and & Vent Hose Clamps

2.5 Nm (20 lb-inch)

3. Install fuel tank vent hose (All California and all 2006) and cap area water drain hose.
4. Install fuel cap assembly if removed (page 5.7).
5. With front wheel pointed straight ahead, place tank on frame.
6. Connect fuel pump/sensor wire harness. Press connectors together until a “click” is heard or felt. Be sure harness is routed on top of fuel line.
7. Route fuel line smoothly to right side of frame toward fuel rail. Install hose clamp on fuel line and connect fuel line to fuel rail (E). Torque clamp to 20 in. lb. (2.5 N-m).



8. Connect vent hose (California) and drain hose at rear left side of tank.
9. Loosely install front mounting screws. Place flat washer (C) on top of clip nut (D). Torque fasteners to specification and install front tank bolt covers.

TORQUE: Fuel Tank Mounting Bolts

47 Nm, 35 lb-ft

10. Prime the fuel system as outlined on page 5.14.
11. Start motorcycle and inspect for fuel leaks.
12. Turn engine off.
13. Install seat and side covers.

⚠ WARNING

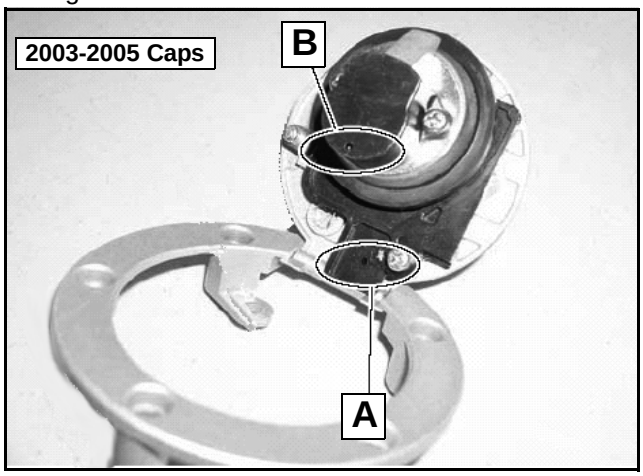
A kinked or obstructed vent line or fuel line may damage fuel tank or cause fuel starvation. Be sure lines are properly installed and routed without being kinked or pinched.

FUEL TANK VENT INSPECTION

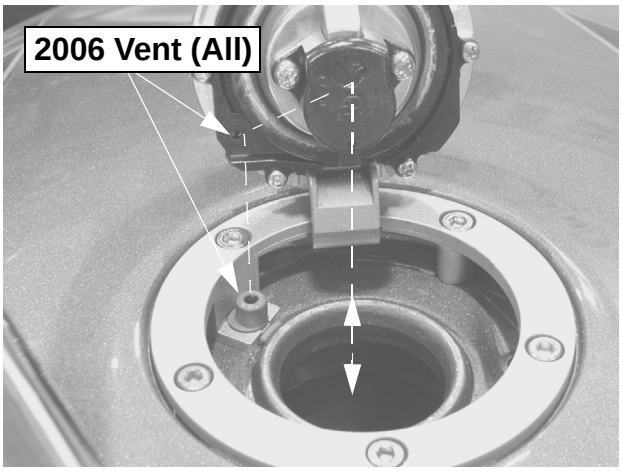
1. Refer to routing diagrams beginning on page 1.29 for tank vent inspection and hose routing information.

FUEL CAP VENT INSPECTION

To determine if a fuel cap is vented or non-vented on 2003-2005 caps, perform the following test. DO NOT use high pressure air to test the vent. The cap does not have to be removed from the tank as shown below, but the tank opening must be covered to prevent water or debris from entering the tank.



1. Open the fuel cap and cover the tank opening.
2. Place a few drops of soapy water solution over the small hole (A) near the hinge.
3. Using an air hose regulated to 15-20 PSI, direct a light stream of air at the vent port (B) located on the lowermost portion of the cap. Do not use high pressure air or the vent valve may be damaged.
4. If the cap is vented, bubbles will form in the area of the soap solution. Bubbles will not appear on a non-vented cap.



PRIMING THE FUEL SYSTEM

If a new fuel pump is installed or if tank is run completely dry, prime the fuel system.

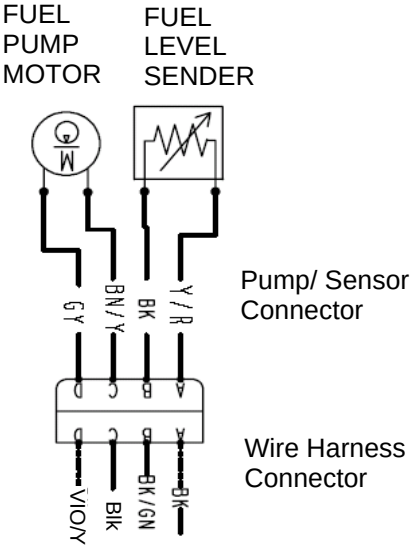
1. Fill the fuel tank.
2. Turn ignition key ON.
3. Toggle kill switch 2-3 times to prime fuel system. **NOTE:** Allow switch to remain in RUN position until pump stops running before toggling back to STOP.
4. Turn ignition key OFF when priming is complete.

PUMP & SENSOR DIAGNOSTICS

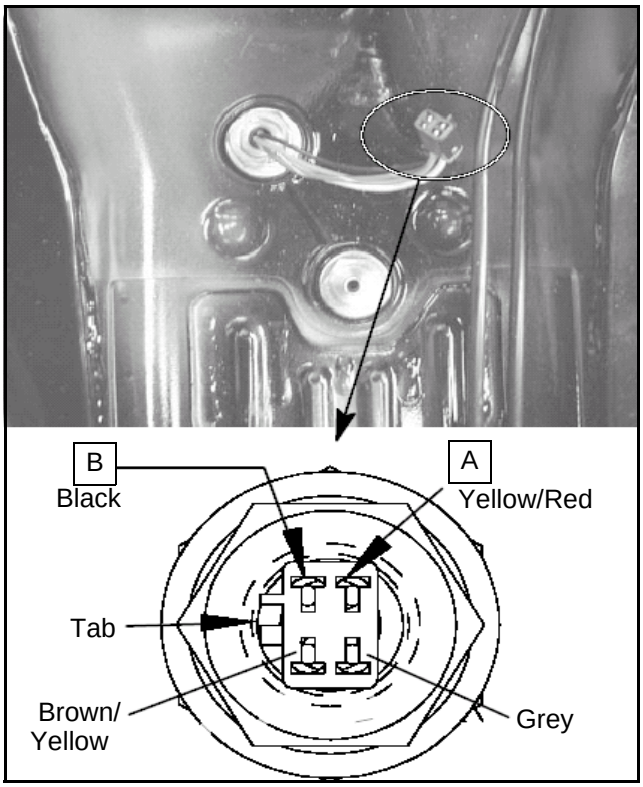
FUEL SENSOR RESISTANCE TEST

The fuel level sensor is located on the fuel pump, inside the fuel tank. The sensor is a thermistor with inverse temperature characteristics (temperature goes up, resistance goes down). When the fuel level goes below the sensor, the temperature increases, lowering the resistance to provide a ground path for the Low Fuel lamp. The lamp will start to glow dimly when the fuel level falls below the sensor, and will brighten as the fuel level continues lower. With fuel tank empty and key ON, the lamp will take approximately 30 seconds to 1 minute to reach full intensity (depending upon ambient temperature). The sensor can be tested using a digital multimeter. Resistance readings obtained with tank installed will be in proportion to the amount of fuel in the tank (the temperature of the thermistor.) The sensor wires are located in the 4-pin connector with the fuel pump wires, at the rear of the tank.

1. For Low Fuel Light circuit testing, refer to page 19.13. If you suspect a faulty sensor, perform this test.



2. Drain the fuel from the tank.
3. Remove the side covers and seat.
4. Remove the rear tank mount screw.
5. Remove the front tank mount covers and loosen both front screws.
6. Carefully raise and support rear of tank to access fuel pump / fuel level sensor 4-pin connector.
7. Set multimeter to measure resistance.



8. Identify the position of the Black (B) and Yellow/Red (A) fuel sensor wires in the connector in reference to the lock tab.
9. Connect the meter leads to pin A and pin B of the 4-pin fuel sensor connector and compare resistance reading to the table. Temperature MUST be close to the testing temperature listed in the table for accuracy.

Measure Resistance Pin A to Pin B	Approximate Resistance
Sensor Resistance ±20% @ 25° C (77° F).	750 Ω – 1100 Ω (.75-1.1 KΩ)

5

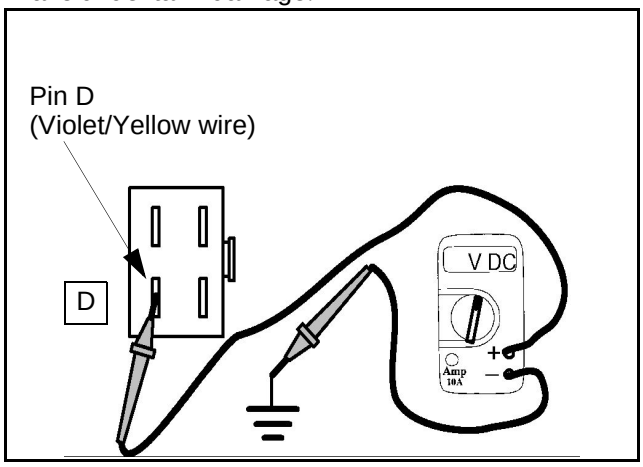
FUEL PUMP ELECTRICAL DIAGNOSTICS

FUEL SYSTEM	
Fuel Pump Pressure	3.37 BAR (338 kPa) (49 psi)
Fuel Pump Volume	45 liters/hr (325 ml/30 seconds) (11 oz./30 seconds) (0.165 gal/min)
Fuel Pump Current Draw	5 amps maximum @ 13.8 VDC

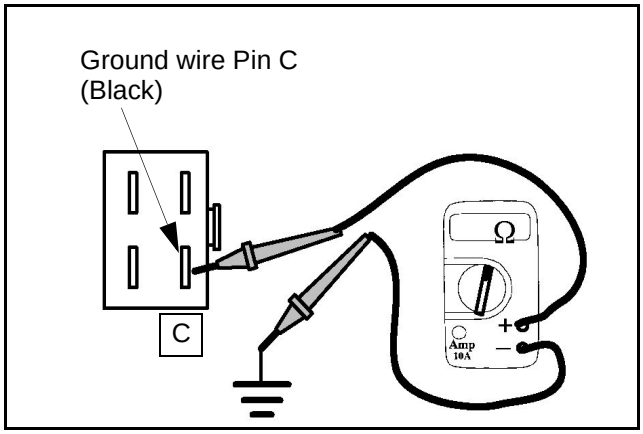
NOTE: When ignition switch is turned ON and kill switch is in the RUN position, fuel pump should run momentarily (about 2-3 seconds.) If Digital Wrench™ communication cable is attached to the diagnostic port, be sure the switch is toward the laptop computer in the diagnostic (not the reprogramming) position, or the fuel pump will not cycle.

FUEL PUMP SUPPLY VOLTAGE TEST

1. Secure handlebars in the straight forward position to avoid fuel tank damage.



2. Remove side covers, seat, and rear fuel tank bolt.
3. Loosen front tank bolts, and carefully lift rear of tank until fuel pump 4-pin connector is accessible. Lift tab and separate connector.
4. Connect meter on the wire harness side of pump connector as shown in the illustration at right.
5. Turn kill switch to RUN.
6. Turn ignition key ON and read DC voltage on meter when key is first turned on. Voltage reading on pin D (Violet/Yellow) wire should be equal to the battery voltage for 2-3 seconds after turning key ON.

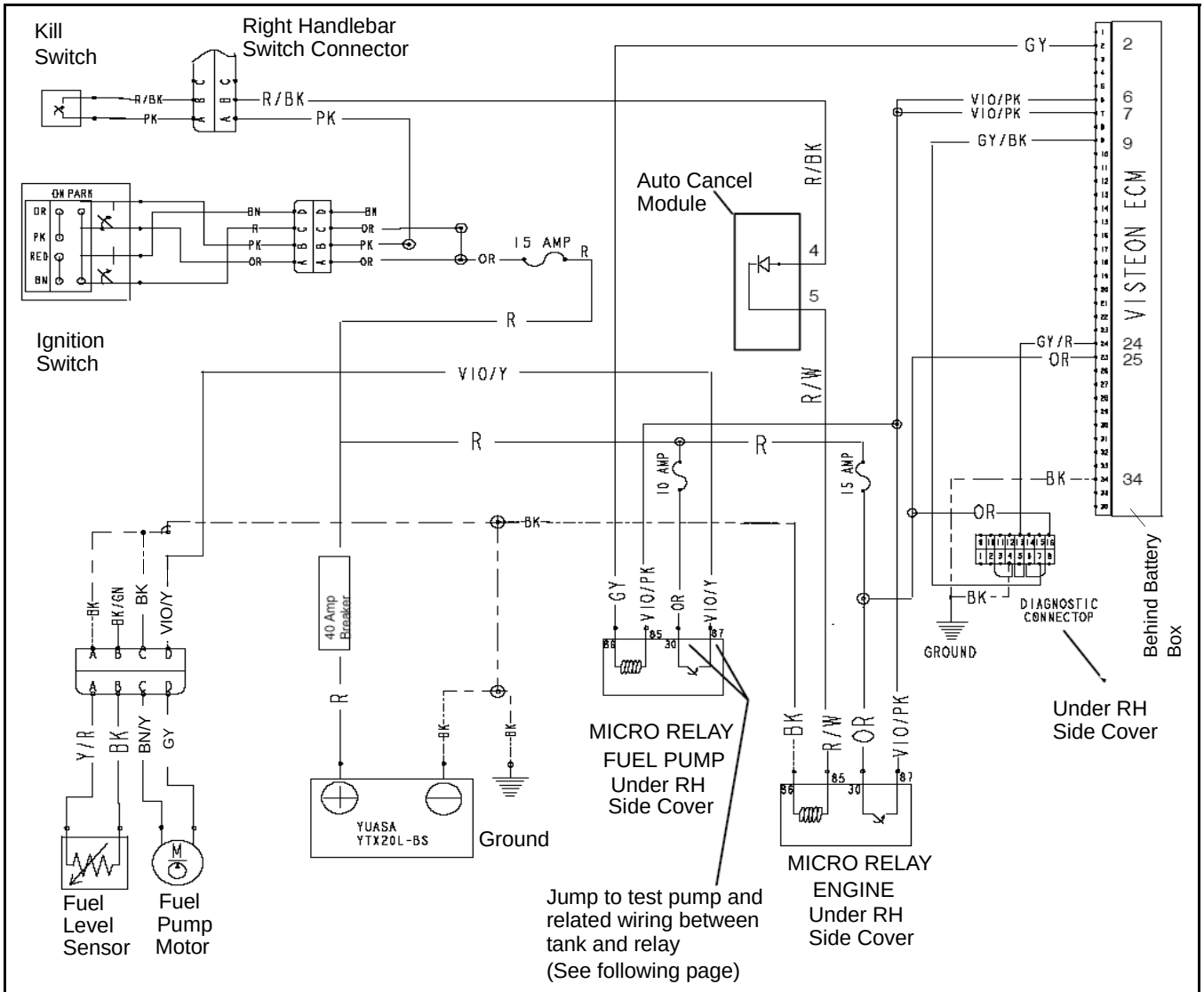


7. If low or no voltage is delivered to the fuel pump, verify ground wire (Pin C, Black) has good continuity to ground battery (-) post. If ground is OK, check Gray wire from fuel pump relay to ECM pin #2. This Gray wire receives a momentary ground from ECM pin 2 (for 2-3 seconds) and activates the fuel pump relay which supplies fuel pump Violet / Yellow wire with power. Trace the power and ground circuits and fuel pump relay to determine fault if battery voltage is not present at connector for 2-3 seconds.

BATTERY VOLTAGE NOT REACHING FUEL PUMP

1. Check fuel pump fuse. If fuse is open (blown) perform fuel pump current draw test on page 5.18.
2. Check engine relay fuse (15 A). If fuse is OK (power both sides) turn key and kill switch ON/Run and remove engine relay and check power at terminal 85 of engine relay. If no power is present check power supply circuit from kill switch through auto cancel module to R/W at terminal 85.
3. If terminal 85 is powered, remove fuel pump relay and jump terminals 30 (Orange) and terminal 87 (Violet/ Yellow) to directly power the fuel pump. (Do not leave connected. This step is only to determine that the fuel pump and circuit between pump and relay is OK). If pump does not run, perform supply voltage test page 5.16.
4. If pump runs when powered directly as in Step 3, swap fuel pump relay with Primary Lights relay, and cycle key/kill switch to test. Repeat test by swapping Engine relay with secondary Lights. If pump runs when key/kill switch is cycled replace faulty relay.
5. If pump does not run when key / kill switch is cycled and relays swapped (but ran in Step 3) check continuity on gray wire from fuel pump relay (terminal 86) to ECM pin 2 in ECM connector. The ECM grounds the pump relay through ECM pin 2 for 2-3 seconds when key switch and kill switch are first turned ON. The ECM maintains this ground connection on pin 2 after engine start-up. Ground Gray wire to bypass ECM ground.

FUEL PUMP CIRCUIT DIAGRAM

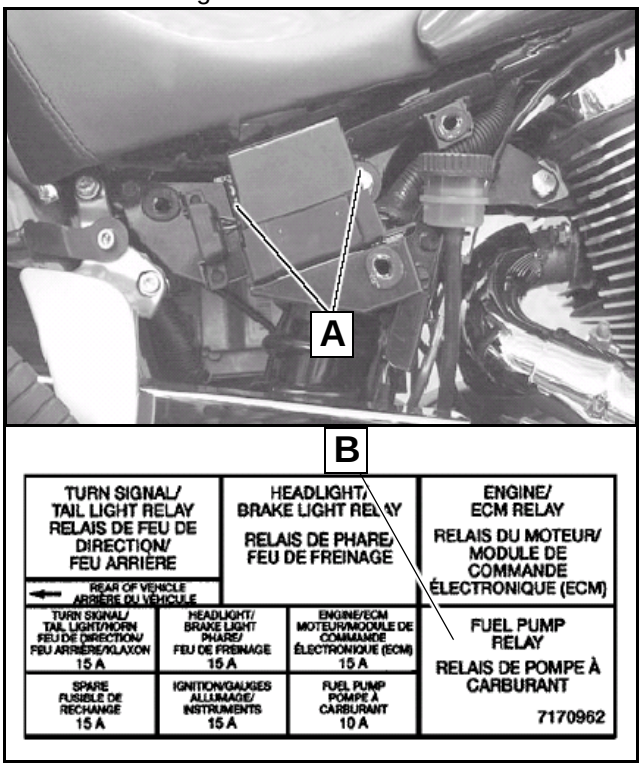


NOTE: All 4 relays in the fuse box are the same and can be swapped for testing purposes

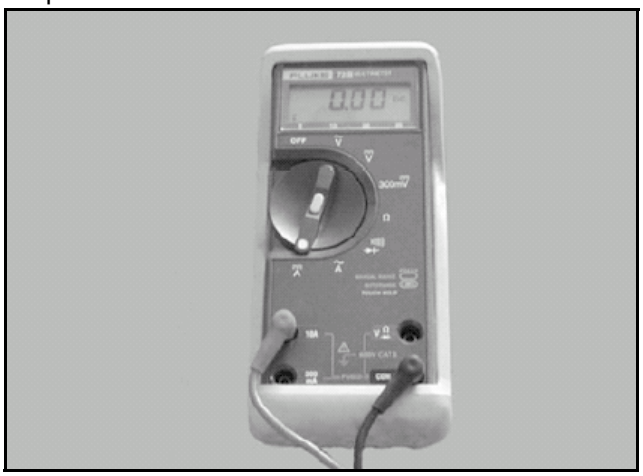
FUEL PUMP CURRENT DRAW TEST

Fuel pump current draw is a good indicator of fuel pump condition. Perform the following test if fuel pump operation is suspect, or if fuel pump fuse is found to be open (blown). NOTE: When meter leads are inserted the pump will run, and current draw will be displayed on the meter, even with key and kill switch off. Fuel tank must be completely installed and have enough fuel in it to cover the fuel pickup screens for an accurate test.

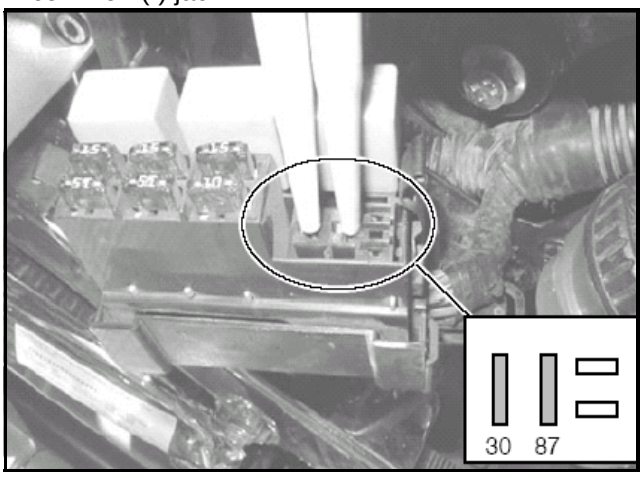
1. Remove the right side cover.



2. Remove fuse box from bracket.
3. Remove fuse box cover by opening clips (A) and lifting cover upward.
4. Remove fuel pump relay (B) by pulling straight upward.



5. Attach test lead adaptors from Electrical Connector Test Lead Adaptor kit.
6. Set meter to DC Amps. Be sure red meter lead is inserted in AMP 10A jack, and black meter lead is in common (-) jack.



7. Insert one meter lead in pin socket (30) and other meter lead in pin socket (87) of relay block. The pump should run.
8. Read fuel pump current draw on meter and compare to specification.
9. Inspect fuel pump circuit wiring or replace fuel pump if current draw exceeds specification

SPEC: Fuel Pump Current Draw

Maximum: 5 DC Amps

FUEL PUMP PRESSURE INSPECTION

⚠ WARNING

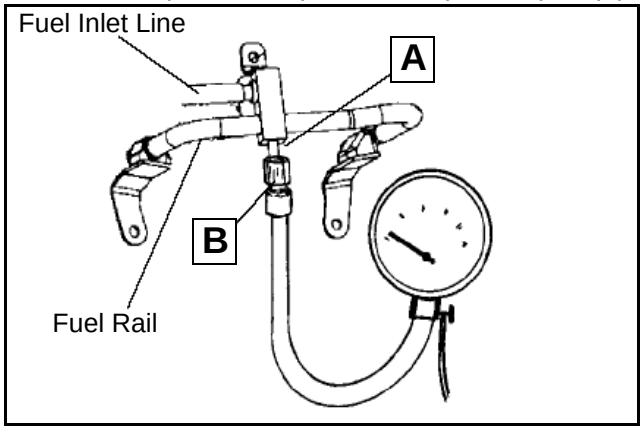
GASOLINE

Gasoline is extremely flammable and is explosive under certain conditions. Work in a well ventilated area. Open flames, sparks and cigarettes must be kept away from gasoline.
KEEP GASOLINE OUT OF THE REACH OF CHILDREN!

⚠ CAUTION

Wear safety glasses or a face shield when working around the fuel system to protect your eyes.

1. Remove cap from fuel pressure inspection port (A).



2. Install fuel pressure gauge and tighten fitting securely.

Fuel pressure gauge: PV-43506

3. Start engine and record fuel pressure (or cycle key and kill switch to read pressure when pump cycles for 2-3 seconds.

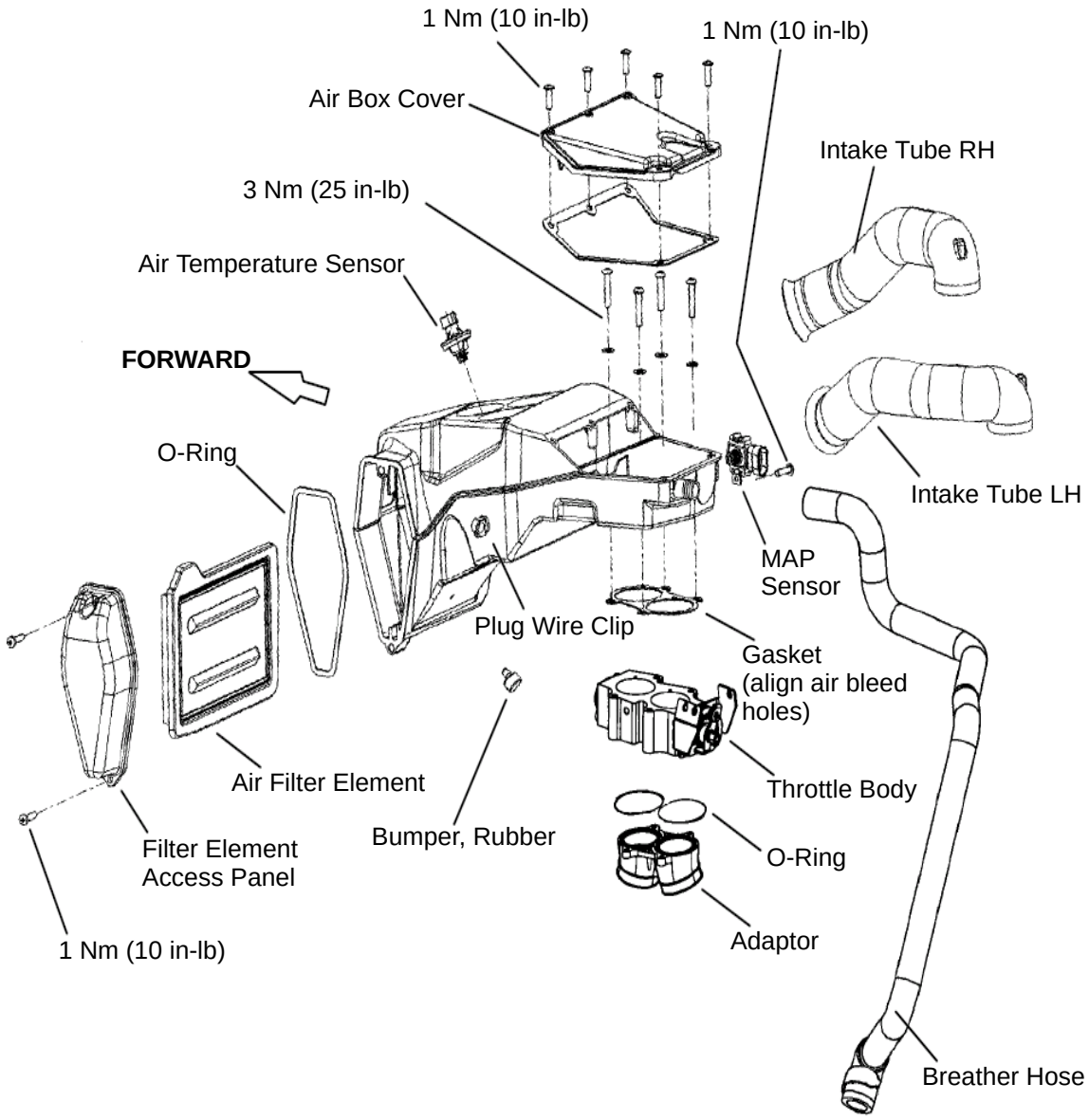
Fuel pressure 3.37 BAR (338 kPa) (49 psi)

4. Turn ignition switch off, bleed gauge at T-valve and remove fuel pressure gauge fittings.
5. Install cap on pressure inspection port securely.
6. Install fuel tank and seat.

TROUBLESHOOTING	
FUEL PRESSURE TOO LOW: INSPECT	**FUEL PRESSURE TOO HIGH: INSPECT**
Low fuel level (add fuel) Pump not running (Fuel pump or circuit malfunction) Wrong pressure gauge fitting (use PV-43506) Poor connection from gauge to pressure inspection port Fuel line kinked or restricted (from tank fitting to rail) Fuel hose leaking (leaking air in or fuel out) Vent restriction Plugged fuel filters (located in fuel tank) Pressure regulator malfunction (located on pump in fuel tank) Fuel pump malfunction (Pump should run for about 2 seconds the instant that the key switch and kill switch are turned ON.	Plugged fuel return (in tank on pressure regulator) Pressure regulator malfunction (located on pump in fuel tank) Open cap and re-test

EFI SYSTEM COMPONENTS

FUEL INJECTION ASSEMBLY VIEW



THROTTLE BODY REMOVAL & INSTALLATION

WARNING

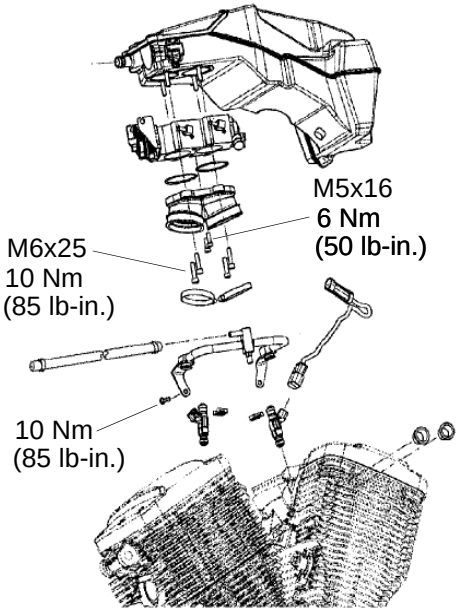
GASOLINE

Gasoline is extremely flammable and is explosive under certain conditions. Work in a well ventilated area. Open flames, sparks and cigarettes must be kept away from gasoline.
KEEP GASOLINE OUT OF THE REACH OF CHILDREN!

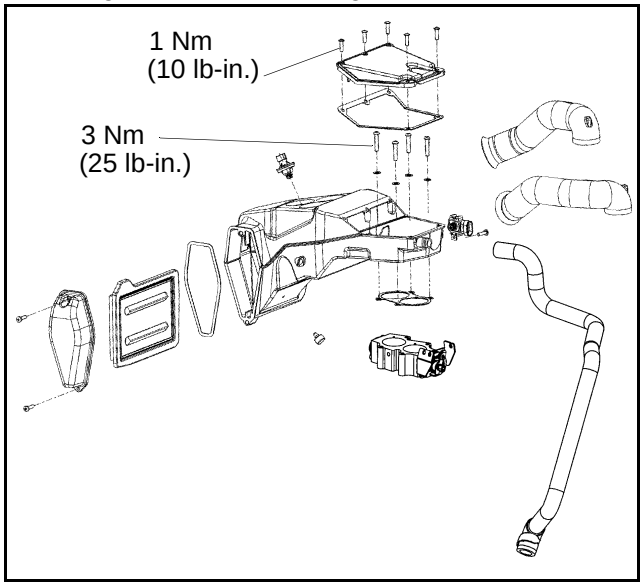
CAUTION

Wear safety glasses or a face shield when working around the fuel system to protect your eyes.

1. Remove side covers and seat.

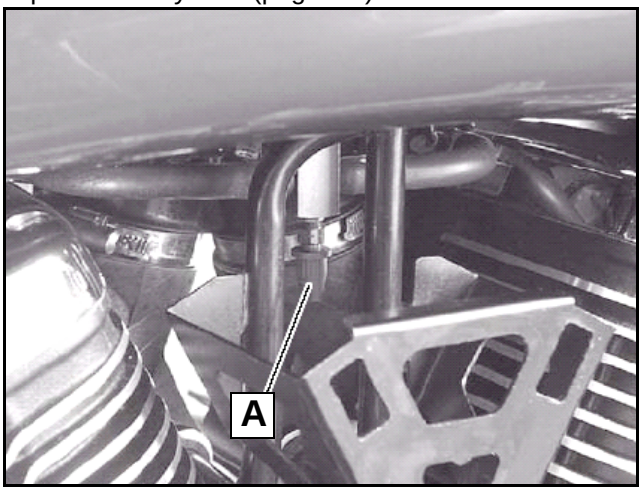


2. Remove fuel tank. (page 5.9)
3. Remove air box top cover.
4. Remove intake tubes from the air box.
5. Remove throttle body through-bolts.
6. Remove throttle body adaptor to throttle body screws and fuel rail mounting bolts.
7. Remove fuel rail attachment bolts.
8. Remove throttle and throttle return cables.
9. Remove fast idle cable.
10. Disconnect TPS wiring connector.
11. Remove cooling oil delivery tubes.
12. Remove throttle body assembly out right side.
13. Reverse steps for installation. Use new gaskets, sealing washers, and O-rings.

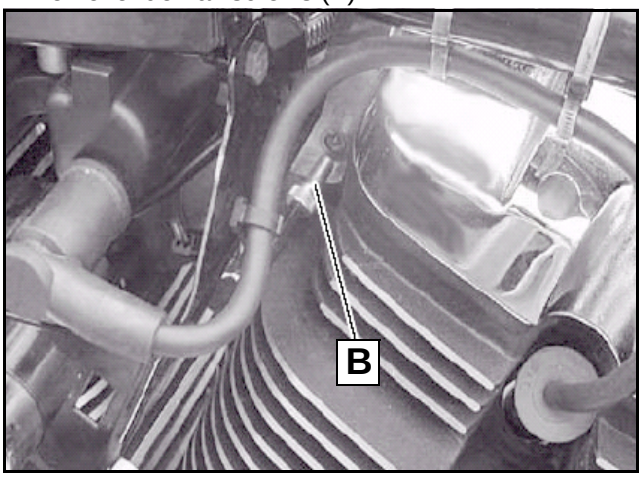


FUEL RAIL / FUEL INJECTOR REMOVAL

1. Remove seat, side covers, and fuel tank.
2. Remove cap (A) from pressure inspection port and depressurize system (page 5.9).



3. REAR INJECTOR: Disconnect rear injector wire harness at the injector.
4. FRONT INJECTOR: Disconnect front injector wire harness at jumper located along RH side of air box.
5. Remove fuel rail screws (B).



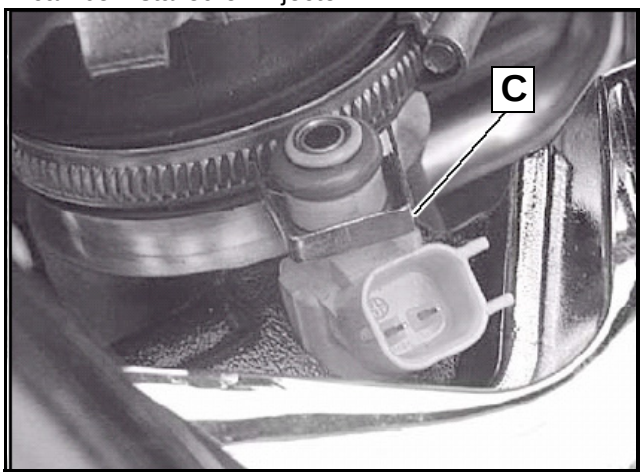
6. Remove oil temperature sensor wires, route wires to allow for fuel rail removal.

> ⚠ CAUTION
>
> Clean the area around injectors to prevent foreign material from falling into the engine.

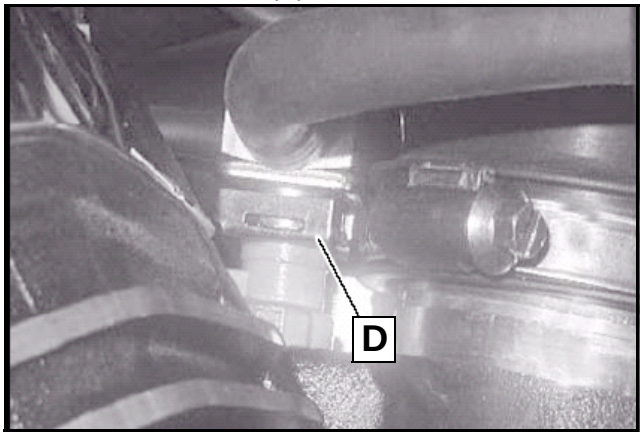
7. Slide clip back and lift rail off injector.
8. Pull injector out of cylinder head.

FUEL RAIL INSTALLATION

1. Install injectors in cylinder head with 2 new O-rings on each.
2. Install fuel rail and set in position above injectors.
3. Be sure rail clips (C) are in position on injectors and if necessary, set them in the expanded position so rail can be installed on injector.



4. Push fuel rail down onto injectors until firmly seated.
5. Slide rail clip in to lock.
6. Inspect both front and rear rail retaining clips and be sure the lower edge of rail is fully engaged in the clip notch on both sides (D).



7. Install fuel rail retaining screws and torque to 85 in. lbs. (10 Nm).
8. Assemble remaining parts.

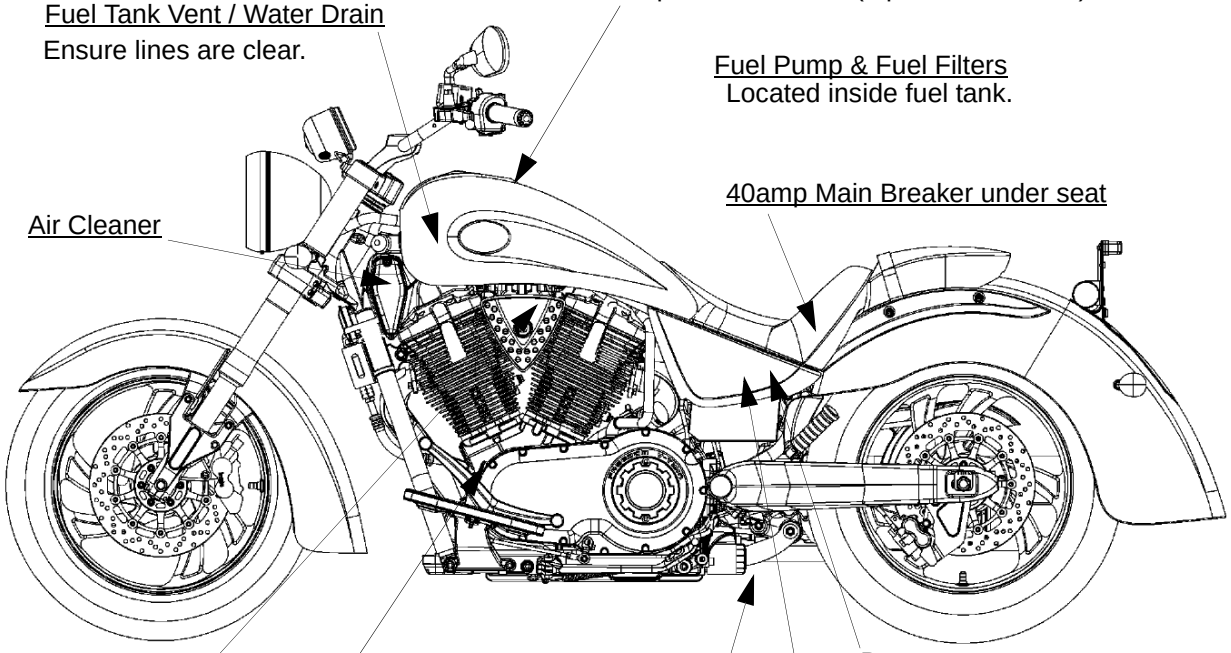
THROTTLE CABLE ADJUSTMENT

Refer to page 2.16 for procedure.

FAST IDLE CABLE ADJUSTMENT

Adjust the fast idle cable free play to specification. Refer to page 2.18 for procedure.

FUEL INJECTION COMPONENT LOCATIONS



All located under fuel tank
Throttle Position Sensor (TPS) (Right front of throttle body)
Throttle Body
Fuel Rail
Fuel Line (tank to rail)
Fuel Injectors
MAP Sensor (Right rear side of air box)
Air Temperature Sensor (top front of air box)

Fuel Tank Vent / Water Drain
Ensure lines are clear.

Fuel Pump & Fuel Filters
Located inside fuel tank.

40amp Main Breaker under seat

Air Cleaner

Oil Temperature Sensor
Rear cylinder head, left front

Battery
Under Left Side Cover

Crank Position Sensor

Evaporative Emissions Canister
(California Models only)

ECM
Behind Battery Box (access by removing battery box or by removing seat and 40A Breaker)

Diagnostic Port, Fuses & Relays
Located under **right** side cover

OVERVIEW OF OPERATION - FUEL INJECTION SYSTEM

The Electronic Fuel Injection (EFI) system functions to provide the engine with precisely metered fuel under varying loads and conditions.

The Engine Control Module, or "ECM", is programmed to provide the proper fuel and ignition timing based mainly on the engine's RPM and throttle position, and also on inputs received from various sensors in the system. The ECM also provides grounds or supplies voltage to other *EFI related* circuits of the electrical and fuel delivery systems.

A throttle position sensor, which is mounted at one end of the throttle plate shaft on the throttle body, monitors throttle position. This sensor changes its voltage output based on its position. The TPS output voltage is monitored by the ECM to determine the amount of air the engine is receiving.

An electric fuel pump, mounted inside the fuel tank supplies fuel pressure to the injectors continuously when the engine is running or during cranking. A pressure regulator incorporated on the pump keeps fuel pressure steady at approximately 49 PSI (3.378 Bar). The fuel pump cycles "ON" for 2-3 seconds when the ignition key and kill switch are turned on.

The fuel injectors inject fuel when they are grounded by the ECM. They continue to inject fuel until the ground is opened or cycled off (also controlled by the ECM). The amount of time the injectors are grounded by the ECM determines the amount of fuel delivered to the engine (longer cycles = more fuel). The ECM selects the correct amount of fuel injector cycle time by referencing a three dimensional fuel "map". Simplified, each reference point on the map represents a different amount of time. The point that is referenced depends on many variables, including engine RPM, throttle position, engine temperature, air temperature, altitude, and so on.

Throttle position and engine RPM are the main ECM inputs to the ECM for selecting the map reference point, but also receives feedback from the sensors for a more accurate "picture" of the fuel needs at any given moment.

The locations of sensors and other EFI system related components are shown on page 5.23.

SELF-DIAGNOSTIC FEATURE

The ECM used on the Victory motorcycle stores fault codes in memory. Fault Codes are stored by the ECM when a sensor reading is outside of the normal range. These codes are listed and described on page 5.25. The ECM is located behind the battery box on the left side of the motorcycle.

When a fault occurs, the ECM records a code in the "Logged Faults" memory. If a fault is currently active, the code is also recorded in the ECM "Current Faults" memory and remains until the fault is no longer occurring. If the problem is corrected, the "Current Fault" is erased, but the code remains in the "Logged Faults" memory until it is manually deleted (cleared) using Digital Wrench™ software. Logged faults remain even if the battery power is removed from the ECM.

Digital Wrench™ diagnostic software is the tool used to interface with the EFI system by coupling to a diagnostic port located under the right side cover behind the fuse box.

FUEL INJECTION PROBLEM NOTIFICATION

INDICATOR DISPLAY	POSSIBLE CAUSE
Check Engine Light	Sensors
	Injectors
	Wiring Problem / Low Battery Voltage
	ECM

FAULT CODES

Access codes by clicking the exclamation point icon on the Digital Wrench diagnostic screen.

CODE NUMBER	DESCRIPTION	COMMENTS
P0107	Barometric Pressure Sensor Circuit Low Input	Circuit voltage below 0.16 volts for 0.1 seconds
P0108	Barometric Pressure Sensor Circuit High Input	Circuit voltage above 4.94 volts for 0.1 seconds
P0112	Intake Air Temperature Sensor Low Input	Circuit voltage below 0.16 volts for 0.8 seconds
P0113	Intake Air Temperature Sensor High Input	Circuit voltage above 4.94 volts for 0.8 seconds
P0122	Throttle Position Circuit Low Input	Circuit voltage below 0.16 volts for 0.1 seconds
P0123	Throttle Position Circuit High Input	Circuit voltage above 4.94 volts for 0.1 seconds
P0126	Insufficient Oil Temperature for Stable Test Operation	Not supported
P0197	Engine Oil Temperature Sensor Low Input	Circuit voltage below 0.16 volts for 0.8 seconds
P0198	Engine Oil Temperature Sensor High Input	Circuit voltage above 4.94 volts for 0.8 seconds
P0201	Injector Circuit Malfunction - Cylinder #1	Open load or short to Vbatt detected for 0.8 seconds
P0202	Injector Circuit Malfunction - Cylinder #2	Open load or short to Vbatt detected for 0.8 seconds
P0230	Fuel Pump Primary Circuit Malfunction	Open load or short to Vbatt detected for 0.8 seconds
P0337	Crankshaft Position Sensor Circuit Low input	Not supported
P0338	Crankshaft Position Sensor Circuit Low input	Not supported
P0351	Ignition Coil A Primary/Secondary Circuit Malfunction	Coil open load, short to ground or short to Vbatt detected for 6.4 seconds
P0352	Ignition Coil B Primary/Secondary Circuit Malfunction	Coil open load, short to ground or short to Vbatt. detected for 6.4 seconds
P0500	Vehicle Speed Sensor Malfunction; or, Neutral Light Switch Malfunction	Loss of VSS signal with engine running & vehicle in gear; Neutral Light Switch fault
P0502	Vehicle Speed Sensor Low Input	Not supported
P0562	System Voltage Low	Battery voltage below 11.0 volts for 0.8 seconds
P0563	System Voltage High	Battery voltage above 16.0 volts for 0.8 seconds
P0601	Internal Control Module Memory Check Sum Error	Code can usually be cleared. See page 5.34.
P0704	Clutch Switch Input Circuit Malfunction	VSS input present, in gear state reported, calculated gear level is out of range (includes Neutral Switch failure)

VIEWING AND CLEARING FAULT CODES

Fault codes are logged in the ECM memory when a sensor or other supported system fault occurs. To view the codes, do the following:

Viewing Fault Codes

1. Connect the Digital Wrench™ diagnostic software and establish communication with the ECM.
2. Select the icon to display loaded fault code(s).
3. The codes are classified as *Current or Historical*. Current codes are occurring at the moment. Historical codes are not occurring at the moment but have occurred in the past. A list of codes is on page 5.25.

Clearing Fault Codes

1. Click on the "*Clear Fault Codes*" icon to clear fault codes.

CAUTION

Tests in this section may require reading resistance and voltages at ECM connector. Once ECM connector has been disconnected, do not touch pins on ECM. Static electricity from your body can easily damage ECM.
Do not attempt to perform tests on the ECM. Tests are done on wire harness side of ECM connector.

SENSOR DIAGNOSTICS - IMPORTANT INFORMATION TO UNDERSTAND BEFORE YOU BEGIN

If a sensor fails or reads outside a "normal" range, a "pre-programmed" (default) value is substituted by the ECM until sensor reading returns to normal.

Sensor values can be viewed in Digital Wrench™ on the "Sensor Data Grid Or Graphs" screen. HOWEVER, the sensor reading may be actual feedback from the sensor, or it may be the default value set by the ECM in the event of a fault in the sensor or wiring.

The check engine ("ENG") warning will illuminate to alert the rider of a possible problem. Following a check engine light, perform a visual inspection to see if a cause can be determined.

Connect the Digital Wrench™ to see what codes are present in memory, and focus your diagnostics on that sensor and the related wiring for that circuit. (Refer to page 19.15 for ENG light circuit wiring diagram.)

The sensor tests described in this section are performed at the 40 pin ECM wire connector. This method ensures that the data from a sensor is reaching the ECM.

The sensor tests are sometimes easier to perform at the sensor; but the wiring between the sensor and the 40 pin connector (and the integrity of the connector pins and receptacles in the connectors themselves) should always be closely examined and tested if the sensor itself passes the test.

FAILED SENSOR	DEFAULT	POSSIBLE SYMPTOM
Crank Position	No Default	Engine will misfire or stop
Throttle Position	Full Throttle	Engine misfire when not at full throttle
M.A.P. (Manifold Absolute Pressure) same as "BAP" (Barometric Air Pressure)	Sea Level (1040 mb)	No significant effect up to 2500 ft.
Oil Temperature	90 Degrees Celsius (194 F)	No effect on warm engine
Air Temperature	10 Degrees Celsius (50 F)	Slight effect on cold engine or in hot weather

ECM INPUT / OUTPUT PARAMETERS

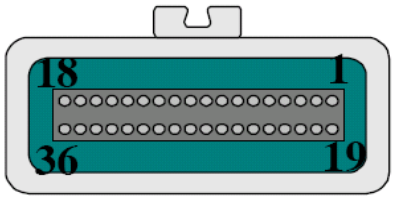
The function of each pin connection to the ECM is listed below. Refer to page 19.22 - 19.28 for Input / Output Parameters of all electrical components.

INPUT / OUTPUT PARAMETERS Electronic Control Module 36-Cavity (Female, Gray)

NOTE: Pin cavities 3, 16, 17, 22, 23, 26, 27, 28, 31, & 33 are not used			
CAV	FUNCTION	INPUT/OUTPUT PARAMETER	WIRE COLOR
1	REAR FUEL INJECTOR OUTPUT	GROUND (ECM CONTROLLED)	WHITE/GRAY
2	FUEL PUMP RELAY OUTPUT	GROUND (ECM CONTROLLED)	GRAY
4-5	POWER GROUND	GROUND	BLACK/WHITE
6-7	SWITCHED ECM POWER	+12 Vdc (IGN ON)	VIOLET/PINK
8	SENSOR SUPPLY VOLTAGE	+5 Vdc (ECM CONTROLLED)	BROWN/RED
9	COMMUNICATION LINK	SERIAL DATA	GRAY/BLACK
10	SPEED SENSOR INPUT	0-1700 Hz SQUARE WAVE (0-12 Vdc)	GREEN/BROWN
11	AIR TEMPERATURE SENSOR INPUT	0-5 Vdc (TEMPERATURE DEPENDANT)	ORANGE/GREEN
12	OIL TEMPERATURE SENSOR INPUT	0-5 Vdc (TEMPERATURE DEPENDANT)	ORANGE/BLUE
13	MAP SENSOR INPUT	0-5 Vdc (TEMPERATURE DEPENDANT)	ORANGE/BROWN
14	SENSOR SIGNAL RETURN	--	BROWN/BLUE
15	CRANKSHAFT SENSOR INPUT (+)	POSITIVE SENSOR INPUT	BLACK
18	REAR COIL OUTPUT	GROUND (ECM CONTROLLED)	WHITE/GREEN
19	FRONT FUEL INJECTOR OUTPUT	GROUND (ECM CONTROLLED)	WHITE/BLUE
20	TACHOMETER OUTPUT	0-120 Hz SQUARE WAVE (0-12 Vdc)	GREEN/WHITE
21	CHECK ENGINE OUTPUT	GROUND (ECM CONTOLLED)	BLACK/ORANGE
24	FLASH EPROM PROGRAM SUPPLY	+12 Vdc (IGN ON)	GRAY/RED
25	CONSTANT POWER	+12 Vdc	ORANGE
29	THROTTLE POSITION SENSOR INPUT	0-5 Vdc (DEPENDANT ON POSITION OF THROTTLE BODY)	ORANGE/YELLOW
30	CLUTCH/NEUTRAL SW INPUT	GROUND (CLUTCH/NEUTRAL SWITCH CLOSED)	BLUE/YELLOW
32	CRANKSHAFT SENSOR INPUT (-)	NEGATIVE SENSOR INPUT	TRANSPARENT
34	CASE & SHIELD GROUND	GROUND	BLACK
36	FRONT COIL OUTPUT	GROUND (ECM CONTROLLED)	WHITE/BLACK

ECM CONNECTOR (Refer to page 5.29 for ECM connector access.)

VIEW FROM OPEN (SOCKET)
END OF ECM 40 PIN CONNECTOR



ECM CONNECTOR MAP (Wire Color & Pin Number)																	
18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
W/GN #2 CYL. (REAR) PRIMARY COIL WIRE	OPEN	OPEN	BK CRANK POSITION SENSOR	BN/BU SENSOR VOLTAGE	OR/BN MAP SENSOR SIGNAL	OR/BU OIL TEMP SENDER	OR/GN AIR TEMP SENDER	GN/BN SPEED SENSOR	GY/BK DIAG PIN #7	BN/R MAP & TPS +5 VDC ECM CONTROLLED	VIO/PK ECM POWER 12 VDC W/ KEY ON	VIO/PK ECM POWER 12 VDC W/ KEY ON	BK/W SYSTEM GROUND	BK/W SYSTEM GROUND	OPEN	GY FUEL PUMP RELAY GROUND ECM CONTROLLED	W/GY INJECTOR #2 (REAR)
BN = Brown BU = Blue GN = Green BK = Black GY = Grey OR = Orange PK = Pink R = Red TRANS = Transparent VIO = Violet W = White Y = Yellow																	
36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
W/BK #1 CYL (FRONT) PRIMARY COIL WIRE	OPEN	BK ECM GROUND	OPEN	TRANS CRANK POSITION SENSOR	OPEN	BU/Y CLUTCH	OR/Y TPS SIGNAL	OPEN	OPEN	OPEN	OR 12VDC POWER	GY/R DIAG PIN #13	OPEN	OPEN	BK/OR CHK ENG GROUND	GN/W TACH OUTPUT	W/BU INJECTOR #1 (FRONT)
VERIFY TERMINAL PINS ARE NOT LOOSE IN CONNECTOR AND WIRE CONNECTION TO TERMINAL IS PIN IS SECURE. BACK OF CONNECTOR IS NUMBERED AT THE PIN SLOT AS SHOWN ABOVE																	

ECM HARNESS CONNECTOR TESTS

COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS ±10% @ Room Temp. 70° F/ 21° C
#1 FUEL INJECTOR	OHMS	Pin #19 to Pin #7	15 ohms / No cont. to ground
#2 FUEL INJECTOR	OHMS	Pin #1 to Pin #7	15 ohms / No cont. to ground
#1 IGNITION COIL (FRONT CYL.)	OHMS	Pin #36 to plug cap of front ignition coil.	11,000 ohms
#2 IGNITION COIL (REAR CYL.)	OHMS	Pin #18 to plug cap of rear ignition coil.	11,000 ohms
CRANK POSITION SENSOR	OHMS	Pin #15 to #32	1500 ohms ± 100 ohms
CRANK POSITION SENSOR	AC VOLTS	Pin #15 to #32	Spark plugs out: 3V AC Spark plugs in: Any fluctuating AC signal.
AIR TEMP. SENSOR	OHMS	Pin #11 to #14	3150 ohms
OIL TEMP. SENSOR	OHMS	Pin #12 to #14	12,300 ohms
THROTTLE POSITION SENSOR (TPS)	OHMS	Pin #29 to #8	3000 - 5000 ohms throttle closed 1000 - 1600 ohms throttle open
THROTTLE POSITION SENSOR (TPS)	OHMS	Pin #29 to #14	1000 - 1600 ohms throttle closed 3000 to 5000 ohms throttle open
THROTTLE POSITION SENSOR (TPS)	OHMS	Pin #8 to #14	3000 - 5000 ohms NOTE: Reading will not change with throttle position
MAP SENSOR	OHMS	Pin # 8 to #13	5400 ohms

ECM CONNECTOR ACCESS

Sensor tests on the following pages are first performed at the sensor (to test the sensor). If the sensor is OK, test for wire continuity back to the ECM connector.

1. Remove left side cover.
2. Remove battery.
3. Remove starter relay (A) from battery box.

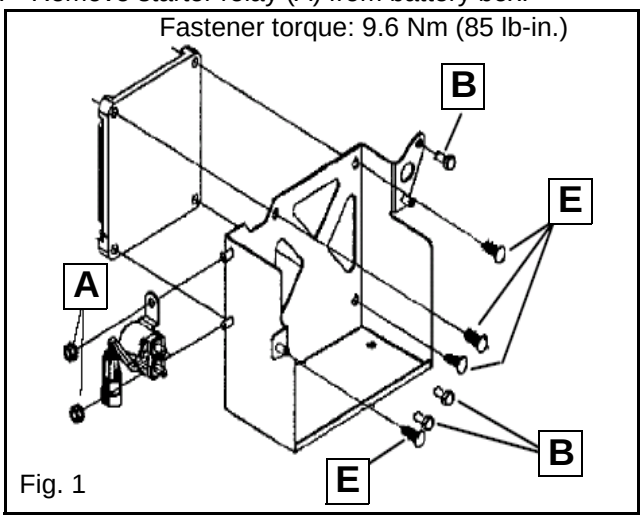
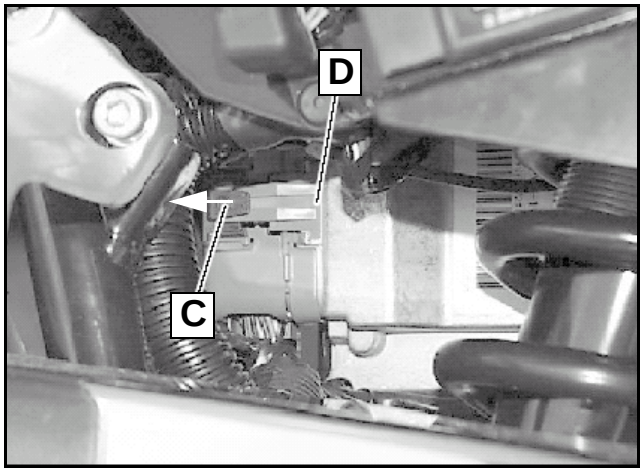


Fig. 1

4. Remove (3) battery box mounting bolts (B).
5. Move battery box until connector is accessible.
6. Disconnect ECM 40 pin connector:

   • Slide back red lock tab (C) and lift tab (D) to disconnect.



ECM Removal

7. Cut or drive the (4) ECM dart clips (E, Fig. 1) out of battery box with a 1/8 inch (3 mm) pin punch.

CRANKSHAFT POSITION SENSOR DIAGNOSTICS

FAIL CODE: P0337 / P0338
COMPONENT AFFECTED: Crankshaft Position Sensor
INSPECT
Sensor resistance / AC Output
Wiring and connectors

CRANK POSITION SENSOR (CPS) TESTING Refer to page 17.9 - 17.10 for CPS testing procedures.

THROTTLE POSITION SENSOR (TPS) DIAGNOSTICS

FAIL CODE: P0122 / P0123	
COMPONENT AFFECTED: Throttle Position Sensor	
INDICATES	**INSPECT**
Voltage received at ECM from TPS is outside of parameters.	Resistance readings at ECM connector. This will test will inspect the TPS and the wiring.

To view and clear fault codes refer to page 5.26. See page 5.28 for wire colors / pin number in connector.

TPS CIRCUIT & RESISTANCE TESTING

1. Disconnect ECM 40 pin connector (page 5.29).
2. Attach test lead adaptors to meter leads.

Testing Resistance of TPS

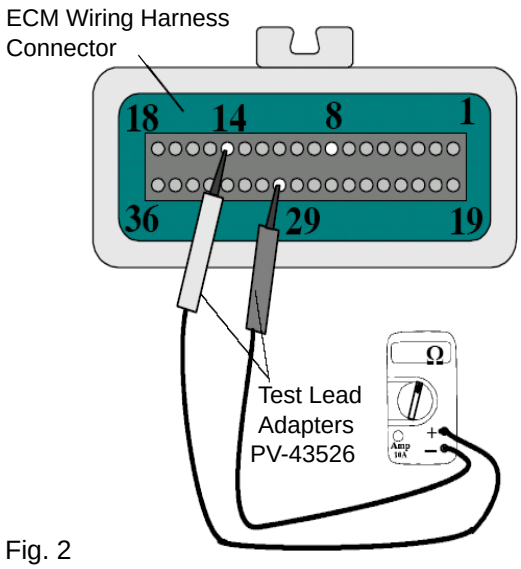
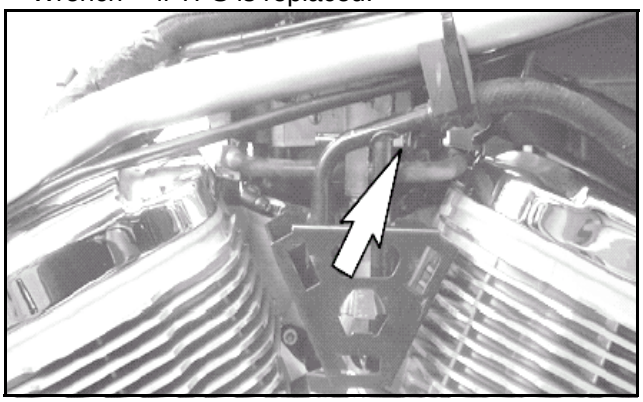


Fig. 2

3. Set DMM to measure resistance.
4. Place meter leads in ECM harness connector pins (**not the ECM**) as indicated in chart below. An example of one test is shown in Fig. 2.
5. If results are outside of specifications, remove fuel tank and disconnect TPS.
6. Inspect wires for continuity from ECM connector to TPS connector. If any wire has no continuity or high resistance, inspect wire harness.
7. If good continuity exists, test TPS separately and compare to chart below. Replace TPS if readings are outside of specification. Calibrate TPS using Digital Wrench™ if TPS is replaced.



NOTE: Readings may vary slightly from vehicle to vehicle. The important thing to remember when resistance testing the TPS is to look for a smooth, uninterrupted sweep between closed and open throttle. Sweep can also be checked using Digital Wrench™ diagnostic software.

COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS (± 10%)
THROTTLE POSITION SENSOR (TPS)	OHMS	Pin #29 to #8	3000 - 5000 ohms throttle closed (3-5K) 1000 - 1600 ohms throttle open (1-1.6K)
THROTTLE POSITION SENSOR (TPS)	OHMS	Pin #29 to #14	1000 - 1600 ohms throttle closed (1-1.6K) 3000 to 5000 ohms throttle open (3-5K)
THROTTLE POSITION SENSOR (TPS)	OHMS	Pin #8 to #14	3000 - 5000 ohms (3-5K) NOTE: Reading will not change with throttle position

BAROMETRIC PRESSURE (MAP) SENSOR DIAGNOSTICS

FAIL CODE: P0107 / P0108	
COMPONENT AFFECTED: Barometric Pressure Sensor (MAP Sensor)	
INDICATES	**INSPECT**
Voltage received at ECM from MAP sensor is outside of parameters.	Resistance readings at ECM connector. This test will inspect the wiring, connectors and MAP sensor resistance.

To view and clear fault codes refer to page 5.26. See page 5.28 for wire colors / pin number in connector.

MAP SENSOR & CIRCUIT TESTING

1. Disconnect ECM 40 pin connector (page 5.29).
2. Attach test lead adaptors to meter leads.

Testing MAP Sensor Resistance

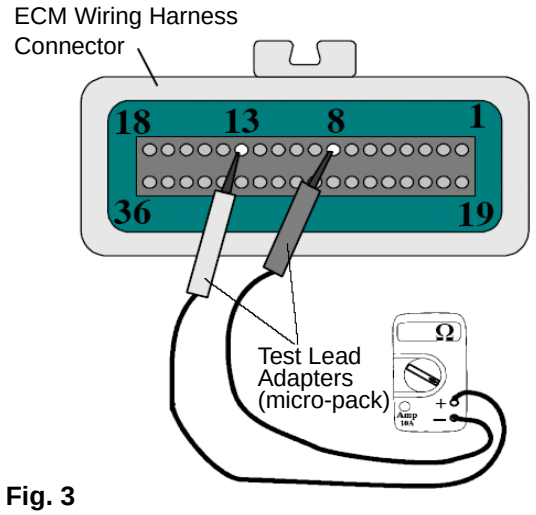
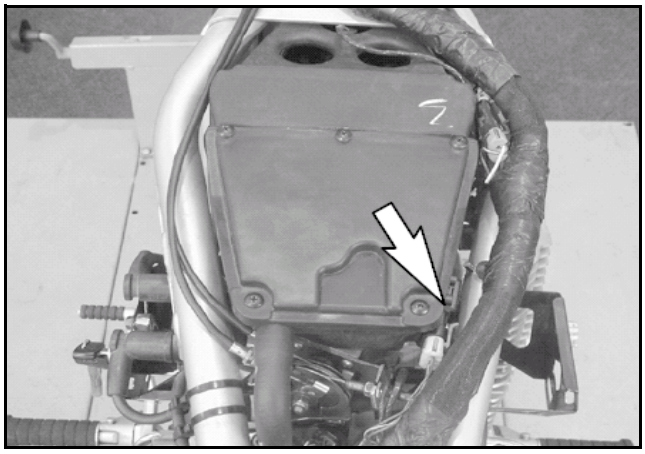


Fig. 3

Connector Test Lead Adaptor Kit: PV-43526

3. Set DMM to measure resistance.
4. Place meter leads in pins of connector as indicated in Fig. 3 **(not in the ECM)** and measure the resistance.
5. If results are outside of specifications, disconnect MAP sensor and inspect wiring between sensor and ECM connector for continuity.
6. If wiring is correct, test resistance of MAP sensor at the sensor and replace if out of range.

Specification: 5.4 KΩ ± 10%



TEST #	COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS (±10%)
MAP SENSOR		OHMS	Pin # 8 to #13	5.4K ohms (5400 Ohms)

AIR TEMPERATURE SENSOR (ATS) DIAGNOSTICS

FAIL CODE: P0112 / P0113	
COMPONENT AFFECTED: Air Temperature Sensor	
INDICATES	**INSPECT**
Voltage received at ECM from Air Temperature sensor is outside of parameters.	Resistance readings at ECM connector. This will test will inspect the wiring, connectors and Air Temperature sensor resistance.

To view and clear fault codes refer to page 5.26. See page 5.28 for wire colors / pin number in connector.

ATS SENSOR & CIRCUIT TESTING

1. Disconnect ECM 40 pin connector (page 5.29).
2. Attach test lead adaptors to meter leads.

Testing ATS Resistance

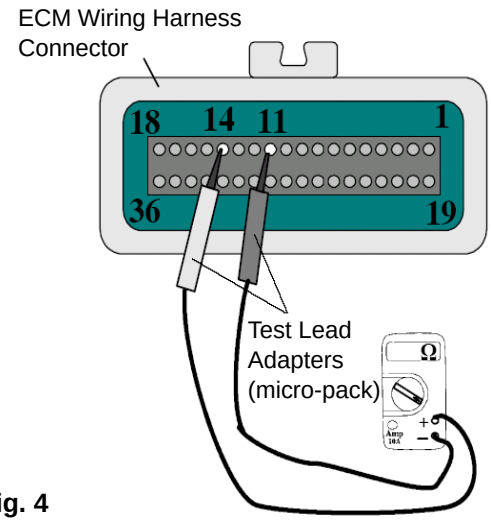


Fig. 4

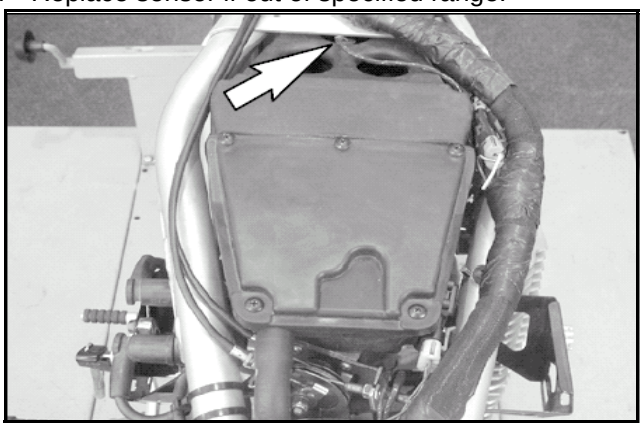
Connector Test Lead Adaptor Kit: PV-43526

3. Set DMM to measure resistance.
4. Place meter leads in pins 11 and 14 of connector **(not the ECM)** as shown in Fig. 4 and compare to specification.

NOTE: Temperature of sensor must be as specified.

Specification: 3.15 KΩ @ 21°C (70° F) ± 10%

5. If reading is outside of specifications, disconnect air temperature sensor connector and verify wires have good continuity back to the 40 pin connector.
6. If wiring is correct, measure the sensor resistance directly at the sensor. In addition, ATS data can be viewed as a temperature value in Digital Wrench™ diagnostic software. The sensor should display a temperature close to ambient room temperature.
7. Replace sensor if out of specified range.



COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS (±10%)
AIR TEMPERATURE SENSOR	OHMS	Pin # 11 to #14	3.15 K ohms at 21° C (70° F)

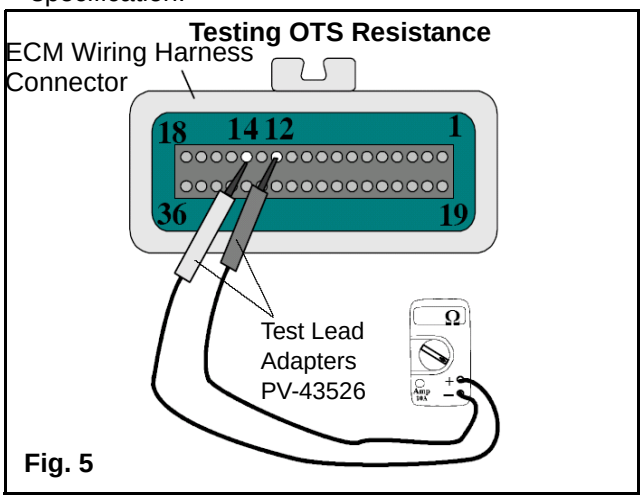
OIL TEMPERATURE SENSOR (OTS) DIAGNOSTICS

FAIL CODE: P0197 / P0198	
COMPONENT AFFECTED: Oil Temperature Sensor (Engine Temperature)	
INDICATES	**INSPECT**
Voltage received at ECM from Oil Temperature sensor is outside of parameters.	Resistance readings at ECM connector. This will test will inspect the wiring, connectors and Oil Temperature sensor resistance.

To view and clear fault codes refer to page 5.26. See page 5.28 for wire colors / pin number in connector.

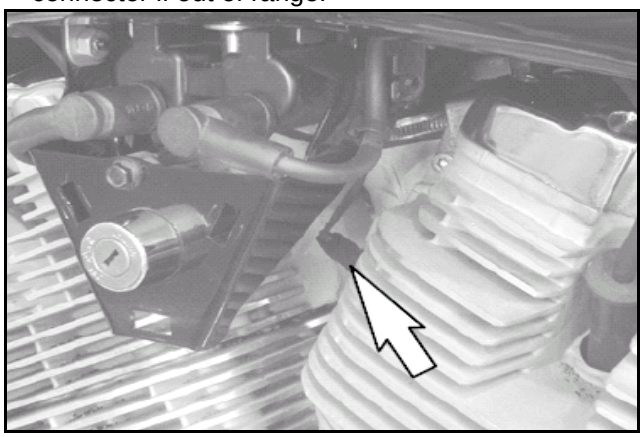
OTS & CIRCUIT TESTING

1. Disconnect sensor wire at sensor.
2. Set DMM to measure resistance.
3. Measure the resistance of sensor between connector tab and battery negative (-) terminal, and compare to specification.



Specification: 11.15 KΩ @ 25°C (77° F) ± 10%
(Approx. 13.5 KΩ @ 21°C (70°F)

4. If sensor resistance is out of specified range, measure resistance of ground path from sensor body to battery negative (-) terminal. It should be less than 1 ohm.
5. If sensor resistance and ground path resistance is within specified range, re-connect oil temperature sensor and disconnect ECM 40 pin connector (page 5.29).
6. Attach test lead adaptors to meter leads.
7. Place DMM leads in pins 14 and 12 of connector as shown in Fig. 5, and compare to specification.
8. Inspect wires from ECM connector to sensor connector if out of range.



TEST #	COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS (±10%)
OIL TEMPERATURE SENSOR		OHMS	Pin # 12 to #14	11.15 K ohms (1115) @ 25° C (77° F) (Approximately 13.5KΩ @ 21° C (70° F) (1350 Ohms)

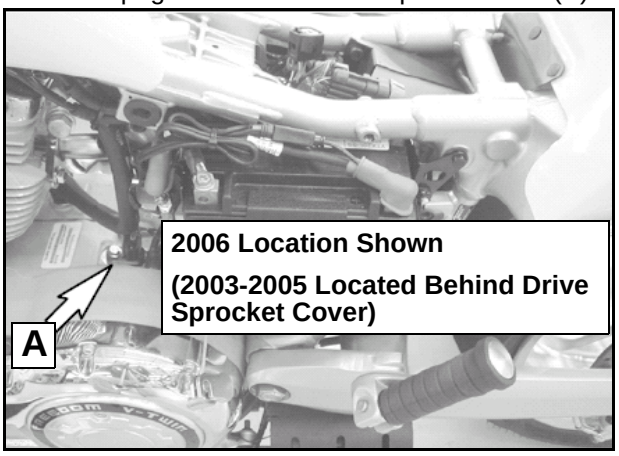
VEHICLE SPEED SENSOR DIAGNOSTICS

FAIL CODE: P0500	
COMPONENT AFFECTED: VEHICLE SPEED SENSOR or NEUTRAL LIGHT SWITCH	
INDICATES	**INSPECT / ACTION**
Vehicle Speed Sensor or sensor wiring malfunction; Neutral light switch or switch wiring malfunction	Test Vehicle Speed Sensor Test or Replace Neutral Light Switch or Repair Neutral light circuit

To view and clear fault codes refer to page 5.26. See page 5.28 for wire colors / pin number in connector.

VEHICLE SPEED SENSOR TESTING

1. Refer to page 19.10 to test the speed sensor (A).



NEUTRAL LIGHT / OVERDRIVE SWITCH TEST

1. Refer to page 19.21 to test the neutral light switch and circuit and to page 19.12 to test the overdrive switch and circuit.

MEMORY CHECK SUM ERROR

FAIL CODE: P0601	
COMPONENT AFFECTED: ECM	
INDICATES	**INSPECT / ACTION**
Module Memory Check Sum Error - Usually due to code not clearing successfully at TPS initial setup when installing new ECM.	Clear the code and check to see if code re-appears

NOTE: All new ECMs have the “Memory Check Sum Error” at first power-up after the memory is loaded into the ECM. This code must be cleared at the time the ECM is initialized. If this code appears when using the diagnostic software, it is possible that a new ECM was not cleared successfully. If this is the case, the code may be present without an actual fault.

1. If Fault Code message P0601 (Internal Control Module Memory Check Sum Error) is present when using the diagnostic software, first try clearing the fault code.
2. Record any other fault codes present before clearing. If the code reappears, further inspection is required; however, it is more likely the code was not cleared from memory during initialization, and will not be present after it is cleared.

BATTERY VOLTAGE AT ECM DIAGNOSTICS

FAIL CODE: P0562 / P0563	
COMPONENT AFFECTED: Battery Voltage to ECM	
INDICATES	**INSPECT**
Voltage received at ECM is outside of parameters.	Vehicle Battery Voltage

To view and clear fault codes refer to page 5.26. See page 5.28 for wire colors / pin number in connector.

BATTERY VOLTAGE TO ECM TESTING

1. Measure voltage at battery.

Specification: 12.5V DC or greater

2. Battery voltage must be 12.5V DC or above. If it is not, correct battery problem before proceeding.
3. Attach test lead adaptors to meter leads.

Connector Test Lead Adaptor Kit: PV-43526

4. Disconnect ECM 40 pin connector (page 5.29).
5. Place one lead in pin 25 of the connector as shown in Fig. 6 (**not the ECM**) and the other to the negative (-) battery terminal.
6. Verify battery voltage is present at the ECM connector.
7. If voltage is low, trace the circuit on Orange wire back to the Engine / ECM fuse.

Testing Battery Voltage at ECM Connector

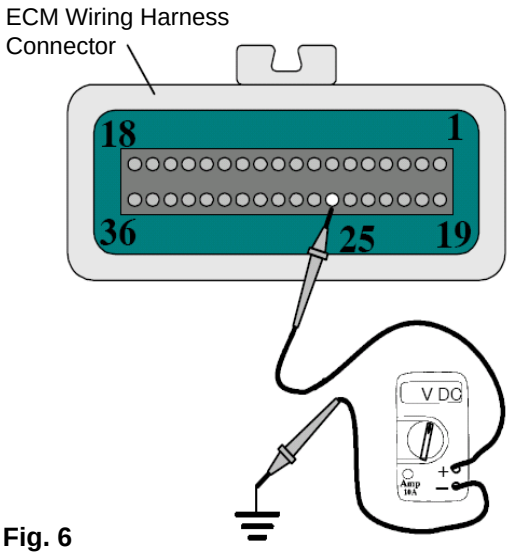
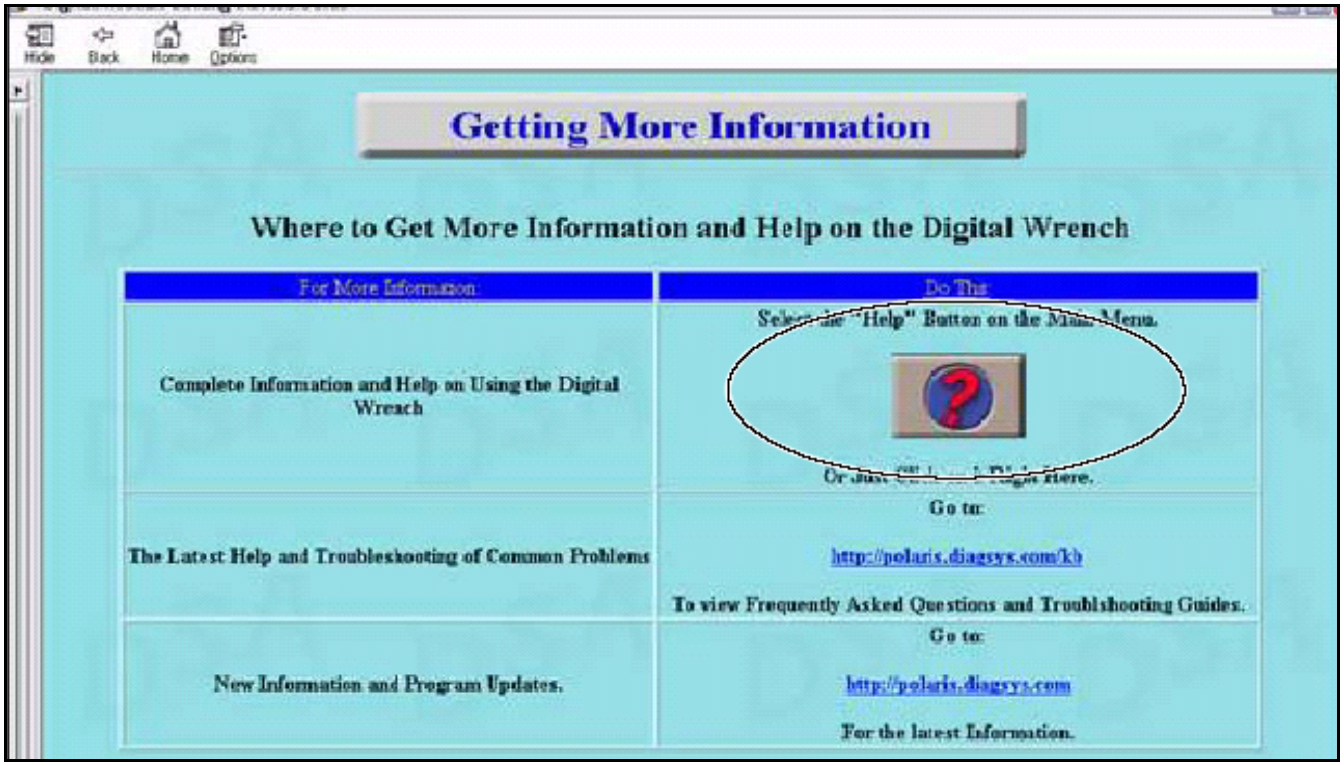


Fig. 6

DIGITAL WRENCH

USING DIGITAL WRENCH™ DIAGNOSTIC SOFTWARE

Refer to Section 2, 3, and 4 in the Instruction Manual provided in the Diagnostic Tool Kit PV-46085 to install the Polaris Digital Wrench™ software on a laptop computer. Once installed, select the HELP icon (?) for more information.



FUEL INJECTION DIAGNOSTICS

> ⚠ CAUTION
>
> Read and understand the Fuel Handling Warnings on page 5.3, the troubleshooting information on page 5.4 and 5.50 through 5.53, and the Fuel Injection Service Procedures on page 5.5 and 5.6 before working on the EFI system. Read each test and related information before performing the test.

NOTE: A laptop computer and the Victory / Polaris Diagnostic Tool Kit w/ Diag Software (PV-46085) are necessary to access fault codes stored in the ECM. EGA Tool Kit with Lambda Sensor (PV-45410) is required to calibrate the Throttle Position Sensor (TPS). **The current version of Digital Wrench™ (as of this manual printing date) is 2.09**

Victory Diagnostic Tool Kit (PV-46085)

EGA Tool Kit with Lambda Sensor (PV-45410)

Connector Test Lead Adaptor Kit: (PV-43526) (To probe connector pins)

DIAGNOSTIC SOFTWARE VERSION

The current version of Digital Wrench‘ (as of this manual printing date) is 2.09.

NOTE: To see the -1 Adjustment Factor menu selection required to calibrate the TPS on 100 cubic inch engines, you must be using version 2.08 or higher.

TPS CALIBRATION REQUIRED

The TPS requires periodic calibration in accordance with the Periodic Maintenance Interval Table (page 2.11).

TPS calibration is also required:

- If TPS related parts are replaced (such as the throttle body, TPS, or ECM).
- If the ECM is re-programmed (re-flashed) for accessory exhaust or other engine related kits.
- If other causes of a running condition have been inspected and a running condition problem still exists. (First inspect spark plugs, air filter, air leaks, fuel quality, engine mechanical condition, etc.)

TPS CALIBRATION ON VEHICLES EQUIPPED WITH ACCESSORY EXHAUST

To prevent inaccurate Lambda (voltage) readings, the upper muffler must be plugged while calibrating the TPS on vehicles equipped with complete accessory exhaust systems (systems that include both head pipes and mufflers). If a vehicle is equipped with an accessory exhaust system, be sure to review special instructions for TPS calibration provided with the kit before you begin.

NOTE: It is not necessary to plug the upper muffler when calibrating the TPS on vehicles equipped with accessory mufflers only such as slip-on mufflers or a Stage 1 kit.

Incorrect TPS calibration *may* cause:

1. Rich Mixture
   - Fouls spark plug(s)
   - Black, sooty exhaust gasses
   - Poor running quality
   - Fuel mileage complaints
   - Muffler discoloration
2. Lean Mixture
   - Backfires excessively
   - Hard starting
   - Runs rough / unstable idle
   - Transmission noise amplified
   - Misses
   - If extremely lean: while attempting to set the TPS, engine rpm drops until the engine dies.
   - Muffler discoloration.

Follow the instructions and perform all of the TPS calibration steps carefully as they are described.

TPS CALIBRATION NOTES

When performing the TPS calibration, airflow is calibrated to match the fuel and ignition timing instructions from the ECM under controlled conditions. If this calibration is correct at idle, it will be correct throughout the operating range of the engine. If the calibration is incorrect, the ECM will receive incorrect information on the requirements of the engine and create a lean or rich condition.

Establishing the correct calibration of the TPS to the throttle plates is accomplished with the TPS Calibration Procedure. During the TPS adjustment procedure, the ECM is “locked” at a specific position to give the engine the proper amount of fuel at a specified operating condition near the idle point. This establishes the fuel calibration at the proper air/fuel ratio.

There are several items to be aware of to ensure accurate TPS calibration:

MECHANICAL CONDITION OF ENGINE

Be sure the engine is in good mechanical condition. Perform a cranking compression or cylinder leakage test if you have any doubt as to the mechanical condition of the engine.

AIR LEAKS IN INTAKE TRACT OR EXHAUST

Check for air leaks in the intake tract or exhaust system and repair if necessary.

SPARK PLUG / AIR FILTER CONDITION

The spark plugs should be in good condition or replace them if there is any sign of carbon fouling. The air filter should be inspected, and the engine should have no modifications other than authorized Victory accessories.*
* For competition use only.

ENVIRONMENTAL CONDITIONS

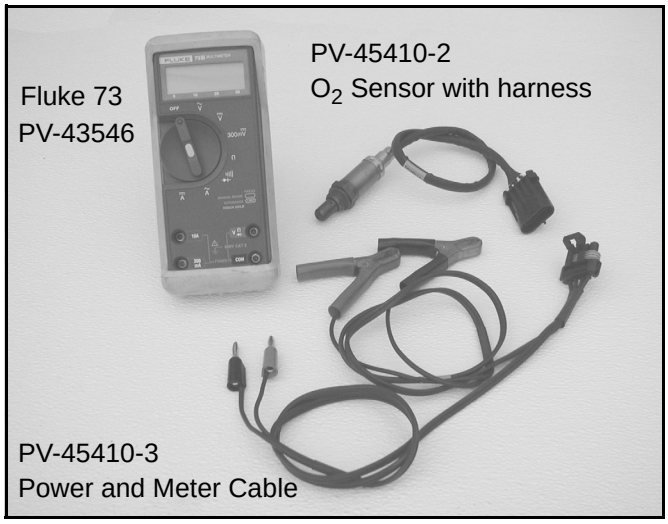
Be aware that environmental conditions such as temperature, humidity, and altitude will affect final calibration.

Minor adjustments will be made later in the procedure to compensate for these conditions if necessary.

TOOLS To perform this procedure you will need the following tools:

- 13 mm and 15 mm socket, 13, 15, and 22 mm open end wrenches
- Anti-seize compound
- Long #2 Phillips screwdriver
- Engine cooling fan, and exhaust extraction (ventilation) system
- Diagnostic Tool Kit (With Software) PV-46085
- Laptop computer
- Fluke 73 (or higher) Digital Multimeter (PV-43546)
- Power and Meter cable (PV-45410-3)
- O2 Sensor with connector harness (PV-45410-2)

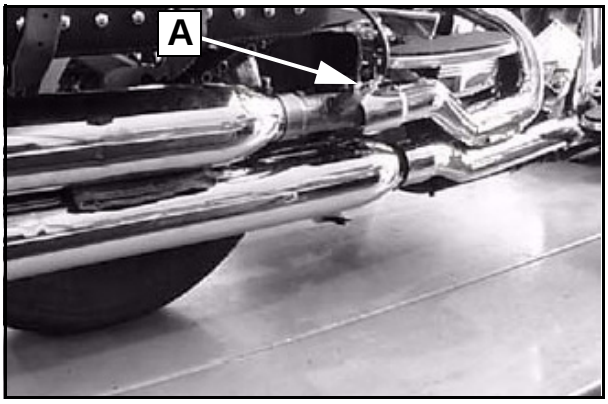
NOTE: O_2 Sensor and power cable are included in Kit PV-45410.

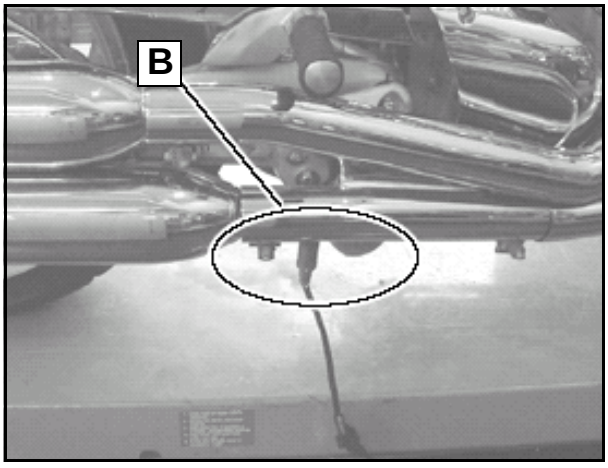


TPS CALIBRATION PROCEDURE

NOTE: Photos are general representations and may not depict your model or equipment.

1. 2003-2005: Remove upper muffler and install the O_2 Sensor Exhaust Tube (A).
   2006: Remove plug (B) from head pipe.



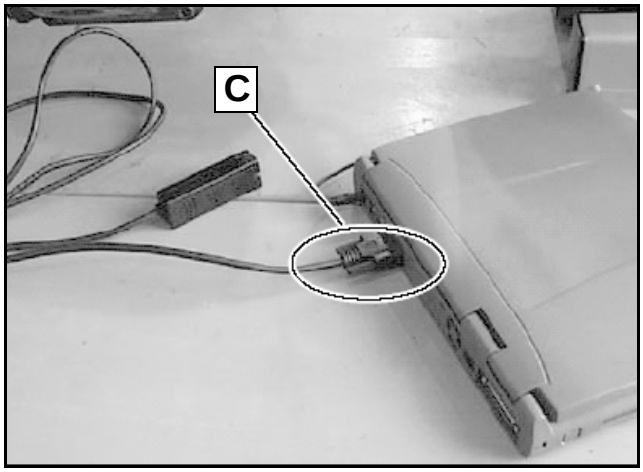


2. Apply anti-seize compound to the threads of the lambda sensor and install into tool or header pipe port.

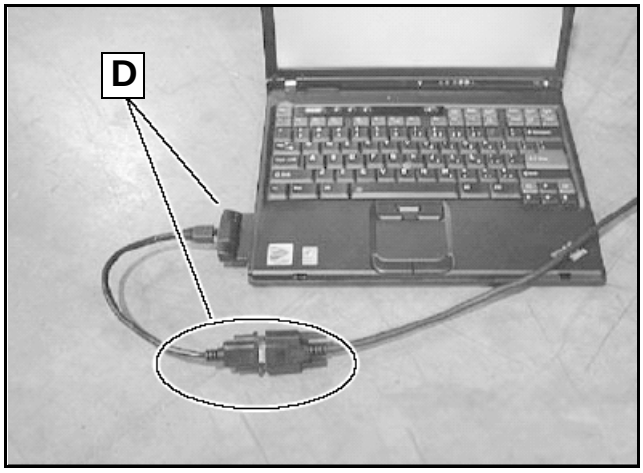
> **⚠ CAUTION**
>
> DO NOT allow anti-seize compound to contact the sensor except for the threaded area, or sensor failure may result.

3. Torque sensor to 8 lb-ft. (11 Nm).

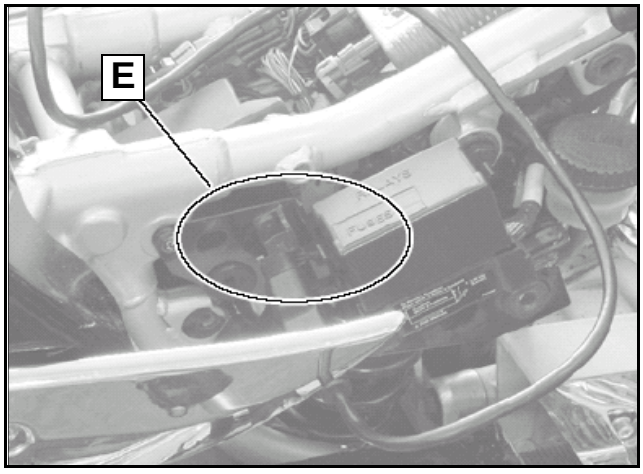
4. Connect diagnostic cable to 9-pin serial port (C) on laptop computer.



or to the serial port adaptor (D) if used.



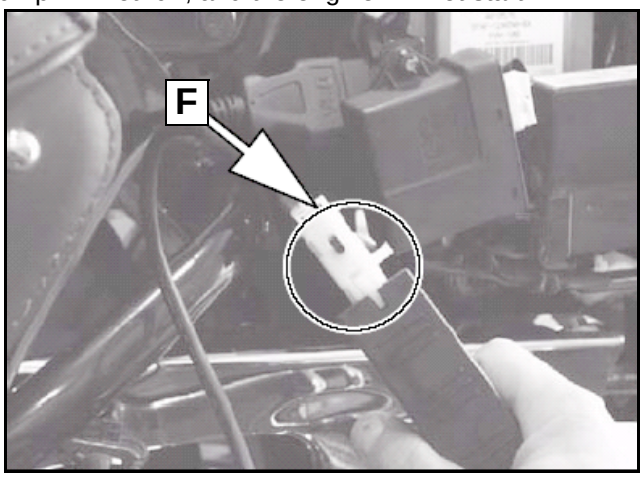
5. Locate ECM diagnostic port (E) under right side cover near fuse box. Remove diagnostic port cover *carefully* and connect the cable to the port.



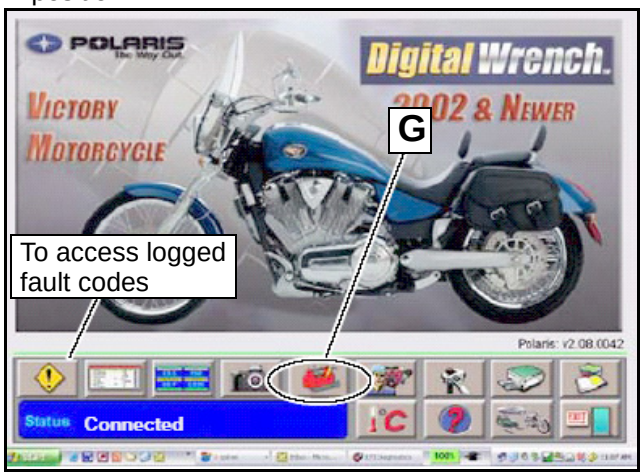
6. Connect the two cables together.
7. Slide the two-position switch (F) toward the computer cable side of the switch (AWAY from motorcycle).

The switch position that is toward the diagnostic port (toward the motorcycle) is for re-programming (re-flash) and is not to be used for this procedure.

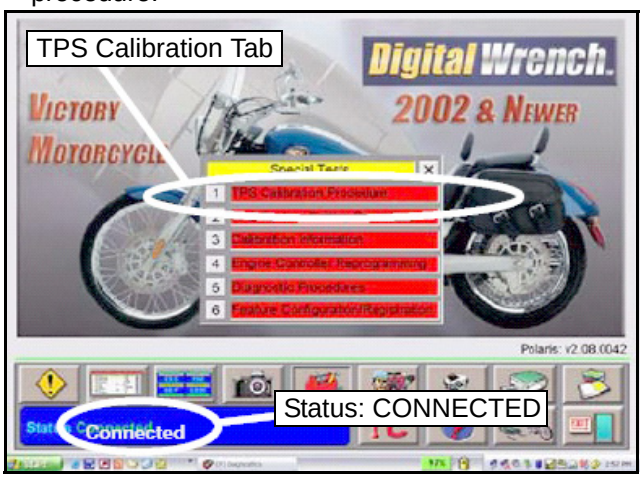
NOTE: If the switch is in re-program position, the fuel pump will not run, and the engine will not start.



8. Remove the diagnostic software instruction manual from the Diagnostic Tool Kit (PV-46085). Read the instructions and install the software on your laptop computer.
9. Start the Victory diagnostic software program (click on the icon) and then click on the *Special Operations* button (G).
10. Turn the ignition switch and kill switch to the ON (run) position.



11. Click the *TPS Calibration* menu tab to begin the procedure.



NOTE: The *Status* shown in lower left hand corner of screen should say “Connected”, and there should be 6 menu items displayed in the Special Tasks window:

¡ TPS Calibration Procedure

© TPS Factory Setting Procedure

¢ Calibration Information

£ Engine Controller Reprogramming

¤ Diagnostic Procedures

¥ Feature Configuration / Registration

If the status displayed is “Not Connected”, or if there are less than 6 items displayed in the window, leave the key and kill switch ON and re-start the diagnostic program. Status must say **“Connected”**.

NOTE: *SYSTEM CONFIGURATION:* It may be necessary to change the communication port configuration within Digital Wrench™ to establish communication. If are unable to get a “Connected” message displayed in the status area, perform the following:

Click on the System Configuration (adjustable wrench) icon located directly above the help (?) icon.

Select a different port from the available com ports in the menu on the left side.

If communication problems persist, consult the on-line help for specific information related to communication errors.

The following is a brief description of the menu items, and when to use them:

¡TPS Calibration Procedure - select this to proceed with TPS Calibration. See "TPS CALIBRATION REQUIRED" on page 5.37.

©TPS Factory Setting Procedure - Use this to set TPS back to a general starting point that will allow the engine to start and run. Must be followed with a TPS calibration procedure. The Factory Setting should only be used if you suspect the TPS is misadjusted so far outside of normal parameters that the engine will not run well enough to perform a TPS calibration.

¢Calibration Information - Select to view the current calibration loaded in the ECM (what "map" is installed).

£ Engine Controller Reprogramming - Select to reprogram the ECM for accessories, or to re-load a stock map.

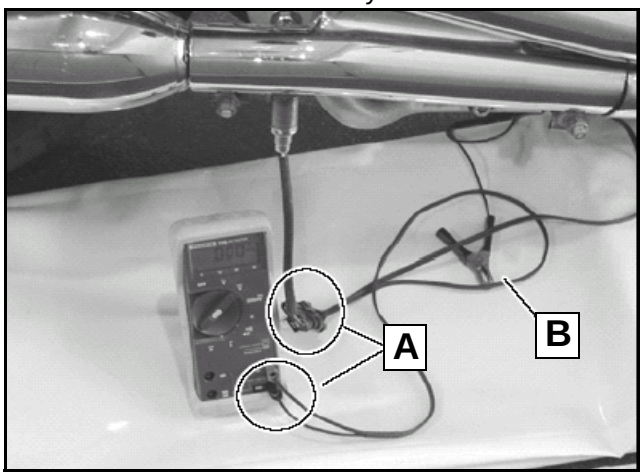
¤Diagnostic Procedures - Select to view a list of diagnostic fail codes and their descriptions.

¥Feature Configuration / Registration - Select to register your Digital Wrench™ software, or to view license information.

12. Next, connect the lambda sensor cable (A) to the lambda sensor and to the voltmeter.

NOTE: IMPORTANT! <u>Do not connect lambda sensor power leads (B) to battery at this time, or the sensor may heat unevenly, reducing the service life.</u>

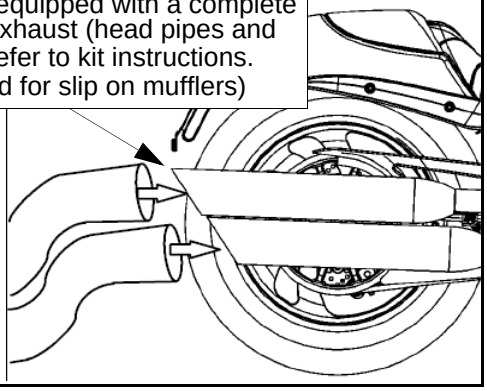
Secure the lambda harness away from the exhaust.



13. Turn on the voltmeter and switch to **DC voltage**.

14. Secure the exhaust extraction system on the exhaust pipes.

IMPORTANT! <u>PLUG</u> Upper muffler if vehicle is equipped with a complete accessory exhaust (head pipes and mufflers). Refer to kit instructions. (Not required for slip on mufflers)



WARNING

Exhaust Gasses Are Poisonous
Never run the engine in an enclosed area without a properly functioning exhaust gas evacuation system connected to the product.

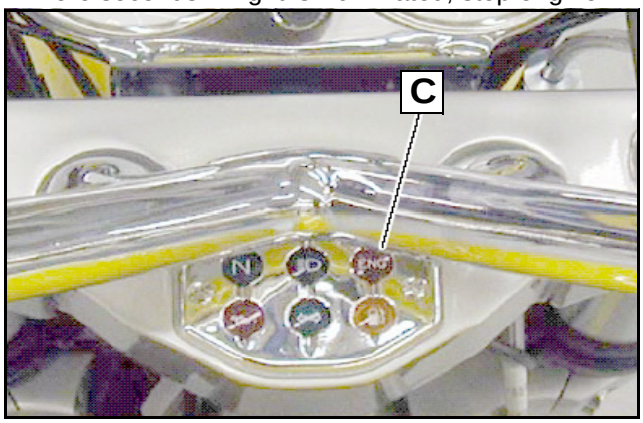
WARNING

Hot Exhaust Components!
The engine and exhaust components get hot and remain hot for a period of time after the engine is stopped. Wear insulated protective clothing.

15. Start the engine and let it run at fast idle for 30 seconds.

16. After 30 seconds, return the fast idle lever to the off position.

17. During this time frame watch ENG light (C) for 10 or more seconds. If light is illuminated, stop engine.



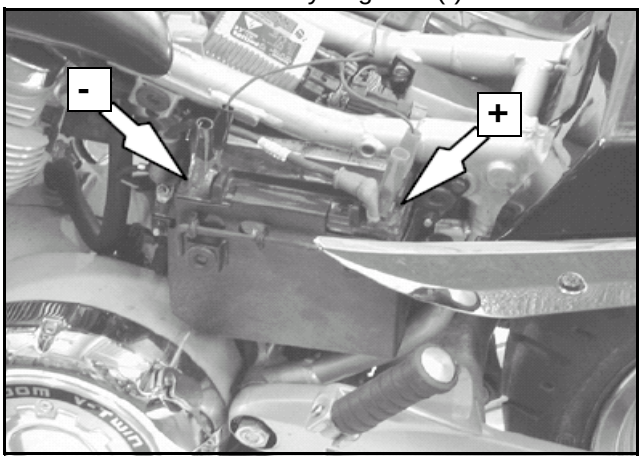
Click on the **!** icon (D) in lower left corner of diagnostic screen to view loaded code(s), and refer to page 5.25.

If there are no trouble codes, proceed to Step 18.

18. With engine running, connect a voltmeter to the battery to verify voltage is between 13 and 14.5 volts. If it is below 13 volts, shut engine off and charge battery before continuing.

CONNECTING THE LAMBDA SENSOR TO THE BATTERY

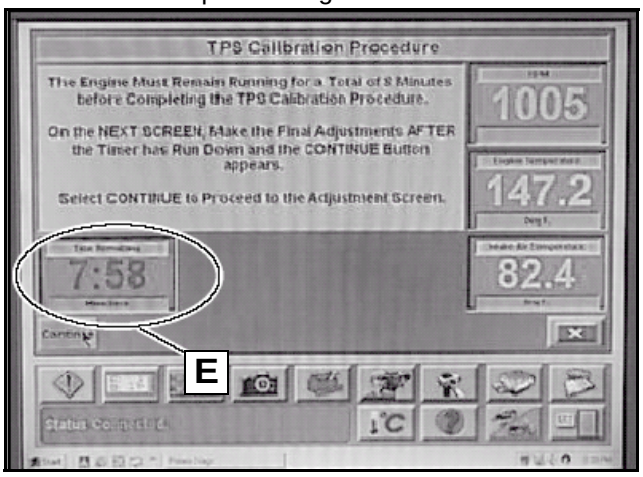
19. After engine has run for 30 seconds, no codes are present, and battery voltage is above 13 volts, connect lambda sensor red lead to battery positive (+) and black lead to battery negative (-) terminal.



NOTE: Voltmeter should display a POSITIVE DC voltage reading. If reading is negative, reverse leads at the voltmeter to display a positive voltage to avoid confusion. (Place red meter lead in "common" (-) jack and black meter lead in red (+) jack on meter.)

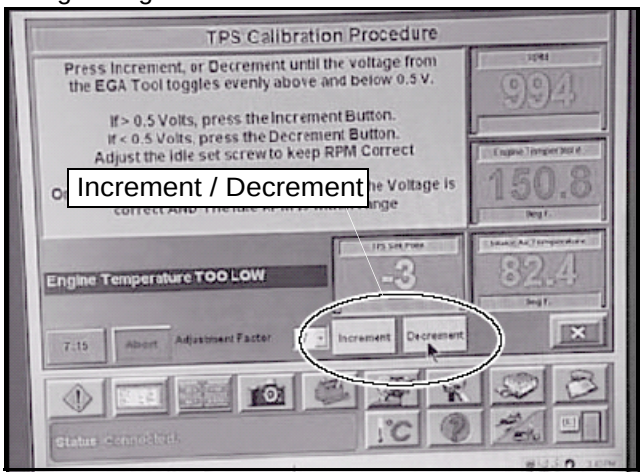
NOTE: The engine oil temperature is critical to ensure accurate TPS calibration. Be sure to allow sufficient warm up time and monitor engine temperature throughout the entire procedure.

20. Allow engine to run for the 8 minute warm-up period indicated by the timer (E) on the TPS calibration screen before proceeding to the next screen.



21. **A minimum of eight minutes run time is required prior to performing the TPS procedure.** After the timer has run out, click the continue button to move to the next screen.

NOTE: If you are having difficulties keeping the engine running during this 8 minute time frame:

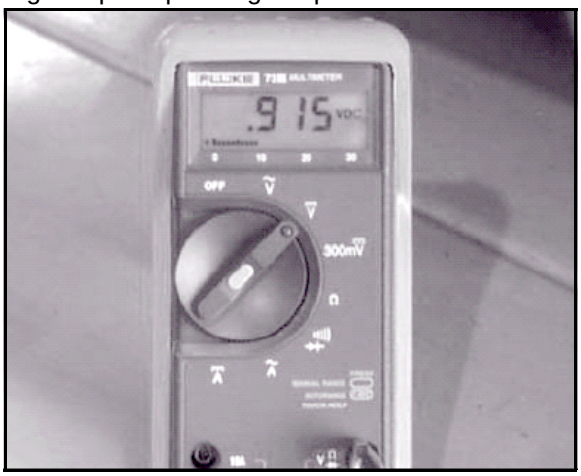


a) Click continue to move to the next screen.

b) Click on "increment" if you suspect the engine is running too rich. (Think: increment is increasing air)

c) Click "decrement" if you suspect the engine is running too lean. (Think: decrement is decreasing air)

Do not attempt to fine-tune the running quality of the engine at this point! At this step, it is important only to get the engine up to operating temperature.



22. With the engine and the timer on the computer screen running, check the voltage displayed on the DC volt meter. The voltage should read between **0.01 and 1.2 volts**. If the voltage reading on the meter reads below 0.5 volt, a lean condition is indicated. Click the "decrement button **one time every two seconds** until the voltage remains mainly above 0.5 volts.

⚠ CAUTION

The use of an exhaust extraction system can cause false lambda sensor value readings. To see if your reading is affected, perform the following:

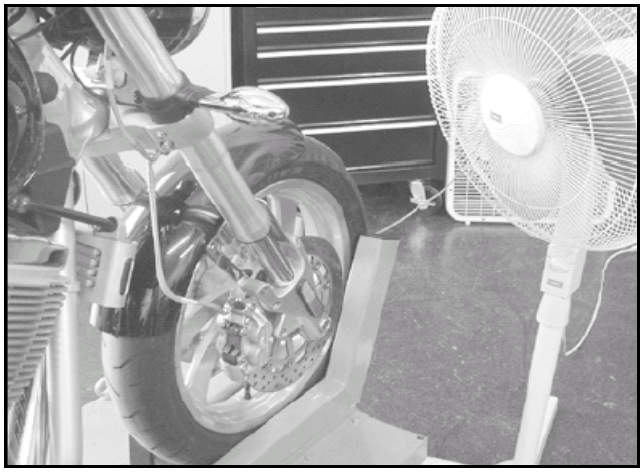
• Set lambda voltage to jump back and forth across 0.5 volts by pressing increment or decrement button.

• Pull extraction hose away from upper muffler and hold it about 2 inches behind the end of the muffler.

• If volt meter changes and stays above 0.5 volts, the lambda reading is being affected by exhaust extraction. Re-install hose on muffler. The voltage should again jump back and forth across 0.5 volts.

• If you determine the reading is affected by the exhaust extraction, pull the hose away from the muffler so it is not completely sealed around the end, but is close enough to extract all exhaust fumes, and continue with Step 23.

23. Place the cooling fan at a 45° angle on the front of the engine and turn it on. Make sure that the air box, engine, header pipes, and oil cooler is in the airflow of the fan.



24. To adjust the TPS make sure the following conditions are met:

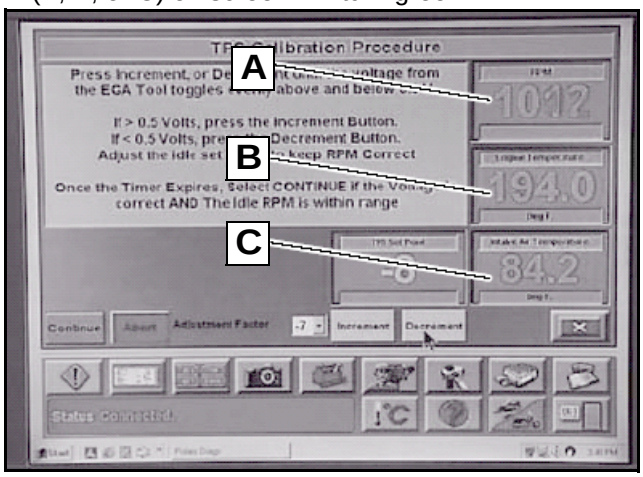
    • Intake air temperature should stay between 65 and 90 degrees Fahrenheit.

    • Engine oil temperature must be maintained between 90°-100° C (194° and 212° F) as displayed on diagnostic screen.

    • Adjust idle screw as necessary to maintain engine RPM between 950 and 1050.

NOTE: Ensure fast idle lever is in the fully closed position.

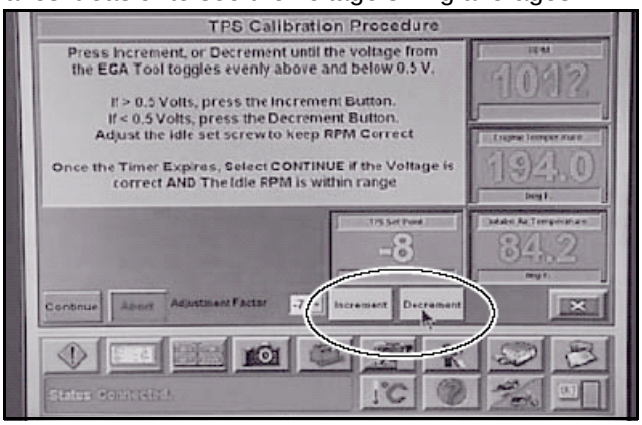
25. As each operational condition is met, the display box (A, B, or C) on screen will turn green.



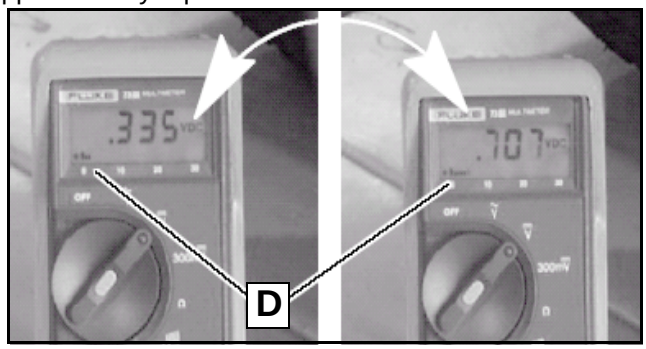
- Click ”increment” (if the volt meter reads above 0.5 volts)
- Click ”decrement” (if below 0.5 volts)...

until the sensor voltage jumps back and forth evenly across 0.5 volts.

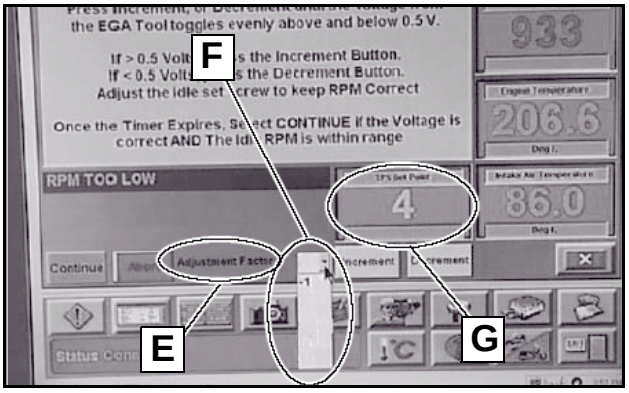
NOTE: The bar graph (D) on the bottom of the meter makes it easier to see the voltage swing averages.



Voltage should swing above and below 0.5 volts in approximately equal amounts.



26. When sensor voltage jumps back and forth evenly across 0.5 volts, locate the “adjustment factor” number on screen (E). You will need to choose an adjustment factor from the pull down menu (F).



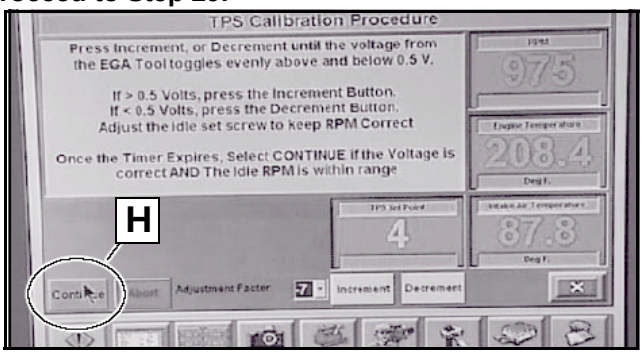
- Choose the correct adjustment factor from the following table:

NOTE: The “-1” menu selection is only available with *Digital Wrench* version 2.08 or higher.

YEAR	ENGINE TYPE	TPS ADJUSTMENT FACTOR	LAMBDA
2003 - 2005	92/5	-7	.97
2006	100/5	-1	.99
2006	100/6	-1	.99

27. Record the TPS Set Point (G, previous photo) and Adjustment Factor for each motorcycle that you perform this procedure on for future reference.
28. When **TPS Set Point** is fixed and recorded, and you have selected your **Adjustment Factor** and recorded it, press the “continue” button (H). These values are not stored in memory.

Pressing the continue button will cause the final TPS setting to occur. **The sensor voltage should change and stabilize between 0.5 and 1.0 volts. If this occurs, proceed to Step 29.**



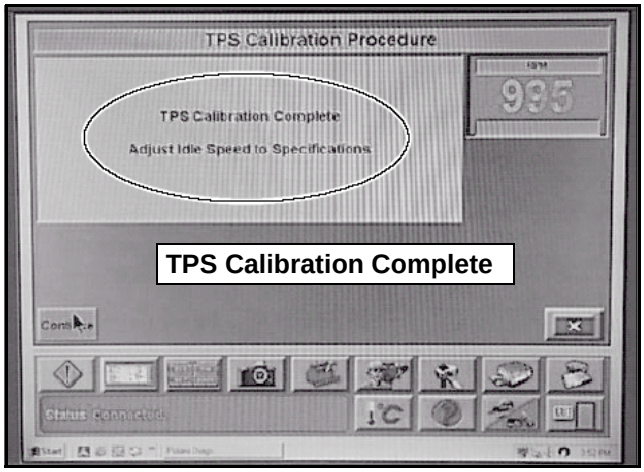
<u>If the voltage continues to flash under 0.5 volts:</u>

The TPS adjustment was not performed properly. Make sure that there are no exhaust leaks, and that you selected the proper adjustment factor. **<u>Do not stop the engine</u>**. If the following conditions are met, you can repeat the TPS adjustment procedure without waiting eight minutes (*<u>only if the engine was not stopped!</u>*):

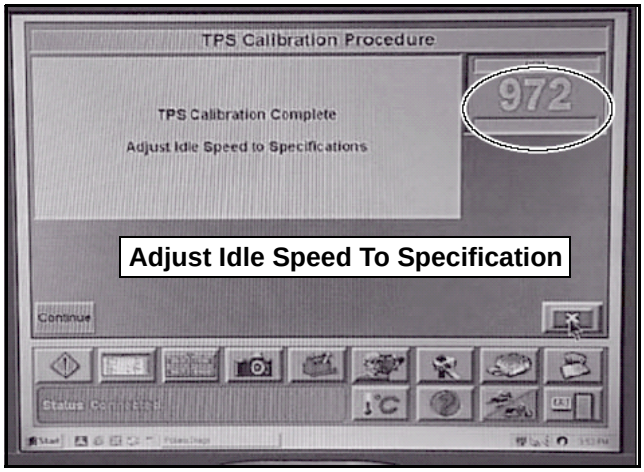
- Intake air temperature and engine oil temperature is in normal range as displayed on the diagnostic screen.
- Ensure the fast idle lever is in the fully closed position.
- RPM is in the correct range (adjust the idle screw to maintain engine RPM between 950 and 1050)

If the engine was stopped you must re-start the eight minute timer. The voltage should change and stabilize between 0.5 and 1.0 volts.

29. Click the ”continue” button. The diagnostic screen will indicate when the TPS calibration is complete.



30. Adjust the idle speed to specification.
950 ± 50 RPM



31. Exit diagnostic software, and turn off engine.
32. Let engine and exhaust cool down.
33. Remove all test equipment and re-install lambda plug in muffler.
34. Test ride motorcycle to ensure proper running quality.

ENGINE CONTROLLER (ECM) REPROGRAMMING ("RE-FLASH")

PROCESS OVERVIEW

ENGINE CONTROLLER REPROGRAMMING ("Reflash") is a unique feature found on the Digital Wrench™ which allows reprogramming of the ECM fuel and ignition map via an authorization* obtained from the Victory Dealer Extranet. This feature is used when installing Victory accessory exhaust, stage kits, etc., and any time there is a need to install a stock calibration into the ECM.

***Stock calibrations do not require an authorization.**

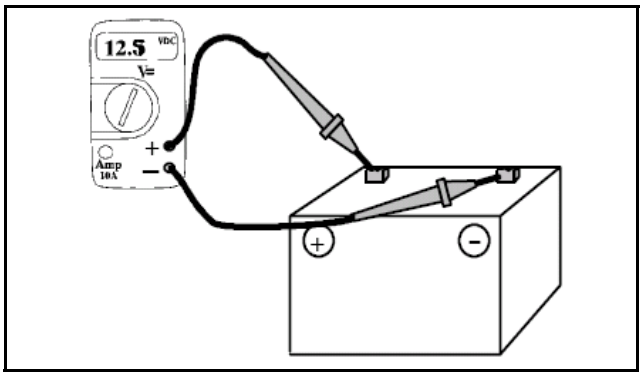
> ⚠ CAUTION
>
> *Failure to follow all instructions completely and correctly can result in an engine that does not run! Leave the diagnostic cable switch in the diagnostic mode until you are instructed to change it to reprogramming. Review items 1 - 12 below and on following pages to reduce the chance of reprogramming problems.*

REPROGRAMMING TIPS

The reprogramming feature is in the Special Tests menu (red toolbox icon) on the Digital Wrench™ screen. The procedure is not difficult, but the technician should be familiar with the process and with computer operation in general.

If Digital Wrench™ software has not been installed, read the *Install* Instructions completely in the "Getting Started" section of the Diagnostic System Installation Guide and User Manual. Laptops that fit the *System Requirements* guidelines listed in the User Manual can be used to perform the reprogramming procedure. Pay close attention to the required memory listed for the version of Windows on your laptop (*Page 3 of the User Manual).*

1. BATTERY VOLTAGE: Be sure the battery is fully charged before you start. In fact, the majority of problems with reprogramming have been attributed to a low battery. Be sure the battery open circuit voltage (no load) is at least **13 volts and at least 12.5 volts with the key ON.** Connect a battery charger if necessary to bring voltage level above minimum. Fully charge the battery before you attempt to reprogram, or leave charger connected during the reprogramming process. If "Key ON" voltage is marginal, it may help to remove the headlamp relay in the fuse box.



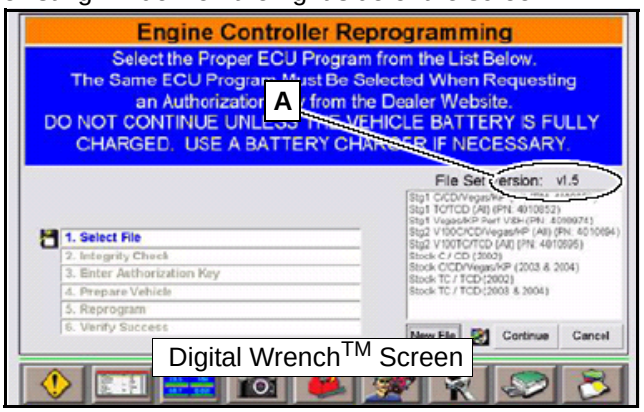
Measure battery voltage.

Specification (Minimum):
13.0 DCV Key Off
12.5V DCV Key On

2. DEDICATED LAPTOP: Best results are obtained using a laptop computer that is "dedicated to Polaris/ Victory service". A laptop that is used by a variety of people and in several applications around the dealership is more likely to cause a reprogramming problem than one dedicated to Digital Wrench™ diagnostics only.

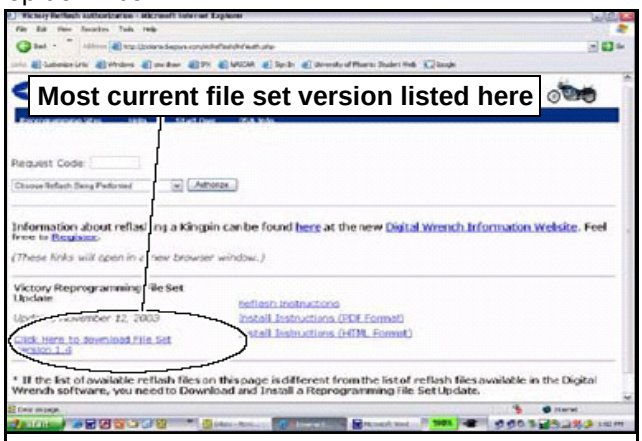
3. CHECK THE REPROGRAMMING FILE SET YOU ARE USING: If you do not see the reprogramming file you need in your list of file options, you may need to download a more current file set from the Victory Dealer web site. Reflash file sets are updated often and contain the most recent calibrations for both Stock and Performance updates. When a new file set is available, you will be informed when you connect to the "Reflash Authorization Website".

To determine which file set you have:
Start the Digital Wrench™ software program.
Select the red tool box icon from the tool bar.
Select ***Engine Controller Reprogramming*** from the menu.
Record the File Set Version number (A) at the top of the file listing window on the right side of the screen.



Digital Wrench™ Screen

Go to the Victory Dealer Web Site.
Select ***Re-Flash Authorization*** from the ***Service & Warranty*** drop-down menu.
Compare the file set version number in the Victory Reprogramming File Set Update window, with the one previously recorded, or compare the list of files in the drop down box.



Dealer Web Screen

4. CLOSE NON-ESSENTIAL PROGRAMS: The programs necessary to run a computer vary depending on what operating system you are using (95,98,NT,ME,XP.....). It is recommended that you DO NOT install non-essential programs on the service department laptop. Digital Camera detection software, Virus Scanners, Tool Bars, etc. may clog up memory if running in the background and make it harder for the diagnostic software to operate. A good "quick check" is the number of icons in the system tray, (icons in the task bar next to the clock). More than 4, or 5 items indicates a potential problem. Things to watch out for include:

   • Video playing software

   • Automatic programs started by your Internet Service Provider

   • Financial software (checking account, business operations and accounting, tax reporting software etc.)

   • All "shareware" & "freeware" downloaded from the internet

   • Personal hand-held PC links (can prevent diagnostic software and reprogram procedure from working)

   • Internet firewalls set to "high security mode" or virus scanning software running in the system tray.

A good rule to follow is that if a particular piece of software wasn't installed when Windows was installed, it has the potential to create problems if it's running at the same time as the diagnostic software. If you're having problems, click on the icons of *non-essential* programs and close, quit, or exit them before starting the reprogramming procedure.

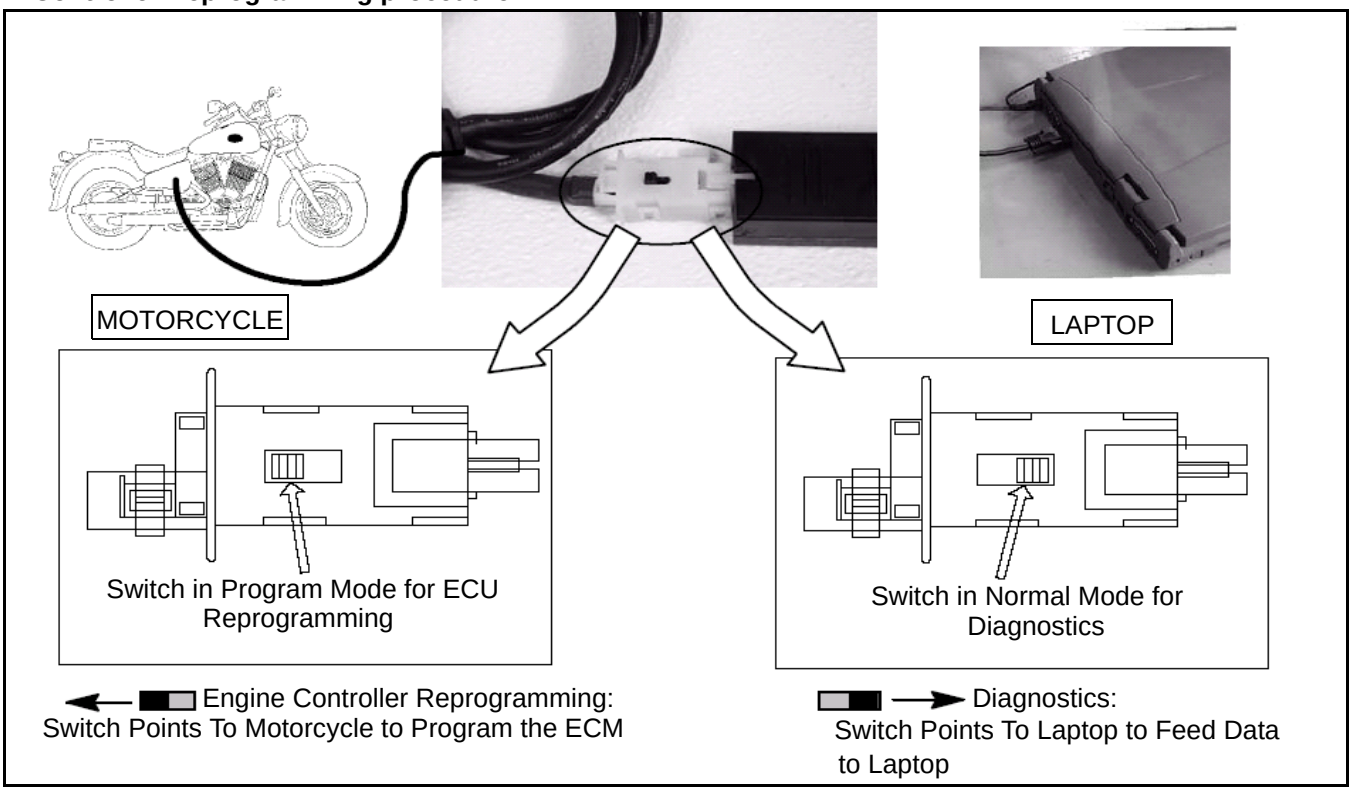
5. KNOW THE PROCESS: If you are not familiar with the entire reprogramming process, review the **HELP** section of the diagnostic software before you attempt reprogramming. Click on the **?** on the toolbar or press F11. The information in the on-line help is the most current and complete information available. This should be your first step until you are familiar with the process.

6. COMMUNICATION PROBLEMS: If you have had problems communicating with a vehicle while performing diagnostic functions, do not attempt reprogramming until the cause has been identified and fixed. Check all connections, and be sure battery voltage is **13 volts (key off) and at least 12.5 volts with the key ON as specified in step 2.** Be sure to follow the diagnostic power-up procedure precisely and be familiar with the reprogramming process before you begin.

7. DON'T DISTURB THE PC: when a reprogramming is in progress. Don't move the mouse, and don't touch the keyboard. The process only takes a few seconds, and is best left alone until complete.

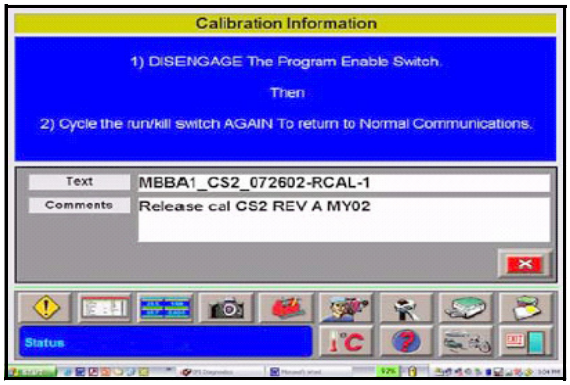
8. REVIEW: Read and understand the reprogramming process before you begin, using the on-line help in the diagnostic software.

9. REPROGRAMMING / DIAGNOSTIC SWITCH SETTING: (See below). There is a two-position switch on the diagnostic communication cable. One position is for diagnostics and the other is for reprogramming. Be aware that in order to reprogram the ECM, the communication cable switch must be moved toward the motorcycle (toward the ECM). Data will be going *into* the ECM, so the switch must be positioned accordingly. **Leave this switch in the diagnostic mode (toward the laptop) at all times until you are instructed to move it during the Engine Controller Reprogramming procedure.**



10. Another way to tell if the switch is set to Diagnostic mode or Reprogramming mode is the behavior of the fuel pump when the ignition switch is first turned ON (and kill switch is in RUN position). If the diagnostic cable switch is set to *diagnostic* mode the fuel pump will run IMMEDIATELY for approximately 2 seconds. This will occur the instant that both the ignition key and kill switch are turned ON.

    When the diagnostic cable switch is set to Reprogramming mode, there is a 4 second delay after turning on the ignition key/kill switch before the fuel pump runs. In some cases, the fuel pump will not run at all. You may also hear a clicking sound in the diagnostic cable switch as the software tries to establish communication with the ECM.



11. You can check the Calibration Information screen to verify the proper calibration has been installed when the reprogramming procedure is complete.
    Select *Calibration Information* on the Special Tests menu to view the current calibration installed in the ECM.

ENGINE CONTROLLER (ECM) REPROGRAMMING PROCESS

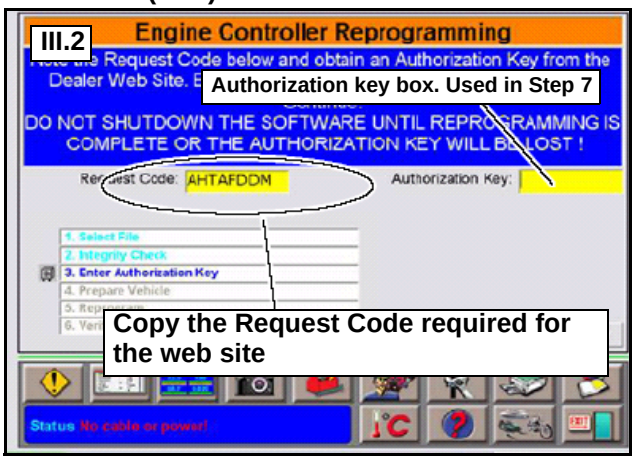
If you are not familiar with the reprogramming process, review tips on page 5.46 - 5.48 before you begin.

There are a few basic steps to the Engine Controller Reprogramming process; below is an overview.

Request codes, Calibration I.D. numbers, and Authorization keys should always be entered exactly as they appear on the screen. If problems are encountered always check the on-line help for current tips and information.

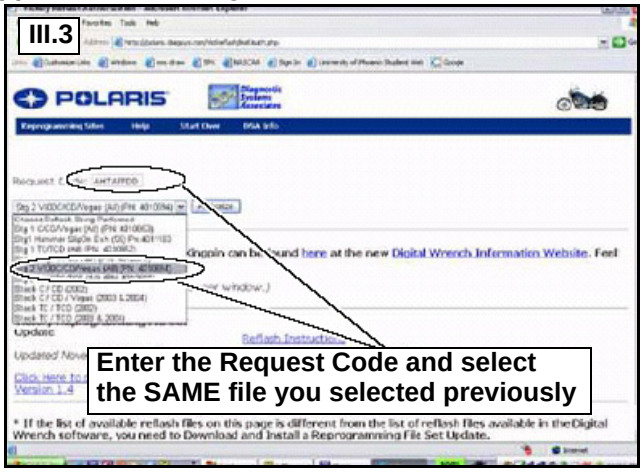
1. Connect the communication cable to the vehicle.
2. Start the Digital Wrench™ program.
3. Select Engine Controller Reprogramming from the menu.
4. **Select the file you want to load into the ECM. (Ill. 1)**

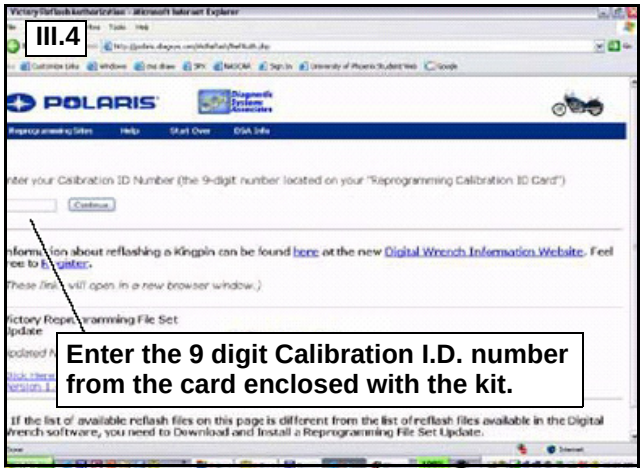
5. **Copy the request code that will be required on the web site. (Ill. 2)**



6. Go to the Victory Dealer web site and select “Engine Controller Reprogramming Authorization” (or “Re-Flash Authorization”) from the Service & Warranty drop-down menu.
7. (See **Ill. 3**) Enter (or paste) the Request Code into the box. Select the same file type from the list that you selected previously (e.g. Kingpin Slip-On Exhaust), and click *Authorize* button to proceed to the next screen. In the empty box provided on the screen **(See Ill. 4)** enter the 9 digit Calibration I.D number from the card enclosed with the accessory kit. Click “Continue”. An 8-digit “AUTHORIZATION KEY” will be appear in the upper left corner of the screen. Copy this number exactly as it appears, and enter it in the Authorization Key box on the Digital Wrench™ screen. Follow instructions provided on the screen to complete the reprogramming procedure.

NOTE: Stock reprogramming files do not require a Calibration I.D. number. An Authorization Key will appear after clicking the Authorize button.





TROUBLESHOOTING

FUEL SYSTEM TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(s)	REPAIR RECOMMENDED
Engine turns over with electric starter, but won't start	Compression too low	See engine section	
	No spark at spark plugs	See ignition system	
	No fuel reaching intake tract	Blown Fuse Plugged fuel filters fuel hose Fuel pump not working If diag cable attached, switch set to re-flash Fuel pressure regulator not working correctly Fuel injector not working Faulty fuel pump relay Open wiring / connector Faulty ECM	Replace Clean/Replace Test / Replace Set diagnostic cable switch to Diagnostic Mode Test / Replace Test / Replace Test / Replace Inspect/Repair Replace
	Excessively rich or lean fuel mixture	Throttle Position Sensor (TPS) out of adjustment Fuel pump Fuel pressure regulator Faulty TPS Crank Position Sensor Barometric pressure sensor Coolant temperature sensor ECM Air temperature sensor Fuel Injector Low battery voltage	Adjust / Reset w/ECM Test / Replace Test / Replace Test / Replace Test / Replace Test / Replace Test / Replace Reset w/ TPS or Replace Test / Replace Test / Replace Charging system
	Spark at wrong time or no spark. Fuel delivery timing incorrect.	Flywheel installed incorrectly	Install Correctly
Poor idle	Excessively rich or lean fuel mixture	Crank Position Sensor TPS Fuel Pump Vacuum Leaks Fuel injector or fuel rail obstructed or leaking Regulator Fuel Return Line Air Filter	Test / Replace Calibrate / Adjust Improper fuel flow to pump Repair/Replace gaskets and/ or connections Clean/Repair/Replace Test / Replace Repair/Replace Replace

FUEL SYSTEM TROUBLESHOOTING (cont.)

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(s)	REPAIR RECOMMENDED
Engine Stalls	Fuel Pump Problem	Low battery voltage Faulty fuel pump No signal from ECM Wiring problem Improper TPS Adjustment	Battery/Charging system Check fuel pressure Repair Wiring Repair/Chk Pump Relay Adjustment
	Excessive rich or lean fuel/air mixture	Manifold Absolute Pressure (MAP) Sensor Plugged fuel filter Fuel pump Fuel pressure regulator Vacuum leak Wiring problem Air Filter TPS Low battery voltage	Repair/Replace Replace Test / Replace Test / Replace Repair/Replace hoses Repair/Replace Missing-Replace Adjust / Replace Charging system
	Control Circuit/Sensors not functioning correctly	Fuel pressure regulator TPS Engine speed sensor Fuel pump relay Flywheel Fuse ECM Relay Low battery voltage ECM	Test Pressure / Replace Test / Replace Test / Replace Test / Replace Inspect / Install correctly Replace Replace Inspect Charging system Replace
	Valve train problems or Compression low	Refer to chapter 7	
Poor Running in upper rpm ranges	Valve train problems Ignition problems Overfilled with oil Low Battery Voltage Moisture in multi-pin connector	 Battery ECM and wiring harness	Refer to cyl. head & valves Refer to ignition section. Refer to maintenance Refer to battery section Unplug and dry connections
Backfiring	Low Battery Voltage Ignition Problem Air leaks Incorrect TPS Calibration Restricted air intake or throttle body	Battery, spark plug fouled, poor wire connection for ignition or fuel injection, loose pin in multi-pin connector for ECM or wiring harness Inlet and Exhaust TPS Intake tract / Throttle body	Refer to battery section Replace plugs / diagnose Inspect wiring connections Disconnect and check pin connections Seal intake or exhaust leaks Calibrate TPS Clean air inlet tract and throttle body

FUEL SYSTEM TROUBLESHOOTING (cont.)

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(s)	REPAIR RECOMMENDED
Poor Running in upper rpm ranges	Control Circuit/ Sensors not functioning correctly	Engine speed sensor TPS Air temperature sensor Barometric pressure sensor Intermittent wiring / connector problem ECM	Test / Replace Test / Replace Test / Replace Test / Replace Repair/Replace Test / Replace
	Fuel delivery incorrect	Plugged or kinked fuel and/or vent hoses Fuel pump Fuel regulator Fuel filter Battery/Charging System Fuel Injector plugged Contaminated fuel (water, additives, etc.) Inadequate octane Defective throttle valve Low battery voltage	Repair/Replace Test / Replace Test Pressure / Replace Test / Replace Charge/Replace Clean/Replace Clean/Replace Use correct fuel Replace throttle body Charging system
	Air intake restriction	Dirty Air Cleaner Intake restriction	Clean Repair
	Air Leak	Throttle body gasket surfaces Intake manifold Throttle body	Repair/Replace Repair/Replace Repair/Replace
Engine lacks power	Engine component problems Ignition problems Overfilled with oil	See chapter 7, 8 See chapter 17 See chapter 2	
	Improper fuel delivery	Plugged fuel injector TPS Dirty air cleaner Vacuum leaks Fuel pump Fuel pressure regulator Air temperature sensor Engine speed sensor MAP sensor Plugged vent hose Low battery voltage ECM	Clean/Replace Adjust or Replace Replace Repair / Replace Test / Replace Test / Replace Test / Replace Test / Replace Test / Replace Charge Battery / Replace Test batt./Charging system Test / Replace

FUEL SYSTEM TROUBLESHOOTING (cont.)

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(s)	REPAIR RECOMMENDED
Engine overheats	Internal Engine Parts	Cooling System	Refer to chapter 4
	Lubrication & Cooling system	Cooling System	Refer to chapter 4
	Low or incorrect oil	Engine Oil	Refer to chapter 3
	Brakes dragging	Brake systems	Refer to chapter 15
	Drive belt too tight	Drive Belt	Refer to chapter 3
	Ignition timing incorrect	Ignition Coils	Refer to chapter 17
		Faulty coolant temperature sensor	Replace
		Faulty engine speed sensor	Replace
		Faulty ECM	Replace
	Spark plug(s)	Heat range incorrect	Replace
	Low battery voltage	Charging System	Refer to charging section
		Faulty Battery	Replace
		Faulty Wiring	Repair
	Lean Air/Fuel mixture	Fuel pressure regulator vacuum hose kinked or plugged	Repair/Replace
		Air leak	Repair
		Fuel injector plugged	Clean/Replace
		Coolant temperature sensor	Replace
		Vent hose plugged/ kinked	Repair
		TPS	Refer to fuel injection
		Air leak at throttle body to manifold seal	Repair
Won't Accept New Calibration	Non-Current Calibration File Set		Go to Dealer website (Victory Re-Flash) and download the most current Victory Calibration File Set
	Low Battery Voltage		Attach Battery Charger During Re-Flash, and Re-Charge Battery When Re-Flash Is Completed
	Attempting Re-Flash Without Proper VIN, Calibration I.D. number, or calibration authorization code		Enter Authorization Code Sent With Accessory Kit

NOTES

CHAPTER 4
LUBRICATION & COOLING

OILING SYSTEM 4.2
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TROUBLESHOOTING 4.2
SPECIAL TOOLS 4.2
OILING SYSTEM DATA 4.3
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INSPECTION 4.4
OIL PRESSURE INSPECTION 4.4
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OIL COOLER 4.6
ASSEMBLY VIEW 4.6
OIL COOLER INSPECTION 4.7
OIL COOLER REMOVAL 4.7
OIL COOLER CLEANING 4.7
OIL COOLER INSTALLATION 4.7
OIL PUMP 4.8
OIL PUMP REMOVAL 4.8
OIL PRESSURE RELIEF VALVES 4.9
OIL PUMP INSPECTION 4.10
OIL PUMP DISASSEMBLY 4.11
OIL PUMP ASSEMBLY 4.12
OIL PUMP INSTALLATION 4.14

OILING SYSTEM

OPERATION

The engine must be running in order to perform some of the procedures in this section. Read, understand and follow the warnings and cautions contained in this section.

The oil pump has two sets of internal gerotors. One set provides lubrication pressure and the other provides cooling oil pressure. There is a pressure relief valve located on the oil pump for each oiling system.

The engine must be removed from the frame and disassembled to access the oil pump. Use the troubleshooting charts contained in this chapter before removing and disassembling the engine.

Check oil pressure any time an engine is making objectionable noises that appear to be coming from rotating parts. Check oil pressure before the engine is disassembled for a visual inspection. Re-check oil pressure following the repair to verify the problem was corrected.

Overheating may be caused by improper cooling (oil and/or air flow or oil cooler problem.) Technical troubleshooting skills will be needed to determine which system (or both) should be inspected. Record oil pressure readings in the vehicle's service records for future reference.

⚠ WARNING

Never run an engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas that can cause loss of consciousness or death. Operate the engine in an open area or with an exhaust evacuation system connected and functioning properly.

⚠ WARNING

The engine components, oil and exhaust system become hot during operation and remain hot for a period of time after the engine is shut off. Wear eye protection and heat-resistant garments for hands and arms if working on a hot engine or wait until the components have cooled sufficiently before working on the machine.

TROUBLESHOOTING

LOW OIL PRESSURE	HIGH OIL PRESSURE
Incorrect oil being used or low oil level	Incorrect oil being used
Engine temp too hot when tested	Additives added to oil to increase viscosity
Damaged o-rings or leaks at pipes or fittings	Engine temp too cool when tested
Damaged or worn oil pump or oil pump drive	Restricted oil passages
Pressure relief valve stuck open	Incorrect oil filter
Damaged engine bearings/excessive engine wear.	Pressure relief valve stuck closed
Restricted oil filter, oil filter screen or passages	

SPECIAL TOOLS

Oil Pressure Gauge PV-43531

OILING SYSTEM DATA

SPECIFICATIONS

LUBRICATION & COOLING SYSTEM			
Item		Standard	Service Limit
Engine Oil Capacity (After Disassembly)		See "OIL CHANGE" on page 2.8.	Not Applicable
Engine Oil Capacity (At Change) Fill to full line with the engine at operating temperature.		See "OIL CHANGE" on page 2.8.	Not Applicable
Recommended Engine Oil If Victory 20W/40 is not available, use a high quality 20W/40 motor oil rated SG or equivalent. DO NOT use additives of any kind.		Victory 20W/40 for all operating temperatures.	Not Applicable
Oil Pressure @ 3000 rpm (Lubrication System) Oil Pressure @ 3000 rpm (Cooling System) **ALL READINGS MUST BE TAKEN WITH ENGINE @ OPERATING TEMPERATURE (82°C/180°F)**		552 kPa (80 psi) 414 kPa (60 psi)	Readings should be within 20% of the specifications. MINIMUM Pressure is 276 kPa (40 psi)
Oil Pump Clearances	Rotor Tip Clearance	.12 mm (.005")	.18 mm (.007")
	Pump Body Clearance	.10 mm (.004")	.26 mm (.010")
	Pump End Clearance	.025 mm (.001")	.10 mm (.004")
	Cooling Rotor Width	14.96 mm (.5889")	14.90 mm (.5866")
	Lubrication Rotor Width	9.99 mm (.3933")	9.90 mm (.3897")
	Shaft End Play (Check assembly of pump if excessive)	2.0 mm (.080")	± .5 mm (.020")

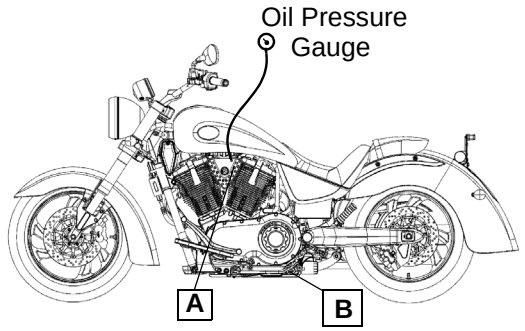
Fastener Torque Specifications - Lubrication & Cooling		
Description	**Torque Nm**	**Torque lb-ft (in-lb)**
Oil Pressure Sensor Loctite™ 565 or pipe sealant	6	(50 in-lb)
Oil Temperature Sensor Loctite™ 565 or pipe sealant	13.5	10 lb-ft
Oil Filter - apply oil to filter O-ring	8 Nm (72 in-lb) Approximately 3/4 turn after sealing ring has contacted the engine case.	
Oil Filter Nipple (Threaded Fitting to Crankcase)	61	45
Oil Drain Plug - Inspect drain plug washer and replace if damaged	19 Nm	14 lb-ft
Oil Pump to Crankcase / Oil Tube to Crankcase	10	(85 in-lb)
Oil Pump Sprocket	10	(85 in-lb)
Oil Manifold Screws to Cylinder Head	10	(85 in-lb)
Oil Line to Oil Cooler (top right) (retaining screw)	10	(85 in-lb)
Oil Line to Oil Cooler (bottom left)	23	17 lb-ft
Oil Line to Crankcase (retaining screw)	10	(85 in-lb)
Oil Line to Cylinder Head (retaining screw)	10	(85 in-lb)

INSPECTION

OIL PRESSURE INSPECTION

Oil pressure is inspected at two locations. Check cooling oil pressure at the temperature sensor (A) on rear cylinder head. Check lubricating oil pressure at the oil pressure sensor (B) on lower left crankcase. Use caution when working around hot engine oil. See warnings at beginning of chapter.

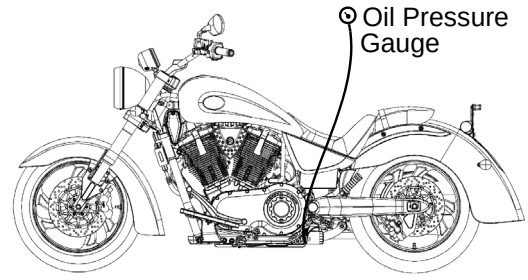
Cooling System Pressure



1. Warm engine to operating temperature.
2. Stop the engine.
3. Remove oil pressure sensor (to check lubrication side) or temperature sensor (to check cooling side) and install oil pressure gauge.

Oil pressure gauge: PV-43531

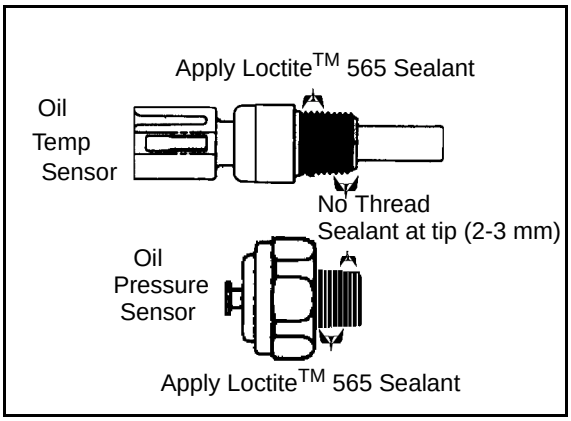
Lubrication System Pressure



4. Check engine oil using dipstick. Add recommended oil if necessary.
5. Start engine and check oil pressure at 3000 rpm.
6. If oil pressure is outside of specification, refer to the troubleshooting on page 4.2 chart for possible causes.
7. Once testing is completed clean threads with Primer N, apply thread sealant to the threads in area indicated at right and install.

Oil Pressure Sensor

TORQUE: Pressure Sensor
6 Nm (50 in-lb)



Loctite™ 565 or pipe sealant

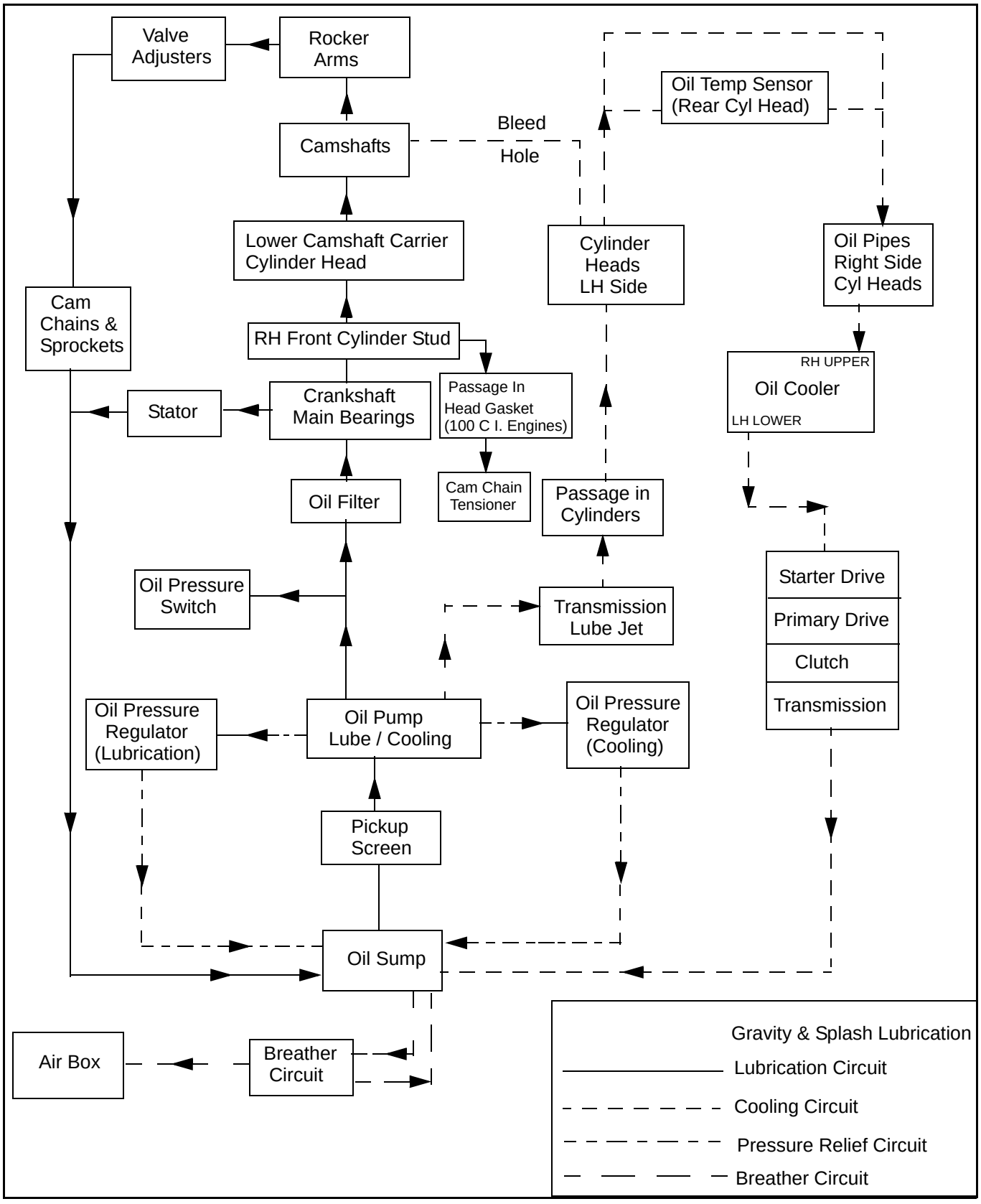
Temperature Sensor

TORQUE: Temperature Sensor
13.5 Nm 10 lb-ft

Item	Standard	Service Limit
Oil Pressure @ 3000 rpm @ Pressure Sensor @ 82°C/180°F Oil Pressure @ 3000 rpm @ Temp. Sensor @ 82°C/180°F	552 kPa (80 psi) 414 kPa (60 psi)	Standard ±20% MINIMUM pressure is 276 kPa (40 PSI)

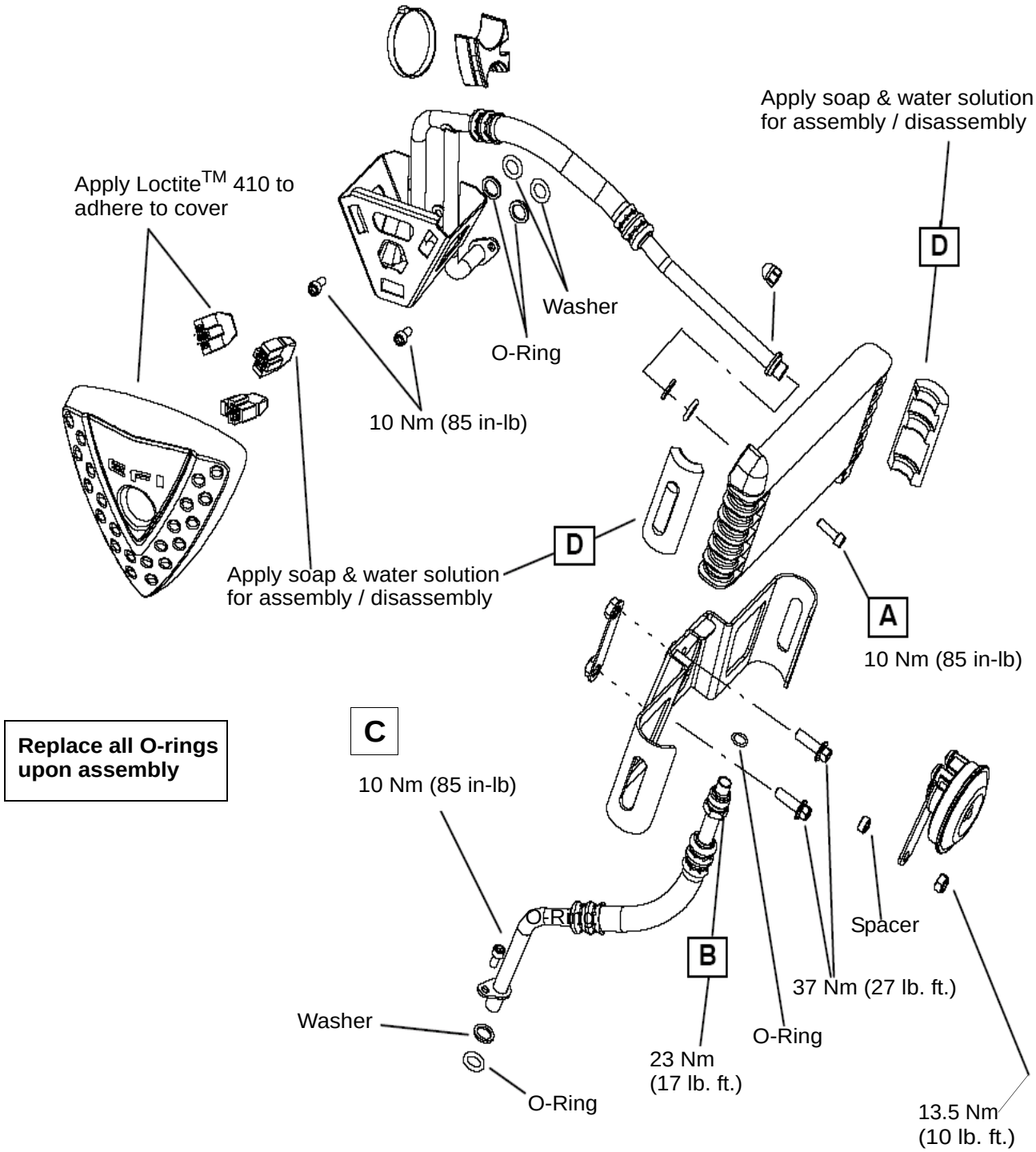
NOTE: Extremely high oil pressure may indicate a system blockage. If oil pressure exceeds 100 PSI @ 82°C/ 180°F (Lubrication side or Cooling side) check the pressure relief valves on the oil pump.

LUBRICATION DIAGRAM



OIL COOLER

ASSEMBLY VIEW



Inspection / Removal / Cleaning / Installation procedure on page 4.7

OIL COOLER INSPECTION

1. Inspect cooler, lines, and all connections for leaks.
2. Inspect lines for proper routing. Replace if there is any sign of abrasion or damage.
3. Inspect cooler surface for obstructions or debris. Carefully remove debris.
4. Inspect oil cooler fins for deformation. Fins can be straightened if not severely deformed and no oil leaks are present.
5. Inspect cooler mounting fasteners for proper torque. Inspect mounting bracket and rubber grommets for cracks or damage.
6. Replace any damaged components.

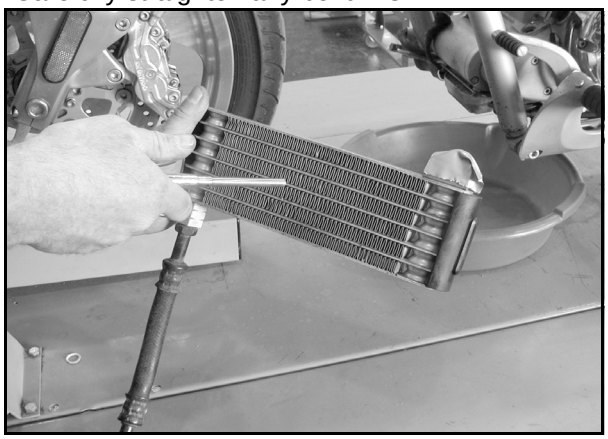
OIL COOLER REMOVAL

Refer to Illustration on page 4.6.

1. Place drain pan beneath oil cooler.
2. Remove screw (A) from top right side of cooler.
3. Remove left side oil hose from cooler (B) or from crankcase (C).
4. Lubricate rubber mounts (D) with soap & water solution. Push downward on cooler and carefully remove from bracket.

OIL COOLER CLEANING

1. Rinse from back side to front with low pressure water.
2. Dry with low pressure air from back to front.
3. Carefully straighten any bent fins.



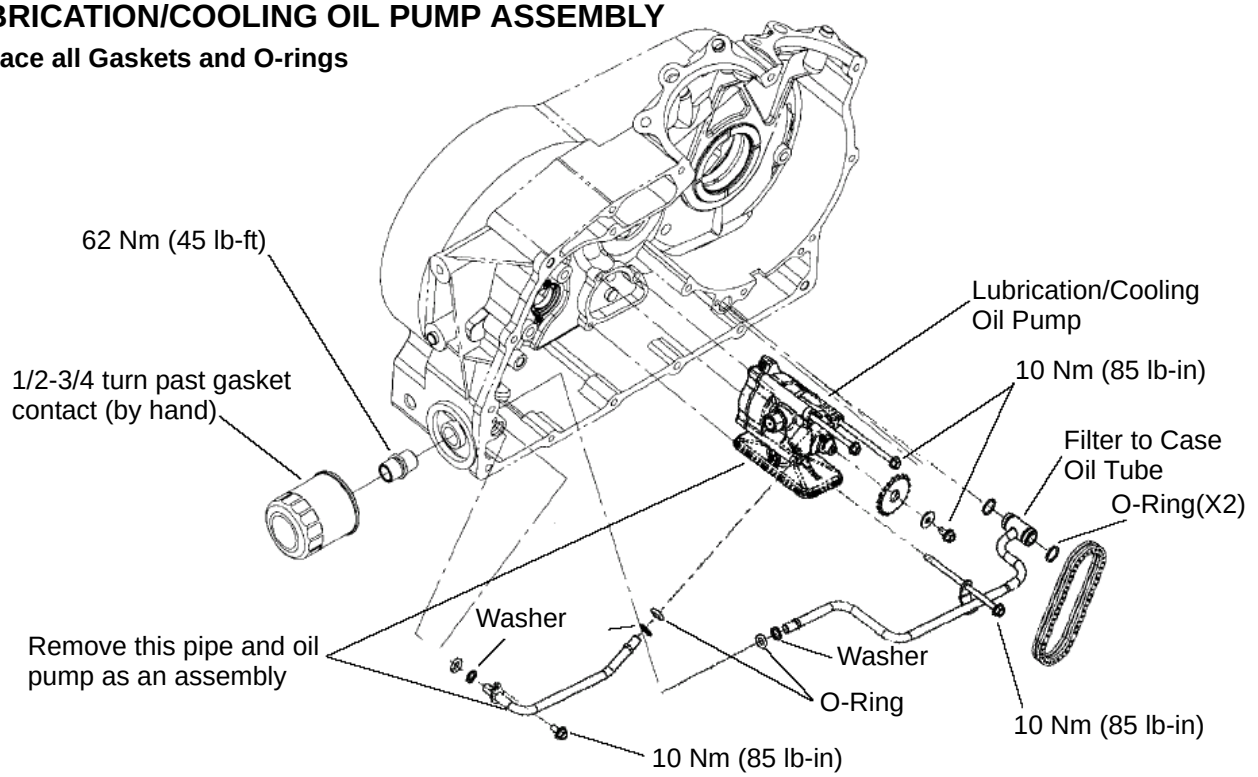
OIL COOLER INSTALLATION

Refer to Illustration on page 4.6 for fastener torque.

1. Place cooler in bracket with rubber mounts attached.
2. Lubricate mounts with mild soap and water solution.
3. Install new O-rings and backing washers on line fittings.
4. Torque fasteners to specification.

LUBRICATION/COOLING OIL PUMP ASSEMBLY

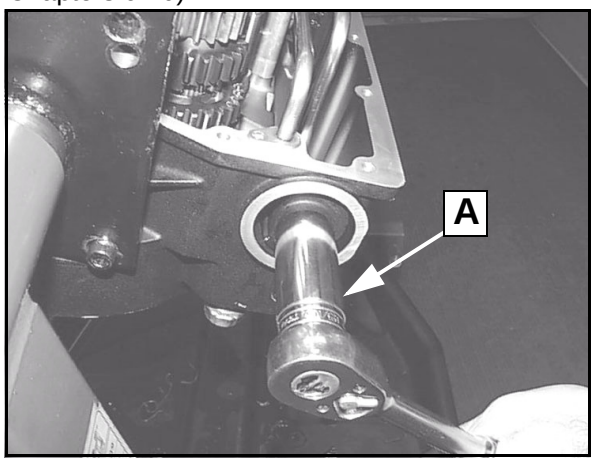
Replace all Gaskets and O-rings



OIL PUMP

OIL PUMP REMOVAL

1. Disassemble engine to access oil pump. (Refer to Chapters 6-10)



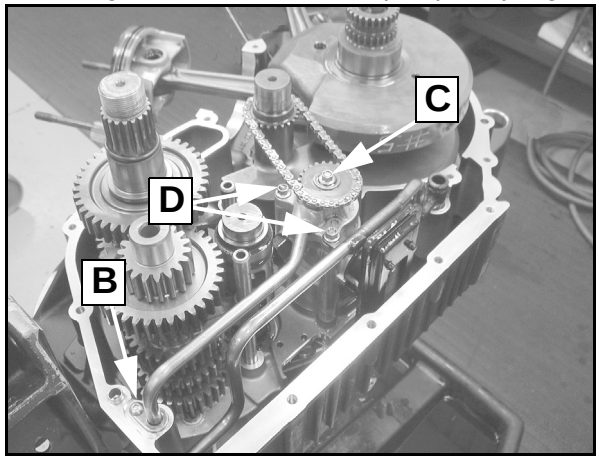
2. Remove oil filter and oil filter nipple (fitting) (A).

NOTE: The oil filter nipple MUST be removed to remove the long oil delivery tube. See photo above.

3. Remove retaining screw for short oil tube (B).

NOTE: The washers and/or O-rings for the oil piping may stay in the engine cases/oil pump body. Be sure to retrieve the used O-rings and washers and discard. Use new o-rings and washers during assembly.

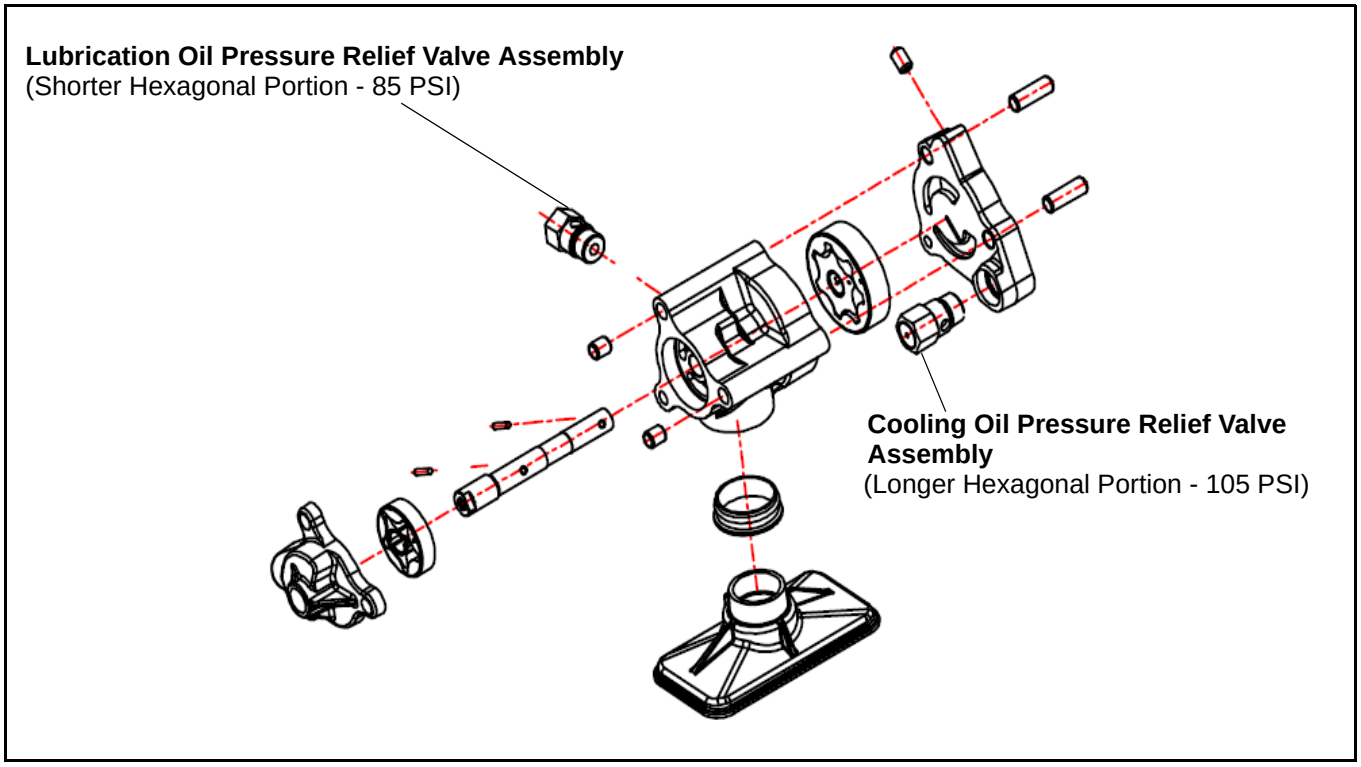
4. Remove oil pump drive sprocket bolt and sprocket (C).
5. Remove (3) oil pump mounting bolts (D). The oil pump mounting bolts also hold the oil pump body together.



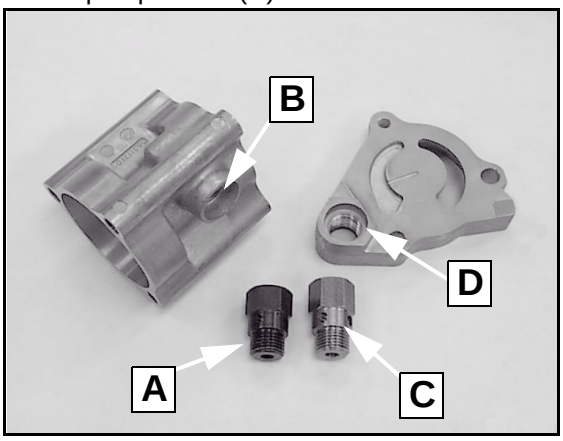
6. Remove long oil tube.
7. Remove oil pump and short oil tube together as a unit. Use caution not to drop any parts when removing oil pump from crankcase.

OIL PRESSURE RELIEF VALVES

The lubrication and cooling systems operate at different oil pressures, regulated by pressure relief valves. The valves are not interchangeable. Be sure to install each valve in the proper location on the oil pump. The lubrication pressure relief valve screws into the main oil pump body, and has a shorter hexagonal portion. The cooling pressure relief valve screws into the oil pump base, and has a longer hexagonal portion.



1. Remove the relief valves. The black lubrication relief valve (A) has a shorter hexagonal portion and screws into the pump BODY (B). The cooling pressure relief valve (C) has a longer hexagonal portion and screws into the pump BASE (D).



2. Visually inspect the relief valve for obstruction or unusual wear.
3. Follow assembly and torque procedure on following pages to reassemble.

OIL PUMP INSPECTION

Inspect the oil pump when lubrication and/or cooling oil pressure is below specification. The oil pump assembly is actually two pumps in one. Follow the inspection directions below for the lubrication and cooling oil pumps. Measure pump clearances to determine if pump is worn beyond the service limit and must be replaced, or if low oil pressure is caused by excessive clearance(s) elsewhere in the pressure side of the system(s).

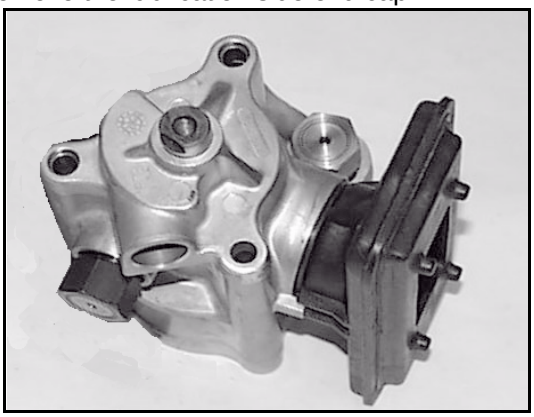
Some of the internal components of the oil pump look similar but are not identical. The parts are not interchangeable. Keep the pump components separate and in order during disassembly and inspection to ensure parts are assembled correctly.

If dots on the gerotors are not visible, mark the gerotors upon disassembly so they can be matched and oriented properly upon assembly.

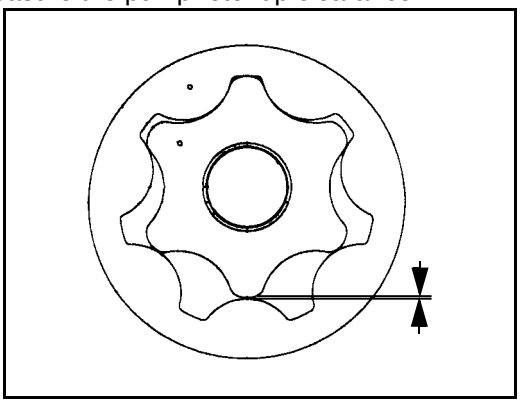
Replace any worn or damaged components. Measure clearances before assembling the engine.

Before disassembling pump completely, follow these inspection steps, and compare to specifications on page 4.3.

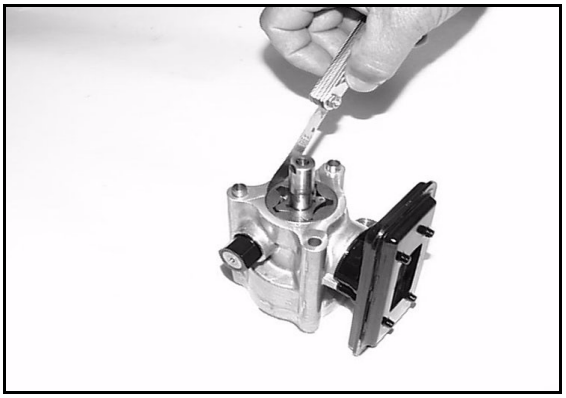
1. Remove the lubrication side end cap.



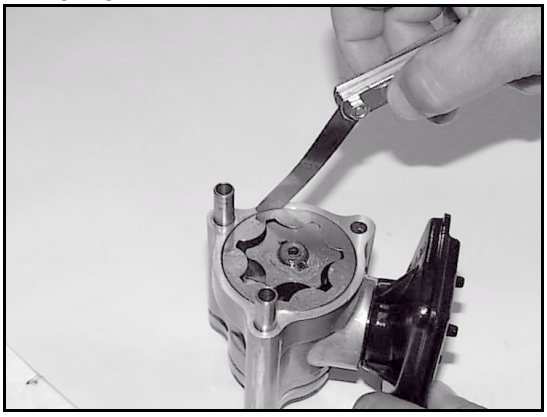
2. Measure the pump rotor tip clearance.



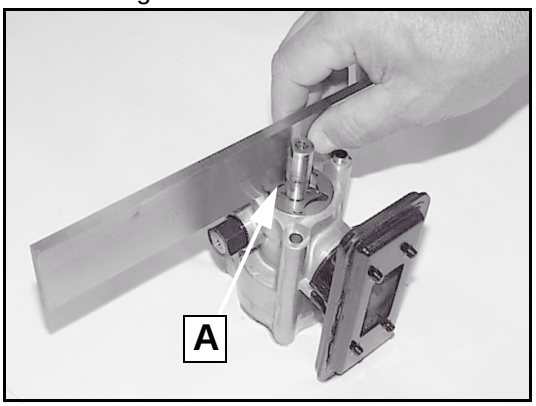
3. Measure the pump body clearance using a feeler gauge as shown. Lubrication side of pump is shown below.



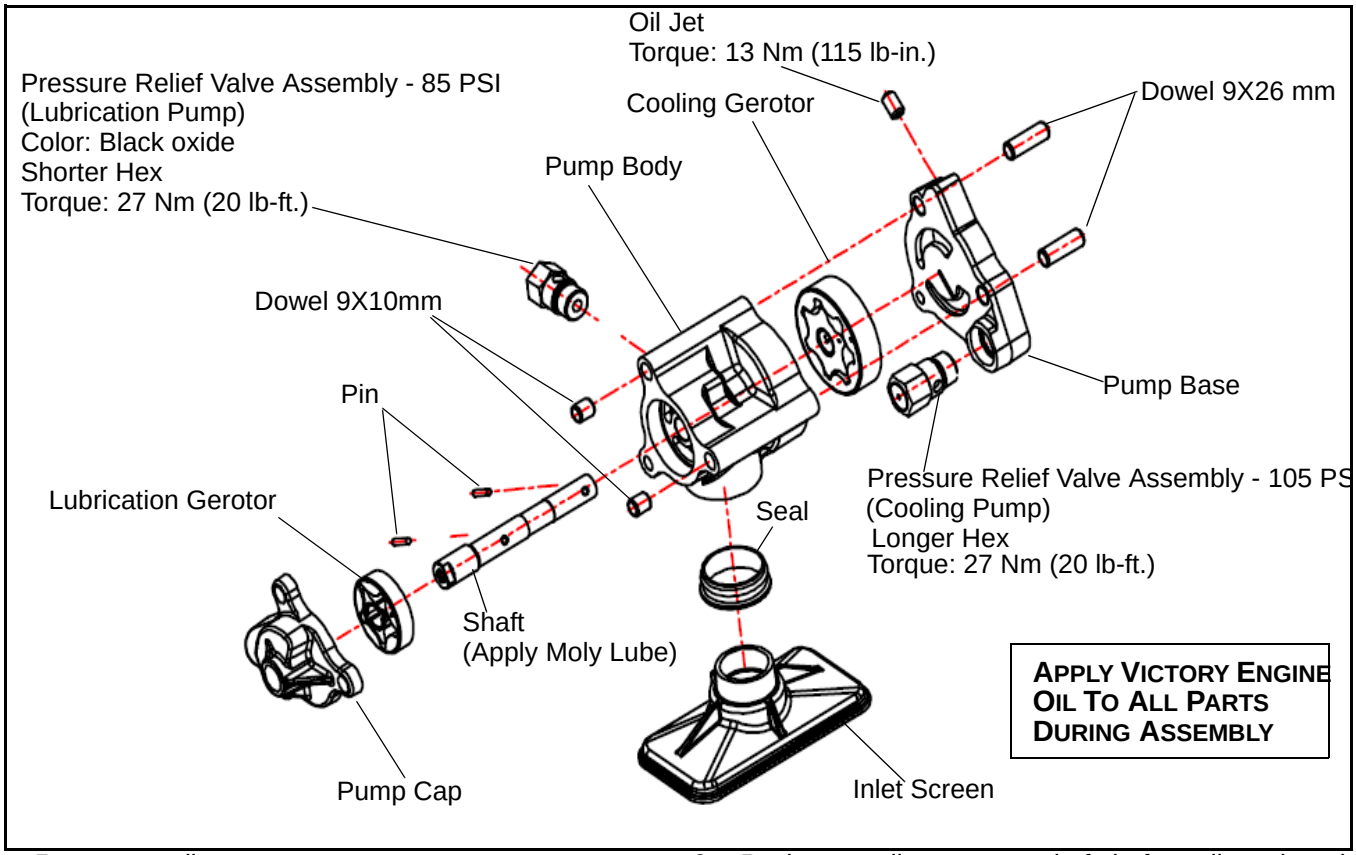
4. Remove the pump base and measure the pump body clearance on the cooling side of the pump using a feeler gauge as shown.



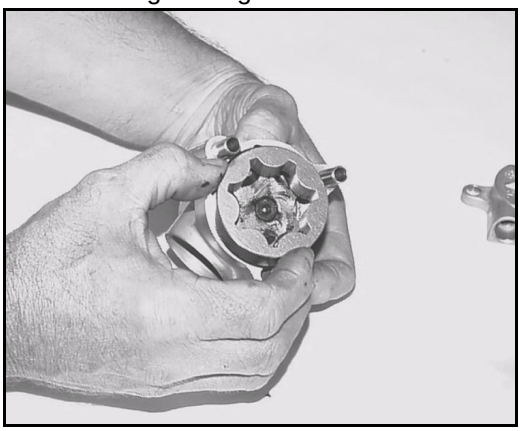
5. Measure the oil pump end clearance with a feeler gauge at point “A”. Lubrication side of pump is shown below. Cooling side is measured in the same manner.



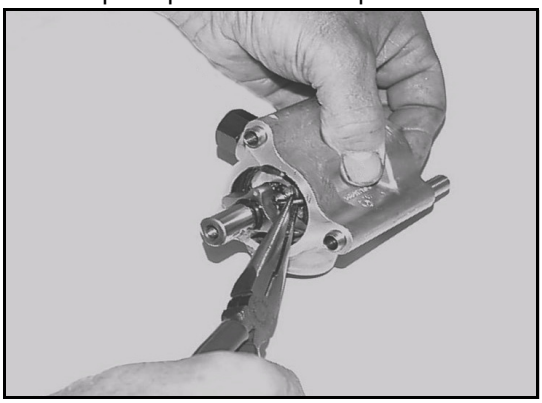
OIL PUMP DISASSEMBLY



1. Remove cooling outer gerotor.



2. Push on cooling pump end of shaft to allow pin to be removed from lubrication rotor. Pull lubrication rotor back to expose pin and remove pin.

