

1999 V92C

SERVICE MANUAL

FN 9916019

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UNDERSTANDING SAFETY LABELS AND INSTRUCTIONS

Throughout these instructions, important information is brought to your attention by the following symbols:



The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

A DANGER

Failure to follow DANGER instructions will result in severe injury or death to the operator, passenger, bystander or person inspecting or servicing the Motorcycle.

WARNING

Failure to follow WARNING instructions could result in severe injury or death to the operator, passenger, bystander or person inspecting or servicing the Motorcycle.

CAUTION:

A CAUTION indicates special precautions that must be taken to avoid minor personal injury, or Motorcycle or property damage.

NOTE:

A NOTE provides key information to clarify instructions.

GENERAL SAFETY

A WARNING

sasoline is extremely tlammable 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 c here gasoline is stored.



Do not overfill the tan Do not the tank neck above e fuel tank .e. re air spac to a fuel expansion.



If you ge gasoline in your eyes of u swallow gasoline, see y doctor immediately. Neve to syphogasoline 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 el exha ist fumes are poisonous and can cause loss of consciousness and death in a short time.

A 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 connected and functioning properly.

△WARNING

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

▲ WARNING HOT COMPONENTS

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 working on the machine.

CAUTION BRAKE FLUID

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

KEEP BRAKE FLUID OUT OF THE REACH OF CHILDREN!

A WARNING

Brake fluid is poisonous. Do not ingest or allow fluid to contact eyes.

Always wear protective eyewear and safety shield when handling brake fluid.

SERVICE RULES

In order to perform service work efficiently and to prevent costly errors, the technician should read the text in this manual, thoroughly familiarizing him/herself with procedures before beginning. Photographs and illustrations have been included with the text as an aid. Notes, Cautions and Warnings have also been included for clarification of text and safety concerns. However, a knowledge of mechanical theory, tool use and shop procedures is necessary to perform the service work safely and satisfactorily.

Use only genuine Victory service parts.

Cleanliness of parts and tools as well as the work area is of primary importance. Dirt and foreign matter will act as an abrasive and cause damage to precision parts. Clean the motorcycle before beginning service. Clean new 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, as in the case of steering, driveline, and chassis components, can result in injury or death for the rider and/or passenger.

If a torquing sequence is indicated for nuts, bolts or screws, start all fasteners in their holes and hand tighten. Then, following the method and sequence indicated in this manual, tighten evenly to the specified torque value. When removing nuts, bolts or screws from a part with several fasteners, loosen them all about 1/4 turn before removing them.

If the condition of any gasket or O-Ring is in question, replace it with a new one. Be sure the mating surfaces for the gasket are clean and smooth in order to avoid leaks and maintain specified tolerances.

A Some procedures will require removal of retaining rings or clips. Because removal weakens and deforms these parts, 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.

A Because removal damages seals, replace any oil or grease seals with new parts.

⚠ Victory recommends the use of Victory lubricants and greases, which have been specially formulated to provide maximum performance and protection of the machines. In some applications, warranty coverage may become void if improper lubricants are used.

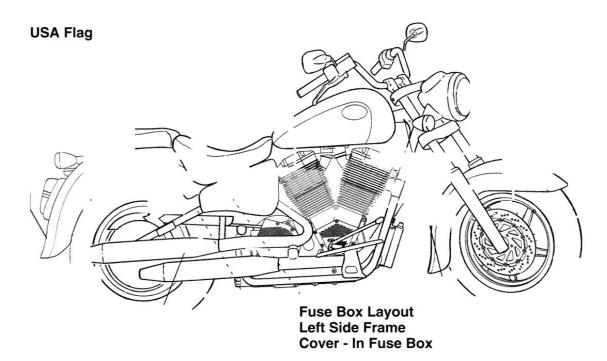
⚠ Grease should be cleaned from parts and fresh grease applied before reassembly of components. Deteriorating grease loses lubricity and may contain abrasive foreign matter.

▲ WARNING

Whenever removing or reinstalling batteries, care should be taken to avoid the possibility of explosion resulting in serious burns. Always disconnect the negative (black) cable first and reconnect it last. Battery electrolyte contains sulfuric acid and is poisonous! Serious burns can result from contact with the 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. The Victory V92C Motorcycle uses a maintenance free battery and hydrogen gas is usually not a concern during normal operation. Hydrogen gas may be produced when the battery is overcharged. Therefore, keep the battery away from the source of any combustion (sparks, fire, etc..) when the battery is being charged.

GENERAL LOCATION OF INFORMATION LABELS

Operator Warning Loading Information Fuel Recommendation



Tire Information

Vehicle Emission Label Left Hand Side of Vehicle Upper Swing Arm Tube

Vehicle Identification Number

BREAK-IN PROCEDURES

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). When the motorcycle is manufactured, the best possible materials and manufacturing techniques are used, but the final machining process is the break-in. The various parts in the engine wear and polish themselves to the correct operating clearances. During this period, the operator must avoid prolonged full throttle operation, or any condition which might result in excessive heating of the engine.

The overall performance and reliability of the engine depends on the care the operator observes during the break-in period. The general guidelines are as follows:

		GUIDELINES FOR ENGINE BREAK-IN
Miles/km	Throttle Position	Notes
0-90 miles	0-1/3 throttle position	Avoid prolonged operation above 1/3 throttle. Stop the engine and let it cool for every hour of operation. Vary the speed of the motorcycle. Do not operate the machine at one set throttle position.
90-300 miles	0-1/2 throttle position	Avoid prolonged operation above 1/2 throttle. Follow the other guidelines in the step above.
300-500 miles	0-3/4 throttle position	Avoid cruising speeds above 3/4 throttle.
500 miles	Replace the	e engine oil and engine oil filter. Have the 500 mile service performed. See chapter 3 for nation.
500 miles and be- yond	Avoid prolor of the owner	nged full-throttle operation. Vary the engine speed occasionally. Follow the pre-ride inspection r's manual.

	Item	Spe	ecifications
Dimensions	Overall Length	238.8 cm	(94")
(General)	Overall Width	87.02 cm	(29.5")
(6.6.1.61.41.)	Overall height	113.0 cm	(44.5")
	Wheelbase	160.8 cm	(63.3")
	Seat Height	20.3 cm	(28")
	Ground Clearance	13.9 cm	(5.5")
	Dry Weight	298.0 kg	(657 lbs.)
	Curb Weight (Full fuel and oil)	315.7 kg	(696 lbs)
	Load Capacity (Total weight of operator, passenger, cargo and accessories)	171.9 kg	(379 lbs)
	Gross Vehicle Weight (GVW)	487.6 kg	(1075 lbs)

FRAME SPECIFICATIONS

	Item	Specifications	
Frame	Frame Type	Double Loop Tubular Steel	
(General)	Front Suspension	Marzocchi™ Conventional Telescopic	
(6.6.1.6.4.1)	Front Wheel Travel	129.54 mm (5.1" in)	
	Rear Suspension	Fox™ Shock	
	Rear Wheel Travel	101.60mm (4.0")	
	Front Tire (Dunlop™)	MT90HB16 71H	
	Rear Tire (Dunlop™)	160/80HB16 75H	
	Front Brake	300mm Floating Rotor with Four Piston Caliper	
	Rear Brake	300mm Floating Rotor with Two Piston Cali- per	
	Caster Angle (Rake)	30°	
	Trail Length	127mm (5")	
	Fuel Tank Capacity	4.8 U.S. gal, 18.16 liters, 3.99 lmp gal	
×	Fuel Tank Reserve Capacity	Reserve light on when .6 U.S. gallons remain	

ELECTRICAL SPECIFICATIONS

	Item	Specifications
Electrical (General)	Ignition System	Distributor-less Transistorized Dual Coil Type Ignition
(Gonoral)	Starting System	Electric
	Charging System	Permanent Magnet/3 Phase/Full Rectification
	Regulator/Rectifier	Solid State Three Phase Voltage Regulator/ Rectifier
	Lighting System	12 VDC

ENGINE/FUEL INDUCTION SPECIFICATIONS

Item		Specifications
Engine (General)	Engine Model Number	MCVT1507D-01, MCVT1507D-02
_,,g,,,e (e.e.,e.a.,	Cylinder Arrangement	2 Cylinder 50° V Twin
	Bore / Stroke	97mm x 102 mm (3.818" x 4.015")
	Displacement	1507 cc (92 cu in)
	Compression Ratio	8.5 : 1
	Valve Train	Single Overhead Cam / 4 valves per cylin der/Hydraulic Lifters
	Valve Angle (Included)	38°
	Intake Valve Opens At 1mm Lift	4° BTDC
	Intake Valve Closes At 1mm Lift	32.5° ABDC
	Exhaust Valve Opens At 1mm Lift	17.5° BBDC
	Exhaust Valve Closes At 1mm Lift	19.0° ATDC
	Lubrication System	Wet Sump
	Oil Pump Type	Two Chambered Trochoid Pump
	Cooling System	Oil / Air Cooled
	Air Filtration	Synthetic Element (Disposable)
	Engine Weight	99.77 kg (220 lb)
	Cylinder Position Identification	Front and Rear
Fuel Induction	Туре	Electronic Fuel Injection
(General)	Throttle Bore	44 mm

DRIVE TRAIN SPECIFICATIONS

	Item	Specifications
Drive Train (General)	Clutch Type	Wet, Multi-Disk 6 Clutch Springs
(denotal)	Clutch Operating Mechanism	Manually Operated Cable
	Transmission	Direct Drive, 5 speeds, Manually Operated
	Primary Reduction Ratio	1.50:1
	Final Reduction Ratio	2.13:1
	Gear Ratio: Ist Gear (Overall Ratio)	3.8:1 (12.2:1)
	Gear Ratio: 2nd Gear (Overall Ratio)	2.5:1 (8.1:1)
	Gear Ratio: 3rd Gear (Overall Ratio)	1.7:1 (5.6:1)
	Gear Ratio: 4th Gear (Overall Ratio)	1.3:1 (4.1:1)
	Gear Ratio: 5th Gear (Overall Ratio)	1.0:1 (3.2:1)
	Transmission Shift Mechanism	Manually Operated, Spring Centered
	Gearshift Pattern	1-N-2-3-4-5

TORQUE SPECIFICATIONS - ENGINE

Torque values listed in the following chart are critical torque values. Use these torque values when tightening fasteners. Critical torque values are also listed at the front of each chapter. Clean fasteners and apply locking agent as specified.

Engine and Transmission Assembly Torque Values			_
Fastener (Size mm)	Torque Value – N-m	Torque Value – Ib.ft (Ib.in)	Apply:
	Crankcase		
Baffle Plate Screws	6 N-m	(50 lb.in.)	
Bearing Retainer Plate (6x1.0)	10 N-m	(85 lb.in.)	
Bearing Retainer Plate (5x.8)	6 N-m	(50 lb.in.)	
Breather Fitting	13 N-m	(115 lb.in.)	
Breather Reed	6 N-m	(50 lb.in.)	94040
Cam Chain Guide Adaptor	25 N-m	18 lb. ft.	
Cam Chain Guide Bolts	12 N-m	(100 lb.in.)	
Cam Drive Cover	13 N-m	(115 lb.in.)	
Countershaft Retaining Bolt	25 N-m	18 lb. ft.	Loctite• 262
Crankcase bolts (8x1.25)	30 N-m	22 lb.ft.	
Cylinder Studs (11x1.5)	35 N-m	25 lb.ft.	
Cylinder Studs (9x1.25)	20 N-m	15 lb.ft.	
Dog Point Set Screw	12 N-m	(100 lb.in.)	
Drive Nut Lock Plate	10 N-m	(85 lb.in.)	
Drain Plug (22x1.5)	39 N-m	28 lb.ft.	
Drive Sprocket Nut	138 N-m	100 lb.ft.	
Inner Sprocket Cover	13 N-m	(115 lb.in.)	
Lubrication Jet Body	12 N-m	(100 lb.in.)	Loctite• 262
Neutral Switch	12 N-m	(100 lb.in)	Pipe Sealant
Oil Filter Nipple	62 N-m	45 lb.ft.	
Oil Line Fitting	41 N-m	30 lb.ft.	
Oil Pressure Switch	6 N-m	(50 lb.in.)	
Shift Drum Bearing	4 N-m	(30 lb.in.)	
Shift Shaft Adaptor	35 N-m	25 lb.ft.	
Shift Star	13 N-m	(115 lb.in.)	
	Oil Pump		†
Oil Inlet Screen	4 N-m	(30-50 lb.in.)	
Oil Lines	13 N-m	(115 lb.in.)	
Oil Pump Sprocket	13 N-m	(115 lb.in.)	1
Oil Pump Mounting	13 N-m	(115 lb.in.)	Loctite• 262
Pressure Relief Plates	10 Ņ-m	(85 lb.in.)	
	Cylinder	1	-
Cam Chain Tensioner Body	13 N-m	(115 lb.in.)	
Cam Chain Tensioner Cap	20 N-m	15 lb.ft.	+

TORQUE SPECIFICATIONS ENGINE, cont.

Fastener (Size mm)	Torque Value – N-m	Torque Value – lb.ft (lb.in)	7
7	Cylinder Head		Apply:
Cam Bore Plug	28 N-m	20 lb.ft.	Loctite• 242
	35 N-m	25 lb.ft.	
	20 N-m	15 lb.ft.	
	14 N-m	(120 lb.in.)	
	9 N-m	(75 lb.in.)	Loctite• 262
-	20 N-m	15 lb.ft.	
-	13 N-m	(115 lb.in.)	
Fuel Rail To Throttle Body	13 N-m	(115 lb.in.)	
Head Mounting Nut (10x1.5)	30 / 55 N-m	22, then 40 lb.ft.	Oil to Threads
Head Mounting Nut (8x1.25)	30 N-m	22 lb.ft.	
Oil Feed Plugs, Camshaft Plugs, and Rocker Feed Plugs	12 N-m	(100 lb.in.)	Loctite• 262 on Camshaft Plugs
Oil Manifold Screws	10 N-m	(85 lb.in.)	
Oil Outlet Adaptor	10 N-m	(85 lb.in.)	
Oil Pressure Sensor	5 N-m	(50 lb.in.)	
Oil Temperature Sensor	14 N-m	(125 lb.in.)	
Spark Plug Tube	7 N-m	(65 lb.in.)	
Spark Plug	16.5 N-m	12 lb.ft.	
Valve Cover	13 N-m	115 lb.in.)	
	Crankshaft		
Connecting Rod	55 N-m	40 lb.ft.	
Crankshaft Position Wheel	12 N-m	(100 lb.in.)	Loctite• 262
Flywheel	103 N-m	75 lb.ft.	
Oil Passage Plug (14x1.5)	20 N-m	15 lb.ft.	
Oil Passage Plug (8x1.25)	10.5 N-m	(90 lb.in.)	
-	Drive Train	•	
Clutch Lock Plate	12 N-m	(100 lb.in.)	
Clutch Nut	103 N-m	75 lb.ft.	Loctite• 262
Clutch Spring	12 N-m	(100 lb.in.)	
Clutch Insert Plate	12 N-m	(100 lb.in.)	Loctite• 242
Compensator Nut	103 N-m	75 lb.ft.	Loctite• 262
Primary Drive Gear	44 N-m	32 lb. ft.	Loctite• 262 (in hole)
Split Gear	10 N-m	(85 lb.in.)	
· ·	Primary Cover	•	
Clutch Shaft Retaining Screws	5 N-m	(40 lb.in.)	
Emblem Plate	10 N-m	(85 lb.in.)	
Primary Cover Mounting Screws	13 N-m	(115 lb.in.)	
Stator Mounting Screws	12 N-m	(100 lb.in.)	

TORQUE SPECIFICATIONS, CHASSIS

Torque values listed in the following chart are critical torque values. Use them when tightening fasteners. Critical torque values are also listed at the front of each chapter. Clean fasteners and apply locking agent as specified.

Chassis Torque Values			
Fastener (Size mm)	Torque Value – N-m	Torque Value – lb.ft (lb.in)	Apply
	Engine Mounting		
Front Upper Bracket to Frame (8x25)	41 N-m	30 lb.ft.	
Front Upper Bracket to Engine (12x100)	104 N-m	75 lb.ft.	
Rear Upper Bracket(s) to Frame (8x25)	41 N-m	30 lb.ft.	
Rear Upper Bracket to Engine (12x100)	104 N-m	75 lb.ft.	
Lower Cradle to Engine (Mid Engine) (10x45)	61 N-m	45 lb.ft.	
Rear Engine to Frame (Lower) (10x45)	61 N-m	45 lb.ft.	
Rear Engine to Frame w/ Passenger Peg Mount (10x50)	61 N-m	45 lb.ft.	
-	Frame Cradles		
Cradles to Main Frame	61 N-m	45 lb.ft.	
	Side Stand	1	
Sidestand Nut	47 N-m	35 lb.ft.	
•	Sub Frame		
Subframe to Mainframe	47 N-m	35 lb. ft.	
Brackets (Subframe, Battery Box, ECM, Fuse Box) to LH Sub Frame (6mm)	16 N-m	12 lb. ft.	
	Swingarm		
Upper Arm to Front Main Swingarm	61 N-m	45 lb.ft.	
Upper Arm to Rear Main Swingarm	61 N-m	45 lb.ft.	
Swingarm Pivot Nut (16mm)	156 N-m	115 lb.ft.	
•	Floor Boards		
L & R Floorboard Support to Frame	48 N-m	35 lb.ft.	
Left Side Shift Lever to Floorboard Support	25 N-m	18 lb.ft.	
Rear Clevis To Splined Shaft	16 N-m	12 lb.ft.	
Linkage Rod End, Jam Nut, Floorboard Scraper	11 N-m	8 lb.ft.	
Right Side Brake Lever Support to Floorboard Support	26 N-m	20 lb.ft.	
Brake Rod Jam Nut	11 N-m	8 lb.ft.	
1	Front Wheel		***************************************
Axle Bolt to Axle	61 N-m	45 lb.ft.	55500
Brake Disc to Wheel	47 N-m	35 lb.ft.	
Hub Cap to Wheel	27 N-m	20 lb.ft.	

TORQUE SPECIFICATIONS CHASSIS, cont.

Chassis Torque Values			
Fastener (Size mm)	Torque Value – N-m	Torque Value – Ib.ft (Ib.in)	Apply:
	Front Brakes	1	
Caliper to Fork Leg	41 N-m	30 lb.ft.	
Brake Line Banjo Bolts (Caliper and Master Cylinder)	18.5 N-m	14 lb.ft.	
Brake Lever Pivot Pin to Master Cylinder	16 N-m	12 lb.ft.	
Brake Lever Pivot Pin Nut to Pin.	16 N-m	12 lb.ft.	
Master Cylinder Clamp To Handlebar	16 N-m	12 lb.ft.	
	Front Forks		
Steering Stem Adjustment Nut*	39 / 21 N-m**	29 /15 lb.ft.**	
Steering Stem Cap Bolt	68 N-m	50 lb.ft.	
Triple Clamp Pinch Bolts	86 N-m	63 lb.ft.	
Fork Tube Spring Cap	25 N-m	18 lb.ft.	
Damper Rod to Slider	50 N-m	37 lb.ft.	200
Axle Pinch Bolts	24 N-m	18 lb.ft.	17.7
	Front Fender	1	
Front Fender to Forks	16 N-m	12 lb.ft.	
	Headlight		
Headlight Assembly to Fork	27 N-m	20 lb.ft.	
Turn Signal Bracket to Fork	27 N-m	20 lb.ft.	
-	Handlebars		
Handlebar Riser Mount to Forks	41 N-m	30 lb.ft.	
Handlebar Clamp to Riser	34 N-m	25 lb.ft.	
Handlebar Switch to Handlebar	3 N-m	(25 lb.in.)	
Throttle Cable Retainer	3 N-m	(25 lb.in.)	
Throttle Cable Jam Nuts	3 N-m	(25 lb.in.)	
Master Cylinder Clamp to Handlebar	16 N-m	12 lb.ft.	
Clutch Lever Bracket to Handlebar	16 N-m	12 lb.ft.	
Clutch Cable Frame Bracket to Frame	11 N-m	8 lb.ft.	
-	Fuel Tank	•	
Tank Mount (Front & Rear) to Frame	11 N-m	8 lb.ft.	1/0
Fuel Level Sending Unit to Tank	2.8 N-m	(25 lb.in.)	
Quick-Connect to Tank	16 N-m	12 lb.ft.	
	Air Box		
Air Cleaner Bolts	3 N-m	(25 lb.in.)	
Air Box Cover to Base	13 N-m	(115 lb.in.)	
Air Box to Throttle Body Adaptor	10 N-m	(85 lb.in.)	
Air Box Cover to Bracket	2.7 N-m	(25 lb.in.)	

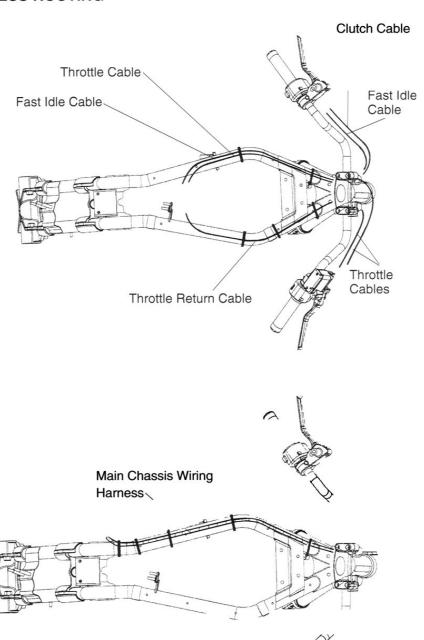
^{*} REFER TO CHAPTER 12 FOR COMPLETE TORQUE PROCEDURE

^{**} TURN LOCK TO LOCK 5 TIMES - LOOSEN AND TORQUE TO 15 LB.FT. REFER TO CHAPTER 12 FOR COMPLETE TORQUE PROCEDURE

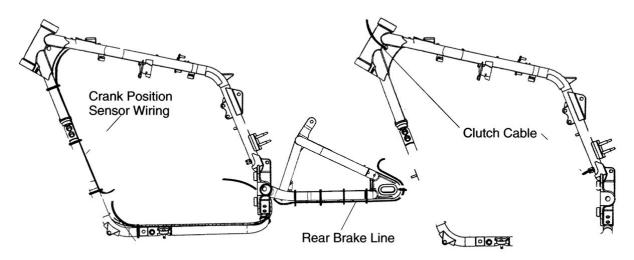
TORQUE SPECIFICATIONS - CHASSIS, cont.

Chassis Torque Values			
Fastener (Size mm)	Torque Value – N-m	Torque Value – Ib.ft (Ib.in)	Apply
* · · · · · · · · · · · · · · · · · · ·	Oil Line Manifold	•	
Oil Manifold to Frame	11 N-m	8 lb.ft.	
•	Belt Drive Cover		
Belt Drive Cover	16 N-m	12 lb.ft.	
•	Rear Shock		
Rear Shock Bolts (Torque Nut)	61 N-m	45 lb.ft.	
	Rear Fender		
Rear Fender to Subframe	16 N-m	12 lb.ft.	
Turn Signal Assembly to Bracket	27 N-m	20 lb.ft.	-
Tail Light Assembly to Fender	11 N-m	8 lb.ft.	
	Rear Wheel	•	14119366000
Brake Disc to Wheel	47 N-m	35 lb.ft.	
Rear Sprocket to Wheel	57 N-m	42 lb.ft.	
Rear Axle Nut	88 N-m	65 lb.ft.	
	Rear Brake		
Brake Line Banjo Bolts	18.5 N-m	14 lb.ft.	
Pressure Switch to Manifold	11 N-m	8 lb.ft.	
Brake Mast. Cyl. to Floorboard Support	16 N-m	12 lb.ft.	
	Belt Guards		
Belt Guard to Swingarm (6mm)	11 N-m	8 lb.ft.	
Belt Guard to Swingarm (8mm)	16 N-m	12 lb.ft.	
	Passenger Seat and Pegs	-	
Passenger Seat to Rear Fender	11 N-m	8 lb.ft.	
Passenger Peg Bracket to Engine Mount Casting; Passenger Peg Brackets to Subframe	62 N-m	45 lb.ft.	
,	Electrical		
Ignition Key Switch to Frame	4 N-m	(35 lb.in.)	
Electrical Lead to Starter Motor	11 N-m	8 lb.ft.	
Battery Terminal Bolts	4.2 N-m	(40 lb.in.)	
	Oil Cooler		
Oil Cooler to Frame	11 N-m	8 lb.ft.	
	Exhaust		
Exhaust Pipe Flange to Cylinder Heads	16 N-m	12 lb.ft.	
Muffler / Cross-over Pipe Clamps	47 N-m	35 lb.ft.	
Muffler Support Bracket to RH Cradle	27 N-m	20 lb.ft.	
Muffler Support Bracket to RH Passenger Peg Support	27 N-m	20 lb.ft.	
Muffler to Muffler Support Bracket	27 N-m	20 lb.ft.	

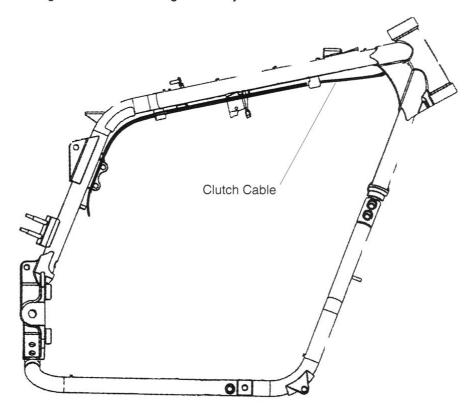
CABLE & HARNESS ROUTING



CABLE & HARNESS ROUTING



Starter Cable & Regulator/Rectifier Wiring To Battery



EMISSION CONTROL SYSTEMS (NON-CALIFORNIA MODELS)

The U.S. Environmental Protection Agency (E.P.A.) requires manufacturers to certify that their motorcycles comply with applicable exhaust emissions standards during their useful life. The motorcycles must be operated and maintained according to the instructions provided in the owner's manual and this service manual.

The E.P.A. also requires that motorcycles built after January 1, 1983 comply with applicable noise emission standards for one year or 6,000 km (3,730 miles) after the time of sale, when operated and maintained according to the instructions provided in the owner's manual and this service manual.

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.

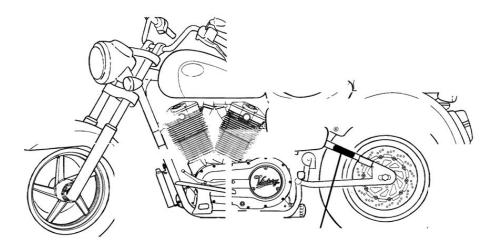
Carbon monoxide does not react with sunlight, but must be controlled because of its toxicity.

EXHAUST EMISSION CONTROL

Victory Motorcycles utilizes an electronic engine management system which controls fuel delivery and ignition timing to control hydrocarbons and carbon monoxide. No adjustments should be made to the system. If components are replaced that affect idle speed follow the instructions in Chapter 3 (Maintenance) page 3.9 - 3.10.

CRANKCASE EMISSION CONTROL

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



Vehicle Emission Label (U.S.A. Only)

EMISSION CONTROL INFORMATION LABEL (U.S.A. only)

NOISE EMISSION CONTROL SYSTEM

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

- The removal or rendering inoperative by any person other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into any new vehicle 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 vehicle after such device or element of design has been removed or rendered inoperative by any person.

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

- 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 vehicle, or parts of the exhaust or intake system, with parts other than those specified by the manufacturer.

A WARNING

If the motorcycles noise levels increase significantly through use, the owner should have the machine inspected and repaired as necessary. Otherwise, the owner may become subject to penalties under state and local ordinances.

VICTORY PAINT CODES

MODEL	FUEL TANK	FENDERS	SIDE COVERS
Cruiser	P-264 / P-266	P-264 / P-266	P-266
Cruiser	P-265 / P-266	P-265 / P-266	P-266

COLOR	PART NUMBER				
K.Y.S.O. Blue T/C PV	P-264				
Antares Red T/C PV	P-265				
Cruiser Black T/C PV	P-266				

ORDERING INFORMATION

All paint is to be ordered from:

MIDWEST INDUSTRIAL COATINGS, INC.

6667 West Old Shakopee Road #101 Bloomington, MN 55438

Orders can be placed by phone or fax: **PHONE**: 612-942-1836 **FAX**: 612-942-1838

The following information must be supplied when placing the order:

- 1. Your Polaris dealer number.
- 2. The Polaris "P" color number.
- 3. The year and model of the vehicle to be painted.

All orders will be shipped within 24 hours of receipt. Any custom or special order will require a minimum of two to three weeks lead time for delivery.

Upon receipt of your invoice, the payment terms to Midwest Industrial Coatings are Net 30 days. If you prefer C.O.D. terms, please indicate when placing order.

PRODUCTS AVAILABLE:

One (1) ounce bottle:

For brush touch-up of small imperfections.

Twelve (12) ounce aerosol can

K.Y.S.O. Blue and Antares Red paint kits:

- * One (1) quart undercoat
- One (1) quart base coat
- * Appropriate components needed for spray application
- Mixing instructions supplied
- Kit will equal 3 1/2 quarts
- Mix appropriate amount for parts to be painted

Cruiser Black and Clear paint kits:

- * One (1) quart base coat
- * Appropriate components needed for spray application
- * Mixing instructions supplied
- Kit will equal 2 1/2 quarts
- * Mix appropriate amount for parts to be painted.

A Detail Kit (polish, wax, and dressing) and Restore Polish, Swirl, and Scuff remover kit is <u>available from the Victory</u> parts department for painted surface protection and to remove minor surface imperfections.

Detail Kit: 2872195 Restore Kit: 2872192

IDENTIFICATION NUMBERS RECORD

Record the following information in the spaces provided below to help you when ordering parts or in the event that your machine is stolen.

KEY IDENTIFICATION NUMBER

The key identification number (1) is stamped on the key tag. You will need this information in the event that you need to purchase a new key.

VEHICLE IDENTIFICATION NUMBER

The vehicle identification number (2) is stamped on the front of the steering head.

NOTE: The VIN is used to identify your motorcycle and will be used to register your motorcycle with the licensing authority in your state.

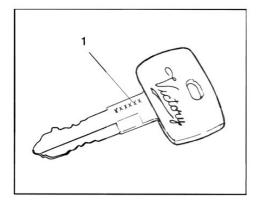


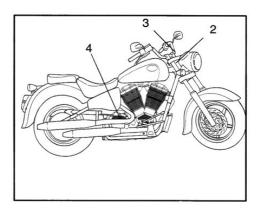
The model label (3) is located on the left side of the steering head.

This information will be needed to order parts or accessories.



The engine label (4) is located on top of the crankcase behind the rear cylinder. This label identifies the engine model and serial number. The engine serial number is also stamped on the crankcase to the right of the oil filter.





Key Identification Number	
Vehicle Identification Number	
Model Label Information	
Engine Identification Number/Transmission Identification Number	

MULTI-FUNCTION DISPLAY

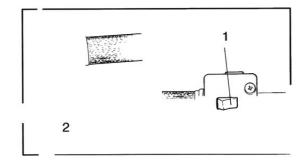
MFD Functions

Odometer

- 2. Trip Odometer
- 3. Clock

Backlight dimming

- 5. Hi-Beam Dimming
- Fuel Level
- 7 Voltmeter
- Check Engine



MODE SWITCH (1) - Toggles all Multi-LCD display functions except "Check Engine." The indicator scrolls from left to right, displaying selection.

SET SWITCH (2) - Function varies with selected function mode. Used to set the clock, to select English or metric while in Odo mode and resets the trip odometer while in trip mode.

ODOMETER - Default function on LCD when starting the machine. It accumulates the distance of the vehicle. The global numeric system can be toggled between English and metric by pressing the SET button for 3 seconds while in this function. Pressing the mode button will change to the next LCD function.

TRIP ODOMETER - This function also accumulates and stores distance but can be reset to zero by pressing the SET button for 3 seconds while in this mode. TRIP MI or TRIP KM indicators are on when in this mode (depending on the current numeric system of choice). Pressing once the MODE button will change to the next LCD function.

CLOCK - the clock function on the LCD shows the time. The CLOCK indicator is on when in clock mode. You must be in CLOCK mode to set the time. To set the time, hold SET key for 3 seconds (hours digits start flashing), press SET to select the hour and MODE to enter the set hour; the first digit of minutes will begin to flash. press SET to select the number and MODE to enter it; continue with this procedure for the final digit. After the last digit is entered, the display will return to normal operational mode (colon flashing). After the clock is set, pressing the MODE button will change to the next LCD function.

BACKLIGHT DIMMING - the intensity of the backlight of the module can be changed to one of 6 levels by pressing the SET button. The LCD display will show in bars the proportional part of the dimming. Pressing the MODE button will change to the next LCD function.

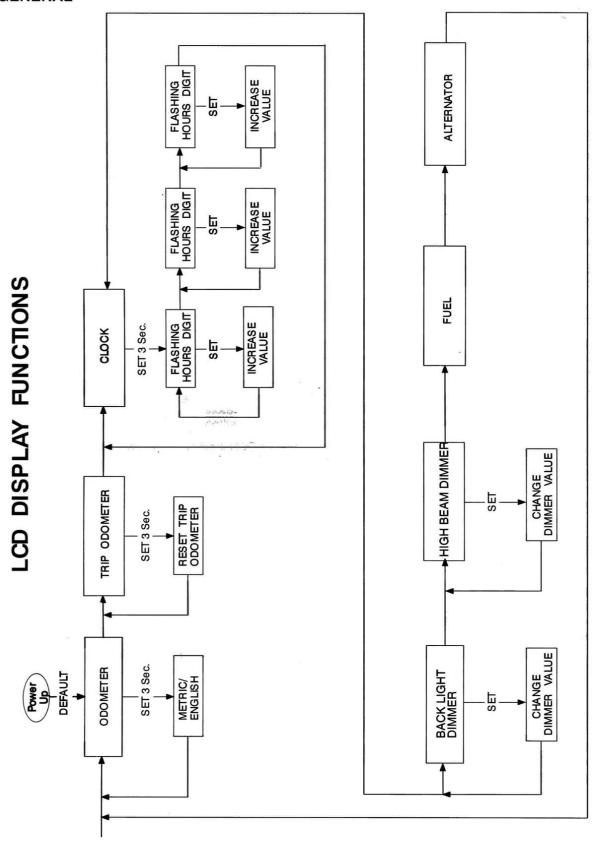
HIGH BEAM INDICATOR DIMMING - The intensity of the high beam indicator can be set to one of 4 levels by pressing the SET button. The LCD display will show HB followed by bars, indicating the proportional part of the dimming. In this mode, the DIM indicator is still on and pressing the MODE button once will change to the next LCD function.

FUEL - Fuel of the vehicle will be shown on the LCD display in gallons or liters according to the current numeric system of the module. the range goes from 0 to 5 gallons. In this function all indicators will be off, pressing the MODE button once will change to the next LCD function.

VOLTMETER - The voltage of the battery will be shown on the LCD display. (i.e. Alt 12.3). In this function, all indicators will be off, pressing the MODE button once will change back to the first LCD function.

CHECK ENGINE - In this function, the microcontroller is checking the the Check Engine input line; the LCD will be shown CK Eng every time this line turns low. This screen will be on for a period of two seconds every 5 seconds as long as the CK Engine line remains low.

Refer to page 1.20 for LCD display functions



CHAPTER 2 FRAME/BODY PANELS/ EXHAUST SYSTEM

TROUBLESHOOTING	10 mg	
TORQUE SPECIFICATIONS		
OPERATOR SEAT REMOVAL		
OPERATOR SEAT INSTALLATION	100 CM 100 CM	
FRAME SIDE COVER(s) REMOVAL / INSTALLATIO	6,10,6-3-11	200
REAR FENDER REMOVAL		
REAR FENDER INSTALLATION	ARCO D. INC.	
MUFFLER REMOVAL / INSTALLATION	ではずればい、よりた。	
EXHAUST HEADPIPE REMOVAL		
EXHAUST HEADPIPE INSTALLATION		~ 16
FUEL TANK REMOVAL		
FUEL TANK INSTALLATION		

FRAME/BODY PANELS/EXHAUST SYSTEM

- * This section covers the removal and installation of the frame body panels, fuel tank and exhaust system.
- Always replace the exhaust system sealing gaskets when removing the exhaust system from the engine.
- Always inspect the exhaust system for leaks after installation.

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.

A 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.

A 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

TROUBLESHOOTING

EXCESSIVE EXHAUST NOISE

Broken exhaust system Leaking exhaust connections

POOR PERFORMANCE

Bent, dented or deformed exhaust system Leaking exhaust Plugged exhaust system

TORQUE SPECIFICATIONS

CRITICAL TORQUE SPECIFICATIONS FRAME/BODY PANELS/EXHAUST SYSTEM					
Fastener Type	Torque N-m	Torque Ib-ft Refer to page 1.10 and 3.33 (#22 - 28)			
Engine Mounts	Refer to page 1.10 and 3.33 (#22 - 28)				
Exhaust Flange Stud Nuts	16 Nm	12 lb-ft			
Exhaust Flange Studs	21 Nm	15 lb-ft			
Frame Rail Bolts (Front & Rear)	61 Nm	45 lb-ft			
Fuel Tank Mounting Hardware (Front & Rear)	11 Nm	8 lb-ft			
Rear Fender Bolts	16 Nm	12 lb-ft			
Rear Sub-Frame (to Main Frame) Bolts	48 Nm	35 lb-ft			
Muffler Brackets (8 mm)	27 Nm	20 lb-ft			
Crossover Clamp	47Nm	35 lb.Ft.			
Muffler Clamp (10 mm)	27 Nm	20 lb-ft			

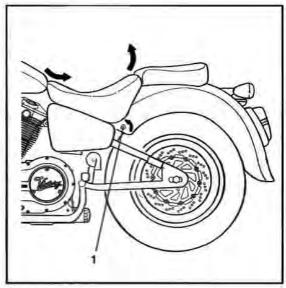
FRAME/BODY PANELS/EXHAUST SYSTEM

OPERATOR SEAT REMOVAL

- Insert key into seat lock and turn counter clockwise.
- 2. Lift seat up and to the rear, remove seat.

OPERATOR SEAT INSTALLATION

- Insert front tang of seat into receiving area of frame (rubber grommet).
- Lower rear of seat until seat post begins to engage with seat lock assembly.
- Insert key into seat lock and turn counterclockwise while pushing seat down.
- Release seat lock.
- Attempt to lift seat out of locking assembly. Seat should now be secured. If not, repeat process.



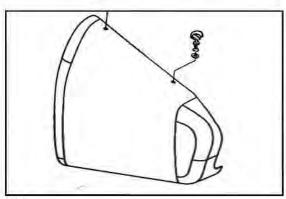
111.1

FRAME SIDE COVER(s) REMOVAL

- Remove seat, see above.
- Turn fasteners 1/4 turn (counter-clockwise) and lift up.
- While holding fastener up, lift side cover up slightly at each pin location and fully release pin from mounting tab/locking plate.
- While still lifting side cover up at release pin location and holding fastener up, move side cover out until fasteners are clear of mounting tabs.
- Pull cover out and down to release it from the pin at the bottom of the cover.
- Remove cover.

FRAME SIDE COVER(s) INSTALLATION

- 1. Place hole in bottom of cover on frame pin.
- Swing cover up until fasteners are positioned next to mounting tabs.
- Hold one fastener up while lifting cover up slightly.
 Push cover in until fastener aligns with hole in mounting tab.
- 4. Repeat step three for other fastener.
- Push fasteners in and turn 1/4 turn clockwise until locked.



111.2

REAR FENDER REMOVAL

- 1. Remove seat.
- 2. Remove frame side covers.
- 3. Disconnect rear wiring harness.
- 4. Remove bolts for seat lock, remove seat lock.
- 5. Remove tie straps for lower fender flap.
- 6. Remove bolts for rear sub-frame.
- Remove rear sub-frame.
- Remove bolts for passenger seat, remove passenger seat.
- 9. Remove 3 screws from each side of fender.
- 10. Remove fender.



- Install fender on sub-frame.
- Install 3 fender bolts on either side of fender. Torque to specification.



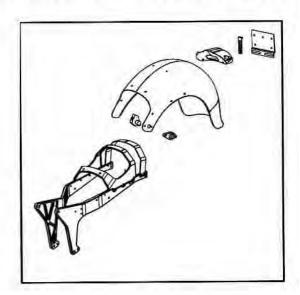
Rear Fender Bolts: 16 Nm (12 lb-ft)

- Install passenger seat and bolts. Tighten securely.
- 4. Install rear sub-frame.
- Install rear sub-frame bolts and torque to specifications.

TORQUE:

Rear Sub-Frame Bolts: 47 Nm (35 lb-ft)

- Install lower fender flap with new tie straps.
- 7. Install seat lock assembly.
- 8. Connect wiring harness.
- 9. Install frame side covers.
- 10. Install seat.



FRAME/BODY PANELS/EXHAUST SYSTEM

MUFFLER REMOVAL

A 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.

- Loosen upper (rear cylinder) muffler clamp. III. 1.
- 2. Remove muffler bracket bolts. III. 1.
- 3. Slide upper muffler back, remove muffler.
- 4. Loosen bottom (front cylinder) muffler clamp.
- Slide front cylinder muffler back, remove muffler.

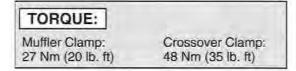


NOTE: Rear Cylinder muffler mounting bracket goes against the muffler bracket first.

- Install front cylinder muffler onto head pipe.
- Install rear cylinder muffler onto head pipe.
- 3. Install muffler bracket bolts.
- Torque muffler bracket bolts to specifications.

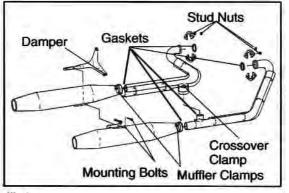


5. Tighten muffler clamps to torque specifications.

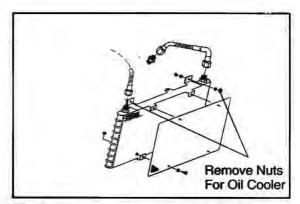


EXHAUST HEADPIPE REMOVAL

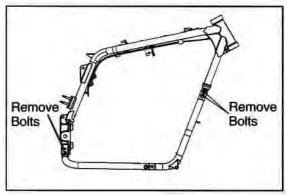
- Remove upper fasteners for oil cooler. III. 2.
- Place oil cooler forward enough to clear upper studs on frame rails.
- Place 4x4 blocking under right frame rail.
- Remove right frame rail bolts. III. 3.
- 5. Lower frame rail and let it rest on blocking.



10.1



III. 2



III. 3

CAUTION:

Do not allow frame rail to hang by the brake reservoir or brake line.

- Remove mufflers.
- 7. Loosen headpipe cross-over clamp. III. 1.
- 8. Remove rear cylinder head pipe flange nuts and flanges. III. 1.
- Remove front cylinder head pipe flange nuts and flanges. III. 1.

EXHAUST HEADPIPE REMOVAL (continued)

- 10. Remove rear cylinder head pipe.
- 11. Remove front cylinder head pipe.
- Remove exhaust gaskets.

CAUTION:

Do not reuse exhaust headpipe gaskets.

EXHAUST HEADPIPE INSTALLATION

- 1. Clean all mating surfaces.
- 2. Install new gaskets in exhaust manifolds. Ill. 2.
- 3. Insert front head pipe into place. III. 1.
- Place exhaust flanges on to front exhaust headpipe studs. III. 1.
- 5. Engage flange nuts 2 or 3 tums.
- 6. Install rear head pipe.

NOTE: Position head pipe into cylinder and then engage the cross-over pipe.

- Place exhaust flanges on rear exhaust headpipe studs.
- 8. Engage nuts for flange 2 or 3 turns.
- 9. Snug all fasteners, do not tighten at this time.
- Install lower frame rail, torque fasteners to specification. III. 3.

TORQUE:

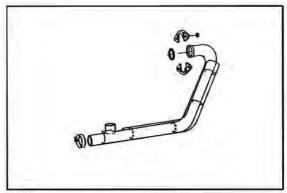
Front & Rear Frame Cradle Bolts: 61 Nm (45 lb-ft)

- 11. Install front cylinder muffler.
- 12. Install rear cylinder muffler.
- Torque all exhaust system fasteners to specification.

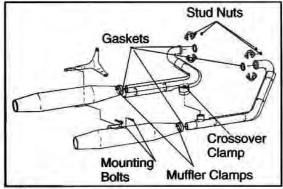
TORQUE:

Exhaust System

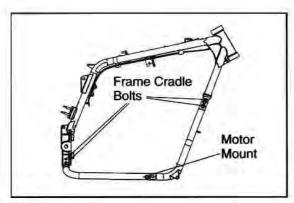
- A. Exhaust Flange Stud Nuts: 16 Nm (12 lb-ft)
- B. Muffler Bracket: 27 Nm (20 lb-ft)
- C. Muffler Clamp: 27 Nm (20 lb-ft)
- D. Crossover Clamp: 47Nm (35lb.ft.)
- 14. Install oil cooler mounting nuts. Ill. 4.



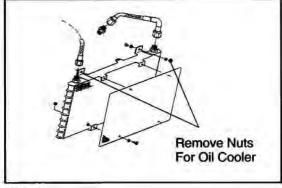
III. 1



III. 2



111.3



III. 4

FRAME/BODY PANELS/EXHAUST SYSTEM

FUEL TANK REMOVAL

CAUTION:

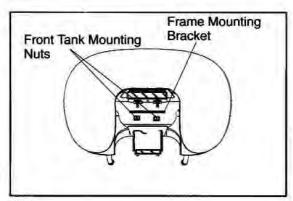
Review gasoline warning on page 1.2.

Fuel tank finish can be damaged if care is not taken when removing, storing, or installing fuel tank. Take all necessary precautions when working around the fuel tank:

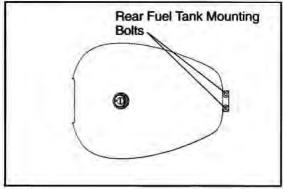
Make sure that the fuel tank does not contact other areas of the motorcycle when removing or installing the fuel tank. Work slowly and carefully.

Make sure you place the fuel tank in an area that will not be disturbed during storage. Place a soft, protective covering over fuel tank while it is being stored.

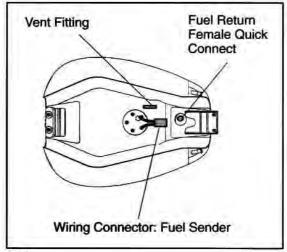
- Remove seat.
- Press tab on fuel connector, disconnect fuel delivery line.
- 3. Remove two (2) nuts for front fuel tank mount. III. 1.
- 4. Remove two (2) bolts at rear of fuel tank. III. 2.
- Position front wheel straight ahead to gain adequate clearance between fuel tank and triple clamps.
- Lift fuel tank straight up until studs at front of fuel tank clear the frame.
- Set fuel tank down, but do not install fuel tank studs (at front of fuel tank) back into their mounting holes.
- Lift up rear of fuel tank. Reach under the fuel tank and press the release button for the fuel return connector. Disconnect the fuel return line. III. 3.
- Disconnect the fuel sender wiring harness connector. III. 3.
- Unplug the fuel tank vent line from the fuel tank. III. 3.
- 11. Remove the fuel tank.
- Place the fuel tank in a safe area and cover with a soft, protective covering.



111. 1



111.2



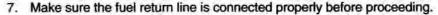
111.3

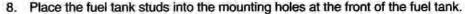
FUEL TANK INSTALLATION

- 1. Position front wheel in the straight ahead position.
- Place fuel tank on frame. Do not place fuel tank studs into mounting holes of frame at this time.

NOTE: Make sure that the rubber mounting pads are in place and properly positioned at the front and rear of the fuel tank.

- Lift up rear of fuel tank and install vent line on to fuel tank vent tubing.
- 4. Connect fuel sender wiring harness connector.
- Insert the male end of the fuel return line into the female end on the fuel tank.
- Press the two fittings firmly together until a "click" is heard or felt.







Do not pinch or bind the fuel return line or tank vent line.

- 9. Install the mounting hardware on the front studs of the fuel tank.
- 10. Install the mounting hardware on the rear of the fuel tank.
- Torque the fasteners to specification.

TORQUE:

Front & Rear Fuel Tank Mounting Hardware: 11 Nm (8 lb-ft)

- 12. Insert the male end of the fuel feed line into the female end of the line.
- 13. Press the two fittings firmly together until a "click" is heard or felt.
- Make sure the fuel feed line is connected properly before proceeding.

CAUTION:

Be certain tank vent lines are not pinched or restricted. Restricted vent lines may damage the fuel tank or cause engine runability issues.

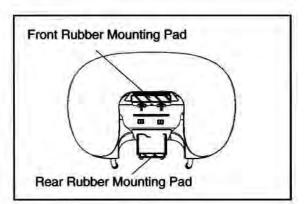
- Start machine and inspect for leaks, correct if necessary.
- 16. Turn machine off and install seat.

FUEL SENDER RESISTANCE TEST

The fuel sender is located inside the fuel tank. The fuel sender can be tested using a digital multimeter

- 1. Pin B to ground at fuel sender connector under the fuel tank tank empty, greater than 70 OHMS.
- Pin B to ground at fuel sender connector under the fuel tank tank full, less than 5 OHMS.
- 3. Resistance should decrease slowly from about 70 OHMS down to less than % OHMS as float is lifted slowly.

NOTE: TIP Pin A of the fuel sender connector is connected to ground. The fuel sender resistance test can also be performed at the speedometer connector Pin 7 to ground (Pin 10).



CHAPTER 3 MAINTENANCE

MAINTENANCE SPECIFICATIONS	
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FRONT SUSPENSION INSPECTION	
REAR SUSPENSION INSPECTION	
STEERING HEAD BEARING INSPECTION	
REAR SHOCK PIVOT LUBRICATION	
TIRE INSPECTION	
CHASSIS TORQUE	
CHASSIS FASTENER TORQUE LOCATIONS	
STORAGE	
	9.00

MAINTENANCE SPECIFICATIONS

COMPONENT	SPECIFICATIONS
Engine Oil Capacity (After disassembly)	5.7 Liters (6 Quart.)
Engine Oil Capacity (At change)	Approximately 5.2 Liters (5.5 Qt.)
Engine Oil Type	Victory 20W/40 for all operating temperatures. If Victory 20W/40 is not available, any 20W/40 SG or SF rated oil. Do not use oils rated higher than SG. Oil additives of any kind are not recommended by Victory.
Engine Idle Speed	950 RPM ± 50 RPM
Throttle Grip Freeplay	3-6mm (1/8-1/4")
Fast Idle Speed	1500-2000 RPM
Fast Idle Lever Freeplay	3-6mm (1/8-1/4")
Clutch Lever Freeplay	1mm (0.40")
Lubrication Oil Pressure	60 psi
Cooling Oil Pressure	120 psi

Item Cylinder Compression (Engine Warm) Throttle @ Wide Open Position		Standard	Service Limit Reading between front & rear cylinder should be within 10% of each other.		
		1240 kPa ± 138 kPa 180 psi ± 20 psi			
Spark plug		Champion: RA8-GHC	Not Applicable		
Drive Belt Freeplay		14 mm (1/2-5/8") With 10-	12 lb Load @ Center Span		
Cold Tire Pressures	Up to 200 lbs (90 kg)	Front	34 PSI (235 kPa)		
		Rear	36 PSI (250 kPa)		
	Up to maximum load	Front	34 PSI (235 kPa)		
	capacity	Rear	40 PSI (275 kPa)		
Minimum Tire Tread De	pth	Front	1.6 mm (.063")		
		Rear	2.0 mm (.080")		
Tire Size & Manufacturer		Dunlop	MT90HB16 71H		
		Dunlop 160/80HB16 75H			
Maximum Load Capacity 408 lbs (185 kg)					

MAINTENANCE

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS FOR MAINTENANCE ITEMS				
Fastener Type	Torque N-m	Torque lb-ft (in.lbs.)		
Rear Axle Torque	90 Nm	65 lb-ft		
Spark Plug	16 Nm	. 12 lb-ft		
Oil Filter	Turn filter one (1) complete turn after the crankcase.	O-ring has contacted		
Oil Drain Bolt	39 Nm	28 lb-ft		
Front Brake Lever Pivot Nut	6 Nm	(50 in-lbs)		
Air Cleaner Housing (front) to Frame	10 Nm	(85 in-lbs)		
Air Intake Plenum to Throttle Body	4 Nm	(36 in-lbs)		
Air Cleaner to Housing	4 Nm	(36 in-lbs)		
Exhaust Flange Stud Nuts	16 Nm	12 lb-ft		
Muffler Bracket to Frame	28 Nm	20 lb-ft		
Muffler Clamps / Crossover	62 Nm	45 lb-ft		
Muffler Support Bracket	28 Nm	20 lb-ft		
Oil Pressure Sending Unit	14 Nm	(120 in. lb)		
Oil Temperature Sending Unit	14 Nm	(120 in. lb)		
Side Stand Pivot Nut	48 Nm	35 lb-ft		

SPECIAL TOOLS

Oil Filter Wrench	PV-43527	-
Compression Gauge Set	Commercially Available	<u> </u>
Oil Pressure Gauge Set	PV-43531	
Wheel Alignment Tool	PV-43528	
Belt Tension Gauge	PV-43532	
Torque Wrench Commercially Available		

PERIODIC MAINTENANCE CHART

ITEM	PROCEDURE	Initial Odometer readings					
	I=Inspect T =Torque R=Replace L= Lubricate C=Clean A=Adjust	500 miles or 1 month	2,500 miles or 6 months	5,000 miles or 12 months	7,500 miles or 18 months	10,000 miles or 24 months	12,500 miles or 30 months
Valve Clearance	Not Necessary. Hydraulic Valve Lash Adjusters.						
Spark Plug	-Check condition. -Inspect every 7,500 miles. Adjust gap and clean. -Replace every 30,000.	ı			ı		
Crankcase Ventilation System	-Check ventilation hose for cracks or damageReplace if necessary.		1	1	t	ı	ı
Fuel Lines	-Check fuel hoses for cracks or damage. -Replace if necessary.		ı	ı	1	1	1
Fuel Filters	-Replace every 17,500 miles. Inspect pre-filters every 5000 miles			1			
Exhaust System	-Check for leakage. -Retighten if necessary. -Replace gaskets if necessary.	т	ı	ı	т	ı	ı
Battery	-Inspect terminal condition & tightnessCheck open cell voltage.	1	ı	ı	ı	ı	R
Throttle Operation	-Check for smooth operation and that the throttle returns to the idle position.	1		ı	1	ı	1
Fast Idle Cable	-Inspect cable free play every 5,000 miles. Adjust if necessary.			1		ı	
Clutch Cable Freeplay	-Adjust cable free play & inspect for smooth operation.	1	ı	ı	ı	ı	1
Evaporative emission control system (for California only)	-Check control system for damage. -Replace if necessary.					1	
Engine Oil & Oil Filter	-Replace.	R	R	R	R	R	R
Air Filter (see note)	-Inspect and replace if necessary.	1	ı	1	ı	1	ı
Compression Pressure	-Inspect engine compression and record.				1		
Brake System	-Replace brake fluid every 30,000 miles or 24 monthsCheck and replace pads if necessaryInspect operation of brake light switches.	ı	ı	ı	,	ı	1
Drive Belt	-Adjust Tension & AlignmentInspect for damage & wearReplace every 30,000 miles.	ı	ı	ı	1		ı
Brake Hoses; Lines; Connections	-Inspect condition; check for fluid leaks						
Headlight Aim	-Inspect and adjust as necessary	ı	1	1		i i	
Control Cables	-Apply cable lube		L	L	L	L	L
Rear Swing Arm Pivot	-Check bearing assembly for looseness.		1	1	1	1	1
Brake/Clutch lever pivot shaft	-Apply light weight grease		L	L	L	L	L
Shift Pedal Shaft	-Apply light weight grease		L	L	L	L	L
Sidestand pivot	-Check operation and apply light weight grease		L	L	L	L	L
Front Fork	-Check operation and for leakage. Replace fork fluid at 15,000 miles or 24 months.	ı	ı	ı	t	R	1
Rear Shock	-Check operation and for leakageComplete shock service every 15,000 miles	1	ı	ı	ı	ı	ı
Steering Bearings	-Check bearing assembly for looseness, adjust as necessaryRepack every 15,000 miles	ı	ı	ı	ı	l I	1
Wheel Bearings	-Check bearings for smooth operation	1	1	l	<u>'</u>	1	Î
Rear Shock pivots	-Apply light weight grease				L	1	
Tires	-Inspect for wear and damage/adjust tire pressure	1	1	1	1	ı	
Nuts, Bolts, Fasteners	-Inspect fastener torque, re-torque as necessary				1	i I	

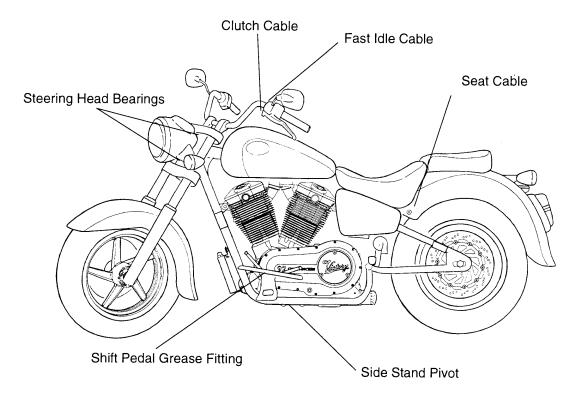
NOTE: For odometer readings or time periods higher than 12,500 miles or 30 months, repeat the same maintenance as listed in the table from the 2,500 mile interval.

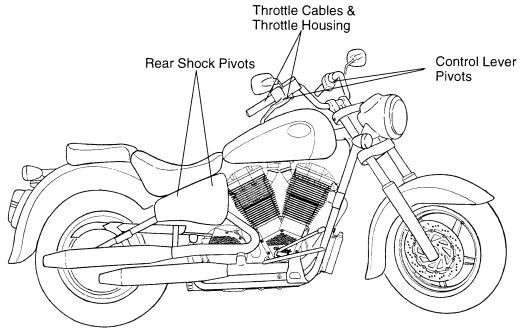
NOTE: The air filter needs more frequent service if you are riding in unusually wet or dusty conditions.

MAINTENANCE

LUBRICATION POINTS

Right & left view of motorcycle showing lubrication points.





FUEL LINE INSPECTION

- 1. Remove seat, refer to Chapter 2
- 2. Remove fuel tank, refer to Chapter 2.
- 3. Inspect the fuel lines for deterioration, damage, leakage, or kinked areas. III. 1.
- 4. Replace the fuel lines if necessary.

A WARNING

The fuel lines exiting the fuel pump are subjected to high pressure. Make sure that these fuel lines are replaced with Original Equipment Manufacture (O.E.M.) parts to reduce the possibility of failed fuel lines.

NOTE: Be sure fuel lines are routed properly.

LUBRICANT:

Victory All Purpose Grease: 2872187

THROTTLE ASSEMBLY INSPECTION

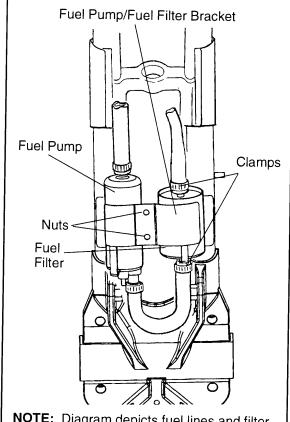
- Inspect the throttle cables and throttle assembly for wear, kinks, or damage. Operate the throttle and observe the operation. The throttle should return to the idle position quickly and smoothly in all steering positions. Start the machine and turn the handlebars fully to the right and left, the engine speed should remain the same in all steering positions.
- If the throttle does not return properly the cable and throttle assembly should be lubricated and inspected for proper routing or damage.
- 3. Disconnect the throttle cables at the throttle housing and remove the throttle assembly. Lubricate the cables with Victory cable lubricant. Lubricate the cable ends with Victory multi-purpose grease. Ill. 2.

LUBRICANT:

Victory All Purpose Grease: 2872187

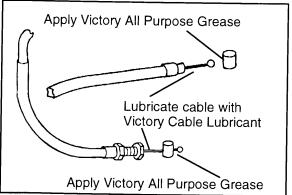
LUBRICANT:

Victory Cable Lube: 2870510



NOTE: Diagram depicts fuel lines and filter in position with sub-frame removed for clarity. Subframe does not need to be removed to replace fuel filter.

III. 1



III. 2

THROTTLE ASSEMBLY LUBRICATION

4. Clean the throttle housing and apply a thin film of Victory multi-purpose grease to the contact area of the handlebars. Ill. 1

LUBRICANT:

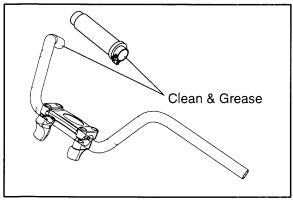
Victory All Purpose Grease: 2872187

- 5. If the throttle cable still doesn't operate properly and the throttle housing is undamaged; replace the throttle cable(s).
- 6. If the idle speed increases when the handlebars are turned throughout their range of movement, inspect the throttle cable free play and cable routing. Refer to Chapter 1 for cable routing.
- 7. Measure the throttle cable free play at the throttle grip. The throttle grip should have 3-6 mm of free movement. Ill. 2.

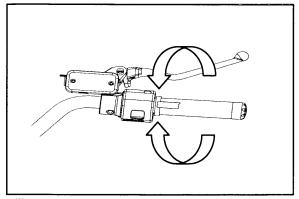
SPEC:

Throttle Cable Free Play 3-6mm (1/8"-1/4") Measured at the throttle housing.

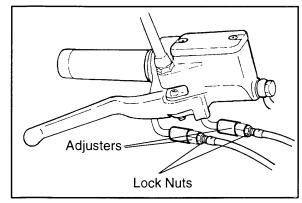
- 8. All adjustments to throttle cable free play are made at the the throttle housing. Ill. 3.
- 9. Loosen the lock nut and rotate the adjuster until the correct free play is obtained. III. 3.
- 10. Tighten the lock nut(s) and reposition the protective boot(s) when the job is completed. Ill. 3.



III. 1



III. 2



III. 3

CABLE LUBRICATION

- · Clutch cable.
- · Fast idle cable.
- Passenger seat release cable.

The cables used on the motorcycle require periodic lubrication for smooth operation and longevity.

Inspect the cables for smooth movement and external damage. Inspect the exposed inner cable for fraying, damage or rust. If damage is found the cable must be replaced.

LUBRICANT:

Victory Cable Lube: 2870510

Disconnect one end of the cable to be lubricated. The end of the cable should also be lubricated at this time.



Victory All Purpose Grease: 2872187

CONTROL PIVOT LUBRICATION

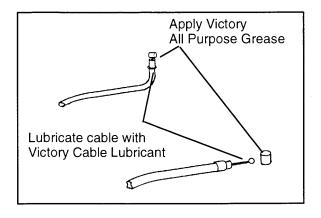
The brake lever and clutch lever pivot point should be lubricated at the time or mileage indicated on the maintenance schedule.

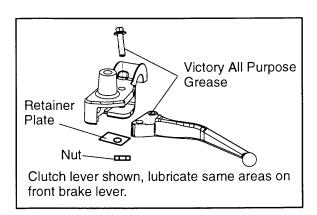
- Remove the clutch and brake levers. Mirror needs to be removed to remove front brake lever pivot both
- 2. Clean the pivot bolt, lever and housing of old lubricant and dirt.
- 3. Lubricate the areas indicated with Victory All Purpose Grease.
- 4. Reassemble the clutch and brake lever assemblies.

TORQUE:

Brake & Clutch Lever Pivot Nut: 11 N-m (8 lb.ft.)

- 5. The brake lever does not require adjustment.
- 6. Refer to page 3.14 for clutch cable adjustment.





ENGINE IDLE SPEED ADJUSTMENT

- Idle speed adjustment must be performed after all other engine adjustments are within manufacturer's specifications.
- In order to obtain a stable and accurate idle speed the engine must be at operating temperature before the idle speed is adjusted.

CAUTION

The idle speed on the V92C engine is extremely important because of the potential effects upon exhaust emission levels. Connect an auxiliary tachometer according to manufacturer's instructions. Do not use the tachometer on the vehicle for idle adjustment.

NOTE: Idle speed adjustment is not necessary unless the Throttle Position Sensor (TPS), Throttle Body, Electronic Control Unit (ECU) or major engine repairs have been performed.

- 1. Remove seat and right frame cover.
- 2. Start engine and warm the engine until engine temperature reaches 60° C (140° F).
- 3. Turn engine off at the ignition switch. Do not turn engine off with the stop switch.



Make sure that the handlebar mounted fast idle lever is in the off position before adjusting the idle speed.

4. Connect the Fuel Injection Diagnostic Lamp to diagnostic connector of wiring harness.

SPECIAL TOOL:

Fuel Injection Diagnostic Lamp:

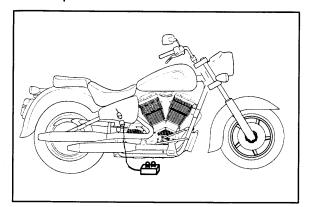
PV-43530

- 5. Move TPS calibrate lever on the diagnostic tool to the "ON" position and hold it there.
- 6. Turn on the ignition switch (Yellow light of Fuel Injection Diagnostic Lamp should be on).
- 7. Start engine.
- 8. Allow engine to run for at least 20 seconds.
- 9. Adjust throttle stop to obtain the specified idle speed.

SPEC:

Engine Idle Speed: 950 RPM ± 50 RPM

- 10. Release the TPS calibrate lever. (Yellow light should be off.
- 11. Turn engine off with ignition switch.
- 12. Remove Fuel Injection Diagnostic Lamp tool.
- Start engine and check idle speed after 20 seconds.
- 14. Repeat steps 2-13 until correct idle speed is obtained.
- 15. Paint the throttle stop screw to lock the screw and deter tampering.
- 16. Reassemble motorcycle.



FAST IDLE LEVER FREE-PLAY ADJUSTMENT

1. Measure fast idle lever free-play.

SPEC:

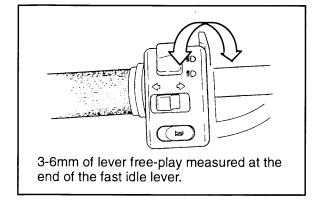
Fast Idle Lever Free-Play 3-6mm (1/8"-1/4")

Recommended Fast Idle Speed: 1500-2000 RPM (Refer to Chapter 5)

2. If adjustment is necessary; remove the seat and fuel tank.

NOTE: Refer to page(s) for seat removal and page(s) for fuel tank removal.

- 3. Loosen the lock nut for the fast idle cable.
- 4. Move the adjustment nut in or out as necessary to achieve the specified fast idle lever free-play.
- 5. Tighten the locknut.
- 6. Install the fuel tank and seat.

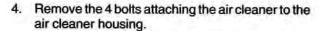


AIR CLEANER

NOTE: If the motorcycle is operated in wet or dusty conditions, more frequent servicing is required.

NOTE: The air filter element cannot be cleaned. Replace the filter when necessary.

- Remove the seat, refer to page 2.2 for seat removal.
- Remove the fuel tank refer to page 2.6 for fuel tank removal.
- 3. Remove the top cover (A) and bottom cover (B).



- Inspect the air cleaner element visually and by holding the air cleaner element next to a strong light source. If the air cleaner element shows dirt contamination it must be replaced. If the air cleaner element has been contaminated with water, oil or fuel it must be replaced.
- 6. Assembly is the reverse of disassembly.

TORQUE:

Air Cleaner Cover Bolts: 10 Nm (85 in-lbs)

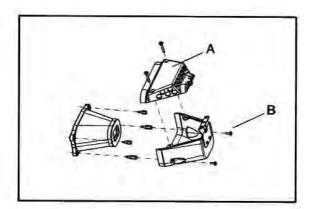


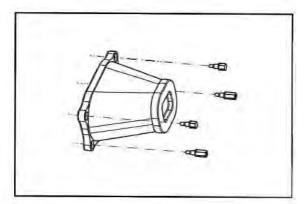
Air Cleaner Bolts: 3 Nm (25 in-lb)

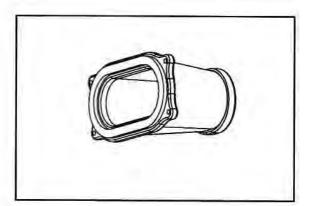
CAUTION

Inspect the gasket between the air cleaner housing and throttle body carefully. Replace as necessary.

Make sure that the air cleaner and air filter housing is installed correctly. Failure to do so can allow dirt to enter the engine which would cause premature engine wear.

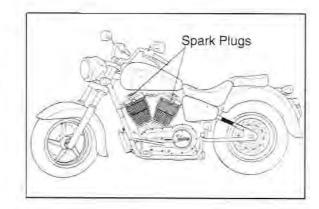






SPARK PLUG REMOVAL & INSPECTION

- 1. Ensure that the engine is at room temperature.
- Remove the seat, refer to page 2.2 for seat removal.
- Remove the fuel tank, refer to page 2.6 for fuel tank removal.
- 4. Remove the spark plug caps.



CAUTION

Be extremely careful when removing spark plug cap(s) to avoid damage to the cap and/or wire connection.

- Clean the area around the spark plug bases with compressed air.
- Remove the spark plugs. Inspect or replace as necessary.
- Inspect the following and replace if the spark plug(s) fail inspection

Insulator for damage

Worn electrodes

Color of insulator

- * Light to dark brown = Good
- Various shades of white = Lean fuel mixture or timing advanced
- Wet or very dark = Rich fuel mixture, continuous slow speed running, oil control problems

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

INSTALLING SPARK PLUG(s)

 Inspect the gap with a wire- gauge. If adjustment is necessary, bend the ground (side) electrode carefully.

SPEC:

Spark Plug Gap 1mm (0.040")

NOTE: A new spark plug directly out of the box cannot be assumed to have the correct gap. Always inspect the spark plug gap, and adjust if necessary, when installing new spark plugs.

- Apply a small amount of anti-seize compound (commercially available) to the threads of the spark plug. Be careful not to allow any anti-seize to contaminate the spark plug firing end.
- Reinstall the spark plug and torque to specification.



Spark Plug Torque: 16.5 Nm (12 ft.-lbs.)

CAUTION

Do not over tighten or under tighten the spark plug. Looseness can cause pre-ignition because heat is not dissipated through the threads. Excessive tightness can damage the threads of both the cylinder head and spark plug, or cause spark plug failure.

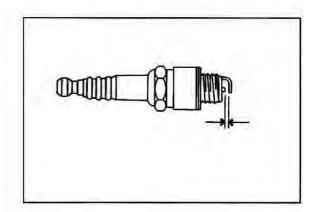
ENGINE OIL LEVEL

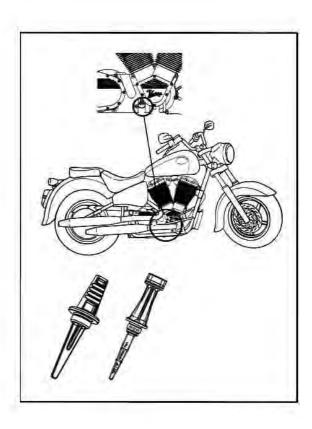
- Remove the dipstick and wipe the oil from it.
- 2. Stand the motorcycle upright.
- 3. Insert the dipstick and screw it in completely.
- Remove the dipstick and observe the oil level indication on the dipstick.
- If the oil level is near or below the low level mark, add oil until the level indicated is on the upper level mark.

LUBRICANT:

Victory 20W/40 Semi-Synthetic Motorcycle Oil

Reinstall the dip stick.





ENGINE OIL AND FILTER CHANGE

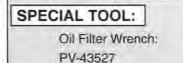
- 1. Secure the motorcycle in an upright position.
- Start the engine and allow it to warm up for a few minutes.

A WARNING

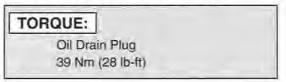
HOT COMPONENTS

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 working on the machine.

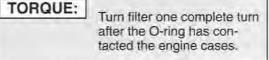
- 3. Remove the drain bolt and drain the oil.
- Remove the oil filter. Be sure that the O-ring is removed with the filter.



- 5. Allow the oil to drain completely.
- Replace the sealing washer for the drain plug with a new one and install the drain bolt.

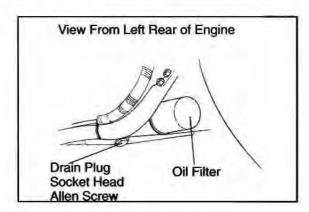


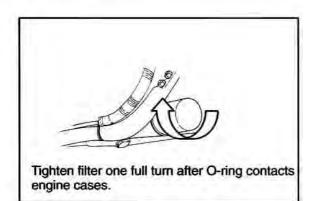
Apply oil to the new oil filter at the O-ring and the threads. Install the oil filter



LUBRICANT: Victory 20W/40 Semi-Synthetic Motorcycle Oil

- 8. Fill the engine with 5 1/2 quarts of oil.
- Start and run the engine for approximately 1 minute. Stop the engine and wait 1 minute. Inspect oil level (page 3.12).
- Inspect drain plug, oil filter, and dipstick area for oil leaks.



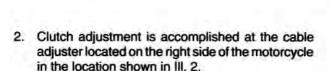


CLUTCH LEVER FREE PLAY

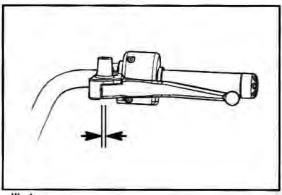
 Measure the clutch lever free play between the clutch lever and lever perch as shown in III. 1.



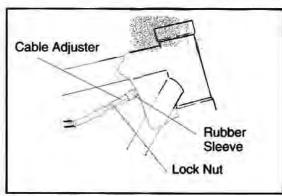
Clutch Lever Free Play: 1mm (0.040")



- If adjustment is necessary, push the rubber sleeve back to expose the cable adjuster.
- 4. Loosen the cable adjuster lock-nut.
- Turn the adjuster in or out as necessary to achieve the proper clutch lever free play.
- When adjustment is complete, tighten lock-nut and position rubber sleeve correctly.



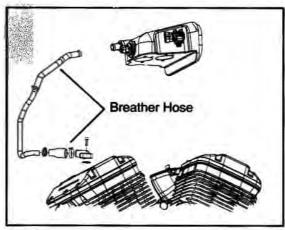




111.2

CRANKCASE VENTILATION SYSTEM INSPECTION

- 1. Remove seat (page 2.2) and fuel tank (page 2.6).
- Inspect connection between crankcase ventilation tube and hose at the manifold on the engine. Ill. 3.
- Inspect the condition of the rubber hose at the crankcase ventilation manifold on the engine. III. 3.
- Inspect the connection between the crankcase ventilation tube and the air cleaner housing. III. 3.
- Inspect the entire length of the crankcase ventilation tube.
- Replace any parts that are damaged and/or correct the connections at either the air cleaner housing or crankcase ventilation manifold.



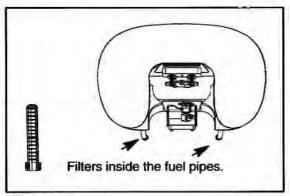
III. 3

PRE-FUEL FILTER REMOVAL, CLEANING & INSTALLATION

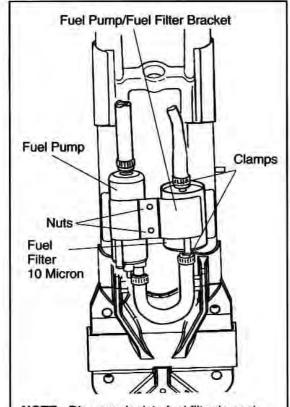
- Two pre-filters are located in the fuel tank at the fuel line piping (one filter for each fuel pipe). III 1.
- The pre-filters can be cleaned and reused if they are not physically damaged.
- 3. Remove the seat (page 2.2).
- 4. Completely drain the fuel tank.
- 5. Remove the fuel tank (page 2.6).
- Remove the fuel lines from the fuel tank.
- Grasp the pre-filters and remove them from the fuel tank.
- 8. Wash the pre-filters in solvent from the outside in.
- Dry the pre-filters with shop air and inspect for damage.
- If filters are undamaged, reinstall the filters into the fuel tank.
- 11. Assembly is reverse of disassembly.

FUEL FILTER REMOVAL & INSTALLATION

- The primary fuel filter cannot be cleaned and should be replaced at the intervals listed on the periodic maintenance chart.
- Remove the seat (page 2.2).
- Remove the frame side covers (page 2.2).
- Remove the rear shock. Refer to Chapter 13 for rear shock removal procedure.
- Remove the fuel filter/fuel pump bracket nuts.
- Remove the bracket.
- 7. Loosen the hose clamps for the fuel filter.
- 8. Remove the fuel filter.
- Install a new fuel filter into place while observing the correct orientation. Stamped end is the outlet side. Molded end connects to the fuel pump.
- Assembly is reverse of disassembly.



III. 1



NOTE: Diagram depicts fuel filter in position with sub-frame removed for clarity. Subframe does not need to be removed to replace fuel filter.

FUEL TANK VENT INSPECTION

 Ensure the fuel tank vent line is not kinked. If too much vent line is pulled up under the fuel tank during removal, the line can be kinked/pinched when the tank is installed. The fuel tank may be damaged (permanently) by an obstructed fuel tank vent line

EXHAUST PIPE FASTENERS

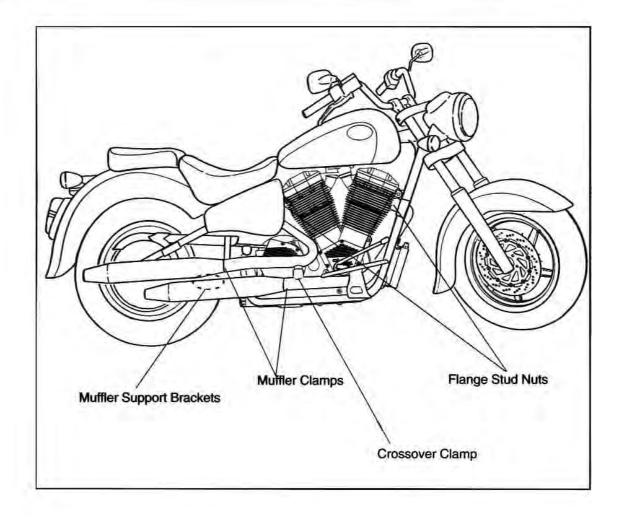
TORQUE: Exhaust System Fasteners

Exhaust Flange Stud Nuts: 16 Nm (12 lb. ft)

Muffler Support Brackets (To frame and to mufflers): 27 Nm (20 lb. ft)

Exhaust Crossover Tube Clamp: 48 Nm (35 lb. ft)

Muffler Clamps 27 Nm (20 lb. ft)

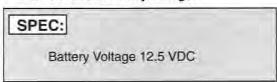


BATTERY

The battery used on the V92C motorcycle is a "Maintenance Free" type battery and requires very little service.

This battery is sealed once it is activated for service and under no circumstances should an attempt be made to add water to the battery. It is not possible to check the specific gravity of the electrolyte.

- Visually inspect the exterior of the battery. If the battery housing is cracked or electrolyte is leaking, replace the battery.
- Inspect the battery terminals. If rust or battery corrosion is found, wash the terminals with a water and baking soda solution. Clean the terminals and battery cable ends with a wire brush or sandpaper once the battery has been washed.
- Use the DC Volts selection on a Digital Multi-Meter and check the battery voltage.



If the voltage reading is below 12.5 VDC, recharge the battery with a battery charger.

CAUTION

When charging the battery, remove the battery from the motorcycle before charging.

NOTE:Do not remove the cap from the battery while recharging.

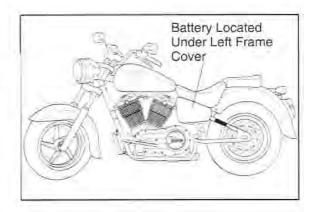
NOTE:Remove the negative terminal first when removing the battery.

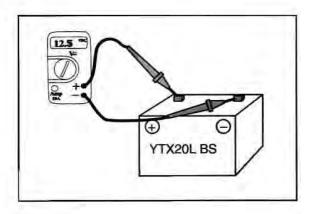
NOTE: Install the positive terminal first when installing the battery.

NOTE:Do not pinch or damage the wiring under the side cover when installing the battery.

After charging, let the battery cool for 30 minutes or more and check the battery voltage with a Digital Multi-Tester.

NOTE:Refer to Chapter 16 for complete battery charging procedures.





BATTERY (continued)

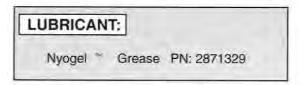
- If the voltage is less than 12.5 VDC, recharge the battery again following the instructions in step 5.
- Recheck the voltage following the instructions in step 6. If battery voltage does not exceed 12.5 VDC, replace the battery.

BATTERY REMOVAL

- Remove the seat. Refer to page 2.2 for seat removal.
- Remove the left side frame cover. Refer to page 2.2 for frame cover removal.
- 3. Remove battery hold down strap. III. 1.
- Remove the negative battery terminal bolt and negative leads. Ill. 2.
- Remove the positive battery terminal bolt and positive leads.
- Remove battery.

