

2001-2003



**HONDA**

**SERVICE MANUAL**

**TRX500FA**

**RUBICON®**

## **A Few Words About Safety**

### **Service Information**

The service and repair information contained in this manual is intended for use by qualified, professional technicians. Attempting service or repairs without the proper training, tools, and equipment could cause injury to you or others. It could also damage the vehicle or create an unsafe condition.

This manual describes the proper methods and procedures for performing service, maintenance, and repairs. Some procedures require the use of specially designed tools and dedicated equipment. Any person who intends to use a replacement part, service procedure or a tool that is not recommended by Honda, must determine the risks to their personal safety and the safe operation of the vehicle.

If you need to replace a part, use genuine Honda parts with the correct part number or an equivalent part. We strongly recommend that you do not use replacement parts of inferior quality.

### **For Your Customer's Safety**

Proper service and maintenance are essential to the customer's safety and the reliability of the vehicle. Any error or oversight while servicing a vehicle can result in faulty operation, damage to the vehicle, or injury to others.

### **For Your Safety**

Because this manual is intended for the professional service technician, we do not provide warnings about many basic shop safety practices (e.g., Hot parts – wear gloves). If you have not received shop safety training or do not feel confident about your knowledge of safe servicing practices, we recommend that you do not attempt to perform the procedures described in this manual.

Some of the most important general service safety precautions are given below. However, we cannot warn you of every conceivable hazard that can arise in performing service and repair procedures. Only you can decide whether or not you should perform a given task.

### **Important Safety Precautions**

Make sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and using safety equipment. When performing any service task, be especially careful of the following:

- Read all of the instructions before you begin, and make sure you have the tools, the replacement or repair parts, and the skills required to perform the tasks safely and completely.
- Protect your eyes by using proper safety glasses, goggles or face shields any time you hammer, drill, grind, pry or work around pressurized air or liquids, and springs or other stored-energy components. If there is any doubt, put on eye protection.
- Use other protective wear when necessary, for example gloves or safety shoes. Handling hot or sharp parts can cause severe burns or cuts. Before you grab something that looks like it can hurt you, stop and put on gloves.
- Protect yourself and others whenever you have the vehicle up in the air. Any time you lift the vehicle, either with a hoist or a jack, make sure that it is always securely supported. Use jack stands.

Make sure the engine is off before you begin any servicing procedures, unless the instruction tells you to do otherwise. This will help eliminate several potential hazards:

- Carbon monoxide poisoning from engine exhaust. Be sure there is adequate ventilation whenever you run the engine.
- Burns from hot parts or coolant. Let the engine and exhaust system cool before working in those areas.
- Injury from moving parts. If the instruction tells you to run the engine, be sure your hands, fingers and clothing are out of the way.

Gasoline vapors and hydrogen gases from batteries are explosive. To reduce the possibility of a fire or explosion, be careful when working around gasoline or batteries.

- Use only a nonflammable solvent, not gasoline, to clean parts.
- Never drain or store gasoline in an open container.
- Keep all cigarettes, sparks and flames away from the battery and all fuel-related parts.

### **⚠ WARNING**

Improper service or repairs can create an unsafe condition that can cause your customer or others to be seriously hurt or killed.

Follow the procedures and precautions in this manual and other service materials carefully.

### **⚠ WARNING**

Failure to properly follow instructions and precautions can cause you to be seriously hurt or killed.

Follow the procedures and precautions in this manual carefully.

# HOW TO USE THIS MANUAL

This service manual describes the service procedures for the TRX500FA.

Follow the Maintenance Schedule (Section 3) recommendations to ensure that the vehicle is in peak operating condition and the emission levels are within the standards set by the California Air Resources Board.

Performing the first scheduled maintenance is very important. It compensates for the initial wear that occurs during the break-in period.

Sections 1 and 3 apply to the whole vehicle. Section 2 illustrates procedures for removal/installation of components that may be required to perform service described in the following sections.

Sections 4 through 23 describe parts of the vehicle, grouped according to location.

Find the section you want on this page, then turn to the table of contents on the first page of the section.

Most sections start with an assembly or system illustration, service information and troubleshooting for the section. The subsequent pages give detailed procedures.

If you don't know the source of the trouble, go to Section 26, Troubleshooting.

Your safety, and the safety of others, is very important. To help you make informed decisions we have provided safety messages and other information throughout this manual. Of course, it is not practical or possible to warn you about all the hazards associated with servicing this vehicle. You must use your own good judgement. You will find important safety information in a variety of forms including:

- Safety Labels – on the vehicle
- Safety Messages – preceded by a safety alert symbol <sup>▲</sup> and one of three signal words, DANGER, WARNING, or CAUTION. These signal words mean:

**▲ DANGER** You WILL be KILLED or SERIOUSLY HURT if you don't follow instructions.

**▲ WARNING** You CAN be KILLED or SERIOUSLY HURT if you don't follow instructions.

**▲ CAUTION** You CAN be HURT if you don't follow instructions.

- Instructions – how to service this vehicle correctly and safely.









As you read this manual, you will find information that is preceded by a **NOTICE** symbol. The purpose of this message is to help prevent damage to your vehicle, other property, or the environment.

# CONTENTS

	<b>GENERAL INFORMATION</b>	<b>1</b>
	<b>FRAME/BODY PANELS/EXHAUST SYSTEM</b>	<b>2</b>
	<b>MAINTENANCE</b>	<b>3</b>
<b>ENGINE</b>	<b>LUBRICATION SYSTEM</b>	<b>4</b>
	<b>FUEL SYSTEM</b>	<b>5</b>
	<b>COOLING SYSTEM</b>	<b>6</b>
	<b>ENGINE REMOVAL/INSTALLATION</b>	<b>7</b>
	<b>CYLINDER HEAD/VALVE</b>	<b>8</b>
	<b>CYLINDER/PISTON</b>	<b>9</b>
	<b>CENTRIFUGAL CLUTCH</b>	<b>10</b>
	<b>ALTERNATOR/STARTER CLUTCH</b>	<b>11</b>
	<b>SUB-TRANSMISSION</b>	<b>12</b>
	<b>CRANKSHAFT/AUTOMATIC TRANSMISSION</b>	<b>13</b>
<b>CHASSIS</b>	<b>FRONT WHEEL/SUSPENSION/STEERING</b>	<b>14</b>
	<b>REAR WHEEL/SUSPENSION</b>	<b>15</b>
	<b>BRAKE SYSTEM</b>	<b>16</b>
	<b>FRONT DRIVING MECHANISM</b>	<b>17</b>
	<b>REAR DRIVING MECHANISM</b>	<b>18</b>
<b>ELECTRICAL</b>	<b>BATTERY/CHARGING SYSTEM</b>	<b>19</b>
	<b>IGNITION SYSTEM</b>	<b>20</b>
	<b>ELECTRIC STARTER</b>	<b>21</b>
	<b>LIGHTS/METERS/SWITCHES</b>	<b>22</b>
	<b>HONDAMATIC</b>	<b>23</b>
	<b>WIRING DIAGRAMS</b>	<b>24</b>
	<b>TECHNICAL FEATURES</b>	<b>25</b>
	<b>TROUBLESHOOTING</b>	<b>26</b>
	<b>INDEX</b>	<b>27</b>

## SYMBOLS

The symbols used throughout this manual show specific service procedures. If supplementary information is required pertaining to these symbols, it would be explained specifically in the text without the use of the symbols.

	Replace the part(s) with new one(s) before assembly.
	Use recommended engine oil, unless otherwise specified.
	Use molybdenum oil solution (mixture of the engine oil and molybdenum grease in a ratio of 1 : 1).
	Use multi-purpose grease (Lithium based multi-purpose grease NLGI #2 or equivalent).
	Use molybdenum disulfide grease (containing more than 3% molybdenum disulfide, NLGI #2 or equivalent). Example: Molykote® BR-2 plus manufactured by Dow Corning, U.S.A. Multi-purpose M-2 manufactured by Mitsubishi Oil, Japan
	Use molybdenum disulfide paste (containing more than 40% molybdenum disulfide, NLGI #2 or equivalent). Example: Molykote® G-n paste, manufactured by Dow Corning, U.S.A. Honda Moly 60 (U.S.A. only) Rocol ASP manufactured by Rocol Limited, U.K. Rocol Paste manufactured by Sumico Lubricant, Japan
	Use silicone grease.
	Apply a locking agent. Use a middle strength locking agent unless otherwise specified.
	Apply sealant.
	Use DOT 3 or DOT 4 brake fluid. Use the recommended brake fluid unless otherwise specified.
	Use Fork or Suspension Fluid.

# 1. GENERAL INFORMATION

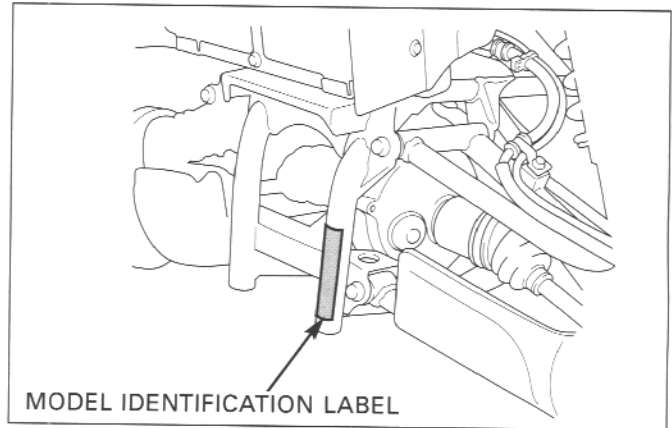
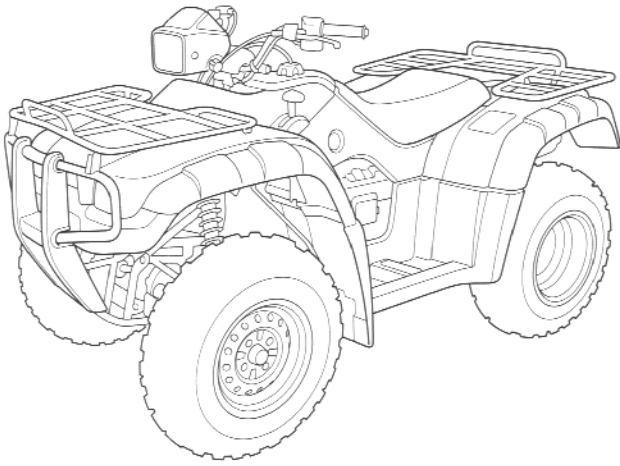
<b>SERVICE RULES</b>	<b>1-1</b>	<b>LUBRICATION &amp; SEAL POINTS</b>	<b>1-16</b>
<b>MODEL IDENTIFICATION</b>	<b>1-2</b>	<b>CABLE &amp; HARNESS ROUTING</b>	<b>1-19</b>
<b>SPECIFICATIONS</b>	<b>1-3</b>	<b>EMISSION CONTROL SYSTEMS</b>	<b>1-32</b>
<b>TORQUE VALUES</b>	<b>1-11</b>	<b>EMISSION CONTROL INFORMATION LABEL (U.S.A. only)</b>	<b>1-33</b>
<b>TOOLS</b>	<b>1-14</b>		

## SERVICE RULES

1. Use genuine HONDA or HONDA-recommended parts and lubricants or their equivalents. Parts that don't meet HONDA's design specifications may cause damage to the motorcycle.
2. Use the special tools designed for this product to avoid damage and incorrect assembly.
3. Use only metric tools when servicing the motorcycle. Metric bolts, nuts and screws are not interchangeable with English fasteners.
4. Install new gaskets, O-rings, cotter pins, and lock plates when reassembling.
5. When tightening bolts or nuts, begin with the larger diameter or inner bolt first. Then tighten to the specified torque diagonally in incremental steps unless a particular sequence is specified.
6. Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.
7. After reassembly, check all parts for proper installation and operation.
8. Route all electrical wires as shown on pages 1-19 through 1-31, Cable & Harness Routing.

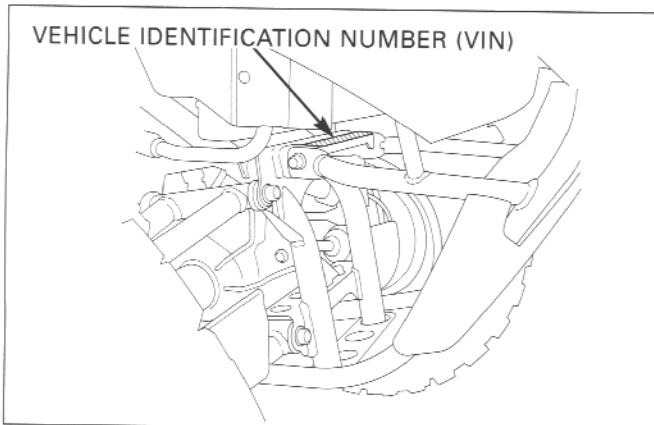
## GENERAL INFORMATION

### MODEL IDENTIFICATION



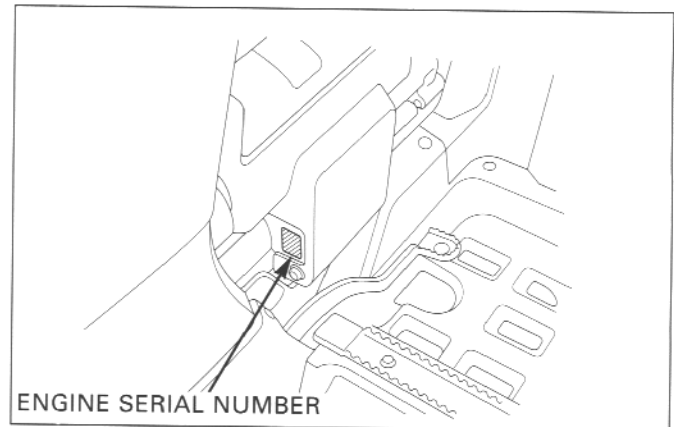
MODEL IDENTIFICATION LABEL

The model identification label is located on the left side frame down tube.



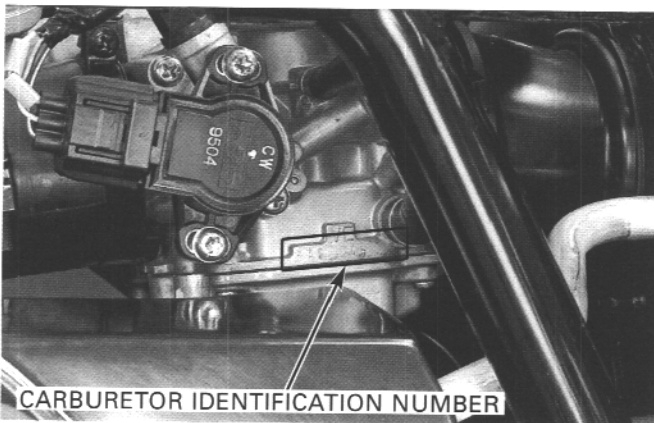
VEHICLE IDENTIFICATION NUMBER (VIN)

The vehicle identification number (VIN) is stamped on the front side of the frame.



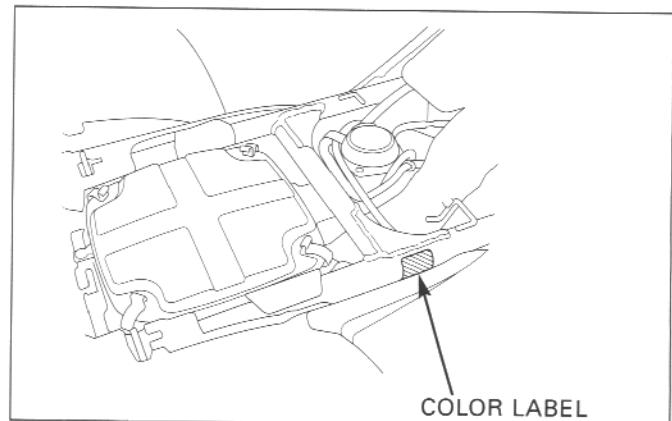
ENGINE SERIAL NUMBER

The engine serial number is stamped on the right side of the crankcase.



CARBURETOR IDENTIFICATION NUMBER

The carburetor identification number is stamped on the left side of the carburetor body.



COLOR LABEL

The color label is attached on the right side of the frame under the seat. When ordering color-coded parts, always specify the designated color code.

**SPECIFICATIONS**

GENERAL		
	ITEM	SPECIFICATIONS
DIMENSIONS	Overall length Overall width Overall height Wheelbase Front tread Rear tread Seat height Footpeg height Ground clearance Dry weight Curb weight Maximum weight capacity	2,072 mm (81.6 in) 1,184 mm (46.6 in) 1,194 mm (47.0 in) 1,287 mm (50.7 in) 914 mm (36.0 in) 925 mm (36.4 in) 862 mm (33.9 in) 337 mm (13.3 in) 198 mm (7.8 in) 273 kg (602 lbs) 285 kg (628 lbs) 220 kg (485 lbs)
FRAME	Frame type Front suspension Front wheel travel Front damper Rear suspension Rear wheel travel Rear damper Front tire size Rear tire size Front rim size Rear rim size Front tire brand Rear tire brand Front brake Rear brake Caster angle Trail length Camber angle Fuel tank capacity Fuel tank reserve capacity	Double cradle Double wish-bone 170 mm (6.7 in) Double tube Swingarm 170 mm (6.7 in) Double tube AT25 x 8-12 ★★ AT25 x 10-12 ★★ 12 x 6.0 AT 12 x 7.5 AT DIRT HOOKS 15 (Bridgestone) DIRT HOOKS 14 (Bridgestone) Hydraulic drum brake (Dual leading) Mechanical drum brake (Leading-trailing) 3° 12 mm (0.5 in) 0° 14 liters (3.7 US gal, 3.1 Imp gal) 3.8 liters (1.00 US gal, 0.84 Imp gal)
ENGINE	Cylinder arrangement Bore and stroke Displacement Compression ratio Valve train Intake valve opens closes Exhaust valve opens closes Lubrication system Oil pump type Cooling system Air filtration Engine dry weight	Single cylinder, longitudinally installed 92 x 75 mm (3.6 x 3.0 in) 498.5 cm <sup>3</sup> (30.41 cu-in) 9.2 : 1 OHV 8° BTDC (at 1 mm lift) 35° ABDC (at 1 mm lift) 40° BBDC (at 1 mm lift) 5° ATDC (at 1 mm lift) Forced pressure (dry sump) Trochoid Liquid cooled Oiled urethane foam 63.2 kg (139.3 lbs)

## GENERAL INFORMATION

GENERAL (Cont'd)		
	ITEM	SPECIFICATIONS
CARBURETOR	Carburetor type Throttle bore	Constant Vacuum (VE type) 36 mm (1.4 in)
DRIVE TRAIN	Clutch system Transmission  Primary reduction Secondary reduction Final reduction Front Rear Automatic transmission ratio Low—O.D. Sub-transmission gear ratio Drive Low Reverse  Gearshift pattern	Centrifugal, wet HONDAMATIC (automatic; non-stage speed) with sub-transmission (constant mesh) 2.188 (70/67) 2.000 (40/20) 3.231 (42/13) 3.154 (41/13) 0.84—3.13 1.583 (38/24) 2.500 (45/18) 3.222 (29/18 x 28/14) R - N - D - L (Sub-transmission) D: 3-mode; Automatic 2-pattern (D1/D2) and Manual (ESP: 5-speeds) L: 2-mode; Automatic and Manual (ESP: 5-speeds) R: 1-mode (fixed low ratio)
ELECTRICAL	Ignition system Starting system Charging system Regulator/rectifier Lighting system	DC-CDI (Direct current-Capacitor discharge ignition) Electric starter motor and emergency recoil starter Triple phase output alternator SCR shorted, triple phase full wave rectification Battery



## GENERAL INFORMATION

Unit: mm (in)

### LUBRICATION

ITEM		STANDARD	SERVICE LIMIT
Engine oil capacity	After draining	4.7 liters (5.0 US qt, 4.1 Imp qt)	—
	After draining/filter change	4.9 liters (5.2 US qt, 4.3 Imp qt)	—
	After disassembly	5.5 liters (5.8 US qt, 4.8 Imp qt)	—
Recommended engine oil		Honda GN4 4-stroke oil or equivalent motor oil API service classification SF or SG Viscosity: SAE 10W-40	—
Oil pressure (80°C/176°F)	At 1,400 rpm	Above 150 kPa (1.5 kgf/cm <sup>2</sup> , 22 psi)	—
	At 5,000 rpm	Above 800 kPa (8.2 kgf/cm <sup>2</sup> , 116 psi)	—
Oil pump	Tip clearance	0.15 (0.006)	0.20 (0.008)
	Body clearance	0.12—0.22 (0.005—0.009)	0.25 (0.010)
	Side clearance	0.02—0.09 (0.001—0.004)	0.11 (0.004)

### FUEL SYSTEM

ITEM	SPECIFICATIONS
Carburetor identification number	VE6AB
Main jet	#158
Slow jet	#45
Jet needle clip position	2nd groove from top
Pilot screw opening	See page 5-15
Float level	18.5 mm (0.73 in)
Idle speed	1,400 ± 100 rpm
Throttle lever free play	3—8 mm (1/8—5/16 in)

### COOLING SYSTEM

ITEM		SPECIFICATIONS
Coolant capacity	Radiator and engine	1.7 liters (1.8 US qt, 1.5 Imp qt)
	Reserve tank	0.40 liter (0.42 US qt, 0.35 Imp qt)
Radiator cap relief pressure		108—137 kPa (1.1—1.4 kgf/cm <sup>2</sup> , 16—20 psi)
Thermostat	Begin to open	80—84°C (176—183°F)
	Fully open	95°C (203°F)
	Valve lift	8 mm (0.3 in) minimum
Recommended antifreeze		Pro Honda HP Coolant or an equivalent high quality ethylene glycol antifreeze containing silicate-free corrosion inhibitors
Standard coolant concentration		50% mixture with distilled water

## GENERAL INFORMATION

### CYLINDER HEAD/VALVE

Unit: mm (in)

ITEM		STANDARD		SERVICE LIMIT
Cylinder compression at 450 rpm		608—902 kPa (6.2—9.2 kgf/cm <sup>2</sup> , 88—131 psi)		—
Valve clearance		IN	0.15 (0.006)	—
		EX	0.23 (0.009)	—
Valve, valve guide	Valve stem O.D.	IN	5.475—5.490 (0.2156—0.2161)	5.45 (0.215)
		EX	5.455—5.470 (0.2148—0.2154)	5.43 (0.214)
	Valve guide I.D.	IN/EX	5.500—5.512 (0.2165—0.2170)	5.53 (0.218)
	Stem-to-guide clearance	IN	0.010—0.037 (0.0004—0.0015)	0.12 (0.005)
		EX	0.030—0.057 (0.0012—0.0022)	0.14 (0.006)
	Valve guide projection above cylinder head	IN	15.8—16.2 (0.62—0.64)	—
EX		18.8—19.2 (0.74—0.76)	—	
Valve seat width	IN/EX	1.0—1.1 (0.039—0.043)	1.4 (0.06)	
	Valve spring Free length	Inner	38.82 (1.528)	37.8 (1.49)
Outer		51.17 (2.015)	49.0 (1.93)	
Rocker arm	Arm I.D.	IN/EX	12.000—12.018 (0.4724—0.4731)	12.05 (0.474)
	Shaft O.D.	IN/EX	11.964—11.984 (0.4710—0.4718)	11.92 (0.469)
	Arm-to-shaft clearance	IN/EX	0.016—0.054 (0.0006—0.0021)	0.08 (0.003)
Camshaft and cam follower	Cam lobe height	IN	33.9602—34.1202 (1.33701—1.34331)	33.790 (1.3303)
		EX	34.1959—34.3559 (1.34629—1.35259)	33.946 (1.3365)
	Cam follower O.D.	IN/EX	22.467—22.482 (0.8845—0.8851)	22.46 (0.884)
	Follower bore I.D.	IN/EX	22.510—22.526 (0.8862—0.8868)	22.54 (0.887)
Follower-to-bore clearance	IN/EX	0.028—0.059 (0.0011—0.0023)	0.07 (0.003)	
Cylinder head warpage		—		0.10 (0.004)

### CYLINDER/PISTON

Unit: mm (in)

ITEM		STANDARD		SERVICE LIMIT	
Cylinder	I.D.	92.000—92.010 (3.6220—3.6224)		92.10 (3.626)	
	Out of round	—		0.10 (0.004)	
	Taper	—		0.10 (0.004)	
	Warpage	—		0.10 (0.004)	
Piston, piston pin, piston ring	Piston O.D. at 15 (0.6) from bottom		91.965—91.985 (3.6207—3.6214)	91.90 (3.618)	
	Piston pin hole I.D.		20.002—20.008 (0.7875—0.7877)	20.04 (0.789)	
	Piston pin O.D.		19.994—20.000 (0.7872—0.7874)	19.96 (0.786)	
	Piston-to-piston pin clearance		0.002—0.014 (0.0001—0.0006)	0.08 (0.003)	
	Piston ring end gap	Top	0.15—0.30 (0.006—0.012)		0.5 (0.02)
		Second	0.30—0.45 (0.012—0.018)		0.6 (0.02)
		Oil (side rail)	0.20—0.70 (0.008—0.028)		—
Piston ring-to-ring groove clearance	Top/Second	0.030—0.060 (0.0012—0.0024)		0.09 (0.004)	
Cylinder-to-piston clearance		0.015—0.045 (0.0006—0.0018)		0.10 (0.004)	
Connecting rod small end I.D.		20.020—20.041 (0.7882—0.7890)		20.07 (0.790)	
Connecting rod-to-piston pin clearance		0.020—0.047 (0.0008—0.0019)		0.1 (0.004)	

## GENERAL INFORMATION

Unit: mm (in)

### CENTRIFUGAL CLUTCH

ITEM		STANDARD	SERVICE LIMIT
Clutch	Drum I.D.	150.0—150.2 (5.906—5.913)	150.4 (5.92)
	Weight lining thickness	3.0 (0.12)	2.0 (0.08)
	Clutch spring height	3.72 (0.146)	3.6 (0.14)
	Clutch weight spring free length	23.2 (0.91)	24.1 (0.95)
Clutch drum boss I.D.		29.000—29.020 (1.1417—1.1425)	29.05 (1.144)
Crankshaft O.D. at clutch drum		28.959—28.980 (1.1401—1.1409)	28.93 (1.139)

Unit: mm (in)

### ALTERNATOR/STARTER CLUTCH

ITEM	STANDARD	SERVICE LIMIT
Starter driven gear boss O.D.	51.705—51.718 (2.0356—2.0361)	51.705 (2.0356)

Unit: mm (in)

### SUB-TRANSMISSION

ITEM		STANDARD	SERVICE LIMIT	
Shift fork	I.D.	11.000—11.021 (0.4331—0.4339)	11.04 (0.435)	
	Claw thickness	4.93—5.00 (0.194—0.197)	4.5 (0.18)	
	Shaft O.D.	10.966—10.984 (0.4317—0.4324)	10.96 (0.431)	
Transmission	Gear I.D.	D., R., L.	28.020—28.041 (1.1031—1.1040)	28.07 (1.105)
		Reverse idle	14.000—14.018 (0.5512—0.5519)	14.04 (0.553)
	Gear bushing O.D.	D./R.	27.979—28.000 (1.1015—1.1024)	27.93 (1.100)
		L.	27.984—28.005 (1.1017—1.1026)	27.93 (1.100)
	Gear-to-bushing clearance	D., R.	0.020—0.062 (0.0008—0.0024)	0.10 (0.004)
		L.	0.015—0.057 (0.0006—0.0022)	0.10 (0.004)
	Gear bushing I.D.	D./R.	25.000—25.013 (0.9843—0.9848)	25.04 (0.986)
	Countershaft O.D.	at D., R.	24.959—24.980 (0.9826—0.9835)	24.93 (0.981)
	Reverse idle shaft O.D.		13.966—13.984 (0.5498—0.5506)	13.93 (0.548)
	Bushing-to-shaft clearance	D./R.	0.020—0.054 (0.0008—0.0021)	0.10 (0.004)
Reverse idle gear-to-shaft clearance		0.016—0.052 (0.0006—0.0020)	0.10 (0.004)	

Unit: mm (in)

### CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

ITEM	STANDARD	SERVICE LIMIT	
Crankshaft	Runout	—	0.05 (0.002)
	Big end side clearance	0.05—0.65 (0.002—0.026)	0.8 (0.03)
	Big end radial clearance	0.006—0.018 (0.0002—0.0007)	0.05 (0.002)

## GENERAL INFORMATION

### FRONT WHEEL/SUSPENSION/STEERING

ITEM		STANDARD	SERVICE LIMIT
Minimum tire tread depth		—	4.0 mm (0.16 in)
Cold tire pressure	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
	Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)	—
	Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)	—
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
Tie-rod distance between the ball joints		382 ± 1 mm (15.0 ± 0.04 in)	—
Toe		Toe-out: 24 ± 15 mm (1 ± 9/16 in)	—

### REAR WHEEL/SUSPENSION

ITEM		STANDARD	SERVICE LIMIT
Minimum tire tread depth		—	4.0 mm (0.16 in)
Cold tire pressure	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
	Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)	—
	Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)	—
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—

### BRAKE SYSTEM

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Front brake	Recommended brake fluid	DOT 3 or DOT 4 brake fluid	—
	Drum I.D.	160.0 (6.30)	161 (6.34)
	Shoe lining thickness	4.0 (0.16)	2.0 (0.08)
	Brake panel warpage	—	0.4 (0.02)
	Waterproof seal lip length	22 (0.9)	20 (0.8)
	Master cylinder I.D.	14.000—14.043 (0.5512—0.5529)	14.055 (0.5533)
	Master piston O.D.	13.957—13.984 (0.4983—0.4994)	13.945 (0.5490)
	Wheel cylinder I.D.	19.050—19.102 (0.7500—0.7520)	19.12 (0.753)
Rear brake	Wheel cylinder piston O.D.	18.997—19.030 (0.7479—0.7492)	18.81 (0.741)
	Drum I.D.	180.0 (7.09)	181 (7.1)
	Lining thickness	5.3 (0.209)	To index mark

### FRONT DRIVING MECHANISM

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Front differential	Oil capacity	After draining	241 cm <sup>3</sup> (8.2 US oz, 8.5 Imp oz)
		After disassembly	275 cm <sup>3</sup> (9.3 US oz, 9.7 Imp oz)
	Recommended oil	Hypoid gear oil SAE #80	—
	Gear backlash	0.05—0.25 (0.002—0.010)	0.4 (0.02)
	Backlash difference	—	0.2 (0.01)
	Slip torque	14—17 N·m (1.45—1.75 kgf·m, 10—13 lbf·ft)	1.2 N·m (1.2 kgf·m, 9 lbf·ft)
	Face cam-to-housing distance	6.3—6.7 (0.25—0.26)	6.3 (0.25)
	Differential housing cap depth	9.55—9.65 (0.376—0.380)	9.55 (0.376)
	Cone spring free height	2.8 (0.11)	2.6 (0.10)

## GENERAL INFORMATION

Unit: mm (in)

### REAR DRIVING MECHANISM

ITEM		STANDARD	SERVICE LIMIT	
Axle runout		—	3.0 (0.12)	
Rear final drive	Oil capacity	After draining	90 cm <sup>3</sup> (3.0 US oz, 3.2 Imp oz)	
		After disassembly	100 cm <sup>3</sup> (3.4 US oz, 3.5 Imp oz)	
	Recommended oil		Hypoid gear oil SAE #80	
	Gear backlash		0.05—0.25 (0.002—0.010)	0.4 (0.02)
	Backlash difference		—	0.2 (0.01)
	Ring gear-to-stop pin clearance		0.3—0.6 (0.01—0.02)	—

### BATTERY/CHARGING SYSTEM

ITEM		SPECIFICATIONS	
Battery	Capacity	12 V - 12 Ah	
	Current leakage	1 mA max.	
	Voltage (20°C/68°F)	Fully charged	13.0—13.2 V
		Needs charging	Below 12.3 V
	Charging current	Normal	1.4 A x 5—10 h
Quick		6.0 A x 1.0 h	
Alternator	Capacity	330 W/5,000 rpm	
	Charging coil resistance (20°C/68°F)	0.1— 1.0Ω	

### IGNITION SYSTEM

ITEM		SPECIFICATIONS
Spark plug	Standard	IJR7A9 (NGK), VX22BC (DENSO)
	For cold climate (below 5°C/41°F)	IJR6A9 (NGK), VX20BC (DENSO)
Spark plug gap		0.8—0.9 mm (0.03—0.04 in)
Ignition coil primary peak voltage		100 V minimum
Ignition pulse generator peak voltage		0.7 V minimum
Ignition timing ("F" mark)		15° BTDC at idle

Unit: mm (in)

### ELECTRIC STARTER

ITEM	STANDARD	SERVICE LIMIT
Starter motor brush length	12.5 (0.49)	9.0 (0.35)

## GENERAL INFORMATION

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### LIGHTS/METER/SWITCHES

	ITEM	SPECIFICATIONS
Bulbs	Headlight (high/low beam)	12 V - 30/30 W x 2
	Assist headlight	12 V - 45 W
	Taillight	12 V - 5 W x 2
	Neutral indicator	LED
	Reverse indicator	LED
	Coolant/oil temperature indicator	LED
	Meter light	LED x 12
Fuse	Main fuse	30 A
	Transmission control motor	30 A
	Sub-fuse	15 A x 2, 10 A x 2

## TORQUE VALUES

STANDARD			
FASTENER TYPE	TORQUE N·m (kgf·m, lbf·ft)	FASTENER TYPE	TORQUE N·m (kgf·m, lbf·ft)
5 mm bolt and nut	5 (0.5, 3.6)	5 mm screw	4 (0.4, 2.9)
6 mm bolt and nut	10 (1.0, 7)	6 mm screw	9 (0.9, 6.5)
8 mm bolt and nut	22 (2.2, 16)	6 mm flange bolt (8 mm head, small flange)	10 (1.0, 7)
10 mm bolt and nut	34 (3.5, 25)	6 mm flange bolt (8 mm head, large flange)	12 (1.2, 9)
12 mm bolt and nut	54 (5.5, 40)	6 mm flange bolt (10 mm head) and nut	12 (1.2, 9)
		8 mm flange bolt and nut	26 (2.7, 20)
		10 mm flange bolt and nut	39 (4.0, 29)

- Torque specifications listed below are for important fasteners.
- Others should be tightened to standard torque values listed above.

- NOTES:
1. Apply locking agent to the threads.
  2. Apply engine oil to the threads and seating surface.
  3. Apply grease to the threads and seating surface.
  4. ALOC bolt/screw: replace with a new one.
  5. Lock nut: replace with a new one.
  6. Castle nut: tighten to the specified torque and further tighten until its grooves aligns with the cotter pin hole.
  7. Special bolt: replace with a new one.
  8. Stake.
  9. Apply sealant to the threads.

ENGINE				
ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
<b>MAINTENANCE:</b>				
Spark plug	1	12	18 (1.8, 13)	
Valve adjusting lock nut	4	6	17 (1.7, 12)	
Timing hole cap	1	14	10 (1.0, 7)	
Engine oil drain bolt (crankcase and oil tank)	2	12	25 (2.5, 18)	
Engine oil filter center bolt	1	20	18 (1.8, 13)	
<b>LUBRICATION SYSTEM</b>				
Oil gallery sealing bolt (front crankcase cover)	2	10	34 (3.5, 25)	
<b>FUEL SYSTEM</b>				
Carburetor insulator band screw	2	5	4 (0.4, 2.9)	
<b>CYLINDER HEAD/VALVE:</b>				
Cylinder head cover cap nut	4	10	53 (5.4, 39)	NOTE 2
<b>CENTRIFUGAL CLUTCH:</b>				
Centrifugal clutch lock nut	1	20	118 (12.0, 87)	NOTE 2, 8
Oil feed pipe setting cap	1	20	18 (1.8, 13)	
Oil gallery sealing bolt (inside of front crankcase cover)	1	10	10 (1.0, 7)	
<b>ALTERNATOR/STARTER CLUTCH:</b>				
Starter clutch outer bolt	6	6	30 (3.1, 22)	NOTE 1
Recoil starter driven pulley bolt	1	12	108 (11.0, 80)	NOTE 2
Alternator stator bolt	3	6	10 (1.0, 7)	
Ignition pulse generator bolt	2	5	6 (0.6, 4.3)	NOTE 1
<b>SUB-TRANSMISSION:</b>				
Gearshift drum center bolt	1	8	26 (2.7, 20)	NOTE 1
Gearshift drum stopper arm pivot bolt	1	6	12 (1.2, 9)	NOTE 1
<b>CRANKSHAFT/AUTOMATIC TRANSMISSION:</b>				
Primary driven gear bolt	4	6	17 (1.7, 12)	NOTE 2
Oil pump driven sprocket bolt	1	6	12 (1.2, 9)	NOTE 1
<b>LIGHTS/METER/SWITCHES:</b>				
Coolant thermosensor	1	PT 1/8	10 (1.0, 9)	NOTE 1
Oil thermosensor	1	12	18 (1.8, 13)	

## GENERAL INFORMATION

<b>ENGINE (Cont'd)</b>				
ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS
<b>HONDAMATIC:</b>				
Angle sensor bolt	2	5	6 (0.6, 4.3)	NOTE 1
Throttle sensor torx screw	2	5	4 (0.4, 2.9)	NOTE 1

<b>FRAME</b>					
ITEM	Q'TY	THREAD DIA. (mm)	TORQUE N·m (kgf·m, lbf·ft)	REMARKS	
<b>FRAME/BODY PANELS/EXHAUST SYSTEM:</b>					
Front carrier/carry pipe bolt	8	8	37 (3.8, 27)	NOTE 4	
Gearshift lever knob screw	2	5	2 (0.2, 1.4)		
Rear carrier bolt	6	8	37 (3.8, 27)		
Muffler band bolt	2	8	23 (2.3, 17)		
Front exhaust pipe cover band screw	2	5	3 (0.3, 2.2)		
Rear exhaust pipe cover end band screw	2	5	6 (0.6, 4.3)		
center band screw	1	5	3 (0.3, 2.2)		
Muffler cover screw	2	5	3 (0.3, 2.2)		
Footpeg bracket nut	4	8	32 (3.3, 24)		
<b>MAINTENANCE:</b>					
Front differential oil filler cap	1	30	12 (1.2, 9)	NOTE 5	
drain bolt	1	8	12 (1.2, 9)		
Rear final gear case oil check bolt	1	8	12 (1.2, 9)		
filler cap	1	30	12 (1.2, 9)		
drain bolt	1	8	12 (1.2, 9)		
Tie-rod lock nut	4	12	54 (5.5, 40)		
<b>FUEL SYSTEM:</b>					
Starting enrichment (SE) valve nut	1	14	2 (0.2, 1.4)		
Throttle drum cover screw	1	4	2 (0.2, 1.4)		
<b>ENGINE REMOVAL/INSTALLATION:</b>					
Left lower engine hanger bracket bolt	2	8	32 (3.3, 24)	NOTE 6	
Lower engine hanger nut (left and right)	2	10	54 (5.5, 40)		
Upper engine hanger bolt (frame side)	1	10	54 (5.5, 40)		
(engine side)	2	8	32 (3.3, 24)		
<b>SUB-TRANSMISSION:</b>					
Gearshift lever box cover bolt	2	6	5 (0.5, 3.6)		
Gearshift lever linkage arm pivot bolt	1	8	26 (2.7, 20)		
Gearshift lever linkage tie-rod lock nut	4	6	10 (1.0, 7)		
<b>FRONT WHEEL/SUSPENSION/STEERING:</b>					
Handlebar lower holder nut	2	10	39 (4.0, 29)		NOTE 5
Front wheel nut	8	10	64 (6.5, 47)		
Front wheel hub nut	2	16	78 (8.0, 58)		
Shock absorber mounting nut	4	10	44 (4.5, 33)		
Upper arm pivot nut	2	10	34 (3.5, 25)		
Lower arm pivot nut	4	10	44 (4.5, 33)		
Upper and lower arm ball joint nut	4	12	29 (3.0, 22)		
Brake hose clamp bolt	4	6	12 (1.2, 9)		
Tie-rod ball joint nut	4	12	54 (5.5, 40)		
Steering shaft end nut	1	14	108 (11.0, 80)		
Steering shaft holder bolt	2	8	32 (3.3, 24)		
<b>REAR WHEEL/SUSPENSION:</b>					
Rear wheel nut	8	10	64 (6.5, 47)	NOTE 3	
Shock absorber mounting bolt (lower)	2	10	44 (4.5, 33)		
Swingarm pivot bolt (left)	1	30	112 (11.4, 82)		
(right)	1	30	10 (1.0, 7)		
Swingarm right pivot lock nut	1	30	112 (11.4, 82)		



**GENERAL INFORMATION**

<b>FRAME (Cont'd)</b>	<b>ITEM</b>	<b>Q'TY</b>	<b>THREAD DIA. (mm)</b>	<b>TORQUE N·m (kgf·m, lbf·ft)</b>	<b>REMARKS</b>
<b>BRAKE SYSTEM:</b>					
	Brake hose oil bolt	3	10	34 (3.5, 25)	
	Wheel cylinder bleed valve	2	8	6 (0.6, 4.3)	
	Front master cylinder reservoir cap screw	2	4	2 (0.2, 1.4)	
	Front brake lever pivot bolt	1	6	1 (0.1, 0.7)	
	nut	1	6	6 (0.6, 4.3)	
	Front brake switch screw	1	4	1 (0.1, 0.7)	
	Front master cylinder holder bolt	2	6	12 (1.2, 9)	
	Wheel cylinder bolt	4	6	8 (0.8, 5.8)	
	nut	4	8	17 (1.7, 12)	
	Wheel cylinder oil pipe joint nut	4	10	16 (1.6, 12)	
	Front brake panel bolt	8	8	29 (3.0, 22)	NOTE 7
	Rear brake arm pinch bolt	1	8	20 (2.0, 14)	
	Rear wheel hub nut	2	20	137 (14.0, 101)	NOTE 6
	Rear brake panel drain bolt	1	8	12 (1.2, 9)	
<b>FRONT DRIVING MECHANISM:</b>					
	Differential ring gear bolt	6	8	49 (5.0, 36)	NOTE 7
	Differential pinion bearing lock nut	1	64	98 (10.0, 72)	NOTE 5, 8
	Differential case cover bolt	2	10	49 (5.0, 36)	NOTE 1
		6	8	25 (2.6, 19)	
	Differential mounting bolt	1	10	44 (4.5, 33)	
		2	8	22 (2.2, 16)	
	nut	1	10	44 (4.5, 33)	NOTE 5
		1	8	22 (2.2, 16)	
<b>REAR DRIVING MECHANISM:</b>					
	Final gear case pinion bearing lock nut	1	64	98 (10.0, 72)	NOTE 5, 8
	Final gear case cover bolt	2	10	49 (5.0, 36)	NOTE 1
		6	8	25 (2.6, 19)	
	Final gear case mounting nut	4	10	54 (5.5, 40)	NOTE 5
	Left and right axle housing nut	12	10	44 (4.5, 33)	NOTE 5
	Skid plate bolt	3	8	32 (3.3, 24)	
	Rear brake panel nut	4	10	44 (4.5, 33)	NOTE 5

## GENERAL INFORMATION

### TOOLS

- NOTES: 1. Newly designed tool  
 2. Equivalent commercially available in U.S.A.  
 3. Not available in U.S.A.  
 4. Alternative tool

DESCRIPTION	TOOL NUMBER	REMARKS	REF. SECTION
Carburetor float level gauge	07401-0010000		5
Universal bearing puller	07631-0010000	NOTE 2	13
Gear holder	07724-0010100	NOTE 3/NOTE 2	13
Flywheel holder	07725-0040000	NOTE 2	11
Bearing remover weight	07741-0010201	NOTE 4: 07936-371020A or 07936-3710200 (U.S.A. only)	10, 12, 13, 15, 17, 18
Valve guide driver, 5.5 mm	07742-0010100		8
Attachment, 37 x 40 mm	07746-0010200		12, 13, 15
Attachment, 42 x 47 mm	07746-0010300		10, 12, 13, 14
Attachment, 52 x 55 mm	07746-0010400		12, 13, 14, 17, 18
Attachment, 62 x 68 mm	07746-0010500		18
Attachment, 24 x 26 mm	07746-0010700		11
Attachment, 22 x 24 mm	07746-0010800		14, 15, 17, 18
Attachment, 15 mm I.D.	07746-0020200		14, 17
Attachment, 20 mm I.D.	07746-0020400		17
Driver, 40 mm I.D.	07746-0030100		18
Attachment, 30 mm I.D.	07746-0030300		18
Pilot, 10 mm	07746-0040100		11
Pilot, 15 mm	07746-0040300		13
Pilot, 17 mm	07746-0040400		10, 12, 13
Pilot, 20 mm	07746-0040500		13
Pilot, 25 mm	07746-0040600		12, 13
Pilot, 30 mm	07746-0040700		13, 14
Pilot, 35 mm	07746-0040800		18
Pilot, 40 mm	07746-0040900		13
Pilot, 22 mm	07746-0041000		10, 14
Pilot, 28 mm	07746-0041100		17, 18
Pilot, 14 mm	07746-0041200		17, 18
Pilot, 16 mm	07746-0041300		14, 15
Driver	07749-0010000		10, 11, 12, 13, 14, 15, 17, 18
Valve spring compressor	07757-0010000		8
Valve seat cutter, 35 mm (IN 45°)	07780-0010400	NOTE 2	8
Valve seat cutter, 33 mm (EX 45°)	07780-0010800	NOTE 2	8
Flat cutter, 33 mm (EX 32°)	07780-0012900	NOTE 2	8
Flat cutter, 36 mm (IN 32°)	07780-0013500	NOTE 2	8
Interior cutter, 30 mm (EX 60°)	07780-0014000	NOTE 2	8
Interior cutter, 34 mm (IN 60°)	07780-0014700	NOTE 2	8
Cutter holder, 5.5 mm	07781-0010101	NOTE 2	8
Lock nut wrench	07908-4690003		15
Pilot screw wrench	07908-4730002		5
Snap ring pliers	07914-SA50001	NOTE 4: 07914-3230001	16
Lock nut wrench, 30 x 64 mm	07916-MB00002		17, 18
Puller shaft	07931-ME40000	NOTE 4: 07931-ME4010B and 07931-HB3020A (U.S.A. only)	18
Flywheel puller	07933-3950000		11
Bearing remover handle	07936-3710100		10, 12, 13
Bearing remover, 17 mm	07936-3710300		10, 12, 13
Bearing remover, 20 mm	07936-3710600		12, 13
Attachment, 28 x 30 mm	07946-1870100		14
Driver	07949-3710001		14
Oil seal driver	07965-KE80200	NOTE 4: 07947-KA50100 (U.S.A. only)	17, 18
Oil seal driver	07965-MC70100		16

## GENERAL INFORMATION

DESCRIPTION	TOOL NUMBER	REMARKS	REF. SECTION
Assembly collar	07965-VM00100		13
Assembly shaft	07965-VM00200	NOTE 3/NOTE 4: 07931-ME4010B and 07931-HB3020A(U.S.A. only)	13, 17
Threaded adaptor	07965-VM00300	NOTE 3/NOTE 4 07931-KF00200	13
Valve guide reamer, 5.5 mm	07984-2000001	NOTE 4: 07984-200000D (U.S.A. only)	8
Pressure gauge hose	07FPJ-7520110	NOTE 3/NOTE 2	4
Attachment, 78 x 90 mm	07GAD-SD40101		13
Inspection adaptor	07GMJ-ML80100		22
Hub bearing driver	07HAD-SG00100		10
Pinion puller base	07HMC-MM80110	NOTE 4: 07HMC-MM8011A (U.S.A. only)	17, 18
Adjustable bearing remover set	07JAC-PH80000	NOTE 4: 07736-A01000B or *07736-A01000A (U.S.A. only)	15
Remover attachment	07JAC-PH80100		15
Remover shaft assembly	07JAC-PH80200		15
Oil seal driver attachment	07JAD-PH80100		18
Oil seal driver	07JAD-PH80101		14
Differential inspection tool	07KMK-HC50101	NOTE 4: 07KMK-HC5010A (U.S.A. only)	17
Pressure gauge attachment	07KPJ-VD60100	NOTE 3/ NOTE 4: 07KPJ-VD6010A (U.S.A. only)	4
Driver attachment	07LAD-PW50500		18
Ball joint remover	07MAC-SL00200		14, 17
Pilot, 32 mm	07MAD-PR90200		13, 18
Recoil pulley holder	07SMB-HM70100		11
Pinion holder	07SMB-HM70200		18
Bearing remover head, 14 mm	07WMC-KFG0100	NOTE 4: 07936-KC10200 and 07YMC-001010A (U.S.A. only)	17, 18
Bearing remover shaft, 15 mm	07936-KC10100		17, 18
Ball joint remover/installer	07WMF-HN00100		14
Oil pressure gauge	07YAJ-0010100	NOTE 3/NOTE 2	4
Oil pressure gauge	07YAJ-0010300		4
Differential Bearing Clip Compressor	07YME-HN4010A		17
Threaded adaptor	07YMF-HN4010A		17
Clutch holder set	07ZMB-HN20000	NOTE 1	10
Clutch holder plate	07ZMB-HN20100		10
Clutch holder pin	07ZMB-HN20200		10
Outside screw puller, 40 x 1.5 mm	07ZMC-HN20100	NOTE 1	10

\*Use with commercially available 3/8"x16 slide hammer.

## GENERAL INFORMATION

### LUBRICATION & SEAL POINTS

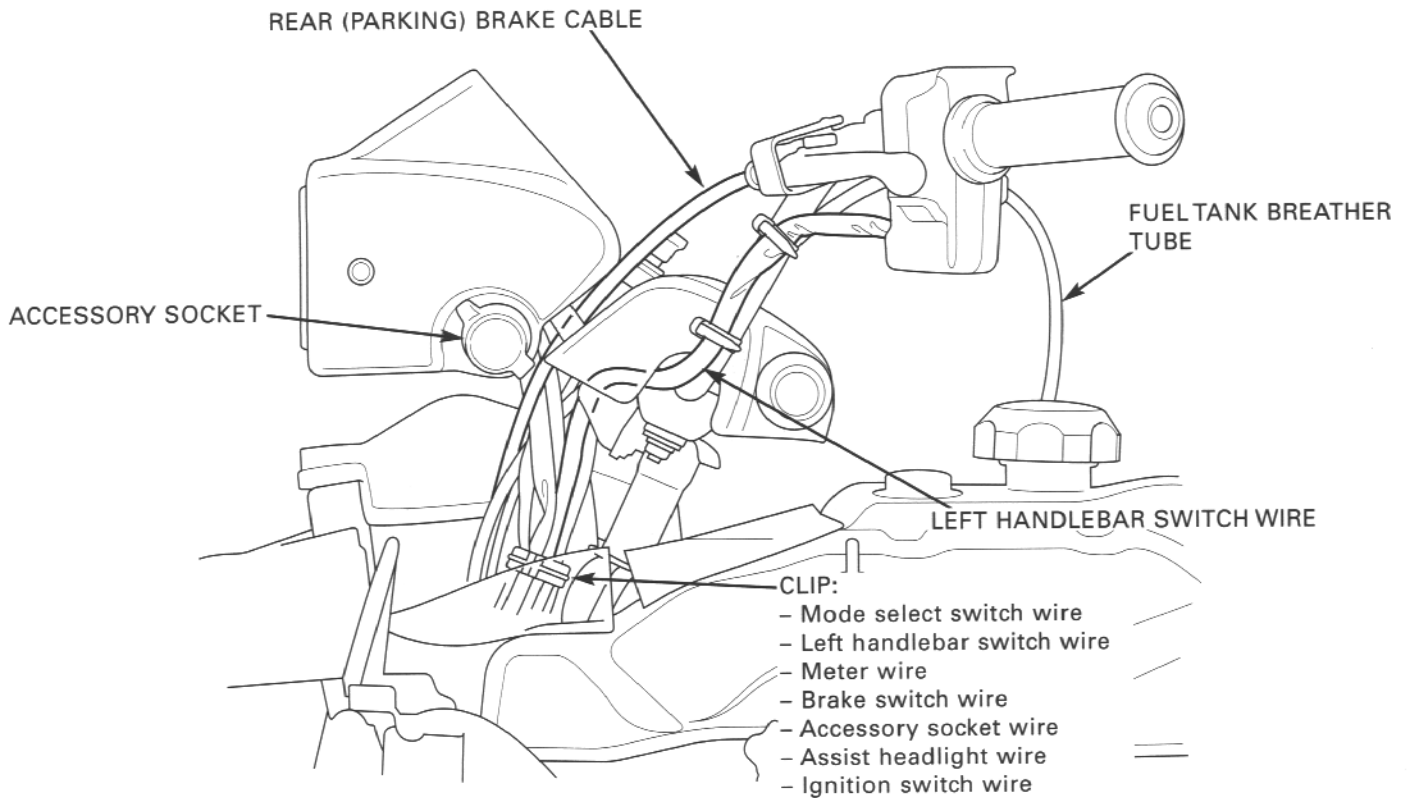
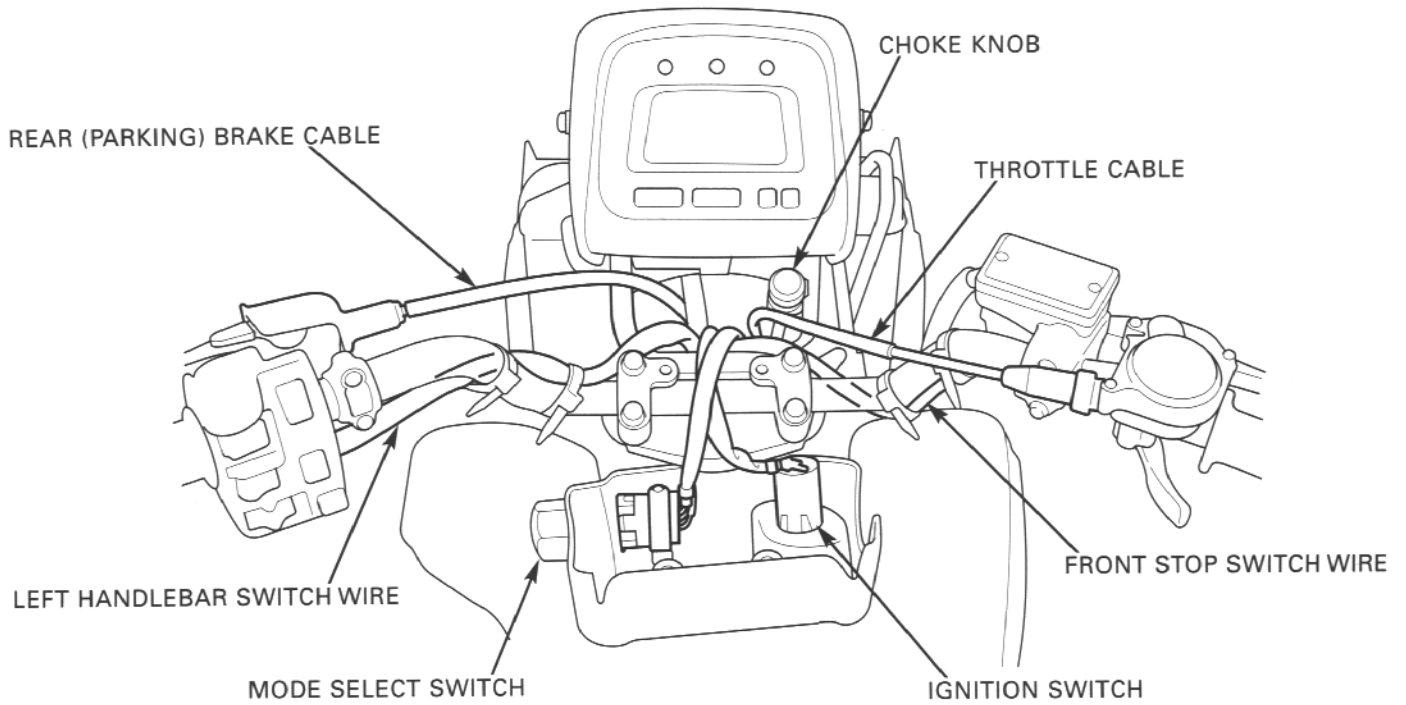
ENGINE	LOCATION	MATERIAL	REMARKS
	Camshaft cam lobes Rocker arm shaft sliding surface Valve stem (valve guide sliding surface) Piston pin outer surface Starter driven gear bearing Starter reduction gear shaft and journals Starter reduction gear teeth Sub-transmission gear sliding surfaces and gear bushings Starter motor shaft spline Control motor shaft splines	Molybdenum disulfide solution (a mixture of 1/2 engine oil and 1/2 molybdenum disulfide grease)	
	Rocker arm followers and adjusting screw tips Cam chain Cam follower whole surfaces Cylinder head cap nut threads and seating surfaces Connecting rod small end inner surface Piston outer surface and piston pin hole Piston rings Cylinder bore Centrifugal clutch drum crankshaft contacting surface Centrifugal clutch drive plate sprag clutch contacting surface Centrifugal clutch center lock nut threads and seating surface Automatic transmission control motor reduction gear teeth, driven gear teeth and shaft Recoil starter driven pulley bolt threads and seating surface Starter sprag clutch whole surface Sub-transmission gear teeth Sub-transmission mainshaft and countershaft journals Shift fork shaft Shift drum grooves Primary driven gear bolt threads and seating surfaces Each bearing rotating area Each O-ring whole surface Each oil seal lip	Engine oil	
	Recoil starter driven pulley oil seal lips	Multi-purpose grease	
	Oil gallery separate plate bolt threads (inside of oil tank) Ignition pulse generator bolt threads Starter clutch bolt threads Oil gallery sealing bolt threads (inside of front crankcase cover) Gearshift spindle stopper plate bolt threads Gearshift drum stopper arm pivot bolt threads Gearshift drum center bolt threads Oil pump driven sprocket bolt threads Cam chain tensioner slider pivot bolt threads Primary driven gear bolt threads Angle sensor bolt threads Coolant thermosensor threads	Locking agent	Do not apply to the sensor head.
	Oil tank mating surfaces Alternator/ignition pulse generator wire grommet seating groove Front crankcase cover mating surface Rear crankcase cover mating surface Crankcase mating surface	Liquid sealant	



## GENERAL INFORMATION

FRAME (Cont'd)		
LOCATION	MATERIAL	REMARKS
Front brake lever-to-master piston contacting area Front brake lever pivot and sub-arm pivot collar Wheel cylinder adjuster screw threads and adjuster nut spindle outer surface Wheel cylinder body boot groove and piston boot groove Brake panel shoe metal contacting areas Wheel cylinder adjuster groove and piston groove (shoe contacting grooves)	Silicone grease	
Throttle cable outer inside Choke cable outer inside Rear brake cable (pedal and lever) outer inside	Cable lubricant	
Master cylinder piston and cups Wheel cylinder piston and cup	DOT 4 brake fluid	
Handlebar grip rubber inside Air cleaner case-to-connecting tube (carburetor and air intake duct) mating surface	Honda Bond A or Honda Hand Grip Cement (U.S.A. only) or equivalent	
Wheel cylinder-to-brake panel mating surface Front differential case cover mating surface Rear final gear case cover mating surface	Liquid sealant	
Cooling fan motor shaft nut threads	Locking agent	

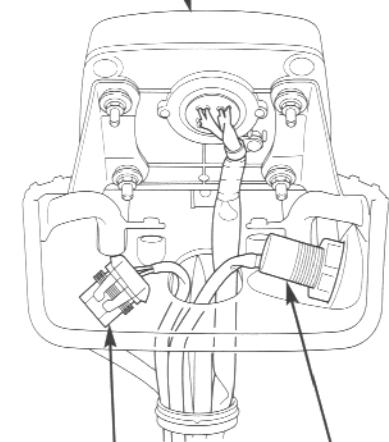
CABLE & HARNESS ROUTING



## GENERAL INFORMATION

Inside of the assist headlight case:

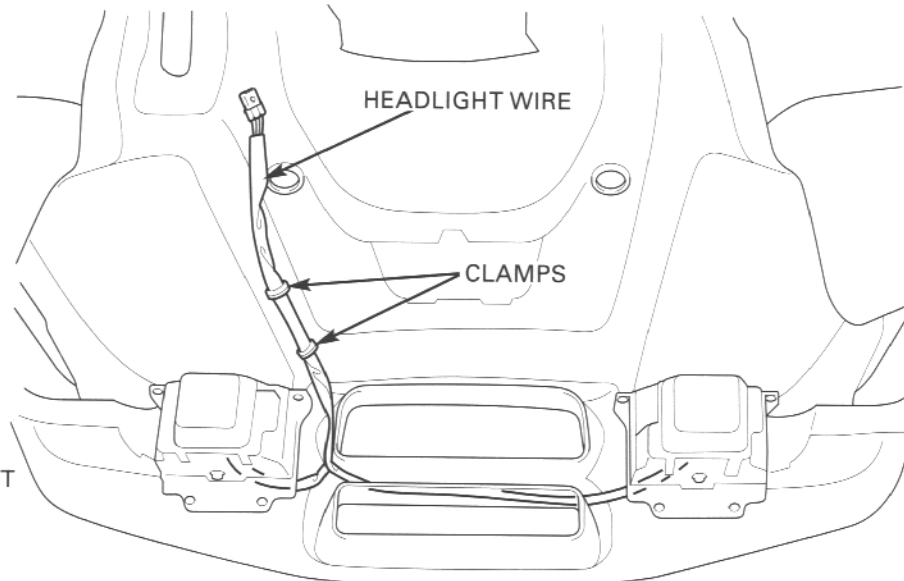
COMBINATION METER



ACCESSORY SOCKET

ASSIST HEADLIGHT SOCKET

Reverse side of the front fender:



HEADLIGHT WIRE

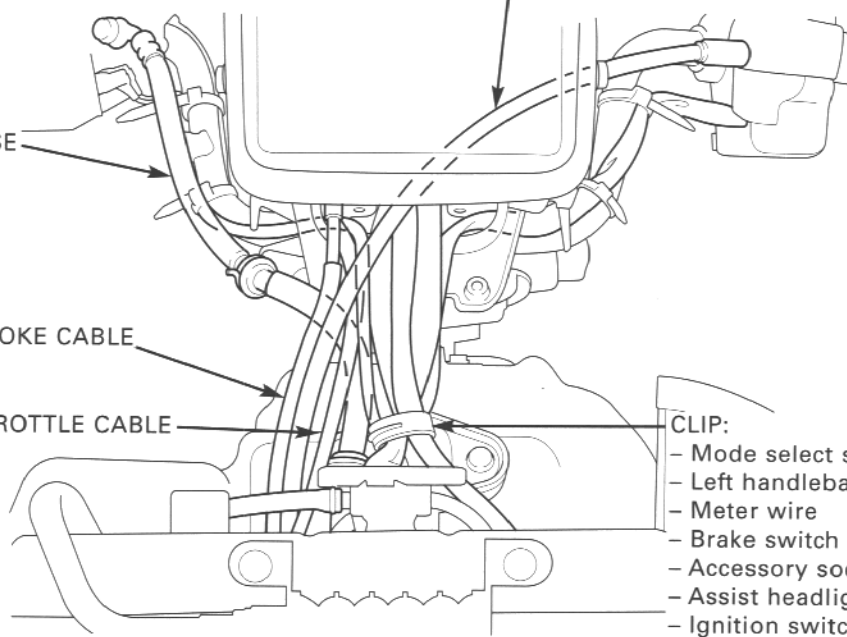
CLAMPS

REAR (PARKING) BRAKE CABLE

FRONT BRAKE HOSE

CHOKE CABLE

THROTTLE CABLE

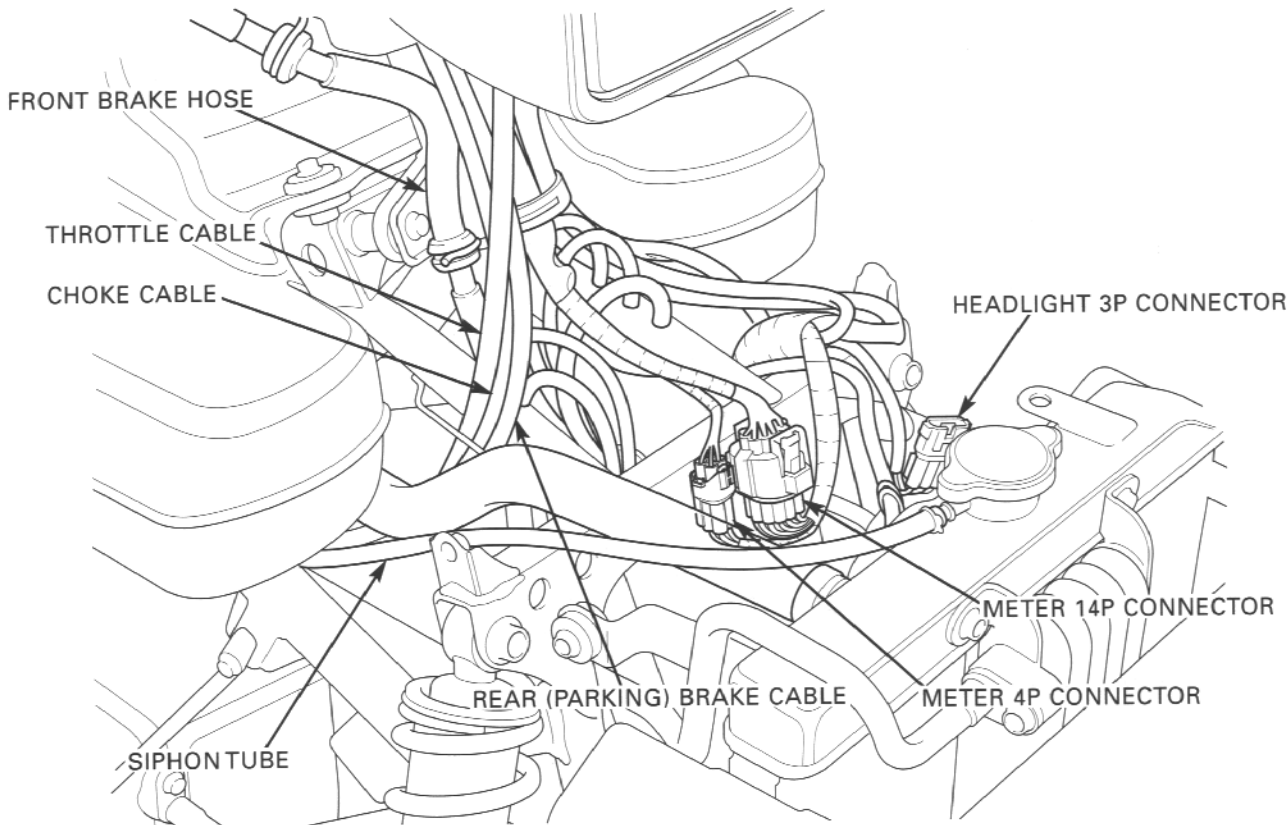
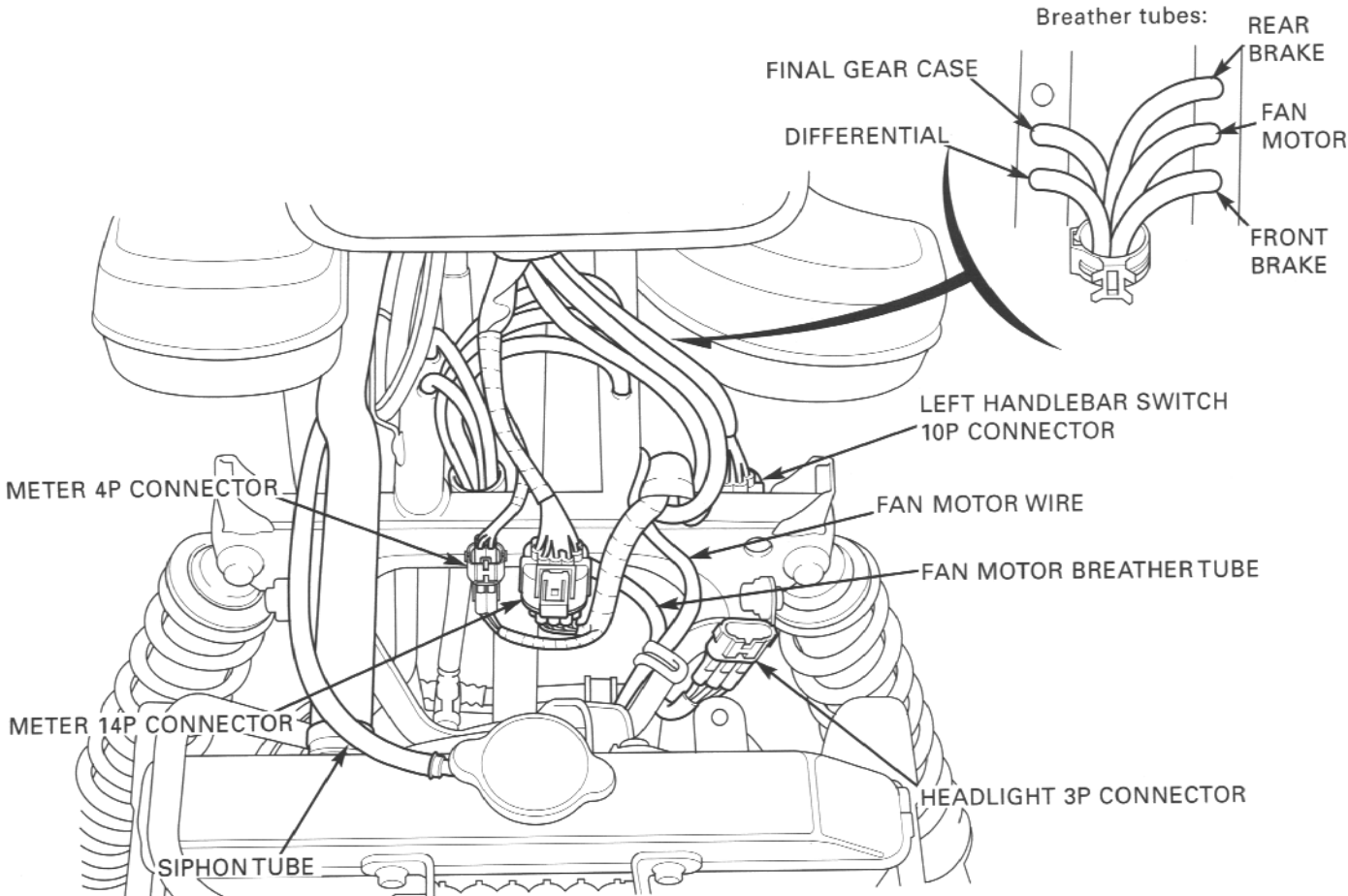


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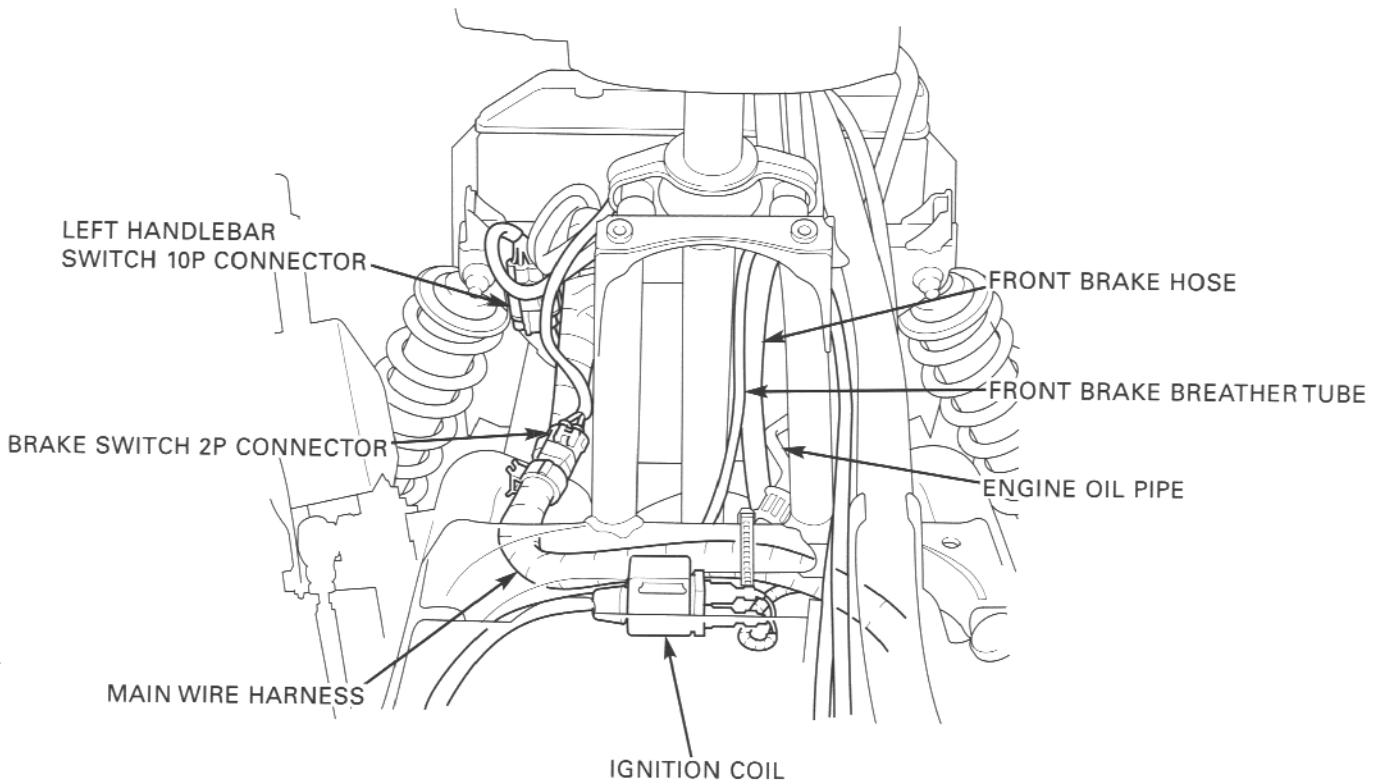
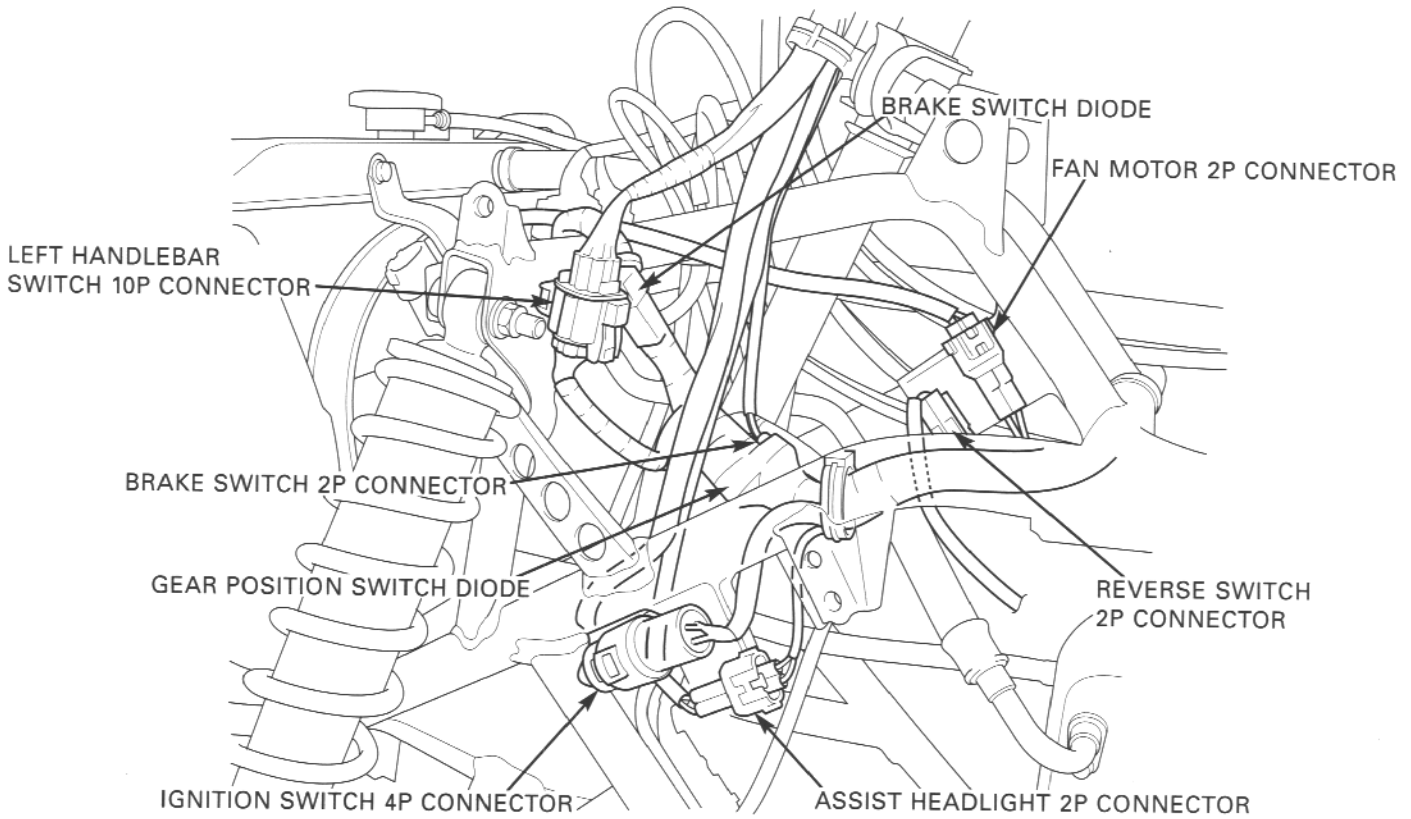
- Mode select switch wire
- Left handlebar switch wire
- Meter wire
- Brake switch wire
- Accessory socket wire
- Assist headlight wire
- Ignition switch wire

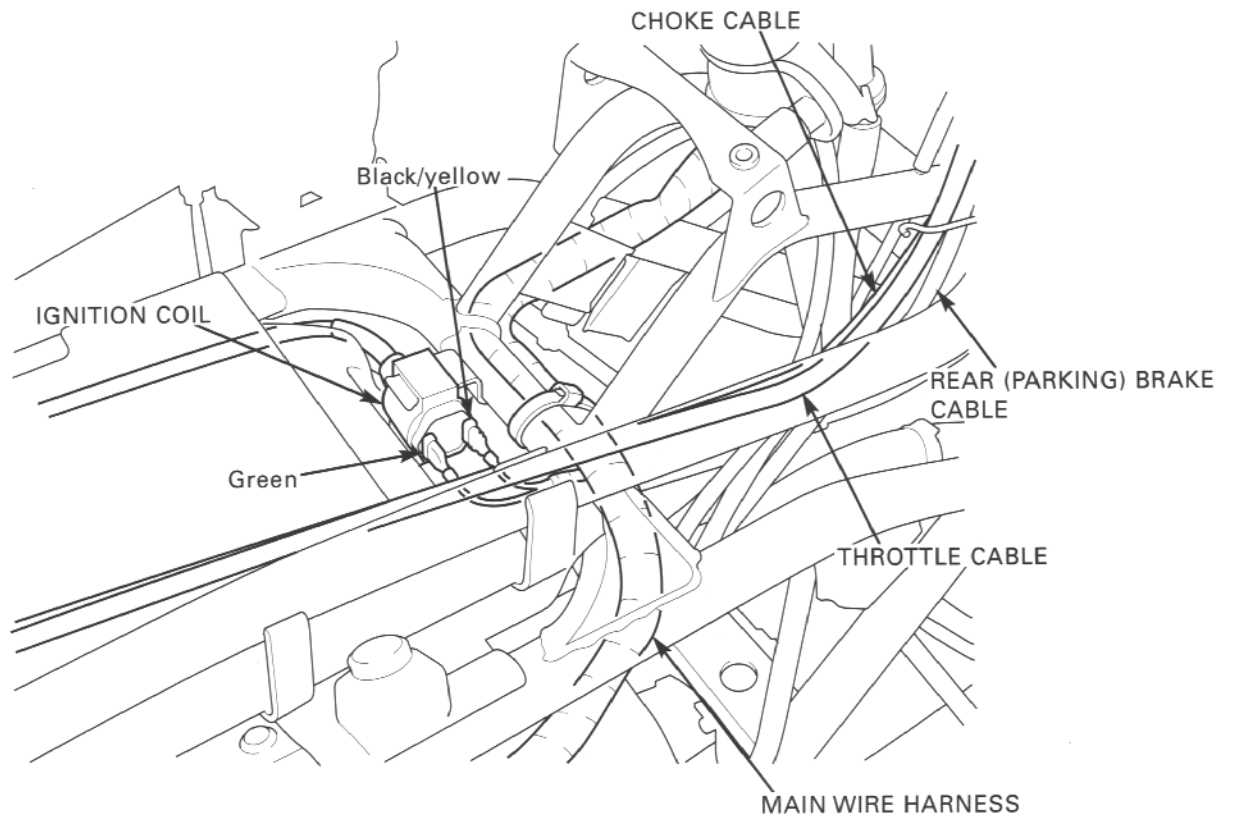


**GENERAL INFORMATION**



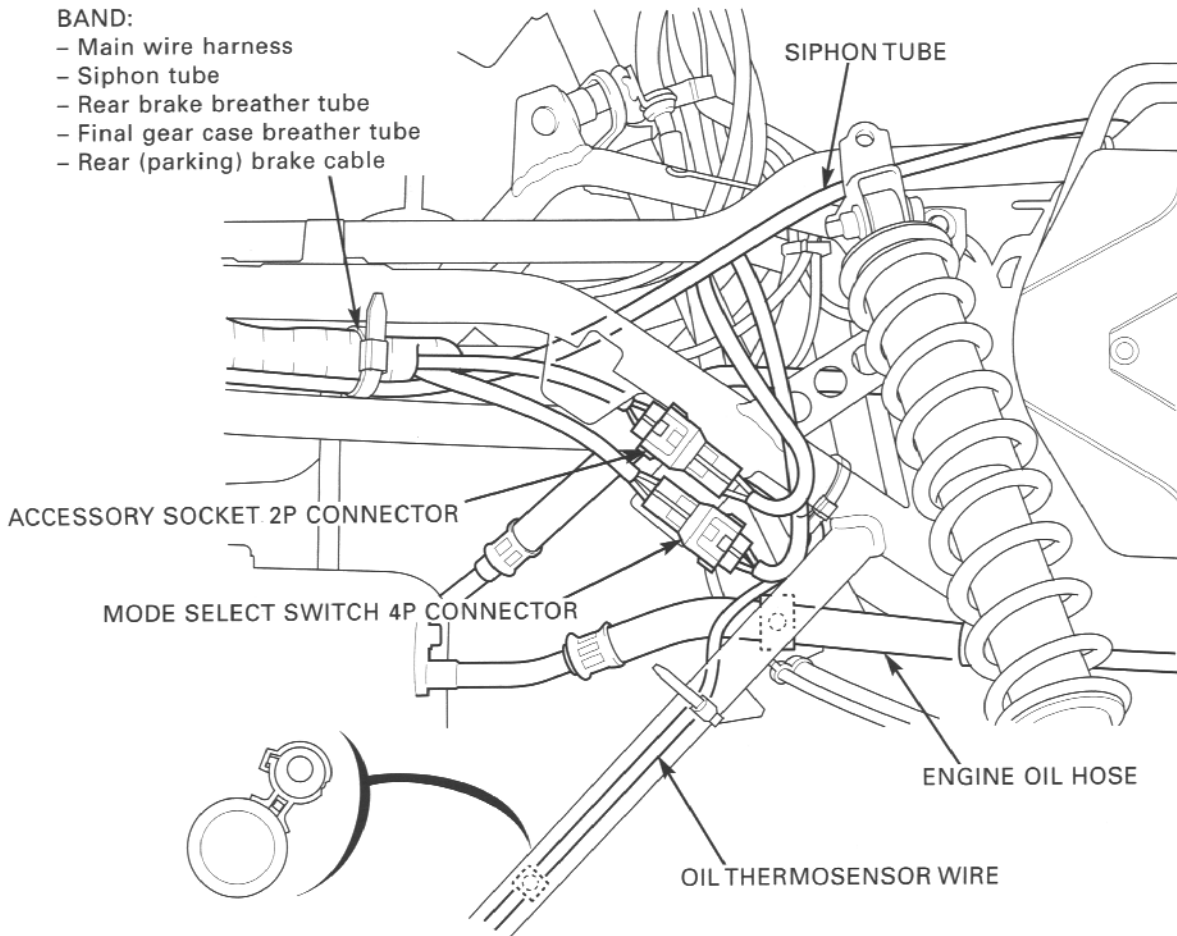
# GENERAL INFORMATION



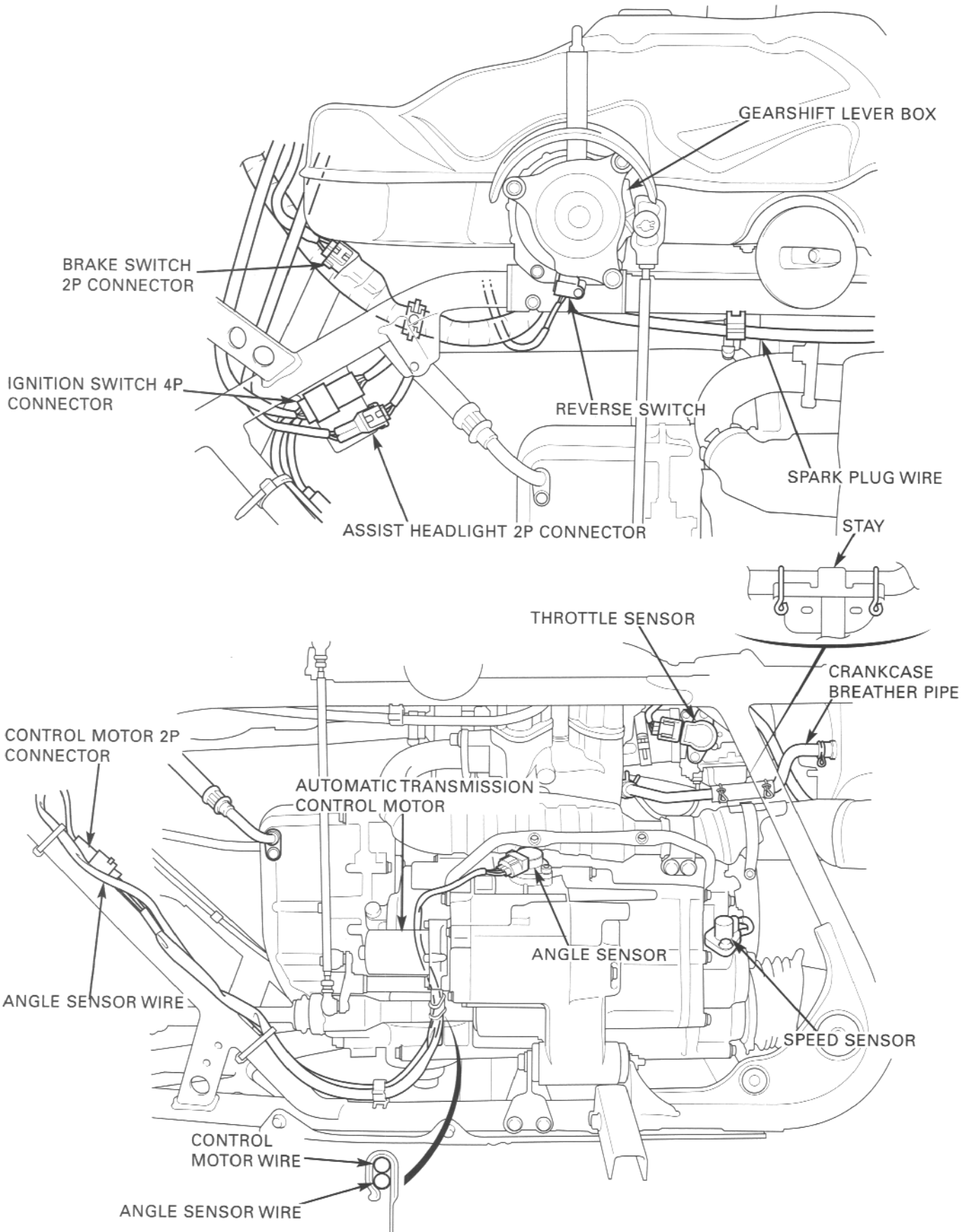


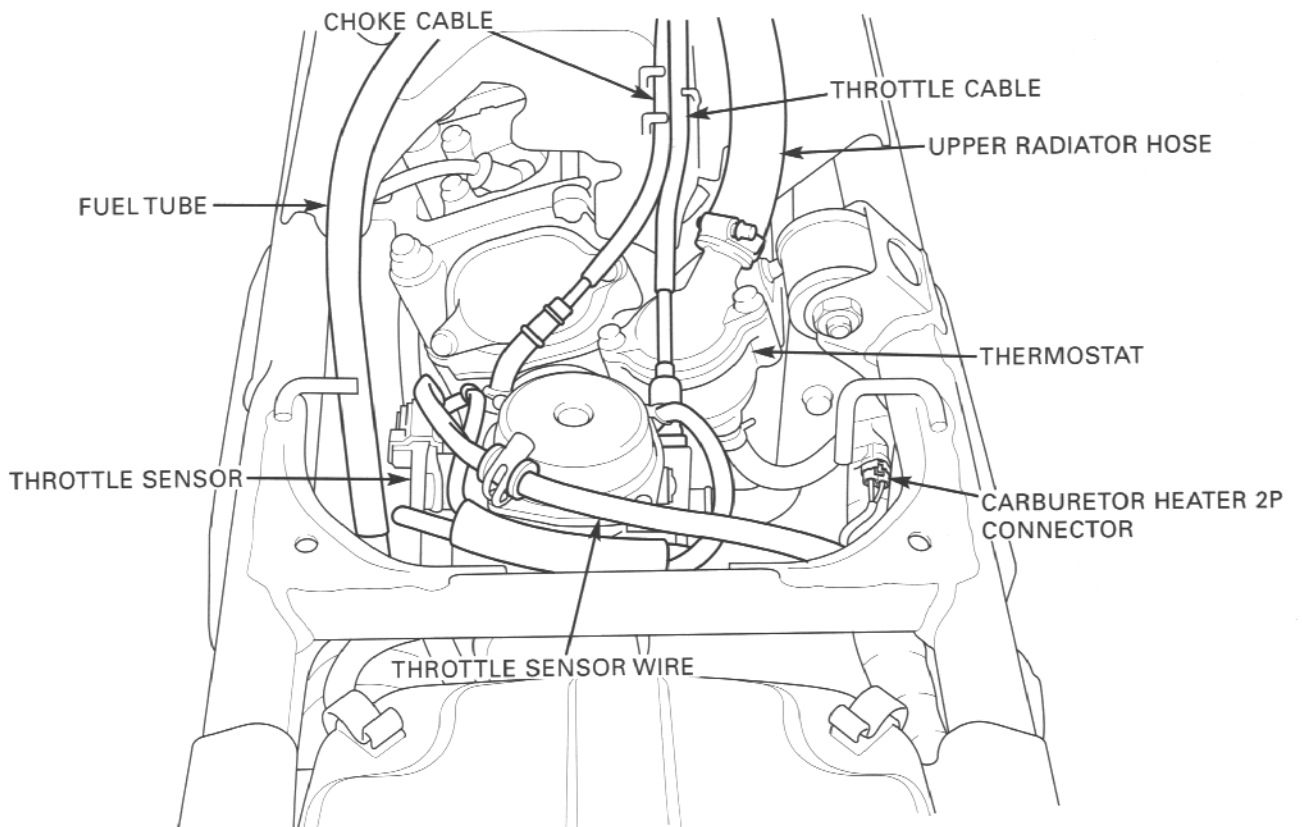
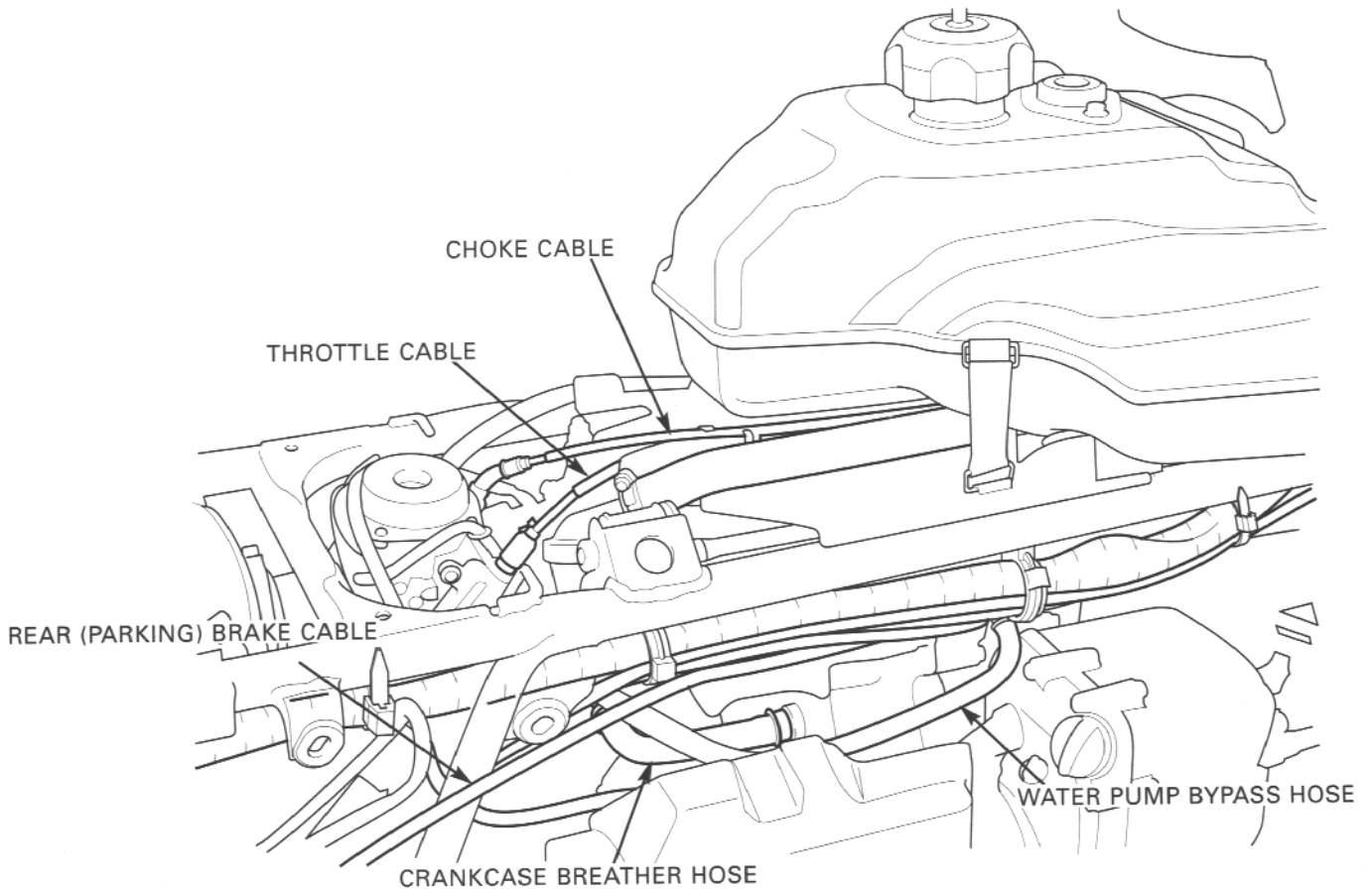
**BAND:**

- Main wire harness
- Siphon tube
- Rear brake breather tube
- Final gear case breather tube
- Rear (parking) brake cable



# GENERAL INFORMATION

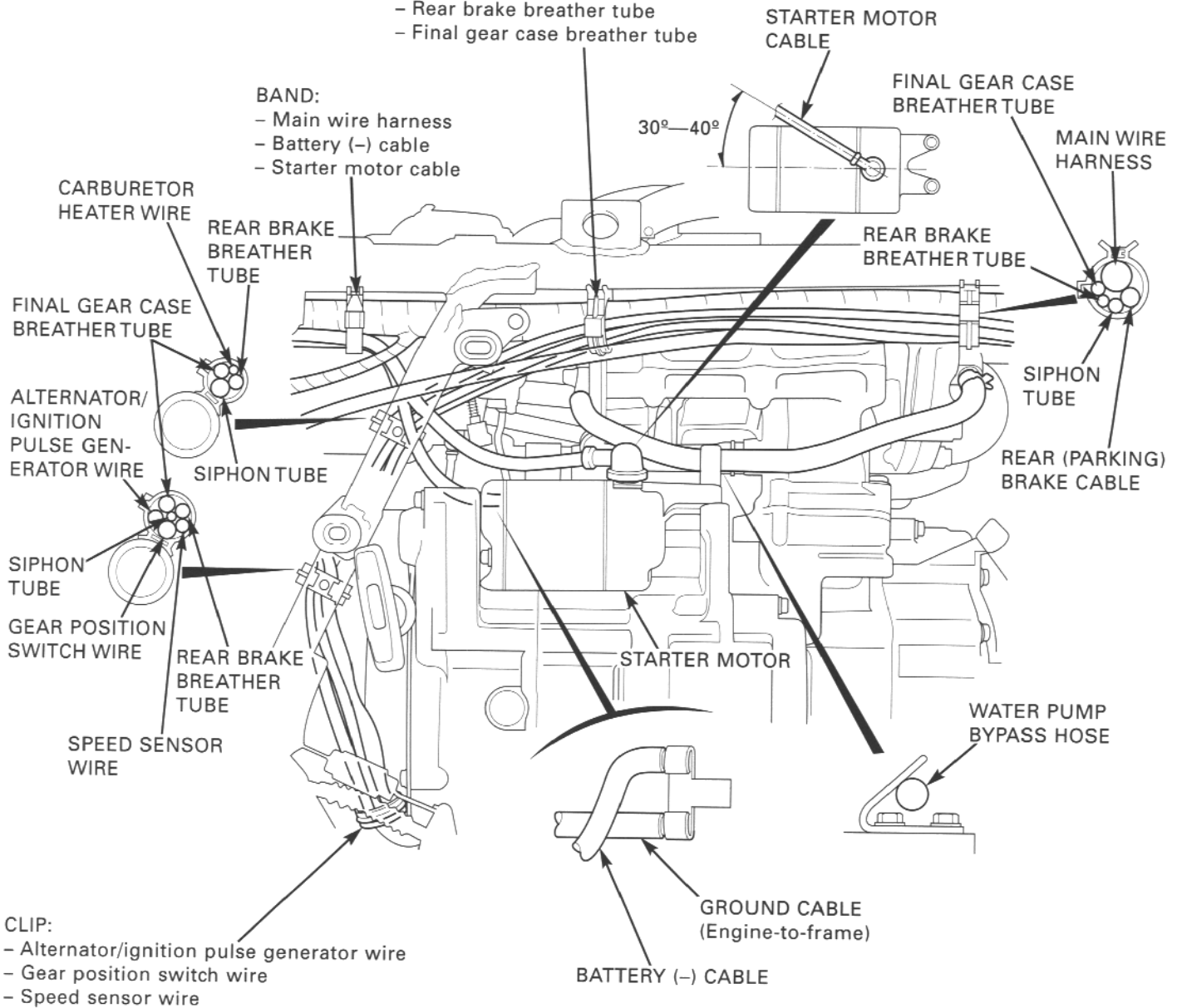


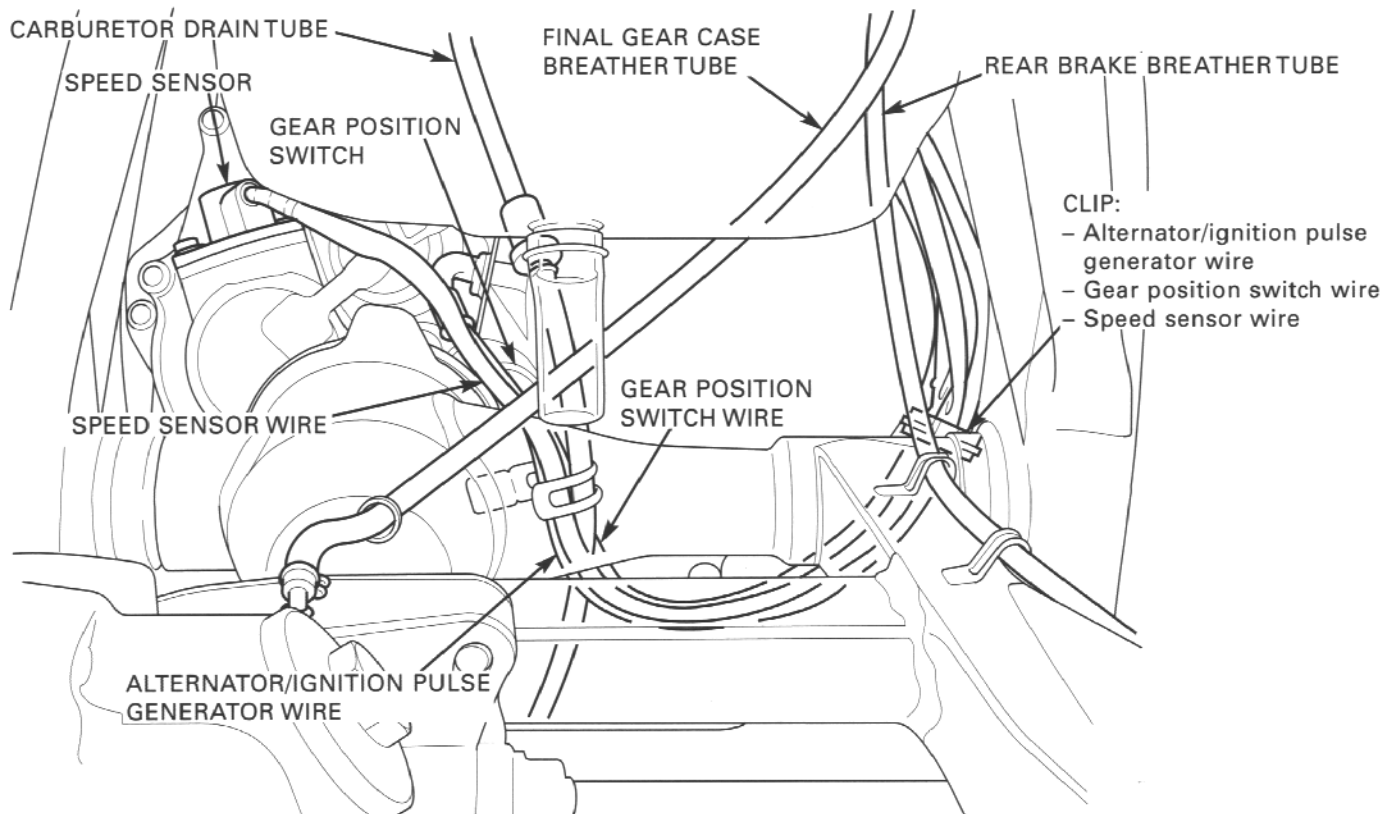
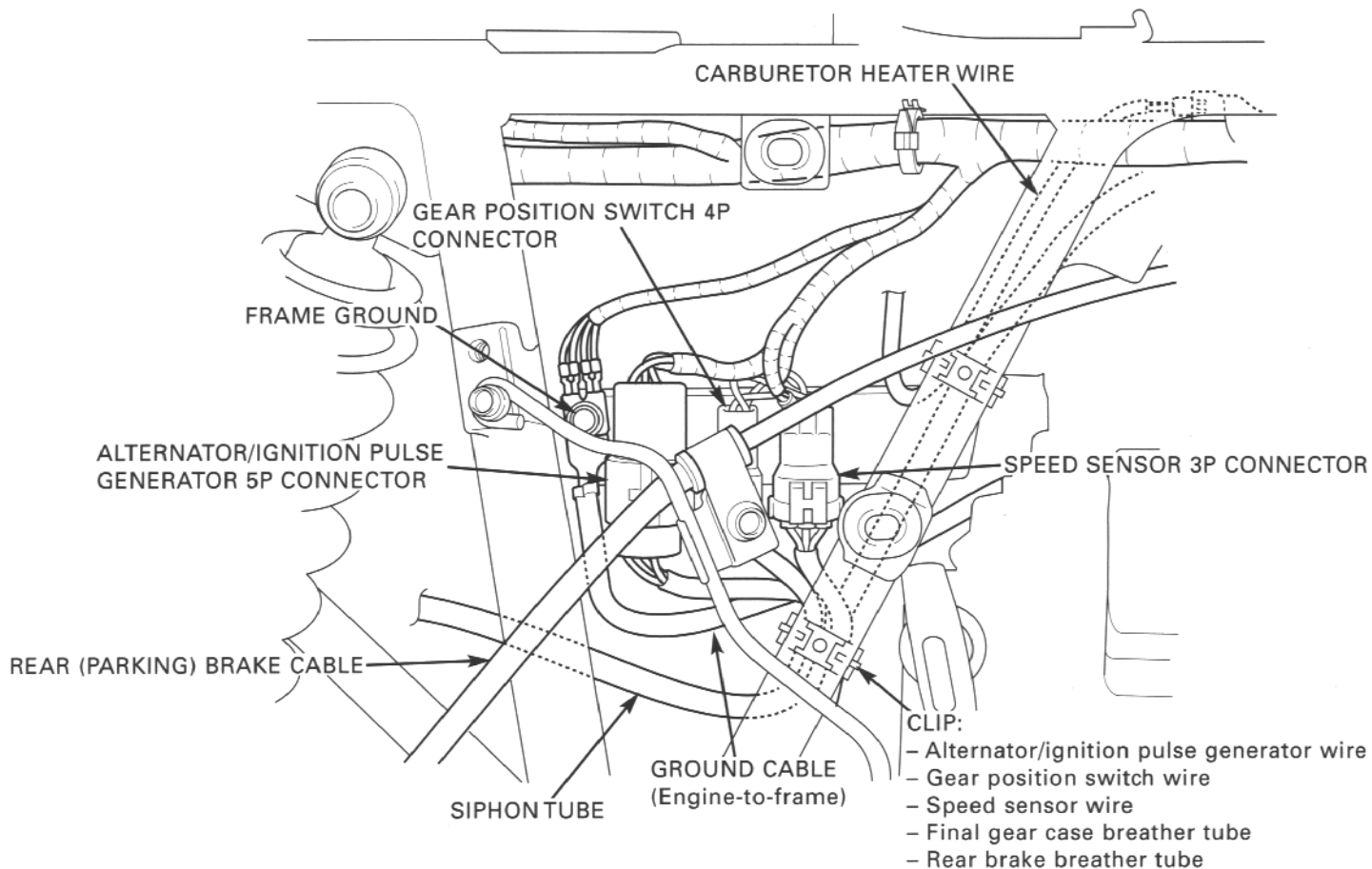


# GENERAL INFORMATION

- CLIP:  
 - Main wire harness  
 - Siphon tube  
 - Rear brake breather tube  
 - Final gear case breather tube

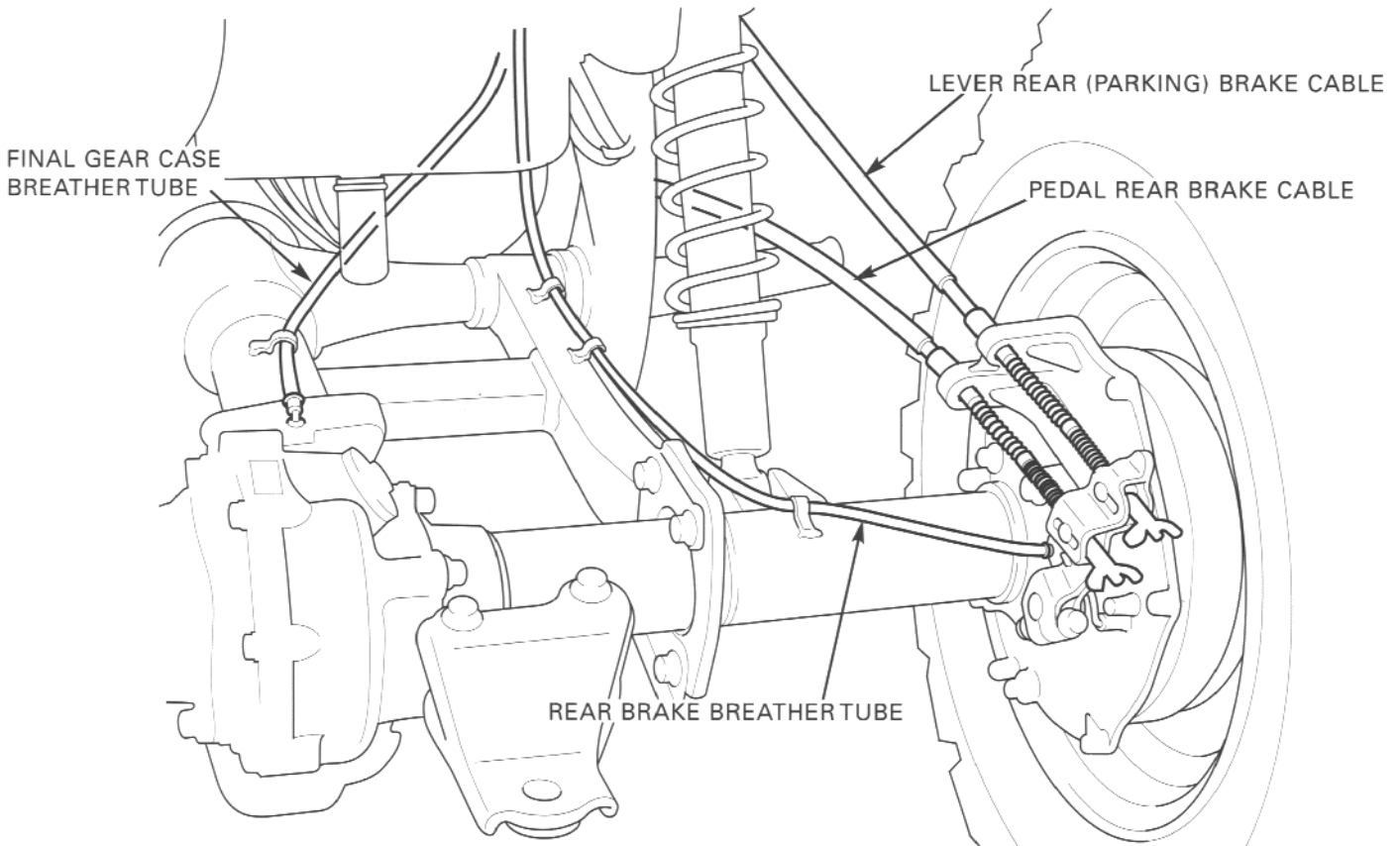
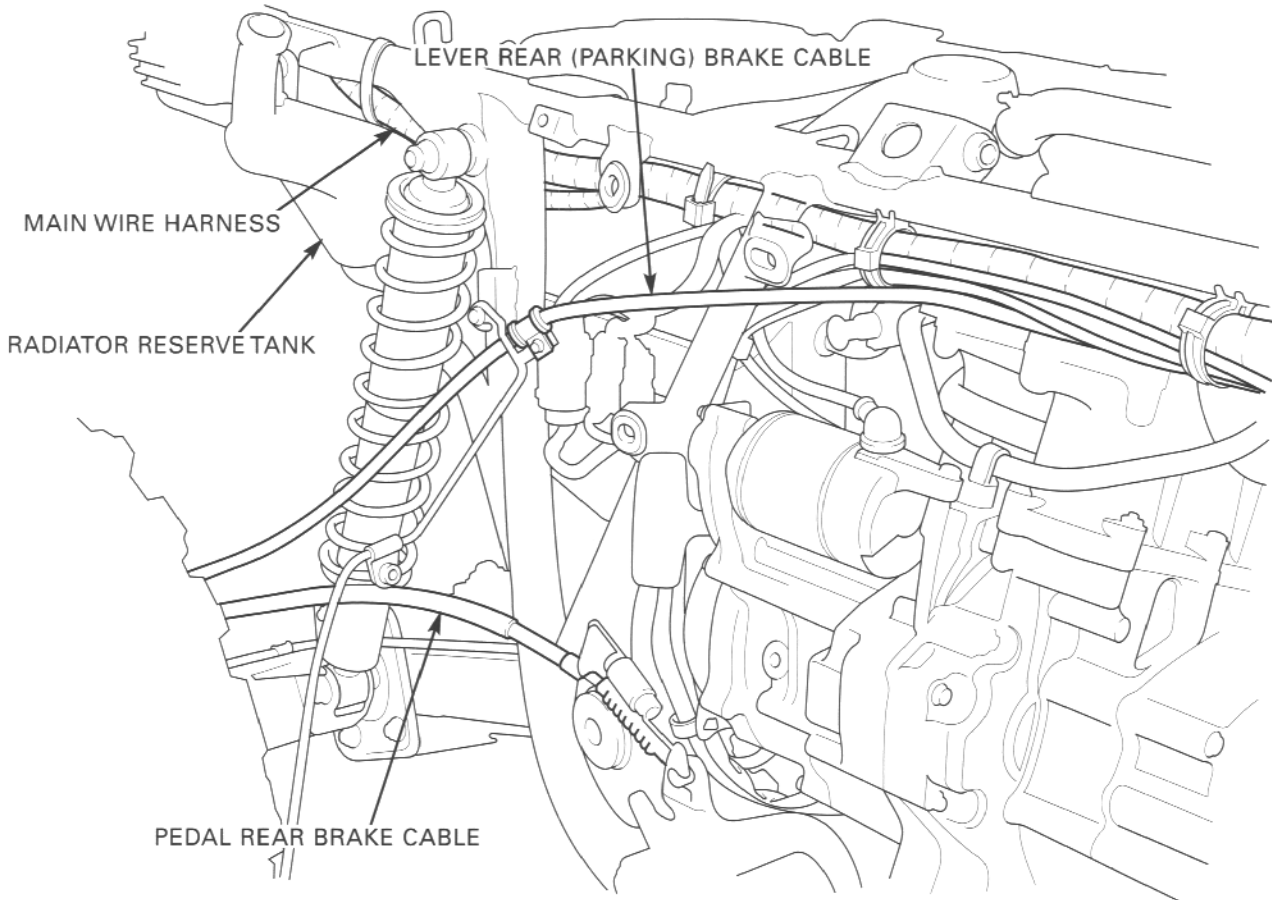
- BAND:  
 - Main wire harness  
 - Battery (-) cable  
 - Starter motor cable



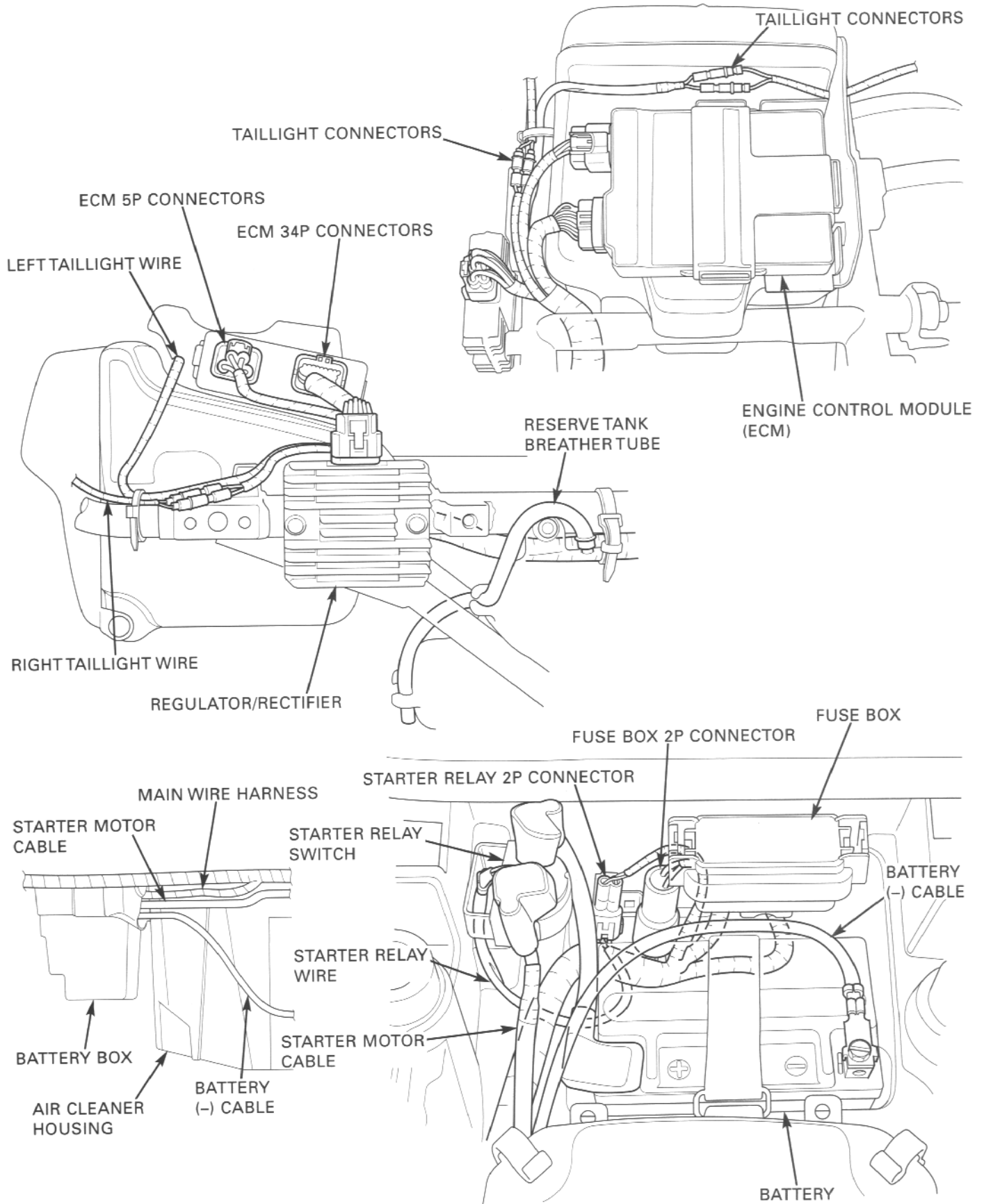


## GENERAL INFORMATION

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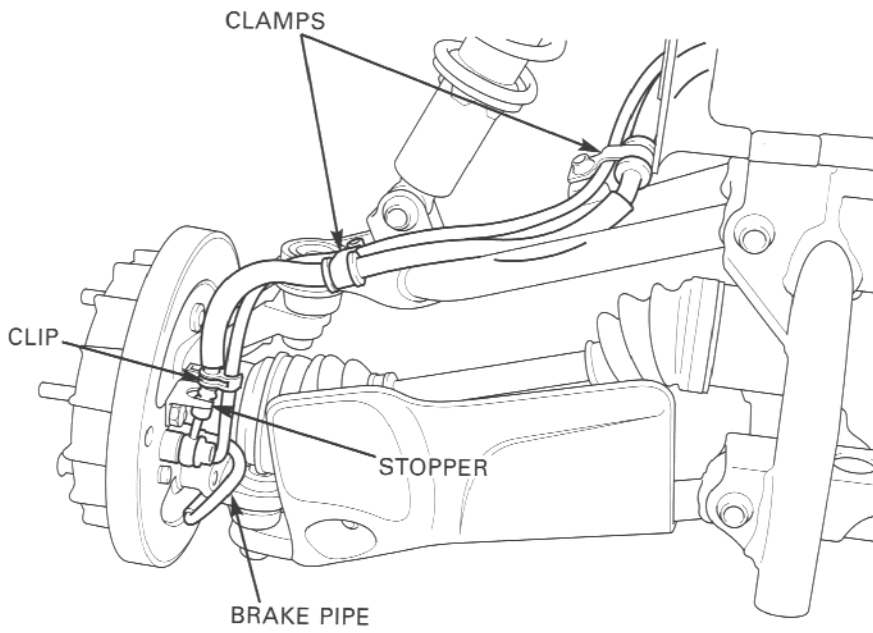
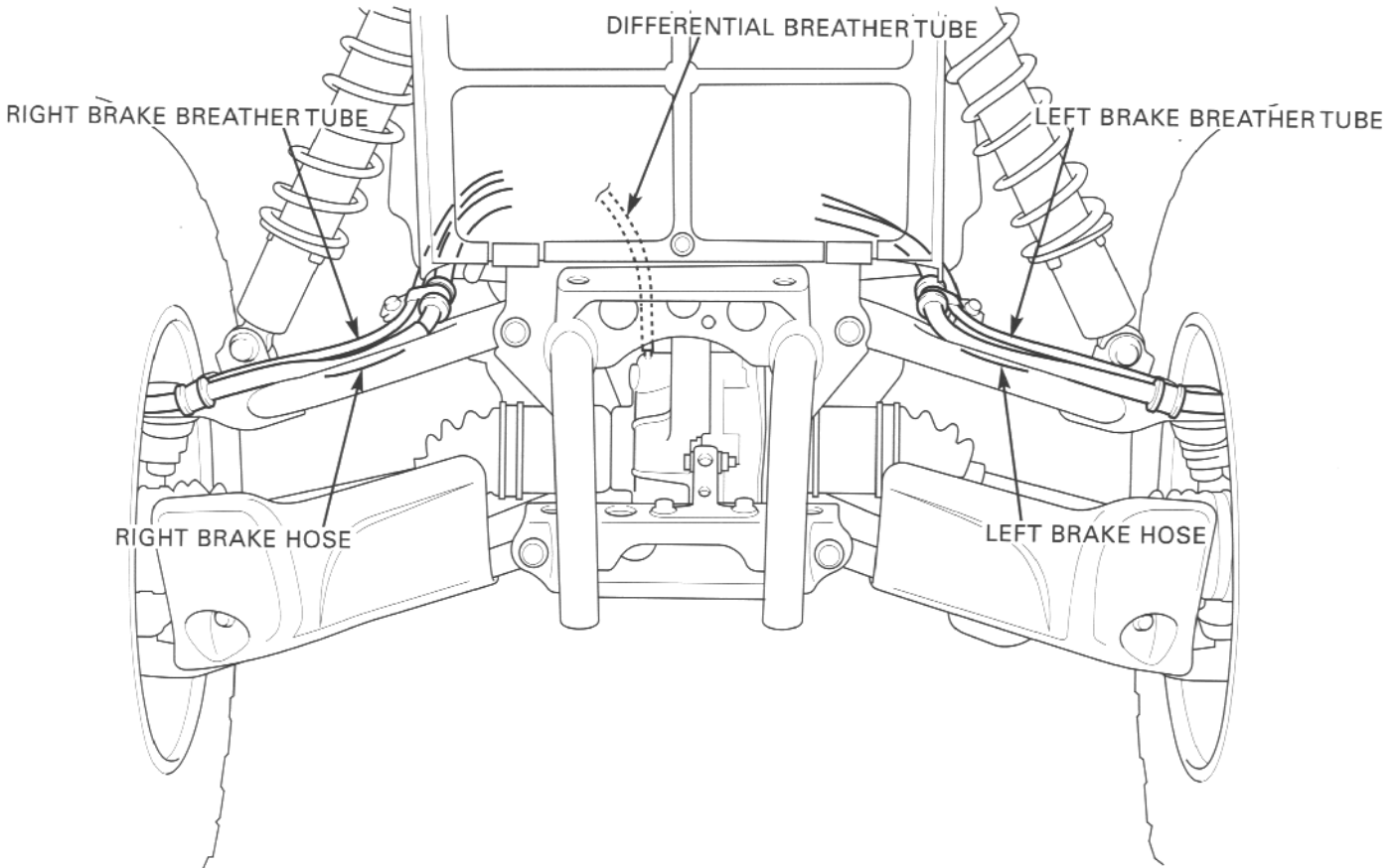


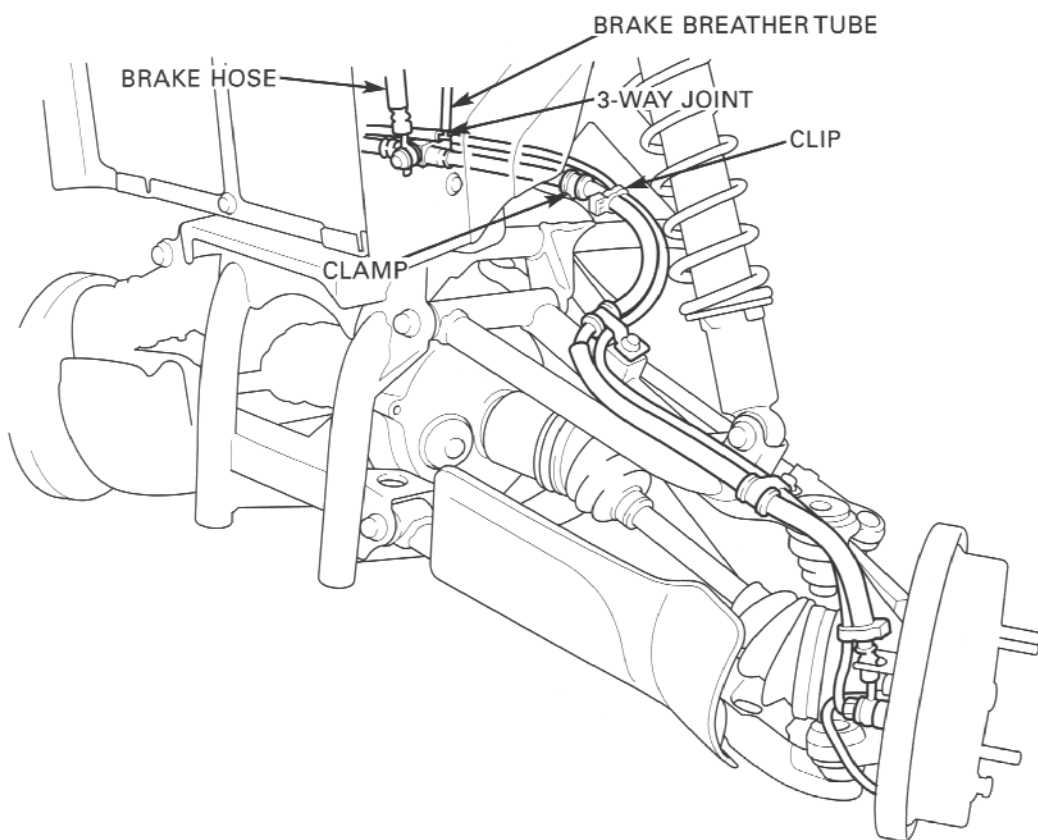
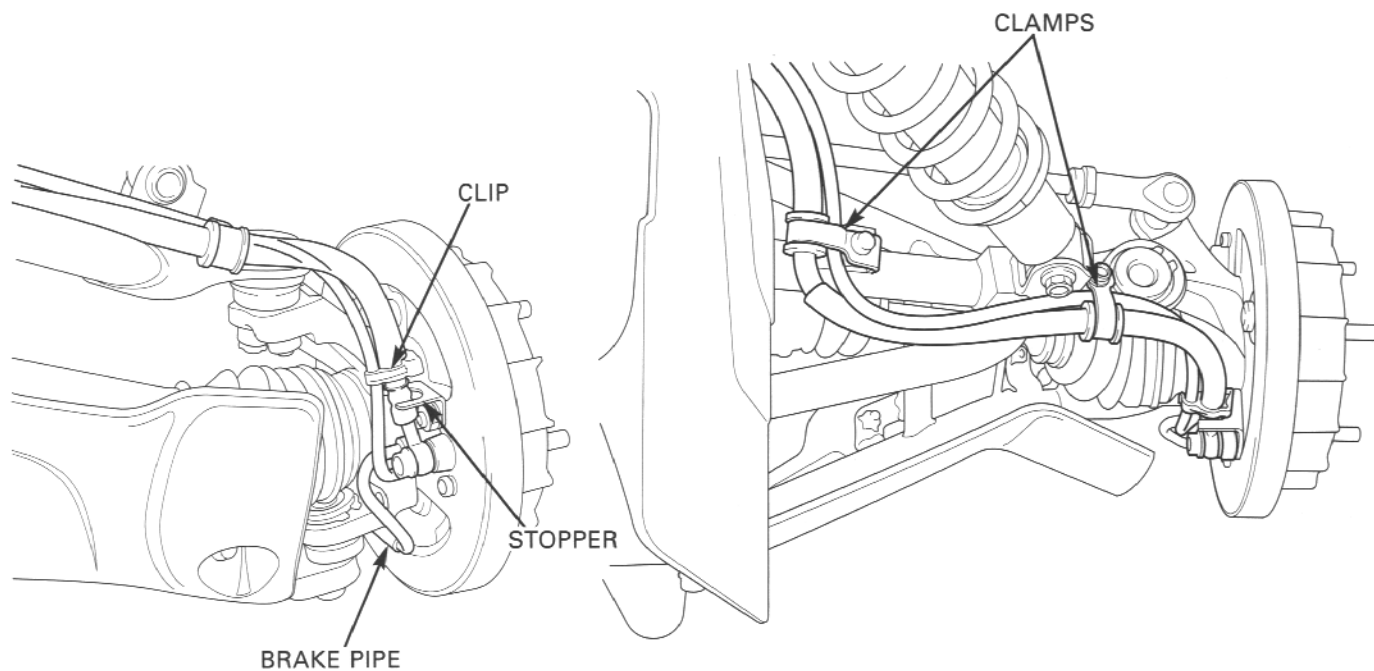




# GENERAL INFORMATION

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## GENERAL INFORMATION

# EMISSION CONTROL SYSTEMS

The California Air Resources Board (CARB) requires manufacturers to certify that their ATVs comply with applicable exhaust emissions standards during their useful life, when operated and maintained according to the instructions provided.

## SOURCE OF EMISSIONS

The combustion process produces carbon monoxide and hydrocarbons. Controlling hydrocarbon emissions is very important because, under certain conditions, they react to form photochemical smog when subjected to sunlight. Carbon monoxide does not react in the same way, but it is toxic.

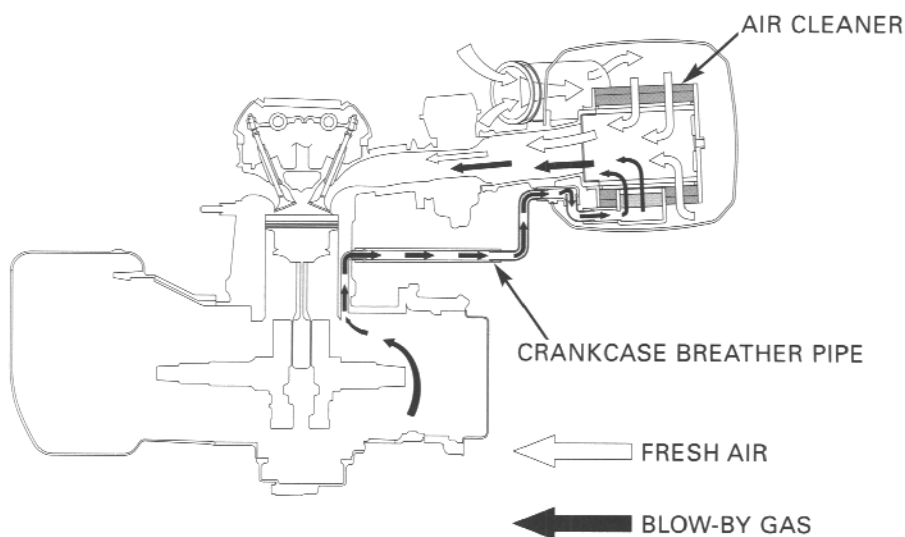
Honda Motor Co., Ltd. utilizes lean carburetor settings as well as other systems, to reduce carbon monoxide and hydrocarbons.

## EXHAUST EMISSION CONTROL SYSTEM

The exhaust emission control system is composed of a lean carburetor setting, and no adjustments should be made except idle speed adjustment with the throttle stop screw. The exhaust emission control system is separate from the crankcase emission control system.

## CRANKCASE EMISSION CONTROL SYSTEM

The engine is equipped with a closed crankcase system to prevent discharging crankcase emissions into the atmosphere. Blow-by gas is returned to the combustion chamber through the air cleaner and carburetor.



## NOISE EMISSION CONTROL SYSTEM

**TAMPERING WITH THE NOISE CONTROL SYSTEM IS PROHIBITED:** U.S. federal law prohibits, or Canadian provincial law prohibits the following acts or the causing thereof: (1) 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; (2) the use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

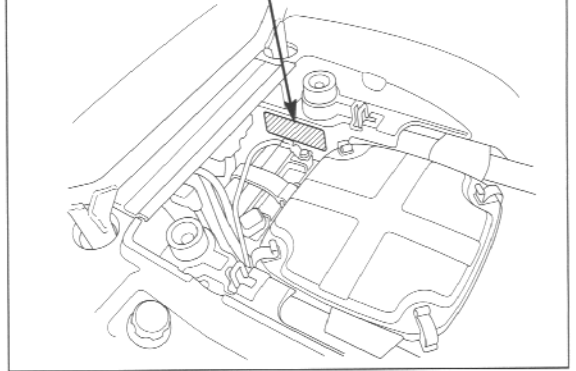
AMONG THOSE ACTS PRESUMED TO CONSTITUTE TAMPERING ARE THE ACTS LISTED BELOW:

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

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

The Vehicle Emission Control Information Label is attached on the left of the battery box.

EMISSION CONTROL INFORMATION LABEL



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MEMO



# 2. FRAME/BODY PANELS/EXHAUST SYSTEM

SERVICE INFORMATION	2-1	INNER FENDER	2-6
TROUBLESHOOTING	2-1	FRONT CARRIER/CARRY PIPE	2-7
BODY PANEL LOCATIONS	2-2	FRONT FENDER	2-7
RECOIL STARTER COVER	2-3	REAR CARRIER	2-8
SEAT	2-3	REAR FENDER	2-8
ENGINE GUARD	2-3	TOOL BOX	2-9
SIDE COVER	2-4	OUTER FENDER	2-9
FUEL TANK COVER	2-5	HEADLIGHT GRILL	2-9
CENTER MUD GUARD	2-5	EXHAUST SYSTEM	2-10
FRONT MUD GUARD	2-6		

## SERVICE INFORMATION

### GENERAL

- This section covers removal and installation of the body panels and exhaust system.
- Always replace the gaskets when removing the exhaust system.
- Always inspect the exhaust system for leaks after installation.

### TORQUE VALUES

Front carrier/carry pipe bolt	37 N·m (3.8 kgf·m, 27 lbf·ft)
Gearshift lever knob screw	2 N·m (0.2 kgf·m, 1.4 lbf·ft) ALOC screw
Rear carrier bolt	37 N·m (3.8 kgf·m, 27 lbf·ft)
Muffler band bolt	23 N·m (2.3 kgf·m, 17 lbf·ft)
Front exhaust pipe cover band screw	3 N·m (0.3 kgf·m, 2.2 lbf·ft)
Rear exhaust pipe cover end band screw	6 N·m (0.6 kgf·m, 4.3 lbf·ft)
center band screw	3 N·m (0.3 kgf·m, 2.2 lbf·ft)
Muffler cover screw	3 N·m (0.3 kgf·m, 2.2 lbf·ft)
Footpeg bracket nut	32 N·m (3.3 kgf·m, 24 lbf·ft)

## TROUBLESHOOTING

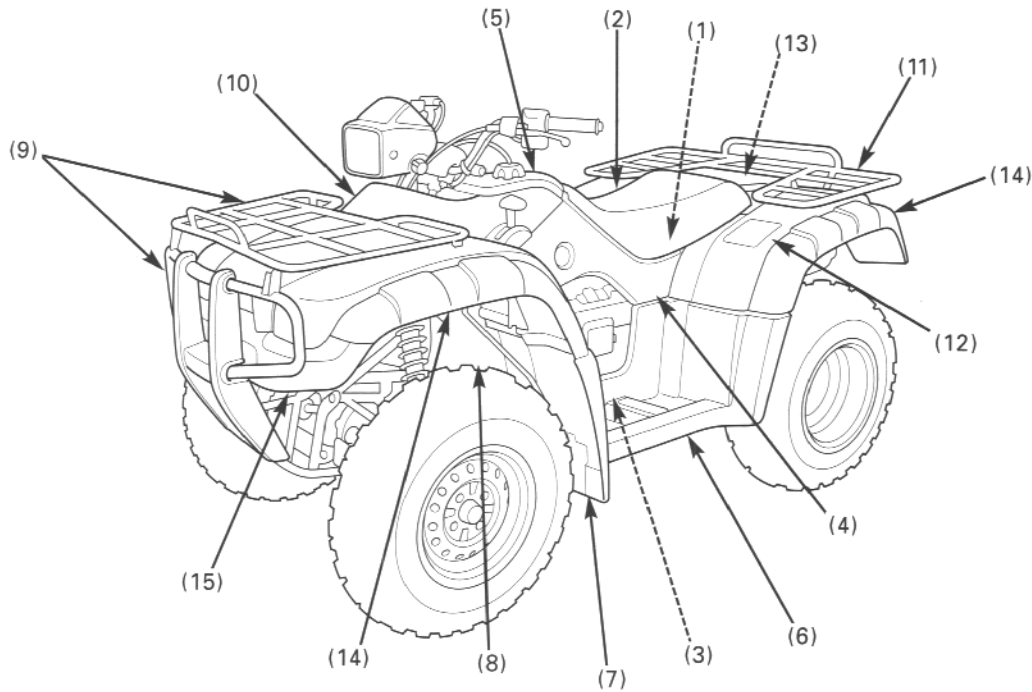
### Excessive exhaust noise

- Broken exhaust system
- Exhaust gas leaks

### Poor performance

- Deformed exhaust system
- Exhaust gas leaks
- Clogged muffler

**BODY PANEL LOCATIONS**

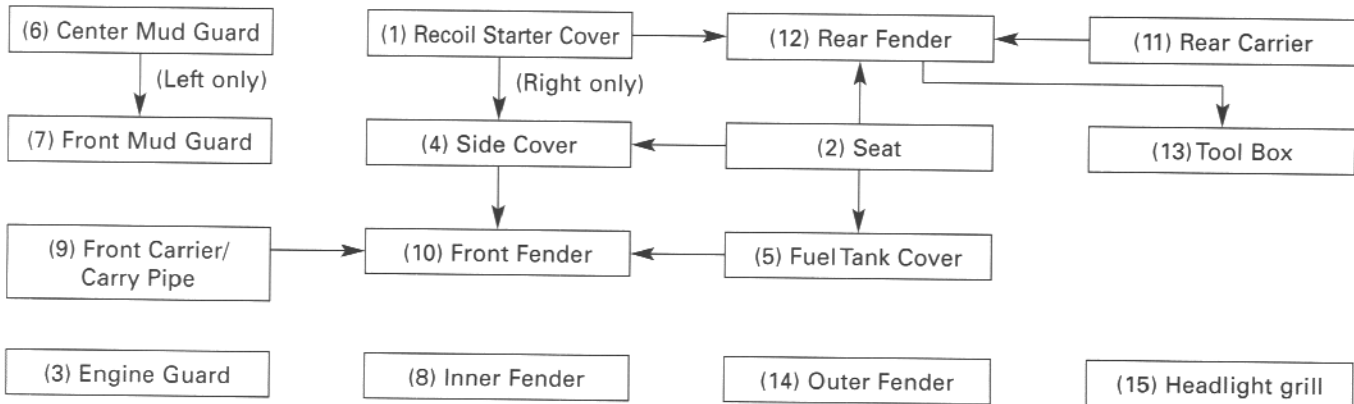


- (1) Recoil starter cover (page 2-3)
- (2) Seat (page 2-3)
- (3) Engine guard (page 2-3)
- (4) Side Cover (page 2-4)
- (5) Fuel Tank Cover (page 2-5)
- (6) Center Mud Guard (page 2-5)
- (7) Front Mud Guard (page 2-6)
- (8) Inner Fender (page 2-6)

- (9) Front Carrier/Carry Pipe (page 2-7)
- (10) Front Fender (page 2-7)
- (11) Rear Carrier (page 2-8)
- (12) Rear Fender (page 2-8)
- (13) Tool Box (page 2-9)
- (14) Outer Fender (page 2-9)
- (15) Headlight Grill (page 2-9)

**BODY PANEL REMOVAL CHART**

This chart shows removal order of body panels by means of arrow.





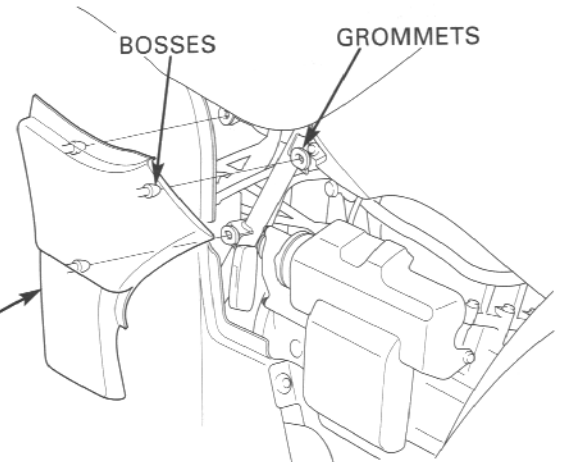
## RECOIL STARTER COVER

Remove the recoil starter cover by releasing the three bosses from the grommets.

*Be careful not to dislodge the grommets in the frame.*

Install the recoil starter cover in the reverse order of removal.

RECOIL STARTER COVER



## SEAT

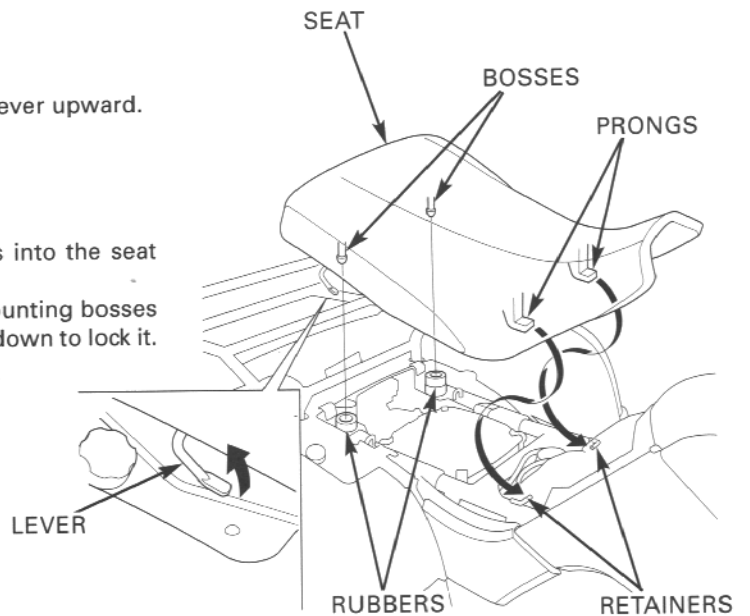
### REMOVAL

Unlock the seat by turning the release lever upward. Pull the seat back and remove it.

### INSTALLATION

Install the seat by inserting the prongs into the seat retainer on the frame.

Push the seat forward and align the mounting bosses with the mounting rubbers, then press down to lock it.

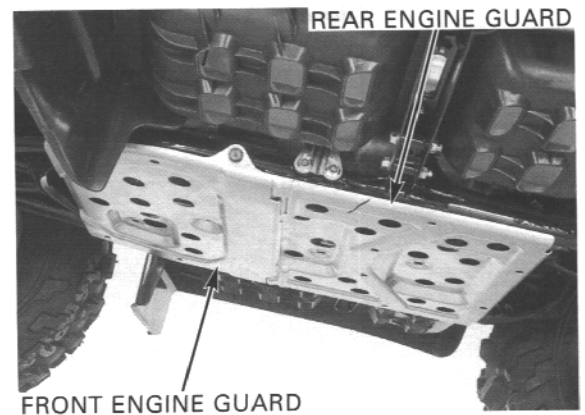


## ENGINE GUARD

Remove the following:

- four bolts and 28 mm washers
- front engine guard
- two bolts and 28 mm washers
- rear engine guard

Installation is in the reverse order of removal.



## SIDE COVER

### RIGHT SIDE:

Remove the following:

- seat (page 2-3)
- recoil starter cover (page 2-3)
- four trim clips
- side cover (release two tabs of cover by sliding cover rearward)

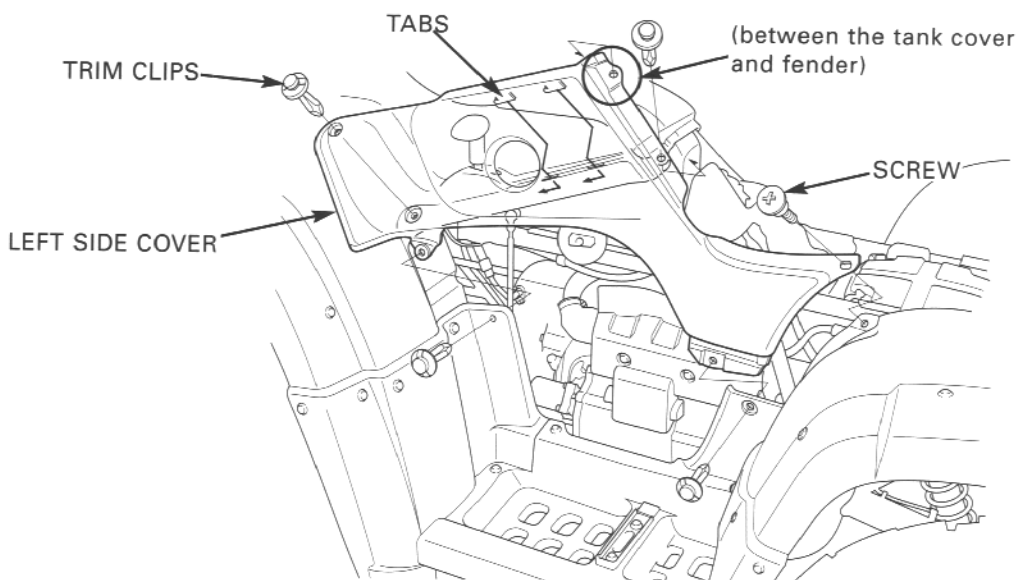
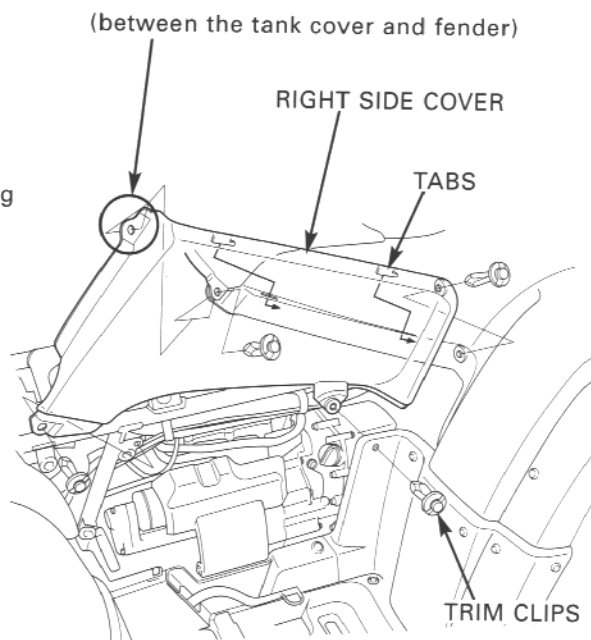
Installation is in the reverse order of removal.

### LEFT SIDE:

Remove the following:

- seat (page 2-3)
- setting screw
- four trim clips
- side cover (release two tabs of cover by sliding cover rearward)

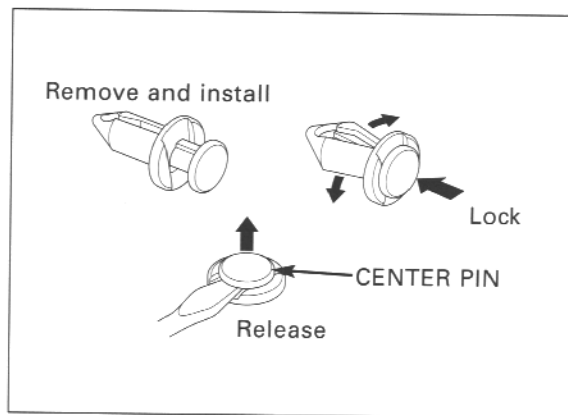
Installation is in the reverse order of removal.



### Trim clip removal and retaining procedure:

- Release by pulling the center pin up using a snap ring pliers or flat blade screwdriver and remove the trim clip.
- Install the clip and lock it by pushing the center pin securely.

*When installing the trim clip, carefully align the clip hole to avoid damaging the clip.*



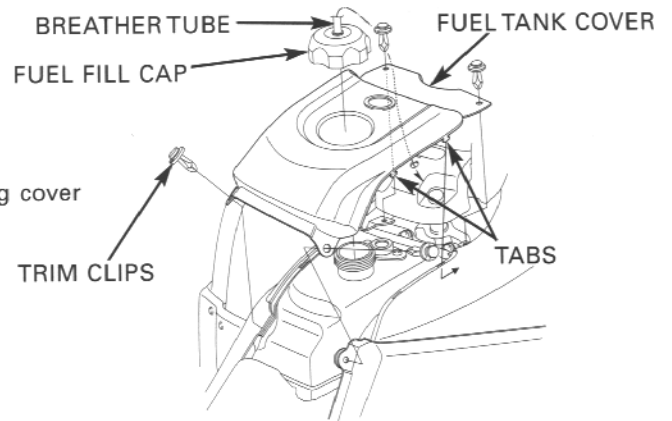
## FUEL TANK COVER

Remove the following:

- seat (page 2-3)
- four trim clips
- fuel tank breather tube and fuel fill cap
- fuel tank cover (release four tabs by sliding cover rearward)

Install the fuel fill cap.

Installation is in the reverse order of removal.



## CENTER MUD GUARD

### RIGHT SIDE:

Remove the following:

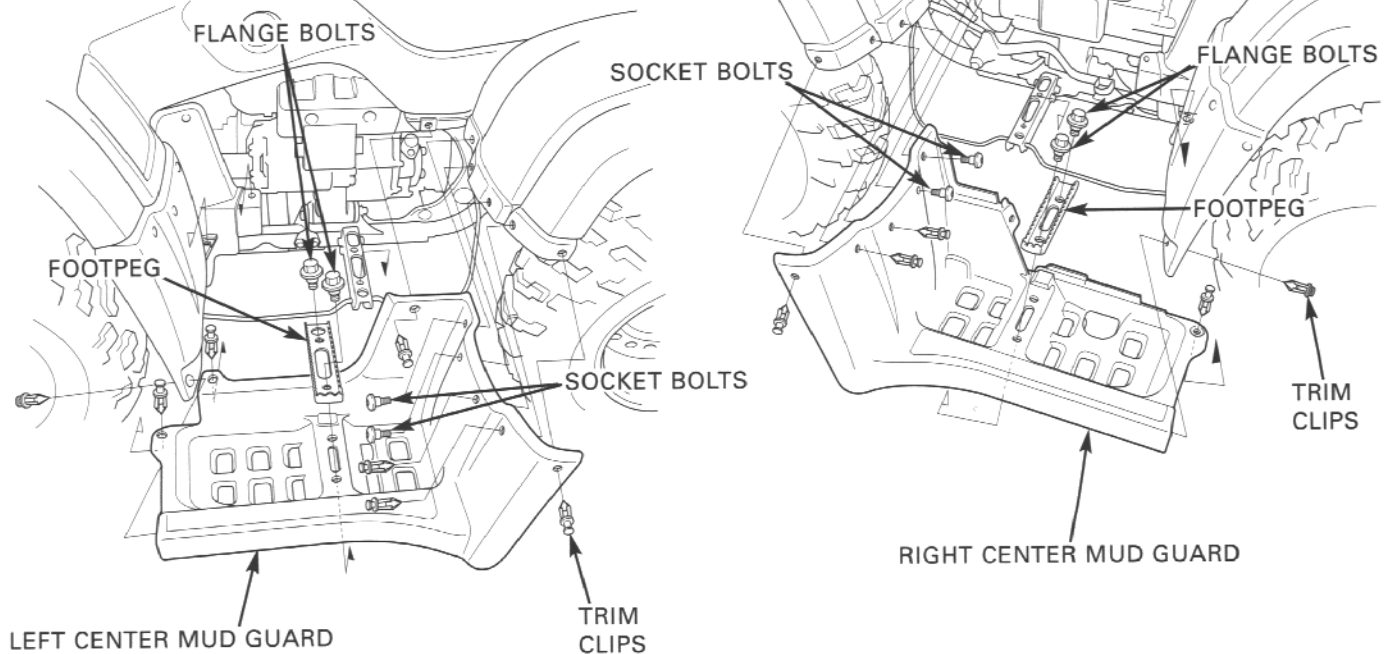
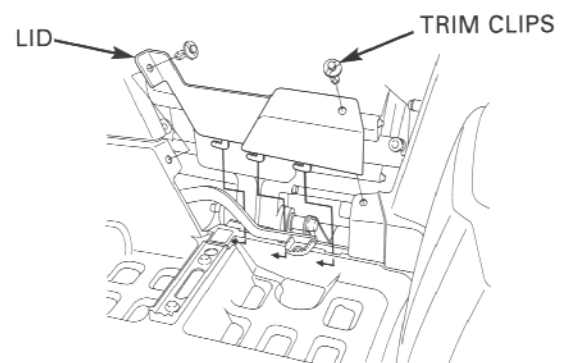
- recoil starter cover (page 2-3)
- two trim clips and mud guard lid
- two bolts and footpeg
- two socket bolts
- five trim clips
- center mud guard

### LEFT SIDE:

Remove the following:

- two bolts and footpeg
- two socket bolts
- seven trim clips
- center mud guard

Installation is in the reverse order of removal.