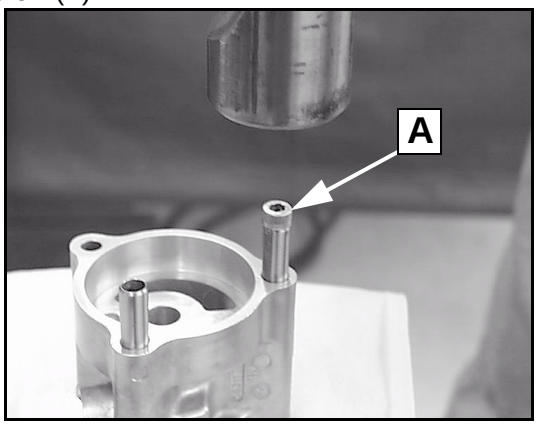


3. Push shaft back toward cooling end of pump and remove pin from cooling rotor.
4. Pull shaft with lubrication rotor from pump.
5. Clean all parts and inspect for wear.
6. Dry with compressed air

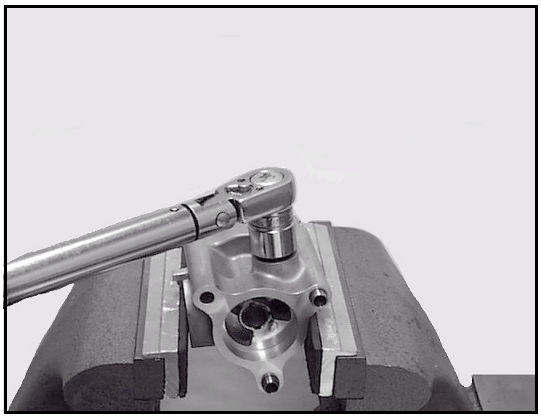
OIL PUMP ASSEMBLY

Refer to Illustration on page 4.11 for assembly view and torque values.

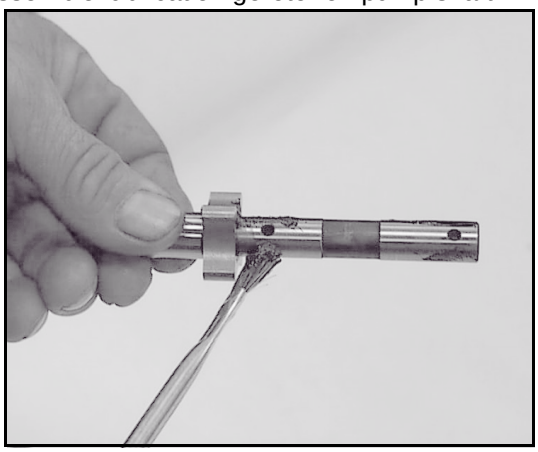
1. Press short dowel pins into lubrication side of pump body using an arbor press and a 6mm allen head screw (A).



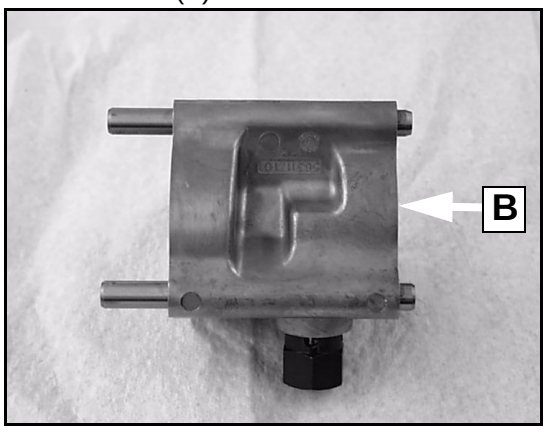
2. Press long dowel pins into cooling side of pump body using same method as above.
3. Secure pump body in a soft jaw vise. Apply Victory engine oil to threads of lubrication pressure relief valve and install into pump body. The lubrication relief valve has a shorter hexagonal portion than the cooling relief valve.



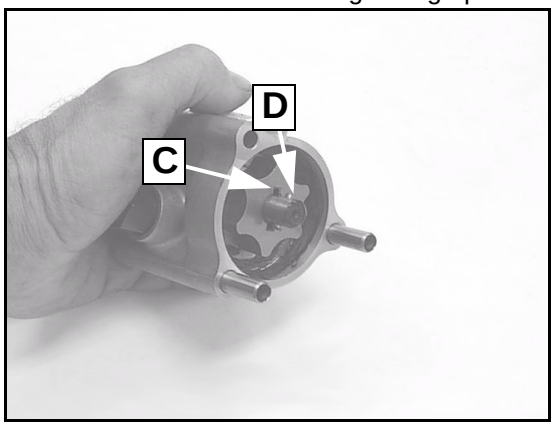
4. Assemble lubrication gerotor on pump shaft.



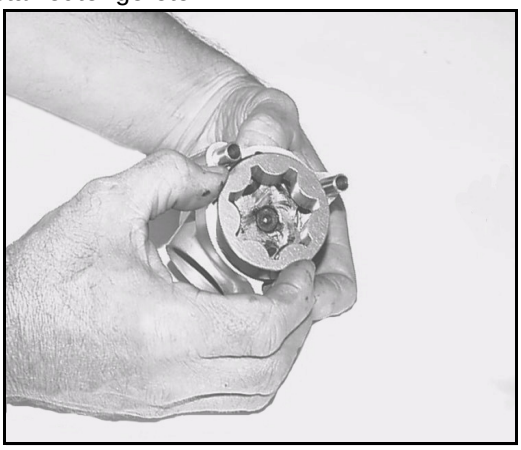
5. Lubricate shaft with moly assembly paste PN 2871460.
6. Insert pump shaft/rotor assembly into pump body in direction shown (B).



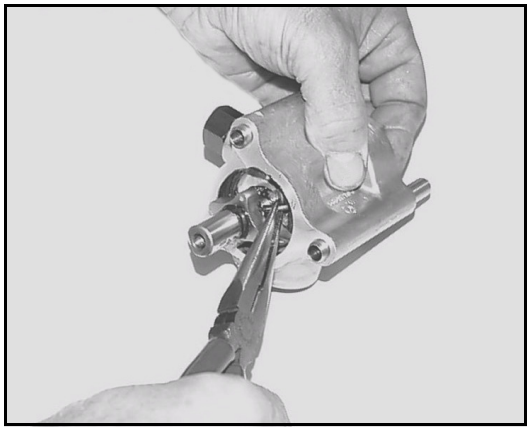
7. Lubricate and install the cooling gerotor with pin slot (C) facing OUT.
8. Insert pin (D) into shaft on cooling side.
9. Push shaft inward while rotating to align pin and slot.



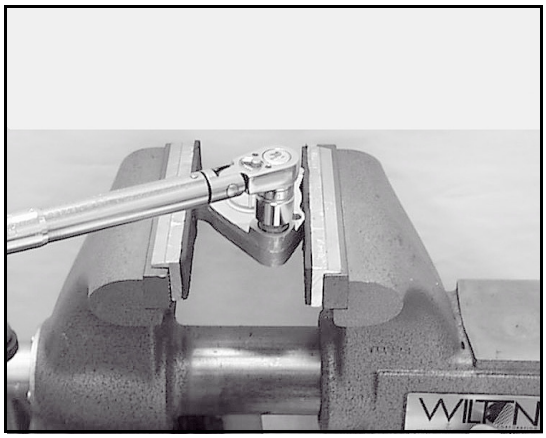
10. Install outer gerotor.



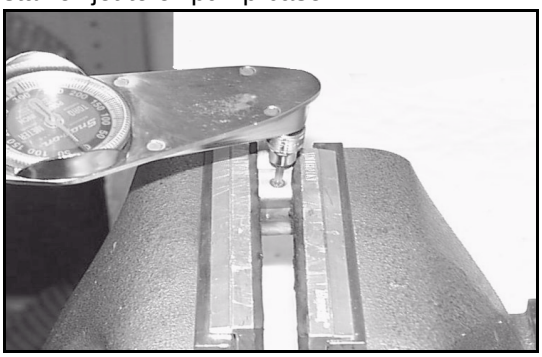
11. Push shaft toward lubrication side and hold in place. Install pin for lubrication rotor. Lubricate both gerotors with oil.



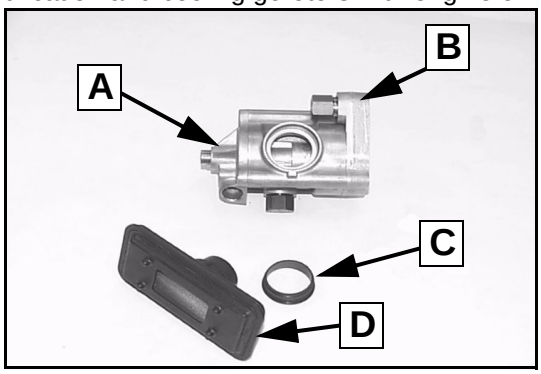
12. Secure pump base in a soft jaw vise. Apply Victory engine oil to threads of cooling pressure relief valve and install into pump base. The cooling relief valve has a longer hexagonal portion than the lubrication relief valve.



13. Install oil jet to oil pump base.



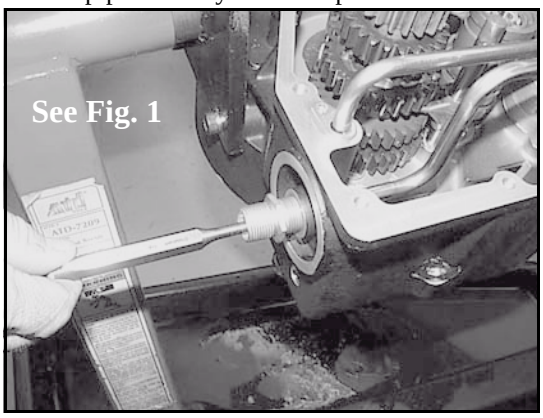
14. Lubricate pressure relief valve assemblies and both lubrication and cooling gerotors with engine oil.



15. Install body cap (A) and base (B) to pump.
16. Install oil inlet seal (C) to inlet screen (D).
17. Lubricate seal with oil and assemble to oil pump body, aligning groove in screen to tab on pump body.

OIL PUMP INSTALLATION

1. Clean oil pipes and dry with compressed air.



2. Install washer (A) and lightly greased O-ring (B) onto short oil pipe. Insert pipe into pump body with a twisting motion.
3. Place washer (C) onto oil pipe followed by a new lightly greased O-ring (D).
4. Install oil pump and short pipe into left crankcase. Start by inserting oil pipe into case. Position pump into crankcase alignment holes.
5. Start the top two oil pump retaining bolts (E) (do not tighten at this time).
6. Install new greased O-rings (F) onto front of long oil pipe. Install washer (G) on end of pipe and a new O-ring (H).
7. Install pipe with retaining bolt (I). Fit front end of pipe into position on crankcase and rear through oil filter boss.
8. Install oil filter nipple (J). See note below.
9. Torque all fasteners to specification.

NOTE: IMPORTANT ASSEMBLY NOTE
The oil filter nipple MUST be removed to install the long oil pump delivery pipe. With pipe installed, use a pin punch or similar tool to align oil filter nipple with oil pipe. Install nipple carefully with tapered side to crankcase (oil pipe).

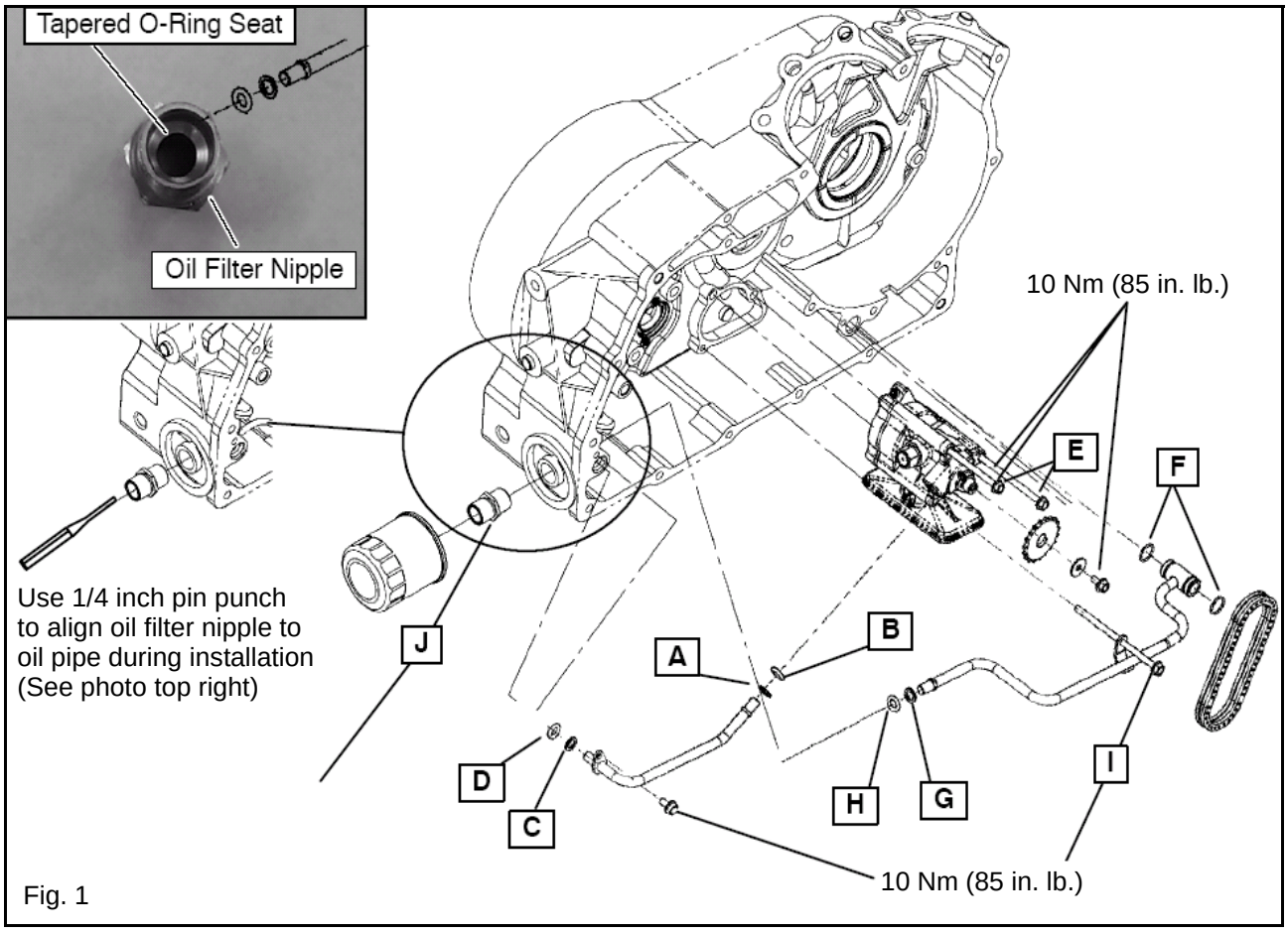
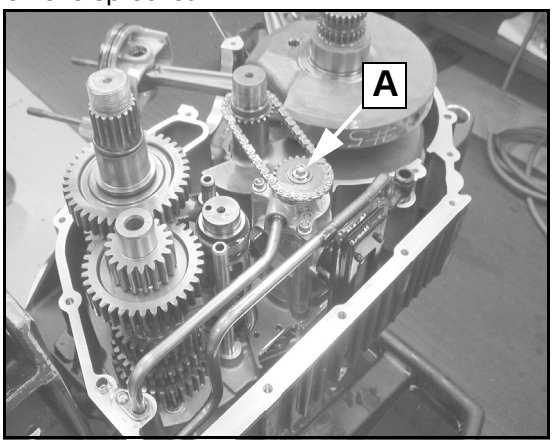


Fig. 1

10. Temporarily install pump sprocket on pump shaft (without the chain) and turn oil pump over by hand.

NOTE: Turn pump shaft by hand to make sure it turns freely.

11. Remove sprocket.



12. Install chain on sprocket and assemble. Torque sprocket retaining bolt (A) to 10 Nm (85 lb-in).

NOTE: The sprocket is a floating design. A small amount of end play is normal after tightening the retaining bolt.

13. Refer to Chapter 10 for crankcase assembly.

14. Verify proper oil pressure after assembly. Refer to page 4.4.

NOTES

CHAPTER 6
ENGINE REMOVAL & INSTALLATION

OVERVIEW - ENGINE REMOVAL 6.2
GENERAL 6.2
SPECIFICATIONS 6.2
SPECIAL TOOLS 6.2
TORQUE VALUES 6.3
FOOT REST SUPPORTS - RIGHT SIDE 6.3
FOOT REST SUPPORTS - LEFT SIDE 6.4
SPIDER BRACKET / REAR ENGINE 6.5
ENGINE MOUNTING 6.6
ENGINE REMOVAL (TYPICAL) 6.7
PREPARATION 6.7
INJECTOR REMOVAL 6.12
ENGINE INSTALLATION 6.13
PREPARATION 6.13

OVERVIEW - ENGINE REMOVAL

GENERAL

A floor jack or commercially available motorcycle engine lift or hoist is required for engine removal. Arrange for assistance when removing and installing the engine into frame to avoid damage and personal injury.

> ⚠ CAUTION
>
> Engine removal should not be attempted without the proper training and equipment. The procedures in this section involve removal of engine and chassis supporting components. Always be sure that the engine and / or frame is supported properly and secured in place before removing any mounting hardware, brackets or fasteners.

Once engine is removed from frame, an engine stand is recommended for engine disassembly and assembly.

The procedure shown here leaves the spider bracket (suspension minor pivot) attached to the frame when removing the engine (refer to page 6.3). However, if the engine is being removed for top end work only, you may choose to leave components such as the regulator / rectifier and starter motor attached to the engine. The rear of the vehicle must be lifted higher to allow components to clear the frame depending on method.

Engine removal and installation methods may differ slightly depending on available equipment.

REQUIRES ENGINE REMOVAL FOR SERVICE	CAN BE SERVICED WITH ENGINE IN FRAME
Airbox Removal	Alternator
Camshaft	Cam Chain Tensioner
Camshaft Chain / Guide / Tensioner Blade	Clutch / Primary Drive
Crankcase Breather Reed Valve	Fuel Injection
Crankshaft & Crankshaft Component Service	Gearshift Linkage (External)
Cylinder Heads	Ignition System
Valve Covers / Valve Cover Gaskets**	Output Shaft Seal
Oil Pump	Starter, Starter Clutch, Flywheel, Anti-Kickback Clutch
Oil Pump Drive/ Balance Shaft	Torque Compensator
Piston/Cylinder	
Transmission/All Internal Transmission Parts	

** 2003-2005 Vegas / Kingpin rear valve cover and gasket can be removed with the engine in the frame. See “Rear Valve Cover Removal (Engine Installed)” on page 32.

SPECIFICATIONS

ENGINE WEIGHT	
Item	**Specifications**
Engine Dry Weight	Approximately 111 Kilograms (244 lbs)

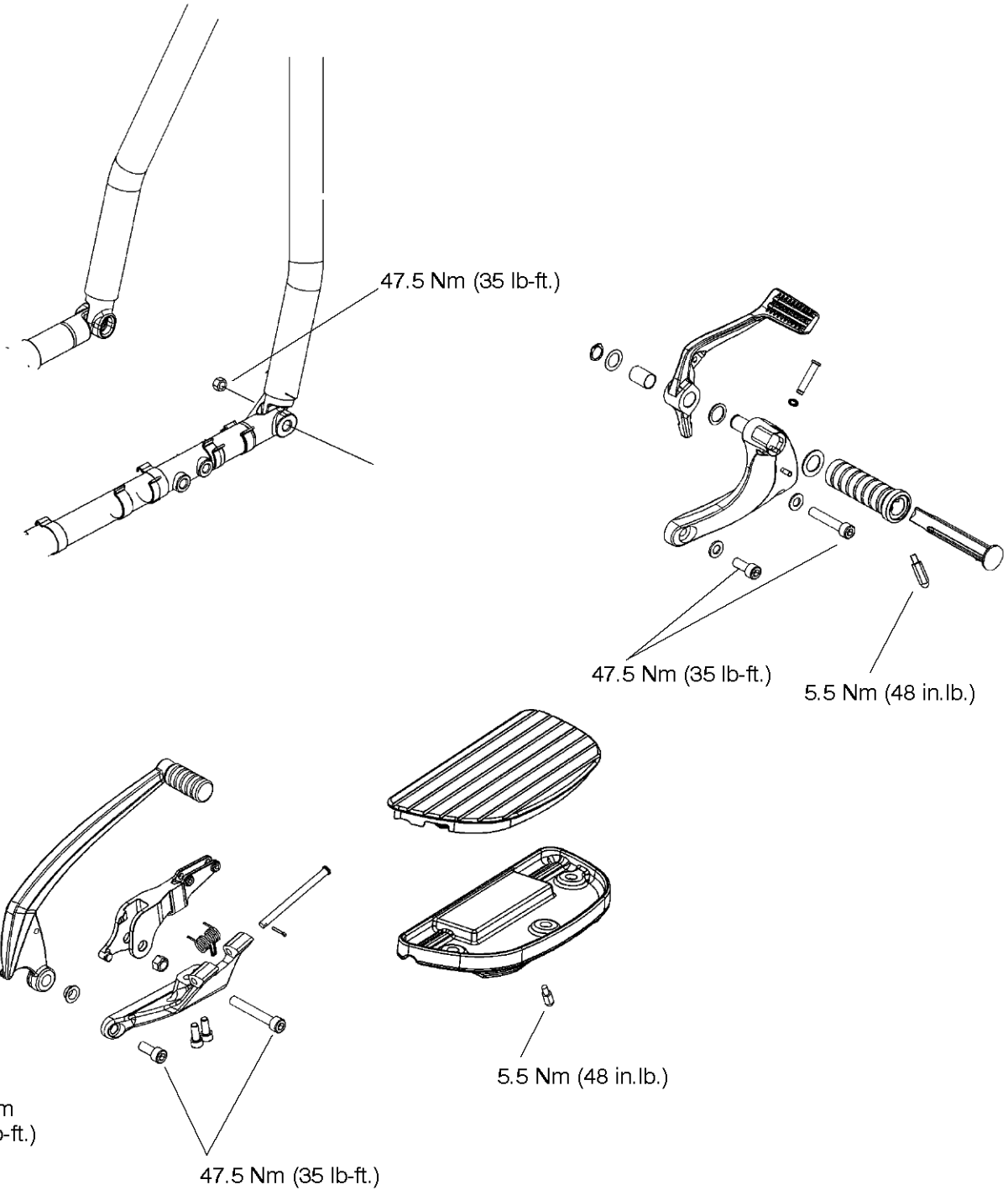
SPECIAL TOOLS

Table lift (commercially available)

Secure platform jack or engine hoist (commercially available)

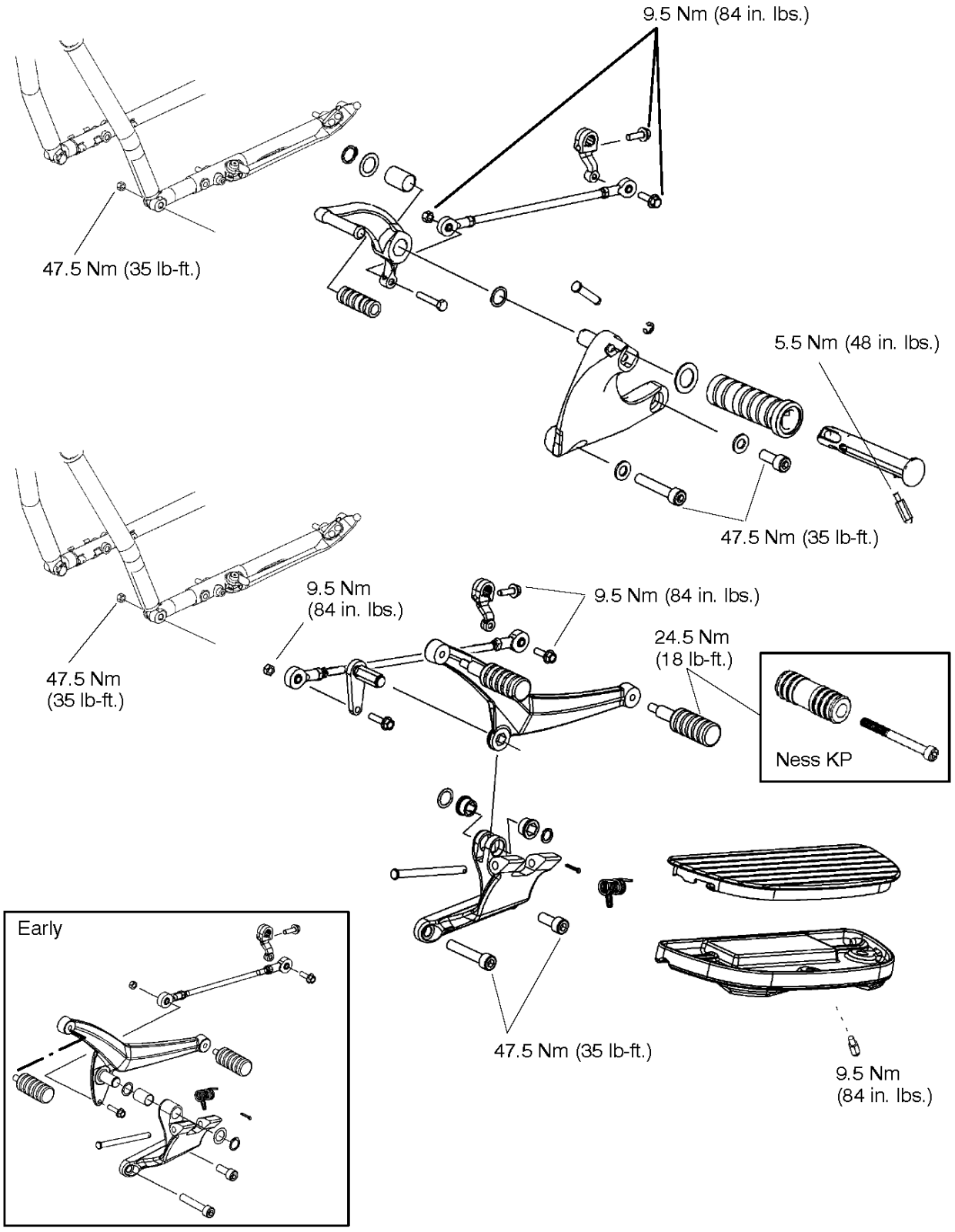
TORQUE VALUES

FOOT REST SUPPORTS - RIGHT SIDE

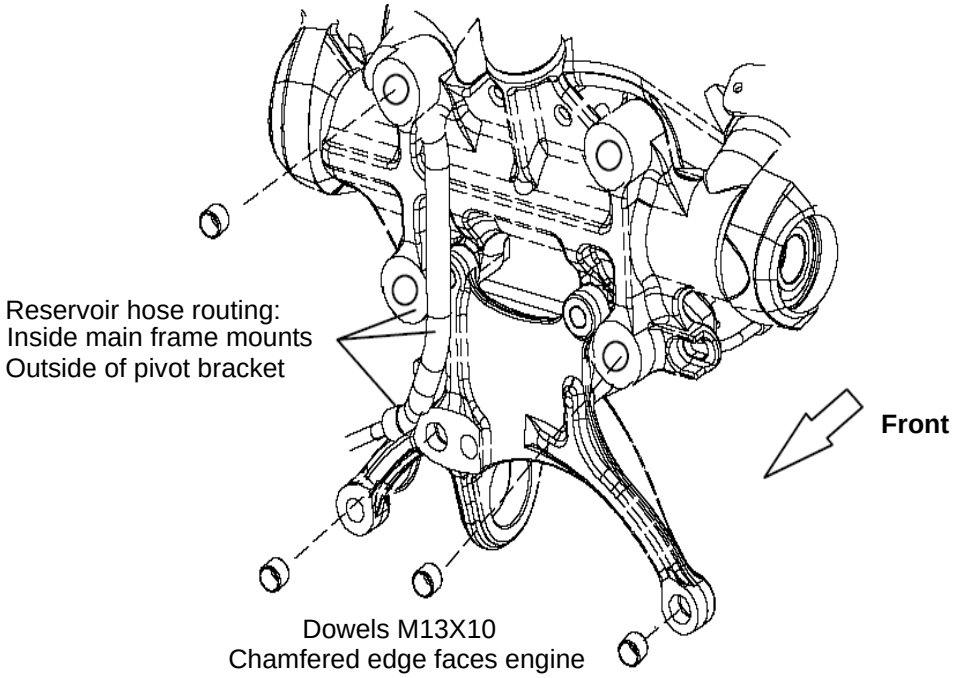


FLOORBOARDS

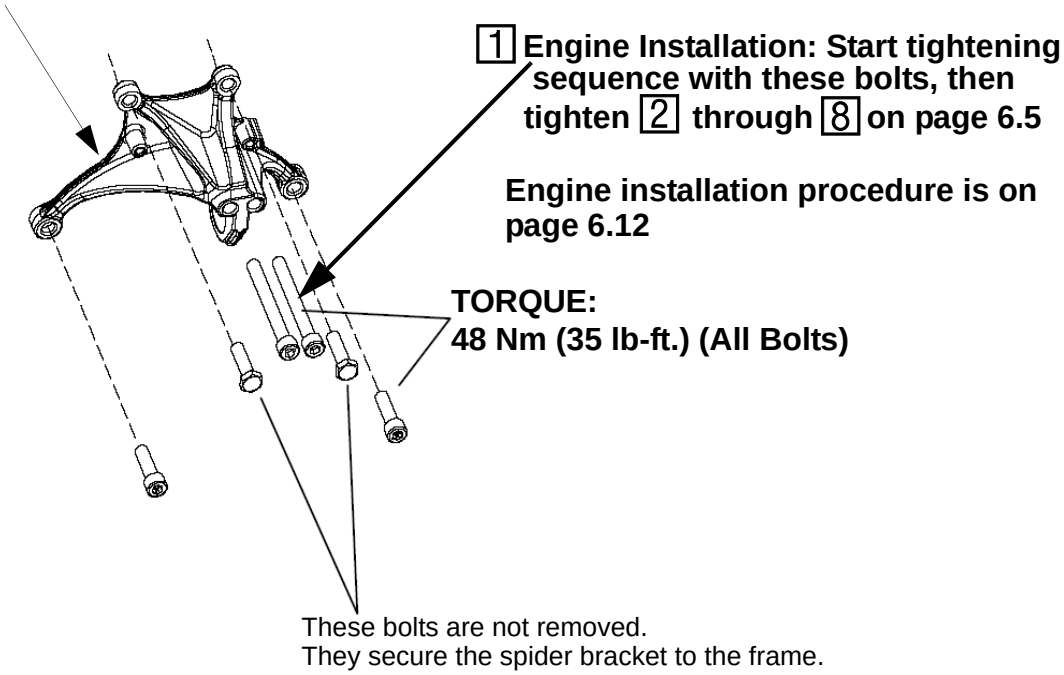
FOOT REST SUPPORTS - LEFT SIDE



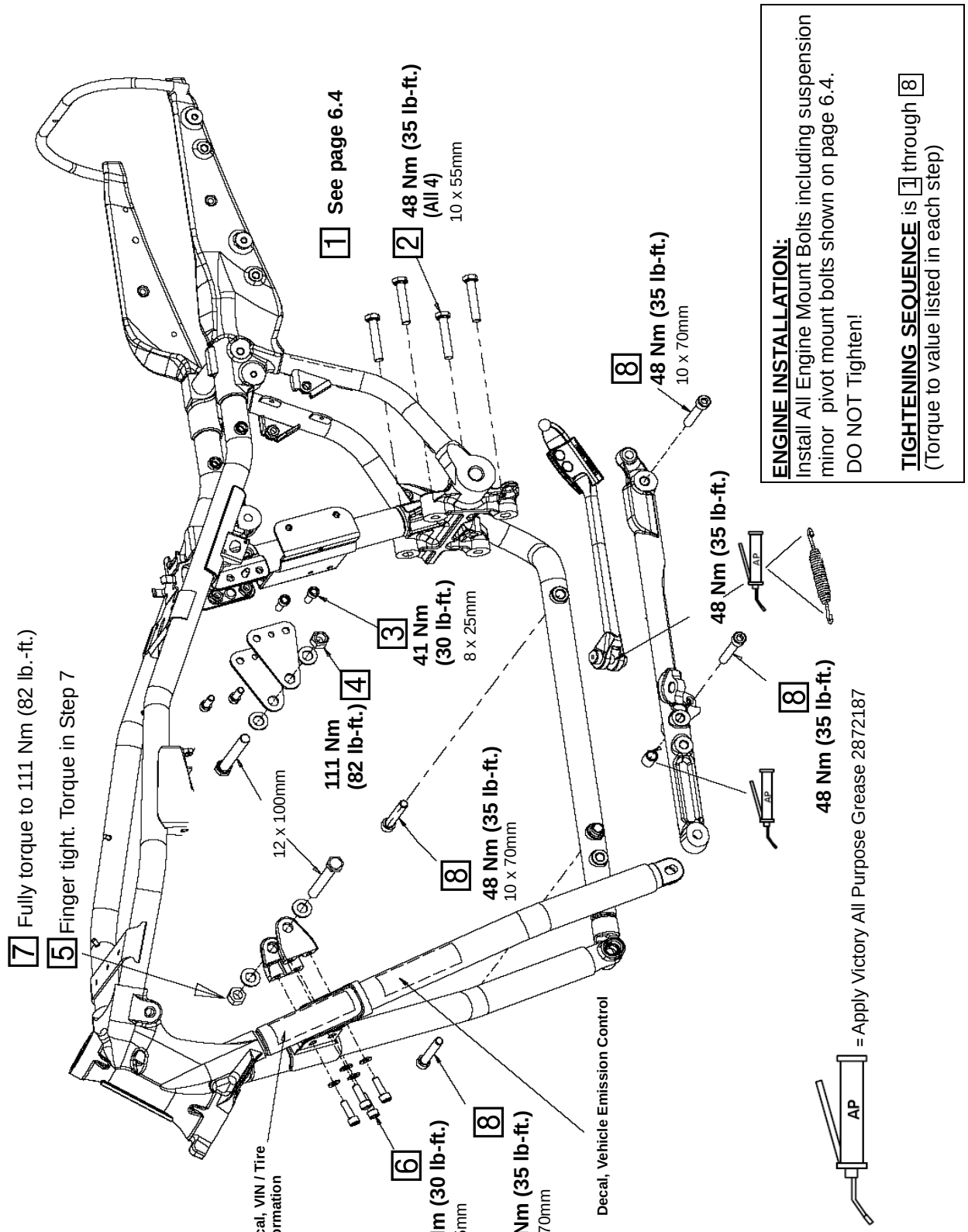
SPIDER BRACKET / REAR ENGINE



Spider bracket (suspension minor pivot) stays with frame for engine removal



ENGINE MOUNTING



ENGINE REMOVAL (TYPICAL)

PREPARATION

A number of different methods can be used to remove the engine depending on equipment available to the technician. All methods require the front wheel stationary to allow the rear of the motorcycle to be elevated at least 8-10 inches above the surface of the lift.

If the engine is being removed for top end work only, it is not necessary to remove the regulator/rectifier, bracket, and starter motor. If these items remain on the engine, the rear of the motorcycle will have to be elevated more than 12 inches using a hoist or other suitable lift on the rear portion of the frame.

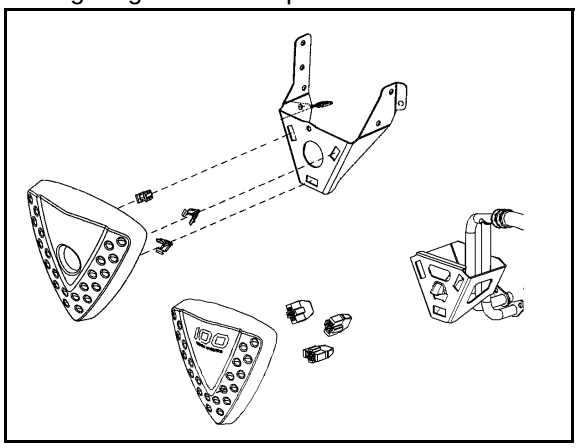
Refer to illustrations on page 6.4 and 6.5.

1. Support motorcycle securely in an upright position. Clamp front tire securely in a wheel vise of lift bench, so rear tire and chassis can be raised 10-12 inches off the bench to allow engine removal.

PRECAUTIONS:

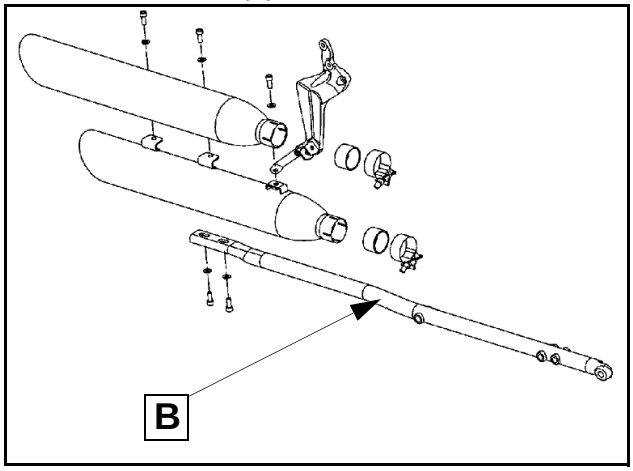
- Protect frame down tubes (A) and other areas from scratches with tape or a protective wrap.

- Clean areas where items (such as oil lines) attach to the engine before you remove them to prevent debris from entering.
- As parts are removed, cover or seal openings with tape.
- Note routing of wires, cables and hoses. Refer to routing diagrams in Chapter 1.

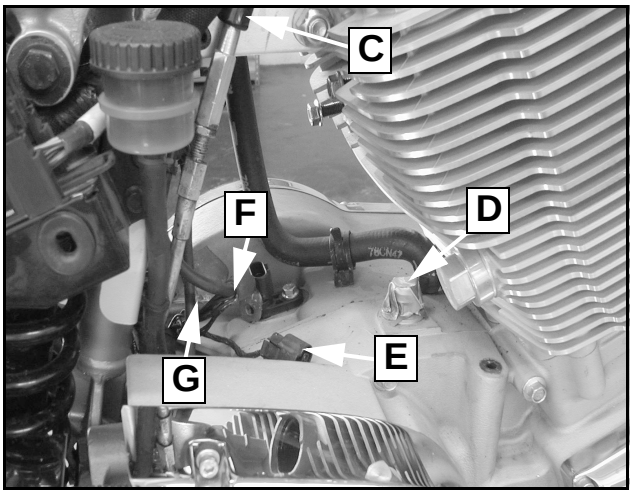


REMOVE:

- Side covers
- Seat cowl or passenger seat, and operator seat
- Fuel tank (Chapter 5)
- Ignition switch cover (left side) (Chapter 3)
- Oil line cover (right side) (Chapter 3)
- Battery - Remove negative (-) cable first.
- Exhaust system (Chapter 3)
- Exhaust mount (B)



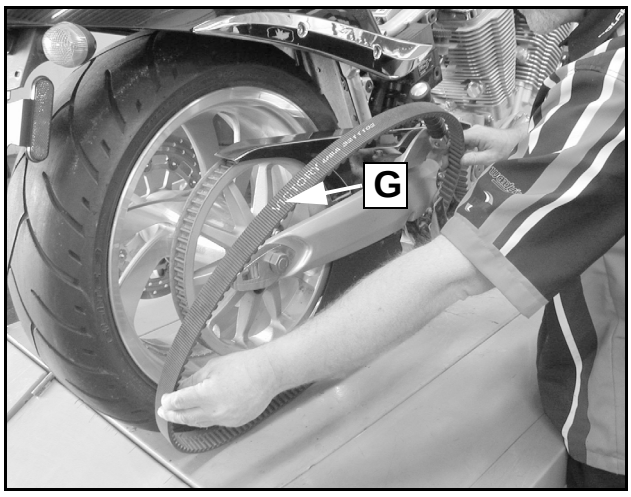
- Clutch cable guide from engine mount plate (C)
- Breather hose at (D) and guide on engine mount plate on left side. Cover breather opening.
- Speed sensor harness (E) (2006 shown.)
- Engine ground cable (F)
- Clutch cable bracket from crankcase (G)
- Clutch cable from release arm



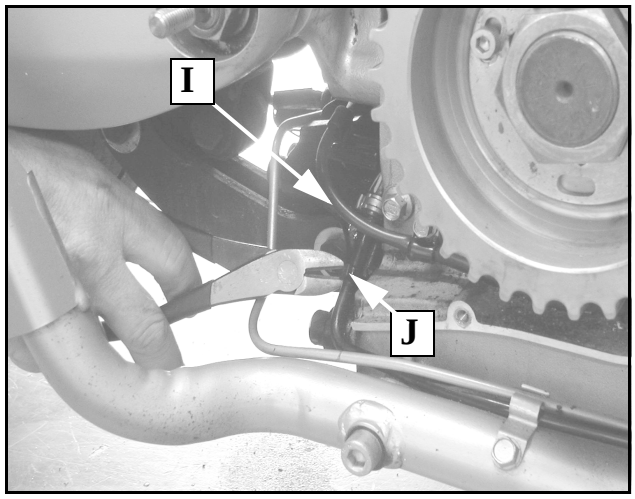
REMOVE:

- Drive belt guard.
- Drive belt sprocket cover and drive belt.

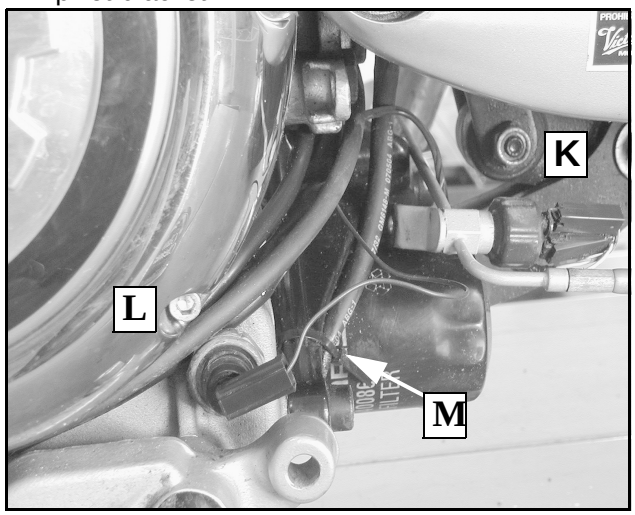
Note direction belt is installed, with “VICTORY” readable from right side (H). Do not kink or twist the drive belt. If you plan to disassemble the engine crankcase, remove drive sprocket (Chapter 11).



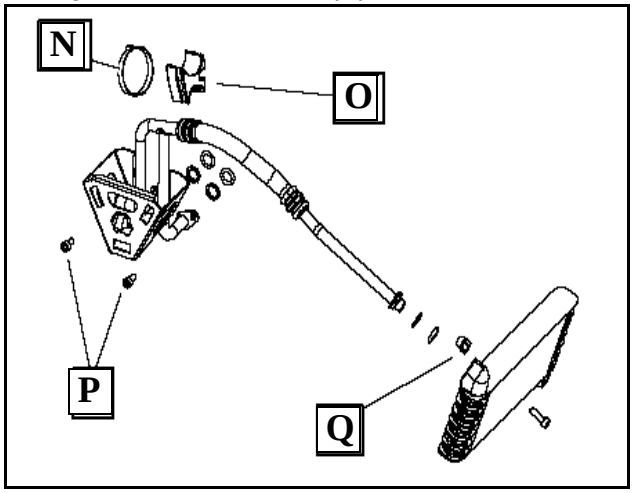
- Gear position switch wire harness guide (I) from lower right leg of suspension pivot bracket (2006).
- Tie strap (J) from right lower leg of spider bracket.
- Separate gear position switch connector (follow wires to connector).
- Separate speed sensor connector on 2003-2005 models (follow wires to connector).



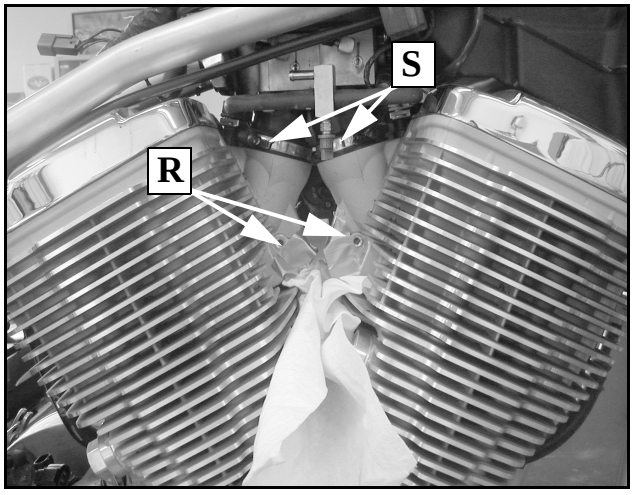
- Rear brake switch bracket (K).
- Disconnect oil pressure sensor wire (L).
- Cut tie strap (M) on lower right side of suspension pivot bracket.



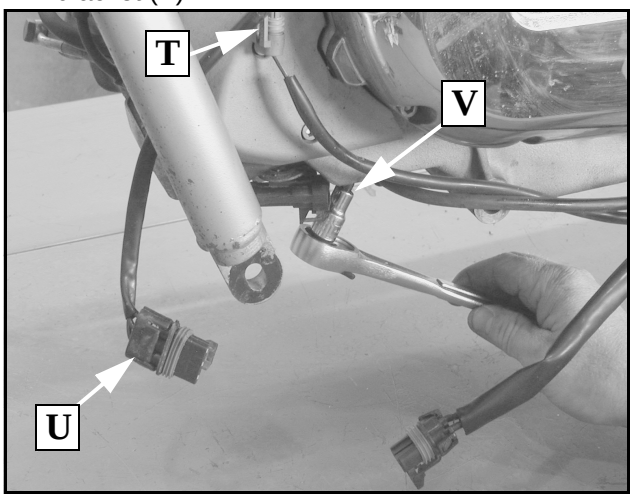
- Tie strap (N) and guide (O) for oil line / clutch cable.
- Oil lines at cylinder head outlets (P) and at upper right cooler connection (Q).



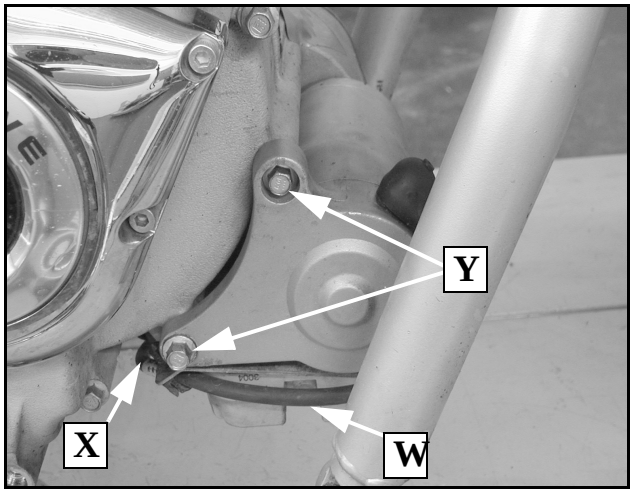
- Cover openings (R) to prevent debris from entering.
- Loosen inlet manifold hose clamps (S).
- Left oil line at engine. (Cover opening to prevent debris from entering).
- Oil cooler (Chapter 4).
- Right lower frame rail assembly (page 6.5). Do not allow assembly to hang by brake lines.
- Linkage arm from shift shaft and left lower frame rail (page 6.5).



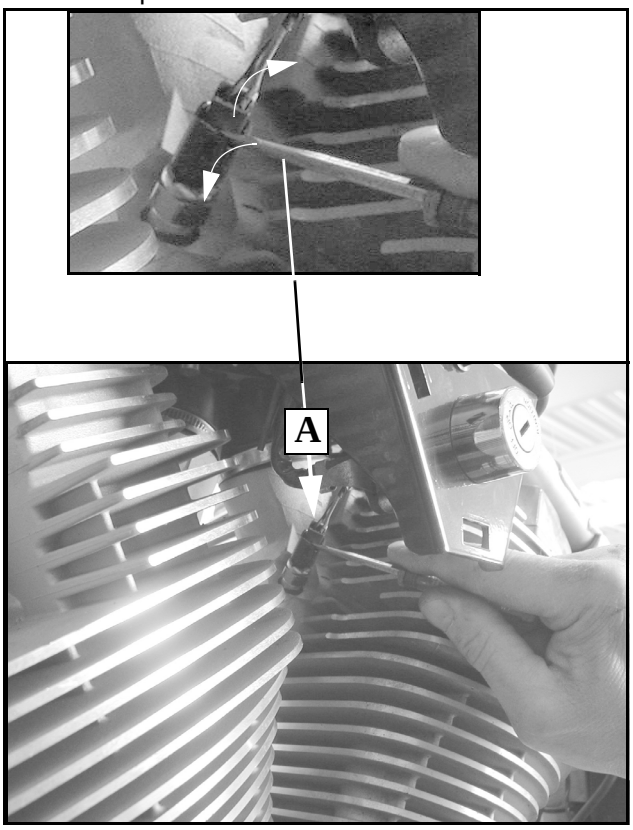
- Crankshaft position sensor harness connector (T).
- The regulator rectifier and the starter motor can remain in place if the crankcase will not be disassembled. Proceed to following page (oil temperature sensor).
- Regulator / Rectifier 3 pin and 2 pin connectors (U).
- Starter positive (+) cable guide on left side of bracket (V).



- Regulator / Rectifier from bracket (2 screws, W).
- Regulator / Rectifier bracket screws (2 at rear, X).
- Starter motor mounts bolts (Y).
- Starter motor.

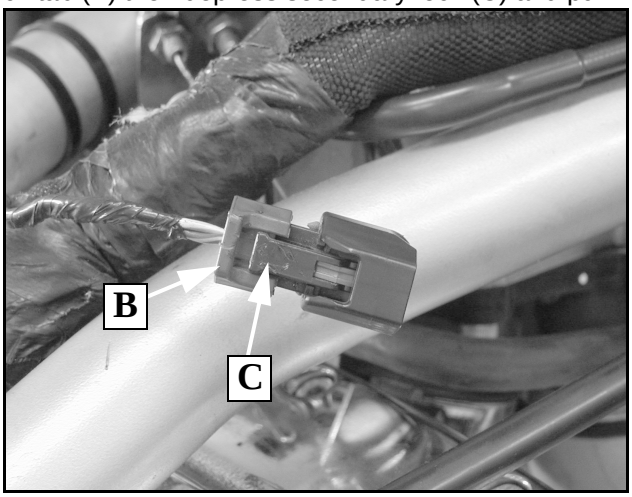


- Oil temperature sensor (A). Use a small, flat screwdriver to lift locking tab on sensor body. Carefully pry inner harness connector off sensor. Do not pull on wires of connector.



- Remove spark plug wires
- Rear Injector (at injector)

NOTE: This is a double-lock connector. Slide back red lock tab (B) then depress secondary lock (C) and pull.



- Front injector, at jumper harness connector (on right side of air box).
- Drain engine oil
- Clean oil filter area. Remove oil filter and cover opening to prevent debris from entering.

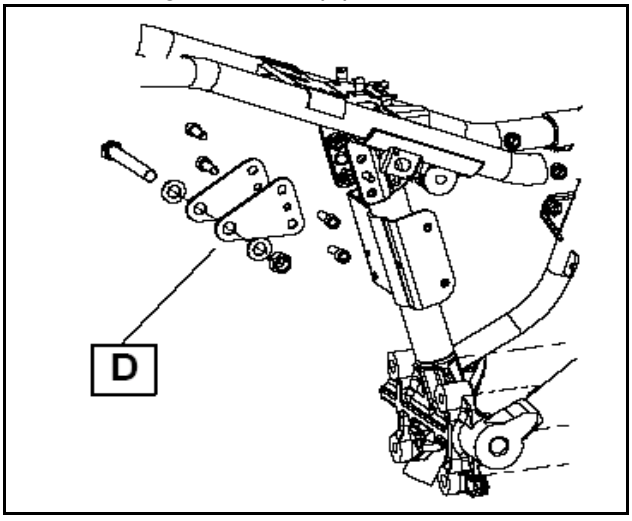
NOTE: Oil and oil filter can remain if engine lower end will not be disassembled, however, a lift hoist will be necessary to raise the rear end of the motorcycle high enough for the front of the engine to clear the frame down tubes and the oil filter to clear the suspension pivot (”spider bracket”).

- Secure air box to upper frame tubes with tie straps or tape to keep it up when engine is lowered.
- Place a lift hoist a position that will center the load and not damage components. **Apply slight upward pressure to support engine**.

⚠ CAUTION

Arrange to have assistance when engine is ready to be removed from frame. The engine is very heavy and could cause severe personal injury if not handled properly. Be sure engine is properly secured and supported before proceeding.

- Remove rear upper engine mounting bolt and both left and right brackets (D).



- Loosen, but <u>do not remove</u> front upper mount bolt (A) and (4) bracket screws (B, Fig. 1).

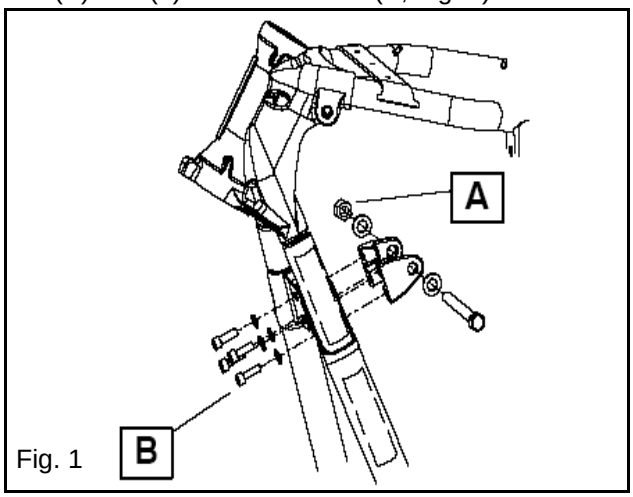
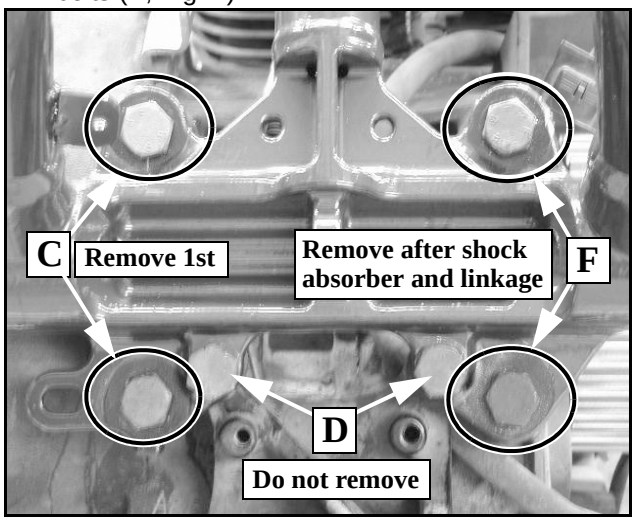


Fig. 1

- Remove LEFT side main frame-to-engine bolts (C).
  Do not remove bolts (D) that hold spider bracket to frame.
- Remove lower left and lower right spider bracket bolts (E, Fig. 2).



REAR SHOCK / LINKAGE REMOVAL

NOTE: Rear shock removal allows access to all frame-to-engine and spider bracket-to-engine bolts.

2. Lift engine / frame slightly to remove weight from rear shock absorber and linkage.

- Remove rear shock absorber and linkage pin in swingarm (Chapter 13) to gain access to RIGHT side main frame-to-engine bolts (F in photo below left) and the two center spider bolts (G, Fig. 2).
- Remove RIGHT side frame-to-engine bolts (F).
- Remove center spider bolts (G).

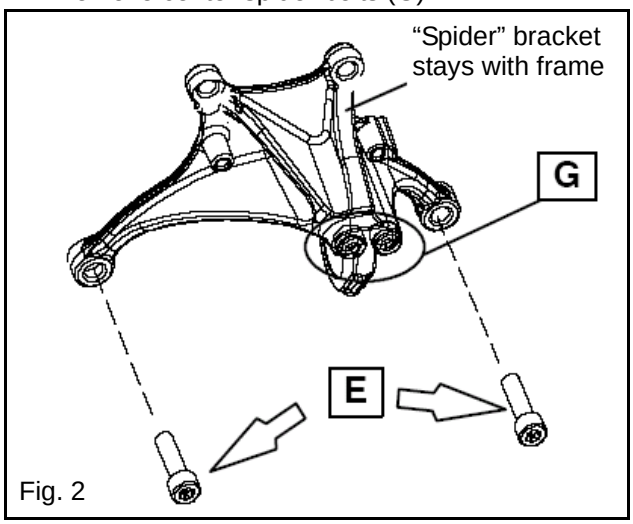


Fig. 2

3. When all rear bolts are removed, re-install rear shock absorber and linkage loosely to support frame and suspension.

- Lower engine slightly until rear suspension is supporting chassis but engine weight is still fully supported by the jack.
- Remove front upper engine mount bolt (H) and both brackets (I) (Fig. 3).

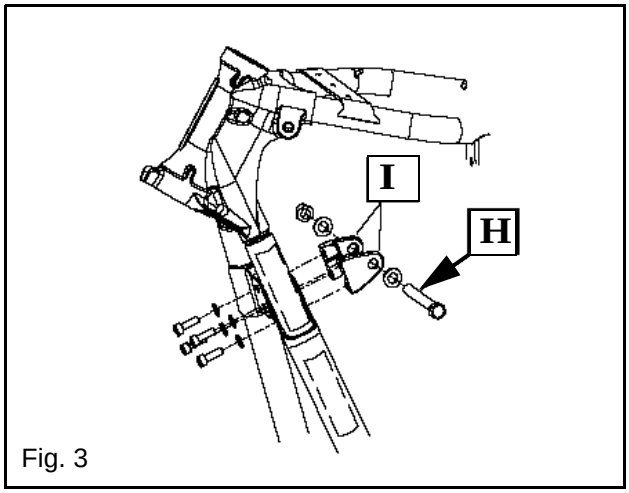
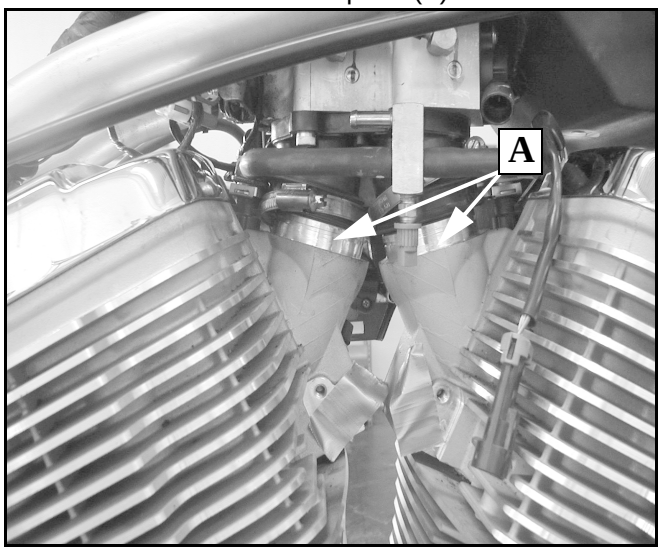


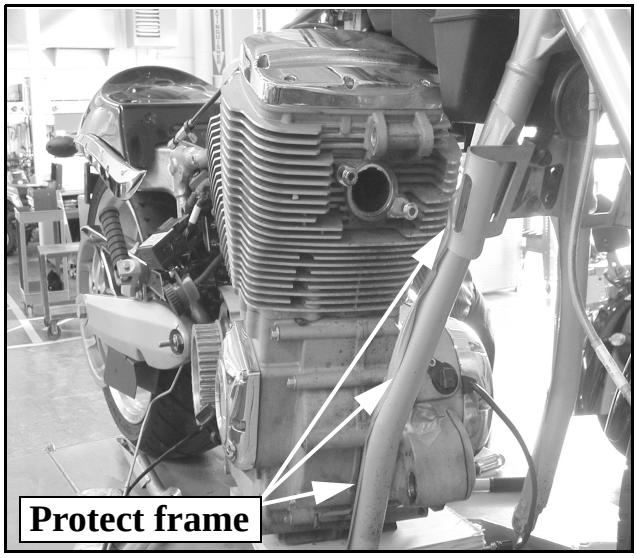
Fig. 3

- When all fasteners have been removed, check to be sure all hoses, wiring, and components have been disconnected or removed to allow engine removal.

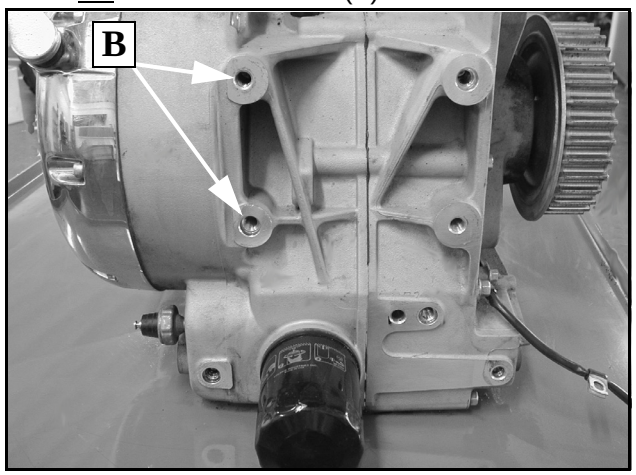
- Lower engine slightly until throttle body can be release from intake adaptors (A).



- Move engine back and forth slightly to release engine from alignment pins at rear of crankcase.
- Slide engine forward until dowel pins on frame and spider bracket are dislocated.
- Rotate engine carefully and remove from right side of frame.

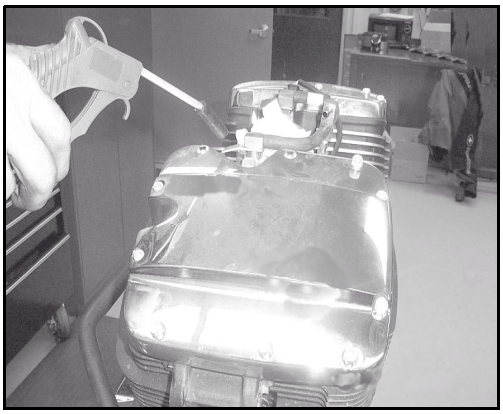


NOTE: Attach engine securely to an engine stand to prevent damage and for ease of disassembly. Use spacers as needed. If crankcases will be separated, use the two left crankcase mounts (B).



INJECTOR REMOVAL

NOTE: IMPORTANT! Debris may collect in and around the injector cavity during operation. If injector removal is required, clean injector cavity and surrounding area with compressed air before removing injectors from cylinder heads.



ENGINE INSTALLATION

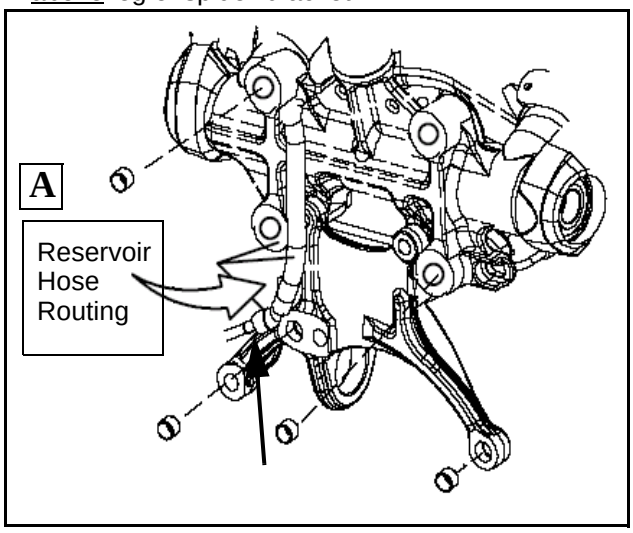
PREPARATION

REFER TO PAGE 6.4 and 6.5 FOR TORQUE VALUES

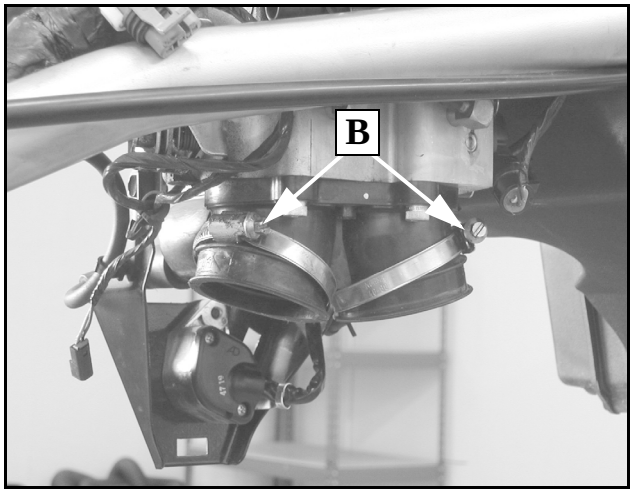
> **⚠ CAUTION**
>
> Arrange for assistance when installing engine. The engine must be held securely to prevent damage to engine, frame, wiring, or hoses. The engine is very heavy and could cause severe personal injury if not handled properly. Be sure engine is properly supported before proceeding.

NOTE: IMPORTANT! Be sure alignment dowel pins are in place on frame cradle and spider bracket.

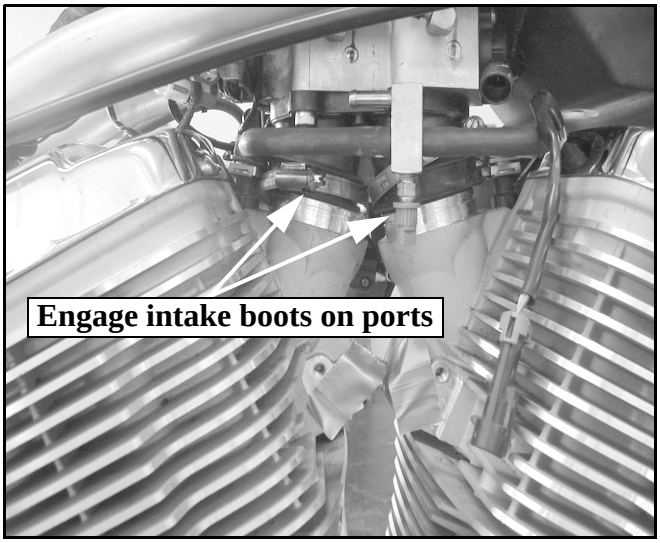
1. Clean mating surfaces of frame, spider bracket, and engine crankcase. Grease dowel pins.
2. Be sure reservoir hose (A) is routed below frame and above leg of spider bracket.



3. During installation, be sure hoses and wiring are not damaged.
4. Place clamps (B) in position on intake boots.

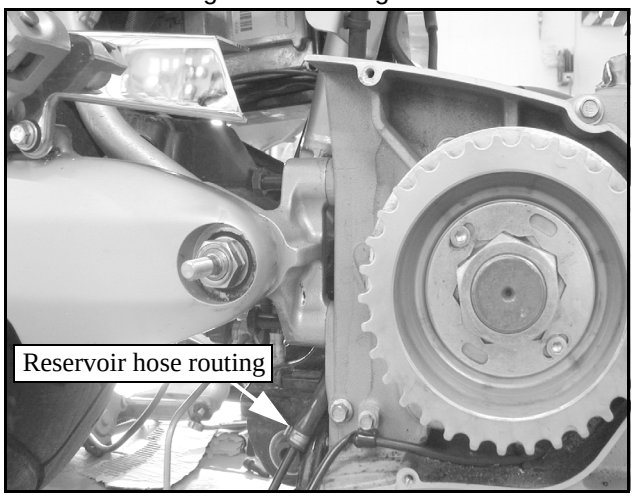


5. Slide and rotate engine into frame and position engine to center of frame. Adjust height of engine as needed to aligned with rear mounts / dowel pins.

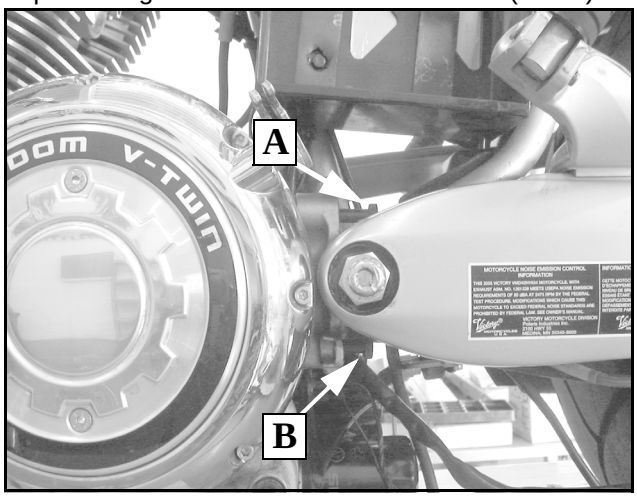


6. Carefully raise engine and start intake boots on intake ports.
7. Slide engine back onto dowel pins and adjust engine height as needed to align the pins and fully seat the intake boots on intake ports.

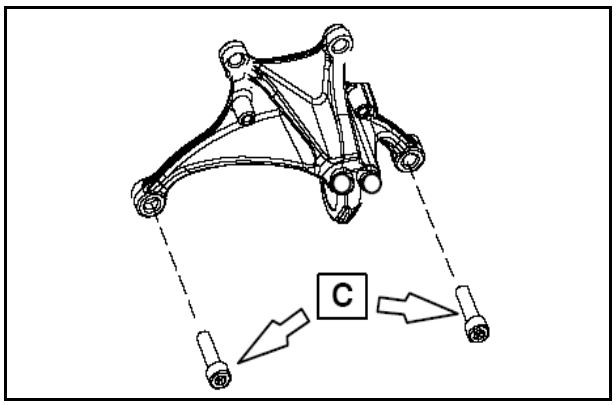
8. Be sure all wiring and hoses are properly routed before installing rear mounting bolts.



9. Loosely install all accessible rear engine mounting bolts in frame (2 left side) and spider bracket (lower left and right).
10. Carefully and evenly draw engine back onto dowel pins using the left side main frame bolts (A & B)...



...and the lower bolts (C) on the suspension pivot.

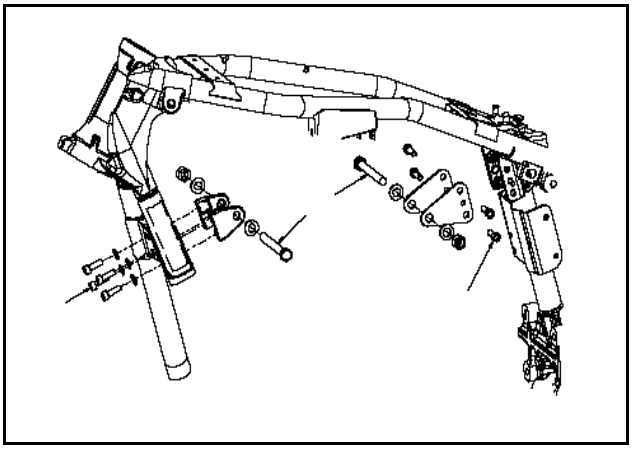


11. Tighten bolts A, B, and C evenly until engine is drawn flat against frame and suspension pivot bracket. Do not torque fully at this time.

⚠ CAUTION

Be sure engine is aligned at the proper height and angle with the dowel pins. DO NOT force engine alignment using the mounting bolts, or the suspension bracket and dowel pins may be damaged! Adjust engine height and angle continuously as required while drawing up the bolts.

12. Loosely install front and rear upper mounting brackets and bolts.



13. Raise engine until weight is off suspension components. Remove rear shock.
14. Install two remaining right side frame-to-engine bolts and two suspension pivot bolts.
15. Torque all rear bolts to 48 Nm (35 lb-ft.).
16. Re-install rear shock. Torque all fasteners to specification (Chapter 13).
17. Refer to illustrations on page 6.4 -6.5 for torque sequence and torque values of engine mounting fasteners. The sequence:
    - Upper rear bracket screws (41 Nm / 30 lb-ft.).
    - Upper rear through-bolt (111 Nm / 82 lb-ft.).
    - Upper front through-bolt snug (1 NM / 8 inch pounds).
    - Upper front bracket screws (41 Nm / 30 lb-ft.).
    - Upper front through-bolt full torque (111 Nm / 82 lb-ft.).

18. **Install starter motor:** Long bolt is installed in bottom hole (8x135) and shorter bolt (8x110) in top hole. Torque to 15 lb-ft. then 22 lb-ft.
19. Install lower frame cradles (page 6.3).
20. Install remaining parts, reversing the order of removal.
21. Install new oil filter and fill crankcase to the proper level with Victory engine oil (Chapter 2).
22. Inspect operation of all controls and adjust as necessary (Chapter 2).
23. Prime the fuel system (Chapter 5).
24. Start engine, inspect for oil leaks.
25. Test ride the motorcycle, inspect for proper operation, fluid leaks.
26. Inspect oil level and adjust if necessary.

NOTES

CHAPTER 7
CYLINDER HEAD & VALVE TRAIN

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GENERAL INFORMATION

IMPORTANT NOTES

- This section covers service of the cylinder heads, camshafts, cam chains and tensioners, cam chain guides and rocker arms. Cam chain tensioners can be serviced with the engine in the frame. Most other cylinder head components require engine removal (Chapter 6).
- If cylinder heads are removed the cylinder should also be removed and the gasket replaced.
- Mark and store all mating parts for correct engine assembly.
- Use moly assembly paste to lubricate parts where indicated.

  Moly assembly paste PN: 2871460

  Victory Semi-Synthetic 20W/40 PN: 2872176
- Handle and store all parts in such a way that they will not be damaged.
- If engine damage has occurred due to lack of lubrication or debris has circulated within the engine, all oil passages must be inspected before engine assembly is completed.
- Pay attention to notes concerning assembly lubrication. Many parts require pre-lube and various parts require different types of pre-lube.
- Some fasteners have a pre-applied locking agent, and must be replaced if loosened or removed. Always replace fasteners that have a pre-applied locking agent or as directed in this service manual.
- There are many precision measuring steps and some precision machining steps to be performed in this section. If you are not sure of your capabilities in these areas, have a competent machinist perform these operations.
- Valve guide and seat reconditioning should be performed by a technician proficient in cylinder head reconditioning techniques using high quality equipment with grinding stones or precision carbide cutters. Do not attempt cylinder head repair without the proper equipment or experience in cylinder head reconditioning techniques.
- The intake and exhaust valves cannot be re-faced.
- Cleanliness of parts is critical to engine life and accurate parts inspection. Use clean solvent to clean all disassembled parts. Dry parts with compressed air and lubricate before engine inspection and engine assembly.

SPECIAL TOOLS

- Valve Spring Compressor PV-1253 or PV-4019 with adaptor PV-43513-A
- Crankshaft Rotation Socket PV-46988
- 8mm or 5/16 pin punch (Commercially available)

DATA - CYLINDER HEAD

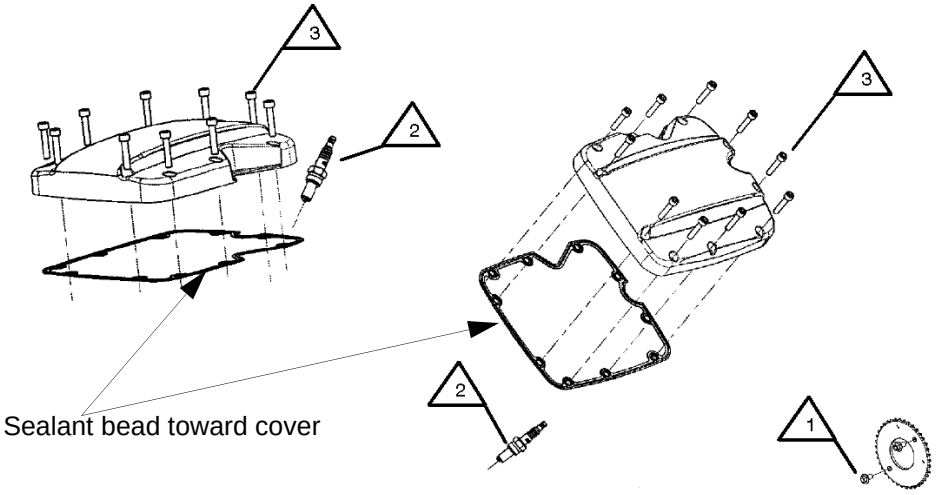
SPECIFICATIONS

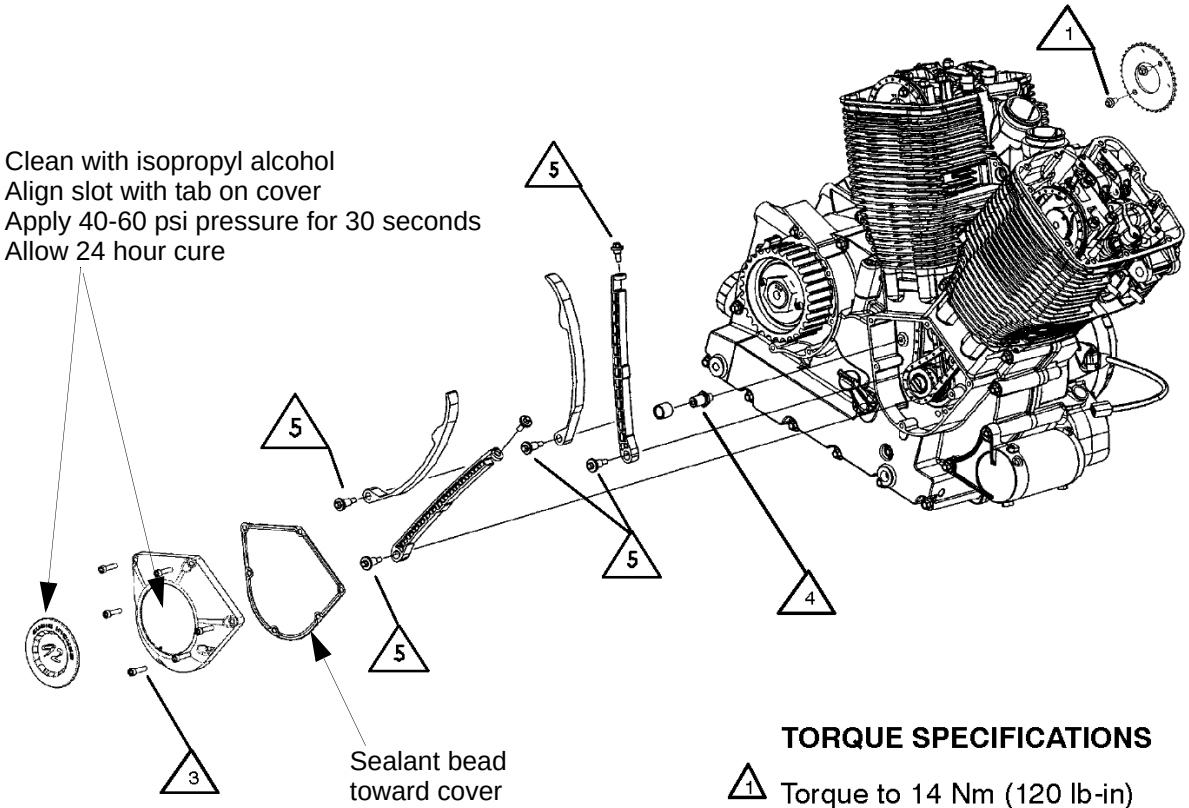
CAMSHAFT TIMING DATA		
2006 (100/5 & 100/6 Engine)	Valve Train	Single Overhead Cam / 4 valves per cyl 2 Intake valves / 2 Exhaust valves
	Intake Valve Opens (@ 1 mm Lift)	0^{o} BTDC
	Intake Valve Closes (@ 1 mm Lift)	36^{o} ABDC
	Exhaust Valve Opens (@ 1 mm Lift)	36^{o} BBDC
	Exhaust Valve Closes (@ 1 mm Lift)	0^{o} ATDC
	Max Lobe Lift (In / Ex)	7.26 mm
	Max Valve Lift (In / Ex)	10 mm / 10 mm
2003-2005 (92/5 Engine)	Intake Valve Opens (@ 1 mm Lift)	10^{o} BTDC
	Intake Valve Closes (@ 1 mm Lift)	45^{o} ABDC
	Exhaust Valve Opens (@ 1 mm Lift)	40^{o} BBDC
	Exhaust Valve Closes (@ 1 mm Lift)	10^{o} ATDC

CYLINDER HEAD & VALVE TRAIN (Specifications below apply to 92 C.I and 100 C.I. except where noted)			
Item	Specification	**Standard**	**Service Limit**
Cam Chain Tensioner	Spring Free Length (92 C.I. Eng)	-	58.80mm (2.31")
	Hydraulic (100 C.I. Engine)	-	-
Cam Shaft (92 C.I. Engine) 2003-2005	Lobe Height IN EX	40.296 mm (1.5864") 40.09 mm (1.5783")	40.02 mm (1.5755") 40.02 mm (1.5755")
	Journal Oil Clearance	.036 mm to .086 mm (.0014" to .0034")	
	Journal O.D.	23.96 - 23.98 mm (.943 - .944")	23.93 mm (.942")
Cam Shaft (100 C.I. Engine) 2006	Lobe Height IN EX	40.27 mm (1.585") 40.09 mm (1.578")	40.02 mm (1.5755") 40.02 mm (1.5755")
	Journal Oil Clearance	.036 mm to .086 mm (.0014" to .0034")	
	Journal O.D.	23.96 - 23.98 mm (.943 - .944")	23.93 mm (.942")
Cylinder Head	Warpage (Distortion)	-	.10 mm max. (.004")
Rocker Arm, Shaft, & Hydraulic Lifter	Rocker Arm Bore I.D. In/Ex	12.01 - 12.03 mm (.473 - .474")	12.065 mm (.475")
	Rocker Arm Shaft O.D. In/Ex	11.97 - 11.98 mm (.471-.472")	11.944 mm (.470")
	Rocker Arm to Rocker Arm Shaft Clearance In/Ex	.024 - .056 mm (.001 - .0022")	.156 mm (.006")
Valve, Valve Guide, Valve Seat	Valve Clearance	Hydraulic / Self Adjusting	-
	Valve Stem O.D. In Ex	6.953 - 6.973 mm (.2737 - .2745") 6.950 - 6.970 mm (.273 - .274")	6.933 mm (.2729") 6.928 mm (.2727")
	Valve Stem Deflection	-	.13 mm max. (.005")
	Valve Seat Width Intake	1.2 mm (.047")	-
	Valve Seat Width Exhaust	1.75 mm (.068")	-
Valves	Valve Stem Runout	-	.13 mm max. (.005")
	Valve Head Radial Runout	-	.05 mm max. (.002")
	Installed Height (Without Valve Seal Installed)	INTAKE: 49.31 - 50.31mm (1.941 - 1.981") EXHAUST: 48.78 - 49.78 mm (1.920 - 1.960")--	
Valve Spring	Free Length In/Ex	43.36 mm (1.708")	41.40 mm (1.630")
	Intake Valve Maximum Lift	10.0 mm (.393")	--
	Exhaust Valve Maximum Lift	10.0 mm (.393")	--
	Installed Height (With Valve Seal Installed)	34.20 - 36.20 mm (1.346 - 1.425")	--

TORQUE VALUES AND ASSEMBLY VIEWS

CAM DRIVE & VALVE COVER - 92 CUBIC INCH ENGINE



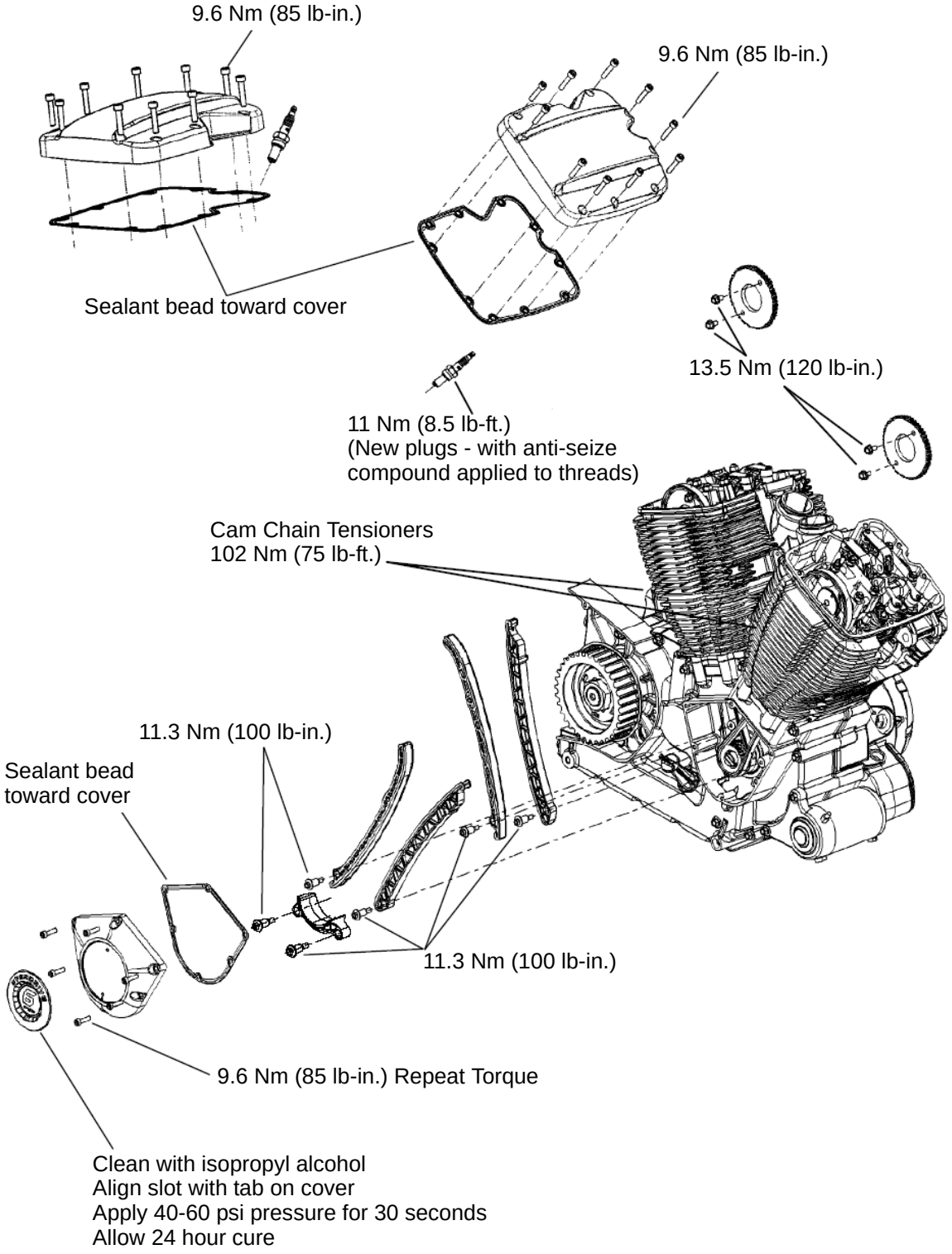


TORQUE SPECIFICATIONS

1	Torque to 14 Nm (120 lb-in)
2	Torque to 11 Nm (96 lb-in)
3	Torque to 10 Nm (85 lb-in)
4	Torque to 24.5 Nm (18 lb-ft)
5	Torque to 12 Nm (100 lb-in)

TORQUE VALUES AND ASSEMBLY VIEWS

CAM DRIVE & VALVE COVER - 100 CUBIC INCH ENGINE



CAMSHAFT CARRIER/ ROCKER ARM

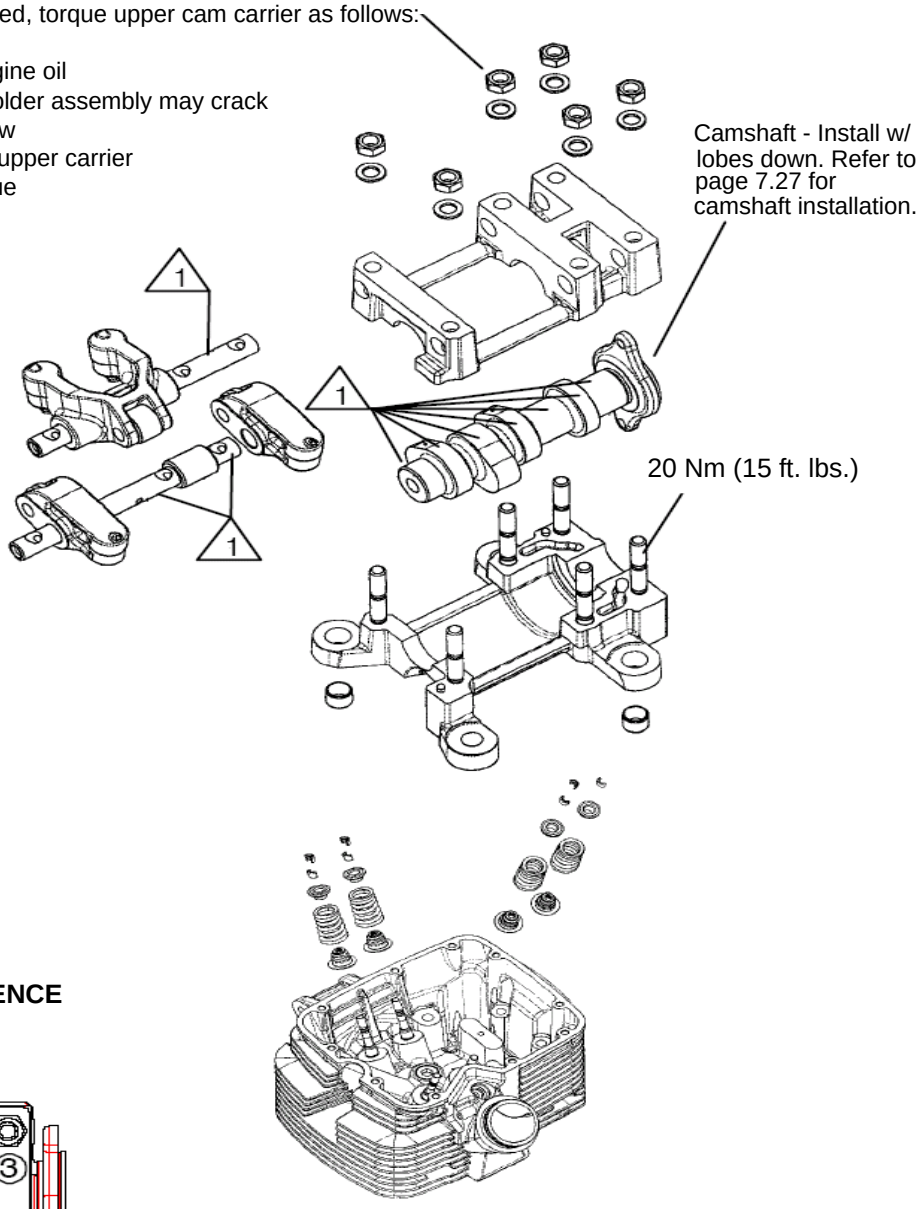
NOTES

1 Apply Moly Assembly Paste (PN 2871460)

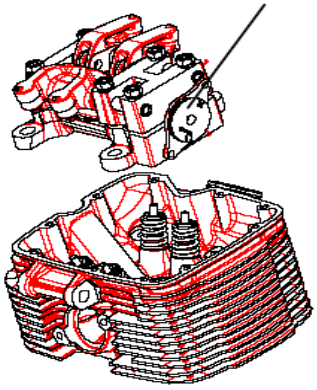
Upper carrier half must be loose to allow upward movement when cylinder head nuts are torqued. (See Cylinder Head Installation page 7.25)

After cylinder head nuts have been torqued, torque upper cam carrier as follows:

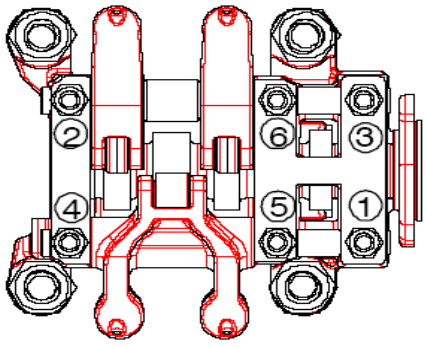
- Lubricate nuts and washers with engine oil
- Tighten slowly and evenly or cam holder assembly may crack
- Follow torque sequence shown below
- Torque to 24.5 Nm (18 lb-ft) to seat upper carrier
- Torque to 27 Nm (20 lb-ft) final torque



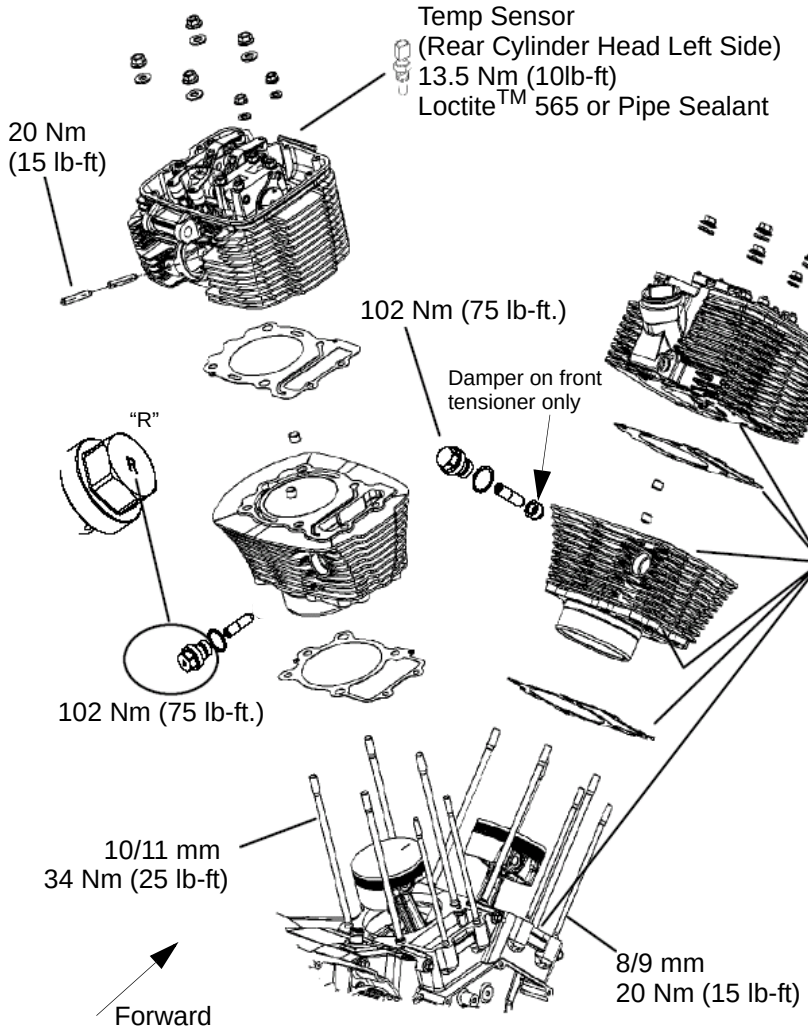
After assembly, rotate cams back and forth slightly to verify free rotation. Allow time for lifters to bleed down before performing this inspection



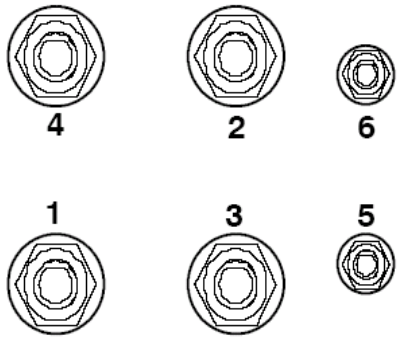
CAM CARRIER TORQUE SEQUENCE



CYLINDER HEAD

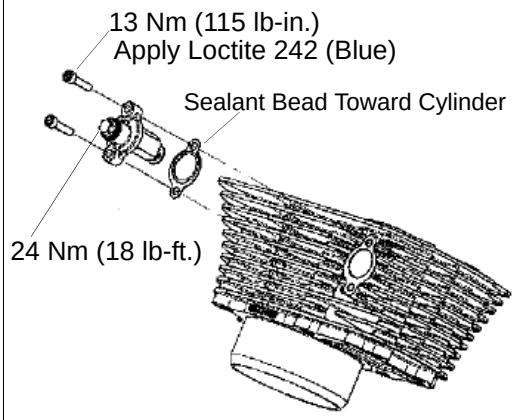


CYLINDER HEAD TORQUE SEQUENCE

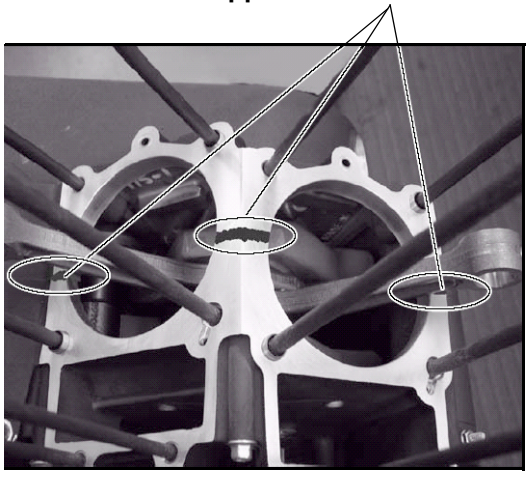


IMPORTANT! Be sure gaskets and gasket sealing surfaces are clean and oil free.

92 C.I Tensioner



Apply a small amount of Loctite 598 to crankcase parting line below base gasket. Assembly top end immediately after sealant is applied. Do not allow sealant to dry.



CYLINDER HEAD TORQUE PROCEDURE

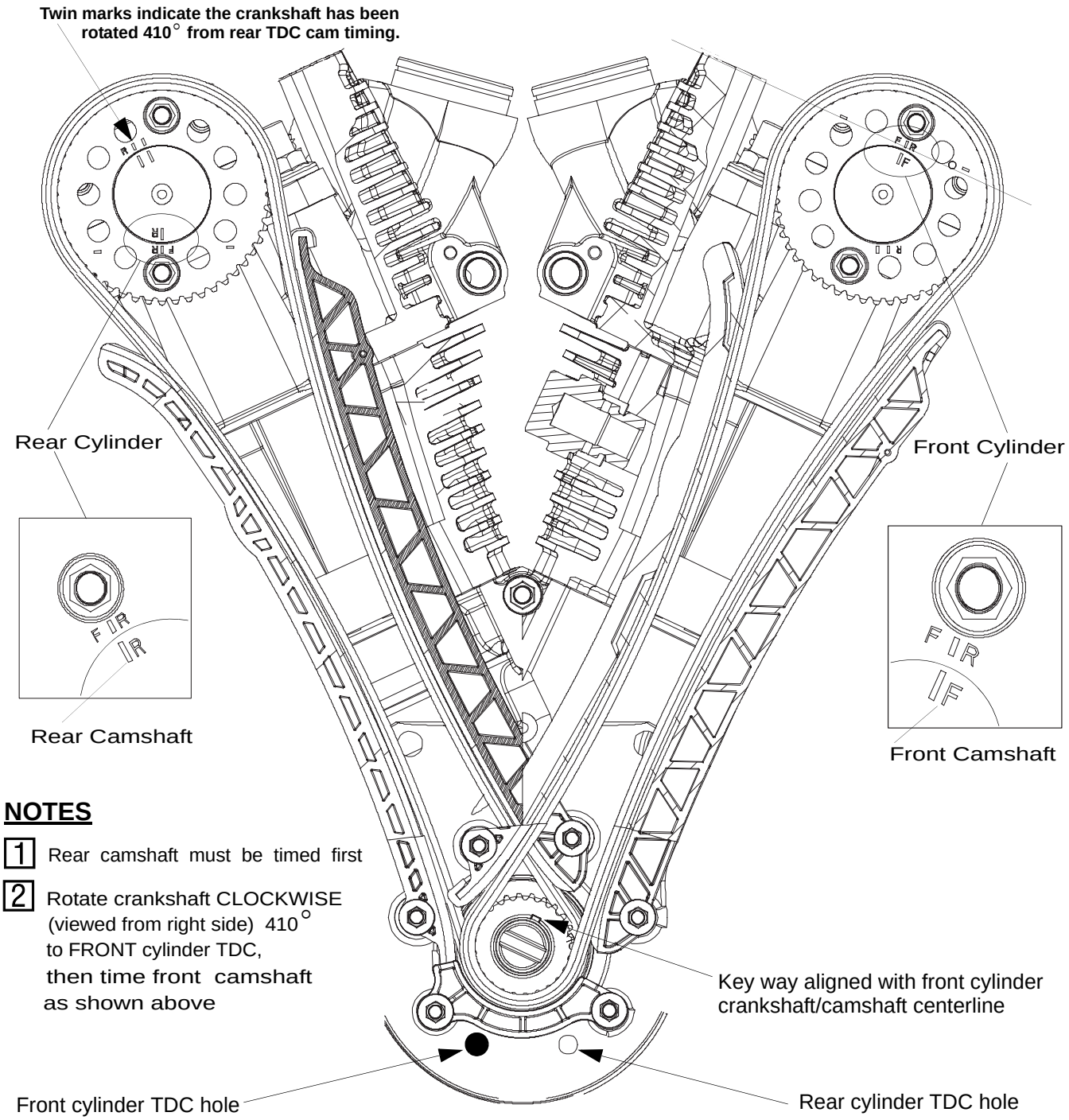
Step 1 Apply engine oil to nut threads and bases.
Step 2 Follow torque pattern shown.
Step 3 Tighten 10mm nuts (1 - 4) to 30 Nm (22 lb. ft.)
Step 3 Back off completely
Step 4 Tighten 10mm nuts (1 - 4) to 54 Nm (40 lb. ft.)
Step 5 Repeat the 54 Nm (40 lb-ft) torque on 1-4.
Step 6 Torque 8mm nuts (5-6) to 24.5 Nm (18 lb-ft)

CAMSHAFT TIMING QUICK REFERENCE

Use this page as a reference ONLY if you are familiar with the cam timing procedure.

Refer to Page 7.28 for complete camshaft timing procedure

The illustration below depicts final cam timing configuration on 100 Cubic Inch engine (92 C.I. is similar). The rear cylinder has been timed and the crankshaft rotated 410° from rear TDC.

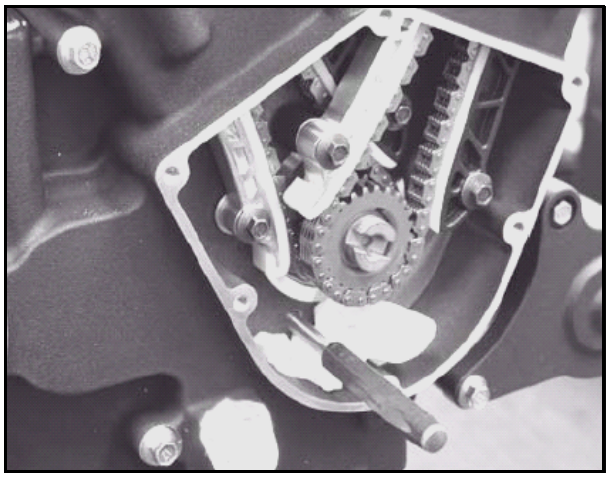


Ill. 1

CYLINDER HEAD SERVICE

CAMSHAFT DRIVE COVER

1. Remove cam drive cover.
2. Place a clean shop towel in the cavity below the cam drive sprocket to prevent objects from falling into crankcase.



⚠ CAUTION

Cover cavity below cam drive sprocket with a clean shop towel. Any debris or engine parts dropped into the lower crankcase may require complete engine disassembly to retrieve.

VALVE COVER REMOVAL

2006 Models (100 Cubic Inch Engines)

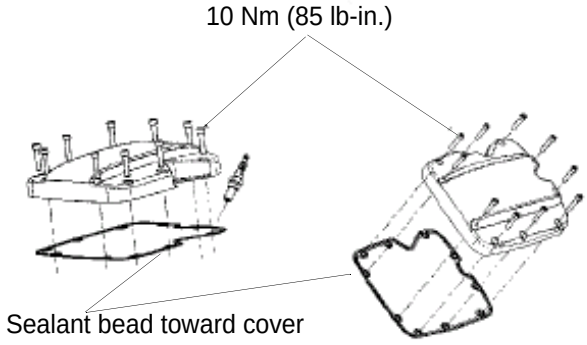
1. Engine removal is required. Refer to Chapter 6.
2. Remove all valve cover screws.
3. Tap lightly on cover with a soft faced hammer to loosen.
4. Remove cover and gasket.

2003-2005 Models ((92 Cubic Inch Engines)

See “Rear Valve Cover Removal (Engine Installed)” on page 7.32.

VALVE COVER INSTALLATION

1. Install gasket with sealant bead UP (toward cover) on clean, dry surfaces.
2. Install all screws and tighten evenly in a cross pattern to specification.

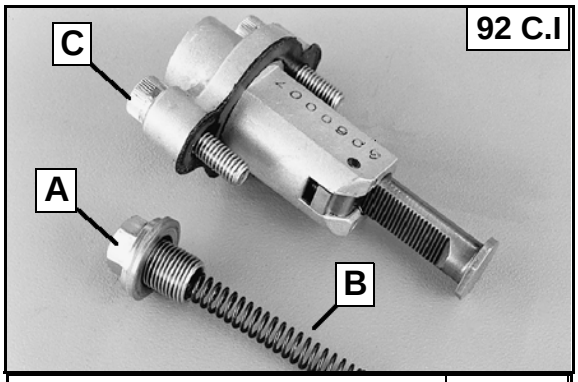


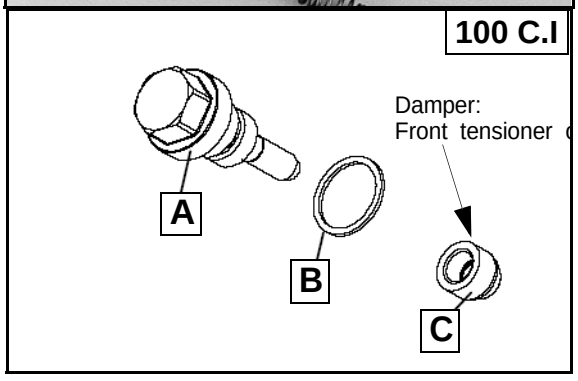
CAM CHAIN TENSIONER REMOVAL

1. 92 C.I. Engines - Remove spring cap (A), spring (B), and screws (C). 100 C.I. Engines - Remove tensioner body (A) with sealing washer (B) and damper sleeve (C) (front tensioner only).

NOTE: The REAR tensioner does not have a damper.

2. Inspect tensioner as described on following page.

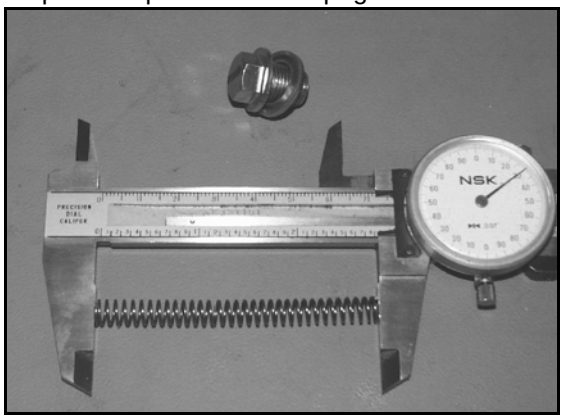




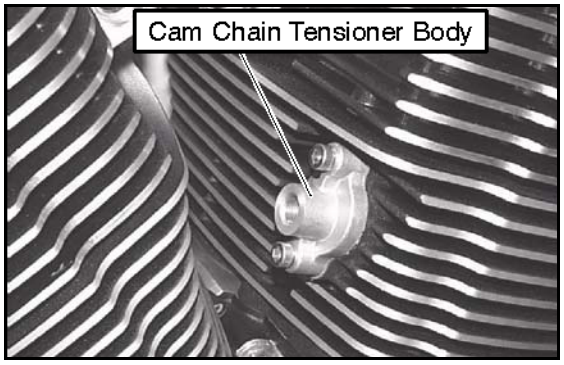
CAM CHAIN TENSIONER INSPECTION

92 C. I. Engines

1. Visually inspect spring. Coils should be evenly spaced.
2. Inspect ratchet pawl and pivot pin on tensioner body. Replace tensioner assembly if pin is loose in body, or if small return spring for pawl is missing or broken.
3. Measure the free length of plunger spring and compare to specification on page 7.3.



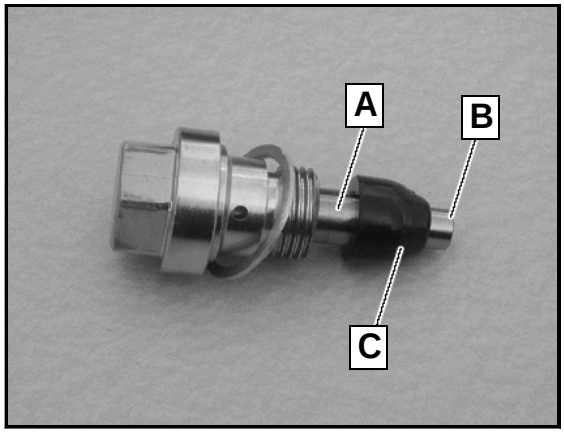
4. Inspect rack teeth on pawl and on plunger for wear.
5. Use new gasket on tensioner body (sealant bead faces cylinder) upon assembly.
6. Apply Loctite 242 (Blue) to threads of body screws. Torque body screws to 13 Nm (115 lb-in). Install spring and spring cap with new sealing washer. Torque spring cap to 24.5 Nm (18 lb-ft).



CAM CHAIN TENSIONER INSPECTION

100 C. I. Engines

1. Visually inspect inner plunger (A) for damage, scoring, or burrs.
2. Lubricate inner plunger with engine oil. Move plunger in and out of outer plunger (B) to check for smooth movement without binding.
3. Inspect damper (C) on FRONT tensioner. It should slip over the inner plunger with noticeable drag, not a loose fit.
4. Replace tensioner assembly if worn or damaged.
5. Use new sealing washer upon assembly. Torque tensioner body to 102 Nm (75 lb-ft).

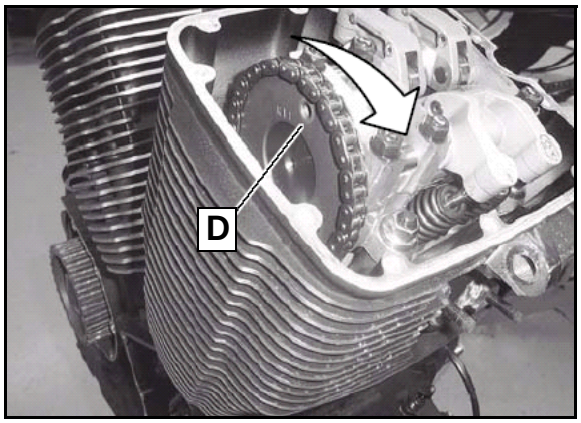


CAMSHAFT CHAIN & SPROCKET REMOVAL

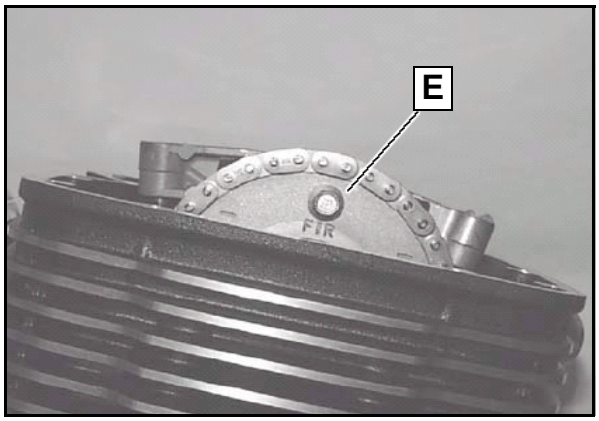
1. Remove the cam chain tensioners (page 7.9) and lower right engine cover.

Crankshaft Rotation Socket: PV-46988

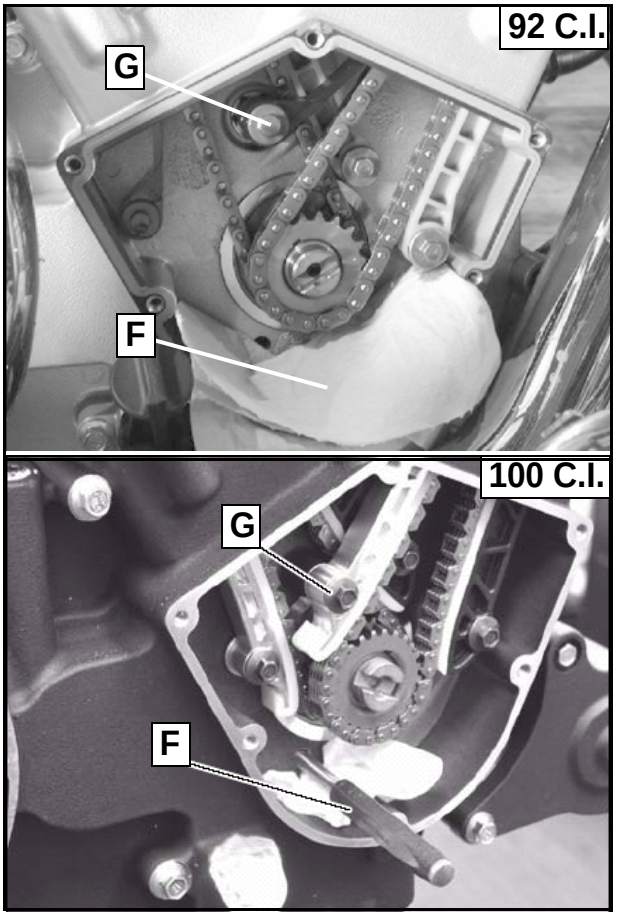
2. Rotate crankshaft clockwise, past TDC on the compression stroke for front cylinder, indicated by the camshaft sprocket timing marks. Continue rotating crankshaft clockwise until lower sprocket bolt (D) is accessible, and remove it.



3. Rotate crankshaft counterclockwise back to TDC (camshaft marks aligned with cylinder head surface) and remove top sprocket bolt (E).



4. Place a shop towel in area (F) below cam chain drive sprocket and dipstick hole (if removed) to prevent anything from falling into crankcase.

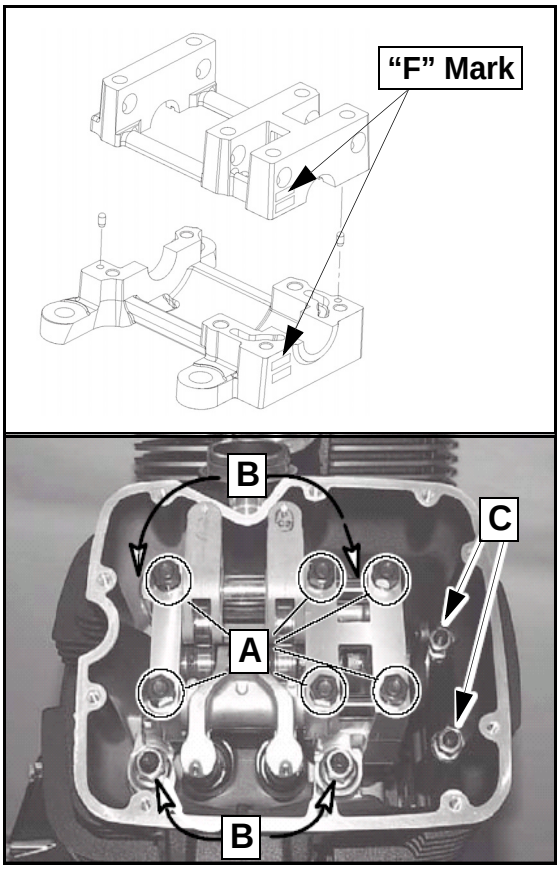


5. Remove front cylinder tensioner blade lower bolt (G).
6. Remove lower cam chain guide (below sprocket on 100 C.I. engine only).
7. Remove cam chain and sprocket from camshaft.
8. Remove chain from drive sprocket (lower).
9. Lift chain, sprocket, and tensioner blade out of engine.
10. Repeat steps for the rear cylinder.

ROCKER ARM REMOVAL

CAUTION

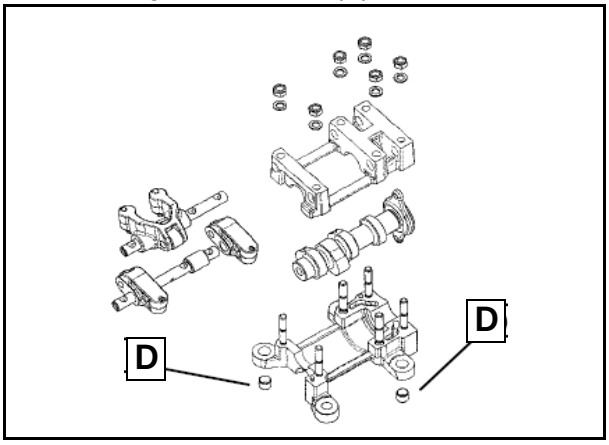
Keep mated rocker arm shafts and rocker arms together. Do not interchange mated parts. Rocker arm carrier is marked “F” for front cylinder. If mark is not visible, use a permanent marker to identify the part for assembly.

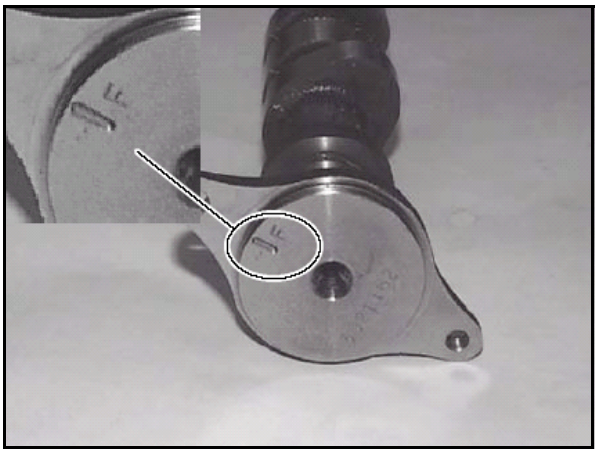


1. Remove or loosen rocker arm carrier nuts (A) 1/2 turn at a time using a cross pattern until loose.

NOTE: The camshaft upper and lower carrier can be removed as an assembly together with camshaft. To do this, loosen nuts (A) evenly in a cross pattern about 3 full turns, then go to Step 4. Do not loosen cylinder head nuts (B, C) if only the upper carrier / rocker assembly or camshaft is being serviced.

2. Remove rocker arm carrier nuts & washers.
3. Remove upper cam carrier and camshaft.
4. Loosen cylinder head 10 mm (B) and 8 mm nuts (C) 1/4 turn at a time until loose. Remove 10 mm nuts and washers and lift upper and lower rocker arm carrier from cylinder head along with camshaft and rocker arms.
5. Remove alignment dowels (D).





CAUTION

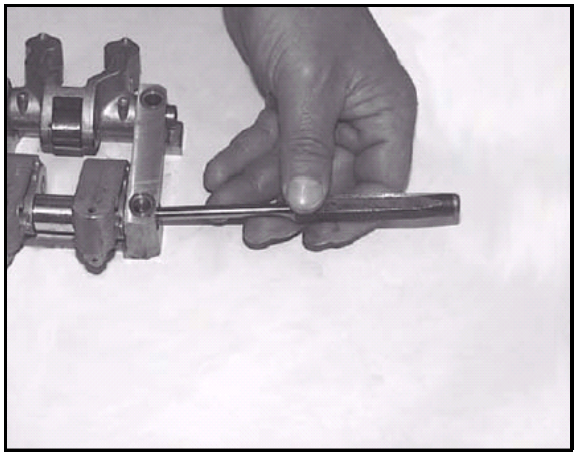
Front and rear cylinder heads use different camshafts. Camshafts are marked at drive end.

F = Front

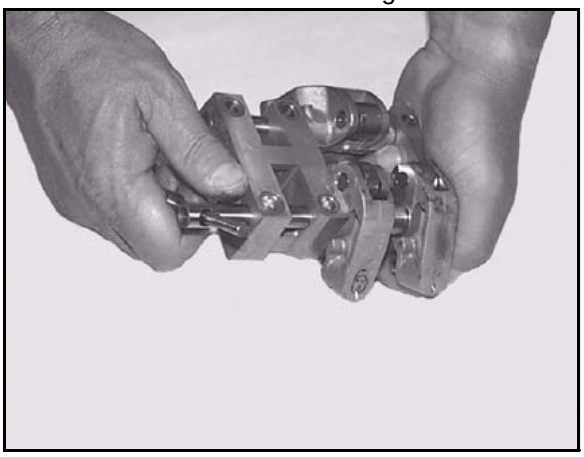
R = Rear

ROCKER ARM & SHAFT INSPECTION

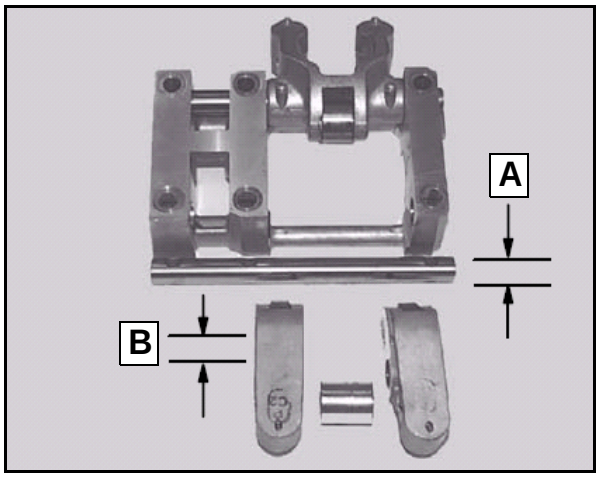
1. Separate top and bottom half of rocker carrier. Tap shaft out of top carrier until hole in shaft is exposed on the other end.



2. Remove the shafts with a twisting motion.



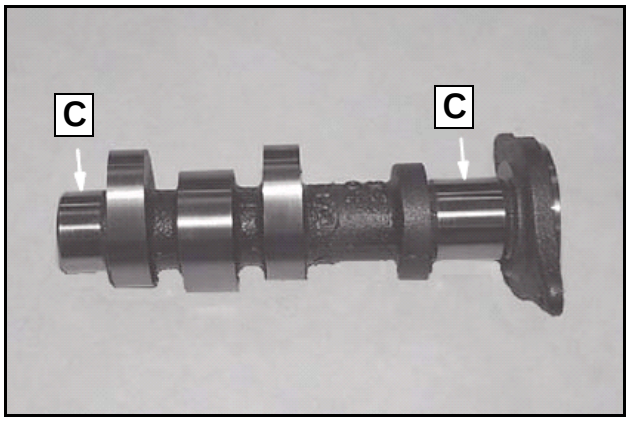
3. Visually inspect rocker arms and rocker arm shafts for excessive wear, scoring or damage.
4. Inspect all oil passages and clean thoroughly. Use only clean solvent. Do not allow dirt to contaminate the hydraulic adjuster on rocker arm.
5. Rotate rocker arm on shaft. The rocker arm should fit the shaft tightly without excessive play, and rotate smoothly on the shaft without binding.
6. Measure O.D. of each rocker arm shaft (A) and compare to specification.
7. Measure I.D. of each rocker arm (B).
8. Subtract rocker arm shaft O.D. from its matching rocker arm I.D. to determine rocker arm shaft-to-rocker arm clearance. Compare to specification on page 7.3.



9. Replace parts worn beyond service limits.

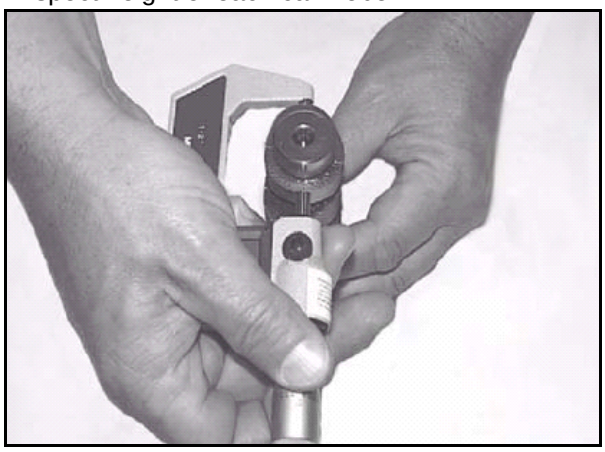
CAMSHAFT INSPECTION

1. Visually inspect camshaft journal surfaces (C) for scoring or signs of insufficient lubrication. Replace camshaft if heavy scoring or damage is noted.



2. Measure O.D. of each camshaft journal.

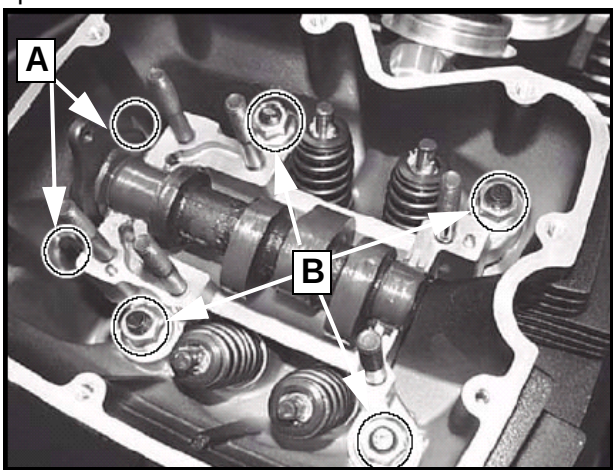
3. Inspect height of each cam lobe.



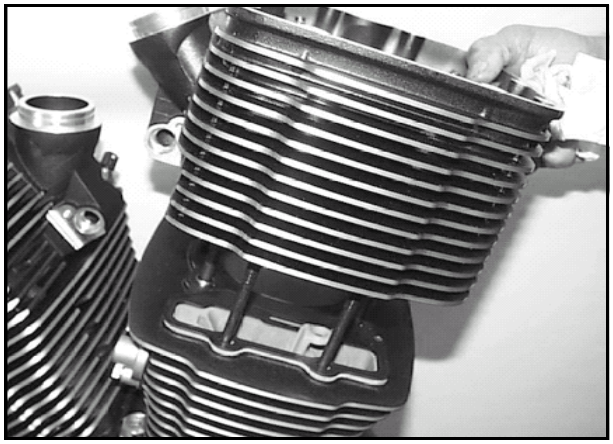
Compare to specifications on page 7.3.
Replace camshaft, camshaft carrier, and rocker arms as a set if either camshaft or rockers fail inspection.

CYLINDER HEAD REMOVAL

1. Remove lower cam chain guide bolt and cam chain guide.
2. Loosen cylinder head nuts (A) completely.
3. Loosen nuts (B) 1/4 turn at a time using a cross pattern until all four are loose.



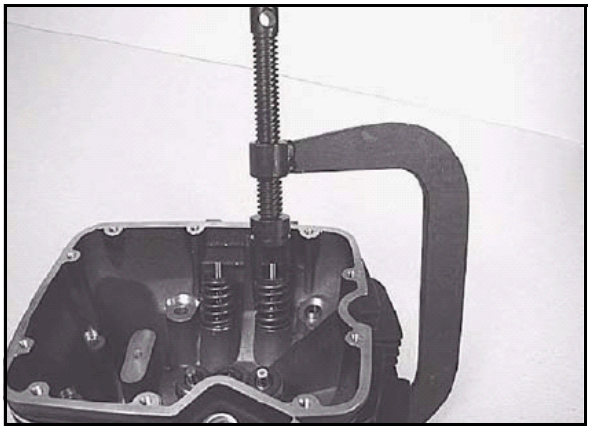
4. Remove all nuts and washers, along with lower camshaft carrier.
5. Remove cylinder head and gasket.



⚠ CAUTION

Use care not to damage gasket sealing surfaces.

CYLINDER HEAD DISASSEMBLY



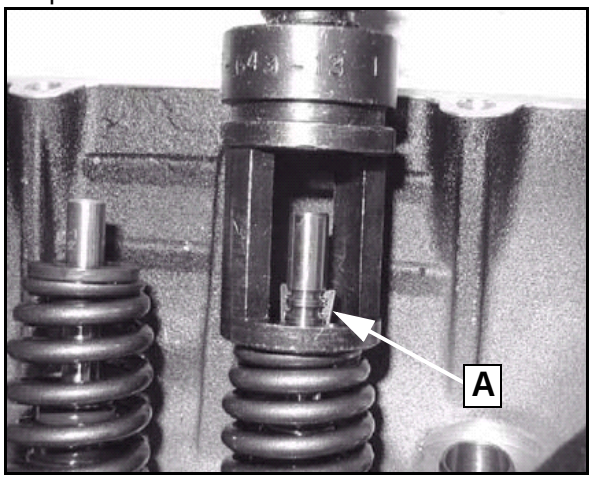
CAUTION

Wear eye protection while removing valve springs.

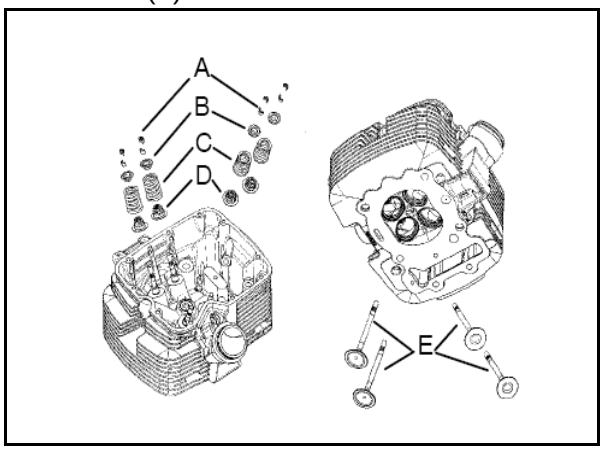
NOTE: Keep mated parts together for assembly. It is important to put cylinder head parts back in the same location.

Valve Spring Compressor: PV-1253 (or PV-4019 with adaptor PV-43513-A)

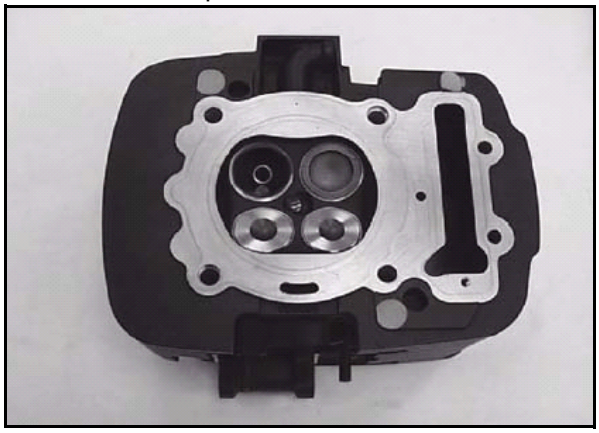
1. Remove the valve keepers (A) using a valve spring compressor tool. Use a pencil magnet to remove valve keepers.



2. Remove upper valve spring retainers (B), springs (C), and valves (E).



3. Remove and discard valve guide seals (D).
4. Clean carbon deposits from combustion chamber.

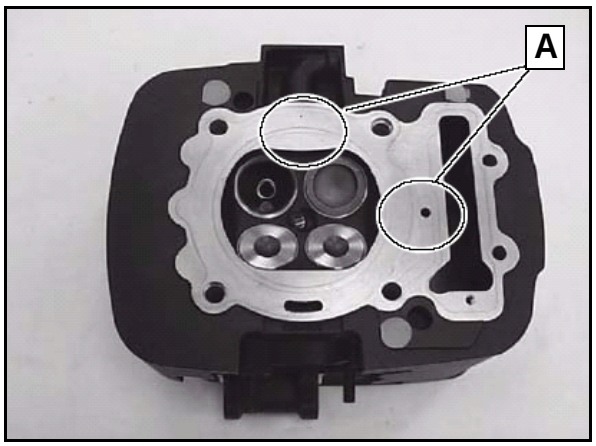


5. Clean gasket surfaces.

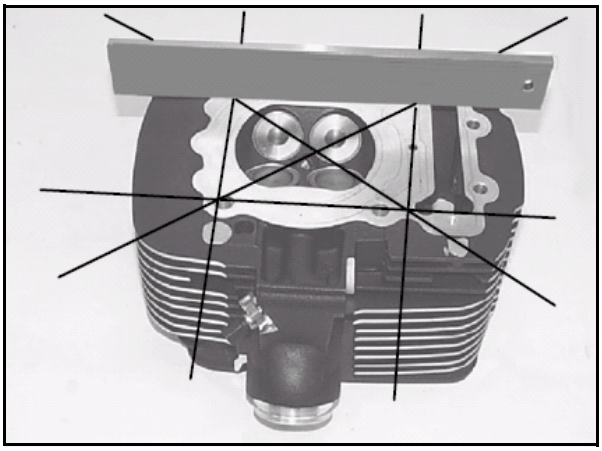
7

CYLINDER HEAD INSPECTION

1. Visually inspect cylinder head for cracks or damage. Pay close attention to the areas around spark plug and valve seats.
2. Be sure oil passage and bleed hole (A) in cylinder head is unobstructed.

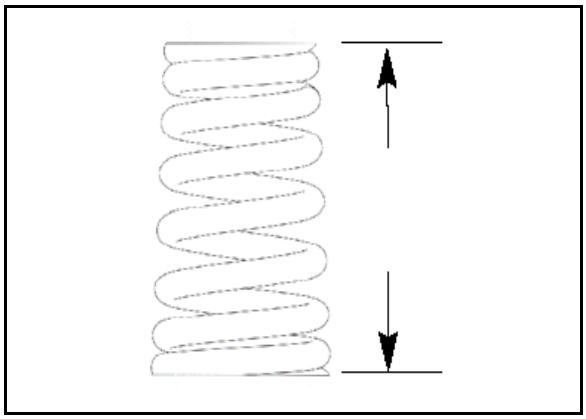


3. Inspect cylinder head for distortion with a straight edge and feeler gauge. Check in different directions and locations on the cylinder head as shown. Compare to specification on page 7.3.



VALVE SPRING FREE LENGTH INSPECTION

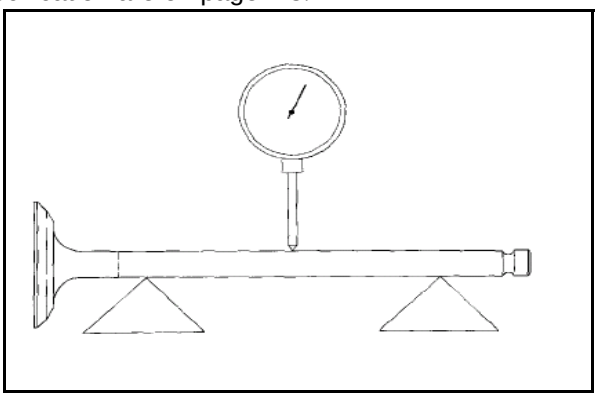
1. Measure free length of valve springs. Replace springs that do not meet specification on page 7.3.



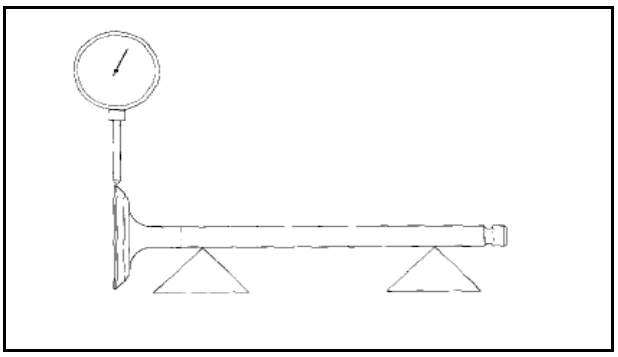
NOTE: Intake and exhaust springs are identical.

VALVE INSPECTION

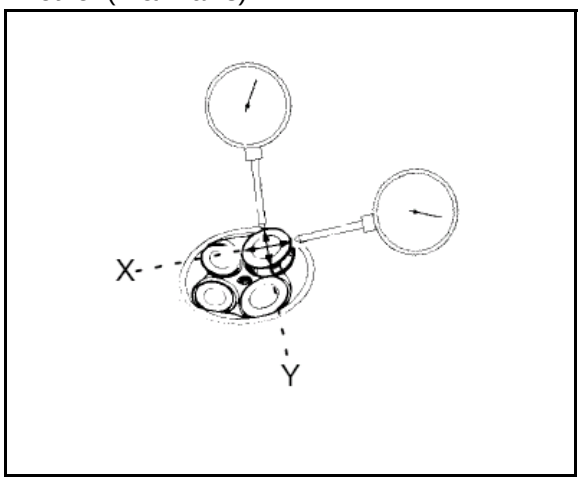
Specification are on page 7.3.



1. Place valves on V-blocks as shown and measure valve stem runout.
2. Inspect the valve face for damage from burning, pitting or uneven contact.
3. Place valves in V-block as shown in and inspect valve head radial runout.

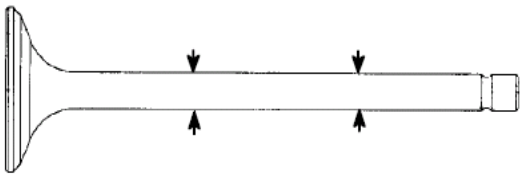


4. Insert valves into their original locations in cylinder head.
5. Inspect that each valve moves up and down smoothly without binding in guide.
6. Measure valve stem deflection for each valve to determine if valve or valve guide requires replacement.
   A. Raise valve 10mm (0.400") off of seat.
   B. Position dial indicator as shown. Measure deflection in two directions perpendicular to each other (X & Y axis).



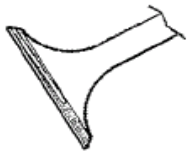
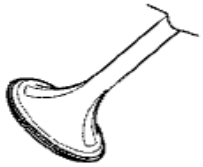
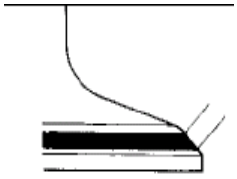
7. If valve deflection exceeds service limit measure valve stem.
8. Replace valve and repeat step 6 if valve stem O.D. measures outside standard range. If valve stem deflection exceeds service limits with a new valve installed, valve guide must be replaced.

Measure valve stem in several places.



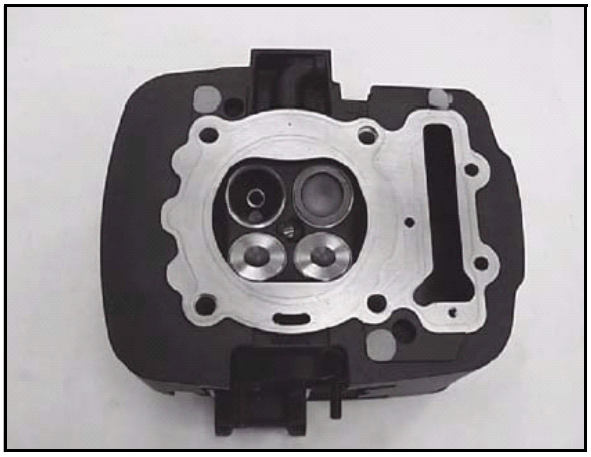
9. Installation of new valve guides and/or new valves requires valve seat reconditioning. This work should be performed by a technician experienced in cylinder head reconditioning and properly equipped.

VALVE INSPECTION

VALVE INSPECTION			
CONDITION	**ILLUSTRATION**	**POSSIBLE CAUSE**	**CORRECTIVE ACTION**
Uneven seat width		Bent valve stem, worn valve guide	Replace valve and reface seat
Damaged valve face		Burnt, pitted, foreign material damage	Replace valve and reface seat
Contact area too high		Wear, settling of valve seat	Lower with 30^{o} stone
Contact area too low		Wear, settling of valve seat	Raise with 60^{o} stone
Contact area too wide		Wear, settling of valve seat	Narrow with both 30^{o} stone and 60^{o} stone
Contact area too narrow			Use 45^{o} stone
Contact area free of pitting and damage, centered in seat, proper width.		Correct	None

VALVE GUIDE REMOVAL / INSTALLATION

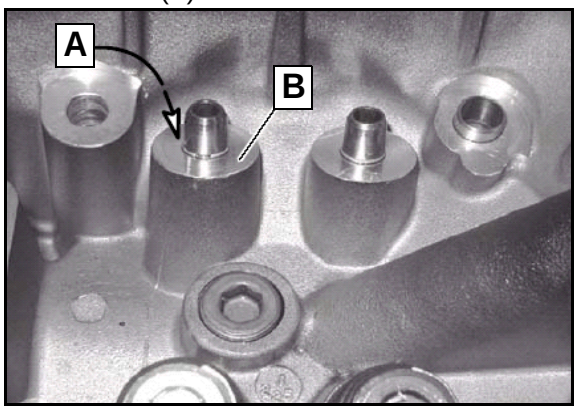
> **CAUTION**
>
> Replacement of valve guides requires an oven, special equipment and experience to do the job correctly. If you are unsure of your ability to do the repair professionally it is best to sublet the labor to a competent machinist. Valve seat reconditioning is required when valve guides are replaced.



1. Support cylinder head and place valve guide remover into valve guide from the combustion chamber side.
2. Drive or press old valve guides out of cylinder head.

> **CAUTION**
>
> The cylinder head can be easily damaged if the procedure is done carelessly.

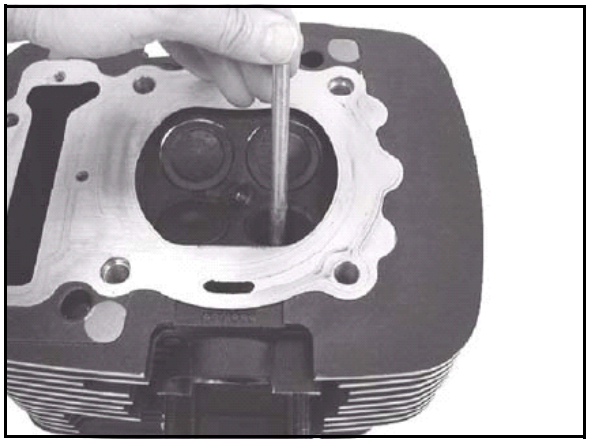
3. Apply 90 weight oil to outside of new valve guides.
4. Drive or press new guides from camshaft side of head. Drive or press guides in until circlip (A) seats against head surface (B).



5. Measure valve guide height from spring seat:

   GUIDE INSTALLED HEIGHT: 12.20-12.80 mm

6. Ream new valve guides to size to obtain specified stem-to-guide clearance. Ream from combustion chamber side of head.

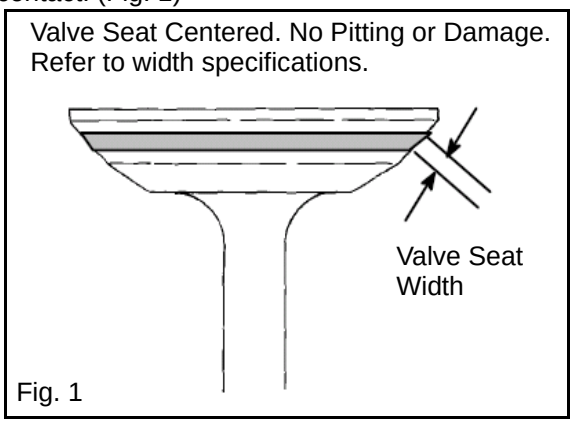


> **CAUTION**
>
> Do not tilt the reamer while reaming the guide. Always rotate the reamer in a clockwise direction.

7. Clean cylinder head thoroughly with clean solvent.
8. Inspect and recondition valve seats.

VALVE SEAT INSPECTION

1. Remove carbon deposits from valves and seats.
2. Inspect valve face for burning, pitting or uneven contact. (Fig. 1)



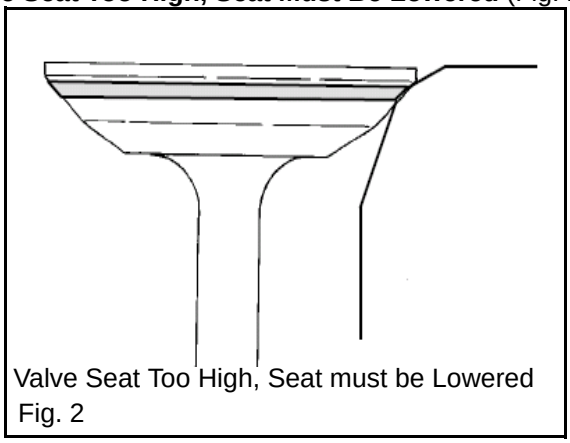
NOTE: Valves cannot be ground. If valve face is burned or badly worn, replace the valve.

3. Apply a light coating of Prussian Blue to valve face.
4. Install valve into valve guide.
5. Tap valve several times to make a clear impression on the valve face. Do not rotate valve!
6. Remove valve and measure contact area (valve seat width).
7. If valve seat is incorrect, recondition as needed.

VALVE SEAT RECONDITIONING

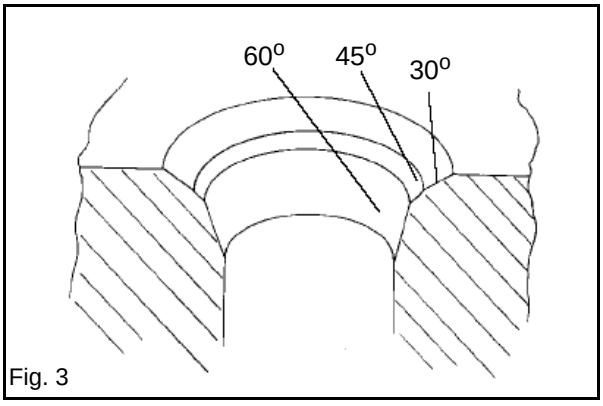
NOTE: Valve seat reconditioning should be performed by a technician proficient in cylinder head reconditioning techniques using grinding stones. The use of carbide cutters is not recommended. Follow recommendations of the manufacturer of the valve seat reconditioning equipment being used. Do not grind seats more than necessary to provide proper seat width and contact point on valve face.

Valve Seat Too High, Seat Must Be Lowered (Fig. 2)



NOTE: The valve seat contact area must be inspected after each cut. Use Prussian Blue to determine seat contact area.

1. Using a 45^{o} stone, dress seat slightly. (Fig. 3)
2. Using a 30^{o} (intake) stone, lower seat slightly and inspect seat contact area.
3. Continue using a 30^{o} stone until contact area is in middle of valve face.
4. Use a 45^{o} stone to bring valve seat to specified width.



5. Inspect width of valve seat. The valve seat must be uniform in width all the way around with no pitting or irregularities on the seat. (Fig. 4)

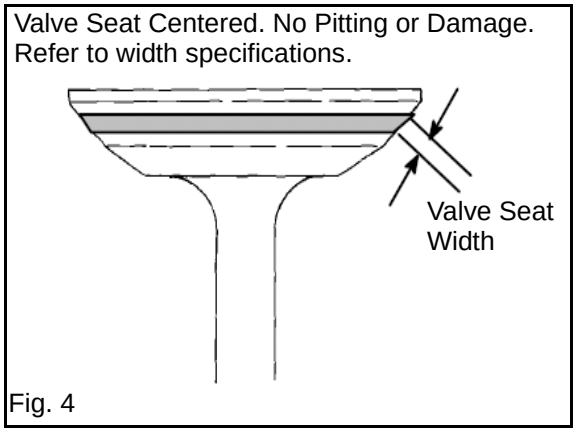


Fig. 4

Valve Seat Too Low, Seat Must Be Raised (Fig. 5)

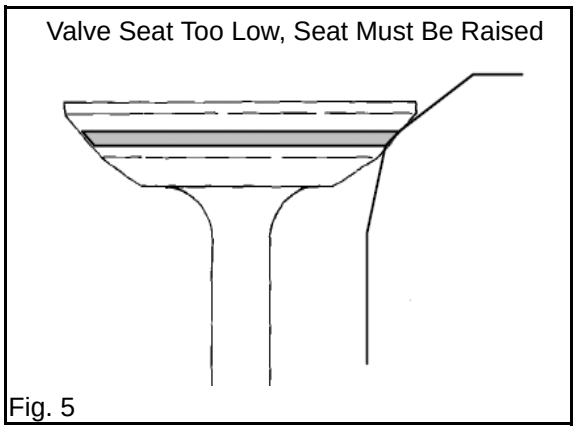


Fig. 5

NOTE: The valve seat contact area must be inspected after each cut. Use Prussian Blue to determine seat contact area, or mark the valve face with a black felt-tip marker.

1. Using a 45° stone, dress seat lightly. (Fig. 6)
2. Using a 60° (exhaust) stone, dress seat lightly and inspect the seat contact area.
3. Continue using a 60° stone until contact area is in middle of valve face.
4. Use a 45° stone to bring valve seat to specified width. (Fig. 6)

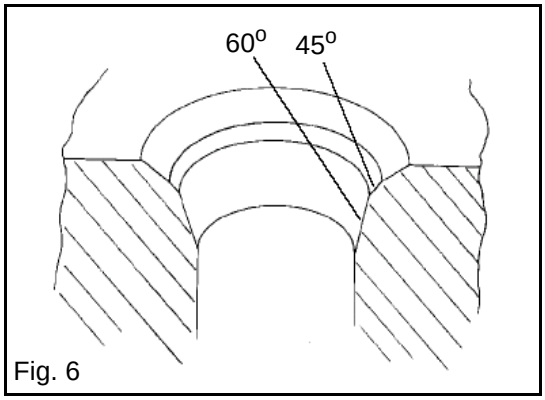


Fig. 6

5. Inspect width of valve seat. The valve seat must be uniform in width all the way around with no pitting or irregularities on seat. Fig. 7.

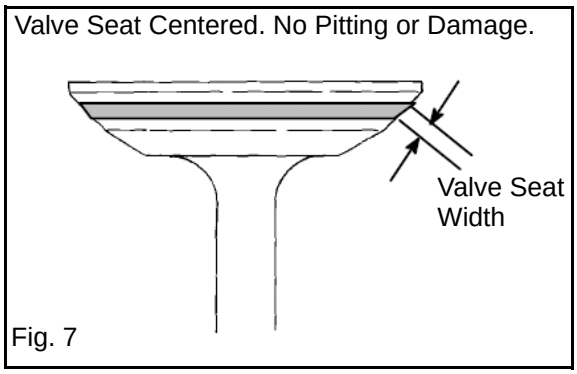


Fig. 7

New Valve Guide Installed Requires Complete Reconditioning

NOTE: The valve seat contact area must be inspected after each cut. Use Prussian Blue to determine contact area.

1. Using a 45° stone, remove any roughness or irregularities from seat. (Fig. 8)

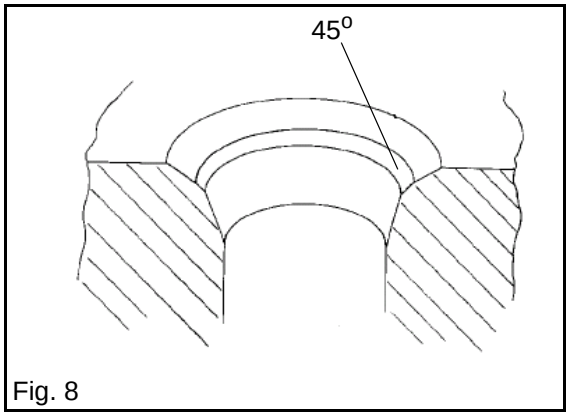


Fig. 8

2. Inspect seat often and continue to grind seat until completely uniform.
3. Using a 30° stone, remove 1/4 of the existing valve seat material. (Fig. 9)

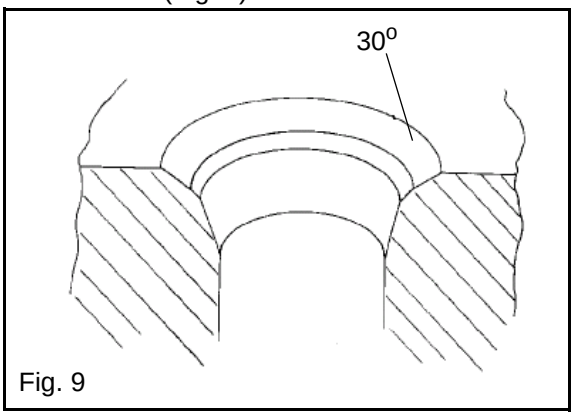


Fig. 9

4. Using a 60° (exhaust) stone, remove bottom 1/4 of old seat. (Fig. 10)

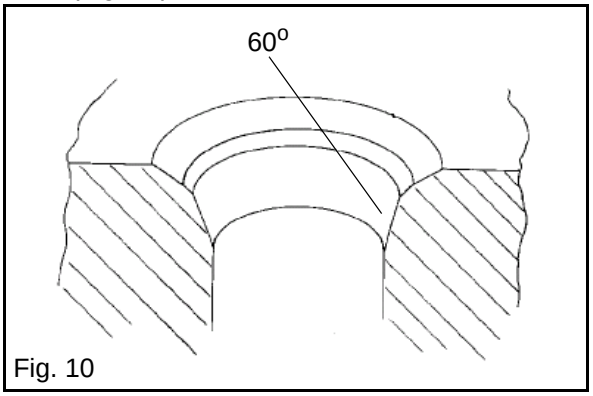


Fig. 10

5. Use the 45° stone to bring the valve seat to specified width. (Fig. 11)

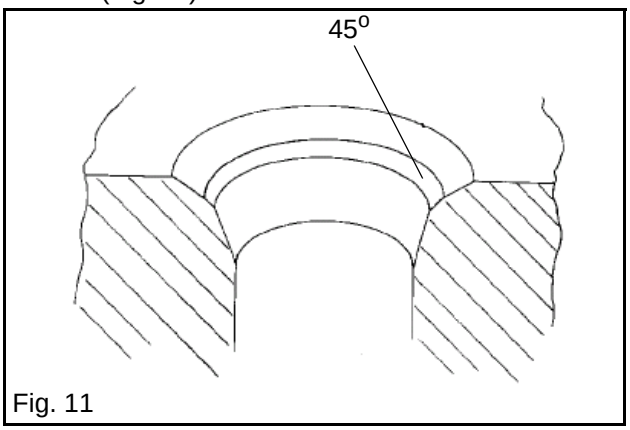


Fig. 11

New Valve Guide Installed Requires Complete Reconditioning

6. Inspect width of valve seat. The valve seat contact area must be uniform in width all the way around with no pitting or irregularities. (Fig. 12)

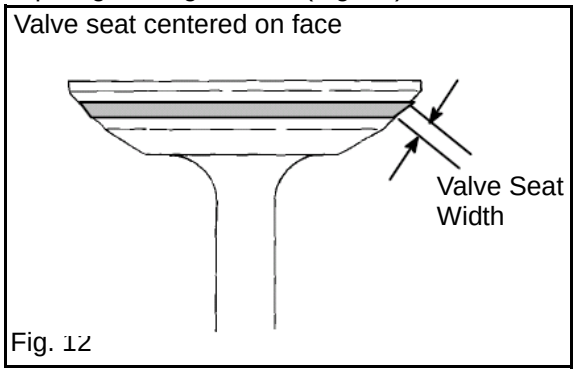


Fig. 12

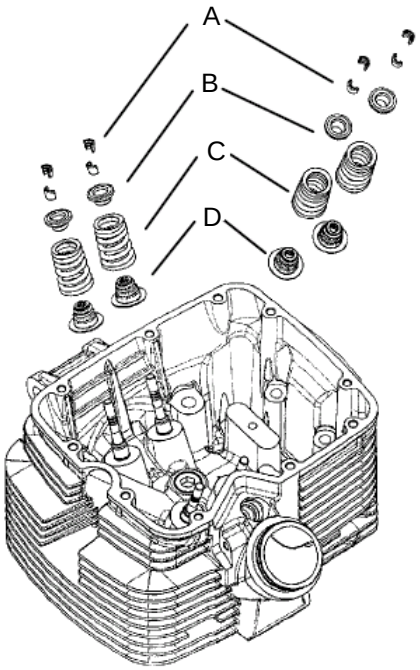
NOTE: Ensure seats are not ground more than absolutely necessary**.**

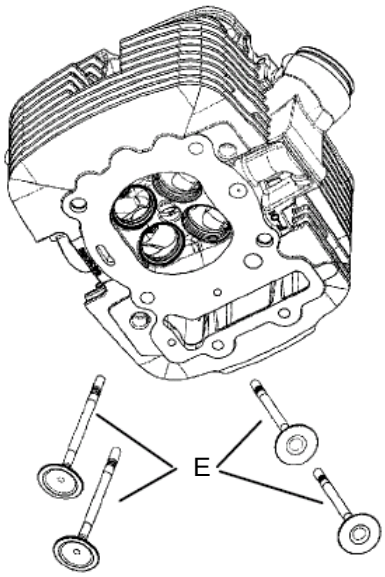
⚠ CAUTION

Do not use lapping compound after valve seat(s) are ground. The interference angle and finish left by valve seat reconditioning kit leaves a surface that provides for almost instantaneous seating when the engine first starts.

7. Wash cylinder head of all abrasive material in clean solvent.
8. Dry components thoroughly with compressed air.
9. Assemble cylinder head.
10. Fill the intake and exhaust ports with clean solvent and inspect for leaks around valve seating area.
11. After 15-30 seconds some leakage is normal. If leaks are evident immediately after filling with solvent, disassemble head and rework the defect.

CYLINDER HEAD ASSEMBLY





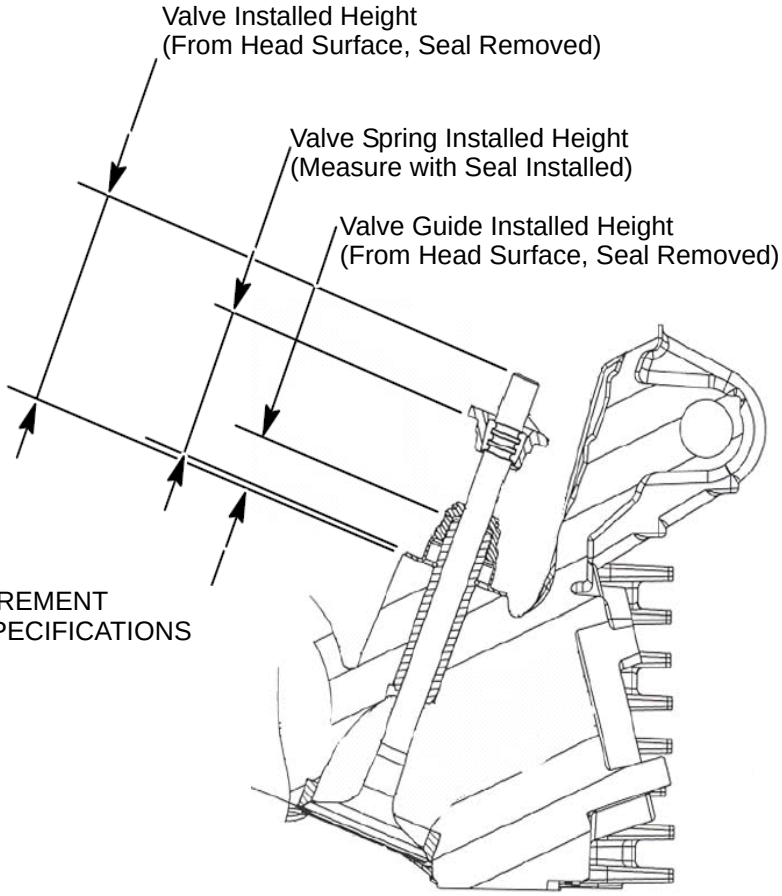
A. Keeper

B. Spring Retainer

C. Spring

D. Seal

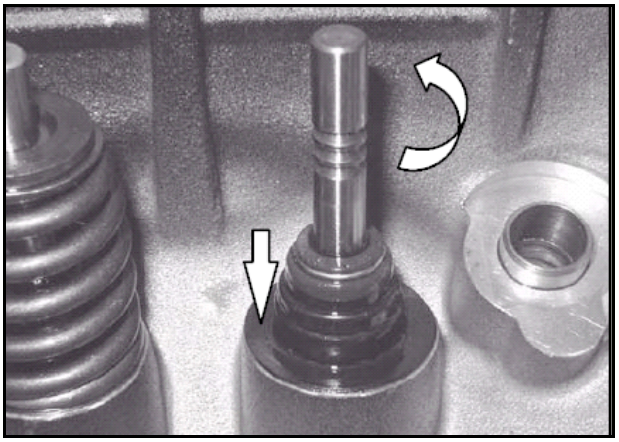
E. Valve



INSTALLED HEIGHT MEASUREMENT
REFER TO PAGE 7.3 FOR SPECIFICATIONS

CYLINDER HEAD ASSEMBLY

> **CAUTION**
>
> Wear eye protection during assembly.



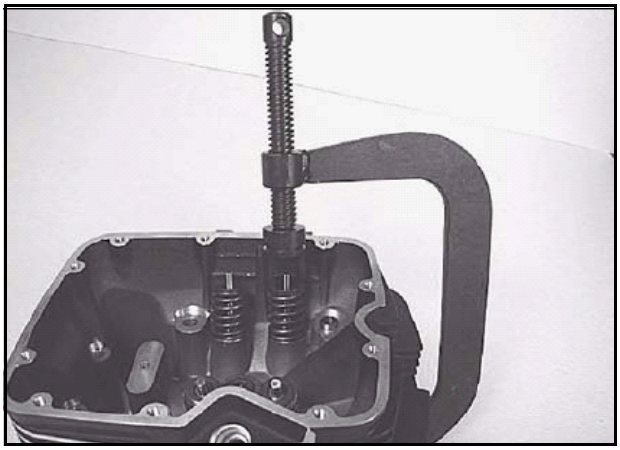
1. Lubricate valve stems with assembly lube.

   Moly assembly paste PN: 2871460

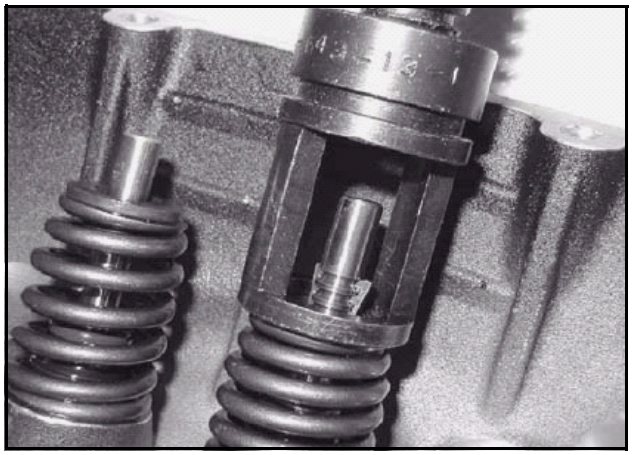
2. Install valve in head before installing seal. Hold valve against seat wipe off the portion that extends above the guide.
3. Apply Victory engine oil to valve guide seal and install seal on valve, rotating the seal as you install it.
4. Press seal firmly in place on top of guide. Be careful not to dislodge spring from seal.
5. Install valve spring and upper retainer.

> **CAUTION**
>
> Support cylinder head so valves will not be damaged.
>
> Do not compress valve springs more than necessary to install keepers.

6. Compress valve springs using a valve spring compressor and adapter.



7. Apply a small amount of grease to both sides of a valve keeper.



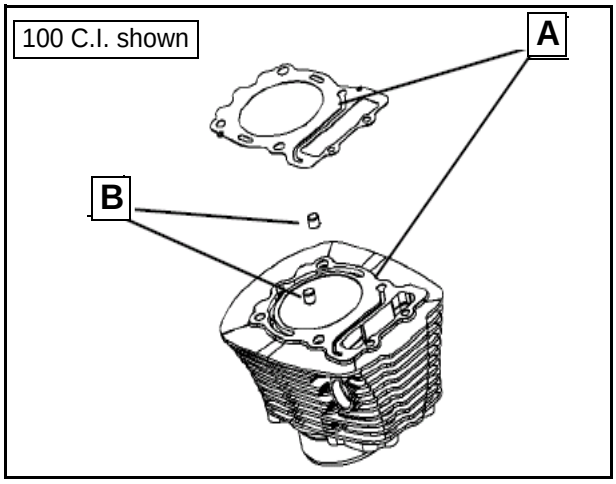
8. Insert both valve keepers in place on valve.
9. Remove spring compressor.
10. Repeat previous steps for remaining valves.
11. Be sure all keepers are fully seated in groove.

CYLINDER HEAD INSTALLATION

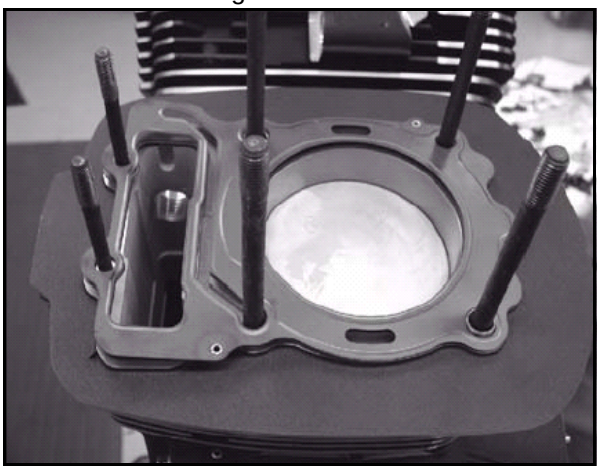
NOTE: Base gasket seal is broken upon cylinder head removal and must be replaced at this time. Refer to Chapter 8 for cylinder base gasket replacement.

1. Thoroughly clean cylinder and cylinder head gasket surfaces. Both surfaces and gasket must be free of oil or grease.

IMPORTANT: Gaskets and gasket sealing surfaces (A) must be free of oil and grease during assembly.

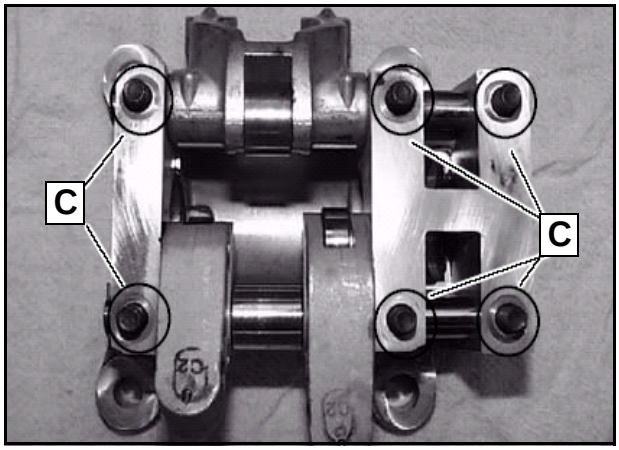


2. Install dowel pins (B).
3. Install a new head gasket.

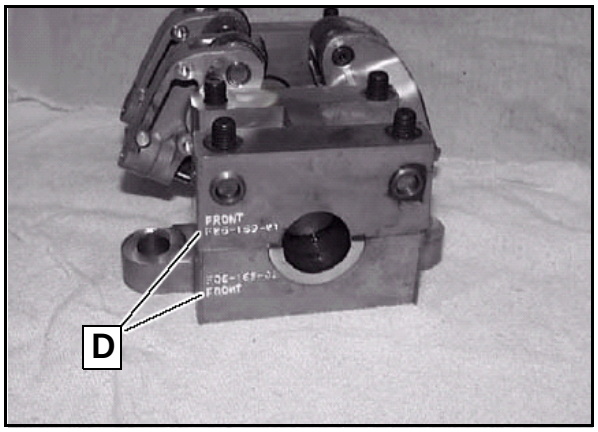


4. Install cylinder head onto cylinder.

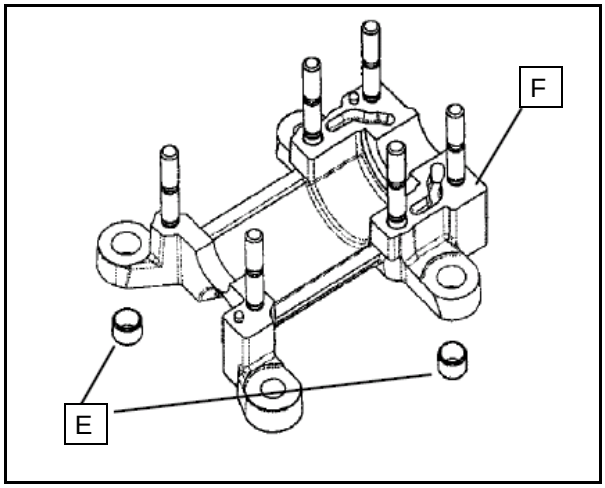
> **CAUTION**
>
> The camshaft carrier with camshaft can be installed as an assembly if the following precautions are observed: All nuts (C) on upper half of carrier must be removed or loosened to allow upper half to move upward when the cylinder head nuts are tightened. Severe damage may occur to lower half of camshaft carrier if the assembly is installed with upper carrier nuts tight. Installation procedure below describes individual assembly of components.



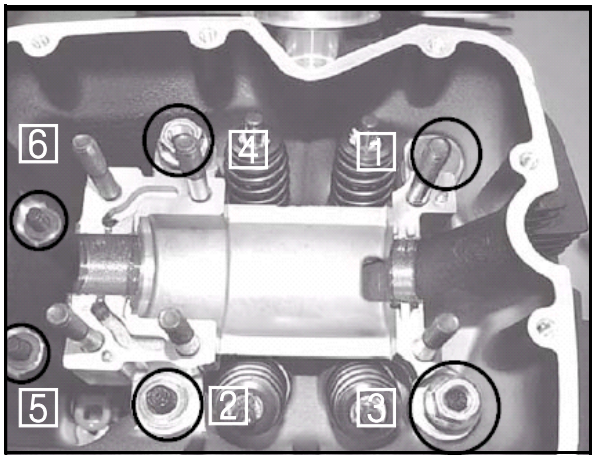
5. Cam carriers are matched, and marked FRONT or REAR for installation in their respective cylinder (D).



6. Install (E) on cylinder head.

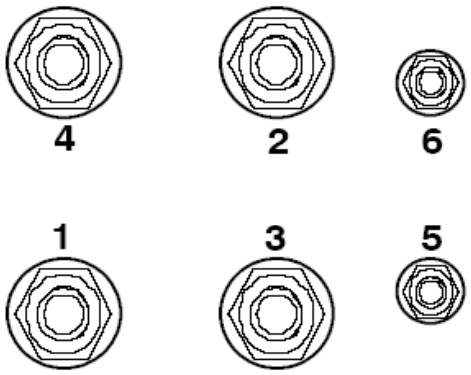


7. Install (F) over dowel pins and tap lightly to seat in place.
8. Apply engine oil to nut threads and nut bases.



9. Install washers and nuts on cylinder studs. Tighten finger tight.
10. Follow torque procedure below to ensure accurate final torque:

CYLINDER HEAD TORQUE SEQUENCE



CYLINDER HEAD TORQUE PROCEDURE

Step 1 Apply engine oil to nut thread and bases.

Step 2 Follow torque pattern show.

Step 3 Tighten 10 mm nuts (1-4) to 30 Nm (22 lb. ft.)

Step 3 Back off completely

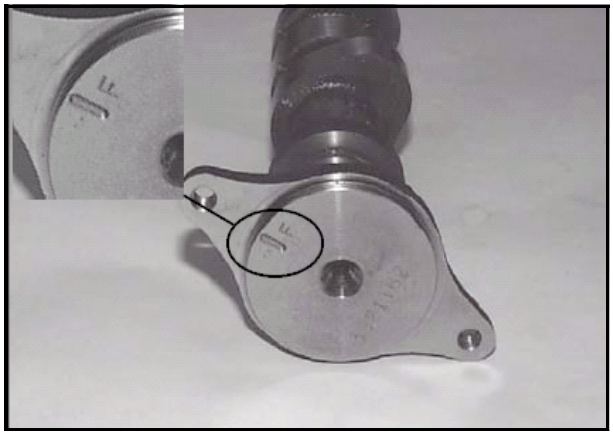
Step 4 Tighten 10 mm nuts (1-4) to 54 Nm (40 lb. ft.)

Step 5 Repeat the 54 Nm (40 lb-ft) torque on 1-4.

Step 6 Torque 8mm nuts (5-6) to 24.5 Nm (18 lb-ft).

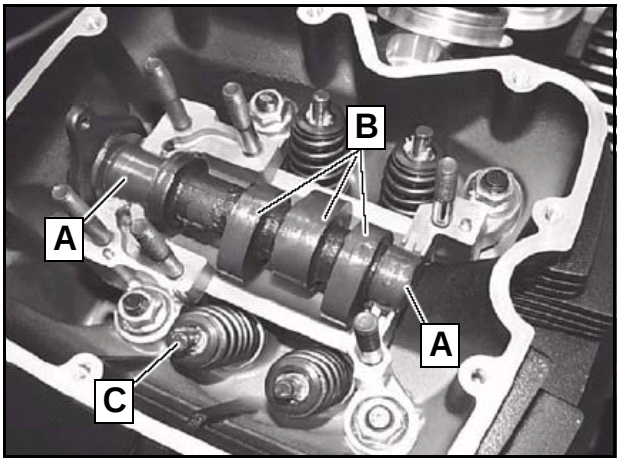
CAMSHAFT & ROCKER ARM INSTALLATION

1. Camshafts are marked F (FRONT) or R (REAR) on sprocket end for installation in their respective cylinders. Align mark on cam and sprocket to ensure proper orientation. Mount cam chain sprocket onto camshaft temporarily with one bolt finger tight.



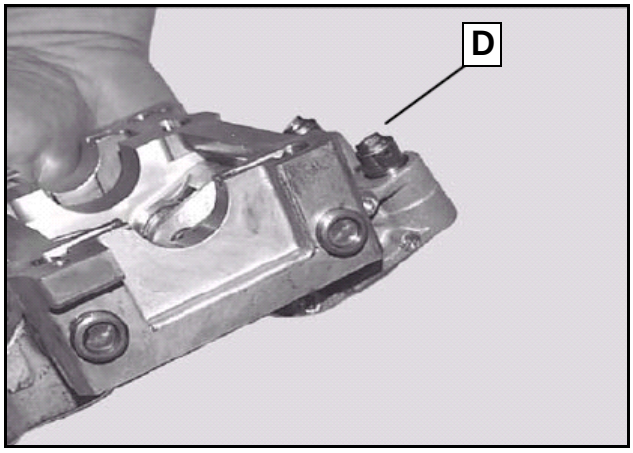
2. Apply moly paste to camshaft journals (A) cam lobes (B) and ends of all valve stems (C). Install camshaft into lower carrier.

Moly assembly paste PN: 2871460



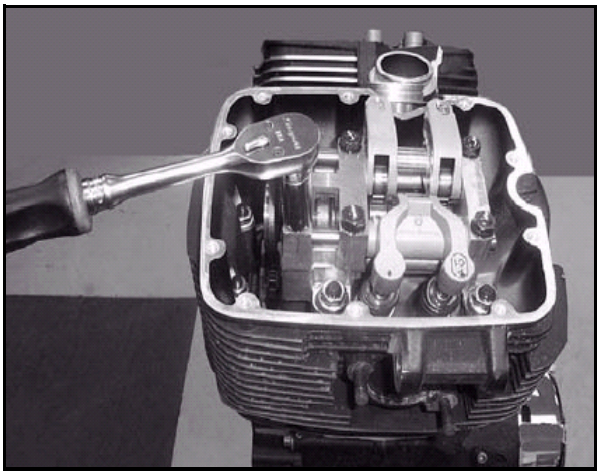
3. Verify the camshaft lobes are pointing down as shown above.

4. Inspect each rocker arm and position flat side of hydraulic adjuster down as shown below (D).



5. Apply engine oil to rocker arms.

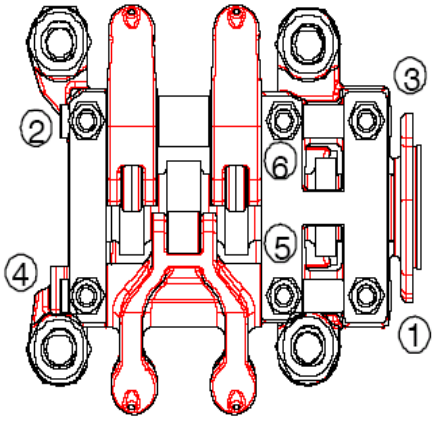
6. Install rocker arm assembly over lower carrier studs.



7. Install washers and nuts.

8. Tighten the nuts in a cross pattern 1/2 turn at a time until rocker assembly is seated.
9. Torque rocker arm carrier to specification in 3 steps following the torque pattern shown below.

CAM CARRIER TORQUE SEQUENCE
27 NM (20 LB-FT.)

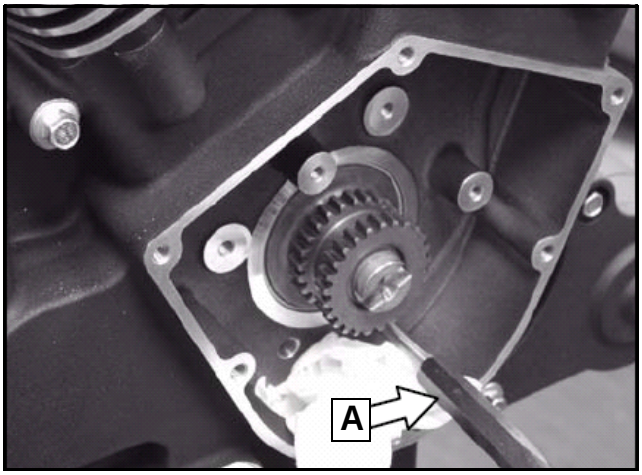


10. Rotate cams back and forth slightly to verify free rotation. Allow sufficient time (up to 3-4 minutes) for lifters to bleed down before performing this inspection.

CAMSHAFT TIMING - REAR CYLINDER

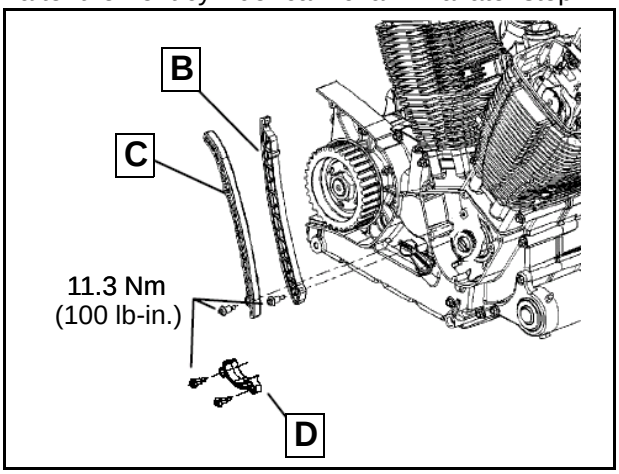
NOTE: Rear cam chain must be installed first.

1. Rotate crankshaft clockwise to TDC (rear cylinder). Hold crankshaft at rear TDC by inserting an 8 mm (or 5/16″) locating pin through crankcase hole (A) into crankshaft.

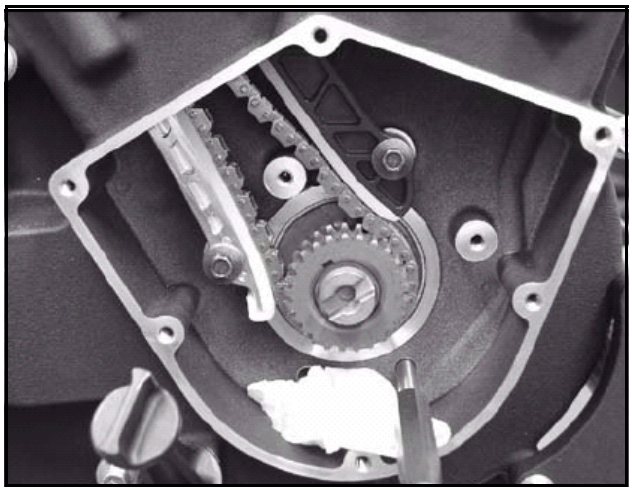


CAMSHAFT CHAIN GUIDE INSTALLATION

1. Install rear cylinder cam chain guide (B), inserting pins on upper end of blade into recess in cylinder head. Install chain tensioner blade (C).
2. Lower guide (D) on 100 C.I. engine will be installed after the front cylinder cam chain in a later step.