BATTERY INSTALLATION

- Clean battery posts, bolts and terminals with wire brush and 50/50 solution of water and baking soda if necessary.
- 2. Lightly lubricate battery bolt threads with grease.



- Install positive battery leads and bolt. Tighten bolt.
- Install negative battery leads and bolt. Tighten bolt.
- Apply thin film of grease over both positive and negative battery leads and terminals.
- Install battery strap.
- 7. Install left side frame cover and seat.

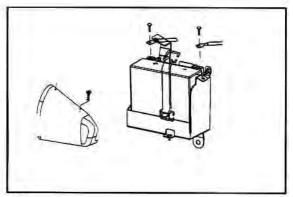
FUEL TANK VENT

- Remove seat, frame side covers and fuel tank.
- Inspect vent line along its entire length for kinks, cuts, breaks, obstructions or other damage.

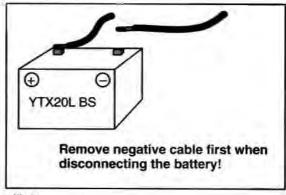
CAUTION:

Restricted vent lines may cause tank damage or runability problems.

Replace vent line or re-route as necessary.



111.1



111.2

ENGINE COMPRESSION

Cylinder compression is a good indicator engine (top-end) condition. Top end rebuilding is often based upon the compression recorded by the technician.

Periodic inspection and recording of engine compression provides a history of engine condition that can prove valuable when troubleshooting. Record compression readings for each scheduled maintenance service.

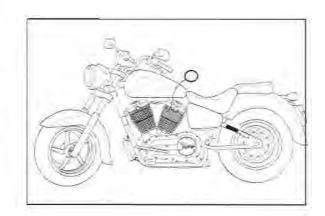
 Start the engine and allow it to idle for a couple of minutes. Turn the engine off.

A 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.

NOTE:The battery must be fully charged and the starting system must be in good working order for the compression test to be accurate.

- Remove the seat (page 2.2) and fuel tank (page 2.6).
- Remove both spark plugs leads and spark plugs. Install spark plugs onto leads and ground spark plug center electrode to the engine for duration of compression test.
- Install the compression tester hose into one of the spark plug holes. Ensure that a tight seal is obtained between the compression hose and the spark plug seat.
- 5. Open the throttle completely.
- Crank the engine a few seconds and record the highest reading obtained on the compression gauge.
- 7. Repeat the procedure for the other cylinder.



Item	Standard	Service Limit	
Cylinder Compression	1069 kPa ± 138 kPa 155 psi ± 20 psi	Reading between front & rear cylinder should be within 10% of each other.	

ENGINE COMPRESSION (continued)

High compression can indicate carbon build up on the piston, cylinder head and/or valves. It can also be an indication that parts other than OEM parts have been installed.

If the parts are stock, the first corrective action to use is Carbon Clean Fuel Additive.

LUBRICANT:

Victory Carbon Clean Fuel Additive: 2872190

Follow the directions on the printed on the container.

If Carbon Clean does not correct the problem, engine disassembly and cleaning is necessary.

Low compression can indicate:

· Wom piston and/or piston rings

Piston rings stuck in the piston ring lands

Leaking exhaust or intake valves

Leaking head gasket

Slow starter motor cranking speed.

Restricted exhaust system

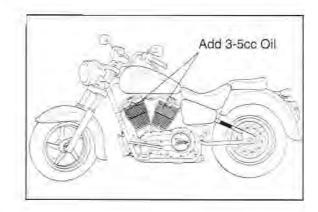
Valve timing incorrect

Non-OEM camshafts.

If low compression is found, further trouble shooting is required. Perform a cylinder leakage test to determine the cause of the problem.

If a cylinder leakage tester is not available, the following can help determine the cause of the problem.

- Pour 3 to 5 cc's of clean engine oil into the cylinder through the spark plug hole and recheck the compression.
- If the compression increases, the cylinder, piston and rings need further investigation.
- If the compression does not increase, the valves and seats need to be inspected.



OIL PRESSURE INSPECTION (lubrication side)

Periodic oil pressure inspection will monitor the condition of moving parts over time.

Any time an engine is making objectionable noises that appear to be coming from rotating parts, an oil pressure inspection should be performed before the engine is disassembled.

Oil pressure should be checked in the event that the oil pressure indicator warns of low oil pressure.

SPECIAL TOOL:

Oil Pressure Gauge Set: PV-43531

A WARNING

HOT COMPONENTS

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 working on the machine.

A WARNING

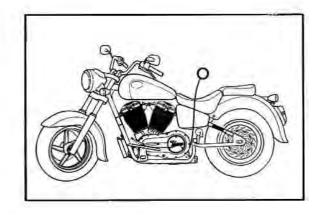
CARBON MONOXIDE

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.

CAUTION

Before inspecting the oil pressure, ensure that the oil type and oil level is correct.

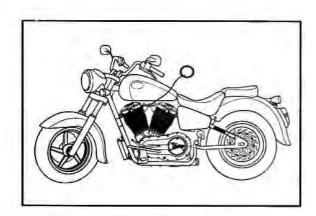
- Place drain pan under oil pressure sending unit.
- 2. Remove the oil pressure sending unit.
- Install the oil pressure gauge fitting in the hole left by the oil pressure sending unit.
- 4. Add oil as necessary to correct oil level.
- Warm the engine to operating temperature. If the vehicle is operated in a stationary condition (on the side stand and in the shop) the engine must be stopped occasionally and the oil temperature checked with a thermometer through the oil dipstick fitting.
- Once the engine is warm, increase the engine speed to 3000 rpm and record the oil pressure.



OIL PRESSURE INSPECTION (cooling side)

When indications of cooling problems present themselves, the cooling side oil pressure should be inspected.

- 1. Remove the oil temperature sending unit.
- Install the oil pressure gauge in the hole left by the oil temperature sending unit.
- Warm the engine to operating temperature. If the vehicle is operated in a stationary condition (on the side stand and in the shop) the engine must be stopped occasionally and the oil temperature checked with a thermometer through the oil dip-stick fitting.
- Once the engine is warm, increase the engine speed to 3000 rpm and record the oil pressure.



SPECIAL TOOL:

Oil Pressure Gauge Set: PV-43531

LUBRIC	CATION SYSTEM	
Item	Standard	Service Limit
Oil Pressure @ 3000 rpm (Lubrication System) Oil Pressure @ 3000 rpm (Cooling System) (@ 60° C / 140° F)	413 kPa, 60 psi 344 kPa, 50 psi	Readings should be within 20% of the specifications.

POSSIBLE CAUSES OF INCORRECT OIL PRESSURE (either lubrication or cooling side)		
TOO LOW TOO HIGH		
Plugged oil filter, oil filter screen or passages	Wrong oil (viscosity too high)	
Wrong oil viscosity (contaminated or wrong oil)	Additives added to oil increasing viscosity	
Damaged O-rings or leaking piping or fittings Plugged oil passages		
Damaged or worn oil pump or oil pump drive Incorrect oil filter		
Low oil level	Pressure relief valve stuck closed	
Pressure relief valve stuck open	Andrew Mary Sand	
Damaged engine bearings/excessive engine wear.		
Combination of above		

TORQUE:

Oil Pressure Sending Unit: Oil Temperature Sending Unit: (Both) 13.8 Nm (120 in-lbs) Apply Loctite PST 565 to threads

BRAKE SYSTEM

SPEC:

Brake Fluid: DOT 4 Victory Part Number: 2872189

NOTE: If the fluid level is low, inspect the brake pads for wear.

NOTE: When the brake pads wear, the piston in the wheel cylinder is pushed out and the fluid level will go down.

NOTE: If the fluid level is low and the brake pads are not worn, inspect the entire system for leaks.

NOTE: Replace brake fluid every two years. Replace the brake hoses every four years.

CAUTION:

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

KEEP BRAKE FLUID OUT OF THE REACH OF CHILDREN!

Ensure that the reservoirs are level before removing the reservoir cap. Brake fluid will spill out.

Do not mix different types of brake fluid.

Ensure that foreign material does not enter the system when filling the reservoirs.

Only use new brake fluid taken from a sealed container.

Never re-use brake fluid.

FRONT BRAKE FLUID LEVEL INSPECTION

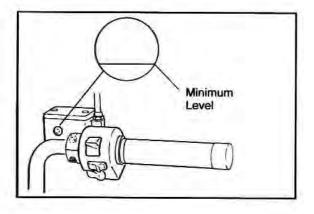
- Turn the handlebars fully to the left and level the front master cylinder.
- Inspect the fluid level through the sight glass.
- If the level is near the lower level mark, remove the reservoir top and add brake fluid until the level reaches the full mark.

SPEC:

Brake Fluid: DOT 4 Victory Part Number: 2872189

CAUTION

Do not overfill either the front or rear brake reservoirs. The air space is critical to proper functioning of the brake system. Too much fluid will not allow for fluid expansion and self-application of the brakes can result.



REAR BRAKE FLUID LEVEL INSPECTION

- 1. Support the motorcycle upright.
- 2. Inspect the fluid level through the reservoir body.
- If the level is near the lower level mark, remove the reservoir top and add brake fluid until the level reaches the MAX mark.

BRAKE PAD WEAR

Front brake pad wear is determined by inspecting the wear limit groove on the brake pads (1). It is not necessary to disassemble the caliper (2) to inspect the brake pads.

FRONT BRAKE PADS

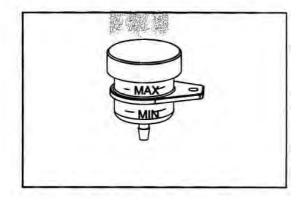
- Observe the brake pads from the disk side of the pads.
- When the wear indicator line is no longer visible, the pads require replacement.
- Refer to Chapter 15 for front brake pad replacement.

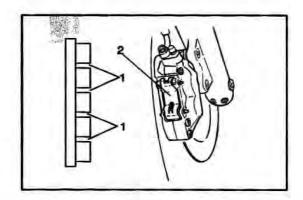
REAR BRAKE PADS

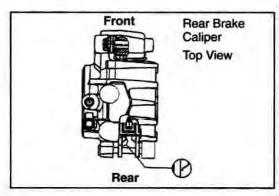
- The rear brake pads do not have wear indicator grooves, but rely upon the chamfer for wear limit indication.
- Inspect the rear brake pads from the rear and above the rear caliper.
- When the pads are worn to the point that the chamfer no longer exists, the brake pads must be replaced.
- Refer to Chapter 15 for brake pad replacement.

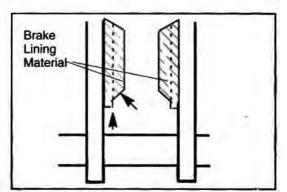
CAUTION:

Do not replace only one brake pad. Always replace the brake pads as a set for each respective caliper assembly. Braking performance is reduced if only one pad is replaced.



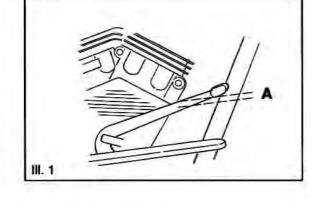






REAR BRAKE PEDAL FREEPLAY

- Measure pedal freeplay travel as illustrated. The freeplay measurement (A) should be 5–8mm when light downward pressure is applied to the pedal. NOTE: No movement of the master cylinder piston should occur.
- If the pedal freeplay is outside of specification, loosen the locking nut (A) and turn the brake actuator rod (B) in or out as necessary to achieve the correct brake pedal freeplay. III. 2.
- Tighten the lock nut and verify that the rear wheel rotates freely without drag or binding.



SPEC:

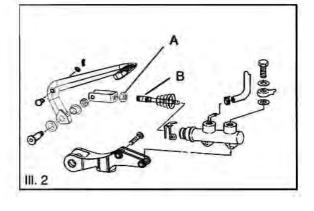
Brake Pedal Freeplay: 5–8 mm (.3150")

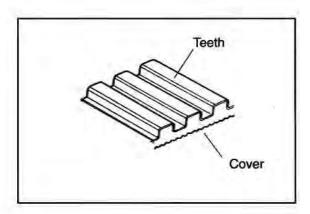
BRAKE SYSTEM INSPECTION

- 1. Firmly apply the front brake lever.
- If the lever feels soft or spongy, bleed the brakes as outlined in Chapter 15.
- 3. Repeat the procedure for the rear brake pedal.
- 4. Inspect all brake lines and connections for leaks.
- 5. Inspect all brake lines for signs of abrasion
- Replace necessary parts.

DRIVE BELT INSPECTION

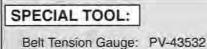
- Visually inspect the drive belt for cuts, excessive wear, foreign substance (oil, etc.), missing teeth, delaminating of the outer belt covering, cracks, or damage.
- If any damage is found, the belt should be replaced.





DRIVE BELT TENSION INSPECTION

- 1. Secure the motorcycle in an upright position.
- Place a tape measure or ruler next to the belt in the location shown.
- Place the O-ring on the 10 lb. mark of the belt tension gauge.



- Determine the center of the belt and place the belt tension gauge squarely against the belt.
- Push up on the belt tension tool. When the O-ring just touches the tool body, belt deflection should be 8mm (0.31").

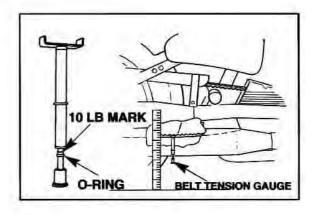
CAUTION

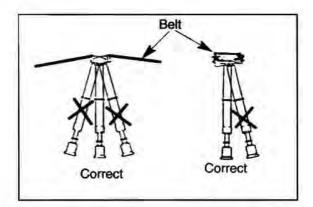
The belt tension gauge must be kept at a 90° angle to the belt in order to obtain an accurate measurement.

- If the belt moved more than 8 mm, with 10 lbs of force, the belt must be tightened. If the belt moved less than 8 mm with 10lbs of force, the belt must be loosened.
- Refer to the next section, Drive Belt Tension Adjustment, for proper adjustment procedures.

SPEC: Drive Belt Deflection:

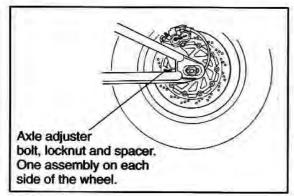
8 mm With 10 lbs Load @ Center Span





DRIVE BELT TENSION ADJUSTMENT

- 1. Remove rear cylinder muffler, refer to Chapter 2.
- Remove rear axle cotter pin and loosen the rear axle nut.
- 3. Loosen axle adjuster lock nuts. III. 1.
- 4. To tighten belt, turn each adjuster bolt in.
- 5. To loosen belt, turn each adjuster bolt out.
- Work in small increments (1/8 to1/4 turn) and turn both right and left adjuster bolts the same amount.
- After turning each adjuster bolt inspect belt tension.
- Continue process until belt tension is within specified range.
- When belt tension is correct inspect wheel alignment.



III. 1

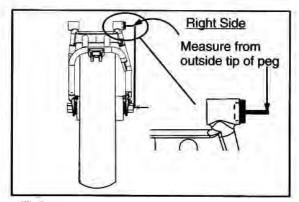
REAR WHEEL ALIGNMENT INSPECTION & ADJUSTMENT

- 1. Secure the machine in an upright position.
- Remove chrome plugs from swing arm pivots on both right and left side of machine.
- Install wheel alignment tool in right side of swing arm pivot.

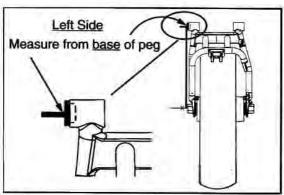
SPECIAL TOOL: Wheel Alignment Tool: PV-43528

NOTE: To ensure accuracy, be sure to measure from the proper point on the alignment tool, in order to form a straight line between the tool and rear wheel measuring points.

- Measure from the forward, outside edge of the wheel alignment tool to the center of the rear axle, record your measurement. Ill. 2.
- Remove the tool from the right side of the swing arm pivot and place it in the left side of the swing arm pivot.
- Measure from the forward, inner edge of the wheel alignment tool to the center of the rear axle.
 Compare this measurement with the measurement taken from the right side of the swing arm. III. 3.
- The two measurements must be identical. Loosen the long side adjuster bolt 1/8 of a turn and tighten the short side adjuster bolt 1/8 of a turn.
- Repeat steps 3 thru 7 until the swing arm pivot to rear axle center measurement is the same on both the right and left sides.
- When wheel alignment is correct, inspect belt tension and adjust as necessary.



III. 2



III. 3

REAR WHEEL ALIGNMENT INSPECTION & ADJUSTMENT

- Continue working back & forth between belt tension adjustment and wheel alignment adjustment until both are correct.
- 11. Install swing arm pivot caps.
- Tighten rear axle nut to specification and install new cotter key.

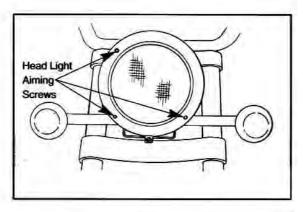
TORQUE:

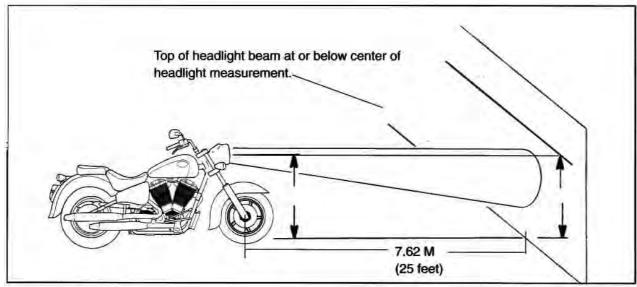
Rear Axle Nut Torque: 90 Nm (65 lb. ft)

- 13. Tighten wheel adjuster bolts lightly.
- 14. Tighten wheel adjuster lock nuts.
- Pump the rear brake pedal several times until the pedal is firm.
- 16. Install rear cylinder muffler, refer to Chapter 2.

HEADLIGHT AIM INSPECTION & ADJUSTMENT

- Inspect tire pressure, correct if necessary.
- Select a level area with low lighting and enough room to place the motorcycle's front tire at least 26 feet from the wall or temporary screen.
- Place the front tire contact patch 7.62 meters (25 feet) from the wall or screen.
- Measure from the center of the headlight to the floor. Draw a horizontal line on the wall or screen that equals this measurement.
- Have someone who is approximately the same weight as the primary rider sit on the motorcycle.





HEADLIGHT AIM INSPECTION & ADJUSTMENT (continued)

- Place the motorcycle upright with the handlebars centered and turn on the high beam of the headlight.
- The top of the light beam must be even or below the horizontal line on the wall or screen.
- The light beam should project evenly to the right and left of the motorcycle's center line.
- If headlight adjustment is necessary, turn the headlight aiming screws in or out as needed.

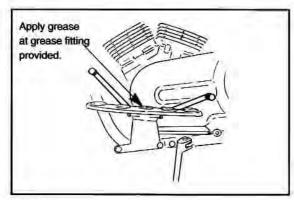
SHIFTER PEDAL PIVOT SHAFT

Early

 Lubricate the shift pedal pivot at 3000 mile intervals at the grease fitting provided. III. 1

Late

The rear brake pedal pivot point bushings are self lubricating and do not require periodic lubrication.



111.1

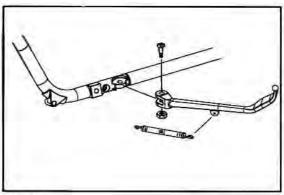
SIDESTAND INSPECTION & LUBRICATION

- 1. Support the motorcycle in an upright position
- Inspect the side stand spring for damage or loss of tension.
- Inspect the side stand for smooth movement, lubricate if necessary. III. 2
- Inspect the side stand pivot bolt nut for proper torque. III. 2.

TORQUE:

Side Stand Pivot Nut:
48 Nm (35 lb-ft)

If the side stand is bent it should be replaced. Do not attempt to straighten a bent side stand.



111.2

SUSPENSION INSPECTION

A WARNING

Damaged, worn, or loose suspension components can cause loss of control and increase the chance of accidents and possible injury.

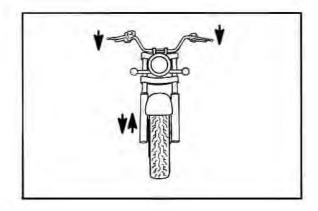
Damaged, worn, or loose suspension components must be repaired before the motorcycle is operated.

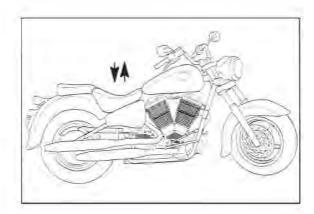
FRONT SUSPENSION INSPECTION

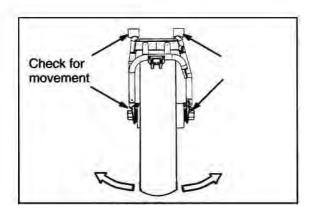
- Sit astride the motorcycle and compress the front suspension several times.
- Ensure that the action of the suspension is smooth and controlled.
- Inspect all front suspension components for leaks, damage, or loose components.
- Inspect the outer surfaces of stanchion tubes for scoring, scratches, and foreign object damage or foreign material stuck to the stanchion tubes.
- Torque all fasteners to the specified torque. Refer to Chapter 12 for torque specifications and detailed information.
- Replace worn or damaged parts.

REAR SUSPENSION INSPECTION

- Sit astride the motorcycle and compress the rear suspension several times.
- Ensure that the action of the rear suspension is smooth and controlled.
- Secure the motorcycle with the rear wheel off the ground.
- Inspect for worn swingarm bearings by grasping the rear wheel and attempting to move the wheel side-to-side.
- If play is observed, further inspection of the rear wheel bearings, swing arm pivot nut torque, rear axle torque and swing arm bushings is necessary.
- Rotate the rear wheel and inspect for smooth rotation of the rear wheel bearings. If roughness or unusual sounds are detected inspect the rear wheel and bearings. Refer to page 13.5.

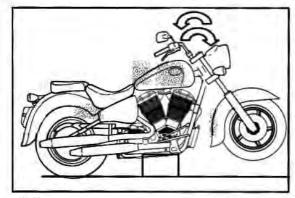






REAR SUSPENSION INSPECTION (continued)

- Inspect all rear suspension components for leaks, damage, or loose components.
- Torque all fasteners to the specified torque. Refer to page 13.2.
- Replace any damaged parts. Refer to page 13.21 for swing arm bushing replacement and page 13.10 for rear shock disassembly and assembly.

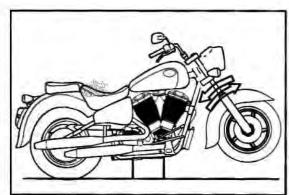


III. 1

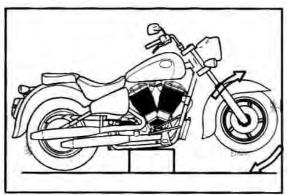
STEERING HEAD BEARING INSPECTION

NOTE: Ensure that the control cables, hoses and wiring are not interfering with handle bar rotation when the following procedures are performed.

- Secure the motorcycle with the front wheel raised off the ground.
- Move the handlebars side-to-side and inspect for smooth movement. III 1
- If the handlebar moves unevenly or binds, adjust and lubricate the steering head bearings. Refer to Chapter 12.
- With the front wheel straight ahead, grasp the fork tubes and pull/push the fork tubes back and forth. III. 2.
- If play is observed, adjust the steering head bearings. Refer to page 12.29.
- Lubrication of the steering head bearings is indicated at 15,000 miles. Refer to page 12.24 for disassembly, lubrication, and assembly procedures.
- 7. With front end still elevated, turn the handle bars fully to either the right or left and hold them in that position. Attempt to move the front wheel side-to-side, III 3. If any play is observed, further inspection of the front wheel bearings is required. Refer to page 12.11 for disassembly and installation procedures.
- Rotate the front wheel and inspect for smooth rotation of the front wheel bearings. If roughness or unusual sounds are present, further inspection of the front wheel bearings is indicated. Refer to page 12.11 for disassembly and installation procedures.



111 2



111.3

REAR SHOCK PIVOT LUBRICATION

- 1. Refer to page 13.9 for shock removal.
- Lubricate the shock pivots with Victory All Purpose grease at the points shown.

TIRE INSPECTION

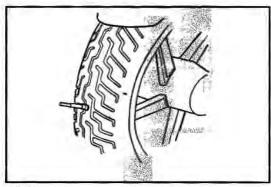
Cold Tire Pressures	Up to 200 lbs (90 kg)	Front	34 PSI
		Rear	36 PSI
Up to maximum capacity	Up to maximum weight	Front	34 PSI
	capacity	Rear	40 PSI
Minimum Tire Tread Depth		Front	1.6 mm (.063")
		Rear	1.6 mm (.063°)
Tire Size & Manufacture	Front: Dunlop	MT90HB16 71H	
		Rear: Dunlop	160/80HB16 75H

A WARNING

This motorcycle was produced with the above designated tires as original equipment. The testing that was done to ensure stability and superior handling included these tires. The use of other tires may cause instability. Review all tire related warnings on page 14.1.

- Inspect the tires for weather checking, cuts, imbedded foreign objects, etc.
- Inspect the front and rear wheels for trueness. Refer to Chapters 12 and 13 for the proper procedure.
- Measure the tread depth at the center of the tread. III 1.

Incorrect tire pressures will affect steering, handling and tire life.



111.1

A WARNING

It is dangerous to ride with a worn out tire. When a tire begins to show lines or 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")	1.6 mm (.063")	

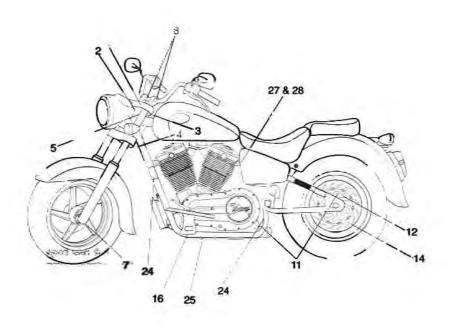
CHASSIS FASTENER TORQUE

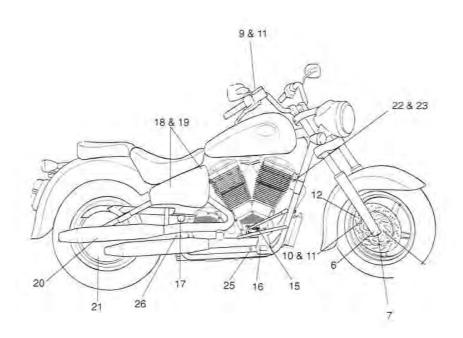
Inspect all chassis fasteners for proper torque at every scheduled maintenance.

NO.	ITEM	QUANTITY	NOTES	Nm	ftlbs.
1	Steering Stem Cap Bolt	1		69	50
2	Steering Stem Jam Nut	1		40	29
3	Upper Triple Clamp Fork Pinch Bolt	2	One on each side	83	60
4	Lower Triple Clamp Fork Pinch Bolt	2	One on each side	83	60
5	Handlebar Riser Mount to Fork	2		41	30
6	Front Axle Bolt	1		62	45
7	Front Axle Pinch Bolts	4	Two on each side	24	18
8	Handle Bar Clamp Bolts (Upper)	4		35	25
9	Front Brake Master Cylinder Mounting Bolt	2		18.5	14
10	Front Brake Caliper Mounting Bolt	2		41	30
11	Front & Rear Brake Line Banjo Bolts (All)	6	1 @ front caliper. 1 @ front master cylinder. 1 @ rear master cylinder. 2 @ rear brake light switch. 1 @ rear caliper.	18.5	14
12	Front & Rear Brake Caliper Bleeder Screws	1 for each cali- per		5.5	48 in-lb
13	Front Brake Disk Bolt	5		48	35
14	Rear Brake Disk Bolt	5		48	35
15	Rear Brake Master Cylinder Rod Lock Nut	1		11	8
16	Floorboard Support Bolts (to Frame)	4	2 on each side	48	35
17	Swingarm Pivot Nut	1		158	115
18	Rear Shock Mounting Nut (Front)	1		62	45
19	Rear Shock Mounting Nut (Rear)	1		62	45
20	Rear Axle Nut	1		88	65
21	Rear Sprocket Bolts	5		58	42
		Motor Mou	nts		
22	Front Upper Bracket (to Frame) 8mm	4		41	30
23	Front Upper Bracket (to Engine) 12mm	1 -		104	75
24	Lower Cradle to Engine (Mid Engine) 10mm	2	One on each side	62	45
25	Front & Rear Frame Rail Attachment Bolts 10mm	- 8	Right side: 2 front & 2 rear Left side: 2 front & 2 rear	62	45
26	Rear Engine to Frame 10mm	4		62	45
27	Rear Upper Brackets (to Frame) 8mm	4		41	30
28	Rear Upper Bracket (Through-Bolt) to Engine 12mm	1		104	75

Use the numbers on the left side of the above table to find the location of the fasteners listed on the diagram on the following page.

CHASSIS FASTENER TORQUE LOCATIONS





STORAGE

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

Top off the fuel tank with fresh fuel and add fuel stabilizer to the fuel.

FUEL STABILIZER:

Victory Fuel Stabilizer: 2870652

- Run the motorcycle for 15 minutes or more to distribute the fuel stabilizer throughout the fuel system.
- Clean the motorcycle completely.
- Dry the machine thoroughly and wax all painted surfaces.
- 5. Change the engine oil as outlined on page 3.13.
- Block the frame to take some of the weight off of both the front and rear wheels.
- Secure a plastic bag over the exhaust outlets to prevent moisture from entering the exhaust system.

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

- Remove the battery and charge it according to the instructions on page 3.17.
- 9. Store the battery in a cool, dry area.
- The battery should be recharged monthly using a trickle charger.
- Cover the motorcycle with a covering that allows adequate ventilation. Do not use plastic coated tarps or corrosion may result.

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

CHAPTER 4 LUBRICATION AND COOLING

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GENERAL

The engine must be operated in order to perform some of the procedures in this section. Pay attention to the following warnings and cautions.

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 connected and functioning properly.

MARNING

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

The oil pump cannot be serviced without removing the engine from the frame. Refer to Chapters 6 through 10 for engine removal, disassembly and assembly.

If inspection reveals that portions of the oil pump are worn beyond factory specifications (other than the piping and relief valves), replace the oil pump as an assembly.

After performing work on the oil pump always perform an oil pressure inspection to verify the repair.

LUBRICATION & COOLING

SPECIFICATIONS

	LUBRIC	ATION SYSTEM	
	Item	Standard	Service Limit
Engine Oil Capacity (After Disa	ssembly)	5.7 Liters (6 U.S. qts)	Not Applicable
Engine Oil Capacity (At Change)		Approximately 5.2 Liters (5.5 U.S. qts)	Not Applicable
Recommended Engine Oil		Victory 20W/40 for all operating temperatures. If Victory 20W/40 is not available, use a high quality 20W/40 motor oil rated SF or lower. Do not use oils rated higher than SG. Oil additives of any kind are not recommended by Victory.	
Oil Pressure @ 3000 RPM (Lul Oil Pressure @ 3000 RPM (Co (@ 60° C / 140° F)		413 kPa, 60 psi 344 kPa, 50 psi	Readings should be within 20% of the specifications.
Oil Pump Clearances	Rotor Tip Clearance	0.038 mm (0.0015")	0.20 mm (0.008")
(Both Lubrication & Cooling	Pump Body Clearance	0.10 mm (0.004")	0.355 mm (0.014")
pumps)	Pump End Clearance	0.025 mm (0.001")	0.10 mm (0.004")
	Cooling Rotor Width	25 mm (0.98425")	24.90 mm (0.98025")
	Lubrication Rotor Width	15 mm (0.59055")	14.9 mm (0.586613")

POSSIBLE CAUSES OF INCORRECT OIL PRESSURE (either lubrication or cooling side)		
TOO LOW	TOO HIGH	
Plugged oil filter, oil filter screen or passages	Wrong oil (viscosity too high)	
Wrong oil viscosity (contaminated or wrong oil)	Additives added to oil, causing increased viscosity	
Damaged O-rings or leaking piping or fittings Plugged oil passages		
Damaged or worn oil pump or oil pump drive Incorrect oil filter		
Low oil level Pressure relief valve stuck closed		
Pressure relief valve stuck open		
Damaged engine bearings/excessive engine wear		
Combination of above		

TORQUE SPECIFICATIONS

TORQUE SPE	CIFICATIONS FOR MAINTENANCE I	TEMS
Fastener Type	Torque Nm	Torque lb-ft (in.lb)
Oil Pressure Sending Unit	6 Nm	(50 in-lb)
Oil Temperature Sending Unit	21 Nm	15 ft-lb
Oil Filter	Turn filter one (1) complete turn afte engine cases.	r O-ring has contacted the
Oil Drain Bolt	39 Nm	28 lb-ft
Oil Pump Mounting Bolts	13 Nm	(115 in-lb)
Oil Pump Driven Sprocket	13 Nm	(115 in-lb)
Oil Pump Relief Valve Cover Screws	10 Nm	(85 in-lb)
Oil Pump Screen Bolts	1.2 Nm	(10 in-lb)
Oil Distribution Manifold Bolts	13 Nm	(115 in-lb)
Oil Cooler Mounting Bolts	11 Nm	8 lb-ft.

SPECIAL TOOLS

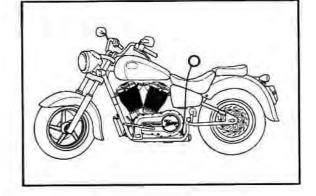
Oil Pressure Gauge Kit	PV-43531

LUBRICATION & COOLING

OIL PRESSURE INSPECTION (Lubrication Side)

If indications of engine problems present themselves (unusual noise, etc.) the lubrication side oil pressure should be inspected before disassembling the engine.

- 1. Remove oil pressure sending unit.
- Install the oil pressure gauge fitting into the oil pressure sending unit passage.
- Warm the engine to operating temperature (60°C, 140° F). Stop the engine occasionally and install a thermometer in the oil dipstick hole to monitor engine temperature. Do not operate the engine with the thermometer installed.
- Once the engine is warm, increase the engine speed to 3000 RPM and record the oil pressure.



SPECIAL TOOL:

Oil Pressure Gauge Set: PV-43531

PRESSURE	
ard	Service Limit
Pa, 60 psi	Readings should be within 20% of the specifications.
	dard (Pa, 60 psi

- If oil pressure is outside of specifications, refer to the troubleshooting chart on page 4.2.
- Remove oil pressure gauge fitting and install the oil pressure sending unit. Torque to specification,

TORQUE:

Oil Pressure Sending Unit: 6 Nm (50 in-lb)

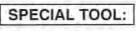


- 7. Connect the sending unit wiring.
- 8. Inspect the oil level and add oil if necessary.

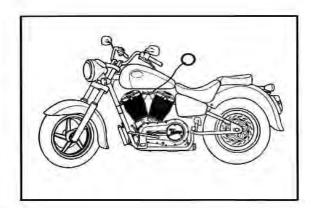
OIL PRESSURE INSPECTION (Cooling Side)

If indications of cooling problems present themselves, the cooling side oil pressure should be inspected

- Remove the oil temperature sending unit.
- Install the oil pressure gauge in the temperature sending unit passage.
- Warm the engine to operating temperature of (Approx. 90°C, 200° F). Stop the engine occasionally and install a thermometer in the oil dipstick hole to monitor oil temperature.
- Once the engine is warm, increase the engine speed to 3000 RPM and record the oil pressure.



Oil Pressure Gauge Set: PV-43531



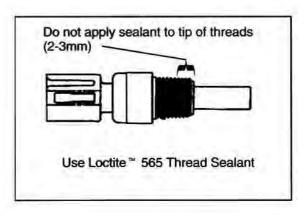
COOLING SYSTEM OIL PRESSURE		
Item	Standard	Service Limit
Oil Pressure @ 3000 RPM (Cooling System) (@ 60° C / 140° F)	344 kPa, 50 psi	Readings should be within 20% of the specifications.

- If oil pressure is outside of specifications, refer to the troubleshooting chart on page 4.2.
- Remove oil pressure gauge fitting and install the oil temperature sending unit. Torque to specification.

TORQUE:

Oil Temperature Sending Unit: 21 Nm 15lb-ft

- Connect the sending unit wiring.
- 8. Inspect the oil level and add oil if necessary.



LUBRICATION & COOLING

OIL PUMP INSPECTION

NOTE:

The engine must be removed from the frame and the engine cases must be split to inspect the oil pump. Refer to Chapters 6 through 10 for engine removal and disassembly.

- 1. Remove driven sprocket retaining bolt.
- 2. Remove driven sprocket.
- 3. Remove retaining bolts for the oil piping.
- 4. Remove oil filter and nipple.
- 5. Remove oil tube from filter to crankcase.

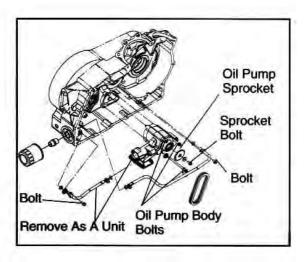
NOTE:

The washers and/or O-rings for the oil piping may stay in the engine cases/oil pump body. Be sure to retrieve the O-rings and replace them with new ones when the oil pump is reassembled. When installing the oil pump, lightly grease the o-rings and fit them inside the pump or crankcase (not on the tube).

- 6. Remove oil pump retaining/body bolts.
- Remove oil pump and oil tube together as a unit.

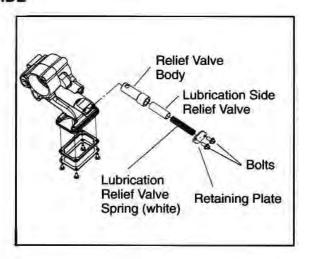
CAUTION

Hold entire oil pump securely while removing the oil pump and oil tube from the engine cases. Failure to do so may allow parts of the oil pump to fall from your grasp and damage the oil pump.



PRESSURE RELIEF VALVE: LUBRICATION SIDE

- Remove the relief valve retaining bolts and retaining plate.
- 2. Remove the lubrication relief valve.
- Inspect the relief valve for scoring or unusual wear.



PRESSURE RELIEF VALVE: LUBRICATION SIDE

- Measure the O.D. of the lubrication relief valve. Record your measurement.
- If damage is noted or the relief valve falls outside of specifications, replace both the relief valve and the relief valve sleeve.
- Measure the length of the lubrication relief valve spring. Record your measurement.
- Replace the relief valve spring if it measures below the service limit.

SPEC:

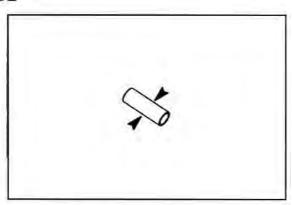
O.D. of lubrication relief valve piston:

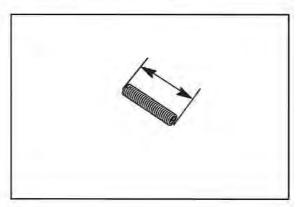
Service Limit: 15.97 mm (0.629")



Free length of lubrication relief valve spring: (Identified By White Paint)

Service Limit: 85.00 mm (3.465")





LUBRICATION & COOLING

PRESSURE RELIEF VALVE: COOLING SIDE

- Remove the relief valve retaining bolts and retaining plate.
- 2. Remove the cooling relief valve.
- Inspect the relief valve for scoring or unusual wear.
- Measure the O.D. of the cooling relief valve. Record your measurement.
- If damage is noted or the relief valve falls outside of specifications, replace both the relief valve and the relief valve body.
- Measure the length of the cooling relief valve spring. Record your measurement.
- Replace the relief valve spring if it measures below the service limit.

SPEC:

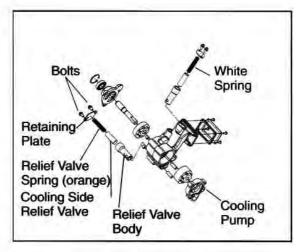
O.D. of cooling relief valve piston:

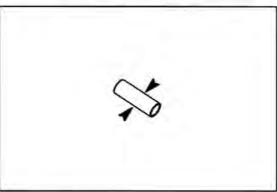
Service Limit: 15.98 mm (0.629")

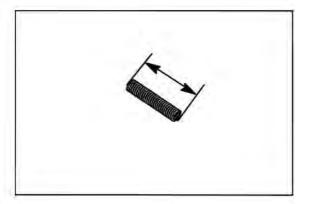
SPEC:

Free length of cooling relief valve spring: (Identified By Orange Stripe)

Service Limit: 85.00 mm (3.3465")







OIL PUMP INSPECTION: PRESSURE SIDE

- Remove the lubrication side of the oil pump body.
 III. 1
- 2. Remove the dowel pins.
- 3. Measure the rotor tip clearance. III. 2.

SPEC:

Lubrication side: Rotor tip clearance Service Limit: 0.20 mm (0.008")

4. Measure the pump body clearance. III. 3.

SPEC:

Lubrication side: Pump body clearance Service Limit: 0.355mm (0.014")

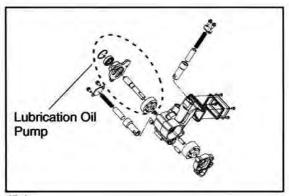
5. Measure the oil pump end clearance. III. 4.

SPEC:

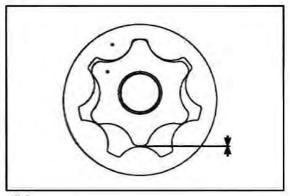
Lubrication side: Pump end clearance Service Limit: 0.08 mm (0.003")

NOTE:

If any of the above clearances are found to be over the service limit, the oil pump should be replaced as an assembly.

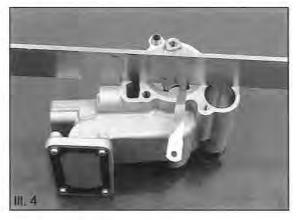


111.1



111.2





LUBRICATION & COOLING

OIL PUMP INSPECTION: COOLING SIDE

- 1. Remove the cooling side of the oil pump body. Ill. 1
- 2. Remove the dowel pins.
- 3. Measure the rotor tip clearance. Ill. 2.

SPEC:

Cooling side rotor tip clearance Service Limit: 0.20mm (0.008")

 Measure the pump body clearance. Use the same procedure used in III. 2 on page 4.9 for the lubrication side of pump.

SPEC:

Cooling side pump body clearance Service Limit: 0.355mm (0.014")

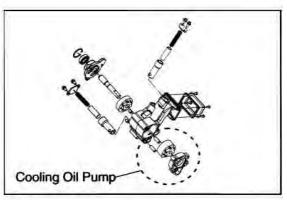
Measure the oil pump end clearance. Use same procedure as used in III. 3 on page 4.9 for lubrication side of pump.

SPEC:

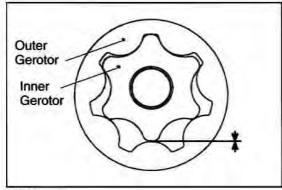
Cooling side pump end clearance Service Limit: 0.08 mm (0.003")

NOTE:

If any of the above clearances are found to be over the service limit, the oil pump should be replaced as an assembly.

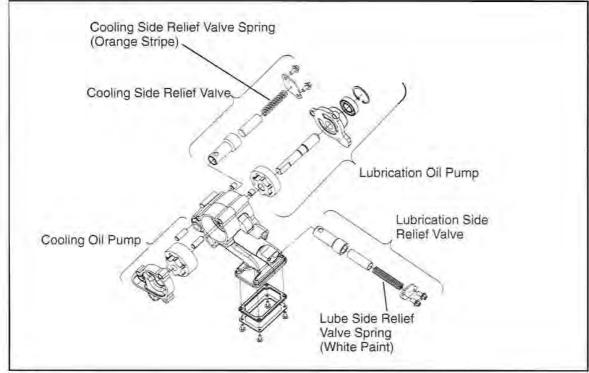


III. 1



III. 2

OIL PUMP ASSEMBLY



III 1.

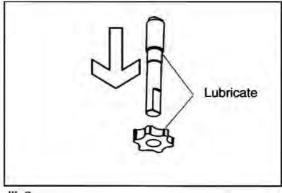
NOTE:

Steps 1 & 2 are not normally used when assembling the oil pump. The following procedure is for complete oil pump assembly. Only use the procedures that apply.

- 1. Apply engine oil to the oil pump shaft. III. 2.
- Press lubrication rotor onto shaft until it bottoms. III. 2.
- Lubricate the cooling side pressure relief valve assembly with engine oil and install. Ill. 1
- Install the cooling side relief valve cover and the bolts. Ill. 1.

TORQUE:

Pressure relief valve cover retaining bolts: 10 Nm (85 in-lbs)



III. 2

LUBRICATION & COOLING

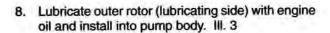
OIL PUMP ASSEMBLY (continued)

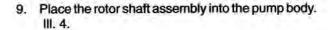
- 5. Install the lubricating side relief valve. III. 1.
- Install the lubricating side relief valve cover and the bolts. Ill. 1.

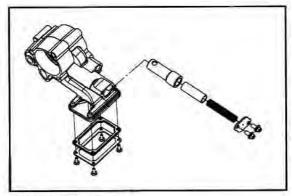
TORQUE:

Lubricating relief valve cover retaining bolts: 10 Nm (85 in-lbs)

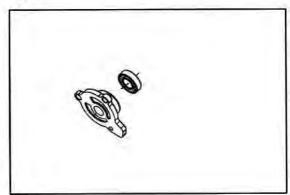
Press bearing into oil pump end cap until it seats. Install retaining snap ring. Ill. 2.



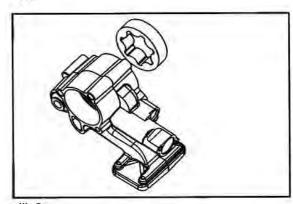




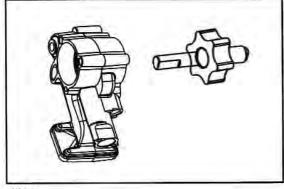
III. 1



111,2



III. 3



111.4

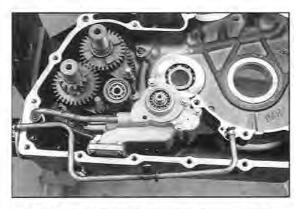
OIL PUMP ASSEMBLY (continued)

- 10. Install cooling side outer & inner rotor.
- 11. Install the oil pump screen.

TORQUE:

Oil Pump Screen Retaining Bolts: Hand Tight Apply Loctite 242 (blue)

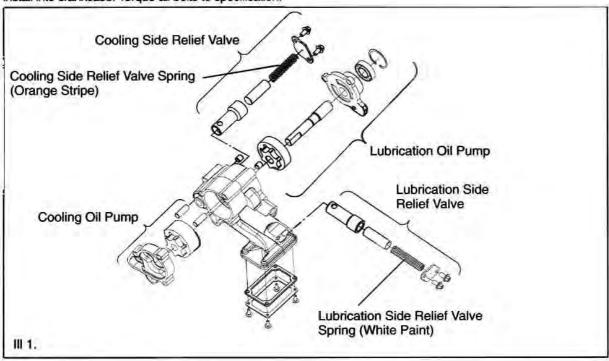
- 12. Install dowel pins for oil pump.
- 13. Lubricate the oil pump shaft, install end caps.
- Place new O-ring in oil pump body near lubrication pressure relief valve and lightly grease. Install washer onto short oil pipe into pump body with a twisting motion.
- Start new O-ring into rear crankcase oil hole and lightly grease.
- Install oil pump assembly with oil pipe and washer into left crankcase. Start by inserting the oil pipe first into its washer and O-ring, then position the pump on its dowels.
- Start the retaining body/bolts for the oil pump (do not tighten at this time). The bottom rear bolt also retains one oil pipe clamp.
- Install a new O-ring into the front crankcase oil hole and lightly grease.
- Insert long oil pipe with washer installed into threaded oil nipple hole first and then into front O-ring. Line up retaining clamp with pump body and install final oil pump retaining bolt.
- Insert new O-ring into oil filter nipple, lightly grease and install into crankcase. Torque all bolts to specification.



Place O-rings in pump or in crankcase. Install washers not O-rings on pipe. Refer to procedure (left).

TORQUE:

Oil pump body/retaining bolt: 13 Nm (115 in-lbs)



LUBRICATION & COOLING

OIL PUMP ASSEMBLY (continued)

21. Torque the remaining oil pipe clamp bolts.

TORQUE:

Oil pump body/retaining bolt: 13 Nm (115 in-lbs)

 Temporarily place the driven sprocket on the oil pump drive shaft and determine that the oil pump can rotate. III. 1.

NOTE:

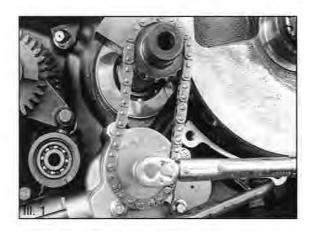
Although resistance will be noticeable when turning the oil pump, be sure the shaft rotates when turned by hand.

23. Remove the driven sprocket, install the sprocket into the drive chain (make sure the chain is properly positioned on the balance shaft), and install the chain sprocket assembly onto the oil pump shaft.

TORQUE:

Sprocket retaining bolt: 13 Nm (115 in-lbs)

- Refer to chapter 10 for lower end engine assembly.
- After assembling the engine, check the oil pressure to ensure the problem has been corrected.



OIL COOLER INSPECTION

- Inspect oil cooler, hoses and connections for oil leaks.
- Inspect oil cooler surface for obstructions, clean as necessary.
- Inspect oil cooler fins for deformation. Fins can be straightened if not severely deformed and no oil leaks are present.
- 4. Inspect oil cooler guard for proper mounting.
- Inspect oil cooler mounting fasteners for tightness and inspect mounts for cracks.
- 6. Repair or replace components as necessary.

OIL COOLER REMOVAL

- Place drain pan under oil cooler.
- 2. Remove oil cooler guard.
- Remove mounting bolt for rear brake reservoir, set reservoir aside.

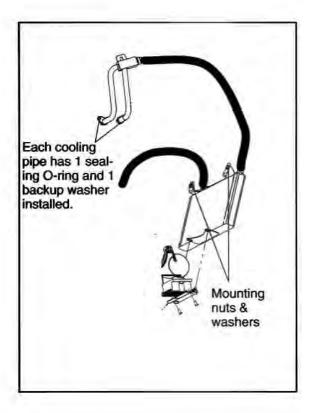
CAUTION

Keep brake reservoir in an upright position. Allowing the reservoir to be stored in any other position may allow air to enter the brake system. Brake bleeding would then be necessary.

- 4. Remove hose connections at oil cooler.
- Remove upper oil cooler nuts and washers.
- 6. Lift oil cooler up and forward, remove oil cooler.

OIL COOLER INSTALLATION

- Installation of oil cooler is the reverse of the removal steps.
- Inspect rear brake to be sure pedal is firm and no air has entered the system.



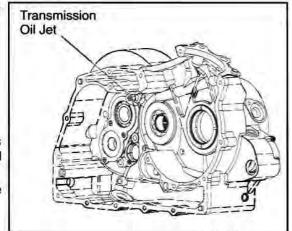
LUBRICATION & COOLING

TRANSMISSION OIL JET INSPECTION & REPLACEMENT

NOTE:Late build 1999 engines use a one piece crankcase/oil jet design.

The engine must be removed from the frame and the engine cases must be split to inspect the the transmission oil jet. Refer to Chapters 6 through 10 for engine removal and disassembly procedure.

- Inspect oil jet for obstructions, clean or replace as necessary (you may need to remove to inspect early build oil iets).
- Blow low pressure shop air through passage and ensure that all passage ways are clear.
- 3. Clean passageways as necessary.



CHAPTER 5 FUEL INJECTION

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FAST IDLE CABLE ADJUSTMENT	
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GENERAL

There are many hazards that 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.

A WARNING

Gasoline is extremely flammable and explosive under certain conditions.

Δ

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

Δ

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

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!

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: 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.

AWARNING

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

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 working on the machine.

For fuel tank removal and installation, refer to chapter 2.

Note the location of all O-rings and gaskets. Replace all O-rings and gaskets encountered during fuel injection service.

If the throttle body is removed, cover the inlet tracts with a clean shop towel to prevent foreign debris from entering the engine. Remove the shop towel before reinstalling the throttle bodies.

Refer to chapter 2 for proper hose routing.

SPECIFICATIONS

FUEL SYSTEM		
Item	Specifications	
Fuel Pump Pressure	3.8 BAR, 380 kPa, 55.86 psi	
Fuel Pump Volume	40-42 liters/hr (0.185 gal/min.) (12 oz./30 seconds)	
Idle Speed	950 rpm ± 50 rpm	
Throttle Grip Free-Play	3-6 mm (1/8"-1/4")	
Fast Idle Lever Free-Play	3-6 mm (1/8"-1/4")	
Fuel Pump Amp Draw	2-4 amps (maximum: 5.5 amps during break-in)	
Recommended Octane	87 Octane minimum	
Recommended Fuel Storage Additive	Victory Fuel Stabilizer 2870652	

SPECIAL TOOLS

TOOL	PART NUMBER
Fuel Injection Diagnostic Lamp	PV-43530
Connector Test Adapter Kit	PV-43526
Fuel Pressure Gauge	PV-43506

TROUBLESHOOTING

NOTE:

No troubleshooting chart can list all of the potential problems that may occur.

Although every effort was 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 trouble-shooting charts.

CAUTION

Don't overlook the obvious when troubleshooting fuel injection problems. It is easy to "just start replacing parts" and hope that the problem will be corrected.

The most overlooked and common problems that occur are:

- Poor, corroded, or disconnected wiring and ground connections.
- Battery in a low state of charge.
- Contaminated fuel.
- Restricted fuel flow/filters.

DO NOT OVERLOOK THESE ITEMS WHEN TROUBLESHOOTING!

FUEL SYSTEM TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE POSSIBLE PART(s) AFFECTED		POSSIBLE REPAIR NEEDED
Engine tums over with	Compression too low	See engine section	
electric starter, but won't start	No spark at spark plugs	See ignition system	
ou.r.	No fuel reaching intake	Blown Fuse	Replace
	tract	Plugged fuel filters/fuel hose	Clean/Replace
		Fuel pump not working	Replace
		Fuel pressure regulator not working correctly	Replace
		Fuel injector not working	Replace
		Faulty fuel pump relay	Replace
		Faulty ECM	Replace
		Open in wiring or con- nectors	Inspect/Repair
	Excessively rich/lean fuel mixture	Throttle Position Sensor (TPS) out of adjustment	Adjust / Reset w/ ECM
		Fuel pump	Replace
		Fuel pressure regulator	Replace
		Faulty TPS	Replace
		Crank Position Sensor	Replace
		Barometric pressure sen- sor	Replace
		Coolant temperature sensor	Replace
		ECM	Reset w/ TPS or Replace
		Air temperature sensor	Replace
		Fuel Injector	Replace
		Low battery voltage	Charging system
	Spark at wrong time or no spark. Fuel delivery timing incorrect.	Flywheel exciter ring installed incorrectly	Install Correctly

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Poor idle	Valve train problems Compression low Ignition problems Low battery voltage	See Engine Section See Engine Section See Ignition Section See Charging Section	Charge battery
	Excessively rich/lean fuel mixture	Crank position sensor ECM TPS Fuel Pump Vacuum Leaks Fuel injector or fuel rail obstructed or leaking Regulator Fuel Return Line Air Filter	Replace Replace Calibrate / Adjust Improper fuel flow to pump Repair/Replace gaskets and/or connections Clean/Replace Replace Repair/Replace Missing or restricted- Replace

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED	
Engine Stalls	Fuel Injector Problem	Faulty fuel injector No signal from ECM Wiring problem Low battery voltage	Replace Repair/Replace Repair/Replace Charging system	
	Excessive rich/lean fuel/ air mixture	Manifold Absolute Pressure (MAP) Sensor Plugged fuel filter Fuel pump Fuel pressure regulator Vacuum leak Coolant sensor Air temperature sensor Wiring problem Air Filter TPS Low battery voltage	Replace Replace Replace Replace Replace Repair/Replace hoses Replace Replace Replace Replace Replace Repair/Replace Missing—Replace Replace Charging system	
	Control Circuit/Sensors not functioning correctly	ECM Fuel pressure regulator TPS Air temperature sensor Engine speed sensor Coolant sensor Fuel pump relay Flywheel Exciter Ring Fuse ECU Relay Low battery voltage	Replace Replace Replace Replace Replace Replace Replace Replace Install correctly Replace Replace Charging system	
	Valve train problems Compression low	See Engine Section See Engine Section	1,27303.00	
Poor Running in upper RPM ranges	Valve train problems Ignition problems Overfilled with oil	See Engine Section See Ignition Section See Maintenance Section Low battery voltage	Charging system	

PROBLEM POSSIBLE CAUSE		POSSIBLE PART(s) AF- FECTED	POSSIBLE REPAIR NEEDED	
Poor Running in upper	Control Circuit/Sensors	Engine speed sensor	Replace	
RPM ranges	not functioning correctly	ECM	Replace	
		TPS	Replace	
		Air temperature sensor	Replace	
		Barometric pressure sen- sor	Replace	
		Intermittent wiring/con- nector problem	Repair/Replace	
	Fuel delivery incorrect	Plugged or kinked fuel and/or vent hoses	Repair/Replace	
		Fuel pump	Replace	
		Fuel regulator	Replace	
		Fuel filter	Replace	
		Battery/Charging System	Charge/Replace	
	1	Fuel Injector plugged	Clean/Replace	
		Contaminated fuel (wa- ter, additives, etc.)	Clean/Replace	
		Inadequate octane	Use correct fuel	
		Defective throttle valve	Replace throttle body	
		Low battery voltage	Charging system	
	Air intake restriction	Dirty Air Cleaner	Clean	
		Intake restriction	Repair	
	Air Leak	Throttle body gasket sur- faces	Repair/Replace	
		Intake manifold	Repair/Replace	
		Throttle body	Repair/Replace	
Engine lacks power	Top-end problems	See Engine Section		
	Ignition problems	See Ignition Section		
	Overfilled with oil	See Maintenance Section		

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AF- FECTED	POSSIBLE REPAIR NEEDED
Engine lacks power		Plugged fuel injector TPS Dirty air cleaner Vacuum leaks Fuel pump ECM Fuel pressure regulator Air temperature sensor Engine speed sensor MAP sensor Plugged vent line	Clean/Replace Replace Clean Repair/Replace Replace
		Low battery voltage	Charging system
Engine overheats	Internal engine parts Lubrication/Cooling system Low or incorrect oil Brakes dragging Drive belt too tight Ignition timing incorrect Spark plug(s) Low battery voltage	See Engine Section See Lubrication/Cooling Section See Maintenance Section See Hydraulic Disc Brake Section See Maintenance Section See Ignition Section or sensors malfunctioning: Coolant temperature sensor Engine speed sensor ECM Heat range incorrect Charging system	Replace Replace Replace Repair
	Lean Air/Fuel mixture	Fuel pressure regulator vacuum hose kinked or plugged Air leak Fuel injector plugged Coolant temperature sensor Vent line plugged TPS Leak at throttle body manifold seal	Repair/Replace Repair Clean/Replace Replace

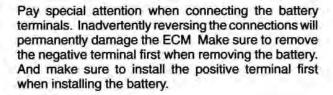
FUEL INJECTION SERVICING PROCEDURES

CAUTION

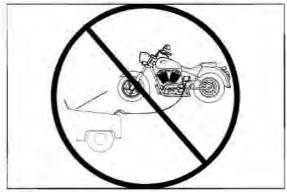
While electronic fuel injection is very durable and reliable, the components can be easily damaged or problems can be introduced if the following precautions are not adhered to.

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 electrical component damage exists. This can result in very expensive parts requiring replacement, III, 1,

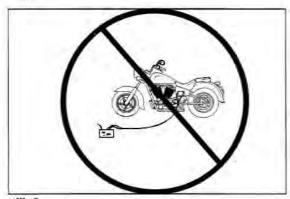
Never charge the battery while it is connected to the machine. III. 2. And never disconnect the battery while the engine is running!



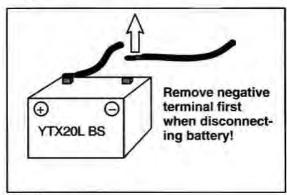
Before disconnecting or connecting any electrical connections, be sure to switch the key off. It is a much better practice to disconnect the battery when disconnecting or connecting electrical connections.



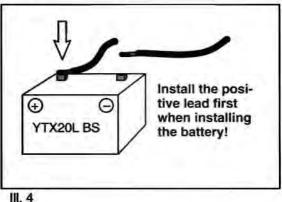
111.1



III. 2

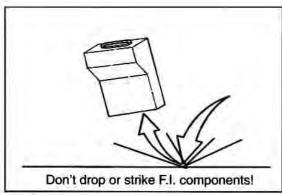


III. 3



FUEL INJECTION SERVICE PROCEDURES

The ECM is a durable piece of electronic equipment. Even so, dropping it or hitting it may cause irreparable damage. This is also true for the sensors used on the system. III. 1.



III. 1

Static electricity can damage the ECM beyond repair. The human body can easily store 500 or more volts of electricity in the form of static electricity. Before working around electronic components of the Fuel Injection system, ground yourself to dissipate the static charge. Also take great care not to touch any of terminal pins on the ECM III. 2.



FUEL INJECTION SERVICING PROCEDURES

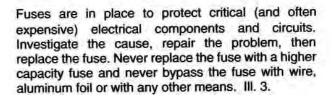
Always use the proper adapter from the Connector Test Adapter Kit when probing the terminals. Most of the connectors are sealed and cannot be probed through the back side. Be extremely careful not damage the connectors by forcing meter probes into the connectors. Ill. 1.

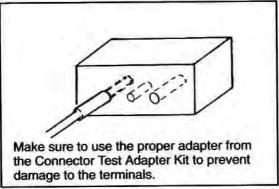
Poor connections are the most common cause of Electronic Fuel Injection malfunctions. Be careful that you don't introduce problems during your troubleshooting procedures.



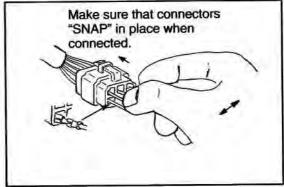
Connector Test Adapter Kit: PV-43526

Faulty connections should always be your first check when diagnosing fuel injection fail codes. Carefully inspect the connections of the failed circuit before doing any other troubleshooting steps. Make sure terminals are tight within the connector block and that the wires are tight within the connectors. Ill. 2.

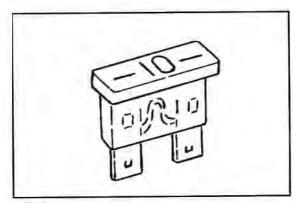




III. 1

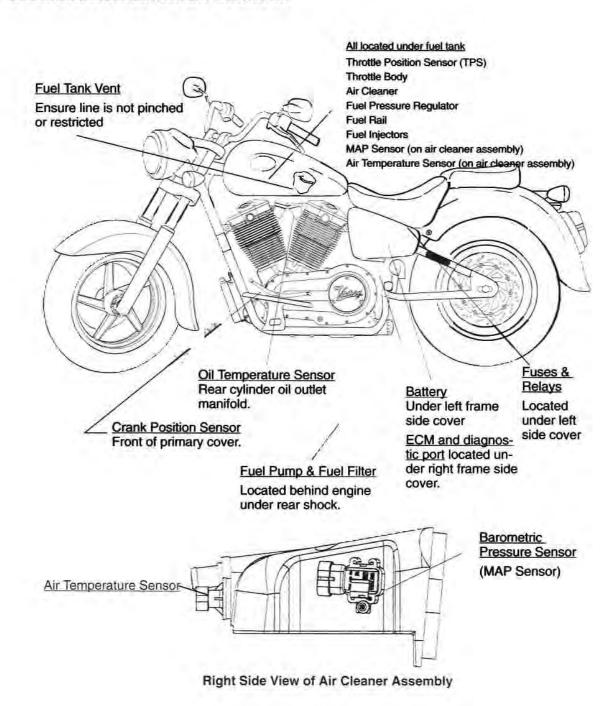


111.2

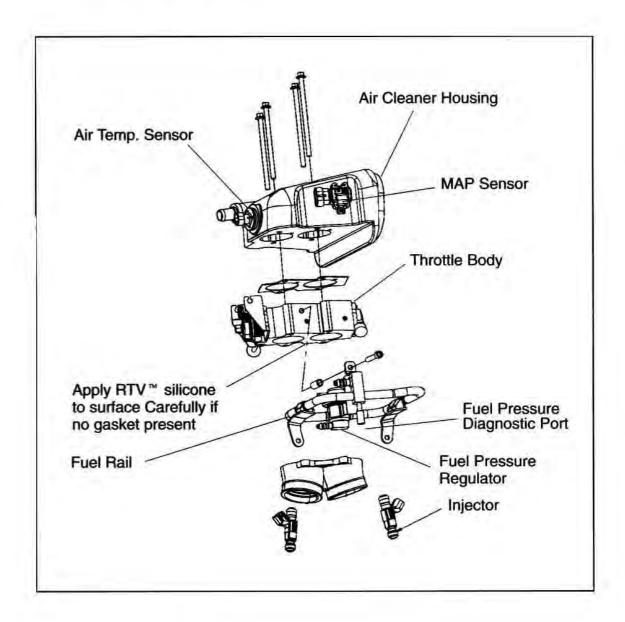


111.3

FUEL INJECTION LOCATION DIAGRAM



FUEL INJECTION EXPLODED VIEW



DIAGNOSIS

Self-Diagnosis Function

A self-diagnosis function is built into the ECM There are two functions available: "User" & "Dealer"

The operator (user) is notified that a possible problem exists via the LED display on the speedometer face.

FUEL INJECTION PROBLEM NOTIFICATION

LCD DISPLAYS	POSSIBLE PROBLEM	
Check Engine	Sensors	
	Injectors	
	ECM	
	Wiring Problem	

Sensor Failure

The fuel injection system defaults to a "pre-programmed" value in the event of a problem with a sensor. The check engine "ch eng" will be illuminated on the speedometer. The machine should not be operated any longer than absolutely necessary.

FAILED SENSOR	DEFAULT	POSSIBLE SYMTOM	RUNNING ABILITY
Crank Position	No Default	Engine will misfire or stop	No
Throttle Position	Full Throttle	Engine will misfire when not at full throttle.	No
M.A.P. (Manifold Absolute Pressure)	Sea Level (1040mB)	No significant effect up to 2500 ft.	Yes
Coolant Temperature	90 Degrees Celsius	No effect on warm engine.	Yes
Air Temperature	10 Degrees Celsius	Slight effect on cold engine.	Yes

FUEL INJECTION DIAGNOSTICS

CAUTION

Read and thoroughly understand the servicing cautions on pages 5.1 and 5.9-5.11 before working on the EFI system. Read each test and related information thoroughly before performing the test.

NOTE: A special tool is necessary to access the stored fail codes from the ECM

SPECIAL TOOL:

Fuel Injection Diagnostic Lamp:

PV-43530

OVERVIEW

The ECM used on the Victory V92C Engine has a simple means of diagnostics built in. Fail Codes are flashed by the ECM in response to the technician requesting the diagnostic mode by using the Diagnostic Lamp.

When a fault occurs with any of the sensors on the system, the ECM records the fail code in its "Logged Faults" memory. If a fault is currently active, the fail code is also recorded in the ECM "Current Faults" memory. Current fail codes are only active while the fault is present. If the problem is corrected, the "Current Fault" is erased, but the fail code remains active in the "Logged Faults" memory until it is manually cancelled. This is true even if the power is removed from the ECM

SYSTEM INPUTS AND MAPS AFFECTED

ENGINE SPEED (CRANK POSITION SENSOR)

Engine speed is used as a primary input to many of the maps which control fuel delivery and ignition advance.

These are comprised of the following:

- Throttle Position Sensor (TPS): Engine speed fuel maps for each cylinder.
- Barometric Pressure: Engine speed Fuel Map
- TPS: Engine speed Ignition Map
- Barometric Pressure: Engine speed Ignition Map

Engine speed is also used in the following maps:

After start fuel map

Acceleration fuel map

Acceleration Ignition map

SYSTEM INPUTS AND MAPS AFFECTED (continued)

THROTTLE ANGLE (TPS)

Throttle angle is used as a primary input to the following maps.

TPS: Engine speed fuel maps for each cylinder

TPS: Engine speed ignition map

TPS: Start map

Rate of change of Throttle Angle is used in the following maps:

Acceleration fuel map

Accelerator pump

Acceleration ignition map

BAROMETRIC PRESSURE

Barometric pressure is used as a primary input to the following maps:

Barometric pressure: Engine speed fuel map

Barometric pressure: Engine speed ignition map

OIL TEMPERATURE (engine temperature)

Oil temperature is used as the input to the following maps:

Coolant temperature start map

Coolant temperature fuel map (warm-up cycle)

Coolant temperature Ignition map

Coolant temperature Ignition idle map

Acceleration fuel map

Acceleration Ignition map

After start fuel map

AIR TEMPERATURE

Air temperature is used as the input to the following maps:

Air temperature fuel map

Air temperature ignition map

BATTERY VOLTAGE

Battery voltage is used as the input to the following maps:

Battery voltage dwell map

Battery voltage fuel map

FAIL CODES

LIGHT CODE AFFECTED SENSOR/		REASON	
	COMPONENT	INSPECT	
2:1 Throttle Position Sensor (TPS) Location: Throttle Body	Throttle position is measured by a potentiometer mounted on the throttle shaft. The sensor is supplied with a regulated 5 VDC supply. The signal is then measured as a ratio of this 5 Volt supply. If the signal reaching the ECM is outside of these parameters, a 2:1 code will be produced.		
		Throttle position sensor, wiring or connector problem.	
1:1	Barometric Pressure Sensor (Manifold Ab- solute Pressure: MAP) Location: Airbox	Barometric pressure is measured via a Thin Film Pressure Transducer mounted on the airbox. The sensor is supplied with a regulated 5 VDC supply. The signal is then measured as a ratio of this 5VDC supply. If the signal reaching the ECM is outside of these parameters a 1:1 code will be produced.	
	100000	MAP sensor, wiring or connector problem.	
2:2 Air Temperature Sensor Location: Airbox	Air temperature is measured via a Negative Temperature Coeffi- cient Thermistor mounted in the airbox. The sensor's resistance decreases with increasing temperature, thereby changing the volt- age signal at the ECM		
	Air Temperature Sensor, wiring or connector problem.		
2:3	Oil Temperature (engine temperature) Location: Rear Cylin- der oil manifold	Oil temperature is measured via a Negative Temperature Coeffi- cient Thermistor mounted in the rear cylinder head oil gallery exit. The sensor's resistance decreases with increasing temperature, thereby changing the voltage signal to the ECM	
		Oil temperature Sensor, wiring or connector problem.	
2:5	Battery Voltage	Battery Voltage is measured via the ECM 12 VDC supply from the vehicle's battery.	
Vehicle battery		Battery , wiring or connector problem.	
NONE	NONE Engine Speed (Crank Position Sensor) Location: Left side of engine, front of primary	Engine speed is measured via a Variable Reluctance (VR) sensor and a crankshaft mounted trigger wheel. The trigger wheel has 60 equally spaced teeth, 6 degrees apart. Two adjacent teeth are removed to determine crankshaft position.	
cover.		Crank Position Sensor, Trigger Wheel, wiring or connector prob- lem.	

ACCESSING FAIL CODES

- 1. Make sure ignition switch is in the off position.
- 2. Remove seat.
- 3. Remove right side frame cover.
- Connect diagnostic lamp to the ECM wiring harness diagnostic connector.
- Put engine stop switch in run position.
- Turn ignition key on. Do not start engine.

The Diagnostic Lamp is illuminated under either of two conditions:

The Ignition Switch is on, but the engine is not running.

There is a fault present.

There is a fault logged.

- 7. Press the "Fault Switch" for one second.
- Release the switch.
- 9. All fail codes that are present will be flashed.

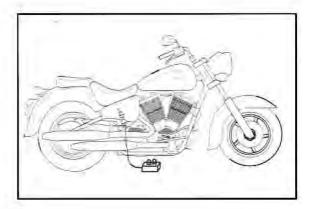
NOTE: If no fault codes are present, the lamp will flash rapidly.

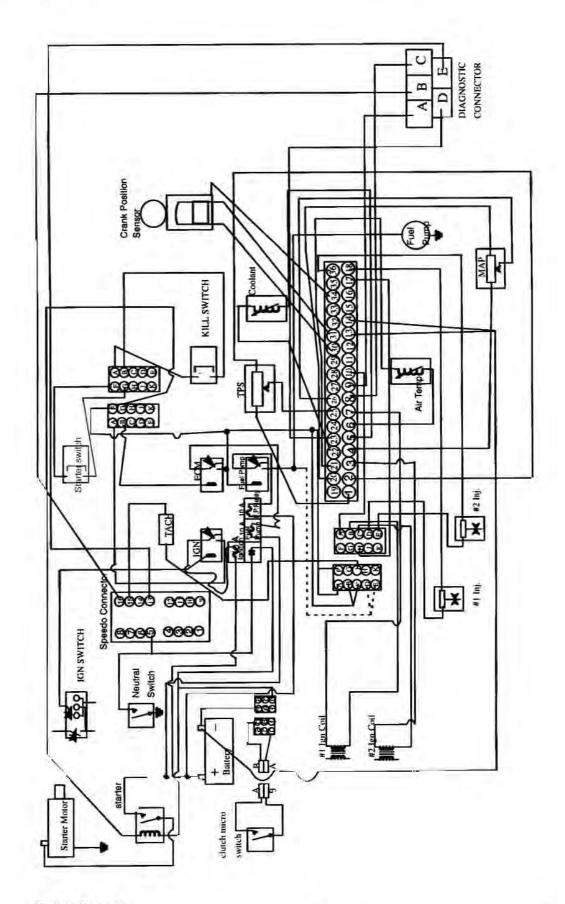
- 10. The ECM will cycle through all logged faults.
- When the "Fault Switch" is is pressed again for one second, the ECM will cease to display the fail codes.
- Pressing the "Fault Switch" again, for one second, will cause the ECM to cycle through the fail codes again.

CANCELLING FAIL CODES

NOTE: Once a repair has been made, the ECM will continue to flash the same fail codes until the fault is cancelled from its memory.

- Repair problem.
- 2. Turn ignition key on.
- Press and hold the "Fault Switch" for at least three(3) seconds. This will cancel all logged fail codes.
- 4. Go through the process to access fail codes again.
- Any fail codes which are not cancelled are still valid fail codes and the problem has not been repaired.





CRANK POSITION SENSOR DIAGNOSTICS

FAIL CODE: No fail code associated with this input.

COMPONENT AFFECTED: Crank position sensor

INSPECT

Fault lamp indication with ignition coils and fuel injectors disconnected.

Sensor resistance.

Wiring and connectors.

INSPECTION PROCEDURES

- Disconnect the ignition coils and injectors. Turn the engine over with the electric starter. The fault lamp should flash once per engine revolution if the sensor is working.
- 2. If fault lamp does not flash, replace sensor and retest per step one.
- If fault lamp still does not flash, perform resistance and AC voltage output tests to inspect wiring, connectors, and flywheel exciter ring.
- If fault lamp does not flash with new sensor installed and resistance and AC voltage output is correct, replace ECM and retest.

CAUTION:

Make sure AC voltage is correct before replacing ECM If AC voltage is incorrect with new sensor, primary cover must be removed and flywheel exciter ring must be inspected.

RESISTANCE AND AC VOLTAGE OUTPUT TESTS

CAUTION:

This test requires probing of the ECM wiring harness connector. Once the ECM harness has been disconnected, do not touch the exposed pins on the ECM Static electricity from your body can easily damage the ECM

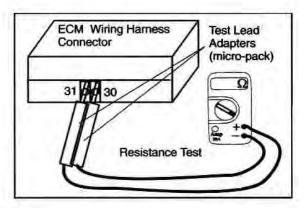
Do not attempt to perform tests on the ECM All tests are done on the wiring harness side of the ECM connector.

NOTE: A connector test adapter kit is necessary. Use of other means to probe the pins can easily damage the ECM connector.

SPECIAL TOOL:

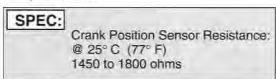
Connector Test Adapter Kit: PV-43526

- Remove right side frame cover.
- 2. Make sure ignition switch is in the off position.
- 3. Disconnect ECM connector.
- 4. Set Digital Multimeter (DMM) to the ohms scale.



CRANK POSITION SENSOR DIAGNOSTICS (continued)

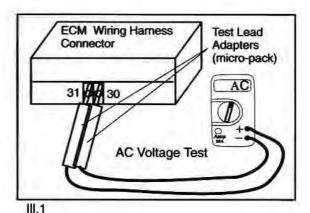
- Place one lead of the DMM in female pin # 30 & the other DMM lead in female pin #31 of the connector (not the ECM), refer to page 5.30 for pin location. III. 1.
- Observe the meter reading and compare to specifications.

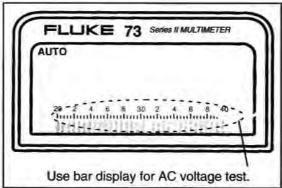


- Set DMM to AC volts scale.
- Turn ignition switch on. Turn engine over with electric starter and observe DMM display. III. 2.
- With the spark plugs in the engine the voltage reading will be erratic due to the low RPM and pulsing nature of the signal. The meter display will be erroneous. Watch the bars at the bottom of the display to determine if a signal exists. Any fluctuating AC signal is correct for this test. III.1.

NOTE: The bar display at the bottom of the display window on a Fluke ™ 73 DMM updates 10 times faster than the numeric display. Ill. 2.

- This test can also be done with the spark plugs removed. Remove spark plugs from engine. Install spark plugs into spark plug caps and ground spark plugs.
- When the engine is turned over with the electric starter with the spark plugs out, the reading on the meter will be 3 VAC ± on a properly functioning ignition system.
- Remove crank position sensor from crankcase.
- Visually inspect the working end of the crank position sensor for damage or metal particles clinging to the magnet.
- 14. If the crank position sensor shows physical damage to the working end, remove the primary cover and inspect the flywheel exciter ring needs to be inspected. Refer to chapter 9 for primary cover removal. Refer to 16 for flywheel removal. Refer to chapter 17 for flywheel exciter ring removal.
- Visually inspect the wiring exiting the engine speed sensor for loose or broken wires.
- Replace the crank position sensor if necessary.





111.2

THROTTLE POSITION SENSOR DIAGNOSTICS

FAIL CODE: 2:1	
COMPONENT AFFECTED: Throttle Posit	ion 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.

INSPECTION PROCEDURES

- Perform step 1 (below) to inspect integrity of wiring, connectors & TPS.
- If step 1 (below) results are outside of specifications, disconnect wiring at TPS and inspect wiring for continuity.
- If wiring is correct, replace TPS.
- 4. Start motorcycle and clear the Fail Codes. (Page 5.19).
- 5. Go through procedure to access Fail Codes again (Page 5.19).
- 6. If 2:1 Fail Code is still present, replace ECM and retest.

RESISTANCE TESTS

CAUTION:

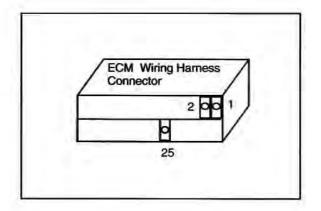
This test requires probing of the ECM wiring harness connector. Once the ECM harness has been disconnected, do not touch the exposed pins on the ECM Static electricity from your body can easily damage the ECM

Do not attempt to perform tests on the ECM All tests are done on the wiring harness side of the ECM connector.

NOTE: A connector test adapter kit is necessary. Use of other means to probe the necessary pins can easily damage the ECM connector.



 Place the DMM leads in the pins indicated in the chart below (not the ECM), refer to page 5.30 for pin location.



TEST #	COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS (±10%)
1	TPS	OHMS	# 25 to #1	4.05 K ohms throttle closed. 1130 ohms throttle open
2	TPS	OHMS	# 25 to # 2	1121 throttle closed. 4.03 K ohms throttle open.
3	TPS	OHMS	#1 to #2	3.74 K ohms. Doesn't change with throttle position.

Verify that readings obtained are within specifications.

BAROMETRIC PRESSURE SENSOR DIAGNOSTICS

FAIL CODE: 1:1			
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.		

INSPECTION PROCEDURES

- Perform step 1 (below) to inspect integrity of wiring, connectors & MAP sensor.
- If step 1 (below) results are outside of specifications, disconnect wiring at MAP sensor and inspect wiring for continuity.
- If wiring is correct, replace MAP sensor.
- 4. Start motorcycle and clear Fail Codes (page 5.19).
- Go through procedure to access Fail Codes again (page 5.19).
- If 1:1 Fail Code is still present, NOTE: 1:1 code may be present on 1999 machines, this does not indicate a problem.

RESISTANCE TESTS

CAUTION:

This test requires probing of the ECM wiring harness connector. Once the ECM harness has been disconnected, do not touch the exposed pins on the ECM Static electricity from your body can easily damage the ECM

Do not attempt to perform tests on the ECM All tests are done on the wiring harness side of the ECM connector.

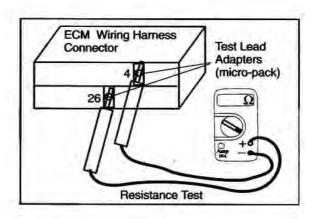
NOTE: A connector test adapter kit is necessary. Use of other means to probe the pins can easily damage the ECM connector.