## **FRONT MUD GUARD**

**RIGHT SIDE:**

Remove the following:

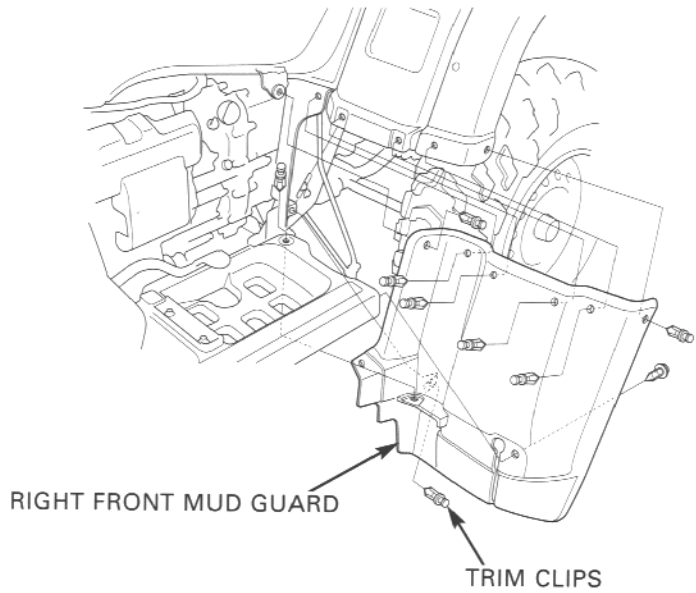
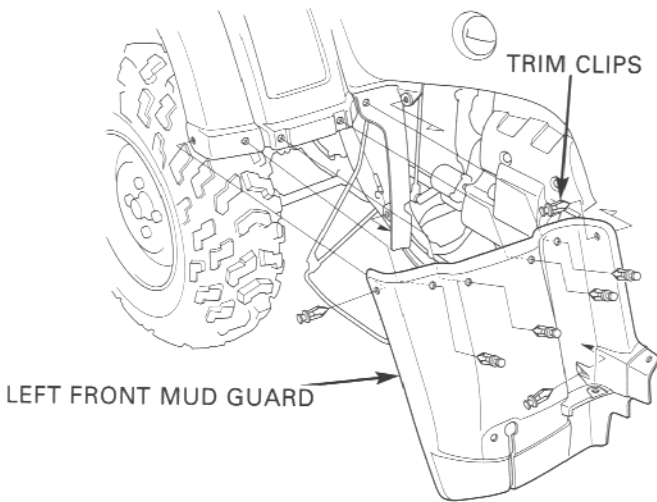
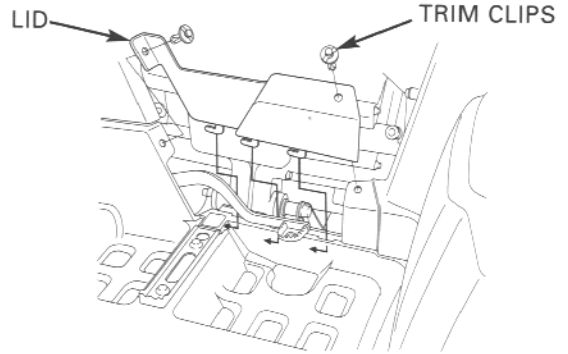
- two trim clips and mud guard lid
- nine trim clips
- front mud guard

**LEFT SIDE:**

Remove the following:

- left center mud guard (page 2-5)
- seven trim clips
- front mud guard

Installation is in the reverse order of removal.

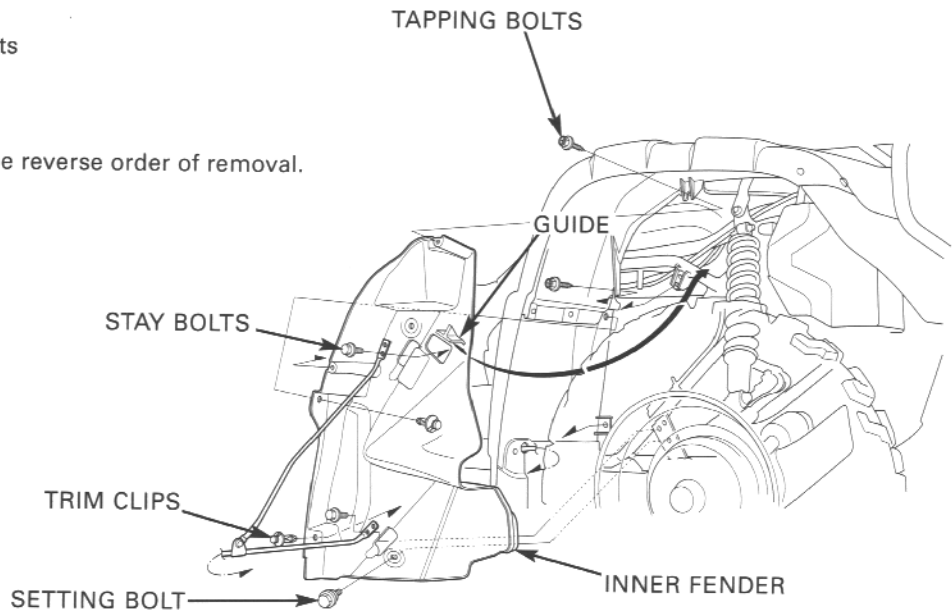


## **INNER FENDER**

Remove the following:

- two stay bolts
- two trim clips
- two tapping bolts
- setting bolt
- inner fender

Installation is in the reverse order of removal.



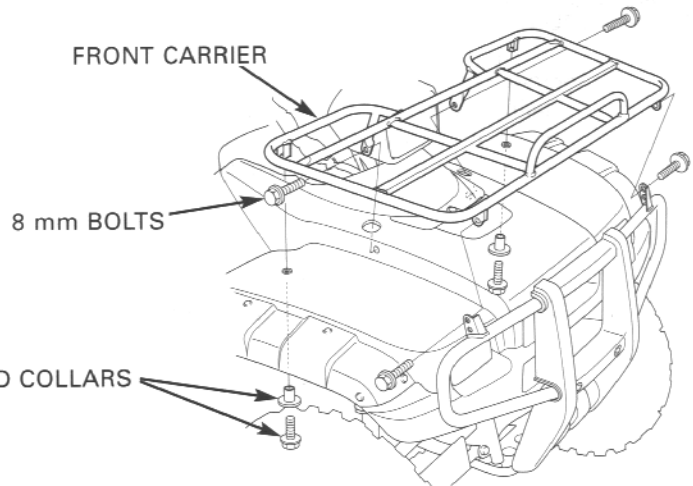
## FRONT CARRIER/CARRY PIPE

### FRONT CARRIER:

Remove the following:

- two 6 mm bolts and two collars
- four 8 mm bolts
- front carrier

*Be careful not to scratch the front fender.*



### CARRY PIPE:

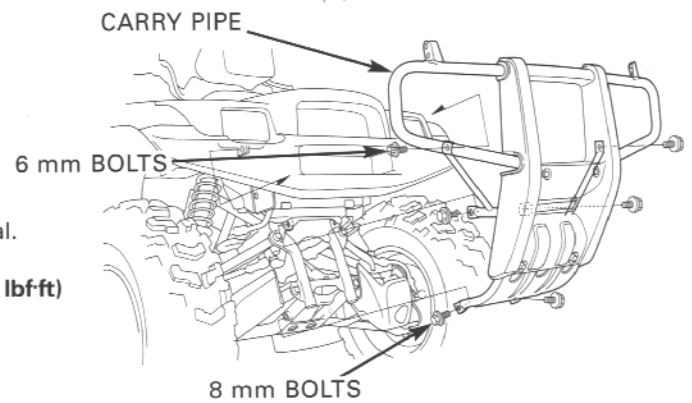
Remove the following:

- front carrier (page 2-7)
- two 6 mm bolts (headlight case)
- four 8 mm bolts
- carry pipe

*Be careful not to damage the headlight grill.*

Installation is in the reverse order of removal.

**TORQUE: 8 mm bolts: 37 N·m (3.8 kgf·m, 27 lbf·ft)**



## FRONT FENDER

Remove the following:

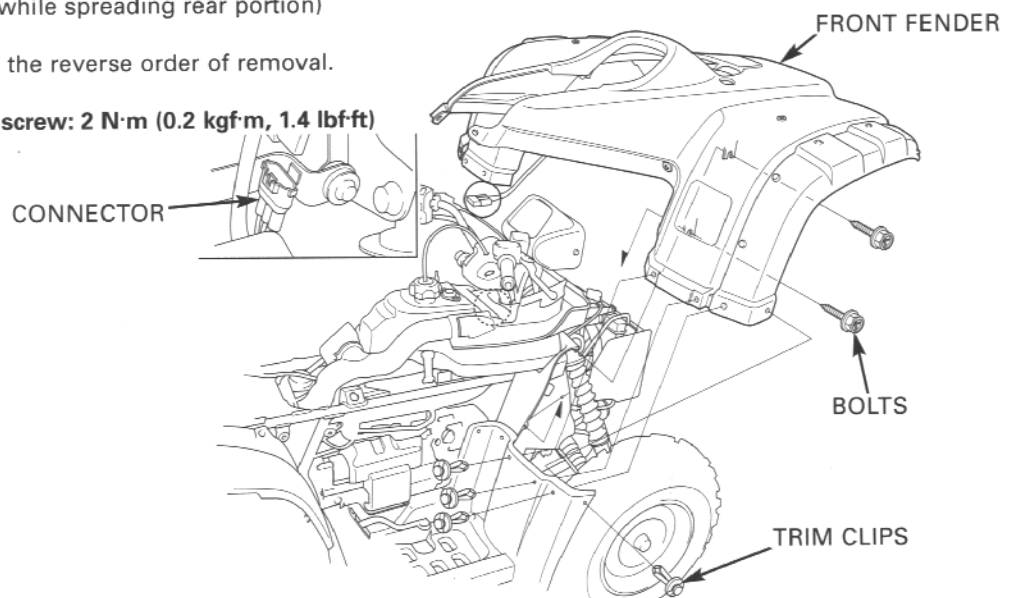
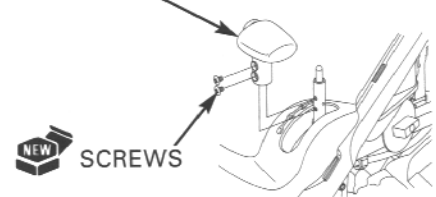
- fuel tank cover (page 2-5)
- side covers (page 2-4)
- front carrier and carry pipe (page 2-7)
- two screws and gearshift lever knob
- headlight connector
- eight trim clips
- four tapping bolts
- front fender (while spreading rear portion)

*Gearshift lever knob screws should be replaced with new ones.*

Installation is in the reverse order of removal.

**TORQUE: Knob screw: 2 N·m (0.2 kgf·m, 1.4 lbf·ft)**

### GEARSHIFT LEVER KNOB



## REAR CARRIER

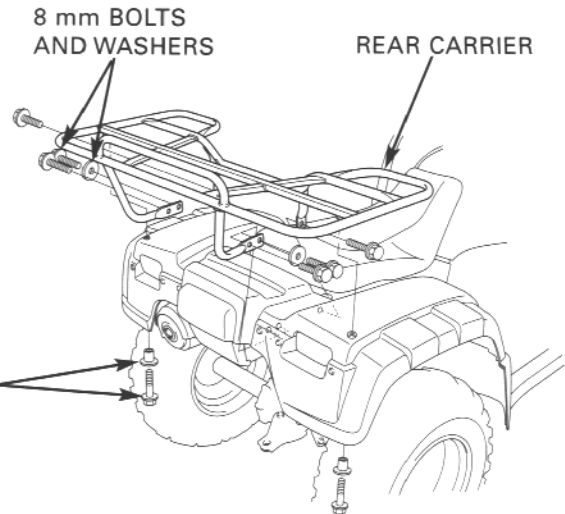
Remove the following:

- taillight wiring harness band
- two 6 mm bolts and two collars
- six 8 mm bolts and two washers
- rear carrier

Installation is in the reverse order of removal.

**TORQUE: 8 mm bolts: 37 N·m (3.8 kgf·m, 27 lbf·ft)**

6 mm BOLTS AND COLLARS



## REAR FENDER

Remove the battery (page 19-4)

Remove the following from the battery box:

- fuse box
- 2P connectors
- starter relay switch

Remove the following body panels:

- recoil starter cover (page 2-3)
- left side cover (page 2-4)
- rear carrier (see above)

Remove the following from the rear fender:

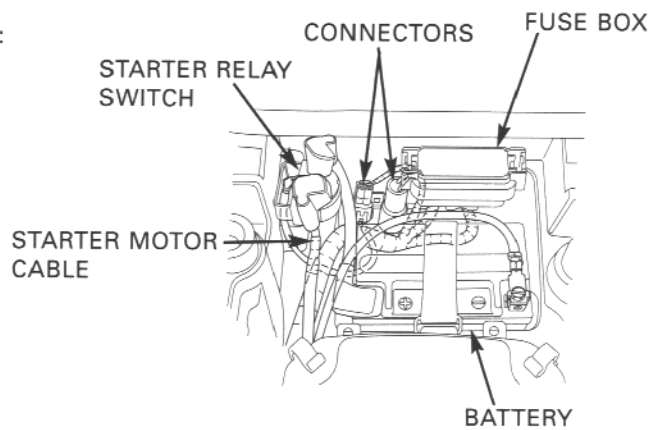
- radiator reserve tank cap
- setting screw (right side)
- four trim clips (upper side)
- eight trim clips (mud guard side)

Disconnect the taillight connectors (above toolbox and behind ECM).

Remove the starter motor and battery (-) cables out of the rear fender and remove the rear fender.

Installation is in the reverse order of removal.

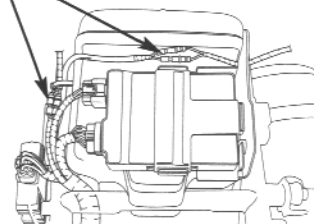
Route the wires and cables properly (page 1-19).



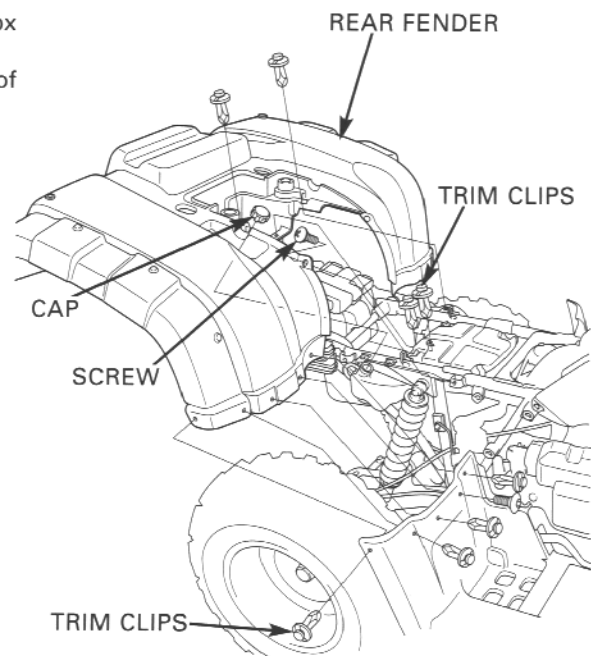
CONNECTORS



REAR  
OF  
UNIT



VIEW WITH REAR  
FENDER REMOVED



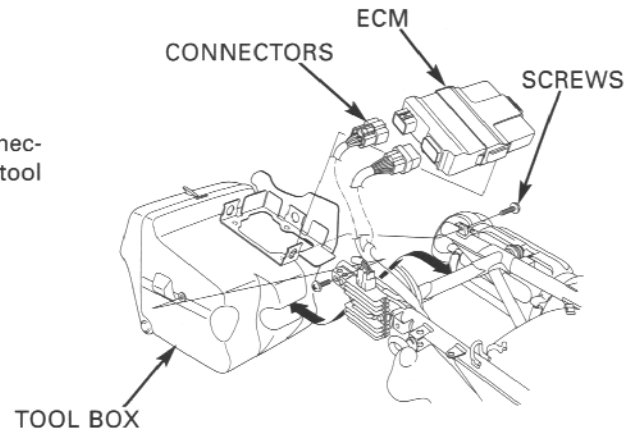
## TOOL BOX

Remove the rear fender (page 2-8).

Disconnect the engine control module (ECM) connectors and remove the ECM from the stay on the tool box.

Remove the two screws and the tool box.

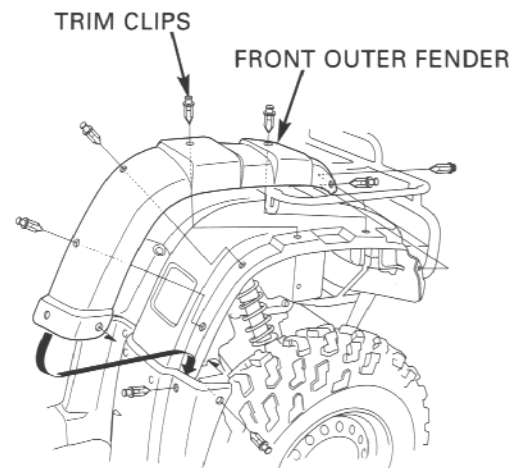
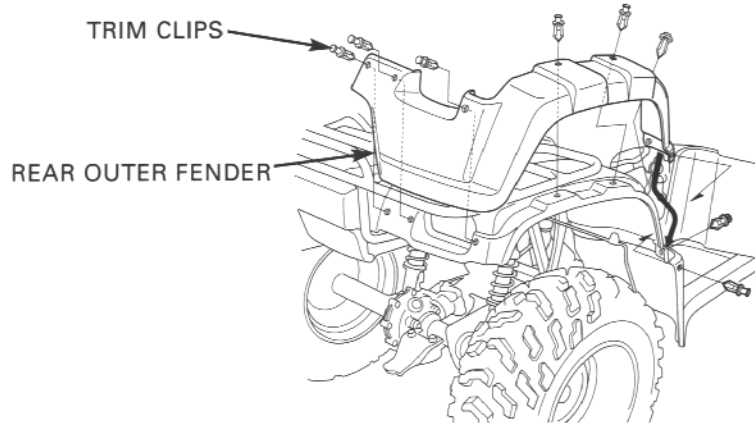
Installation is in the reverse order of removal.



## OUTER FENDER

Remove the eight trim clips and the outer fender.

Installation is in the reverse order of removal.



## HEADLIGHT GRILL

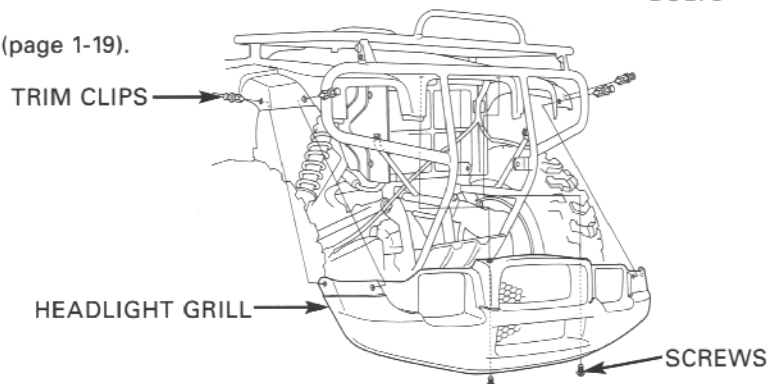
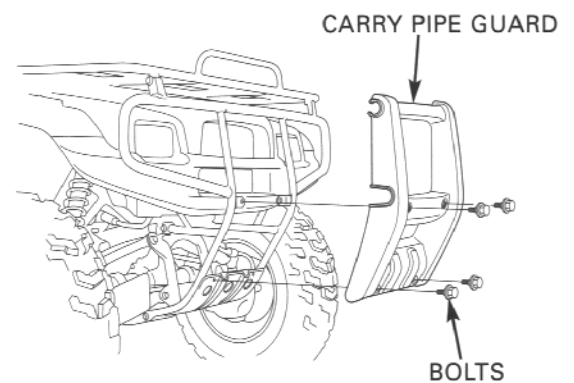
Remove the headlights (page 22-3).

Remove the following:

- four bolts and carry pipe guard
- two screws
- four trim clips
- headlight grill (releasing from four tabs of fender)

Installation is in the reverse order of removal.

Route the headlight wires properly (page 1-19).



## EXHAUST SYSTEM

### REMOVAL

#### EXHAUST PIPE

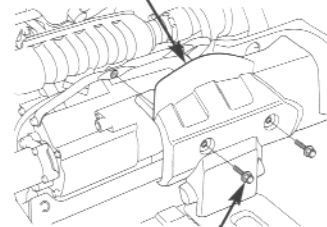
Remove the two bolts and left engine side cover.

Loosen the muffler band bolts.  
Remove the joint nuts and pull the exhaust pipe forward gradually to disconnect it from the muffler.  
Remove the joint gasket and muffler gasket.

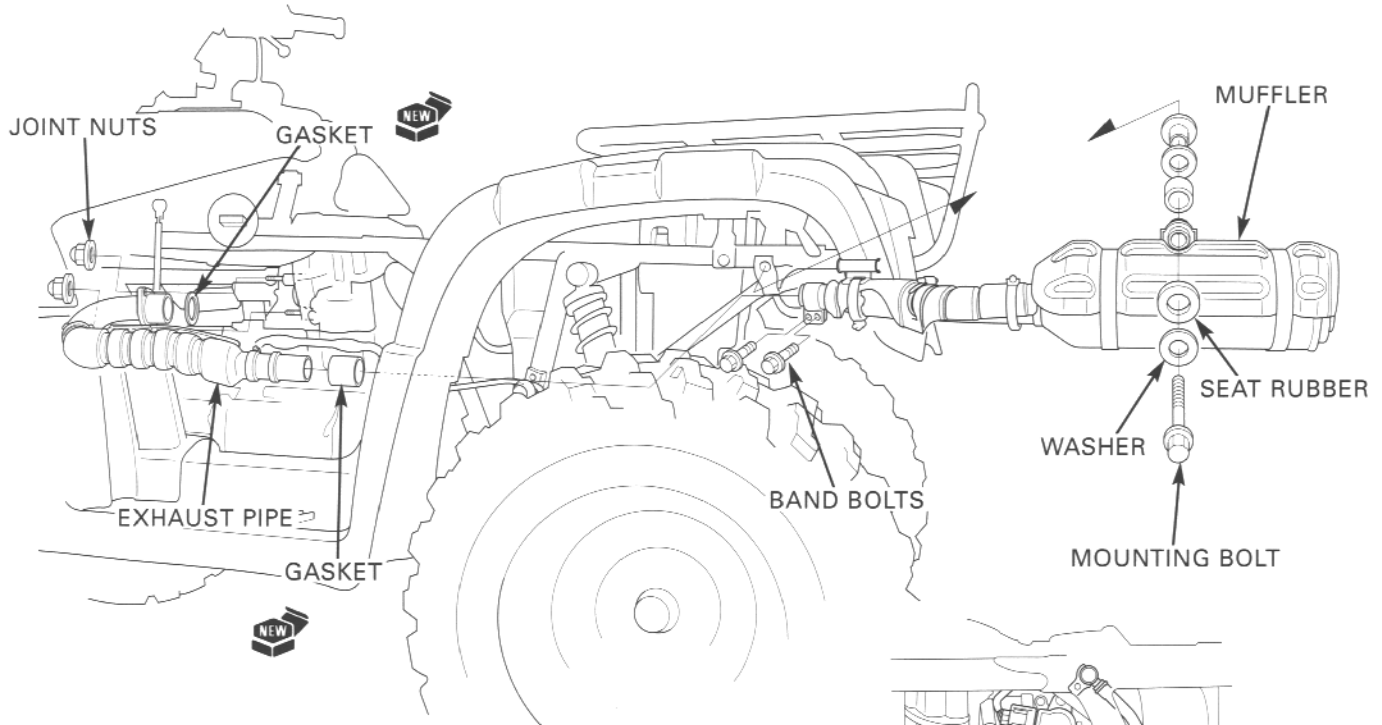
#### MUFFLER

Release the crankcase breather pipe clips from the stay on the muffler.  
Remove the mounting bolt, washer and seat rubber, and the muffler from the frame.

LEFT ENGINE SIDE COVER



COVER BOLTS



### INSTALLATION

Install new joint and muffler gaskets.  
Install the muffler and exhaust pipe in the reverse order of removal by loosely tightening all fasteners.

*Set the breather pipe onto the stay properly (page 1-19).*

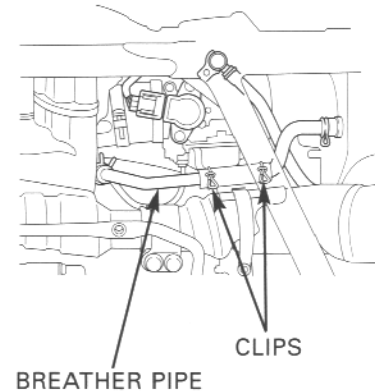
Tighten the joint nuts first, then tighten the mounting nut and the band bolts.

#### TORQUE:

**Muffler band bolt: 23 N·m (2.3 kgf·m, 17 lbf·ft)**

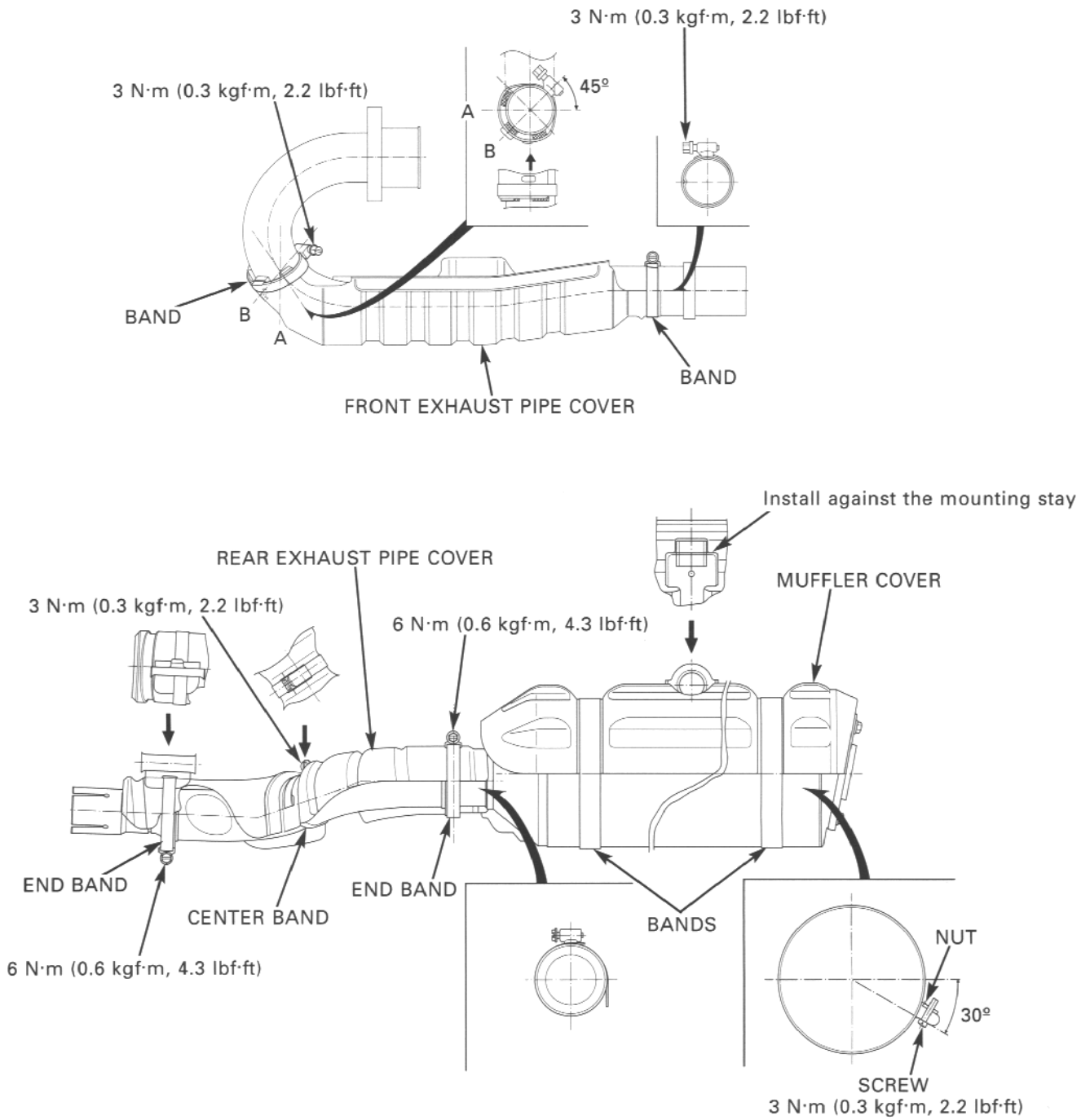
After installation, inspect the exhaust system for leaks.

Install the left engine cover and the fender stay by tightening the bolts.





DISASSEMBLY/ASSEMBLY



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**MEMO**



# 3. MAINTENANCE

SERVICE INFORMATION	3-1	DRIVE SHAFT BOOTS	3-13
MAINTENANCE SCHEDULE	3-3	REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL	3-14
FUEL LINE	3-4	BRAKE FLUID	3-15
THROTTLE OPERATION	3-4	BRAKE SHOE WEAR	3-16
CARBURETOR CHOKE	3-5	BRAKE SYSTEM	3-17
AIR CLEANER	3-5	SKID PLATE, ENGINE GUARD	3-18
AIR CLEANER HOUSING DRAIN TUBE	3-7	SUSPENSION	3-18
SPARK PLUG	3-7	SPARK ARRESTER	3-19
VALVE CLEARANCE	3-8	NUTS, BOLTS, FASTENERS	3-20
ENGINE OIL	3-10	WHEELS/TIRES	3-20
ENGINE OIL FILTER	3-11	STEERING SHAFT HOLDER BEARING	3-20
ENGINE IDLE SPEED	3-12	STEERING SYSTEM	3-21
RADIATOR COOLANT	3-12		
COOLING SYSTEM	3-13		

## SERVICE INFORMATION

### GENERAL

- Place the vehicle on level ground before starting any work.

### SPECIFICATIONS

ITEM		SPECIFICATIONS
Throttle lever free play		3—8 mm (1/8—5/16 in)
Spark plug	Standard	IJR7A9 (NGK), VX22BC (DENSO)
	For cold climate (below 5°C/48°F)	IJR6A9 (NGK), VX20BC (DENSO)
Spark plug gap		0.8—0.9 mm (0.03—0.04 in)
Valve clearance	IN	0.15 mm (0.006 in)
	EX	0.23 mm (0.009 in)
Engine oil capacity	After draining	4.7 liters (5.0 US qt, 4.1 Imp qt)
	After draining/filter change	4.9 liters (5.2 US qt, 4.3 Imp qt)
	After disassembly	5.5 liters (5.8 US qt, 4.8 Imp qt)
Recommended engine oil		Honda GN4 4-stroke oil or equivalent motor oil API service classification SF or SG Viscosity: SAE 10W-40
Engine idle speed		1,400 ± 100 rpm
Front differential oil capacity	After draining	241 cm <sup>3</sup> (8.2 US oz, 8.5 Imp oz)
	After disassembly	275 cm <sup>3</sup> (9.3 US oz, 9.7 Imp oz)
Recommended differential oil		Hypoid gear oil SAE #80
Rear final drive oil capacity	After draining	90 cm <sup>3</sup> (3.0 US oz, 3.2 Imp oz)
	After disassembly	100 cm <sup>3</sup> (3.4 US oz, 3.5 Imp oz)
Recommended final drive oil		Hypoid gear oil SAE #80

## MAINTENANCE

ITEM		SPECIFICATIONS
Recommended brake fluid		DOT 3 or DOT 4 brake fluid
Front brake shoe lining thickness		Standard: 4.0 mm (0.16 in)/Service limit: 2.0 mm (0.08 in)
Front brake lever free play		25—30 mm (1—1-3/16 in)
Rear (parking) brake lever free play		15—20 mm (9/16—13/16 in)
Rear brake pedal free play		15—20 mm (9/16—13/16 in)
Cold tire pressure (Front/Rear)	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)
	Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)
	Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)
Tire size	Front	AT25 x 8-12
	Rear	AT25 x 10-12
Tire brand	Front	DIRT HOOKS 15 (Bridgestone)
	Rear	DIRT HOOKS 14 (Bridgestone)
Minimum tread depth (Front/Rear)		4.0 mm (0.16 in)
Toe		Toe-out: 24 ± 15 mm (1 ± 9/16 in)

## TORQUE VALUES

Spark plug	18 N·m (1.8 kgf·m, 13 lbf·ft)
Valve adjusting lock nut	17 N·m (1.7 kgf·m, 12 lbf·ft)
Timing hole cap	10 N·m (1.0 kgf·m, 7 lbf·ft)
Engine oil drain bolt	25 N·m (2.5 kgf·m, 18 lbf·ft)
Engine oil filter center bolt	18 N·m (1.8 kgf·m, 13 lbf·ft)
Front differential oil filler cap	12 N·m (1.2 kgf·m, 9 lbf·ft)
Front differential oil drain bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Rear final gear case oil check bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Rear final gear case oil filler cap	12 N·m (1.2 kgf·m, 9 lbf·ft)
Rear final gear case oil drain bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)
Front master cylinder reservoir cap screw	2 N·m (0.2 kgf·m, 1.4 lbf·ft)
Tie-rod lock nut	54 N·m (5.5 kgf·m, 40 lbf·ft)

# MAINTENANCE SCHEDULE

Perform the PRE-RIDE INSPECTION in the Owner's Manual at each scheduled maintenance period.  
 I: Inspect and Clean, Adjust, Lubricate or Replace if necessary.  
 C: Clean R: Replace A: Adjust L: Lubricate

ITEMS	FREQUENCY	WHICHEVER COMES FIRST → ↓ NOTE	INITIAL MAINTENANCE			REGULAR MAINTENANCE INTERVAL		Refer to page
			mi	100	600	1,200		
			km	150	1,000	2,000		
			HOURS	20	100	200		
EMISSION RELATED ITEMS	* FUEL LINE					I	3-4	
	* THROTTLE OPERATION					I	3-4	
	* CARBURETOR CHOKE					I	3-5	
	AIR CLEANER	NOTE 1			C	C	3-5	
	AIR CLEANER HOUSING DRAIN TUBE	NOTE 2			I	I	3-7	
	SPARK PLUG					I	3-7	
	* VALVE CLEARANCE			I	I	I	3-8	
	ENGINE OIL			R	R	R	3-9	
	ENGINE OIL FILTER			R	R	R	3-11	
	* ENGINE IDLE SPEED			I	I	I	3-12	
	RADIATOR COOLANT	NOTE 3			I	I	3-12	
	* COOLING SYSTEM	NOTE 2			I	I	3-13	
NON-EMISSION RELATED ITEMS	DRIVE SHAFT BOOTS					I	3-13	
	REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL				(R: Every 2 years)	I	3-14	
	* BRAKE FLUID	NOTE 3				I	3-15	
	* BRAKE SHOE WEAR	NOTE 1				I	3-16	
	BRAKE SYSTEM			I	I	I	3-17	
	SKID PLATE, ENGINE GUARD					I	3-18	
	* SUSPENSION					I	3-18	
	* SPARK ARRESTER				C	C	3-19	
	* NUTS, BOLTS, FASTENERS			I		I	3-20	
	** WHEELS/TIRES			I	I	I	3-20	
	** STEERING SHAFT HOLDER BEARING					I	3-20	
** STEERING SYSTEM					I	3-21		

- \* Should be serviced by your Honda dealer, unless the owner has proper tools and service data and is mechanically qualified.
- \*\* In the interest of safety, we recommend these items be serviced only by your Honda dealer.

NOTES: 1. Service more frequently when riding in dusty areas, sand or snow.  
 2. Service more frequently after riding in very wet or muddy conditions.  
 3. Replace every 2 years. Replacement requires mechanical skill.

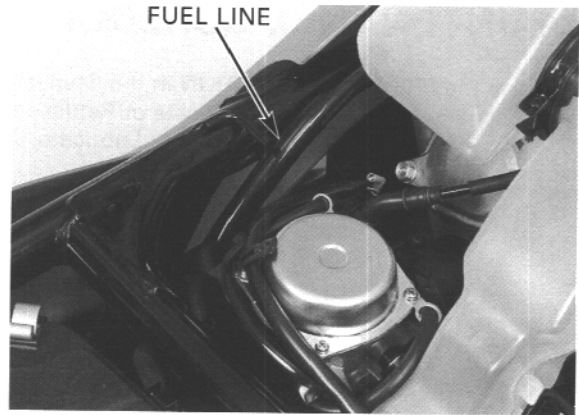
## MAINTENANCE

### FUEL LINE

Remove the seat (page 2-3).

Check the fuel line for deterioration, damage or leakage.

Replace the fuel line if necessary.



### THROTTLE OPERATION

Check for any deterioration or damage to the throttle cable. Check the throttle lever for smooth operation. Check that the throttle opens and automatically closes in all steering positions.

If the throttle lever does not return properly, lubricate the throttle cable and overhaul and lubricate the throttle housing.

For cable lubrication: Disconnect the throttle cable at its upper end. Thoroughly lubricate the cable and its pivot point with a commercially available cable lubricant or a light weight oil.

*Reusing a damaged or abnormally bent or kinked throttle cable can prevent proper throttle slide operation and may lead to a loss of throttle control while riding.*

If the throttle lever still does not return properly, replace the throttle cable.

With the engine idling, turn the handlebar all the way to the right and left to ensure that the idle speed does not change. If idle speed increases, check the throttle lever free play and the throttle cable connection.

Measure the throttle lever free play at the tip of the throttle lever.

#### THROTTLE LEVER FREE PLAY:

**3—8 mm (1/8—5/16 in)**

Throttle lever free play can be adjusted at either end of the throttle cable. Minor adjustments are made with the upper adjuster.

Slide the rubber boot off the adjuster. Loosen the lock nut, turn the adjuster as required and tighten the lock nut.

Install the rubber boot securely.

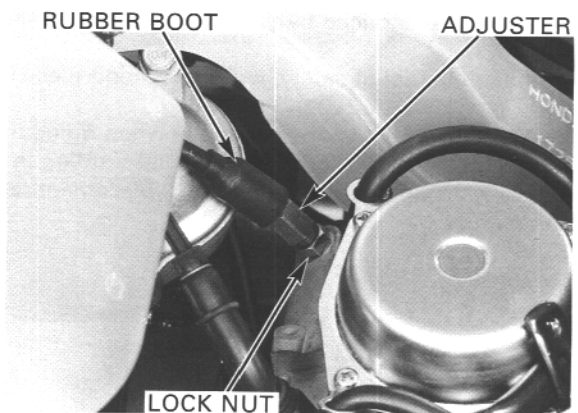
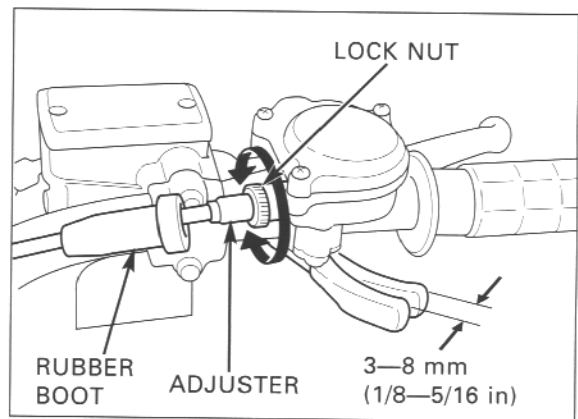
Major adjustments are made with the lower adjuster.

Remove the seat (page 2-3).

Slide the rubber boot off the adjuster. Loosen the lock nut, turn the adjuster as required and tighten the lock nut.

Install the rubber boot securely.

Recheck the throttle operation and install the seat (page 2-3).

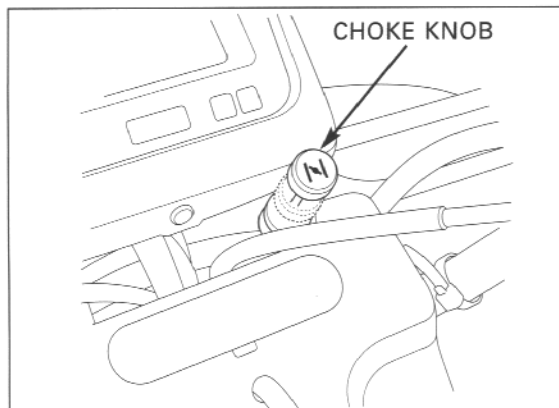


## CARBURETOR CHOKE

This model's choke system uses a fuel enriching circuit controlled by a starting enrichment (SE) valve. The SE valve opens the enriching circuit via a cable when the choke knob on the handlebar is pulled up.

Check for smooth choke knob operation and lubricate the choke cable if required.

Check the choke cable for fraying, kinking or other damage.



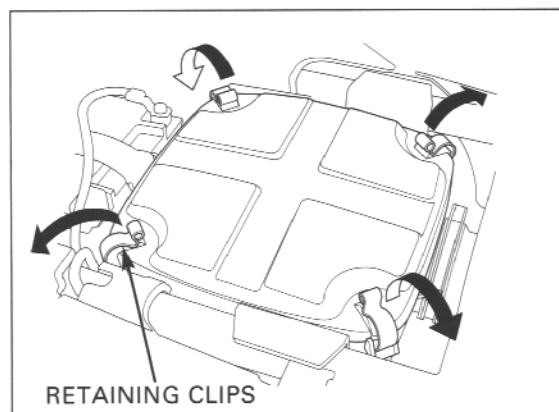
## AIR CLEANER

Remove the seat (page 2-3).

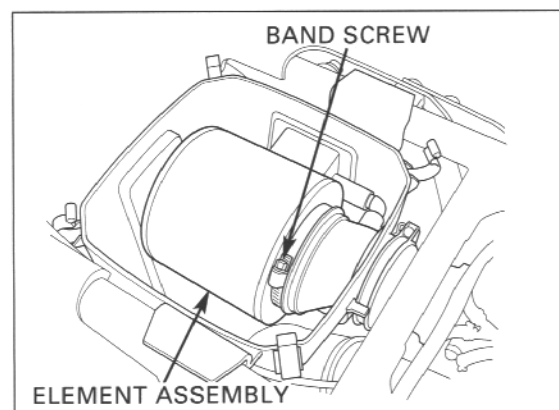
Release the retaining clips from the air cleaner housing cover and remove the cover.

**NOTE:**

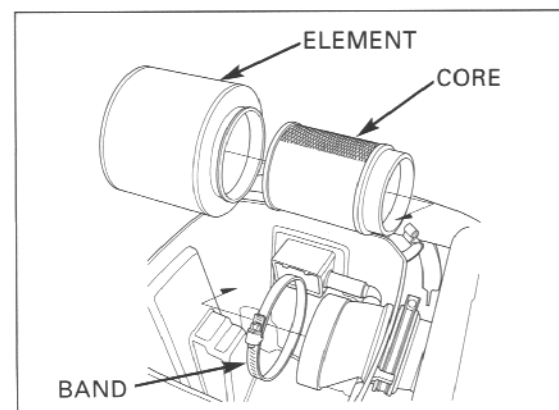
- If the vehicle is used in dusty areas, sand or snow, more frequent inspections are required.



Loosen the air cleaner element band screw. Remove the air cleaner element assembly from the housing.



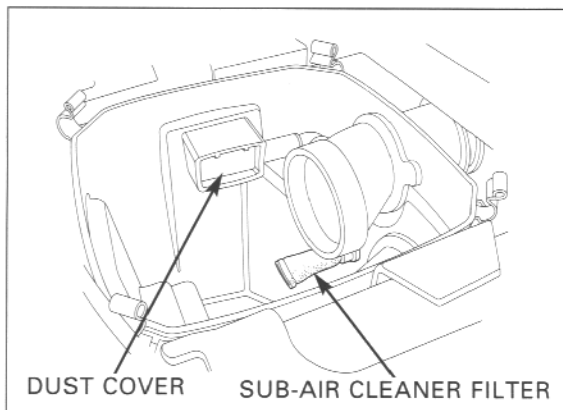
Remove the air cleaner element band and element core from the element.



## MAINTENANCE

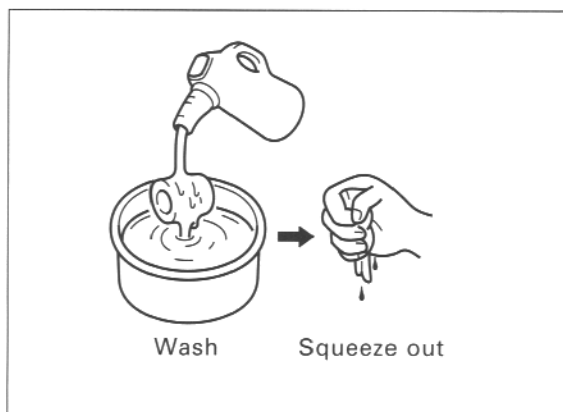
Remove the sub-air cleaner filter from the air cleaner joint.

Remove the dust cover and clean it with compressed air if it is dirty.  
Install the dust cover in position.



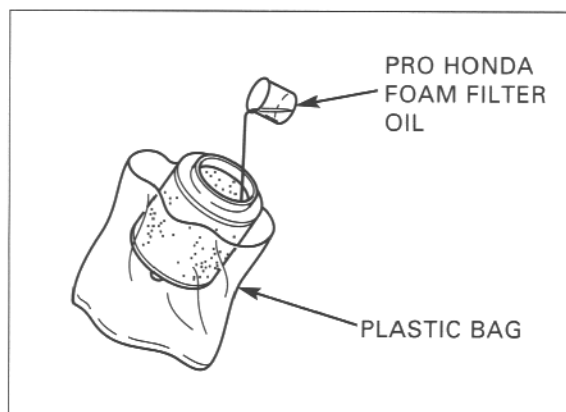
Wash the element and filter in non-flammable or high flash point solvent.  
Squeeze out the solvent thoroughly, and allow the element and filter to dry.

Install the sub-air cleaner filter onto the air cleaner joint.



Apply approximately 20 g (0.7 oz) of Pro Honda Foam Filter Oil or equivalent oil from the inside of the element.

Place the element into a plastic bag and spread the oil evenly by hand.

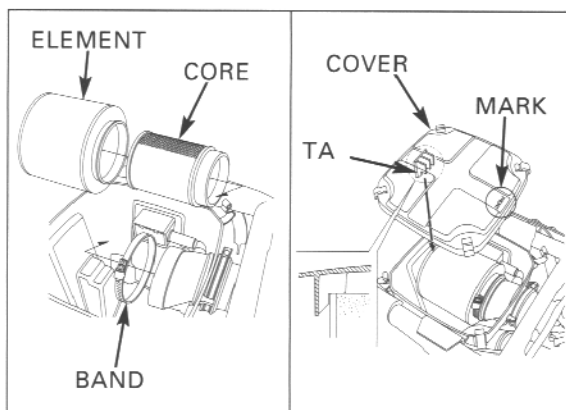


Install the element core into the air cleaner element properly.

Install the element band onto the air cleaner element and the element assembly over the connecting tube flange of the housing securely.  
Tighten the band screw.

### NOTE:

- Failure to properly tighten the band screw will allow the air cleaner element to fall off and engine damage could result.



The "FRONT" mark of the cover faces forward.

Install the air cleaner housing cover by aligning the setting tab with the element end and secure it with the retaining clips.

Install the seat (page 2-3).



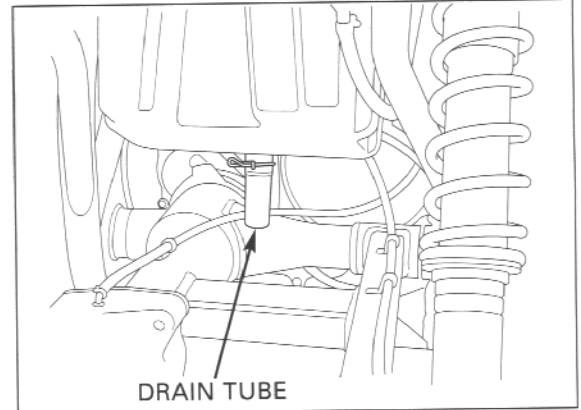
## AIR CLEANER HOUSING DRAIN TUBE

Remove the drain tube from bottom of the air cleaner housing to empty any deposits.

Install the drain tube securely.

**NOTE:**

- If the vehicle is used in very wet or muddy conditions, more frequent inspections are required.

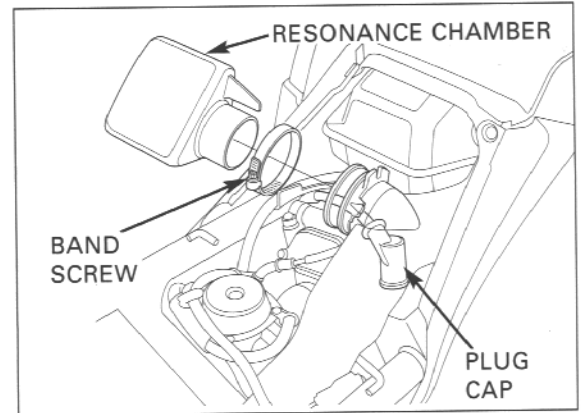


## SPARK PLUG

Remove the seat (page 2-3).

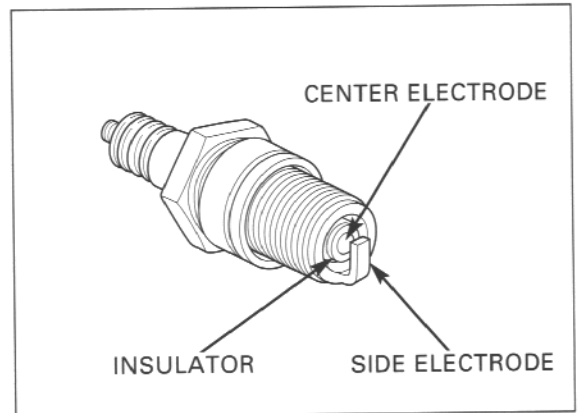
Loosen the band screw and remove the resonance chamber.

Disconnect the spark plug cap and clean around the spark plug base with compressed air. Remove the spark plug.



*This vehicle's spark plug is equipped with a iridium type center electrode. Do not clean the electrodes.*

Check the insulator for cracks or damage, and the electrodes for wear, fouling or discoloration. Replace the plug if necessary.



Replace the plug if the center electrode is rounded as shown.

*Always use specified spark plugs on this vehicle.*

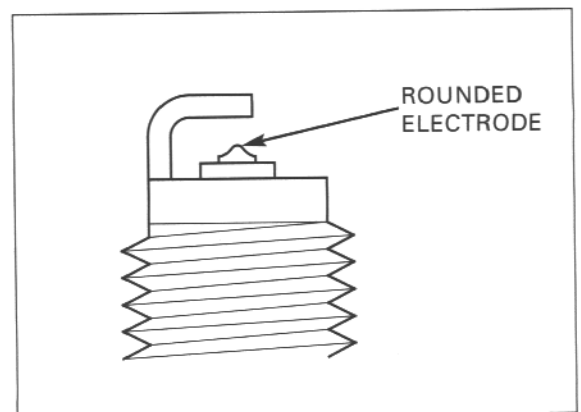
**SPECIFIED SPARK PLUG:**

**Standard:**

IJR7A9 (NGK), VX22BC (DENSO)

**For cold climate (below 5°C/41°F):**

IJR6A9 (NGK), VX20BC (DENSO)



## MAINTENANCE

To prevent damaging the iridium coating of the center electrode, use a wire type feeler gauge to check the spark plug gap. Do not adjust the spark plug gap. If the gap is out of specification, replace with a new one.

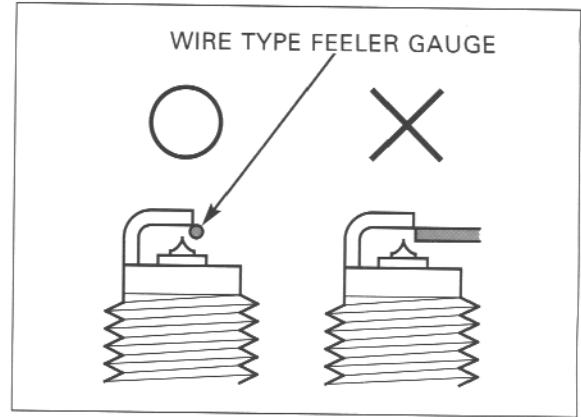
Measure the spark plug gap between the center and side electrodes with a wire-type feeler gauge.

Make sure that the 1.20 mm (0.047 in) wire type feeler gauge cannot be inserted into the gap. If the gauge can be inserted into the gap, replace the plug with a new one.

Screw the spark plug in the cylinder head by hand to prevent cross-threading. Tighten the spark plug.

**TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)**

Install the removed part in the reverse order of removal.



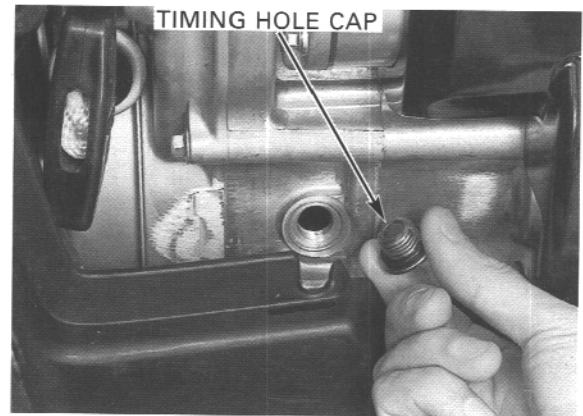
## VALVE CLEARANCE

### NOTE:

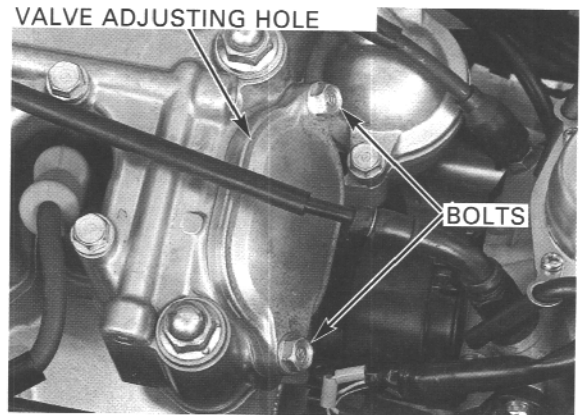
- Inspect and adjust the valve clearance while the engine is cold (below 35°C/95°F).

Remove the recoil starter cover (page 2-3).  
Remove the fuel tank heat guard (page 8-3).

Remove the timing hole cap.



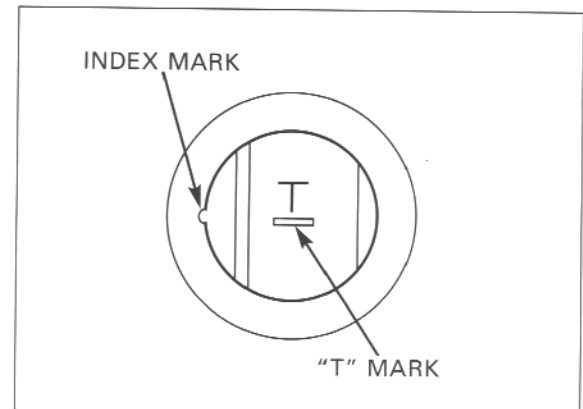
Remove the four bolts, intake and exhaust valve adjusting hole caps.



Rotate the crankshaft using the recoil starter knob and align the "T" mark on the flywheel with the index mark on the rear crankcase cover.

Make sure the piston is TDC (Top Dead Center) on the compression stroke.

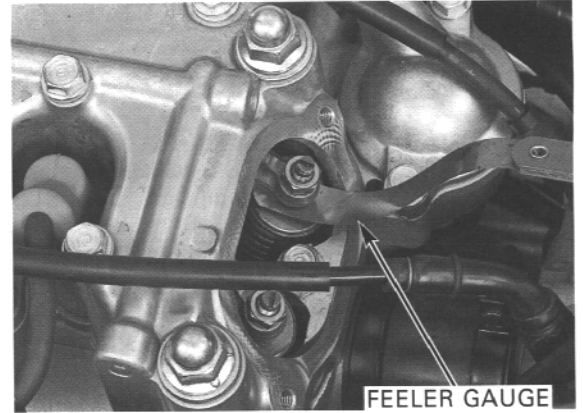
This position can be obtained by confirming that there is slack in the rocker arm. If there is no slack, it is because the piston is moving through the exhaust stroke to TDC. Rotate the crankshaft one full turn and match up the "T" mark again.



When checking the clearance, slide the feeler gauge from the center toward the outside.

Check the clearance of all valves by inserting a feeler gauge between the adjusting screw and valve stem.

**VALVE CLEARANCES: IN: 0.15 mm (0.006 in)  
EX: 0.23 mm (0.009 in)**

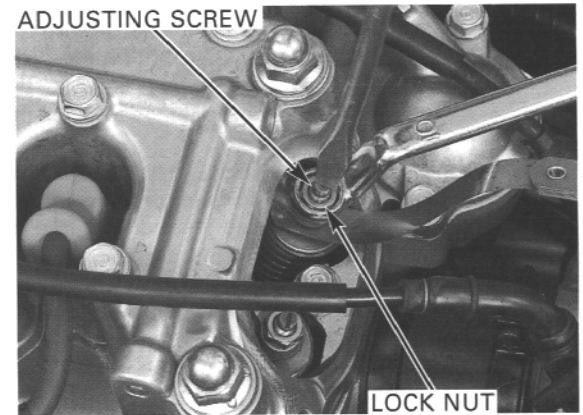


Adjust by loosening the lock nut and turning the adjusting screw until there is a slight drag on the feeler gauge.

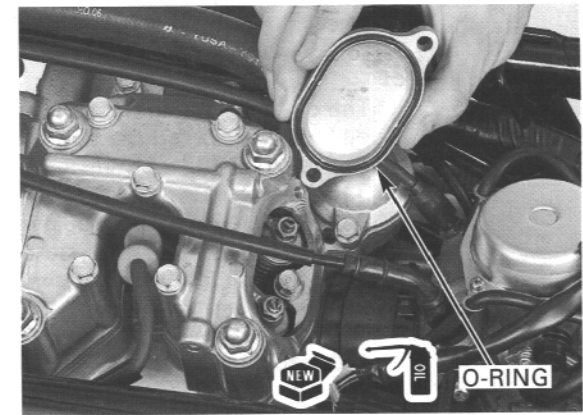
Hold the adjusting screw and tighten the lock nut.

**TORQUE: 17 N·m (1.7 kgf·m, 12 lbf·ft)**

After tightening the lock nut, recheck the valve clearance.



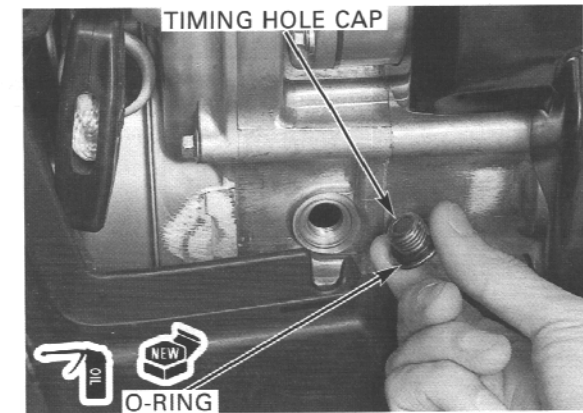
Coat new O-rings with oil and install them into the grooves in the valve adjusting hole caps. Install the valve adjusting hole caps and tighten the bolts securely.



Coat a new O-ring with engine oil and install it onto the timing hole cap. Install the timing hole cap and tighten it.

**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

Install the recoil starter cover (page 2-3).  
Install the fuel tank heat guard (page 8-19).



# ENGINE OIL

## LEVEL CHECK

### Before checking the engine oil level:

Make sure the vehicle is on level ground. Remove the dipstick from the oil tank and wipe it clean. Insert the dipstick without screwing it in, then remove the dipstick and check the oil level.

If the oil level is above the tip mark, replace the dipstick and proceed to the oil level check procedure.

If the oil does not stick to the dipstick or the oil level is below the tip mark, do not start the engine. Before starting the engine, remove the oil filler cap and add the specified oil into the filler cap hole, up to the lower level mark on the dipstick. Do not over fill. Reinstall the oil filler cap and dipstick. Proceed to the oil level check procedure.

### Oil Level Check Procedure

Place the vehicle on a level ground. Start the engine and let it idle for 5 minutes. If the air temperature is below 10°C (50°F), let the engine idle for an additional 5 minutes (a total of 10 minutes). Do not snap the throttle while idling or the oil level reading will be inaccurate.

*Stop the engine.*

After a few minutes, remove the dipstick and wipe it clean. Check the oil level by inserting the dipstick into the oil tank without screwing it in.

The oil tank contains a sufficient amount of oil if the oil level is between the upper and lower level marks on the dipstick.

If the oil level is near or below the lower level mark, remove the oil filler cap and add the recommended engine oil up to the upper level mark.

### NOTE:

- Due to the comparatively large volume of oil in a dry sump engine, it is especially important to start the engine and allow the oil to circulate through the engine thoroughly.

### RECOMMENDED ENGINE OIL:

**Honda GN4 4-stroke oil or equivalent motor oil**  
**API service classification SF or SG**  
**Viscosity: SAE 10W-40**

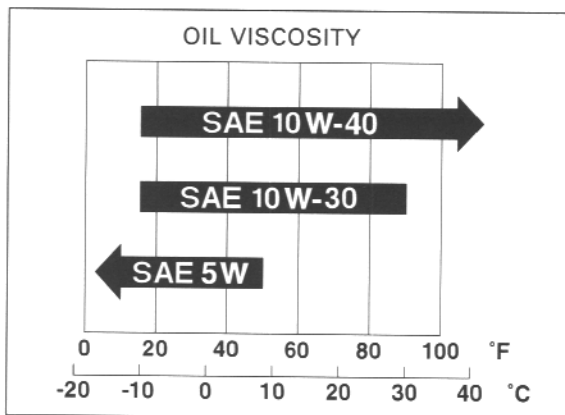
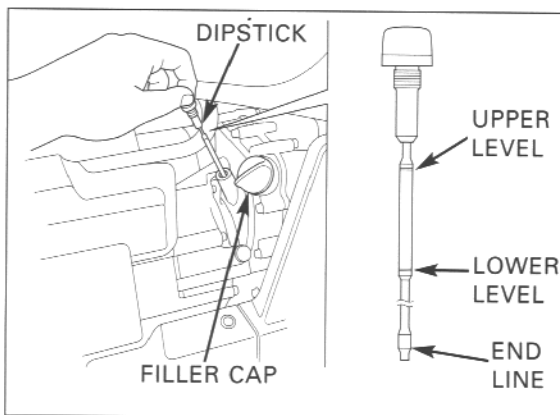
### NOTE:

- Other viscosities shown in the chart may be used when the average temperature in your riding area is within the indicated range.

Reinstall the oil filler cap and dipstick.

## ⚠ CAUTION

Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.



**NOTE:**

- The oil pump adjusts the oil level so that the oil in the oil tank is always kept at the proper level. If this check shows otherwise, some portion of the lubrication system is not working properly.
- Do not check the oil level immediately after the engine has been operated at high speeds. Make sure the vehicle is on firm, level ground while idling. Allow the engine to idle for a few minutes to stabilize the oil level.

The oil level is correct if the oil is above the stepped end line of the dipstick.

**OIL CHANGE**

**NOTE:**

- Pour in the engine oil after replacing the oil filter (see below).
- Change the oil with engine warm to assure complete and rapid draining.

Start the engine and let it idle for a few minutes. Stop the engine and remove the oil filler cap.

Remove the drain bolts from the oil tank and crankcase and drain the engine oil.

After draining the oil completely, install the drain bolts with new sealing washers.

**TORQUE: 25 N·m (2.5 kgf·m, 18 lbf·ft)**

Pour the recommended oil (page 3-10) into the oil tank up to the upper level mark on the dipstick.

**OIL CAPACITY:**

**4.9 liters (5.2 US qt, 4.3 Imp qt) at draining/  
filter change**

**5.5 liters (5.8 US qt, 4.8 Imp qt) at disassembly**

Install the oil filler cap.

After changing the oil, be sure to reset the maintenance indicator (see Owner's manual).

Check the oil level (page 3-10).

**ENGINE OIL FILTER**

Drain the engine oil (see above).

Remove the front engine guard (page 2-3)

Remove the oil filter center bolt, cover, spring, washer and oil filter.

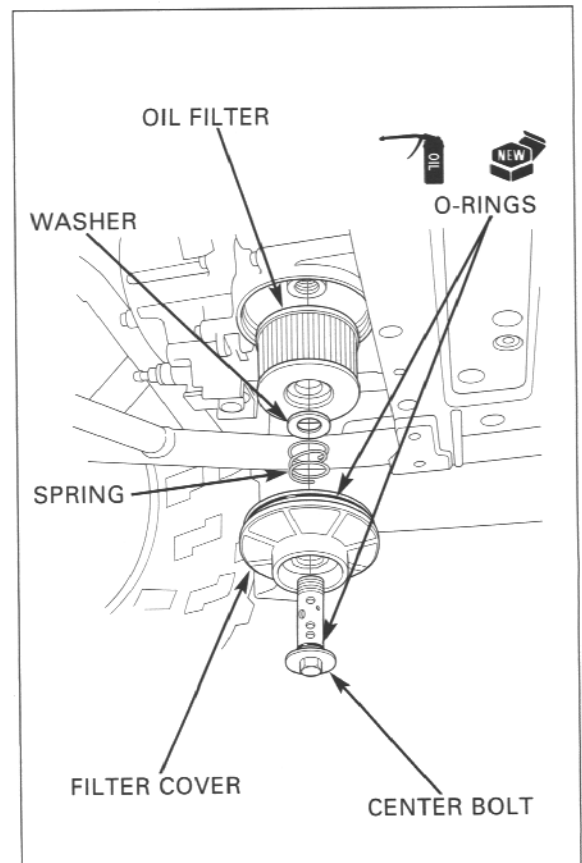
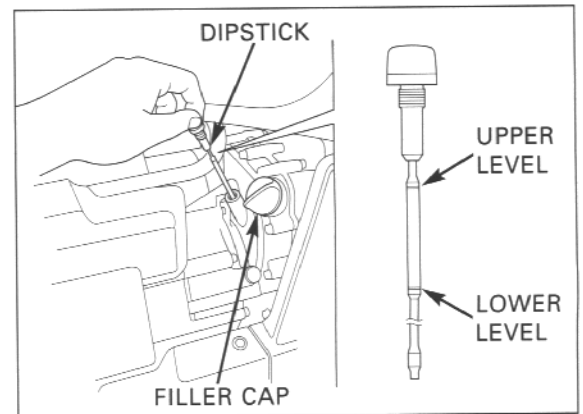
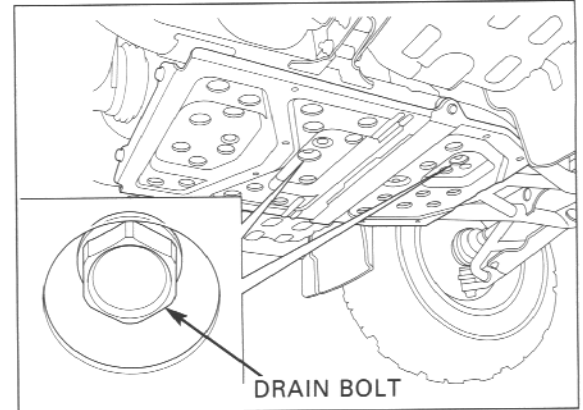
Remove the O-rings from the oil filter cover and center bolt.

Coat new O-rings with engine oil and install them into the grooves in the oil filter cover and center bolt.

Install a new oil filter. Reinstall the washer, spring, cover and center bolt. Tighten the center bolt.

**TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)**

Fill the oil tank with engine oil (see above).



## MAINTENANCE

### ENGINE IDLE SPEED

#### NOTE:

- Inspect and adjust the idle speed after all other engine maintenance items have been performed and are within specifications.
- Engine must be warm for accurate adjustment. Ten minutes of stop-and-go riding is sufficient

Remove the seat (page 2-3).

Connect a tachometer.

Warm up the engine, shift the transmission into neutral and place the vehicle on a level surface.

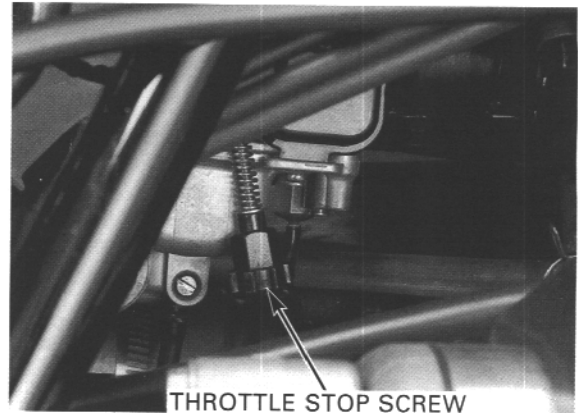
Check the idle speed.

**IDLE SPEED: 1,400 ± 100 rpm**

If the adjustment is necessary, remove the recoil starter cover (page 2-3).

Adjust the idle speed by turning the throttle stop screw as required.

Remove the tachometer and install the removed parts.



### RADIATOR COOLANT

Check the coolant level of the reserve tank with the engine running at normal operating temperature.

The level should be between the "UPPER" and "LOWER" level lines with the vehicle upright on a level surface.

If the level is low, remove the reserve tank cap, and fill the tank to the "UPPER" level line with a 50/50 mixture of distilled water and antifreeze (coolant preparation: page 6-4).

#### RECOMMENDED ANTIFREEZE:

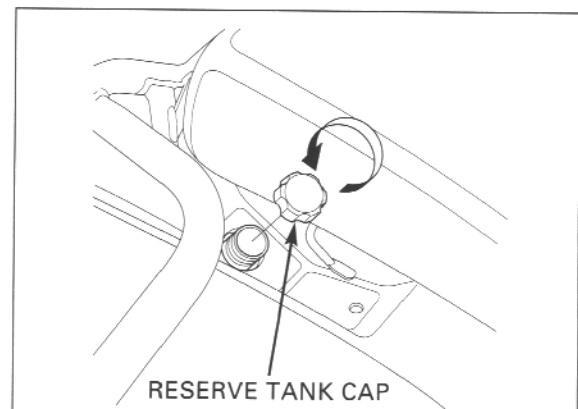
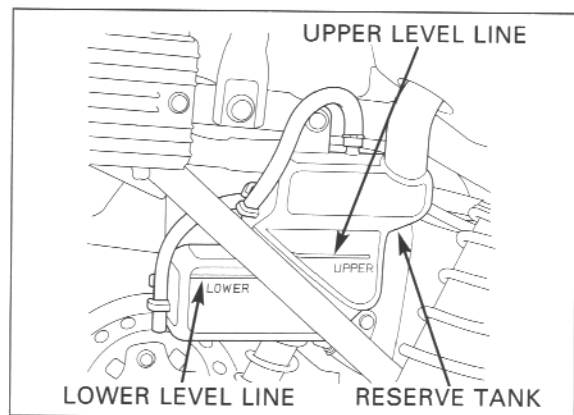
**Pro Honda HP coolant or an equivalent high quality ethylene glycol antifreeze containing silicate-free corrosion inhibitors**

#### NOTICE

*Using coolant with silicate corrosion inhibitors may cause premature wear of water pump seals or blockage of radiator passages. Using tap water may cause engine damage.*

Check to see if there are any coolant leaks when the coolant level decreases very rapidly.

If reserve tank becomes completely empty, there is a possibility of air getting into the cooling system. Be sure to remove all air from the cooling system (page 6-6).



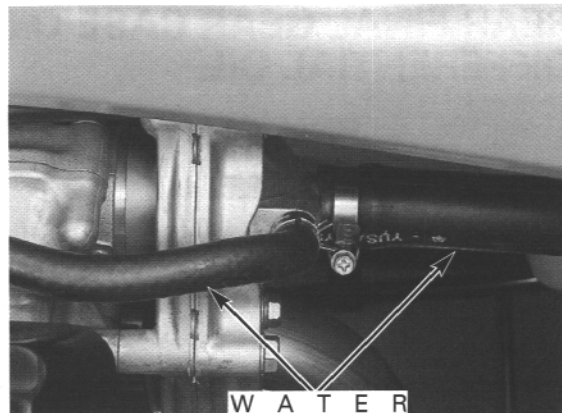
## COOLING SYSTEM

Remove the front fender (page 2-7).

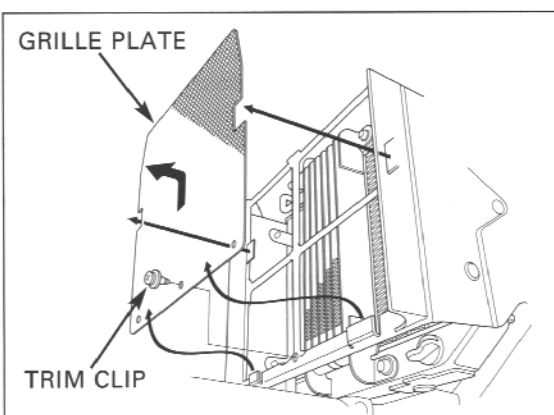
Check for any coolant leakage from the water pump, water hoses (radiator and by-pass hoses) and hose joints.

Check the water hoses for cracks or deterioration and replace if necessary.

Check that all hose clamps are tight.



Remove the trim clip, lift the radiator grille plate and remove it by aligning the cutouts with the tabs of the radiator grille.



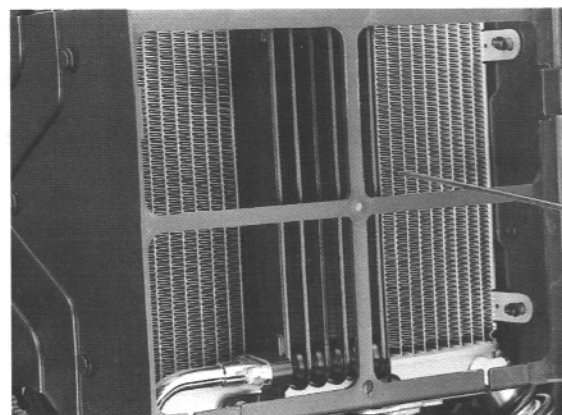
Check the radiator air passage for clogging or damage.

Straighten bent fins with a small, flat blade screwdriver and remove insects, mud or other obstructions with compressed air or low pressure water.

Replace the radiator if the air flow is restricted over more than 20% of the radiating surface.

Install the radiator grille.

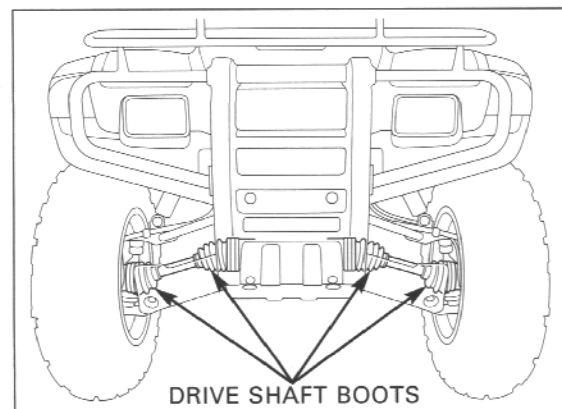
Install the front fender (page 2-7).



## DRIVE SHAFT BOOTS

Check the drive shaft boots for cuts or other damage.

If the boot is damaged, replace it (page 17-3).



## MAINTENANCE

# REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL

## FINAL GEAR CASE OIL

### LEVEL CHECK

Place the vehicle on a level surface.

Remove the oil check bolt and check that the oil flows out of the check bolt hole.

Check for leaks if there is no oil flow.

Remove the oil filler cap and pour the oil slowly through the filler hole until the oil starts to flow out of the check bolt hole.

**RECOMMENDED OIL:** Hypoid gear oil SAE #80

Install the check bolt with a new sealing washer and tighten it.

**TORQUE:** 12 N·m (1.2 kgf·m, 9 lbf·ft)

Coat a new O-ring with grease and install it into filler cap groove.

Install the filler cap and tighten it.

**TORQUE:** 12 N·m (1.2 kgf·m, 9 lbf·ft)

### OIL CHANGE

Place the vehicle on a level surface.

Remove the oil filler cap and drain bolt to drain the oil. When the oil is completely drained, install the drain bolt with a new sealing washer.

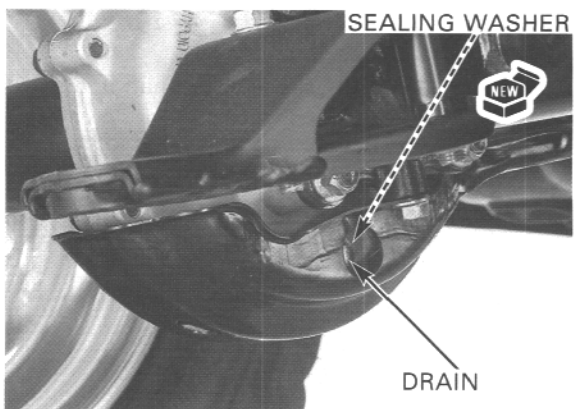
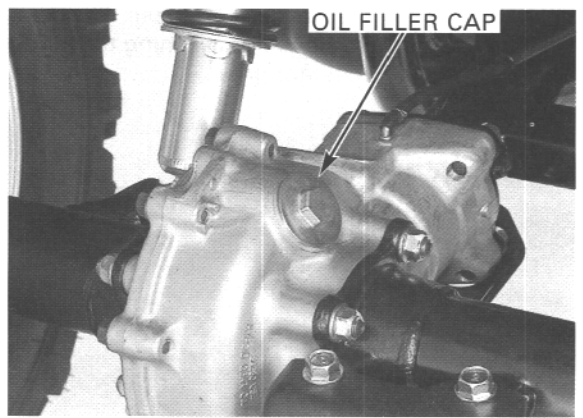
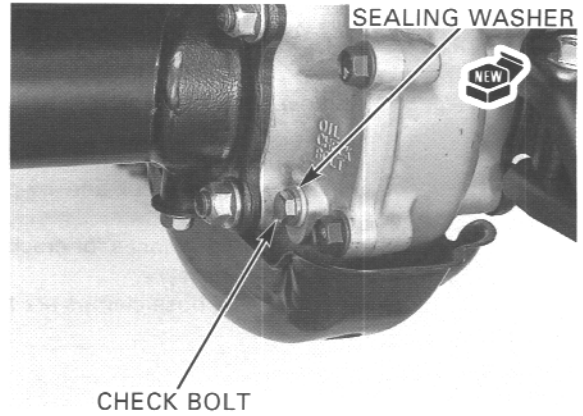
**TORQUE:** 12 N·m (1.2 kgf·m, 9 lbf·ft)

Fill the final gear case with the recommended oil (see above).

### OIL CAPACITY:

90 cm<sup>3</sup> (3.0 US oz, 3.2 Imp oz) at draining

100 cm<sup>3</sup> (3.4 US oz, 3.5 Imp oz) at disassembly





## DIFFERENTIAL OIL

### LEVEL CHECK

Place the vehicle on a level surface.

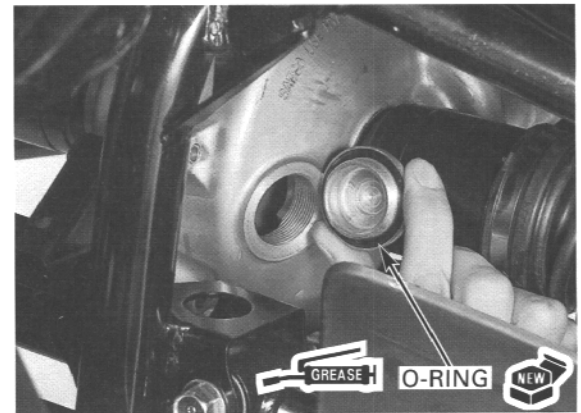
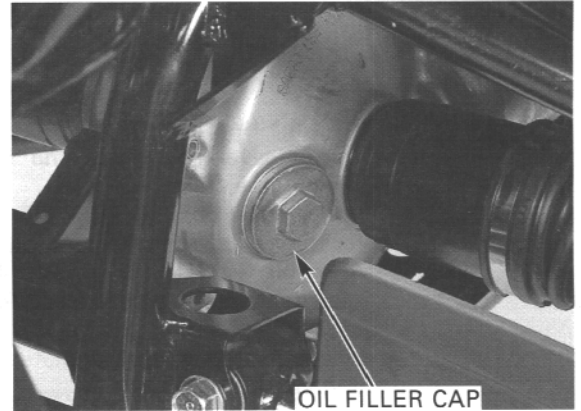
Remove the oil filler cap and check that the oil level is up to lower edge of the oil filler hole.

Check for leaks. If the oil level is low, pour the oil through the filler hole until it reaches the lower edge of the hole.

**RECOMMENDED OIL:** Hypoid gear oil SAE #80

Coat a new O-ring with grease and install it into filler cap groove. Install the filler cap and tighten it.

**TORQUE:** 12 N·m (1.2 kgf·m, 9 lbf·ft)



### OIL CHANGE

Place the vehicle on a level surface.

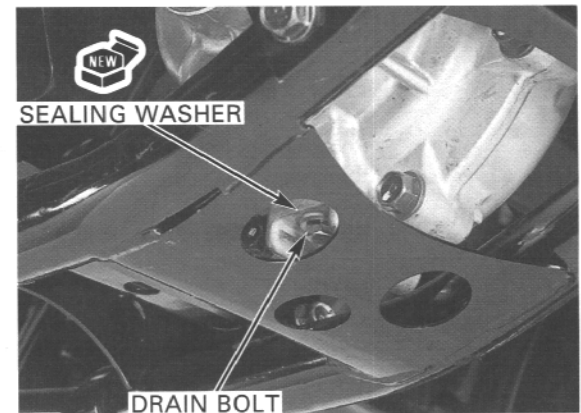
Remove the oil filler cap and drain bolt to drain the oil. When the oil is completely drained, install the drain bolt with a new sealing washer.

**TORQUE:** 12 N·m (1.2 kgf·m, 9 lbf·ft)

Fill the differential case with the recommended oil (see above).

### OIL CAPACITY:

241 cm<sup>3</sup> (8.2 US oz, 8.5 Imp oz) at draining  
275 cm<sup>3</sup> (9.3 US oz, 9.7 Imp oz) at disassembly



## BRAKE FLUID

### FRONT BRAKE

#### NOTICE

- Do not mix different types of fluid, as they may not be compatible with each other.
- Do not allow foreign material to enter the system when filling the reservoir.
- Avoid spilling fluid on painted, plastic or rubber parts. Place a rag over these parts whenever the system is serviced.

## MAINTENANCE

### NOTE:

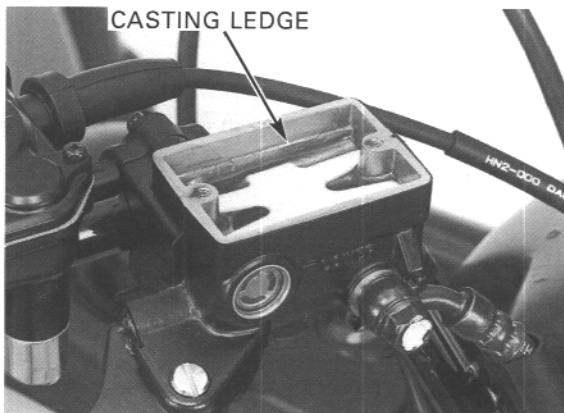
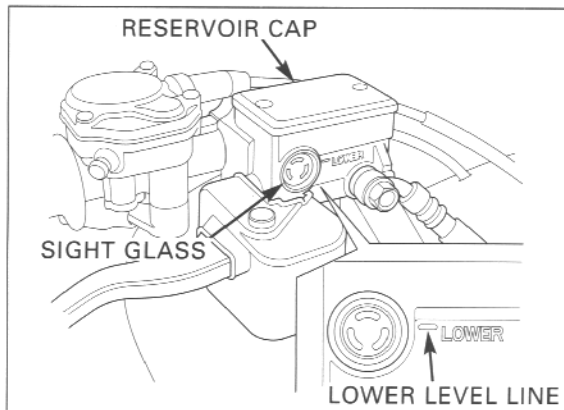
- When the fluid level is low, check entire system for leaks.

Turn the handlebar to the left side so that the reservoir is level and check the brake reservoir level through the sight glass.

If the level is near the "LOWER" level line, remove the reservoir cap, set plate and diaphragm, and fill the reservoir with DOT 3 or DOT 4 brake fluid from a sealed container to the casting ledge.

Install the diaphragm, set plate and reservoir cap and tighten the cap screws.

**TORQUE: 2 N·m (0.2 kgf·m, 1.4 lbf·ft)**



## BRAKE SHOE WEAR

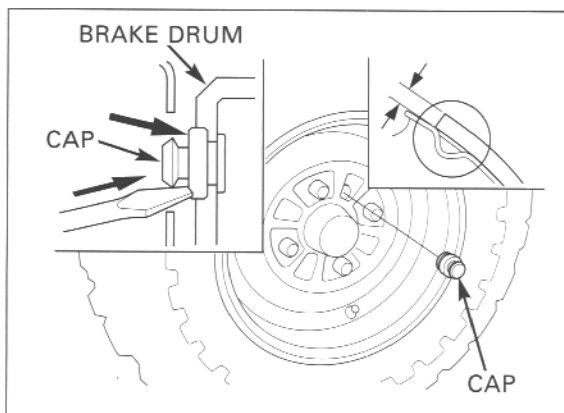
### FRONT BRAKE

Remove the inspection hole cap and inspect the lining thickness.

**SERVICE LIMIT: 2.0 mm (0.08 in)**

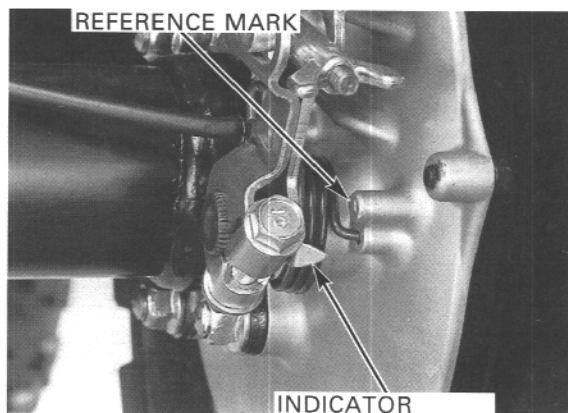
### NOTE:

- If either lining on one wheel is worn beyond the limit, both brake shoes for that wheel must be replaced.



### REAR BRAKE

Replace the brake shoes if the wear indicator plate aligns with the reference mark "Δ" on the brake panel when the rear brake is applied.



## BRAKE SYSTEM

### FRONT BRAKE

Measure the free play (distance the brake lever moves before the brake starts to take hold) at the end of the front brake lever.

**FREE PLAY: 25—30 mm (1—1-3/16 in)**

If the free play is excessive and the brake shoe lining are not worn beyond the service limit, adjust the brake shoe lining-to-drum clearance.

Raise the front wheel off the ground by placing a support block under the vehicle.

*Be careful not to damage the wheel while adjusting.*

Remove the inspection hole cap and line up the cap hole with one of the brake shoe adjusters and turn the adjuster up with a screw driver until the shoes lock, then back off three stops.

Spin the wheel manually to make sure the brake does not drag.

Line up the inspection hole with the second adjuster and repeat the procedure.

Adjust both wheels.

**NOTE:**

- There are two adjusters on each front wheel. Adjust all four adjusters.

Recheck the brake lever free play. If the free play is still excessive after adjusting the brake shoe lining clearance, there is probably air in the brake system and it must be bled out (section 16).

After checking, install the inspection hole cap securely in the drum while pushing the cap with a screwdriver.

Inspect the brake hoses and fittings for deterioration, cracks, damage or signs of leakage.

Tighten any loose fittings.

Replace hoses, pipes and fittings as required.

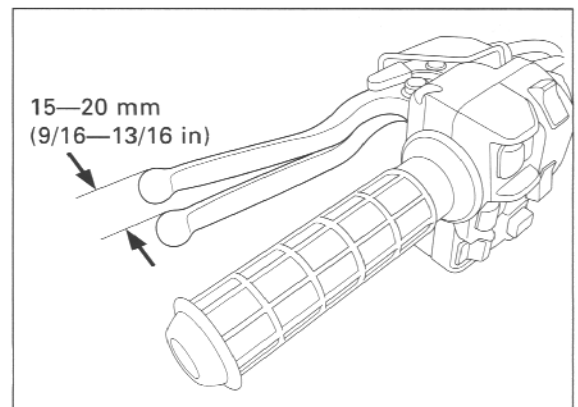
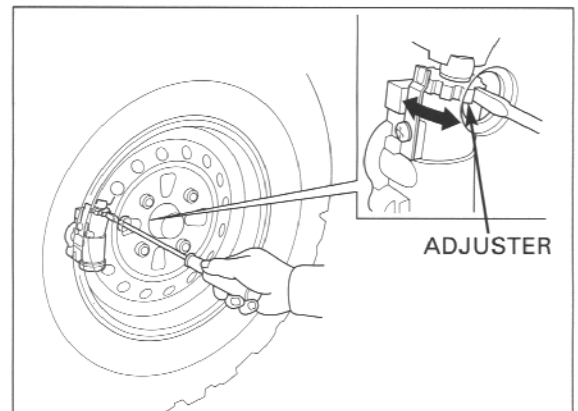
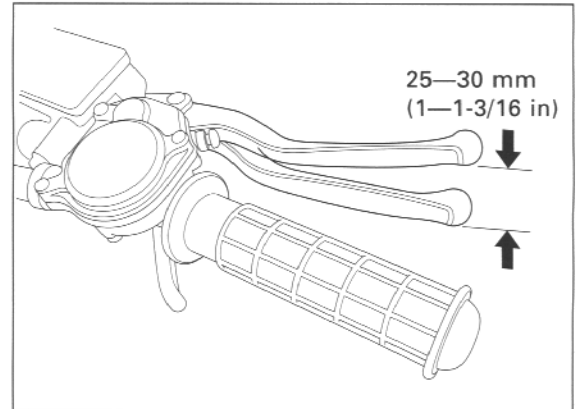
### REAR BRAKE

Check the brake cable, brake lever and brake pedal for loose connections, excessive play or other damage. Replace or repair if necessary.

For cable lubrication: Disconnect the brake cable at the brake lever or pedal. Thoroughly lubricate the cables and their pivot points with a commercially available cable lubricant or a light weight oil.

Measure the rear (parking) brake lever free play at the end of the lever.

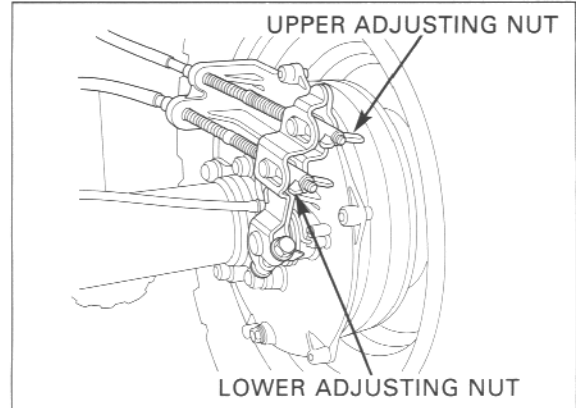
**FREE PLAY: 15—20 mm (9/16—13/16 in)**



## MAINTENANCE

*Make sure that the cutout in the adjusting nut is seated on the brake arm joint.*

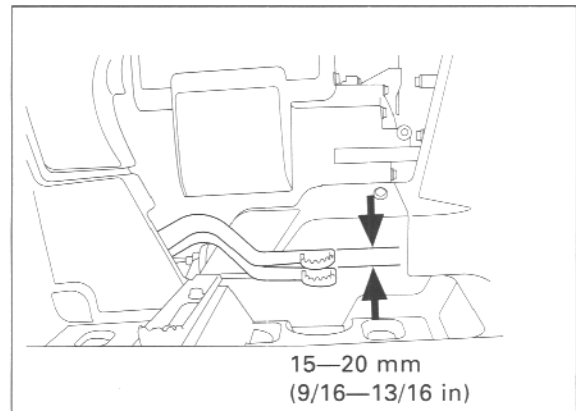
Adjust the brake lever free play by turning the upper adjusting nut at the brake arm.



Measure the rear brake pedal free play at the end of the pedal.

**FREE PLAY: 15—20 mm (9/16—13/16 in)**

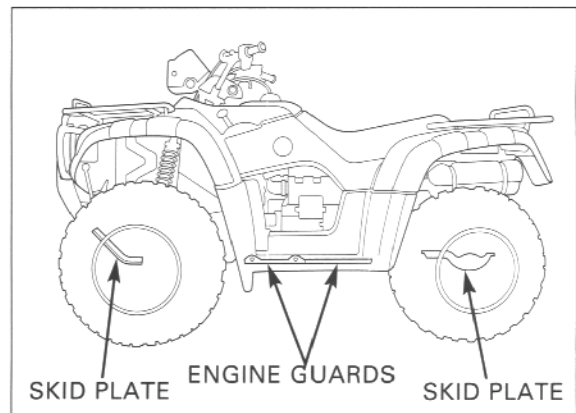
Adjust the brake pedal free play by turning the lower adjusting nut at the brake arm.



## SKID PLATE, ENGINE GUARD

Check the skid plates and engine guards for cracks, damage or looseness.

Tighten any loose fasteners. Replace the skid plate and engine guard as required.



## SUSPENSION

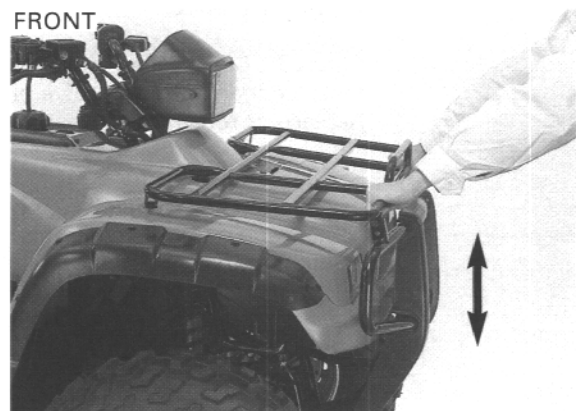
*Loose, worn or damaged suspension parts impair vehicle stability and control.*

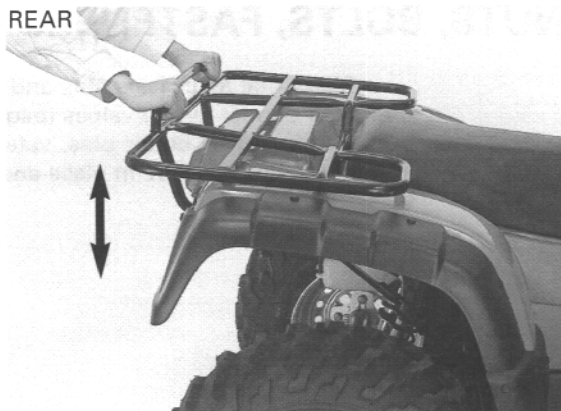
Check the action of the front and rear shock absorbers by compressing them several times.

Check the entire shock absorber assembly for signs of leaks, damage or loose fasteners.

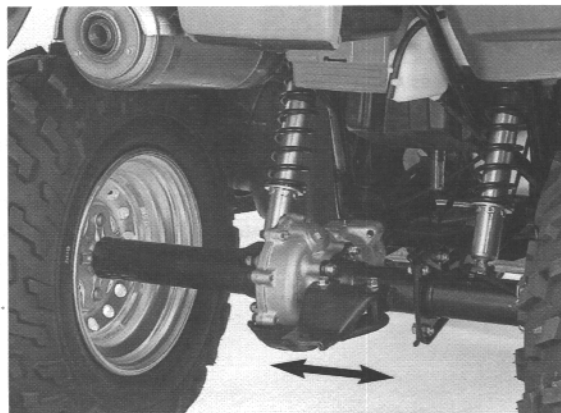
Replace damaged components which cannot be repaired.

Tighten all nuts and bolts.



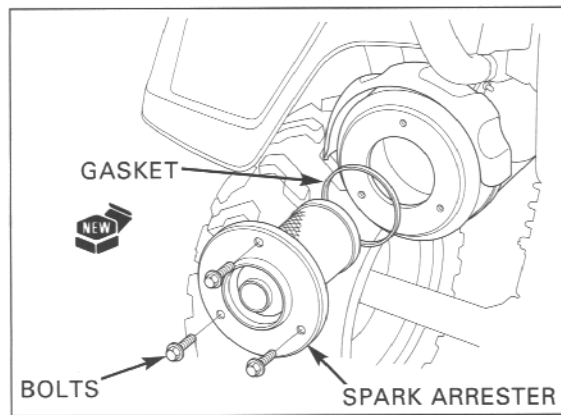


Raise the rear wheel off the ground by supporting the frame securely.  
 Check for worn swingarm pivot bearings by grabbing the rear axle housings and attempting to move the swingarm side to side.  
 Replace the pivot bearings if any looseness is noted (section 15).



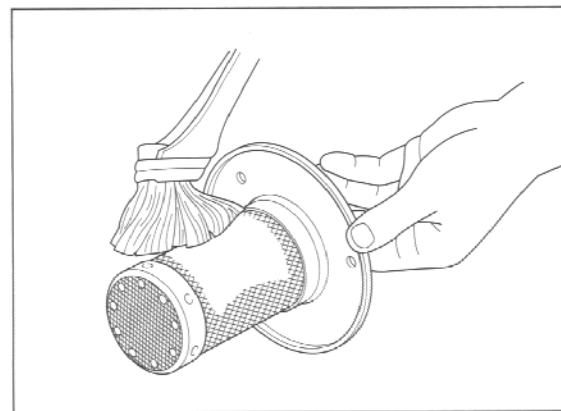
## SPARK ARRESTER

Remove the three bolts and the spark arrester with the gasket.



Use a brush to remove carbon deposits from the screen mesh, being careful not to damage the screen mesh.  
 The screen mesh must be free of breaks and holes.  
 Replace the spark arrester if necessary.

Install the spark arrester with a new gasket and tighten the bolts securely



## MAINTENANCE

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### NUTS, BOLTS, FASTENERS

Check that all chassis nuts and bolts are tightened to their correct torque values (page 1-12).

Check that all cotter pins, safety clips, hose clamps and cable stays are in place and properly secured.

### WHEELS/TIRES

*Tire pressure should be checked when the tires are COLD.*

Check the tire pressure with the tire pressure gauge.

#### RECOMMENDED TIRE PRESSURE:

**Standard:** 25 kPa (0.25 kg/cm<sup>2</sup>, 3.6 psi)

**Minimum:** 22 kPa (0.22 kg/cm<sup>2</sup>, 3.2 psi)

**Maximum:** 28 kPa (0.28 kg/cm<sup>2</sup>, 4.0 psi)

**With cargo:** 25 kPa (0.25 kg/cm<sup>2</sup>, 3.6 psi)



Check the tires for cuts, embedded nails, or other damage.

Measure the tread depth at the center of the tires. Replace the tires when the tread depth reaches the following limits.

#### MINIMUM TREAD DEPTH (Front/Rear):

**4.0 mm (0.16 in)**

Raise the wheel off the ground and check the hub or knuckle and axle bearings for excessive play or abnormal noise.

### STEERING SHAFT HOLDER BEARING

Raise the front wheels off the ground and support the vehicle securely.

Check that the handlebar moves freely from side to side.

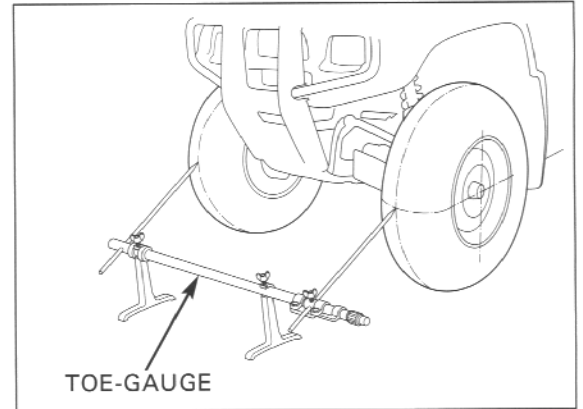
If the handlebar moves unevenly, binds, or has horizontal movement, inspect the steering shaft holder bushing and bearing (section 14).



## STEERING SYSTEM

Place the vehicle on level ground with the front wheels facing straight ahead.  
Mark the centers of the tires with chalk to indicate the axle center height.

Align the gauge with the marks on the tires as shown.  
Check the readings on the gauge scales.



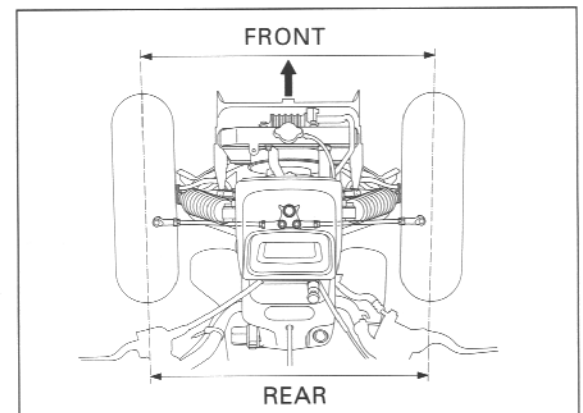
Slowly move the vehicle back until the wheels have been turned 180° so the marks on the tires are aligned with the gauge height on the rear side.

Measure the toe on the rear part of the tires at the same points with no load on the vehicle.

**Toe-out: 24 ± 15 mm (1 ± 9/16 in)**

**NOTE:**

- Toe-out means the front measurement is greater than the rear measurement.

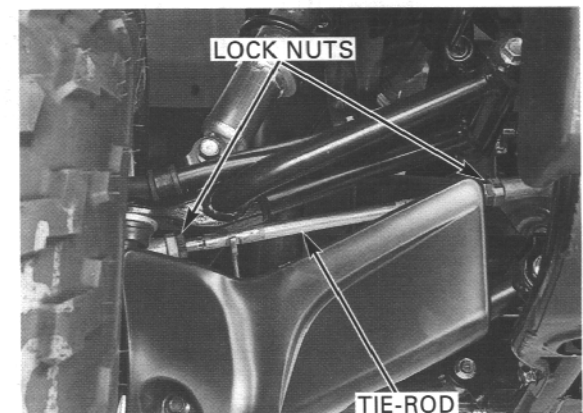


When the toe is out of specification, adjust it by changing the length of the tie-rods equally by loosening the lock nuts and turning the tie-rods while holding the ball joints.

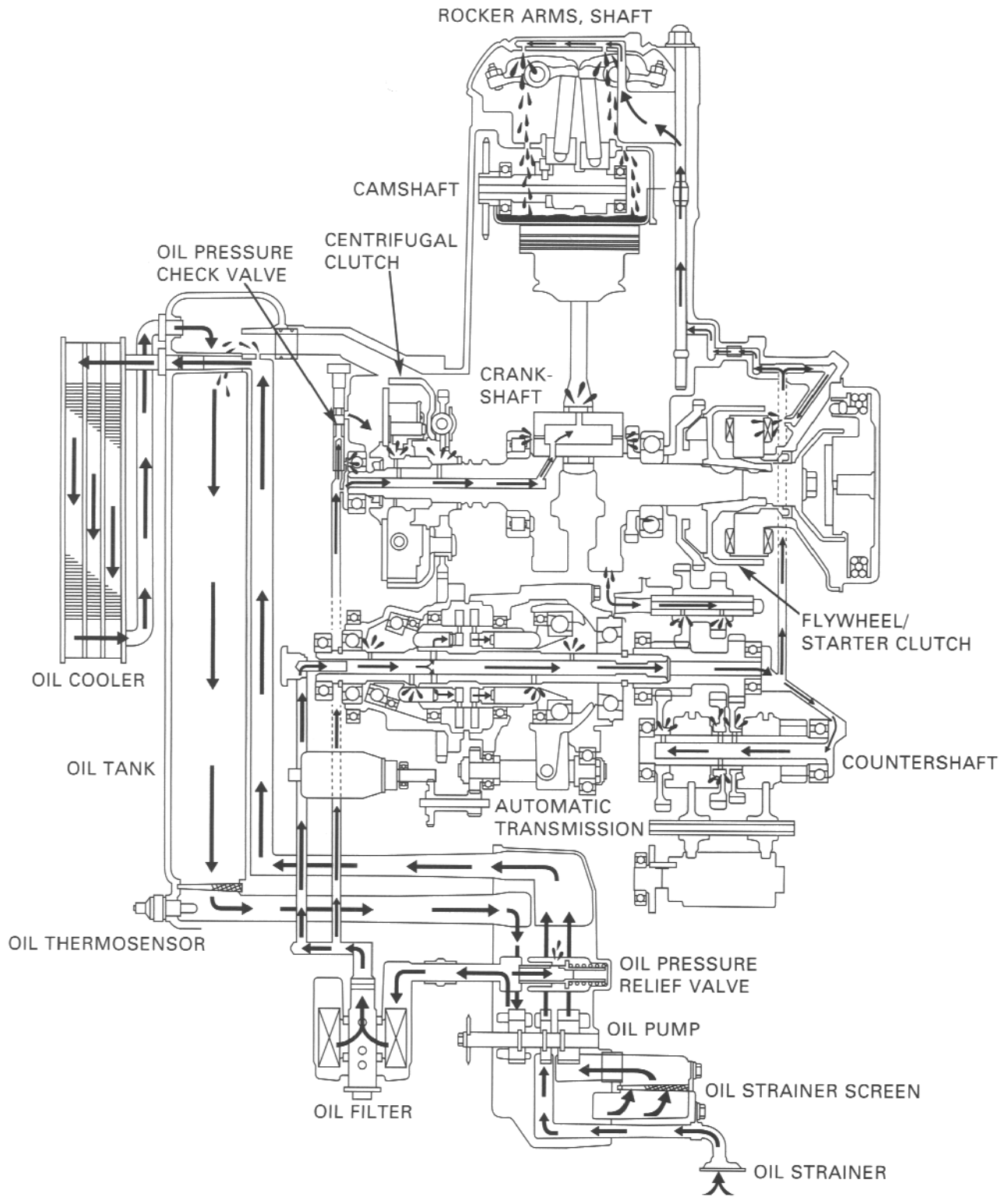
After adjusting each tie-rod, rotate both ball joints in the same direction with the tie-rod axis until they stop against the ball joint stud. Hold them in that position and tighten the tie-rod lock nuts.

**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

After finally tightening the lock nuts, make sure the ball joints operate properly by rotating the tie-rods, to make sure both ball joints have equal play.



# LUBRICATION SYSTEM





# 4. LUBRICATION SYSTEM

SERVICE INFORMATION	4-1	OIL COOLER	4-4
TROUBLESHOOTING	4-2	OIL STRAINER	4-5
OIL PRESSURE CHECK	4-3	OIL PUMP	4-9

## SERVICE INFORMATION

### GENERAL

4

### ⚠ CAUTION

Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.

- This section covers service of the oil pump, oil tank and oil cooler.
- The crankcase must be separated to service the oil pump.
- For oil level check, oil change and filter replacement, refer to section 3.
- For oil thermosensor information, refer to section 22.
- The engine oil is used for automatic transmission oil. For troubleshooting of the automatic transmission unit, refer to section 13.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Engine oil capacity	After draining	4.7 liters (5.0 US qt, 4.1 Imp qt)	——
	After draining/filter change	4.9 liters (5.2 US qt, 4.3 Imp qt)	——
	After disassembly	5.5 liters (5.8 US qt, 4.8 Imp qt)	——
Recommended engine oil		Honda GN4 4-stroke oil or equivalent motor oil API service classification SF or SG Viscosity: SAE 10W-40	——
Oil pressure (80°C/176°F)	At 1,400 rpm	Above 150 kPa (1.5 kgf/cm <sup>2</sup> , 22 psi)	——
	At 5,000 rpm	Above 800 kPa (8.2 kgf/cm <sup>2</sup> , 116 psi)	——
Oil pump	Tip clearance	0.15 (0.006)	0.20 (0.008)
	Body clearance	0.12—0.22 (0.005—0.009)	0.25 (0.010)
	Side clearance	0.02—0.09 (0.001—0.004)	0.11 (0.004)

### TORQUE VALUES

Oil gallery sealing bolt (front crankcase cover) 34 N·m (3.5 kgf·m, 25 lbf·ft)  
 Oil thermosensor 18 N·m (1.8 kgf·m, 13 lbf·ft)

### TOOLS

Oil pressure gauge 07YAJ-0010100 — or equivalent commercially available in U.S.A.  
 Oil pressure gauge 07YAJ-0010300 —  
 Pressure gauge hose 07FPJ-7520110 —  
 Pressure gauge attachment 07KPJ-VD60100 — or 07KPJ-VD6010A (U.S.A. only)

## LUBRICATION SYSTEM

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### TROUBLESHOOTING

#### **Oil level too low—high oil consumption**

- Oil consumption
- External oil leak
- Worn piston rings or incorrect piston ring installation
- Worn cylinder
- Worn valve guide or stem seals
- Oil pump worn or damaged

#### **Low oil pressure**

- Oil level low
- Oil pressure relief valve wear
- Clogged oil strainer or filter
- Faulty oil pump
- Internal oil leak
- Incorrect oil being used

#### **No oil pressure**

- Oil level too low
- Oil pressure relief valve stuck open
- Broken oil pump drive chain
- Broken oil pump drive or driven sprocket
- Damaged oil pump
- Internal oil leak

#### **High oil pressure**

- Oil pressure relief valve stuck closed
- Clogged oil gallery
- Incorrect oil being used

#### **Oil contamination**

- Oil or filter not changed often enough
- Worn piston rings or incorrect piston ring installation
- Worn valve guide or stem seals

#### **Oil emulsification**

- Blown cylinder head gasket
- Water entry

## OIL PRESSURE CHECK

Check the oil level and add the recommended oil if necessary (page 3-10). Also, check the engine and oil line for external oil leak before checking the oil pressure.

Remove the oil gallery sealing bolt and washer on the left side of the front crankcase cover.

**NOTE:**

- Clean around the sealing bolt with compressed air before removing the bolt, and be sure that no dirt is allowed to enter the oil gallery. Connect an oil pressure gauge attachment and gauge to the oil gallery hole.

**TOOLS:**

Pressure gauge (for 1,400 rpm)	07YAJ-0010100
Pressure gauge (for 5,000 rpm)	07YAJ-0010300
Gauge hose	07FPJ-7520110
Pressure gauge attachment	07KPJ-VD60100 or 07KPJ-VD6010A (U.S.A. only)

or equivalent commercially available in U.S.A.

Start the engine and check the oil pressure at both engine rpm levels.

**OIL PRESSURE (80°C/176°F):**

- Above 150 kPa (1.5 kgf/cm<sup>2</sup>, 22 psi) at 1,400 rpm
- Above 800 kPa (8.2 kgf/cm<sup>2</sup>, 116 psi) at 5,000 rpm

Stop the engine.

If the pressure is abnormal, check the pressure check valve in the front crankcase cover (see below). If it is OK, inspect the lubrication system.

Clean the sealing bolt threads and install it with a new sealing washer.

**TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)**

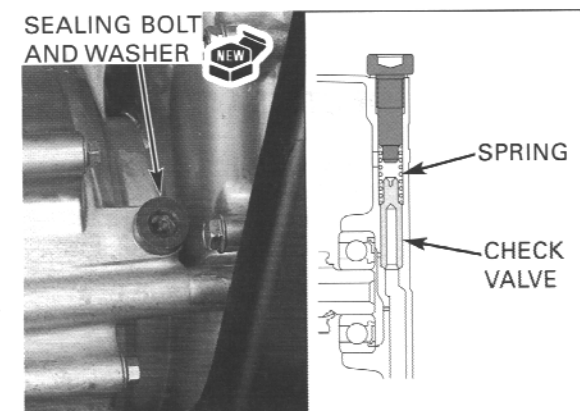
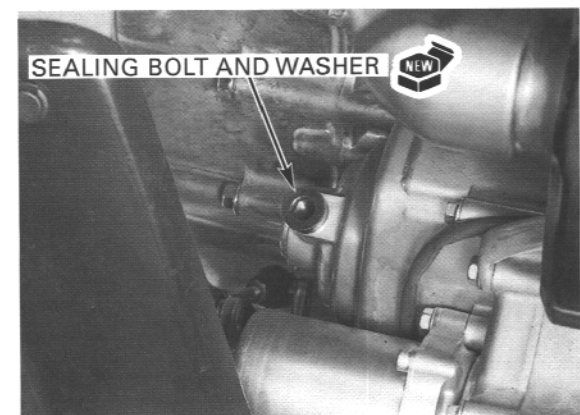
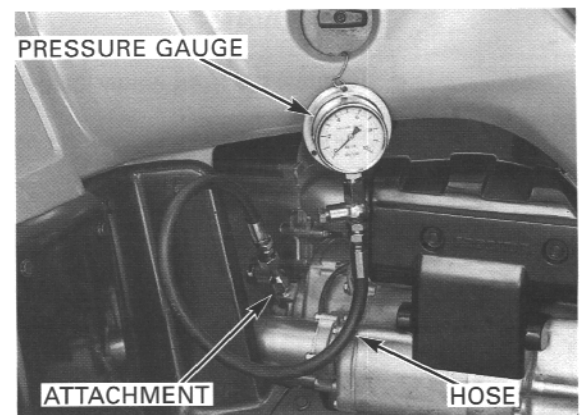
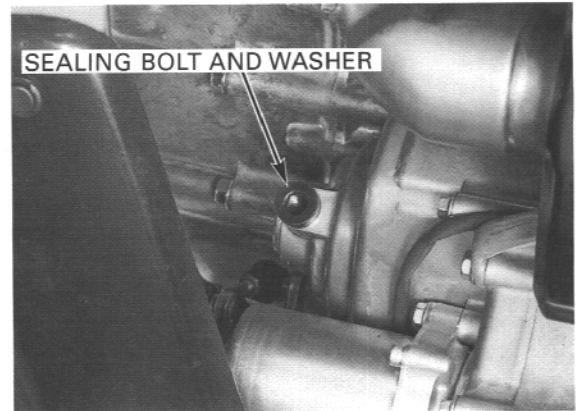
## CHECK VALVE INSPECTION

Remove the oil gallery sealing bolt and washer on the right side of the front crankcase cover.

Remove the valve spring and check valve. Check the valve for wear, sticking or other damage. Check the spring for fatigue or damage.

Install the check valve and spring. Clean the sealing bolt threads and install it with a new sealing washer.

**TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)**



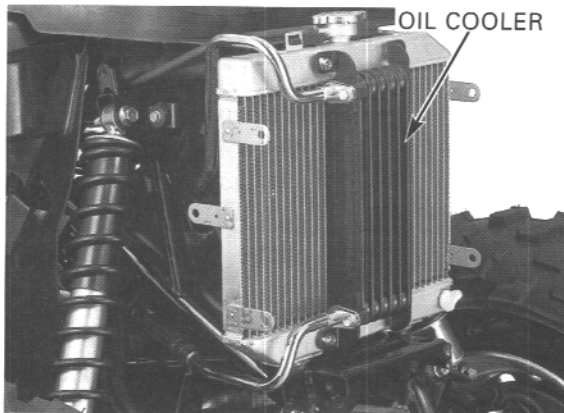
### OIL COOLER

#### INSPECTION

Remove the radiator grill plate (page 3-12).

Check the oil cooler pipe joints and seams for leaks. Check the oil cooler air passage for clogging or damage.

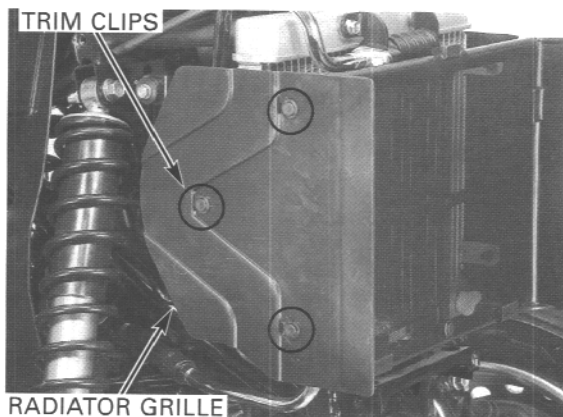
Straighten bent fins with a small, flat blade screwdriver and remove insects, mud or other obstructions with compressed air or low pressure water.



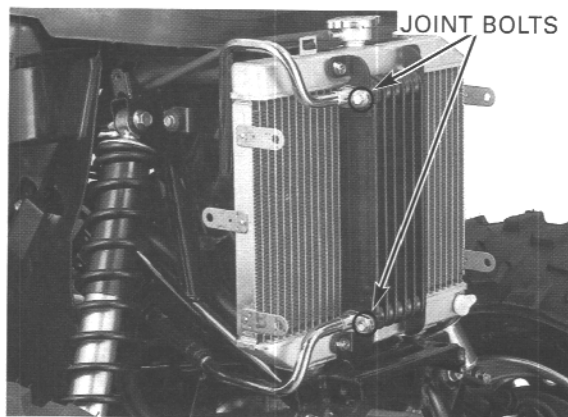
#### REMOVAL

Remove the front fender (page 2-7).

Remove the six clips and the radiator grill.



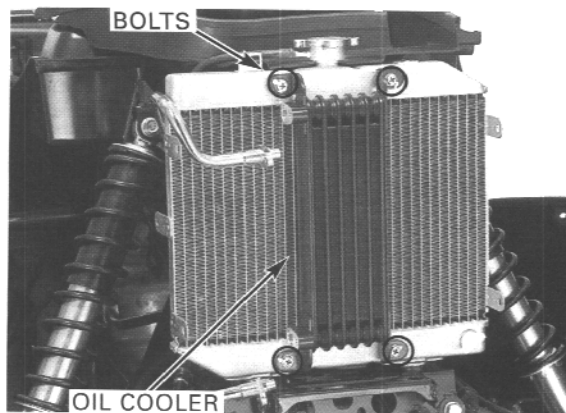
Remove the oil cooler pipe joint bolts and joints from the oil cooler.  
Remove the O-rings.



Remove the four bolts and the oil cooler from the radiator.

#### INSTALLATION

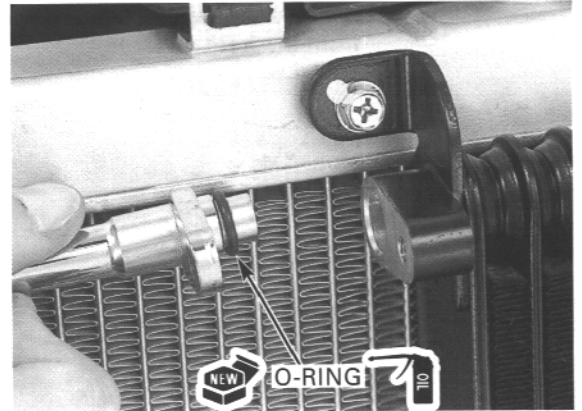
Install the oil cooler onto the radiator and tighten the four bolts securely.



Coat new O-rings with oil and install them onto the oil cooler pipe joints.  
Install the pipe joints onto the oil cooler.

Install the removed parts in the reverse order of removal.

Check the oil level and add the recommended oil if the level is low (page 3-9).



## OIL STRAINER

### CLEANING

#### FOR FEED PUMP:

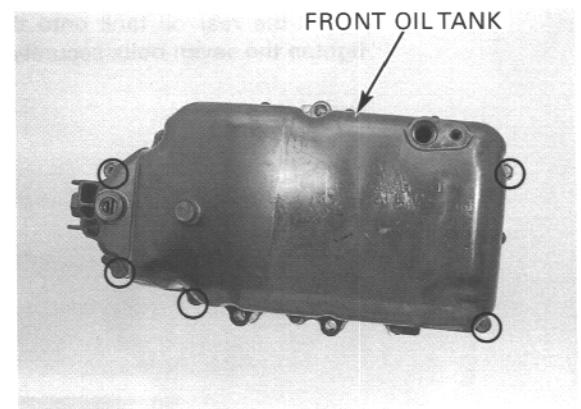
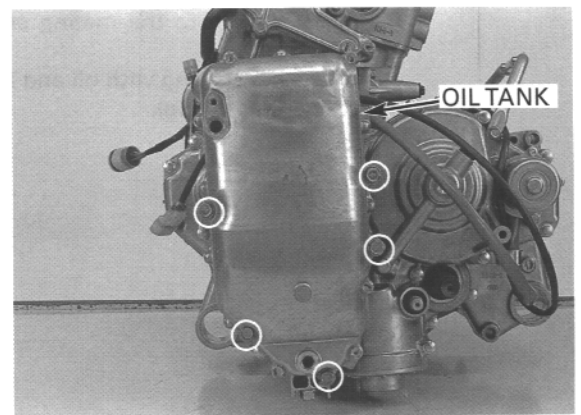
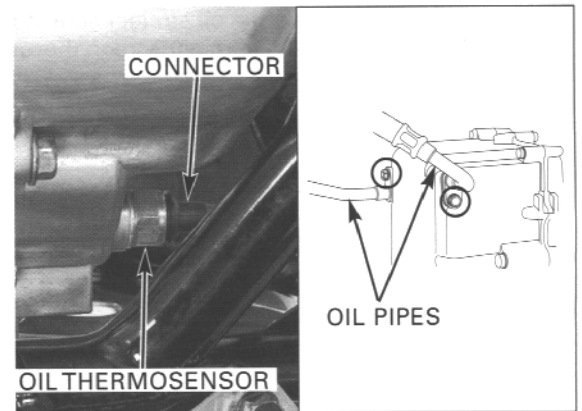
Remove the right front mud guard and right inner fender (page 2-6).

Disconnect the oil thermosensor connector and remove the thermosensor.

Remove the bolts and oil pipes from the oil tank.

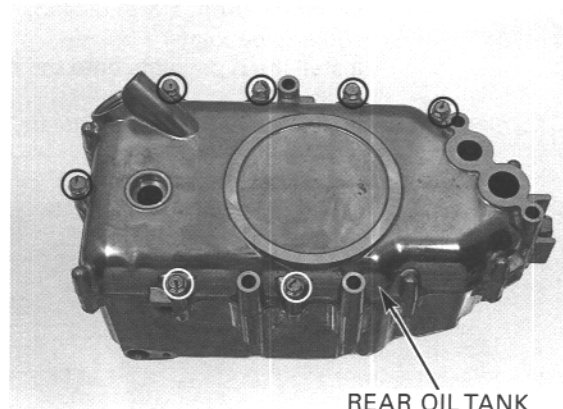
Remove the five bolts and oil tank.  
Remove the O-rings and collar.

Remove the five bolts from the front oil tank.

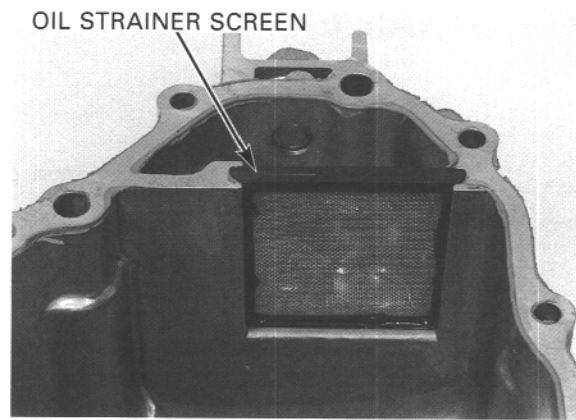


## LUBRICATION SYSTEM

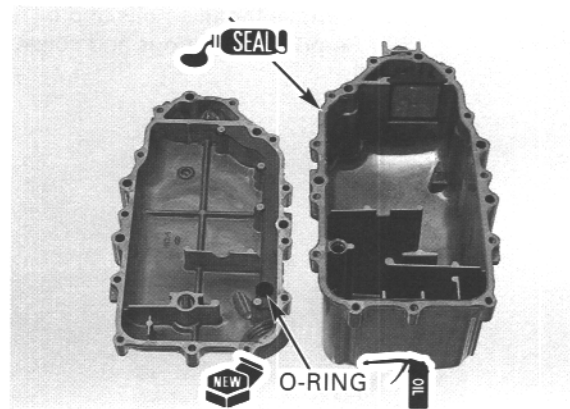
Remove the seven bolts and remove the rear oil tank from the front oil tank.



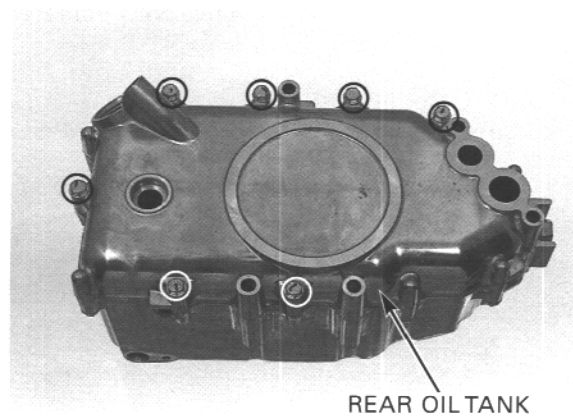
Remove the oil strainer screen from the front oil tank. Clean the strainer screen thoroughly and reinstall it.



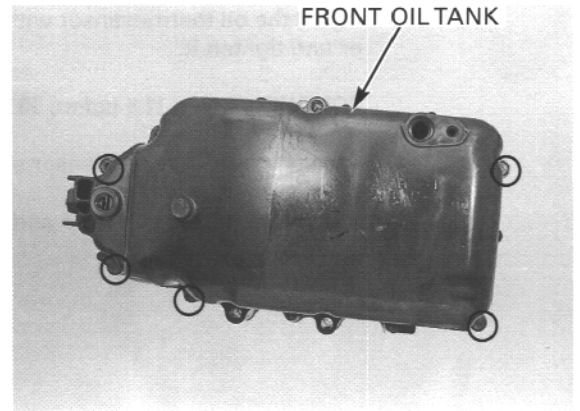
Apply sealant to the mating surface of the front oil tank. Coat a new O-ring with oil and install it onto the plate on the rear oil tank.



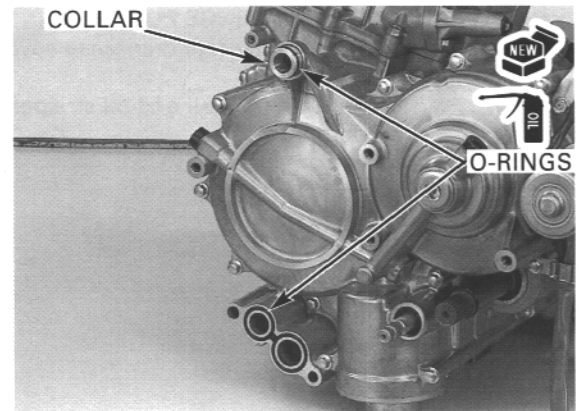
Install the rear oil tank onto the front oil tank, and tighten the seven bolts securely.



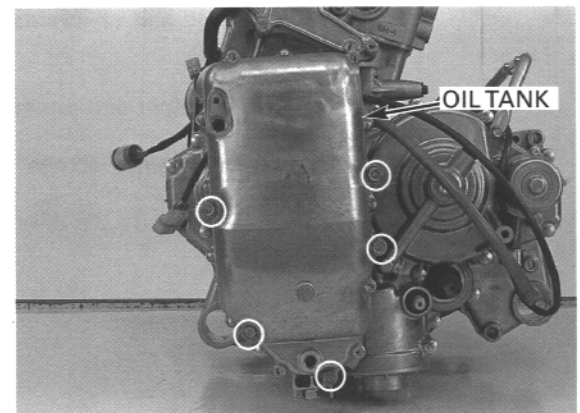
Install the five bolts and tighten them securely.



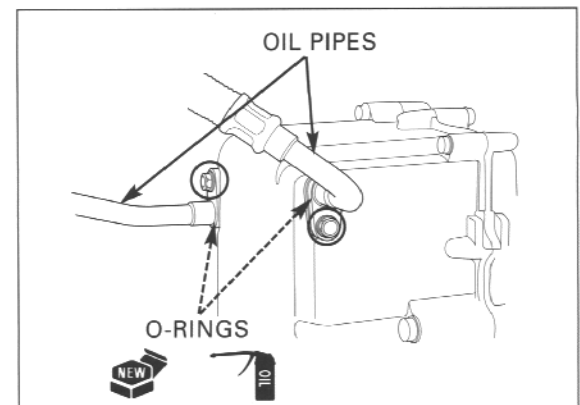
Install the joint collar into the front crankcase cover. Coat new O-rings with oil and install them onto the collar and into the crankcase cover groove.



Install the oil tank onto the front crankcase cover and tighten the five bolts securely.



Coat new O-rings with oil and install them onto the oil pipes. Install the oil pipes into the oil tank and tighten the bolts securely.



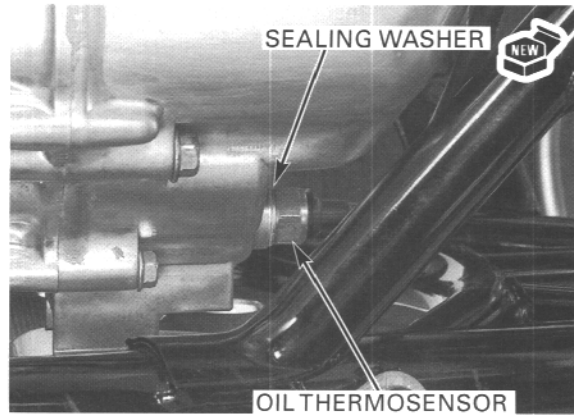
## LUBRICATION SYSTEM

Install the oil thermosensor with a new sealing washer and tighten it.

**TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)**

Connect the oil thermosensor connector.

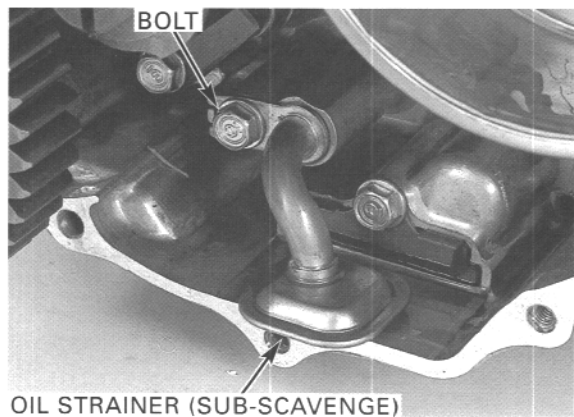
Install the left inner fender and left front mud guard (page 2-6).



### FOR SCAVENGE PUMPS:

Remove the rear crankcase cover (page 12-3).

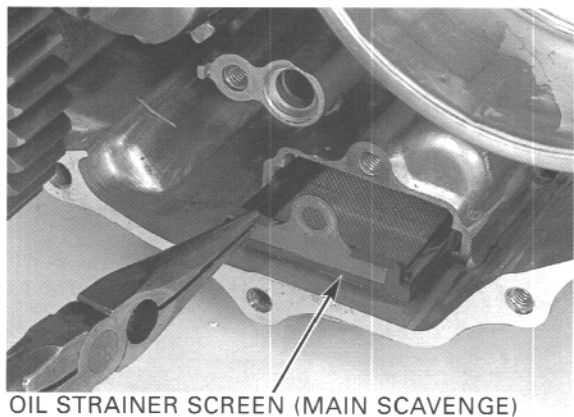
Remove the bolt and oil strainer for the sub-scavenge pump.



Remove the bolt and oil strainer screen for the main scavenge pump.

Clean the oil strainer and screen thoroughly.

Install the oil strainer screen and tighten the bolt securely.



Coat a new O-ring with oil and install it onto the oil strainer.  
Install the oil strainer and tighten the bolt securely.





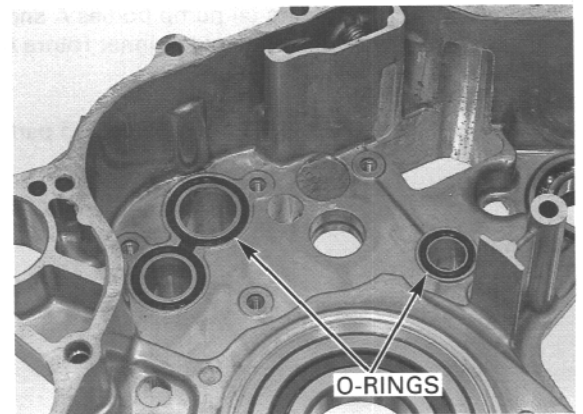
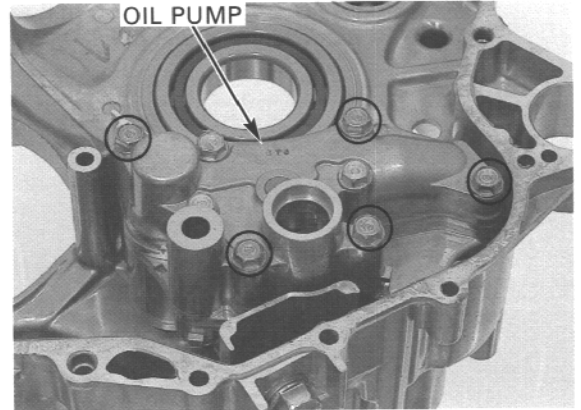
# OIL PUMP

## REMOVAL

Separate the crankcases (page 13-6).

Remove the five bolts (gold) and oil pump from the front crankcase.

Remove the O-rings.



## DISASSEMBLY

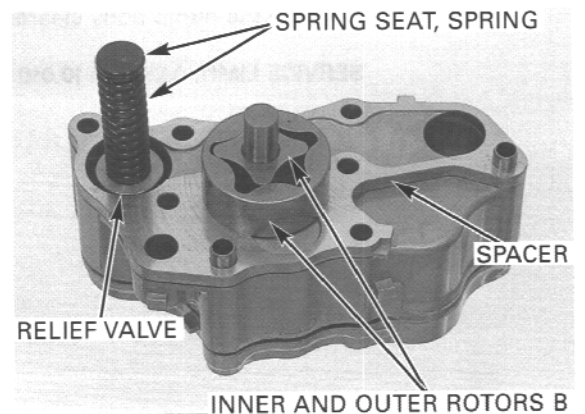
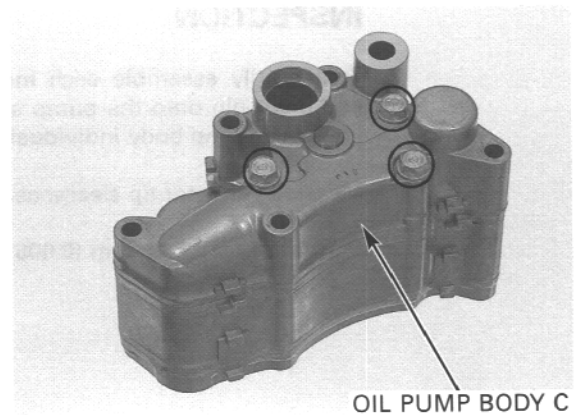
*Oil pump body C may pop out due to spring force.*

Remove the three bolts and oil pump body C.

Remove the spring seat, spring and relief valve.

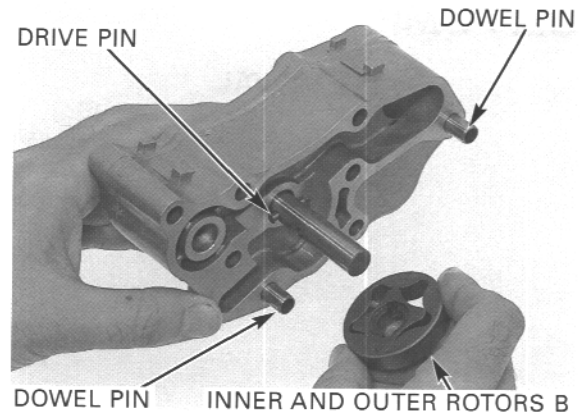
Check the valve for wear, sticking or other damage. Check the spring for fatigue or damage.

Remove outer, inner rotors C and drive pin. Remove the oil pump spacer.



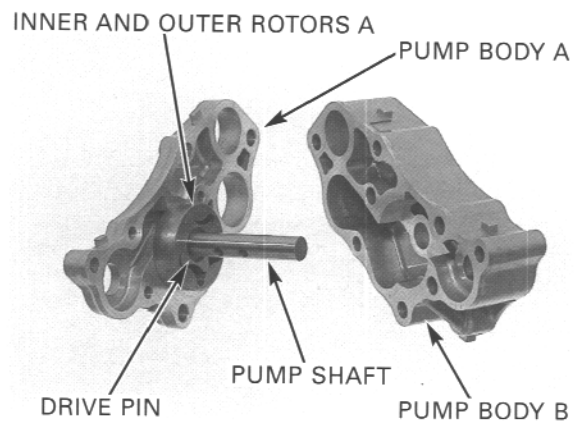
## LUBRICATION SYSTEM

Remove outer, inner rotors B and drive pin.  
Remove the dowel pins



Separate oil pump bodies A and B.  
Remove the outer, inner rotors A, drive pin and pump shaft.

Clean all the disassembled parts thoroughly.

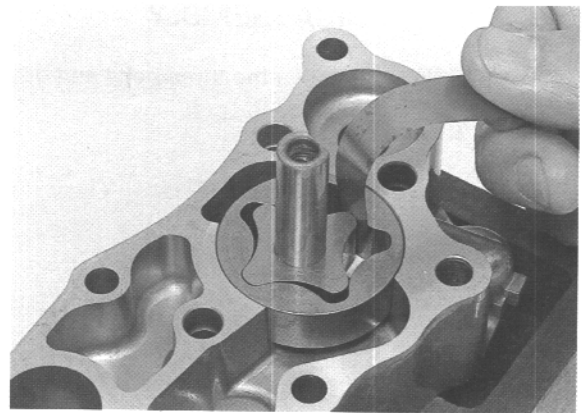


### INSPECTION

Temporarily assemble each inner rotor, outer rotor and drive pin onto the pump shaft, and install them into each pump body individually.

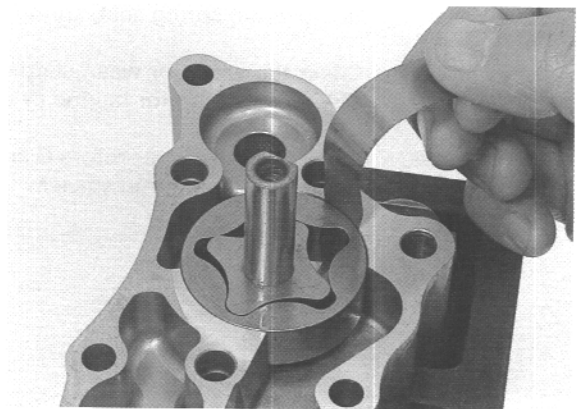
Measure the rotor tip clearance.

**SERVICE LIMIT: 0.20 mm (0.008 in)**



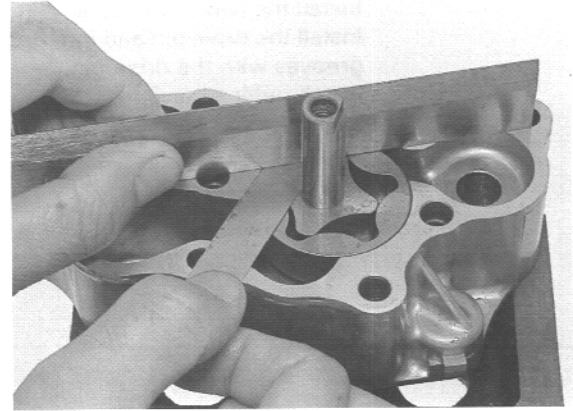
Measure the pump body clearance.

**SERVICE LIMIT: 0.25 mm (0.010 in)**



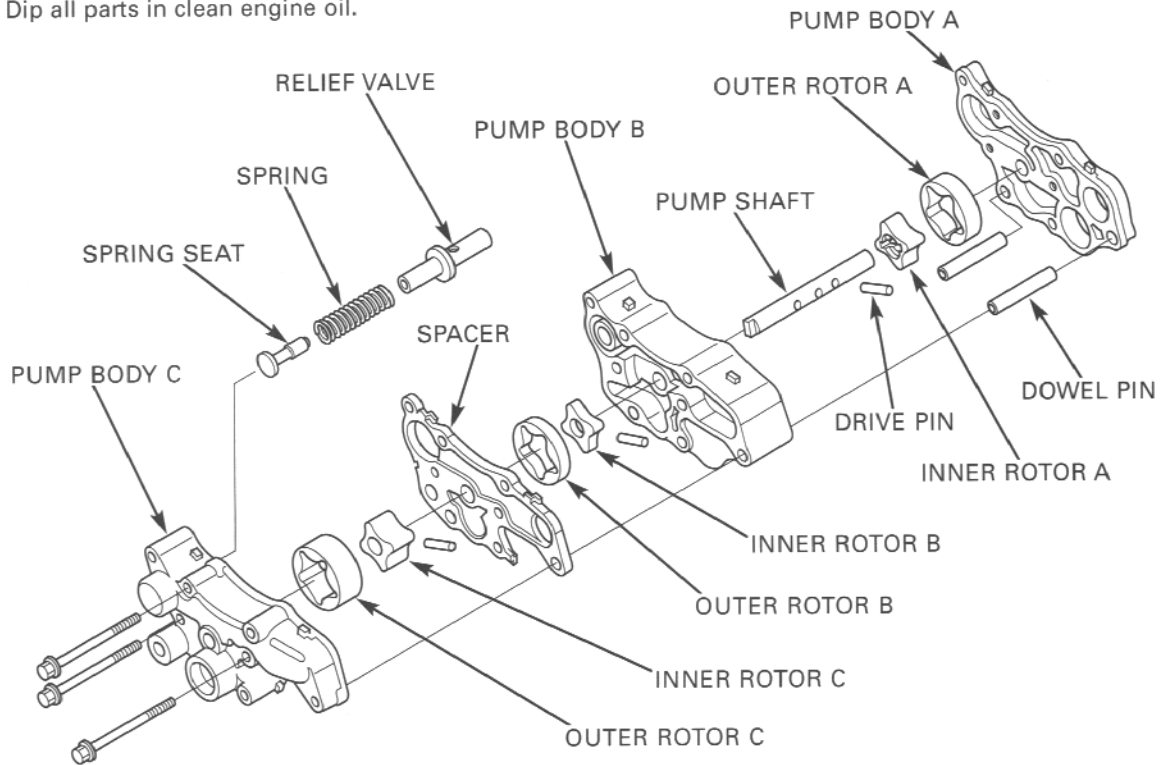
Measure the pump side clearance.

**SERVICE LIMIT: 0.11 mm (0.004 in)**

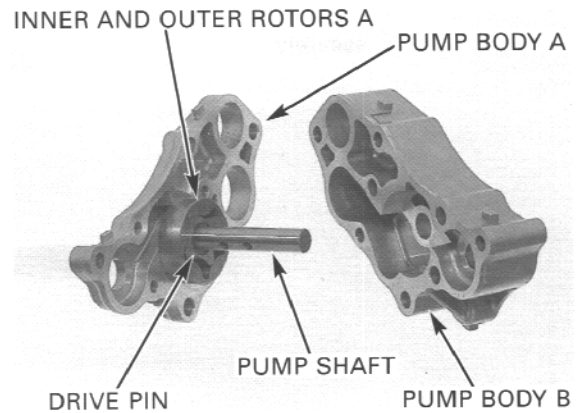


**ASSEMBLY**

Dip all parts in clean engine oil.

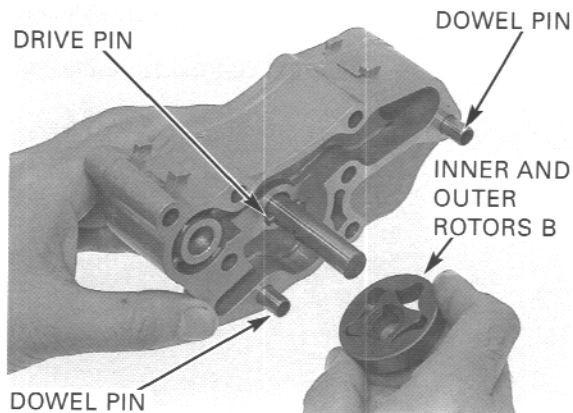


Install the pump shaft into pump body A with the threaded hole end facing toward pump body A.  
 Install inner rotor A onto the shaft with the drive pin grooves facing out.  
 Install outer rotor A.  
 Install the drive pin into the pump shaft hole and set the drive pin in the inner rotor grooves.  
 Install pump body B.



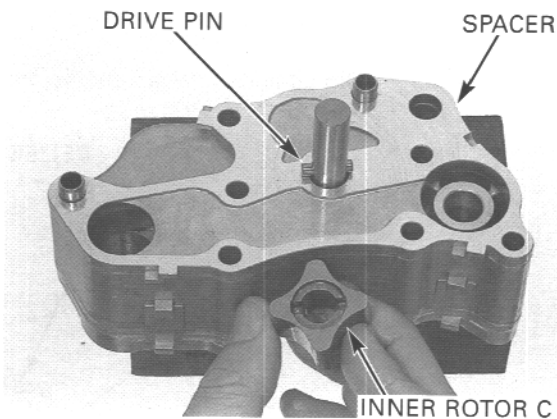
## LUBRICATION SYSTEM

Install the two dowel pins.  
Install the drive pin and inner rotor B, aligning the pin grooves with the drive pin.  
Install outer rotor B.

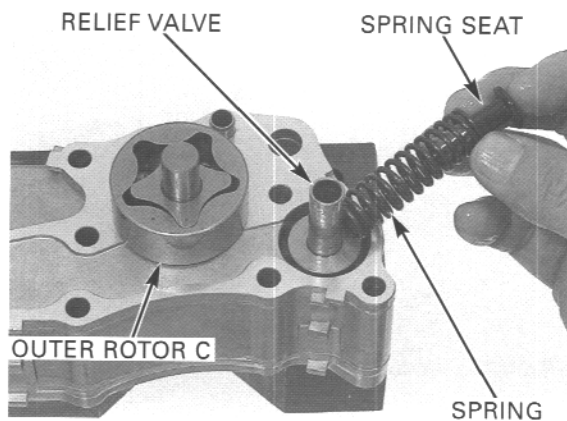


Install the pump spacer.

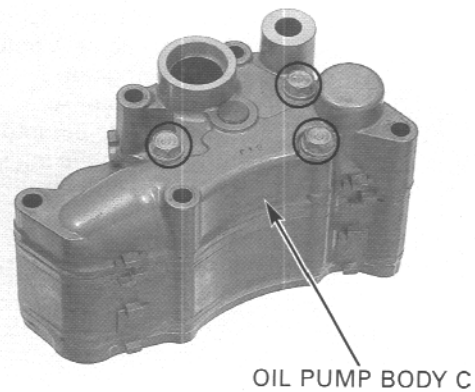
Install the drive pin and inner rotor C, aligning the pin grooves with the drive pin.  
Install outer rotor C.



Install the relief valve, spring and spring seat.

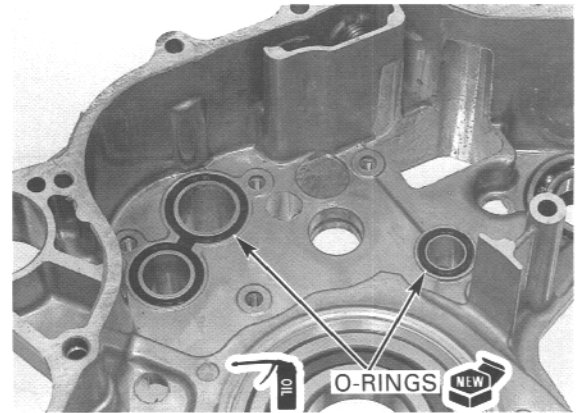


Install the pump body C and tighten the three bolts securely.



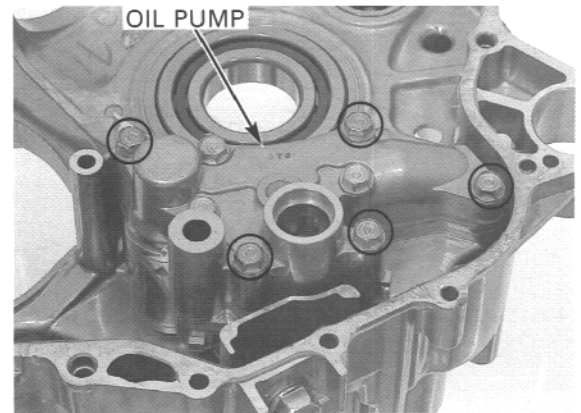
**INSTALLATION**

Coat new O-rings with oil and install it into the grooves in the front crankcase.



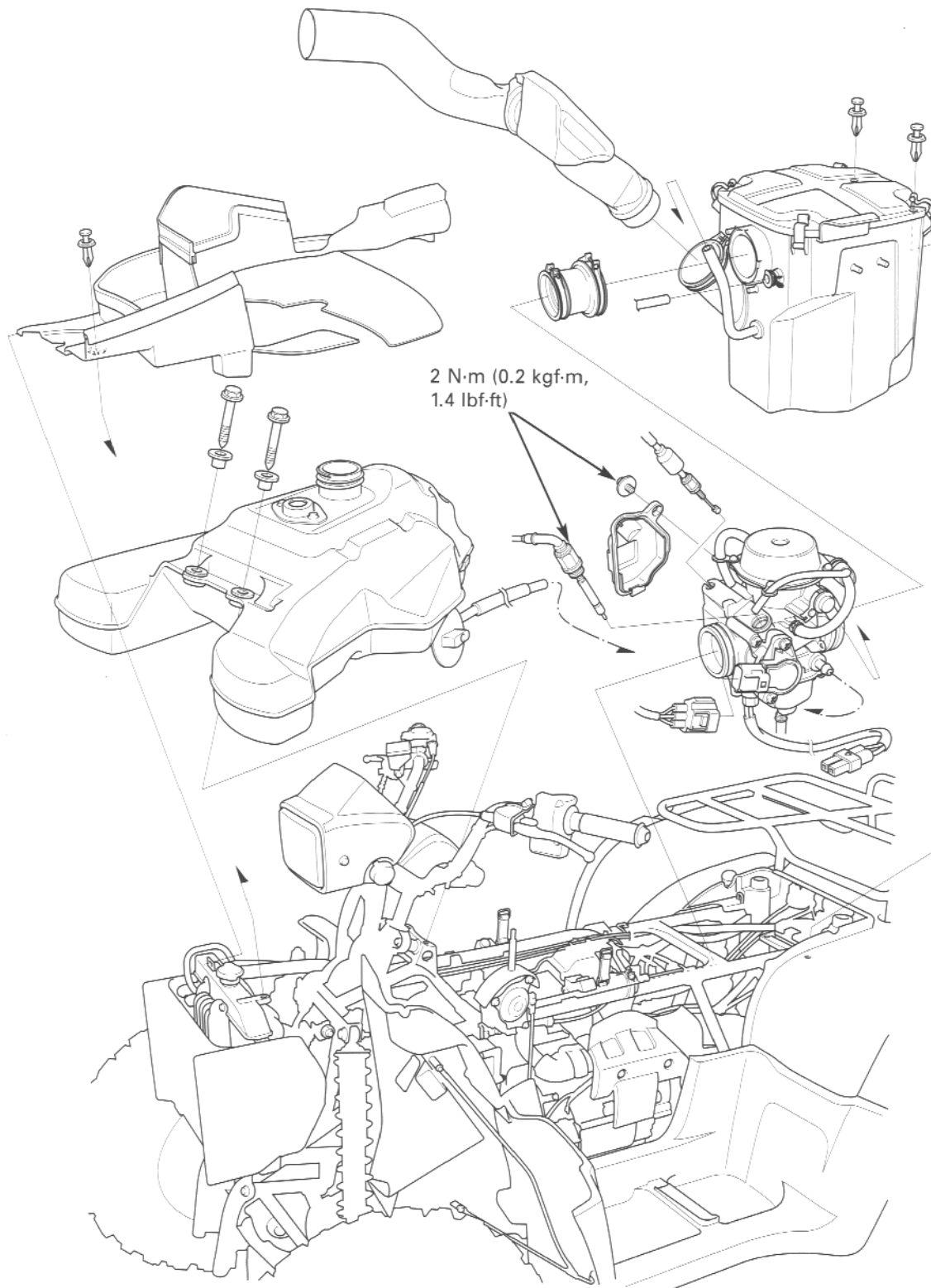
Install the oil pump onto the front crankcase and tighten the five bolts securely.