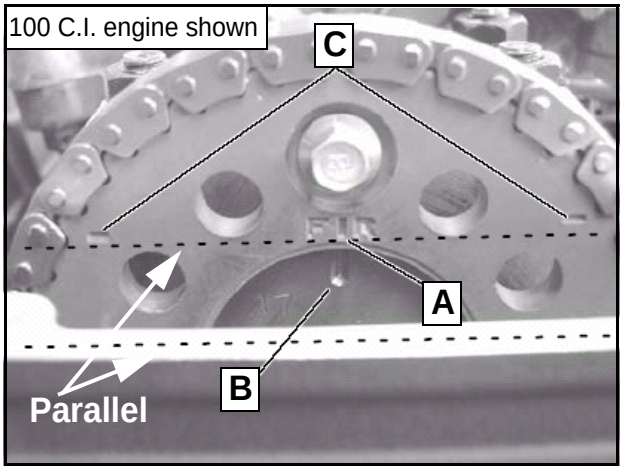
3. Torque fasteners to 11.3 Nm (100 lb-in.).
4. Place cam chain around rear camshaft sprocket and lower it down between cam chain guide and tensioner blade.



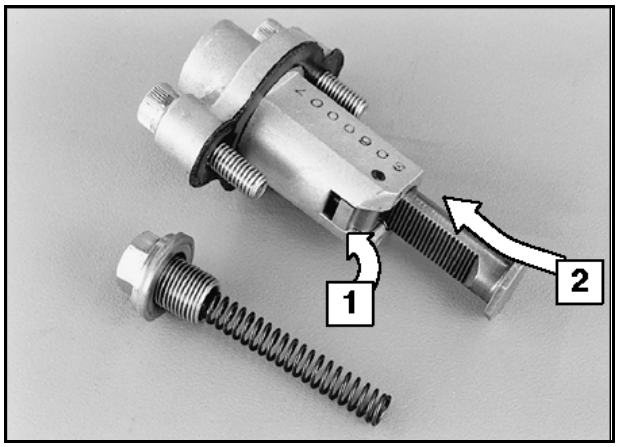
5. Loop chain around the innermost sprocket.

CAMSHAFT TIMING - REAR CYLINDER (cont.)

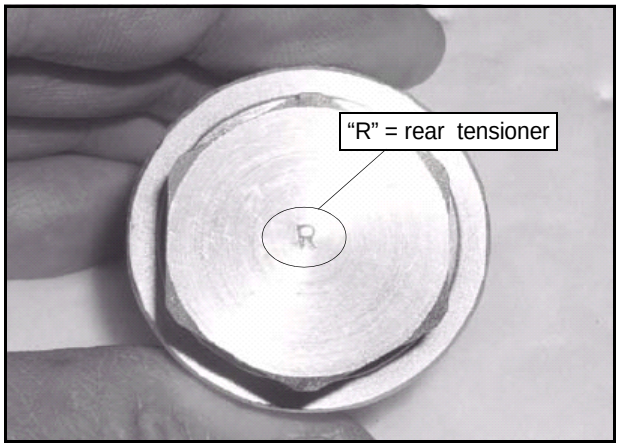
6. Install camshaft (lobes pointing DOWN) and install sprocket onto camshaft.
7. Inspect marks before installing sprocket on camshaft. Mark on sprocket (A) must align with camshaft “R” mark (B). Outer marks (C) must be parallel with valve cover gasket surface.



8. Align camshaft with sprocket hole and install top sprocket bolt finger tight. The second camshaft sprocket bolt will be installed in a later step.
9. Rear Cam Chain Tensioner - 92 C.I. Engine:
   Install a new gasket on tensioner body with sealant bead facing the cylinder.
10. Push and hold the ratchet pawl (1) down and push plunger (2) into tensioner body until it stops.



11. Apply Loctite 242 (Blue) to threads of body screws. Torque body screws to 13 Nm (115 lb-in). Install spring and spring cap with new sealing washer. Torque spring cap to 24.5 Nm (18 lb-ft).
12. Verify cam timing is still correct:
    - Crankshaft secured by pin and locked in the rear cylinder TDC position.
    - Rear camshaft lobes facing down (”R” mark on cam aligned with “F|R” mark on sprocket).
    - Rear tensioner is installed and tight.
    - Outer marks on camshaft sprocket are parallel to valve cover gasket surface.
13. Torque top sprocket bolt to 13.5 Nm (120 lb-in.)
14. Remove pin from crankcase and proceed to “Camshaft Timing - Front Cylinder”.
15. Rear Cam Chain Tensioner - 100 C.I. Engine:
    Apply engine oil to rear cam chain tensioner. Tensioners are not interchangeable due to the length of the tensioner body. Rear tensioner is stamped “R”.

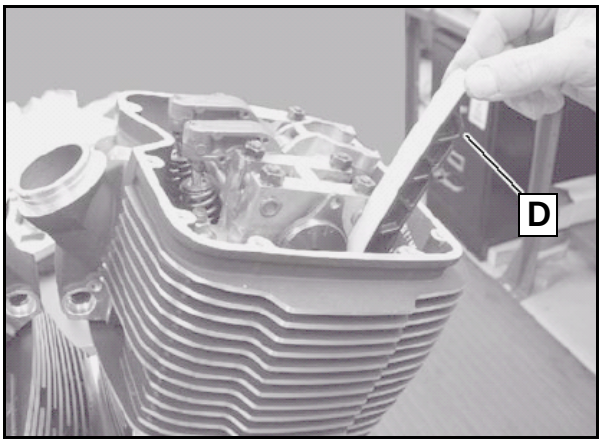


16. Install tensioner with a new sealing washer. Torque to 102 Nm (75 lb-ft.).
17. Check carefully to be sure rear cylinder camshaft timing is correct before proceeding:
    - Crankshaft secured by pin and locked in the rear cylinder TDC position.
    - Rear camshaft lobes facing down (”R” mark on cam aligned with “F/R” mark on sprocket)
    - Rear tensioner (stamped “R”) is installed and tight
    - Outer marks on camshaft sprocket are parallel to valve cover gasket surface.
18. **Torque top sprocket bolt to 13.5 Nm (120 lb-in).**

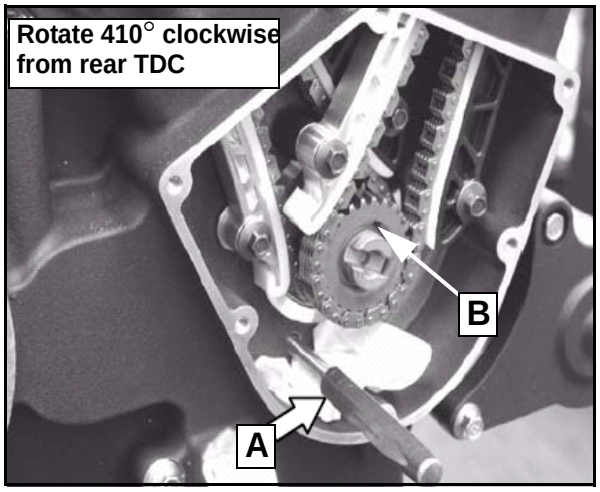
CAMSHAFT TIMING - FRONT CYLINDER

NOTE: Rear camshaft must be properly timed before installing and timing the front camshaft.

19. Install cam chain guide for front cylinder, inserting pins (D) on upper end of blade into recess in cylinder head. Torque chain guide fastener to 11.3 Nm (100 lb-in.).

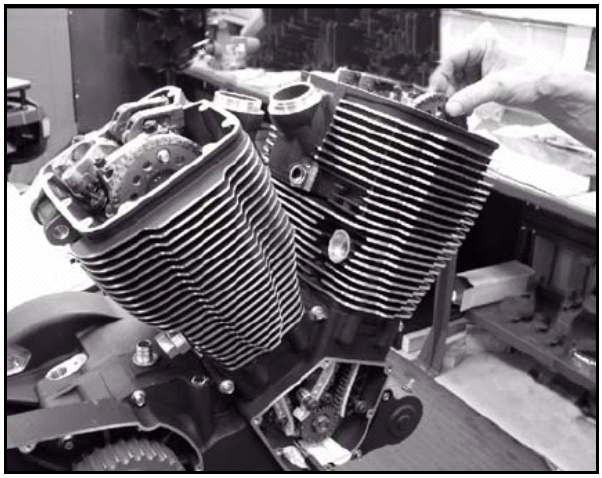


20. Remove TDC locating pin from crankcase.
21. Rotate crankshaft **clockwise 410°** to TDC on the front cylinder (exactly one full turn, plus an additional 50°).
22. Insert locating pin (A) to locate and maintain front piston TDC (sprocket key way (B) will be aligned with pin and front cylinder centerline).

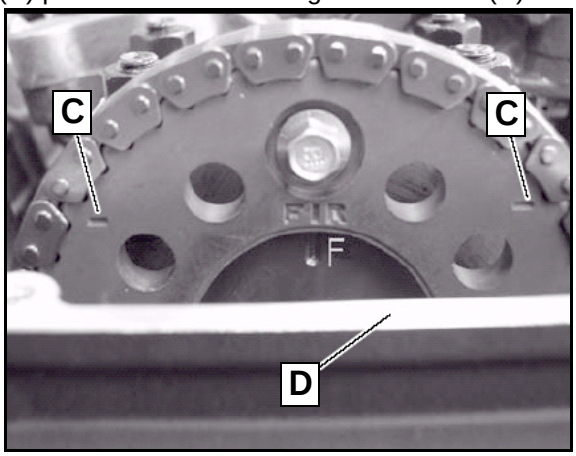


NOTE: Install and tighten the REAR camshaft sprocket bolt that is accessible at this time. Torque to 13.5 Nm (120 lb-in).

23. Install chain on front sprocket and drop chain into front cylinder chain tower and around the drive sprocket on crankshaft.

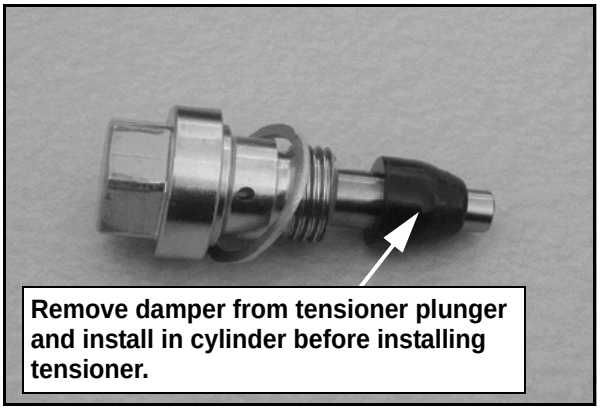


24. Torque cam chain tensioner blade fastener to 11.3 Nm (100 lb-in.).
25. Position front camshaft with lobes pointing DOWN.
26. Install sprocket on camshaft with two lines on sprocket (C) parallel to valve cover gasket surface (D).



27. **Install top camshaft sprocket bolt and torque to 13.5 Nm (120 lb-in).**

28. **92 C.I. Engines:** Install the front cylinder cam chain tensioner (follow same procedure as rear tensioner). following procedure as for the rear.
    100 C.I. Engines: Apply engine oil to front cam chain tensioner.
    Remove the damper from the tensioner plunger and install it in the cylinder. Install tensioner with a new sealing washer.
    Torque tensioner to 102 Nm (75 lb-ft.).



Remove damper from tensioner plunger and install in cylinder before installing tensioner.

29. Verify cam timing by comparing to Ill. 1 on page 7.8.
30. Remove TDC locating pin from crankcase.
31. Rotate crankshaft until the remaining front camshaft sprocket bolt hole is accessible.
32. **Install the other front sprocket bolt and torque to 13.5 Nm (120 lb-in).**

NOTE: Be sure all camshaft sprocket bolts have been installed and properly tightened.

33. Fill cam carrier area of both front and rear cylinders with Victory engine oil.
34. Rotate crankshaft clockwise approximately three complete revolutions and stop on front cylinder TDC on the compression stroke.
35. Again compare camshaft timing to Ill. 1 on page 7.8 to verify the timing is correct.
36. Install valve covers.

VALVE COVER

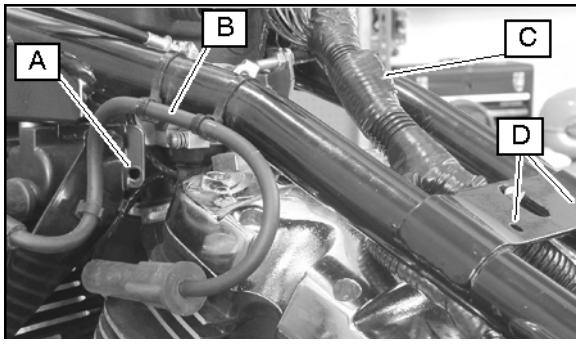
Rear Valve Cover Removal (Engine Installed)

NOTE: On 2003-2005 Models (92 Cubic Inch) the rear valve cover can be removed with the engine in the frame. Engine removal is required for front cover removal.

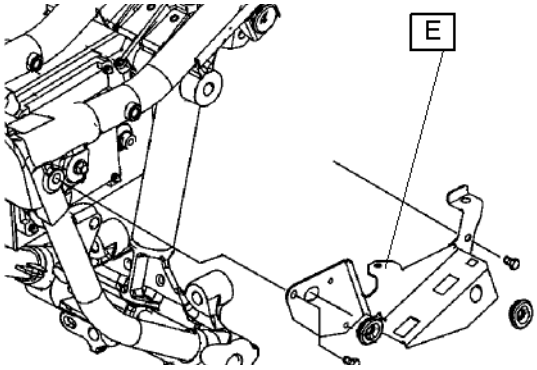
IMPORTANT: The wiring harness must be moved to the *outside* of the left upper frame tube. This requires removal of the upper rear engine mount plates and various harness guides and retainers. Use care not to damage the wire harness or gasket sealing surface on the cover or cylinder head.

Preparation

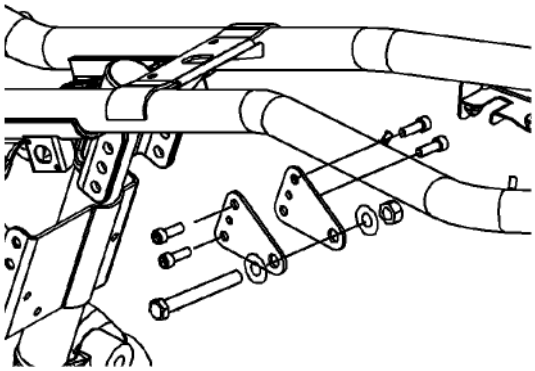
1. Remove seat, side covers, and fuel tank.
2. Disconnect the battery negative (-) cable.
3. Disconnect breather hose from air box; remove tie straps and breather hose.
4. Remove ignition switch cover, coil wire harness dart (A) from bracket.
5. Remove rear spark plug wire from plug and move it outside the frame tube (B).



6. Use a small flat blade screwdriver to pry the (3) wire main wire harness guides (C) off the right frame tube.
7. Push the (2) darts (D) out of the rear tank mount.
8. Remove fuse box bracket and release dart (E) from bracket. Keep the brake fluid reservoir upright to prevent air from entering the supply hose.



9. Slide back the red lock tab on the connector for the rear fuel injector. Push the black lever tab to release and pull harness off of injector.
10. Disconnect the MAP sensor (lift tab and pull back) from the rear right side of the air box.
11. Disconnect TPS wire connector at front right side of throttle body.
12. Remove clutch cable and breather hose guides from upper rear engine mount brackets (if equipped).
13. Remove engine mount bracket (6mm hex and 19mm).



Cover Removal

14. Remove all screws from the cover.
15. Push main wire harness toward left frame tube, fitting the thickest part of the harness into the spark plug wire channel of the cover.

NOTE: It will be necessary to move the front of the main harness to the top of the air box, and to lower the rear portion into the area of the rear engine mount to gain enough slack.

16. Shift cover to the right side and move wire harness to the outside of left frame tube.
17. Carefully lift front of cover over rocker arms and upper camshaft carrier. When clear, slide the cover rearward, and rotate the cover in a counterclockwise direction while pulling cover out the right side. Do not force the cover or the gasket surface may be permanently damaged!
18. Remove cover and gasket.

Cover Installation

19. Clean gasket surfaces and install gasket with sealant bead UP (to cover) on clean, dry surfaces.and cover.
20. Shift cover to right side and move wire harness back between frame tubes using same method as removal.
21. Install screws and torque evenly to 10 Nm (85 lb-in.).
22. Reverse removal process to assemble. Be sure all wiring and hoses are secured and routed away from exhaust and throttle cable reel.

TROUBLESHOOTING, CYLINDER HEAD AND VALVE TRAIN

Cylinder head, valve train and piston/cylinder problems are usually detected by an engine compression test. Other problems associated with this area of the engine are external fluid leaks, excessive use of oil or abnormal noises.

Troubleshooting involves the use of:

- Leak down or compression gauge
- Visual inspection for source / cause of a fluid leak
- Listening to the engine with a stethoscope to determine source of abnormal noise

The troubleshooting table below lists problems and possible causes, parts affected, and repair suggestions. Thoroughly investigate the problem and possible solution before disassembling the engine to replace suspect parts.

PROBLEM	POSSIBLE CAUSE	PART(s) AFFECTED	REPAIR RECOMMENDED
Hard Starting Won't Start Excessive Lifter Noise	Low Compression	Lifter(s) locked	Replace lifter(s)
		Collapsed Hydraulic Lifter(s). Lifter Extremely Noisy.	Bleed Lifter Noise will typically stop after 10-15 minutes of high idle operation. If lifter will not bleed, replace lifter.
		Worn Valve Guide(s)	Replace Valve Guide(s).
		Poor Seating of Valve(s)	Repair or Replace
		Broken Valve Springs	Replace
		Spark Plug Not Seated	Torque to Specifications
		Incorrect Valve Timing	Repair
		Valve Stuck Open	Repair
		Cylinder Head Gasket Leak	Repair
		Slow Starter Motor	See Electrical Section
		Worn Rings, Piston, or Cylinder	See Cylinder/Piston Section
		Ignition Problem	See Ignition Section
		Fuel Problem	See F.I. Section
Electric Starter Straining to Turn Engine Over	High Compression	Excessive carbon build-up in combustion chamber.	Use "Carbon Clean" fuel system additive or disassemble engine to de-carbon combustion chamber.
	Excessive Starter Load	Internal Engine / Drive Components Seized or Binding	Determine Cause of Seizure or Binding
Abnormal Pre-ignition			
Poor Idle Quality	Low Compression	Collapsed Hydraulic Lifter(s). Lifter Extremely Noisy.	Air trapped in lifter. Noise will stop after 10-15 minutes of high idle operation. If air will not bleed, replace lifter.
		Poor Seating of Valve(s)	Repair or Replace

PROBLEM	POSSIBLE CAUSE	PART(s) AFFECTED	REPAIR RECOMMENDED
Poor Engine Idle Quality	Air leak	Mounting Surfaces, Hoses	Repair Air Leak
	Fuel Mixture Rich Fuel Mixture Lean TPS Adjusted Incorrectly	F.I. System F.I. System / Inlet Tract Adjust TPS	Refer to Chapter 5 Refer to Chapter 5 Refer to Chapter 5
	Ignition Misfire	Ignition System	Refer to Chapter 17
	Excessive Oil in Combustion Chamber	Valve guides	Replace
	Excessive Oil in Combustion Chamber	Worn Rings, Cylinder, or Piston	Refer to Chapter 8
		Engine Oil Overfilled	Correct
	Valves Not Opening Fully	Worn Cam Shaft or Rocker Arms	Replace
Engine Noise	Valve Train Area	Collapsed Hydraulic Lifter(s). Lifter Extremely Noisy.	Air trapped in lifter. Noise will stop after 10-15 minutes of high idle operation. If lifter will not bleed, replace lifter.
		Lifter(s) Locked	Replace Lifter(s)
		Broken or Weak Valve Springs	Replace
		Worn Camshaft or Rocker Arm	Replace
		Rocker Arm Roller Bearing Damage	Replace
		Cam Journal Worn or Damaged	Replace
	Piston/Cylinder Area	Worn Pistons and/or Cylinders	Replace
		Excessive Carbon Build-up in Combustion Chamber	Clean
		Worn Piston Pin, Piston Pin Bore and/or Small End of Connecting Rod	Replace
		Worn Piston Rings or Piston Ring Lands.	Replace
Engine Noise	General (May apply to all areas below)	Exhaust leak	Remove exhaust and seal
	Timing Chain Area	Stretched Chain	Replace
		Worn Sprockets	Replace
		Tensioner Not Working	Replace
	Primary Cover Area	Clutch	Refer to Chapter 9
		Flywheel	Refer to Chapter 9
		Starter System	Refer to Chapter 18
		Torque Compensator	Refer to Chapter 9
	Bottom End Area	Main Bearings	Refer to Chapter 10
		Rod Bearings	Refer to Chapter 10
		Loose Side Clearance	Refer to Chapter 10
	Transmission Area	Bearings	Refer to Chapter 10
		Misplaced Circlips	Refer to Chapter 10
		Incorrect Side Clearance	Refer to Chapter 10

PROBLEM	POSSIBLE CAUSE	PART(s) AFFECTED	REPAIR RECOMMENDED
Poor high speed running	Air Intake Problem		Refer to Chapter 5
	F.I. System Problem		Refer to Chapter 5
	Ignition Problem		Refer to Chapter 17
	Valve Float	Weak Valve Springs	Replace
	Insufficient Valve Travel	Worn Camshaft/Rocker Arms	Replace
	Valves Opening & Closing at Wrong Time	Incorrect Valve Timing	Correct
Lack of power in all RPM ranges	Low Compression	Worn Piston, Rings, Cylinder	Replace
	Low Compression	Poor Valve Seating	Repair/Replace
	Valves Opening & Closing at Wrong Time	Valve Timing Incorrect	Correct
	Incorrect Valve Clearance	Hydraulic Lifter Bleeding Down	Replace
	Lifter(s) Locked	Debris in Lifter	Replace lifter(s)
	Collapsed Hydraulic Lifter(s). Lifter Extremely Noisy.	Air Trapped in Lifter. Noise will stop after 10-15 minutes of high idle operation. If lifter will not bleed, replace lifter.	Replace Lifter
	Valve Float	Weak Valve Springs	Replace
	Insufficient Valve Travel	Worn Camshaft/Rocker Arms	Replace
	Ignition Problem		Refer to Chapter 5
	F.I. Problem		Refer to Chapter 5
	Air Intake Problem		Refer to Chapter 5
	Oiling Problem	Oil Overfilled	Correct
	Vacuum Leak	Mounting Surfaces, Hoses	Correct
Using/Burning Oil	Oil in Combustion Chamber	Oil Overfilled	Correct
	Oil Past Rings	Worn or Damaged Piston, Rings, Cylinder	Replace
	Oil Past Valve Guides	Worn Valve Guides	Replace
		Worn Valve Guide Seals	Replace

NOTES

CHAPTER 8
CYLINDER & PISTON

CYLINDER & PISTON 8.2
GENERAL 8.2
BASE GASKET SEALING & CYLINDER STUD TORQUE 8.2
PISTON RING PROFILE & ORIENTATION 8.2
SPECIFICATIONS 8.3
SPECIAL TOOLS 8.3
CYLINDER REMOVAL 8.4
CYLINDER INSPECTION 8.4
CYLINDER BORE MEASUREMENT 8.4
PISTON TO CYLINDER CLEARANCE WORKSHEET 8.5
CYLINDER WARPAGE MEASUREMENT 8.6
PISTON & PISTON RING REMOVAL 8.6
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PISTON PIN / PIN BORE INSPECTION 8.8
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PISTON INSTALLATION 8.9
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TROUBLESHOOTING, CYLINDER & PISTON 8.11
TROUBLESHOOTING (CONT.) 8.12

CYLINDER & PISTON

GENERAL

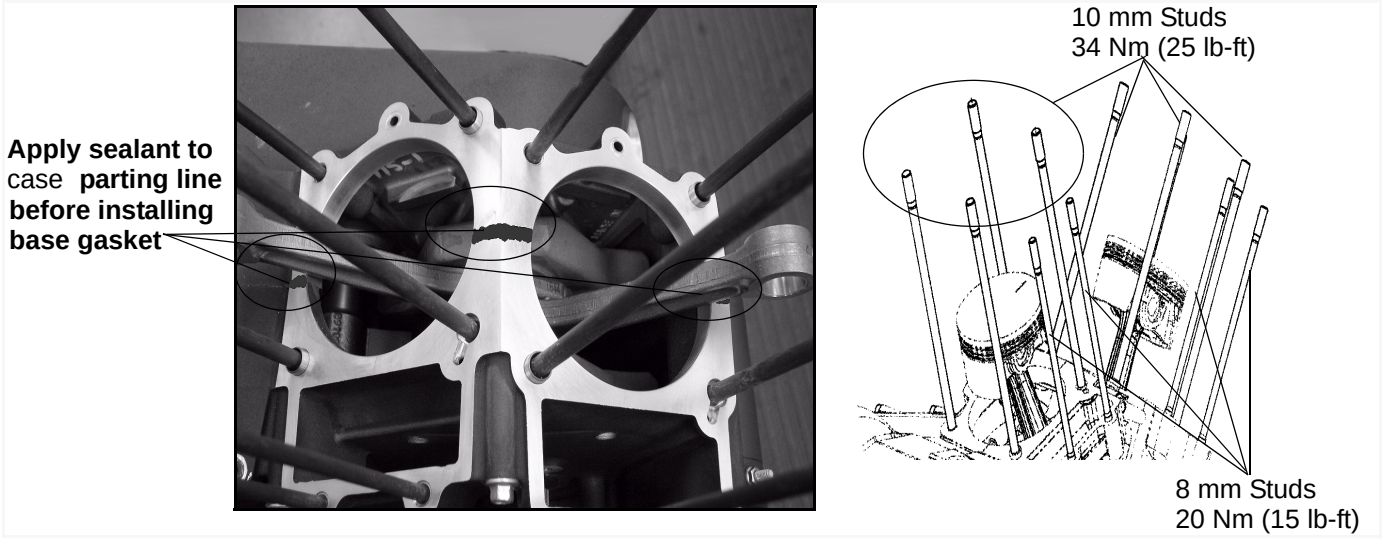
NOTE: Clean the machine thoroughly before removing engine from frame.

- This section covers service of the cylinder, piston and rings. The engine must be removed from the frame to perform the procedures in this section. Refer to chapter 6 for engine removal and installation.
- Mark and store all mated parts for assembly. Assemble engine by putting used parts that pass inspection back in the same location.
- Machined and mated surfaces are very delicate. Handle and store all parts in such a way that the mating surfaces will not be damaged.
- Many parts require assembly lubrication. Follow the assembly lubrication procedures carefully.

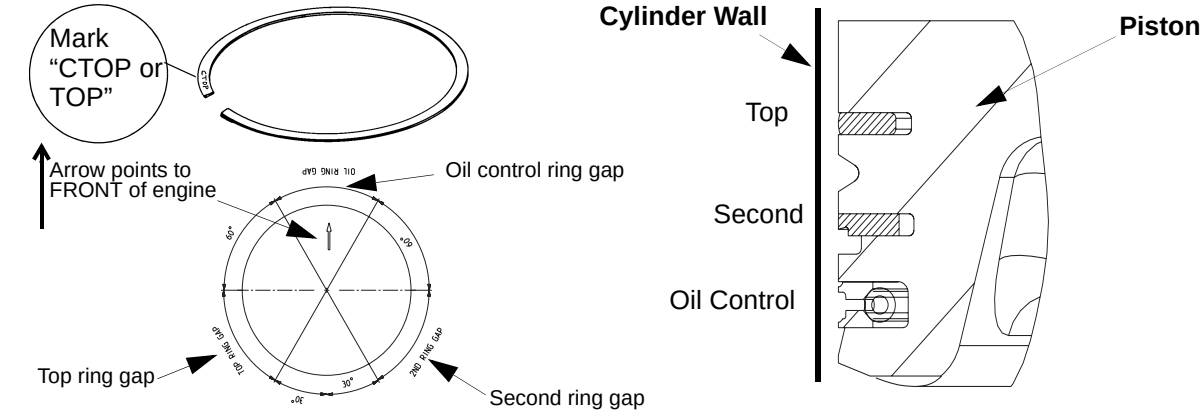
Moly assembly paste PN: 2871460

- There are many precision measuring steps in this section. If you are not sure of your capabilities in these areas, have a competent machinist perform the precision part inspection operations.
- Cleanliness of parts is critical to engine life and proper parts inspection. Use clean solvent and hot, soapy water to clean parts. Dry with compressed air before inspection and engine assembly. Coat parts with fresh lubricant to prevent oxidation after cleaning.

BASE GASKET SEALING & CYLINDER STUD TORQUE



PISTON RING PROFILE & ORIENTATION



SPECIFICATIONS

CYLINDER & PISTON			
Item	Specification	**Standard**	**Service Limit**
Cylinder	Inside Diameter **92 Cubic Inch Engine**	96.945 mm ± .013 (3.8167″ ± .0005″)	Check taper and out-of-round
	Inside Diameter **100 Cubic Inch Engine**	100.987 - 101.013 (3.9759" - 3.9769")	Check taper and out-of-round
	Out of Round	--	0.05 mm (.002")
	Taper	--	0.05 mm (.002")
	Gasket Surface Warpage	→	.1mm max. (.0039")
Piston	Piston Mark Direction	Piston orientation is determined by arrow on piston crown. Position BOTH pistons so arrows point to front of engine.	
	Piston O.D. (Nominal) (Measured 8mm up from bottom of skirt, 90° to pin)	**92 C.I Engine** 96.90mm ± .01 (3.8149" ± .0003″)	Replace if piston-to-cylinder clearance is excessive with good cylinder
		100 C.I. Engine 100.946mm ± .01 (3.9742" ± .0003″)	
	Piston Pin Hole I.D.	22.006 - 22.012 mm (.8664 - .8666")	22.047 mm (.8680")
	Piston Pin O.D.	21.995 - 22.000 mm (.8659 - .8661")	21.96 mm (.864")
Piston Clearances	Piston to Cylinder	.023 - .067 mm (.0009 - .0026")	.15 mm (.006")
	Piston to Piston Pin	.006 - .017 mm (.0002 - .0007")	.035 mm (.0014")
	Ring End Gap - Top (Installed) Ring End Gap - 2nd (Installed) Ring End Gap - 3rd (Installed)	.15 - .35 mm (.006 - .014") .33 - .53 mm (.013 - .021") .15 - .35 mm (.006 - .014")	.80 mm (.031") 1.11 mm (.043") .80 mm (.031")
	Piston Ring Marks	--	"CTOP" mark must face UP on all rings. See page 8.2 and page 8.9.
	Piston Ring to Ring Land		
	Top Ring (1.2mm** ring thickness)	.02 - .055 mm (.0008 - .002")	.11 mm (.0043")
	2nd Ring (1.2mm** ring thickness)	.02 - .055 mm (.0008 - .002")	.11 mm (.0043")
	** 2003 Top ring and second ring thickness is 1.475-1.490mm (.0580 - .0586")		

SPECIAL TOOLS

Piston ring compressor pliers: PV-43570-1

Piston ring compressor band: PV-43570-2

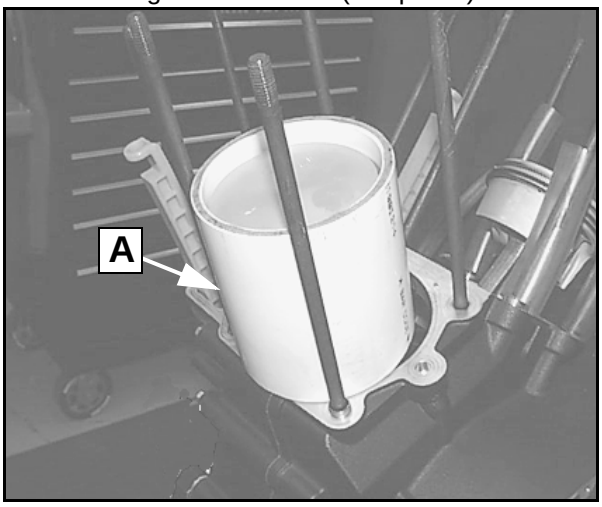
Cylinder bore gauge: PV-3017

Straightedge, feeler gauge, precision measuring instruments: Refer to Chapter 1 or Commercially available

Protective sleeves for pistons / studs: Commercially available

CYLINDER REMOVAL

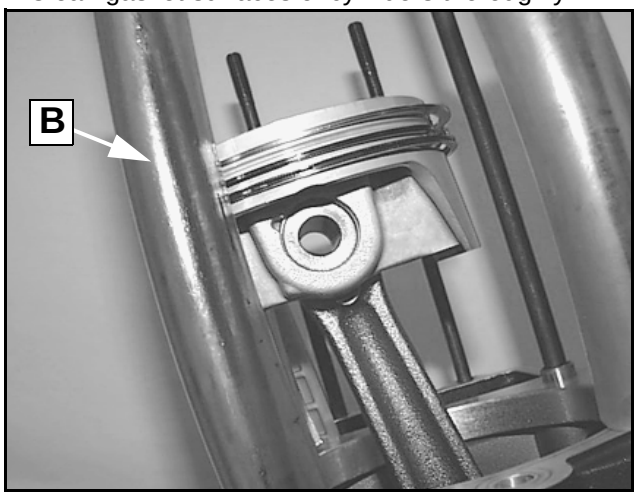
1. Remove engine from frame (Chapter 6).



2. Remove cylinder head(s) (Chapter 7).
3. Remove cylinder(s). Support the pistons while removing cylinders so they do not fall into the cylinder studs.

Slide large diameter section of clean PVC pipe (A) or a length of hose (B) over cylinder studs to protect pistons and rings from damage by contact with cylinder studs.

4. Clean gasket surfaces of cylinders thoroughly.



⚠ CAUTION

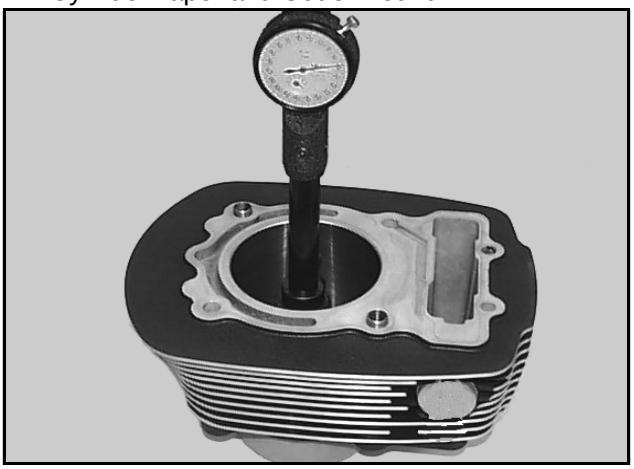
Careless handling of cylinder, pistons or rings may cause irreparable damage. Handle these parts with care. Do not damage gasket surfaces during cleaning.

CYLINDER INSPECTION

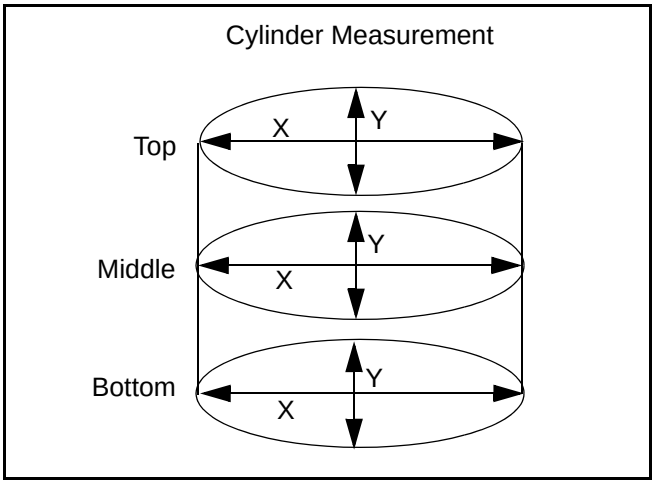
1. Visually inspect cylinder bores for scratches and wear.
2. Inspect gasket surfaces for scratches or other damage that may cause an oil leak.

CYLINDER BORE MEASUREMENT

1. Measure each cylinder bore in 6 places to determine:
   - Cylinder Bore Inside Diameter
   - Cylinder Taper and Out of Round



2. Use maximum measurement to determine wear.
3. Use the worksheet provided on page 8.5 to record measurements and calculate the clearance.



PISTON TO CYLINDER CLEARANCE WORKSHEET

Front Cylinder	Recorded Measurement	Specification
Top “X”		Taper Service Limit: .05mm (.002")
Middle “X”		
Bottom “X”		
Top “Y”		
Middle “Y”		
Bottom “Y”		
Difference between largest “Y” measurement and smallest “Y” measurement	Taper for “Y” axis:	
Difference between largest “X” measurement and smallest “X” measurement	Taper for “X” axis:	
Largest difference between any “X” axis measurement and “Y” axis measurement	Cylinder Out-of-Round:	Out-of-Round Service Limit: .05mm (.002")
Piston Skirt Measurement (page 8.7)		
Difference between largest “X” axis measurement and piston measurement	Piston-to-Cylinder Clearance*	Piston-to-Cylinder Clearance Service Limit: .15 mm (.006")

Rear Cylinder	Recorded Measurement	Specification
Top “X”		Taper Service Limit: .05mm (.002")
Middle “X”		
Bottom “X”		
Top “Y”		
Middle “Y”		
Bottom “Y”		
Difference between largest “Y” measurement and smallest “Y” measurement	Taper for “Y” axis:	
Difference between largest “X” measurement and smallest “X” measurement	Taper for “X” axis:	
Largest difference between any “X” axis measurement and “Y” axis measurement	Cylinder Out-of-Round:	Out-of-Round Service Limit: .05mm (.002")
Piston Skirt Measurement (page 8.7)		
Difference between largest “X” axis measurement and piston measurement	Piston-to-Cylinder Clearance*	Piston-to-Cylinder Clearance Service Limit: .15 mm (.006")

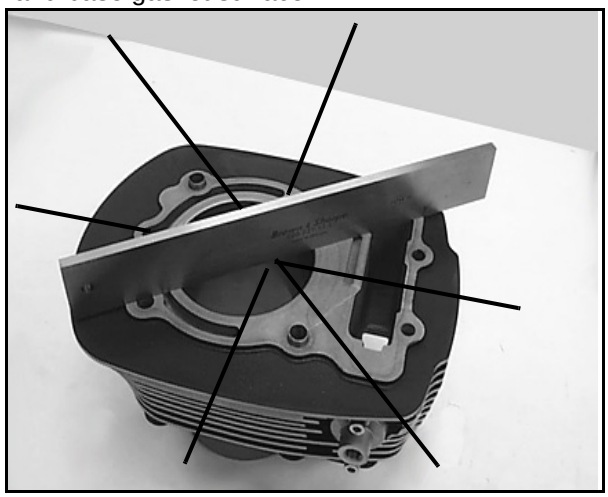
Compare recorded measurement to specifications. If measured value exceeds service limit replace the appropriate part.

NOTE: The cylinders are NiCaSil plated and cannot be reconditioned by boring or honing. If excessive surface damage, taper or out-of-round exists, the cylinder must be replaced.

- If the piston-to-cylinder clearance exceeds the service limit, **measure a new piston and re-calculate the clearance.** If the piston-to-cylinder clearance exceeds the service limits with a new piston, the cylinder must be replaced.

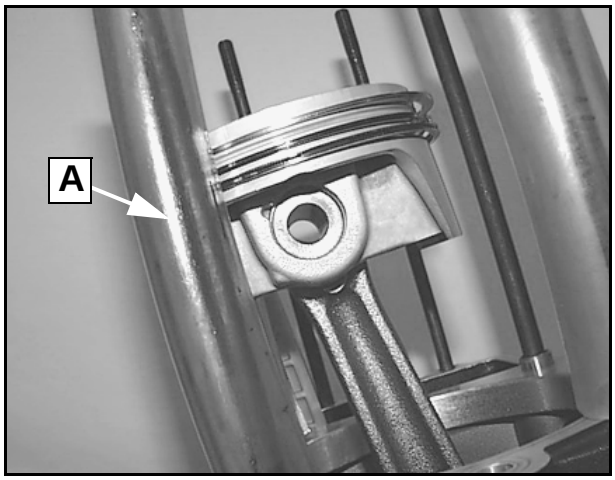
CYLINDER WARPAGE MEASUREMENT

1. Inspect cylinder for warpage at cylinder head surface and base gasket surface.



2. Place a straight edge diagonally across cylinder mating surfaces in several positions. Attempt to slide a .05mm (.002") feeler gauge under the straight edge in each position.
3. Replace cylinder is warped beyond the service limit.

PISTON & PISTON RING REMOVAL

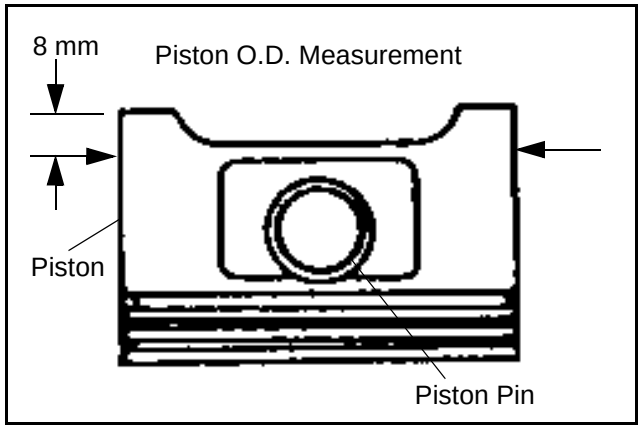


1. Cover crankcase with a clean shop towel to prevent piston clip from falling into the crankcase.
2. Slide large diameter fuel line or hose (A) over cylinder studs to protect pistons from damage.
3. Remove left side piston pin circlip.
4. Push piston pin out to left side of engine and remove the piston.

5. Rotate rings in piston groves. Rings should rotate freely in grooves.
6. Clean carbon deposits from piston.
7. Spread rings only wide enough to remove them from piston. Spreading rings too wide will damage them.
8. Clean piston ring grooves. Break or cut a piston ring in half. File or grind one edge square and remove all burrs. Use this piston ring to carefully clean piston ring grooves.

NOTE: A soft wire brush is permissible to clean top of piston. Do not use a wire brush to clean sides of piston or the piston ring groves.

PISTON & PISTON RING INSPECTION



1. Visually inspect piston for cracks, excessive wear, scoring, etc.
2. Measure piston skirt O.D. (90^{o} to pin and 8 mm from bottom of piston skirt and compare to specifications listed on page 8.3. Replace piston if worn beyond the service limit.
3. Calculate Piston to Cylinder Clearance. Subtract piston O.D. from cylinder bore I.D. and compare to specification listed on page 8.3.

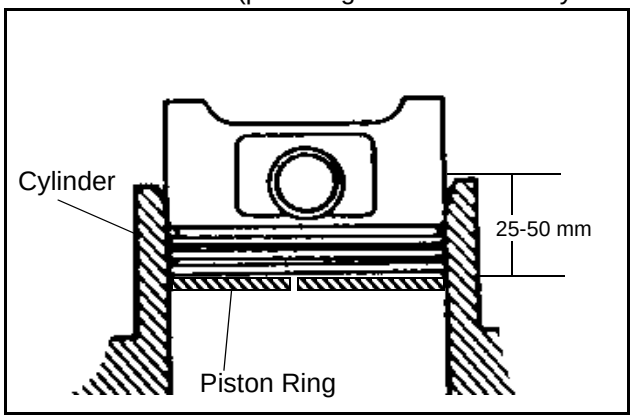
Piston to Cylinder Clearance Calculation

Cylinder I.D.
\- Piston O.D.
= Piston to Cylinder Clearance

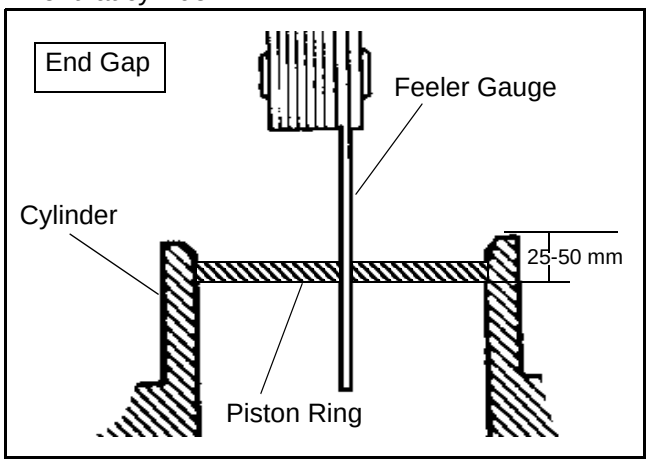
4. Replace parts that do not meet specification.

NOTE: If piston-to-cylinder clearance exceeds service limit, **measure a new piston and re-calculate clearance**. If piston-to-cylinder clearance exceeds service limits with a new piston, cylinder must be replaced.

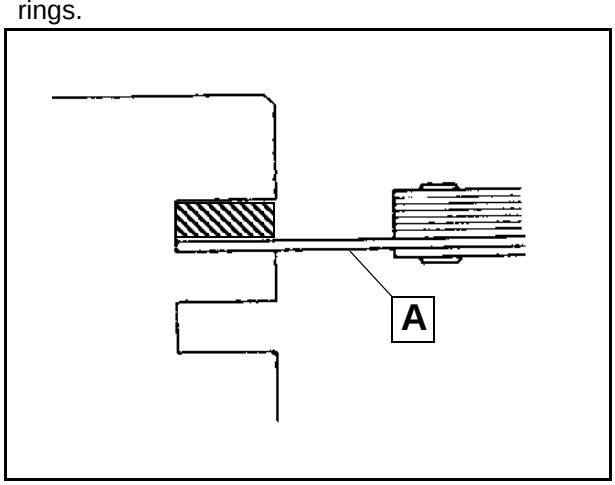
5. Use a piston to push each ring squarely into cylinder bore from bottom (push rings 25-50mm into cylinder).



6. Measure installed ring end gap with a feeler gauge and compare to specification listed on page 8.3. If either ring exceeds the service limit, replace ring set for that cylinder.

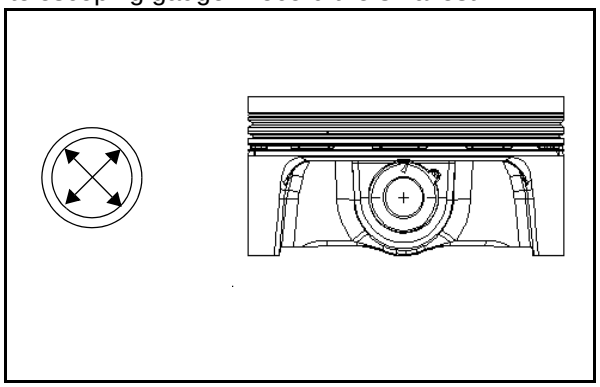


7. Install rings onto a cleaned piston. Push rings in until they are flush with piston. Using a feeler gauge (A), measure side clearances for the 1st & 2nd rings. If any of clearances exceed limit, replace piston and piston rings.

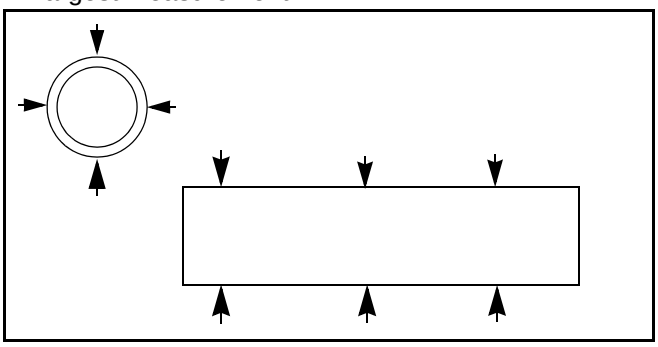


PISTON PIN / PIN BORE INSPECTION

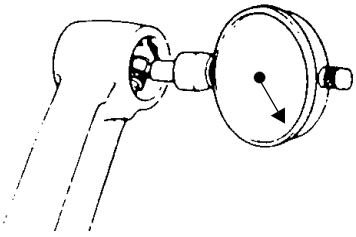
1. Measure piston pin hole I.D. in four locations with a telescoping gauge. Record the smallest.



2. Measure piston pin O.D. at six locations. Record largest measurement.



3. Calculate piston pin-to-piston clearance. Subtract pin O.D. from pin hole I.D.
4. Measure connecting rod small end I.D. at two locations.
5. Calculate connecting rod-to-piston pin clearance by subtracting pin O.D from rod hole I.D.



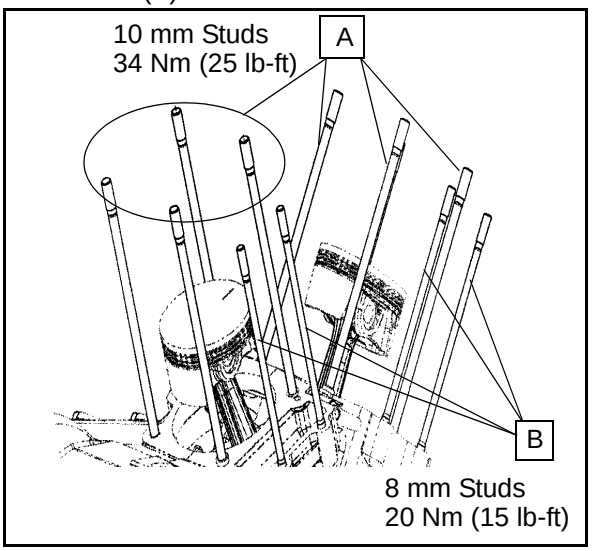
Connecting Rod Hole I.D.
\- Piston Pin O.D.

= Connecting Rod to Piston Pin Clearance

6. Compare measurements to specifications listed on page 8.3 and replace any worn parts.

CYLINDER STUD REPLACEMENT

1. Use a stud remover to remove 10mm studs (A) and 8mm studs (B).



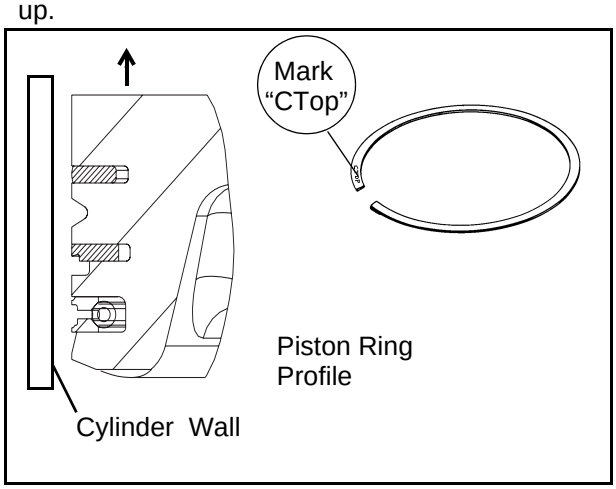
2. Clean threads in cases thoroughly.
3. Apply engine oil to stud threads.
4. Install studs and torque them to specification.

PISTON RING INSTALLATION

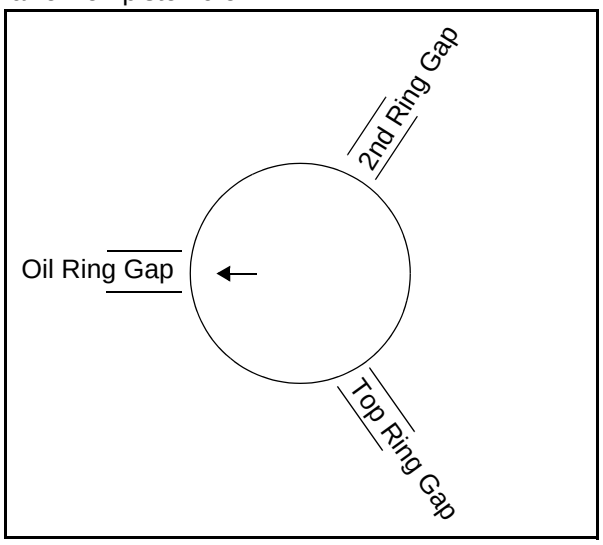
CAUTION

Rings may be damaged if expanded more than necessary to install them.

1. Carefully install oil control ring assembly (bottom ring) with “CTOP” mark facing up. The oil control ring consists of a backing spring and one rail component.
2. Install first and second rings with “CTOP” mark facing up.



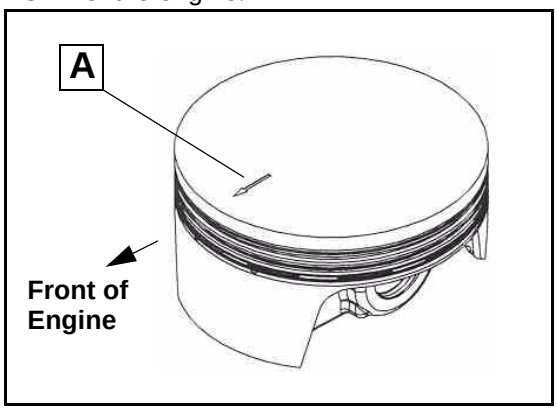
3. Make sure that rings rotate freely in grooves.
4. Stagger ring end gaps at 120^{o} intervals in relation to arrow on piston crown.



NOTE: Arrow on piston faces FRONT of engine for both front and rear cylinders.

PISTON INSTALLATION

The pistons are marked with an arrow on the crown. Install pistons on connecting rods with arrow (A) facing the FRONT of the engine.



1. Place a clean shop towel over crankcase to prevent foreign material from entering crankcase.
2. Install a new circlip on one side of the piston with end gap facing UP (12:00 position.)

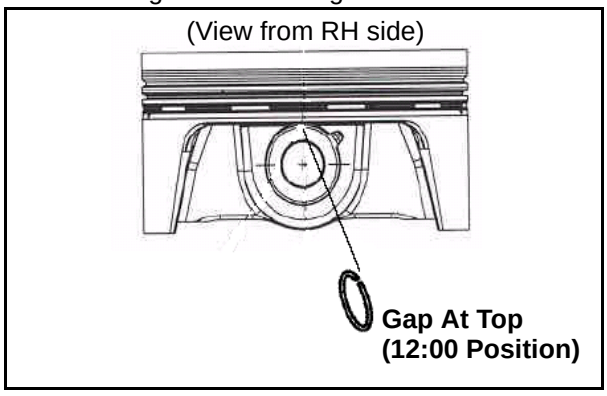
CAUTION

Never reuse piston pin circlips.

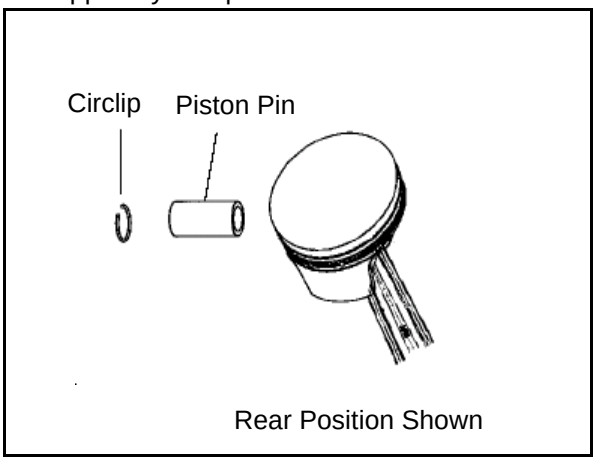
3. Apply assembly lube piston pin and I.D. of connecting rod small end.

Moly assembly paste PN: 2871460

4. Install piston over connecting rod with arrow on piston crown facing FRONT of engine.



5. Push piston pin through rod and piston pin hole until it is stopped by circlip.

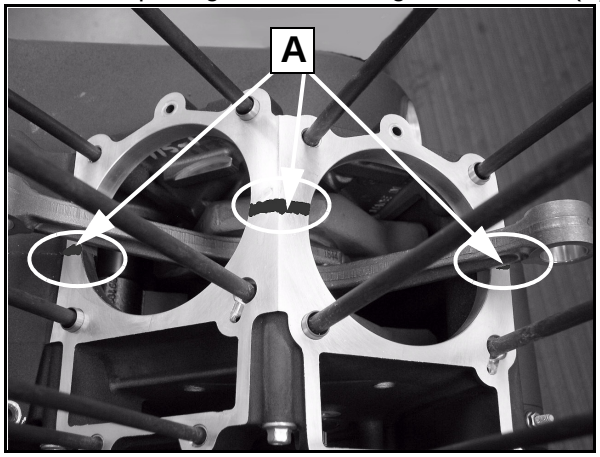


6. Install remaining circlip with end gap facing up (12:00 position.)
7. Make sure both piston circlips are seated properly in the groove.

CYLINDER INSTALLATION

NOTE: Be sure all top end parts are ready for assembly. Sealant on crankcase parting line must not be allowed to dry before top end is assembled and torqued.

1. Wash cylinders with clean solvent first, then with hot soapy water.
2. Rinse cylinders with clear water and dry immediately with compressed air. Wipe cylinder bore with a clean white shop towel and engine oil.
3. Apply a light coat of engine oil to piston and rings.
4. Ensure cylinder alignment dowel pins are in place and gasket surfaces are clean and oil-free.
5. Apply a small amount of crankcase sealant to the crankcase parting lines on base gasket surface (A).



6. Install new cylinder base gaskets onto crankcase.

NOTE: Inspect all sealing surfaces carefully for scratches or imperfections. **DO NOT allow oil or grease to contact gaskets or sealing surfaces during the assembly process.**

7. Place a small amount of engine oil to inside surfaces of a piston ring compressor band.

Piston Ring Compressor Band:PV-43570-2

Piston Ring Compressor Pliers PV-43570-1

8. Install piston ring compressor over rings and compress rings into ring grooves.

> **⚠ CAUTION**
>
> Be sure compressor band end gap does not align with any ring end gap when compressing the rings.

NOTE: Install cylinders in their original locations.

9. Remove protective covering from crankcase.
10. Carefully install cylinder(s) over piston/ring assembly. Do not force cylinder over piston. Monitor rings carefully. If a piston ring becomes dislodged from the ring compressor; remove cylinder, inspect ring carefully for damage.
11. Remove piston ring compressor when rings are fully captive in cylinder.
12. Slide cylinder down over piston until seated to base gasket and crankcase surface.
13. Repeat for other cylinder.
14. Install cylinder head(s). (Chapter 7).

TROUBLESHOOTING, CYLINDER & PISTON

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(s)	REPAIR RECOMMENDED
Engine Hard Starting (or) Engine Will Not Start	Low Compression	Lifter(s) Locked	Refer to chapter 7
		Collapsed Hydraulic Lifter(s). Lifter Extremely Noisy.	Refer to chapter 7
		Worn Valve Guide(s)	Refer to chapter 7
		Poor Seating of Valve(s)	Refer to chapter 7
		Broken Valve Springs	Refer to chapter 7
Poor High Speed Performance	Valve Float	Weak Valve Springs	Refer to chapter 7
	Insufficient Valve Travel	Worn Camshaft/Rocker Arms	Refer to chapter 7
	Valves Opening & Closing at Wrong Time	Valve Timing Incorrect	Refer to chapter 7
	Ignition Problem		Refer to chapter 18
	F.I. System Problem		Refer to chapter 5
	Air Intake Problem		Refer to chapter 5
Lack of Power in all RPM Ranges	Incorrect Valve Clearance	Hydraulic Lifter Bleeding Down	Refer to chapter 7
	Collapsed Hydraulic Lifter(s). Lifter Extremely Noisy.	Air trapped in lifter. Noise will stop after 10-15 minutes of high idle operation. If air will not bleed, replace lifter.	Refer to chapter 7
	Valve Float	Weak Valve Springs	Refer to chapter 7
	Valves Opening & Closing at Wrong Time	Valve Timing Incorrect	Refer to chapter 7
Engine Hard Starting (or) Engine Will Not Start	Low Compression	Spark Plug Not Seated	Torque Spark Plug
		Incorrect Valve Timing	Refer to chapter 7
		Valve Stuck Open	Refer to chapter 7
		Leaking Cylinder Head Gasket	Repair
		Slow Starter Motor	Refer to chapter 18
		Worn cylinder, Pistons and/or Rings	Replace parts that do not meet specification
		Ignition Problem	Refer to chapter 17
		Fuel Problem	Refer to chapter 5
Electric Starter Straining to Turn Engine Over Abnormal Pre-ignition	High Compression	Excessive Carbon Build-up In Combustion Chamber.	Use Carbon Clean fuel system additive or disassemble engine to remove carbon from combustion chamber

TROUBLESHOOTING (Cont.)

PROBLEM	POSSIBLE CAUSE	AFFECTED PART(s)	REPAIR RECOMMENDED
Engine Idles Poorly	Low Compression	Collapsed Hydraulic Lifter(s). Lifter Extremely Noisy	Refer to chapter 7
		Lifter(s) Locked	Refer to chapter 7
		Poor Seating of Valve(s)	Refer to chapter 7
		Worn Cylinder, Pistons and/or Rings	Replace parts that do not meet specification
Lack of Power in all RPM Ranges	Insufficient Valve travel	Worn Camshaft/Rocker arms	Refer to chapter 7
Lack of Power in all RPM Ranges	Low Compression	Worn Piston, Rings, Cylinder	Replace parts that are worn beyond the service limit
Leaks	Improper Assembly	Cylinder, Gaskets, Gasket Surfaces Incorrect Fastener Torque	Perform white powder test to determine leak path. Assemble parts clean and free of oil, grease, or debris. Torque fasteners properly
	Damaged gasket sealing surface(s)	Cylinder/Crankcase	Repair surface or replace part
Noise	Excessive piston to cylinder clearance	Piston / Cylinder	Replace parts that are worn beyond the service limit
	Excessive piston pin clearance (to piston or connecting rod)	Piston / Pin / Connecting Rod	Replace parts that are worn beyond the service limit
	Exhaust Leak	-	Inspect seal of exhaust system at cylinder head

CHAPTER 9
CLUTCH, PRIMARY, & SHIFT LINKAGE

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TROUBLESHOOTING 9.33

GENERAL

SERVICE INFORMATION

- Clutch and external transmission shift linkage service can be accomplished with the engine in the frame.
- Internal transmission or internal shifting mechanism service requires engine removal and crankcase separation.
- Oil additives of any kind are not recommended by Victory. Using oil additives can have a detrimental affect on clutch performance, operation, and service life.
- Engine oil type and viscosity can affect clutch operation.
- Burnt clutch plates are not an indication of defective clutch plates. Burnt clutch plates indicate that a problem exists within the clutch system, the clutch has been used improperly, or plates were contaminated by improper oil or additives.
- Victory 20W/40 motorcycle oil is recommended for all operating temperatures. If Victory 20W/40 oil is not available, a high quality 20W/40 motorcycle oil suitable for use in wet clutch transmissions can be used. Do not use oils rated higher than SG.
- Lubricate parts during assembly as described in the procedures.

⚠ CAUTION

Corroded or sticking shift linkage pivot points can cause abnormal shifting. Replace any linkage components that are damaged or do not move freely, and lubricate at regular intervals.

SPECIFICATIONS

GENERAL

Item		Specifications
Clutch Gear Shift and Linkage	Clutch Type	Wet, Multi-Disk
	Clutch Operating Mechanism	Manual / Cable Operated
	Torque Compensator	Belleville Spring Loaded Cam Assembly
	Primary Reduction Ratio	1.5 : 1
	Transmission Shift Mechanism	Manually Operated, Spring Centered
	Gearshift Pattern	1-N-2-3-4-5-(6)
	Clutch Spring (Diaphragm Type)	Yellow Paint Mark 125 lb. (92 C.I)
		Green Paint Mark 145 lb. (100 C.I)

SERVICE / MAINTENANCE

CLUTCH/GEARSHIFT/LINKAGE		
Item	**Standard**	**Service Limit**
Clutch Lever Free Play	.50-1.50 mm (.020-.060")	←

SPECIAL TOOLS

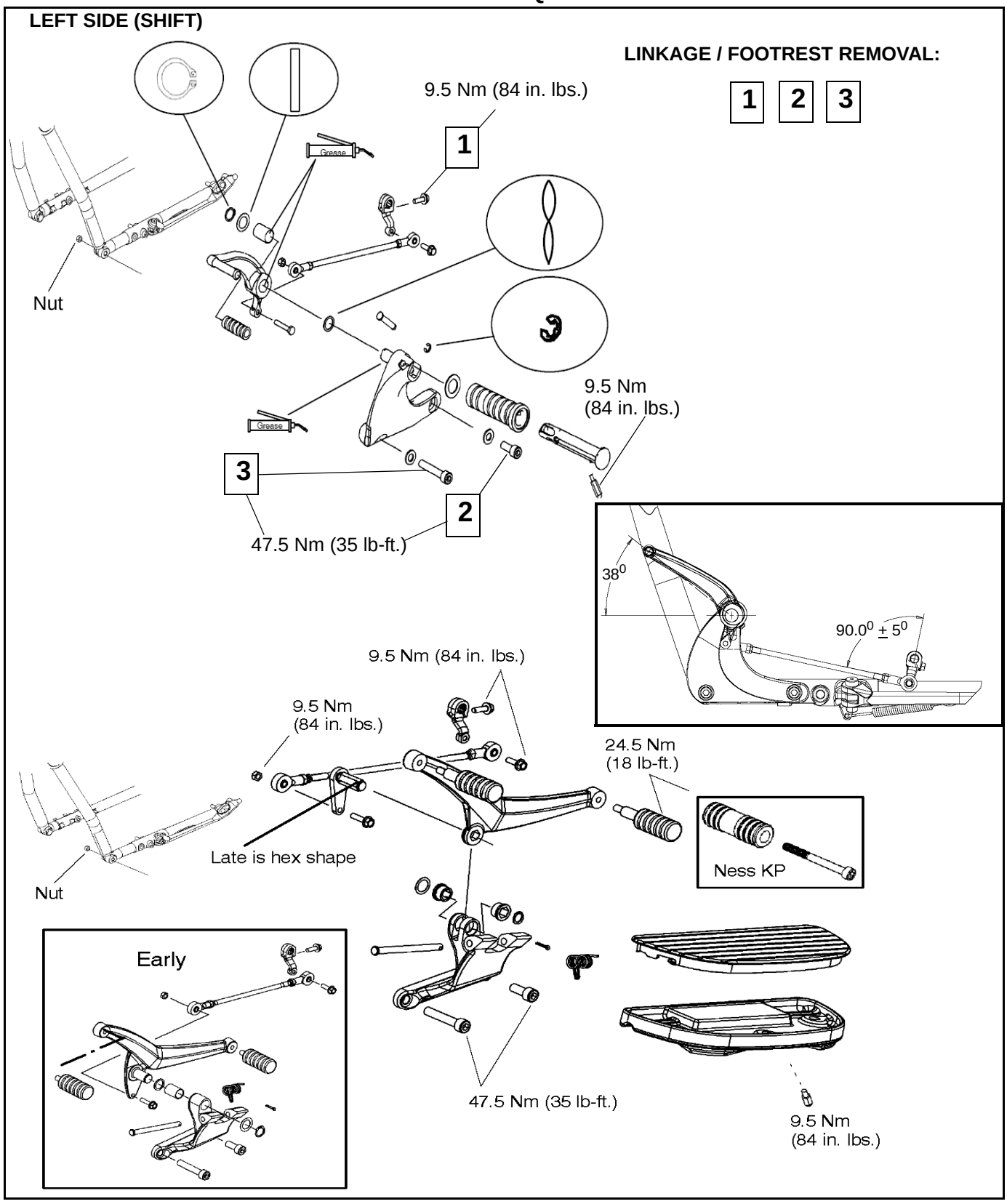
PRIMARY DRIVE SPECIAL TOOLS

Engine Lock Tool: PV-43502-A
Clutch Spring Compressor: PV-45032
Flywheel Puller: PV-43533

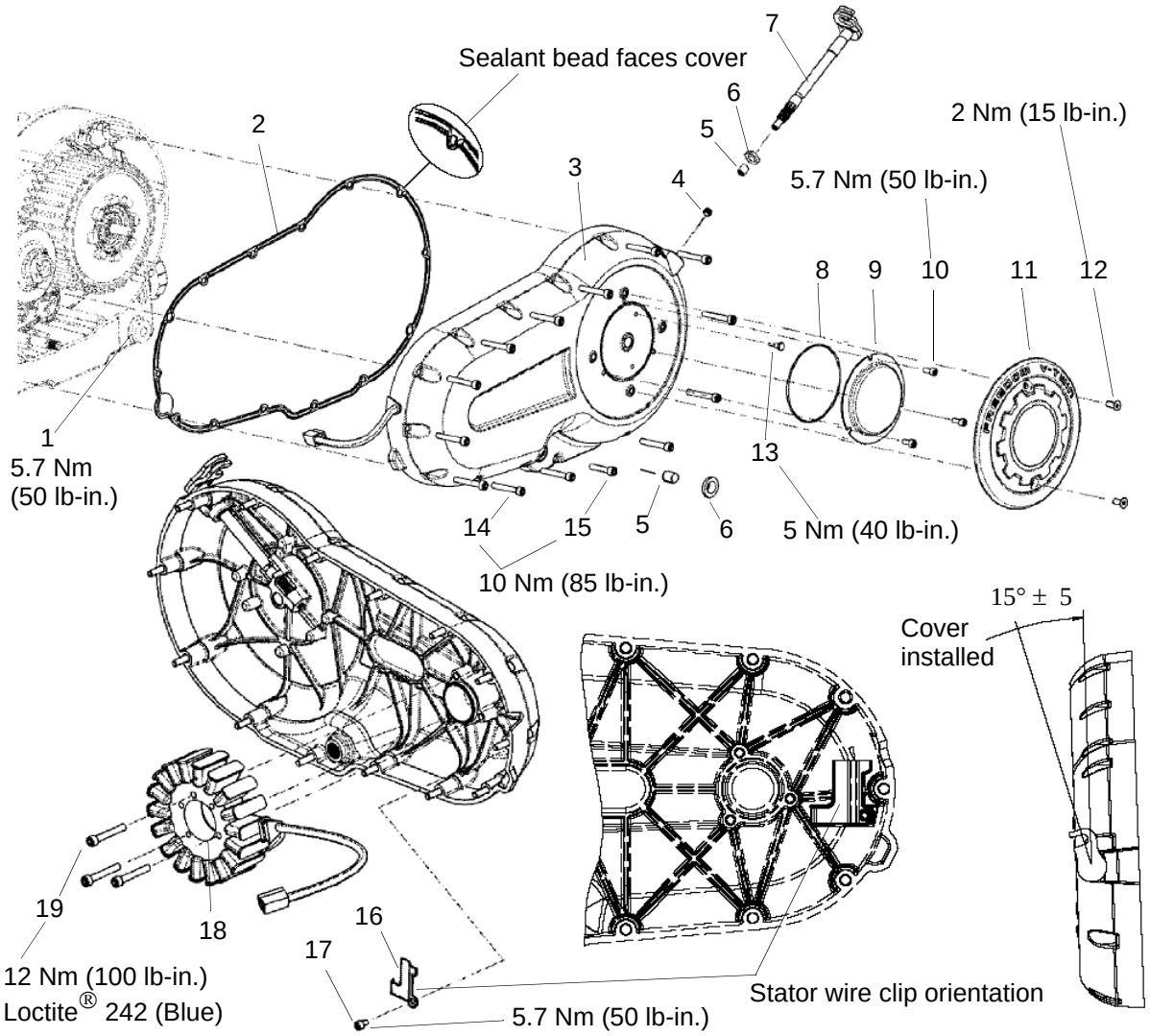
1/4″ (or 6mm) Pin Punch or Flat Punch: Commercially available

ASSEMBLY VIEWS & TORQUE - SHIFT & PRIMARY COVER

SHIFT LINKAGE / FOOTREST - FASTENER TORQUE



PRIMARY COVER

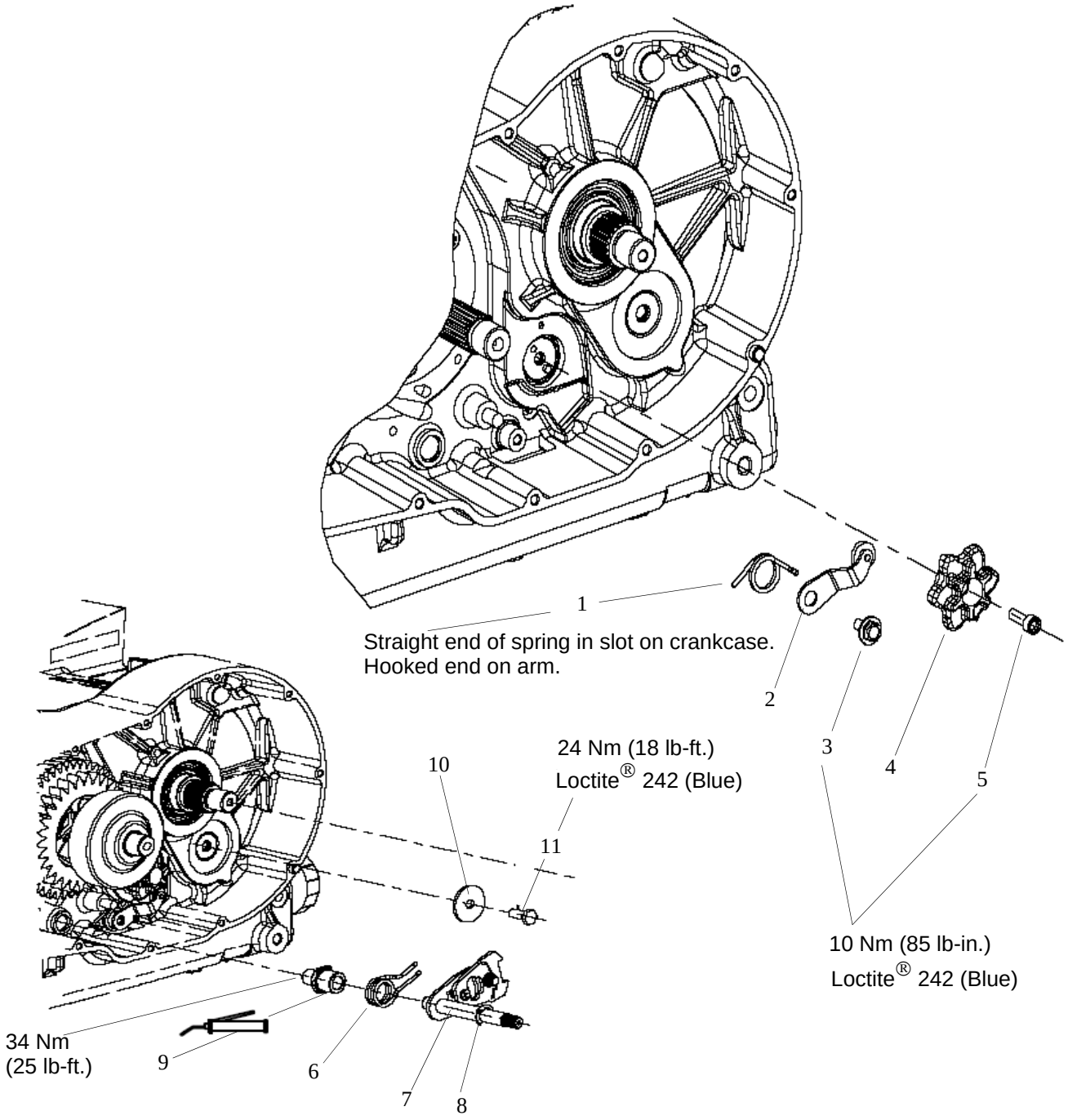


1. Sensor, Oil Pressure
2. Gasket, Primary Cover
3. Asm, Primary Cover (Incl. 4, 5, 6)
4. Bearing, Needle (1)
5. Bearing, Needle (2)
6. Seal (2)
7. Pinion, Clutch
8. O-Ring
9. Cover, Cap Seal
10. Screw (3) 5x12 Button Head
11. Cap Plate
12. Screw (2) 6x14 Tapered
13. Screw, Dog Point (1) 8x16
14. Screw, (16) 6x40 Hex Head
15. Screw (1) 6x30 Hex Head
16. Bracket, Stator Wire
17. Screw, (1) 5x8 Hex Head
18. Stator
19. Screw (3) 6x40 Hex Head

⚠ CAUTION

Flywheel contains powerful magnets. Use caution when installing primary cover to avoid personal injury. Refer to page 9.11.

SHIFT MECHANISM



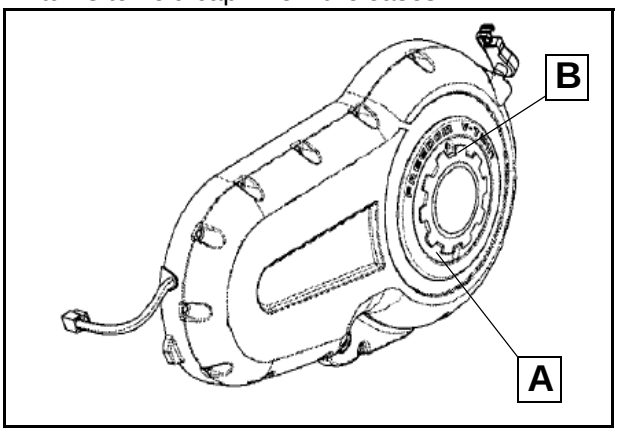
1. Spring
2. Roller Arm, Detent
3. Screw, Flanged
4. Shift Star
5. Screw, 6x20
6. Spring, Pedal Return
7. Shift Ratchet Assembly
8. Retaining Ring
9. Adaptor, Shift Shaft
10. Washer
11. Bolt, Special

SERVICE PROCEDURES

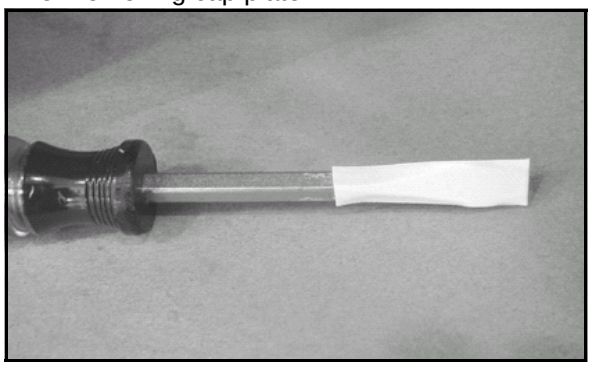
CAP PLATE & CAP PLATE SEAL REMOVAL

NOTE: If cap plate does not release from primary cover after the two screws are removed, the adhesive foam ring may be holding it in place. Do not attempt to pry the cap plate off of the cover from only one point on the outer edge or the plate may be permanently damaged. Use the following method to release the foam ring if the cap plate is stuck. Work slowly when removing the cap plate.

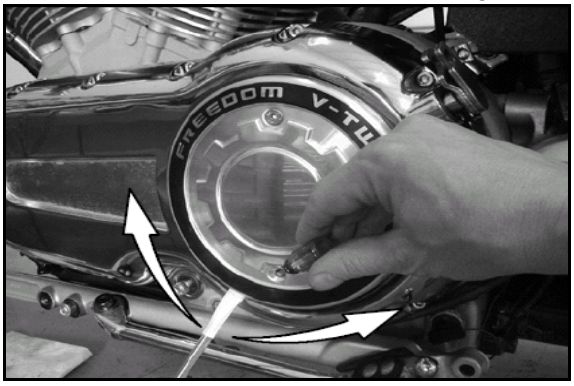
1. Remove screw (A). Back out upper screw (B) about 3-4 turns to hold cap when it releases.



2. Place protective tape on both sides of a thin, wide screwdriver tip to protect finish of cover and cap plate when removing cap plate.



3. Use a small screw driver to lift cap plate enough to insert the screwdriver under the outer edge.

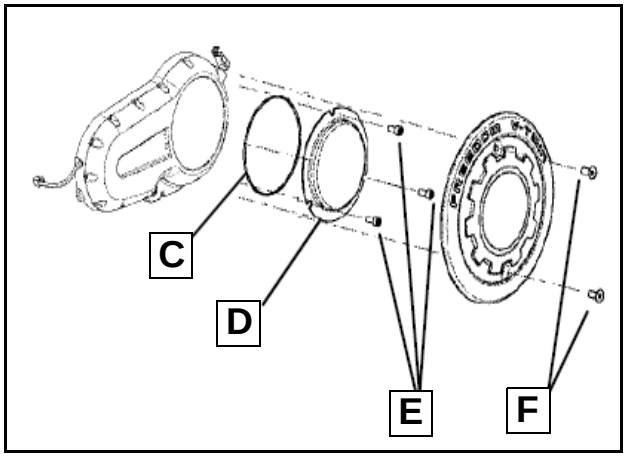


4. *Slowly and carefully* work around the outside edges of cap plate to release it from the adhesive foam.
5. A few drops of lacquer thinner can be used to help release the adhesive.

> **⚠ WARNING**
>
> Lacquer thinner is extremely flammable and is explosive under certain conditions. Work in a well ventilated area. Open flames, sparks, cigarettes must be kept away from lacquer thinner. Protect finished or painted surfaces to prevent damage.

6. When cap plate is free, remove top screw and cap plate.
7. Remove three screws (E), cover, and O-ring.

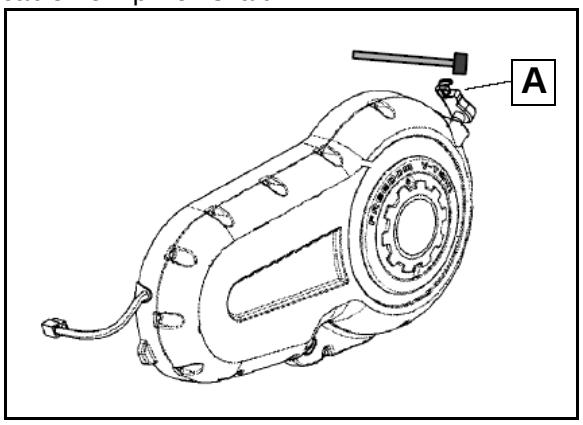
CAP PLATE & CAP PLATE SEAL INSTALLATION



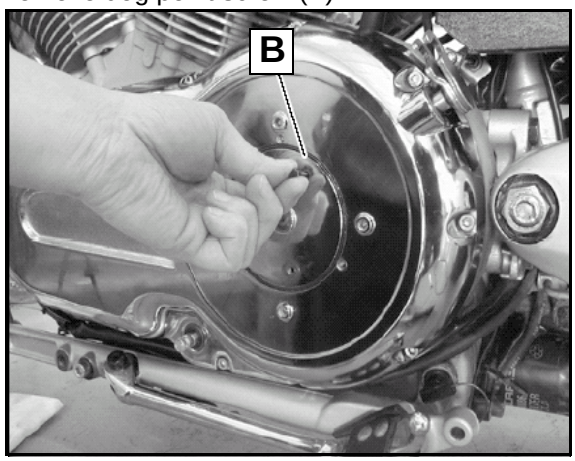
1. Install new O-ring (C).
2. Install cover (D). Torque screws (E) to 5.6 Nm (50 in.-lb.).
3. Install cap plate with screws (F) and torque to 1.7 Nm (15 in.-lb.).

CLUTCH PINION SHAFT REMOVAL

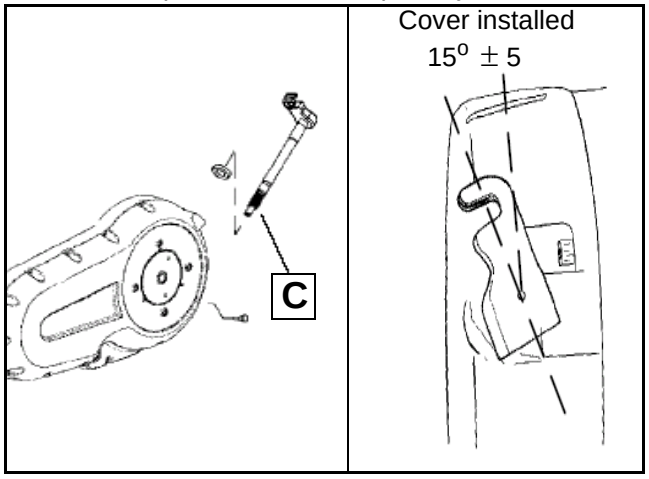
1. Protect finish of pinion shaft (A). Use an adjustable wrench to rotate arm toward clutch cable and remove cable from pinion shaft.



2. Remove primary cover cap plate, cover plate, and O-ring (page 9.6).
3. Remove dog point screw (B).



4. Pull clutch pinion shaft out of primary cover.



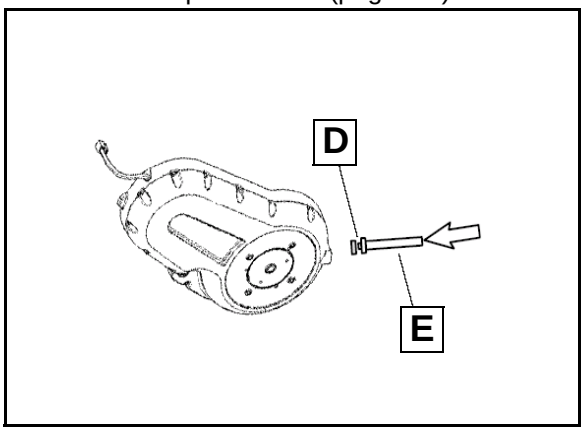
5. Inspect pinion shaft gear teeth (C) for cracks, broken teeth, or wear.

CLUTCH PINION SHAFT BEARING INSPECTION

1. Apply engine oil to the bearings.
2. Temporarily install pinion shaft into primary cover.
3. Turn shaft by hand. Observe feel of bearings. Replace bearings if rough or notched action is noticed.

CLUTCH PINION SHAFT SEAL REMOVAL & INSTALLATION

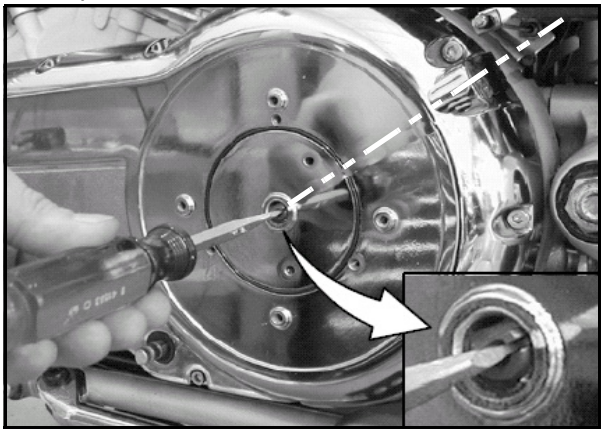
1. Remove clutch pinion shaft (page 9.7).



2. Carefully pry seal (D) out of primary cover.
3. Lubricate outer edge of new seal with engine oil and sealing lip with grease.
4. Drive seal into place with a suitable driver (E).

CLUTCH PINION SHAFT INSTALLATION

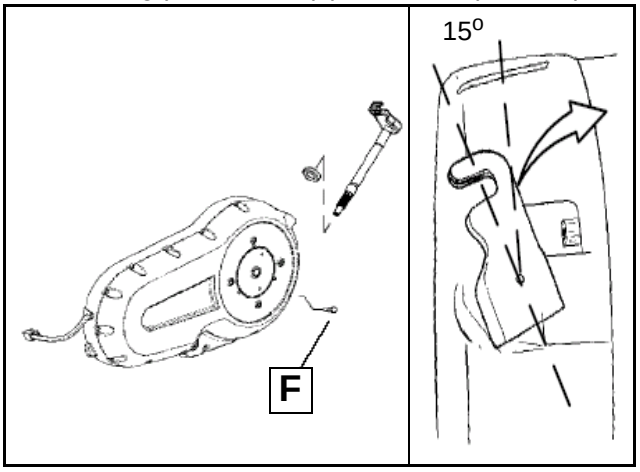
1. Lubricate and install clutch pinion shaft. Rotate release rack with screwdriver until rack teeth align with teeth of pinion shaft.
2. Push pinion shaft into cover until seated.



3. Rotate arm toward clutch cable until it stops. The arm must be positioned at a $15^{o}\pm5^{o}$ angle to primary cover

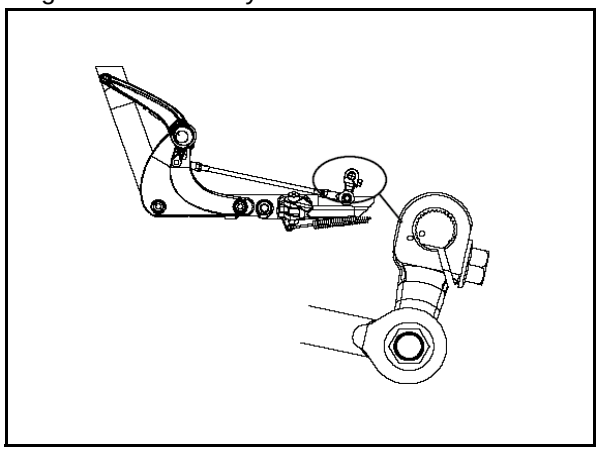
parting line when it stops. If angle is not correct, lift arm, rotate as needed, and re-install until angle is correct.

4. Install dog-point screw (F) to 4.5 Nm (40 lb-in.).



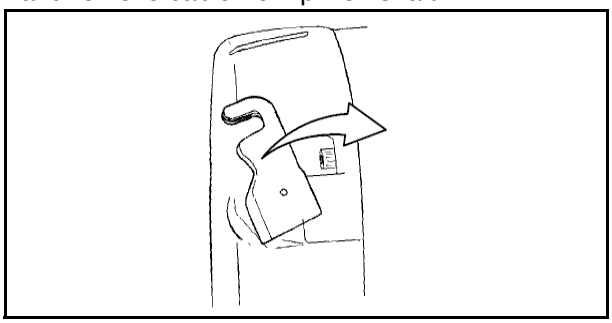
PRIMARY COVER REMOVAL

1. Refer to exploded view on page 9.4.
2. Remove shift linkage and footrest as an assembly (page 9.3). Note dots on arm and shaft must be aligned for assembly.

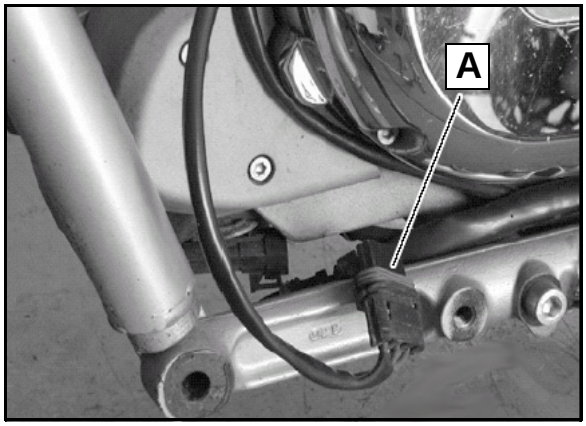


Clutch Cable Removal From Release Arm

3. Protect finish of pinion shaft release arm and use an adjustable wrench to rotate arm toward clutch cable and remove cable from pinion shaft.



4. Disconnect regulator/rectifier 2 pin connector so stator wire 3 pin connector (A) can be pulled clear of frame.



5. Remove cap plate and cap plate seal (page 9.6).
6. Drain engine oil into suitable container.

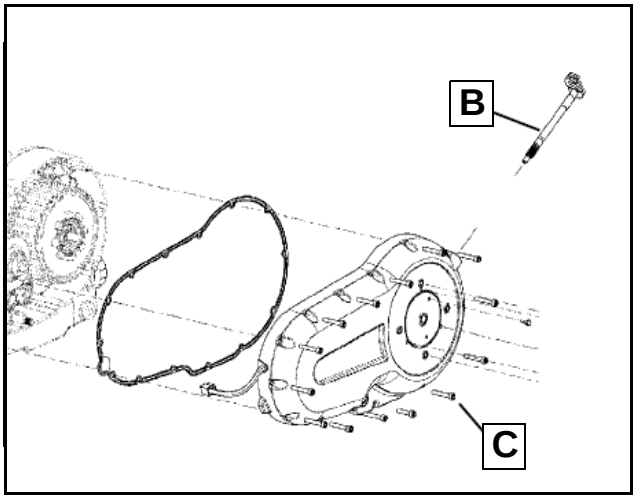
NOTE: Primary cover can be removed without draining the engine oil. Use a suitable oil drain pan under the primary cover to catch the oil.

7. Remove clutch pinion shaft (B) (page 9.7).

NOTE: Pinion shaft removal is not required for primary cover removal.

8. Remove primary cover screws.

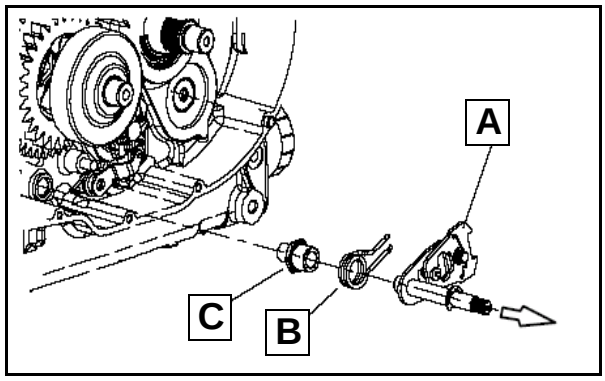
NOTE: Note position of shorter screw (C) in the hole just to the rear of shift shaft.



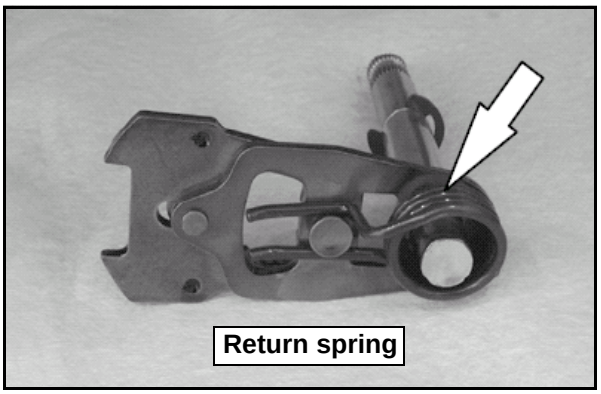
9. Remove primary cover.

SHIFT RATCHET REMOVAL & INSPECTION

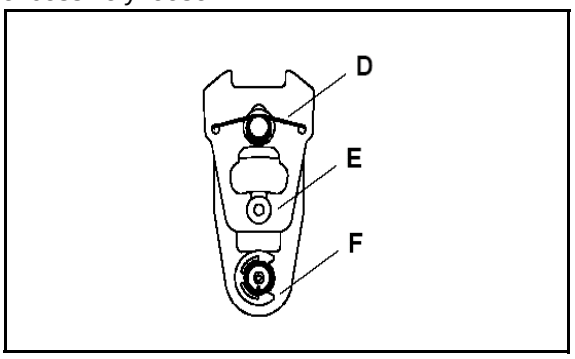
1. Shift transmission into neutral.



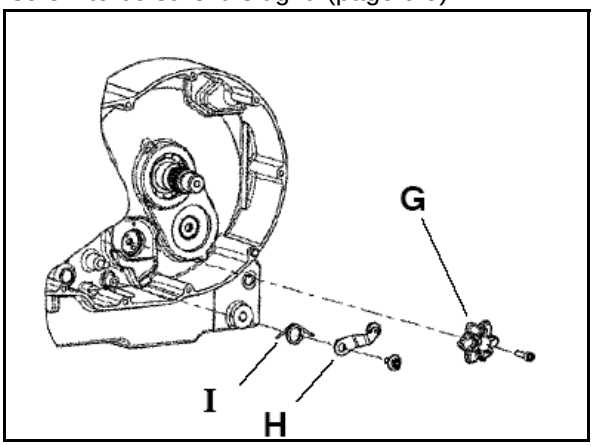
2. Remove primary cover. Refer to page 9.8.
3. Pull straight outward on shaft to remove the shift ratchet assembly (A) with return spring (B) attached.
4. Inspect shift shaft adapter (C) on crankcase for wear and verify it is tight.
5. Inspect shift shaft return spring for cracks or loss of tension. The spring should have enough tension to keep the shift shaft centered.



6. Inspect shift shaft for wear or damage.
7. Inspect compression spring (D) for tension. The spring should apply enough tension on the shift ratchet mechanism to keep it extended.
8. Inspect fit of rivet (E) on shift ratchet assembly. It should allow for free movement, but not be excessively loose.



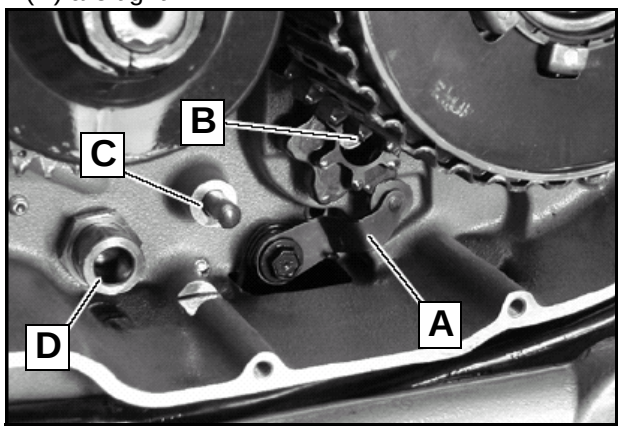
9. Inspect fit of locating retainer clip (F) and all parts of ratchet for cracks or damage.
10. Inspect cases around shift shaft adapter for cracks.
11. Inspect shift star (G) on shift drum. Check retaining screw to be sure it is tight. (page 9.5)



12. Inspect detent roller arm (H) for wear or damage.
13. Inspect spring (I) for proper tension.
14. Check retaining bolt to be sure it is tight. (page 9.5)

SHIFT RATCHET INSTALLATION

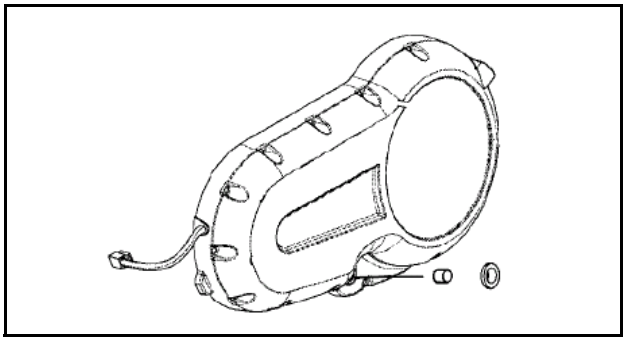
1. Install detent roller arm (A) with spring. Refer to page 9.5 for assembly view and torque values. Be sure shift star screw (B), pin (C), and shift shaft adaptor (D) are tight.



2. Apply a small amount of lithium grease to ratchet shaft and shift shaft adaptor.
3. Install shift ratchet into shift shaft adaptor with centering spring attached by pushing shaft inward until seated
4. Engage ratchet with shift star.
5. Install clutch. Refer to page 9.18.

SHIFT SHAFT BEARING & SEAL REPLACEMENT

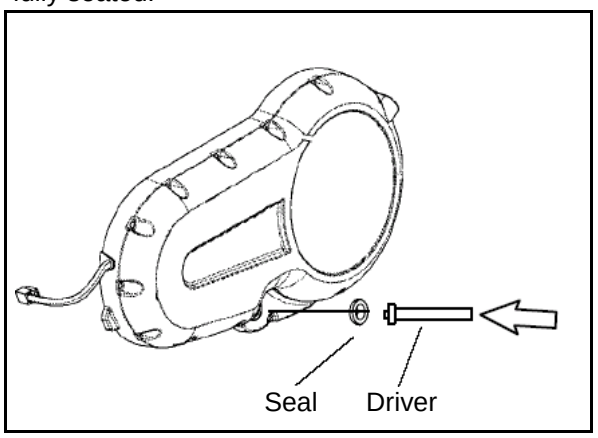
1. Remove primary cover (page 9.8). Carefully pry shift shaft seal from cover.



2. Using a suitable arbor and arbor press, press bearing from inside of cover to outside.
3. Apply assembly lube to inner & outer surfaces of new bearing.

Moly assembly paste PN: 2871460

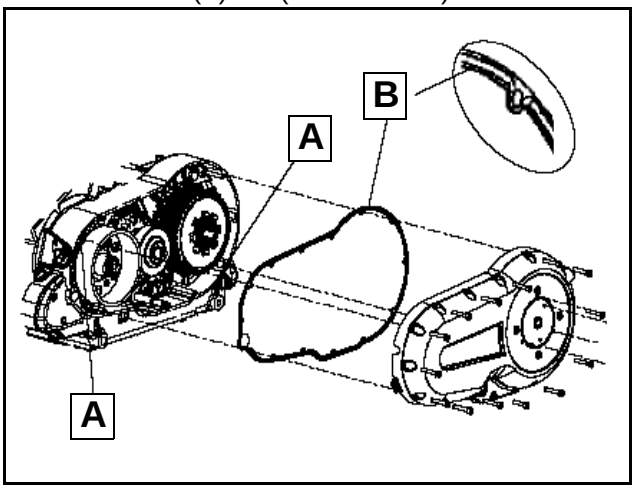
4. Press bearing into place with numbered side out until fully seated.



5. Apply a small amount of grease to lip of seal and apply engine oil to outside of seal.
6. Drive seal into place with a seal driver slightly smaller than the O.D. of seal.
7. Install primary cover. (page 9.11)
8. After installing primary cover, be sure shift shaft returns freely to the centered position after rotating up or down.

PRIMARY COVER INSTALLATION

1. Clean gasket surfaces of crankcases and cover.
2. Verify alignment pins (A) are in position and pinion shaft is removed from cover.
3. Place new primary cover gasket on crankcase with sealant bead (B) out (toward cover).

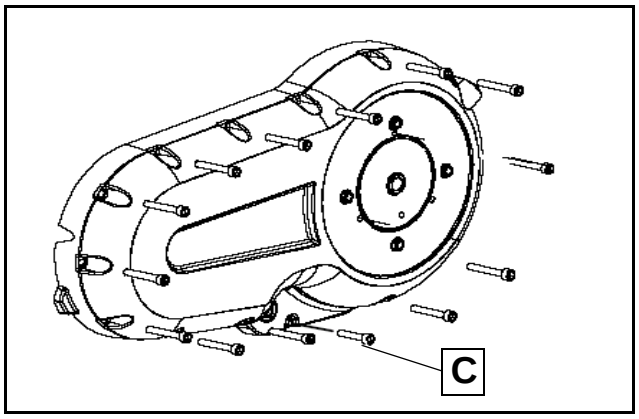


4. Install cover keeping it parallel to crankcase to prevent binding on shift shaft.

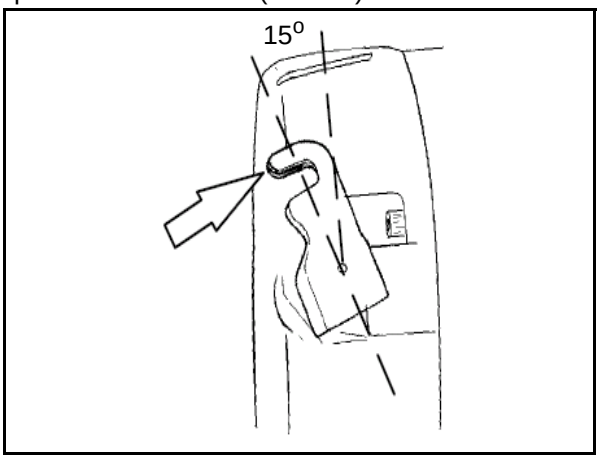
> ⚠ CAUTION
>
> The flywheel magnets have considerable energy. DO NOT place fingers between primary cover gasket surface and other parts or they may be pinched.

5. Install primary cover screws.

NOTE: Short screw (C) is placed in hole just behind shift shaft.



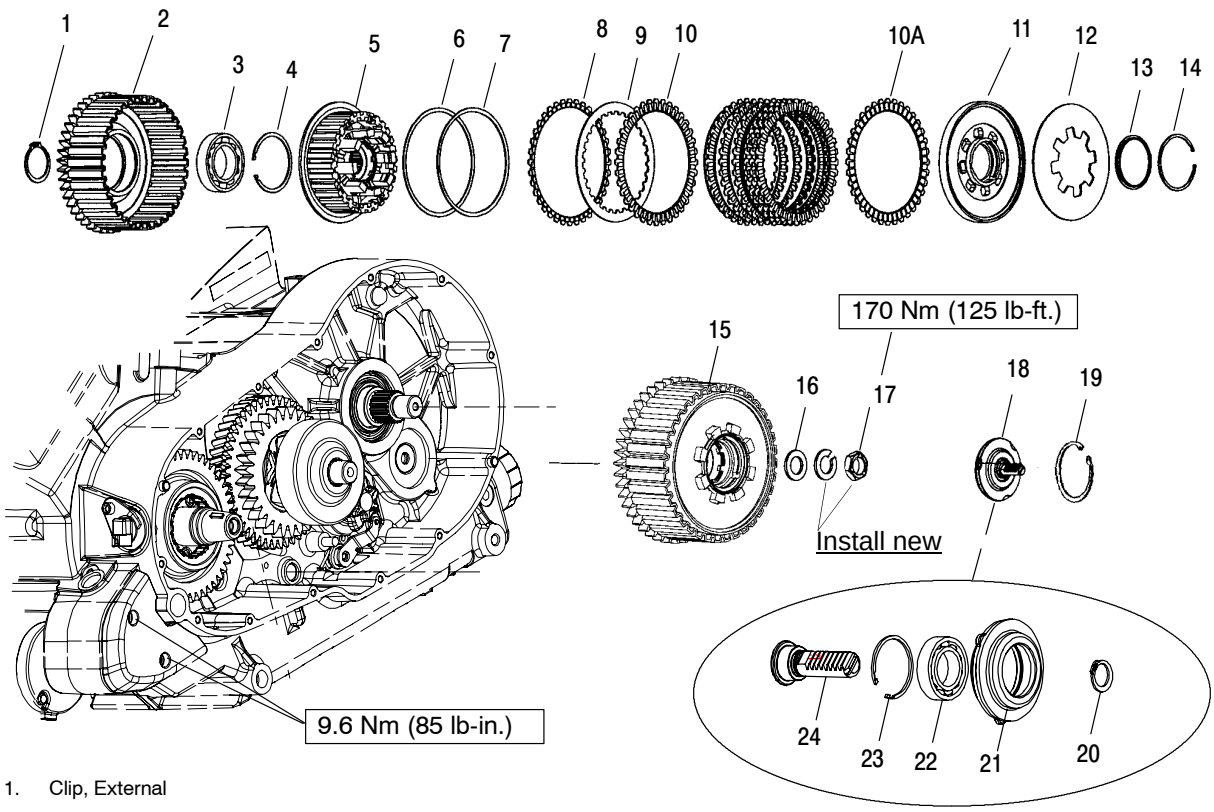
6. Torque screws in two steps to 85 in. lbs. (10 Nm). Repeat torque on all screws.
7. Install pinion shaft (page 9.7).
8. Install cap plate with seal (page 9.6).
9. Install clutch cable on pinion shaft arm and adjust clutch lever freeplay (Chapter 2).
10. Install shift linkage arm on shift shaft with dots aligned and install left footrest assembly. Torque linkage arm pinch bolt to 9.5 Nm (84 lb-in).



11. Connect regulator / rectifier 3 pin connector, then connect the 2 pin connector.
12. Check engine oil and fill to proper level (Chapter 2).

CLUTCH SERVICE

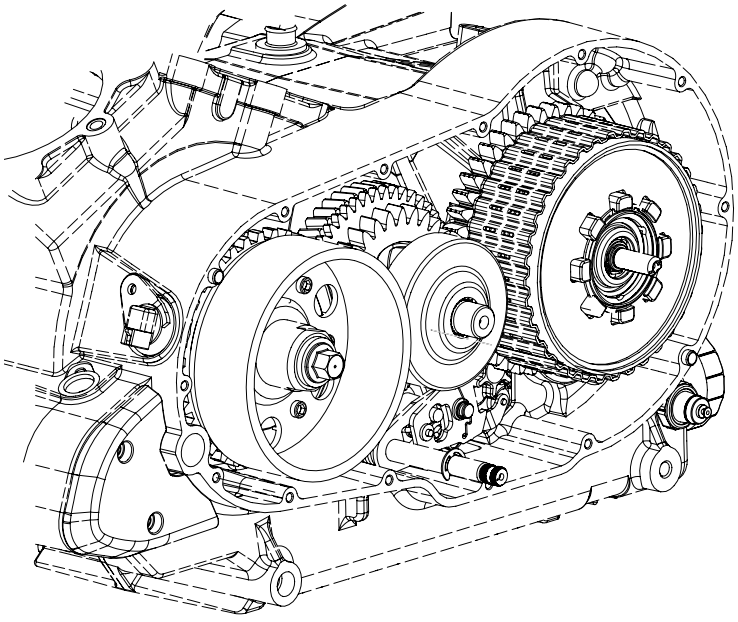
CLUTCH ASSEMBLY VIEW & TORQUE



1. Clip, External
2. Asm., Gear/Basket
3. Bearing, Ball
4. Snap Ring, Internal
5. Hub, Clutch
6. Seat, Judder Spring
7. Spring, Diaphragm, Judder
8. Plate, Friction, Judder (1)
9. Plate, Separator (9)
10. Plate, Friction (8)

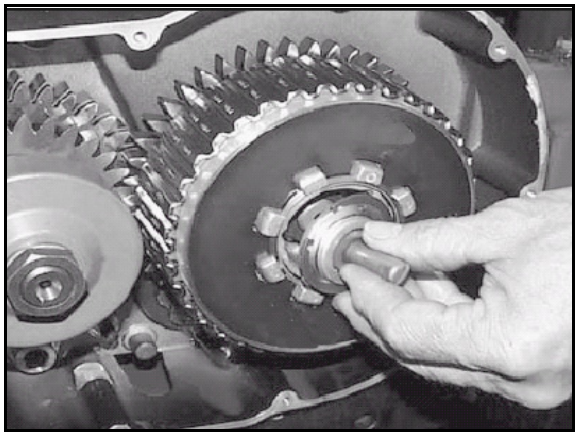
10A Plate, Friction, Special Outer (1)

11. Plate, Pressure
12. Spring, Clutch, Diaphragm
13. Seat, Snap Ring
14. Snap Ring, Internal
15. Asm., Clutch (Asm., Clutch Pack Incl 9&10)
16. Washer
17. Nut, 20x1.5
18. Asm, Rack Insert (Incl 22,23,24)
19. Circlip, Internal
20. Ring, Retaining, External
21. Insert, Pressure Plate
22. Bearing, Ball
23. Snap Ring, Internal
24. Rack, Clutch



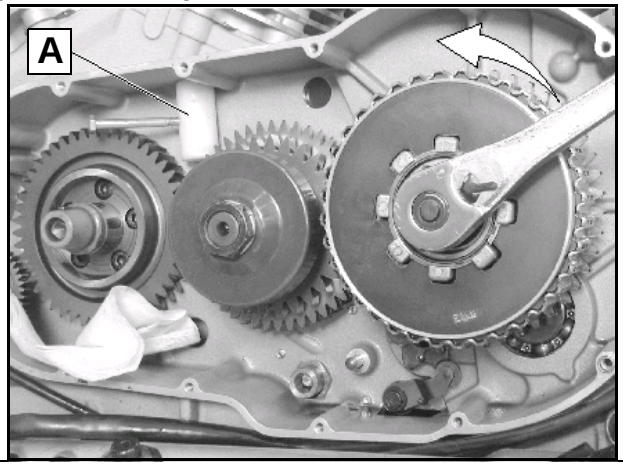
CLUTCH REMOVAL

1. Remove primary cover (page 9.8).
2. Using an internal snap ring pliers, remove clutch rack.



3. Install engine lock tool (A) between crankcase and split gear to prevent gear rotation and loosen clutch nut. (flywheel / starter gear removal is not required).

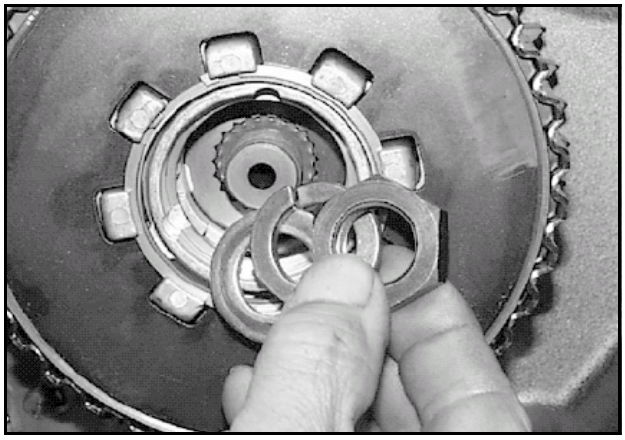
Special tool: Engine lock tool PV-43502-A



⚠ CAUTION

DO NOT LOCK ENGINE USING SQUARE TIMING GEAR TEETH. Use caution when removing nut and keep hands and body clear in case tool slips off gears.

4. Remove clutch nut, lock washer, and flat washer. Discard lock washer and nut.



5. Remove clutch assembly from clutch shaft.

CLUTCH DISASSEMBLY

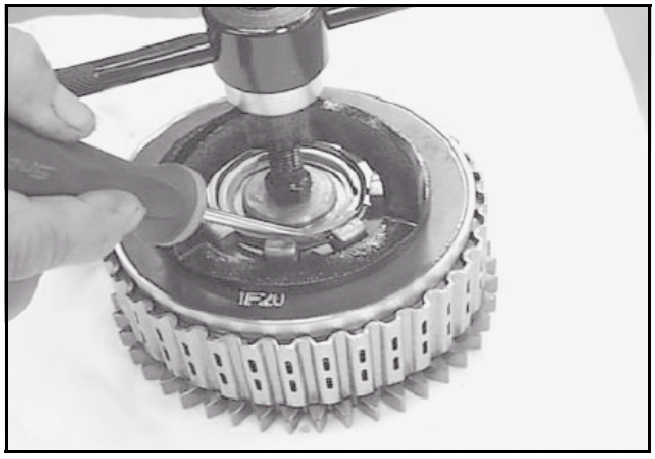
1. Set clutch on a clean shop towel or work surface. Install clutch spring compressor tool.

⚠ CAUTION

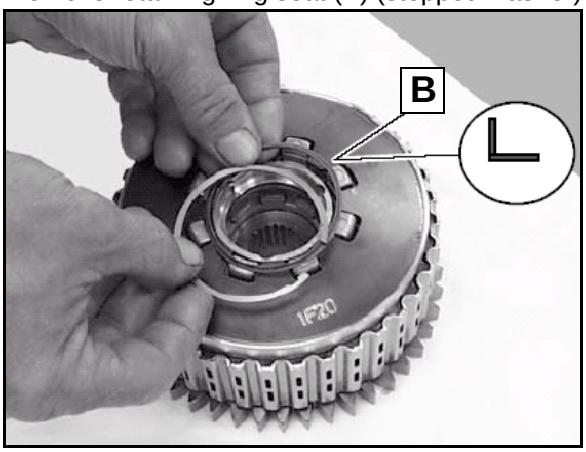
Clutch is under spring pressure. WEAR EYE PROTECTION.

2. Compress clutch spring.
3. Remove retaining ring.

Special tool: Clutch spring compressor PV-45032

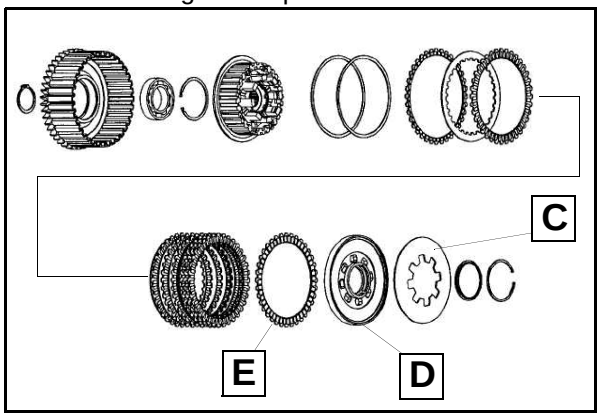


4. Remove retaining ring seat (B) (stepped washer).



5. Remove tool from clutch.

6. Refer to exploded view on page 9.12. Disassemble clutch following the steps below.



7. Lay parts out for inspection in order of removal, and keep them in order.

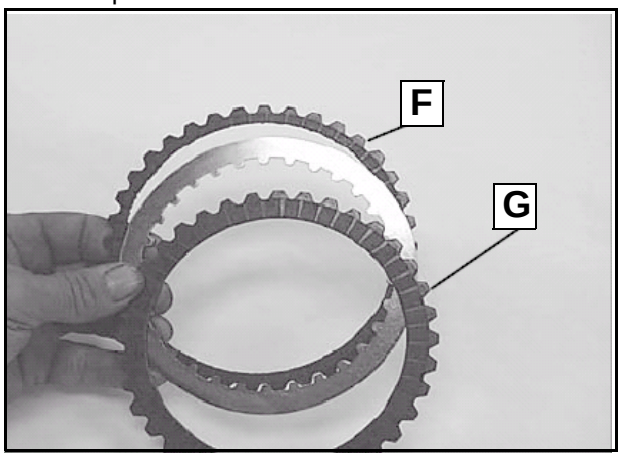
8. Remove clutch spring (C) and pressure plate (D).

9. Remove (1) special friction plate (E) that is placed outermost against pressure plate. This plate has a different friction material.

10. Remove (9) identical steel plates that separate the (8) identical friction plates.

11. Remove judder friction plate, judder spring, and judder spring seat.

12. Note difference between judder plate (F) and next friction plate (G). The judder plate is the innermost friction plate on the clutch hub.



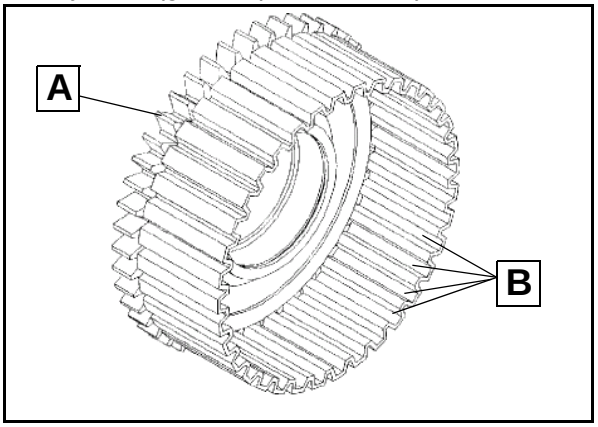
CLUTCH INSPECTION

1. Clean clutch plates, inner hub, and outer basket.

Clutch Basket

2. Inspect clutch gear teeth (A) for wear, cracks or damage.

3. Inspect inside surfaces (B) of basket for cracks or heavy wear (grooves) from clutch plates.



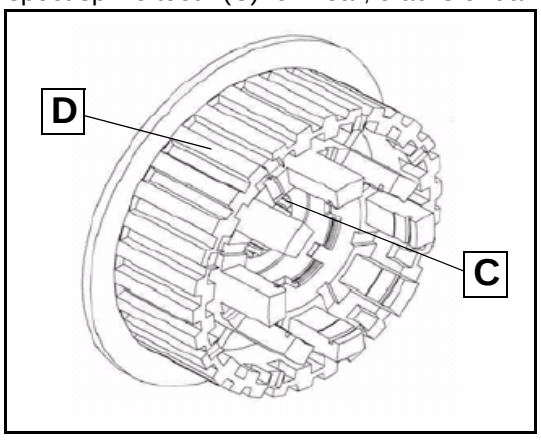
4. Replace parts that fail inspection

5. Rotate hub, inspecting for smooth bearing feel without any play.

6. Lubricate bearing with engine oil.

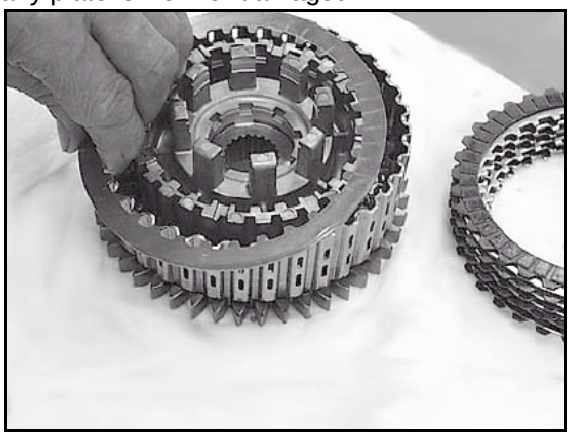
CLUTCH HUB

7. Inspect spline teeth (C) for wear, cracks or damage.

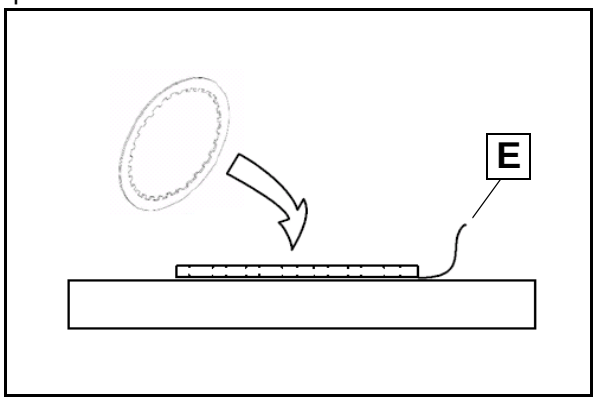


8. Inspect surface of separator plate guides (D) on outer edge of hub for wear, grooves, or damage.

9. Visually inspect friction and steel plates for wear or damage on both surfaces. Replace plates as a set if any plate is worn or damaged.

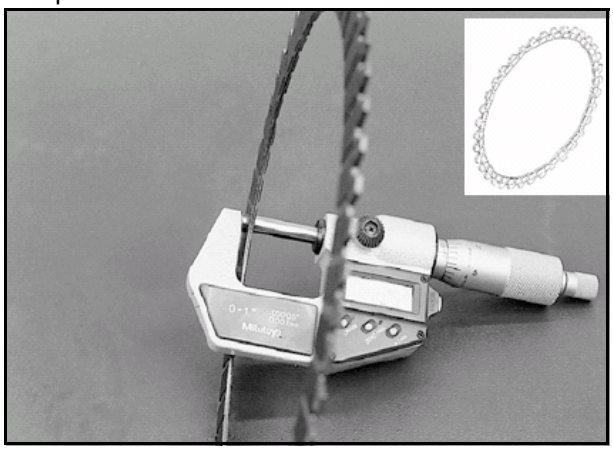


10. Replace steel plates if grooved, distorted or discolored. Inspect plates for distortion by placing each plate on a precision flat surface. Insert a feeler gauge (E) between plate and flat surface in several places.



Clutch steel plate warp limit: .20mm (.008in)

11. Measure thickness of friction plates in several places. Thickness of plate should be the same at each place. Replace entire clutch plate set if any plate fails inspection.

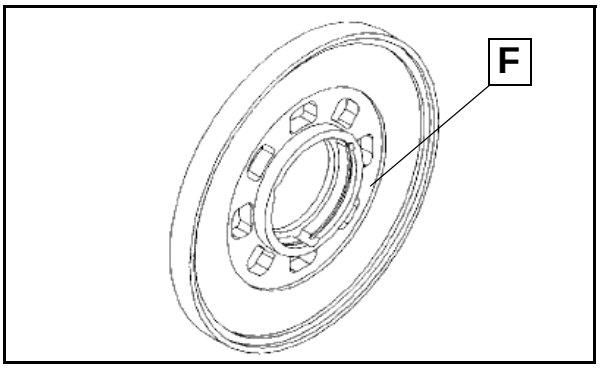


Friction plate thickness service limit:
2.00 mm (.078 in)

CLUTCH PRESSURE PLATE INSPECTION

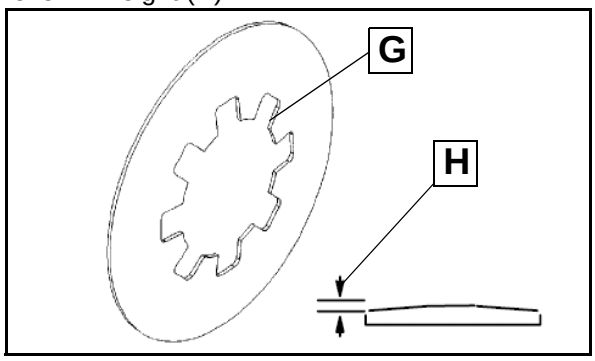
12. Inspect pressure plate for cracks, scoring, or steps on friction surface.

13. Inspect lifter retaining ring groove (F) for cracks or chips. Replace pressure plate if it fails inspection.



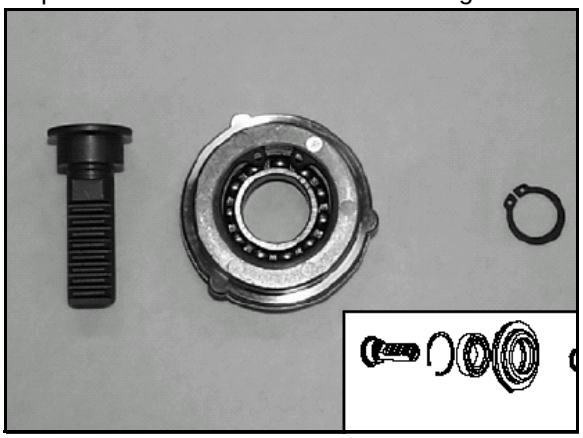
CLUTCH SPRING

14. Inspect clutch diaphragm spring (G) for cracks or distortion.
15. Inspect inner and outer edges of spring carefully for unusual wear or damage. Outer edge should lay flat against a surface plate and inner tabs (A) should be even in height (H).

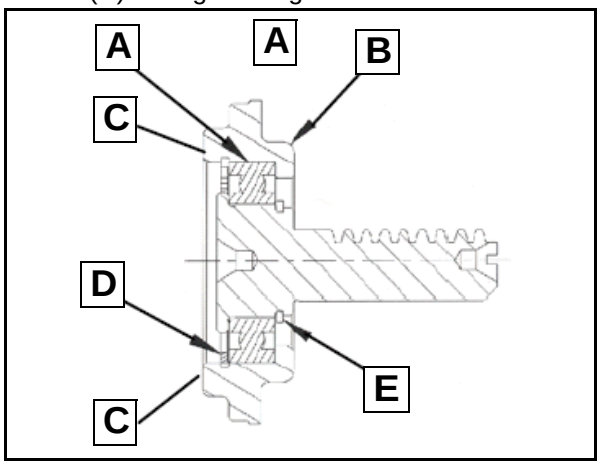


CLUTCH RELEASE RACK AND BEARING

16. Inspect clutch rack for broken or damaged teeth.



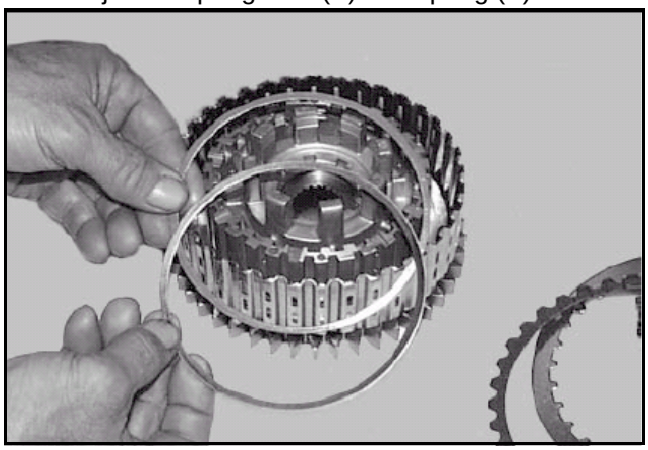
17. Remove retaining ring and disassemble as shown.
18. Inspect lifter bearing visually for any signs or wear or discoloration. Rotate bearing inner race with your finger and check for smooth movement and no play.
19. If bearing (A) fails inspection, remove it from housing (B) using an arbor press. Support housing evenly in areas (C) during bearing removal.



20. Press new bearing into housing until seated and past snap ring groove (D). Press only on outer race of bearing.
21. Install rack into bearing as shown.
22. Install retaining ring (E) with sharp (machined) edge away from bearing (toward rack teeth). Be sure it is fully seated.

CLUTCH ASSEMBLY

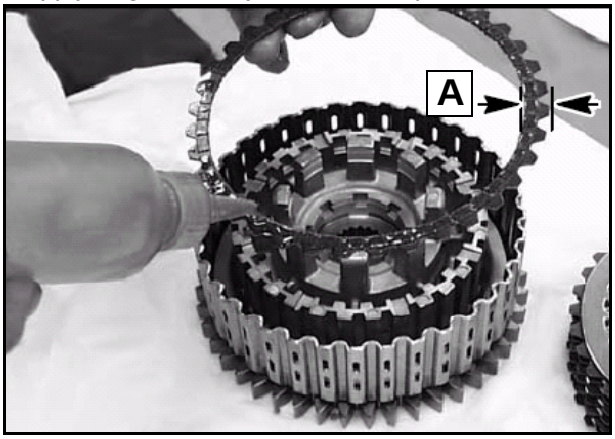
1. Refer to exploded views on page 9.12. Apply engine oil to judder spring seat (A) and spring (B).



2. Install judder spring seat, then judder spring.

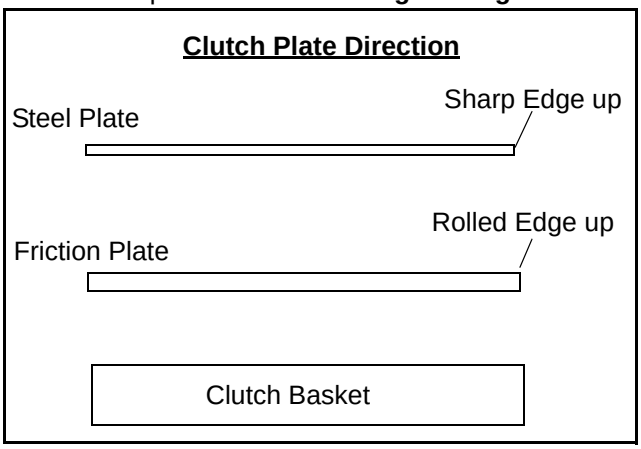
NOTE: Judder spring must be installed with concave side facing UP (toward outside of basket). The tallest edge of spring is outermost.

3. Apply engine oil to judder friction plate and install.



NOTE: This plate has a thinner profile (A) than the rest of the friction plates.

NOTE: Feel the edge of steel plates and friction plates with your finger. One side of plate is machined at the edges and the other side is a rolled edge (rounded). Install steel plates with **machined edge facing UP**. Install friction plates with **rolled edge facing UP**.



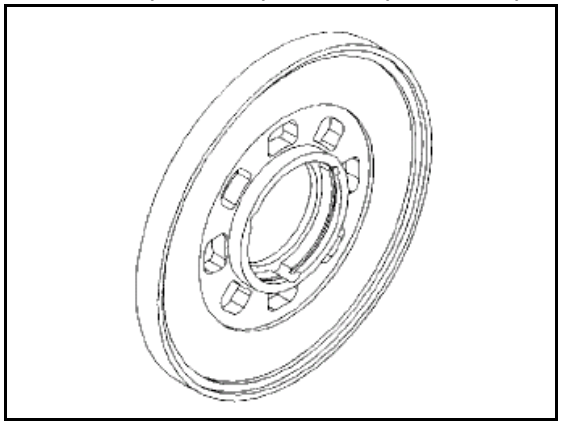
4. Place an oiled steel plate into clutch basket with machined edge UP.

NOTE: If friction plates are new, soak them in clean engine oil for a few minutes before installing.

5. Continue stacking oiled clutch plates into clutch basket alternating friction and steel plates until all are installed, ending with the special friction plate.

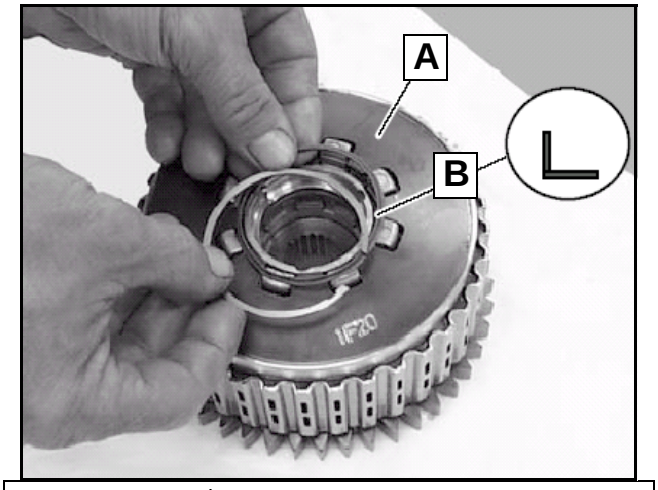
NOTE: Be sure to install special friction plate last (against pressure plate). This plate has a different material than the other (8) main friction plates. See illustrations on page 9.12.

6. Install clutch pressure plate on top of clutch packing.



7. Install clutch diaphragm spring (A) with concave side down on top of pressure plate.

8. Place retaining ring seat (B) and retaining ring over clutch assembly before installing clutch spring compressor tool. Flange on inner edge of seat faces UP as shown.



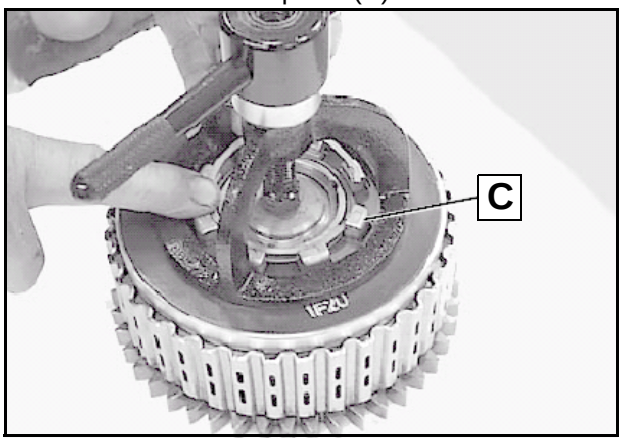
CAUTION

Tool will be under spring pressure. WEAR EYE PROTECTION.

9. Install compressor tool and compress spring so ring seat can be positioned and retaining ring installed.

Special tool: Clutch spring compressor PV-45032

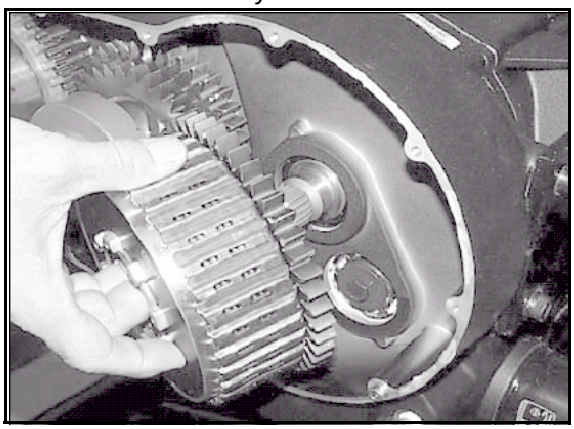
10. Install retaining ring with machined (sharp) edge up. Position retaining ring so one end of retainer is located on one of the posts (C).



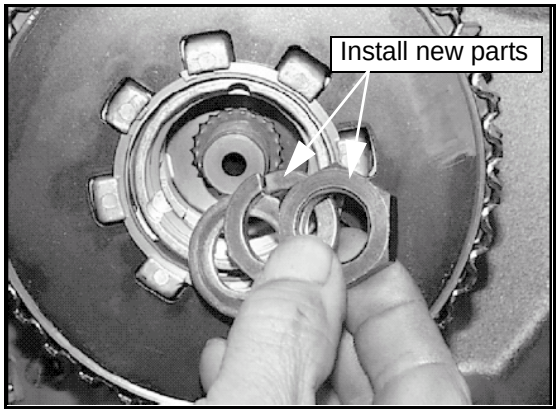
11. After retaining ring is installed, slowly release pressure from tool and guide flange into position under the retaining ring.
12. Remove spring compressor tool and inspect retaining ring to be sure it is fully expanded.

CLUTCH INSTALLATION

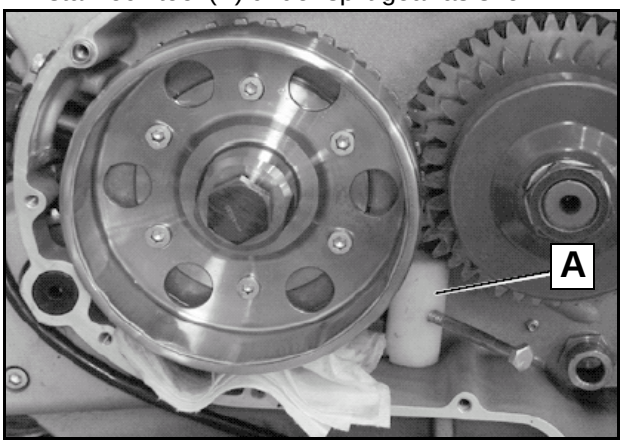
1. Install clutch assembly onto clutch shaft.



2. **Clean shaft threads** with Loctite™ Primer N.



3. Install washer, a new lock washer, and new nut.
4. Install lock tool (A) under split gear as shown.



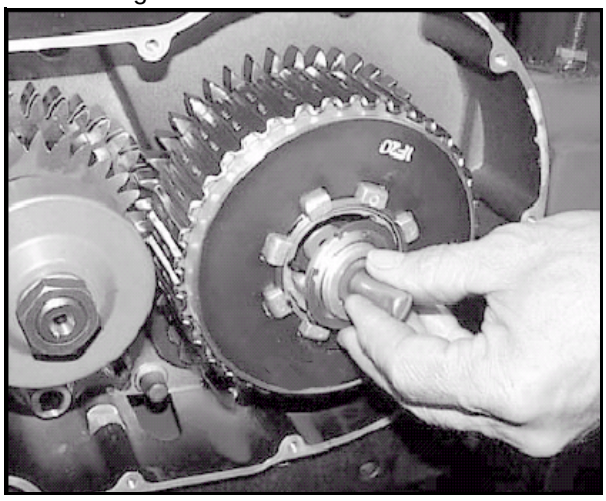
Engine lock tool PV-43502-A

> ⚠ CAUTION
>
> DO NOT LOCK ENGINE USING SQUARE TIMING GEAR TEETH. Use caution when tightening nut and keep hands and body clear in case tool slips off gear

5. Torque nut to 170 Nm (125 lb-ft).

TORQUE: Clutch Nut
170Nm (125 lb-ft)

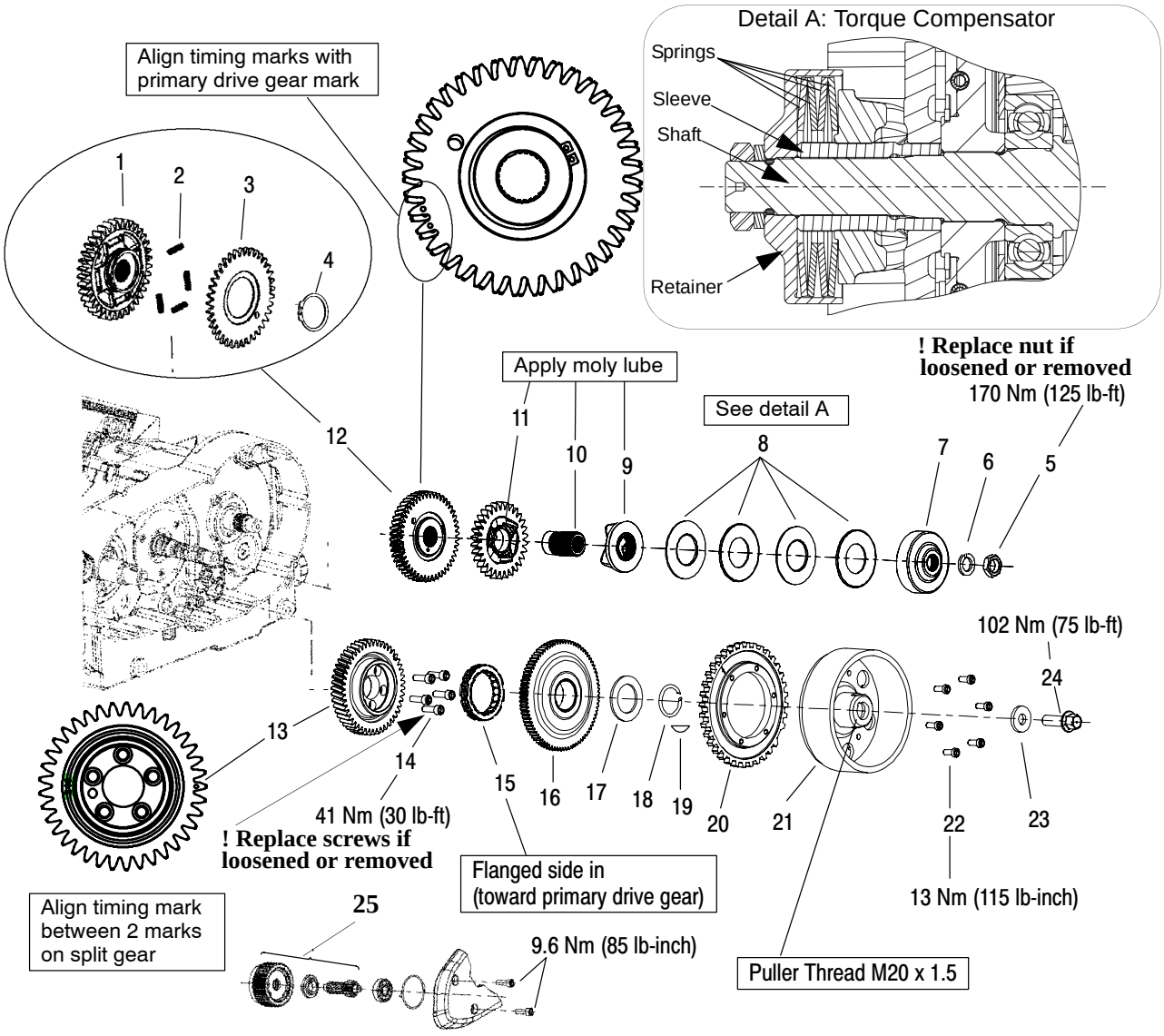
6. Install clutch lifter assembly. Be sure retaining ring is seated in groove.



7. Install primary cover. Refer to page 9.11.
8. Check engine oil and fill to proper level.

TORQUE COMPENSATOR / SPLIT GEAR

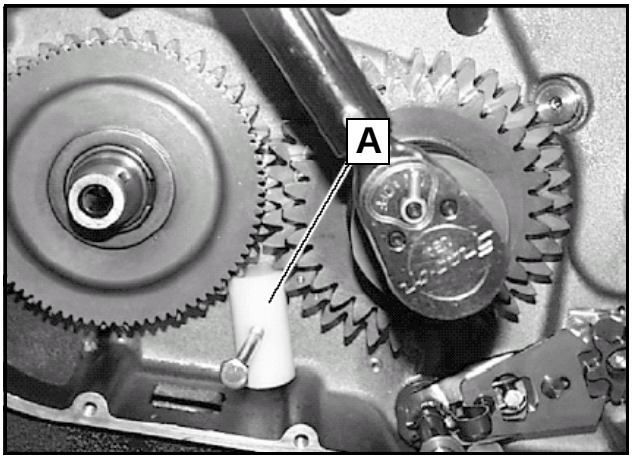
PRIMARY DRIVE ASSEMBLY VIEW & TORQUE



1. Gear, Split, Drive, 37T
2. Spring, Split Gear (4)
3. Gear, Split, Backlash
4. Ring, Retaining
5. Nut M20 x 1.5 (Pre-applied locking agent)
6. Washer, Split Lock
7. Retainer, Compensator
8. Spring, Belleville Compensator (4)
9. Slider, Compensator
10. Sleeve, Compensator
11. Gear, Compensator
12. Asm, Split Gear, 37T (Incl items 1-4)
13. Gear, Crankshaft
14. Screw (5) 8x25 (Pre-applied locking agent)
15. Clutch, Starter Drive
16. Asm, Crankshaft Gear Starter Drive
17. Washer, Flat
18. Ring, Retaining
19. Key, Woodruff
20. Adaptor, Flywheel
21. Flywheel
22. Screw (6)
23. Washer, Flat
24. Bolt, Oil Jet

TORQUE COMPENSATOR REMOVAL

1. Remove primary cover. Refer to page 9.8.

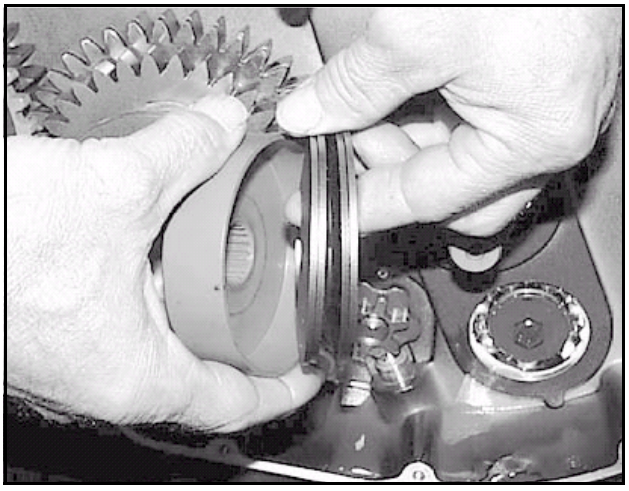


2. Install engine lock tool (A) as shown and remove torque compensator nut and lock washer. Discard the nut and lock washer.

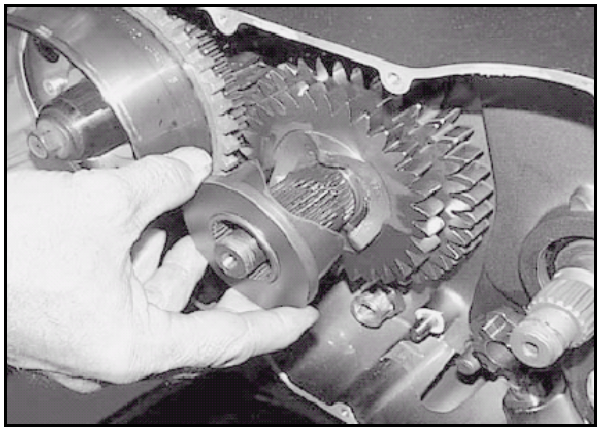
Engine lock tool PV-43502-A

NOTE: Flywheel shown removed for clarity. It is not necessary to remove the flywheel to service the torque compensator, including retainer plate, spring washers, slider, sleeve and (outer) compensator gear.

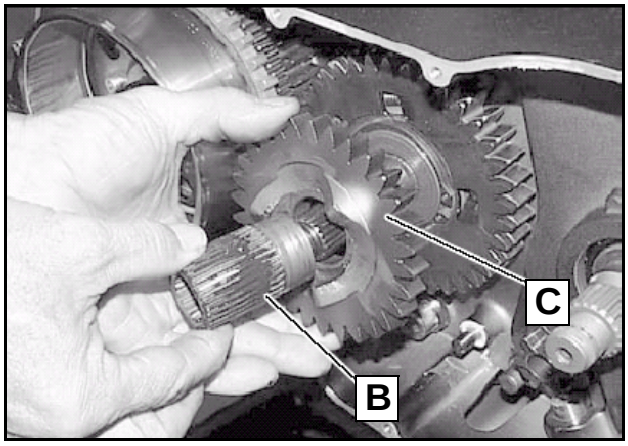
3. Remove retainer plate and Belleville springs. Note orientation of washers (concave edges of washers face each other) for installation.



4. Remove compensator slider.



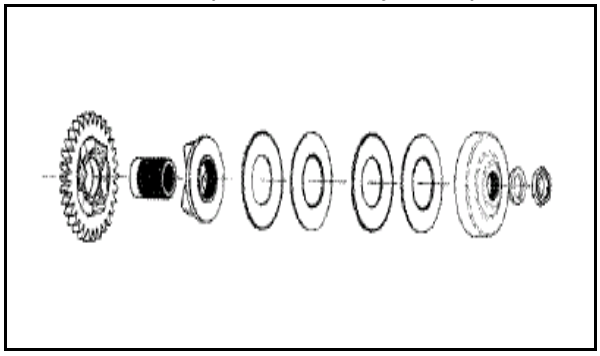
5. Remove compensator sleeve (B) and gear (C)



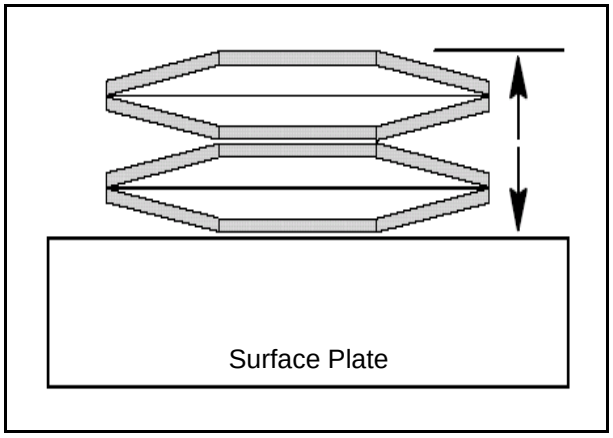
TORQUE COMPENSATOR INSPECTION

1. Inspect all parts for excessive galling or damage.

NOTE: Some polishing will be evident between the compensator gear and the compensator slider and is a normal condition. Replace assembly if ramps are worn.



2. Measure free length of torque compensator spring stack.

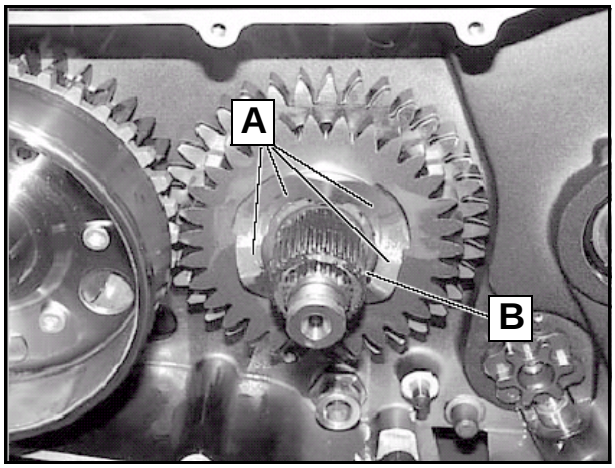


Specification: Compensator Spring Stack Height
Standard: 17.68-18.08mm
(.696 - .712 inch)

Service Limit: 16mm
.630 inch

TORQUE COMPENSATOR INSTALLATION

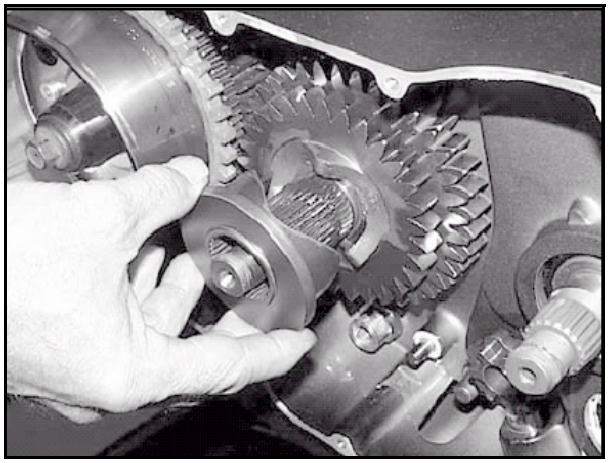
1. Apply moly paste to the back side of compensator drive gear and install along with compensator sleeve onto balancer shaft.



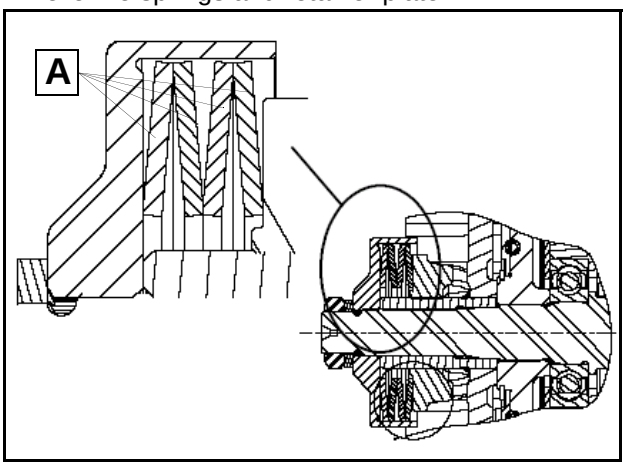
2. Apply a thin film of Moly Assembly Paste to the ramp surfaces (A) and sleeve (B).

Moly Assembly Paste: 2871460

3. Apply a thin film of Moly Assembly Paste to the ramp surfaces of the compensator slider, and install on sleeve.

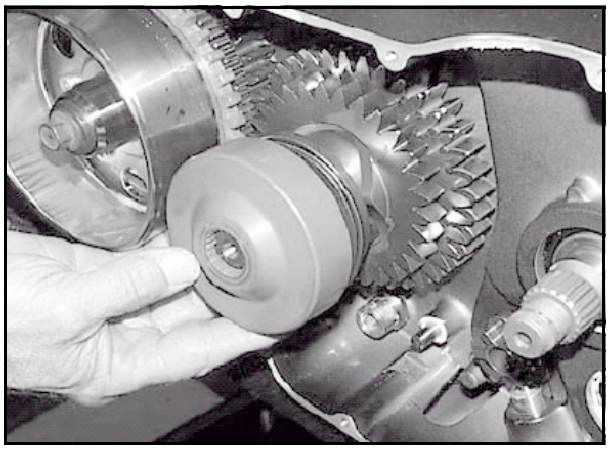


4. Apply a thin film of Moly Assembly Paste to the Belleville springs and retainer plate.

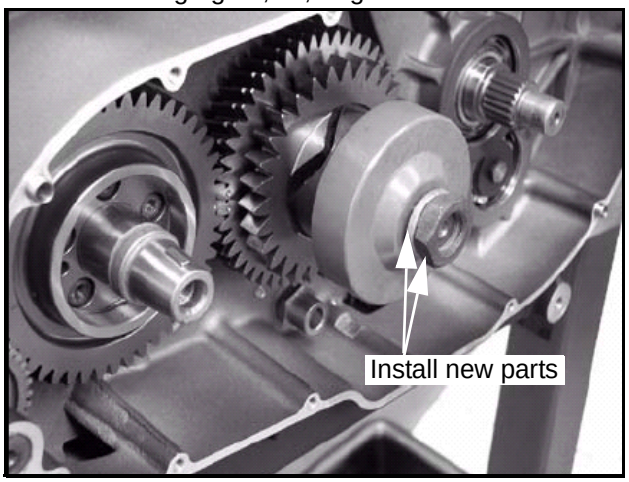


5. Be sure 4 spring washers (A) are correctly assembled, with concave edge facing each other. The assembled sets of two spring washers are stacked back to back.

6. Be sure splines in retainer plate engage splines of shaft.



7. **Clean balance shaft threads** thoroughly to remove all old locking agent, oil, or grease.



8. Install a new lock washer, and nut. The nut has a pre-applied locking agent.
9. Hold shaft by inserting lock tool between split gear and upper crankcase.
10. Torque nut to 170 Nm (125 lb-ft.).

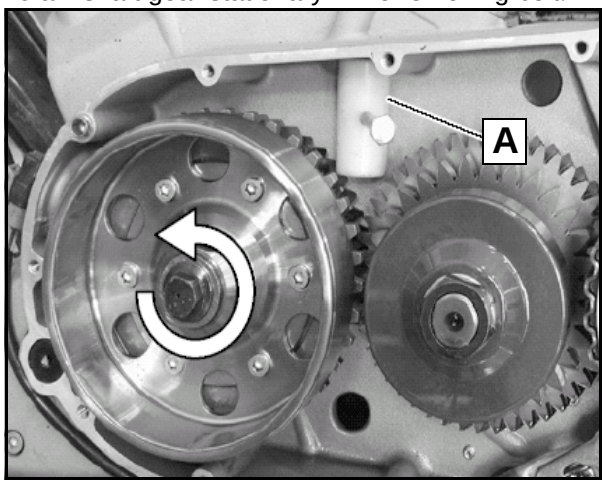
Engine lock tool PV-43502-A

TORQUE: Compensator Nut
170 Nm (125 lb-ft)

11. Install primary cover (refer to page 9.11).
12. Fill engine oil to proper level.

FLYWHEEL REMOVAL

1. Remove primary cover (page 9.8) and flywheel retaining bolt. Use engine lock tool (A) to hold crankshaft gear stationary while removing bolt.

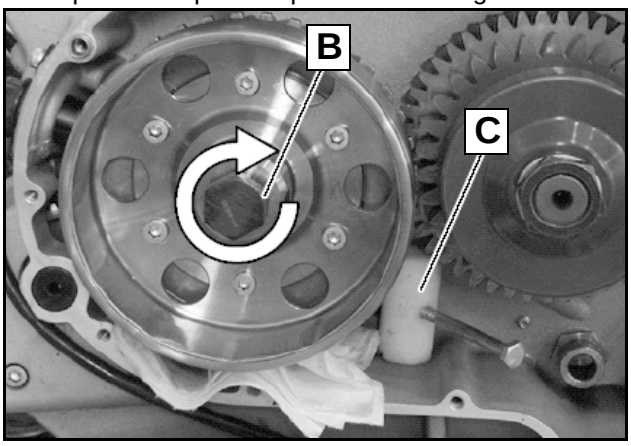


Engine lock tool PV-43502-A

CAUTION

DO NOT LOCK ENGINE USING SQUARE TIMING GEAR TEETH. Use caution when removing nut and keep hands and body clear in case tool slips off gear.

2. Remove lock tool.
3. Cover crankcase cavity under flywheel with a clean shop towel to prevent parts from falling into case.



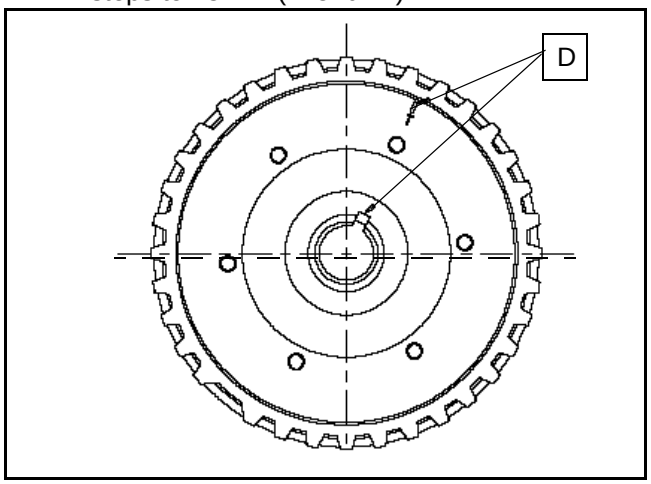
4. Install puller (B). Install lock tool (C) on bottom of gear and rotate puller clockwise to remove flywheel.

Flywheel puller PV-43533

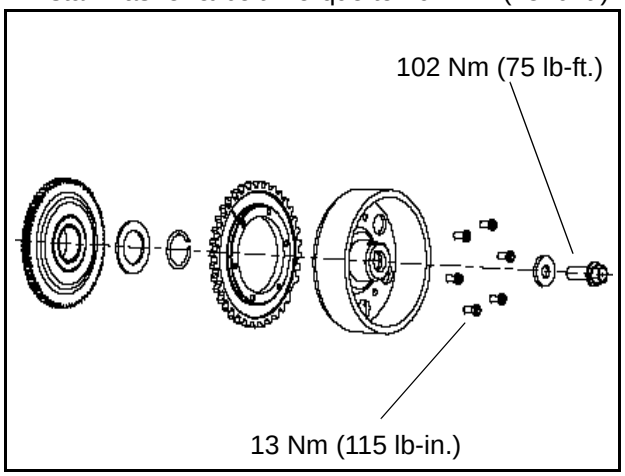
5. Remove flywheel and key.

FLYWHEEL INSTALLATION

1. If flywheel adaptor (timing gear) was removed from flywheel, install with “T” mark (D) on gear aligned with key way of flywheel. Torque screws in a cross pattern in 2 steps to 13 Nm (115 lb-in.)

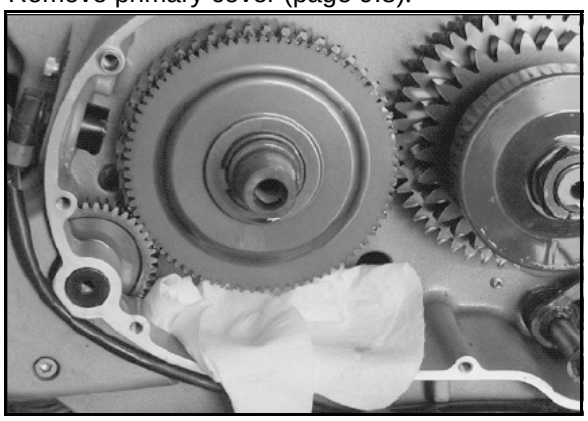


2. Clean taper of flywheel and crankshaft thoroughly.
3. Inspect condition woodruff key and install in key way on crankshaft.
4. Install flywheel on crankshaft while aligning woodruff key with key-way in flywheel.
5. Install washer & bolt. Torque to 102 Nm (75 lb-ft.).



SPLIT GEAR REMOVAL

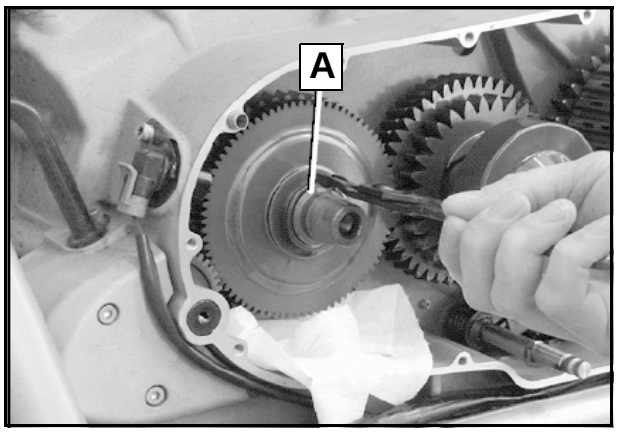
1. Remove primary cover (page 9.8).



2. Place a shop towel in the crankcase cavity.
3. Remove clutch assembly (page 9.13).
4. Remove flywheel (page 9.22).

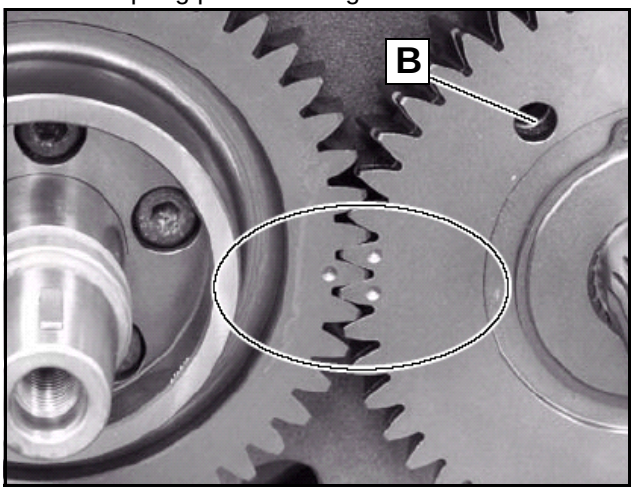
Flywheel Puller PV-43534

5. Remove starter gear retaining ring (A) with a flat-billed external ring pliers. Remove any burrs from crankshaft ring groove before removing starter gear, or starter gear bushing may be damaged when gear is removed.



6. Remove torque compensator (page 9.20).
7. Temporarily install flywheel to rotate engine until flywheel key is pointing up, and timing marks on split gear are aligned with mark on crankshaft gear.

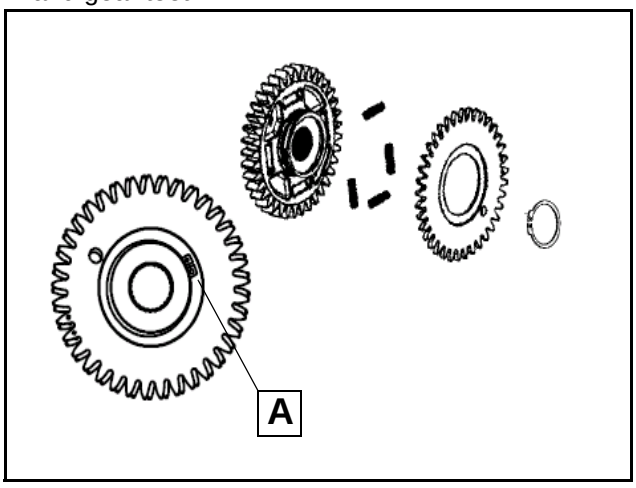
8. Insert a 1/4” pin punch in gear alignment hole (B) to relieve spring pressure on gear teeth.



9. Pull split gear off balancer shaft.

SPLIT GEAR INSPECTION

1. Remove retaining ring (A) from split gear hub and separate outer gear from inner gear. Visually inspect contact surfaces of gears, springs, spring channels, and gear teeth.

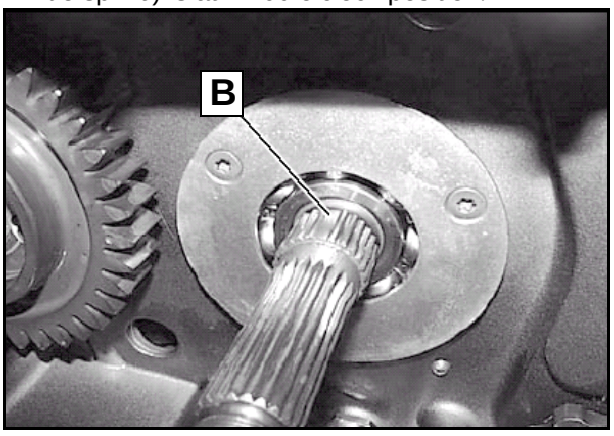


NOTE: Some normal wear polishing may be evident in the spring channels of gears. Replace the gear assembly if wear is evident.

2. After assembly, outer gear must rotate and return freely without binding on inner gear.

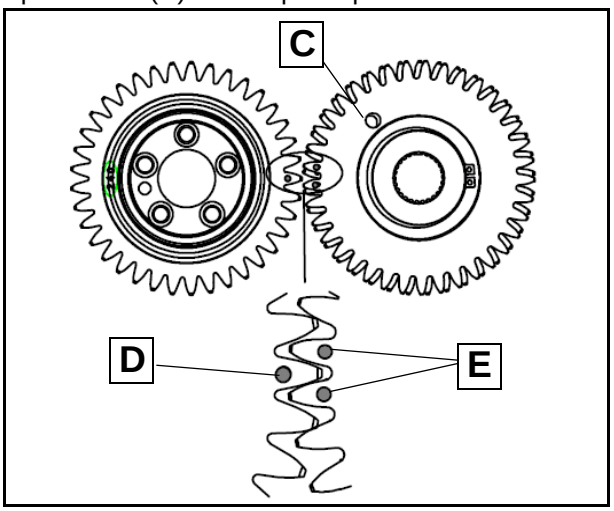
SPLIT GEAR INSTALLATION

1. Rotate balance shaft until “boss” spline (B) (double wide spline) is at 12:00 o’clock position.



2. Apply grease to balance shaft and back of split gear assembly.

3. Line up teeth of split gear assembly with 1/4" straight pin in hole (C). Leave pin in place.



NOTE: Do not allow pin to protrude out the back of the split gear assembly.

4. Place split gear on balance shaft with alignment dots at the 9:00 o’clock position.

5. Align “boss” splines of balance shaft and split gear while engaging crankshaft gear with split gear. Dot on crankshaft gear (D) must be between the 2 dots on balance gear (E).

6. Push split gear inward until fully seated and flush with crankshaft gear.

7. Install torque compensator (page 9.21), starter gear (page 9.28), flywheel (page 9.23), clutch (page 9.18), and primary cover (page 9.11).

STARTER DRIVE

STARTER DRIVE REMOVAL

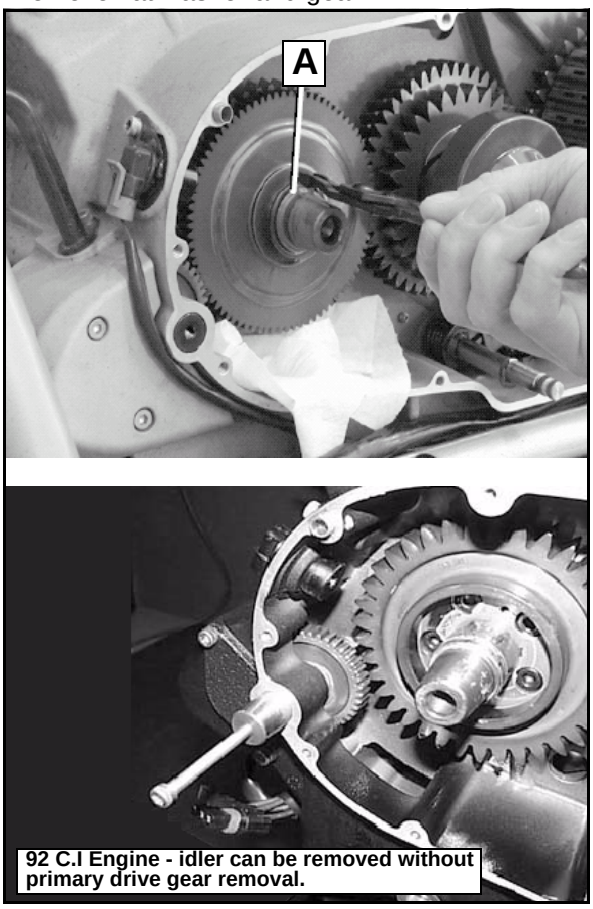
NOTE: On 100 C.I engines, the starter gear and primary drive (crankshaft) gear must be removed before the starter idler gear or starter torque limiter clutch and shaft can be removed from crankcase.

1. Remove primary cover (page 9.8).
2. Remove flywheel (page 9.22).

Flywheel Puller PV-4353

Ring Pliers PV-43534

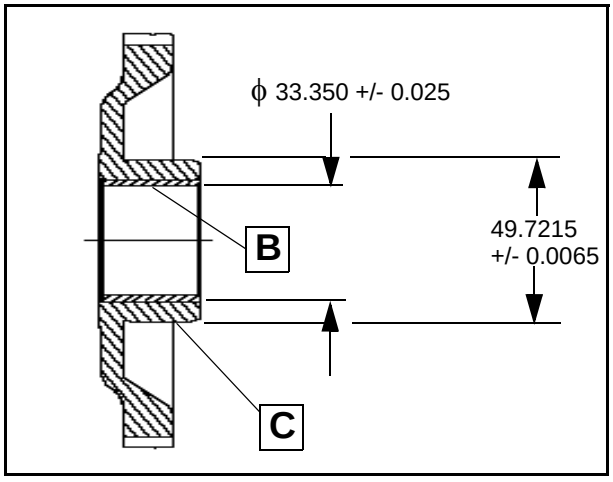
3. Place a shop towel in the crankcase cavity.
4. Remove starter gear retaining ring (A) with ring pliers. Remove any burrs from crankshaft ring groove before removing starter gear, or starter gear bushing may be damaged when gear is removed.
5. Remove flat washer and gear.



92 C.I Engine - idler can be removed without primary drive gear removal.

STARTER GEAR INSPECTION

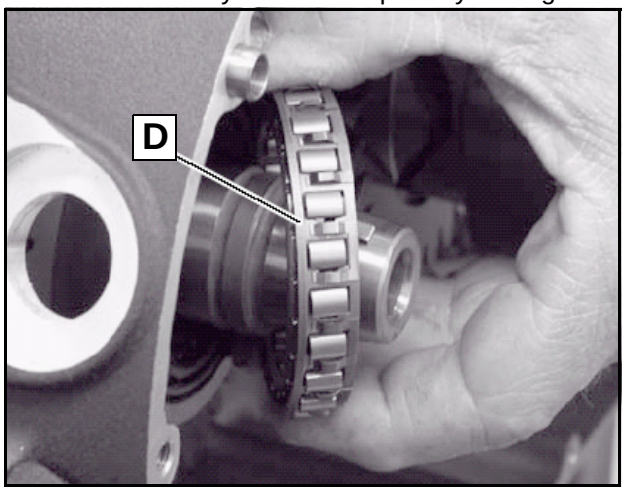
1. Inspect gear teeth for chips, cracks or excessive wear.



2. Inspect bushing (B) for excessive wear and scoring.
3. Inspect one-way clutch hub (C) for wear, scoring or rough surface.
4. Measure I.D. of bushing and O.D. of one-way clutch hub and compare to specification.
5. Replace gear if wear or damage is evident.

STARTER CLUTCH REMOVAL / INSPECTION

1. Remove one-way clutch from primary drive gear.

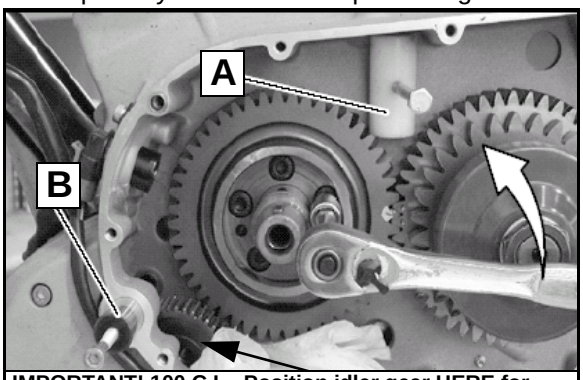


2. Note direction of one-way clutch with flanged side (D) inward (toward engine) for reassembly.
3. Inspect cage for cracks. Check band springs for tension and proper function.
4. Inspect clutch lobes for wear, galling, or rough surface.

PRIMARY DRIVE GEAR

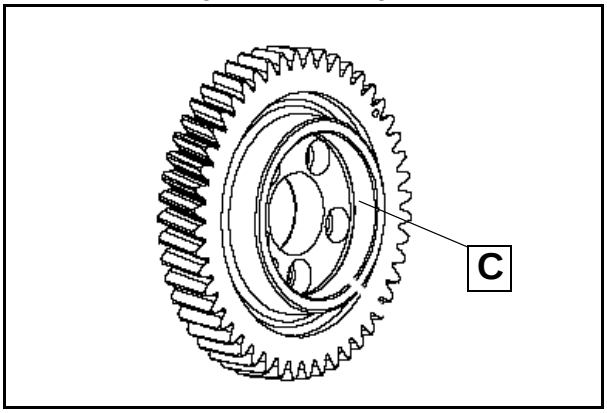
PRIMARY DRIVE GEAR REMOVAL / INSPECTION

1. Install engine lock tool (A) to hold crankshaft gear stationary while removing bolts.
2. Remove primary gear screws.
3. Use a primary cover screw to pull idler gear shaft (B).



IMPORTANT! 100 C.I. - Position idler gear HERE for primary gear removal. If removed from the case, place idler gear back in this position BEFORE installing primary gear.

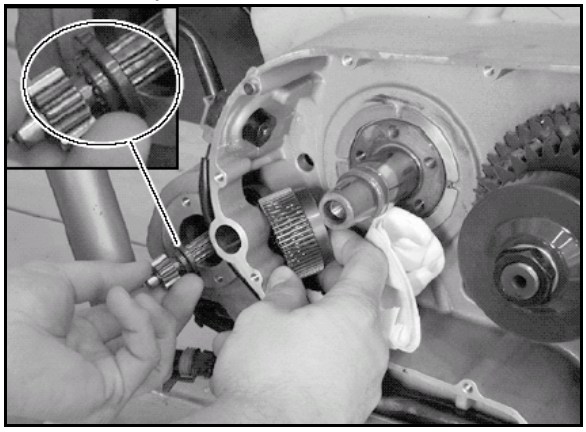
4. Pull primary drive gear off crankshaft.
5. Remove idler gear from crankcase.
6. Inspect clutch hub (C) on inside of primary drive gear for wear, scoring, nicks, or rough surface.



7. Inspect gear teeth on idler and primary drive gear for chips, cracks or excessive wear.
8. Remove starter drive cover.
9. Pull torque limiter clutch shaft out through cover opening with washer.

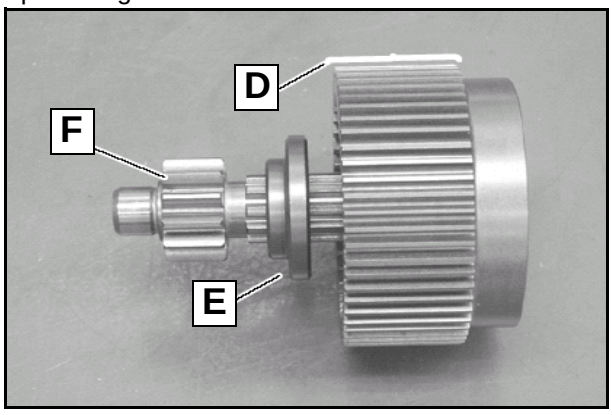
NOTE: Stepped side of washer faces out (toward gear) and flat side of washer is against limiter clutch (inset).

10. Remove torque limiter clutch.



STARTER TORQUE LIMIT CLUTCH INSPECTION

1. Mount torque limit clutch in a soft jawed vise across entire gear face (D). Clamp only tight enough to prevent gear rotation.

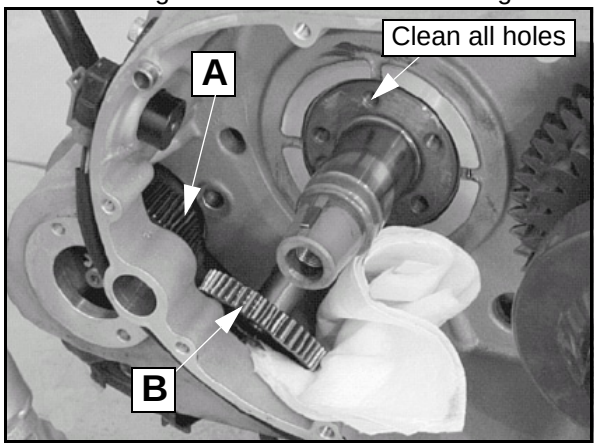


2. Install shaft *with spacer* (E).
3. Use a 19mm 12 point socket on gear (F).
4. Read torque at point of clutch slip.

Starter Torque Limit Clutch Break-Away Torque:		
Engine	Standard	Service Limit
92 Cubic Inch	34-43 N-m (25-31 lb-ft)	28.5 N-m (21 lb.-ft.)
100 Cubic Inch	43-63N-m (32-46.5 lb-ft)	38 N-m (28 lb.-ft.)