SPECIAL TOOL:

Connector Test Adapter Kit: PV-43526

- Place the DMM leads in the pins of the connector indicated in the illustration at right (not the ECM). Refer to page 5.30 for pin location.
- Verify that readings obtained are within specifications.

SPEC: MAP Sensor Resistance: @ 25° C (77° F) 5.7 K ohms ± 10%



AIR TEMPERATURE SENSOR DIAGNOSTICS

FAIL CODE: 2:2				
COMPONENT AFFECTED: Air Temperatu	ire 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.			

INSPECTION PROCEDURES

- Perform step 1 (below) to inspect integrity of wiring, connectors & Air Temperature sensor.
- If step 1 (below) results are outside of specifications, disconnect wiring at Air Temperature sensor and inspect wiring for continuity.
- 3. If wiring is correct, replace Air Temperature sensor.
- Start motorcycle and clear Fail Codes (page 5.19).
- Go through procedure to access Fail Codes again (page 5.19).
- If 2:2 Fail Code is still present, replace ECM and retest.

RESISTANCE TESTS

CAUTION:

This test requires probing of the ECM wiring harness connector. Once the ECM harness has been disconnected, do not touch the exposed pins on the ECM Static electricity from your body can easily damage the ECM

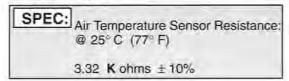
Do not attempt to perform tests on the ECM All tests are done on the wiring harness side of the ECM connector.

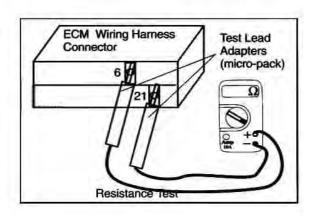
NOTE: A connector test adapter kit is necessary. Use of other means to probe the pins can easily damage the ECM connector.

SPECIAL TOOL:

Connector Test Adapter Kit: PV-43526

- Place the DMM leads in the pins of the connector indicated in the illustration at right (not the ECM). Refer to page 5.30 for pin information.
- Verify that readings obtained are within specifications.





OIL TEMPERATURE SENSOR DIAGNOSTICS

FAIL CODE: 2:3					
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.				

INSPECTION PROCEDURE

- Perform step 1 (below) to inspect integrity of wiring, connectors & Oil Temperature sensor.
- If step 1 (below) results are outside of specifications, disconnect wiring at Oil Temperature sensor and inspect wiring for continuity.
- 3. If wiring is correct, replace Oil Temperature sensor.
- 4. Start motorcycle and clear Fail Codes (page 5.19).
- Go through procedure to access Fail Codes again (page 5.19).
- 6. If 2:3 Fail Code is still present, replace ECM and retest.

RESISTANCE TESTS

CAUTION:

This test requires probing of the ECM wiring harness connector. Once the ECM harness has been disconnected, do not touch the exposed pins on the ECM Static electricity from your body can easily damage the ECM

Do not attempt to perform tests on the ECM All tests are done on the wiring harness side of the ECM connector.

NOTE: A connector test adapter kit is necessary. Use of other means to probe the pins can easily damage the ECM connector.

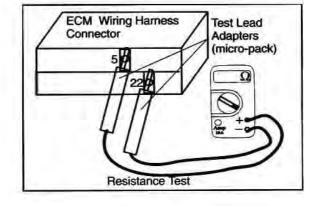
SPECIAL TOOL:

Connector Test Adapter Kit: PV-43526

- Place the DMM leads in the pins of the connector indicated in the illustration at right (not the ECM). Refer to page 5.30 for pin information.
- Verify that readings obtained are within specifications.

SPEC:

Oil Temperature Sensor Resistance: @ 25° C (77° F) 13.78 K ohms ±10%



BATTERY VOLTAGE AT ECM DIAGNOSTICS

FAIL CODE: 2:5				
COMPONENT AFFECTED: Battery Voltage	ge to ECM			
INDICATES	INSPECT			
Voltage received at ECM is outside of parameters.	Vehicle Battery Voltage			

INSPECTION PROCEDURES

- Measure voltage at battery. Refer to chapters 3 & 16 for battery testing information.
- 2. Battery voltage must be 12.5 VDC or above. If it is not, correct battery problem before proceeding.
- Perform Step 1 below to measure battery voltage at ECM
- If step 1 (below) results are outside of specifications, trace the system from the connector to the battery to find the cause of the problem.
- Start motorcycle and clear Fail Codes (page 5.19).
- Go through procedure to access Fail Codes again (page 5.19).
- 7. If 2:5 Fail Code is still present, replace ECM and retest.

VOLTAGE INSPECTION AT ECM CONNECTOR

CAUTION:

This test requires probing of the ECM wiring harness connector. Once the ECM harness has been disconnected, do not touch the exposed pins on the ECM Static electricity from your body can easily damage the ECM

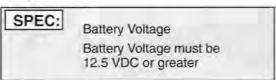
Do not attempt to perform tests on the ECM All tests are done on the wiring harness side of the ECM connector.

NOTE: A connector test adapter kit is necessary. Use of other means to probe the pins can easily damage the ECM connector.

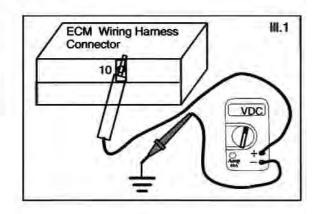
SPECIAL TOOL:

Connector Test Adapter Kit: PV-43526

- Place the DMM leads in the pins of the connector indicated in the illustration at right (not the ECM). Refer to page 5.30 for pin location.
- Verify that readings obtained are within specifications.



If the voltage at the ECM connector is not the same as battery voltage, trace the system from the connector to the battery.



BATTERY VOLTAGE AT ECM DIAGNOSTICS (continued)

VOLTAGE PATH FROM BATTERY TO ECM

- Battery to: Ignition fuse, fuel pump fuse and ignition switch.
- Turn ignition switch on: Voltage goes to ignition relay.
- 3. Ignition relay turns on: Voltage goes to kill switch.
- With kill switch in on position: Voltage goes to ECM relay.
- ECM relay turns on: Voltage is allowed to go from fuel pump fuse.
- From fuel pump fuse: Voltage goes to fuel pump relay, starter switch, ignition coils and #10 pin on ECM

INSPECT THE FOLLOWING IF BATTERY VOLTAGE IS NOT REACHING ECM (either no voltage or low voltage)

- Voltage at ignition fuse.
- Voltage at ignition switch.
- Voltage at ignition relay.
- Voltage at kill switch.
- Voltage at ECM relay.
- 6. Voltage at fuel pump fuse.
- If low voltage readings are obtained perform voltage drop tests from the battery to each of the above components.

FUEL PUMP ELECTRICAL DIAGNOSTICS

FUEL SYSTEM				
Fuel Pump Amp Draw	3-4 amps (maximum: 5.5 amps during break-in)			
Fuel Pump Pressure	3.8 BAR, 380 kPa, 55.86 psi			
Fuel Pump Volume	40-42 liters/hr (0.185 gal/min.) (12 oz./30 seconds)			
Recommended Octane	87 Octane minimum			
Recommended Fuel Storage Additive	Victory Fuel Stabilizer 2870652			

When the engine stop switch is in the run position and the ignition switch is turned on the fuel pump should run until operating pressure is reached. This usually only takes a few seconds. Fuel pump operation is audible with the engine off until pressure is obtained.

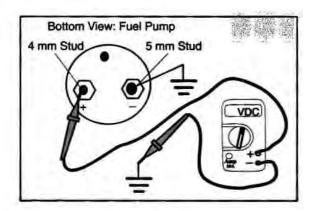
If it is suspected that the fuel pump is not operating, perform the tests outlined on the following pages.

FUEL PUMP ELECTRICAL DIAGNOSTICS

- Connect DMM as shown in the illustration at right.
 Turn engine stop switch on, turn ignition key on and inspect for voltage at the fuel pump when key is first turned on. Voltage reading should be battery voltage.
- If no or low voltage is delivered to the fuel pump, trace the circuit from the fuel pump back to the battery until the problem is found.
- 3. Correct problem and retest.

VOLTAGE PATH FROM BATTERY TO FUEL PUMP

- Battery to: Ignition fuse, fuel pump fuse, fuel pump relay fuse and ignition switch.
- Turn ignition switch on: Voltage goes to ignition relay.
- Ignition relay turns on: Voltage goes to kill switch.
- With kill switch in on position: Voltage goes to ECM relay.
- ECM relay turns on: Voltage is allowed to go from fuel pump fuse to fuel pump relay.
- Fuel pump relay turns on: Voltage from fuel pump relay fuse flows through fuel pump relay to the Fuel Pump.



INSPECT THE FOLLOWING IF BATTERY VOLTAGE IS NOT REACHING FUEL PUMP (either no voltage or low voltage)

- 1. Voltage at ignition fuse.
- 2. Voltage at ignition switch.
- 3. Voltage at ignition relay.
- 4. Voltage at kill switch.
- Voltage at ECM relay.
- Voltage at fuel pump fuse.
- 7. Voltage at the fuel pump relay fuse.
- 8. Voltage at the fuel pump relay.
- If low voltage readings are obtained perform voltage drop tests from the battery to each of the above components.

ECM CONNECTOR MAP

							ECM (CONN	ECTO	RMA	P						
18	17	16	(5)	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Yellow	Gm/ WT	Blue/ Gm		Pink/ Blk	Pink/ Bik		Gray	Pink	Black/ Gray	Black/ Gray	White/ Black	Black	Black	Red	White/ Green	Black	Red
#1 F.L	Tach output	Ck eng. lamp		Grd.	Grd.		Fuel Pump Relay	Kill Switch	Com- mon Grd.	TDX con- nector	#1 Ign. Coll	Air Temp Sensor	Cool- ant Temp.	MAP Sensor 5 Volt	#2 Ign Coll	TPS	TPS
								To G	round							•	
17.A	60.7 K	OL	111	0.1	0.2	1111	OL	OL	OL	OL	OL	OF.	OL	OL.	OL	OL	OL
36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
Yellow/ Gm	Black/ Pink	Yellow/ Green		Black/ Pink	Black	White		111	111	Brown	Yellow	1111	Gray	Blue	Green	Black	11
62 F.L	Grd.	Shield Grd.		Grd.	Crank Sensor	Crank Sensor				MAP Signal	TPS		RDX	Cool- ant Temp Sensor	Air Temp Sensor	MAP 0 Vott- age	
								To G	round								122
16.9	0.2	OL	1881	0.2	OL	OL	188	111	1111	OL	OL	1111	OL	OL	OL.	OL	11

MATRIX FOR ELECTRICAL TESTING AT ECM WIRING HARNESS CONNECTOR

COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS (±10% @ Room Temp. 68° F)	
#1 FUEL INJECTOR	OHMS	18 to ground	17.4 ohms	
#2 FUEL INJECTOR	OHMS	36 to ground	17.4 ohms	
#1 SECONDARY SIDE OF IGNITION COIL	OHMS	#7 to plug cap of # 1 ignition coil.	10.15 K ohms	
#2 SECONDARY SIDE OF IGNITION COIL	OHMS	#3 to plug cap of #2 ignition coil.	10.15 K ohms	
# 1 PRIMARY SIDE OF IGNITION COIL	OHMS	# 10 to #7	0.4 to 0.5 ohms	
# 2 PRIMARY SIDE OF IGNITION COIL	онмѕ	# 10 to # 3	0.4 to 0.5 ohms	
CRANK POSITION SENSOR	OHMS	#30 to # 31	1567 ohms	
CRANK POSITION SENSOR	AC VOLTAGE	#30 to # 31	Spark plugs out: 3 VAC + Spark plugs in: any fluctuating AC signal.	
AIR TEMP. SENSOR	OHMS	#21 to #6	3.32 K ohms	
COOLANT TEMP. SENSOR	OHMS	#22 to #5	13.78 K ohms	
TPS	OHMS	# 25 to #1	4.05 K ohms throttle closed. 1130 ohms throttle open	
TPS OHMS		# 25 to # 2	1121 throttle closed. 4.03 K ohms throttle open.	
TPS	OHMS	#1 to #2	3.74 K ohms. Doesn't change with throttle position.	
MAP SENSOR	OHMS	#4 to #26	5.44 K ohms	
KILL SWITCH	DC VOLT- AGE	#10 to Engine Ground	Ignition Switch Off: O volts DC Ignition Switch On; Kill Switch Off = 0 volts DC. Ignition Switch On; Kill Switch On = Battery Voltage	

Throttle Position Sensor (TPS) Overview

The Electronic Control Module (ECM) is programmed to provide the proper fuel and ignition timing based on the engine's RPM and throttle position. A Throttle Position Sensor (TPS), which is mounted at one end of the throttle plate shaft, 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.

The ECM assigns a numbered "site" to each throttle position based on the voltage reading from the TPS. These site numbers range from 0 near or at idle to 15 at full throttle. Within each site, information has been programmed into the ECM so it can provide the correct signals to the ignition and fuel injection system based on the voltage signal from the TPS sensor and engine RPM.

When performing the TPS adjustment, airflow is calibrated to match the fuel and ignition timing instructions from the ECM under a controlled situation. 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 orientation or calibration of the TPS to the throttle plates is accomplished with the TPS calibration procedure. During the TPS adjustment procedure, we "lock" the ECM at the 0 site. The 0 site is programmed in the ECM to give the engine the proper amount of fuel at a specified throttle position near the idle point.

When the ECM is locked into the 0 site, fuel and ignition timing stay constant, and the adjustment procedure simply changes the amount of air the engine receives by turning the idle speed screw. This establishes the fuel calibration at the proper air/fuel ratio.

When the ECM is in the calibrate mode, it operates differently. When the TPS voltage changes and the ECM is in the calibrate mode, the ECM waits 5 seconds, then defines the new TPS voltages as the new TPS set voltage (0 site voltage). Therefore, in calibrate mode, as the throttle plates are opened, the airflow increases but the fuel remains the same (after the 5 second wait). Note also, that the ECM will only recognize voltages of .96volts or less as a valid, possible TPS set voltage. Attempting to set the TPS to a higher voltage than that will result in a setting of .96 volts.

Important Notes

It is extremely important to understand that the toggle switch on the tool must be engaged prior to turning the key on. When this is done, the ECM understands that it needs to go into its calibration mode. If the toggle switch is released prior to finishing the procedure or is not engaged prior to turning the ignition switch on, the ECM will not be in the calibration mode. The only thing that will be accomplished is a change in idle RPM.

Engine temperature is important when setting TPS. If the TPS is set when the engine temperature is not at operating temperature, the engine will not run correctly when the procedure is completed. Besides the individual "sites" there are also various sensors on the engine that slightly modify each site to compensate for changes in battery voltage, engine temperature, air temperature, and barometric pressure. The ECM delivers the correct signals to the ignition and fuel injection system based on the input from the sensors.

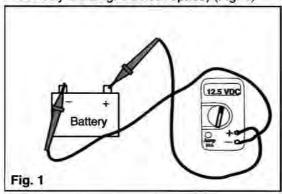
When the ECM is in the calibration mode, it assumes that the engine is at operating temperature. Any
adjustments the ECM makes based on engine temperature starts from the place we set it. If we set the TPS
when the engine is below or above operating temperature, the ECM will always compensate incorrectly when
engine temperature changes.

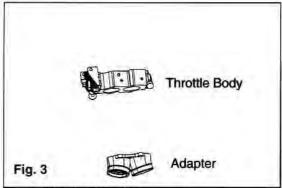
Important Notes, cont.

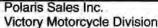
- The instructions state "Start the engine and wait 60 seconds at 900 RPM before making an adjustments." DO NOT
 overlook this step! When the engine is first started, it is operating off the "start-up MAP". Timing and fuel delivery
 are different for the first 900 revolutions of engine operation than it is for normal operation. We must wait until the
 ECM leaves its "start-up" programming and the engine has had a chance to stabilize <u>before</u> adjusting TPS.
- The instructions also state that the idle screw must be adjusted in increments of 1/16 of a turn. The ECM makes large changes due to small changes in TPS voltage. The TPS set voltage range is about 0.3 volts (0.6 volts to 0.9 volts DC). Each 1/16 turn of the idle screw will change TPS set voltage about 0.01 volts DC. It is extremely easy to mis-calibrate the ECM if the idle screw is turned in too fast or too far.
- The instructions state to wait 5 seconds between each 1/16 of a turn. This step of the procedure cannot be overlooked. Usually, engine RPM will rise slightly, and then come back down as the idle screw is turned in. When the idle screw is turned in (while in the calibrate mode) the TPS output voltage changes, and the ECM goes to the next site based on this information. With the toggle switch engaged, the ECM "thinks" a moment, decides that it is really in the TPS set mode and comes back to the 0 site. You must wait 5 seconds between each adjustment in order to evaluate the change properly.
- Proper TPS adjustment cannot correct for other problems that may exist on the motorcycle. If the battery voltage
 is low, poor electrical connections exist, fuel delivery problems exist, air leaks are present, etc., TPS adjustments
 cannot be performed correctly.

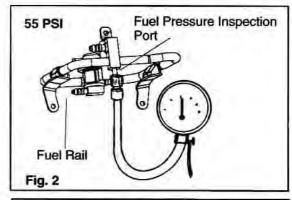
The following must be correct before an accurate TPS adjustment can be made:

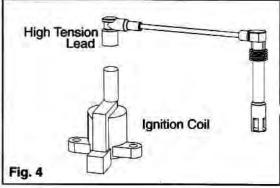
- . Battery Voltage (must be above 12.5 volts) (Fig. 1)
- Fuel Pressure (should maintain 55 psi) (Fig. 2)
- . Air Leaks (inspect between the throttle body and the throttle body adapter) (Fig. 3)
- Current Trouble Codes: (CK ENG indication will be displayed on the vehicle speedometer LCD)
- Secondary Coil Connection (make sure spade connector on ignition coil end of high tension lead is connected securely to the ignition coil spade) (Fig. 4)











Two characteristics are common when the TPS is set incorrectly.

1. Mixture Is Too Rich

Fouls spark plug(s)

Black, sooty exhaust gasses

Doesn't run well

Fuel mileage complaints

Muffler discoloration

2. Mixture Is Too Lean

Backfires excessively

Hard starting

Runs rough

ECM is mistakenly replaced due to incorrect TPS adjustment

Transmission sounds are greatly magnified

Misses

If extremely lean: while attempting to set the TPS, engine RPM drops until the engine dies.

Muffler discoloration.

A lean condition is quite possible and it is important to understand how this can happen.

- The machine is not running well so a TPS adjustment is performed.
- Inadvertently, the idle screw is turned in too far. This may be because the engine cannot or will not reach 950 RPM as required in previous procedures.
- While increasing the idle from about 800 RPM, at some point RPM will usually level off, and then start going
 down slightly and it can be confusing. As the idle screw is turned in the throttle plates are opened and the engine
 pumps more air, but the amount of fuel remains constant while in the calibration mode.
- If the idle screw is turned in more, air intake goes up, as does the TPS voltage. The maximum TPS <u>set</u> voltage that is available, however, is 0.96 volts. Until this point, as the idle screw is turned in, air intake goes up, but the fuel delivery does not (because it is in the calibration mode). As a result the air/fuel ratio leans out. After this point, if the throttle is opened farther, the ECM regards the TPS as out of range for calibration. As a result, the <u>set</u> voltage is not changed (it stays at 0.96 volts) and the fuel delivery increases with increased TPS voltage. (cont.)
- If the engine is still running at this point and the idle screw is turned in farther, the fuel will start increasing with
 the increased throttle opening and the idle speed will start to increase again. Finishing the TPS setting
 procedure in this condition will result in a set voltage of 0.96 volts. Poor driveability will result from the lean
 condition created. Typical TPS set voltage is in the 0.80 to 0.88 range.
- If the TPS is incorrectly set extremely lean, a static TPS adjustment may be needed just to get the engine running well enough to perform the dynamic TPS adjustment.

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

TPS ADJUSTMENT PROCEDURE

CAUTION:

Ensure that the handlebar mounted fast idle lever is in the off position and there is free play in the throttle cable prior to performing the TPS adjustment procedure.

CAUTION:

Ensure that you read and understand the items that can affect the TPS adjustment procedure as explained in the Throttle Position Sensor explanation that accompanied these instructions.

NOTE: The following procedure is used for vehicles with the stock and accessory exhaust systems.

TOOLS NEEDED

- Accurate shop tachometer. Kent-Moore PN: PV-8036B or equivalent
- Fuel Injection Diagnostic Lamp PV-43530
- A means to monitor engine temperature.
- Long shaft #2 Philips Screwdriver
- Shop Fan to keep engine temperature constant once it is at operating temperature.
- A shop fan should also be directed over the mufflers during the procedure.

CAUTION:

If a cooking thermometer is used, it can only be used when the engine is shut off. Make sure that you remove the thermometer and install the dipstick prior to starting the engine. You will have to start the engine, run it for a while, shut the engine off, measure the oil temperature, and repeat as needed. Continue the process until the engine oil temperature is 90-100° Celsius.

STATIC TPS ADJUSTMENT PROCEDURE

The static TPS adjustment procedure is recommended as a starting point. While not always necessary, this procedure gives you a starting point, which will allow you to properly perform the dynamic TPS adjustment procedure.

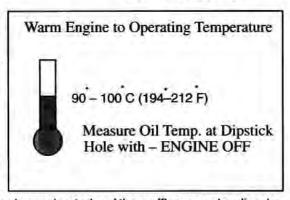
- Verify that all other components are working properly. Check the following items:
 - Fuel Pump
 - Charging System
 - Battery Voltage
 - Ignition Coil Connections
 - No air leaks.
- Once you have verified that there are no other problems, you may elect to perform a static TPS adjustment prior to performing a dynamic TPS adjustment procedure.

CAUTION:

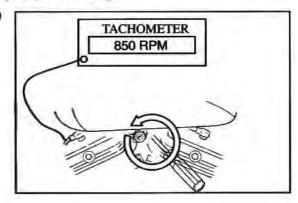
Even if the machine runs considerably better than it ever has after performing the static TPS adjustment, you are not finished. You must complete the procedure by performing the dynamic TPS adjustment. The machine will not be running correctly if you stop at the static TPS procedure.

- Ensure that the fast idle lever is in the off position.
- Back out the throttle stop screw until the throttle plates are completely closed.
- Connect the Fuel Injection Diagnostic Lamp (PV-43530) to the vehicle diagnostic connector.
- Press and hold the diagnostic tool toggle switch to the calibrate position.
- 5. Make sure the engine stop switch is in the run position.
- 6. Switch the Key ON
- 7. Hold the TPS toggle switch in the calibrate position for at least 20 seconds.
- Switch the Key OFF
- 9. Release the toggle switch.
- Start the machine (will have to give the machine some throttle).
- Adjust the throttle stop so the engine will idle at 850 RPM.
- Perform the entire dynamic TPS adjustment procedure from this point.

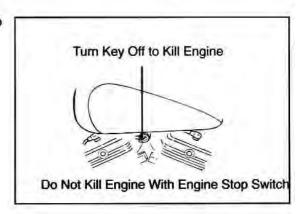
- Start the machine and let it warm up to operating temperature (90 – 100 degrees Celsius, 194 – 212 Fahrenheit engine oil temperature).
 - If the machine is idling in the shop, it can take 10 minutes or longer to warm the machine up to operating temperature.
 - The best solution is take a 10 minute test ride to warm the engine to operating temperature prior to setting the TPS.
 - While warming the machine up (if doing so while the machine is idling in the shop) and during the procedure itself, cooling fans must be directed to the head pipes and mufflers of the machine. While it is normal for headpipes to discolor during operation, without cooling airflow over the machine, the process is accelerated and the mufflers can also discolor.



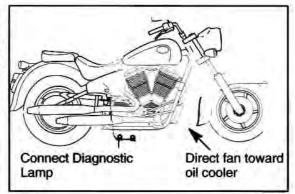
- Currently, the only reasonable way to measure oil temperature is with a cooking thermometer inserted into the dipstick hole. Make sure you only insert the thermometer into the hole when the engine is not running. If the temperature exceeds the normal temperature range, the TPS cannot be set properly. If you are experiencing problems and the machine is operated for more than a few minutes (once at operating temperature), it may get too warm. Stop the engine periodically and check the oil temperature if you experience problems to make certain the TPS is set while the engine is within the normal operating temperature range.
- Once the machine is at operating temperature, set idle to 850 RPM.



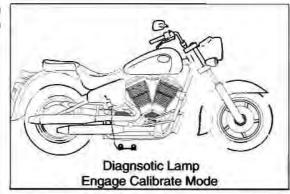
Turn the engine off with the key switch, not the engine stop switch.



4. Install the fuel injection diagnostic lamp to the diagnostic plug—in on the motorcycle. Direct fan toward the oil cooler. Once engine is at operating temperature, the fan will allow the engine to maintain its temperature in the correct range. This fan is separate from the fan(s) used to direct air over the exhaust system.



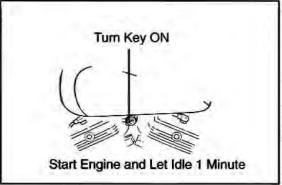
Engage the toggle switch on the tool to the TPS calibrate position. Hold the toggle switch in the TPS calibrate position until instructed to release.



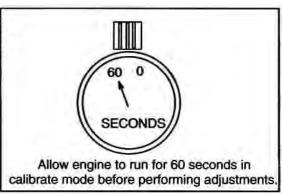
CAUTION:

Do not release the TPS calibrate toggle switch until you have completed the procedure. If you release the toggle switch during the procedure, you must start over.

Turn the key on and start the motorcycle. Ensure that the toggle switch for the fuel injection diagnostic lamp is engaged prior to starting the motorcycle.



7. Let the machine run in calibrate mode for a minimum of 60 seconds. Each time the machine is started, it does so in a start up mode. During this mode the ECM is delivering a rich "starting" mixture. This starting mode must be completed before you can set the TPS correctly.

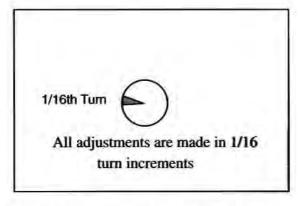


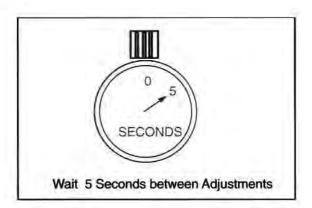
CAUTION:

The following procedure instructs you to turn the idle speed screw in 1/16 turn. This is extremely important; you must turn the idle speed screw in extremely small increments in order for the procure to be done correctly.

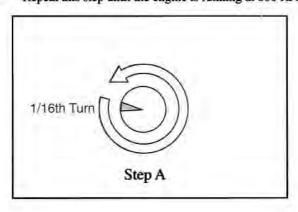
CAUTION:

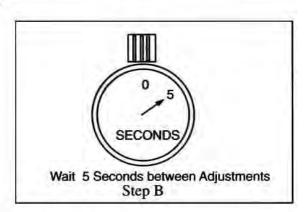
After each turn you must wait 5 seconds for the idle to stabilize and for the ECM to set itself properly.

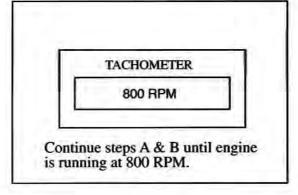




- While still holding the toggle switch in the TPS calibrate position, turn the throttle stop screw out in 1/16 turn increments, waiting 5 seconds between adjustments.
 - Repeat this step until the engine is running at 800 RPM.







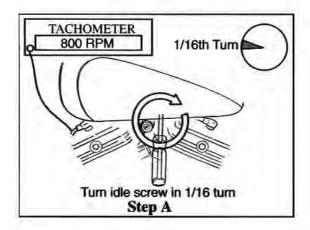
9. Once the engine is running at 800 RPM.

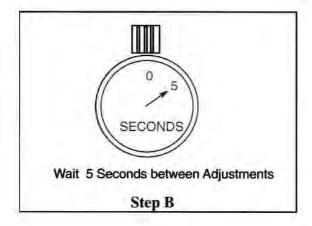
Turn the idle screw in 1/16 of a turn and pause 5 seconds.

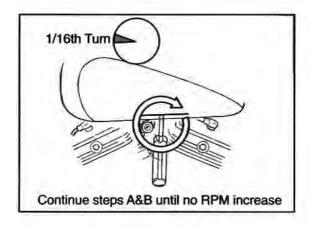
Closely observe your shop tachometer.

After each complete adjustment (1/16 of a turn and waiting5 seconds), the RPM should go up.

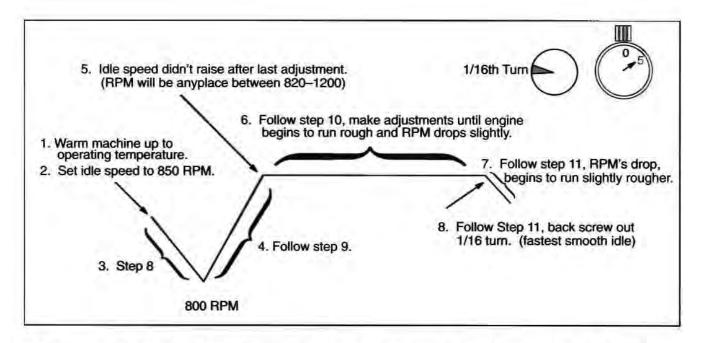
• Continue to perform the adjustment procedure until the RPM no longer increases when the idle speed screw is turned in. This is a very subtle area that you are attempting to find. The idle RPM will go up and level off even though you continue to turn the idle speed screw in. The RPM this occurs at is not important. It might occur at 830 RPM on one machine and 1030 on another machine. One machine might require you to turn the screw in 2 or 3 times and the next machine might require six or seven (or more) 1/16 turn adjustments.







- 10. Once the idle speed no longer increases with 1/16 turn adjustments, you are now on a plateau.
 - Watch your tachometer carefully and listen to the engine note intently.
 - Continue with the same adjustment procedure until you reach a point where the idle RPM goes down slightly.
 - An engine that just starts to run a little rougher will usually accompany this.
- At the exact point where the idle speed goes down slightly, turn the idle speed screw out 1/16 turn. This will be the fastest, smooth idle in calibrate mode.



NOTE: In summary, While in the TPS calibrate mode, you are finding the the place where the engine has the fastest, smooth idle. All previous information that instructed you to perform a procedure that "set" the TPS at 950 RPM is no longer used.

12. Release the toggle switch and remove the fuel injection diagnostic lamp.

IMPORTANT!

- If the machine is now operating below 950 RPM +/- 50 RPM, you may increase the idle to 950 +/- 50 RPM.
- 14. If the machine is now operating above 950 RPM, you must leave it there.
 - Once the TPS is set correctly, going up in RPM doesn't matter.
 - However, trying to reduce RPM richens the idle mixture considerably and will result in poor engine
 performance and driveability. The fuel delivery at idle is set, and the only thing that you would be changing
 is the amount of air going into the engine.
- 15. Test ride the machine to ensure that it is running correctly.

FUEL PUMP PRESSURE INSPECTION

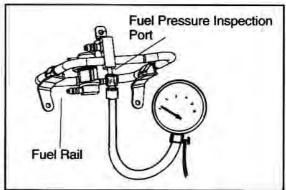
A WARNING

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!

- 1. Remove the seat and fuel tank.
- 2. Remove the cap from the F.I. pressure inspection port.
- Place a rag over the F.I. pressure inspection port. Carefully and slowly depress the Schrader valve with a small screwdriver to remove the pressure from the F.I. system.
- Install the fuel pressure gauge securely.



SPECIAL TOOL:

Fuel Pressure Gauge:

PV-43506

Start the motorcycle and record the fuel pressure.

SPEC:

Fuel Pressure:

3.8 BAR (380 kPa) (55.86 psi)

CAUTION:

When working around the fuel system, protect your eyes. Wear safety glasses and a face shield.

TROUBLESHOOTING				
FUEL PRESSURE TOO LOW: INSPECT	FUEL PRESSURE TOO HIGH: INSPECT			
Fuel hose leaking	Plugged or kinked fuel return line			
Plugged fuel filters				
Pressure regulator malfunction	Pressure regulator malfunction			
Fuel pump malfunction	a de la constanta de la consta			
Fuel pump relief valve malfunction	1			
Fuel flow to pump (See page 5.45 and perform test)				

- Turn ignition switch off, bleed gauge at T-valve and remove fuel pressure gauge fittings.
- 7. Reinstall protective cover on the F.I. pressure inspection port. Install fuel tank and seat.

FUEL PUMP VOLUME INSPECTION

A 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

When working around the fuel system, protect your eyes. Wear safety glasses and a face shield.

 Turn on the ignition switch and listen for the operation of the fuel pump.

A. If the fuel pump does not run, inspect the electrical circuit and the fuel pump relay.

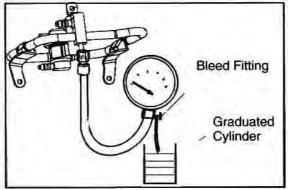
- 2. Turn switch off.
- Install the fuel pump gauge as per steps 1-4 of fuel pump pressure inspection on the previous page.
- Place the bleed hose of the fuel pressure gauge into a graduated container.
- Turn the ignition switch on, open bleed fitting and measure the amount of fuel delivered.



40-42 liters/hr (0.185 gal/min.) (12 oz./30 seconds)

NOTE: The battery must be fully charged. Ensure that the fuel tank is at least 1/2 full.

 If fuel volume is below specification, inspect fuel pump, fuel lines, and fuel filters. Also inspect vent line for fuel tank.



FUEL PUMP REMOVAL & INSTALLATION

- Remove the seat. .
- 2. Remove the fuel tank. Refer to Chapter 2.
- Remove the frame side covers. Refer to Chapter 2.
- Disconnect wires/cable from battery negative terminal.
- Remove the rear shock. Refer to page 13.9 for rear shock removal.
- 6. Remove the fuel filter/fuel pump bracket nuts.
- 7. Remove the bracket.
- Loosen the hose clamp on bottom of fuel pump, remove hose.
- Lift up fuel pump and remove terminal nuts, remove fuel pump.
- 10. Installation is the reverse of removal.

FUEL FILTER REMOVAL & INSTALLATION

 Refer to chapter 3 for fuel filter removal & installation procedures.

THROTTLE BODY REMOVAL

A WARNING

GASOLINE

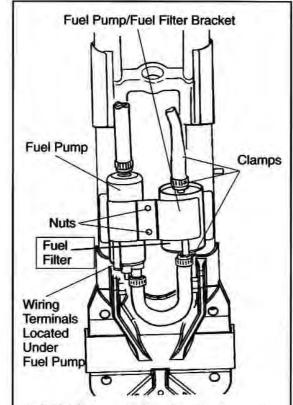
Gasoline is extremely flammable and is explosive under certain conditions. Work in a well ventilated area. Open flames, sparks and cigarettes must be kept away from gasoline.

KEEP GASOLINE OUT OF THE REACH OF CHILDREN!

CAUTION

When working around the fuel system, protect your eyes. Wear safety glasses and a face shield.

- Remove seat.
- Remove fuel tank. Refer to Chapter 2 for fuel tank removal.



NOTE: Diagram depicts fuel filter in position with sub-frame removed for clarity. Sub-frame does not need to be removed to replace fuel filter.

THROTTLE BODY REMOVAL (continued)

- Remove Map sensor, air temperature sensor, and crankcase breather from air box.
- Remove bolts from rear section of air cleaner housing.
- Remove bolts from front section of air cleaner housing. Remove air cleaner housing.
- 6. Remove fuel rail attachment bolts.
- 7. Remove throttle and throttle return cables.
- Remove fast idle cable.
- 9. Remove throttle body assembly.
- 10. Assembly is reverse of disassembly.

INTAKE MANIFOLD REMOVAL & INSTALLATION

- Remove throttle body assembly, see above.
- Loosen intake manifold hose clamps, remove intake manifold.

FUEL INJECTOR REMOVAL

NOTE: The throttle body assembly must be removed before the injectors can be removed. Follow the procedure above.

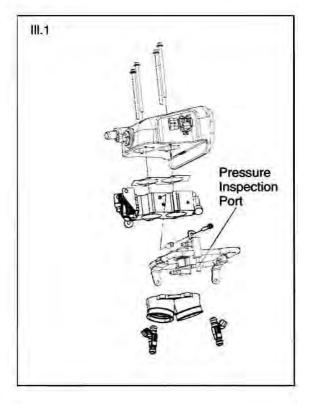
CAUTION

When working around the fuel system, protect your eyes. Wear safety glasses and a face shield.

- Remove cap from the F.I. pressure inspection port.
- Place a rag over the F.I. pressure inspection port. Carefully and slowly depress the Schrader valve with a small screwdriver to remove the pressure from the F.I. system.
- 3. Remove wiring harness connectors from injectors.

NOTE: Injector harness connectors are removed by lifting the tab and pressing the upper portion of the tab toward the wiring harness.

- Remove fuel rail hold down bolts.
- Remove fuel supply hose clamp and fuel supply hose.



FUEL INJECTOR REMOVAL (continued)

- Remove oil temperature sensor wires, route wires to allow for fuel rail removal.
- Clean area around injectors to prevent foreign material from falling into the engine.
- Remove fuel rail, fuel return line and injectors as an assembly.
- The injectors are held in place on the fuel rail by the interference fit of the O-rings. The injectors can now be removed from the fuel rail.
- Installation is the reverse of removal, Use new o-rings upon assembly.

THROTTLE CABLE ADJUSTMENT

Adjust the throttle cable free play to specification.

Refer to chapter 3.

SPEC:

Throttle Cable Free Play: 3-6 mm (1/8-1/4")

FAST IDLE CABLE ADJUSTMENT

Adjust the fast idle cable free play to specification. Refer to chapter 3.

SPEC:

Fast Idle Cable Free Play: 3-6 mm (1/8-1/4")

SPEC:

Fast Idle Speed:

1500 RPM (Maximum) with lever in fully extended position

Fuel Pump Flow Test

If the pump is not receiving fuel flow, it will overheat and be permanently damaged. Use the following chart and instructions when investigating fuel pump problems.

When a fuel pressure problem or venting problem is suspected, the following test will confirm proper fuel flow to the fuel pump.

Low fuel pressure and resulting low fuel flow can be caused by but not limited to a pinched or restricted vent line or restricted primary fuel filters.

A restricted fuel tank vent line can cause the above and/or a collapsed fuel tank.

TOOLS NEEDED: Quick

Quick-Disconnect: PN 2520136

24, of 1/2, ID fuel line Graduated Cylinder

Stop watch or watch with second hand

PROCEDURE:

Fill fuel tank with 4 gallons of fuel.

Firmly install fuel cap (press down and rotate to the stop).

- To assemble the test hose required for this procedure, attach the 24, section of fuel line to the quick-disconnect (PN 2520136).
- Disconnect fuel line quick-disconnect at fuel tank.
- 3. Place open end of test hose into graduated cyclinder.
- 4. Connect test to fuel tank quick-disconnect fitting.
- 5. Measure the amount of fuel that drains out of the fuel tank in a 30 second period.

Amount of Fuel in Tank	Time	Amount that should drain out	Condition	
One Gallon	30 seconds	500 ml	Open Vent	
One Gallon	30 seconds	225 ml	Restricted Vent/Filter	
Two Gallons	fallons 30 seconds 600 ml		Open Vent	
Two Gallons	30 seconds	180 ml	Restricted Vent/Filter	
Three Gallons	e Gallons 30 seconds 675 ml		Open Vent	
Three Gallons	30 seconds	280 ml	Restricted Vent/Filter	
Four Gallons	Four Gallons 30 seconds		Open Vent	
Four Gallons	Gallons 30 seconds 170 ml		Restricted Vent/Filter	

In general, with two or more gallons of fuel in the tank, clean prefitters, unrestricted vent line, and with the fuel cap firmly on: You can expect to see 600 ml in 30 seconds +/- 100 ml.

In general, with two or more gallons of fuel in the tank and the fuel cap firmly on, if the vent line is restricted: You can expect to see 200 ml in 30 seconds +/- 100 ml.

If you measure less than 500 ml in 30 seconds, further investigation will be necessary.

CHAPTER 6 ENGINE REMOVAL / INSTALLATION

GENERAL	6.1
SPECIFICATIONS	6.2
TORQUE SPECIFICATIONS	6.2
ENGINE REMOVAL	6.3-6.10
ENGINE INSTALLATION	6.10-6.18

GENERAL

A floor jack or commercially available motorcycle engine jack is required for both the safety of the technician and the engine.

Once the engine is removed from the frame, an engine stand greatly facilitates engine disassembly and assembly.

SPECIAL TOOL:

Engine Stand:

Use commercially available automotive engine stand. 3 - 3/8" spacers will be necessary.

SPECIAL TOOL:

Floor Jack or Motorcycle Engine Jack: Commercially Available

REQUIRES ENGINE REMOVAL FOR SERVICE	CAN BE SERVICED WITH ENGINE IN FRAME				
Oil Pump	Clutch				
Camshaft	Fuel Injection				
Rear Cylinder Head	External Gearshift Linkage				
Cam Drive	Alternator				
Crankshaft & Crankshaft Component Service	Starter, Starter Clutch, Flywheel, Anti-Kick Back Clutch.				
Piston/Cylinder	Ignition System				
Transmission/All Internal Transmission Parts	Output shaft seal				
Oil Pump Drive/Counter Balancer	Torque Compensator				
Crankcase Breather Reed Valve	Cam Chain Tensioner Mechanism				
	Valve Cover/Valve Cover Gasket, Front Cyl. Head				

ENGINE REMOVAL AND INSTALLATION

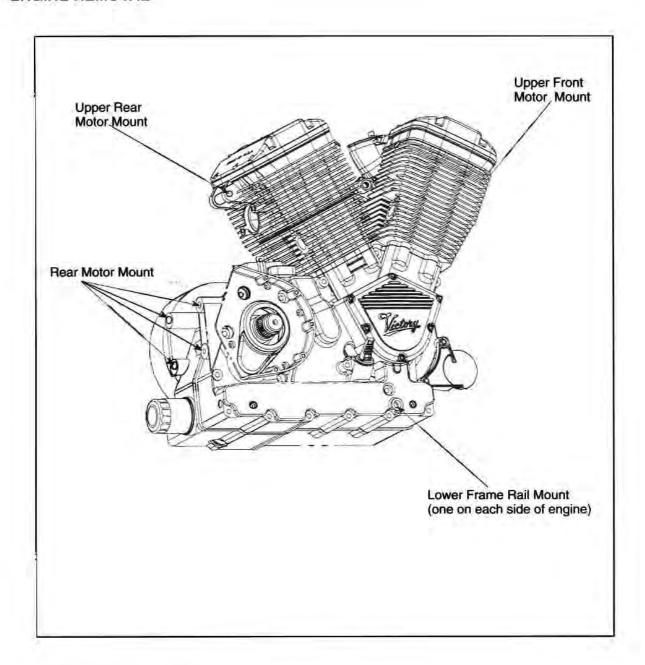
SPECIFICATIONS

ENGINE REMOVAL					
Item	Specifications				
Engine Weight	100 Kilograms + (220 lbs +)				
Oil Capacity	5.7 Liters (6 Quarts)				

TORQUE SPECIFICATIONS

ENGI	NE MOUNTS					
Item	Torque Nm / lb. ft. (in. lbs.)					
Front Upper Bracket (to Frame) 8mm	41 Nm / 30 lb-ft					
Front Upper Bracket (to Engine) 12mm	104 Nm / 75 lb-ft					
Lower Cradle to Engine (Mid Engine) 10mm	62 Nm / 45 lb-ft					
Frame Cradle Bolts 10mm	62 Nm / 45 lb-ft					
Rear Engine to Frame 10mm	62 Nm / 45 lb-ft 62 Nm / 45 lb-ft 104 Nm / 75 lb-ft 41 Nm / 30 lb-ft OTHER 10 Nm (85 in-lbs) 62 Nm / 45 lb-ft 13 Nm (115 in-lbs) 18 Nm (150 in-lbs) 138 Nm / 100 lb-ft 13 Nm (115 in-lbs)					
Rear Upper Bracket (to Engine) 12mm	104 Nm / 75 lb-ft					
Rear Upper Bracket (to Frame) 8mm	41 Nm / 30 lb-ft					
	OTHER					
Air Box to Throttle Body Adaptor Bolts	10 Nm (85 in-lbs)					
Front & Rear Frame Rail Attachment Bolts						
Fuel Rail Attachment Bolts	13 Nm (115 in-lbs)					
Inner Sprocket Cover Bolts	18 Nm (150 in-lbs)					
Engine Sprocket Nut	138 Nm / 100 lb-ft					
Engine Sprocket Nut Retainer Plate Bolts	13 Nm (115 in-lbs)					
Drive Sprocket Cover Bolts, Outer	16 Nm 12 lb-ft.					
Oil Cooler Distribution Piping Attachment Bolts	10 Nm (85 in-lbs)					
Oil Drain Plug	39 Nm / 28 lb-ft					
Oil Filter	Turn filter one complete turn after the O-ring has contacted the engine cases.					
Shift Arm	13 Nm (115 in-lbs)					
E	XHAUST					
Exhaust Flange Stud Nuts	16 Nm / 12 lb-ft					
Muffler Clamps / Crossover Pipe Clamp	27 Nm / 20 lb-ft					
Crossover Pipe Clamp	47 Nm / 35 lb ft					
Muffler Mounting Brackets	28 Nm / 20 lb-ft					

ENGINE REMOVAL



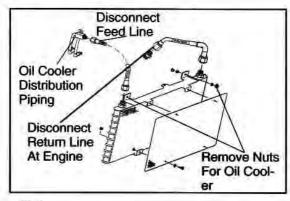
ENGINE REMOVAL AND INSTALLATION

ENGINE REMOVAL (continued)

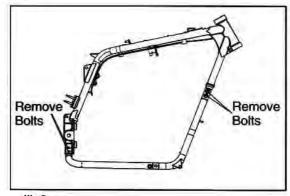
- Support the machine securely in an upright position.
- Drain the engine oil & remove filter. Drain engine oil from filter and reinstall to protect sealing surfaces during engine removal.
- 3. Remove seat, refer to Chapter 2.
- 4. Remove frame side covers, refer to Chapter 2.
- 5. Remove fuel tank, refer to Chapter 2.
- Disconnect battery, refer to Chapter 3.
- 7. Disconnect spark plug wires.
- 8. Remove mufflers, refer to Chapter 2
- Remove the feed line to the oil cooler at the junction between the cylinders. Remove the return line at the engine. III. 1.
- Remove the mounting bolts for the oil cooler (III 1).
- Remove oil cooler. Refer to Chapter 4.
- Remove oil cooler distribution piping bolt, remove piping.
- Loosen 2 bolts at front of right side, lower frame member. Remove two rear bolts and engine mount bolt from frame member. III. 2.
- Remove all head pipe bolts for front and rear head pipes. Remove rear head pipe. III. 3
- 15. Remove engine sprocket cover.
- Remove retaining plate bolts from engine sprocket.
- 17. Place motorcycle in gear and apply rear brake.
- With rear brake applied, remove nut for engine sprocket. III. 4.

SPECIAL TOOL:

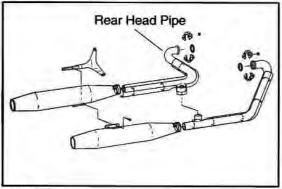
Engine Sprocket Nut Requires 1 7/8" Socket Commercially Available



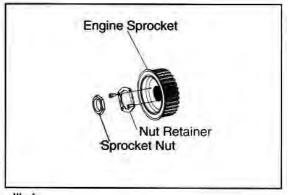
III. 1



III. 2



III. 3



III. 4

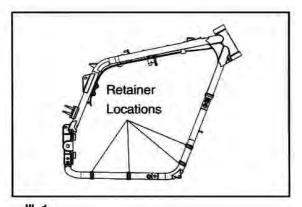
ENGINE REMOVAL (continued)

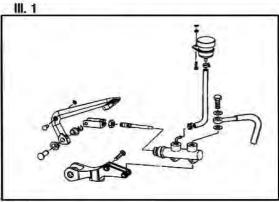
 Remove retainers for rear brake line leading from rear brake master cylinder to rear brake light switch. III. 1.

NOTE: Rear Brake assembly can remain attached to right to right lower frame when removing the engine. Some technicians find it easier to remove the assembly as described below.

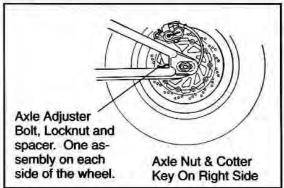
- Remove rear master cylinder reservoir hold down bolt. III. 2
- Remove two bolts for rear brake master cylinder assembly. III. 2
- Set rear brake master cylinder assembly and reservoir to rear of motorcycle. Take precautions to keep both components in an upright position to prevent the infiltration of air into the brake system.
- Remove right side, lower engine mount. Remove frame member. III. 1
- 24. Remove front cylinder head pipe.
- Loosen rear axle and wheel adjuster lock nuts.
 Back wheel adjuster bolts out. Ill. 3
- Place a small floor jack under the engine and operate jack to lift rear of motorcycle. Do not place the lifting plate on the oil filter.











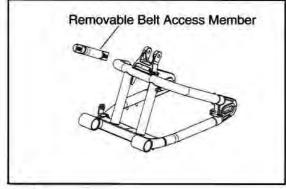
III. 3



ENGINE REMOVAL AND INSTALLATION

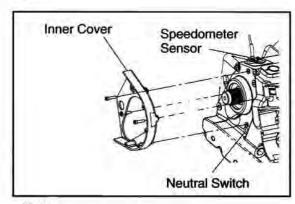
ENGINE REMOVAL (continued)

- 28. Remove swing arm access member.
- 29. Remove belt guard.
- 30. Remove drive belt and engine sprocket.



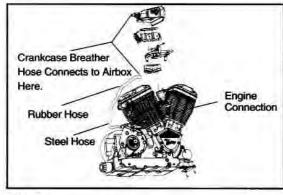
III. 1

- 31. Remove inner engine sprocket cover. III. 2.
- 32. Remove neutral switch wiring from switch. III. 2.



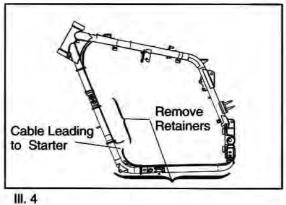
111.2

- 33. Remove breather hose from engine breather manifold. III. 3.
- 34. Remove bolt for speedometer sensor bracket, remove sensor. III. 2



III. 3

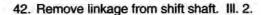
- 35. Remove retainers from left side, lower frame member. III. 4.
- 36. Remove battery cable from starter.



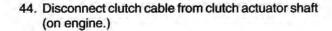
ENGINE REMOVAL (continued)

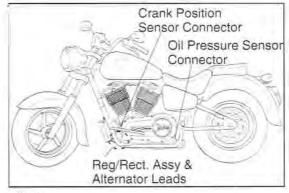
- 37. Remove regulator/rectifier assembly. III. 1.
- Disconnect the wiring harness from the alternator.
 III. 1.
- 39. Remove crank position sensor wiring connector.
- Remove oil pressure sending unit wiring connector. Ill. 1.



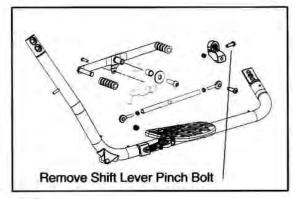




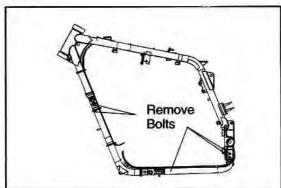




III. 1



III. 2



111.3



ENGINE REMOVAL AND INSTALLATION

ENGINE REMOVAL (continued)

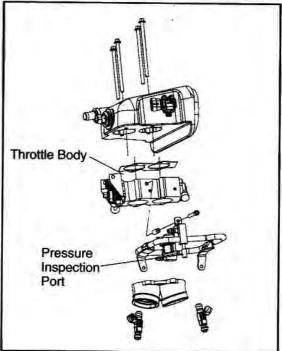
- Remove air filter housing. Refer to Chapter 3 for removal procedures.
- 46. Remove throttle cables and fast idle cable. III. 1.
 NOTE: To save time, remove the throttle body, fuel rail, and throttle body adaptor as an assembly.

- Remove fuel rail attachment bolts. NOTE: Seal the joint with r'RTV [™] sealant if seal is broken when assembling.
- Remove throttle body and intake boot assembly.
 III. 2. NOTE: Throttle body should remain sealed to throttle body adaptor. Do not break seal.
- Remove cap from the F.I. pressure inspection port. III. 2.
- Place a rag over the F.I. pressure inspection port. Carefully and slowly depress the Schrader valve with a small screwdriver to remove the pressure from the F.I. system.
- 51. Remove wiring harness connectors from injectors.

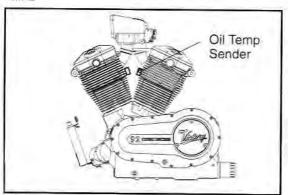
NOTE: Injector harness connectors are removed by lifting the tab and pressing the upper portion of the tab toward the wiring harness.

- 52. Remove fuel rail hold down bolts.
- Remove fuel supply hose clamp and fuel supply hose.
- Remove oil temperature sensor wires. Route wires to allow for fuel rail removal. III. 3.
- Remove fuel rail, fuel return line and injectors as an assembly.





111.2



1113

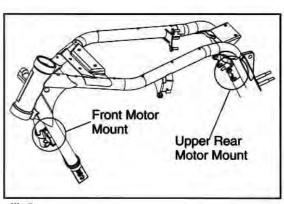
ENGINE REMOVAL (continued)

NOTE: Engine is now ready to be removed. Ensure all wiring and cables have been disconnected and are secured out of the way.

- 56. Operate floor jack and lift rear tire. Place a 4"x4" wooden block under rear tire and lower floor jack until tire contacts wooden block. Do not remove jack at this time. Ill. 1.
- 57. Secure a hand operated winch to a suitable structure located above the motorcycle. Place a tie-down strap in a position that will center the load and not damage components. Connect the winch hook to the tie down strap and take up the slack in the winch cable. III. 1.



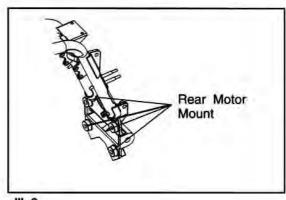
- 58. Remove the upper front motor mount bolt. III. 2.
- 59. Remove the upper front motor mount. III. 2.
- 60. Remove the upper rear motor mount bolt. III. 2.
- Remove both right and left motor mount plates.
 III. 2.



III. 2

62. Remove the rear motor mount bolts. III. 3.

NOTE: Adjust the floor jack as necessary to relieve the side loads on the engine mounting bolts.



III. 3

ENGINE REMOVAL AND INSTALLATION

ENGINE REMOVAL (continued)

CAUTION:

It is advisable to have assistance when the engine is ready to be removed from the frame. The engine must be held securely so as not to damage the engine or frame and to ensure that the technician is not injured.

- 63. Slowly lower the floor jack. Inspect for secure attachment of the rigging. Once rigging is determined to be secure, remove the floor jack from under the engine. III. 1.
- 64. Lower the engine slowly (with the hand operated winch) to avoid damage. Once engine is lowered, remove from right side of frame.

NOTE: The engine is aligned to the frame with locating lugs at the rear motor mount. It may be necessary to move the engine back and forth slightly to release the engine from the mounting lugs. Ill. 2.

NOTE: If the engine is to be disassembled, attach the engine securely to an engine stand. III. 3. Refer to chapter 10, page 10.9 for engine stand information.

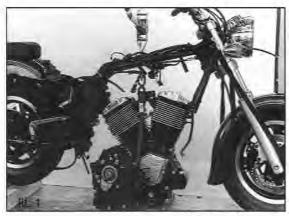
ENGINE INSTALLATION

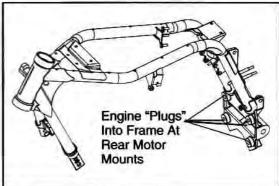
CAUTION:

Insure that the hoses and wiring are routed out of the way.

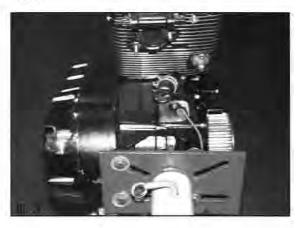
CAUTION:

It is advisable to have assistance when the engine is installed into the frame. The engine must be held securely so as not to damage the engine or frame and to reduce the chance of personal injury.



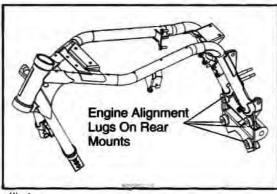


III. 2

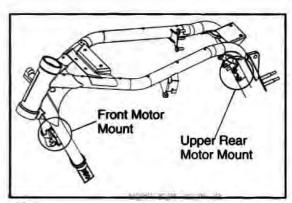


ENGINE INSTALLATION (continued)

- w/
- Raise rear of motorcycle and place a 4x4 wooden block under rear tire. See photo on page 10.
- Position the engine on the lift table in the center of the frame.
- Secure a hand operated winch to a suitable structure located above the motorcycle. Place a tie-down strap in a position that will center the load and not damage components. Connect the winch hook to the tie down strap and take up the slack in the winch cable.
- Raise the engine until a small floor jack can be placed under the engine. Do not place the floor jack under the oil filter or oil filter mounting surface.
- Carefully raise the engine with the hand winch. Manipulate the engine with the winch and floor jack until the engine is located into the rear motor mount alignment lugs.
- Install four rear motor mount bolts. Hand tighten the bolts. III. 1.
- 7. Install upper front motor mount III. 2.
- 8. Install the upper front motor mount bolt. III. 2.
- Install upper rear motor mount plates (right & left).
 III. 2.
- Torque motor mount bolts. Refer to page 6.2 and 6.3 for torque specifications.



111. 1



III. 2

ENGINE REMOVAL AND INSTALLATION

ENGINE INSTALLATION (continued)

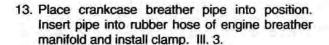
11. Install oil cooler distribution piping. III. 1.

TORQUE:

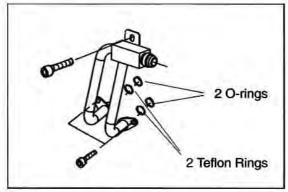
Oil Cooler Distribution Pipe Bolts: 10 Nm (85 in. lbs.)

NOTE: Each end of the piping utilizes two O-rings. Lightly grease the O-rings and insert them into the hole first, carefully align the distribution piping and install.

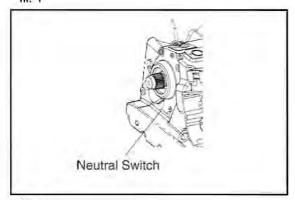
12. Connect neutral switch wiring harness. III. 2.



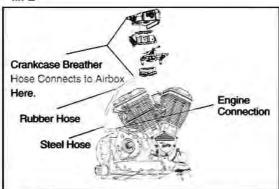




111.1



111.2



III. 3



ENGINE REMOVAL & INSTALLATION

ENGINE INSTALLATION (continued)

 Install inner engine sprocket cover. Make sure neutral indicator wire is not pinched by cover. Torque bolts to specification. Ill. 1

TORQUE:

Inner Sprocket Cover Bolts: 18 Nm (150 in. lbs)

16. Install oil filter, tighten to specifications. III. 2

TORQUE:

Turn filter one complete turn after the O-ring has contacted the crankcase.

17. Install left frame rail. III. 3

TORQUE:

Front & Rear Frame Rail Bolts: 62 Nm (45 lb-ft) (10mm)

TORQUE:

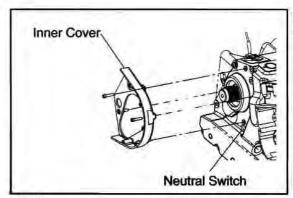
Engine Mount On Frame Rail: 62 Nm (45 lb-ft) (10mm)

 Install shift lever assembly onto shift lever shaft.
 Align the shift lever correctly. Install bolt and torque to specifications. III. 3

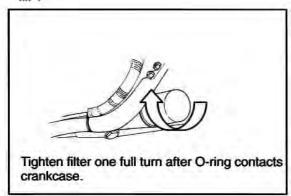
NOTE: Illustration 3-Shows both late and early build shifters.

TORQUE:

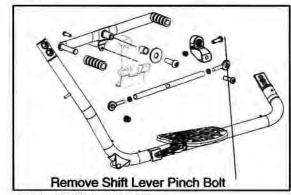
Shift Arm: 13 Nm (115 in-lbs)



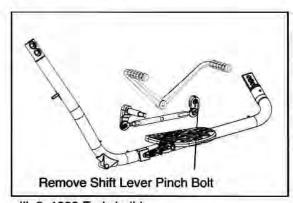
III. 1



111.2



III. 3-1999.5 Late build



III. 3-1999 Early build

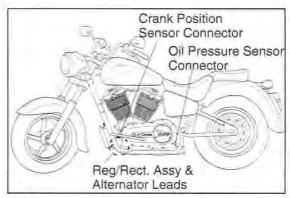
ENGINE REMOVAL AND INSTALLATION

ENGINE INSTALLATION (continued)

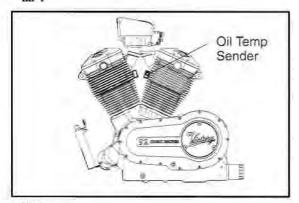
- Connect oil pressure switch wiring connector.
 11. 1.
- 20. Install regulator/rectifier assembly. Ill. 1.
- 21. Connect alternator wiring harness. III. 1.
- Connect crankshaft position sensor wiring connector. III. 1.

- Connect engine oil temperature sensor connector.
 Make sure wires are routed correctly. Ill. 2.
- 24. Connect battery cable to starter motor.
- 25. Install spark plug leads onto spark plugs.

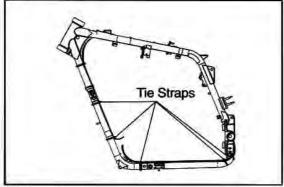
- Route all wiring between frame rail and engine (wires will be under the primary cover when properly routed.) Ill. 3.
- Install tie straps for wiring along left frame rail.
 III. 3.
- Install fuel rail, fuel return line and injectors as an assembly.
- Install fuel supply hose clamp, install fuel supply hose.
- 30. Install wiring harness connectors for fuel injectors.



III. 1



1112



III. 3

ENGINE INSTALLATION (continued)

- 31. Install throttle body assembly. Ill. 1.
- 32. Install fuel rail attachment bolts. III. 1.

TORQUE:

Fuel Rail Attachment Bolts: 13 Nm (115 in-lbs)

- Install throttle and fast idle cables. See Chapter 3 for correct adjustment.
- Install air filter housing, refer to Chapter 3 for proper assembly procedures.

TORQUE:

Air Cleaner Housing Bolts: 13 Nm (115 in-lbs)

- Install MAP sensor, air temperature sensor, and crankcase breather into air filter housing. III. 1.
- 36. Connect clutch cable to clutch cable actuator.
- 37. Install drive belt and front engine sprocket.
- 38. Install belt guard.
- Install swing arm access member. Torque bolts to specification.

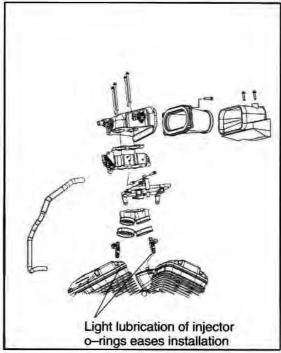
TORQUE:

Swing Arm Access Member Bolts: 61 Nm (45 lb-ft) (10mm)

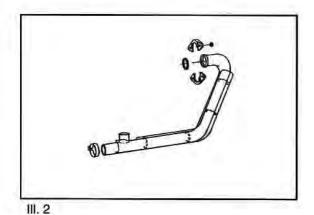
40. Install front cylinder head pipe, loosely hand tighten manifold bolts at this time. III. 2.

CAUTION:

Use new exhaust gasket for front cylinder head pipe.



III. 1



ENGINE REMOVAL AND INSTALLATION

ENGINE INSTALLATION (continued)

41. Install right, lower frame rail. III. 1.

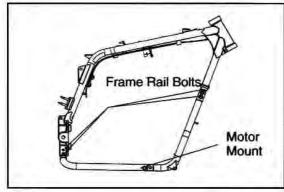
TORQUE:

Front & Rear Frame Rail Bolts: 62 Nm / 45 lb-ft (10mm)

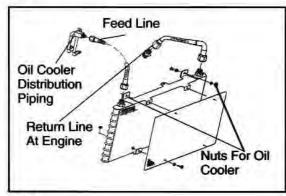
TORQUE:

Engine Mount On Frame Rail: 62 Nm / 45 lb-ft (10mm)

 Install oil cooler and oil lines. Ill. 2. NOTE: Apply lubrication to oil line fittings to aid assembly.

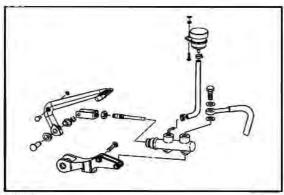


111. 1



111.2

- Install rear brake master cylinder assembly and rear master cylinder reservoir. Ill. 3.
- 44. Install tie straps for rear brake line. III. 3.

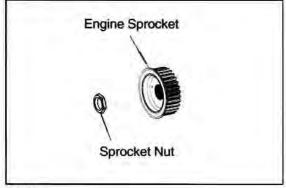


III. 3

Apply rear brake and torque engine sprocket nut.
 III. 4.

TORQUE:

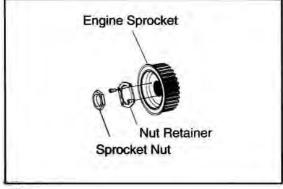
Engine Sprocket Nut: 138 Nm / 100 lb. ft.



III. 4

ENGINE INSTALLATION (continued)

- 46. Install lockplate and retaining bolts. Ill. 1.
- 47. The lockplate can be installed in various positions. Use all positions on one side and turn lockplate over to try all positions on the other side until proper alignment is achieved.
- 48. If none of the available positions align the lockplate's holes with the bolt holes in the sprocket, the sprocket nut may be tightened an additional 45°. Mark the output shaft and sprocket nut and tighten the sprocket nut in small increments until alignment of the retaining plate is accomplished.



III. 1

TORQUE:

Engine Sprocket Nut Retainer Plate Bolts: 13 Nm (115 in. lbs)

- Adjust wheel alignment and belt tension. Refer to Chapter 3 for procedure.
- 50. Install engine sprocket cover.

TORQUE:

Engine Sprocket Cover Bolts: 120 Nm (85 in. lbs)

51. Install complete exhaust system. III. 2

CAUTION:

Use new exhaust gasket for rear cylinder head pipe.

TORQUE:

Exhaust System

Exhaust Flange Stud Nuts: 16 Nm /.12 lb-ft

Muffler Bracket: 28 Nm / 20 lb-ft Muffler Clamps: 27 Nm / 20 lb-ft Crossover Clamp: 48 Nm / 35 lb ft

52. Install oil drain plug. III. 3

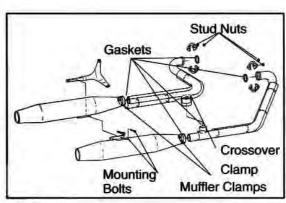
TORQUE:

Oil Drain Plug: 39 Nm (28 lb-ft)

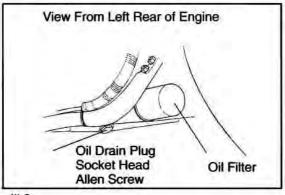
CAUTION:

Use new oil drain plug gasket.

 Fill engine with oil, refer to page 3.13 for procedure.



111.2



111.3

Polaris Sales Inc. Victory Motorcycle Division

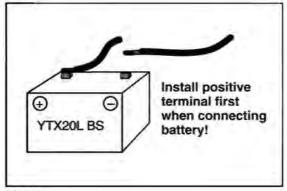
ENGINE REMOVAL AND INSTALLATION

ENGINE INSTALLATION (continued)

- 54. Connect battery. III. 1.
- 55. Install fuel tank, frame covers and seat.

NOTE: Ensure fuel supply and venting lines are properly routed and secured. Restricted vent lines may cause fuel tank damage and engine runability issues.

- 56. Inspect operation of all controls.
- 57. Start engine, inspect for oil leaks.
- Ensure that the engine RPM does not increase when the handlebars are turned side-to-side, correct if necessary. Refer to pages 3.6-3.7.
- Test ride machine, inspect for proper operation, fluid leaks, and top off oil level if necessary.



111. 1

CHAPTER 7 CYLINDER HEAD/VALVE TRAIN

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GENERAL

This section covers servicing of the cylinder head, camshafts, cam chain, cam chain followers and rocker arms. The engine must be removed to service these components. Refer to Chapter 6 for engine removal and installation.

Mark and store all mating parts for correct engine assembly.

Use Moly Assembly Paste (2871460) to lubricate the cam shafts and rocker arms during start up and engine break-in.

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 the notes concerning assembly lubrication. Many parts require pre-lube and various parts require different types of pre-lube.

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.

Cleanliness of parts is critical to engine life and accurate parts inspection. Use clean solvent and clean all disassembled parts. Blow dry parts with compressed air before engine inspection and engine assembly.

SPECIFICATIONS

Engine (General)	Engine Model Number	MCVT1507D-01
	Valve Train	Single Overhead Cam / 4 valves per cylin der/2 Intake valves / 2 Exhaust valves
	Valve Angle (Included)	38°
	Intake Valve Opens At 1 mm Lift	4° BTDC
	Intake Valve Closes At 1 mm Lift	32.5° ABDC
	Exhaust Valve Opens At 1 mm Lift	17.5° BBDC
	Exhaust Valve Closes At 1 mm Lift	19° ATDC

SPECIFICATIONS (continued)

	CYLINDER H	EAD/VALVE	
	Item	Standard	Service Limit
Cylinder Head	Warpage		0.05 mm (0.002")
	Cam Lobe Height EX		36.332 mm (1.430") 36.332 mm (1.430")
Cam Shaft	Oil Clearance	0.04 mm to 0.10 mm (0.0015	" to 0.004")
	Journal O.D.		25.95 mm (1.0216")
	Rocker Arm Bore I.D. In/Ex		18.008 mm (0.709°)
Rocker Arm & Lifter	Rocker Arm Shaft O.D. In/Ex		17.932 mm (0.706")
Hooker Aim & Lines	Rocker Arm to Rocker Arm Shaft Clearance In/Ex		0.0762 mm (0.003")
	Valve Clearance	Hydraulic/Self Adjusting	
	Valve Stem O.D. In/Ex		6.94 mm (0.2732")
	Valve Stem Deflection		0.35 mm (0.0137")
	Valve Seat Width Intake	1.2 mm ± 0.10 mm (0.048" ±	0.004")
Valve & Valve Guide & Seat	Valve Seat Width Exhaust	1.6 mm ± 0.15 mm (0.063" ± 0.006")	
	Valve Stem Runout		0.05 mm (0.002")
	Valve Head Radial Runout		0.05 mm (0.002")
	Free Length Inner In/Ex		36.65 mm (1.443")
Valve Spring	Free Length Outer In/Ex		39.92 mm (1.572")

TORQUE SPECIFICATIONS

Item	Torque Specification Nm / Lb.ft (in. lbs.)	Item	Torque Specification Nm / Lb.ft (in. lbs.)
Valve Cover Bolts	18 Nm (150 in-lbs)	Spark Plug	17 Nm / 12 lb-ft
Fuel Rail Retaining Bolts	13 Nm (115 in-lbs)	Spark Plug Sleeve Bolts	8 Nm (65 in-lbs)
10 mm Cylinder Head Nuts	58 Nm / 40 lb-ft	Cam Drive Cover Retaining Bolts	18 Nm (150 in-lbs)
8 mm Cylinder Head Nuts	30 Nm / 22 lb-ft	Cam Chain Guide Bolts (Fixed Guide)	12 Nm (100 in-lbs)
Cooling Cavity Pipe Plug	9 Nm (75 in-lbs)	Cam Chain Guide Bolts (Rotating)	12 Nm (100 in-lbs)
Cam Bore Plugs	43 Nm / 30 lb-ft	Cam Chain Tensioner Body	13 Nm (115 in-lbs)
Cam Sprocket Bolts	13 Nm (115 in-lbs)	Cam Chain Tensioner Cap	12 Nm (100 in-lbs)
Throttle Body Clamp	2.4 Nm (20 in-lbs)	Oil Feed Plugs (Lifter)	12 Nm (100 in-lbs)
Cam Carrier Studs	21 Nm / 15 lb-ft	Camshaft Plug	12 Nm (100 in-lbs)
Cam Carrier Nuts	36 Nm / 25 lb-ft	Exhaust Studs	20 Nm / 15 lb ft
Oil Out Manifold Bolts	22 Nm (180 in-lbs)	Oil Temperature Sensor	21 Nm / 15lb ft

SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER
Valve Spring Compressor (compressor adapter)	PV-1253, or PV-4019, (PV-43513)
Valve Guide Remover	N.A.
Valve Guide Installer	N.A.
Valve Seal Remover	N.A.
Valve Seat Reconditioning Kit	N.A.
Micrometer (0–25mm)	PV-3006
Surface Gauge	Commercially Available
Dial Indicator (10mm travel)	PV-26900-12
Dial Indicator Base	Commercially Available
Dial Caliper	PV-26900-7
1/4" Drive in-lb Torque Wrench	Commercially Available
3/8" Drive lb-ft Torque Wrench	PV-43564
Leak-down Gauge	PV-35667-A
Compression Gauge	PV-33223
Plastigauge [®]	Commercially Available

TROUBLESHOOTING

Cylinder head, valve train and piston/cylinder problems are usually related to engine compression, external fluid leaks, excessive use of oil or abnormal noises. Troubleshooting involve the use of a leak down or compression gauge, searching for the cause of the fluid leak, or listening to the engine with a stethoscope to determine sources of abnormal noise.

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Hard Starting or will not	Compression too low	Lifter(s) locked	Replace lifter(s)
start. Excessive Lifter Noise.		Collapsed hydraulic lift- er(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.
		Wom Valve Guide(s)	Replace valve guide(s).
		Poor seating of valve(s)	Repair or replace
	1	Broken valve springs	Replace
		Spark plug not seated correctly	Torque to specifications
		Incorrect valve timing	Repair
		Valve stuck open	Repair
		Leaking cylinder head gasket	Repair
		Slow starter motor	See electrical section
		Worn cylinder, pistons and/or rings.	See cylinder/piston section
		Ignition problem	See ignition section
		Fuel problem	See F.I. section
Electric Starter straining to turn engine over Abnormal pre-ignition	Compression too high	Excessive carbon build- up in combustion cham- ber.	Use "Carbon Clean" fuel system additive or disassemble engine to de-carbon combustion chamber.
Engine idles poorly	Low compression	Collapsed hydraulic lift- er(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

TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Engine idles poorly	Oil in combustion cham-	Valve guides	Replace
	ber	Wom cylinder, pistons and/or rings.	See cylinder/piston sec- tion
		Engine overfilled with oil	Correct
	Ignition misfire	Ignition system	See ignition system section
	Rich/lean fuel mixture	F.I. system	See F.I. system
	Air leak	Mounting surfaces, hoses	Correct
	Valves not opening fully	Cam shaft or rocker arms worn	Replace
Engine noise	Valve Train area	Collapsed hydraulic lift- er(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)
1		Broken or weak valve springs	Replace
		Worn camshaft or rocker arms	Replace
		Roller bearing damage on rocker arm	Replace
		Worn or damaged cam- shaft journal	Replace
	Piston/Cylinder area	Worn pistons and/or cyl- inders	Replace
		Excessive carbon build- up in combustion cham- ber	Clean
		Wom piston pin, piston pin bore and/or small end of connecting rod	Replace
3		Worn piston rings or pis- ton ring lands.	Replace

TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Engine noise	Timing chain area	Stretched chain	Replace
		Worn sprockets	Replace
		Tensioner not working	Replace
	Primary cover area	Clutch	See Clutch section
		Flywheel	See Charging section
	l	Starter system	See Starter section
		Torque compensator	See Clutch section
	Bottom End area	Main bearings	See Crankshaft section
		Rod bearings	See Crankshaft section
		Loose side clearance	See Crankshaft section
	Transmission area	Bearings	See Transmission
		Misplaced circlips	See Transmission
		Incorrect side clearance	See Transmission
Poor high speed running	Valve float	Weak valve springs	Replace
	Insufficient valve travel	Worn camshaft/rocker arms	Replace
	Valves opening & closing at wrong time	Valve timing incorrect	Correct
	Ignition problem		See ignition section
	F.I. system problem		See F.I. section
	Air intake problem	7. 7. 7. 7. 1	See F.I. section & main- tenance section
Lack of power in all RPM ranges	Incorrect valve clearance	Hydraulic lifter bleeding down	Replace
	Lifter(s) locked	Debris in lifter	Replace lifter(s)
	Collapsed hydraulic lift- er(s). Lifter extremely noisy.	Air trapped in lifter. Noise will stop after 10-15 minutes of high idle operation. If will not bleed, replace lifter.	
	Valve float	Weak valve springs	Replace
	Valves opening & closing at wrong time	Valve timing incorrect	Correct

TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Lack of power in all RPM ranges	Insufficient valve travel	Worn camshaft/rocker arms	Replace
	Low compression	Worn piston, rings, cylin- der	Replace
	Low compression	Poor valve seating	Repair/replace
	Ignition problem		See ignition section
	F.I. problem		See F.I. section
	Air intake problem		See F.I. or maintenance section
	Oiling problem	Too much oil	Correct
	Vacuum leak	Mounting surfaces, hoses	Correct
Using/Burning oil	Oiling problem	Too much oil	Correct
	Oil past rings	Worn or damaged piston, rings, cylinder	Replace
	Oil past valve guides	Worn valve guides	Replace
	1.1.1.2.1.2.1.1.1.1.1.1.1.1.1.1.1.1.1.1	Worn valve guide seals	Replace

EXTERNAL INSPECTION

See Maintenance Section for engine compression inspection procedures.

Refer to manufacturer's instructions provided with leakage tester to inspect cylinder leakage.

CYLINDER HEAD DISASSEMBLY

- 1. Remove engine from frame. Refer to Chapter 6.
- 2. Attach the engine to an engine stand.

SPECIAL TOOL:

Engine Stand: Commercially Available

- Remove intake manifold if not previously removed. III. 2.
- Remove spark plugs from front & rear cylinders. III. 2.

 Remove cylinder head oil cooler pipes. O-rings will tend to stay in the manifolds. Remove them and replace with new O-rings during assembly. Ill. 3.

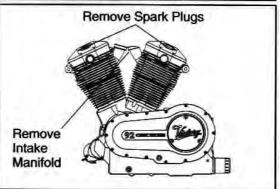


Place a clean shop towel in the cavity below the cam drive sprocket.

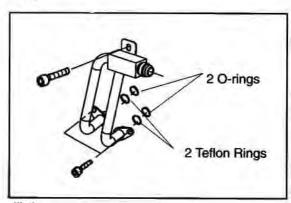
CAUTION

Any debris or engine parts dropped into the lower crankcase will require complete engine disassembly to retrieve such items. Make sure you cover the cavity below the cam drive sprocket.

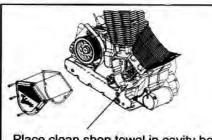




111.2



III. 3



Place clean shop towel in cavity below cam chain drive sprocket to prevent debris from entering bottom end of engine.

111. 4.

CYLINDER HEAD DISASSEMBLY (continued)

- Rotate spark plug tubes 30° to 45° until one of the mounting tabs is exposed.
- Place a small pry bar under the spark plug tube ear and gently pry it up until the O-ring is released and the spark plug tube can be removed.
- Remove valve cover bolts, remove valve covers.

NOTE: Inspect hydraulic lifters at this time. Refer to page 7.13.

 Remove front cylinder cam chain tensioner spring cap and spring.

NOTE: For consistency, these procedures will start with the front cylinder for all disassembly and end with the front cylinder during assembly.

NOTE: It is not necessary to disassemble both cylinder heads or cylinders if only one (front or rear) needs to be disassembled. However, this manual will cover disassembly of both the front and rear cylinder heads and cylinders for all procedures.

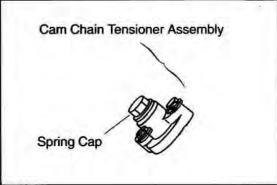
- Rotate engine in clockwise direction (viewed from right side of engine) until cam sprocket bolts can be accessed. Loosen both bolts 1/4 to 1/2 turn.
- Rotate engine in clockwise direction until front cylinder is at TDC on the compression stroke.

NOTE: The compression stroke can be determined by installing a spark plug (finger tight) in the front cylinder. Rotate engine until compression resistance is felt. Remove spark plug and continue rotating engine until TDC mark is aligned.

NOTE: Top Dead Center is located using 2–8mm holes in the cam sprocket and the woodruff key on the camshaft drive sprocket. Refer to page 7.34.

- Remove both cam chain sprocket bolts.
- Move sprocket and chain off cam shaft, lower chain until it can be removed from the lower sprocket.





111.2

CYLINDER HEAD DISASSEMBLY (continued)

- Once chain is free of the lower sprocket lift chain and sprocket out of engine. III. 1.
- Remove rocker arm carrier nuts 1/2 turn at a time (in a cross pattern) until loose. Ill. 2.