Assemble the crankcases (page 13-12).



# FUEL SYSTEM

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# 5. FUEL SYSTEM

<b>SERVICE INFORMATION</b>	<b>5-1</b>	<b>CARBURETOR ASSEMBLY</b>	<b>5-9</b>
<b>TROUBLESHOOTING</b>	<b>5-2</b>	<b>CARBURETOR INSTALLATION</b>	<b>5-14</b>
<b>AIR CLEANER HOUSING</b>	<b>5-3</b>	<b>PILOT SCREW ADJUSTMENT</b>	<b>5-15</b>
<b>CARBURETOR REMOVAL</b>	<b>5-3</b>	<b>HIGH ALTITUDE ADJUSTMENT</b>	<b>5-16</b>
<b>CARBURETOR DISASSEMBLY/ INSPECTION</b>	<b>5-5</b>	<b>FUEL TANK</b>	<b>5-17</b>

## SERVICE INFORMATION

### GENERAL

- Work in a well ventilated area. Smoking or allowing flames or sparks in the work area or where gasoline is stored can cause a fire or explosion.
- Bending or twisting the control cable will impair smooth operation and could cause the cable to stick or bind, resulting in loss of vehicle control.
- Before removing the carburetor, place an approved fuel container under the drain tube, loosen the drain screw and drain the carburetor.
- After removing the carburetor, cover the intake port of the cylinder head with shop towel to prevent any foreign material from dropping into the engine.
- When disassembling the fuel system parts, note the locations of the O-rings. Replace them with new ones on reassembly.
- Do not loosen the throttle sensor attaching screws (torx) unless the throttle sensor requires replacement.
- If the throttle cable was disconnected, perform the initial setting 2 (page 23-5) after all carburetor adjustments have been completed.
- If the vehicle is to be stored for more than one month, drain the float chamber. Fuel left in the float chamber may cause clogged jets, resulting in hard starting or poor driveability.
- Refer to section 22 for carburetor heater inspection.
- Refer to section 23 for throttle sensor inspection and replacement.

### SPECIFICATIONS

ITEM	SPECIFICATIONS
Carburetor identification number	VE6AB
Main jet	#158
Slow jet	#45
Jet needle clip position	2nd groove from top
Pilot screw opening	See page 5-15
Float level	18.5 mm (0.73 in)
Idle speed	1,400 ± 100 rpm
Throttle lever free play	3—8 mm (1/8—5/16 in)

### TORQUE VALUE

Carburetor insulator band screw	4 N·m (0.4 kgf·m, 2.9 lbf·ft)
Starting enrichment (SE) valve nut	2 N·m (0.2 kgf·m, 1.4 lbf·ft)
Throttle drum cover screw	2 N·m (0.2 kgf·m, 1.4 lbf·ft)

### TOOLS

Carburetor float level gauge	07401-0010000
Pilot screw wrench	07908-4730002

## FUEL SYSTEM

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### TROUBLESHOOTING

#### Engine cranks but won't start

- No fuel in tank
- No fuel to carburetor
  - Clogged fuel strainer
  - Clogged fuel line
  - Clogged fuel tank breather tube
  - Misadjusted fuel level
- Too much fuel getting to the engine
  - Clogged air cleaner
  - Flooded carburetor
- Intake air leak
- Contaminated/deteriorated fuel
  - Clogged jets
- Clogged starting enrichment valve circuit
- Improper starting enrichment valve operation
- Improper throttle operation
- No spark at plug (faulty ignition system – section 20)

#### Lean mixture

- Clogged fuel jets
- Faulty float valve
- Float level too low
- Restricted fuel line
- Clogged carburetor air vent tube
- Restricted fuel tank breather tube
- Intake air leak
- Faulty vacuum piston
- Faulty throttle valve

#### Rich mixture

- Starting enrichment valve open (ON)
- Clogged air jets
- Faulty float valve
- Float level too high
- Dirty air cleaner
- Worn jet needle or needle jet
- Faulty vacuum piston

#### Engine stalls, hard to start, rough idling

- Restricted fuel line
- Fuel mixture too lean/rich
- Contaminated/deteriorated fuel
  - Clogged jets
- Intake air leak
- Misadjusted idle speed
- Misadjusted pilot screw
- Misadjusted float level
- Restricted fuel tank breather tube
- Clogged air cleaner
- Clogged slow circuit
- Clogged starting enrichment valve circuit
- Faulty ignition system (section 20)

#### Afterburn when engine braking is used

- Lean mixture in slow circuit
- Faulty ignition system (section 20)

#### Backfiring or misfiring during acceleration

- Lean mixture
- Faulty ignition system (section 20)

#### Poor performance (driveability) and poor fuel economy

- Clogged fuel system
- Faulty ignition system (section 20)

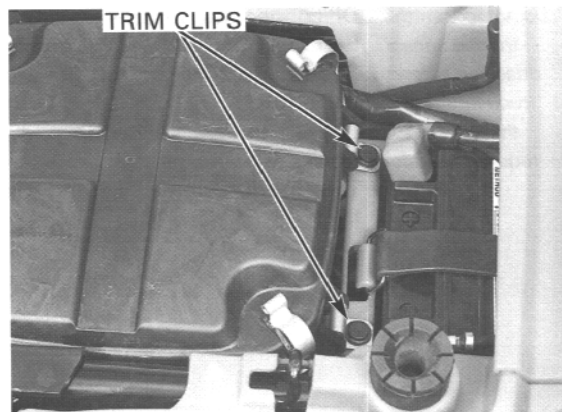


## AIR CLEANER HOUSING

### REMOVAL/INSTALLATION

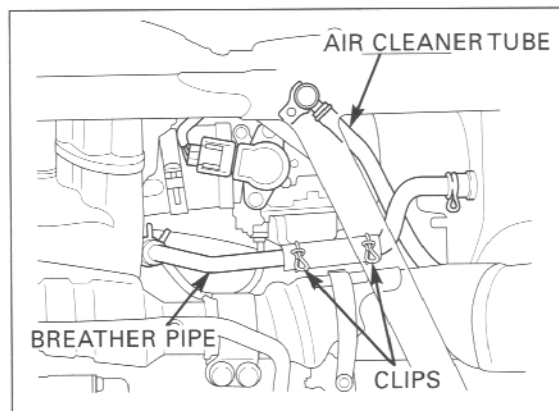
Remove the following:

- left and right side covers (page 2-4)
- fuel tank cover (page 2-5)
- two trim clips



Disconnect the air cleaner tube from the carburetor tube joint.

Release the breather pipe clips from the stay on the muffler. Disconnect the crankcase breather pipe from the air cleaner housing.



Loosen the band screw and remove the air intake duct from the air cleaner housing.

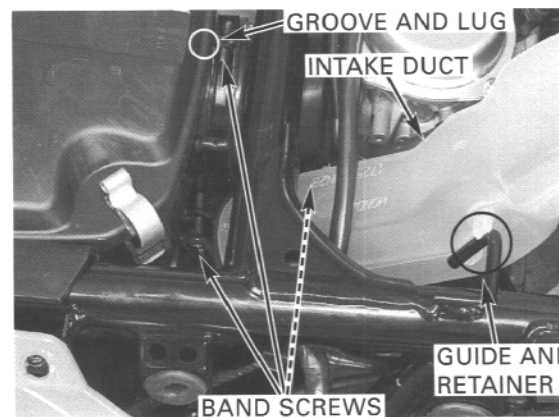
*Be careful not to damage the connecting tube.*

Loosen the air cleaner connecting tube band screws, and remove the air cleaner housing and connecting tube from the frame.

Install the air cleaner housing and connecting tube, and align the groove in the connecting tube with the lug on the air cleaner housing.

Install the air intake duct, aligning guide on the duct with the seat retainer.

Install the removed parts in the reverse order of removal.

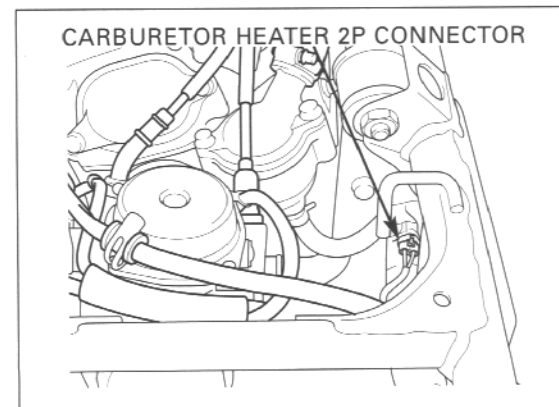


## CARBURETOR REMOVAL

Remove the air cleaner housing (see above).

Release the carburetor heater wire from the wire clip and disconnect the heater 2P connector.

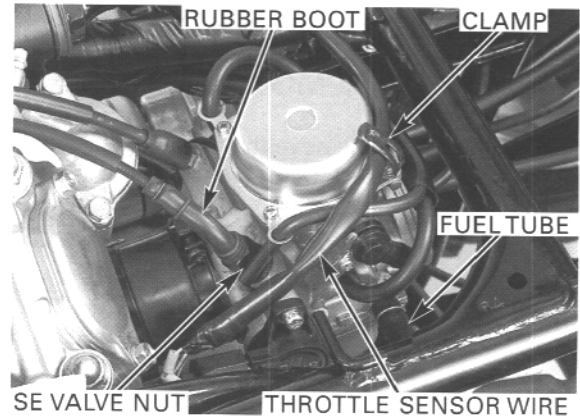
Remove the carburetor drain tube from the clamp.



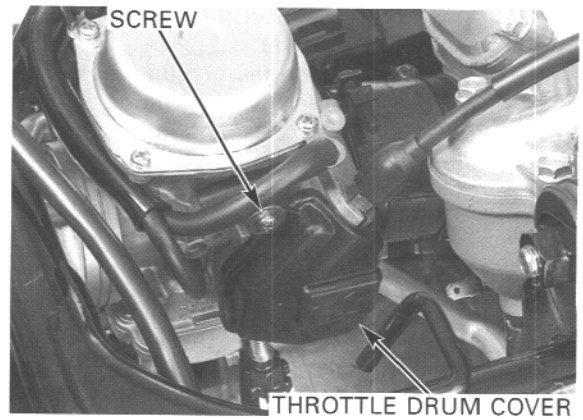
## FUEL SYSTEM

*Do not loosen the throttle sensor attaching screws (torx) unless the throttle sensor requires replacement.*

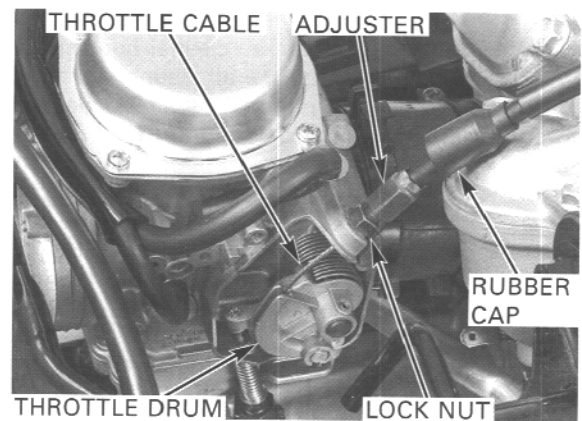
Disconnect the throttle sensor connector.  
Remove the throttle sensor wire from the clamp.  
Slide the rubber cap off the starting enrichment (SE) valve nut.  
Loosen the SE valve nut and remove the SE valve from the carburetor.  
Turn the fuel valve OFF and disconnect the fuel tube from the carburetor.



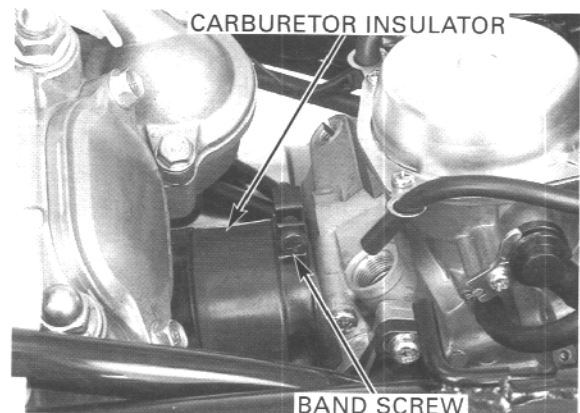
Remove the screw and throttle drum cover.



Slide the rubber cap off the throttle cable adjuster.  
Loosen the throttle cable lock nut and remove the adjuster from the carburetor body, and disconnect the cable from the throttle drum.

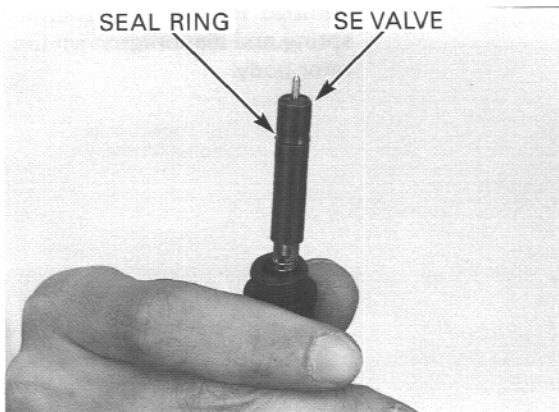


Loosen the carburetor insulator band screw and remove the carburetor from the insulator.

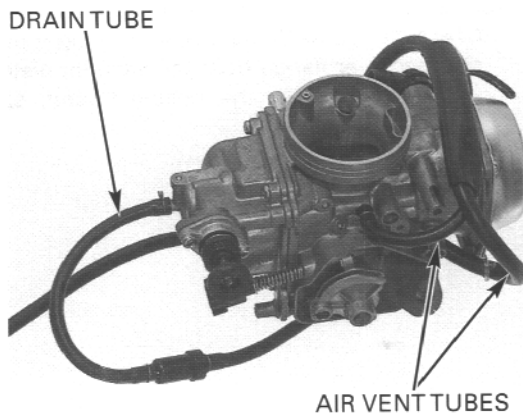


## CARBURETOR DISASSEMBLY/ INSPECTION

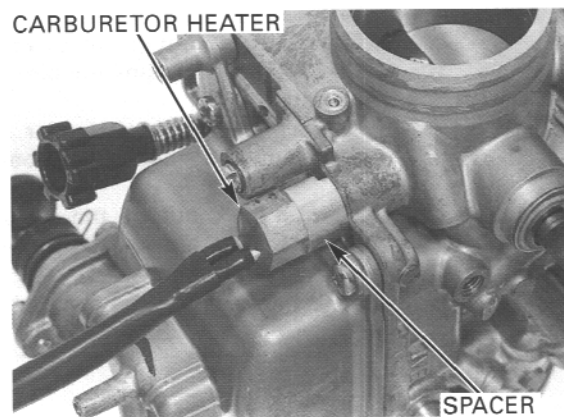
Check the SE valve face for scores, scratches or wear.  
Check the SE valve seat at the tip of the valve for stepped wear.  
Check the seal ring for wear or damage.



- Remove the following:
- throttle sensor (page 23-29).
  - air vent tubes
  - drain tube

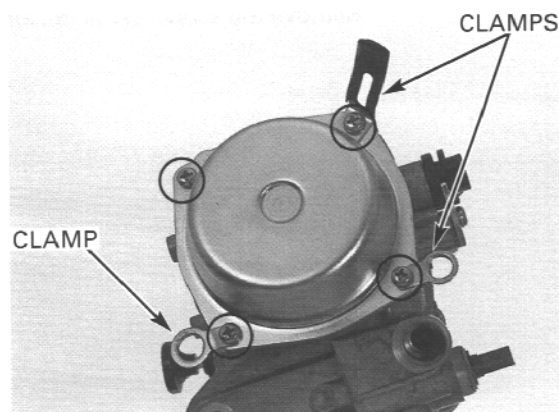


- carburetor heater and spacer



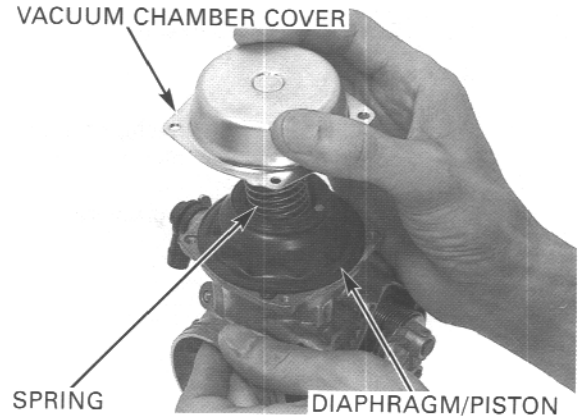
## VACUUM CHAMBER

Remove the four screws and clamps while holding the vacuum chamber cover.

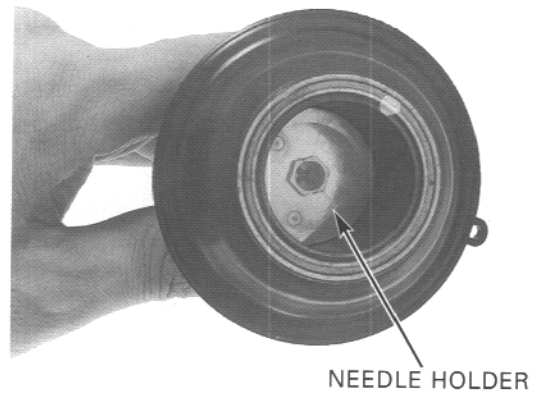


## FUEL SYSTEM

Remove the vacuum chamber cover, compression spring and diaphragm/vacuum piston from the carburetor body.

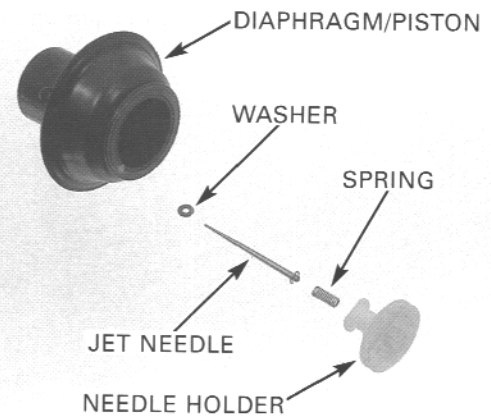


*Be careful not to damage the diaphragm.* Turn the needle holder counterclockwise by using a screwdriver while pressing it in and release the holder flange from the vacuum piston. Remove the needle holder, spring, jet needle and washer.

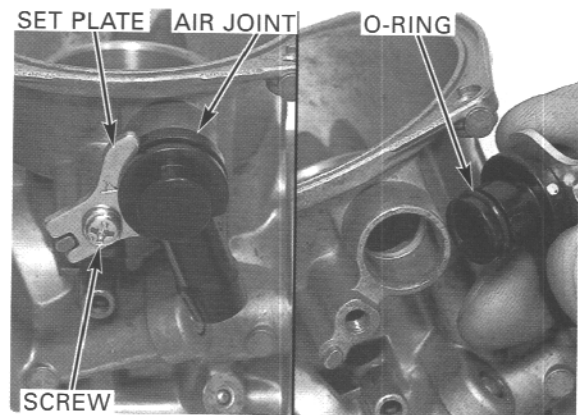


Check the jet needle for stepped wear.  
Check the vacuum piston for wear or damage.  
Check the diaphragm for pin hole, deterioration or damage.  
Check the vacuum piston for smooth operation up and down in the carburetor body.

Air will leak out of the vacuum chamber if the diaphragm is damaged in any way, even with just a pin hole.



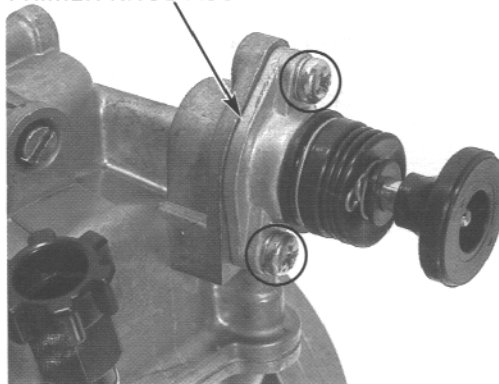
Remove the screw, set plate, air joint and O-ring.



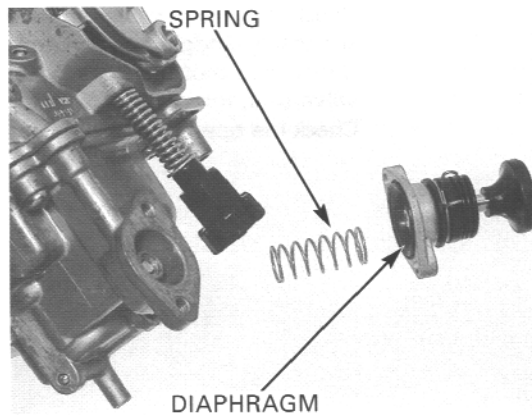
### PRIMER KNOB

Remove the two screws while holding the primer knob body.  
Remove the primer knob assembly and spring.

PRIMER KNOB ASSEMBLY



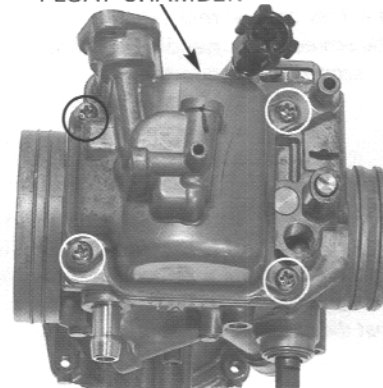
Check the diaphragm for holes, deterioration or damage.



### FLOAT CHAMBER

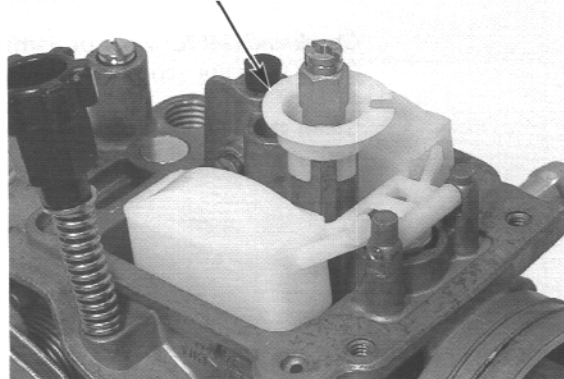
Remove the four screws and the float chamber.

FLOAT CHAMBER



Remove the baffle plate.

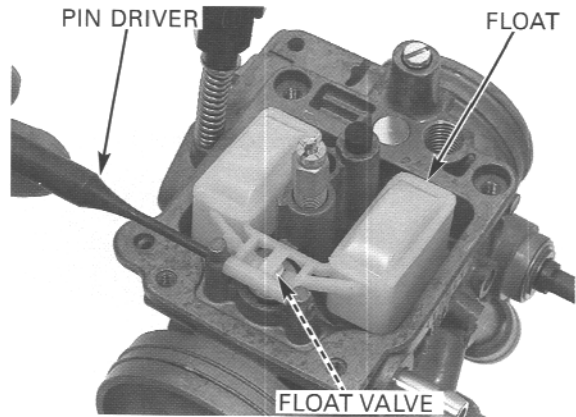
BAFFLE PLATE



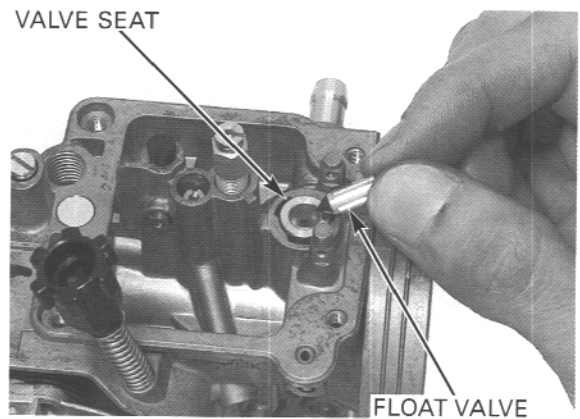
## FUEL SYSTEM

Drive out the float pin from the throttle stop screw side using a pin driver.  
Remove the float and float valve.

Check the float for damage or fuel in the float.



Check the float valve and valve seat for scoring, scratches, clogging or damage.  
Check the tip of the float valve, where it contacts the valve seat, for stepped wear or contamination.  
Check the operation of the float valve.



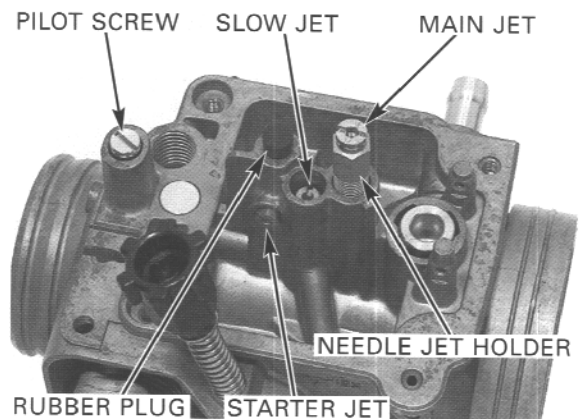
*Handle the jets with care. They can easily be scored or scratched.*

Remove the following:

- main jet
- needle jet holder
- needle jet
- slow jet
- starter jet
- rubber plug

*Damage to the pilot screw seat will occur if the pilot screw is tightened against the seat.*

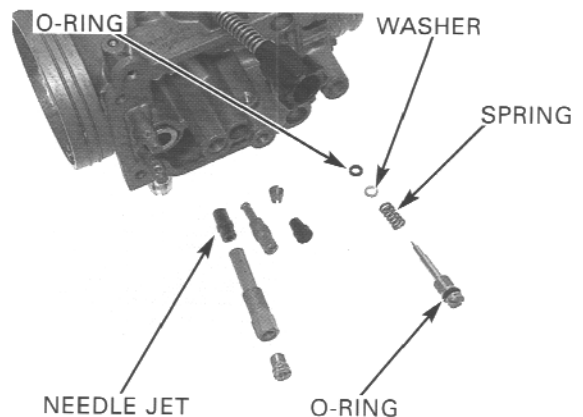
Turn the pilot screw in and carefully count the number of turns until it seats lightly. Make a note of this to use as a reference when reinstalling the pilot screw.



Remove the pilot screw, spring, washer and O-rings.

Check each jet for wear or damage.  
Check the pilot screw for wear or damage.

Clean the jets with cleaning solvent and blow open with compressed air.

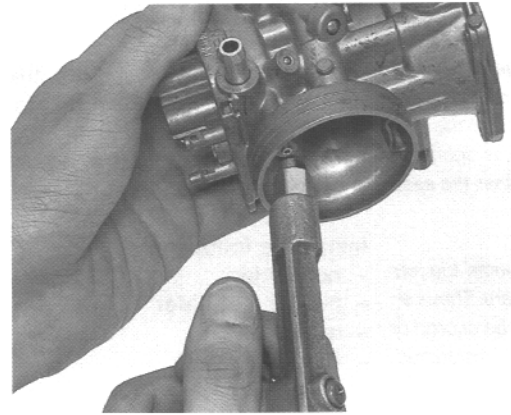


### CARBURETOR CLEANING

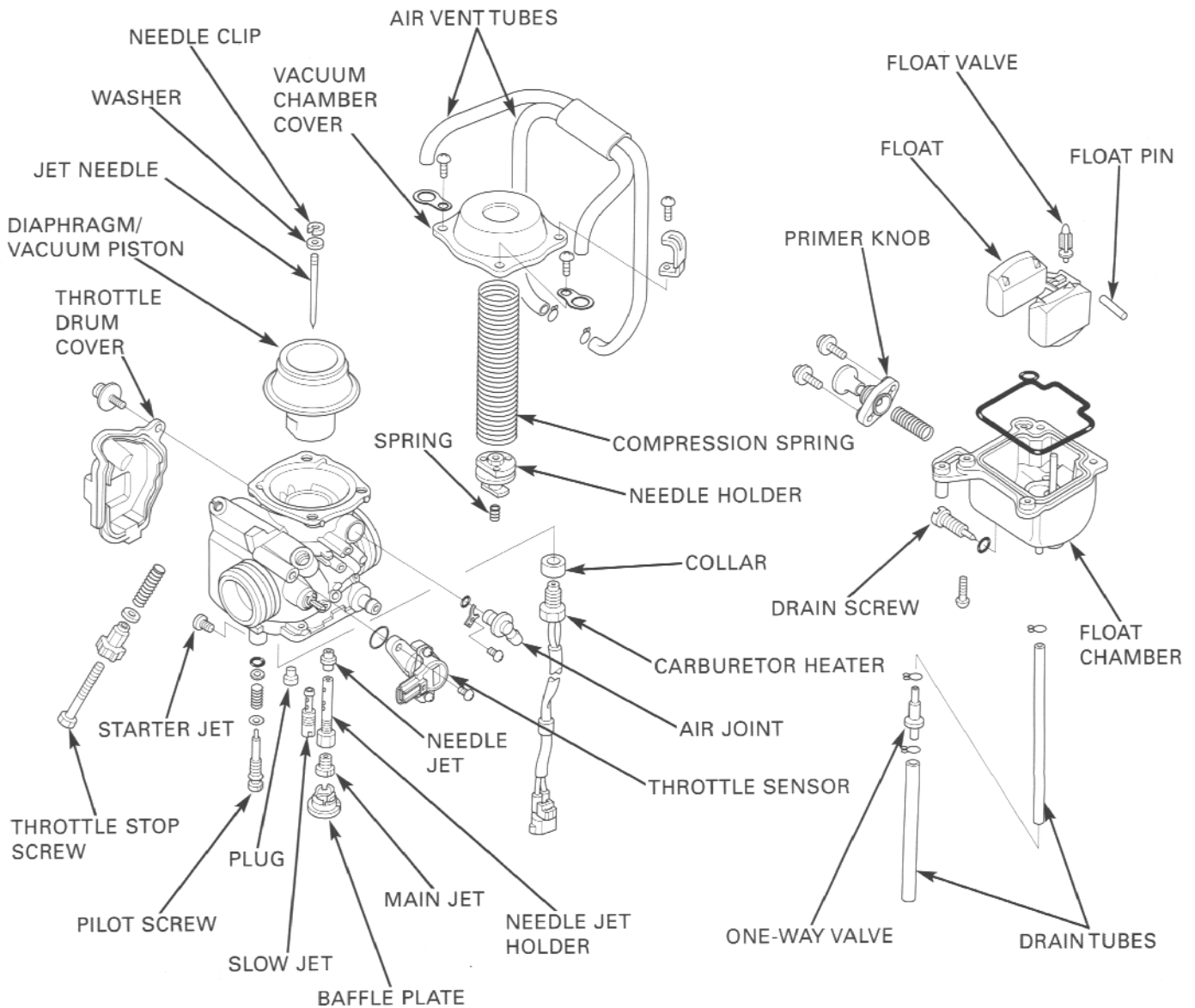
- Remove the following:
  - diaphragm/vacuum piston
  - all jets and pilot screw

*Cleaning the air and fuel passages with a piece of wire will damage the carburetor body.*

Blow open all air and fuel passages in the carburetor body with compressed air.



### CARBURETOR ASSEMBLY



## FUEL SYSTEM

### FLOAT AND JETS

*Damage to the pilot screw seat will occur if the pilot screw is tightened against the seat.*

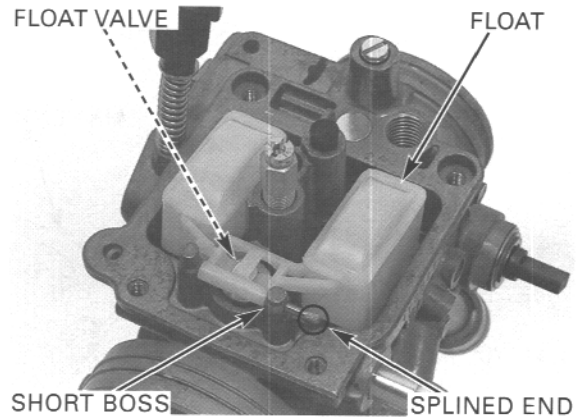
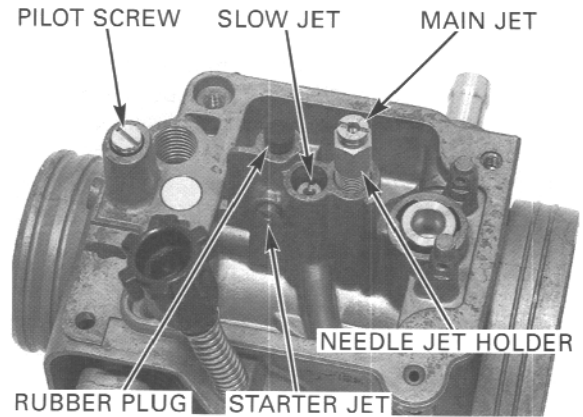
Install the pilot screw with the spring, washer and new O-rings, and return it to its original position as noted during removal. Perform the pilot screw adjustment if a new pilot screw is installed.

*Handle the jets with care. They can easily be scored or scratched.*

Install the following:

- needle jet
- needle jet holder
- main jet
- slow jet
- starter jet
- rubber plug

Hang the float valve onto the float arm lip. Install the float valve and float, and insert the float pin so that the splined end rests in the short boss (splined hole) side as shown. Drive the float pin using the pin driver until its end is flush with the boss.



### FLOAT LEVEL INSPECTION

NOTE:

- Check the float level after checking the float valve, valve seat and float.

*Set the float level gauge so that it is perpendicular to the float chamber face at the highest point of the float.*

With the float valve seated and the float arm just touching the valve, measure the float level with the float level gauge.

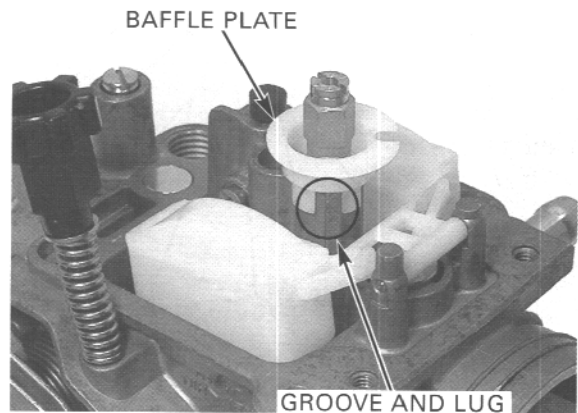
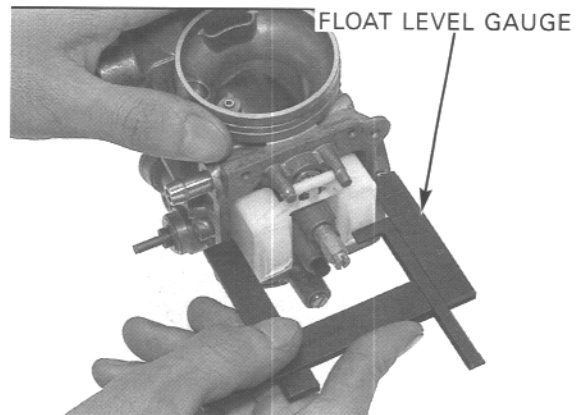
TOOL:

Carburetor float level gauge 07401-001000

**FLOAT LEVEL: 18.5 mm (0.73 in)**

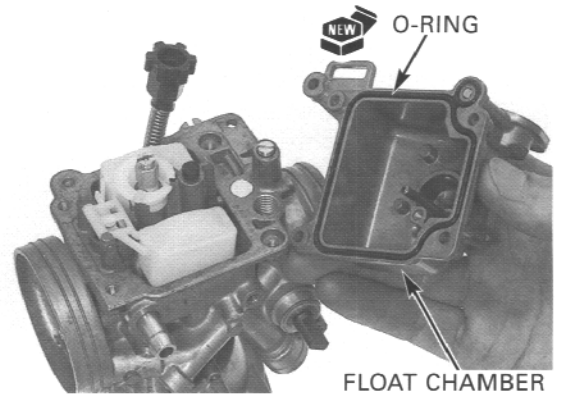
The float cannot be adjusted. Replace the float assembly if the float level is out of specification.

Install the baffle plate by aligning its groove with the lug on the carburetor body as shown.





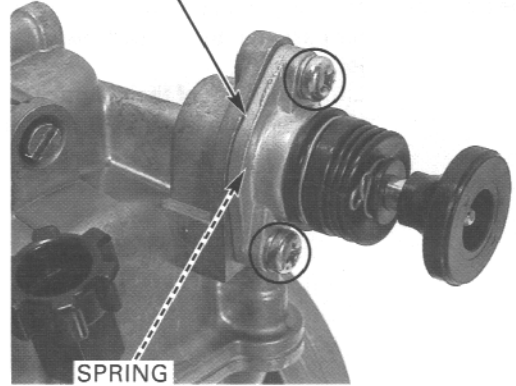
Install a new O-ring into the float chamber groove properly.  
Install the float chamber and tighten the four screws securely.



## PRIMER KNOB

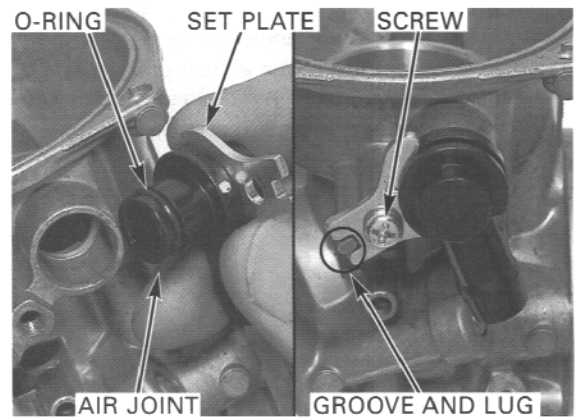
Install the spring primer knob assembly, and tighten the two screws securely.

PRIMER KNOB ASSEMBLY



## VACUUM CHAMBER

Install a new O-ring into the air joint groove.  
Install the set plate into the air joint groove.  
Install the air joint into the carburetor body, aligning the set plate groove with the lug on the carburetor body, and tighten the screw.

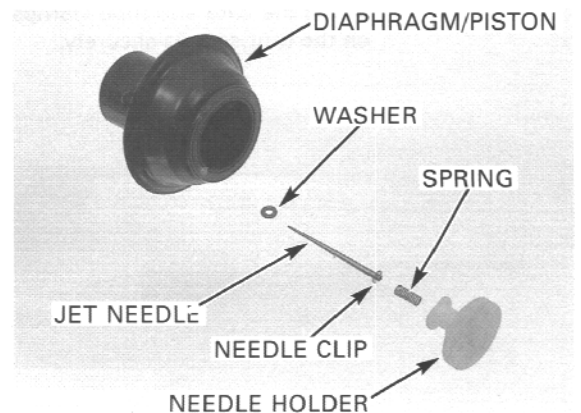


Install the needle clip onto the jet needle.

**STANDARD CLIP POSITION: 2nd groove from top**

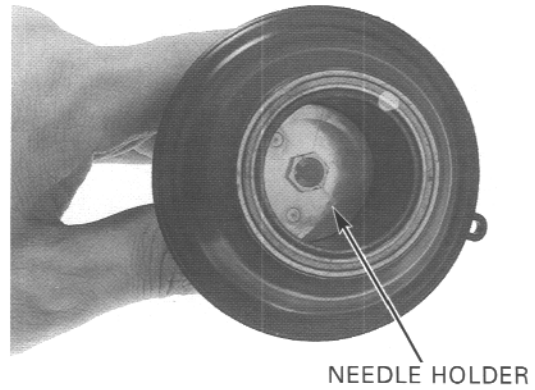
Install the washer onto the jet needle and insert the jet needle into the vacuum piston.

Install the spring into the needle holder and set the needle holder into the vacuum piston.



## FUEL SYSTEM

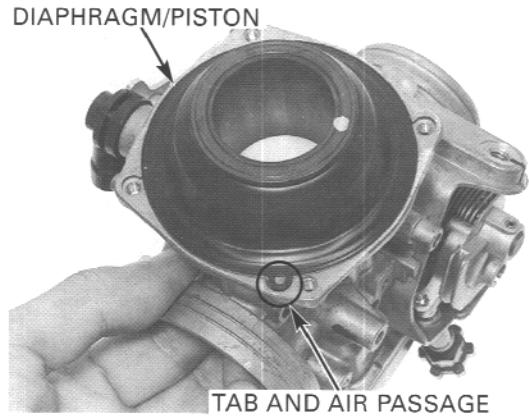
Turn the needle holder 90 degrees clockwise while pressing it until it locks.



*Be careful not to damage the jet needle.*

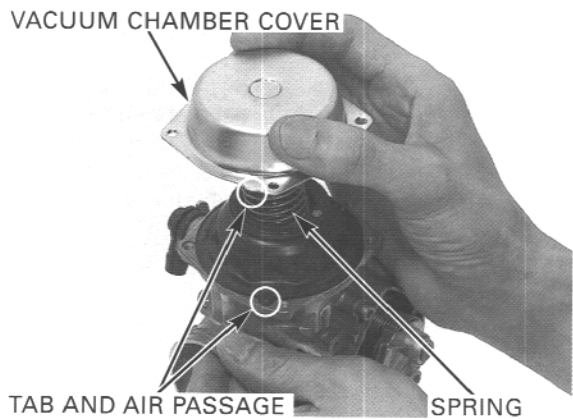
Install the diaphragm/vacuum piston into the carburetor body by aligning the tab of the diaphragm with the air passage, then insert the jet needle into the needle jet.

Lift the bottom of the piston with your finger to set the diaphragm rib into the groove in the carburetor body.

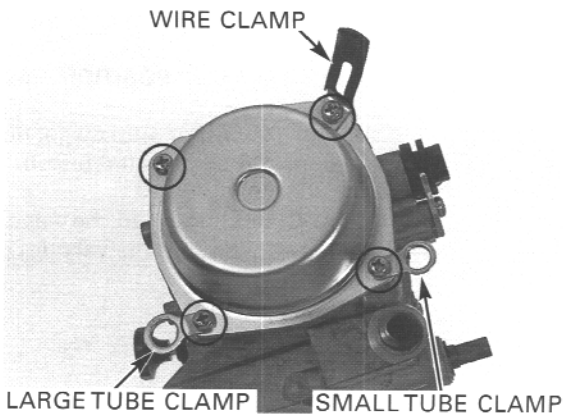


*Be careful not to pinch the diaphragm under the chamber cover, and to keep the spring straight when compressing the spring.*

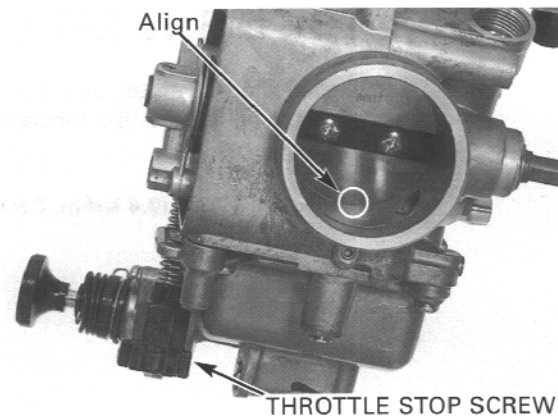
Install the compression spring and vacuum chamber cover while lifting the piston in place. Align the tab of the cover with the air passage and secure the cover with at least two screws before releasing the vacuum piston.



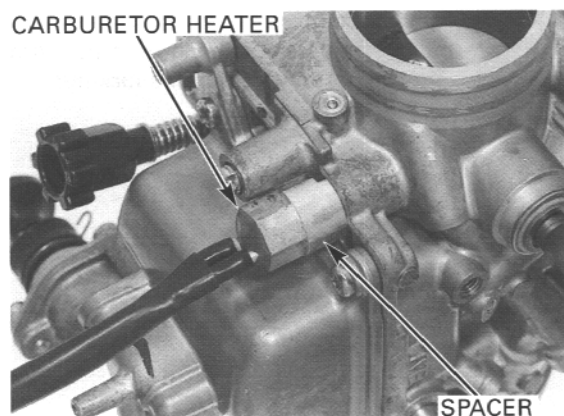
Install the wire and tube clamps as shown, and tighten the four screws securely.



Turn the throttle stop screw to align the butterfly throttle valve with the edge of the outside by-pass hole in the carburetor body, if the throttle stop screw was removed.

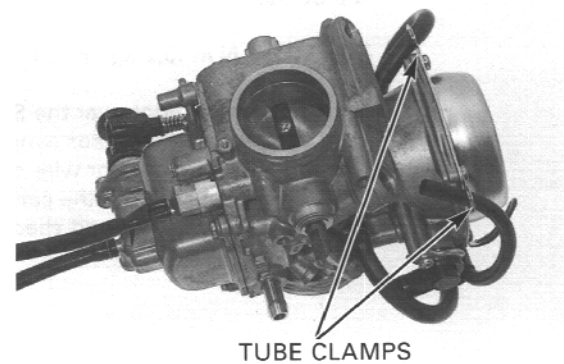
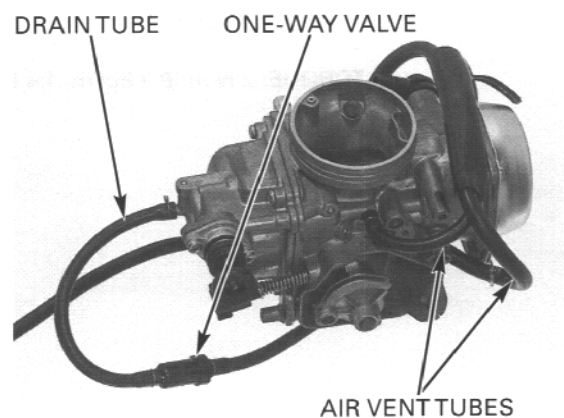


Install the collar and carburetor heater with the stepped side of the collar facing the carburetor and tighten the carburetor heater.



Connect the carburetor drain tube so that the "UP" mark on the one-way valve is facing toward the carburetor. Connect the air vent tubes and route them into the tube clamps as shown.

Install the throttle sensor (page 23-29).

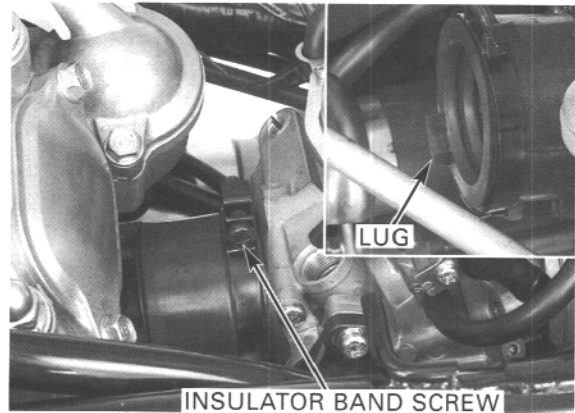


## FUEL SYSTEM

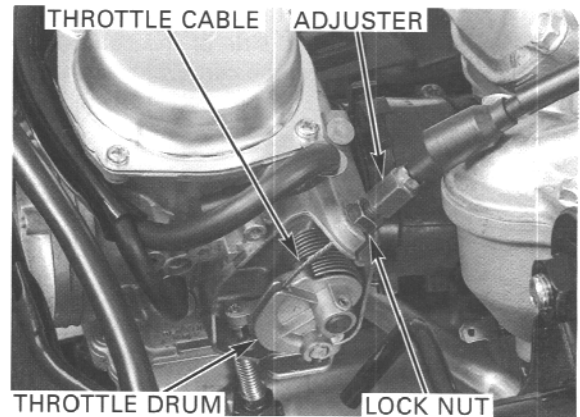
### CARBURETOR INSTALLATION

Install the carburetor into the insulator, rest the carburetor rib against the insulator lug and tighten the band screw.

**TORQUE: 4 N·m (0.4 kgf·m, 2.9 lbf·ft)**

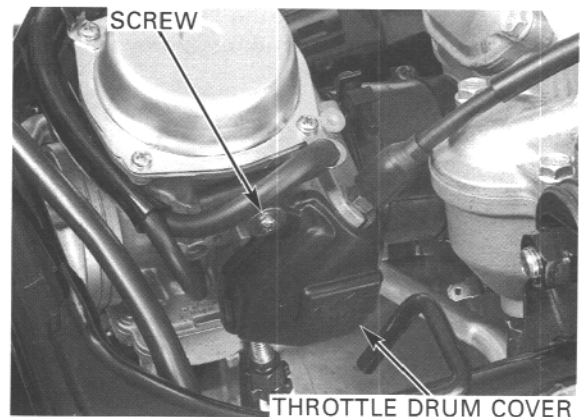


Connect the throttle cable to the throttle drum, install the cable adjuster into the carburetor body and temporarily tighten the lock nut.



Install the throttle drum cover and tighten the screw.

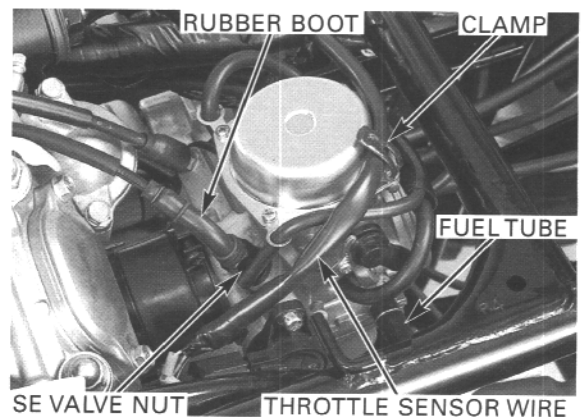
**TORQUE: 2 N·m (0.2 kgf·m, 1.4 lbf·ft)**



Install the starting enrichment (SE) valve and tighten the SE valve nut.

**TORQUE: 2 N·m (0.2 kgf·m, 1.4 lbf·ft)**

Slide the rubber boot over the SE valve nut. Connect the throttle sensor connector to the sensor. Clamp the throttle sensor wire onto the carburetor. Connect the fuel tube to the carburetor. Turn the fuel valve ON and check that there is no fuel leak.



Route the carburetor heater wire and carburetor drain tube properly (page 1-19)

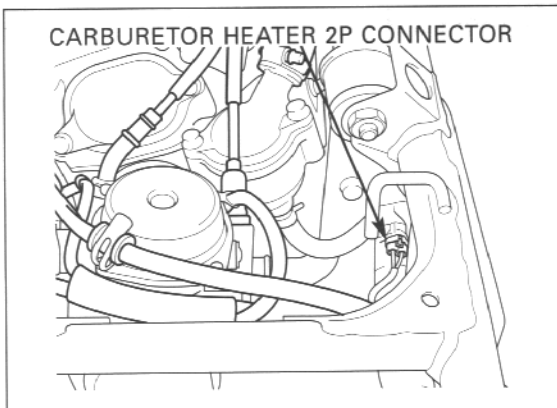
Connect the carburetor heater connector.

Install the air cleaner housing (page 5-3).

Perform the following inspections and adjustments:

- engine idle speed (page 3-12)
- throttle operation (page 3-4)
- pilot screw if it was replaced (see below)

Perform the initial setting (page 23-6) after all carburetor adjustments have been completed.



## PILOT SCREW ADJUSTMENT

### IDLE DROP PROCEDURE

**NOTE:**

- The pilot screw is factory pre-set and no adjustment is necessary unless the pilot screw is replaced.
- Use a tachometer with graduations of 50 rpm or smaller that will accurately indicate a 50 rpm change.

1. Remove the recoil starter cover (page 2-3).

*Damage to the pilot screw seat will occur if the pilot screw is tightened against the seat.*

Turn the pilot screw clockwise until it seats lightly, then back it out to the specification given. This is an initial setting prior to the final pilot screw adjustment.

**TOOL:**

**Pilot screw wrench**                      07908-4730002

**INITIAL OPENING: 2-5/8 turns out**

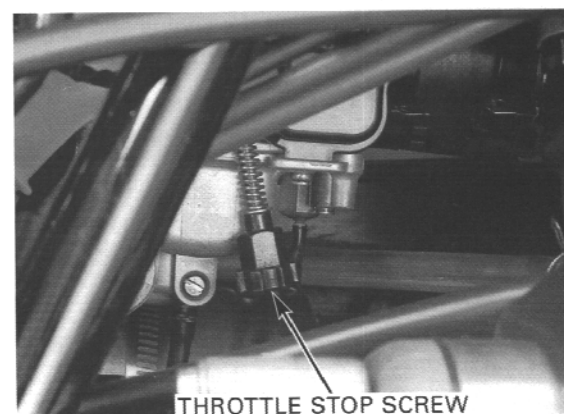
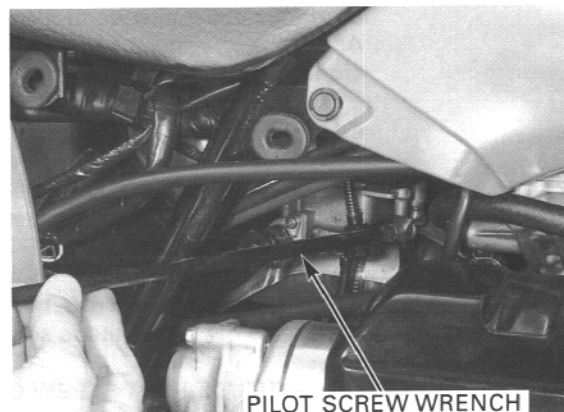
2. Warm up the engine to operating temperature. Stop and go riding for 10 minutes is sufficient.
3. Stop the engine and connect a tachometer according to the tachometer manufacturer's instructions.
4. Start the engine and adjust the idle speed with the throttle stop screw.

**IDLE SPEED: 1,400 ± 100 rpm**

5. Turn the pilot screw in or out slowly to obtain the highest engine speed.
6. Lightly open the throttle 2—3 times, then adjust the idle speed with the throttle stop screw.
7. Turn the pilot screw in gradually until the engine speed drops by 100 rpm.
8. Turn the pilot screw out to the final opening.

**FINAL OPENING: 1 turn out from the position obtained in step #7**

9. Readjust the idle speed with the throttle stop screw.



## HIGH ALTITUDE ADJUSTMENT

	Below 5,000 ft (1,500 m)	Between 3,000—8,000ft (1,000—2,500 m)
Pilot screw opening	Factory preset	7/8 turn in from factory preset

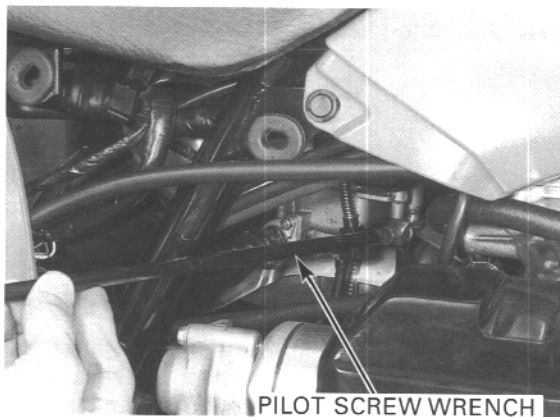
The carburetor must be adjusted for high altitude riding (between 3,000—8,000 ft/1,000—2,500 m).

**STANDARD SETTING: Below 5,000 ft (1,500 m)**  
**HIGH ALTITUDE SETTING: Between 3,000—8,000ft  
(1,000—2,500 m)**

The high altitude carburetor adjustment is performed as follows:

Screw in the pilot screw the specified number of turn from the factory preset position.

**HIGH ALTITUDE PILOT SCREW OPENING:**  
**7/8 turn in from the factory preset position**



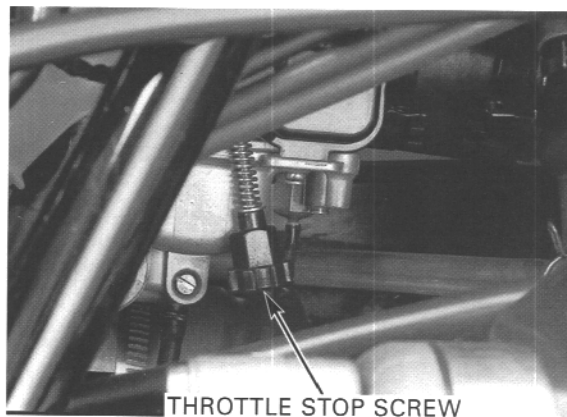
Start the engine and warm it up.  
Adjust the idle speed at high altitude with the throttle stop screw to ensure proper high altitude operation.

**IDLE SPEED: 1,400 ± 100 rpm**

Sustained operation below 5,000 ft (1,500 m) with the high altitude setting may cause engine overheating and engine damage. When riding below 5,000 ft (1,500 m), readjust the carburetor as follows:  
Screw out the pilot screw the specified number of turns from the high altitude setting.

**LOW ALTITUDE PILOT SCREW OPENING:**  
**7/8 turn out from the high altitude setting**

Warm up the engine and adjust the idle speed at low altitude with the throttle stop screw.

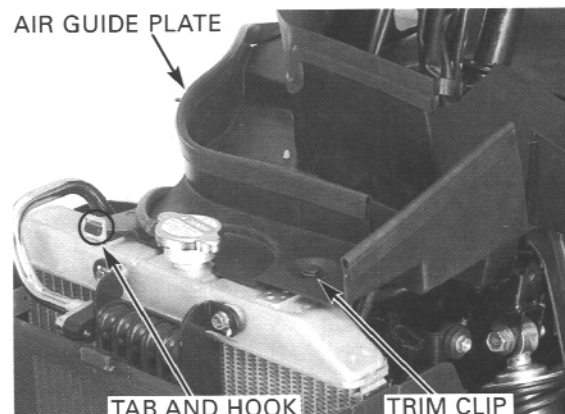


## FUEL TANK

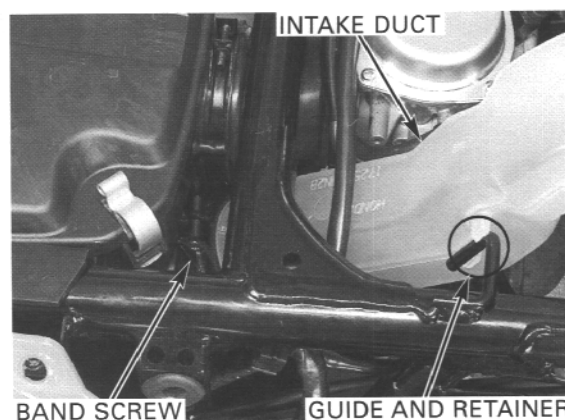
### REMOVAL/INSTALLATION

Remove the front fender (page 2-7).

Remove the trim clip and air guide plate by releasing the tab from the hook on the radiator.



Loosen the band screw and remove the air intake duct from the air cleaner housing.



Turn the fuel valve OFF and disconnect the fuel tube from the carburetor.

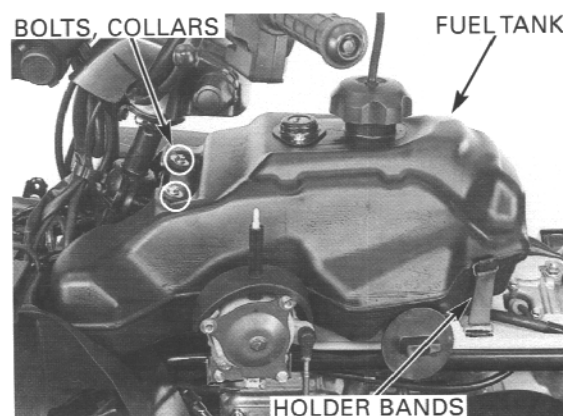


Unhook the two holder bands from the fuel tank, and remove the two bolts, collars and the fuel tank.

Install the fuel tank in the reverse order of removal.

**NOTE:**

- After connecting the fuel tube, turn the fuel valve ON and check that there is no fuel leak.
- When installing the air intake duct, align the guide on the duct with the seat retainer.



## FUEL SYSTEM

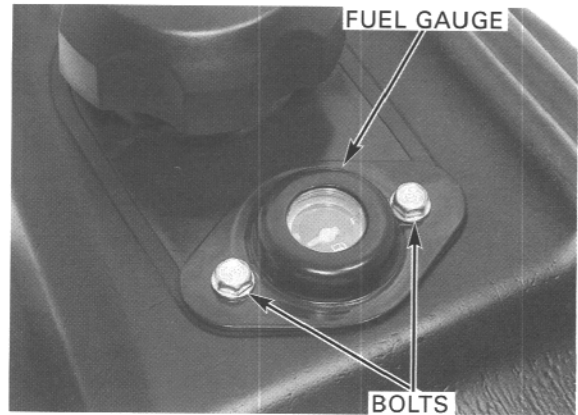
### FUEL GAUGE REPLACEMENT

Remove the fuel tank cover (page 2-5).

Remove the two bolts and fuel gauge.

Install a new fuel gauge and tighten the two bolts securely.

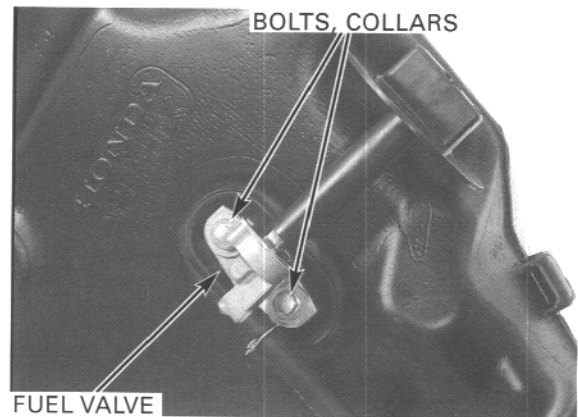
Install the fuel tank cover (page 2-5).



### FUEL STRAINER SCREEN CLEANING

Remove the fuel tank (page 5-17).

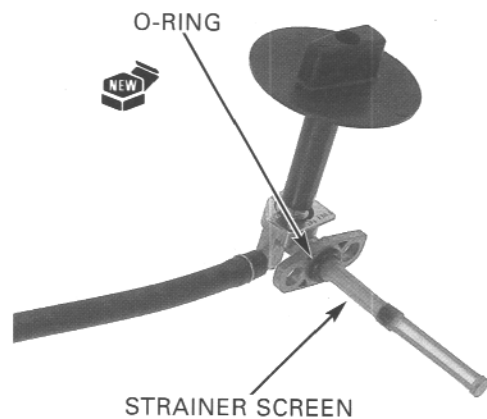
Drain the gasoline into an approved fuel container. Turn fuel valve OFF and remove the two mounting bolts, collars and the fuel valve.



Remove the O-ring.  
Clean the fuel strainer screen with non-flammable or high flash point solvent.  
Dry the strainer screen thoroughly.

Install a new O-ring onto the fuel valve.  
Install the fuel valve into the fuel tank with the two collars and bolts, and tighten the bolts securely.

Install the fuel tank (page 5-17).



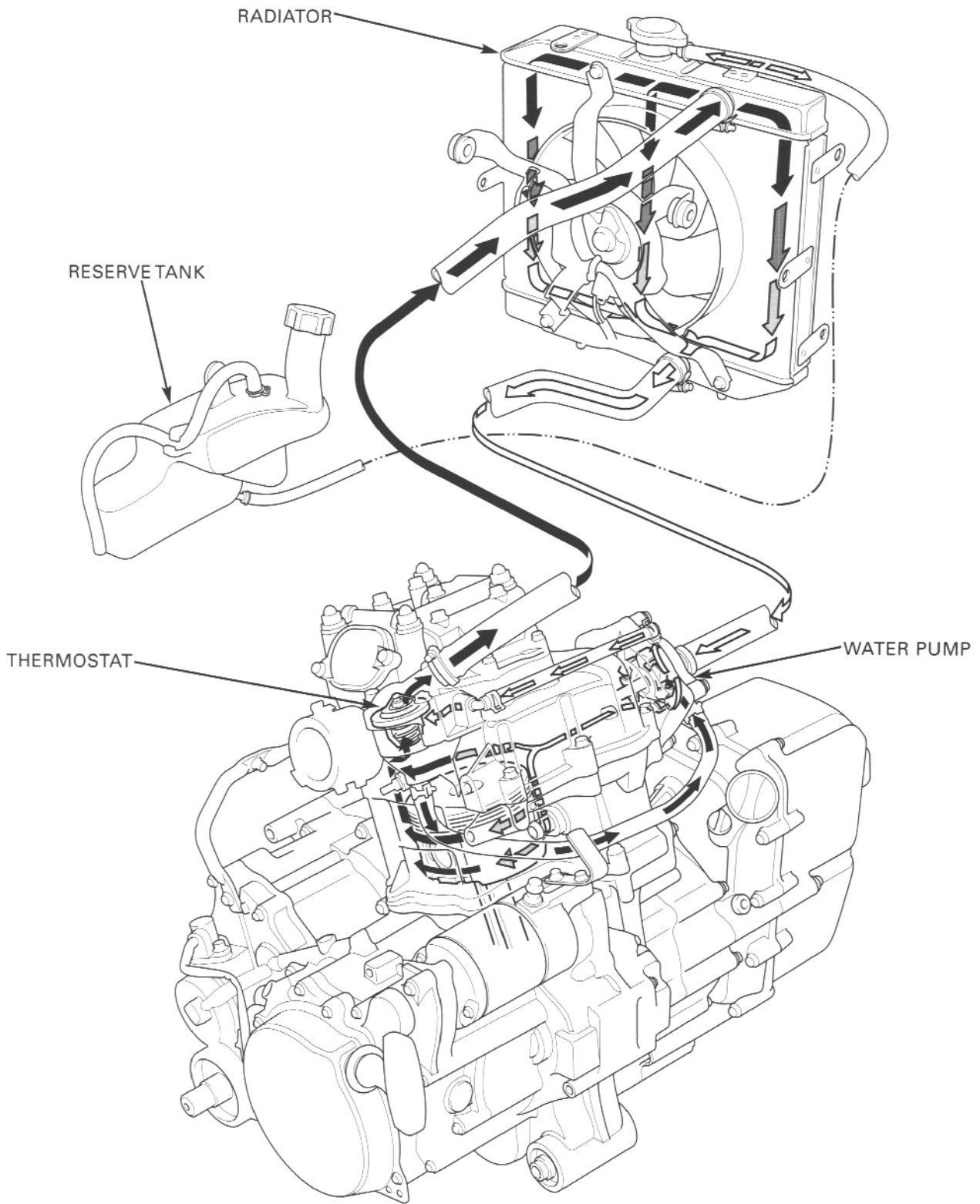


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**MEMO**

# COOLING SYSTEM

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# 6. COOLING SYSTEM

SERVICE INFORMATION	6-1	RADIATOR RESERVE TANK	6-6
TROUBLESHOOTING	6-2	RADIATOR/COOLING FAN	6-7
SYSTEM TESTING	6-3	THERMOSTAT	6-10
COOLANT REPLACEMENT	6-4	WATER PUMP	6-12

## SERVICE INFORMATION

### GENERAL

#### WARNING

Removing the radiator cap while the engine is hot can allow the coolant to spray out, seriously scalding you. Always let the engine and radiator cool down before removing the radiator cap.

6

#### CAUTION

Radiator coolant is toxic. Keep it away from eyes and mouth.

- If any coolant gets in your eyes, rinse them with water and consult a doctor immediately.
- If any coolant is swallowed, induce vomiting, gargle and consult a physician immediately.
- If any coolant gets on your skin or clothes, rinse thoroughly with plenty of water.

#### NOTICE

*Using coolant with silicate corrosion inhibitors may cause premature wear of water pump seals or blockage of radiator passage. Using tap water may cause engine damage.*

- Add coolant at the reserve tank. Do not remove the radiator cap except to refill or drain the system.
- All cooling system service can be done with the engine in the frame.
- Avoid spilling coolant on painted surfaces.
- After servicing the system, check for leaks with a cooling system tester.
- Refer to section 22 for fan motor drive circuit and coolant thermosensor information.

### SPECIFICATIONS

ITEM		SPECIFICATIONS
Coolant capacity	Radiator and engine	1.7 liters (1.8 US qt, 1.5 Imp qt)
	Reserve tank	0.40 liter (0.42 US qt, 0.35 Imp qt)
Radiator cap relief pressure		108—137 kPa (1.1—1.4 kgf/cm <sup>2</sup> , 16—20 psi)
Thermostat	Begin to open	80—84°C (176—183°F)
	Fully open	95°C (203°F)
	Valve lift	8 mm (0.3 in) minimum
Recommended antifreeze		Pro Honda HP Coolant or an equivalent high quality ethylene glycol antifreeze containing silicate-free corrosion inhibitors
Standard coolant concentration		50% mixture with distilled water

## COOLING SYSTEM

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### TROUBLESHOOTING

#### Engine temperature too high

- Thermostat stuck closed
- Faulty radiator cap
- Insufficient coolant
- Passages blocked in radiator, hoses or water jacket
- Air in system
- Faulty cooling fan motor
- Faulty water pump
- Faulty temperature indicator or indicator drive circuit (section 22)
- Faulty fan motor drive circuit (section 22)

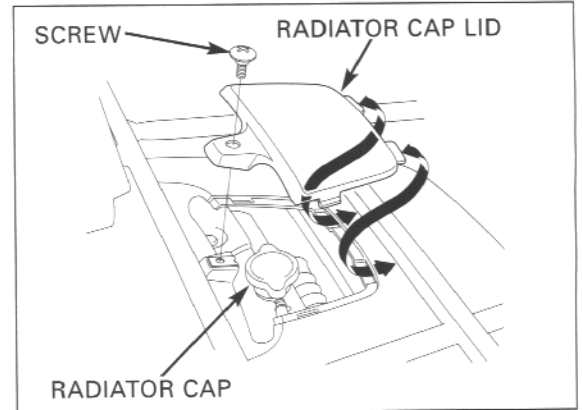
#### Coolant leaks

- Faulty water pump mechanical seal
- Deteriorated O-rings
- Faulty radiator cap
- Damaged or deteriorated cylinder head gasket
- Loose hose connection or clamp
- Damaged or deteriorated hoses

## SYSTEM TESTING

Remove the screw and radiator cap lid from the front fender.

Remove the radiator cap.

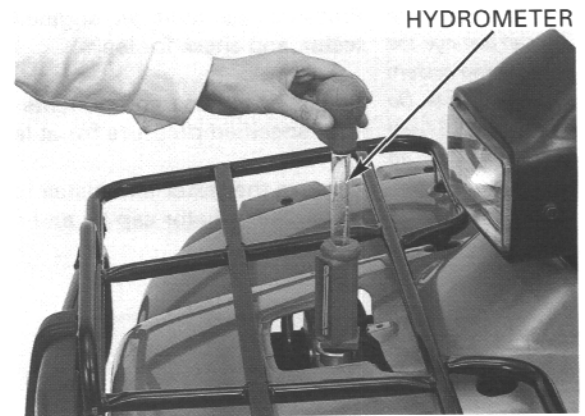


## COOLANT (HYDROMETER TEST)

Test the coolant gravity using a hydrometer.

**STANDARD COOLANT CONCENTRATION: 50%**

Look for contamination and replace the coolant if necessary.



Coolant temperature °C (°F)	0 (32)	5 (41)	10 (50)	15 (59)	20 (68)	25 (77)	30 (86)	35 (95)	40 (104)	45 (113)	50 (122)
Coolant ratio %											
5	1.009	1.009	1.008	1.008	1.007	1.006	1.005	1.003	1.001	0.999	0.997
10	1.018	1.017	1.017	1.016	1.015	1.014	1.013	1.011	1.009	1.007	1.005
15	1.028	1.027	1.026	1.025	1.024	1.022	1.020	1.018	1.016	1.014	1.012
20	1.036	1.035	1.034	1.033	1.031	1.029	1.027	1.025	1.023	1.021	1.019
25	1.045	1.044	1.043	1.042	1.040	1.038	1.036	1.034	1.031	1.028	1.025
30	1.053	1.052	1.051	1.049	1.047	1.045	1.043	1.041	1.038	1.035	1.032
35	1.063	1.062	1.060	1.058	1.056	1.054	1.052	1.049	1.046	1.043	1.040
40	1.072	1.070	1.068	1.066	1.064	1.062	1.059	1.056	1.053	1.050	1.047
45	1.080	1.078	1.076	1.074	1.072	1.069	1.066	1.063	1.060	1.057	1.054
50	1.086	1.084	1.082	1.080	1.077	1.074	1.071	1.068	1.065	1.062	1.059
55	1.095	1.093	1.091	1.088	1.085	1.082	1.079	1.076	1.073	1.070	1.067
60	1.100	1.098	1.095	1.092	1.089	1.086	1.083	1.080	1.077	1.074	1.071

## COOLING SYSTEM

### RADIATOR CAP/SYSTEM PRESSURE INSPECTION

*Before installing the cap in the tester, wet the sealing surfaces.*

Pressure test the radiator cap using the tester. Replace the radiator cap if it does not hold pressure, or if relief pressure is too high or too low. It must hold specified pressure for at least 6 seconds.

#### RADIATOR CAP RELIEF PRESSURE:

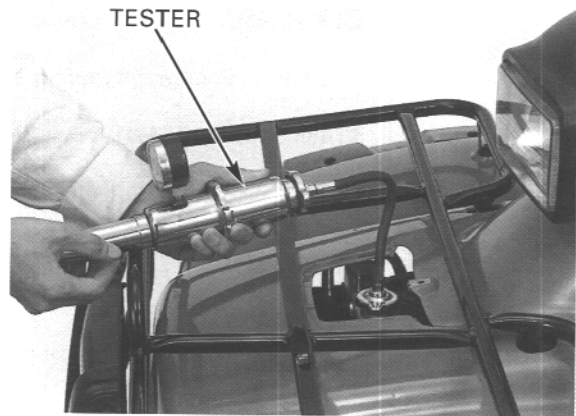
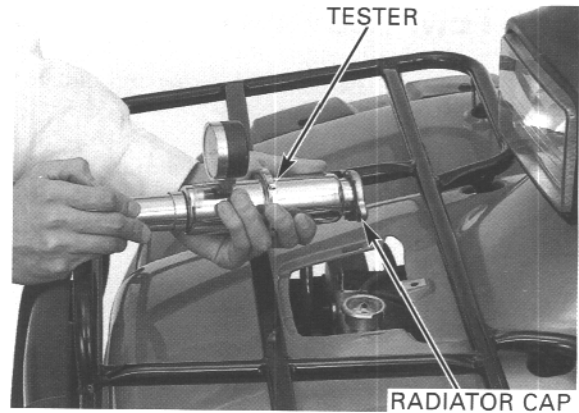
108—137 kPa (1.1—1.4 kgf/cm<sup>2</sup>, 16—20 psi)

*Excessive pressure can damage the cooling system components. Do not exceed 137 kPa (1.4 kgf/cm<sup>2</sup>, 20 psi).*

Pressure the radiator, engine and hoses using the tester, and check for leaks.

Repair or replace components if the system will not hold specified pressure for at least 6 seconds.

Remove the tester and install the radiator cap. Install the radiator cap lid and tighten the screw.



## COOLANT REPLACEMENT

### PREPARATION

#### NOTICE

*Using coolant with silicate corrosion inhibitors may cause premature wear of water pump seals or blockage of radiator passage. Using tap water may cause engine damage.*

#### NOTE:

- The effectiveness of coolant decreases with the accumulation of rust or if there is a change in the mixing proportion during usage. Therefore, for best performance change the coolant regularly as specified in the maintenance schedule.

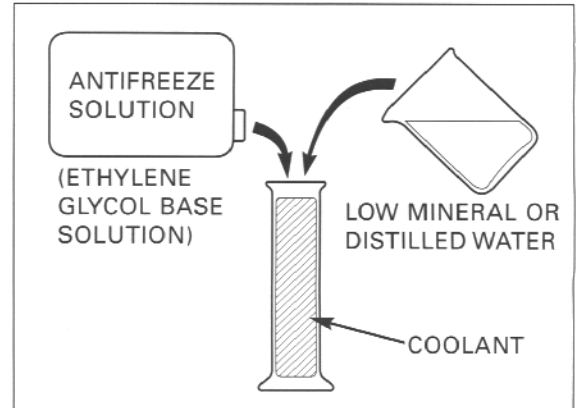
Mix only distilled, low mineral water with the recommended antifreeze.

**RECOMMENDED ANTIFREEZE:**

**Pro Honda HP Coolant or an equivalent high quality ethylene glycol antifreeze containing silicate-free corrosion inhibitors**

**RECOMMENDED MIXTURE:**

**50 – 50 (Distilled water and recommended antifreeze)**



### REPLACEMENT/AIR BLEEDING

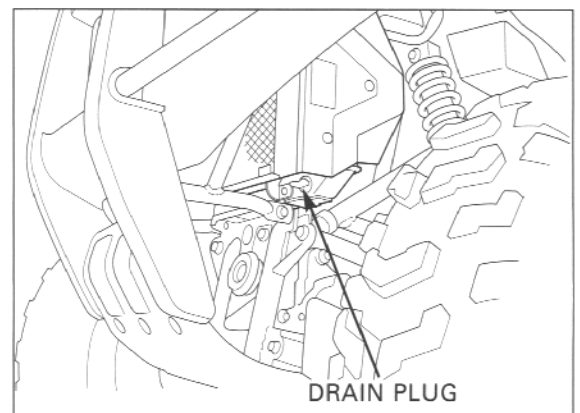
**NOTE:**

- When filling the system with a coolant, place the vehicle on a flat, level surface.

Remove the radiator cap (page 6-3).

Remove the drain plug and drain the coolant from the radiator.

Install the drain plug with a new seal rubber.

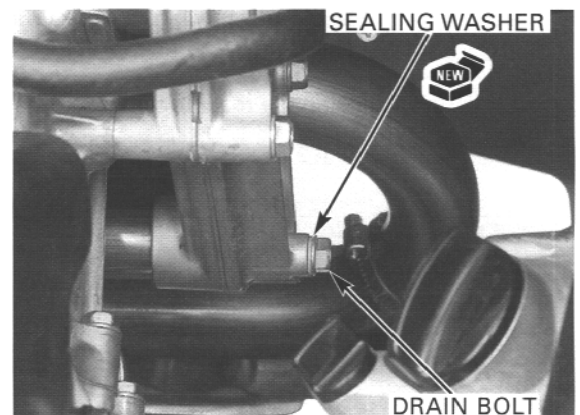


Remove the right side cover (page 2-4).

Remove the drain bolt and drain the coolant from the engine.

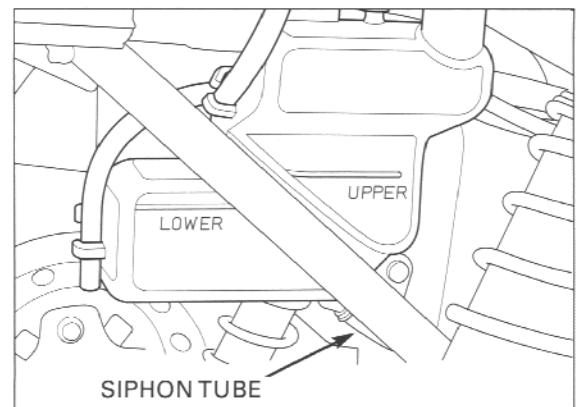
Install the drain bolt with a new sealing washer.

Install the right side cover (page 2-4).



Disconnect the siphon tube and drain the coolant from the radiator reserve tank.

Connect the siphon tube to the reserve tank.

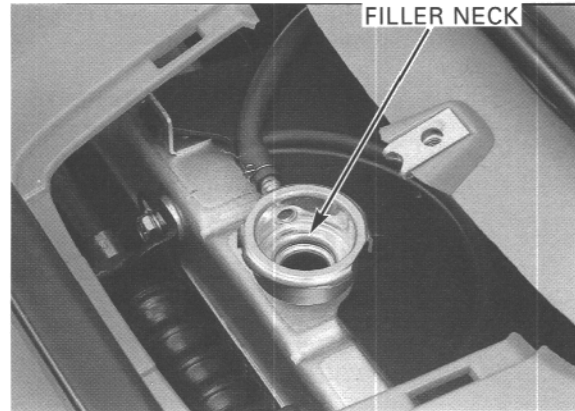


## COOLING SYSTEM

Fill the system with recommended coolant up to the filler neck.

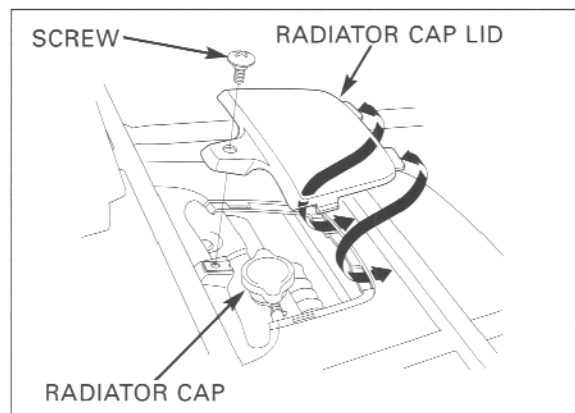
Bleed air from the system as follows:

1. Shift the transmission into neutral.  
Start the engine and let it idle for 2—3 minutes.
2. Snap the throttle 3—4 times to bleed air from the system.
3. Stop the engine and add coolant up to the filler neck.



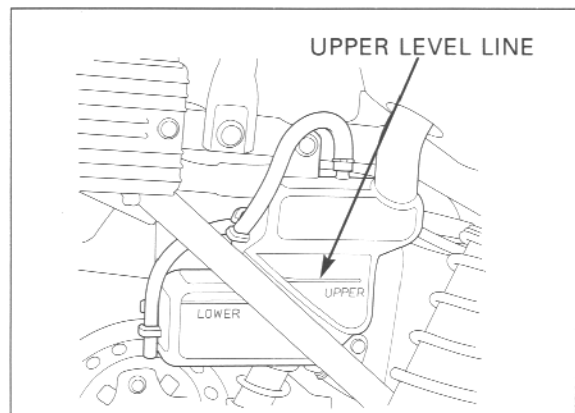
4. Install the radiator cap.

Install the radiator cap lid and tighten the screw.



Fill the reserve tank to the upper level line with the vehicle on a flat, level surface.

Install the reserve tank cap.

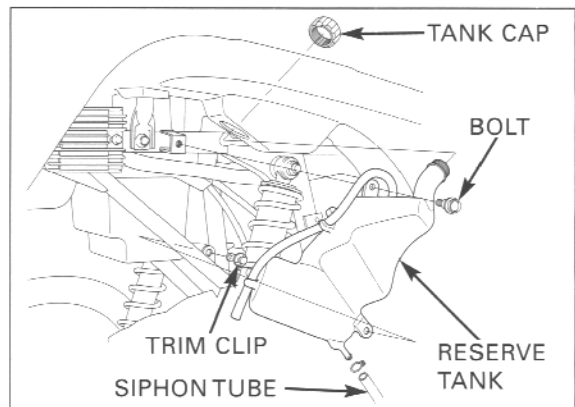


## RADIATOR RESERVE TANK

### REMOVAL/INSTALLATION

Remove the reserve tank cap.  
Remove the trim clip, mounting bolt and reserve tank.  
Disconnect the siphon tube from the reserve tank and drain the coolant.

Install the reserve tank in the reverse order of removal.  
Fill the reserve tank to the upper level line.



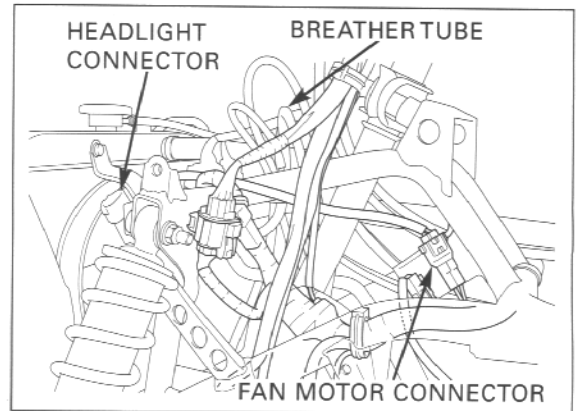


**RADIATOR/COOLING FAN**

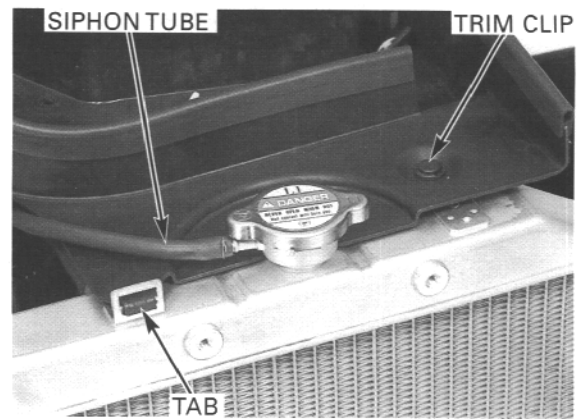
**RADIATOR REMOVAL**

Remove the oil cooler (page 4-4).  
 Drain the coolant from the radiator (page 6-4).

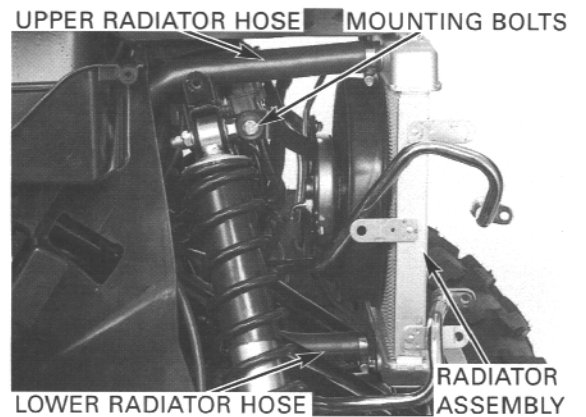
Disconnect the fan motor connectors and release the wire from the clip.  
 Remove the headlight 3P connector from the stay of the fan shroud.  
 Disconnect the fan motor breather tube from the frame.



Remove the trim clip attaching the air guide plate onto the radiator.  
 Release the air guide plate tab from the hook.  
 Disconnect the siphon tube from the radiator.

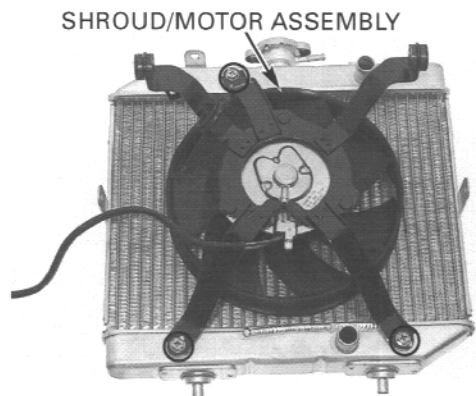


Disconnect the upper and lower radiator hoses.  
 Remove the two mounting bolts and radiator assembly from the frame.



**COOLING FAN DISASSEMBLY**

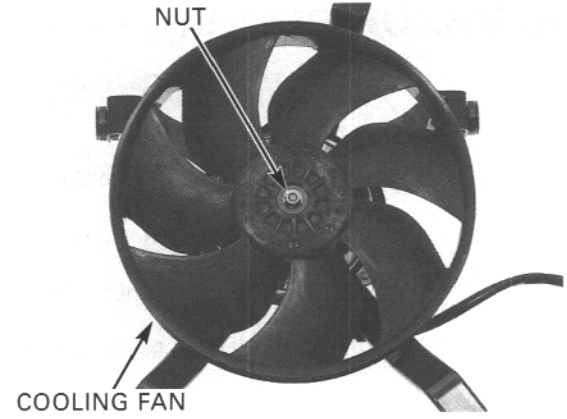
Remove the radiator.  
 Free the fan motor wire and breather tube from the clamp, and disconnect the breather tube from the motor.  
 Remove the three bolts and fan shroud/motor assembly from the radiator.



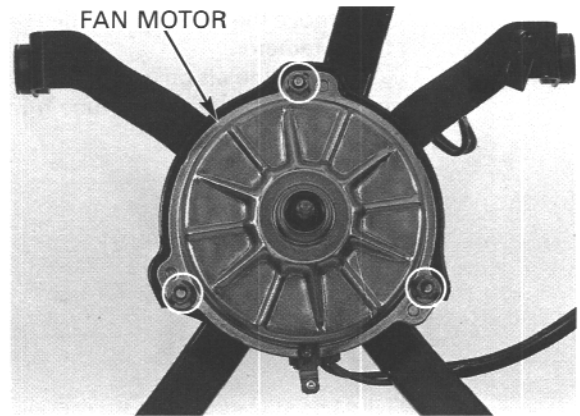
## COOLING SYSTEM

---

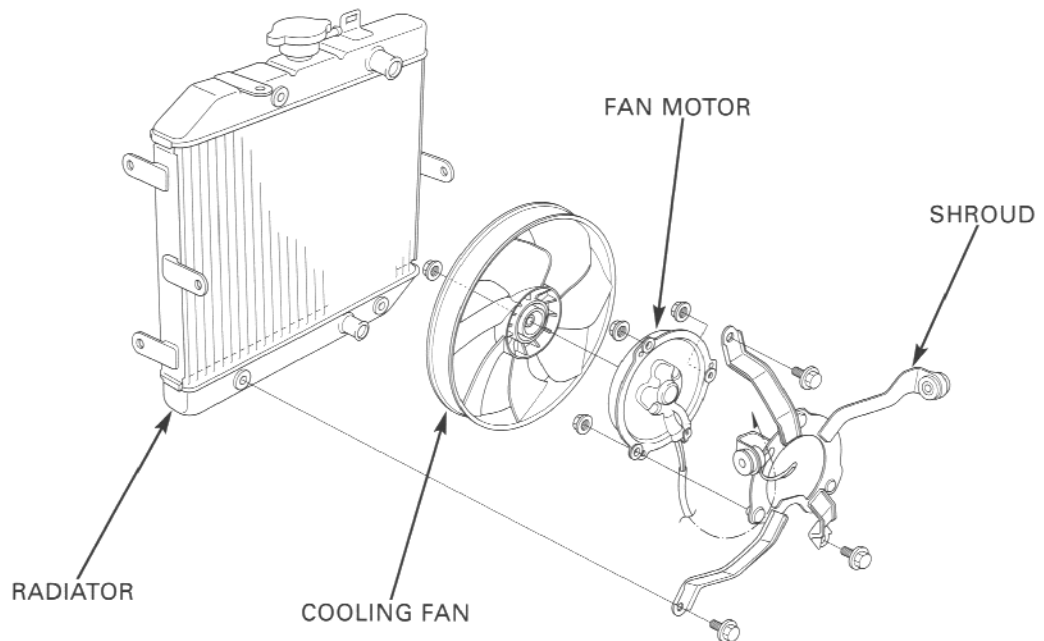
Remove the nut and cooling fan from the motor.



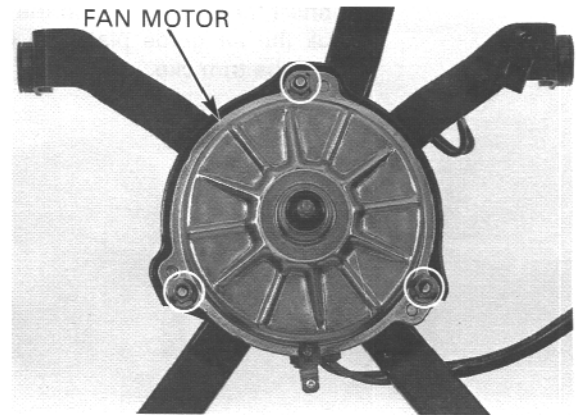
Remove the three nuts and the fan motor from the shroud.



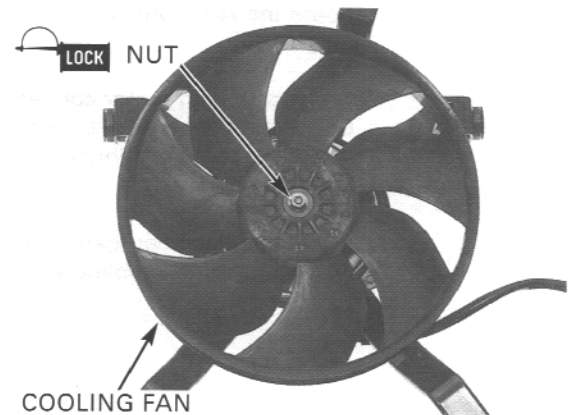
## COOLING FAN ASSEMBLY



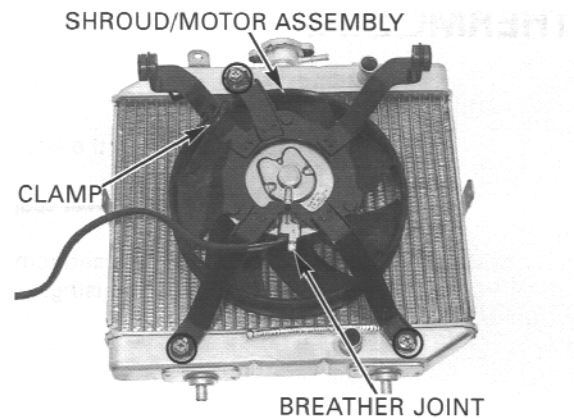
Install the fan motor onto the shroud and tighten the three nuts securely.



Install the cooling fan onto the motor shaft, aligning the flat surfaces. Apply locking agent to the motor shaft threads. Install and tighten the nut.

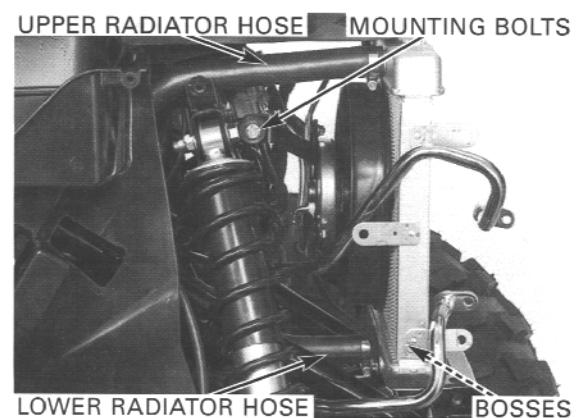


Install the fan shroud/motor assembly onto the radiator and tighten the three bolts securely. Connect the breather tube to the motor breather joint. Clamp the fan motor wire and breather tube.



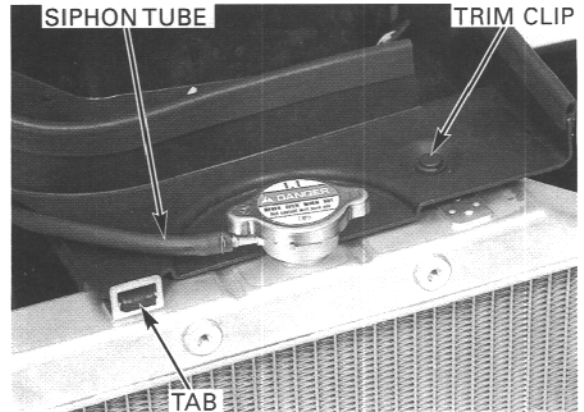
### RADIATOR INSTALLATION

Install the radiator/cooling fan assembly, aligning the lower mounting bosses with the holes in the frame. Install and tighten the two mounting bolts. Connect the upper and lower radiator hoses, and tighten the hose band screws securely.



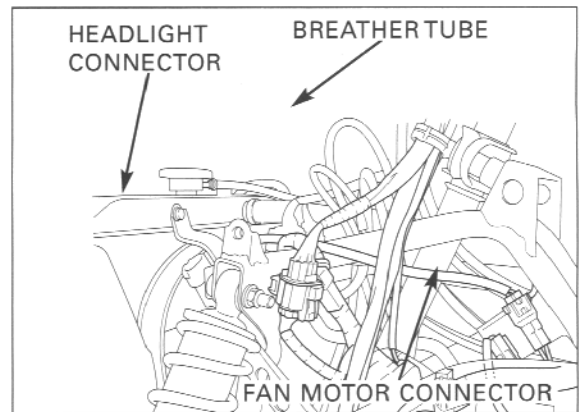
## COOLING SYSTEM

Connect the siphon tube to the radiator.  
Hook the air guide plate tab into the radiator, and  
install the trim clip.



Route the fan motor wire and breather tube properly  
(page 1-19).

Connect the fan motor connectors.  
Connect the fan motor breather tube to the frame.  
Install the headlight connector onto the stay of the fan  
motor shroud.



Install the oil cooler (page 4-4).  
Fill and bleed the cooling system (page 6-6).

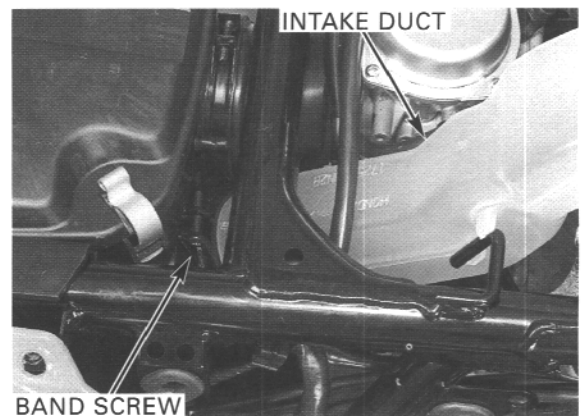
## THERMOSTAT

### REMOVAL

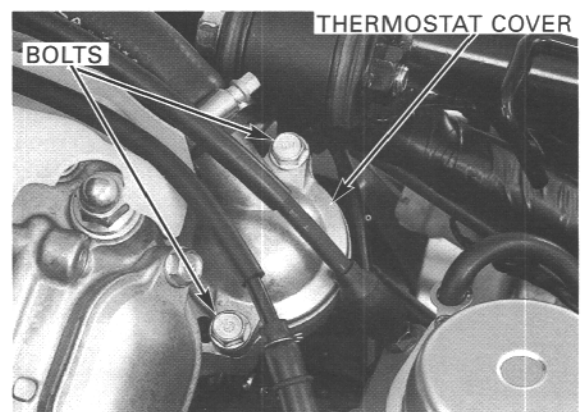
Drain the coolant from the engine (page 6-5).

Remove the fuel tank cover (page 2-5)

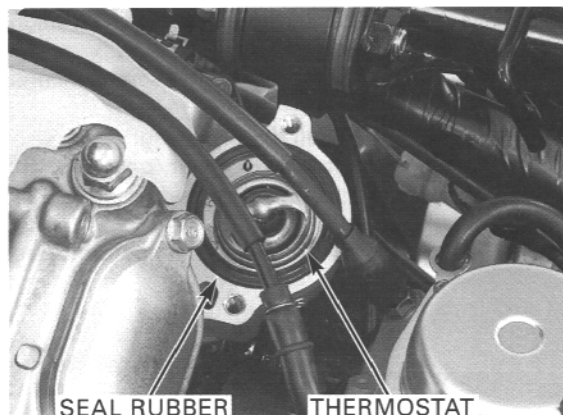
Loosen the band screw and remove the air intake duct  
from the air cleaner housing.



Remove the two bolts and thermostat cover.



Remove the thermostat from the the cylinder head.  
Remove the seal rubber from the thermostat.



## INSPECTION

Visually inspect the thermostat for damage.  
Replace the thermostat if the valve stays open at room temperature.

*Keep flammable materials away from the electric heating element. Do not let the thermometer or thermostat touch the pan, or you will get false readings.*

Heat the water with an electric heating element to operating temperature for 5 minutes.  
Suspend the thermostat in heated water to check its operation.

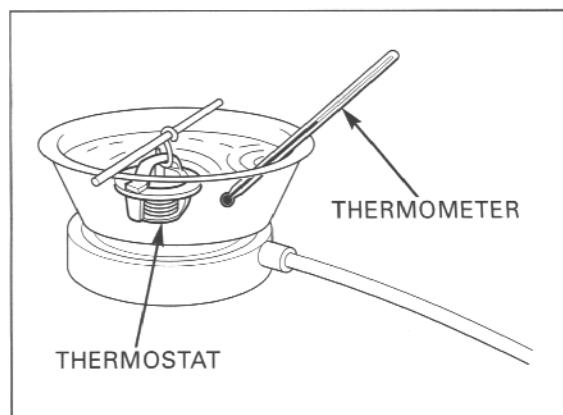
### THERMOSTAT BEGINS TO OPEN:

**80—84°C (176—183°F)**

### VALVE LIFT:

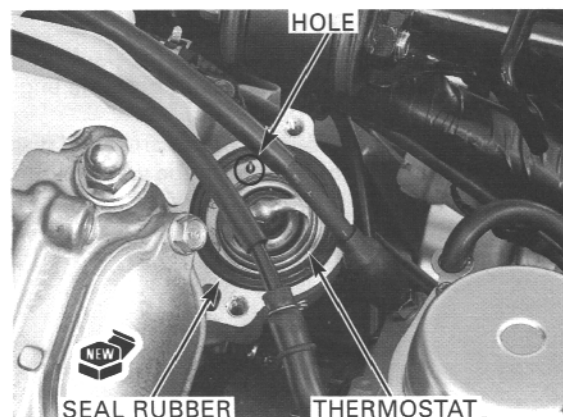
**8 mm (0.31 in) minimum at 95°C (203°F)**

Replace the thermostat if the valve responds at temperature other than those specified.

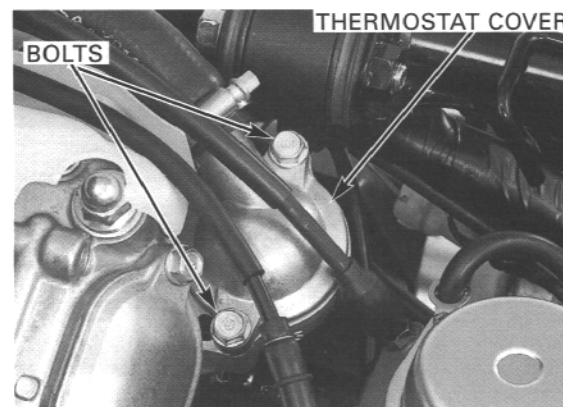


## INSTALLATION

Install a new seal rubber onto the thermostat flange.  
Install the thermostat into the cylinder head with its hole facing toward the right side.



Install the thermostat cover and tighten the two bolts securely.



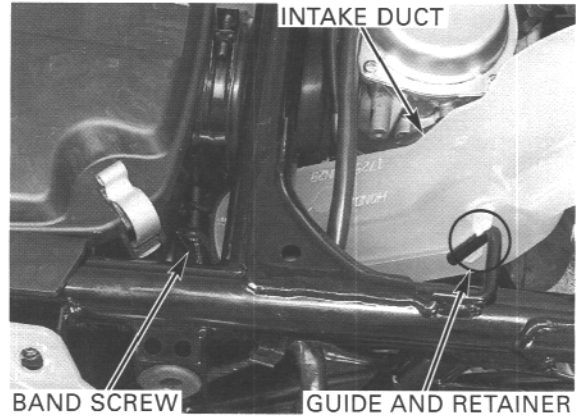
## COOLING SYSTEM

Install the air intake duct, aligning guide on the duct with the seat retainer.  
Tighten the band screw securely.

Install the following:

- fuel tank cover (page 2-5)
- right side cover (page 2-4)

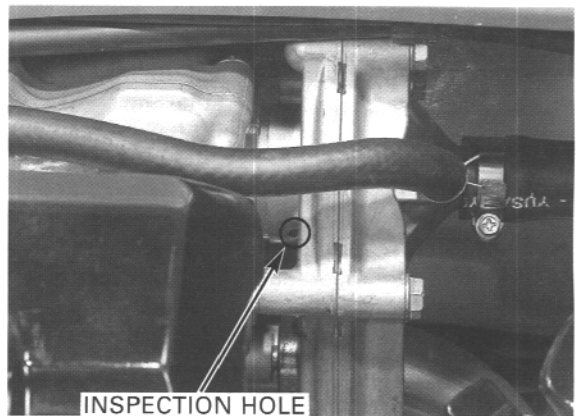
Fill and bleed the cooling system (page 6-6).



## WATER PUMP

### MECHANICAL SEAL INSPECTION

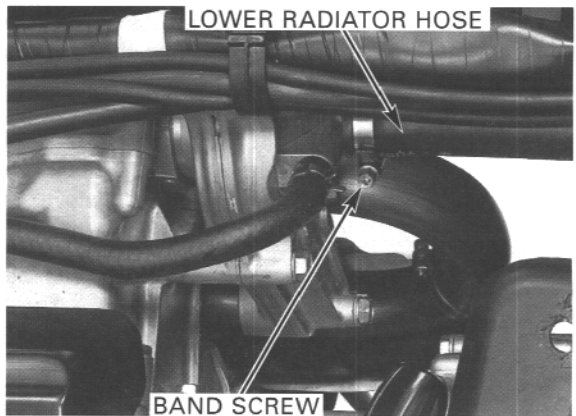
Check the inspection hole for signs of coolant leakage. If there is leakage, the water pump mechanical seal is defective, and the water assembly should be replaced.



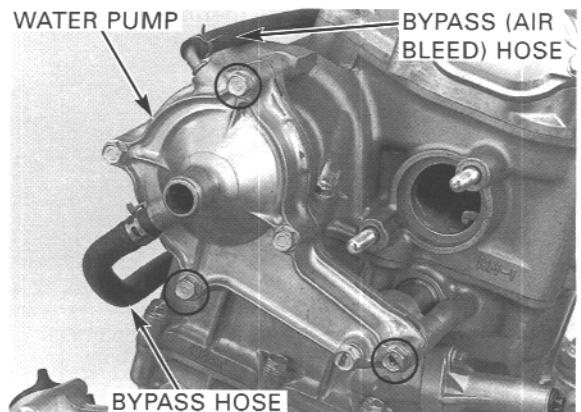
### REPLACEMENT

Drain the coolant from the engine (page 6-5).

Loosen the band screw and disconnect the lower radiator hose from the water pump.



Disconnect the bypass hoses from the water pump.  
Remove the three bolts and water pump.



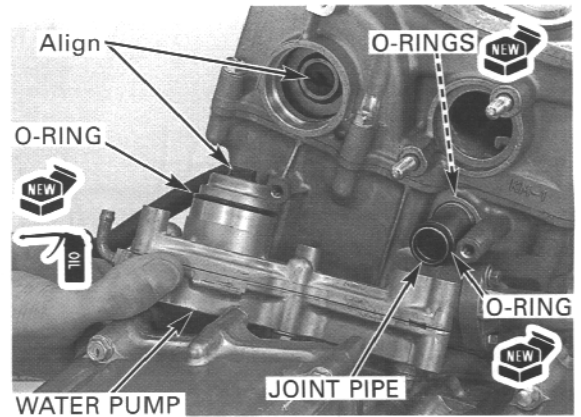
*Do not twist or apply oil to the O-rings; coat them with clean coolant.*

Install a new O-ring onto the pump side of the water joint pipe.

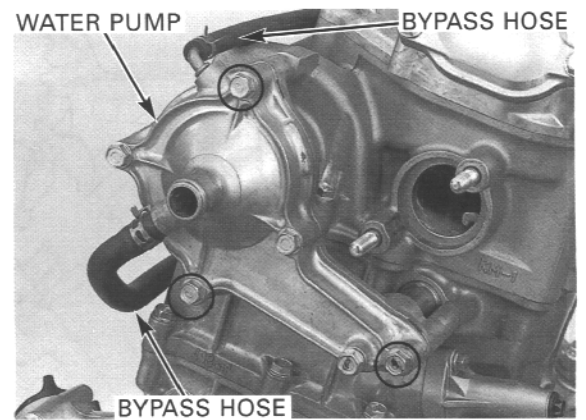
Install a new O-ring onto the engine side of the water joint pipe.

Coat a new O-ring with oil and install it onto the water pump.

Install the water pump onto the engine while aligning the flat end of the pump shaft with the slot in the camshaft.

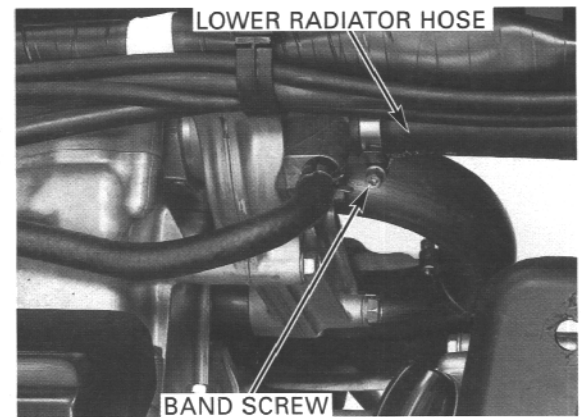


Install the three bolts and tighten them securely.  
Connect the bypass hoses to the water pump.

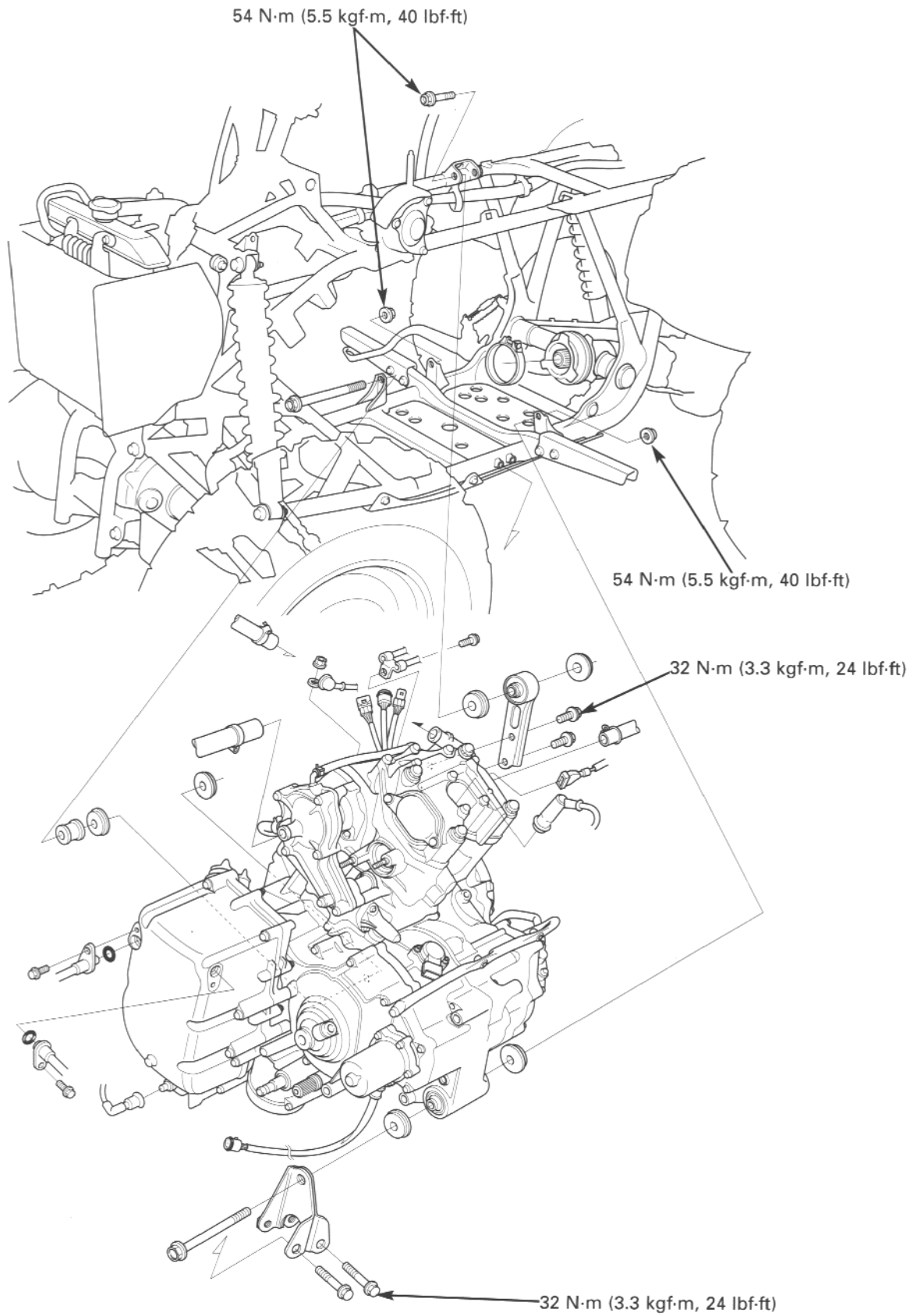


Connect the lower radiator hose to the water pump and tighten the band screw securely.

Install the right side cover (page 2-4).  
Fill and bleed the cooling system (page 6-6).



# ENGINE REMOVAL/INSTALLATION





# 7. ENGINE REMOVAL/INSTALLATION

<b>SERVICE INFORMATION</b>	<b>7-1</b>	<b>ENGINE INSTALLATION</b>	<b>7-5</b>
<b>ENGINE REMOVAL</b>	<b>7-2</b>		

## SERVICE INFORMATION

### GENERAL

- When removing and installing the engine, tape the frame around the engine beforehand for frame protection.
- The following components require engine removal for service:
  - sub-transmission (section 12)
  - crankshaft and automatic transmission (section 13)

### SPECIFICATIONS

ITEM		SPECIFICATIONS
Engine dry weight		63.2 kg (139.3 lbs)
Engine oil capacity	After draining	4.7 liters (5.0 US qt, 4.1 Imp qt)
	After draining/filter change	4.9 liters (5.2 US qt, 4.3 Imp qt)
	After disassembly	5.5 liters (5.8 US qt, 4.8 Imp qt)
Coolant capacity (radiator and engine)		1.7 liters (1.8 US qt, 1.5 Imp qt)

### TORQUE VALUES

Left lower engine hanger bracket bolt	32 N·m (3.3 kgf·m, 24 lbf·ft)
Lower engine hanger nut (left and right)	54 N·m (5.5 kgf·m, 40 lbf·ft)
Upper engine hanger bolt (frame side)	54 N·m (5.5 kgf·m, 40 lbf·ft)
(engine side)	32 N·m (3.3 kgf·m, 24 lbf·ft)
Oil thermosensor	18 N·m (1.8 kgf·m, 13 lbf·ft)
Gearshift lever linkage arm pivot bolt	26 N·m (2.7 kgf·m, 20 lbf·ft)
Differential mounting bolt (10 mm)	44 N·m (4.5 kgf·m, 33 lbf·ft)
nut (10 mm)	44 N·m (4.5 kgf·m, 33 lbf·ft) Lock nut
bolt and nut (8 mm)	22 N·m (2.2 kgf·m, 16 lbf·ft)

## ENGINE REMOVAL/INSTALLATION

### ENGINE REMOVAL

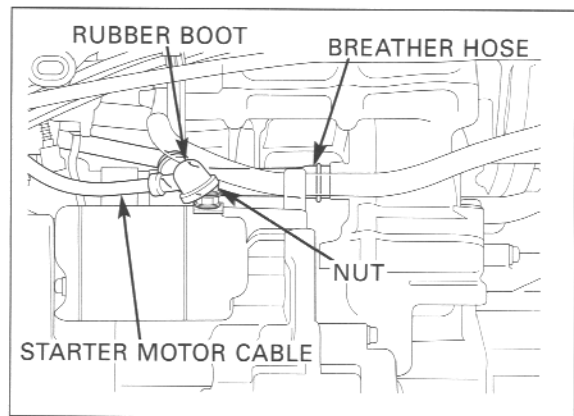
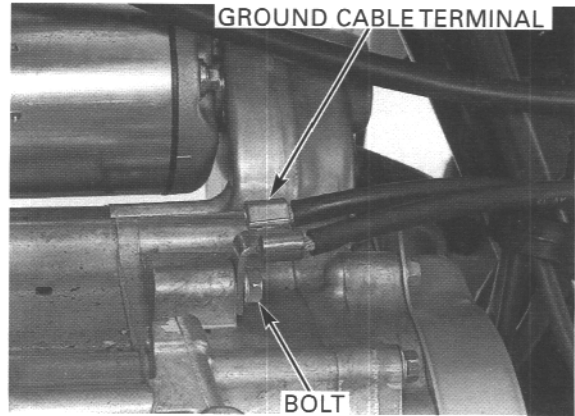
Drain the engine oil (page 3-11).  
Drain the coolant from the engine (page 6-5).

Remove the following:

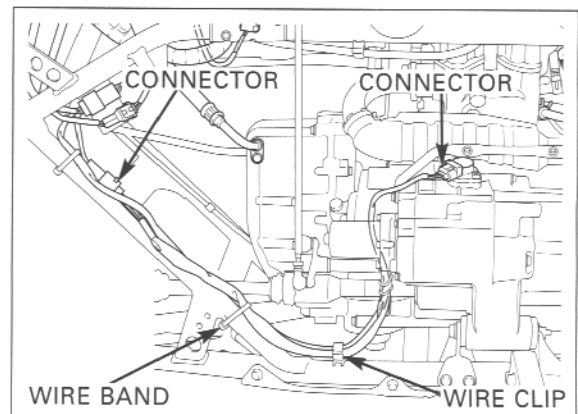
- left and right center mud guards (page 2-5)
- left and right front mud guards (page 2-6)
- right inner fender (page 2-6)
- exhaust system (page 2-10)
- carburetor (page 5-3)
- heat guard (page 8-3)
- bolt and ground cable terminal
- coolant thermosensor connector (page 22-10)

Remove the rubber cap, terminal nut and starter motor cable.

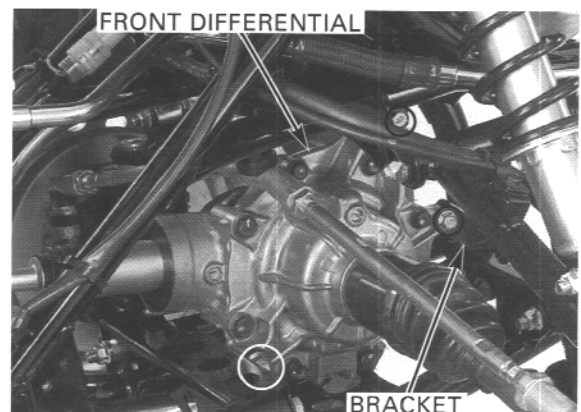
Disconnect the crankcase breather hose from the cylinder.



Free the control motor and angle sensor wires from the wire band and clip, and disconnect their connectors.



Remove the front differential mounting bolts, nuts and bracket.  
Move the front differential forward.

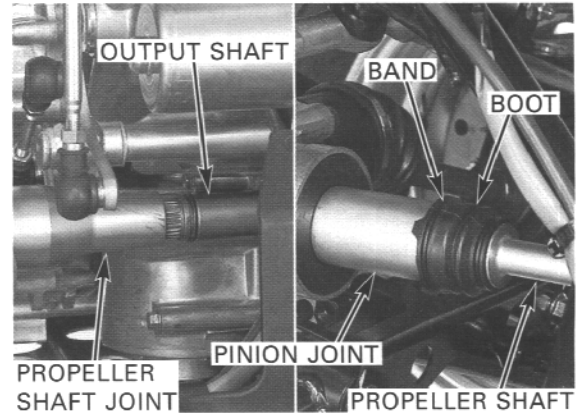


## ENGINE REMOVAL/INSTALLATION

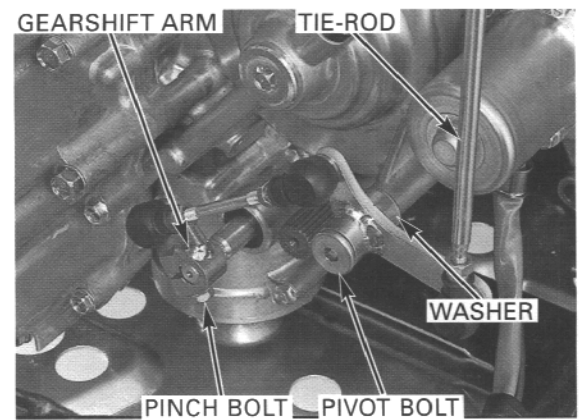
Pull the propeller shaft joint out of the output shaft.

Remove the boot band from the dust boot and release the dust boot off the pinion joint of the front differential.

Pull the propeller shaft to force the stopper ring at the propeller shaft end past the groove in the pinion joint and remove the propeller shaft.



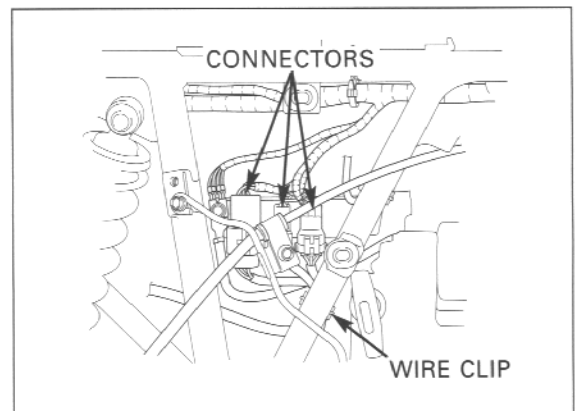
Make sure that the sub-transmission is into neutral. Remove the pivot bolt, washer, pinch bolt and the gearshift arm from the gearshift spindle. Pivot the tie-rod up out of the way.



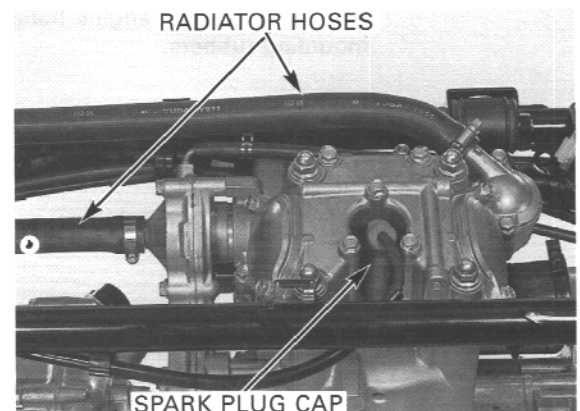
Remove the following from the stays and disconnect them:

- alternator/ignition pulse generator connector
- gear position switch connector
- speed sensor connector

Free the wires from the wire clip.

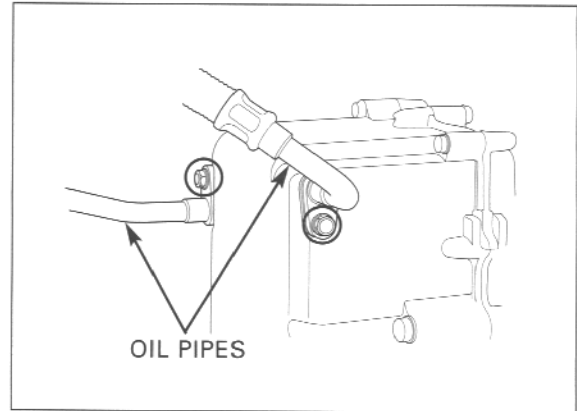


Remove the spark plug cap from the plug. Loosen the band screws and disconnect the upper and lower radiator hoses from the thermostat cover and water pump.

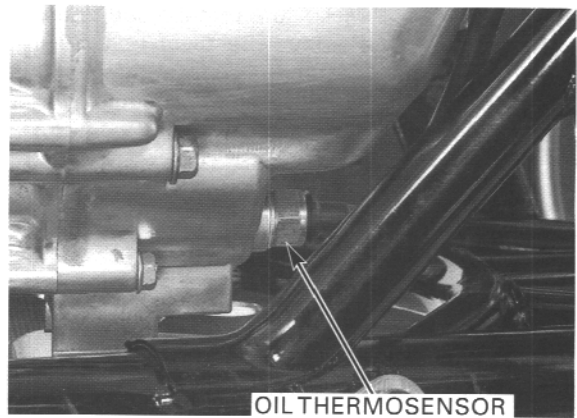


## ENGINE REMOVAL/INSTALLATION

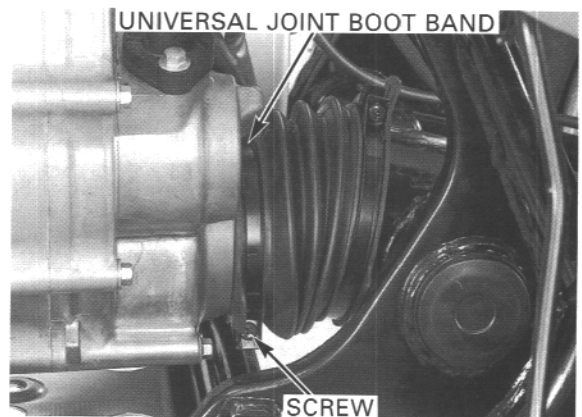
Remove the bolts and oil pipes from the oil tank.



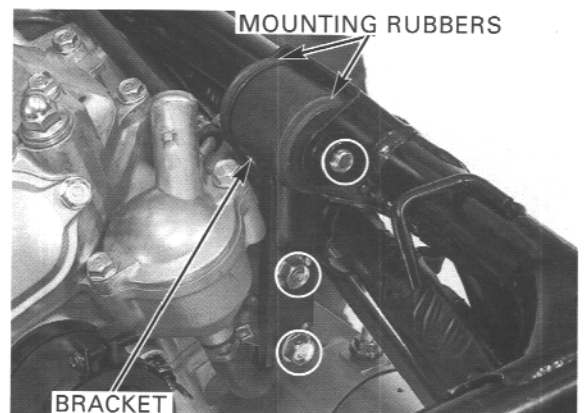
Disconnect the oil thermosensor connector and remove the thermosensor.



Remove the screw and universal joint boot band.  
Remove the boot from the engine.



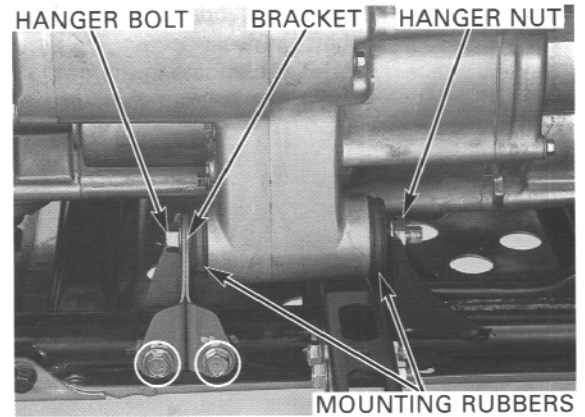
Remove the upper engine hanger bolts, bracket and mounting rubbers.



## ENGINE REMOVAL/INSTALLATION

Remove the following:

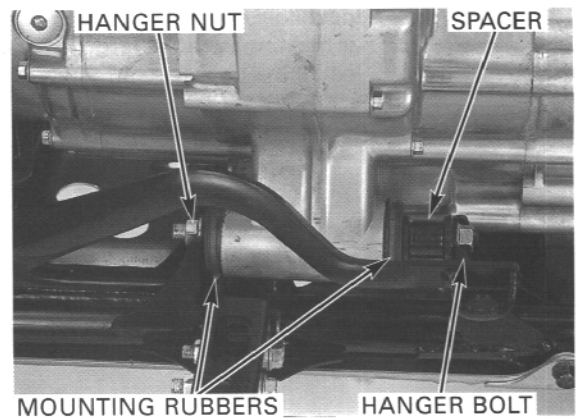
- left lower engine hanger nut and bolt
- mounting rubbers
- bolts and hanger bracket



- right lower engine hanger nut and bolt
- spacer and mounting rubbers

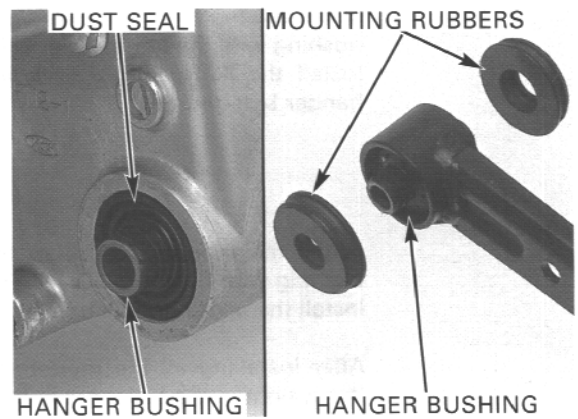
Move the engine forward and disconnect the output shaft from the universal joint.

Remove the engine from the frame toward the left side.



Remove the engine hanger bushings and dust seals.

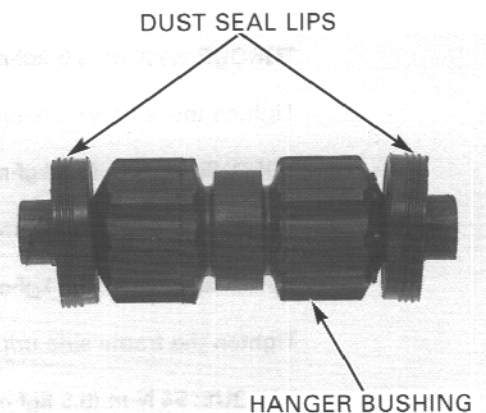
Check the mounting rubbers, hanger bushings and dust seals for wear or damage.



## ENGINE INSTALLATION

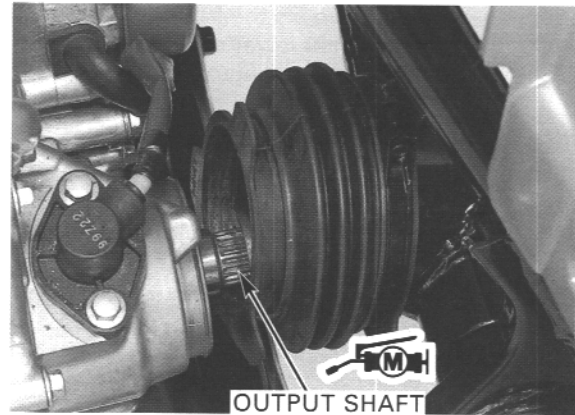
Install the lower hanger bushings into the engine lower mounts.

Install the dust seals with the lip side facing out.



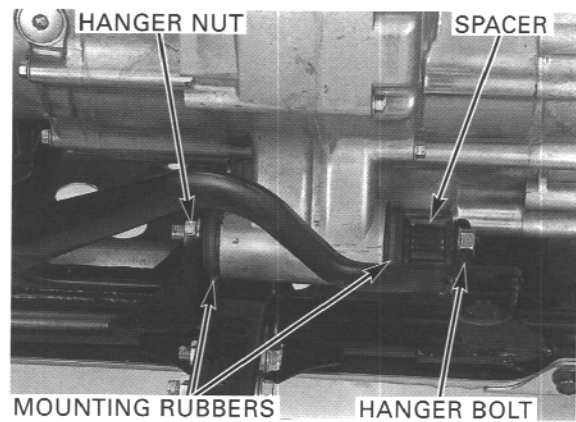
## ENGINE REMOVAL/INSTALLATION

Apply molybdenum disulfide grease to the output shaft splines.  
Install the engine in the frame from the left side.  
Engage the output shaft with the universal joint.

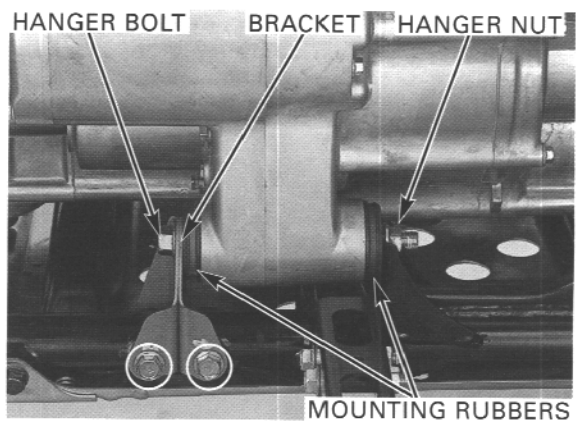


*Support the engine with a scissors type jack during installation*

Install the mounting rubbers on the right lower hanger bushing with the large I.D. side facing in.  
Install the spacer, right lower engine hanger bolt and nut.



Install the mounting rubbers on the left lower hanger bushing with the large I.D. side facing in.  
Install the hanger bracket, bolts, left lower engine hanger bolt and nut.



Install the mounting rubbers on the upper hanger bushing with the large I.D. side facing in.  
Install the upper engine hanger bracket and bolts.

After installing all the mounting fasteners and seat them, tighten the fasteners in order as follows.

Tighten the left and right lower engine hanger nuts.

**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

Tighten the left lower hanger bracket bolts.

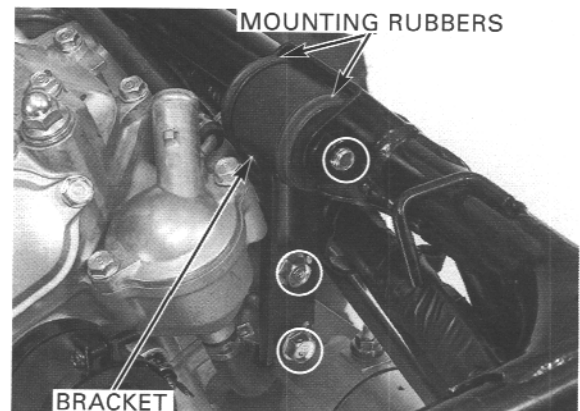
**TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)**

Tighten the engine side upper hanger bolts.

**TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)**

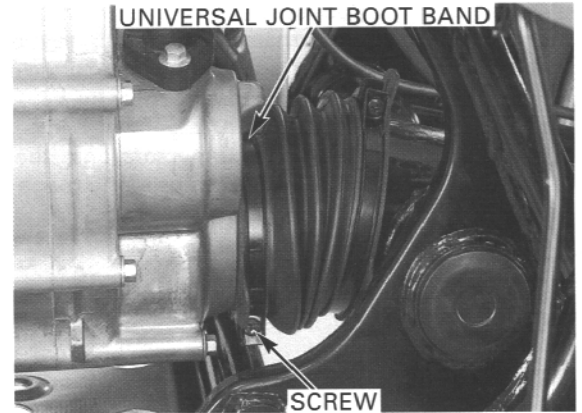
Tighten the frame side upper hanger bolt

**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**



## ENGINE REMOVAL/INSTALLATION

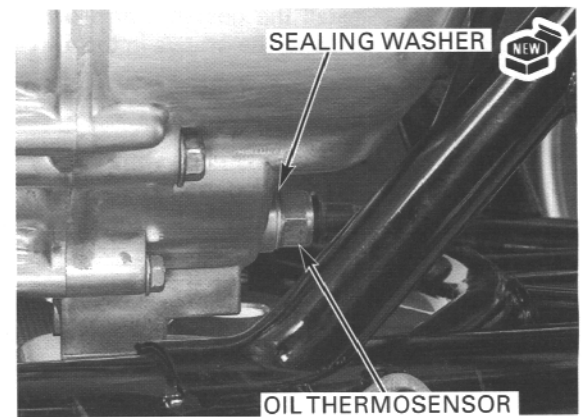
Install the universal joint boot onto the engine.  
Install the boot band and tighten the screw securely.



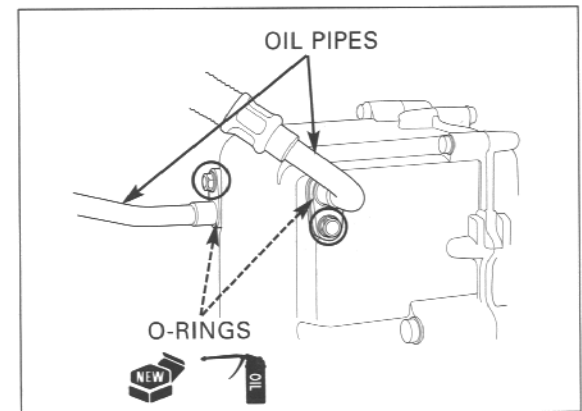
Install the oil thermosensor with a new sealing washer and tighten it.

**TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)**

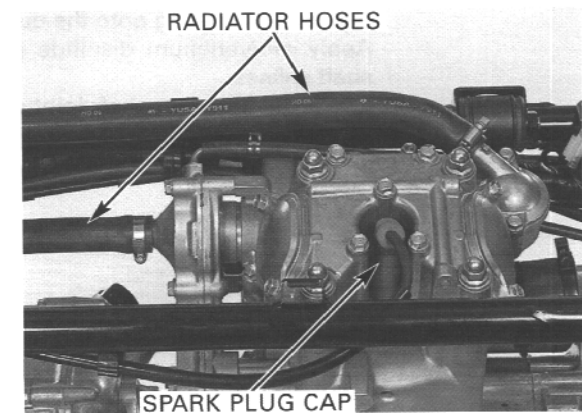
Connect the oil thermosensor connector.



Coat new O-rings with oil and install them onto the oil pipes.  
Install the oil pipes into the oil tank and tighten the bolts securely.



Connect the upper and lower radiator hose to the thermostat cover and water pump.  
Tighten the hose band screws securely.  
Install the spark plug cap onto the plug.

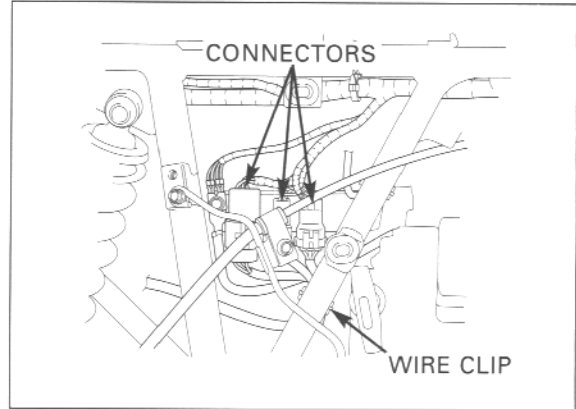


## ENGINE REMOVAL/INSTALLATION

Connect the following:

- alternator/ignition pulse generator connector
- gear position switch connector
- speed sensor connector

Install the connectors onto the stays and clamp the wires and tubes properly (page 1-19).



Install the gearshift arm onto the gearshift spindle, aligning the groove in the arm with the wide tooth on the spindle.

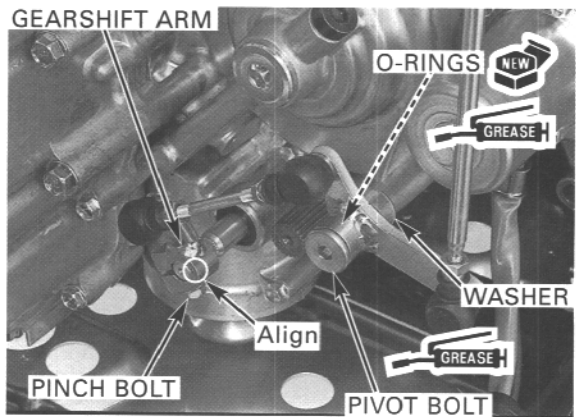
Install and tighten the pinch bolt.

Coat new O-rings with grease and install it onto the pivot bolt.

Apply grease to the pivot bolt groove and install the washer, linkage lever and pivot bolt.

Tighten the pivot bolt.

**TORQUE: 26 N·m (2.7 kgf·m, 20 lbf·ft)**



Place the boot band over the propeller shaft.

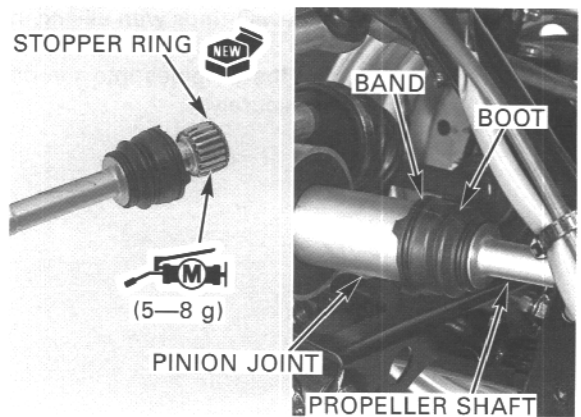
Install a new stopper ring into the groove in the propeller shaft.

Apply 5—8 g of molybdenum disulfide grease to the pinion joint splines of the front differential.

Install the propeller shaft into the pinion joint, aligning the joint and shaft splines until the stopper ring seats in the groove.

Make sure that the stopper ring is seated properly by pulling on the propeller shaft lightly.

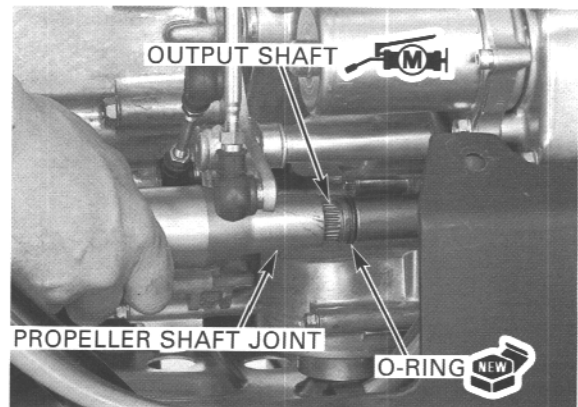
Install the boot over the pinion joint securely and the boot bands into the boot groove.



Install a new O-ring onto the output shaft groove.

Apply molybdenum disulfide grease to the output shaft splines.

Install the propeller shaft joint over the output shaft, aligning the output shaft and joint splines.





## ENGINE REMOVAL/INSTALLATION

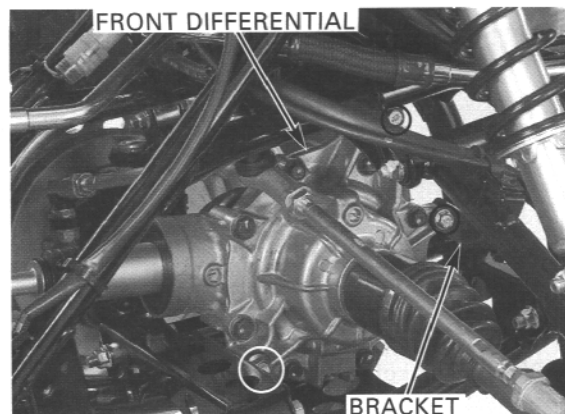
Move the front differential rearward, align the mounting points and install the spacer (upper side; between the right side of the differential and frame), 10 mm bolts and a new nut.

Install the mounting bracket, 8 mm bolts and nut. Tighten the 10 mm bolt and nut.

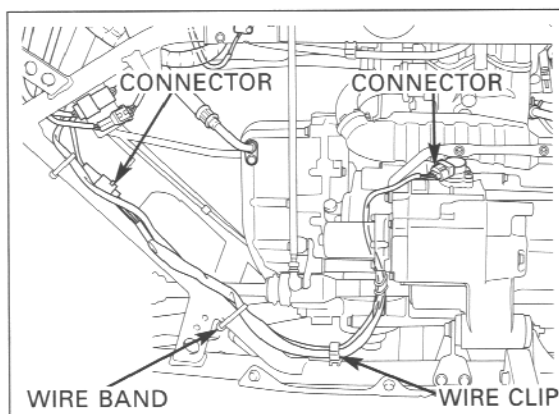
**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Tighten the 8 mm bolts and nut.

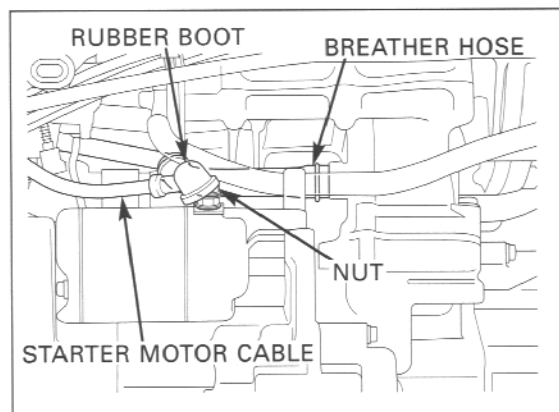
**TORQUE: 22 N·m (2.2 kgf·m, 16 lbf·ft)**



Connect the angle sensor and control motor connectors, and secure their wires with the wire clip and band.



Connect the crankcase breather hose to the cylinder. Install the starter motor cable onto the terminal and tighten the nut securely. Install the rubber cap over the terminal properly.



Install the ground cable terminal onto the engine and tighten the bolt securely.

Adjust the tie-rod length of the gearshift lever linkage (page 12-15).

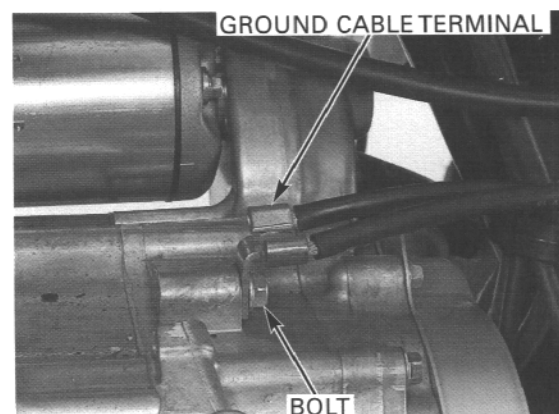
Install the following:

- coolant thermosensor connector (page 22-10)
- heat guard (page 8-19)
- carburetor (page 5-3)
- exhaust system (page 2-10)
- right inner fender (page 2-6)
- left and right front mud guards (page 2-6)
- left and right center mud guards (page 2-5)

Fill the oil tank with recommended engine oil (page 3-11).

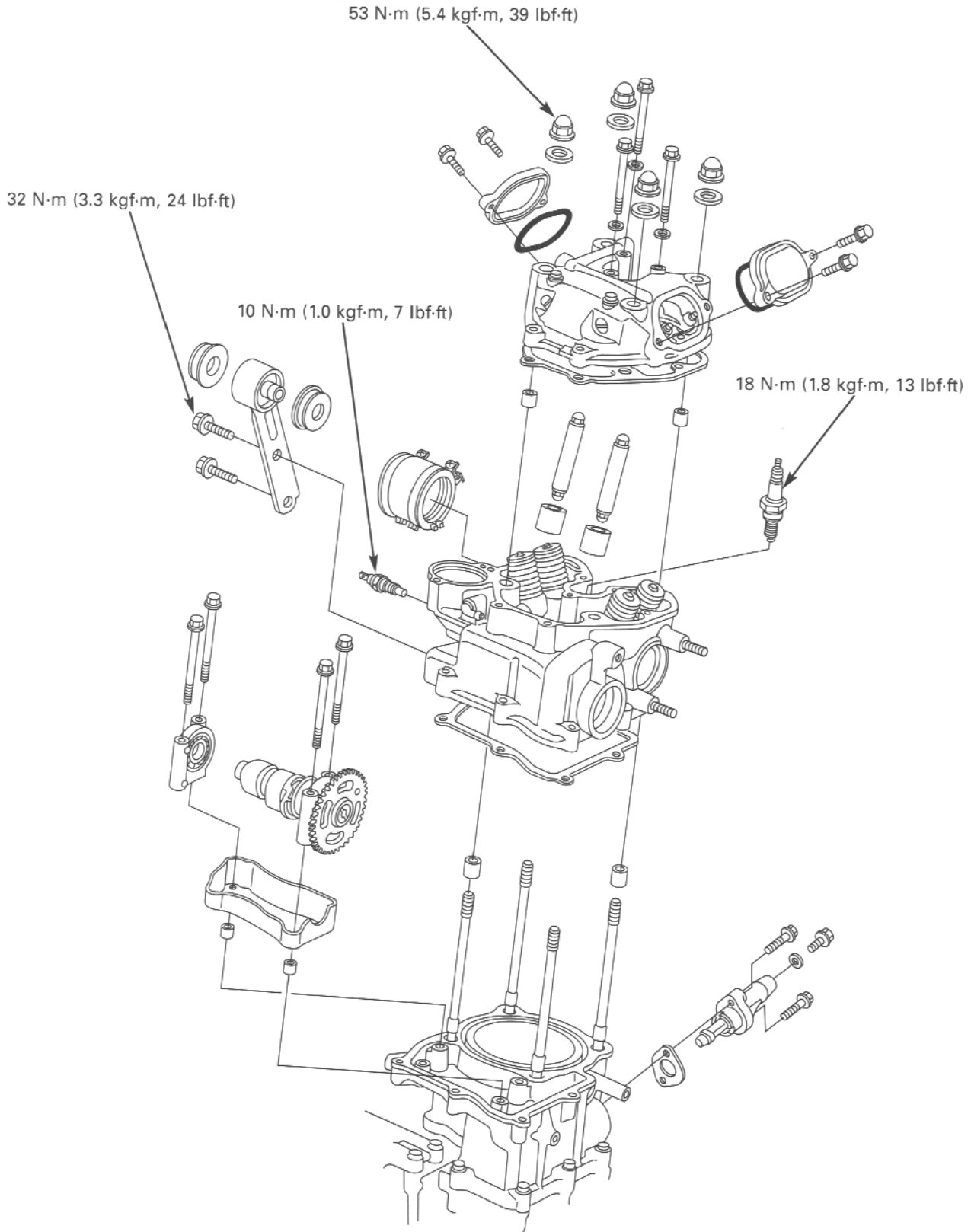
Fill and bleed the cooling system (page 6-6).

Check the engine oil level (page 3-10).



# CYLINDER HEAD/VALVE

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# 8. CYLINDER HEAD/VALVE

<b>SERVICE INFORMATION</b>	<b>8-1</b>	<b>VALVE SEAT INSPECTION/REFACING</b>	<b>8-9</b>
<b>TROUBLESHOOTING</b>	<b>8-2</b>	<b>CAMSHAFT REMOVAL</b>	<b>8-12</b>
<b>CYLINDER COMPRESSION</b>	<b>8-3</b>	<b>CAMSHAFT INSTALLATION</b>	<b>8-14</b>
<b>CYLINDER HEAD COVER REMOVAL/ DISASSEMBLY</b>	<b>8-3</b>	<b>CYLINDER HEAD ASSEMBLY</b>	<b>8-15</b>
	<b>8-3</b>	<b>CYLINDER HEAD INSTALLATION</b>	<b>8-16</b>
<b>CYLINDER HEAD REMOVAL</b>	<b>8-5</b>	<b>CYLINDER HEAD COVER ASSEMBLY/ INSTALLATION</b>	<b>8-18</b>
<b>CYLINDER HEAD DISASSEMBLY</b>	<b>8-6</b>		
<b>VALVE GUIDE REPLACEMENT</b>	<b>8-9</b>		

## SERVICE INFORMATION

### GENERAL

- This section covers service of the rocker arm, cylinder head, valve and camshaft. These service can be done with the engine installed in the frame.
- When disassembling, mark and store the disassembled parts to ensure that they are reinstalled in their original locations.
- Clean all disassembled parts with cleaning solvent and dry them by blowing them off with compressed air before inspection.
- Rocker arm, valve and camshaft lubricating oil is fed through oil passages in the cylinder head and head cover. Clean the oil passages before assembling cylinder head and head cover.
- Be careful not to damage the mating surfaces when removing the cylinder head cover and cylinder head.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD		SERVICE LIMIT
Cylinder compression at 450 rpm		608—902 kPa (6.2—9.2 kgf/cm <sup>2</sup> , 88—131 psi)		—
Valve clearance		IN	0.15 (0.006)	—
		EX	0.23 (0.009)	—
Valve, valve guide	Valve stem O.D.	IN	5.475—5.490 (0.2156—0.2161)	5.45 (0.215)
		EX	5.455—5.470 (0.2148—0.2154)	5.43 (0.214)
	Valve guide I.D.	IN/EX	5.500—5.512 (0.2165—0.2170)	5.53 (0.218)
	Stem-to-guide clearance	IN	0.010—0.037 (0.0004—0.0015)	0.12 (0.005)
		EX	0.030—0.057 (0.0012—0.0022)	0.14 (0.006)
	Valve guide projection above cylinder head	IN	15.8—16.2 (0.62—0.64)	—
		EX	18.8—19.2 (0.74—0.76)	—
Valve seat width	IN/EX	1.0—1.1 (0.039—0.043)	1.4 (0.06)	
Valve spring	Free length	Inner	38.82 (1.528)	37.8 (1.49)
		Outer	51.17 (2.015)	49.0 (1.93)
Rocker arm	Arm I.D.	IN/EX	12.000—12.018 (0.4724—0.4731)	12.05 (0.474)
	Shaft O.D.	IN/EX	11.964—11.984 (0.4710—0.4718)	11.92 (0.469)
	Arm-to-shaft clearance	IN/EX	0.016—0.054 (0.0006—0.0021)	0.08 (0.003)
Camshaft and cam follower	Cam lobe height	IN	33.9602—34.1202 (1.33701—1.34331)	33.790 (1.3303)
		EX	34.1959—34.3559 (1.34629—1.35259)	33.946 (1.3365)
	Cam follower O.D.	IN/EX	22.467—22.482 (0.8845—0.8851)	22.46 (0.884)
	Follower bore I.D.	IN/EX	22.510—22.526 (0.8862—0.8868)	22.54 (0.887)
Follower-to-bore clearance	IN/EX	0.028—0.059 (0.0011—0.0023)	0.07 (0.003)	
Cylinder head warpage		—		0.10 (0.004)

## CYLINDER HEAD/VALVE

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### TORQUE VALUES

Cylinder head cover cap nut	53 N·m (5.4 kgf·m, 39 lbf·ft)
Upper engine hanger bolt (frame side)	54 N·m (5.5 kgf·m, 40 lbf·ft)
(engine side)	32 N·m (3.3 kgf·m, 24 lbf·ft)
Thermosensor	10 N·m (1.0 kgf·m, 7 lbf·ft)
Spark plug	18 N·m (1.8 kgf·m, 13 lbf·ft)

### TOOLS

Valve spring compressor	07757-0010000
Valve guide driver, 5.5 mm	07742-0010100
Valve guide reamer, 5.5 mm	07984-2000001 or 07984-200000D (U.S.A. only)
Valve seat cutter, 35 mm (IN 45°)	07780-0010400 — or equivalent commercially available in U.S.A.
Valve seat cutter, 33 mm (EX 45°)	07780-0010800 —
Flat cutter, 36 mm (IN 32°)	07780-0013500 —
Flat cutter, 33 mm (EX 32°)	07780-0012900 —
Interior cutter, 34 mm (IN 60°)	07780-0014700 —
Interior cutter, 30 mm (EX 60°)	07780-0014000 —
Cutter holder, 5.5 mm	07781-0010101 —

### TROUBLESHOOTING

- Engine top-end problems usually affect engine performance. These can be diagnosed by a compression test, or by tracing top-end noise with a sounding rod or stethoscope.
- If the performance is poor at low speeds, check for a white smoke in the crankcase breather tube. If the tube is smoky, check for seized piston ring (section 9).