PRIMARY DRIVE GEAR INSTALLATION

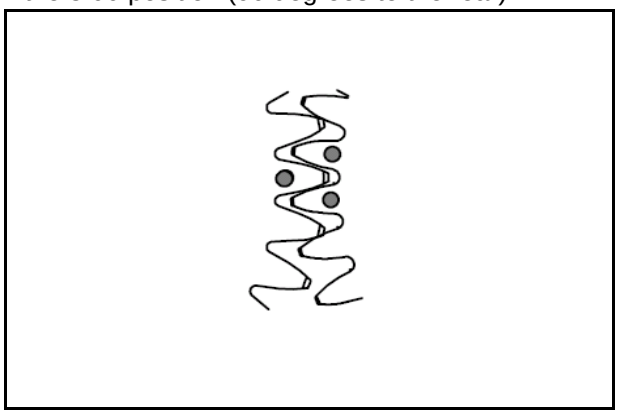
1. Clean mating surfaces of crankshaft and gear.



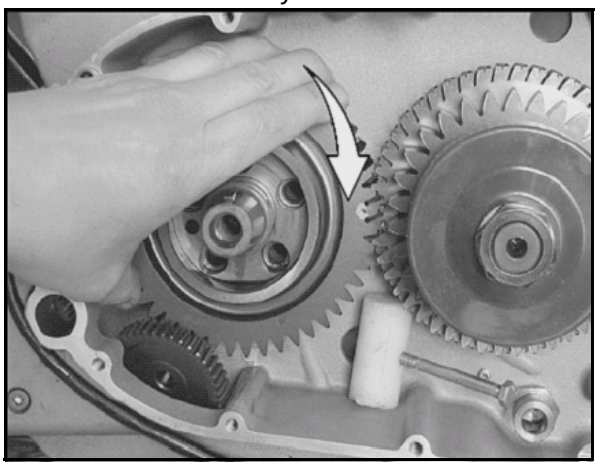
2. Clean threads of screws and crankshaft to remove all locking agent, oil, and grease with Loctite™ Primer N.

NOTE: Starter torque limit clutch (A) and idler gear (B) MUST be placed in the case **before** the primary drive gear is installed!

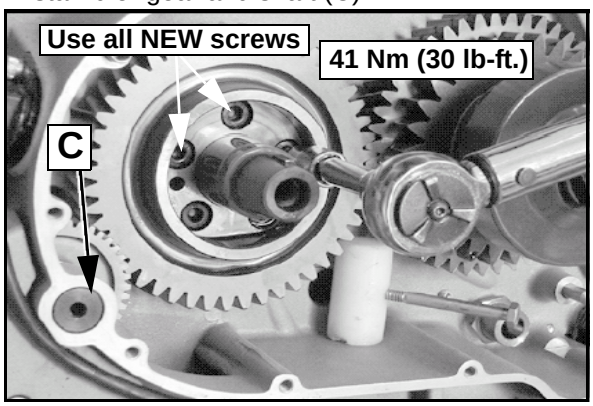
3. Place idler gear in crankcase but do not install shaft.
4. Temporarily install flywheel to rotate engine until flywheel key is pointing UP. Remove flywheel.
5. Install primary gear on crankshaft with dot on gear at the 3:00 position (90 degrees to the rear).



6. Engage teeth of primary gear and split gear, with dot on primary gear between two dots on split gear.
7. Place engine lock tool between bottom of inner split gear and crankcase.
8. Rotate drive gear clockwise against spring pressure until split gear teeth align. Push gear in and rotate until pin on crankshaft aligns. Primary and split gear teeth will be flush if fully seated.



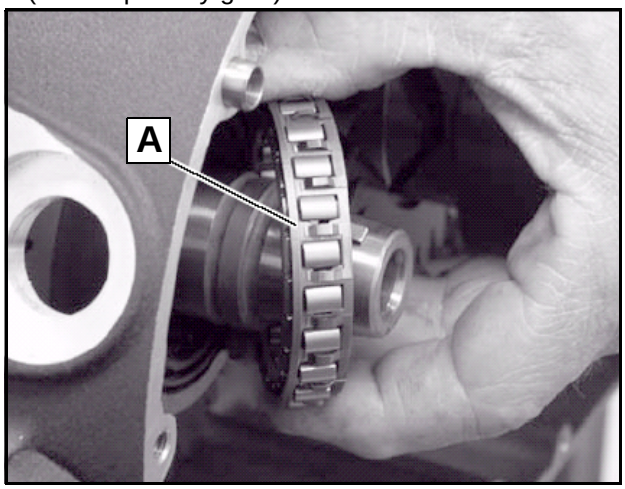
9. Install idler gear and shaft (C).



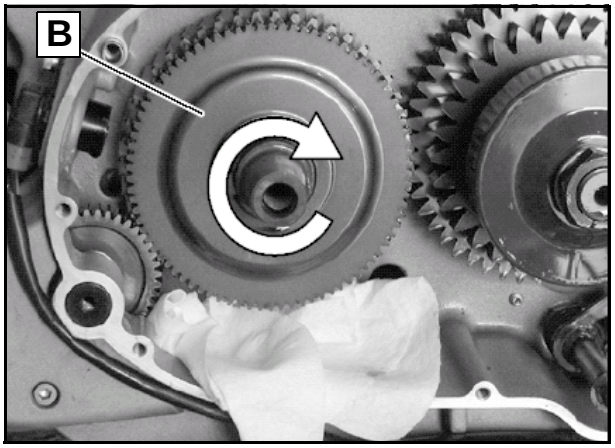
10. Install new primary drive gear screws. These screws have a pre-applied locking agent. Always replace these screws if loosened or removed.
11. Install screws and torque in 2 steps following a star pattern to 41 Nm (30 lb-ft.). Repeat final torque on all screws.
12. Install limiter clutch cover with a new O-ring and torque screws to 9.6 Nm (85 lb-in).

STARTER GEAR / STARTER CLUTCH INSTALLATION

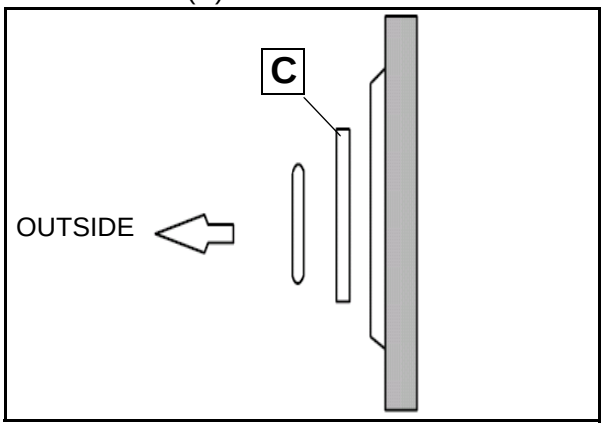
1. Install one-way clutch with raised edge (A) inward (toward primary gear).



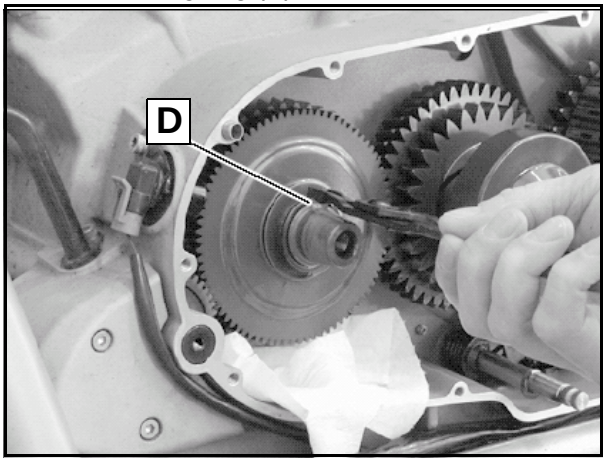
2. Install starter gear (B) with a clockwise rotating motion.



3. Install washer (C).



4. Install retaining ring (D).



5. Install flywheel (refer to page 9.23).
6. Install clutch (refer to page 9.18)
7. Install primary cover (refer to page 9.11).
8. Check engine oil and fill to proper level.

TROUBLESHOOTING

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	PART(s) AFFECTED	REPAIR RECOMMENDED
Clutch Lever Pulls Excessively Hard	Outer clutch cable housing damaged	Clutch Cable	Replace
	Clutch cable is dry, corroded, contaminated, worn, etc.	Clutch Cable	Lubricate or replace
	Clutch lever pivot, bushings, ferrules need lubrication	Clutch Lever Pivot Point	Lubricate
	Drive plates catching on primary driven gear basket	Clutch Primary Driven Gear/ Clutch Plates	Replace Necessary Parts
	Clutch cable routed incorrectly	Clutch Cable	Inspect for wear, replace if necessary, and / or re-route
	Clutch lifter plate bearing damage	Clutch Plate Bearing Lifter	Replace
	Damaged clutch lifter mechanism	Clutch Release Mechanism	Repair as Necessary
Clutch Slips	Clutch Cable Adjusted Incorrectly (no lever free play)	Clutch Cable Adjustment	Adjust (refer to ch 2)
	Clutch Spring Weak	Clutch Spring	Replace
	Clutch Spring Snap ring Loose or Broken	Clutch Spring Snap ring	Repair or Replace as Necessary
	Pressure Plate Worn or Warped / Distorted	Pressure Plate	Replace
	Clutch Plate(s) Worn or Warped/Distorted	Driven Plates (possibly drive plates)	Replace
	Clutch Lifter Mechanism Sticking	Clutch Lifter Mechanism	Repair
	Engine Oil Level Low	Oil Level	Correct
	Oil Additives Present in Oil or Used Previously	Oil Quality	Replace oil & filter (clutch plates may need to be replaced)
Dragging Clutch (doesn't disengage completely, creeping, hard to find Neutral)	Too Much Clutch Lever Free Play	Clutch Cable Adjustment	Adjust (refer to ch 2)
	Oil Additives Present in Oil or Used Previously	Oil Quality	Replace oil & filter (clutch plates may need to be replaced)
	OIl Level Too High	Oil Level	Correct
	Oil Viscosity Too High	Oil Quality	Replace Oil & Filter
	Pressure Plate Worn or Warped/Distorted	Pressure Plate	Replace
	Clutch Plate(s) Warped / Distorted	Driven Plates (possibly drive plates)	Replace
	Weak Clutch Spring(s)	Clutch Springs	Replace All

PROBLEM	POSSIBLE CAUSE	PART(s) AFFECTED	REPAIR RECOMMENDED
Transmission Will Not Shift	Broken Shift Drum	Shift Drum	Replace shift drum
	Bent Shift Forks	Shift Fork	Replace shift forks
	Worn Shift Drum	Shift Drum	Replace shift drum
	Broken Gears	Transmission Gears	Replace broken gear(s)
	Damaged/Broken Bearings	Transmission, Shift Cam Bearings	Replace bearings that fail inspection
	Worn Gear Shift Pawl Ratchet Mechanism	Shift Pawl Mechanism	Replace parts that fail inspection
	Broken or dislodged shift shaft return spring	Shift Shaft Return Spring	Repair or Replace
	Roller Detent Arm Seized	Roller Detent Arm	Repair or replace parts
	Bent Shift Shaft (internal)	Shift Shaft	Repair or Replace
	External Shift Linkage Binding or Damaged	External Shift Linkage	Repair or Replace as
	Bent or Distorted Shift Forks	Shift Forks	Replace
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	Replace
	Broken Transmission Components	Transmission Components	Repair or Replace
Transmission Hard to Shift	Improper Clutch Operation	Clutch	Inspect, Repair
	Incorrect Oil Viscosity	Oil Quality	Replace Engine Oil
	Incorrect Clutch Adjustment	Clutch Adjustment	Adjust
	Shift Shaft Damaged	Shift Shaft Components	Repair or Replace
	Sticking Pivot Point, Bent External Shift Linkage	External Shift Linkage	Repair or Replace
	Bent or Distorted Shift Forks	Shift Forks	Replace
	Damaged Shift Drum Grooves	Shift Drum	Repair or Replace
	Shift Detent Plunger Stuck	Shift Detent Plunger	Repair or Replace
	Bent/Binding Shift Fork Rails	Shift Fork Rails	Repair or Replace
Transmission Jumps Out of Gear	Broken / Loose Stop Pin	Shift Stop Pin	Replace
	Worn Shift Drum or Shift Drum Ratchet	Shift Drum or Shift Linkage	Replace as Necessary
	Broken Shift Return Spring	Shift Return Spring	Replace
	Damaged Shift Drum Grooves	Shift Drum	Repair or Replace
	Bent or Worn Shift Forks	Shift Forks	Repair or Replace
	Bent/Binding Shift Fork Rails	Shift Fork Rails	Repair or Replace
	Worn Engagement Dogs on Transmission Gears	Transmission Gears	Repair or Replace
Transmission Noise	Drive Belt Tension Incorrect	Drive Belt	Adjust or Replace
	Clutch Plates Bind or Drag (When Clutch is Disengaged)	Clutch Plates	Adjust / Repair / Replace
	Gear/Bearing Wear/Damage	Transmission Components	Inspect / Repair / Replace

CHAPTER 10
TRANSMISSION & CRANKSHAFT

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GENERAL

SERVICE INFORMATION

- Remove engine from frame to service internal transmission and/or crankshaft components (Chapter 6).
- The crankcase must be separated to access internal transmission components and crankshaft. Remove:
  - Cylinder heads
  - Cylinders & pistons
  - Gear shift linkage
  - Primary cover and components (as required depending on needed access to other components).
  - Regulator / Rectifier and Bracket.
  - Starter motor
- Label and store parts neatly to speed the assembly process.
- Crankshaft main bearing replacement requires line boring. This procedure requires full machine shop capabilities and specialized knowledge. It is recommended that a qualified machine shop perform this procedure if it becomes necessary.
- Crankshafts and connecting rods are color coded for manufacturing tolerances with a white or red paint mark (see page 10.29).
- Label and store connecting rods, crankshaft and bearings so parts can be installed in original location.
- All torque specifications are "dry" unless specified for oil or locking agent. Refer to exploded views.
- When locking agents are required, use Loctite Primer N™ to clean fastener before applying locking agent. Primer N™ reduces cure time of thread locking agent in addition to cleaning the surfaces.

SPECIAL TOOLS

CRANKCASE / CRANKSHAFT / CONNECTING ROD SPECIAL TOOLS

Crankshaft Main Bearing Protector: PV-43504 (92 C.I.) or PV-47207 (100 C.I.)
Crankcase Separator: PV-45029 (5 Speed Only) or PV-47332 (5 or 6 Speed)
Crankcase Assembly Tool: PV-45030
Crankcase Assembly Collar (M36 x 1.50 Thread for use with PV-45030): PV-46299
Crankcase Assembly Tool Adaptor (required for 6 Speed): PVX-47429
Drive Sprocket Seal Installer: PV-43505

Clutch Shaft Installation Tool: PV-47331

SPECIFICATIONS

DRIVE TRAIN

Item		Specifications
Drive Train (General)	Transmission	5 Speed or 6 Speed (O/D)
	Primary Reduction Ratio	1.50: 1
	Final Reduction Ratio	2.13: 1
Drive Train (Gear Ratios)	Gear Ratio: 1st Gear	3.20: 1
	Gear Ratio: 2nd Gear	2.19: 1
	Gear Ratio: 3rd Gear	1.53: 1
	Gear Ratio: 4th Gear	1.24: 1
	Gear Ratio: 5th Gear	1.00: 1
	Gear Ratio: 6th Gear (O/D) (6 Speed models)	0.92: 1

CONNECTING ROD AND CRANKSHAFT SPECIFICATIONS

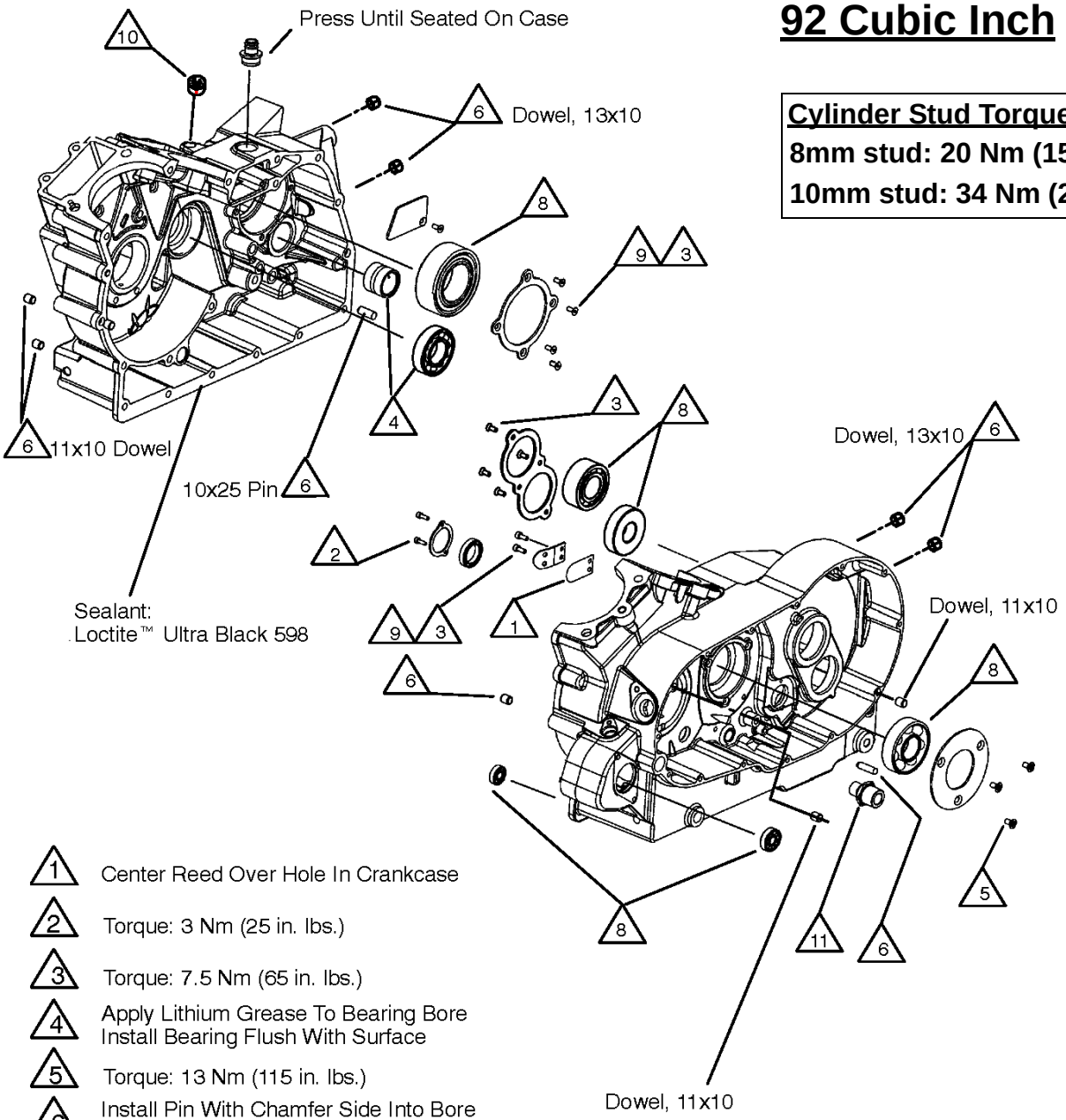
CRANKSHAFT and COMPONENTS			
Part	**Part Specific**	**Standard**	**Service Limit**
Connecting Rod	Connecting Rod to Crankshaft Side Clearance	.22 - .42 mm (.0087 - .0165")	.65 mm (.025")
	Connecting Rod Bearing to Crankshaft Oil Clearance	.0254 - .0635 mm (.001 - .0025")	.11 mm (.0043")
	Connecting Rod Small End I.D.	22.01 - 22.02 mm (.8665 - .8670")	22.09 mm (.8694")
	Connecting Rod Width	20.28 - 20.34 mm (.798 - .801")	20.03 mm (.788")
See bearing selection chart page 10.29	Connecting Rod Big End I.D. (White)	50.84 - 50.85 mm (2.0016 - 2.0020")	50.89 mm (2.0031")
	Connecting Rod Big End I.D. (Red)	50.85 - 50.86 mm (2.0019 - 2.0024")	50.89 mm (2.0034")
Crankshaft Main Bearing / Rod Journals	Connecting Rod Journal Width	40.00 - 40.58 mm (1.5748 - 1.5976")	41.35 mm (1.627")
	Crankshaft Rod Journal O.D. (White)	47.970 - 47.978 mm (1.888 - 1.889")	47.94 mm (1.8871")
	Crankshaft Rod Journal O.D. (Red)	47.978 - 47.986 mm (1.8888 - 1.8891")	47.95 mm (1.8875")
	Main Bearing Oil Clearance	Left .013 - .060 mm (.0005 - .0023") Right .014 - .061mm (.0005 - .0024")	.10 mm (.004") .10 mm (.004")
	Left Main Bearing Journal O.D.	64.952 - 64.973 mm (2.5571 - 2.5579")	64.93 mm (2.556")
	Right Main Bearing Journal O.D.	59.952 - 59.973 mm (2.3603 - 2.3611")	59.93 mm (2.359")
	Crankshaft End Play	.05 - .30 mm (.0019 - .0118")	-
Balance Shaft	Journal O.D., Left (Primary Side) Journal O.D., Right (Oil Pump Drive Side)	29.980 - 29.992 mm 29.969 - 29.979 mm	-
Transmission			
Shift Fork	Shift Fork I.D. (Dimension A, Page 10.11)	12.00 - 12.026 mm (.4725 - .4732")	12.05 mm (.4744")
	Shift Fork Pin O.D. (Dimension B, Page 10.11)	6.036 - 6.136 mm (.2376 - .2416")	6.02 mm (.2370")
	Shift Fork Width (Dimension D, Page 10.11)	5.10 - 5.30 mm (.2008 - .2086")	5.05 mm (.1988")
Shift Fork Rail	Shift Fork Rail O.D. (Dimension C, Page 10.11)	11.948 - 11.972 mm (.4704 - .4713")	11.92 mm (.4693")
	Shift Fork Rail Runout	-	.025 mm (.001")
Shift Drum	Shift Drum Groove	-	Replace drum if any wear is evident

ASSEMBLY VIEWS & TORQUE VALUES

CRANKCASE COMPONENTS / FASTENER TORQUE - 92 CUBIC INCH ENGINES

92 Cubic Inch

Cylinder Stud Torque
8mm stud: 20 Nm (15 lb-ft)
10mm stud: 34 Nm (25 lb-ft)

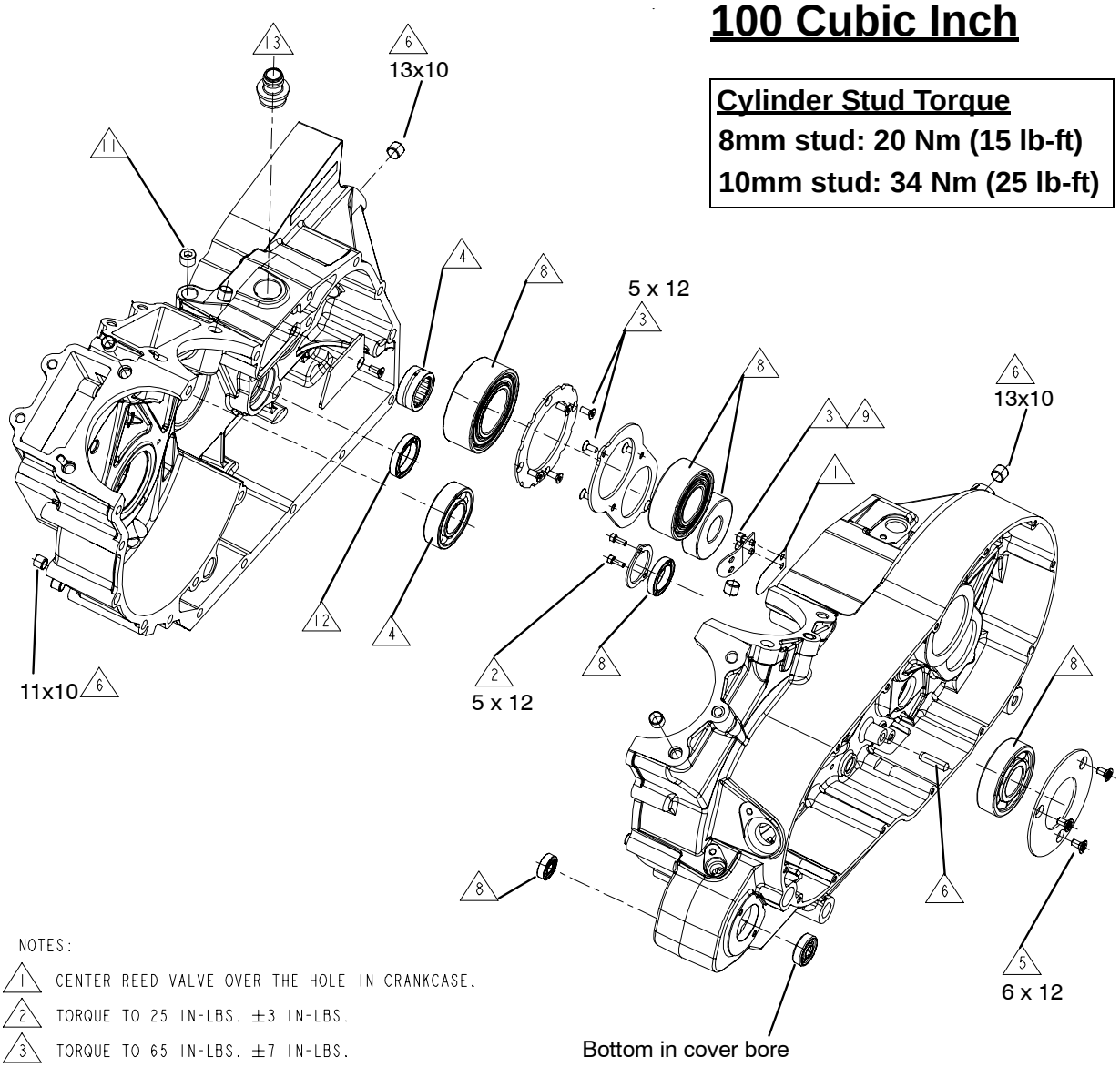


1. Center Reed Over Hole In Crankcase
2. Torque: 3 Nm (25 in. lbs.)
3. Torque: 7.5 Nm (65 in. lbs.)
4. Apply Lithium Grease To Bearing Bore
   Install Bearing Flush With Surface
5. Torque: 13 Nm (115 in. lbs.)
6. Install Pin With Chamfer Side Into Bore
   Press Until Completely Seated In Hole
7. Torque: 30 Nm (22 lb-ft.)
8. Apply Lithium Grease To Bearing Bore
   Press Until Completely Seated In Bearing Pocket
9. Apply Loctite 262. Heat to remove.
10. Apply Pipe Sealant
    Torque: 24 Nm (18 lb-ft)
11. Torque: 34 Nm (25 lb-ft)

CRANKCASE COMPONENTS / FASTENER TORQUE - 100 CUBIC INCH ENGINES

100 Cubic Inch

Cylinder Stud Torque
8mm stud: 20 Nm (15 lb-ft)
10mm stud: 34 Nm (25 lb-ft)



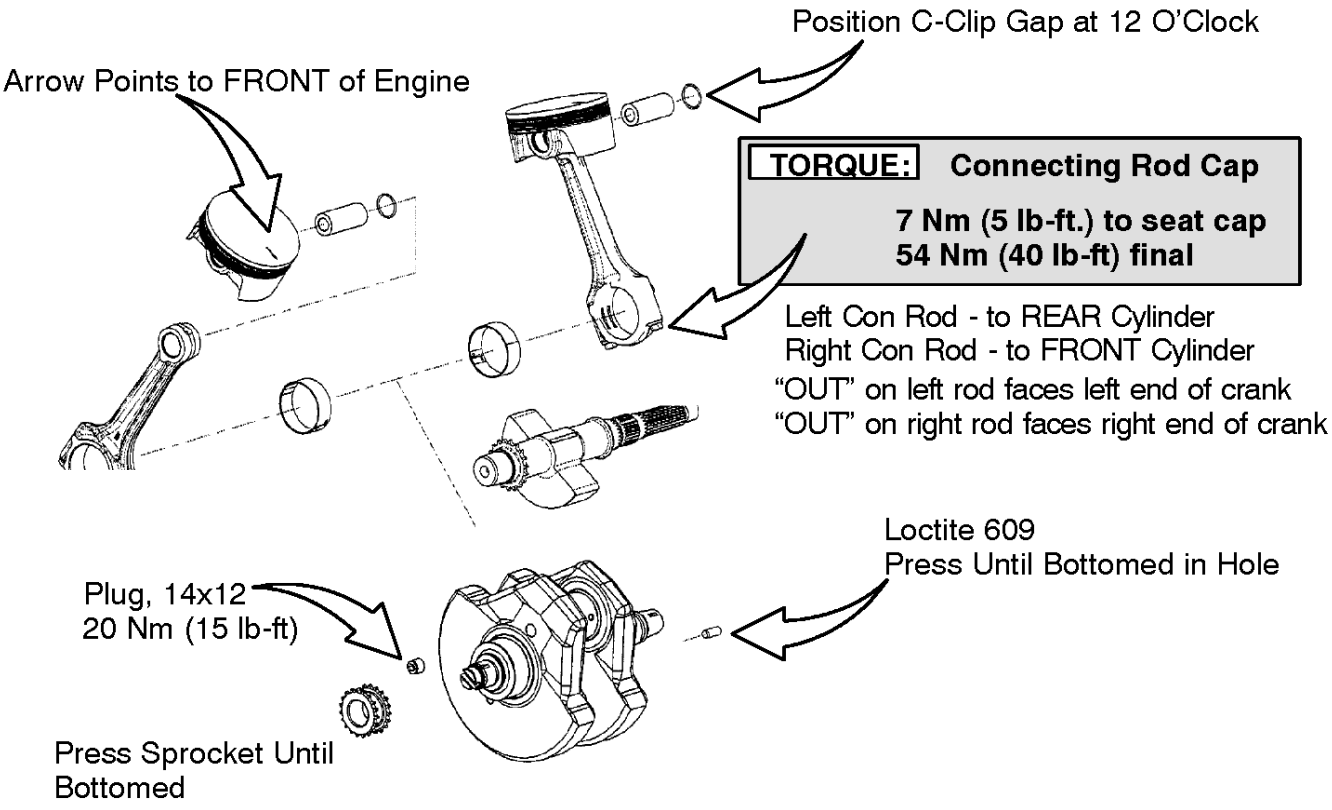
NOTES:

1. CENTER REED VALVE OVER THE HOLE IN CRANKCASE.
2. TORQUE TO 25 IN-LBS. ±3 IN-LBS.
3. TORQUE TO 65 IN-LBS. ±7 IN-LBS.
4. APPLY LITHIUM GREASE TO BEARING BORE; BEARING TO BE ASSEMBLED FLUSH TO SURFACE.
5. TORQUE TO 115 IN-LBS. ±12 IN-LBS.
6. INSTALL PIN WITH CHAMFER SIDE INTO BORE PRESS UNTIL COMPLETELY SEATED IN HOLE.
7. TORQUE TO 22 FT-LBS. ±2 FT-LBS.
8. APPLY LITHIUM GREASE TO BEARING BORES THEN PRESS BEARING UNTIL COMPLETELY SEATED IN BEARING POCKET.
9. APPLY LOCTITE 262 (P/N 8560044) TO THREADS.
10. (2) 7517409 ARE PART OF CRANKCASE ASM.
11. TORQUE TO 18±2 FT-LBS.
12. PRESS BEARING UNTIL FULLY SEATED IN BORE.
13. PRESS UNTIL BOTTOMED ON CASE BOSS.

CRANKSHAFT / CONNECTING ROD

92 & 100 Cubic Inch

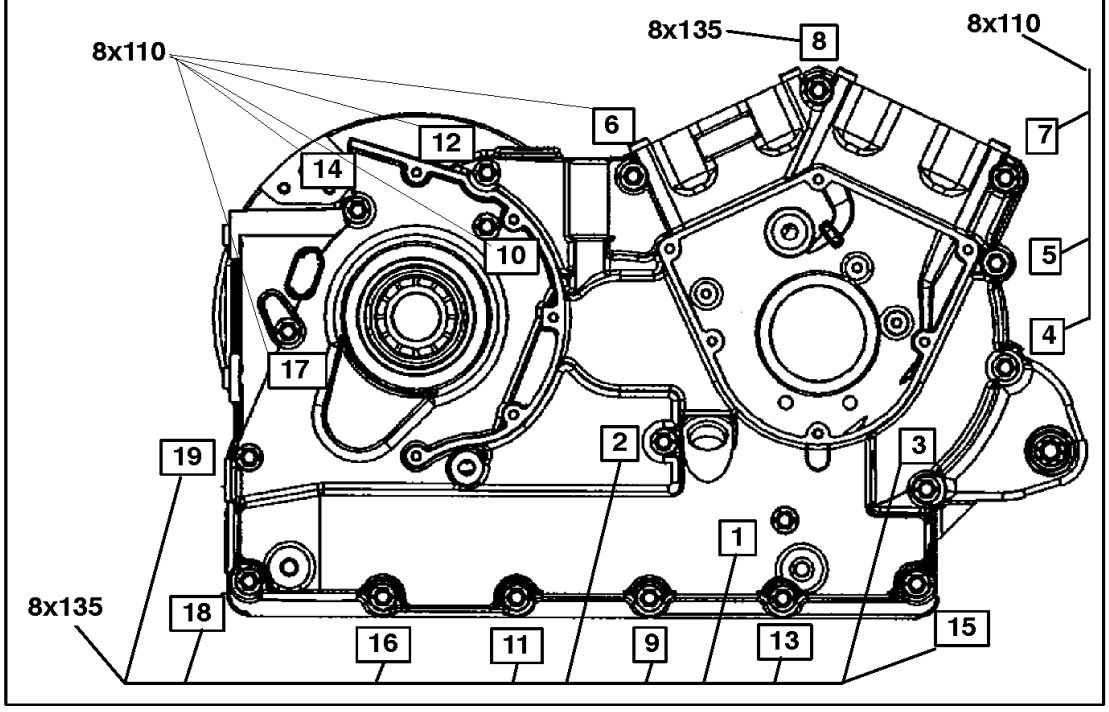
BEARING SELECTION CHART
IS ON PAGE 10.29



CRANKCASE TORQUE PATTERN & BOLT LENGTH

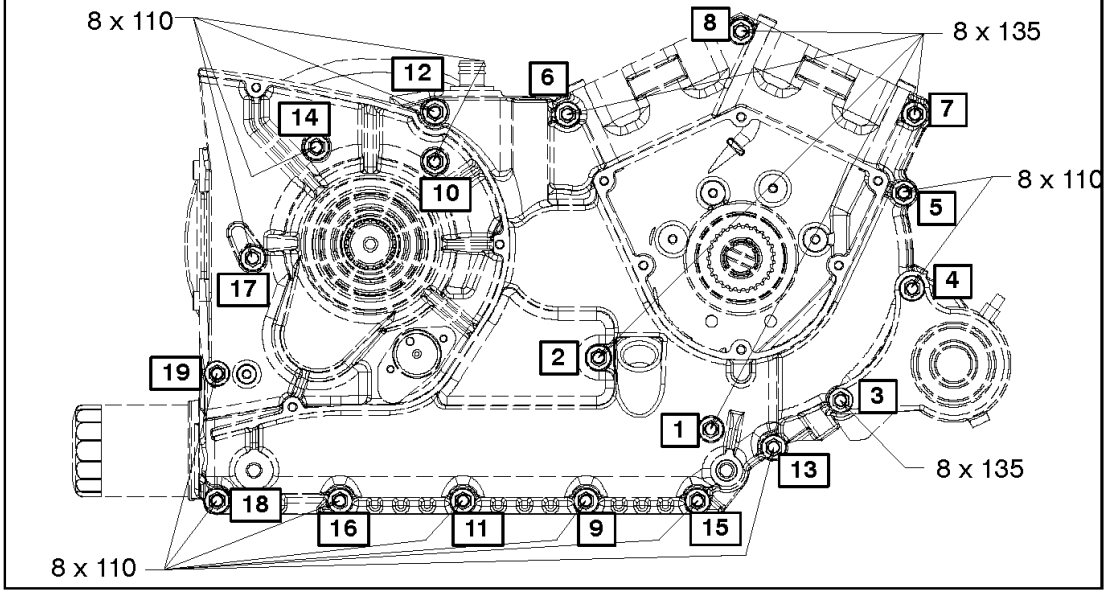
92 Cubic Inch

TORQUE: Crankcase Bolts
(2 steps) 10/20/30 Nm (5/15/22 lb-ft) Repeat the 30 Nm (22lb-ft) torque



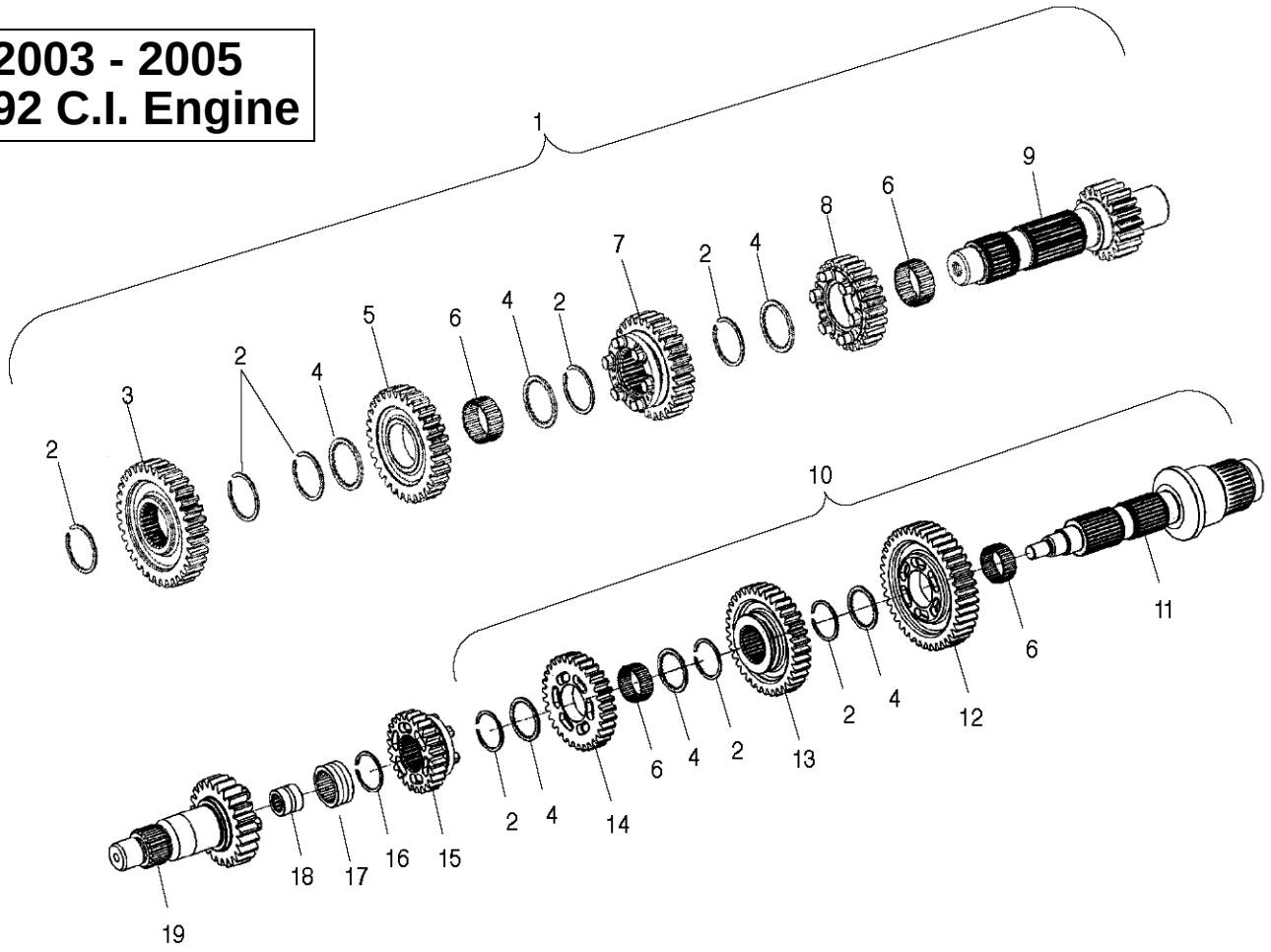
100 Cubic Inch

TORQUE: Crankcase Bolts
(2 steps) 20 / 30 Nm (15 / 22 lb-ft) (Repeat the 30 Nm (22 lb-ft.) torque



TRANSMISSION ASSEMBLY VIEW - 2003-2005 5 SPEED

2003 - 2005
92 C.I. Engine

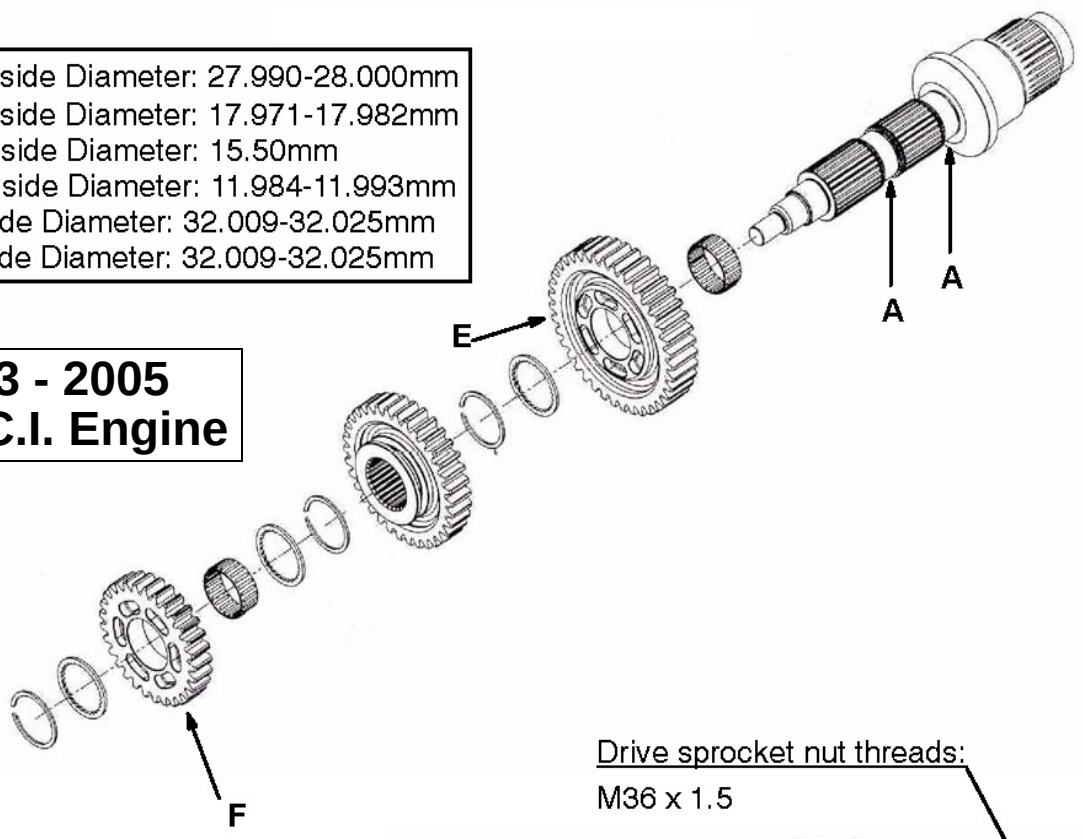


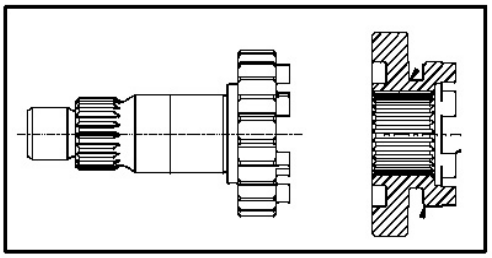
1. Assembly, Countershaft. Incl. 2-9
2. Ring, Retaining (Qty 8)
3. Gear, Countershaft 34 Teeth
4. Washer, Thrust, (Qty. 6)
5. Gear, Countershaft 4th, 31 Teeth
6. Bearing, Roller (Qty 4)
7. Gear, Countershaft 3rd, 28 Teeth
8. Gear, Countershaft 2nd, 24 Teeth
9. Countershaft, 19 Teeth
10. Assembly, Mainshaft (Incl. 2, 4-14, 11-13)
11. Mainshaft
12. Gear. 1st Mainshaft, 38 Teeth
13. Gear. 2nd Mainshaft, 33 Teeth
14. Gear, 3rd Mainshaft , 29 Teeth
15. Gear. 4th Mainshaft, 26 Teeth
16. Ring, Retaining
17. Bearing, Roller
18. Bearing, Needle
19. Assembly, Clutch Shaft (5th Gear Main 23T)

MAINSHAFT / CLUTCH SHAFT ASSEMBLY VIEW - 2003-2005 5 SPEED

A: Outside Diameter: 27.990-28.000mm
B: Outside Diameter: 17.971-17.982mm
C: Outside Diameter: 15.50mm
D: Outside Diameter: 11.984-11.993mm
E: Inside Diameter: 32.009-32.025mm
F: Inside Diameter: 32.009-32.025mm

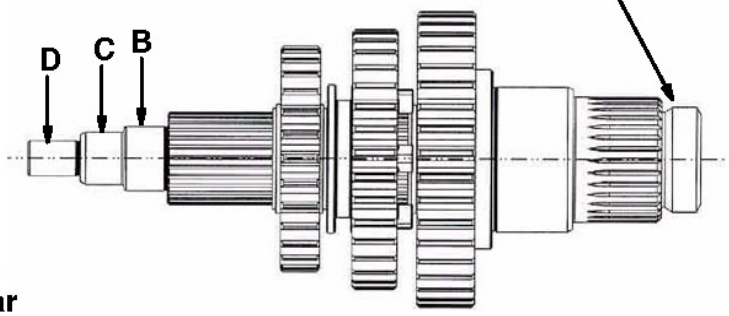
2003 - 2005
92 C.I. Engine





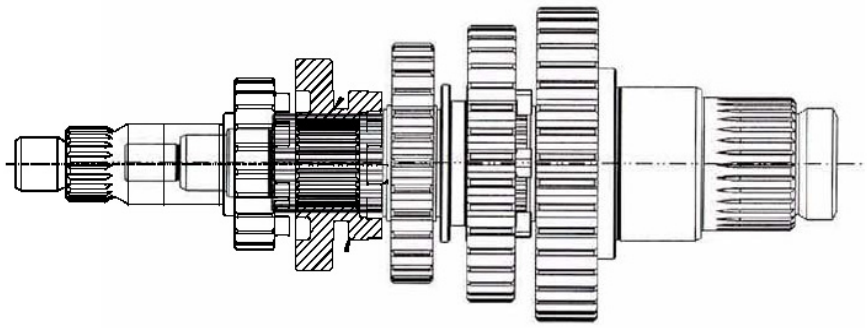
Clutch Shaft & Mainshaft 4th Gear

Drive sprocket nut threads:
M36 x 1.5



Mainshaft Assembly

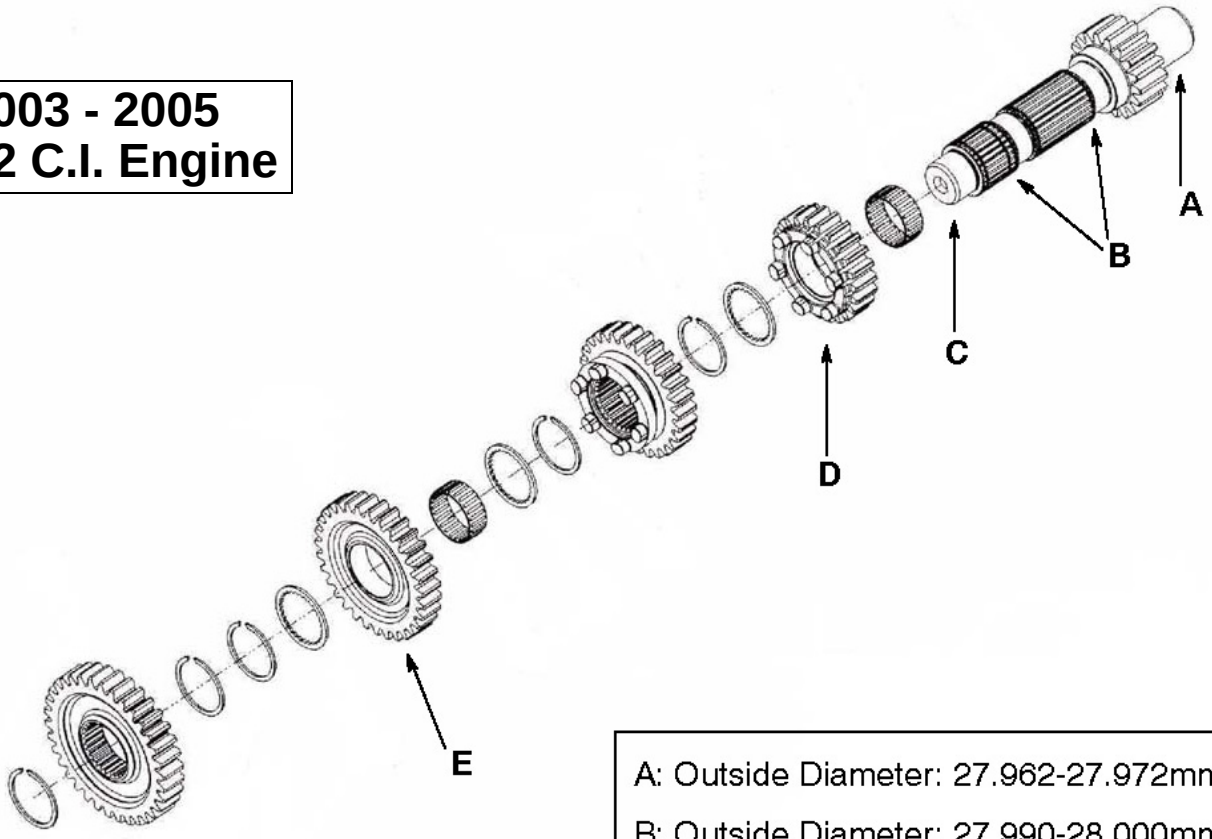
Clutch Shaft Bearings:
18x27x13 and 12x19x16



Mainshaft Complete With 4th Gear and Clutch Shaft

COUNTERSHAFT ASSEMBLY VIEW - 2003-2005 5 SPEED

2003 - 2005
92 C.I. Engine



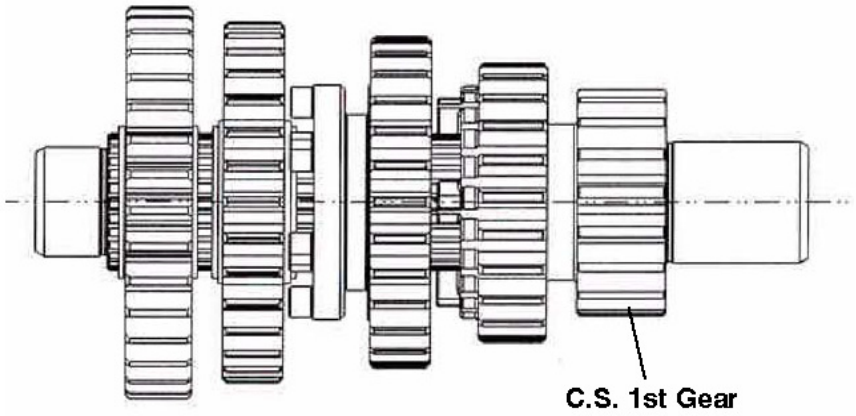
A: Outside Diameter: 27.962-27.972mm

B: Outside Diameter: 27.990-28.000mm

C: Outside Diameter: 24.982-24.995mm

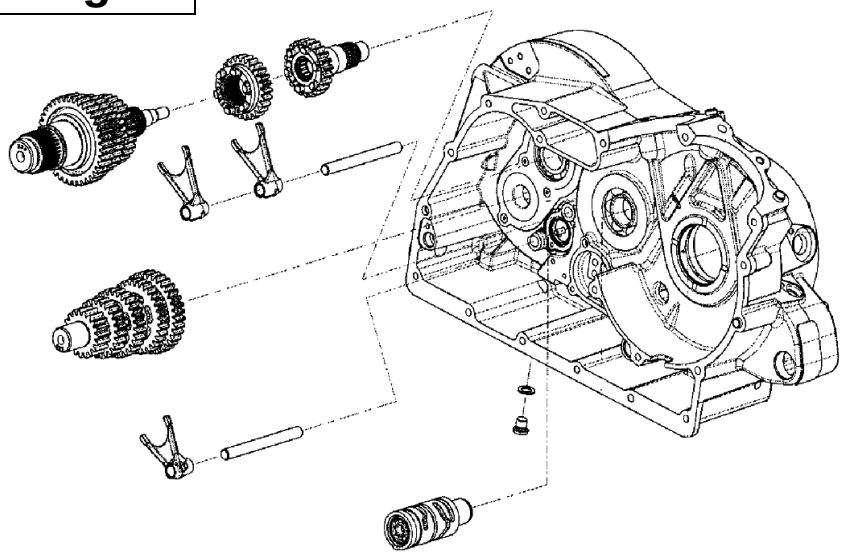
D: Inside Diameter: 32.009-32.025mm

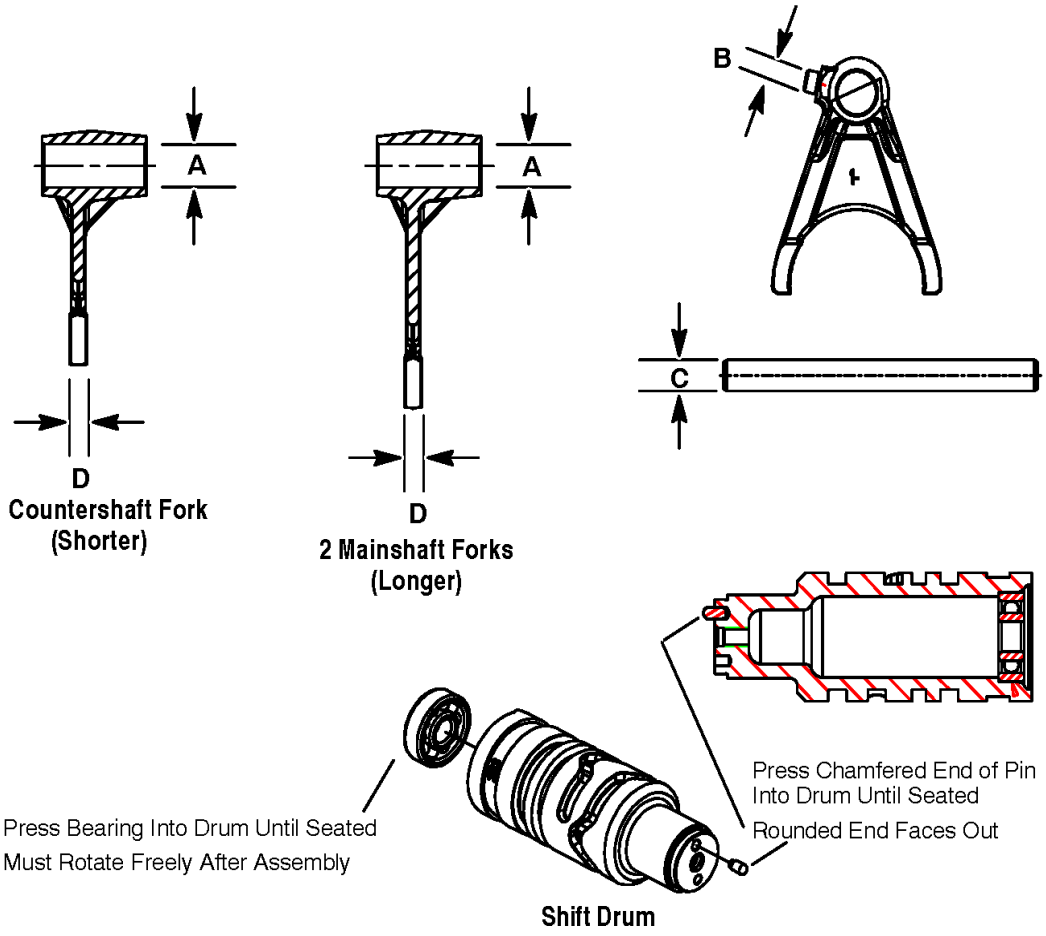
E: Inside Diameter: 32.009-32.025mm



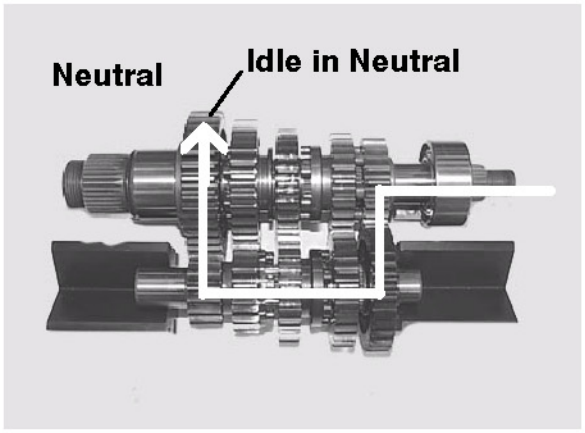
SHIFT DRUM AND SHIFT FORK ASSEMBLY VIEW - 2003-2005 5 SPEED

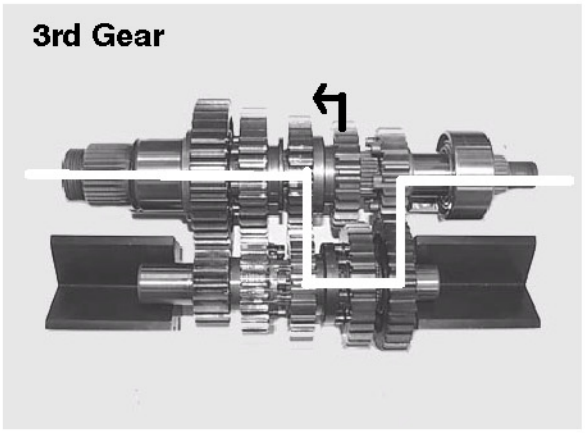
2003 - 2005
92 C.I. Engine

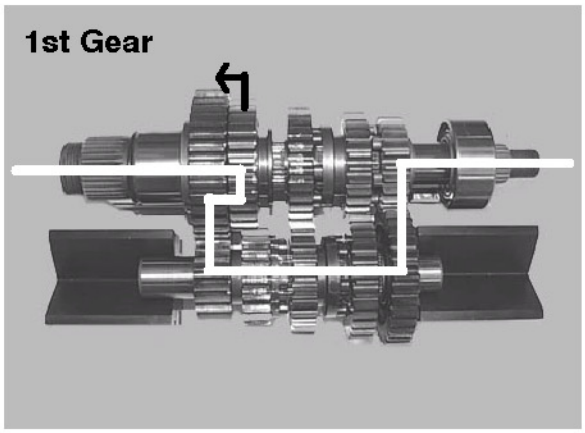


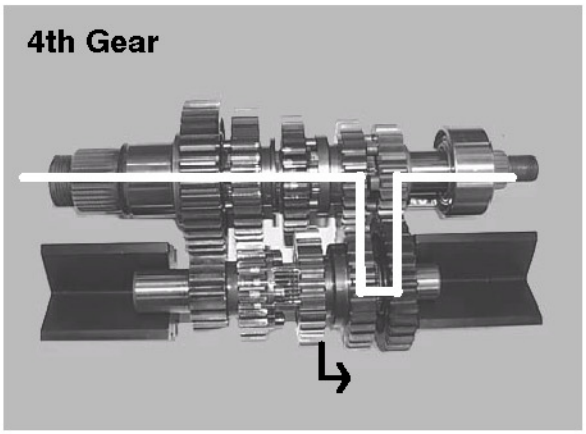


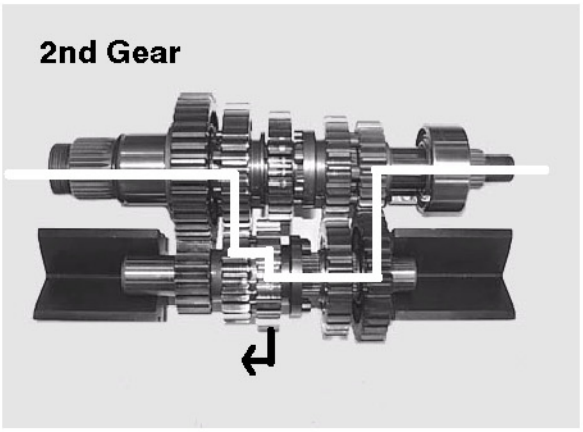
POWER DELIVERY - 2003-2005 5 SPEED

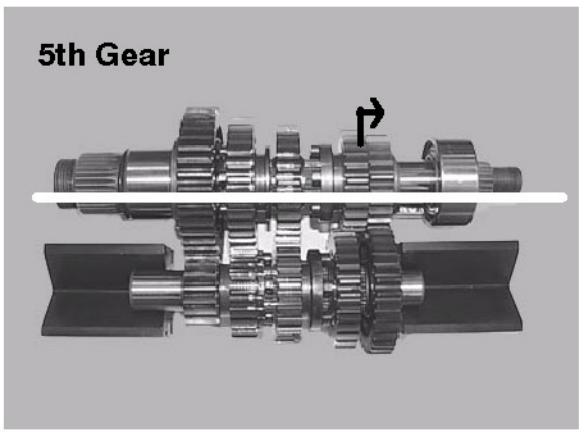




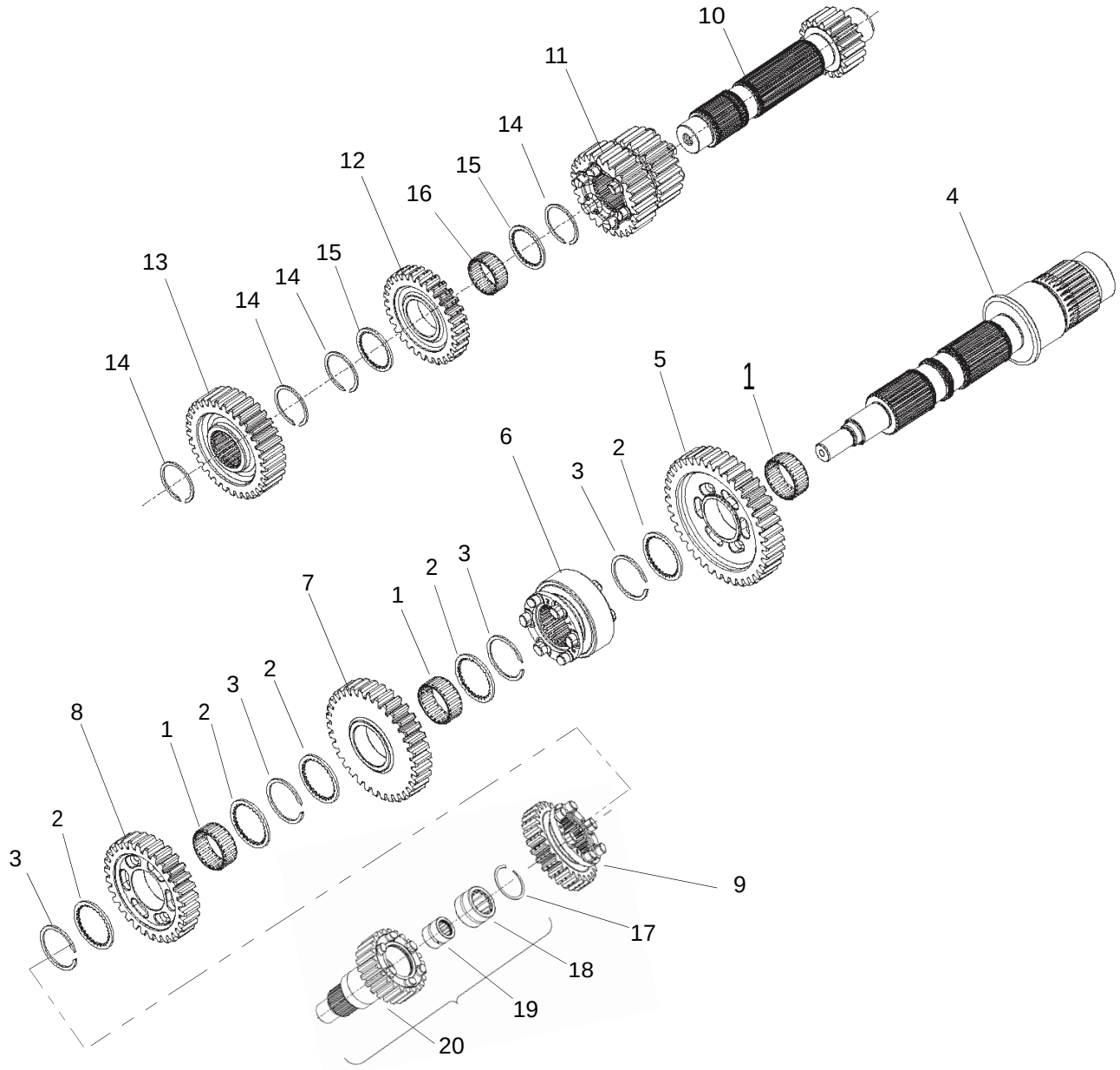








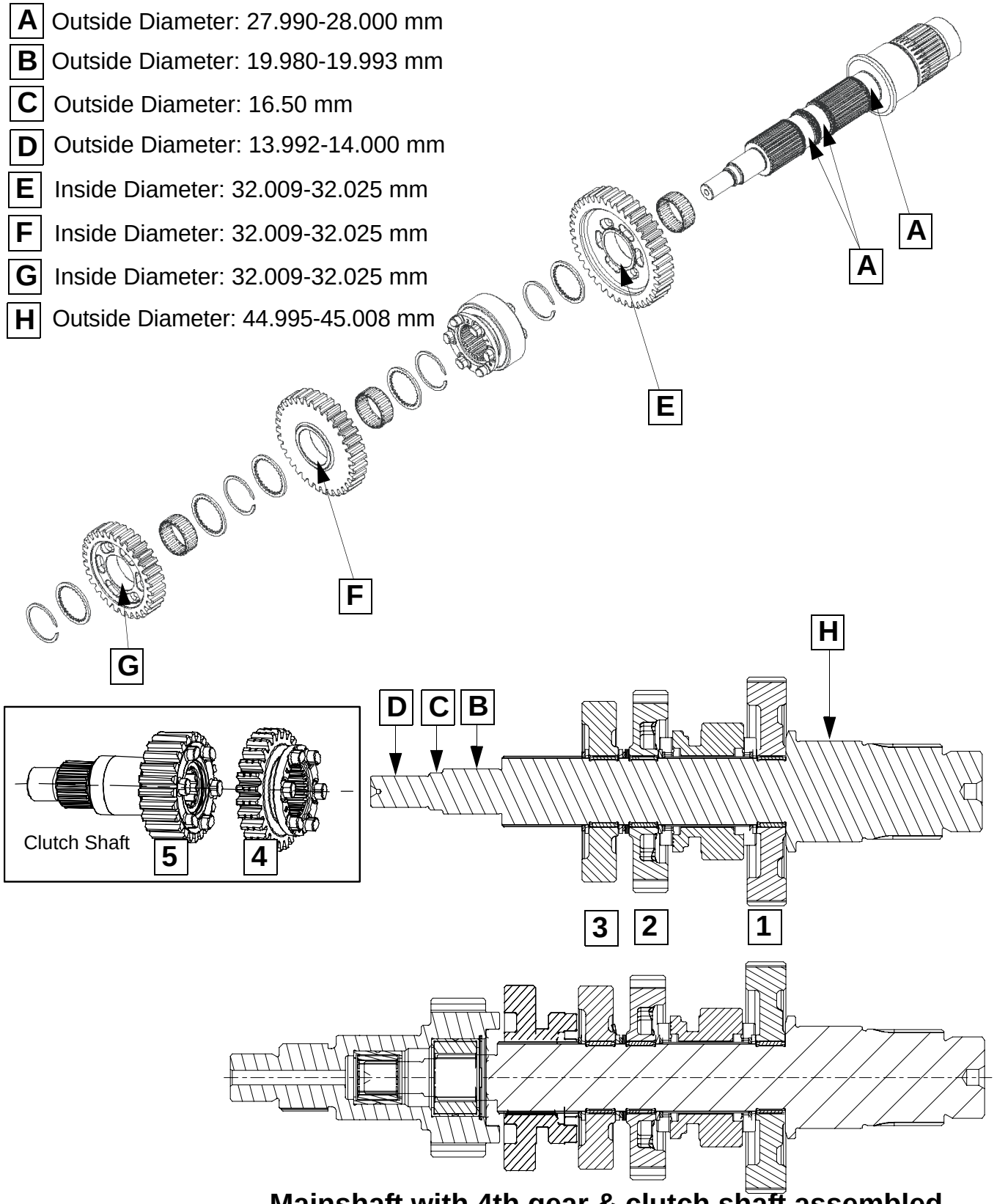
TRANSMISSION ASSEMBLY VIEW - 2006 5 SPEED (100 C.I. Engine)



MAINSHAFT		COUNTERSHAFT		CLUTCH SHAFT	
1	Roller Bearing 28 x 32 x 12.7 (3)	10	Countershaft (1st Gear 18T)	17	Retaining Ring, External
2	Thrust Washer (5)	11	Gear, Countershaft 2nd (23T)/ 3rd (27T)	18	Needle Bearing 20 x 32 x 20
3	Retaining Ring, External (4)	12	Gear, Countershaft 4th (30T)	19	Needle Bearing 14 x 22 x 20
4	Mainshaft	13	Gear, Countershaft 5th (33T)	20	Clutch Shaft (5th Gear 24T)
5	Gear, Mainshaft 1st (39T)	14	Retaining Ring, External (4)		
6	Gear, Slider Engagement 1st/2nd	15	Thrust Washer (5)		
7	Gear, Mainshaft 2nd (34T)	16	Roller Bearing 28 x 32 x 12.7		
8	Gear, Mainshaft 3rd (30T)				
9	Gear, Mainshaft 4th (27T)				

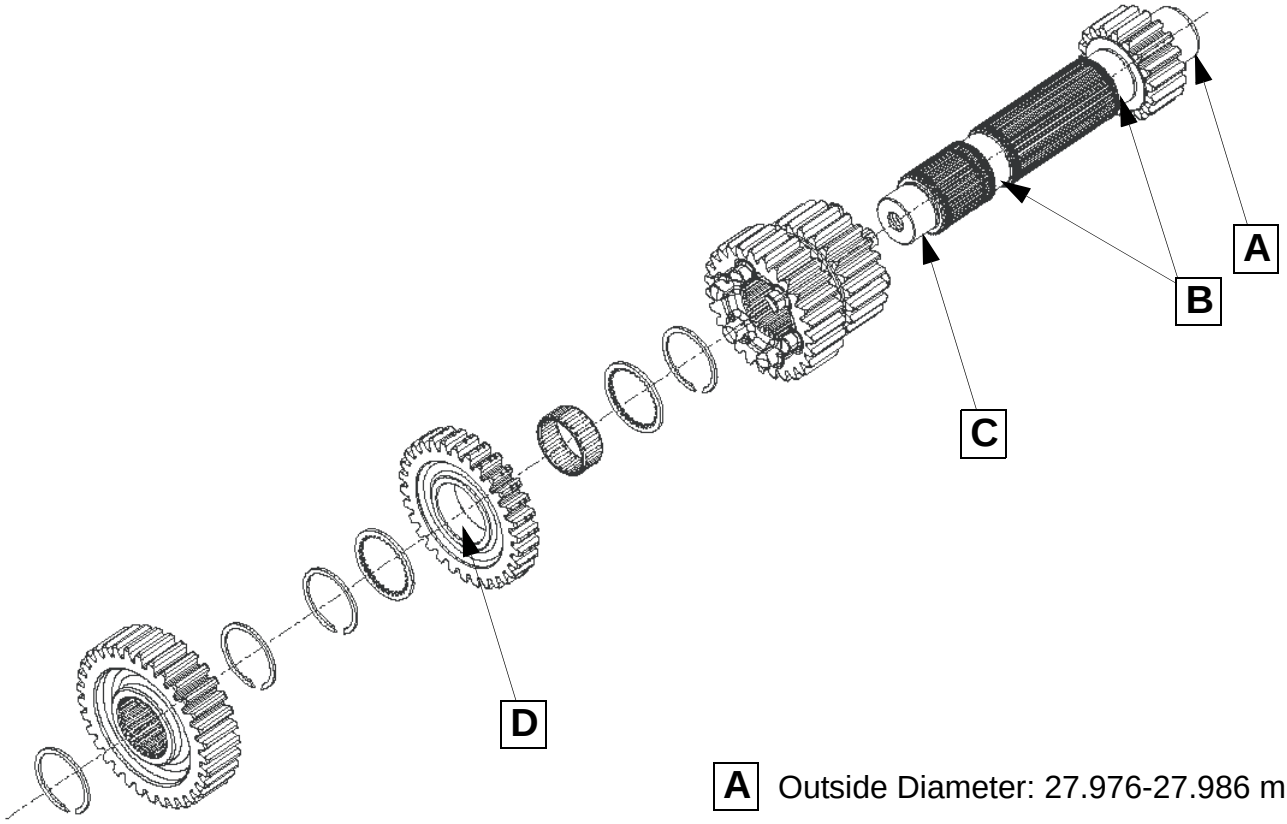
MAINSHAFT / CLUTCH SHAFT ASSEMBLY VIEW - 2006 5 SPEED (100 C.I. Engine)

- **A** Outside Diameter: 27.990-28.000 mm
- **B** Outside Diameter: 19.980-19.993 mm
- **C** Outside Diameter: 16.50 mm
- **D** Outside Diameter: 13.992-14.000 mm
- **E** Inside Diameter: 32.009-32.025 mm
- **F** Inside Diameter: 32.009-32.025 mm
- **G** Inside Diameter: 32.009-32.025 mm
- **H** Outside Diameter: 44.995-45.008 mm



Mainshaft with 4th gear & clutch shaft assembled

COUNTERSHAFT ASSEMBLY VIEW - 2006 5 SPEED (100 C.I. Engine)

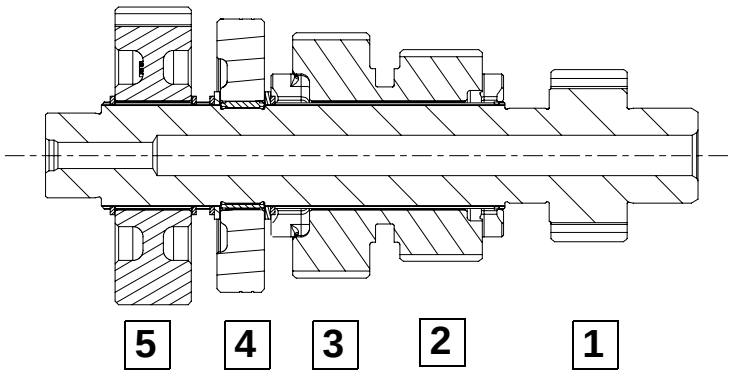


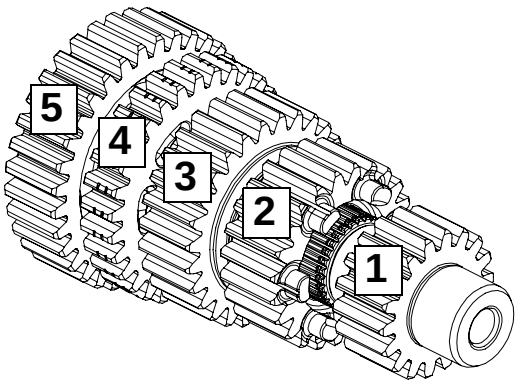
A Outside Diameter: 27.976-27.986 mm

B Outside Diameter: 27.990-28.000 mm

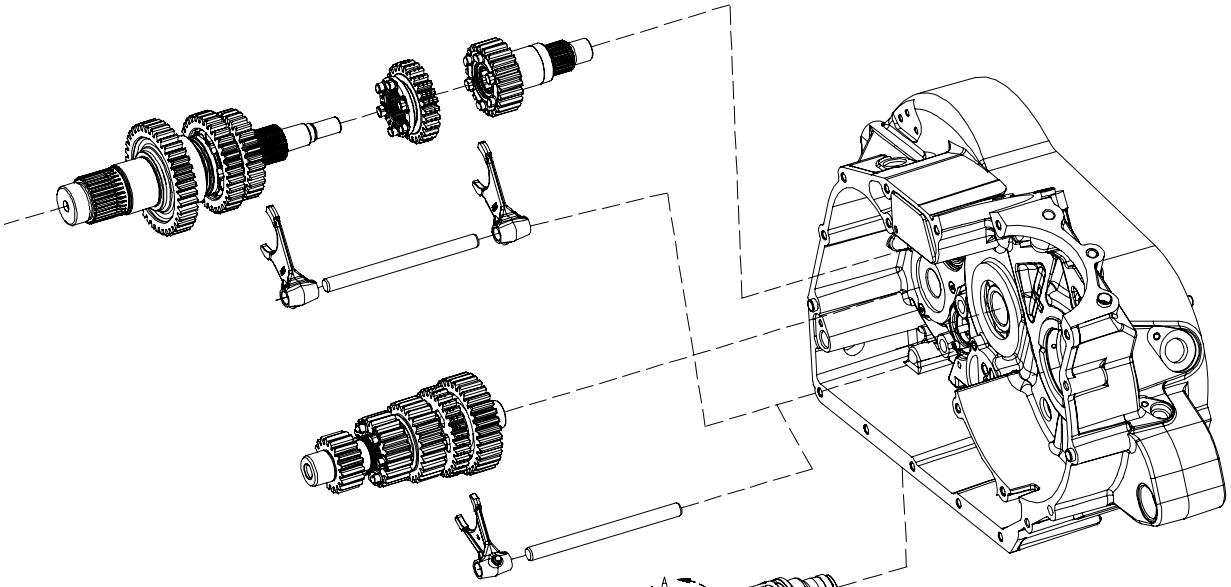
C Outside Diameter: 24.982-24.995 mm

D Inside Diameter: 32.005-32.021 mm

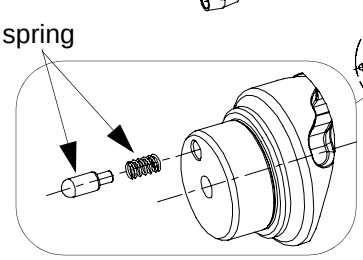


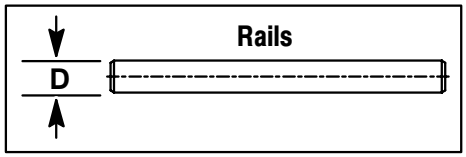


SHIFT DRUM AND SHIFT FORK ASSEMBLY VIEW - 2006 5 SPEED (100 C.I. Engine)



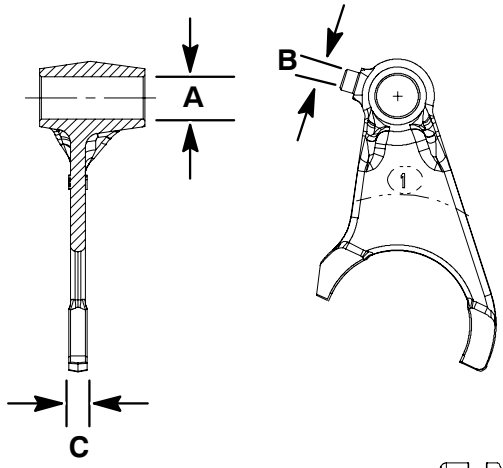
Gear position switch pin and spring



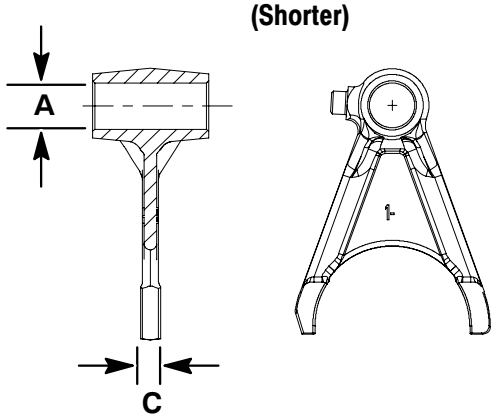


(Dimensions in millimeters)		
∅	A	12.000 - 12.026
∅	B	6.036 - 6.136
	C	5.10 - 5.30
∅	D	11.948 - 11.972

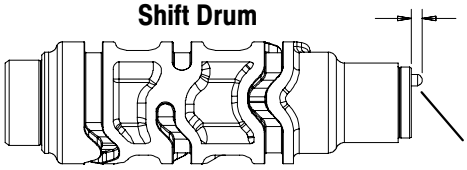
Mainshaft Forks (2)



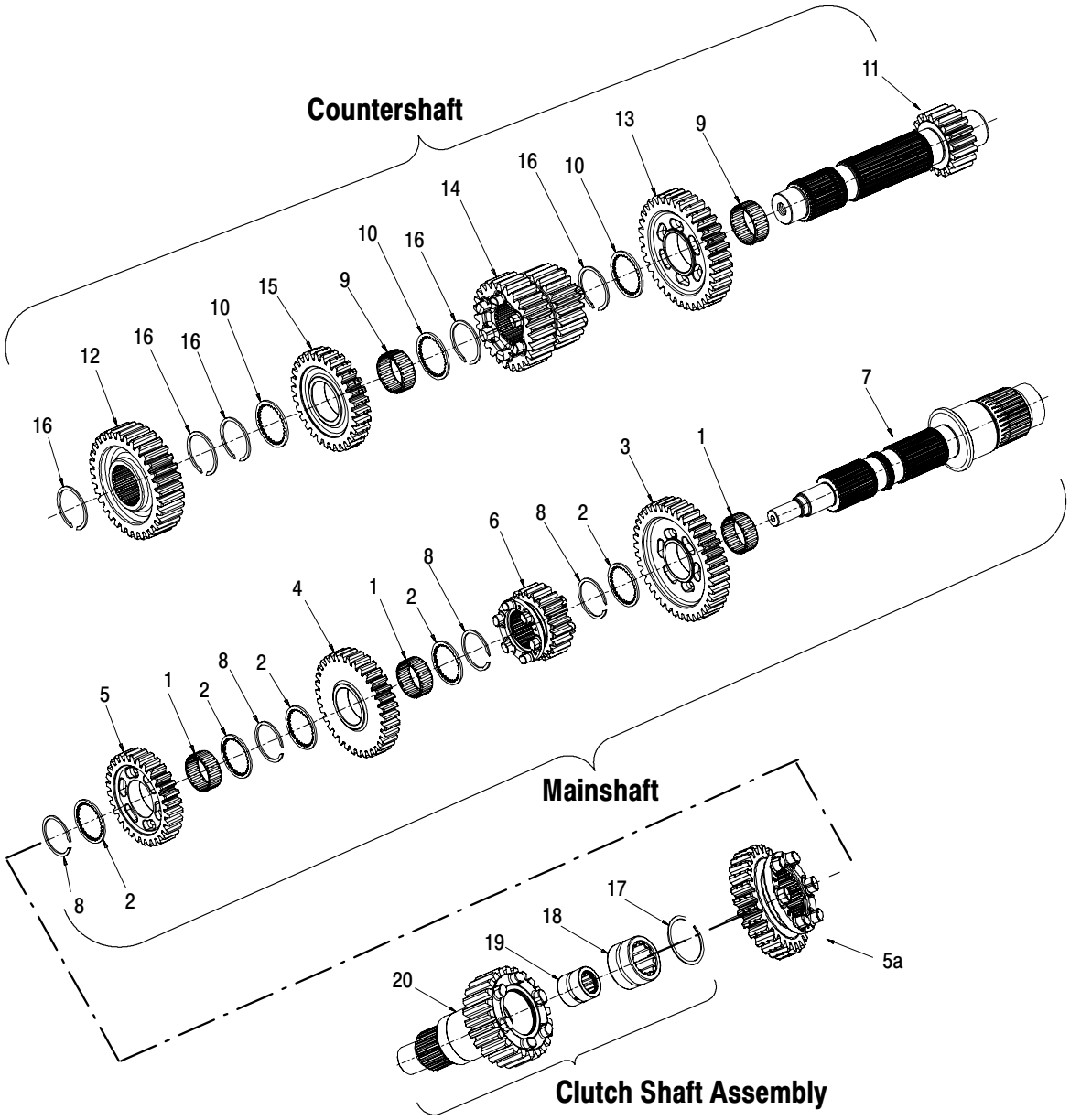
Countershaft Fork (1) (Shorter)



Shift Drum



TRANSMISSION ASSEMBLY VIEW - 6 SPEED



MAINSHAFT

1. Roller Bearing 28 x 32 x 12.7 (3)
2. Thrust Washer (5)
3. 1st Gear, Mainshaft, 39T
4. 2nd Gear Mainshaft, 34T
5. 3rd Gear Mainshaft, 30T

5a. 4th Gear Mainshaft, 27T

6. 6th Gear Mainshaft, 22T
7. Mainshaft
8. Retaining Ring, External (4)

COUNTERSHAFT

9. Roller Bearing 28 x 32 x 12.7 (2)
10. Thrust Washer (3)
11. Countershaft (1st Gear CS, 18T)
12. 5th Gear Countershaft, 33T
13. 6th Gear Countershaft, 35T
14. 2nd (23T) & 3rd (27T) Gear C.S.
15. 4th Gear Countershaft, 30T
16. Retaining Ring, External (5)

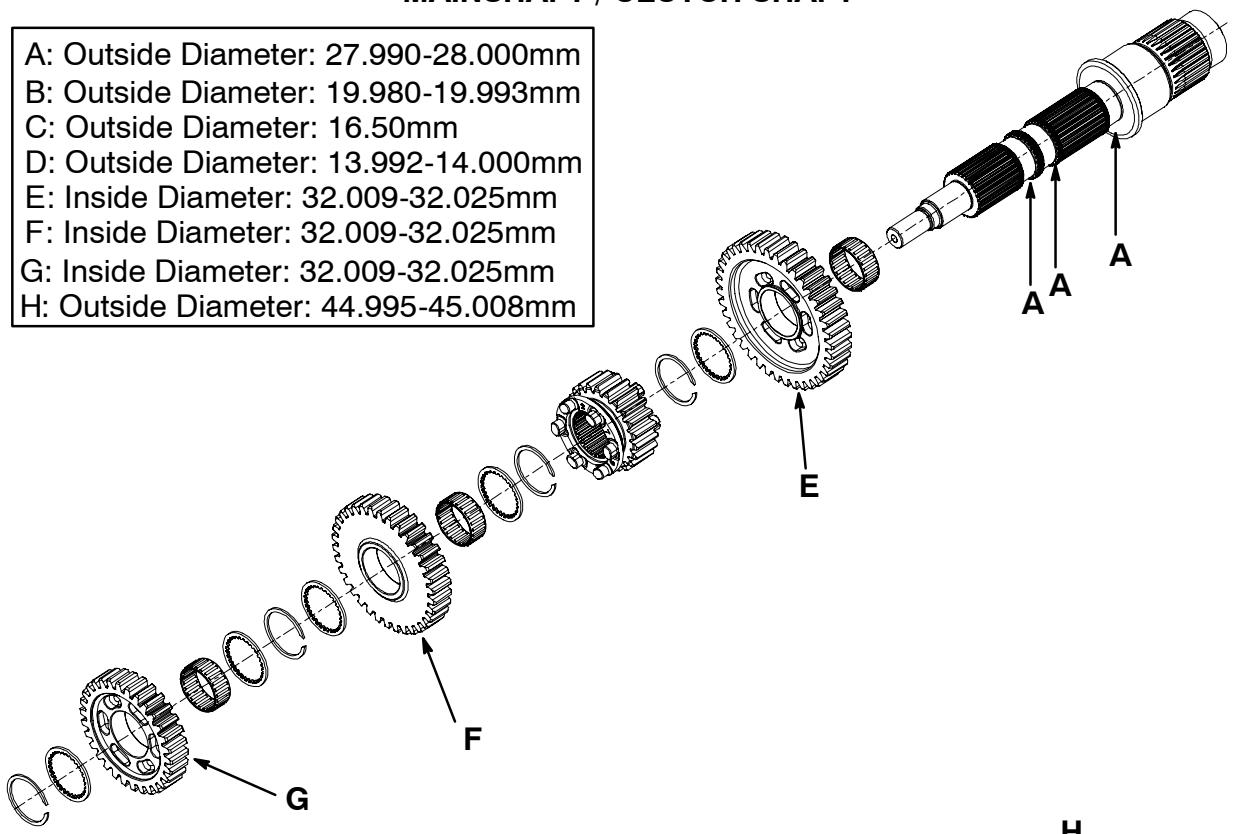
CLUTCH SHAFT

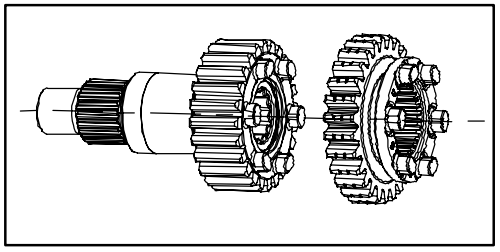
17. Retaining Ring, External
18. Needle Bearing 20 x 32 x 20
19. Needle Bearing 14 x 22 x 20
20. Clutch Shaft **(5th Gear Main 24T)**

MAINSHAFT / CLUTCH SHAFT ASSEMBLY VIEW - 6 SPEED

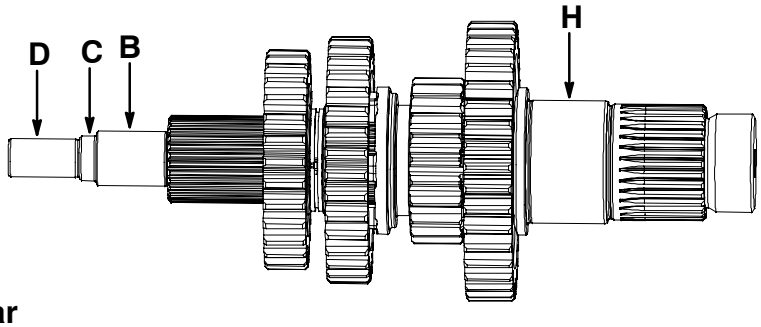
MAINSHAFT / CLUTCH SHAFT

A: Outside Diameter: 27.990-28.000mm
B: Outside Diameter: 19.980-19.993mm
C: Outside Diameter: 16.50mm
D: Outside Diameter: 13.992-14.000mm
E: Inside Diameter: 32.009-32.025mm
F: Inside Diameter: 32.009-32.025mm
G: Inside Diameter: 32.009-32.025mm
H: Outside Diameter: 44.995-45.008mm



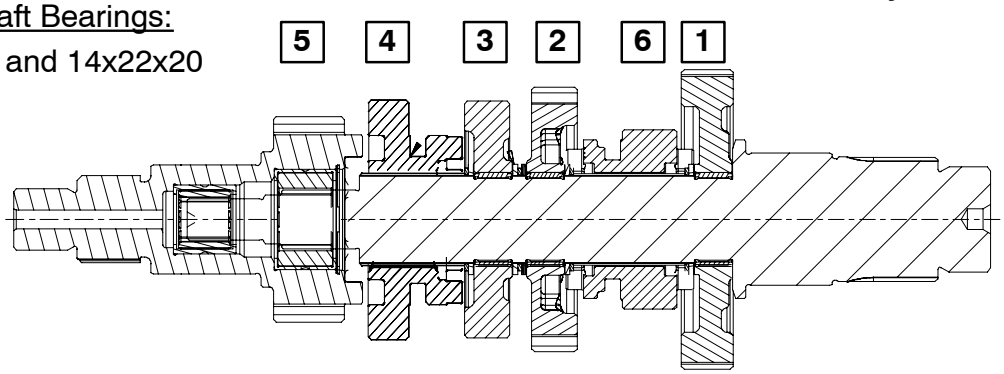


Clutch Shaft & Mainshaft 4th Gear



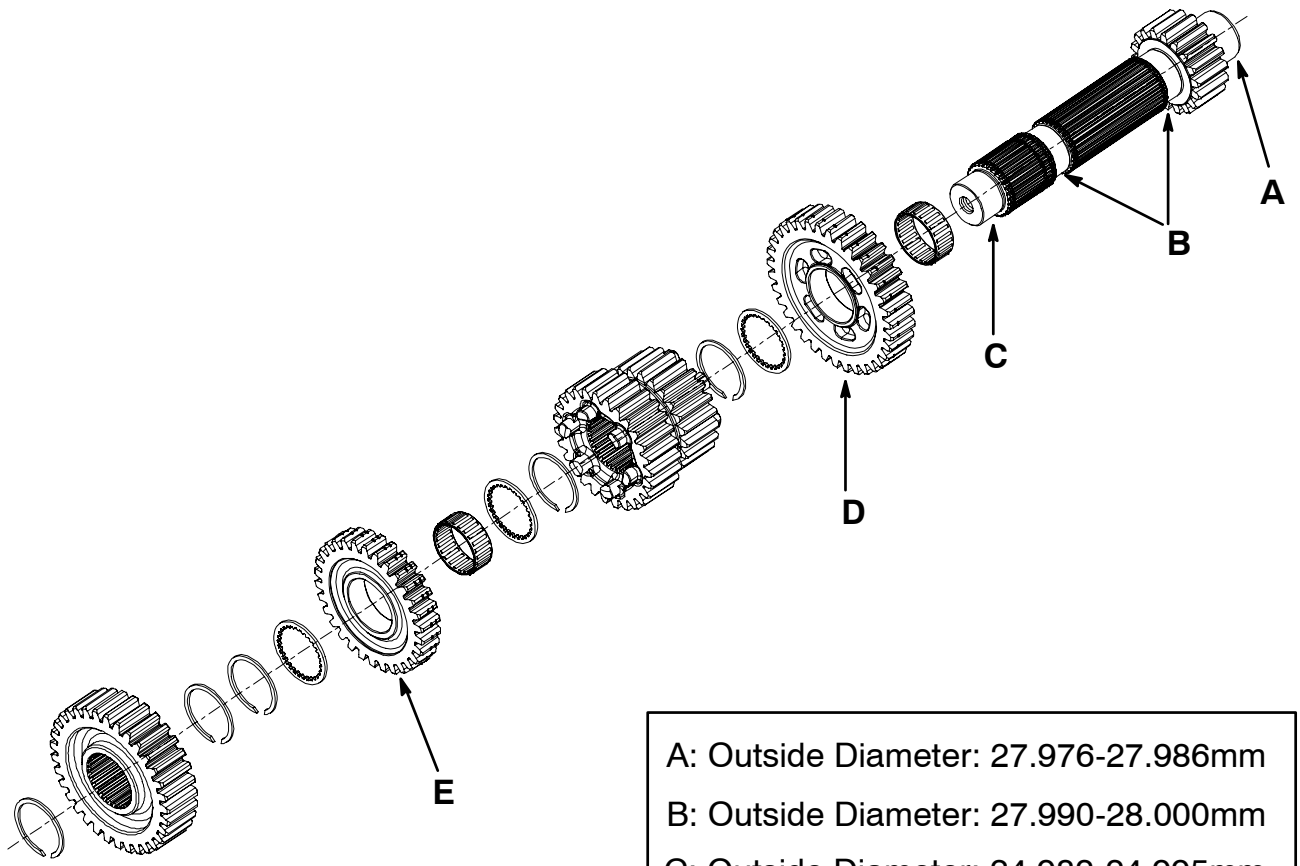
Mainshaft Assembly

Clutch Shaft Bearings:
20x32x20 and 14x22x20



Mainshaft Complete With 4th Gear and Clutch Shaft

COUNTERSHAFT ASSEMBLY VIEW - 6 SPEED



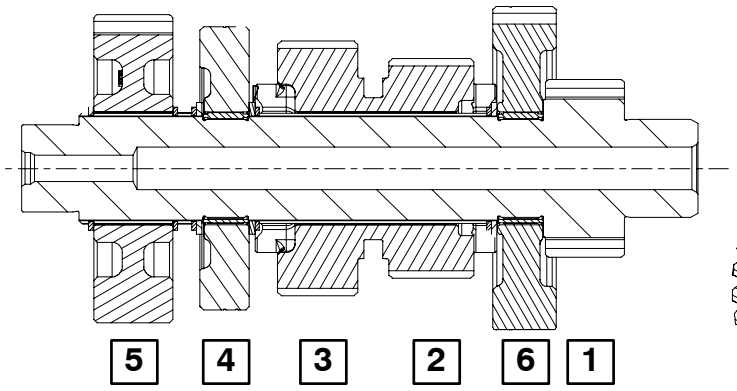
A: Outside Diameter: 27.976-27.986mm

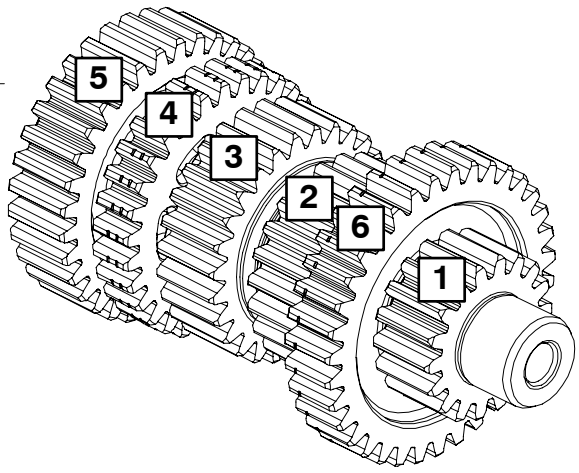
B: Outside Diameter: 27.990-28.000mm

C: Outside Diameter: 24.982-24.995mm

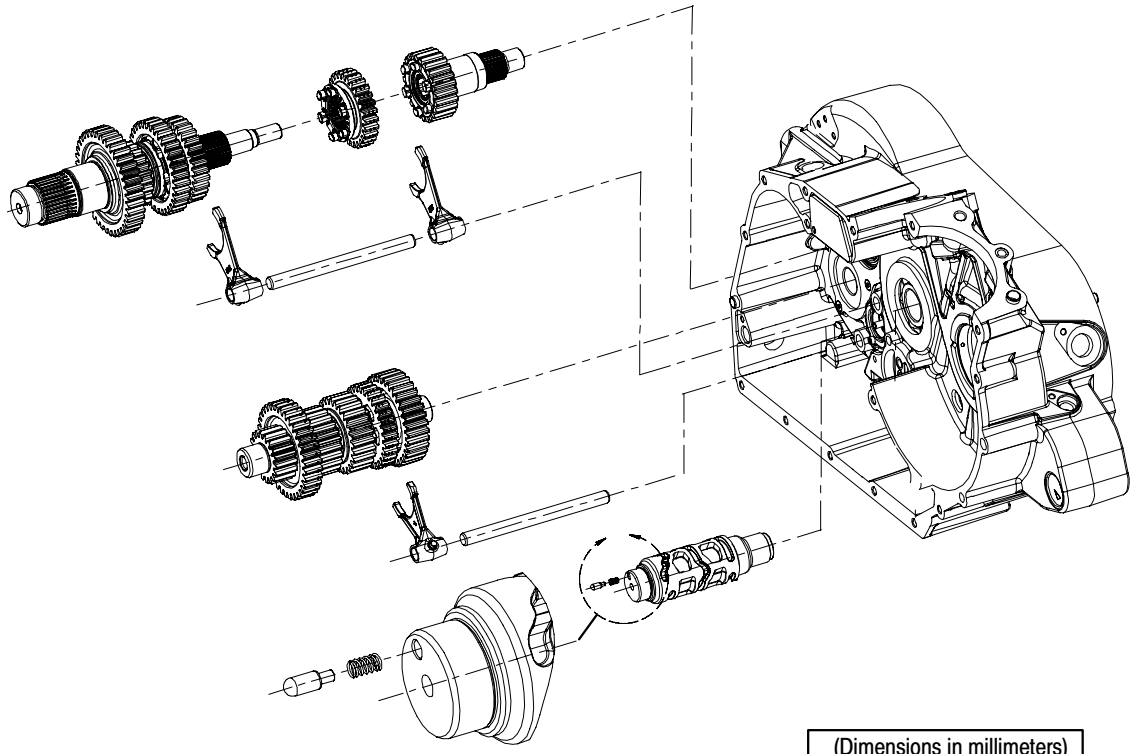
D: Inside Diameter: 32.005-32.021mm

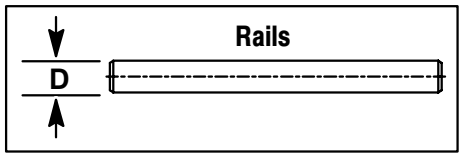
E: Inside Diameter: 32.005-32.021mm





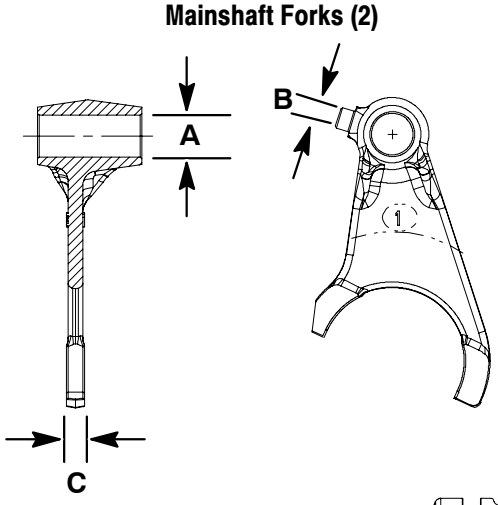
SHIFT DRUM AND SHIFT FORK ASSEMBLY VIEW - 6 SPEED

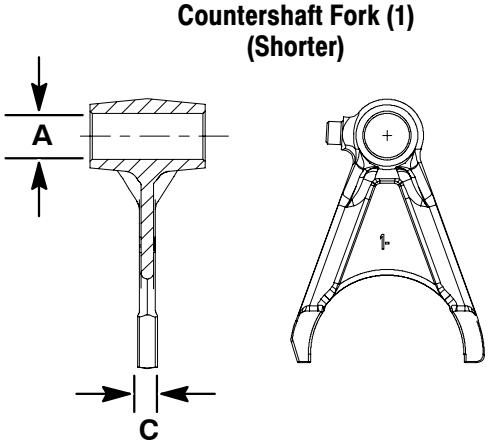


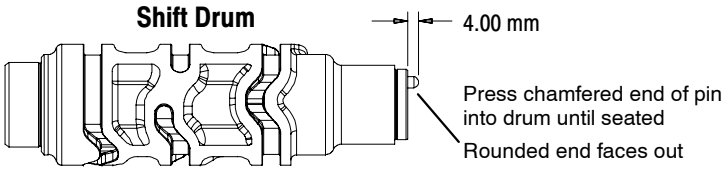


(Dimensions in millimeters)

∅	A	12.000 - 12.026
∅	B	6.036 - 6.136
	C	5.10 - 5.30
∅	D	11.948 - 11.972

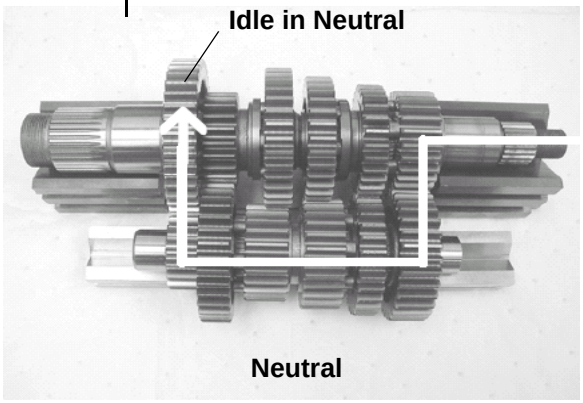




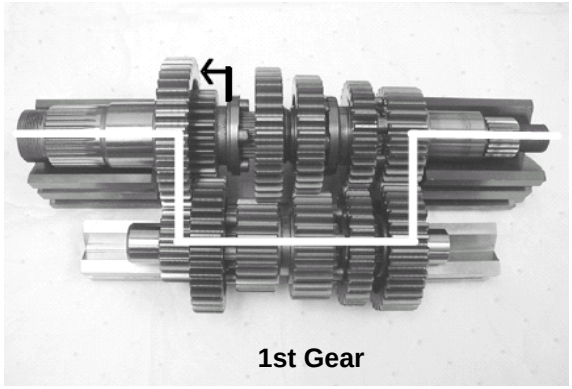


POWER DELIVERY - 6 SPEED (& 2006 5 Speed)

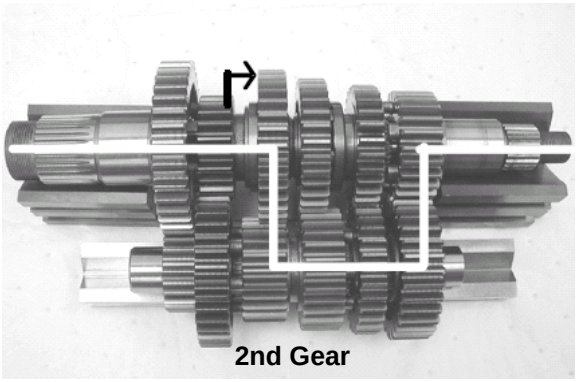
Indicates movement of sliding gear for engagement



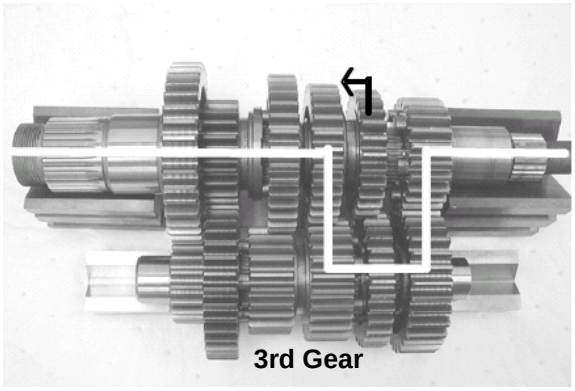
Neutral



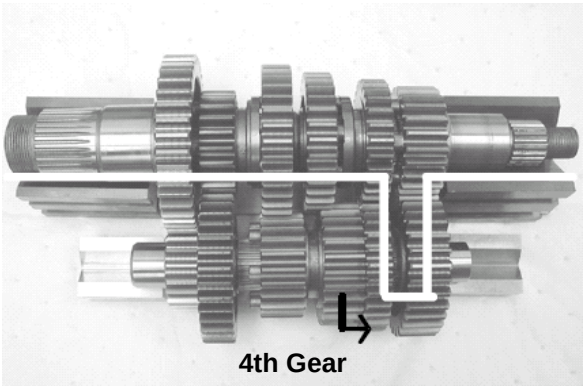
1st Gear



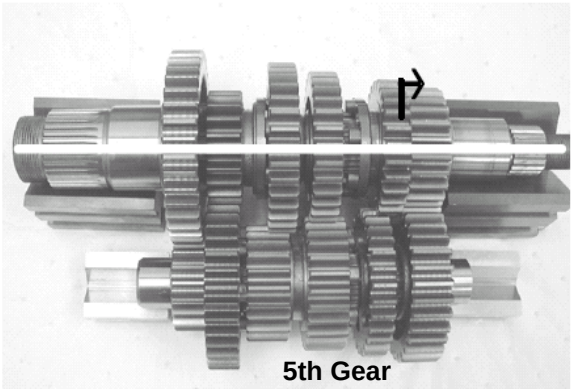
2nd Gear



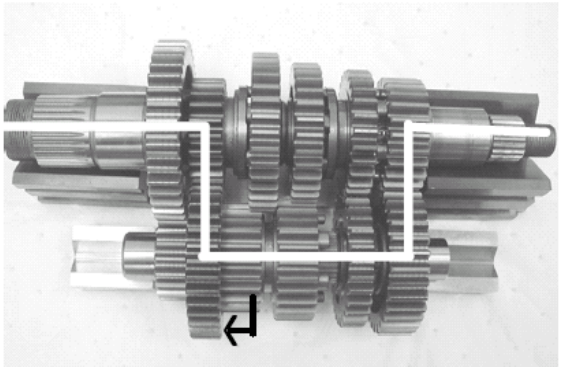
3rd Gear



4th Gear



5th Gear



Sixth Gear (O/D)

10

SERVICE PROCEDURES

CRANKCASE SEPARATION

1. Remove engine and mount securely on an engine stand. (Chapter 6).
2. Drain engine oil.
3. Remove belt drive sprocket (Chapter 11).
4. Remove primary cover (Chapter 9).
5. Remove cylinder heads (Chapter 7) & cylinders (Chapter 8).
6. Protect pistons and rings during engine disassembly by slipping a length of 4" diameter PVC pipe over them or slip large diameter hose over cylinder studs.

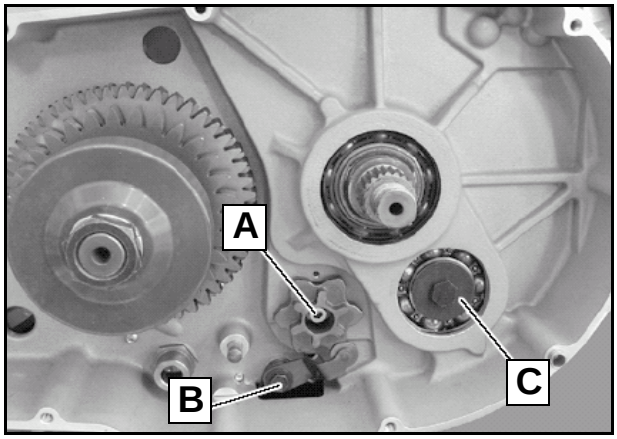
NOTE: Remove pistons if necessary (Chapter 7).

7. Remove shift ratchet and clutch (Chapter 9).

NOTE: For transmission service only, remove:

- Clutch
- Shift drum star (A)
- Roller detent arm (B).
- Countershaft retaining bolt (C).

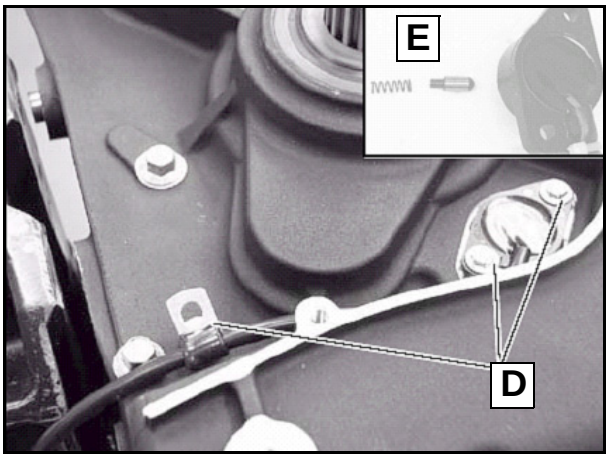
This will allow transmission removal after cases are split.



NOTE: For complete engine disassembly, refer to Chapter 9 to remove:

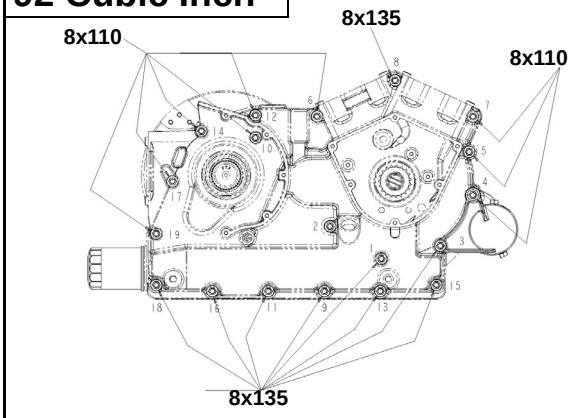
- Clutch and primary drive
- Flywheel
- Torque compensator
- Starter gear & one way clutch
- Primary drive gear
- Starter idler gear and shaft

8. <u>100 Cubic Inch</u> Remove:
   - Gear position switch (D).
   - Gear position pin and spring (E) from end of shift drum.

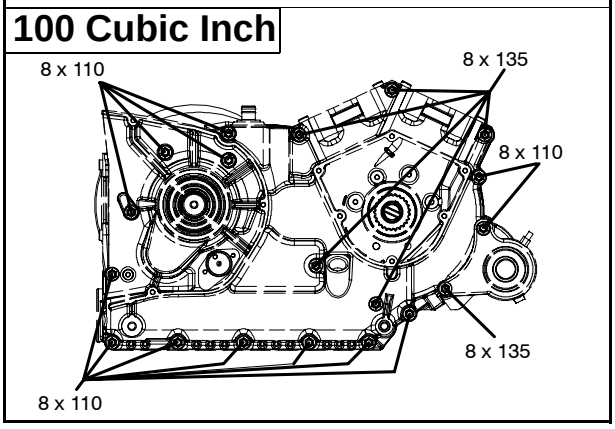


9. Remove starter motor.
10. Loosen (19) crankcase bolts evenly and remove from case.
11. There are two different length bolts used on the crankcases - 8x110mm and 8x135mm. Note their position for assembly.

92 Cubic Inch



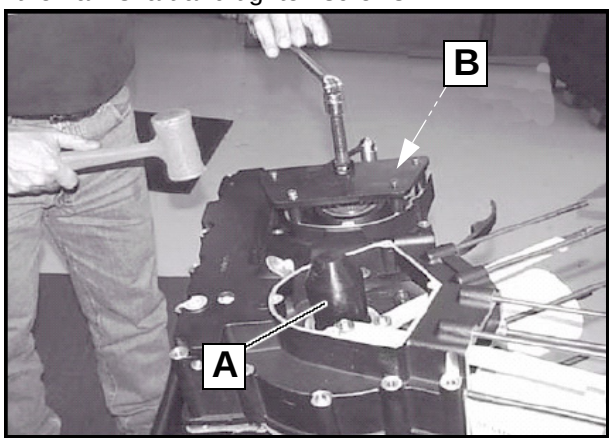
100 Cubic Inch



12. Install the crankshaft bearing protector (A) over the cam chain drive gear on the crankshaft.

Special Tool: PV-43504 (92 C.I.) PV-47207 (100 C.I.)

13. Install crankcase separator tool (B) on crankcase over themain shaft and tighten screws.



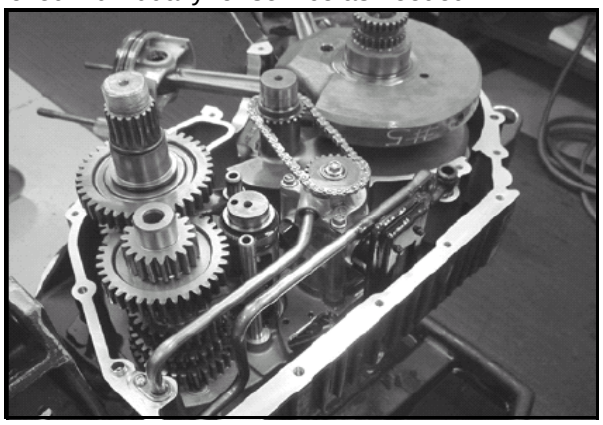
Special Tool:
PV-45029 (5 Speed Only) or PV-47332 (5 or 6 Speed)

14. Be sure ALL case bolts are removed.

15. Separate cases by tightening center bolt while tapping on cases with a soft mallet. The tool will press the main shaft out of the main shaft bearing inner race as the case is drawn upward.

16. Lift crankcase half off and remove bearing protector from cam chain drive sprocket.

NOTE: Components such as the crankshaft, oil pump, balance shaft, transmission, and shift drum can be removed individually for service as needed.

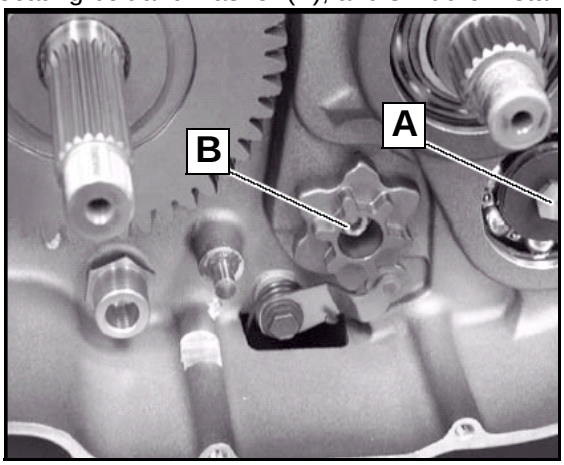


Refer to the following pages as required:

- Crankshaft: Page 10.15
- Oil Pump: Chapter 3
- Balance Shaft: Page 10.24
- Shift Drum / Transmission: Page 10.13

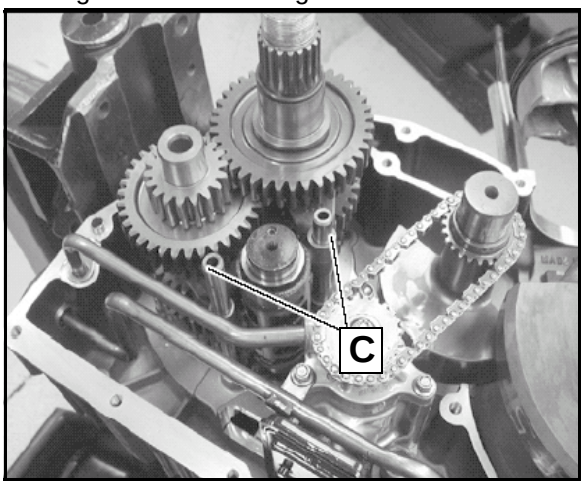
TRANSMISSION REMOVAL

1. If not removed previously, remove countershaft locating bolt and washer (A), and shift drum star (B).



2. Remove shift fork shafts (C).

3. Dislodge shift forks from grooves in the shift drum

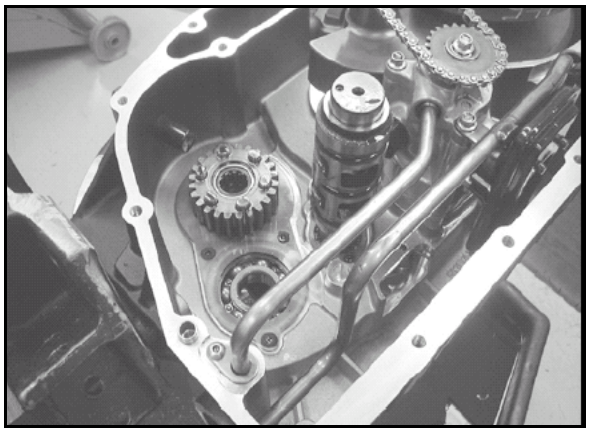


4. Remove shift forks, shift drum, mainshaft and countershaft from crankcase.

5. Carefully lift crankshaft out of left case.

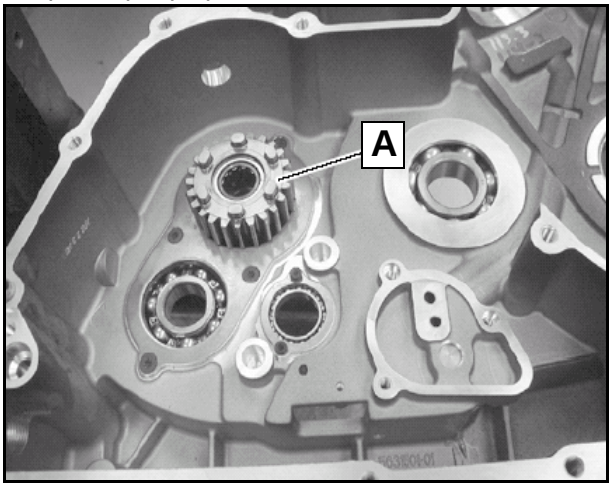
6. Remove oil pump sprocket, chain, oil pipes, and pump (page 4.7).

7. Pull balance shaft from left case.



CLUTCH SHAFT INSPECTION / REMOVAL

1. The clutch shaft (A) (Mainshaft 5th) is press-fit in the bearing inner race. Inspect shaft and bearing with clutch shaft in the crankcase. Rotate gear and check for smooth movement and no play. Inspect gear, bearings, and shaft splines for wear or damage. Remove clutch shaft if bearing or gear service is required (Step 2).



2. Use an arbor press to push clutch shaft out of bearing from clutch side. Support crankcase and protect case mating surface during press operation. Replace bearing if clutch shaft is removed.

TRANSMISSION INSPECTION

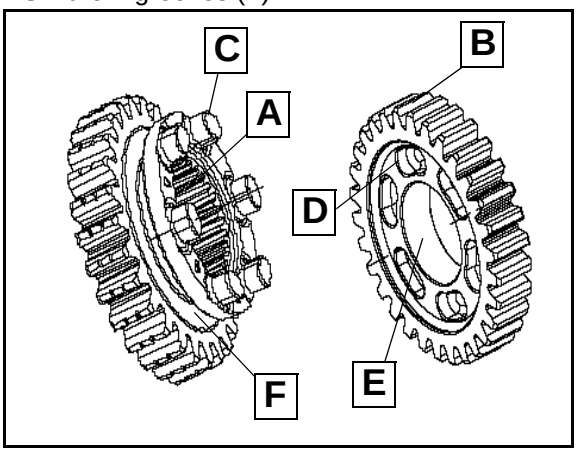
Refer to exploded views on page 10.8. Standard specifications for shaft and gears are on page 10.9 (main and clutch shaft) and page 10.10 (countershaft).

Shafts

1. Measure outside diameter of shafts in bearing areas for wear and concentricity as shown on page 10.9 and 10.10. Look closely at splines and retaining ring grooves of shafts for wear. Inspect ends of shafts for signs of wear:
   - Dull finish
   - Discoloration
   - Rough or uneven surface
   - Measurement outside of specification

Gears

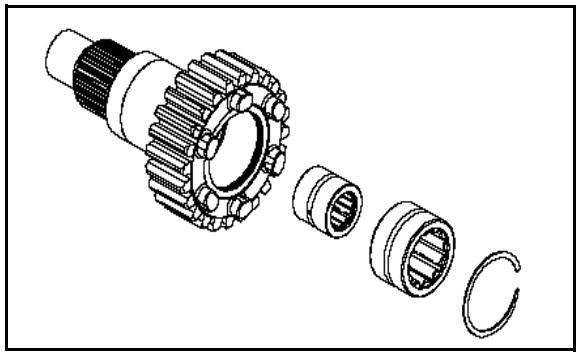
1. Visually inspect:
   - Gear internal splines (A)
   - Gear teeth (B)
   - Gear dogs (C) for rounding, cracks, chips
   - Gear dog slots (D) for rounding
   - Bearing surfaces (E)
   - Shift fork grooves (F)



Check each gear for damage, cracks, wear (rounding of dogs or surfaces), or discoloration.

Clutch Shaft Bearings

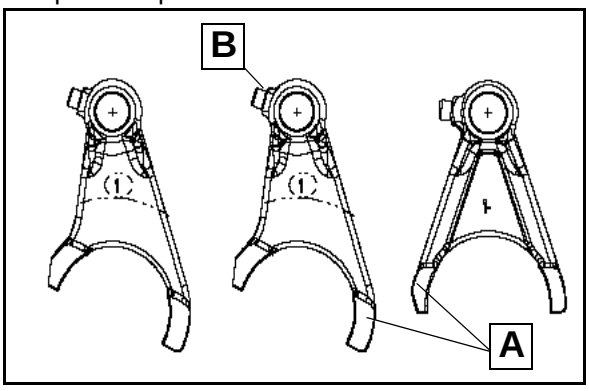
1. Inspect clutch shaft needle bearings (inside) that support the mainshaft. The clutch shaft should spin freely and smoothly on the mainshaft. The bearings should support the shaft firmly with little or no detectable lateral movement.
2. Replace clutch shaft assembly if bearings are worn or damaged.



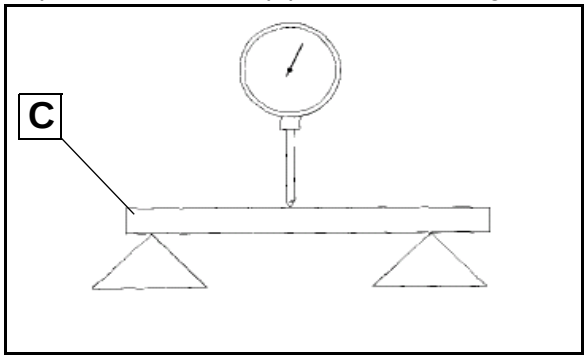
Shift Forks, Shift Fork Rails

Refer to specifications listed on page 10.3 and 10.11.

3. Inspect all contact surfaces (A) of each shift fork. Replace a shift fork if any part is discolored (overheated), unusually scored, warped, or worn beyond service limit.
4. Inspect each shift fork pin (B) for wear or damage and compare to specifications.

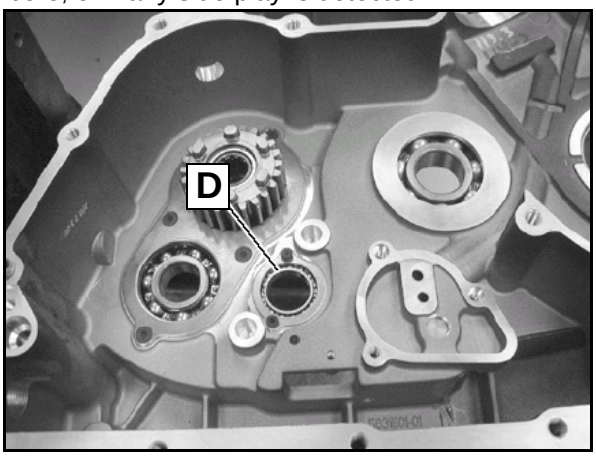


5. Inspect shift fork rails (C) for wear, scoring, or runout.



6. Measure shift fork rail O.D. for wear in 3 or 4 places along the length. The rail O.D. should be consistent over the entire length.
7. Slide rails into crankcase holes and check for a good snug fit.

8. Visually inspect the shift drum bearing (D) in the left crankcase for wear or damage. The bearing must be fully seated in the case and held in position by the retaining plate. Replace the bearing if it is loose in the bore, or if any side play is detected.

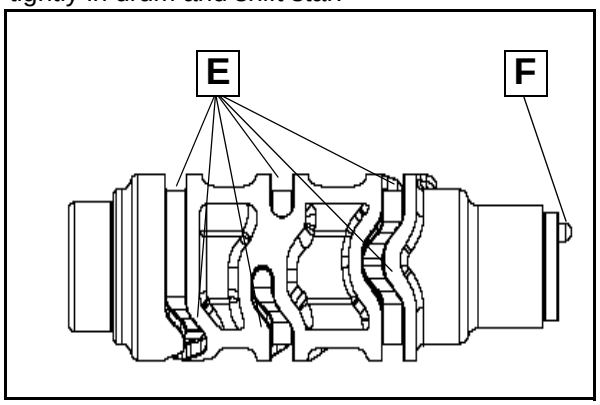


9. Temporarily install shift drum into bearing and rotate, checking for smooth bearing operation. Also, inspect shift drum bearing pin in the right crankcase to ensure it is not loose or worn.

SHIFT DRUM INSPECTION

10. Inspect shift drum grooves (E) for wear. Pay close attention to corners of grooves where forks change direction.

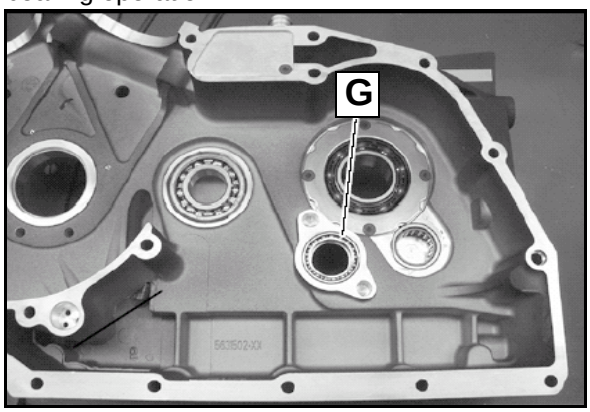
11. Inspect shift drum star alignment pin (F). It should fit tightly in drum and shift star.



12. Inspect surface of shift drum star for excessive wear or damage.

13. Inspect right side shift drum bearing (G).

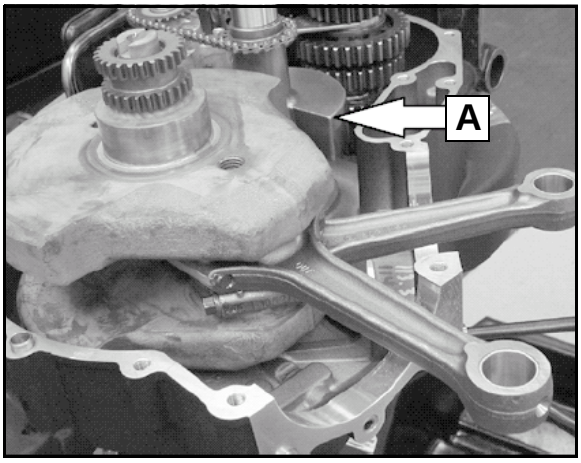
14. Temporarily install shift drum in right hand case bearing and inspect fit. Spin drum to check for smooth bearing operation.



CRANKSHAFT REMOVAL

1. Separate RH crankcase from LH case (page 10.6).

2. Rotate balance shaft (A) until counterweights are clear of crankshaft.

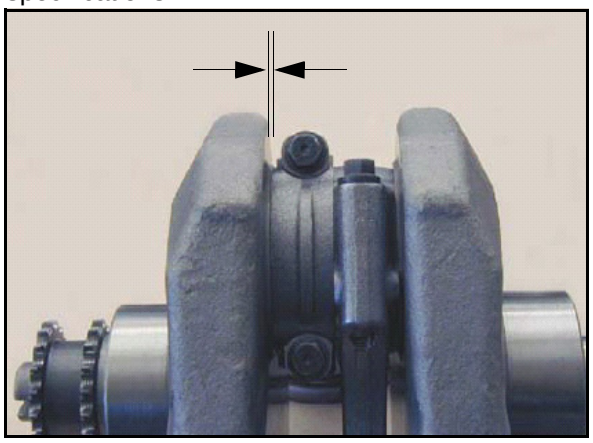


3. Lift crankshaft straight up until clear of case.

NOTE: Connecting rod bearings and main bearings are easily damaged. Be careful not to cause damage to these parts when servicing items within the crankcase.

CONNECTING ROD SIDE CLEARANCE INSPECTION

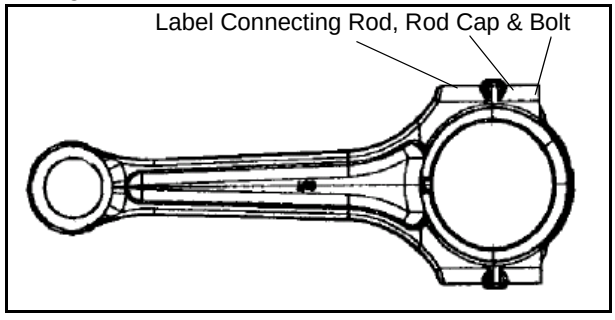
1. Move connecting rods to one side of crankshaft. Insert a feeler gauge between one connecting rod and the crankshaft. Compare measurement to specification on page 10.3.
2. If clearance recorded exceeds service limit, the crankshaft, connecting rod or both must be inspected and worn parts replaced. Refer to crankshaft inspection on page 10.19 and specifications on page 10.3 to determine which part(s) are outside of specifications.



CONNECTING ROD REMOVAL / IDENTIFICATION

NOTE: The connecting rod caps are marked from the factory, however it is recommended that an additional reference mark be added for clarity. Caps are matched to rods and must be installed with the proper orientation. DO NOT strike or stamp the connecting rod.

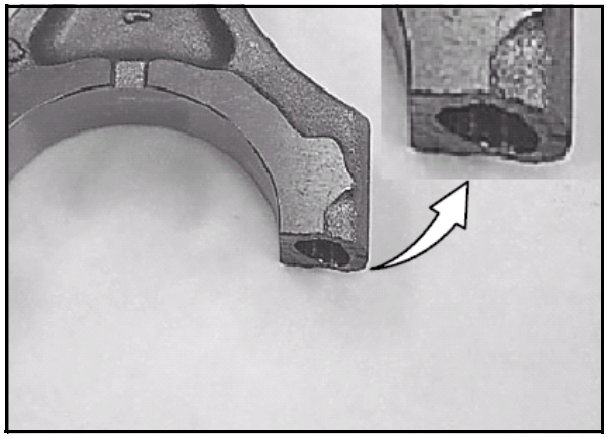
1. Use a permanent marker to mark orientation of connecting rods and rod bearing caps. These parts must be installed in their original locations. EXAMPLE: Right connecting rod must be assembled to the right with the bearing cap that was removed from it. The bearing cap and connecting rod must be assembled in the same direction as it was removed using the **same bolt.**



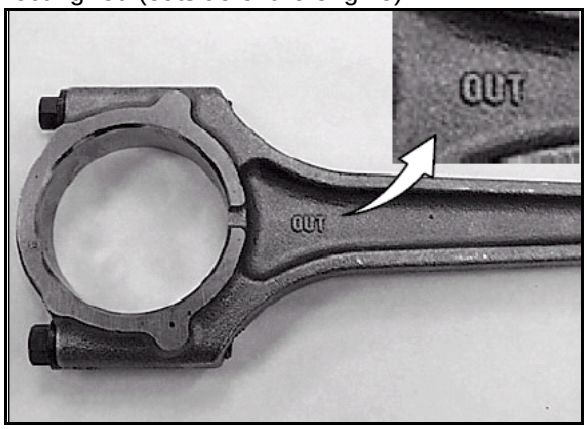
2. Remove connecting rod bolts and connecting rod bearing caps.

NOTE: It may be necessary to lightly tap the caps with a plastic mallet to loosen them.

> ⚠ CAUTION
>
> The mating surface of connecting rod and cap is rough in appearance, which is a normal condition due to the manufacturing process. If rod caps are installed *incorrectly* and tightened, the precision mating surfaces will be damaged. Replace the connecting rod assembly if mating surfaces are damaged.



NOTE: Rods are marked OUT as shown in photo. "OUT" must face toward the **left** for the **left** connecting rod and must face toward the **right** for the **right** connecting rod (outside of the engine).



CONNECTING ROD INSPECTION (Big end)

1. Refer to page 8.8 for connecting rod small end inspection.

> ⚠ CAUTION
>
> Be sure to match connecting rod caps with their respective rod and orient the cap properly before installing the cap. Secure the big end of rods in a vise equipped with soft, protective jaws before torquing rod bolts. (Fig. 1)

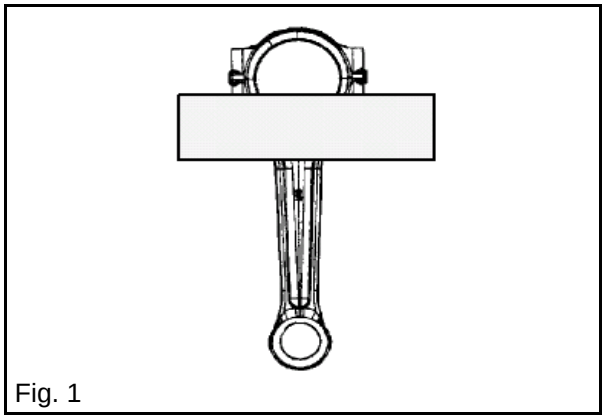
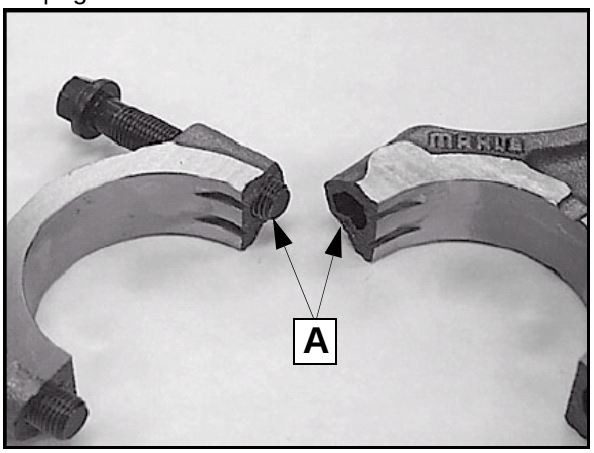
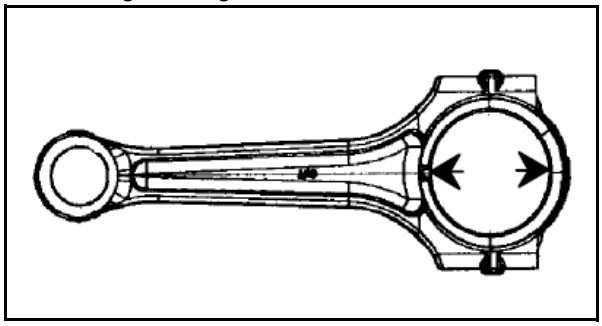


Fig. 1

2. Install caps on connecting rods. Be sure mating surfaces (A) of rod and cap are clean.
3. Apply Victory engine oil to threads of rod bolts and nuts. Torque evenly in 2 steps to specification directed on page 10.19.



4. Measure I.D. of connecting rod big end for size and out of round. Compare to specifications on page 10.3.
5. Visually inspect connecting rod upper and lower ends for scoring, damage, or excessive wear.



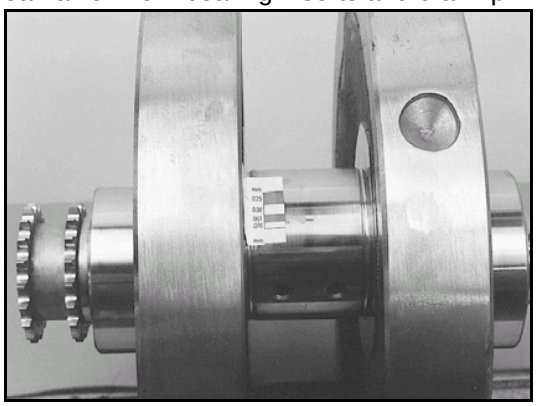
CONNECTING ROD BEARING INSPECTION

1. Inspect bearing inserts for unusual wear, peeling, scoring, damage etc. Replace as a set if damage is noted.

NOTE: If one insert requires replacement, replace both connecting rod bearing inserts as a set. **Refer to Bearing Selection Chart on page 10.29**

CONNECTING ROD BEARING CLEARANCE INSPECTION (Typical)

1. Clean all oil from bearing inserts and crank pin.



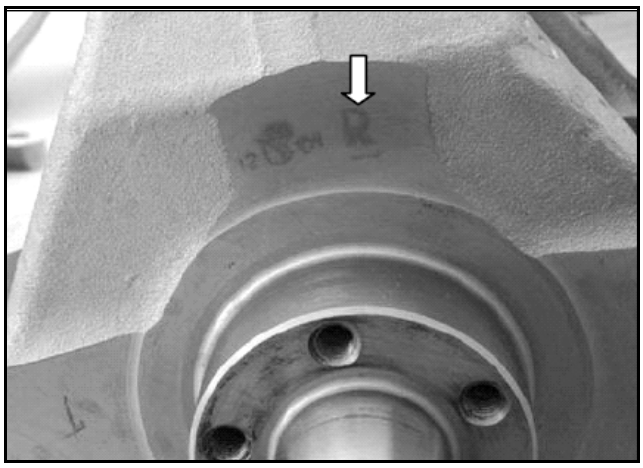
2. Place a strip of Plastigauge® across the complete width of the crank pin.
   - Do not place Plastigauge® across oil holes
   - Do not allow connecting rods to move during this procedure
3. Install connecting rods and bearing caps in the correct orientation (put them on the same way they were taken off using the same bolts).
4. Torque rod cap bolts as directed on page 10.4.
5. Remove bearing caps being careful not to disturb the Plastigauge®.
6. Use measuring scale on Plastigauge® wrapper to measure thickness of Plastigauge® for each connecting rod and compare measurement to specification on page 10.2

NOTE: Use widest part of Plastigauge® to determine rod to crankshaft oil clearance.

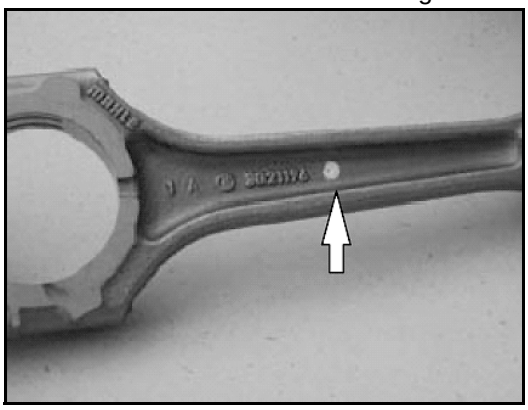
7. If service limits are exceeded, install new rod bearings and recheck oil clearance.
8. If service limits are still exceeded, determine if crankshaft or connecting rods need to be replaced.
9. At completion of measurement procedure, remove all traces of Plastigauge® from bearing and crankshaft.

CONNECTING ROD BEARING SELECTION

1. There are 3 sizes of connecting rod bearings available: Black, Orange and Blue (see chart below).
2. To determine which bearing to use, look at the color code on the crankshaft...



3. ...and the color code on the connecting rod.



4. Refer to the chart below to select the proper bearing insert.

FOR EXAMPLE: If the CONNECTING ROD paint mark is RED and the CRANKSHAFT stamp is W (white) (or not stamped), use BLUE bearing inserts.

Connecting Rod Bearing Selection Chart		
CON ROD COLOR / CRANKSHAFT	BEARING COLOR (P/N 3514390-**xxx**)	BEARING THICKNESS
WHITE Connecting Rod with **RED** Crankshaft	Black (**-067**)	1.409- 1.415 mm
WHITE Connecting Rod with **WHITE** Crankshaft (or not stamped)	Orange (**-159**)	1.413- 1.419 mm
RED Connecting Rod with **RED** Crankshaft	Orange (**-159**)	
RED Connecting Rod with **WHITE** Crankshaft (or not stamped)	Blue (**-027**)	1.417- 1.423 mm

CONNECTING ROD INSTALLATION

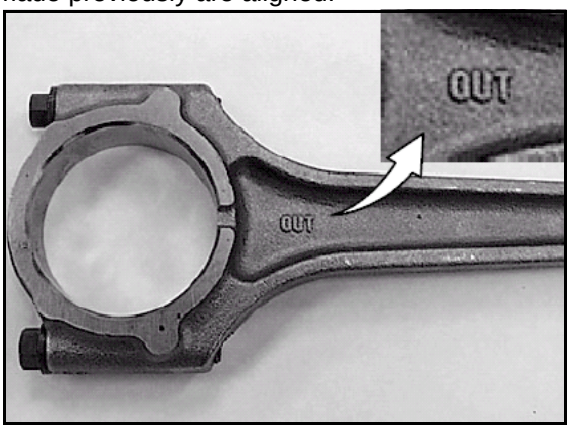
1. Make sure proper bearing clearance is achieved by using the correct colored bearing insert for a given color combination of connecting rod and crankshaft.
2. Clean all oil off connecting rod, connecting rod cap and bearing inserts.
3. Install bearing inserts into connecting rods and caps. First, install bearing tab into groove, then press the rest of the bearing into place.

NOTE: Procedure during disassembly called for marking of connecting rods and caps. Ensure that each part is installed in original location including rod cap bolts.

4. Apply assembly lube to connecting rod bearings and crank pin.

Moly Assembly Paste PN: 2871460

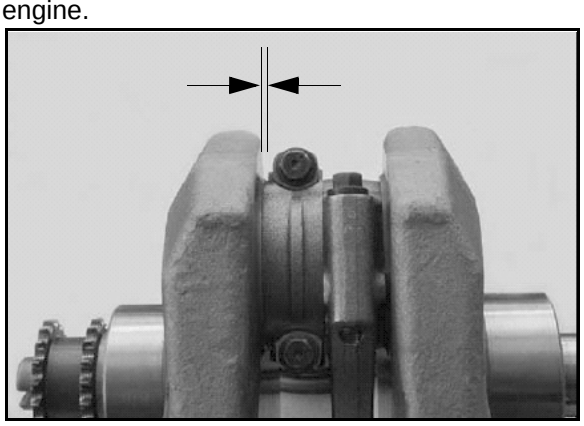
5. Install rods and caps onto the crankshaft, observing the "OUT" mark on the connecting rods. "OUT" must face toward the **left** for the **left** connecting rod and must face toward the **right** for the **right** connecting rod (outside end of crankshaft). Be sure the I.D. marks made previously are aligned.



6. Tighten rod cap bolts:
   - To 7 Nm (5 lb-ft) to seat caps and bearings.
   - Tighten to specification in two steps.

TORQUE: Connecting Rod Cap
7 Nm (5 lb-ft) (To Seat Bearing)
55 Nm (40 lb-ft) (Final Torque)

7. Check that the connecting rods rotate smoothly and freely on crankshaft journal.
4. Crankshaft and connecting rods are identified by color. Be sure to compare measurements to specification on page 10.3 for the proper color (or non-marked) connecting rod or crankshaft.
8. If a connecting rod or crankshaft was replaced, re-measure side clearance (A) to be sure it is within specification listed on page 10.3 before assembling engine.



CRANKSHAFT INSPECTION

Compare all measurements to specifications on page 10.3. Replace crankshaft if worn beyond service limit.

1. Measure the width of the rod bearing journal. (Fig. 2)

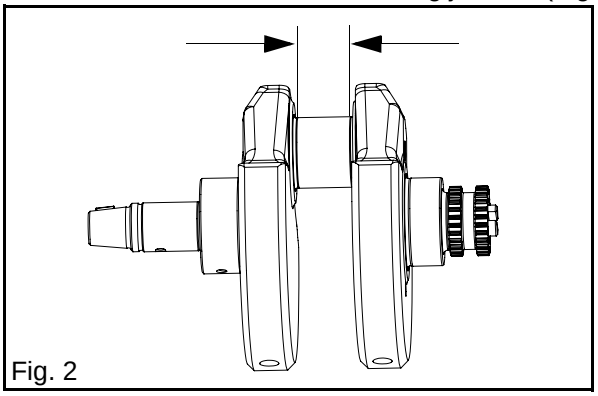


Fig. 2

2. Measure width of connecting rods at big end. (Fig. 3)

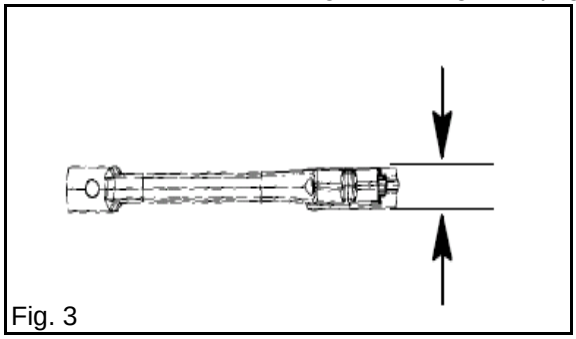


Fig. 3

3. Visually inspect all bearing journals for scoring, damage or excessive wear.

Measure O.D. of crankshaft rod journal in four places and compare to specifications. (Fig. 4)

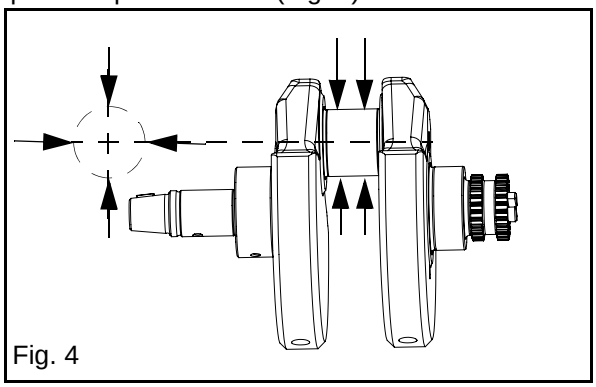


Fig. 4

5. Measure O.D. of main bearing journals.(Fig. 5)

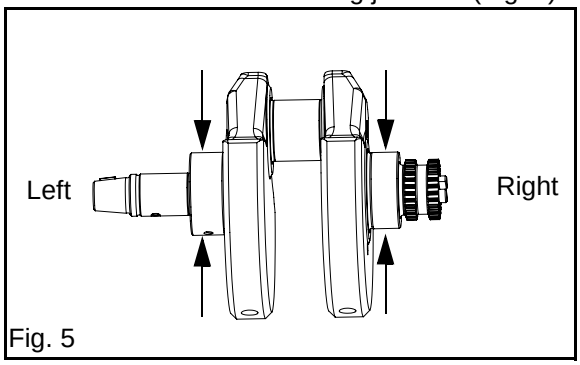
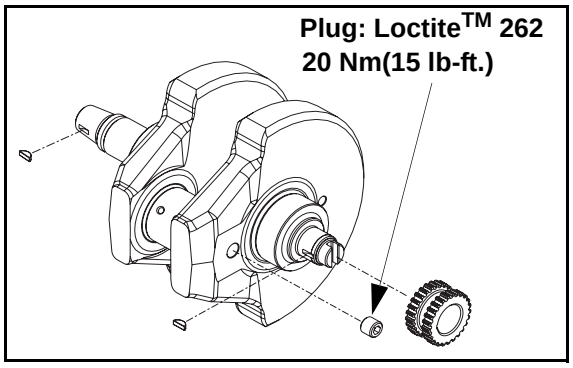


Fig. 5

CRANKSHAFT CLEANING

1. Remove blind plugs from crankshaft to ensure that all passages are clear.

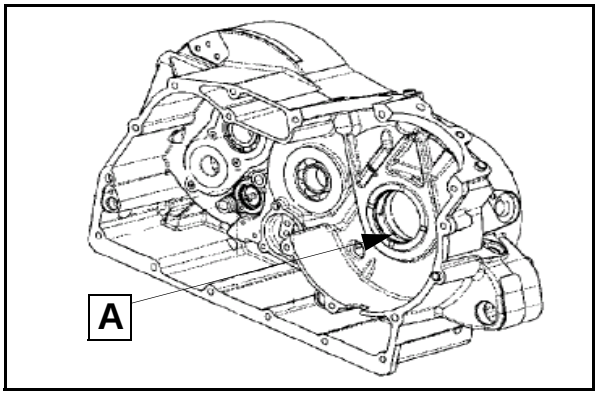
> ⚠ CAUTION
>
> Blind plugs are installed with Loctite™ 262. Use localized heat (such as a soldering gun) when removing blind plugs.



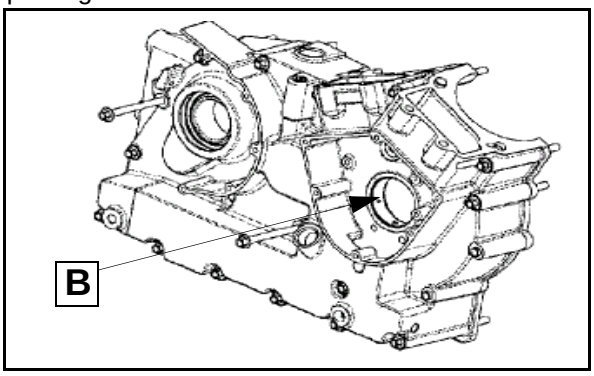
2. After cleaning passages, apply Loctite™ 262 to blind plug threads and install plugs into crankshaft to specified torque. Plug should be flush with surface of crankshaft.
3. Install woodruff key(s). Install drive and alignment pins.

MAIN BEARING INSPECTION

1. Inspect crankcase main bearing surfaces for unusual wear, peeling, scoring, damage etc.
2. Inspect alignment of bearing lubrication hole (A) in left crankcase half. It should be aligned with oil passage in crankcase.



3. Inspect alignment of bearing lubrication hole (B) in right crankcase half. It should be aligned with oil passage in crankcase.



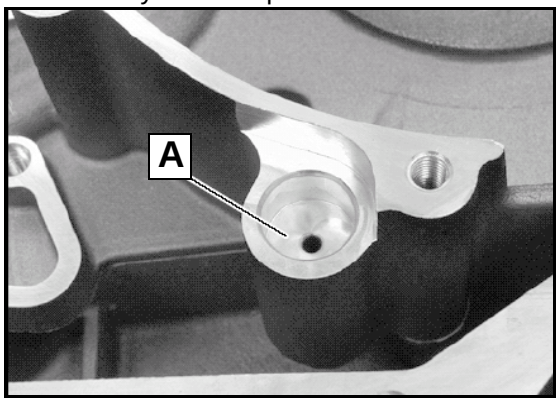
10

LEFT CRANKCASE ASSEMBLY

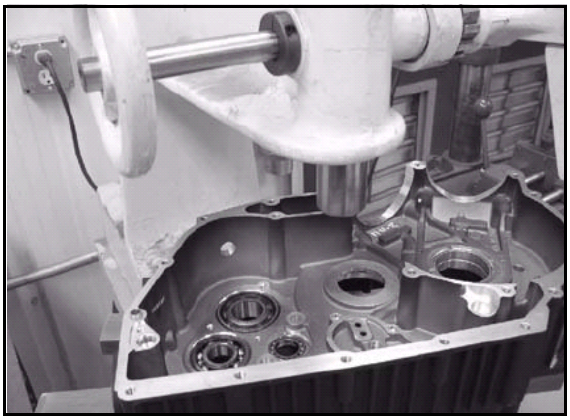
Prepare LEFT crankcase for assembly:

Refer to exploded view on page 10.4 for torque values, bearing press depth, and locking agent.

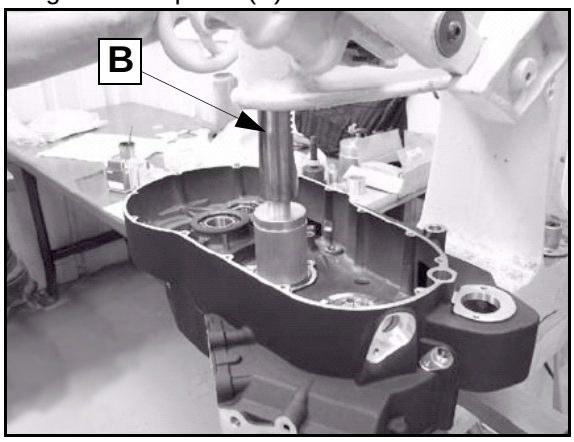
1. Clean crankcase and oil passages (A) thoroughly. Rinse and dry with compressed air.



- Install new bearings in crankcase as required.
- Apply a film of lithium grease to outer race of bearings to prevent galling upon installation.
- Press on outer race of bearings using an arbor press and a suitable arbor that is slightly smaller than bearing outside diameter.
- DO NOT press on inner race of ball bearings.

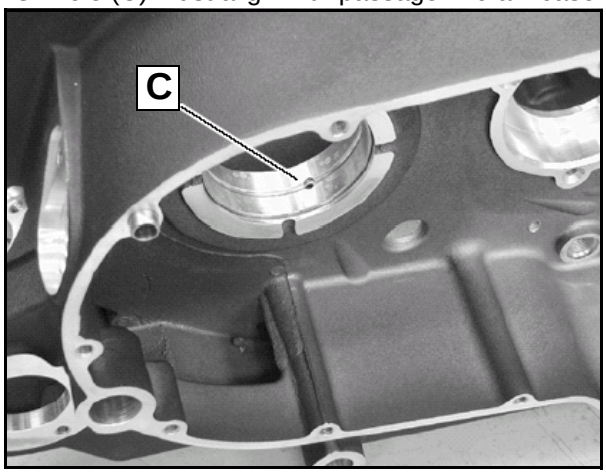


2. Press balance shaft bearing from the primary side using an arbor press (B).



Main Bearings:

3. If main bearings are installed, they must be line-honed with the right side crankcase to proper finished size. Pressing operation and fitting must be performed by a qualified machinist.
4. Oil hole (C) must align with passage in crankcase.



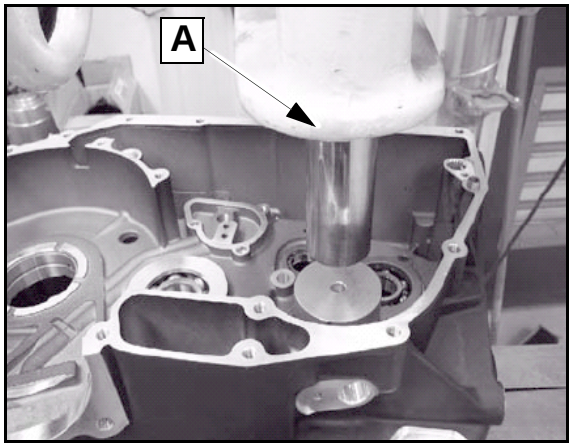
CLUTCH SHAFT INSTALLATION

5. Place clutch shaft support tool press plate on clutch side of crankcase to support inner race of bearing. Clutch shaft is a firm press-fit in bearing, and bearing damage may result if inner race is not supported during the press operation.

Special tool:

Clutch Shaft Bearing Support: PV-47331

6. Press clutch shaft until fully seated using an arbor press (A). Check for smooth, quiet operation after shaft is installed.

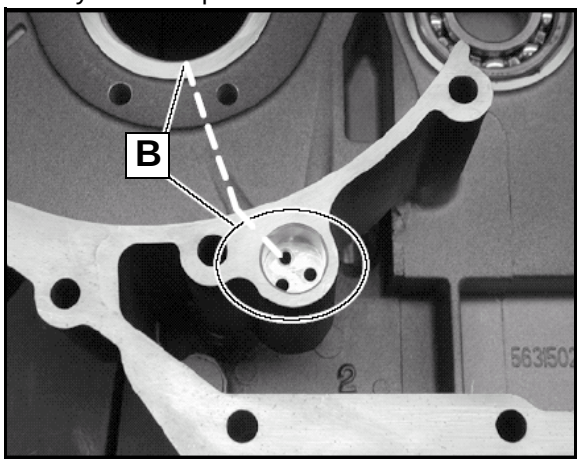


RIGHT CRANKCASE ASSEMBLY

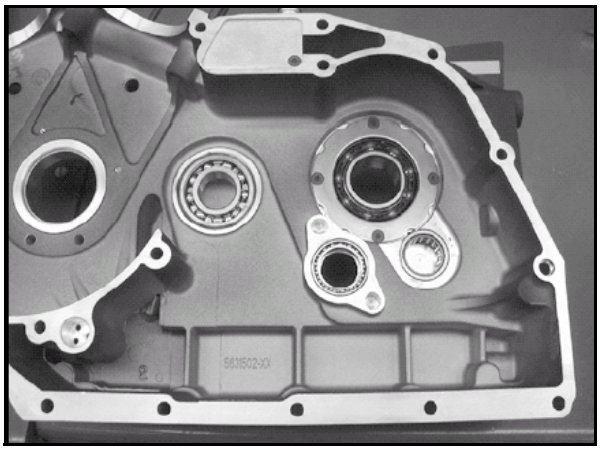
Prepare RIGHT crankcase for assembly:

Refer to exploded view on page 10.4 for torque values, bearing press depth, and locking agent.

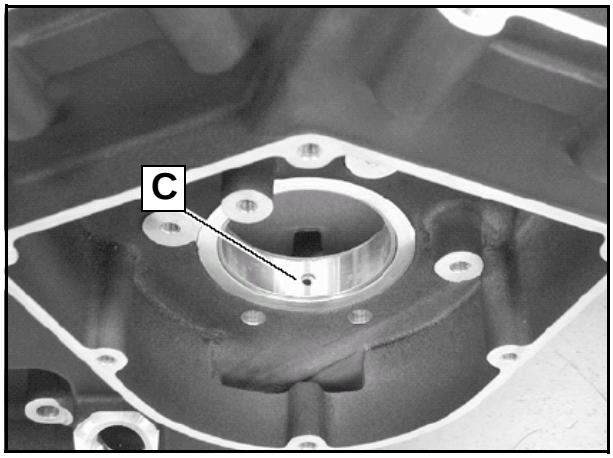
1. Clean crankcase oil passages (B) thoroughly. Rinse and dry with compressed air.



- Install new bearings in crankcase as required.
- Apply a film of lithium grease to outer race of bearings to prevent galling upon installation.
- Press on outer race of bearings using an arbor press and a suitable arbor that is slightly smaller than bearing outside diameter.
- DO NOT press on inner race of ball bearings.



2. Oil hole (C) must align with passage in crankcase.



3. If main bearings are replaced, they must be line-honed with the left side crankcase to proper finished size. Press operation and fitting must be performed by a qualified machinist.

MAIN BEARING OIL CLEARANCE INSPECTION

1. Record crankshaft main bearing journal O.D. for both right and left side. Refer to crankshaft inspection procedure (page 10.19).
2. Measure and record installed main bearing I.D.

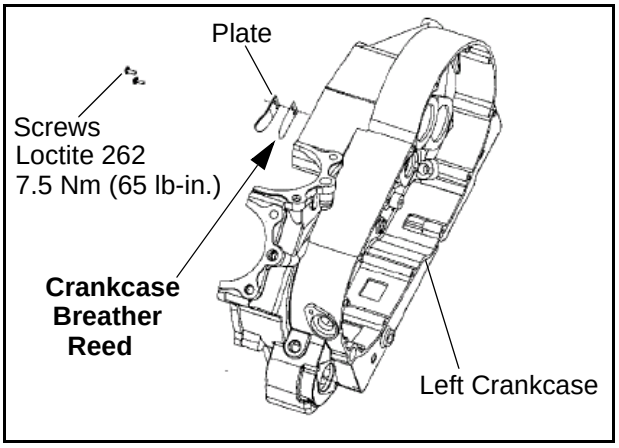
Main Bearing I.D.
- Crankshaft Main Bearing Journal O.D.
= Main Bearing Oil Clearance

3. Determine the clearance between crankshaft main bearing journals and main bearings.
4. Compare measurement to specification on page 10.3.
5. If crankshaft dimensions are within tolerances and oil clearances are incorrect, the crankcase set must be replaced or new main bearings installed and line-honed by a competent machinist.

NOTE: Replace crankcase halves as a set.

CRANKCASE REED VALVE ASSEMBLY REMOVAL & INSPECTION

1. Separate engine cases (page 10.6).
2. Remove the retaining screws for the reed valve assembly. Remove breather valve assembly.
3. Inspect the reed valve for bending, pitting, or other damage at the sealing surface that would prevent a good seal.
4. Replace the reed valve as necessary. Refer to page 10.4.



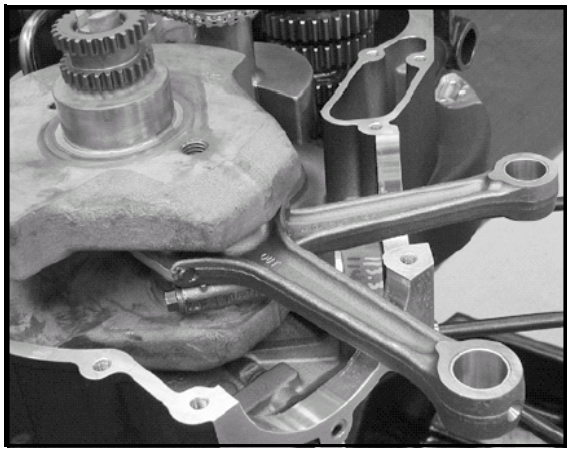
CRANKSHAFT INSTALLATION

NOTE: Install left engine case onto an engine stand.

1. Apply assembly paste to main bearings.

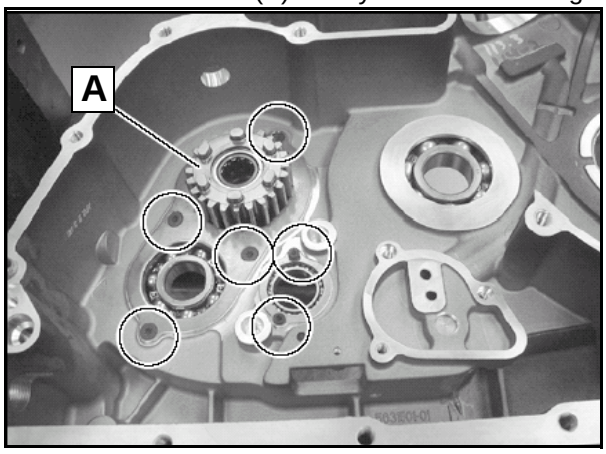
Moly Assembly Paste PN: 2871460

2. Hold crankshaft over left crankcase and position rods so that left side rod is in cutout for rear cylinder and right side rod is in cutout for the front cylinder.
3. Place crankshaft into left crankcase half.



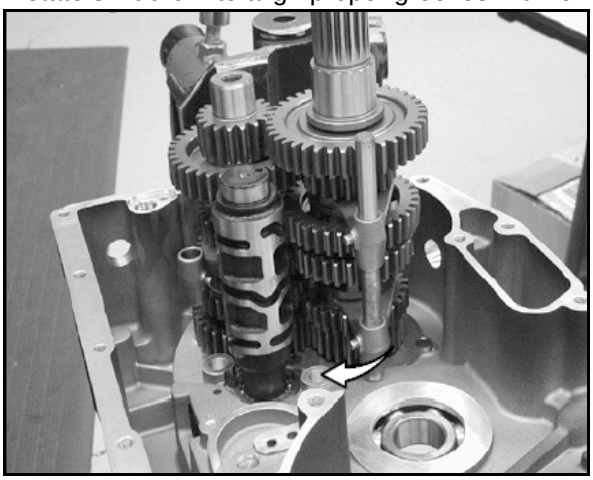
TRANSMISSION INSTALLATION

1. Be sure all bearing retainer plate screws are installed and tightened to specification.
2. Be sure clutch shaft (A) is fully seated in bearing.



3. Lubricate parts with Victory engine oil. Apply Moly Assembly Paste (PN 2871460) to ends of transmission shafts.

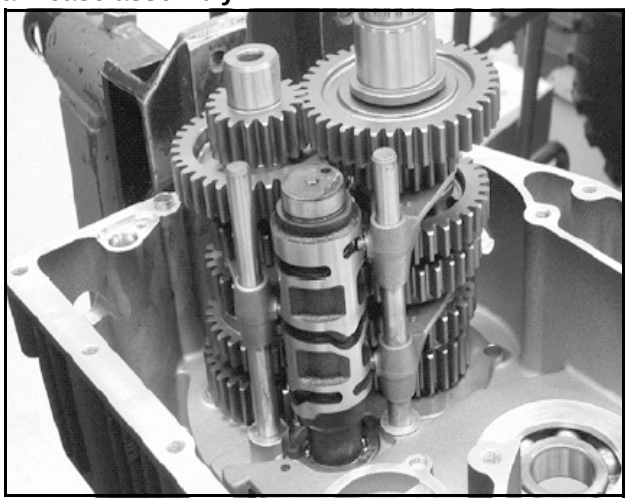
4. Install shift drum, countershaft, and mainshaft into the left crankcase. Hold mainshaft 4th gear on shaft during assembly. Make certain both shafts are fully seated and rotate freely.
5. Install shift forks in grooves of sliding gears. The two mainshaft forks are identical.
6. Install shift rails through forks.
7. Rotate shift drum to align proper grooves with forks.



8. Move shift fork pins into drum grooves and seat rails.
9. Photo shows transmission installed and shift forks engaged; shift rails seated.

At this point, test the transmission by shifting through the gears while rotating the shafts. Test operation in each gear to ensure transmission works properly before proceeding.

NOTE: Shift transmission into 5Th gear for crankcase assembly

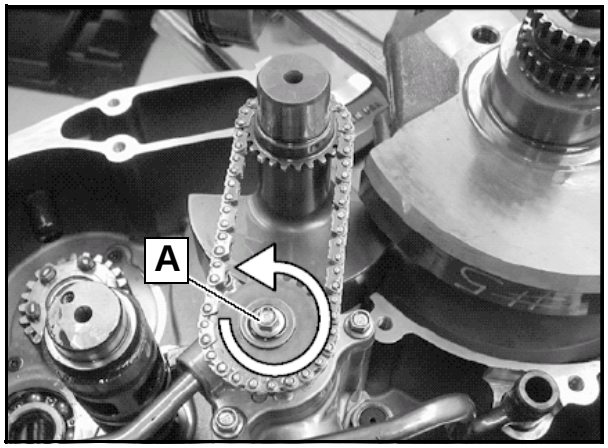


10. Install balance shaft, oil pump with pipes page 4.15), and crankshaft (page 10.23) if removed.
11. Refer to Crankcase Assembly on page 10.25.

BALANCE SHAFT

BALANCE SHAFT REMOVAL & INSPECTION

1. Remove bolt (A) from oil pump drive sprocket. Use engine lock tool between balance shaft weight and crankcase to hold shaft.

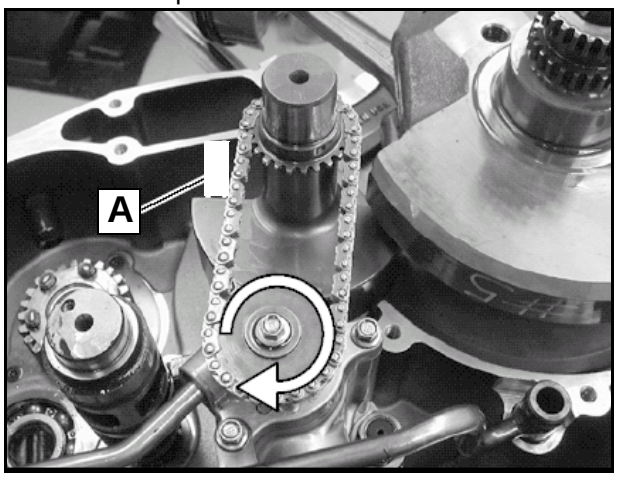


2. Remove sprocket & chain from oil pump.
3. Remove chain from balance shaft sprocket.
4. Rotate balance shaft until counterweights are clear of crankshaft. Grasp balance shaft and remove it from case.
5. Inspect sprocket teeth for wear or damage.
6. Check shaft for runout, or twisting.
7. Rotate right and left balance shaft bearings by hand while observing bearing rotation. Bearings should run smooth and quiet and shaft should be a snug fit in bearing.
8. Visually inspect bearings for damage.

BALANCE SHAFT INSTALLATION

1. Lubricate balance shaft bearings with engine oil.
2. Insert threaded end of shaft into left crankcase bearing.
3. Install oil pump drive chain onto balance shaft.

4. Install chain and sprocket onto oil pump shaft. Align flats to seat sprocket.



5. Install engine lock tool between balance shaft weight and crankcase (A) to lock balance shaft.
6. Install oil pump sprocket bolt and torque to specification.

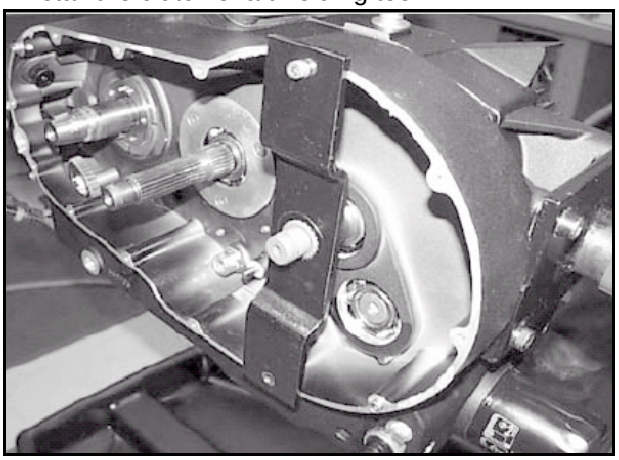
TORQUE:
10 Nm (85 in-lb)

CRANKCASE

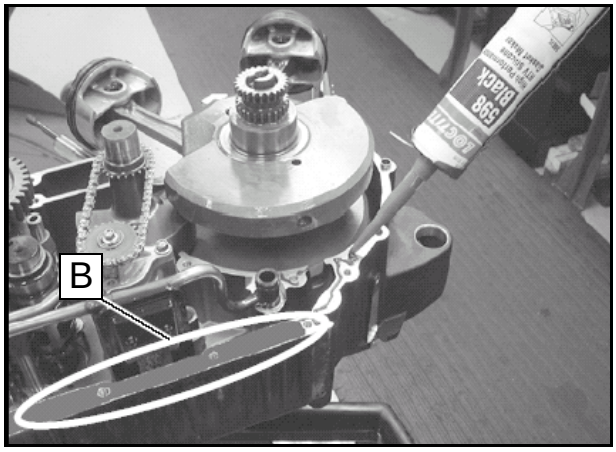
CRANKCASE ASSEMBLY & SEALING

NOTE: Place transmission in 5th gear prior to crankcase assembly.

1. Clean crankcase mating surfaces to remove all grease, oil, and old sealant.
2. Check to be sure all shafts are seated, and that all (new) O-rings, alignment dowel pins, oil pipes, etc. are in place.
3. Install the clutch shaft holding tool.



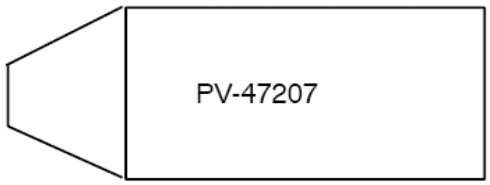
4. Apply an even bead of Loctite™ Ultra Black 598 to entire case sealing surface.
5. Spread sealant into a thin even layer on entire case mating surface (B). Be sure all areas are covered. DO NOT ALLOW SEALANT TO DRY. CONTINUE ASSEMBLY UNTIL CASES ARE SEALED AND ALL BOLTS ARE TIGHT.



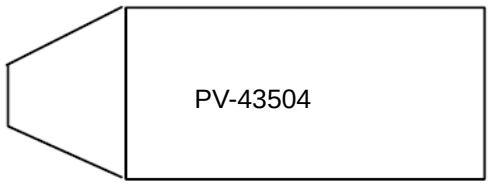
6. Install crankshaft bearing protector over the cam chain drive sprocket

Special tool:

Crankshaft Bearing Protector PV-47207 or PV-43504



100 C. I. Engines (2006)



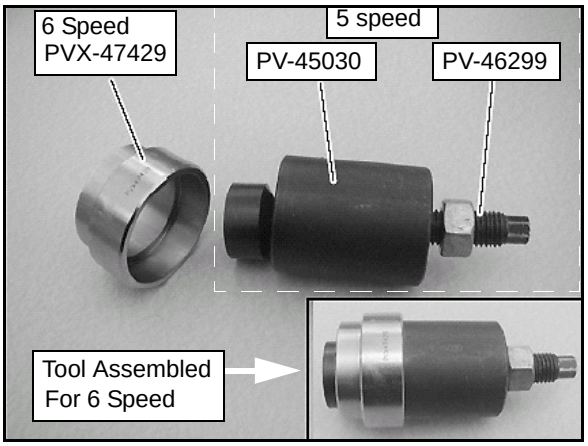
92 C. I . Engines (2003-2005)

7. Assemble the Crankcase Installation Tool as shown in photo below.

Special Tool: Mainshaft / Crankcase Installer:

PV-45030 with Threaded Shaft PV-46299 for both 5 and 6 Speed.

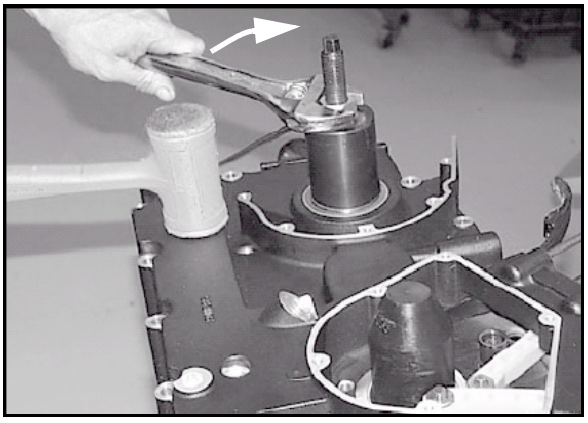
Extension PVX-47429 required for 6 speed.



8. Install crankcase installation tool onto the output shaft.
9. Pull crankcase together by tightening nut and tapping on crankcase with a soft mallet.

NOTE: The cases will mate before the mainshaft is drawn fully into bearing. IMPORTANT! Continue to turn nut and tap case and apply approximately 102-136 Nm (75-100 lb-ft.) torque to the nut).

10. Remove the tool.
11. Install crankcase bolts with starter motor
.

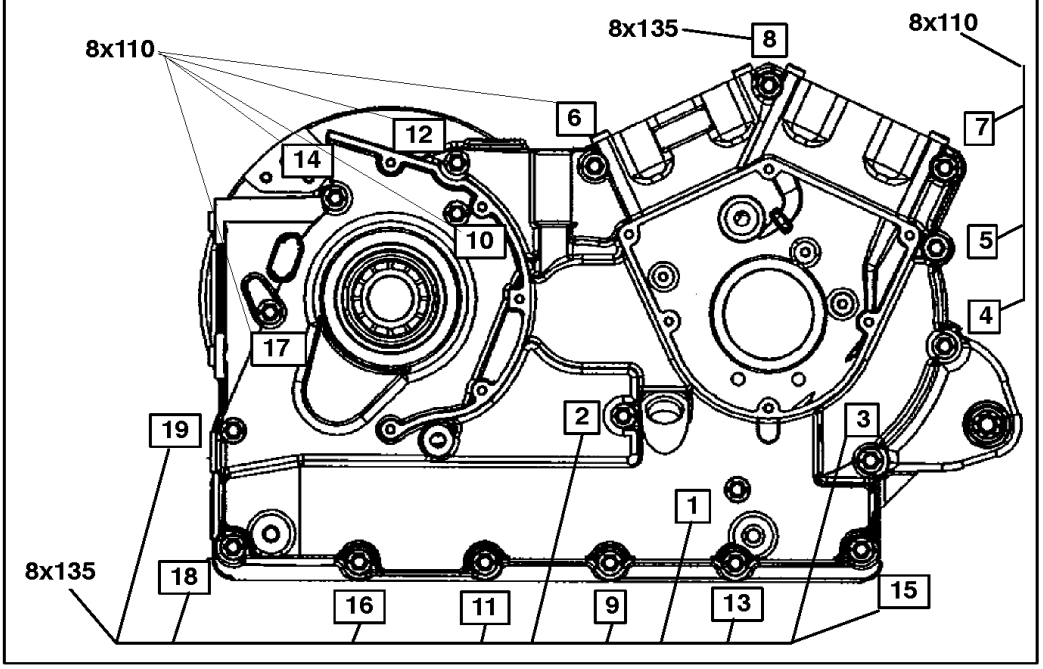


12. Tighten crankcase bolts in two steps following the sequence shown on following page. Repeat the final torque on all bolts.