CAUTION

The valve springs are under considerable tension and may distort the rocker arm carrier if the camshaft is not positioned at the T.D.C. position before removal.

- 18. Remove rocker arm carrier nuts & washers.
- 19. Remove rocker arm carrier from cylinder head.

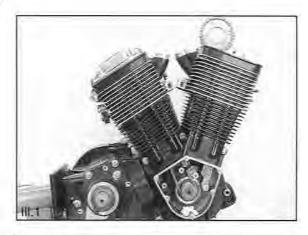
CAUTION

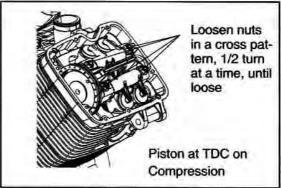
Keep rocker arm shafts and rocker arms together. Do not interchange mated parts.

NOTE: Rocker arm carrier is marked "F" for front cylinder. If mark is not visible, use a permanent marker to identify the part for assembly purposes.

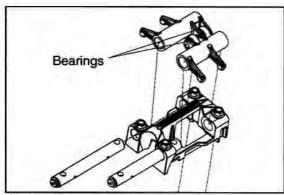
ROCKER ARM SHAFT/ROCKER ARM INSPECTION

- Visually inspect rocker arms and rocker arm shafts for excessive wear, scoring or damage. Replace as necessary.
- Inspect all oil passages for debris, clean as necessary.
- Rotate bearing on rocker arm, inspect for smooth movement and excessive play. Replace rocker arm assembly as necessary. Ill. 3.





111.2



III. 3

ROCKER ARM SHAFT/ROCKER ARM INSPECTION (continued)

4. Measure O.D. of each rocker arm shaft. III. 1.

SPEC:

Rocker Arm Shaft O.D.

Service Limit: 17.932 mm (0.706")

5. Measure I.D. of each rocker arm. III. 2.

SPEC:

Rocker Arm I.D.

Service Limit: 18.008 mm (0.709")

Subtract rocker arm shaft O.D. from its matching rocker arm I.D. to determine rocker arm shaft-to-rocker arm clearance.

SPEC:

Rocker arm-to-rocker arm shaft clearance, Service Limit: 0.0762 mm (0.003")

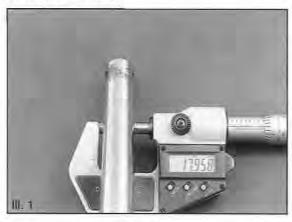
7. Replace any parts worn beyond service limits.

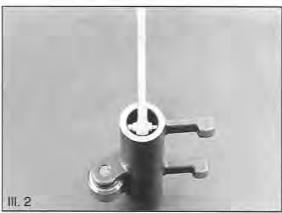
CAMSHAFT INSPECTION

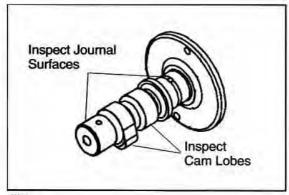
 Visually inspect camshaft journal surfaces for scoring or signs of insufficient lubrication. Replace camshaft if heavy scoring or damage is noted.

CAUTION

If camshaft requires replacement, replace both rocker arms and camshaft as a set.







111.3

CAMSHAFT INSPECTION (continued)

Use micrometer to inspect height of each cam lobe. III. 1.

SPEC:

Intake Cam Lobe Height Service Limit: 36.32 mm (1,430")

SPEC:

Exhaust Cam Lobe Height Service Limit: 36.32 mm (1.430")

3. Measure O.D. of each camshaft journal. III. 2.

SPEC:

Camshaft Journal O.D. Service Limit: 25.95mm (1.0216")

- Clean all oil from camshaft journals and cam bearing area on head and rocker arm carrier.
- Place camshaft onto head, place strip of Plastigauge[®] on each camshaft journal (lay the Plastigauge[®] lengthwise and at the top of the journal). Ill. 3.

CAUTION

Do not rotate the camshaft during this procedure!

 Install the rocker arm carrier onto the head. In a crisscross pattern, tighten the nuts in 2 steps to proper torque (1st 1/2 torque, then full torque). Ensure that the cam lobes are in the T.D.C. position with the cam lobes pointing to 5 & 7 O'clock position. III. 4.

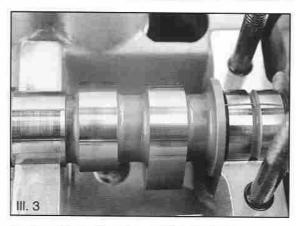
TORQUE:

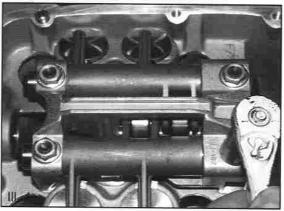
Rocker Arm Carrier Nuts: 36 Nm / 25 ft-lbs

 Remove the rocker arm carrier slowly and carefully. Loosen the nuts in a crisscross pattern, 1/2 turn at a time until the nuts are loose.









CAMSHAFT INSPECTION (continued)

Use the measuring scale on the Plastigauge[®] wrapper to measure the thickness of the Plastigauge[®]. III. 1.

NOTE: Use the widest part of the Plastigauge® to determine the oil clearance

SPEC:

Camshaft Journal Oil Clearance Service Limit: Not less than 0.025 mm (0.0015") Not more than 0.10 mm (0.004")

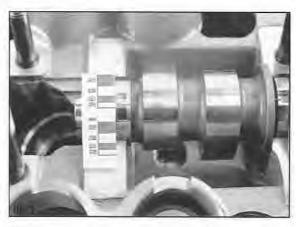
- If service limits are exceeded, replace the camshaft and recheck the oil clearance.
- Replace the cylinder head and rocker arm carrier if the clearances are still out of specification when measurement is taken with new camshaft installed.

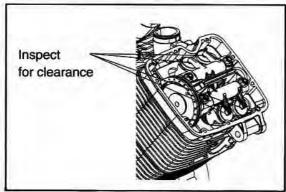
HYDRAULIC TAPPET INSPECTION

- Rotate engine until piston is at T.D.C. on the compression stroke.
- Inspect for clearance between the rocker arm and lifter(s). Ill. 2.
- Repeat for other cylinder.
- If clearance is evident, the lifter(s) should be replaced.
- Inspect tappet for excessive wear or damage. Replace as necessary.

CAM CHAIN TENSIONER INSPECTION

- Remove cam chain tensioner. Refer to page 7.9.
- Visually inspect spring, replace if necessary. III. 3.
- Inspect pin for ratchet pawl. If pin is loose, replace tensioner assembly. III. 3.
- Inspect small spring for ratchet pawl. If broken or missing, replace tensioner assembly. III. 3.
- Inspect rack for unusual wear, replace if necessary. III. 3.
- When replacing, use new gasket and sealing washer. III. 3.





111.2



CYLINDER HEAD REMOVAL

- Remove front, upper retaining bolt for cam chain guide. III. 1.
- 2. Remove lower cam chain guide bolt. III. 1.
- 3. Remove cam chain guides. III. 1.
- Loosen the cylinder head nuts 1/4 turn at a time, in a crisscross pattern, until loose. III. 2.
- 5. Remove cylinder head nuts & washers. III. 2.
- 6. Remove cylinder head.

CAUTION

Careless handling of the cylinder head or cylinder gasket surfaces can cause irreparable damage. Handle these parts with care.

7. Remove the cylinder head gasket.

CYLINDER HEAD DISASSEMBLY

NOTE: Mark and store all parts with their mating parts during disassembly to ensure all parts are assembled in their original locations.

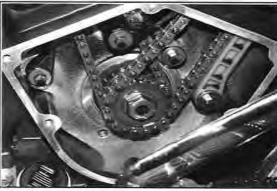
 Remove the valve keepers using a valve spring compressor, adapter and pencil magnet. Ill. 3.

CAUTION

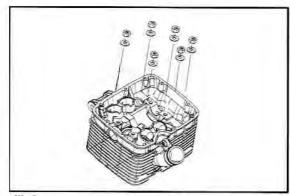
Do not reuse valve keepers!

SPECIAL TOOL:

Valve Spring Compressor & Adapter PV-43513



III. 1



III. 2



CYLINDER HEAD DISASSEMBLY (continued)

- Remove valve valve spring compressor. Remove retainers, springs and valves. III. 1.
- 3. Remove valve spring seats. Ill. 1.
- 4. Remove valve guide seals. III. 1.

SPECIAL TOOL:

Valve Guide Seal Remover: PV-43510

CAUTION

Do not reuse valve guide seals!

CAUTION

Take precautions that the valve seating surfaces or gasket surfaces are not damaged by careless handling.

- Remove carbon deposits from combustion chamber.
- Remove head gasket material from both cylinder and cylinder head.

CYLINDER HEAD INSPECTION

- Visually inspect the cylinder head for cracks (especially around the spark plug).
- Inspect cylinder head for warpage with a straight edge and feeler gauge. Ill. 2.

SPEC:

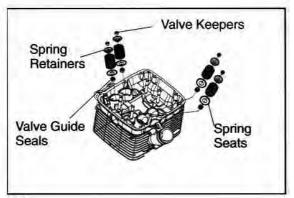
Cylinder Head Distortion Service Limit: 0.05mm (0.002")

Measure free length of inner and outer valve springs. III. 3.

NOTE: Intake and exhaust springs are identical.

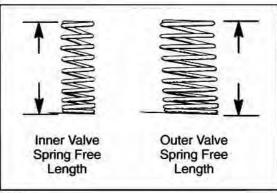
SPEC:

Valve Spring Free Length Service Limit: Inner 37.9 mm (1.492") Outer 41.0 mm (1.614")



111.1





111.3

CYLINDER HEAD INSPECTION (continued)

 Place valves on V-blocks as shown and measure valve stem run-out. If specifications are exceeded, replace the valve(s). Ill. 1.

SPEC:

Valve Stem Run-out Service Limit: 0.05 mm (0.002")

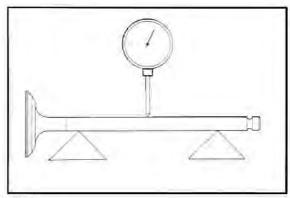
Inspect the valve face for burning, pitting or uneven contact.

NOTE: Valves cannot be ground. If valve face is burned or badly worn, replace the valve.

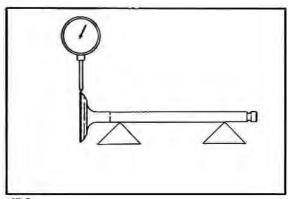
Place valves in V-block as shown in III. 2 and inspect valve head radial runout. If run-out exceeds service limit, replace the valve(s).

SPEC:

Valve Head Radial Run-out Service Limit (Intake & Exhaust): 0.05 mm (0.002")



III. 1



111.2

CYLINDER HEAD INSPECTION (continued)

- Insert the valves into their original locations in the cylinder head.
- Inspect that each valve moves up and down smoothly without binding.
- Measure valve stem deflection for each valve to determine if either the valve or valve guide requires replacement.
 - A. Raise valve 10 mm (0.400") off of seat.
 - Position dial indicator as shown (III. 1). Measure deflection in two directions perpendicular to each other (X & Y axis).



Valve Stem Deflection Service Limit (Intake & Exhaust): 0.35 mm (0.0137")

 If the valve deflection exceeds the service limit measure the valve stem. III. 2.



Valve Stem O.D.

Intake

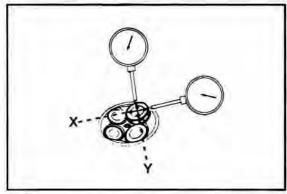
Standard: 6.955-6.970 mm

Exhaust

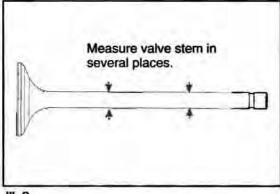
Standard: 6.945-6.960 mm

- Replace the valve and repeat step 10 if the valve stem O.D. measures outside the standard range.
 If valve stem deflection exceeds service limits with a new valve installed, the valve guide must be replaced.
- If the valve stem measures correctly and the deflection is incorrect, the valve guide must be replaced.

NOTE: Installation of new valve guides and/or new valves requires valve seat reconditioning.



111.1



III. 2

INSTALLING NEW VALVE GUIDES

CAUTION

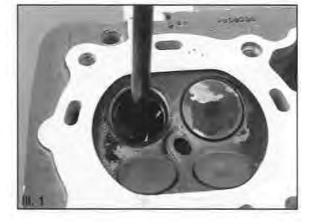
Replacement of valve guides requires an oven, special tools and some experience to do the job correctly. If you are unsure of your ability to do the repair professionally it may be best to sublet the labor to a competent machinist.

 Support cylinder head and place valve guide remover into valve guide from the combustion chamber side. III. 1.

SPECIAL TOOL:

Valve Guide Remover / Installer: PV-43512

2. Drive old valve guides out of the cylinder head. Ill. 1



CAUTION

The cylinder head can be easily damaged if the procedure is done carelessly.

LUBRICANT:

Valve Guide Installation: 90W Gear Lubricant

- Apply 90 weight oil to the outside of the new valve guides.
- Drive in new valve guides from the camshaft side of the head. Drive the valve guides in until they seat. III. 2.



INSTALLING NEW VALVE GUIDES (continued)

Ream new valve guides using special tool. III. 1

SPECIAL TOOL:

Valve Guide Reamer: Commercially Available

CAUTION

Do not tilt the reamer while reaming the guide. This will cause the valve to be positioned at an angle to the valve seat which can cause oil leaks and poor valve seat contact.

Insert the reamer from the combustion side of the head.

Always rotate the reamer in a clockwise direction.

- 6. Clean cylinder head thoroughly with clean solvent.
- 7. Recondition the valve seat, refer to the next section.

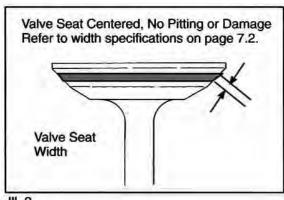


VALVE SEAT INSPECTION

- 1. Clean all carbon deposits off valves and valve seats.
- 2. Inspect the valve face for burning, pitting or uneven contact. III. 2.

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
- Install the valve into its respective valve guide.
- 5. Tap the valve several times to make a clear impression on the valve face. Do not rotate valve!
- Remove valve and inspect its contact area.
- 7. Using the chart on the next page, determine if any corrective action is necessary. If so, follow the instructions provided.



III. 2

VALVE INSPECTION

	VALV	/E 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° cutter
Contact area too low		Wear, settling of valve seat	Raise with 60° cutter
Contact area too wide	~	Wear, settling of valve seat	Narrow with both 30° cutter and 60° cutter
Contact area too narrow			Use 45° cutter
Contact area free of pitting and damage, centered in seat, proper width.		Correct	None

VALVE SEAT RECONDITIONING

NOTE: Follow the recommendations of the manufacturer of the valve seat reconditioning tools that are being used.

SPECIAL TOOL:

Valve Seat Reconditioning Kit: Commercially Available

NOTE: Ensure that the seats are not cut more than absolutely necessary.

Valve Seat Too High, Seat Must Be Lowered (III. 1)

NOTE: The valve seat contact area must be inspected after each cut. Use Prussian Blue as outlined on page 7.19.

- Using 45° cutter, dress the seat lightly with one or two turns. Ill. 2.
- Using the 30° (intake) or 25° (exhaust) cutter, lower the seat one or two turns and inspect the seat contact area. III. 2.
- Continue using the 30° or 25° cutter until the contact area is in the middle of the valve face.
 2
- Use the 45° cutter to bring the valve seat to specified width. III. 2.

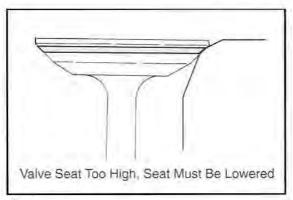


Valve Seat Width:

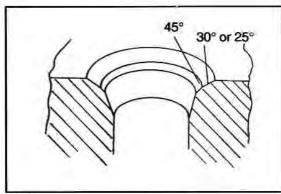
Intake 1.2 mm (.048") Exhaust 1.6 mm (.063")

Refer to Page 7.2 for tolerance range

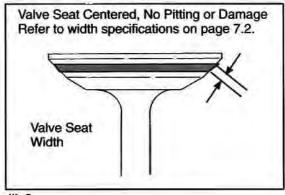
Inspect the width of the valve seat. The valve seat must be uniform in width all the way around the circumference of the valve with no pitting or irregularities on the seat. III. 3.



III. 1



111.2

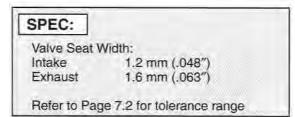


III. 3

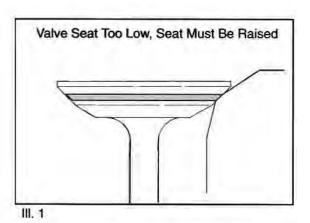
Valve Seat Too Low, Seat Must Be Raised (III. 1)

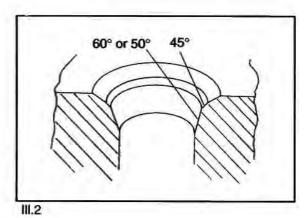
NOTE: The valve seat contact area must be inspected after each cut. Use Prussian Blue as outlined on page 7.19.

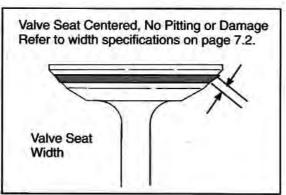
- Using 45° cutter, dress the seat lightly with one or two turns, III. 2.
- Using the 60° (exhaust) or 50° (intake) cutter, dress the seat one or two turns and inspect the seat contact area. Ill. 2.
- Continue using the 60° or 50° cutter until the contact area is in the middle of the valve face. III.
 2.
- Use the 45° cutter to bring the valve seat to specified width. III. 2.



Inspect the width of the valve seat. The valve seat must be uniform in width all the way around the circumference of the valve with no pitting or irregularities on the seat. III. 3.





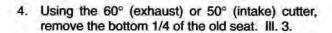


111.3

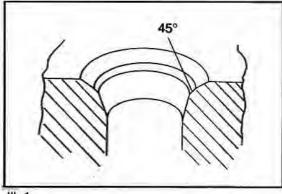
New Valve Guide Installed or Valve Seat Requires Complete Reconditioning

NOTE: The valve seat contact area must be inspected after each cut. Use Prussian Blue as outlined on page 7.19.

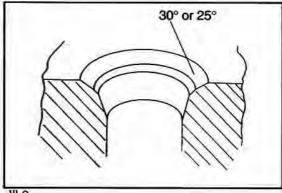
- Using 45° cutter, remove any roughness or irregularities from the seat, III. 1.
- Inspect the seat often (after every one or two turns of the cutter) and continue to cut the seat until the seat is completely uniform.
- Using the 30° (intake) or 25° (exhaust) cutter, remove 1/4 of the existing valve seat material. III.
 2.



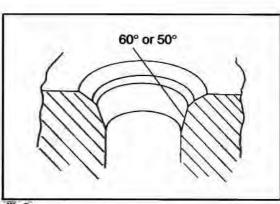
Use the 45° cutter to bring the valve seat to specified width. III. 4.



111. 1



111.2

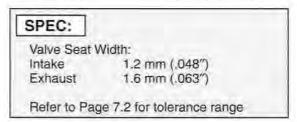


45°

III. 4

New Valve Guide Installed or Valve Seat Requires Complete Reconditioning, (cont.)

Inspect the width of the valve seat. The valve seat contact area must be uniform in width all the way around the circumference of the valve with no pitting or irregularities on the seat. III. 1.

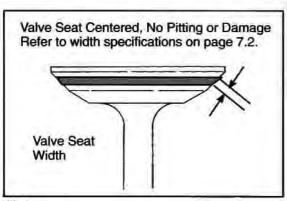


NOTE: Ensure that the seats are not cut more than absolutely necessary.

CAUTION

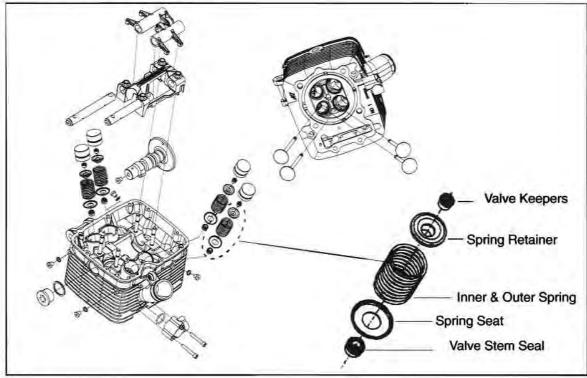
Do not use lapping compound after the valve seat(s) are cut. The finish left by the valve seat reconditioning kit leaves a surface that provides for almost instantaneous seating when the engine first starts.

- Wash the cylinder head of all metal cuttings in clean solvent.
- Dry the components thoroughly with compressed air.
- Assemble the head, refer to page(s) 7.25-7.28.
- Fill the intake and exhaust ports with clean solvent and inspect for leaks around the valve seating area.
- 11. After 15-30 seconds some seepage is normal when using the correct procedure for carbide cutters. If leaks are evident immediately after filling with solvent, disassemble the head and inspect for the cause; then correct.



III, 1

CYLINDER HEAD ASSEMBLY



111.1

CAUTION

Ensure that all components meet specifications and are thoroughly clean.

- 1. Install valve spring seats. III. 1.
- Apply engine oil to the lower lip of the valve guide seals.

LUBRICANT:

Victory 20W/40 Semi-Synthetic Motorcycle Oil

Using a 10mm deep-well socket, drive the valve guide seals into place. Ill. 2.

CAUTION

Ensure that the 10mm socket is extremely clean.



CYLINDER HEAD ASSEMBLY (Continued)

4. Lubricate valve stems with assembly lube. III. 1.

LUBRICANT:

Moly Assembly Paste: 2871460

- Insert valve into the valve guide. Turn the valve slowly when inserting to prevent damage to the valve stem seal.
- 6. Install the valve spring.

NOTE: The valve springs are not progressively wound. Their orientation (up or down) is not critical.

7. Install top valve spring retainer.

CAUTION

Support the cylinder head so the head of the valves are clear of anything that can cause damage.

CAUTION

Do not compress the valve springs more than necessary or loss of valve spring pressure may result.

CAUTION

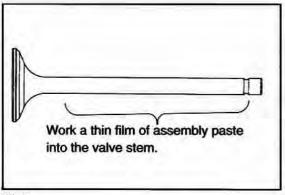
The valve spring compressor adapter travels down into the lifter bore. Use care not to damage the lifter bore in any way.

Compress the valve springs using a valve spring compressor and adapter. Ill. 3.

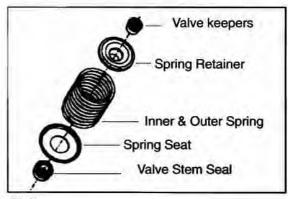
SPECIAL TOOL:

Valve Spring Compressor With Adapter: PV-43513

- Apply a small amount of thick, heavy grease to both sides of a valve keeper. III. 3.
- "Glue" a valve keeper onto a small screw driver with the grease. Ill. 3.
- Insert the valve keepers in place on the valve. III.
 3.
- Remove the valve spring compressor.
- 13. Repeat steps 8-12 for the remaining valves.
- After all valve keepers have been installed, place a socket over the valve spring retainer and lightly tap the socket. This will ensure that the keepers are seated correctly. Ill. 4.

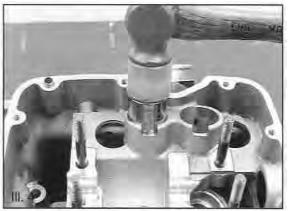


III. 1



III. 2





CYLINDER HEAD ASSEMBLY (Continued)

- 15. Lubricate the lifters and lifter bores with engine oil.
- 16. Install the lifters.
- Lubricate the front camshaft (marked "F") journals and lobes with assembly lube.
- Install the camshaft with the lobes pointing down (5 & 7 O'clock position). III. 1.
- Lubricate the rocker arm shafts and rocker arms with assembly lube.



Moly Assembly Paste: 2871460

- 20. Oil the rocker arm bearings with engine oil.
- Install rocker arm shafts & rocker arms into rocker arm carrier.
- Install rocker arm assembly (notch goes towards the spark plug).
- Tighten the nuts in a cross pattern 1/2 turn at a time until the assembly is seated.
- 24. Torque rocker arm carrier to specified torque. Ill. 2.

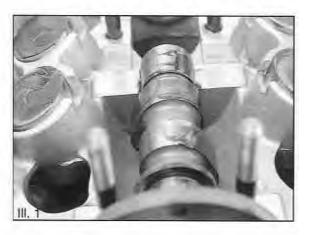


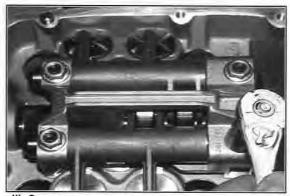
Rocker Arm Carrier: 36 Nm (25 ft-lbs)

- Ensure that the cylinder head and cylinder gasket surfaces are clean.
- 26. Install front head gasket. III. 3.

CAUTION

Ensure that cylinder head alignment dowels are properly positioned.



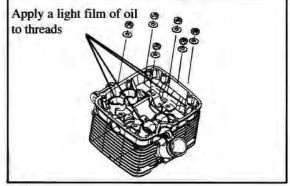


III. 2



CYLINDER HEAD ASSEMBLY (Continued)

- 27. Install the front cylinder head.
- 28. Install washers onto cylinder studs. Ill. 1.
- Install the nuts onto cylinder studs. Apply a light film of oil to the stud threads. III. 1.
- Tighten all cylinder head nuts following the pattern below to 35 Nm / 25 lb-ft.
- Back off 1/4 turn then torque cylinder head nuts 1-4 to 58 Nm / 40 lb-ft. following the pattern shown below.



111.1

TORQUE:

Cylinder Head

(Refer to III. 3 below)

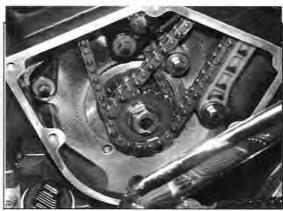
1st - torque all to 34 Nm / 25 lb. ft.

2nd – back of 1/4 turn then torque nuts 1-4 to 58Nm / 40 lb. ft.

- 32. Re-torque 8mm nuts.
- Install the cam chain tensioner blade for the rear cylinder. Ill. 2.
- Install the cam chain slipper for the rear cylinder. III.2.
- 35. Repeat the procedure for the rear cylinder head.

TORQUE:

All Chain Guide Bolts: 12 Nm (100 in-lbs)

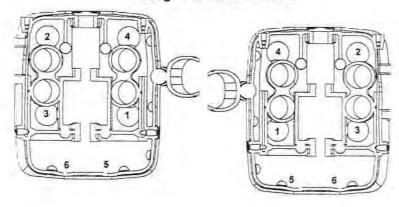


111.2

Cylinder Head Torque Pattern

Step #1 Torque 1 through 6 to 35 Nm / 25 lb ft

Step #2 Back off 1/4 turn then torque 1 through 4 to 58 Nm / 40 lb ft



CAMSHAFT TIMING

NOTE: If both front and rear camshafts were removed, start the timing procedure with the rear cylinder as described below.

NOTE: If you are only servicing one cylinder, both head covers must be removed so the other camshaft position can be observed.

NOTE: This engine is "free-wheeling" in that the pistons cannot hit the valves even if the valves are are open and the piston is at Top Dead Center (TDC).

REAR CYLINDER CAMSHAFT TIMING

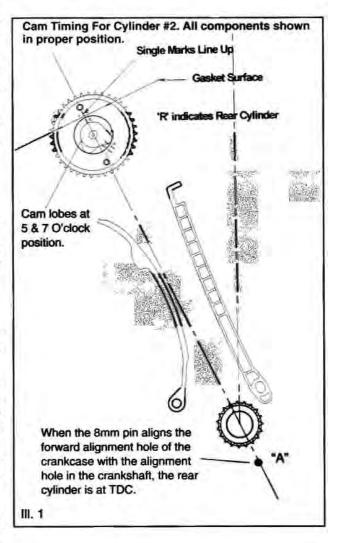
 Rotate engine in clockwise direction (viewed from the right side of the engine) until rear cylinder's piston is at TDC. Cam lobes must be in the 5 and 7 O'clock position as shown in III. 1 (right) and in III. 1 on page 7.27 (top photo).

CAUTION

The engine is difficult to rotate "backwards" (counter clockwise) when the starter motor is in place. Only rotate the engine in a clockwise direction.

LOCATING T.D.C.: As the rear cylinder's piston nears TDC, insert an 8 mm pin into the forward locating hole (labeled as "A" in illustration 1) of the crankcase. While slowly rotating the engine, push the 8 mm pin in until it drops into the 8 mm locating hole in the crankshaft. When the 8 mm pin can be inserted into the locating hole of the crankshaft, the rear cylinder's piston is at TDC.

- Temporarily install the carn chain sprocket onto the carn shaft with one bolt. The two lines on the sprocket must align with the top of the cylinder head. If they do not, move the carn shaft slightly in the necessary direction until the lines are properly positioned. Remove the sprocket.
- Place the cam chain over the top sprocket and lower the cam chain down the cam chain cavity. Place the cam chain onto the drive sprocket.
- Install the upper cam chain sprocket onto the camshaft.
- The front of the chain should be taunt (drive side) and the slack should be on the rear of the chain when inspecting for correct camshaft timing.



REAR CYLINDER CAMSHAFT TIMING (Continued)

- Do not move the crankshaft from its T.D.C. position. The camshaft is in the proper position when:
 - A. The crankshaft is positioned at T.D.C. for the rear cylinder.
 - B. The alignment marks on the camshaft sprocket align with the top surface of the cylinder head when the sprocket bolts are inserted.
 - C. Slack is taken up on the front of the chain.
- If necessary, reposition the sprocket in the chain until the bolt holes line up. Do not move the crankshaft or the camshaft to align the holes.
- 8. Install the camshaft sprocket bolts.

NOTE: No lock washers, locking tab or locking agent is used or required.

- Torque the accessible cam shaft sprocket bolt to specifications while holding the crankshaft in position.
- 10. Remove 8 mm locating pin.

TORQUE:

Cam Shaft Sprocket Bolt: 13 Nm (115 in-lbs)

 Install the cam chain tensioner, spring and cap bolt.

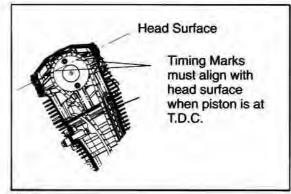
TORQUE:

Cam Chain Tensioner Bolts: 13 Nm (115 in-lbs)

TORQUE:

Cam Chain Tensioner Cap Bolt: 12 Nm (100 in-lbs)

- Rotate engine until remaining cam shaft sprocket bolt can be accessed. Torque to specification.
- Rotate engine until rear cylinder is again at T.D.C. on the compression stroke. Recheck work to ensure that camshaft timing for rear cylinder is correct.



111.1

FRONT CYLINDER CAMSHAFT TIMING

 With the rear cylinder at T.D.C. on the compression stroke, rotate the engine clockwise (viewed from right side of the engine) 410° and place the front cylinder's piston at T.D.C.

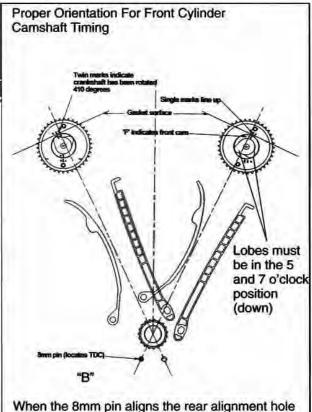
NOTE: Cam lobes must be in the 5 and 7 O'clock position as shown in III. 1 (right) and in III. 1 on page 7.27 (top photo).

CAUTION

The engine is difficult to rotate "backwards" (counter clockwise) when the starter motor is in place. Only rotate the engine in a clockwise direction.

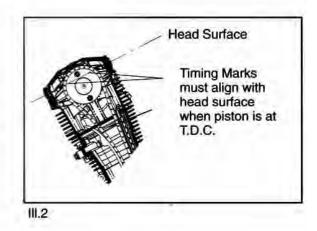
LOCATING T.D.C.: As the front cylinder's piston nears TDC, insert an 8 mm pin into the rear locating hole (labeled as "B" in illustration 1) of the crankcase. While slowly rotating the engine, push the 8 mm pin in until it drops into the 8 mm locating hole in the crankshaft. When the 8 mm pin can be inserted into the locating hole of the crankshaft, the front cylinder's piston is at TDC.

- Temporarily install the cam chain sprocket onto the cam shaft with one bolt. The two lines on the sprocket must align with the top of the cylinder head. If they do not, move the cam shaft slightly in the necessary direction until the lines are properly positioned. Remove the sprocket.
- Place the cam chain over the top sprocket and lower the cam chain down the cam chain cavity. Place the cam chain onto the drive sprocket.
- Install the upper cam chain sprocket onto the camshaft.
- The front of the chain should be taunt (drive side) and the slack should be on the rear of the chain when inspecting for correct cam shaft timing.
- Do not move the crankshaft from its T.D.C. position. The camshaft is in the proper position when:
 - A. The crankshaft is positioned at T.D.C. for the front cylinder.
 - B. The alignment marks on the camshaft sprocket align with the top surface of the cylinder head when the sprocket bolts are inserted.
 - C. Slack is taken up on the front of the chain.
- If necessary, reposition the sprocket in the chain until the bolt holes line up. Do not move the crankshaft or the camshaft to align the holes.



When the 8mm pin aligns the rear alignment hole of the crankcase with the alignment hole in the crankshaft, the front cylinder is at TDC.

III. 1



CYLINDER HEAD/VALVE TRAIN

FRONT CYLINDER CAMSHAFT TIMING (continued)

8. Install the cam shaft sprocket bolts. Ill. 1.

NOTE: No lock washers, locking tab or locking agent is used or required.

- Torque the accessible cam shaft sprocket bolt to specifications while holding the crankshaft in position.
- 10. Remove 8 mm locating pin.



Cam Shaft Sprocket Bolt: 13 Nm (115 in-lbs)

 Install the cam chain tensioner, spring and cap bolt. III. 2.

TORQUE:

Cam Chain Tensioner Bolts: 13 Nm (115 in-lbs)

TORQUE:

Cam Chain Tensioner Cap Bolt: 12 Nm (100 in-lbs)

- Rotate engine until remaining camshaft sprocket bolt can be accessed. Torque to specification.
- Rotate engine until front cylinder is again at T.D.C. on the compression stroke. Recheck work to ensure that camshaft timing for rear cylinder is correct.

VALVE COVER INSTALLATION

1. Install the valve cover gaskets.

NOTE: The front and rear valve cover gaskets are not interchangeable. Proper orientation is determined by their ability to fit around the spark plug cut-out on the cylinder head.

Install the valve covers. Do not bolt them in place at this time.

NOTE: The front and rear valve covers are not interchangeable.





VALVE COVER INSTALLATION (continued)

3. Install the valve cover retaining bolts. Ill. 1.

NOTE: The two 6 x 30mm bolts are installed where the dowel pins are located. The rest are 6 x 25mm. Ill. 1.

 Tighten the valve bolts in a cross pattern, first to 1/2 torque then to final torque.



Valve Cover Bolts: 18 Nm (150 in-lbs)

- Inspect the O-rings on the spark plug tubes. Replace if damaged. Damaged O-rings may leak oil. See III 2a and 2b.
- Apply light weight grease to the O-rings on the spark plug tubes and install them in place.
- Position the spark plug tubes in place and push them as far down as they will go. Strike them firmly with a plastic mallet to seat them.

CAUTION

Do not attempt to draw the spark plug tubes into place with their mounting bolts. Doing so could break the mounting tabs for the spark plug tubes.

Align the mounting tabs for the spark plug tubes and install the 5 x 12mm bolts.

TORQUE:

Spark Plug Tube Bolts: 8 Nm (65in-lbs)

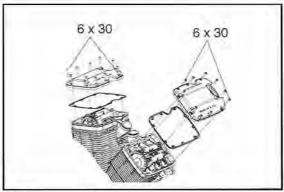
9. Install the oil outlet manifolds.

NOTE: The rear oil outlet manifold has a port for the oil temperature sensor.

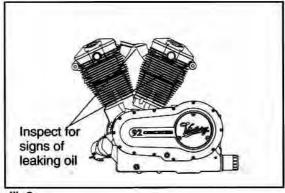
TORQUE:

Oil Manifold Bolts: 22 Nm (180 in-lbs)

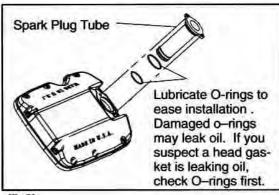
- Install the intake manifolds, injectors, fuel rail and throttle body. Refer to Chapter 5.
- 11. Install the engine in the frame. Refer to Chapter 6.



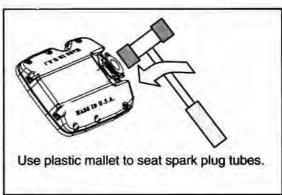
III. 1



III. 2a

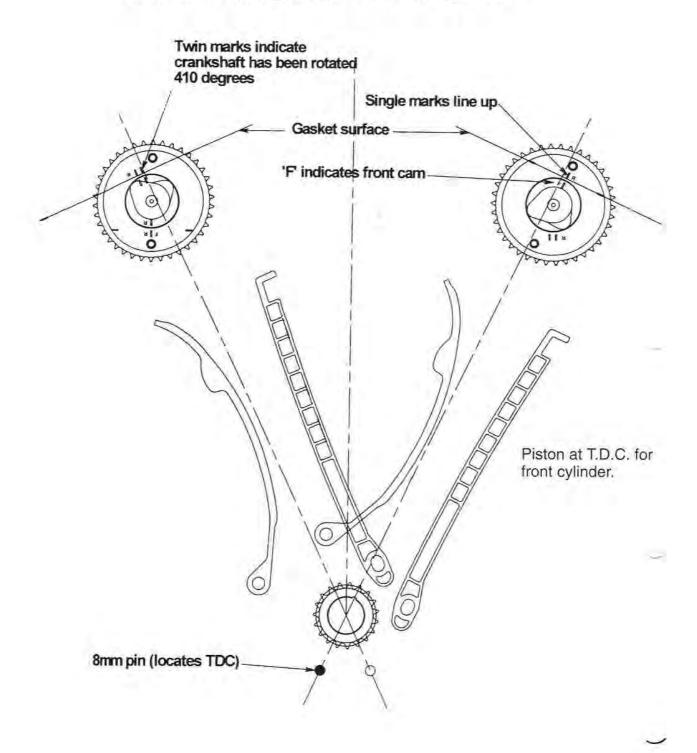


III. 2b



CAMSHAFT TIMING CUTAWAY VIEW

Cam Shaft Timing Shown For Front Cylinder



CHAPTER 8 CYLINDER AND PISTON

GENERAL	
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TROUBLESHOOTING(continued)	8.4-8.6
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CYLINDER STUD REPLACEMENT	
PISTON RING INSTALLATION	8.13
PISTON INSTALLATION	
CYLINDER INSTALLATION	7777 37777 67

GENERAL

This section covers service of the cylinder, piston and rings. The engine must be removed to service these components. Refer to Chapter 6 for engine removal and installation.

Mark and store all mated parts for correct engine assembly.

NOTE: Although many parts are interchangeable from the front to rear cylinder (pistons, rings, rings etc.) care should be taken so mated parts, due to break-in, will be assembled together.

Machined and mated surfaces are very delicate, handle and store all parts in such a way that the mating surfaces will not be damaged.

Pay attention to the notes concerning assembly lubrication, many parts require pre-lube and various parts require different types of pre-lube.

There are many precision measuring 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.

Cleanliness of parts is critical to engine life and proper parts inspection. Use clean solvent and hot, soapy water to clean all parts. Blow dry with compressed air before engine inspection and engine assembly.

NOTE: Clean the machine thoroughly before removing engine from frame.

SPECIFICATIONS

	CYLINDE	R/PISTON	
	Item	Standard	Service Limit
V-000 A	I.D.	97.00mm±0.015 (3.8189" ± 0.0006")	97.04mm (3.82")
Cylinder	Out of Round	7 1-7 7 12	0.05mm (0.002")
	Taper		0.05mm (0.002")
	Gasket Surface Warpage		0.05mm (0.002")
	Piston Mark Direction	Piston orientation is determined by relief cutout for valves. Larger reliefs face the intake side of the cylinder. (center of engine)	
Piston	Piston O.D.		96.85mm (3.813"
i istori	Piston Pin Hole I.D.		22.015mm (0.8667")
	Piston Pin O.D.		21.98mm (0.8653")
Clearances	Connecting Rod Small End I.D.		22.085mm (0.8694")
	Cylinder to Piston Clear- ance		0.15 mm (0.006")
	Piston to Piston Pin Clearance		0.035mm (0.0014")
	Connecting Rod to Pis- ton Pin Clearance		0.1mm (0.004")
	Piston Ring to Top Groove Clearance		0.254mm (0.010")
	2nd		0.20mm (0.008")
	Piston Ring End Gap Top		0.5mm (0.020")
	2nd		0.5mm (0.020")
	Piston Ring Mark Direc- tion (Top & Second Ring)		Circle Faces "UP"

TROUBLESHOOTING

Piston/cylinder problems are usually related to engine compression, external fluid leaks, excessive use of engine oil or abnormal noises. Troubleshooting involves using a leak down or compression gauge, searching for the cause of the fluid leak or listening to the engine with a stethoscope to determine sources of abnormal noise.

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED	
Hard Starting or will not	Compression too low	Lifter(s) locked	Chapter 7	
start		Collapsed hydraulic lift- er(s). Lifter extremely noisy.	Chapter 7	
		Wom Valve Guide(s)	Chapter 7	
		Poor seating of valve(s)	Chapter 7	
	1	Broken valve springs	Chapter 7	
	1	Spark plug not seated correctly	Re-torque spark plug	
		Incorrect valve timing	Chapter 7	
		Valve stuck open	Chapter 7	
		Leaking cylinder head gasket	Repair	
		Slow starter motor	See electrical section	
		Worn cylinder, pistons and/or rings.	Replace necessary parts	
		Ignition problem	See ignition section	
		Fuel problem	See F.I. section	
Electric Starter straining to turn engine over Abnormal pre-ignition	Compression too high	Excessive carbon build- up in combustion cham- ber.	Use Carbon Clean fuel system additive or disassemble engine to remove carbon from combustion chamber.	
Engine idles poorly	Low compression	Collapsed hydraulic lift- er(s). Lifter extremely noisy.	Chapter 7	
		Lifter(s) locked	Chapter 7	
a		Poor seating of valve(s)	Chapter 7	
		Worn cylinder, pistons and/or rings.	Replace necessary parts	

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Engine idles poorly	Oil in combustion cham-	Valve guides	Chapter 7
	ber	Worn cylinder, pistons and/or rings.	Replace as necessary
		Engine overfilled with oil	Correct
	Ignition misfire	Ignition system	See ignition system sec- tion
	Rich/lean fuel mixture	F.I. system	See F.I. system
	Air leak	Mounting surfaces, hoses	Correct
	Valves not opening fully	Cam shaft or rocker arms worn	Chapter 7
Engine noise	Valve Train area	Collapsed hydraulic lift- er(s). Lifter extremely noisy.	Chapter 7
		Lifter(s) locked	Chapter 7
		Broken or weak valve springs	Chapter 7
		Worn camshaft or rocker arms	Chapter 7
		Roller bearing damage on rocker arm	Chapter 7
		Worn or damaged cam- shaft journal	Chapter 7
	Piston/Cylinder area	Worn pistons and/or cyl- inders	Replace
		Excessive carbon build- up in combustion cham- ber	Clean
		Worn piston pin, piston pin bore and/or small end of connecting rod	Replace as necessary
		Worn piston rings or piston ring lands.	Replace as necessary

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Engine noise	Timing chain area	Stretched chain	Chapter 7
		Worn sprockets	Chapter 7
		Not working	Chapter 7
	Primary cover area	Clutch	See Clutch section
		Flywheel	See Charging section
		Starter system	See Starter section
		Torque compensator	See Clutch section
	Bottom End area	Main bearings	See Crankshaft section
	100	Rod bearings	See Crankshaft section
		Loose side clearance	See Crankshaft section
	Transmission area	Bearings	See Transmission
		Mis-placed circlips	See Transmission
		Incorrect side clearance	See Transmission
Poor high speed running	Valve float	Weak valve springs	Chapter 7
	Insufficient valve travel	Worn camshaft/rocker arms	Chapter 7
	Valves opening & closing at wrong time	Valve timing incorrect	Chapter 7
	Ignition problem		See ignition section
	F.I. system problem		See F.I. section
	Air intake problem		See F.I. section & main- tenance section
Lack of power in all RPM ranges	Incorrect valve clearance	Hydraulic lifter bleeding down	Chapter 7
	Collapsed hydraulic lift- er(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.	Chapter 7
	Valve float	Weak valve springs	Chapter 7
	Valves opening & closing at wrong time	Valve timing incorrect	Chapter 7

TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Lack of power in all RPM ranges	Insufficient valve travel	Worn camshaft/rocker arms	Chapter 7
	Low compression	Worn piston, rings, cylin- der	Replace as necessary
	Low compression	Poor valve seating	Chapter 7
	Ignition problem		See ignition section
	F.I. problem		See F.I. section
	Air intake problem		See F.I. or maintenance section
	Oiling problem	Too much oil	Correct
	Vacuum leak	Mounting surfaces, hoses	Correct
Using/Burning oil	Oiling problem	Too much oil	Correct
	Oil past rings	Worn or damaged piston, rings, cylinder	Replace
	Oil past valve guides	Worn valve guides	Chapter 7
		Worn valve guide seals	Chapter 7

EXTERNAL INSPECTION

See page 3.20-3.21 of the Maintenance Section for engine compression inspection procedures.

Follow instructions provided with the engine leak-down inspection gauge (commercially available) to inspect cylinder leakage.

SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER
0-100mm Outside Micrometer Set	
Cylinder Bore Gauge	
Small Hole Bore Gauge	
Feeler Gauge Set	Commercially Available
Dial Caliper	
Compression Gauge	
Leak-down Gauge	
Surface Gauge (precision straight edge)	
Piston Ring Compressor (97mm +)	Commercially Available
Moly Assembly Paste	Victory Part Number: 2871460

CYLINDER REMOVAL

- 1. Remove engine from frame, refer to Chapter 6.
- Remove cylinder head(s), refer to Chapter 7.
- Remove cylinder(s).
- 4. Clean gasket surfaces of cylinders thoroughly.

CAUTION

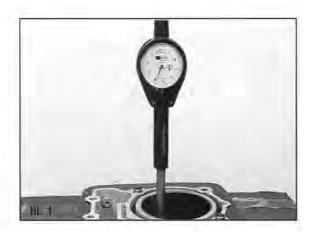
Careless handling of the cylinder, pistons or rings may cause irreparable damage. Handle these parts with care. Do not damage the gasket surfaces during the cleaning operation.

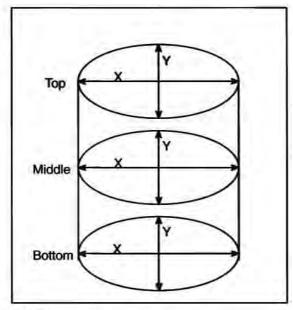
CAUTION

Take care not to let the piston or rings contact the studs or crankcase or damage may occur.

CYLINDER INSPECTION

- Visually inspect the cylinder bores for scratches, unusual wear, scoring, etc.
- Each cylinder bore needs to be measured in 6 places to determine cylinder out-of-round, taper and piston to cylinder clearance. Use the chart on page 8.8 for piston & cylinder clearance calculations. III. 1 & 2.





111.2

PISTON/CYLINDER CLEARANCE WORKSHEET

Front Cylinder	Recorded Measurement	Specification
Top "X"		
Middle "X"		
Bottom "X"		
Top "Y"		
Middle "Y"		7
Bottom "Y"		7
Difference between largest "Y" measure- ment and smallest "Y" measurement	Taper for "Y" axis:	Taper Service Limit:
Difference between largest "X" measure- ment and smallest "X" measurement	Taper for "X" axis	0.05mm (0.002")
Largest difference between any "X" axis measurement and "Y" axis measurement	Cylinder Out-of-Round	Out-of-Round Service Limit: 0.05mm (0.002")
Piston Skirt Measurement (page 8.10)		
Difference between largest "X" axis mea- surement and piston measurement	Piston-to-Cylinder Clearance*	Piston-to-Cylinder Clearance Service Limit: 0.15 mm (0.006")
Rear Cylinder	Recorded Measurement	Specification
Top "X"		
Middle "X"		
Bottom "X"		3
Top "Y"		
Middle "Y"		
Bottom "Y"		
Difference between largest "Y" measure- ment and smallest "Y" measurement	Taper for "Y" axis:	Taper Service Limit:
Difference between largest "X" measure- ment and smallest "X" measurement	Taper for "X" axis	0.05mm (0.002")
Largest difference between any "X" axis measurement and "Y" axis measurement	Cylinder Out-of-Round	Out-of-Round Service Limit: 0.05mm (0.002")
Piston Skirt Measurement (page 8.10)		
Difference between largest "X" axis mea- surement and piston measurement	Piston-to-Cylinder Clearance*	Piston-to-Cylinder Clearance Service Limit: 0.15 mm (0.006")

Compare the recorded measurement to the specifications. If the measured value exceeds the 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 limits, <u>measure a new piston and</u>
 <u>re-calculate the clearance</u>. If the piston-to-cylinder clearance exceeds the service limits with a new piston, the cylinder must be replaced.

CYLINDER WARPAGE INSPECTION

- Inspect the cylinder for warpage at the cylinder head surface and base gasket surface. Ill's 1 & 2.
- Place a straight edge diagonally across the cylinder mating surfaces in several areas. Attempt to slide a 0.002" feeler gauge under the straight edge for each position of the straight edge. Ill's 1 & 2.
- If a feeler gauge larger than 0.002" will slide under the straight edge the cylinder is warped beyond service limits and must be replaced.



Cylinder Warpage Service Limit: 0.05mm (0.002")



CAUTION

Cover the crankcases with a clean shop towel to prevent parts and debris falling into the crankcase.

- Remove the left side piston pin circlip using outside circlip pliers.
- Push the piston pin out to the left side of the engine and remove the piston.

NOTE: The piston pin is a slip fit. A piston pin puller is not required.

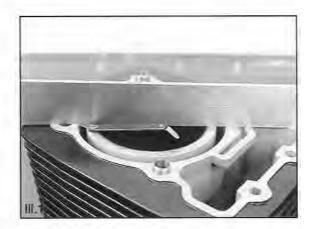
- Attempt to rotate the rings and inspect for freedom of rotation. Failure to rotate freely indicates carbon fouling of the ring lands or damaged piston and/or rings.
- Spread the rings at the ring gap and remove the rings by lifting the opposite side of the ring.

CAUTION

Piston rings are easily damaged if the ends are spread too far. When removing the rings, spread the rings no more than absolutely necessary.

Clean carbon from piston combustion chamber surfaces and ring lands.

NOTE: A soft wire brush is permissible for the top of the piston. Do not use a wire brush to clean the sides of the piston or the piston ring lands.



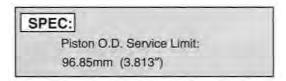


PISTON REMOVAL (Continued)

 Break or cut a discarded piston ring in half. File or grind one edge square and remove all burrs. Use this piston ring to carefully clean the piston ring lands.

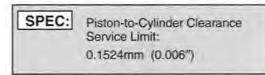
PISTON/PISTON RING INSPECTION

- Visually inspect the piston for cracks, excessive wear, scoring, etc.
- Measure the piston O.D. at a point 90° from the piston pin and 10mm from the bottom of the piston skirt. III. 1.



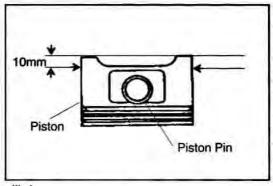
Record the measurement from step two and return to page 8.8 to calculate the piston-to-cylinder clearance.

NOTE: If the piston-to-cylinder clearance exceeds the service limits, 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.

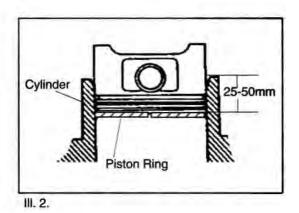


 Place each piston ring (1st & 2nd ring) into its respective cylinder from the bottom of the cylinder. Push the ring in with a piston 25mm-50mm. III. 2.

NOTE: Using a piston to push the ring into the cylinder ensures that piston ring will be placed squarely into the bore.



III. 1



Polaris Sales Inc. Victory Motorcycle Division

PISTON/PISTON RING INSPECTION (Continued)

Measure the installed end gap with a feeler gauge. If either ring exceeds the service limit, replace the ring set for that cylinder. III. 1.

SPEC: Piston Ring Installed Gap Service Limit:(1st, 2nd & Oil Ring) 0.5mm (0.020")

 Install the rings onto a cleaned piston. Push the rings in until they are flush with the piston. Using a feeler gauge, measure the side clearances for the 1st & 2nd rings. If any of the clearances exceed the limit, replace both the piston and piston rings. III. 2.

SPEC: Piston Ring-to-Groove Service Limit: 1st Ring: 0.254mm (0.010") 2nd Ring: 0.20mm (0.008")

PISTON PIN / PISTON PIN BORE INSPECTION

 Measure the piston pin bore I.D. in four locations as shown in III 3 with a telescoping gauge. Record the largest measurement.

SPEC: Piston Pin Hole I.D. Service Limit: 22.015mm (0.8667")

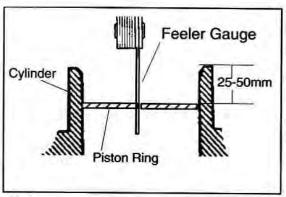
Measure and record the piston pin O.D. at six locations as shown in III 4.

Piston Pin O.D. Service Limit: 21.98mm (0.8653")

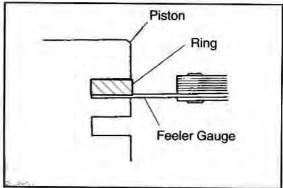
Calculate the piston pin-to-piston clearance by subtracting the measurement recorded in step two from the measurement recorded in step one.

SPEC:

Piston Pin To Piston Clearance
Service Limit:0.035mm (0.0014")

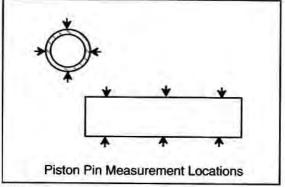


III. 1



III. 2





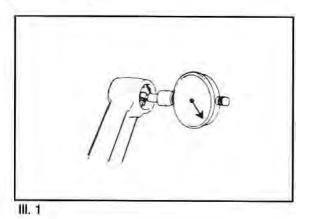
111.4

PISTON PIN / PISTON PIN BORE INSPECTION (continued)

 Measure and record the connecting rod small end I.D.

SPEC: Connecting Rod Small End I.D. Service Limit: 22.085mm (0.8694")

 Calculate the connecting rod-to-piston pin clearance by subtracting the recorded measurement in step 2 from the measurement recorded in step 4.



Connecting Rod-to-Piston Pin Clearance

SPEC:

Service Limit: 0.1mm (0.004")

CYLINDER STUD REPLACEMENT

NOTE: Cylinder studs do not need to be removed for normal engine disassembly and assembly. They only need to be removed to replace cases or the studs themselves.

- Use a stud remover to remove the studs.
- 2. Clean the threads in the cases thoroughly.
- Install the stude and torque them to specification.

NOTE: No locking agent or lubricant is used to install cylinder studs.

TORQUE:

10 mm Cylinder Studs: 34 Nm (25 lb-ft)

TORQUE:

8 mm Cylinder Studs: 20 Nm (15 lb-ft)

PISTON RING INSTALLATION

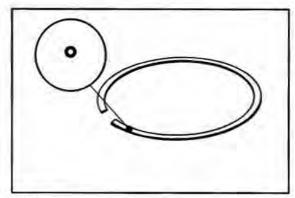
CAUTION

Piston and rings are easily damaged by careless handling. Do not spread the rings any more than necessary when installing them.

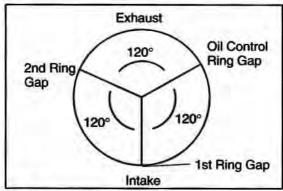
- Carefully install the oil control ring assembly. The oil control ring consists of a backing spring and one rail component.
- The first and second rings are installed with their markings facing up.

NOTE: The first and second rings are not identical. There is a top and a secondary ring. If reusing the rings, ensure that the rings are installed in their origional locations.

- 3. Make sure that the rings are free to rotate.
- Stagger the ring end gaps at 120° intervals with the top ring gap facing the exhaust side of the engine.



111. 1



111.2

PISTON INSTALLATION

The pistons are marked on the combustion chamber side as shown in III. 1.

- Place a clean shop towel over the crankcase to prevent foreign material from entering the crankcase.
- Ensure that the crankcase gasket surfaces are thoroughly clean. Be extremely careful not to damage the surfaces and not to drop any debris into the crankcases.
- 3. Install a circlip onto one side of the piston pin.

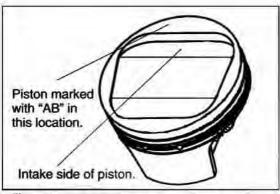


Never reuse piston pin circlips!

Apply assembly lube to the piston pin outer surface and I.D. of the connecting rod small end.



Moly Assembly Paste: 2871460



ML 1

PISTON INSTALLATION (continued)

NOTE: The front and rear cylinders are identical.

NOTE: Even though the front and rear cylinders are identical, ensure that the cylinders are installed in their original locations.

- 5. Install a piston pin clip on to piston pin.
- Lubricate piston pin with thin film of moly paste. Insert piston pin into cam chain side of piston. Push piston pin in until it just reaches the cutout for the connecting rod.



Moly Assembly Paste: 2871460

- Place the piston over the rod with the large valve relief facing the center of the engine (intake side).
- 8. Push the piston pin completely through the piston.
- 9. Install the left side circlip.

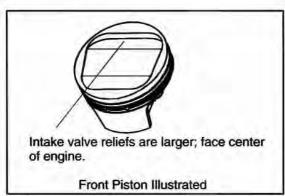
CYLINDER INSTALLATION

- Wash the cylinders with clean solvent first, then with hot soapy water.
- 2. Rinse cylinders with hot water.
- 3. Dry cylinders with compressed air.
- Wipe the cylinder bores with a clean shop towel and engine oil. A white shop towel performs best.
 When the towel no longer shows any discoloration, the cylinders are clean and ready to be installed.
- Lightly oil the cylinders for installation.
- Apply a few drops of engine oil to surfaces of the pistons. Rub the oil over the thrust surfaces of the piston until the surfaces are coated with a very thin film of oil.

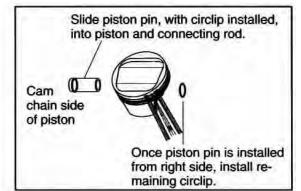
LUBRICANT:

Victory 20W/40 Semi-Synthetic Motorcycle Oil

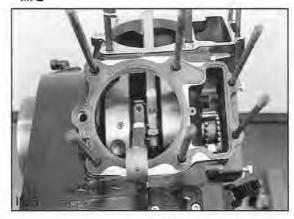
- Ensure that the cylinder alignment dowel pins are in place. III. 3.
- Install new base gaskets onto the cases.



III. 1



111, 2



CYLINDER INSTALLATION (continued)

Place a small amount of engine oil to the inside surfaces of a piston ring compressor.

SPECIAL TOOL:

Piston Ring Compressor (range up to 97mm+): Commercially Available

- Install piston ring compressor over rings and compress rings.
- Carefully install the cylinder(s) onto the piston/ring assembly. Monitor rings carefully. If a piston ring becomes dislodged from the ring compressor; remove cylinder, reinstall the ring compressor and begin again.



Do not force the cylinder down. Excessive resistance may be due to a misplaced piston ring.

- Remove piston ring compressor once rings are fully inserted into cylinder.
- 13. Remove protective covering from crankcase.
- 14. Repeat for other cylinder if necessary.
- 15. Install cylinder head(s), refer to Chapter 7.
- Install engine into frame, refer to Chapter 6.



CHAPTER 9 CLUTCH / TRANSMISSION SHIFT LINKAGE

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GENERAL

- Clutch and external transmission shift linkage repair can be accomplished with the engine in the frame.
- Internal transmission or 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 and operation.
- Engine oil type and viscosity can affect clutch operation. Always determine what type of oil is being
 used, if oil is contaminated, oil level is low, or if oil additives are present before servicing the clutch
 system. If any of these items are present, change the oil before performing clutch service.
- Burnt clutch plates are not an indication of defective clutch plates. Burnt clutch plates indicate that a
 problem exists within the clutch system or the the clutch has been used improperly.
- Victory 20W/40 Motorcycle oil is recommended for all operating temperatures. If Victory 20W/40 oil
 is not available, any 20W/40 oil SG rated oil or lower can be substituted. Do not use oils rated higher
 than SG.

CAUTION: Dry, corroded or sticking shift linkage pivot points can cause abnormal shifting. See Maintenance Section of this manual.

CAUTION: Improper shift linkage adjustment can cause apparent shifting problems. Ensure that the motorcycle is properly adjusted to the rider.

SPECIFICATIONS

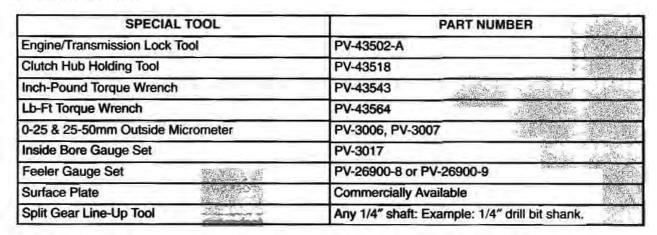
Item		Specifications
Clutch & Shift Linkage (General)	Clutch Type	Wet, Multi-Disk 6 Clutch Springs
	Clutch Operating Mechanism	Manually Operated Cable
	Torque Compensator	Spring Loaded Cam Assembly
	Primary Reduction Ratio	1.50 : 1
	Transmission Shift Mechanism	Manually Operated, Spring Centered
	Gearshift Pattern	1-N-2-3-4-5

CLUTCH/GEARSHIFT/LINKAGE				
Item	Standard	Service Limit		
Clutch Lever Free Play	1mm (0.40")	Not Applicable		
Clutch Spring Free Length	54.1 mm	52.6 mm		
Drive Clutch Plate Thickness	2.067-2.115mm (0.081"-0.083")	1.447 mm (0.056")		
Driven Clutch Plate Thickness	1.507-1.512mm 0.0593"-0.0595")	Not Applicable		
Driven Clutch Plate Warpage	Not Applicable	0.30mm (0.012")		

TORQUE SPECIFICATIONS

Item	Torque Specification	
Clutch Release Bearing Plate Bolts	11.5 Nm (100 in-lbs)	
Clutch Spring Bolts	11.5 Nm (100 in-lbs)	
Clutch Hub Nut	104 Nm (75 lb-ft)	
Clutch Pinion Shaft Retaining Bolt	11.5 Nm (100 in-lbs)	
Gear Shift Lever Pinch Bolt	16 Nm 12 lb-ft	
Primary Cover Bolts	18 Nm (150 in-lbs)	
Primary Cover Emblem Bolts	10 Nm (85 in-lbs)	-
Split Gear Bolts	11.5 Nm (100 in-lbs)	
Torque Compensator Retaining Nut	104 Nm (75 lb-ft)	

SPECIAL TOOLS



TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Clutch Lever Pulls Excessively Hard	Outer clutch cable housing damaged	Clutch Cable	Replace
	Clutch cable is dry, cor- roded, contaminated, worn, etc.	Clutch Cable	See Maintenance Chapter 3
	Clutch lever pivot needs lubrication	Clutch Lever Pivot Point	See Maintenance Chapter 3
	Drive plates catching on primary driven gear basket	Clutch Primary Driven Gear/Clutch Plates	Replace Necessary Parts
	Clutch cable routed incor- rectly	Clutch Cable	Re-route
	Clutch lifter plate bearing damage	Clutch Plate Bearing Lifter	Replace
	Damaged clutch lifter mechanism	Clutch Release Mechanism	Repair as Necessary

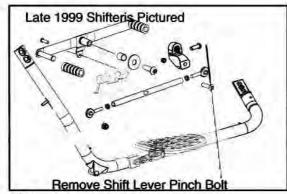
PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Clutch Slips	Clutch Cable Out of Ad- justment (no lever free play)	Clutch Cable Adjustment	See Maintenance Chapter
	Clutch Springs Weak	Clutch Springs	Replace
	Clutch Spring Bolts Loose or Broken	Clutch Spring Bolts	Repair or Replace 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 (clutch doesn't dis- engage completely, motorcycle may creep with clutch disengaged)	Too Much Clutch Lever Free Play	Clutch Cable Adjustment	See Maintenance Chapter
	Weak Clutch Spring(s)	Clutch Springs	Replace All
	Pressure Plate Worn or Warped/Distorted	Pressure Plate	Replace
	Clutch Plate(s) Warped/ Distorted	Driven Plates (possibly drive plates)	Replace
	Oil Additives Present in Oil or Used Previously	Oil Quality	Replace oil & filter (clutch plates may need to be re- placed)
	Oll Level Too High	Oil Level	Correct
	Oil Viscosity Too High	Oil Quality	Replace Oil & Filter

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Transmission Will Not Shift	Broken Shift Cam	Shift Cam	See Transmission Chapter
	Bent Shift Forks	Shift Fork	See Transmission Chapter
	Worn Gearshift Pawl	Shift Cam	See Transmission Chapter
	Broken Gears	Transmission Gears	See Transmission Chapter
	Damaged/Broken Bearings	Transmission, Shift Cam Bearings	See Transmission Chapter
	Worn Gear Shift Pawl Ratchet Mechanism	Shift Pawl Mechanism	See Transmission Chapter
	Broken or dislodged shift shaft return spring	Shift Shaft Return Spring	Repair or Replace as Necessary
	Shift Detent Plunger Stuck	Shift Detent Plunger	See Transmission Chapter
	Bent Shift Shaft (internal)	Shift Shaft	Repair or Replace as Necessary
	External Shift Linkage Binding or Damaged	External Shift Linkage	See Maintenance Chapter
	Bent or Distorted Shift Forks	Shift Forks	Replace
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	Replace
	Broken Transmission Components	Transmission Components	Inspect, Repair as Necessary

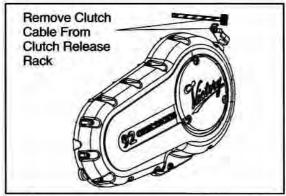
PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Transmission Hard to Shift	Improper Clutch Operation	Clutch	Inspect, Repair as Necessary
	Incorrect Oil Viscosity	Oil Quality	Replace Engine Oil
	Incorrect Clutch Adjustment	Clutch Adjustment	See Maintenance Chapter
	Bent, Rubbing, Sticky, Bro- ken Shift Shaft (internal)	Shift Shaft Components	Repair or Replace as Necessary
	Sticking Pivot Point, Bent External Shift Linkage	External Shift Linkage	See Maintenance Chapter
	Bent or Distorted Shift Forks	Shift Forks	Replace
	Damaged Shift Drum Grooves	Shift Drum	See Transmission Chapter
	Shift Detent Plunger Stuck	Shift Detent Plunger	See Transmission Chapter
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	See Transmission Chapter
Transmission Jumps Out of Gear	Broken Shift Stop Pin	Shift Stop Pin	Replace
	Wom Shift Drum Pawls or Shift Drum Pawl Ratchet	Shift Drum or Shift Linkage	Replace as Necessary
	Broken Shift Return Spring	Shift Return Spring	Replace
	Damaged Shift Drum Grooves	Shift Drum	See Transmission Chapter
	Bent, Worn, Distorted Shift Forks	Shift Forks	See Transmission Chapter
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	See Transmission Chapter
	Worn Engagement Dogs on Transmission Gears	Transmission Gears	See Transmission Chapter

PRIMARY COVER REMOVAL

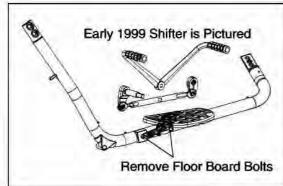
- Securely support motorcycle in an upright position.
- Drain engine oil, refer to chapter 3.
- 3. Remove shift lever linkage pinch bolt.
- 4. Release clutch cable from clutch release rack.
- Remove stator lead connector.



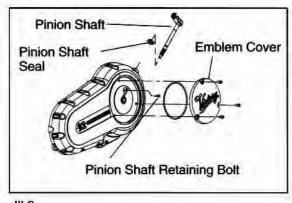
III. 1



III. 2



111.3



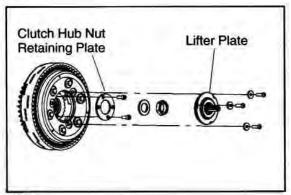
111.3

- Remove two bolts for floor board, remove floor board and shift lever (shift pedal assembly will stay with the floorboard).
- 7. Remove the primary cover emblem screws. Remove release arm locator bolt. Pull release arm out of cover.

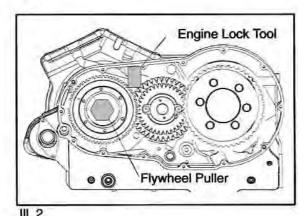
- Remove primary cover screws. Note length and position for reassembly.
- 9. Remove primary cover.

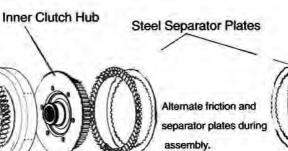
CLUTCH REMOVAL

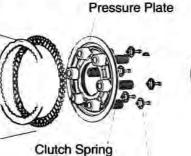
- Remove 3 screws for clutch lifter plate. Remove lifter plate. Ill. 1.
- 2. Install engine lock tool. III. 2.
- 3. Remove clutch hub nut retaining plate.
- 4. Remove clutch hub nut & washer.
- Clutch can now be removed as a complete assembly.
- Remove clutch spring bolts, washers & clutch springs.
- 7. Remove pressure plate.
- 8. Remove clutch plates.
- 9. Remove inner clutch hub.



III. 1







Primary Driven Gear

Bearing (2 used)

Fiber Friction Plates

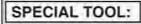
Clutch Spring Bolt & Washer

CLUTCH RELEASE BEARING INSPECTION

- Remove snap ring from clutch release rack. Remove clutch release rack and spring washers.
- 2. Visually inspect bearing for damage.
- Rotate bearing with finger pressure, the bearing should turn freely and quietly without play.
- Inspect the bearing fit in the release plate. The bearing is a press fit and should not move when pushed by hand.
- Replace the bearing if it fails any of the above inspections.

CLUTCH RELEASE BEARING REMOVAL & INSTALLATION

 Press the bearing out towards the clutch side of the release plate with a suitable arbor and arbor press. III.2



Arbor Press: Commercially Available

- 2. Clean the release plate thoroughly.
- Apply a thin film of engine oil to the O.D. of the bearing.



Victory 20W/40 Semi-Synthetic Motorcycle Oil

- Press a new bearing into place until it is seated.
- Place the two spring washers so the bevel faces the head of the clutch release rack. Ill. 3.
- Install the snap ring so the sharp side of the snap ring faces toward the outside of the clutch. Ill. 3.

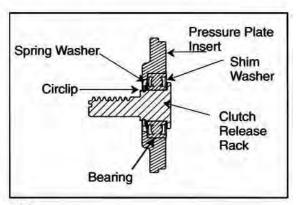
CLUTCH SPRING INSPECTION

 Measure the clutch spring free length of all clutch springs. Ill. 4.

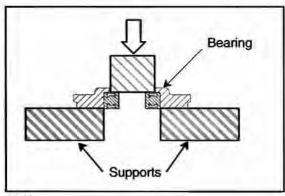
SPEC:

Clutch Spring Free Length Service Limit: ∠ 52.6 mm

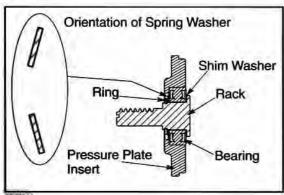
If any clutch springs measure below specifications, replace the clutch springs as a set.



111.1



111.2



III. 3



CLUTCH PRESSURE PLATE INSPECTION

- Visually inspect the pressure plate for deep scoring or steps on the friction surface.
- Replace the pressure plate if it fails visual inspection.

CLUTCH DRIVE PLATE INSPECTION

- Visually inspect the plates for scoring, discoloration, and/or surface damage.
- Measure the thickness of each clutch plate in several areas. III. 1.



Clutch Drive Plate Thickness Service Limit: 1.447 mm (0.056")

NOTE: If clutch plate replacement is warranted due to failed inspection, replace the clutch plates as a set.

CLUTCH DRIVEN PLATE INSPECTION

- Clean the clutch plates. Dry them with compressed air.
- Visually inspect the plates for scoring or discoloration.

NOTE: Heavy discoloration indicates that the clutch has been slipping excessively and the cause must be determined.

Stack the plates together and place the stack on a surface plate. III. 2.

NOTE: A piece of clean plate glass will work as a surface plate.

 Without placing pressure on the stacked plates, use a feeler gauge to determine plate warpage. III.
 2.

SPEC:

Driven Plate Warpage Service Limit: 0.20mm (0.008")

NOTE: If clutch plate replacement is needed due to failed inspection, replace the clutch plates as a set.





CLUTCH PRIMARY DRIVEN GEAR/BASKET ASSEMBLY INSPECTION

- Inspect the primary driven gear teeth for cracked or broken teeth, wear or damage.
- Inspect the clutch basket for cracks, heavy indentations, or wear made by the drive plates.
- Inspect the thrust surface for unusual wear or scoring.
- 4. Ensure that the lubrication holes are free of debris.
- 5. Inspect the bearings for wear or damage.
- 6. Replace any parts that fail inspection.

CLUTCH RELEASE PINION SHAFT REMOVAL & INSPECTION

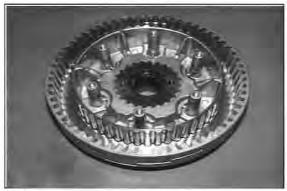
- Remove primary cover emblem (refer to page 9.18) III. 3.
- 2. Remove the clutch pinion shaft retaining bolt. III. 3.
- Pull the clutch release pinion shaft out of the primary case. III. 3.
- Inspect the pinion gear teeth for cracks, broken teeth, or wear.
- Clean the clutch release pinion bearings & dry them with compressed air.
- 6. Apply engine oil to the bearings.
- Temporarily re-install the clutch release pinion shaft into the primary case.
- Turn the clutch release pinion shaft by hand.
 Observe the feel of the bearings. Replace the bearings if rough or notched action is noticed.

CLUTCH RELEASE PINION SEAL REMOVAL

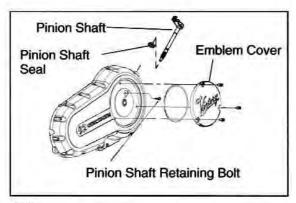
- Remove clutch release pinion. See previous procedure.
- Use a suitable seal remover and carefully pry the seal out.



111.1



111.2



111.3

CLUTCH RELEASE PINION SEAL & SHAFT REPLACEMENT

- 1. Clean all parts thoroughly.
- Apply engine oil to bearings and contact surfaces of clutch release pinion shaft.
- Lubricate the O.D. of the seal with a thin film of engine oil.



Victory 20W/40 Semi-Synthetic Motorcycle Oll

4. Lubricate the sealing lip of the seal with grease.



Victory All Purpose Grease: 2872187

- 5. Drive the seal into place with a suitable driver. III 1.
- Install clutch release pinion shaft into primary case.
- 7. Install pinion shaft retaining bolt.

TORQUE:

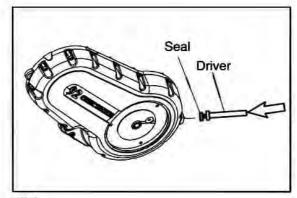
Pinion Shaft Retaining Bolt: 4.7 Nm (40 in-lbs)

CLUTCH RELEASE PINION SHAFT and/or SEAL REMOVAL & REPLACEMENT (With Primary Cover Installed)

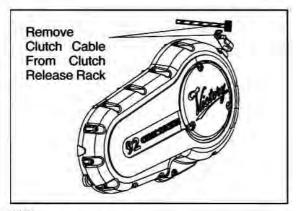
- 1. Release clutch cable from clutch pinion shaft. III 2.
- Remove primary cover emblem (3 screws). Ill 3.
- 3. Remove clutch pinion shaft retaining bolt. III. 3.
- 4. Remove clutch pinion shaft. III. 3
- Use a suitable seal remover and carefully pry the seal out.
- 6. Clean the seal cavity thoroughly.
- Apply engine oil to contact surfaces of clutch release pinion shaft.
- Lubricate the O.D. of the seal with a thin film of engine oil.
- 9. Lubricate the sealing lip of the seal with grease.

LUBRICANT:

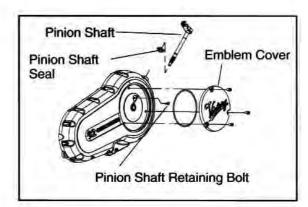
Victory All Purpose Grease: 2872187



111.1



111.2



111.3

CLUTCH RELEASE PINION SEAL & SHAFT REPLACEMENT

- 10. Drive the seal into place with a suitable driver. III. 1
- 11. Install clutch release pinion shaft into primary
- Observe alignment of the pinion shaft arm. If necessary, remove pinion shaft and reposition until it is correctly installed. Refer to III.2

NOTE: The clutch pinion shaft is properly oriented when all of the slack is taken out in a clockwise direction and the end of the arm is at a 15° angle to the primary cover parting line. III. 2.

- If difficulty is encountered aligning the clutch release pinion shaft with the clutch release rack; turn the release rack until proper alignment is achieved. Ill. 3.
- 14. Install pinion shaft retaining bolt.

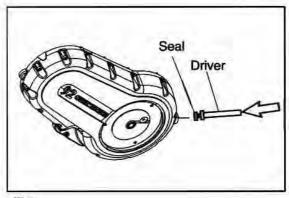


Pinion Shaft Retaining Bolt: 4.5 Nm (40 in-lbs)

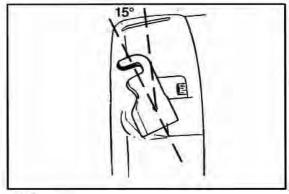
- 15. Install clutch cable.
- 16. Adjust clutch cable if necessary, refer to Chapter 3.
- 17. Install primary cover emblem. Refer to page 9.17.

TORQUE:

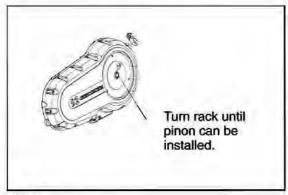
Emblem Cover Screws: 10 Nm (85 in-lbs)



111.1

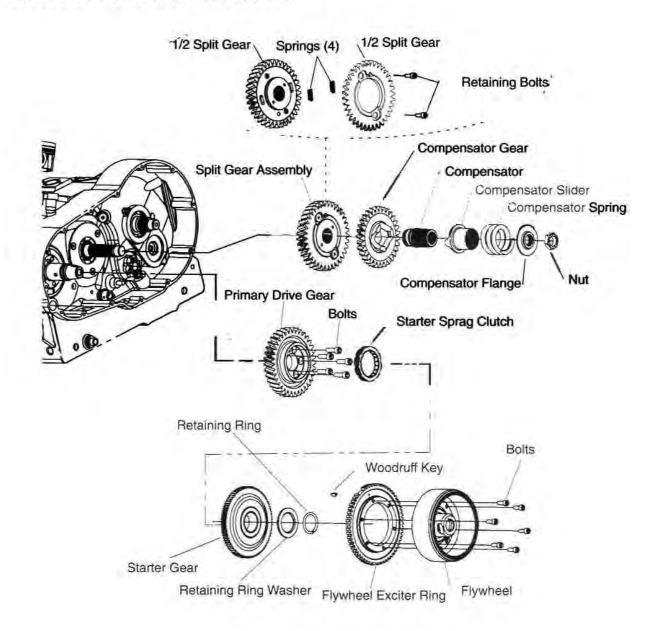


111.2



111, 3

EXPLODED VIEW OF PRIMARY DRIVE



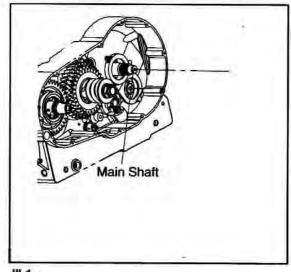
CLUTCH ASSEMBLY

NOTE: If installing new fiber drive plates, place them in a clean container and soak them in engine oil for a hour or more before installing them.

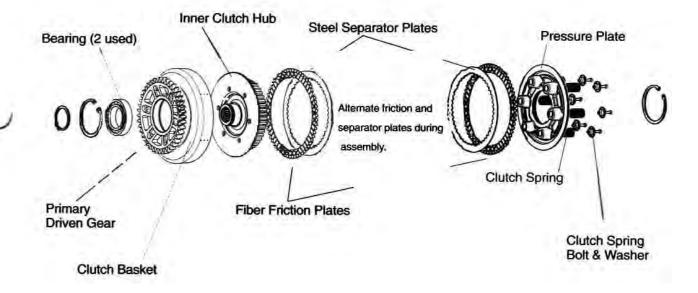
LUBRICANT:

Victory 20W/40 Semi-Synthetic Motorcycle Oil

- 1. Ensure that all parts are thoroughly clean.
- 2. Place the transmission into neutral.