#### Compression too low, hard starting or poor performance at low speed

- Valves
  - Incorrect valve adjustment
  - Burned or bent valves
  - Incorrect valve timing
  - Broken valve spring
  - Uneven valve seating
  - Valve stuck open
- Cylinder head
  - Leaking or damaged cylinder head gasket
  - Warped or cracked cylinder head
  - Loose spark plug
- Cylinder/piston problem (section 9)

#### Compression too high

- Excessive carbon build-up on piston head or combustion chamber
- Worn or damaged decompressor system

#### Excessive smoke

- Worn valve stem or valve guide
- Damaged stem seal
- Cylinder/piston problem (section 9)

#### Excessive noise

- Incorrect valve clearance
- Sticking valve or broken valve spring
- Excessive worn valve seat
- Worn or damaged camshaft
- Worn rocker arm and/or shaft
- Worn rocker arm follower or valve stem end
- Worn or damaged push rod and/or cam follower
- Worn cam chain
- Worn or damaged cam chain tensioner
- Worn cam sprocket teeth
- Cylinder/piston problem (section 9)

#### Rough idle

- Low cylinder compression

## CYLINDER COMPRESSION

Warm up the engine to normal operating temperature.

Stop the engine, disconnect the spark plug cap and remove the spark plug (page 3-7).

Install the compression gauge into the spark plug hole.

Shift the transmission in neutral.

Open the throttle all the way and crank the engine with the starter motor until the gauge reading stops rising. The maximum reading is usually reached within 4–7 seconds.

### COMPRESSION PRESSURE:

608—902 kPa (6.2—9.2 kgf/cm<sup>2</sup>, 88—131 psi)  
at 450 rpm

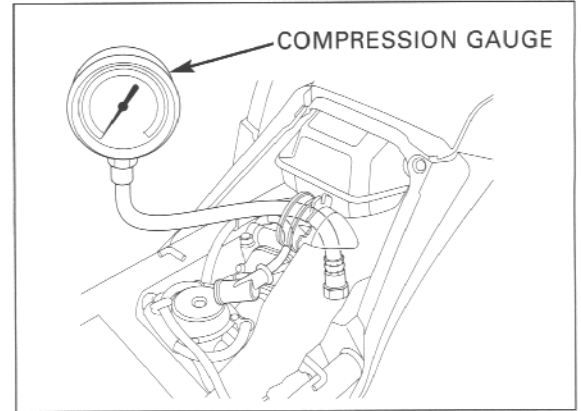
Check that there is no leakage at the gauge connection.

Low compression can be caused by:

- blown cylinder head gasket
- improper valve adjustment
- valve leakage
- worn piston ring or cylinder

High compression can be caused by:

- carbon deposits in combustion chamber or on piston head

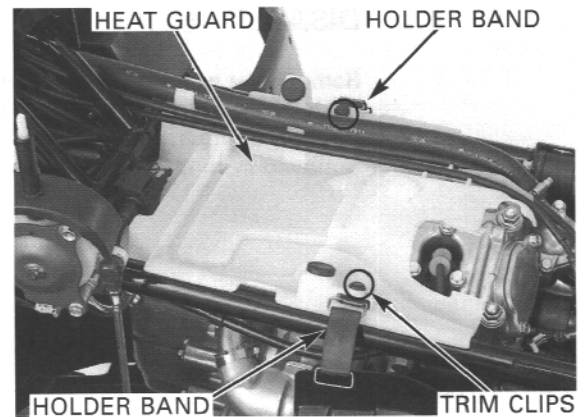


## CYLINDER HEAD COVER REMOVAL/ DISASSEMBLY

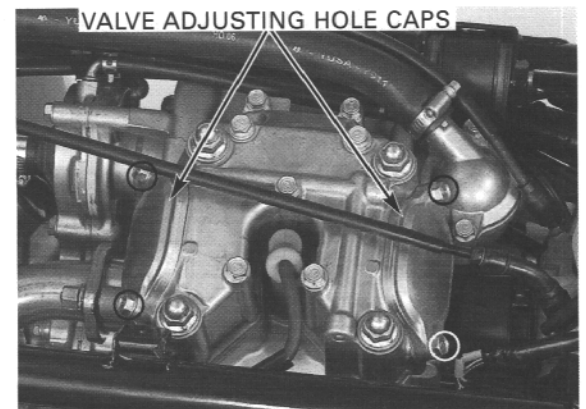
### REMOVAL

Remove the fuel tank (page 5-17).

Remove the holder bands from the frame.  
Remove the two trim clips and heat guard.

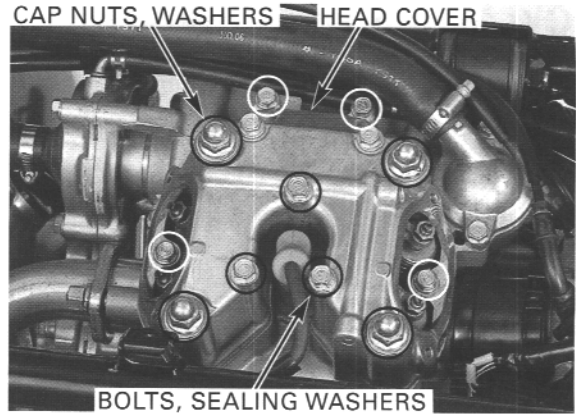


Remove the four bolts and valve adjusting hole caps.

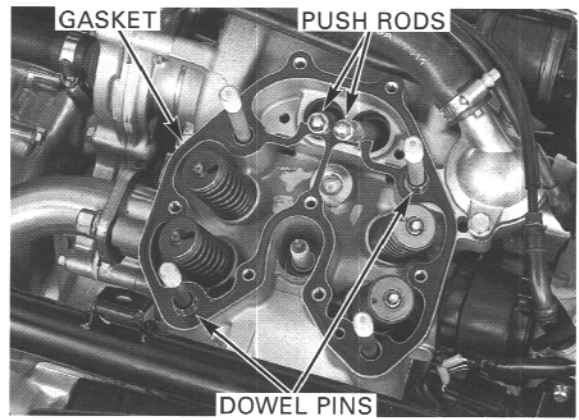


## CYLINDER HEAD/VALVE

Remove the spark plug cap.  
Remove the seven bolts, three sealing washers, four cap nuts, washers and the cylinder head cover.



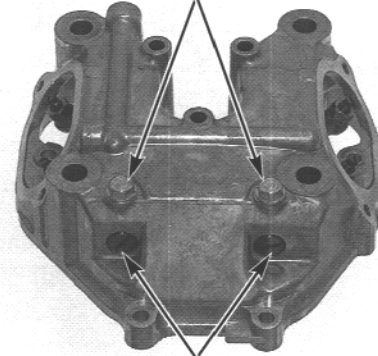
*Mark the push rods so they can be placed back in their original locations.* Remove the push rods, gasket and dowel pins.



### DISASSEMBLY

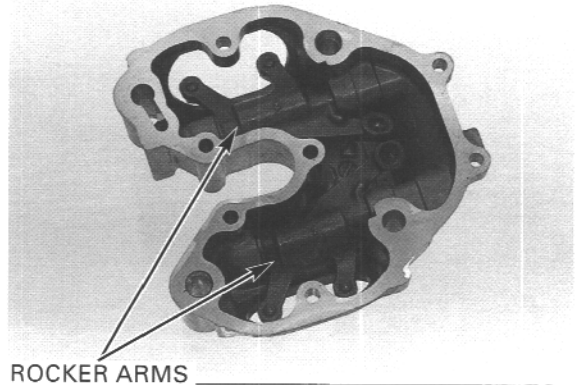
Remove the two setting bolts and sealing washers. Push the rocker arm shaft with the small screwdriver through the bolt hole until the O-ring on the shaft is removed from the cylinder head cover.

BOLTS, SEALING WASHERS



ROCKER ARM SHAFTS

Remove the rocker arm shafts and rocker arms from the cylinder head cover.



ROCKER ARMS

**INSPECTION**

**ROCKER ARM/SHAFT**

Check the rocker arms and shafts for wear or damage. If the rocker arm follower is worn or damaged, check the push rod and oil passages.

Measure each rocker arm shaft O.D.

**SERVICE LIMITS: 11.92 mm (0.469 in)**

Measure each rocker arm I.D.

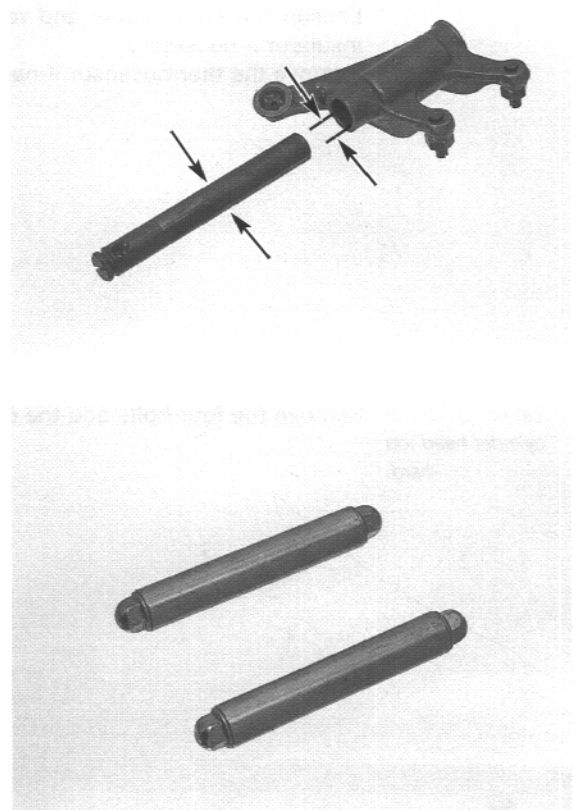
**SERVICE LIMITS: 12.05 mm (0.474 in)**

Subtract each rocker arm shaft O.D. from the corresponding rocker arm I.D. to obtain the rocker arm-to-shaft clearance.

**SERVICE LIMIT: 0.08 mm (0.003 in)**

**PUSH ROD**

Check the push rods for wear or damage. If the push rod is worn or damaged, check the cam follower and camshaft.



**CYLINDER HEAD REMOVAL**

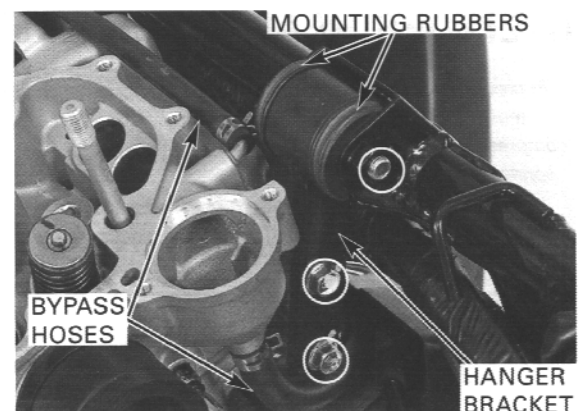
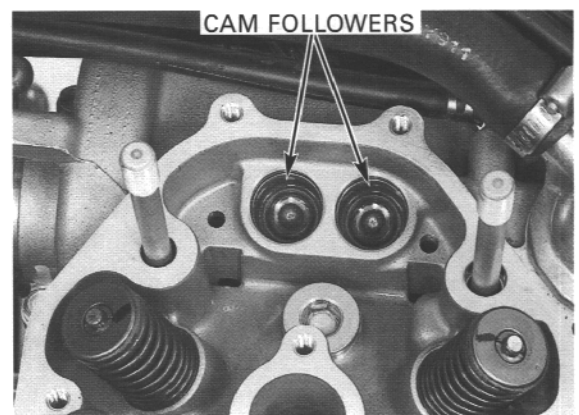
Remove the following:

- exhaust pipe (page 2-10)
- carburetor (page 5-3)
- cylinder head cover (8-3)
- cam followers
- thermostat (page 6-10)

*The cam followers can be removed without removing the exhaust pipe and carburetor.*

- bypass hoses from the cylinder head
- water pump (page 6-12)
- upper engine hanger bolts
- hanger bracket and mounting rubbers

Disconnect the thermosensor connector.

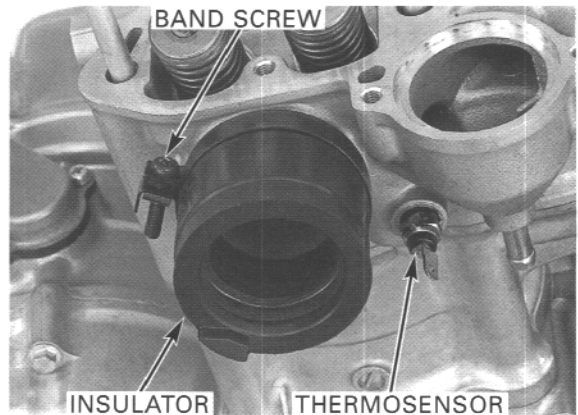


## CYLINDER HEAD/VALVE

Remove the spark plug.

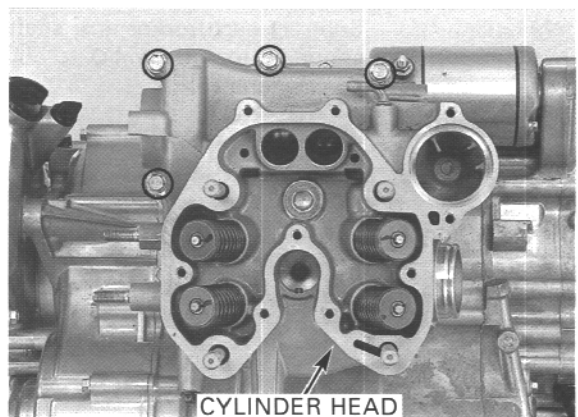
Loosen the band screw and remove the carburetor insulator if necessary.

Remove the thermosensor if necessary.

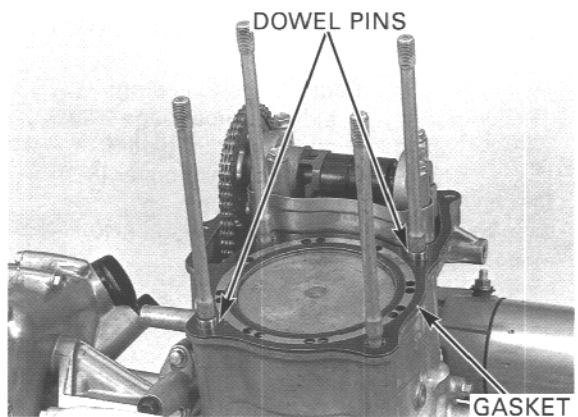


*Do not strike the cylinder head too hard.*

Remove the four bolts and the cylinder head.



Remove the gasket and dowel pins.



## CYLINDER HEAD DISASSEMBLY

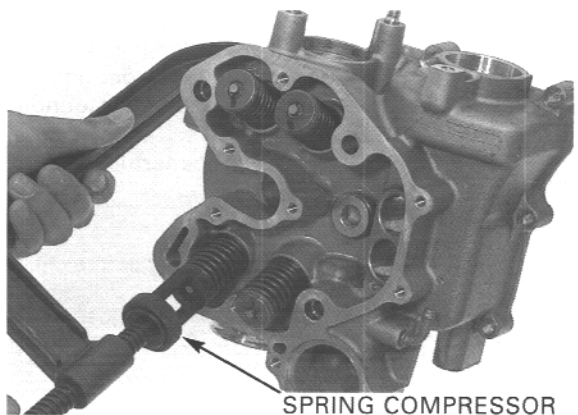
*To prevent loss of tension, do not compress the valve springs more than necessary to remove the cotters.*

Remove the valve spring cotters using the valve spring compressor.

**TOOL:**

**Valve spring compressor**

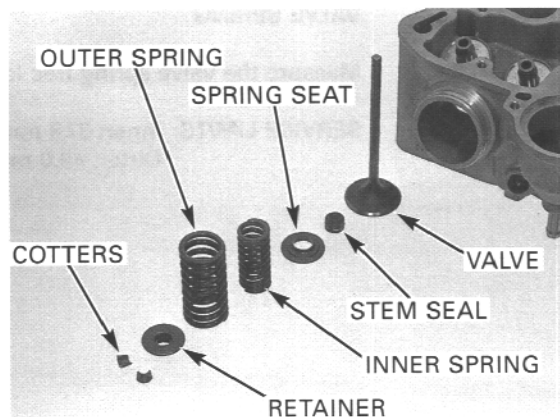
**07757-0010000**





Mark all parts so they can be placed back in their original locations.

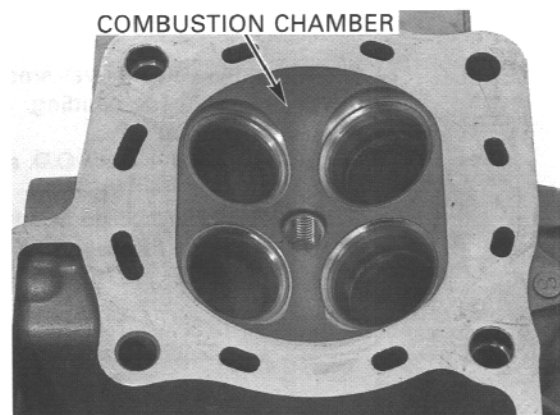
- Remove the following:
- spring retainer
  - inner and outer valve springs
  - valve
  - stem seal
  - valve spring seat



**INSPECTION**

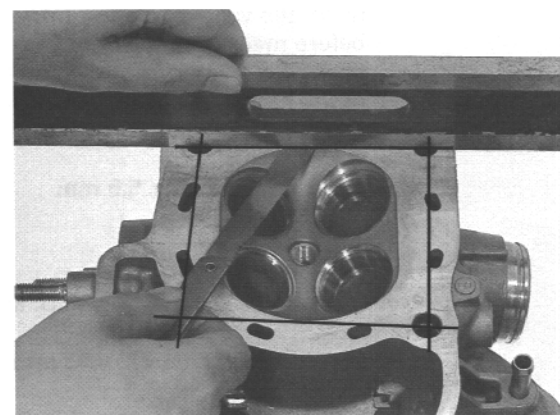
**CYLINDER HEAD**

Remove the carbon deposits from the combustion chamber, being careful not to damage the gasket surface. Check the spark plug hole and valve areas for cracks.



Check the cylinder head for warpage with a straight edge and feeler gauge.

**SERVICE LIMIT: 0.10 mm (0.004 in)**



**CAM FOLLOWER**

Check the cam follower and follower bore in the cylinder head for scoring, scratches or damage. Measure each follower O.D.

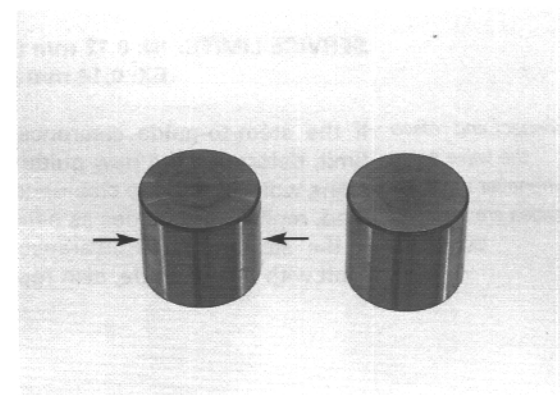
**SERVICE LIMIT: 22.46 mm (0.884 in)**

Measure each follower bore I.D.

**SERVICE LIMIT: 22.54 mm (0.887 in)**

Subtract each follower O.D. from the corresponding bore I.D. to obtain the rocker arm-to-shaft clearance.

**SERVICE LIMIT: 0.07 mm (0.003 in)**

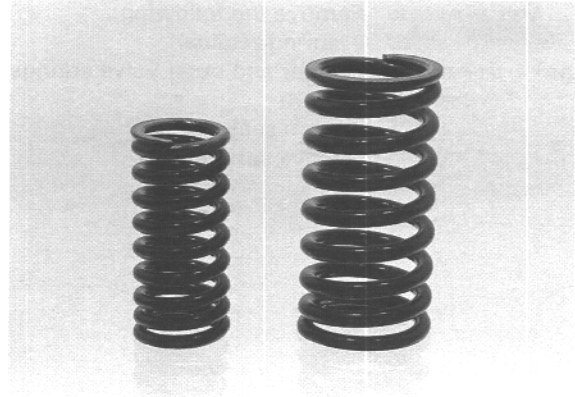


## CYLINDER HEAD/VALVE

### VALVE SPRING

Measure the valve spring free length.

**SERVICE LIMITS:** Inner: 37.8 mm (1.49 in)  
Outer: 49.0 mm (1.93 in)

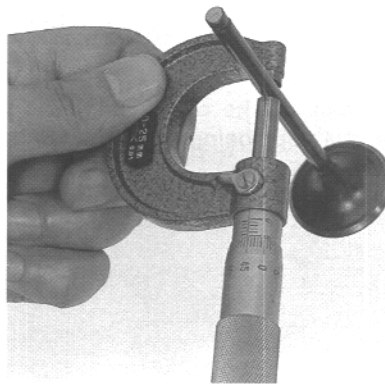


### VALVE/VALVE GUIDE

Check that the valve moves smoothly in the guide.  
Check the valve for bending, burning or abnormal wear.

Measure each valve stem O.D. and record it.

**SERVICE LIMITS:** IN: 5.45 mm (0.215 in)  
EX :5.43 mm (0.214 in)



Ream the valve guide to remove any carbon build-up before measuring the guide.  
Insert the reamer from the combustion chamber side of the head and always rotate the reamer clockwise.

#### TOOL:

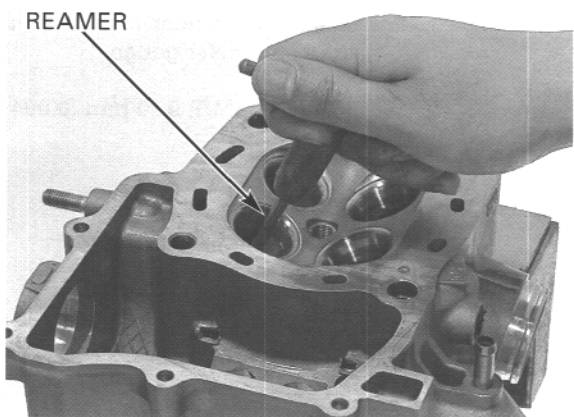
Valve guide reamer, 5.5 mm      07984-2000001 or  
07984-200000D  
(U.S.A. only)

Measure each valve guide I.D. and record it.

**SERVICE LIMIT:** IN/EX: 5.53 mm (0.218 in)

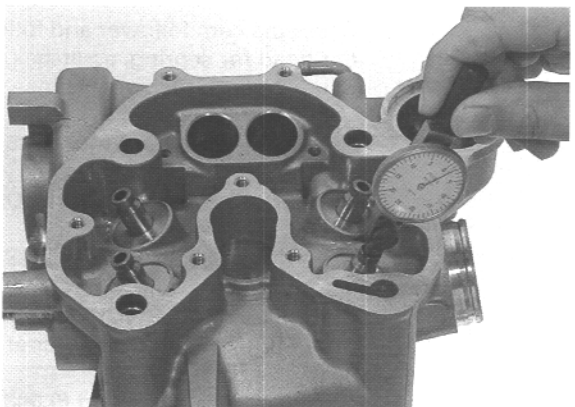
Subtract each valve stem O.D. from the corresponding guide I.D. to obtain the stem-to-guide clearance.

**SERVICE LIMITS:** IN: 0.12 mm (0.005 in)  
EX: 0.14 mm (0.006 in)



*Inspect and reface the valve seats whenever the valve guides are replaced (page 7-9).*

If the stem-to-guide clearance exceeds the service limit, determine if a new guide with standard dimensions would bring the clearance within tolerance. If so, replace any guides as necessary and ream to fit. If the stem-to-guide clearance exceeds the service limit with a new guide, also replace the valve.



## VALVE GUIDE REPLACEMENT

*Be sure to wear heavy gloves to avoid burns when handling the heated cylinder head. Using a torch to heat the cylinder head may cause warpage.*

Chill new valve guides in the freezer section of a refrigerator for about an hour.

Heat the cylinder head to 130—140°C (275—290°F) with a hot plate or oven. Do not heat the cylinder head beyond 150°C (300°F). Use temperature indicator sticks, available from welding supply stores, to be sure the cylinder head is heated to the proper temperature.

Support the cylinder head and drive the valve guides out of the cylinder head from the combustion chamber side.

**TOOL:**

**Valve guide driver, 5.5 mm      07742-0010100**

While the cylinder head is still heated, drive new valve guides in the cylinder head from the rocker arm side using the same tool until the exposed height is specified value.

**VALVE GUIDE PROJECTION:**

**IN: 15.8—16.2 mm (0.62—0.64 in)**

**EX: 18.8—19.2 mm (0.74—0.76 in)**

Let the cylinder head cool to room temperature.

Ream the new valve guides.

*Take care not to tilt or lean the reamer in the guide while reaming.*

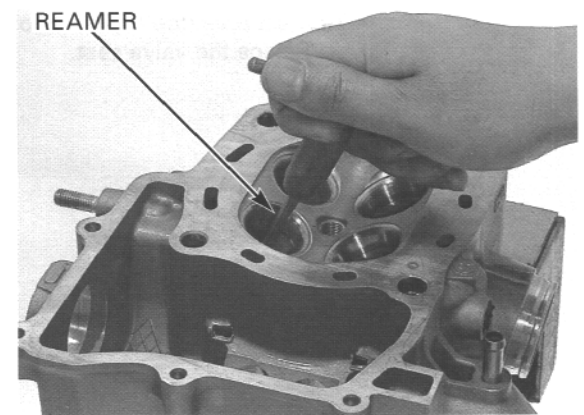
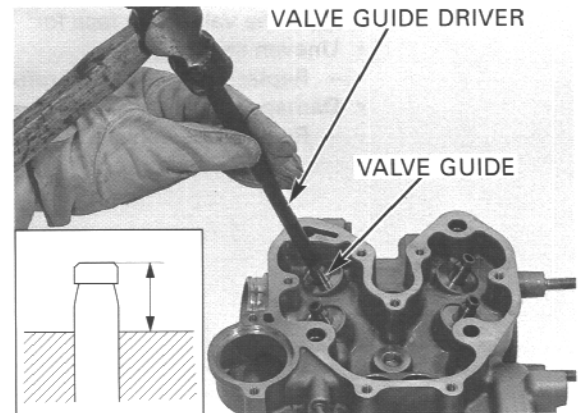
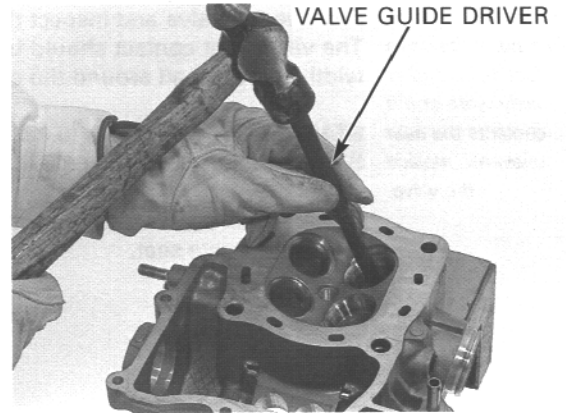
Insert the reamer from the combustion chamber side of the head and always rotate the reamer clockwise.

**TOOL:**

**Valve guide reamer, 5.5 mm      07984-2000001 or 07984-200000D (U.S.A. only)**

Use cutting oil on the reamer during this operation.

Clean the cylinder head thoroughly to remove any metal particles after reaming and reface the valve seat (see below).



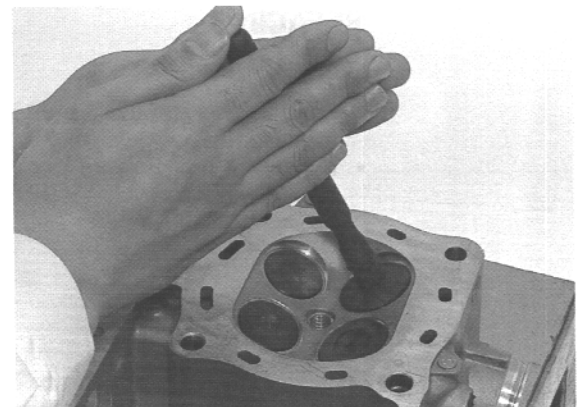
## VALVE SEAT INSPECTION/REFACING

### INSPECTION

Clean all intake and exhaust valves thoroughly to remove carbon deposits.

Apply a light coating of Prussian Blue to each valve seat.

Tap the valve against the valve seat several times without rotating the valve, to check for proper valve seat contact.



## CYLINDER HEAD/VALVE

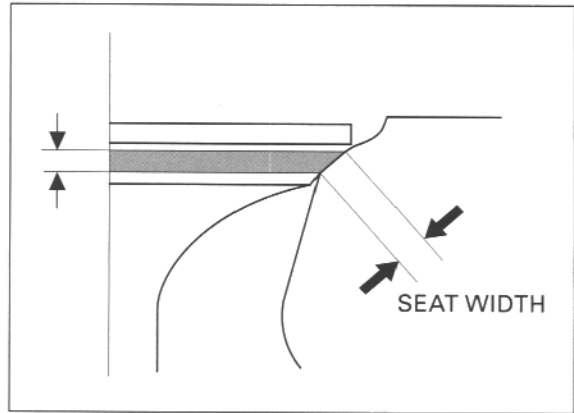
The valve cannot be ground. If the valve face is burned or badly worn or if it contacts the seat unevenly, replace the valve.

Remove the valve and inspect the valve seat face. The valve seat contact should be within the specified width and even all around the circumference.

**STANDARD: 1.0—1.1 mm (0.039—0.043 in)**

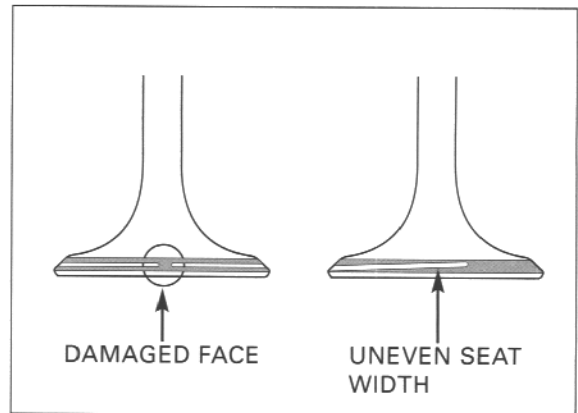
**SERVICE LIMIT: 1.4 mm (0.06 in)**

If the valve seat width is not within specification, reface the valve seat.

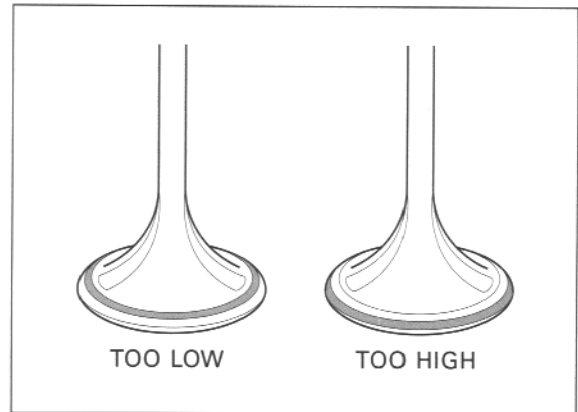


Inspect the valve seat face for:

- Uneven seat width:
  - Replace the valve and reface the valve seat.
- Damaged face:
  - Replace the valve and reface the valve seat.



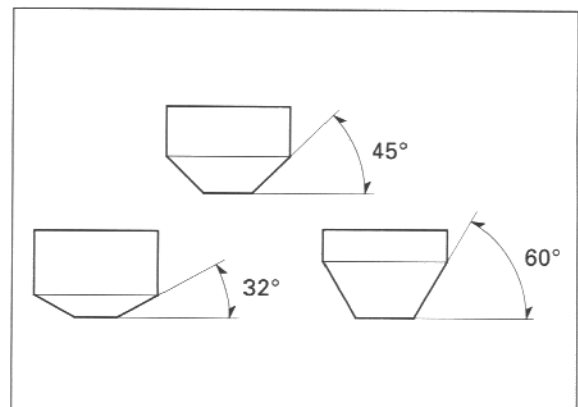
- Contact area (too high or too low)
  - Reface the valve seat.



## REFACING

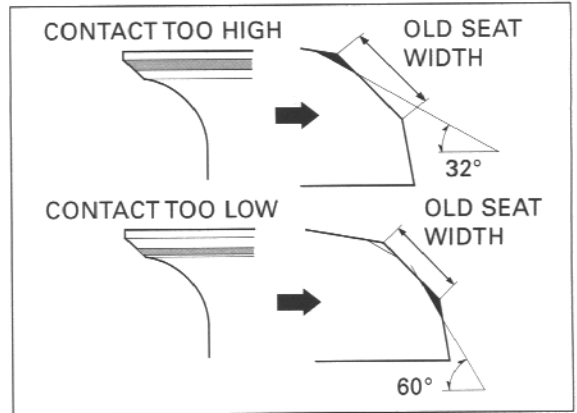
### NOTE

- Follow the refacer manufacturer's operating instructions.
- Be careful not to grind the seat more than necessary.



If the contact area is too high on the valve, the seat must be lowered using a 32° flat cutter.

If the contact area is too low on the valve, the seat must be raised using a 60° interior cutter.

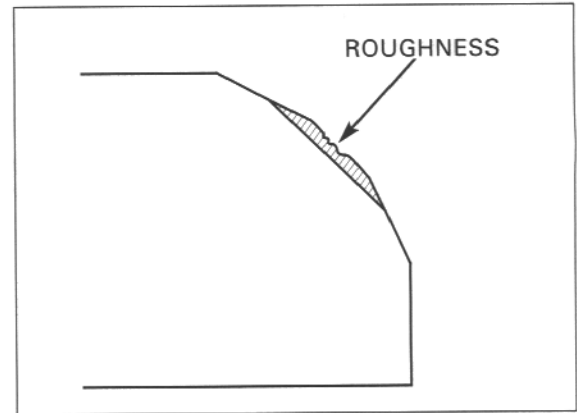


Using a 45° seat cutter, remove any roughness or irregularities from the seat.

**TOOLS:**

- Valve seat cutter, 35 mm (IN) 07780-0010400
- Valve seat cutter, 33 mm (EX) 07780-0010800
- Cutter holder, 5.5 mm 07781-0010101

or equivalent commercially available in U.S.A.

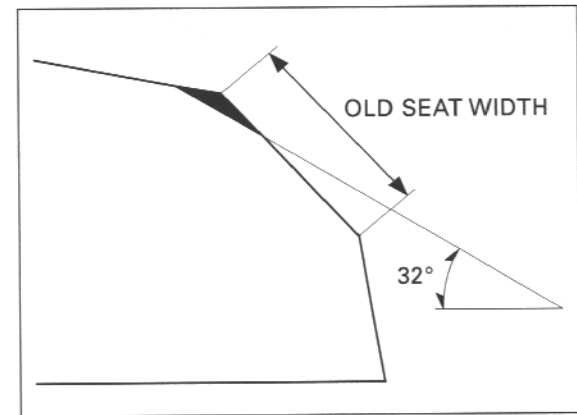


Using a 32° flat cutter, remove 1/4 of the existing valve seat material.

**TOOLS:**

- Flat cutter, 36 mm (IN) 07780-0013500
- Flat cutter, 33 mm (EX) 07780-0012900
- Cutter holder, 5.5 mm 07781-0010101

or equivalent commercially available in U.S.A.

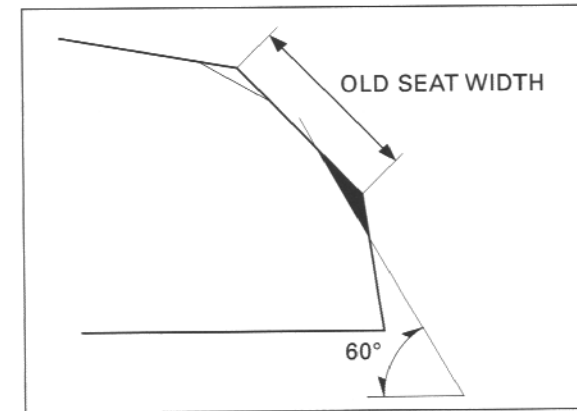


Using a 60° interior cutter, remove 1/4 of the existing valve seat material.

**TOOLS:**

- Interior cutter, 34 mm (IN) 07780-0014700
- Interior cutter, 30 mm (EX) 07780-0014000
- Cutter holder, 5.5 mm 07781-0010101

or equivalent commercially available in U.S.A.

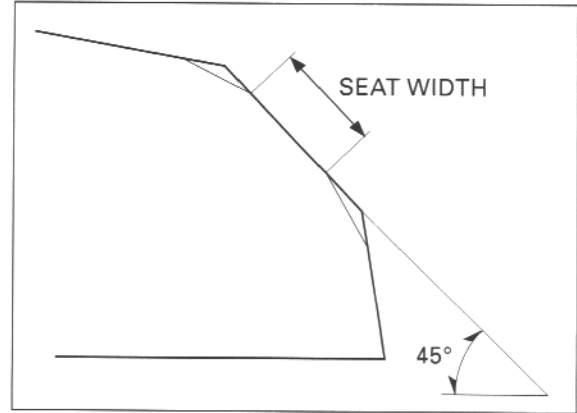


## CYLINDER HEAD/VALVE

Using a 45° seat cutter, cut the seat to the proper width.

**VALVE SEAT WIDTH: 1.0—1.1 mm (0.039—0.043 in)**

Make sure that all pitting and irregularities are removed.

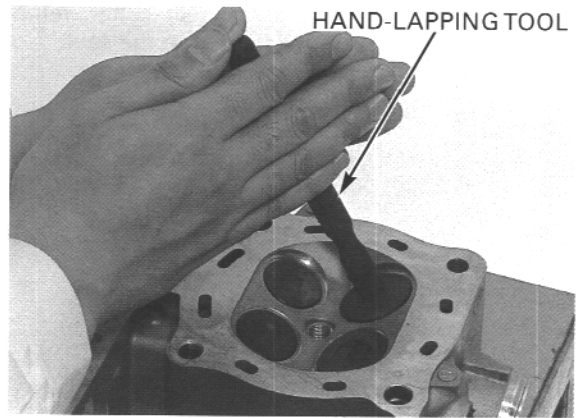


*Excessive lapping pressure may deform or damage the seat.*

*Do not allow lapping compound to enter the guides.*

After cutting the seat, apply lapping compound to the valve face, and lap the valve using light pressure. Change the angle of lapping tool frequently to prevent uneven seat wear.

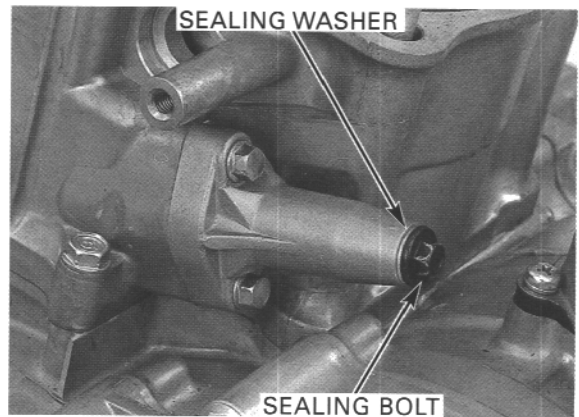
After lapping, wash any residual compound off the cylinder head and valve and recheck the seat contact.



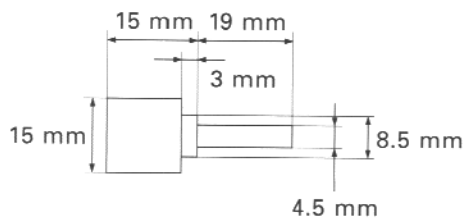
## CAMSHAFT REMOVAL

Remove the cylinder head (page 8-5).

Remove the cam chain tensioner lifter sealing bolt and sealing washer.



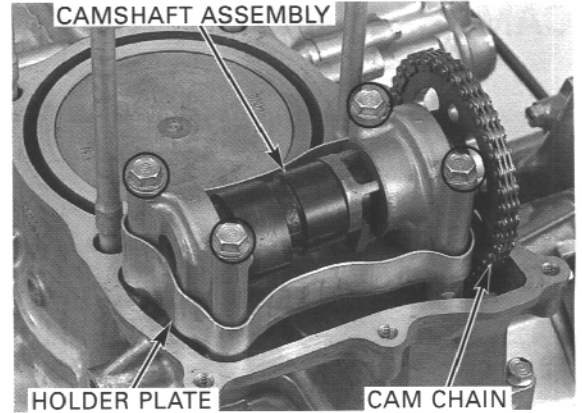
Turn the cam chain tensioner lifter shaft clockwise fully and secure it with a stopper tool. This tool can easily be made from a thin (1 mm of thickness) piece of steel as shown below.



Material thickness: 1 mm

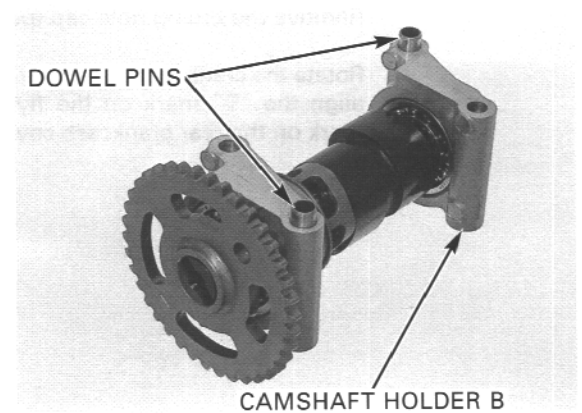


Remove the four camshaft holder bolts.  
 Raise the camshaft holder plate so that the dowel pins fitted in the camshaft holders are removed from the cylinder.  
 Remove the cam chain from the cam sprocket, and suspend the cam chain with a piece of wire to prevent it from falling into the crankcase  
 Remove the camshaft assembly and holder plate.



*Do not forcibly remove the dowel pins from the camshaft holders.*

Remove the dowel pins from the camshaft holders.  
 Remove camshaft holder B from the camshaft assembly.

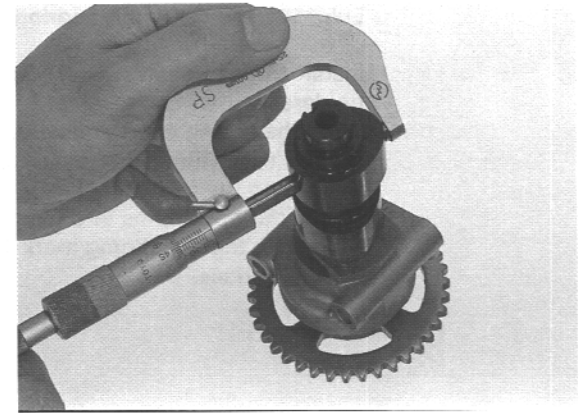


## INSPECTION

Check the cam surfaces for scoring, scratches or evidence of insufficient lubrication.  
 Check the sprocket teeth for wear or damage.

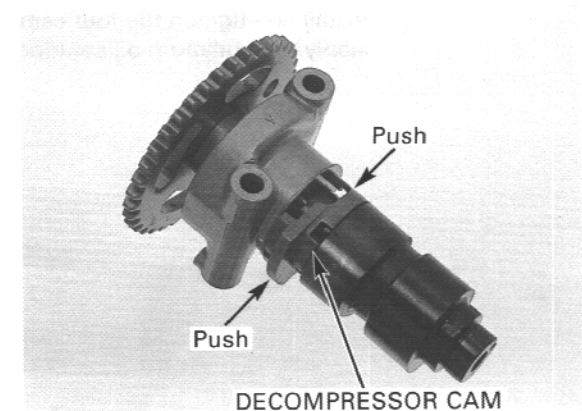
Measure each cam lobe height.

**SERVICE LIMITS: IN: 33.790 mm (1.3303 in)**  
**EX: 33.946 mm (1.3365 in)**



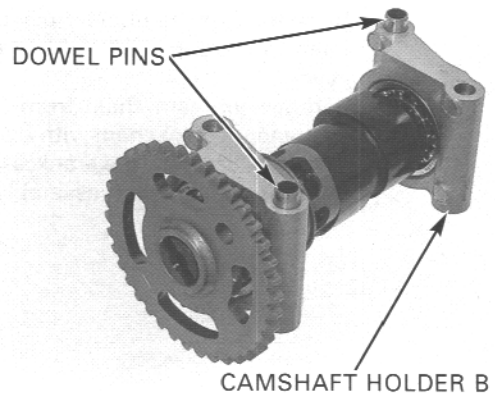
Turn the camshaft holder to check the bearing.  
 The bearing should turn smoothly and quietly.  
 Replace the camshaft assembly if the bearing does not turn smoothly and quietly.

Check the decompressor cam operation.  
 Press on the decompressor cam as shown.  
 As you press on one side, the decompressor cam should lock above the base of the exhaust cam lobe.  
 As you press on other side, the decompressor cam lobe should extend below the base of the exhaust cam lobe.



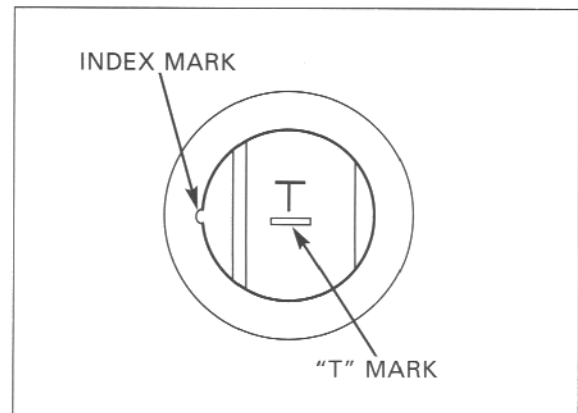
## CAMSHAFT INSTALLATION

Install camshaft holder B onto the camshaft assembly. Install the dowel pins if they were removed.



Remove the timing hole cap (page 3-8).

Rotate the crankshaft using the recoil starter knob and align the "T" mark on the flywheel with the index mark on the rear crankcase cover.

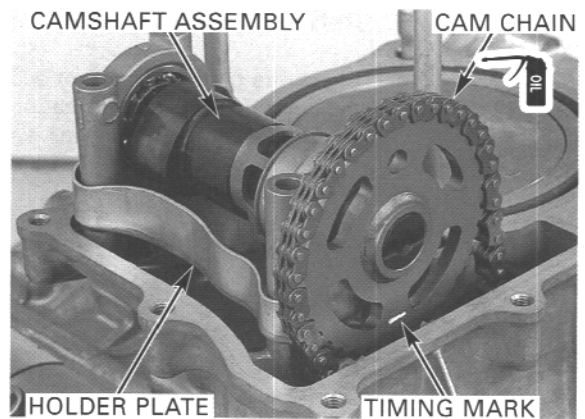


Lubricate the camshaft bearings and cam chain with oil.

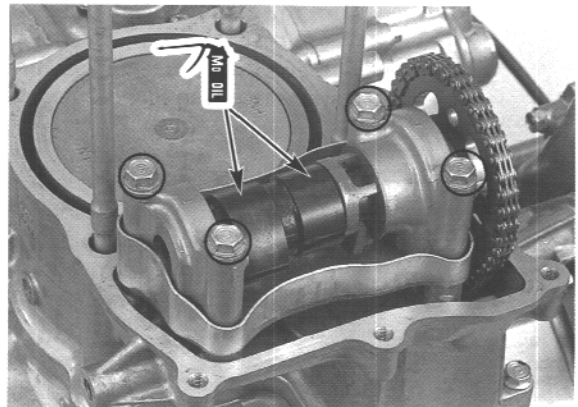
Install the camshaft holder plate onto the camshaft holders.

Align the timing mark (index line) on the cam sprocket with the cylinder top surface, and install the cam chain onto the cam sprocket.

Locate the dowel pins into the holes in the cylinder. Make sure that the timing mark lines up with the cylinder top surface.



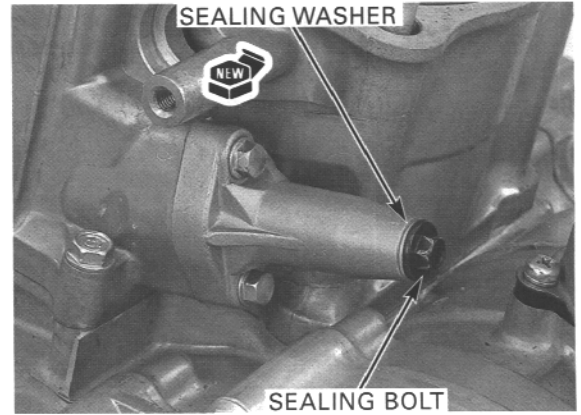
Install and tighten the four camshaft holder bolts. Apply molybdenum oil solution to the cam lobes.



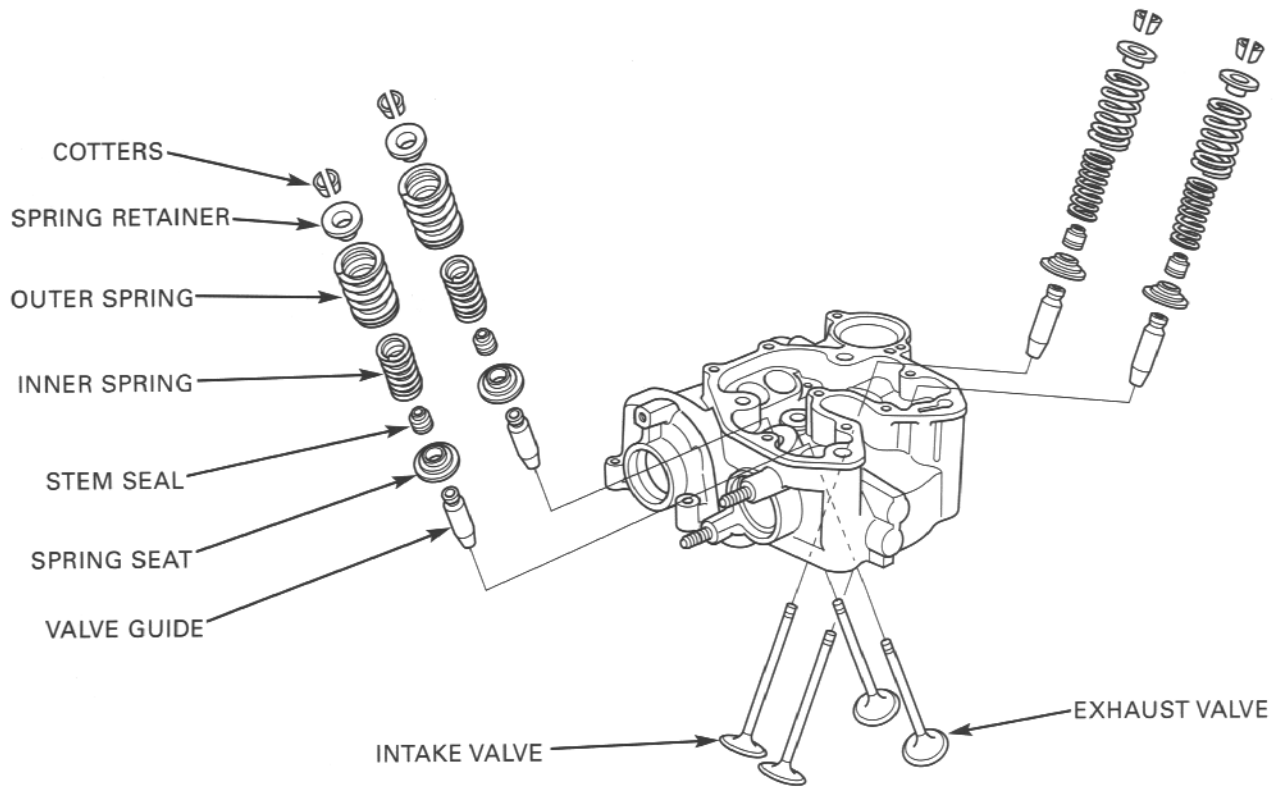


Remove the stopper tool from the cam chain tensioner lifter and install the sealing bolt with a new sealing washer.

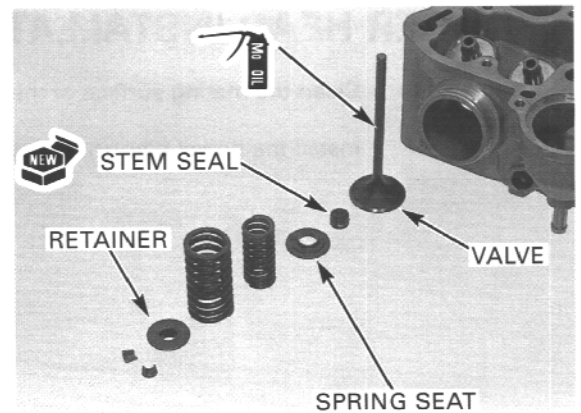
Install the cylinder head (page 8-16).



## CYLINDER HEAD ASSEMBLY



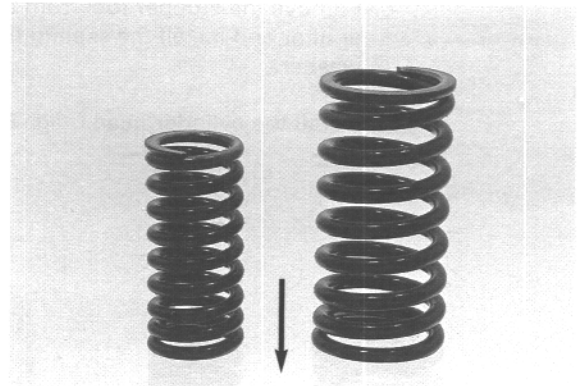
Blow through the oil passage (stud bolt hole) in the cylinder head with compressed air.  
 Install the valve spring seats.  
 Install new stem seals.  
 Lubricate the valve stem sliding surface with molybdenum oil solution.  
 Insert the valve into the guide while turning it slowly to avoid damage to the stem seal.



## CYLINDER HEAD/VALVE

Install the inner and outer valve springs with the tightly wound coils facing the combustion chamber.

Install the spring retainer.



COMBUSTION CHAMBER SIDE

*Grease the cotters to ease installation.*

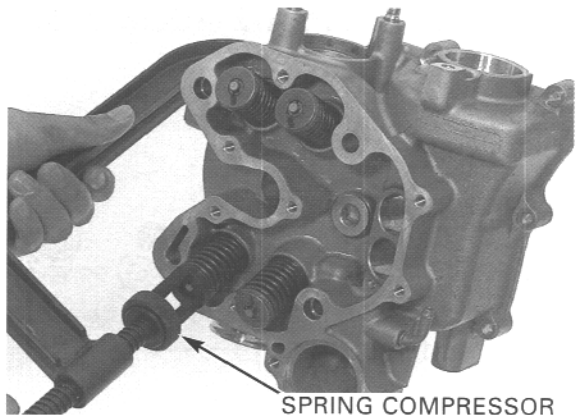
*To prevent loss of tension, do not compress the valve springs more than necessary to install the cotters.*

Install the valve spring cotters using the valve spring compressor.

**TOOL:**

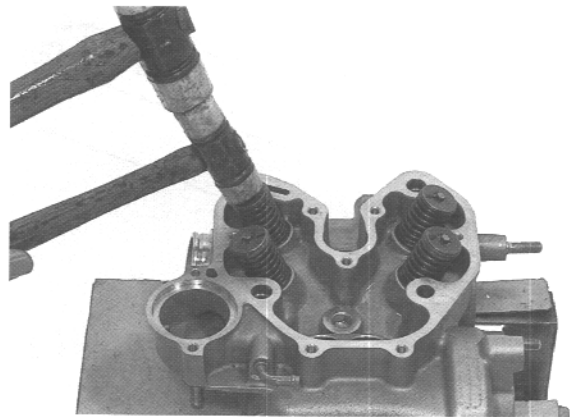
**Valve spring compressor**

**07757-0010000**



SPRING COMPRESSOR

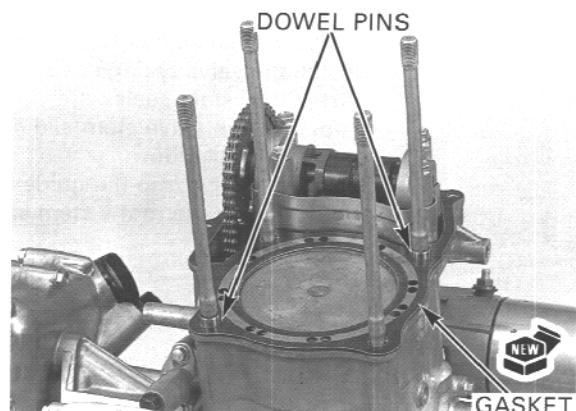
Support the cylinder head so that the valve heads will not contact anything that cause damage. Tap the valve stems gently with two plastic hammers as shown to seat the cotters firmly.



## CYLINDER HEAD INSTALLATION

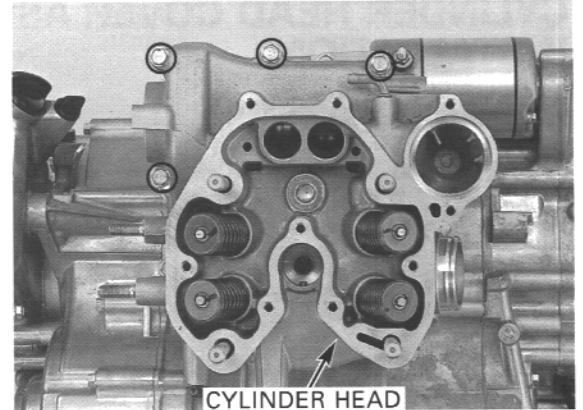
Clean the mating surface of the cylinder and head.

Install the dowel pins and a new gasket.



*Tighten the cylinder head bolts after installing the cylinder head cover.*

Install the cylinder head.  
Install and temporarily tighten the four cylinder head bolts.



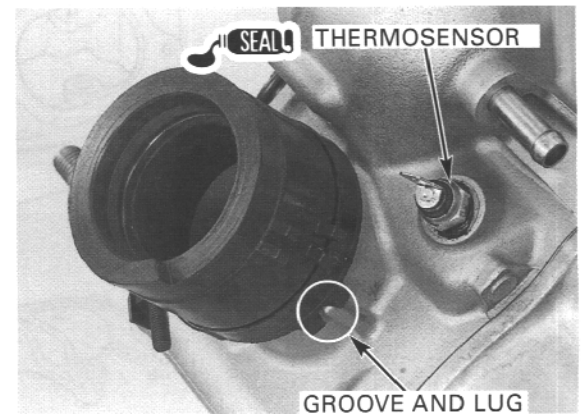
If the thermosensor was removed, apply sealant to the thermosensor threads. Do not apply sealant to the sensor head.  
Install and tighten the thermosensor.

**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

If the carburetor insulator was removed, install it, aligning its groove with the lug on the cylinder head.

Install and tighten the spark plug.

**TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)**



Connect the thermosensor connector.

Install the mounting rubbers on the upper engine hanger bushing with the large I.D. side facing in.  
Install the upper engine hanger bracket and bolts.  
Tighten the engine side hanger bolts.

**TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)**

Tighten the upper engine hanger bolt and lower engine hanger nuts.

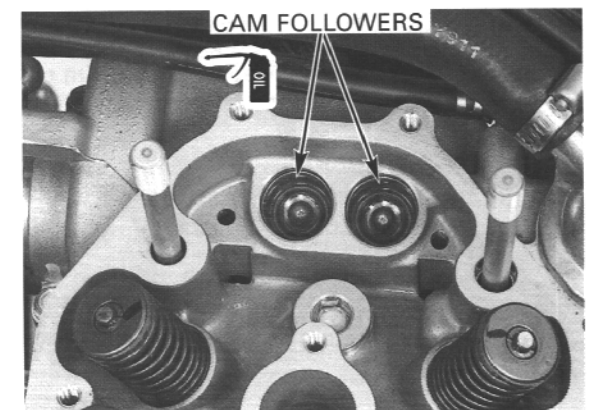
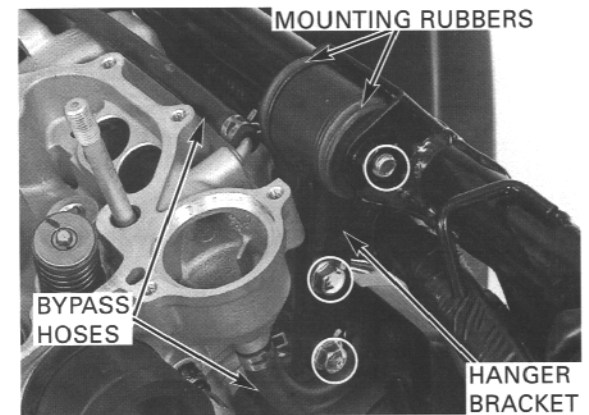
**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

Connect the bypass hoses to the cylinder head.

Coat the cam followers with oil and install them into the cylinder head.

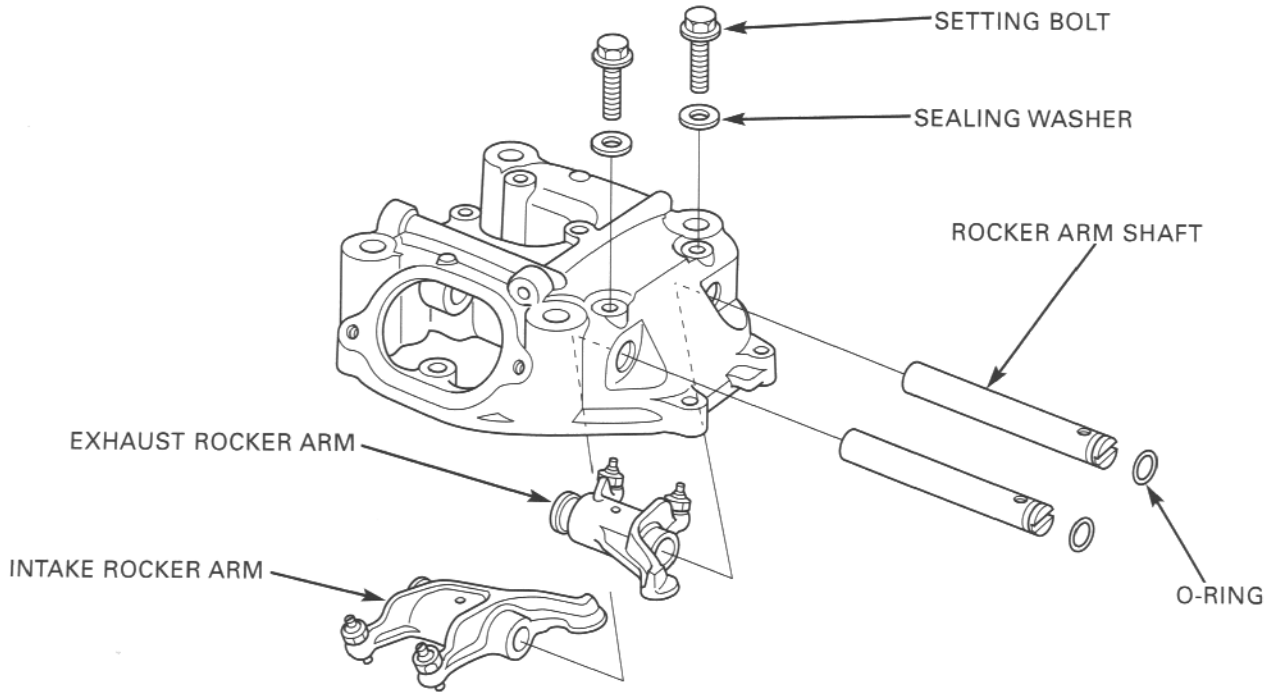
Install the following:

- water pump (page 6-13)
- cylinder head cover (8-18)
- thermostat (page 6-10)
- carburetor (page 5-14)
- exhaust pipe (page 2-10)

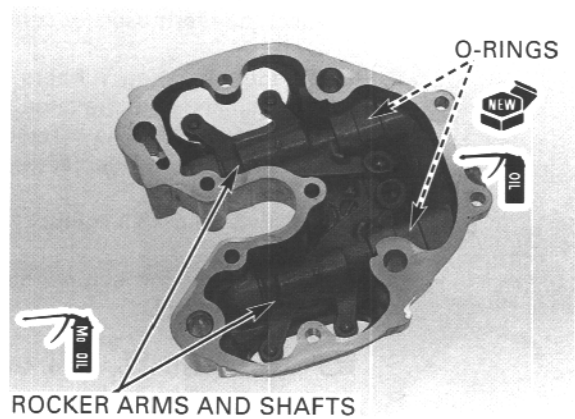


# CYLINDER HEAD COVER ASSEMBLY/ INSTALLATION

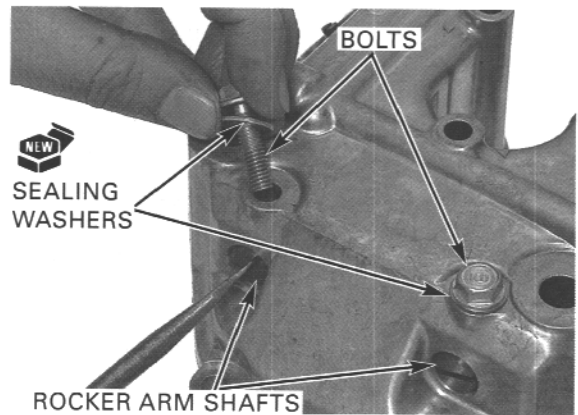
## ASSEMBLY



Coat new O-rings with oil and install them onto the rocker arm shaft grooves.  
Apply molybdenum oil solution to the rocker arm shaft sliding surface.  
Install the rocker arms and shafts into the cylinder head cover.



Align the bolt holes in the cylinder head cover and rocker arm shaft by turning the shaft.  
Install the setting bolts with new sealing washers and tighten the bolt securely.



**INSTALLATION**

Install the dowel pins and a new gasket. Install the push rods into the cam followers rest them into the gasket grooves as shown.

*Installing head cover incorrectly will result in severe engine damage. Do not tighten the cap nuts when the rocker arms are not aligned with the push rod ends.*

Install the cylinder head cover while holding the rocker arms lightly and align the rocker arm followers with the push rod ends. Be sure to seat the rocker arm followers on the push rods properly by turning the crankshaft slowly with the recoil starter. Apply oil to the cap nut threads and seating surfaces. Install the four washers, cap nuts, three new sealing washers and seven bolts. Tighten the nuts and bolts in a crisscross pattern in 2 or 3 steps.

**TORQUE: Cap nut: 53 N·m (5.4 kgf·m, 39 lbf·ft)**

Install the spark plug cap.

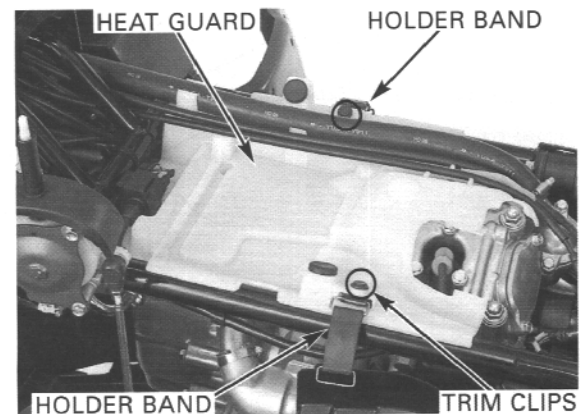
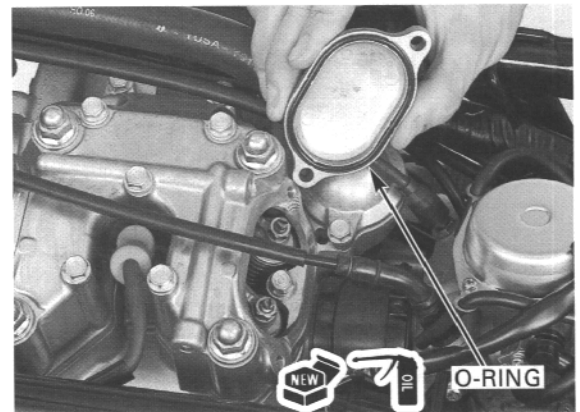
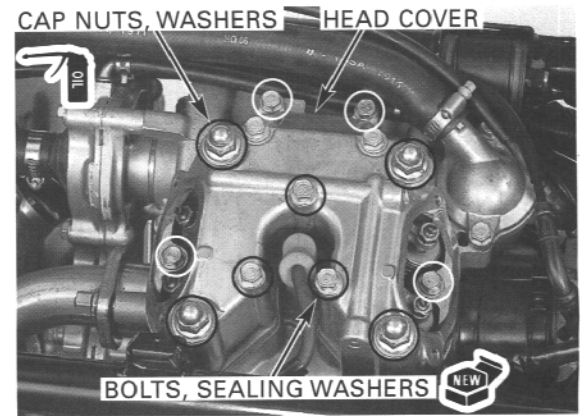
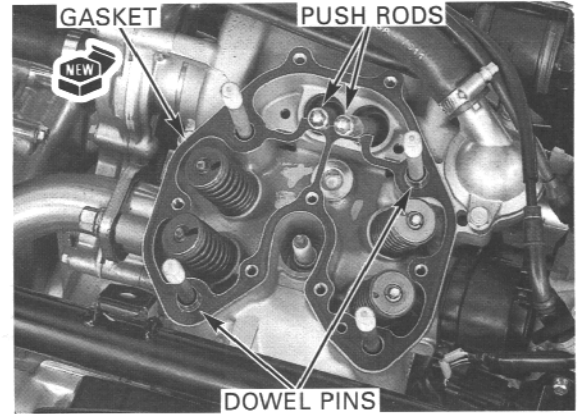
If the cylinder and/or cylinder head were serviced, tighten the four cylinder bolts and four cylinder head bolts securely

Coat new O-rings with oil and install them into the grooves in the valve adjusting hole caps. Install the valve adjusting hole caps and tighten the bolts securely.

Install the heat guard and secure it with the two trim clips. Install the upper radiator hose, choke and throttle cables onto the heat guard properly.

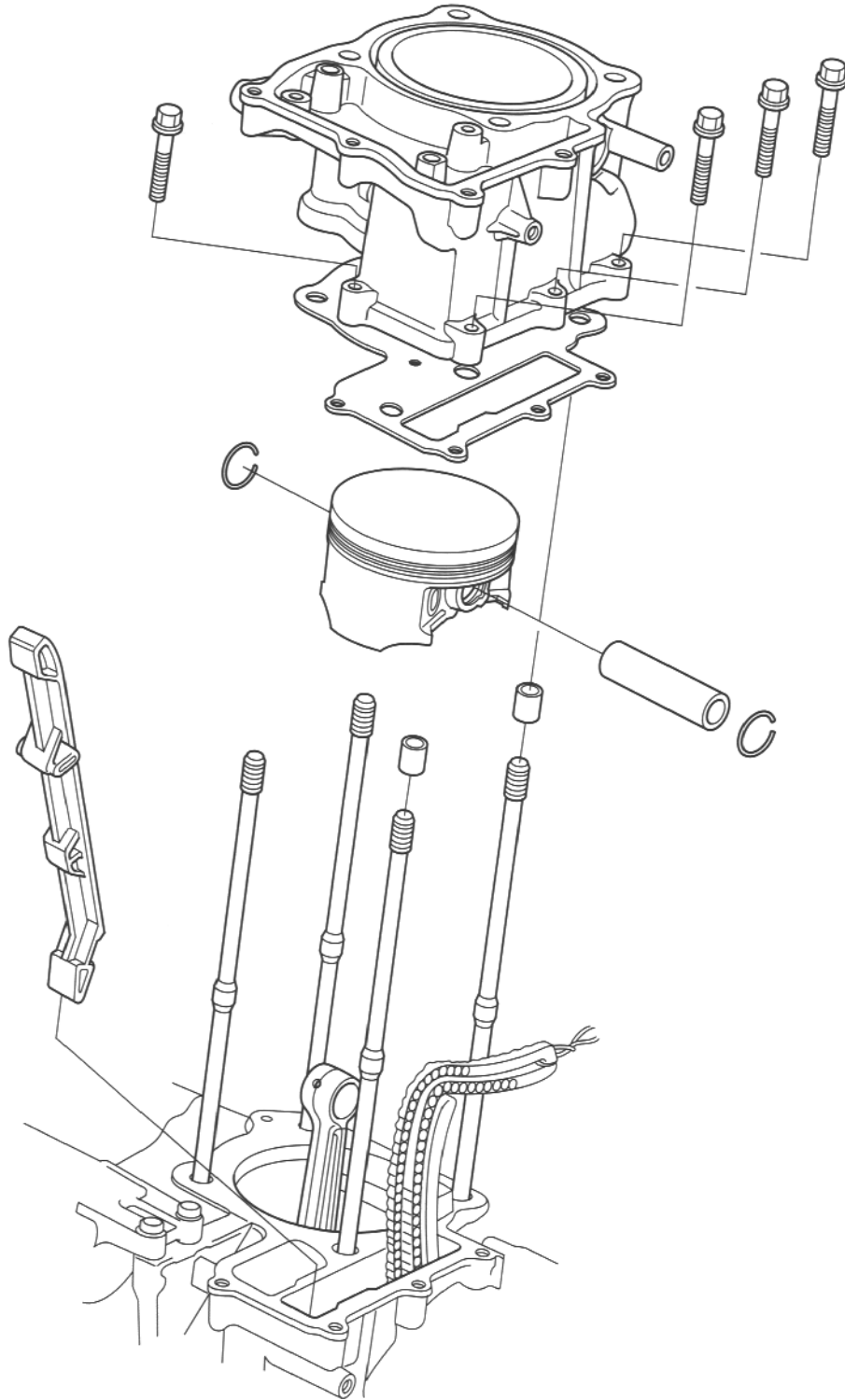
Hook the fuel tank holder bands to the frame.

Install the fuel tank (page 5-17).



CYLINDER/PISTON

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# 9. CYLINDER/PISTON

<b>SERVICE INFORMATION</b>	<b>9-1</b>	<b>CYLINDER/PISTON REMOVAL</b>	<b>9-2</b>
<b>TROUBLESHOOTING</b>	<b>9-1</b>	<b>PISTON/CYLINDER INSTALLATION</b>	<b>9-5</b>

## SERVICE INFORMATION

### GENERAL

- The cylinder and piston can be serviced with the engine installed in the frame.
- Take care not to damage the cylinder wall and piston.
- Be careful not to damage the mating surfaces when removing the cylinder.
- Rocker arm and valve lubricating oil is fed through the oil passage in the cylinder. Clean the oil passage before installing the cylinder.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT	
Cylinder	I.D.	92.000—92.010 (3.6220—3.6224)	92.10 (3.626)	
	Out of round	—	0.10 (0.004)	
	Taper	—	0.10 (0.004)	
	Warpage	—	0.10 (0.004)	
Piston, piston pin, piston ring	Piston O.D. at 15 (0.6) from bottom	91.965—91.985 (3.6207—3.6214)	91.90 (3.618)	
	Piston pin hole I.D.	20.002—20.008 (0.7875—0.7877)	20.04 (0.789)	
	Piston pin O.D.	19.994—20.000 (0.7872—0.7874)	19.96 (0.786)	
	Piston-to-piston pin clearance	0.002—0.014 (0.0001—0.0006)	0.08 (0.003)	
	Piston ring end gap	Top	0.15—0.30 (0.006—0.012)	0.5 (0.02)
		Second	0.30—0.45 (0.012—0.018)	0.6 (0.02)
		Oil (side rail)	0.20—0.70 (0.008—0.028)	—
Piston ring-to-ring groove clearance	Top/Second	0.030—0.060 (0.0012—0.0024)	0.09 (0.004)	
Cylinder-to-piston clearance		0.015—0.045 (0.0006—0.0018)	0.10 (0.004)	
Connecting rod small end I.D.		20.020—20.041 (0.7882—0.7890)	20.07 (0.790)	
Connecting rod-to-piston pin clearance		0.020—0.047 (0.0008—0.0019)	0.1 (0.004)	

9

## TROUBLESHOOTING

### Compression too low, hard starting or poor performance at low speed

- Leaking cylinder head gasket
- Worn, stuck or broken piston ring
- Worn or damaged cylinder and piston

### Compression too high, overheating or knocking

- Excessive carbon built-up on piston head or combustion chamber

### Excessive smoke

- Worn cylinder, piston or piston rings
- Improper installation of piston rings
- Scored or scratched piston or cylinder wall

### Abnormal noise

- Worn piston pin or piston pin hole
- Worn connecting rod small end
- Worn cylinder, piston or piston rings

## CYLINDER/PISTON

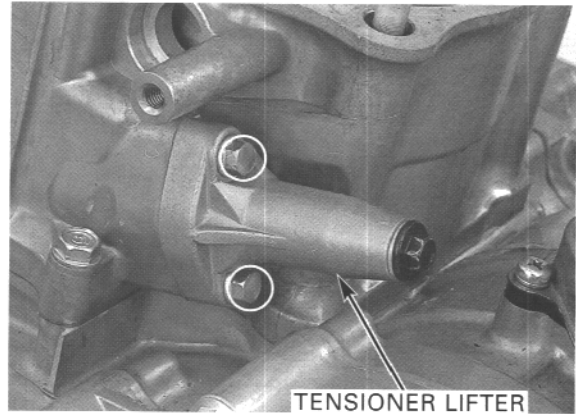
### CYLINDER/PISTON REMOVAL

#### CYLINDER REMOVAL

Remove the cylinder head (page 8-5).

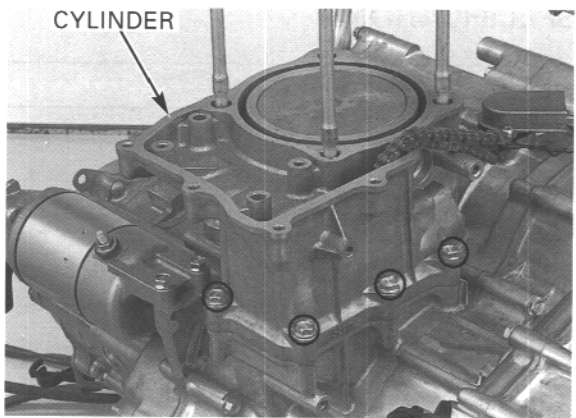
Loosen the cam chain tensioner lifter sealing bolt, and remove the two bolts and cam chain tensioner lifter from the cylinder.

Remove the camshaft (page 8-12).

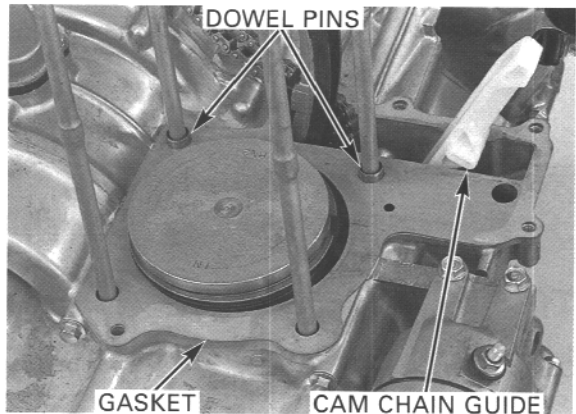


*Do not strike the cylinder too hard and do not damage the mating surface with a screwdriver.*

Remove the four bolts and cylinder.



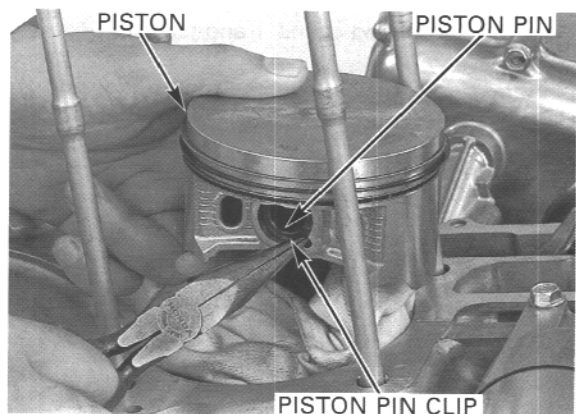
Remove the gasket and dowel pins.  
Remove the cam chain guide.



#### PISTON REMOVAL

Place a clean shop towel over the crankcase to prevent the clip from falling into the crankcase.

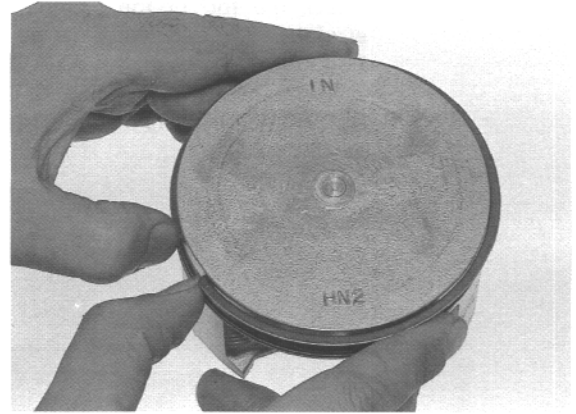
Remove the piston pin clips with the pliers. Push the piston pin out of the piston and connecting rod, and remove the piston.



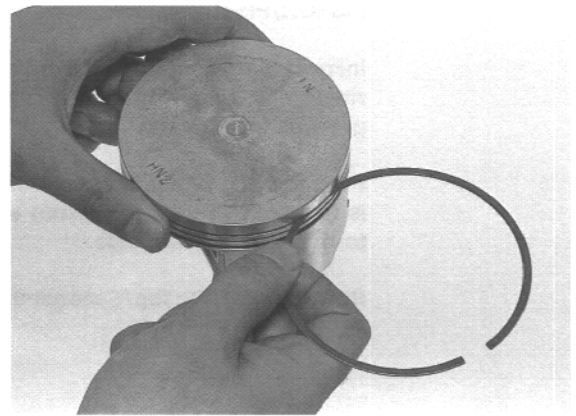


*Do not damage the piston ring by spreading the ends too far.*

Spread each piston ring and remove it by lifting up at a point opposite the gap.



Clean carbon deposits from the ring grooves with a ring that will be discarded. Never use a wire brush; it will scratch the groove.



**INSPECTION**

**CYLINDER**

Inspect the cylinder bore for scratch or wear. Measure the cylinder I.D. at three levels in an X and Y axis. Take the maximum reading to determine the cylinder wear.

**SERVICE LIMIT: 92.10 mm (3.626 in)**

Calculate the cylinder-to-piston clearance. Refer to page 9-4 for measurement of the piston O.D.

**SERVICE LIMIT: 0.10 mm (0.004 in)**

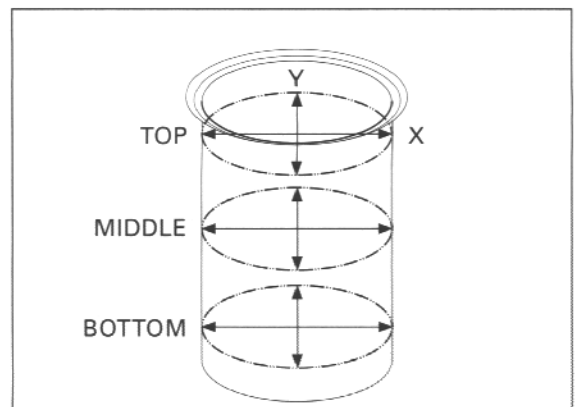
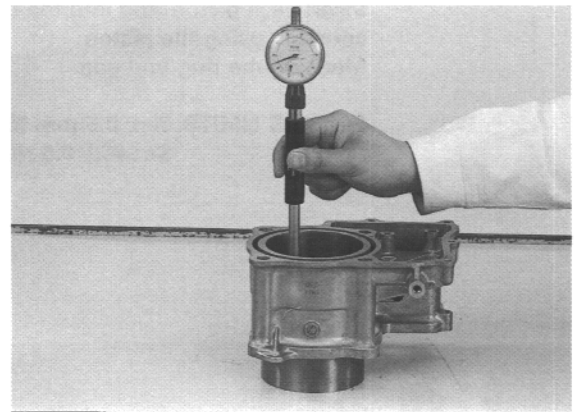
Calculate the cylinder taper and out-of-round at three levels in an X and Y axis. Take the maximum reading to determine the taper and out-of-round.

**SERVICE LIMITS: Taper: 0.10 mm (0.004 in)  
Out-of-round: 0.10 mm (0.004 in)**

The cylinder must be rebored and an oversize piston fitted if the service limits are exceeded.

The 0.25 mm (0.010 in) and 0.50 mm (0.020 in) oversize pistons are available.

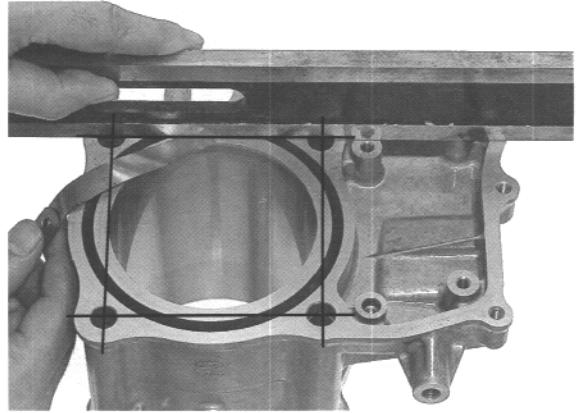
The cylinder must be rebored so that the clearance for an oversize piston is 0.015—0.045 mm (0.0006—0.0018 in).



## CYLINDER/PISTON

Check the top of the cylinder for warpage with a straight edge and feeler gauge across the studs and bolt holes as shown.

**SERVICE LIMIT: 0.10 mm (0.004 in)**

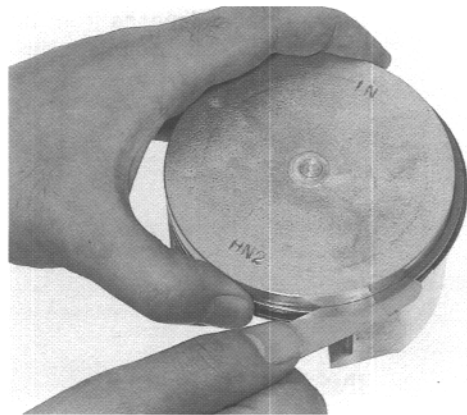


### PISTON/PISTON RING

Inspect the piston rings for movement by rotating the rings. The rings should be able to move in their grooves without catching.

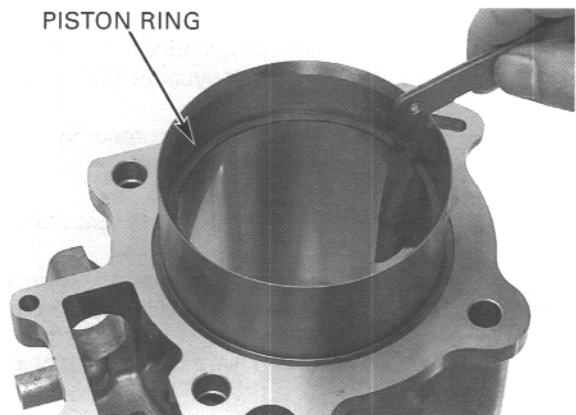
Push the ring until the outer surface of the piston ring is nearly flush with the piston and measure the ring-to-ring groove clearance.

**SERVICE LIMITS: Top/Second: 0.09 mm (0.004 in)**



Insert each piston ring into the bottom of the cylinder squarely using the piston. Measure the ring end gap.

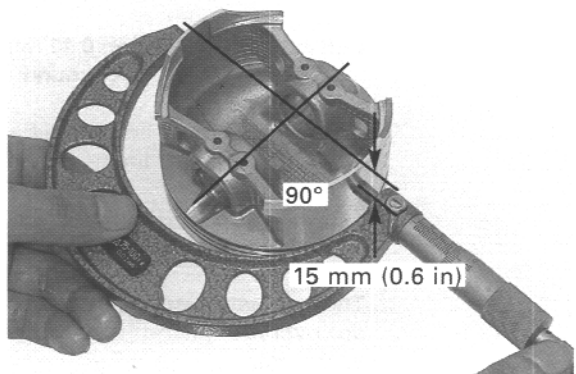
**SERVICE LIMITS: Top: 0.5 mm (0.02 in)  
Second: 0.6 mm (0.02 in)**



Measure the piston pin O.D. 90° to the piston pin hole and at point 15 mm (0.6 in) from bottom of the piston skirt.

**SERVICE LIMIT: 91.90 mm (3.618 in)**

Compare this measurement against the maximum cylinder I.D. measurement and calculate the piston-to-cylinder clearance (page 9-3).



Measure piston pin hole. Take the maximum reading to determine the I.D.

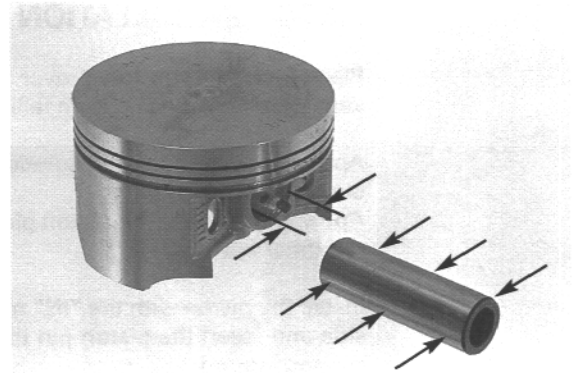
**SERVICE LIMIT: 20.04 mm (0.789 in)**

Measure the piston pin O.D. at three points.

**SERVICE LIMIT: 19.96 mm (0.786 in)**

Calculate the piston-to-piston pin clearance.

**SERVICE LIMIT: 0.08 mm (0.003 in)**



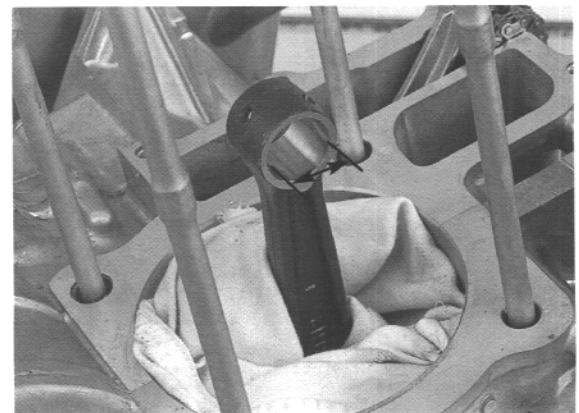
**CONNECTING ROD**

Measure the connecting rod small end I.D.

**SERVICE LIMIT: 20.07mm (0.790 in)**

Calculate the connecting rod-to-piston pin clearance.

**SERVICE LIMIT: 0.1 mm (0.004 in)**



**CYLINDER/PISTON INSTALLATION**

*Be careful not to damage the piston and rings.*

**PISTON RING INSTALLATION**

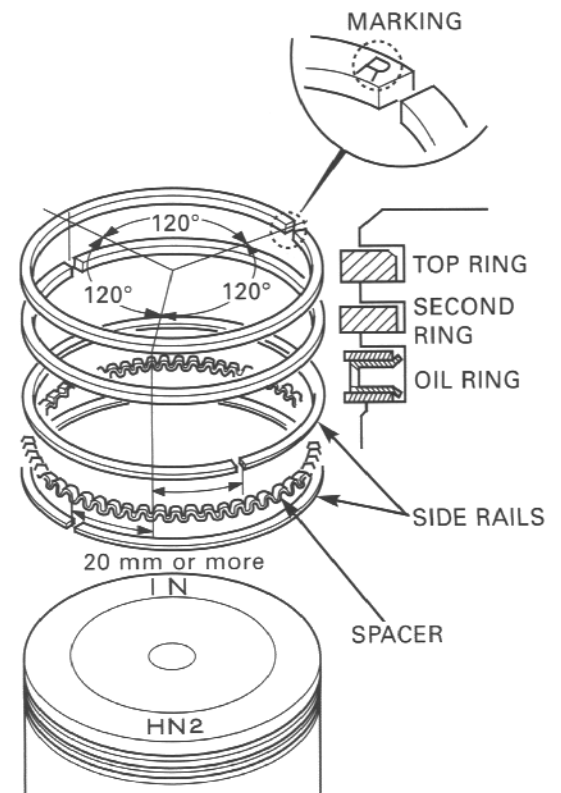
Carefully install the piston rings into the piston ring grooves with the markings facing up.

**NOTE:**

- Do not confuse the top and second rings.
- To install the oil ring, install the spacer first, then install the side rails.

Stagger the piston ring end gaps 120° degrees apart from each other.

Stagger the side rail end gaps as shown.



## CYLINDER/PISTON

### PISTON INSTALLATION

Place a clean shop towel over the crankcase to prevent the piston pin clip from falling into the crankcase.

Apply molybdenum oil solution to the piston pin outer surface.

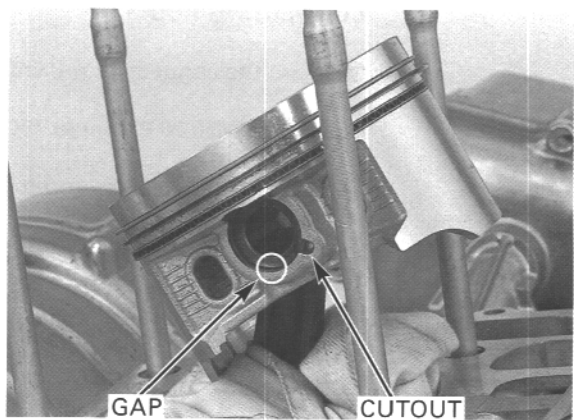
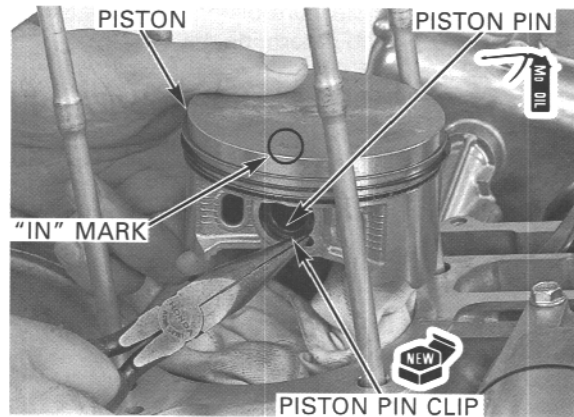
Apply engine oil to the piston pin hole and connecting rod inner surface.

Install the piston with the "IN" mark toward the intake side and insert the piston pin through the piston and connecting rod.

Install new piston pin clips into the grooves in the piston pin hole.

#### NOTE:

- Make sure that the piston pin clips are seated securely.
- Do not align the piston pin clip end gap with the piston cutout.

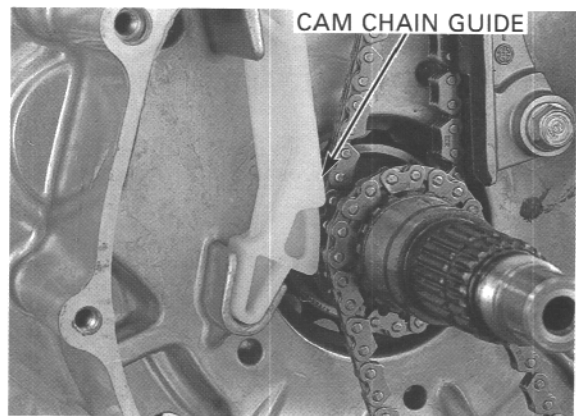


### CYLINDER INSTALLATION

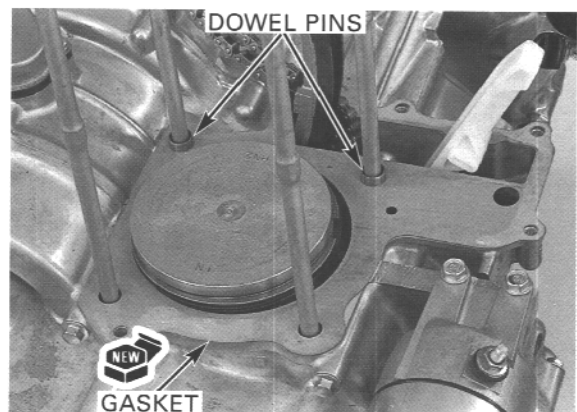
Clean the gasket surfaces of the cylinder and crankcase thoroughly, being careful not to damage them, and being careful not to allow gasket material into the crankcase.

Blow through the oil passage (stud bolt hole) in the cylinder with compressed air.

Install the cam chain guide into the crankcase so that its end rests in the groove properly as shown.



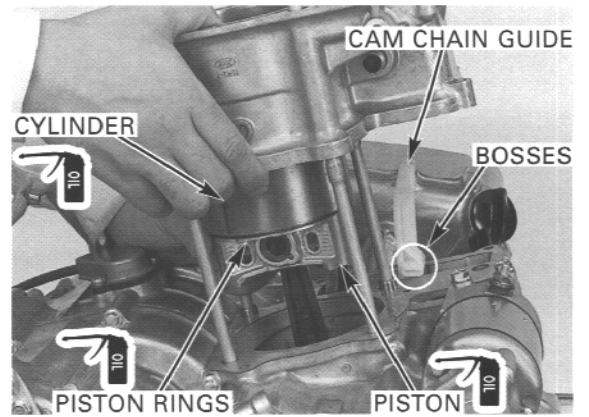
Install the dowel pins and a new gasket.



Apply engine oil to the cylinder wall, piston outer surface and piston rings.

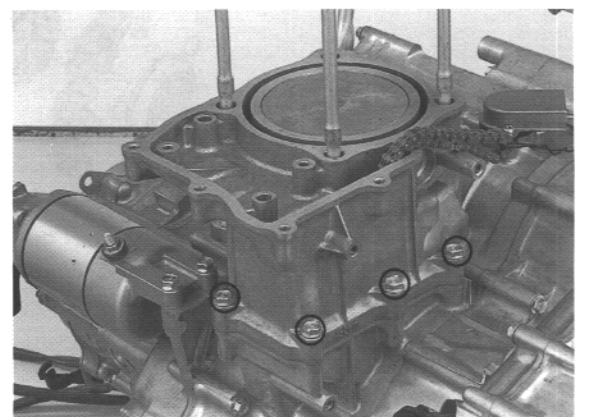
*Be careful not to damage the piston rings and cylinder wall.*

Install the cylinder over the piston while compressing the piston rings with your fingers. Align the cam chain guide bosses with the grooves in the cylinder properly to seats the cylinder onto the crankcase.



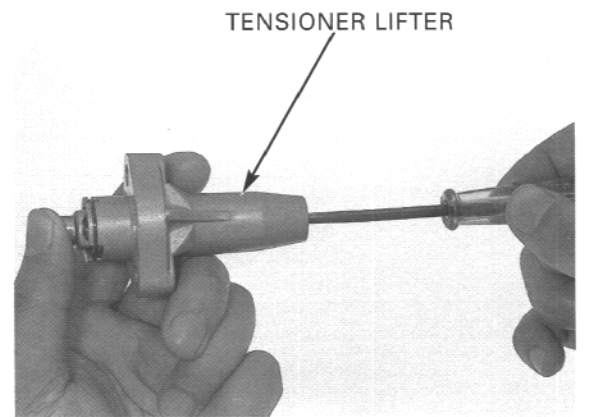
*Tighten the cylinder bolts after installing the cylinder head cover.*

Make sure that the cylinder touches the crankcase evenly. Install and temporarily tighten the four cylinder bolts.



Remove the sealing bolt and washer from the cam chain tensioner lifter.

Turn the cam chain tensioner lifter shaft clockwise fully to retract the tensioner lifter and secure it with a stopper tool (page 8-12).

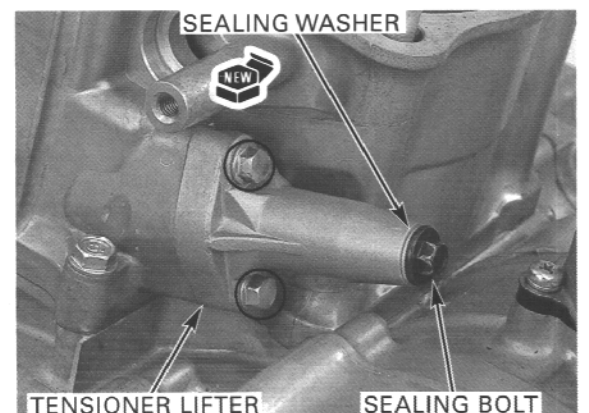


Install the camshaft (page 8-14).

Install the cam chain tensioner lifter into the cylinder and tighten the two bolts securely.

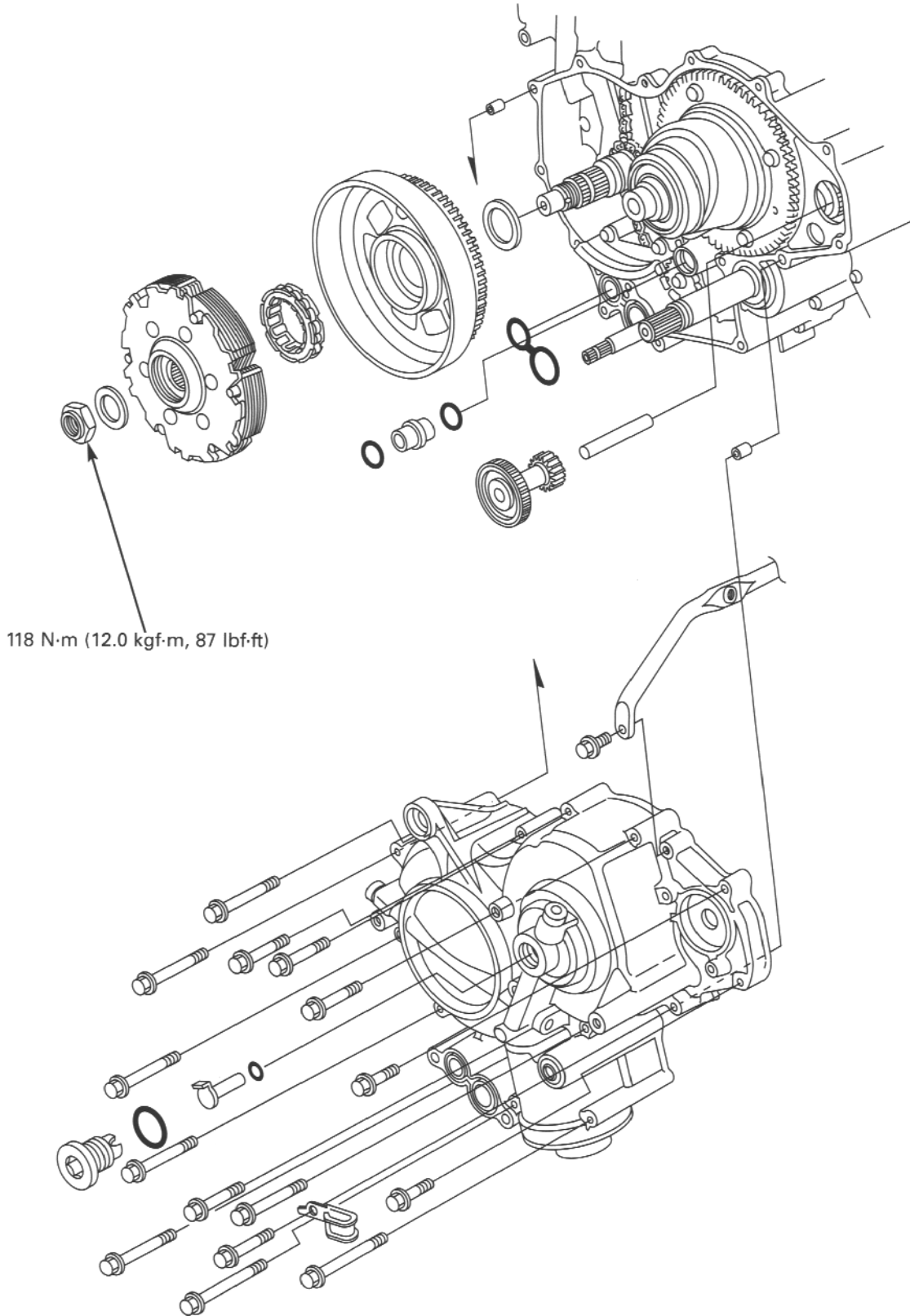
Remove the stopper tool and install the sealing bolt with a new sealing washer.

Install the cylinder head (page 8-16).



# CENTRIFUGAL CLUTCH

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# 10. CENTRIFUGAL CLUTCH

<b>SERVICE INFORMATION</b>	<b>10-1</b>	<b>CENTRIFUGAL CLUTCH ASSEMBLY</b>	<b>10-7</b>
<b>TROUBLESHOOTING</b>	<b>10-1</b>	<b>FRONT CRANKCASE COVER</b>	
<b>FRONT CRANKCASE COVER REMOVAL</b>	<b>10-2</b>	<b>INSTALLATION</b>	<b>10-10</b>
<b>CENTRIFUGAL CLUTCH DISASSEMBLY</b>	<b>10-4</b>		

## SERVICE INFORMATION

### GENERAL

- The centrifugal clutch can be serviced with the engine installed in the frame.
- The automatic transmission unit and engine lubricating oil from the oil filter is fed through the oil passages in the front crankcase cover. Clean the oil passages before installing the front crankcase cover.
- The clutch will not engage properly if the engine oil contains additives such as molybdenum disulfide. Oils with a molybdenum disulfide additive tend to reduce clutch friction.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Clutch	Drum I.D.	150.0—150.2 (5.906—5.913)	150.4 (5.92)
	Weight lining thickness	3.0 (0.12)	2.0 (0.08)
	Clutch spring height	3.72 (0.146)	3.6 (0.14)
	Clutch weight spring free length	23.2 (0.91)	24.1 (0.95)
Clutch drum boss I.D.		29.000—29.020 (1.1417—1.1425)	29.05 (1.144)
Crankshaft O.D. at clutch drum		28.959—28.980 (1.1401—1.1409)	28.93 (1.139)

10

### TORQUE VALUES

Centrifugal clutch lock nut	118 N·m (12.0 kgf·m, 87 lbf·ft)	Apply oil to the threads and seating surface/ Stake
Oil feed pipe setting cap	18 N·m (1.8 kgf·m, 13 lbf·ft)	

### TOOLS

Clutch holder set	07ZMB-HN20000	or 07ZMB-HN2000A (U.S.A. only)
–Clutch holder plate	07ZMB-HN20100	or 07ZMB-HN2010A
–Clutch holder pin	07ZMB-HN20200	or 07ZMB-HN2020A
Outside screw puller, 40 x 1.5 mm	07ZMC-HN20100	
Driver	07749-0010000	
Attachment, 42 x 47 mm	07746-0010300	
Pilot, 17 mm	07746-0040400	
Pilot, 22 mm	07746-0041000	
Hub bearing driver	07HAD-SG00100	
Bearing remover, 17 mm	07936-3710300	
Bearing remover handle	07936-3710100	
Bearing remover weight	07741-0010201	or 07936-371020A or 07936-3710200 (U.S.A. only)

## TROUBLESHOOTING

#### Clutch slips when accelerating

- Worn clutch weight linings
- Worn clutch drum
- Improper oil additive used

#### Vehicle creeps when engine is idling

- Weak clutch weight springs

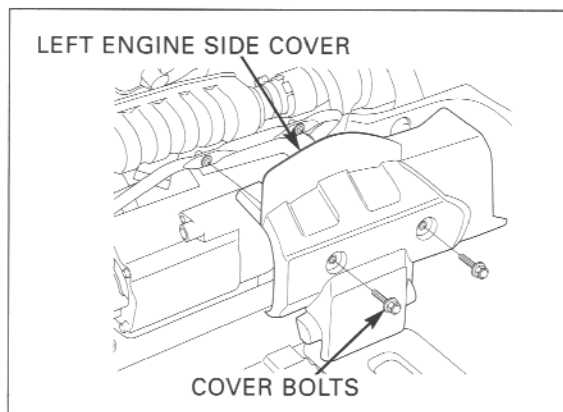
## CENTRIFUGAL CLUTCH

### FRONT CRANKCASE COVER REMOVAL

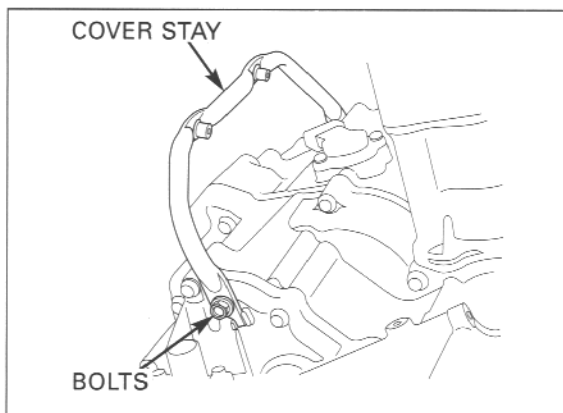
Remove the following:

- front mud guards (page 2-6)
- inner fenders (page 2-6)
- propeller shaft (page 7-2)
- gearshift linkage (page 7-3)
- oil tank (page 4-5)

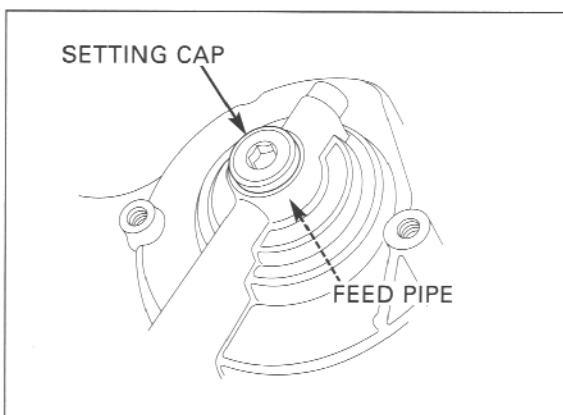
Remove the two bolts and left engine side cover.



Remove the two bolts and left engine side cover stay.

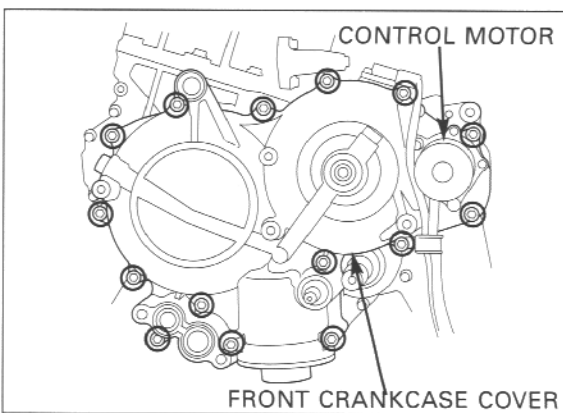


Remove the setting cap and oil feed pipe from the front crankcase cover.  
Remove the O-rings from the setting cap and feed pipe.



Remove the fifteen crankcase cover bolts.  
Remove the control wire from the clip.  
Remove the two bolts and control motor from the front crankcase cover.

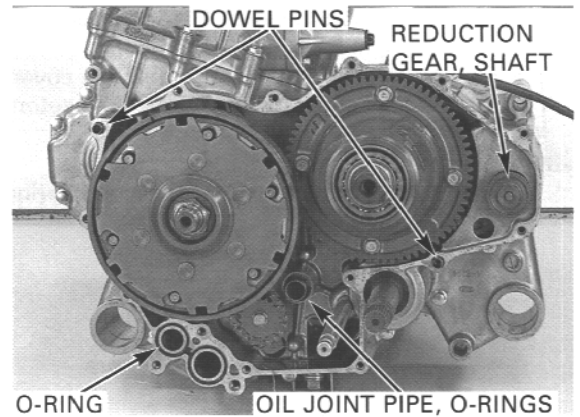
Remove the front crankcase cover.





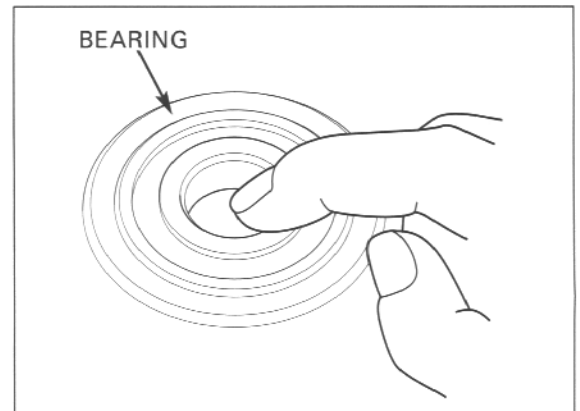
Remove the dowel pins and O-ring.  
Remove the oil joint pipe and O-rings.

Remove the control motor reduction gear and shaft if necessary.



## BEARING INSPECTION/REPLACEMENT

Turn the inner race of each bearing with your finger. The bearing should turn smoothly and quietly. Also check that the outer race of the bearing fits tightly in the front crankcase cover. Replace the bearing if the inner race does not turn smoothly, quietly, or if the outer race fits loosely in the front crankcase cover.



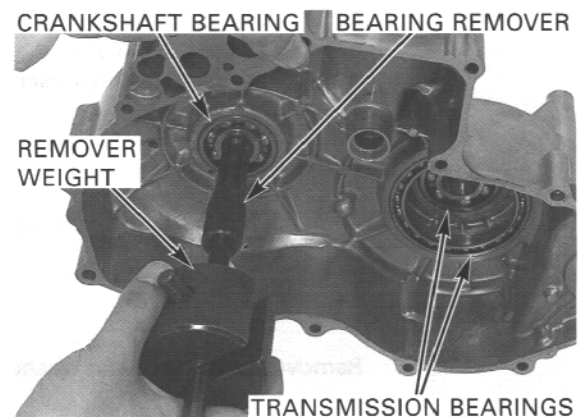
## CRANKSHAFT BEARING

Remove the crankshaft bearing using special tools.

### TOOLS:

<b>Bearing remover, 17 mm</b>	<b>07936-3710300</b>
<b>Bearing remover handle</b>	<b>07936-3710100</b>
<b>Bearing remover weight</b>	<b>07741-0010201 or</b>
	<b>07936-371020A or</b>
	<b>07936-3710200</b>
	<b>(U.S.A. only)</b>

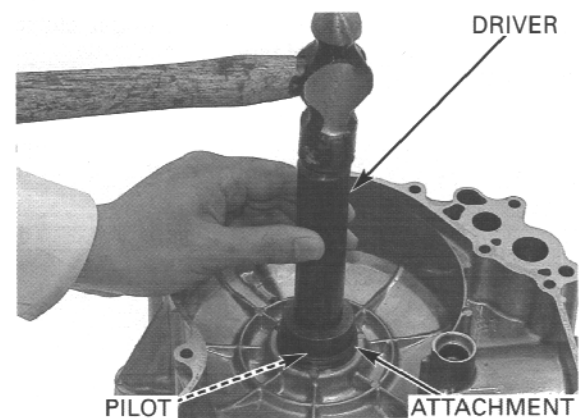
or equivalent commercially available in U.S.A.



Drive a new crankshaft bearing in with the sealed side facing down, using the special tools.

### TOOLS:

<b>Driver</b>	<b>07749-0010000</b>
<b>Attachment, 42 x 47 mm</b>	<b>07746-0010300</b>
<b>Pilot, 17 mm</b>	<b>07746-0040400</b>



## CENTRIFUGAL CLUTCH

### AUTOMATIC TRANSMISSION UNIT BEARINGS

*Be sure to wear heavy gloves to avoid burns when handling the heated cover.*

Heat the front crankcase cover with a heat gun or a hot plate and remove the automatic transmission unit bearings from the cover.

Drive new transmission bearings in using the special tools.

*Be sure to press the bearing in evenly and flush with the surface.*

#### TOOLS:

##### Inner bearing:

**Driver**

07749-0010000

**Attachment, 52 x 55 mm**

07746-0010400

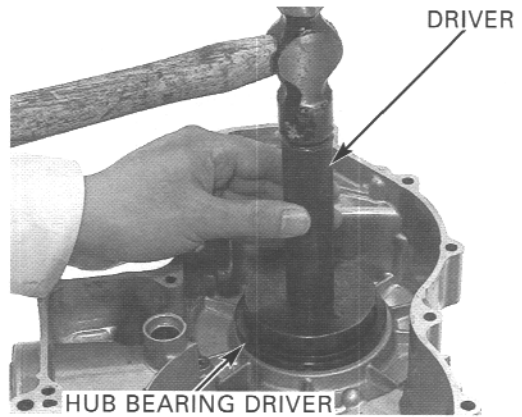
##### Outer bearing:

**Driver**

07749-0010000

**Hub bearing driver**

07HAD-SG00100

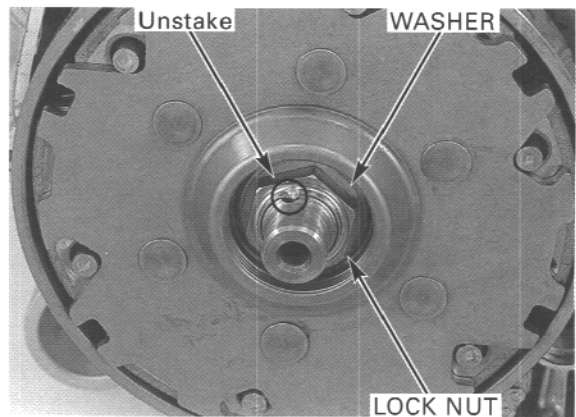


## CENTRIFUGAL CLUTCH DISASSEMBLY

*Be careful not to damage the crankshaft threads.*

Remove the front crankcase cover (page 10-2).

Unstake the centrifugal clutch lock nut.



Install the special tools by aligning the pins with the grooves in the drive plate.

Hold the drive plate and loosen the lock nut

#### TOOLS:

**Clutch holder set**

07ZMB-HN20000 or

07ZMB-HN2000A

– clutch holder plate

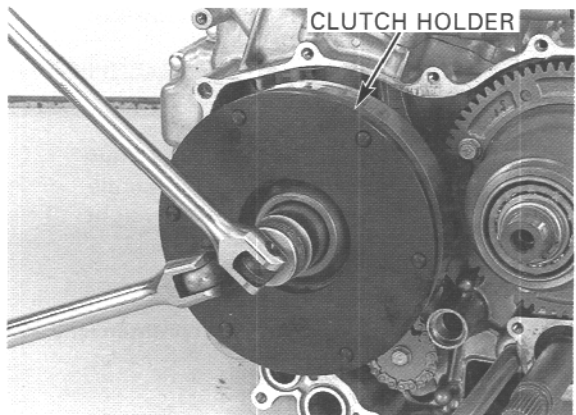
07ZMB-HN20100 or

07ZMB-HN2000A

– holder plate pin

07ZMB-HN20200 or

07ZMB-HN2000A



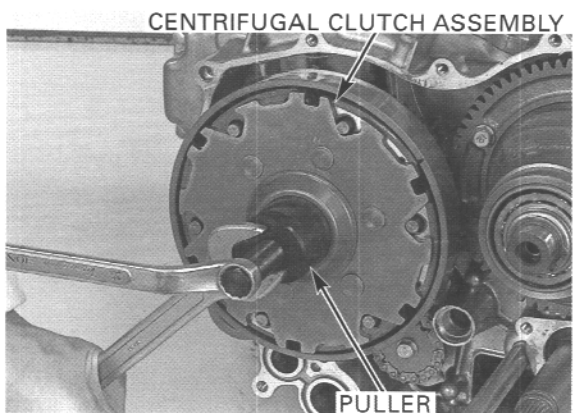
Remove the lock nut and washer.

Remove the centrifugal clutch assembly using the special tool.

**Puller, 40 x 1.5 mm**

07ZMC-HN20100

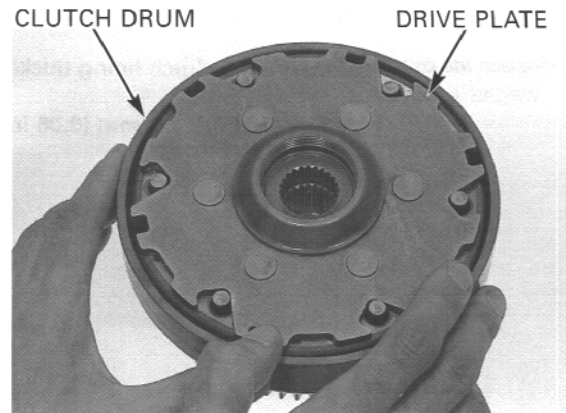
Remove the washer.



## INSPECTION

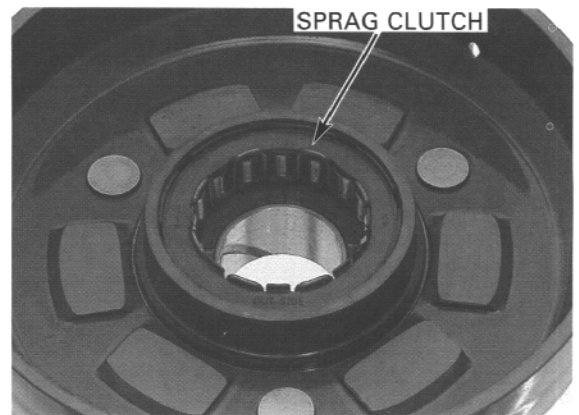
### ONE-WAY CLUTCH

Hold the clutch drum and turn the drive plate. The drive plate should turn counterclockwise smoothly and should not turn clockwise. Remove the drive plate assembly from the clutch drum by turning it counterclockwise.



### CLUTCH DRUM

Check the one-way clutch sprag for abnormal wear, damage or irregular movement.



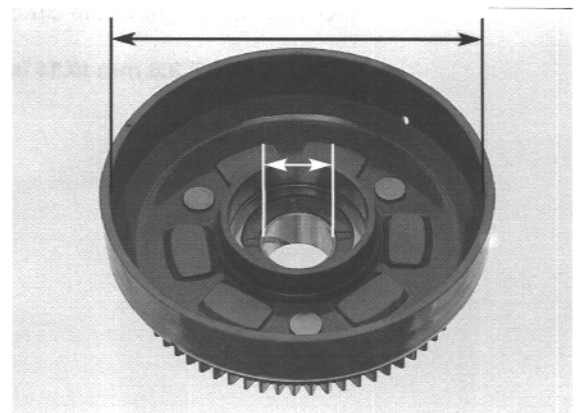
Remove the sprag clutch from the clutch outer. Check the clutch lining and sprag clutch contacting surfaces for abnormal wear or damage.

Measure the clutch drum I.D.

**SERVICE LIMIT: 150.4 mm (5.92 in)**

Check the crankshaft sliding surface of the clutch drum boss for scratches or abnormal wear. Measure the clutch drum boss I.D.

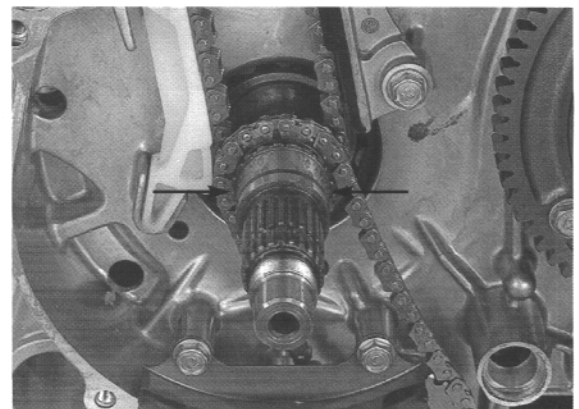
**SERVICE LIMIT: 29.05 mm (1.144 in)**



### CRANKSHAFT

Check the clutch drum sliding surface of the crankshaft for scratches or abnormal wear. Measure the crankshaft O.D.

**SERVICE LIMIT: 28.93 mm (1.139 in)**

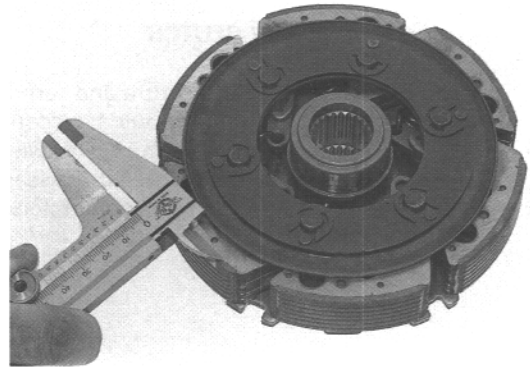


# CENTRIFUGAL CLUTCH

## DRIVE PLATE ASSEMBLY

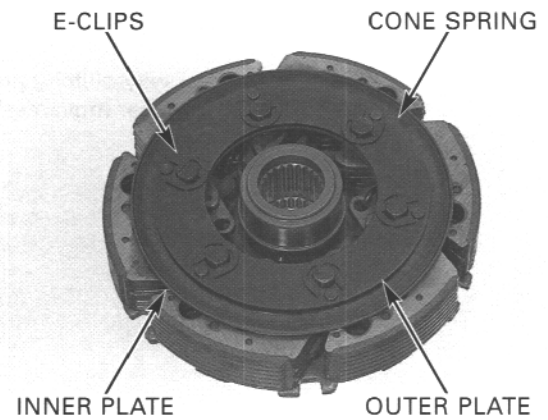
Replace the clutch weights as a set. Measure the clutch lining thickness of the weight.

**SERVICE LIMIT: 2.0 mm (0.08 in)**



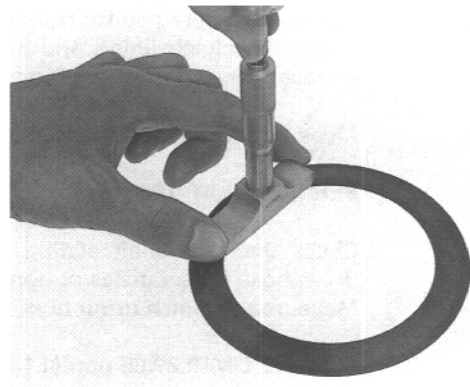
Check the sprag clutch contacting surface of the drive plate boss for abnormal wear or damage.

Compress the clutch cone spring and remove the E-clips. Remove the outer plate, cone spring and inner plate.

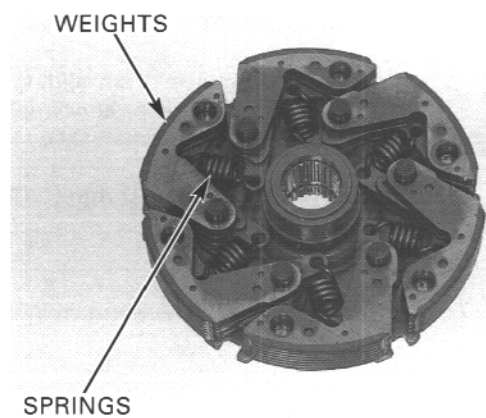


Measure the height of the clutch cone spring.

**SERVICE LIMIT: 3.6 mm (0.14 in)**

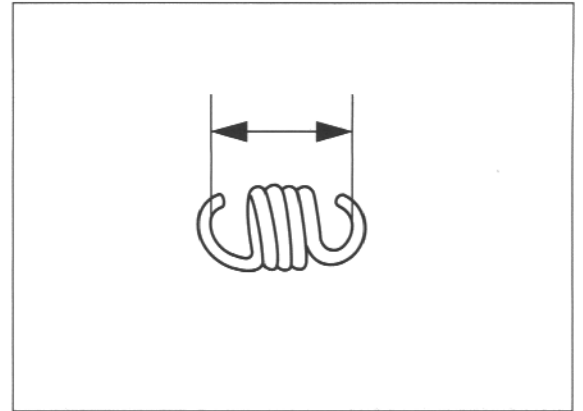


Remove the clutch weights and springs from the drive plate.

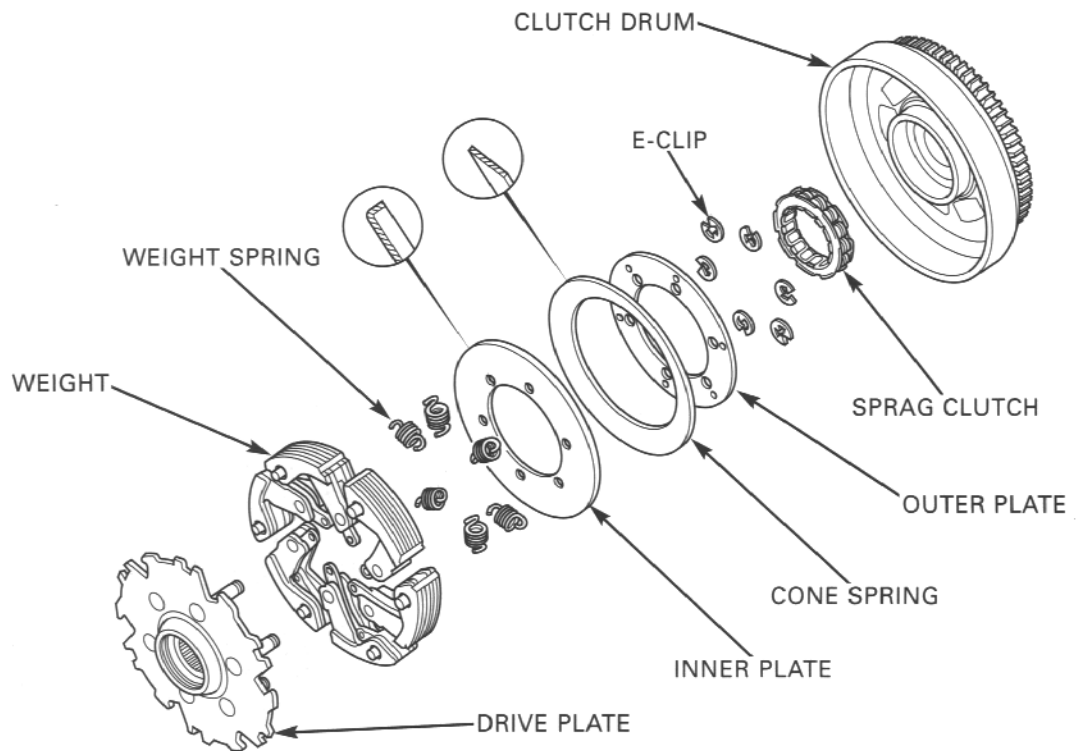


## CENTRIFUGAL CLUTCH

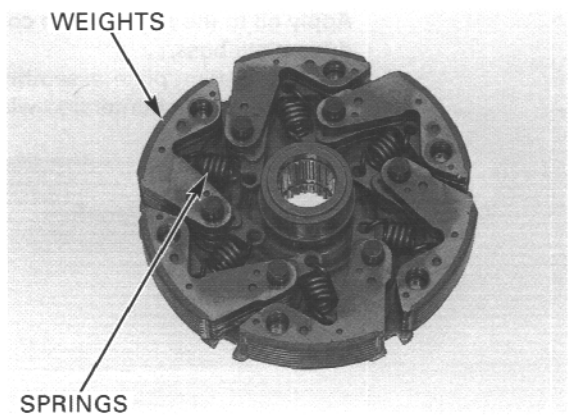
Replace the clutch weight springs as a set. Measure the clutch weight spring free length.  
set. **SERVICE LIMIT: 24.1 mm (0.95 in)**



## CENTRIFUGAL CLUTCH ASSEMBLY



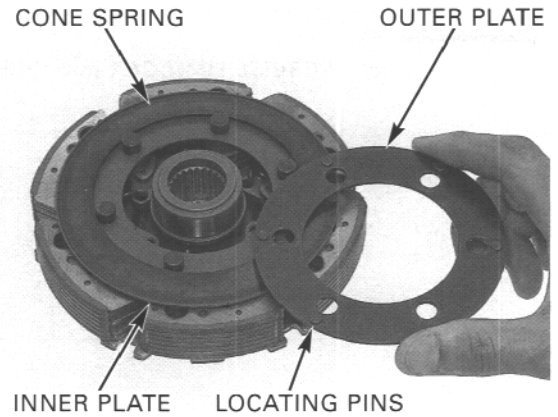
Install with the spring's open ends facing in. Install the clutch weights and springs onto the drive plate as shown.



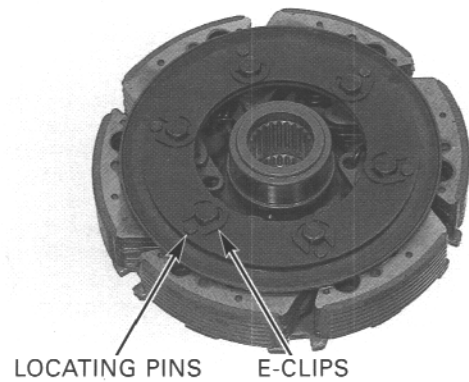
## CENTRIFUGAL CLUTCH

Install the following:

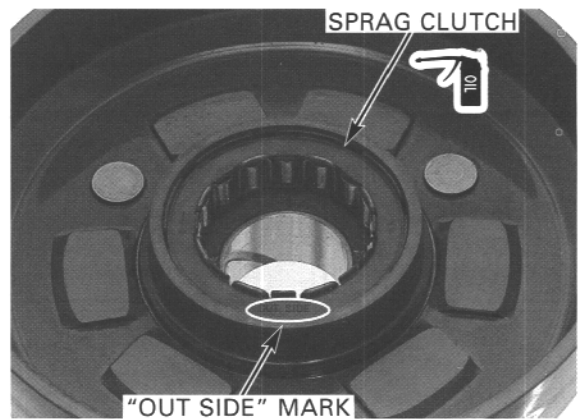
- inner plate with dished side facing up
- clutch spring with concaved side facing down
- outer plate with locating pins facing up



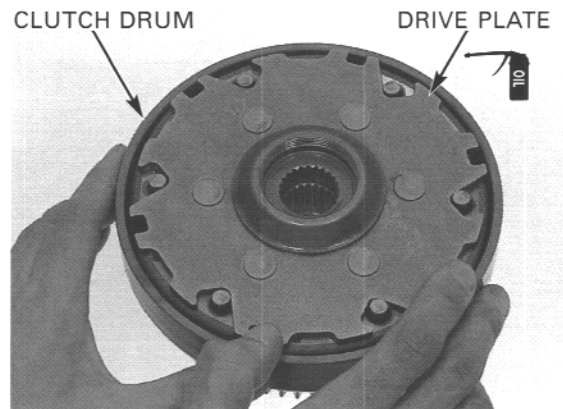
Install the E-clips into the pin grooves of the drive plate with their gaps facing towards the locating pins while compressing the cone spring with pliers.



Apply oil to the sprag clutch whole surface and the sprag clutch contacting surface of the clutch drum. Install the sprag clutch into the clutch drum with the "OUT SIDE" mark facing up.



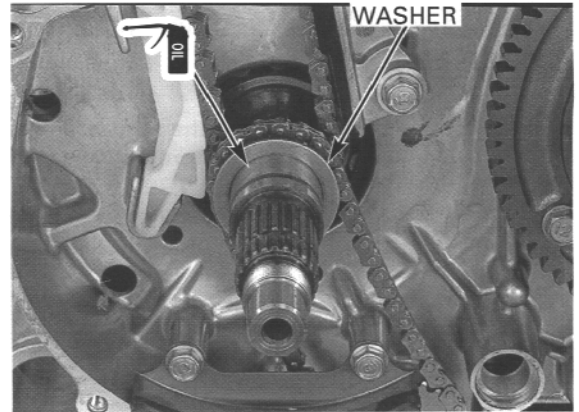
Apply oil to the sprag clutch contacting surface of the drive plate boss. Install the drive plate assembly into the clutch drum while turning it counterclockwise.



## CENTRIFUGAL CLUTCH

Install the washer onto the crankshaft.

Apply oil to the clutch drum sliding surface of the crankshaft.

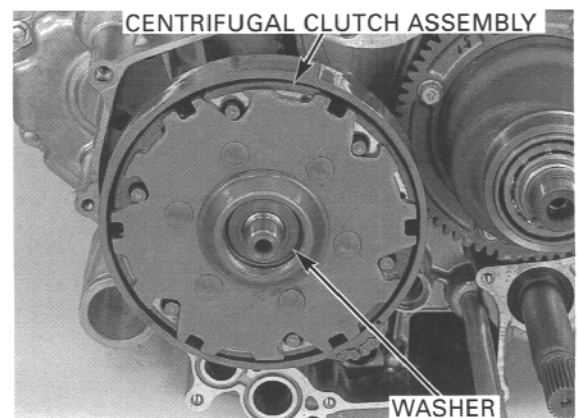


Install the centrifugal clutch assembly onto the crankshaft while aligning the splines of the drive plate boss and crankshaft.

*Keep the clutch drum and drive plate as an assembly*

Engage the primary drive gear of the clutch drum with the driven gear of the automatic transmission unit.

Install the washer.



Apply oil to the threads and seating surface of a new clutch lock nut and install it.

Install the special tools by aligning the pins with the grooves in the drive plate.

Hold the drive plate and tighten the lock nut

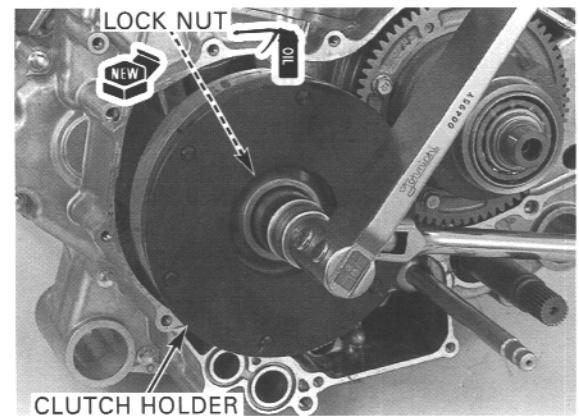
### TOOLS:

**Clutch holder set**

- clutch holder plate
- holder plate pin

07ZMB-HN20000 or  
07ZMB-HN2000A  
(U.S.A. only)  
07ZMB-HN20100  
07ZMB-HN20200 or  
07ZMB-HN20100A

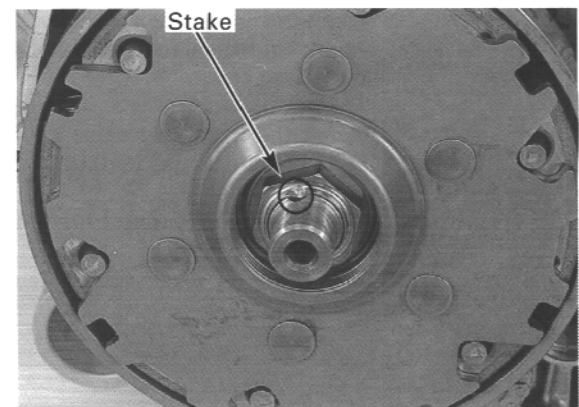
**TORQUE: 118 N·m (12.0 kgf·m, 87 lbf·ft)**



*Be careful not to damage the crankshaft threads.*

Stake the clutch lock nut into the crankshaft groove.

Install the front crankcase cover (page 10-10).

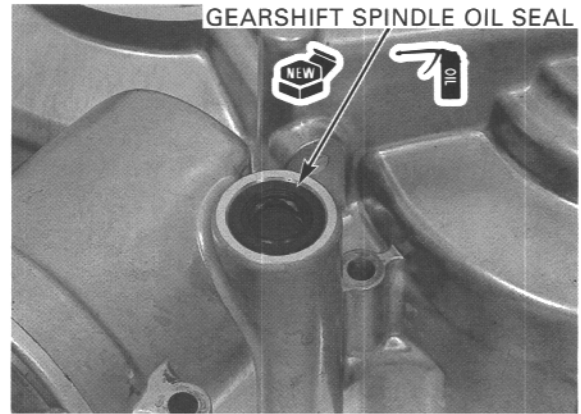


## CENTRIFUGAL CLUTCH

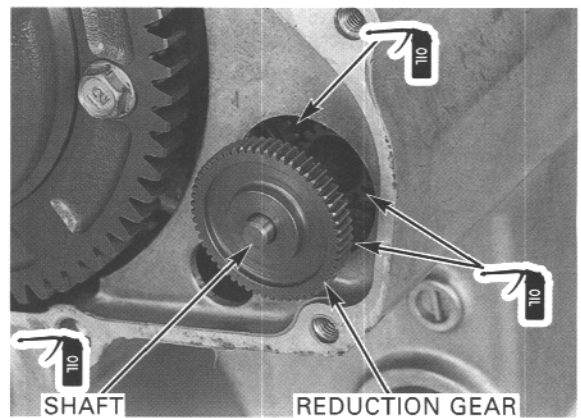
### FRONT CRANKCASE COVER INSTALLATION

Blow through the oil passages in the front crankcase cover with compressed air.

Remove the gearshift spindle oil seal.  
Apply oil to a new oil seal lip and install it.

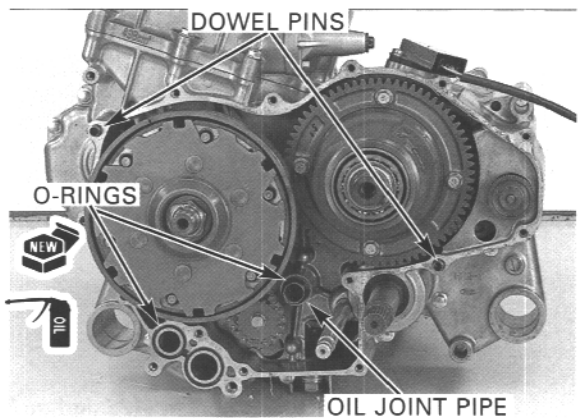


Apply engine oil to the control motor driven gear teeth, reduction gear teeth and shaft. Install the shaft and reduction gear if they were removed.



Coat new O-rings with oil and install them onto the oil joint pipe.  
Install the oil joint pipe into the crankcase.

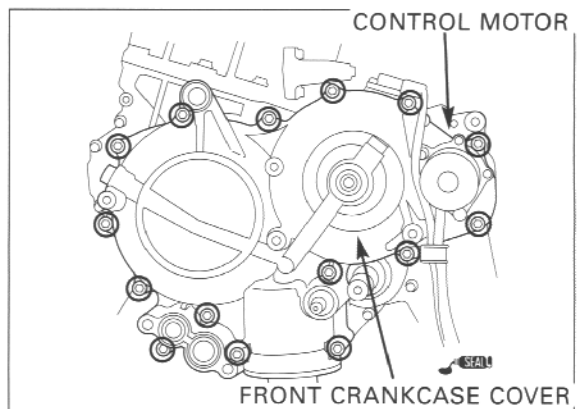
Coat a new O-ring with oil and install it into the crankcase groove.  
Install the dowel pins.



Clean the crankcase and cover mating surfaces.  
Apply liquid sealant to the mating surface of the front crankcase cover.

Install the front crankcase cover and tighten the 15 bolts in a crisscross pattern in 2 or 3 steps.

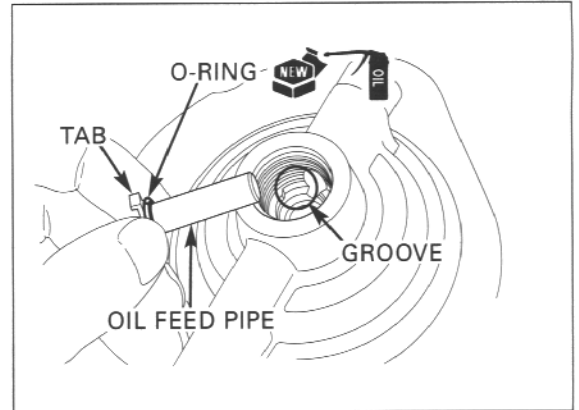
Install the control motor (page 23-32).





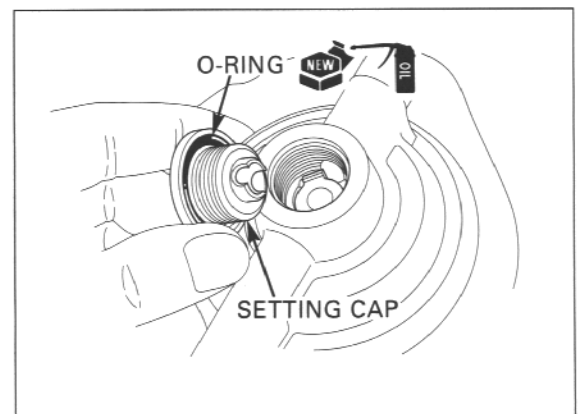
## CENTRIFUGAL CLUTCH

Coat a new O-ring with oil and install it onto the oil feed pipe.  
Install the oil feed pipe into the front crankcase cover, aligning the tab with the groove in the cover.

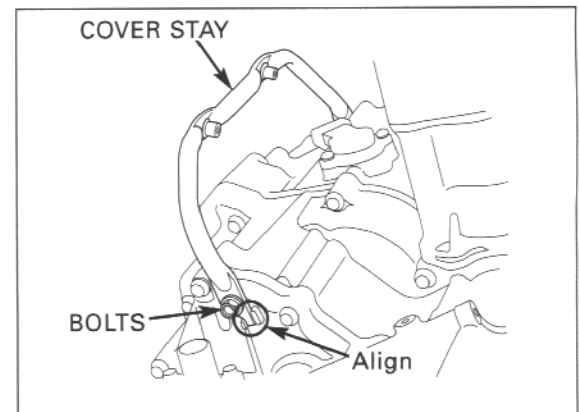


Coat a new O-ring with oil and install it onto the oil feed pipe setting cap.  
Install and tighten the setting cap.

**TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)**



Install the left engine side cover stay by aligning the locating tab with the groove in the rear crankcase cover, and tighten the two bolts securely.

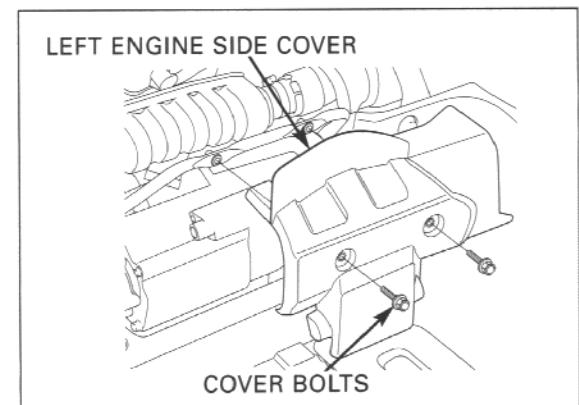


Install the left engine side cover and tighten the two bolts.

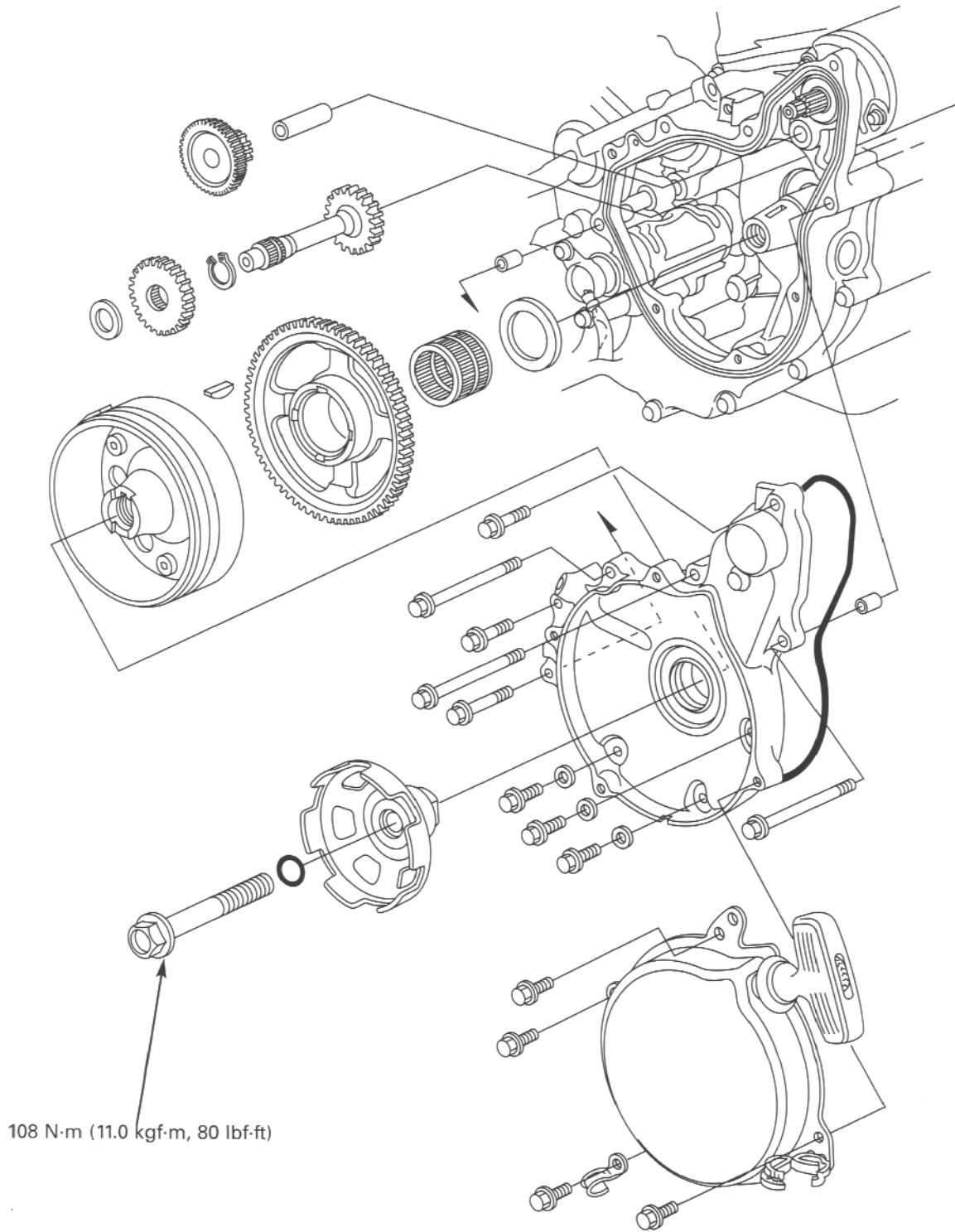
Install the following:

- oil tank (page 4-7)
- gearshift linkage (page 7-8)
- propeller shaft (page 7-8)
- inner fenders (page 2-6)
- front mud guards (page 2-6)

Remove the left side cover (page 2-4). Adjust the tie-rod length of the gearshift lever linkage (page 12-15).



# ALTERNATOR/STARTER CLUTCH



# 11. ALTERNATOR STARTER CLUTCH

SERVICE INFORMATION	11-1	ALTERNATOR STATOR	11-5
TROUBLESHOOTING	11-1	FLYWHEEL/STARTER CLUTCH	11-8
RECOIL STARTER	11-2		

## SERVICE INFORMATION

### GENERAL

- This section covers service of the recoil starter, alternator stator, flywheel and starter clutch. These parts can be serviced with the engine installed in the frame.
- Starter clutch lubricating oil is fed through the oil passage in the alternator cover. Clean the oil passage before installing the rear crankcase cover.
- Refer to section 19 for alternator stator inspection.
- Refer to section 21 for starter motor servicing.

### SPECIFICATION

Unit: mm (in)

ITEM	STANDARD	SERVICE LIMIT
Starter driven gear boss O.D.	51.705—51.718 (2.0356—2.0361)	51.705 (2.0356)

### TORQUE VALUES

Starter clutch bolt	30 N·m (3.1 kgf·m, 22 lbf·ft)	Apply locking agent to the threads
Recoil starter driven pulley bolt	108 N·m (11.0 kgf·m, 80 lbf·ft)	Apply oil to the threads and seating surface
Alternator stator bolt	10 N·m (1.0 kgf·m, 7 lbf·ft)	
Ignition pulse generator bolt	6 N·m (0.6 kgf·m, 4.3 lbf·ft)	Apply locking agent to the threads

### TOOLS

Flywheel holder	07725-0040000	or equivalent commercially available in U.S.A.
Flywheel puller	07933-3950000	
Recoil pulley holder	07SMB-HM70100	
Driver	07749-0010000	
Attachment, 24 x 26 mm	07746-0010700	

## TROUBLESHOOTING

### Starter motor turns, but engine does not turn

- Faulty starter clutch
- Damaged starter reduction gears

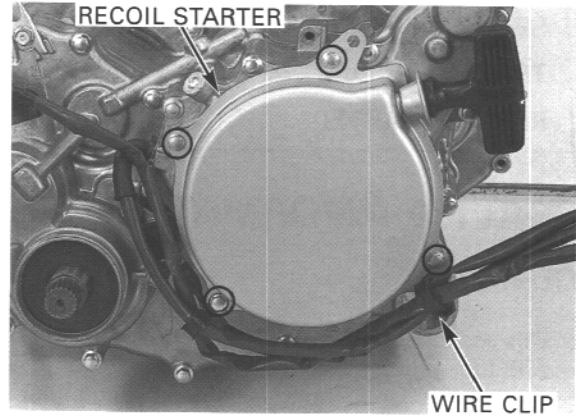
## ALTERNATOR/STARTER CLUTCH

### RECOIL STARTER

#### REMOVAL

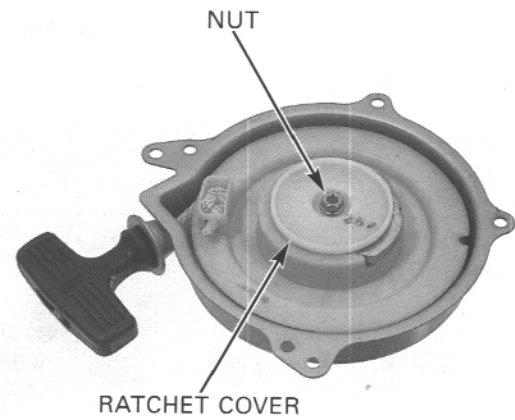
Remove the air cleaner housing (page 5-3).