(Continued)

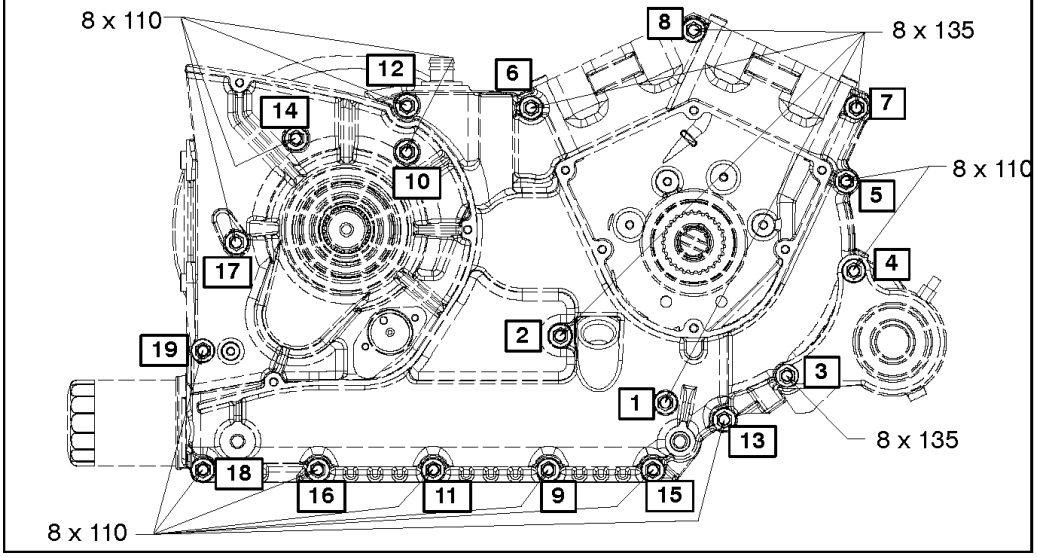
92 Cubic Inch

TORQUE: Crankcase Bolts
(2 steps) 10/20/30 Nm (5/15/22 lb-ft) Repeat the 30 Nm (22lb-ft) torque

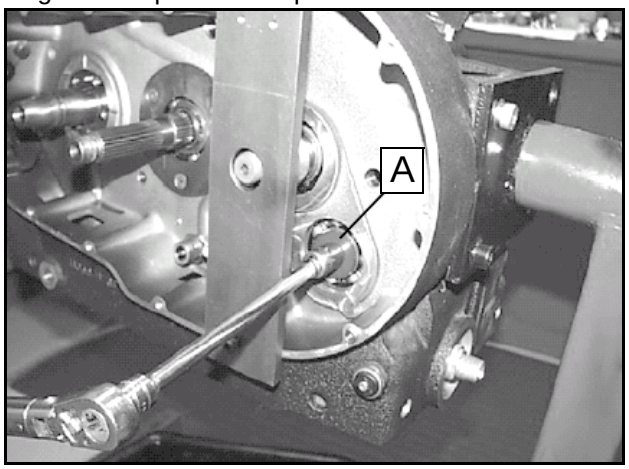


100 Cubic Inch

TORQUE: Crankcase Bolts
(2 steps) 20 / 30 Nm (15 / 22 lb-ft) (Repeat the 30 Nm (22 lb-ft.) torque



13. Clean threads of countershaft and bolt with Loctite™ Primer N. Apply 2 drops of Loctite™ 262 to threads of countershaft bolt. Install bolt with washer (A) and tighten to specified torque.



TORQUE: Countershaft Bolt
24 Nm (18 lb-ft.)
Loctite 262 (Red)

14. Remove tool from shaft and assemble shift mechanism, primary drive, and primary cover. Refer to Chapter 9.

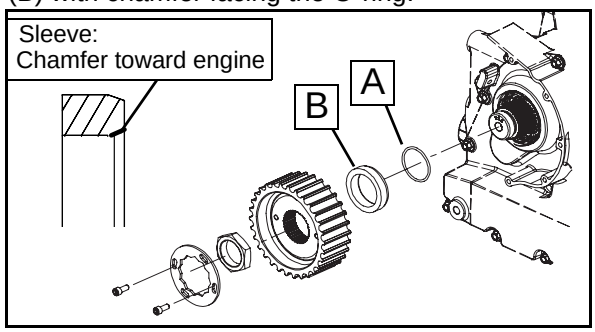
DRIVE SPROCKET INSTALLATION

1. Install a new mainshaft seal in RH crankcase using the seal installer.

Special Tool:

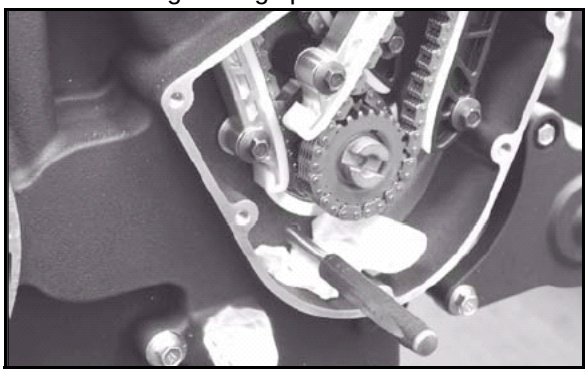
Final Drive Seal Installer PV-43505

2. Inspect seal sleeve for burrs, nicks, or wear on the surfaces that contact bearing race and drive sprocket. Replace if worn or if surface is not smooth and flat.
3. Apply lithium grease to seal lip and to a new O-ring. (A). Slide new O-ring on shaft and install seal sleeve (B) with chamfer facing the O-ring.

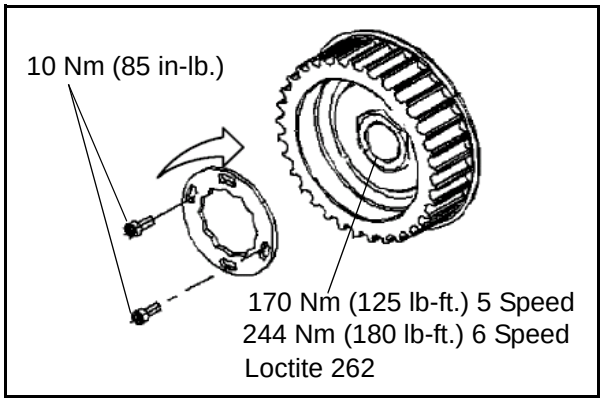


4. Clean threads of shaft to remove all oil, grease, or old locking agent.
5. Install sprocket. Apply Loctite 262 to shaft threads and install nut.

NOTE: Use an 8mm or a 5/16 diameter pin punch in timing hole and shift transmission into 1st gear to hold crankshaft while tightening sprocket nut.



TORQUE: Drive Sprocket Nut
170 Nm (125 lb-ft) (92 C.I.)
244 Nm (180 lb-ft.) (100 C.I.)
Loctite 262



6. Tighten nut to specified torque.
7. Install lock plate screws.

NOTE: The lock plate can be installed in many positions and either side of the plate can be used. If you cannot find a position that will work, flip the plate over and again try to install it. If the plate still does not align, tighten the sprocket nut slightly and try to fit the lock plate again.

8. Rotate the plate CLOCKWISE until it stops and hold it firmly against the nut.
9. Tighten the lock plate screws to specified torque.

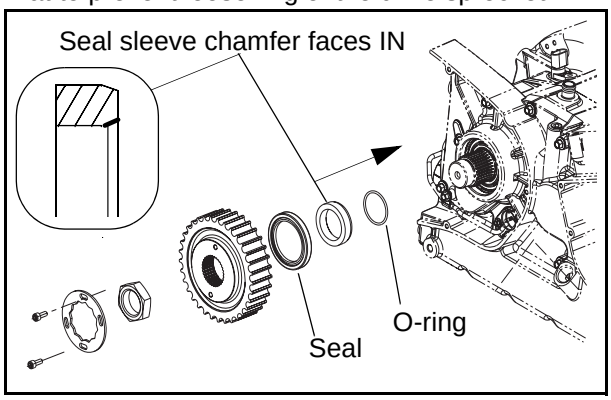
MAINSHAFT SEAL INSTALLATION (Engine Installed in Frame)

1. Remove exhaust system (Chapter 3).
2. Remove drive belt and drive sprocket (Chapter 11).
3. Clean area around seal thoroughly.
4. Remove seal sleeve.
5. Remove o-ring.
6. Using suitable seal remover, work around inner portion of seal until seal is free of engine case.

⚠ CAUTION

Choose a seal remover with a rounded, polished working end. Take care not to scratch seal bore of engine case.

7. Inspect output shaft seal sleeve for burrs, nicks, or surface wear. The end surfaces that contact the bearing race and drive sprocket must be smooth and flat to prevent loosening of the drive sprocket.



8. Lightly grease sealing lip of new seal.

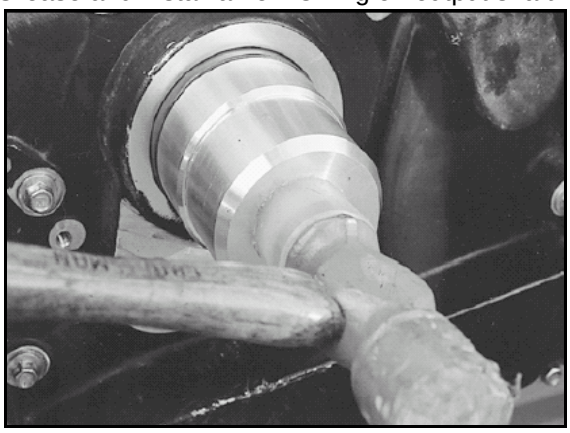
Victory All Purpose Grease: 2872187

9. Place thin film of engine oil to O.D. of new seal.

Special tool:

Final Drive Seal Installer PV-43505

10. Use seal driver to drive seal into place. Seal driver will stop at correct seal depth.
11. Grease and install a new O-ring on output shaft.



12. Lightly grease seal sleeve. Install seal sleeve with slight chamfer on inside diameter of sleeve facing IN (toward engine).
13. Install drive sprocket (page 10.38) and drive belt (Chapter 11).
14. Install exhaust.

TROUBLESHOOTING

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	PART(s) AFFECTED	REPAIR RECOMMENDED
Transmission Will Not Shift	Broken Shift Cam	Shift Cam	Replace shift cam
	Bent Shift Forks	Shift Fork	Replace shift fork(s)
	Worn Gearshift Pawl	Shift Cam	Replace shift cam
	Broken Gears	Transmission Gears	Replace necessary parts
	Damaged/Broken Bearings	Transmission, Shift Cam Bearings	Replace necessary parts
	Worn Gear Shift Ratchet Mechanism	Shifter Ratchet	Refer to chapter 9
	Broken or out-of-place spring on shift ratchet	Shift Ratchet Spring	Refer to chapter 9
	Shift Detent Plunger Stuck	Shift Detent Plunger	Repair as necessary
	Frozen Pivot Point, Bent External Shift Linkage	External Shift Linkage	Repair as necessary
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	Replace Shift Fork Rails
	Debris From Broken Parts Locking Transmission	Transmission Components	Repair as necessary
Excessive Noise Related to Bottom End of Engine	Worn Main Bearings	Crankshaft and/or Crankshaft Bearings	Repair as necessary
	Worn Connecting Rod Bearings	Connecting Rod Bearings and/or Connecting Rod and/or Rod Bearings	Repair as necessary
	Worn Connecting Rod Small End Bushing	Connecting Rod, Connecting Rod Bushing, Piston Pin, Piston	Repair as necessary
	Worn, seized, chipped or broken gear teeth	Transmission Gears	Repair as necessary
	Worn, seized, chipped or broken Transmission Bearings	Transmission Bearings	Repair as necessary
	Originates from Primary Cover	Clutch, Torque Compensator, Flywheel, Starter Drive Assembly, Starter Clutch, Starter Motor	Refer to chapter(s) 9, 16, 17, 18
	Oil Pump	Oil Pump, Oil Pump Drive	Refer to chapter 4
	Cam Drive	Cam Chain, Cam Sprocket	Refer to chapter 7

PROBLEM	POSSIBLE CAUSE	PART(s) AFFECTED	REPAIR RECOMMENDED
Transmission Hard to Shift	Improper Clutch Operation	Clutch	Refer to chapter 9
	Incorrect Oil Viscosity	Engine oil and filter	Refer to chapter 3
	Incorrect Clutch Adjustment	Clutch Adjustment	Refer to chapter 3
	Bent, Rubbing, Sticky, Broken Shift Shaft	Shifter Ratchet Assembly	Refer to chapter 9
	Sticking Pivot Point, Bent External Shift Linkage	External Shift Linkage	Repair or replace components as necessary
	Bent or Distorted Shift Forks	Shift Forks	Replace bent shift fork
	Damaged Shift Drum Grooves	Shift Drum	Replace damaged shift drum
	Shift Detent Plunger Stuck	Shift Detent Plunger	Repair as necessary
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	Replace Shift Fork Rails
Transmission Jumps Out of Gear	Broken Shift Stop Pin	Shift Stop Pin	Replace stop pin
	Worn Shift Drum Pawls or Shifter Ratchet	Shift Drum or Shift Linkage	Replace damaged shift drum or shifter ratchet
	Broken Shift Ratchet Spring	Shift Ratchet Spring	Replace spring
	Damaged Shift Drum Grooves	Shift Drum	Replace shift drum
	Bent, Worn, Distorted Shift Forks	Shift Forks	Replace shift forks
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	Replace shift fork rails
	Worn Engagement Dogs on Transmission Gears	Transmission Gears	Replace necessary parts

CHAPTER 11
DRIVE LINE

SPECIAL TOOLS 11.2
DRIVE LINE SPECIAL TOOLS 11.2
ASSEMBLY VIEWS & TORQUE VALUES 11.3
SPROCKET FASTENER TORQUES 11.3
DRIVE SPROCKET FASTENER TORQUES 11.4
BELT GUARD FASTENER TORQUE 11.5
DRIVE BELT 11.5
BELT INSPECTION 11.5
BELT REMOVAL 11.6
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REAR SPROCKET INSPECTION 11.9
REAR SPROCKET INSTALLATION 11.10
TROUBLESHOOTING 11.11
TROUBLESHOOTING 11.11

SPECIAL TOOLS

DRIVE LINE SPECIAL TOOLS

Output Shaft Seal Installation Tool: PV-43505

8mm (5/16″) Pin Punch (to hold crankshaft for drive sprocket removal / installation): Commercially available

Torque Wrench with 250 Nm (185 lb-ft.) range: Commercially available

⚠ CAUTION

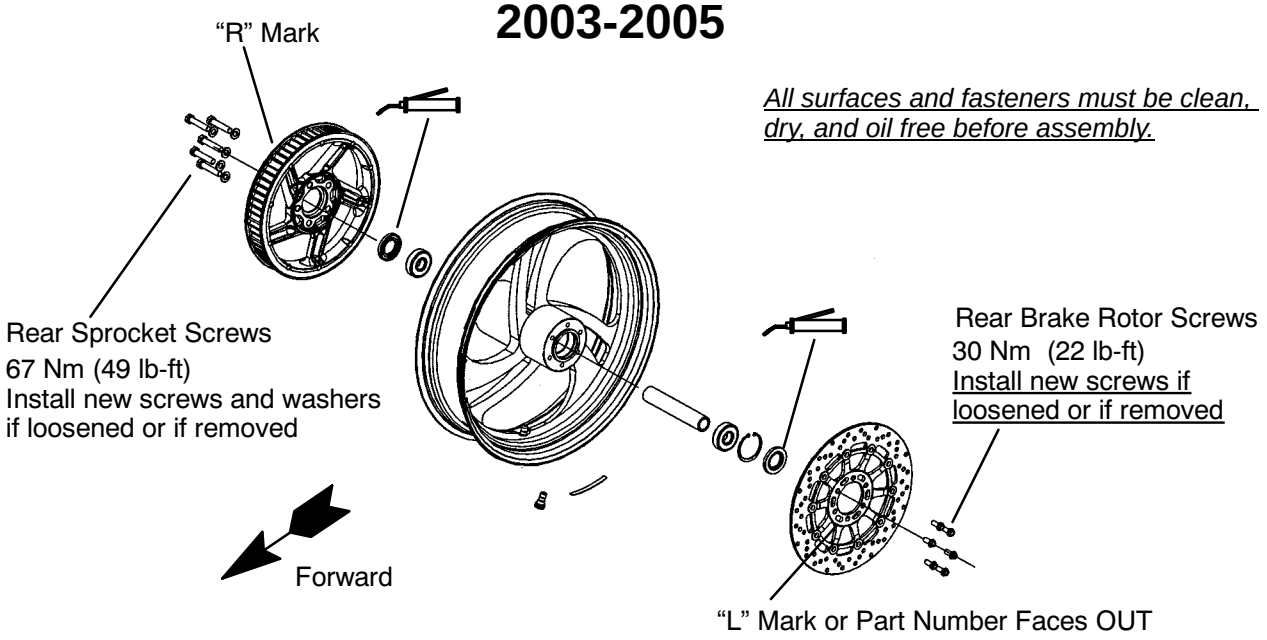
Some drive line repair or maintenance involves supporting the machine with the rear end elevated. Take precautions so that the motorcycle is securely supported when the tire is off the ground. This reduces the possibility of personal injury or damage to the motorcycle.

- Replace belt and sprockets as a set if the drive system has been in service for 5000 miles or more (8000 Km).
- Refer to Chapter 2 for **MAINTENANCE** of drive belt.
- Refer to Chapter 14 for **TIRE REMOVAL, REPAIR, & BALANCING**.
- Refer to Chapter 15 for **BRAKE SYSTEM** service and repairs.

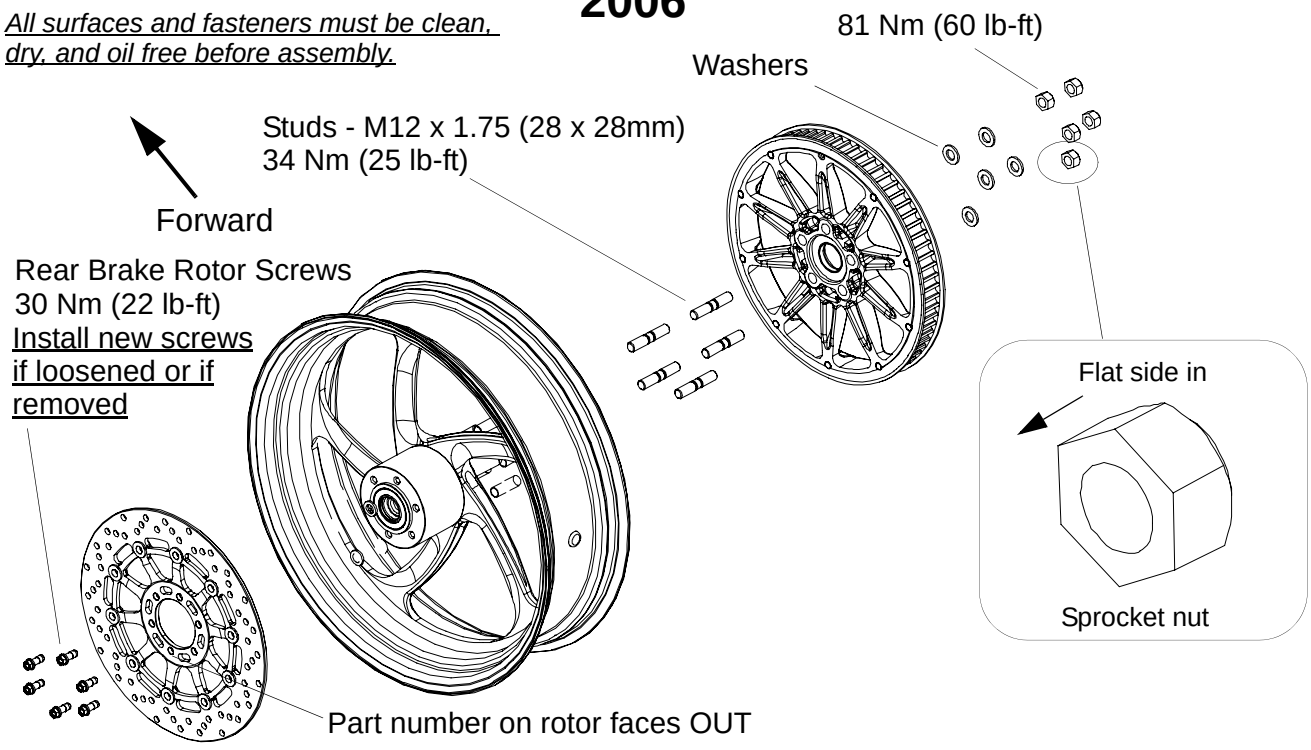
ASSEMBLY VIEWS & TORQUE VALUES

SPROCKET FASTENER TORQUES

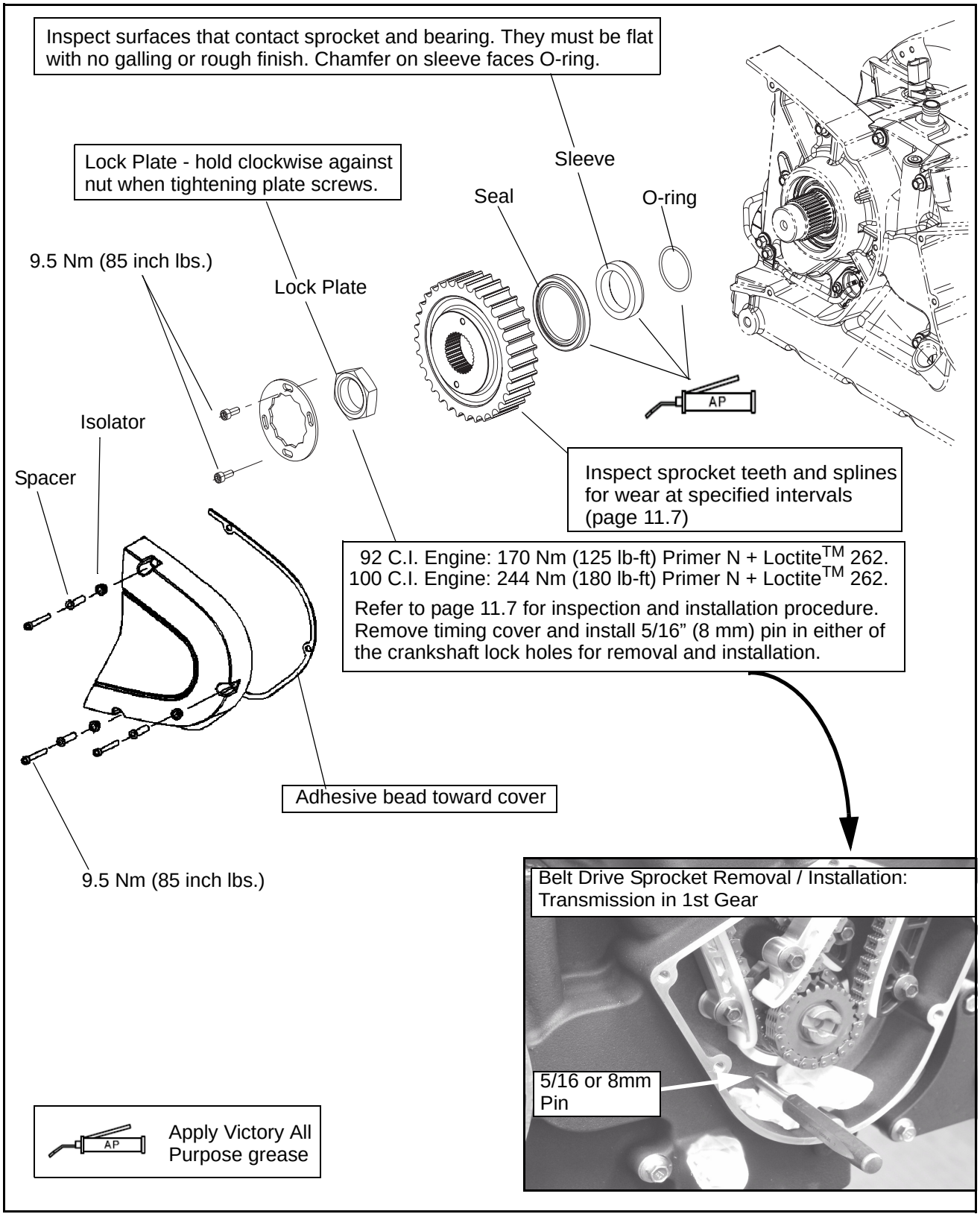
2003-2005



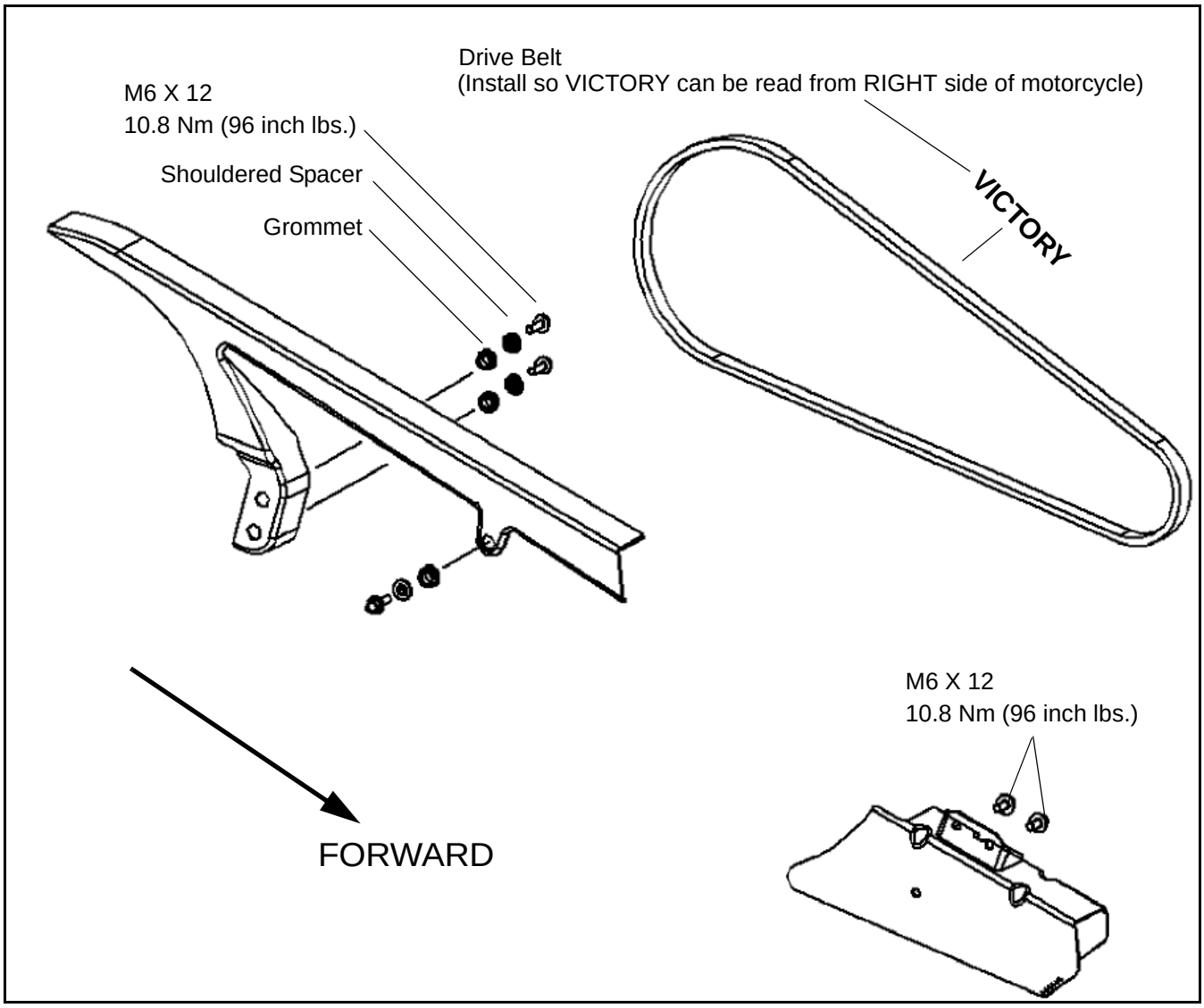
2006



DRIVE SPROCKET FASTENER TORQUES

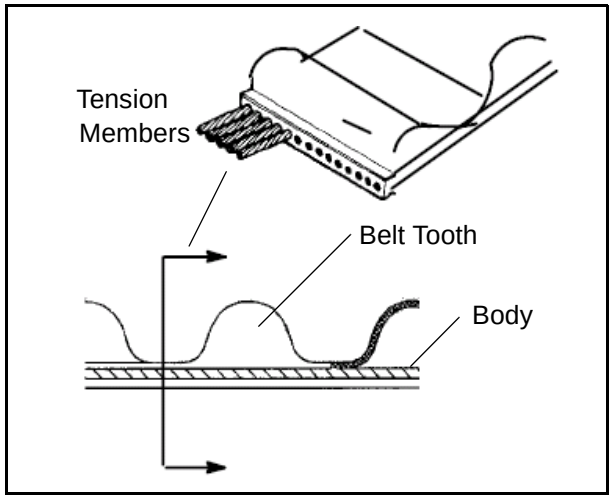


BELT GUARD FASTENER TORQUE



DRIVE BELT

BELT INSPECTION



1. Inspect belt teeth for foreign material damage, cracking, and wear.
2. Inspect belt tension, adjust if necessary. Refer to page 2.35.
3. Inspect all belt surfaces for excessive wear or foreign material damage.
4. If one or more component is damaged, replace belt and both sprockets as a set if the drive system has been in service for 5000 miles or more (8000 Km).

BELT REMOVAL

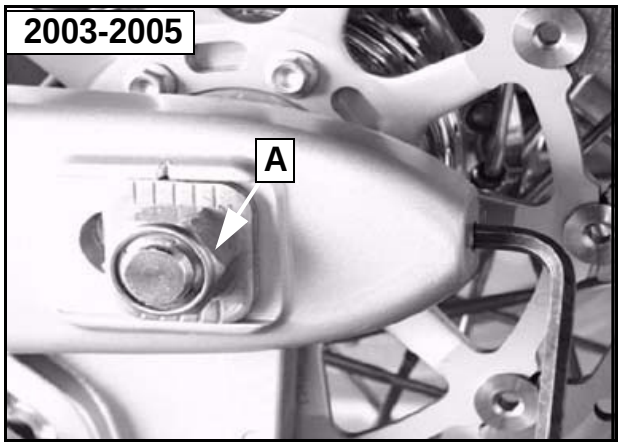
NOTE: If you plan to remove the front sprocket, refer to Drive Sprocket Removal this chapter.

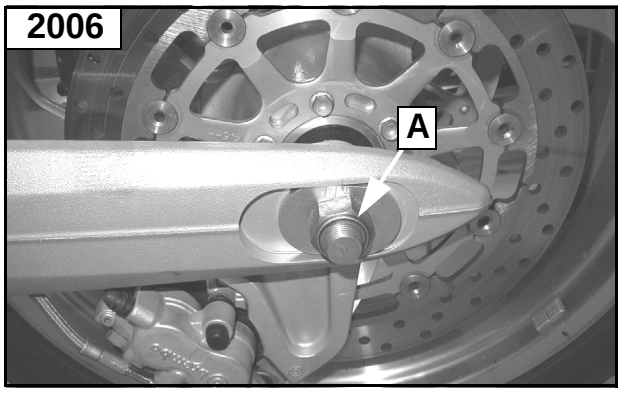
NOTE: If belt is to be reinstalled, mark direction of rotation on the outer surface of belt. Reinstall belt in same direction as it was removed.

> **⚠ WARNING**
>
> **A mis-aligned rear axle can damage the drive belt, causing it to fail and loss of control of the motorcycle.**

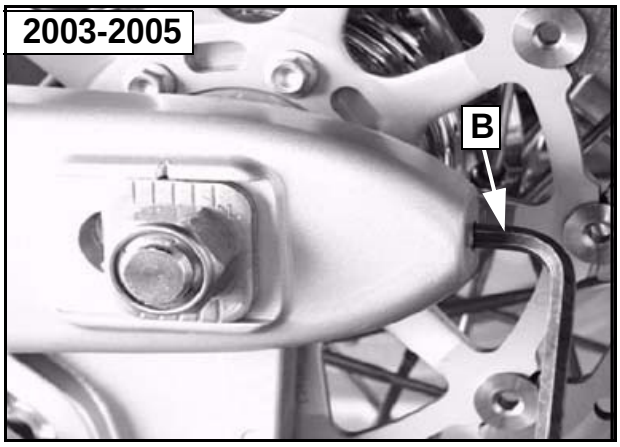
> **⚠ WARNING**
>
> **Care should be taken to be sure the motorcycle will not tip or fall while elevated. Severe personal injury or death may occur if the motorcycle tips or falls.**

1. Remove exhaust (Chapter 3).
2. Remove exhaust mount and drive sprocket cover.
3. Remove upper belt guard (page 11.5).
4. Loosen axle nut (A).

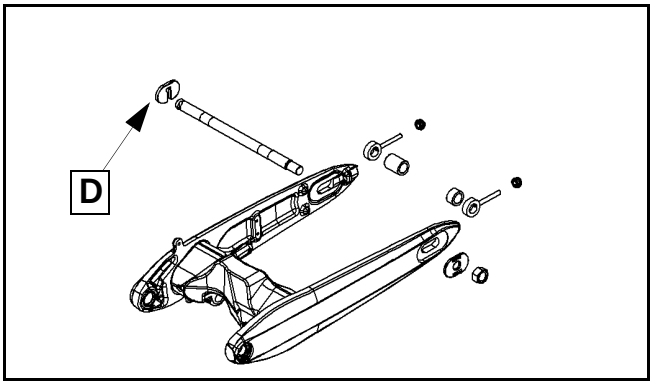




5. 2003-2005 turn adjuster screws (B) counterclockwise equally until belt is slack.
   2006 turn adjuster nuts (C) equally counterclockwise and push axle forward until belt is slack.



6. 2003-2005 remove the axle nut.
   2006 loosen the axle nut about 5 turns.
7. Safely lift and support the rear of the motorcycle so tire is 1-2 inches off the floor (Chapter 13)
8. 2003-2005 - Tap axle out from left to right.
   2006 tap axle to the right until retainer plate (D) can be removed. Draw axle out LEFT side.



9. Slide belt off rear sprocket, then remove belt from front sprocket. DO NOT bend or twist the drive belt during removal or damage may result.
10. Remove drive belt from motorcycle.

BELT INSTALLATION

1. Inspect sprockets and verify sprocket fasteners are tight.
2. Place belt onto drive sprocket and rear sprocket.
3. Install drive sprocket cover and belt guards. Torque fasteners to specification (page 11.3-11.4).
4. Install rear axle (Chapter 13).
5. Adjust belt tension and verify proper alignment (page 2.35-2.37).

⚠ CAUTION

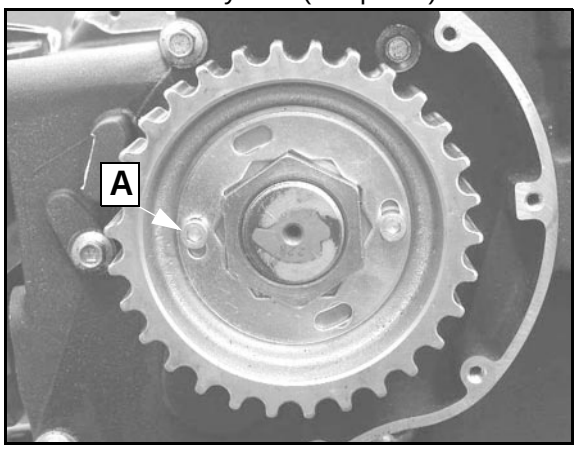
Improper alignment of rear wheel will cause steering instability and premature belt wear. Take precautions to perform belt adjustment correctly any time belt is removed or during maintenance.

6. Install exhaust (Chapter 3)

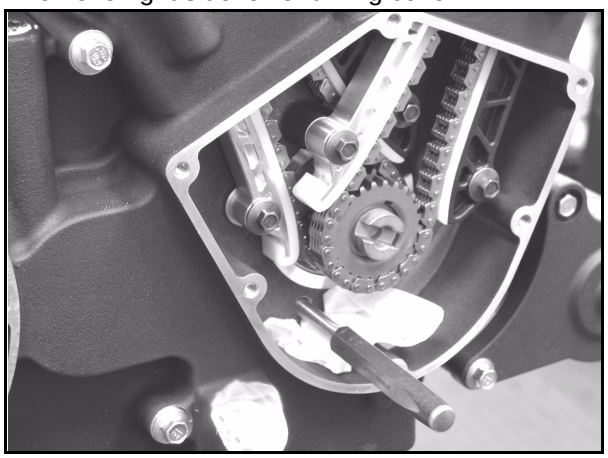
DRIVE SPROCKET

DRIVE SPROCKET REMOVAL

1. Remove exhaust system (Chapter 3).



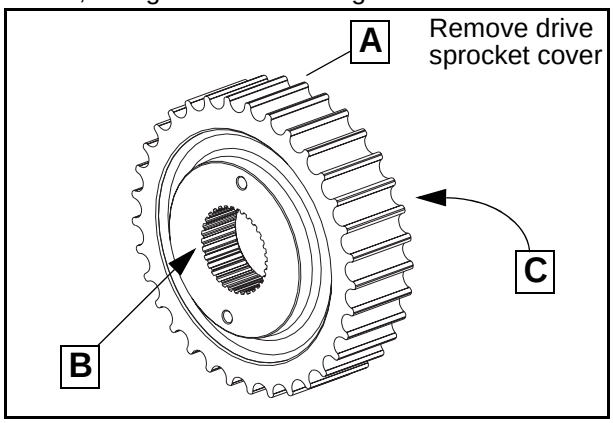
2. Remove drive sprocket cover and gasket.
3. Remove sprocket lock plate screws (A) and lock plate.
4. Place transmission in 1st gear.
5. Remove right side lower timing cover.



6. Rotate crankshaft until key way is aligned with one of the TDC holes in crankcase.
7. Insert an 8mm or 5/16″ diameter pin into crankcase hole and into crankshaft to hold shaft while loosening sprocket nut.
8. Remove sprocket nut.
9. Loosen rear axle nut.
10. Loosen axle adjuster screw lock nut.
11. Loosen both axle adjuster screws evenly to move wheel forward until belt is loose.
12. Pull belt off sprocket.
13. Remove front sprocket, spacer, and O-ring from output shaft.

DRIVE SPROCKET INSPECTION

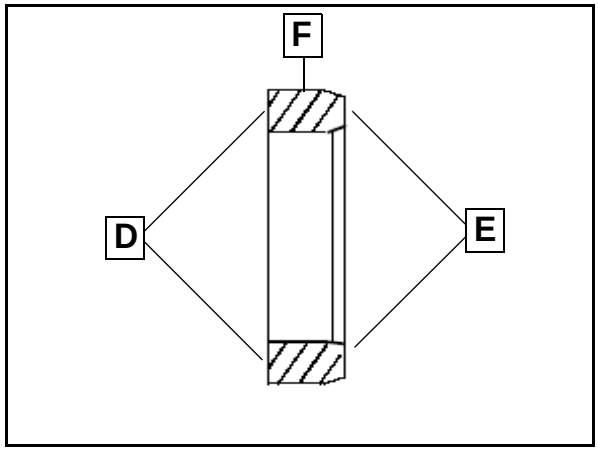
1. Visually inspect sprocket teeth (A) for excessive wear, foreign material damage.



2. Inspect splines (B) for a tight fit on output shaft splines.
3. Inspect the back surface of sprocket hub (C) where it contacts the seal sleeve. Replace if worn or if surface is rough.

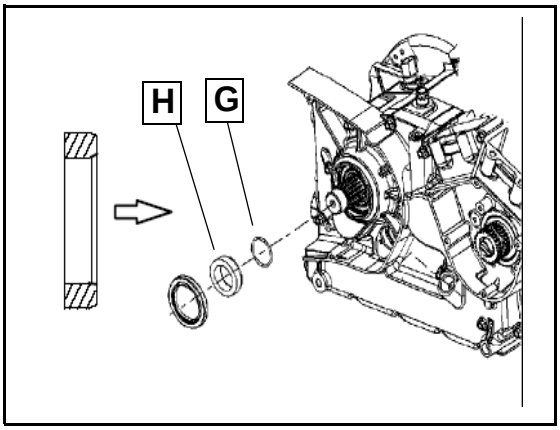
NOTE: Sprockets and belt normally exhibit a polished appearance due to normal operation. Belt replacement is not required unless uncharacteristic damage is noted, or if the mileage service interval is reached. Belt or sprocket damage is usually due to debris trapped between belt and sprocket, or from improper maintenance and adjustment.

4. Inspect outer surface (D), inner surface (E), and sealing surface (F) of seal sleeve. Surfaces must be flat without wear or galling. Replace the sleeve if worn, or if the surface appears rough or chafed. The O-ring sealing surface of slightly chamfered edge must be smooth to seal the shaft.



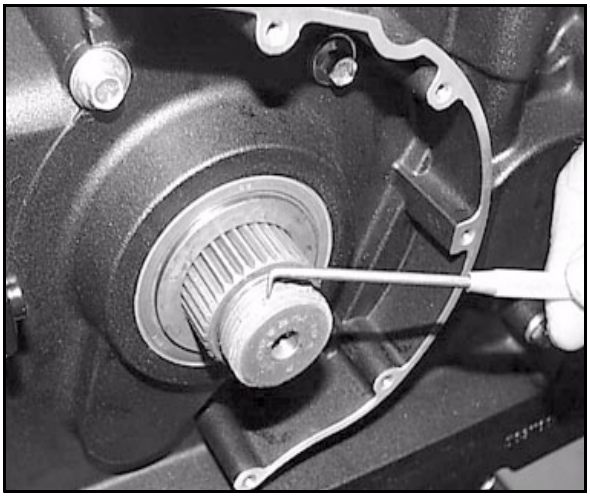
DRIVE SPROCKET INSTALLATION

1. Apply grease to a new O-ring (G) and install on output shaft.



2. Install seal sleeve (H) with the chamfer on inside diameter of sleeve facing in, toward O-ring.

3. Clean shaft threads and sprocket nut to remove all previous thread locking agent and apply Loctite™ Primer N.

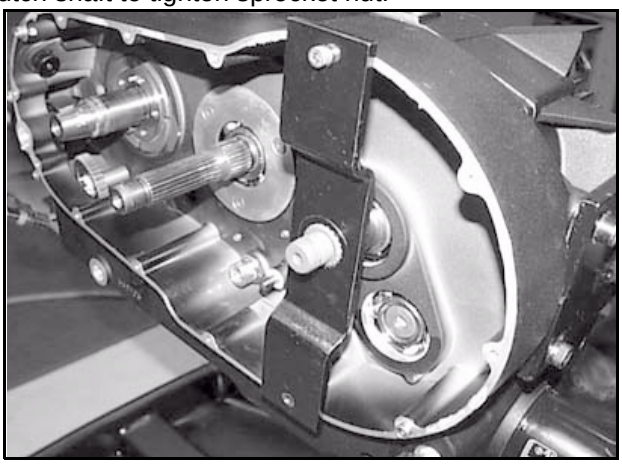


4. Place belt onto front sprocket, place sprocket over splines of output shaft.

5. Apply Loctite™ 262 to threads of shaft and nut.

6. Install drive sprocket nut.

NOTE: If primary is disassembled, shift transmission into 5th gear and install clutch shaft holding tool on clutch shaft to tighten sprocket nut.



NOTE: If primary is assembled, follow instructions to lock shaft as described for *Drive Sprocket Removal*, page 11.7.

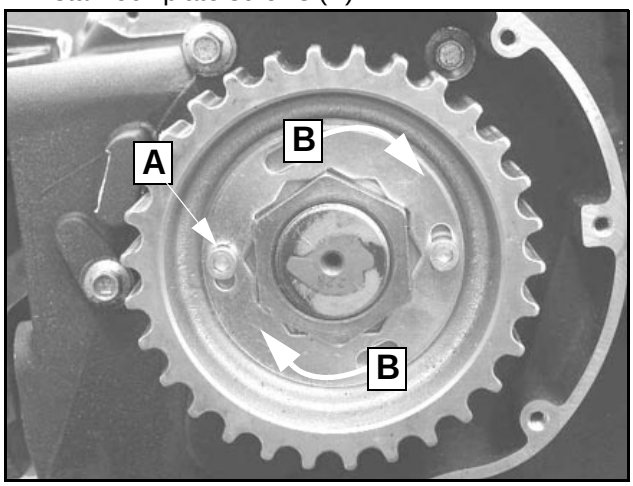
7. Torque nut.

TORQUE: Drive Sprocket Nut
92 C.I Engines: 170 Nm (125 lb-ft.)
100 C.I. Engines: 244 Nm (180 lb-ft.)
Loctite™ 262

8. Install lock plate.

NOTE: The lock plate can be installed in many positions and either side of the plate can be used. If the plate still does not align, tighten sprocket nut slightly and try to fit the lock plate again.

9. Install lock plate screws (A).



10. Rotate the plate CLOCKWISE (B) until it stops and hold it firmly against the nut.
11. Tighten the lock plate screws to 9.5 Nm (85 lb-in).
12. Adjust belt tension and wheel alignment (page 2.35-2.37).
13. Install drive sprocket cover with a new gasket (adhesive side of gasket faces cover). Torque cover screws to 9.5 Nm (85 lb-in).

REAR SPROCKET

REAR SPROCKET REMOVAL

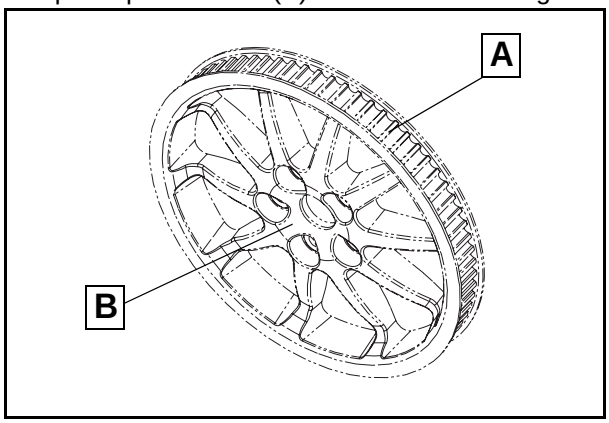
1. Remove rear wheel (Chapter 13).
2. 2003-2005 loosen all sprocket screws evenly in a star pattern and remove screws and washers.
   2006 loosen all sprocket nuts evenly in a star pattern and remove screws and washers.
3. Remove sprocket.

> ⚠ CAUTION
>
> Protect brake disc surface while working on rear sprocket (or any rear wheel repair procedures).

REAR SPROCKET INSPECTION

NOTE: Sprockets and belt normally exhibit a polished appearance due to normal operation. Belt replacement is not required unless uncharacteristic damage is noted, or if the mileage service interval is reached. Most often, belt or sprocket damage is due to foreign debris getting between belt and sprocket, or from improper maintenance or adjustment.

1. Inspect the sprocket teeth (A) for excessive wear, foreign material damage due to road debris between sprocket and belt, bent or cracked flanges, and cracks of any kind.
2. Inspect sprocket hub (B) for cracks or damage.

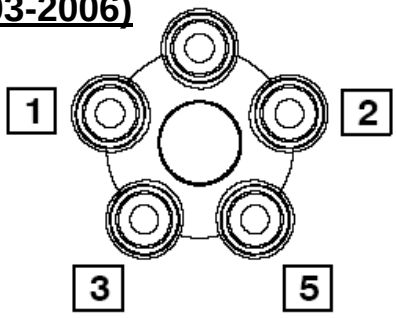


3. 2006 Inspect wheel studs for wear or looseness in the hub.
   All - Mounting flange on wheel and sprocket must be flat and clean.
4. Inspect wheel hub and sprocket mating surfaces for galling, roughness, or cracks. Surface must be flat, with no burrs or surface irregularities.
5. Clean threads of wheel studs or screws/threaded holes to remove any residual locking agent, dirt, oil, or grease.

REAR SPROCKET INSTALLATION

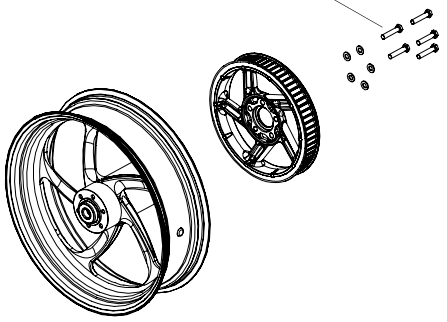
1. Clean sprocket stud threads screws to remove all grease or oil residue.
2. Clean mating surfaces of wheel and sprocket.
3. Install sprocket.
4. 2003-2005 - Install screws with washers and nuts. 2006 - Install nuts with washers. Flat side of nut faces IN (against washer).
5. Torque fasteners in a star pattern to specified torque.
6. Refer to Chapter 13 for rear wheel installation procedure.

Torque Pattern (All 2003-2006)



2003-2005

(Screws)
81 Nm (49 lb-ft)

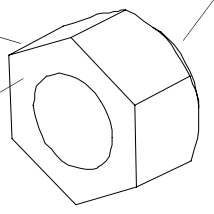


2006

(Nuts)
81 Nm (60 lb-ft)

Tapered side OUT

Flat side IN (toward washer & wheel)



Sprocket Nut

TROUBLESHOOTING

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	POSSIBLE REPAIR NEEDED
Belt Shows Excessive Wear On One Side	Out-of-Alignment	Align rear wheel
Belt Squeal	Out-of-Alignment	Align rear wheel
Broken Sprocket Teeth	Foreign material damage Loose drive belt or sprocket	Replace parts or repair as necessary
Broken or Torn Cogs on Belt	Foreign material damage, loose belt or sprocket	Replace parts as necessary
Belt Jumps Sprocket Teeth	Worn, damaged or out of adjustment belt or sprockets	Replace parts as necessary
	Belt Loose	Adjust Belt
Excessive Wear, Binding Suspension	Belt Tight	Adjust Belt
Broken Belt	Belt weakened by foreign material damage. Belt run excessively tight or loose for extended period	Replace Belt, Replace Sprockets

NOTES

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GENERAL

IMPORTANT INFORMATION

⚠ WARNING

Victory motorcycles are produced using the designated tires listed as original equipment. This includes field testing to ensure stability and superior handling. The use of tires other than original equipment may cause instability which could lead to a crash, resulting in serious injury or death. Use only the recommended tires inflated to the recommended tire pressures based on load conditions as listed on the tire inflation decal.

Tubeless tires are used on certain Victory models. Operating the motorcycle with damaged rims creates a safety hazard including air pressure loss, steering imbalance and/or reduced steering control. Do not attempt to repair or straighten damaged rims.

⚠ CAUTION

Work performed to the front end of the motorcycle usually involves supporting the machine with the front end elevated. Take precautions so that the motorcycle is securely supported when the front tire is off the ground. This reduces the possibility of personal injury or damage to the motorcycle.

Leaking front fork seals are a safety hazard and should be replaced immediately if a leak is found. Fork oil may contaminate the front brake components which could reduce stopping ability of the motorcycle. Contaminated brake discs or pads greatly reduce the amount of stopping force available & increase stopping distance. Brake discs can be cleaned using Victory brake cleaner. NEVER attempt to clean contaminated brake pads. Replace pads as a set.

- Refer to Chapter 2 for **MAINTENANCE** of front end components.
- Refer to Chapter 14 for **TIRE REMOVAL, REPAIR, & BALANCING**
- Refer to Chapter 15 for **BRAKE SYSTEM** service and repairs.

SPECIAL TOOLS

SPECIAL TOOLS

Cartridge Shaft Holder (Kingpin):	PV-47060
Damper Rod Holder (Vegas):	PV-43517
Fork Seal Driver (Kingpin):	PV-47035
Fork Seal Driver (Vegas):	PV-47036
Fork Seal Guide:	PV-47037
Oil Level Tool:	PV-59000-A
Wheel Bearing / Stem Bearing Race Installation Set:	PV-43515
Stem Bearing Remover:	PV-43551
Spanner Socket (Steering Stem):	PV-43508
Spanner Wrench (Steering Stem):	PV-43509
Lower Steering Stem Bearing Remover:	PV-44683
Blind Bearing Remover Set (for wheel bearings):	PV-43551

MAINTENANCE PRODUCTS

MAINTENANCE PRODUCTS

Hand Grip Adhesive - Three Bond 1501 (10ml tube)	2872575
Fork Oil, Inverted Cartridge (Kingpin)	2874828
Fork Oil (Vegas)	2874568

Refer to page 2.10 for a complete list of maintenance products and part numbers.

TORQUE SPECIFICATIONS

FASTENER TORQUE SPECIFICATIONS

Refer to Assembly Views in this chapter for fastener torque specifications.

SPECIFICATIONS

SPECIFICATIONS - KINGPIN / NESS KINGPIN

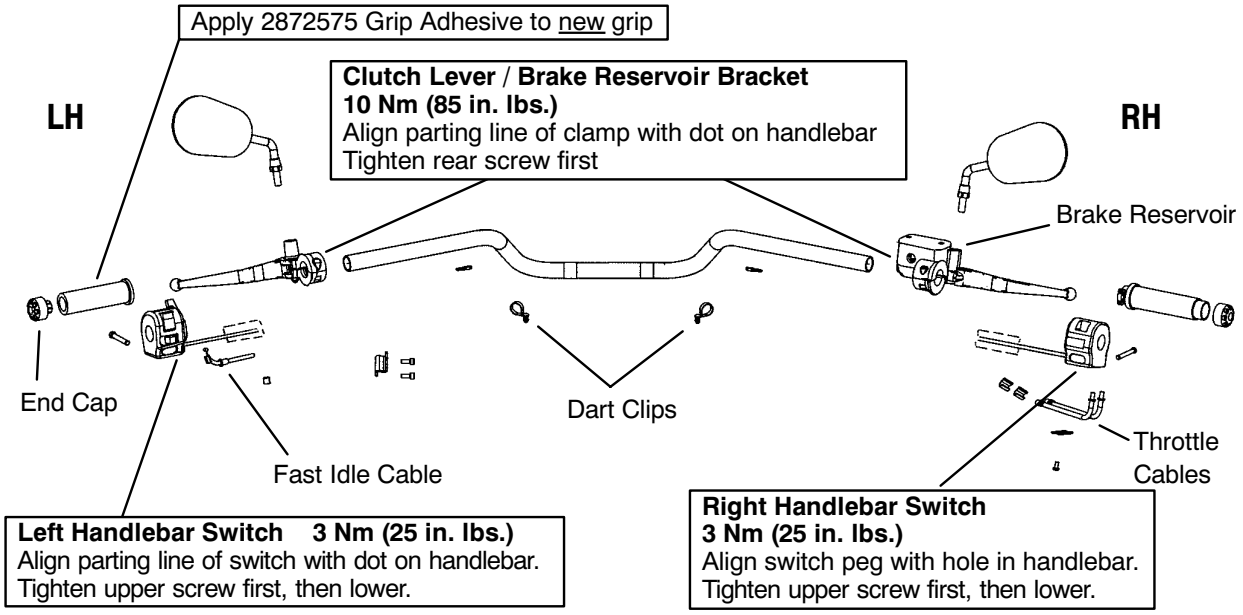
KINGPIN			
Item		**Standard**	**Service Limit**
Axle Runout		-	.20 mm (.008")
Front Wheel Runout 3.00" x 18"	Billet or Cast: Axial	.50 mm (.020")	2.0 mm (.080")
	Billet or Cast: Radial	.50 mm (.020")	2.0 mm (.080")
	40 Spoke: Axial	1.00 mm (.040")	2.0 mm (.080")
	40 Spoke: Radial	.80 mm (.032")	2.0 mm (.080")
Fork Spring Free Length		320 mm (5.43")	314 mm (12.36")
Fork Spring Pre-Load		48 mm (1.889")	-
Fork Spring Spacer Length		138 mm (5.43")	-
Fork Spring Rate		6.6 N/mm (37 lb./inch)	Not Applicable
Fork Tube Diameter (Inner Tube)		43 mm	Not Applicable
Fork Tube Runout		-	.20 mm (.008")
Fork Oil Type/Weight	Victory Cartridge Fork Oil		
Fork Oil Level From Top of Tube (Spring removed, tube fully compressed, preload spacer and spring guide installed)		70 mm (2.756")	(±1 mm)
Fork Oil Capacity (per leg, dry)	NOTE: Always measure and adjust oil level to specification	470 cc (±3 cc) (470 ml ± 3 ml)	Not Applicable
Steering Bearing Preload	Refer to procedure page 12.39		

SPECIFICATIONS - VEGAS / NESS VEGAS / EIGHT BALL

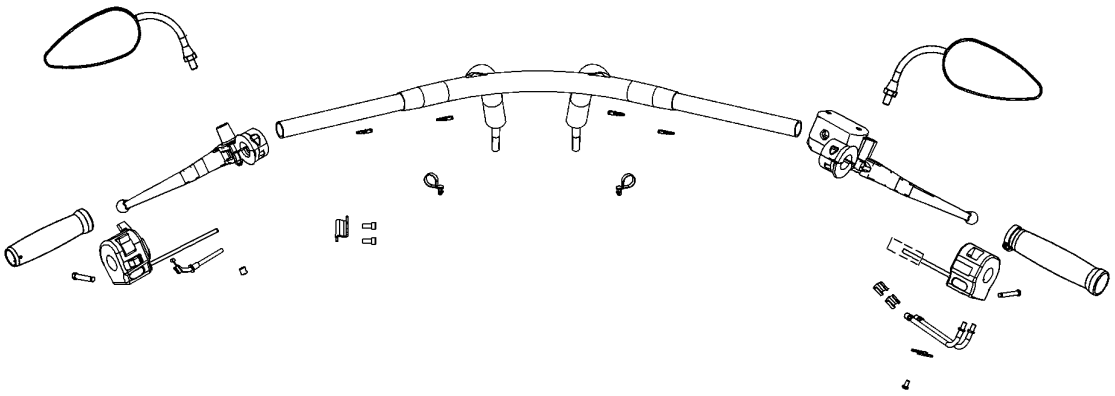
VEGAS			
Item		**Standard**	**Service Limit**
Axle Runout		-	.20 mm (.008")
Front Wheel Runout 2.15" x 21"	Cast or Billet: Axial	.50 mm (.020")	2.0 mm (.080")
	Cast or Billet: Radial	.50 mm (.020")	2.0 mm (.080")
	40 Spoke: Axial	1.00 mm (.040")	2.0 mm (.080")
	40 Spoke: Radial	.80 mm (.032")	2.0 mm (.080")
Fork Spring Free Length		487.5 mm (19.193")	481.5 mm (18.957")
Fork Spring Pre-Load		58-60 mm (2.28-2.36")	-
Fork Spring Pre-Load Spacer Length		150 mm (5.91")	-
Fork Spring Rate		6.0 N/mm (34.2 lb./inch)	Not Applicable
Fork Top-Out Spring Length		23.5-25.5 mm (.925-1.00")	21.5mm (.846")
Fork Tube Diameter		43 mm	Not Applicable
Fork Tube Runout		-	.20 mm (.008")
Fork Oil Type/Weight	Victory Fork Oil 2874568		
Fork Oil Level From Top of Tube (Spring removed, tube fully compressed, preload spacer and spring guide installed)		130 mm (5.118")	(±1 mm)
Fork Oil Capacity (per leg, dry)	NOTE: Always measure and adjust oil level to specification	545 cc (±3 cc) (545 ml ± 3 ml)	Not Applicable
Steering Bearing Preload	Refer to procedure on page 12.39		

ASSEMBLY VIEWS & TORQUE

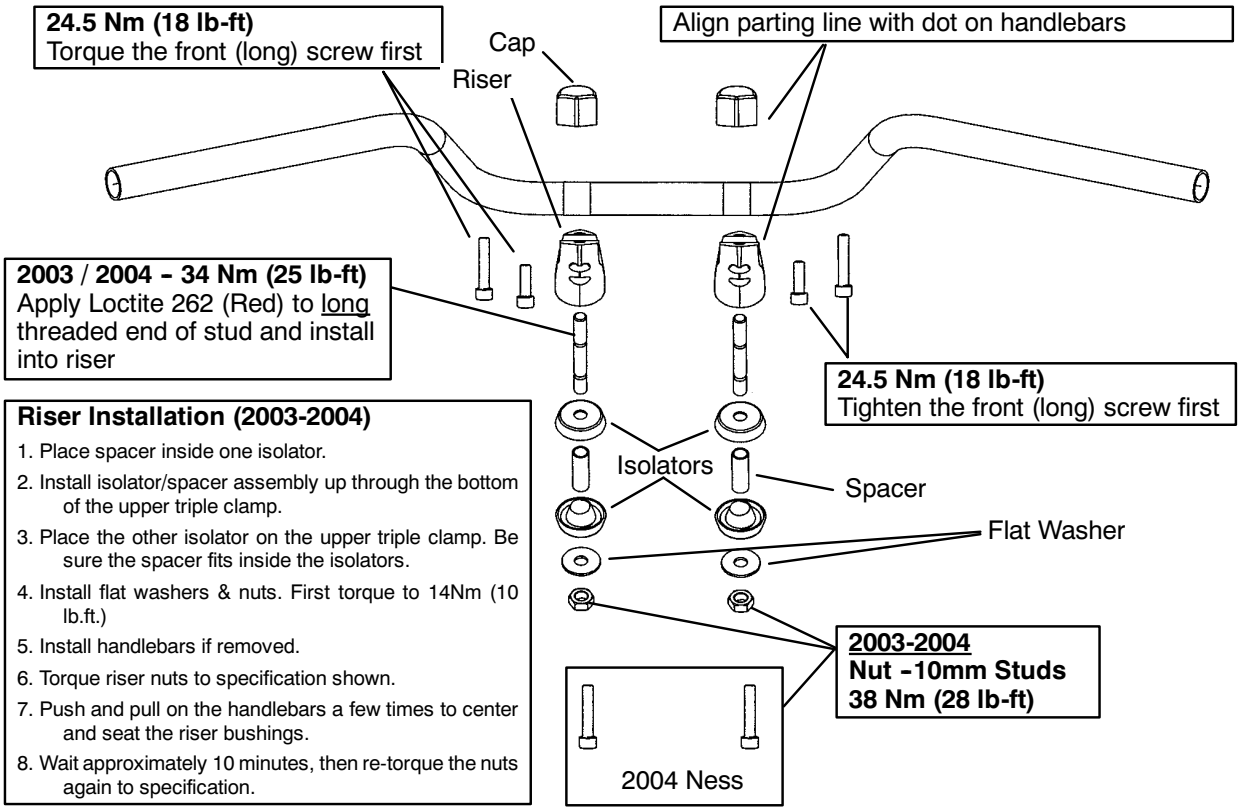
ASSEMBLY VIEW, HANDLEBAR

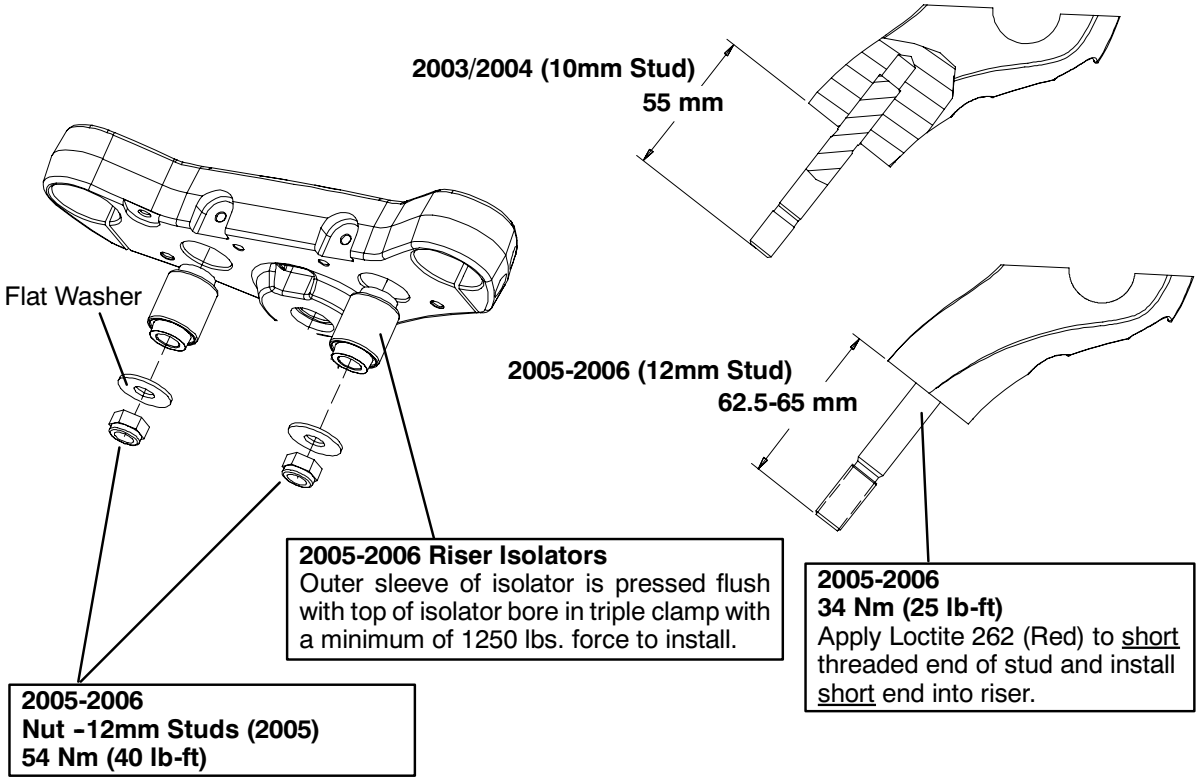


NESS MODELS

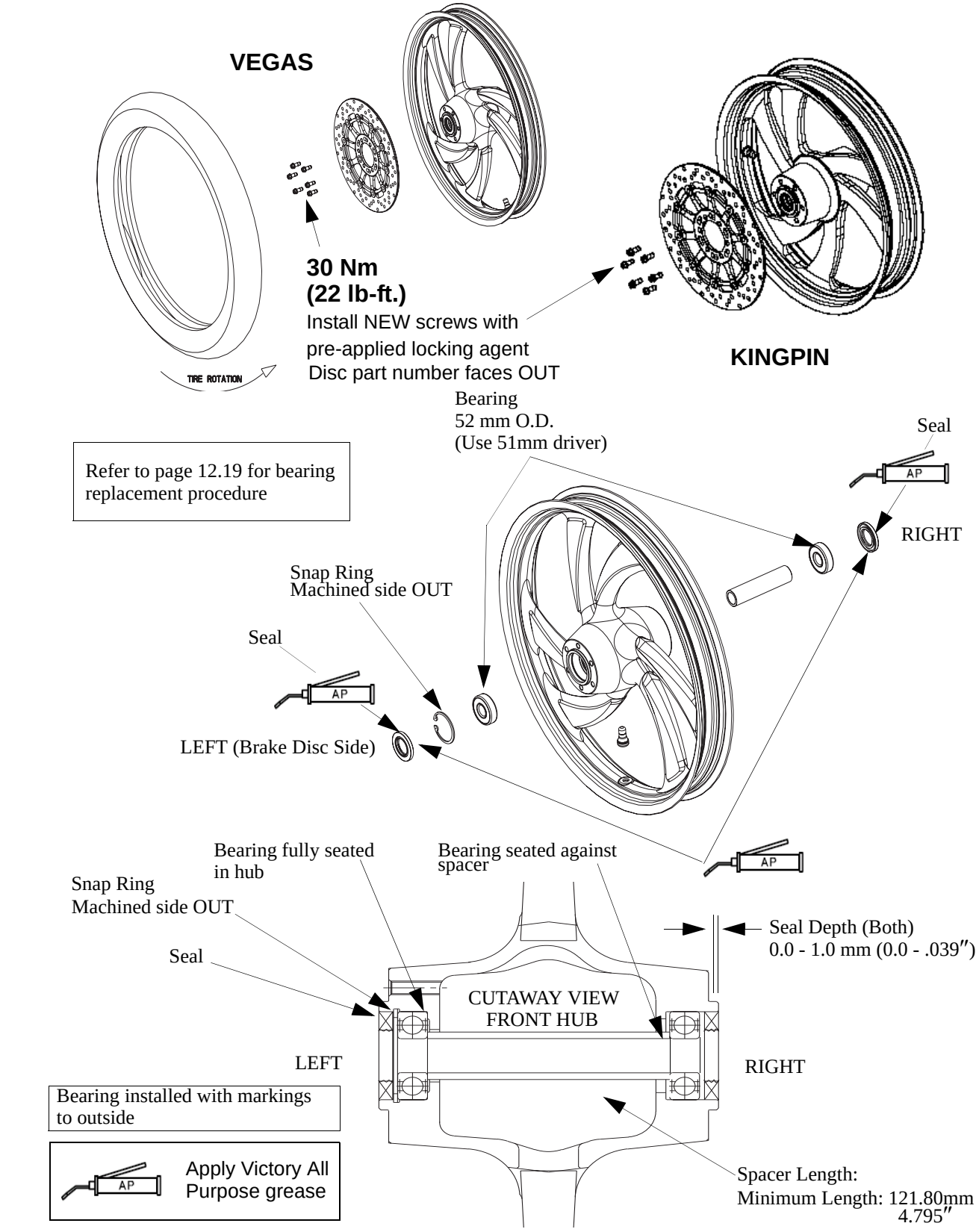


ASSEMBLY VIEW, HANDLEBAR RISER



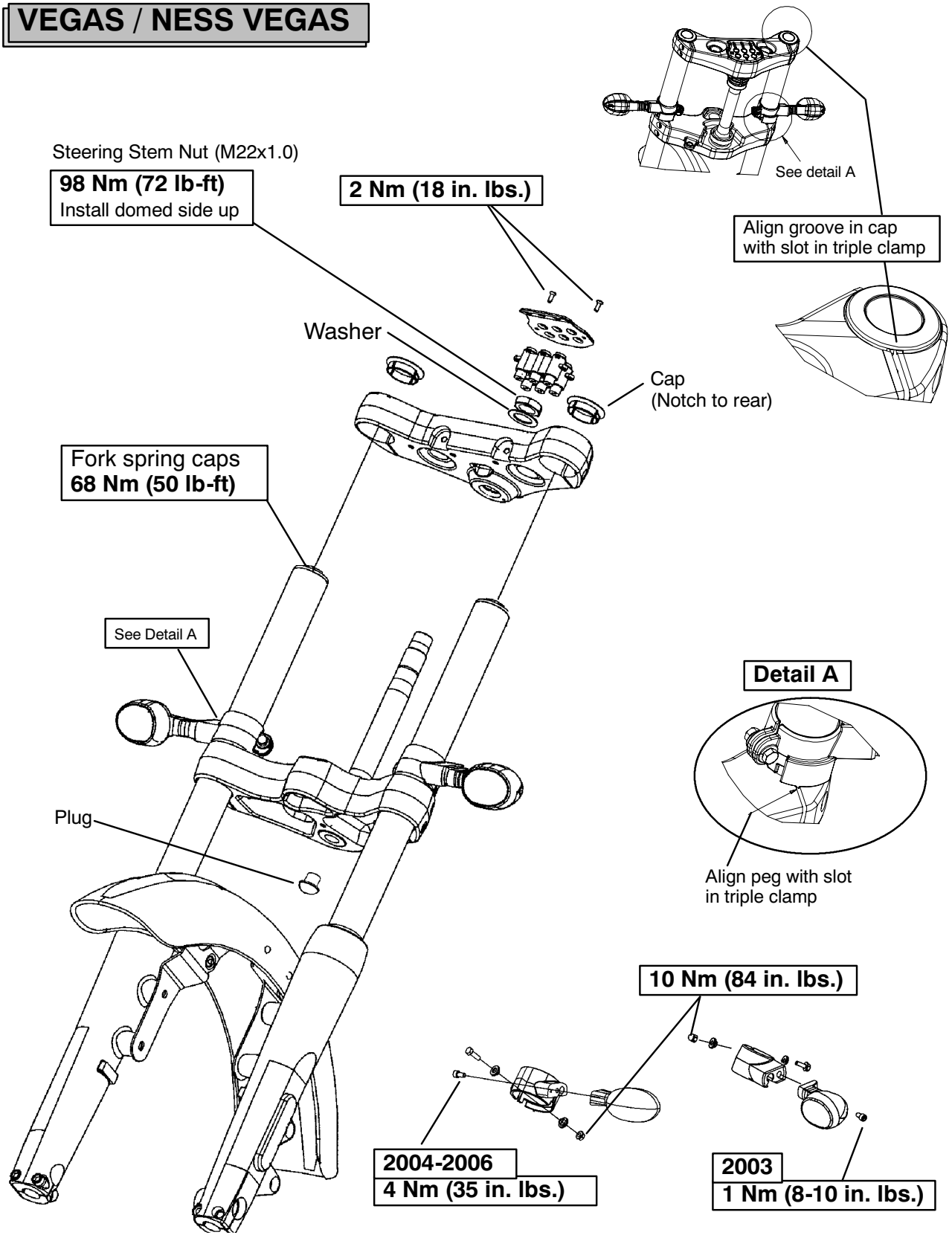


ASSEMBLY VIEW, FRONT WHEEL



ASSEMBLY VIEW, FRONT FORK ATTACHMENTS - VEGAS / NESS VEGAS / EIGHT BALL

VEGAS / NESS VEGAS



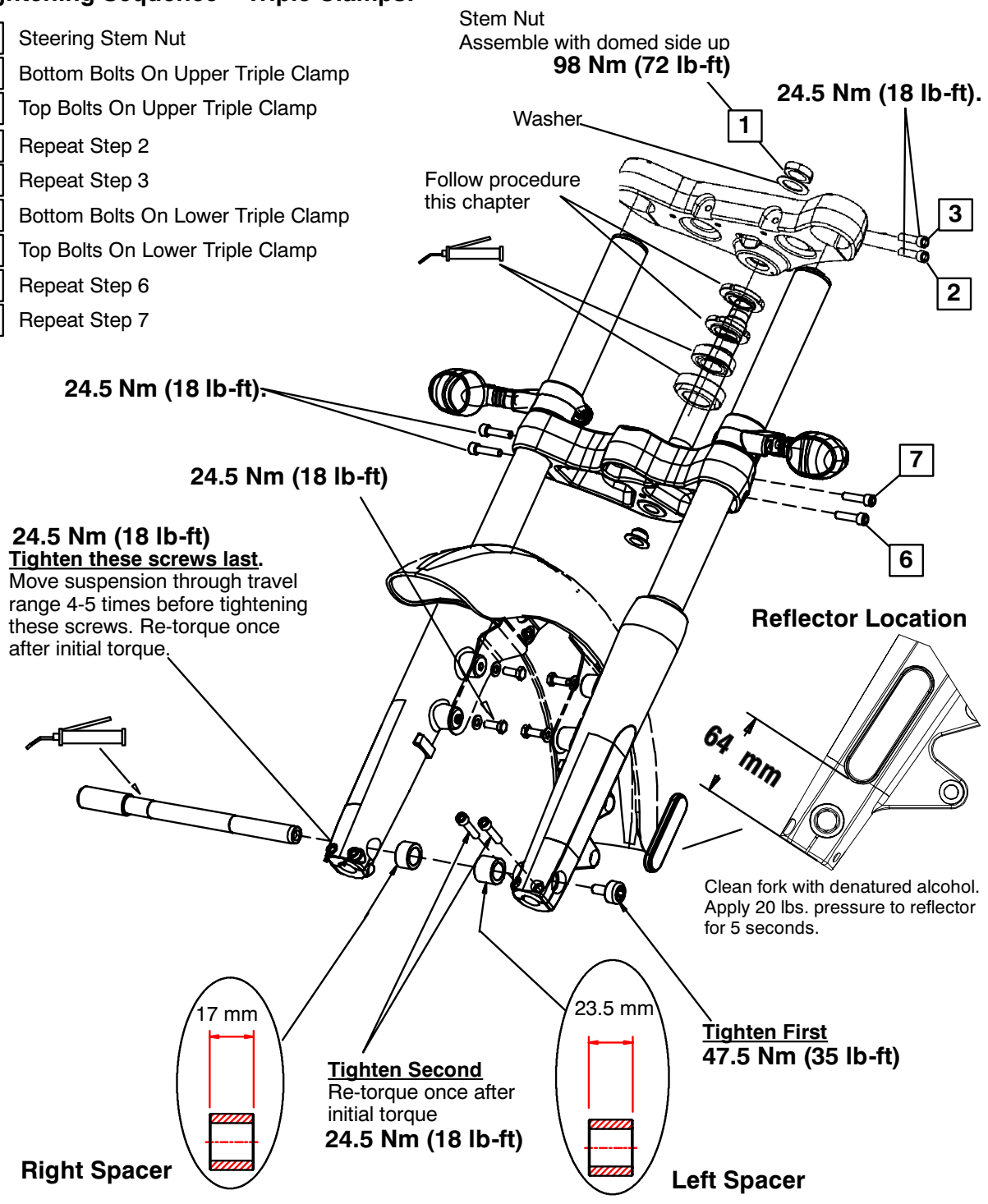
ASSEMBLY VIEW, TRIPLE CLAMP & FRONT AXLE - VEGAS / NESS VEGAS / EIGHT BALL

VEGAS / NESS VEGAS

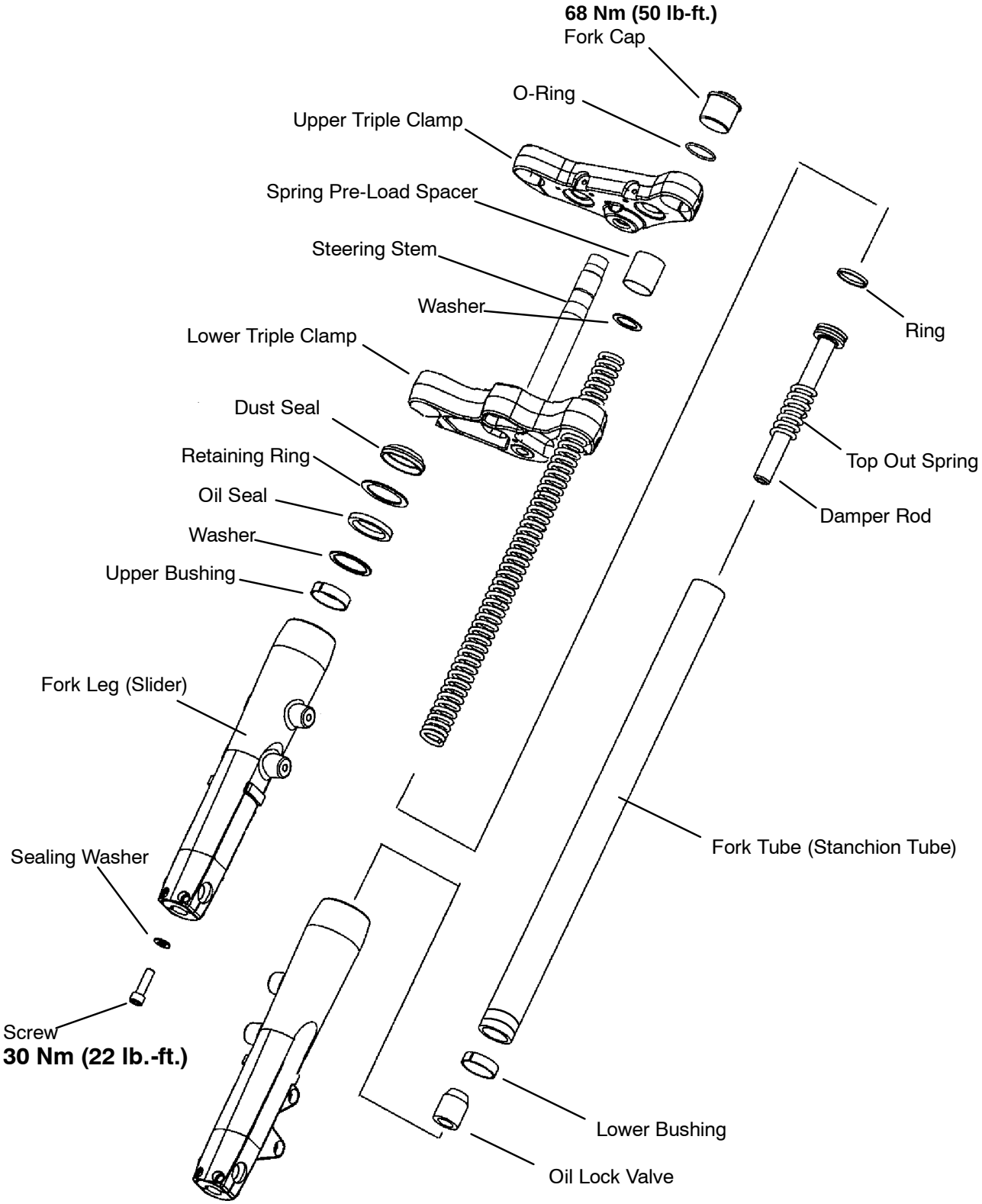
Apply Victory All Purpose grease.

Tightening Sequence – Triple Clamps:

1. Steering Stem Nut
2. Bottom Bolts On Upper Triple Clamp
3. Top Bolts On Upper Triple Clamp
4. Repeat Step 2
5. Repeat Step 3
6. Bottom Bolts On Lower Triple Clamp
7. Top Bolts On Lower Triple Clamp
8. Repeat Step 6
9. Repeat Step 7

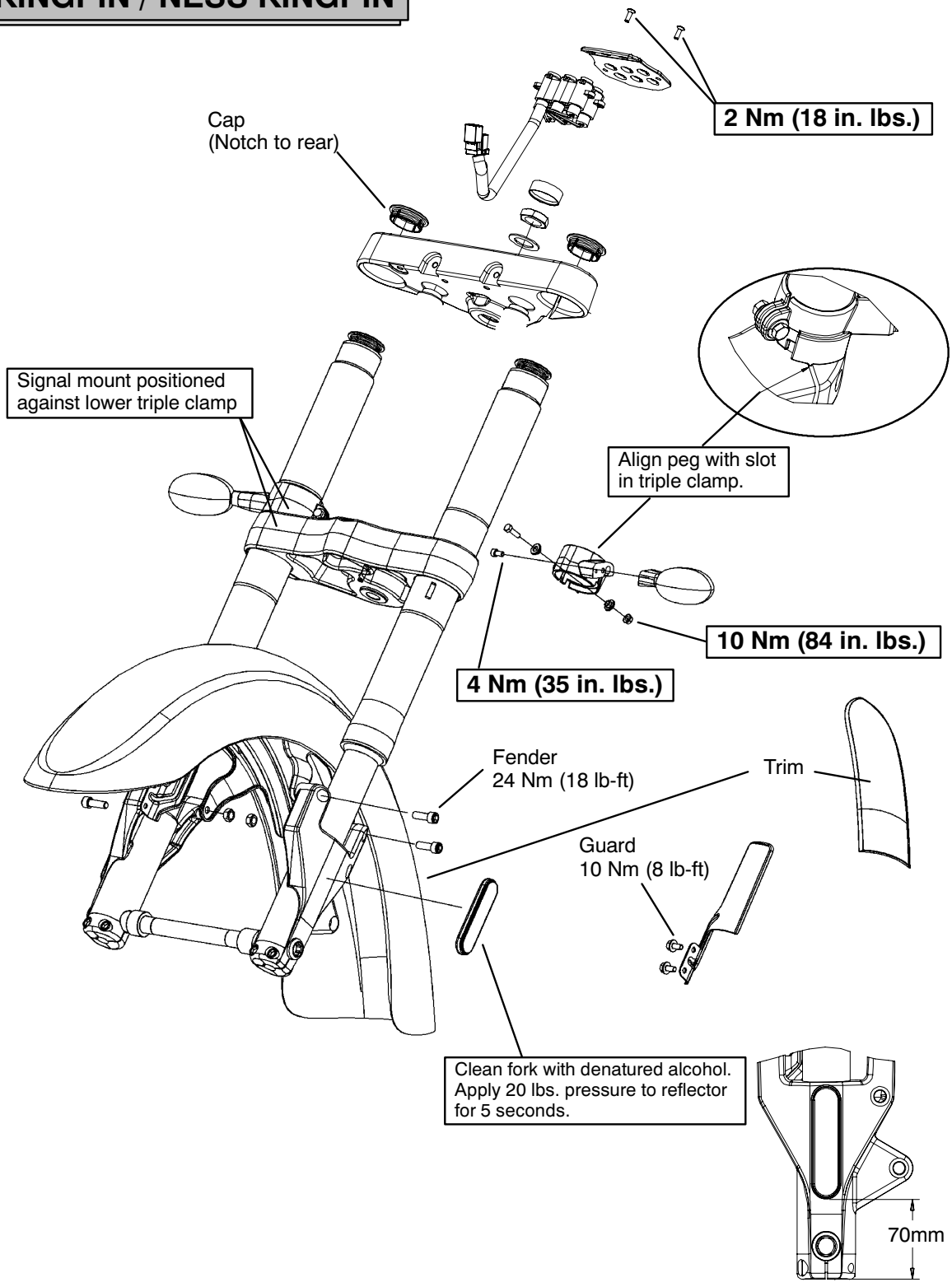


ASSEMBLY VIEW, FRONT FORK - VEGAS / NESS VEGAS / EIGHT BALL



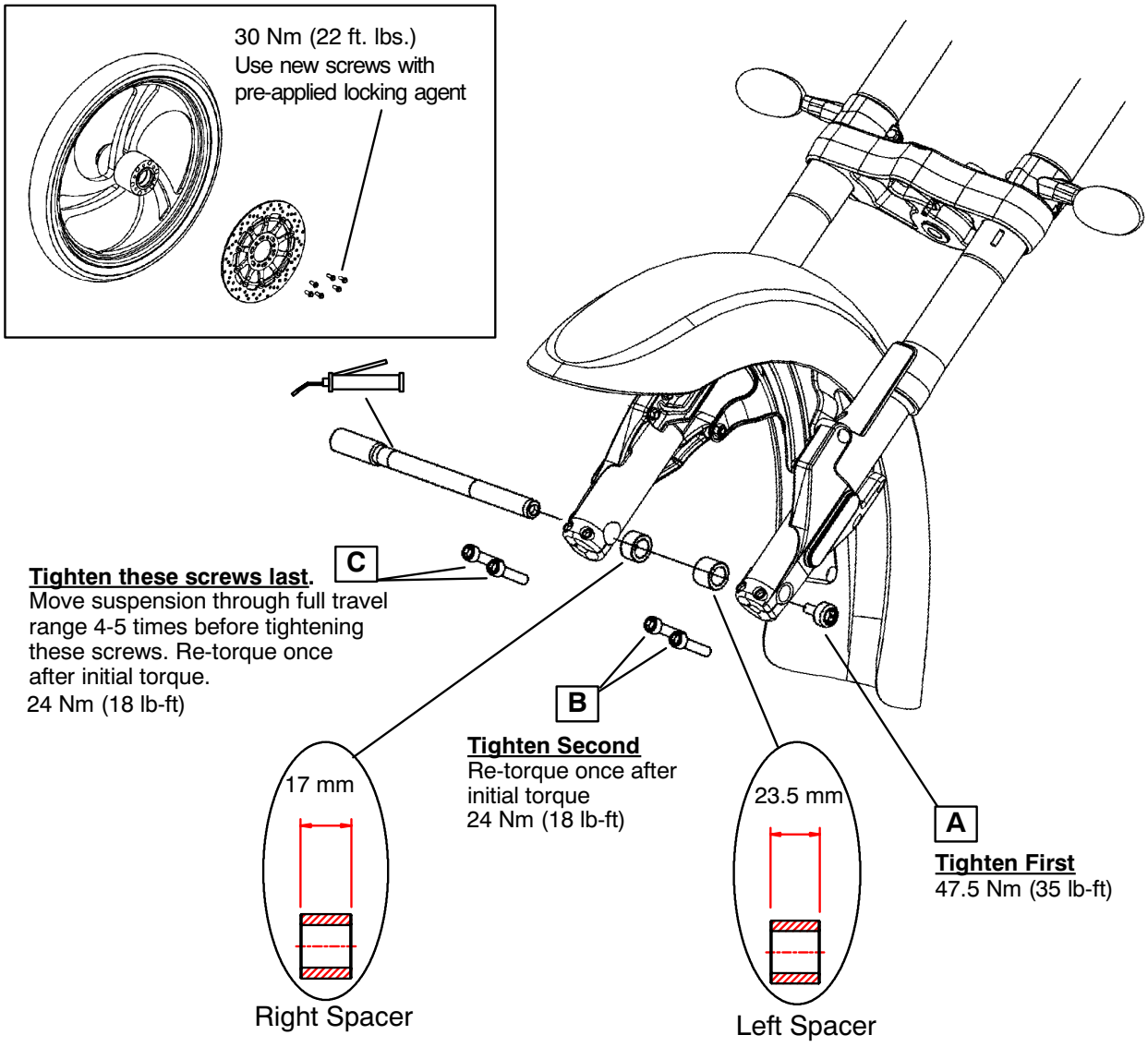
ASSEMBLY VIEW, FRONT FORK ATTACHMENTS - KINGPIN / NESS KINGPIN

KINGPIN / NESS KINGPIN



ASSEMBLY VIEW, FRONT AXLE - KINGPIN / NESS KINGPIN

KINGPIN / NESS KINGPIN



Front Wheel Installation:

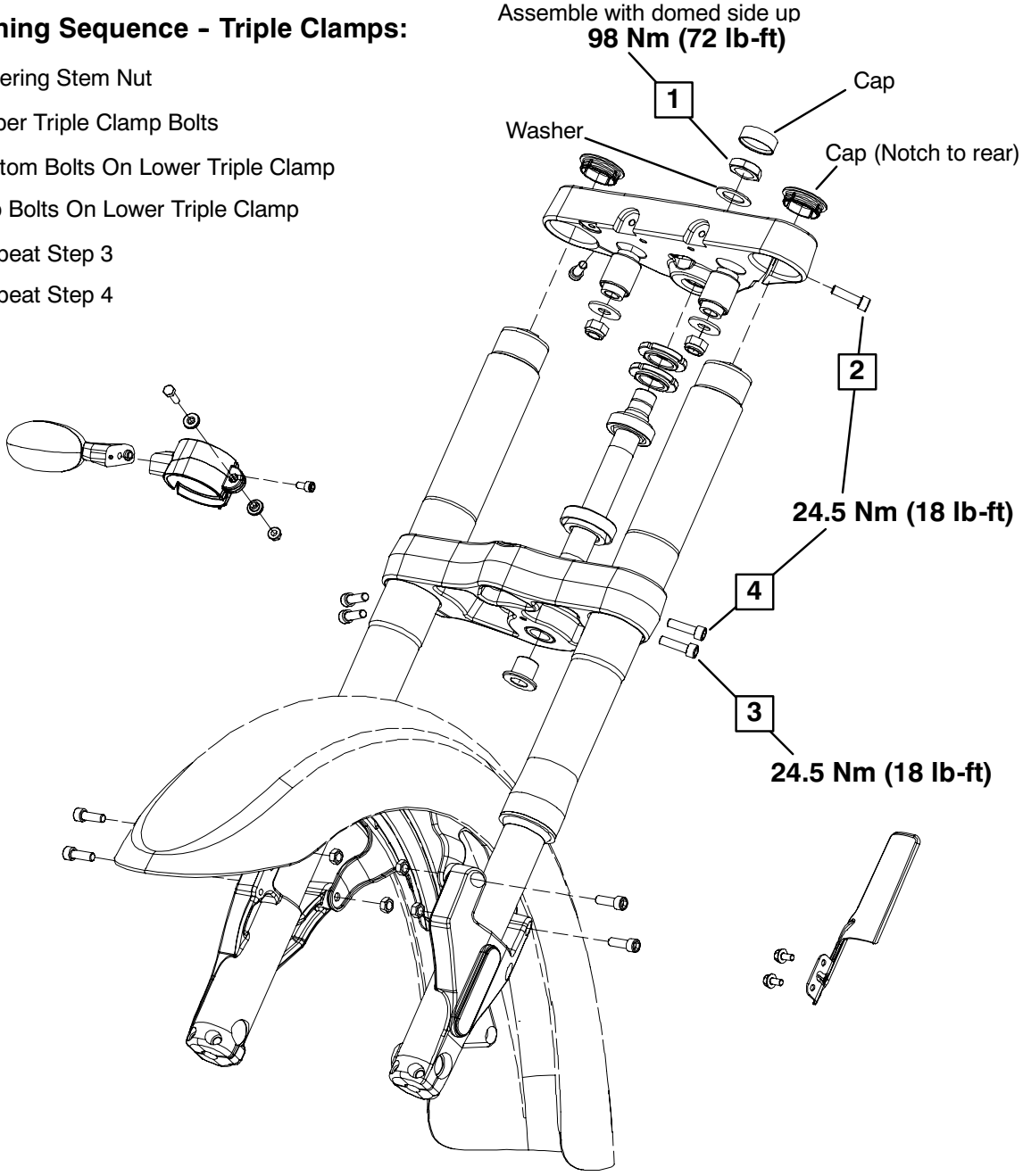
1. Lubricate axle and wheel bearing seals with Victory All Purpose Grease.
2. Install spacers in wheel hub.
3. Clean brake disc and install wheel, fitting brake disc between brake pads.
4. Install axle from right to left.
5. Torque axle cap screw (A) to 47.5 Nm (35 lb-ft). Squeeze front brake lever until lever pressure is firm. Release brake lever and rotate wheel. Be sure wheel rotates freely without binding.
6. Torque LEFT side axle pinch screws (B) to 24 Nm (18 lb-ft). Re-torque once after initial torque.
7. Lower the front wheel to the ground. Move suspension through travel range 4-5 times.
8. Tighten RIGHT side axle pinch screws (C) to 24 Nm (18 lb-ft). Re-torque once after initial torque.

ASSEMBLY VIEW, TRIPLE CLAMP - KINGPIN / NESS KINGPIN

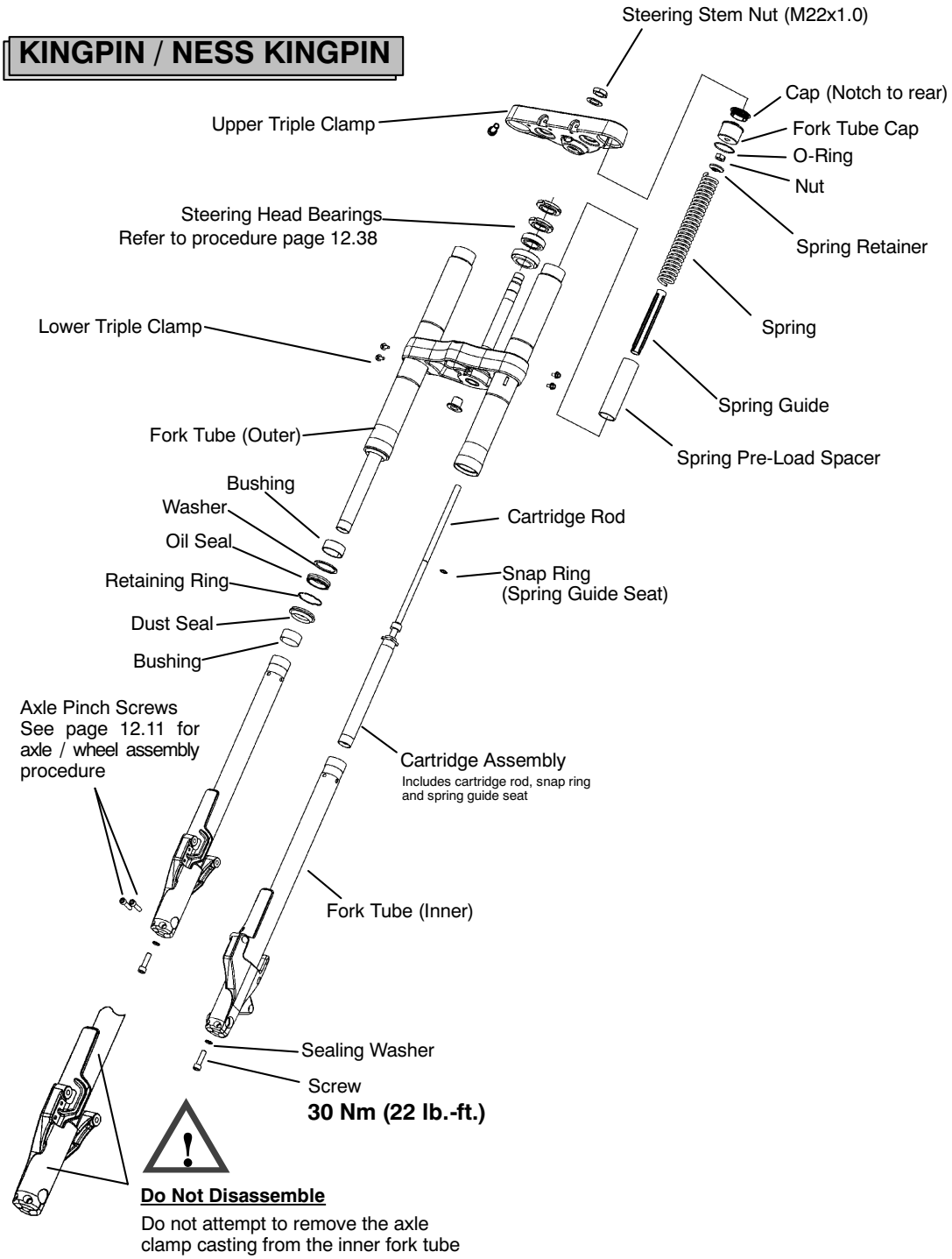
KINGPIN / NESS KINGPIN

Tightening Sequence – Triple Clamps:

1. Steering Stem Nut
2. Upper Triple Clamp Bolts
3. Bottom Bolts On Lower Triple Clamp
4. Top Bolts On Lower Triple Clamp
5. Repeat Step 3
6. Repeat Step 4



ASSEMBLY VIEW, FRONT FORK - KINGPIN / NESS KINGPIN



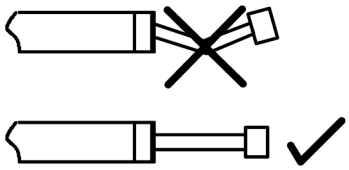
SERVICE PROCEDURES

HANDLEBAR REMOVAL (ALL MODELS)

⚠ CAUTION

Left handlebar grip and grip end may be damaged during the removal process. Plan on replacing the left grip and grip end if it must be removed. Many items will be hanging loose when removing the handlebars. Cover painted or chrome parts to prevent damage. Special care should be taken to protect the fuel tank and front fender finish. Secure or support parts or set them aside as they are removed. Note wire harness and cable routing for assembly later. DO NOT bend or kink cables during the removal process.

NOTE: Refer to illustrations on page 12.4 & 12.5.



1. Remove handlebar switch harnesses from dart clips on handlebars.
2. Remove two bolts from clutch lever bracket clamp with a 5 mm hex wrench.
3. Remove two screws from left handlebar switch assembly with a #2 Phillips screwdriver. Split the switch assembly and disconnect the fast idle cable from the lever.
4. Remove switch assembly and clutch lever bracket. These will remain connected by the wire harness.

LEFT HANDLEBAR GRIP REMOVAL

5. Grasp left grip end cap firmly. Twist while pulling to remove.
6. Remove left-hand grip from the handlebar.

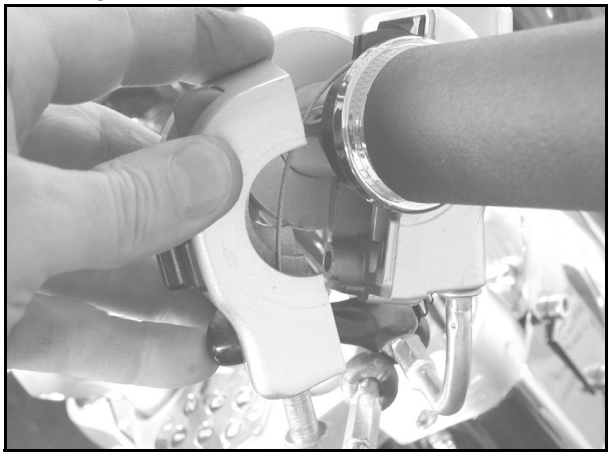
FRONT MASTER CYLINDER REMOVAL

7. Remove two screws from brake master cylinder clamp with a 5 mm hex wrench. Remove clamp and master cylinder assembly. Temporarily secure master cylinder to the vehicle, keeping reservoir in an upright position.

⚠ CAUTION

Keep brake reservoir in an upright position to prevent air from entering the system. Bleeding is required if air enters the system.

8. Remove two screws from right handlebar switch housing.

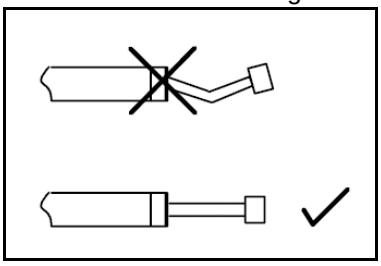


9. Place a soft piece of cloth or padded material on the top of the fuel tank if tank has not been removed.
10. TO REMOVE RISERS AND HANDLEBARS: Remove two nuts that secure the risers to the isolators on upper triple clamp and collect the washers. Remove handlebars and risers as an assembly.
11. TO LEAVE RISERS IN PLACE: Hold the handlebars in place and loosen the rear handlebar clamp screws, and then the front.
12. Remove handlebar clamps and screws.
13. Slide throttle grip assembly off handlebar.

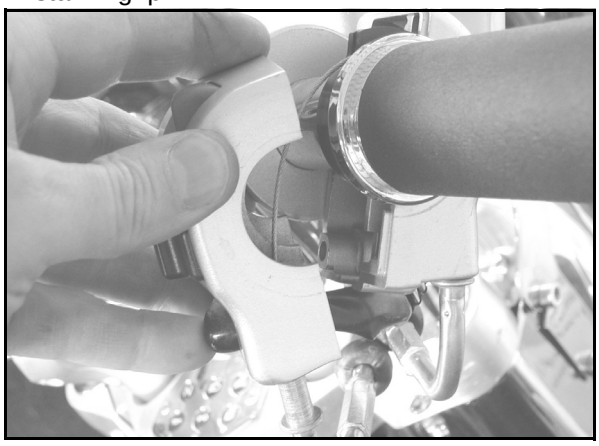
HANDLEBAR INSTALLATION

NOTE: Refer to illustrations / photos here and to the illustrations on page 12.4 & 12.5.

1. Do not bend or kink cables during installation.

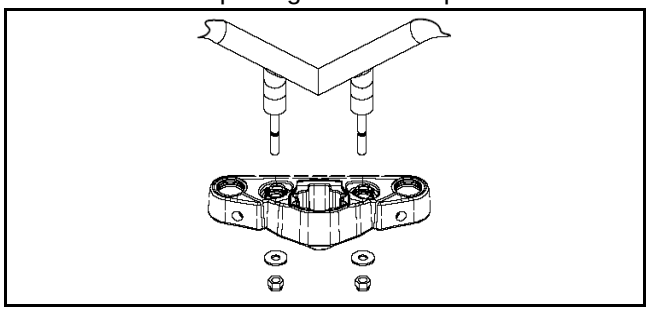


2. Clean straight-knurled handlebar clamp grooves on handlebar to remove any debris.
3. Clean inside of throttle grip assembly and throttle grip area on handlebar. Lightly grease cable ends and install in grip.

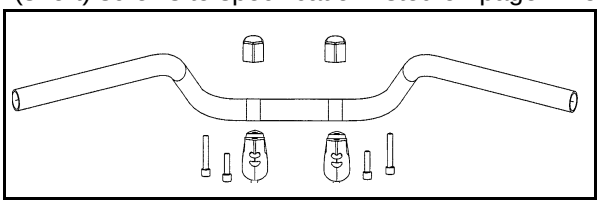


NOTE: On metal throttle twist grips (such as NESS models or motorcycles equipped with metal accessory twist grips) apply a thin film of Victory multi-purpose grease to the right handlebar end before installing the twist grip.

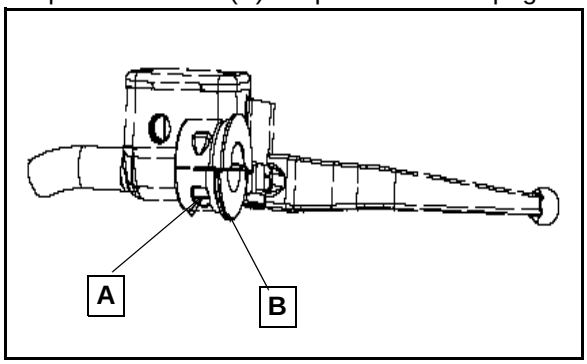
4. Slide throttle grip assembly onto handlebar.
5. Be sure wires are routed properly and set handlebars on risers. NESS MODELS - Set handlebars in position on triple clamp and assemble isolators as shown in illustration on page 12.5.
6. Install handlebars clamps and screws. Align dot on handlebar with parting line of clamps.



7. Install handlebars onto riser clamps. Loosely install clamps and screws. Align dot on handlebars with parting line of clamps and hold in position. Tighten the front (long) clamp screws first, and then the rear (short) screws to specification listed on page 12.5.)



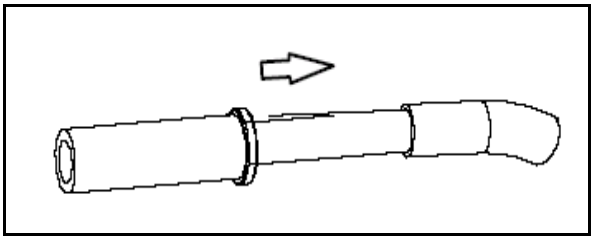
8. Install right handlebar switch housing onto handlebar and install screws. **Align locating pin with hole in handlebar.** Torque top screw first then bottom screw to specification on page 12.4.
9. Install master cylinder and clamp. Install screws. Align parting line of clamp with dot on handlebar. Torque the rear screw (A) first (rider's side), then torque front screw (B) to specification on page 12.4.



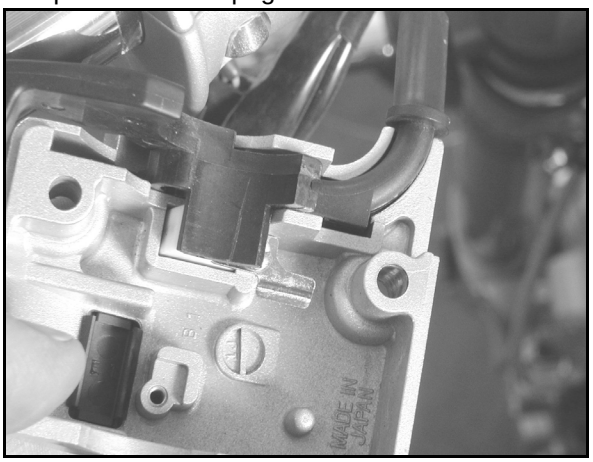
10. Clean left-hand grip mounting surface on handlebar.
11. Apply grip cement (P/N 2872575) to inside surface of new grip and slide grip onto handlebar. Make sure 10 mm of bar is exposed for end cap installation.

> ⚠ CAUTION
>
> Read and follow all instructions and pre-cautions on adhesive container.

12. Install new end cap with a twisting motion, carefully tapping it in with a rubber mallet. Do not use a hard faced hammer.



13. Install clutch lever bracket with clamp and screws. Align parting line of clamp with dot on handlebar. Torque rear screw first (rider's side), then torque front screw to specification on page 12.4.
14. Install left handlebar switch housing on handlebar. Align seam with dot on handlebar and torque screws to specification on page 12.4.



15. Lightly grease the end of fast idle cable and install it on the lever in the left switch housing. Position fast idle cable / lever in left switch housing.
16. Secure all wiring to handlebar with dart clips and be sure harness and cables are routed through guides as shown at right. Note: Clutch cable is NOT routed through the left guide.

17. Check operation of cables, switches, controls. Adjust if necessary:
    - Fast idle cable - Chapter 2.
    - Clutch cable - Chapter 2
    - Throttle cables - Chapter 2
18. Check operation of throttle assembly and adjust throttle freeplay (Chapter 2).

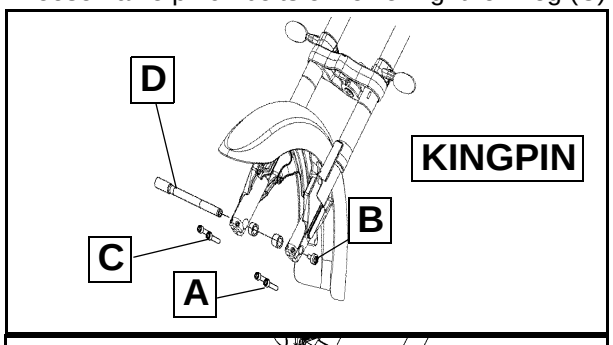
19. Check operation of front brake. Bleed brakes if lever does not feel firm. Refer to Chapter 15.

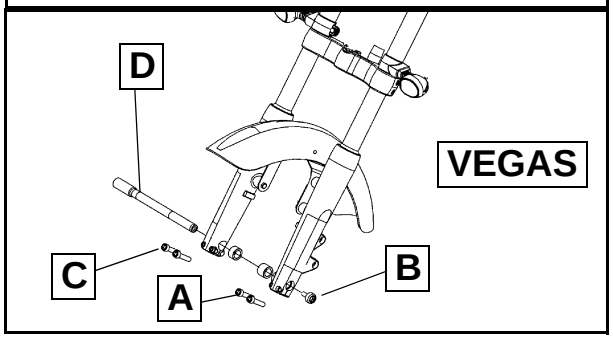
FRONT WHEEL REMOVAL

1. Refer to illustrations below and on page 12.8 (Vegas) or page 12.11 (Kingpin).

> ⚠ CAUTION
>
> Do not twist the brake hose or brake line. Do not allow caliper to hang from the brake hose. Secure caliper in such a way to avoid hose damage. Do not operate the front brake lever with the caliper or wheel removed

2. Loosen axle pinch bolts (A).
3. Remove axle bolt (B).
4. Loosen axle pinch bolts on lower right fork leg (C).





5. Securely support front end of motorcycle so front wheel is off the ground.

> ⚠ CAUTION
>
> Take precautions so that the motorcycle is securely supported when the tire is off the ground.

6. Support wheel and remove axle (D). Be prepared to catch spacers on each side of the wheel and remove wheel.

FRONT AXLE INSPECTION

1. Place axle in V-blocks and inspect runout. Compare to specifications on page 12.3.

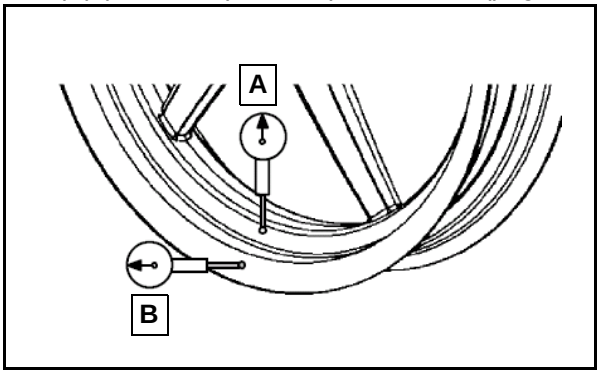
2. Replace axle if it fails inspection. Do not attempt to straighten a bent axle.

FRONT WHEEL INSPECTION

1. Install front wheel in truing stand.

NOTE: Bearings must be in good condition to accurately measure runout.

2. Set up a dial indicator to measure radial runout (up and down) (A) and compare to specifications (page 12.3).
3. Position dial indicator to measure axial runout (side to side) (B) and compare to specifications (page 12.3).



4. Visually inspect wheel for cracks.
5. Replace wheel if it fails visual or measured inspection. Do not attempt to straighten cast or billet wheels.

BRAKE DISC REMOVAL

NOTE: Disc must be inspected before removing from wheel.
Refer to Chapter 15 for disc inspection.

1. Remove front wheel (refer to page 12.17.)
2. Position wheel with brake disc facing up.
3. Remove and discard brake disc screws.
4. Remove brake disc from wheel.

BRAKE DISC INSTALLATION

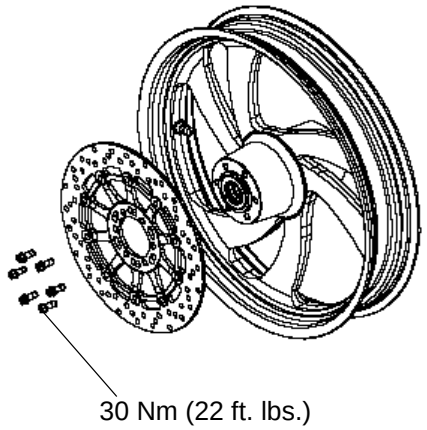
1. Clean screw hole threads with Loctite Primer N.
2. Clean surface of wheel and brake disc with Victory Brake Cleaner.
3. Install disc on wheel with part number facing OUT.
4. Replace screws with new screws which have pre-applied locking agent.

⚠ WARNING

Do not re-install brake disc screws. Use only new screws which have a pre-applied locking agent.

5. Torque screws in a cross pattern to specification.

All surfaces and fasteners must be clean, dry, and oil free before assembly.

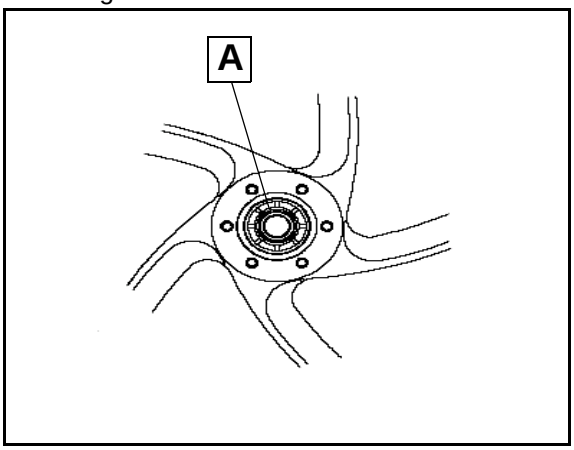


- **Use new screws**
- **Install disc with part number facing OUT**

FRONT WHEEL BEARING INSPECTION

NOTE: Inspect bearings installed in the wheel. Do not remove to inspect. Bearings cannot be repacked. Replace both wheel bearings if one or both fail inspection, or if either bearing was removed. For inspection with the wheel installed on the vehicle, refer to Chapter 2.

1. Visually inspect bearing seals on each side for wear or damage.



2. Check bearings by turning inner race (A) by hand.
   - Look for signs of discoloration, scoring, galling, or contamination from moisture or dirt. Replace bearings if any of the above are present.
   - Turn the inner race of the bearings. The bearings should turn smoothly and quietly. The inner race should be firm with minimal side to side movement and no detectable up and down movement.
3. Discard bearings that fail any of the above inspections.

⚠ CAUTION

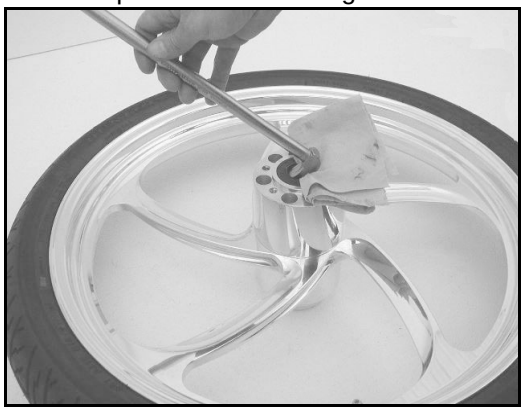
Do not reuse bearings after removing them from the wheel. Removal damages the bearings internally.

4. Inspect bearing fit into wheel hub. The outer race of the bearing must fit tightly into the bore. You should not be able to move it (or remove it) by hand. Replace the wheel if outer race of a new bearing does not fit tightly in the bore.

FRONT WHEEL BEARING REMOVAL

NOTE: Replace both wheel bearings as a set. Do not replace only one wheel bearing.

1. Place a shop towel over the edge of seal bore.



2. Carefully remove both seals using a pry-bar and discard. Be careful not to scratch the seal bore.
3. Remove retaining ring from left side.
4. Install bearing remover element into left side bearing and remove it.

Blind bearing remover PV-43551

5. Remove bearing spacer from wheel hub, measure the length and compare to specification. Replace spacer if it is worn beyond the service limit or if the bearing contact surface is damaged.

Minimum Spacer Length: 121.80 mm (4.795″)

6. Use an appropriate drift, drive out right side bearing.

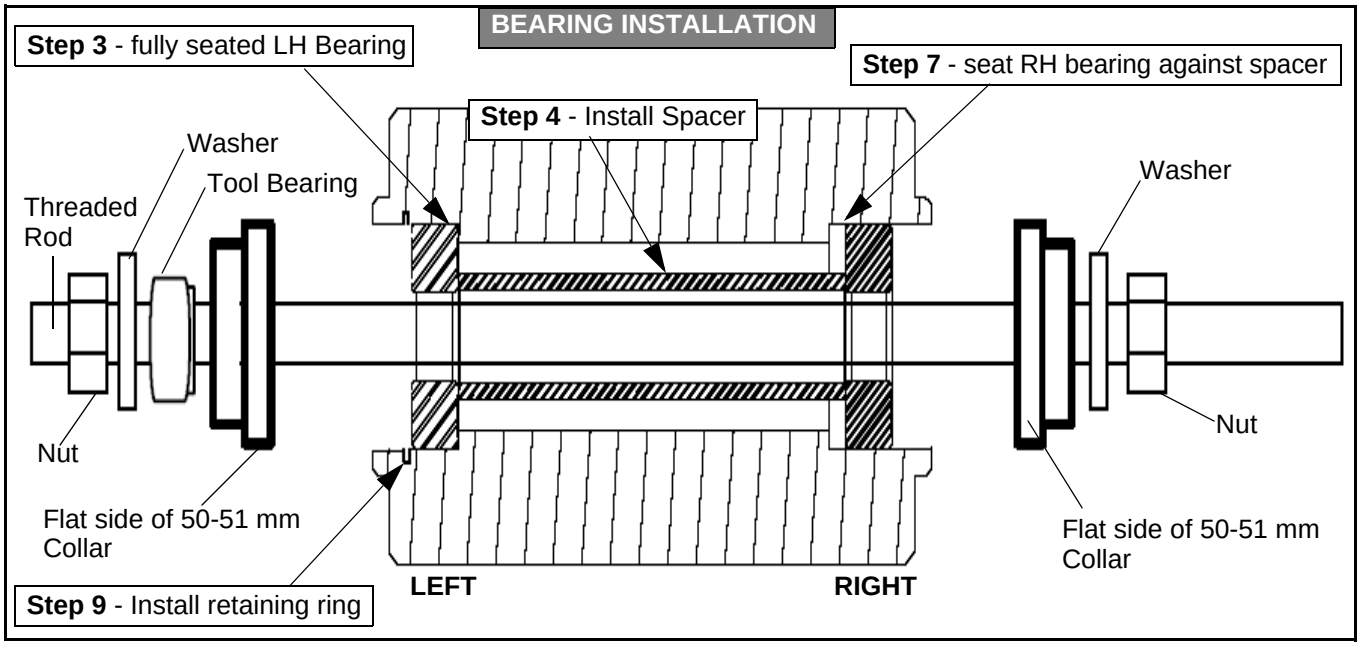
FRONT WHEEL BEARING INSTALLATION

NOTE: Refer to illustration below for Steps 3-9.

1. Clean inside of wheel hub and bearing spacer. Replace spacer if any wear is evident on the ends.
2. Place new bearing into left hand side of wheel with markings facing up (toward outside of hub).
3. Assemble bearing installation tool with flat side of 50-51 mm collar against bearing. Collar must be slightly smaller than O.D. of bearing and must be flat to support inner and outer race equally. DO NOT pull or press on inner race of ball bearings or bearing will be permanently damaged! Assemble right side of tool as shown and pull bearing into hub until fully seated.

Bearing installation tool set: PV-43515
NOTE: Use of this special tool is shown with rear wheel bearing installation in Chapter 13.

4. Turn wheel over and install bearing spacer.
5. Place new right wheel bearing onto wheel with markings facing up.
6. Install another 50-51 mm wheel bearing installation tool against bearing.
7. Pull bearing in to right side of wheel until seated against spacer.
8. Remove tool. Check that spacer is centered with bearings. **If not, center it by inserting front axle. Repeat Step 7 to fully seat bearing on spacer.**
9. Install retaining ring. Be sure it is fully seated in the groove.
10. Install retaining ring. Be sure it is fully seated in the groove. (Continued on next page)



11. Install new seals using a 52mm seal driver. (Fig. 1)

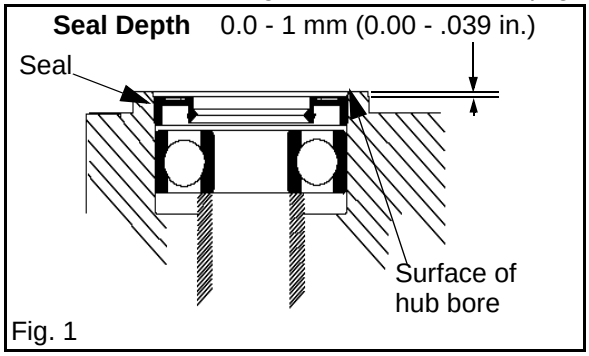


Fig. 1

12. Rotate inner races of bearings to check for free, smooth rotation.
13. Install discs (page 12.18). Clean discs with Victory Disc Brake Cleaner.

⚠ CAUTION

Do not allow brake cleaner to contact painted surfaces.

⚠ WARNING

Grease or oil on the brake disc will increase stopping distance which may lead to loss of vehicle control or an accident.

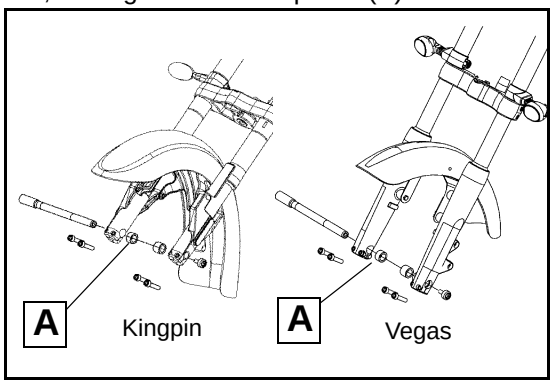
FRONT WHEEL INSTALLATION

NOTE: Also refer to illustrations on page 12.8 (Vegas) or page 12.11 (Kingpin).

1. Lubricate axle and spacers with a light film of grease.

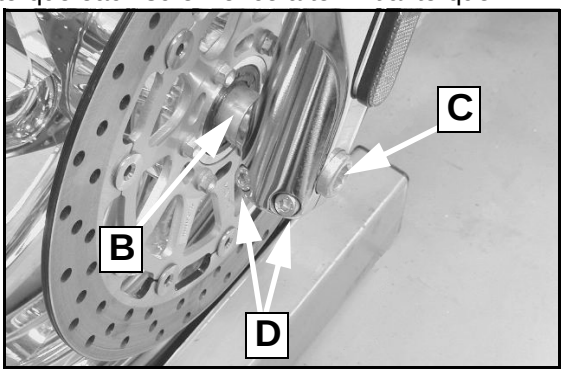
Victory All Purpose Grease: 2872187

2. Install spacers in wheel hub.
3. Clean brake disc and install wheel, fitting brake disc between brake pads on caliper.
4. Align and place axle shaft from right side through fork tube, into right side axle spacer (A).

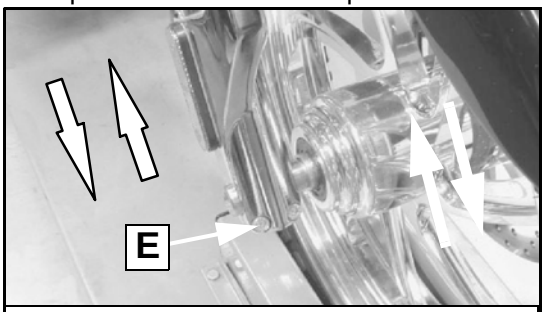


NOTE: The left spacer is wider than the right.

5. Push axle through wheel, left axle spacer (B) and into left fork.
6. Fully seat axle into fork.
7. Install axle bolt (C) into left end of axle.
8. Hold right side of axle and torque bolt to 47.5 Nm (35 lb-ft).
9. Torque left fork leg screws (D) to 24 Nm (18 lb-ft). Re-torque each screw once after initial torque.



10. Separate brake pads in caliper and install over disc. Torque mounting screws to 41 Nm (31 lb.-ft.)
11. Lower front of machine.
12. Slowly pump front brake lever to regain pressure. Apply and hold front brake.
13. Pump forks to move suspension through range of motion 4-5 times.
14. Torque pinch bolts (E) to 24 Nm (18 lb-ft). Re-torque once after initial torque.



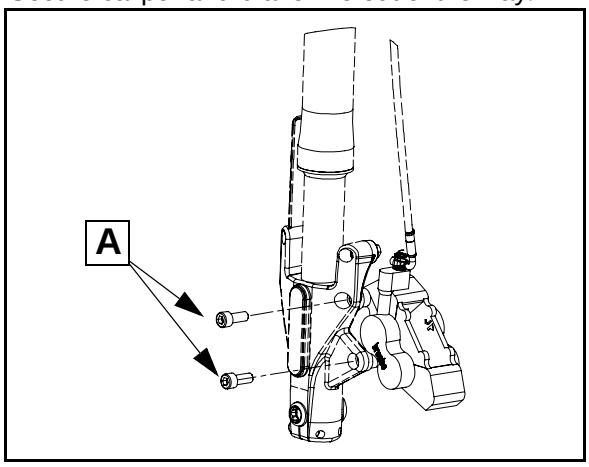
Pump forks before tightening screws (E) on right fork leg

NOTE: Fork action should be smooth without binding. If problems are found, inspect for cause and correct as necessary.

15. Elevate front wheel and spin it to check for drag. Apply and release front brake. Wheel should spin freely and quietly without drag when brake lever is released.
16. Lower front of machine.
17. Inspect operation of front brake lever. Bleed front brake system if lever is not firm. (Chapter 15).

FRONT FORK REMOVAL - KINGPIN

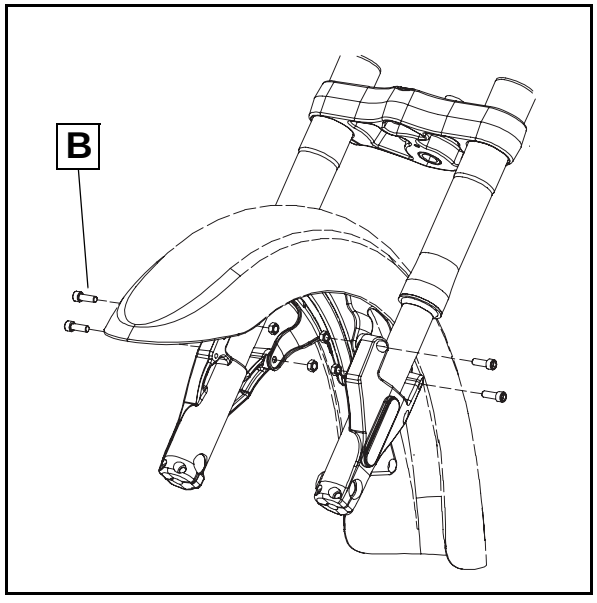
1. Remove front brake caliper screws (A) and caliper. Secure caliper and brake line out of the way.



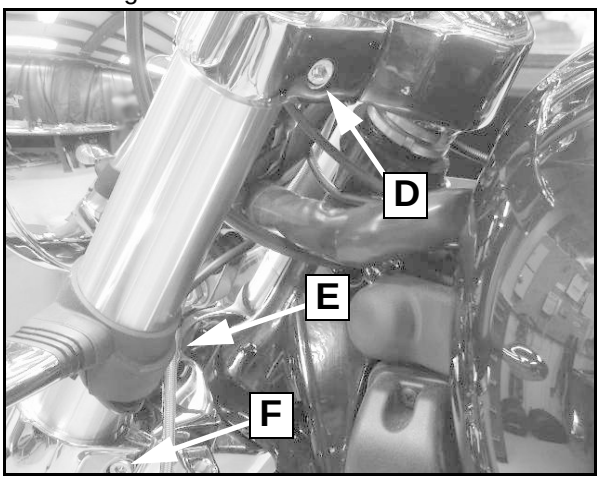
⚠ CAUTION

Do not twist the brake hose or brake line. Do not allow caliper to hang from the brake hose. Secure caliper in such a way to avoid hose damage.

2. Remove front wheel (refer to page 12.17).
3. Remove front fender screws and fender (B).



4. Loosen upper triple clamp pinch bolt(s) (D) for both left and right fork tubes.



5. Loosen turn signal mount screws (E) and lower triple clamp pinch bolts (F).
6. Slide fork legs down and remove turn signal mounts from tubes.

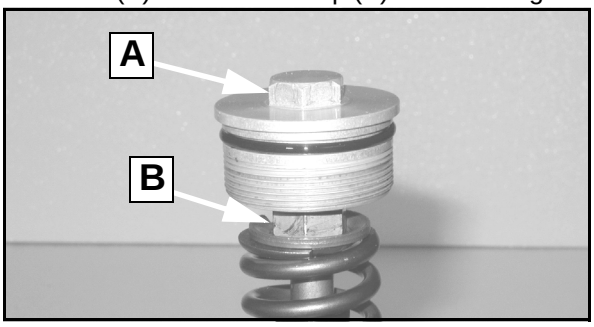
FRONT FORK DISASSEMBLY - KINGPIN

NOTE: Also refer to Front Fork Assembly View on page 12.13. Clean the fork tubes thoroughly before disassembly.

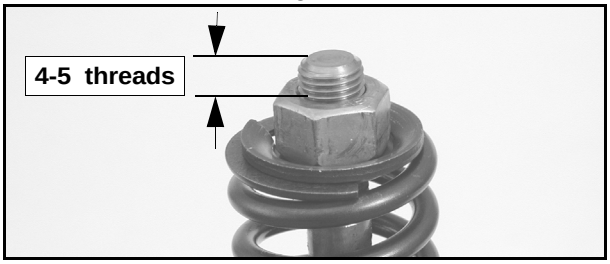
1. Loosen fork cap (A).

NOTE: If cap was not loosened before removing from the tube from the triple clamp, temporarily re-install tube to hold it.

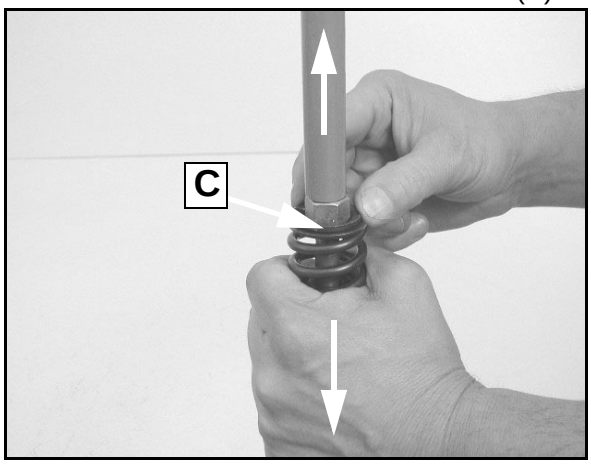
2. Clamp the fork tube in a soft jaw vise or work table vertically, with fork cap upward.
3. Hold nut (B) and remove cap (A) from cartridge shaft.



4. Loosen nut to relieve pre-load until 4-5 threads are visible on end of cartridge shaft.



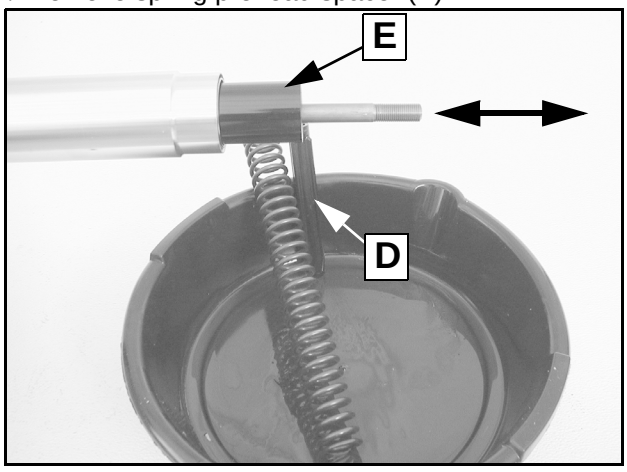
5. Install cartridge shaft tool (PV-47060). Pull upward on cartridge shaft tool while pulling downward on spring, and have an assistant remove the retainer (C).



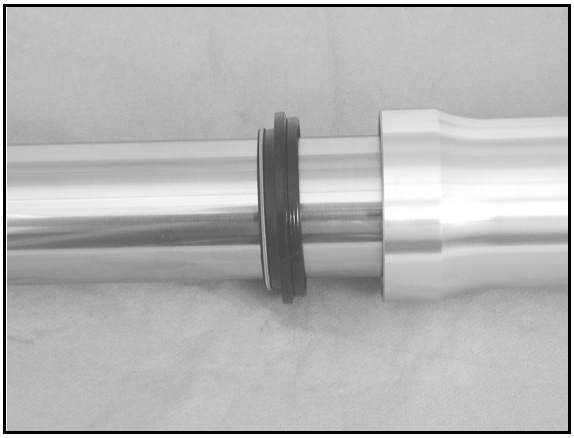
⚠ WARNING

Wear eye/face protection. The spring retainer is under spring pressure. Hold firm downward pressure on spring while removing retainer, and release spring tension slowly after retainer is removed.

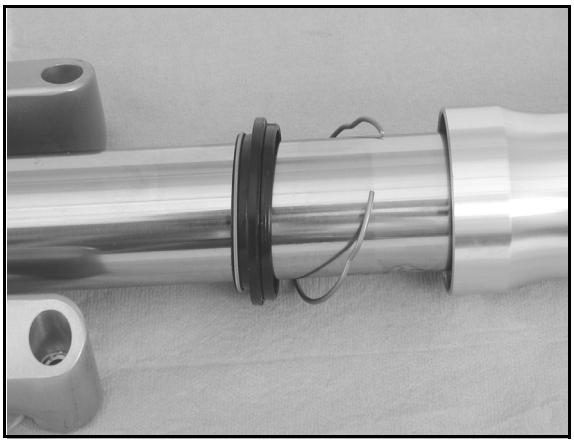
6. Remove nut from cartridge shaft.
7. Remove spring.
8. Remove spring guide (D).
9. Pour fork oil out of tube assembly.
10. Move cartridge shaft through complete stroke several times to drain cartridge.
11. Remove spring pre-load spacer (E).



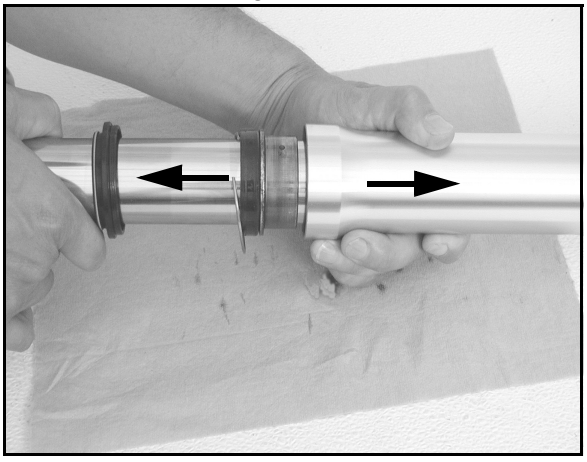
12. Carefully lift dust seal out of outer fork tube with a small flat screwdriver.



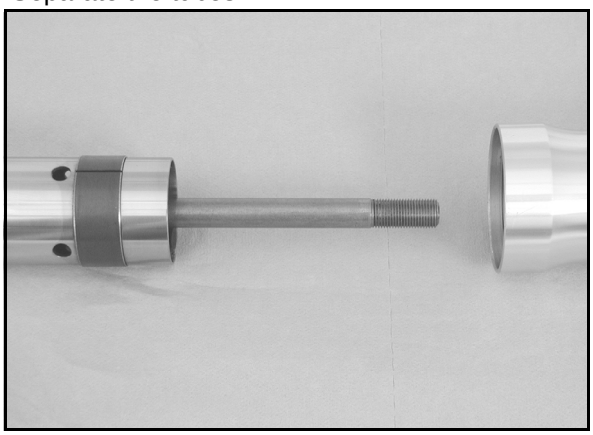
13. Remove seal retaining ring. Use care not to scratch the surface of the inner fork tube.



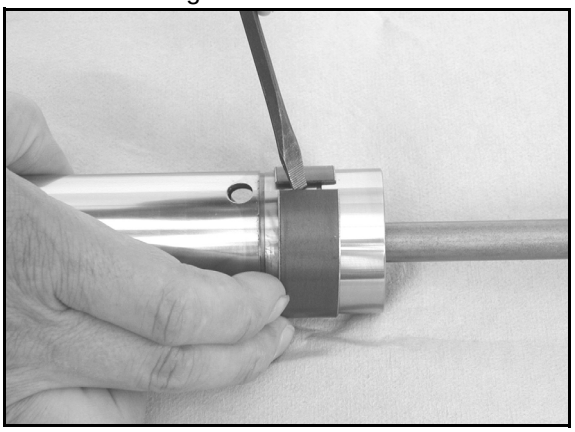
14. Push inner and outer tube together, then pull apart quickly to produce a slide hammer motion. Repeat until seal and bushing are removed from outer tube.



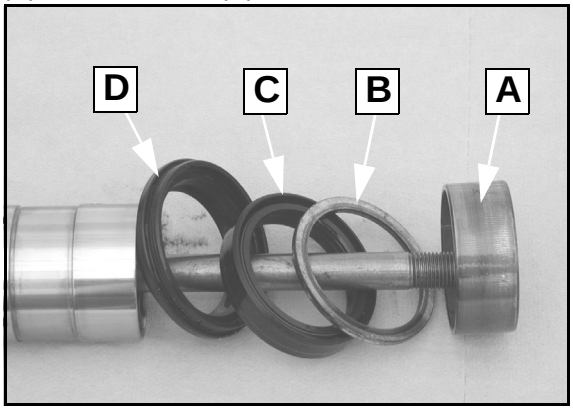
15. Separate the tubes.



16. Remove bushing from inner tube.

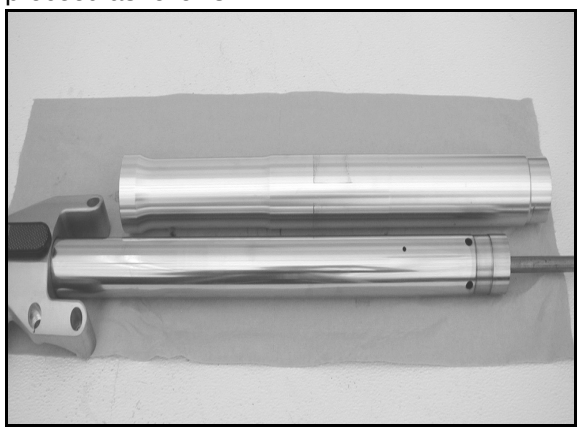


17. Slide outer bushing (A), backup washer (B), oil seal (C), and dust seal (D) from inner tube.

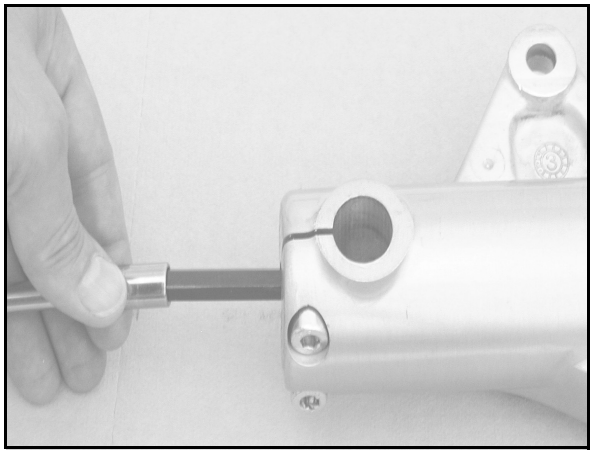


NOTE: Replace all seals and bushings upon assembly

18. Clean tubes and drain completely. Cartridge removal is not required for seal and bushing replacement. Cartridge can be cleaned by flushing in a clean oil bath (see Step 20.). If cartridge removal is required proceed as follows:



19. Remove cartridge screw and sealing washer using an extended 8 mm hex socket.



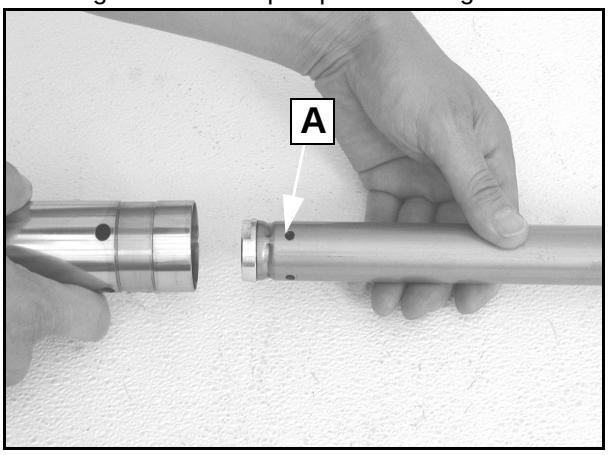
20. Remove cartridge from inner tube.

⚠ WARNING

DO NOT disassemble the cartridge. If damaged or worn, it must be replaced as an assembly.

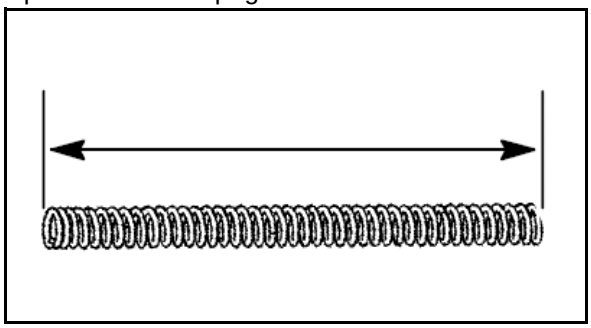
12

21. To clean cartridge, submerge oil holes (A) in clean cartridge fork oil and pump the cartridge shaft.

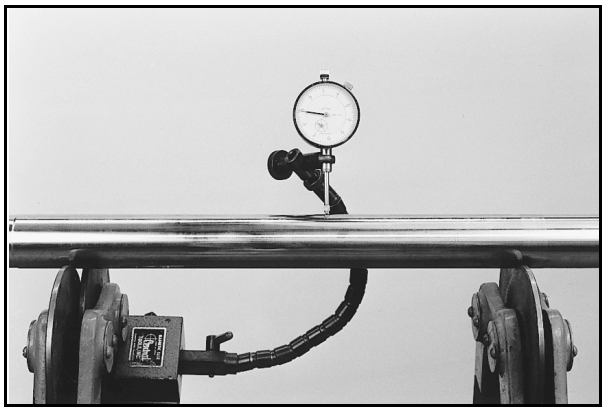


FRONT FORK INSPECTION - KINGPIN

1. Measure fork spring free length and compare to specifications on page 12.3.



2. Inspect inner fork tube for scoring, heavy scratches, dents due to rocks or other road debris, or excessive wear. Replace tube if deep scratches, pitting, or dents are found.



3. Place fork tube in V-blocks and measure runout. Replace tube if runout exceeds service limit listed on page 12.3.

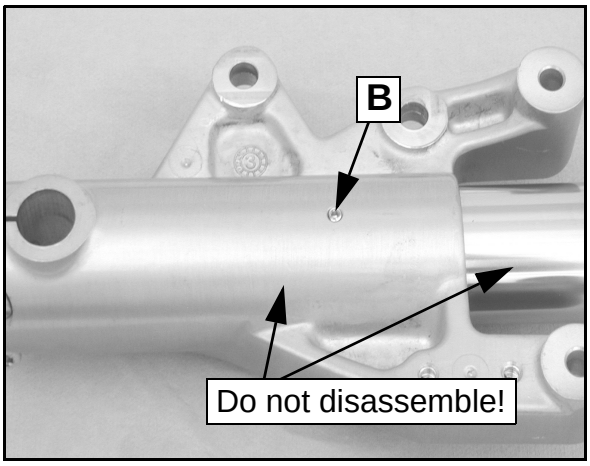
⚠ WARNING

Do not attempt to straighten bent fork tubes. Doing so will weaken the structural integrity of the forks and make the motorcycle unsafe to operate.

4. DO NOT loosen or remove the set screw (B).

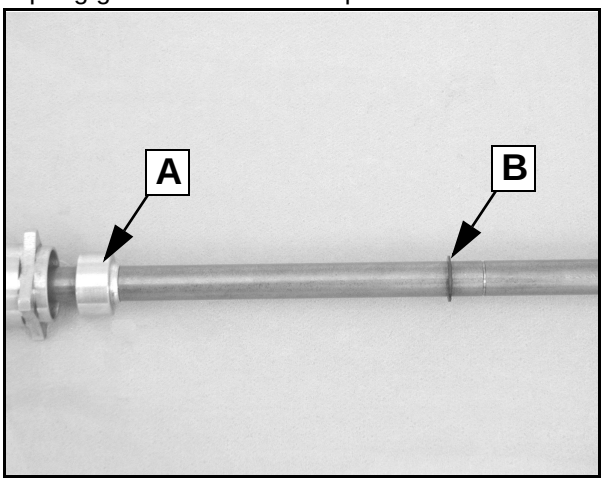
⚠ WARNING

DO NOT disassemble the inner fork tube. If damaged or worn, the inner fork tube / lower casting must be replaced as an assembly.



5. Inspect outer tube for dents or other damage. Look for cracks in the tube, especially in the clamping zone. Assemble inner and outer fork tube with new bushings and move inner tube through complete travel range. Check for resistance or binding in suspect area of outer tube. Replace outer tube if binding or resistance is evident, or if tube is cracked.
6. Inspect cartridge by moving cartridge shaft through travel range. If binding is evident, replace the cartridge assembly.

7. Be sure oil lock valve (A) and snap ring (B) for the spring guide are secured in position on shaft.

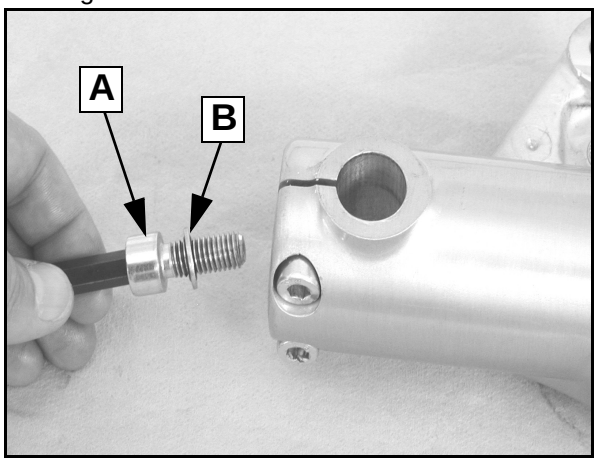


NOTE: The snap ring should be positioned in groove closest to oil lock valve as shown.

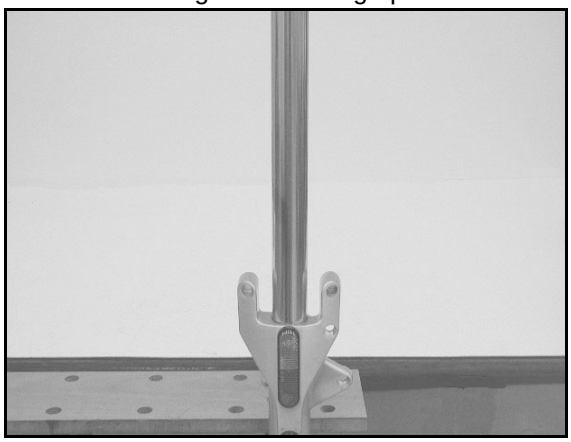
FRONT FORK ASSEMBLY - KINGPIN

NOTE: Also refer to Front Fork Assembly View on page 12.13.

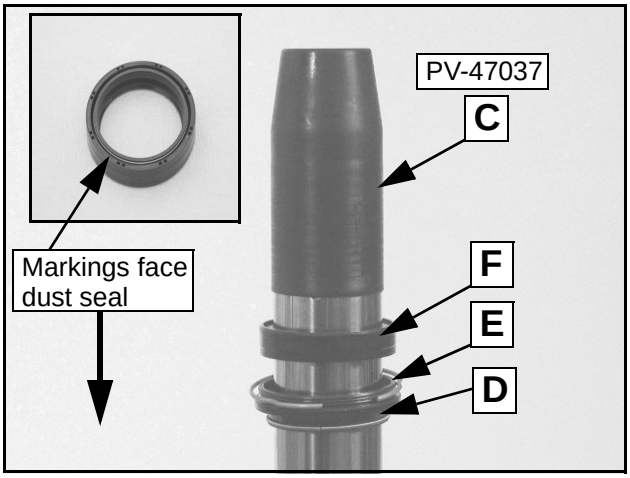
1. Be sure screw threads in cartridge are clean and not damaged.



2. Place cartridge assembly into inner fork tube, and rotate until flats on bottom of cartridge align with recess inside tube.
3. Install a new cartridge screw (A) and new sealing washer (B).
4. Clamp lower casting in a soft jaw vise or work table across axle bore and torque cartridge screw to 30 Nm (22 lb.-ft.)
5. Secure fork assembly in a soft jawed vise or work table with cartridge shaft facing up.

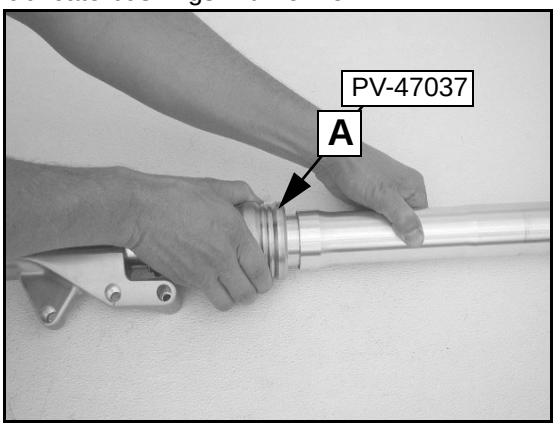


6. Lightly oil sealing lips of new dust seal with fork oil.
7. To prevent seal damage, install seal guide (C) over end of fork tube as shown and apply a thin film of fork oil.

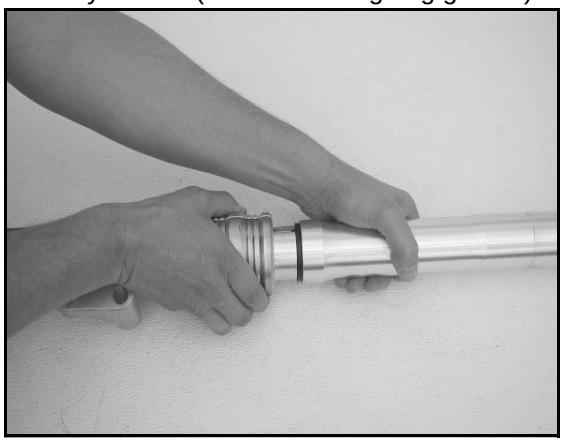


8. Carefully install a new dust seal (D) and slide it over seal guide.
9. Install a new retaining ring (E).
10. Lightly grease *outside* of new fork seal (F) with Victory All-Purpose grease and inside sealing lips with fork oil.
11. Install seal with markings facing toward dust seal and retaining ring.
12. Remove tool and install new backing washer and new (large I.D.) bushing.
13. Install bushing on end of inner tube.

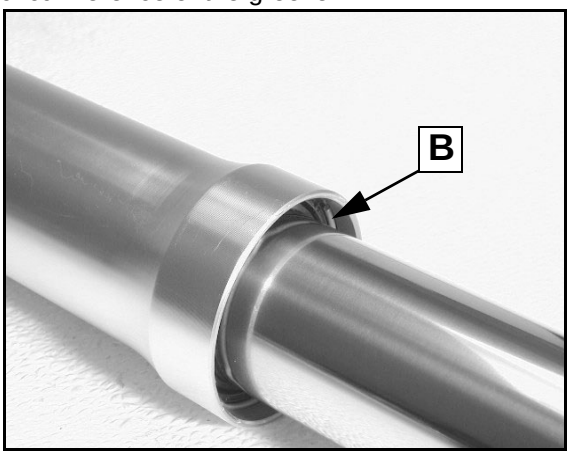
14. Lubricate bushings with fork oil.



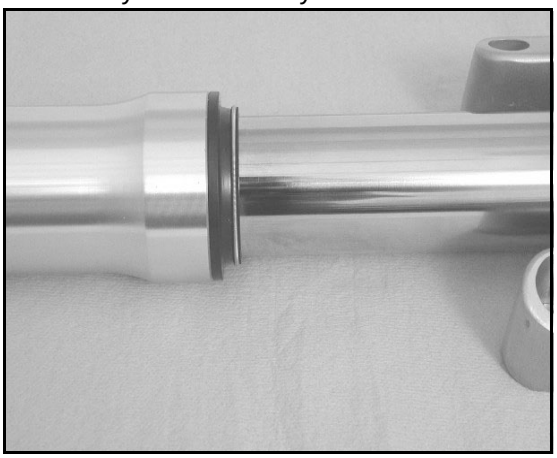
15. Remove tube from vise.
16. Using small side of seal driver (A) drive bushing and backing washer into outer tube until seated.
17. Drive seal into fork slider with large side of seal driver until fully seated (below retaining ring groove).



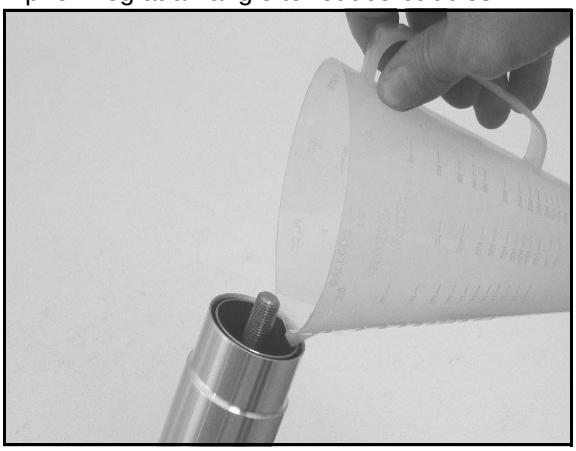
18. Install retaining ring into groove of fork tube. Be sure it is completely seated around the entire circumference of the groove.



19. Wipe away any excess grease or oil and install the dust seal by hand until fully seated in outer tube.



20. Mount fork assembly upright in a soft jawed vise.
21. Tip fork leg at an angle to reduce bubbles.

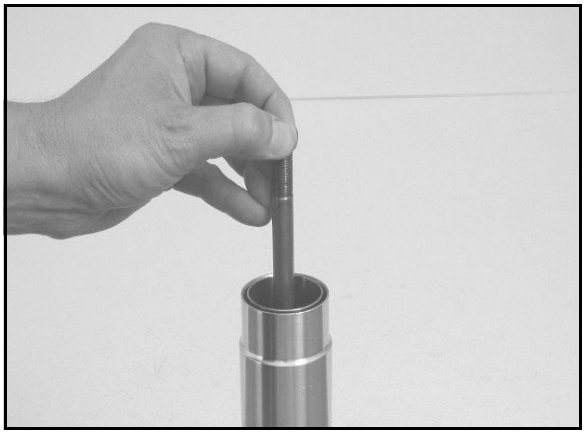


22. Slowly add about 470 cc of Victory cartridge fork oil.

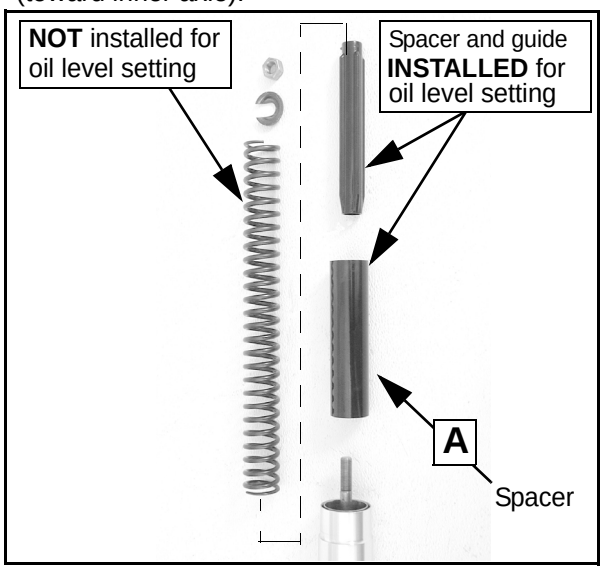
NOTE: The oil quantity slightly exceeds the capacity of the fork. Final fork oil level must be adjusted correctly as outlined later.

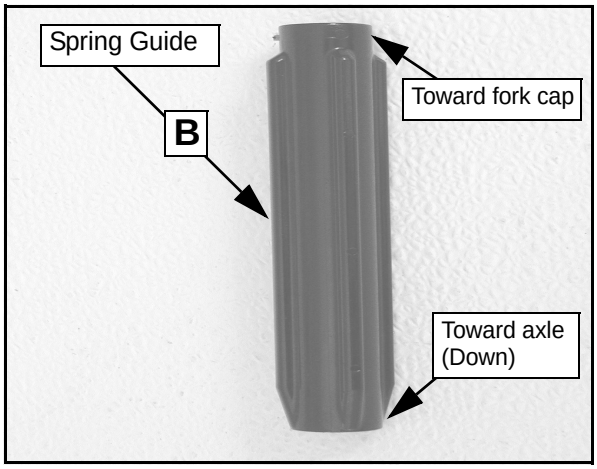
23. Set fork leg upright.
24. Lift outer tube up about 4 inches from the fully compressed position. Seal the top of the tube with your hand and push downward against air pressure. Hold for 10-15 seconds to force out trapped air.

25. Bleed cartridge by moving shaft up and down to purge air. Begin with small strokes, increasing stroke length until all air is removed and damping is smooth and consistent.

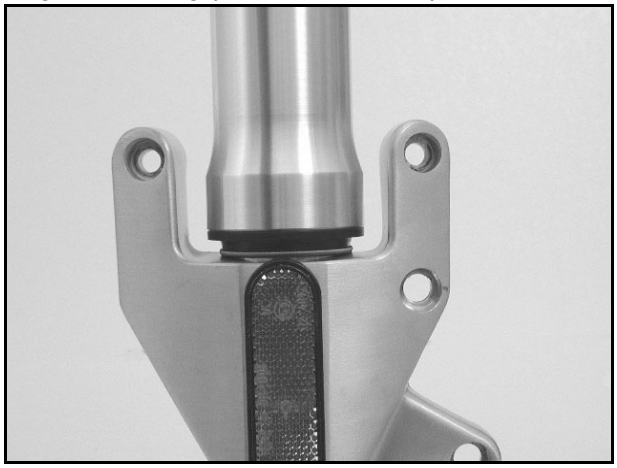


26. Clean and install spring spacer (A) and spring guide (B). Install spring guide with tapered end down (toward inner axle).



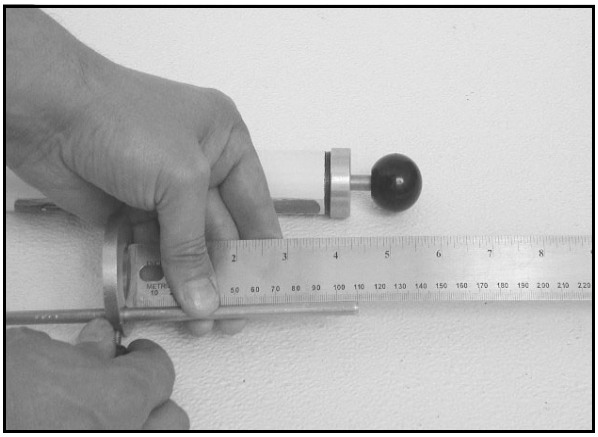


27. Slowly compress fork until it stops with dust seal against casting (at bottom of travel).

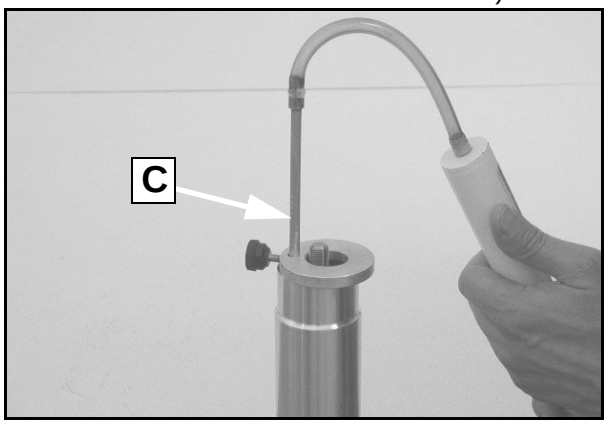


28. Adjust tool to specified level:

Fork oil level: 70 mm (2.756")
Spring removed / tube fully compressed.

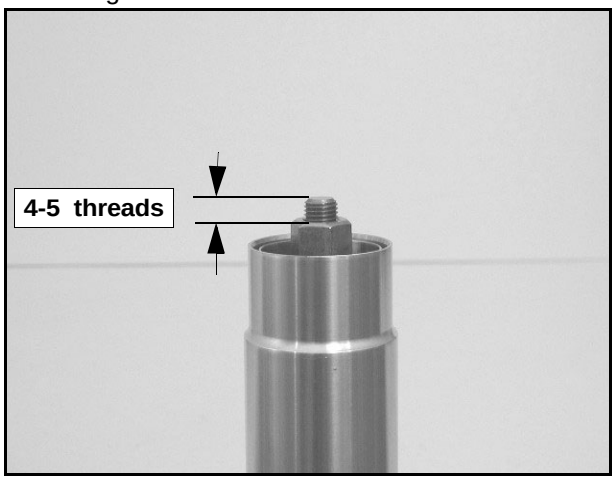


29. Insert fork oil level tool (C) into fork. Be sure fork leg is standing upright and fork is fully compressed (top of inner and outer tubes should be even.)



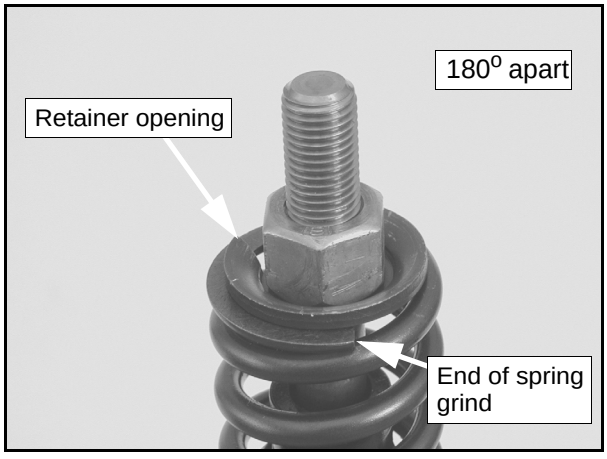
30. Draw excess oil out to the specified level.

31. Install nut on cartridge shaft until 4 or 5 threads are showing.

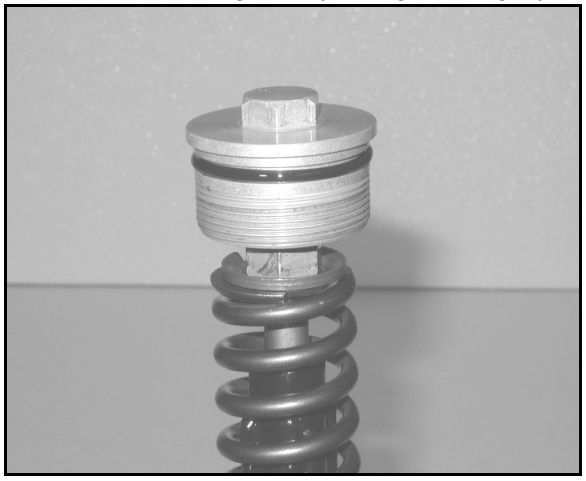


32. Install spring.
33. Install cartridge shaft tool.
34. Pull upward on tool and down on spring. Have an assistant install the retainer with opening facing 180° (opposite) the end of the spring grind.

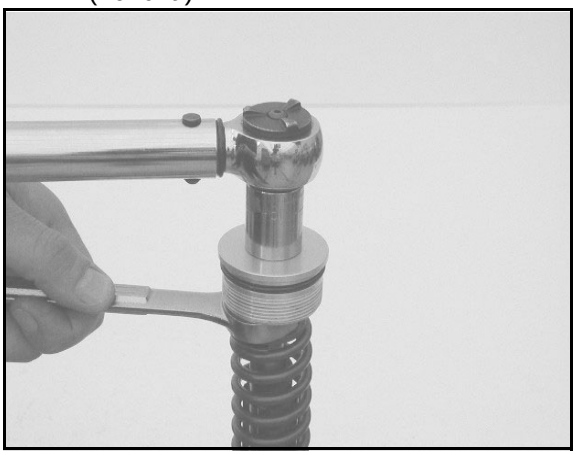
35. Remove tool and turn nut to bottom of threads.



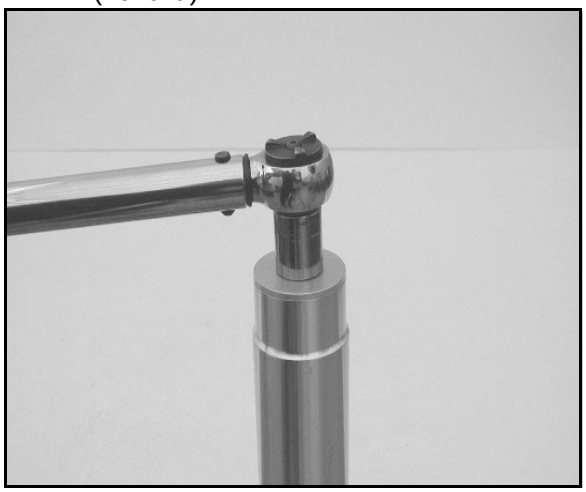
36. Install a new O-Ring on cap and grease lightly.



37. Install cap until bottomed lightly on shaft threads.
38. Unscrew nut until it contacts the cap.
39. Tighten nut against cap. Hold nut and torque cap to 27 Nm (20 lb.ft.).



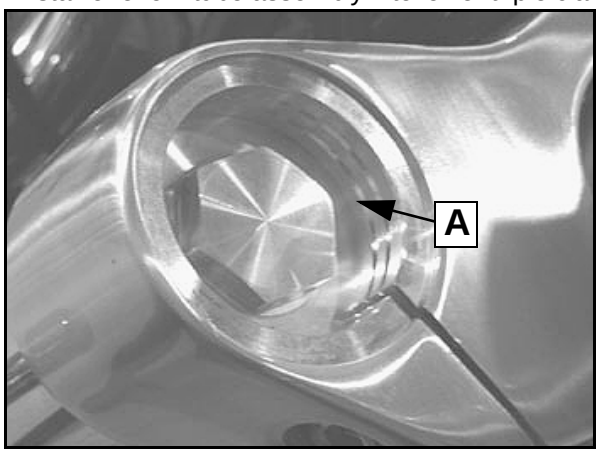
40. Screw cap into outer tube and torque to 27 Nm (20 lb.ft.).



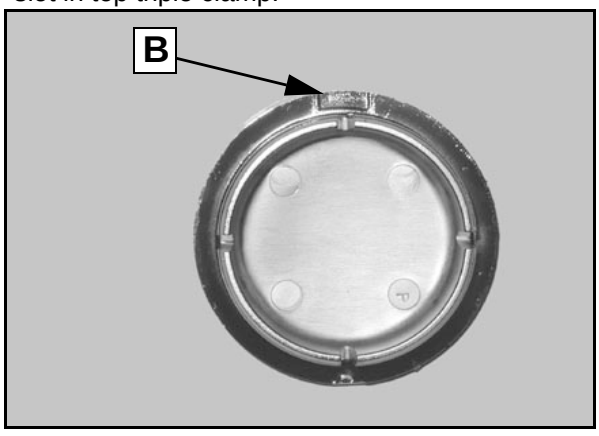
FRONT FORK INSTALLATION - KINGPIN

Also refer to illustration on page 12.12.

1. Install one fork tube assembly into lower triple clamp.



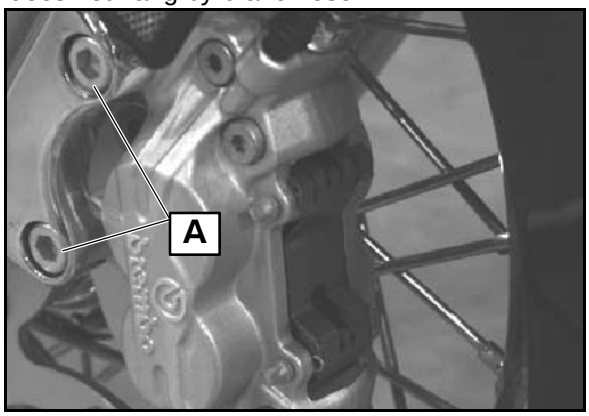
2. Place turn signal mount onto fork tube.
3. Continue to slide tube through lower triple clamp and into upper triple clamp until fully seated (A).
4. Torque each upper triple clamp pinch bolt to 24.5 Nm (18 lb.-ft.)
5. Torque lower triple clamp bolts, starting with lower bolt, then upper bolt to 24.5 Nm (18 lb.-ft.).
6. Repeat torque on both lower triple clamp bolts.
7. Repeat steps 1 through 5 for the other fork tube.
8. If caps were removed, install with notch (B) aligned to slot in top triple clamp.



9. Install front fender. Compress fender mounting area slightly to avoid scratches. Torque screws to 24.5 Nm (18 lb.-ft.)
10. Set turn signals against lower triple clamp (C) with wires properly routed in the channel. Align notch in mount with slot on triple clamp and torque screws to 10 Nm (84 in. lbs.)
11. Install brake caliper(s). Torque screws to 41 Nm (30 lb-ft).
12. Install front wheel (refer to page 12.20).
13. Inspect all bolts for proper torque. Inspect hoses and wiring for proper routing.

FRONT FORK REMOVAL - VEGAS

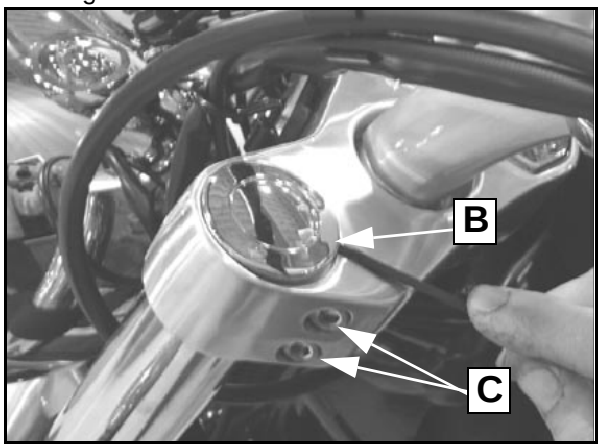
1. Remove front brake caliper (A) and support so caliper does not hang by brake hose.



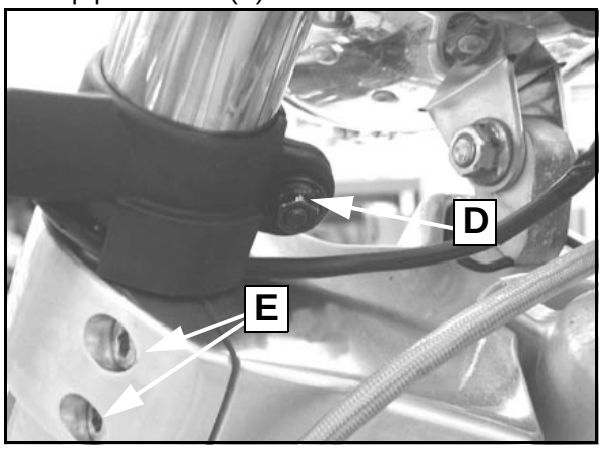
⚠ CAUTION

Do not twist the brake hose or brake line. Do not allow caliper to hang from the brake line or brake hose. Secure caliper in such a way to avoid hose damage.

2. Remove front wheel (refer to page 12.17).
3. Remove front fender.
4. Carefully pry both fork caps (B) off the top of the tubes using a small screwdriver.
5. Loosen upper triple clamp pinch bolts (C) for both left and right fork tubes.



6. Loosen turn signal mount screws (D) and lower triple clamp pinch bolts (E).



7. Slide fork legs down, remove turn signal mounts from tubes and remove tubes.

FRONT FORK DISASSEMBLY - VEGAS

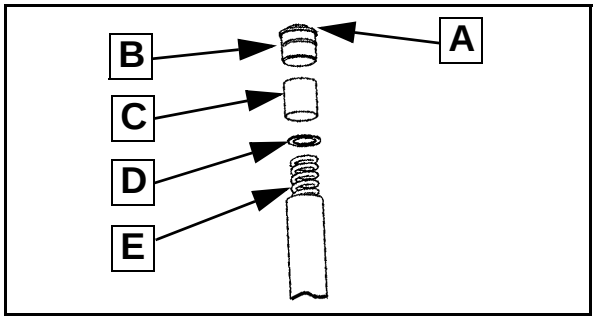
NOTE: Refer to Front Fork Assembly View on page 12.9. Clean the fork tubes thoroughly before disassembly.

1. Remove fork cap (A) with O-ring (B).

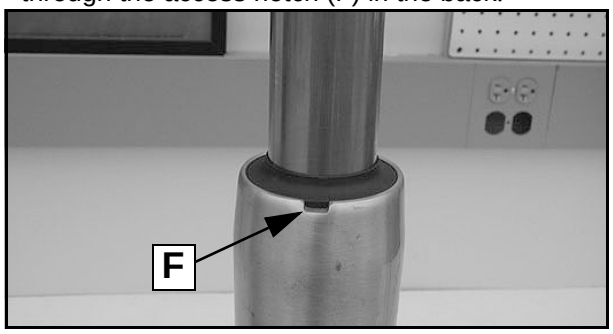
⚠ WARNING

Wear safety glasses and a face shield. The fork cap is under spring pressure. Apply firm downward pressure on fork cap and use extreme caution when removing the fork cap(s).

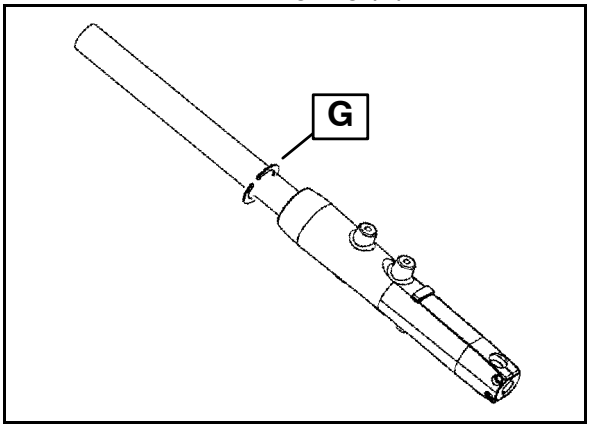
2. Clamp the fork tube in a soft jaw vise or work table vertically, with fork cap upward.
3. Remove spacer (C) washer (D) and spring (E).



4. Pour fork oil into a drain pan. Move slider through entire stroke several times to drain completely.
5. Remove dust seal from slider by tapping it out through the access notch (F) in the back.



6. Remove oil seal retaining ring (G).

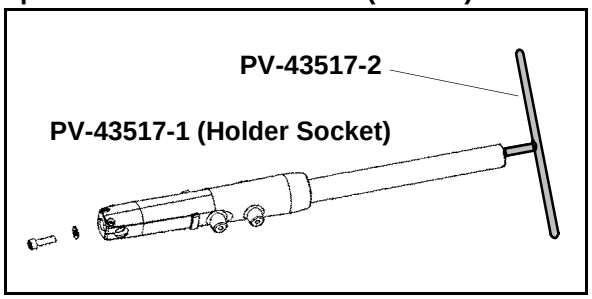


7. Insert the axle into the slider to keep it from turning and loosen the damper rod screw about 1 turn.

8. Remove damper rod screw and sealing washer.

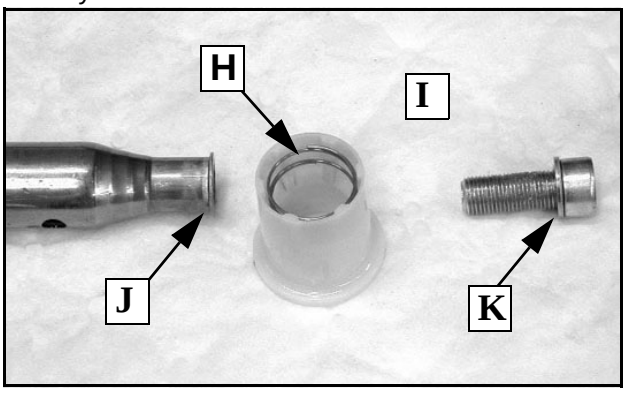
NOTE: If the damper rod spins while attempting to remove the damper rod bolt, it will be necessary to hold the damper rod with the special tool.

Damper rod holder: PV-43517-2 (Handle)

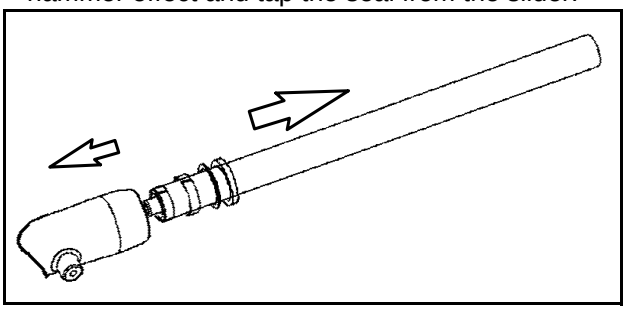


9. Pull the fork tube out of the slider until it stops against the slider bushing.

NOTE: Use care when separating the tube and slider. The small spring (H) located inside the oil lock valve (I) may catch on the bottom of the damper rod (J), which can damage the spring if the tube and slider are separated carelessly. Replace sealing washer (K) upon assembly.



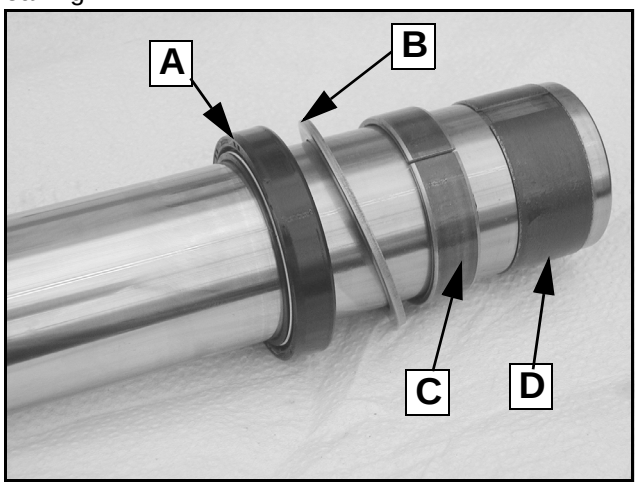
10. Alternately push and pull the tube to produce a slide-hammer effect and tap the seal from the slider.



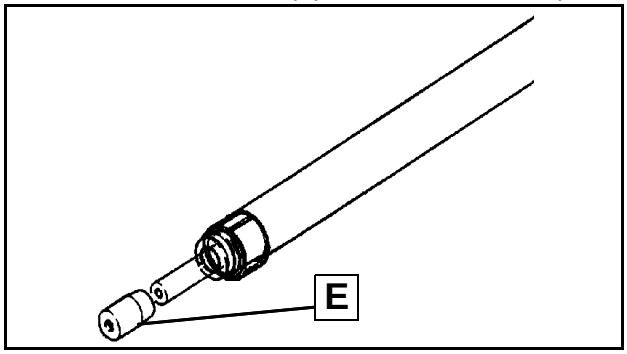
11. Remove tube from slider with fork seal (A), large washer (B), upper bushing (C) and lower bushing (D).

NOTE: Fork seal and retaining ring must be replaced if tubes are disassembled. Carefully inspect the fork bushings (both upper and lower) for nicks, burrs or other damage that can be caused by the disassembly process and replace if damaged.

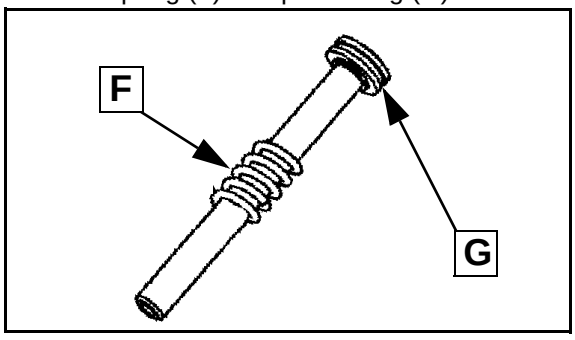
NOTE: The oil lock valve may stay in the bottom of slider. Remove it from the slider for inspection and cleaning.