111.1



- Lubricate clutch bearings with engine oil and install into clutch basket.
- 4. Install inner clutch hub.
- Install clutch plates. Start with a fiber drive plate and finish with a fiber drive plate. Alternate between fiber drive plates and steel driven plates.

CLUTCH / TRANSMISSION SHIFT LINKAGE

CLUTCH ASSEMBLY (continued)

NOTE: Steel driven plates can be installed in either direction, however the plates are stamped and have a bevel on one side of the plate. Maximum surface contact area is achieved when all steel plates are installed in the same direction, either bevel in or bevel out.

- Install clutch pressure plate. Refer to previous page illustration.
- Install clutch springs, spring washers and clutch spring bolts. Tighten the clutch springs in 2 to 3 steps in a cross pattern. Torque to specifications. III. 2

TORQUE:

Clutch Spring Bolts: 11.5 Nm (100 in-lbs)

- 8. Install clutch nut and washer. III. 4.
- 9. Install engine lock tool. III. 3.
- 10. Torque clutch hub nut to specifications. III. 3.

TORQUE:

Clutch Hub Nut: 104 Nm (75 lb-ft)

- 11. Install lockplate and retaining bolts.
- The lockplate can be installed in various positions.
 Use all positions on one side and turn lockplate over to try all positions until proper alignment is achieved.
- 13. If none of the available positions align the lockplate's holes with the bolt holes, the clutch hub nut may be turned an additional 45°. Mark the shaft and hub nut and tighten the clutch hub nut in small increments until alignment of the retaining plate is accomplished.

TORQUE:

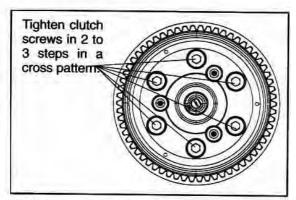
Clutch Hub Nut Retainer Plate Bolts: 10 Nm (85 in. lbs)

 Install the clutch release bearing plate assembly and the three attachment screws. Torque bolts to specification. Ill. 4.

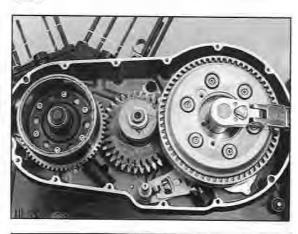
TORQUE:

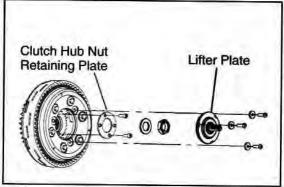
Clutch Release Bearing Plate Bolts: 11.5 Nm (100 in-lbs)

15. Install primary cover, refer to page 9.17.



III. 2





III. 4

Polaris Salees Inc. Victory Motorcycle Division

PRIMARY COVER INSTALLATION

 Clean the gasket surfaces of the crankcases and primary cover. Ill. 1.

CAUTION

Use care when removing old gaskets. Careless removal practices can damage the gasket surfaces.

- Ensure that the alignment dowels are in position.
- Place a new primary cover gasket on the crankcases. III. 1.

NOTE: It may be helpful to "glue" the gasket in place with a small amount of grease.

 Place the primary cover onto the crankcases. Hold the alternator side (front) of the primary cover to keep the primary cover from sticking when the cover is installed.

NOTE: The primary cover will tend to stick slightly at the shift shaft. No more than a firm hand pressure is necessary to properly install the primary cover.

CAUTION

The flywheel magnets have considerable energy. When the primary cover approaches the crankcases the flywheel magnets may pull the primary cover on quickly and forcibly. Make sure that fingers are not trapped between the primary cover and the center cases or personal injury may occur.

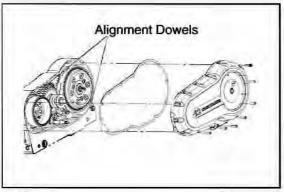
Observe the alignment of the pinion shaft cable retainer. If necessary, pull back on the primary cover slightly and turn the clutch release pinion shaft until proper alignment is obtained. III. 2.

NOTE: The clutch release arm is properly oriented when all of the slack is taken out in a clockwise direction and the end of the arm is at a 15° angle to the primary cover parting line. III. 2.

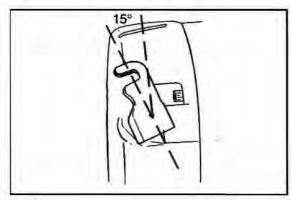
- Install the primary cover screws and torque them to specification. Ill. 1.
- 7. Install the primary emblem cover. III. 3.

TORQUE:

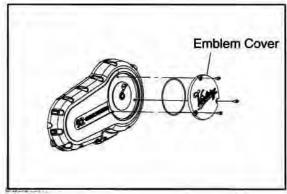
Primary Cover Screws: 18 Nm (150 in-lbs)



III. 1



111.2

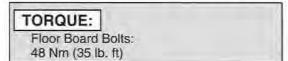


111.3

CLUTCH / TRANSMISSION SHIFT LINKAGE

PRIMARY COVER INSTALLATION (continued)

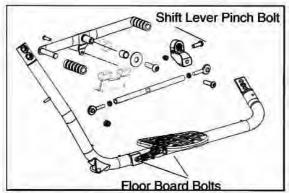
- Place the floor board close to its final position and install the shift lever linkage onto the shift shaft in its proper position. Ill. 1 & Ill. 2.
- 9. Install the floor board attachment bolts. III. 1.



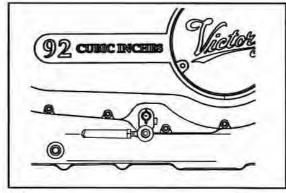
 Install the pinch bolt for the shift lever and torque it to specification (Late 1999 shifter pictured) III. 1.



- Install the clutch cable. Refer to Chapter 3 for clutch cable adjustment procedure.
- Inspect shift pedal linkage adjustment, refer to chapter 3 if adjustment is necessary.
- 13. Fill engine with oil, refer to Chapter 3.



111. 1



III. 2

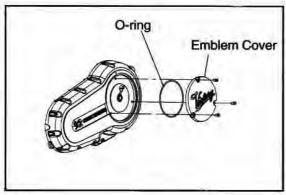
PRIMARY EMBLEM COVER REMOVAL AND INSTALLATION

NOTE: The primary emblem cover can be removed and replaced without removing the primary cover.

- 1. Remove the three screws for the emblem cover. III. 3.
- 2. Remove emblem cover. III. 3.
- Remove all traces of gasket material from the primary cover and emblem cover.
- Install new O-ring.
- Install emblem cover, start screws, torque screws to specification. Ill. 3.



Emblem Cover Screws: 10 Nm (85 in-lbs)



III. 3

GEARSHIFT REMOVAL & INSPECTION

- 1. Shift the transmission into neutral.
- 2. Drain the engine oil, refer to Chapter 3.
- Remove primary cover, refer to page 9.7.
- 4. Remove the clutch, refer to page 9.8.
- 5. Pull out on the shift shaft assembly and remove.
- Inspect the shift shaft adapter for looseness or excessive wear.

TORQUE:

Shift Shaft Adapter: 36 Nm (25 lb. ft)

- Inspect the cases around the shift shaft adapter for cracks.
- Inspect the shift pawls on the shift drum and shift ratchet mechanism for cracks or excessive wear.
- Inspect the gear shift shaft for excessive wear or damage.
- Inspect the fit of the rivet and shifting pawl. The fit should allow for free movement, but not be excessively loose. Ill. 2.
- 11. Inspect the fit of the pressed on washer. III. 2.
- Inspect the compression spring for cracks. The spring should apply enough tension on the shift ratchet mechanism to keep it extended. Ill. 2.
- Inspect the shift shaft centering spring. The spring should have enough tension to keep the shift shaft centered. III. 2.

SHIFT SHAFT BEARING & SEAL REPLACEMENT

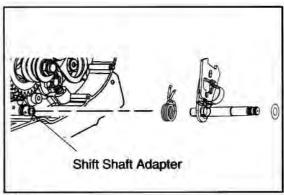
- 1. Shift the transmission into neutral.
- 2. Drain the engine oil, refer to Chapter 3.
- 3. Remove primary cover, refer to page 9.7.
- Using a small seal remover, remove the shift shaft seal.

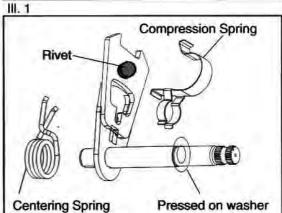
NOTE: The shift shaft seal can be removed and replaced without removing the primary cover.

Using a suitable arbor and arbor press, press the bearing out towards the outside of the cover.

SPECIAL TOOL:

Arbor Press: Commercially Available





Bearing Seal

III. 3

CLUTCH / TRANSMISSION SHIFT LINKAGE

SHIFT SHAFT BEARING & SEAL REPLACEMENT (continued)

- 6. Clean all parts thoroughly
- Apply assembly lube to inner & outer surfaces of new bearing.



Moly Assembly Paste: 2871460

Using the same arbor and arbor press as used for removal, press the bearing in until it seats.

NOTE: Press all needle bearings from the numbered side.

Apply a small amount of grease to the sealing lip of the seal and apply engine oil to the O.D. of the seal.



Victory All Purpose Grease: 2872187 Victory 20W/40 Semi-Synthetic Motorcycle Oil

10. Using a suitable driver, drive the seal into place. III. 1.

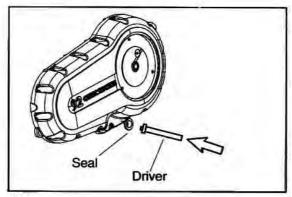
CAUTION

Use only the minimum amount of force necessary to drive the seal in place to prevent damage.

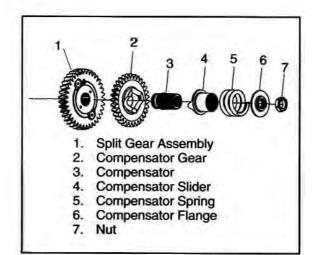
Install the primary cover, refer to page 9.17.

TORQUE COMPENSATOR REMOVAL

- Drain engine oil, refer to chapter 3.
- 2. Remove primary cover, refer to page 9.7.
- Remove clutch, refer to page 9.8
- Remove torque compensator nut, spring flange, spring, and torque compensator slider. Ill. 2.
- Rotate engine until notch in flywheel exciter ring lines up with gear teeth as shown. III. 3.



111.1



111.2



TORQUE COMPENSATOR REMOVAL (continued)

Remove splined collar. Use two appropriate pry bars if necessary. III. 1.

NOTE: The splined collar is not pressed on, but considerable force may be necessary for removal.

Move the compensator gear away from the flywheel exciter ring and lift off.

TORQUE COMPENSATOR INSPECTION

1. Inspect all parts for excessive galling or damage.

NOTE: Some wear will be evident between the compensator gear and the compensator slider. This is normal. Do not replace parts unnecessarily.

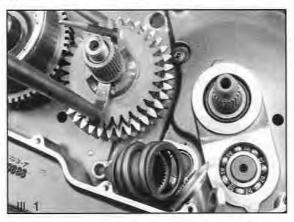
 Measure free length of torque compensator spring. III. 2.

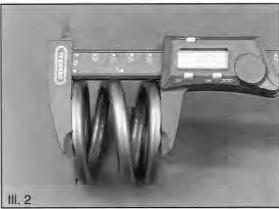
SPEC:

Torque Compensator Spring Free Length: Std: 47.2 mm (1.858") Wear Limit: 46.0 mm (1.811")

TORQUE COMPENSATOR INSTALLATION

 Make sure that the crankshaft exciter ring is positioned as shown. III 3.







CLUTCH / TRANSMISSION SHIFT LINKAGE

TORQUE COMPENSATOR INSTALLATION (continued)

2. Apply a very thin film of grease to all wear surfaces of compensator gear, place onto balance shaft.

LUBRICANT:

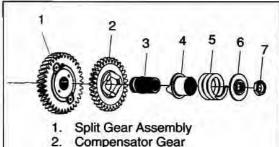
Victory All Purpose Grease: 2872187

- Lubricate balance shaft with a thin film of grease.
- 4. Lubricate I.D. of compensator with a thin film of grease. Install compensator into compensator
- 5. Lightly grease the splines and cam of the compensator slider. Install slider onto compensator.
- 6. Temporarily install the nut. Hold nut with pliers and pull on balance shaft until it is fully extended. Remove nut. III. 2.
- 7. Clean the balance shaft threads thoroughly. Place one or two drops of Loctite™ 262 onto the balancer shaft threads.

LOCKING AGENT:

Loctite™ 262

- 8. Place spring and flange onto compensator assembly. Tighten nut until light resistance is felt.
- 9. Attach chain wrench to compensator flange. Only attach the chain wrench to compensator flange and not the compensator spring. III. 3.
- 10. While slowly tightening nut, rotate compensator flange back and forth until the splines of the compensator flange align with the balancer shaft splines. This procedure is done by "feel", not visually. III. 3.



- Compensator 3.
- Compensator Slider 4.
- Compensator Spring
- Compensator Flange
- 7. Nut

III. 1





TORQUE COMPENSATOR INSTALLATION (continued)

1. Install engine lock tool.

SPECIAL TOOL:

Engine Lock Tool: PV- 43502-A

2. Tighten compensator nut to specified torque.

TORQUE:

Torque Compensator Nut: 104 Nm (75 lb-ft)

- 3. Install clutch, refer to page NO TAG.
- 4. Install primary cover, refer to page NO TAG.
- 5. Fill engine with oil, refer to Chapter 3.

SPLIT GEAR REMOVAL

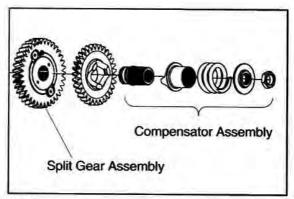
- Drain engine oil. Refer to Chapter 3.
- 2. Remove primary cover. Refer to page NO TAG.
- 3. Remove clutch. Refer to page NO TAG.
- 4. Remove flywheel. Refer to page 16.2.
- Rotate engine until alignment marks on split gear and primary drive gear are aligned.
- 6. Lock engine with engine lock tool.

SPECIAL TOOL:

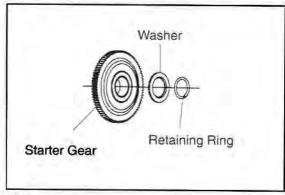
Engine Lock Tool: PV-43502-A

- Remove compensator nut. Remove compensator as an assembly.
- Remove starter gear retaining ring, washer, and starter gear.
- 9. Remove split gear assembly.





III. 2



III. 3

CLUTCH / TRANSMISSION SHIFT LINKAGE

SPLIT GEAR DISASSEMBLY

- 1. Place split gear in vise equipped with soft jaws. III. 1.
- Place tapered alignment punch into alignment hole. III. 1.
- Remove split gear bolts while keeping gear aligned with alignment punch. III. 1.
- Slowly remove alignment punch. Split gear will move as alignment punch is removed.
- 5. Separate split gear. III. 2.

SPLIT GEAR INSPECTION

- Visually inspect contact surfaces of gears, springs, spring channels, and gear teeth.
- Make sure the lubrication holes are free of debris. Clean if necessary.

NOTE: Some wear may be evident in the spring channels of the gears. This is normal and replacement is not necessary.

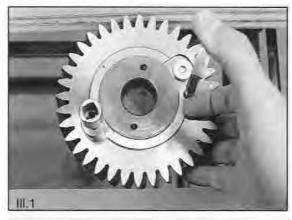
Replace parts as necessary.

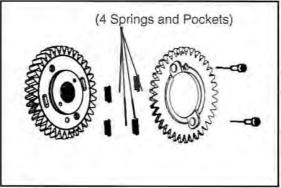
SPLIT GEAR ASSEMBLY & INSTALLATION

- Place the inner gear in a vise equipped with soft jaws and install the springs into the spring channels. III. 3.
- Apply grease to the mating surfaces of the two gears.
- Observe the alignment marks on the inner and outer gear. After split gear is assembled, the alignment dots must align. III. 4.
- Place the upper gear onto the lower gear and align the spring slots with the springs. III. 2.
- Apply downward pressure to the upper gear and insert tapered alignment bar into alignment holes. III. 1.
- While continuing to apply downward pressure. move gears into alignment with the alignment bar. III. 1.
- 7. Install bolts and hand tighten fully.
- Remove alignment bar and torque bolts to specification.

TORQUE:

Split Gear Assembly Bolts: 11.5 Nm (100 in-lbs)





III. 2





SPLIT GEAR ASSEMBLY & INSTALLATION (continued)

- Apply grease to the balancer shaft and mating surface of the crankcase and back of split gear assembly.
- Line up teeth of split gear assembly with 1/4" straight alignment bar (shank of 1/4" drill bit works well). Leave the alignment bar in place. Ill. 1.

NOTE: Do not allow the alignment bar to protrude out the back of the split gear assembly or installation will be difficult.

- Rotate the balancer shaft until the "boss" spline (double wide spline) is at the 12:00 o'clock position. Ill. 2.
- Place the alignment dots on the split gear at the 9:00 o'clock position and place the split gear onto the balancer shaft. Ill. 2.
- 13. Align the "boss" splines of the balancer shaft and split gear while simultaneously aligning the alignment dots of the split gear and primary drive gear. Failure to do so will result in excessive vibration and/or engine failure. III. 2.

NOTE: The two alignment dots on the split gear must straddle the one alignment dot on the primary drive gear. Ill. 2.

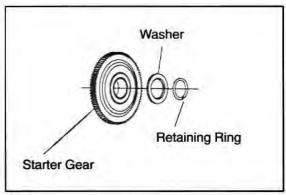
- Fully seat the split gear until it is flush with the primary drive gear. The alignment pin will have to be moved to fully align and seat the split gear.
- Install starter gear, starter gear washer, and starter gear retaining ring.

NOTE: Bevel of retaining ring washer faces retaining ring.

- Install compensator assembly. Refer to page 9.21.
- 17. Install flywheel. Refer to Chapter 16.
- 18. Install clutch, refer to page 9.15.
- 19. Install primary cover. Refer to page 9.17.
- 20. Fill engine with oil. Refer to Chapter 3.







III. 3

CHAPTER 10 TRANSMISSION/CRANKSHAFT

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MAIN BEARING INSPECTION	10.12
CONNECTING ROD BEARING CLEARANCE INSPECTION	10.12-10.13
CONNECTING ROD BEARING SELECTION	10.13
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GENERAL

 The engine must be removed from the frame in order to repair internal transmission components or crankshaft components. Refer to Chapter 6.

The following parts must be disassembled in order to repair internal transmission components or crankshaft components.

Cylinder Heads, refer to Chapter 7.

Cylinders & pistons, refer to Chapter 8.

Primary cover, clutch, torque compensator and gear shift linkage, refer to Chapter 9.

Starter motor, starter motor drive assembly, refer to Chapter 18.

Flywheel, refer to Chapter 16.

Starter clutch, refer to Chapter 18.

Mark and store disassembled parts so assembly can proceed with a minimum amount of wasted time.

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.

There are "White" and "Red" marked crankshafts and connecting rods. White connecting rods must be used with white crankshafts and red connecting rods must be used with red crankshafts.

Mark and store connecting rods, crankshaft and bearings so parts may be installed in their original locations.

Unless specifically called out, all torque specifications are "dry". Do not apply lubricants or locking agents to the threads of a fastener unless specifically directed to do so by the text.

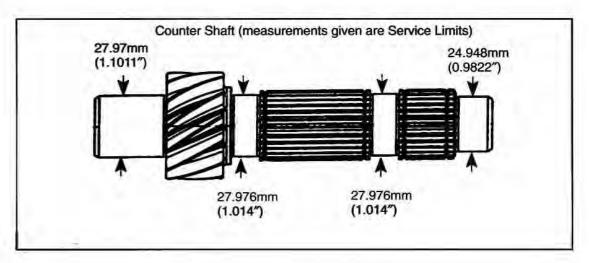
SPECIFICATIONS

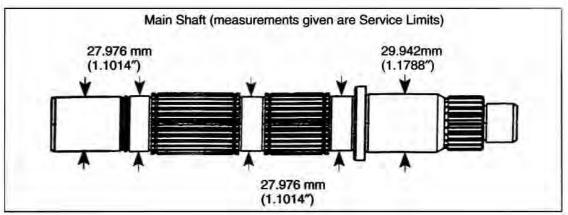
	Item	
Drive Train (General)	Transmission	Direct Drive, 5 speeds, Manually Operated
	Primary Reduction Ratio	1.50 : 1
	Final Reduction Ratio	2.13:1
	Gear Ratio: 1st Gear (Overall Ra- tio)	3.81 : 1 (12.17 : 1)
	Gear Ratio: 2nd Gear (Overall Ratio)	2.54 : 1 (8.11 : 1)
	Gear Ratio: 3rd Gear (Overall Ra- tio)	1.74 : 1 (5.56 : 1)
	Gear Ratio: 4th Gear (Overall Ra- tio)	1.29 : 1 (4.12 : 1)
	Gear Ratio: 5th Gear (Overall Ra- tio)	1.00 : 1 (3.19 : 1)

	Crankshaft / Connecting	ng Rod	
Part	Part Specific	Standard	Service Limit
Connecting Rod/Crankshaft	Connecting Rod to Crank- shaft Side Clearance		0.75mm (0.030")
	Connecting Rod to Crank- shaft Oil Clearance	0.05mm (0.002")	0.08 mm (0.003")
	Connecting Rod Small End I.D.		22.085 mm (0.8694")
	Main Bearing Oil Clearance	0.05mm (0.002")	0.08 mm (0.003")
	Connecting Rod Small End I.D.		22.085mm (0.8694")
	Crankshaft Rod Journal Width		41.5 mm (1.634")
	Connecting Rod Width		20.371mm (0.802")
	Rod Big End I.D. (White)		50.868 mm (2.0026")
	Rod Big End I.D. (Red)		50.87 mm (2.0027")
	Crankshaft Rod Journal O.D. (White)		47.965 mm (1.8884")
	Crankshaft Rod Journal O.D. (Red)		47.96 mm (1.8882")
	Left Main Bearing Journal O.D.		64.93 mm (2.5563")
	Right Main Bearing Journal O.D.		59.93 mm (2.3594")

SPECIFICATIONS

TRANSMISSION		
Part	Service Limit	
Shift Fork to Gear Clearance	0.35mm (0.014")	
Spinning Gear Side Clearance	0.35mm (0.014")	
Shift Fork Groove Width	5.26mm (0.207")	
Shift Fork Width	4.89mm (0.1925")	
Shift Fork Pin O.D.	5.94 mm (0.2338")	
Shift Fork Bore I.D.	10.036mm (0.3951")	
Shift Fork Rail Runout	0.025mm (0.001")	
Shift Fork Rail O.D.	9.938 mm (0.3912")	
Shift Fork Rail Journal I.D.	10.04mm (0.3953")	
5th Gear Bearing Surface O.D.	49.97mm (1.9673")	





TRANSMISSION/CRANKSHAFT SERVICE SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER	
Engine Stand	Commercially Available	
Engine/Transmission Stop Block	PV-43502	
Inch-Pound Torque Wrench	Commercially Available	
Foot-Pound Torque Wrench	Commercially Available	
0-25 & 25-50mm Outside Micrometer	Commercially Available	
Inside Bore Gauge Set	Commercially Available	
Telescoping Gauge Set	Commercially Available	
Small Hole Gauge Set	Commercially Available	
Feeler Gauge Set	Commercially Available	
Crankshaft Bearing Protector	PV-43504	
Crankcase Separating Bolts & Studs	PV-43503	
Bearing & Seal Driver Set	Commercially Available	
5th Gear (output shaft) Seal Installation Tool	PV-43505	
Plastigauge [®]	Commercially Available	
Blind Bearing Remover Set	Commercially Available	

TORQUE SPECIFICATIONS

Item			Torque Specification Nm / lb.ft. (in.lbs.)	
Crankcase Bolts	30.36	Nm	22 lb-ft	
Connecting Rod Bolts	55.20	Nm	40 lb-ft	
Oil Jet Body (where applicable)	27.6	Nm	(240 in-lbs)	
Crankshaft Upper Plug (8x1.25)	10.00	Nm	(90 in-lbs)	
Crankshaft Side Plug (14x1.5)	21.00	Nm	15 lb-ft	
Crankcase Reed Valve Retaining Bolts	7.5	Nm	(65 in-lbs)	
Oil Pump Driven Sprocket Bolt	13.2	Nm	(115 in-lbs)	
Shift Shaft Adapter	34.50	Nm	25 lb-ft	
Shift Detent Set Screw	11.50	Nm	(100 in-lbs)	
Neutral Switch	11.5	Nm	(100 in-lb)	
Shift Star Bolt	13.2	Nm	(115 in-lbs)	4
Crankcase Breather Baffle Plate Screws	7.55	Nm	(65 in-lbs)	
Crankcase Breather (top of crankcases)	13.2	Nm	(115 in-lbs)	
Counter Shaft Retaining Bolt	24.84	Nm	18 lb-ft	
Inner Sprocket Cover Bolts	17.3	Nm	(150 in-lbs)	
6 x 12 Bearing Retainer Screws	13.2	Nm	(115 in-lbs)	
5 x 12 Bearing Retainer Screws	7.5	Nm	(65 in-lbs)	
Shift Drum Bearing Retaining Screws	2.9	Nm	(25 in-lbs)	
Oil Line Fitting (3/8" NPT)	34.50	Nm	25 lb-ft	
Drain Plug	38.64	Nm	28 lb-ft	
Oil Pressure Switch	5.75	Nm	(50 in-lbs)	
Oil Filter Nipple	62.10	Nm	45 lb-ft	
11 mm Cylinder Studs	35.00	Nm	25 lb-ft	
9 mm Cylinder Studs	21.00	Nm	15 lb-ft	

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
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 Bear- ings	Transmission, Shift Cam Bearings	Replace Necessary Parts
	Worn Gear Shift Pawl Ratchet Mechanism	Shift Pawl Mechanism	See Chapter 9 & 10
	Broken or out-of-place return spring on shift shaft	Shift Shaft Return Spring	See Chapter 9
	Shift Detent Plunger Stuck	Shift Detent Plunger	Repair as Necessary
	Frozen Pivot Point, Bent External Shift Linkage	External Shift Linkage	See Chapter 3
	Bent or Distorted Shift Fork Rails	Shift Fork Rails	Replace Shift Fork Rails
	Debris From Broken Parts Locking Transmis- sion	Transmission-All	Repair as Necessary
Excessive Noise Related to Bottom End of Engine	Worn Main Bearings	Crankshaft and/or Crank- shaft Bearings	Repair as Necessary
	Worn Connecting Rod Bearings	Connecting Rod Bear- ings and/or Connecting Rod and/or Rod Bearings	Repair as Necessary
	Worn Connecting Rod Small End Bushing	Connecting Rod, Con- necting 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 Compen- sator, Flywheel, Starter Drive Assembly, Starter Clutch, Starter	See Chapter 9, 16, 17, 18
	Oil Pump	Oil Pump, Oll Pump Drive	See Chapter 4
	Cam Drive	Cam Chain, Cam Sprocket	Chapter 7

TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	POSSIBLE PART(s) AFFECTED	POSSIBLE REPAIR NEEDED
Transmission Hard to Shift	Improper Clutch Opera- tion	Clutch	See Chapter 9
	Incorrect Oil Viscosity	Oil Quality	See Chapter 3
	Incorrect Clutch Adjust- ment	Clutch Adjustment	See Chapter 3
	Bent, Rubbing, Sticky, Broken Shift Shaft (inter- nal)	Shift Shaft Components	See Chapter 9
	Sticking Pivot Point, Bent External Shift Linkage	External Shift Linkage	See Chapter 3
	Bent or Distorted Shift Forks	Shift Forks	Replace Shift Forks
	Damaged Shift Drum Grooves	Shift Drum	Replace 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	See Chapter 9
	Worn Shift Drum Pawls or Shift Drum Pawl Ratchet	Shift Drum or Shift Link- age	See Chapter 9 & this Chapter
	Broken Shift Return Spring	Shift Return Spring	See Chapter 9
	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

CRANKCASE SEPARATION

- 1. Remove engine from frame, refer to chapter 6.
- Place engine in engine stand. Tighten attachment bolts securely.

CAUTION:

3/8" spacers must be installed when attaching engine to engine stand.

SPECIAL TOOL:

Engine Stand:

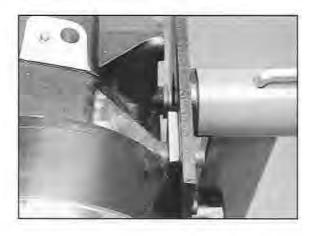
Commercially Available

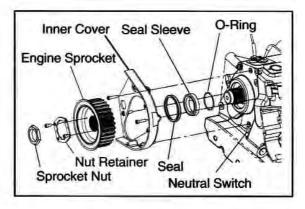
- 3. Remove cylinder heads, refer to chapter 7.
- Remove cylinders & pistons, refer to chapter 8.
- Remove primary cover, refer to chapter 9.
- Remove engine sprocket if not previously removed. Refer to chapter 6.
- Remove clutch, torque compensator, and gear shift linkage, refer to chapter 9.
- Remove starter motor, starter motor drive assembly, refer to chapter 18.
- Remove flywheel and starter clutch, refer to chapter 16 & 18.
- Ensure that all parts are removed from primary side of engine. Rotate engine stand so right side of engine is up.

CAUTION:

Make sure that engine stand is locked securely so engine cannot rotate!

- Remove two engine stand attachment bolts from right engine case half.
- 12. Remove drive sprocket cover.
- Remove spacer and O-ring from output shaft.
- Remove neutral switch.





CRANKCASE SEPARATION (continued)

 Place main bearing protector sleeve over cam drive sprocket. III. 1.

SPECIAL TOOL:

Main Bearing Protector Sleeve: PV-43504

- Loosen crankcase bolts 1/2 turn at a time following the torque sequence shown in III 2 until bolts are loose.
- 17. Remove crankcase bolts.
- Place crankcase separator studs in locations shown in III. 2.
- Place crankcase separator bolts on top of previously installed studs, alternate between the separator bolts turning them 1/2 turn at a time until the case half is loose.



Case Splitting Studs & Bolt Kit: PV-43503



NOTE: No gaskets, O-rings or shims are loose within the crankcase, no parts will be dislodged when the crankcase halves are separated.

CAUTION:

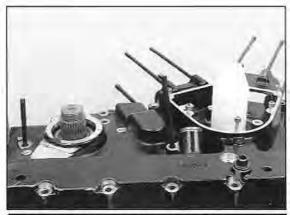
The main bearing is easily damaged. Ensure that the bearing protector is in place and that care is taken when removing the right crankcase half.

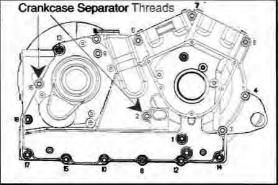
CRANKSHAFT REMOVAL

- Position the engine lock tool as shown in III.3.
- Remove the oil pump sprocket retaining bolt & washer.
- 3. Remove oil pump sprocket and chain.
- 4. Remove balance shaft.
- Grasp the crankshaft, pull crankshaft straight out of the left crankcase half.

CAUTION:

Connecting rod bearings and main bearings are easily damaged. Be careful not to cause damage to these parts when servicing items within the crankcases.





111.2



TRANSMISSION/CRANKSHAFT SERVICE CRANKSHAFT REMOVAL (continued)

 Use a permanent marker to mark the orientation of the connecting rods and the 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.

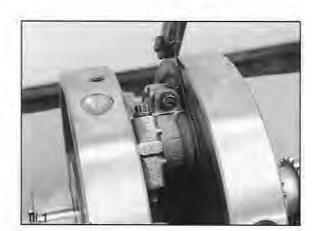
Move the rods to one side of the crankshaft. Insert a feeler gauge between one connecting rod and the crankshaft. III. 1 Record this measurement.

SPEC:

Connecting Rod To Crankshaft Side Clearance Service Limit: 0.75mm (0.030")

- If the clearance recorded exceeds the service limit, either the crankshaft, connecting rod or both need to be replaced. Refer to items 1 & 2 under crankshaft inspection to determine which part(s) are outside of specifications.
- Remove the connecting rod bolts and connecting rod bearing caps.

NOTE: It may be necessary to lightly tap on the side of the caps with a plastic mallet to loosen them.



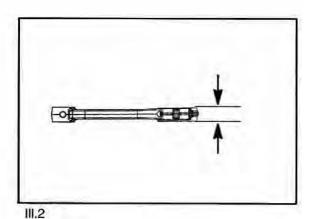
CRANKSHAFT INSPECTION

- 1. Measure the width of the rod bearing journal.
- Measure the width of the connecting rods at the big end. Ill. 2

SPEC:

Connecting Rod Width Service Limit: 20.371mm (0.802")

Visually inspect all bearing journals for scoring, damage or excessive wear. Replace crankshaft if it fails visual inspection.



CRANKSHAFT INSPECTION

 Measure the O.D. of the crankshaft rod journal in four places. Replace the crankshaft if it measures below the service limit. III.1.

SPEC:

White Crankshaft: Rod Bearing Journal O.D.

Service Limit; 47.965 mm (1.8884")

SPEC:

Red Crankshaft: Rod Bearing Journal O.D.

Service Limit: 47.96 mm (1.8882")

 Measure the O.D. of the main bearing journals, record the measurements. Replace the crankshaft if it measures below the service limit. III. 2.

SPEC:

Left Main Bearing Journal O.D. Service Limit: 64.93 mm (2.5563")

SPEC:

Right Main Bearing Journal O.D. Service Limit: 59.93 mm (2.3594")

Remove the blind plugs from the crankshaft. Ensure that all passages are clear. III.3.

CAUTION:

Blind plugs are installed with Locktite™ 262. Use localized heat (such as a soldering gun) when removing blind plugs.

CONNECTING ROD INSPECTION

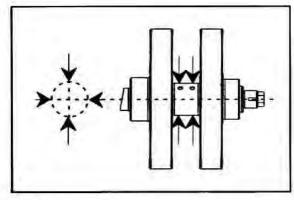
- Refer to chapter 8 for connecting rod small end inspection.
- Assemble the connecting rods without rod bearings. Torque rod bolts to specifications.

TORQUE:

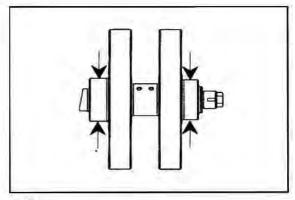
Rod Bolts: 55.20Nm (40 lb-ft)

CAUTION:

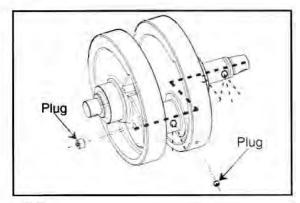
Secure the big end of the rods in a vise equipped with soft, protective jaws before torquing rod bolts. III.4.



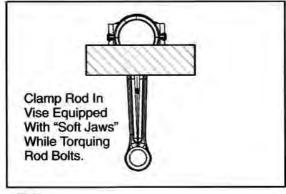
111.1



111.2



111.3



111.4

CONNECTING ROD INSPECTION (continued)

 Measure the I.D. of the connecting rod big end. Replace the connecting rod(s) if measurement is exceeds specification. III. 1.

SPEC:

White Connecting Rod Big End I.D. 50.868 mm (2.0026")

SPEC:

Red Connecting Rod Big End I.D. 50.87 mm (2.0027")

 Visually inspect the connecting rod upper and lower ends for scoring, damage, or excessive wear. Replace connecting rod(s) if they fail visual inspection.

CONNECTING ROD BEARING INSPECTION

 Inspect bearing inserts for unusual wear, peeling, scoring, damage etc. Replace as necessary.

NOTE: If one insert requires replacement, replace both connecting rod bearing inserts as a set.

MAIN BEARING INSPECTION

- Inspect bearing inserts for unusual wear, peeling, scoring, damage etc. Replace as necessary.
- Inspect location of lubrication hole in left crankcase. It should be located at the bottom. Ill. 2.
- Inspect location of lubrication hole in right crankcase. It should be positioned to the front of the engine as shown in III. 3.

CONNECTING ROD BEARING CLEARANCE INSPECTION

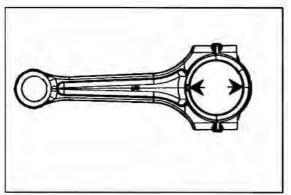
- 1. Clean all oil from bearing inserts and crank pins.
- Place a strip of Plastigauge[®] across the complete width of the crank pin. III. 4.

CAUTION:

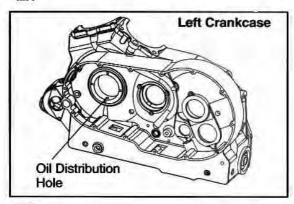
Do not place Plastigauge® across the oil holes.

CAUTION:

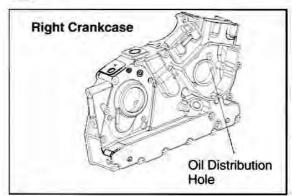
Do not allow the connecting rods to move during this procedure!



111.1



111.2



111.3



CONNECTING ROD BEARING CLEARANCE INSPECTION (continued)

- Install the connecting rods and bearing caps in the correct orientation.
- Torque the rod bolts to specification.

TORQUE:

Rod Bolts:
55.20Nm (40 lb-ft)

- Remove the bearing caps being careful not to disturb the Plastigauge[®].
- Use the measuring scale on the Plastigauge[®] wrapper to measure the thickness of the Plastigauge[®] for each connecting rod.

NOTE: Use the widest part of the Plastigauge® to determine the oil clearance.

SPEC:

Connecting Rod To Crankshaft Clearance

Service Limit: 0.0762 mm (0.003")

- If service limits are exceeded, install new rod bearings and recheck the oil clearance.
- If service limits are still exceeded, determine if the crankshaft or connecting rods need to be replaced per Crankshaft Inspection and Connecting Rod Inspection.
- At completion of measurement procedure; remove all traces of Plastigauge[®] from bearing and crankshaft.

CONNECTING ROD BEARING SELECTION

- Only one connecting rod bearing size is available, no oversized or undersized bearings are available.
- Proper oil clearance is determined by matched connecting rods and crankshaft.
- Connecting rods are color coded either "Red" or "White".
- Crankshafts are color coded either "Red" or "White".
- "White" coded crankshafts must be used with "White" coded connecting rods.
- "Red" coded crankshafts must be used with "Red" coded connecting rods.

MAIN BEARING OIL CLEARANCE INSPECTION

Record crankshaft main bearing journal O.D. for both right and left side. Refer to step 5 (page 11) of crankshaft inspection.

- 2. Measure and record installed main bearing I.D.s.
- Determine the clearance between the crankshaft main bearing journals and main bearings.

Main Bearing I.D.

- Crankshaft Main Bearing Journal O.D.
- = Main Bearing Oil Clearance

SPEC:

Main Bearing Oil Clearance Service Limit: 0.08 mm (0.003")

 If crankshaft dimensions are within tolerances per Crankshaft Inspection and oil clearances are incorrect, the main bearings must be replaced.

NOTE: 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.

NOTE: Replace main bearings as a set.

CONNECTING ROD INSTALLATION

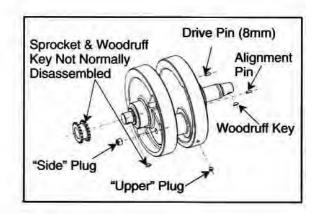
- Ensure that "White" connecting rods are installed on a "White" crankshaft or that "Red" connecting rods are installed on a "Red" crankshaft.
- Install blind plugs into crankshaft. Use Loctite™ 262.

TORQUE: Upper Crankshaft Blind Plug: 10 Nm (90 in. lbs.) Side Crankshaft Blind Plug: 21 Nm (15 lb-ft)

LOCKING AGENT

Loctite™ 262

- Install woodruff key in slot on left side of crankshaft.
- Install drive and alignment pins on left side of crankshaft.



CONNECTING ROD INSTALLATION (continued)

- Clean all oil off connecting rod, connecting rod cap and bearing inserts.
- Install bearing inserts onto connecting rods and caps.

NOTE: First, install bearing tab into groove, then press the rest of the bearing into place.

Apply assembly lube onto the connecting rod bearings and crank pin.

LUBRICANT:

Moly Assembly Paste: 2871460

Install rods and caps onto the crankshaft. Ensure that I.D. marks are aligned. Ill. 1.

NOTE: Procedure during disassembly called for marking of connecting rods and caps. Ensure that each part is installed in its original location by noting the marks placed on the parts during disassembly.

NOTE: Observe "OUT" 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.

Tighten rod cap bolts to 1/2 torque specification, then full torque.

TORQUE:

Rod Bolts: 55.20Nm (40 lb-ft)

- Inspect that the connecting rods are free to rotate on the crankshaft journal.
- Measure the rod side clearance as outlined in step 6 (page 10) of crankshaft removal. III. 1.

SPEC:

Connecting Rod To Crankshaft Side Clearance Service Limit: 0.75mm (0.030")



CRANKSHAFT INSTALLATION

NOTE: If the crankcases have been removed from the engine stand, install the left engine case on the engine stand at this time.

Apply assembly lube to the main bearing inserts.

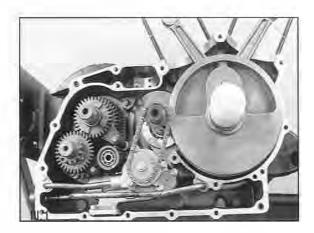
LUBRICANT:

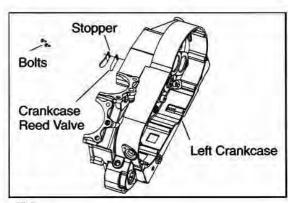
Moly Assembly Paste: 2871460

- Position the rods so that the left side rod is in the cutout for the rear cylinder and right side rod is in the cutout for the front cylinder. III. 1.
- 3. Place the crankshaft into the left crankcase half.
- Assemble the crankcases, page 10.30-10.34.
- Assemble the cylinders, pistons and cylinder heads, refer to Chapter(s) 7 & 8.
- 6. Install engine into frame, refer to Chapter 6.

CRANKCASE REED VALVE ASSEMBLY REMOVAL & INSPECTION

- Remove engine from frame, refer to Chapter 6.
- Remove cylinder heads, refer to Chapter 7.
- Remove cylinders & pistons, refer to Chapter 8.
- Remove primary cover & components under primary cover, refer to Chapters 9, 16, 17 & 18.
- Separate engine cases, refer to pages 10.8 and 10.9.
- Remove the retaining bolts for the reed valve assembly. Remove the assembly. III. 2.
- Inspect the reed valve for pitting or other damage at the sealing surface.
- Inspect that the reed valve can seal properly (not warped).
- 9. Replace the reed valve as necessary.





111.2

CRANKCASE REED VALVE ASSEMBLY INSTALLATION

- 1. Install reed valve with stopper plate.
- Install retaining bolt, torque to specification.

TORQUE:

Crankcase Reed Valve Retaining Bolts: 7.5 Nm (65 in-lbs)

COUNTER BALANCER REMOVAL & INSPECTION

- 1. Remove engine from frame, refer to Chapter 6.
- 2. Remove cylinder heads, refer to Chapter 7.
- Remove cylinders & pistons, refer to Chapter 8.
- Remove primary cover & components under primary cover, refer to Chapters 9, 16, 17 & 18.
- Separate engine cases, refer to pages 10.8 and 10.9.
- Remove bolt from oil pump drive sprocket.
- Remove sprocket & chain from oil pump.
- 8. Remove chain from counter balancer.
- Grasp counter balancer and pull it from the left center case.
- Inspect counter balancer gear and sprocket teeth for cracks, broken teeth or excessive wear.
- Rotate right and left counter balancer bearings by hand while observing bearing freedom of rotation. Bearings should not exhibit roughness or impaired rotation.
- 12. Visually inspect bearings for damage.
- Bearings which fail inspection must be replaced.

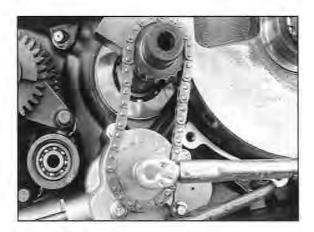
COUNTER BALANCER INSTALLATION

 Lubricate counter balancer bearings and bearing contact surfaces of counter balancer with engine oil.

LUBRICANT:

Victory 20W/40 Semi-Synthetic Motorcycle Oil

Insert threaded end of counter balancer shaft into left side bearing.



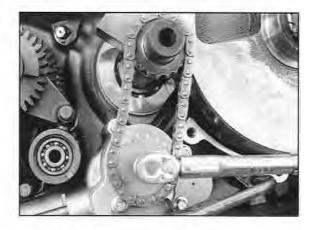
COUNTER BALANCER INSTALLATION (continued)

- 3. Install oil pump drive chain onto counter balancer.
- Install chain and sprocket onto oil pump driven shaft.
- Install oil pump sprocket bolt and torque to specification.

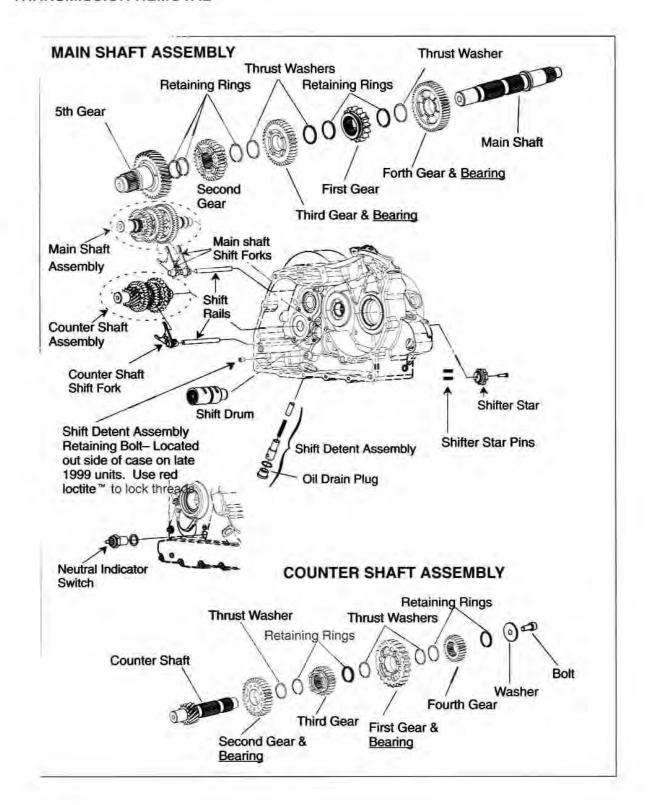
TORQUE:

Oil Pump Driven Sprocket Bolt: 13.2 Nm (115 in-lbs)

- Reassemble crankcases, refer to pages 10.30-10.34.
- 7. Reassemble the top end, refer to Chapters 7 & 8.
- 8. Install engine into frame, refer to Chapter 6.



TRANSMISSION REMOVAL



TRANSMISSION REMOVAL

- 1. Remove engine from frame, refer to Chapter 6.
- Remove cylinder heads, refer to Chapter 7.
- 3. Remove cylinders & pistons, refer to chapter 8.
- Remove primary cover & components under primary cover, refer to Chapters 9, 16, 17, & 18.
- 5. Remove bolt & washer from countershaft. III. 1
- Remove shift star. III. 1
- 7. Split cases, refer to pages 10.8 and 10.9.
- 8. Remove shift fork rails. III. 2.
- 9. Remove shift forks. Ill. 2.
- Remove transmission clusters. Remove both main shaft and counter shaft clusters together. III.2.

NOTE: No loose shims will be encountered when splitting the center cases or during transmission removal.

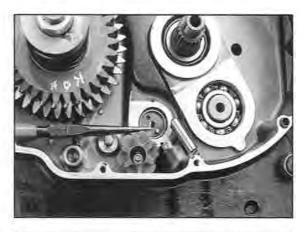
- 11. Remove shift drum. III. 2.
- Place right center case (with output shaft assembly pointing up) into press.
- 13. Press out the output shaft assembly. III. 3

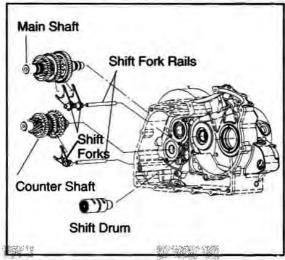
CAUTION:

Mating surfaces of center cases are easily damaged due to careless handling. Protect the surfaces with wood or other soft material when placing center case into press.

TRANSMISSION BEARING INSPECTION

- Clean bearings thoroughly with clean solvent & dry with compressed air.
- 2. Lubricate bearings with engine oil.
- Rotate bearings with fingers observing for rough or loose bearings.
- Visually inspect bearings for surface damage.
- Replace any bearings that fail inspection.





111.2



TRANSMISSION DISASSEMBLY

CAUTION:

Make notes, record and store parts so that shims, circlips and gears can be reassembled in their correct location and orientation.

Remove circlips, shims and gears from shafts.

TRANSMISSION INSPECTION

- Visually inspect all of the gear teeth, dogs and dog holes, splines and bearing surfaces for damage or excessive wear. Ill. 1
- Measure and record the shift fork to shift fork groove clearance between the 3 shift forks and their respective gears. III. 2



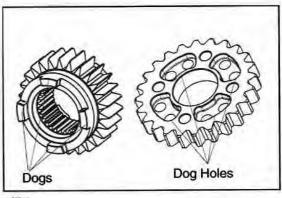
Shift Fork to Gear clearance Service Limit: 0.35mm (0.014")

Measure and record the clearance between the spinning gears and their shims. III. 3.

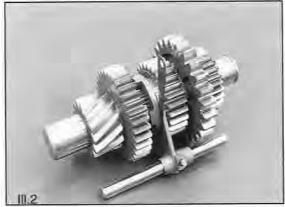
SPEC:

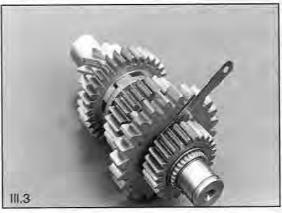
Spinning Gear Side clearance Service Limit: 0.35mm (0.014")

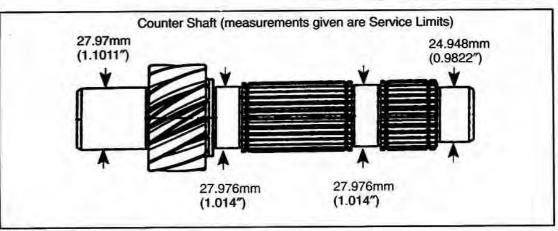
- Visually inspect the spline grooves and sliding surfaces of main shaft & countershaft for scoring, abnormal wear or damage.
- Measure and record the O.D. of the countershaft at the bearing surfaces. III. 4.



111.1



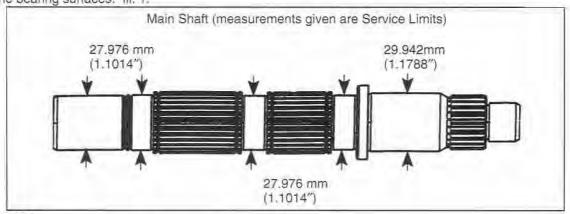




111.4

TRANSMISSION INSPECTION

Measure and record the O.D. of the main shaft at the bearing surfaces. III. 1.



- 111.1
- Visually inspect the shift forks and shift fork grooves for scoring, burning or abnormal wear.
- Measure and record the shift fork groove width. III. 2.

SPEC:

Shift Fork Groove Width Service Limit: 5.26mm (0.207")

Measure and record the shift fork width (A, III. 3) and shift fork pin O.D. (B, III. 3).

SPEC: Shift Fork Width (A) Service Limit: 4.89mm (0.1925") Shift Fork Pin O.D.(B) Service Limit: 5.94 mm (0.2338")

- Visually inspect the shift rails for damage.
- 11. Measure the I.D. of the shift fork rail bores, III. 3.

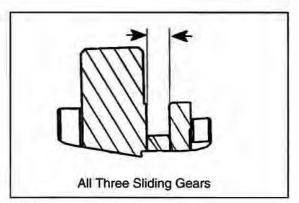
SPEC:

Shift Fork Bore I.D.(C) Service Limit:10.036mm (0.3951")

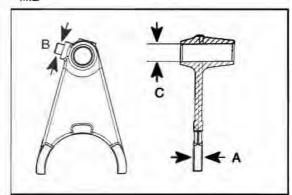
 Place the shift fork rails on V-blocks and inspect for run out with a dial indicator. III. 4.

SPEC:

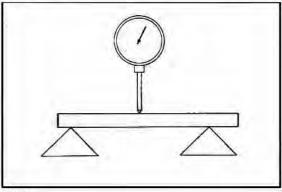
Shift Fork Rail Runout Service Limit: 0.025mm (0.001")



111.2



111.3



111.4

Polaris Sales Inc. Victory Motorcycle Division

10.22

7/99

SHIFT DRUM INSPECTION

Inspect the right side shift cam pin for looseness in the crankcase. Inspect the surface of the pin for damage.

TORQUE:

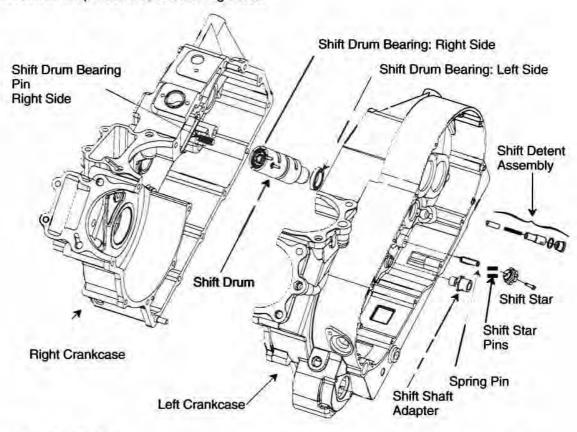
Shift Shaft Adapter: 34.50 Nm (25 lb-ft)

- Inspect the right side shift cam bearing for damage.
- Inspect the bearing surface on the left side of the shift drum for damage. Inspect the left side bearing for roughness or damage.
- Inspect the shift shaft adapter for tightness and/or damage.
- Inspect the spring pin for tightness and/or damage.

TORQUE:

Shift Detent Set Screw: 11.50 Nm (100 in-lbs)

- 6. Inspect the shift star for excessive wear.
- Inspect the shift detent assembly for freedom of movement. Inspect the set screw for tightness.



SHIFT DRUM INSPECTION (continued)

 Inspect the grooves of the shift drum for excessive wear. Pay close attention to the areas that position the shift forks for each chosen gear ratio. III. 1.

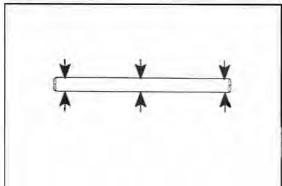


Measure the O.D. of the shift fork rails in several places. III. 2.

SPEC:

Shift Fork Rail O.D.

Service Limit: 9.938 mm (0.3912")

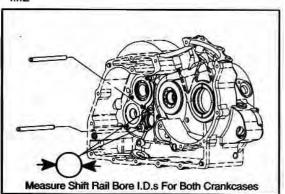


 Measure and record the shift fork rail journal I.D.s in both the right & left case halves. Ill. 3.

SPEC:

Shift Fork Rail Journal I.D. Service Limit:10.04mm (0.3953")





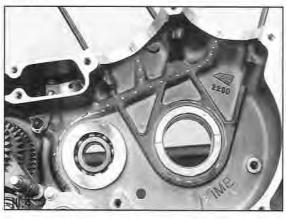
TRANSMISSION OIL JET INSPECTION

Inspect the transmission oil jet for obstructions.
 NOTE: Late 1999 models utilize a one piece design.

TORQUE:

Transmission Oil Jet (If Equipped) 27.6 N m (240 lb-in)





5th GEAR INSPECTION

 Measure and record the O.D. of 5th gear's bearing surface. III. 1.

SPEC:

5th Gear Bearing Surface O.D. Service Limit: 49.97mm (1.9673")

- Visually inspect the needle bearing within the 5th gear assembly for damage and abnormal wear. III. 2.
- 3. Visually inspect gear teeth of the 5th gear. III. 2.

5th GEAR SEAL REMOVAL & INSTALLATION (Engine Disassembled & Output Shaft Removed)

- Use suitable seal remover and carefully pry seal out. Ill. 3.
- 2. Clean seal cavity thoroughly.
- 3. Lightly grease new O-ring and install.

LUBRICANT:

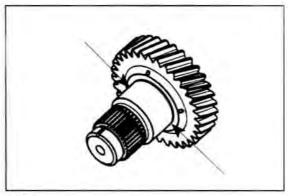
Victory All Purpose Grease: 2872187

 Lightly grease sealing lip of seal and surface of seal installation tool.

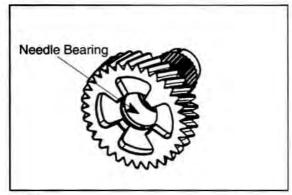
SPECIAL TOOL:

Output Shaft Seal Installation Driver: PV-43505

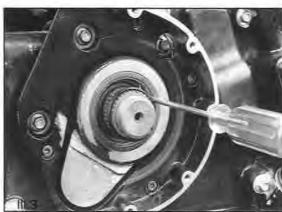
- 5. Place thin film of engine oil to O.D. of new seal.
- 6. "Load" seal onto seal driver.
- Drive seal into place. Seal driver will stop at correct depth. III. 4.



111.1



111.2





5th GEAR SEAL INSTALLATION (Engine In Frame)

- Remove drive belt and engine sprocket. Refer to chapter 11.
- 2. Clean area around seal thoroughly.
- 3. Remove seal sleeve. III. 1.
- 4. Remove O-ring.
- Using suitable seal remover, work around inner portion of seal until seal is free of engine cases. III.2.



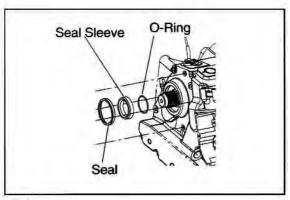
Choose a seal remover with a rounded, polished working end. Take care not to gouge the seal bore of the engine cases. Scratching or damaging the cases can result in an oil leak.

- Install the seal following the directions in steps 2-8 of the previous section.
- Lightly grease seal sleeve. Install seal sleeve with chamfer towards engine. III. 3.

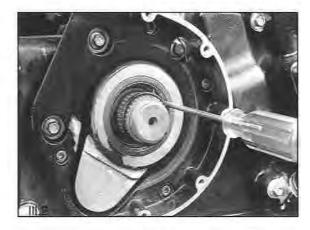
LUBRICANT:

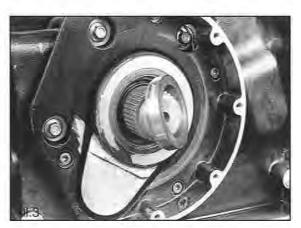
Victory All Purpose Grease: 2872187

Install the engine sprocket and drive belt. Refer to chapter 11.

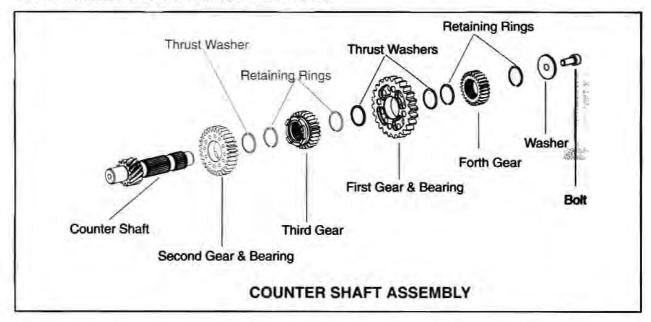


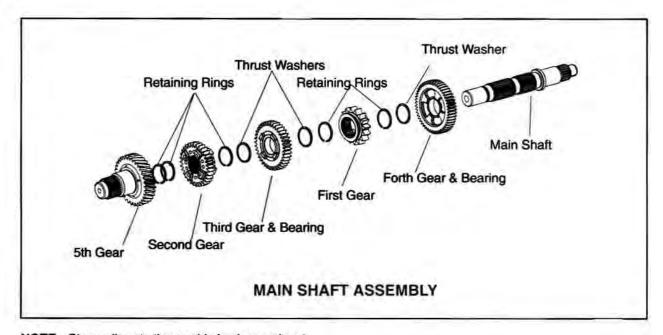
111.1





TRANSMISSION COMPONENT ASSEMBLY





NOTE: Clean all parts thoroughly in clean solvent.

NOTE: Apply engine oil to gear and bushing sliding surfaces, shift fork grooves and bearing elements.

NOTE: Assemble all parts in original positions.

TRANSMISSION COMPONENT ASSEMBLY

NOTE: Never reuse circlips, always assemble transmission with new circlips.

NOTE: Snap rings must have their sharp edge facing the thrust load side. III.1.

NOTE: Inspect the snap rings to ensure that they are seated in their grooves and aligned with their ends placed in the grooves of the splines. III. 2.

- 1. Install the shift drum.
- Install shift star locating pins if previously removed.
- 3. Install the shift star and retaining bolt.



Shift Star Bolt: 13.2 Nm (115 in-lbs) Apply Red Loctite "

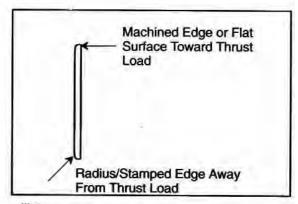
NOTE: It is possible to install the shift star incorrectly. The shift star is properly positioned when the neutral detent of the shift star aligns with the neutral button for the neutral switch. Ill. 3.

 Install the shift detent, spring and bolt, torque to specification. Late build units have detent set screw on outside of crankcase

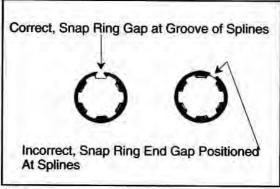
TORQUE:

Shift Detent Set Screw: 11.50 Nm (100 in-lbs)

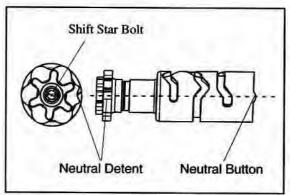
Align the neutral protrusion in the 6 o'clock position. III. 3.



111.1



111.2



111.3

TRANSMISSION COMPONENT ASSEMBLY (continued)

- Position the left crankcase half in the engine stand so that inside of crankcase is facing up.
- Place right crankcase in press. Securely support crankcase with wooden blocks. Do not allow crankcase to rest on steel portion of press.
- 8. Lubricate shaft O.D. and bearing with engine oil.

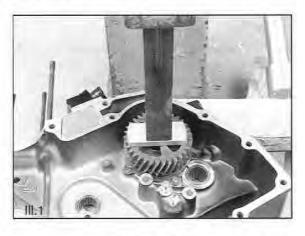


Victory 20W/40 Semi-Synthetic Motorcycle Oil

- 9. Lubricate shaft O.D. and bearing with engine oil.
- Press 5th gear into bearing until it bottoms.
 III. 1

NOTE: This is a very light press fit and excessive force is not necessary.

- Install the main shaft cluster and the countershaft cluster into the left case as an assembly. Ill. 2.
- 12. Install the countershaft bolt & washer.
- Install the 2 main shaft shift forks (long) on to the main shaft and shift drum. III. 3.
- Install the shift rail for the main shaft shift forks.
 3.
- Install the countershaft shift (short) fork on the countershaft and shift drum. Install the shift rail. III. 3.







CRANKCASE ASSEMBLY

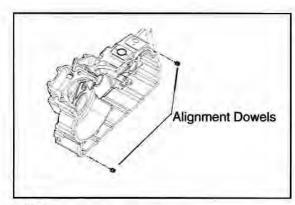
NOTE: Make sure that crankcase sealing surfaces are clean.

NOTE: Make sure that alignment dowels are properly positioned. III. 1.

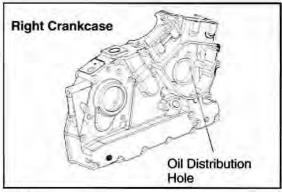
NOTE: Make sure that right side main bearing oiling hole is at the 9:00 o'clock position when viewed from the outside of the case. Ill. 2.

NOTE: Make sure that the left side main bearing oiling hole is at the 6:00 o'clock position. Ill. 3.

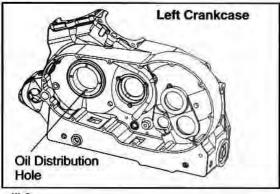
NOTE: Make sure that crankcase breather baffle plate is properly installed. III. 4.



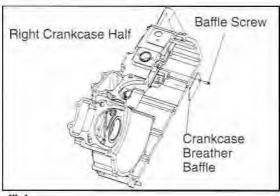
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111.4

CRANKCASE ASSEMBLY

NOTE: See page 10.17 for crankshaft installation.

NOTE: See page 10.18 for countershaft balancer

installation.

NOTE: See Chapter 4 for oil pump installation.

NOTE: Make sure all oil passages are clear.

NOTE: Position the rods so that the left side rod is in the cutout for the rear cylinder and right side rod is in

the cutout for the front cylinder. III. 1.



Crankcase Breather Baffle Plate Bolts:7.5 Nm (65 in-lbs)

 Lubricate right and left main bearing with assembly lube.



Moly Assembly Paste: 2871460

2. Place bearing protector over cam drive sprocket.

SPECIAL TOOL:

Main Bearing Protector Sleeve:

PV-43504

Place a light coating of case sealant to both crankcase sealing surfaces.

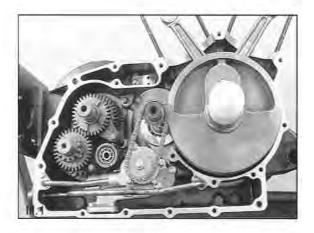
SEALANT:

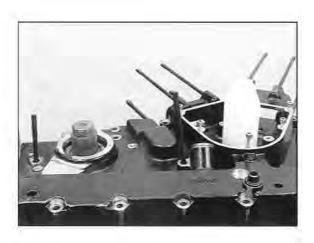
Case Sealant: Loctite™ Ultra Black 598

CAUTION:

Only use a very light coat of case sealant on the crankcase sealing surfaces. Excessive sealant will be pushed out and can plug lubrication passages within the engine causing severe engine damage.

- Install right side crankcase half on to left crankcase half and push case half together with hand pressure. III. 2.
- Turn 5th gear by hand as the cases are going together to align the engagement dogs. Ill. 2.





CRANKCASE ASSEMBLY (continued)

- When the cases are as close together as can be obtained by hand pressure, install case screws and tighten each 1/2 turn at a time while turning all shafts by hand to ensure alignment. Do not torque screws to final torque at this time.
- Continue to do so until case halves contact each other.

CAUTION:

The cases should come together with very little pressure applied with the case screws. If excessive force is needed to assemble the cases, something is wrong! Remove the right case half and determine the cause before proceeding.

- 8. Ensure that all shafts turn freely.
- 9. Rotate engine so left side faces up.
- Apply a light coat of grease to the starter O-ring and install the starter (use new O-ring).

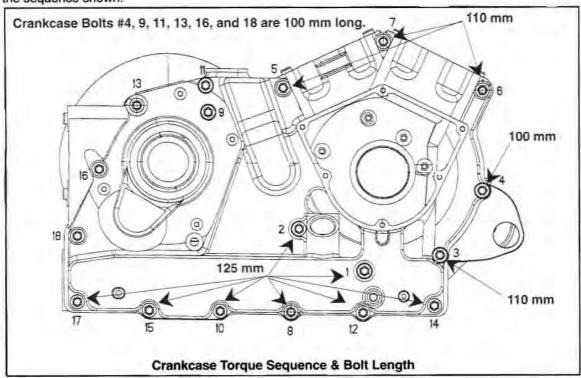
LUBRICANT:

Victory All Purpose Grease: 2872187

11. Rotate engine so right side is facing up.

CRANKCASE ASSEMBLY (continued)

Torque crankcase screws to 1/2 of final torque in the sequence shown.



TORQUE:

Crankcase Bolts (1/2 Torque First): 15.18Nm (11 lb-ft)

Torque crankcase screws to final torque specification.

TORQUE:

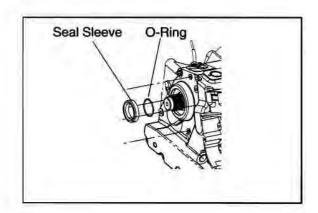
Crankcase Bolts (Final Torque): 30.36Nm (22 lb-ft)

- Rotate all shafts to determine freedom of rotation.
 If shafts are bound, determine reason before continuing.
- 15. Shift transmission by hand to determine functioning of transmission. Transmission input and/or output shafts will have to be turned by hand to shift transmission. If transmission does not shift through all gear positions, determine the cause before proceeding.

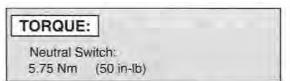
CRANKCASE ASSEMBLY (continued)

 Lightly grease O-ring and seal sleeve. Install O-ring and seal sleeve on output shaft.

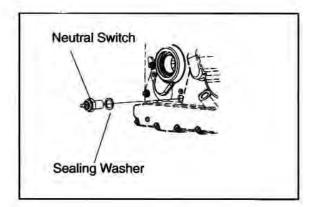
NOTE: Spacer is installed with chamfer towards engine.



17. Install neutral switch with new sealing washer.



- Install components in primary cover, refer to Chapters 9, 16, 17, & 18.
- 19. Install cylinders & pistons, refer to Chapter 8.
- 20. Install cylinder heads, refer to Chapter 7.
- 21. Install engine into frame, refer to Chapter 6.



CHAPTER 11 DRIVE LINE

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C-10-10-10-10-10-10-10-10-10-10-10-10-10-	11.1
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GENERAL

Adjustment of belt deflection and wheel alignment is covered in the maintenance section, Chapter 3.

CAUTION:

Improper alignment of rear wheel will cause steering instability and premature belt wear. Take precautions to do this procedure correctly any time belt is removed or during maintenance services.

NOTE: Belt and sprockets will generally last a very long time. In most circumstances, the only inspection that needs to be performed is visual for both sprockets and belt. Belt misalignment and foreign material damage (rocks or road debris getting between the belt and sprockets) are generally the cause of needed belt and/or sprocket replacement.

NOTE: If the belt needs replacement and the sprockets pass visual inspection, it is permissible to replace the belt only.

SPECIFICATIONS

FINAL DRIVE		
Drive Belt Deflection 8mm (5/16") at center of belt with 10 lb. force applied to belt.		

DRIVE LINE

TORQUE SPECIFICATIONS

	FRAME PRQUE SPECIFICATIONS PRIVE LINE
Fastener Type Torque N-m (lb-ft)	
Rear Wheel Sprocket Bolts	57 Nm (42 lb-ft)
Engine Sprocket Nut	138 Nm (100 lb-ft)
Engine Sprocket Nut Retainer Plate Bolts	10 Nm (85 in-lbs)
Rear Axle Nut	90 Nm (65 lb-ft)
Swing Arm Access Member Bolts	62 Nm (45 lb-ft)
Belt Guard Bolts – 8mm [6mm]	16 Nm (12 lb-ft) [11 N m (96 in-lb)]
Drive Belt Adjusting Lock Nuts 23 Nm (16.5 lb-ft)	
Front Sprocket Cover Bolts	11.5 Nm (100 in-lbs)

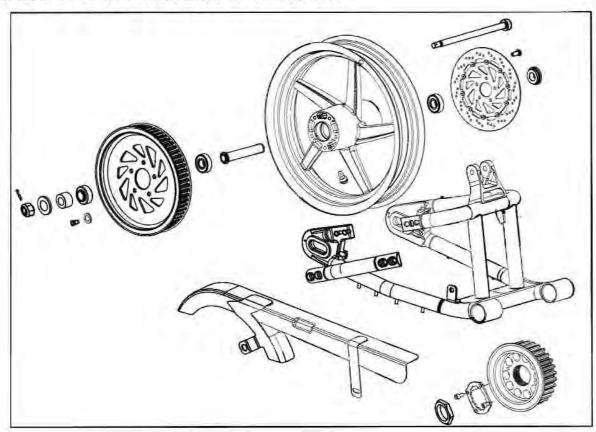
SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER	
Drive Belt Tension Gauge	PV-43532	
Torque Wrench	PV-43543, PV-43564	
Wheel Alignment Gauge	PV-43528	

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	Replace Parts As Necessary
Broken or Torn Cogs on Belt	Foreign Material Damage	Replace Parts As Necessary
Belt Jumps Sprocket Teeth	Worn or Damaged Belt or Sprockets.	Replace Parts As Necessary
	Belt Too Loose	Adjust Belt
Excessive Wear, Binding Suspension	Belt Too Tight	Adjust Belt
Broken Belt	Belt Weakened By Foreign Material Damage. Belt Run Excessively Tight For Long Period of Time.	Replace Belt, Inspect Sprockets
Belt Delaminating	Foreign Material Damage Weakened Belt. Chemical Contamination	Replace Belt

EXPLODED VIEW OF DRIVELINE COMPONENTS



DRIVE LINE

BELT INSPECTION

- 1. Inspect belt backing for delaminating.
- 2. Inspect belt teeth for foreign material damage.
- Inspect belt tension, adjust if necessary. Refer to chapter 3.
- Inspect all belt surfaces for excessive wear or foreign material damage.

BELT REMOVAL

NOTE: Belt does not have to be removed in order to remove front sprocket. If front sprocket will be removed to accomplish the job performed, the front sprocket should be removed first. The rear brake will be used to hold the sprocket when removing the front sprocket nut. See page 11.5 for front sprocket removal.

NOTE: If original belt is to be reinstalled, mark belt with a crayon (or something similar) to indicate direction of belt rotation. Reinstall belt in same direction as it was removed.

- Remove rear cylinder muffler. Refer to III. 2 and chapter 2.
- 2. Remove rear cylinder head pipe. Refer to chapter 2.
- 3. Remove front sprocket guard.
- 4. Remove belt guard
- 5. Remove belt access member of swing arm. III. 3.
- 6. Loosen rear axle nut.
- Loosen belt adjustment bolts completely.
- 8. Slide rear wheel forward as far as it will go.
- Take belt off rear sprocket, then front sprocket.

BELT INSTALLATION

- 1. Place belt onto front sprocket.
- 2. Work belt onto rear sprocket.
- Install swing arm access member & belt guard.

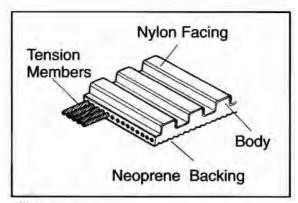
TORQUE:

Swing Arm Access Member Bolts: 61 Nm (45 lb-ft)

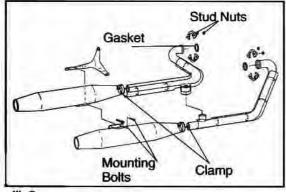
TORQUE:

Belt Guard Bolts: 23 Nm (16.5 lb-ft)

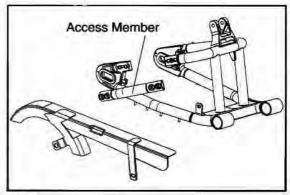
4. Tighten rear axle nut then back off 1 turn.



111.1



111.2



111.3

BELT INSTALLATION (continued)

Install front sprocket cover, torque bolts to specification.

TORQUE:

Sprocket Cover Bolts: 9.78 Nm (85 lb in)

- 6. Adjust belt tension, refer to chapter 3.
- Inspect wheel alignment, refer to chapter 3.
- 8. Torque rear axle nut to specification.



Rear Axle Nut: 90 Nm (65 lb-ft)

9. Install rear head pipe and muffler. Refer to chapter 2.

FRONT SPROCKET REMOVAL

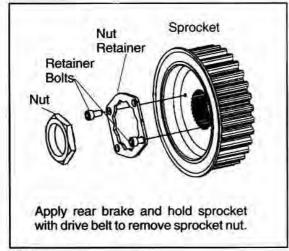
NOTE: Belt does not have to be removed in order to remove front sprocket. If belt will be removed to accomplish the job performed, the front sprocket should be removed first. The rear brake will be used to hold the sprocket when removing the front sprocket put

- 1. Remove rear cylinder muffler, refer to chapter 2.
- Loosen front cylinder head pipe head pipe clamp, refer to chapter 2.
- Remove rear cylinder head pipe.
- 4. Remove the front sprocket cover.
- Apply rear brake to hold sprocket, remove front sprocket nut. III. 1.
- Loosen rear axle.
- Loosen rear wheel alignment bolt lock nuts.
- Loosen rear wheel alignment bolts, push wheel completely forward. Ill. 2
- Move belt & front sprocket to the right of the machine and remove the front sprocket.

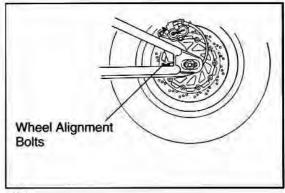
FRONT SPROCKET INSPECTION

 Visually inspect the sprocket for excessive wear, foreign material damage due to road debris between sprocket and belt, bent or cracked flanges, and cracks of any kind. III. 3

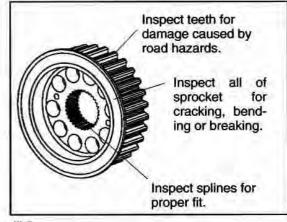
NOTE: Both front and rear sprockets (and to some extent, the belt) will exhibit a polished and worn appearance due to normal operation. Do not needlessly replace belt and/or sprockets unless uncharacteristic damage is noted. Virtually all damage encountered will be due to foreign material damage.



111. 1



111.2



111.3

DRIVE LINE

FRONT SPROCKET INSTALLATION

- Place belt onto front sprocket, place sprocket over splines of output drive shaft.
- Tighten rear axle then back it off 1 turn.
- 3. Adjust belt tension visually to provide enough tension to keep the belt from jumping the teeth of the sprocket while torquing the front sprocket nut.
- 4. Install front sprocket nut.
- Apply rear brake and torque engine sprocket nut.



Engine Sprocket Nut: 138 Nm (100 lb. ft.)

- Install lockplate and install retaining bolts. III. 1.
- The lockplate can be installed in various positions. Use all positions on one side and turn lockplate over to try all positions on the other side until proper alignment is achieved.
- 8. If none of the available positions align the lockplate's holes with the bolt holes in the sprocket, the sprocket nut may be turned an additional 45°. Mark the output shaft and sprocket nut and tighten the sprocket nut in small increments until alignment of the retaining plate is accomplished.

TORQUE:

Engine Sprocket Nut Retainer Plate Bolts: 13.2 Nm (115 in. lbs)

- 9. Adjust wheel alignment and belt tension. Refer to Chapter 3 for proper procedures.
- 10. Install engine sprocket cover. Torque to specification. See belt installation section for torque specification.

TORQUE:

Sprocket Cover Bolts: 11.5 Nm (100 lb in)

11. Install rear cylinder exhaust system. Refer to Chapter 2.

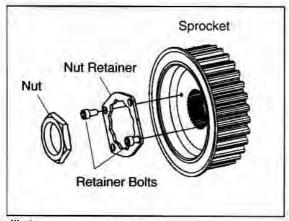
CAUTION:

Use new exhaust gasket for rear cylinder head pipe.

TORQUE:

Exhaust System

- A. Exhaust Flange Stud Nuts: 17 Nm / 12 lb-ft
- B. Muffler Brackets: 27 Nm / 20 lb-ft
- C. Muffler Clamp: 27 Nm 20 lb-ft
- D.Crossover Clamp 47 Nm / 35 ft lb



111. 1

FRONT SPROCKET INSTALLATION (continued)

12. Torque rear axle nut to specification.

TORQUE:

Rear Axle Nut: 90 Nm 65 lb-ft

REAR SPROCKET REMOVAL

- 1. Securely support rear of motorcycle off floor.
- 2. Remove rear wheel, refer to chapter 13.
- 3. Remove sprocket nuts, remove rear sprocket.



While working on the rear sprocket (or any rear wheel repair procedures) take necessary steps to protect the disc surface.

REAR SPROCKET INSPECTION

 Visually inspect the sprocket for excessive wear, foreign material damage due to road debris between sprocket and belt, bent or cracked flanges, and cracks of any kind.

NOTE: Both front and rear sprockets (and to some extent, the belt) will exhibit a polished and worn appearance due to normal operation. Do not needlessly replace belt and/or sprockets unless uncharacteristic damage is noted. Most all damage encountered will be due to foreign material damage.

REAR SPROCKET INSTALLATION

- Clean all mounting surfaces of the rear wheel and rear sprocket.
- Install sprocket and sprocket bolts, torque bolts in a cross pattern to specification.

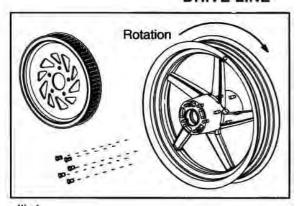
TORQUE:

Rear Sprocket Bolts: 57 Nm 42 lb-ft

- Install rear wheel, refer to chapter 13.
- Adjust belt tension, refer to chapter 3.
- Inspect wheel alignment, refer to chapter 3.
- 6. Torque rear axle nut to specification.

TORQUE:

Rear Axle Nut: 90 Nm 65 lb-ft



111. 1

CHAPTER 12 FRONT WHEEL/SUSPENSION/STEERING

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GENERAL

A WARNING

This motorcycle was produced with the designated tires as original equipment. The testing that was done to ensure stability and superior handling included these tires. The use of other tires may cause instability. Failure to use Victory original equipment tires could result in poor motorcycle stability and handling, which can lead to a crash and subsequent serious injury or death. Use <u>only</u> the recommended tire at the recommended tire pressure.