Remove the wire clip from the recoil starter housing. Remove the four mounting bolts and the recoil starter assembly.

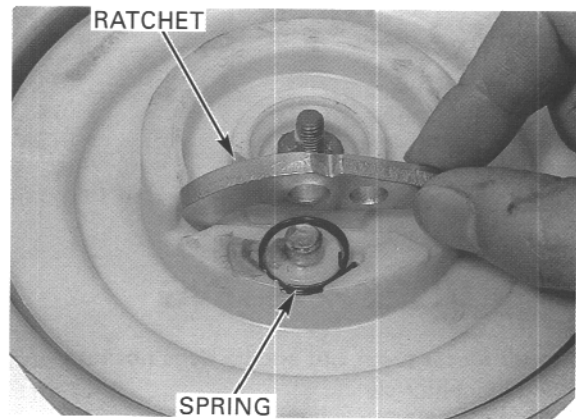


#### DISASSEMBLY

Remove the nut and ratchet cover

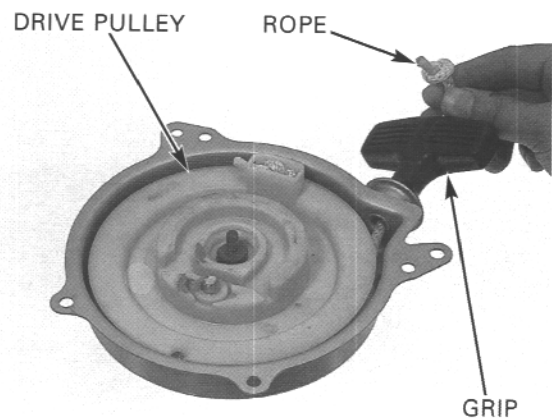


Remove the ratchet and spring.



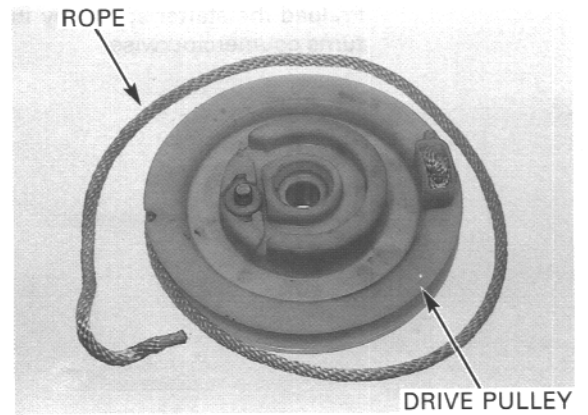
Untie the starter rope and remove the starter grip. Release the starter rope slowly. Remove the starter drive pulley.

*Wear eye protection and use care when removing the drive pulley and starter spring. The spring can pop out of the housing if care is not used.*



## ALTERNATOR/STARTER CLUTCH

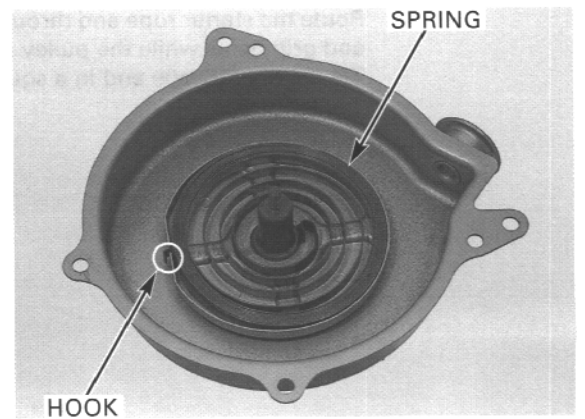
Remove the starter rope from the drive pulley.  
Check the starter rope for wear or damage.



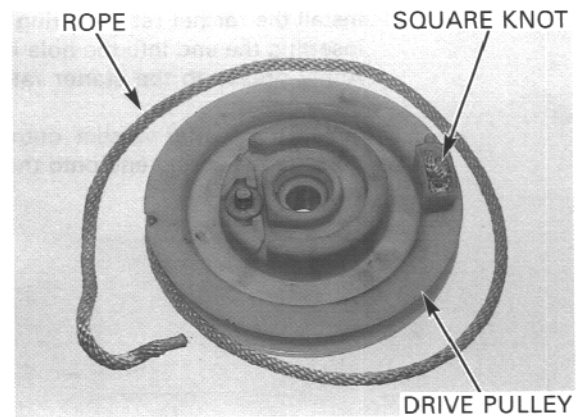
Check the recoil starter spring and replace it with a new one if it is damaged or broken.

### ASSEMBLY

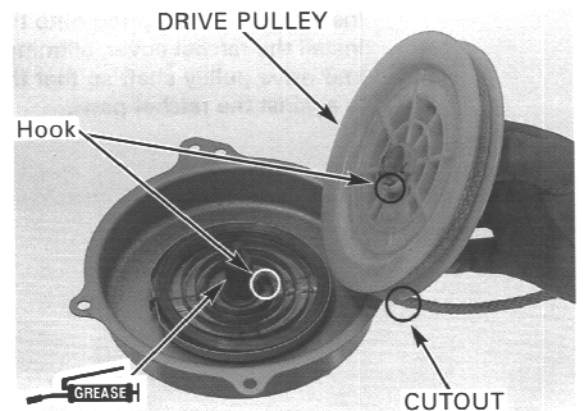
Install the spring by hooking the outer end onto the starter housing hook as shown.



Install the starter rope into the drive pulley and tie the rope end in a square knot.  
Wrap the rope around the drive pulley in a counter-clockwise direction as viewed from the ratchet side as shown.

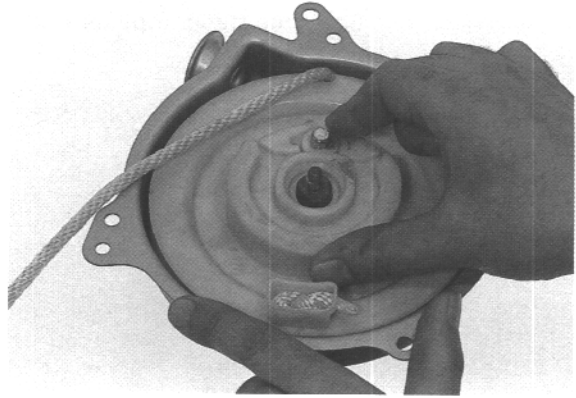


Apply grease to the drive pulley shaft.  
Set the starter rope into the pulley cutout and install the pulley while hooking the spring inner end onto the pulley hook.

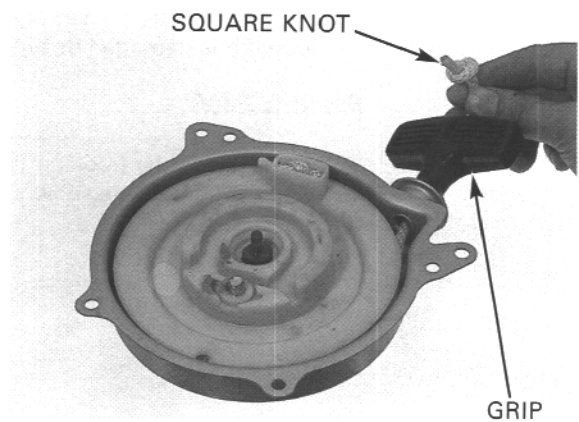


## ALTERNATOR/STARTER CLUTCH

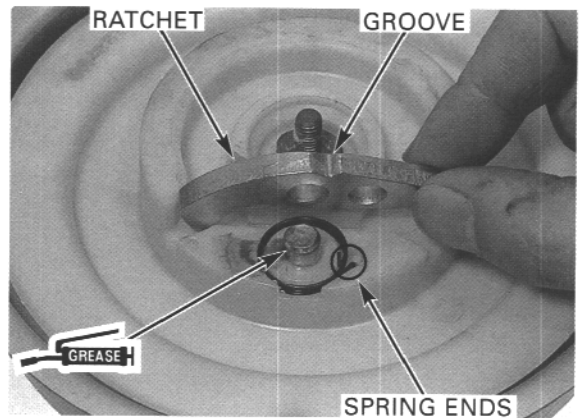
Preload the starter spring by turning the pulley 2-1/2 turns counterclockwise.



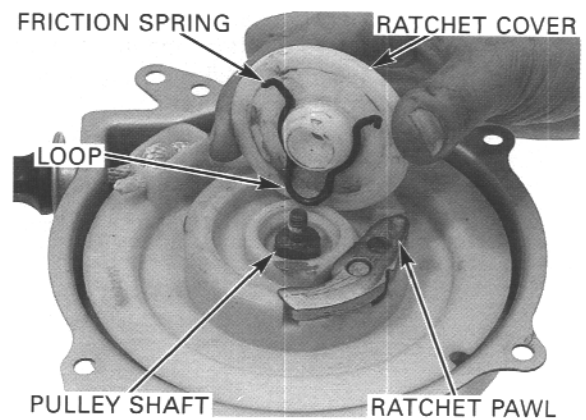
Route the starter rope end through the starter housing and grip holes while the pulley remains held in place. Tie the starter rope end in a square knot.



Install the ratchet return spring onto the drive pulley, inserting the end into the hole in the pulley. Apply grease to the starter ratchet pivot pin on the drive pulley. Install the starter ratchet onto the pivot pin while hooking the spring end onto the ratchet groove.



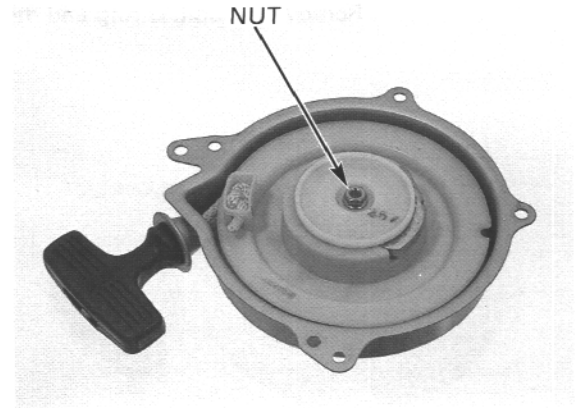
Install the friction spring onto the ratchet cover. Install the ratchet cover, aligning the flats on the boss and drive pulley shaft so that the friction spring loop is against the ratchet pawl.



## ALTERNATOR/STARTER CLUTCH

Install and tighten the nut.

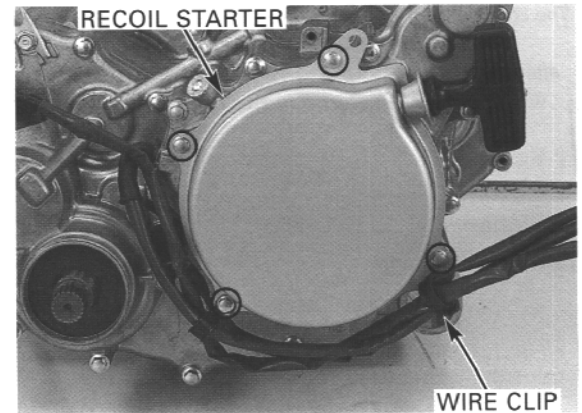
Check that the recoil starter for smooth operation by pulling the grip.



### INSTALLATION

Install the recoil starter assembly and tighten the four bolts securely.  
Install the wire clip into the recoil starter housing.

Install the air cleaner housing (page 5-3).



## ALTERNATOR STATOR

### ALTERNATOR COVER REMOVAL

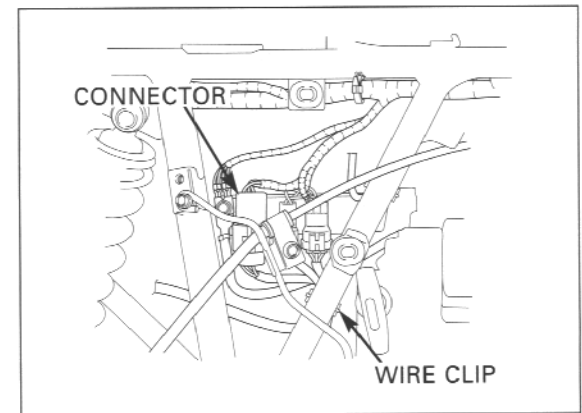
Remove the following:

- air cleaner housing (page 5-3).
- swingarm (page 15-5):

Remove the alternator connector from the stay and disconnect it.

Free the alternator wire from the clip.

Remove the recoil starter (page 11-2).

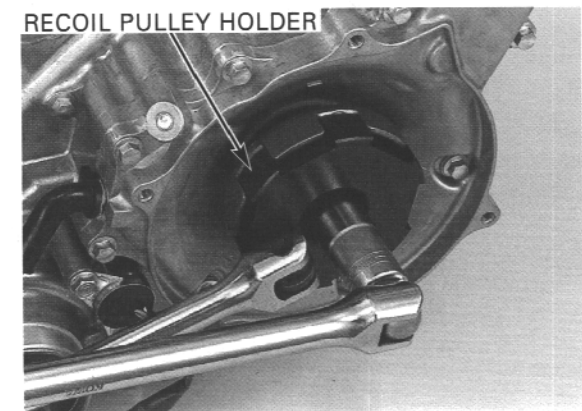


Hold the recoil starter driven pulley using the special tool and loosen the bolt.

**TOOL:**

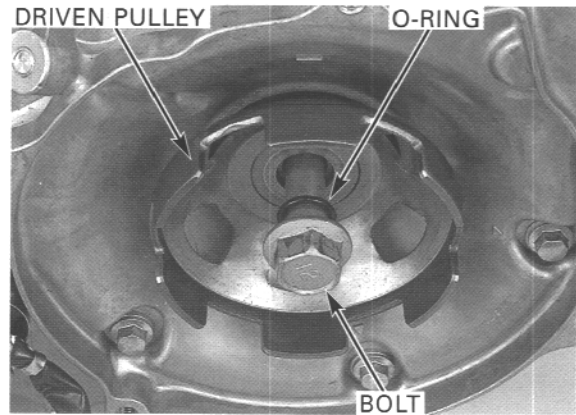
Recoil pulley holder

07SMB-HM70100



## ALTERNATOR/STARTER CLUTCH

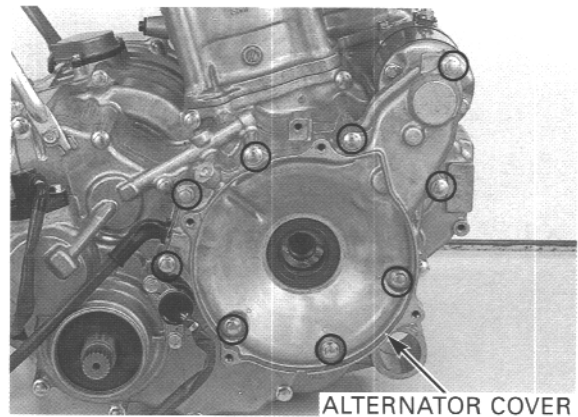
Remove the bolt, O-ring and the driven pulley.



*The cover (stator) is magnetically attached to the fly-wheel, be careful during removal*

Remove the nine bolts, three sealing washer and alternator cover.

Remove the dowel pins and O-ring.



### IGNITION PULSE GENERATOR/STATOR REMOVAL/INSTALLATION

Disconnect the ignition pulse generator connector. Remove the two bolts and ignition pulse generator. Remove the wire grommet from the alternator cover groove. Remove the three bolts and alternator stator.

Install the alternator stator onto the cover and tighten the three bolts.

**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

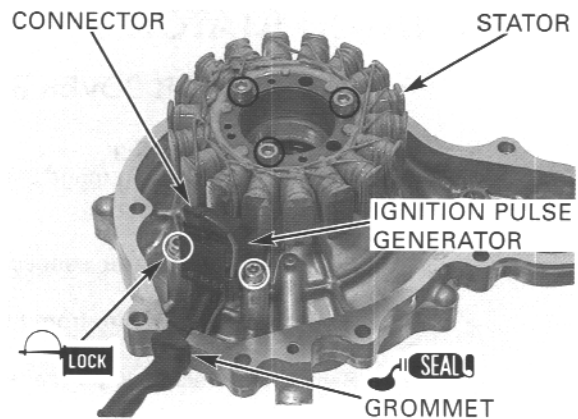
Apply sealant to the wire grommet seating groove and install the grommet into the cover groove properly.

Apply locking agent to the ignition pulse generator bolt threads.

Install the ignition pulse generator and tighten the two bolts.

**TORQUE: 6 N·m (0.6 kgf·m, 4.3 lbf·ft)**

Connect the ignition pulse generator connector.





**ALTERNATOR COVER INSTALLATION**

Replace the oil seal in the alternator cover with a new one.  
Blow through the oil passage in the alternator cover with compressed air.

Install the dowel pins and a new O-ring.  
Check that the starter reduction gears are installed in position.  
Apply molybdenum oil solution to the starter reduction shaft journals.

*The cover (stator) is magnetically attached to the fly-wheel, be careful not to get anything caught between these parts when installing.*

Apply sealant to the wire grommet seating surface and install the alternator cover.

Install the nine bolts with three new sealing washers and tighten the bolts in a crisscross pattern in 2 or 3 steps.

**NOTE:**

- The location for the bolt with sealing washer is marked "Δ" on the cover.

Coat a new oil seal lips with oil and install it into the alternator cover until it is fully seated.

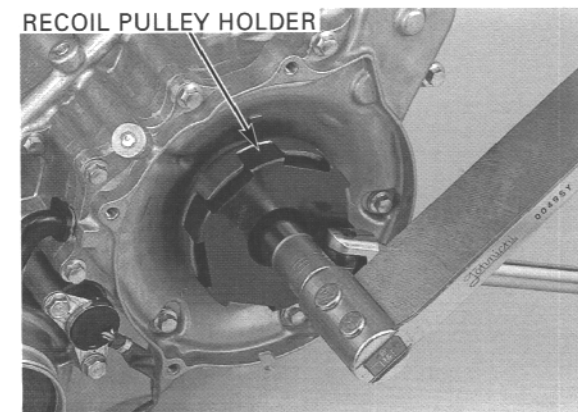
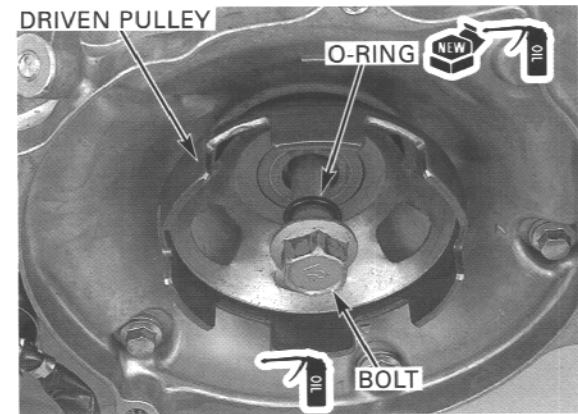
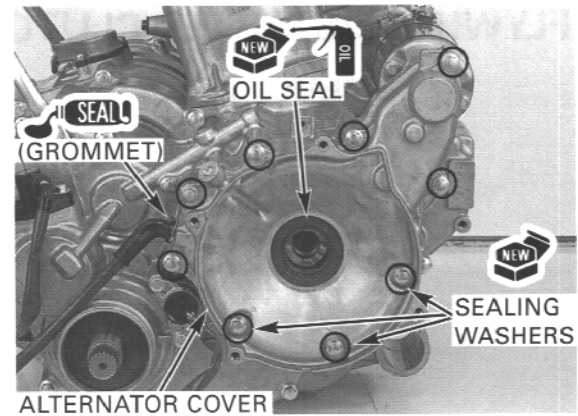
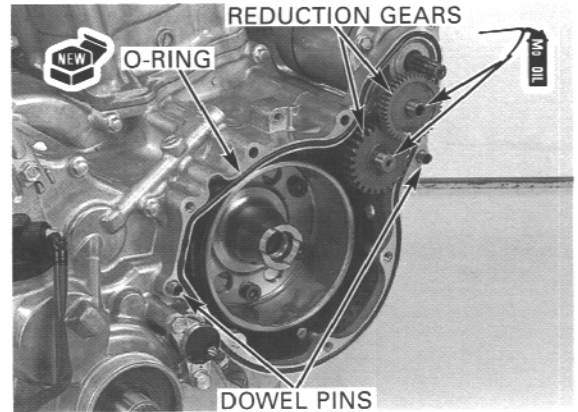
Install the starter driven pulley aligning the bosses with the grooves in the crankshaft.

Coat a new O-ring with oil and install it onto the driven pulley bolt.  
Apply oil to the driven pulley bolt threads and seating surface, and install the bolt.

Hold the starter driven pulley using the special tool and tighten the bolt.

**TOOL:**  
**Recoil pulley holder** 07SMB-HM70100

**TORQUE:** 108 N·m (11 kgf·m, 80 lbf·ft)



## ALTERNATOR/STARTER CLUTCH

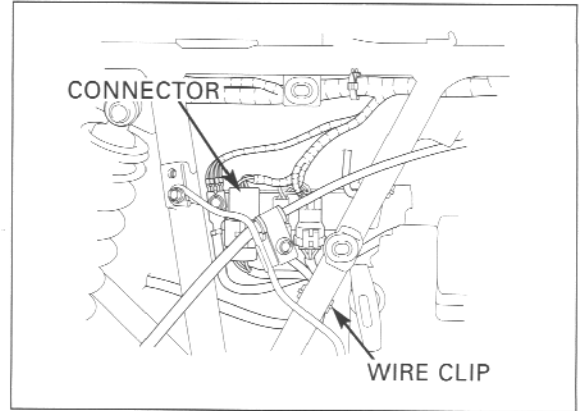
Install the recoil starter (page 11-5).

Route the wires and tubes properly (page 1-19).  
Connect the alternator connector and install it onto the stay.

Install the following:

- swingarm (page 15-8)
- air cleaner housing (page 5-3)

Check the oil level and add the recommended oil if necessary (page 3-10).

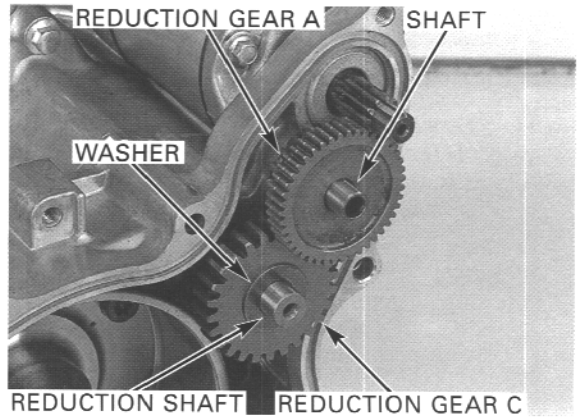


## FLYWHEEL/STARTER CLUTCH

### REMOVAL

Remove the following:

- alternator cover (page 11-5)
- starter reduction gear A and shaft
- washer and starter reduction gear C
- starter reduction shaft

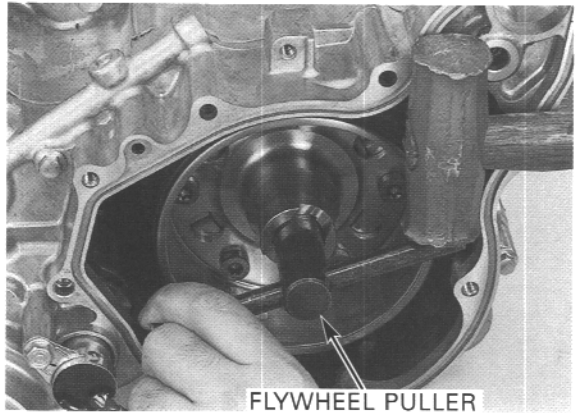


Remove the flywheel and starter driven gear using the special tool.

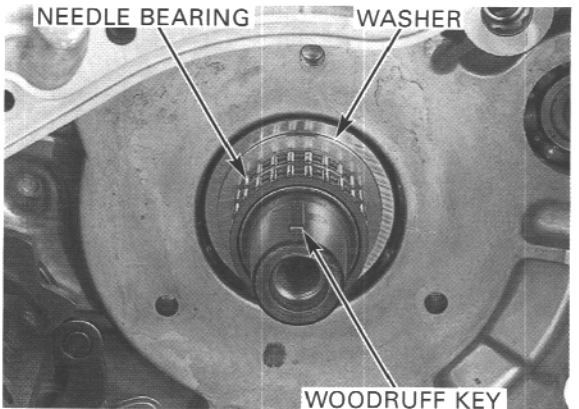
### TOOL:

Flywheel puller

07933-3950000



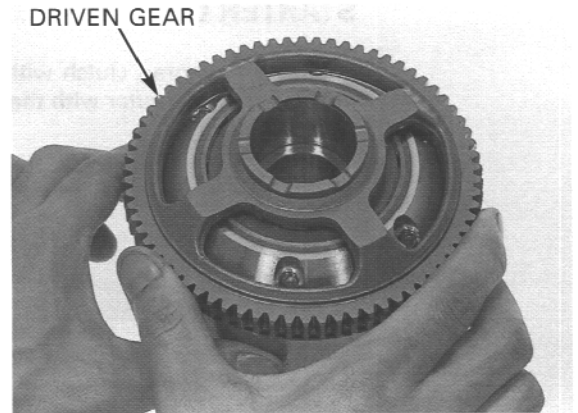
Remove the needle bearing, washer and woodruff key.



### STARTER CLUTCH DISASSEMBLY/ INSPECTION

Make sure that the starter driven gear turns clockwise smoothly and does not turn counterclockwise.

Remove the driven gear while turning it clockwise.

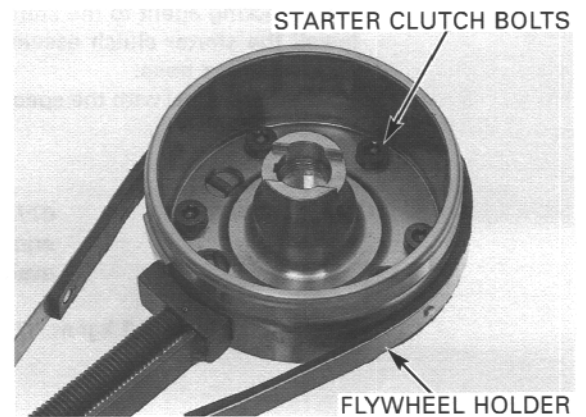


Hold the flywheel with the special tool and remove the starter clutch bolts.

**TOOL:**  
**Flywheel holder**

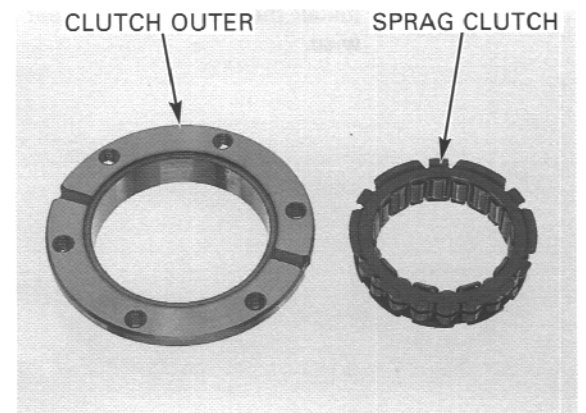
**07725-0040000 or  
equivalent commercially  
available in U.S.A.**

Remove the starter clutch assembly from the flywheel.



Remove the sprag clutch from the starter clutch outer.

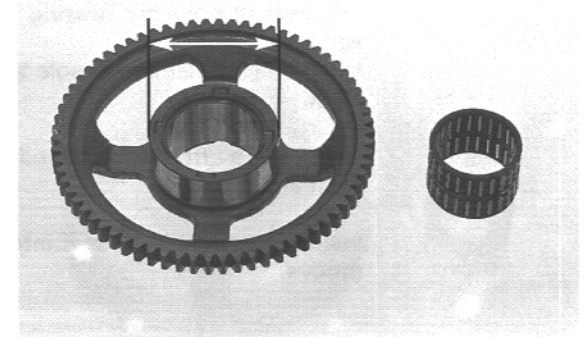
Check the starter clutch outer and sprag clutch for abnormal wear or damage.



Check the starter driven gear teeth and needle bearing for wear or damage.

Measure the starter driven gear boss O.D.

**SERVICE LIMIT: 51.705 mm (2.0356 in)**



## ALTERNATOR/STARTER CLUTCH

### STARTER CLUTCH ASSEMBLY

Lubricate the sprag clutch with oil and install it into the starter clutch outer with the flange side facing the flywheel side.

Apply locking agent to the starter clutch bolt threads. Install the starter clutch assembly onto the flywheel and install the bolts. Hold the flywheel with the special tool and tighten the bolts.

**TOOL:**  
Flywheel holder

07725-0040000 or  
equivalent commercially  
available in U.S.A.

**TORQUE:** 23 N·m (2.3 kgf·m, 17 lbf·ft)

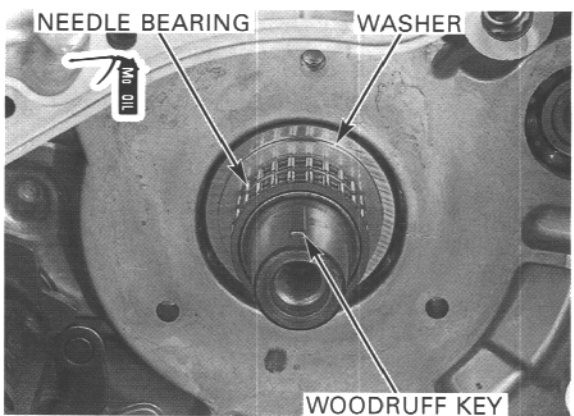
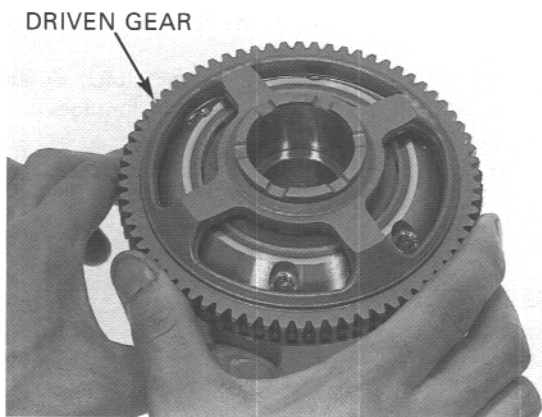
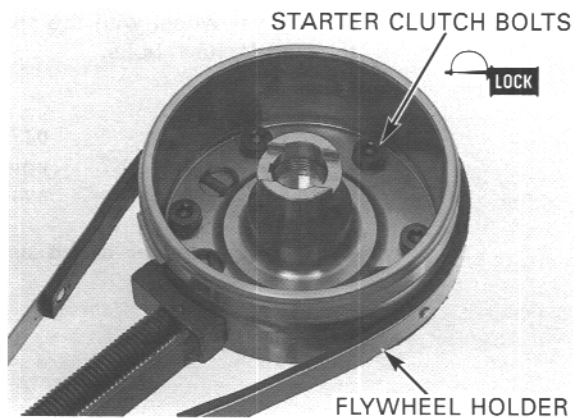
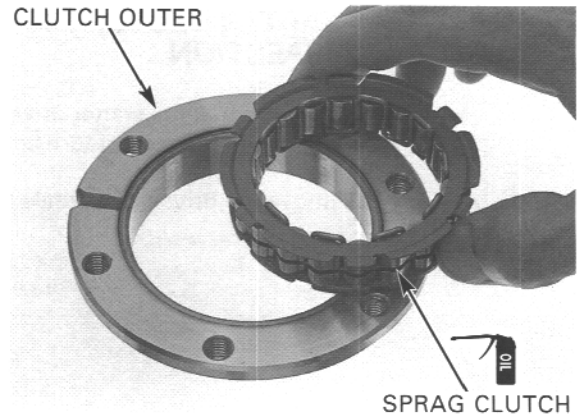
Install the starter driven gear while turning it clockwise.

### INSTALLATION

Lubricate the needle bearing with molybdenum oil solution. Install the washer and needle bearing onto the crankshaft.

Clean any oil from the tapered portions of the crankshaft and flywheel.

Install the woodruff key into the crankshaft key groove.



Install the flywheel/starter driven gear, aligning the key way in the flywheel with the key on the crankshaft.

Install the starter driven pulley aligning the bosses with the grooves in the crankshaft.  
Apply oil to the driven pulley bolt threads and seating surface, and install the bolt.  
Hold the starter driven pulley using the special tool and tighten the bolt.

**TOOL:**  
**Recoil pulley holder** 07SMB-HM70100

**TORQUE: 108 N·m (11 kgf·m, 80 lbf·ft)**

Loosen the starter driven pulley bolt, and remove the pulley holder, bolt and pulley.

Check the starter motor shaft bearing.  
Replace the bearing if the inner race does not turn smoothly, quietly, or if the outer race fits loosely in the alternator cover.

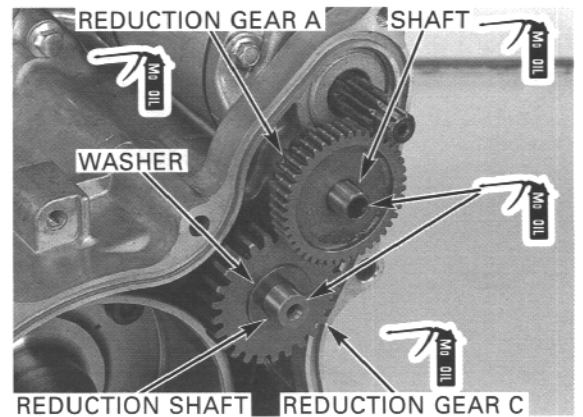
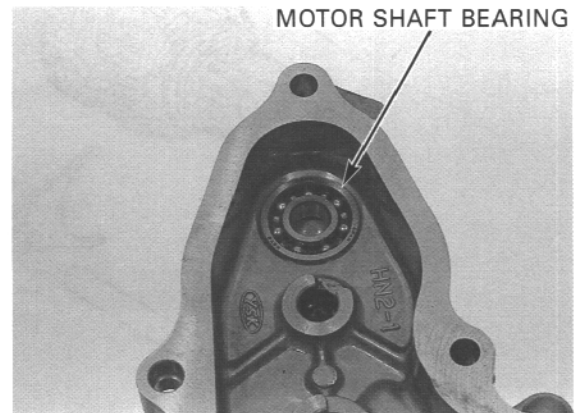
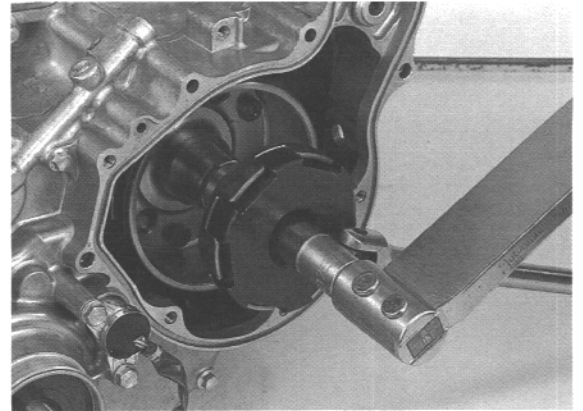
To replace the bearing:  
Heat the alternator cover and remove the bearing.  
Drive a new bearing in the cover using the special tools.

*Be sure to press the bearing in evenly and flush with the surface.*

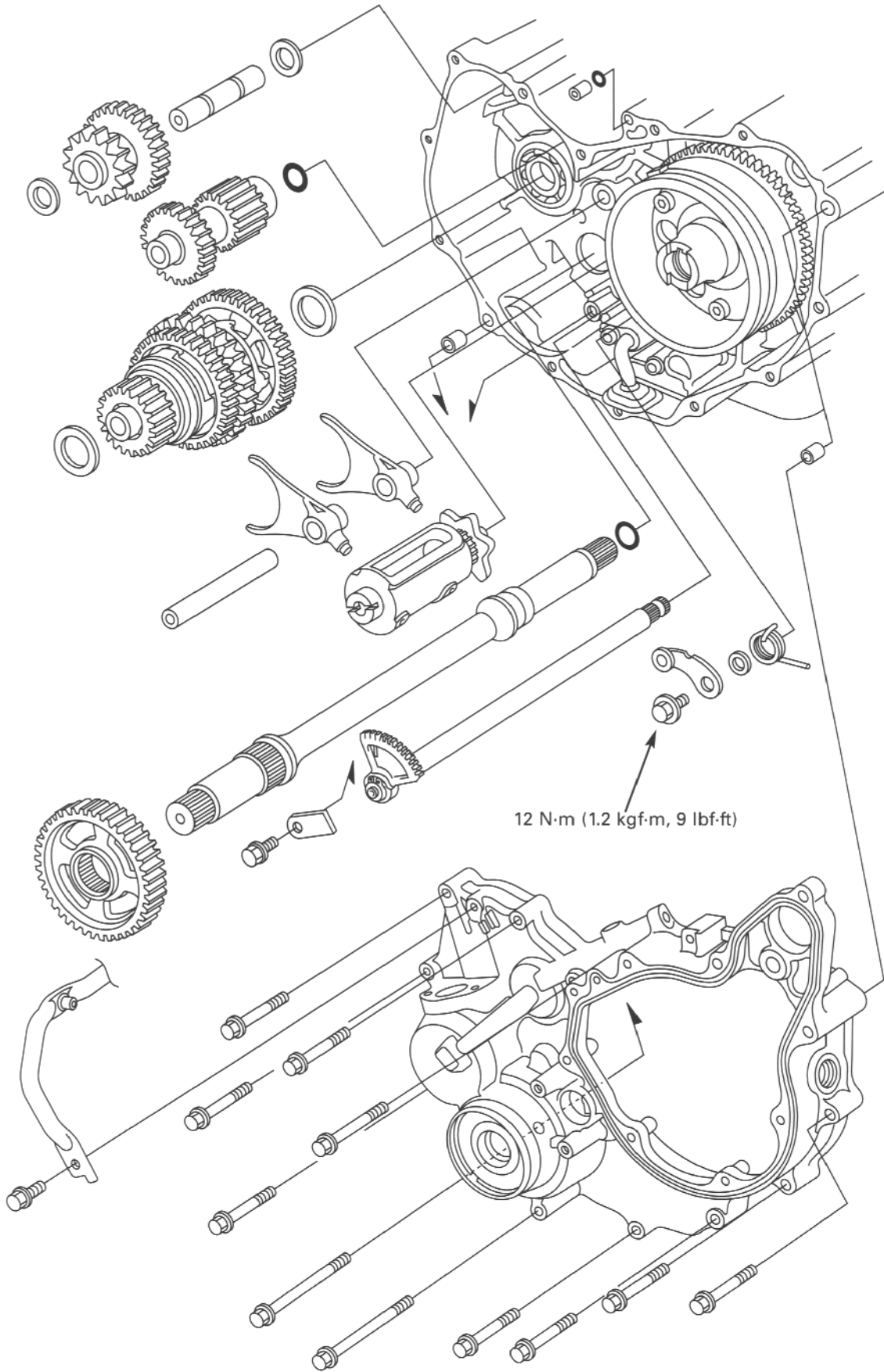
**TOOLS:**  
**Driver** 07749-0010000  
**Attachment, 24 x 26 mm** 07746-0010700

Apply molybdenum oil solution to the reduction gear teeth, shaft journals and gear A shaft.

- Install the following:
- starter reduction shaft
  - starter reduction gear C and washer
  - starter reduction gear A and shaft
  - alternator cover (page 11-7)



# SUB-TRANSMISSION



12 N·m (1.2 kgf·m, 9 lbf·ft)

# 12. SUB-TRANSMISSION

<b>SERVICE INFORMATION</b>	<b>12-1</b>	<b>GEARSHIFT LINKAGE</b>	<b>12-5</b>
<b>TROUBLESHOOTING</b>	<b>12-2</b>	<b>SUB-TRANSMISSION</b>	<b>12-8</b>
<b>REAR CRANKCASE COVER</b>	<b>12-3</b>	<b>GEARSHIFT LEVER LINKAGE</b>	<b>12-12</b>

## SERVICE INFORMATION

### GENERAL

- This section covers service of the gearshift lever linkage and sub-transmission. The shift lever linkage can be serviced with the engine installed in the frame. To service the sub-transmission, the engine must be removed from the frame.
- Cylinder head and sub-transmission lubricating oil is fed through the oil passages in the rear crankcase cover. Clean the oil passages before installing the rear crankcase cover.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Shift fork	I.D.	11.000—11.021 (0.4331—0.4339)	11.04 (0.435)
	Claw thickness	4.93—5.00 (0.194—0.197)	4.5 (0.18)
	Shaft O.D.	10.966—10.984 (0.4317—0.4324)	10.96 (0.431)
Transmission	Gear I.D.	D., R., L.	28.020—28.041 (1.1031—1.1040)
		Reverse idle	14.000—14.018 (0.5512—0.5519)
	Gear bushing O.D.	D./R.	27.979—28.000 (1.1015— 1.1024)
		L.	27.984—28.005 (1.1017—1.1026)
	Gear-to-bushing clearance	D., R.	0.020—0.062 (0.0008—0.0024)
		L.	0.015—0.057 (0.0006—0.0022)
	Gear bushing I.D.	D./R.	25.000—25.013 (0.9843—0.9848)
	Countershaft O.D.	at D., R.	24.959—24.980 (0.9826—0.9835)
	Reverse idle shaft O.D.		13.966—13.984 (0.5498—0.5506)
	Bushing-to-shaft clearance	D./R.	0.020—0.054 (0.0008—0.0021)
Reverse idle gear-to-shaft clearance		0.016—0.052 (0.0006—0.0020)	

12

### TORQUE VALUES

Gearshift lever box cover bolt	5 N·m (0.5 kgf·m, 3.6 lbf·ft)
Gearshift lever linkage arm pivot bolt	26 N·m (2.7 kgf·m, 20 lbf·ft)
Gearshift lever linkage tie-rod lock nut	10 N·m (1.0 kgf·m, 7 lbf·ft)
Gear shift drum center bolt	26 N·m (2.7 kgf·m, 20 lbf·ft) Apply locking agent to the threads.
Gearshift drum stopper arm pivot bolt	12 N·m (1.2 kgf·m, 9 lbf·ft) Apply locking agent to the threads.

### TOOLS

Driver	07749-0010000	
Attachment, 37 x 40 mm	07746-0010200	
Attachment, 42 x 47 mm	07746-0010300	
Attachment, 52 x 55 mm	07746-0010400	
Pilot, 17 mm	07746-0040400	
Pilot, 25 mm	07746-0040600	
Bearing remover, 17 mm	07936-3710300	
Bearing remover, 20 mm	07936-3710600	
Bearing remover handle	07936-3710100	
Bearing remover weight	07741-0010201	or 07936-371020A or 07936-3710200 (U.S.A. only)

## SUB-TRANSMISSION

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### TROUBLESHOOTING

#### Hard to shift

- Bent shift forks
- Bent shift fork shaft
- Bent shift fork claw
- Damaged shift drum cam grooves
- Improperly adjusted tie-rod length of gearshift lever linkage
- Bent tie-rod of gearshift lever linkage
- Improperly installed gearshift spindle and drum

#### Transmission jumps out of gear

- Worn gear dogs
- Worn gear shifter groove
- Bent shift fork shaft
- Broken shift drum stopper arm
- Broken shift drum stopper arm spring
- Damaged shift drum center plate



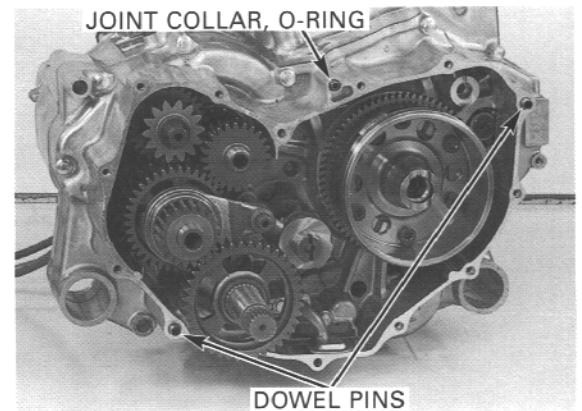
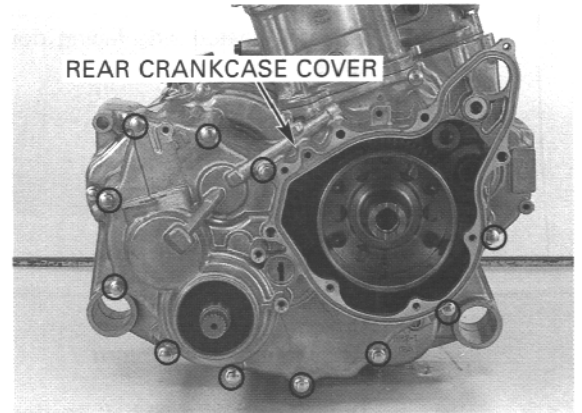
## REAR CRANKCASE COVER

### REMOVAL

Remove the following:

- engine from the frame (page 7-2)
- alternator cover (page 11-5)
- starter reduction gears and shafts (page 11-8)
- starter motor (page 21-4)
- speed sensor (page 22-8)
- gear position switch (23-27)
- engine side cover stay (page 10-2)
- eleven bolts and rear crankcase cover

- dowel pins
- oil joint collar and O-ring



### BEARING REPLACEMENT

Remove the stopper ring and output shaft oil seal. Drive the output shaft bearing out of the cover.

Remove the mainshaft and countershaft bearings using the special tools.

#### TOOLS:

##### Mainshaft bearing:

- Bearing remover, 17 mm
- Bearing remover handle
- Bearing remover weight

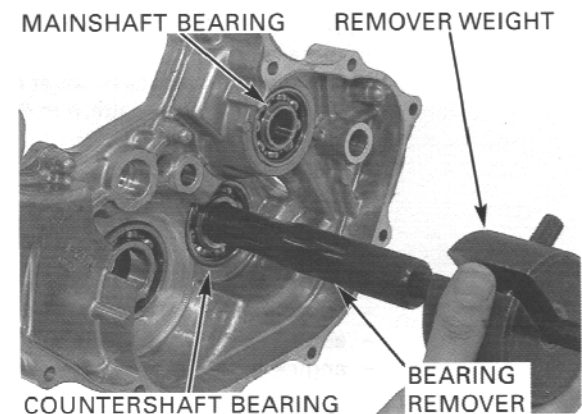
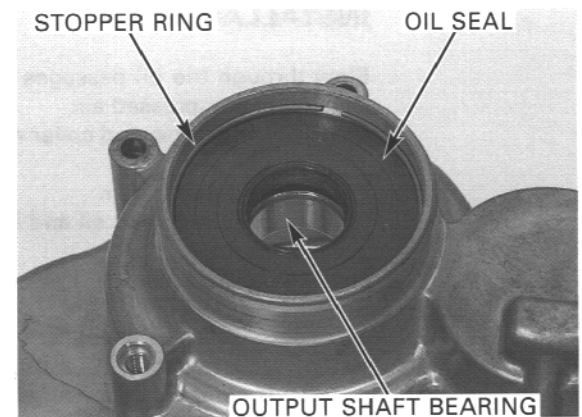
- 07936-3710300
- 07936-3710100
- 07741-0010201 or
- 07936-371020A or
- 07936-3710200
- (U.S.A. only)

##### Countershaft bearing:

##### Mainshaft bearing:

- Bearing remover, 20 mm
- Bearing remover handle
- Bearing remover weight

- 07936-3710600
- 07936-3710100
- 07741-0010201 or
- 07936-371020A or
- 07936-3710200
- (U.S.A. only).



## SUB-TRANSMISSION

Drive new mainshaft and countershaft bearings in with the sealed side facing down, using the special tools.

### TOOLS:

#### Mainshaft bearing:

Driver 07749-0010000  
Attachment, 37 x 40 mm 07746-0010200  
Pilot, 17 mm 07746-0040400

#### Countershaft bearing:

Driver 07749-0010000  
Attachment, 42 x 47 mm 07746-0010300

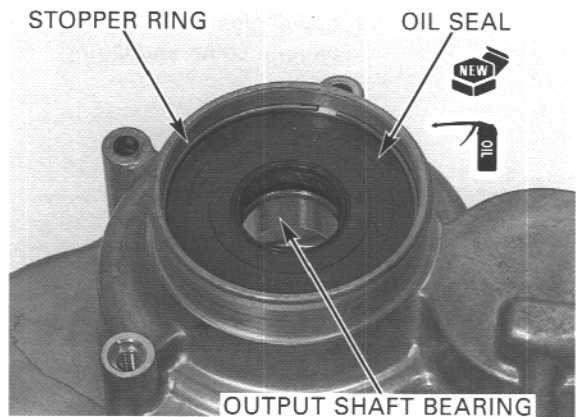
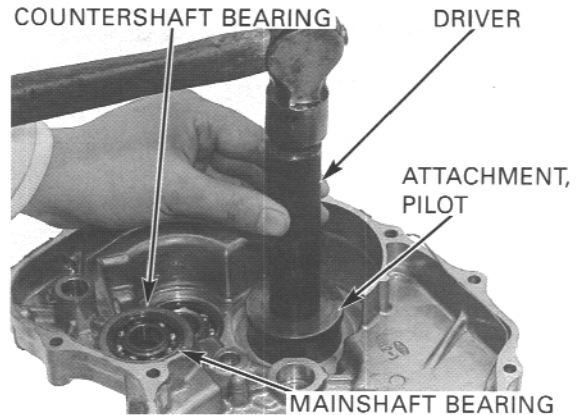
Drive a new output shaft bearing in with the markings facing up, using the special tools.

### TOOLS:

#### Mainshaft bearing:

Driver 07749-0010000  
Attachment, 52 x 55mm 07746-0010400  
Pilot, 25 mm 07746-0040600

Apply oil to a new output shaft oil seal lip.  
Drive the oil seal until the stopper ring groove in the cover is visible.  
Install the stopper ring.



## INSTALLATION

Blow through the oil passages in the rear crankcase cover with compressed air.  
Clean the crankcase and cover mating surfaces.

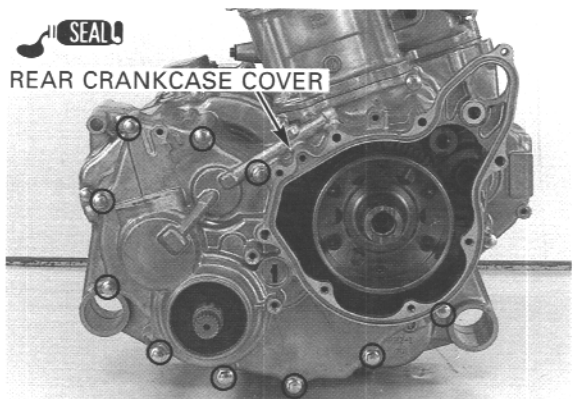
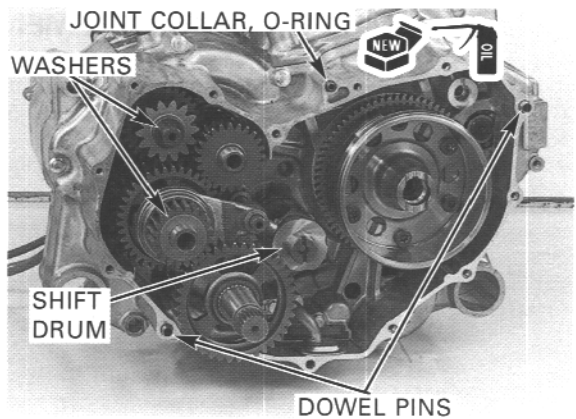
Install the oil joint collar.  
Coat a new O-ring with oil and install it onto the joint collar.  
Install the dowel pins.

Make sure that the washers are installed on the countershaft and reverse idle shaft, and the shift drum position is neutral as shown (gear position switch pin groove is in positioned lengthwise).

Apply liquid sealant to the mating surface of the rear crankcase cover.  
Install the rear crankcase cover and tighten the eleven bolts in a crisscross pattern in 2 or 3 steps.

Install the following:

- engine side cover stay (page 10-11)
- gear position switch (23-27)
- speed sensor (page 22-8)
- starter motor (page 21-9)
- starter reduction gears and shafts (page 11-11)
- alternator cover (page 11-7)
- engine in the frame (page 7-5)

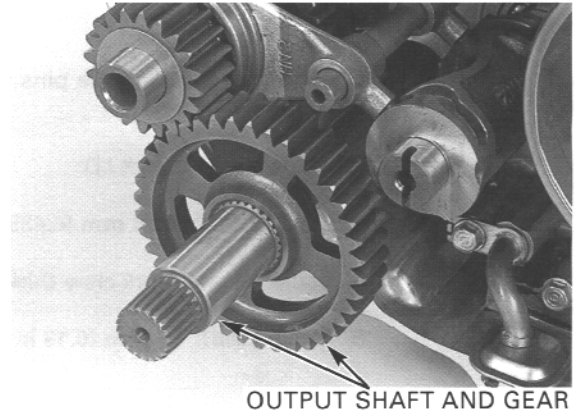


## GEARSHIFT LINKAGE

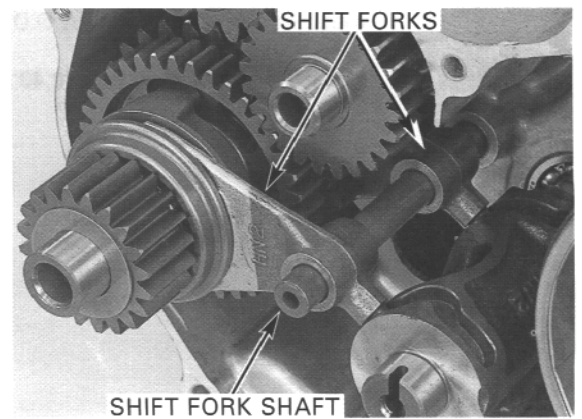
### REMOVAL

Remove the following:

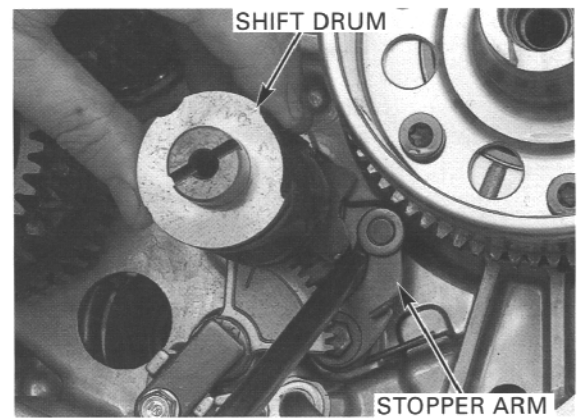
- rear crankcase cover (page 12-3).
- output shaft and driven gear from the crankcase.



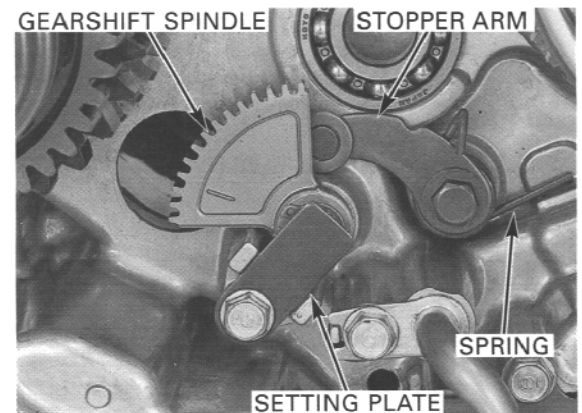
- shift fork shaft
- shift forks



- shift drum while lowering the stopper arm with a screwdriver



- bolt and setting plate
- gearshift spindle
- pivot bolt, stopper arm, washer and spring



## SUB-TRANSMISSION

### INSPECTION

Check the shift fork guide pins for abnormal wear or damage.

Measure the shift fork I.D.

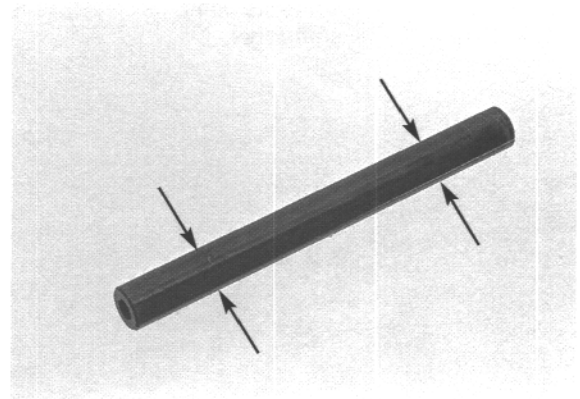
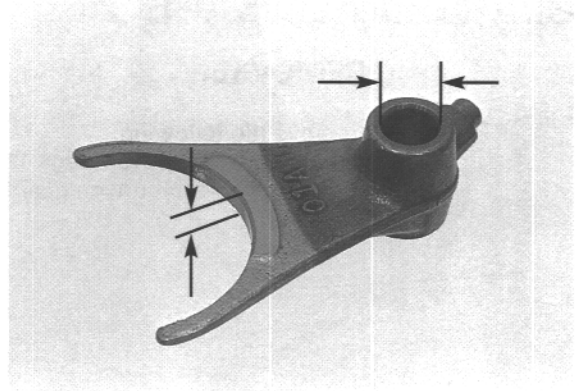
**SERVICE LIMIT: 11.04 mm (0.435 in)**

Measure the shift fork claw thickness.

**SERVICE LIMIT: 4.5 mm (0.18 in)**

Measure the shift fork shaft O.D.

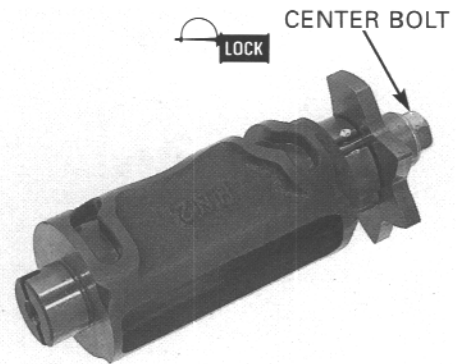
**SERVICE LIMIT: 10.96 mm (0.431 in)**



Check the shift drum guide grooves for abnormal wear or damage.

Check the shift drum center plate and shifter gear for abnormal wear or damage.

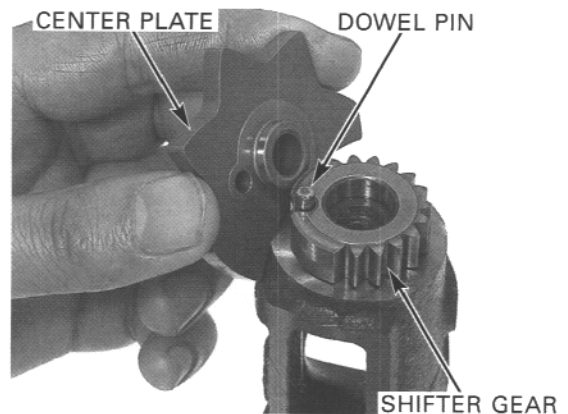
Remove the bolt, center plate, shifter gear and dowel pin if necessary.



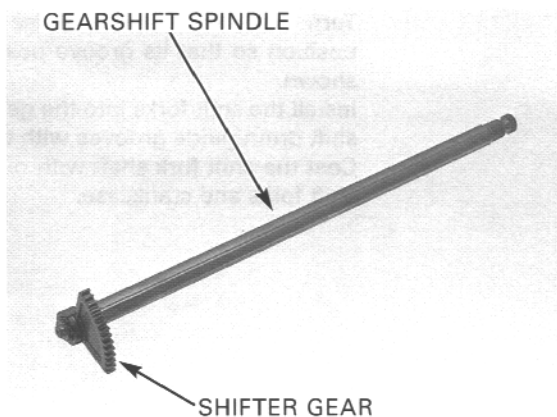
Install the dowel pin, drum shifter gear and center plate.

Apply locking agent to the drum center bolt threads. Install and tighten the bolt.

**TORQUE: 26 N·m (2.7 kgf·m, 20 lbf·ft)**



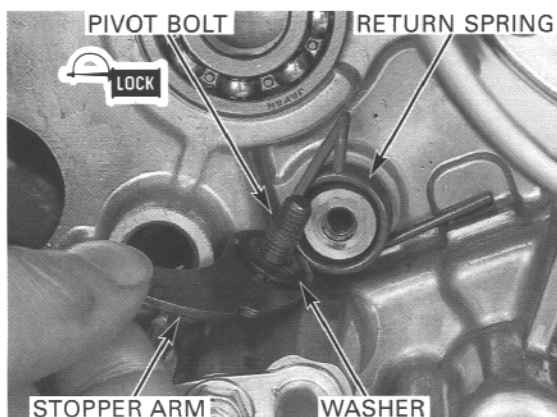
Check the gearshift spindle for bending or damage.  
Check the spindle shifter gear for abnormal wear or damage.



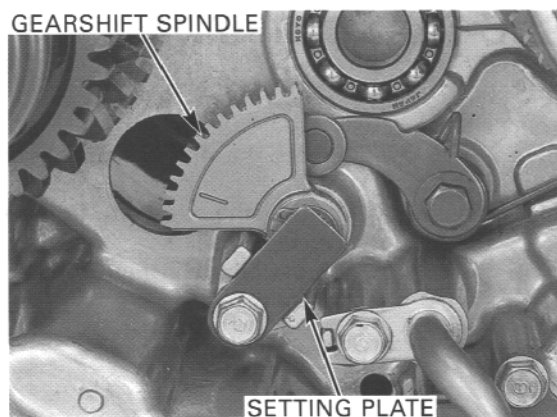
### INSTALLATION

Apply locking agent to the stopper arm pivot bolt threads.  
Install the return spring as shown.  
Install the washer, stopper arm and pivot bolt, and tighten the bolt.

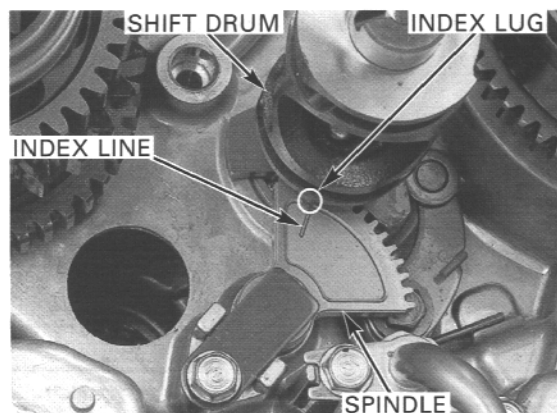
**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**



Insert the gearshift spindle into the crankcase.  
Install the setting plate and tighten the bolt securely.



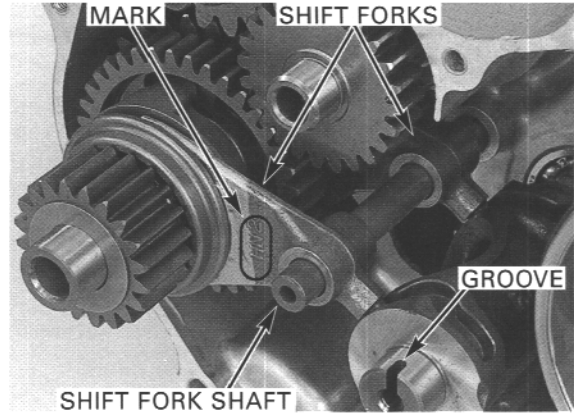
Apply oil to the shift drum guide grooves.  
Lower the stopper arm and install the shift drum by aligning the index lug on the drum with the index line on the spindle.



## SUB-TRANSMISSION

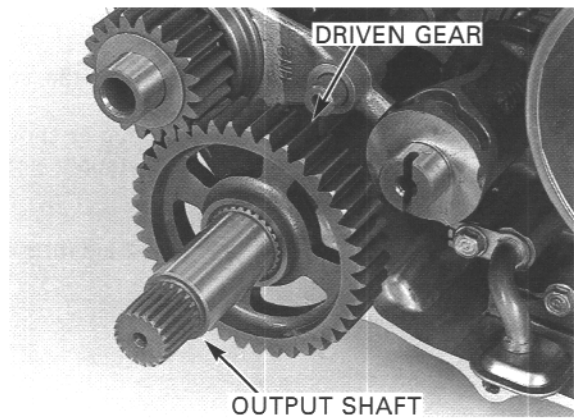
Turn the shift drum clockwise and set it in neutral position so that its groove position is lengthwise as shown.

Install the shift forks into the gear shifter grooves and shift drum guide grooves with the marks facing out. Coat the shift fork shaft with oil and insert it into the shift forks and crankcase.



Install the output shaft into the crankcase and the output driven gear onto the shaft with the large raised side facing out.

Install the rear crankcase cover (page 12-4).



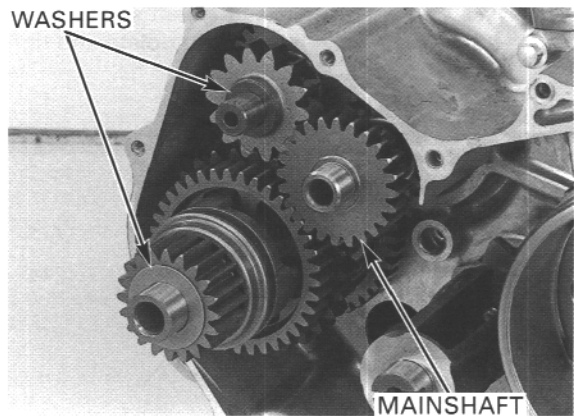
## SUB-TRANSMISSION

### DISASSEMBLY

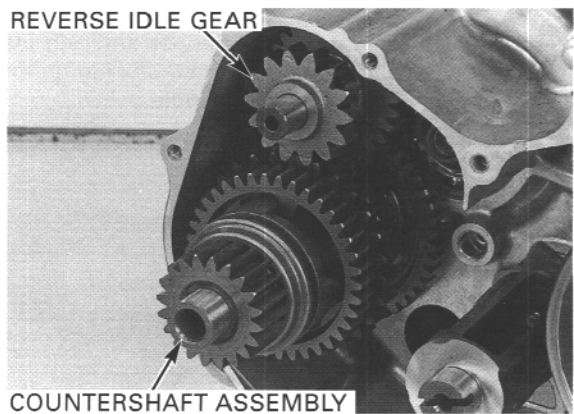
Remove the shift fork shaft and shift forks (page 12-5)

Remove the washers from the countershaft and reverse idle shaft.

Pull out the mainshaft from the automatic transmission unit.



Remove the countershaft assembly and reverse idle gear as a set.

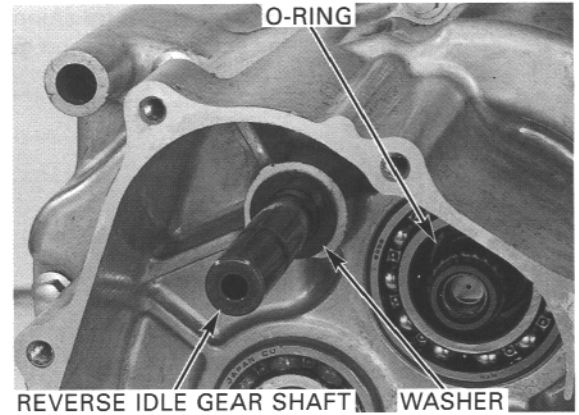


Remove the reverse idle gear shaft and washer.

Remove the O-ring from the automatic transmission unit.

Disassemble the countershaft.

Clean all disassemble parts in solvent thoroughly



**INSPECTION**

**COUNTERSHAFT**

Check the gear dogs and teeth for abnormal wear or damage.

Measure the gear I.D.

**SERVICE LIMIT: D., R., L.: 28.07 mm (1.105 in)**

Check the gear bushings for scratches or damage.

Measure the gear bushing O.D.

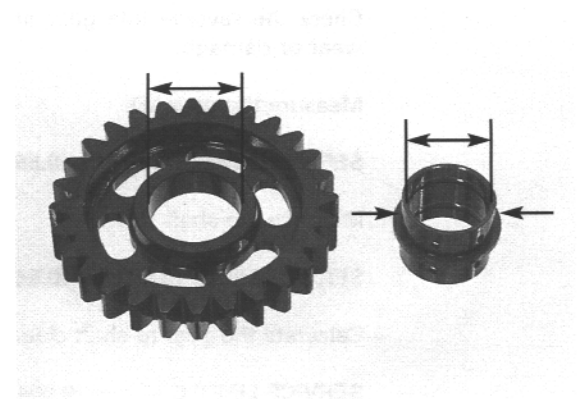
**SERVICE LIMITS: D./R./L.: 27.93 mm (1.100 in)**

Calculate the gear-to-bushing clearance.

**SERVICE LIMIT: D., R., L.: 0.10 mm (0.004 in)**

Measure the gear bushing I.D.

**SERVICE LIMIT: D./R. 25.04 mm (0.986 in)**



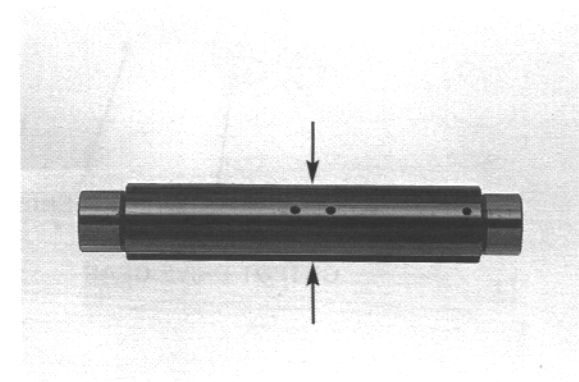
Check the countershaft for abnormal wear or damage.

Measure the countershaft O.D. at the D./R. gear bushing.

**SERVICE LIMIT: 24.93 mm (0.981 in)**

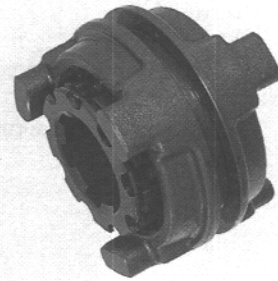
Calculate the gear bushing-to-shaft clearance.

**SERVICE LIMIT: 0.10 mm (0.004 in)**



## SUB-TRANSMISSION

Check the gear shifter for smooth operation.  
Check the shifter groove and gear dogs for abnormal wear or damage.



### REVERSE IDLE GEAR

Check the reverse idle gear and shaft for abnormal wear or damage.

Measure the gear I.D.

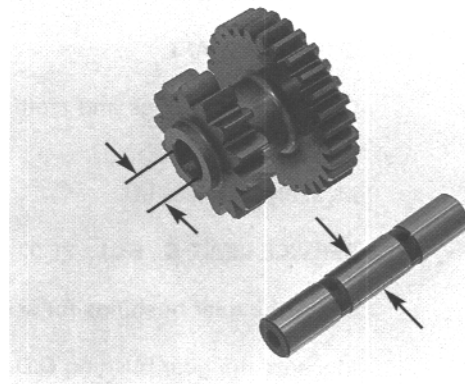
**SERVICE LIMIT: 14.04 mm (0.553 in)**

Measure the shaft O.D.

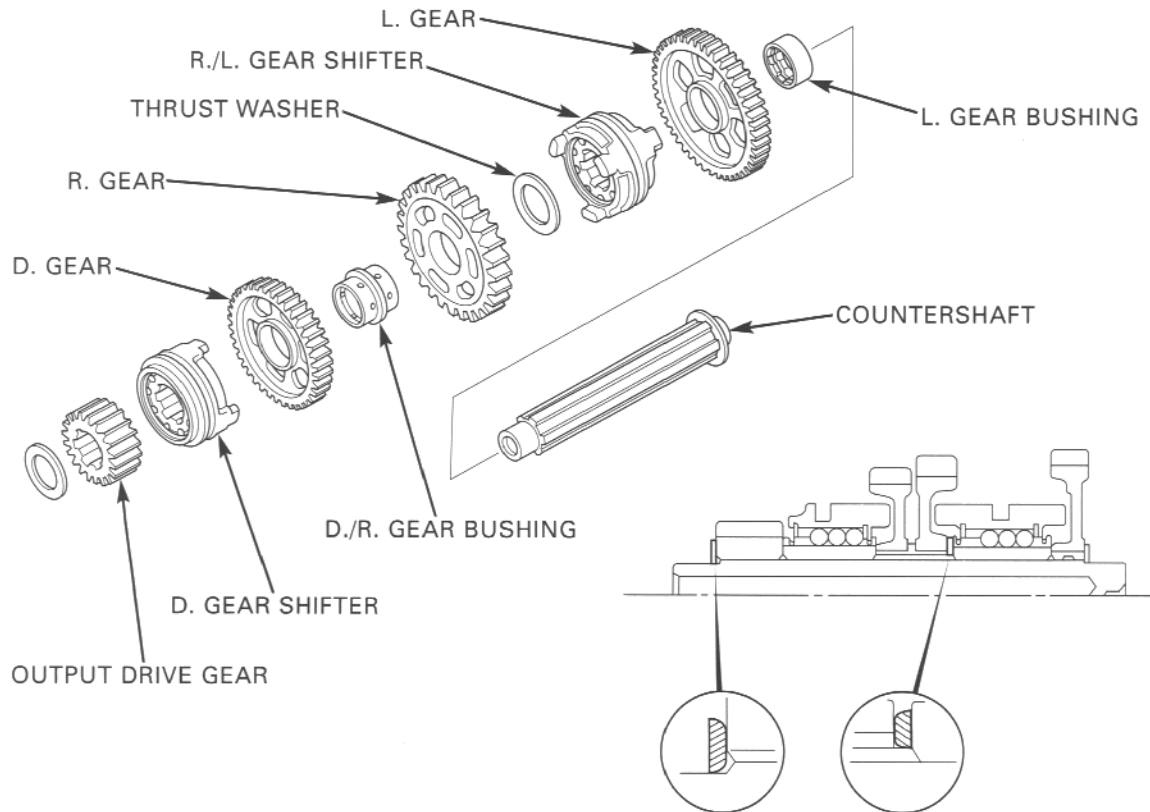
**SERVICE LIMIT: 13.93 mm (0.548 in)**

Calculate the gear-to-shaft clearance.

**SERVICE LIMIT: 0.10 mm (0.004 in)**



### ASSEMBLY

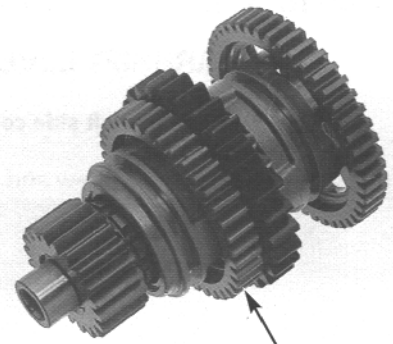




Apply molybdenum oil solution to the gear sliding surface, shifter grooves and bushings.

*Do not forget to install the washer onto the crankcase side end of the shaft.*

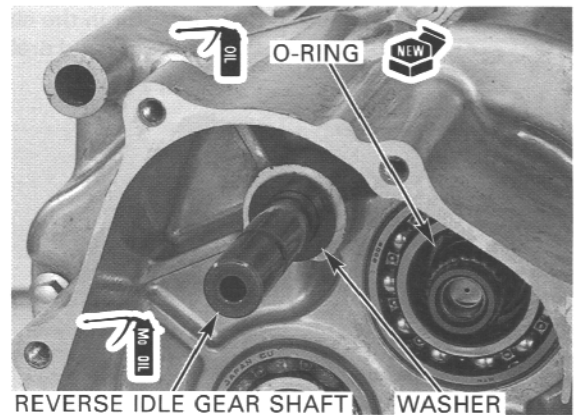
Assemble the countershaft.



COUNTERSHAFT ASSEMBLY

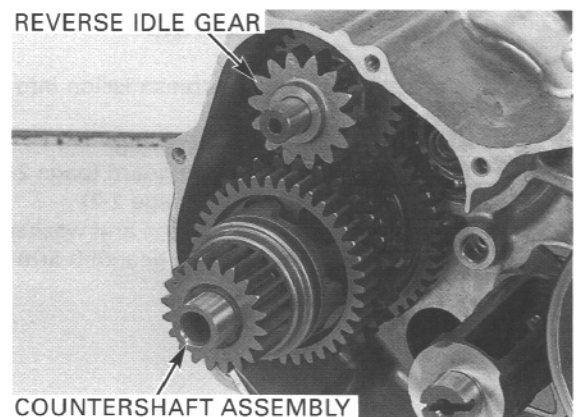
Coat a new O-ring with oil and install it into the groove in the automatic transmission unit.

Coat the reverse idle gear shaft with molybdenum oil solution and install it into the crankcase. Install the washer onto the reverse idle gear shaft.



REVERSE IDLE GEAR SHAFT WASHER

Install the countershaft assembly and reverse idle gear as a set.

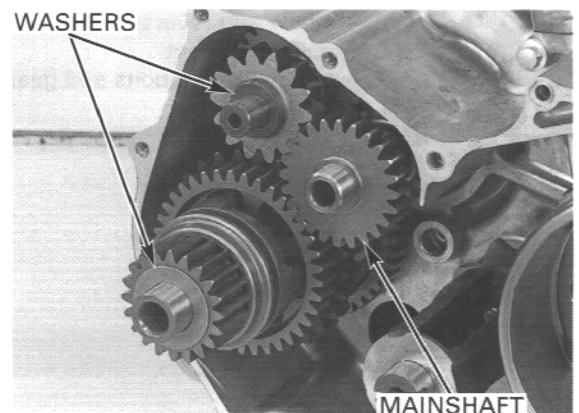


REVERSE IDLE GEAR COUNTERSHAFT ASSEMBLY

Install the mainshaft onto the automatic transmission unit and into the crankcase.

Install the washers onto the reverse idle gear shaft and countershaft.

Install the shift forks and shaft (page 12-8).



WASHERS MAINSHAFT

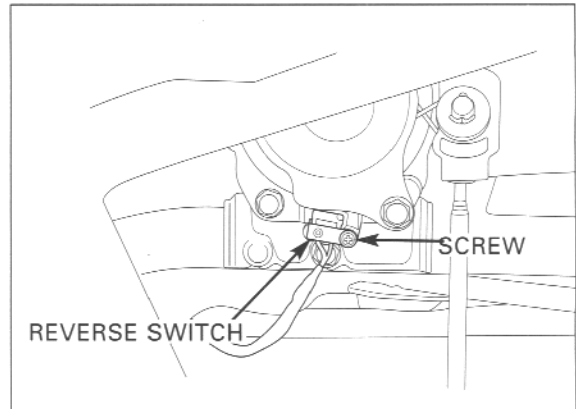
## SUB-TRANSMISSION

### GEARSHIFT LEVER LINKAGE

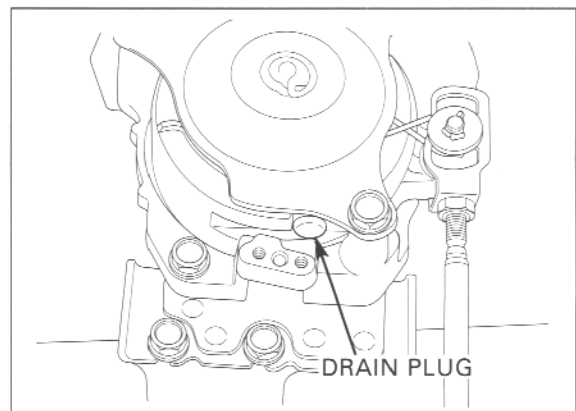
#### GEARSHIFT LEVER BOX DRAINING

Remove the left side cover (page 2-4).

Remove the screw and reverse switch.



Check if there is water in the shift lever box.  
Remove the drain plug and drain the box if necessary.

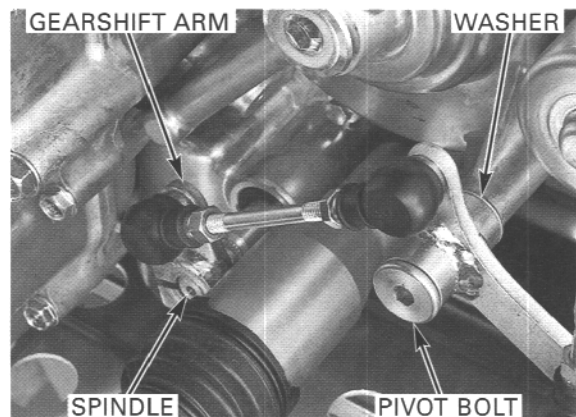


#### DISASSEMBLY

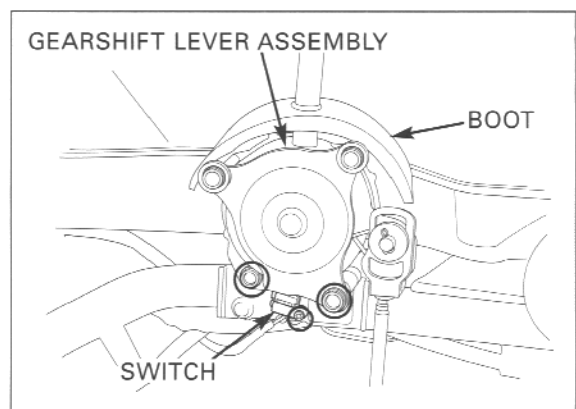
Shift the sub-transmission into neutral.

Remove the following:

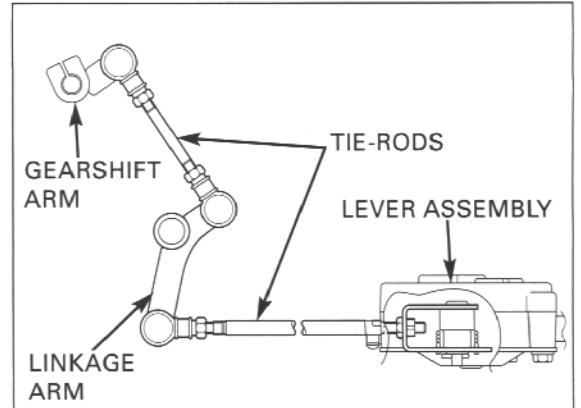
- left front mud guard (page 2-6)
- front fender (page 2-7)
- pivot bolt, O-ring and washer
- pinch bolt and gearshift arm from the spindle



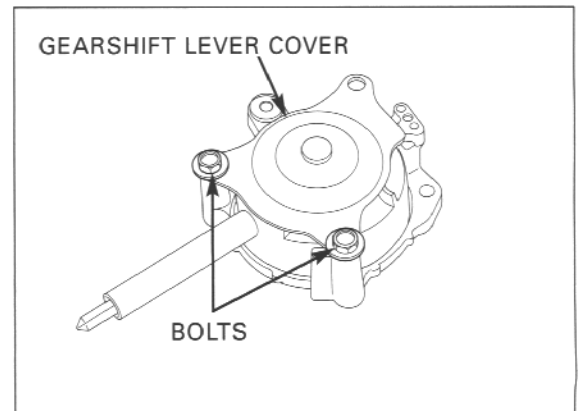
- screw and reverse switch
- shift lever boot
- two mounting bolts and gearshift lever assembly.



Loosen the lock nuts and remove the tie-rods from the gearshift arm, linkage arm and lever assembly.



Remove the two bolts and gearshift lever cover.

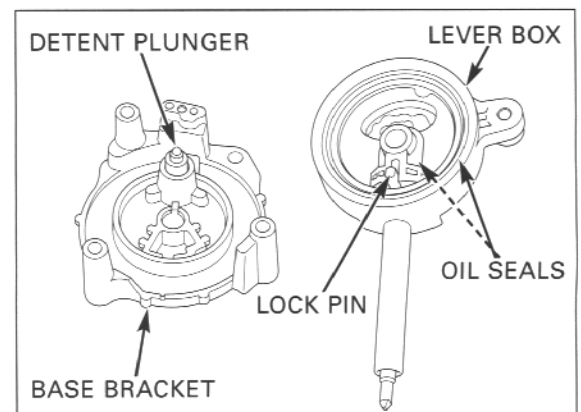


Remove the shift lever box from the base bracket.

Check that the detent plunger moves smoothly.  
Check the plunger sliding surface of the shift lever box for abnormal wear or damage.

Check the oil seals in the shift lever box for wear, deterioration or damage.

Remove the detent plunger and spring.  
Check the plunger, spring and lock pin for wear or damage.



## SUB-TRANSMISSION

### ASSEMBLY

Apply molybdenum disulfide grease to the plunger, lock pin sliding area, lever box pivot and both mating surfaces of lever box, and dust seal lips.

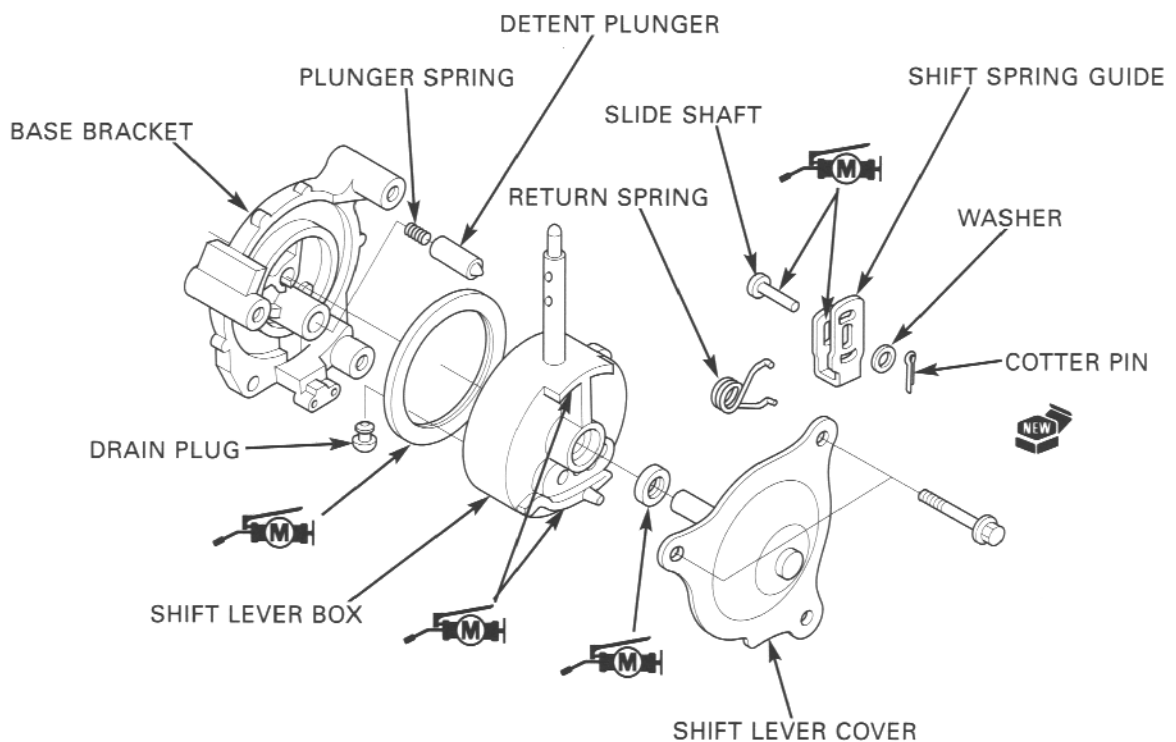
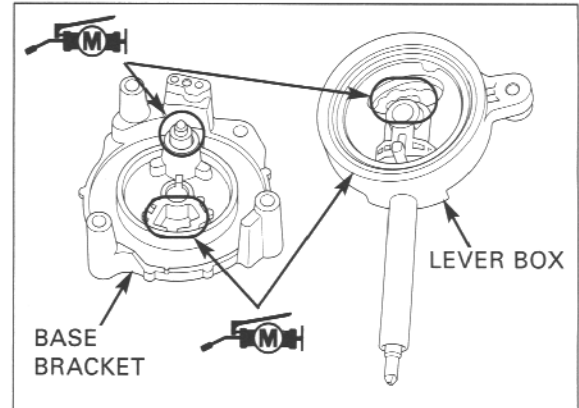
Assemble the base bracket, gearshift lever box, return spring and cover, and tighten the two bolts.

Apply molybdenum disulfide grease to the slide shaft pivot.

Install the spring guide onto the lever box by aligning its guide holes with the spring ends

Install the slide shaft from the base bracket side, and the washer and cotter pin.

*Secure the cotter pin after adjusting the tie-rod length (page 12-15).*



Install the tie-rods into the gearshift arm, linkage arm and lever assembly.

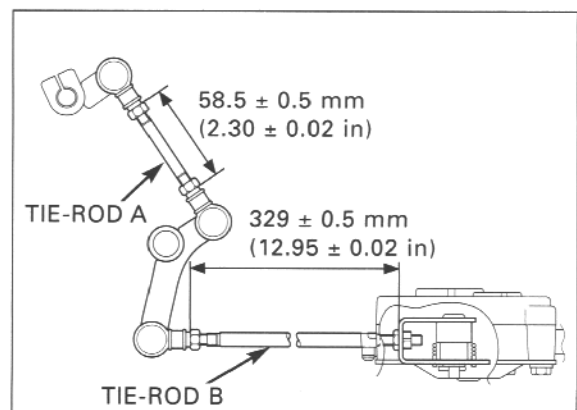
Adjust the tie-rod length to the specified value.

#### TIE-ROD LENGTH:

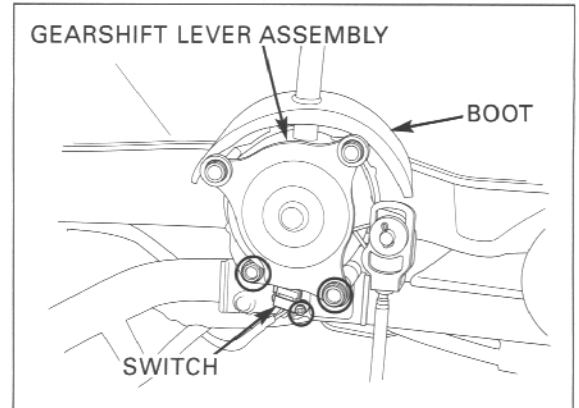
Tie-rod A:  $58.5 \pm 0.5$  mm ( $2.30 \pm 0.02$  in)

Tie-rod B:  $329.0 \pm 0.5$  mm ( $12.95 \pm 0.02$  in)

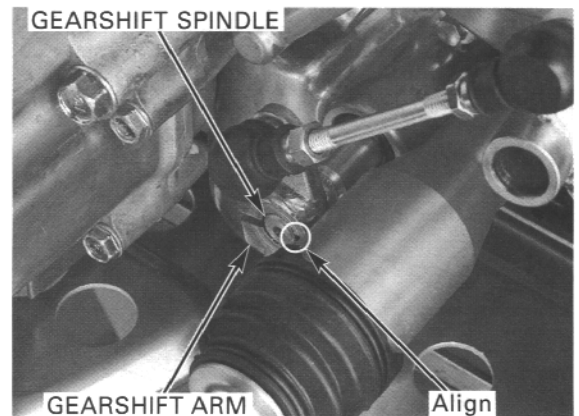
Temporarily tighten the lock nuts.



Install the gearshift lever assembly onto the frame and tighten the two bolts securely.  
 Install the shift lever boot.  
 Install the reverse switch onto the base bracket and tighten the screw.

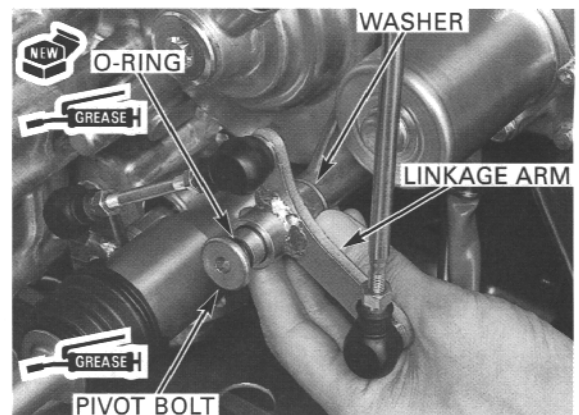


Put the gearshift lever in the neutral position.  
 Install the gearshift arm onto the gearshift spindle, aligning the groove in the arm with the wide tooth on the spindle.  
 Install and tighten the pinch bolt.



Coat a new O-rings with grease and install them onto the pivot bolt.  
 Apply grease to the pivot bolt groove and install the washer, linkage arm and pivot bolt.  
 Tighten the pivot bolt.

**TORQUE: 26 N·m (2.7 kgf·m, 20 lbf·ft)**



Remove the cotter pin and washer. Be sure to center the slide shaft of the spring guide slot when the gear position is in neutral.

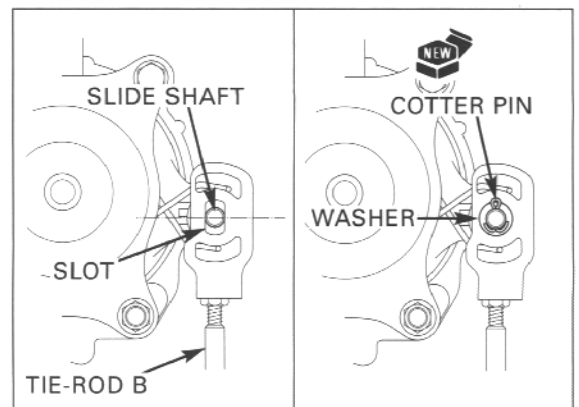
If it is not centered, loosen the lock nuts on the tie-rod B and adjust the slide shaft position by turning the tie-rod B.

Install the washer and secure the slide shaft with a new cotter pin.  
 Tighten all the tie-rod lock nuts.

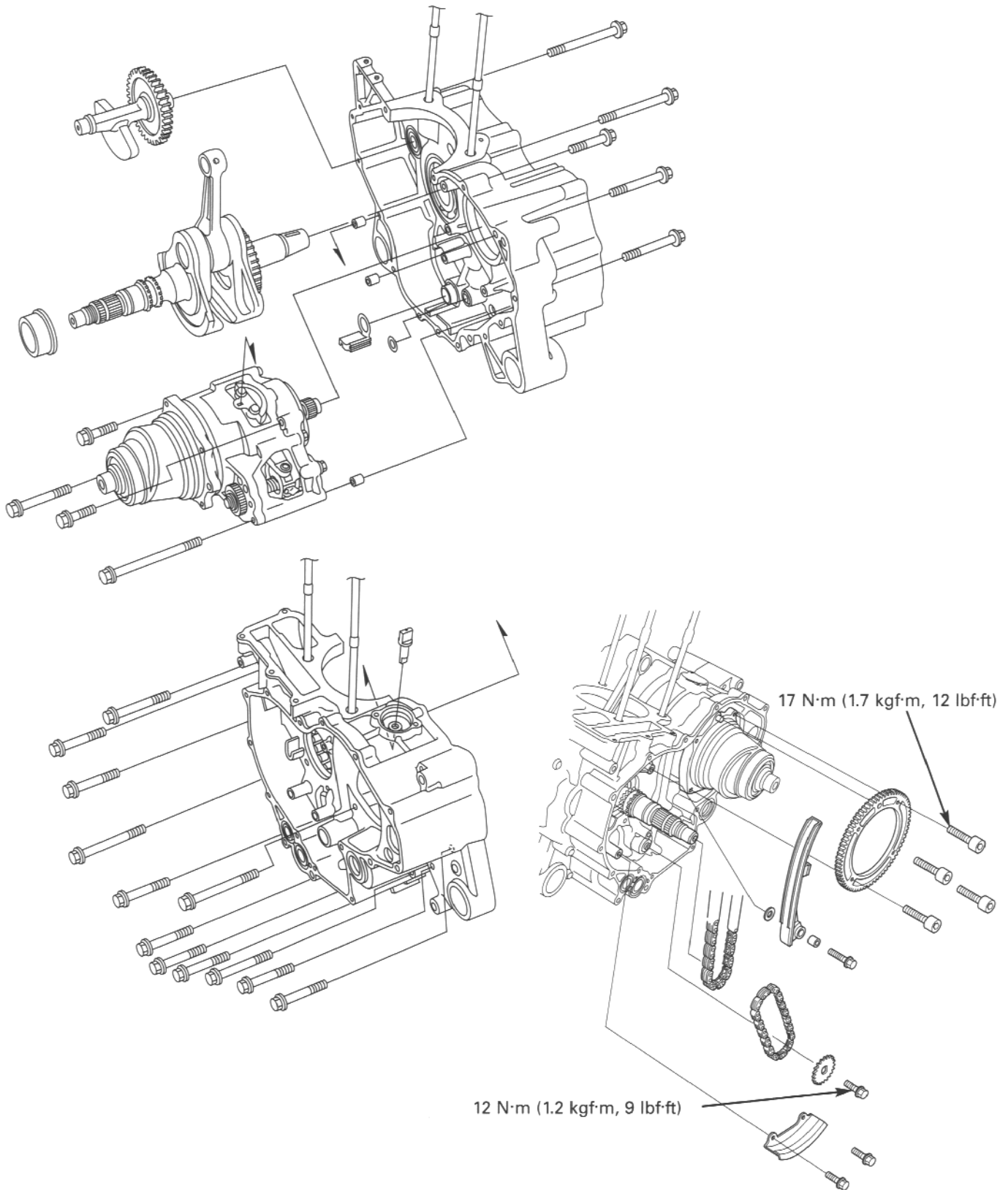
**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

Install the following:

- front fender (page 2-7)
- left front mud guard (page 2-6)



# CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT



# 13. CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

SERVICE INFORMATION	13-1	CRANKCASE BEARING REPLACEMENT	13-11
TROUBLE SHOOTING	13-3	CRANKCASE ASSEMBLY	13-12
CRANKCASE SEPARATION	13-6		
AUTOMATIC TRANSMISSION AND CRANKSHAFT	13-7		

## SERVICE INFORMATION

### GENERAL

- The crankcase halves must be separated to service the crankshaft and automatic transmission unit. To service these parts, the engine must be removed from the frame (section 7).
- For electrical system of the Hondamatic, see section 23.
- The engine oil is use for automatic transmission oil. For lubrication system service, see section 4.
- Be careful not to damage the crankcase mating surfaces when servicing.
- Cylinder head section lubricating oil is fed through the oil passage in the crankcase. Clean the oil passages before assembling the crankcase halves.
- Do not disassemble the automatic transmission unit. Replace the automatic transmission unit as an assembly when it is faulty.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Crankshaft	Runout	—	0.05 (0.002)
	Big end side clearance	0.05—0.65 (0.002—0.026)	0.8 (0.03)
	Big end radial clearance	0.006—0.018 (0.0002—0.0007)	0.05 (0.002)

13

### TORQUE VALUES

Primary driven gear bolt	17 N·m (1.7 kgf·m, 12 lbf·ft) Apply engine oil to the threads and seating surface
Oil pump driven sprocket bolt	12 N·m (1.2 kgf·m, 9 lbf·ft) Apply locking agent to the threads

## CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

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### TOOLS

Universal bearing puller	07631-0010000 or equivalent commercially available in U.S.A.
Gear holder	07724-0010100 not available in U.S.A
Driver	07749-0010000
Attachment, 37 x 40 mm	07746-0010200
Attachment, 42 X 47 mm	07746-0010300
Attachment, 52 x 55 mm	07746-0010400
Attachment, 78 x 90 mm	07GAD-SD40101
Pilot, 15 mm	07746-0040300
Pilot, 17 mm	07746-0040400
Pilot, 20 mm	07746-0040500
Pilot, 25 mm	07746-0040600
Pilot, 30 mm	07746-0040700
Pilot, 32 mm	07MAD-PR90200
Pilot, 40 mm	07746-0040900
Bearing remover, 17 mm	07936-3710300
Remover handle	07936-3710100
Remover weight	07741-0010201 or 07936-371020A or 07936-3710200 (U.S.A. only)
Bearing remover set, 20 mm	07936-3710001 not available in U.S.A.
- bearing remover, 20 mm	07936-3710600
- remover handle	07936-3710100
- remover weight	07741-0010201 or 07936-371020A or 07936-3710200 (U.S.A. only)
Crankcase assembly tool	07965-VM00000 not available in U.S.A.
- assembly collar	07965-VM00100
- assembly shaft	07965-VM00200 not available in U.S.A. or 07931-ME4010B and 07931-HB3020A
- threaded adaptor	07965-VM00300 not available in U.S.A. or 07931-KF00200



## TROUBLESHOOTING

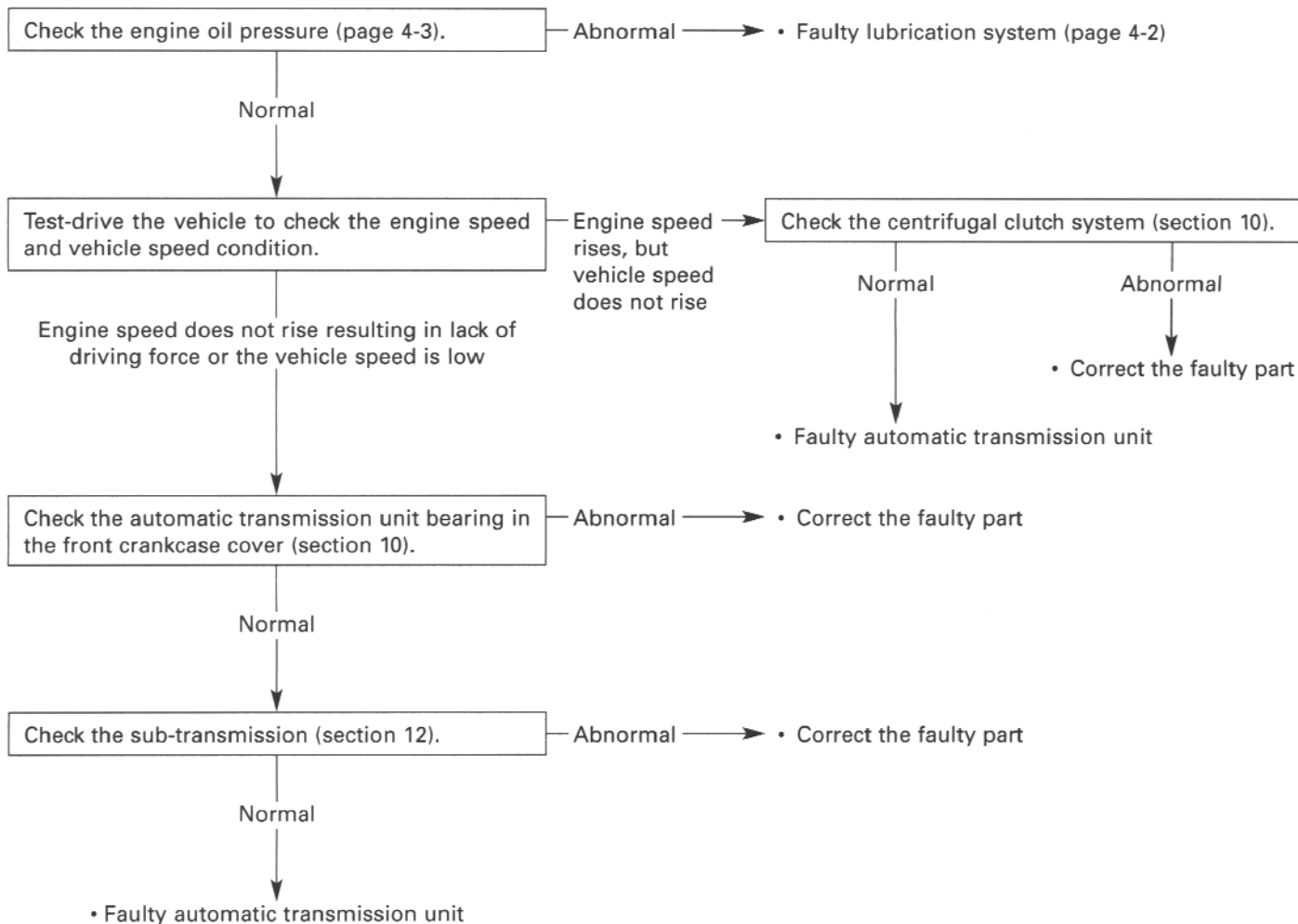
**NOTE:**

- Before starting this diagnostic troubleshooting, make sure that the gear position indicator is not blinking "--" (Electrical system of the Hondamatic is normal) and all the engine maintenance items have been performed and are within specifications.

**Faulty drive performance of the vehicle**

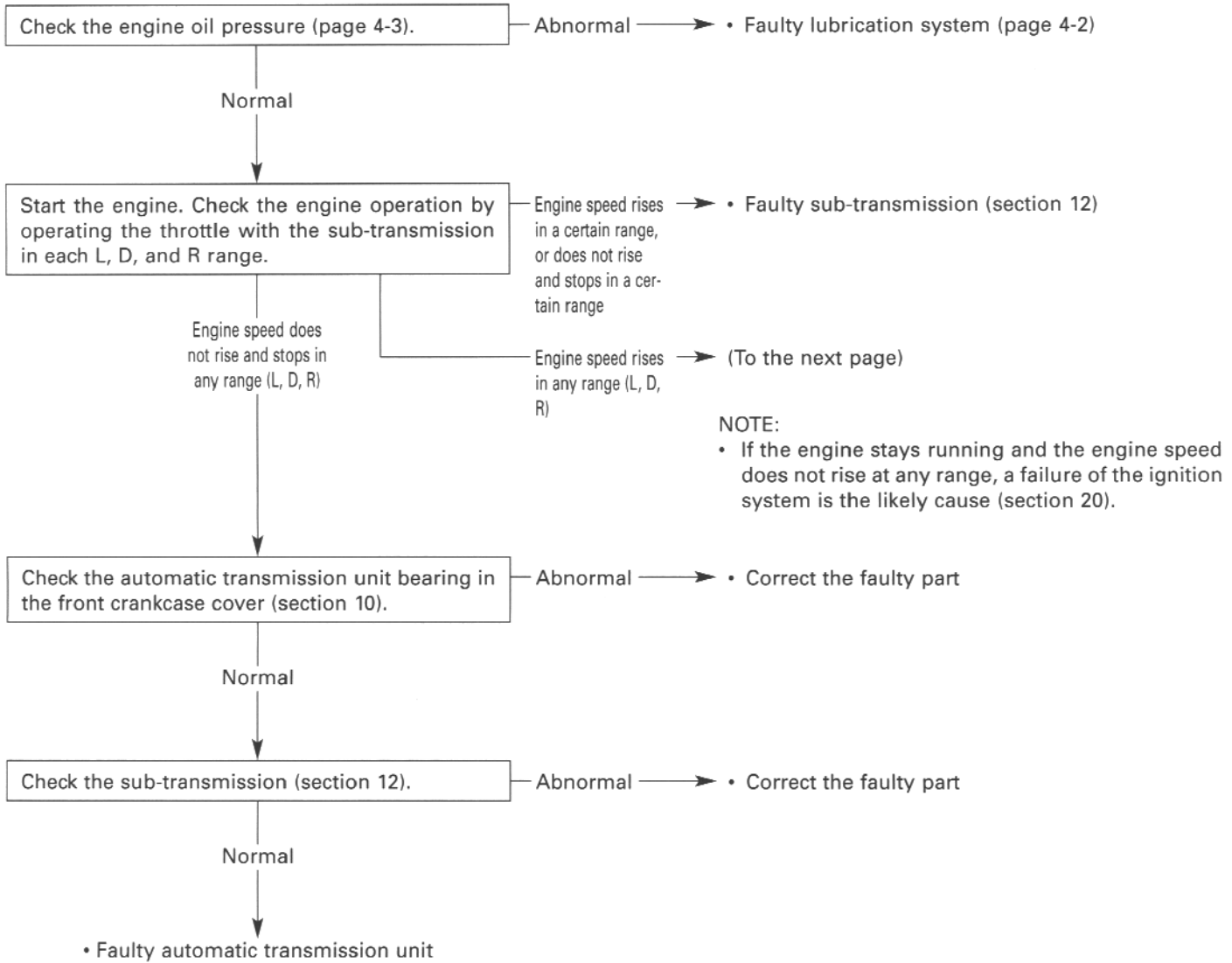
**NOTE:**

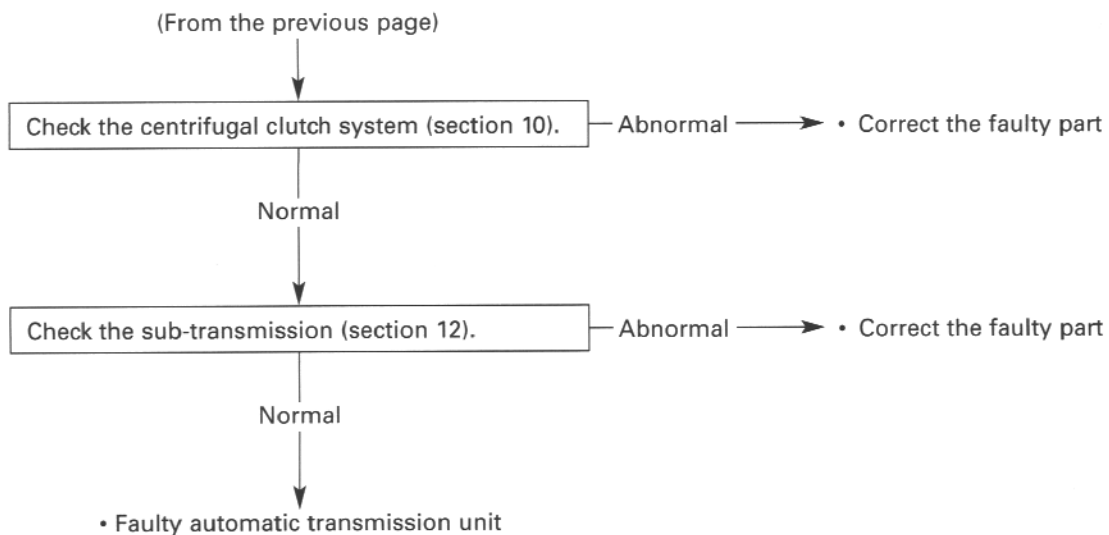
- If poor performance occurs only at vehicle maximum speed with ESP selected, angle sensor malfunction is the likely cause. Perform angle sensor inspection (page 23-29).



# CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

Vehicle does not move





### **Excessive engine noise**

- Worn or damaged connecting rod bearing
- Worn crankshaft main journal bearing
- Worn connecting rod small end
- Worn balancer bearing
- Improper balancer installation
- Worn automatic transmission unit bearings (section 10)

### **Abnormal vibration**

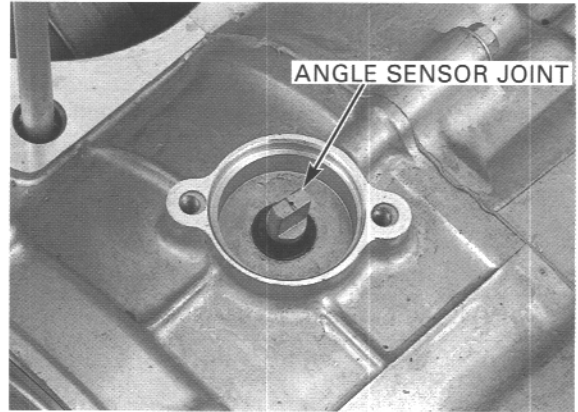
- Improper balancer timing

# CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

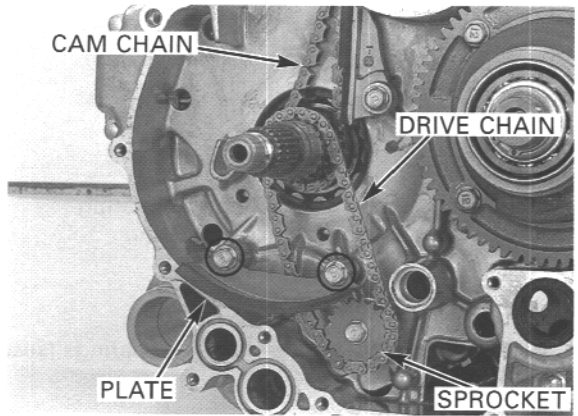
## CRANKCASE SEPARATION

Remove the following:

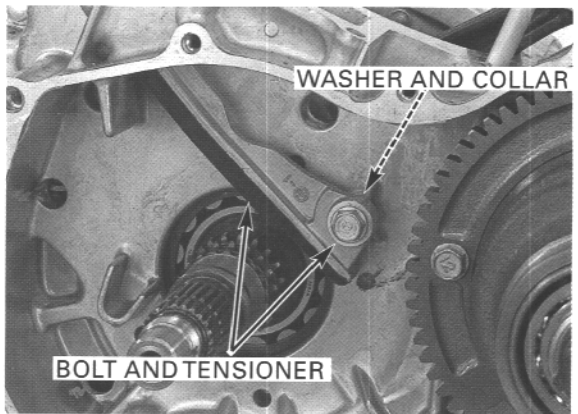
- engine (section 7)
- cylinder head and camshaft (section 8)
- cylinder and piston (section 9)
- centrifugal clutch (section 10)
- flywheel and starter clutch (section 11)
- sub-transmission and shift linkage (section 12)
- angle sensor (page 23-30)
- angle sensor joint



- two bolts and oil separation plate
- sprocket bolt
- oil pump driven sprocket and drive chain
- cam chain



- pivot bolt and cam chain tensioner
- washer and collar

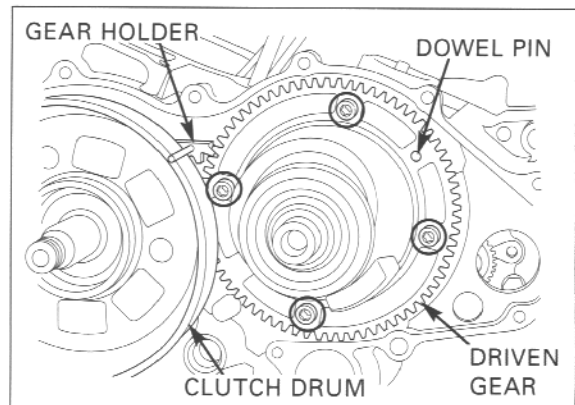


Temporarily install the clutch drum onto the crankshaft and the gear holder as shown. Loosen the four driven gear socket bolts and remove them.

**TOOL:**  
Gear holder

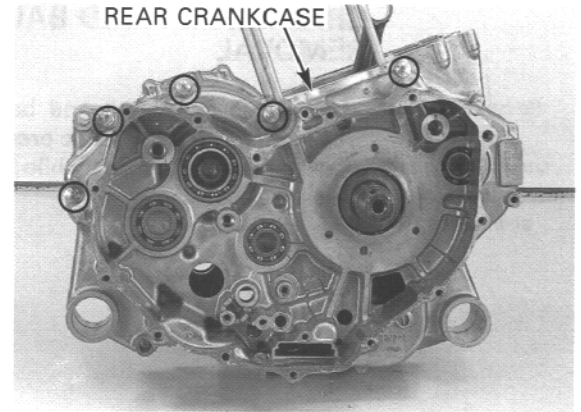
07724-0010100  
not available in U.S.A

Remove the clutch drum and the primary driven gear from the automatic transmission unit.  
Remove the dowel pin.



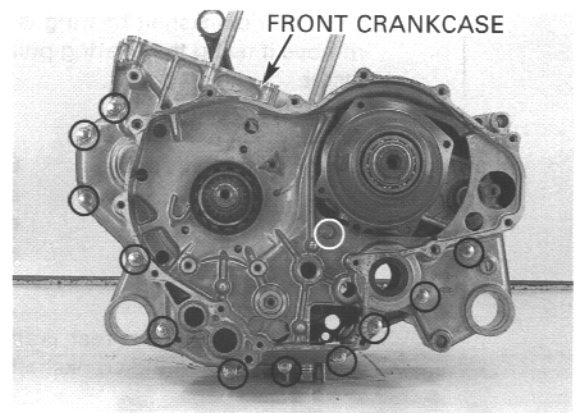
## CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

Loosen the five rear crankcase bolts in a crisscross pattern in several steps and remove them.



Loosen the twelve front crankcase bolts in a crisscross pattern in several steps and remove them.

Place the crankcase assembly with the rear crankcase down.



*You may need to rotate the outer housing of the transmission unit to remove the front crankcase. Do not pry the crankcase apart with a screwdriver.*

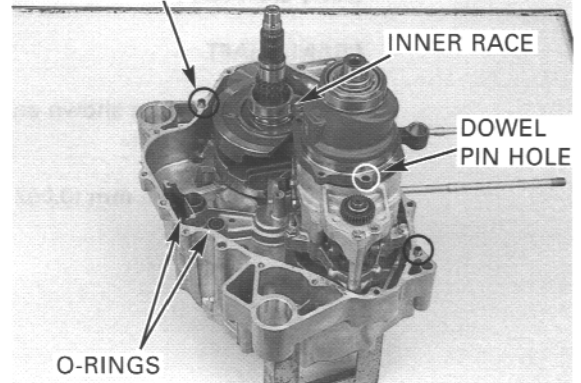
The dowel pin hole in the automatic transmission unit face to the left.

Remove the front crankcase from the rear crankcase while tapping them at several locations with a soft hammer.

Remove the following:

- front crankshaft bearing inner race
- two dowel pins
- two O-rings.

DOWEL PINS



## AUTOMATIC TRANSMISSION UNIT AND CRANKSHAFT

### AUTOMATIC TRANSMISSION UNIT REMOVAL

NOTE:

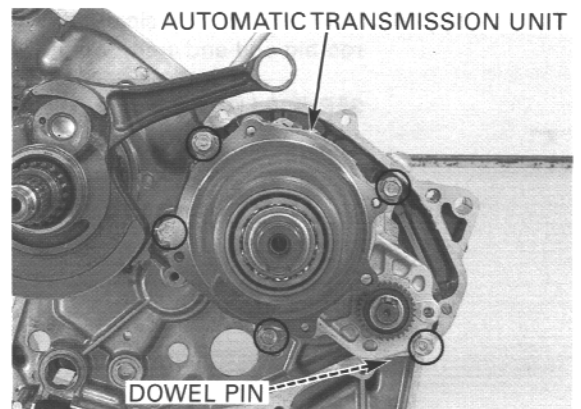
- Do not disassemble the automatic transmission unit.

Separate the crankcase (page 13-6).

Remove the five mounting bolts and the automatic transmission unit.

Remove the dowel pin.

AUTOMATIC TRANSMISSION UNIT

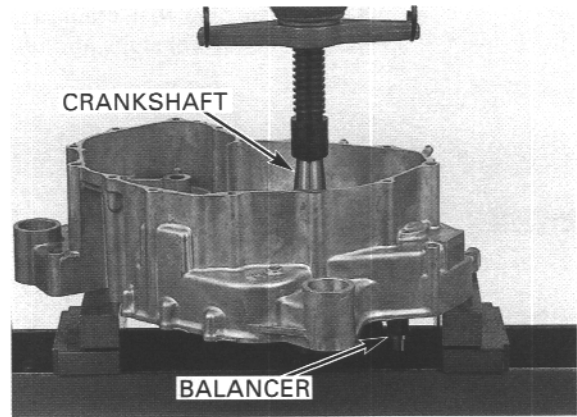


## CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

### CRANKSHAFT AND BALANCER REMOVAL

*Be careful not to damage the crankcase mating surface and crankshaft assembly.*

Remove the crankshaft and balancer from the rear crankcase using a hydraulic press. Be sure to hold the crankshaft and balancer while pressing them out of the crankcase.

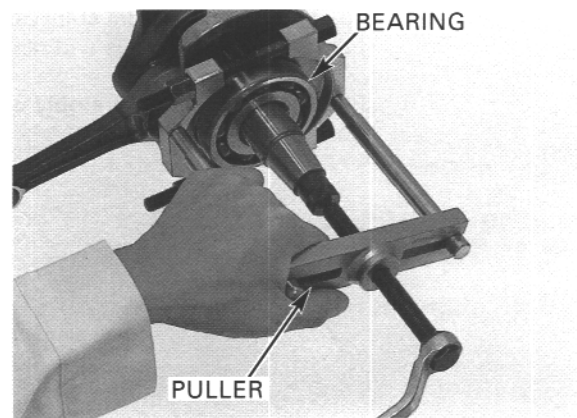


If the rear crankshaft bearing is left on the crankshaft, remove it using the bearing puller with a suitable protector.

**TOOL:**  
**Universal bearing puller**      **07631-0010000 or equivalent commercially available in U.S.A.**

**NOTE:**

- Always replace the rear crankshaft bearing with a new one when the crankshaft is removed.

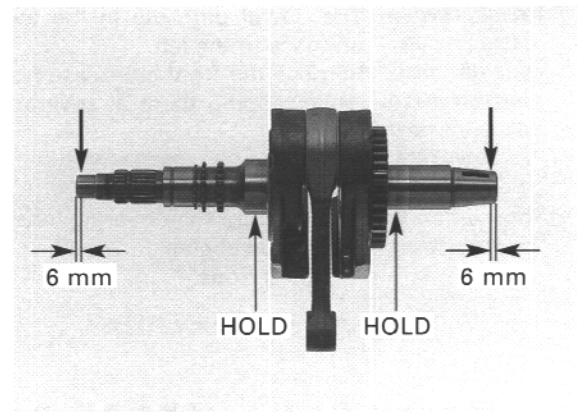


### INSPECTION

#### CRANKSHAFT

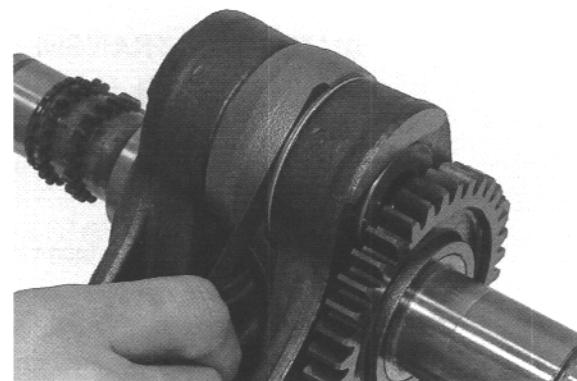
Set the crankshaft as shown and measure the runout using a dial indicator.

**SERVICE LIMIT: 0.05 mm (0.002 in)**



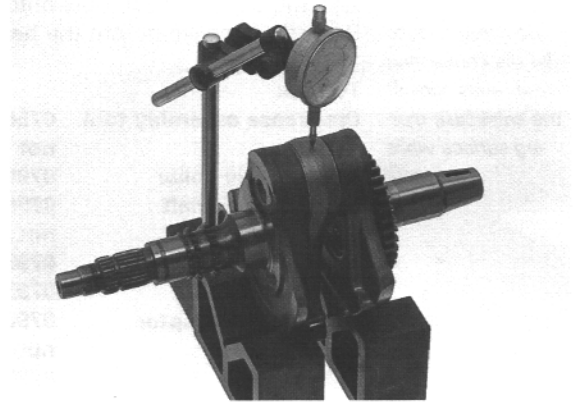
Measure the side clearance between the connecting rod big end and crank weight with a feeler gauge.

**SERVICE LIMIT: 0.8 mm (0.03 in)**



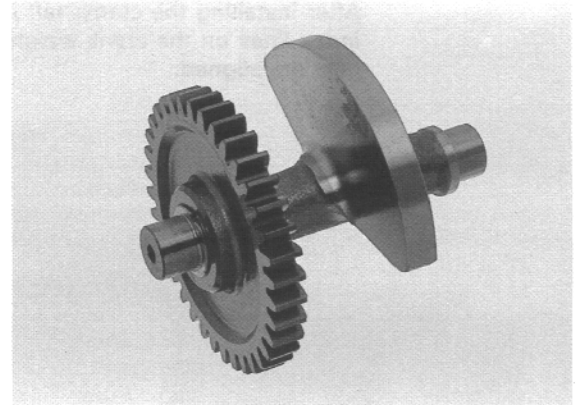
Measure the radial clearance at the connecting rod big end in an X and Y directions.

**SERVICE LIMIT: 0.05 mm (0.002 in)**



### BALANCER

Check the balancer gear for wear or damage.



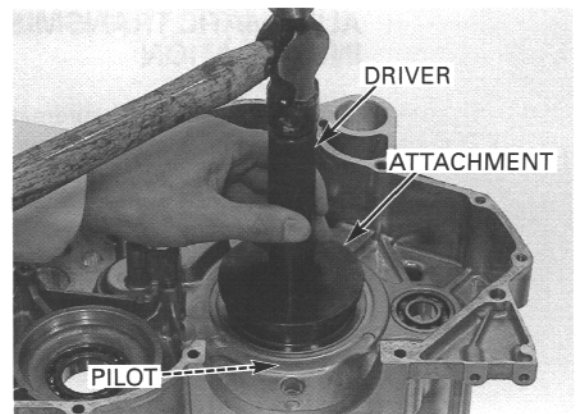
### CRANKSHAFT AND BALANCER INSTALLATION

Apply engine oil to a new rear crankshaft bearing. Drive the crankshaft bearing into the rear crankcase with the marking side facing up.

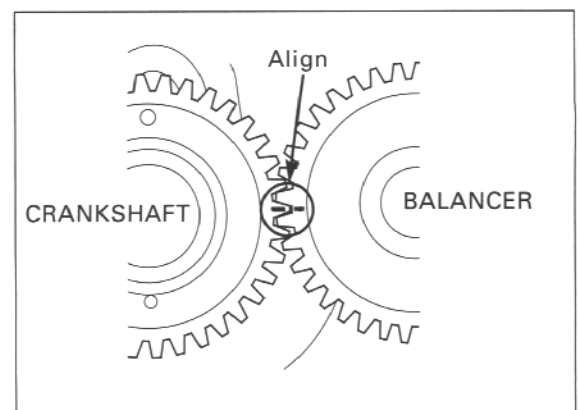
#### TOOLS:

Driver	07749-0010000
Attachment, 78 x 90 mm	07GAD-SD40101
Pilot, 32 mm	07MAD-PR90200

For front crankshaft bearing replacement, see page 13-11.



Engage the balancer and crankshaft by aligning the index lines on the side surfaces of the balancer drive and driven gears and install the crankshaft and balancer together into the rear crankcase.



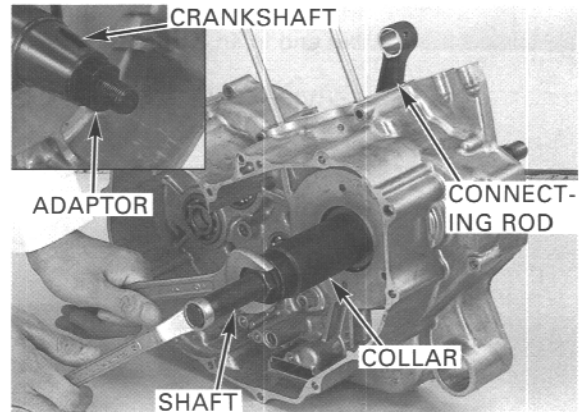
## CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

*Be careful not to let the connecting rod press against the crankcase mating surface while drawing.*

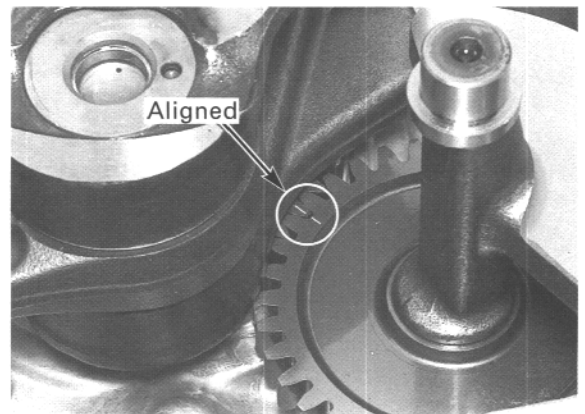
Assemble the special tools onto the crankshaft.  
Draw the crankshaft into the bearing inner race.

### TOOLS:

- Crankcase assembly tool** 07965-VM00000  
not available in U.S.A.  
07965-VM00100  
07965-VM00200  
not available in U.S.A. or  
07931-ME4010B and  
07931-HB3020A  
07965-VM00300  
not available in U.S.A. or  
07931-KF00200
- assembly collar
  - assembly shaft
  
  - threaded adaptor



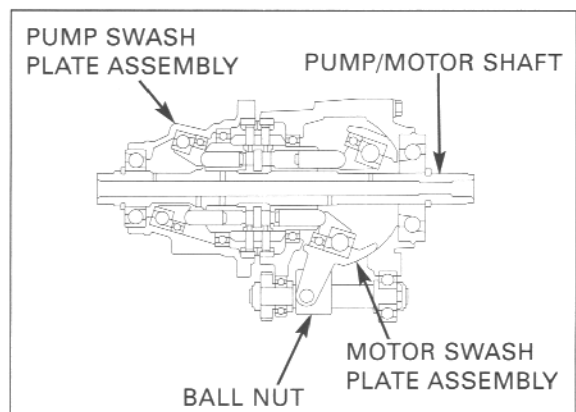
After installing the crankshaft in, make sure that the index lines on the crank weight and balancer driven gear are aligned.



## AUTOMATIC TRANSMISSION UNIT INSTALLATION

Before installing the automatic transmission unit, check the following components for smooth operation.

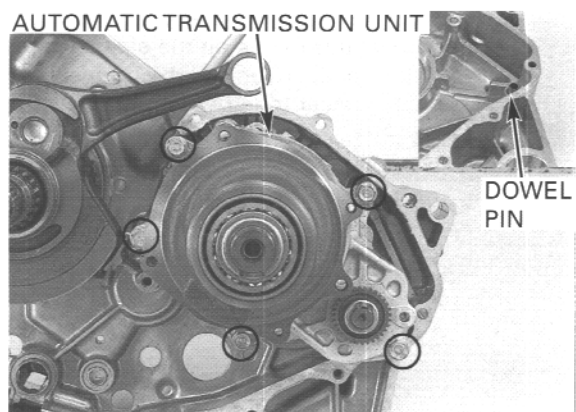
- rotation of the pump swash plate assembly
- rotation of the pump/motor shaft
- movement of the motor swash plate assembly and ball nut



Install the dowel pin into the rear crankcase.

Install the automatic transmission unit and tighten the five mounting bolts.

Assemble the crankcase halves (page 13-12).





## CRANKCASE BEARING REPLACEMENT

### REAR CRANKCASE

Remove the shift drum and countershaft bearings with the special tools.

**TOOLS:**

**Shift drum bearing:**

<b>Bearing remover, 17 mm</b>	07936-3710300
<b>Remover handle</b>	07936-3710100
<b>Sliding weight</b>	07741-0010201 or 07936-371020A or 07936-3710200

**Countershaft bearing:**

<b>Bearing remover set, 20 mm</b>	07936-3710001	not available in U.S.A.
— bearing remover, 20 mm	07936-3710600	
— remover handle	07936-3710100	
— sliding weight	07741-0010201 or 07936-371020A or 07936-3710200	

Drive the mainshaft and balancer bearings out of the rear crankcase.

Apply engine oil to new bearings.  
Drive the following bearings in with the marking side facing up using the special tools.

**TOOLS:**

**Mainshaft bearing:**

<b>Driver</b>	07749-0010000
<b>Attachment, 52 x 55 mm</b>	07746-0010400
<b>Pilot, 30 mm</b>	07746-0040700

*Be sure to press the bearing in evenly and flush with the surface.*

**Countershaft bearing:**

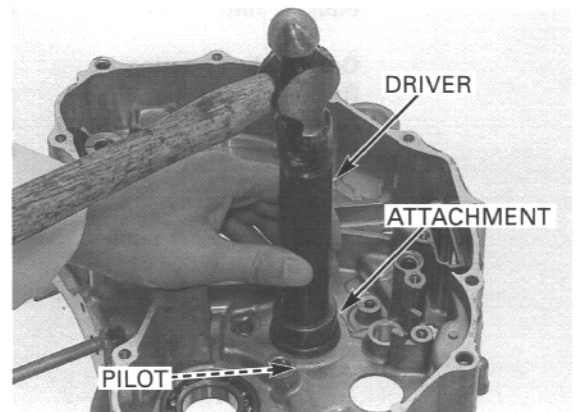
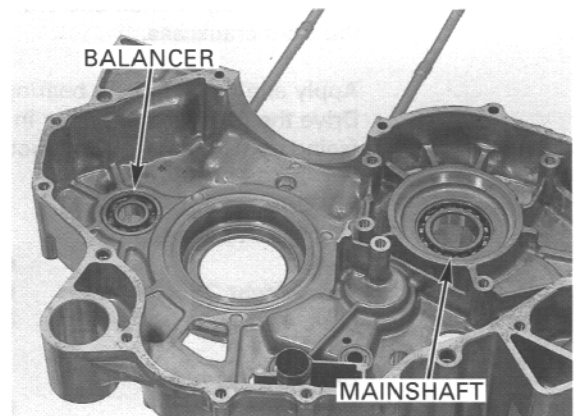
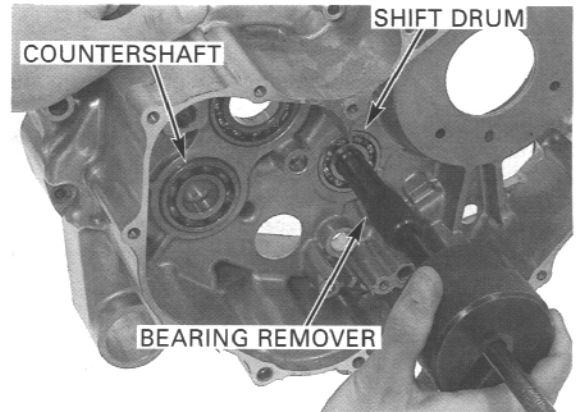
<b>Driver</b>	07749-0010000
<b>Attachment, 42 X 47 mm</b>	07746-0010300

**Shift drum bearing:**

<b>Driver</b>	07749-0010000
<b>Attachment, 37 x 40 mm</b>	07746-0010200
<b>Pilot, 17 mm</b>	07746-0040400

**Balancer bearing:**

<b>Driver</b>	07749-0010000
<b>Attachment, 37 x 40 mm</b>	07746-0010200
<b>Pilot, 15 mm</b>	07746-0040300



## CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

### FRONT CRANKCASE

Remove the oil pump (page 4-9).

Remove the balancer bearing with the special tools.

#### TOOLS:

<b>Balancer bearing:</b>	
<b>Bearing remover, 17 mm</b>	07936-3710300
<b>Remover handle</b>	07936-3710100
<b>Sliding weight</b>	07741-0010201 or 07936-371020A or 07936-3710200

Remove the output shaft oil seal.  
Drive the output shaft and crankshaft bearings out of the front crankcase.

Apply engine oil to new bearings.  
Drive the following bearings in with the marking side facing up using the special tools.

#### TOOLS:

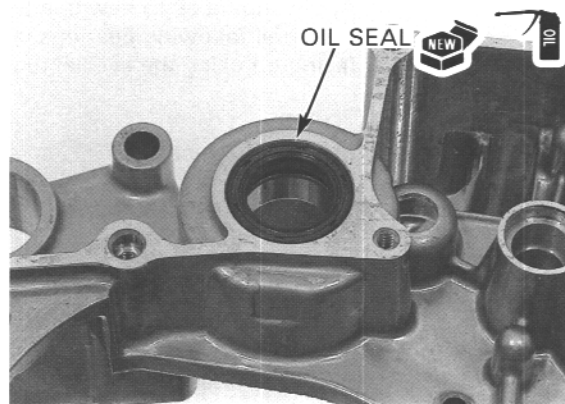
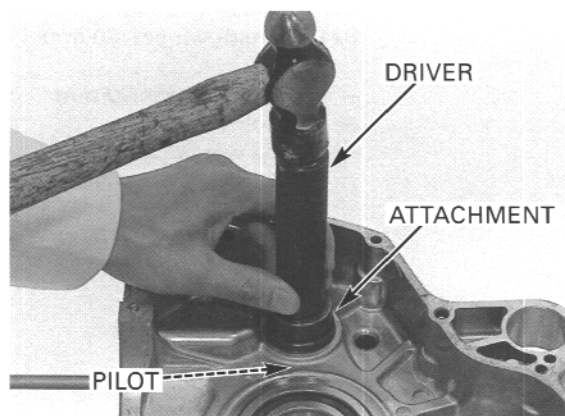
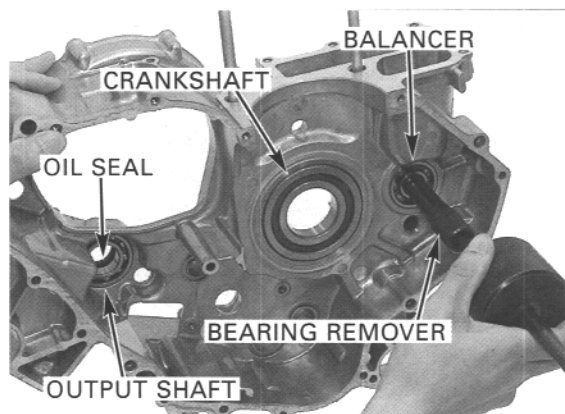
<b>Crankshaft bearing:</b>	
<b>Driver</b>	07749-0010000
<b>Attachment, 78 x 90 mm</b>	07GAD-SD40101
<b>Pilot, 40 mm</b>	07746-0040900

<b>Balancer bearing:</b>	
<b>Driver</b>	07749-0010000
<b>Attachment, 37 x 40 mm</b>	07746-0010200
<b>Pilot, 17 mm</b>	07746-0040400

<b>Output shaft bearing:</b>	
<b>Driver</b>	07749-0010000
<b>Attachment, 42 X 47 mm</b>	07746-0010300
<b>Pilot, 25 mm</b>	07746-0040600

Apply engine oil to a new output shaft oil seal lips and install it until it is flush with the crankcase.

Install the oil pump (page 4-13).

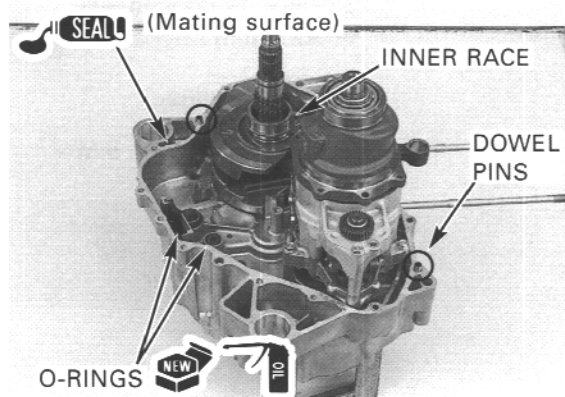


## CRANKCASE ASSEMBLY

Clean the front and rear crankcase mating surfaces thoroughly, being careful not to damage them.  
Blow through the oil passage in the rear crankcase with compressed air.

Install the bearing inner race onto the crankshaft with the flange side facing in.  
Apply engine oil to new O-rings and install them into the grooves in the rear crankcase.

Apply liquid sealant to the mating surface of the crankcase.  
Install the two dowel pins.

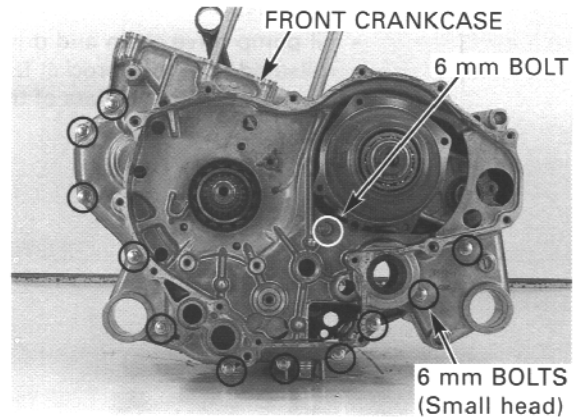


## CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

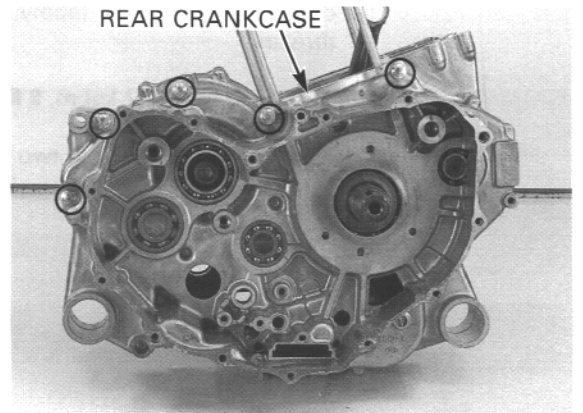
*Be careful not to interfere the front crankcase with the automatic transmission unit.*

Install the front crankcase over the rear crankcase.

Install the twelve front crankcase bolts and tighten them in a crisscross pattern in 2 or 3 steps.



Install the five rear crankcase bolts and tighten them in a crisscross pattern in 2 or 3 steps.



Install the dowel pin and primary driven gear. Apply engine oil to the driven gear bolt threads and seating surface, and install them.

Temporarily install the clutch drum and the gear holder.

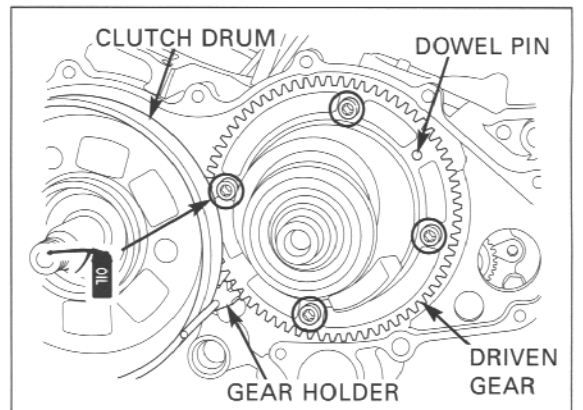
**TOOL:**

**Gear holder**

**07724-0010100**  
**not available in U.S.A**

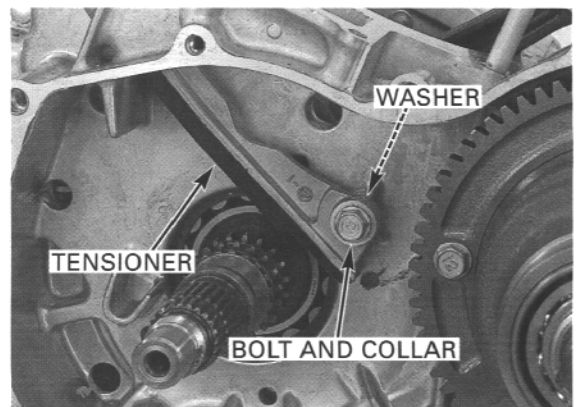
Tighten the four driven gear bolts in a crisscross pattern in 2 or 3 steps.

**TORQUE: 17 N·m (1.7 kgf·m, 12 lbf·ft)**



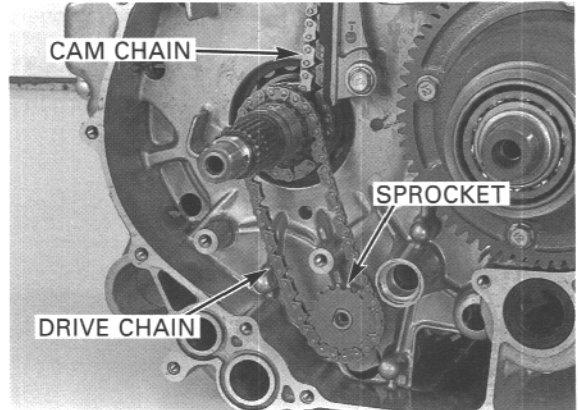
Install the following:

- pivot collar (into the tensioner pivot)
- cam chain tensioner with bolt and washer (between the tensioner and crankcase)



## CRANKSHAFT/AUTOMATIC TRANSMISSION UNIT

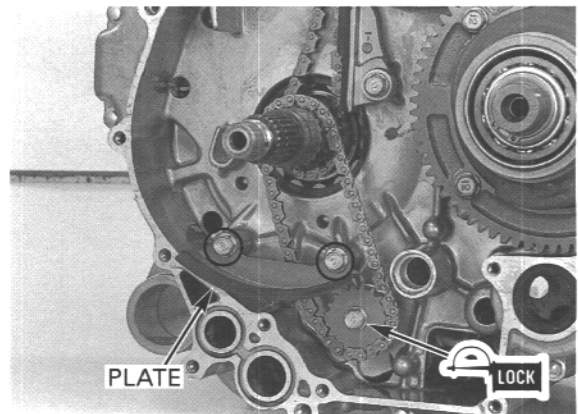
- cam chain
- oil pump drive chain and driven sprocket (with the rolled edge of the sprocket facing to the crankcase, and by aligning the flats of the sprocket and pump shaft)



- driven sprocket bolt (apply locking agent to the threads)

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

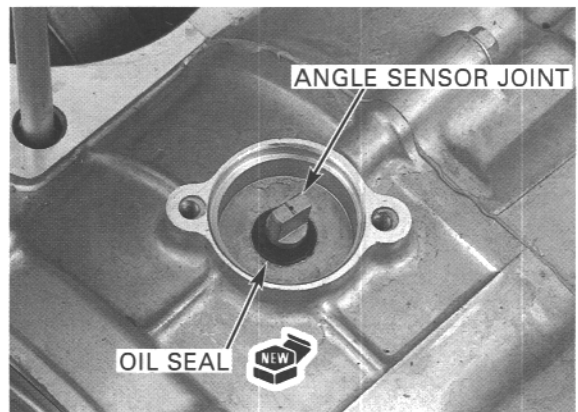
- oil separation plate with two bolts



- new oil seal (do not apply oil)
- angle sensor joint

Install the removed parts:

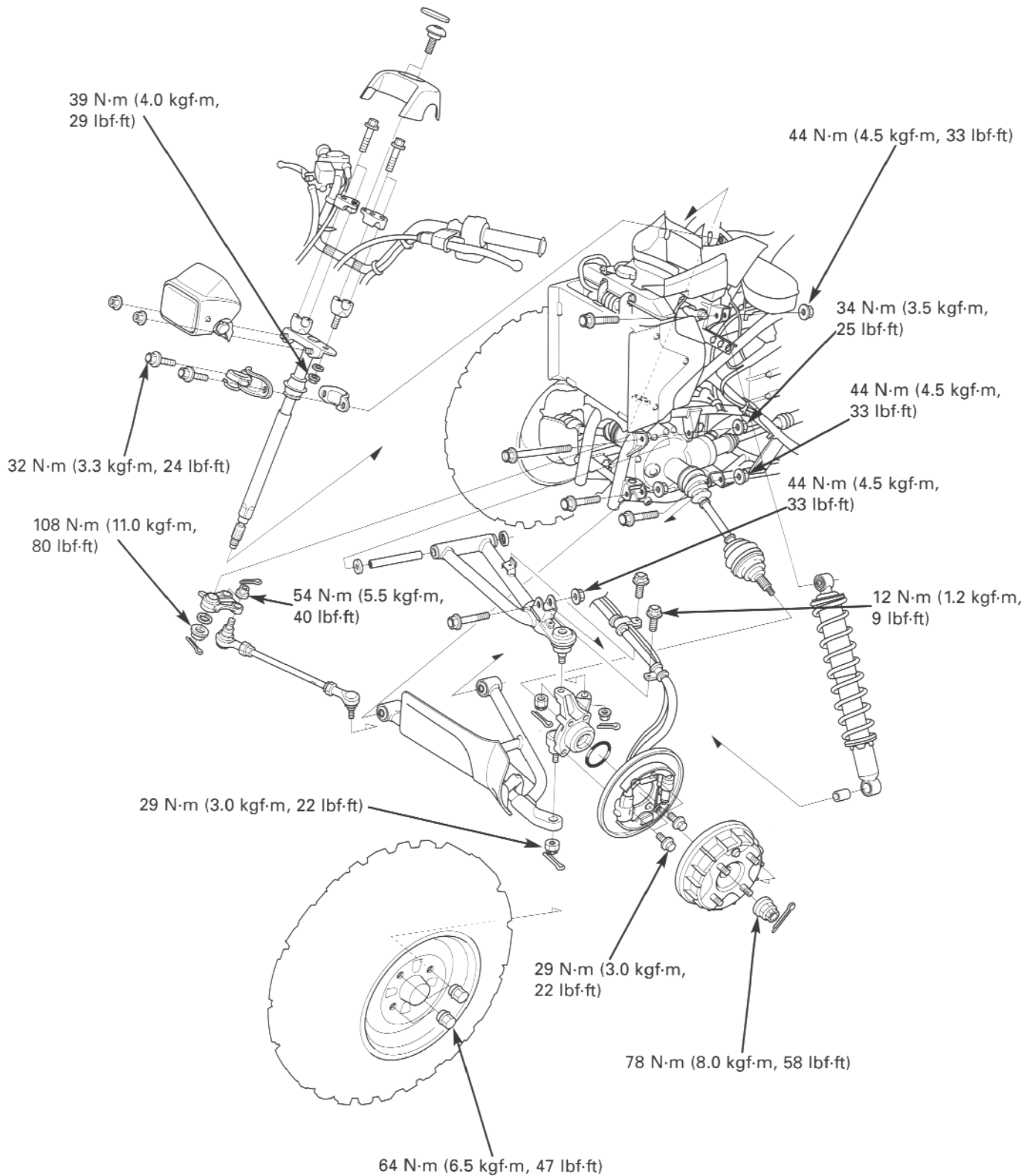
- angle sensor (page 23-30)
- centrifugal clutch (section 10)
- sub-transmission and shift linkage (section 12)
- flywheel and starter clutch (section 11)
- cylinder and piston (section 9)
- cylinder head and camshaft (section 8)
- oil tank (section 4)
- engine (section 7)



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**MEMO**

# FRONT WHEEL/SUSPENSION/STEERING



# 14. FRONT WHEEL/SUSPENSION/STEERING

<b>SERVICE INFORMATION</b>	<b>14-1</b>	<b>WHEEL HUB/KNUCKLE</b>	<b>14-11</b>
<b>TROUBLESHOOTING</b>	<b>14-2</b>	<b>SUSPENSION ARM</b>	<b>14-15</b>
<b>HANDLEBAR</b>	<b>14-3</b>	<b>STEERING SHAFT</b>	<b>14-19</b>
<b>THROTTLE HOUSING</b>	<b>14-6</b>	<b>TIE-ROD</b>	<b>14-24</b>
<b>FRONT WHEEL</b>	<b>14-7</b>	<b>FRONT SHOCK ABSORBER</b>	<b>14-25</b>
<b>TIRE</b>	<b>14-8</b>		

## SERVICE INFORMATION

### GENERAL

- A contaminated brake drum or shoe reduces stopping power. Discard contaminated shoes and clean a contaminated drum with a high quality brake degreasing agent.
- A jack or other support is required to support the vehicle.
- Adjust toe whenever the tie-rod, knuckle or steering shaft are replaced or removed (page 3-21).
- Do not twist or bend the brake hose and pipe when servicing.
- Use genuine Honda replacement bolts and nuts for all suspension pivots and mounting points.
- Refer to section 16 for brake system information.
- Refer to section 22 for handlebar switch inspection.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Minimum tire tread depth		—	4.0 mm (0.16 in)
Cold tire pressure	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
	Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)	—
	Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)	—
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
Tie-rod distance between the ball joints		382 ± 1 (15.0 ± 0.04)	—
Toe		Toe-out: 24 ± 15 (1 ± 9/16)	—

14

### TORQUE VALUES

Handlebar lower holder nut	39 N·m (4.0 kgf·m, 29 lbf·ft)	Lock nut
Front wheel nut	64 N·m (6.5 kgf·m, 47 lbf·ft)	
Front wheel hub nut	78 N·m (8.0 kgf·m, 58 lbf·ft)	Castle nut
Front brake panel bolt	29 N·m (3.0 kgf·m, 22 lbf·ft)	Special bolt
Shock absorber mounting nut	44 N·m (4.5 kgf·m, 33 lbf·ft)	Lock nut
Upper arm pivot nut	34 N·m (3.5 kgf·m, 25 lbf·ft)	Lock nut
Lower arm pivot nut	44 N·m (4.5 kgf·m, 33 lbf·ft)	Lock nut
Upper and lower arm ball joint nut	29 N·m (3.0 kgf·m, 22 lbf·ft)	Castle nut
Brake hose clamp bolt	12 N·m (1.2 kgf·m, 9 lbf·ft)	
Tie-rod ball joint nut	54 N·m (5.5 kgf·m, 40 lbf·ft)	Lock nut
Steering shaft end nut	108 N·m (11.0 kgf·m, 80 lbf·ft)	Apply grease to the threads and seating surface
Steering shaft holder bolt	32 N·m (3.3 kgf·m, 24 lbf·ft)	

## FRONT WHEEL/SUSPENSION/STEERING

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### TOOLS

Ball joint remover	07MAC-SL00200
Ball joint remover/installer	07WMF-HN00100
Oil seal driver	07JAD-PH80101
Driver	07749-0010000
Driver	07949-3710001
Attachment, 28 x 30 mm	07946-1870100
Attachment, 42 x 47 mm	07746-0010300
Attachment, 52 x 55 mm	07746-0010400
Attachment, 22 x 24 mm	07746-0010800
Attachment, 20 mm I.D.	07746-0020400
Pilot, 30 mm	07746-0040700
Pilot, 22 mm	07746-0041000
Pilot, 16 mm	07746-0041300

### TROUBLESHOOTING

#### Hard steering

- Steering shaft holder too tight
- Damaged steering shaft bearing/bushing
- Insufficient tire pressure

#### Steers one side or does not track straight

- Incorrect wheel alignment
- Unequal tire pressure
- Bent tie-rod, suspension arm or frame
- Worn or damaged knuckle bearing or brake drum bearing
- Weak shock absorber

#### Front wheel wobbling

- Bent rim
- Worn or damaged knuckle bearing or brake drum bearing
- Faulty tire
- Axle nut not tightened properly

#### Soft suspension

- Weak shock absorber spring
- Faulty shock absorber damper

#### Hard suspension

- Bent shock absorber damper rod
- Improperly installed suspension arms
- Faulty suspension arm bushings

#### Front suspension noise

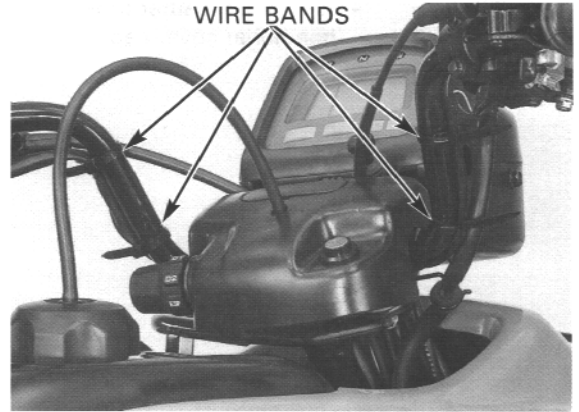
- Loose front suspension fasteners
- Damaged suspension components



# HANDLEBAR

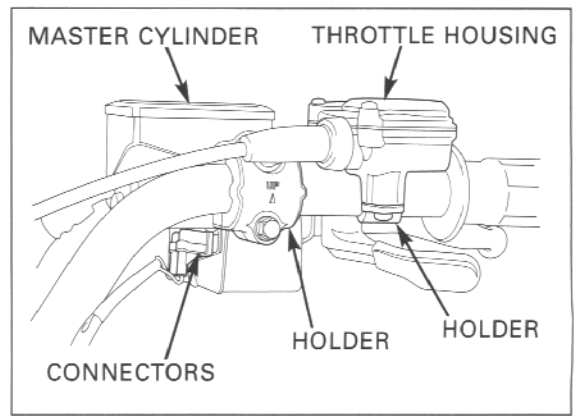
## REMOVAL

- Remove the following:
- four wire bands

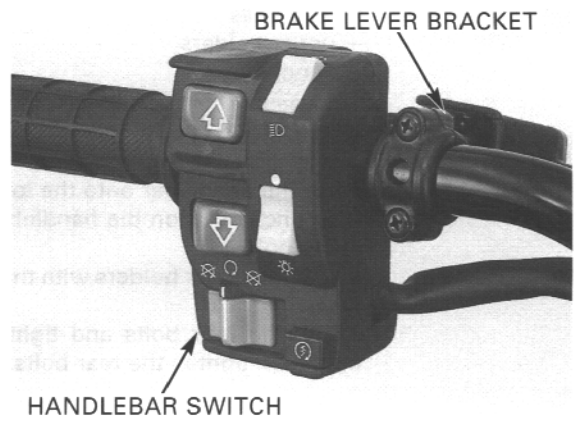


- two screws
- throttle housing holder
- throttle housing
- brake light switch connectors
- two bolts
- master cylinder holder
- front brake master cylinder

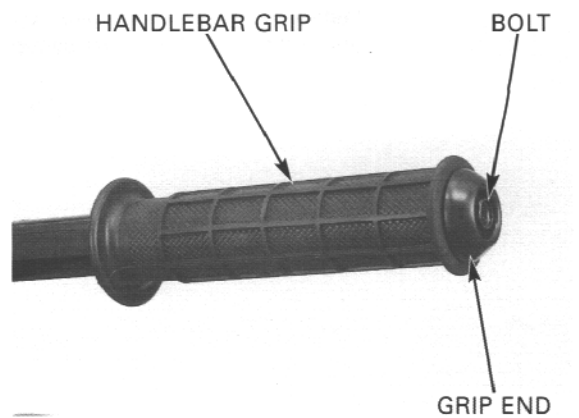
*Keep the brake master cylinder upright to prevent air from entering the hydraulic system.*



- two screws
- bracket holder
- rear (parking) brake lever bracket
- three screws
- handlebar switch

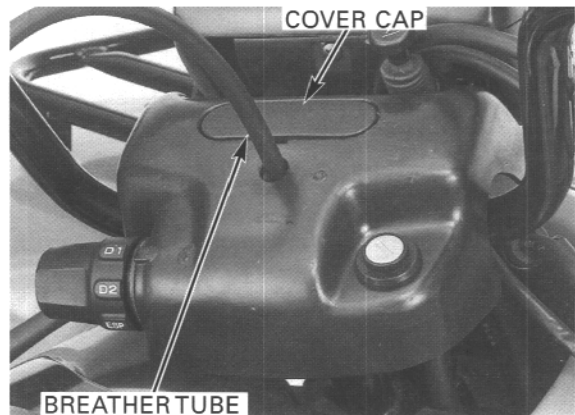


- bolts
- grip ends
- handlebar grips

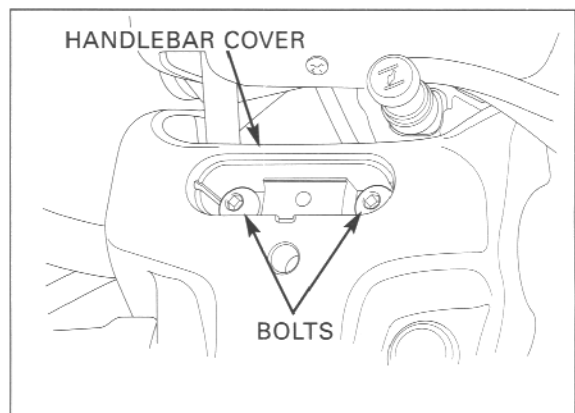


## FRONT WHEEL/SUSPENSION/STEERING

- fuel tank breather tube
- handlebar cover cap



- two bolts
- handlebar cover



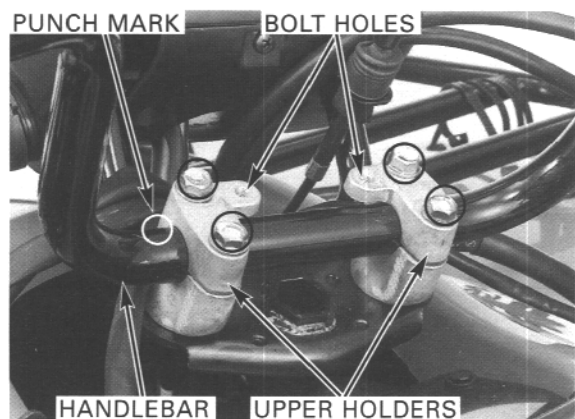
- four bolts
- upper holders
- handlebar

### INSTALLATION

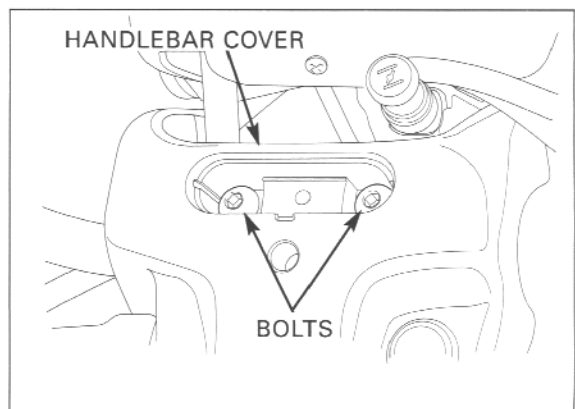
Place the handlebar onto the lower holders and align the punch mark on the handlebar with the top of the lower holder.