12. Remove oil lock valve (E) from bottom of damper rod.



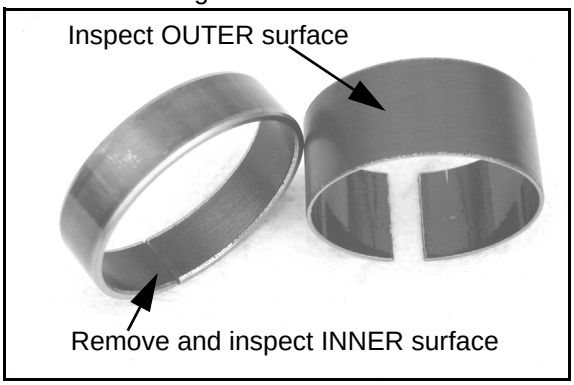
13. Remove damper rod from stanchion tube along with rebound spring (F) and piston ring (G).



14. Spread fork tube (lower) bushing and remove it from stanchion tube.

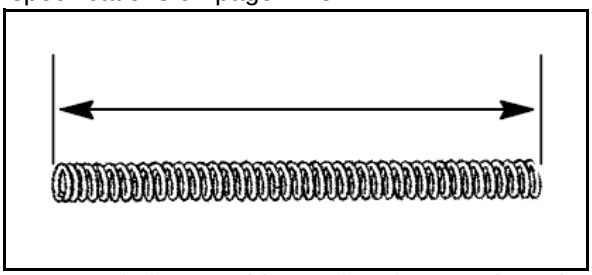
NOTE: Remove the lower bushing only if it will be replaced.

15. Visually inspect the outer surface of the lower bushing. Replace bushing if bronze material appears on more than 1/4 (25%) of the entire bearing surface.
16. Remove the upper bushing from the stanchion tube and inspect the inner surface. Replace bushing if bronze material appears on more than 1/4 (25%) of the entire bearing surface.

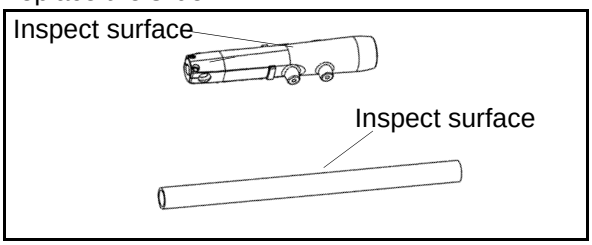


FRONT FORK INSPECTION - VEGAS

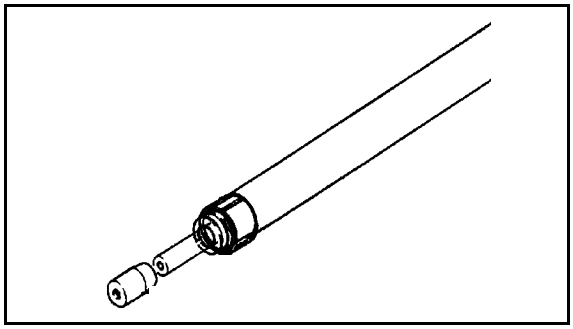
1. Measure fork spring free length and compare to specifications on page 12.3.



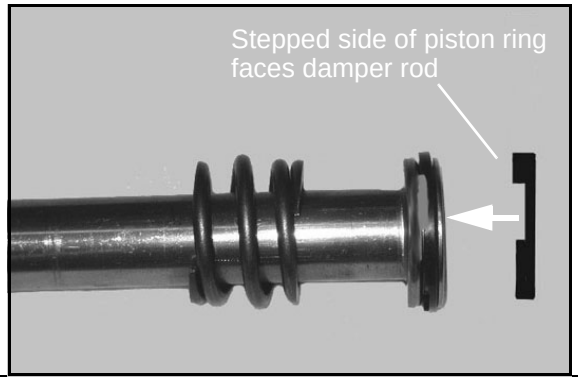
2. Inspect fork stanchion tube for scoring, heavy scratches, dents due to rocks or other road debris, or excessive wear. Replace tube(s) if deep scratches, pitting, or dents are found.
3. Inspect slider for dents or other indentations due to rocks or other road debris or damage. If damage is found on exterior of slider, insert fork tube into slider and move the tube through the complete travel range. Check for resistance or binding in the damaged area. If binding or resistance is evident, replace the slider.



4. Inspect oil lock valve for scoring, excessive or abnormal wear.



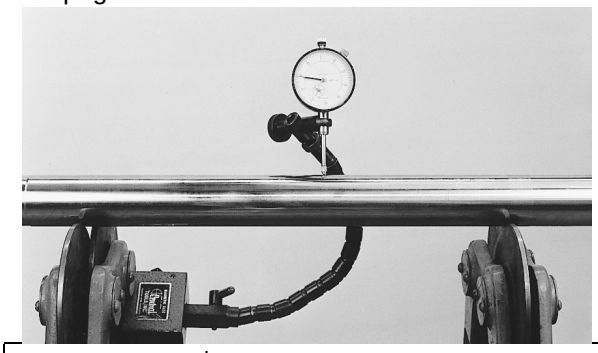
5. Visually inspect the damper rod piston ring. Replace ring if scoring, deep scratches and/or excessive wear is noted.



⚠ CAUTION

Ring is directional. Be sure to install it with stepped edge toward damper rod and top-out spring as shown.

6. Place fork tube in V-blocks and measure runout. Replace the tube if runout exceeds service limit listed on page 12.3.



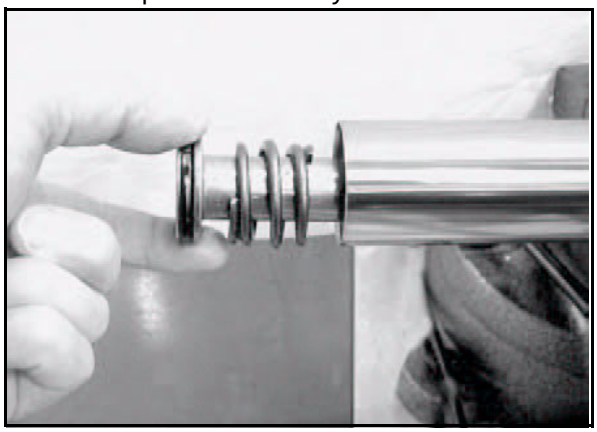
⚠ WARNING

Do not attempt to straighten bent fork tubes. Doing so will weaken the tube and make the motorcycle unsafe to operate.

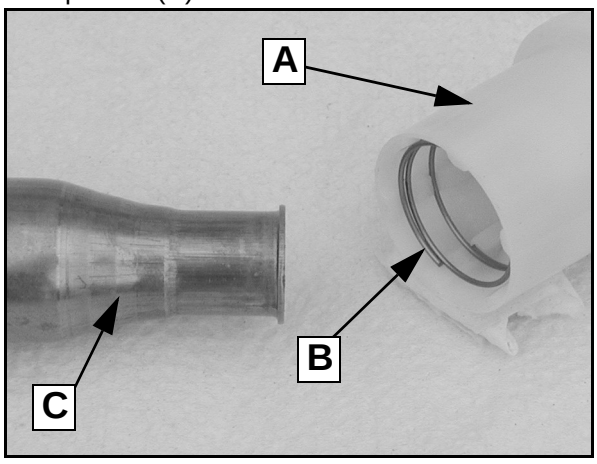
FRONT FORK ASSEMBLY - VEGAS

NOTE: Also refer to Front Fork Assembly View on page 12.9.

1. Clean all parts thoroughly with clean solvent.
2. If upper and/or lower bushings were removed, carefully install new bushings on fork stanchion tube.
3. Lubricate the damper rod piston ring with fork oil.
4. Install rebound (top-out) spring on damper rod.
5. Install damper rod assembly into fork stanchion tube.

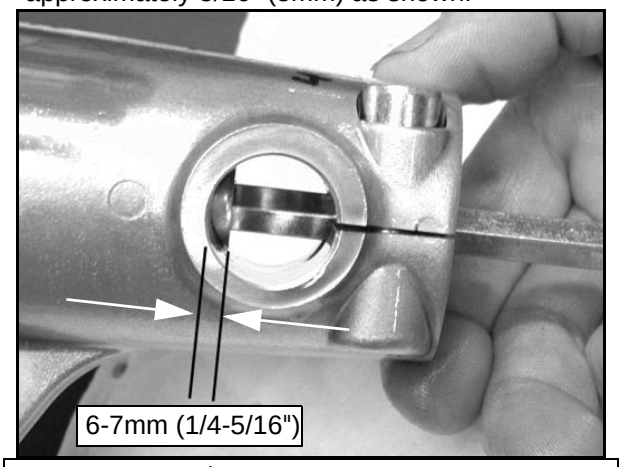


6. Use damper rod holder tool PV-43517 to hold damper in place at the bottom of the stanchion tube.
7. Place stanchion tube upside down in a soft jaw vise. Do not apply excessive pressure to the tube with the vise or the tube will be damaged.
8. Install oil lock valve A) with spring (B) onto end of damper rod (C).



9. Apply fork oil to the bushings.
10. Lower fork slider over stanchion tube.

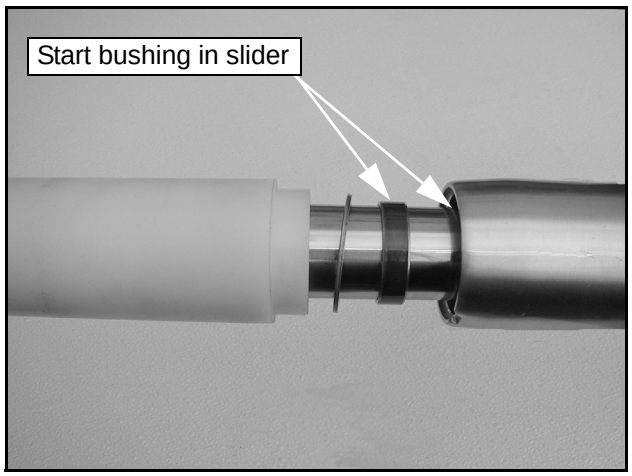
11. Using a machinist's scribe or a similar tool through the hole in the bottom of the slider, center the foot valve and damper rod with the fork slider. When properly aligned, the damper rod threads will be aligned with the hole in the slider.
12. Install the damper rod screw with a new sealing washer, and verify proper assembly of the oil lock valve. If the valve is centered properly on the damper rod, the head of the retaining screw will protrude approximately 3/16" (5mm) as shown.



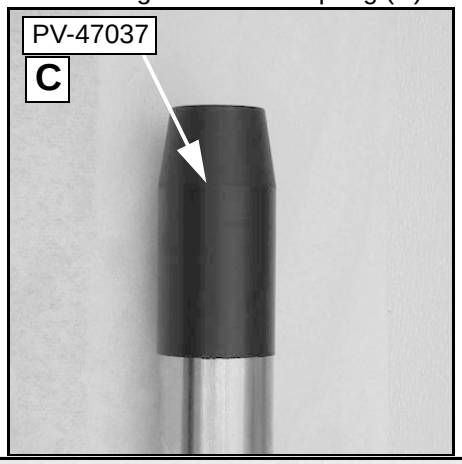
CAUTION

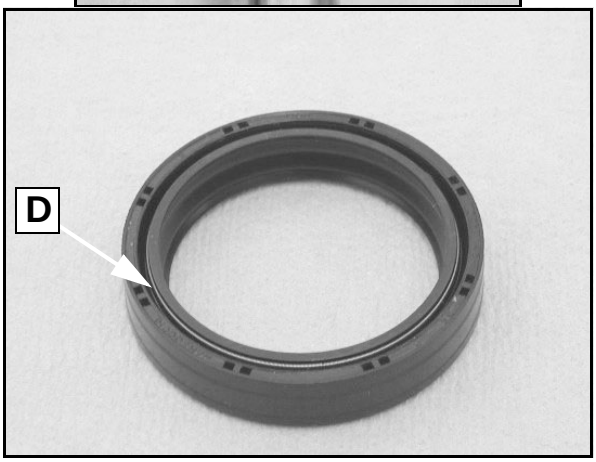
If the screw head does not protrude or if it protrudes more than 1/4-5/16" (6 or 7 mm), disassemble the tube and check for proper assembly.

13. Torque damper rod bolt to 30 Nm (22 lb-ft.). Use tool PV-43517 to hold damper rod if necessary.
14. Secure fork in upright position.
15. Install large washer on tube and slide it against the upper bushing.



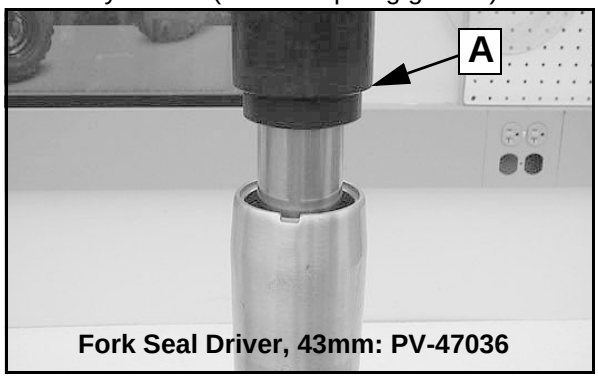
16. Start the bushing into the slider by hand, then use the 43mm seal driver to lightly tap the washer and bushing into place until fully seated.
17. Gently lower stanchion tube until it bottoms in slider. The tube should slide freely in and out of the slider. If it binds, loosen damper rod screw about 2 turns, rotate tube and slider, and re-tighten. If tube still binds, disassemble fork and inspect parts again as described in INSPECTION.
18. Lightly grease outside of new fork seal with Victory All-Purpose grease.
19. Lightly oil the sealing lips of seal with fork oil.
20. To prevent damage to fork seal, place the seal guide (PV-47037) over stanchion tube and then install new seal with markings and visible spring (D) facing UP.





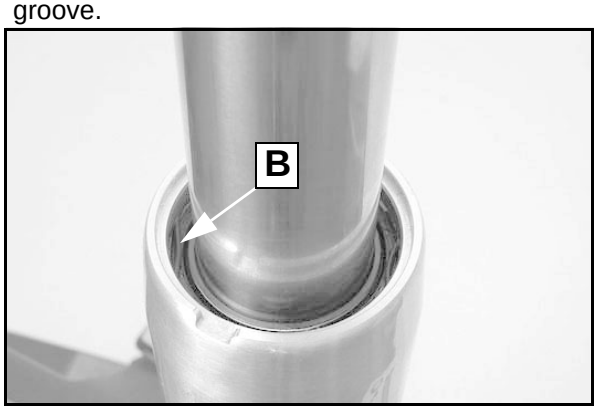
21. Lower seal until it is fully installed on tube.

22. Drive seal into the fork slider with fork seal driver (A) until fully seated (below stop ring groove).

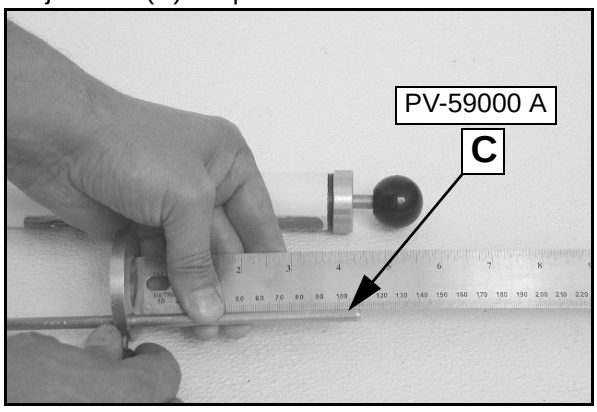


Fork Seal Driver, 43mm: PV-47036

23. Slide fork tube fully into the slider so sealing surface of tube will not be exposed while installing the retaining ring. Install retaining ring (B) into groove of fork tube. Make sure stop ring is properly seated into groove.



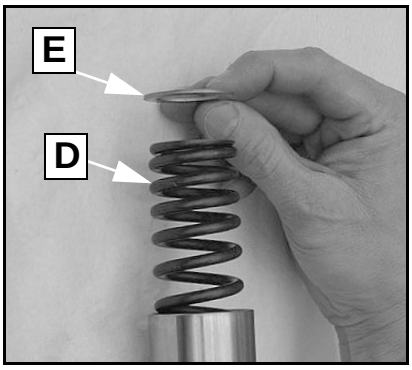
24. Tip the tube and *slowly* add about 550cc of fork oil to minimize bubble formation.
25. Move stanchion tube up and down several times to disperse oil and purge air.
26. Secure the fork tube assembly upright for several minutes to allow air bubbles to work to the surface before proceeding.
27. Slowly push the stanchion tube into the slider until bottomed (fully compressed).
28. Adjust tool (C) to specified oil level.



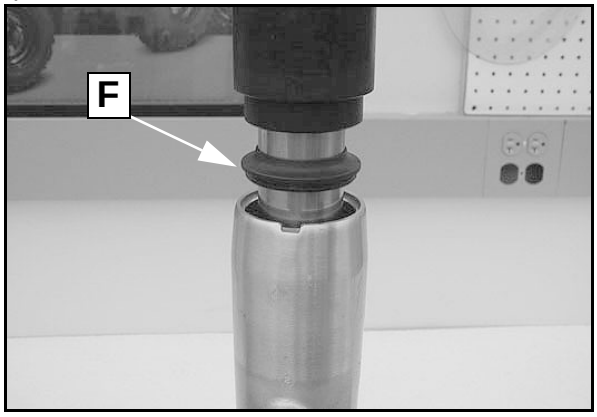
Fork oil level: 130 mm (5.118")
Spring removed / tube fully compressed

29. With tube perfectly vertical, insert tool and draw out excess oil until level is correct. Keep tube upright.

30. Fully extend fork to prevent oil leakage when spring is installed.
31. Install fork spring with tightly wound end (D) UP.
32. Install the flat washer (E) between spring and pre-load spacer.



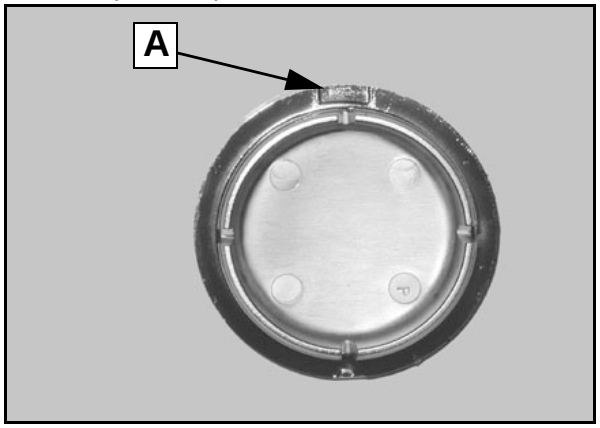
33. Install spring preload spacer and cap.
34. Lightly oil the fork cap o-ring.
35. Install fork cap until seated against tube. Tighten cap to 68 Nm (50 lb-ft).
36. Place dust seal (F) over stanchion tube and drive into place with the seal driver.



FRONT FORK INSTALLATION - VEGAS

Refer to illustration on page 12.8.

1. Install one fork tube assembly into lower triple clamp.
2. Place turn signal mount onto fork tube.
3. Continue to slide tube through lower triple clamp and into upper triple clamp until fully seated.
4. Torque bottom pinch bolt on UPPER triple clamp, then the top bolt on UPPER triple clamp, to 24.5 Nm (18 lb.-ft.)
5. Repeat torque sequence on UPPER triple clamp bolts (repeat Step 4).
6. Torque the bottom pinch bolt on LOWER triple clamp, then torque the top pinch bolt on LOWER triple clamp to 24.5 Nm (18 lb.-ft.).
7. Repeat torque sequence on LOWER triple clamp bolts (repeat Step 6).
8. Repeat steps 1 through 7 for the other fork tube.
9. Install upper triple clamp cap with notch (A) aligned to slot in triple clamp.



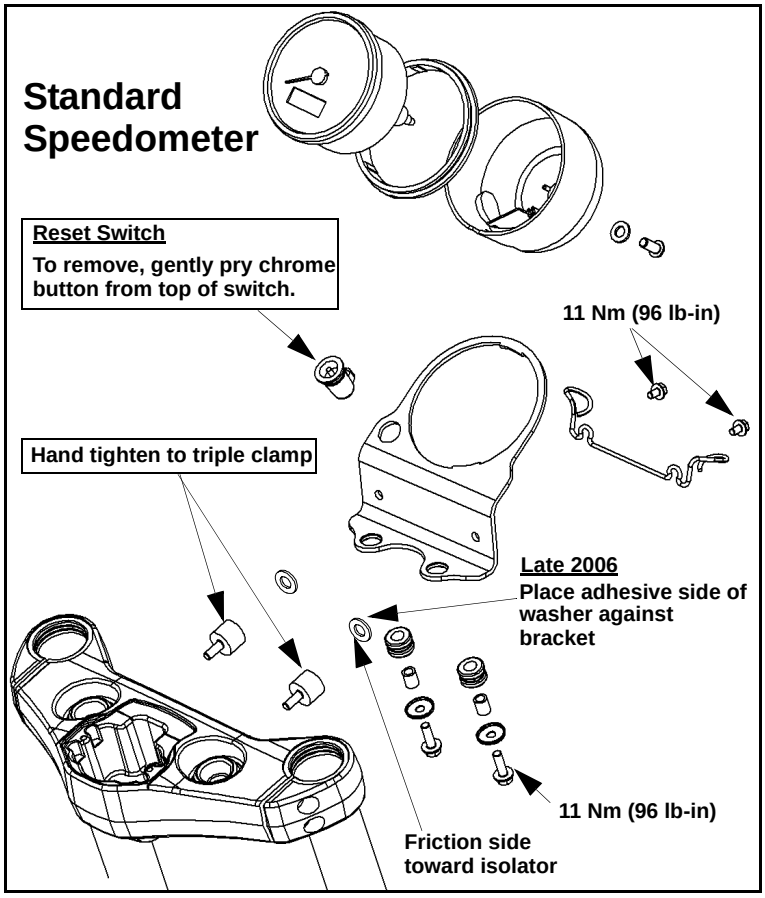
10. Install front fender. Compress fender mounting area slightly to avoid scratches.
11. Torque fender screws to 24.5 Nm (18 lb.-ft.)
12. Set turn signals against lower triple clamp with wires properly routed in the channel. Align notch in mount with slot on triple clamp and torque screws to 10 Nm (84 in. lbs.)

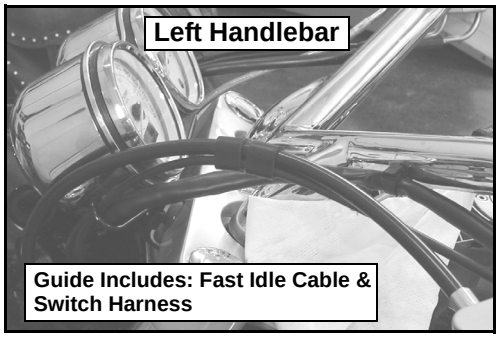
13. Install brake caliper. Torque screws to 41 Nm (30 lb-ft).
14. Install brake line guides (if removed). Refer to Chapter 15.
15. Install front wheel (refer to page 12.20).
16. Inspect all bolts for proper torque. Inspect hoses and wiring for proper routing.

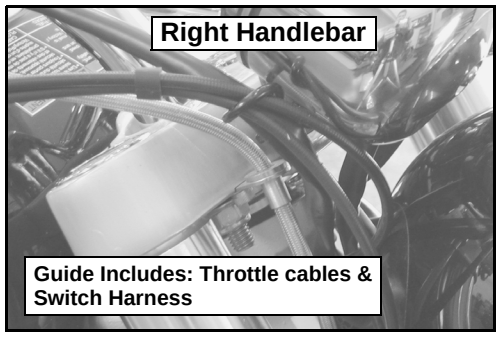
HEADLAMP REMOVAL

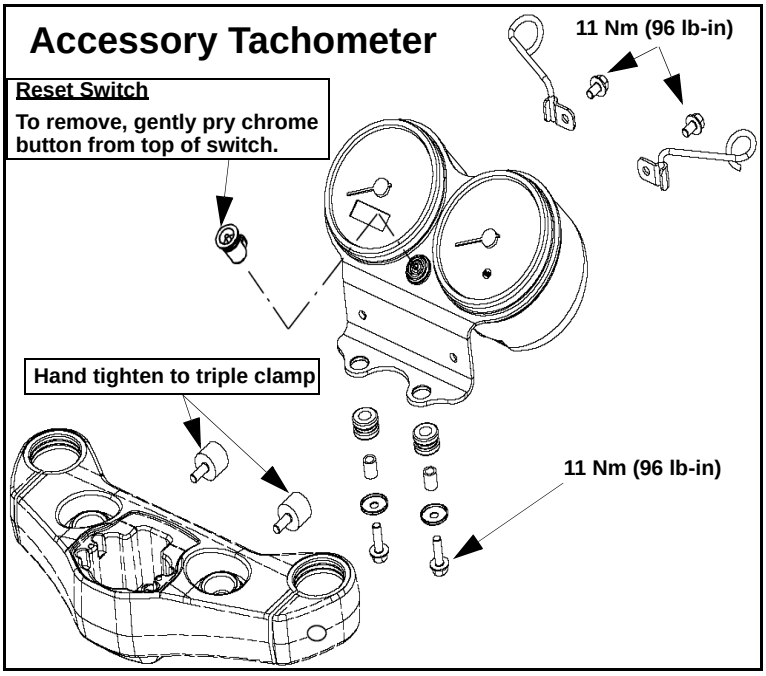
Refer to Chapter 19 for headlamp removal procedure.

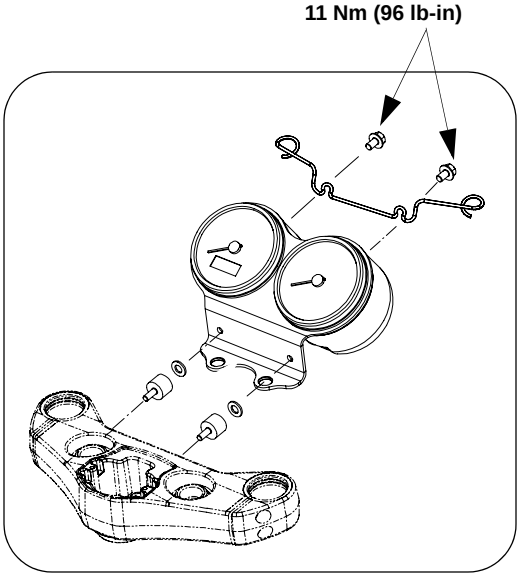
SPEEDOMETER / TACHOMETER





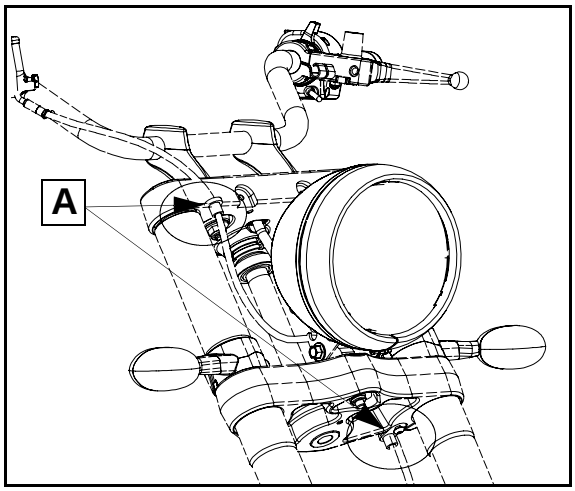




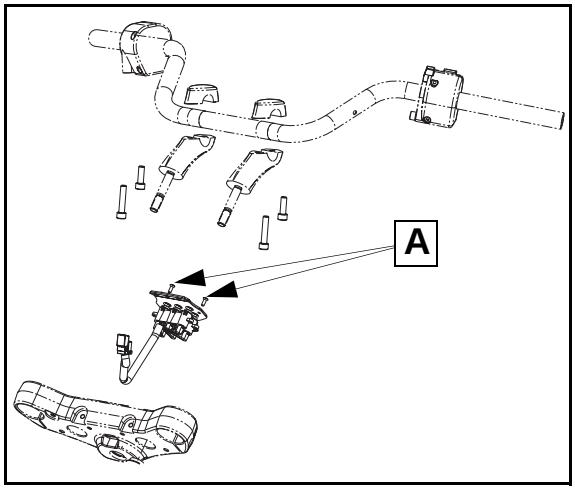


TRIPLE CLAMP REMOVAL

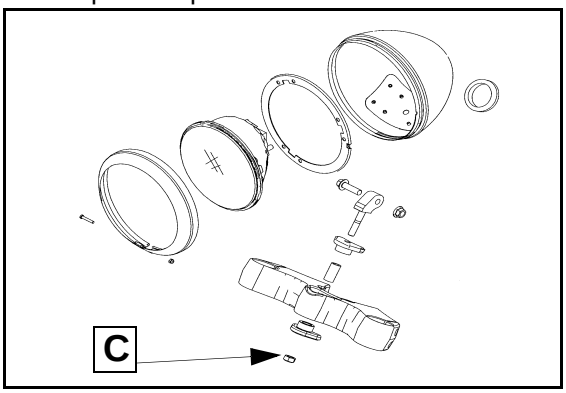
1. Elevate front of machine so that front wheel can be removed. Support machine securely in an upright position.
2. Remove fuel tank (Chapter 5).
3. Remove front wheel (page 12.17).
4. Remove fork tubes.
5. Remove brake line guides (A) from upper and lower triple clamp. (Kingpin example shown).



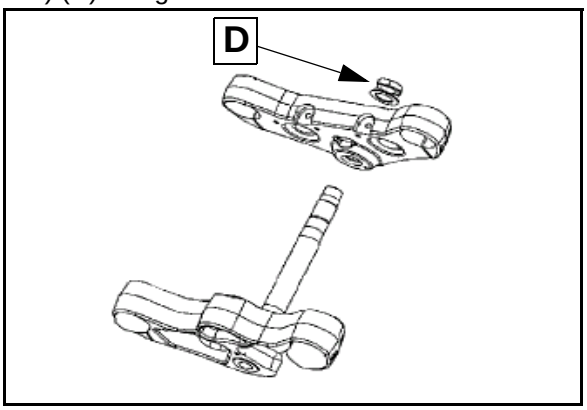
6. Remove handlebars (page 12.14) and set aside.
7. Remove two screws for the indicator light panel (B).



8. Remove headlamp lens, disconnect indicator light wires in headlamp housing and remove indicator lights from upper triple clamp.
9. Remove headlamp housing by removing nut (B) from lower triple clamp.



10. Remove speedometer with bracket (page 12.37)
11. Loosen upper triple clamp center nut (steering stem nut) (D) using a 30 mm socket.



12. Slide upper triple clamp off steering stem.
13. Remove stem adjuster lock nut on steering stem with Victory spanner socket (PV-43508). Hold adjuster nut with spanner wrench (PV-43509).

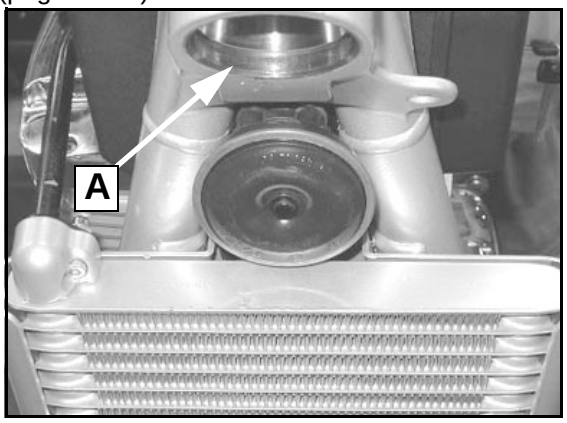
NOTE: Support lower triple clamp while removing the nuts.

14. Remove upper steering head roller bearing from the frame.
15. Remove lower triple clamp, with lower steering head bearing, steering stem, and lower bearing.
16. Inspect bearings and bearing races as described on page 12.39.

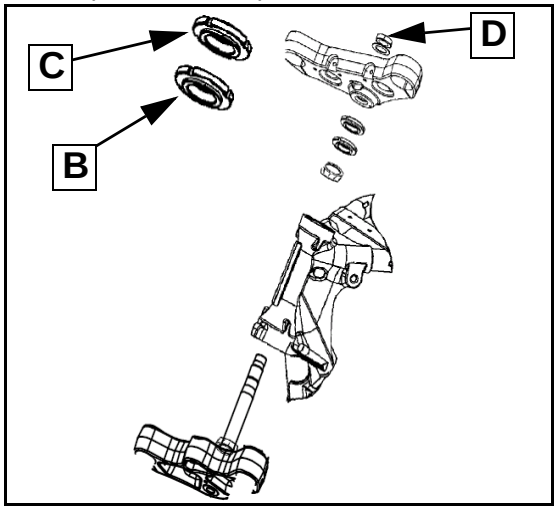
TRIPLE CLAMP INSTALLATION / STEERING HEAD BEARING ADJUSTMENT

Refer to page 12.8 and 12.12 for torque specifications.

1. Inspect both top and bottom bearing races (A) for pitting, dents, or worn surface. Replace bearings and races as a set if bearing races are worn or damaged (page 12.40).



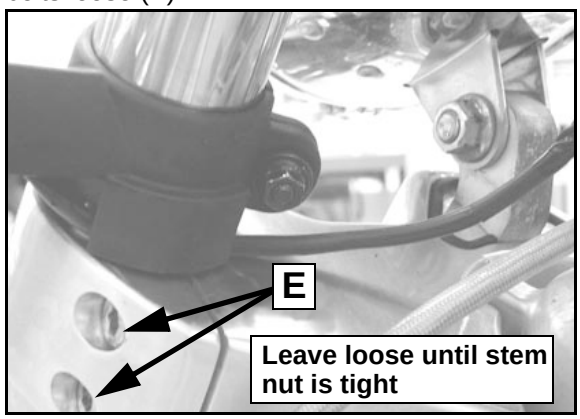
2. Apply Victory All Purpose grease to lower bearing and install lower triple clamp into frame.
3. Install upper steering head bearing onto stem and push it down until seated in bearing race.
4. **Place adjuster nut (B) (shoulder side down) on the shaft and tighten with a Victory spanner socket (PN PV-43508) to 39 Nm (29 ft. lbs.)**
5. **Turn lower triple clamp from lock to lock five times.**
6. **Loosen adjuster nut 180 degrees (1/2 turn).**
7. **Re-torque adjuster nut to 15 lb-ft.**
8. Place lock nut (C) on stem and torque to 30 ft. lbs. (41 Nm) while holding lock nut with Victory spanner wrench (PN PV-43509).



9. Slide upper triple clamp onto stem.
10. Install washer and nut (D) (domed side up) onto stem. Tighten steering stem nut with a 30 mm socket.

NOTE: Nut will be torqued after fork tubes are installed.

11. Install fork tubes through lower triple clamp and slide turn signal mounts over fork tubes.
12. Slide tubes into upper triple clamp until fully seated, and tighten top triple clamp pinch bolts enough to hold tubes in place. Leave lower triple clamp pinch bolts loose (E).



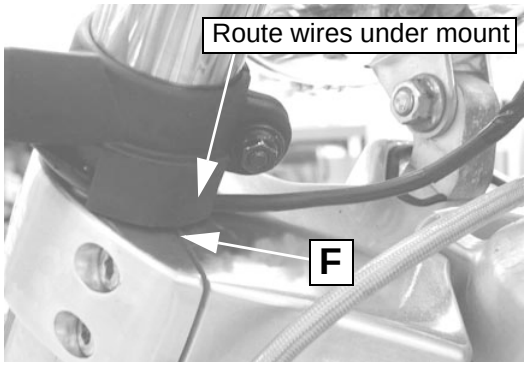
13. Use a 30 mm socket to torque steering stem nut to 72 ft. lbs. (97.5 Nm).
14. Torque UPPER triple clamp pinch bolt(s) to specification, starting with the then torque bottom bolt on LOWER triple clamp.

NOTE: CHECK STEERING HEAD BEARINGS at this time. Pull firmly on fork tubes with a front-to-rear motion. If movement (play) can be felt in steering head bearings, disassemble and go back to Step 7. Tighten steering stem adjuster nut an additional 5^{o}, and reassemble following Steps 8-14. Repeat this procedure until no play can be felt.

15. Apply final torque to triple clamp bolts in the following order:

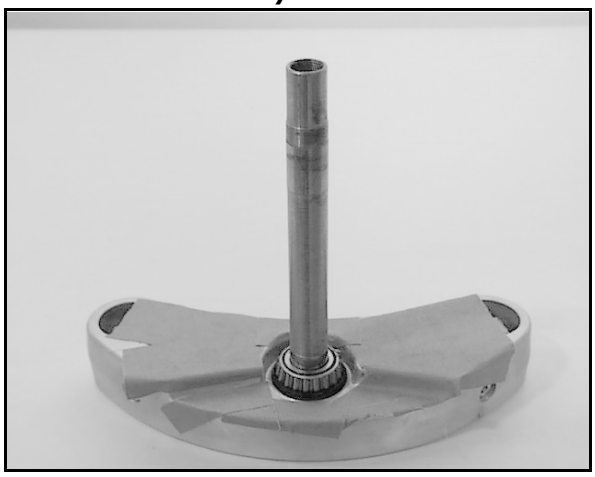
- Bottom bolt on UPPER triple clamp (Vegas) or the single bolt of UPPER triple clamp on Kingpin.
- Top bolt on UPPER triple clamp (Vegas)
- Repeat torque on top triple clamp bolt(s) starting with the bottom bolt on Vegas models.
- Bottom bolts on LOWER triple clamp.
- Top bolts on LOWER triple clamp
- Repeat torque on lower triple clamp bolts, starting with the bottom bolts.

16. Install brake line guides, headlamp assembly, indicator light panel, handlebars (page 12.15), fender, and front wheel.
17. Adjust headlight aim (Chapter 2).
18. Slide turn signal mounts against lower triple clamp, aligning tab of mount with slot (F).

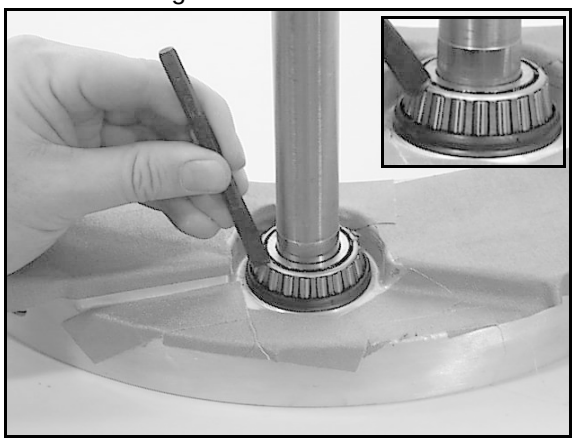


19. Verify all fasteners are installed and properly torqued.

STEERING STEM BEARING REMOVAL (TYPICAL EXAMPLE)



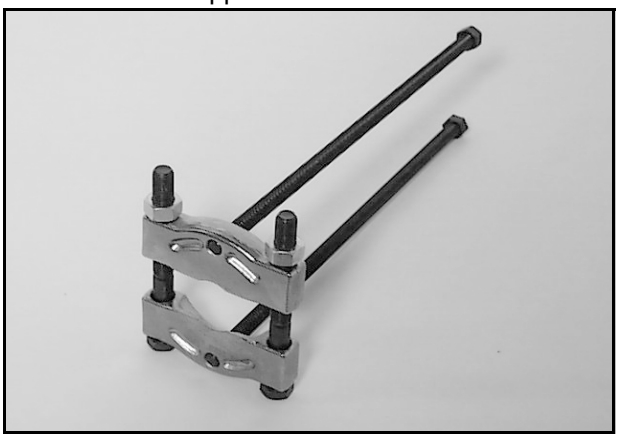
1. Mask the top cosmetic surface of the triple clamp to protect it from damage.
2. Remove lower bearing cage and rollers. Use a cold chisel to cut through the cage, then use a pliers to remove the cage.



⚠ CAUTION

Wear eye protection. Use care not to damage steering stem bearing surface during bearing removal process.

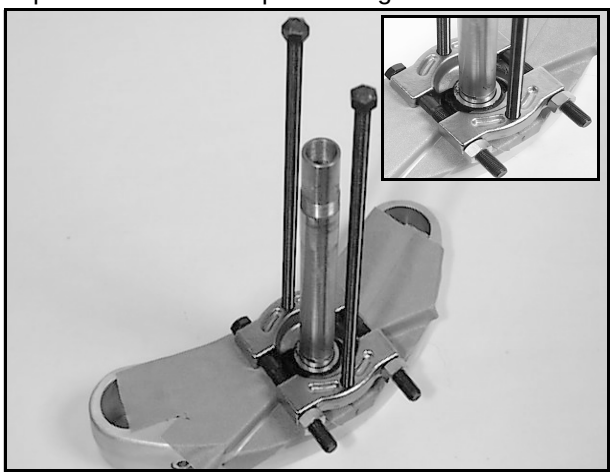
3. Drive inner bearing race upward until clear of recess in lower triple clamp.
4. Install two long bolts into bearing collar. The two long bolts should be threaded into bearing collar approximately 8 turns each or until flush with the bottom of the tapped hole.



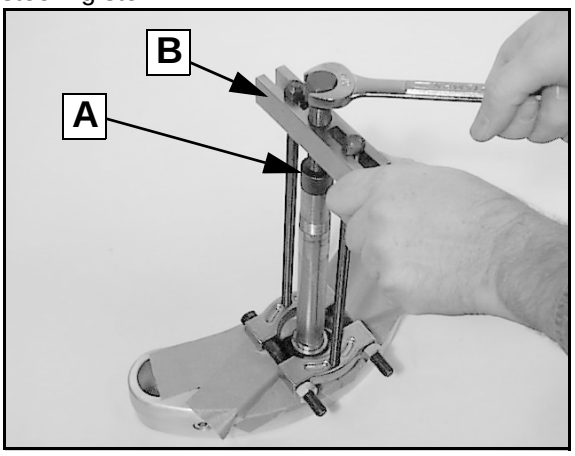
⚠ CAUTION

Do not turn the long bolts in too far or the lower triple clamp finish may be damaged.

5. Install bearing collar onto lower bearing inner race. The knife edge of bearing collar must catch under top lip of inner race. Torque bearing collar nuts to 10 lb-ft.



6. Place spacer (A) and puller bracket (B) on top of steering stem.



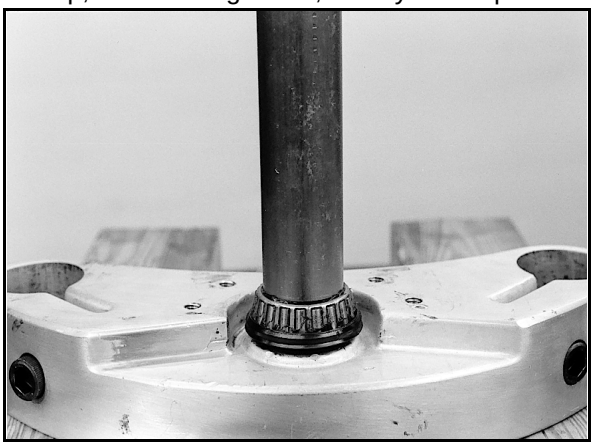
7. Install puller bolt and turn clockwise to remove bearing race from stem. Hold puller bracket to prevent it from turning and bending the long bolts.

STEERING STEM BEARING INSTALLATION

1. Thoroughly grease new bearing (grease both upper and lower bearings at this time). Ensure that the grease is packed well into the bearing cage and that a thin film of grease completely covers all bearing elements.

Victory All Purpose Grease: 2872187

2. Clean the stem thoroughly and inspect bearing support surface for nicks or damage.
3. Install lower bearing over steering stem.
4. Place bearing driver over stem. Place lower triple clamp, with bearing driver, into hydraulic press.



5. Support the lower triple clamp directly below the steering stem with a suitable press plate.
6. Press lower bearing down until it is firmly seated.

⚠ CAUTION

Make sure bearing driver contacts the inner race of the bearing only, not the cage or the rollers.

STEERING HEAD BEARING RACE REMOVAL

1. Remove triple clamps (page 12.38)
2. Drive steering head bearing races evenly out of the steering head using a long flat punch through the access notch in the steering head.

STEERING HEAD BEARING RACE INSTALLATION

1. Grease inner and outer surfaces of bearing races.
2. Load lower bearing race onto special tool with tapered side facing DOWN. (Fig. 2)

Steering head bearing race installation tool PV-43515

3. Insert tool from bottom of steering head.
4. Place upper bearing race onto steering neck with tapered side facing UP.
5. Loosely assemble the tool.
6. Apply anti-seize compound to the threads of the nuts and center screw. Apply anti-seize compound to faces of each washer, and to the tool bearing.

> ⚠ CAUTION
>
> Make sure bearings are started straight into steering head of the frame.

7. Tighten tool to draw bearing races into steering neck.
8. Be sure the races are firmly seated and “bottomed” in the steering head.
9. Assemble triple clamp and adjust steering head bearings (page 12.29.)

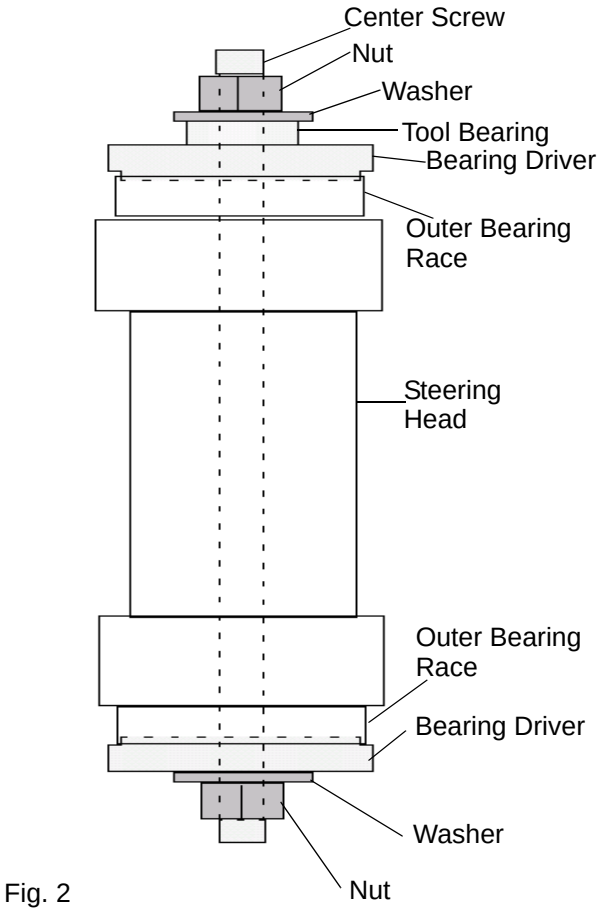


Fig. 2

TROUBLESHOOTING

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Heavy Steering	Steering Stem Nut Over Tightened	Torque to specification
	Damaged Steering Stem Bearings or Races	Replace
	Bent Steering Stem	Replace
	Front Tire Damaged or Worn	Replace
	Low Tire Pressure	Inflate to specification
Pulls to One Side or Wanders	Damaged Steering Stem Bearings or Races	Replace
	Steering Stem Nut Over Tightened or Under Tightened	Torque to specification
	Low Tire Pressure	Inflate to specification
	Rear Wheel Not Aligned Correctly	Align
	Bent Front Axle	Replace
	Damaged or Excessively Worn Front Tire / Incorrect Tire	Replace
	Damaged Wheel Bearings	Replace
	Damaged Swing Arm Bearings	Replace
	Loose Swing Arm Pivot Nut	Torque to specification
	Bent Frame or Swingarm	Replace
Handlebars Oscillate (Wobble)	Bent Front Axle	Replace
	Wheel Has Excessive Runout	Spoke: True or Replace (Billet)
	Tire Mounted Incorrectly	Check Mounting and Balance
	Damaged Tire / Worn Tire	Replace
	Loose Steering Stem Nut	Torque to specification
	Incorrect Tire	Replace
	Incorrect Tire Pressure	Correct
Noise Coming From Front Suspension	Worn Fork Bushings	Rebuild Forks
	Low Fork Fluid	Determine Cause/Replace Fork Oil
	Loose Fasteners	Torque to specification
	Loose Steering Stem Bearings	Determine Cause/Correct
Front Wheel Oscillates (Wobbles)	Bent Front Rim	Replace
	Damaged Front Wheel Bearings	Replace
	Damaged or Incorrect Tire	Replace
Front Wheel Oscillates (Wobbles)	Loose Axle or Axle Pinch Bolts	Torque to specification
	Fork Tube Height Unequal (L&R)	Install Correctly
	Fork Oil Level Unequal	Set Correctly
	Fork Spring Free Length Different Between Right & Left	Replace
	Wheel Assembly Out-of-Balance	Balance
	Low Tire Pressure	Inflate to specification

TROUBLESHOOTING (cont.)

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Front Suspension Too Soft	Weak Fork Springs	Replace
	Low Fork Oil Level	Determine Cause/Replace Fork Oil
	Wrong Weight Fork Oil	Replace
	Contaminated and/or Deteriorated Fork Oil	Replace
	Low Tire Pressure	Set Correctly
Front Suspension Too Hard	Tire Pressure Too High	Set Correctly
	Bent Fork Tubes	Replace
	Wrong Weight Fork Oil	Replace
	Too Much Fork Oil	Set Correctly
	Plugged Oil Passages	Rebuild Front Forks
	Damaged Sliders	Replace
	Forks Binding, Incorrect Assembly Front Fender and/or Front Wheel	Correct
Wheel Turns Hard	Damaged Wheel Bearings	Replace
	Front Axle Bent	Replace
	Brake Dragging (Hydraulic or Mechanical Problem)	Repair as Necessary
	Brake Dragging (Bent Disc)	Replace
	Improper Assembly After Repairs	Correct as Necessary

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REAR WHEEL & SUSPENSION

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SHOCK ABSORBER INSTALLATION 13.17
SWINGARM 13.18
SWING ARM REMOVAL 13.18
SWING ARM BUSHINGS / BEARING REPLACEMENT 13.19
SWING ARM INSTALLATION 13.20
TROUBLESHOOTING 13.21
TROUBLESHOOTING 13.21

GENERAL INFORMATION

WARNINGS AND PRECAUTIONS

⚠ WARNING

This motorcycle was produced with the designated tires as original equipment. The testing to ensure stability and superior handling was done using the OEM tires. Using non-OEM tires could result in poor motorcycle stability and handling, which can lead to a crash resulting in serious injury or death. Use only the recommended tires inflated to the recommended tire pressures.

Tubeless tires are used on certain Victory models. Operating the motorcycle with damaged rims creates a safety hazard including air pressure loss, steering imbalance and/or reduced steering control. Do not attempt to repair or straighten damaged rims.

Always use genuine Victory parts or equivalent so that quality is not compromised. The use of tire valves and valve cores other than original equipment replacement Victory parts could cause tire deflation which may lead to loss of control, resulting in injury or death. Do not allow any motorcycle to leave your service area without tire valve caps securely installed.

⚠ CAUTION

Work performed to the rear end of the motorcycle usually involves supporting the machine with the rear end elevated. Take precautions so that the motorcycle is securely supported when the rear tire is off the ground. This reduces the possibility of personal injury or damage to the motorcycle.

- The rear shock absorber is a sealed unit and cannot be re-built.
- Refer to Chapter 2 for maintenance of rear wheel & suspension components, and suspension ride height adjustment.
- Refer to Chapter 15 for brake system service.
- Refer to Chapter 14 for tire removal, repair, & balancing.

TIRE PRESSURE

TIRE PRESSURE TABLE

NOTE: Also refer to the Manufacturing Information decal located on the motorcycle.

VEGAS / VEGAS EIGHT BALL / NESS VEGAS		
	Up to 200 lbs (91 kg) load	200-465 lbs (91-211 kg) load
FRONT	36 psi (248 kPa)	38 psi (262 kPa)
REAR	36 psi (248 kPa)	41 psi (283 kPa)

KINGPIN / NESS KINGPIN		
	Up to 200 lbs (91 kg) load	200-465 lbs (91-211 kg) load
FRONT:	32 psi (222 kPa)	36 psi (248 kPa)
REAR:	36 psi (248 kPa)	41 psi (283 kPa)

SPECIAL TOOLS

SPECIAL TOOLS

Wheel Bearing / Stem Bearing Race Installation Set:	PV-43515
Platform Jack or Hoist:	Commercially available
Blind Bearing Remover Set (for wheel bearings):	PV-43551

SPECIFICATIONS

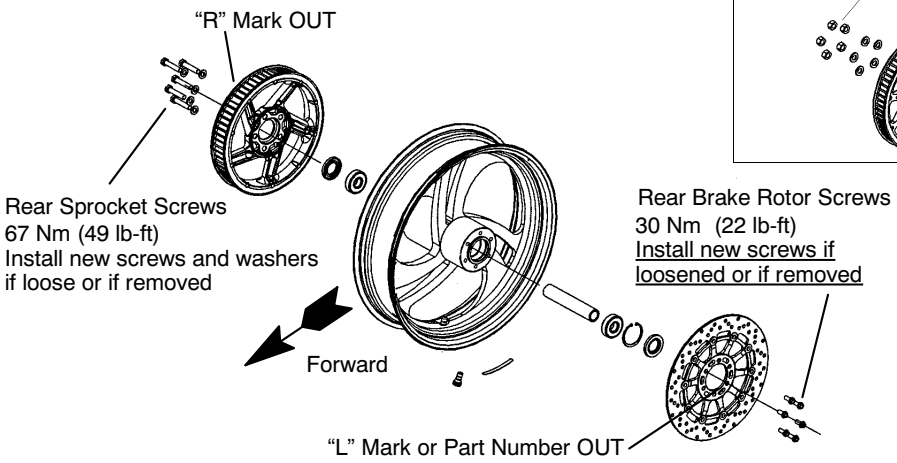
SPECIFICATIONS - REAR WHEEL AND SUSPENSION

SPECIFICATIONS			
Item		**Standard**	**Service Limit**
Axle Runout		-	.20 mm (.008")
Rear Shock Absorber		Single-Shock - Pre-Load Adjustable - Gas - Sealed Unit (Not Serviceable)	*Inspect shock for leakage*
Rear Wheel Runout (Cast & Billet)	Axial	.80 mm (.032″)	2.0 mm (.080")
	Radial	.80 mm (.032″)	2.0 mm (.080")
Rear Wheel Runout (40 Spoke Laced)	Axial	1.00 mm (.040″)	2.0 mm (.080")
	Radial	.80 mm (.032″)	2.0 mm (.080")
Rear Wheel Size			--
	2003 Vegas	4.50 x 18″	
	2004-2006 Vegas & Kingpin	5.00 x 18″	
Rear Wheel Travel	**Vegas**	100 mm (3.9″)	--
	Kingpin	100 mm (3.9″)	--
Shock Spring Free Length	**Vegas**	269 mm (10.59″)	--
	Kingpin	269 mm (10.59″)	--
Shock Spring Installed Length (Standard)		Perform Ride Height Adjustment (page 2.40)	--
Suspension Ride Height Measurement (See procedure page 2.40)	**Vegas**	131 mm (5.15") ± 3mm (1/8″)	--
	Kingpin	127 mm (5.00") ± 3mm (1/8″)	--
Spring Rate	**2003 Vegas**	100 N/mm (571 lb-in)	--
	2004-2006 Vegas	105 N/mm (600 lb-in)	--
	2004-2006 Kingpin	110 N/mm (628 lb-in)	
Swing Arm Pivot Shaft Runout		Not Applicable	.20 mm (.008")
Swing Arm Pivot Shaft O.D.		16.20 - 16.25 mm (.638 - .640")	16.08 mm (.633")
Swing Arm Bushing Sleeve O.D.		29.95 mm - 30.00 mm	29.83 mm (1.1744")
Swing Arm Bushing Sleeve I.D.		16.25 mm - 16.50 mm	16.62 mm (0.6543")
Swing Arm Bushing I.D.		30.035 mm - 30.099 mm	30.22 mm (1.1897")
Swing Arm Bushing O.D.		38.035 mm - 38.060 mm	37.195 mm (1.4927")
Wheel bearing O.D. (approx)		51 mm	--
Wheel bearing I.D. (approx)		20 mm	--
Wheel bearing spacer length		223.70 - 223.90 mm (8.807 - 8.815″)	223.60 mm (8.803″)

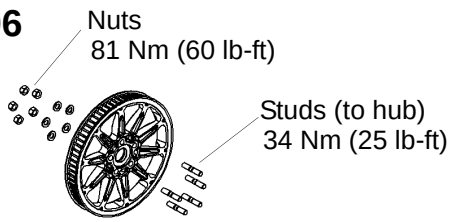
ASSEMBLY VIEWS & TORQUE

ASSEMBLY VIEW - REAR WHEEL / AXLE

2003-2005

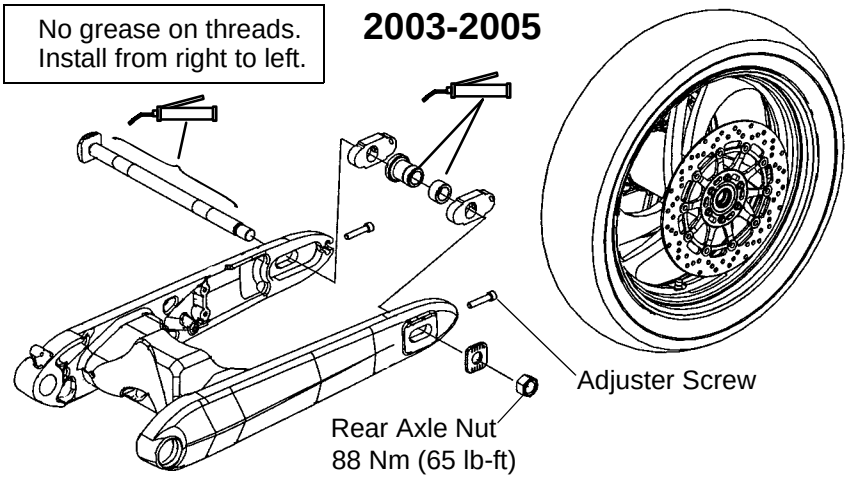


2006



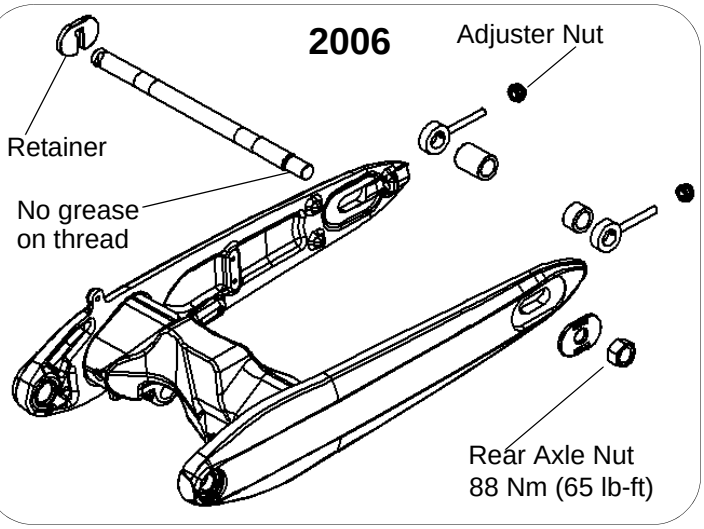
No grease on threads.
Install from right to left.

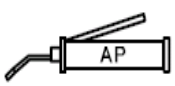
2003-2005



2006 - Axle can be removed from left

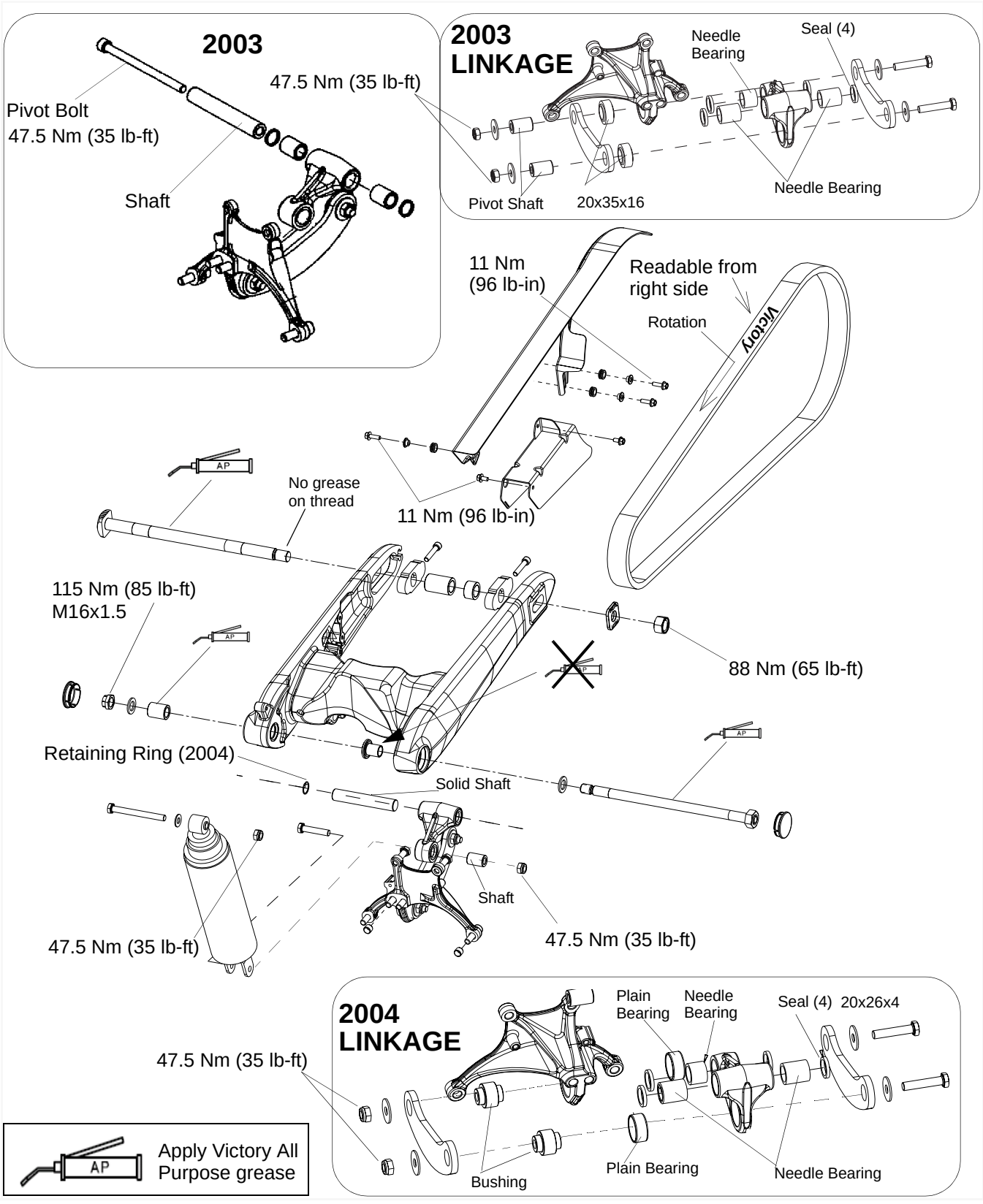
2006



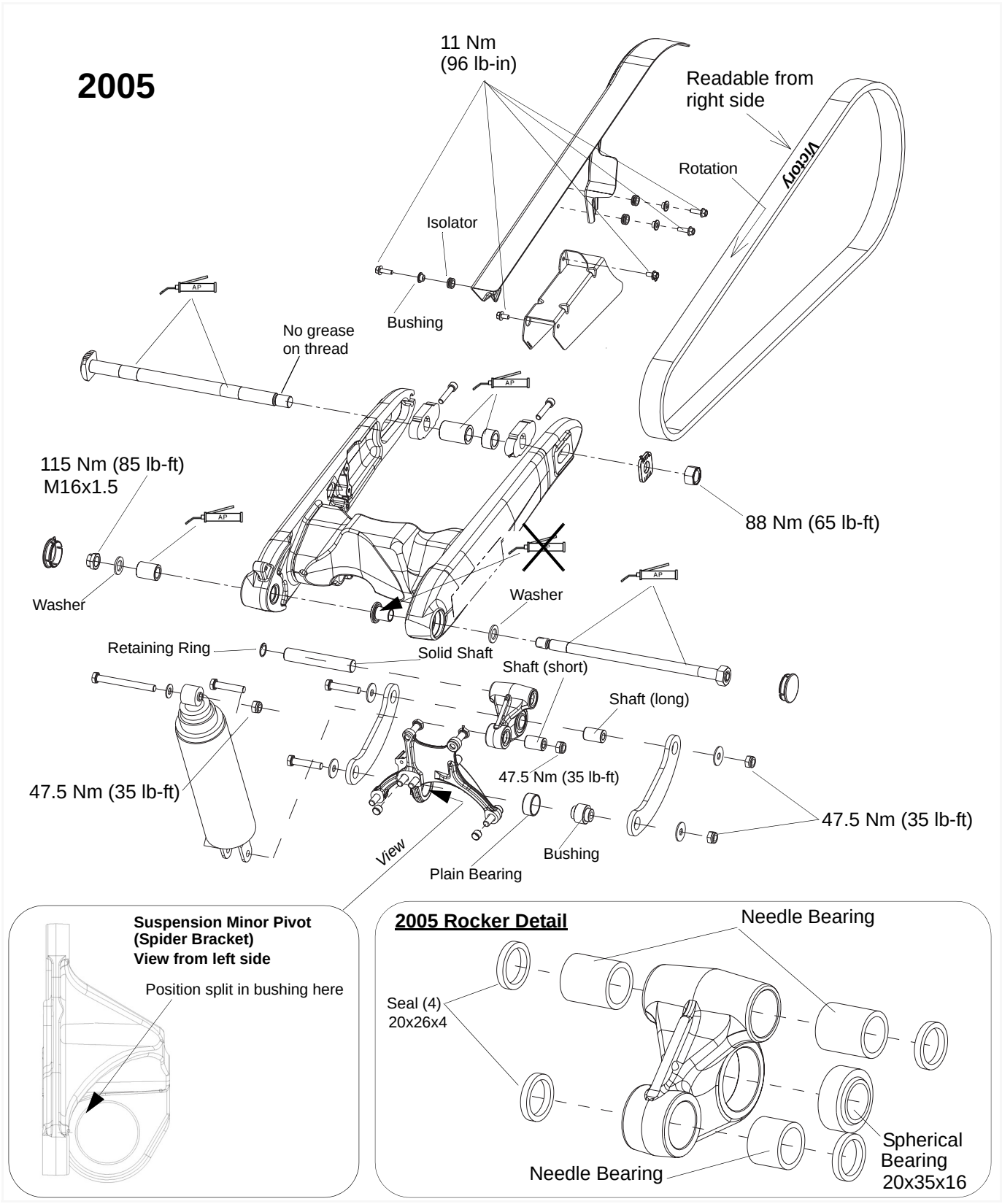


Apply Victory All Purpose grease

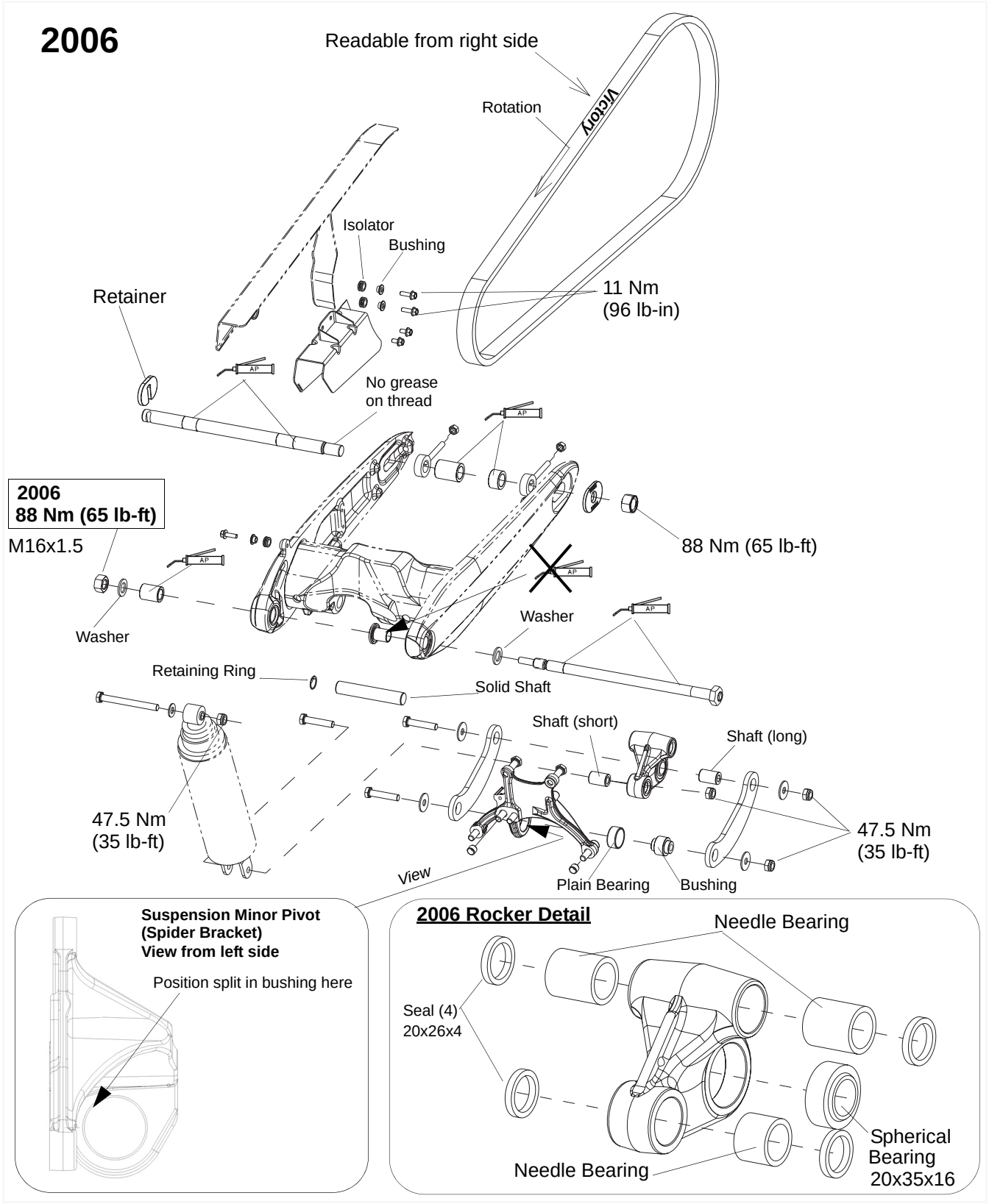
ASSEMBLY VIEW - SWINGARM & SUSPENSION LINKAGE - 2003 & 2004



ASSEMBLY VIEW - SWINGARM & SUSPENSION LINKAGE - 2005

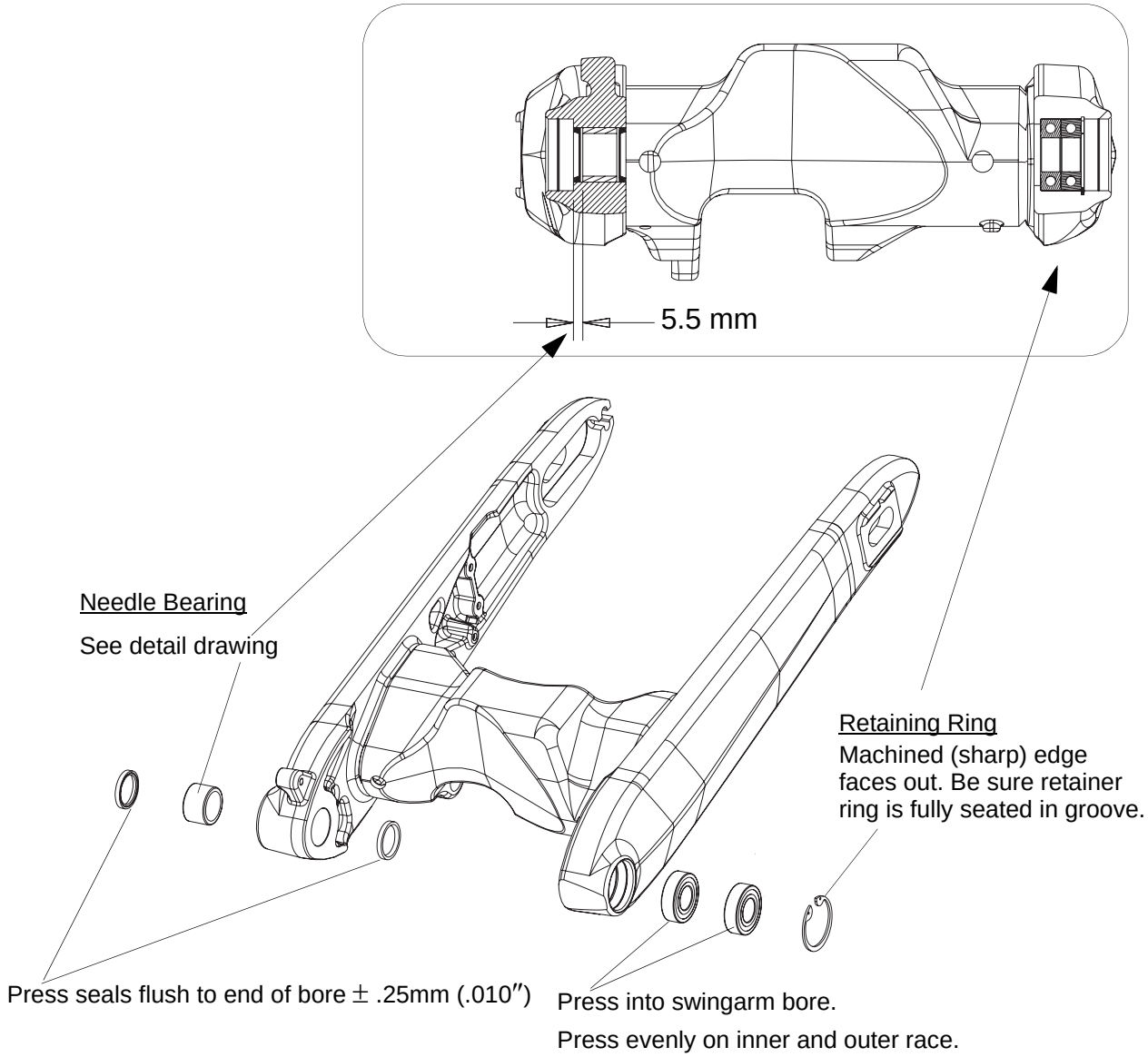


ASSEMBLY VIEW - SWINGARM & SUSPENSION LINKAGE - 2006



SWINGARM

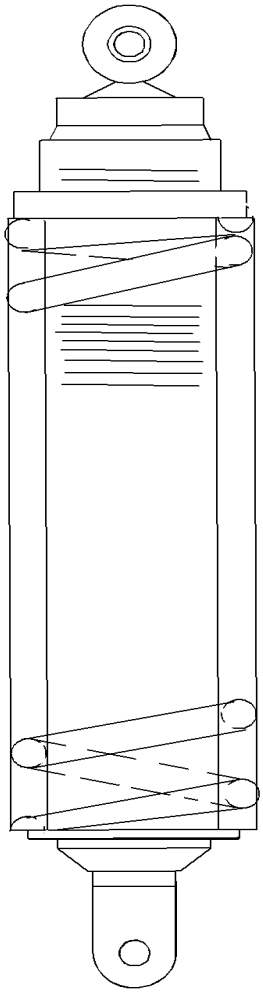
ASSEMBLY VIEW (TYPICAL)



REAR SHOCK SERVICE DATA

REAR SHOCK ABSORBER

ALL INFORMATION APPLIES TO BOTH VEGAS & KINGPIN UNLESS NOTED



The rear shock is not serviceable.

Do not attempt to de-pressurize or re-pressurize the shock.

Spring Installed Length: Perform Ride Height Adjustment

Shock Extended Length: Vegas: 356.6 mm ± 2mm
Shock Extended Length: Kingpin: 368.6 mm ± 2mm

Shock Minimum (Compressed) Length: 318.6 mm
Jounce Bumper Length: 35 mm

Eyelet Sleeve I.D.: 10.0 - 10.15 mm
Eyelet Sleeve Width: 30 mm

Clevis Inside Width: 30 mm
Clevis Hole I.D.: 10.05 - 10.15 mm

Spring Rates:

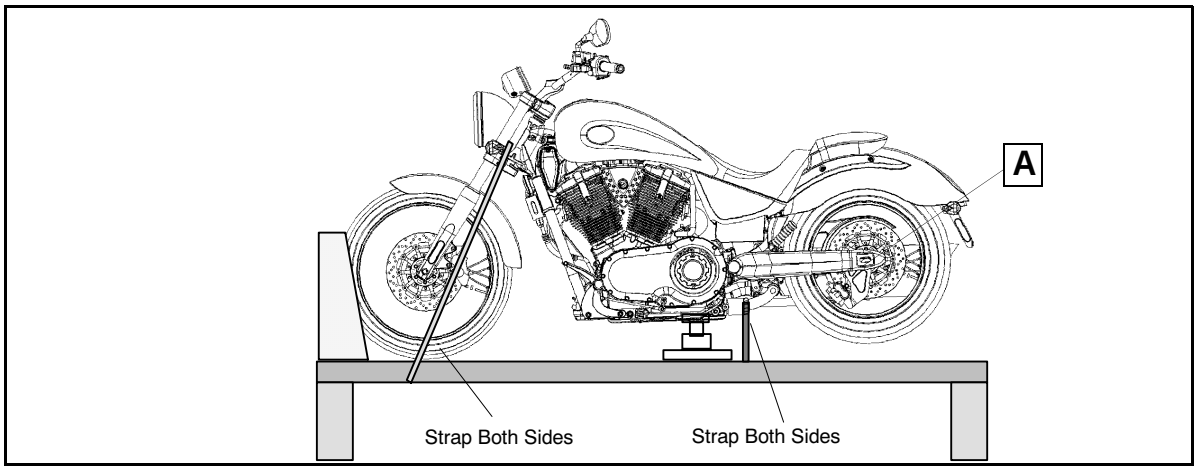
2003 Vegas - 100 N/mm

2004-2006 Vegas - 105 N/mm

2004-2006 Kingpin - 110 N/mm

SERVICE PROCEDURES

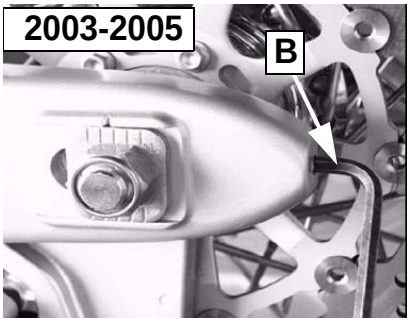
REAR WHEEL REMOVAL



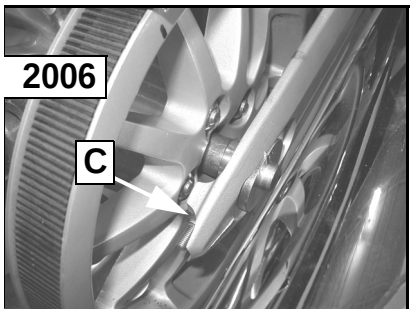
⚠ WARNING

Rear wheel involves supporting the machine with the rear end elevated. Take precautions so that the motorcycle is securely supported when the rear tire is elevated. Severe personal injury or death can occur if the motorcycle tips or falls.

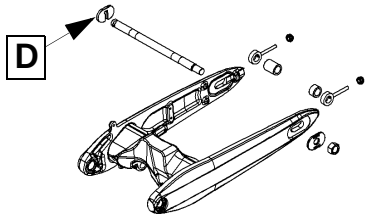
1. Secure motorcycle with rear wheel elevated.
2. 2003-2005 - Remove mufflers (Chapter 3).
3. All - Loosen axle nut (A, above).
4. 2003-2005-Turn adjuster screws (B) counterclockwise equally until belt is slack.



5. 2006 Turn adjuster nuts (C) equally counterclockwise and push axle forward until belt is slack.



6. 2003-2005 remove the axle nut.
   2006 loosen the axle nut about 5 turns.
7. All - Safely lift and support the rear of the motorcycle so tire is 1-2 inches off the floor.
8. 2003-2005 - Tap axle out from left to right.
   2006 tap axle to the right until retainer plate (D) can be removed. Draw axle out LEFT side.



9. Lower rear wheel, disengage drive belt from rear sprocket and remove wheel from swing arm.
10. Secure brake caliper to swing arm with tie strap.

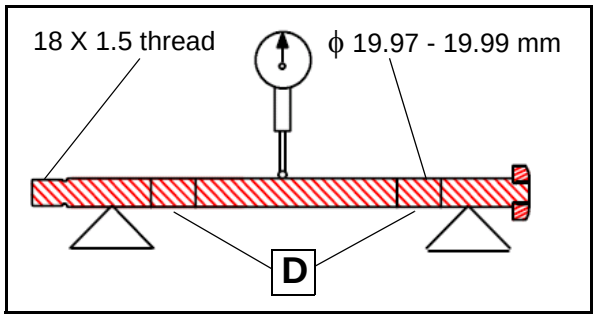
⚠ CAUTION

Do not hang rear brake caliper brake line or twist the brake line or damage may result.

NOTE: Do not apply rear brake pedal once the brake caliper has been removed.

REAR AXLE INSPECTION

1. Install rear axle in V-blocks and measure runout. Compare to service limit on page 13.3. Axle diameter should be measured on bearing surfaces at (D).



REAR WHEEL INSPECTION

NOTE: Wheel bearings must be in good condition for this inspection to be valid.

1. Set up a dial indicator to measure axial and radial runout of the wheel. Refer to Chapter 14 for procedure. Compare measurements to service limit listed on page 13.3.
2. Visually inspect wheel for cracks or other damage.
3. Replace wheel if it fails visual or measured inspection.

REAR WHEEL BEARING INSPECTION

NOTE: If possible, also inspect wheel bearings before removing the wheel from the vehicle (page 2.38). Inspect bearings installed in the wheel. Do not remove to inspect. Bearings cannot be repacked. Replace both wheel bearings if one or both fail inspection, or if either bearing was removed.

1. Visually inspect integral bearing seal for damage.
2. Inspect bearing fit in wheel hub. The outer race of the bearing must fit tightly into the bore. You should not be able to move outer race by hand.
3. Slide axle into wheel and check for smooth rotation and tight fit.

NOTE: Due to extremely close tolerances, the bearings must be inspected visually, and by feel. Look for signs of discoloration, scoring, galling, or contamination from moisture or dirt. Replace bearings if any of the above are present. Turn the inner race of the bearings. The bearings should turn smoothly and quietly. The inner race should be firm with minimal side to side movement and no detectable up and down movement.

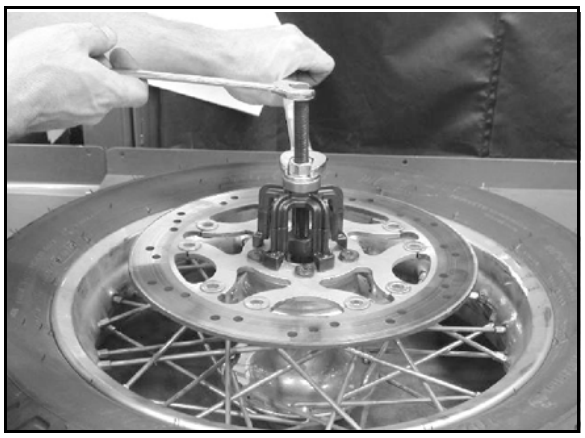
WHEEL BEARING REMOVAL (Typical removal shown)

⚠ CAUTION

Do not reuse bearings that have been removed.

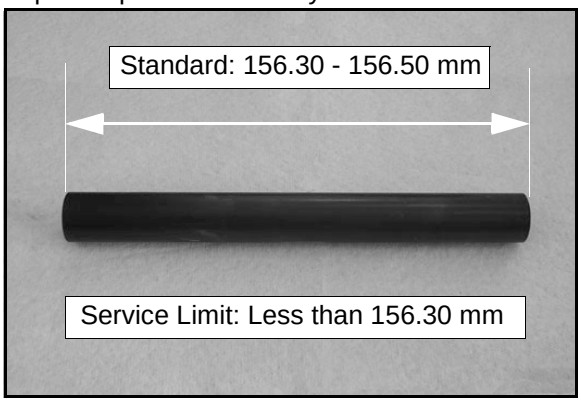
NOTE: Refer to instructions included with blind bearing removal tool.

1. Remove sprocket. Brake disc removal may be required on some wheels (page 13.14).
2. Protect hub. Pry seals out of hub on both sides.
3. Install bearing remover element into bearing. Tighten bearing remover until firm. Do not over-tighten or tool may be damaged.
4. Remove bearing.
5. Remove spacer.
6. Remove retaining ring from disc side of hub.
7. Extract or drive bearing from sprocket side.



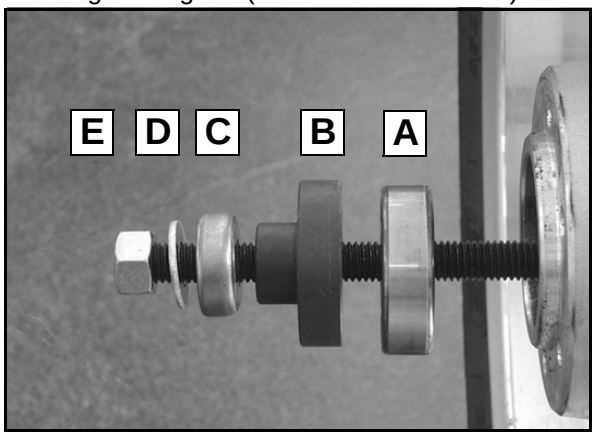
WHEEL BEARING INSTALLATION (Typical installation shown)

1. Clean inside of wheel hub and bearing spacer. Replace spacer if worn beyond the service limit.



Wheel Bearing Installation Set PV-43515

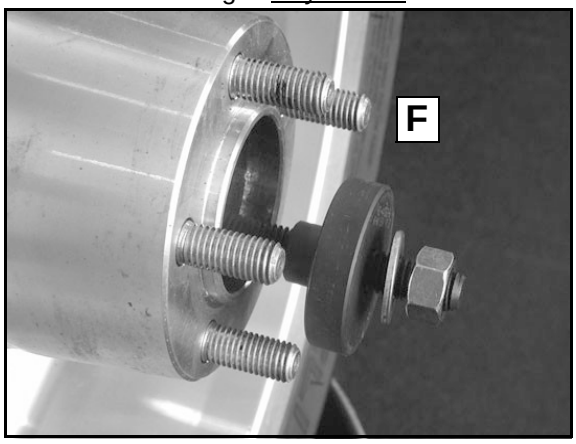
2. Place new bearing (A) into left (disc) side of wheel with markings facing out (toward outside of hub).



3. Assemble tool with flat side of 50-51mm wheel bearing collar (B) against bearing. This tool must be slightly smaller than O.D. of bearing and must be flat to support both inner and outer race equally. DO NOT pull or press on inner race of ball bearings or bearing will be permanently damaged!

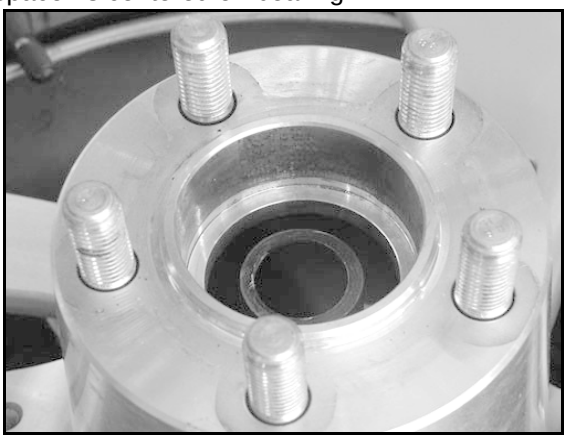
4. Install bearing (C), washer (D), and nut (E) on threaded shaft.

5. Install the other 50-51mm bearing tool (F) in bearing bore on right side of hub with flat washer and nut. Pull left bearing into hub by tightening nut on left side of tool until left bearing is fully seated in hub

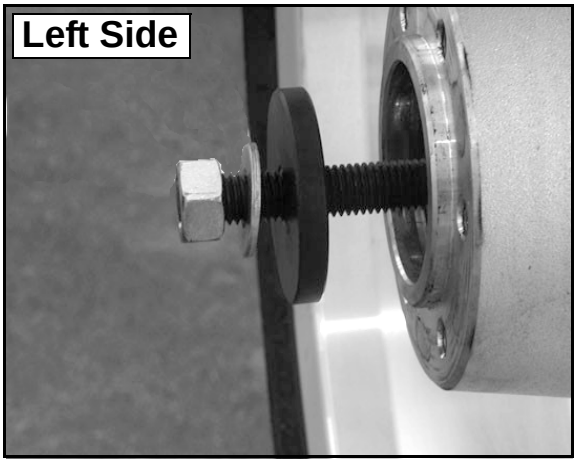


NOTE: DO NOT install retaining ring at this time.

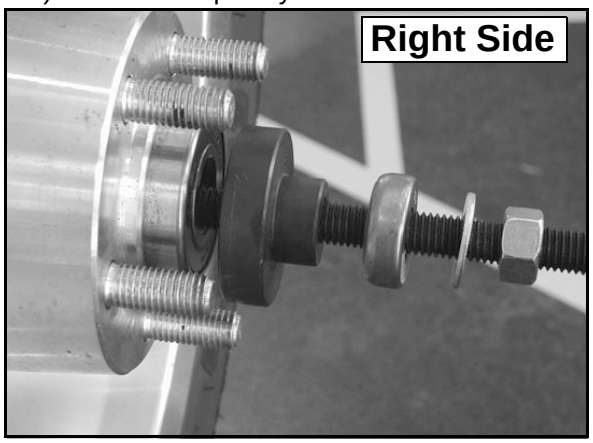
6. Turn wheel over and install bearing spacer. Be sure spacer is centered on bearing.



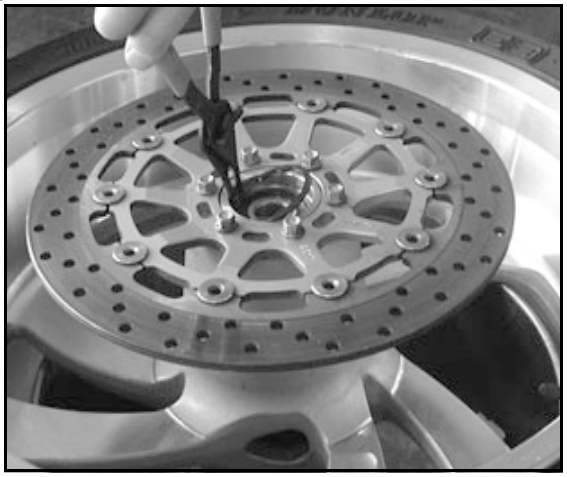
7. Assemble tool through left side with backing disc (or bearing tool) flat against left bearing. Be sure the tool supports both inner and outer race.



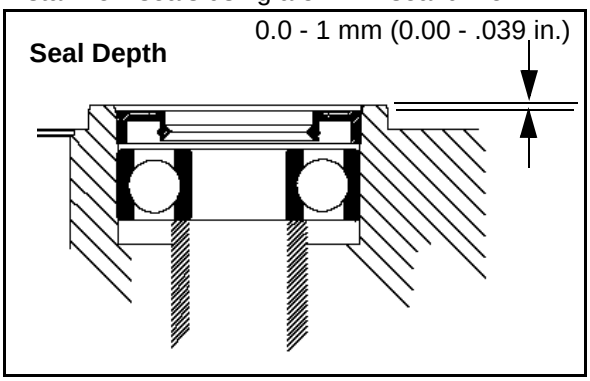
8. Place new wheel bearing on threaded shaft (markings out) and start it squarely in the hub.



9. Install 50-51 mm wheel bearing installation tool with flat side against bearing, followed by tool bearing, flat washer, and nut.
10. Set the wheel with right side upright to keep spacer centered during installation of right bearing.
11. Pull bearing in to right side of wheel until seated against spacer.
12. Remove tool and check to be sure that spacer is centered and trapped firmly between bearing inner races. **If not centered or not trapped, use the axle to center it and repeat Steps 9 - 11 to fully seat bearing against spacer**.
13. Install retaining ring. Be sure retainer is <u>fully</u> seated in groove.



14. Install new seals using a 52 mm seal driver.



15. Rotate inner races of bearings to check for free, smooth rotation.
16. Install brake disc if removed (page 13.14). Clean discs with Victory Disc Brake Cleaner.

⚠ CAUTION

Do not allow brake cleaner to contact painted surfaces.

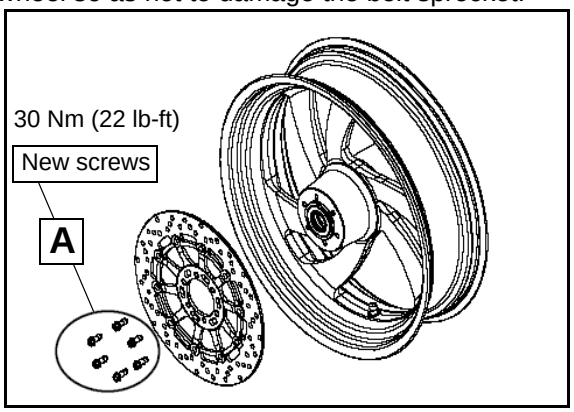
⚠ WARNING

Grease or oil on the brake disc will increase stopping distance which may lead to loss of vehicle control or an accident.

17. Install rear sprocket (page 13.14).

BRAKE DISC REMOVAL

1. Remove rear wheel. Refer to page 13.10.
2. Position wheel with brake disc facing up. Support wheel so as not to damage the belt sprocket.



3. Remove and discard brake disc screws (A).
4. Remove brake disc from wheel.

BRAKE DISC INSTALLATION

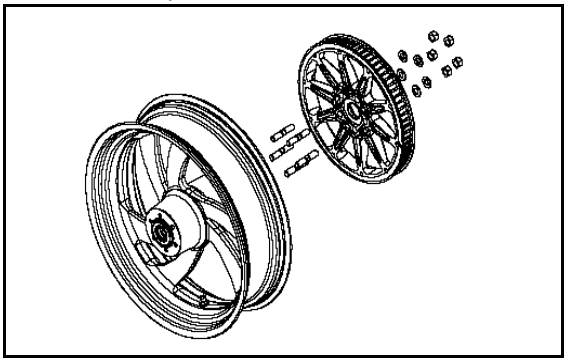
1. Clean bolt hole threads with Loctite Primer N.
2. Clean mating surfaces of disc and hub.
3. Install brake disc with part number to outside.
4. Install new brake disc screws and torque to specification. Do not re-use brake disc screws. New screws have a pre-applied locking agent.
5. Install rear wheel. Refer to page 13.15.

REAR SPROCKET REMOVAL

⚠ CAUTION

While working on the rear sprocket or wheel repair, take necessary steps to protect brake disc surface. Replace brake disc if damaged.

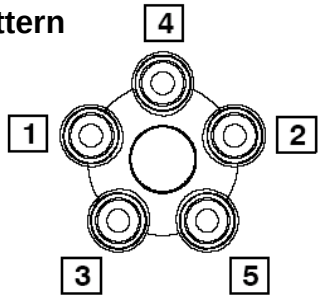
1. Remove rear wheel. Refer to page 13.10.
2. 2003-2005 - Remove sprocket screws and washers.
3. 2006 - Remove sprocket nuts and washers.
4. Remove rear sprocket from wheel.



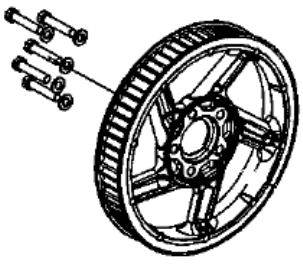
REAR SPROCKET INSTALLATION

1. Clean sprocket stud threads to remove all grease or oil residue.
2. Clean mating surfaces of wheel and sprocket.
3. Install sprocket.
4. Install washers and screws or nuts. Torque in a star pattern to specified torque.
5. Refer to page 13.15 for rear wheel installation procedure.

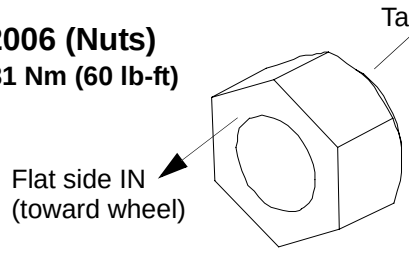
Torque Pattern (All)



2003-2005 (Screws)
67 Nm (49 lb-ft)

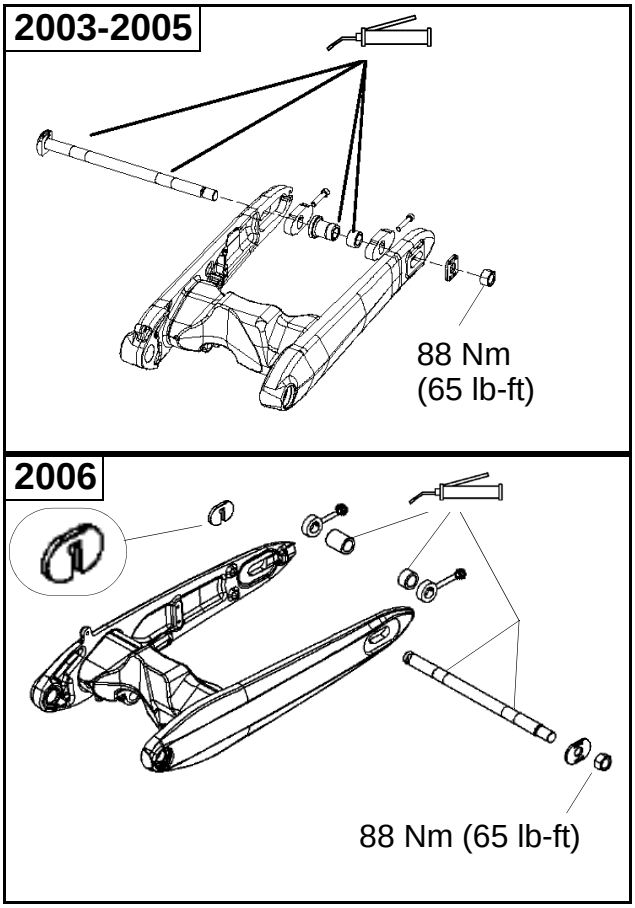


2006 (Nuts)
81 Nm (60 lb-ft)

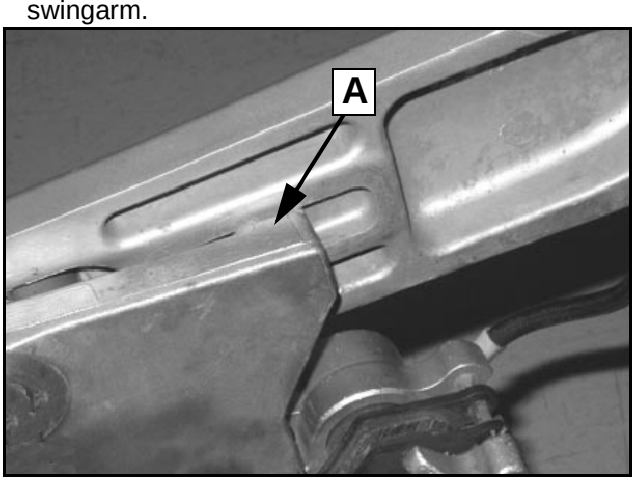


REAR WHEEL INSTALLATION

1. Loosen axle adjuster screws or nuts equally to provide maximum belt slack.



2. Apply a thin film of grease to axle surface and seals in wheel hub or each axle spacer. Do not apply grease to axle threads.
3. Insert long spacer on sprocket side and short spacer on disc side of wheel.
4. Place caliper bracket tab (A) in slot on left side of swingarm.



5. Insert wheel assembly between swingarm, guiding brake disc between brake pads.
6. Install belt around rear sprocket.

Rear Axle Installation

7. 2003-2005 - Start axle through right side swingarm and axle adjuster, through right side spacer and into wheel. Push axle through entire wheel assembly, left spacer, caliper bracket, and left axle adjuster. Install plate washer and axle nut.
   2006 - Start the slotted end of axle through left side swingarm and axle adjuster, through caliper bracket, left wheel spacer, and into wheel. Push axle through entire wheel assembly, right wheel spacer, and right axle adjuster until retaining plate can be installed in slot. Install retaining plate so wheel alignment marks are visible and tap or pull axle back to the right side until retainer is engaged in swingarm slot. Install plate washer and axle nut on left end of axle.

IMPORTANT: Be sure the tab of caliper bracket is still engaged in slot on left side of swingarm.

8. Tighten axle nut until seated and back off one full turn.
9. Adjust belt tension and wheel alignment (Chapter 2).
10. Torque rear axle nut to specification.
11. Apply rear brake pedal 2-3 times to position brake pads. If brake bleeding is necessary, refer to Ch 15.
12. Release brake pedal and turn rear wheel by hand. Inspect for smooth, free rotation without binding or brake drag. If drag is evident, inspect assembly and repair.
13. Install mufflers if removed (Chapter 3).
14. Lower the motorcycle and test drive to ensure proper operation.

SHOCK ABSORBER REMOVAL

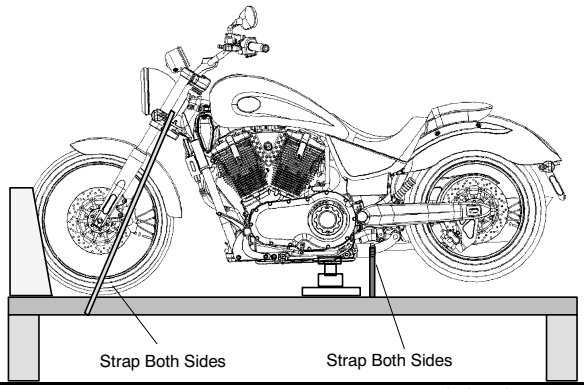
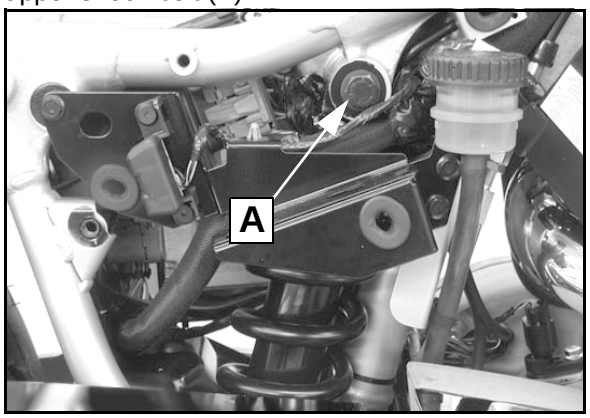


Fig. 1

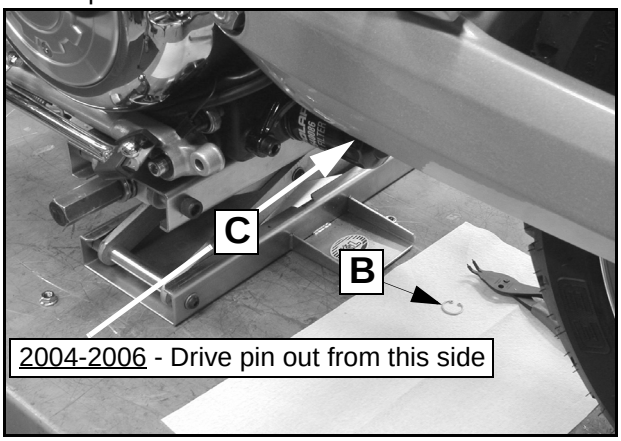
⚠ WARNING

Shock absorber removal involves supporting the machine with the rear end elevated. Take precautions so that the motorcycle is securely supported when the rear tire is off the ground. Severe personal injury or death can occur if the motorcycle tips or falls.

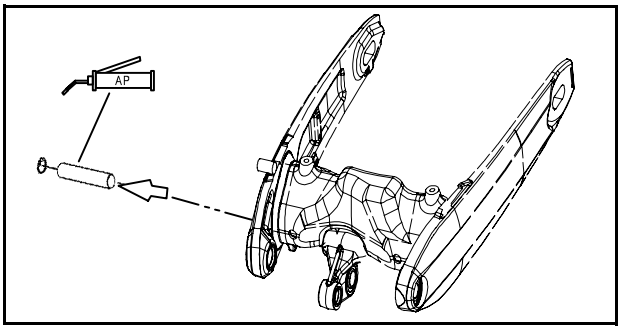
1. Place motorcycle on lift table and secure front tire in the wheel vise. Stabilize the motorcycle with straps on both left and right sides. (Fig.1)
2. Remove seat & side covers.
3. Remove fuse box from mounting bracket to expose upper shock bolt (A).



4. Loosen upper and lower shock mounting bolts and remove the nuts.
5. Place a wide-based platform jack under rear of engine. Elevate the jack slightly until weight is removed from shock mounting bolts.
6. 2003 Vegas - Remove the bolt for the suspension link pivot shaft. The bolt is accessed from the right lower side of the swingarm.
   2004-2006 - Remove snap ring (B) from pivot pin bore on right lower side of swingarm with a 45° internal snap ring pliers.
7. Be sure weight is removed from suspension and remove bottom shock mounting bolt.
8. 2003 Vegas - Remove suspension link bolt. The pivot shaft can be removed using a 12mm x 1.75 bolt.
   2004-2006 - Drive pivot pin out of swingarm / suspension link from the left side (C) as shown in photo below. Remove driver and allow suspension link to drop out.



9. Remove top shock bolt.



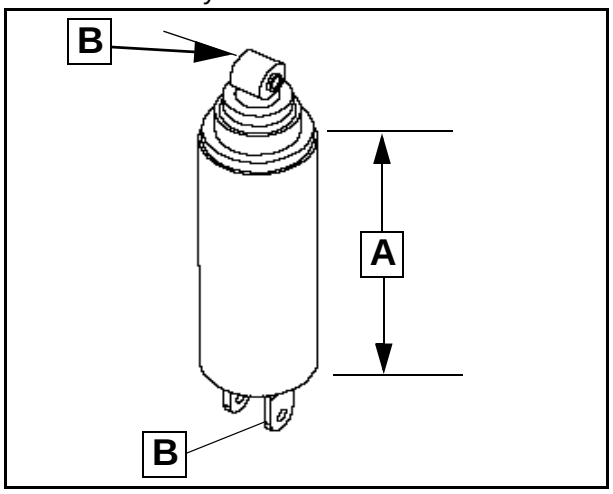
10. Lift rear end of motorcycle slightly with jack until shock can be removed out the bottom.

SHOCK ABSORBER INSPECTION

WARNING

The rear shock absorber is gas pressurized and not rebuildable. DO NOT attempt to de-pressurize, disassemble, or service the shock.

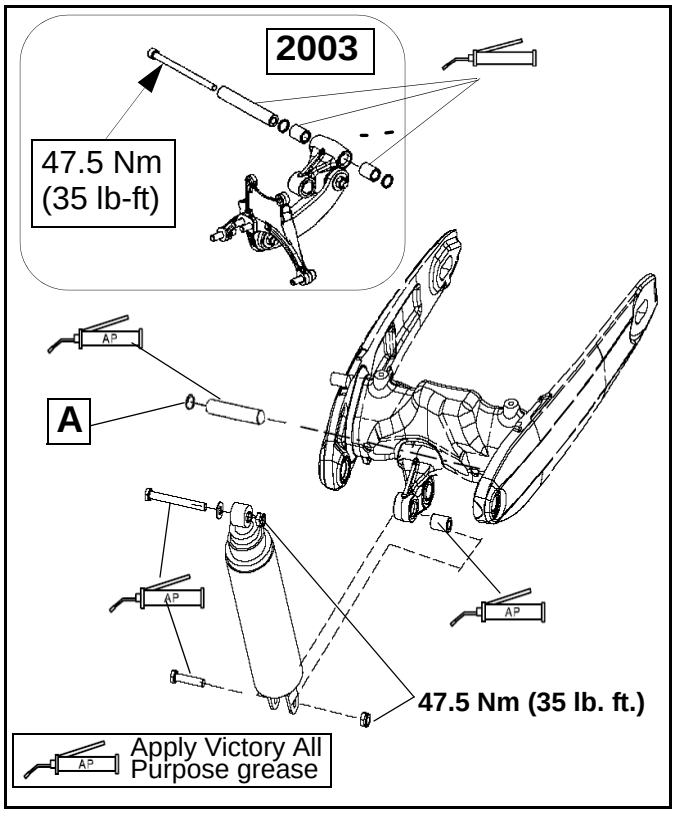
1. Measure spring installed height (A) and record so ride height adjustment can be returned to rider's preference.
2. Lubricate spring collars and loosen completely.
3. Remove the shock spring.
4. Inspect shock for signs of oil seepage around the shaft seal. If leakage is suspected replace the shock absorber assembly.
5. Inspect eyelets (B) for cracks or damage. Replace shock if either eyelet is cracked.



6. Clean shock thoroughly.
7. Inspect damper rod for corrosion, pitting, or damage. Replace shock if any of the above is evident.
8. With shock upright, move damper rod through entire travel range. Damper rod should move smoothly with consistent damping through the entire travel range, and return to the fully extended position when released. Replace shock if damping is inconsistent, or if gas leakage has occurred and the damper rod does not fully extend when released.
9. Inspect shock spring for cracks or distortion.
10. Install spring, adjuster nut, and adjuster jam nut.
11. Adjust spring to the distance recorded in Step 1.
12. Install shock.

SHOCK ABSORBER INSTALLATION

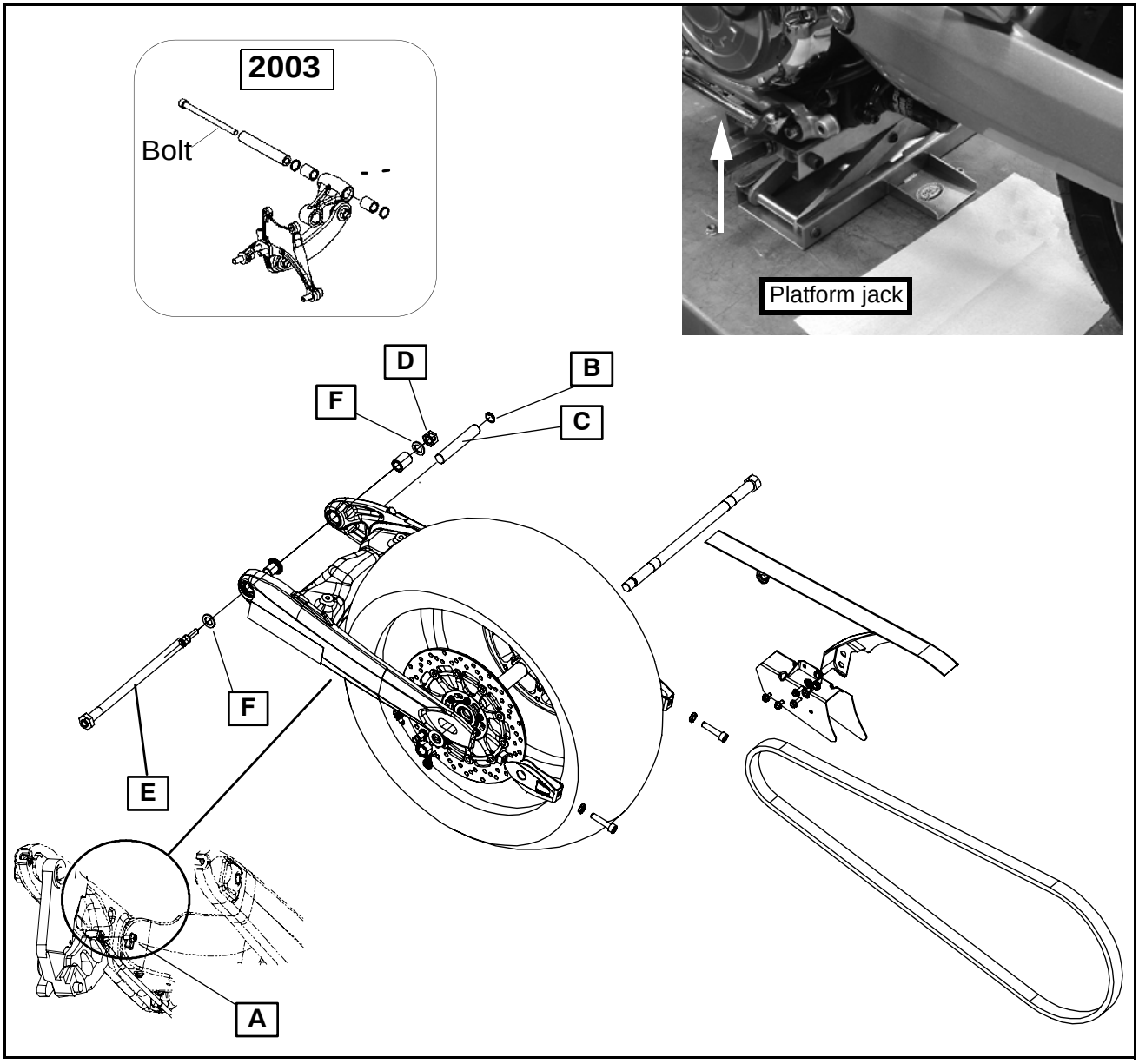
1. Grease all pivot points indicated below.
2. Lift shock into position and install top shock bolt with washer from right to left, and install nut.
3. Lubricate and install pivot pin through right side of swingarm.
4. Lift suspension link and align with swingarm and pivot pin bore in swingarm.
5. Tap pivot pin from right side of swingarm through suspension link and into left side of swingarm until fully seated.
6. 2003 - Install bolt through pivot shaft and torque to specification.
   2004-2006 - Install a new snap ring (A) in swingarm with machined (flattest) edge facing out (toward right side). Be sure snap ring is seated properly in the groove.
7. Raise or lower motorcycle slowly as needed to align lower shock mount with suspension link.
8. Install lower shock bolt from right to left and install nut.
9. Torque shock bolts (nut side) to specification.
10. Be sure ride height measurement is within specified range after installing the shock (page 2.40).



SWINGARM

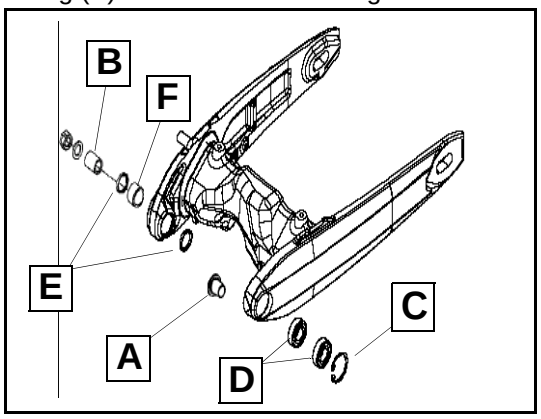
SWING ARM REMOVAL

1. Remove exhaust system (Chapter 3).
2. Place a wide-based platform jack under rear of engine. Elevate the jack slightly until weight is removed from suspension / swingarm linkage.
3. Remove rear wheel assembly following procedure on page 13.10.
4. Remove belt guards (Chapter 11).
5. Remove brake line guide from left-hand side of swingarm (A).
6. 2003 Vegas - Remove the bolt for the suspension link pivot shaft. The bolt is accessed from right lower side of swingarm.
   2004-2006 - Remove snap ring (B) from pivot pin bore on right lower side of swingarm with a 45° internal snap ring pliers.
7. Drive pin (C) out from left to right through access hole in lower left side of swingarm using a pin punch.
8. Remove swingarm pivot shaft nut (D) and shaft (E). Collect the two washers (F).



SWING ARM BUSHINGS / BEARING REPLACEMENT

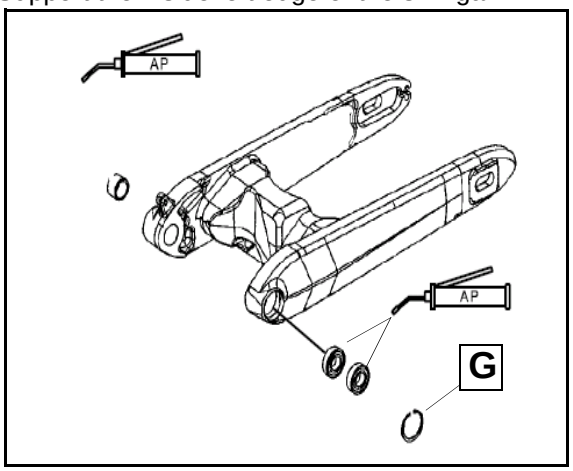
1. With swingarm removed (page 13.18) remove bushing (A) from left side of swingarm.



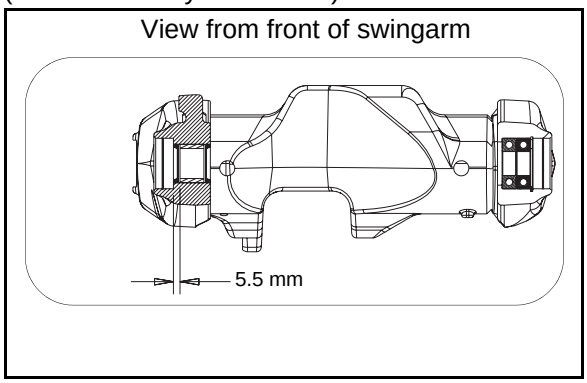
2. Remove sleeve (B) from right side of swingarm.
3. Remove snap ring (C) and drive bearings (D) out from inside to outside.

> **⚠ CAUTION**
>
> Do not reuse bearings that have been removed.

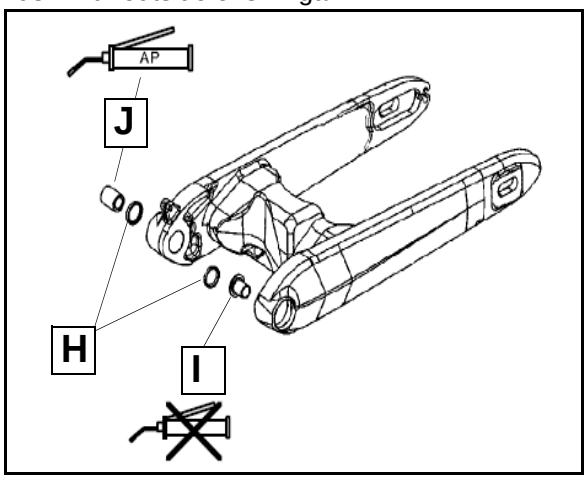
4. Remove seals (E) and bearing (F) from right side of swingarm.
5. Support the inside left edge of the swingarm.



6. Grease outside surface of new bearings and press into bore until seated using a 41.5mm drive adaptor or a suitable arbor. Press evenly on inner and outer race.
7. Install snap ring (G) with machined (sharp) edge facing out and be sure it is seated properly in groove.
8. Support inside right edge of swingarm.
9. Grease surface of a new right side bearing. Press using a 31.5 mm drive adaptor or arbor until bearing is 5.5mm past the outer edge of bearing bore as shown (centered axially in the bore).



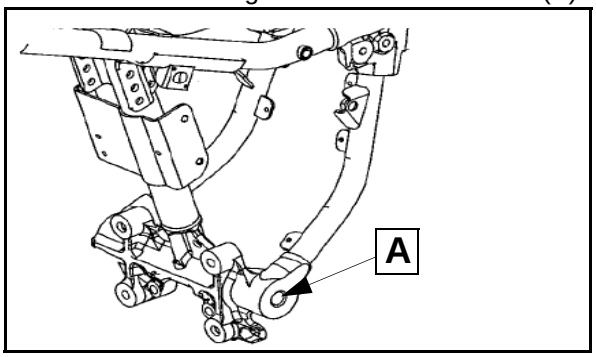
10. Apply grease to inner lip of seals (H) and install seals flush with outside of swingarm.



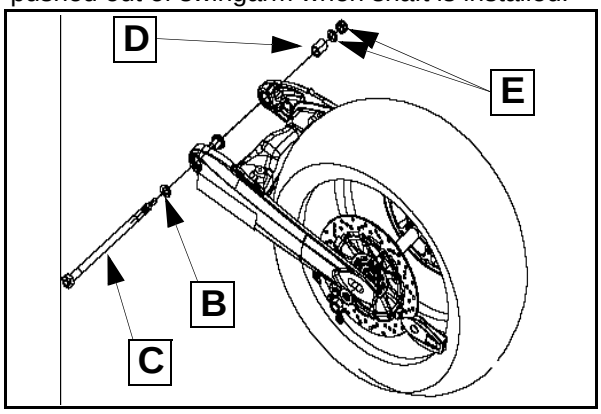
11. Install bushing (I) into left side of swingarm. Left side bearings are pre-lubricated and sealed. Do not apply grease to this bushing.
12. Grease right side bearing sleeve (J) and install with a twisting motion until centered in the seals and bearing.

SWING ARM INSTALLATION

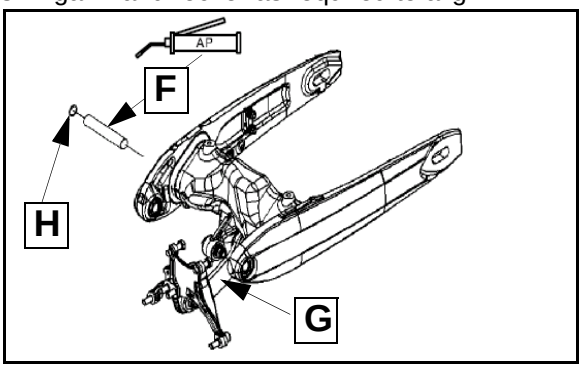
1. Clean inside of swingarm shaft bore in frame (A).



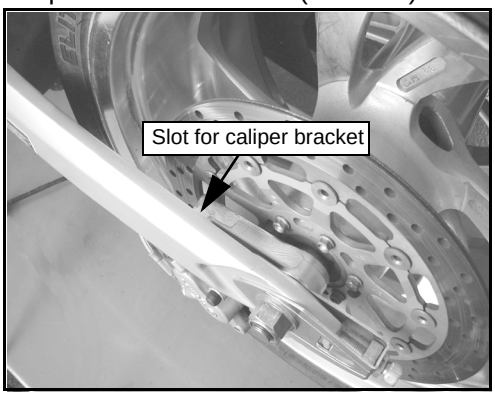
2. Grease swingarm pivot shaft.
3. Install left side washer (B) onto pivot shaft (C).
4. Place swingarm assembly (bearings and seals installed) in position on frame.
5. Install pivot shaft (C) from left to right through swingarm bearings/bushings and frame. Be sure right-hand sleeve (D) is in place and does not get pushed out of swingarm when shaft is installed.



6. Install right side washer and nut (E). Torque nut to 65 ft. lbs. (88 Nm).
7. Move swingarm through travel range to be sure it pivots smoothly and freely.
8. Lubricate and install pin (F) through rearmost swingarm pivot and suspension rocker (G). Move swingarm and rocker as required to align.



9. Install a new retaining ring (H) with machined edge (sharp edge) facing out (toward right side).
10. Be sure snap ring is fully seated in the groove.
11. Replace rear brake line clamp to left side of swingarm and torque screw to 8 ft. lbs. (10.8 Nm).



12. Locate caliper bracket in slot on the swingarm.
13. Install rear wheel assembly (page 13.15).
14. Install belt guards, exhaust bracket(s) and mufflers.
15. Raise rear of motorcycle again and check to make sure that the following applies:
    - The rear wheel turns freely, without any interference between the belt guard, the tire, and the swingarm.
    - Brake line is properly routed and secured.
    - The left and right axle adjusters are aligned properly (wheel is in alignment).
    - The rear brake functions properly and wheel rotates freely when brake pedal is released. If brake pedal does not feel firm refer to Chapter 15 for brake inspection and bleeding procedure.
    - The peg on the caliper mount is engaged with the slot in the swingarm.
    - All fasteners have been tightened correctly.
    - There is adequate clearance between swingarm and exhaust mufflers and mounting.
    - The swingarm is not loose, it doesn't wobble from side to side, and it doesn't move up and down more than 1/32 of an inch when pushed and pulled firmly.
16. Test ride motorcycle to be sure rear suspension operates smoothly without binding or abnormal noises.
17. Adjust ride height (page 2.40).

TROUBLESHOOTING

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Rear Wheel Feels “Loose” or Wobbles	Distorted (bent) rear wheel	Replace wheel
	Worn or damaged wheel bearings	Replace wheel bearings
	Worn or damaged swing arm bushings.	Replace swing arm bushings
	Damaged or incorrect rear tire	Replace rear tire
	Unbalanced rear wheel assembly	Balance tire/wheel
	Low tire pressure	Inflate to specification
	Loose swing arm, axle or suspension fasteners.	Torque to specifications
PROBLEM	**POSSIBLE CAUSE**	**REPAIR RECOMMENDED**
Rear Suspension Too Hard	Bent shock damper rod	Replace shock
	Damaged or corroded suspension mount bushing	Correct as necessary
	Incorrect preload adjustment	Adjust to rider & load
	Damaged or corroded swingarm bushings	Replace
	High tire pressure	Deflate to specification
	Drive belt adjustment too tight	Adjust drive belt tension
Rear Suspension Too Soft	Leaking	Rebuild or replace shock
	Weak shock spring	Replace shock spring
	Incorrect preload adjustment	Adjust to rider & load
	Excessive load placed on motorcycle	Educate consumer
	Low tire pressure	Inflate to specification
Rear Suspension Noisy	Loose fasteners	Torque to specifications
	Worn wheel bearings	Replace
	Worn swing arm bushings	Replace
	Damaged shock absorber	Replace as necessary
Wheel Drags (Turns Hard)	Bent rear axle	Replace
	Damaged wheel bearings	Replace
	Brake problem	Refer to chapter 15
	Incorrect drive belt adjustment	Adjust drive belt tension
	Tire contact with object or chassis	Determine point of contact and correct

NOTES

CHAPTER 15
BRAKES

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BRAKE SYSTEM SAFETY

GENERAL

Brakes play a critical role in vehicle safety. For this reason, Victory does not recommend rebuilding internal components of the brake master cylinder or brake wheel calipers. Victory also does not offer replacement internal components of the master cylinder or wheel calipers.

No procedures for rebuilding brake master cylinders or brake wheel calipers are presented in this manual or any other Victory publication. If it is determined that a problem exists within the internal workings of the brake master cylinders or brake wheel calipers, replace the faulty component as an assembly.

External parts such as, brake pedal, brake lever, brake hoses, external sealing washers, master cylinder diaphragm, master cylinder covers or caps and fasteners are available as replacement parts.

⚠ WARNING

Contaminated brake discs or pads greatly reduce the amount of stopping force available & increase stopping distance. Brake discs can be cleaned using a commercially available brake disc cleaner. Follow the manufacturer instructions printed on the container. NEVER attempt to clean contaminated brake pads. Always replace pads as a set.

⚠ CAUTION

Brake fluid and some types of brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed.

⚠ CAUTION

The brake system uses ethylene-glycol based fluid (DOT 4). Do not use or mix with different types of fluid such as silicone-based (DOT 5) or petroleum-based.

Do not use brake fluid taken from old, used or unsealed containers. Never reuse brake fluid.

Keep brake fluid containers completely sealed and out of reach of children.

Make sure the master cylinder reservoir being worked on is level before removing the cap.

Brake fluid should be completely replaced every 24 months or 12,500 miles.

Brake hoses should be replaced whenever the exterior shows signs of deterioration or damage. Brake hoses should be replaced every four (4) years regardless of their exterior condition.

Bleed the brake system anytime it is disassembled or when the brake action is spongy.

Always inspect the operation of the brakes before riding the motorcycle.

Replace sealing washers whenever brake lines are removed.

Always remove the master cylinder fluid reservoir cover and inspect the fluid level after pads are replaced.

SPECIFICATIONS

GENERAL SPECIFICATIONS

BRAKE SYSTEM		
Item	**Standard**	**Service Limit**
Specified Brake Fluid	DOT 4	Replace every 24 months or 12,500 miles
Brake Disc Thickness (Front and Rear)	5 mm	4.5 mm (.177") (Min)
Brake Disc Runout	-	.30 mm (.012") (Max)
Front Brake Pads Wear Limit	-	When groove is no longer visible
Rear Brake Pads Wear Limit	-	When groove is no longer visible
Brake Pedal Freeplay (Rear)	4.5 - 7 mm (.177-.280")	-
Brake Lever Freeplay (Front)	No Adjustment	-

FASTENER TORQUES

FASTENER TORQUE SPECIFICATIONS

Description	Torque Nm	Torque lb-ft (in-lb)
Caliper Bleed Screw	8.5 Nm	(75 in-lb)
Footrest Support to Frame	47.5 Nm	35 lb-ft
Front Brake Disc to Wheel Hub	30 Nm	22 lb-ft
Front Brake Line Banjo Bolt To Master Cylinder	27-30 Nm	20-22 lb-ft
Front Brake Line Banjo Bolt To Caliper	27-30 Nm	20-22 lb-ft
Front Brake Line Banjo Bolt To Manifold	27-30 Nm	20-22 lb-ft
Front Brake Lever Pivot Screw	6 Nm	(52 in. lbs.)
Front Brake Master Cylinder to Handlebar	10 Nm	(84 in-lbs)
Front Brake Master Cylinder Reservoir Cover	1 Nm	(9 in-lbs)
Front Brake Caliper to Fork Leg	40.5 Nm	31 lb-ft
Rear Brake Disc to Wheel Hub	30 Nm	22 lb-ft
Rear Brake Line Banjo Bolt To Master Cylinder	27-30 Nm	20-22 lb-ft
Rear Brake Line Banjo Bolt To Caliper	27-30 Nm	20-22 lb-ft
Rear Brake Master Cylinder Mounting Screws	10 Nm	(84 in-lbs)
Rear Brake Pressure Switch to Manifold	13.5 Nm	10 lb-ft
Rear Brake Pressure Switch Manifold to Frame	11 Nm	(96 in-lbs)
Rear Brake Reservoir Mounting Screw	6 Nm	(55 in-lbs)

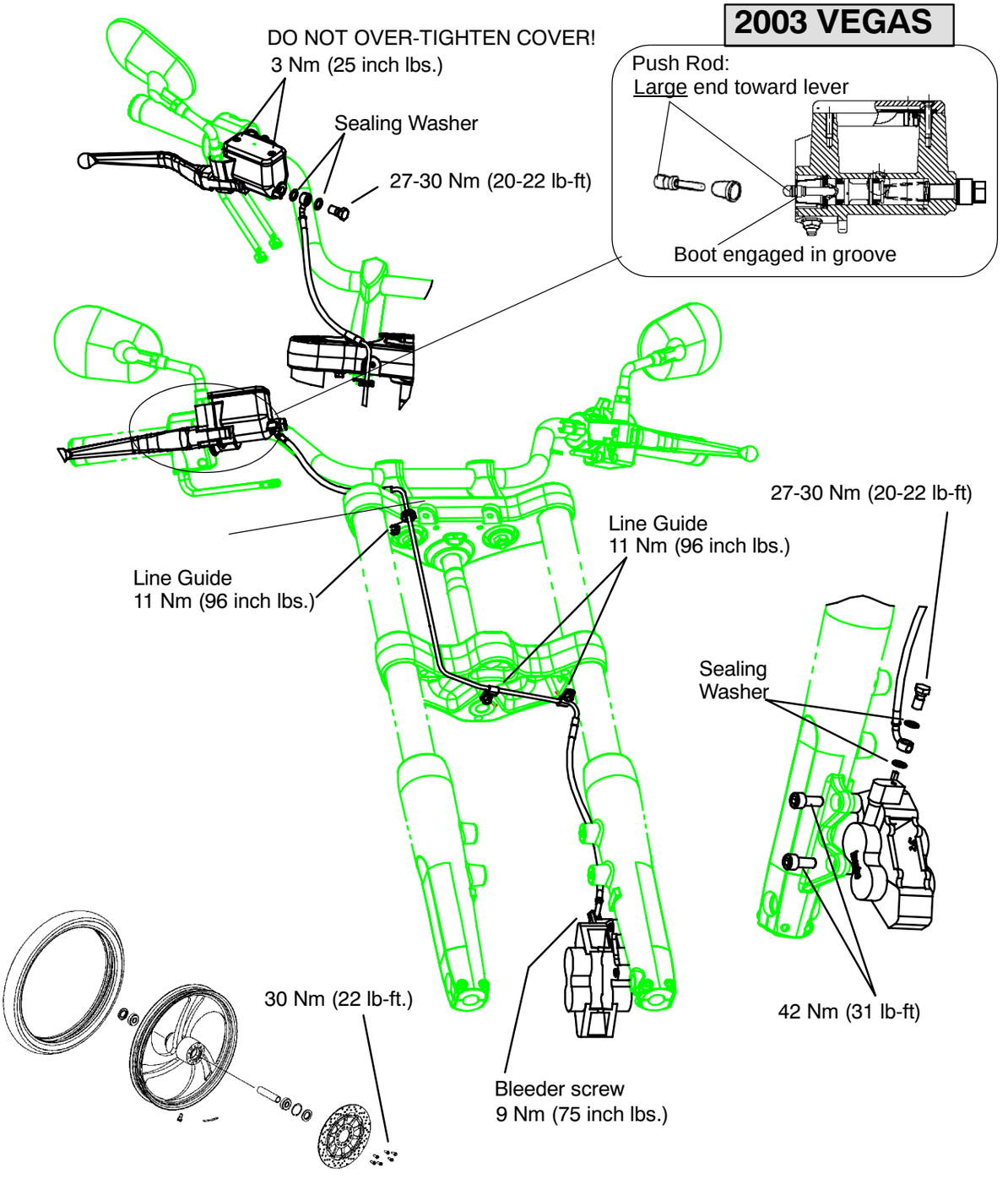
SPECIAL TOOLS

SPECIAL TOOLS

Special tools are not required in this section.

ASSEMBLY VIEWS & ROUTING

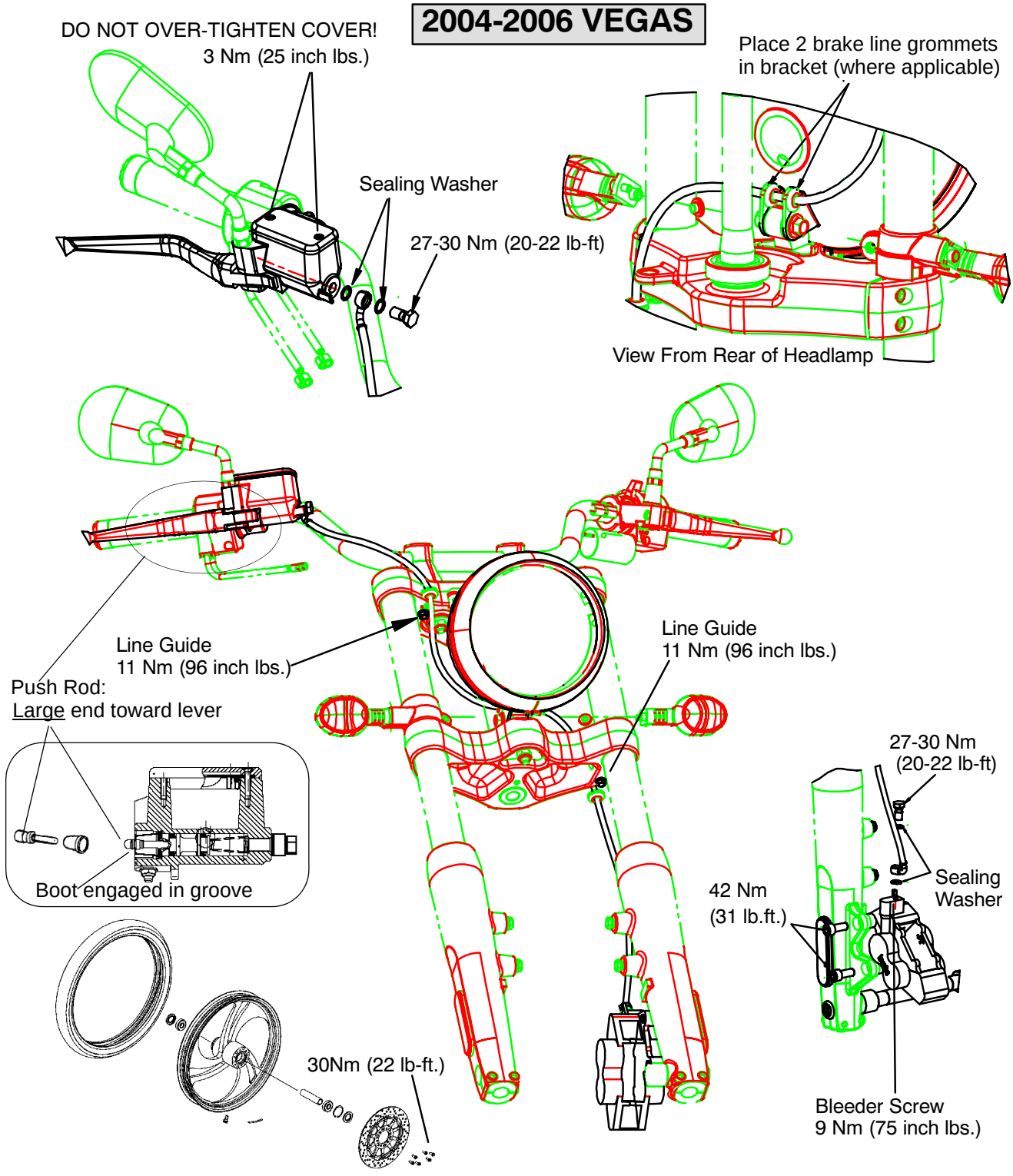
FRONT BRAKE HOSE / LINE ROUTING



Replace disc screws if loosened or removed*

* If brake disc is removed, use new screws that have a pre-applied locking agent. DO NOT re-install brake disc screws if loosened or disassembled.

FRONT BRAKE HOSE / LINE ROUTING

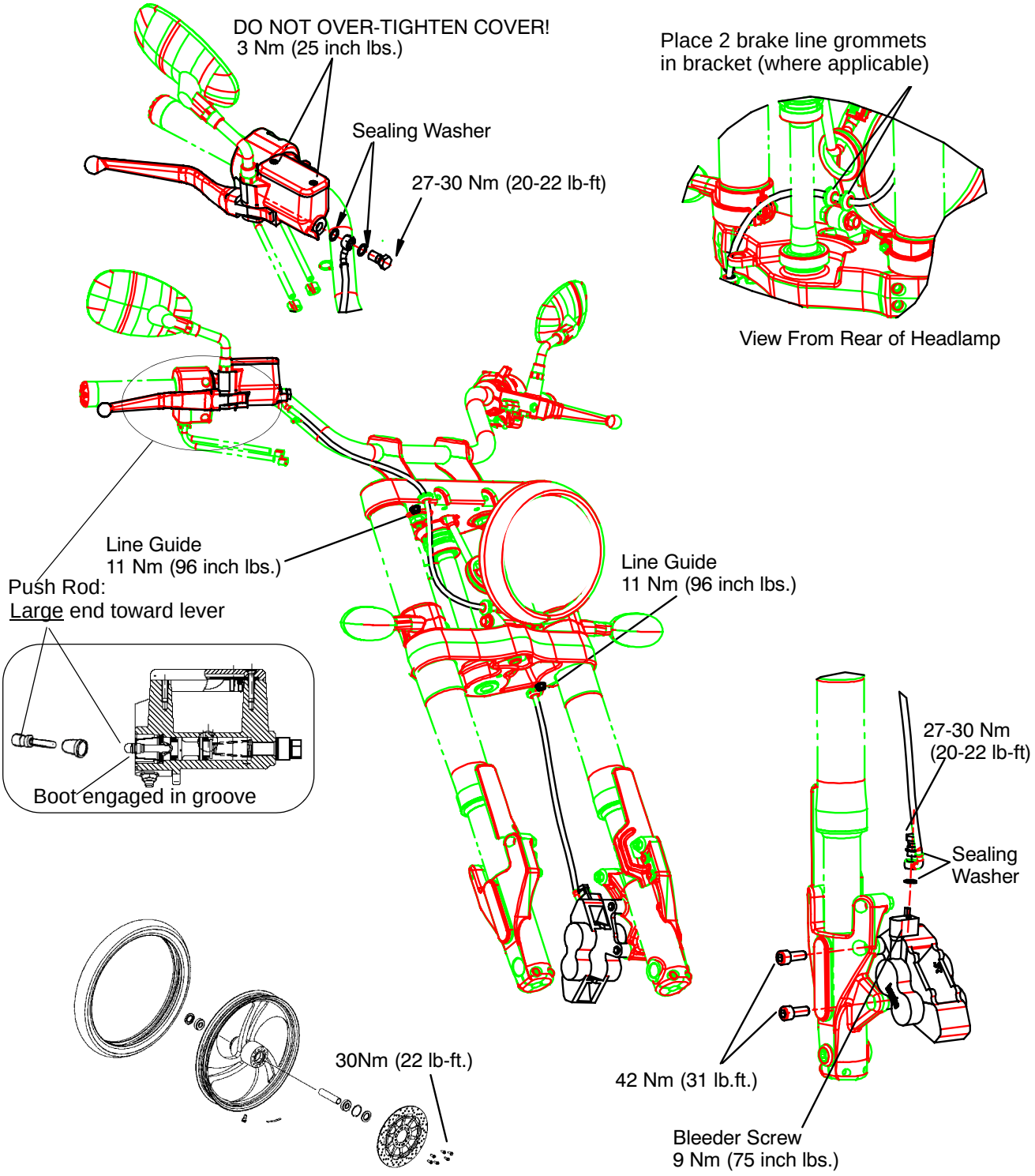


Replace disc screws if loosened or removed*

* If brake disc is removed, use new screws that have a pre-applied locking agent. DO NOT re-install brake disc screws if loosened or disassembled.

FRONT BRAKE HOSE / LINE ROUTING

2004-2006 KINGPIN

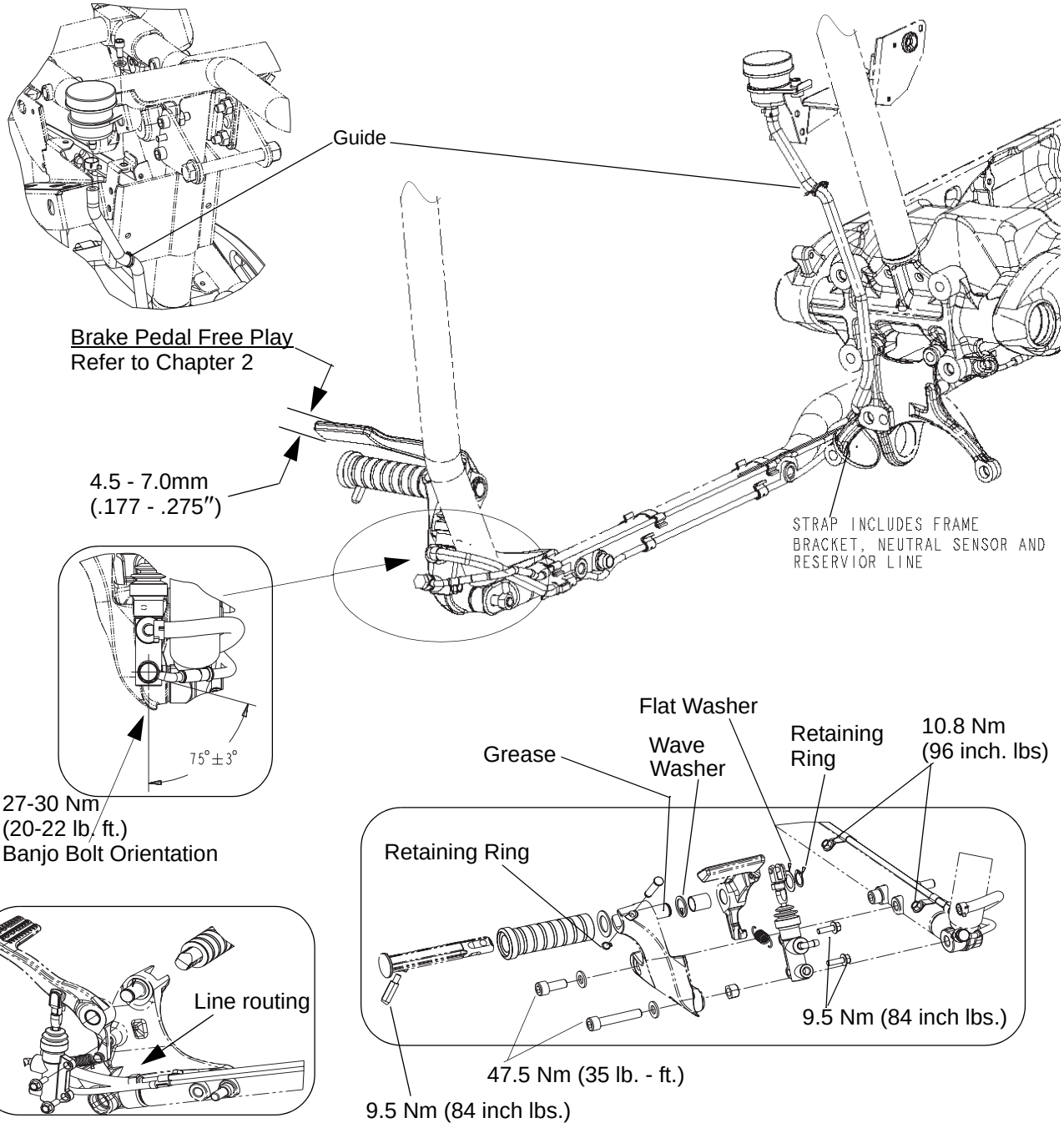


Replace disc screws if loosened or removed*

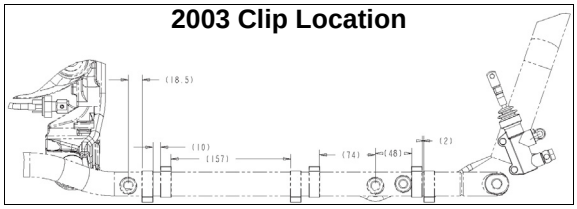
* If brake disc is removed, use new screws that have a pre-applied locking agent. DO NOT re-install brake disc screws if loosened or disassembled.

REAR BRAKE HOSE / LINE ROUTING - FRAME

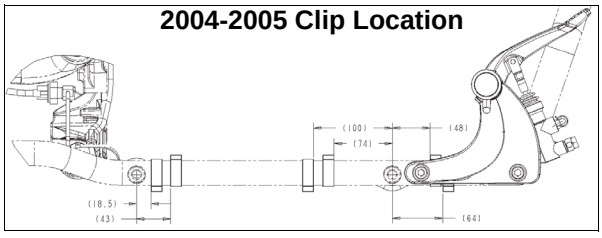
VEGAS 2003-2005



2003 Clip Location

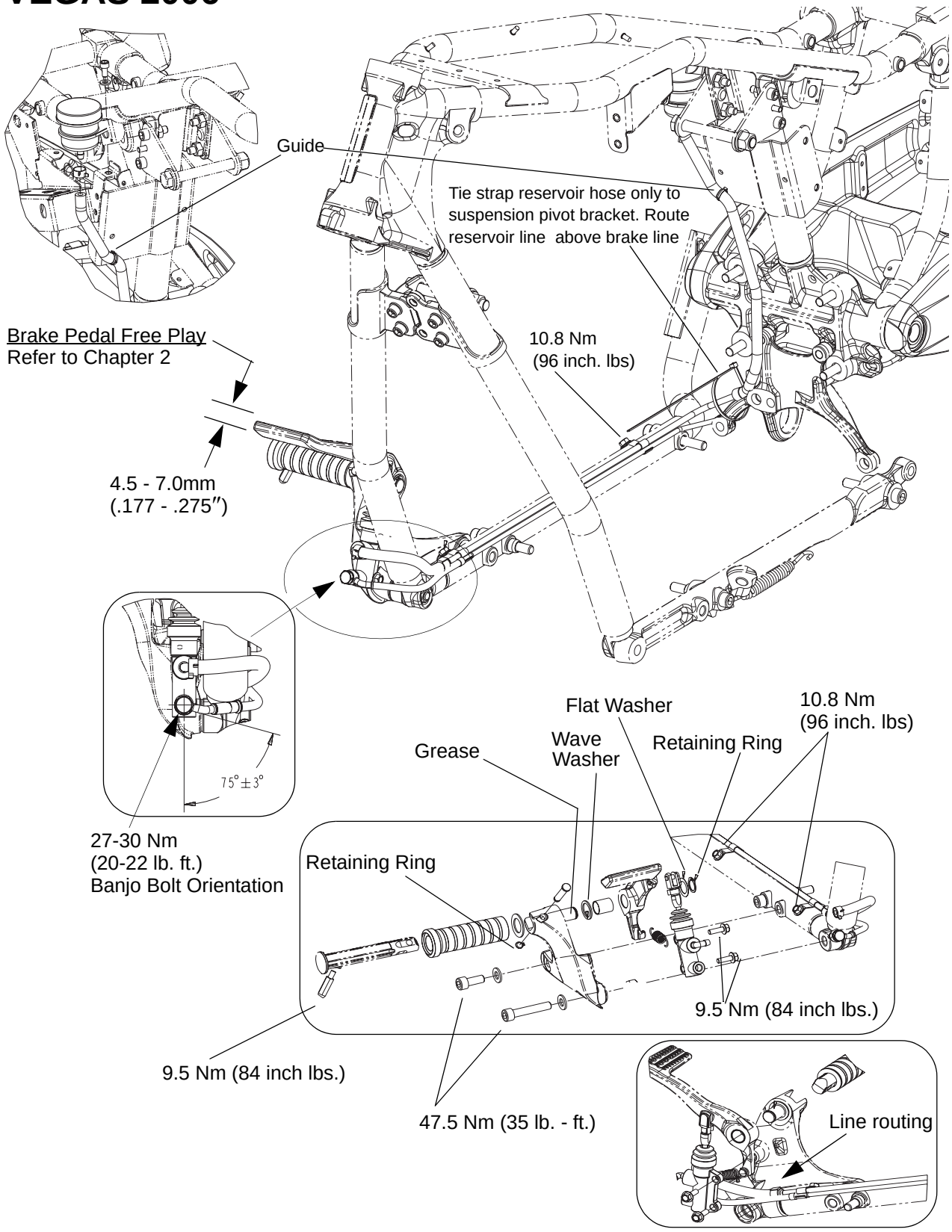


2004-2005 Clip Location



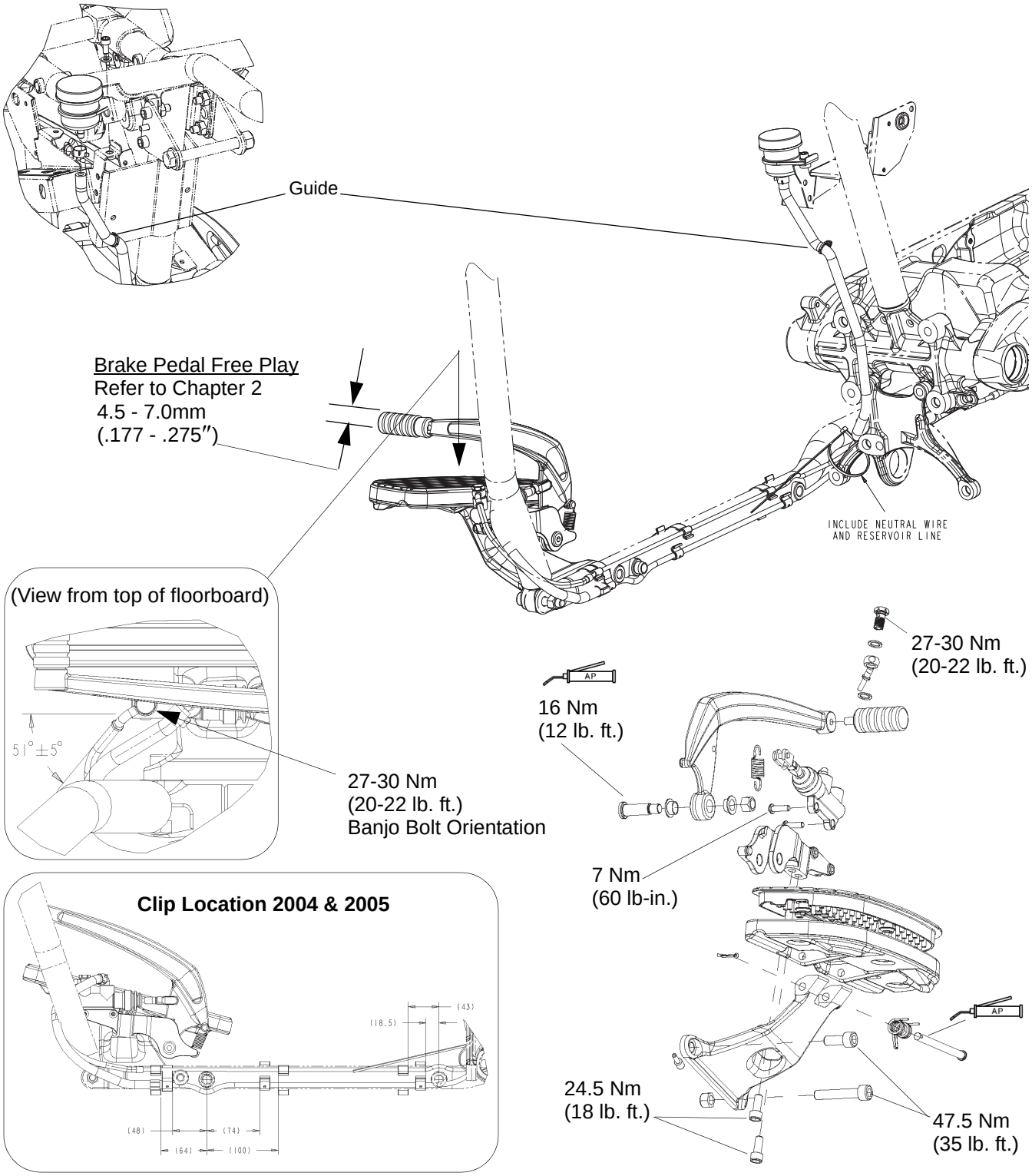
REAR BRAKE HOSE / LINE ROUTING - FRAME

VEGAS 2006



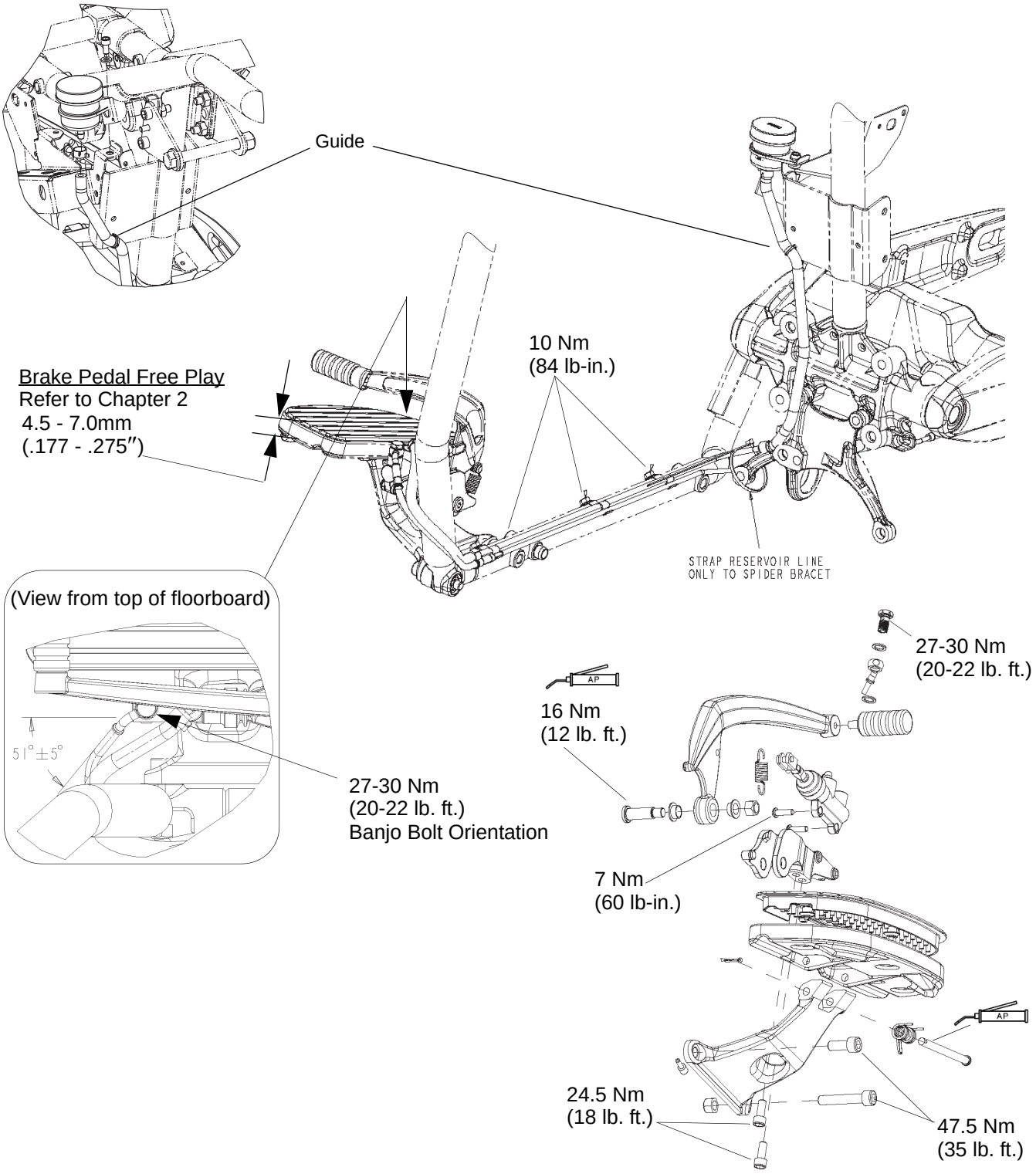
REAR BRAKE HOSE / LINE ROUTING - FRAME

KINGPIN 2004-2005



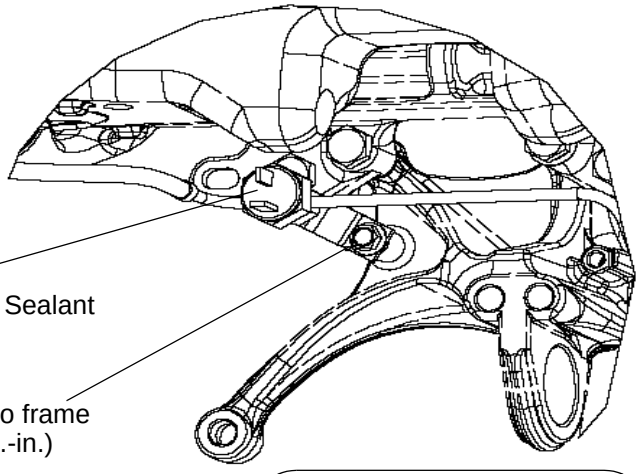
REAR BRAKE HOSE / LINE ROUTING - FRAME

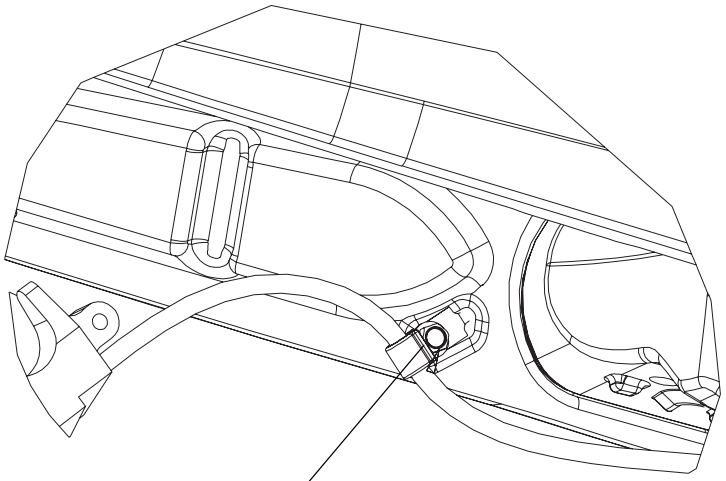
KINGPIN 2006

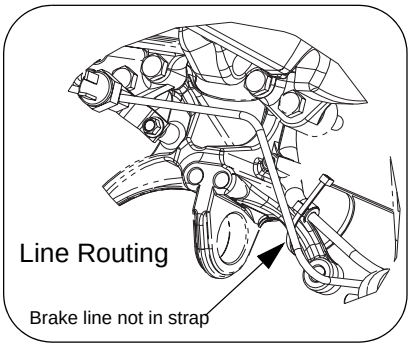


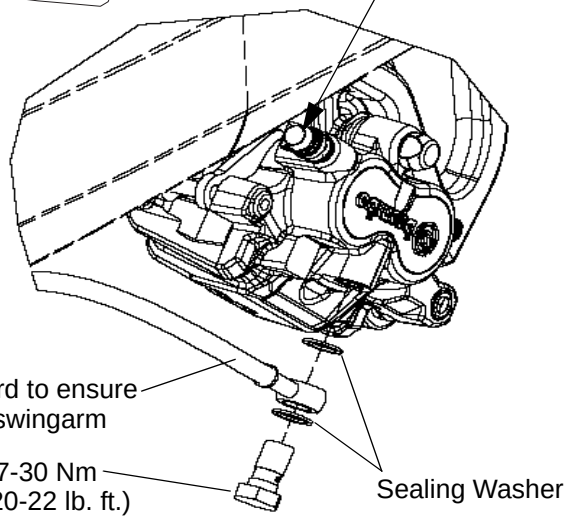
REAR BRAKE HOSE / LINE ROUTING - SWINGARM / REAR FRAME CRADLE

VEGAS & KINGPIN









BRAKE SYSTEM SERVICE

BRAKE FLUID REPLACEMENT & BLEEDING

⚠ WARNING

Contaminated brake discs or brake pads greatly reduce braking performance and increase stopping distance. Do not attempt to clean contaminated pads. Replace them. Clean the brake disc with brake cleaner.

⚠ WARNING

This brake system requires ethylene-glycol based fluid (DOT 4). Do not use or mix different types of fluid such as silicone-based or petroleum-based.

⚠ WARNING

Do not use brake fluid taken from old, used or unsealed containers. Never reuse brake fluid.

⚠ WARNING

Keep brake fluid tightly sealed and out of reach of children. Brake fluid can accumulate moisture, reducing it's effectiveness.

⚠ WARNING

A soft, spongy feeling in the brake lever and/or brake pedal could indicate a hazardous condition in the brake system. Do not operate the motorcycle until the failure in the brake system is corrected.

⚠ WARNING

An unsafe condition exists when air is trapped in the hydraulic brake system. Air in the brake hydraulic system acts like a soft spring and absorbs a large percentage of the pressure developed by the master cylinder. Without this pressure, the braking system cannot develop full braking force to allow for safe, controlled stops. It is extremely important to bleed the brakes properly after any brake system work has been performed or when inspection reveals spongy brakes.

⚠ CAUTION

Pressure bleeding is not recommended by Victory. When fluid surges through the fittings, it is possible to cavitate the fluid and create air in the system. In addition, the fluid stored in a pressure bleeder may be contaminated. Always use fresh DOT 4 brake fluid from a sealed container.

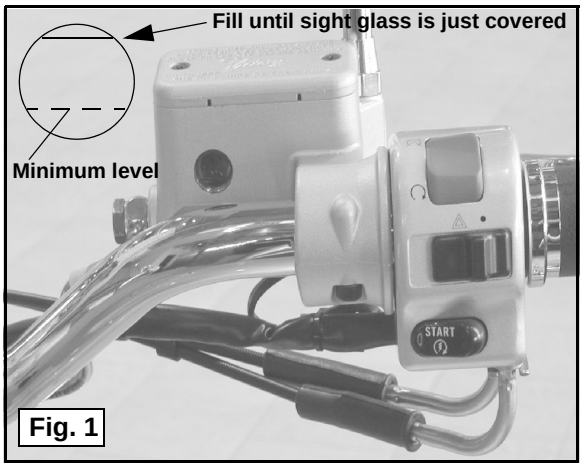
Keep these points in mind when bleeding hydraulic brakes:

- The master cylinder reservoirs have limited capacities. It is easy to empty them during the bleeding procedure. This introduces air into the system which you are trying to purge. Watch the reservoir closely and add fluid when necessary to prevent air from entering the system.
- Apply only light to moderate pressure to the lever or pedal when bleeding the brake system. Extreme pressure will cause a surge of fluid through the small orifices of the brake system when the bleeder screw is opened and introduce air into the system by means of cavitation.
- Small amounts of air can become trapped in the banjo bolt fittings at the master cylinder(s) and junction points of brake lines. These fittings can be purged of air by following a standard bleeding procedure at these fittings (instead of the bleed screw on caliper) if necessary to speed the bleeding process. This is usually only needed if system was completely drained of fluid. Bleed each line connection, starting with the fitting closest to the master cylinder, working toward the caliper, and ending with the bleed screw.
- Always torque banjo bolts and other brake system fittings to specified torque.

BRAKE FLUID FILLING & BLEEDING

NOTE: Procedure is basically the same for both front and rear brakes. For best results, pump the lever/pedal slowly to avoid fluid aeration. If lines have been replaced (lines are empty) it may be helpful to bleed each connection individually, starting at the master cylinder and working toward the caliper.

1. Fill reservoir until observation window is covered with DOT 4 brake fluid from a sealed container.

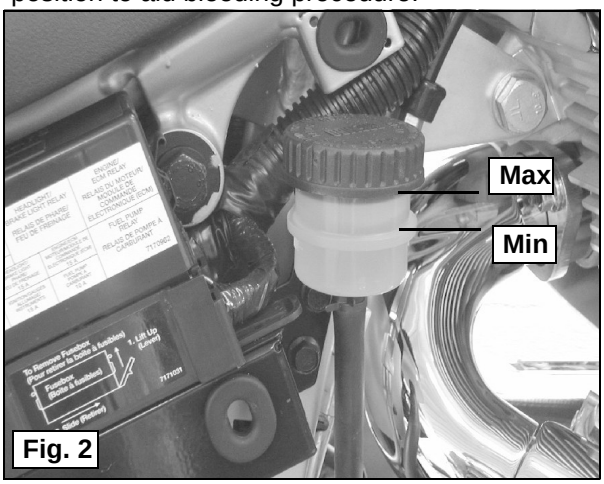


Victory DOT 4 Brake Fluid 2872189

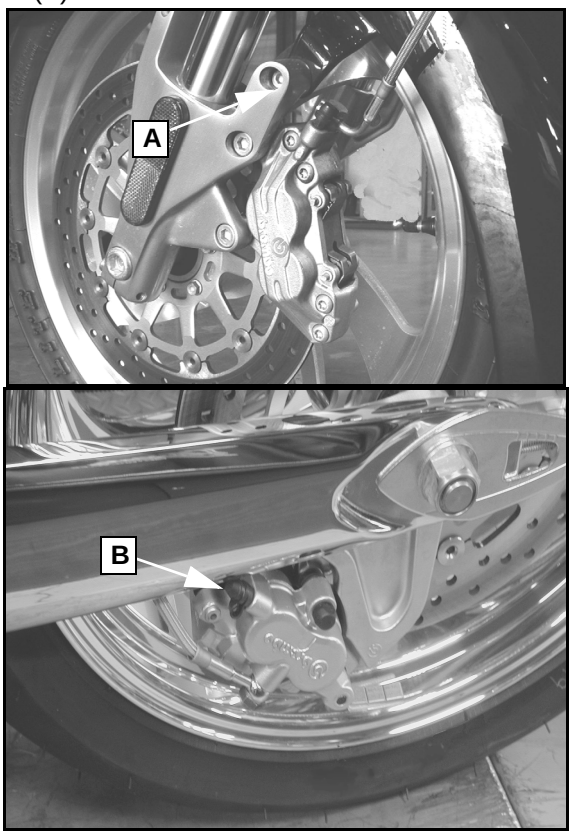
2. Place reservoir cap on master cylinder to prevent entry of contaminants.

NOTE: Throughout the following procedure, monitor fluid level in master cylinder reservoir constantly. Do not allow fluid level to fall below minimum level. (Fig. 1 and 2)

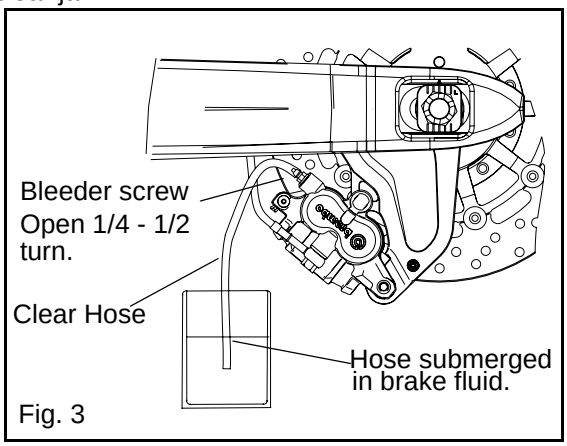
3. If bleeding is difficult, if master cylinder reservoir was low, or if system was drained, remove right footrest support and place master cylinder in a horizontal position to aid bleeding procedure.



NOTE: Remove rubber cap and connect a tight-fitting clear hose to the bleed screw of front caliper (A) or rear caliper (B).



4. Place a small quantity of fresh brake fluid into a small, clear jar.



5. Place the other end of bleeder hose into jar, making sure the end of hose is always submerged in brake fluid (Fig. 3).

NOTE: Keep the hose constantly submerged in brake fluid.

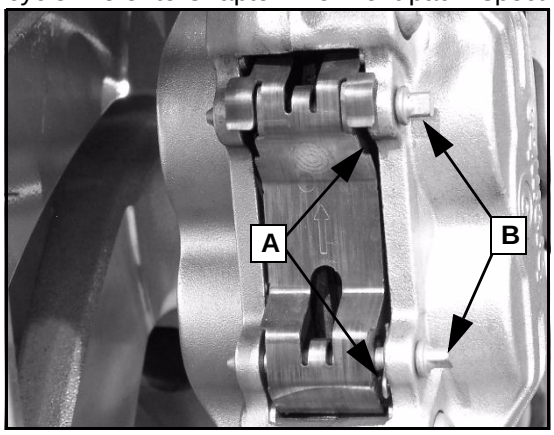
6. Apply light pressure to brake lever or pedal and hold. Do not release lever or pedal until bleeder screw is closed.
7. Open bleeder screw 1/4 to 1/2 turn until lever or pedal stops moving.
8. Close bleeder screw.
9. *Slowly* pump brake lever or pedal to build pressure. Again, hold light pressure.
10. Open bleeder screw 1/4 to 1/2 turn until lever or pedal stops moving.
11. Close bleeder screw.

NOTE: Monitor fluid level in reservoir. Add brake fluid as required during the bleeding procedure to keep fluid above the minimum level.

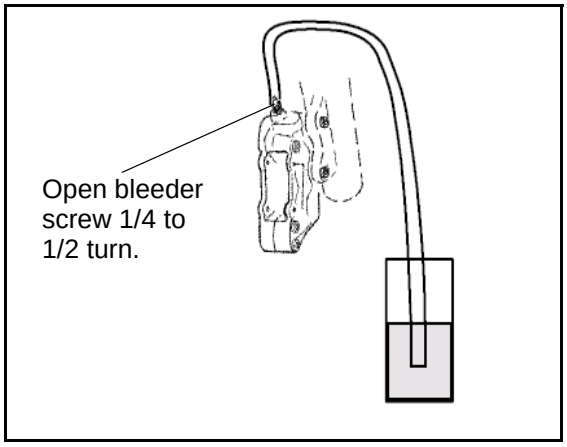
12. Repeat Steps 7-12 until a steady stream of air-free fluid is observed in the clear hose leading to the container.
13. When no more air is observed, close bleeder screw while brake lever or pedal is being applied.
14. **Torque bleeder screw to 9 Nm (75 lb-in)**.
15. Release brake lever or pedal and inspect the feel when pressure is applied. The lever or pedal should be firm. If it is spongy, repeat procedure.
16. If you are bleeding the front brake system, repeat the bleeding procedure on the other front caliper.
17. After completing the bleeding procedure, check to ensure master cylinder brake fluid level is correct.
18. Clean the reservoir cover, diaphragm, and sealing surface on the master cylinder. Install the cover.
19. Torque front reservoir cover screws to 1 Nm (9 lb-in). DO NOT OVERTIGHTEN THE SCREWS.

FRONT BRAKE PAD REPLACEMENT

NOTE: Always replace brake pads as a set. The front pads can be changed with the caliper installed on the motorcycle. Refer to Chapter 2 for front pad inspection,



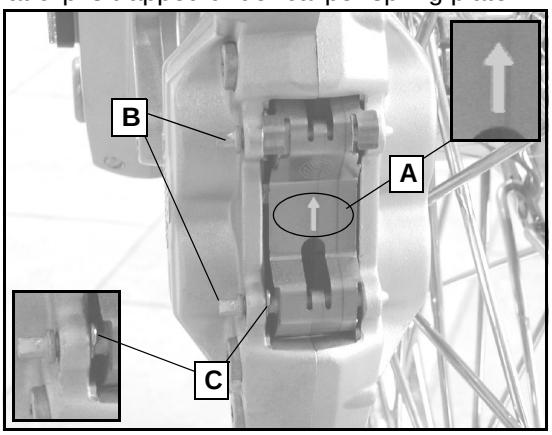
1. Remove retaining clips (A) from brake pins.
2. Remove brake pad pins (B).
3. Remove spring plate. Note arrow on spring plate points in the direction of normal disc rotation.
4. Lift brake pads up and out.
5. Place a bleeder hose on to the caliper bleed screw. Place the other end of the hose into a container.



6. Open the bleed screw and slowly push the caliper inward to pistons into their bores. Close the bleed screw when the pistons are fully retracted. Torque bleed screw to 8.5 Nm (75 lb-in).
7. Clean brake disc and brake caliper with brake cleaner.
8. Install new brake pads with friction material against disc.
9. Position spring plate onto caliper.

NOTE: The arrow (A) on spring plate points in brake disc direction of rotation.

10. Install brake pad pins (B).
11. Install brake pad pin clips (C). Rotate the top pin so that clip is trapped under caliper spring plate.



12. Remove cover from master cylinder and inspect fluid level. Adjust fluid level as required.

> **⚠ CAUTION**
>
> Always remove the cover from master cylinder to check fluid level after pad replacement. Do not overfill front or rear brake reservoirs. Too much fluid will not allow thermal expansion during operation, and brake drag may result.

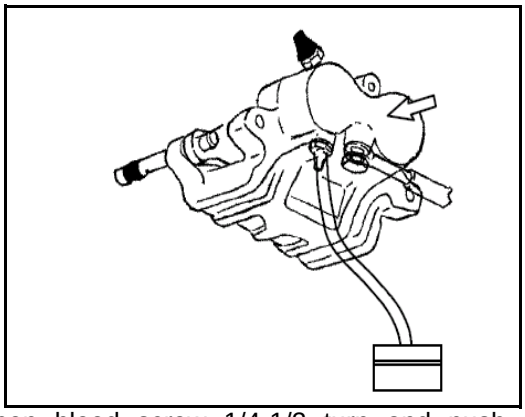
13. Operate brake lever several times until lever is firm and pressure can be felt. Bleed brakes if necessary.

> **⚠ WARNING**
>
> After pad installation or any brake system repair, safely elevate the wheel, apply and release the brake pedal or lever 2-3 times and release. Verify the wheel turns freely without drag. If brake drag is evident, do not operate the motorcycle. Inspect the vehicle to determine the cause and then repair as necessary.

REAR BRAKE PAD REPLACEMENT

NOTE: Always replace brake pads as a set. The rear pads can be changed with the caliper installed on the motorcycle. Refer to Chapter 2 for rear brake pad inspection.

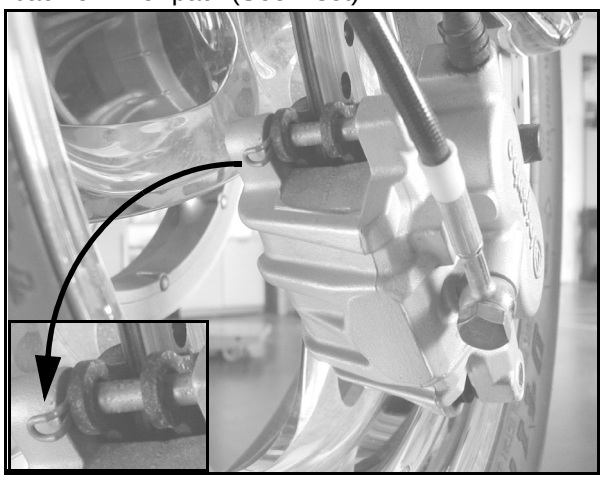
1. Place a hose on caliper bleed screw. Place other end of hose into a container.



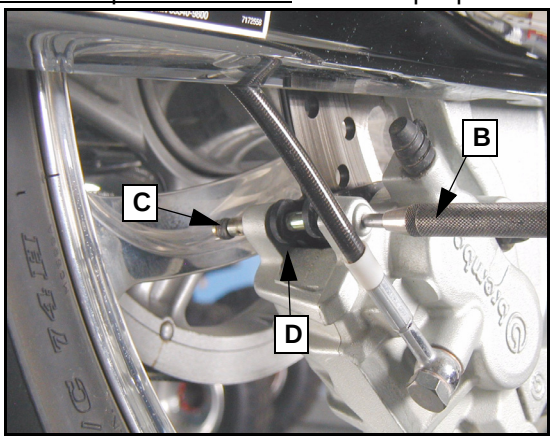
2. Open bleed screw 1/4-1/2 turn and push caliper toward wheel. Close bleed screw when pistons are fully retracted.

NOTE: The caliper should move freely on the mounting pins.

1. Remove the retaining clip (A) from the pin.
   NOTE: The pin is inserted between caliper body and back of inner pad. (See inset)



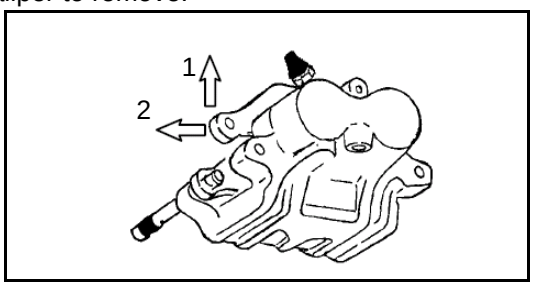
2. Use a 5/32" pin punch (B), drive brake pad pin (C) past outermost brake pad (D). Do not push pin out of innermost pad at this time. Remove pin punch.

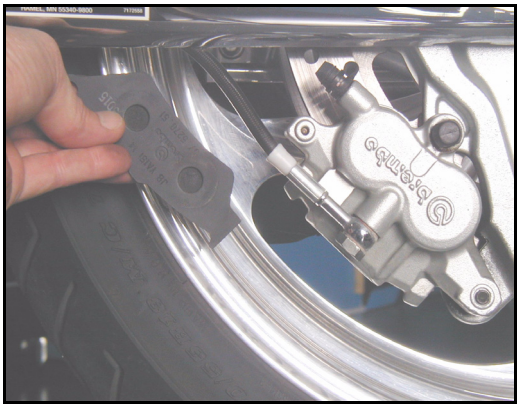


CAUTION

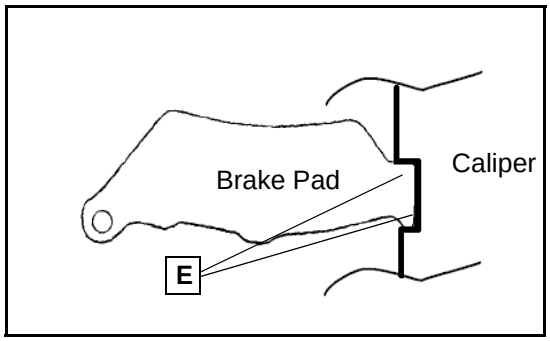
Replace one pad at a time to prevent the spring plate at the top of the pads from becoming dislodged.