Tubeless tires are used on this motorcycle. Damaged rims create the possibility of sudden or slow air loss. Out-of-round rims (either axially or radially) can create steering imbalance and/or reduced steering control. Operating the motorcycle with damaged rims creates a safety hazard. Do not attempt to straighten rims, they must be replaced if they are found to be damaged.

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. The possibility of injury to the technician or damage to the motorcycle is created if safe practices are not followed.

Leaking front fork seals do more than destabilize the workings of the front fork and create unsightly appearance. Contaminated brake discs or pads greatly reduce the amount of stopping force available. Do not attempt to clean contaminated disc pads, they must be replaced. Brake discs can be cleaned using Victory Disc Brake Cleaner or a commercially available disc cleaner. Follow the instructions printed on the container purchased.

- 1. Refer to Chapter 15 for brake system service and repairs.
- 2. Refer to Chapter 14 for tire removal, repair and balancing.
- 3. Refer to Chapter 3 for maintenance of front end components.

SPECIFICATIONS

	Item	Specifications
GENERAL	Front Suspension	Marzocchi™ Conventional Telescopic
	Fork Tube Diameter	45mm (1.771")
	Front Wheel Travel	129.54 mm (5.1" in)
	Fork Spring Preload	44.704mm=36.46kgs (1.76"=80.4lbs)
	Front Tire (Dunlop™)	MT90HB16 71H
	Front Brake	300mm Floating Rotor with Four Pistor Caliper
	Caster Angle (Rake)	30°
	Trail Length	127mm (5")

	FRONT WHEEL/SU	ISPENSION/STEERII	NG
	Item	Standard	Service Limit
Minimum Tire Center Tread Depth			1.6 mm (0.063")
Cold Tire Pressure	Up to 90 kg (200 lb) load	34 PSI	Not Applicable
	Up to Maximum Weight Capacity	34 PSI	Not Applicable
Axle Runout		Not Applicable	0.20mm (0.008")
Front Wheel Rim Runout	Radial	Not Applicable	2.0mm (0.080")
Spoudostra 4000	Axial	Not Applicable	2.0mm (0.080")
Fork Spring Free Length		380 mm ± 3 mm (14.96" ± 0.120")	370 mm (14.57")
Fork Top-Out Spring Free Length		32 mm ± 1.5 mm	28 mm (1.1")
Fork Tube Runout		Not Applicable	0.20mm (0.008")
Fork Oil Type/Weight	Victory 7.5W/10 Fork Oil		
Fork Oil Level	130 mm (5.12")	Not Applicable	Not Applicable
Fork Oil Capacity (per leg)	600cc (20.24 oz.)	Not Applicable	Not Applicable
Steering Bearing Preload	Refer to procedure		

TORQUE SPECIFICATIONS

	FRAME FICAL TORQUE SPECIFI WHEEL / SUSPENSION	
Fastener Type	Torque N-m	Torque lb-ft or (in-lbs)
Clutch Lever Bracket to Handlebar	16 Nm	12 lb-ft
Fork Spring Cap	25 Nm	18 lb-ft
Fork Damper Rod Bolt	50 Nm	37 lb-ft
Triple Clamp Pinch Bolt (Upper)	86 Nm	63 lb-ft
Triple Clamp Pinch Bolt (Lower)	86 Nm	63 lb-ft
Front Axle Bolt	61 Nm	45 lb-ft
Front Axle Pinch Bolt	25 Nm	18 lb-ft
Front Brake Master Cylinder Clamp To Handlebar	16 Nm	12 lb-ft
Front Brake Caliper Mounting Bolt	41 Nm	30 lb-ft
Front Brake Disc Bolt	47 Nm	35 lb-ft
Front Brake Hose Clamp Bolt	11 Nm	(96 in-lbs)
Front Fender Mounting Bolts	16 Nm	12 lb-ft
Front Wheel Hub Cap	27 Nm	20 lb-ft
Handlebar Riser To Fork	41 Nm	30 lb-ft
Handlebar Clamp To Riser	34 Nm	25 lb-ft
Handlebar Switch Screws	3 Nm	(25 in-lbs)
Headlight Mounting Bolts	27 Nm	20 lb-ft
Steering Stem Bearing Adjustment Nut (Refer to procedure)	39 Nm to seat bearings 21 Nm final torque	29 lb-ft initially to seat bearings 15 lb-ft final torque
Steering Bearing Adjustment Lock Nut	39 Nm	29 lb-ft
Steering Stem Cap Bolt	68 Nm	50 lb-ft
Valve Stem Nut	3 Nm	(24 in-lbs)

SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER
Blind Bearing Remover Set	PV-43551
Steering Bearing; Wheel Bearing; Swing Arm Bushing Removal & Installation Set.	PV-43515
Damper Rod Holder	PV-43517
Fork Seal Driver	PV-43516
Steering Stem Bearing Adjustment Socket	PV-43508
Steering Stem Bearing Spanner Wrench	PV-43509

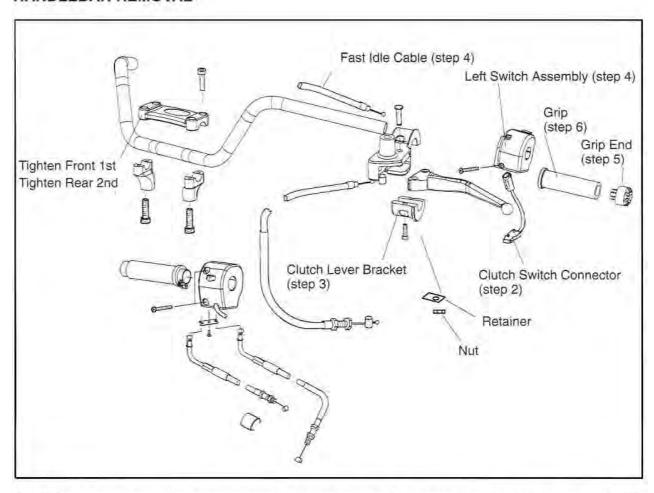
TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	POSSIBLE REPAIR NEEDED
Heavy Steering	Steering Stem Nut Over Tightened	Adjust Correctly
	Damaged Steering Stem Bearings or Races	Replace
	Bent Steering Stem	Replace
	Front Tire Damaged or Wom Ex- cessively	Replace
	Low Tire Pressure	Adjust Correctly
Pulls to One Side or Wanders	Damaged Steering Stem Bearings or Races	Replace
	Steering Stern Nut Over Tightened or Under Tightened	Adjust Correctly
	Bent Front Axle	Replace
	Rear Wheel Not Aligned Correctly	Adjust Correctly
	Bent Frame	Replace or Have Professionally Straightened
	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
	Low Tire Pressure	Adjust Correctly
Handlebars Oscillate (Wobble)	Bent Front Axle	Replace
	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	Worn Fork Bushings	Rebuild Forks
Suspension	Low Fork Fluid	Determine Cause/Replace Fork Oil
	Loose Fasteners	Correct
	Loose Steering Stem Bearings	Determine Cause/Correct

TROUBLESHOOTING (continued)

PROBLEM	POSSIBLE CAUSE	POSSIBLE REPAIR NEEDED
Front Wheel Oscillates (Wobbles)	Bent Front Rim	Replace
	Damaged Front Wheel Bearings	Replace
	Damaged or Incorrect Tire	Replace
	Loose Axle or Axle Pinch Bolts	Torque to Specification
	Right and Left Fork Not Installed at Same Height	Set Correctly
	Right and Left Fork Have Different Fork Oil Levels	Set Correctly
	Fork Spring Free Length Different Between Right & Left	Replace
	Wheel Assembly Out-of-Balance	Correct
	Low Tire Pressure	Adjust Correctly
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. See Chapter 15.
	Brake Dragging (Bent Disc)	Replace, See Chapter 15.
	Improper Assembly After Repairs	Correct as Necessary

HANDLEBAR REMOVAL



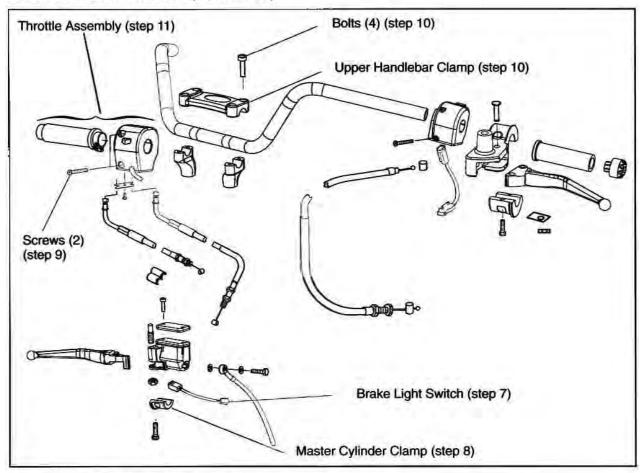
CAUTION: Many items will be hanging loose when removing the handlebars (clutch assembly, wires, throttle cable etc.). Take precautions to prevent damage to the fuel tank, front fender or other painted or chrome surfaces. Cover the fuel tank, front fender and other cosmetic surfaces with padded, protective coverings. Secure all parts removed from handlebars which will be left hanging loose with wire, tape or string to prevent damage.

1. Remove wiring harness retainers.

NOTE: Wiring harness retainers are meant to be used once. After removal they should be replaced with new retainers.

- 2. Disconnect clutch switch connector.
- Remove 2 screws for clutch lever bracket clamp, remove clutch lever bracket from handlebar,
- Remove screws for left handlebar switch assembly. Disconnect fast idle cable from lever. Remove switch assembly.
- Grasp left grip end firmly. While twisting grip end back & forth, pull grip end off.
- Remove left grip by inserting a thin screwdriver between the grip and handlebar end. Spray a small amount of water/soap solution into the area between the grip and handlebar end. Aggressively twist the grip back-and-forth while simultaneously pulling the grip off.

HANDLEBAR REMOVAL (continued)



- 7. Disconnect front brake light switch wires.
- Remove 2 screws for brake master cylinder clamp. Remove master cylinder clamp and master cylinder.

CAUTION: Secure master cylinder in such a way that it cannot damage other components and is held upright and level to prevent air from entering the hydraulic brake system.

- Remove 2 screws from right handlebar switch housing, separate handlebar switch.
- Remove bolts from upper handlebar clamp, remove clamp.
- Move handlebars to the left, slide throttle grip assembly off handlebar.

HANDLEBAR INSTALLATION

- Clean inside of throttle grip assembly and throttle cable flange grooves. Ill. 1.
- 2. Clean throttle grip area. III. 1.
- Apply a thin film of grease on the contact area of the handlebar between the throttle grip and handlebar. III. 1.
- Apply a thin film of grease to the throttle cable flange grooves. III. 1.



Victory All Purpose Grease: 2872187

- Slide throttle assembly onto right handlebar end (cables have not been removed and should still be attached to the throttle tube).
- Position handlebar onto lower handlebar clamps, install upper handlebar clamp.
- Position alignment dot (on front left of handlebar) with inside edge of handlebar clamp parting line. III. 2.
- Start all handlebar clamp bolts. Tighten front handlebar clamp bolts to specified torque.

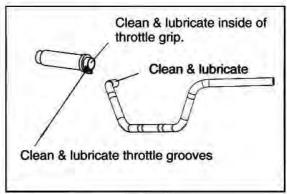


Handlebar Clamp Bolts (to riser): 34 Nm (25 lb-ft)

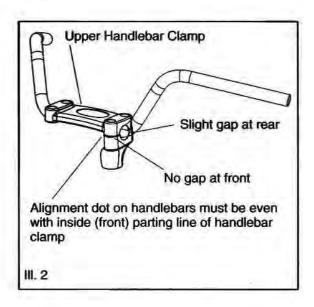
Torque rear handlebar clamp bolts to specification.

NOTE: When final tightening is completed, the handlebar clamp will be flush at the front and a gap will exist at the rear. III. 2.

 Install right handlebar switch housing onto handlebar. Make sure that locating pin of switch assembly aligns with hole in handlebars.



III. 1



HANDLEBAR INSTALLATION (continued)

 Install right handlebar switch housing screws, make sure locating pin properly aligns with hole in handlebar. Tighten screws to specified torque.

TORQUE:

Handlebar Switch Screws: 3 Nm (25 in-lbs)

- 12. Install master cylinder and clamp, install screws.
- Torque screws to specification.

TORQUE:

Master Cylinder Clamp to Handlebar: 16 Nm (12 lb-ft)

- Connect front brake switch wiring harness.
- Install fast idle cable onto fast idle lever.
- 16. Clean inside of new left grip and handlebar grip surfaces.

NOTE: The procedure used to remove the grip can cause damage and/or deterioration of the grip. It is recommended that a new grip be installed.

- Apply grip cement to inside surface of left handlebar grip and to outside surface of left handlebar grip surfaces. Follow directions supplied with grip cement for proper application.
- Install left handlebar grip cap.
- Install left handlebar switch housing onto handlebar, make sure dot aligns with parting line of switch housing.

TORQUE:

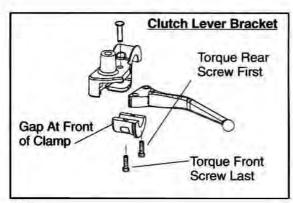
Handlebar Switch Screws: 3 Nm (25 in-lbs)

- 20. Install clutch lever bracket and clamp with screws.
- Torque the rear screw first and then the front (gap will exist at front of the clutch lever clamp). Ill. 1.

TORQUE:

Clutch Lever Clamp Screws: 16 Nm (12 lb-ft)

- 22. Connect clutch interlock switch terminals.
- Inspect operation of throttle assembly and fast idle lever. Refer to Chapter 3.
- 24. Inspect clutch free play, refer to Chapter 3.
- 25. Inspect operation of switches.
- Inspect operation of front brake. If brake bleeding is necessary, refer to Chapter 15.
- 27. Adjust mirrors as needed.



111. 1

LOWER HANDLEBAR CLAMP REMOVAL

CAUTION: The lower handlebar clamps can be removed without complete handlebar removal. However, extreme caution must be taken not to damage the fuel tank. Either remove the fuel tank or cover the fuel tank with a padded protective covering, regardless of the method chosen. Be extremely careful when handling or working around the fuel tank.

CAUTION: Secure handlebar assembly in such a way that other components cannot be damaged and master cylinder is held upright and level to prevent air from entering the hydraulic brake system.

- Before removing handlebars, loosen lower handlebar clamp retaining bolts on underside of upper triple clamp.
- Remove upper handlebar clamp bolts and upper handlebar clamp.
- 3. Secure handlebars out of the way.
- 4. Remove lower clamp (riser) retaining bolts
- Remove lower handlebar clamp(s).

LOWER HANDLEBAR CLAMP INSTALLATION

- Clean mounting surface on triple clamp.
- 2. Install lower handlebar clamp(s) (riser).
- 3. Install bolts, tighten finger tight.
- Install handlebars, upper handlebar clamp and handlebar clamp bolts.
- Tighten upper handlebar bolts snugly, do not torque to final specification at this time.
- Tighten lower handlebar clamp bolts to final torque specification.

TORQUE:

Lower Handlebar Clamp (Riser) Bolts: 41 Nm (30 lb-ft)

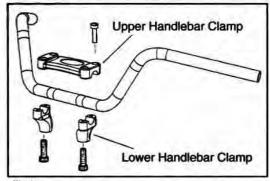
- 7. Loosen upper handlebar clamp bolts.
- Position alignment dot (on front left of handlebar) with inside edge of handlebar clamp parting line. III. 2.
- Start all handlebar clamp bolts. Tighten front handlebar clamp bolts to specified torque.

TORQUE:

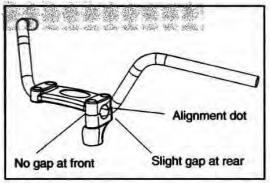
Upper Handlebar Clamp Bolts: 34 Nm (25 lb-ft)

Torque rear handlebar clamp bolts to specification.

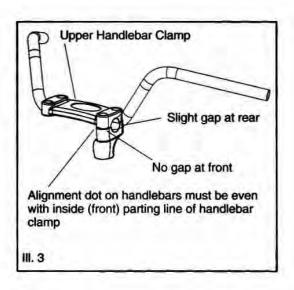
NOTE: When final tightening is completed, the handlebar clamp will be flush at the front and a gap will exist at the rear.

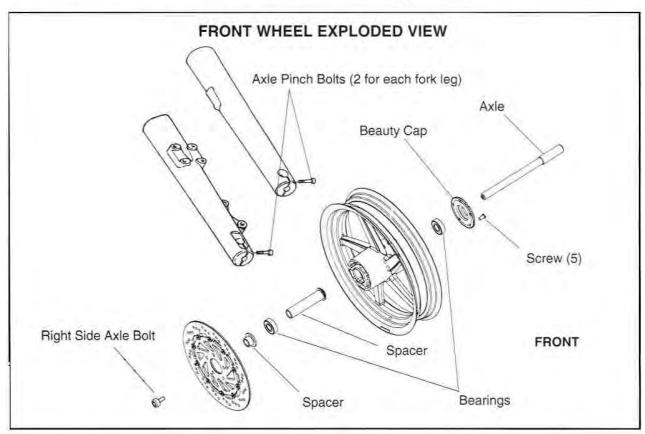


111. 1



III. 2





FRONT WHEEL REMOVAL

 Securely support front end of motorcycle so front wheel is off the ground.

NOTE: It is only necessary to raise the front wheel 1 1/2"-2" off the floor to gain clearance for wheel removal.

- 2. Loosen right side axle pinch bolts. III. 1.
- 3. Loosen and remove right side axle bolt.
- 4. Loosen left side axle pinch bolts.
- Support wheel and remove axle from left side of motorcycle.
- Lower wheel, tilt the wheel slightly and remove it. III. 2.
- 7. Remove axle spacer from right side.

NOTE: Do not operate the front brake lever with the wheel removed.





FRONT AXLE INSPECTION

Place axle in V-blocks and inspect runout. III. 1.

SPEC:

Axle Runout Service Limit: 0.20mm (0.008")

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 for this inspection to be valid.

Set up a dial indicator to measure radial runout (up and down). Ill. 2.

SPEC:

Wheel Radial & Axial Runout Service Limit: 2.0mm (0.080")

- Position dial indicator to measure axial runout (left to right). Ill. 3.
- 4. Visually inspect wheel for cracks.
- Replace wheel if it fails visual or measured inspection.

FRONT WHEEL BEARING INSPECTION

NOTE: Bearings cannot be repacked, if they fail inspection they must be replaced.

- Visually inspect integral bearing seal for damage.
- Inspect bearings by turning inner race by hand.

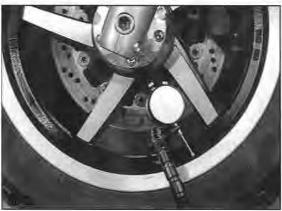
NOTE: Due to extremely close tolerances, the bearings must be inspected visually, and by feel. Look for signs of discoloration, scoring, galling, or contamination from moisture or dirt. Replace bearings if any of the above are present. Turn the inner race of the bearings. The bearings should turn smoothly and quietly. The inner race should be firm with minimal side to side movement and no detectable up and down movement.

- 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 by hand.
- Replace bearings that fail any of the above inspections.

NOTE: If one bearing fails inspection, replace both bearings.

CAUTION: The removal process damages the bearings. If bearings are removed they must be replaced with new bearings.







WHEEL BEARING REMOVAL

NOTE: Replace both bearings as a set.

- Remove 5 screws for hub cap, remove hub cap. III. 1.
- Install bearing remover element into one bearing. III. 2.



- 3. Remove bearing, III. 2.
- 4. Remove bearing spacer from wheel hub. III. 1.
- Use an appropriate drift and drive out remaining bearing.

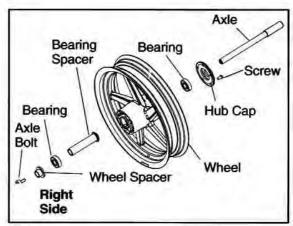


- 1. Clean inside of wheel hub and bearing spacer.
- Place new bearing onto disc side of wheel with markings facing up.
- Install wheel bearing installation tool. Pull the <u>disc</u> <u>side</u> wheel bearing into the hub until <u>fully seated</u>. Ill. 3.

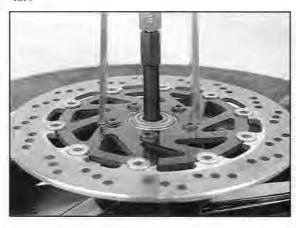
NOTE: The disc side (right) wheel bearing must be seated firmly in the hub.



- Turn wheel over, install bearing spacer. The spacer can be installed in either direction. Ill. 1.
- Place new left wheel bearing onto wheel with markings facing up.
- Install wheel bearing using the installation tool until fully seated against the spacer. III. 3.



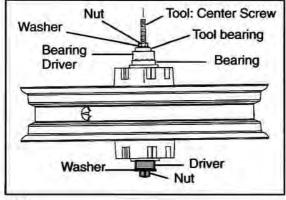
111.1



Front Wheel Bearing Installation Note:

Install disc side bearing first - must be fully seated in hub.

Install left side bearing last, must be fully seated against spacer.



111.3

WHEEL BEARING INSTALLATION (continued)

Clean brake disc with Victory Disc Brake Cleaner or an equivalent disc brake cleaner.

WARNING: Grease or oil on the brake disc will increase stopping distance and may result in loss of vehicle control.

TORQUE:

Front Brake Disc Bolt: 48 Nm (35 lb-ft)

FRONT WHEEL INSTALLATION

- 1. Position wheel into fork legs. Ill. 1.
- Work a thin film of grease onto the surface of the front axle.

LUBRICANT:

Victory All Purpose Grease: 2872187

- 3. Lift wheel and insert axle from left side of machine.
- 4. Insert wheel spacer on right side of machine. III. 2.
- 5. Fully seat axle.
- Install axle bolt on right side. Hold left side of axle and torque axle bolt to specification.

TORQUE:

Front Axle Bolt: 61 Nm (45 lb-ft)

- Spin front wheel by hand and inspect for proper assembly.
- 8. Lower front of machine.
- Apply front brake and push front end up and down several times. Check for excessive "stiction" or binding. If problems are found, inspect for cause and correct as necessary.
- Torque axle pinch bolts to specification.

TORQUE:

Front Axle Pinch Bolt: 25 Nm (18 lb-ft)

 Inspect operation of front brake lever, lever action should be firm. If brake bleeding is required refer to chapter 15.





SUSPENSION/STEERING/FRONT WHEEL FRONT FORK REMOVAL

- 1. Remove front wheel, refer to page 12.10.
- Remove four bolts, flanged washers, and rubber washers from each side of front fender. Remove front fender. III. 1.

CAUTION: Front fender finish is easily damaged if handled carelessly. Carefully remove front fender taking care not to scratch it. Place fender in protected area until it is needed for assembly.

If right fork leg is to be removed, remove brake caliper bolts and wheel caliper.

CAUTION: Do not allow caliper to hang from the brake hose. Secure brake caliper in such a way to keep stress off of brake hose.

- Loosen upper triple clamp bolts on both forks. III.2.
- Loosen fork caps until O-ring is fully exposed, do not fully remove fork cap. III. 3.

A WARNING

Failure to loosen upper triple clamp bolts before loosening fork caps will do irreparable damage to the fork caps.

If forks are to be disassembled, loosen damper rod bolts. III. 4.

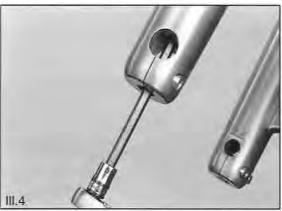
CAUTION: Do not remove fork damper rod bolts completely at this time. Only loosen them 1/2 to 1 turn.

NOTE: Damper rod may spin and the bolt will not loosen. If the damper rod spins, do not continue to attempt to loosen the bolt. Proceed to Step 7.









FRONT FORK REMOVAL (continued)

- 7. Loosen lower triple clamp bolts. III. 1
- 8. Remove forks from triple clamps.

FRONT FORK DISASSEMBLY

1. Remove fork cap. III. 2.

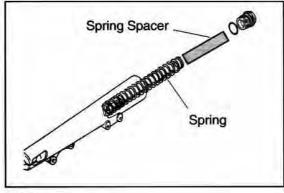
A WARNING

The fork cap is under spring pressure. Apply firm downward pressure on fork cap and use extreme caution when removing the fork cap(s). Take care not to damage O-ring. Wear safety glasses and a face shield.

2. Remove spacer and fork spring. III. 3.







III. 3

SUSPENSION/STEERING/FRONT WHEEL FRONT FORK DISASSEMBLY (continued)

- Invert the fork over a drain pan. Pour out fork fluid by moving the fork through its entire stroke several times.
- 4. Carefully pry up dust seal cap and remove. III. 1.



Remove damper rod bolt and sealing washer. III. 2.

NOTE: If the damper rod spins while attempting to remove the damper rod bolt, it will be necessary to install the damper rod holding tool into the top of the damper rod.

SPECIAL TOOL:

Damper Rod Holder: PV-43517

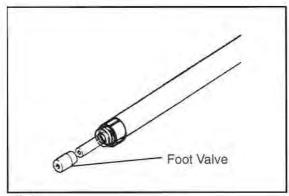
6. Pull the stanchion tube out of the slider.

NOTE: Resistance may be encountered because of the bushings; this is normal. Once forks are disassembled, the fork seals will be ruined and require replacement. It is also possible that the disassembly process will damage either the upper slider bushing and/or lower stanchion tube bushing. Inspect them carefully upon assembly.



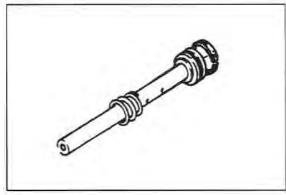
FRONT FORK DISASSEMBLY (continued)

Remove foot valve from bottom of damper rod. III.



III. 1

Remove damper rod from stanchion tube along with top-out spring. III. 2



III. 2

9. Remove wire seal retaining ring. III. 3.



 Protect the edge of the slider with a shop towel.
 Use a large, flat pry-bar to pry the fork seal out of the slider. Ill. 4.

CAUTION: Work carefully around the circumference of the slider and pry the seal out in small steps. Do not contact the seal bore with the tip of the pry bar or slider will be permanently damaged.

11. Remove seal cap (large flat washer under seal).



SUSPENSION/STEERING/FRONT WHEEL FRONT FORK DISASSEMBLY (continued)

 Spread stanchion tube bushing and remove it from stanchion tube. Ill. 1.

NOTE: Do not remove the upper & lower bushings and the damper rod piston ring unless they are going to be replaced with new parts.



 Work carefully and distort the slider bushing slightly. When the slider bushing can be grasped with pliers, remove the bushing carefully. Ill. 2.



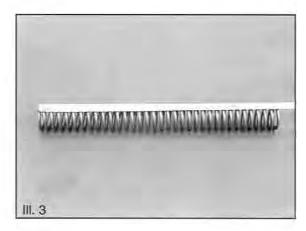
FRONT FORK INSPECTION

1. Measure fork spring free length. III. 3.

SPEC:

Fork Spring Free Length Service Limit: 380 mm ± 3 mm

 Inspect stanchion tube for scoring, indentations due to rocks or other road debris, excessive or abnormal wear. Very light scratches may be polished out, deeper scratches will damage the seal and upper bushing and may cause oil to leak past seals. Stanchion tube replacement is necessary if deep scratches or indentations are found.



SUSPENSION/STEERING/FRONT WHEEL

FRONT FORK INSPECTION (continued)

- Inspect slider for dents or other indentations due to rocks or other road debris. If damage is found on exterior of slider, insert stanchion tube into slider and move the stanchion tube throughout its complete stroke observing for binding at the indentation discovered. If binding is found, slider must be replaced.
- Inspect foot valve for scoring, excessive or abnormal wear.
- Inspect damper rod for scoring, excessive or abnormal wear.
- Place stanchion tube in V-blocks and measure runout. Runout that exceeds service limits require stanchion tube replacement. III. 1.

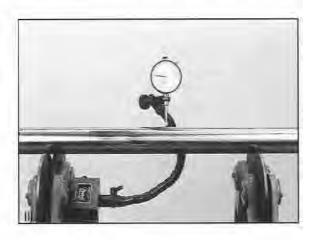


Fork Tube Runout Service Limit: 0.20 mm (0.008")

A 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.

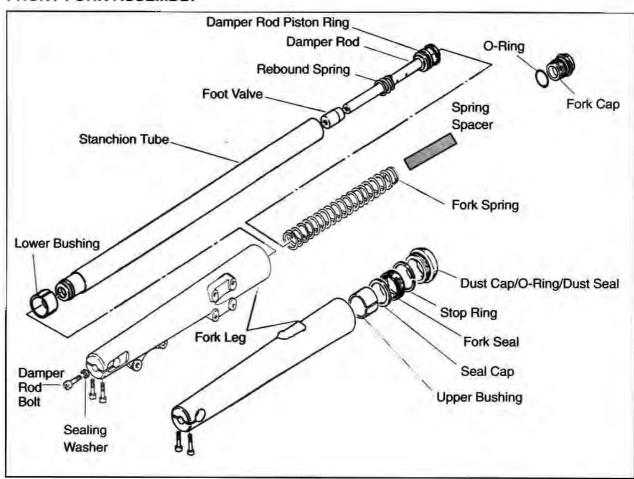
- Visually inspect the slider bushing. Replace the bushing if bronze material appears on more than 1/2 (50%) of the entire surface.
- Visually inspect the lower stanchion bushing. Replace the bushing if bronze material appears on more than 1/2 of the entire surface.



SUSPENSION/STEERING/FRONT WHEEL FRONT FORK INSPECTION (continued)

- Inspect the seal cap (large washer under seal) for flatness. Replace the seal cup if it is warped or damaged.
- Visually inspect the damper rod piston ring. Replace the ring if scoring, deep scratches and/or abnormal or excessive wear is noted.
- Forks are usually disassembled to replace leaking fork seals. Carefully inspect the sealing surface of the seal you are replacing. Often times the surface of the seal will help determine the cause of the leak.

FRONT FORK ASSEMBLY



- Clean all parts thoroughly with clean solvent.
- If stanchion tube bushing has been removed, install new stanchion tube bushing. Do not spread bushing any more than is necessary during installation.

FRONT FORK ASSEMBLY (continued)

- If upper bushing has been removed, install new upper bushing.
- Lubricate the outside of the bushing with a thin film of grease. Lightly squeeze the ends of the bushing together and install the bushing into the slider. Carefully push the bushing in until it is seated.

LUBRICANT:

Victory All Purpose Grease: 2872187

- Place a thin film of grease on the surface of the damper rod piston ring.
- Install the damper rod assembly into the stanchion tube
- Insert spring, spacer, and fork cap. Screw the cap in until the O-ring just contacts the stanchion tube.
 Spring, spacer, and fork cap will be removed and replaced later in this procedure. III. 1.
- Place stanchion tube upside down and secure in vise equipped with soft jaws. Do not apply excessive pressure with the vise. III. 1.
- 9. Place foot valve on damper rod. III. 1.
- Place a thin film of grease on both the upper and lower bushings.
- 11. Lower fork tube over stanchion tube.

NOTE: Resistance will be encountered due to the bushings. Twist the fork tube back and forth during the installation process.

- 12. Center the foot valve with the fork tube. III. 2.
- Install damper rod bolt and a new sealing washer.
 Torque bolt to specifications. Ill. 3.

TORQUE:

Damper Rod Bolt: 50 Nm (37 lb-ft)

- Secure fork in upright position. Remove fork cap, spring spacer, and fork spring.
- 15. Gently lower stanchion tube until it bottoms.
- Lightly grease I.D. of new fork seal with light weight grease.
- 17. Install seal cap (large washer under seal).
- 18. Lightly oil O.D. of new fork seal with fork oil.
- Place plastic sheet over stanchion tube and place seal over fork tube. III. 4.









SUSPENSION/STEERING/FRONT WHEEL FRONT FORK ASSEMBLY (continued)

- 20. Lower seal until it contacts fork tube.
- 21. Drive seal into position with fork seal driver. III. 1.

SPECIAL TOOL:

Fork Seal Driver: PV-43516

- Install stop ring into groove of fork tube. Make sure stop ring is properly seated into groove. Ill. 2.
- Lightly grease dust cap O-ring and seal. Place assembly over stanchion tube and drive into place with seal driver. Ill. 3.
- Pour 600 cc (20.24 oz.) of specified fork oil into fork.

FORK OIL:

Victory 7.5W/10 Fork Oil: 2872184

SPEC:

Fork Oil Quantity: 600 cc (20.24 oz) Fork Oil Level 130 mm (5.12")

- Move stanchion tube up and down several times to disperse oil.
- Stand the fork tube upright for several minutes before continuing to purge air bubbles.
- Make sure that stanchion tube is completely down. Insert fork oil level tool into fork. III. 4.
- Remove or add oil until fork oil level meets specifications.









SUSPENSION/STEERING/FRONT WHEEL

FRONT FORK ASSEMBLY (continued)

- Extend fork, install fork spring and fork spring spacer.
- Lightly oil the fork cap O-ring. Install fork cap until the O-ring just touches the stanchion tube.

CAUTION:

Do not tighten fork cap at this time. Make sure a 1mm gap exists between the fork cap and stanchion tube. Failure to do so can cause damage to the fork assembly and difficulty during installation. III. 1

FRONT FORK INSTALLATION

- 1. Install fork into triple clamp assembly. III. 2.
- Align top edge of stanchion tube with top surface of upper triple clamp, then raise the tube 2mm. Ill. 3.
- 3. Torque lower fork pinch bolt to specification. III. 3.



Lower Fork Pinch Bolt: 86 Nm (63 lb-ft)

4. Torque fork cap to specification. III. 3.

TORQUE:

Fork Cap: 25 Nm (18 lb-ft)

Torque upper fork pinch bolt to specification. III. 3.

TORQUE:

Upper Fork Pinch Bolt: 86 Nm (63 lb-ft)

6. Install front fender. Torque bolts to specification.

TORQUE:

Front Fender Bolt: 16 Nm (12 lb-ft)

- Install front wheel, refer to page 12.13.
- 8. Install front brake caliper, refer to Chapter 15.

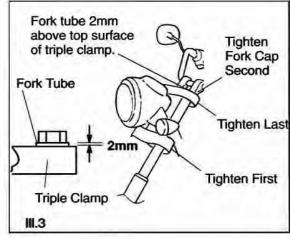
TORQUE:

Front Brake Caliper: 41 Nm (30 lb-ft)

Inspect all bolts for proper torque. Inspect hoses and wiring for proper routing.







SUSPENSION/STEERING/FRONT WHEEL TRIPLE CLAMP REMOVAL

- Elevate front of machine, support machine securely.
- 2. Remove front wheel, refer to page 12.10.
- Remove front fender, refer to page 12.14.
- Remove brake caliper and brake hose retainer.
- Loosen right and left side, upper fork pinch bolts. III.1.
- Loosen fork caps until a 1mm gap exists between fork cap and stanchion tube. III.1.
- 7. Remove handlebars, refer to page 12.5.
- 8. Loosen upper triple clamp center bolt. III. 2.
- 9. Loosen lower fork pinch bolts.
- 10. Remove forks.

CAUTION:

Make sure to follow fork removal steps carefully. Component damage and/or difficulty during removal will result if steps are not followed correctly.

- Remove four (4) bolts securing headlight assembly to lower triple clamp. Detach headlight assembly from lower triple clamp. Complete removal of headlight is not necessary. III.3.
- Remove upper triple clamp cap bolt, handlebar riser bolts and headlamp bracket. Remove upper triple clamp. III. 2.
- Remove steering bearing lock nut and adjustment nut. III. 4.

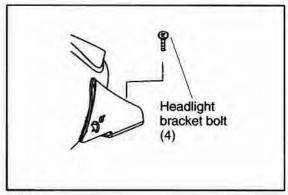
SPECIAL TOOL:

Steering Stem Bearing Adjustment Socket: PV-43508

 Push lower triple clamp and stem down and out of steering neck of frame.







III. 3



SUSPENSION/STEERING/FRONT WHEEL

TRIPLE CLAMP REMOVAL (continued)

- 15. Remove upper bearing element.
- Inspect outer bearing races for indentations, corrosion, cracks or abnormal wear.
- Inspect bearing elements for corrosion, broken or cracked cages, deformed roller elements or any abnormal wear.

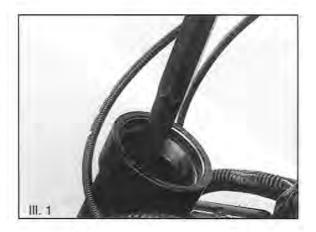
NOTE: Bearings that fail inspection must be replaced. Always replace bearings and races as a set.

OUTER RACE REMOVAL

 Insert long drift punch through top of steering neck. Place drift punch into recess of steering neck and drive out lower bearing race. III. 1.

NOTE: Working end of drift punch must be dressed so the edges are square. The diameter of the working end of the punch must also be of the correct size so that it will fit into the recess provided.

Insert punch from bottom of steering neck and repeat above procedure to remove upper race.



SUSPENSION/STEERING/FRONT WHEEL

BEARING INSTALLATION

Thoroughly grease new bearing (grease both upper and lower bearings at this time), ensure that a thin film of grease completely covers all bearing elements.

LUBRICANT:

Victory All Purpose Grease: 2872187

- Install lower bearing over steering stem (tapered end up).
- Place bearing driver over stem. Place lower triple clamp, with bearing driver, into hydraulic press. Press lower bearing down until it seats. III. 1.

CAUTION:

Make sure that the bearing driver used only contacts the inner race of the bearing.

- Grease inner and outer surfaces of outer bearing races.
- 5. Load lower bearing race onto special tool. III. 2.
- 6. Insert tool from bottom of steering neck. III. 2.
- Place upper bearing race onto steering neck. III. 2.
- Assemble tool. Make sure that threads, washer, and bearing of tool are greased with the grease supplied with the tool. Ill. 2.

SPECIAL TOOL:

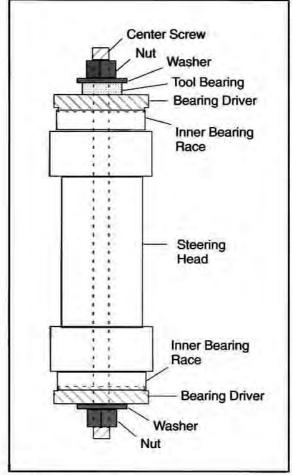
Steering Head Bearing Installation Tool: PV-43515

CAUTION:

Make sure that the bearings are started straight into the steering neck.

Tighten tool and draw bearings into steering neck.





III. 2

TRIPLE CLAMP ASSEMBLY

- Make sure that both upper and lower bearing races are thoroughly greased.
- Insert lower triple clamp from bottom of steering neck.
- Install upper bearing while holding the lower triple clamp assembly.

NOTE: Upper bearing is not a press fit on steering stem, but may be a tight fit. If necessary, tap lightly on inner race to seat the bearing.

 Install bearing preload adjustment nut on to steering stem. Ill. 1.

NOTE: Stepped side of nut faces bearing.

Torque nut to 39 Nm (29 lb-ft). III. 2.

SPECIAL TOOL:

Steering Stem Bearing Adjustment Socket: PV-43508

- Turn triple clamp assembly lock-to-lock several times
- Loosen bearing preload adjustment nut 1/2 to 1 turn. Torque nut to specification.

TORQUE:

Steering Bearing Adjustment Nut: 21 Nm (15 lb-ft)

- Turn triple clamp assembly lock-to-lock several times.
- Repeat steps 5, 6, 7, and 8 until triple clamp assembly turns with equal resistance in all positions.
- 10. Install steering stem lock nut.
- Hold pre-load nut with spanner wrench and torque lock nut to specification. Ill. 3.

SPECIAL TOOL:

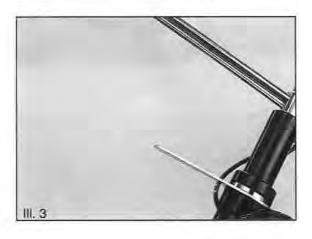
Steering Stem Bearing Spanner Wrench: PV-43509

TORQUE:

Steering Bearing Adjustment Lock Nut: 39 Nm (29 lb-ft)







SUSPENSION/STEERING/FRONT WHEEL

TRIPLE CLAMP ASSEMBLY (continued)

- Place upper triple clamp over steering stem and loosely install steering stem bolt.
- Insert fork legs until top of stanchion tube is flush with top of upper triple clamp.
- 14. Torque lower fork pinch bolts to specification.



Lower Fork Pinch Bolts: 86 Nm (63 lb-ft)

15. Torque steering stem center bolt to specification.



Steering Stem Cap Bolt: 68 Nm (50 lb-ft)

Torque fork caps to specification.

TORQUE:

Fork Spring Cap: 25 Nm (18 lb-ft)

17. Torque upper fork pinch bolts to specification.

TORQUE:

Upper Fork Pinch Bolt: 86 Nm (63 lb-ft)

- Install headlight attachment bolts, torque to specification.
- 19. Install handlebars, refer to page 12.7.

TORQUE:

Headlight Attachment Bolts: 27 Nm (20 lb-ft) Stiffener Bracket 21 Nm (15 lb-ft)

- 20. Install front fender.
- 21. Install front wheel assembly, refer to page 12.13.
- Install brake caliper.

TORQUE:

Front Brake Caliper: 41 Nm (30 lb-ft)



TRIPLE CLAMP ASSEMBLY (continued)

- 23. Install bolt for brake hose.
- 24. Lower front of machine.
- Pump brake lever several times to make sure brakes function correctly. Bleed brakes if necessary (refer to Chapter 15).
- Inspect all bolts for proper torque and inspect hoses and wiring for proper routing.

CAUTION: Refer to Chapters 1 and 3 for proper cable and wiring routing.

STEERING BEARING ADJUSTMENT INSPECTION

- Raise the front end of the machine until the tire is 1 inch off the floor or machine lift.
- Ensure that cables and wire harness are properly routed and cannot bind the action of the handlebars when they are turned.
- Position the front wheel straight ahead and attach a spring scale to the right handlebar grip as shown in III. 1.
- Read the spring scale when the handlebar just begins to move. Repeat the procedure for the left side of the handlebar.

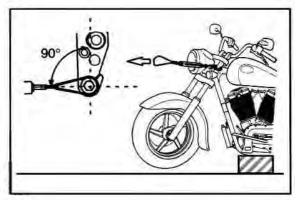


Initial Force to Initiate Front Fork Movement: 11 to 18 oz.

If the initial force required to start handlebar movement is too loose or too tight, further adjustment is necessary.

STEERING BEARING ADJUSTMENT

- Remove handlebars, refer to page 12.5.
- Loosen upper triple clamp fork pinch bolts.
- Loosen fork caps until a gap of 1mm exists.
- Remove upper triple clamp retaining bolt, remove upper triple clamp.
- 5. Loosen steering bearing locknut.
- Make adjustments in small increments when loosening or tightening the adjustment nut.
- Torque steering bearing locknut, triple clamp retaining bolt, fork caps and upper triple clamp fork pinch bolts to specifications. Refer to previous page.
- 8. Replace handlebars.
- Recheck the initial force to initiate front fork movement. If the force is found within the specified range, adjustment is complete.
- Lower machine, check operation of front brakes. If brake bleeding is necessary, refer to chapter 15.



111.1

CHAPTER 13 REAR WHEEL/REAR SUSPENSION

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GENERAL

A WARNING

This motorcycle was produced with the designated tires as original equipment. The testing that was done to ensure stability and superior handling included these tires. The use of other tires may cause instability. Failure to use Victory original equipment tires could result in poor motorcycle stability and handling, which can lead to a crash and subsequent serious injury or death. Use <u>only</u> the recommended tire at the recommended tire pressure.

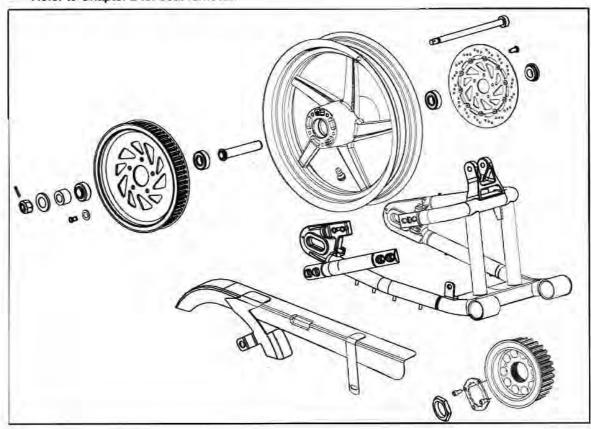
Tubeless tires are used on this motorcycle. Damaged rims create the possibility of sudden or slow air loss. Out-of-round rims (either axially or radially) can create steering imbalance and/or reduced steering control. Operating the motorcycle with damaged rims creates a safety hazard. Do not attempt to straighten rims, they must be replaced if they are found to be damaged.

The use of tire valves and valve cores other than original equipment replacement Victory parts could cause tire deflation during extended driving. Always use genuine Victory parts or their equivalent for replacement.

Be certain to install the valve caps securely. Not doing so may lead to air pressure leakage during extended driving.

Work performed on the rear wheel or suspension usually involves supporting the machine with the rear wheel elevated. Take precautions so that the motorcycle is securely supported when the rear tire is off the ground. The possibility of injury to the technician or damage to the motorcycle is created if safe practices are not observed.

- Refer to Chapter 15 for brake system service and repairs.
- Refer to Chapter 14 for tire removal, repair and balancing.
- Refer to Chapter 2 for exhaust system removal.
- Refer to Chapter 3 for maintenance of rear wheel/rear suspension components.
- · Refer to Chapter 2 for rear fender removal.
- Refer to Chapter 2 for side cover removal.
- Refer to Chapter 2 for seat removal.



REAR WHEEL/REAR SUSPENSION SPECIFICATIONS

	Item	Specifications
General	Rear Suspension	Fox™ Shock
	Rear Wheel Travel	101.6 mm (4.0")
	Rear Tire (Dunlop™)	160/80HB16 75H
	Rear Brake	Hydraulic, Single Disk

	REAR WHEEL	/ SUSPENSION	
Item Minimum Tire Tread Depth		Standard	Service Limit
		Not Applicable	1.6 mm (.063")
Cold Tire Pressure	Up to 90 kg (200 lb) load	36 PSI	Not Applicable
	Up to Maximum Weight Capacity	40 PSI	Not Applicable
Axle Runout		Not Applicable	0.20 mm (0.008")
Rear Wheel Rim Runout	Radial	Not Applicable	2.0 mm (0.080")
	Axial	Not Applicable	2.0 mm (0.080")
Shock Spring Free Length		218.44 mm (8.6")	208.44 mm (8.206")
IFP Depth	14 mm (0.550")	Not Applicable	Not Applicable
Shock Oil Type/Weight	Victory 5W Gas Shock Oil	Not Applicable	Not Applicable
Shock IFP Depth		14mm (.550")	± .5mm (.020")
Wheel Radial & Axial Runout		Not Applicable	2.0 mm (0.080")
Swing Arm Pivot Shaft Runout		Not Applicable	0.20 mm (0.008")
Swing Arm Pivot Shaft O.D.		16.20mm-16.250mm	16.08 mm (0.633")
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")

TORQUE SPECIFICATIONS

TORQUE SPECIFICA	TIONS FOR REAR WHEEL/REAR SUSPE	NSION
Fastener Type	Torque N-m	Torque lb-ft (in. lbs)
Rear Brake Disc	47 Nm	35 lb-ft
Rear Sprocket Bolts	58 Nm	42 lb-ft
Valve Stem Nut	3 Nm	(24 in-lbs)
Shock-Rear Mount Nut	61 Nm	45 lb-ft
Shock-Front Mount Nut	61 Nm	45 lb-ft
Rear Axle Nut	88 Nm	65 lb-ft
Swing Arm Pivot Shaft Nut	156 Nm	115 lb-ft
Shock Valve Nut	20 Nm	15 lb-ft
Shock Bearing Cap	75 Nm	55 lb-ft
Swing Arm Access Member Bolts	61 Nm	45 lb-ft

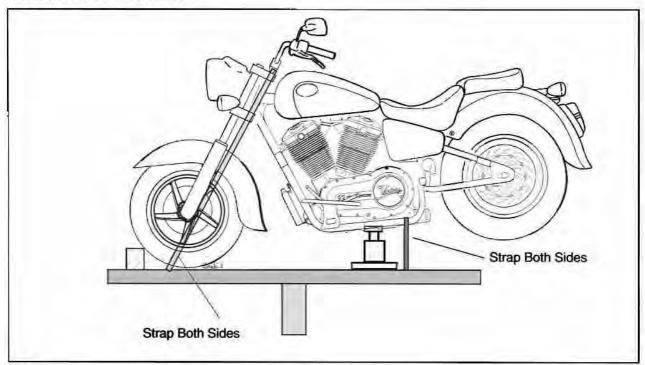
SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER
Steering Bearing, Wheel Bearing, Swing Arm Bushing Removal/Installation Tool	PV-43515
Shock Pre-Load Adjustment Wrench	PV-43507
Gas Shock Recharging Tool Kit	

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	POSSIBLE REPAIR NEEDED
Rear Wheel Feels "Loose" or Wobbles	Distorted (bent) rear wheel	Replace wheel
	Wom or damaged wheel bearings	Replace wheel bearings
	Wom 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	Set Tire Pressure
	Loose swing arm, axle or suspension fasteners.	Torque to specifications
Rear Suspension	Bent damper rod	Replace
Too Hard	Damaged or corroded suspension mount bushing	Correct as necessary
	Incorrect preload adjustment	Adjust to rider & load
	Damaged or corroded swingarm bush- ings	Replace
	High tire pressure	Set Tire Pressure
	Drive belt adjustment too tight	Adjust Drive Belt
	Incorrect shock fluid	Rebuild shock with correct weight fluid
Rear Suspension Too Soft	Contaminated or incorrect shock fluid	Rebuild shock
	Leaking shock fluid, fluid level low	Rebuild shock
	Leaking nitrogen pressure, pressure low	Rebuild shock or correct pressure if no leaks present
	Weak shock spring	Replace
	Incorrect preload adjustment	Adjust to rider & load
	Excessive load placed on motorcycle	Educate consumer
	Low tire pressure	Set Tire Pressure
Noisy	Loose fasteners	Torque to specifications
Rear Suspension	Worn wheel bearings	Replace
	Worn swing arm bushings	Replace
	Damaged shock absorber	Rebuild or replace as necessary
Wheel Drags	Bent rear axle	Replace
(Turns Hard)	Damaged wheel bearings	Replace
	Brake problem	See Chapter 15
	Incorrect drive belt adjustment	See Chapter 3

REAR WHEEL REMOVAL



III.1

- Elevate rear tire approximately 6", make sure that motorcycle is safely secured. III. 1.
- Remove rear cylinder muffler.
- Remove rear axle cotter key and loosen rear axle nut.
- 4. Loosen rear wheel adjustment bolt lock nuts. Ill. 2.
- Loosen rear wheel adjustment bolts completely and slide rear wheel completely forward. Ill. 2.
- 6. Lift up slightly on rear wheel and remove rear axle.

NOTE: Observe location of wheel spacers. III. 3.

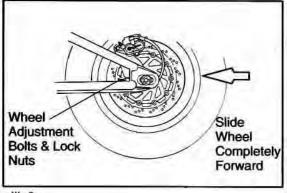
- Lower rear wheel and remove belt to right of sprocket.
- 8. Secure brake caliper with tie strap.

CAUTION:

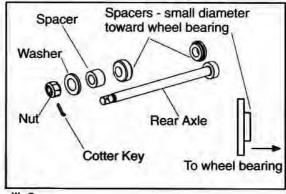
Do not hang rear brake caliper by its hose and do not twist the brake hose.

9. Remove rear wheel assembly from motorcycle.

NOTE: Do not apply rear brake pedal once the brake caliper has been removed.



III. 2



III. 3

REAR AXLE INSPECTION

1. Install rear axle in V-blocks and measure runout.

SPEC:

Axle Runout

Service Limit: 0.20mm (0.008")

REAR WHEEL INSPECTION

1. Install rear wheel in truing stand.

NOTE: Bearings must be in good condition for this inspection to be valid.

Set up a dial indicator to measure radial runout (up and down). Ill. 1.

SPEC:

Wheel Radial & Axial Runout Service Limit: 2.0mm (0.080")

- Position dial indicator to measure axial runout. III. 2.
- 4. Visually inspect wheel for cracks.
- Replace wheel if it fails visual or measured inspection.

REAR WHEEL BEARING INSPECTION

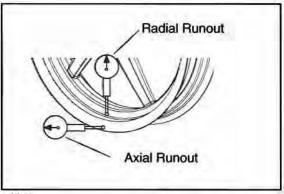
NOTE: Bearings are not serviceable. If they fail inspection they must be replaced.

- Visually inspect integral bearing seal for damage.
- 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 it by hand.

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.

Replace both bearings if either bearing fails any of the above inspections.





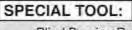
111.2

WHEEL BEARING REMOVAL

CAUTION

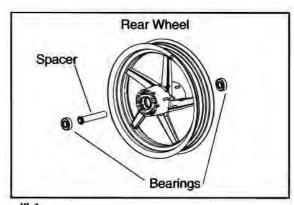
The removal process damages the bearings. Once bearings are removed they must be replaced with new bearings.

- Take precautions to prevent damage to brake disc.
- Install bearing remover element into bearing.



Blind Bearing Remover: PV-43523

- Remove bearing.
- Remove bearing spacer from wheel hub.
- Use an appropriate drift and drive out remaining bearing.



111.1

WHEEL BEARING INSTALLATION

Rear Wheel Bearing Installation Note:

Install disc side bearing first - must be fully seated in hub.

Then install right side bearing, last must be fully seated against spacer.

CAUTION

Use appropriate wooden blocking to prevent damage to brake disc and/or driven sprocket when installing wheel bearings.

- Clean inside of wheel hub and bearing spacer.
- Place new bearing onto disc side of wheel with markings facing up.
- 3. Install wheel bearing installation tool. Install wheel bearing until fully seated in the hub.

SPECIAL TOOL:

Wheel Bearing Installation Set: PV-43515

- Turn wheel over, install bearing spacer. NOTE: The spacer can be installed in either direction.
- Place new bearing on sprocket side of wheel with markings facing up.
- 6. Install wheel bearing installation tool. Install bearing until seated against spacer.

Tool: Center Screw Nut Washer-Tool bearing Bearing Bearing Driver Driver Washer -Nut 111.2

WHEEL BEARING INSTALLATION (continued)

7. Clean brake disk with commercially available Disk Brake Cleaner.

WARNING

Grease or oil on the brake disc will reduce stopping ability and increase stopping distance from any given speed. This can lead to loss of vehicle control and may lead to an accident.

BRAKE DISC REMOVAL

- Remove rear wheel, refer to page 13.4.
- Position wheel with brake disc facing up. Support wheel so as not to damage belt sprocket.
- Remove brake disc bolts, remove brake disc.

BRAKE DISC INSTALLATION

- 1. Clean bolt hole threads.
- Clean and examine brake disc bolts. Replace as necessary.
- Install brake disc with part number to outside. Install bolts and torque to specification.

TORQUE:

Rear Brake Disc Bolts: 47 Nm (35 lb-ft)

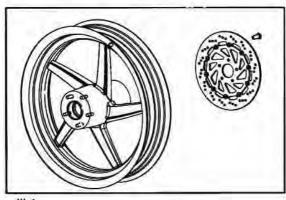
Install rear wheel, refer to page 13.8.

REAR SPROCKET REMOVAL

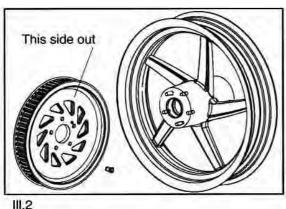
- 1. Securely support rear of motorcycle off floor.
- Remove rear wheel, refer to page 13.4.
- Remove sprocket nuts, remove rear sprocket.

CAUTION:

While working on the rear sprocket (or any rear wheel repair procedures) take necessary steps to protect the disc surface.



111.1



REAR SPROCKET INSTALLATION

- Clean all mounting surfaces of the rear wheel and rear sprocket.
- Install sprocket and sprocket bolts, torque bolts in a criss-cross pattern to specification.

TORQUE:

Rear Sprocket Bolts: 56 Nm 42 lb-ft

Install rear wheel, see below.

REAR WHEEL INSTALLATION

- 1. Secure motorcycle with rear wheel raised.
- Apply a thin film of grease to the axle surface.
- Insert wheel assembly from left side of motorcycle.
 III. 1.
- 4. Install belt on sprocket. Ill. 2.
- Center wheel in swing arm and place belt over tab of belt guard. III. 2.

LUBRICANT:

Victory All Purpose Grease: 2872187

Apply grease to inner portion of left side wheel spacer to hold it in place on the wheel bearing. Ill. 3.

NOTE: Small diameter of spacer faces wheel bearing.

- Engage slot of rear brake caliper bracket with lug on swing arm.
- Lift wheel assembly and guide brake disc between brake pads.
- 9. Align wheel assembly with swing arm.
- Insert axle into swing arm and wheel assembly from left side of motorcycle. Push axle in until 1/2" of axle is exposed on right side of wheel assembly.
- Install right side axle spacers (small diameter of shouldered inner spacer against wheel bearing).
- Install axle nut. Tighten nut until it seats and back off 1/2 turn.









REAR WHEEL INSTALLATION (continued)

- 13. Adjust belt tension, refer to chapter 3.
- Inspect wheel alignment, refer to chapter 3.
- 15. Torque rear axle nut to specification.

TORQUE:

Rear Axle Nut: 88 Nm (65 lb-ft)

- 16. Install new rear axle nut cotter key.
- Turn rear wheel by hand and inspect for proper rotation without binding.
- Apply rear brake pedal two or three times to position brake pads. If brake bleeding is necessary, refer to chapter 15.
- 19. Install muffler, refer to chapter 2.

SHOCK ABSORBER REMOVAL

- 1. Remove seat, refer to chapter 2.
- Elevate rear of machine slightly (1/2"-1"), ensure that front wheel is secured.
- Remove right and left frame side covers.
- Remove nuts from front and rear shock mount bolts.
- Lift up rear wheel slightly to remove tension from shock mounting bolts. Remove mounting bolts.
- Lift rear of shock out of mounting eye. Late 1999 shock has urethane bushing on swingarm end (rear).
- Lower wheel, pull shock back to disengage front mounting eye.
- 8. Lift front of shock and remove shock.

NOTE: Front shock mount bushings may fall out.



SHOCK ABSORBER DISASSEMBLY

IMPORTANT: The following procedures instruct you to inspect O-rings, seals, and piston rings. Replace parts as necessary if worn or damaged. It is recommended that all O-rings, seals and piston rings be replaced whenever shock is disassembled. Carefully inspect O-rings, seals and piston rings to determine if damage exists to the sealing surfaces.

A WARNING

Use extreme caution when servicing rear shocks. The shocks are pressurized with 200 psi of nitrogen gas. Safety equipment and safe handling practices are required. Always wear a face shield, safety glasses, ear protection and observe safe work habits when servicing the shock used on the V92C.

MARNING

Use only nitrogen gas when recharging shock. Use of other gases can cause shock damage and/or create a safety hazard.

CAUTION:

Any contaminants allowed into the rear shock during rebuilding will be detrimental to the damping characteristics of the shock and cause premature wear. Extreme care must be exercised to ensure that all parts are extremely clean and remain that way during the entire rebuilding process.

NOTE: Shock disassembly is required to replace leaking seals, change the shock fluid or replaced damaged parts.

NOTE: It is recommended that shock oil be changed every three years as part of normal maintenance or more frequently due to the environment and conditions that the motorcycle is subjected to. Periodic oil changes are necessary to avoid possibilities of corrosion due to moisture contamination and breakdown of shock fluid.

IMPORTANT! Store parts in the same sequence that they were disassembled. The direction and orientation of all internal parts (especially valve washers) is critical to shock operation.

CAUTION:

The gas volume for the rear shock is extremely small. Do not attempt to check the gas pressure. The amount of gas lost when the gauge is filled will lower the gas pressure significantly. The only acceptable means to measure gas pressure is during the re-charging process.

 Measure spring preload and record for assembly so preload adjustment can be returned to rider's preference if it is within specifications.

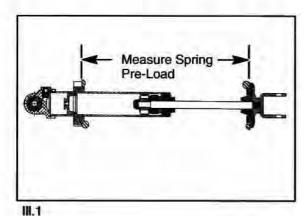
SPEC:

Rear Shock Preload Allowable Limits: Complete travel of shock pre-load nut is available for use. Std.:195.50mm (7.70")

Turn preload adjuster with special tool so all preload is removed from spring.



Shock Pre-Load Adjustment Wrench: PV-43507



SHOCK ABSORBER DISASSEMBLY (continued)

 Install spring compressor, compress shock spring, remove spring retainer and spring.

SPECIAL TOOL:

Shock Spring Compressor: PV-43571

- Clean shock thoroughly. Rinse shock and dry with compressed air.
- 3. Remove upper and lower shock bushings.
- Clamp shock body cap across the flats in a vise equipped with soft jaws.

Release Nitrogen Pressure From Shock

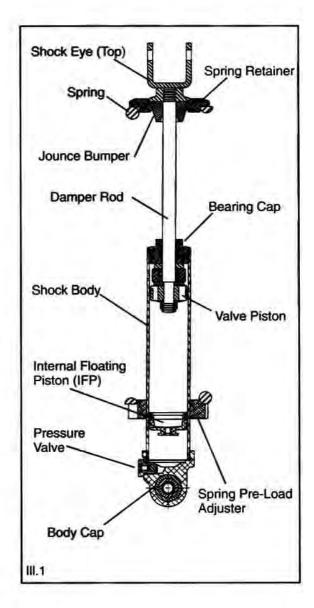
- 5. Remove hex head screw from pressure valve.
- 6. Point valve outlet in a safe direction. Insert tip of safety needle assembly (special tool) into shock pressure valve. Depress safety pin on needle assembly and push gauge and needle assembly slowly into shock. Be sure to hold safety needle straight and push needle completely into shock valve. Release nitrogen in a safe direction by depressing the relief valve pin.
- Remove valve and sealing O-ring from body cap.
 Remove valve slowly as some pressure may still
 be present. Make sure eyes and facial areas are
 protected with a face shield and safety glasses.
 Keep other individuals away from the valve when it
 is being removed.

CAUTION:

It is possible that all of the pressure was not relieved in step 8. Always completely remove valve from body cap before performing further disassembly.

- Push damper rod down until jounce bumper contacts bearing cap. If all pressure is removed the rod should stay down.
- Use appropriate sized open-end wrench to loosen shaft bearing cap. Loosen slowly and listen for a hissing sound or any other sign of pressure in the oil cavity. Pressure release from the oil cavity indicates a faulty IFP O-ring.

NOTE: If the shock body starts to unscrew from the body cap, secure shock and in the Body Clamp Tool and clamp tool in vise. Position body clamp at least 1 1/2" below bearing cap. Repeat Step 11.



SHOCK ABSORBER DISASSEMBLY (continued)

- Carefully remove damper rod/valve piston assembly. Be prepared to catch piston ring when removing the damper rod/valve piston.
- Remove shock from vise and pour shock fluid into a suitable container. Set shock body aside.
- Mount top shock eye in soft jawed vise with valve piston facing up.
- 15. Remove valve piston retaining nut.
- Remove valve piston and all washers. Note placement of valve washers and orientation of the slots in valve piston. Keep washers in order and for proper assembly. (III. 1 and Page 13.26).
- Clean the valve piston and valving washers with electrical contact cleaner or brake cleaner. Dry thoroughly with compressed air.



NOTE: Perform steps 18-25 only if seal or jounce bumper replacement is necessary. Proceed to Step 26 if these are in good condition.

- 18. Remove bearing cap from damper rod.
- 19. Inspect cap O-ring, replace if damaged or worn.
- Using a needle nose pliers, carefully remove wiper and main seal. Use a small screwdriver or a pick to remove the O-ring from bearing cap. Ill. 2.

CAUTION:

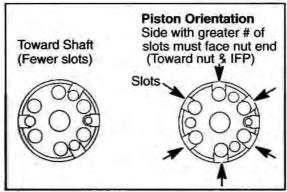
Use extreme care not to damage seal cavity.

- Clean seal cavity and inspect bushing for wear or damage. Replace bearing cap if bushing is worn. Ill. 3.
- Install new seals and O-ring. Lubricate sealing surface with shock fluid. Ensure that seals are completely seated in seal cavity.

SHOCK FLUID

Victory 5W Gas Shock Oil: 2872185

- Inspect jounce bumper and replace if damaged.
- Inspect damper rod for nicks, scratches or abrasion on the sealing surface.
- Wrap electrical tape over threads of damper rod to protect seals during installation. Lubricate and re-install bearing cap. Remove tape.



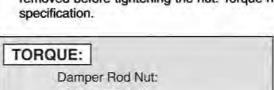
111.1





BEARING CAP SEAL REPLACEMENT (continued)

- Install compression valve washer stack in correct order. Refer to page 13.26 for exploded view.
- Install valve piston with greater number of slots facing threads (nut end) of damper rod (toward IFP). III.1
- 28. Install rebound valve washer stack in correct order.
- 29. Install washer and new nut loosely on damper rod. Using compressed air, blow dry the valve piston and valve washers to ensure all dust or debris is removed before tightening the nut. Torque nut to specification.



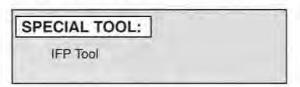
Body Cap / IFP Removal

20 Nm (15 lb-ft)

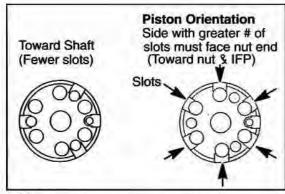
 Position shock body in body clamp tool. Clamp securely in a vise with body cap facing up. Do not overtighte. Apply only enough pressure to prevent the shock body from turning in the clamp. III.2



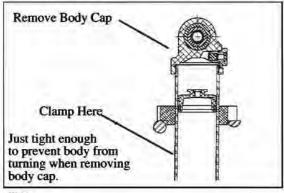
- Use appropriate size open end wrench to loosen and remove body cap from shock body.
- Remove IFP using IFP tool. Be prepared to catch IFP piston ring. III.3.



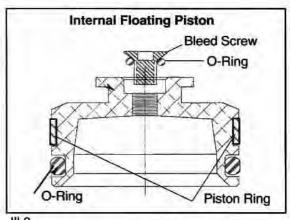
- 33. Remove shock from vise.
- 34. Remove bleed screw from center of IFP.
- Inspect bleeder screw O-ring for wear or damage.
 Replace if necessary.
- Inspect IFP sealing O-ring for wear or damage. Replace if necessary.
- Inspect IFP piston ring for wear or damage. Replace if necessary. Nominal thickness is .050".



111.1



111.2



111.3

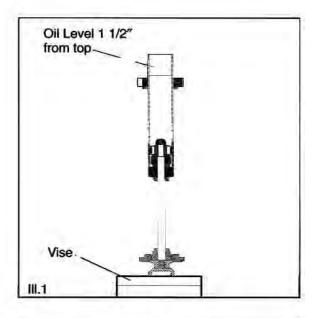
SHOCK ABSORBER ASSEMBLY

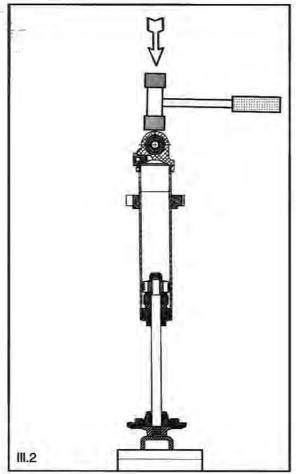
- Mount top shock eye securely in soft jaw vise with damper rod/valve piston assembly facing up.
- 2. Replace large bearing cap O-ring with a new one.
- Clean shock body and inspect for pitting, abrasion, nicks or scratches.
- Lubricate and install piston ring on valve piston and hold in place. The most square edge of the piston ring should be against piston.
- Carefully slide shock body over valve piston while holding piston ring compressed with fingers, until piston ring is trapped. Be careful not to damage the piston ring during installation.
- Screw the bearing cap into the shock body until the o-ring is fully seated. Tighten hand tight.
- Fully extend shock by pulling upward on shock body.
- Pour oil into shock until the level is 1 1/2" from body cap end of the shock body. III.1.



poportio actanos.

- Temporarily install the body cap on the shock body. III. 2.
- Tap the cap lightly a few times with a plastic hammer. This will force the valve washer stack open and purge all remaining air from the piston. III. 2.
- 12. Remove the body cap.
- 13. Stroke the shock again and let it sit for 5 minutes.
- Repeat Step 13 until air bubbles can no longer be seen rising through the oil.

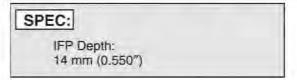


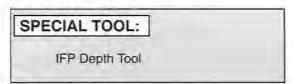


SHOCK ABSORBER ASSEMBLY (Cont.)

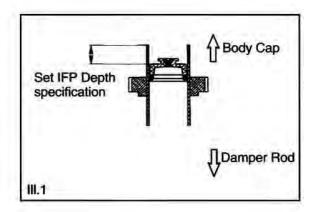
IFP / Body Cap Installation

- Lubricate IFP with new O-ring and install in shock body until O-ring is trapped and piston ring groove is still exposed.
- Lubricate and install IFP piston ring with most square edge against piston and hold in place.
- Push IFP into shock body until piston ring is trapped.
- Set IFP tool to specified depth with a dial caliper.





- Place IFP tool into shock and rotate the tool to ensure that it is fully seated against the IFP.
- Slowly push IFP to specified depth. Do not move the IFP after depth is set. If IFP tool is not available set depth with dial caliper or machinist's rule.
- Slowly compress shock by pushing down on the body to allow air to escape through the IFP bleed hole.
- Pour shock oil in until IFP is covered by about 1/4" of oil.
- 23. Slowly extend shock by pulling up on the body to back-fill shock through the bleed hole in IFP. Add oil if necessary to keep the bleed hole covered with oil by at least 1/4" until shock is fully extended.
- 24. Using short strokes of about 1/2", slowly stroke the shock body up and down until all air has been removed through the bleed hole, and only clear, bubble free oil is observed moving through the bleed hole.
- Fully extend the shock and install bleed screw securely with new O-ring using the IFP tool to hold the IFP.



SHOCK ABSORBER ASSEMBLY (continued)

- 26. Remove shock from vise and pour out excess oil.
- Lubricate and install a new O-ring in body cap.
- 28. Screw body cap on body hand tight.
- Turn shock upright (damper rod up) and mount flats of body cap in soft jaw vise.
- Re-install pressure valve in body cap using a new O-ring.
- Torque bearing cap to specification. This will also tighten both bearing cap and body cap at the same time.

TORQUE: Bearing Cap: 75 Nm (55 lb-ft)

 Slowly compress the damper rod. Movement should be smooth with consistent damping through entire travel range.

Pressurizing The Shock

- Set nitrogen tank pressure regulator to 200-205 psi.
- Insert Fox™ Safety Needle and charge with nitrogen to 200 psi. Pull needle straight out when removing.

CAUTION:

Do not insert the needle again to inspect pressure. The volume inside the gauge will reduce the pressure in the shock.

SPEC: Fox ** Shock Nitrogen Pressure: 200 PSI

- 35. Compress the damper rod completely (there will be considerable resistance due to the nitrogen pressure). The damper rod must bottom out at full travel, and then slowly rise to full extension. Shaft movement must be smooth and consistent throughout the entire compression and rebound stroke, without binding or loss of damping.
- Install socket head screw into pressurizing valve, tighten securely.
- Inspect for leaks. Submerge the shock in water and look for bubbles or oil seepage around the bearing and body caps.

SHOCK ABSORBER ASSEMBLY (continued)

- Inspect shock eye bushings for abnormal wear, replace if necessary.
- Apply a thin film of grease to the inner and outer surfaces of the bushings. Install bushings into shock eyes.
- Install spring pre-load adjuster onto shock. Set adjuster as close to shock body cap as possible for minimum amount of preload.
- 41. Install shock spring.
- 42. Install spring compressor onto spring.

SPECIAL TOOL:

Shock Spring Compressor: PV-43571

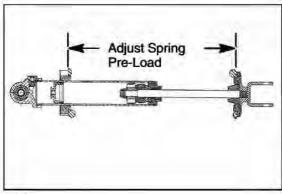
- 43. Compress spring and install spring retainer.
- Adjust spring pre-load with special tool to measured preload recorded before disassembly.

SPEC:

Rear Shock Preload Allowable Limits: Complete travel of shock pre-load nut is available for use. Std:195mm (7.70")

SPECIAL TOOL:

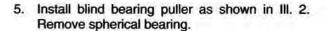
Shock Pre-Load Adjustment Wrench: PV-43507



III.1

FORWARD SHOCK MOUNT REMOVAL

- Remove right and left frame side covers, refer to chapter 2.
- 2. Remove fuel tank, refer to chapter 2.
- 3. Remove shock, refer to page 13.9.
- 4. Remove snap ring. III. 1



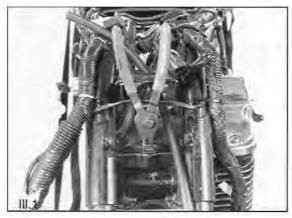
FORWARD SHOCK MOUNT INSTALLATION

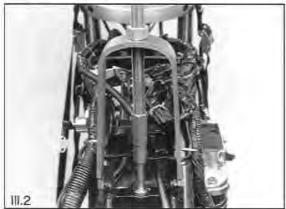
- Remove all dirt and foreign material from spherical bearing bore and snap ring groove.
- Apply a thin coat of grease to the outer and inner surfaces of the new shock mount.
- Place the new spherical bearing into position. NOTE: Bearing can be installed in either direction.
- Arrange bolt, nut, washers and driver as shown in III. 3. Draw bearing into place until bearing seats.
- Install new circlip with machined face upward.

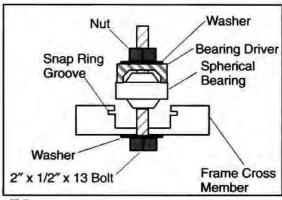
CAUTION:

Always use a new circlip.

- Install shock, refer to page 13.20.
- Install fuel tank, refer to chapter 2.
- Install frame side covers, refer to chapter 2.
- 9. Install seat, refer to chapter 2.



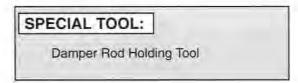




111.3

SHOCK EYELET REPLACEMENT

- 1. Remove shock, refer to page 13.9.
- Remove shock spring, refer to page 13.10.
- Mount shock vertically with damper rod holding tool in vise equipped with soft jaws.



 Use appropriately sized open end wrench and remove shock eyelet.

NOTE: Loctite [™] 262 is used to retain shock eyelet. It may be necessary to heat the thread area of the eyelet to 320°-350°F with a propane torch to loosen the eyelet.

A WARNING

Do not overheat the eyelet and do not direct heat to the shock body. Doing so can cause serious injury due to the pressurized gas contained in the shock body.

Wear a face shield, safety glasses and insulated gloves if heat is necessary to remove the eyelet. Work in a well ventilated area.



 Clean threads of damper rod with soft wire brush and Loctite ™ Primer N.



- Clean the threads of the eyelet as instructed above.
- Apply Loctite[™] 262 to threads of damper rod, install eyelet and torque to specification. Allow 24 hours to cure.



```
TORQUE:
Shock Eyelet:
25 lb-ft (34.6 Nm)
```

- 8. Install shock spring, refer to page 13.17.
- 9. Install shock, refer to page 13.20.

SHOCK ABSORBER INSTALLATION

- 1. Install front shock mount spacers.
- Place front shock eye on to front shock mount.
- 3. Install bolt for front shock mount.
- 4. Install rear shock urethane bushing on to shock.
- Lift rear tire, position rear of shock into swing arm mount, and install rear shock bolt.
- Install nuts for front and rear shock retaining bolts. Torque to specification.

TORQUE:

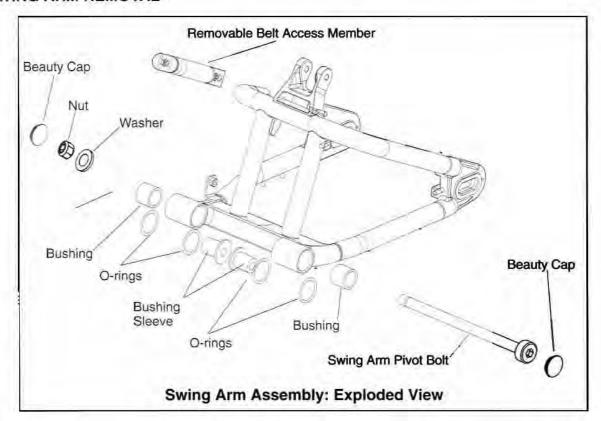
Front Shock Mount Nut: 61 Nm (45 lb-ft)

TORQUE:

Rear Shock Mount Nut: 61 Nm (45 lb-ft)

- 7. Install right and left frame side covers.
- Install seat, refer to chapter 2.

SWING ARM REMOVAL



- 1. Remove rear wheel assembly, refer to page 13.4.
- 2. Remove rear shock, refer to page 13.9.
- 3. Remove belt guard.
- Remove belt access member from swing arm, place belt of outside of swing arm.
- 5. Remove exhaust system, refer to chapter 2.
- Remove cable ties for rear brake caliper line. Set caliper aside.
- Remove right & left beauty caps from swing arm pivot.
- Remove swing arm pivot nut, remove swing arm pivot bolt.
- 9. Remove swing arm.
- Grasp bushing sleeves and attempt to move them up and down. If excessive play is noted, bushings and/or other swing arm pivot parts will require replacement. Continue with inspection process.

SWINGARM BUSHING REMOVAL

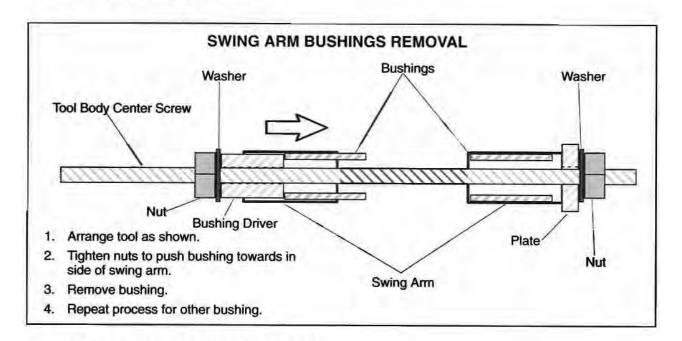
- Remove O-rings and bushing sleeves.
- Use bearing installation tool to remove swing arm bushing from one side of swing arm.
- Once one bushing is removed, set up tool to remove other swing arm bushing in same manner.

SPECIAL TOOL:

Swing Arm Bushing Driver: PV-43515

NOTE: Once bushings are removed they must be replaced.

4. Clean all parts thoroughly in solvent.

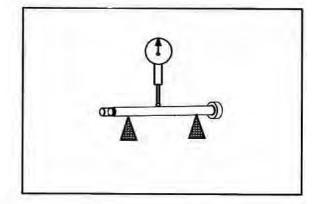


SWINGARM PIVOT PARTS INSPECTION

- Visually inspect swing arm pivot shaft for excessive wear or corrosion damage, replace if it fails visual inspection.
- Place swing arm pivot shaft on V-blocks and measure runout, replace shaft if runout exceeds service limit.

SPEC:

Swing Arm Pivot Shaft Runout Service Limit: 0.20 mm (0.008")



SWINGARM PIVOT PARTS INSPECTION (continued)

 Measure swing arm pivot shaft O.D. in several places at bushing sleeve contact areas. Replace swing arm pivot shaft if worn beyond service limit. III. 1.



Swing Arm Pivot Shaft O.D.

Service Limit: 16.08 mm (0.633")

- Visually inspect bushing sleeves for excessive wear, distortion or corrosion damage. Replace sleeves if they fail visual inspection. III. 2.
- Measure O.D. of bushing sleeves in several places, replace sleeve(s) if worn beyond service limit.



Swing Arm Bushing Sleeve O.D. Service Limit: 29.83 mm (1.1744")

Measure I.D. of bushing sleeves in several places, replace sleeve(s) if worn beyond service limit.



Swing Arm Bushing Sleeve I.D. Service Limit: 16.62 mm (0.6543")

- O-rings should be replaced with new during assembly.
- Measure O.D. and I.D. of swing arm bushings. III.4.

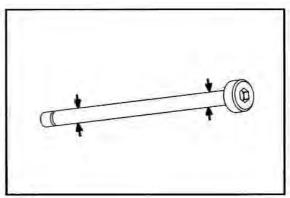
NOTE: Dimensions are provided for reference only. Once bushings are removed, they should be replaced.