Install the upper holders with the bolt holes facing forward.

Install the four bolts and tighten the forward bolts first, then tighten the rear bolts.

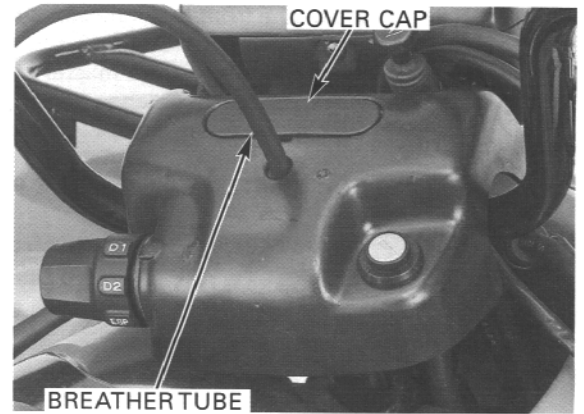


Install the handlebar cover onto the upper holders and tighten the two bolts securely.



## FRONT WHEEL/SUSPENSION/STEERING

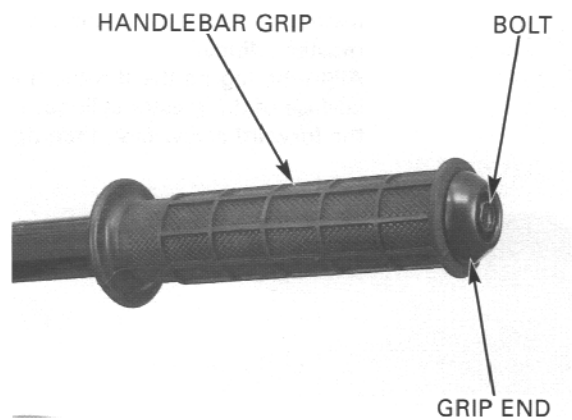
Install the handlebar cover cap.  
Insert the fuel tank breather tube into the handlebar cover.



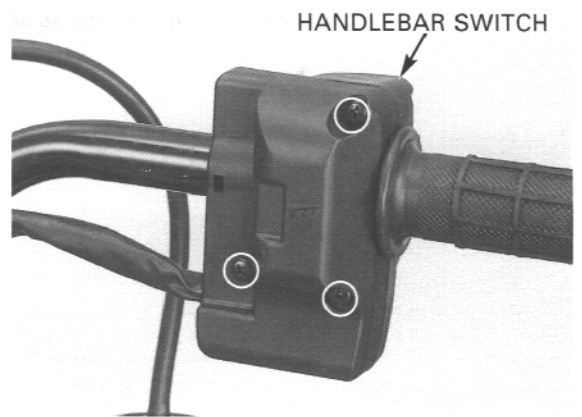
Apply Honda Bond A or Honda Hand Grip Cement (U.S.A. only) to the inside surfaces of the handlebar grips and to the clean surfaces of the handlebar. Wait 3—5 minutes and install the grip. Rotate the grip for even application of the adhesive.

*Allow the adhesive to dry for an hour before using.*

Install the grip ends and tighten the bolts securely

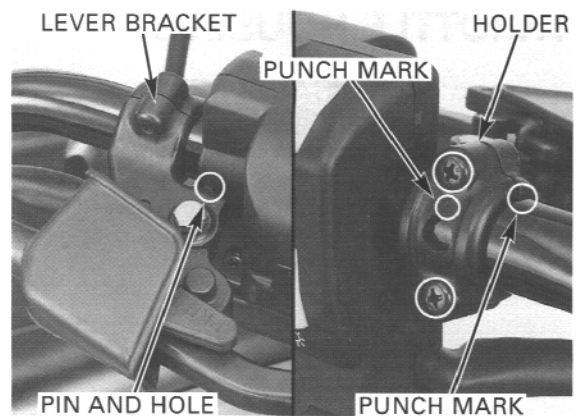


Install the handlebar switch and loosely tighten the three screws.



Install the brake lever bracket and holder with the punch mark facing up by aligning the locating pin on the lever bracket with the hole in the switch housing. Loosely tighten the bracket holder screws.

Align the edge of the brake lever bracket with the punch mark on the handlebar, and tighten the upper bracket screw first, then tighten the lower screw. Tighten the upper handlebar switch screw first, then tighten the lower screws.

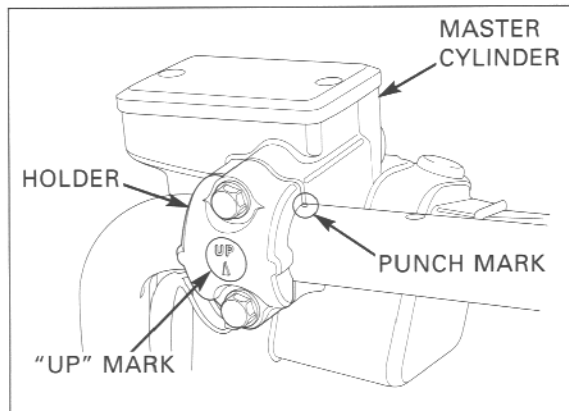


## FRONT WHEEL/SUSPENSION/STEERING

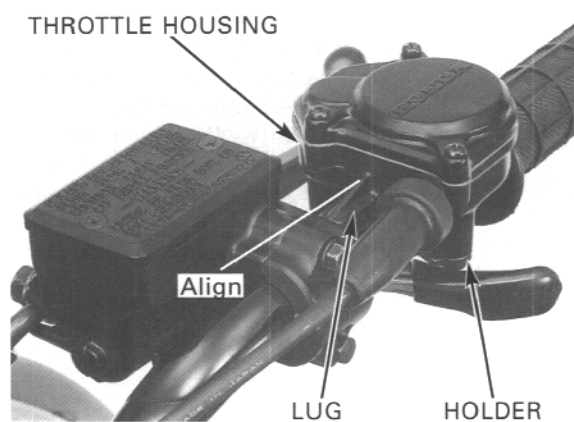
Install the front brake master cylinder and holder with the "UP" mark facing up. Align the edge of the master cylinder with the punch mark on the handlebar, and tighten the upper bolt first, then tighten the lower bolt.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

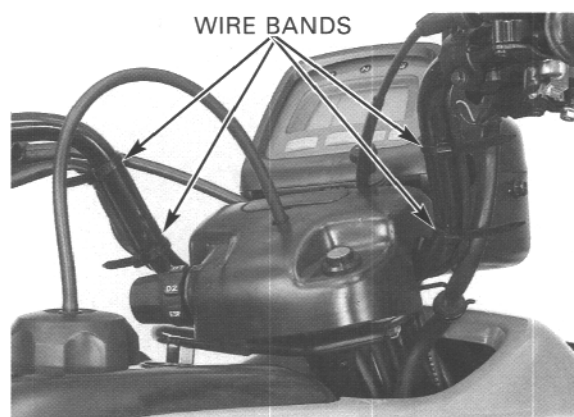
Connect the brake light switch connectors.



Install the throttle housing and holder against the master cylinder. Align the lug on the throttle housing with the mating surface of the master cylinder and holder, and tighten the forward screw first, then tighten the rear screw.



Install the four wire bands as shown.

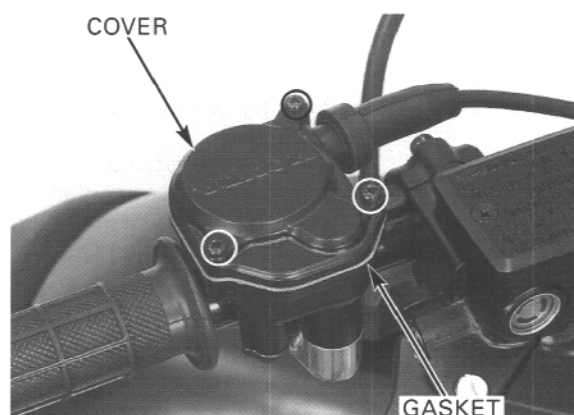


## THROTTLE HOUSING

### DISASSEMBLY

Remove the following:

- three screws
- throttle housing cover
- gasket



## FRONT WHEEL/SUSPENSION/STEERING

Slide the boot off the throttle cable adjuster.  
Loosen the lock nut and cable adjuster.

Bend down the lock washer tab and remove the pivot nut, lock washer, throttle arm, return spring, throttle lever and washer.

Disconnect the throttle cable from the throttle arm.  
Remove the dust seal from the housing bottom.

### ASSEMBLY

Coat a new dust seal lip with grease and install it into the throttle housing until it is fully seated.

Apply grease to the throttle lever pivot.

Apply grease to the throttle cable end and connect the cable to the throttle arm.

Install the washer onto the throttle lever and insert the lever into the throttle housing.

Install the throttle arm with the spring over the throttle lever pivot by aligning the flat surfaces.

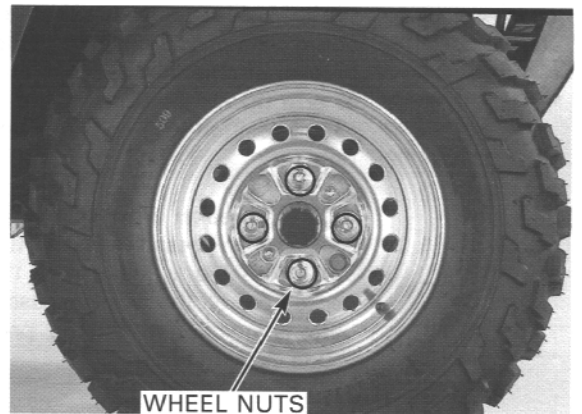
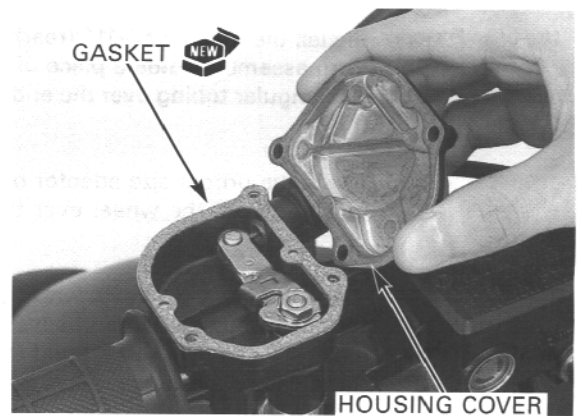
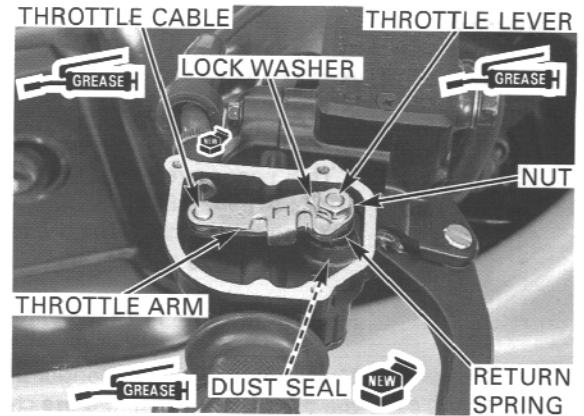
Install a new lock washer and the pivot nut.

Tighten the pivot nut and bend up the washer tab against the nut.

Install the throttle housing cover with a new gasket and tighten the three screws.

Adjust the throttle lever free play (page 3-4).

If the throttle cable was replaced, perform the initial setting 2 (page 23-6) after adjustment the free play .



## FRONT WHEEL

### REMOVAL

Loosen the wheel nuts.

Place the support block under the frame to raise the front wheel off the ground.

Remove the nuts and wheel.

### INSTALLATION

Install the wheel with the arrow mark facing in the normal rotating direction.

#### NOTE:

- Do not interchange the left and right tires.

Install the wheel nuts and tighten them.

**TORQUE: 64 N·m (6.5 kgf·m, 47 lbf·ft)**

## TIRES

### REMOVAL

**NOTE:**

- This service requires the Universal Bead Breaker (GN-AH-958-BB1).
- Remove and install the tire from the rim side opposite the valve stem.

Remove the core from the valve stem.

*Do not damage the bead seating area of the rim.*

Use a pneumatic tire changer or equivalent to remove the tire from the rim. If a tire changer is not available, rim protectors and tire irons may be used.

*Use of an improper size blade may result in damage to the rim, tire or blade.*

Install the blade for 9/11" (rear) rims onto the breaker arm assembly. Slide a piece of 1-1/2" I.D. x 8" length rectangular tubing over the end of the breaker assembly.

Place the proper size adaptor onto the threaded shaft and then put the wheel over the threaded shaft and adaptor.

*Use only water as a lubricant when removing or mounting tires. Soap or some mounting lubricants may leave a slippery residue which can cause the tire to shift on the rim and lose air pressure during riding.*

Lube the bead area with water, pressing down on the tire sidewall/bead area in several places to allow the water to run into and around the bead. Also lube the area where the breaker arm will contact the sidewall of the tire.

While holding the breaker arm assembly at an approximate 45° position, insert the blade of the breaker arm between the tire and rim. Push the breaker arm inward and downward until it is in the horizontal position with its press block in contact with the rim.

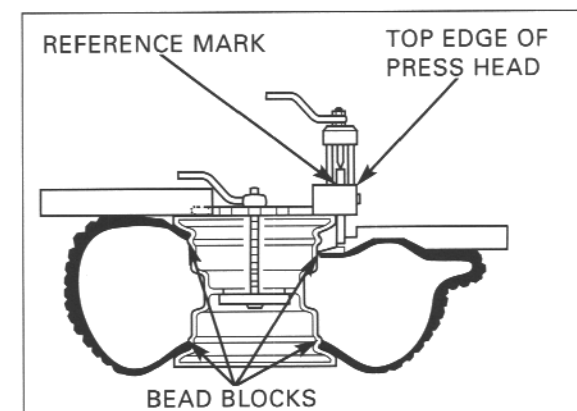
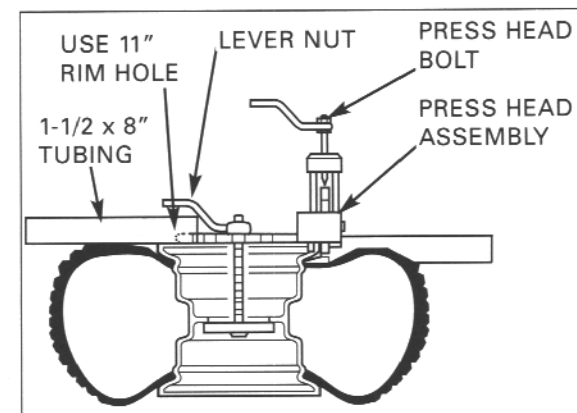
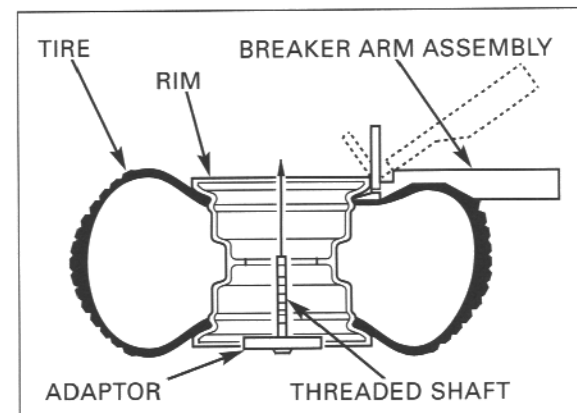
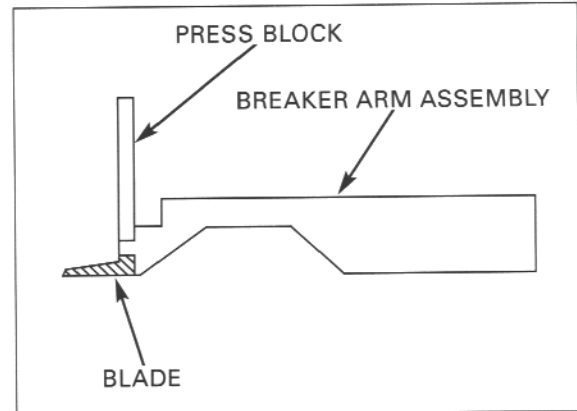
With the breaker arm in the horizontal position, place the breaker press head assembly over the breaker arm press block. Make sure the press head bolt is backed out all the way and use one of the two nylon buttons positioned on the press head against the inside edge of the rim.

Insert the threaded shaft through the appropriate hole in the breaker press head assembly and then tighten the lever nut until both ends of the breaker press head assembly are in firm contact with the rim.

Tighten the press head bolt until the reference mark on the press block is aligned with the top edge of the press head.

If the rest of the bead cannot be pushed down into the center of the rim by hand, loosen the press head bolt and the lever nut.

Rotate the breaker arm assembly and breaker press head assembly 1/8 to 1/4 the circumference of the rim. Tighten the lever nut and then tighten the press head bolt as described.



Repeat this procedure as necessary until the remainder of the bead can be pushed down into the center of the rim.

Assemble the Universal Bead Breaker on the other side of the wheel and break the bead following the same procedures.

Remove the tire from the rim using a tire changer machine or tire irons and rim protectors.

Remove the tire from the side of the rim that has the smallest shoulder area to simplify removal.

### TIRE REPAIR

#### NOTE:

- Use the manufacturer's instructions for the tire repair kit you are using. If your kit does not have instructions, use the procedures provided here.

Check the tire for puncturing objects.

Chalk mark the punctured area and remove the puncturing object.

Inspect and measure the injury.

Tire repairs for injuries larger than 15 mm (5/8 in) should be a section repair.

Section repairs should be done by a professional tire repair shop.

If the injury is smaller than 15 mm (5/8 in), proceed with the repair as described here.

Install a rubber plug into the injury as follows:

Apply a cement to a plug inserting needle and work the needle into the injury to clean and lubricate it.

Do this three times.

Do not let the cement dry.

Insert and center a rubber plug through the eye of the inserting needle.

Apply cement to the rubber plug.

Push the inserting needle with plug into the injury until the plug is slightly above the tire.

Twist the needle and remove it from the tire; the plug will stay in the tire.

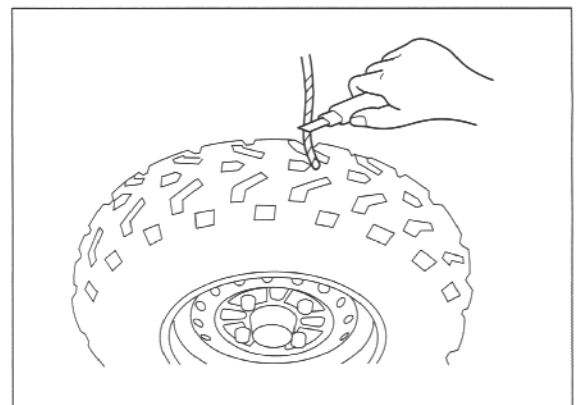
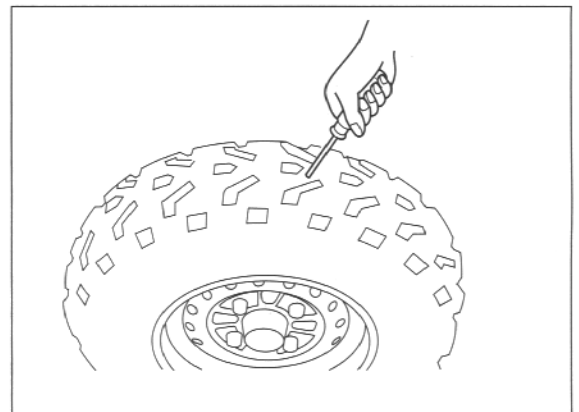
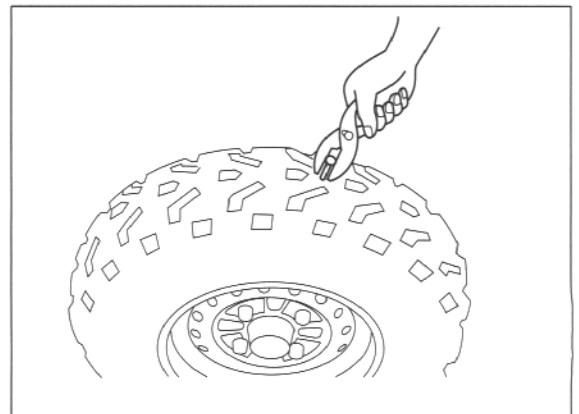
Trim the plug 6 mm (1/4 in) above the tire surface.

Repeat the above procedure if the puncture is large.

Do not use more than two plugs per injury.

Allow the repair to dry. Drying time will vary with air temperature. Refer to the tire repair kit manufacturer's recommendations.

*Be careful not to push the plug all the way into the tire to prevent it from falling inside.*



## FRONT WHEEL/SUSPENSION/STEERING

Inflate the tire and test the seal by dabbing a small amount of cement around the plug. Escaping air will cause a bubble in the cement. If there is leakage, remove the tire (page 14-8) and apply a cold patch to the inside of the tire as described.

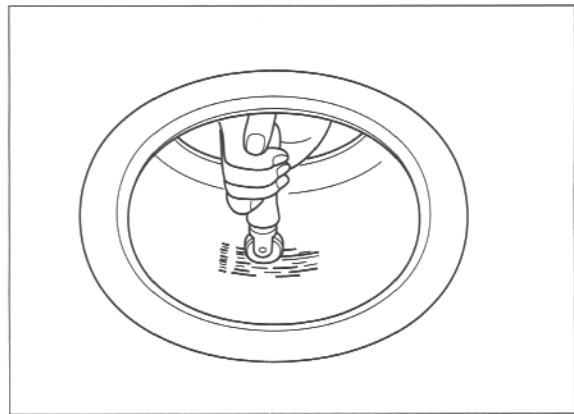
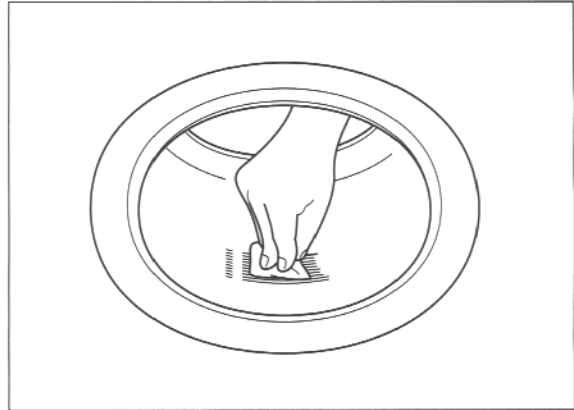
If a plug has been inserted, trim it even with the inner tire surface.

Temporarily place a rubber patch that is at least twice the size of the puncture over the injury. Make a mark around the patch, slightly larger than the patch itself. Rough the area marked inside the tire with a tire buffer or a wire brush. Clean the rubber dust from the buffed area.

Apply cement over the area marked and allow it to dry until tacky.

Do not touch the cement with dirty or greasy hands. Remove the lining from the patch and center it over the injury.

Press the patch against the injury using a special roller.



## ASSEMBLY

Install the tire onto the rim, where the rim shoulder width is the narrowest, to simplify installation.

Clean the rim bead seat and flanges.

Apply clean water to the rim flanges, bead seat and base.

Install the valve core in the valve stem.

Install the tire with the arrow mark facing in the normal rotating direction.

Inflate the tire to seat the tire bead.

Deflate the tire. Wait 1 hour and inflate the tire to the specified pressure.

### RECOMMENDED TIRE PRESSURE:

**Standard:** 25 kPa (0.25 kg/cm<sup>2</sup>, 3.6 psi)

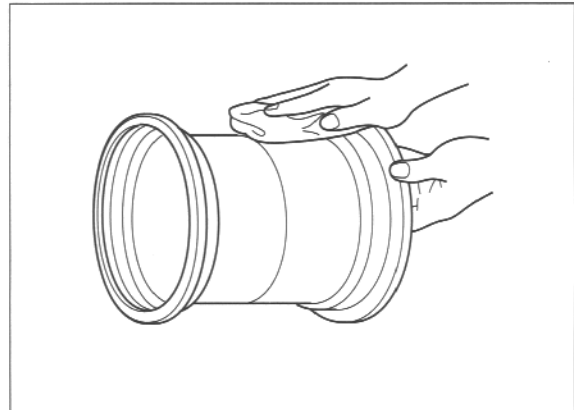
**Minimum:** 22 kPa (0.22 kg/cm<sup>2</sup>, 3.2 psi)

**Maximum:** 28 kPa (0.28 kg/cm<sup>2</sup>, 4.0 psi)

**With cargo:** 25 kPa (0.25 kg/cm<sup>2</sup>, 3.6 psi)

Check for air leaks and install the valve cap.

*Use only water as a lubricant when removing or mounting tires. Soap or some mounting lubricants may leave a slippery residue which can cause the tire to shift on the rim and lose air pressure during riding.*





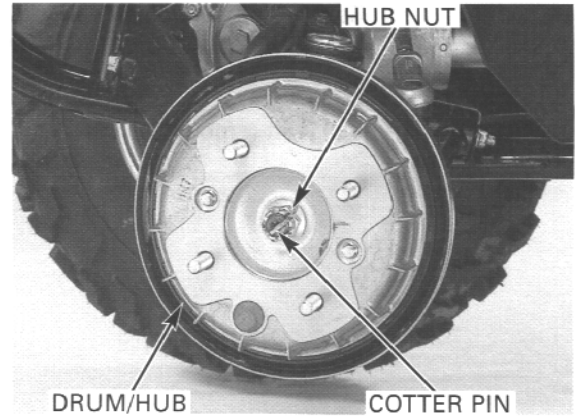
## WHEEL HUB/KNUCKLE

### REMOVAL

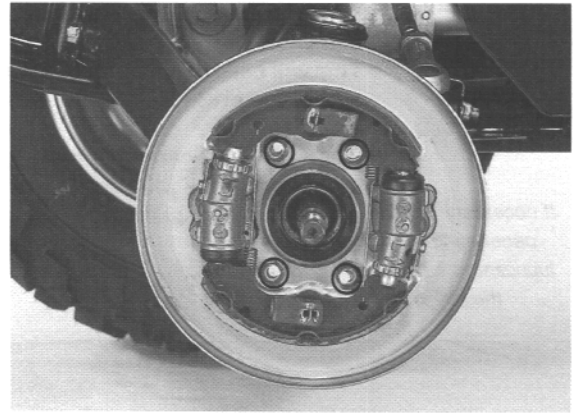
- Remove the following:
- front wheel (page 14-7).
  - cotter pin
  - hub nut
  - brake drum/wheel hub

*Do not get grease onto the brake shoes and drum, or stopping power will be reduced.*

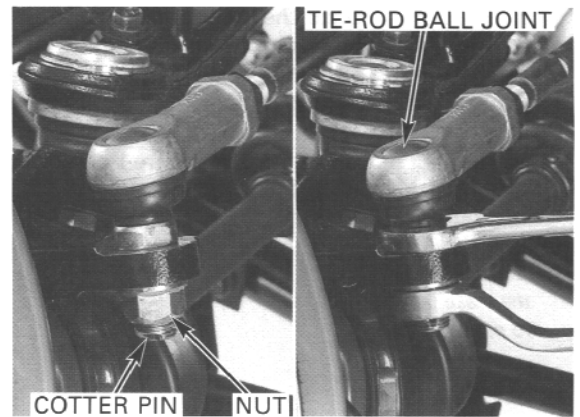
For waterproof seal inspection, see section 16.



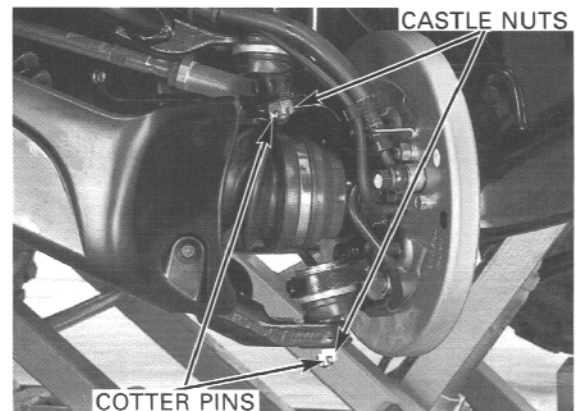
Loosen the four brake panel bolts.



Remove the cotter pin.  
Remove the tie-rod ball joint nut while holding the joint stud flats with an open end wrench.  
Remove the tie-rod from the knuckle.



Remove the cotter pins and loosen the ball joint castle nuts, but do not remove them yet.

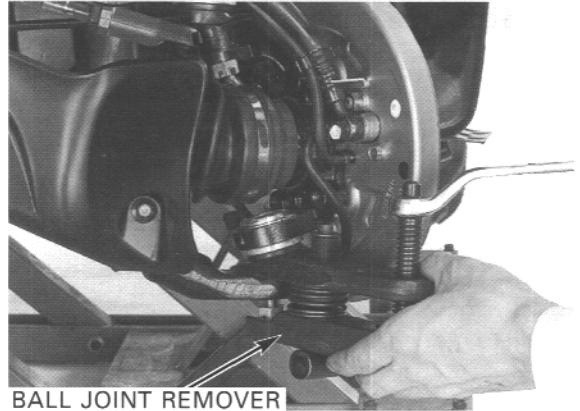


## FRONT WHEEL/SUSPENSION/STEERING

Release the ball joints, using the special tool according to the following instructions.

**TOOL:**

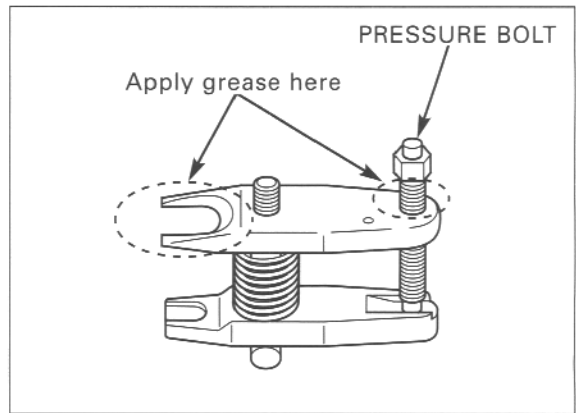
**Ball joint remover, 28 mm      07MAC-SL00200**



Apply grease to the ball joint remover at the point shown. This will ease installation of the tool and prevent damage to the pressure bolt threads.

Insert the jaws carefully, making sure that you do not damage the ball joint boot. Adjust the jaw spacing by turning the pressure bolt.

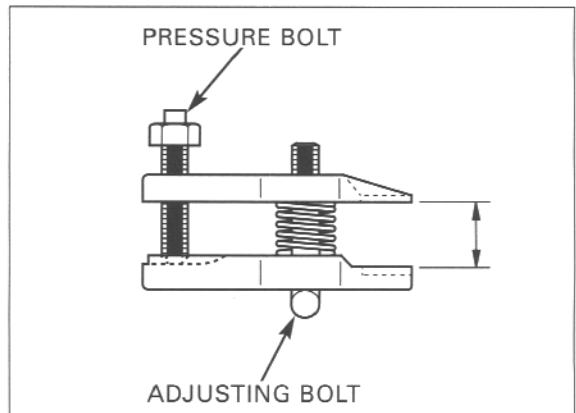
*If necessary, apply penetrating type lubricant to loosen the ball joint.*



Once the tool is in place, turn the adjusting bolt as necessary to make the jaws parallel. Then hand-tighten the pressure bolt and recheck the jaws to make sure they are still parallel.

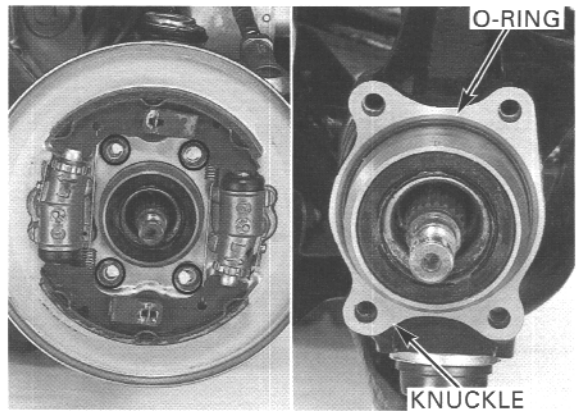
Tighten the pressure bolt with a wrench until the ball joint stud pops loose.

*Do not hang the brake panel from the brake hose. Do not twist the brake hose.*



Remove the four bolts and brake panel from the knuckle. Remove the O-ring from the knuckle.

Remove the castle nuts and knuckle from the upper and lower arms.



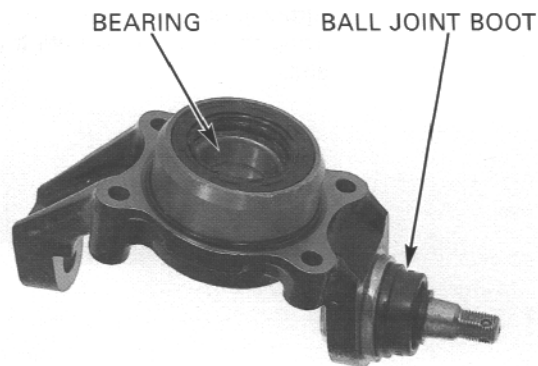
## INSPECTION

Turn the inner race of the bearing in the knuckle with your finger. The bearing should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the knuckle.

Inspect the knuckle for damage or cracks.

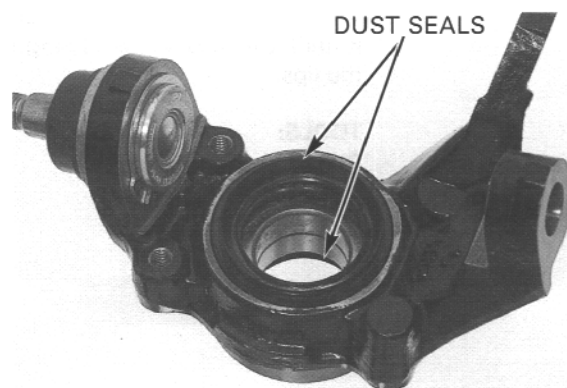
Inspect the ball joint boot for tears or other damage by moving the ball joint stud. It should move freely and smoothly.

For ball joint replacement, see page 14-17.

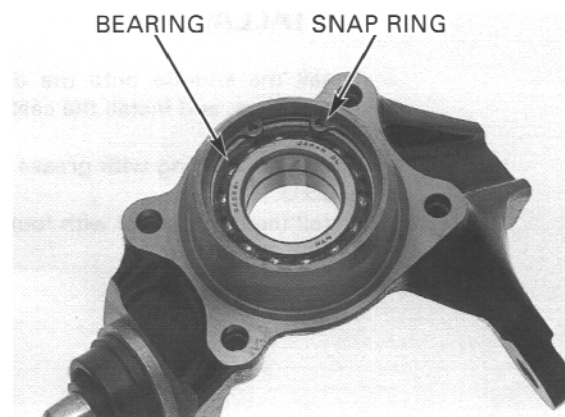


## BEARING REPLACEMENT

Remove the dust seals from the knuckle.



Remove the snap ring and drive the bearing out of the knuckle.

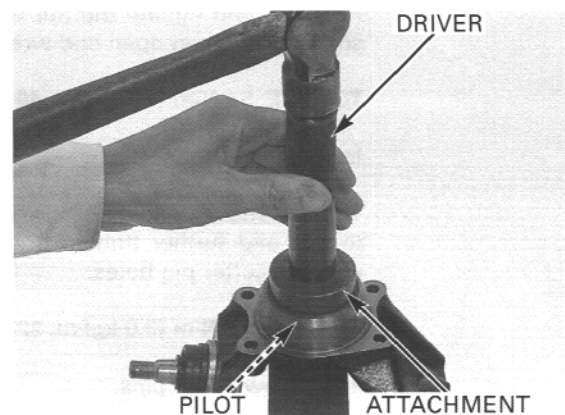


Pack the cavities of a new bearing with grease. Drive in the bearing squarely with the marking side facing up until it is fully seated.

### TOOLS:

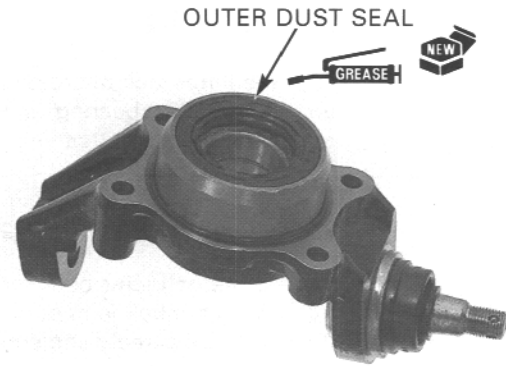
Driver	07749-0010000
Attachment, 52 x 55 mm	07746-0010400
Pilot, 30 mm	07746-0040700

Install the snap ring into the knuckle groove with the chamfered edge facing



## FRONT WHEEL/SUSPENSION/STEERING

Apply grease to a new outer dust seal lip and install it using the same tools until it is flush with the knuckle end.



Apply grease to a new inner dust seal lips and install it until it is fully seated, being careful not to damage the lips.

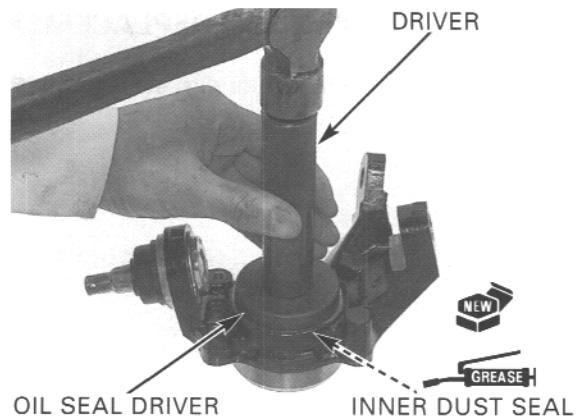
### TOOLS:

Driver

Oil seal driver

07749-001000

07JAD-PH80101

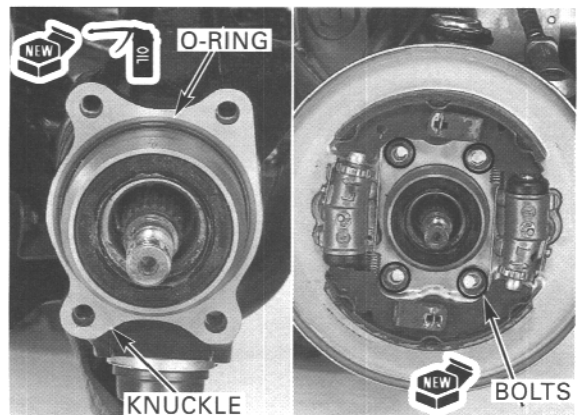


## INSTALLATION

Install the knuckle onto the drive shaft, lower and upper arms, and install the castle nuts.

Coat a new O-ring with grease and install it onto the knuckle.

Install the brake panel with four new bolts.



Install the tie-rod ball joint onto the knuckle with a new nut, and tighten the nut while holding the joint stud flats with an open end wrench

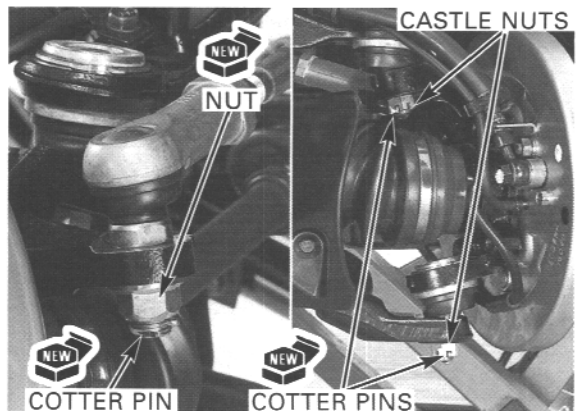
**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

Install a new cotter pin

Tighten the ball joint castle nuts to the specified torque and further tighten until their grooves align with the cotter pin holes.

**TORQUE: 29 N·m (3.0 kgf·m, 22 lbf·ft)**

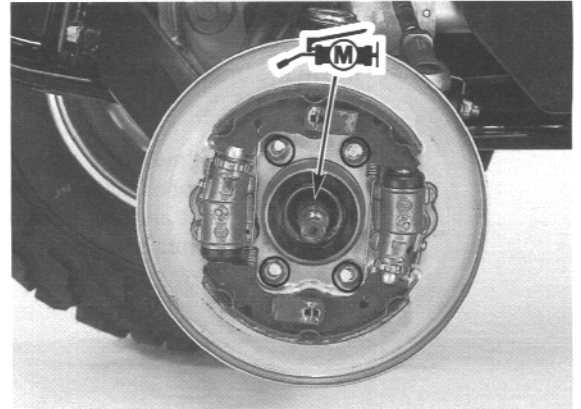
Install new cotter pins.



Tighten the brake panel bolts.

**TORQUE: 29 N·m (3.0 kgf·m, 22 lbf·ft)**

Apply molybdenum disulfide grease to the drive shaft spline.



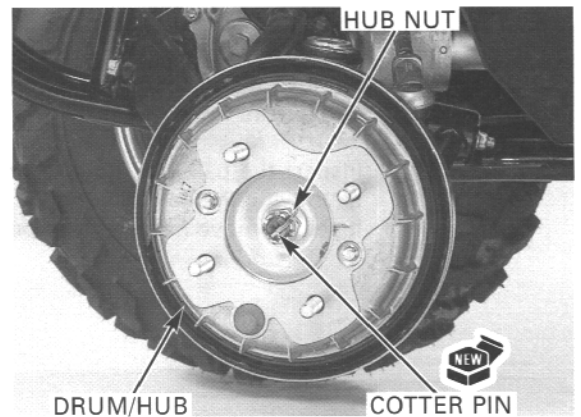
Install the brake drum/wheel hub.

Tighten the hub nut to the specified torque and further tighten until its grooves align with the cotter pin hole.

**TORQUE: 78 N·m (8.0 kgf·m, 58 lbf·ft)**

Install a new cotter pin.

Install the wheel (page 14-7).



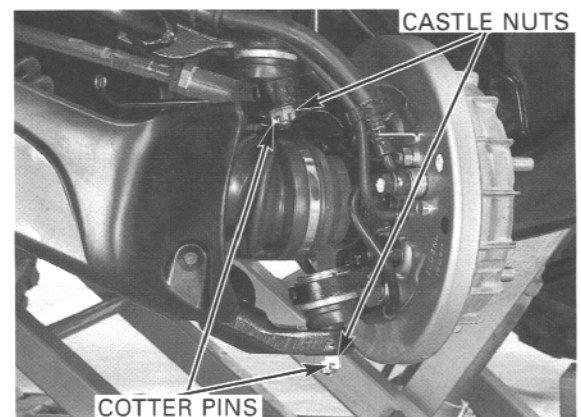
## SUSPENSION ARM

### REMOVAL

Remove the following:

- front carry pipe (page 2-7)
- front wheel (page 14-7)

Remove the cotter pins and loosen the ball joint castle nuts, but do not remove them yet.

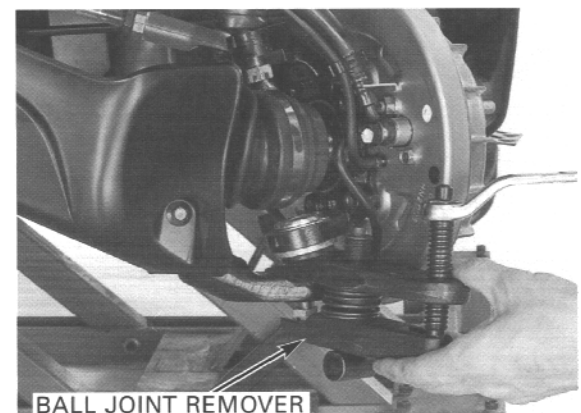


Release the ball joints, using the special tool according to the instructions described on page 14-12.

### TOOL:

Ball joint remover, 28 mm

07MAC-SL00200



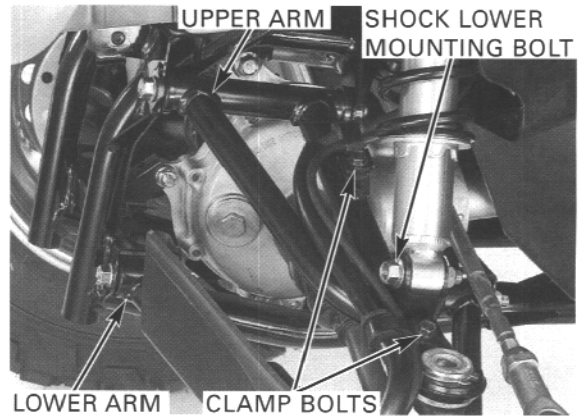
## FRONT WHEEL/SUSPENSION/STEERING

Remove the two brake hose/breather tube clamp bolts.

Move the brake drum/knuckle assembly rearward and support it.

Remove the following:

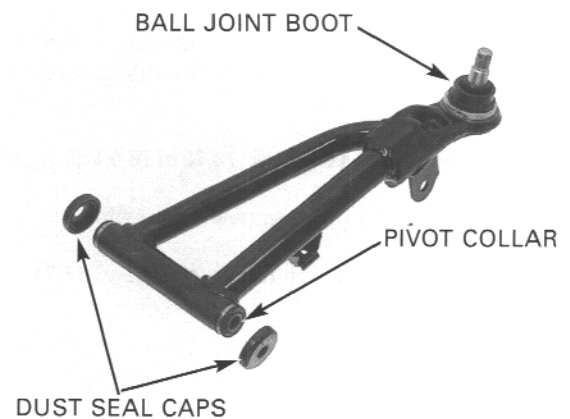
- front shock absorber lower mounting nut and bolt
- pivot nut, bolt and upper arm
- pivot nuts, bolts and lower arm



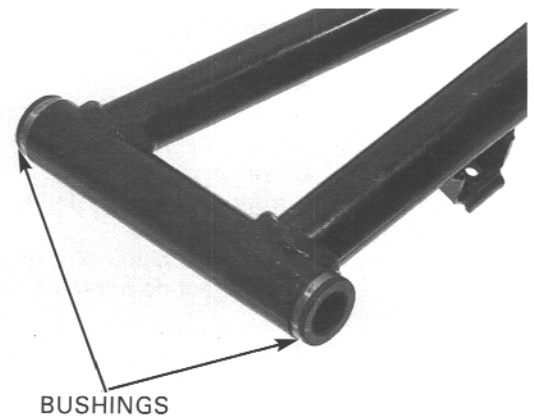
### INSPECTION

Remove the dust seal caps and pivot collar from the upper arm.

Inspect the ball joint boot for tears or other damage by moving the ball joint stud. It should move freely and smoothly.

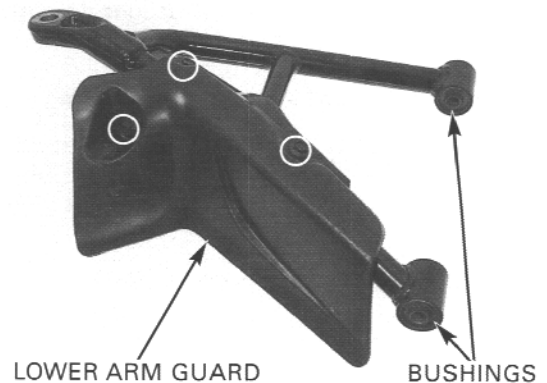


Check the pivot bushings of the upper arm for wear or damage.



Remove the three bolts and lower arm guard if necessary.

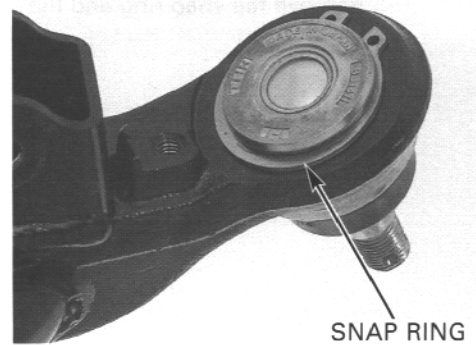
Check the pivot bushings of the lower arm for wear or damage.



**BALL JOINT REPLACEMENT**

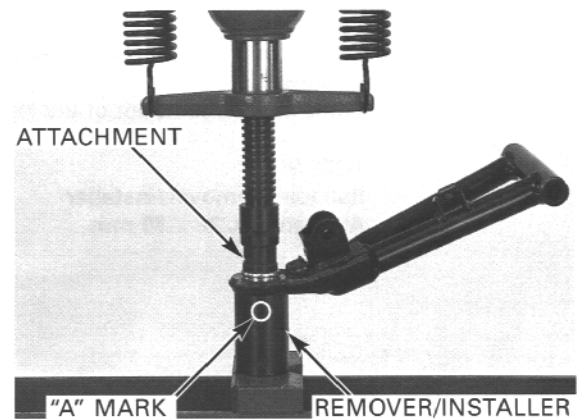
**UPPER ARM**

Remove the snap ring from the ball joint.



Set the upper arm and special tools with "A" mark side of the remover/installer facing to the ball joint as shown.  
Press the ball joint out of the upper arm.

**TOOLS:**  
**Ball joint remover/installer**      07WMF-HN00100  
**Attachment, 28 x 30 mm**      07946-1870100

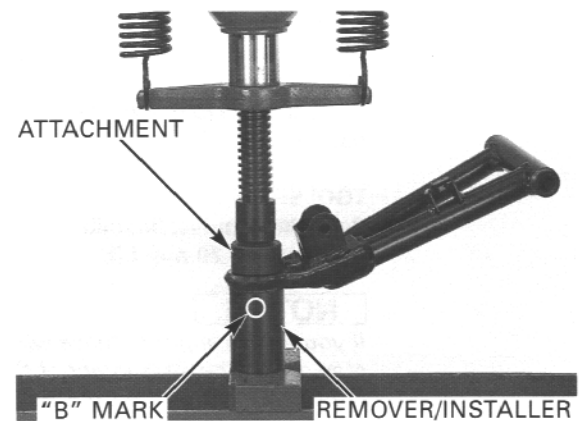


Set the upper arm and special tools with "B" mark side of the remover/installer facing to the ball joint as shown.  
Press the ball joint into the upper arm until it is fully seated.

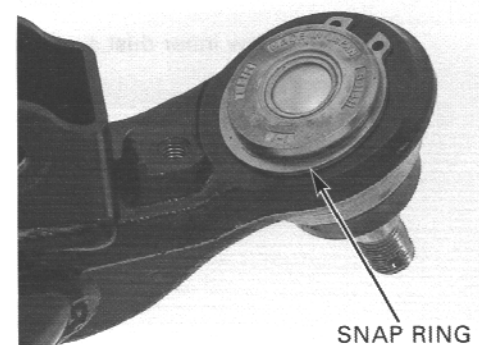
**TOOLS:**  
**Ball joint remover/installer**      07WMF-HN00100  
**Attachment, 20 mm I.D.**      07746-0020400

**NOTICE**

*If you feel strong resistance when lowering the press, stop. Reset the attachment of the tool so that the ball joint head can go into the hollow of the attachment and try again.*



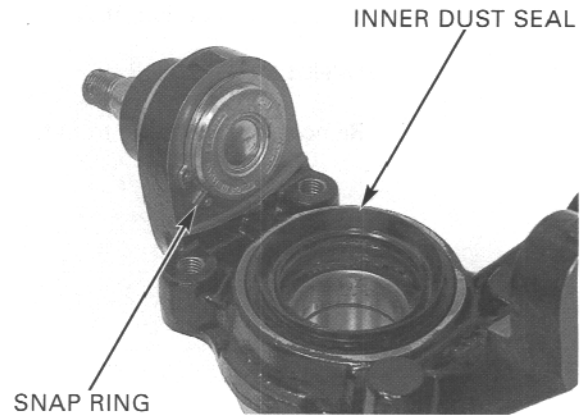
Install the snap ring with the chamfered edge facing in.



## FRONT WHEEL/SUSPENSION/STEERING

### KNUCKLE

Remove the snap ring and the inner dust seal.

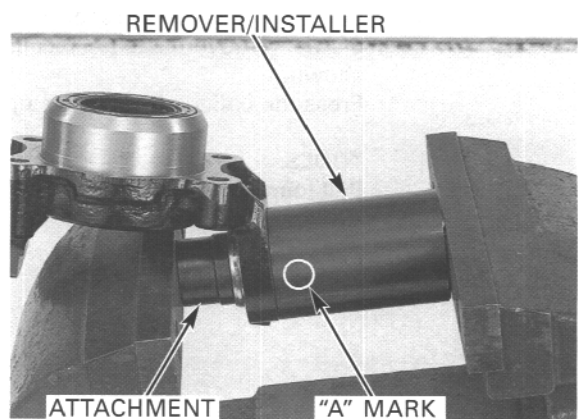


Set the knuckle and special tools with "A" mark side of the remover/installer facing to the ball joint, in a vise as shown.

Press the ball joint out of the knuckle.

#### TOOLS:

**Ball joint remover/installer**      07WMF-HN00100  
**Attachment, 28 x 30 mm**      07946-1870100



Set the knuckle and special tools with "B" mark side of the remover/installer facing to the ball joint in a vise as shown.

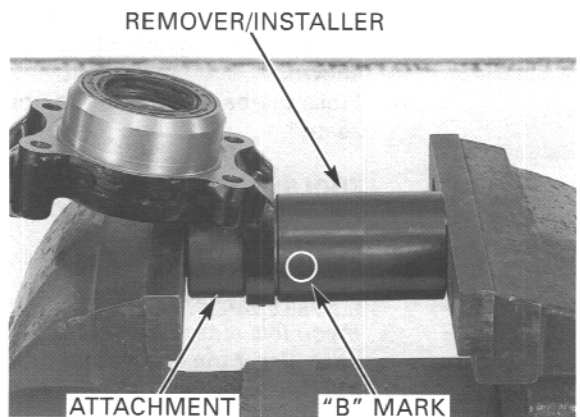
Press the ball joint into the knuckle until it is fully seated.

#### TOOLS:

**Ball joint remover/installer**      07WMF-HN00100  
**Attachment, 20 mm I.D.**      07746-0020400

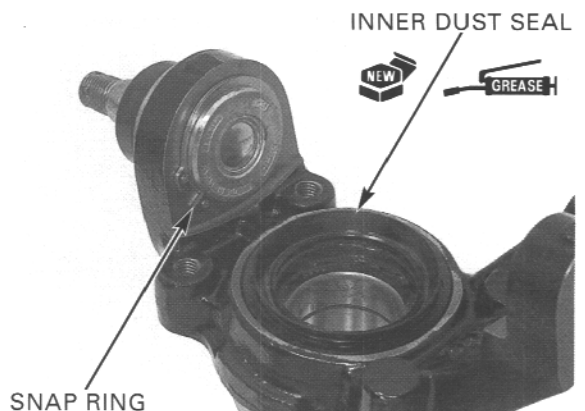
#### NOTICE

*If you feel strong resistance when lowering the press, stop. Reset the attachment of the tool so that the ball joint head can go into the hollow of the attachment and try again.*



Install the snap ring with the chamfered edge facing in.

Install a new inner dust seal (page 14-14).

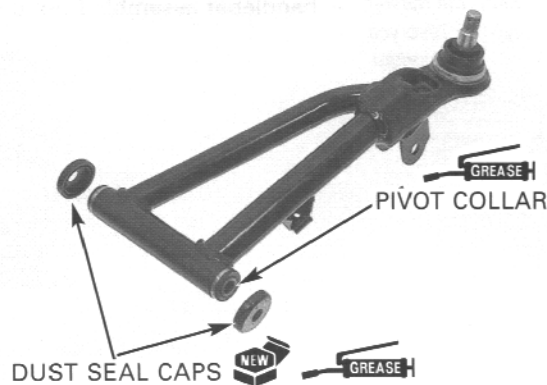




## INSTALLATION

Apply grease to the pivot collar and install it into the upper arm.

Apply grease to new dust seal cap lips and install them onto the upper arm.



Install the upper arm into the frame with the pivot bolt and a new nut, and tighten the nut.

**TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)**

Connect the shock absorber to the upper arm with the lower mounting bolt and a new nut, and tighten the nut.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Install the lower arm into the frame with the two pivot bolts and new nuts, and loosely tighten the nuts.

Install the brake drum/knuckle assembly onto the upper and lower arms and tighten the castle nuts.

**TORQUE: 29 N·m (3.0 kgf·m, 22 lbf·ft)**

Install new cotter pins.

Install the brake hose/breather tube clamps and tighten the bolts.

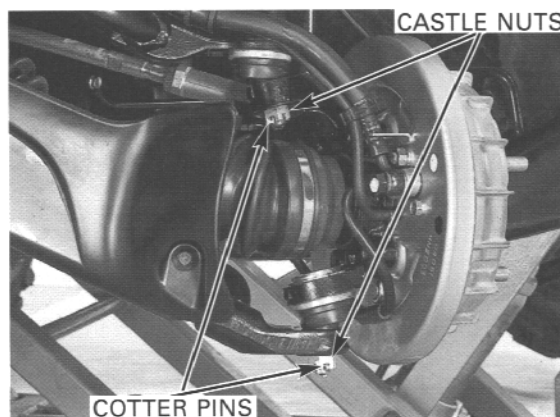
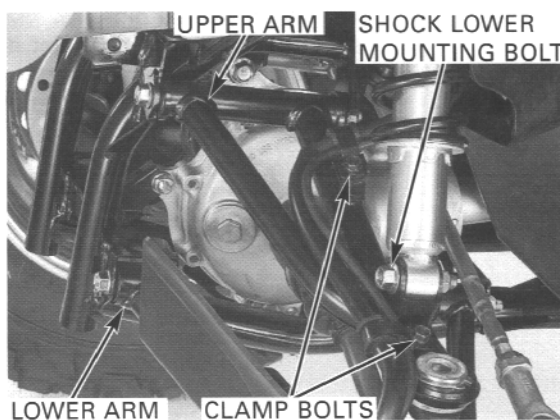
**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

Install the front wheel (page 14-7), then place the vehicle on level ground.

Tighten the lower arm pivot nuts to the specified torque.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Install the carry pipe (page 2-7).

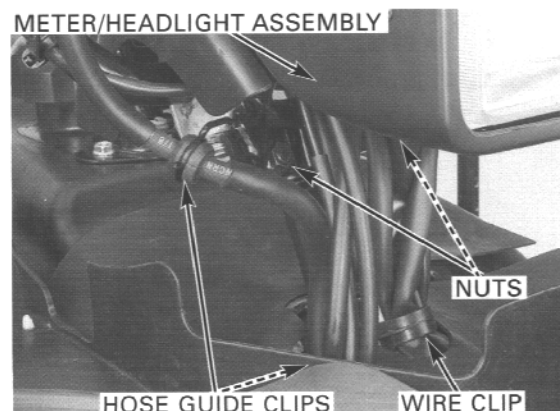


## STEERING SHAFT

### REMOVAL

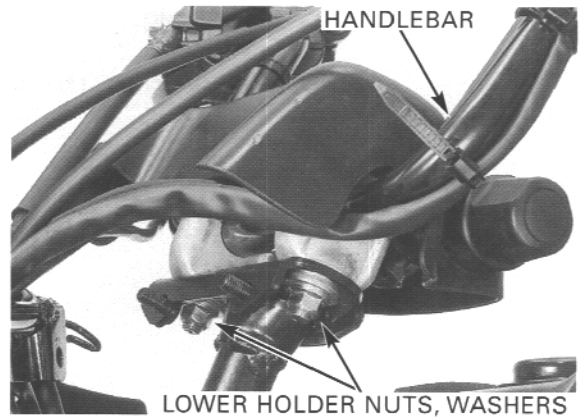
Remove the following:

- inner fenders (page 2-6)
- front fender (page 2-7)
- brake hose from the guide clips
- wires from the wire clip
- two nuts and meter/assist headlight assembly from the steering shaft

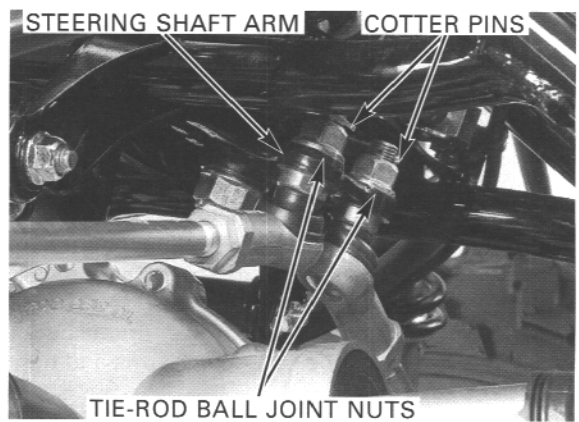


## FRONT WHEEL/SUSPENSION/STEERING

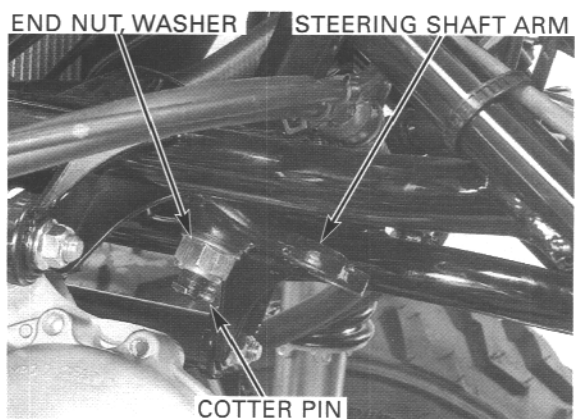
- handlebar lower holder nuts and washers
  - handlebar assembly from the steering shaft
- Keep the master cylinder reservoir upright.*



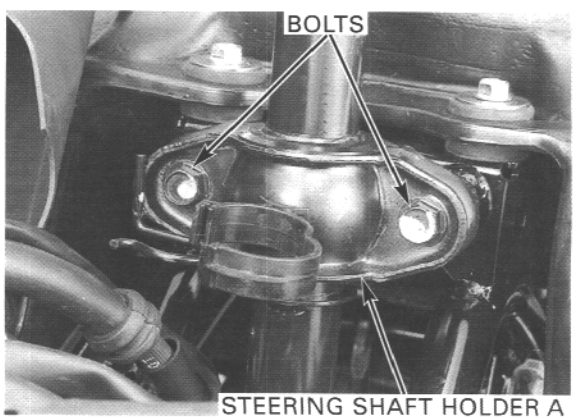
- Remove the cotter pins.  
Remove the tie-rod ball joint nuts while holding the joint stud flats with an open end wrench.  
Remove the tie-rods from the steering shaft arm.



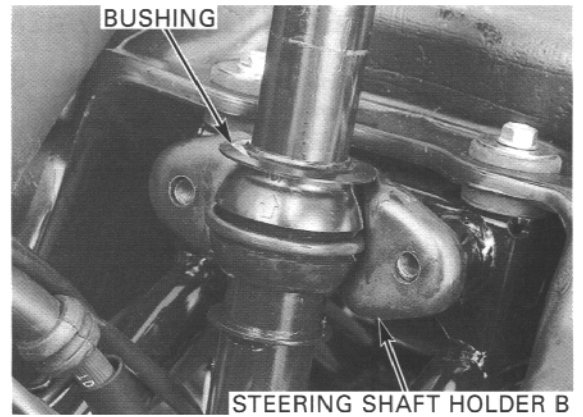
- Remove the cotter pin, steering shaft end nut, washer and steering shaft arm.



- Remove the two bolts and steering shaft holder A.



Remove the steering shaft from the shaft bearing.  
Remove the steering shaft bushing, holder B and shaft.



### INSPECTION

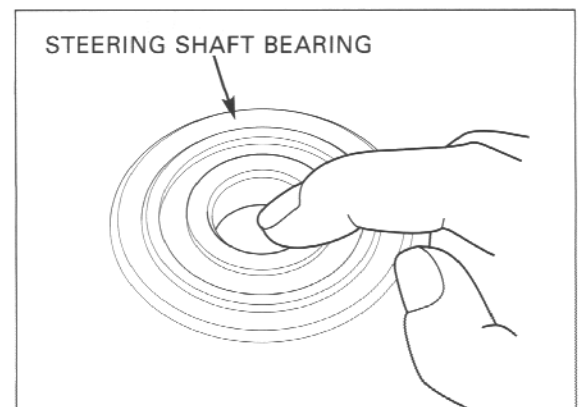
Check the steering shaft bushing for wear or damage.



Check the steering shaft for distortion or damage.



Turn the inner race of the steering shaft bearing with your finger. The bearing should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the frame.



## FRONT WHEEL/SUSPENSION/STEERING

### BEARING REPLACEMENT

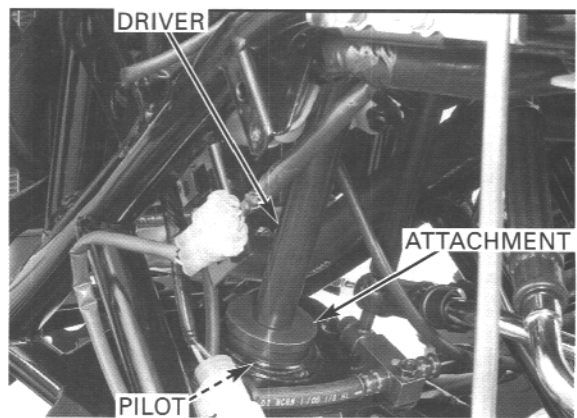
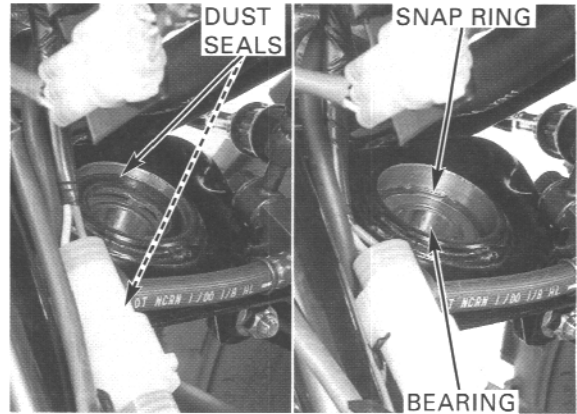
Remove the upper and lower dust seals.  
Remove the snap ring.

Drive the steering shaft bearing out of the frame.

Drive in a new bearing squarely with the marked side facing up until it is fully seated.

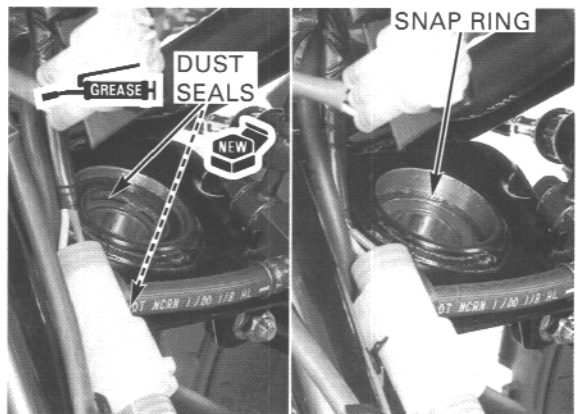
#### TOOLS:

Driver	07949-3710001
Attachment, 42 x 47 mm	07746-0010300
Pilot, 22 mm	07746-0041000



Install the snap ring into the groove properly with the chamfered edge facing up.

Coat new dust seal lips with grease and install them (the upper seal is flush with the frame edge and the lower seal is fully seated onto the bearing).

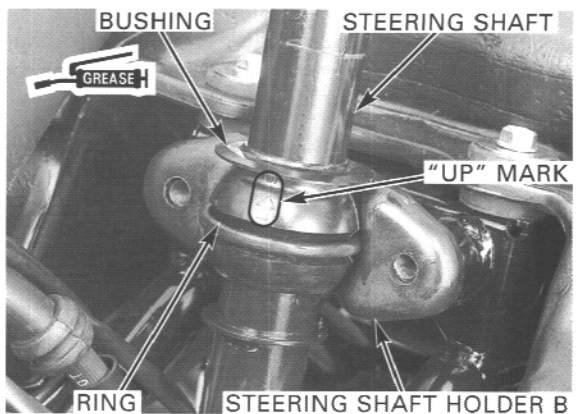


### INSTALLATION

Install the bushing ring onto the shaft bushing.  
Apply grease to the shaft bushing inner surface.

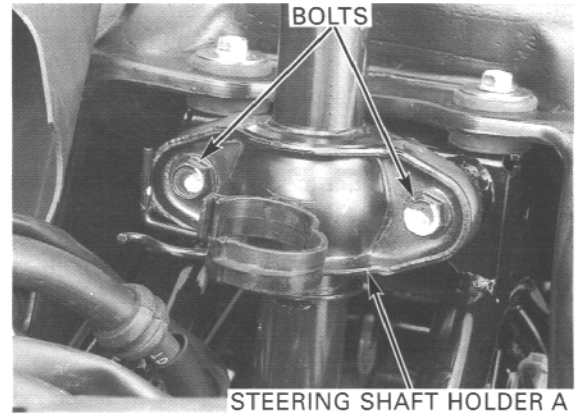
Install the shaft bushing onto the steering shaft with the "UP" mark (arrow) facing up.

Install steering shaft holder B onto the frame.  
Install the steering shaft into the shaft bearing.



Install steering shaft holder A with the hose guide clip facing the right side.  
Install and tighten the two bolts.

**TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)**

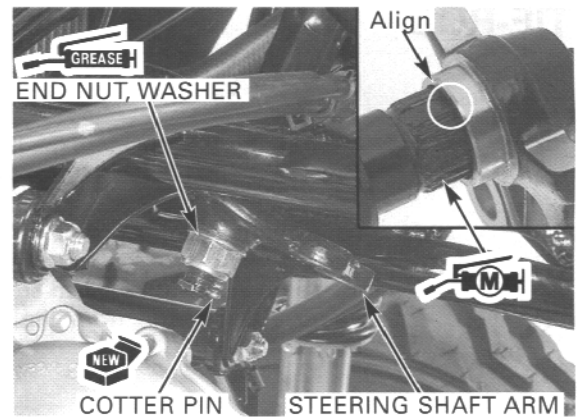


Apply grease to the end nut threads and seating surface.  
Apply molybdenum disulfide grease to the steering shaft spline.

Install the shaft arm over the steering shaft by aligning the wide tooth with the wide groove.  
Install the washer and end nut, and tighten the nut.

**TORQUE: 108 N·m (11.0 kgf·m, 80 lbf·ft)**

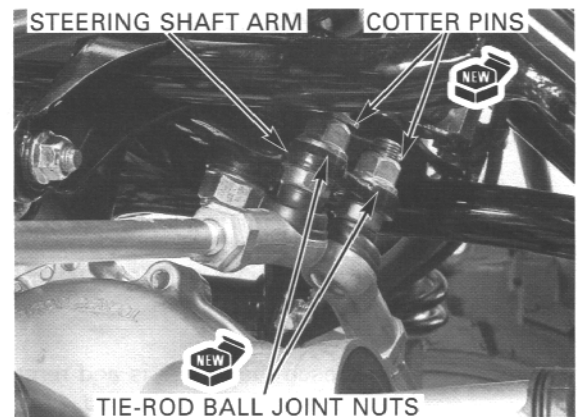
Install a new cotter pin.



Install the tie-rods into the the steering shaft arm.  
Install new nuts and tighten them by holding the ball joint stud flats with an open end wrench.

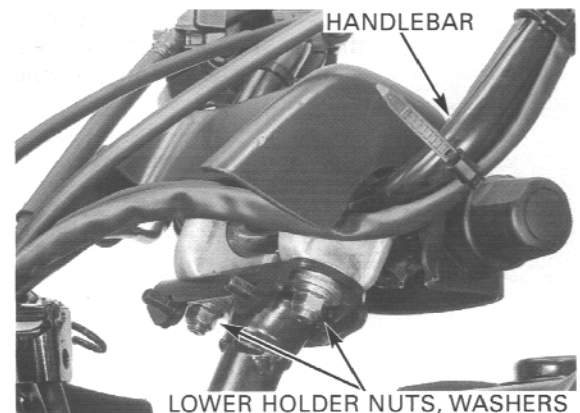
**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

Install new cotter pins.



Install the handlebar assembly onto the steering shaft with the washers and new lower holder nuts, and tighten the nuts.

**TORQUE: 39 N·m (4.0 kgf·m, 29 lbf·ft)**



## FRONT WHEEL/SUSPENSION/STEERING

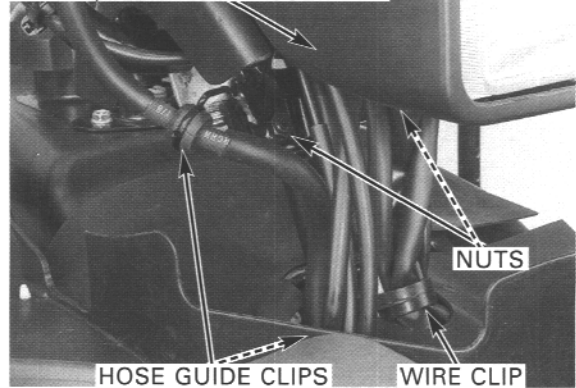
Install the meter/assist headlight assembly onto the steering shaft and tighten the two nuts securely.

Secure the wires with the wire clip.  
Install the brake hose onto the guide clips.

Set the air guide rubber properly.

Install the front fender (page 2-7).  
Install the inner fenders (page 2-6).

METER/HEADLIGHT ASSEMBLY

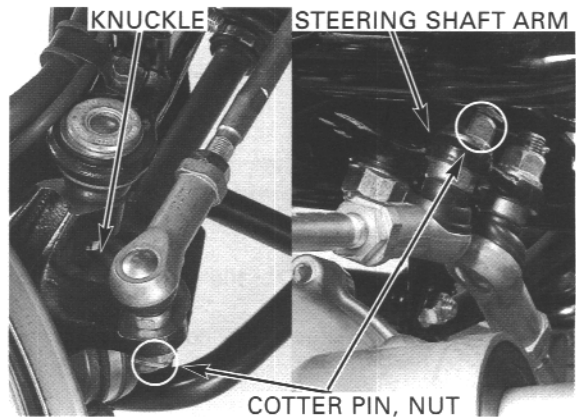


## TIE-ROD

### REMOVAL

Remove the inner fenders (page 2-6)  
Remove the front wheel (page 14-7)

Remove the cotter pins.  
Remove the tie-rod ball joint nuts while holding the joint stud flats with an open end wrench.  
Remove the tie-rod from the knuckle and steering shaft.



### INSPECTION

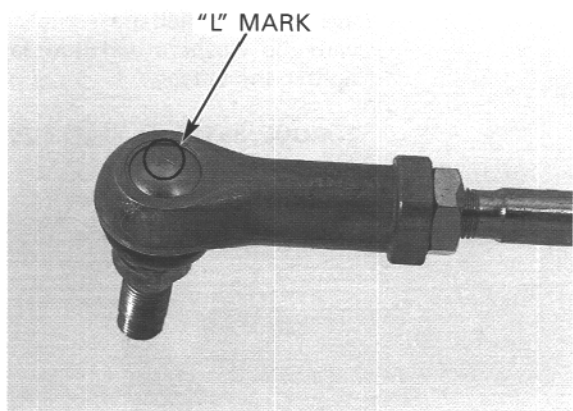
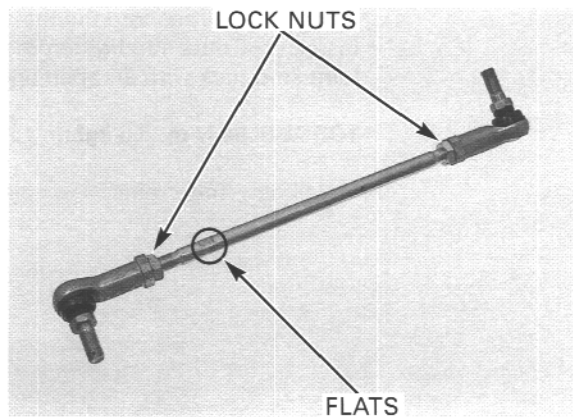
Inspect the tie-rod for distortion or damage.  
Inspect the ball joint boots for tears or other damage by moving the ball joint studs.  
They should move freely and smoothly.

Replace the ball joints if necessary.

### BALL JOINT DISASSEMBLY/ASSEMBLY

Loosen the lock nuts and remove the ball joints and lock nuts from the tie-rod.

Install the unmarked ball joint and gold colored nut on the flat side of the tie-rod, and the "L" marked ball joint and silver nut on the opposite side.



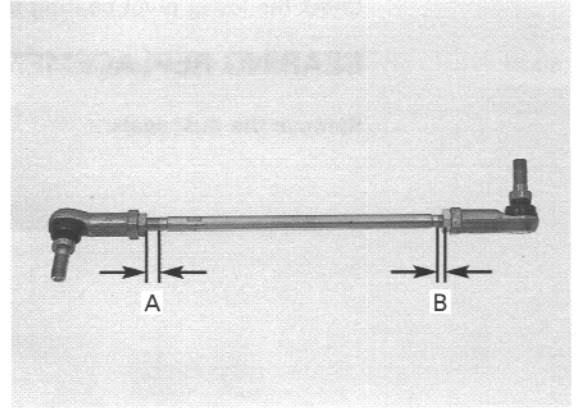
Hand-tighten the lock nuts and measure the distance between the lock nut and thread end.

### STANDARD DISTANCES:

**A: 5.5 mm (0.22 in)  $\pm$  1.5 mm**

**B: 5.5 mm (0.22 in)  $\pm$  1.5 mm**

The difference between distances A and B should be 3 mm (0.12 in) or less.



## INSTALLATION

Install the tie-rod onto the knuckle and steering arm, and adjust the toe (page 3-21).

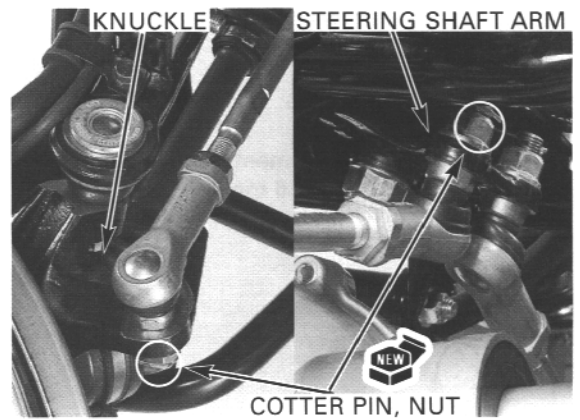
Install new nuts and tighten them by holding the ball joint stud flats with an open end wrench.

**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

Install new cotter pins.

Install the front wheel (page 14-7)

Install the inner fenders (page 2-6)

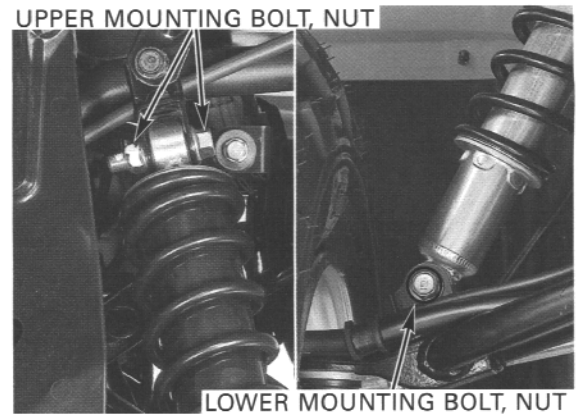


## FRONT SHOCK ABSORBER

### REMOVAL

Support the vehicle with a support block to raise the front wheels off the ground.

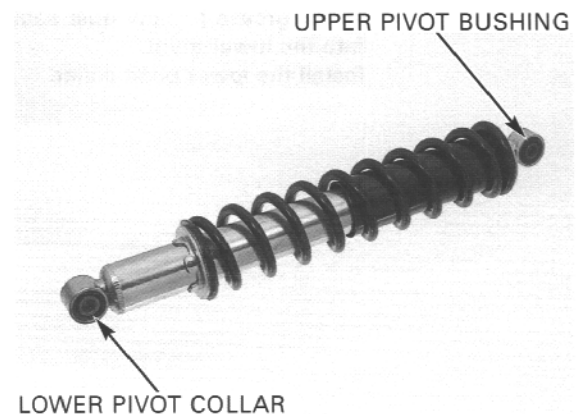
Support the suspension arm or front wheel, and remove the mounting nuts, bolts and shock absorber.



### INSPECTION

Check the upper pivot bushing for wear or damage. Check the damper unit for leakage or other damage. Replace the shock absorber assembly if necessary.

Remove the lower pivot collar.

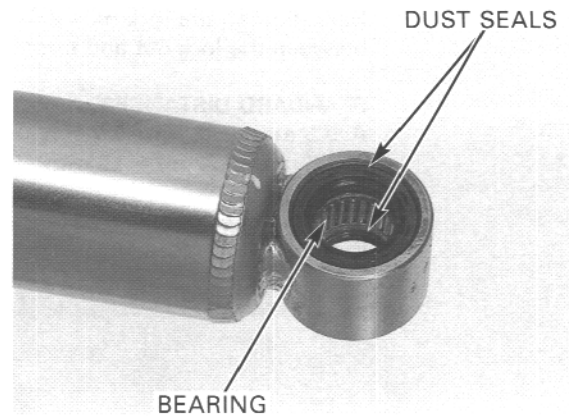


## FRONT WHEEL/SUSPENSION/STEERING

Check the lower pivot bearing for wear or damage.

### BEARING REPLACEMENT

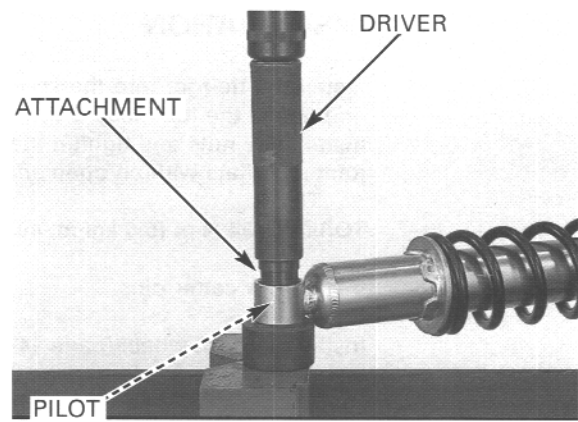
Remove the dust seals.



Press the needle bearing out of the lower pivot using the special tools.

#### TOOLS:

<b>Driver</b>	<b>07749-0010000</b>
<b>Attachment, 22 x 24 mm</b>	<b>07746-0010800</b>
<b>Pilot, 16 mm</b>	<b>07746-0041300</b>

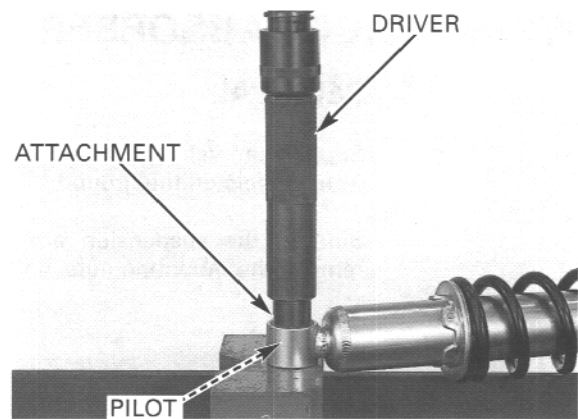


*Press in the bearing with the marking side facing up.*

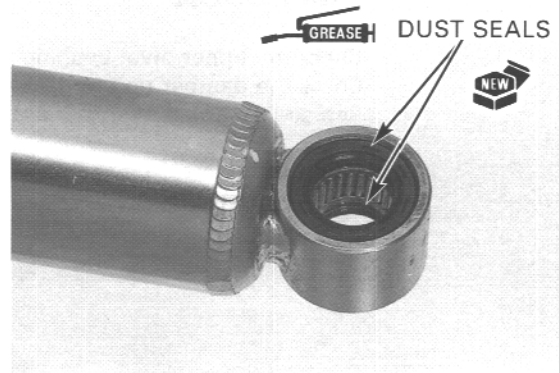
Apply grease to the needle rollers of a new bearing. Carefully press the needle bearing in the lower pivot until the depth from the lower pivot outer surface is 5.4—5.5 mm (0.21—0.22 in), using the special tools.

#### TOOLS:

<b>Driver</b>	<b>07749-0010000</b>
<b>Attachment, 22 x 24 mm</b>	<b>07746-0010800</b>
<b>Pilot, 16 mm</b>	<b>07746-0041300</b>



Apply grease to new dust seal lips and install them into the lower pivot.  
Install the lower pivot collar.





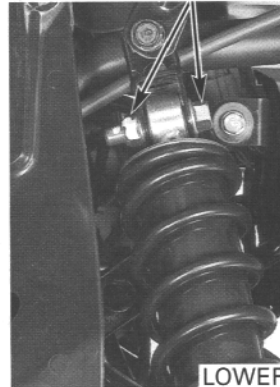
**INSTALLATION**

Install the front shock absorber in the frame and insert the upper and lower mounting bolts from the front side.

Install and tighten new mounting nuts.

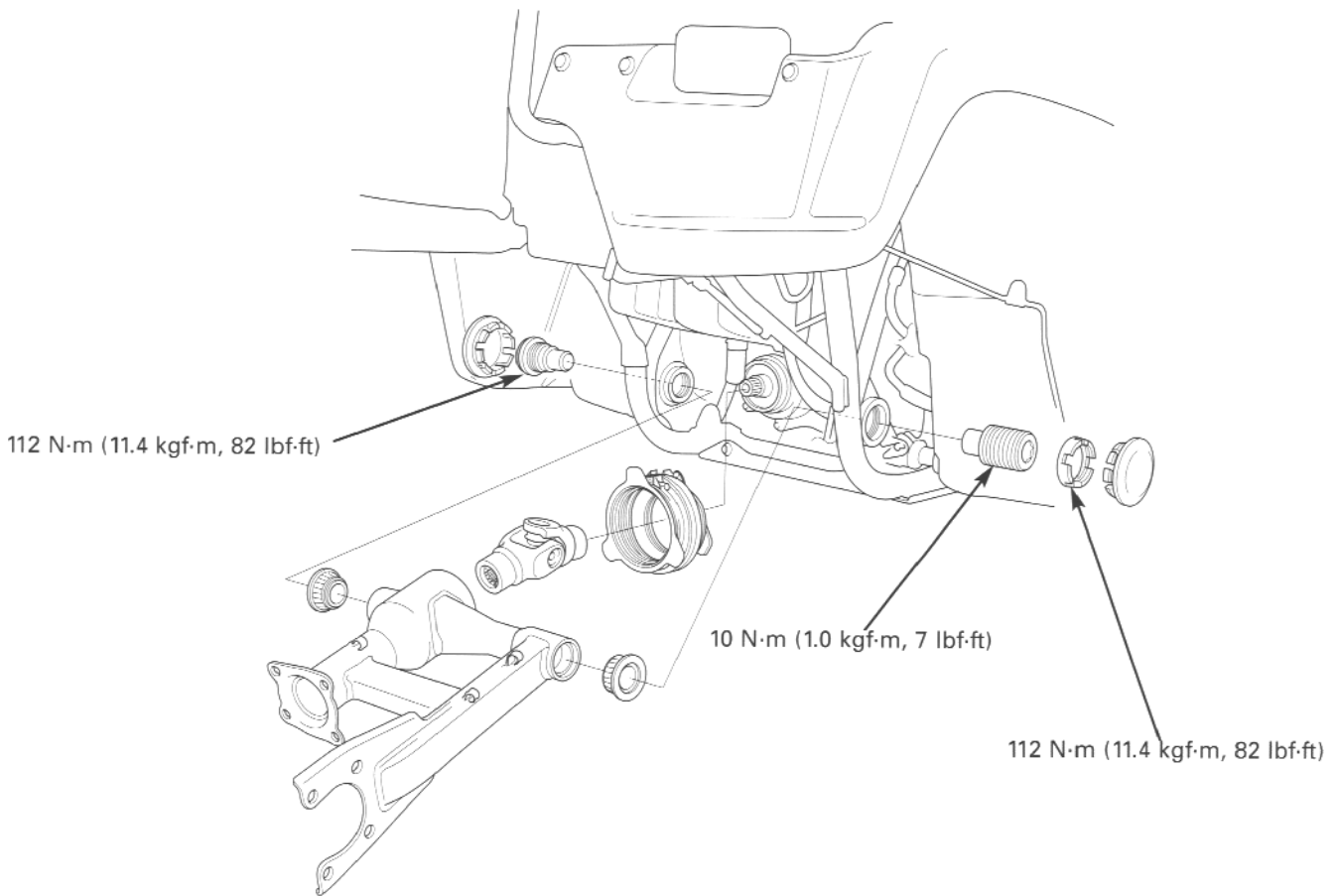
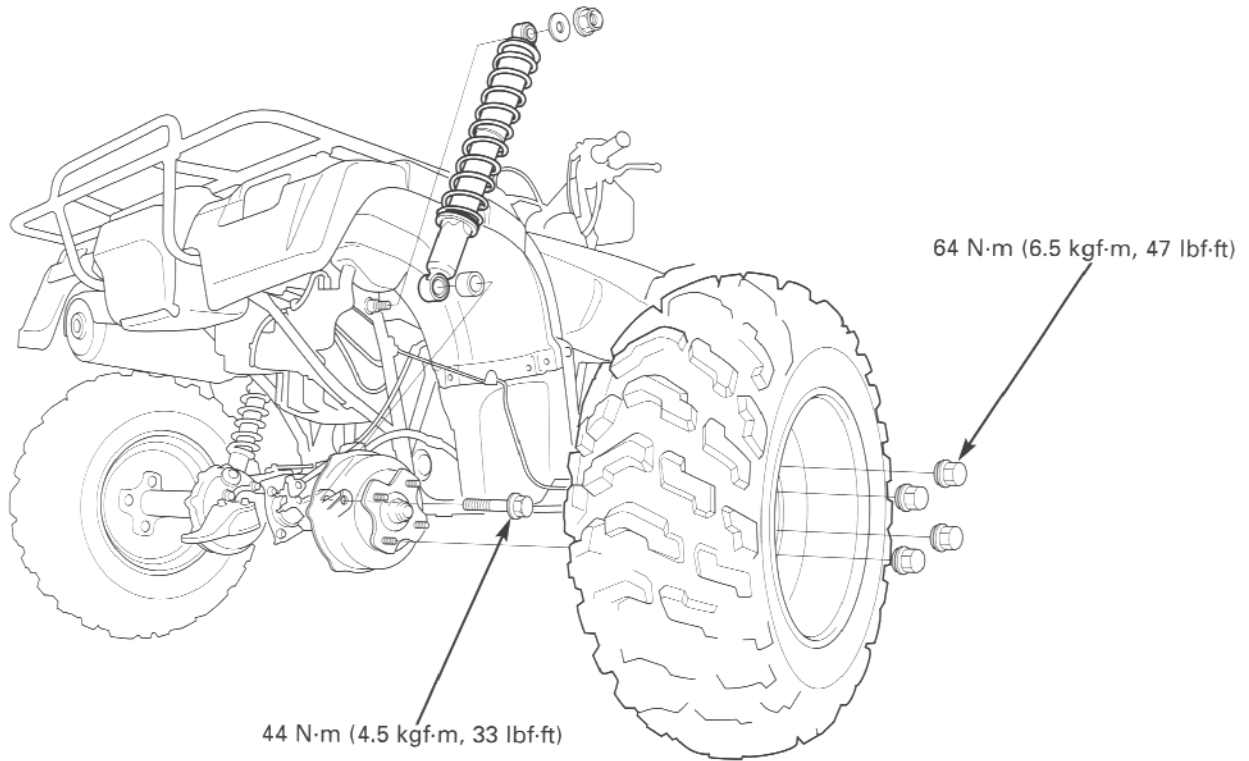
**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

UPPER MOUNTING BOLT, NUT



LOWER MOUNTING BOLT, NUT

# REAR WHEEL/SUSPENSION



# 15. REAR WHEEL/SUSPENSION

<b>SERVICE INFORMATION</b>	<b>15-1</b>	<b>REAR SHOCK ABSORBER</b>	<b>15-3</b>
<b>TROUBLESHOOTING</b>	<b>15-2</b>	<b>SWINGARM</b>	<b>15-5</b>
<b>REAR WHEEL</b>	<b>15-3</b>		

## SERVICE INFORMATION

### GENERAL

- This section covers service of the rear wheel, rear shock absorber and swingarm.
- For tire information, refer to section 14 .
- For brake system service, refer to section 16.
- For rear driving mechanism service, refer to section 18.
- A jack or other support is required to support the vehicle.
- Use genuine Honda replacement bolts and nuts for all suspension pivots and mounting points.
- When using the lock nut wrench, use a deflecting beam type torque wrench 20 inches long. The lock nut wrench increases the torque wrench's leverage, so the torque wrench reading will be less than the torque actually applied to the lock nut. The specification given is the actual torque applied to the lock nut, not the reading on the torque wrench. Do not over-tighten the lock nut. The specification later in the text gives both actual and indicated.

### SPECIFICATIONS

ITEM		STANDARD	SERVICE LIMIT
Minimum tire tread depth		—	4.0 mm (0.16 in)
Cold tire pressure	Standard	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—
	Minimum	22 kPa (0.22 kgf/cm <sup>2</sup> , 3.2 psi)	—
	Maximum	28 kPa (0.28 kgf/cm <sup>2</sup> , 4.0 psi)	—
	With cargo	25 kPa (0.25 kgf/cm <sup>2</sup> , 3.6 psi)	—

### TORQUE VALUES

15

Rear wheel nut	64 N·m (6.5 kgf·m, 47 lbf·ft)
Shock absorber lower mounting bolt	44 N·m (4.5 kgf·m, 33 lbf·ft)
Swingarm pivot bolt (left)	112 N·m (11.4 kgf·m, 82 lbf·ft)
(right)	10 N·m (1.0 kgf·m, 7 lbf·ft)
Swingarm right pivot lock nut	112 N·m (11.4 kgf·m, 82 lbf·ft)

### TOOLS

Driver	07749-0010000
Attachment, 37 x 40 mm	07746-0010200
Attachment, 22 x 24 mm	07746-0010800
Pilot, 16 mm	07746-0041300
Lock nut wrench	07908-4690003
Adjustable bearing remover set	07JAC-PH80000 — or 07736-A01000B or 07736-A01000A (U.S.A. only)*
– Remover attachment	07JAC-PH80100 —
– Remover shaft assembly	07JAC-PH80200 —
Bearing remover weight	07741-0010201

\*Used with 3/8" x 16 thread slide hammer commercially available

## REAR WHEEL/SUSPENSION

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### TROUBLESHOOTING

#### Rear wheel wobbling

- Bent rim
- Worn or damaged rear axle bearings
- Faulty rear tire
- Axle fastener not tightened properly
- Faulty swingarm pivot bearings

#### Rear wheel turns hard

- Faulty rear axle bearings
- Bent rear axle
- Rear brake drag

#### Soft suspension

- Weak shock absorber spring
- Oil leakage from damper unit

#### Hard suspension

- Damaged rear suspension pivot bearing or bushing
- Damaged swingarm pivot bearing
- Improperly tightened swingarm pivot

#### Rear suspension noise

- Faulty rear shock absorber
- Loose rear suspension fasteners
- Worn rear suspension pivot bearing or bushing

## REAR WHEEL

### REMOVAL

Loosen the wheel nuts.

Support the vehicle with a support block to raise the rear wheels off the ground.  
Remove the nuts and wheel.

For tire removal/installation and repair, refer to section 14.

### INSTALLATION

Install the wheel with the arrow mark facing in the normal rotating direction.

#### NOTE:

- Do not interchange the left and right tires.

Install the wheel nuts and tighten them.

**TORQUE: 64 N·m (6.5 kgf·m, 47 lbf·ft)**



## REAR SHOCK ABSORBER

### REMOVAL

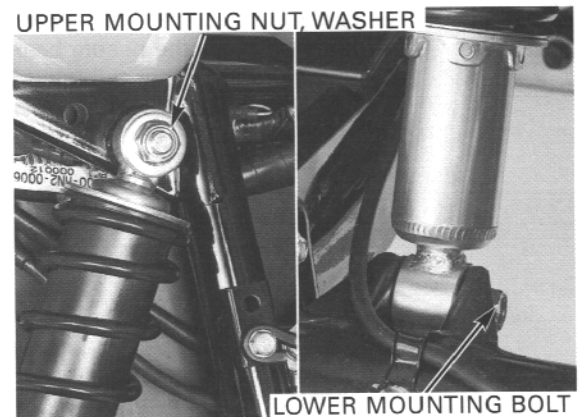
Support the vehicle with a support block to raise the rear wheels off the ground.

Support the swingarm and remove the mounting nut, washer, bolt and the shock absorber.

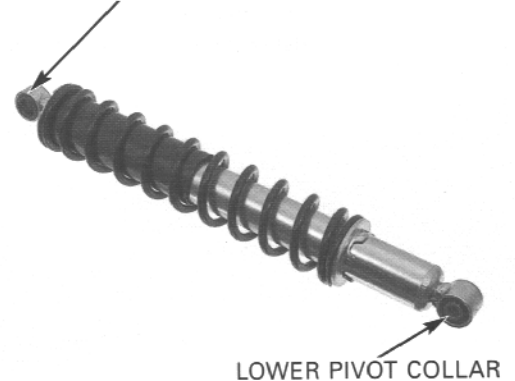
### INSPECTION

Check the upper pivot bushing for wear or damage.  
Check the damper unit for leakage or other damage.  
Replace the shock absorber assembly if necessary.

Remove the lower pivot collar.



UPPER PIVOT BUSHING

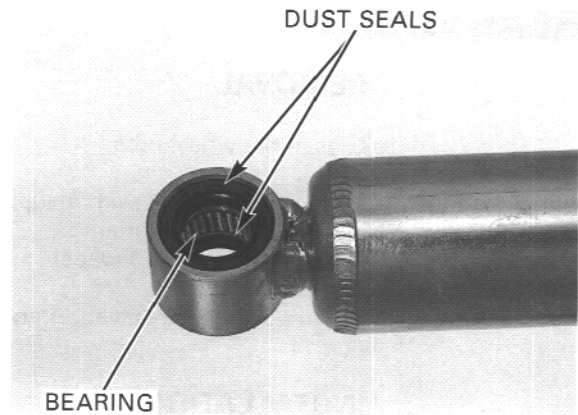


## REAR WHEEL/SUSPENSION

Check the lower pivot bearing for wear or damage.

### BEARING REPLACEMENT

Remove the dust seals.



Press the needle bearing out of the lower pivot using the special tools.

#### TOOLS:

Driver

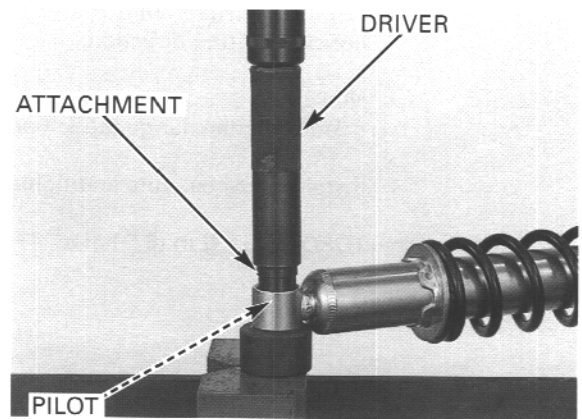
07749-0010000

Attachment, 22 x 24 mm

07746-0010800

Pilot, 16 mm

07746-0041300



Apply grease to the needle rollers of a new bearing. Carefully press the needle bearing in the lower pivot until the depth from the lower pivot outer surface is 5.4—5.5 mm (0.21—0.22 in), using the special tools.

#### TOOLS:

Driver

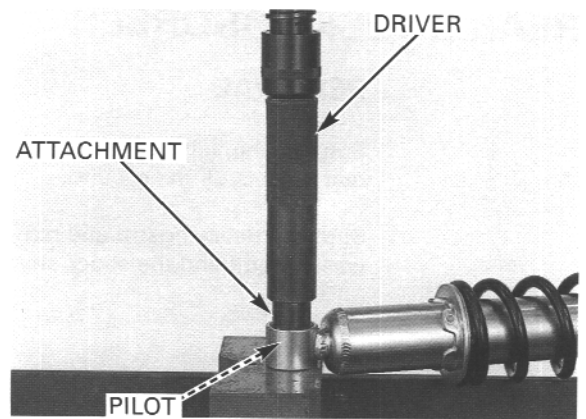
07749-0010000

Attachment, 22 x 24 mm

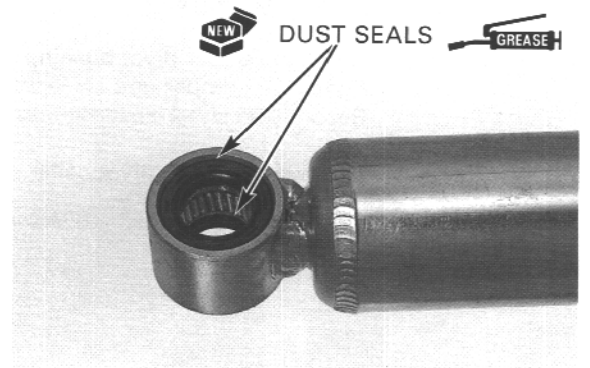
07746-0010800

Pilot, 16 mm

07746-0041300



Apply grease to new dust seal lips and install them into the lower pivot.  
Install the lower pivot collar.

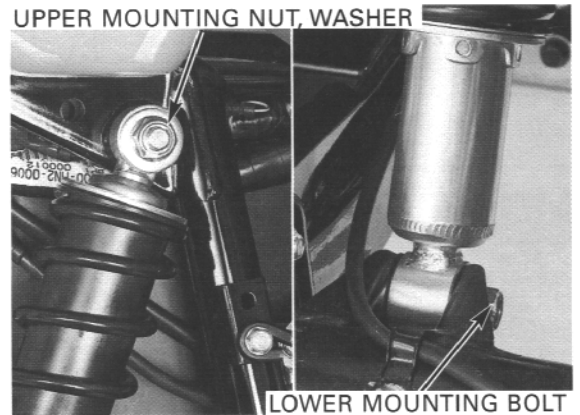


### INSTALLATION

Install the rear shock absorber onto upper mounting stud of the frame.  
Install the lower mounting bolt and tighten it.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Install the washer and a new upper mounting nut and tighten the nut securely.

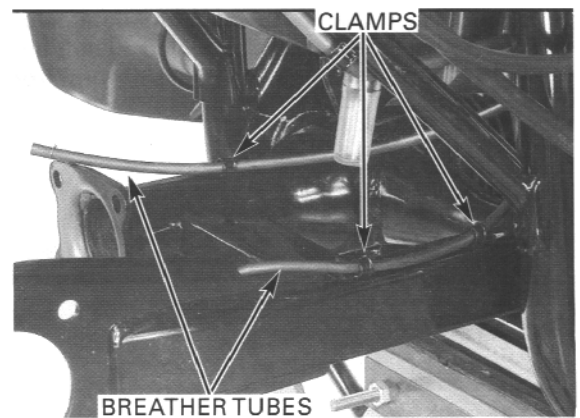


### SWINGARM

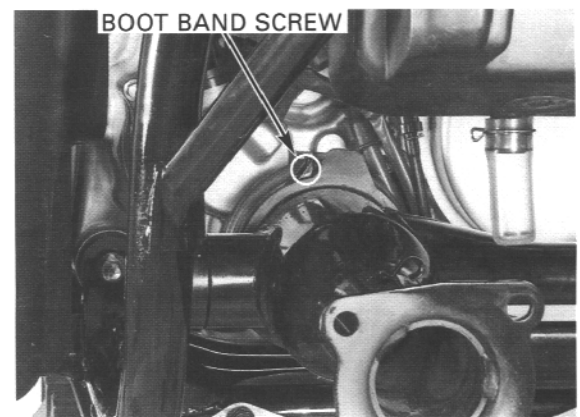
#### REMOVAL

Remove the final drive assembly (page18-5).

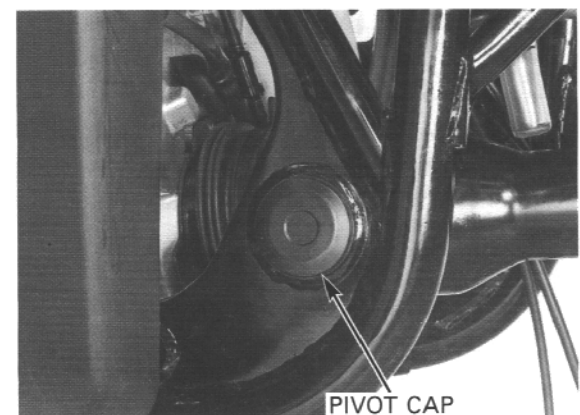
Remove the breather tubes from the clamps on the swingarm.



Remove the band screw and universal joint boot band.



Remove the left and right swingarm pivot caps.



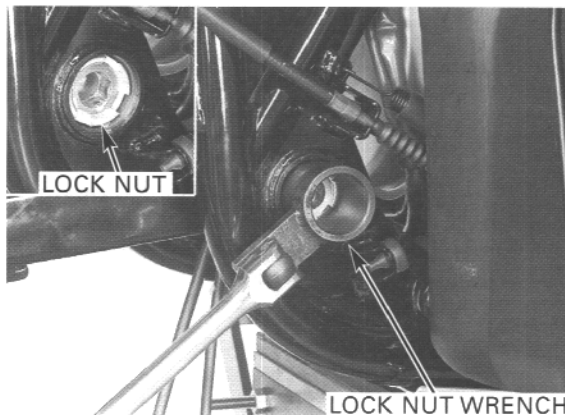
## REAR WHEEL/SUSPENSION

Remove the right pivot lock nut using the special tool.

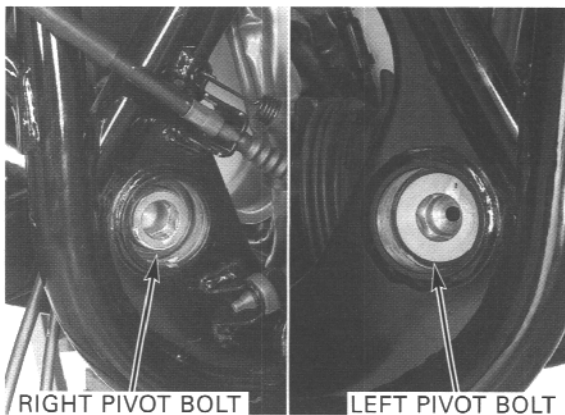
### TOOL:

Lock nut wrench

07908-4690003

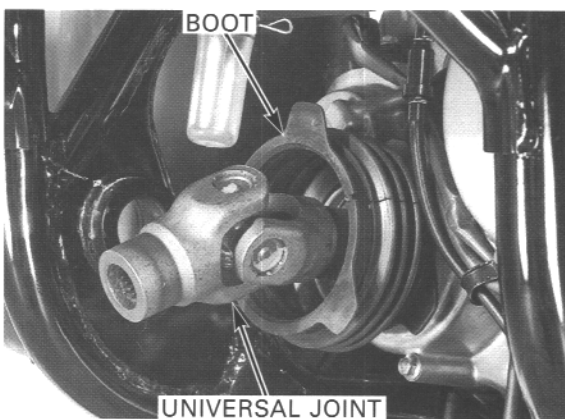


Remove the left and right pivot bolts.  
Remove the universal joint boot from the swingarm, then remove the swingarm from the frame.



Remove the universal joint.

Check the joint boot for tears or other damage and replace it if necessary.

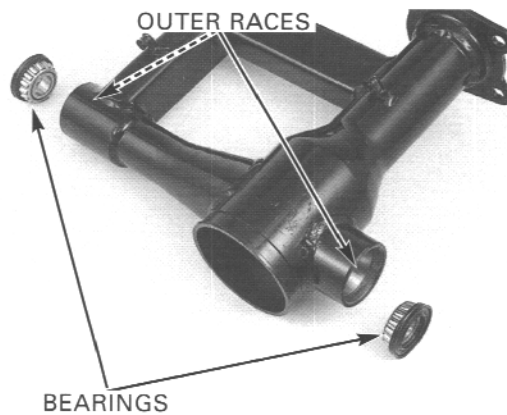


## INSPECTION

Remove the pivot bearings from the swingarm pivots.

Check the bearing rollers, dust seals and outer races for wear or damage.

*Both bearings, outer races and grease holders must be replaced as a set if any part is damaged or worn.*

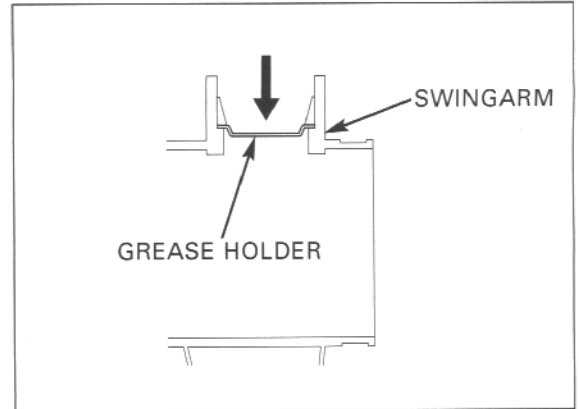




Drive the grease holder into the swingarm to remove it.

**TOOLS:**

**Driver** 07749-0010000  
**Attachment, 28 x 30 mm** 07946-1870100



Remove the outer race from the swingarm using the special tools.

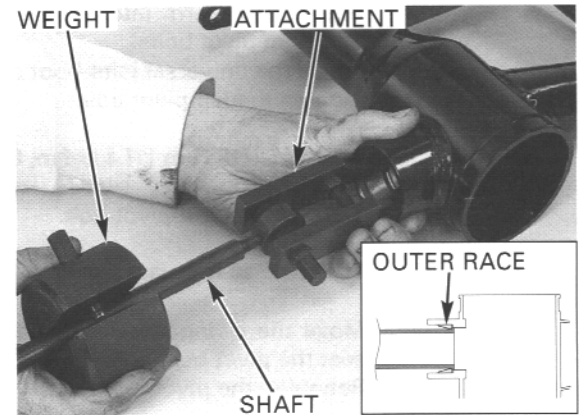
**TOOLS:**

**Adjustable bearing remover set** 07JAC-PH80000  
 - Remover attachment 07JAC-PH80100  
 - Remover shaft assembly 07JAC-PH80200  
**Bearing remover weight** 07741-0010201

**U.S.A. only:**

**Adjustable bearing puller** 07733-A01000B or 07733-A01000A

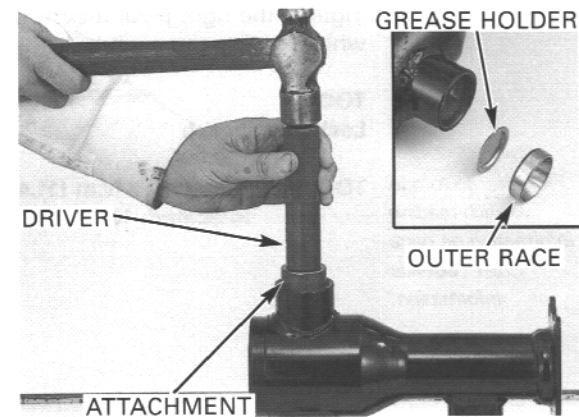
**Commercially Available**  
**3/8" x 16 Slide hammer**



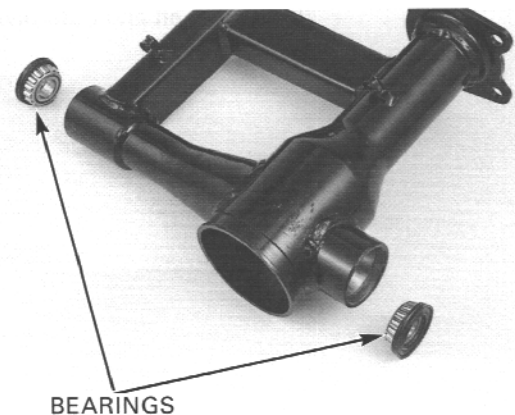
Install a new grease holder into the swingarm pivot. Drive a new outer race into the swingarm pivot until it is fully seated, using the special tools.

**TOOLS:**

**Driver** 07749-0010000  
**Attachment, 37 x 40 mm** 07746-0010200



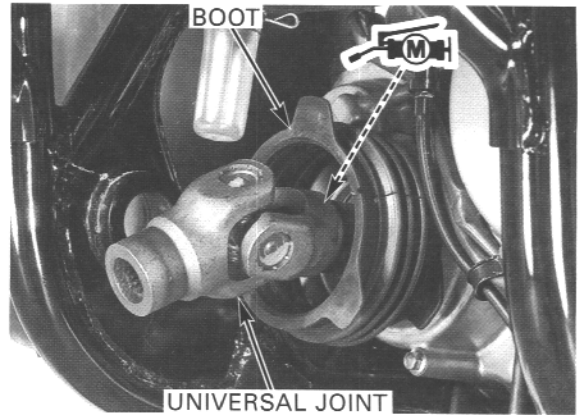
Apply Shell 6459 grease to new bearing rollers and dust seal lips and install the bearings into the swingarm pivots.



## REAR WHEEL/SUSPENSION

### INSTALLATION

Apply molybdenum disulfide grease to the output shaft spline and install the universal joint onto the output shaft.



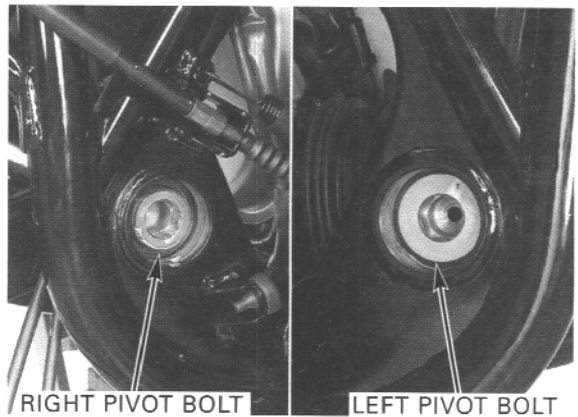
Set the swingarm into the frame and install the left and right pivot bolts. Install the universal joint boot onto the swingarm. Tighten the left pivot bolt.

**TORQUE: 112 N·m (11.4 kgf·m, 82 lbf·ft)**

Tighten the right pivot bolt.

**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

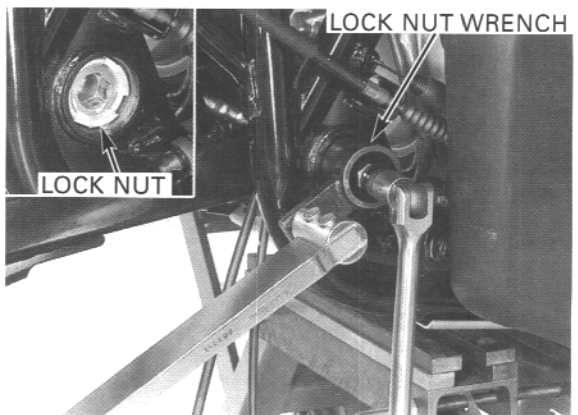
Move the swingarm up and down several times to seat the pivot bearings. Retighten the pivot bolts to the same torques.



Tighten the right pivot lock nut using the special tool, while holding the pivot bolt.

**TOOL:**

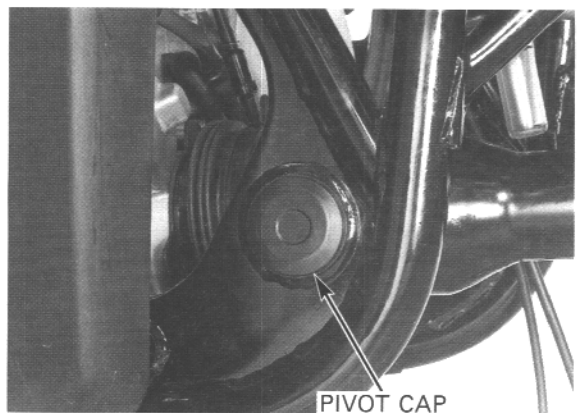
**Lock nut wrench** 07908-4690003



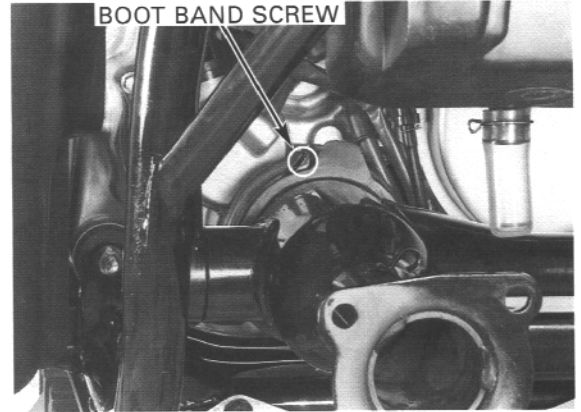
**TORQUE: Actual: 112 N·m (11.4 kgf·m, 82 lbf·ft)**  
**Indicated: 102 N·m (10.4 kgf·m, 75 lbf·ft)**

*Refer to torque wrench reading information on page 15-1 "Service Information."*

Install the left and right pivot caps securely.

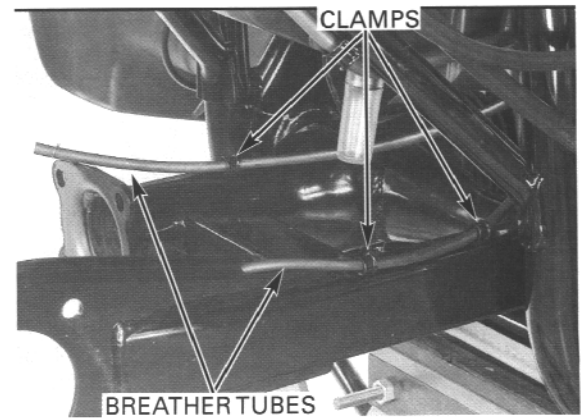


Install the universal joint boot band and screw so that the screw is positioned top and facing left side. Tighten the band screw securely.

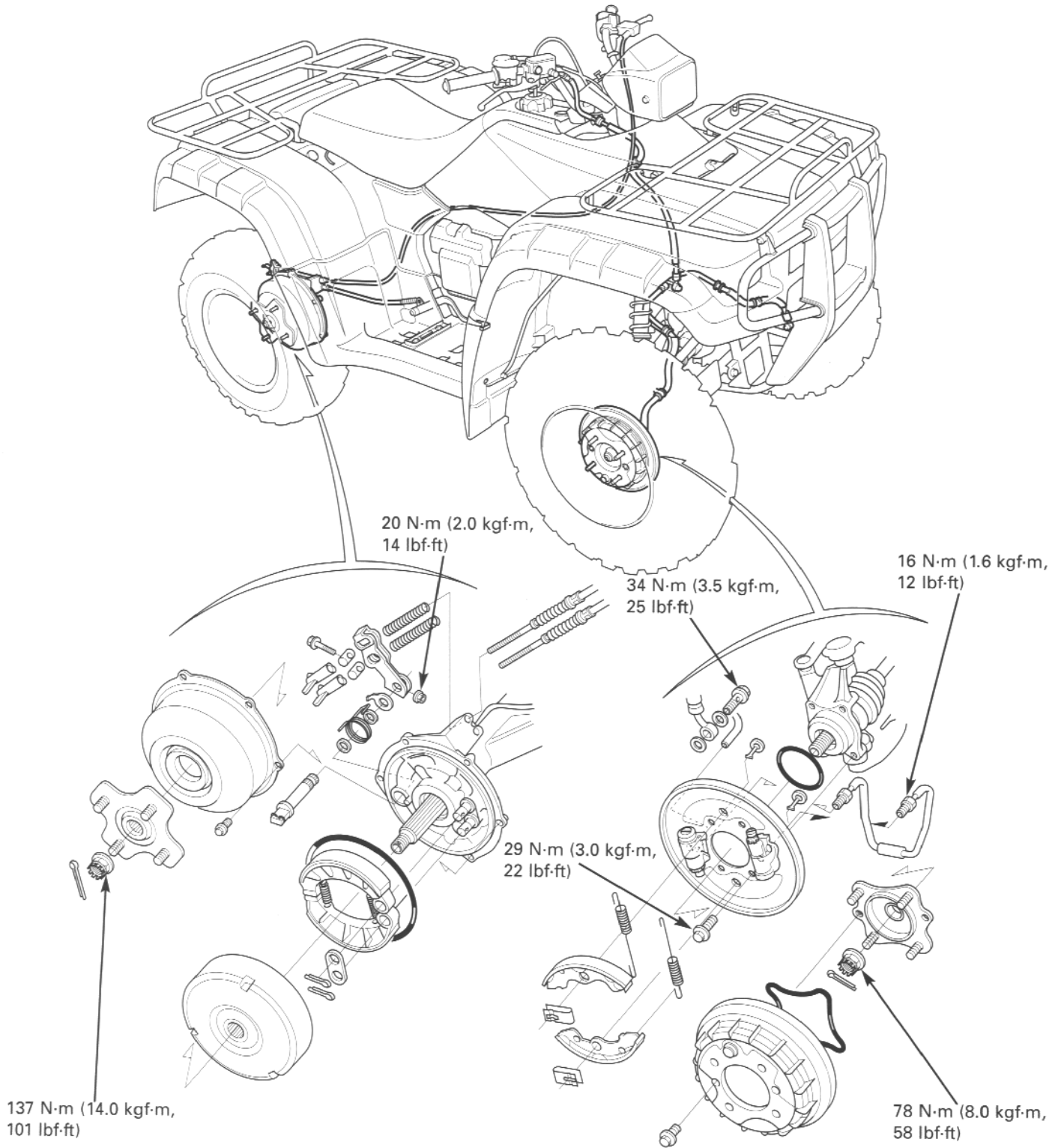


Route the breather tubes properly (page 1-19) and secure them with the clamps.

Install the final drive assembly (page 18-17).



# BRAKE SYSTEM



# 16. BRAKE SYSTEM

SERVICE INFORMATION	16-1	FRONT BRAKE SHOES/DRUM	16-7
TROUBLESHOOTING	16-2	FRONT WHEEL CYLINDER/ BRAKE PANEL	16-10
BRAKE FLUID REPLACEMENT/ AIR BLEEDING	16-3	REAR BRAKE SHOES/DRUM	16-14
FRONT MASTER CYLINDER	16-4	REAR BRAKE PEDAL	16-19

## SERVICE INFORMATION

### GENERAL

#### ⚠ CAUTION

Frequent inhalation of brake lining dust, regardless of material composition could be hazardous to your health.

- Avoid breathing dust particles.
- Never use an air hose or brush to clean brake assemblies. Use an OSHA-approved vacuum cleaner.

- A contaminated brake drum or lining reduces stopping power. Discard contaminated linings and clean a contaminated drum with a high quality brake degreasing agent.
- Spilled brake fluid will severely damage the plastic parts and painted surfaces. It is also harmful to some rubber parts. Be careful whenever you remove the reservoir cap; make sure the reservoir is horizontal first.
- Never allow contaminants (dirt, water, etc.) to get into an open reservoir.
- Once the hydraulic system has been opened, or if the brake feels spongy, the system must be bled.
- Always use fresh DOT 4 brake fluid from a sealed container when servicing the system. Do not mix different types of fluid as they may not be compatible.
- Always check brake operation before operating the ATV.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Front brake	Recommended brake fluid	DOT 3 or DOT 4 brake fluid	——
	Drum I.D.	160.0 (6.30)	161 (6.34)
	Shoe lining thickness	4.0 (0.16)	2.0 (0.08)
	Brake panel warpage	——	0.4 (0.02)
	Waterproof seal lip length	22 (0.9)	20 (0.8)
	Master cylinder I.D.	14.000—14.043 (0.5512—0.5529)	14.055 (0.5533)
	Master piston O.D.	13.957—13.984 (0.4983—0.4994)	13.945 (0.5490)
	Wheel cylinder I.D.	19.050—19.102 (0.7500—0.7520)	19.12 (0.753)
	Wheel cylinder piston O.D.	18.997—19.030 (0.7479—0.7492)	18.81 (0.741)
Rear brake	Drum I.D.	180.0 (7.09)	181 (7.1)
	Lining thickness	5.3 (0.209 )	To index mark

## BRAKE SYSTEM

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### TORQUE VALUES

Brake hose oil bolt	34 N·m (3.5 kgf·m, 25 lbf·ft)	
Wheel cylinder bleed valve	6 N·m (0.6 kgf·m, 4.3 lbf·ft)	
Front master cylinder reservoir cap screw	2 N·m (0.2 kgf·m, 1.4 lbf·ft)	
Front brake lever pivot bolt	1 N·m (0.1 kgf·m, 0.7 lbf·ft)	
Front brake lever pivot nut	6 N·m (0.6 kgf·m, 4.3 lbf·ft)	
Front brake switch screw	1 N·m (0.1 kgf·m, 0.7 lbf·ft)	
Front master cylinder holder bolt	12 N·m (1.2 kgf·m, 7 lbf·ft)	
Wheel cylinder bolt	8 N·m (0.8 kgf·m, 5.8 lbf·ft)	
Wheel cylinder nut	17 N·m (1.7 kgf·m, 12 lbf·ft)	
Wheel cylinder oil pipe joint nut	16 N·m (1.6 kgf·m, 12 lbf·ft)	
Front brake panel bolt	29 N·m (3.0 kgf·m, 22 lbf·ft)	Special bolt
Front wheel hub nut	78 N·m (8.0 kgf·m, 58 lbf·ft)	Apply grease to the threads and seating surface
Rear brake arm pinch bolt	20 N·m (2.0 kgf·m, 14 lbf·ft)	
Rear wheel hub nut	137 N·m (14.0 kgf·m, 101 lbf·ft)	Apply grease to the threads and seating surface

### TOOLS

Snap ring pliers	07914-SA50001 or 07914-3230001
Oil seal driver	07965-MC70100

## TROUBLESHOOTING

### Front wheel wobbling and noise

- Worn brake shoes

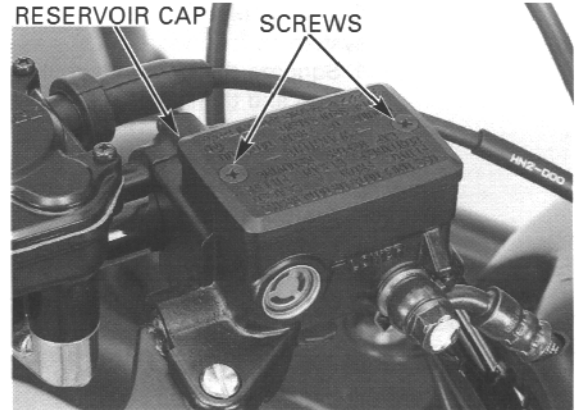
### Poor brake performance

- Improperly adjusted brake
- Worn brake shoes and/or drum
- Water in brake drum
- Contaminated brake shoes and/or drum
- Air in hydraulic system
- Leaking hydraulic system
- Clogged/restricted fluid passage
- Incorrectly installed rear brake arm
- Worn rear brake cam

## FRONT BRAKE FLUID REPLACEMENT/ AIR BLEEDING

### NOTICE

- Do not allow foreign material to enter the system when filling the reservoir.
- Avoid spilling fluid on painted, plastic or rubber parts. Place a rag over these parts whenever the system is serviced.
- Use only DOT 3 or DOT 4 brake fluid from a sealed container.
- Do not mix different types of fluid. They are not compatible.

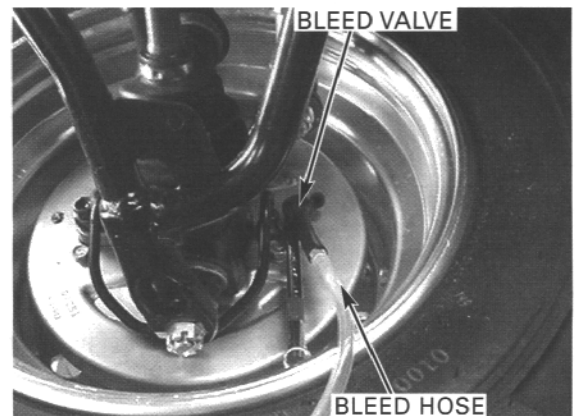


### BRAKE FLUID DRAINING

Turn the handlebar to the left side so that the reservoir is level and remove the reservoir cap, set plate and diaphragm.

Connect the bleed hose to the bleed valve. Loosen the bleed valve and pump the brake lever or pedal until no more fluid flows out of the bleed valve.

Perform above procedure for other side bleed valve.



### BRAKE FLUID FILLING/BLEEDING

Close the bleed valves. Fill the reservoir with DOT 3 or DOT 4 brake fluid from a sealed container.

Connect a commercially available brake bleeder to the bleed valve.

Operate the brake bleeder and loosen the bleed valve. If not using an automatic refill system, add brake fluid when the fluid level in the reservoir is low.

#### NOTE:

- Check the fluid level often while bleeding the brake to prevent air from being pumped into the system.
- When using a brake bleeding tool, follow the manufacturer's operating instructions.

Perform the bleeding procedure until the system is completely flushed/bled.

#### NOTE:

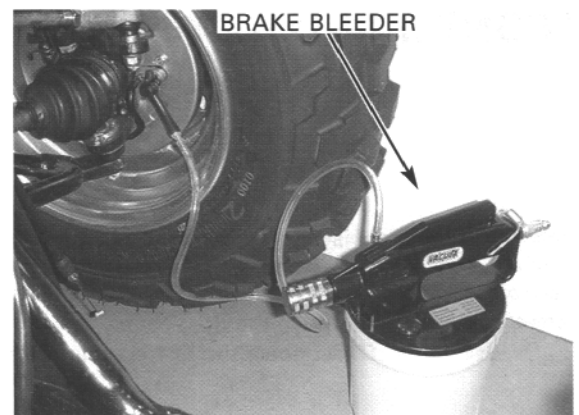
- If air is entering the bleeder from around the bleed valve threads, seal the threads with teflon tape.

Close the bleed valve and perform air bleeding for the other side bleed valve.

Close the bleed valve and operate the brake lever. If it still feels spongy, bleed the system again.

If a brake bleeder is not available, use the following procedure:

Pump up the system pressure with the brake lever until lever resistance is felt.



## BRAKE SYSTEM

Connect a bleed hose to the bleed valve and bleed the system as follows:

1. Squeeze the brake lever, open the bleed valve 1/4 turn and then close it.

**NOTE:**

- Do not release the brake lever until the bleed valve has been closed.

2. Release the brake lever slowly and wait several seconds after it reaches the end of its travel.

Repeat the steps 1 and 2 until air bubbles do not appear in the bleed hose.

Tighten the bleed valve.

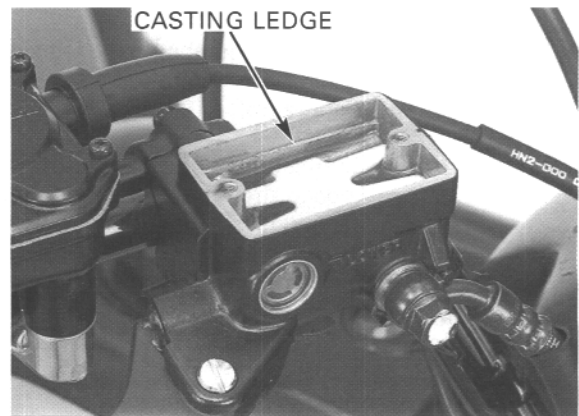
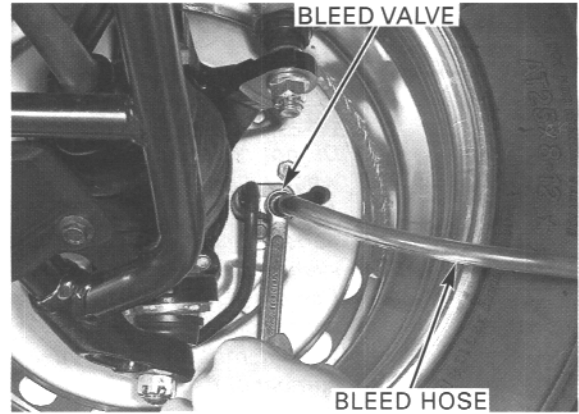
**TORQUE: 6 N·m (0.6 kgf-m, 4.3 lbf-ft)**

Perform air bleeding for the other side bleed valve.

Fill the reservoir to the casting ledge with DOT 3 or DOT 4 brake fluid from a sealed container.

Install the diaphragm, set plate and reservoir cap and tighten the screws.

**TORQUE: 2 N·m (0.2 kgf-m, 1.4 lbf-ft)**



## FRONT MASTER CYLINDER

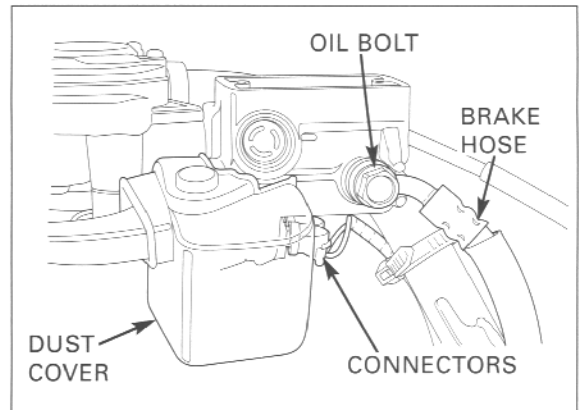
### DISASSEMBLY

Drain the brake fluid from the front brake hydraulic system (page 16-3).

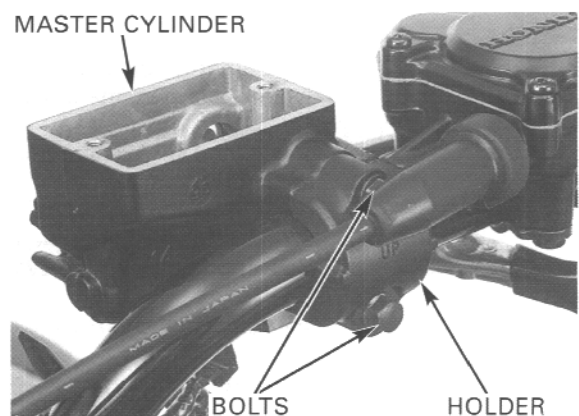
*When removing the oil bolt, cover the end of the hose to prevent contamination.*

Disconnect the brake hose from the master cylinder by removing the oil bolt and sealing washers.

Remove the dust cover.  
Disconnect the brake switch connectors.



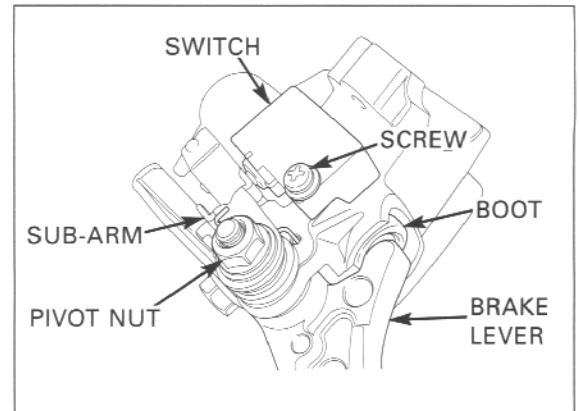
Remove the master cylinder holder bolts, holder and the master cylinder.





Remove the following:

- screw and brake switch
- pivot nut and washer
- sub-arm
- spring
- pivot collar
- washer
- bolt and brake lever
- piston boot



- snap ring using the special tool

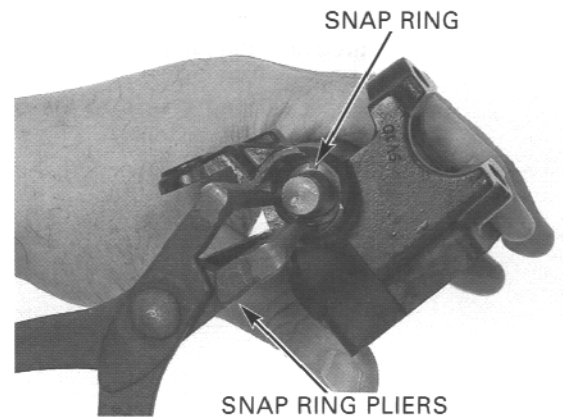
**TOOL:**

**Snap ring pliers**

**07914-SA50001 or  
07914-3230001**

- master piston
- primary cup/spring
- oil seal

Clean the master cylinder, reservoir and master piston in clean brake fluid.



## INSPECTION

Check the piston cups, oil seal and piston boot for wear, deterioration or damage.  
Check the spring for damage.  
Check the master cylinder and piston for scoring, scratches or damage.  
Measure the master cylinder I.D.

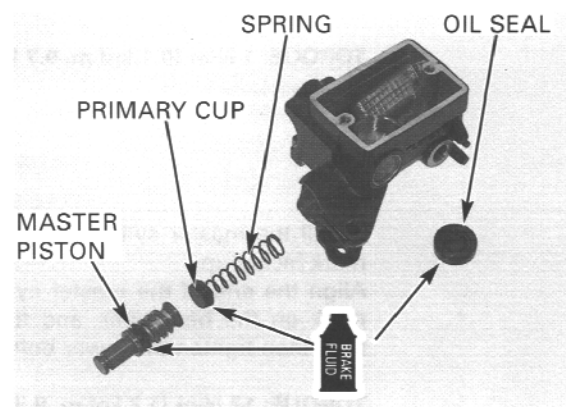
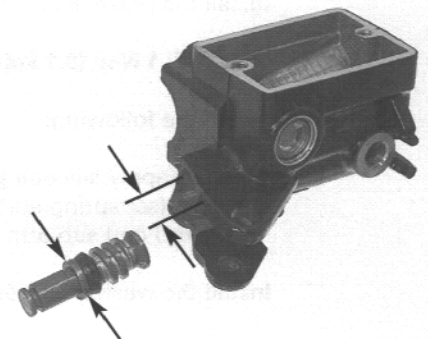
**SERVICE LIMIT: 14.055 mm (0.5533 in)**

Measure the master piston O.D.

**SERVICE LIMIT: 13.945 mm (0.5490 in)**

Coat the master piston, piston cups and oil seal with clean brake fluid.  
Install the oil seal into the master cylinder.  
Install the primary cup onto the spring.  
Install spring and master piston into the master cylinder.

*Do not allow the piston cup lips to turn inside out.*



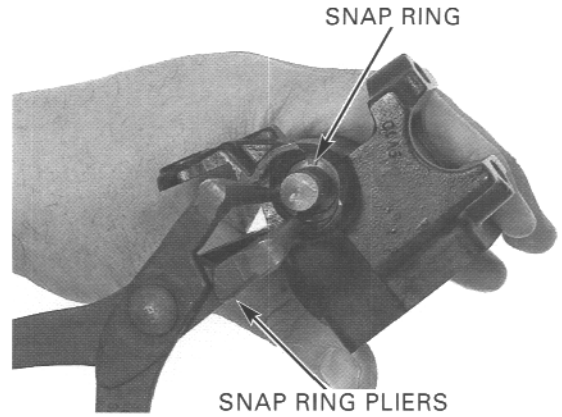
## BRAKE SYSTEM

Be certain the snap ring is firmly seated in the groove.

Install the snap ring into the groove in the master cylinder, using the special tool.

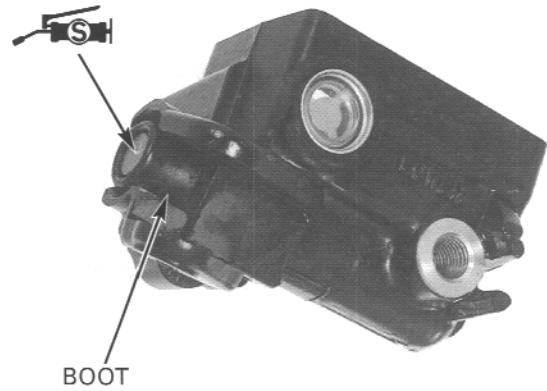
**TOOL:**  
Snap ring pliers

07914-SA50001 or  
07914-3230001



Install the boot into the master cylinder and into the groove in the piston.

Apply silicone grease to the brake lever contacting surface of the piston.



Apply silicone grease to the brake lever pivot. Install the brake lever and pivot bolt, and tighten it.

**TORQUE: 1 N·m (0.1 kgf·m, 0.7 lbf·ft)**

Install the following:

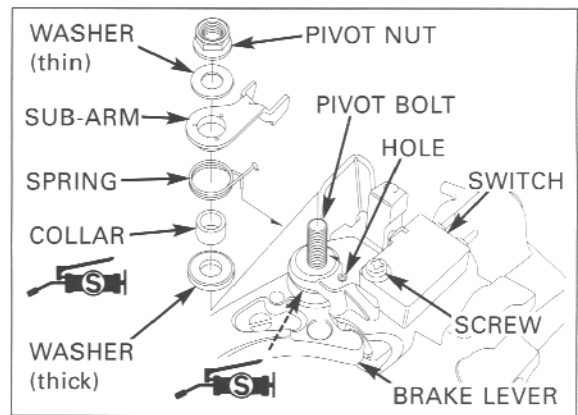
- washer
- collar (apply silicone grease to inner surface)
- spring (set spring ends onto sub-arm and into hole in lever) and sub-arm

Install the washer and pivot nut, and tighten it.

**TORQUE: 6 N·m (0.6 kgf·m, 4.3 lbf·ft)**

Install the brake switch and tighten the screw.

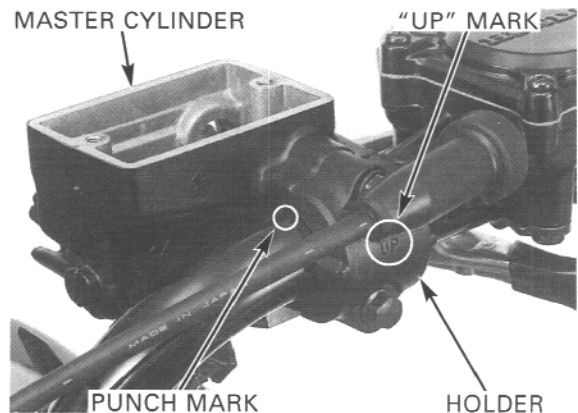
**TORQUE: 1 N·m (0.1 kgf·m, 0.7 lbf·ft)**



Install the master cylinder and holder with the "UP" mark facing up.

Align the end of the master cylinder with the punch mark on the handlebar, and tighten the upper bolt first, then tighten the lower bolt.

**TORQUE: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

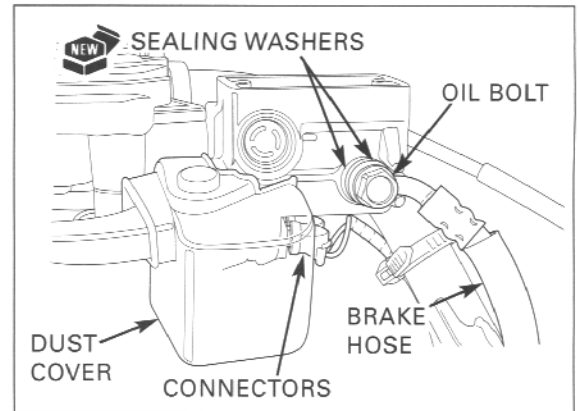


Connect the brake hose to the master cylinder with the oil bolt and new sealing washers by aligning the hose joint with the stopper groove. Tighten the oil bolt.

**TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)**

Connect the brake switch connectors. Install the dust cover properly.

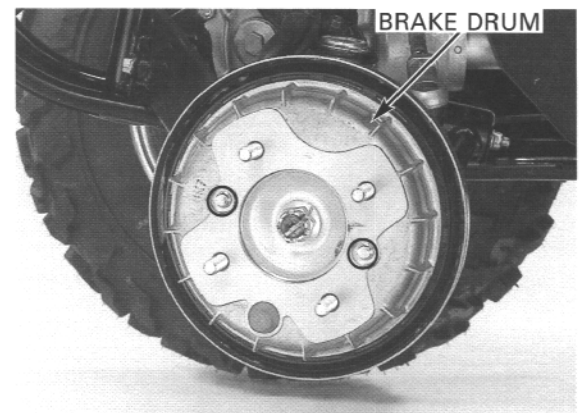
Fill and bleed the front brake hydraulic system (page 16-3).



## FRONT BRAKE SHOES/DRUM

### BRAKE DRUM REMOVAL

- Remove the following:
- front wheel (page 14-7)
  - two bolts
  - brake drum

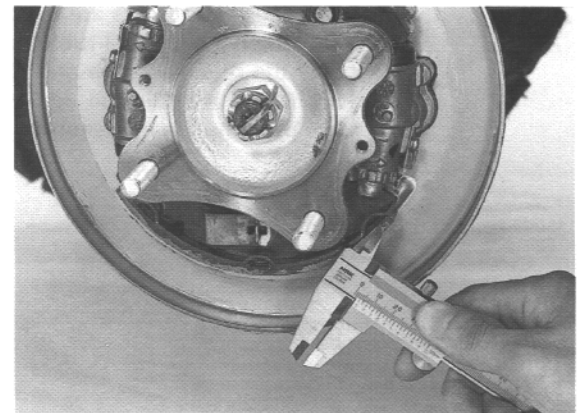


### INSPECTION/REPLACEMENT

#### SHOE INSPECTION

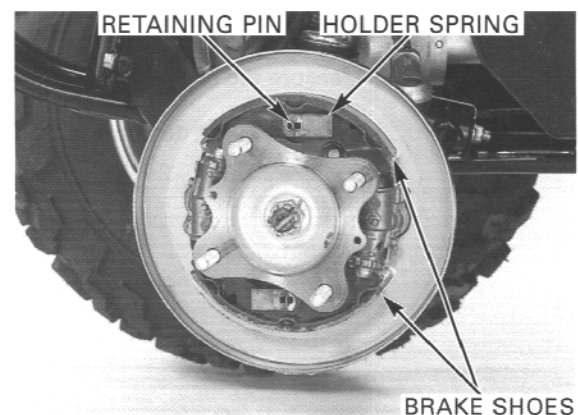
Measure the lining thickness.