3. Lift outer brake pad up, and pull it toward front of caliper to remove.





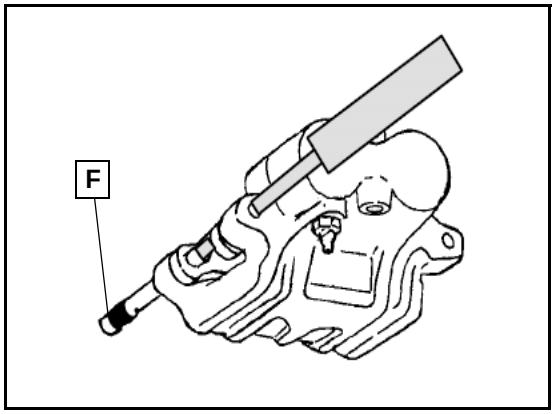
4. Clean brake disc and brake caliper with brake cleaner.
5. Install new outer brake pad with friction material toward brake disc.



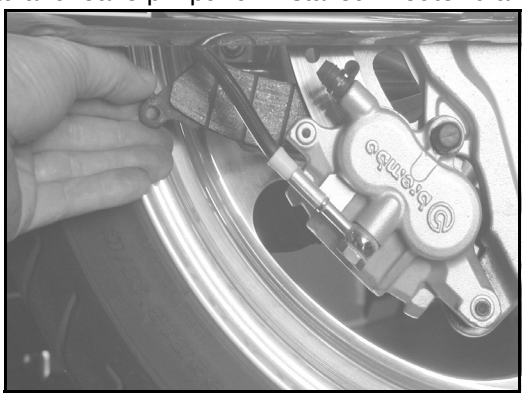
CAUTION

Make sure that the end of the brake pad (E) is correctly engaged in the caliper slot.

6. Install pin punch through caliper and through new outer pad, and drive brake pin (F) past inner brake pad.



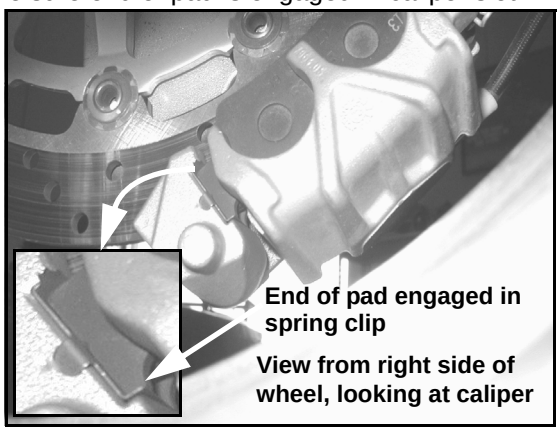
7. Pull pin punch back just enough to remove inner brake pad and leave pin punch installed in outer brake pad.



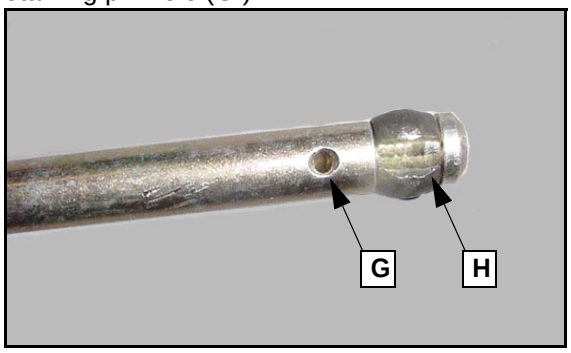
8. Install new inner brake pad with friction material toward disc.

NOTE: Spring clip may dislodge when removing pads. Be sure to replace spring clip in proper position if required (arrow on spring clip indicates normal brake disc rotation).

9. Be sure end of pad is engaged in caliper slot.



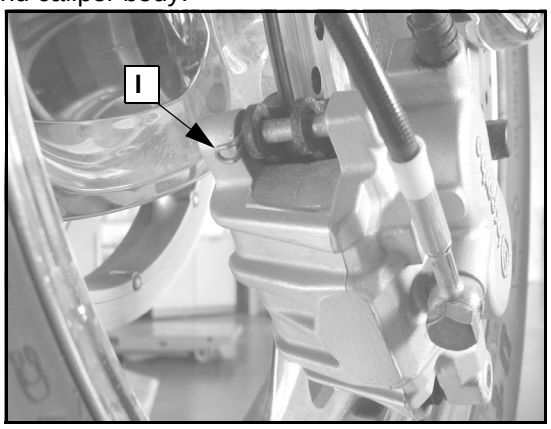
10. Install brake pad pin starting with the end opposite the retaining pin hole (G).



NOTE: Push down on the front edge of brake pads to align holes in pads with pin as you push pin through caliper.

11. The pin will stop when spring (H) contacts the caliper. Use a pin punch from the right side of the motorcycle to tap the pin fully into caliper until seated.

12. Install brake pad pin clip (I) between inner brake pad and caliper body.



13. Operate brake pedal several times until lever is firm and pressure can be felt, and to ensure the brakes are operating correctly.

14. Remove reservoir cover and inspect fluid level. Adjust fluid level as required.

⚠ CAUTION

Always remove the cover from master cylinder to check fluid level after pad replacement. Do not overfill front or rear brake reservoirs. Too much fluid may not allow thermal expansion during operation, and brake drag may result.

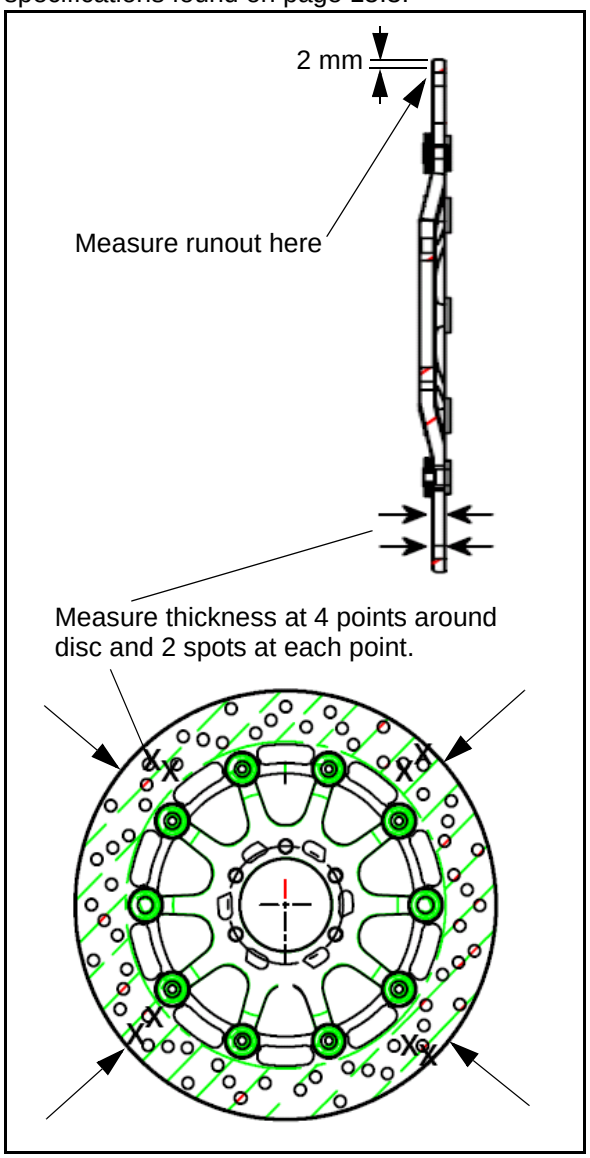
15. Bleed brake system if necessary (page 15.7).

⚠ WARNING

After pad installation or any brake system repair, safely elevate the wheel, apply and release the brake pedal or lever 2-3 times and release. Verify the wheel turns freely without drag. If brake drag is evident, do not operate the motorcycle. Inspect the vehicle to determine the cause and then repair as necessary.

BRAKE DISC INSPECTION (Front & Rear)

1. Visually inspect disc for cracks or damage.
2. Measure brake disc thickness in several locations around disc and along wear surface and compare to specifications found on page 15.3.



NOTE: Replace the brake disc if any measurement is worn beyond the service limit.

3. With disc mounted to wheel, inspect for brake disc runout / warpage and compare to specifications found on page 15.3. Runout should be measured 2mm in from outside edge of disc.

Excessive brake disc runout can be caused by several factors:

- Worn or damaged wheel bearings
- Loose axle nut or axle pinch bolts
- Foreign material between the disc and wheel hub
- Damaged wheel hub or brake disc

4. Replace the brake disc if the dial indicator reading displays excessive brake disc runout and other possible causes have been eliminated.
5. Refer to Chapter 12 for front brake disc removal and installation. Refer to Chapter 13 for rear brake disc removal & installation.

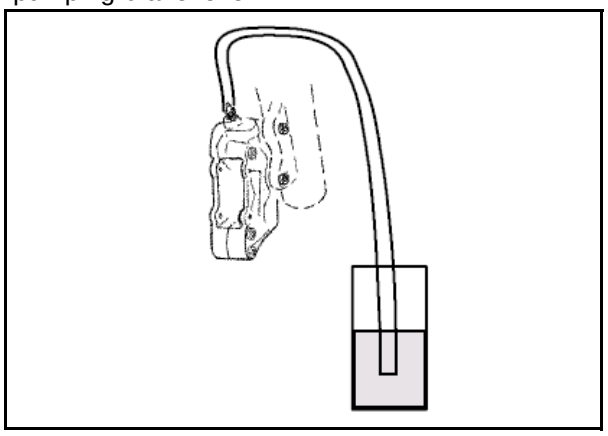
FRONT MASTER CYLINDER REMOVAL

CAUTION

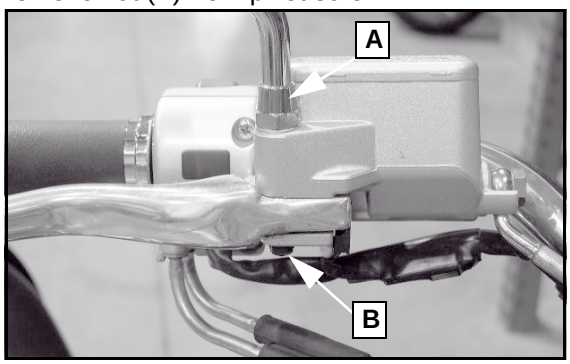
Brake fluid and some types of brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse area with a mild solution of soap and water until all traces of brake fluid are removed.

NOTE: The master cylinder is not serviceable.

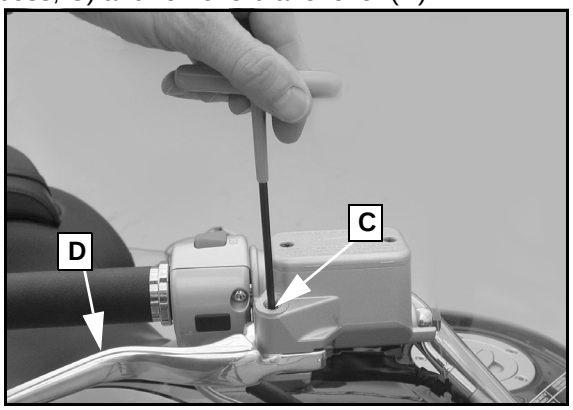
1. Attach a drain hose to caliper bleed screw and place the end in a suitable container. Drain brake fluid from the front brake system (left and right caliper) by slowly pumping brake lever.



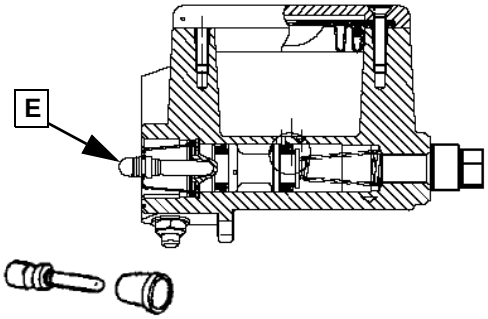
2. Remove right mirror (A).
3. Remove nut (B) from pivot screw.



4. Remove lever pivot screw (inside mirror mounting boss, C) and remove brake lever (D).

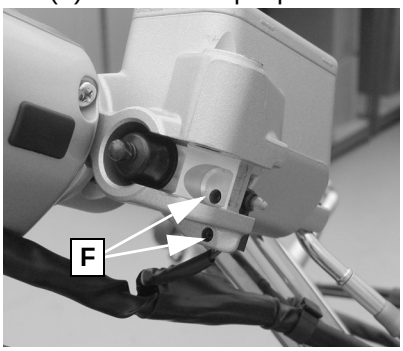


5. Remove push rod (E) from master cylinder.

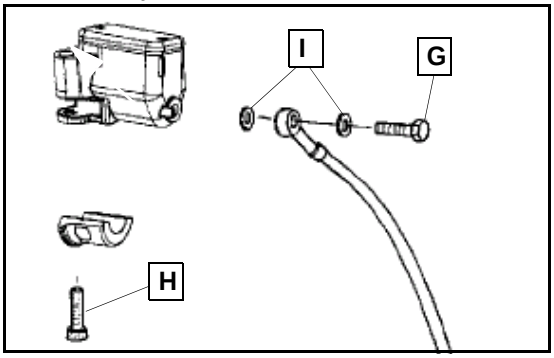


NOTE: Note orientation of pushrod, with large diameter end toward lever, and boot engaged in groove.

6. Remove front brake light switch by carefully tapping out the two (F) darts with a pin punch.



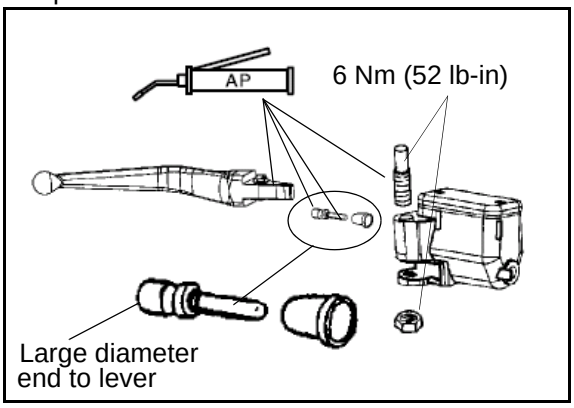
7. Remove banjo bolt (F), sealing washers (G) and brake hose from the master cylinder.
8. Remove master cylinder clamp screws (H), clamp, and master cylinder.



FRONT MASTER CYLINDER INSTALLATION

NOTE: Refer to torque specifications listed on page 15.4.

1. Clean the mounting surface on the handlebar.
2. Install master cylinder and clamp. Align parting line of clamp to dot on handlebar.



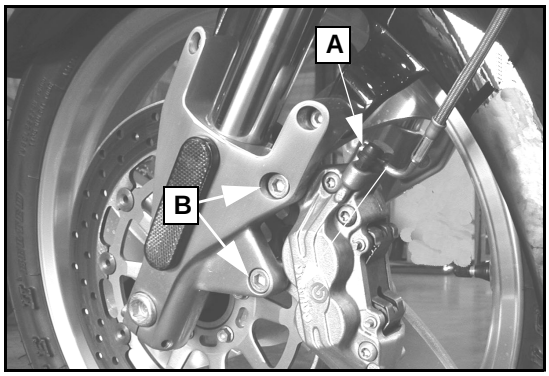
3. Torque rear bolt first (toward rider) then torque front bolt to 10 Nm (84 lb-in.).
4. Lightly grease both ends of push rod, lever pivot bolt, and lever.
5. Install push rod with large diameter toward lever, and engage dust seal in groove of pushrod.
6. Install front brake light switch.
7. Install brake lever and pivot bolt. Torque pivot bolt first, then nut to 6 Nm (52 lb-in).
8. Connect brake hose to master cylinder with banjo bolt and new sealing washers. Torque banjo bolt to 27-30 Nm (20-22 lb-ft).
9. Install mirror and adjust.
10. Fill and bleed the front hydraulic brake system.

FRONT CALIPER REMOVAL

⚠ CAUTION

Brake fluid and some types of brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed.

1. Remove banjo bolt (A), sealing washers, and brake hose from caliper assembly and allow it to drain into a container.



2. Remove front caliper mounting bolts (B) and remove the caliper.

FRONT CALIPER INSTALLATION

NOTE: Refer to torque specifications listed on page 15.3 and 15.4.

1. Clean mounting surfaces of caliper and fork leg.
2. Clean brake disc and caliper with Victory brake cleaner.

Victory Brake Cleaner PN 2872191

3. Separate brake pads and install caliper assembly over brake disc.
4. Install caliper mounting bolts.
5. Connect brake hose to caliper with banjo bolt and new sealing washers.
6. Fill and bleed the front brake hydraulic system (page 15.7).

⚠ WARNING

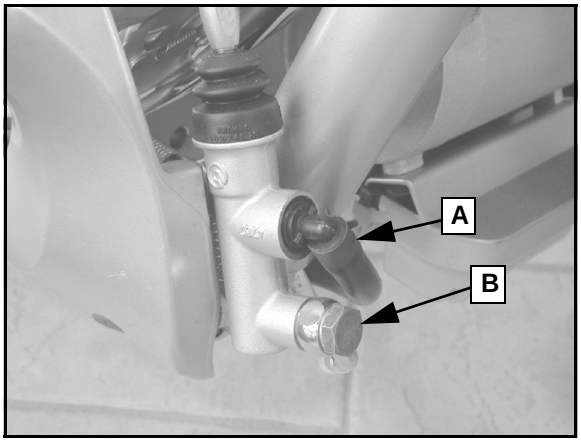
After pad installation or any brake system repair, safely elevate the wheel, apply and release the brake pedal or lever 2-3 times and release. Verify the wheel turns freely without drag. If brake drag is evident, do not operate the motorcycle. Inspect the vehicle to determine the cause and then repair as necessary

REAR MASTER CYLINDER REMOVAL

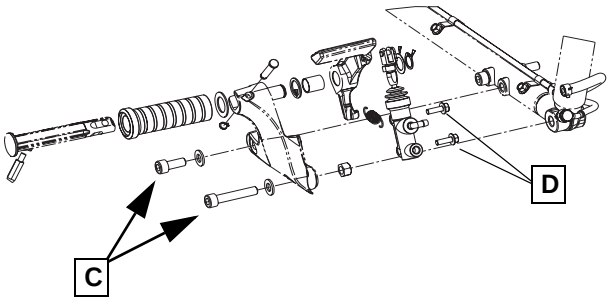
⚠ CAUTION

Brake fluid and some types of brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed.

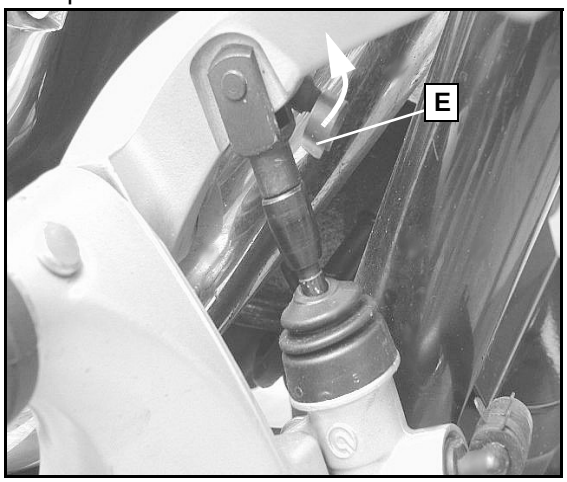
1. Remove clamp for reservoir hose at master cylinder (A) and disconnect fluid supply hose. Allow fluid to drain into a container.
2. Remove brake line banjo bolt (B), sealing washers and brake line.



3. Remove footpeg support screws (C).
4. Remove master cylinder from footpeg support by removing the two mounting screws (D).



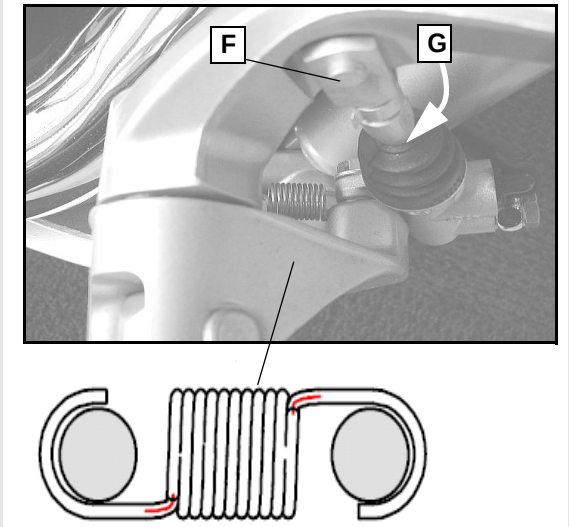
5. Open retaining clip (E) and disconnect pushrod from brake pedal.



REAR MASTER CYLINDER INSTALLATION

NOTE: Refer to torque specifications listed on page 15.5.

1. Install pushrod clevis onto brake pedal.



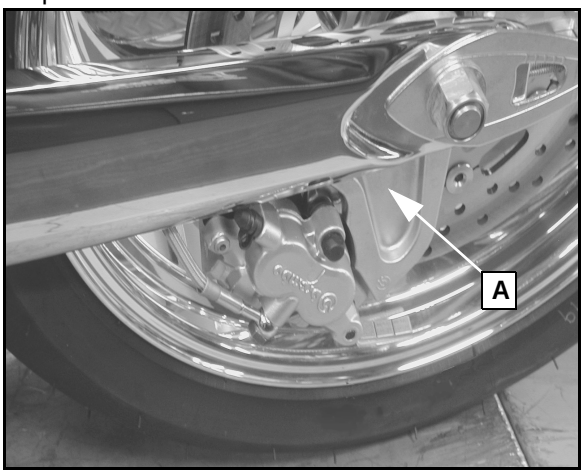
2. Install retainer pin (F) from inside to outside and push clip (G) onto pushrod.
3. Install pedal return spring.
4. Assemble master cylinder to support.
5. Install footrest assembly to frame.
6. Install reservoir hose to master cylinder inlet fitting and secure with clamp.
7. Connect brake line to master cylinder with banjo bolt and new sealing washers.
8. Fill and bleed rear brake system (page 15.7).
9. Inspect and adjust brake pedal freeplay (Chapter 2).

REAR CALIPER REMOVAL

⚠ CAUTION

Brake fluid and some types of brake cleaners will damage paint, plastics and some rubber compounds. Cover or remove plastic and painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately rinse the area with a mild solution of soap and water until all traces of brake fluid are removed.

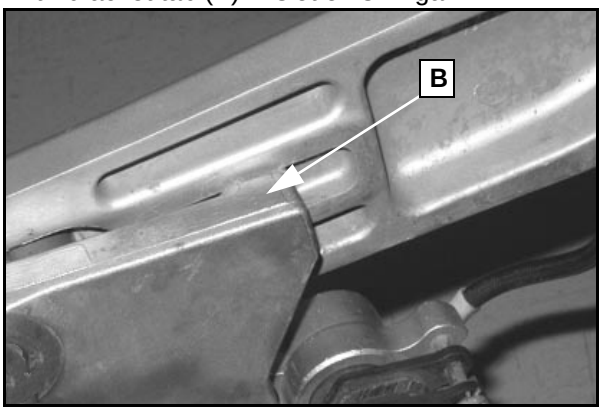
1. Remove banjo bolt and sealing washers from rear caliper and allow fluid to drain into a container.



2. Remove rear wheel (Chapter 13). Caliper and bracket (A) must be removed as an assembly.
3. Remove caliper and bracket assembly.

REAR CALIPER INSTALLATION

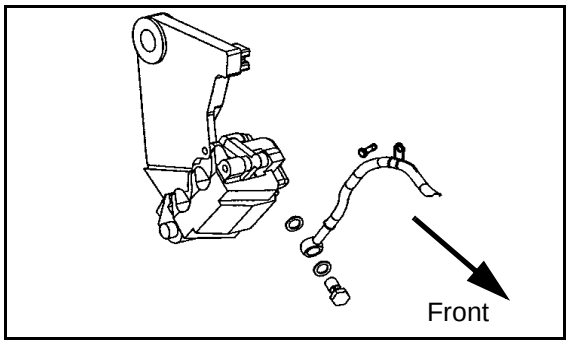
1. Position caliper and mount bracket onto swing arm, with bracket tab (B) in slot on swingarm.



2. Install rear wheel (Chapter 13).
3. Install brake hose, banjo bolt and new sealing washers. Orient banjo fitting inward toward caliper to provide clearance of brake line to swingarm.
4. Torque banjo bolt to 27-30 Nm (20-22 lb-ft.)
5. Fill and bleed the rear hydraulic brake system. Refer to page 15.7.

⚠ WARNING

After pad installation or any brake system repair, safely elevate the wheel, apply and release the brake pedal or lever 2-3 times and release. Verify the wheel turns freely without drag. If brake drag is evident, do not operate the motorcycle. Inspect the vehicle to determine the cause and then repair as necessary.



REAR BRAKE PEDAL REMOVAL

Refer to Chapter 2 to remove and install the brake pedal and adjust free play.

TROUBLESHOOTING

TROUBLESHOOTING

Problem	Symptom and/or Possible Cause	Possible Repair
Weak Brakes or Erratic Braking Action	Fluid Leakage (External) Fluid Leakage (Internal of Master Cylinder) Worn Pads Oil Contamination of Brake Pads and/or Brake Disc Air In System Low Brake Fluid Level In Reservoir Excessive Brake Disc Runout Worn or Damaged Wheel Bearings. Loose Front Axle Nut or Clamps Clogged or Restricted Hydraulic Line Caliper Mount Bent or Distorted Fork Oil Level Incorrect Loose Brake Disc Loose or Damaged Steering Bearings Brake Pads Glazed	Repair or Replace Leaking Component Replace Master Cylinder Replace Brake Pads Pads Must Be Replaced. Disc May Be Cleaned. Bleed Air From System Fill Reservoir, Bleed Brakes, Top Off Fluid Level. Replace Brake Disc. Replace Wheel Bearings. Torque Correctly, See Chapter 12 Replace Line(s) Replace Mount Set Level Correctly, See Chapter 12 Torque to Specification Adjust or Replace, See Chapter 12 Avoid Needless Heavy Braking For Initial 100 to 200 miles.
Poor Brakes or No Brakes When First Applied Brake Lever Pressure Present If Lever Is “Pumped”	Air In System Low Brake Fluid Level In Reservoir Brake Disc is Bent or Warped Caliper Misalignment External Leak Internal Leak (master cylinder) Faulty brake hose	Bleed Air From System Fill Reservoir, Bleed Brakes, Top Off Fluid Level. Replace Brake Disc Determine Cause and Correct Repair or Replace Damaged Component Replace Master Cylinder Inspect for bulges / replace
Brake Pedal or Brake Lever Pulsates	Brake Disc is Bent or Warped Mounting Surface of Brake Disc Uneven or Disc Is Loose Caliper Mount Surface Uneven Or Misaligned; Missing or Damaged Fasteners	Replace Brake Disc Repair or Replace as Necessary Repair or Replace as Necessary
Excessive lever or pedal travel.	Air in System Loose Mounting Hardware Low Brake Fluid Level In Reservoir Incorrect Brake Fluid Used	Bleed Air From System Repair as Necessary Fill Reservoir, Bleed Brakes, Top Off Fluid Level. Flush System and Replace With Correct Fluid
Fluid Leakage	Loose Banjo Fittings Damaged Banjo Fitting Sealing Washers Cracked Hose Worn Piston, Caliper or Seals Diaphragm leaking Fluid level too high (new brake pads installed without removing added fluid)	Tighten to Specified Torque Replace Replace Replace Master Cylinder or Wheel Caliper Replace diaphragm Correct fluid level

Problem	Symptom and/or Possible Cause	Possible Repair
Brakes Drag Excessively or Self-Apply (Brakes Over Heat)	Reservoir Over Filled	Adjust Level As Necessary
	Brake Pedal Or Lever Not Returning Completely To Rest Position	Inspect Linkage, Pivots and Mechanism For Cause Of Binding Or Restricted Movement; Measure Free Play
	Pushrod Installed Incorrectly	Check Installation Of Pushrod (Front Master Cylinder)
	Compensating Port Plugged	Replace master cylinder
	Internal Corrosion of Components (Master Cylinder / Caliper)	Replace Damaged Component
	Rear Caliper: Corrosion of Sliding Parts, Bent or Damaged Parts	Repair or Replace As Necessary
	Contaminated Brake Fluid	Flush System, Install Correct Fluid
	Rider Error (riding brakes)	Educate Operator
Brake Squeal/Squeak	If noise is minor and inconsistent, some Brake Squeak/Squeal is a characteristic of Disc Brakes.	Clean Dirt & Dust From Disc Surface and Pad Surface Periodically.
	Contaminated Brake Pad or Disc (not oil or grease)	Repair Disc Surface With Emery Cloth; Replace Pads
	Pad Not Secure in Caliper	Repair as Necessary
	Damaged Wheel Bearing(s)	Replace
	Worn Pads	Replace

NOTE: If it is determined that a problem exists within the internal workings of the brake master cylinder(s) or wheel caliper(s), replace the master cylinder(s) or wheel caliper(s) as an assembly.

CHAPTER 14
TIRES / WHEELS

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GENERAL / SAFETY

WARNINGS / PRECAUTIONS

WARNING

If a consumer wishes to replace the Original Equipment Manufacturer (OEM) tires with another brand of tire, Victory recommends contacting the tech-line department of the tire manufacturer being considered to ensure compatibility. Victory makes no other recommendation other than the OEM tires. Tires other than OEM may or may not adversely affect the handling characteristics of the motorcycle or may not have adequate clearance between tire and various parts of the motorcycle.

WARNING

Victory motorcycles are produced using the designated tires listed as original equipment. This includes field testing to ensure stability and superior handling. The use of tires other than original equipment may cause instability which can lead to a crash resulting in serious injury or death. Use only the recommended tires inflated to the recommended tire pressures.

Operating the motorcycle with damaged rims creates a safety hazard including air pressure loss, steering imbalance and/or reduced steering control. Do not attempt to repair or straighten damaged rims.

The use of tire valves and valve cores other than original equipment replacement Victory parts could cause tire deflation during driving. Always use genuine Victory parts or their equivalent. Be certain to install the valve stem caps securely. Do not allow the motorcycle to be ridden without properly installed valve stem caps.

WARNING

Do not attempt to repair tires that have:

- Punctures with a diameter of greater than 6mm (0.240").
- Cuts with a length of greater than 6mm (0.240").
- Any punctures or cuts on the sidewall of the tire.
- Tread depth of less than 1.6mm (.063") for the front tire.
- Tread depth of less than 1.6mm (.063") for the rear tire.
- Ply separation
- Tread separation
- Severe tread cupping.
- Cuts, gouges or scratches on the sealing surface of the bead.
- Flat spots on the tread.
- Bubbles, separation or any unusual damage to the inner liner of the tire.
- Chemical sealants or balance additives added to the tire.

WARNING

All repairs must be made from inside the tire. Victory recommends the use of “head-type” plugs such as: Tech *Tire Repair™* Uni-Seals. Complete Tech *Tire Repair™* kits are commonly available at most automotive parts outlets.

WARNING

No form of temporary repair should ever be attempted. Secondary damage caused by a penetrating object may not be detected and tire or tube deflation may occur at a later date.

⚠ WARNING

It is dangerous to ride with a worn tire. When a tire reaches the minimum tread depth listed below, replace the tire immediately.

FRONT TIRE MINIMUM TREAD DEPTH	REAR TIRE MINIMUM TREAD DEPTH
1.6 mm (.063") (1/16 inch)	1.6 mm (.063") (1/16 inch)

⚠ CAUTION

Two of the biggest factors contributing to premature tire wear are overloading and under-inflation. Do not deviate from the specifications for loading or inflation.

TIRE DATA

TIRE PRESSURE / LOADING

Refer to Chapter 2 or to the decal on the motorcycle for tire pressure and loading information.

WHEEL DATA

WHEEL SPECIFICATIONS

Item		Standard	Service Limit
Front Wheel			
Front Wheel Size (Kingpin)		3.00 x 18	-
Front Wheel Size (Vegas)		2.15 x 21	-
Front Wheel Runout	Cast or Billet: Axial	.50 mm (.020")	2.0 mm (.080")
	Cast or Billet: Radial	.50 mm (.020")	2.0 mm (.080")
	40 Spoke: Axial	1.00 mm (.040")	2.0 mm (.080")
	40 Spoke: Radial	.80 mm (.032")	2.0 mm (.080")
Rear Wheel			
Rear Wheel Size		8.50 x 18	-
Rear Wheel Runout (Cast & Billet)	Axial	.80 mm (.032″)	2.0 mm (.080")
	Radial	.80 mm (.032″)	2.0 mm (.080")
Rear Wheel Runout (40 Spoke Laced)	Axial	1.00 mm (.040″)	2.0 mm (.080")
	Radial	.80 mm (.032″)	2.0 mm (.080")

SPECIAL TOOLS

SPECIAL TOOLS

Rim Protectors: PV-43536

Tire Irons (for manual tire changing): Commercially available

TIRE INSPECTION

TIRE WEAR PATTERNS & GENERAL CAUSES

WEAR PATTERNS AND GENERAL CAUSES	
SYMPTOM	**CAUSE**
Wear on Left Side	Riding on Crowned Roads
Edges Worn	Underinflation or Excessive Loads
Excess Wear in the Middle of Tire	Over-inflation or Tire Abuse
Cracks in Tread Grooves	Underinflation, Excessive Loads, Suspension Bottoming
Tread Block Cupping (Usually Front Tire -See Below)	Normal Braking Wear

OZONE CRACKING

Ozone cracking usually shows up on the sidewalls of tires and is caused by sunlight, electric motor emissions, smog, or other environmental factors. Ozone cracking does not pose a problem unless the cracks reach the cords. If this occurs, moisture may penetrate the carcass of the tire causing cord separation. Tires showing signs of severe ozone cracking (cords visible at the bottom of the cracks) must be replaced.

FRONT TIRE CUPPING

Front of tread block worn more than rear of tread block:

- The cupping of front tires is somewhat normal.
- Rear tires are subjected to forces in both directions. The forces of braking and acceleration result in even tire wear.
- Front tires are subjected only to the forces of braking. When the brakes are applied, tire deflection is increased and wear occurs in only one direction.
- Incorrect tire pressure is the number one cause of excessive tire cupping. Too little tire pressure causes the tire to over-deflect which increases the amount of scrubbing and causes more tire cupping.
- Binding or improperly assembled front forks can also contribute to excessive tire cupping. If the front forks do not react as they should the tire acts as the sole suspension component and tread deflection increases.

TIRE CHANGING

GENERAL

There are three generally acceptable methods to dismount and mount a tubeless motorcycle tire from its rim. Furthermore, there are countless variations for each of the three methods.

The three general methods are:

- Pneumatic or electrically operated tire machine.
- Manually operated tire machine.
- Manual manipulation of tire irons.

The seal between the tire and its rim is one of the most critical factors contributing to the safe operation of the wheel/tire assembly. Each of the three generally acceptable methods to dismount and mount tires is permissible and recommended by Victory. However, careless or improper work habits can damage both the tire and rim regardless of which method is used.

The pneumatic or electrically operated tire machine is preferred as it is the most efficient method to dismount and mount tires. It is also the most expensive way to change tires.

The manually operated tire machine is the next preferred method to dismount and mount tires. It can be just as efficient as a power assisted tire machine. With some types of manually operated tire machines, it will be necessary to remove the belt driven sprocket to gain sufficient clearance for tire removal.

Manual manipulation of tire irons is the least preferred method of tire dismounting and mounting. It will not generally deliver the same efficiency as the other two methods and greater care needs to be taken when performing the operation. Use care not to damage or stress the tire bead when using tire irons. Be sure opposite bead is in drop center of wheel when mounting and dismounting the tire.

Be very careful not to damage the rim, tire, inner tube, brake disk or sprocket regardless of which method is used.

The following method describes the procedure using manually manipulated tire irons. Other than the actual operation of various tools, the general concept is the same regardless of which method is used.

The following procedure shows the front tire being removed from its rim. Other than the possibility of interference of the sprocket, the procedure is the same for the rear tire.

NOTE: Rear sprocket bolts and brake rotor bolts have a pre-applied locking agent and bolts should either be replaced or a locking agent applied upon assembly. Refer to Chapter 11 for rear sprocket removal and installation. Refer to Chapter 13 for rear brake rotor removal and installation. Brake rotor bolts should not be re-used.

TIRE REMOVAL

TIRE REMOVAL (TYPICAL)

1. Remove wheel / tire assembly from motorcycle (front refer to Chapter 12, rear refer to Chapter 13).

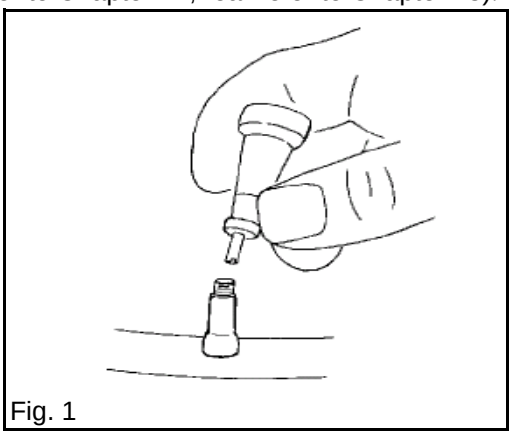


Fig. 1

2. Remove valve core from valve stem and let all air escape. (Fig. 1)

> **⚠ CAUTION**
>
> If the tires have a directional arrow it must be observed and the tire installed correctly.

3. Mount the wheel assembly into a tire bead breaker and break the bead. (Fig. 2)

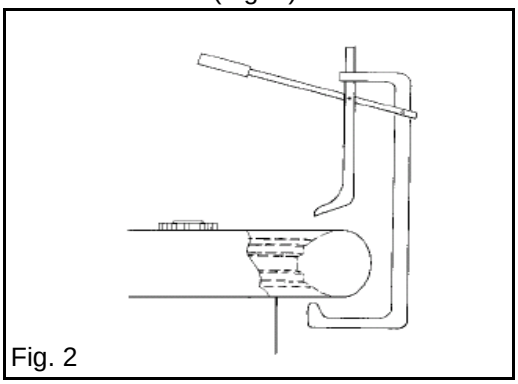


Fig. 2

4. Flip the wheel assembly over and break the bead on the other side.

> **⚠ CAUTION**
>
> **IMPORTANT**: Take great care not to bend or otherwise damage the brake disc and/or belt driven sprocket. If the bead breaker being used interferes with either the brake disk and/or belt driven sprocket, remove the disc or sprocket as required.

NOTE: This procedure can be performed on an empty 30 gallon drum with the top cut out. The top lip of the drum should be covered with a split rubber hose to protect the rim. (Fig. 3)

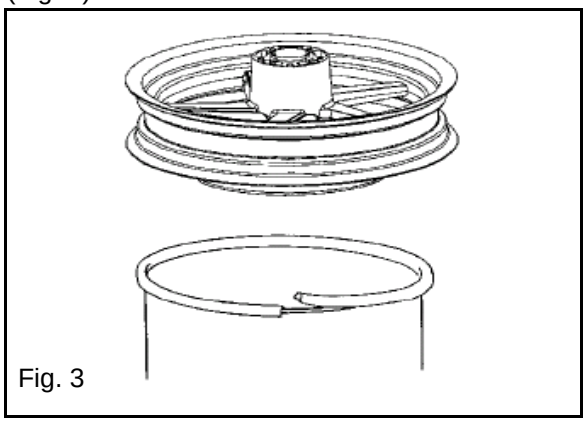


Fig. 3

5. Position the wheel assembly so that the brake disc will not be damaged and the rim will not be scratched.

6. Push tire down and lubricate tire sealing edge (bead) with tire lubricant on both sides of tire. (Fig. 4)

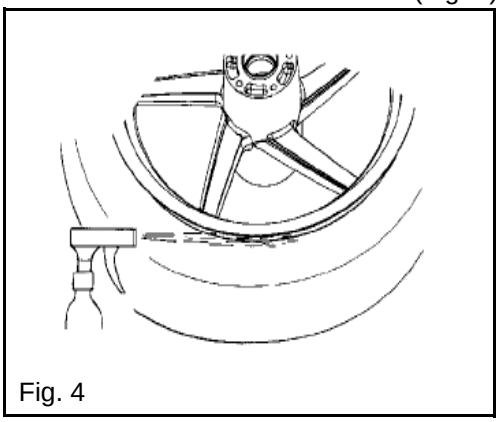


Fig. 4

7. Install rim protectors. (Fig. 5)

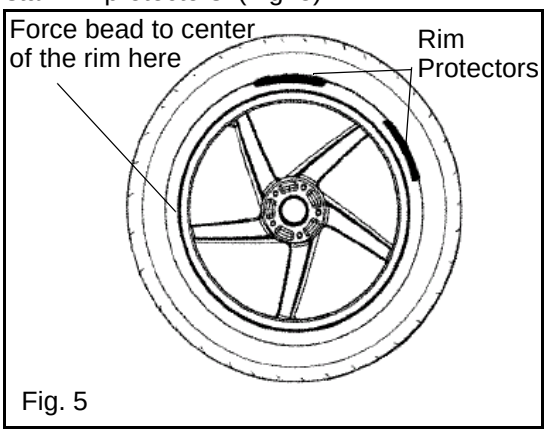


Fig. 5

Rim protectors PV-43536

8. Stand opposite of the rim protectors and use your knee to push a portion of the tire down into the rim's drop center while pulling the bottom bead up into the rim's drop center. For purposes of this procedure, the rim protector directly opposite you is now labeled the "12 o'clock" rim protector. (Fig. 6)

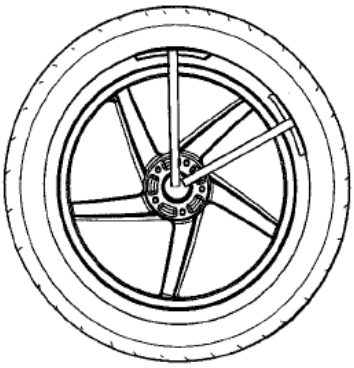


Fig. 6

9. While keeping both beads in the rim's drop center, slide a tire iron between the tire bead and the 12 o'clock rim protector.
10. Using your other hand, slide a tire iron between the tire bead and the 2 o'clock rim protector.
11. Lever the 12 o'clock tire iron up and over (about 160^{O}) and keep it positioned there.
12. Lever the 2 o'clock tire iron up and over.
13. Leave the 12 o'clock tire iron in place and levered over. Remove the 2 o'clock tire iron and slide it between the tire and rim protector at the 4 o'clock position.

IMPORTANT: The top and bottom tire beads must continually be pushed into the drop center of the wheel during the entire removal process.

14. Continue going around the tire until one side of the tire is off the rim.
15. Turn the tire and wheel assembly over on the drum, so the removed bead is on the bottom side.

TUBE TYPE TIRES:

Remove valve stem nut, push stem through rim.

Remove tube and inspect tube carefully for signs of abrasion or other damage.

Replace tube and rim band whenever a tire is removed.

16. Push the tire away from you so the remaining bead is in the drop center of the rim.
17. Lubricate the bead and start it over the rim with a tire iron.
18. In most cases the tire can be forced off of the rim by hand. Continue to work around the tire until the tire is completely dismounted.

WHEEL INSPECTION

VISUAL INSPECTION & RUNOUT

1. Refer to chapter 12 for complete front wheel inspection procedures.
2. Refer to chapter 13 for complete rear wheel inspection procedures.
3. Clean the rim of all rubber particles and corrosion.

⚠ WARNING

If any of the following problems are discovered, replace the wheel.

4. Inspect the wheel for cracks and/or distortion.
5. Inspect the bead seating area of scratches, gouges, distortion or any damage that could create a sealing problem.
6. Inspect the wheel for axial runout, measured on a smooth surface on the outer edge of wheel as shown in Fig. 7 (A).
7. Measure wheel for radial runout (Fig. 7, B)

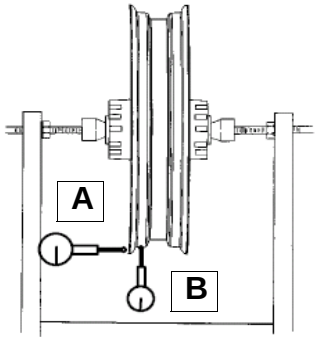


Fig. 7

NOTE: Measure radial runout on the tire bead sealing surface of wheel as shown. Be sure surface is clean before measuring

8. Compare measurements of axial and radial runout to specifications listed on page 14.3. Replace wheel if any measurement exceeds Service Limit. Cast or Billet wheels cannot be straightened.

9. Clean the sealing surfaces of the rim thoroughly. Use a soft brush (nylon) soap and water if necessary.

> **⚠ WARNING**
>
> Do not scratch or damage the sealing surfaces of the rim. The tire could fail to seal properly and an air leak would be the result. Loss of air pressure can cause a loss of control and an accident, resulting in serious injury or death.

TIRE REPAIR PRECAUTIONS

> **⚠ WARNING**
>
> Only permanent plug-patch repairs of small tread area punctures from **inside** the unmounted tire are recommended. Never perform an exterior repair and never use an inner tube as a substitute for a proper repair. Speed should not exceed 50 MPH for the first 24 hours after repair and the repaired tire should never be used over 80 MPH. Inspect inflation pressure after the tire cools for at least three hours following initial operation.

VALVE STEM

TIRE VALVE INSPECTION

1. Inspect valve core. Replace if seal is worn, deformed or otherwise damaged. (Fig 8 & 9)
2. Inspect tire valve for visible damage, replace if necessary.

NOTE: If tire is being replaced due to normal wear, replace valve stem also.

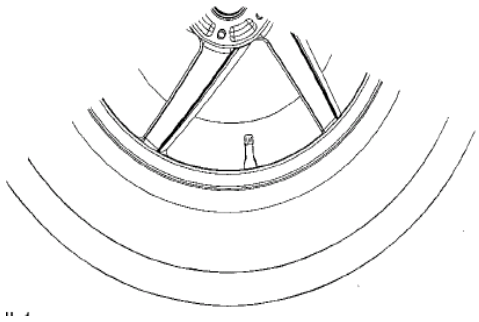


Fig. 8

TIRE VALVE INSTALLATION

1. Remove tire from wheel.

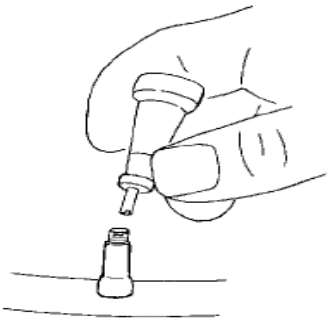


Fig. 9

2. Clean tire valve hole and area around the valve hole thoroughly.
3. Lubricate tire valve and tire valve hole with rubber lubricant.
4. Place tire valve into hole from tire side of the rim with valve core facing the wheel hub.
5. Screw a tire valve installation tool onto tire valve. (A, Fig. 10)

Tire valve installation tool: Commercially available

6. Place a small wood block against the rim to improve leverage point. (Fig. 10)
7. Lever tire valve into place. Be sure it is fully seated.

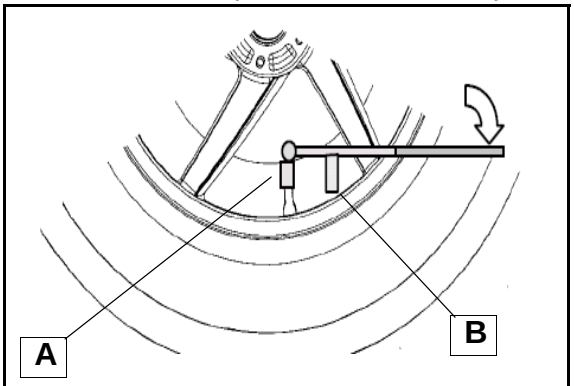


Fig. 10

8. Remove tire valve tool.

TIRE INSTALLATION

TIRE MOUNTING

1. Lubricate both tire beads with rubber lubricant. (Fig. 11).

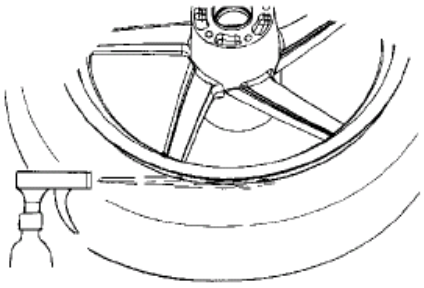


Fig. 11

⚠ WARNING

Never apply grease, oil, gasoline, spray type lubricants or anything other than rubber lubricant or a neutral soap and water solution to the tire bead. Doing so can damage the tire.

Balance Dots

Dunlop tires have a yellow dot on the sidewall which corresponds to the lightest part of the tire. This dot is meant to line-up with the tire valve which often is the heaviest part of the rim (although this is not always the case).

⚠ WARNING

Victory does not recommend the use of liquid balancer/ sealers. These are a form of temporary repair which may adversely affect ply material and mask secondary damage caused by the penetrating object. Reliance upon sealants can result in sudden tire failure and accident.

Directional Arrows

If tires have directional arrows, they must be observed and tires installed correctly. When tires are manufactured, tread rubber is laid down as a strip and its ends connect as overlapping joints. When the tire is mounted correctly the scrubbing forces of acceleration (rear) or braking (front) press the lap joints together rather than try to separate the joint.

The wheel assemblies must be free of foreign debris that would affect balancing.

Carefully inspect the wheel bearings, seals and axle for damage or corrosion.

Ensure that bead is correctly seated.

TUBE TYPE TIRES:
Install new rim band (rim flap) on rim with hole oriented over valve stem hole in rim.

1. Place tire on drum.

⚠ CAUTION

Support tire assembly in such a way that brake disk or belt drive sprocket will not be damaged.

2. Lubricate the bead.
3. Orient tire correctly as to the balance dot and directional arrow.
4. Push tire on to rim until one bead is installed. It shouldn't be necessary to use tire irons to put one side of the tire onto the rim. Remember to keep bead(s) in the drop center of the wheel whenever possible.
5. Turn the tire / wheel over on the drum so the uninstalled portion of tire is facing up.

NOTE: Confirm tire is positioned correctly by observing directional arrows. (Fig. 12)

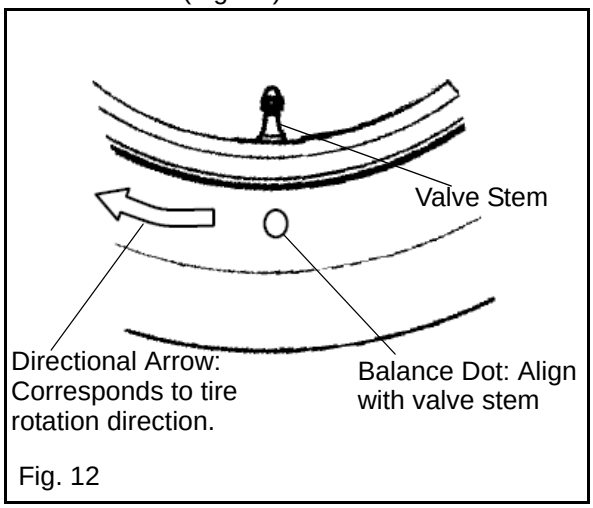


Fig. 12

6. For tube type tires, also observe the following:

TUBE TYPE TIRES:
Apply baby powder to new tube and install by inserting valve stem through rim band and rim.

Tube must be completely deflated at this time.

Install the valve stem lock nut a few threads. Do not tighten the lock nut at this time.

Install tube in tire starting at valve stem and working your way around until entire tube is laying inside the tire in a natural position.

Arrange the tube if necessary to eliminate kinks or bends, and be sure the valve stem projects straight out. The stem should form a 90 degree angle with the rim.

Finger tighten lock nut to hold stem in position.

⚠ CAUTION

Make sure your tire irons are smooth and free of scratches or any sharp edges. Polish them if necessary. Do not slide the tire iron in any more than is necessary. When installing tube type tires, avoid lifting the tire iron past vertical to minimize the chance of pinching the tube.

7. Lubricate the tire bead.
8. With your hands, push as much of the remaining tire bead as possible into the rim, pinching both upper and lower beads into the drop center.
9. When no more of tire can be installed by hand, press down on portion of tire in front of you with your knee to keep the top bead in the drop center.
10. Carefully slide a tire iron between the rim and tire at the other side of the un-installed portion of the tire.

NOTE: Be sure both beads are forced as far as possible into the drop center of the rim.

11. Lever the tire iron over and install that portion of tire. Continue to move tire iron in small increments until tire is completely installed.
12. Install valve core if it was removed.
13. Line up balance dot.
14. Confirm that the directional arrows are pointing in the correct direction.
15. Bounce tire on the floor several times while rotating tire. This will expand tire bead outward slightly which will make tire inflation easier. (Fig. 13)

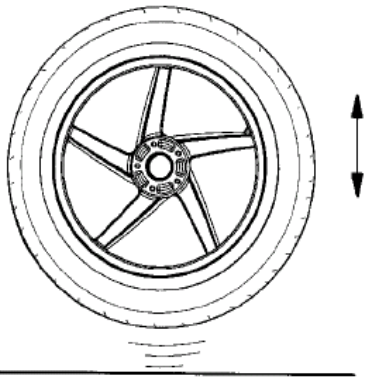
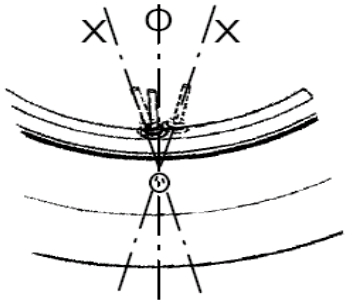


Fig. 13

16. Inflate tire observing the precautions listed below and on page 14.10.

TIRE INFLATION & PRECAUTIONS

- Wear approved eye protection
- Lubricate the tire beads with a tire mounting lubricant before inflation.
- Before inflating a tube type tire, check to be sure valve stem is still straight. If not, rotate tire slightly on rim (in the direction the stem is pointing) to align (Fig. 14).



Valve Stem Alignment (Tube Tires)
Fig. 14

- Lock assembly on mounting machine or place in safety cage before inflating to seat beads
- Use extension gauge and hose with slip-on air chuck.
- Stand back with no part of your body within the perimeter of the assembled tire and rim.
- Inflate with core in valve stem
- Never inflate above 42 psi to seat beads
- If beads do not seat by 42 psi. Deflate and repeat procedures. Never use a volatile substance or rubber “donut” to aid bead seating.

1. Inspect the line molded onto the tire side walls. It must be the same distance from the rim all the way around the tire. If the distance varies it indicates that tire is not seated properly. (Fig. 15)

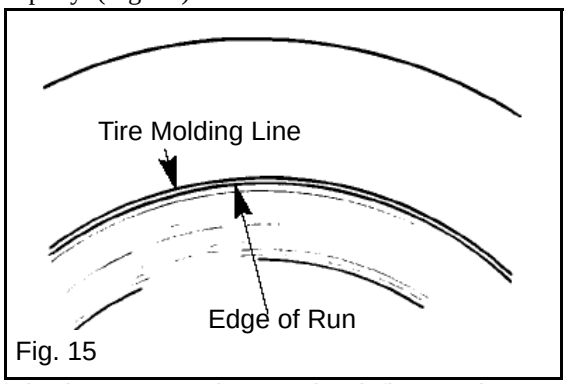


Fig. 15

2. If tire is not seated correctly, deflate and unseat the tire, relubricate the tire beads and repeat inflation procedure.
3. Install wheel assembly onto balance stand and spin. Observe the wheel assembly while it is spinning to make sure the tire is seated properly.
4. Adjust tire pressures to specifications.
5. Balance tire / wheel assembly. Refer to page 14.11.

⚠ WARNING

FOR REPAIRED TIRES: Speed should not exceed 50 MPH for the first 24 hours after repair and repaired tire should never be used over 80 MPH. Inspect inflation pressure after tire cools for at least three hours following run-in.

FOR NEW TIRES: Replacement of OEM tires or replacement with differently constructed tires will not immediately produce improved reactions the same as the original tires when new. When new tires are installed, they should not be subjected to maximum power or hard cornering until a reasonable "scrub" period of approximately 100 miles has been covered. This will permit the rider to become accustomed to "feel" of new tires or tire combination, and achieve optimum road grip.

Inspect and adjust tire inflation pressure after tire cools down for at least three hours following "run-in".

TIRE BALANCING

TIRE BALANCING

⚠ WARNING

It is essential that the wheel assembly be balanced before use and rebalanced each time the tire is removed.

Wheel balance affects stability, handling and overall safety of the motorcycle.

All Dunlop street tires should be installed with the yellow balance dot at the tire valve.

The use of liquid balancer/sealer is not recommended.

This procedure will outline balancing wheel assembly in a gravity balance stand. If a pendulum or spin type balancer is being used, reference the manufacturer's instructions that came with the equipment.

1. Mount wheel assembly in a balance stand.

Typical Balance Stand (Commercially available) (Fig. 16)

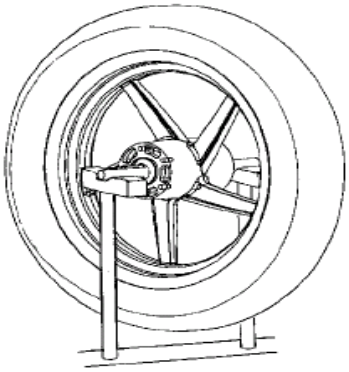


Fig. 16

2. Remove all balance weights. Clean tire and rim thoroughly.

NOTE: While it is possible to balance a wheel assembly with axle and grease-free wheel bearings as the pivot point, it is not recommended. Use an inspection stand that has knife edge bearings and its own axle.

3. Spin the wheel assembly. Allow it to stop on its own and mark the highest (lightest) part of the wheel.

4. Repeat the spinning process to verify the heaviest part of the wheel. (Fig. 17)

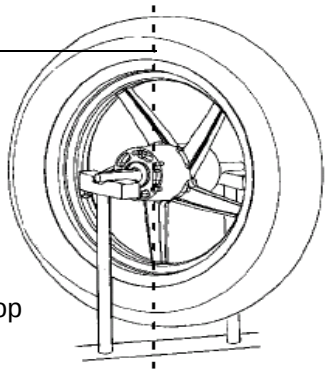


Fig. 17

NOTE: If the bearings are totally free to rotate and the wheel does not stop in the same place each time, the wheel is in balance.

5. Place balance weights at the lightest portion of wheel in small increments. (Fig. 18)

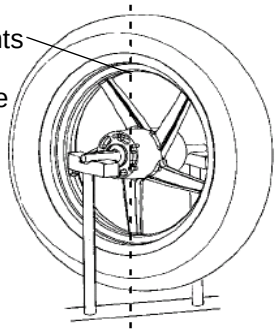


Fig. 18

6. After each addition of weight, spin the wheel assembly and allow it to stop by itself.
7. When correct amount of weight has been added to wheel, it will no longer stop in the same location and the wheel assembly is balanced.
8. Install wheel / tire assembly tire on motorcycle.

Front wheel installation: Chapter 12

Rear wheel installation: Chapter 13

⚠ CAUTION

Do not add more than 85 grams (3.0 oz.) of weight to the rear wheel.

Do not add more than 85 grams (3.0 oz.) of weight to the front wheel

If more than the recommended weight is necessary to balance the wheel, dismount the tire and rotate it 90° without regard to the yellow balance dot, and re-balance the wheel / tire.

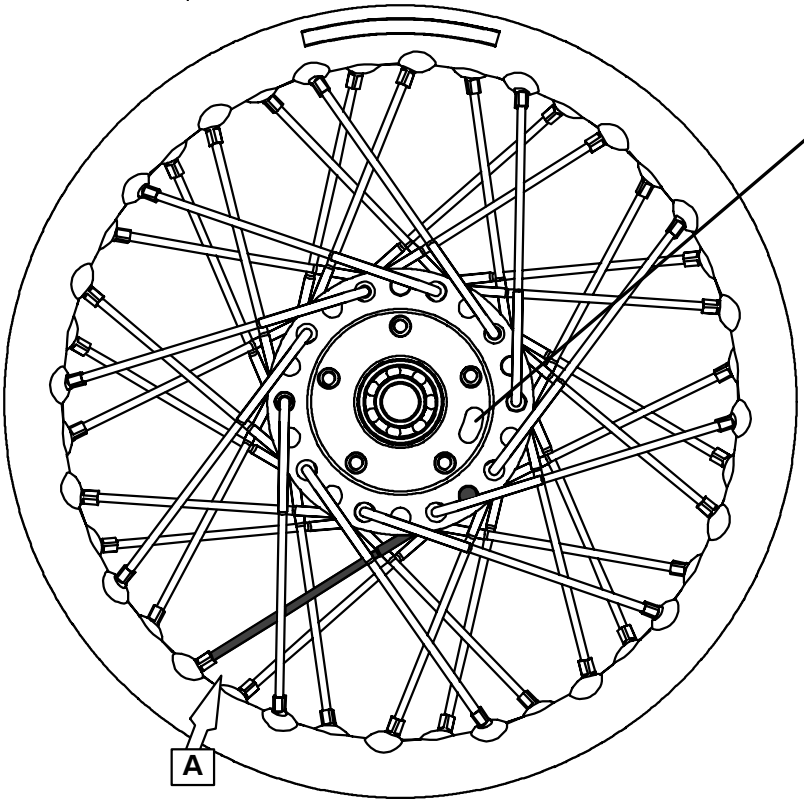
Adhesive Weight P/N 1520253

LACED WHEELS

WHEEL LACING (TYPICAL)

FRONT WHEEL
VIEW FROM LEFT (DISC) SIDE

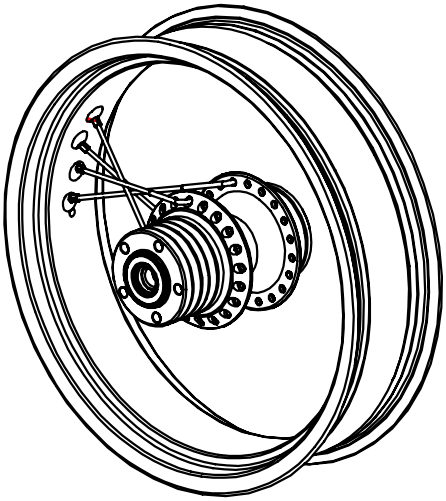
DIRECTION OF FORWARD ROTATION

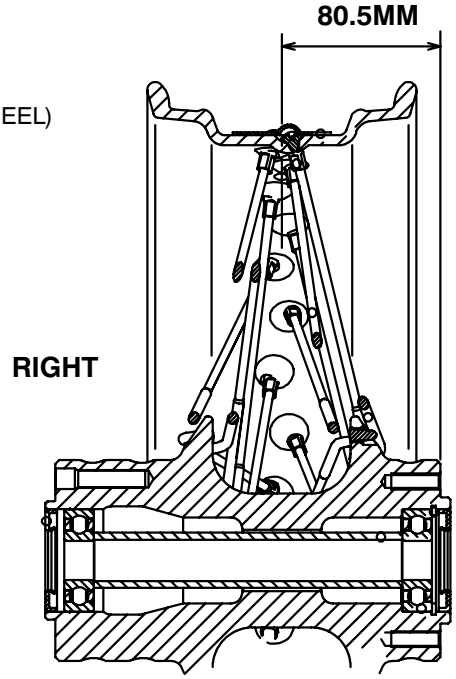


MARKING:
(IN DRIVING DIRECTION)
RIGHT = DRIVE SIDE
LEFT = BRAKE SIDE

OFFSET (FRONT AND REAR)
ALWAYS MEASURE AND RECORD OFFSET **BEFORE** DISASSEMBLY (FROM RIM CENTER TO DISC MOUNTING SURFACE) Refer to page 14.16 for more information.

A VALVE STEM LOCATION (ON RIGHT SIDE OF WHEEL)





VIEW FROM FRONT

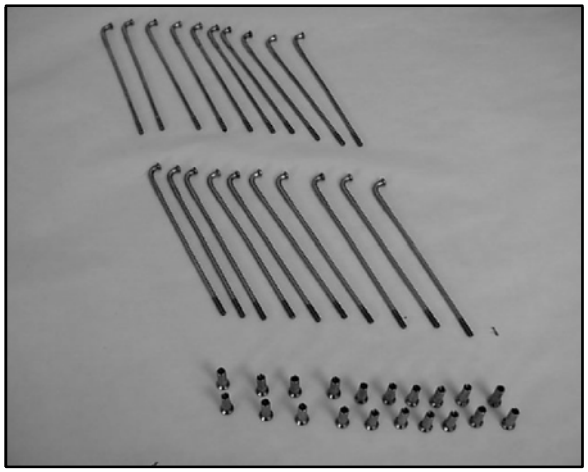
WHEEL LACING (CONT.)

1. Select matching components and organize your spokes carefully.

   Use a properly laced wheel as an example of the spoke pattern.

   Layout 20 inside spokes and nipples in an organized fashion.

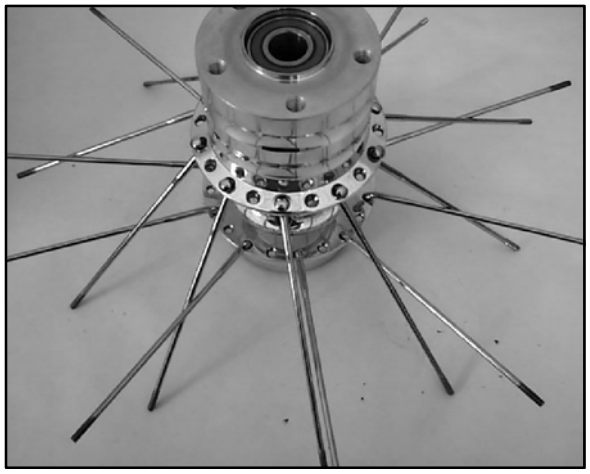
   Lubricate spoke nipples with light lubricant.



2. Insert all inside spokes in the hub.

   Install the remaining inner spokes on both hub flanges skipping every other hub flange hole.

   Opposite flange inside spokes begin in the hole just to the right.



3. Lay rim in position with valve stem hole oriented to the right side as wheel is installed on bike (right from the rider's perspective) and start nipples a few threads.

   Place a spoke into the first rim hole closest to the valve stem hole

   Screw nipples onto spokes and tighten nipples equally.

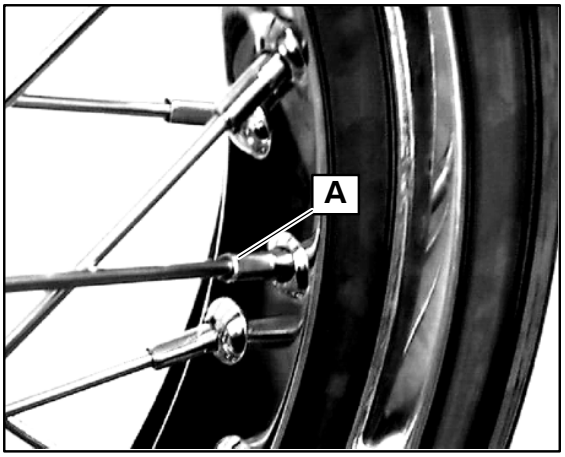
WHEEL LACING (CONT.)

4. Install outside spokes and screw on nipples. Work your way around the wheel, installing spokes on alternate sides of wheel.

   The outside spokes should cross over the inside spokes.

   Continue until all spokes and nipples are installed. Tighten nipples equally by hand.
5. With all nipples installed, evenly snug all nipples using a spoke wrench. Tighten until one thread shows above each nipple (A).

   Work your way around the wheel tightening spokes equally.
6. Install wheel assembly into a truing stand for rim offset adjustment, final spoke tightening and truing of wheel.

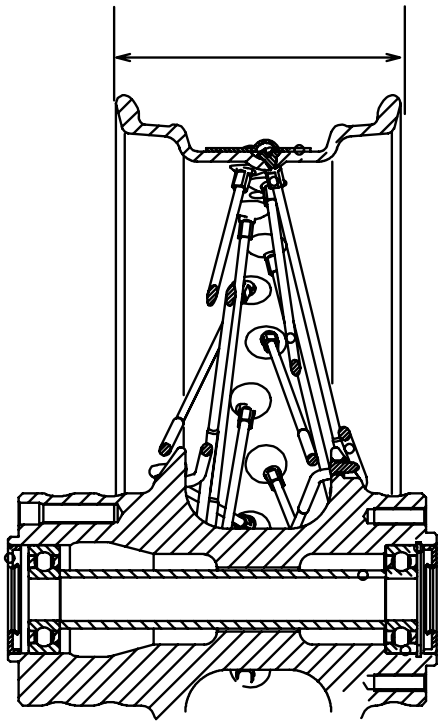


WHEEL OFFSET

CALCULATING WHEEL OFFSET SPECIFICATION TO RIM

NOTE: The offset for both front and rear wheel is 80.5mm (± 1mm) from the brake disc mounting surface (left side) to the **center** of the rim. The offset measurement procedure in this manual depicts the measurement being taken to the **side** of the rim, which is easier to perform in the shop. Specified offset is listed below. The method of calculation is:

1. Measure the total width of the rim in millimeters
2. Divide the total width measurement (from Step 1) by 2 (this equals1/2 the rim width)
3. Subtract the result of Step 2 from 80.5
4. Result is offset distance to **edge of rim** in millimeters



Front Rim Example

TOTAL WIDTH OF RIM =	74.30 MM
÷ 2	
= 1/2 WIDTH OF RIM	37.15 MM
OFFSET (CENTER OF WHEEL)	80.50 MM
– 1/2 RIM WIDTH	37.15 MM
OFFSET TO EDGE OF RIM	***43.35 MM***

SPECIFICATION TOLERANCE ± 1 MM

Rear Rim Example

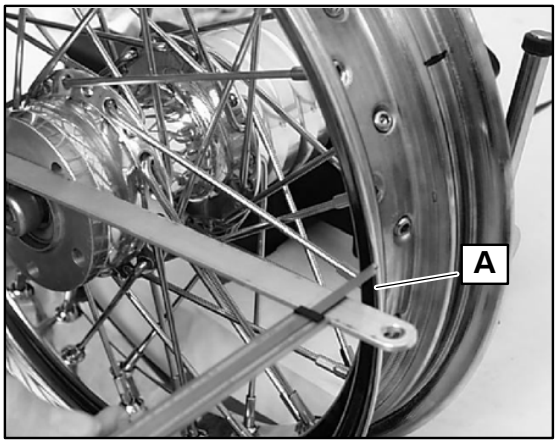
TOTAL WIDTH OF RIM =	133.80 MM
÷ 2	
= 1/2 WIDTH OF RIM	66.90 MM
OFFSET (CENTER OF WHEEL)	80.50 MM
– 1/2 RIM WIDTH	66.90 MM
OFFSET TO EDGE OF RIM	***13.60 MM***

SPECIFICATION TOLERANCE ± 1 MM

OFFSET ADJUSTMENT

1. Lay a straight edge on the brake disc mounting surface and measure the offset distance to outermost edge of rim (A).

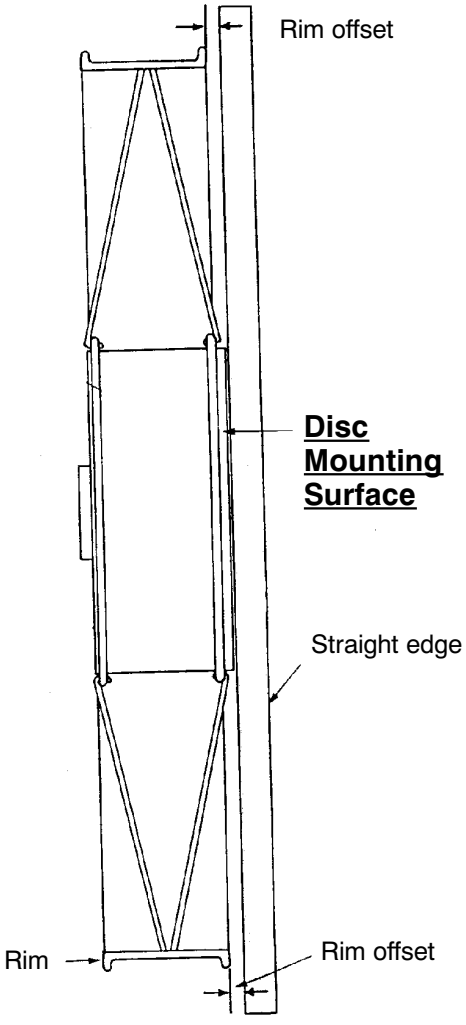
   If the measurement is not correct, loosen spokes in one side of rim and tighten spokes on the other side equal amounts.



2. Initially tighten spokes in 3 steps to the specified torque while maintaining distance A. This is a starting torque only. Final torque is listed on page 14.19.

TORQUE: Initial Spoke Torque
8 Nm +1Nm / - 2.5
69 in. lb. + 8 / -21)

3. Place straightedge on disc mounting surface and measure to edge of rim.
4. Rim offset is adjusted by loosening all the spokes on one side of the wheel and tightening the spokes on the other side of the wheel.
5. All spokes must be loosened or tightened the same amount to maintain minimum axial and radial runout.



VIEW FROM FRONT

14

WHEEL TRUING

1. Inspect wheel offset as outlined on page 14.16 if it was not checked prior to beginning this truing process.

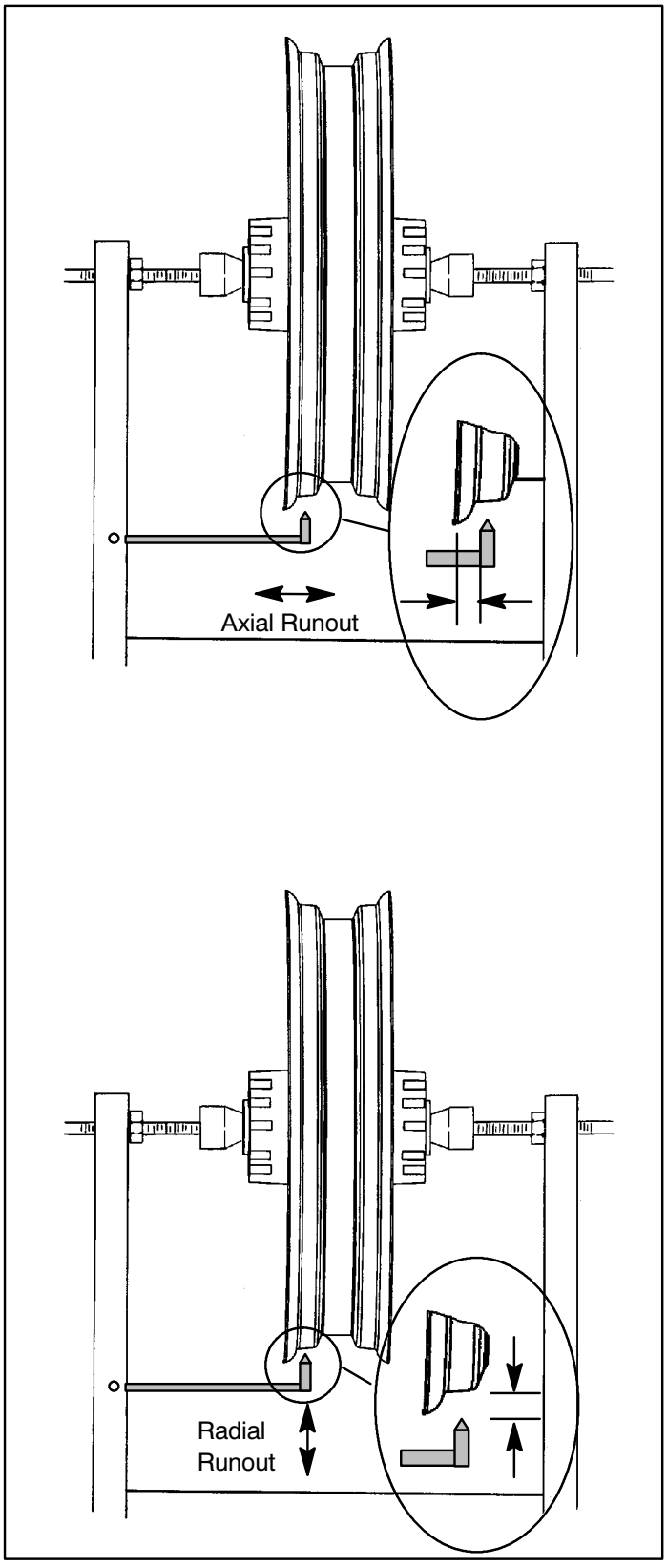
2. Measure axial and radial runout.

NOTE: Axial runout is side to side movement or “wobble” of rim. It is measured on the inside wall of the rim just outside the horizontal bead sealing surface.

It is best to make an initial adjustment of axial runout first. This allows you to see how much radial runout is present.

Radial runout is up and down movement of rim (”hop”). It is measured on the bead sealing surface.

Monitor offset adjustment during the truing procedure to be sure the offset is correct.



WHEELTRUING (CONT.)

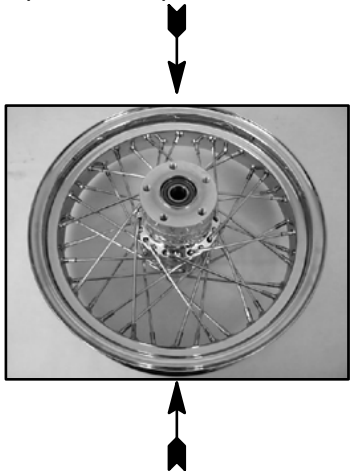
3. Adjust radial runout.

   Radial runout is how concentric (round) the rim is with the hub. Radial runout causes up and down movement.

   At this point all spokes should be snug. It may be necessary to alternately adjust axial and radial runout.

   Alternate between axial and radial adjustments until as close to zero runout is achieved. Runout specifications are found on page 12.2 (front wheel) and .

To move rim down: loosen spokes at bottom and tighten spokes at top



To move rim up: loosen spokes at top and tighten spokes at bottom

FINAL TIGHTENING

1. Perform final tightening of spokes.

   Using tape or crayon, divide wheel into four sections or *quadrants* to final tighten spokes.

   Tighten each spoke equally.

   Tightening sequence is 1,**3**,2,**4**.

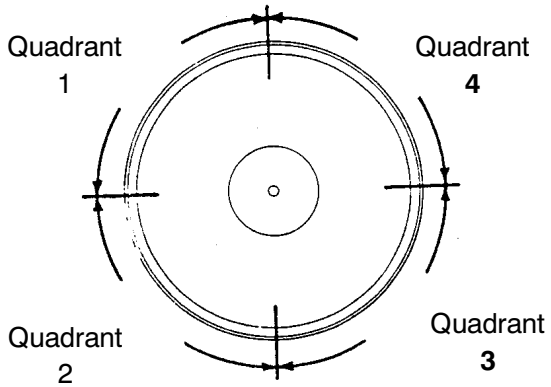
TORQUE: **FINAL Spoke Torque**

8 Nm, 69 in-lb

2. Maintain proper runout adjustment during final tightening of spokes.

   Proper tightening of spokes should have minimal effect on runout.

Spoke final tightening sequence 1,3,2,4

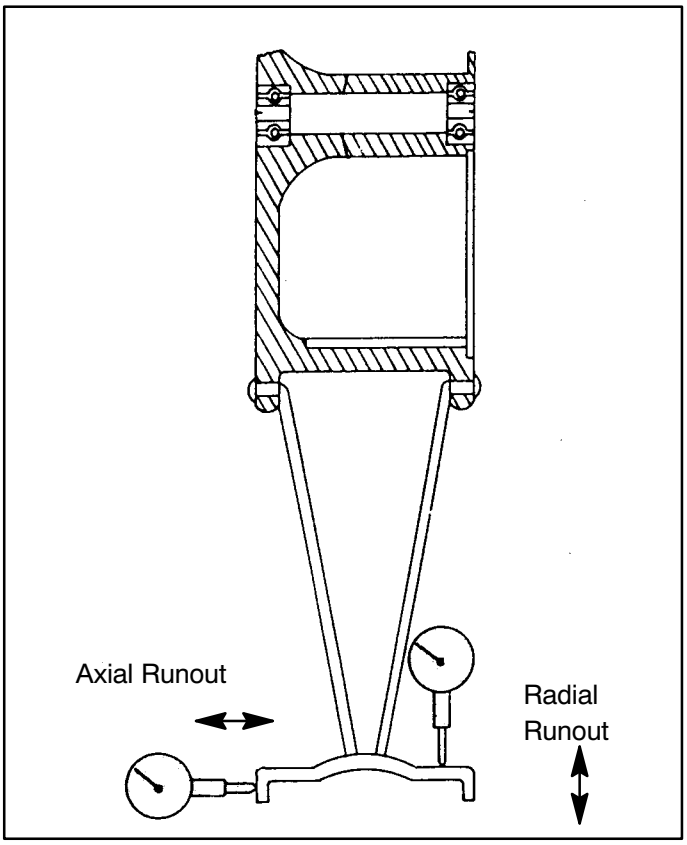


WHEEL TRUING (CONT.)

3. Make a final check of runout and offset.

4. Check spokes for the correct tightness. Use a spoke wrench or check them by tone.

   It is best to get as close as possible to zero runout.



IMPORTANT PRACTICES THAT MAKE WHEEL TRUING EASIER ARE:

- Progressively tighten and loosen spoke nipples.
- Keep all spokes at approximately the same tension (snug).
- Lubricate spoke nipples and threads.
- Do not try to change runout with only a few spokes.
- Alternately check axial and radial runout throughout the truing process.
- Properly final tighten all spokes.

TROUBLESHOOTING

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REPAIR RECOMMENDED
Rear Wheel (Wobbles)	Bent rim	Replace
	Worn or damaged wheel bearings	Replace as a set
	Worn or damaged swing arm bushings.	Replace as a set
	Damaged or incorrect tire	Replace rear tire
	Wheel assembly out-of-balance	Balance wheel
	Low tire pressure	Inflate to specification
	Loose swing arm, axle or suspension fasteners.	Torque to specification
Handlebars Oscillate (Wobble)	Bent front axle	Replace
	Worn or damaged wheel bearings	Replace as a set
	Tire mounted incorrectly	Inspect and re-mount tire
	Damaged tire	Replace
	Loose steering stem nut	Adjust to specification
	Incorrect tire	Replace
	Incorrect tire pressure	Inflate to specification
Front Wheel Oscillates (Wobbles)	Bent rim	Replace
	Worn or damaged wheel bearings	Replace as a set
	Damaged or incorrect tire	Replace
	Loose axle or axle pinch bolts	Torque to specification
	Right and left fork not installed at same height	Repair
	Fork oil level incorrect	Fill to specification
	Fork spring free length different between right & left	Replace spring that does not meet specification
	Wheel assembly out-of-balance	Balance wheel

NOTES

CHAPTER 16
CHARGING SYSTEM & BATTERY

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RECTIFIER / REGULATOR REPLACEMENT 16.17

IMPORTANT INFORMATION

GENERAL

All electrical system and component service can be performed with the engine in the frame.

CAUTIONS TO OBSERVE DURING ELECTRICAL SYSTEM SERVICE

CONNECTORS

Always turn off ignition switch before disconnecting any electrical component.

Always verify that bullet-type connectors are free of corrosion, contamination or breaks when troubleshooting electrical problems.

Verify that bullet-type connectors are firmly seated. Listen and/or feel for a click when connecting them.

Ensure to release the lock on lock-type couplers before disconnecting them to avoid damaging the connector.

Pulling on the wires when disconnecting couplers can introduce problems. Hold the connectors themselves when disconnecting them, not their associated wires.

Inspect each male and female terminal of multi-pin connectors for corrosion, contamination, loose or bent pins.

BATTERY SAFETY

⚠ WARNING

Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing. Antidote:

External: Flush with water.

Internal: Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

Eyes: Flush with water for 15 minutes. Call physician immediately.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries.

KEEP BATTERIES AND BATTERY ACID OUT OF REACH OF CHILDREN.

⚠ CAUTION

The charging system used on the motorcycle is calibrated for the maintenance free battery that is installed as original equipment. Do not replace with a conventional lead-acid battery.

Before troubleshooting the charging system, inspect the battery thoroughly. A discharged, poorly charged or faulty battery will make the readings obtained during charging system troubleshooting erroneous or difficult to interpret.

⚠ CAUTION

Even with a good battery, battery voltage can recover after charging, but under excessive loads the battery voltage will drop quickly and eventually “die”. Often the charging system is suspect when it is not the cause of the problem. Always inspect for excessive loads if the battery continues to lose its charge. Items such as incorrect wattage bulbs, sticking brake light switch(s), continuous low rpm operation or leaving the lights on without the engine running for long periods of time can drain a battery even if the charging system is operating correctly.

A battery will self-discharge when the motorcycle is not in use. Make sure to properly store the battery as outlined later in this section.

Maximum voltage and service life is only achieved when the battery is properly serviced initially. Make sure to follow instructions outlined later in this section.

Overcharging can be caused by a faulty battery (shorted cell). Test system with a known good battery when diagnosing an overcharge condition.

New batteries must be properly maintained as outlined in this section to ensure proper service life.

CAUTION

CONNECTING AND DISCONNECTING THE BATTERY

Be sure to disconnect the **negative** battery cable **first** when **removing** the battery.

Be sure to connect the **positive** battery cable **first** when **connecting** the battery.

If corrosion is found on terminals, remove battery and clean terminals with a solution of baking soda and water. Finish the process by cleaning terminals (both battery and battery cables) with a wire brush.

Once connections are secured, apply a thin film of Nyogel™ grease to the terminals.

Make sure that the positive terminal has it's protective boot in place.

CAUTION

WIRE ROUTING

Make sure that all wires are routed correctly.

CAUTION

FUSES

Fuses are in place to protect circuit wiring and components. Always determine the cause of an open fuse before installing a new fuse.

Do not increase the value of the fuse to correct the problem.

Do not use wire, tin foil or other substitutes for fuses.

CAUTION

ELECTRONIC COMPONENTS

Semiconductor parts used in electronic components will not withstand careless handling.

Do not drop or strike parts that contain semiconductors such as the ECM or rectifier/regulator. Dropping electronic components can cause damage to the component.

Follow instructions supplied in this chapter, including chapter 5 (Fuel Injection) and chapter 17 (Ignition System), very carefully when working on electronic components. Failure to follow instructions may cause irreparable damage to the part being inspected.

SPECIFICATIONS

GENERAL

Item		Specifications
Electrical (General)	Ignition System	Distributor-less Transistorized Dual Coil Type Ignition
	Starting System	Electric
	Charging System	Permanent Magnet / 3 Phase / Full Wave Rectification
	Regulator/Rectifier	Solid State Three Phase Voltage Regulator/Rectifier
	Lighting System	12 V DC

CHARGING SYSTEM & ALTERNATOR

Item		Specifications
Alternator No Load AC Output (Minimum)		20 V AC @ Idle
Alternator No Load AC Output @ 3000 - 4000 RPM (Minimum)		65 V AC @ 3000 - 4000 RPM
Stator Coil Resistance (@ 21°C / 70°F) (Black to Black)		0.3 to 0.5 ohms
Stator Coil Resistance To Ground (Stator Black Wires)		Infinity (no continuity)
Regulator/Rectifier Regulated Voltage		14-14.8 V DC
Alternator Output (Amps / Watts)		38 A / 525 Watts
Battery	Type (2003-2005)	Yuasa: YTX20L-BS
	Type (2006)	Yuasa: YTX20HL-BS
	Voltage	12 Volts DC
	Nominal Capacity @ 10 Hr Rate	18 AH
	Recommended Battery Charging Current	STD: 1.85 A for 5 to 10 hrs
	Cold Cranking Amp Rating	310

FASTENER TORQUE

Description	Torque Nm	Torque lb-ft (in-lb)
Flywheel Bolt	102 Nm	75 lb-ft
Primary Cover Screws	10 Nm	(85 in-lbs)
Regulator/Rectifier to Bracket	10 Nm	(85 in-lb)
Regulator/Rectifier Bracket to Crankcase	10 Nm	(85 in-lb)
Stator Mounting Screws to Primary Cover	11 Nm	(100 in-lbs) Loctite™ 242

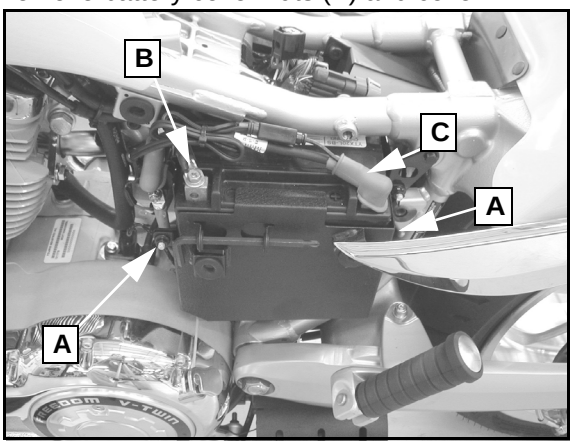
SPECIAL TOOLS

Engine Stop Tool: PV-43502 / Flywheel Puller: PV-43533 / Digital Multi-Meter: PV-43546 / Connector Test Kit: PV-43526

BATTERY

BATTERY REMOVAL

1. Remove both side covers. (Chapter 3)
2. Remove operator's seat. (Chapter 3).
3. Remove battery cover nuts (A) and cover.



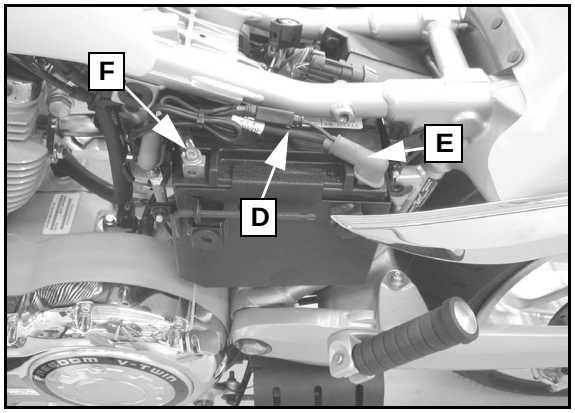
4. Remove negative (-) battery terminal bolt and cable first (B).
5. Remove positive (+) battery terminal bolt and cable last (C).
6. Remove battery.

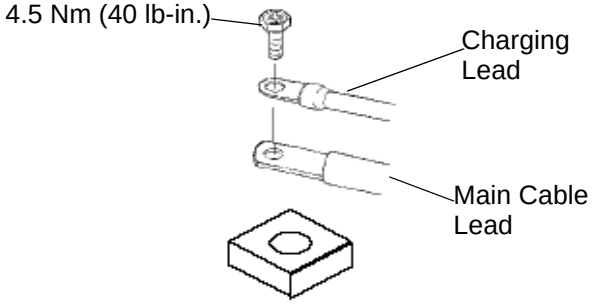
BATTERY INSTALLATION

NOTE: Be sure cable ends and battery terminals are clean. Apply a light film of di-electric grease to terminal bolt threads.

1. Carefully install battery with negative (-) terminal toward front of vehicle.
2. Connect positive cable (D) and charging lead ring terminal (with red marking).
3. Apply dielectric grease over terminal area for corrosion protection.
4. Slide red protective boot (E) over the terminal.
5. Connect ground (negative) cable (F) and charging lead ring terminal.
6. Apply dielectric grease over terminal area for corrosion protection.
7. Install battery cover. Assemble two nuts to studs and torque to 4.5 Nm (40 lb.-in.).

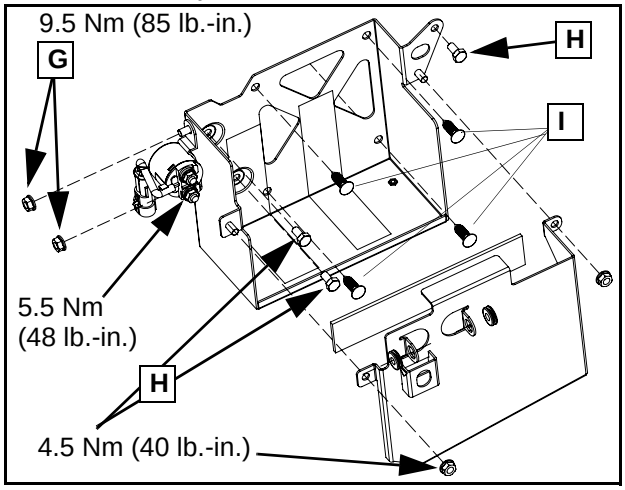
NOTE: Install side covers, seat.





BATTERY BOX

1. Remove battery.
2. Remove starter relay (solenoid) (G).
3. Remove 3 screws (H).
4. Disconnect ECM or remove 4 darts (I).
5. Remove battery box.



INITIAL BATTERY SERVICE

⚠ WARNING

Read, understand and heed the warnings at the beginning of this section as related to battery electrolyte.

⚠ WARNING

Battery electrolyte is poisonous. It contains sulfuric acid. Serious burns can result from contact with skin, eyes or clothing. Antidote:

External: Flush with water.

Internal: Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg, or vegetable oil. Call physician immediately.

Eyes: Flush with water for 15 minutes and get prompt medical attention.

Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield eyes when working near batteries.
KEEP BATTERIES AND BATTERY ACID OUT OF REACH OF CHILDREN.

⚠ CAUTION

The battery electrolyte used for the maintenance free battery on the motorcycle comes with the battery. Do not use common battery electrolyte. Failure to use the electrolyte that comes with the battery will result in reduced battery service life.

1. Place the battery in an acid proof catch pan or receptacle. Work in a well ventilated area.

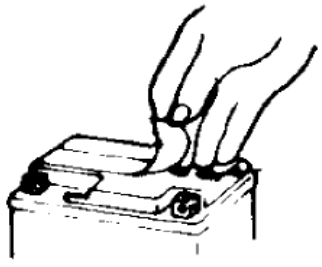


Fig. 1

2. Remove aluminum sealing tape from top of battery. Ill.1.
3. Remove cap assembly from battery acid pack. Ill.2.

⚠ CAUTION

Do not attempt to remove or pierce the seal on acid pack. The seal will be pierced by battery when the acid pack is placed on battery. Fig. 2.

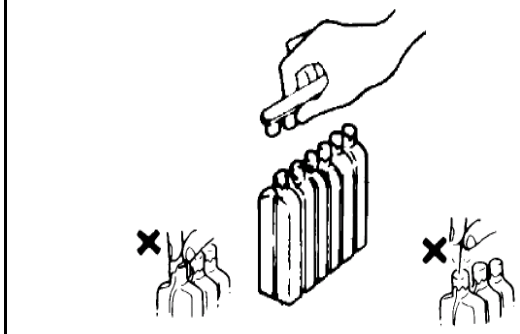


Fig. 2

4. Insert the nozzles of electrolyte container into battery filler holes. Fig. 3.

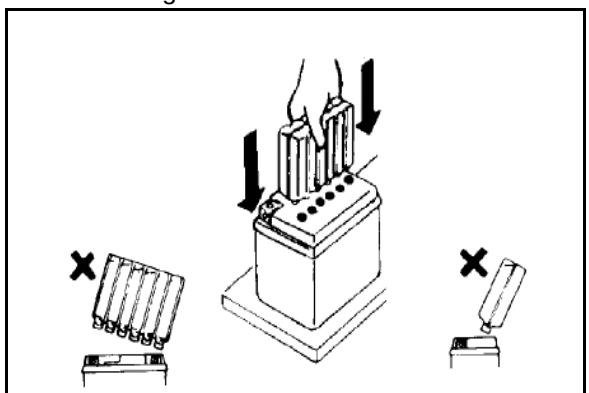


Fig. 3

5. Press down firmly on acid pack so seal for acid pack is completely penetrated. Take precautions not to let any of the fluid spill.

NOTE: The acid pack will be secured in battery and be able to stand by itself if it is inserted correctly.

⚠ CAUTION

The filler pack is designed to slowly drain electrolyte into battery cells. Do not attempt to force electrolyte into battery cells.

6. Ensure seal on acid pack is completely penetrated by visually inspecting for air bubbles rising in each cell of acid pack. If air is not bubbling up in one of the cells, fully seat acid pack into battery again. Tap bottom of acid pack a couple of times and observe for bubbles again. Do not remove the acid pack from the battery until all acid is drained. Fig. 4.

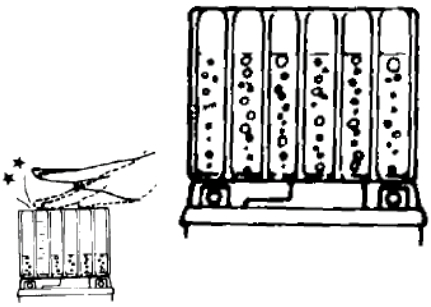
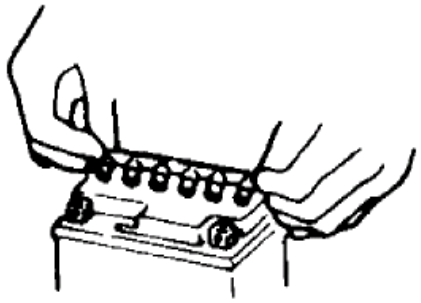


Fig. 4

7. Leave acid pack installed in battery for at least 20 minutes. Do not force the electrolyte into battery. Time is needed for the plates to absorb the electrolyte.
8. After the 20 minute period has elapsed, verify that all acid has drained from acid pack. If it has not, allow time as required until all fluid has drained from acid pack.
9. Remove empty acid pack and place previously removed cap assembly onto acid pack. Dispose of acid pack properly.
10. Let battery sit with battery cap strip off for at least 20 minutes.
11. Insert battery cap strip into battery filler holes. Press firmly on cap strip and ensure that none of the strip is above the upper surface of battery top and that it is fully seated. (Fig. 5)



Let battery sit for at least 20 minutes before installing battery cap strip.

Fig. 5

⚠ CAUTION

Do not remove battery cap strip once it has been installed.

Specification: 12.5 V DC (Fig. 6)

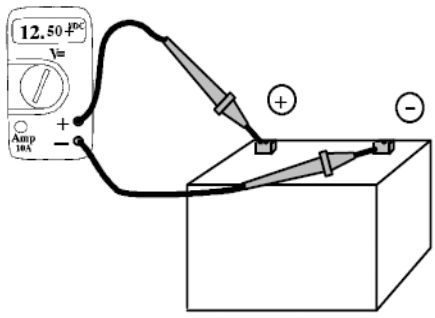


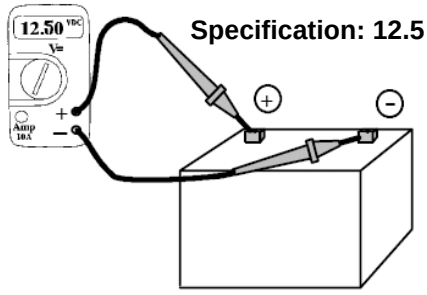
Fig. 6

CHARGING NEW MAINTENANCE FREE BATTERIES

1. Charge the battery at 1.8 amps for 5 to 10 hours. use a straight rate charger (not load sensing or battery tender type) for the initial charge of a new battery.

⚠ CAUTION

Do not attempt to quick charge the battery at any time.



Specification: 12.5 VDC

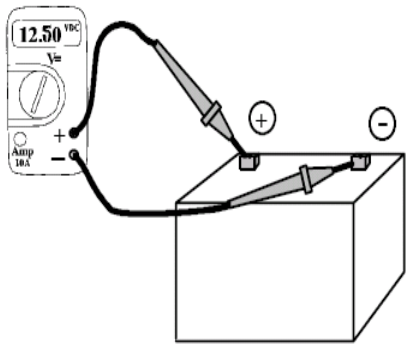
Fig. 7 New Battery After Initial Service

2. Remove battery from charger and let it sit for 30 minutes or longer.
3. Measure voltage with a digital multimeter (Fig. 7). If lower than 12.5VDC, battery must be recharged again in accordance with step 1 and 2 above.

Specification: 12.5 V DC

4. After charging battery and letting it sit for 30 minutes or more, check battery voltage again. If battery voltage is still below 12.5 V DC, replace the battery.

CHARGING MAINTENANCE FREE BATTERIES THAT HAVE BEEN IN SERVICE



Battery in Service: Must Be Above 12.50 V DC
Fig. 8

1. Measure battery voltage with a digital multimeter. The reading should be above 12.50 V DC. If battery voltage is lower than 12.50 V DC battery must be charged according to the instructions given below. (Fig. 8)

⚠ CAUTION

Do not remove caps on battery while recharging. Do not attempt to inspect or add fluid to a maintenance free battery.

2. Charge battery at 1.8 amps for 5 to 10 hours.

Specification: 1.8 A for 5-10 hours

3. Remove battery from charger and let it sit for 30 minutes or longer.
4. Measure battery voltage with a digital multimeter. If battery voltage is lower than 12.50 V DC battery must be recharged again in accordance with step 1 and 2 above.
5. After charging battery and letting it sit for 30 minutes or more, check the battery voltage again. If battery voltage is still below 12.50 V DC, replace battery.

NOTE: When motorcycle is not used for one (1) month or more, remove battery and store it in a cool, dry area. Inspect voltage monthly and charge according to above instructions if necessary.

BATTERY INSPECTION

1. Remove the left side cover and battery.
2. Inspect battery tray and hold-down cover for damage and tight fasteners.
3. Inspect for cracked or broken exterior case.
4. The motorcycle uses a maintenance free battery, it does not require inspection of specific gravity or fluid level.

⚠ CAUTION

Do not remove the battery cap assembly in an attempt to inspect fluid level, specific gravity or attempt to add fluid to battery. After initial servicing, battery should remain sealed.

5. Inspect the terminals for corrosion. If corrosion is found, remove battery and clean terminals with a solution of baking soda and water. Finish process by cleaning terminals (both battery and battery cables) with a wire brush.

⚠ CAUTION

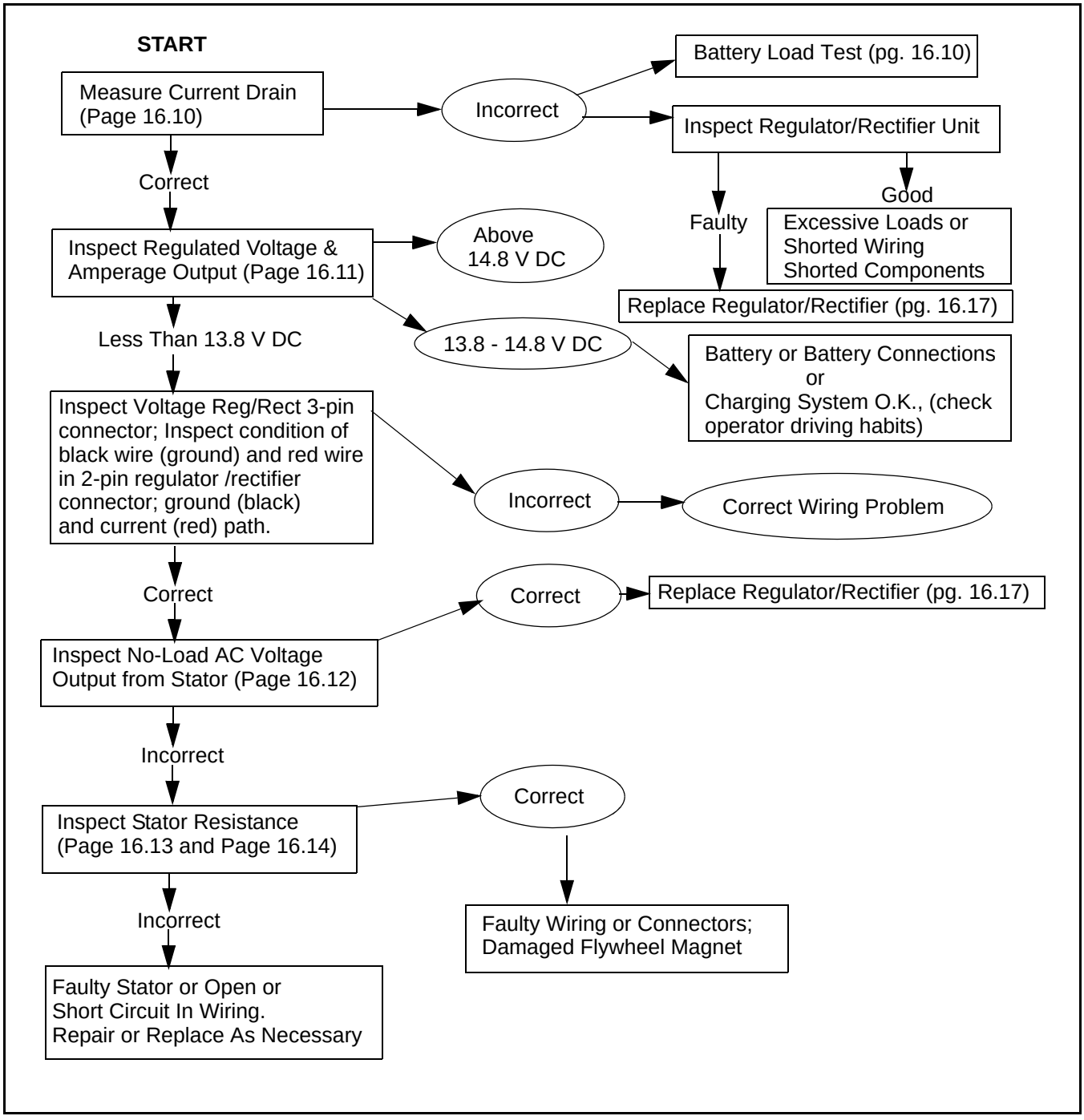
Remove the negative terminal first when removing the battery.
Install the positive terminal first when installing the battery.

6. Install battery (refer to page 16.5)
7. Once connections are secured, apply a thin film of grease to terminals.
8. Install left side frame cover and seat.

DIAGNOSTICS

TROUBLESHOOTING

> **⚠ CAUTION**
>
> The battery must be fully charged and in good condition to obtain accurate test readings.
> After discovering the cause of the problem and correcting it, always recheck the charging system output to verify the repair.



BATTERY LOAD TEST

1. Perform a battery load test using a battery load tester. Follow the load tester manufacturer instructions carefully.

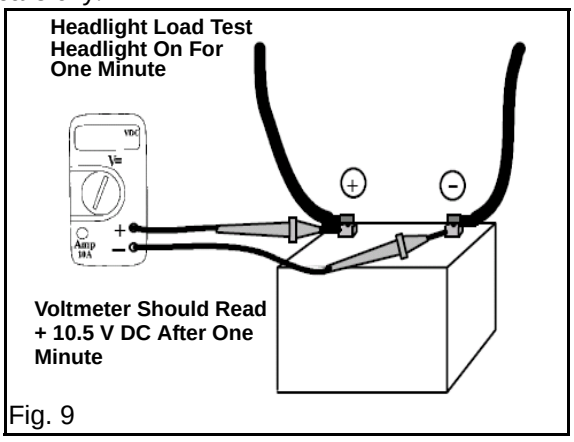


Fig. 9

NOTE: Although not as conclusive, the following test can be used to direct troubleshooting efforts if a battery load tester is not available.

2. Charge battery as outlined in this section.
3. Install battery (refer to page 16.5).
4. Connect a digital multimeter to battery and keep it connected for duration of test. (Fig. 9)
5. Turn ignition key on.
6. Switch head light to high beam position and leave it on for 1 minute (without the engine running).
7. At end of one minute, the digital multimeter should show a reading of above 10.5 V DC.
8. If battery voltage drops below 10.5 V DC, battery should be charged again and the test repeated.

CURRENT DRAIN INSPECTION

1. Remove seat and left side cover.

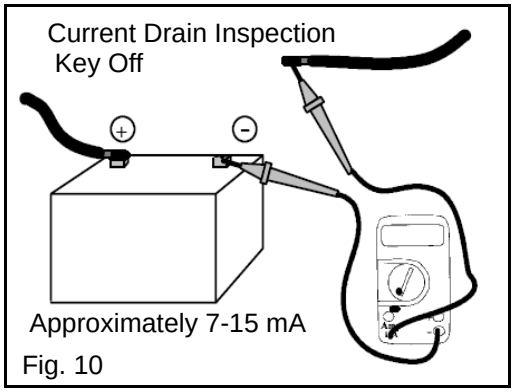


Fig. 10

2. Disconnect ground cable (-) from battery.
3. Connect digital multi-meter red (+) probe to ground cable and connect black DMM (-) probe to battery negative (-) terminal.

Fluke™ 73 Multimeter PV-43546

4. With ignition switch off, read current drain.
5. If current drain exceeds specifications, inspect wiring and components for short to ground.

Specification: Less than 2 mA

6. Locate the faulty component or wiring by disconnecting wiring connections one-at-a-time while observing current drain. Use the wiring diagram to locate possible current drains from battery. When current drain falls within specifications, the last connection disconnected shows which circuit or component is affected.

REGULATED VOLTAGE / AMPERAGE OUTPUT INSPECTION

1. Remove side covers and operator's seat.

Caution: Amperage will be 20 amps or greater if the battery is in a low state of charge. An inductive ammeter or a suitable shunt must be used to avoid possible meter damage.

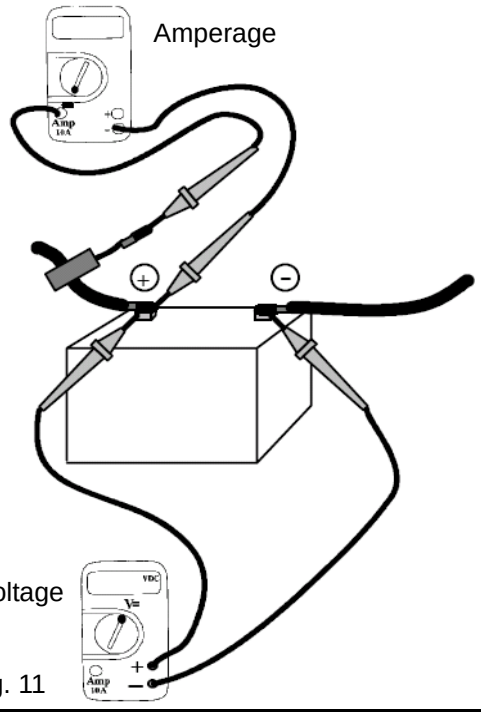


Fig. 11

2. Remove negative battery leads and connect a 12V shunt as outlined in the instructions provided with shunt or use an inductive amperage clamp.
3. Set digital multimeter (DMM) to V DC scale.
4. Connect DMM red (+) lead to battery red (+) lead and DMM black (-) lead to battery black (-) lead.
5. Start engine and warm to operating temperature.
6. At 1000 RPM or slightly above; the ammeter should reach the "break-even" point (no amperage leaving the battery) and the voltmeter should be rising toward 14 VDC.

Specification: "Break-even" point for charging Approx. 1000 rpm

7. Increase engine RPM to 2500. The ammeter should rise a slight amount, then stabilize. Volt meter should read above 14 V DC.
8. Use results obtained from preceding tests and the following descriptions to determine if charging system is functioning properly.

CHARGING SYSTEM OPERATING CORRECTLY: Ammeter goes up a small amount, then stabilizes slightly above +0 amps. Volt meter rises toward 14.8 ± V DC, drops off a little and starts to stabilize.

LOW BATTERY: Amperage continues to rise, voltage levels off as battery is absorbing voltage. Charging system may be O.K. Need to charge battery fully or use a good battery and repeat test. Meters will indicate similar reading to the overcharging chart.

CHARGING SYSTEM UNDERCHARGING: Ammeter drops to 0 or remains below 0 (negative reading) at all rpm, volt meter remains the same or goes down. Go to voltage drop inspection.

CHARGING SYSTEM OVERCHARGING: Ammeter rises well above 0 and remains there or continues to rise. Volt meter goes well above 14.8 V DC and may continue to rise. Go to voltage regulator/rectifier inspection.

EXCESSIVE LOAD: Amperage levels off or starts to drop, voltage continues to rise. Load may be excessive (accessories or shorted components). Determine if excessive loads are present. Disconnect accessories and re-test).

9. Turn ignition key off.
10. Remove ammeter shunt or inductive clamp.
11. Re-connect negative battery cables to battery.
12. Install seat and right and left side covers.

VOLTAGE DROP: RECTIFIER / REGULATOR TO BATTERY(+)

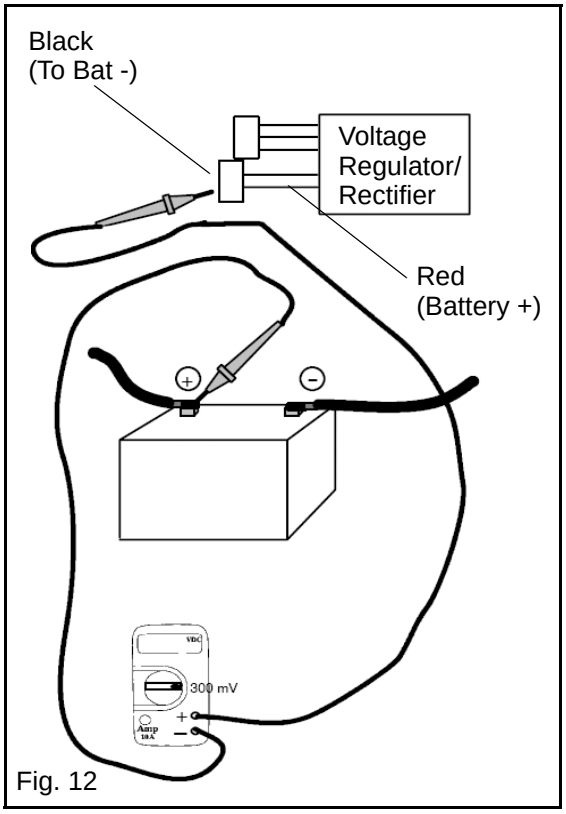


Fig. 12

NOTE: Leave regulator/rectifier connected for this test.

1. Set Digital Multi-Meter (DMM) to DC Volts scale.
2. Connect red lead (+) of DMM to red wire coming out of rectifier/regulator assembly.
3. Connect black lead (-) of DMM to positive (+) lead of battery.
4. DMM must read below 0.1 volts DC (100 mV). If it does read 0.1 V DC or less the circuit is O.K.

Specification: 0.1 V DC

5. If DMM reads above 0.1 volts DC there is excessive resistance in the circuit that must be corrected.
6. Likely problem areas will be the battery terminal connection and/or regulator/rectifier connector although the problem can be located at any point within the circuit. Visual inspections or continued voltage drop inspections are necessary to determine the cause.

STATOR AC VOLTAGE OUTPUT INSPECTION

NOTE: The following tests require engine to be operating. Be sure to heed the following warnings and cautions.

WARNING

HOT COMPONENTS

The engine and exhaust system become very hot during operation and remain hot for a period of time after the engine is shut off. Wear insulated protection for hands and arms or wait until the engine and exhaust system have cooled sufficiently before working on the machine.

WARNING

CARBON MONOXIDE

Never run an engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas that can cause loss of consciousness and may lead to death. If you must run the engine to do some repairs, do so in an open area or with an exhaust evacuation system operating.

1. Locate three wires coming from *stator* and follow the wires to the 3-pin connector.

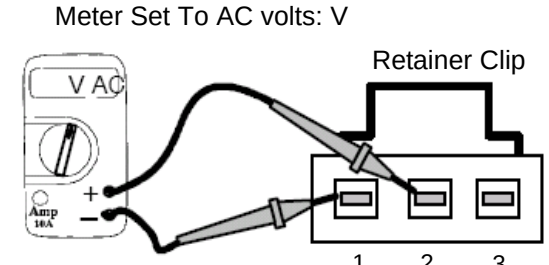


Fig. 13

2. Disconnect 3-pin connector.
3. Set Digital Multimeter (DMM) to AC Volts scale.
4. Connect one lead of DMM to pin labeled “1” in Fig. 13 on the wire connector that comes FROM the stator.
5. Connect other lead of DMM to pin labeled “2” (Fig. 13).
6. Start the engine and let it run at idle. Observe the DMM reading.

7. The DMM should indicate a minimum reading of 20 V AC.
8. Repeat test for pins 1 & 3.
9. Repeat test for pins 2 & 3.

Specification: No load AC Volts (Minimum)
20 V AC @ idle

NOTE: The test results in steps 7, 8 and 9 can read more than 20 V AC, but it is important that the reading for each pair of wires is approximately equal.

10. Increase engine RPM to 3000-4000 RPM and repeat steps 4, 5, 8, and 9.
11. At 3000-4000 RPM the DMM should read 65 V AC.

NOTE: The test results obtained in step 10 can read more than 65 V AC, but it is important that they are all at least 65 V AC and approximately equal.

Specification: No load AC Volts:
65 V AC @ 3500 rpm (Minimum)

STATOR RESISTANCE INSPECTION

CAUTION

The **engine must not be running** while performing the following inspections.

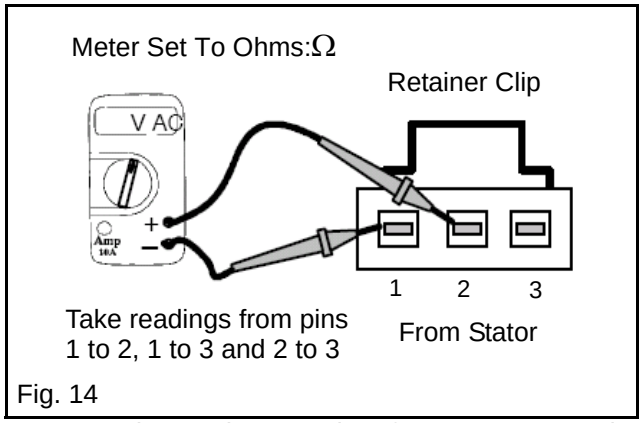


Fig. 14

1. Locate three wires coming from stator contained within the multi-connector.
2. Disconnect connector.
3. Set Digital Multi-Meter to ohms scale.

NOTE: Make sure DMM leads are plugged into correct jacks.

4. Connect one lead of DMM to any one of pins in multi-connector leading from stator. (Fig. 14)
5. Connect other lead of DMM to any one of the other two pins in the multi-connector and observe circuit resistance reading.

Specification: Stator resistance 0.1-0.5 Ω* (*plus meter resistance, see below)

CAUTION

Do not allow your hands or fingers to touch meter leads or one meter lead and any grounded portion of the motorcycle or reading obtained will be inaccurate.

CAUTION

0.3Ω to 0.5Ω ohms may be less than the internal resistance of your meter leads or meter. Before measuring stator resistance, connect the meter leads together and read the display and record this measurement. Subtract this reading from stator resistance readings.

EXAMPLE: Connect meter leads together, meter reads 0.7 ohms. Measure stator resistance, meter reads 1.10 ohms. Subtract 0.7 ohms (meter/lead resistance) from 1.10 ohms.

True reading is:
1.10 ohms (observed reading when checking stator)
- 0.7 ohms (meter/lead resistance)
= 0.4 ohms (true stator winding resistance)

6. Remove one of the DMM leads and connect it to the other pin in the multi-connector. The reading should be the same as the first test reading.
7. Remove the lead that was connected to the same multi-connector pin for the first two tests and connect it to the other multi-connector pin. This reading should also be the same as the first two readings.

NOTE: If engine oil is found in the stator connector, drain oil from connector, clean the connectors and re-connect.

STATOR WINDINGS TO GROUND INSPECTION

1. Connect one DMM lead to one of the multi-connector pins and place the other lead of the DMM in contact with a good engine ground, observe resistance to ground reading. (Fig. 15)

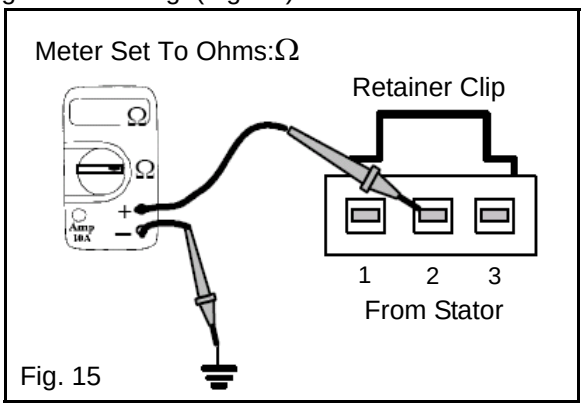


Fig. 15

Specification: Open Circuit (O.L.;

2. Repeat test for other two stator leads to ground.
3. There should be no connection from stator windings to ground. Replace stator if electrical connection to ground is found.

STATOR REMOVAL

1. Remove primary cover. (Chapter 9).

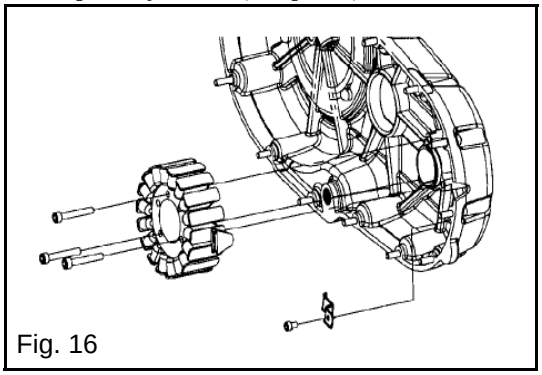
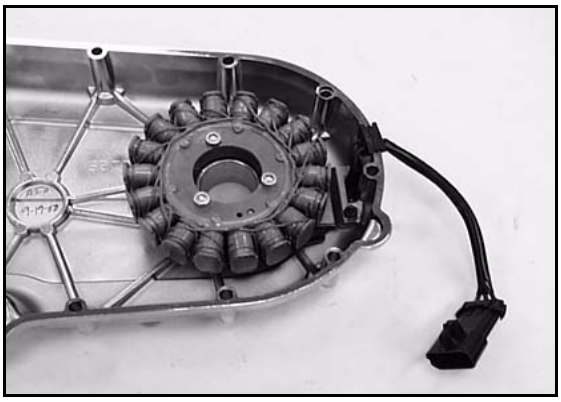


Fig. 16

2. Place primary cover on bench with padded material between primary cover and bench top.
3. Remove wiring retainer plate. (Fig. 16)
4. Remove three (3) socket head screws. (Fig. 16)
5. Remove stator from primary cover. (Fig. 16)

STATOR INSTALLATION

1. Clean primary cover gasket surface thoroughly.
2. Inspect screw holes in primary cover and clean screw holes to remove any residual locking agent.
3. Clean stator mounting surface on stator and primary cover.



4. Place stator in primary cover taking care to route wiring harness correctly in the area of the wire retainer plate.
5. Apply Loctite™ 242 to the screw threads.
6. Insert socket head screws and torque to 12 Nm (100 lb-in.)

TORQUE: Stator Screws
12 Nm (100 inch lbs.)

7. Install wiring retainer plate.
8. Install wire grommet into groove in primary cover.
9. Install primary cover (short screw is placed in the hole just behind the shift shaft). (Chapter 9)

FLYWHEEL REMOVAL

1. Refer to Chapter 9.

RECTIFIER / REGULATOR INSPECTION & TESTING

NOTE: Check the regulator / rectifier 3-pin and 2-pin connectors as outlined below, and perform battery and charging system inspection and diagnostics provided in this chapter. If other components test correctly, and system output is still above or below specifications, replace the regulator / rectifier.

1. Disconnect 3-pin (stator) connector and 2-pin (+ and -) connector.

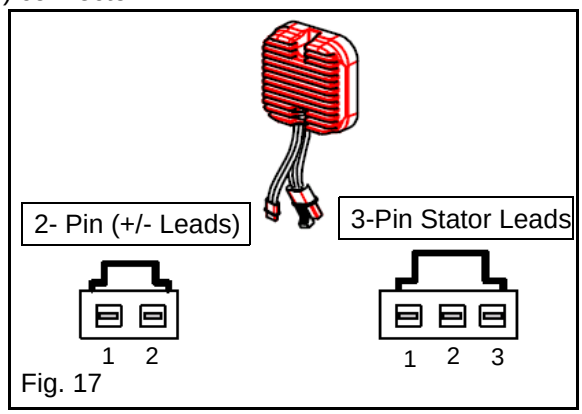


Fig. 17

2. Inspect male and female pins in the 3-pin connector and the 2-pin connector for the regulator/rectifier. Check for corrosion, loose pins, poor connections, or evidence of overheating or other damage.
3. If the wiring and connectors are undamaged and appear to be clean and tight, inspect the battery, stator, and related wiring.

NOTE: If engine oil is found in the stator connector, drain oil from connector and re-connect. Oil in the connector does not indicate a faulty stator and does not affect charging system function.

NOTE: False readings may be obtained if you touch your fingers to meter lead(s). The readings below are correct for a Fluke™ 73 multimeter. Using other meters may generate readings other than those listed. Semiconductors have different resistance values depending on the voltage applied to them.

DIODE LEAKAGE TEST

NOTE: Engine must be OFF. Perform this test at the regulator / rectifier 2-Pin connector. Testing at any other point (between battery and battery cable for example) could include leakage not attributable to the Regulator / Rectifier unit.

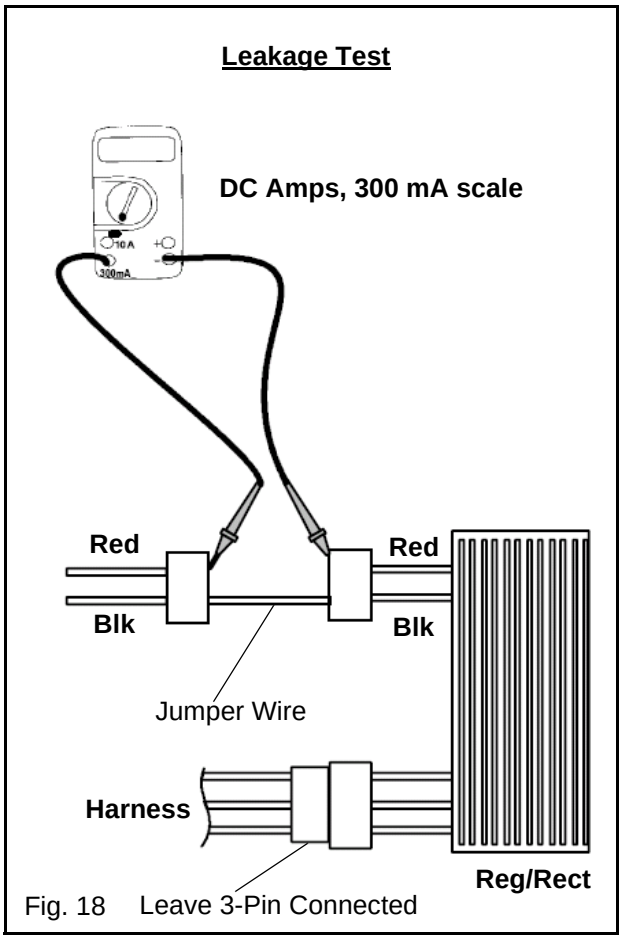


Fig. 18 Leave 3-Pin Connected

1. Disconnect the 2-pin connector at voltage regulator / rectifier unit.
2. Install a jumper wire as shown to provide a complete ground path.
3. Connect meter as shown, with red (+) meter lead to the red wire on harness side, and the black meter lead to the red wire on the regulator / rectifier side.
4. Compare leakage to specification below.

Leakage Specification: Less than 1.0 mA

SCR TEST

NOTE: This test must be conducted with the 2-Pin and 3-Pin connectors disconnected from the system.

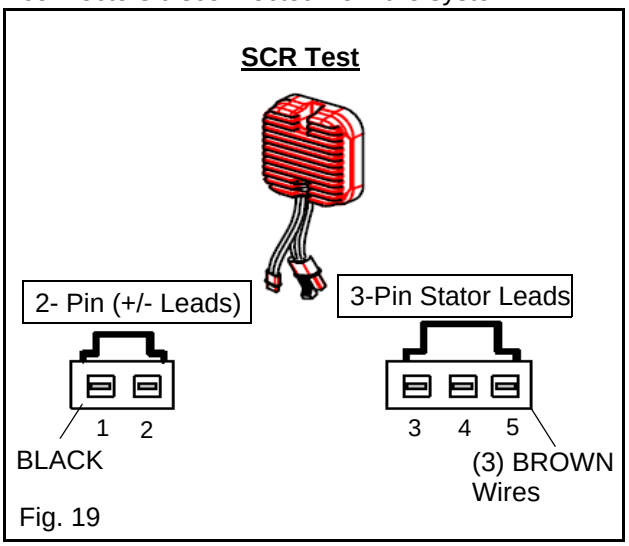


Fig. 19

1. Remove the (2) regulator/rectifier mounting screws.
2. Cut the tie strap to access the 2-Pin connector.
3. Disconnect both 2-Pin and 3-Pin connector.
4. Set the multi-meter to the Diode Test function.
5. Place the black meter lead in Pin 1 (Black wire). Place the red meter lead alternately in Pin 3, Pin 4, and Pin 5. There should be no continuity indicated.
6. Reverse the meter leads (red meter lead to pin 1, and black meter lead to pins 3, 4, and 5 alternately). There should be no continuity indicated.
7. Check between all combinations of the 3 Brown leads (Pins 3, 4, and 5) in both directions to each other. There should be no continuity indicated.

SCR Test Specification: OPEN CIRCUIT

RECTIFIER TEST

NOTE: This test must be conducted with the 2-Pin and 3-Pin connectors disconnected from the system.

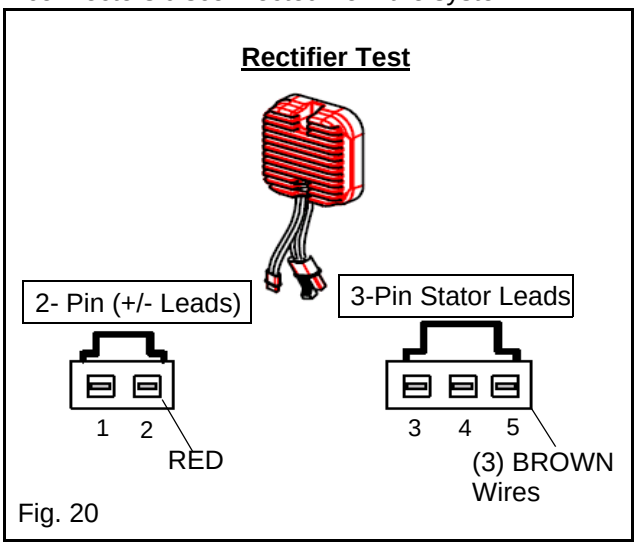


Fig. 20

1. Follow Steps 1-4 of the SCR Test at left.
2. Place the black meter lead in Pin 2 (Red wire). Place the red meter lead alternately in Pin 3, Pin 4, and Pin 5. There should be continuity indicated (diode junction).
3. Reverse the meter leads (red meter lead to pin 2, and black meter lead to pins 3, 4, and 5 alternately). There should be no continuity indicated.

Rectifier Test Specification:

Step 2 of Test - Diode Junction (Continuity)
Step 3 of Test - No Diode Junction (Open Circuit)

RECTIFIER / REGULATOR REPLACEMENT

1. Remove the (2) mounting screws (A).
2. Lift the locking tab and disconnect the 3-pin connector.
3. Lift the locking tab and disconnect the 2-Pin connector.
4. Remove dart (B).
5. Installation steps are done in reverse order of removal. Be sure mounting bracket is clean and that all connections are clean and tight. Route wires as shown in Fig. 22.

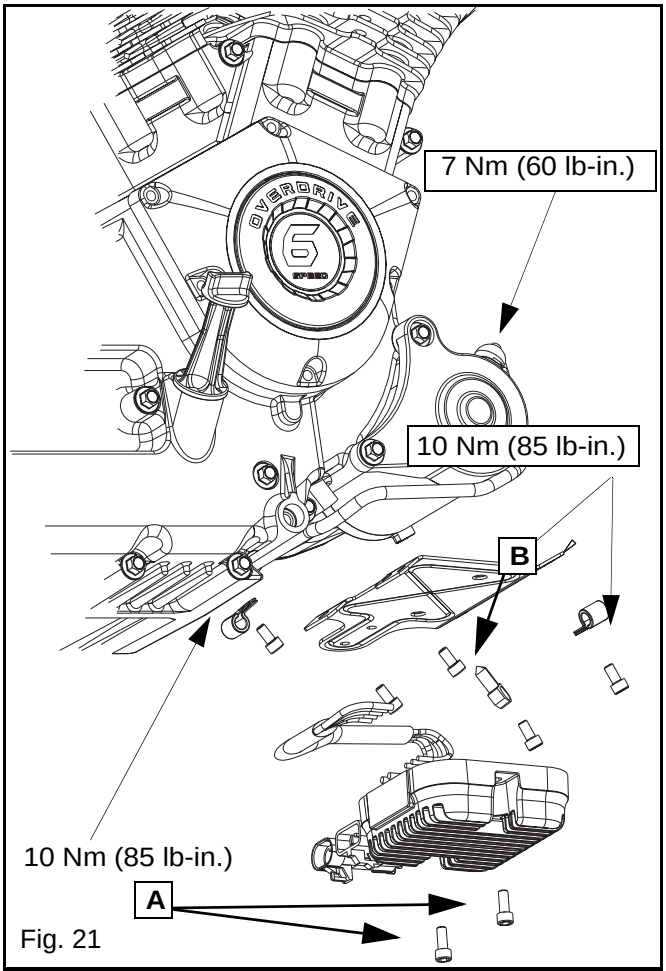


Fig. 21

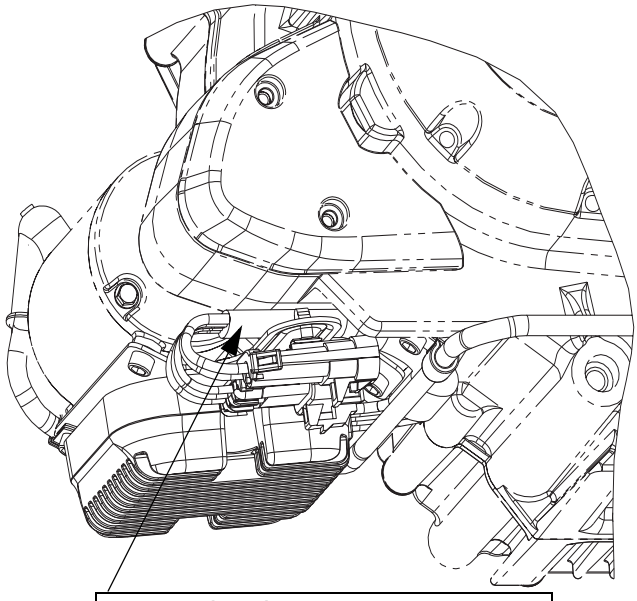


Fig. 22

NOTES

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IGNITION

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FLYWHEEL ADAPTOR (TIMING GEAR) INSTALLATION 17.13

GENERAL

SAFETY INFORMATION

There are many hazards present when working on or around the ignition system. Read and pay close attention to the following warnings and cautions when working on any component in this section.

⚠WARNING

Never run an engine in an enclosed area. Exhaust contains poisonous carbon monoxide gas that can cause loss of consciousness and may lead to death. If you must run the engine to do some repairs, do so in an open area or with an exhaust evacuation system operating.

⚠WARNING

The engine and exhaust system become very hot during operation and remain hot for a period of time after the engine is shut off. Wear insulated protection for hands and arms or wait until the engine and exhaust system have cooled before working on the machine.

⚠CAUTION

Some procedures call for the engine to be run in order to warm the engine to operating temperature. If this is done the exhaust pipes can “blue" if a cooling air stream is not provided by means of a shop fan directed at the exhaust system (particularly the head pipes).

⚠CAUTION

Parts containing semi-conductors can be easily damaged if handled carelessly. Do not drop or subject the electronic components to shock loads.

⚠CAUTION

Follow the instructions closely when troubleshooting items in this section. Some electrical components can be damaged if they are connected or discon--nected while the ignition switch is ON and current is present.

⚠CAUTION

Using incorrect heat range spark plugs can damage the engine. Always follow the manufacturer's recommendations for spark plug heat range.

GENERAL CAUTIONS TO OBSERVE WHEN WORKING ON IGNITION SYSTEM

- This ignition system is controlled electronically and no provisions are available to inspect or change ignition timing. A timing light is still valuable as it offers a way to determine if spark is occurring when the engine is running.
- Poor connections are the most common cause of ignition problems. Make sure to inspect all connections and replace the spark plugs before doing extensive ignition system troubleshooting.
- Make sure the battery is fully charged and that the charging system is operating correctly. A weak battery may not be able to turn the engine fast enough to produce any or adequate spark, and can easily complicate the troubleshooting process.

SPECIFICATIONS

IGNITION SYSTEM

GENERAL SPECIFICATIONS		
Item		**Specifications**
Spark Plug (All Models 2003-2006)		NGK CPR6EB-9
Spark Plug Gap		0.8 mm (.032”)
Ignition Coil Resistance	Primary	0.4 - 0.6 ohms
	Secondary	5400 ohms ± 10% (Without Plug Cap) 11 K ohms ± 10% (With Plug Cap)
	Plug Cap	5.6 ohms ± 10%
Crank Position Sensor Resistance		1450 to 1800 ohms

TORQUE VALUES

IGNITION SYSTEM

Fastener Torque Specifications - Ignition System			
Description	**Torque Nm**	**Torque lb-ft (in-lb)**	**Notes**
Flywheel Adaptor (Screws that secure timing gear to flywheel)	13 Nm	(115 in-lbs)	Apply Loctite™ 262
Flywheel Bolt	102 Nm	75 lb-ft	
Ignition Coil to Frame	11 Nm	(100 in-lbs)	
Primary Drive Gear	41 Nm	30 lb-ft	Screws have pre-applied locking agent. Replace if loosened or removed.
Spark Plug (new plugs)	16 Nm	12 lb-ft	Apply Anti-Seize

SPECIAL TOOLS

IGNITION SYSTEM

SPECIAL TOOL	PART NUMBER
Connector Test Adapter Kit	PV-43526
Fluke 73™ Digital Multimeter	PV-43546
Inductive Timing Light	PV-43537

TROUBLESHOOTING

BASICS

Before troubleshooting the ignition system, ensure that the engine stop switch is in the run position, that the battery is fully charged, the engine is in neutral and the fuses are not blown.

⚠ CAUTION

Don't forget the spark plugs! The Ignition System Troubleshooting flow chart (and the accompanying text) is designed to help you troubleshoot ignition system problems. It will not lead you to faulty or fouled spark plugs. Always inspect spark plug condition **first** (and replace if necessary) when troubleshooting ignition system problems.

Be sure that the spark plugs are the correct heat range and are the specified resistor spark plugs. Non-resistor spark plugs can introduce electrical problems due to increased Radio Frequency Interference (RFI).

⚠ WARNING

Extremely high voltage is present on the secondary side of the ignition system. Do not touch the ignition coil, wires or spark plugs during test procedures.

ECM CIRCUIT TESTS

1. The majority of tests necessary for ignition system troubleshooting can be performed at the ECM connector, located behind the battery box. (For ECM connector access see Page 5.29).
2. Extreme care must be taken not to introduce problems while probing the connector.

NOTE: A connector test adapter kit is required to prevent damage to the ECM connector pins.

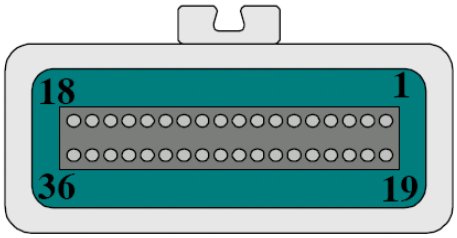
Test lead kit PV-43526

> **⚠ CAUTION**
>
> Once the ECM connector has been disconnected, do not touch the pins on the ECM. Static electricity from your body can damage the ECM.
>
> Do not attempt to perform tests on the ECM. Tests are done on wiring harness side of ECM connector.

3. The ECM connector is marked with numbers to identify pin terminals. Refer to the diagram below for a description of wire location / function, and wire colors.
4. Use the information on the following page to perform tests at ECM connector.

ECM CONNECTOR MAP

Refer to Page 5.29 to remove connector from ECM



ECM CONNECTOR MAP (Wire Color & Pin Number)

18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
W/GN #2 CYL. (REAR) PRIMARY COIL WIRE	OPEN	OPEN	BK CRANK POSITION SENSOR	BN/BU SENSOR VOLTAGE	OR/BN MAP SENSOR SIGNAL	OR/BU OIL TEMP SENDER	OR/GN AIR TEMP SENDER	GN/BN SPEED SENSOR	GY/BK DIAG PIN #7	BN/R MAP & TPS +5 VDC ECM CONTROLLED	VIO/PK ECM POWER 12 VDC W/ KEY ON	VIO/PK ECM POWER 12 VDC W/ KEY ON	BK/W SYSTEM GROUND	BK/W SYSTEM GROUND	OPEN	GY FUEL PUMP RELAY GROUND ECM CONTROLLED	W/GY INJECTOR #2 (REAR)

BN = Brown BU = Blue GN = Green BK = Black GY = Grey OR = Orange PK = Pink R = Red TRANS = Transparent VIO = Violet W = White Y = Yellow

36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
W/BK #1 CYL (FRONT) PRIMARY COIL WIRE	OPEN	BK ECM GROUND	OPEN	TRANS CRANK POSITION SENSOR	OPEN	BU/Y CLUTCH	OR/Y TPS SIGNAL	OPEN	OPEN	OPEN	OR 12VDC POWER	GY/R DIAG PIN #13	OPEN	OPEN	BK/OR CHK ENG GROUND	GN/W TACH OUTPUT	W/BU INJECTOR #1 (FRONT)

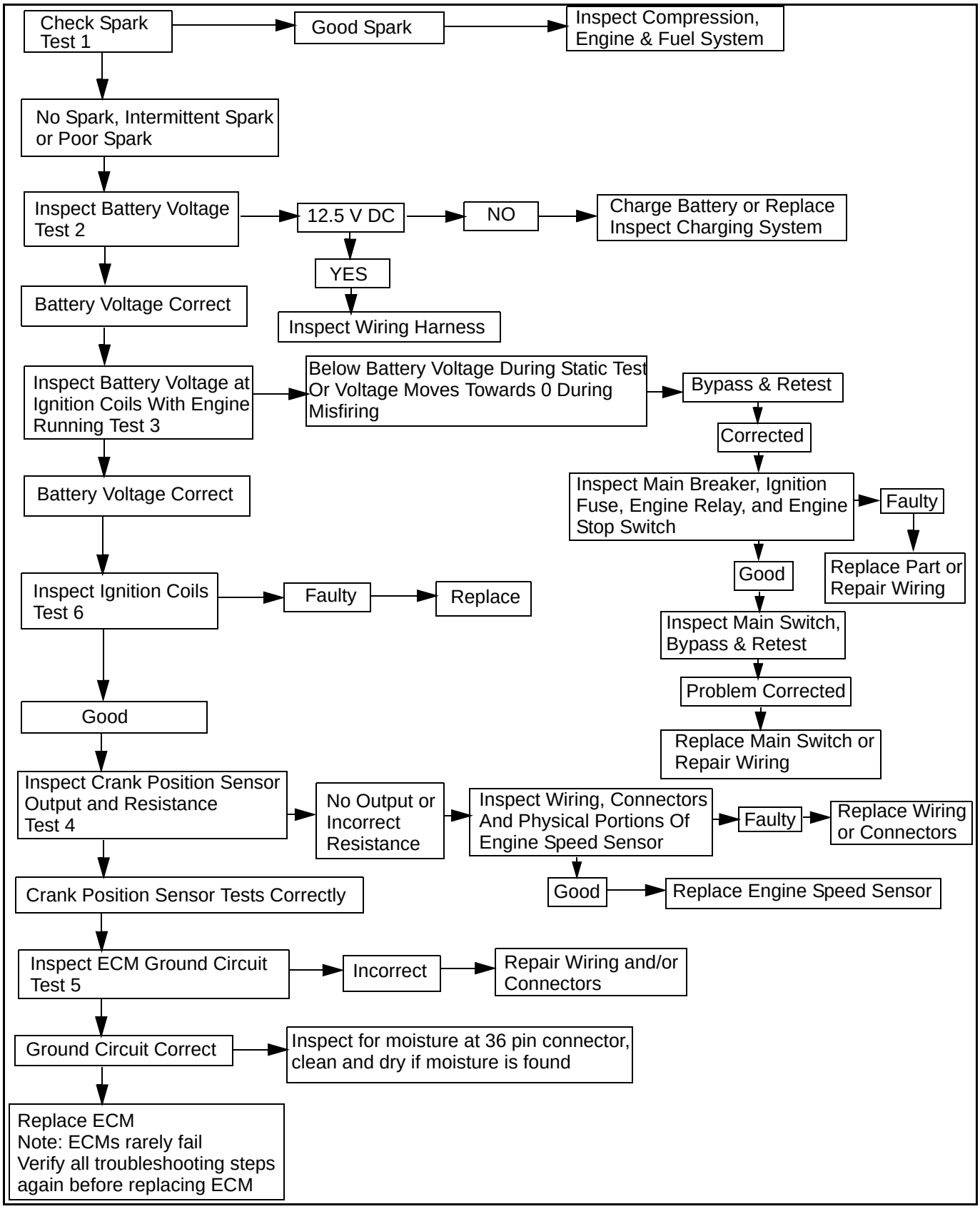
VERIFY TERMINAL PINS ARE NOT LOOSE IN CONNECTOR AND WIRE CONNECTION TO TERMINAL IS PIN IS SECURE. BACK OF CONNECTOR IS NUMBERED AT THE PIN SLOT AS SHOWN ABOVE.

ECM HARNESS CONNECTOR TESTS

COMPONENT	METER SETTING	TEST CONNECTIONS (at ECM Connector)	SPECIFICATIONS ±10% @ Room Temp. 70° F/ 21° C
#1 FUEL INJECTOR	OHMS	Pin #19 to Pin #7	15 ohms / No cont. to ground
#2 FUEL INJECTOR	OHMS	Pin #1 to Pin #7	15 ohms / No cont. to ground
#1 IGNITION COIL (FRONT CYL.)	OHMS	Pin #36 to plug cap of front ignition coil.	11,000 ohms
#2 IGNITION COIL (REAR CYL.)	OHMS	Pin #18 to plug cap of rear ignition coil.	11,000 ohms
CRANK POSITION SENSOR	OHMS	Pin #15 to #32	1500 ohms ± 100 ohms
CRANK POSITION SENSOR	AC VOLTAGE	Pin #15 to #32	Spark plugs out: 3V AC Spark plugs in: Any fluctuating AC signal.
AIR TEMP. SENSOR	OHMS	Pin #11 to #14	3150 ohms
OIL TEMP. SENSOR	OHMS	Pin #12 to #14	12,300 ohms
THROTTLE POSITION SENSOR* (TPS)	OHMS	Pin #29 to #8	3000 - 5000 ohms throttle closed* 1000 - 1600 ohms throttle open*
THROTTLE POSITION SENSOR* (TPS)	OHMS	Pin #29 to #14	1000 - 1600 ohms throttle closed* 3000 to 5000 ohms throttle open*
THROTTLE POSITION SENSOR* (TPS)	OHMS	Pin #8 to #14	3000 - 5000 ohms* NOTE: Reading will not change with throttle position
MAP SENSOR	OHMS	Pin # 8 to #13	5400 ohms

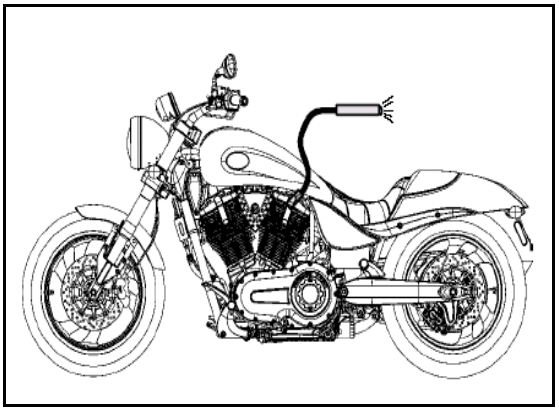
* Actual resistance may vary slightly form the specification. when testing the resistance of the TPS, look for a smooth sweep as the throttle is opened and closed, with no open or shorted “gaps”.

IGNITION SYSTEM TEST FLOWCHART



SPARK INSPECTION: TEST 1

1. Connect an inductive timing light to one spark plug wire.



Inductive timing light PV-33277-A

2. Turn on ignition stop switch and ignition switch.
3. Shift transmission into neutral and pull in clutch lever.
4. Depress starter button and observe timing light.
5. Determine if timing light flashes without interruption for both cylinders.
6. If timing light flashes consistently for both cylinders, the chances of an ignition related problem is remote, but spark plugs should be removed and inspected. Inspect engine compression (refer to chapter 3) and inspect fuel system functioning (refer to chapter 5).
7. Repeat test for other cylinder.
8. If timing light does not flash consistently for one or both cylinders, go to battery voltage inspection (Test 2).

   However, keep the following points about timing lights in mind:

   - There is a threshold voltage and amperage requirement for timing lights below which they will not trigger and therefore, not flash.
   - **Fouled spark plugs** may drop secondary **voltage so low** that a **timing light will** not trigger and therefore, **not flash**.
   - With no current flowing (open secondary side of the ignition coil) the timing light will not flash.
   - A plug cap not making a connection to the plug wire is one example of an open secondary.

⚠ CAUTION

Do not attempt to remove the spark plug caps from the spark plug secondary leads. The spark plug caps are molded to the plug wires and are only available as an assembly. The specifications given include the resistance of the spark plug caps.

   - Low battery voltage, and therefore slow cranking speeds, may not turn the engine over fast enough for the ignition system to function.

BATTERY VOLTAGE INSPECTION: Test 2

1. Remove seat (Chapter 3), side covers, (Chapter 3) and fuel tank (Chapter 5).

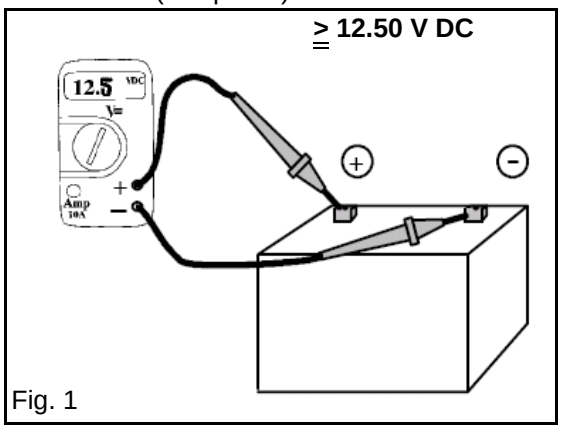


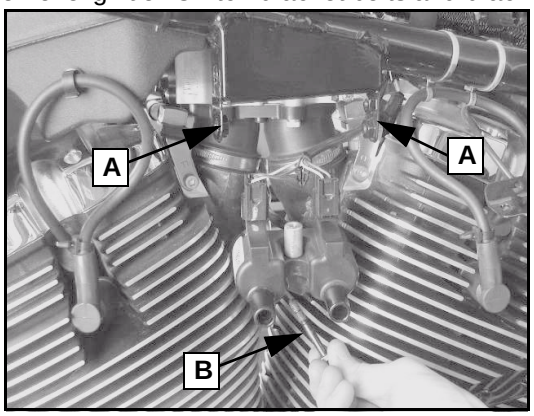
Fig. 1

2. Set Digital Multimeter (DMM) to DC Volts.
3. Inspect battery voltage. (Fig. 1)
4. If the battery voltage is below 12.5 V DC charge or replace the battery with a fully charged battery. Refer to Chapter 16 for battery inspection, battery charging and charging system inspection.

NOTE: When operating the starter with a low battery, the voltage available for the ignition coils can drop below the minimum required to produce spark.

5. Remove ignition switch cover by pulling straight outward.

6. Remove ignition switch bracket bolts and bracket (A).



7. Remove ignition coil mounting bolt (B).
8. Disconnect primary side of ignition coil by pushing the tab.
9. Connect red meter lead to pink wire at ignition coil connector. (Fig. 2)
10. Connect black meter lead to negative battery post.
11. Turn ignition switch and ignition stop switch ON.
12. With lights and switches on, a good battery will deliver a minimum of 10.5 V DC to the ignition coils.
13. If voltage reading is less than 10.5 V DC, perform a battery load test (Chapter 16).

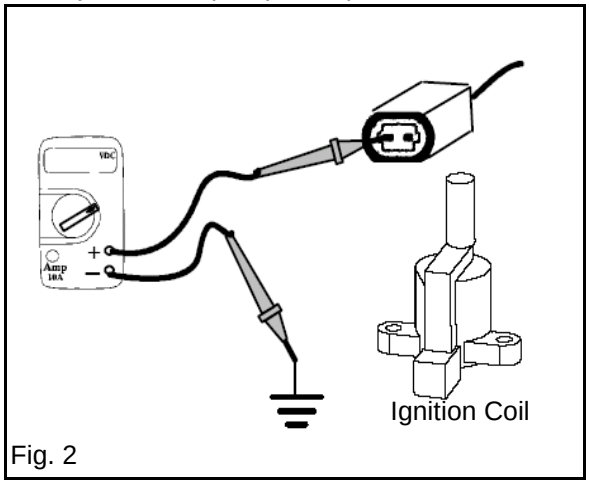


Fig. 2

14. If battery is within specifications and voltage reading at ignition coil(s) is below specification, there is resistance in the circuit between the ignition coil(s) and battery. The resistance, and consequent low voltage, will reduce spark voltage.
15. Connect black meter lead to negative battery post.
16. Trace circuit between ignition coil(s) and battery with the positive meter lead at each connector until battery voltage is found. Some place between the point where battery voltage is found and the ignition coil(s) is a loose, corroded or broken wire or connector. Inspect wiring, relays, fuses, fuse connections, main switch, engine stop switch and all connections. Repair as needed to eliminate voltage drop.

BATTERY VOLTAGE INSPECTION (engine misfires): Test 3

1. Lift and support fuel tank to access ignition coil wires.

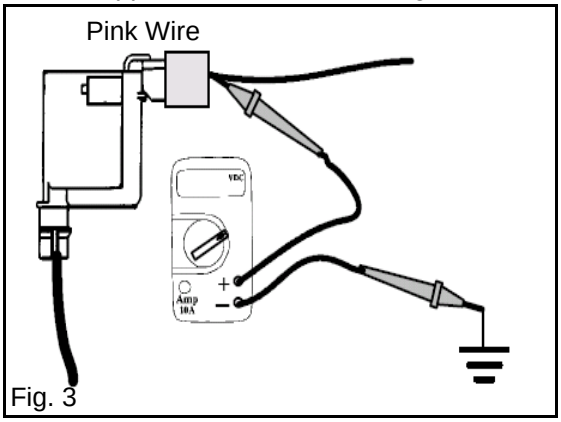


Fig. 3

2. Set Digital Multimeter (DMM) to DC volts.
3. Connect red meter lead to the pink wire at the ignition coil(s). (Fig. 3)
4. Connect black meter lead to the negative battery post. (Fig. 3)
5. Turn ignition stop switch and ignition switch ON.
6. Shift transmission to neutral and pull in clutch lever.
7. Start motorcycle and increase engine rpm until misfire occurs.

8. If DMM display falls quickly towards 0 and is erratic during misfire, there is a problem with the circuit supplying battery voltage to the ignition coil(s). Inspect wiring, relays, fuses, fuse connections, main switch, engine stop switch and all connections for a loose, corroded or broken wire or connector. (Fig. 4)

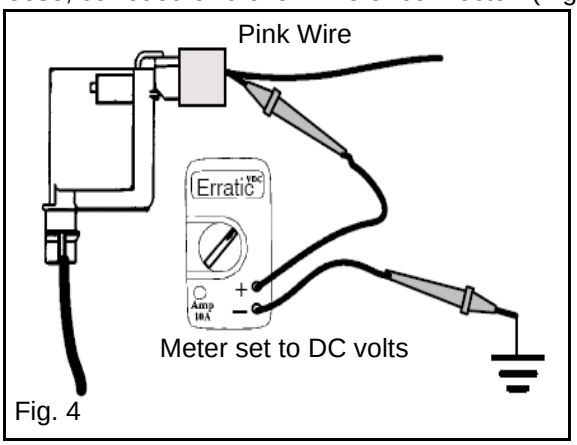


Fig. 4

9. If battery voltage is stable during all tests, the circuit supplying battery voltage to the ignition coil(s) is not at fault.
10. A quick test to verify that battery voltage is not reaching the ignition coil(s) is to use a jumper wire to jump from the positive post of the battery to the battery supply wire at the ignition coil(s).
11. Try to start the engine or operate the engine in the RPM range where the mis-fire occurs.
12. If problem is corrected, this verifies wiring harness and/or components between the ignition coil(s) and battery need repair. Repair as needed to eliminate voltage drop.

CRANK POSITION SENSOR (CPS) RESISTANCE INSPECTION: Test 4

1. Lift tab (A) and disconnect crankshaft position sensor harness from the sensor.
2. Visually inspect the sensor wire harness for loose or broken wires or connectors.
3. Set DMM to Ohms scale.
4. Measure crank position sensor resistance and compare to specification. (Fig. 5)

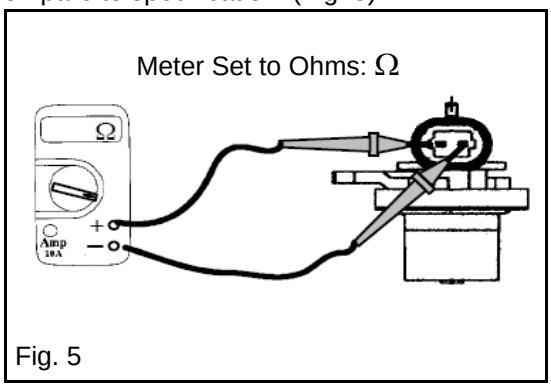
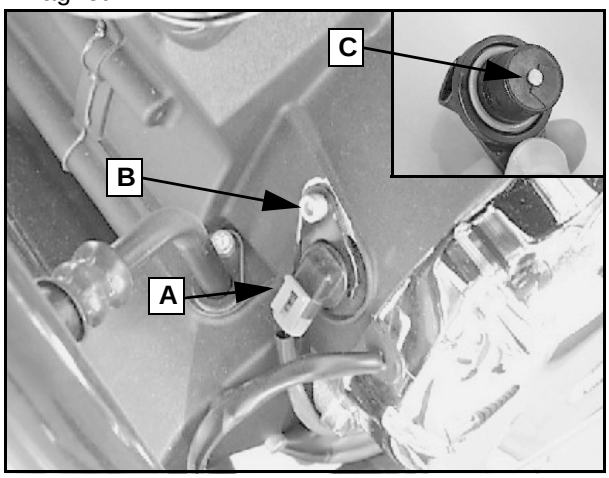


Fig. 5

Specification: 1450-1800Ω @ 25°C, 77°F

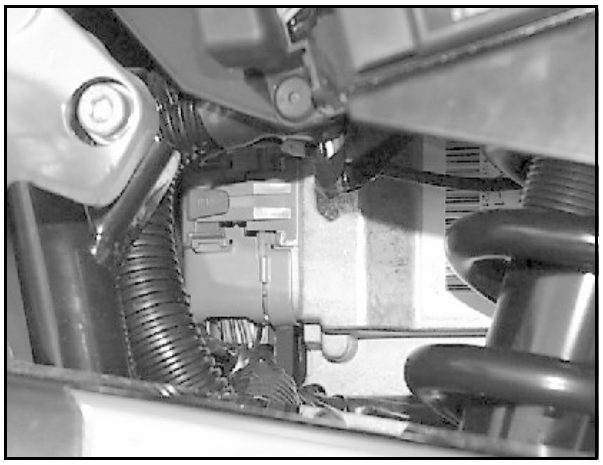
5. Remove screw (B) and pull crank position sensor from crankcase.
6. Visually inspect center pole of crank position sensor (C) for damage or metal particles clinging to the magnet.



7. If crank position sensor is damaged, remove primary cover and inspect flywheel timing gear. (Chapter 9)

CRANK POSITION SENSOR AC OUTPUT Test 4A

> **⚠ CAUTION**
>
> This test requires reading voltages at ECM connector. Once ECM connector has been disconnected, do not touch pins on ECM. Static electricity from your body can easily damage ECM.
>
> Do not attempt to perform tests on ECM. Tests are done on wiring harness side of ECM connector.



NOTE: A connector test adapter kit is necessary. Use of other means to probe necessary pins can easily damage the ECM connector and cause a poor connection.

Test lead kit PV-43526

1. Remove connector from ECM (page 5.29).
2. Locate the #15 pin and #32 pin in the ECM harness connector (C). Set DMM to AC volts scale.
3. Place one lead of the DMM in female pin #15 & the other DMM lead into female pin #32 of the connector **(not the ECM).** Fig. 6.

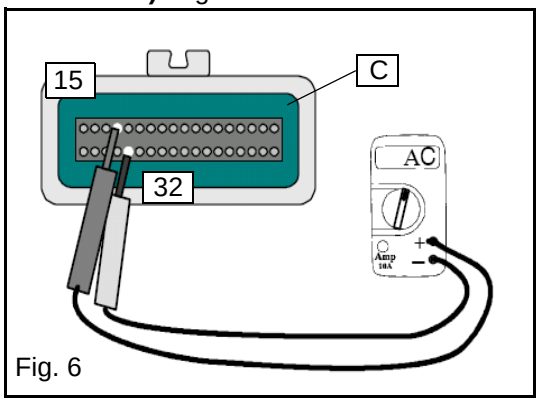


Fig. 6

4. Turn engine over with electric starter and observe DMM display. (Fig. 6)
5. With the spark plugs installed voltage reading will be erratic due to the low rpm and pulsing nature of the signal. The meter display will be erratic. Watch bar (D) at bottom of display to determine if a signal exists. Any fluctuating AC signal is correct for this test. (Ill. 3)

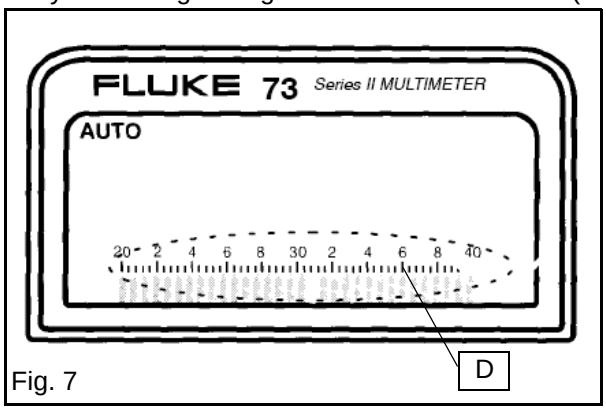


Fig. 7

NOTE: The bar display at the bottom of the display window on a Fluke™ 73 DMM updates 10 times faster than the numeric display. (Fig. 7)

6. Remove spark plugs from engine. Install spark plugs into spark plug caps and ground spark plugs.
7. Measure AC voltage signal from crank position sensor while turning engine over using electric starter with spark plugs out and compare to specification.

Specification: 3 V AC ± 10% (Spark Plugs Removed)

8. A resistance test of the CPS can also be performed at the ECM connector (Fig. 8). Use the test lead adaptors from kit (D).

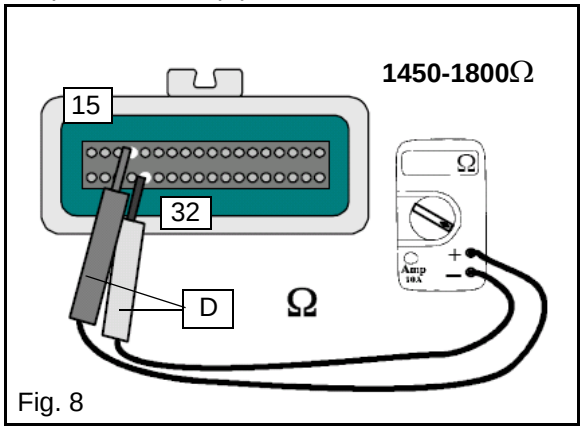


Fig. 8

Test lead kit PV-43526

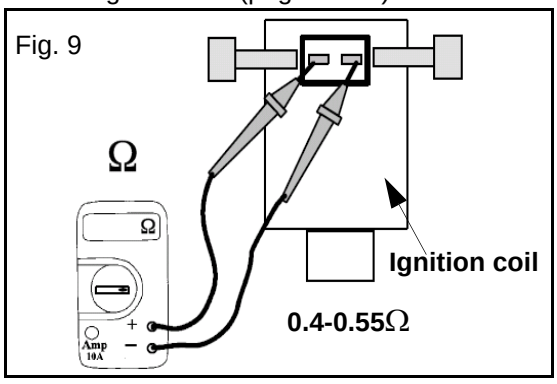
GROUND CIRCUIT INSPECTION: Test 5

1. Set DMM to DC volts.
2. Connect red meter lead to positive (+) post of battery.
3. Connect black meter lead to several bare metal places on frame, engine and wiring harness ground connections while observing meter reading at each.
4. At each ground test point, meter should read battery voltage.
5. Low voltage indicates resistance. Corrosion, paint, loose or damaged connections or broken wires are possible problem areas.
6. Refer to wiring diagram to locate all ground connections for wiring harness. Clean battery terminals thoroughly and apply a thin coat of dielectric grease. The battery ground cable is attached to the frame at the left rear corner of crankcase (by clutch cable).

IGNITION COIL INSPECTION: Test 6

Primary Resistance

1. Remove ignition coil (page 17.12).



2. Turn ignition switch **OFF**.
3. Disconnect ignition coil primary wire connector.
4. Disconnect spark plug caps from plugs

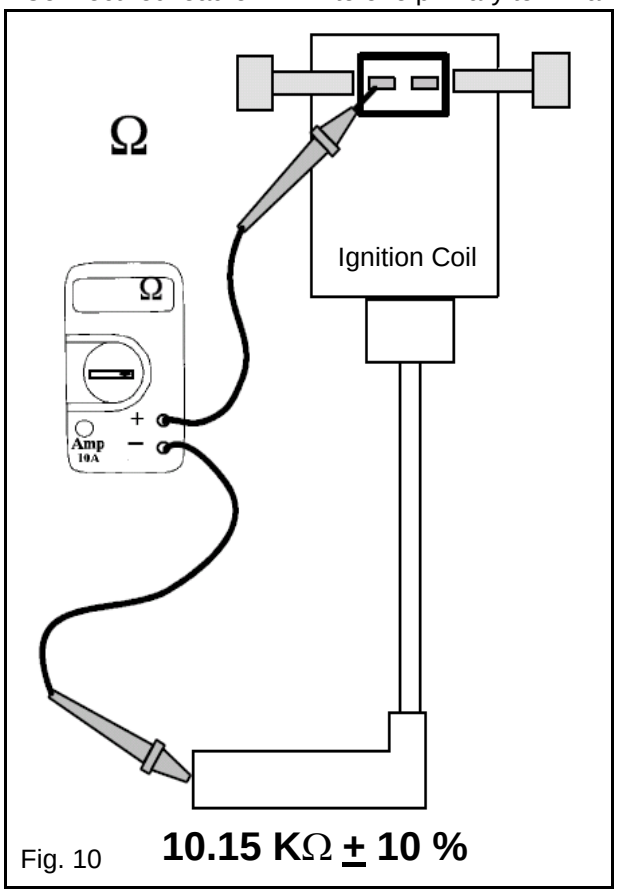
> **⚠ CAUTION**
>
> Do not attempt to remove spark plug caps from spark plug secondary leads. The spark plug caps are molded to the plug wires and are only available as an assembly. The specifications given includes the resistance of the spark plug caps.

5. Set DMM to Ohms scale.
6. Measure ignition coil primary winding resistance.
7. Repeat primary winding resistance test for other coil.

Specification: 0.4-0.55 Ω

Secondary Resistance

8. Connect red lead of DMM to one primary terminal.



9. Connect black lead of DMM to spark plug terminal inside spark plug cap; observe resistance reading.

Specification: 10.15 KΩ ± 10%

> **⚠ CAUTION**
>
> Most DMM are auto ranging and will automatically set themselves to the appropriate scale. Do not fail to look for the "K" or "M" on the meter display when taking any resistance measurements.

10. If the suspected coil tests correctly, but motorcycle has an intermittent miss after it warms up, heat coil with a hair dryer or heat gun and retest the coil.

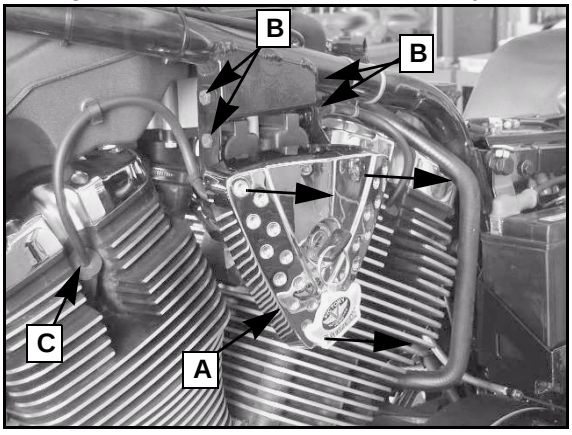
> ⚠ CAUTION
>
> Do not heat coil to more than 200° F.

11. Cracks in the coil's insulation may enlarge enough to be detected when the coil is at operating temperature.

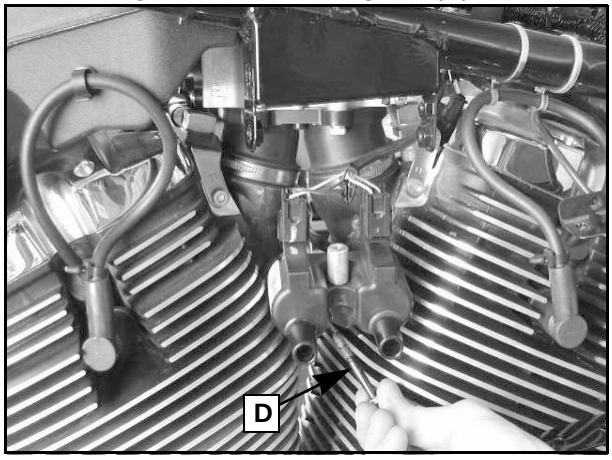
NOTE: Specific readings are unimportant when looking for a change in the meter's reading when heating a coil. Resistance will change considerably even with a good coil due to resistance properties of wire when subjected to temperature changes.

IGNITION COIL REMOVAL

1. Turn ignition switch OFF and remove key.



2. Remove fuel tank (Chapter 5), seat, and side covers (Chapter 3).
3. Remove ignition switch cover (A) by pulling straight outward.
4. Remove ignition switch mounting bracket bolts (B).
5. Remove both high tension leads (C) from coils.
6. Remove ignition coil mounting bolt (D).



7. Disconnect primary winding connectors by pushing tab in and pulling connector away.
8. Remove ignition coil.

IGNITION COIL INSTALLATION

1. Installation procedure is the reverse of removal procedures.
2. Apply light film of dielectric grease to primary winding terminals.

IGNITION SWITCH REMOVAL

1. Follow steps 1 through 3 of ignition coil removal.
2. Disconnect ignition switch from the main wire harness on right side of motorcycle by pushing the tab and pulling connector apart.

FLYWHEEL ADAPTOR (TIMING GEAR) REMOVAL

1. Remove flywheel (Chapter 9).

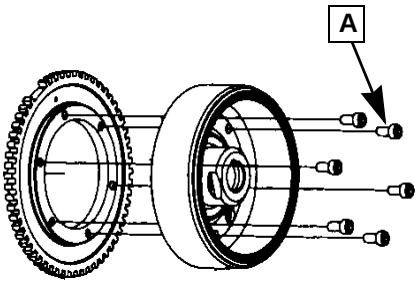


Fig. 11

2. Remove flywheel adaptor (timing gear) bolts (A). (Fig. 11)

FLYWHEEL ADAPTOR (TIMING GEAR) INSTALLATION

1. Align adaptor with flywheel.

NOTE: Keyway of flywheel (B) must line up with line or "T" on flywheel adaptor when installed. (Fig. 12)

2. Apply Loctite™ 262 threadlock to screws and install. Torque to specification.

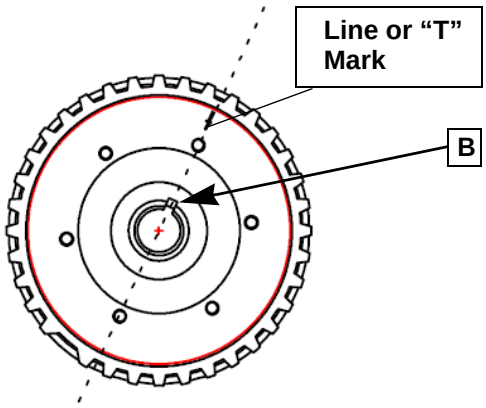


Fig. 12

TORQUE:
13 Nm, 115 in-lb
Loctite™ 262

3. Install flywheel (Chapter 9).
4. Install primary cover (Chapter 9).

NOTES

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ELECTRIC STARTER

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GENERAL

SAFETY INFORMATION

⚠ WARNING

Always disconnect the battery (negative terminal first) before servicing the starter motor.

GENERAL CAUTIONS TO OBSERVE WHEN WORKING ON STARTER SYSTEM

- Inspect the condition of the battery before troubleshooting the starter system. Also inspect main engine ground (at rear left top of crankcase) and battery cable connections.