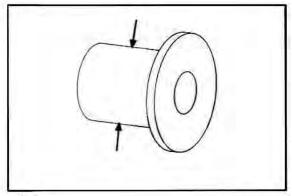
Swing Arm Bushing I.D. Service Limit: 30.22 mm (1.1897")

SPEC:

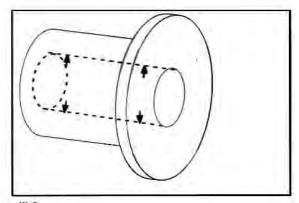
Swing Arm Bushing O.D. Service Limit: 37.915 mm (1.4927")



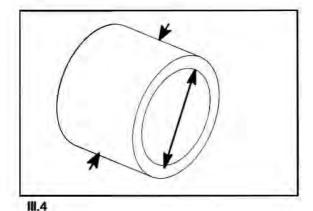
111.1



III. 2

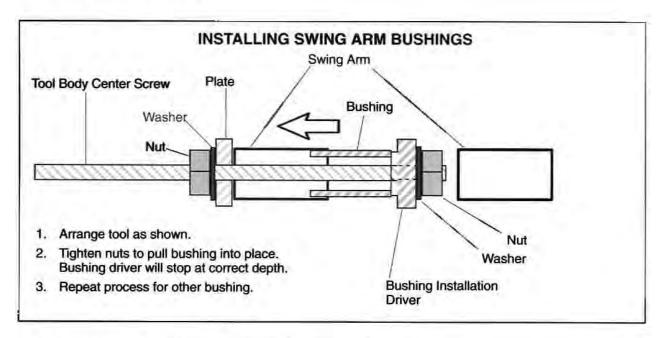


111.3

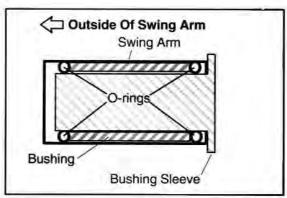


SWINGARM BUSHING INSTALLATION

- Clean all parts thoroughly.
- Lightly grease O.D. & I.D. of new swing arm bushings.
- Insert new bushing from inner side of swing arm by hand. Push bushing in as far as it will go.
- Arrange swing arm bushing installation tool as shown in below diagram.
- Tighten nuts to pull bushing into place. Bushing driver will stop bushing at correct depth.
- 6. Repeat process for other side.



- Lightly grease two O-rings and place one O-ring next to each bushing on the inner side of the bushings.
- Lightly grease the swing arm bushing sleeves and install into swing arm from inside of swing arm.
- Lightly grease the two remaining O-rings and place next to the bushings on the outside of the bushings.



SWINGARM INSTALLATION

- 1. Lightly grease swing arm pivot shaft.
- 2. Install swing arm into place.
- Install swing arm pivot shaft from left side of motorcycle.
- Install washer and nut on to swing arm pivot. Torque nut to specification.

TORQUE:

Swingarm Pivot Shaft Nut: 156 Nm (115 lb-ft)

- 5. Install beauty caps onto ends of swing arm pivot.
- Install shock absorber, refer to page 13.25.
- Install rear wheel, refer to page 13.8.
- Secure brake caliper hose to swing arm.
- Install swing arm belt access member and belt guard.

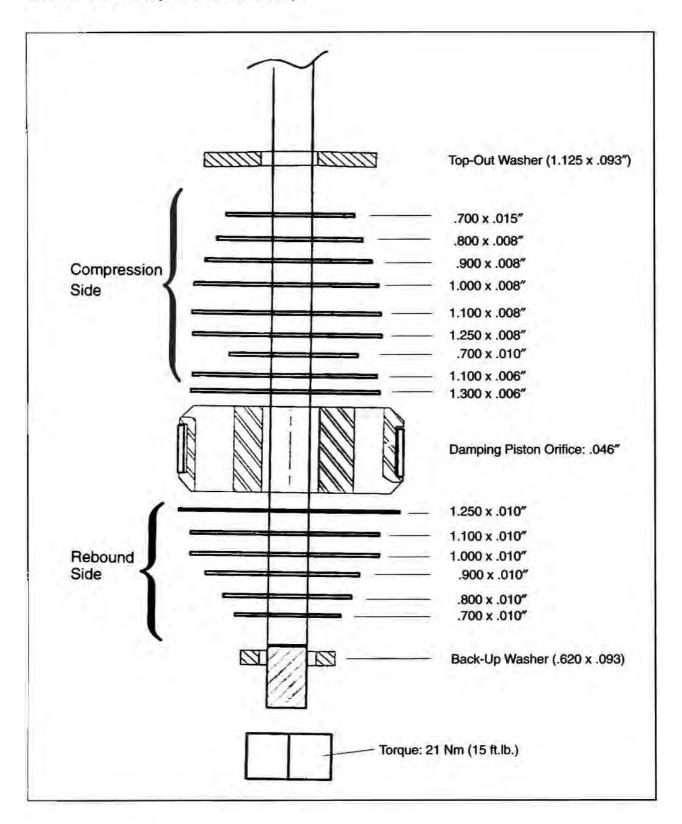
TORQUE:

Swing Arm Access Member Bolts: 61 Nm (45 lb-ft)

- Install exhaust system, refer to chapter 2.
- 11. Install side covers, refer to chapter 2.
- 12. Install seat, refer to chapter 2.

REAR WHEEL/REAR SUSPENSION

SHOCK VALVING (EXPLODED VIEW)



CHAPTER 14 TIRES

GENERAL	14.1
SPECIFICATIONS	14.3
SPECIAL TOOLS	14.3
TROUBLESHOOTING	14.4
TIRE WEAR PATTERNS & GENERAL CAUSES	14.5
TIRE REMOVAL-GENERAL	14.6
TIRE REMOVAL	14.7-14.9
WHEEL INSPECTION	14.9
TIRE INSPECTION	14.10
TIRE VALVE INSPECTION	14.11
TIRE VALVE INSTALLATION	14.11
TIRE INSTALLATION	14.12-14.15
TIRE BALANCING	14,15-14.16

GENERAL



The recommended tire for the V92C Victory motorcycle are Dunlop 491 Elite IIs. If a consumer wishes to replace the Original Equipment Manufacturer (O.E.M.) tires with another brand of tire he or she must contact the tech-line department of the tire manufacture being considered. Victory makes no other recommendation other than Dunlop Elite IIs. Tires other than O.E.M. may or may not adversely affect the handling characteristics of the motorcycle. Tires other than O.E.M. tires may or may not have adequate clearance between the tire and various parts of the motorcycle.

A WARNING

This motorcycle was produced with the designated tires as original equipment. The testing that was done to ensure stability and superior handling included these tires. The use of other tires may cause instability. Failure to use Victory original equipment tires could result in poor motorcycle stability and handling, which can lead to a crash and subsequent serious injury or death. Use <u>only</u> the recommended tire at the recommended tire pressure.

Tubeless tires are used on this motorcycle. Damaged rims create the possibility of sudden or slow air loss. Out-of-round rims (either axially or radially) can create steering imbalance and/or reduced steering control. Operating the motorcycle with damaged rims creates a safety hazard. Do not attempt to straighten rims, they must be replaced if they are found to be damaged.

The use of tire valves and valve cores other than original equipment replacement Victory parts could cause tire deflation during extended driving. Always use genuine Victory parts or their equivalent for replacement.

Be certain to install the valve caps securely. Not doing so may lead to air pressure leakage during extended driving.

CAUTION:

The two biggest factors contributing to premature tire wear are overloading and under-inflation. Do not deviate from the specifications for loading or inflation.

A 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 tire.

NOTE: Refer to chapter 12 for front wheel assembly removal.

NOTE: Refer to chapter 13 for rear wheel assembly removal.

A WARNING

All repairs must be made from inside the tire. Victory only recommends the use of "head-type" plugs such as: Tech *Tire Repair™* kits are commonly available at most automotive parts outlets.

SPECIFICATIONS

	Item	Specifications
Tires (General)	Front Tire (Dunlop™)	MT90HB16 71H
	Rear Tire (Dunlop™)	160/80HB16 75H

	FRON	T WHEEL	
Ito	em	Standard	Service Limit
Minimum Tire Tread Depth	1	Not Applicable	1.6 mm (0.063")
Cold Tire Pressure	Up to 90 kg (200 lb) load	34 PSI	Not Applicable
	Up to Maximum Weight Capacity	34 PSI	Not Applicable
Front Wheel Rim Runout	Axial	Not Applicable	2.0 mm (0.080")
	Radial	Not Applicable	2.0 mm (0.080")
Maximum Load Capacity	379 lbs (172 kg)		
	REAR	WHEEL	
Ito	em	Standard	Service Limit
Minimum Tire Tread Depti	1	Not Applicable	1.6 mm (0.063")
Cold Tire Pressure	Up to 90 kg (200 lb) load	36 PSI	Not Applicable
	Up to Maximum Weight Capacity	40 PSI	Not Applicable
Rear Wheel Rim Runout	Axial	Not Applicable	2.0 mm (0.080")
		Not Applicable	2.0 mm (0.080")

SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER
Tire Removal Equipment	Commercially Available
Wheel Balancing/Truing Stand	PV-43556
Bead Breaker (May be part of the tire removal equipment being used)	Commercially Available
Air Pressure Gauge	Commercially Available
Rim Protector (May come with the tire removal equipment being used)	PV-43536
Valve Core Remover	Commercially Available
Tire Mounting Lubricant	Commercially Available

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	POSSIBLE REPAIR NEEDED
Rear Wheel (Wobbles)	Bent rim	Replace. See Chapters 12 & 13
	Wom or damaged wheel bearings	See Chapters 12 & 13
	Worn or damaged swingarm bushings.	See Chapter 13
	Damaged or incorrect tire	Replace rear tire
	Wheel assembly out-of-balance	Balance Wheel Assembly
	Low tire pressure	Correct
	Loose swingarm, axle or suspen- sion fasteners.	See Chapter 13
Handlebars Oscillate (Wobble)	Bent front axle	See Chapter 12
	Tire mounted incorrectly	Correct
	Damaged tire	Replace
	Loose steering stem nut	See Chapter 12
	Incorrect tire	Replace
	Incorrect tire pressure	Correct
Front Wheel Oscillates (Wobbles)	Bent rim	Replace. See Chapters 12 & 13
	Worn or damaged wheel bearings	See Chapter 12
	Damaged or incorrect tire	Replace
	Loose axle or axle pinch bolts	See Chapter 12
	Right and left fork not installed at same height	See Chapter 12
	Fork oil level incorrect	See Chapter 12
	Fork spring free length different between right & left	See Chapter 12
	Wheel assembly out-of-balance	Correct

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 (doing "Burn-Outs")	
Cracks in Tread Grooves	Underinflation, Excessive Loads, or 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 REMOVAL-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 (if not the most critical factor) contributing to the safe operation of the wheel/tire assembly. Each of the three generally acceptable methods to dismount and mount tubeless tires is permissible and recommended by Victory. However, careless or improper work habits can cause damage to 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 tubeless tires. It is also the most expensive way to change tires. However, depending on how many tires a dealership changes in a year, the time savings can pay for the cost of the tool.

The manually operated tire machine is the next preferred method to dismount and mount tubeless tires. It can be just as efficient as the pneumatic or electrically operated tire machine if the technician has sufficient experience using the machine. With some types of manually operated tire machines it will be necessary to remove the belt driven sprocket to gain sufficient clearance when using the machine.

Manual manipulation of tire irons is the least preferred method of tire dismounting and mounting. This method delivers the same level of safety to the rim/tire seal area as the other two methods if the technician is skilled and careful. It will not generally deliver the same efficiency as the other two methods and greater care needs to be taken when performing the operation.

The technician must be very careful not to damage the rim, tire, brake disk or driven belt sprocket regardless of which method is used.

If a self-powered or manual tire machine is used, follow the instructions for that machine carefully when changing tires.

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.

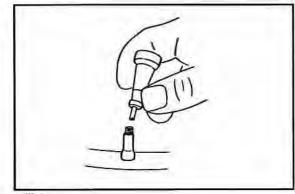
The following procedure shows the front tire being removed from its rim. Other than the possibility of interference of the belt driven sprocket (and removing it if necessary), the procedure is the same for the rear tire.

NOTE: Rear sprocket bolts have a pre-applied locking agent and should not be re-used.

TIRE REMOVAL

- Remove wheel assembly from motorcycle.
- Front wheel assembly removal, refer to chapter 12.
- 3. Rear wheel assembly removal, refer to chapter 13.
- Remove valve core from valve stem and let all air escape. Ill. 1.

IMPORTANT: 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 should be the heaviest part of the rim (although not always the case).

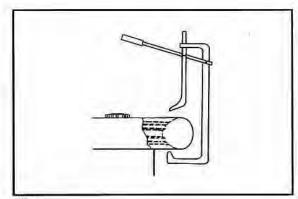


111.1

CAUTION:

If the tires have a directional arrow they must be observed and the tires installed correctly. When tires are manufactured the tread rubber is laid down as a strip and their 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.

- Mount the wheel assembly into a tire bead breaker and break the bead. Ill. 2.
- Flip the wheel assembly over and break the bead on the other side.

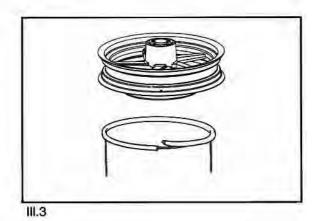


III. 2

CAUTION:

IMPORTANT: Take great care not to bend or otherwise damage the brake disk and/or belt driven sprocket. If the bead breaker being used interferes with either the brake disk and/or belt driven sprocket, remove them.

Position the wheel assembly so that the brake disk cannot be damaged and the rim cannot be scratched. III. 3.



Polaris Sales Inc. Victory Motorcycle Division

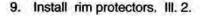
TIRE REMOVAL (continued)

 Push the tire down and lubricate the tire sealing edge (bead) with tire lubricant on both sides of the tire.
 11. 1.

LUBRICANT:

Rubber Lubricant:

Available At Most Auto Parts Stores



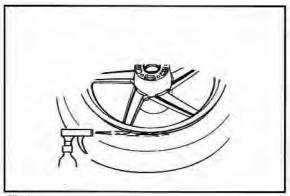


Rim Protectors:

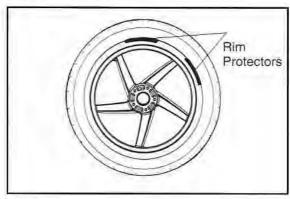
PV-43536

- 10. Stand opposite one of the rim protectors and use knee to push a portion of the tire down into the rim's drop center and pull 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. Ill. 3.
- While keeping the tire in the rim's drop center, slide a tire iron between the tire and 12 o'clock rim protector.
- Using your other hand, slide a tire iron between the tire and 2 o'clock rim protector.
- Lever the 12 o'clock tire iron up and over (about 160°) and keep it positioned there.
- 14. Lever the 2 o'clock tire iron up and over.
- 15. Remove the 2 o'clock tire iron (leave the 12 o'clock tire iron in place and levered over) and slide it between the the tire and rim protector at the 4 o'clock position.

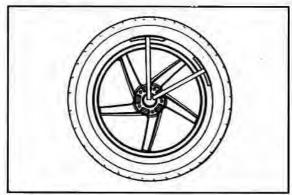
IMPORTANT: The tire beads must continually be pushed into the drop center of the wheel during the entire removal process.



III. 1



III. 2



III. 3

TIRE REMOVAL (continued)

- Continue going around the tire until this side of the tire is off the rim.
- Lift the tire up and push it away from you so the bottom bead is in the drop center of the rim.
- Place a tire iron at the 12 o'clock position and 2 o'clock position. Lever the 12 o'clock tire iron up and over and then the 2 o'clock tire iron.
- Continue to work around the tire until the tire is off the rim.

WHEEL INSPECTION

- Refer to chapter 12 for complete front wheel inspection procedures.
- Refer to chapter 13 for complete rear wheel inspection procedures.
- 3. Clean the rim of all rubber particles and corrosion.

A WARNING

If any of the following problems are discovered, replace the wheel.

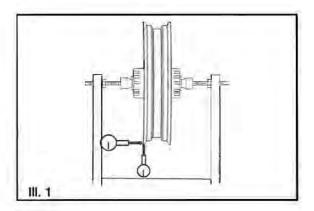
- Inspect the wheel for cracks and/or distortion.
- Inspect the bead seating area of scratches, gouges, distortion or any damage that could create a sealing problem.
- Inspect the wheel for radial & axial runout. III.1



Clean the sealing surfaces of the rim thoroughly. Use a soft brush (nylon) soap and water if necessary.

A 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 operator control and an accident, which can lead to a crash and subsequent serious injury or death.



TIRE INSPECTION

A WARNING

No form of temporary repair should be attempted because secondary damage caused by the penetrating object may not be detected and tire or tube deflation may occur at a later date.

A WARNING

Do not attempt to repair tires that have:

- Punctures with a diameter of greater than 6mm (0.080").
- Cuts with a length of greater than 6mm (0.080").
- 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 tire.

A WARNING

TIRES WITH NON-REPAIRABLE DAMAGE MUST NOT BE USED. Damage caused by impacts, penetrations or continued underinflation/overloaded use is progressive and can result in sudden and complete tire failure and accident.

Only permanent plug-patch repairs of small tread area punctures from within 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.

TIRE VALVE INSPECTION

- Inspect the valve core. Replace if the seal is worn, deformed or otherwise damaged. Ill 1 & 2.
- Inspect the tire valve for visible damage, replace if necessary. III. 1 & 2.

NOTE: If the tire is being replaced due to normal wear, the tire valve assembly should be replaced at this time also.

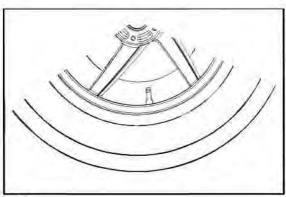
TIRE VALVE INSTALLATION

- 1. Remove tire.
- Clean the tire valve hole and area around the tire valve hole thoroughly.
- Lubricate the tire valve and tire valve hole with rubber lubricant.
- Place the tire valve into the hole from the tire side of the rim with the valve core facing the wheel hub.
- Screw a tire valve installation tool onto the tire valve. Ill. 3.

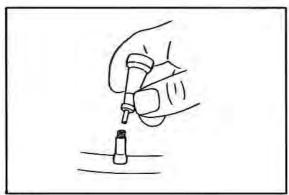


Tire Valve Installation Tool:
Available At Most Auto Parts Outlets

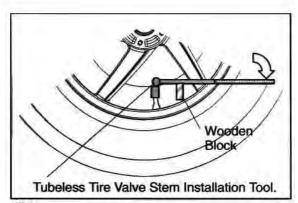
- Place a small piece of wood against the rim so the leverage point for the tire valve tool will be advantageous when levering the tire valve in. III. 3.
- Lever the tire valve into place. Be sure it is fully seated. III. 3.
- 8. Remove the tire valve tool.



III.1



111.2



111.3

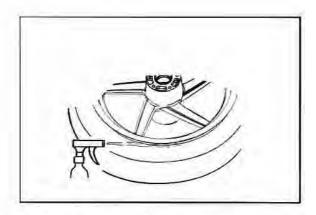
TIRE INSTALLATION

Lubricate both tire beads with rubber lubricant.

LUBRICANT:

Rubber Lubricant:

Available At Most Auto Parts Stores



A 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.

Important Points

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 should be the heaviest part of the rim (although this is not always the case).

A 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.

If the tires have directional arrows, they must be observed and the tires installed correctly. When tires are manufactured the 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 the bead is correctly seated.

- 2. Hold the tire vertically on the floor.
- Orient the tire correctly as to the balance dot and directional arrow.
- Place the rim into the tire and push it down.
- Pull/push the tire on to the rim until one sealing lip is on the rim. It shouldn't be necessary to use tire irons to put one side of a tubeless tire onto the rim.

TIRE INSTALLATION (continued)

Place the tire in a horizontal position with the un-installed portion of the tire facing up.

NOTE: Confirm the tire is positioned correctly by observing the directional arrows. III. 1.

CAUTION:

Support the tire assembly in such a way that the brake disk or belt drive sprocket cannot be damaged.

NOTE: This procedure can be performed on an empty 30 gallon drum with the top cut out. The top lip of the drum is covered with a split rubber hose to protect the rim.

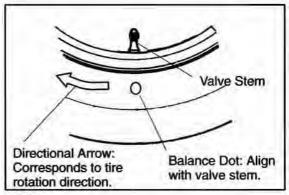
- With your hands, push as much of the tire as possible into the rim.
- When no more of the tire can be installed by hand, press down on the portion of tire in front of you with your knee to push the tire into the rim's drop center.
- Place one hand at the point where the tire is above the rim to keep it in this position.
- Carefully slide a tire iron between the rim and tire at the other side of the un-installed portion of the tire.

CAUTION:

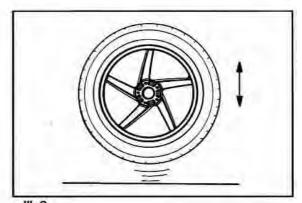
Make sure your tire irons are smooth and free of scratches or any sharp edges. Polish them if necessary. Do not slide the tire iron in any more than is necessary.

NOTE: Be sure both beads are forced as far as possible into the drop center of the rim.

- Lever the tire iron over and install that portion of the tire. Continue to move the tire iron in small increments and repeat the procedure until the tire is installed.
- 12. Install the valve core.
- Line up the balance dot.
- Confirm that the directional arrows are pointing the correct direction.
- Bounce the tire on the floor several times while rotating the tire. This will expand the tire bead outward slightly which will make tire inflation easier. III. 2.



111.1



III. 2

TIRE INSTALLATION (continued)

Inflate the tire observing the following precautions.

A DANGER

TIRE INFLATION PRECAUTIONS

Wear approved eye protection

Lock assembly on mounting machine or place in safety cage before inflating to seat beads

Set air hose relief valve at 40 psi

Use extension gauge and hose with slip-on air chuck.

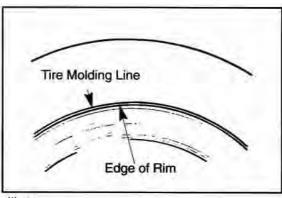
Stand back with no part of your body within the perimeter of the assembled tire and rim.

Inflate with core in valve stem

Never inflate above 40 psi to seat beads

If beads do not seat by 40 psi. Deflate and repeat procedures. Never use a volatile substance or rubber "donut" to aid bead seating.

- 17. 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 the tire is not seated properly. III. 1.
- 18. If the tire is not seated correctly, deflate the tire, unseat the tire, lubricate the tire beads with rubber lubricant and repeat the inflation procedure.
- Install wheel assembly onto balance stand and spin. Observe the wheel assembly while it is spinning to make sure the tire is seated properly.
- Adjust tire pressures to specifications. Refer to page 14.3.



111. 1

TIRE INSTALLATION (continued)

A WARNING

FOR REPAIRED TIRES: 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 run-in.

FOR NEW TIRES: Replacement for worn tires with the same type and brand of tire or replacement of original tires with differently constructed tires will not react 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 "run-in" period of approximately 100 miles has been covered. This will permit the rider to become accustomed to the "feel" of the 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".

NOTE: Refer to chapter 12 for front wheel installation.

NOTE: Refer to chapter 13 for rear wheel installation.

TIRE BALANCING

A WARNING

It is essential that the wheel assembly be balanced before use and rebalanced each time the tire is removed or replaced.

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.

A WARNING

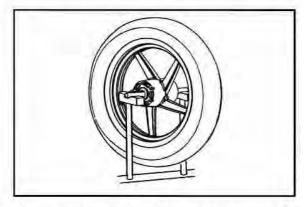
The use of liquid balancer/sealer is not recommended.

This procedure will outline balancing the wheel assembly in a gravity balance stand. If a pendulum or spin type balancer is being used, the manufacturer's instructions that came with the equipment must be referenced.

Mount the wheel assembly in a balance stand.



Remove all balance weights and clean tire and rim thoroughly.



NOTE: While it is possible to balance a wheel assembly with the axle and wheel bearings as the pivot point, it is not recommended due to the friction caused by the grease in the wheel bearings. The inspection stand should be of the type that has knife edge bearings and its own axle. Using the wheel assembly's axle and bearings requires that the wheel bearings be totally free to rotate with no sticking points. This is usually not possible to the degree necessary to do an accurate job within a reasonable period of time.

TIRE BALANCING (continued)

- Spin the wheel assembly, allow it to stop on its own and mark the highest (lightest) part of the wheel. Ill. 1.
- Repeat the spinning process several times to verify the heaviest part of the wheel.

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.

- Place balance weights at the lightest portion of the wheel in small increments. III. 2.
- Spin the wheel assembly and allow it to stop by itself after each addition of weight.
- When the correct amount of weight has been added to the wheel, it will no longer stop in the same location and the wheel assembly is in balance.

CAUTION:

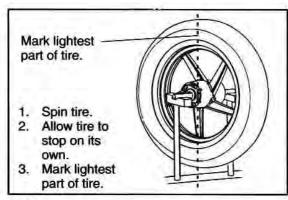
Do not add more than 65 grams (2.50 oz.) of weight to the rear wheel.

Do not add more than 63 grams (2.25 oz.) of weight to the front wheel.

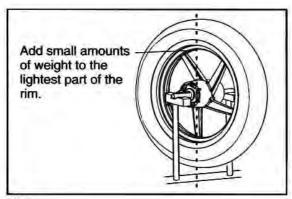
If more than the recommended weight is necessary to balance the wheel, dismount the tire and rotate it 90° irrespective of the yellow balance dot.

NOTE: Refer to chapter 12 for front wheel installation.

NOTE: Refer to chapter 13 for rear wheel installation.



111.1



111.2

CHAPTER 15 BRAKES

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GENERAL

Brakes contribute a critical role in vehicle safety. Thus, Victory does not recommend rebuilding internal components of the brake master cylinder or brake wheel calipers. Furthermore, Victory does not offer replacement parts for the 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 Victory publications.

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.

A WARNING

Contaminated brake discs or pads greatly reduce the amount of stopping force available & increase stopping distance. Do not attempt to clean contaminated disc pads; they must be replaced. Brake discs can be cleaned using a commercially available brake disc cleaner. Follow the instructions printed on the container purchased.

CAUTION:

Brake fluid and some types of brake cleaners will damage paint, some plastics and some rubber compounds. Cover or remove plastic or painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately flood the area with a mild solution of soap and cool water until all traces of brake fluid are removed.

BRAKES

CAUTION:

The brake system uses ethylene-glycol based fluid (DOT 4). Do not use or mix different types of fluid such as silicone-based or petroleum-based.

Do not use brake fluid taken from old, used or unsealed containers. Never reuse brake fluid.

Keep the container completely sealed and out of reach of children.

Make sure the master cylinder being worked on is level before removing the cap.

Do not leave the brake bleeder screw or union bolts loose for long periods of time with the reservoir cap removed. Doing so may allow brake fluid to overflow from the reservoir and damage painted, plastic or rubber parts.

Brake fluid should be completely replaced every 24 months or 12,000 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 test riding the motorcycle.

SPECIFICATIONS

BRAKING SYSTEM			
Item	Standard	Service Limit	
Specified Brake Fluid	DOT 4	Replace every 24 months or 30,000 miles	
Brake Disc Thickness Front/Rear	Not Applicable	4.5 mm (0.177")	
Brake Disc Runout Front/Rear	Not Applicable	0.30 mm (0.012")	
Front Brake Pads Wear Limit	Not Applicable	When groove is no longer visible	
Rear Brake Pads Wear Limit	Not Applicable	When chamfer is no longer visible (1.8 mm friction material thickness)	
Brake Pedal Height	Not Applicable	5-8 mm (.3150")	

TORQUE SPECIFICATIONS

Fastener Type	Torque N-m	Torque lb-ft or (in-lb)
Brake Bleeder Screw	5.5 Nm	(48 in-lbs)
Brake Line Banjo Bolts (All)	18.5 Nm	14 lb-ft
Front Brake Hose Union Bolt	18.5 Nm	14 lb-ft
Front Brake Lever Pivot Nut	16 Nm	12 lb-ft
Front Master Cylinder Clamp (Mounting) Bolt	16 Nm	12 lb-ft
Front Master Cylinder Reservoir Cap Screw	3 Nm	(25 in-lbs)
Front Caliper Mounting Bolt	41 Nm	30 lb-ft
Rear Master Cylinder Reservoir Mounting Bolt	3 Nm	(25 in-lbs)
Master Cylinder to Brake Pedal Support	16 Nm	12 lb-ft
Rear Master Cylinder Push Rod Lock Nut	11 Nm	(96 in-lbs)

TROUBLESHOOTING

Problem	Symptom and/or Possible Cause	Possible Repair
Weak Brakes or Erratic Braking Action	Fluid Leakage (External)	Repair or Replace Leaking Component
	Fluid Leakage (Internal of Master Cylinder)	Replace Master Cylinder
	Worn Pads	Replace Brake Pads
	Oil Contamination of Brake Pads and/or Brake Disc	Pads Must Be Replaced. Disc May Be Cleaned.
	Air In System	Bleed Air From System
	Low Brake Fluid Level In Reservoir	Fill Reservoir, Bleed Brakes, Top Off Fluid Level.
	Excessive Brake Disc Runout	Replace Brake Disc
	Worn or Damaged Wheel Bearings.	Replace Wheel Bearings
	Loose Front Axle Nut or Clamps	Torque Correctly, See Chapter 12
	Clogged or Restricted Hydraulic Line	Replace Line(s)
	Caliper Mount Bent or Distorted	Replace Mount
	Fork Oil Level Incorrect	Set Level Correctly, See Chapter 12
	Loose Brake Disc	Torque to Specification
	Loose or Damaged Steering Bearings	Adjust or Replace, See Chapter 12
	Brake Pads Glazed	Avoid Needless Heavy Braking For Initial 100 to 200 miles.
Poor Brakes or No Brakes When First Applied	Brake Disc is Bent or Warped	Replace Brake Disc
	Caliper Misalignment	Determine Cause and Correct
Brake Lever Pressure Can Be Obtained	External Leak	Repair or Replace Damaged Component
If Lever Is "Pumped"	Internal Leak (master cylinder)	Replace Master Cylinder
	Air In System	Bleed Air From System
	Low Brake Fluid Level In Reservoir	Fill Reservoir, Bleed Brakes, Top Off Fluid Level.
Brake Pedal or Brake Lever Pulsates	Brake Disc is Bent or Warped	Replace Brake Disc
	Mounting Surface of Brake Disc Uneven or Disc Is Loose	Repair or Replace as Necessary
	Caliper Mount Surface Uneven Or Misa- ligned; Missing or Damaged Fasteners	Repair or Replace as Necessary
Excessive lever or pedal travel.	Air in System	Bleed Air From System
	Loose Mounting Hardware	Repair as Necessary
	Low Brake Fluid Level In Reservoir	Fill Reservoir, Bleed Brakes, Top Off Fluid Level.
	Incorrect Brake Fluid Used	Flush System and Replace With Correct Fluid

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.

7/99

BRAKES

TROUBLESHOOTING (continued)

Problem	Symptom and/or Possible Cause	Possible Repair
Fluid Leakage	Loose Banjo Fittings	Tighten to Specified Torque
	Damaged Banjo Fitting Sealing Washers	Replace
	Cracked Hose	Replace
	Worn Piston, Caliper or Seals	Replace Master Cylinder or Wheel Caliper
	Diaphragm leaking	Replace diaphragm
	Fluid level too high (new brake pads installed without removing added fluid)	Correct fluid level
Brakes Drag Excessively or Self-Apply	Reservoir Over Filled	Adjust Level As Necessary
(Brakes Over Heat)	Brake Pedal Not Returning Completely To Rest Position	Inspect Linkage, Pivots and Mechanism For Cause Of Binding Or Restricted Movement
	Compensating Port Plugged	Replace master cylinder
	Internal Corrosion of Components	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	Contaminated Brake Pad / Disc (not oil or grease)	Repair Surface With Emery Cloth; Clean
	Pad Not Secure in Caliper	Repair as Necessary
	Damaged Wheel Bearing(s)	Replace
	Worn Pads	Replace
	If noise is minor and inconsistent, some Brake Squeak/Squeal is characteristic of Disc Brakes.	Clean Dirt & Dust From Disc Surface and Pad Surface Periodically.

NOTE: If it is determined that a problem exists within the internal workings of the brake master cylinders or brake wheel calipers, they must be replaced.

BRAKE FLUID REPLACEMENT/BRAKE BLEEDING

A 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.

A WARNING

The 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.

A WARNING

Do not use brake fluid taken from old, used or unsealed containers. Never reuse brake fluid.

A WARNING

Keep the container completely sealed and out of reach of children when storing.

A 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. Investigate the cause of a soft, spongy feeling brake lever and/or brake pedal and perform the necessary maintenance or repair immediately.

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 and controlled stops.

A WARNING

An unsafe condition exists when air is trapped in the hydraulic brake system. It is extremely important to bleed the brakes properly after any brake system work has been performed or when inspection reveals spongy brakes.

CAUTION

Brake fluid attacks paint, some plastics and some rubber compounds. Cover or remove plastic or painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately flood the area with a mild solution of soap and cool water.

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.

BRAKE FLUID REPLACEMENT/BRAKE BLEEDING (continued)

Keep these points in mind when bleeding hydraulic brakes:

The master cylinder reservoirs have limited capacities and it is easy to empty them during your bleeding procedure. This will introduce air into the system you 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. Cavitation is a form of boiling caused by low pressure areas in the system.

BRAKE FLUID FILLING/BLEEDING

 Fill the reservoir until the observation window is covered with DOT 4 brake fluid from a sealed container. III. 1.

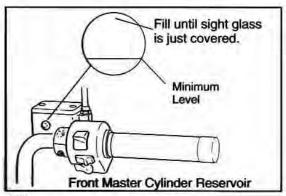
SPEC:
Brake Fluid: DOT 4
Victory Part Number: 2872189

Place the reservoir cap on the master cylinder to prevent the entry of contaminates.

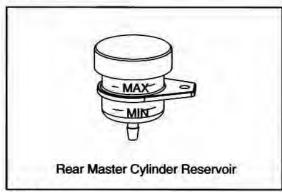
NOTE: Throughout the following procedure, monitor the fluid level in the master cylinder constantly. Do not allow fluid level to fall below the minimum level.

NOTE: The following method does not create the air bubbles associated with cavitation and it is relatively quick and easy. It is a very simple procedure and requires a minimum amount of equipment.

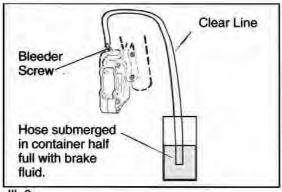
- Connect one end of a small hose to the bleed screw on the wheel caliper. This hose should be clear so air bubbles and fluid can be monitored.
- Place a small quantity of fresh brake fluid into a small, clear jar.
- Place the other end of the bleeder hose into the jar, making sure that the end of the hose is always submerged in brake fluid.



111.1



III. 2.

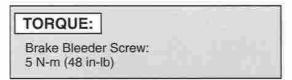


III. 3

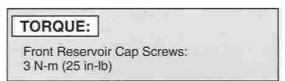
BRAKE FLUID FILLING/BLEEDING (continued)

NOTE: Keep the hose constantly submerged in brake fluid to prevent the system from drawing air on the return stroke of the master cylinder.

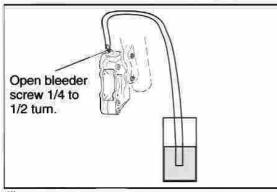
- 6. Open the bleeder screw 1/4 to 1/2 of a turn. III. 1.
- Slowly pump the brake lever while observing the level of fluid in the master cylinder. Add brake fluid as required during the bleeding procedure to keep fluid above the minimum level.
- Continue to pump the brake lever with the bleeder screw open until a steady stream of air-free fluid is observed.
- When no more air is observed, close the bleeder screw on a downward stroke of the brake lever.



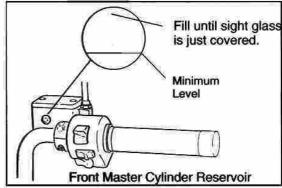
- Release the brake lever and inspect the feel of the brake lever. If it is spongy, repeat the procedure.
- After completing the brake bleeding procedure, ensure that the level of the fluid is covering the sight glass for the front master cylinder reservoir. Install the diaphragm and reservoir cover. Ill. 2



12. The procedure for the rear brake is the same with the exception of the reservoir cap, location of the bleeder screw and the brake is actuated by a pedal instead of a lever.



10.1



111.2

BRAKES

BRAKE PAD REPLACEMENT (Front)

CAUTION

Always replace brake pads as a set.

- Remove retaining clips from brake pins. III. 1
- 2. Remove brake pad pins. III. 2
- 3. Remove spring plate. III. 3
- 4. Lift brake pads up and out. III. 4

NOTE: When brake pads wear, the pistons extend farther out of their bores and the fluid level in the reservoir goes down. During normal maintenance procedures, fluid is added to the reservoir.

NOTE: If brake pads are being replaced because of wear, the pistons must be pushed back into their bores and brake fluid must be removed

- Place a bleeder hose on to the caliper bleed screw. Place the other end of the hose into a container.
- Open the bleed screw and push the pistons into their bores. Close the bleed screw when the pistons are fully retracted.
- Clean the brake disc and brake caliper with brake cleaner.

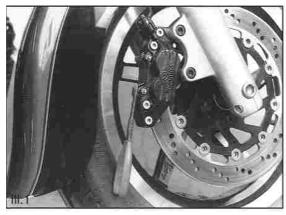
NOTE: The arrow on the spring plate points toward the front of the motorcycle.

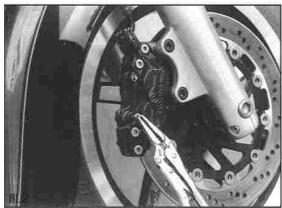
- Install new brake pads.
- Position the spring plate onto the caliper.
- 10. Install brake pad pins.
- Install brake pad pin clips. Rotate the front pin so that the clip is trapped under caliper cover.
- 12. Add fluid to brake fluid reservoir as necessary.

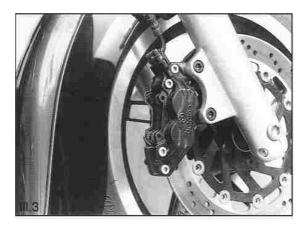
CAUTION

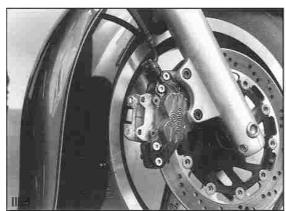
Do not overfill either the front or rear brake reservoirs. The air space is critical to proper function of the brake system. Too much fluid will not allow for fluid expansion and self-application of the brakes can result.

- Operate brake lever several times to insure that the brakes are operating correctly.
- Bleed brakes if necessary, refer to pages 15.6 and 15.7.









7/99

BRAKE PAD REPLACEMENT (Rear)

CAUTION

Always replace brake pads as a set.

NOTE: When brake pads wear, the pistons extend farther out of their bores and the fluid level in the reservoir goes down. During normal maintenance procedures, fluid is added to the reservoir.

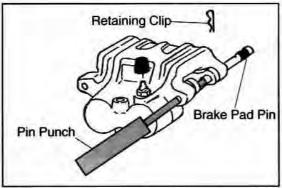
NOTE: If brake pads are being replaced because of wear, the pistons must be pushed back into their bores and brake fluid must be removed

- 1. Remove retaining clip from brake pin. III. 1.
- Use a 5/32" pin punch to drive the brake pad pin past the outer brake pad. Remove pin punch. Do not push the pin out of the innermost pad at this time! III. 1.

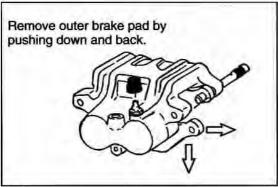
CAUTION

Only replace one pad at a time to prevent the spring plate from becoming dislodged.

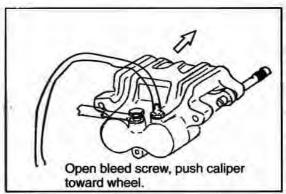
- Push outer brake pad down and to the rear of the machine to remove. Ill. 2.
- Place a hose on the caliper bleed screw. Place the other end of the hose into a container. Ill. 3
- Open the bleed screw and push the caliper towards the wheel. Close the bleed screw when piston is fully retracted. III. 3
- Clean the brake disc and brake caliper with brake cleaner.



111.1



111.2



111.3

BRAKES

BRAKE PAD REPLACEMENT (Rear) (continued)

- 7. Install new, outer brake pad.
- Install pin punch and drive brake pin past inner brake pad.
- Pull pin punch back just enough to remove inner brake pad and leave pin punch installed in outer brake pad. Remove inner brake pad.
- Clean the brake disc and brake caliper with brake cleaner.
- Pull caliper towards left side of machine to retract piston.
- Install new, inner brake pad.NOTE: Spring clip can be dislodged when removing pads. Be sure to replace spring clip in proper position (arrow indicates brake disc rotation).



Make sure that the ends of the brake pads are correctly installed into the caliper.

 Install brake pad pin. Use long drift punch to lightly drive the brake pad pin into place from the drive sprocket side of the motorcycle.

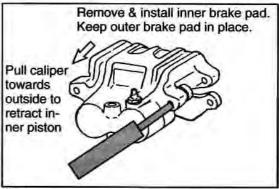
NOTE: Lift up on the brake pads while installing the brake pad pin.

- Install brake pad pin clip.
- Add fluid to brake fluid reservoir as necessary.

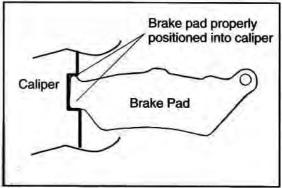
CAUTION

Do not overfill the front or rear brake reservoir(s). The air space is critical to proper function of the brake system. Too much fluid will not allow for fluid expansion and self-application of the brakes can result.

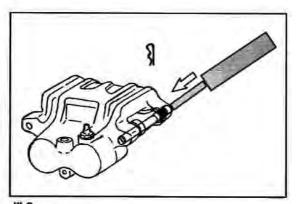
- Operate brake pedal several times to insure that the brakes are operating correctly.
- Bleed brakes if necessary, refer to page 15.6 and 15.7.



111. 1



111.2



111.3

BRAKE DISC INSPECTION (Front & Rear)

- 1. Visually inspect the disc for cracks or damage.
- Measure the brake disc thickness in several locations along the inner and outer wear surface. III. 1.

SPECIAL TOOL:

0-25mm (0-1") Outside Micrometer: Commercially Available

SPEC:

Brake Disc Thickness Service Limit: 4.5 mm (0.177")

NOTE: Replace the brake disc if any measurement is less than the service limit.

3. Inspect for brake disc warpage. Ill. 2

SPECIAL TOOL:

Dial Indicator and Stand: Commercially Available

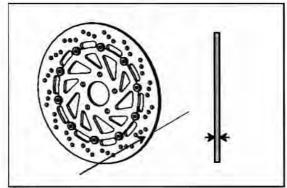
SPEC:

Brake Disc Runout Service Limit: 0.30mm (0.012")

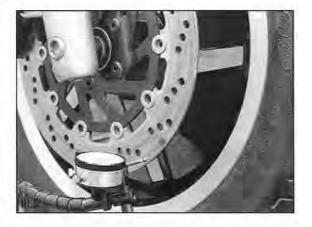
CAUTION

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
- Replace the brake disc if the dial indicator reading displays excessive brake disc runout and other possible causes have been eliminated.
- Refer to Chapter 12 for front wheel removal and brake disc removal and installation. Refer to Chapter 13 for rear wheel removal and brake disc removal & installation.



111.1



BRAKES

FRONT MASTER CYLINDER REMOVAL

CAUTION

Brake fluid attacks paint, some plastics and some rubber compounds. Cover or remove plastic or painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately flood the area with a mild solution of soap and cool water until all traces of brake fluid have been removed.

- 1. Remove the right rear mirror.
- 2. Drain the brake fluid from the front brake system.
- 3. Disconnect the brake light switch. III. 1.
- 4. Remove the pivot nut, bolt and brake lever. III. 1.
- Remove the union bolt, sealing washers and brake hose.
- Remove master cylinder clamp bolts, clamp and master cylinder.

FRONT MASTER CYLINDER INSTALLATION

- Clean the mounting surface on the handlebar.
- Install the master cylinder and its clamp. Align split between master cylinder and clamp to dot on handlebar.
- Torque rear bolt to specification first to close gap between master cylinder and clamp, then torque front bolt to specification. (Gap at front).

TORQUE:

Master Cylinder Clamp (Mounting) Bolt Screws: 16 Nm / 12 lb-ft

- Apply grease to both ends of the master cylinder piston push rod.
- 5. Apply grease to the lever pivot bolt.

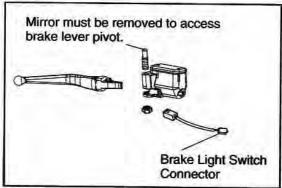
LUBRICANT:

Victory All Purpose Grease: 2872187

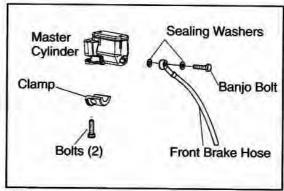
Install the brake lever and pivot bolt, torque the bolt first and then the nut to specification.

TORQUE:

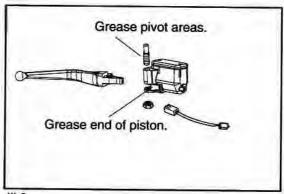
Brake Lever Pivot Nut: 16 N-m / 12 lb ft



111.1



111.2



111.3

FRONT MASTER CYLINDER INSTALLATION (continued)

Connect the brake hose to the master cylinder with the union bolt and new sealing washers. Torque the bolt to specification.

TORQUE:

Front Brake Hose Union Bolt: 18.5 N-m / 14 lb ft

- 8. Connect front brake light switch wire connectors.
- Fill and bleed the front hydraulic system, refer to page 15.6.

FRONT WHEEL CALIPER REMOVAL

CAUTION:

Brake fluid attacks paint, some plastics and some rubber compounds. Cover or remove plastic or painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately flood the area with a mild solution of soap and cool water until all traces of brake fluid have been removed.

- Drain the brake fluid from the front brake system.
- 2. Remove the brake pads, refer to page 15.8.
- Remove union bolt and sealing washers, remove brake hose from caliper assembly. Ill. 1.
- Remove front caliper mounting bolts, remove the caliper. III. 2.

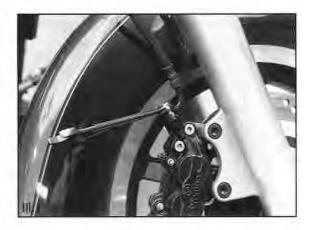
FRONT WHEEL CALIPER INSTALLATION

- Clean mounting surfaces thoroughly.
- Clean brake disc and caliper with Victory brake cleaner.

SPEC:

Victory Brake Cleaner: 2872191

Install caliper assembly over brake disc and onto the fork leg.





BRAKES

FRONT WHEEL CALIPER INSTALLATION (continued)

Install caliper mounting bolts, torque to specification.

TORQUE:

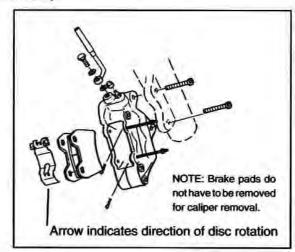
Front Caliper Mounting Bolts: 41 Nm / 30 lb-ft

Connect brake hose to caliper with new sealing washers and union bolt, torque bolt to specification.

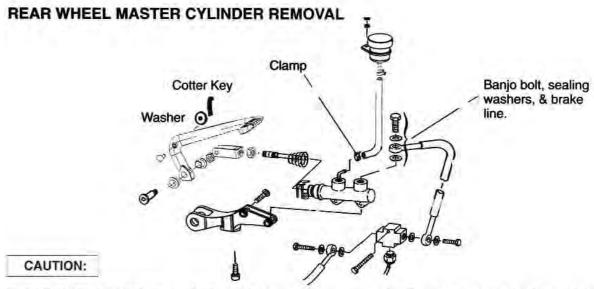
TORQUE:

Front Brake Hose Union Bolt: 18.5 N-m / 14 lb-ft

- 6. Install brake pads, refer to page 15.8-15.9.
- Fill and bleed the front hydraulic system, refer to page 15.6.

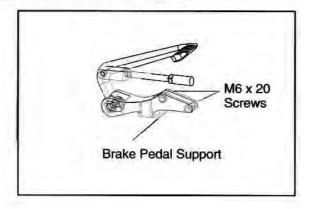


111.1



Brake fluid attacks paint, some plastics and some rubber compounds. Cover or remove plastic or painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately flood the area with a mild solution of soap and cool water until all traces of brake fluid have been removed.

- 1. Drain the brake fluid from the rear brake system.
- Remove clamp for reservoir hose at master cylinder, remove hose.
- Remove brake line banjo bolt, sealing washers and brake line.
- Remove two 6 x 20 hex socket screws attaching master cylinder to brake pedal support. Remove master cylinder.



REAR WHEEL MASTER CYLINDER INSTALLATION

- 1. Grease end of master cylinder push rod.
- Install master cylinder on brake pedal support. At the same time, place brake rod into master cylinder with spring. Install mounting screws.

TORQUE:

Master Cylinder to Brake Pedal Support: 16 Nm / 12 lb-ft

- 3. Ensure that dust cover is properly positioned.
- Install reservoir hose to master cylinder, secure clamp
- Connect brake hose to master cylinder with union bolt and new sealing washers. Torque to specification.

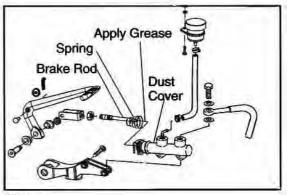


Rear Brake Hose Union Bolt: 35 N-m / 25 lb-ft

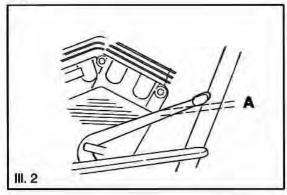
- Fill and bleed the rear hydraulic system, refer to page 15.6-15.7.
- Inspect pedal freeplay (A), adjust if necessary. Refer to chapter 3, page 3.25. Ill.2.



Brake Pedal Freeplay: A 5-8 mm (.3150")



111.1

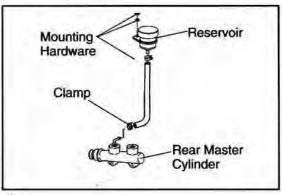


REAR MASTER CYLINDER RESERVOIR REMOVAL

CAUTION:

Brake fluid attacks paint, some plastics and some rubber compounds. Cover or remove plastic or painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately flood the area with a mild solution of soap and cool water until all traces of brake fluid have been removed.

- Drain the brake fluid from the rear brake system.
- 2. Disconnect reservoir hose from reservoir.
- Remove mounting bolt and reservoir.



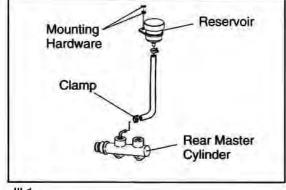
111.3

REAR MASTER CYLINDER RESERVOIR INSTALLATION

- 1. Connect reservoir hose to reservoir.
- 2. Install reservoir onto oil cooler and tighten mounting bolt to specification. III, 1.



3. Fill and bleed the rear hydraulic system, refer to page 15.6-15.7.

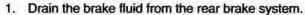


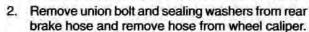
111 1

REAR WHEEL CALIPER REMOVAL

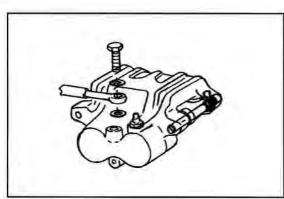
CAUTION:

Brake fluid attacks paint, some plastics and some rubber compounds. Cover or remove plastic or painted parts before working on the brake system. If brake fluid is spilled on cosmetic surfaces, immediately flood the area with a mild solution of soap and cool water until all traces of brake fluid have been removed.





- Remove rear wheel, refer to chapter 13.
- Remove caliper.
- Remove brake pads and spring plate.



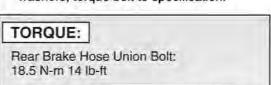
111.2

REAR WHEEL CALIPER INSTALLATION

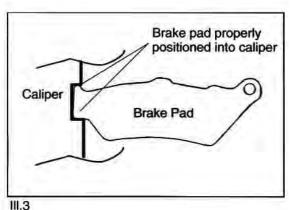
- Install spring plate into caliper. See III.3
- Install brake pads, refer to page 15.9-15.10.

NOTE: Brake pad installation is slightly different when caliper is removed. Unlike previous instructions, both pads will be removed and installed at the same time. Be extremely careful that the spring plate is properly installed and that the brake pads are properly retained in the caliper.

- 3. Install rear wheel, refer to chapter 13.
- 4. Install brake hose, union bolt and new sealing washers, torque bolt to specification.



Fill and bleed the rear hydraulic system, refer to page 15.6-15.7.



15.16

REAR BRAKE PEDAL REMOVAL

- 1. Remove cotter pin (I) and washer (H), Ill. 1
- 2. Remove pin (A), bolt (B), and nut (G) III. 1
- 3. Remove brake pedal (F) and bushings (C), Ill. 1.

REAR BRAKE PEDAL INSTALLATION

- Inspect bushings (C), pin (A) pivot bolt (B), cotter pin (I), and washer (H), replace if worn or damaged. III. 1.
- 2. Insert bushings (C) into brake pedal (F). III. 1.
- Install clevis (D) onto brake pedal (F) and install pin A. III. 1.
- 4. Install washer and cotter pin for pin A.
- Insert brake pedal and bushings into brake pedal support (E) and install bolt (B). Ill. 1.
- Install nut (G) for bolt (B) and torque to specification. III. 1.



Rear Brake Pedal Pivot Bolt: 16 N-m / 12 lb-ft

NOTE: Bushings are self lubricating and grease is not required.

7. Operate brake pedal to ensure proper function.

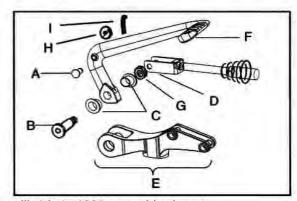
CAUTION:

Make sure that brake rod is properly positioned into master cylinder.

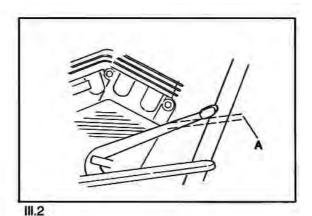
Inspect pedal height and adjust if necessary. III. 2.
 Refer to Chapter 3 for procedure.

SPEC:

Brake Pedal Freeplay: 5-8 mm (0.3150")



III. 1 Late 1999 assembly shown



Polaris Saes Inc. Victory Motorcycle Division

CHAPTER 16 CHARGING SYSTEM/BATTERY

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GENERAL

All electrical system and component servicing can be done with the engine in the frame.

Refer to chapter 9 for primary cover removal.

CAUTIONS TO OBSERVE DURING ELECTRICAL SYSTEM SERVICING

Always turn off the ignition switch before disconnecting any electrical component.

CONNECTORS

CAUTION:

Always turn off the ignition switch before disconnecting any electrical component.

Ensure that bullet-type connectors are free of corrosion, contamination or breaks when troubleshooting electrical problems.

To ensure 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. Make sure to push it in fully when connecting them.

Hold the couplers themselves when disconnecting them, not their associated wires. Pulling on the wires when disconnecting couplers can introduce problems.

Inspect each male and female terminal in multi-pin connectors for corrosion, contamination and loose or bent pins.

BATTERY

AWARNING

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 charging system used on the V92C is calibrated for the maintenance free battery that is installed as original equipment. Do not replace the battery with one of ordinary construction (non-maintenance free).

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.

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 speed 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.

Voltage is produced when the battery is first filled with electrolyte. Maximum voltage and service life is only achieved when the battery is properly serviced initially. Make sure to follow the instructions outlined later in this section.

Overcharging is often caused by the battery itself which may appear to be a charging system problem. If one or more of the battery cells is shorted the battery voltage may not increase. The regulator/rectifier unit monitors battery voltage to determine the amount of voltage sent to the battery. If the battery constantly "tells" the regulator/rectifier assembly that it needs more voltage, those cells that are not shorted will receive too much voltage and cause an overcharging problem to appear.

New batteries must be properly cooled after filling and charged as outlined in this section to ensure proper service life.

BATTERY (continued)



CAUTION: C

CONNECTING AND DISCONNECTING THE BATTERY

Be sure to disconnect the negative terminal first when removing the battery.

Be sure to connect the positive terminal first when connecting the battery.

If corrosion is found on the terminals, remove the battery and clean the terminals with a solution of baking soda and water. Finish the process by cleaning the terminals (both battery and battery cables) with a wire brush.

Once the connections are secured, apply a thin film of di-electric grease to the terminals.

Make sure that the positive terminal has its protective boots in place.



CAUTION:

WIRE ROUTING

Make sure that all wires are routed correctly by referring to the wiring and cable routing diagrams in Chapter 1.

CAUTION:

FUSES

Fuses are in place to protect circuit wiring and components. Always determine the cause before installing a new fuse.

Do not increase the capacity of the fuse to correct the problem.

Do not use wire, tin foil or other substitutes for fuses.

CAUTION:

ELECTRONIC COMPONENTS

Electronic components used on the V92C are extremely reliable when used in the manner in which they are intended to be used. However, the semi-conductor parts used in the electronic components will not withstand careless handling.

Do not drop or strike parts that contain semi-conductors (such as the E.C.U., rectifier/regulator, etc.), doing so may cause irreparable damage to the component.

Follow the instructions supplied in this section, chapter 5 (Fuel Injection) and chapter 17 (Ignition System) very carefully with no deviation to the instructions when working on electronic components. Failure to follow the instructions provided may cause irreparable damage to the part being inspected.

SPECIFICATIONS

	Item	Specifications
Electrical (General)	Ignition System	Distributor-less Transistorized Dual Coil Type Ignition
March 1974	Starting System	Electric
	Charging System	Permanent Magnet/3 Phase/Full Rectification
	Regulator/Rectifier	Solid State Three Phase Voltage Regulator/Rectifier
	Lighting System	12 vdc



SPECIFICATIONS (continued)

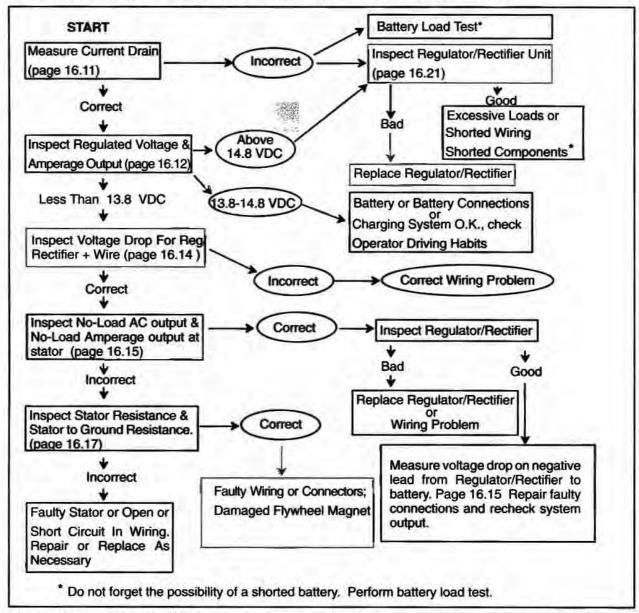
CHAP	RGING SYSTEM / ALTERNATOR	
İtem		Specifications
Alternator Charging Coil Resistance (@ 20°C / 68°F)	(Yellow to Yellow)	0.3 to 0.5 ohms
Alternator No Load AC Output		15 VAC @ Idle
Alternator Charging Coil Output Wires To Ground		Infinity (no continuity)
Alternator AC Amperage Output @ Idle	Greater Than 15 Amps	
Regulator/Rectifier Regulated Voltage	13.8-14.5 VDC	
Alternator Output (Watts)		327 Watts
	Туре	Yuasa: YTX20L-BS
	Voltage	12 Volts DC
Battery	Nominal Capacity @ 10 Hr Rate	18 AH
	Specific Gravity	1.320±0.01 @ 20°C (68°F)
	Recommended Battery Charging Current	STD: 1.85 A for 5 to 10 hrs

	ENGINE CRITICAL TORQUE SPECIFIC IARGING SYSTEM / ALTE	
Fastener Type	Torque N-m	Torque lb-ft (in. lb)
Flywheel Bolt Torque	103 Nm	75 lb-ft
Regulator/Rectifier Attachment Bolts	11 Nm	(100 in-lbs)
Stator Socket Head Screws	11 Nm	(100 in-lbs)
Primary Cover Screws	10 Nm	(85 in-lbs)

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 CONNECTING/DISCONNECTING

For battery removal & installation refer to chapter 3.

CAUTION:

CONNECTING AND DISCONNECTING THE BATTERY

Be sure to disconnect the negative terminal first when removing the battery.

Be sure to connect the positive terminal first when connecting the battery.

If corrosion is found on the terminals, remove the battery and clean the terminals with a solution of baking soda and water. Finish the process by cleaning the terminals (both battery and battery cables) with a wire brush.

Once the connections are secured, apply a thin film of dielectric grease to the terminals to reduce corrosion in the future.

Make sure that the positive terminal has its cover in place.

INITIAL BATTERY SERVICING

AWARNING

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 V92C comes with the battery. Do not use common battery electrolyte which is normally purchased at auto parts stores. Failure to use the electrolyte that comes with the battery will result in reduced battery service life. Conventional battery electrolyte has a specific gravity of 1.265 and maintenance free battery electrolyte has a specific gravity of 1.320.

INITIAL BATTERY SERVICING (continued)

- Place the battery in an acid proof catch pan or receptacle. Work in a well ventilated area.
- Remove aluminum sealing tape from top of the battery. III.1.
- Remove the cap assembly from the battery acid pack. III.2.

CAUTION:

Do not attempt to remove or pierce the seal on the acid pack. The seal will be pierced by the battery when the acid pack is placed on the battery. Ill. 2.

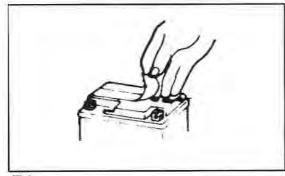
- Insert the nozzles of the electrolyte container into the battery's filler holes. III. 3.
- Press down firmly on the acid pack so that the seal for the acid pack is completely penetrated. Take precautions not to let any of the fluid spill.

NOTE: The acid pack will be secured in the battery and be able to stand by itself if it is inserted correctly.

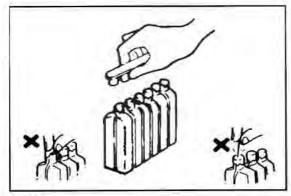
CAUTION:

The filler pack is designed to slowly drain the electrolyte into the battery cells. Do not attempt to force electrolyte into the battery cells.

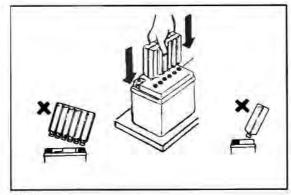
- 6. Ensure that the seal on the acid pack is completely penetrated by visually inspecting for air bubbles rising in each cell of the acid pack. If air is not bubbling up in one of the cells, fully seat the acid pack into the battery again. Tap the bottom of the acid pack a couple of times and observe for bubbles again. Under no circumstances should the acid pack be removed from the battery until all the acid is drained from it. III. 4.
- Leave the acid pack installed in the battery for at least 20 minutes.



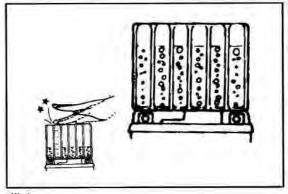
111.1



111.2



111.3



111.4

INITIAL BATTERY SERVICING (continued)

- After the 20 minute period has elapsed, verify that all the acid has drained from the acid pack. If it has not, allow times as required until all fluid has drained from the acid pack.
- Remove the empty acid pack and place the previously removed cap assembly onto the acid pack. Dispose of the acid pack properly.
- Let the battery sit with its battery cap strip uninstalled for at least 20 minutes.
- Insert the battery cap strip into the battery's filler holes. Press firmly on the cap strip and ensure that none of the strip is above the upper surface of the battery top. III. 1.



Do not remove the battery cap strip once it has been installed.

Measure battery voltage with a digital multimeter.
 The reading should be above 12.5 VDC. If the battery voltage is lower than 12.5 VDC the battery must be charged according to the instructions given below. III. 2.



Battery Voltage After Initial Servicing: Above 12.5 VDC

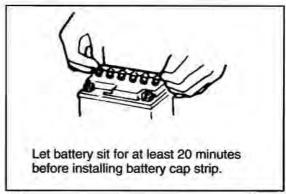
BATTERY CHARGING FOR NEW MAINTENANCE FREE BATTERIES

Charge the battery at 1.8 amps for 5 to 10 hours.

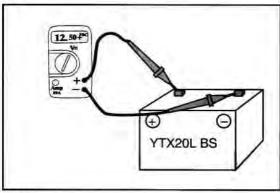
CAUTION:

Do not attempt to quick charge the battery at any time.

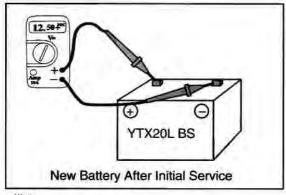
- Remove battery from charger and let it sit for 30 minutes or longer.
- Measure battery voltage with a digital multimeter.
 If the battery voltage is lower than 12.5 VDC the battery must be recharged again in accordance with step 1 and 2 above.
- After charging the battery and letting it sit for 30 minutes or more, check the battery voltage again.
 If the battery voltage is still below 12.5 VDC, replace the battery.



111.1



111.2



111.3

BATTERY CHARGING FOR MAINTENANCE FREE BATTERIES ALREADY PLACED IN SERVICE

 Measure battery voltage with a digital multimeter. The reading should be above 12.50 VDC. If the battery voltage is lower than 12.50 VDC the battery must be charged according to the instructions given below. III. 1.

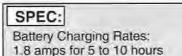
CAUTION:

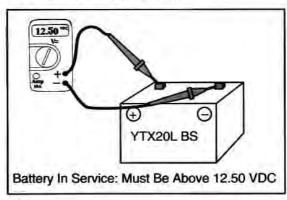
Remove the battery from the motorcycle before charging the battery.

CAUTION:

Do not remove the caps on the battery while recharging. Do not attempt to inspect or add fluid to a maintenance free battery.

2. Charge the battery at 1.8 amps for 5 to 10 hours.





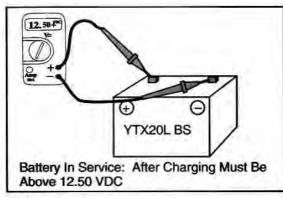
111.1

CAUTION:

Do not allow the charging current to exceed 9.0 amps at any time.

- Remove battery from charger and let it sit for 30 minutes or longer.
- Measure battery voltage with a digital multimeter.
 If the battery voltage is lower than 12.50 VDC the
 battery must be recharged again in accordance
 with step 1 and 2 above.
- After charging the battery and letting it sit for 30 minutes or more, check the battery voltage again.
 If the battery voltage is still below 12.50 VDC, replace the battery.

NOTE: When the motorcycle is not used for one (1) month or more, remove the battery and store it in a cool, dry area. Inspect the voltage monthly and charge according to the above instructions if necessary.



111.2

BATTERY INSPECTION

- 1. Remove the left side frame cover.
- Inspect battery tray and hold-down cover for damage and tight fasteners.
- Inspect for cracked or broken exterior case.
- The V92C 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 the battery. After initial servicing, the battery should remain sealed throughout its service life.

Inspect the terminals for corrosion. If corrosion is found, remove the battery and clean the terminals with a solution of baking soda and water. Finish the process by cleaning the terminals (both battery and battery cables) with a wire brush.



Remove the negative terminal first when removing the battery.

Install the positive terminal first when installing the battery.

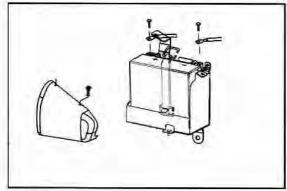
- Re-install the battery. Refer to chapter 3.
- Once the connections are secured, apply a thin film of grease to the terminals.
- 8. Install the left side frame cover. Refer to chapter 2.

BATTERY LOAD TEST

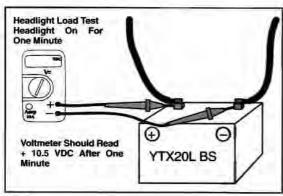
 The most accurate load test will be obtained with a commercially available battery load tester. If such a tester is being used, follow the manufacturer's instructions that accompanies the tool.

NOTE: Although not as conclusive, the following test can be used to direct troubleshooting efforts.

- Charge the battery as outlined on page 16.9.
- Install the battery and connect the battery terminals.
- Connect a digital multimeter to the battery and keep it connected for the duration of the test. III.2.



111.1



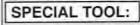
111.2

BATTERY LOAD TEST (continued)

- Turn the head light on high beam and leave it on for 1 minute (without the engine running).
- At the end of one minute, the digital multimeter should show a reading of above 10.5 VDC.
- If the battery voltage drops below 10.5 VDC the battery should be charged again and the test repeated.

CURRENT DRAIN INSPECTION

- 1. Remove the left side cover.
- 2. Ensure that the ignition switch is turned off.
- 3. Disconnect ground cable (-) from the battery.
- Connect digital multi-meter red (+) probe to the ground cable and connect the meter's black (-) probe to the battery's negative (-) terminal.



Digital Multimeter: Fluke 73 or equivalent

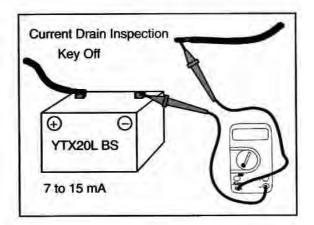
- With the ignition switch off, read the meter's display.
- If the current drain exceeds the specifications, there may be a short circuit in one of the electrical components or wiring.

SPEC:

Specified Current Drain: 7 to 15 mA

NOTE: The speedometer assembly will draw 7 to 15 mA in a normally operating system.

7. Locate the faulty component or wiring by disconnecting wiring connections one at a time while observing the meter. When the current drain falls within specifications, the last connection disconnected shows which circuit or component is affected. With this information and the wiring diagram the cause of the current drain can be identified and corrected.



REGULATED VOLTAGE & AMPERAGE OUTPUT INSPECTION

- 1. Remove the seat.
- 2. Remove left side cover.
- Remove the negative battery leads. Remove the positive battery leads.
- Reconnect the starter solenoid lead to the battery, leave the other positive lead disconnected from the battery.
- 5. Connect the negative battery leads to the battery.
- Set the digital multimeter (DMM) to the VDC scale.
- Connect DMM red (+) lead to the battery's red (+) lead and the DMM black (-) lead to the battery's black (-) lead.
- Connect ammeter between the battery's positive post and the leads that were removed in step 3.
- Start the engine and warm to operating temperature.

A 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.

A WARNING

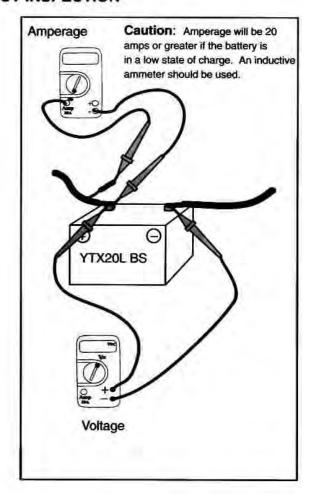
CARBON MONOXIDE

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.

 At 1000 RPM or slightly above; the ammeter should reach the break-even point (0 amps, no amperage leaving the battery and no amperage entering the battery) and the volt meter should read above 14 VDC.

SPEC:

1000 RPM Charging Rate: Ammeter = Break Even Volt Meter = 14 VDC +



REGULATED VOLTAGE & AMPERAGE OUTPUT INSPECTION (continued)

SPEC:

2500 RPM Charging Rate: Ammeter = Break Even Volt Meter = 14 VDC +

- Increase engine RPM to 2500. The ammeter should rise a slight amount and then stabilize and the volt meter should read above 14 VDC.
- Increase engine RPM to 5000. The ammeter should again rise a slight amount and then stabilize and the volt meter should read above 14 VDC.

SPEC:

5000 RPM Charging Rate: Ammeter = Break Even Volt Meter = 14 VDC +

 Use the results obtained from the preceding tests and the following charts to determine if charging system is functioning correctly.

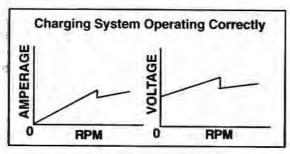
CHARGING SYSTEM OPERATING CORRECTLY: Ammeter goes up a small amount, then stabilizes slightly above +0 amps. Volt meter goes to 14.8 \pm VDC, drops off a little and starts to stabilize.

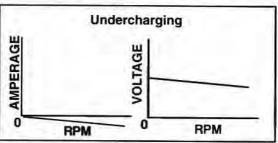
CHARGING SYSTEM UNDERCHARGING: Ammeter drops to 0 or remains below 0 at all RPMs, volt meter remains the same or goes down. Go to voltage drop inspection, page 16.14.

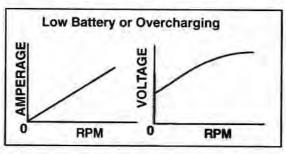
CHARGING SYSTEM OVERCHARGING: Ammeter rises well above 0 and remains there or continues to rise. Volt meter goes well above 14.8 VDC and may continue to rise. Go to voltage regulator/rectifier inspection, page 16.21.

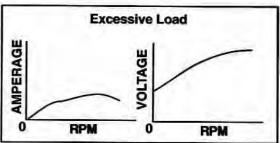
LOW BATTERY: Amperage continues to rise, voltage levels off as battery is absorbing voltage. Charging system may be O.K. Need to charge battery fully or use a good battery and repeat test. Meters will indicate similar reading to the overcharging chart.

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.









REGULATED VOLTAGE & AMPERAGE OUTPUT INSPECTION (continued)

- 14. Turn ignition key off.
- 15. Remove the ammeter.
- 16. Remove the negative leads from the battery.
- Install all battery terminal leads that were removed from the positive battery post.
- Install the negative battery terminal leads.
- 19. Replace right and left side covers.
- 20. Replace the seat.

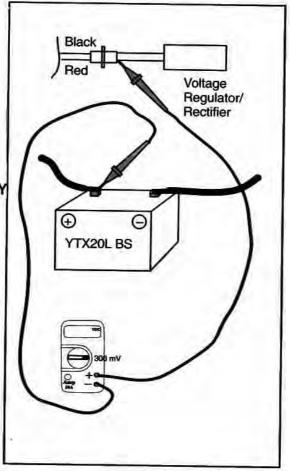
VOLTAGE DROP INSPECTION FOR POSITIVE SIDE OF REGULATOR/RECTIFIER TO BATTERY

- Set Digital Multi-Meter (DMM) to DC Volts scale.
- Connect red lead (+) of DMM to red wire coming out of rectifier/regulator assembly.
- Connect black lead (-) of DMM to positive (+) lead of battery.
- DMM must read below 0.1 volts DC (100 mV). If it does read 0.1 VDC or less the circuit is O.K.

SPEC:

Voltage Drop Allowable Limit For Positive Side Of Voltage Regulator/Regulator: 0.1 VDC

- If DMM reads above 0.1 volts DC there is excessive resistance in the circuit that must be corrected.
- Likely problem areas will be the battery terminal connection and/or the regulator/rectifier connection although the problem can be located at any point within the circuit. Visual inspections or continued voltage drop inspections are necessary to determine what needs to be corrected.



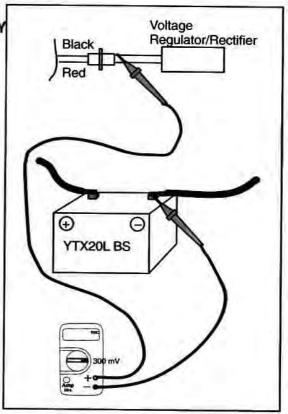
VOLTAGE DROP INSPECTION FOR NEGATIVE SIDE OF REGULATOR/RECTIFIER TO BATTERY

- 1. Set Digital Multi-Meter (DMM) to DC Volts scale.
- Connect red lead (+) of DMM to black wire coming out of rectifier/regulator assembly.
- Connect black lead (-) of DMM to negative (-) lead of battery.
- DMM must read below 0.3 volts DC (500 mV-volts). If it does read 0.3 VDC or less the circuit is O.K.

SPEC:

Voltage Drop Allowable Limit For Positive Side Of Voltage Regulator/Regulator: 0.3 VDC

- If DMM reads above 0.3 volts DC there is excessive resistance in the circuit that must be corrected.
- Likely problem areas will be the battery terminal connection and/or the regulator/rectifier connection although the problem can be located anyplace within the circuit. Visual inspections or continued voltage drop inspections are necessary to determine what needs to be corrected.



NO LOAD AC VOLTAGE AND AMPERAGE OUTPUT INSPECTION

NOTE: The following tests require the engine to be operating. Be sure to heed the following warnings and cautions.

A 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.

A 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.

NO LOAD AC VOLTAGE INSPECTION

- Locate the three yellow wires coming from the stator contained within the multi-connector.
- 2. Disconnect the connector.
- 3. Set Digital Multimeter (DMM) to AC Volts scale.
- Connect one lead of the DMM to pin labeled "1" in III. 1.
- Connect the other lead of the DMM to pin labeled "2" in III. 1.
- Start the engine and let it run at idle. Observe the DMM reading.
- The DMM should indicate a minimum reading of 15 VAC.
- 8. Repeat test for pins 1 & 3.
- 9. Repeat test for pins 2 & 3.

SPEC:

No Load AC Voltage Output @ Idle: 15 VAC +

NOTE: The test results in steps 7, 8 and 9 can read more than 15 VAC, but it is important that they all be above 15 VAC and that they are all the same.

- Increase engine RPM to 3500 and repeat steps 4,
 8, and 9 with the engine running at 3500 RPM.
- At 3500 RPM the DMM should read above 40 VAC.

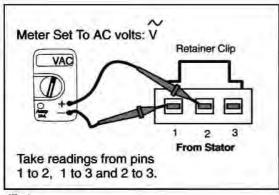
NOTE: The test results obtained in step 10 can read more than 40 VAC, but it is important that they are all above 40 VAC and that they are all the same.

SPEC:

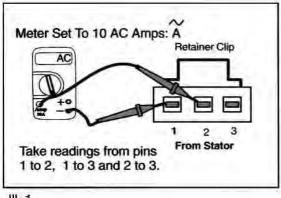
No Load AC Voltage Output @ 3500 RPM: 40 VAC+

AC AMPERAGE INSPECTION

- Shut the engine off.
- Set the DMM to the AC amperage scale. Connect the meter leads to the 10 amp receptacle.
- Connect one lead of the DMM to any one of the pins in the multi-connector leading from the stator
- Connect the other lead of the DMM to any one of the other two pins in the multi-connector.



III. 1



111. 1

NO LOAD AC VOLTAGE AND AMPERAGE OUTPUT INSPECTION (continued)

Start the engine and let it run at idle. Observe the DMM reading.

NOTE: Attach meter leads to stator wires only long enough to obtain a reading. The Fluke 73 is fuse protected to 10 amps continuous and 20 amps momentarily. Do not prolong the test.

CAUTION:

Do not increase engine RPM above idle when taking AC amperage tests for the alternator!

- 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.
- 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.

SPEC:

Stator AC Amperage Output: 15+ Amps

 If any of the above test results (steps 7, 8, 9, 10, 11, 16, 17 and 18) are below specifications, the stator and/or wiring is faulty. Go to stator resistance & stator to ground inspection.

NOTE: It is permissible that the test results obtained are greater than or equal to the specifications, but it is important that they are all at or above the specifications and that they are all the same for the test being performed.

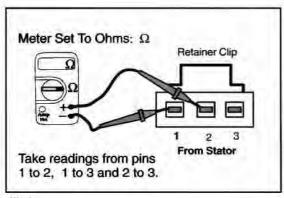
STATOR INSPECTION

CAUTION:

The <u>engine must not be running</u> while performing the following inspections.

- Locate the three yellow wires coming from the stator contained within the multi-connector.
- Disconnect the connector.
- Set the Digital Multi-Meter to the ohms scale.

NOTE: Make sure the DMM leads are plugged into the correct jacks.



111. 1

STATOR INSPECTION (continued)

- Connect one lead of the DMM to any one of the pins in the multi-connector leading from the stator.
- Connect the other lead of the DMM to any one of the other two pins in the multi-connector and observe the meter reading.

CAUTION:

Do not allow your hands or fingers to touch the meter leads or one meter lead and any grounded portion of the motorcycle or reading obtained will be inaccurate.

SPEC:

Stator Resistance (Yellow to Yellow): 0.3 - 0.5 ohms

CAUTION:

0.3 to 0.5 ohms may be less than the internal resistance of your meter leads or meter. Before measuring the stator resistance, short the meter leads together and read the display and record this measurement. Subtract this reading from the stator resistance readings.

EXAMPLE: Short 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 (reading obtained when checking yellow lead to yellow lead). True reading is: 1.10 ohms (observed reading when checking stator)

_0.7 ohms (meter/lead resistance)

= 0.4 ohms (true stator resistance)

- 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.
- 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.

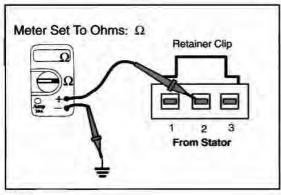
STATOR INSPECTION TO GROUND INSPECTION

 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 the meter reading. III. 1.