**SERVICE LIMIT: 2.0 mm (0.08 in)**



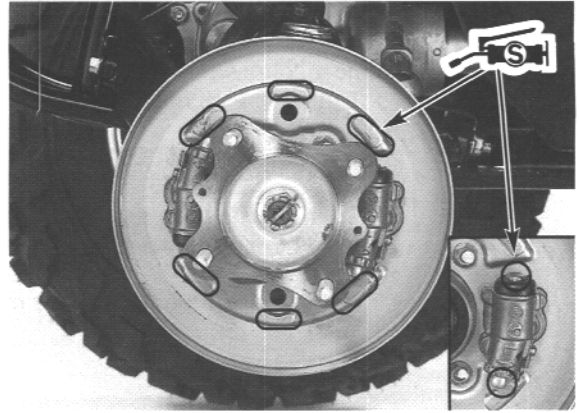
#### SHOE REPLACEMENT

Turn each retaining pin 90° while pressing the pin holder spring and remove the pins, pin caps/seal rubbers and holder springs. Expand the shoes and remove the shoes and shoe springs from the wheel cylinders.

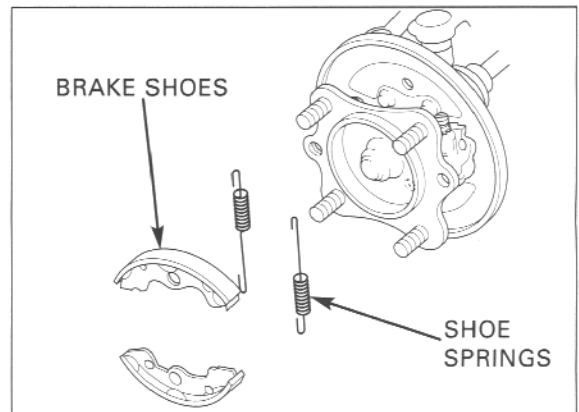


## BRAKE SYSTEM

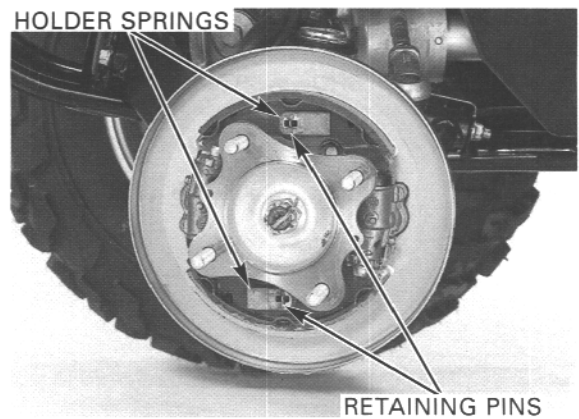
Coat the shoe metal contact areas of brake panel with silicone grease (6 places).  
Apply silicone grease into the shoe contact grooves of the wheel cylinders (4 places).



*Note the installation direction of the shoes and shoe springs.* Install the shoe springs and new shoes onto the wheel cylinders as shown.



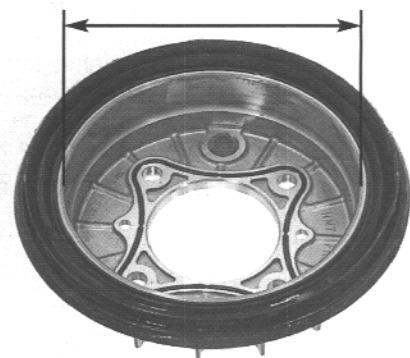
Check the seal rubbers are in good condition. Install the pin caps/seal rubbers onto retaining pins. Install the retaining pins and holder spring, then set the pin ends lengthwise against the holder grooves while pressing the holder springs to secure the shoes.



### DRUM INSPECTION

Measure the drum I.D.

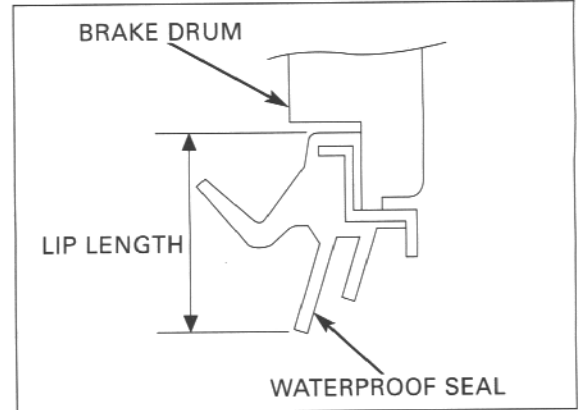
**SERVICE LIMIT: 161 mm (6.34 in)**



**WATERPROOF SEAL INSPECTION**

Check the waterproof seal for damage, fatigue or faulty installation.  
Measure the seal lip length.

**SERVICE LIMIT: 20 mm (0.8 in)**



**WATERPROOF SEAL REPLACEMENT**

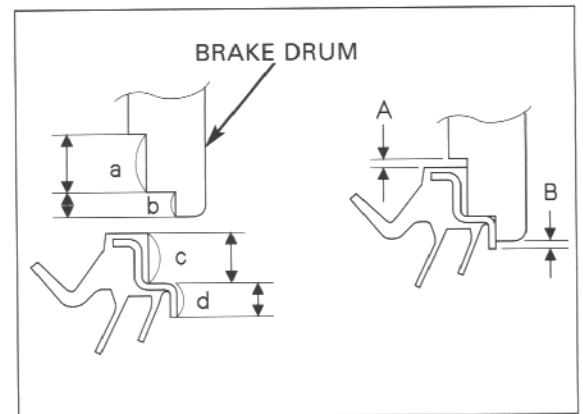
Remove the waterproof seal from the brake drum by prying open the seal edge.

Measure the drum and seal at points a, b, c and d as shown.

Calculate clearances A and B between the drum and seal.

$A = a - c$

$B = d - b$



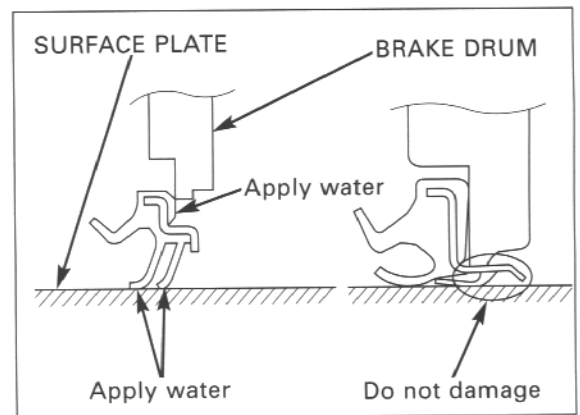
*Press the drum onto the seal evenly, so the lips will not be damaged. If the seal is damaged or mis-installed, remove it and try again with a new seal.*

Apply water to a new waterproof seal edge.

Place the waterproof seal on a clean surface plate, and press the brake drum into the waterproof seal, making sure that the clearances between the drum and seal will reach the calculated clearances (see previous step).

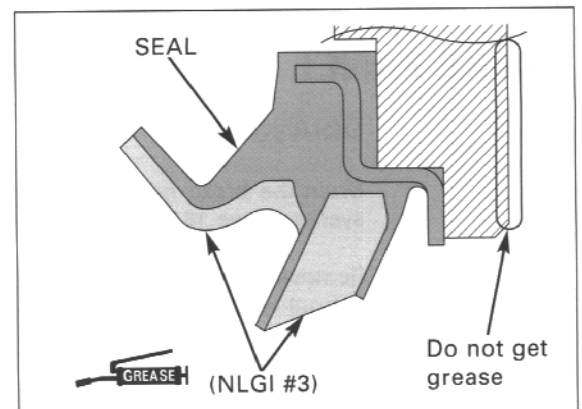
**NOTE:**

- When pressing the drum, place a steel plate [about 140 mm (5.5 in) in diameter and more than 10 mm (0.4 in) in thickness] on the brake drum, or the brake drum will be warped or damaged.



*Do not get grease onto the inner surface of the brake drum. Keep grease off the drum.*

Dry the seal thoroughly and pack the lips cavities with 14–16 g (0.5–0.6 oz) of multi-purpose grease (NLGI #3) as shown.



## BRAKE SYSTEM

*Do not get grease on the shoe linings.*

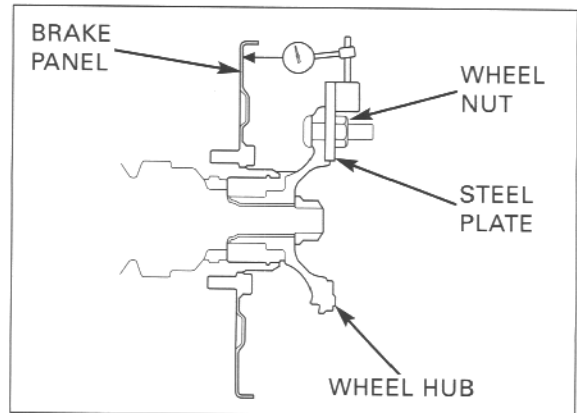
### BRAKE PANEL INSPECTION

Clean any grease from the brake panel thoroughly. Check the brake panel at the waterproof seal lip contact area for abnormal scratches or wear.

Install a suitable steel plate onto the wheel hub and secure it with the wheel nut securely as shown. Measure the brake panel on the points attached to the seal lip for warpage using a dial indicator.

**SERVICE LIMIT: 0.4 mm (0.02 in)**

For brake panel replacement, see below.

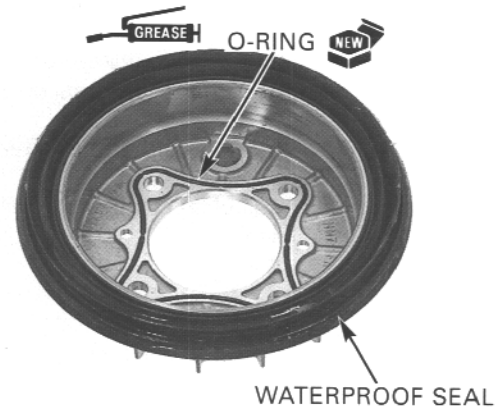


*Do not get grease on the brake drum and shoe linings.*

### BRAKE DRUM INSTALLATION

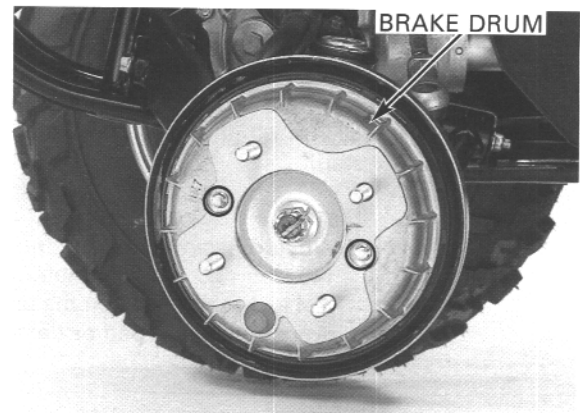
Coat a new O-ring with grease and install it into the brake drum groove.

Make sure that the waterproof seal is packed with the multi-purpose grease (NLGI #3).



Install the brake drum onto the hub and tighten the two bolts securely.

Install the front wheel (page 14-7).



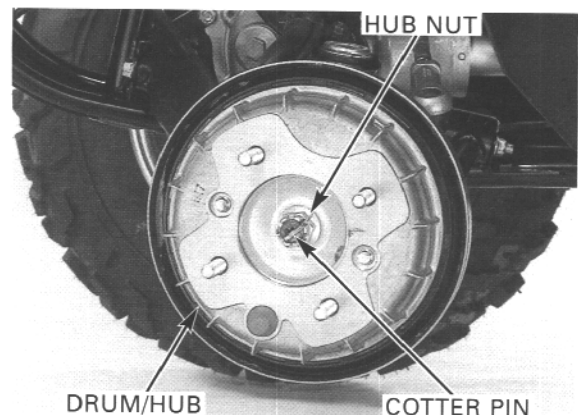
## FRONT WHEEL CYLINDER/ BRAKE PANEL

### DISASSEMBLY

Drain the brake fluid from the front brake hydraulic system (page 16-3).

Remove the following:

- front wheel (page 14-7)
- cotter pin
- hub nut
- brake drum/wheel hub



- brake shoes (page 16-7)
- oil bolt
- sealing washers
- brake hose
- breather tube

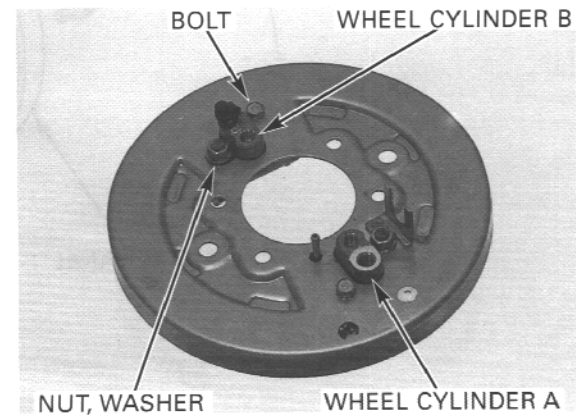
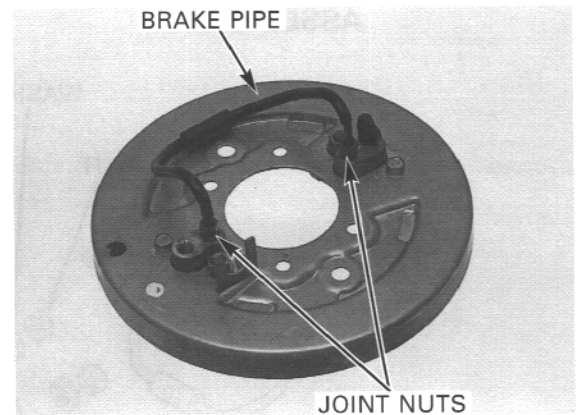
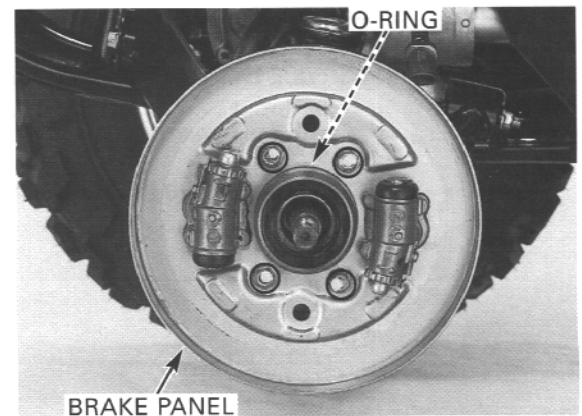
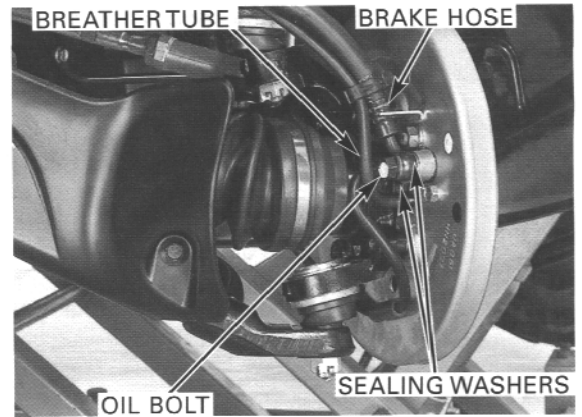
*Do not reuse the panel bolts because their threads are specially dry-coated for waterproofing.*

- four bolts (discard them)
- brake panel
- O-ring

Loosen the joint nuts and remove the brake pipe.

Remove the nuts, washers, bolts and wheel cylinders A and B.

Clean any sealant material from the wheel cylinders, bolts and brake panel.

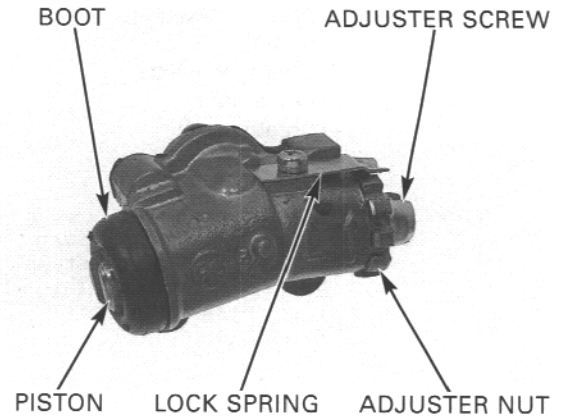


## BRAKE SYSTEM

Remove the boot, piston, adjuster nut and screw from the cylinder.

### INSPECTION

Check the piston cup and boot for wear, deterioration or damage.  
Check the cylinder bore and piston for scoring, scratches or damage.  
Check the adjuster for wear or damage.  
Check the lock spring for fatigue or damage.

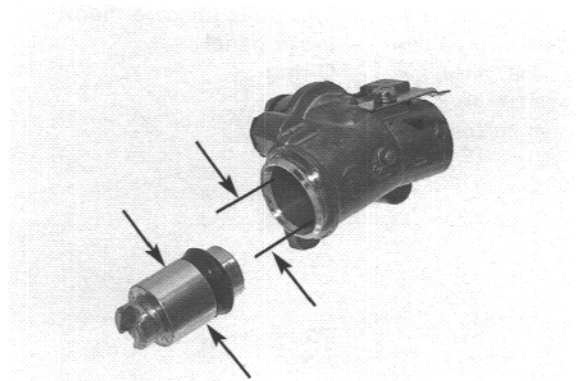


Measure the wheel cylinder I.D.

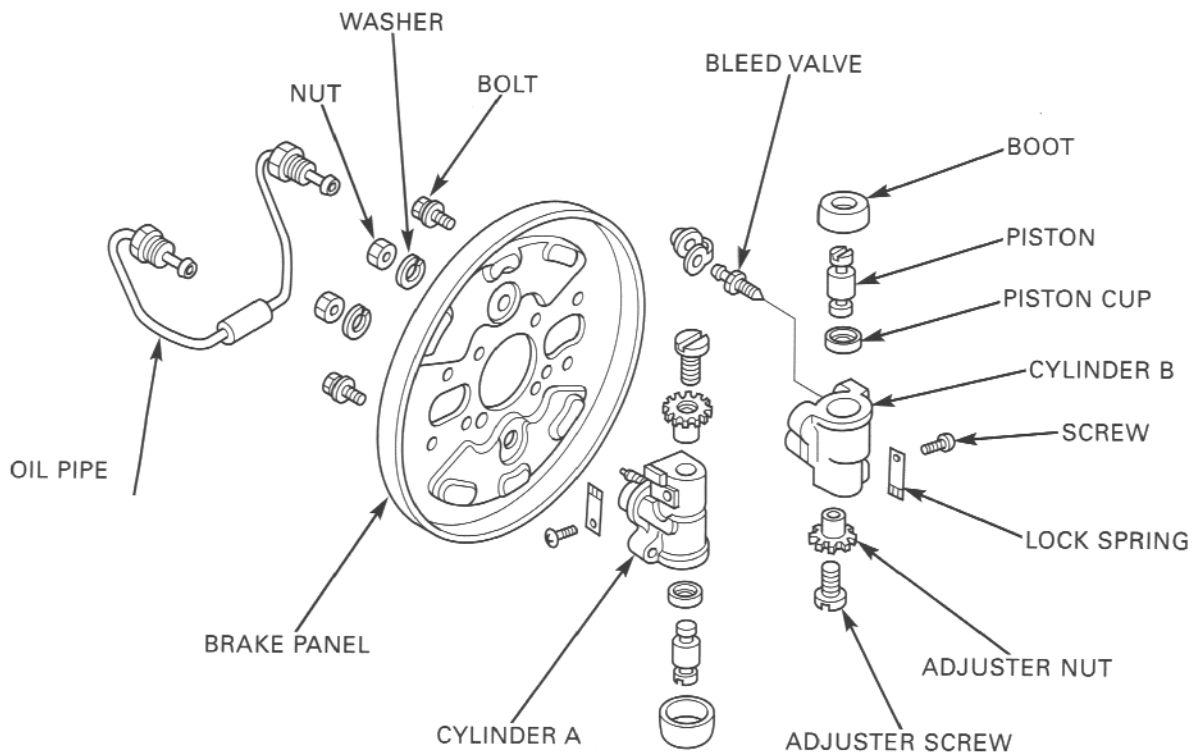
**SERVICE LIMIT: 19.12 mm (0.753 in)**

Measure the piston O.D.

**SERVICE LIMIT: 18.81 mm (0.741 in)**



### ASSEMBLY



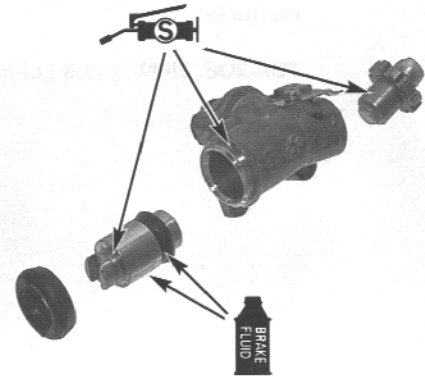


*Do not allow the piston cup lip to turn inside out.*

Coat the piston and cups with clean brake fluid.  
Install the piston into the wheel cylinder.

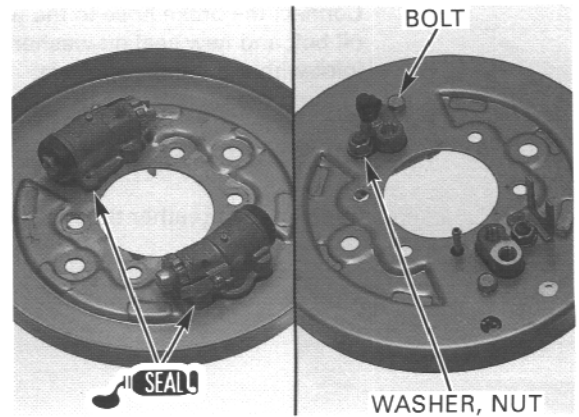
Apply silicone grease to the boot grooves in the piston and cylinder body.  
Install the piston boot onto the cylinder and piston grooves properly.

Apply silicone grease to the adjuster screw threads and adjuster nut spindle outer surface.  
Install the adjuster into the master cylinder.



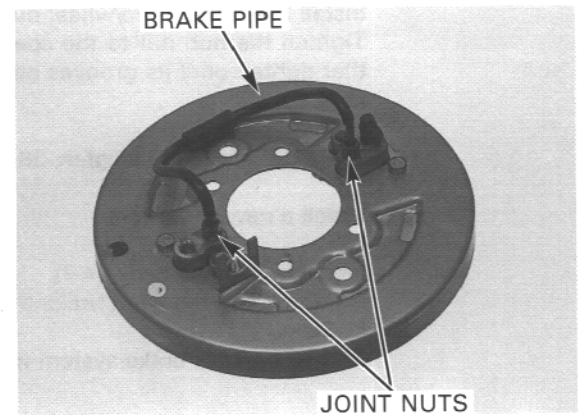
Apply sealant to the mating surface of the cylinder body.  
Install wheel cylinders A and B with the bolts, washers and nuts.  
Tighten the nuts and bolts.

**TORQUE: Bolt: 8 N·m (0.8 kgf·m, 5.8 lbf·ft)**  
**Nut: 17 N·m (1.7 kgf·m, 12 lbf·ft)**

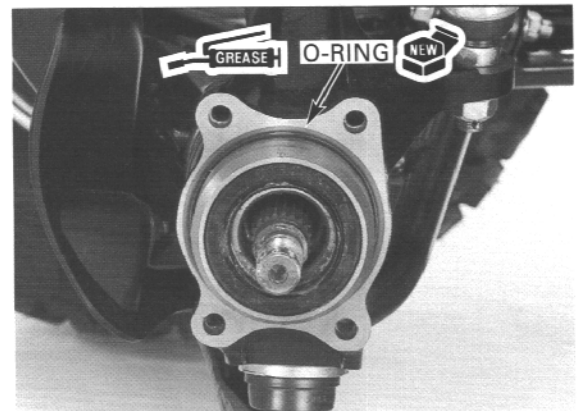


Install the brake pipe as shown and tighten the joint nuts.

**TORQUE: 16 N·m (1.6 kgf·m, 12 lbf·ft)**



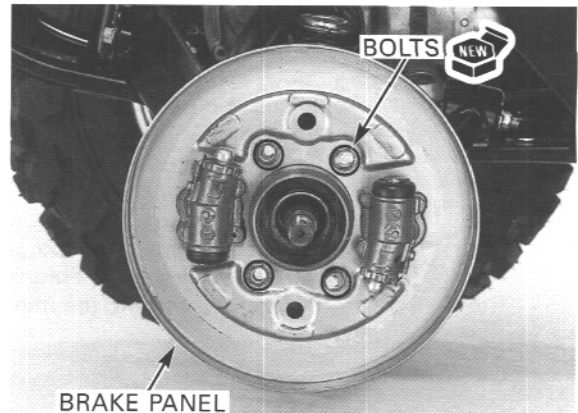
Coat a new O-ring with grease and install it onto the knuckle.



## BRAKE SYSTEM

Install the brake panel and four new bolts, and tighten the bolts.

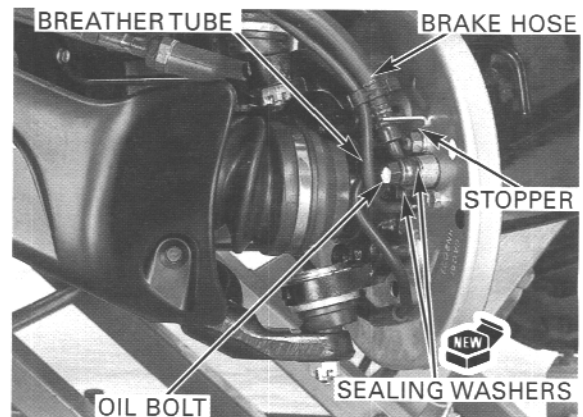
**TORQUE: 29 N·m (3.0 kgf·m, 22 lbf·ft)**



Connect the brake hose to the wheel cylinder with the oil bolt and new sealing washers by aligning the hose joint with the stopper groove. Tighten the oil bolt.

**TORQUE: 34 N·m (3.5 kgf·m, 25 lbf·ft)**

Connect the breather tube to the brake panel joint.

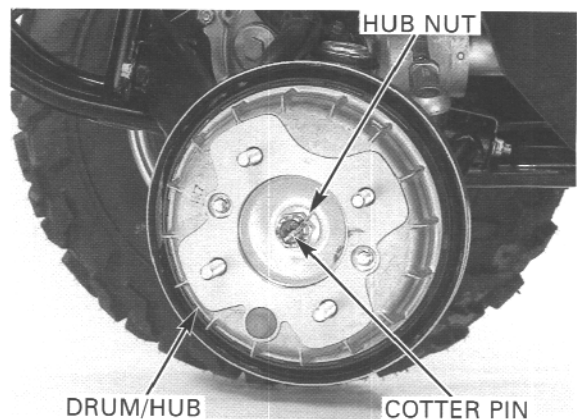


Install the brake drum/wheel hub. Tighten the hub nut to the specified torque and further tighten until its grooves align with the cotter pin hole.

**TORQUE: 78 N·m (8.0 kgf·m, 58 lbf·ft)**

Install a new cotter pin.

Install the wheel (page 14-7).  
Fill and bleed the front brake hydraulic system (page 16-3).  
Adjust the front brake system (page 3-17).

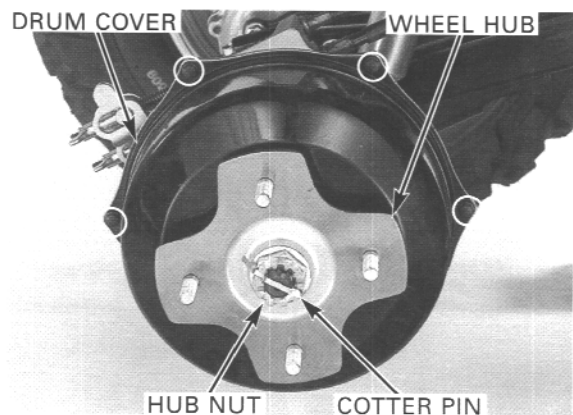


## REAR BRAKE SHOES/DRUM

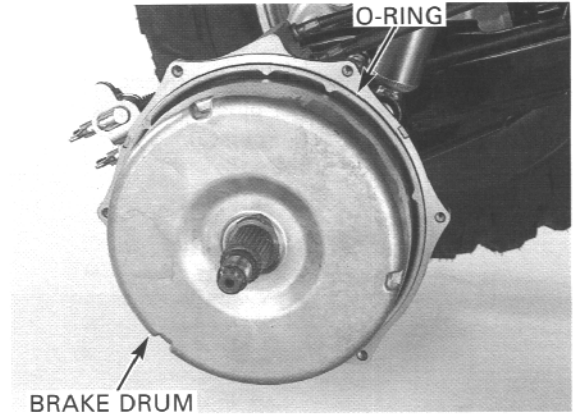
### BRAKE DRUM REMOVAL

Remove the following:

- right rear wheel (page 15-3)
- cotter pin
- hub nut
- wheel hub
- six bolts
- brake drum cover



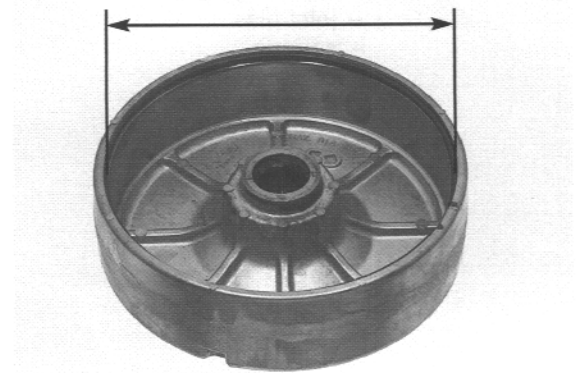
- O-ring
- brake drum



**INSPECTION**

Measure the brake drum I.D.

**SERVICE LIMIT: 181.0 mm (7.1 in)**



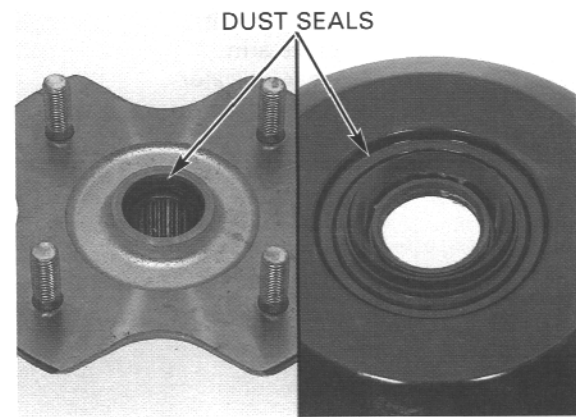
Check the dust seals in the wheel hub and drum cover for wear or damage.  
Replace the dust seal if necessary.

**DUST SEAL REPLACEMENT**

**WHEEL HUB DUST SEAL**

Remove the dust seal from the wheel hub.

Apply molybdenum disulfide grease to a new seal lips and install it into the wheel hub with the flat side facing in until it is fully seated.



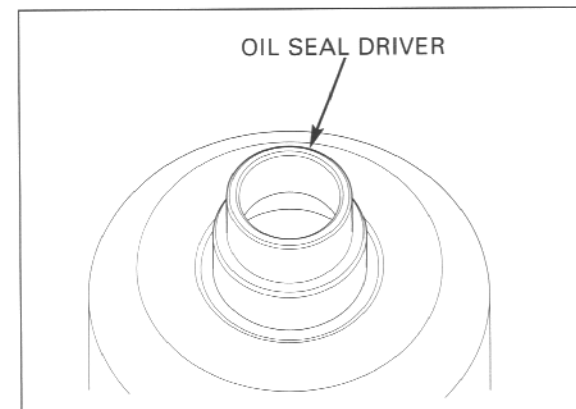
**DRUM COVER DUST SEAL**

Remove the dust seal from the drum cover.

Apply grease to a new dust seal lips and install it into the drum cover using the special tool.

**TOOL:**  
**Oil seal driver**

**07965-MC70100**



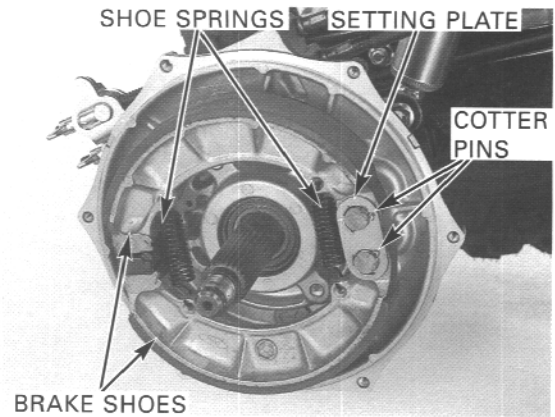
## BRAKE SYSTEM

### DISASSEMBLY

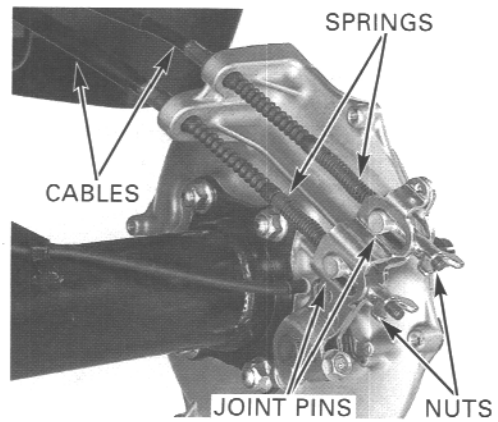
Remove the following:

- cotter pins
- setting plate
- brake shoes
- shoe springs

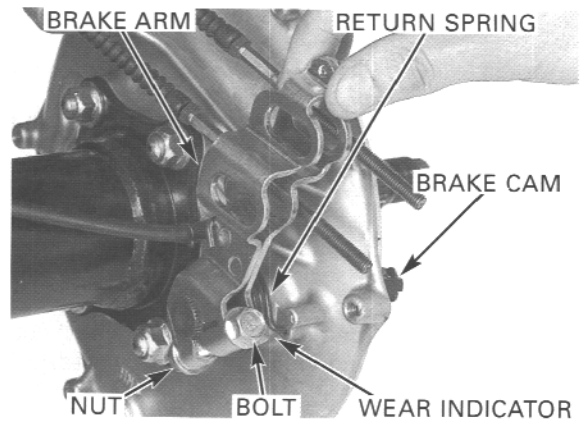
*Always replace the brake shoes in pairs.*



- adjusting nuts
- joint pins
- springs
- brake cables



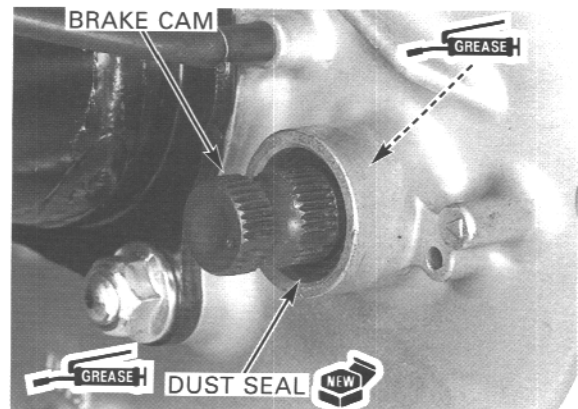
- nut and bolt
- brake arm
- wear indicator
- return spring
- brake cam
- felt seal
- dust seal



### ASSEMBLY

Apply grease to the lips of a new brake cam dust seal and install it with the flat side facing toward the brake arm until it is fully seated.

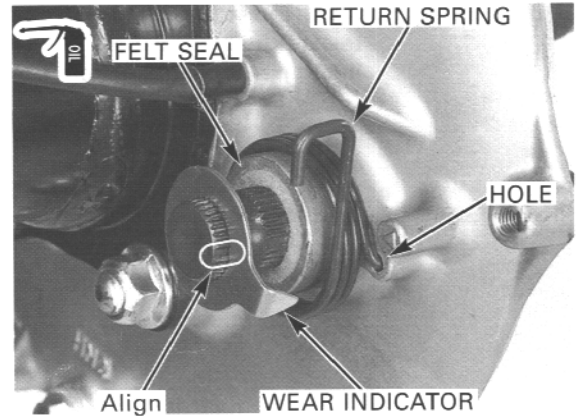
Apply grease to the brake cam spindle and install it.



Apply engine oil to a new felt seal and install it over the brake cam and into the brake panel.

Install the return spring while inserting its end with the hole in the brake panel.

Install the wear indicator by aligning its wide teeth with the wide groove.

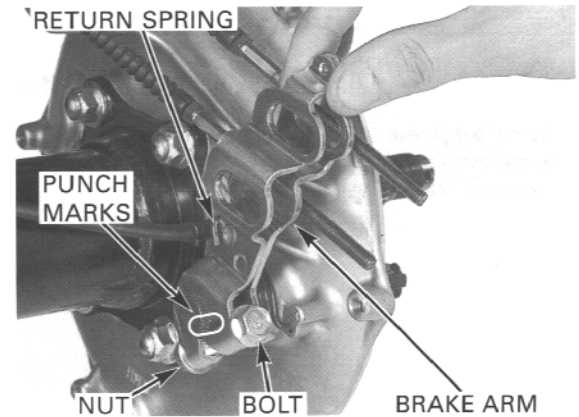


Install the brake arm by aligning the punch marks on the arm and cam.

Install the pinch bolt from the punch mark side. Install and tighten the nut.

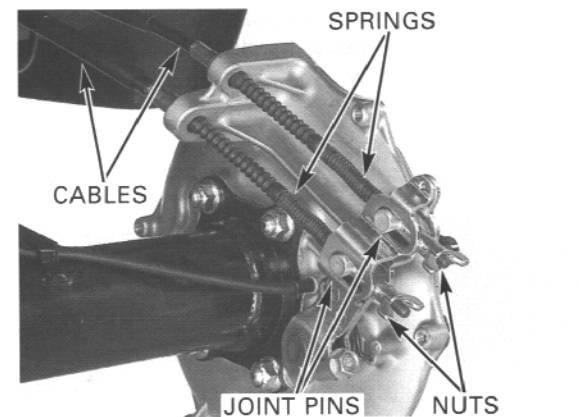
**TORQUE: 20 N-m (2.0 kgf-m, 14 lbf-ft)**

Hook the return spring end to the brake arm.



Install the brake cables into the cable holders on the brake panel (upper holder for lever brake cable and lower holder for pedal brake cable).

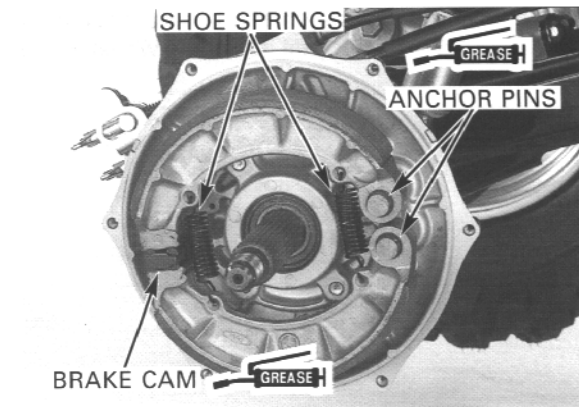
Install the cable springs onto the cables. Connect the brake cables to the brake arm with the joint pins and adjusting nuts.



Apply grease to the anchor pins and brake cam sliding surfaces.

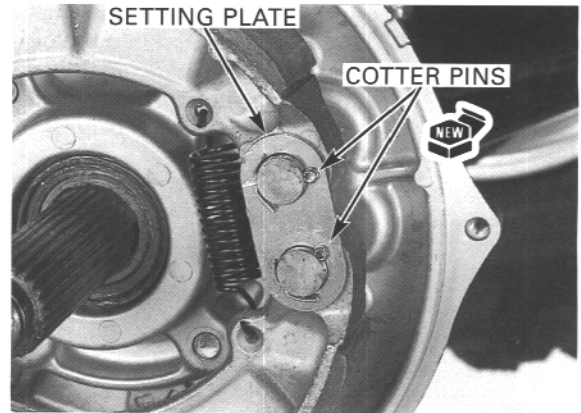
*Do not get grease on the shoe linings.*

Assemble the brake shoes and springs so that the spring ends are facing outside as shown and install the assembly onto the brake panel.



## BRAKE SYSTEM

Install the setting plate with the chamfered side facing toward the brake shoes.  
Install new cotter pins from front side.

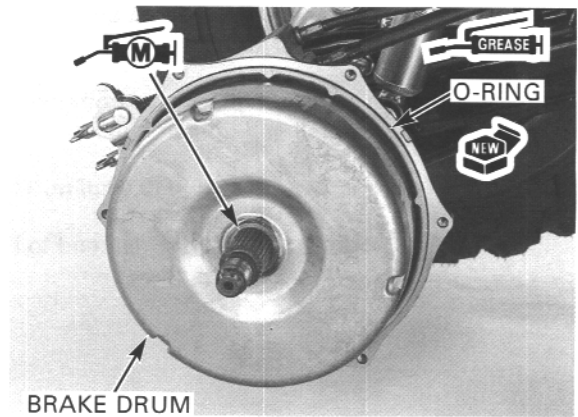


## BRAKE DRUM INSTALLATION

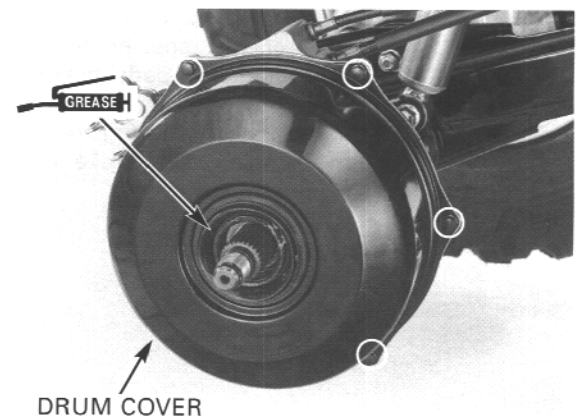
Apply molybdenum disulfide grease to the rear axle splines.  
Install the brake drum onto the axle.

*Do not get grease on the brake drum and shoe linings.*

Coat a new O-ring with grease and install it into the groove in the brake panel.



Apply grease to the drum cover dust seal lips.  
Install the drum cover and tighten the six bolts securely.



Apply molybdenum disulfide grease to the dust seal lips and install the wheel hub onto the axle.

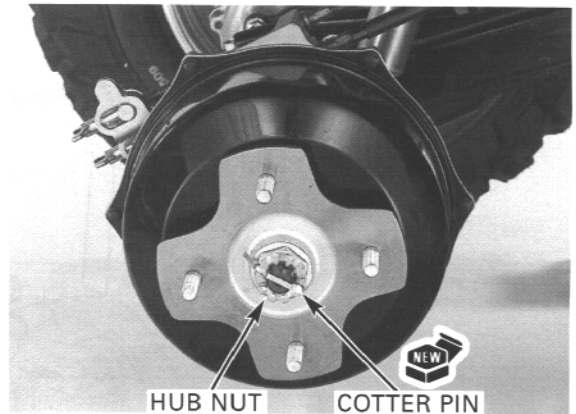


Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

**TORQUE: 137 N·m (14.0 kgf·m, 101 lbf·ft)**

Install a new cotter pin.

Install the right rear wheel (page 15-3).  
Adjust the rear brake (page 3-17).



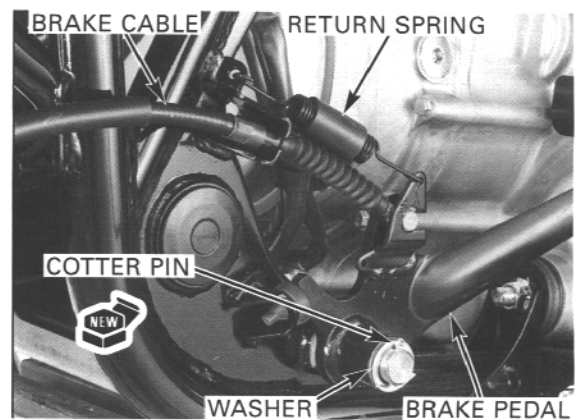
## REAR BRAKE PEDAL

### REMOVAL

Remove the right center mud guard (page 2-5).  
Disconnect the pedal brake cable from the brake arm (page 16-16).

Remove the following:

- cotter pin
- washer
- brake pedal
- return spring
- brake cable
- dust seals



### INSTALLATION

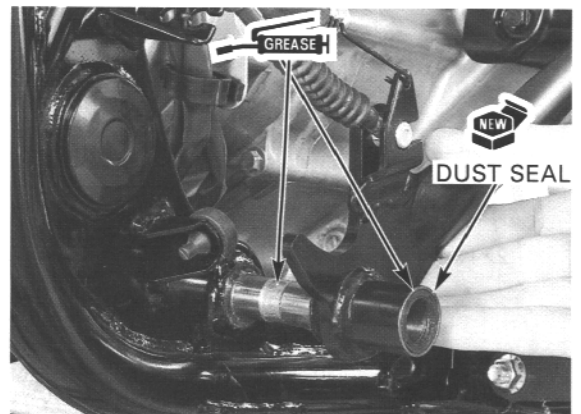
Apply grease to new dust seal lips and install them with the flat side facing out.

Connect the brake cable to the pedal and install it into the stay on the frame.  
Install the return spring as shown.

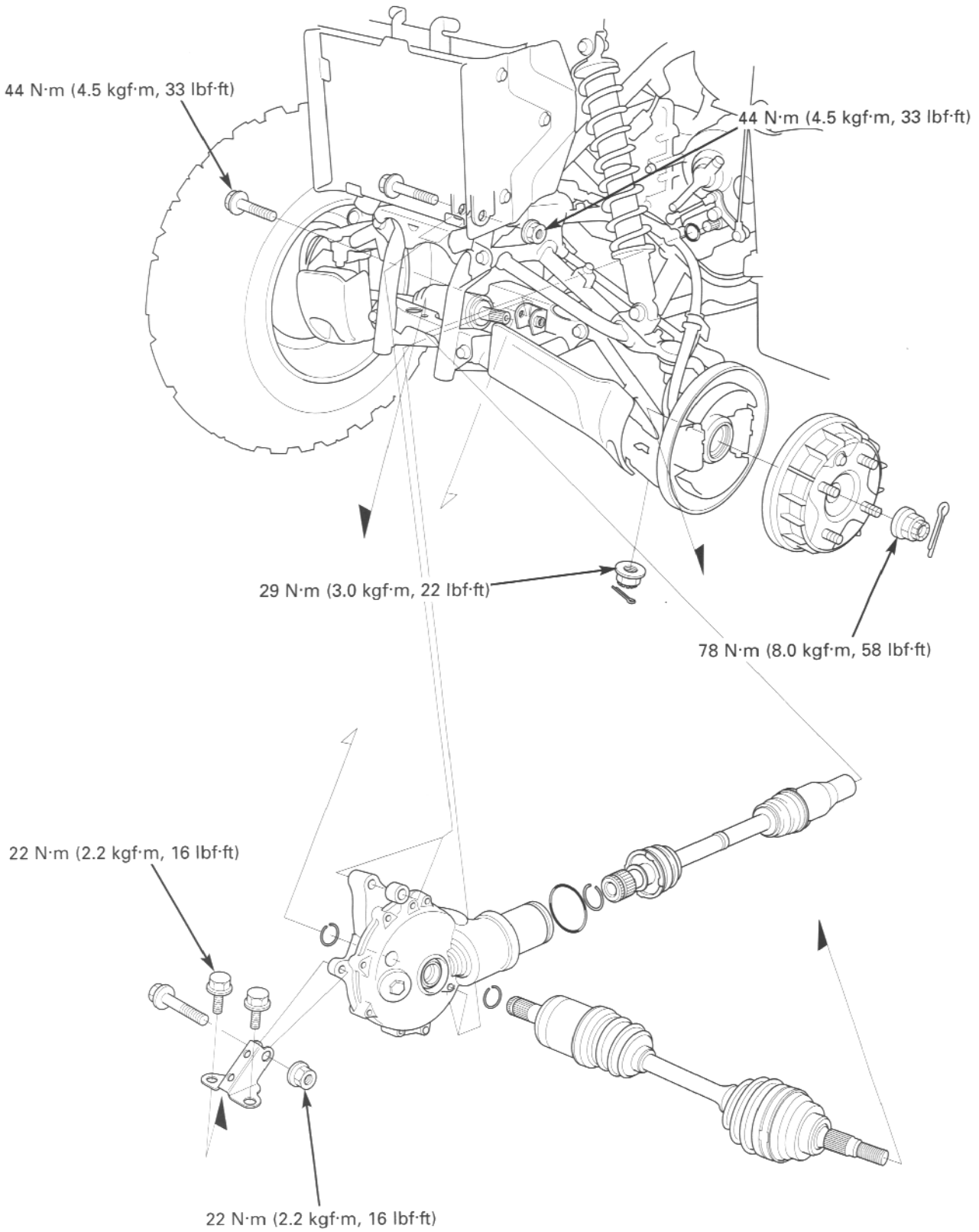
Apply grease to the groove in the pivot shaft and install the brake pedal.  
Install the washer and a new cotter pin.

Connect the brake cable to the brake arm (page 16-17) and adjust the rear brake (page 3-17).

Install the right center mud guard (page 2-5).



# FRONT DRIVING MECHANISM





# 17. FRONT DRIVING MECHANISM

<b>SERVICE INFORMATION</b>	<b>17-1</b>	<b>CASE BEARING REPLACEMENT</b>	<b>17-17</b>
<b>TROUBLESHOOTING</b>	<b>17-2</b>	<b>DIFFERENTIAL ASSEMBLY</b>	<b>17-19</b>
<b>FRONT DRIVE SHAFT</b>	<b>17-3</b>	<b>DIFFERENTIAL INSTALLATION</b>	<b>17-23</b>
<b>DIFFERENTIAL REMOVAL</b>	<b>17-8</b>		
<b>DIFFERENTIAL DISASSEMBLY/ INSPECTION</b>	<b>17-9</b>		

## SERVICE INFORMATION

### GENERAL

- Perform the gear contact pattern and backlash inspection whenever you replace the bearings, gears or gear case. The extension lines from the gear engagement surfaces should intersect at one point.
- Protect the gear case with a shop towel or soft jaws while holding it in vise. Do not clamp it too tight as it could damage the gear case.
- When using the lock nut wrench, use a deflecting beam type torque wrench 20 inches long. The lock nut wrench increases the torque wrench's leverage, so the torque wrench reading will be less than the torque actually applied to the lock nut. The specification given is the actual torque applied to the lock nut, not the reading on the torque wrench. Do not over-tighten the lock nut. The specification later in the text gives both actual and indicated.
- Replace the ring and pinion gears as a set.
- Replace the cam followers (12 pieces) as a set, and the cam followers, face cams and differential housing halves as an assembly if the face cam, differential housing or cap is faulty.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Front differential	Oil capacity	After draining	241 cm <sup>3</sup> (8.2 US oz, 8.5 Imp oz)
		After disassembly	275 cm <sup>3</sup> (9.3 US oz, 9.7 Imp oz)
	Recommended oil		Hypoid gear oil SAE #80
	Gear backlash		0.05—0.25 (0.002—0.010)
	Backlash difference		——
	Slip torque		14—17 N·m (1.45—1.75 kgf·m, 10—13 lbf·ft)
	Face cam-to-housing distance		6.3—6.7 (0.25—0.26)
	Differential housing cap depth		9.55—9.65 (0.376—0.380)
	Cone spring free height		2.8 (0.11)

17

### TORQUE VALUES

Upper and lower arm ball joint nut	29 N·m (3.0 kgf·m, 22 lbf·ft)	Castle nut
Front wheel hub nut	78 N·m (8.0 kgf·m, 58 lbf·ft)	Castle nut
Differential ring gear bolt	49 N·m (5.0 kgf·m, 36 lbf·ft)	Special bolt
Differential pinion bearing lock nut	98 N·m (10.0 kgf·m, 72 lbf·ft)	Stake/Lock nut
Differential case cover bolt (10 mm)	49 N·m (5.0 kgf·m, 36 lbf·ft)	Apply locking agent to the threads
(8 mm)	25 N·m (2.6 kgf·m, 19 lbf·ft)	
Differential mounting bolt (10 mm)	44 N·m (4.5 kgf·m, 33 lbf·ft)	
nut (10 mm)	44 N·m (4.5 kgf·m, 33 lbf·ft)	Lock nut
bolt and nut (8 mm)	22 N·m (2.2 kgf·m, 16 lbf·ft)	

## FRONT DRIVING MECHANISM

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### TOOLS

Driver	07749-0010000
Attachment, 22 x 24 mm	07746-0010800
Attachment, 52 x 55 mm	07746-0010400
Attachment, 20 mm I.D.	07746-0020400
Pilot, 14 mm	07746-0041200
Pilot, 28 mm	07746-0041100
Bearing remover, 14 mm	07WMC-KFG0100 or 07936-KC10200 and 07YMC-001010A (U.S.A. only)
Bearing remover shaft, 15 mm	07936-KC10100
Bearing remover weight	07741-0010201 or 07936-371020A or 07936-3710200 (U.S.A. only)
Ball joint remover, 28mm	07MAC-SL00200
Pinion puller base	07HMC-MM80110 or 07HMC-MM8011A (U.S.A. only)
Assembly shaft	07965-VM00200 not available in U.S.A. or 07931-ME4010B and 07931-HB3020A (U.S.A. only)
Differential inspection tool	07KMK-HC50101 or 07KMK-HC5010A (U.S.A. only)
Lock nut wrench, 30 x 64 mm	07916-MB00002
Oil seal driver	07965-KE80200 or 07947-KA50100 (U.S.A. only)
Threaded Adapter, 16 x 1.5 x 12 x 1.25 mm	07YMF-HN4010A (U.S.A. only)
Remover Handle	07936-3710100
Differential Bearing Clip Compressor	07YME-HN4010A

### TROUBLESHOOTING

#### Consistent noise during cruising

- Oil level too low
- Foreign matter contaminating gear oil
- Worn or damaged bearing
- Worn or damaged ring gear and pinion gear
- Deformed ring gear or differential case
- Improper tooth contact between ring gear and pinion gear

#### Gear noises while running

- Oil level too low
- Foreign matter contaminating gear oil
- Chipped or damaged gears
- Improper tooth contact between ring gear and pinion gear

#### Gear noises while coasting

- Damage or chipped gears

#### Abnormal noises when turning

- Worn or damaged ring gear bearing
- Worn or damaged face cam and cam follower
- Worn or damaged differential housing groove
- Worn cone spring or shim

#### Abnormal noises at start or during acceleration

- Excessive backlash between ring gear and pinion gear
- Worn differential splines
- Loose fasteners
- Worn cone spring or shim

#### Oil leak

- Oil level too high
- Clogged breather
- Damaged seals
- Loose case cover bolt

#### Over heating

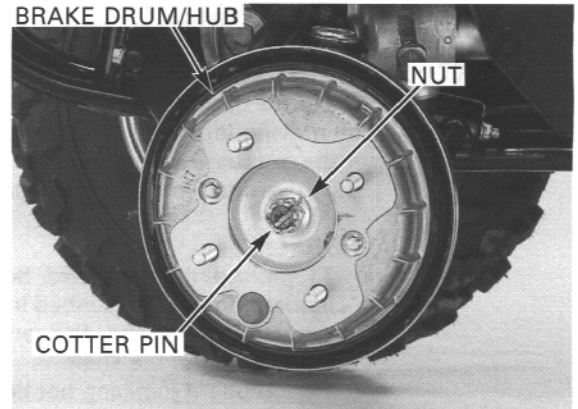
- Oil level too low
- Insufficient backlash between ring gear and pinion gear

## FRONT DRIVE SHAFT

### REMOVAL

Remove the front wheel (page 14-7).

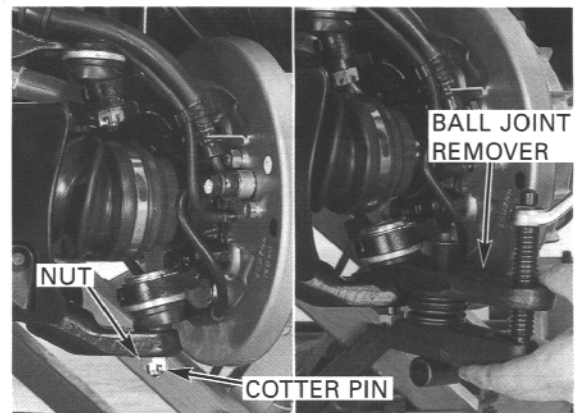
Remove the cotter pin and loosen the hub nut.



Remove the cotter pins and loosen the ball joint nuts. Separate the ball joints, using the special tool according to the instructions on page 14-12.

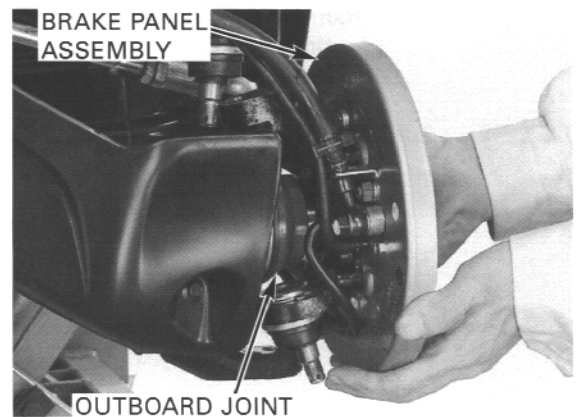
**TOOL:**

**Ball joint remover, 28mm      07MAC-SL00200**



*Do not get grease onto the shoe linings.  
Do not twist the brake hose.*

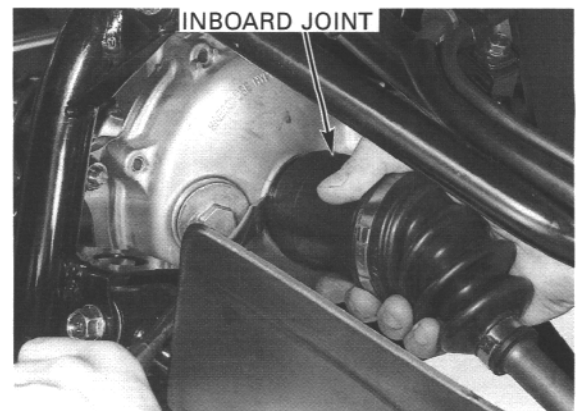
Remove the hub nut and the brake drum/hub. Remove the joint nuts and separate the brake panel assembly from the outboard joint of the drive shaft. Support the brake panel assembly so that it does not hang from the brake hose.



*To prevent damage to the differential oil seal, hold the inboard joint horizontal until the drive shaft is clear of the differential.*

Hold the inboard joint of the drive shaft and tug firmly to force the stopper ring at the drive shaft end past the groove while prying with a screwdriver.

Remove the stopper ring



## FRONT DRIVING MECHANISM

### DISASSEMBLY/INSPECTION

Check the boots for cuts or other damage.  
Check the drive shaft joints for excessive play or noise by moving the joints in a circular direction.  
If the outboard joint seems to be worn or damaged, the drive shaft must be replaced.

#### NOTE:

- To replace the outboard boot, first remove the inboard boots as described in following steps. Then remove bands and the outboard boot off the inboard end of the shaft.
- The outboard joint can not be disassembled.

*Replace the bands with new ones whenever removing them.*

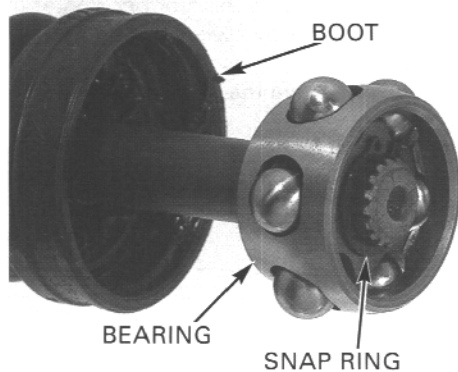
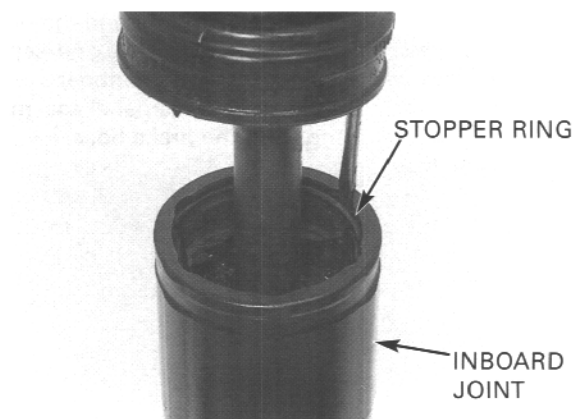
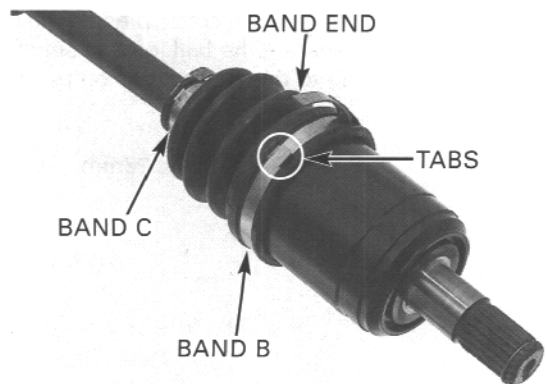
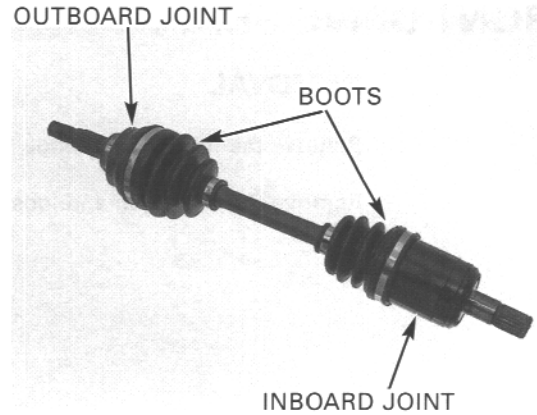
Bend up the lock tabs and raise the band end to loosen the boot bands on the inboard side.  
Remove the boot band B.

Release the boot off the inboard joint.

Remove the following:

- stopper ring
- inboard joint

- snap ring
- bearing
- inboard boots
- boot band C

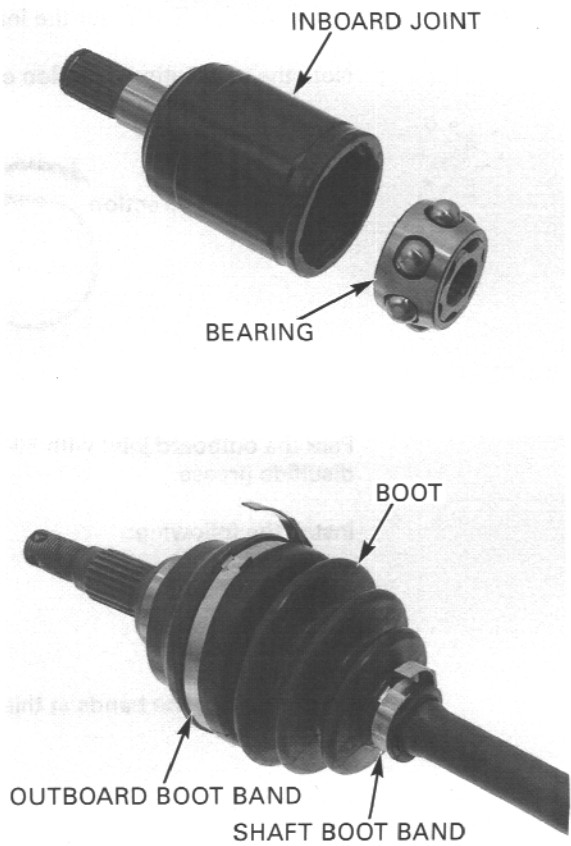


# FRONT DRIVING MECHANISM

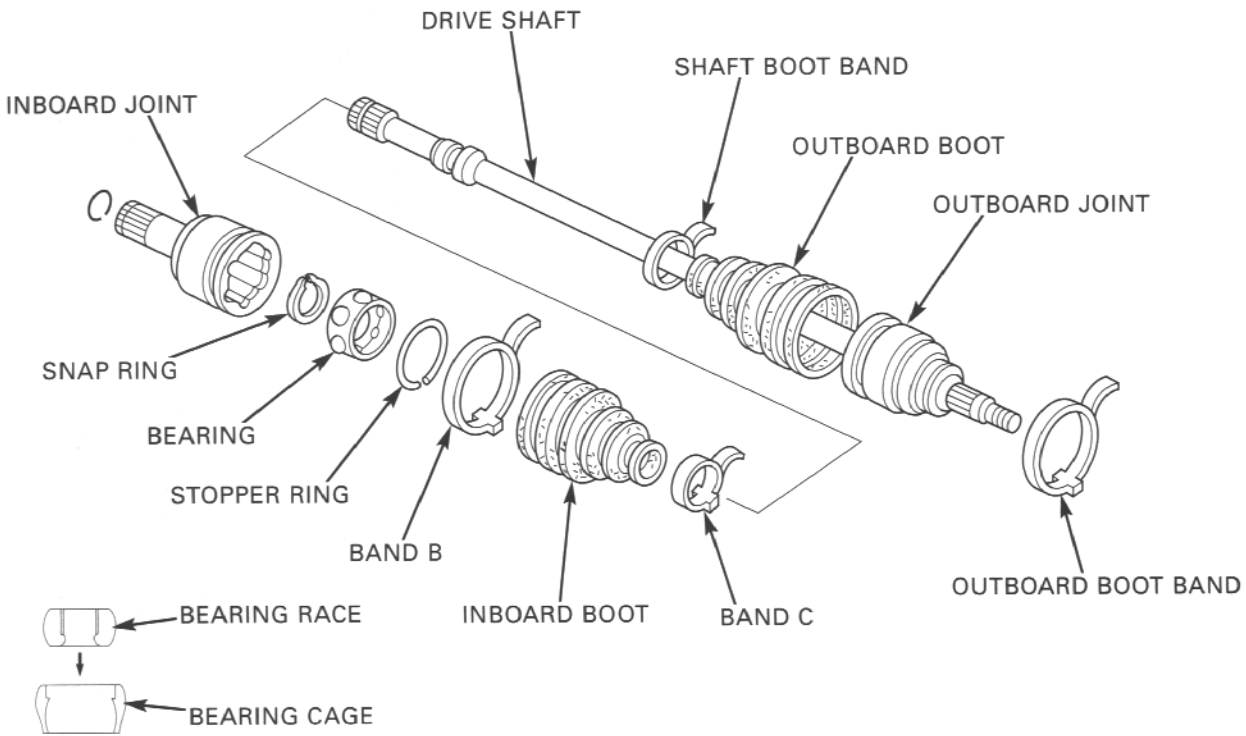
Replace their components as an assembly.

- Check the following for wear or damage:
- bearing cage
  - race
  - steel balls
  - inboard joint

- Remove the following:
- shaft boot band
  - outboard boot band
  - outboard boot



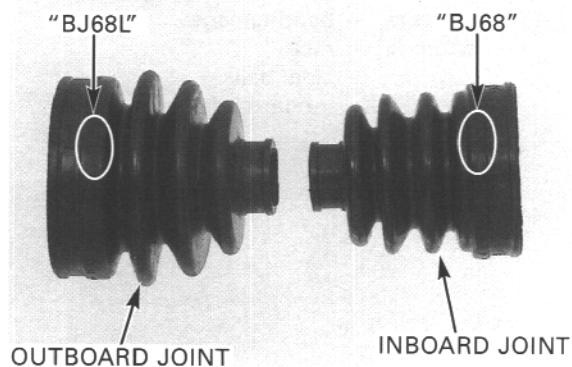
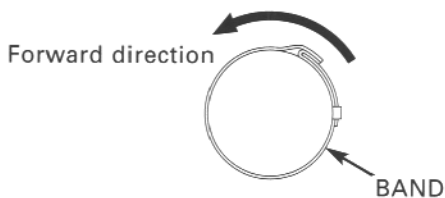
## ASSEMBLY



## FRONT DRIVING MECHANISM

Each boot has an identification mark; "BJ68L" for the outboard and "BJ68" for the inboard.

Note the installation direction of the boot bands.

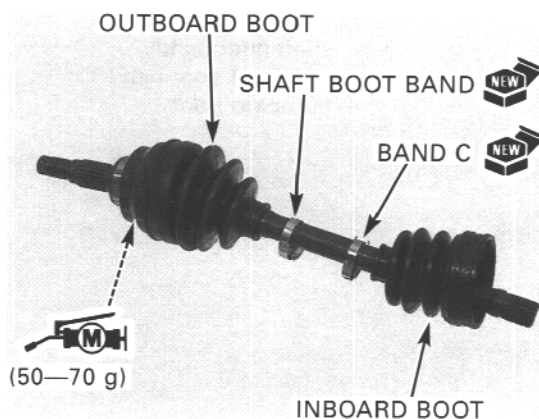


Pack the outboard joint with 50—70 g of molybdenum disulfide grease.

Install the following:

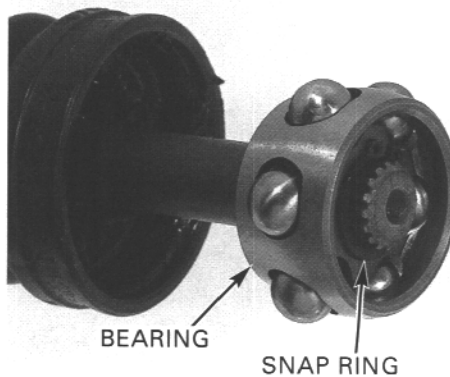
- outboard boot
- new shaft boot band
- new boot band C
- inboard boot

Do not tighten the bands at this time.



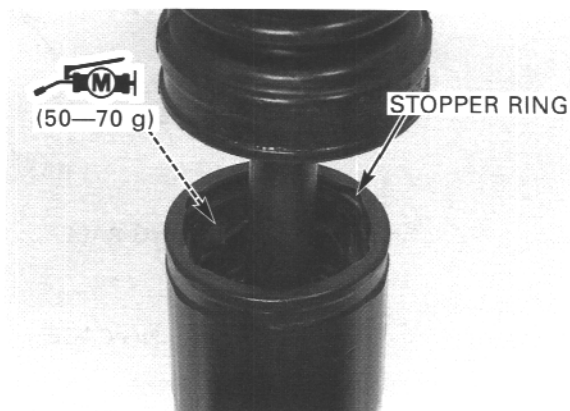
Install the bearing with the small O.D. facing to the drive shaft.

Install the snap ring with the chamfered side facing to the bearing.



Pack the inboard joint with 55—75 g of molybdenum disulfide grease.

Install the inboard joint over the bearing.  
Install the stopper ring into the groove the in the inboard joint properly.

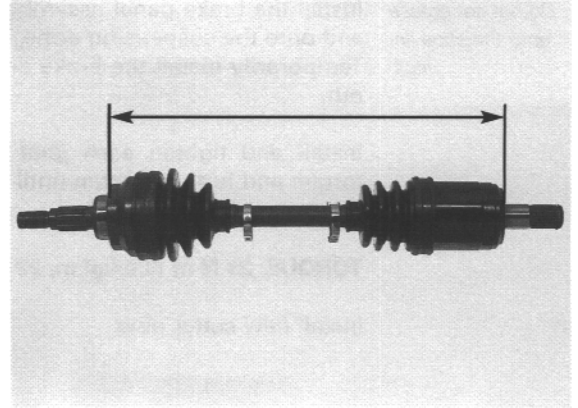


Adjust the length of the drive shaft to the figure given below.

### DRIVE SHAFT LENGTH:

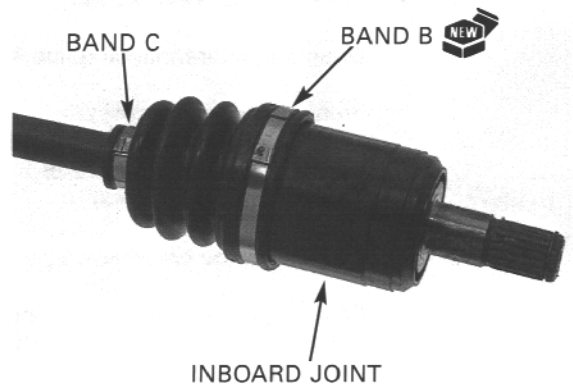
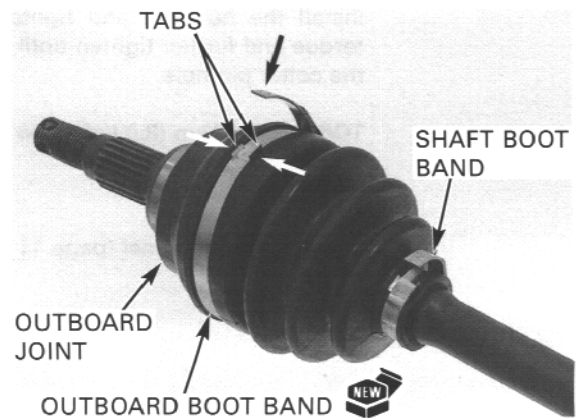
Left: 353.3—373.3 mm (13.91—14.70 in)

Right: 373.1—393.1 mm (14.69—15.48 in)



Install the shaft boot band and boot band C onto the boots.  
 See page 17-6 for band installation direction,  
 Install a new outboard boot band onto the outboard boot and a new band B onto the inboard boot.

Bend down the band end and secure it with the lock tabs. Tap the lock tabs with a plastic hammer.



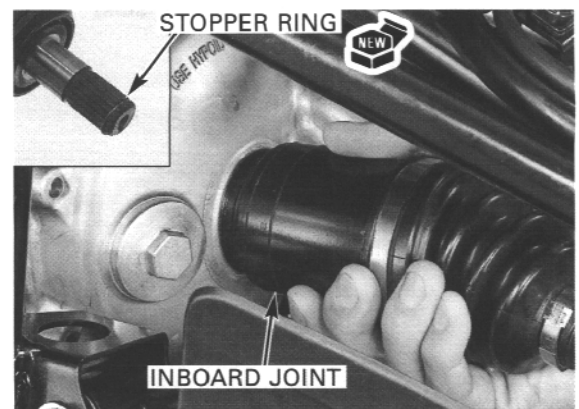
## INSTALLATION

Install a new stopper ring into the groove in the inboard joint splines.

*Be careful not to damage the oil seal in the differential gear case.*

Install the drive shaft by holding the inboard joint until the stopper ring seats in the groove of the differential.

Make sure that the stopper ring is seated properly by pulling on the inboard joint lightly.



## FRONT DRIVING MECHANISM

*Do not get grease onto the shoe linings.*

Install the brake panel assembly over the drive shaft and onto the suspension arms. Temporarily install the brake drum/hub with the hub nut.

Install and tighten each joint nut to the specified torque and further tighten until its grooves align with the cotter pin hole.

**TORQUE: 29 N·m (3.0 kgf·m, 22 lbf·ft)**

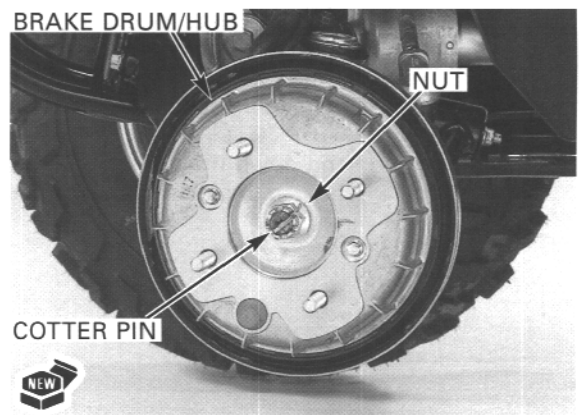
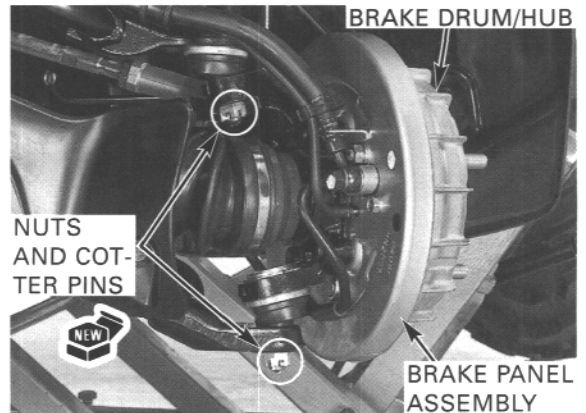
Install new cotter pins.

Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

**TORQUE: 78 N·m (8.0 kgf·m, 58 lbf·ft)**

Install a new cotter pin.

Install the front wheel (page 14-7).



## DIFFERENTIAL REMOVAL

Drain the differential oil (page 3-15).

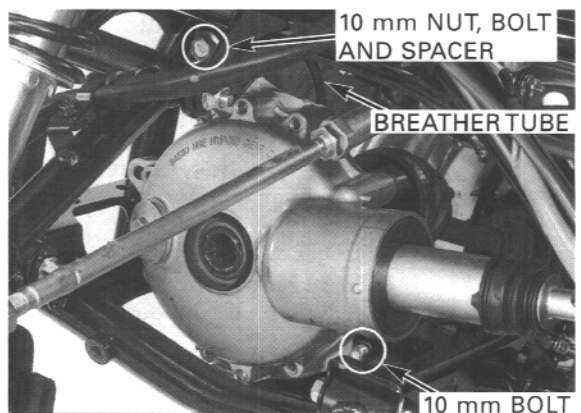
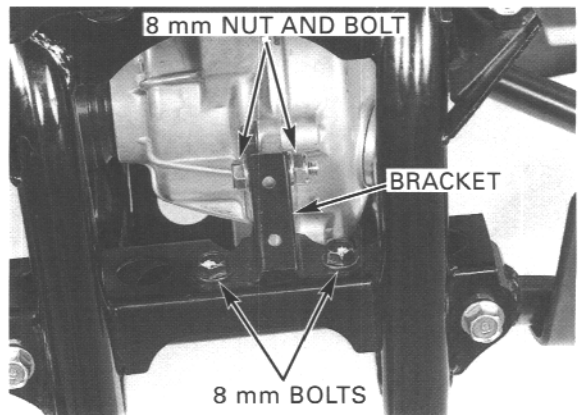
Remove the following:

- left front mud guard (page 2-6)
- left inner fender (page 2-6)
- drive shaft (page 17-3)

Disconnect the breather tube.

Remove the following mounting fasteners:

- 8 mm nut and bolt (front side)
- two 8 mm bolts and mounting bracket
- 10 mm nut, bolt and spacer (upper side)
- 10 mm bolt (rear side)



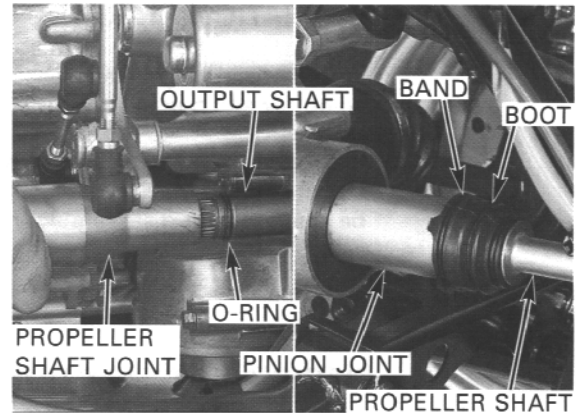


Move the differential forward for maximum clearance between the propeller shaft joint and engine.

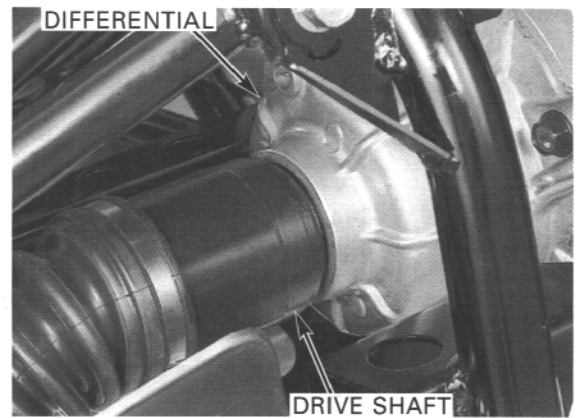
Pull the propeller shaft joint out of the output shaft of the engine.  
Remove the O-ring.

Remove the boot band from the dust boot and release the dust boot off the pinion joint of the front differential.

Pull the propeller shaft to force the stopper ring at the propeller shaft end past the groove in the pinion joint and remove the propeller shaft.



Separate the other drive shaft from the differential as you remove it.  
Remove the differential assembly out of the frame.

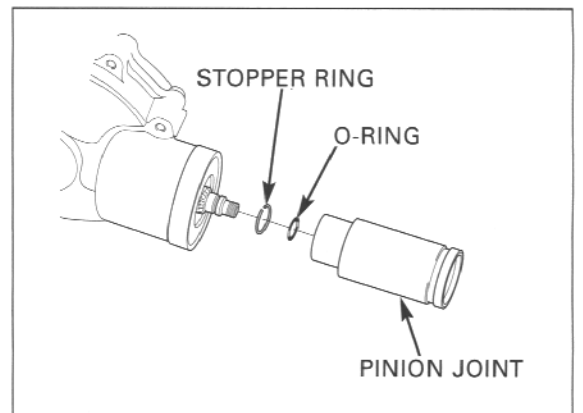


## **DIFFERENTIAL DISASSEMBLY/INSPECTION**

### **PROPELLER SHAFT DISASSEMBLY/INSPECTION**

Remove the pinion joint from the differential by pulling it to force the stopper ring at the pinion gear shaft past the groove in the pinion joint.

Remove the O-ring and stopper ring from the pinion gear shaft.



Remove the boot band from the dust boot of the propeller shaft joint side and release the dust boot off the joint to remove the propeller shaft joint and spring.

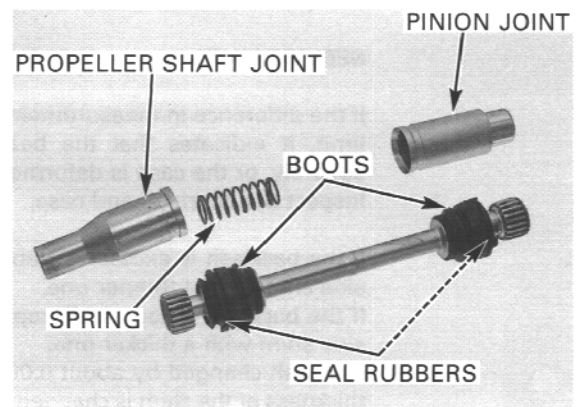
Check the splines of the propeller shaft and joints for wear or damage.

If damaged, check the pinion joint and output shaft also.

Check the seal rubbers for fatigue or damage.

Check the boots for cuts or damage.

For propeller shaft assembly, see page 17-23.

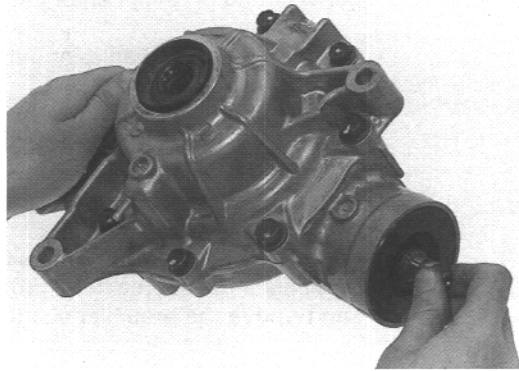


## FRONT DRIVING MECHANISM

### OPERATION CHECK

Turn the pinion gear and check that the gear turns smoothly and quietly without binding.

If the gears do not turn smoothly or quietly, the gears and/or bearing may be damaged or faulty. They must be checked after disassembly; replace them if necessary.



### BACKLASH INSPECTION

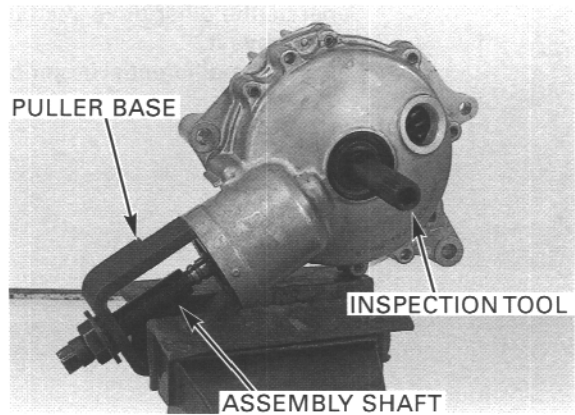
Hold the pinion gear with the special tools.

#### TOOLS:

Pinion puller base	07HMC-MM80110 or 07HMC-MM8011A (U.S.A. only)
Assembly shaft	07965-VM00200 not available in U.S.A. or 07931-ME4010B and 07931-HB3020A (U.S.A. only)
Puller shaft	07931-ME4010B and 07931-HB3020A (U.S.A. only)
Special nut	07931-HB3020A (U.S.A. only)
Threaded Adapter	07YMF-HN4010A

Set the differential case into a jig or vise with soft jaws.

Install the differential inspection tool into the right side of the differential.



#### TOOL:

Differential inspection tool	07KMK-HC50101 or 07KMK-HC5010A (U.S.A. only)
------------------------------	--

Remove the oil filler cap and set a horizontal type dial indicator on the ring gear through the filler hole. Turn the ring gear back and forth to read backlash.

**STANDARD: 0.05—0.25 mm (0.002—0.010 in)**  
**SERVICE LIMIT: 0.4 mm (0.02 in)**

Remove the dial indicator. Turn the ring gear 120° and measure backlash. Repeat this procedure once more. Compare the difference of the three measurements.

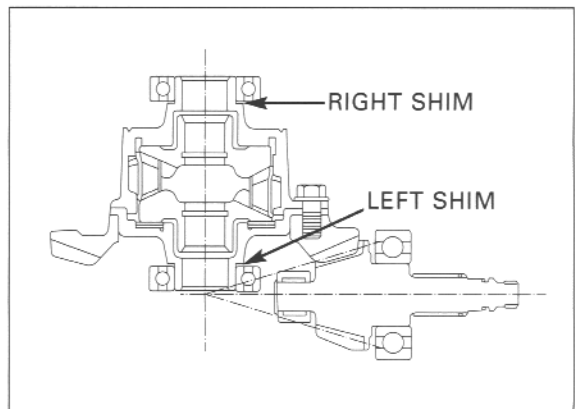
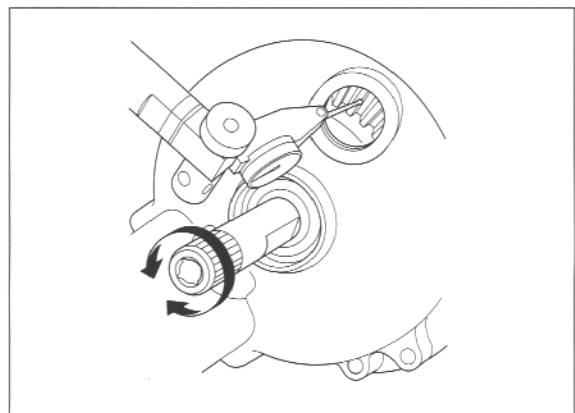
**SERVICE LIMIT: 0.2 mm (0.01 in)**

If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed. Inspect the bearings and case.

If the backlash is excessive, replace the ring gear left side shim with a thinner one.

If the backlash is too small, replace the ring gear left side shim with a thicker one.

Backlash changed by about 0.06 mm (0.002 in) when thickness of the shim is changed by 0.10 mm (0.004 in).



**NOTE:**

- Twenty-three different thickness shims are available from the thinnest (0.50 mm thickness: A) shim to the thickest (1.60 mm thickness: W) in intervals of 0.05 mm.

**Ring gear shims:**

**A: (thinnest): 0.50 mm (0.020 in)—**

**K: (standard): 1.00 mm (0.039 in)—**

**W: (thickest): 1.60 mm (0.063 in)**

Change the right side shim and equal thickness and opposite amount of what the left side shim was changed; If the left shim was replaced with a 0.10 mm (0.004 in) thicker shim, replace the right shim with one that is 0.10 mm (0.004 in) thinner.

### DIFFERENTIAL CASE DISASSEMBLY

Remove the eight cover bolts in a crisscross pattern in several steps.

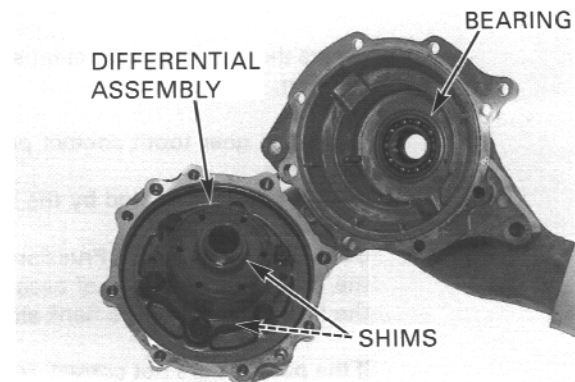
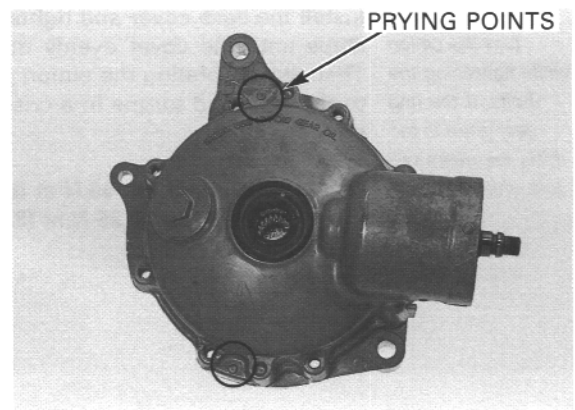
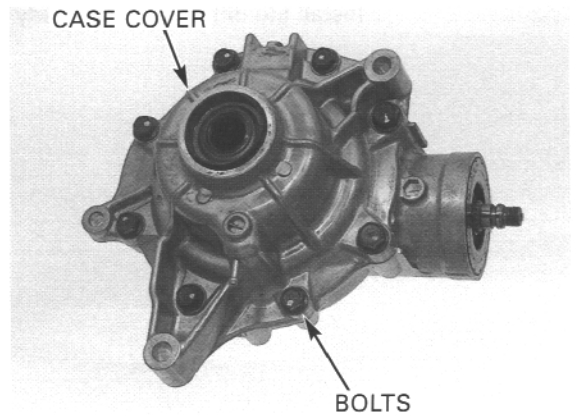
Pry the cover at the points as shown by using a screwdriver and remove the case cover.

Remove the differential assembly and shims.

### BEARING INSPECTION

Turn the inner race of each bearing in the gear case and case cover with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the case or cover.

For ring gear bearing replacement, see page 17-11.  
For pinion gear removal and bearing replacement, see page 17-16 and 17-18.



# FRONT DRIVING MECHANISM

## GEAR TOOTH CONTACT PATTERN CHECK

*Keep dust and dirt out of the case and cover.*

Clean sealing material off the mating surfaces of the differential case and cover, being careful not to damage them.

Apply thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

Install the ring gear shims onto the differential assembly.

Install the differential assembly into the gear case.

*It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.*

Install the case cover and tighten the bolts in several steps until the cover evenly touches the gear case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

**TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)**  
**8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)**

Remove the oil filler cap.

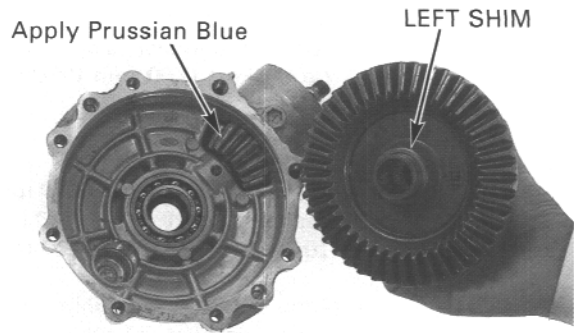
Rotate the ring gear several times in both directions of rotation.

Check the gear tooth contact pattern through the oil filler hole.

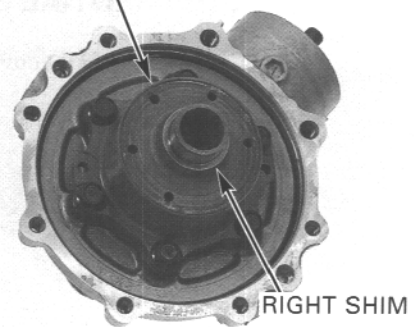
The pattern is indicated by the Prussian Blue applied to the pinion.

Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth, but slightly to the heel side and to the flank side.

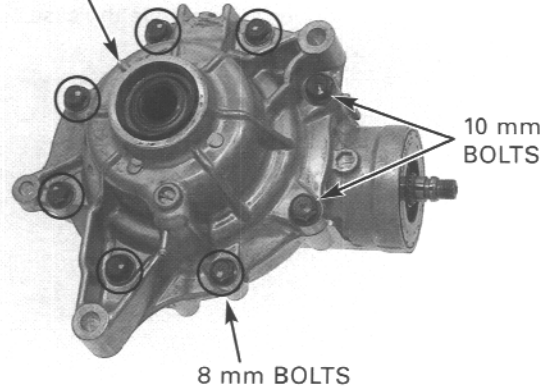
If the patterns are not correct, remove and change the pinion shim with one of an alternate thickness.



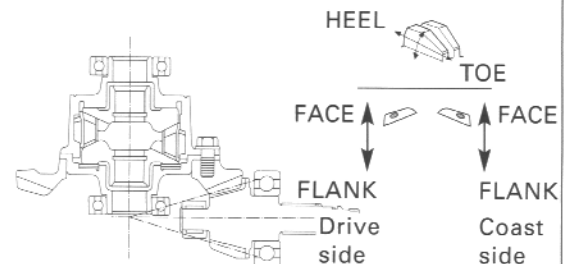
DIFFERENTIAL ASSEMBLY



CASE COVER



NORMAL:



Replace the pinion shim with a thicker one if the contact pattern is too high, toward the face.

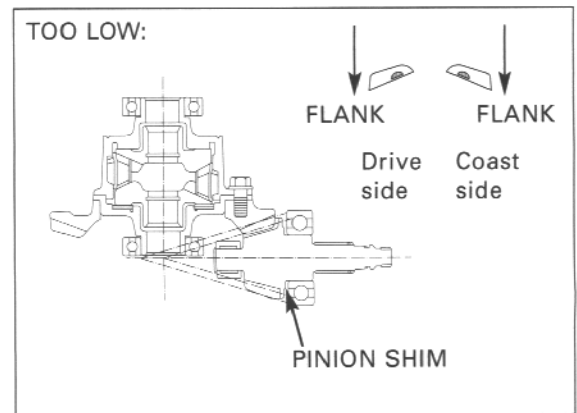
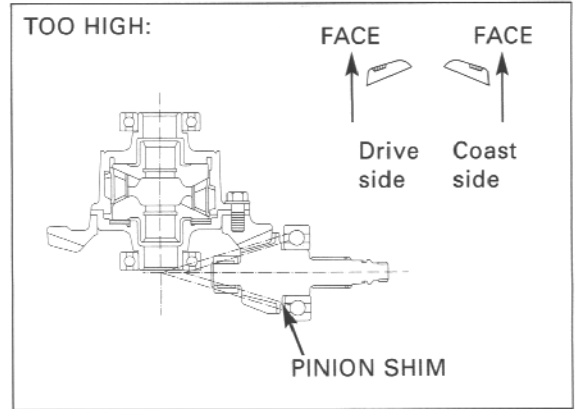
Replace the pinion shim with a thinner one if the contact pattern is too low, toward the flank.

The pattern will shift about 0.5—1.0 mm (0.02—0.04 in) when the thickness of the shim is changed by 0.12 mm (0.005 in).

**Pinion shims:**

<b>A: 1.64 mm (0.064 in)</b>	<b>F: 1.94 mm (0.076 in)</b>
<b>B: 1.70 mm (0.067 in)</b>	<b>G: 2.00 mm (0.079 in)</b>
<b>C: 1.76 mm (0.069 in)</b>	<b>H: 2.06 mm (0.081 in)</b>
<b>D: 1.82 mm (0.072 in)</b>	<b>I: 2.12 mm (0.083 in)</b>
<b>E: 1.88 mm (0.074 in)</b>	<b>J: 2.18 mm (0.086 in)</b>

For pinion shim replacement, see page 17-16.



## DIFFERENTIAL INSPECTION

Install the inspection tools into both sides of the differential.

**TOOL:**

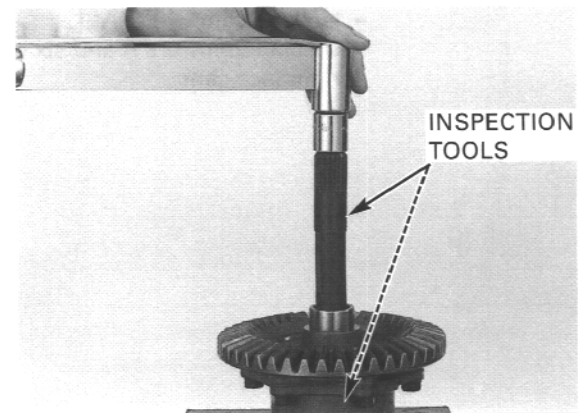
**Differential inspection tool**      **07KMK-HC50101 or 07KMK-HC5010A (U.S.A. only)**

Hold the flat surface of the tool with a bench vise. Attach a torque wrench to the other tool and measure the limited slip torque.

**STANDARD:**

**14—17 N·m (1.45—1.75 kgf·m, 10—13 lbf·ft)**  
**SERVICE LIMIT: 12 N·m (1.2 kgf·m, 9 lbf·ft)**

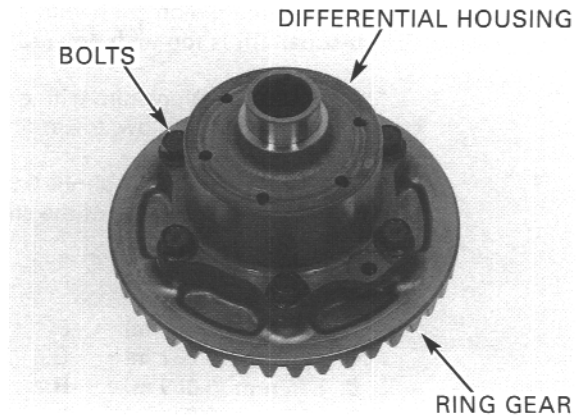
If the slip torque is out of specification, disassemble the differential and perform the components inspection (page 17-14) since the differential may be faulty.



## FRONT DRIVING MECHANISM

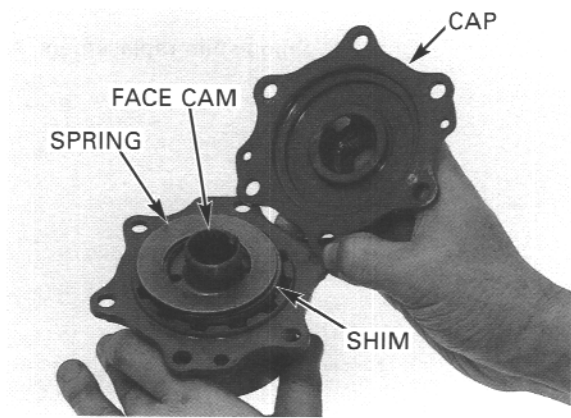
### DIFFERENTIAL DISASSEMBLY

Remove the six bolts, then place the differential assembly with the housing side down, and remove the ring gear.



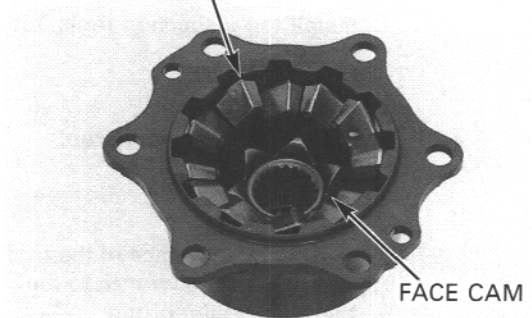
Remove the following:

- differential cap
- cone spring
- shim



- left face cam
- six cam followers A and six cam followers B
- right face cam

CAM FOLLOWERS A AND B



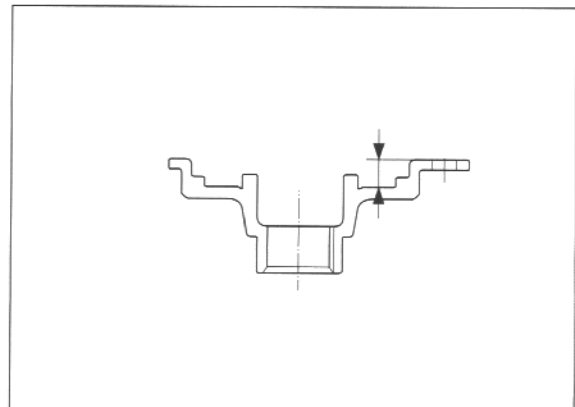
### DIFFERENTIAL COMPONENTS INSPECTION

#### DIFFERENTIAL CAP

Check the sliding surface of the cap for damage or discoloration.

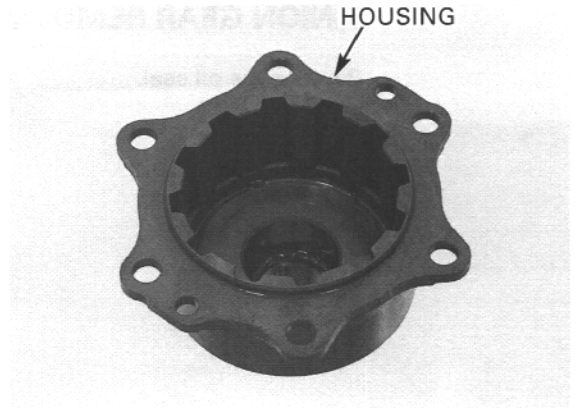
Measure the depth of the cap from the mating surface as shown.

**SERVICE LIMIT: 9.55 mm (0.376 in)**



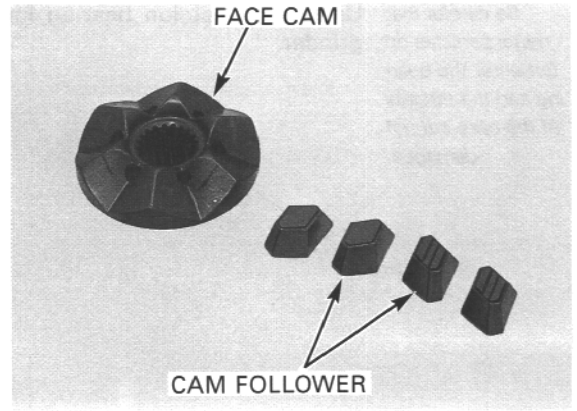
## DIFFERENTIAL HOUSING/FACE CAM/CAM FOLLOWER

Check the sliding surface and grooves of the housing for damage or discoloration.



*Replace the cam followers as a set (12 pieces).*

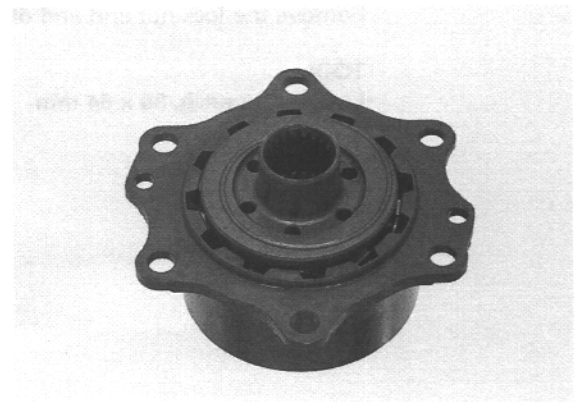
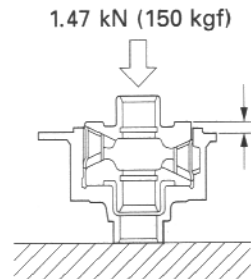
Check the shim, face cams and followers for damage.



Temporarily assemble the differential housing, face cams and cam followers (page 17-21). Measure the height of the face cam from the housing mating surface as shown while applying a load of 1.47 kN (150 kgf) to the face cam boss using a hydraulic press.

**SERVICE LIMIT: 6.3 mm (0.25 in)**

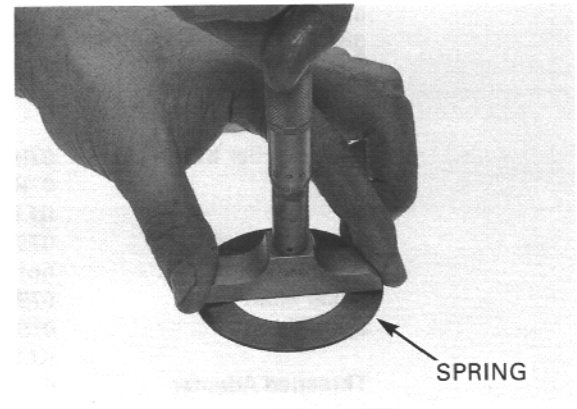
If the height exceeds the limit, replace the differential as an assembly.



## SIDE CONE SPRING

Check the spring for damage  
Measure the height of the cone spring.

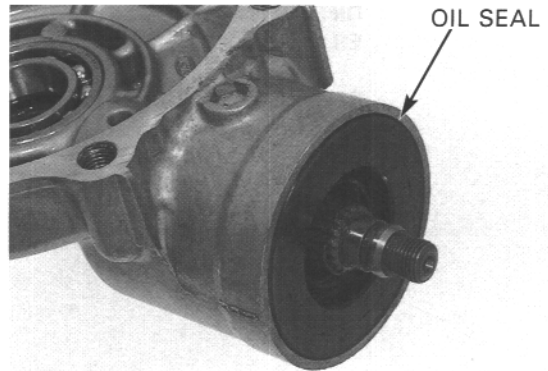
**SERVICE LIMIT: 2.6 mm (0.10 in)**



## FRONT DRIVING MECHANISM

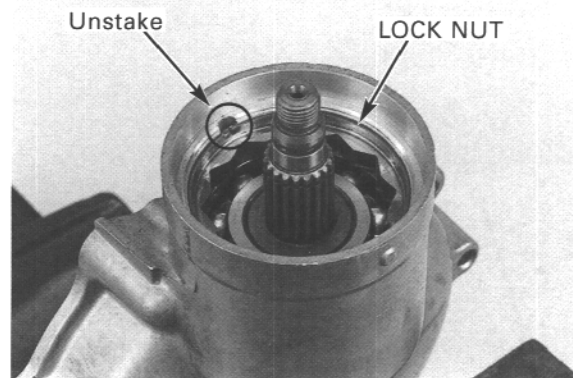
### PINION GEAR REMOVAL

Remove the oil seal.



*Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.*

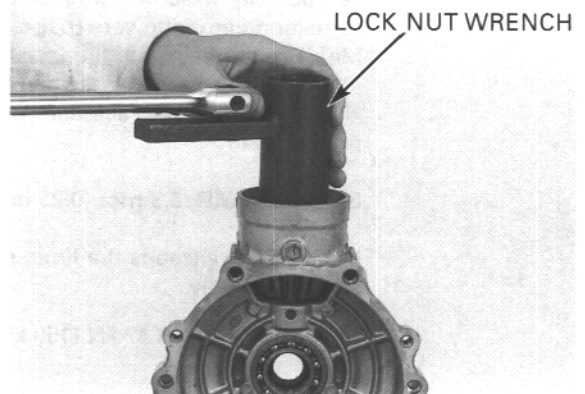
Unstake the pinion bearing lock nut with a drill or grinder.



Remove the lock nut and discard it.

**TOOL:**

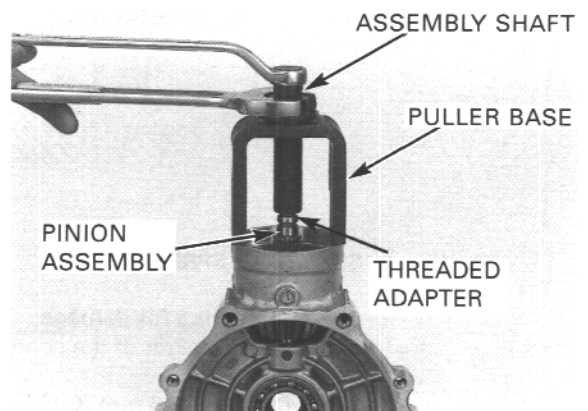
**Lock nut wrench, 30 x 64 mm 07916-MB00002**



Install the special tools onto the pinion gear shaft and gear case.  
Pull the pinion assembly out of the case.

**TOOLS:**

<b>Pinion puller base</b>	<b>07HMC-MM80110 or 07HMC-MM8011A (U.S.A. only)</b>
<b>Assembly shaft</b>	<b>07965-VM00200 not available in U.S.A. or 07931-ME4010B and 07931-HB3020A (U.S.A. only)</b>
<b>Puller shaft</b>	
<b>Special nut</b>	
<b>Threaded Adapter</b>	<b>07YMF-HN4010A</b>





### PINION GEAR BEARING AND SHIM REPLACEMENT

Pull the pinion bearing from the shaft with a commercially available bearing puller.

Remove the pinion shim.

Install the shim and a new bearing onto the pinion gear with the bearing mark facing out.

**NOTE:**

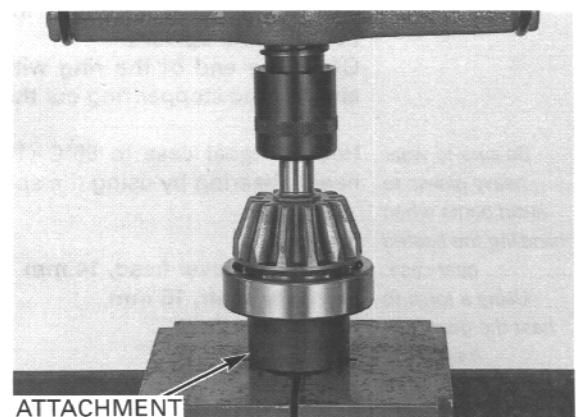
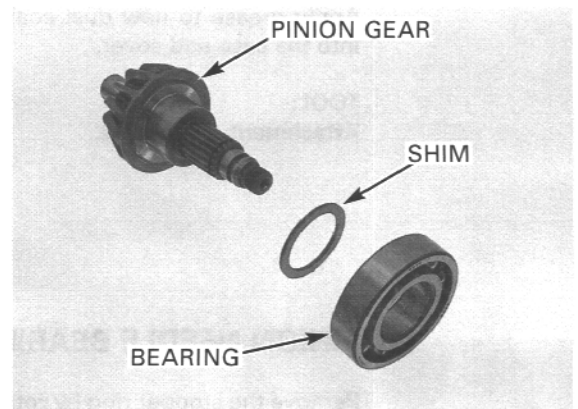
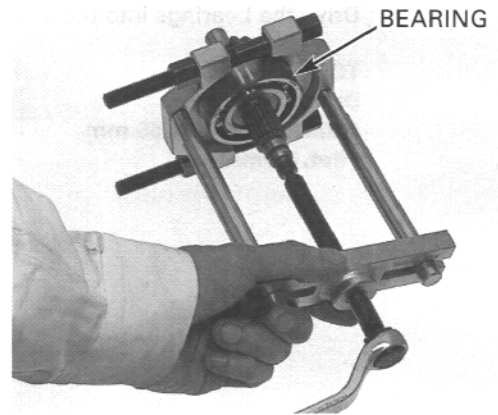
- When the gear set, ring gear bearing, differential housing and/or gear case has been replaced, use a 2.00 mm (0.79 in) thick shim for initial reference.

Press the bearing with the marked side facing the attachment until it is fully seated.

**TOOL:**

Attachment, 20 mm I.D.

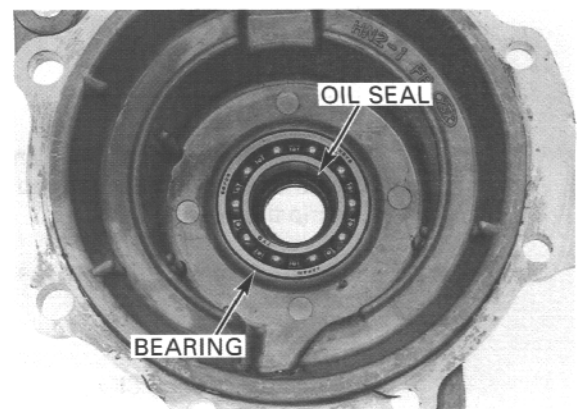
07746-0020400



## CASE BEARING REPLACEMENT

### DIFFERENTIAL BEARING

Remove the oil seal.  
Drive each bearing out of the case and cover.

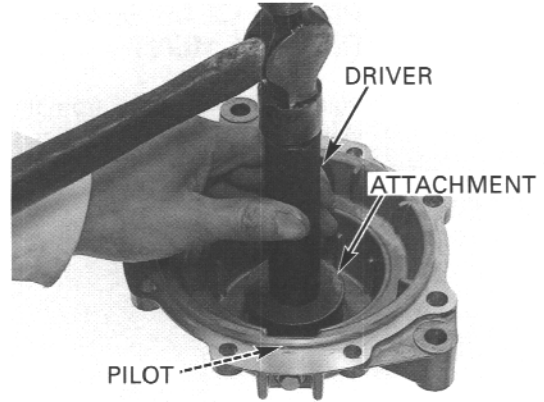


# FRONT DRIVING MECHANISM

Drive the bearings into the case and cover.

**TOOLS:**

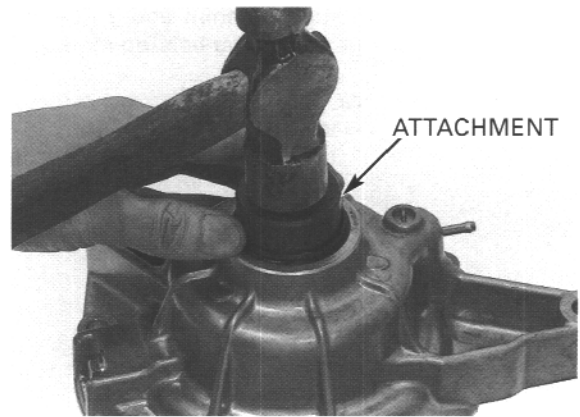
- Driver** 07749-0010000
- Attachment, 52 x 55 mm** 07746-0010400
- Pilot, 28 mm** 07746-0041100



Apply grease to new dust seal lips and install them into the case and cover.

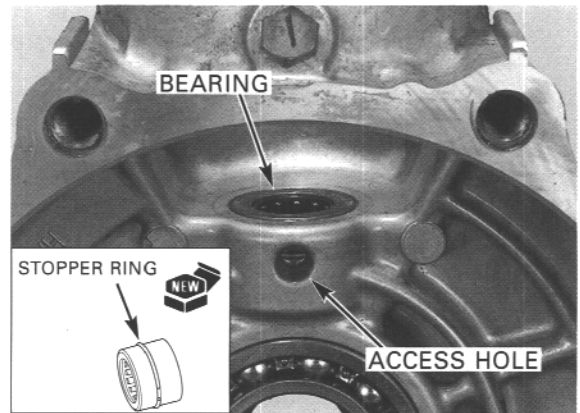
**TOOL:**

- Attachment, 20 mm I.D.** 07746-0020400



## PINION NEEDLE BEARING

Remove the stopper ring by rotating it until the end of the stopper ring appears in the access hole. Strike gently near the end of the ring with a punch to bent the end upward. Grasp the end of the ring with needle-nosed pliers and pull the stopper ring out through the access hole.



*Be sure to wear heavy gloves to avoid burns when handling the heated gear case. Using a torch to heat the gear case may cause warpage.*

Heat the gear case to 80°C (176°F) and remove the needle bearing by using the special tools.

**TOOLS:**

- Bearing remover head, 14 mm** 07WMC-KFG0100
- Remover shaft, 15 mm** 07936-KC10100
- Remover weight** 07741-0010201
- or**
- U.S.A. only:**
- Bearing remover head, 15 mm** 07936-KC10200
- Remover shaft, 14 mm** 07YMC-001010A
- Remover weight** 07741-0010201
- 07936-371020A or**
- 07936-3710200**
- 07936-3710100**

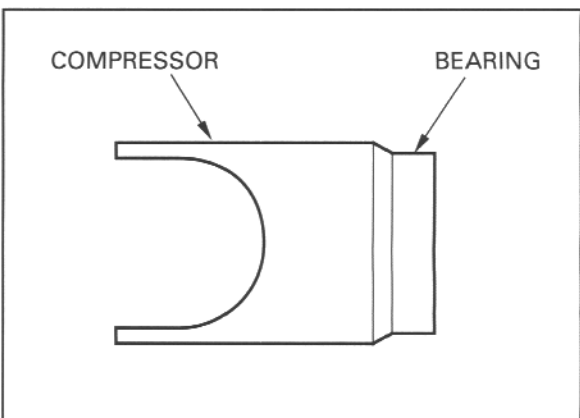
**Remover handle**

Remove the bearing cage and bearings from the inside of the pinion bearing to allow the special tool to grip the bearing.

Install the stopper ring into the groove using the special tool.

**TOOL:**

- Differential Bearing Clip Compressor** 07YME-HN4010A



## FRONT DRIVING MECHANISM

Be sure to wear heavy gloves to avoid burns when handling the heated gear case. Using a torch to heat the gear case may cause warpage.

Place the needle bearing in a freezer. Heat the gear case to 80°C (176°F).

Remove the needle bearing from the freezer and drive it into the gear case using the special tools.

### TOOLS:

**Driver**

07749-0010000

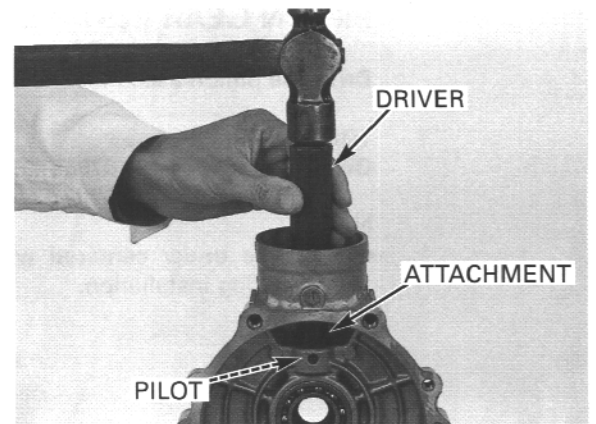
**Attachment, 22 x 24 mm**

07746-0010800

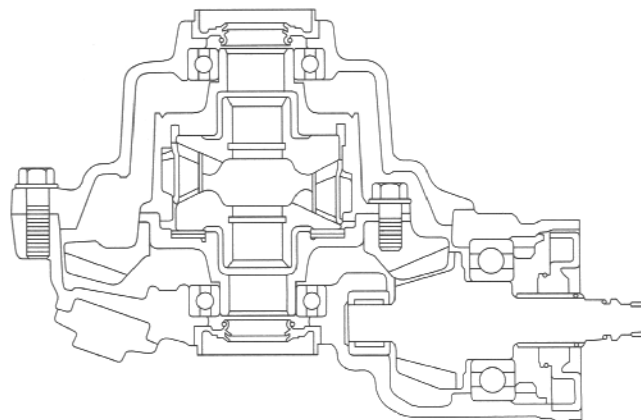
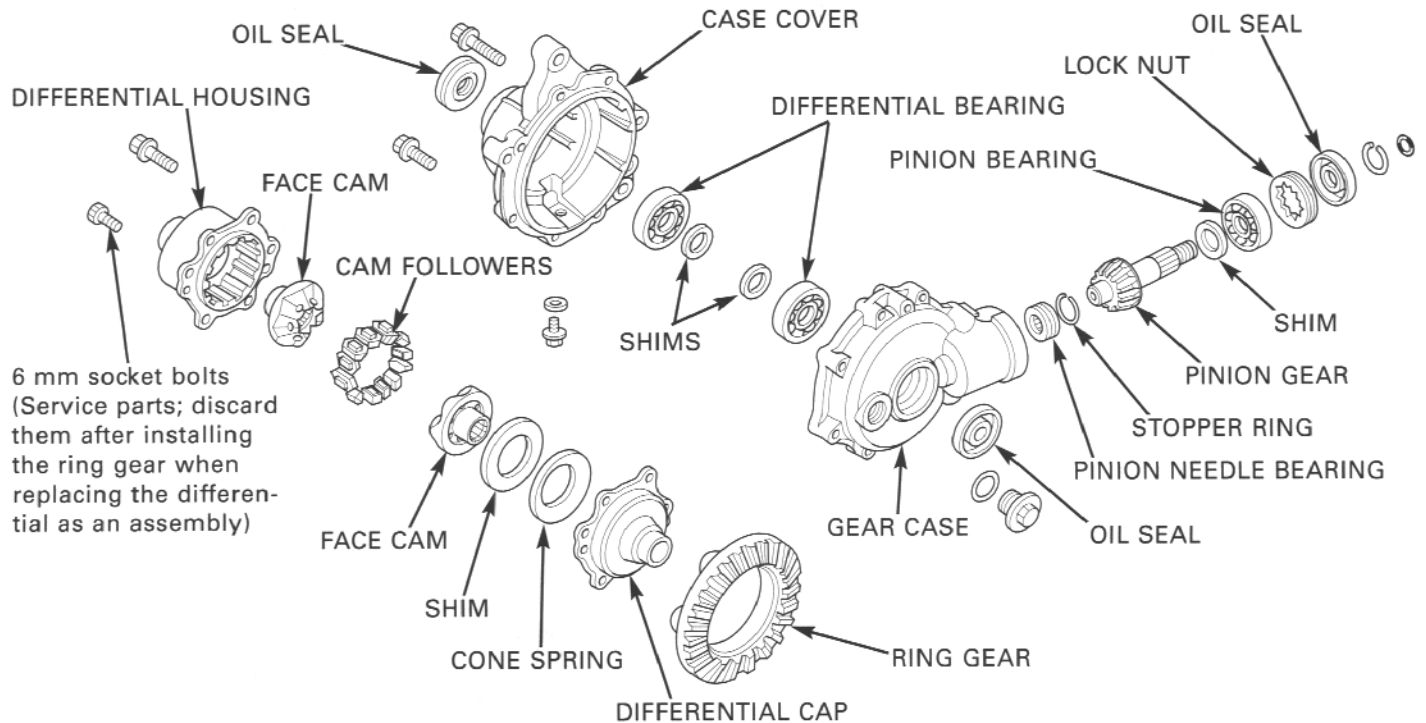
**Pilot, 14 mm**

07746-0041200

Make sure that the stopper ring is securely set in the groove in the gear case.



## DIFFERENTIAL ASSEMBLY



## FRONT DRIVING MECHANISM

### PINION GEAR INSTALLATION

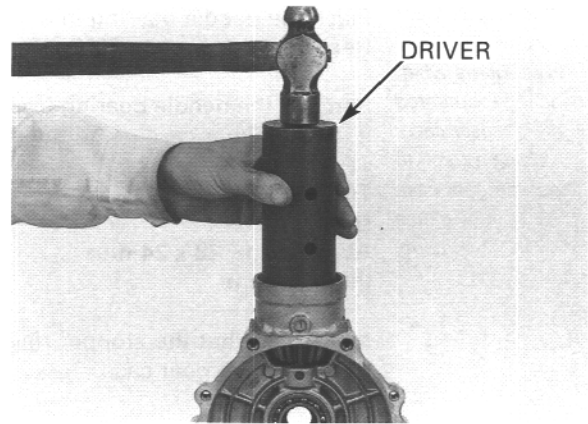
Drive the pinion assembly into the gear case.

**TOOL:**

**Oil seal driver**                    **07965-KE80200 or**  
   **07947-KA50100 (U.S.A. only)**

**NOTE:**

- Keep the driver centered with the bearing outer race during installation.



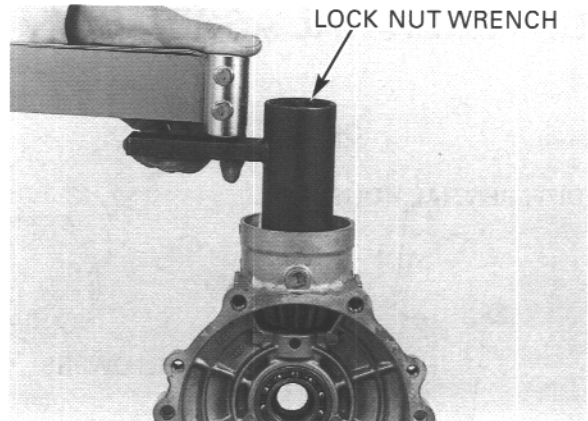
Install a new lock nut and tighten it.

**TOOL:**

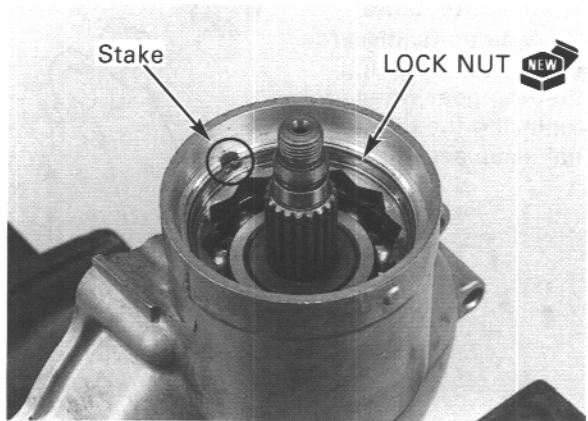
**Lock nut wrench, 30 x 64 mm**    **07916-MB00002**

**TORQUE: Actual: 98 N·m (10.0 kgf·m, 72 lbf·ft)**  
**Indicated: 89 N·m (9.1 kgf·m, 66 lbf·ft)**

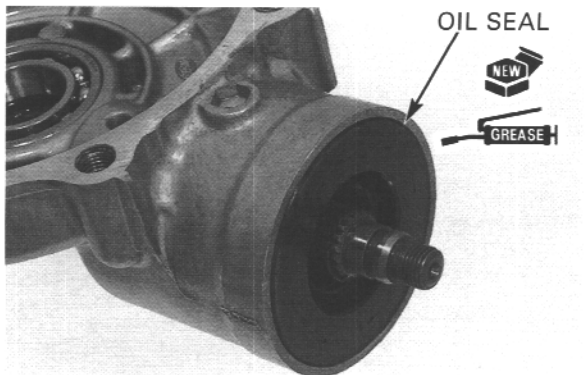
*Refer to torque  
wrench reading  
information on page  
17-1 "Service  
Information."*



Stake the lock nut into the case groove.



Apply grease to a new oil seal lips.  
Install the oil seal into the gear case until it is fully  
seated.



Keep dust and dirt out of the differential housing.

## DIFFERENTIAL ASSEMBLY

Install the face cam into the differential housing.

Install the six cam followers A (rib) and six followers B (flat) into the specified grooves in the housing by two and two as shown.

Install the face cam onto the cam followers.

Measure the depth of the differential cap and the height of the housing-to-cam, and record them (page 17-14 and 17-15).

Calculate the shim thickness using the equation below. The correct shim is the one nearest to this dimension.

$$A = B - C - 1.7 \text{ mm}$$

- A: New shim thickness
- B: Recorded cap depth
- C: Recorded cam height

Select the shim and install it onto the face cam.

### Differential shims:

- |                     |                     |
|---------------------|---------------------|
| L: 1.3 mm (0.05 in) | C: 1.7 mm (0.07 in) |
| M: 1.4 mm (0.06 in) | D: 1.8 mm (0.07 in) |
| N: 1.5 mm (0.06 in) | E: 1.9 mm (0.07 in) |
| A: 1.6 mm (0.06 in) |                     |

Install the cone spring with the concave side facing up (differential cap side).  
Install the differential cap.

### NOTE:

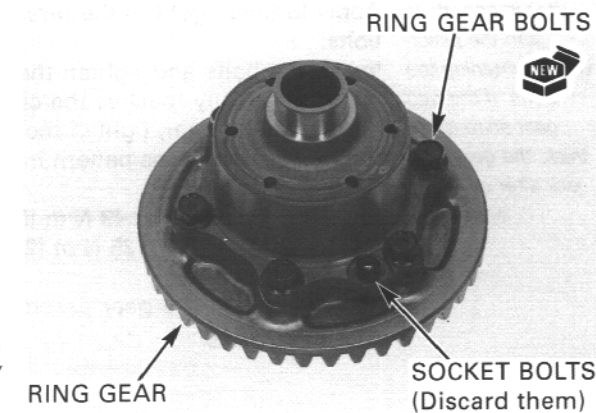
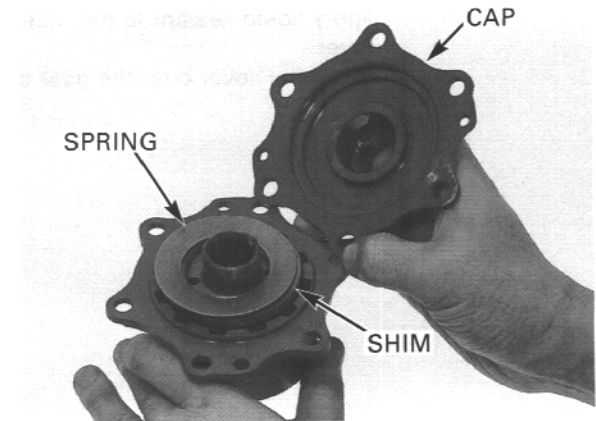
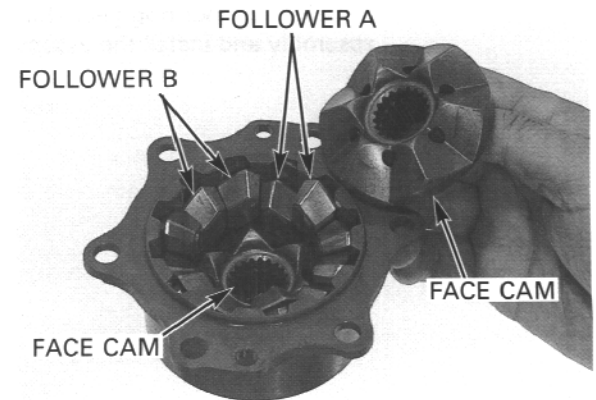
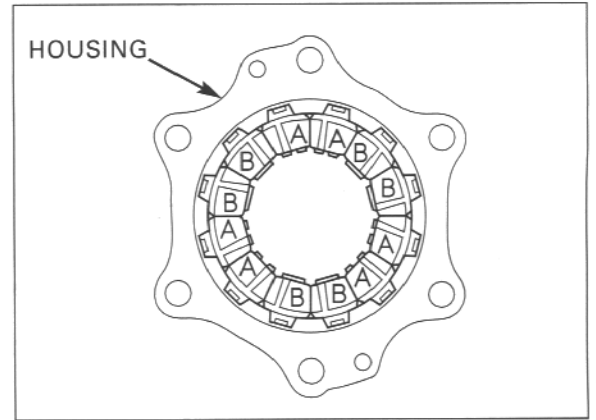
- Inspect the slip torque (page 17-13) after installing the ring gear with the original bolts. If the slip torque is out of specification, perform the shim adjustment. Replace the differential assembly when the replacement shim is changed by 0.3 mm or more from the selected shim (see above).

Install the ring gear onto the differential assembly with new ring gear bolts.  
Tighten the six bolts in a crisscross pattern in several steps.

**TORQUE: 49 N·m (5.0 kgf·m, 36 lbf·ft)**

### NOTICE

If the differential was replaced as an assembly, remove the two socket bolts from a new assembly and discard them after installing the ring gear.



# FRONT DRIVING MECHANISM

## DIFFERENTIAL CASE ASSEMBLY

**NOTE:**

- When the gear set, bearing, differential housing and/or gear case has been replaced, check the tooth contact pattern check (page 17-12) and gear backlash (page 17-10).

*Keep dust and dirt out of the case and cover.*

Clean the mating surface of the gear case and cover, being careful not to damage them.

Blow compressed air through the breather hole in the case cover.

Install the proper ring gear shims onto the differential assembly and install the assembly into the gear case.

Apply liquid sealant to the mating surface of the case cover.

Install the cover over the gear case.

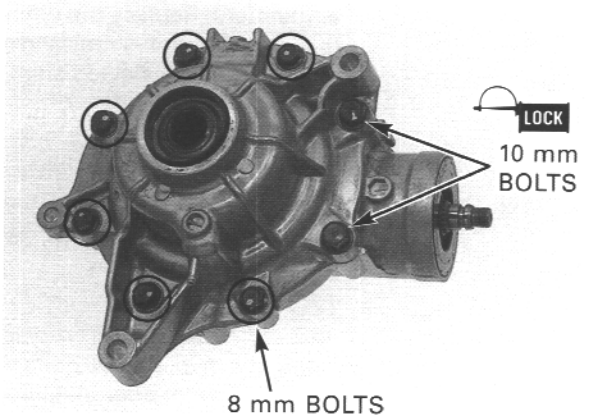
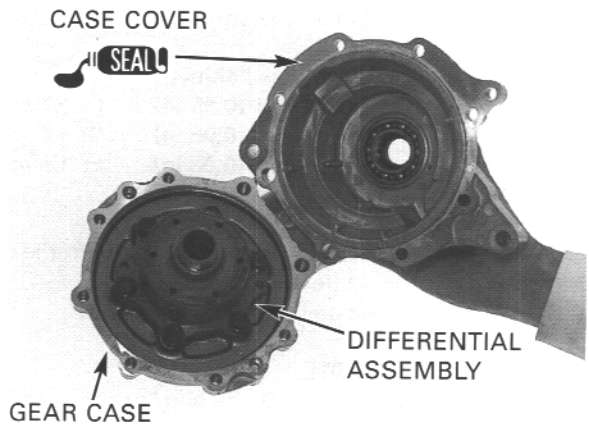
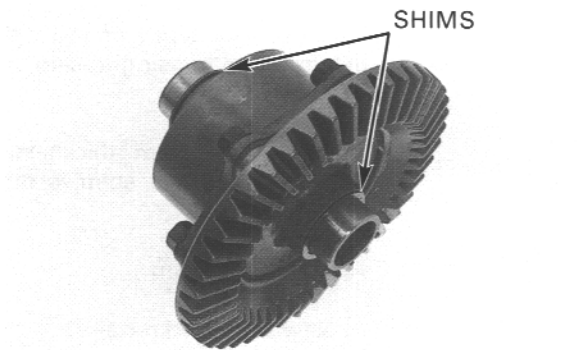
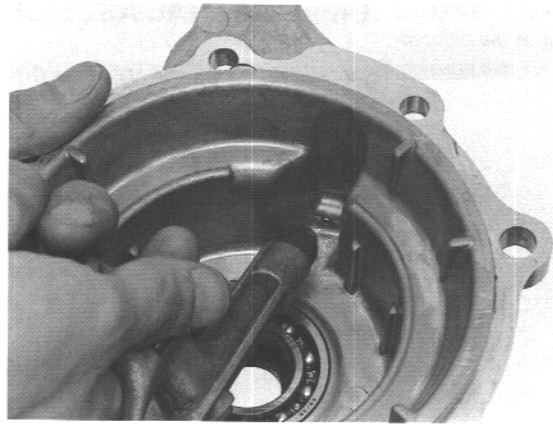
*It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.*

Apply locking agent to the threads of the two 10 mm bolts.

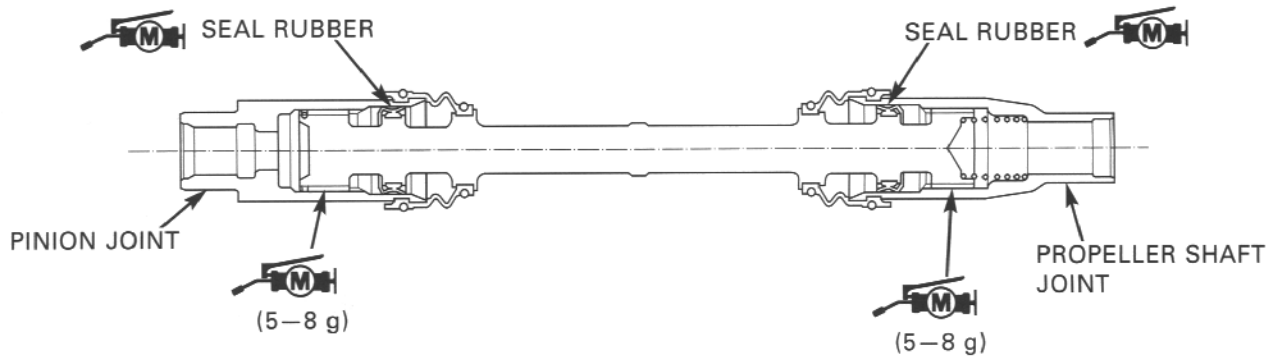
Install the bolts and tighten them several steps until the cover evenly touches the case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

**TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)  
8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)**

Make sure that the gear assembly rotates smoothly without binding.



**PROPELLER SHAFT ASSEMBLY**

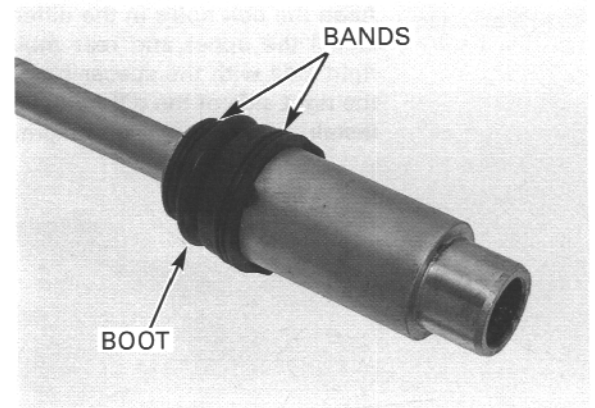
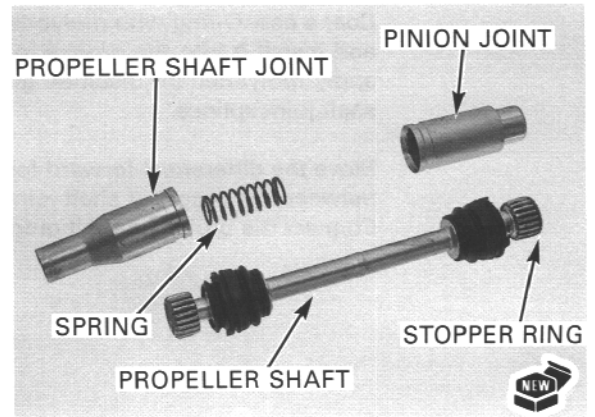


Place the boot bands over the propeller shaft. Install a new stopper ring into the groove in the propeller shaft.

Apply 5–8 g of molybdenum disulfide grease to the pinion joint splines. Install the pinion joint over the propeller shaft until the stopper ring seats in the groove. Make sure that the stopper ring is seated properly by pulling on the pinion joint lightly.

Install the boot over the pinion joint securely and the boot bands into the boot grooves.

Apply 5–8 g of molybdenum disulfide grease to the propeller shaft joint splines. Set the spring and propeller shaft joint onto the propeller shaft and install the boot over the propeller shaft joint securely while compressing it. Install the boot bands into the boot grooves.

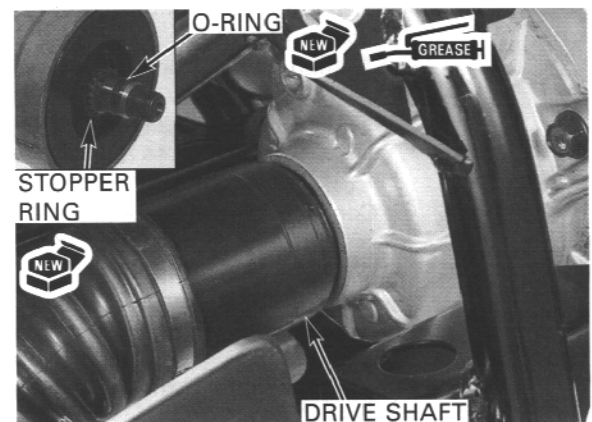


**DIFFERENTIAL INSTALLATION**

Install a new stopper ring into the groove in the pinion gear shaft splines. Coat a new O-ring with grease and install it into the groove in the pinion gear shaft.

Place the differential into the frame.

Install the differential onto the drive shaft in the same manner as on page 17-7.

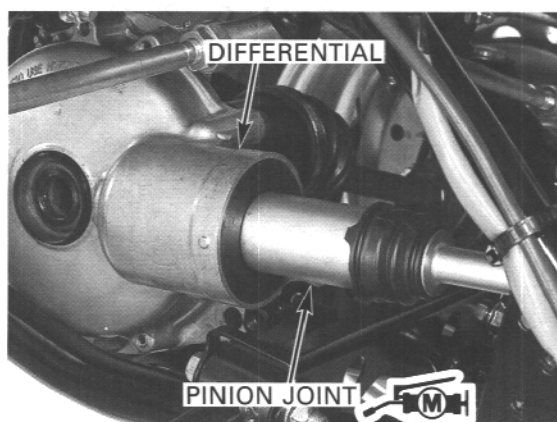


## FRONT DRIVING MECHANISM

Apply molybdenum disulfide grease to the pinion joint splines.

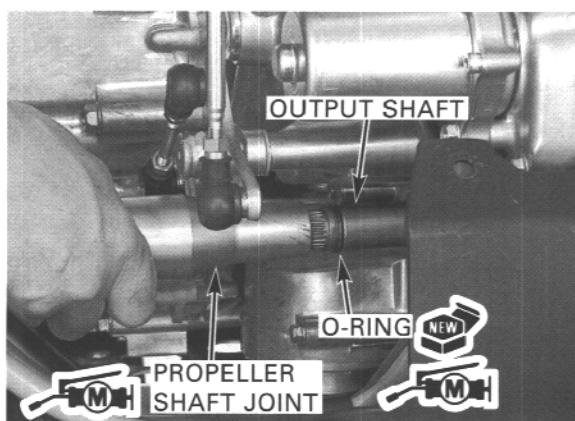
Install the propeller shaft assembly into the differential until the stopper ring on the pinion gear seats in the pinion joint groove.

Make sure that the stopper ring is seated properly by pulling on the pinion joint lightly.

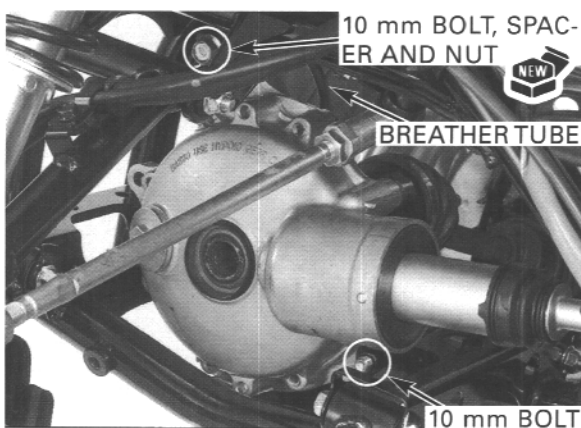


Coat a new O-ring with molybdenum disulfide grease and install it into the groove in the output shaft and apply molybdenum disulfide grease to the propeller shaft joint splines.

Move the differential forward for maximum clearance between the propeller shaft joint and output shaft. Connect the propeller shaft onto the output shaft.



Align the bolt holes in the differential and frame, and install the upper and rear mounting bolts from the right side with the spacer (upper side only; between the right side of the differential and frame). Install a new upper mounting nut.



Install the mounting bracket with the front mounting bolts and nut. Tighten all the mounting fasteners.

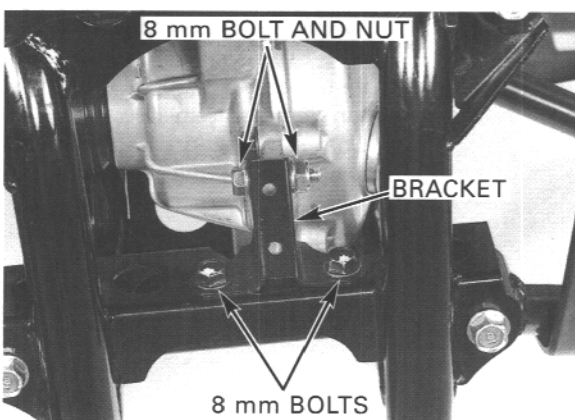
**TORQUE: 8 mm: 22 N.m (2.2 kgf.m, 16 lbf.ft)**  
**10 mm: 44 N.m (4.5 kgf.m, 33 lbf.ft)**

Connect the breather tube.

Install the following

- drive shaft (page 17-7)
- inner mud guard and front mud guard (page 2-6).

Fill the differential with the recommended oil (page 3-15).

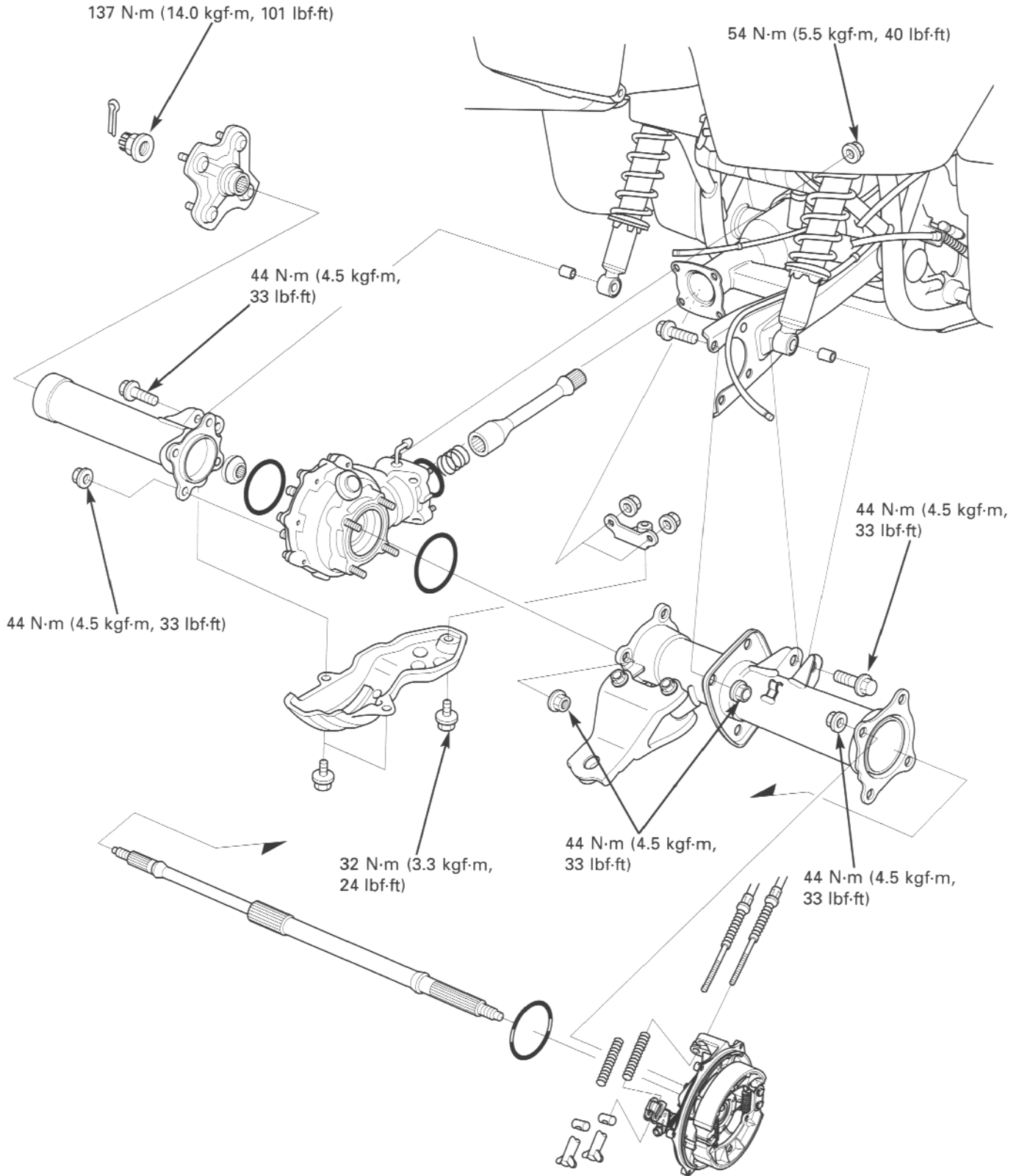




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**MEMO**

# REAR DRIVING MECHANISM



# 18. REAR DRIVING MECHANISM

<b>SERVICE INFORMATION</b>	<b>18-1</b>	<b>CASE BEARING REPLACEMENT</b>	<b>18-12</b>
<b>TROUBLESHOOTING</b>	<b>18-2</b>	<b>FINAL DRIVE ASSEMBLY</b>	<b>18-14</b>
<b>REAR AXLE REMOVAL</b>	<b>18-3</b>	<b>FINAL DRIVE INSTALLATION</b>	<b>18-17</b>
<b>FINAL DRIVE REMOVAL</b>	<b>18-5</b>	<b>REAR AXLE INSTALLATION</b>	<b>18-18</b>
<b>FINAL DRIVE DISASSEMBLY/ INSPECTION</b>	<b>18-6</b>		

## SERVICE INFORMATION

### GENERAL

- Perform the gear contact pattern and backlash inspection whenever you replace the bearings, gears or gear case. The extension lines from the gear engagement surfaces should intersect at one point.
- Protect the gear case with a shop towel or soft jaws while holding it in vise. Do not clamp it too tight as it could damage the gear case.
- When using the lock nut wrench, use a deflecting beam type torque wrench 20 inches long. The lock nut wrench increases the torque wrench's leverage, so the torque wrench reading will be less than the torque actually applied to the lock nut. The specification given is the actual torque applied to the lock nut, not the reading on the torque wrench. Do not over-tighten the lock nut. The specification later in the text gives both actual and indicated.
- Replace the ring and pinion gears as a set.