SPECIFICATIONS

STARTER SPECIFICATIONS

ELECTRIC STARTER & STARTER CLUTCH		
Item	**Standard**	**Service Limit**
Battery Voltage, No Load	Above 12.5 V DC	-
Resistance: Between Any Two Commutator Bars	Continuity (0 Ohms)	-
Resistance: Commutator to Armature Shaft	Infinity (OL on Fluke™ 73)	-
Resistance: Battery Input Terminal to Insulated Brush	Continuity (0 Ohms)	-
Resistance: Bat. Input Terminal to Starter Motor Case	Infinity (OL on Fluke™ 73)	-
Starter Motor Brush Length	13 mm ± 0.5 mm (0.512 ± 0.020")	6.5 mm (0.255")
Starter Motor Operating Amp Draw	90-120 Amps	-
Starter Motor No Load Amp Draw (Bench Test)	30-40 Amps after initial surge	-
Starter Slip Clutch Break-Away Torque	50 lb-ft when new	35-45 lb-ft after break-in
Total Voltage Drop Allowed - Pos Side Of Starter	0.3 V DC (300 millivolts)	-
Total Voltage Drop Allowed - Neg Side Of Starter	0.3 V DC (300 millivolts)	-
Voltage Drop Allowed: Each Connection - Pos Circuit	0.2 V DC (200 millivolts)	-
Voltage Drop Allowed: Each Connection - Neg Circuit	0.2 V DC (200 millivolts)	-

FASTENER TORQUE SPECIFICATIONS

Torque Specifications - Starter		
Description	**Torque Nm**	**Torque lb-ft (in-lb)**
Bearing Cover Screws	10 Nm	(85 in-lb)
Crankshaft Gear Bolts	41 Nm	30 lb-ft (Screws have pre-applied locking agent - replace if loosened or removed)
Electrical Terminal to Starter	6.8 Nm	(60 in-lb)
Flywheel Adaptor (Timing Gear)	13 Nm	(115 in-lb) Loctite™ 262
Flywheel Bolt	102 Nm	75 lb-ft
Neutral / Overdrive Switch	11 Nm	(100 in-lb) Apply Pipe Sealant
Regulator / Rectifier Screws	10 Nm	(85 in-lb)
Positive Cable (+) to Motor Terminal	7 Nm	(60 in-lb)
Starter Motor to Crankcase Bolts	30 Nm	22 lb-ft
Starter Motor Case Bolts	10 Nm	(85 in-lb)

SPECIAL TOOLS

STARTER SYSTEM SPECIAL TOOLS

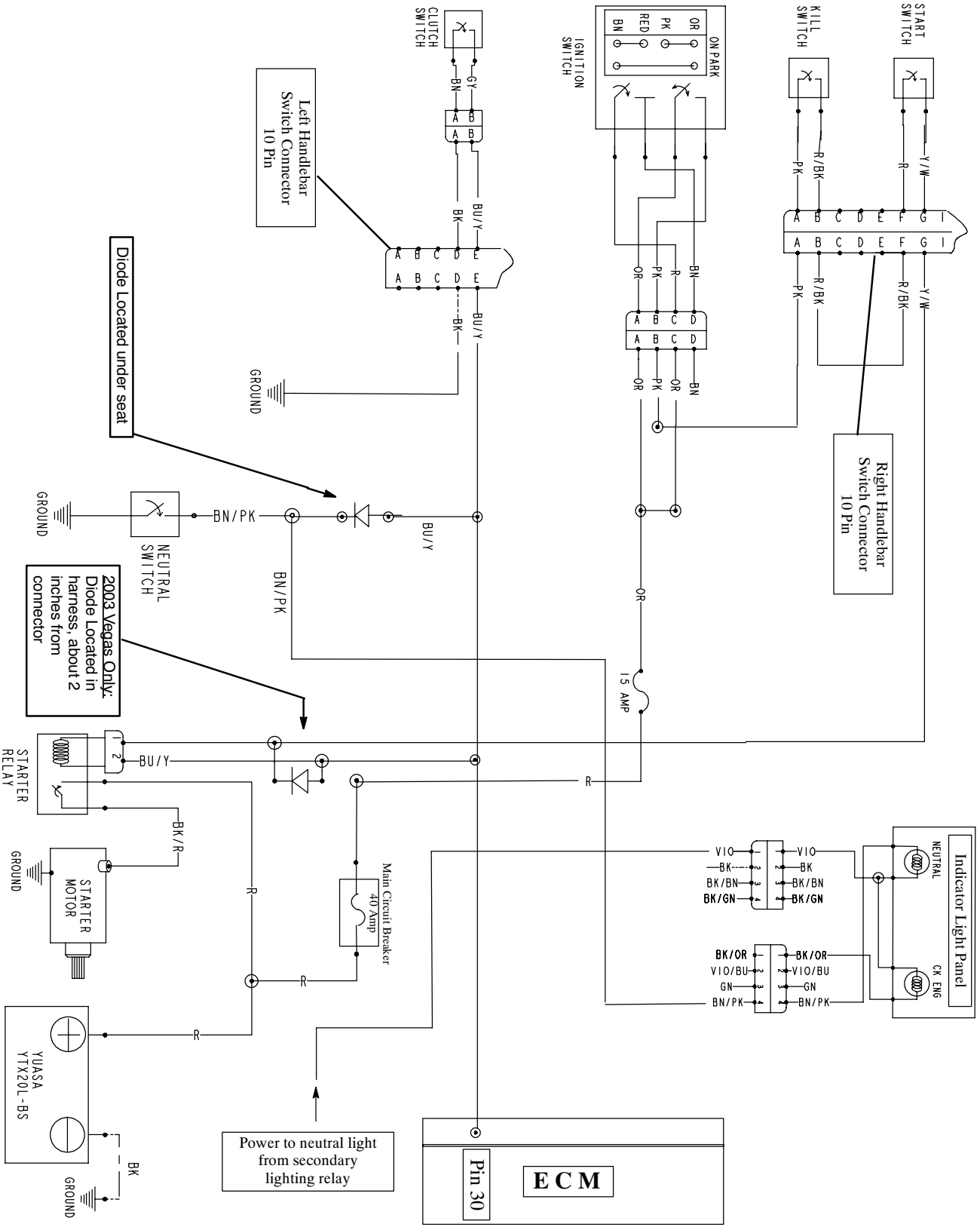
SPECIAL TOOL	PART NUMBER
Digital Multi-Meter	PV-43546
Optional Amp Meter Inductive Clamp	PV-39617
Flywheel Puller	PV-43533
Engine Stop Tool	PV-43502
Connector Test Kit	PV-43526

DIAGNOSTICS

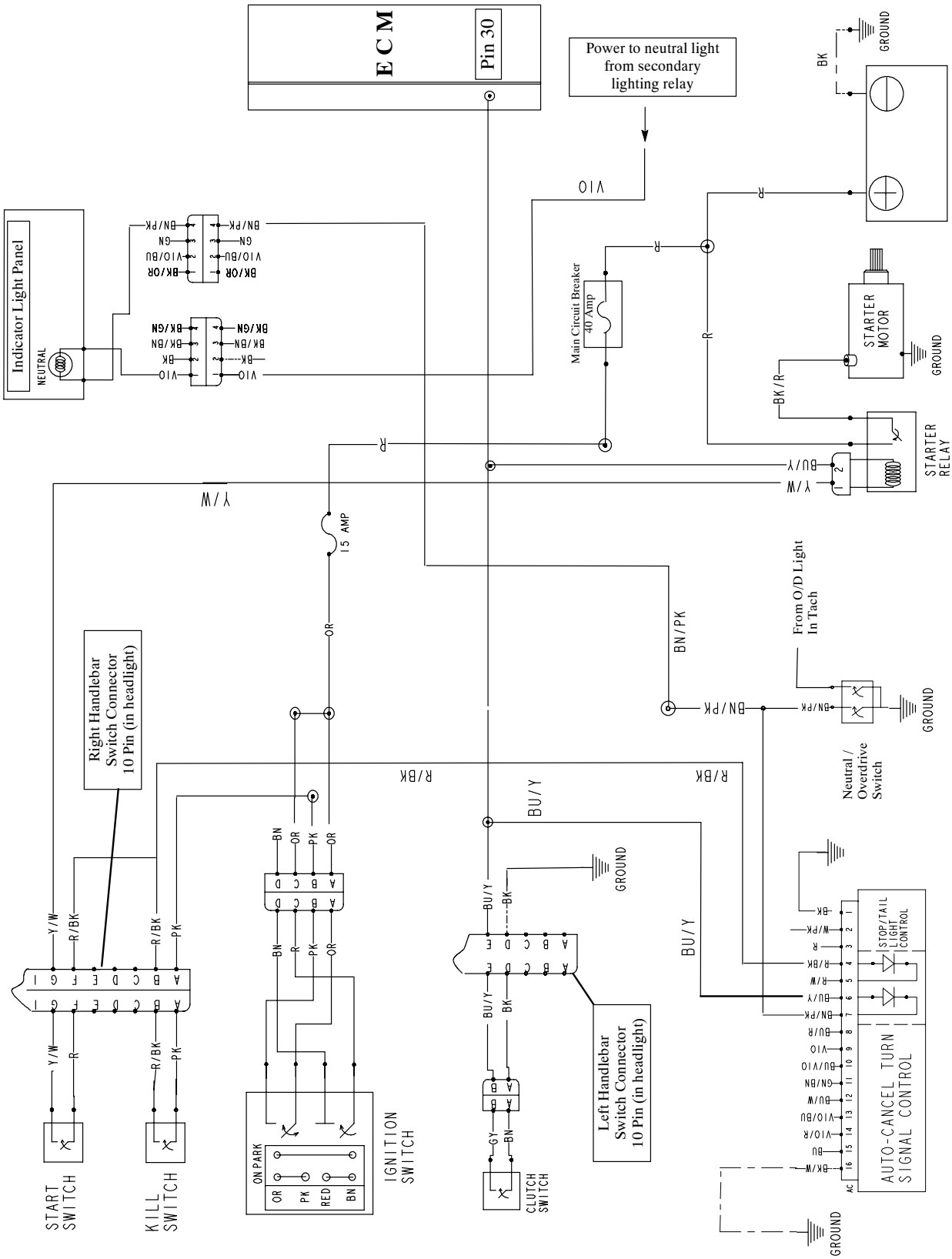
TROUBLESHOOTING FLOW CHART MENU

Symptom	Possible Cause	Refer To:
Starter motor does not turn with transmission in neutral. Turns with clutch pulled in.	Neutral Switch or Circuit Malfunction	Test Neutral Switch (page 18.9)
Starter motor does not turn with transmission in gear and clutch lever pulled in. Turns with transmission in neutral.	Clutch Switch or Circuit Malfunction	Test Clutch Switch (page 18.10)
Starter motor will not turn	Low battery voltage. Poor cable connections. Main engine ground loose (rear left top of crankcase).	See Troubleshooting Flow Chart 1 (page 18.5)
Starter motor turns slowly. Engine may or may not start.	Low battery. Faulty starter motor. Engine mechanical problem.	See Troubleshooting Flow Chart 2 (page 18.6)
Starter motor turns, but engine does not turn.	Starter torque limit clutch slipping (Chapter 9).	See Troubleshooting Flow Chart 3 (page 18.7)
Starter motor turns at normal speed, but engine does not start.	Ignition Problem Engine Problem Fuel Delivery Problem	Chapter 17 Chapter 7-10 Chapter 5

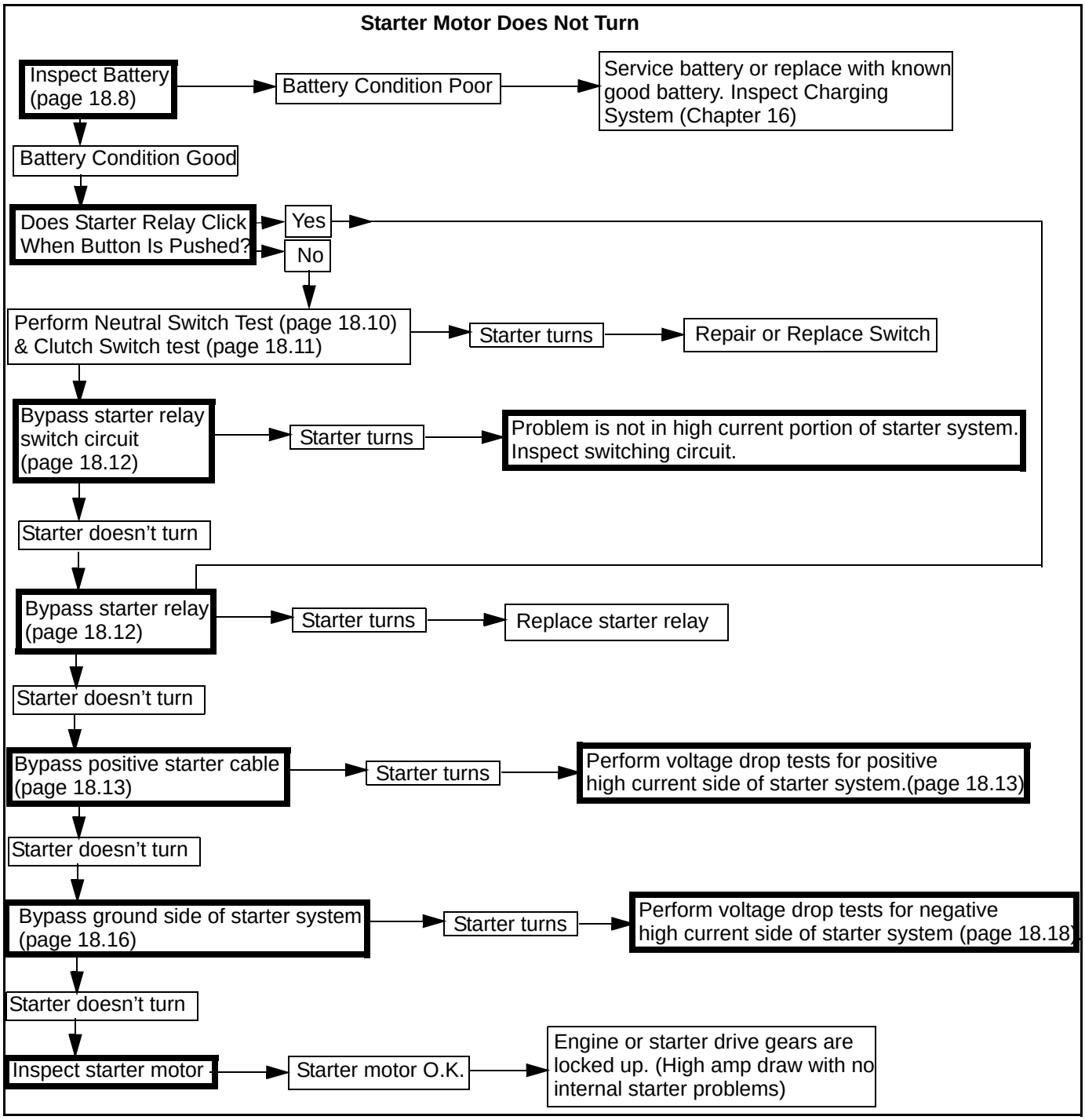
STARTER CIRCUIT DIAGRAM - 2003/2004 MODELS



STARTER CIRCUIT DIAGRAM - 2005/2006 MODELS



TROUBLESHOOTING FLOW CHART 1



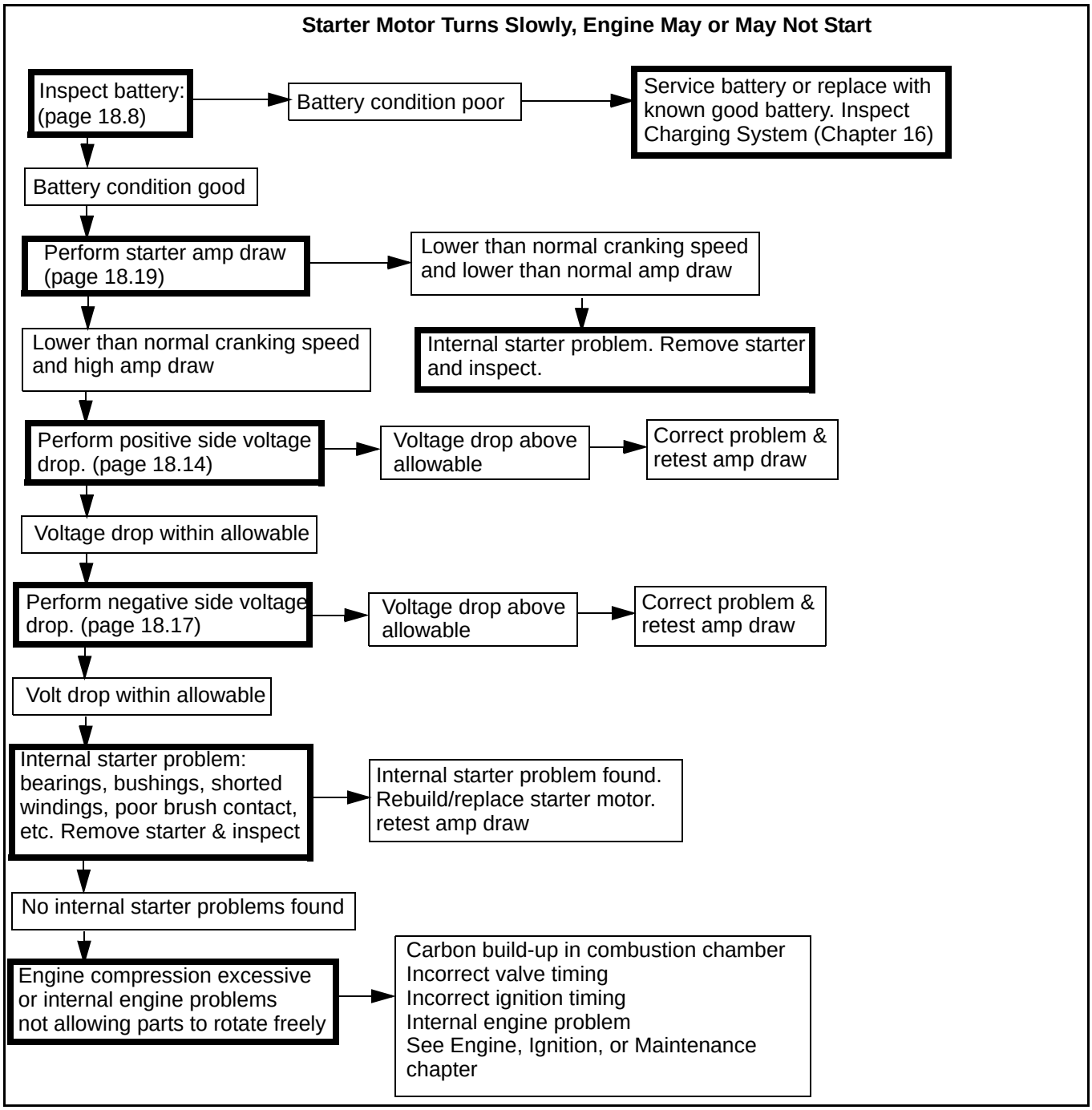
⚠ WARNING

Ensure that motorcycle is secure and transmission is in neutral for all tests.

⚠ CAUTION

Inspect fuses and make sure battery is fully charged before inspecting starter system.

TROUBLESHOOTING FLOW CHART 2



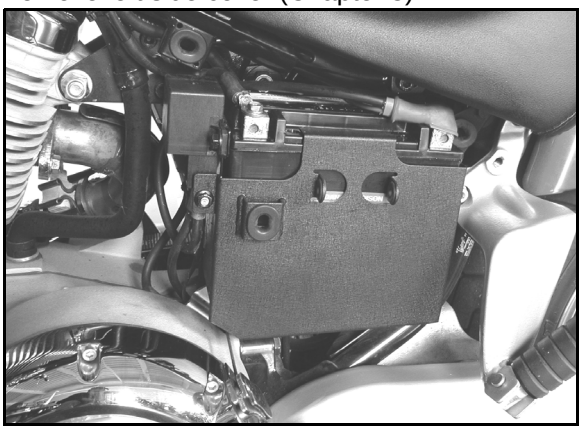
NOTE: These procedures require a Digital Multimeter and High Amp capacity ammeter, a shunt, or an inductive ammeter clamp and a DMM.

TROUBLESHOOTING FLOW CHART 3

Symptom	Possible Cause	Possible Reason and/or Inspection Needed
Starter motor turns, but engine does not turn. The starter motor can be heard spinning.	Starter clutch malfunction.	Refer To Procedure Chapter 9.
	Starter torque limit clutch slipping.	Refer To Procedure Chapter 9.
	Starter gears damage.	Refer To Procedure Chapter 9.

BATTERY INSPECTION & CHARGING PROCEDURES

1. Remove left side cover (Chapter 3).



2. Measure battery voltage. Voltage reading should be above 12.5 V DC. If the battery voltage is lower than 12.5 V DC charge battery according to the instructions given below.

> ⚠ CAUTION
>
> Remove battery from motorcycle before charging.

The battery is a maintenance free type. Do not attempt to inspect or add fluid to a maintenance free battery.

3. Charge battery at <u>1.8 amps for 5 to 10 hours.</u>

Specification: 1.8 A for 5-10 hours

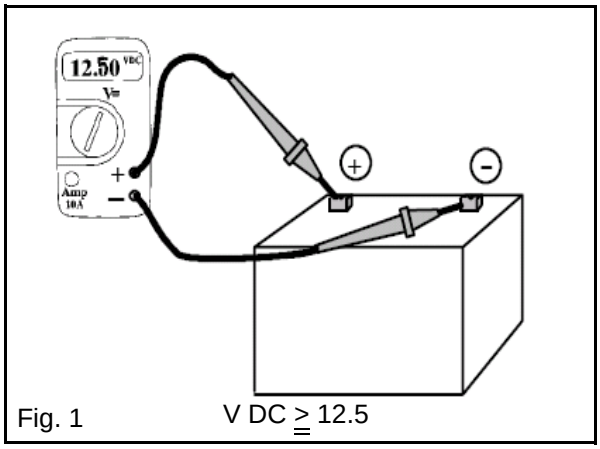


Fig. 1 V DC ≥ 12.5

4. Remove battery from charger and let it sit for 30 minutes or longer.
5. Measure battery voltage. If lower than 12.5 V DC battery must be recharged again in accordance with step 1 and 2.
6. After charging battery and waiting 30 minutes or more, check battery voltage again. If voltage is still below 12.5 V DC, replace the battery.

NOTE: When motorcycle is not used for one (1) month or more, remove battery from motorcycle and store in a cool, dry area. Inspect voltage monthly and charge according to above instructions if necessary.

NOTE: If battery measures below specifications inspect the charging system. Refer to chapter 16.

CIRCUIT & SWITCH TESTING

BATTERY LOAD TEST

1. Load test battery using a commercially available battery load tester. Follow the battery load tester manufacturer instructions.

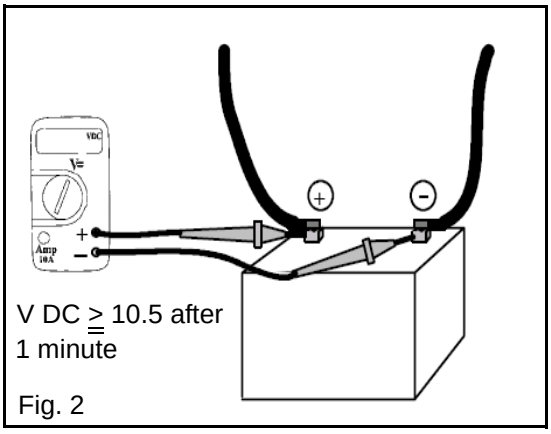


Fig. 2

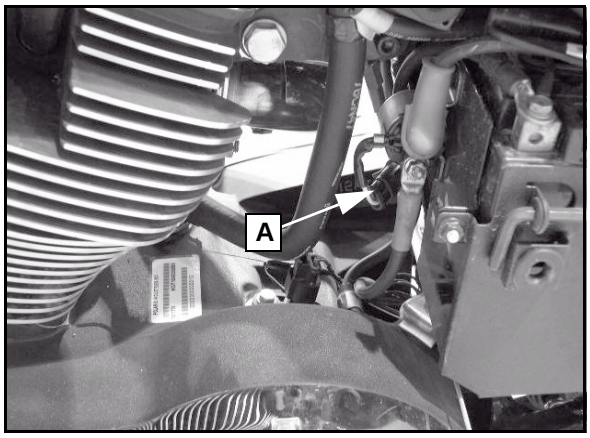
NOTE: Although not as conclusive, the following test can be used to direct troubleshooting efforts if a battery load tester is not readily available.

2. Charge battery (see procedure).
3. Install battery and connect battery cables.
4. Connect digital multimeter to battery and keep it connected for duration of test.
5. Turn ignition key on and move head light high beam switch to High Beam for 1 minute (without the engine running).
6. Turn ignition off. Measure battery voltage.
7. If battery voltage drops below 10.5 V DC the battery should be charged again and the test repeated.

STARTER RELAY GROUND CIRCUIT TEST

WARNING

Ensure that motorcycle is secure and that transmission is in neutral for the following inspection.



NOTE: Shifting transmission to neutral or pulling in the clutch lever provides a ground path for the low current side of the starter relay. This test will temporarily bypass these components. Refer to Starter Circuit Diagram on page 18.4 (2003-2004) or page 18.5 (2005-2006).

1. Shift transmission to Neutral.
2. Tap into the Blue / Yellow wire (A) and connect it to ground.
3. Turn ignition switch ON and place engine stop switch in run position.
4. Press starter button. If starter motor turns, inspect clutch switch (page 18.11) and gear position switch page 18.10).

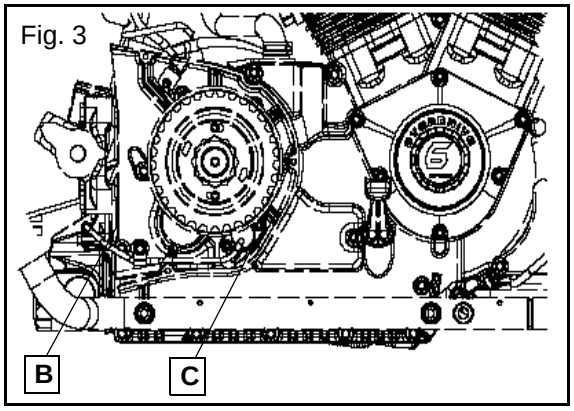
NEUTRAL SWITCH CIRCUIT INSPECTION

The symptom of a faulty neutral switch circuit is:

- Starter motor will not operate when transmission is in neutral.
- Starter will operate when clutch is pulled in.

1. Turn ignition switch on and place engine stop switch in the run position.
2. Place the transmission in neutral.
3. Observe neutral indicator light.
4. If indicator is not lit with transmission is in neutral:

Fig. 3



- Disconnect neutral switch wire at switch (92 C.I.) or the neutral / overdrive switch at (B) on 100 C.I. engines.
- Connect Brown/Pink on main harness side of connector to ground on engine (not the switch side of connector) with a jumper lead. This provides a path to ground for the neutral light.

5. If the gear position switch is at fault (neutral light came on with wire grounded in step 4) continue with Step 7 to test the gear position switch (C).
6. Shift transmission into Neutral.
7. Set meter to measure resistance.
8. Place one meter lead on Brown / Pink wire on switch side of connector.
9. Place the other lead on a good engine ground, such as a case screw.
10. Compare reading to Table 1 below.
11. Replace neutral switch or repair wiring as necessary.
12. If neutral switch is working correctly and neutral indicator did not light with the transmission in neutral; inspect neutral lamp and circuit wiring for a open/short circuit.

If switch is faulty, refer to Neutral Switch Removal / Installation in Chapter 19.

TABLE 1 - TESTING NEUTRAL SWITCH (92 C.I.) OR NEUTRAL SIDE OF GEAR POSITION SWITCH (100 C.I.)

Gear	Meter lead connections		Ohmmeter Reading*
Neutral	Brown / Pink in switch connector	Crankcase	$\leq .5\ \Omega$
Any gear (except Neutral)	Brown / Pink in switch connector	Crankcase	∞ (OL or Overload)
* Be sure to subtract meter lead resistance from resistance reading			

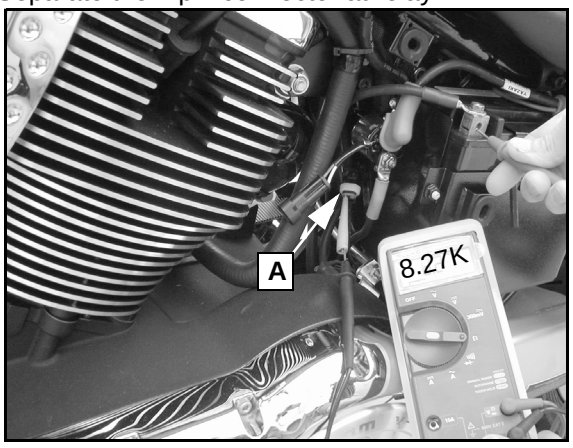
CLUTCH SWITCH / CIRCUIT TEST

Refer to Starter Circuit Diagram on page 18.4.

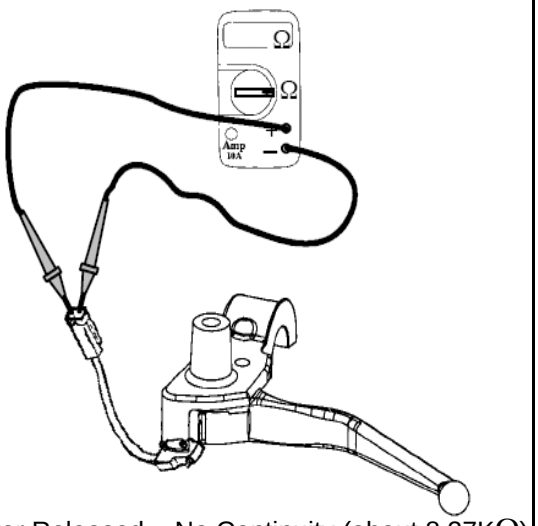
The symptom of a faulty clutch switch circuit is:

- Starter motor will not operate with transmission in gear and clutch lever pulled in. Starter operates with transmission in neutral. Use an ohmmeter to determine if continuity is present when the switch is closed (lever pulled in).

1. Transmission can be in neutral or in any gear.
2. Remove left side cover.
3. Separate the 2 pin connector at relay.



4. Set meter to measure resistance (Ω).
5. Connect red (+) lead of DMM to Blue/Yellow wire in connector on main harness side using a test probe (A) from Victory Connector Test Kit PV-43526.
6. Connect black meter lead to battery negative post.
7. Operate clutch lever while observing meter display.
8. Pull clutch lever to the handlebar. Meter should display continuity or very low resistance (less than 1 ohm) when the clutch switch closes.
9. Release clutch lever, meter should display approximately 8.27 KΩ.
10. If clutch switch does not test as described inspect clutch switch, clutch switch wiring or mounting of switch to clutch lever for fault as described below.
11. Disconnect clutch switch wiring connector at handlebar.

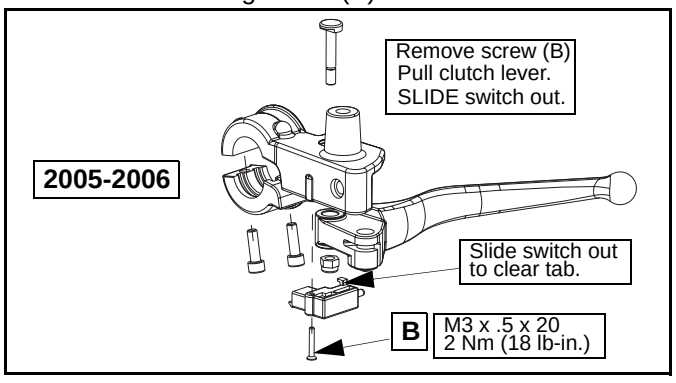


Lever Released = No Continuity (about 8.27KΩ)
Lever Pulled = Continuity
Fig. 4

12. Connect ohmmeter across terminals of clutch switch. Test for continuity when clutch lever is pulled to handlebar. Test for open circuit when clutch lever is released.
13. If the clutch switch now operates correctly, the wiring between this point and the previous test point is at fault and must be corrected.
14. If clutch switch still does not operate correctly, inspect mounting of switch.
15. If switch is mounted correctly and physically operates but does not open and close electrically, replace switch.

CLUTCH SWITCH REMOVAL

1. Disconnect wire harness.
2. Remove retaining screw (B).



3. Pull clutch lever and slide switch out of retaining notch.

CLUTCH SWITCH INSTALLATION

1. Make sure clutch handle is pulled toward handlebars and secured there during the installation process.
2. Install switch.
3. Install retaining screw.
4. Connect wire harness.
5. Release clutch handle.

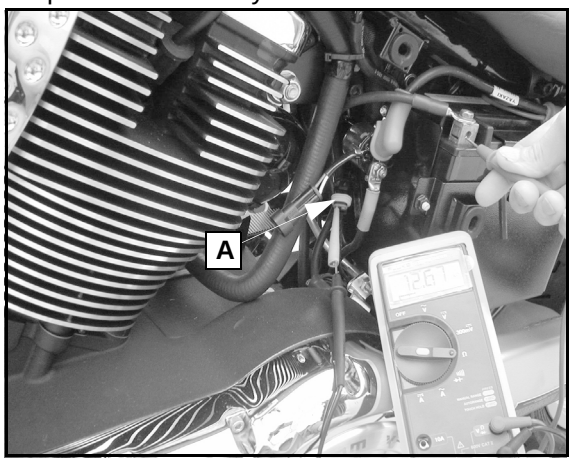
STARTER RELAY POSITIVE CIRCUIT TEST

WARNING

Secure motorcycle and place transmission in neutral for the following test.

Refer to Starter Circuit Diagram on page 18.4.

1. Place the transmission in neutral.
2. Remove left side cover.
3. Separate connector at starter relay.
4. Set DMM to **DC Volts**.
5. Check battery voltage by testing across battery terminals. Note the voltage reading (should be above 12 DC volts.)
6. Connect red (+) lead of DMM to the yellow/white wire in starter relay wiring harness connector (A) using a test probe from Victory Connector Test Kit PV 43526.



7. Connect DMM black lead to battery negative post.
8. Turn ignition key ON and Kill Switch to RUN position.
9. Press starter button. The meter should display battery voltage. If voltage is more than .2 volts below battery voltage, inspect the power supply circuit.

STARTER RELAY BYPASS TEST

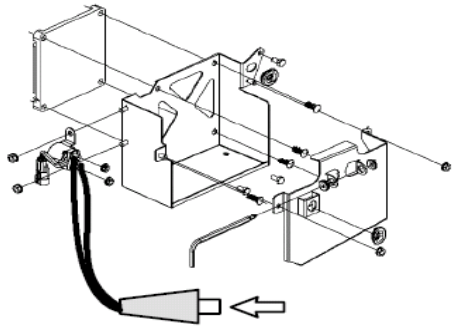
WARNING

Secure motorcycle and place transmission in neutral for the following test. Be sure the transmission is in neutral!

WARNING

The following test involves high current, heat and possible sparks. Wear a face shield and approved safety glasses while doing the following test. Only use the tool recommended to prevent excessive heat and possible burns.

1. Place the transmission in neutral.



Remote Starter Switch

Fig. 5

2. Remove left frame side cover.
3. Connect one lead of a remote starter switch to one of the terminal posts on the relay and the other lead to the other terminal post on the relay. (Fig. 5)

CAUTION

Do not allow the metal clips of the remote starter relay switch to touch each other and short out.

4. Depress button on remote starter switch. (Fig. 5)
5. If starter motor operates, and Positive Circuit Test, Clutch Switch Test, and Neutral switch tests have passed inspection, replace the relay.
6. If the starter motor does not operate, perform test below.

STARTER RELAY TO STARTER MOTOR POSITIVE CABLE BYPASS TEST

WARNING

Secure motorcycle and place transmission in neutral for the following test.

WARNING

The following test involves high current, heat and possible sparks. Wear a face shield and approved safety glasses while doing the following test.

1. Place the transmission in neutral.
2. Remove left side cover.

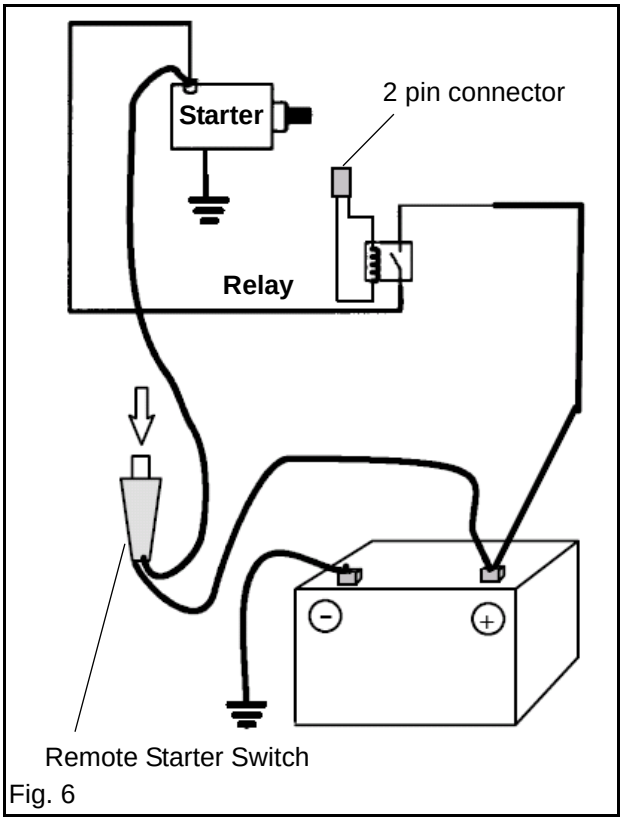


Fig. 6

3. Connect one clamp of a heavy-duty, automotive remote starter switch to positive terminal lug at starter motor.
4. Connect other clamp of remote starter switch to positive terminal of battery.

WARNING

Do not allow any part of the jumper cable clamp to touch the chassis or any other ground. Be sure transmission is in neutral.

5. Make sure transmission is in neutral, key switch off and stop switch off.
6. Pull in clutch lever and depress the remote starter switch momentarily.
7. If starter turns, there is excessive resistance in the positive, high current side of the starter system. Go to Positive Side Voltage Drop Test.
8. If starter does not turn, go to Negative Cable Bypass Test.

POSITIVE SIDE VOLTAGE DROP TEST

Symptoms: Starter motor does not turn or turns slowly when starter relay is bypassed. Starter motor works correctly when performing Starter Relay Positive Cable Bypass Test.

> **⚠ CAUTION**
>
> The ignition system must be disabled when doing voltage drop tests, if engine starts it will be difficult to measure voltage drop. To disable ignition system quickly and safely, observe the following steps.

1. Remove spark plug caps.
2. Install test spark plugs or plugs with the gap CLOSED into plug caps.
3. Ground spark plug center electrode to engine.

POSITIVE SIDE VOLTAGE DROP TESTS		
Location	**Steps**	**Allowable Voltage Drop**
Battery (+) To Starter (+)	1 through 8	0.3 Volts DC (300 mV DC)
Battery (+) to Battery Side of Relay	9 through 17	0.2 Volts DC (200 mV DC)*****
Across Relay	18 through 22	0.2 Volts DC (200 mV DC)*****
Starter (+) to Starter Side of Relay	23 through 31	0.2 Volts DC (200 mV DC)*****

**NOTE: ***The total voltage drop equal to the voltage drop between the battery (+) to starter (+). The total voltage drop must not exceed 0.3 Volts DC.

> **⚠ CAUTION**
>
> Only operate starter long enough to stabilize the reading on the DMM (less than 10 seconds running time). Let starter motor cool down between each voltage drop test to prevent damage to starter motor.

4. Place transmission in neutral.

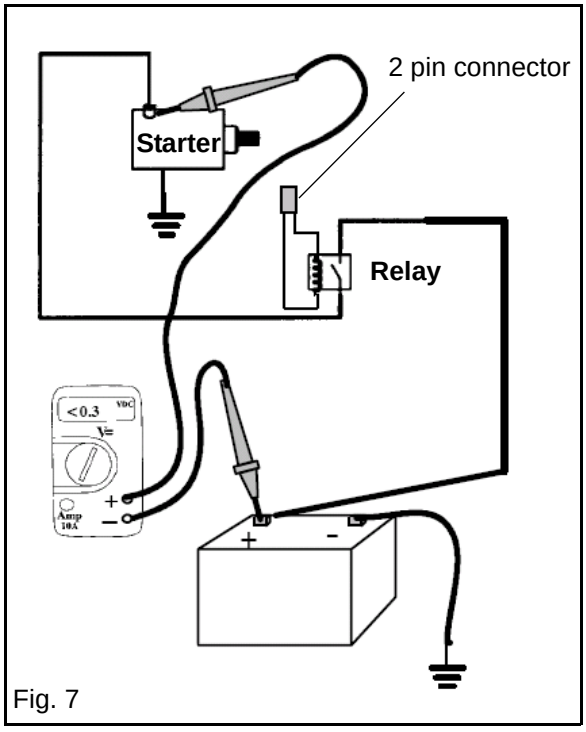


Fig. 7

5. Remove left side cover.
6. Set DMM to DC Volts.
7. Place one lead of DMM to positive battery post.(Fig. 7)
8. Place the other lead of the DMM to starter motor positive terminal screw. (Fig. 7)
9. Turn ignition switch on, turn engine stop switch to run

position. Pull in clutch lever.

10. Operate the starter normally (no jumper cables in place) and observe meter display.
11. If DMM reads more than 0.3 Volts DC when the starter motor is engaged, it indicates that there is excessive resistance in the starter's battery positive path. Continue with the following tests to isolate each section of the positive path and observe the voltage drop with DMM leads placed as indicated.
12. Place one lead of DMM to positive battery post. Ensure DMM is set to read DC Volts. (Fig. 8)

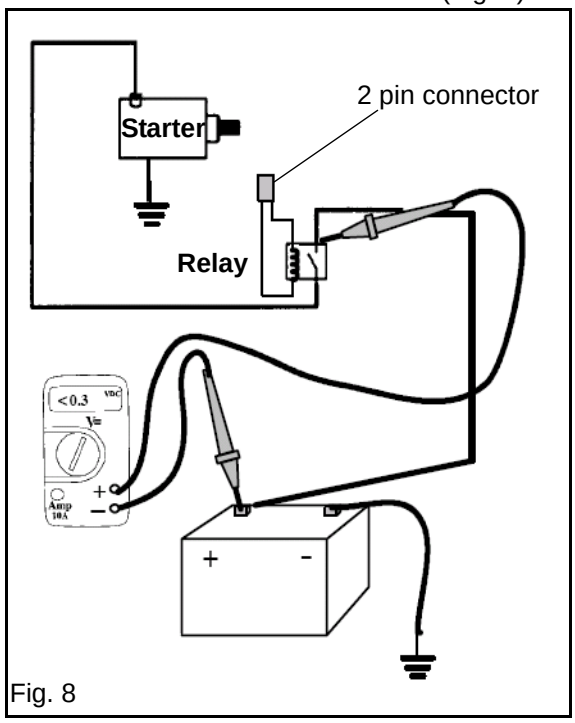


Fig. 8

13. Place other lead of DMM to relay terminal leading to battery. (Fig. 8)
14. Engage starter and observe meter display, it should read less than 0.2 Volts DC (200 mV DC).
15. If voltage drop is observed, the cable, connection at the battery or connection at the relay is causing resistance and must be corrected.
16. Inspect cable ends for corrosion where cable is connected to terminal lugs.
17. Remove cable. Set the DMM to read Ohms.
18. Place DMM leads at both ends of the cable and measure the cable's resistance. The resistance should be 0 ohms. Replace cable if necessary.
19. Inspect battery post, battery cable lug and relay lug for corrosion or looseness.

NOTE: Corrosion has resistance that limits or stops the flow of current to the starter motor.

20. If corrosion is found, wash all connections with a solution of baking soda and water, wire brush all contact areas, apply a light film of dielectric grease to the hardware and tighten connections. Retest to verify problem has been corrected.

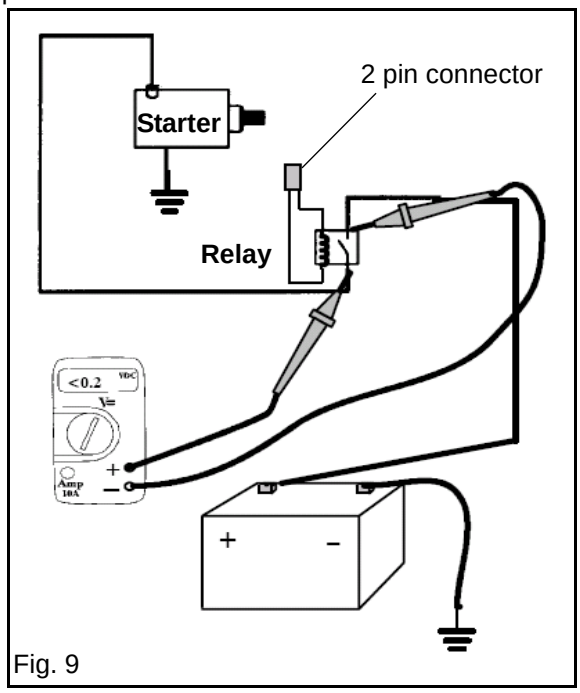


Fig. 9

21. Place one lead of DMM to battery side of relay. Reset DMM to read DC Volts if necessary. (Fig. 9)
22. Place other lead to starter motor side of relay. (Fig. 9)
23. Engage starter and observe meter display; it should read less than 0.2 Volts DC (200 mV DC).
24. If voltage drop is observed, remove cables and clean cable terminals and relay terminals. Reattach cables. Retest voltage drop.
25. If voltage drop is still observed through the relay, replace relay.

26. Place one lead of DMM to starter motor side of relay. Ensure DMM is set to read Volts DC. (Fig. 10)

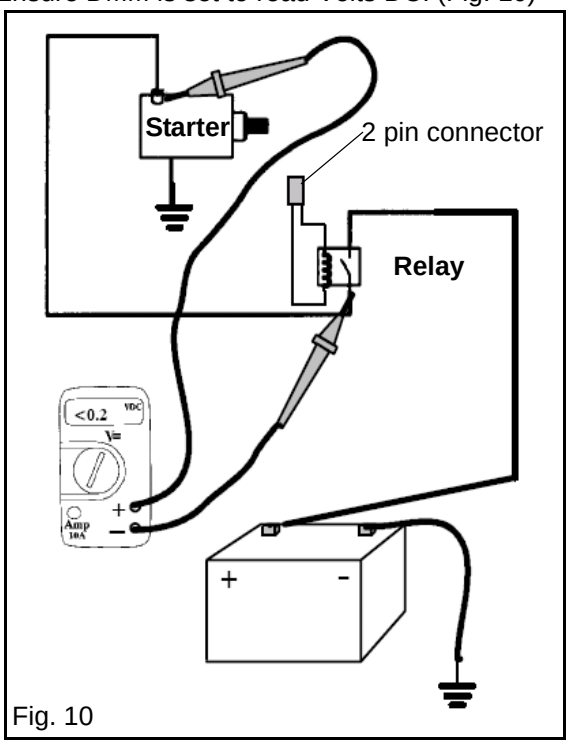


Fig. 10

27. Place other lead of DMM to starter motor positive terminal. (Fig. 10)
28. Engage starter and observe meter display.
29. If voltage drop is observed, cable connection at relay or connection at starter motor is causing resistance and must be corrected.
30. Inspect cable ends for corrosion where cable is connected to terminal lugs.
31. Remove cable. Set DMM to read Ohms.
32. Place DMM leads at both ends of cable and measure cable resistance. The resistance should be 0 ohms. Replace cable if necessary. Remember to subtract test lead resistance.
33. Inspect starter cable lug and relay lug for corrosion or looseness.
34. If corrosion is found, wash all connections with a solution of baking soda and water, wire brush all contact areas, apply a light film of dielectric grease to hardware and tighten connections. Retest to verify problem has been corrected.

NEGATIVE CABLE BYPASS TEST

1. Place transmission in neutral.

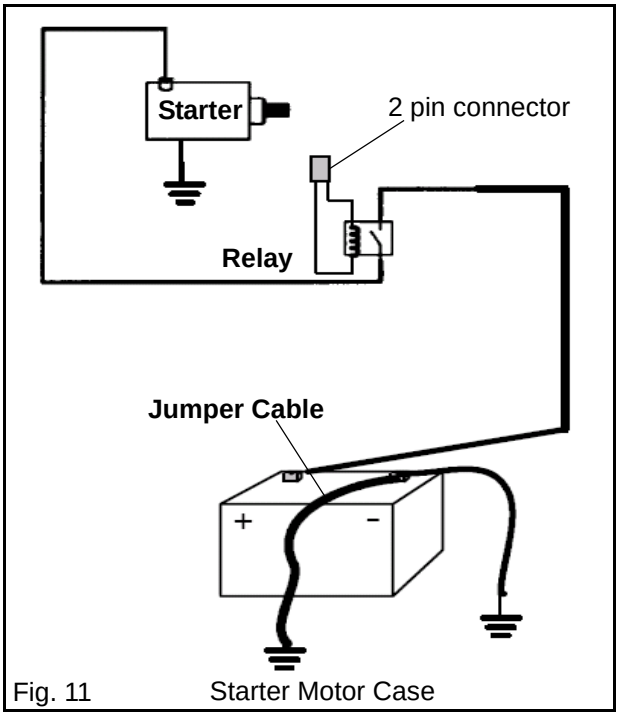


Fig. 11 Starter Motor Case

2. Remove left side cover.
3. Connect one clamp of an automotive type jumper cable (heavy gauge jumper cable) to battery negative post.
4. Connect other end of jumper cable to a good ground location on starter motor body.
5. Make sure transmission is in neutral. Turn ignition key and stop switch on. Pull clutch lever in and attempt to start motorcycle.
6. If starter motor turns, there is excessive resistance in the negative, high current side of the starter system. Perform Negative Side Voltage Drop Test.
7. If starter does not turn and all troubleshooting steps have led to this test, replace starter motor.

NEGATIVE SIDE VOLTAGE DROP TEST

NEGATIVE SIDE VOLTAGE DROP TESTS		
Location	**Steps**	**Allowable Voltage Drop**
Battery (-) To Starter Body (-)	1 through 8	0.3 Volts DC (300 mV DC)
Battery (-) to Battery Cable Ground Connection At Engine	9 through 17	0.2 Volts DC (200 mV DC)*
Battery Cable Ground Connection To Starter Body (-)	18 through 24	0.2 Volts DC (200 mV DC)*

NOTE: *The total voltage drop of these two items will equal to the voltage drop between the battery (-) to starter body (-). The total voltage drop must not exceed 0.3 Volts DC.

⚠ CAUTION

Only operate the starter long enough to stabilize the reading on the DMM (less than 10 seconds running time). Let starter motor cool down between each voltage drop tests to prevent damage to starter motor.

Disable the ignition system so engine will not start during this test.

- Remove spark plug caps.
- Install test spark plugs or plugs with the gap closed into plug caps.
- Ground center electrode of spark plugs to engine.

1. Place transmission in neutral.

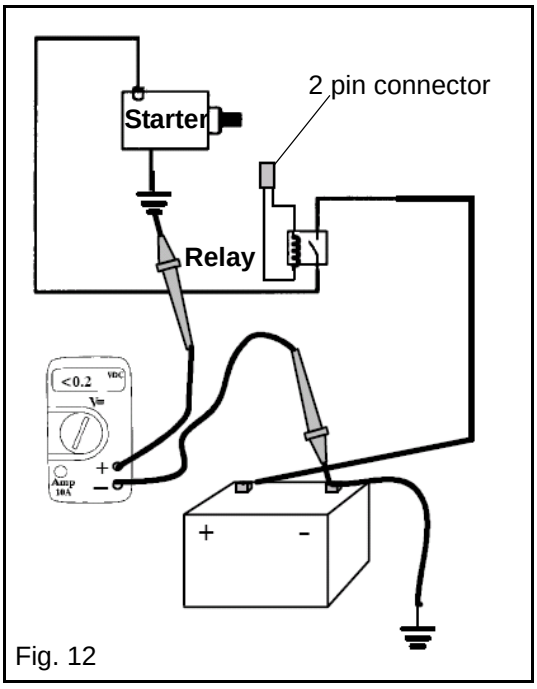


Fig. 12

2. Remove left side cover.
3. Set DMM to DC Volts.
4. Place one lead of DMM to negative battery post.
5. Place other lead of DMM to a clean ground on starter motor body.
6. Turn ignition switch ON and engine stop switch to RUN position. Pull clutch lever in.
7. Operate starter normally (no jumper cables in place) and observe meter display.
8. If DMM reads more than 0.3 Volts DC when starter motor is engaged, it indicates that there is excessive resistance in the starter's battery negative path. Continue with the following tests to isolate each section of the negative path and observe the voltage drop with DMM leads placed as indicated.
9. Place one lead of the DMM to the negative battery post. Ensure that the DMM is set to read DC Volts.
10. Place the other lead of the DMM to the battery cable engine ground connection.

11. Engage the starter and observe the meter display, it should read less than 0.2 Volts DC (200 mV DC).

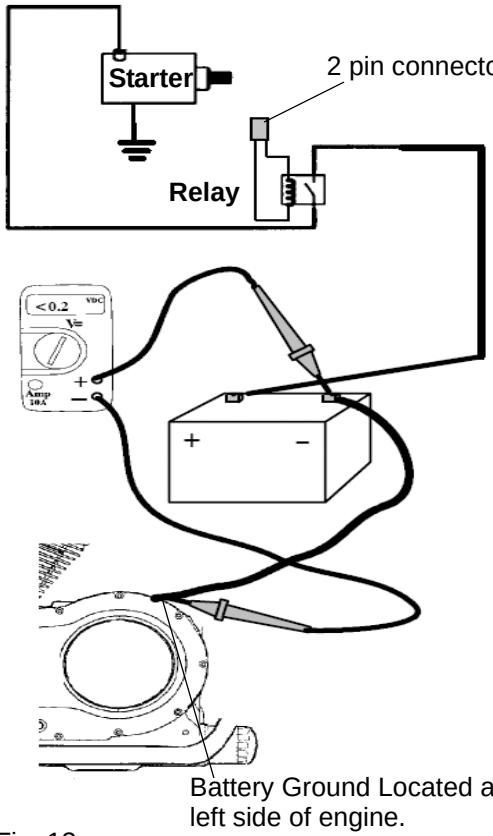


Fig. 13

12. If voltage drop is observed, the cable, connection at the battery, connection at the engine or mounting surface of the starter motor body is causing resistance and must be corrected.
13. Inspect the cable ends for corrosion where cable is connected to battery or engine.
14. Remove the cable. Set the DMM to read Ohms.
15. Place the DMM leads at both ends of the cable and measure the cable's resistance. The resistance should be 0 ohms. Remember to subtract meter lead resistance. Replace the cable if necessary.
16. Inspect the battery post, battery cable lug and engine battery cable mount for corrosion or looseness.

NOTE: Corrosion has resistance that limits or stops the flow of current to the starter motor.

17. If corrosion is found, wash all connections with a solution of baking soda and water, wire brush all contact areas, apply a light film of dielectric grease to the hardware and tighten connections. Retest to verify problem has been corrected.
18. Place one lead of DMM to battery cable mount at engine. Reset the DMM to read DC Volts if necessary.
19. Place the other lead on starter motor body.
20. Engage the starter and observe the meter display, it should read less than 0.2 Volts DC (200 mV DC).
21. If voltage drop is observed, there is resistance between the battery cable connection at engine and the mounting surfaces of the starter motor. While this would be unusual, it is possible.

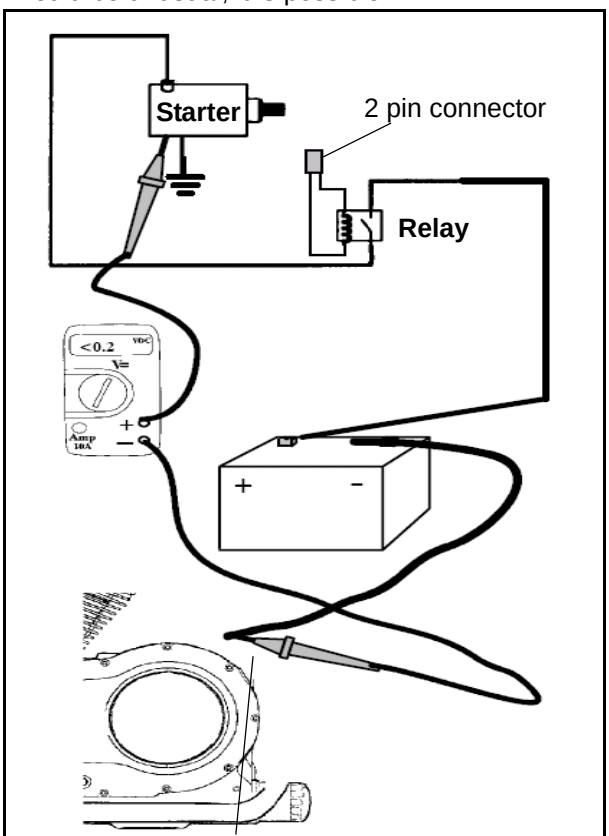


Fig. 14

22. Remove and clean the connection between ground battery cable and engine.
23. Remove the starter and ensure that the starter is making firm contact with engine. Ensure that the starter mounting bolts are tight.
24. If corrosion is found, wash all connections with a solution of baking soda and water, wire brush all contact areas, apply a light film of dielectric grease to the hardware and tighten connections. Retest to verify problem has been corrected.

STARTER CURRENT DRAW TEST

WARNING

Do not allow any part of the jumper cable clamp to touch the chassis or any other ground.

CAUTION

Disable the ignition system so that the engine will not start during this test.

Remove spark plug caps.

Install test spark plugs into plug caps.

Ground spark plugs against engine.

1. Inspect the battery (see procedure). Charge or replace battery as necessary before proceeding.
2. Place transmission in neutral.
3. Position an inductive ammeter clamp on battery positive cable. (Fig. 15)

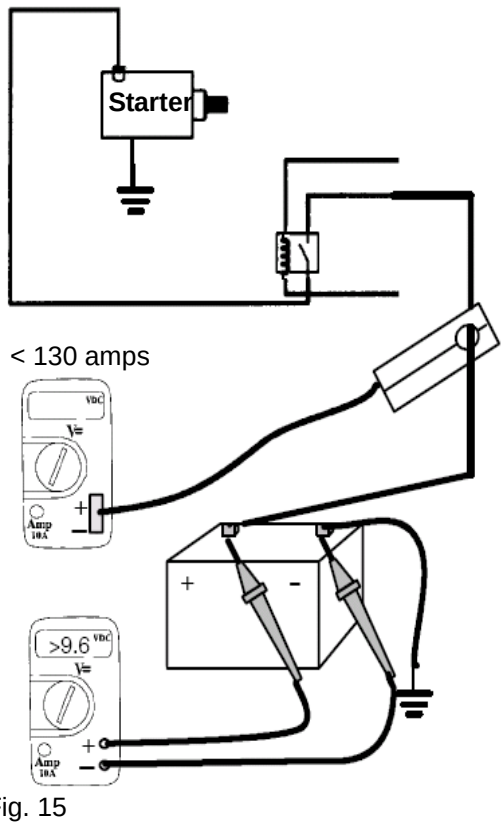


Fig. 15

4. Set DMM to Volts DC scale and connect red lead of meter to positive post of battery. (Fig. 15)
5. Connect black lead of meter to negative post of battery. (Fig. 15)
6. Turn ignition switch on and observe ammeter. It should register negative amps. If it does not, turn the ammeter probe around.
7. Make sure ignition switch is on, engine stop switch is in the run position, transmission is in neutral, clutch lever pulled in and that the ignition system is disabled.
8. Press starter switch and crank starter for about 5 seconds and observe both meters and the tachometer.
9. The battery voltage should remain above 9.6 volts.
10. The amperage draw of the starter should not exceed 130 amps. See page 18.18 for Starter Current Draw chart.

STARTER CURRENT DRAW RESULTS (Good Battery Condition Verified)			
Amperage Draw	**Battery Voltage**	**Engine RPM**	**Possible Problem**
90 to 120 amps	9.6 Volts DC or Greater	Greater Than 400 rpm	Normal
Less Than 90 amps	9.6 Volts DC or Greater	Less Than 400 rpm	Internal starter problems
Greater Than 130 amps	Less Than 9.6 Volts DC	Less Than 400 rpm	Inspect for voltage drops on positive or negative side of starter circuit.
Greater Than 130 amps	Less Than 9.6 Volts DC	Less Than 400 rpm	Voltage drops within acceptable limits. Remove starter & inspect.
Greater Than 130 amps	Less Than 9.6 Volts DC	Less Than 400 rpm	Voltage drops within acceptable limits. No internal starter problem. Engine compression is excessive or internal engine problems not allowing parts to rotate freely.

STARTER MOTOR REMOVAL

⚠ WARNING

Ensure that the ignition switch is turned off. Remove the negative cable at the battery before removing the starter motor.

1. Remove exhaust system. (Refer to Chapter 3)
2. Remove regulator/rectifier assembly.
3. Remove cable from starter terminal.

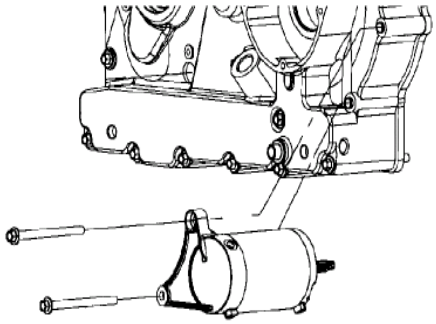


Fig. 16

4. Place drain pan under starter.
5. Remove 2 starter motor mounting bolts and remove starter.

STARTER MOTOR INSTALLATION

⚠ WARNING

Make sure that the ignition switch is turned off and that the negative cable is disconnected from the battery before installing the starter.

1. Place starter into the engine case while aligning the starter mounting lugs as closely as possible during the installation process.
2. Rotate the starter to align starter mounting lugs with bolt holes in engine cases.
3. Install starter mounting bolts and tighten to specification.

30 Nm (22 lb-ft)

4. Connect starter motor cable and cable nut. Torque cable nut to specification.

6.8 Nm (60 in-lb)

5. Install regulator/rectifier assembly.

10 Nm (85 in-lb)

6. Install exhaust system. Refer to Chapter 3.
7. Connect negative battery cable.

STARTER CLUTCH REMOVAL

1. Refer to Chapter 9.

CHAPTER 19
WIRING / LIGHTING SYSTEMS

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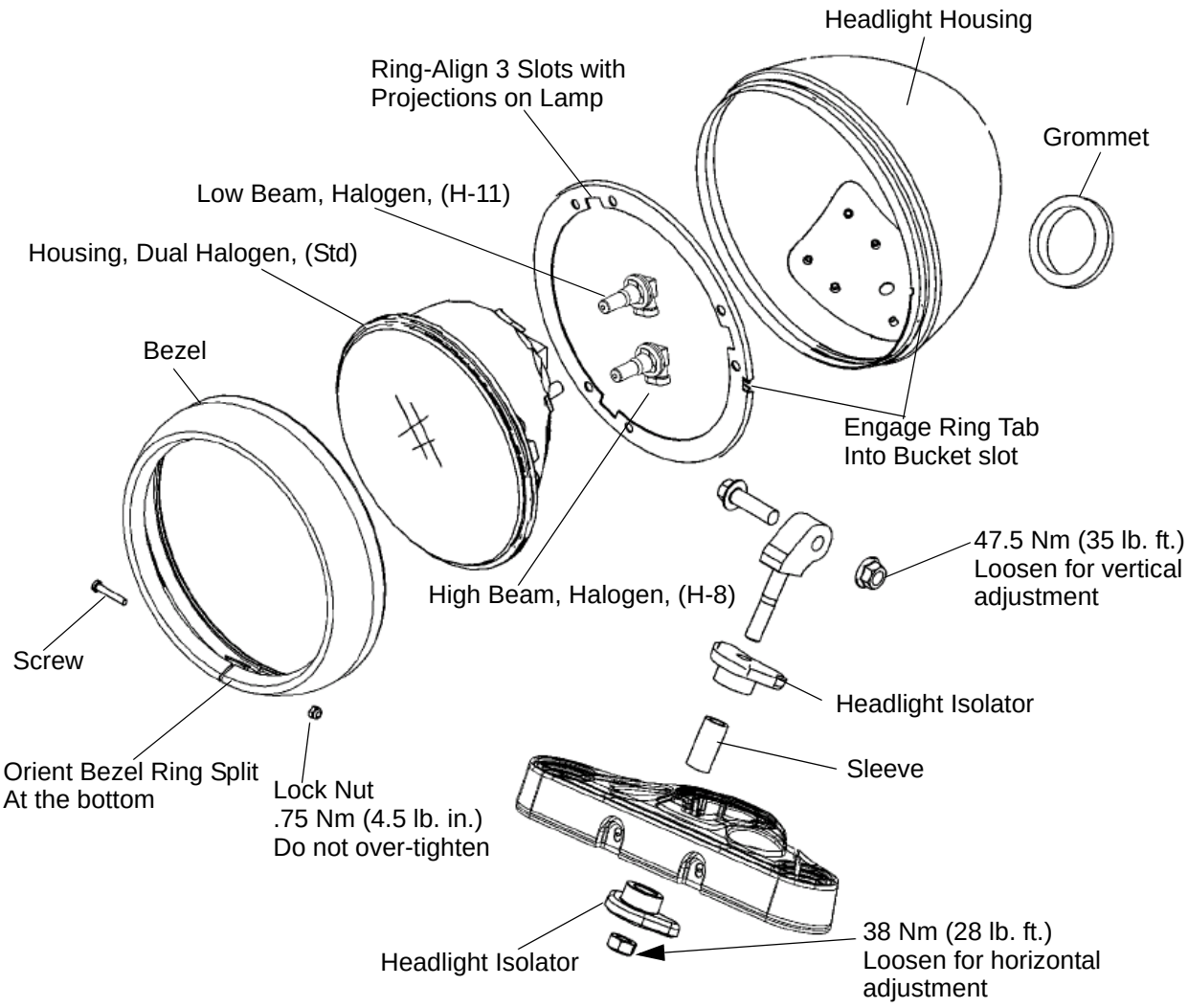
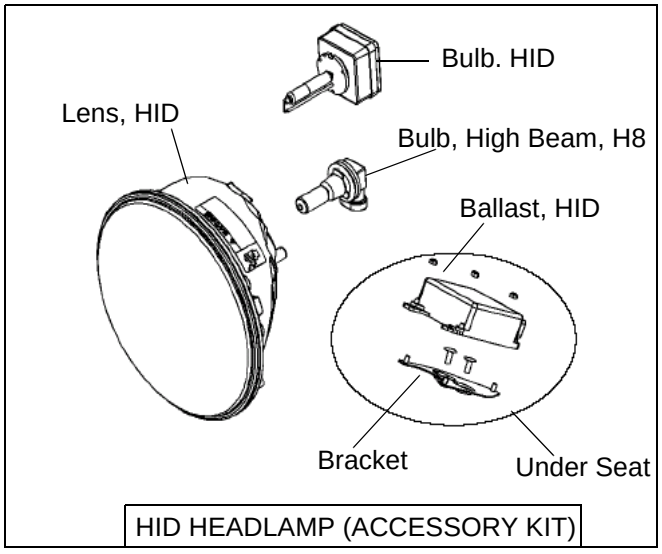
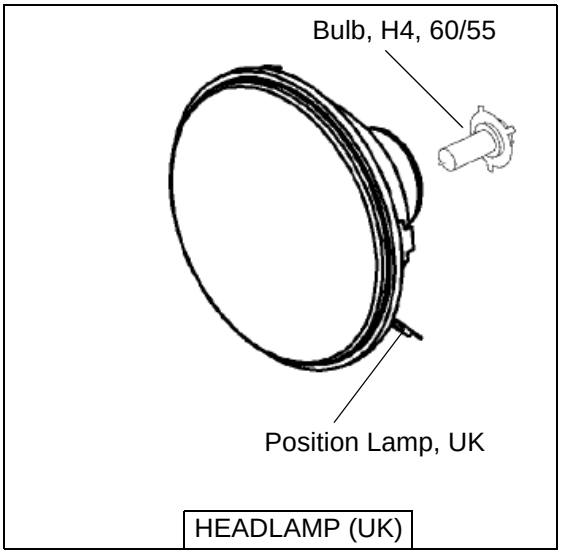
HEADLIGHT

VEGAS & KINGPIN





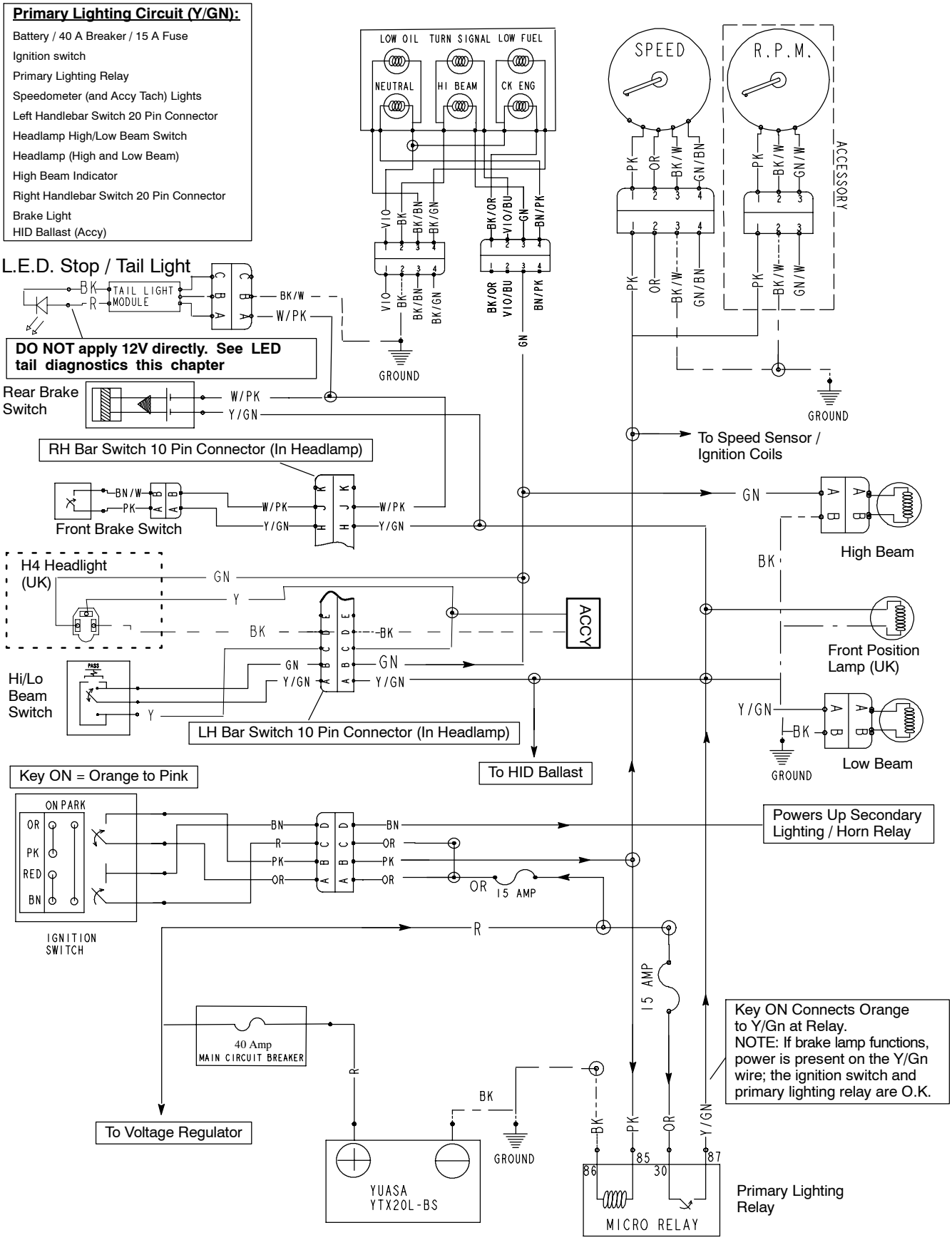
HID HEADLAMP (ACCESSORY KIT)



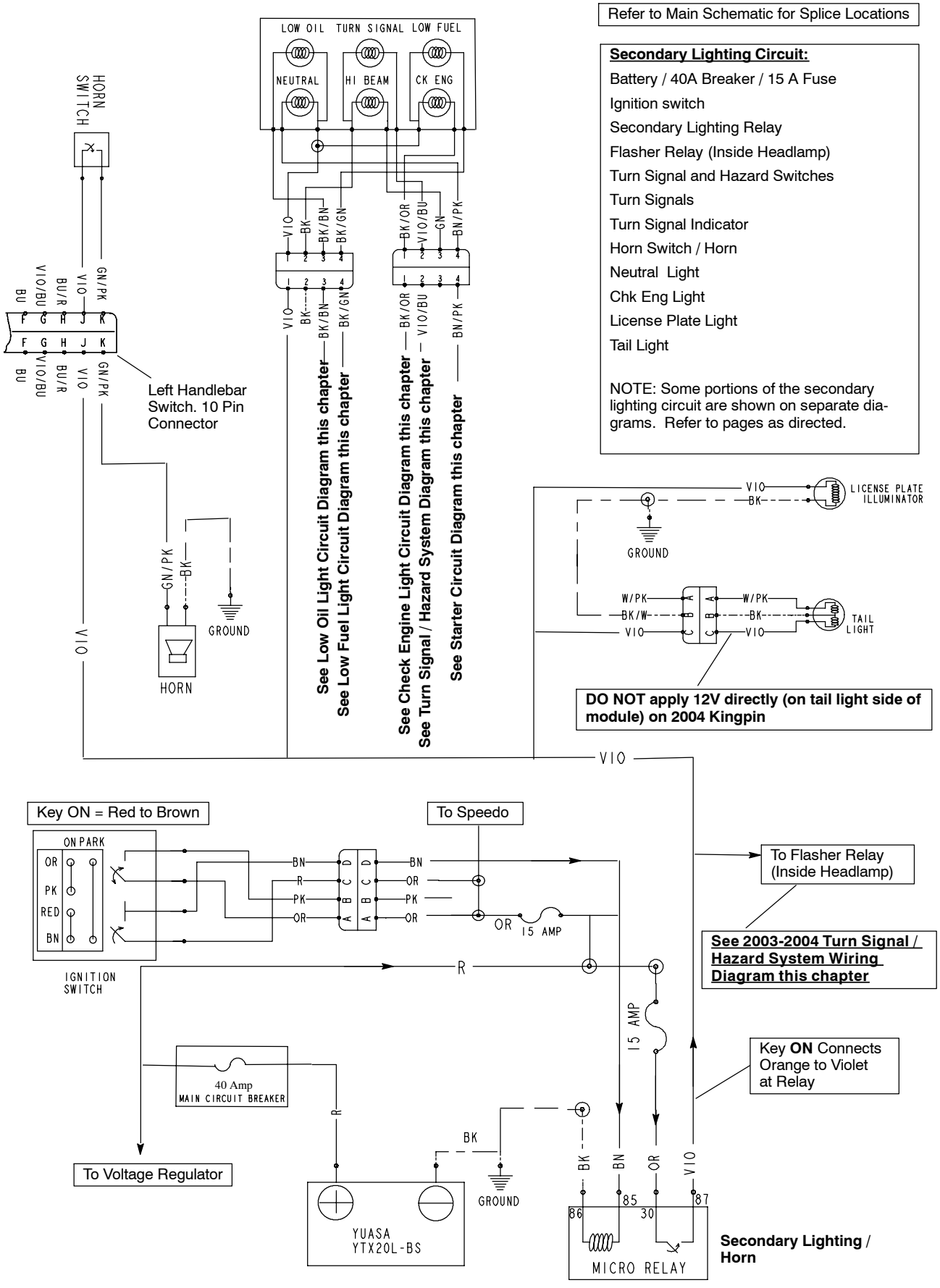
HEADLAMP (UK)

2003-2004 - PRIMARY LIGHTING WIRING DIAGRAM

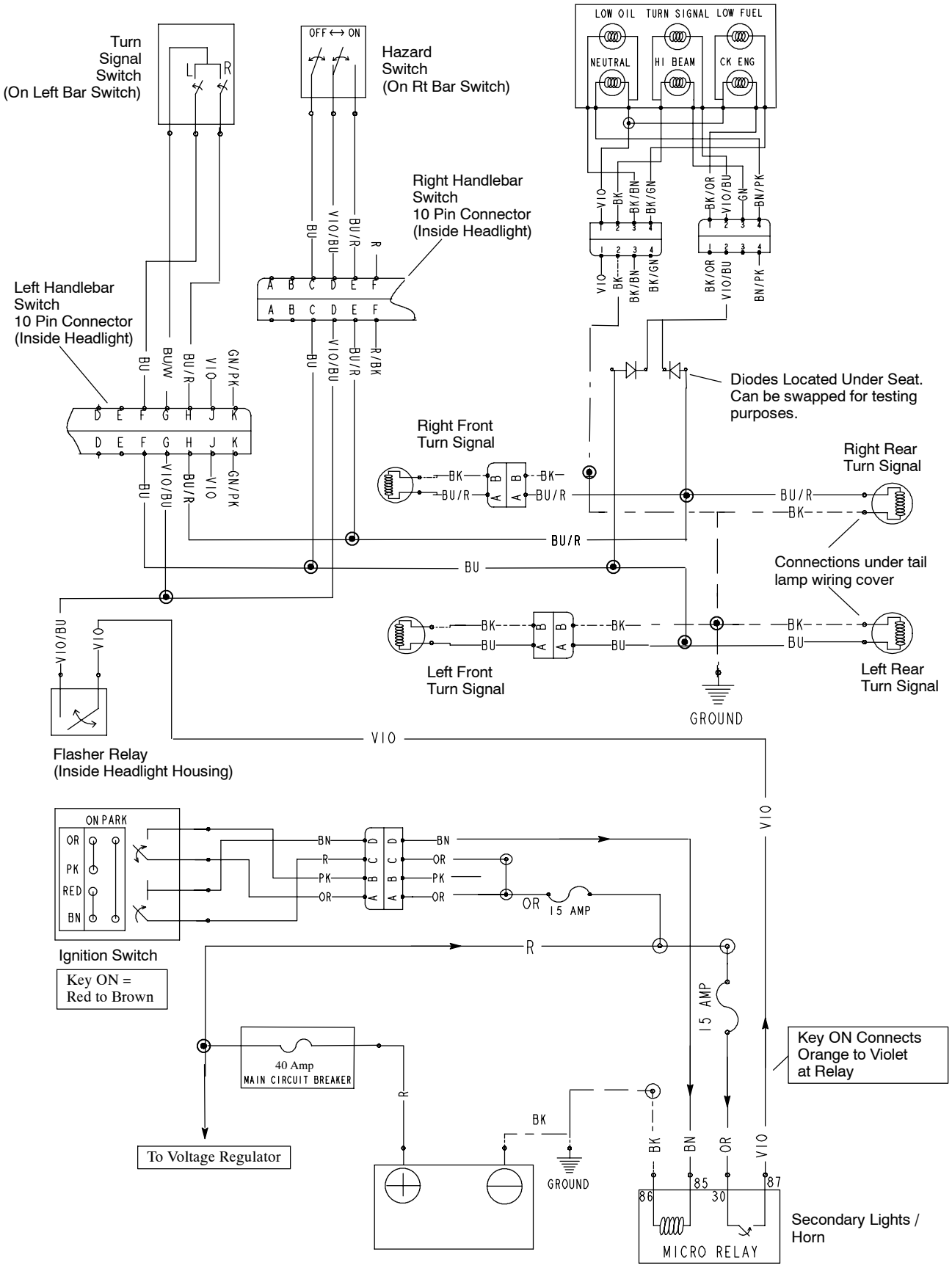
These components are powered by the Yellow/Green wire from the Primary Lighting Relay.



2003-2004 - SECONDARY LIGHTING WIRING DIAGRAM

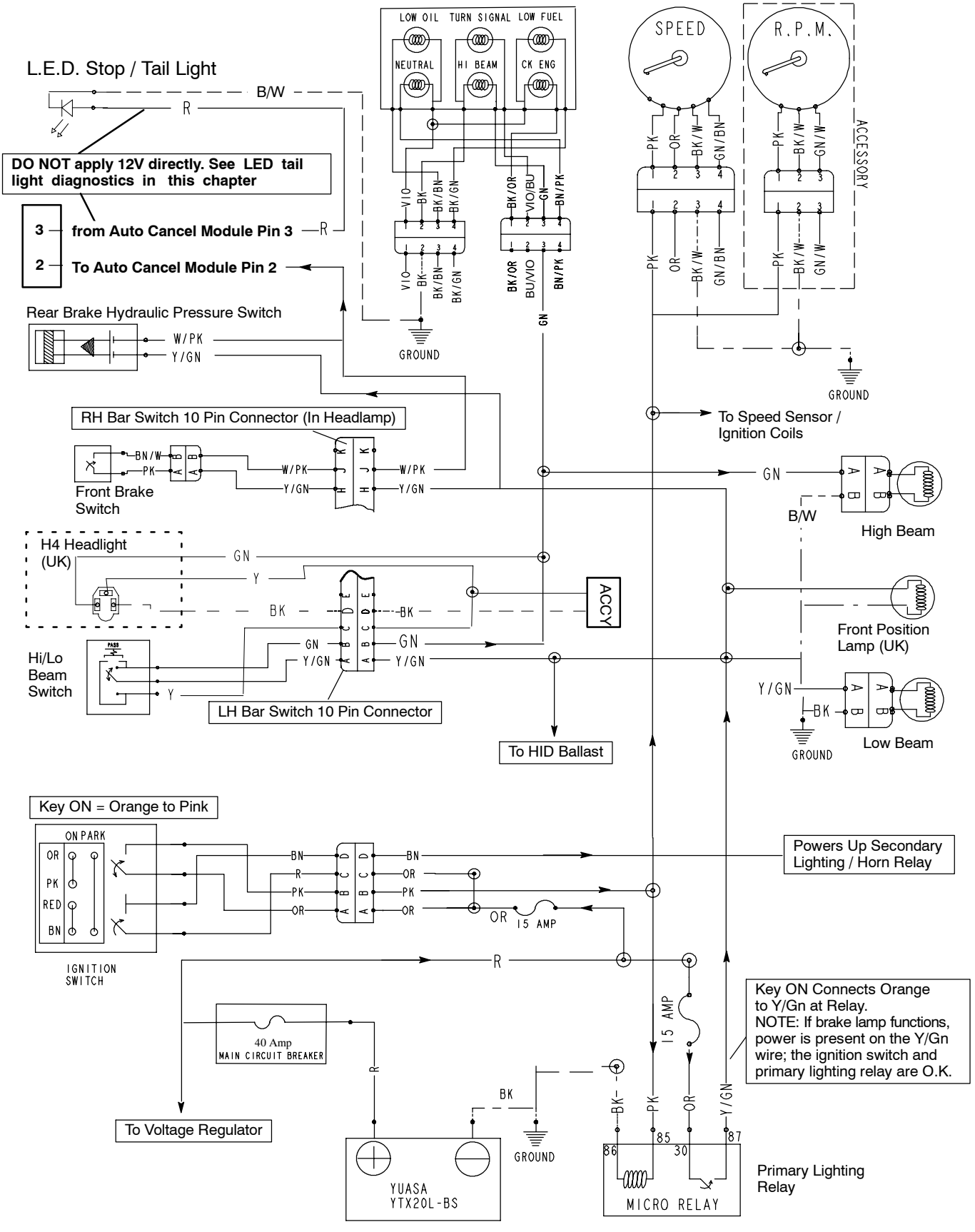


2003 / 2004 - TURN SIGNAL / HAZARD SYSTEM WIRING DIAGRAM



2005 - 2006 PRIMARY LIGHTING WIRING DIAGRAM

These components are powered via the Yellow/Green wire from the Primary Lighting Relay.

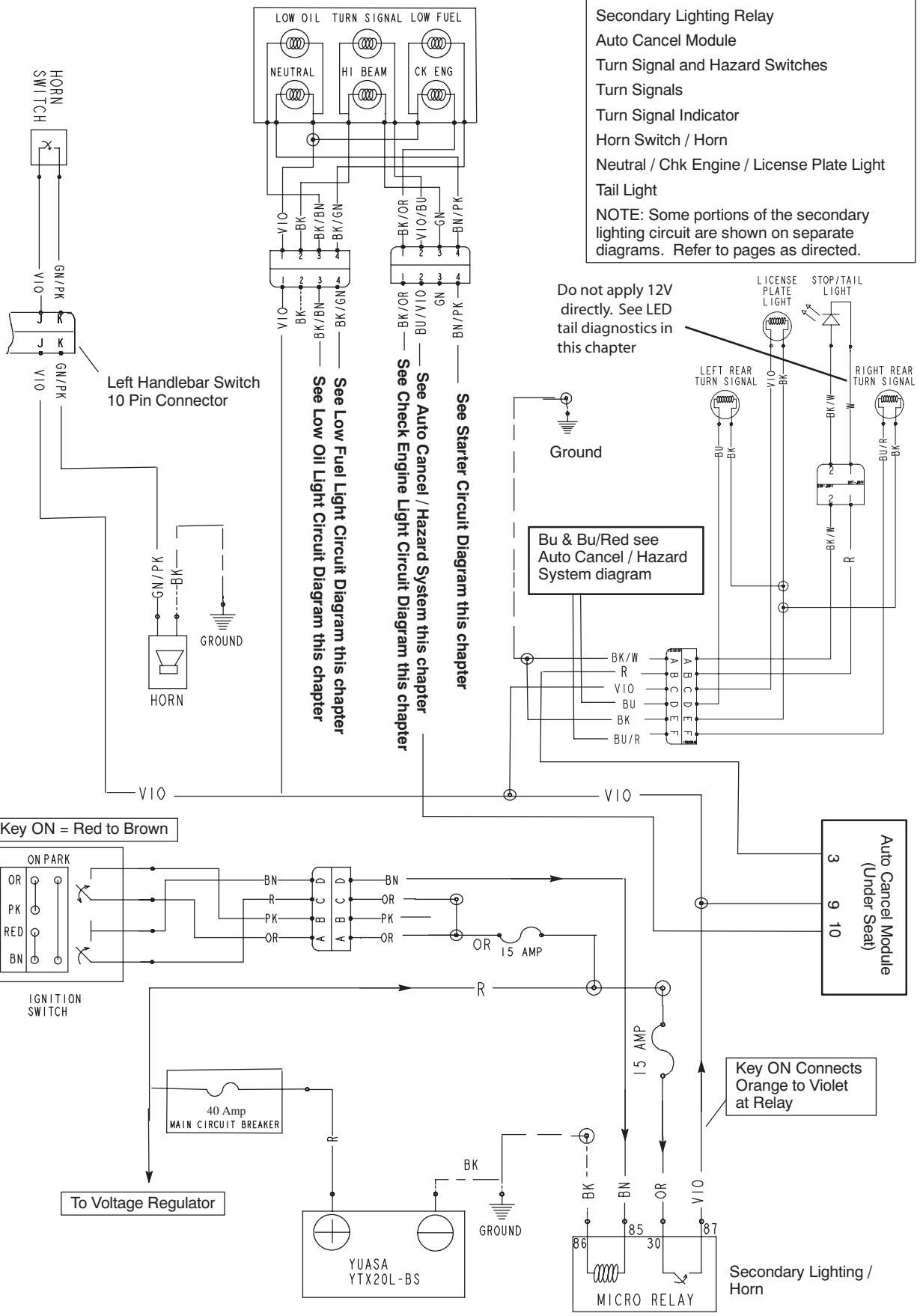


2005 - 2006 SECONDARY LIGHTING WIRING DIAGRAM

Secondary Lighting Circuit:

Battery / 40A Breaker / 15 A Fuse
Ignition switch
Secondary Lighting Relay
Auto Cancel Module
Turn Signal and Hazard Switches
Turn Signals
Turn Signal Indicator
Horn Switch / Horn
Neutral / Chk Engine / License Plate Light
Tail Light

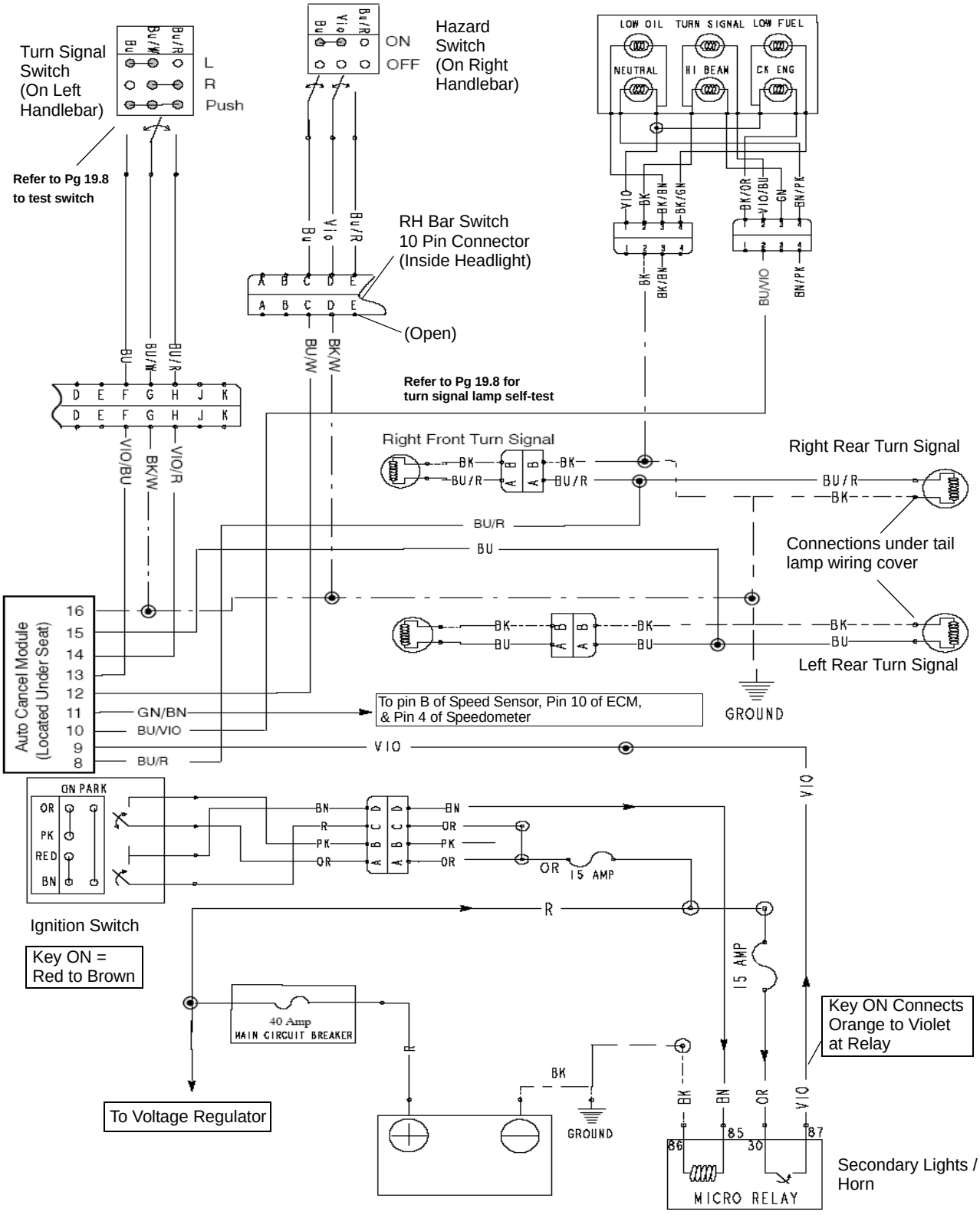
NOTE: Some portions of the secondary lighting circuit are shown on separate diagrams. Refer to pages as directed.



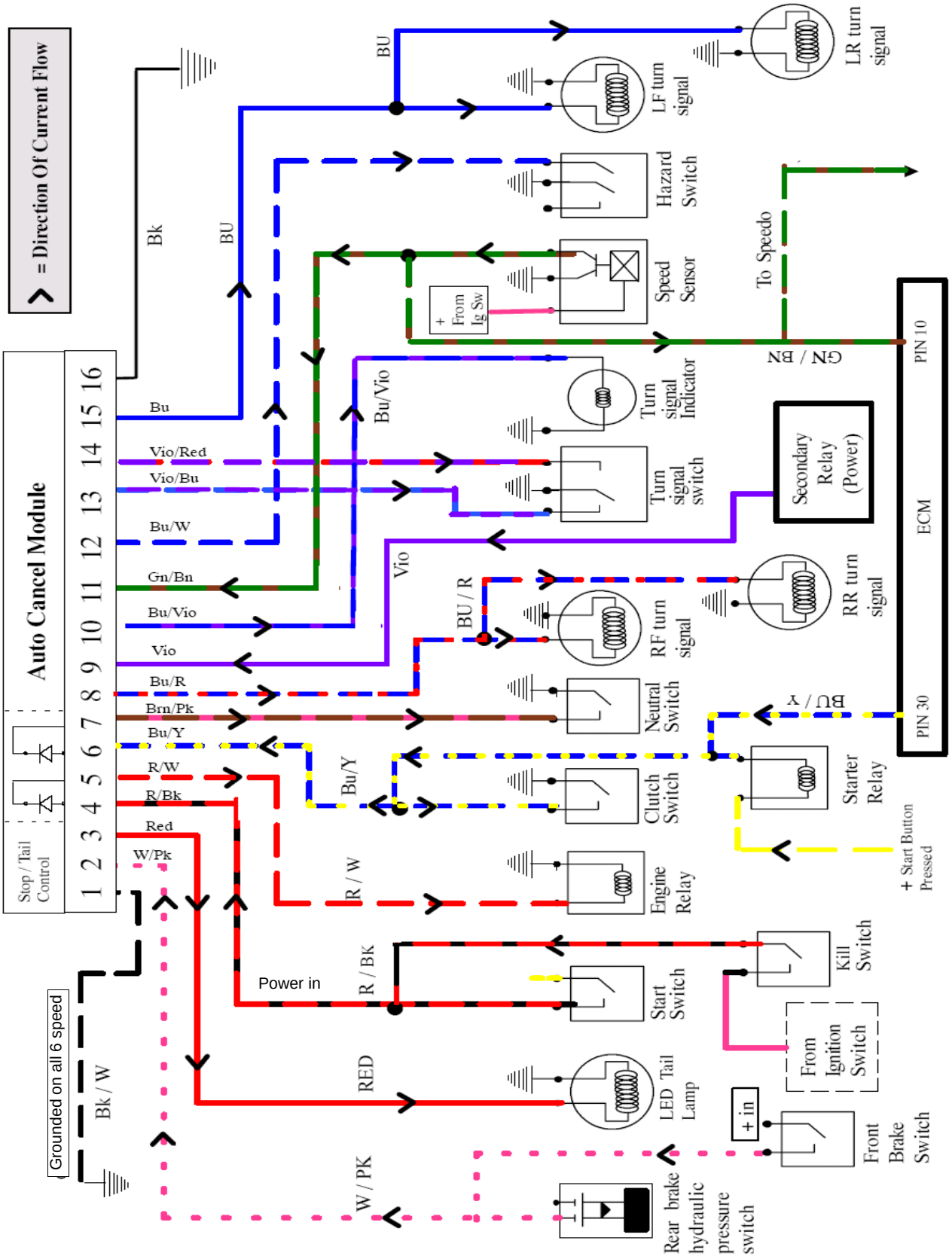
AUTO CANCEL TURN SIGNAL SYSTEM

SYSTEM WIRING DIAGRAM

Refer to main wiring diagram for splice locations.



AUTO CANCEL MODULE INPUT / OUTPUT



AUTO CANCEL TURN SIGNAL SYSTEM SELF-DIAGNOSTICS

These models are equipped with an on-board self-diagnostic feature built into the auto cancel turn signal module. The self-diagnostics can be activated to run a test of the turn signal circuits, the turn signal switch (LH bar switch), the auto-cancel module, and the speed sensor.

To enter the diagnostic mode:

1. Turn ignition key OFF.
2. Turn hazard switch ON.
3. Turn ignition key ON.
4. Pull and release the front brake lever (or rear brake pedal) 3 times within a 3 second period to enable the diagnostic mode.
   - All 4 turn signal bulbs will illuminate for 1 second and then go out, to indicate the diagnostic mode has been enabled. (Only bulbs in working order will illuminate)
   - The “blink codes” now start flashing on the turn signal indicator lamp.

Notes about the blink codes:

- Refer to the chart on page 19.9 for a list of codes and what they mean.
- Code 12 will *always* be present; alone if there are no faults in the system, or with other codes following if there is a fault. Code 12 marks the beginning of the code display sequence.
- There is a 2 second pause between blinked codes.
- Each code will blink twice before the next code is displayed. Example: If a code 13 is present, the indicator lamp will flash code 12 (1 long pulse, then 2 short), then repeat the code 12, then code 13, and repeat code 13.
- The blink codes will flash until cancelled by turning the key OFF or by turning the hazard switch OFF. Turning the hazard switch OFF before turning the key OFF will change the diagnostic mode to the next level, which is “Turn Signal Switch and Speed Sensor” diagnostic mode.

Turn Signal Switch and Speed Sensor Diagnostic Mode:

5. Perform Steps 1-4 above.
6. When codes are blinking on the indicator lamp, turn the hazard switch OFF. The system will finish the entire code display sequence then enter the Turn Signal Switch / Speed Sensor diagnostic mode.

NOTE: The indicator lamp may remain on, or it may turn off when entering this mode depending on if the speed sensor is “high” or “low”.

Turn Signal Switch Tests:

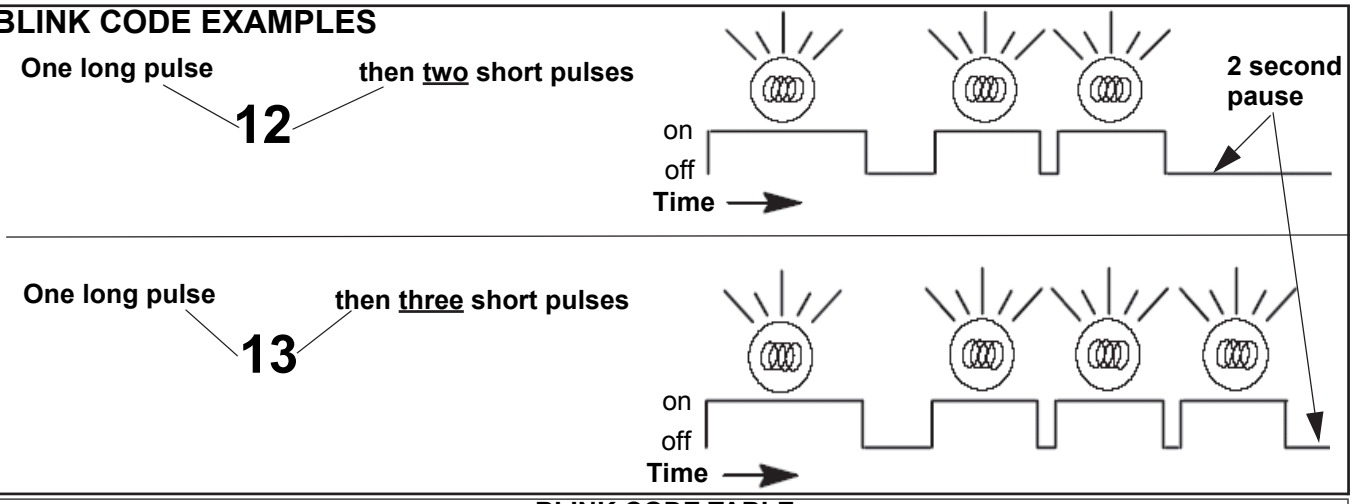
7. Move the turn signal switch to the LEFT TURN position and HOLD. Both left turn signal lamps should light.
8. Move the turn signal switch to the RIGHT TURN position and HOLD. Both right turn signal lamps should light.
9. Push the switch in to the CANCEL position. All 4 turn signal lamps should light, indicating the cancel switch is working properly.

Speed Sensor Test (Self Diagnostic):

10. Perform Steps 5 and 6 above to enter speed sensor diagnostic mode. Push the bike a short distance or turn the rear wheel and watch the indicator lamp. It should flash at the pulse rate of the speed sensor input.

NOTE: The speed sensor can also be tested manually using the Speed Sensor Tester. See page 19.10.

BLINK CODE EXAMPLES



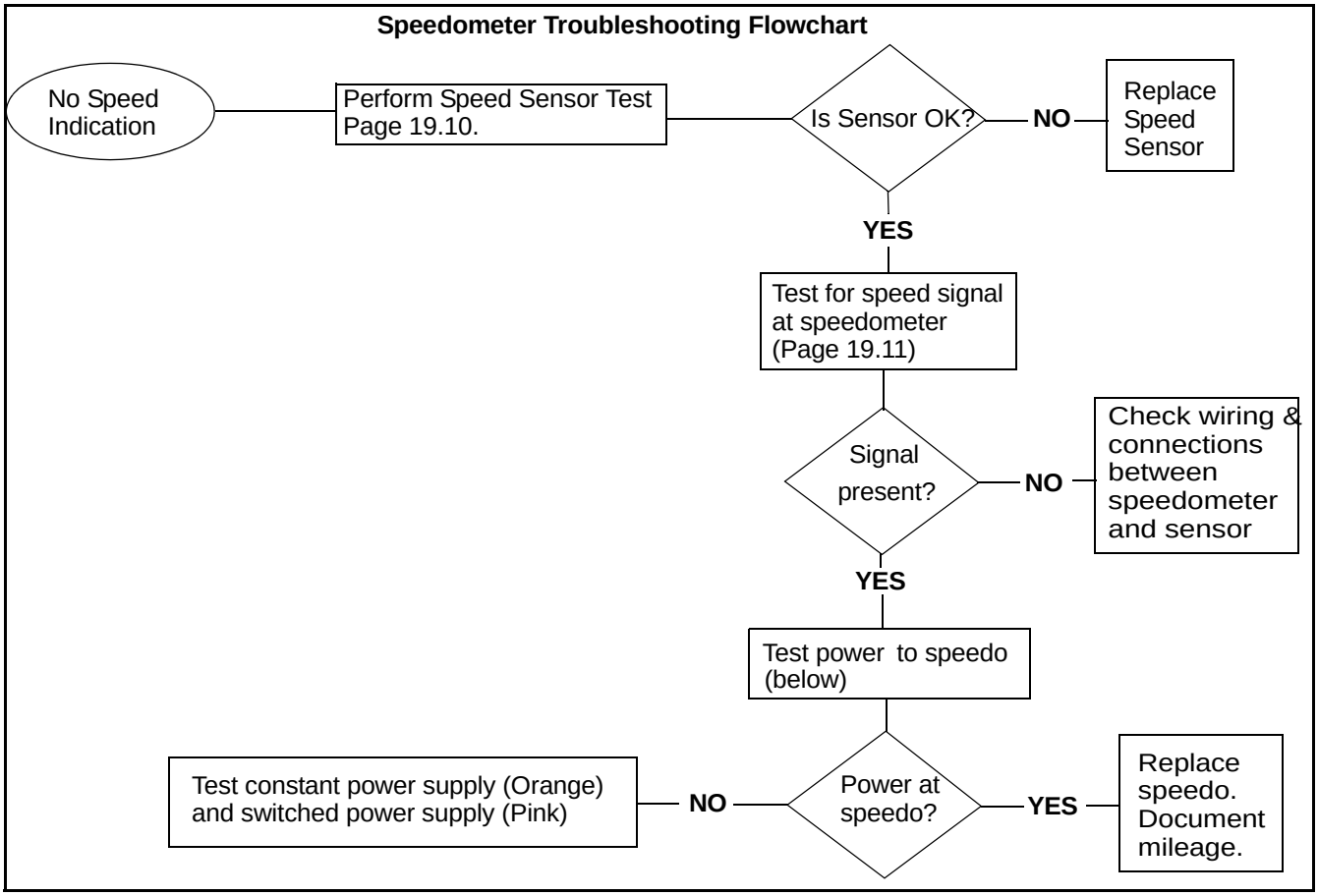
BLINK CODE TABLE

NOTE: Fault codes (13 and above) will only appear when actually present. A separate "code clearing" operation is not required. When a problem is corrected, the code will not be displayed when the sequence repeats.

CODE	Code Description / Possible Cause	Diagnostic Steps
12	Self Check Complete	Normal - always displayed as first code
13	Left Hand Circuit Over-Current *Possible Causes:* Shorted bulb (filament has shorted across filament posts) Action: replace bulb. Short to ground at socket or in related wiring. System will interrupt power to the shorted circuit. Left side bulbs will not be illuminated. Action: Determine front or rear. Inspect wiring.	To determine if front or rear left signal circuit is at fault: 1) Remove seat. 2) Disconnect rear wire harness 8-pin connector. 3) If code 13 is no longer displayed, cause of overcurrent is in rear left signal unit or circuit. If code 13 remains, fault is in front left signal unit or circuit. **IMPORTANT:** The system will now detect undercurrent due to the open rear connector, and display code 14 and code 16. These codes will disappear when rear harness is re-connected.
14	Left Hand Circuit Under Current Possible Causes: Open Bulb, No Bulb, faulty connection, etc.	Inspect / replace bulb; inspect socket or connections to bulb that is not lit.
15	Right Hand Circuit Over-Current Possible Causes: Shorted bulb (filament has shorted across filament posts) Action: replace bulb. Short to ground at socket or in related wiring. System will interrupt power to the shorted circuit. Right side bulbs will not be illuminated. Action: Determine front or rear. Inspect wiring.	To determine if front or rear right signal circuit is at fault: 1) Remove seat. 2) Disconnect rear wire harness 8-pin connector. 3) If code 15 is no longer displayed, cause of overcurrent is in *rear* right signal unit or circuit. If code 15 remains, fault is in *front* right signal unit or circuit. **IMPORTANT:** The system will now detect undercurrent due to the open rear connector, and display codes 14 and 16. These codes will disappear when rear harness is re-connected.
16	Right Hand Circuit Under Current Possible Causes: Open Bulb, No Bulb, faulty connection, etc.	Inspect / replace bulb; inspect socket or connections to bulb that is not lit.
17	Low Module Voltage	Check for battery voltage to module (Pin 9, Violet) (Must be ≥12 VDC)
18, 19, & 20	Not Used	-

SPEEDOMETER

SPEEDOMETER TROUBLESHOOTING



SPEED SENSOR TEST

NOTE: The speed sensor can also be tested using the Auto Cancel System Self-Diagnostics. (Page 19.8)

To test the speed sensor with the signal test tool, unplug speed sensor connector (top of crankcase behind rear cylinder). Install signal test adaptor harness between sensor and tool harness. Rotate rear wheel slowly. If speed sensor is functioning, light on tool will alternate on and off corresponding to rear wheel rpm.

Speedometer Signal Tester (PV-43544) and Signal Test Adaptor (PV-47303)

SPEEDOMETER CIRCUIT VOLTAGE SUPPLY TEST

1. Disconnect the 4-pin connector from the speedometer, and the 3-pin speed sensor connector (located behind engine near frame down tube).
2. Set digital multimeter to measure DC voltage. Turn ignition key ON and verify battery voltage is present on the Pink wire at pin 1 on the harness side of the speedometer 4-pin connector, and on the harness side pin A of the speed sensor connector.
3. If battery voltage is present, re-connect both connectors and perform the signal test below. If battery voltage is not present, test the ignition switch and related wiring (refer to wiring schematic).

TESTING FOR SPEED SIGNAL AT SPEEDOMETER

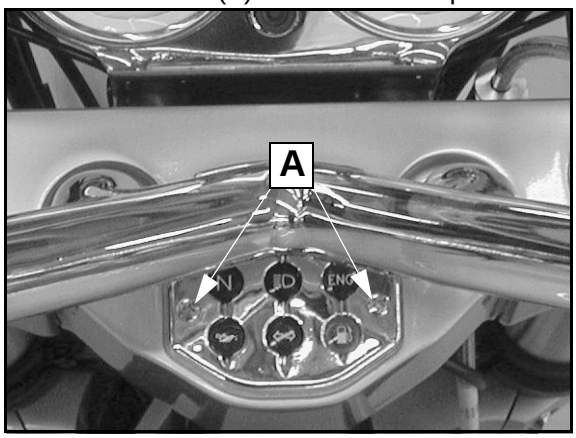
1. Safely elevate the rear of the motorcycle so rear tire is off the ground.
2. Be sure both speedometer 4-pin and speed sensor 3-pin harnesses are connected. Remove screw from speedometer cup and move cup out of the way.
3. Set digital multimeter to measure DC voltage.
4. Connect the red meter probe to the Gn/Bn wire at the speedometer 4 pin connector. Connect black meter probe to battery ground.
5. Turn ignition key ON and rotate rear wheel slowly.
6. Voltage should toggle between approximately 0.06 V and battery voltage if a speed signal is present. Look for a voltage swing from very low to high, not a specific voltage.
7. If no speed input signal is present, test speed sensor and wiring.

INDICATOR LAMPS

INDICATOR LAMP REPLACEMENT

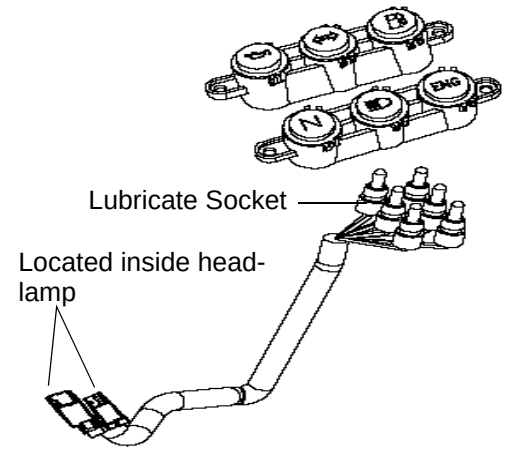
Neutral, High Beam, ENG, Oil Pressure, Turn and Fuel

1. Remove 2 screws (A) from lens cover plate.



2. Lift cover plate, top, and bottom lens off indicator lights.
3. Remove and replace bulbs as required.
4. Lubricate rubber socket with silicone spray or mild detergent and push socket into back of each lens until seated.
5. Place lenses in cavity. Align lenses with opening in cover plate and hold plate in place.

6. Install screws and tighten securely.

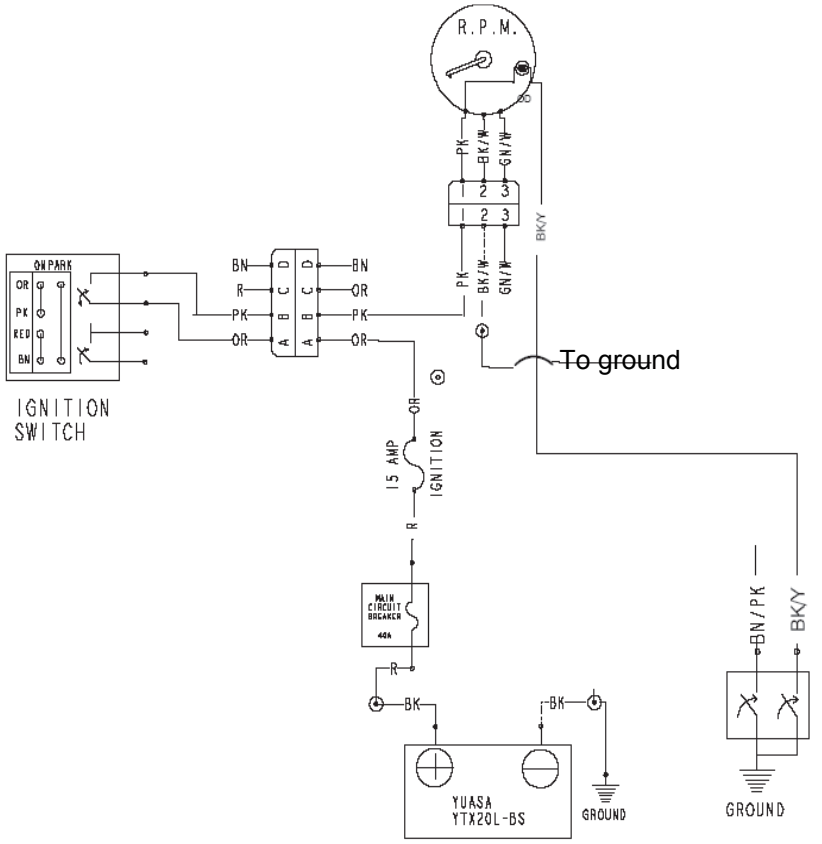


OVERDRIVE LAMP REPLACEMENT (Tachometer equipped models)

1. Remove screw from tachometer cup and slide cup away from tach.

2. Pull socket out to remove from tach.
3. Pull bulb from socket.
4. Assemble in reverse order.

OVERDRIVE LIGHT CIRCUIT



Overdrive Indicator Lamp Circuit Testing (6 speed equipped with tachometer)

NOTE: The overdrive indicator lamp is powered by the Pink wire in the tachometer harness. If the tachometer light works (with the ignition key ON) the pink wire is supplying power to the tachometer.
The ground for the Overdrive indicator lamp is supplied by the Neutral / Overdrive switch, located behind the drive sprocket cover on the crankcase. The Neutral / Overdrive switch 2-Pin harness connector is located behind the right side cover on the frame down-tube.

1. Disconnect the Neutral / Overdrive switch connector.
2. Connect the Black / Yellow wire (on the main harness side) to ground.
3. Turn ignition key ON.

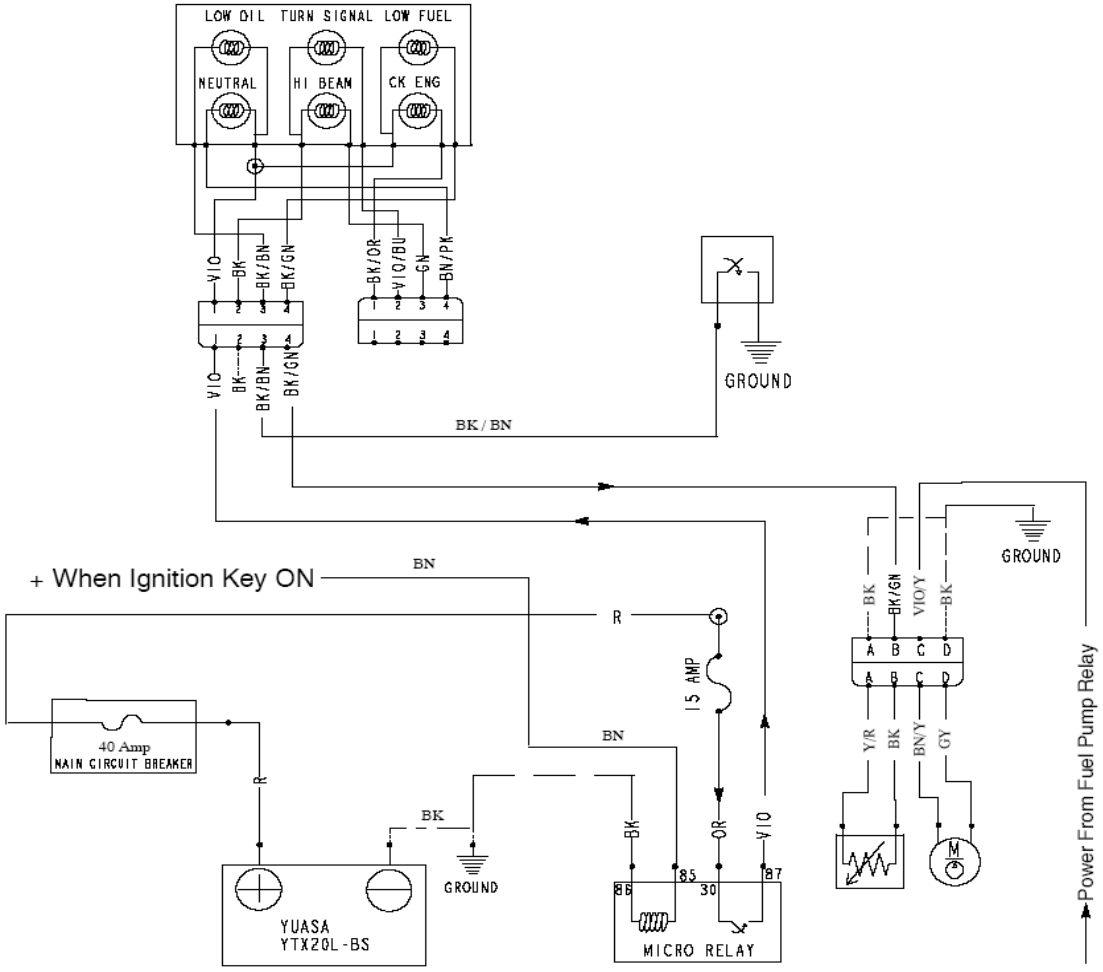
If O.D. lamp lights - Check the Neutral / Overdrive switch:

- Connect one lead of an ohmmeter to the Black / Yellow wire terminal in the overdrive switch harness.
- Connect the other lead to a good ground on the engine.
- Shift the transmission into overdrive (6th gear). Roll the vehicle slightly if necessary to fully engage the gears. The ohmmeter should read less than .5 Ohms.
- Shift the transmission out of overdrive. Then meter should read infinite or OL ("Overload")
- Reconnect the switch harness.

If the O.D. lamp does not light - Check power supply to tachometer (see NOTE: above)

4. Remove headlamp (pg. 19.2) and disconnect the white 3-Pin Tachometer connector
   - Connect the positive lead of a voltmeter to the Pink wire terminal in the female connector.
   - Connect the negative lead to ground
   - Turn ignition key ON. The meter should display battery voltage.
   - If OK, remove tachometer and check bulb.

LOW FUEL LIGHT CIRCUIT
LOW OIL PRESSURE LIGHT CIRCUIT



Low Fuel Light

1. Remove rear fuel tank mounting bolt to access connector.
2. Disconnect the 4-pin connector for the fuel pump and fuel level sensor, located at the rear of the fuel tank.
3. Connect Bk/Gn wire (on wire harness side of connector, not the fuel sensor side) to ground.
4. Turn the ignition key ON.
5. The Low Fuel light should illuminate.
6. If the light works, check fuel level sensor (Chapter 5).
7. If the light does not illuminate with the wire grounded, check the bulb (refer to page 19.11).
8. If bulb is O.K., check power supply to the bulb at the 4-pin connector to the indicator light harness.

NOTE: The Neutral light and Low Oil Pressure light use the same power feed as the low fuel indicator lamp. If these are functioning, power supply is not the likely cause.

Low Oil Pressure Light

NOTE: If the oil light is on with the engine running, first inspect oil pressure (Chapter 4).

1. Disconnect the Bk/Bn wire from oil pressure switch.
2. Connect the Bk/Bn wire to ground.
3. Turn the ignition key ON.
4. The Low Oil light should illuminate.
5. If the light does not illuminate with the wire grounded, check the bulb (refer to page 19.11).
6. If bulb is O.K., check power supply to the bulb at the 4-pin connector to the indicator light harness.

NOTE: The Neutral light and Low Fuel light use the same power feed as the Low Oil Pressure light. If these are functioning, power supply is not the likely cause.

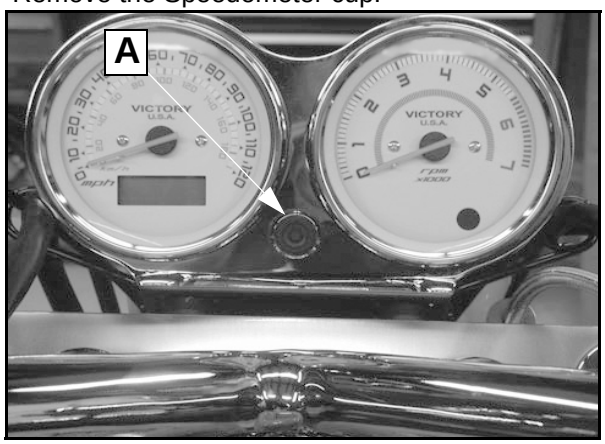
7. Check the Bk/Bn wire for continuity to the 4-pin connector.

TRIP ODOMETER RESET SWITCH

Trip Odometer Reset Switch Testing

NOTE: The reset switch (A) located on the Speedometer / Tachometer bracket grounds the Black / White wire out of the speedometer when pushed. The button is used to toggle between Odometer display mode and Trip Odometer display mode on the speedometer.

1. Remove the Speedometer cup.



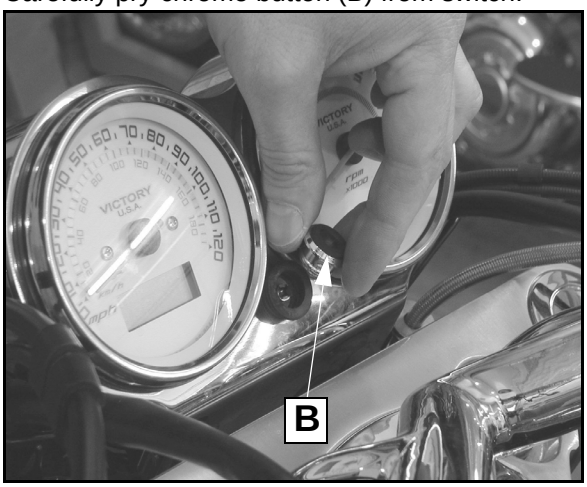
2. Disconnect the Black White wire from the speedometer.
3. Turn ignition key ON.
4. Connect the Black / White wire from the speedometer to a good ground for 1-2 seconds. The display will toggle between modes.
5. Select Trip Odometer mode.
6. Reconnect the wire to ground and hold for 5 seconds (minimum). The display will reset the Trip Odometer.

To test the reset switch:

- Disconnect the switch wires from the speedometer.
- Connect one lead of an ohmmeter to one wire of the switch.
- Connect the other lead to the remaining wire.
- Push and hold the switch button. The meter should display less than .5 Ohms when pushed (good continuity) and very high resistance (infinite, or OL “Overload") when released.

TRIP ODOMETER RESET SWITCH REPLACEMENT

1. Carefully pry chrome button (B) from switch.



2. Push switch out of speedo / tach bracket.
3. Remove speedometer cup.
4. Disconnect wires.
5. Reverse order to assemble.

CHECK ENGINE LIGHT CIRCUIT

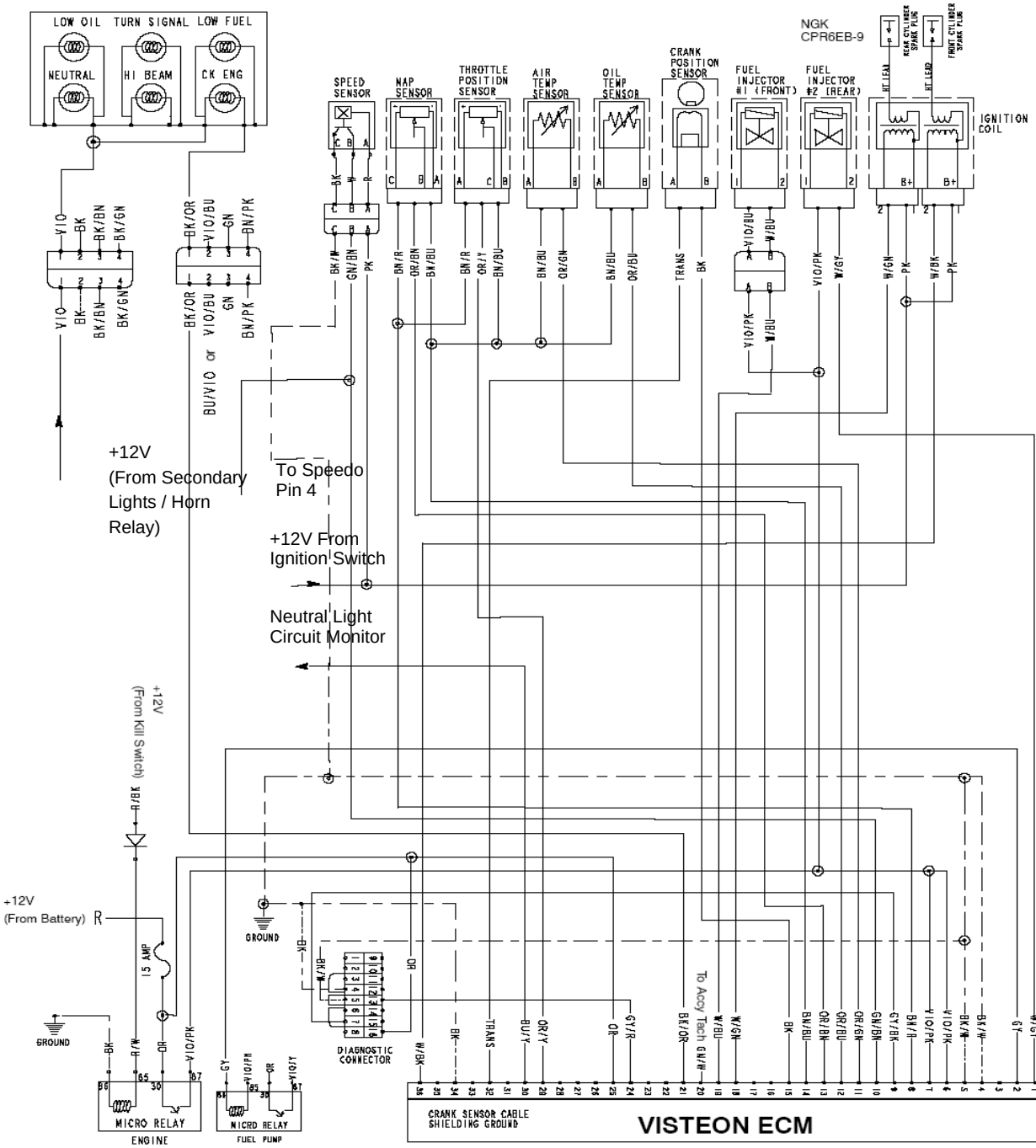
CHECK ENGINE LIGHT WIRING DIAGRAM

ENG Light Circuit Operation:

The ENG light is controlled entirely by the ECM if a fault occurs on one or more of the fault-monitored circuits.

Power is supplied to the ENG light via the Violet wire from the Secondary Lighting Relay when the ignition key is turned ON.

If a fault occurs, the ECM connects the Black / Orange wire to ground via Pin #21 in the ECM connector, illuminating the ENG light.



FUEL PUMP CIRCUIT DIAGRAM

Refer to Chapter 5 for fuel pump circuit diagram and circuit operation.

TAIL LIGHT

LED TAIL LIGHT - THEORY OF OPERATION

The LED tail lamp functions like a conventional incandescent tail / brake lamp, with a few exceptions. A single LED is used with a regulating module that controls the amount of current going through the LED based on tail and brake light inputs to the module.

- **2003-2004 Vegas** - the tail light / brake light module is contained inside the tail lamp unit.
- **2004 Kingpin** - the module is external and separate from the tail lamp unit.
- **All 2005-2006 models** - the Auto Cancel Turn Signal module contains the LED tail lamp regulator circuit.

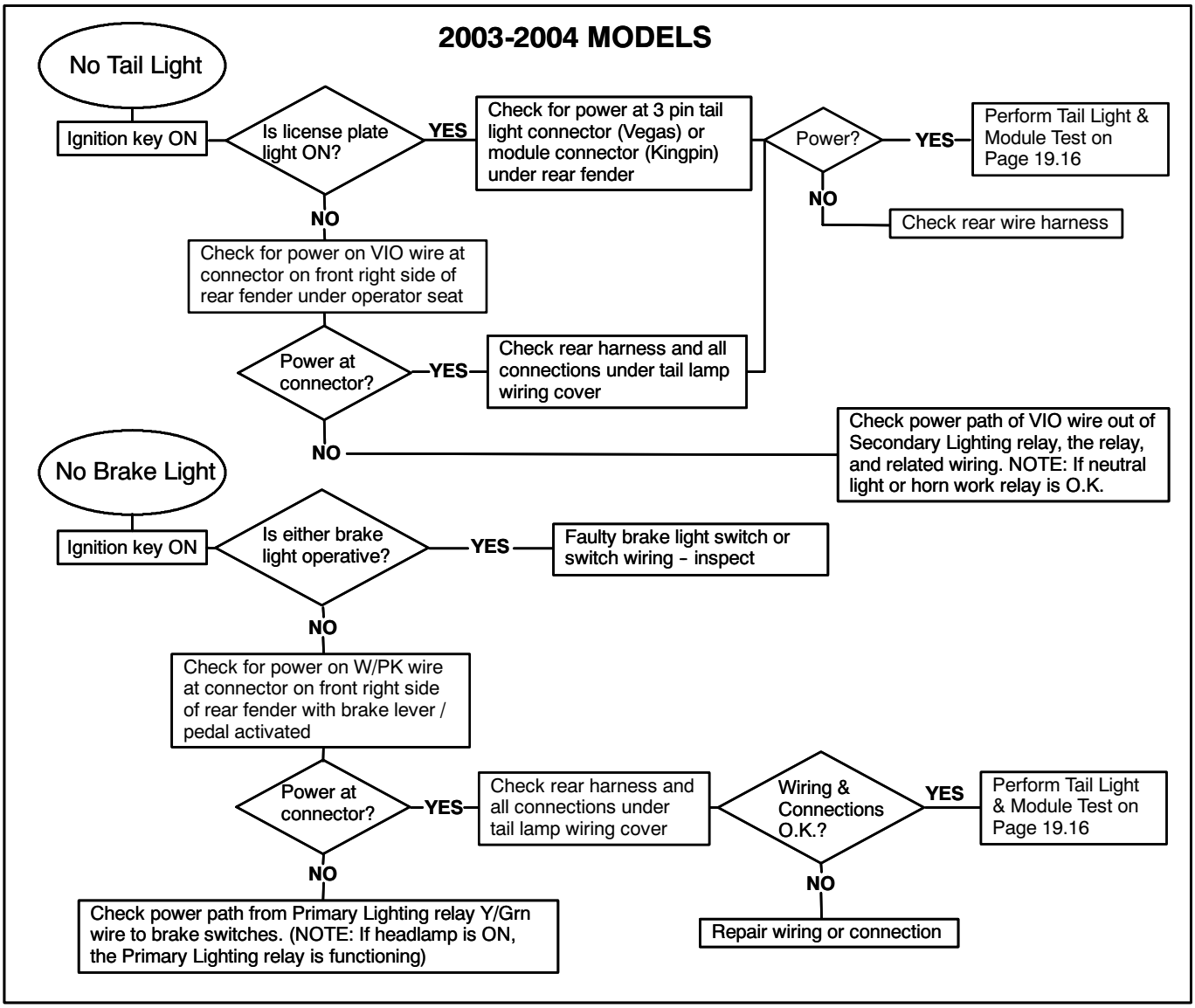
Tail Light Input / Output: When the ignition key is turned to ON or PARK position, battery voltage is delivered to the module on the VIOLET wire from the Secondary Lights / Horn relay. The “tail light” input goes through a constant-current circuit inside the module, and the module limits current to approximately 250 mA through the LED.

Brake Light Input / Output: With the key in the ON position, the primary lighting relay delivers battery voltage to the front and rear brake switches on the YELLOW/GREEN wire. When the front or rear brake is applied, power flows to the module on the WHITE/PINK wire. This input goes through a constant-current circuit inside the module, which increases current through the LED to about 500 mA, increasing the brightness of the LED.

LED TAIL LIGHT CIRCUIT DIAGNOSTICS (2003-2004 MODELS)

⚠ CAUTION

DO NOT BYPASS THE AUTO CANCEL MODULE TO THE LED with battery power. Application of power directly to the LED (Red) wire will permanently damage the LED.



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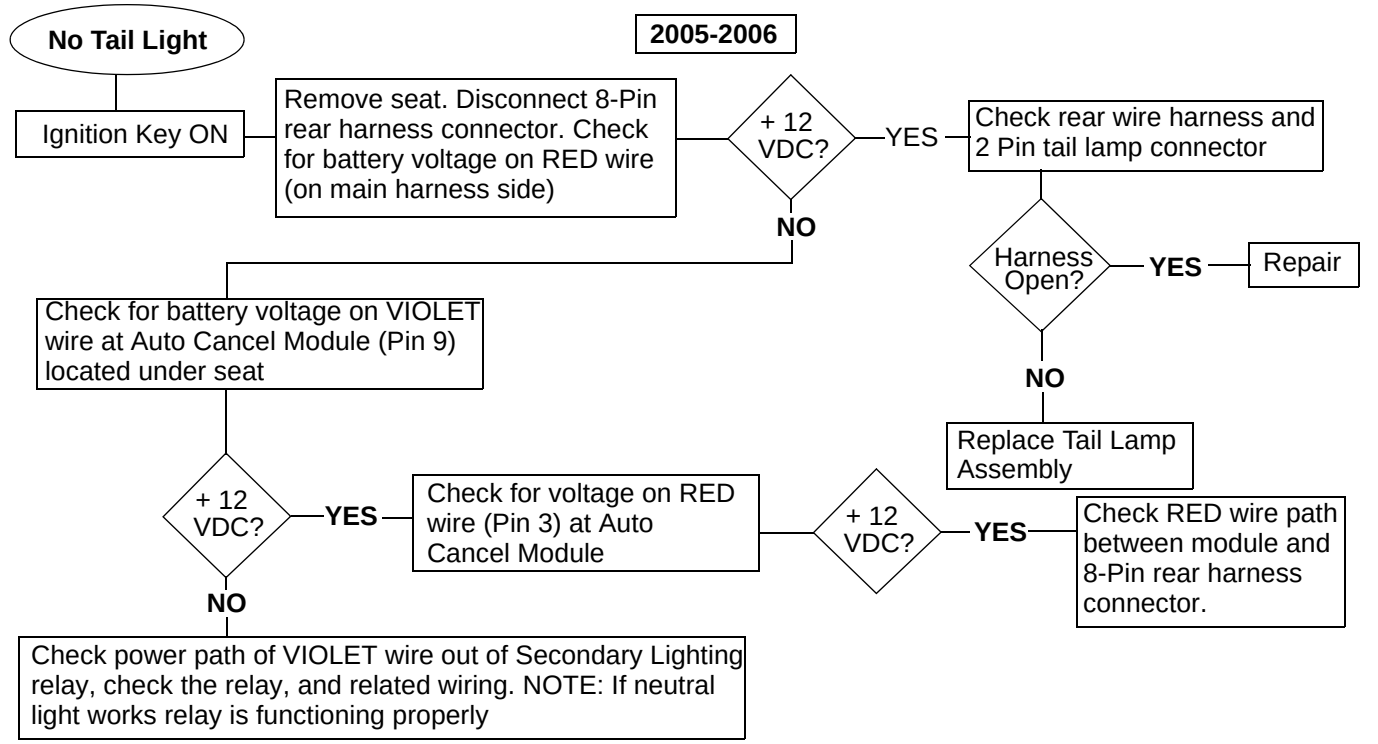
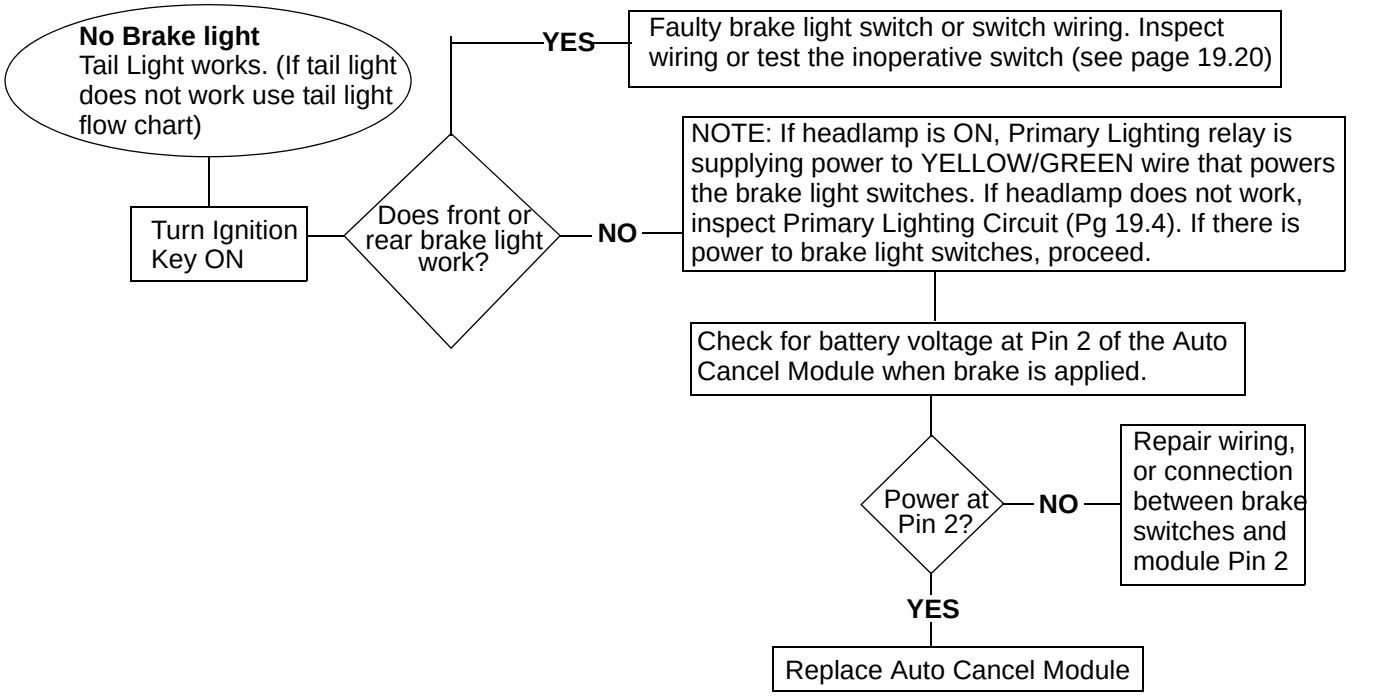
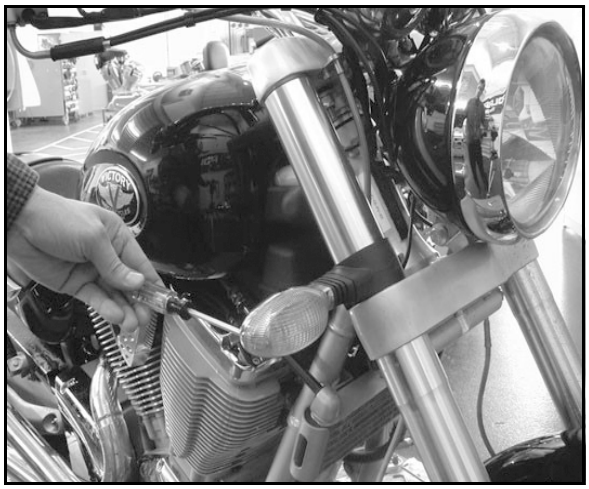




TURN SIGNAL / BULB REPLACEMENT

Bulb Removal

1. Remove #1 Phillips screw from back of signal unit.
2. Swing lens out and carefully disengage tab on inside edge of unit.
3. Push bulb in and rotate 1/4 turn counterclockwise to remove.

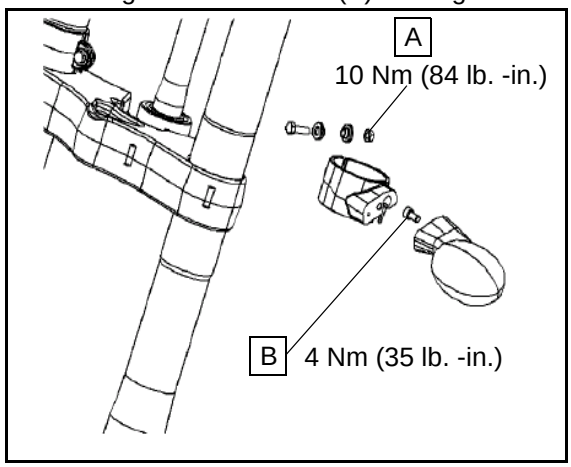


Bulb Installation

1. Apply a light film of dielectric grease to base of new bulb.
2. Align tabs. Push bulb inward and rotate 1/4 turn clockwise to install.
3. Engage tab of lens in edge of signal unit.
4. Swing lens cover onto unit and hold in position.
5. Install screw and tighten only until lens is secure. DO NOT over-tighten screw!

Signal Unit Removal - Front

1. Remove nut (A), screw, and bushings from mount.
2. Open mount and remove from fork tube.
3. Remove signal mount screw (B) and signal unit.

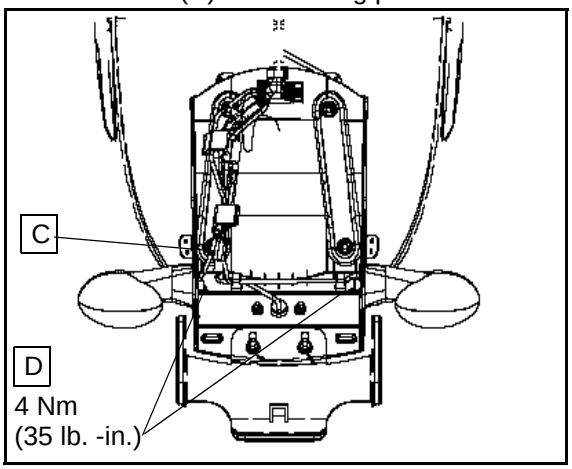


Signal Unit Installation - Front

1. Reverse steps for removal and torque

Signal Unit Removal - Rear

1. Disconnect wire(s) at (C).
2. Remove screw (D) and backing plate.



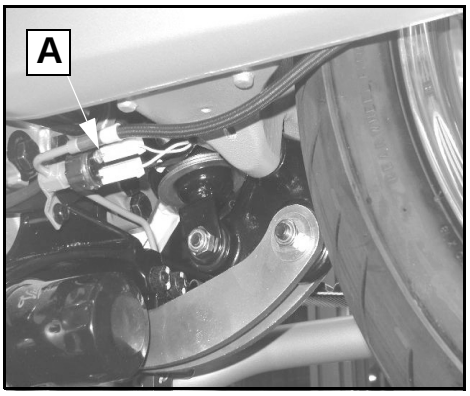
Signal Unit Installation - Rear

1. Feed wire through mount and backing plate and connect wire(s) at (C).
2. Torque screw (D) to 4Nm (35 lb.-in.).

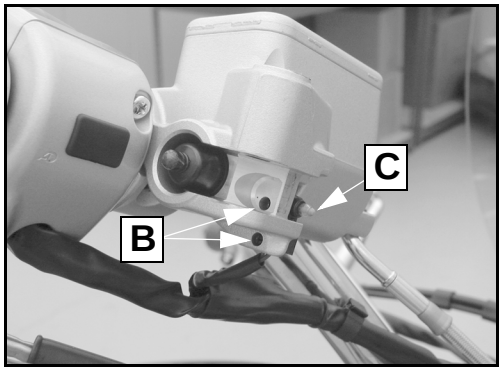
SWITCH TESTING

BRAKE LIGHT SWITCH TEST

1. Disconnect the rear brake light switch wires (A) for rear switch or the connector at front brake switch.
2. Set multimeter to measure resistance.
3. Connect meter leads to each terminal of the switch or to each wire of the switch wire harness (from switch).
4. Apply the brake.

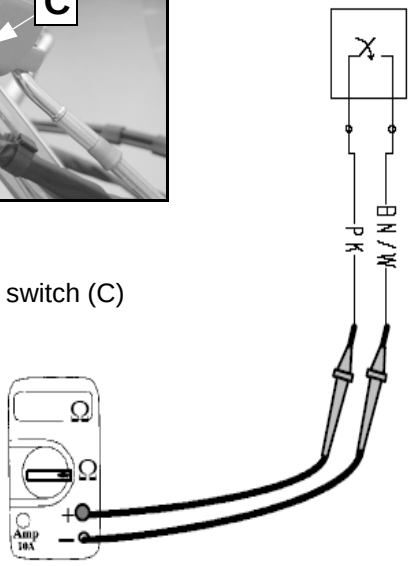


SPECIFICATION: Continuity When Brake Applied

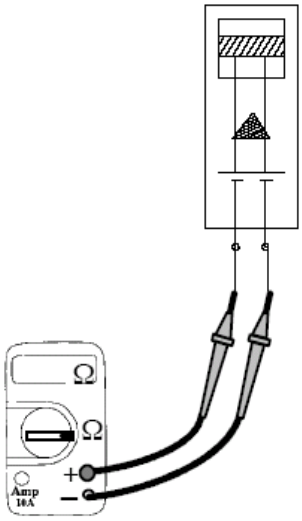


Remove RH mirror
Remove brake lever
Tap darts (B) out to remove switch (C)

Front brake micro switch located on front brake lever perch

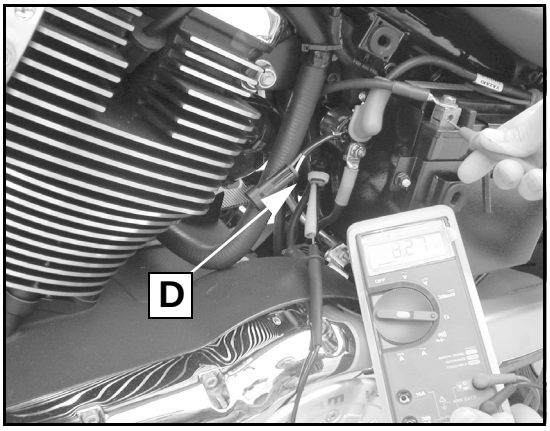


Rear brake hydraulic pressure switch located above oil filter



CLUTCH SWITCH TESTING

1. Set DMM to measure resistance (Ω).
2. Measure resistance of Blue / Yellow wire to ground at the starter solenoid harness connector (D) (located near relay on battery box).



Specification:

Clutch lever released (switch open) 8.27 KΩ

Clutch lever pulled in (switch closed): Less than .5 Ω (good continuity to ground with lever pulled in). Note: Subtract meter lead resistance from total resistance.

NEUTRAL / OVERDRIVE SWITCH INSPECTION

1. Disconnect Neutral / Overdrive switch 2 pin connector behind right side cover on frame down-tube. Switch is located on crankcase behind drive sprocket. Follow switch wires from switch to locate connector.

Neutral Switch Test

2. Shift transmission into Neutral.
3. Compare resistance to Table 1.

Overdrive Switch Test

4. Shift transmission into Overdrive (6th gear).
5. Compare resistance to Table 2.

TABLE 1 - TESTING NEUTRAL SIDE OF GEAR POSITION SWITCH

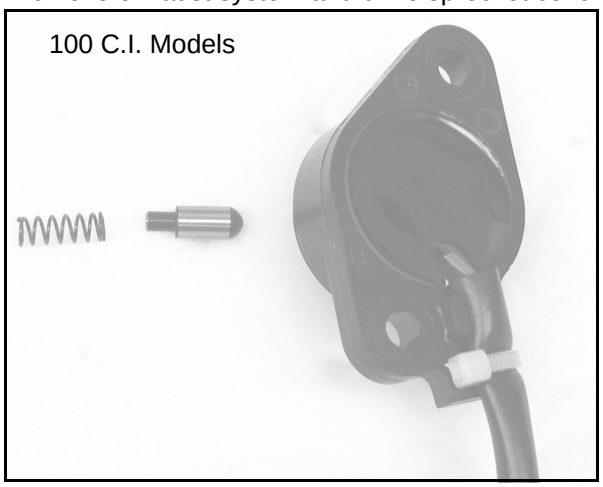
Gear	Meter lead connections		Ohmmeter Reading*
Neutral	Brown / Pink	Crankcase	≤ .5 Ω
Any gear (except Neutral)			∞ (OL or "overload")
* Be sure to subtract meter lead resistance from resistance reading			

TABLE 2 - TESTING OVERDRIVE SIDE OF GEAR POSITION SWITCH (100 C.I. Models)

Gear	Meter lead connections		Ohmmeter Reading*
Overdrive (6th)	Black / Yellow	Crankcase	≤ .5 Ω
Any gear (except Overdrive)			∞ (OL or "overload")
* Be sure to subtract meter lead resistance from resistance reading			

NEUTRAL SWITCH REMOVAL

1. Remove exhaust system and drive sprocket cover.



2. Remove drive sprocket.
3. Disconnect Neutral / Overdrive switch 2 pin connector located near rear top of crankcase (follow wires from switch to connector).
4. Remove 2 screws.
5. Remove Neutral / Overdrive switch.
6. Remove pin and spring from shift drum.
7. Remove sealing O-ring.

ELECTRICAL COMPONENT INPUT / OUTPUT PARAMETERS

Auto Cancel Module (2005-2006 Only) 16 Cavity (Female, Gray)

CAV	FUNCTION	INPUT/OUTPUT PARAMETER	WIRE COLOR
1	NOT USED	--	--
2	BRAKE INPUT POWER	+12 Vdc (IGN ON, BRAKE SW CLOSED)	WHITE/PINK
3	TAIL/BRAKE LIGHT OUTPUT	MODULE CONTROLLED CONSTANT CURRENT OUTPUT	WHITE
4	ECM PROTECTION DIODE INPUT	+12 Vdc (IGN ON, KILL SW CLOSED)	RED/BLACK
5	ECM PROTECTION DIODE OUTPUT	DIODE CATHODE	RED/WHITE
6	NEUTRAL DIODE INPUT	GROUND (CLUTCH SW CLOSED)	BLUE/YELLOW
7	NEUTRAL DIODE OUTPUT	DIODE CATHODE	BROWN/PINK
8	RIGHT TURN SIGNAL OUTPUT	+12 Vdc (IGN ON/PARK, MODULE CONTROLLED)	BLUE/RED
9	MODULE INPUT POWER	+12 Vdc (IGN ON/PARK)	VIOLET
10	TURN SIGNAL IND. LIGHT OUTPUT	+12 Vdc (IGN ON/PARK, MODULE CONTROLLED	BLUE/VIOLET
11	SPEED SENSOR INPUT	0-1700 Hz SQUARE WAVE, 0-12 Vdc	GREEN/BROWN
12	HAZARD SW INPUT	GROUND (HAZARD SW CLOSED)	BLUE/WHITE
13	LEFT TURN SIGNAL SW INPUT	GROUND (LEFT TURN SIGNAL SW CLOSED)	VIOLET/BLUE
14	RIGHT TURN SIGNAL SW INPUT	GROUND (RIGHT TURN SIGNAL SW CLOSED)	VIOLET/RED
15	LEFT TURN SIGNAL OUTPUT POWER	+12 Vdc (IGN ON/PARK, MODULE CONTROLLED	BLUE
16	MODULE GROUND	GROUND	BLACK/WHITE

Brake Pressure Switch, Rear (Female)

Cav	Function	Input / Output Parameter	Wire Color
--	REAR BRAKE SWITCH INPUT	+12 Vdc (IGN ON)	YELLOW/GREEN
--	REAR BRAKE SWITCH OUTPUT	+12 Vdc (IGN ON & BRAKE SW CLOSED)	WHITE/PINK

Crankshaft Position Sensor 2-Cavity (Female, Gray)

Cav	Function	Input / Output Parameter	Wire Color
A	CRANK SENSOR SIGNAL	NEGATIVE SENSOR OUTPUT	TRANSPARENT
B	CRANK SENSOR SIGNAL	POSITIVE SENSOR OUTPUT	BLACK

Diode, Clutch/Neutral Switch 2-Cavity (Female, Gray) (2003-2004 Only)

Cav	Function	Input / Output Parameter	Wire Color
1	CLUTCH SW INPUT	GROUND (CLUTCH SW CLOSED)	BLUE/YELLOW
2	NEUTRAL SW INPUT	GROUND (NEUTRAL SW CLOSED)	BROWN/PINK

Diode, ECM Protection 2-Cavity (Female, Gray) (2003-2004 Only)

Cav	Function	Input / Output Parameter	Wire Color
1	ECM DIODE INPUT POWER	+12 Vdc (IGN ON & KILL SW CLOSED)	RED/BLACK
2	ECM RELAY POWER OUTPUT	+12 Vdc (IGN ON & KILL SW CLOSED)	RED/WHITE

Diode, Left Turn Signal 2-Cavity (Female, Gray) (2003-2004 Only)

Cav	Function	Input / Output Parameter	Wire Color
1	LEFT TURN SIGNAL INPUT POWER	+12 Vdc (IGN ON/PARK & LEFT/HAZARD SW CLOSED)	BLUE
2	TURN SIGNAL INDICATOR OUTPUT	+12 Vdc (IGN ON/PARK & LEFT/HAZARD SW CLOSED)	VIOLET/BLUE

Diode, Right Turn Signal 2-Cavity (Female, Gray) (2003-2004 Only)

Cav	Function	Input / Output Parameter	Wire Color
1	RIGHT TURN SIGNAL INPUT POWER	+12 Vdc (IGN ON/PARK & RIGHT/HAZARD SW CLOSED)	BLUE/RED
2	TURN SIGNAL INDICATOR OUTPUT	+12 Vdc (IGN ON/PARK & RIGHT/HAZARD SW CLOSED)	VIOLET/BLUE

Diagnostic Port, OBD II 16-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
1-3	NOT USED	--	--
4	VEHICLE GROUND	GROUND	BLACK
5	ECM GROUND	GROUND	BLACK/WHITE
6	NOT USED	--	--
7			GRAY/BLACK
8-12	NOT USED	--	--
13	SUPPLY POWER	+12 Vdc (ECM CONTROLLED/SUPPLIED)	GRAY/RED
14-15	NOT USED	--	--
16	CONSTANT POWER	+12 Vdc	ORANGE

ELECTRICAL COMPONENT INPUT / OUTPUT PARAMETERS

Electronic Control Module 36-Cavity (Female, Gray)

CAV	FUNCTION	INPUT/OUTPUT PARAMETER	WIRE COLOR
1	REAR FUEL INJECTOR OUTPUT	GROUND (ECM CONTROLLED)	WHITE/GRAY
2	FUEL PUMP RELAY OUTPUT	GROUND (ECM CONTROLLED)	GRAY
3	NOT USED	--	--
4-5	POWER GROUND	GROUND	BLACK/WHITE
6-7	SWITCHED ECM POWER	+12 Vdc (IGN ON)	VIOLET/PINK
8	SENSOR SUPPLY VOLTAGE	+5 Vdc (ECM CONTROLLED)	BROWN/RED
9	COMMUNICATION LINK	SERIAL DATA	GRAY/BLACK
10	SPEED SENSOR INPUT	0-1700 Hz SQUARE WAVE (0-12 Vdc)	GREEN/BROWN
11	AIR TEMPERATURE SENSOR INPUT	0-5 Vdc (TEMPERATURE DEPENDANT)	ORANGE/GREEN
12	OIL TEMPERATURE SENSOR INPUT	0-5 Vdc (TEMPERATURE DEPENDANT)	ORANGE/BLUE
13	MAP SENSOR INPUT	0-5 Vdc (TEMPERATURE DEPENDANT)	ORANGE/BROWN
14	SENSOR SIGNAL RETURN	--	BROWN/BLUE
15	CRANKSHAFT SENSOR INPUT (+)	POSITIVE SENSOR INPUT	BLACK
16-17	NOT USED	--	--
18	REAR COIL OUTPUT	GROUND (ECM CONTROLLED)	WHITE/GREEN
19	FRONT FUEL INJECTOR OUTPUT	GROUND (ECM CONTROLLED)	WHITE/BLUE
20	TACHOMETER OUTPUT	0-120 Hz SQUARE WAVE (0-12 Vdc)	GREEN/WHITE
21	CHECK ENGINE OUTPUT	GROUND (ECM CONTOLLED)	BLACK/ORANGE
22-23	NOT USED	--	--
24	FLASH EPROM PROGRAM SUPPLY	+12 Vdc (IGN ON)	GRAY/RED
25	CONSTANT POWER	+12 Vdc	ORANGE
26-28	NOT USED	--	--
29	THROTTLE POSITION SENSOR INPUT	0-5 Vdc (DEPENDANT ON POSITION OF THROTTLE BODY)	ORANGE/YELLOW
30	CLUTCH/NEUTRAL SW INPUT	GROUND (CLUTCH/NEUTRAL SWITCH CLOSED)	BLUE/YELLOW
31	NOT USED	--	--
32	CRANKSHAFT SENSOR INPUT (-)	NEGATIVE SENSOR INPUT	TRANSPARENT
33	NOT USED	--	--
34	CASE & SHIELD GROUND	GROUND	BLACK
35	NOT USED	--	--
36	FRONT COIL OUTPUT	GROUND (ECM CONTROLLED)	WHITE/BLACK

Flasher Relay (2003-2004 Only) 3-Cavity (Female, Natural)

Cav	Function	Input / Output Parameter	Wire Color
1	NOT USED	--	--
2	FLASHER RELAY OUTPUT	+12 Vdc (IGN ON/PARK & LEFT/RIGHT/HAZARD SW CLOSED)	VIOLET/BLUE
3	FLASHER RELAY INPUT	+12 Vdc (IGN ON/PARK)	VIOLET

Fuel Injector, Front 2-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
A	FRONT FUEL INJECTOR POWER	+12 Vdc (IGN ON)	VIOLET/PINK
B	FRONT FUEL INJECTOR GROUND	GROUND (ECM CONTROLLED)	WHITE/BLUE

Fuel Injector, Rear 2-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
1	REAR FUEL INJECTOR POWER	+12 Vdc (IGN ON)	VIOLET/PINK
2	FRONT FUEL INJECTOR GROUND	GROUND (ECM CONTROLLED)	WHITE/GRAY

Fuel Pump and Level Sensor 4-Cavity (Male, Black)

Cav	Function	Input / Output Parameter	Wire Color
A	FUEL SENDER GROUND	GROUND	BLACK
B	FUEL SENDER OUTPUT	GROUND (THERMISTOR CLOSED)	BLACK/GREEN
C	FUEL PUMP GROUND	GROUND	BLACK
D	FUEL PUMP POWER	+12 Vdc (ECM CONTROLLED)	VIOLET/YELLOW

ELECTRICAL COMPONENT INPUT / OUTPUT PARAMETERS

Handlebar Controls, Right Hand, 2003-2004 10-Cavity (Female, Natural)			
Cav	Function	Input / Output Parameter	Wire Color
A	KILL SWITCH INPUT	+12 Vdc (IGN ON)	PINK
B	KILL SWITH OUTPUT	+12 Vdc (IGN ON & KILL SW CLOSED)	RED/BLACK
C	LEFT HAZARD OUTPUT	+12 Vdc (IGN ON/PARK & HAZARD SW CLOSED)	BLUE
D	HAZARD SWITCH INPUT	+12 Vdc (IGN ON/PARK)	VIOLET/BLUE
E	RIGH HAZARD OUTPUT	+12 Vdc (IGN ON/PARK & HAZARD SW CLOSED)	BLUE/RED
F	START SWITCH INPUT	+12 Vdc (IGN ON & KILL SW CLOSED)	RED/BLACK
G	START SWITCH OUTPUT	+12 Vdc (IGN ON, KILL SW CLOSED, & START SW CLOSED)	YELLOW/WHITE
H	FRONT BRAKE SWITCH INPUT	+12 Vdc (IGN ON)	YELLOW/GREEN
J	FRONT BRAKE SWITCH OUTPUT	+12 Vdc (FRONT BRAKE SW CLOSED)	WHITE/PINK
K	NOT USED	--	--

Handlebar Controls, Left Hand, 2003-2004 10-Cavity (Female, Blue)			
Cav	Function	Input / Output Parameter	Wire Color
A	HEADLAMP SWITCH INPUT	+12 Vdc (IGN ON)	YELLOW/GREEN
B	HIGH BEAM OUTPUT	+12 Vdc (IGN ON & HIGH BEAM SW CLOSED)	GREEN
C	LOW BEAM OUTPUT	+12 Vdc (IGN ON & LOW BEAM SW CLOSED)	YELLOW
D	CLUTCH SWITCH INPUT	GROUND	BLACK
E	CLUTCH SWITCH OUTPUT	GROUND (CLUTCH SW CLOSED)	BLUE/YELLOW
F	LEFT TURN SIGNAL SWITCH OUTPUT	+12 Vdc (IGN ON/PARK, LEFT TURN SIGNAL SW CLOSED)	BLUE
G	TURN SIGNAL SWITCH INPUT	+12 Vdc (IGN ON/PARK & RIGHT/LEFT TURN SIGNAL SW CLOSED)	VIOLET/BLUE
H	RIGH TURN SIGNAL SWITCH OUTPUT	+12 Vdc (IGN ON/PARK, RIGHT TURN SIGNAL SW CLOSED)	BLUE/RED
J	HORN SWITCH INPUT	+12 Vdc (IGN ON)	VIOLET
K	HORN SWITCH OUTPUT	+12 Vdc (IGN ON & HORN SW CLOSED)	GREEN/PINK

Handlebar Controls, Right Hand, 2005 10-Cavity (Female, Natural)			
CAV	FUNCTION	INPUT/OUTPUT PARAMETER	WIRE COLOR
A	KILL SWITCH INPUT	+12 Vdc (IGN ON)	PINK
B	KILL SWITH OUTPUT	+12 Vdc (IGN ON & KILL SW CLOSED)	RED/BLACK
C	HAZARD OUTPUT	GROUND (HAZARD SW CLOSED)	BLUE/WHITE
D	HAZARD SWITCH INPUT	GROUND	BLACK/WHITE
E	NOT USED	--	--
F	START SWITCH INPUT	+12 Vdc (IGN ON & KILL SW CLOSED)	RED/BLACK
G	START SWITCH OUTPUT	+12 Vdc (IGN ON, KILL SW CLOSED, & START SW CLOSED)	YELLOW/WHITE
H	FRONT BRAKE SWITCH INPUT	+12 Vdc (IGN ON)	YELLOW/GREEN
J	FRONT BRAKE SWITCH OUTPUT	+12 Vdc (FRONT BRAKE SW CLOSED)	WHITE/PINK
K	NOT USED	--	--

Handlebar Controls, Left Hand, 2005 10-Cavity (Female, Blue)			
CAV	FUNCTION	INPUT/OUTPUT PARAMETER	WIRE COLOR
A	HEADLAMP SWITCH INPUT	+12 Vdc (IGN ON)	YELLOW/GREEN
B	HIGH BEAM OUTPUT	+12 Vdc (IGN ON & HIGH BEAM SW CLOSED)	GREEN
C	LOW BEAM OUTPUT (UK & ACC)	+12 Vdc (IGN ON & LOW BEAM SW CLOSED)	YELLOW
D	CLUTCH SWITCH INPUT	GROUND	BLACK
E	CLUTCH SWITCH OUTPUT	GROUND (CLUTCH SW CLOSED)	BLUE/YELLOW
F	LEFT TURN SIGNAL SWITCH OUTPUT	GROUND (LEFT TURN SIGNAL SW CLOSED)	VIOLET/BLUE
G	TURN SIGNAL SWITCH INPUT	GROUND	BLACK/WHITE
H	RIGH TURN SIGNAL SWITCH OUTPUT	GROUND (RIGHT TURN SIGNAL SW CLOSED)	VIOLET/RED
J	HORN SWITCH INPUT	+12 Vdc (IGN ON/PARK)	VIOLET
K	HORN SWITCH OUTPUT	+12 Vdc (IGN ON/PARK & HORN SW CLOSED)	GREEN/PINK

ELECTRICAL COMPONENT INPUT / OUTPUT PARAMETERS

H4 Headlamp Socket, 2005 3 Cavity (Female, Natural)			
CAV	FUNCTION	INPUT/OUTPUT PARAMETER	WIRE COLOR
A	H4 LOW BEAM INPUT POWER	+12 Vdc (IGN ON & LOW BEAM SW CLOSED)	YELLOW
B	H4 HIGH BEAM INPUT POWER	+12 Vdc (IGN ON & HIGH BEAM SW CLOSED)	GREEN
C	H4 GROUND	GROUND	BLACK

HID Ballast Output 3-Cavity (Female, Black)			
Cav	Function	Input / Output Parameter	Wire Color
1	HID	--	RED/PINK
2	HID	--	YELLOW/BLUE
3	HID	--	BLUE/GREEN

HID Ballast Power 2-Cavity (Female, Black)			
Cav	Function	Input / Output Parameter	Wire Color
A	HID BALLAST POWER	+12 Vdc (IGN ON)	YELLOW/GREEN
B	HID BALLAST GROUND	GROUND	BLACK

HID Headlamp 4-Cavity (Female, Black)			
Cav	Function	Input / Output Parameter	Wire Color
1	HID	--	RED/PINK
2	HID	--	YELLOW/BLUE
3	NOT USED	--	--
4	HID	--	BLUE/GREEN

High Beam Socket 2-Cavity (Female, Black)			
Cav	Function	Input / Output Parameter	Wire Color
A	HIGH BEAM POWER	+12 Vdc (IGN ON & HIGH BEAM SW CLOSED)	GREEN
B	HIGH BEAM GROUND	GROUND	BLACK

Horn Connectors (Female)			
Cav	Function	Input / Output Parameter	Wire Color
--	HORN POWER	+12 Vdc (IGN ON & HORN SW CLOSED)	GREEN/PINK
--	HORN GROUND	GROUND	BLACK

ELECTRICAL COMPONENT INPUT / OUTPUT PARAMETERS (Cont.)

Ignition Coil, Front 2-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
1	FRONT COIL POWER	+12 Vdc (IGN ON)	PINK
2	FRONT COIL GROUND	GROUND (ECM CONTROLLED)	WHITE/BLACK

Ignition Coil, Rear 2-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
1	REAR COIL POWER	+12 Vdc (IGN ON)	PINK
2	REAR COIL GROUND	GROUND (ECM CONTROLLED)	WHITE/GREEN

Ignition Switch 4-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
A	IGNITION MAIN POWER	+12 Vdc (CONSTANT)	ORANGE
B	IGNITION ON POWER OUT	+12 Vdc (IGNITION ON)	PINK
C	IGNITION MAIN POWER	+12 Vdc (CONSTANT)	ORANGE
D	IGNITION ON/PARK POWER OUT	+12 Vdc (IGNITION ON/PARK)	BROWN

Indicator Lights 4-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
1	CHECK ENGINE INPUT	GROUND (VEHICLE SYSTEM ERROR PRESENT)	BLACK/ORANGE
2	TURN SIGNAL INPUT	+12 Vdc (IGN ON/PARK & LEFT/RIGHT/HAZARD SW CLOSED)	VIOLET/BLUE
3	HIGH BEAM INPUT	+12 Vdc (IGN ON & HIGH BEAM SW CLOSED)	GREEN
4	NEUTRAL INPUT	GROUND (NEUTRAL SW CLOSED)	BROWN/PINK

Indicator Lights 4-Cavity (Male, Black)

Cav	Function	Input / Output Parameter	Wire Color
1	INDICATOR LIGHTS COMMON POWER	+12 Vdc (IGN ON)	VIOLET
2	INDICATOR LIGHTS COMMON GROUND	GROUND	BLACK
3	LOW OIL PRESSURE INPUT	GROUND (LOW OIL SENSOR CLOSED)	BLACK/BROWN
4	LOW FUEL INPUT	GROUND (LOW FUEL THERMISTOR CLOSED)	BLACK/GREEN

Intake Air Temperature Sensor 2-Cavity (Female, Gray)

Cav	Function	Input / Output Parameter	Wire Color
A	INTAKE AIR TEMP. SENSOR RETURN	--	BROWN/BLUE
B	INTAKE AIR TEMP. SIGNAL	0-5 Vdc (TEMPERATURE DEPENDANT)	ORANGE/GREEN

Low Beam Socket 2-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
A	LOW BEAM POWER	+ 12 Vdc (IGN ON)	YELLOW/GREEN
B	LOW BEAM GROUND	GROUND	BLACK

Manifold Air Pressure Sensor 3-Cavity (Female, Gray)

Cav	Function	Input / Output Parameter	Wire Color
A	MAP SENSOR RETURN	--	BROWN/BLUE
B	MAP SENSOR SIGNAL	0-5 Vdc (PRESSURE DEPENDANT)	ORANGE/BROWN
C	MAP SENSOR SUPPLY VOLTAGE	+5 Vdc (IGN ON)	BROWN/RED

Neutral Switch (Female)

Cav	Function	Input / Output Parameter	Wire Color
--	NEUTRAL SWITCH SIGNAL	GROUND (NEUTRAL SW CLOSED)	BROWN/PINK

ELECTRICAL COMPONENT INPUT / OUTPUT PARAMETERS (Cont.)

Oil Pressure Sensor (Female)			
Cav	Function	Input / Output Parameter	Wire Color
--	OIL PRESSURE SENSOR SIGNAL	GROUND (OIL PRESSURE SW CLOSED)	BLACK/BROWN

Oil Temperature Sensor (Female, Black)			
Cav	Function	Input / Output Parameter	Wire Color
A	OIL TEMP. SENSOR RETURN	--	BROWN/BLUE
B	OIL TEMP. SENSOR SIGNAL	0-5 Vdc (TEMPERATURE DEPENDANT)	ORANGE/BLUE

Rear Wiring Harness Connector (2003-2004) 8-Cavity (Female, Black)			
Cav	Function	Input / Output Parameter	Wire Color
A	STOP/TAIL LIGHT GROUND	GROUND	BLACK/WHITE
B	STOP LIGHT POWER	+12 Vdc (IGN ON & FRONT/REAR BRAKE SW CLOSED)	WHITE/PINK
C	TAIL LIGHT POWER	+12 Vdc (IGN ON/PARK)	VIOLET
D	LEFT REAR TURN SIGNAL POWER	+12 Vdc (IGN ON/PARK & LEFT TURN SIGNAL SW CLOSED)	BLUE
E	LEFT/RIGHT TURN SIGNAL GROUND	GROUND	BLACK
F	RIGHT TURN SIGNAL POWER	+12 Vdc (IGN ON/PARK & RIGHT TURN SIGNAL SW CLOSED)	BLUE/RED

Rear Wiring Harness Connector (2005) 8-Cavity (Male, Black)			
CAV	FUNCTION	INPUT/OUTPUT PARAMETER	WIRE COLOR
A	STOP/TAIL LIGHT GROUND	GROUND	BLACK/WHITE
B	STOP/TAIL LIGHT POWER	AC MODULE CONTROLLED (IGN ON/PARK)	WHITE/PINK
C	LP LIGHT POWER	+12 Vdc (IGN ON/PARK)	VIOLET
D	LEFT REAR TURN SIGNAL POWER	+12 Vdc (IGN ON/PARK & LEFT TURN SIGNAL SW CLOSED)	BLUE
E	L/R TURN SIGNAL/LP LIGHT GROUND	GROUND	BLACK
F	RIGHT TURN SIGNAL POWER	+12 Vdc (IGN ON/PARK & RIGHT TURN SIGNAL SW CLOSED)	BLUE/RED
G	NOT USED	--	--
H	NOT USED	--	--

Speedometer 4-Cavity (Female, White)			
Cav	Function	Input / Output Parameter	Wire Color
1	SPEEDOMETER SWITCHED POWER	+12 Vdc (IGN ON)	PINK
2	SPEEDOMETER CONSTANT POWER	+12 Vdc	ORANGE
3	SPEEDOMETER GROUND	GROUND	BLACK/WHITE
4	SPEED SENSOR INPUT SIGNAL	0-1700 Hz SQUARE WAVE, 0-12 Vdc	GREEN/BROWN

Speed Sensor 3-Cavity (Male, Black)			
Cav	Function	Input / Output Parameter	Wire Color
A	SPEED SENSOR POWER	+12 Vdc (IGN ON)	PINK
B	SPEED SENSOR OUTPUT SIGNAL	0-1700 Hz SQUARE WAVE (0-12 Vdc)	GREEN/BROWN
C	SPEED SENSOR GROUND	GROUND	BLACK/WHITE

ELECTRICAL COMPONENT INPUT / OUTPUT PARAMETERS (Cont.)

Starter Relay 2-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
1	STARTER RELAY COIL POWER	+12 Vdc (IGN ON & STARTER SW CLOSED)	YELLOW/WHITE
2	STARTER RELAY GROUND	GROUND (CLUTCH SW CLOSED or NEUTRAL SW CLOSED)	BLUE/YELLOW

Tachometer 3-Cavity (Female, White)

Cav	Function	Input / Output Parameter	Wire Color
1	TACHOMETER POWER	+12 Vdc (IGN ON)	PINK
2	TACHOMETER GROUND	GROUND	BLACK
3	TACHOMETER INPUT SIGNAL	0-120 Hz SQUARE WAVE, 0-12 Vdc	GREEN/WHITE

Throttle Position Sensor 3-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
A	TPS SUPPLY VOLTAGE	+5 Vdc (IGN ON)	BROWN/RED
B	TPS RETURN	--	BROWN/BLUE
C	TPS SIGNAL	0-5 Vdc (DEPENDANT ON POSITION OF THROTTLE BODY)	ORANGE/YELLOW

Turn Signal Lamp, Front Left 2-Cavity (Female, Black)

Cav	Function	Input / Output Parameter	Wire Color
1	FRONT TURN SIGNAL POWER	+12 Vdc (IGN ON/PARK & LEFT SW ACTIVATED)	BLUE
2	FRONT TURN SIGNAL GROUND	GROUND	BLACK

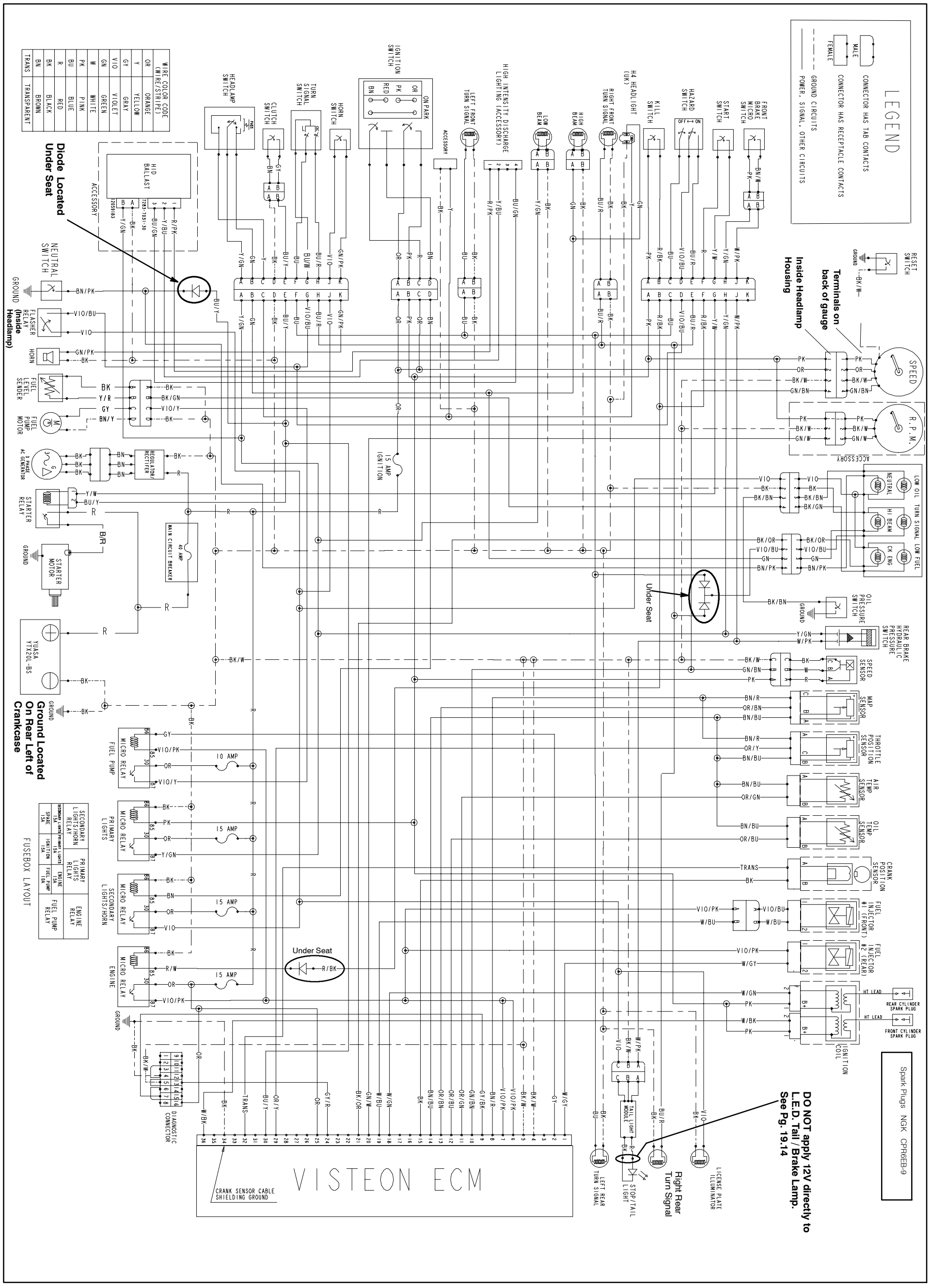
Turn Signal Lamp, Front RIght 2-Cavity (Male, Black)

Cav	Function	Input / Output Parameter	Wire Color
1	TURN SIGNAL POWER	+12 Vdc (IGN ON/PARK & RIGHT SW ACTIVATED)	BLUE/RED
2	TURN SIGNAL GROUND	GROUND	BLACK

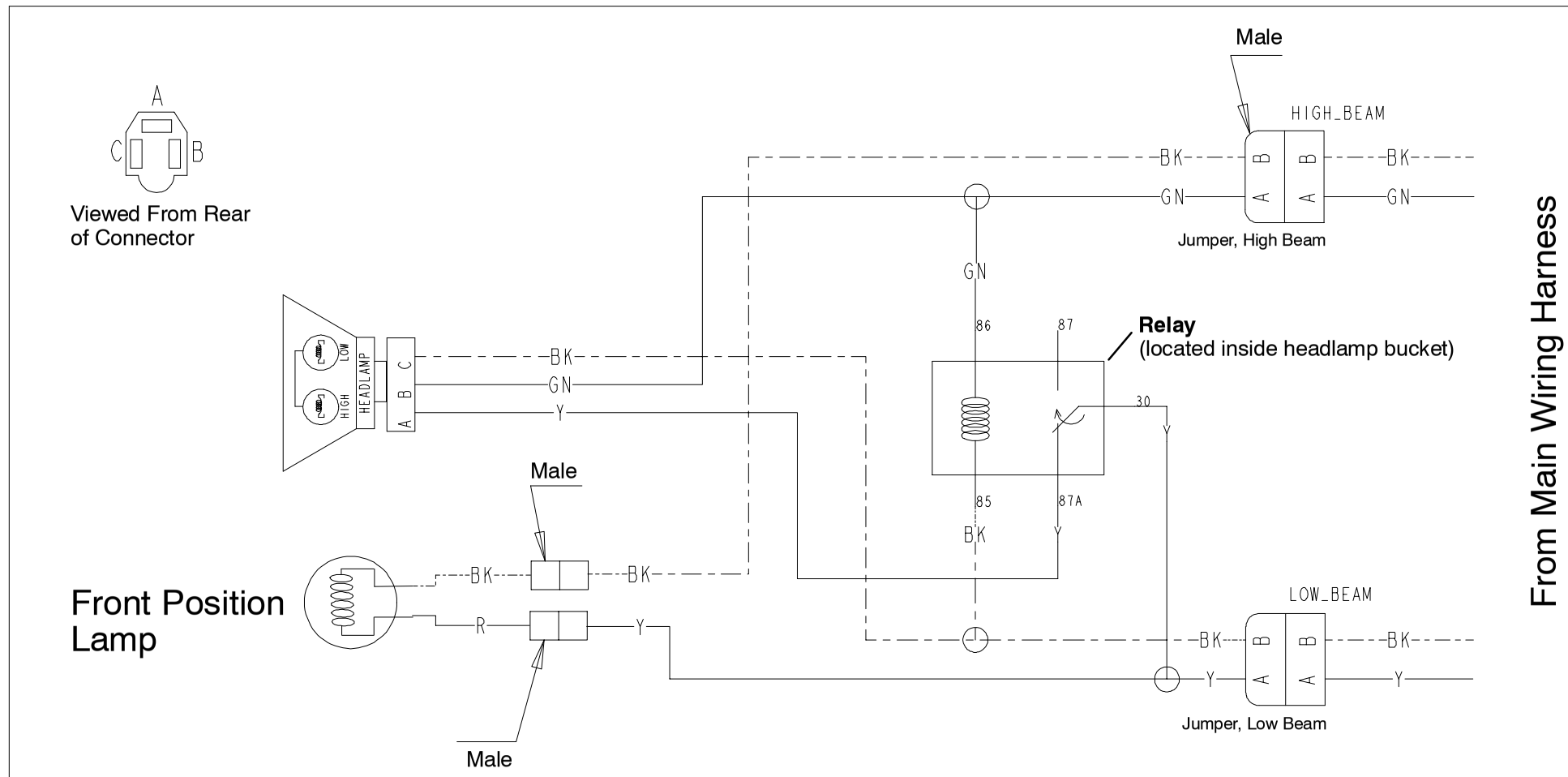
Voltage Regulator 2-Cavity (Male, Black)

Cav	Function	Input / Output Parameter	Wire Color
A	REGULATOR B+ OUTPUT	+12 Vdc (IGN ON & ENGINE RUNNING)	RED/BLACK
B	REGULATOR GROUND	GROUND	BLACK

2003-2004 Victory Vegas™ and Kingpin™ Wiring Diagram



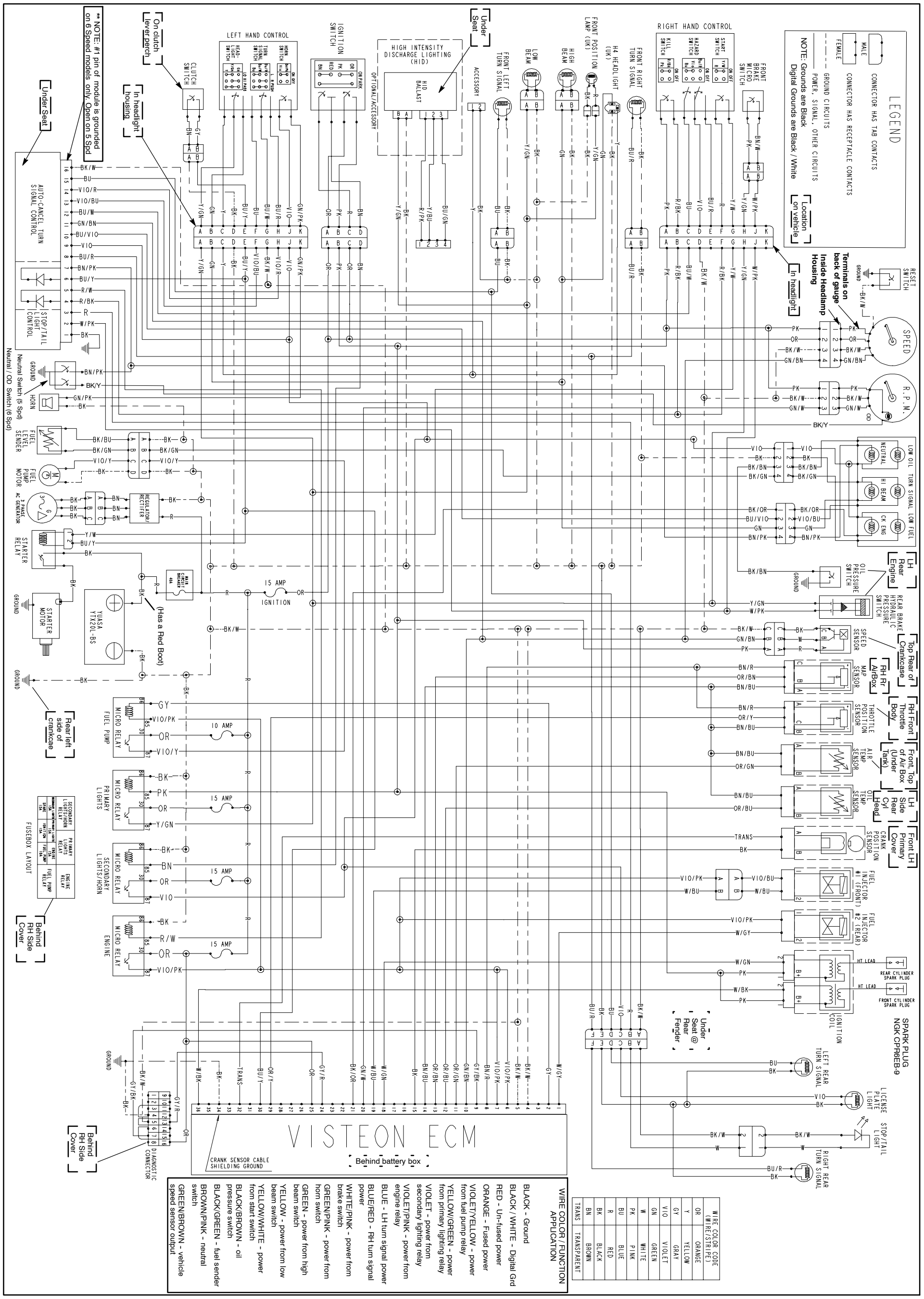
SUPPLEMENT - 2003 United Kingdom Models - Headlamp Wiring Diagram



Schematic - 2003 Vegas U.K. Model Headlamp Jumper
(2004 - 2005 Models Have Wiring Integrated in Harness)

NOTE: Jumper is P/N 2461207

Wiring Diagram - 2005-2006 Models



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