SPEC:

Stator to Ground Resistance Each Yellow Wire To Ground Open (Infinity)

- Repeat the test for the other two stator leads to ground.
- If any of the above test readings are outside of specifications, the stator or wiring for the stator is faulty. Go to stator removal section.



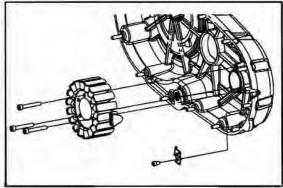
III. 1

STATOR REMOVAL

- Remove primary cover, refer to chapter 9, page 9.7.
- Place primary cover on bench with padded material between primary cover and bench top.
- 3. Remove wiring retainer plate. III. 2.
- 4. Remove three (3) socket head screws. III. 2.
- 5. Remove stator from primary cover. III. 2.

STATOR INSTALLATION

- Clean primary cover gasket surface thoroughly.
- Inspect screw holes for stator screws and the stator screws themselves. Replace screws if necessary and clean screw holes if necessary.
- Place stator in primary cover taking care to route wiring harness beneath the stator correctly.
- Apply Loctite[™] 242 to the socket head screw threads.
- Insert socket head screws and torque to specification.



111.2

TORQUE:

Stator Socket Head Screws 11.50 Nm (100 in-lbs)

- 6. Install wiring retainer plate.
- Install wire grommet into groove in primary cover.
- Install primary cover. Refer to chapter 9, pages 9.17 & 9.18.

FLYWHEEL REMOVAL

- 1. Remove primary cover, refer to chapter 9.
- 2. Lock engine with engine lock tool as shown. III. 2.

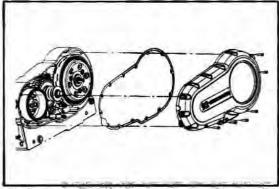
SPECIAL TOOL:

Engine Lock Tool PV-43502-A

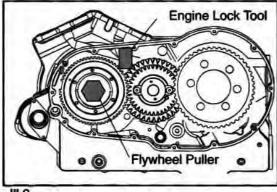
- 3. Remove flywheel retaining bolt.
- Install flywheel puller onto flywheel. Tighten the puller bolt to remove flywheel. III. 2.



Flywheel Puller: PV-43533

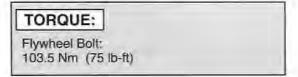


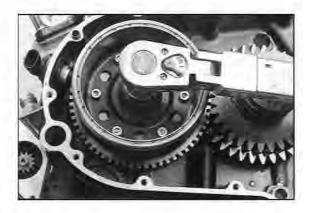
III. 1



FLYWHEEL INSTALLATION

- Clean taper of flywheel and crankshaft thoroughly.
- Inspect condition and installation of woodruff key, replace if necessary.
- Install flywheel on crankshaft while aligning woodruff key with key-way.
- 4. Install washer & nut. Torque to specification.





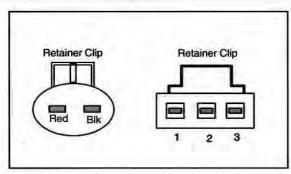
REGULATOR/RECTIFIER INSPECTION

Disconnect wiring for regulator/rectifier.

Inspect the following to determine the integrity of the wiring harness side of the regulator/rectifier.

Component	Digital Multi-Meter Setting	Terminals to Check	Specification
Battery Charging Line	DC Volts	Red (+) to Ground (-)	Battery Voltage
Stator	Ohmmeter	Yellow to Yellow (refer to page 16.16-16.17	0.3 - 0.5 ohms
Ground	Ohmmeter	Black (-) to Ground (-)	Continuity

- Inspect the male and female pins in all of the wires for the regulator/rectifier. Inspect for corrosion, loose pins or connections, evidence of overheating or other damage.
- If the wiring and connectors are undamaged and appear to be clean and tight, proceed with the following inspection.
- 5. Set your Digital Multi-Meter to the ohms position.
- Inspect the regulator/rectifier assembly by measuring the resistance according to the chart provided.



	-	Positiv	ve Lead of DMM C	onnected to Th	nese Wires	
	day -	RED	BROWN (1)	BROWN (2)	BROWN (3)	BLACK
Negative	RED		- 1-2 Meg Ohms	1-2 Meg Ohms	1-2 Meg Ohms	1-3 Meg Ohms
Lead Connected	BROWN (1)	Infinity		Infinity	Infinity	1-2 Meg Ohms
To These	BROWN (2)	Infinity	Infinity		Infinity	1-3 Meg Ohms
Terminals	BROWN (3)	Infinity	Infinity	Infinity	-	1-2 Meg Ohms
	BLACK	Infinity	Infinity	Infinity	Infinity	1

NOTE: False readings will be obtained if you touch your fingers to the meter lead(s).

NOTE: The readings 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.

REGULATOR/RECTIFIER INSPECTION (continued)

CAUTION:

Do not allow your hands or fingers to touch the meter leads or one meter lead and any grounded portion of the motorcycle or reading obtained will be inaccurate.

CAUTION:

0.3 to 0.5 ohms may be less than the inherent resistance of your meter leads or meter. Before measuring the stator resistance, short the meter leads together and read the display and record this measurement. Subtract this reading from the stator resistance readings.

EXAMPLE: Short 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 (reading obtained when checking yellow lead to yellow lead).

True reading is:

1.10 ohms (observed reading when checking stator)

-0.7 ohms (meter/lead resistance)

= 0.4 ohms (true stator resistance)

7. If the resistance measurements obtained are out of specification and the troubleshooting chart has led you to this test for a charging system problem, replace the regulator/rectifier assembly. Retest the charging system output after replacing the regulator/rectifier assembly.

REGULATOR/RECTIFIER REMOVAL

- Remove seat.
- 2. Remove left side frame cover.
- Disconnect negative battery lead.
- Disconnect the regulator/rectifier wiring connectors.
- Remove attachment bolts, remove regulator/rectifier assembly.
- Installation steps are done in the reverse order of removal.

TORQUE:

Regulator/Rectifier Attachment Bolts:11.50 Nm (100 in-lbs)

CHAPTER 17 IGNITION SYSTEM

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GENERAL

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.

A

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.

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).

MARNING

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

Parts containing semi-conductors can be easily damaged if handled carelessly. Do not drop or subject the electronic components to shock loads.

CAUTION

Using incorrect heat range spark plugs can damage the engine. Always follow the manufacturer's recommendations for spark plug heat range.

CAUTION

Follow the instructions closely when troubleshooting items in this section. Some electrical components can be damaged if they are connected or disconnected while the ignition switch is ON and current is present.

GENERAL CAUTIONS TO OBSERVE WHEN WORKING ON IGNITION SYSTEM

Always follow the troubleshooting flow chart when troubleshooting the 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 number one cause of ignition problems. Make sure to inspect all connections 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. This can easily confuse the troubleshooting process.

IGNITION SYSTEM

SPECIFICATIONS

	IGNITION SYST	EM
Spark Plug Spark Plug Gap		Specifications
		Champion: RA8-GHC
		1 mm (0.040")
Ignition Coil Resistance	Primary	0.4 – 0.5 ohms @ 20° C (68° F)
	Secondary	5400 ohms ± 10% (Without Plug Cap) 10.15 K ohms ± 10% (With Plug Cap)
	Plug Cap	5000 ohms ± 10%
Crank Position Sensor Resista	ance	1450 to 1800 ohms @ 25° C (77° F)

TORQUE SPECIFICATIONS

ENGINE CRITICAL TORQUE SPECIFICATIONS IGNITION SYSTEM				
Fastener Type	Torque N-m	Torque lb-ft or (ln-lb)	Notes	
Spark Plug	16 Nm	12 lb-ft	Apply Anti-Seize	
Ignition Coil Mounting Bolts	10 Nm	(85 in-lbs)		
Exciter Ring Bolts:	14 Nm	(120 in-lbs)	10	
Flywheel Nut	103 Nm	75 lb-ft		

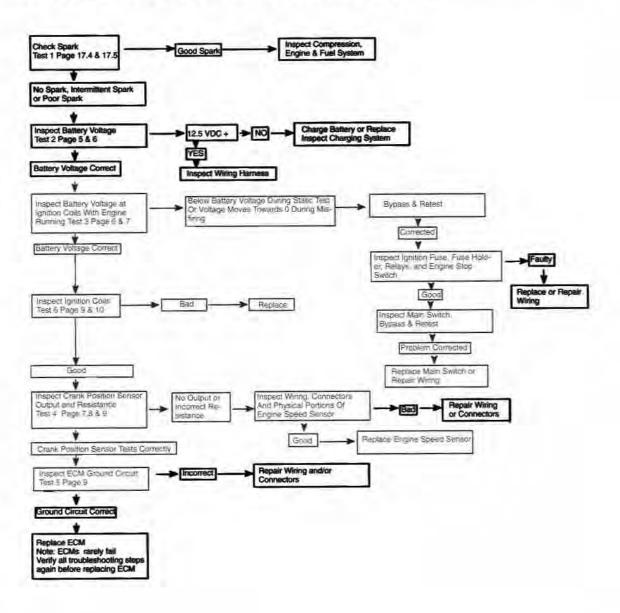
SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER
Connector Test Adapter Kit	PV-43526
Fluke 73™ Digital Multimeter	PV-43546
Inductive Timing Light	PV-43537

IGNITION SYSTEM TROUBLESHOOTING FLOW CHART

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 <u>first</u> (and replace if necessary) when troubleshooting ignition system problems.

Be sure that the spark plugs are the correct heat range and are resistor spark plugs. Non-resistor spark plugs can introduce electrical problems due to increased RFI.



IGNITION SYSTEM

INSPECT SPARK: Test 1

A 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.

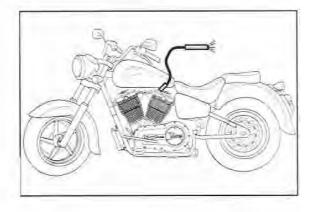
SPARK INSPECTION: FOR ENGINE NOT RUNNING, WON'T START CONDITION

Connect an inductive timing light to one of the spark plug wires.

SPECIAL TOOL:

Inductive Timing Light: PV-33277-A

2.



4

7.

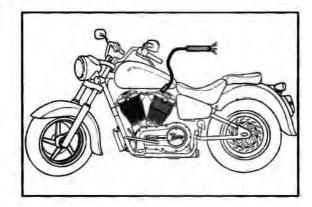
With no current flowing (open secondary side of the ignition coil) the timing light will not flash.

A plug cap not making a connection to the plug wire is one example of an open secondary.

Low battery voltage, and therefore slow cranking speeds, may not turn the engine over fast enough for the ignition system to function.

SPARK INSPECTION (engine misfires) Test 1A

- Turn on the ignition stop switch and ignition switch.
- Ensure that the transmission is in neutral and pull in the clutch lever.
- Start engine with inductive timing light connected to one of the spark plug wires.
- Increase engine RPMs to the point where the engine misfires and observe the timing light.
- 5. Repeat test for other cylinder.
- Determine if the timing light flashes without interruption for both cylinders.
- If the timing light flashes consistently for both cylinders, the chances of the problem being ignition related are extremely remote. Inspect compression (refer to chapter 3) and inspect fuel system functioning (refer to chapter 5).
- If the 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:

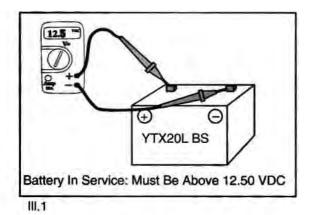


- * Some timing lights automatically change flash rates when engine speed increases and only fire every other spark. Do not confuse a change of flash rates with an ignition system problem.
- There is a threshold voltage and amperage requirement for timing lights below which they will not trigger and therefore, not flash.
- Badly fouled spark plugs will drop secondary voltage so low that the 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.

BATTERY VOLTAGE INSPECTION: Test 2

- Remove seat, frame side covers, and fuel tank.
- Set Digital Multimeter (DMM) to DC Volts position.
- 3. Inspect battery voltage. III. 2.
- If the battery voltage is below 12.5 VDC charge or replace the battery with a fully charged battery. Refer to chapter 16 for battery inspection, battery charging and charging system inspection.

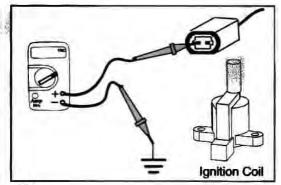
NOTE: When operating the starter with a low battery the voltage available for the ignition coils can drop below the minimum required to produce spark. Do not confuse this problem with an ignition system problem.



IGNITION SYSTEM

BATTERY VOLTAGE INSPECTION: Test 2 (continued)

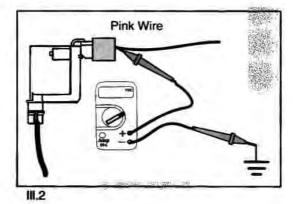
- 5. Disconnect primary side of ignition coil. III. 1.
- Connect red meter lead to the pink wire at the ignition coil connector. III. 1.
- Connect black meter lead to the negative battery post. III. 1.
- 8. Turn ignition switch and ignition stop switch on.
- With the lights and switches on, a good battery will deliver a minimum of 10.5 VDC to the ignition coils.
- If the voltage reading is less than 10.5 VDC, perform a battery load test, refer to chapter 16.
- 11. If the battery is within specifications and the voltage reading at the ignition coil(s) is below specification, there is resistance in the circuit between the ignition coil(s) and the battery. The resistance, and consequent low voltage, will reduce spark voltage.
- Connect the black meter lead to the negative battery post.
- 13. Trace the circuit between the ignition coil(s) and the 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 that needs to be repaired or replaced. Inspect the wiring, relays, fuses, fuse connections, main switch, engine stop switch and all connections.



111.1

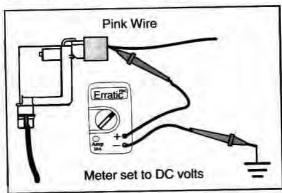
BATTERY VOLTAGE INSPECTION (engine misfires): Test 3

- Remove fuel tank, refer to chapter 2.
- Set Digital Multimeter (DMM) to DC Volts position.
- Connect red meter lead to the pink wire at the ignition coil(s). Ill. 2.
- Connect black meter lead to the negative battery post. III. 2.
- 5. Turn on the ignition stop switch and ignition switch.
- Ensure that the transmission is in neutral and pull in the clutch lever.
- Start the motorcycle and increase engine speed until the misfire occurs.



BATTERY VOLTAGE INSPECTION (engine misfires): Test 3 (continued)

- 8. If the DMM display falls quickly towards 0 and is erratic during the misfire, there is a problem with the circuit supplying battery voltage to the ignition coil(s). Some place between the battery and the ignition coil(s) a loose, corroded or broken wire or connector needs to be repaired or replaced. Inspect the wiring, relays, fuses, fuse connections, main switch, engine stop switch and all connections. Ill. 1.
- If the DMM steadily displays battery voltage during all tests, the circuit supplying battery voltage to the the ignition coil(s) is not at fault.
- 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).
- Try to start the engine or operate the engine in the RPM range where the mis-fire occurs.
- If the problem is corrected, this verifies that the wiring harness and/or components between either the ignition coil(s) and the battery needs to be repaired.



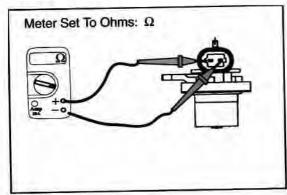
111.1

CRANK POSITION SENSOR RESISTANCE INSPECTION: Test 4

- Disconnect the crank position sensor leads.
- 2. Set the DMM to the Ohms scale.
- Carefully probe the engine speed sensor with the DMM leads and observe the resistance.



- 4. Remove crank position sensor from crankcase.
- Visually inspect the working end of the crank position sensor for damage or metal particles clinging to the magnet.
- If the crank position sensor shows physical damage to the working end, remove the primary cover and inspect the flywheel exciter ring. Refer to chapter 9 for primary cover removal. Refer to 16 for flywheel removal. Refer to page 17.11 for flywheel exciter ring removal.
- Visually inspect the wiring exiting the engine speed sensor for loose or broken wires.
- 8. Replace the crank position sensor as necessary.



111.2

IGNITION SYSTEM

CRANK POSITION SENSOR AC OUTPUT Test 4A

CAUTION:

This test requires testing to be done at the ECM connector. Once the ECM connector has been disconnected, do not touch the pins on the ECM Static electricity from your body can easily damage the ECM

Do not attempt to perform tests on the ECM All tests are done on the wiring harness side of the ECM connector.

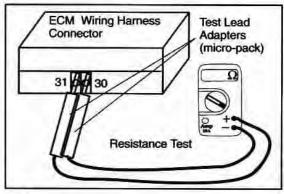
NOTE: A connector test adapter kit is necessary. Use of other means to probe the necessary pins can easily damage the ECM connector.

SPECIAL TOOL: Connector Test Adapter Kit: PV-43526

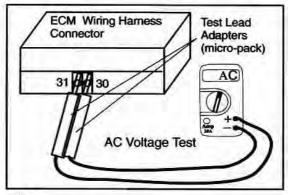
- Remove right side frame cover.
- Disconnect ECM connector.
- 3. Set DMM to AC volts scale.
- Place one lead of the DMM in female pin # 30 & the other DMM lead into female pin #31 of the connector (not the ECM), refer to pages 17.12 & 17.13 for pin information. Ill. 2.
- Turn engine over with electric starter and observe DMM display. Ill. 2.
- 6. With the spark plugs in the engine the voltage reading will be erratic due to the low RPMs and pulsing nature of the signal. The meter display will be erroneous. Watch the bars at the bottom of the display to determine if a signal exists. Any fluctuating AC signal is correct for this test. III. 2.

NOTE: The bar display at the bottom of the display window on a Fluke ™ 73 DMM updates 10 times faster than the numeric display. III. 3.

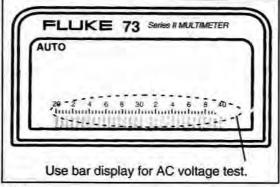
- This test can also be done with the spark plugs removed. Remove spark plugs from engine. Install spark plugs into spark plug caps and ground spark plugs.
- When the engine is turned over using the electric starter with the spark plugs out, the reading on the meter will be 3 VAC ± on a properly functioning ignition system.



111.1



111.2



111.3

ECM GROUND CIRCUIT INSPECTION: Test 5

- 1. Set the DMM to read DC volts.
- Connect the red meter lead to the positive (+) post of the battery.
- Connect the black meter lead to several places on the frame, engine and wiring harness ground connections while observing the meter reading at each point.
- At each ground test point, the meter should read battery voltage.
- Low voltage indicates resistance. Corrosion, paint, loose or damaged connections or broken wires are possible problem areas.
- Two of the most common areas that will cause poor ground connections will be at the battery terminals and/or the wiring harness ground connections. Refer to the wiring diagram to locate all ground connections for the wiring harness.

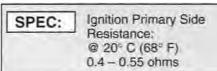
IGNITION COIL INSPECTION: Test 6

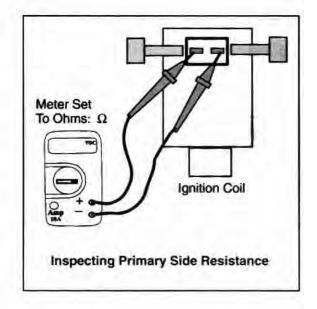
- 1. Remove the fuel tank, refer to chapter.
- Ensure that the ignition switch is turned OFF.
- Remove the connectors from the ignition coil primary terminals.
- 4. Remove the spark plug caps from the spark plug.

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.

- 5. Set the DMM to the ohms scale.
- Connect the red lead of the DMM to one of the primary terminals.
- Connect the black lead of the DMM to the other primary terminal.
- 8. Repeat test for other coil





IGNITION SYSTEM

IGNITION COIL INSPECTION: Test 6 (continued)

- Connect the red lead of the DMM to either one of the primary terminals.
- Connect the black lead of the DMM to the spark plug terminal within the spark plug cap; observe the meter reading.

S Ignition Secondary Side Resistance:

P @ 20° C (68° F)

E 5400 ohms ± 10% (Without Plug Cap)

C 10.15 K ohms ± 10% (With Plug Cap)

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.

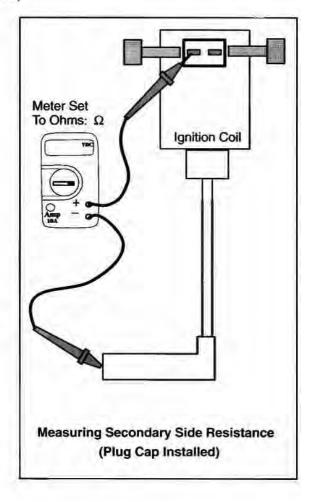
 If the suspected coil tests correctly, but the motorcycle has an intermittent miss after it warms up, heat the coil with a hair dryer or heat gun and retest the coil.

CAUTION:

Do not heat the coil to more than 200° F.

 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 the coil. The resistance will change considerably even with a good coil due to the resistance properties of wire when subjected to temperature changes. Attempting to find a dead short or complete open is the purpose of this test, not specific resistance readings.



IGNITION COIL REMOVAL

- Ensure that the ignition switch is turned OFF.
- Remove the fuel tank, refer to chapter 2.
- Remove plug lead from spark plug.
- 4. Disconnect primary side connector.
- 5. Remove attachment bolts.
- 6. Remove ignition coil.

IGNITION COIL INSTALLATION

- Installation procedure is the reverse of removal procedures.
- Apply light film of dielectric grease to primary side terminals.

TORQUE:

Ignition Coil Mounting Bolts: 9.78 Nm (85 in-lbs)

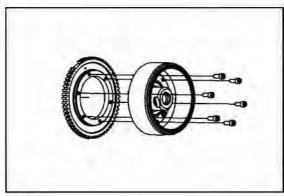
EXCITER RING REMOVAL

- 1. Remove flywheel, refer to chapter 16, page 16.20.
- 2. Remove exciter ring bolts, remove exciter ring. III. 1.

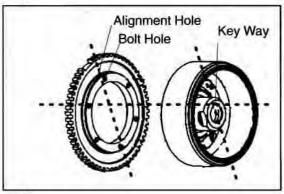
EXCITER RING INSTALLATION

Align the exciter ring with the flywheel. III. 2.

NOTE: Alignment hole, bolt hole and key way must line up when exciter ring is properly installed.



111.1



111.2

IGNITION SYSTEM

EXCITER RING INSTALLATION (continued)

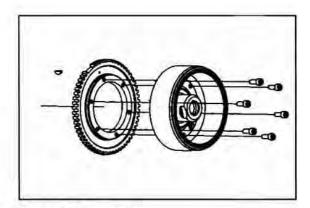
Install the exciter ring bolts and torque to specification.

TORQUE: Exciter Ring Bolts:
14 Nm (120 in-lbs)

3. Install flywheel, refer to chapter 16, page 16.21.

TORQUE: Flywheel Nut: 103 Nm (75 lb-ft)

Install primary cover, refer to chapter 9.



CRANKSHAFT POSITION SENSOR REMOVAL & INSTALLATION

Refer to chapter 5.

SPARK PLUG REMOVAL & INSTALLATION

Refer to chapter 3.

PERFORMING TESTS AT ECM CONNECTOR

- The majority of tests necessary for ignition system troubleshooting can be performed at the main connector for the ECM
- Extreme care must be taken not to introduce problems while doing the troubleshooting procedures.

NOTE: A connector test adapter kit is necessary. Use of other means to probe the necessary pins can easily damage the ECM connector.

SPECIAL TOOL:

Connector Test Adapter 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 easily damage the ECM

Do not attempt to perform tests on the ECM All tests are done on the wiring harness side of the ECM connector.

- The connector is not marked with numbers. Determining the correct pin(s) is easily accomplished by observing the empty terminals.
- Use the information on the following page to perform tests at the ECM connector.

ECM CONNECTOR MAP

							ECM (CONN	ECTO	R MA	P						
18	17	16	(5)	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Yellow	Gm/ WT	Blue/ Gm		Pink/ Blk	Pink/ Blk		Gray	Pink	Black/ Gray	Black/ Gray	White/ Black	Black	Black	Red	White/ Green	Black	Red
#1 F.I.	Tach output	Ck eng lamp		Grd.	Grd.		Fuel Pump Relay	Kill Switch	Com- mon Grd.	TDX con- nector	#1 ign. Coli	Air Temp Sensor	Cool- ant Temp.	MAP Sensor 5 Volt	#2 Ign Coll	TPS	TPS
		•			•			To G	round			•				•	•
17.4	60.7 K	OL.	1111	0.1	0.2	1111	OL	OL	OL	OL	OL	OL.	OL.	OL	OL	OL	OL
36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
Yellow/ Gm	Black/ Pink	Yellow/ Green		Black/ Pink	Black	White	1111	111		Brown	Yellow	III	Gray	Blue	Green	Black	111
#2 F.I.	Grd.	Shield Grd.		Grd.	Crank Sensor	Crank Sensor				MAP Signal	TPS		RDX	Cool- ant Temp Sensor	Air Temp Sensor	MAP 0 Volt- age	
								To G	round								
16.9	0.2	OL	1111	0.2	OL.	OL.	111	1883	111	OL	OL	188	OL	OL.	OL.	OL	111

MATRIX FOR ELECTRICAL TESTING AT ECM WIRING HARNESS CONNECTOR

COMPONENT	METER SETTING	TEST CONNECTIONS	SPECIFICATIONS (±10% @ Room Temp. 68° F)
#1 FUEL INJECTOR	OHMS	18 to ground	17.4 ohms
#2 FUEL INJECTOR	OHMS	36 to ground	17.4 ohms
#1 SECONDARY SIDE OF IGNITION COIL	OHMS	#7 to plug cap of # 1 ignition coil.	10.15 K ohms (Plug cap installed)
#2 SECONDARY SIDE OF IGNITION COIL	OHMS	#3 to plug cap of #2 ignition coil.	10.15 K ohms (Plug cap installed)
# 1 PRIMARY SIDE OF IGNITION COIL	OHMS	# 10 to #7	0.4 to 0.5 ohms
# 2 PRIMARY SIDE OF IGNITION COIL	OHMS	# 10 to # 3	0.4 to 0.5 ohms
CRANK POSITION SENSOR	OHMS	#30 to # 31	1500 ± 100 ohms
CRANK POSITION SENSOR	AC VOLTAGE	#30 to # 31	Spark plugs out: 3 VAC + Spark plugs in: any fluctuating AC signal.
AIR TEMP. SENSOR	OHMS	#21 to #6	3.32 K ohms
COOLANT TEMP. SENSOR	OHMS	#22 to #5	13.78 K ohrns
TPS	онмѕ	# 25 to #1	4.05 K ohms throttle closed. 1130 ohms throttle open
TPS	онмѕ	# 25 to # 2	1121 throttle closed. 4.03 K ohms throttle open.
TPS	OHMS	#1 to #2	3.74 K ohms. Doesn't change with throttle position.
MAP SENSOR	OHMS	#4 to #26	5.44 K ohms
KILL SWITCH	DC VOLT- AGE	#10 to Engine Ground	Ignition Switch Off: O volts DC Ignition Switch On; Kill Switch Off = 0 volts DC. Ignition Switch On; Kill Switch On = Battery Voltage

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GENERAL



Always disconnect the battery 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. A weak battery may not be able to turn the engine over or turn the engine over fast enough to supply ignition voltage.

STARTER SPECIFICATIONS

ELECTRIC STARTER	R / STARTER CLUTCH	
Item	Standard	Service Limit
Starter Motor Brush Length	13 mm ± 0.5mm (0.512 ± 0.020")	6.5 mm (0.255")
Starter Motor Operating Amp Draw	90-120 Amps	Not Applicable
Starter Motor No Load Amp Draw (Bench Test)	30-40 Amps after initial surge.	Not Applicable
Starter Torque Limiter Break-Away Torque	50 lb-ft when new	25-35 lb-ft after break-in
Battery Voltage, No Load	Above 12.00 VDC	Not Applicable
Battery Voltage, Engine Not Running, Lights On For One Minute	Above 10.5 VDC	Not Applicable
Voltage Drop Allowed For Each Connection On Positive Circuit	0.2 VDC (200 millivolts)	Not Applicable
Voltage Drop Allowed For Each Connection On Negative Circuit	0.2 VDC (200 millivolts)	Not Applicable
Total Voltage Drop Allowed On Positive Side Of Starter	0.3 VDC (300 millivolts)	Not Applicable
Total Voltage Drop Allowed On Negative Side Of Starter	0.3 VDC (300 millivolts)	Not Applicable
Resistance Between Any Two Commutator Bars	Continuity (0 Ohms)	Not Applicable
Resistance Between Commutator And Armature Shaft	Infinity (OL on Fluke™ 73)	Not Applicable
Resistance Between Battery Input Terminal & Insulated Brushes	Continuity (0 Ohms)	Not Applicable
Resistance Between Battery Input Terminal & Starter Motor Case	Infinity (OL on Fluke™ 73)	Not Applicable

18.1

SPECIFICATIONS

ENGINE CRITICAL TORQUE SPECIFIC ELECTRIC STARTE	
Torque N-m	Torque lb-ft or (in-lbs)
103 Nm	75 lb-ft
14 Nm	(120 in-lbs)
30 Nm	22 lb-ft
10 Nm	(85 in-lbs)
10 Nm	(85 in-lbs)
20 Nm	15 lb-ft
	Torque N-m 103 Nm 14 Nm 30 Nm 10 Nm 10 Nm

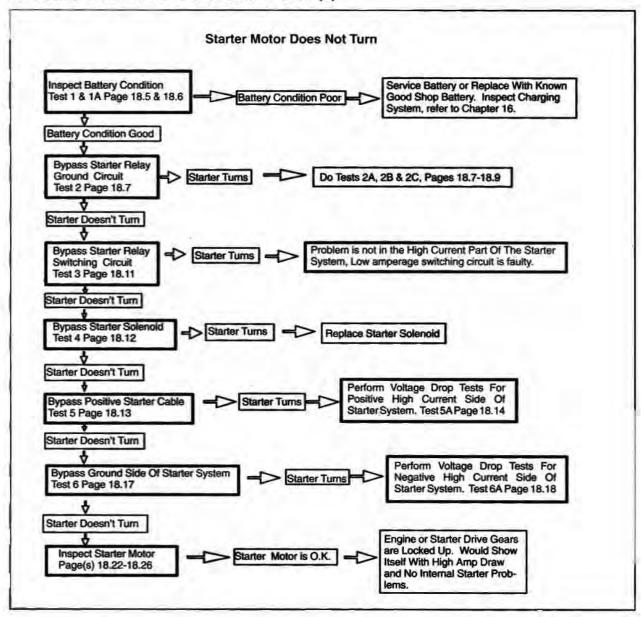
SPECIAL TOOLS

SPECIAL TOOL	PART NUMBER
Digital Multi-Meter	
Optional Amp Meter Inductive Clamp	
Flywheel Puller	PV-43533
Engine Stop Tool	PV-43502

TROUBLESHOOTING FLOW CHART MENU

Symptom	Possible Cause	Refer To:
Starter motor will not turn when transmission is in neutral, but will turn if clutch is pulled in.	Neutral Safety Switch Circuit is not functioning correctly.	Tests 2A&2B Page 18.7 & 18.8
Starter motor will not turn when the transmission is in gear with the clutch pulled in, but will turn when the transmission is in neu- tral.	Clutch Safety Switch Circuit is not functioning correctly.	Test 2C, Page 18.9
Starter motor will not turn regard- less if engine is in neutral and the clutch is pulled in.	Go to Troubleshooting Flow Chart One (1) page 18.3	Go to Troubleshooting Flow Chart One (1)
Starter motor turns slowly. Engine may or may not start.	Go to Troubleshooting Flow Chart Two (2) page 18.4	Go to Troubleshooting Flow Chart Two (2)
Starter motor turns, but engine does not turn.	Go to Troubleshooting Flow Chart Three (3) page 18.5	Go to Troubleshooting Flow Chart Three (3)
Starter motor turns at normal speed, but engine does not start.	Ignition Problem Engine Problem Fuel Delivery Problem	Chapter 17 Chapter 7,8,9,10 Chapter 5

TROUBLESHOOTING FLOW CHART ONE (1)



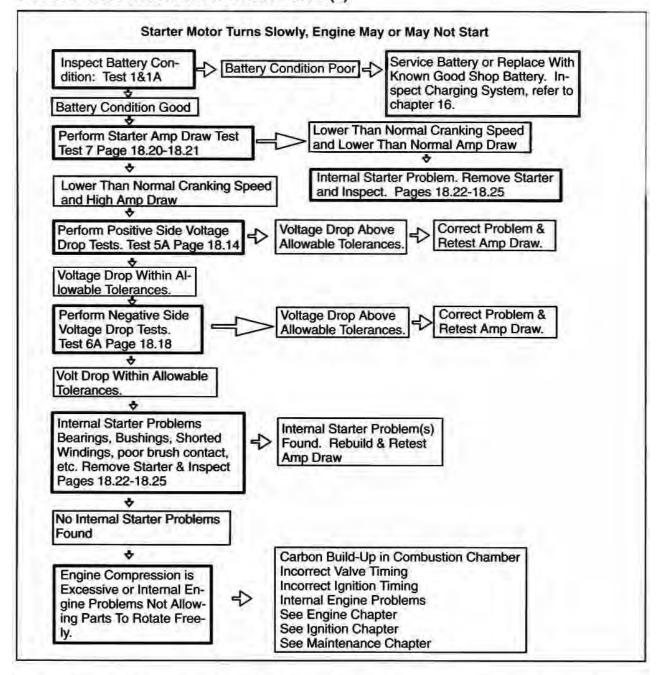
A WARNING

Ensure that motorcycle is secure and that transmission is in neutral for all tests.

CAUTION:

Inspect the fuses and make sure the battery is fully charged before inspecting the starter system.

TROUBLESHOOTING FLOW CHART TWO (2)



NOTE: These procedures require a Digital Multimeter and High Amp capacity ammeter or inductive ammeter clamp and a DMM.

A WARNING

Ensure that motorcycle is secure and that transmission is in neutral for all tests.

TROUBLESHOOTING FLOW CHART THREE (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 Motor is Running Back- wards.	Starter Motor Case Assembled In- correctly. Battery Terminals Are Connected Incorrectly.
	Starter Clutch Is Damaged.	Refer To Page 18.26.
	Starter Torque Limiting Clutch Is Damaged.	Refer To Page 18.27.
	There will be a substantial squeal- ing noise if the torque limiting clutch is slipping.	
	Starter Gears Are Damaged	Refer To Page 18.26.

BATTERY INSPECTION & CHARGING PROCEDURES: Test 1

- 1. Remove the left frame cover
- Measure battery voltage with a digital multimeter. The reading should be above 12.0 VDC. If the battery voltage is lower than 12.0 VDC the battery must be charged according to the instructions given below.

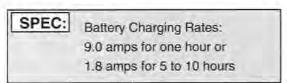


Remove the battery from the motorcycle before charging the battery, refer to chapter 3.

CAUTION:

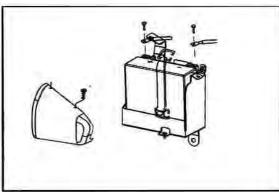
Do not remove the caps on the battery while recharging. Do not attempt to inspect or add fluid to a maintenance free battery.

 Charge the battery at 9.0 amps for one hour or <u>1.8</u> amps for 5 to 10 hours.

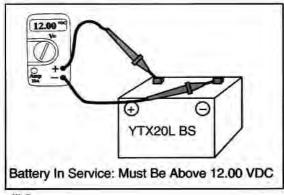


CAUTION:

Do not allow the charging current to exceed 9.0 amps at any time.



III.1



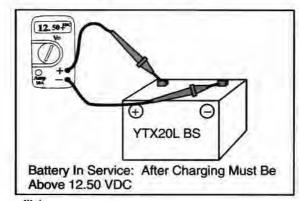
111.2

BATTERY INSPECTION & CHARGING PROCEDURES: Test 1 (continued)

- Remove battery from charger and let it sit for 30 minutes or longer.
- Measure battery voltage with a digital multimeter. If the battery voltage is lower than 12.5 VDC the battery must be recharged again in accordance with step 1 and 2 above.
- After charging the battery and letting it sit for 30 minutes or more, check the battery voltage again.
 If the battery voltage is still below 12.5 VDC, replace the battery.

NOTE: When the motorcycle is not used for one (1) month or more, remove the battery from the motorcycle and store in a cool, dry area. Inspect the voltage monthly and charge according to the above instructions if necessary.

NOTE: If battery measures below specifications the charging system should be inspected. Refer to chapter 16.



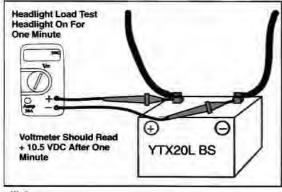
111.1

BATTERY LOAD TEST: Test 1 A

 The most accurate load test will be obtained with a commercially available battery load tester. If such a tester is being used, follow the manufacturer's instructions that accompanies the tool.

NOTE: Although not as conclusive, the following test can be used to direct troubleshooting efforts.

- Charge the battery as outlined on page 18.5.
- Install the battery and connect the battery terminals, refer to chapter 16.
- Connect a digital multimeter to the battery and keep it connected for the duration of the test.
- Turn the head light on high beam and leave it on for 1 minute (without the engine running).
- At the end of one minute, the digital multimeter should show a reading of above 10.5 VDC.
- If the battery voltage drops below 10.5 VDC the battery should be charged again and the test repeated.



111.2

STARTER RELAY GROUND CIRCUIT: Test 2

A WARNING

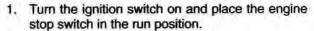
Ensure that motorcycle is secure and that transmission is in neutral for the following inspection.

NOTE: On the V92C, placing the transmission in neutral or operating the clutch lever grounds the starter relay completing the circuit during starting.

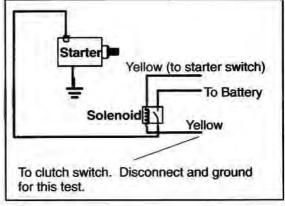
- Disconnect the yellow wire from the starter solenoid. III. 1.
- Attach a jumper wire from a good engine ground and the yellow wire leading from the starter solenoid. Ill. 1.
- Turn on the ignition switch on and place the engine start switch in the run position.
- 4. Attempt to start the motorcycle.
- If the starter turns, the problem is in the clutch switch, neutral switch or wiring harness between the starter solenoid and engine ground.



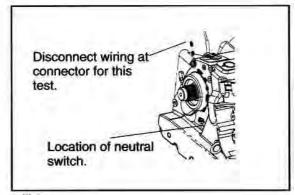
The symptom of a faulty neutral switch circuit will be: Starter motor will not turn when transmission is in neutral, but will turn if clutch is pulled in.



- 2. Place the transmission in neutral.
- Observe the neutral indicator light.
- If the neutral indicator light comes on when the transmission is in neutral, the neutral indicator switch is working correctly.
- If the light does not light up when the transmission is in neutral, either the switch isn't working, the light is burned out or the wiring harness needs repair.
- Remove the gray wire at the neutral indicator switch.
- 7. Position the DMM to Ohms scale.
- Place one lead of the DMM on the terminal at the neutral switch.
- 9. Place the other lead on a good engine ground.
- 10. Shift the transmission in and out of neutral.



111.1



111.2

NEUTRAL SWITCH INSPECTION: Test 2A (continued)

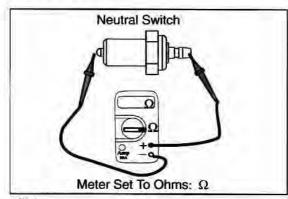
- The DMM should display infinity (O.L. on a Fluke [™]
 when the transmission is in gear and continuity when the transmission is in neutral.
- If the neutral switch does not operate as it should, it must be removed for further inspection.
- 13. If the neutral switch is working correctly and the light did not light up when the transmission was in neutral; the light needs replacing or the wiring needs to be inspected. Refer to chapter 19 for neutral light replacement or troubleshoot the wiring using normal procedures.

NEUTRAL SWITCH REMOVAL & BENCH TESTING: Test 2B

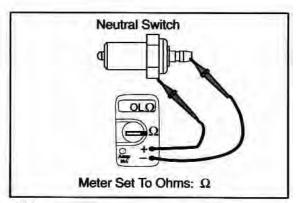
- Drain engine oil, refer to chapter 3.
- Remove inner sprocket cover, refer to chapter 6 & 11
- 3. Remove the wire connected to the neutral switch.
- 4. Unscrew the neutral switch and remove it.
- 5. Position the DMM to Ohms scale. III. 1.
- Place one lead on the terminal of the neutral switch. III. 1.
- Place the other lead on the plunger of the neutral switch. III. 1.
- 8. The meter should read continuity.
- Operate the plunger a few times and observe the meter: continuity should always be present regardless of the position of the plunger.

NOTE: The neutral switch on the V92C isn't really a switch. It is a spring loaded plunger mechanism that always has continuity when it is operating correctly. When the protrusion on the end of the shift cam contacts the plunger of the neutral switch, a ground path is created for the neutral light and starter solenoid circuit.

- 10. Place one lead of the DMM on the neutral switch terminal and the other lead to the body of the neutral switch. The meter should register infinity (O.L. on Fluke™ 73). Operate the plunger a few times with the meter leads connected to the neutral switch, the reading on the meter should always register infinity. III. 2.
- If the neutral switch fails either test 9 or 10 it must be replaced.



111.1



111.2

NEUTRAL SWITCH REMOVAL & BENCH TESTING (continued)

 If the neutral switch tests correctly, but the neutral switch did not create a ground circuit when step 10 and 11 were performed in test 2A, the shift cam is not contacting the neutral switch when the transmission is in neutral.

Some possibilities for the condition found in step 13 would be:

Repeat steps 10 & 11 of test 2A and ensure that the transmission was in fact in neutral.

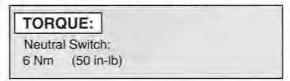
The plunger is stuck in its retracted position.

The shift cam protrusion is worn off.

The shift cam is broken, although this would present other symptoms such as the transmission locked up or unable to shift the transmission.

NEUTRAL SWITCH INSTALLATION

- 1. Place a new sealing washer on the neutral switch.
- Install switch and tighten to specification.

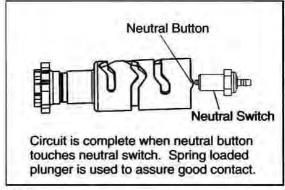


- Attach neutral switch wire to terminal on neutral switch.
- 4. Fill engine with oil, refer to chapter 3.
- Inspect operation of neutral switch.
- Install front sprocket components, refer to chapter 6 & 11.

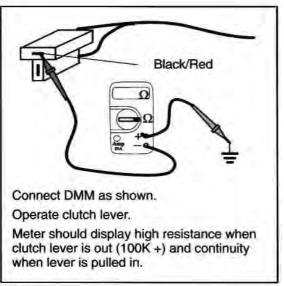
CLUTCH SWITCH: Test 2C

The symptom of a faulty clutch switch circuit is: Starter motor will not turn when transmission is in gear with the clutch lever pulled in, but will turn when the transmission is in neutral.

- Disconnect switch connector at starter solenoid.
- 2. Place the DMM to the Ohms scale.
- Connect one lead of the DMM to the black/white lead of the starter solenoid wiring harness.
- Connect the other lead of the DMM to the battery negative post.
- Operate the clutch lever while observing the meter display.



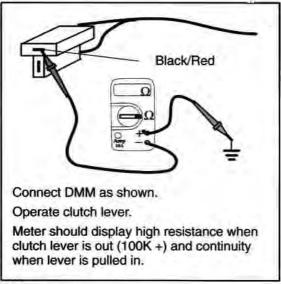
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111.2

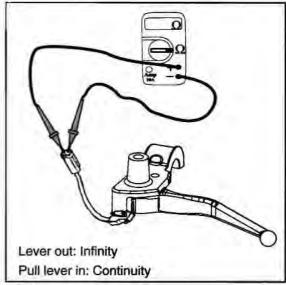
CLUTCH SWITCH INSPECTION (continued)

- When the clutch lever is pulled to the handlebar, the meter should display continuity (0 ohms).
- When the clutch lever is in the relaxed position, the meter should display infinity (O.L. on Fluke [™] 73).
- If the clutch switch does not operate correctly, either the switch, wiring or mounting of the switch is at fault.



111.1

- 9. Disconnect the wires at clutch switch.
- Connect ohmmeter across terminals of clutch switch.
- If the clutch switch now operates correctly, the wiring between this point and the previous test point is at fault and must be corrected.
- If the clutch switch still does not operate correctly, inspect the mounting of the switch.
- If the switch is mounted correctly and physically operates correctly, the switch must be replaced.



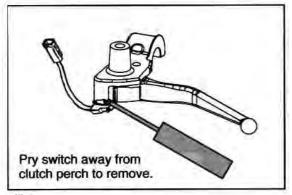
III. 2

CLUTCH SWITCH REMOVAL

- 1. Disconnect wiring connector.
- Pull clutch lever towards handlebars and secure in this position.
- Place small screwdriver between switch body and clutch perch.
- Carefully pry switch away from clutch perch.

CLUTCH SWITCH INSTALLATION

- Make sure clutch handle is pulled toward handlebars and secured there during the installation process.
- 2. Align switch locking tab with clutch perch.
- 3. Firmly press switch into place.
- Connect wiring connector.
- 5. Release clutch handle.



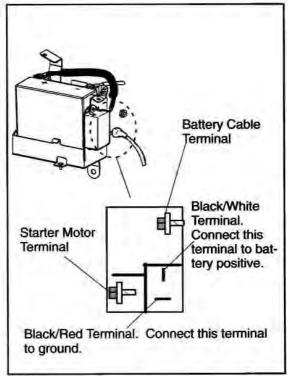
111.1

STARTER RELAY POSITIVE CIRCUIT: Test 3

A WARNING

Secure motorcycle and place transmission in neutral for the following test.

- 1. Place the transmission in neutral.
- 2. Remove left frame cover. III. 2.
- Remove solenoid mounting bolts for easier access. Ill. 2.
- Connect a jumper wire from the positive battery post to the battery side of the starter relay. III. 2.
- Turn ignition key and stop switch on. Pull in clutch. Attempt to start motorcycle.
- If the starter motor turns the engine over, the high amperage side of the starter circuit is functioning correctly. The problem is on the positive side of the starting system switch circuit. Inspect all switches, fuses, relays and wiring for the low amperage side of the circuit.



111.2

STARTER SOLENOID BYPASS: Test 4

A WARNING

Secure motorcycle and place transmission in neutral for the following test.

A 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.
- 2. Remove frame side cover.
- Connect one lead of a remote starter solenoid switch to one of the terminal posts on the solenoid. III. 1.
- Connect the other lead of the remote starter solenoid switch to the other terminal post on the solenoid. III. 1.

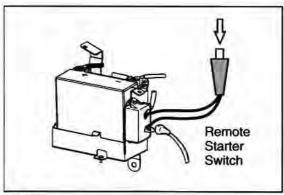
CAUTION

Do not allow the alligator clips of the remote starter solenoid switch to touch each other and short out.

SPECIAL TOOL:

Remote Starter Solenoid Switch: Available At Most Automotive Supply Stores

- Depress the button on the remote starter solenoid switch. III. 1.
- If the starter motor turns over, replace the solenoid switch.
- 7. If the starter motor does not operate, go to test 5.



111. 1

STARTER SOLENOID POSITIVE CABLE BYPASS: Test 5

A WARNING

Secure motorcycle and place transmission in neutral for the following test.

A WARNING

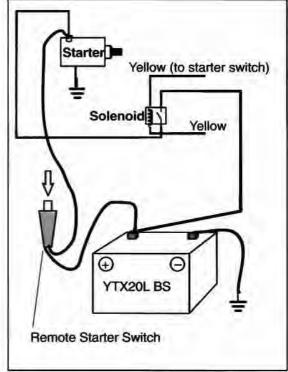
The following test involves high current, heat and possible sparks. Wear a face shield and approved safety glasses while doing the following test.

- 1. Place the transmission in neutral.
- Remove frame side cover.
- Connect one clamp of a heavy-duty, automotive remote starter switch to the positive terminal lug at the starter.
- Connect the other clamp of the remote starter switch to the positive side of the battery.

A WARNING

Do not allow any part of the jumper cable clamp to touch the chassis or any other ground.

- Make sure that the machine is in neutral, the key is off and the stop switch is in the off position.
- Pull in the clutch lever and depress the remote starter switch momentarily.
- If the starter turns, there is excessive resistance in the positive, high current side of the starter system. Go to test 5A (Positive Side Voltage Drop Test).
- If starter does not turn, go to Negative Cable Bypass (Test 6).



111.1

POSITIVE SIDE VOLTAGE DROP TEST: (Test 5A)

Starter motor does not turn or turns slowly when the starter solenoid is bypassed. Starter motor works correctly with a jumper cable placed between the positive battery post and the starter motor positive terminal screw.

CAUTION

The ignition system must be disabled when doing voltage drop tests, if the engine starts it will be difficult to measure voltage drop. To disable the ignition system quickly and safely, observe the following steps.

- 1. Remove spark plug caps.
- Install test spark plugs into plug caps.
- Ground spark plugs against engine.

POSITIVE SIDE VOLTAGE DROP TESTS				
Location	Steps	Allowable Voltage Drop		
Battery (+) To Starter (+)	1 through 8	0.3 Volts DC (200 mV DC)		
Battery (+) to Battery Side of So- lenoid	9 through 17	0.2 Volts DC (200 mV DC)*		
Across Solenoid	18 through 22	0.2 Volts DC (200 mV DC)*		
Starter (+) to Starter Side of Sole- noid	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.

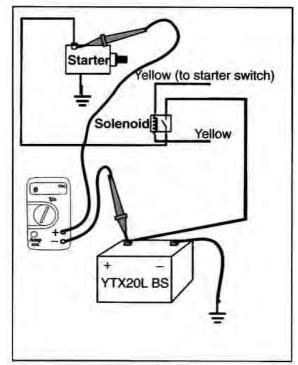
CAUTION

Only operate the starter long enough to stabilize the reading on the DMM (less than 10 seconds running time). Let the starter motor cool down between each of the voltage drop tests to prevent damage to the starter motor.

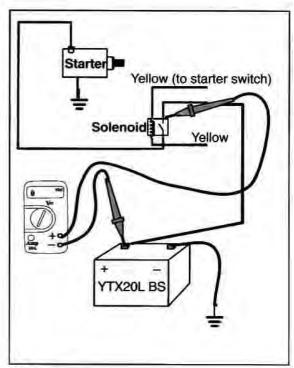
POSITIVE SIDE VOLTAGE DROP TEST (Test 5A Continued)

- 1. Place the transmission in neutral.
- Remove left frame cover.
- 3. Set DMM to DC Volts.
- Place one lead of the DMM to the positive battery post. Ill. 1.
- Place the other lead of the DMM to the starter motor positive terminal screw. III. 1.
- Turn on the ignition switch and turn the engine stop switch to the run position. Pull in the clutch lever.
- Operate the starter normally (no jumper cables in place) and observe the meter display.
- 8. If the 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 the DMM leads placed as indicated.
- Place one lead of the DMM to the positive battery post. Ensure that the DMM is set to read DC Volts. III. 2.
- Place the other lead of the DMM to the solenoid terminal leading to the battery. III. 2.
- Engage the starter and observe the meter display, it should read less than 0.2 Volts DC (200 mV DC).
- If voltage drop is observed, the cable, connection at the battery or connection at the solenoid is causing resistance and must be corrected.
- Inspect the cable ends for corrosion where the cable is connected to the terminal lugs.
- 14. Remove the cable. Set the DMM to read Ohms.
- Place the DMM leads at both ends of the cable and measure the cable's resistance. The resistance should be 0 ohms. Replace the cable if necessary.
- Inspect the battery post, battery cable lug and solenoid lug for corrosion or looseness.

NOTE: Corrosion has resistance that limits or stops the flow of current to the starter motor.



MI.1

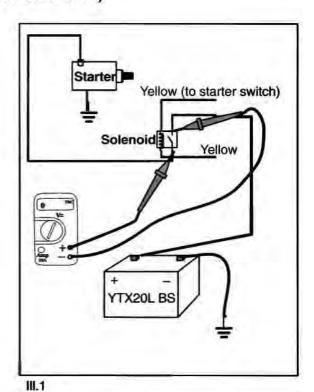


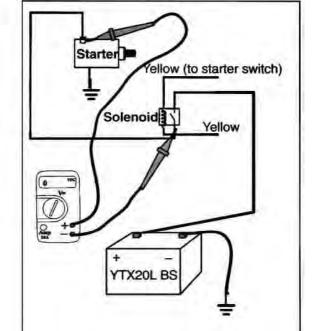
111.2

18.15

POSITIVE SIDE VOLTAGE DROP TEST (Test 5A Continued)

- 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.
- Place one lead of the DMM to the battery side of the solenoid. Reset the DMM to read DC Volts if necessary. Ill. 1.
- Place the other lead to the starter motor side of the solenoid. III. 1.
- Engage the starter and observe the meter display; it should read less than 0.2 Volts DC (200 mV DC).
- If voltage drop is observed, remove the cables and clean the cable terminals and the solenoid terminals. Reattach cables. Retest voltage drop.
- If voltage drop is still observed through the solenoid, the resistance is in the solenoid. High current has burned the switch contacts and the solenoid needs to be replaced.
- Place one lead of the DMM to the starter motor side of the solenoid. Ensure that the DMM is set to read Volts DC. III. 2.
- Place the other lead of the DMM to the starter motor positive terminal. III. 2.
- 25. Engage the starter and observe the meter display.
- If voltage drop is observed, the cable connection at the solenoid or connection at the starter motor is causing resistance and must be corrected.
- Inspect the cable ends for corrosion where the cable is connected to the terminal lugs.
- 28. Remove the cable. Set the DMM to read Ohms.
- Place the DMM leads at both ends of the cable and measure the cable's resistance. The resistance should be 0 ohms. Replace the cable if necessary.



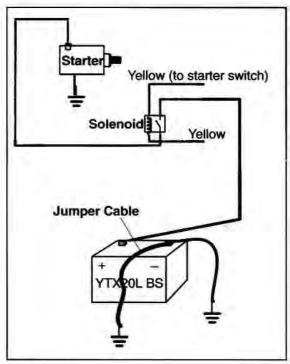


POSITIVE SIDE VOLTAGE DROP TEST (Test 5A Continued)

- Inspect the starter cable lug and solenoid lug for corrosion or looseness.
- 31. 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.

NEGATIVE CABLE BYPASS (Test 6 of Flow Chart Troubleshooting)

- 1. Place the transmission in neutral.
- 2. Remove left side frame cover.
- Connect one clamp of an automotive type jumper cable (heavy gauge jumper cable) to the battery's negative post.
- Connect the other end to the jumper cable to a good ground location on the starter motor's body.
- Make sure transmission is in neutral. Turn ignition key and stop switch on. Pull in clutch lever and attempt to start motorcycle.
- If the starter turns, there is excessive resistance in the negative, high current side of the starter system. Go to test 6A (Negative Side Voltage Drop Test).
- If starter does not turn and all troubleshooting steps have led to this test, remove and inspect the starter motor, refer to page 18.22-18.25.



111.1

NEGATIVE SIDE VOLTAGE DROP TEST (Test 6A)

NEGATIVE SIDE VOLTAGE DROP TESTS				
Location	Steps	Allowable Voltage Drop		
Battery (-) To Starter Body(-)	1 through 8	0.3 Volts DC (200 mV DC)		
Battery (-) to Battery Cable Ground Connection At Frame	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.

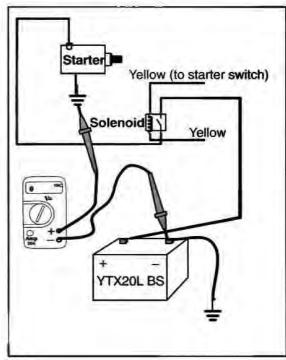
CAUTION

Only operate the starter long enough to stabilize the reading on the DMM (less than 10 seconds running time). Let the starter motor cool down between each of the voltage drop tests to prevent damage to the starter motor.

CAUTION

The ignition system must be disabled when doing voltage drop tests; if the engine starts it will be difficult to measure voltage drop. To disable the ignition system guickly and safely, see page 18.14.

- 1. Place the transmission in neutral.
- 2. Remove left frame cover.
- Set DMM to DC Volts.
- Place one lead of the DMM to the negative battery post.
- Place the other lead of the DMM to the starter motor to a good, clean ground on the starter motor body.
- Turn on the ignition switch and turn the engine stop switch to the run position. Pull in the clutch lever.
- Operate the starter normally (no jumper cables in place) and observe the meter display.



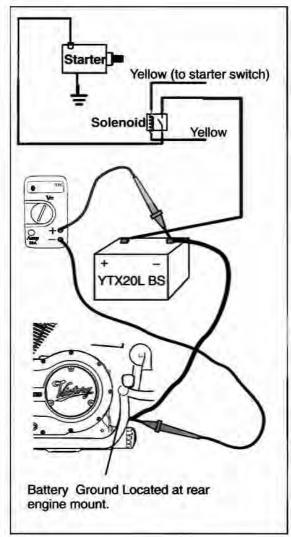
111.1

NEGATIVE SIDE VOLTAGE DROP TEST (Test 6A Continued)

- 8. If the 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 negative path. Continue with the following tests to isolate each section of the negative path and observe the voltage drop with the DMM leads placed as indicated.
- Place one lead of the DMM to the negative battery post. Ensure that the DMM is set to read DC Volts.
- Place the other lead of the DMM to the battery cable engine ground connection.
- Engage the starter and observe the meter display, it should read less than 0.2 Volts DC (200 mV DC).
- 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.
- Inspect the cable ends for corrosion where the cable is connected to the battery or the 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. Replace the cable if necessary.
- 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.



111.1

NEGATIVE SIDE VOLTAGE DROP TEST: Test 6A (Continued)

- Place one lead of the DMM to the battery cable mount at the engine. Reset the DMM to read DC Volts if necessary.
- 19. Place the other lead on the starter motor body.
- 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 the engine and the mounting surfaces of the starter motor. While this would be unusual, it is possible.
- Remove and clean the connection between the battery cable and engine.
- Remove the starter and ensure that the starter is making firm contact with the 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.

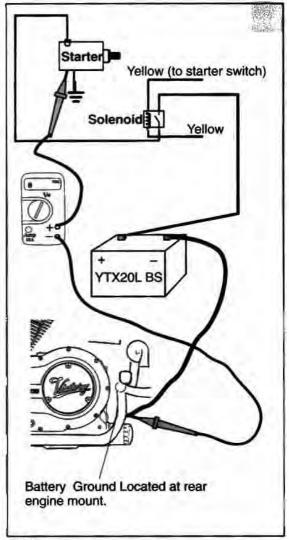
STARTER AMP DRAW TEST: (Test 7)

A WARNING

Do not allow any part of the jumper cable clamp to touch the chassis or any other ground.

CAUTION

The ignition system must be disabled when doing amperage draw tests; if the engine starts it will be difficult to measure voltage drop. Refer to page 18.14.

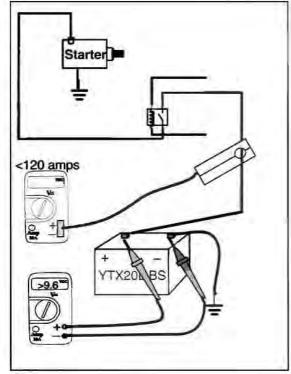


111.1

STARTER AMP DRAW TEST: Test 7 (continued)

- Inspect the battery per page 18.5. Charge or replace the battery as necessary before proceeding.
- 2. Place the transmission in neutral.
- Position the inductive ammeter on the battery's positive cable. III. 1.
- Set the DMM to the Volts DC scale and connect the red lead of the meter to the positive post of the battery. Ill. 1
- Connect the black lead of the meter to the negative post of the battery. III. 1.
- Turn the ignition switch on and observe the ammeter. It should register negative amps. If it does not, turn the ammeter probe around.
- Make sure that the 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.
- Press the starter switch, crank the starter for about 5 seconds and observe both meters and the tachometer.
- The battery voltage should remain above 9.6 volts.
- The amperage draw of the starter should not exceed 130 amps.

The possible combinations are as follows:



111.1

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 start- er 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

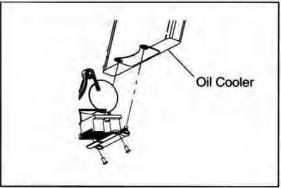
A WARNING

Ensure that the ignition switch is turned off. Remove the negative cable at the battery before removing the starter motor.

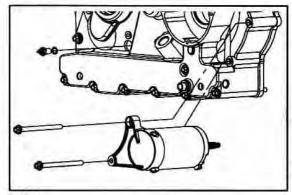
- 1. Remove exhaust system, refer to chapter 2.
- 2. Remove regulator/rectifier assembly. III. 1.
- Remove 2 hex socket bolts attaching lower oil cooler bracket to starter. III. 1.
- 4. Remove solenoid cable from starter.
- 5. Place drain pan under starter.
- Remove the 2 starter motor mounting bolts and remove the starter. III. 2.



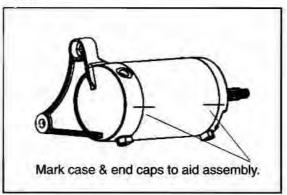
- 1. Mark case and end caps to aid in assembly.
- Inspect splines on armature for unusual wear or damage.
- 3. Remove the motor case bolts.
- 4. Remove the front and rear covers.
- Observe the location and number of any shims used between the armature assembly and the front cover. III. 4.
- 6. Remove the armature.



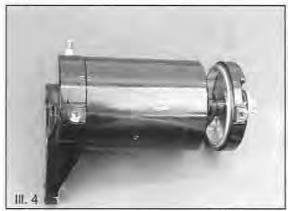
111.1



111.2



111.3



STARTER MOTOR INSPECTION

1. Measure the length of each brush. III. 1.

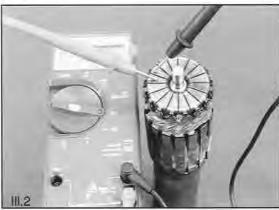
SPEC:

Starter Motor Brush Length: 6.5 mm (0.256")

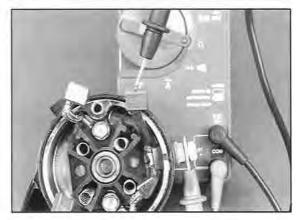
- 2. Replace brushes if necessary.
- 3. Set the DMM to the Ohms position.
- Place the meter leads on any two adjacent commutator bars. Continuity should be present. Continue to check around the commutator. If any open circuits are found, replace the armature. III.
 2.
- Visually inspect the commutator bars for discoloration. Adjacent bars that are discolored can indicate a grounded armature coil.
- Visually inspect the commutator bars for excessive wear or extreme pitting. Do not attempt to sand the surface smooth. Replace the armature if necessary.
- Place one of the meter leads on the commutator and the other lead on the armature shaft. This should be open or infinity (O.L. on a Fluke [™] 73). Replace the armature if the armature shaft is shorted to the commutator. Ill. 3.

 Place one meter lead on the battery cable input and the other lead on one of the insulated brushes.
 Continuity should be present (0 ohms). Repeat test for other insulated brush. If continuity is not present, determine why and repair or replace necessary parts. III. 4.









STARTER MOTOR INSPECTION (Continued)

- Place one meter lead on the battery cable input and the other lead on the starter motor case. An open circuit should be present (infinity or O.L. on a Fluke [™] 73). If continuity exists, determine why and repair or replace necessary parts.
- Inspect the front cover oil seal for wear or damage.
 Replace if necessary. III. 1.
- Inspect the front cover bearing for smooth rotation. Replace if necessary. III. 1.

STARTER MOTOR ASSEMBLY

CAUTION

Replace all O-rings to prevent oil leakage or contamination of the starter.

- Thoroughly clean all starter components. Dry with compressed air.
- Work a very thin film of grease on to the armature shaft.

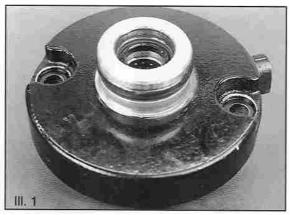
LUBRICANT:

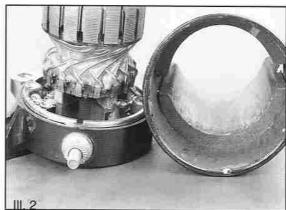
Victory All Purpose Grease: 2872187

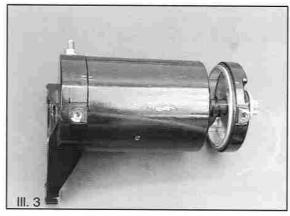
- Install armature into end plate while aligning brushes into slots. Work slowly and carefully to avoid damage to brushes. Make sure that brushes are free to move up and down. III. 2.
- Observe alignment marks and install starter case on to end plate. Make sure tab tab of case aligns with slot on end plate. Ill. 3.
- Install shims onto armature shaft. III. 3.
- Make sure O-ring is seated into groove of front cover. Lightly grease O-ring. III. 4.
- Install front cover. Make sure that alignment marks align and that tab aligns with slot.
- Install starter case bolts (with O-rings) and torque to specification.

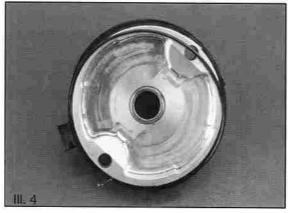
TORQUE:

Starter Motor Case Bolts: 9.78 Nm (85 in-lbs)









STARTER MOTOR ASSEMBLY (continued)

9. Torque the terminal nut to specification.

TORQUE:

Starter Motor Terminal Nut: 9.78 Nm (85 in-lbs)

STARTER MOTOR INSTALLATION

A WARNING

Make sure that the ignition switch is turned off and that the negative cable is disconnected from the battery before installing the starter.

- Place the starter into the engine case while aligning the starter mounting lugs as closely as possible during the installation process. Ill. 1.
- 2. Rotate the starter to align the starter mounting lugs with the bolt holes in the engine cases. III. 1.
- Install the starter mounting bolts and tighten to specification. Ill. 1.



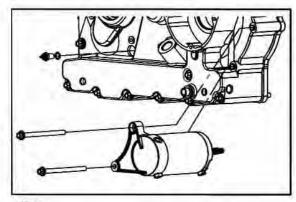
Starter Motor Mounting Bolts: 30.36 Nm (22 lb-ft)

 Connect the starter motor cable and cable nut. Torque the cable nut to specification.

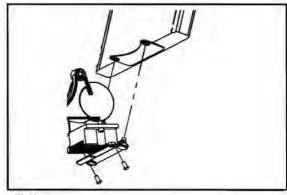


Starter Motor Cable Nut: 9.78 Nm (85 in-lbs)

- 5. Install lower oil cooler bracket to starter. III. 2.
- Install regulator/rectifier assembly. III. 2.
- Install exhaust system. Refer to chapter 2.
- 8. Install the negative battery terminal at the battery.



111.1



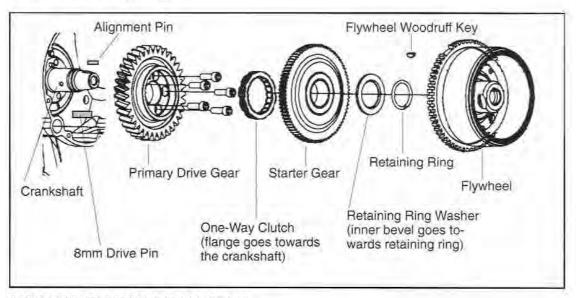
III. 2

STARTER CLUTCH REMOVAL

A WARNING

Make sure that the ignition switch is turned off and that the negative cable is disconnected from the battery before starting procedure.

- Remove the primary cover, refer to chapter 9.
- 2. Remove flywheel, refer to chapter 16.
- 3. Remove retaining ring and washer.
- 4. Remove starter drive gear.
- Remove one-way clutch.



STARTER CLUTCH INSPECTION

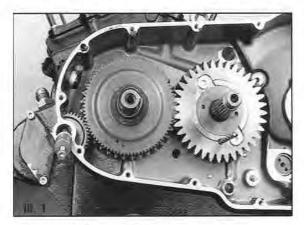
1. Place one-way clutch into primary drive gear.

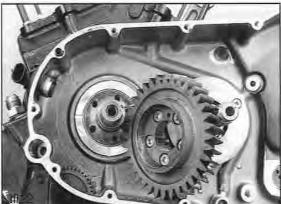
NOTE: Flange of one-way clutch goes towards the crankshaft.

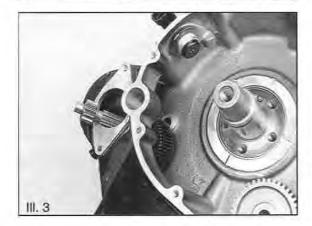
- Place starter drive gear into one-way clutch.
- Observe that the driven gear turns smoothly in the clockwise direction and locks up in the counterclockwise direction.
- Inspect the one-way clutch contact surfaces for abnormal wear, sticking or abnormal movement or damage.
- Inspect the starter gear's inner contact surface for damage.
- Inspect the starter driven gear roller contact surface for damage.

STARTER IDLER GEAR, TORQUE LIMITING CLUTCH, PRIMARY DRIVE GEAR REMOVAL

- 1. Remove primary cover, refer to chapter 9.
- Remove cover for torque limiting clutch.
- 3. Remove clutch, refer to chapter 9.
- Remove flywheel, refer to chapter 16.
- 5. Remove torque compensator, refer to chapter 9.
- 6. Remove electric starter.
- 7. Remove idler gear shaft. III. 1.
- Rotate engine counter-clockwise and position idler gear down and towards the rear of the engine.
- 9. Remove retaining ring and washer.
- 10. Remove idler gear.
- 11. Remove primary drive gear. III. 2.
- 12. Remove shaft for torque limiting clutch. III. 3.
- 13. Remove torque limiting clutch. III. 3.

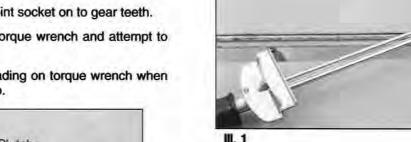






STARTER TORQUE LIMITER INSPECTION

- 1. Secure torque limiter clutch in vise equipped with soft jaws.
- Insert shaft into torque limiter clutch.
- Place 19mm, 12 point socket on to gear teeth.
- 4. Use a beam type torque wrench and attempt to turn shaft.
- Observe torque reading on torque wrench when clutch begins to slip.



SPEC:

Torque Limiting Clutch:

New: 50 lb-ft of break-away torque. In Service: 25 to 35 lb-ft of breakaway torque.

6. Rotate the cover bearing with your fingers observing for rough or sticky movement. Replace if necessary.

STARTER TORQUE LIMITER COVER BEARING REMOVAL

- Place blind bearing puller into bore of bearing.
- Remove bearing.

STARTER TORQUE LIMITER COVER BEARING INSTALLATION

Lubricate O.D. of bearing with grease.

LUBRICANT:

Victory All Purpose Grease: 2872187

- 2. Place bearing in cover and set assembly into
- 3. Using appropriate driver, press bearing into place until it seats.

STARTER TORQUE LIMITER COVER INSTALLATION

- Install new gasket on torque limiter cover.
- Install cover and tighten screws to specification.

TORQUE:

Torque Limiter Cover Screws 11.50 Nm (100 in lbs)

STARTER IDLER GEAR, TORQUE LIMITING CLUTCH, PRIMARY DRIVE GEAR INSTALLATION

 Apply thin film of grease to torque limiting clutch shaft.

LUBRICANT:

Victory All Purpose Grease: 2872187

- 2. Install torque limiting clutch and shaft. Ill. 1.
- 3. Apply thin film of grease to starter idler gear shaft.
- 4. Temporarily install idler gear and idler gear shaft.
- Apply a thin film of grease to the crankcase where primary gear rides.
- Install primary gear pins.



Make sure alignment and drive pin are in place during assembly.

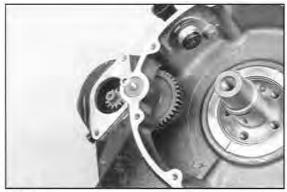
- 7. Install primary gear. III. 2.
- Apply Loctite[™] 262 in the primary drive gear mounting bolt holes. Clean and install primary gear bolts, torque to specification. III. 2.

TORQUE:

Primary Drive Gear Bolts: 44 N-m (32 lb-ft) (Loctite 262 in holes)

- Remove idler gear shaft and let idler gear fall down and towards the rear of the engine. Ill. 3.
- Install one-way clutch with flange towards crankshaft. III. 3.

NOTE: Install one-way clutch by placing it into position and rotating it. While rotating the clutch, push each clutch pin in so it falls into place. Continue doing so until the one-way clutch can be fully seated with light hand pressure.



III. 1



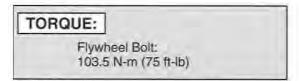
111 2



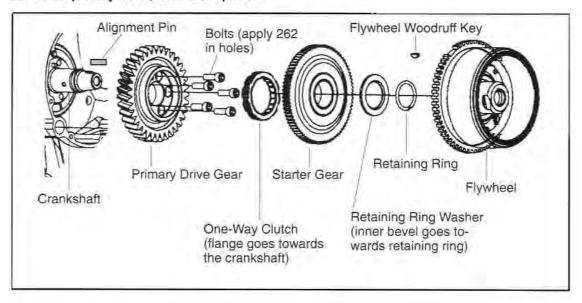
111.3

STARTER IDLER GEAR, TORQUE LIMITING CLUTCH, PRIMARY DRIVE GEAR INSTALLATION (continued)

- 11. Install starter gear.
- 12. Install starter drive gear washer.
- 13. Install new retaining ring.
- 14. Install torque compensator, refer to chapter 9.
- 15. Install flywheel key.
- Thoroughly clean taper of crankshaft and flywheel.
- Install washer & flywheel bolt and torque to specification.



- Roll idler gear into position and install idler gear shaft.
- 19. Install electric starter.
- 20. Install clutch, refer to chapter 9.
- Install cover for torque limiting clutch.
- 22. Install primary cover, refer to chapter 9.

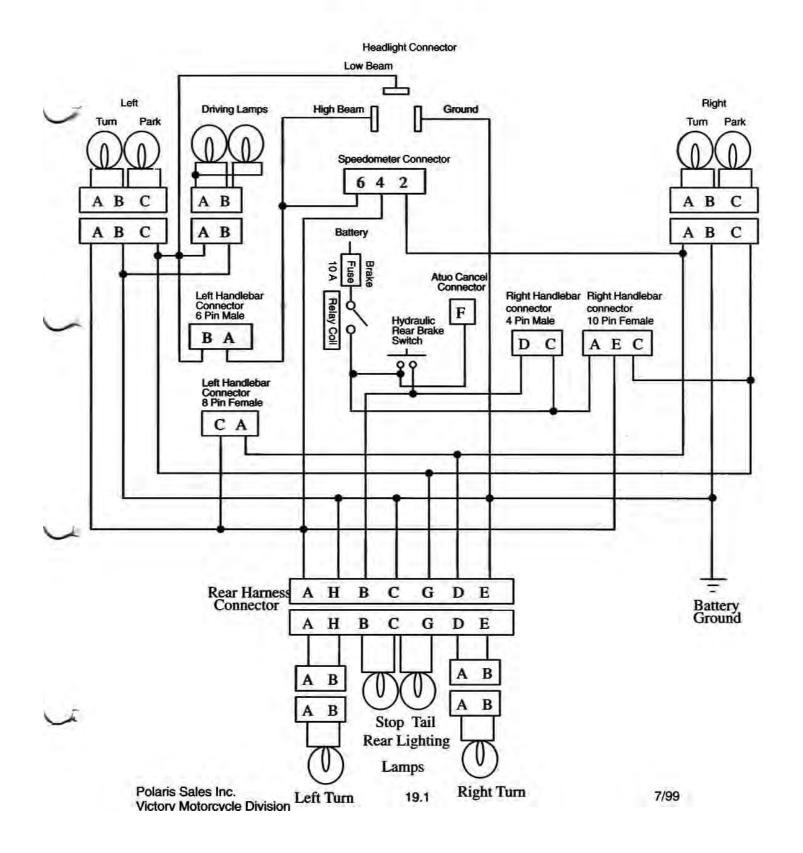


CHAPTER 19 LIGHTING SYSTEMS

LIGHTING SYSTEM WIRING DIAGRAM	19.1
AUTO CANCEL/ HAZARD SYSTEM BLOCK DIAGRAMS	19.2
TURN SIGNAL AUTO CANCEL SYSTEM	19.3
RIGHT HANDLEAR SWITCH WIRING DIAGRAM	19,4
LEFT HANDLBAR SWITCH WIRING DIAGRAM	19.5

LIGHTING WIRING DIAGRAM

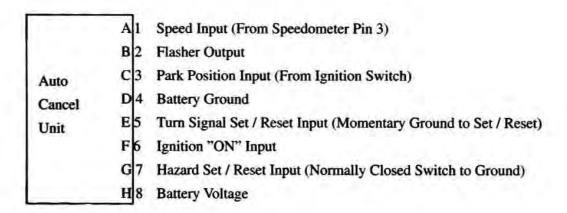
V92C Lighting System Wiring Diagram

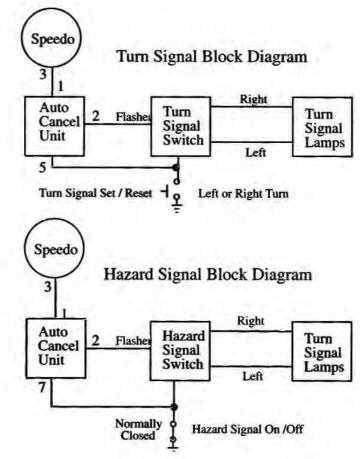


LIGHTING SYSTEMS

AUTO CANCEL / HAZARD SYSTEM BLOCK DIAGRAM

Auto Cancel Unit Connector





AUTOMATIC TURN SIGNAL CANCEL SYSTEM

Turn signals will automatically cancel depending upon vehicle speed. Turn signals will not automatically cancel when the vehicle is stationary. Signals will flash for a longer period of time when the vehicle is moving slow and a shorter period of time when the vehicle is moving fast. Test the turn signal auto cancel function at higher speeds where the signal flash time is relatively short.

The auto cancel unit is located under the right side frame cover. The turn signal and hazard signal systems utilize the same non-serviceable flasher relay that is built into the auto cancel unit.

TROUBLESHOOTING PROCEDURE

Turn signals will not automatically cancel.

TURN SIGNAL SET/ RESET SWITCH

The auto cancel unit receives input from the turn signal switch. Holding the switch in the right or left turn position will continuously reset the turn signal flasher and it will not auto cancel.

Set/Reset Signal Test

Unplug the connector from the auto cancel unit (under right side frame cover).

Set digital multi-tester to test continuity (W).

Test for open circuit from Pin 4 to Pin 5.

Press and hold the turn signal switch in either direction.

Test for continuity from Pin 4 to Pin 5.

VEHICLE SPEED INPUT SIGNAL

The auto cancel unit receives an input signal from the vehicle speed sensor located on the top rear of the transmission. Turn signals will not automatically cancel without the vehicle speed input signal. Connectors must be plugged in to test for the speed input signal.

Vehicle Speed Signal Test (Signal from speedometer to auto cancel unit)

Test DC volts at pin 1 on the auto cancel unit. Connector plugged in,ignition key on.

Elevate and support rear of vehicle in a safe manner so the wheel can be rotated.

Set digital multi-tester to test DC voltage. You will need sharp meter probes to pierce the wire insulation to get a voltage reading.

Pierce the insulation of the wire leading to the auto cancel unit connector Pin 1 with the red meter probe. (connector must be plugged in and the wire insulation must be pierced by the meter probe). Connect black meter probe to battery ground.

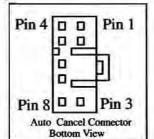
Turn ignition key on and rotate rear wheel slowly. (while probing the wire leading to pin 1)

Voltage will alternate between 0.6V and 5V if the speed signal is present.

If no speed input signal is present, test speed sensor and wiring. Make any necessary repairs.

Vehicle Speed Sensor Test (Signal from vehicle speed sensor to speedometer)

Unplug speed sensor at transmission. Plug sensor into the test tool (PN-43544) and rotate rear wheel slowly. If the vehicle speed sensor is functioning, the test light will alternate on and off corresponding to rear wheel RPM.

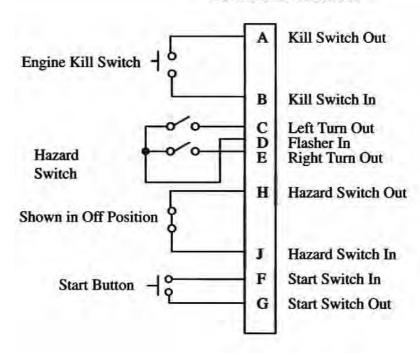


LIGHTING SYSTEMS

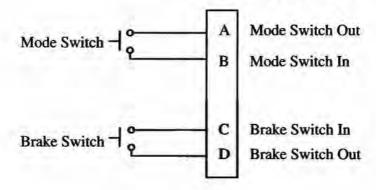
RIGHT HANDLEBAR SWITCH WIRING DIAGRAM

Right Handlebar Switch Diagram

10 Pin Male Connector



4 Pin Female Connector



LIGHTING SYSTEMS

LEFT HANDLEBAR SWITCH WIRING DIAGRAM

Left Handlebar Switch Diagram

8 Pin Female Connector