### SPECIFICATIONS

Unit: mm (in)

ITEM		STANDARD	SERVICE LIMIT
Axle runout		—	3.0 (0.12)
Rear final drive	Oil capacity	After draining	90 cm <sup>3</sup> (3.0 US oz, 3.2 Imp oz)
		After disassembly	100 cm <sup>3</sup> (3.4 US oz, 3.5 Imp oz)
	Recommended oil		Hypoid gear oil SAE #80
	Gear backlash		0.05—0.25 (0.002—0.010)
	Backlash difference		—
	Ring gear-to-stop pin clearance		0.3—0.6 (0.01—0.02)

### TORQUE VALUES

Final gear case pinion bearing lock nut	98 N·m (10.0 kgf·m, 72 lbf·ft)	Stake/Lock nut
Final gear case cover bolt (10 mm)	49 N·m (5.0 kgf·m, 36 lbf·ft)	Apply locking agent to the threads
(8 mm)	25 N·m (2.6 kgf·m, 19 lbf·ft)	
Final gear case mounting bolt	54 N·m (5.5 kgf·m, 40 lbf·ft)	
Axle housing nut	44 N·m (4.5 kgf·m, 33 lbf·ft)	Lock nut
Skid plate bolt	32 N·m (3.3 kgf·m, 24 lbf·ft)	
Rear wheel hub nut	137 N·m (14.0 kgf·m, 101 lbf·ft)	
Rear brake panel nut	44 N·m (4.5 kgf·m, 33 lbf·ft)	Lock nut

## REAR DRIVING MECHANISM

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### TOOLS

Driver	07749-0010000	
Attachment, 52 x 55 mm	07746-0010400	
Attachment, 62 x 68 mm	07746-0010500	
Attachment, 22 x 24 mm	07746-0010800	
Pilot, 32 mm	07MAD-PR90200	
Pilot, 35 mm	07746-0040800	
Pilot, 28 mm	07746-0041100	
Pilot, 14 mm	07746-0041200	
Pinion holder	07SMB-HM70200	
Oil seal driver attachment	07JAD-PH80100	
Lock nut wrench, 30 x 64 mm	07916-MB00002	
Pinion puller base	07HMC-MM80110	or 07HMC-MM8011A (U.S.A. only)
Puller shaft	07931-ME40000	or 07931-ME4010B and 07931-HB3020A (U.S.A. only)
Driver, 40 mm I.D.	07746-0030100	
Attachment, 30 mm I.D.	07746-0030300	
Bearing remover head, 14 mm	07WMC-KFG0100	or 07936-KC10200 and 07YMC-001010A (U.S.A. only)
Bearing remover shaft, 15 mm	07936-KC10100	
Bearing remover weight	07741-0010201	or 07936-371020A or 07936-3710200 (U.S.A. only)
Oil seal driver	07965-KE80200	
Driver attachment	07LAD-PW50500	

### TROUBLESHOOTING

#### Excessive noise

- Worn or scored ring gear shaft and axle
- Worn or scored pinion and splines
- Worn pinion and ring gears
- Excessive backlash between pinion and ring gears
- Oil level too low

#### Wobble or vibration in vehicle

- Axle not tightened properly
- Bent axle

#### Oil leak

- Oil level too high
- Clogged breather
- Damaged seals
- Loose case cover bolt

## REAR AXLE REMOVAL

Remove the following:

- rear wheels (page 15-3)
- rear brake drum (page 16-14)
- breather tube
- adjusting nuts
- joint pins
- springs
- brake cables
- four nuts (discard them)
- brake panel assembly
- O-ring

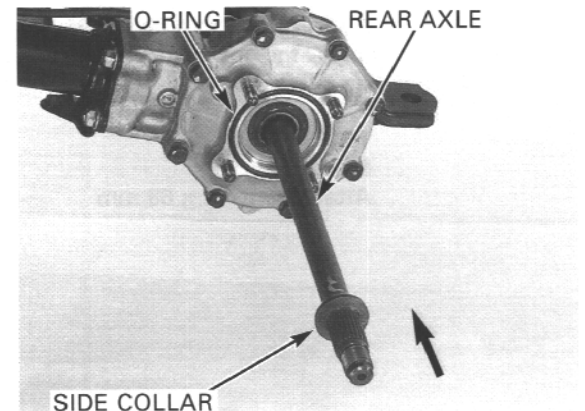
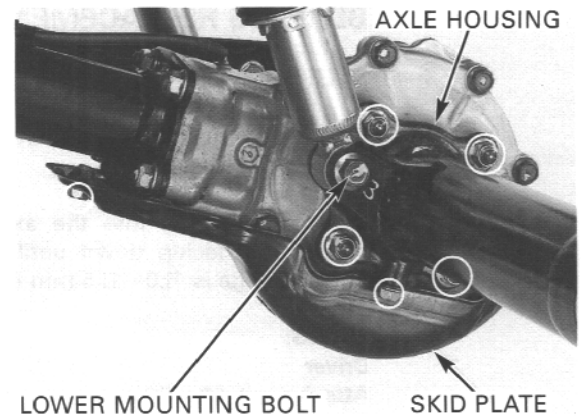
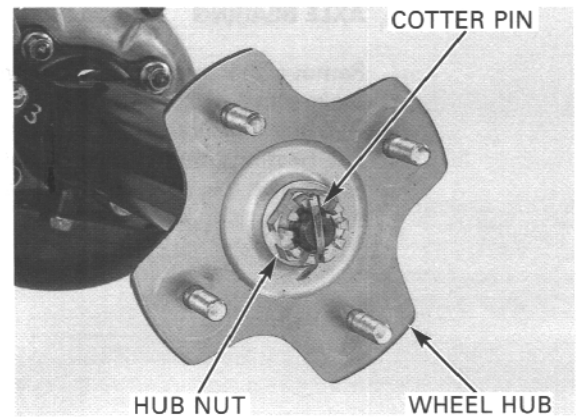
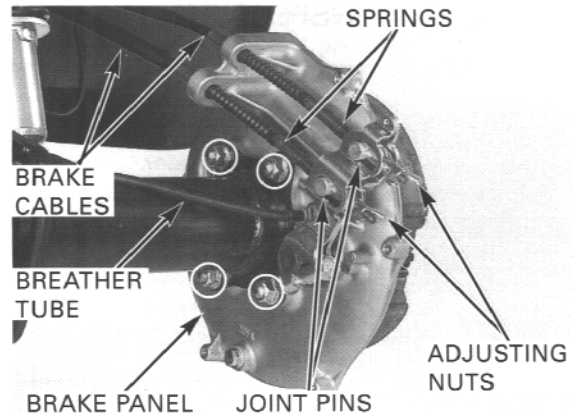
*Do not get grease on the shoe linings.*

- cotter pin
- hub nut
- left wheel hub

- three bolts and skid plate
- left shock absorber lower mounting bolt
- four nuts and left axle housing

- O-ring
- left side collar

Remove the rear axle by driving the axle from the left side using a rubber mallet.



## REAR DRIVING MECHANISM

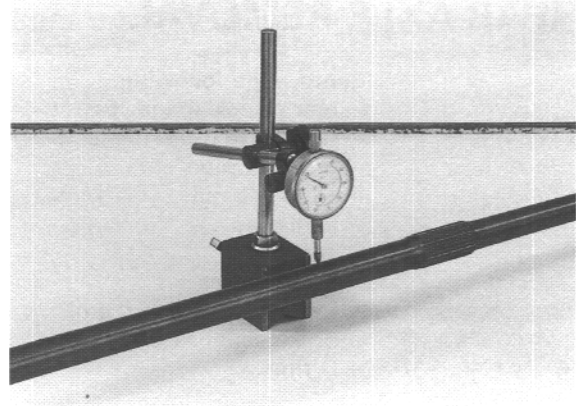
### INSPECTION

#### REAR AXLE

Set the axle in V-blocks and measure the axle runout with a dial indicator.

Axle runout is 1/2 the total indicator reading.

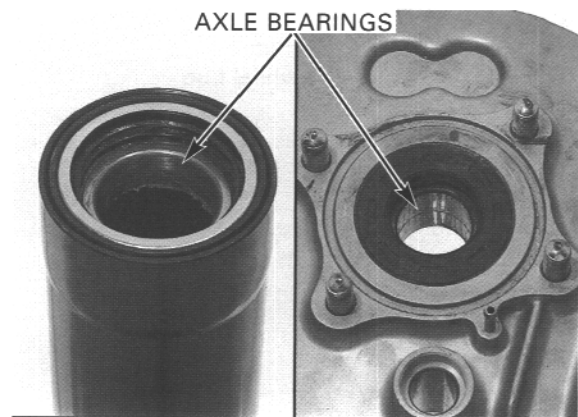
**SERVICE LIMIT: 3.0 mm (0.12 in)**



#### AXLE BEARING

Remove the dust seals from the axle housing and brake panel.

Turn the inner race of each bearing with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the housing or panel.



### BEARING REPLACEMENT

#### AXLE HOUSING

Remove the dust seal and drive the axle bearing out of the axle housing.

Press the bearing into the axle housing with the sealed side facing down until the depth from the housing edge is 11.0—11.5 mm (0.43—0.45 in).

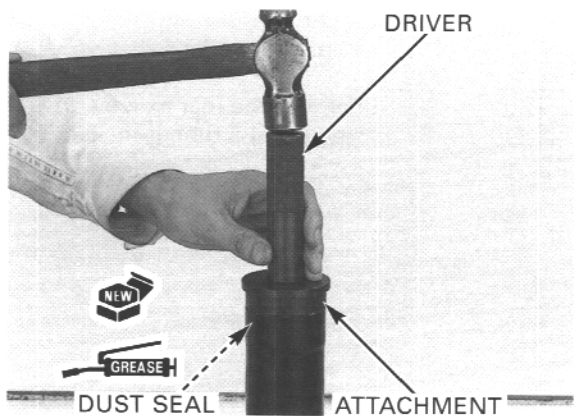
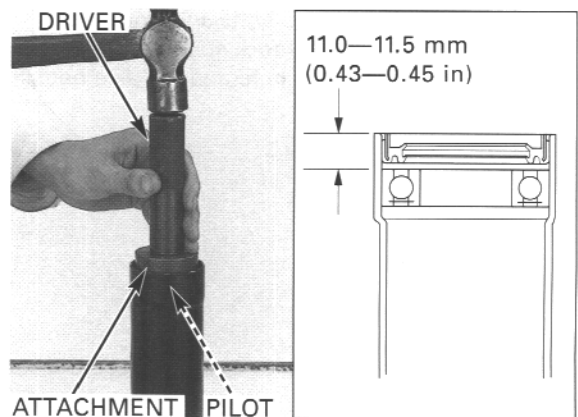
#### TOOLS:

Driver	07749-0010000
Attachment, 52 x 55 mm	07746-0010400
Pilot, 32 mm	07MAD-PR90200

Apply grease to a new dust seal lips. Install the dust seal with the metal plate side facing up until it is flush with the housing end.

#### TOOLS:

Driver	07749-0010000
Attachment, 62 x 68 mm	07746-0010500



## BRAKE PANEL

Remove the dust seal and snap ring.  
Drive the axle bearings out of the brake panel.

*Support the bearing housing section of the brake panel when installing.*

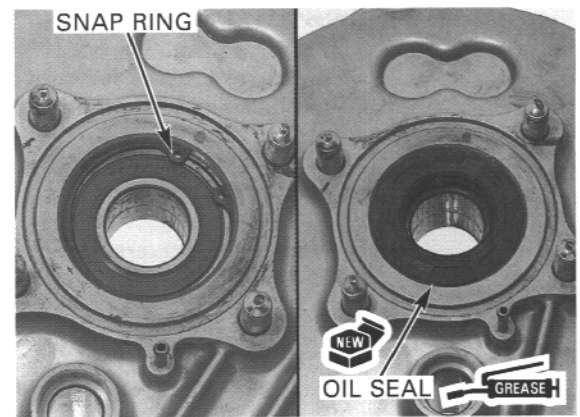
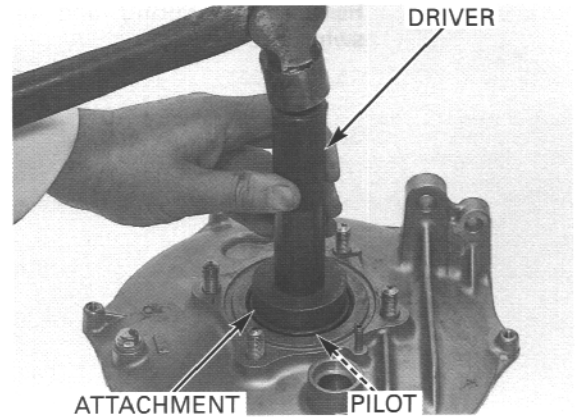
Drive the outer bearing (brake drum side) squarely with the sealed side facing down until it is fully seated, then the inner bearing with the sealed side facing up.

### TOOLS:

<b>Driver</b>	<b>07749-0010000</b>
<b>Oil seal driver attachment</b>	<b>07JAD-PH80100</b>
<b>Pilot, 28 mm</b>	<b>07746-0041100</b>

Install the snap ring into the groove in the brake panel securely.

Apply grease to a new dust seal lips.  
Install the dust seal until it is flush with the brake panel.

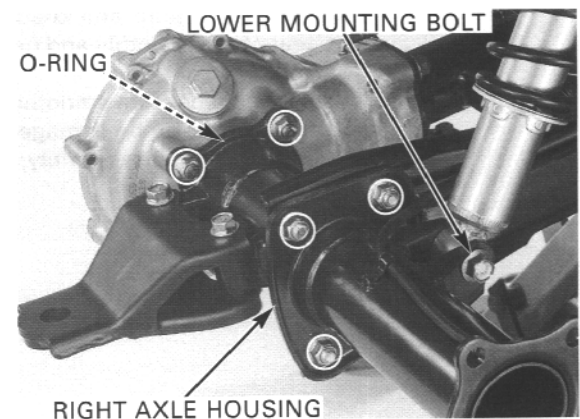


## FINAL DRIVE REMOVAL

Remove the rear axle (page 18-3)  
Drain the final gear case oil (page 3-14).

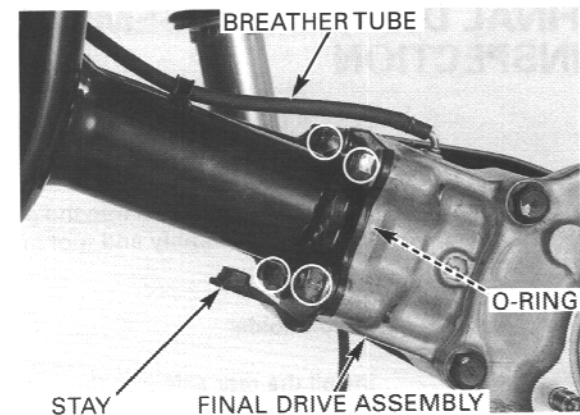
Support the swingarm and remove the right shock absorber lower mounting bolt.

Remove the eight nuts, four bolts and right axle housing.  
Remove the O-ring from the final drive gear case.



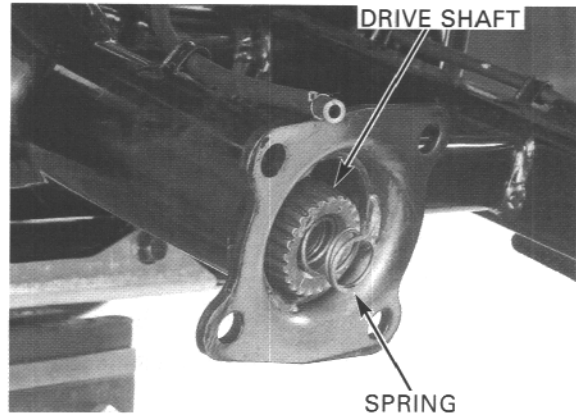
Disconnect the breather tube from the final drive gear case.

Remove the four nuts, skid plate stay and final drive assembly from the swingarm.  
Remove the O-ring from the final drive gear case.



## REAR DRIVING MECHANISM

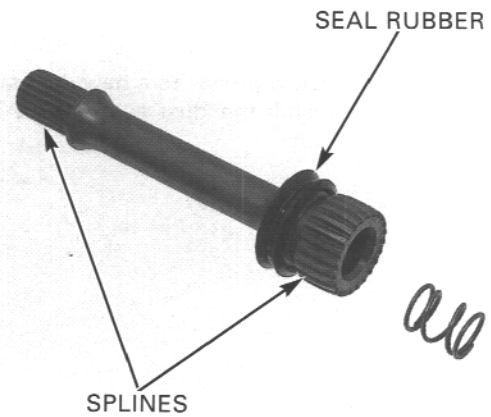
Remove the spring and drive shaft from the swingarm.



### INSPECTION

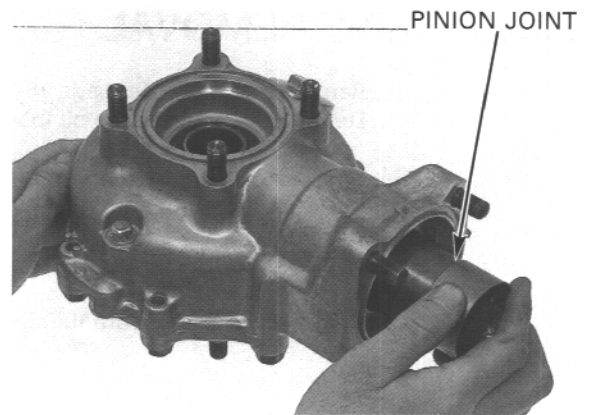
Check the seal rubber for wear or damage.  
Check the splines of the drive shaft for wear or damage.  
If the splines are damaged, check the pinion and universal joint splines also.

To remove the universal joint, remove the swingarm (page 15-5).



Turn the pinion joint and check that the pinion and ring gears turn smoothly and quietly without binding.

If the gears do not turn smoothly or quietly, the gears and/or bearing may be damaged or faulty. They must be checked after disassembly; replace faulty parts/assemblies as required.



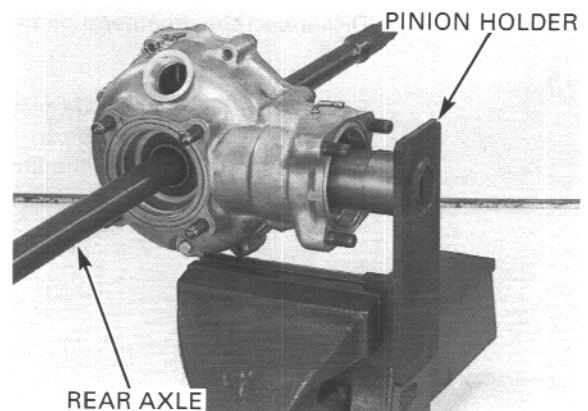
## FINAL DRIVE DISASSEMBLY/ INSPECTION

### BACKLASH INSPECTION

Remove the oil filler cap.  
Install the special tool into the pinion joint, and set the final drive assembly and tool in a vise as shown.

**TOOL:**  
Pinion holder **07SMB-HM70200**

Install the rear axle into the final drive assembly.





Set a horizontal type dial indicator on the ring gear through the oil filler hole.  
Turn the ring gear back and forth with the axle to read backlash.

**STANDARD: 0.05—0.25 mm (0.002—0.010 in)**  
**SERVICE LIMIT: 0.4 mm (0.02 in)**

Remove the dial indicator. Turn the ring gear 120° and measure backlash. Repeat this procedure once more. Compare the difference of the three measurements.

**SERVICE LIMIT: 0.2 mm (0.01 in)**

If the difference in measurements exceeds the service limit, it indicates that the bearing is not installed squarely, or the case is deformed. Inspect the bearings and case.

If the backlash is excessive, replace the ring gear right shim with a thinner one.

If the backlash is too small, replace the ring gear right shim with a thicker one.

Backlash is changed by about 0.06 mm (0.002 in) when thickness of the shim is changed by 0.12 mm (0.005 in).

**NOTE:**

- Nine different thickness shims (from A to I) are available in thickness intervals of 0.06 mm (0.002 in).

**RING GEAR SHIMS:**

**A (thinnest): 1.82 mm (0.072 in)**

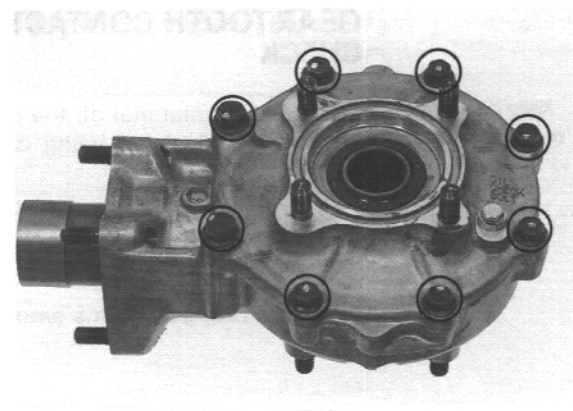
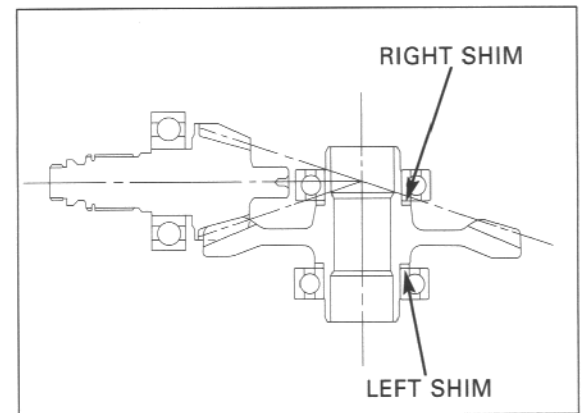
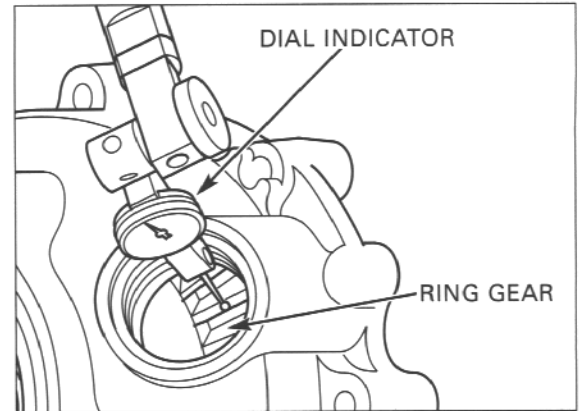
**D (standard): 2.00 mm (0.079 in)**

**I (thickest): 2.30 mm (0.091 in)**

Change the left shim thickness in an opposite amount of what the right shim was changed; if the right shim was replaced with a 0.12 mm (0.005 in) thicker one, replace the left shim with a 0.12 mm (0.005 in) thinner one.

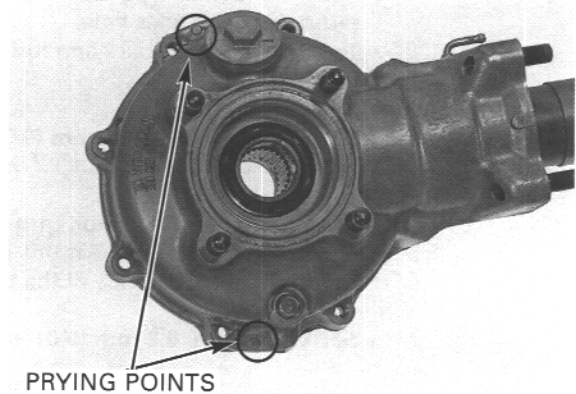
### FINAL GEAR CASE DISASSEMBLY

Loosen the eight cover bolts in a crisscross pattern in 2 or 3 steps and remove them.

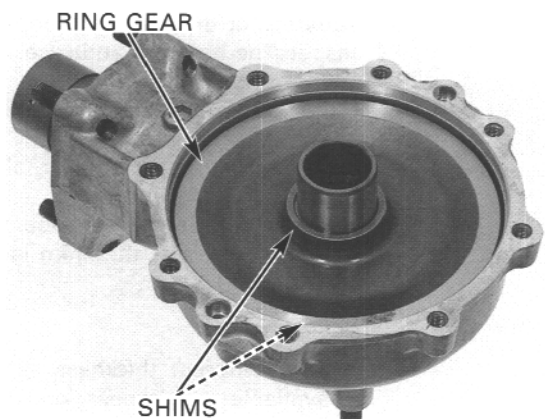


## REAR DRIVING MECHANISM

Pry the cover at the prying points using a screwdriver and remove the case cover.



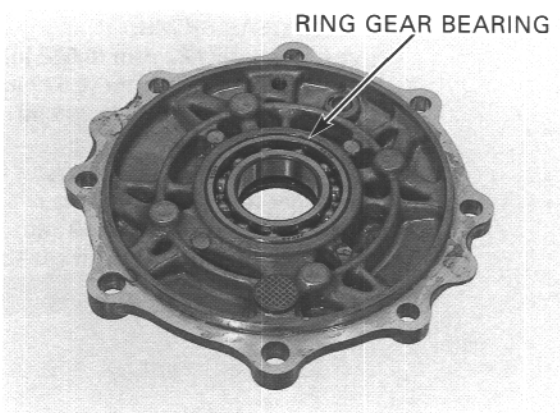
Remove the ring gear and shims.



### BEARING INSPECTION

Turn the inner race of each bearing in the gear case and case cover with your finger. The bearings should turn smoothly and quietly. Also check that the bearing outer race fits tightly in the case or cover.

For ring gear bearing replacement, see page 18-12.



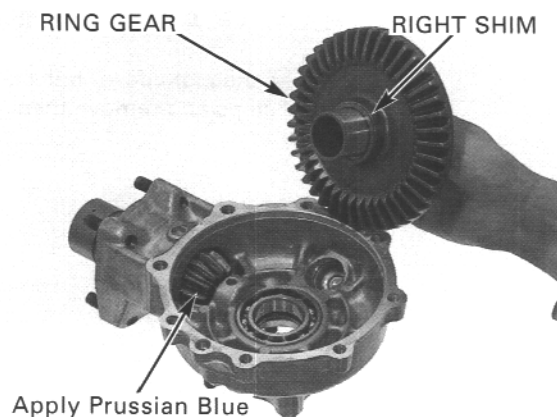
### GEAR TOOTH CONTACT PATTERN CHECK

*Keep dust and dirt out of the case and cover.*

Clean sealing material off the mating surfaces of the gear case and cover, being careful not to damage them.

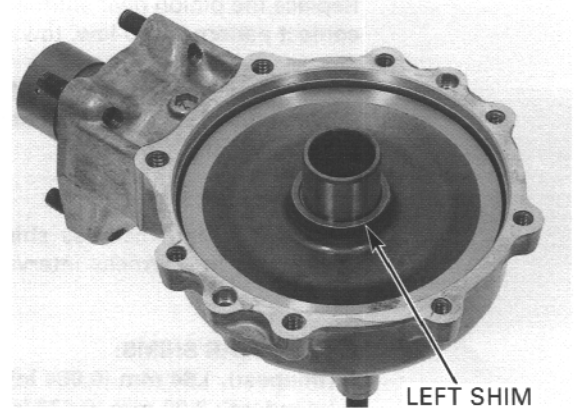
Apply thin coat of Prussian Blue to the pinion gear teeth for a tooth contact pattern check.

Install the ring gear shims onto the ring gear.



## REAR DRIVING MECHANISM

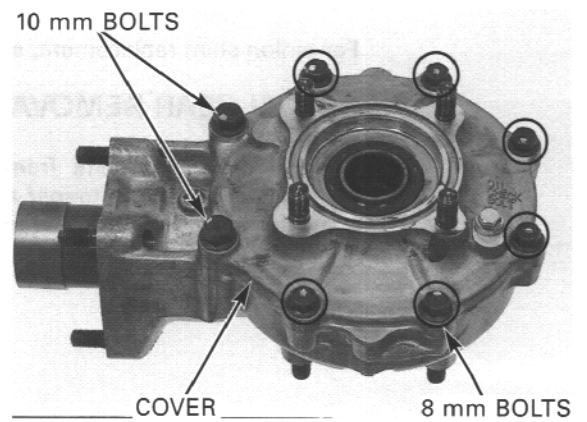
Install the ring gear with the shims into the gear case.



*It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.*

Install the case cover and tighten the bolts in several steps until the cover evenly touches the gear case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

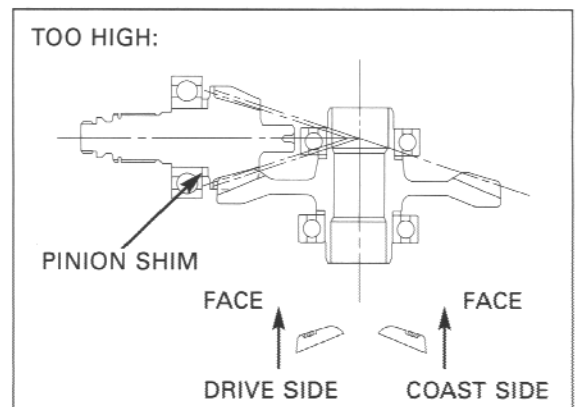
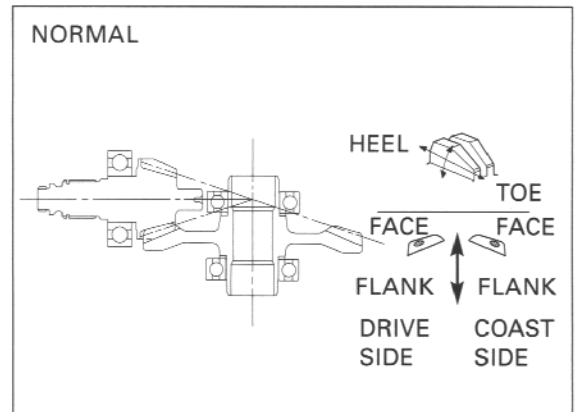
**TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)**  
**8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)**



Remove the oil filler cap.  
 Rotate the ring gear several times in both directions of rotation.  
 Check the gear tooth contact pattern through the oil filler hole.  
 The pattern is indicated by the Prussian Blue applied to the pinion.  
 Contact is normal if the Prussian Blue is transferred to the approximate center of each tooth, but slightly to the heel side and to the flank side.

If the patterns are not correct, remove and change the pinion gear shim with a suitable one.

Replace the pinion gear shim with a thicker one if the contact pattern is too high, toward the face.



## REAR DRIVING MECHANISM

Replace the pinion gear shim with a thinner one if the contact pattern is too low, toward the flank.

The pattern will shift about 0.5—1.0 mm (0.02—0.04 in) when the thickness of the shim is changed by 0.12 mm (0.005 in).

**NOTE:**

- Nine different thickness shims (from A to J) are available in thickness intervals of 0.06 mm (0.002 in).

**PINION GEAR SHIMS:**

**A (thinnest): 1.64 mm (0.064 in)**

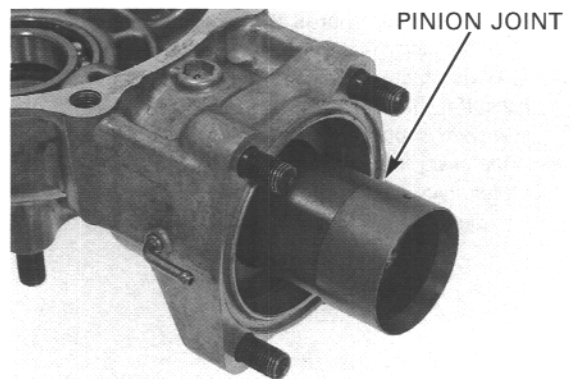
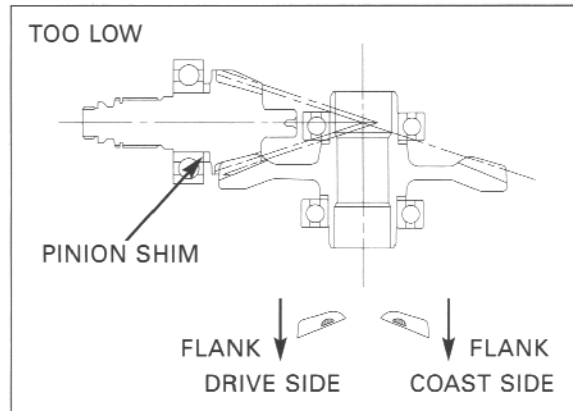
**D (standard): 2.00 mm (0.079 in)**

**I (thickest): 2.18 mm (0.086 in)**

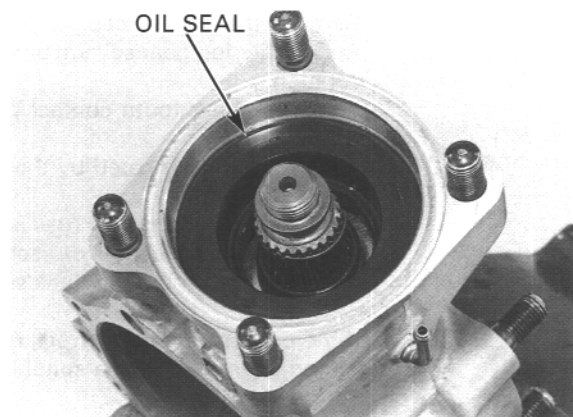
For pinion shim replacement, see page 18-11.

### PINION GEAR REMOVAL

Remove the pinion joint from the pinion gear by pulling it to force the stopper ring at the pinion gear shaft end past the groove in the pinion joint.

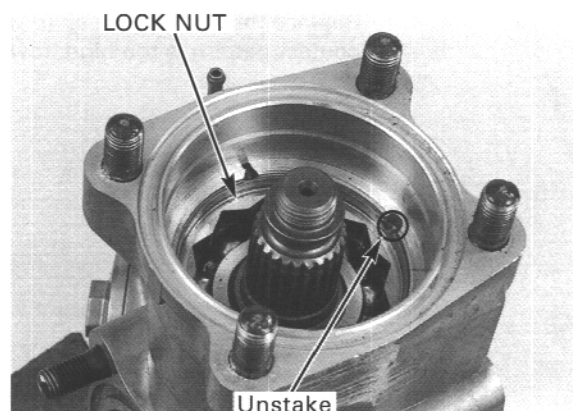


Remove the oil seal from the gear case.



*Be careful that metal particles do not enter the bearing and the threads of the case are not damaged.*

Unstake the pinion gear bearing lock nut with a drill or grinder.



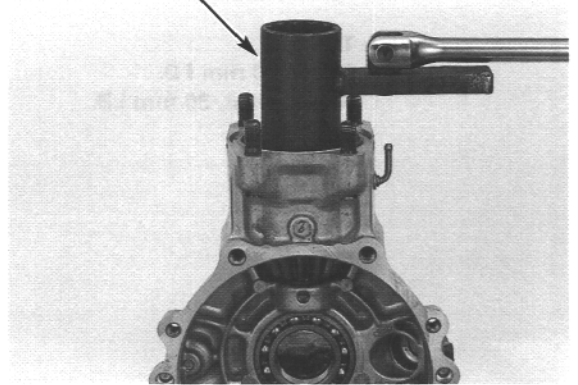
## REAR DRIVING MECHANISM

Remove the lock nut using the special tool.

**TOOL:**

**Lock nut wrench, 30 x 64 mm** 07916-MB00002

LOCK NUT WRENCH



Install the special tools onto the pinion gear shaft and gear case.

**TOOLS:**

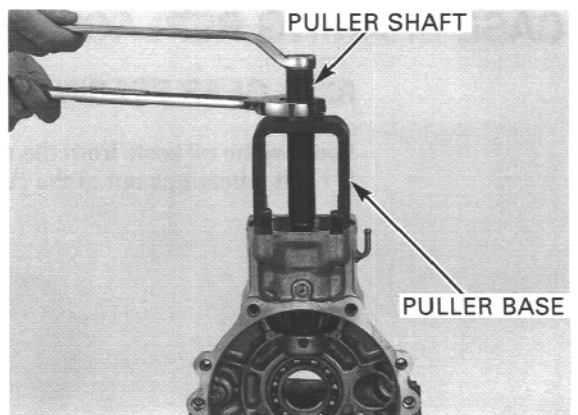
**Pinion puller base**

07HMC-MM80110 or  
07HMC-MM8011A  
(U.S.A. only)

**Puller shaft**

07931-ME40000 or  
07931-ME4010B and  
07931-HB3020A  
(U.S.A. only)

PULLER SHAFT



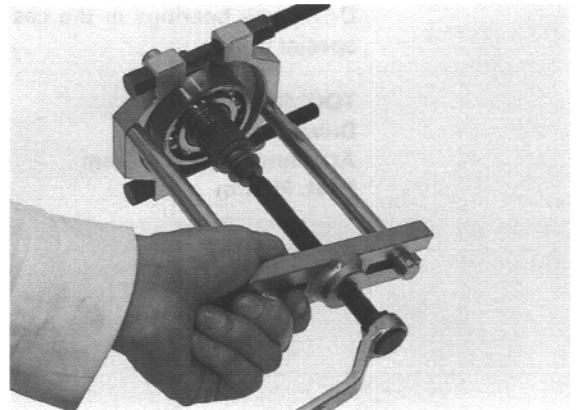
PULLER BASE

Pull the pinion gear assembly out of the gear case.

### PINION GEAR BEARING/SHIM REPLACEMENT

Pull the pinion gear bearing from the shaft with a commercially available bearing puller.

Remove the pinion gear shim.



Install the shim and bearing onto the pinion gear.

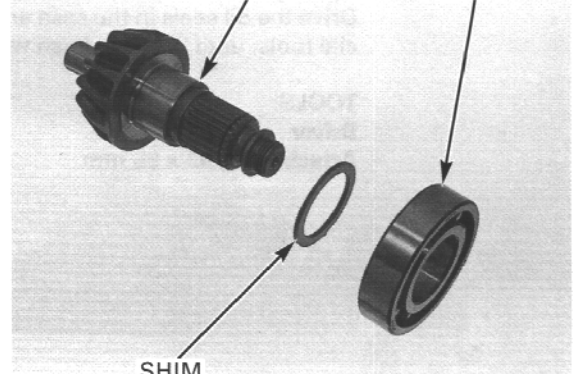
**NOTE:**

- When the gear set, ring gear bearing, and/or gear case has been replaced, use a 2.00 mm (0.79 in) thick shim for initial reference.

PINION GEAR

BEARING

SHIM



## REAR DRIVING MECHANISM

Drive the bearing with the marking side facing up.

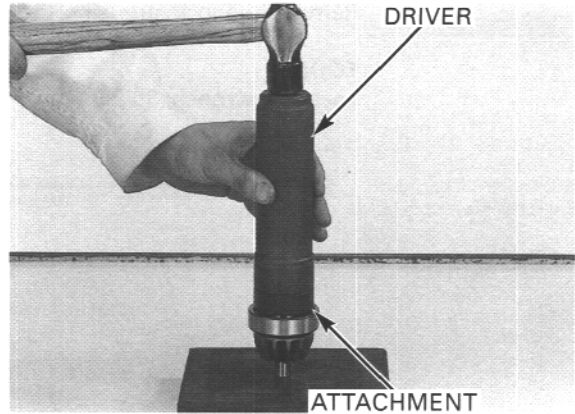
**TOOLS:**

**Driver, 40 mm I.D.**

07746-0030100

**Attachment, 30 mm I.D.**

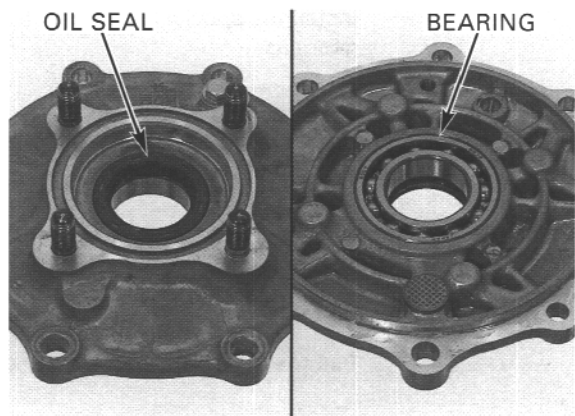
07746-0030300



## CASE BEARING REPLACEMENT

### RING GEAR BEARING

Remove the oil seals from the case and cover.  
Drive the bearings out of the case and cover.



Drive new bearings in the case and cover using the special tools.

**TOOLS:**

**Driver**

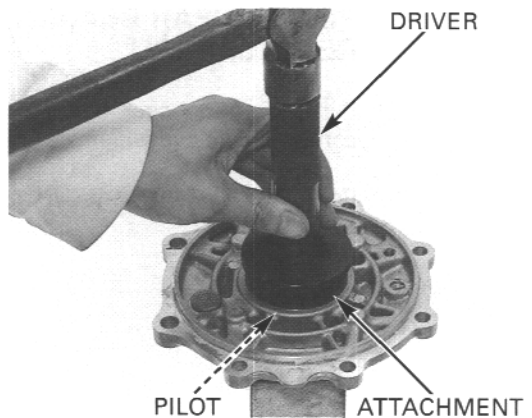
07749-0010000

**Attachment, 62 x 68 mm**

07746-0010500

**Pilot, 35 mm**

07746-0040800



Apply grease to new oil seal lips.  
Drive the oil seals in the case and cover using the special tools, until they are flush with the case and cover.

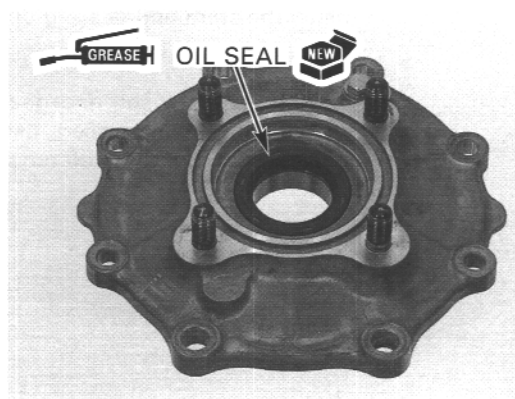
**TOOLS:**

**Driver**

07749-0010000

**Attachment, 52 x 55 mm**

07746-0010400



**PINION NEEDLE BEARING**

Remove the stopper ring by rotating it until the end of the stopper ring appears in the access hole. Strike gently near the end of the ring with a punch to bent the end upward. Grasp the end of the ring with needle-nosed pliers and pull the stopper ring out through the access hole.

*Be sure to wear heavy gloves to avoid burns when handling the heated gear case. Using a torch to heat the gear case may cause warpage.*

Heat the gear case to 80°C (176°F) and remove the needle bearing by using the special tool.

- TOOLS:**
- Bearing remover head, 14 mm** 07WMC-KFG0100
  - Remover shaft, 15 mm** 07936-KC10100
  - Remover weight** 07741-0010201
  - or**
  - U.S.A. only:**
  - Bearing remover head, 15 mm** 07936-KC10200
  - Remover shaft, 14 mm** 07YMC-001010A
  - Remover weight** 07741-0010201
  - 07936-371020A or 07936-3710200

Remove the bearing cage and bearings from the inside of the pinion bearing to allow the special tool to grip the bearing.

Install the stopper ring into the groove using the special tool.

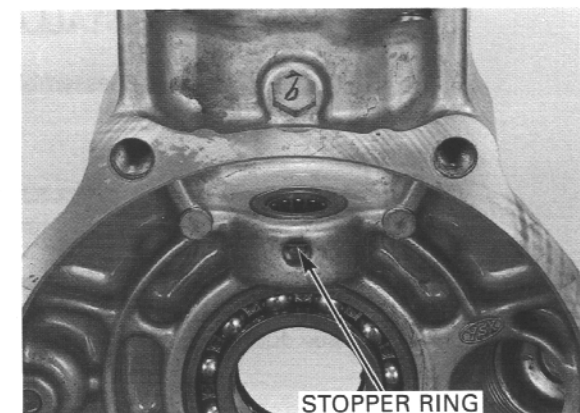
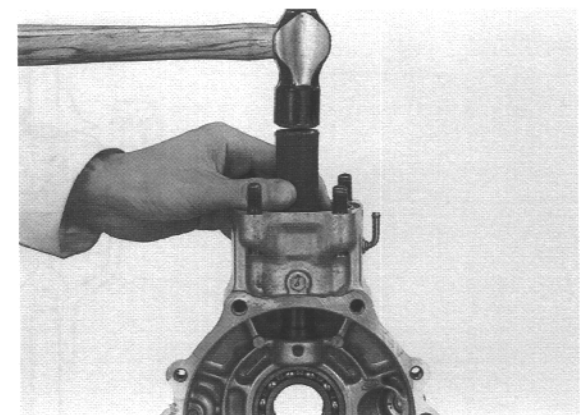
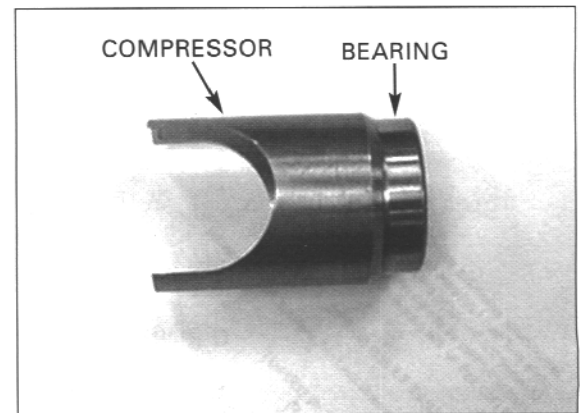
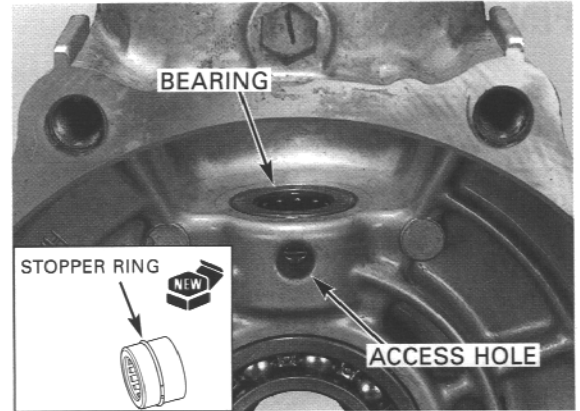
- TOOL:**
- Differential Bearing Clip Compressor** 07YME-HN4010A

Heat the gear case to 80°C (176°F) and freeze the pinion bearing on ice or in a freezer.

Drive the pinion bearing into the gear case using the special tools.

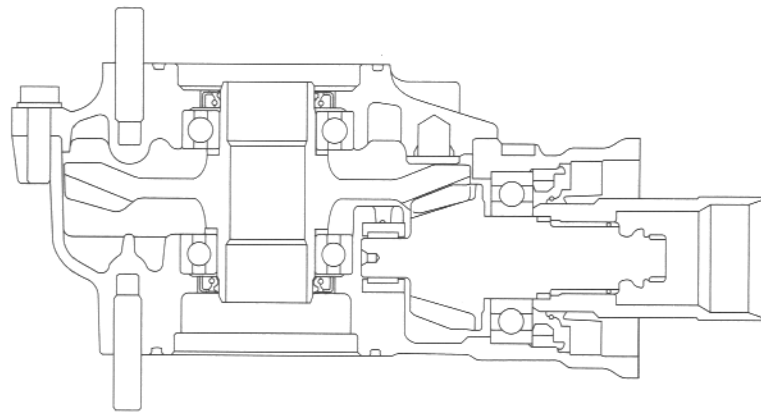
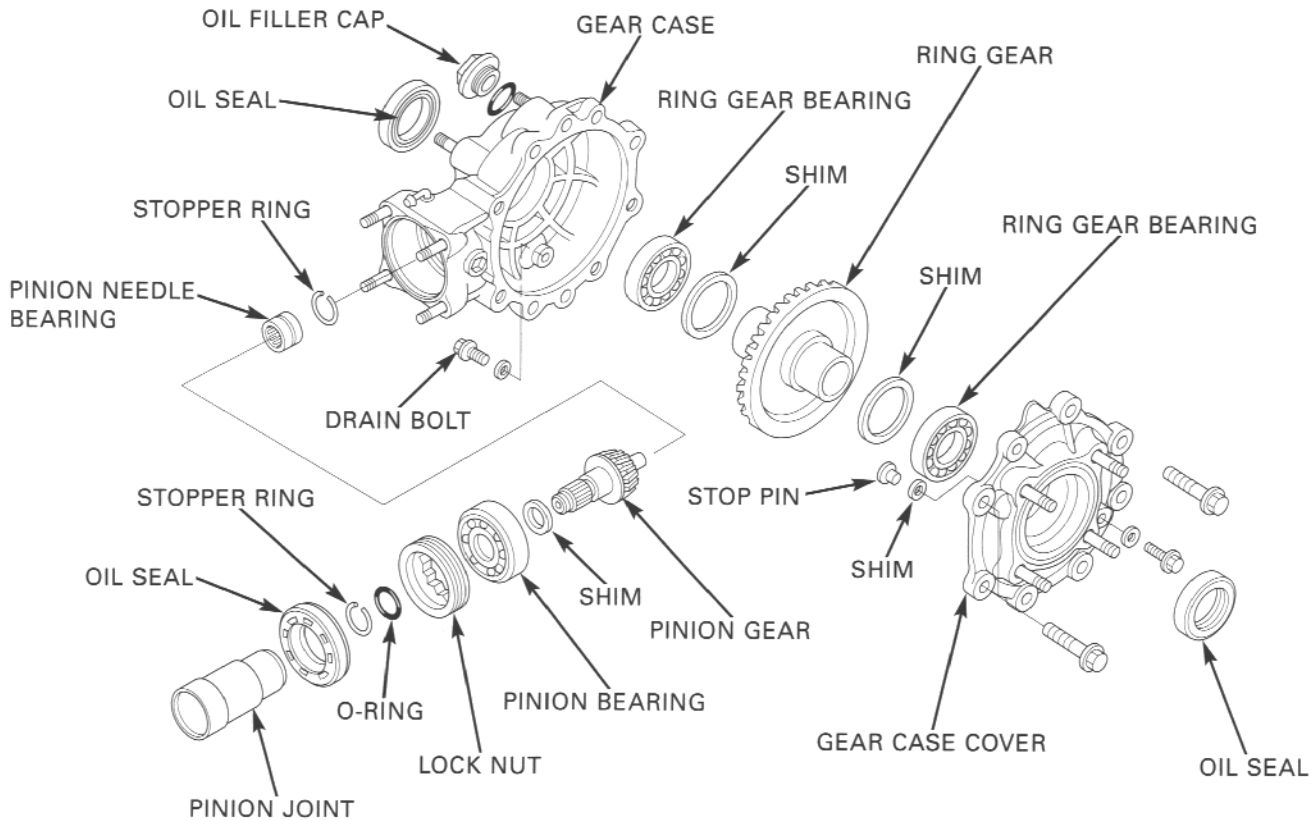
- TOOLS:**
- Driver** 07749-0010000
  - Attachment, 22 x 24 mm** 07746-0010800
  - Pilot, 14 mm** 07746-0041200

Make sure that the stopper ring is securely set in groove of gear case.



## REAR DRIVING MECHANISM

### FINAL DRIVE ASSEMBLY



#### PINION GEAR INSTALLATION

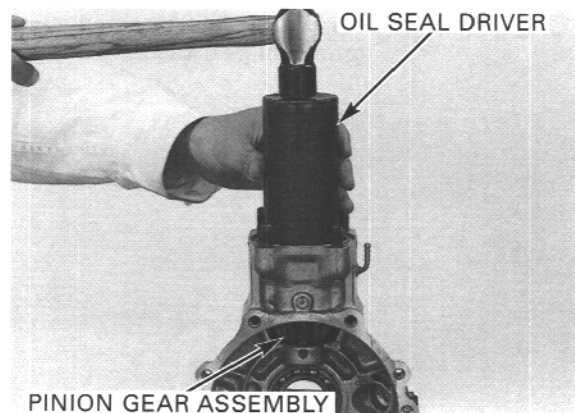
Drive the pinion gear assembly into the gear case using the special tool.

**TOOL:**

Oil seal driver      07965-KE80200 or  
07947-KA50100 (U.S.A. only)

**NOTE:**

- Keep the driver centered with the bearing outer race during installation.



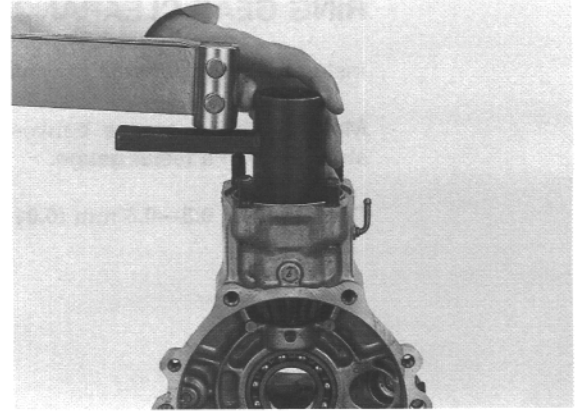


Install a new lock nut and tighten it using the special tool.

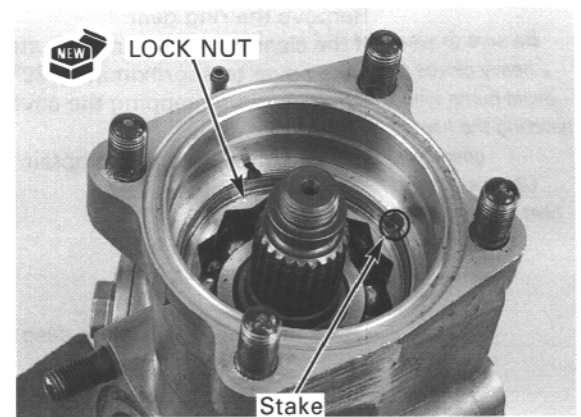
**TOOL:**  
Lock nut wrench, 30 x 64 mm 07916-MB00002

*Refer to torque wrench reading information on page 18-1 "Service Information."*

**TORQUE:** Actual: 98 N·m (10.0 kgf·m, 72 lbf·ft)  
Indicated: 89 N·m (9.1 kgf·m, 66 lbf·ft)



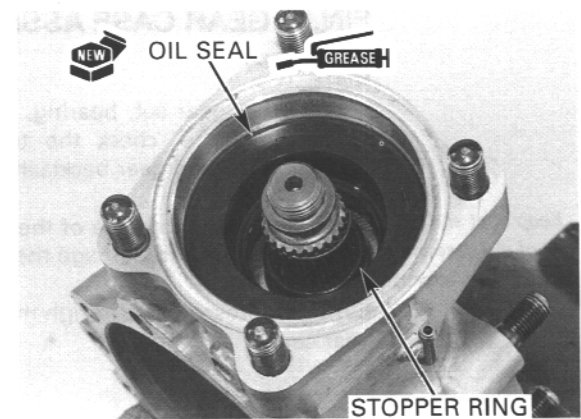
*Be careful not to damage the threads of the case.* Stake the lock nut into the case groove.



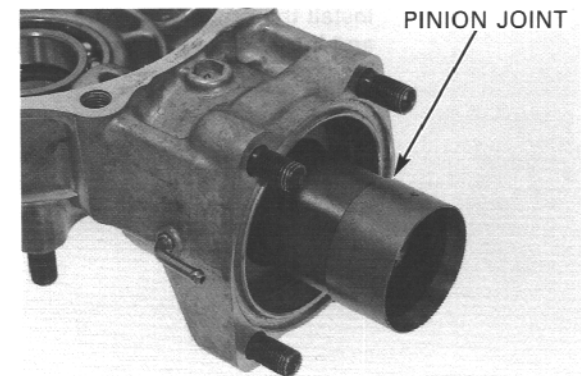
Apply grease to a new oil seal lips and install it into the gear case until it is fully seated, using the special tools.

**TOOLS:**  
Driver 07749-0010000  
Driver attachment 07LAD-PW50500

Make sure that the stopper ring is installed in the pinion gear shaft groove.



*Be careful not to damage the oil seal lip.* Install the pinion joint onto the pinion gear shaft by pushing it in until the stopper ring seats in the groove in the joint.



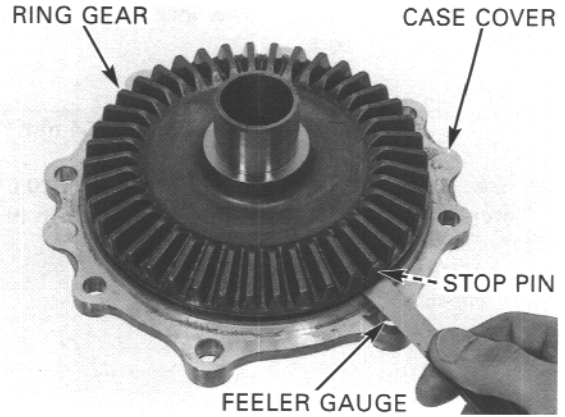
## REAR DRIVING MECHANISM

### RING GEAR CLEARANCE INSPECTION

Install the ring gear with the shim into the case cover.

Measure the clearance between the ring gear and stop pin with a feeler gauge.

**CLEARANCE: 0.3—0.6 mm (0.01—0.02 in)**



Remove the ring gear.

If the clearance is without the standard value, heat the case cover to approximately 80°C (176°F) and remove the stop pin by tapping the cover.

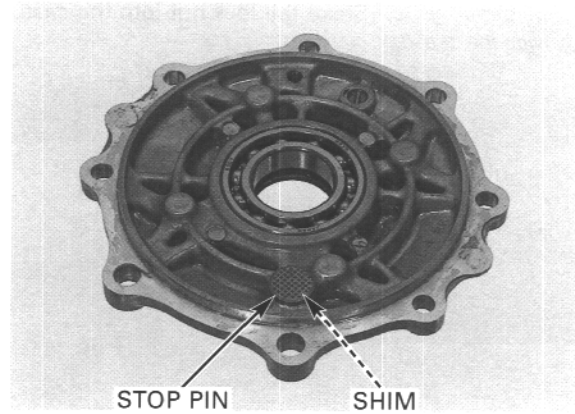
Install a stop pin shim to obtain the correct clearance.

**Stop pin shims:**

**A: 0.10 mm (0.004 in)**

**B: 0.15 mm (0.006 in)**

Drive the stop pin into the case cover.



### FINAL GEAR CASE ASSEMBLY

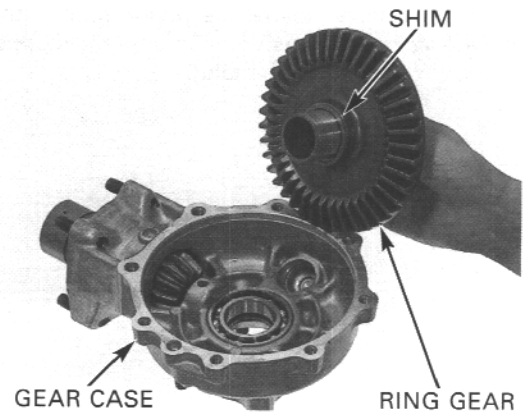
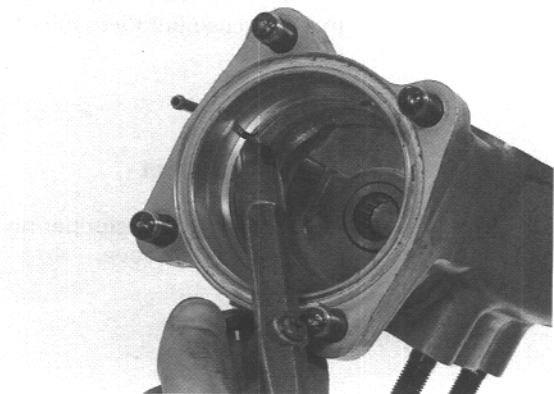
NOTE:

- When the gear set, bearing, and/or gear case has been replaced, check the tooth contact pattern (page 18-8) and gear backlash (page 18-6).

Clean the mating surface of the gear case and cover, being careful not to damage them.

Blow compressed air through the breather hole in the gear case.

Install the proper ring gear shims onto the ring gear and install them into the gear case.

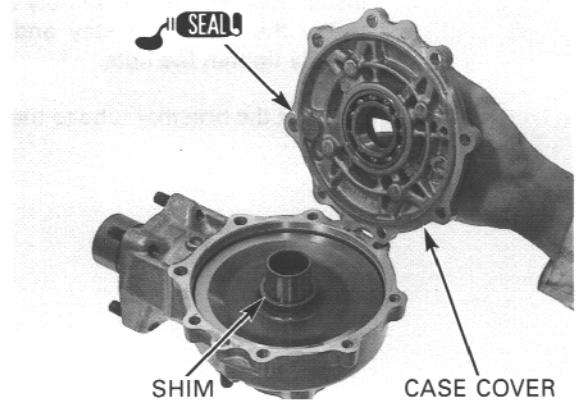


*Be sure to wear heavy gloves to avoid burns when handling the heated gear case. Using a torch to heat the gear case may cause warpage.*

*Keep dust and dirt out of the case and cover.*

## REAR DRIVING MECHANISM

Apply liquid sealant to the mating surface of the case cover.  
Install the cover onto the gear case.



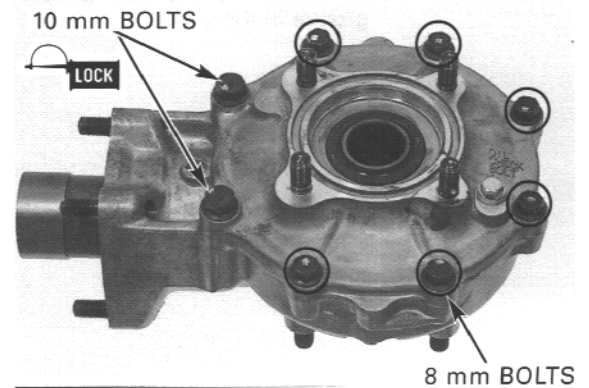
Apply locking agent to the threads of the two 10 mm bolts.

*It is important to turn the pinion while tightening the bolts. If the ring gear shim is too thick, the gears will lock after only light tightening.*

Install the case cover and tighten the bolts in several steps until the cover evenly touches the gear case. Then, while rotating the pinion gear, tighten the bolts to the specified torque in a crisscross pattern in several steps.

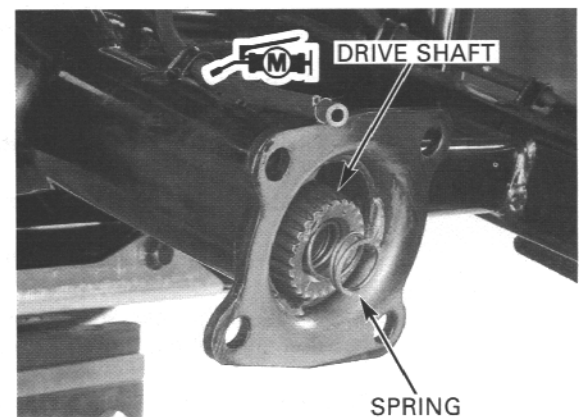
**TORQUE: 10 mm bolt: 49 N·m (5.0 kgf·m, 36 lbf·ft)**  
**8 mm bolt: 25 N·m (2.6 kgf·m, 19 lbf·ft)**

Check that the gear assembly turns smoothly without binding.



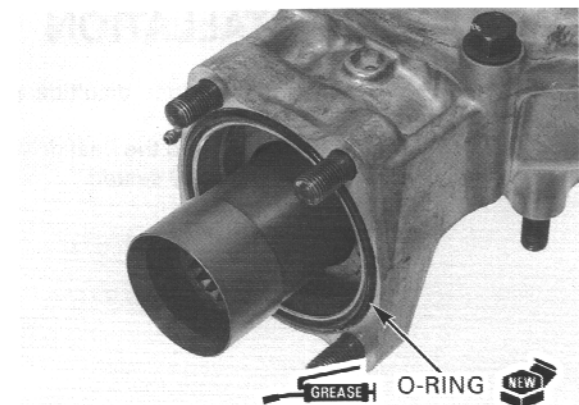
## FINAL DRIVE INSTALLATION

Apply 5—8 g of molybdenum disulfide grease to the drive shaft splines.  
Insert the drive shaft into the swingarm, while aligning the splines of the drive shaft and universal joint.  
Install the spring into the drive shaft.



Clean the mating surfaces of the gear case.

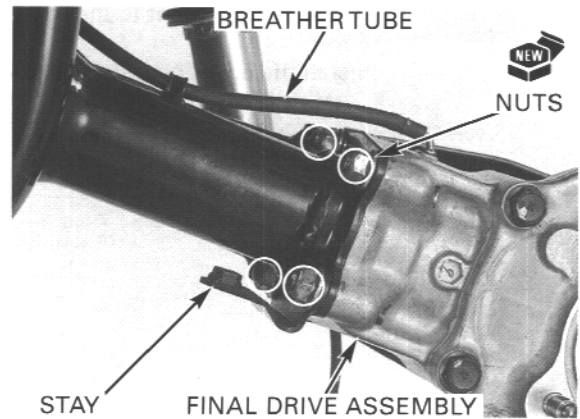
Coat a new O-ring with grease and install it into the groove in the gear case.



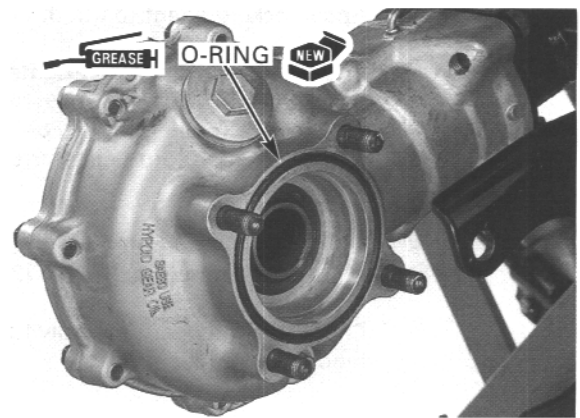
## REAR DRIVING MECHANISM

Install the final drive assembly onto the swingarm. Install the skid plate stay and four new nuts, and loosely tighten the nuts.

Connect the breather tube to the tube joint of the gear case.



Coat a new O-ring with grease and install it into the groove in the gear case.



Install the right axle housing onto the gear case and swingarm with the four bolts and eight new nuts.

Tighten the four final drive assembly mounting nuts

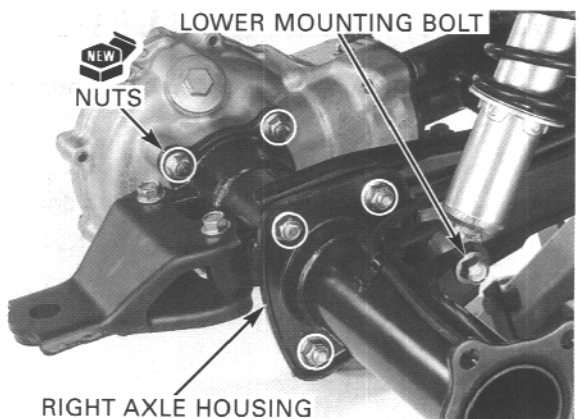
**TORQUE: 54 N·m (5.5 kgf·m, 40 lbf·ft)**

Tighten the eight axle housing mounting nuts.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Install the right rear shock absorber into the axle housing and tighten the lower mounting bolt.

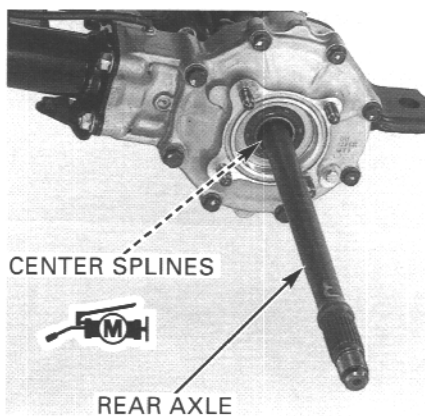
**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**



## REAR AXLE INSTALLATION

Apply molybdenum disulfide grease to the center splines of the axle.

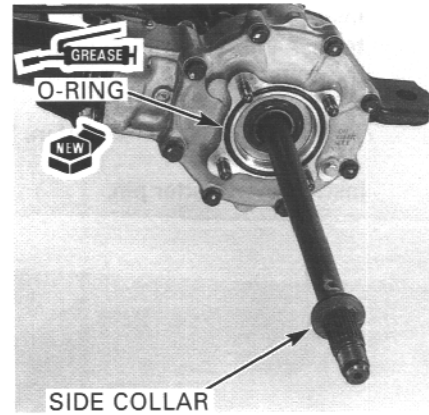
Install the axle into the final drive gear case from right side until it is fully seated.



## REAR DRIVING MECHANISM

Coat a new O-ring with grease and install it into the groove in the gear case.

Install the side collar onto the rear axle with the tapered side facing inward.

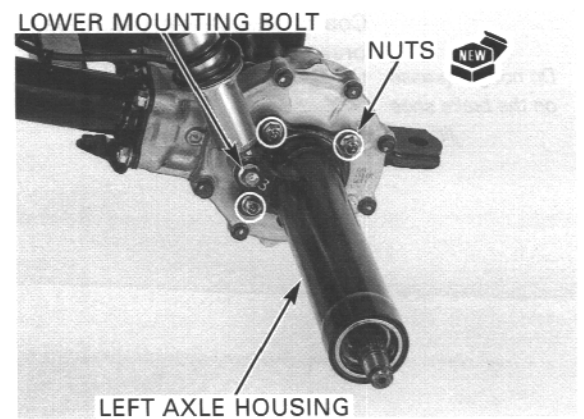


Install the left axle housing with four new nuts, and tighten the nuts.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

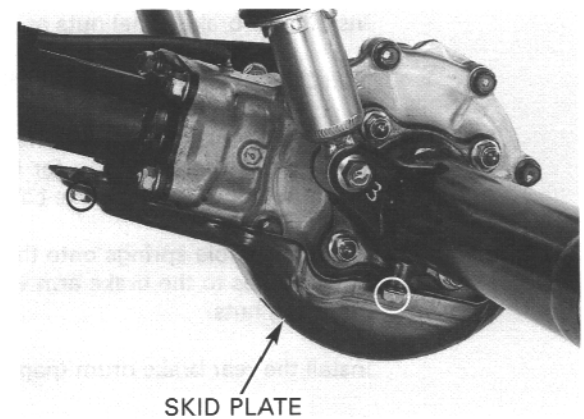
Install the left rear shock absorber into the axle housing and tighten the lower mounting bolt.

**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**



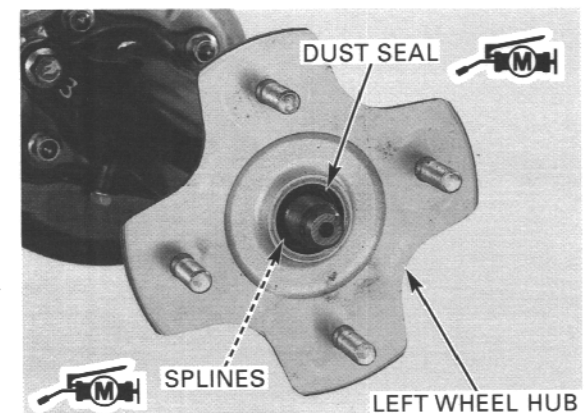
Install the skid plate and tighten the three bolts.

**TORQUE: 32 N·m (3.3 kgf·m, 24 lbf·ft)**



Apply molybdenum disulfide grease to a new hub dust seal lip and install it into the left wheel hub until it is fully seated.

Apply molybdenum disulfide grease to the left spline of the axle and install the wheel hub.

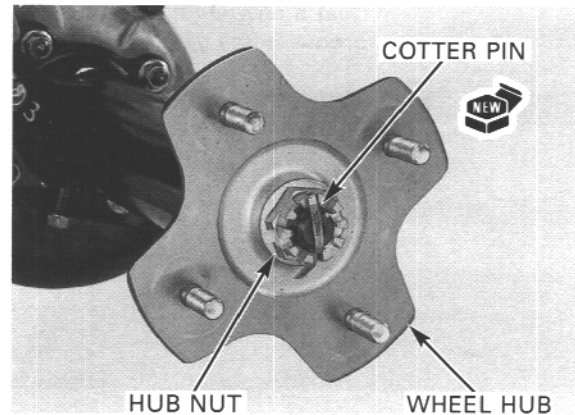


## REAR DRIVING MECHANISM

Install the hub nut and tighten it to the specified torque and further tighten until its grooves align with the cotter pin hole.

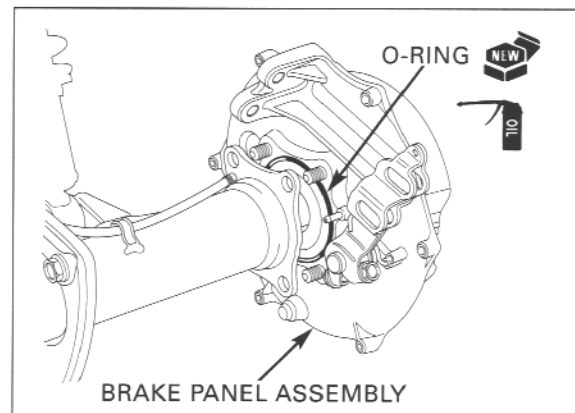
**TORQUE: 137 N·m (14.0 kgf·m, 101 lbf·ft)**

Install a new cotter pin.



Coat a new O-ring with grease and install it into the brake panel groove.  
Install the brake panel assembly onto the axle.

*Do not get grease on the brake shoe linings.*



Install new brake panel nuts and tighten them.

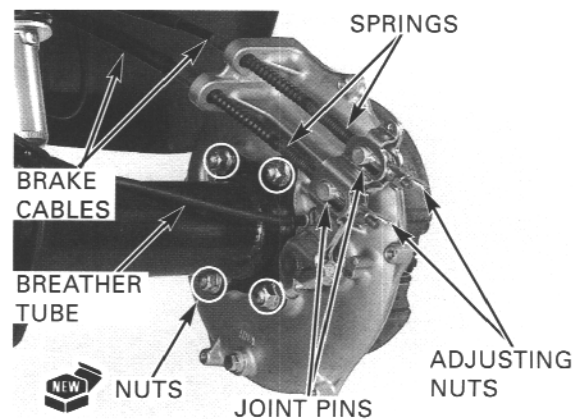
**TORQUE: 44 N·m (4.5 kgf·m, 33 lbf·ft)**

Install the brake cables into the cable holders on the brake panel (upper holder for lever brake cable and lower holder for pedal brake cable).

Install the cable springs onto the cables. Connect the brake cables to the brake arm with the joint pins and adjusting nuts.

Install the rear brake drum (page 16-18).

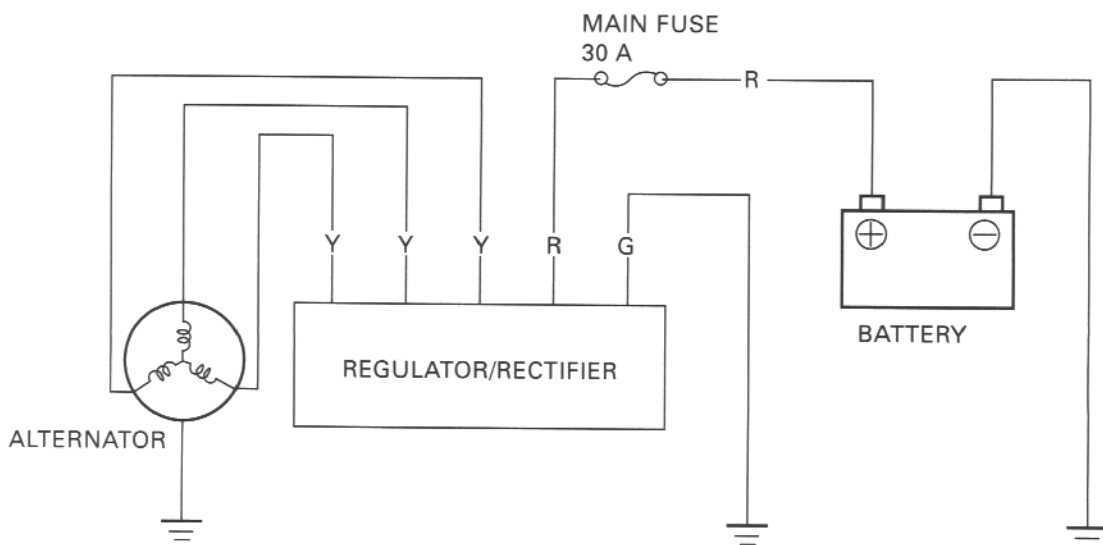
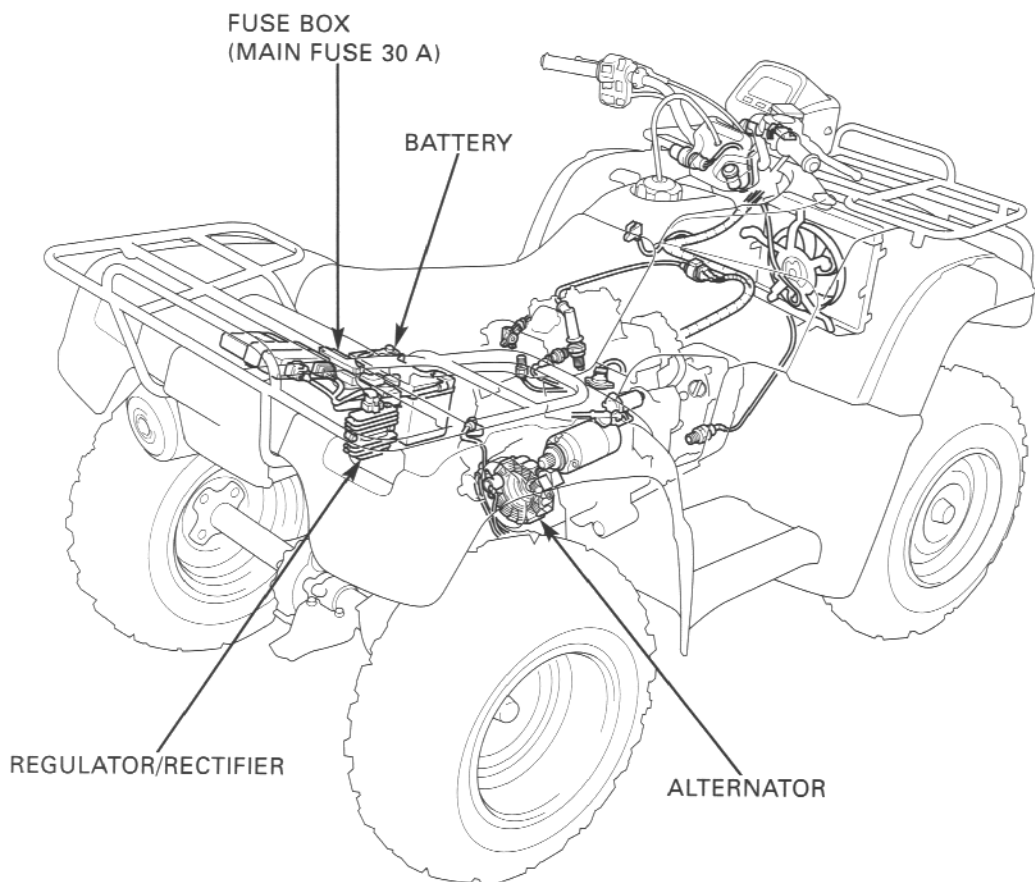
Fill the gear case with the recommended oil (page 3-14).



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**MEMO**

# BATTERY/CHARGING SYSTEM



G: Green  
R: Red  
Y: Yellow



# 19. BATTERY/CHARGING SYSTEM

SERVICE INFORMATION	19-1	CHARGING SYSTEM INSPECTION	19-5
TROUBLESHOOTING	19-3	REGULATOR/RECTIFIER	19-6
BATTERY	19-4	ALTERNATOR CHARGING COIL	19-6

## SERVICE INFORMATION

### GENERAL

#### WARNING

- The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging.
- The battery contains sulfuric acid (electrolyte). Contact with skin or eyes may cause severe burns. Wear protective clothing and a face shield.
  - If electrolyte gets on your skin, flush with water.
  - If electrolyte gets in your eyes, flush with water for at least 15 minutes and call a physician immediately.
- Electrolyte is poisonous.
  - If swallowed, drink large quantities of water or milk and call your local Poison Control Center or a physician immediately.

- Always turn off the ignition switch before disconnecting any electrical component.
- Some electrical components may be damaged if terminals or connectors are connected or disconnected while the ignition switch is ON and current is present.
- For extended storage, remove the battery, give it a full charge, and store it in a cool, dry place.
- For a battery remaining in a stored vehicle, disconnect the negative battery cable from the battery.
- The battery caps should not be removed. Attempting to remove the sealing caps from the cells may damage the battery.
- The maintenance free battery must be replaced when it reaches the end of its service life.
- The battery can be damaged if overcharged or undercharged, or if left to discharge for long period. These same conditions contribute to shortening the "life span" of the battery. Even under normal use, the performance of the battery deteriorates after 2—3 years.
- Battery voltage may recover after battery charging, but under heavy load, the battery voltage will drop quickly and eventually die out. For this reason, the charging system is often suspected as the problem. Battery overcharge often results from problems in the battery itself, which may appear to be an overcharging symptom. If one of the battery cells is shorted and battery voltage does not increase, the regulator/rectifier supplies excess voltage to the battery. Under these conditions, the electrolyte level goes down quickly.
- Before troubleshooting the charging system, check for proper use and maintenance of the battery. Check if the battery is frequently under heavy load, such as having the headlight and taillight ON for long periods of time without riding the vehicle.
- The battery will self-discharge when the vehicle is not in use. For this reason, charge the battery every two weeks to prevent sulfation from occurring.
- Filling a new battery with electrolyte will produce some voltage, but in order to achieve its maximum performance, always charge the battery. Also, the battery life is lengthened when it is initially charged.
- When checking the charging system, always follow the steps in the troubleshooting flow chart (page 16-3).
- For alternator servicing, refer to section 11.

19

#### BATTERY CHARGING

- This model comes with a maintenance free (MF) battery. Remember the following about MF batteries.
  - Use only the electrolyte that comes with the battery
  - Use all of the electrolyte
  - Seal the battery properly
  - Never open the seals again
- For battery charging, do not exceed the charging current and time specified on the battery. Using excessive current or extending the charging time may damage the battery.

## BATTERY/CHARGING SYSTEM

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### BATTERY TESTING

Refer to the instructions in the Operation Manual for the recommended battery tester for details about the battery testing. The recommended battery tester puts a "load" on the battery so that the actual battery condition of the load can be measured.

Recommended battery tester

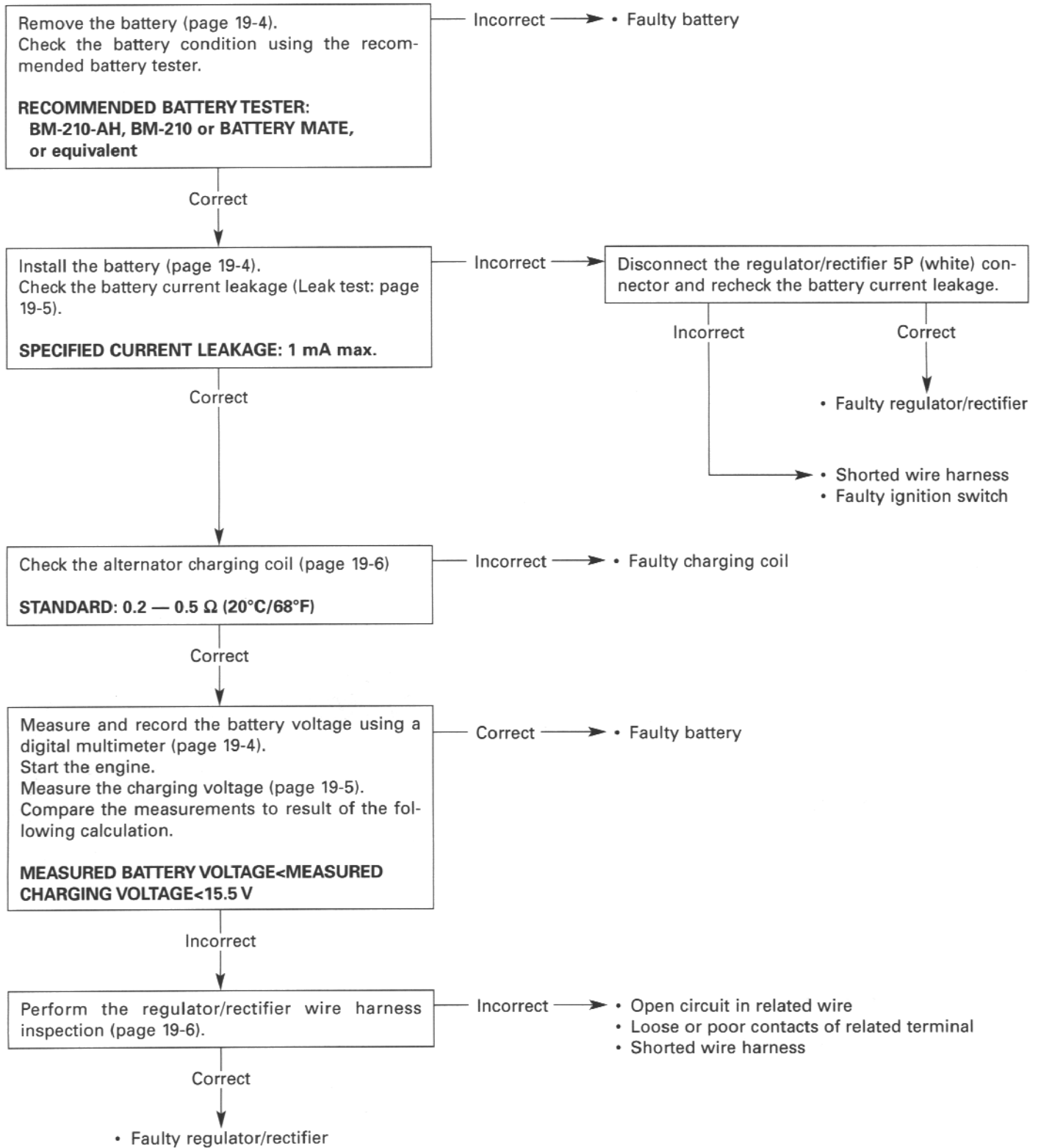
BM-210-AH, BM-210

### SPECIFICATIONS

ITEM		SPECIFICATIONS	
Battery	Capacity	12 V – 12 Ah	
	Current leakage	1 mA max.	
	Voltage (20°C/68°F)	Fully charged	13.0—13.2 V
		Needs charging	Below 12.3 V
	Charging current	Normal	1.4 A x 5—10 h
Quick		6.0 A x 1.0 h	
Alternator	Capacity	330 W/5,000 rpm	
	Charging coil resistance (20°C/68°F)	0.1— 1.0 Ω	

# TROUBLESHOOTING

## Battery is damaged or weak



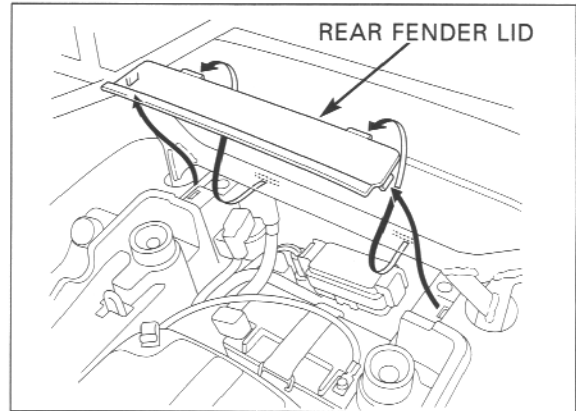
## BATTERY/CHARGING SYSTEM

### BATTERY

Remove the seat (page 2-3).

#### REMOVAL/INSTALLATION

Remove the rear fender lid.



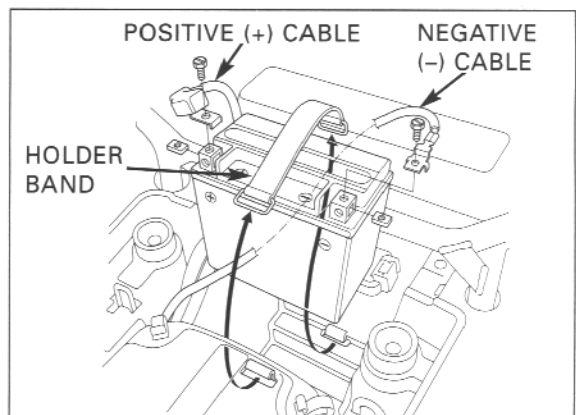
Remove the battery holder band.

With the ignition switch OFF, disconnect the negative (-) cable first, then disconnect the positive (+) cable. Remove the battery.

Install the battery in the reverse order of removal.

#### NOTE:

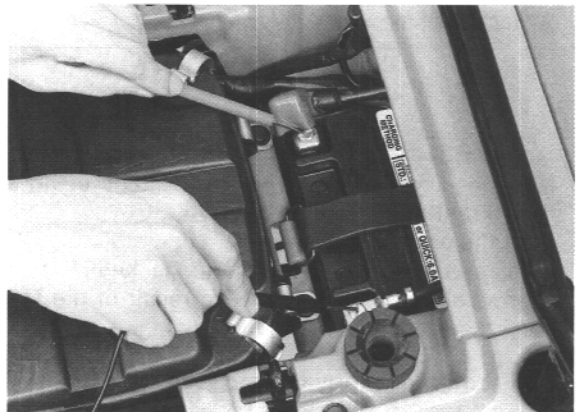
- Connect the positive (+) cable first, then connect the negative (-) cable.
- After connecting the battery cables, coat the terminals with grease.



#### VOLTAGE INSPECTION

Measure the battery voltage using a commercially available digital multimeter.

**VOLTAGE (20°C/68°F): Fully charged: 13.0—13.2 V**  
**Under charged: Below 12.3 V**



#### BATTERY CHARGING

Remove the battery.

*Turn the power ON/OFF at the charger, not at the battery terminals.*

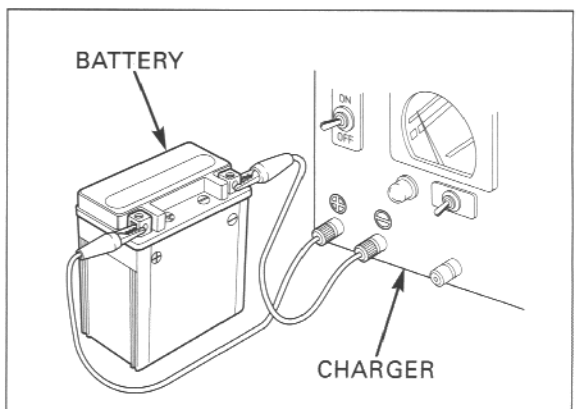
Connect the charger positive (+) cable to the battery positive (+) terminal.  
Connect the charger negative (-) cable to the battery negative (-) terminal.

#### CHARGING CURRENT/TIME:

**Standard: 1.4 A/5—10 h**  
**Quick: 6.0 A/1.0 h**

#### NOTE:

- Quick charging should only be done in an emergency; slow charging is preferred.
- For battery charging, do not exceed the charging current and time specified on the battery. Using excessive current or extending the charging time may damage the battery.



## CHARGING SYSTEM INSPECTION

Remove the seat (page 2-3).

### CURRENT LEAKAGE TEST

Turn the ignition switch OFF, and disconnect the negative (-) cable from the battery.

Connect the ammeter (+) probe to the negative (-) cable and the ammeter (-) probe to the battery (-) terminal.

With the ignition switch OFF, check for current leakage.

#### NOTE:

- When measuring current using a tester, set it to a high range, and then bring the range down to an appropriate level. Current flow higher than the range selected may blow out the fuse in the tester.
- While measuring current, do not turn the ignition switch ON. A sudden surge of current may blow out the fuse in the tester.

#### SPECIFIED CURRENT LEAKAGE: 1 mA maximum

If current leakage exceeds the specified value, a shorted circuit is likely.

Locate the short by disconnecting connections one by one and measuring the current.

### CHARGING VOLTAGE INSPECTION

#### NOTE:

- Be sure that the battery is in good condition before performing this test.

*Do not disconnect the battery or any cable in the charging system without first switching off the ignition switch.*

*Failure to follow this precaution can damage the tester or electrical components.*

Start the engine and warm it up to the operating temperature; stop the engine.

Connect the multimeter between the positive and negative terminals of the battery.

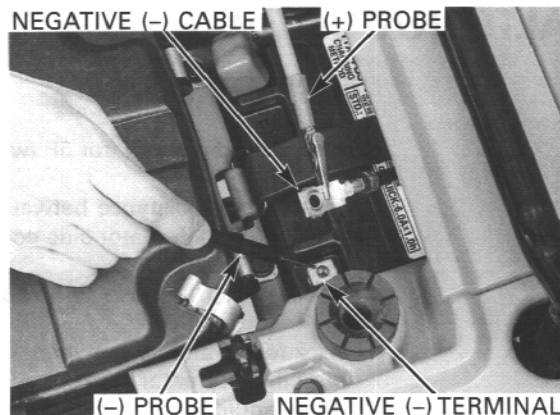
#### NOTE:

- To prevent a short, make absolutely certain which are the positive and negative terminals or cable.

With the headlight on high beam, restart the engine. Measure the voltage on the multimeter when the engine runs at 5,000 rpm.

#### STANDARD:

**Measured battery voltage (page 17-4) < Measured charging voltage (see above) < 15.5 V**



## BATTERY/CHARGING SYSTEM

### ALTERNATOR CHARGING COIL

#### INSPECTION

Disconnect the alternator 5P (white) connector.

Measure the resistance between the Yellow wire terminals of the alternator side connector.

**STANDARD: 0.1—1.0  $\Omega$  (20°C/68°F)**

Check for continuity between each Yellow wire terminal of the alternator side connector and ground. There should be no continuity.

Replace the alternator stator if resistance is out of specification, or if any wire has continuity to ground.

Refer to section 11 for alternator stator replacement.



### REGULATOR/RECTIFIER

#### WIRE HARNESS INSPECTION

Disconnect the regulator/rectifier 5P (black) connector. Check the connector for loose contacts or corroded terminals.

#### BATTERY LINE

Measure the voltage between the Red wire terminal and ground. There should be battery voltage at all times.

#### GROUND LINE

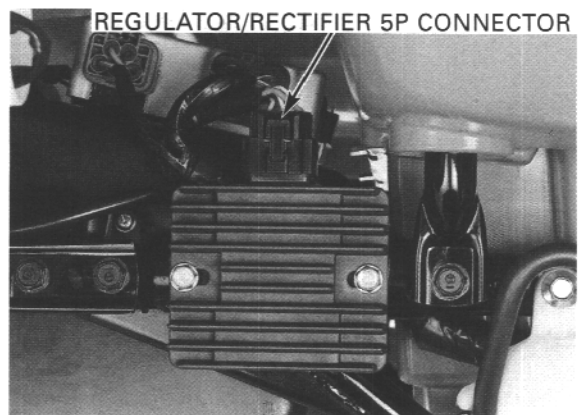
Check the continuity between the Green wire terminal and ground. There should be continuity at all times.

#### CHARGING COIL LINE

Measure the resistance between the Yellow wire terminals.

**STANDARD: 0.1—1.0  $\Omega$  (20°C/68°F)**

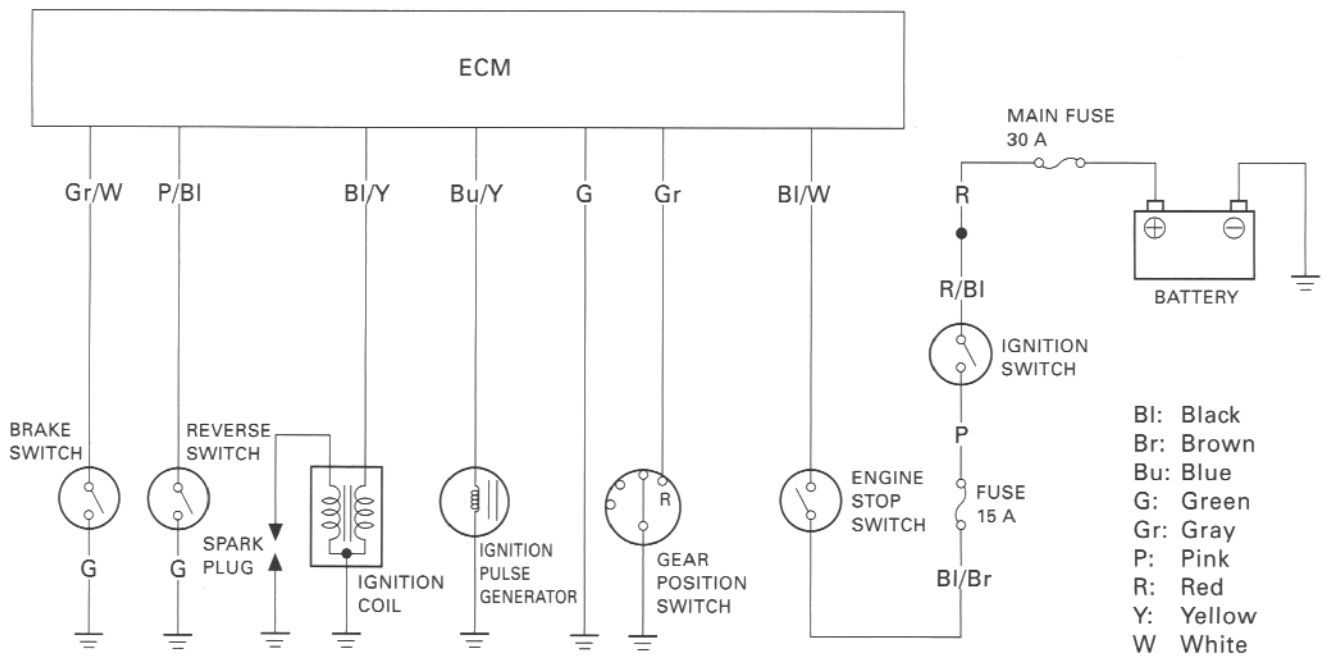
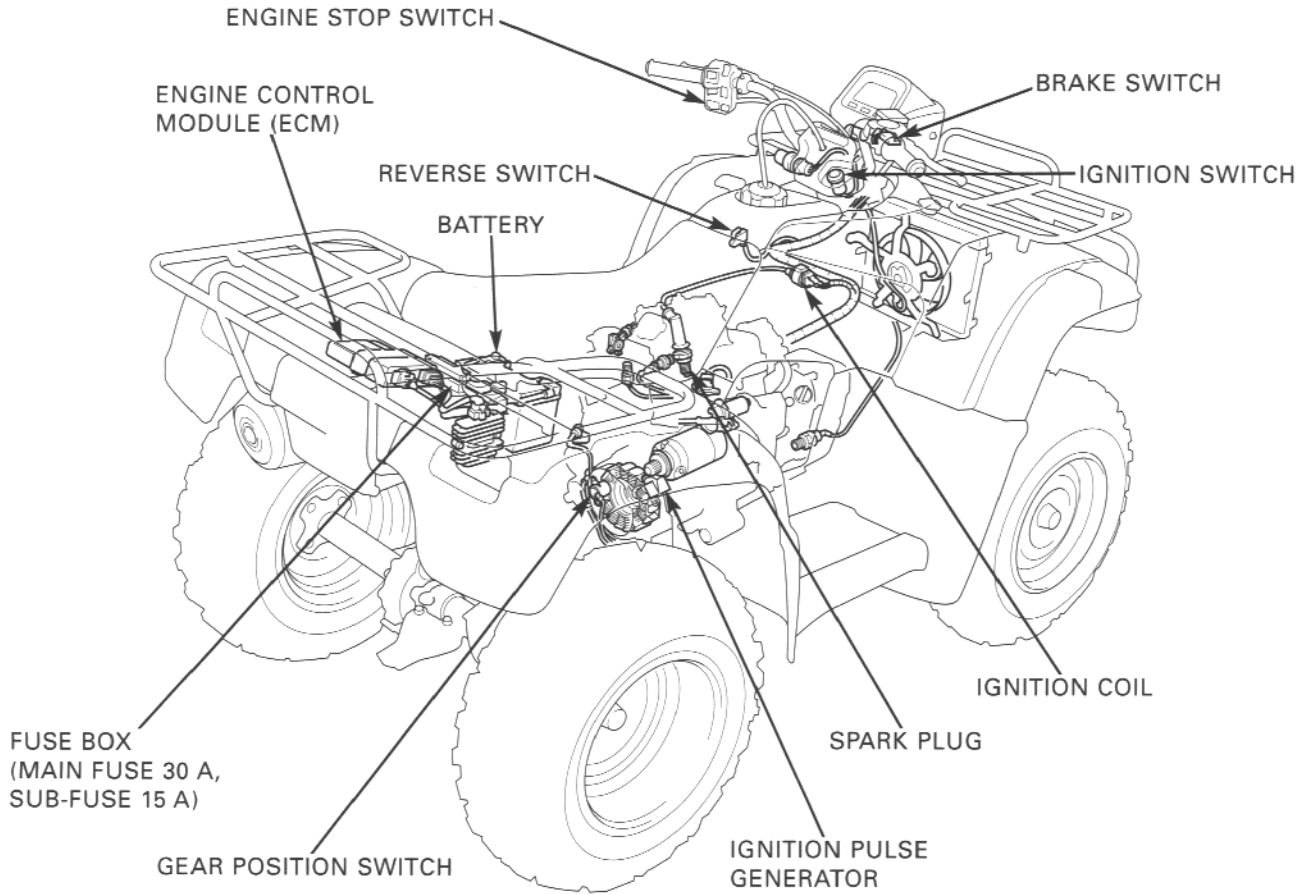
Check for continuity between each Yellow wire terminal and ground. There should be no continuity.



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**MEMO**

# IGNITION SYSTEM





# 20. IGNITION SYSTEM

SERVICE INFORMATION	20-1	IGNITION COIL	20-4
TROUBLESHOOTING	20-2	IGNITION TIMING	20-5
IGNITION SYSTEM INSPECTION	20-3		

## SERVICE INFORMATION

### GENERAL

- Some electrical components may be damaged if terminals or connectors are connected or disconnected while the ignition switch is ON and current is present.
- When servicing the ignition system, always follow the steps in the troubleshooting on page 20-2.
- This vehicle's Ignition Control Module (ICM) is built in the Engine Control Module (ECM).
- The ignition timing cannot be adjusted since the ECM is factory preset.
- The ECM may be damaged if dropped. Also, if the connector is disconnected when current is flowing, the excessive voltage may damage the ECM. Always turn off the ignition switch before servicing.
- A faulty ignition system is often related to poor connections. Check those connections before proceeding.
- Make sure the battery is adequately charged. Using the starter motor with a weak battery results in a slower engine cranking speed as well as no spark at the spark plug.
- This vehicle's spark plug is equipped with iridium type electrode. Do not use any spark plug other than specified.
- See section 11 for ignition pulse generator removal/installation.
- See section 22 for following components:
  - ignition switch
  - engine stop switch
  - reverse switch
- See section 23 for gear position switch information.

### SPECIFICATIONS

ITEM		SPECIFICATIONS
Spark plug	Standard	IJR7A9 (NGK), VX22BC (DENSO)
	For cold climate (below 5°C/41°F)	IJR6A9 (NGK), VX20BC (DENSO)
Spark plug gap		0.8—0.9 mm (0.03—0.04 in)
Ignition coil primary peak voltage		100 V minimum
Ignition pulse generator peak voltage		0.7 V minimum
Ignition timing ("F" mark)		15° BTDC at idle

### TORQUE

Timing hole cap 10 N·m (1.0 kgf·m, 7 lbf·ft)

### TOOL

Peak voltage tester (U.S.A. only) or  
Peak voltage adaptor

07HGJ-0020100 (not available in U.S.A.) with commercially available digital multimeter (impedance 10 MΩ/DCV minimum)

## IGNITION SYSTEM

### TROUBLESHOOTING

- Inspect the following before diagnosing the system:
  - Faulty spark plug
  - Loose spark plug cap or spark plug wire connections
  - Water got into the spark plug cap (Leaking the ignition coil secondary voltage)
- If the engine speed will not rise above 2,200 rpm with the gearshift lever in “R” position, inspect the following:
  - Gearshift lever linkage adjustment (page 12-14)
  - Reverse switch (page 22-13)
  - Gear position switch (page 23-25)
- If the engine speed will not rise above 1,750 rpm with the front brake lever released and the gearshift lever in “D” or “L” position, inspect the brake switch (page 22-13) and its installation condition.

#### No spark at spark plug

UNUSUAL CONDITION		PROBABLE CAUSE (Check in numerical order)
Ignition coil primary voltage	Low peak voltage	<ol style="list-style-type: none"> <li>1. Incorrect peak voltage adaptor connections. (System is normal if measured voltage is over the specifications with reverse connections.)</li> <li>2. The multimeter impedance is too low; below 10MΩ/DCV.</li> <li>3. Cranking speed is too low. (Battery is undercharged.)</li> <li>4. The sampling timing of the tester and measured pulse were not synchronized. (System is normal if measured voltage is over the standard voltage at least once.)</li> <li>5. Poorly connected connectors or an open circuit in ignition system.</li> <li>6. Faulty ignition coil.</li> <li>7. Faulty engine control module (ECM). (when above No. 1 through 6 are normal.)</li> </ol>
	No peak voltage	<ol style="list-style-type: none"> <li>1. Incorrect peak voltage adaptor connections. (System is normal if measured voltage is over the specifications with reverse connections.)</li> <li>2. Battery is undercharged. (Voltage drops largely when the engine is started.)</li> <li>3. Faulty ignition switch or engine stop switch.</li> <li>4. Loose or poorly connected ECM.</li> <li>5. No voltage at the black/white wire of the ECM.</li> <li>6. Open circuit or poor connection in ground (green) wire of the ECM.</li> <li>7. Faulty peak voltage adaptor.</li> <li>8. Faulty ignition pulse generator. (Measure peak voltage.)</li> <li>9. Faulty ECM. (when above No.1 through 8 are normal.)</li> </ol>
	Peak voltage is normal, but no spark jumps at plug	<ol style="list-style-type: none"> <li>1. Faulty spark plug or leaking ignition coil secondary current ampere.</li> <li>2. Faulty ignition coil.</li> </ol>
Ignition pulse generator	Low peak voltage	<ol style="list-style-type: none"> <li>1. The multimeter impedance is too low; 10MΩ/DCV.</li> <li>2. Cranking speed is too slow. (Battery is undercharged.)</li> <li>3. The sampling timing of the tester and measured pulse were not synchronized. (System is normal if measured voltage is over the standard voltage at least once.)</li> <li>4. Faulty ignition pulse generator. (when above No. 1 thru 3 are normal).</li> </ol>
	No peak voltage	<ol style="list-style-type: none"> <li>1. Faulty peak voltage adaptor.</li> <li>2. Faulty ignition pulse generator.</li> </ol>

## IGNITION SYSTEM INSPECTION

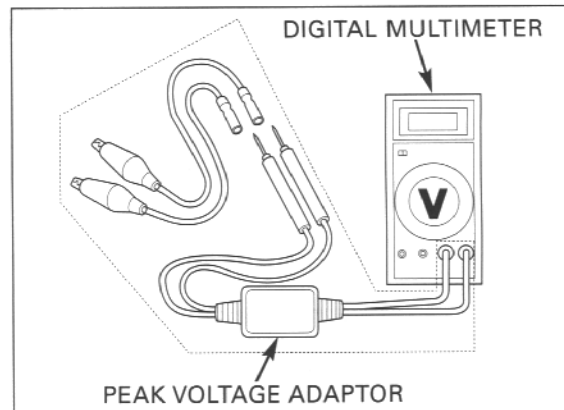
**NOTE:**

- If not spark jumps at the plug, check all connections for loose or poor contact before measuring each peak voltage.
- Use recommended digital multimeter or a commercially available digital multimeter (impedance 10 MΩ/DCV minimum).
- The display value differs depending upon the internal impedance of the multimeter.

Connect the peak voltage adaptor to the digital multimeter, or use the peak voltage tester.

**TOOLS:**

**Peak voltage tester (U.S.A. only) or  
Peak voltage adaptor 07HGJ-0020100  
(not available in U.S.A.)  
with commercially available digital multimeter  
(impedance 10 MΩ/DCV minimum)**



### IGNITION PRIMARY PEAK VOLTAGE

**NOTE:**

- Check all system connections before this inspection. Poor connected connectors can cause incorrect readings.
- Check the cylinder compression and check that the spark plug is installed correctly in the cylinder.

Remove the fuel tank (page 5-17).

Disconnect the spark plug cap from the spark plug. Connect known good spark plug to the spark plug cap and ground the spark plug to the cylinder head as done in a spark test.

With the connector connected, connect the peak voltage tester or adaptor probes to the ignition coil primary terminal and body ground.

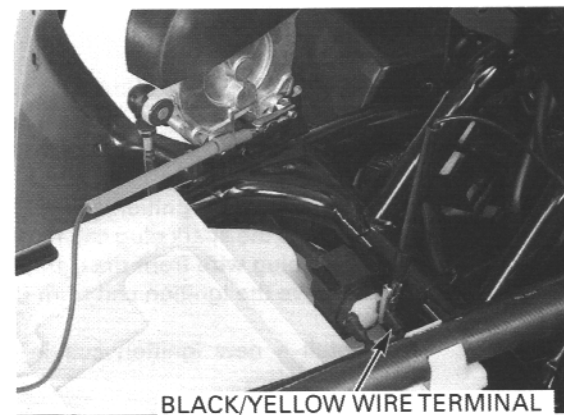
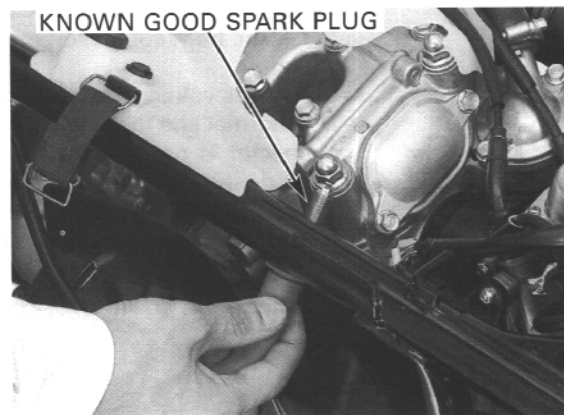
**CONNECTION: Black/yellow (-) — Body ground (+)**

Turn the ignition switch ON. Crank the engine with the starter motor and read the ignition coil primary voltage.

**PEAK VOLTAGE: 100 V minimum**

If the peak voltage is lower than the standard value, follow the checks described in the troubleshooting on page 20-2.

*To avoid electric shock, do not touch the spark plug or tester probes during this procedure.*



## IGNITION SYSTEM

### IGNITION PULSE GENERATOR PEAK VOLTAGE

**NOTE:**

- Check that the cylinder compression is normal and the spark plug is installed correctly in the cylinder head.

Disconnect the engine control module (ECM) 34P connector.

Connect the peak voltage tester or adaptor probes to the Blue/yellow wire terminal of the wire harness side connector and ground.

**CONNECTION: Blue/yellow (+) — Ground (-)**

Turn the ignition switch ON.

Crank the engine with the starter motor and read the peak voltage.

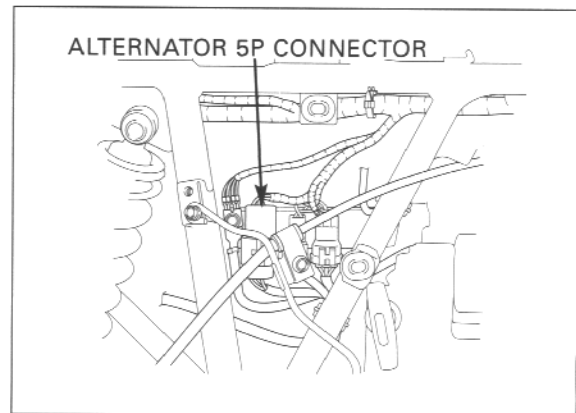
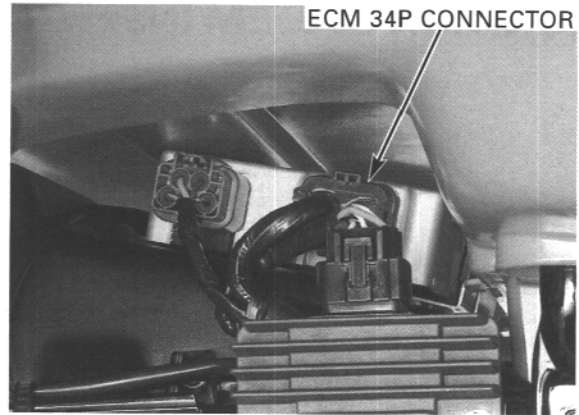
**PEAK VOLTAGE: 0.7 V minimum**

If the voltage measured at ECM connector is abnormal, measure the peak voltage at the alternator connector.

Disconnect the alternator 5P (white) connector and connect the peak voltage tester or adaptor probes to the Blue/yellow wire terminal of the alternator side connector and ground.

In the same manner as at the ICM connector, measure the peak voltage and compare it to the voltage measured at the ECM connector.

- If the peak voltage measured at the ECM connector is abnormal and the one measured at the alternator connector is normal, the Blue/yellow wire has an open or short circuit, or loose connections.
- If both peak voltages are abnormal, follow the checks described in the troubleshooting on page 20-2.  
See section 11 for ignition pulse generator replacement.



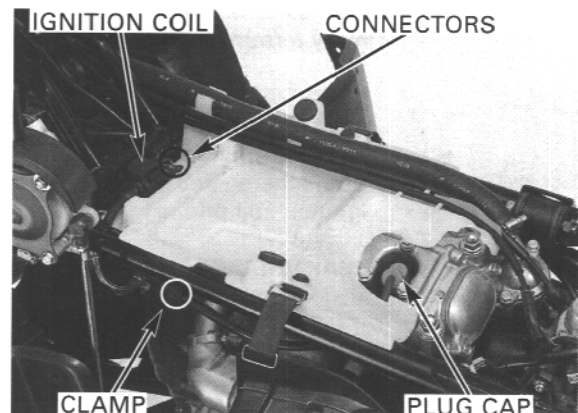
## IGNITION COIL

### REPLACEMENT

Remove the fuel tank (page 5-17).

Disconnect the ignition coil primary wire connectors. Remove the spark plug cap from the plug and free the spark plug wire from the clamp. Remove the ignition coil from the frame.

Install a new ignition coil in the reverse order of removal.



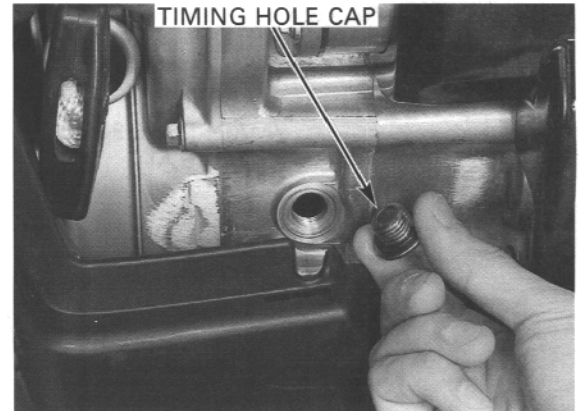
## IGNITION TIMING

Remove the recoil starter cover (page 2-3).

Start the engine and warm it up to operating temperature.

Stop the engine and remove the timing hole cap from the rear crankcase cover.

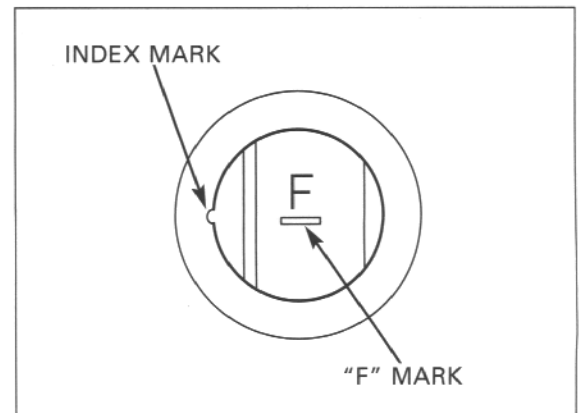
Connect the timing light and tachometer.



Start the engine, let it idle (1,400 rpm) and check the ignition timing.

The ignition timing is correct if the "F" mark on the flywheel aligns with the index mark on the rear crankcase cover at idle.

Increase the engine speed and make sure the "F" mark begins to move.

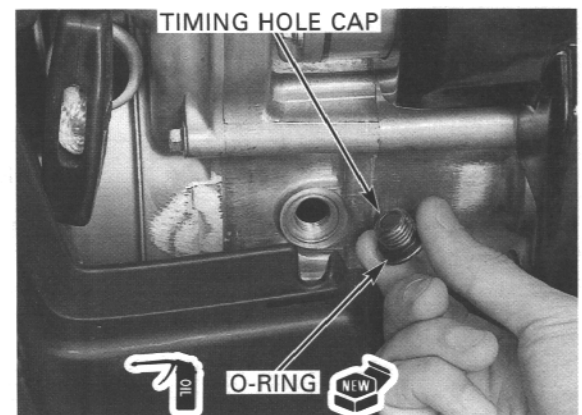


Coat a new O-ring with oil and install it onto the timing hole cap.

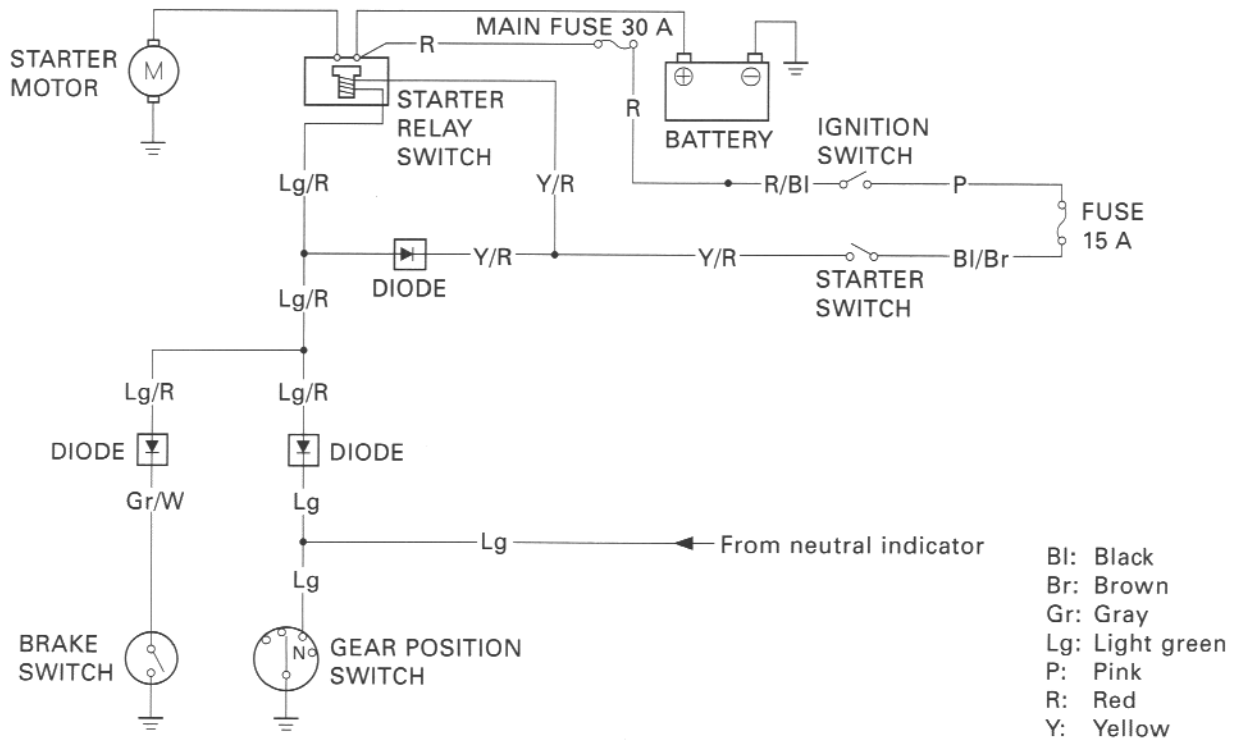
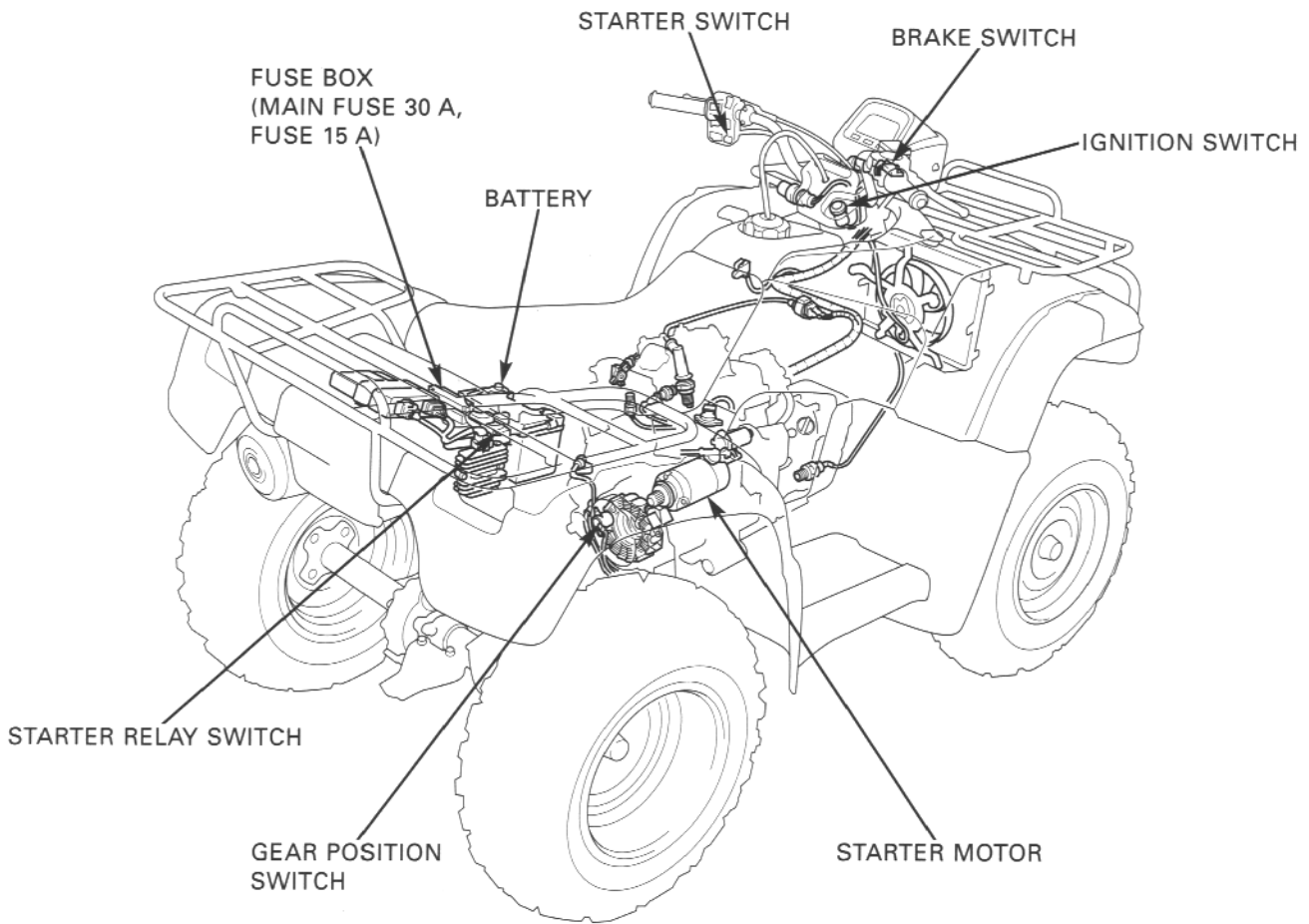
Install the timing hole cap and tighten it.

**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

Install the recoil starter cover (page 2-3).



# ELECTRIC STARTER



# 21. ELECTRIC STARTER

<b>SERVICE INFORMATION</b>	<b>21-1</b>	<b>STARTER RELAY SWITCH</b>	<b>21-10</b>
<b>TROUBLESHOOTING</b>	<b>21-2</b>	<b>DIODE</b>	<b>21-11</b>
<b>STARTER MOTOR</b>	<b>21-4</b>		

## SERVICE INFORMATION

### GENERAL

- Always turn the ignition switch OFF before servicing the starter motor. The motor could suddenly start, causing serious injury.
- The starter motor can be serviced with the engine in the frame.
- When checking the starter system, always follow the steps in the troubleshooting flow chart (page 21-2).
- A weak battery may be unable to turn the starter motor quickly enough, or supply adequate ignition current.
- If the current is kept flowing through the starter motor to turn it while the engine is not cranking over, the starter motor may be damaged.
- See section 11 for starter clutch servicing.
- See section 22 for following components:
  - ignition switch
  - starter switch
  - front brake switch
- See section 23 for gear position switch information.

### SPECIFICATIONS

Unit: mm (in)

ITEM	STANDARD	SERVICE LIMIT
Starter motor brush length	12.5 (0.49)	9.0 (0.35)

## ELECTRIC STARTER

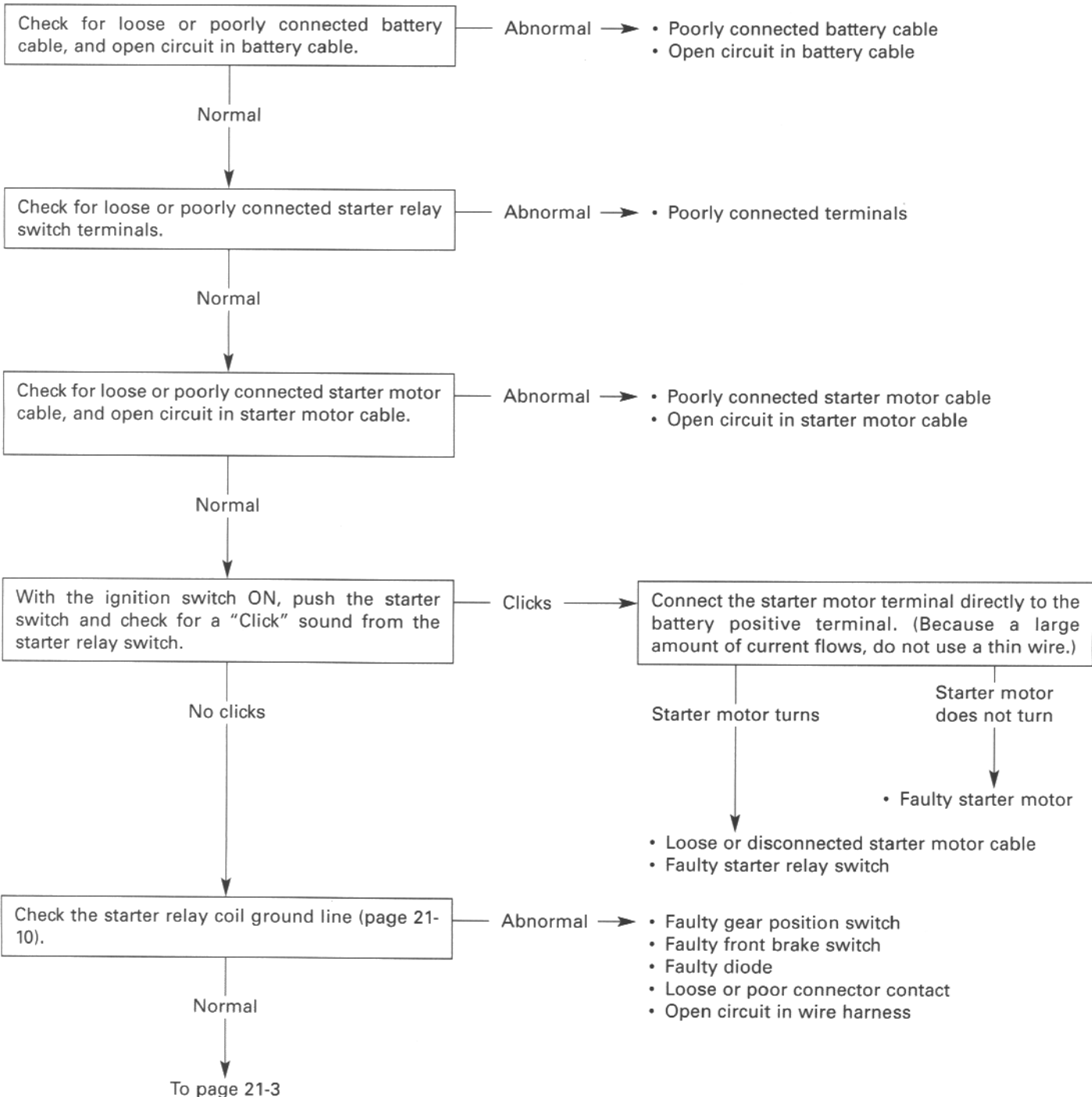
### TROUBLESHOOTING

**NOTE:**

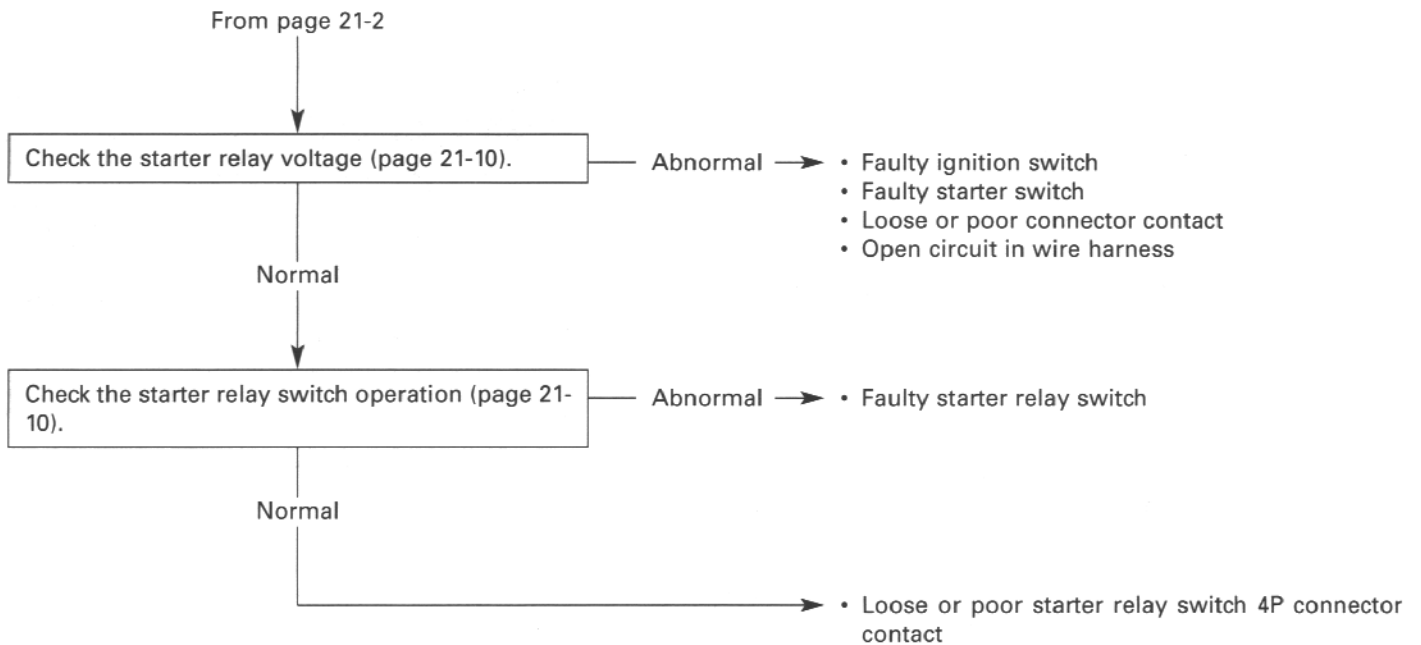
- The starter motor should operate when the transmission is in neutral or the front brake lever is squeezed.

**Starter motor will not turn**

- Check for a blown fuse (15 A).
- Check that the battery is fully charged and in good condition.
- If the motor turns either with the front brake lever squeezed and the sub-transmission in any gear except neutral or with the sub-transmission in neutral, inspect the starter relay coil ground line (page 21-10).







### **Starter motor turns slowly**

- Weak battery
- Poorly connected battery cable
- Poorly connected starter motor cable
- Faulty starter motor

### **Starter motor turns, but engine does not turn**

- Faulty starter clutch (section 11)

### **Starter relay switch "clicks", but engine does not turn over**

- Crankshaft does not turn due to engine problem
- Faulty starter reduction gears (section 11)

## ELECTRIC STARTER

### STARTER MOTOR

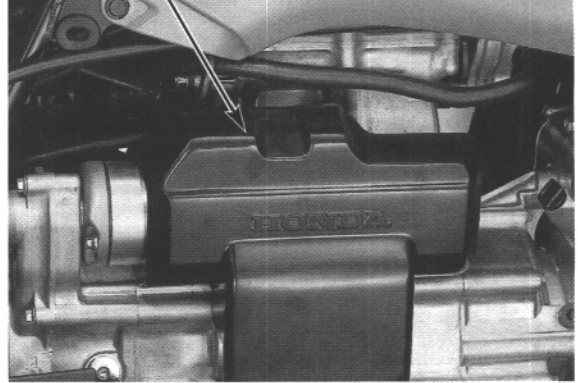
#### REMOVAL

Remove the seat and recoil starter cover (page 2-3).

With the ignition switch OFF, remove the negative (-) cable from the battery.

Remove the two bolt and right engine side cover.

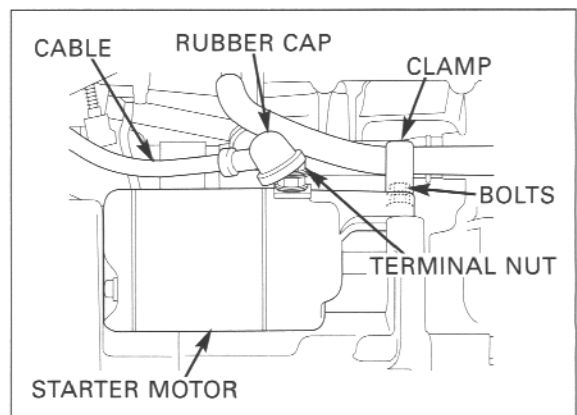
RIGHT ENGINE SIDE COVER



Slide the rubber cap off the starter motor terminal and remove the terminal nut and starter motor cable.

Remove the two mounting bolts and clamp, and the starter motor from the rear crankcase cover.

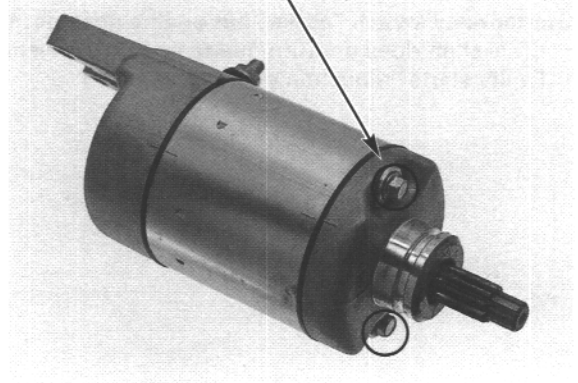
Remove the O-ring from the starter motor.



#### DISASSEMBLY/INSPECTION

Remove the starter motor case bolts, set plates and O-rings.

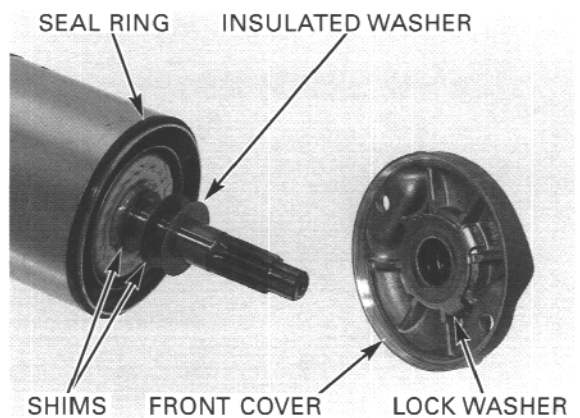
BOLTS, SET PLATES, O-RINGS



*Record the location and number of shims.*

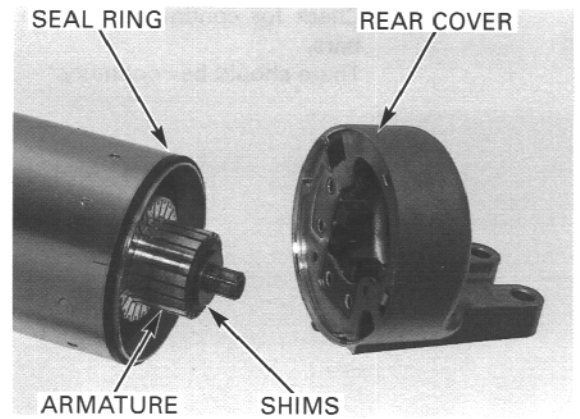
Remove the following:

- front cover
- lock washer
- insulated washer
- shims
- seal ring

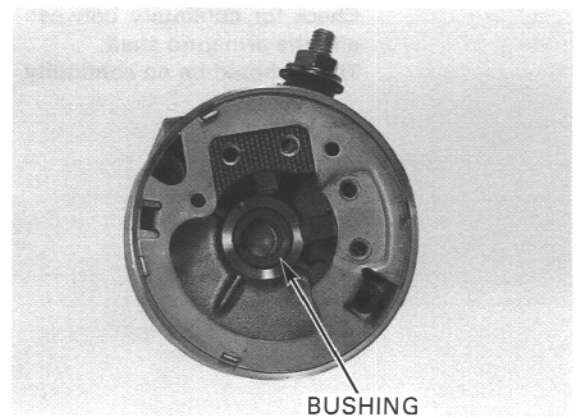


## ELECTRIC STARTER

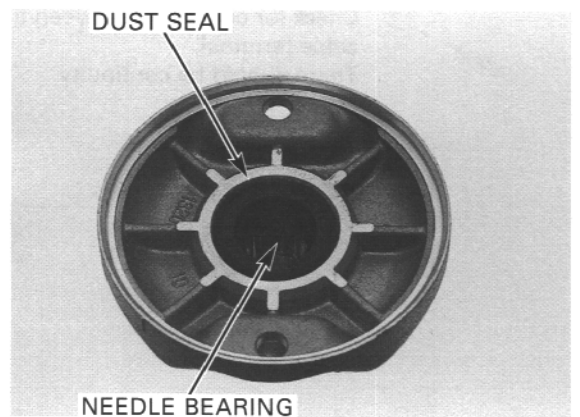
- rear cover
- shims
- seal ring
- armature



Check the bushing in the rear cover for wear or damage.



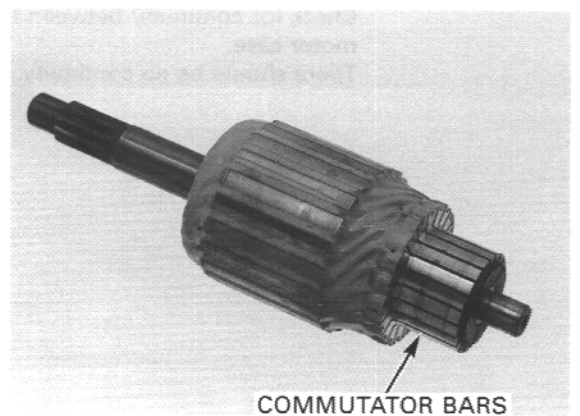
Check the dust seal and needle bearing in the front cover for deterioration, wear or damage.



Check the commutator bars of the armature for discoloration.

**NOTE:**

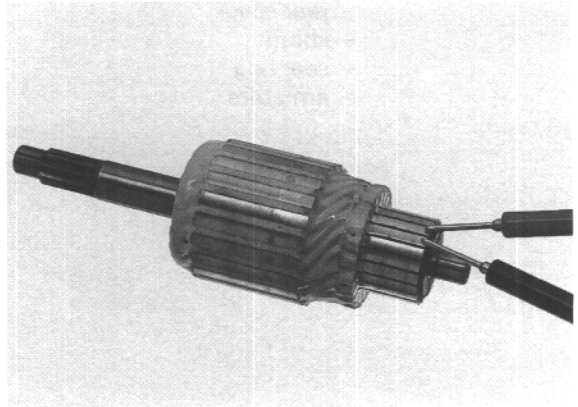
- Do not use emery or sand paper on the commutator.



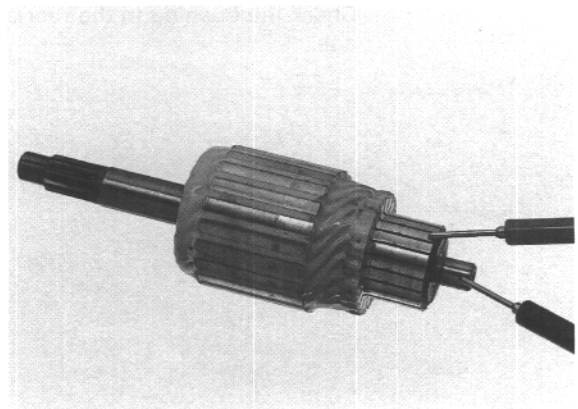
## ELECTRIC STARTER

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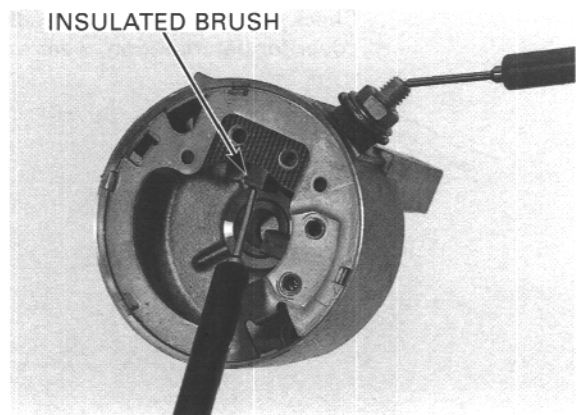
Check for continuity between pairs of commutator bars.  
There should be continuity.



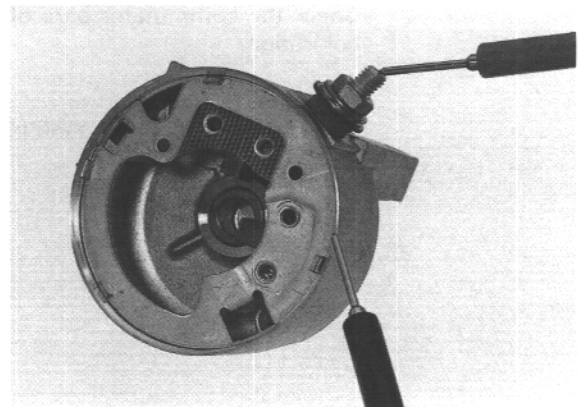
Check for continuity between each commutator bar and the armature shaft.  
There should be no continuity.



Check for continuity between the insulated brush and cable terminal.  
There should be continuity.

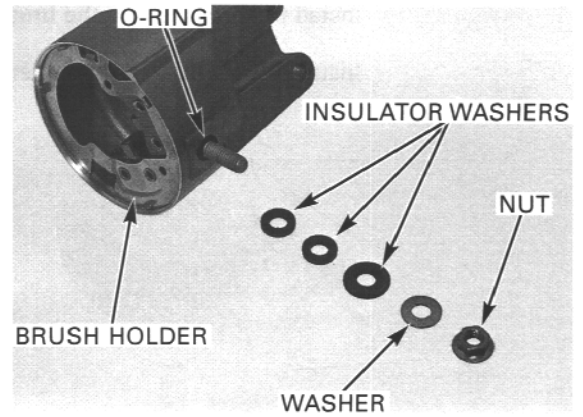


Check for continuity between the cable terminal and motor case.  
There should be no continuity.



Remove the following:

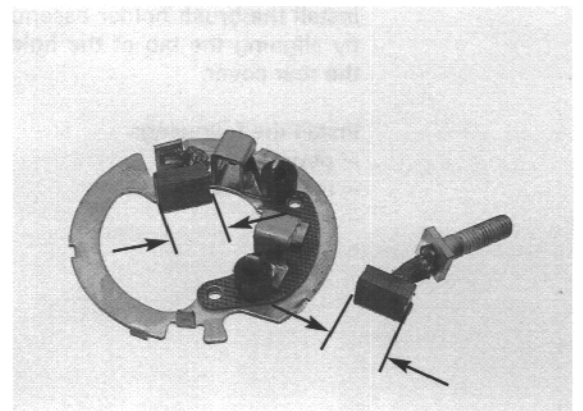
- nut
- washer
- insulator washers
- brush holder assembly
- O-ring
- insulator



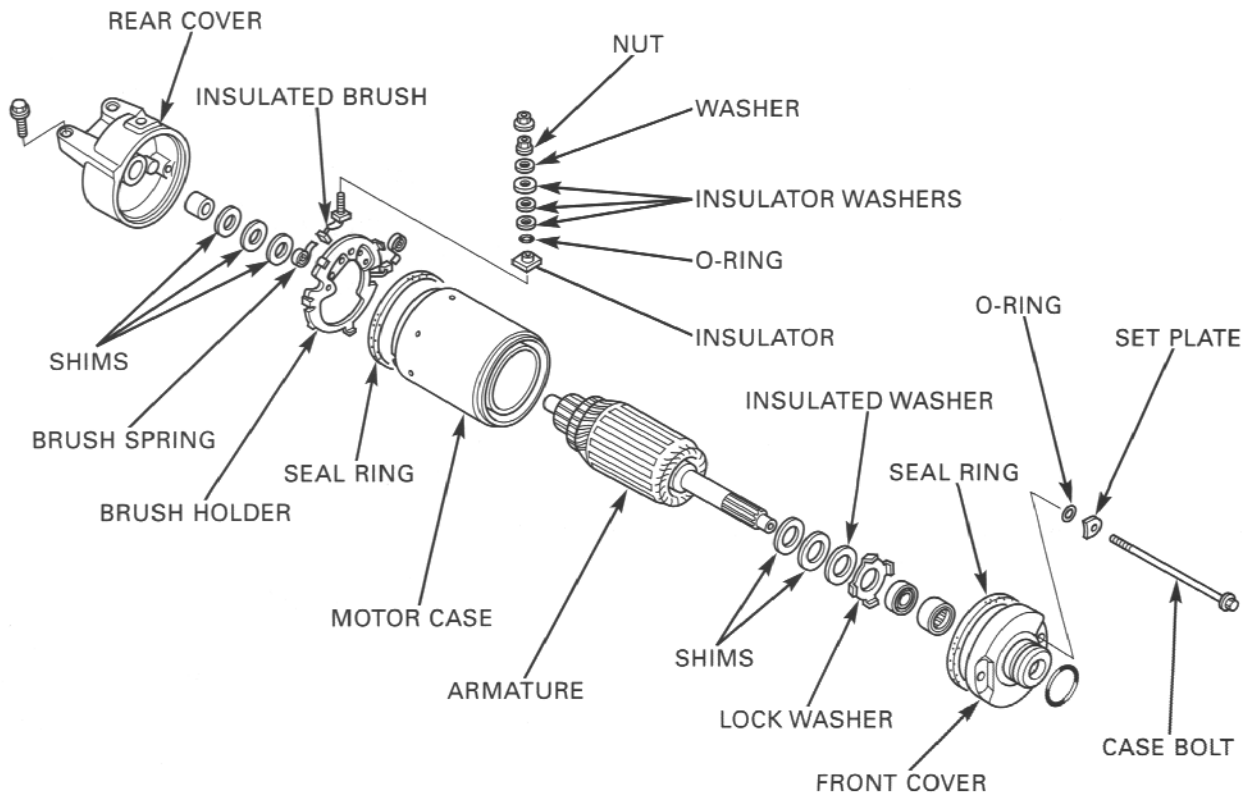
Remove the brushes from the brush holder.

Measure the brush length.

**SERVICE LIMIT: 9.0 mm (0.35 in)**



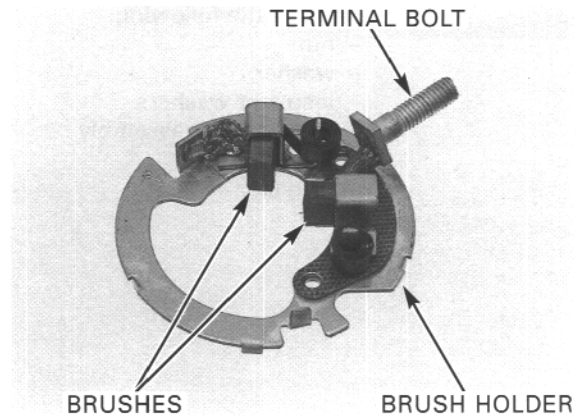
**ASSEMBLY**



## ELECTRIC STARTER

Install the brushes into the brush holder.

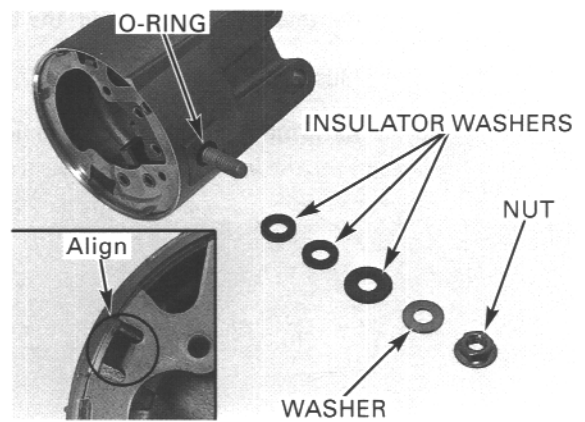
Install the insulator onto the terminal bolt.



Install the brush holder assembly into the rear cover by aligning the tab of the holder with the groove in the rear cover.

Install the following:

- new O-ring
- insulator washers
- washer
- nut

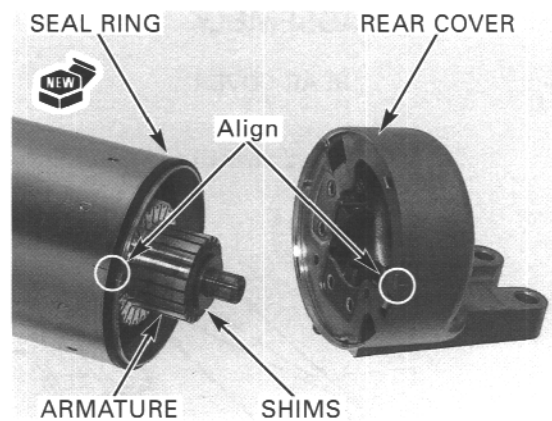


*The coil may be damaged if the magnet pulls the armature against the case.*

Install the armature into the motor case while holding the armature tightly to keep the magnet of the case from pulling the armature against it.

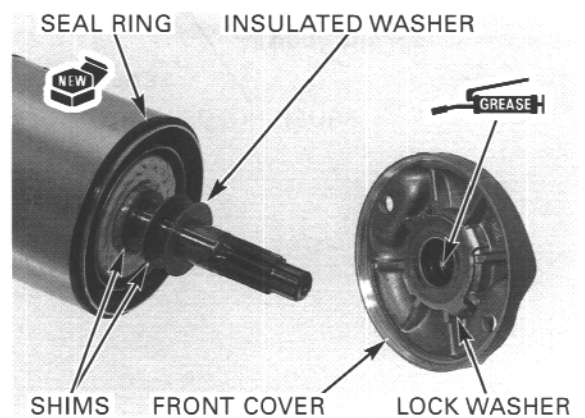
Install a new seal ring onto the motor case. Install the same number of shims in the same locations as noted during disassembly.

Install the rear cover while pushing the brushes into the brush holder and aligning the brush holder tab with the motor case groove (aligning the index lines).

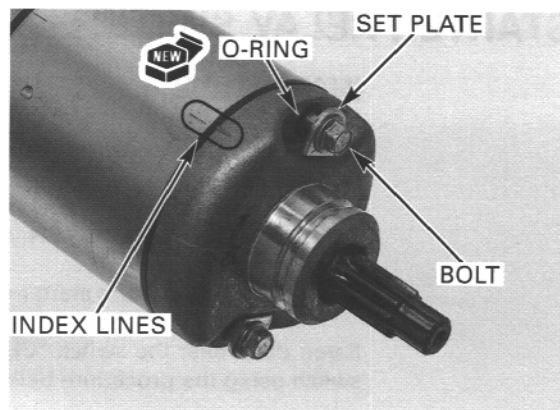


Install a new seal ring onto the motor case. Install the shims and insulated washer onto the armature shaft.

Apply grease to the dust seal lip and needle bearing in the front cover. Install the lock washer onto the front cover and the front cover onto the motor case.



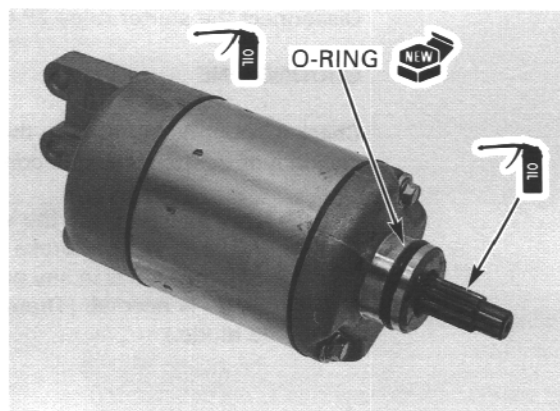
Align the index lines on the front cover and motor case.  
 Install the set plates and new O-rings onto the motor case bolts.  
 Install the motor case bolts and tighten them.



## INSTALLATION

Coat a new O-ring with engine oil and install it into the starter motor groove.

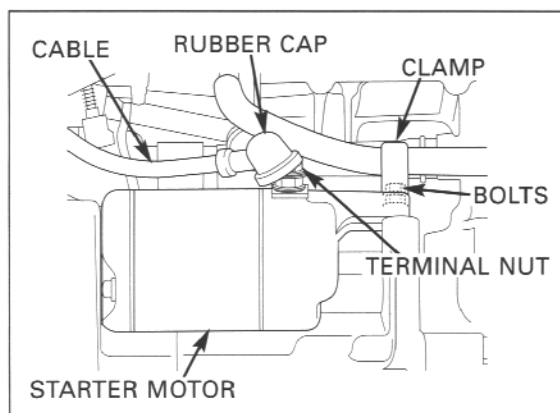
Apply molybdenum oil solution to the starter motor shaft splines.



*Set the water pump bypass hose properly (page 1-19).*

Install the starter motor into the rear crankcase cover with the two mounting bolts and clamp, and tighten the mounting bolts securely.

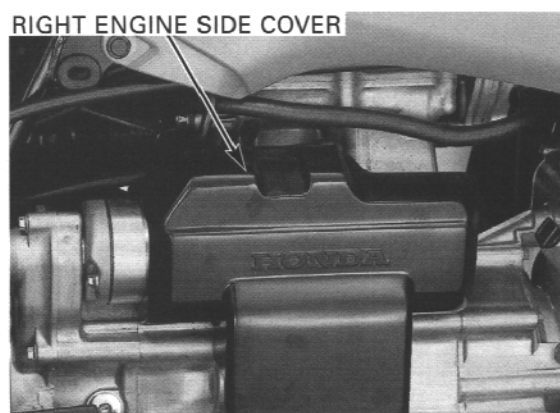
Install the starter motor cable and nut onto the motor terminal and tighten the nut securely.  
 Install the rubber cap over the starter motor terminal properly.



Install the right engine side cover and tighten the two bolts.

Connect the battery negative (-) cable.

Install the recoil starter cover and seat (page 2-3).



## ELECTRIC STARTER

### STARTER RELAY SWITCH

#### INSPECTION

Remove the rear fender lid (page 19-4).

Shift the sub-transmission into neutral.  
Turn the ignition switch ON and push the starter switch.  
The coil is normal if the starter relay switch clicks.

If you don't hear the switch "CLICK", inspect the relay switch using the procedure below.

Disconnect the starter relay 2P (white) connector.

#### GROUND LINE

Check for continuity between the Light green/red wire terminal of the harness side connector and ground.

If there is continuity when the sub-transmission is in neutral or when the front brake lever is squeezed and the sub-transmission is in any gear except neutral, the ground circuit is normal. (There is a slight resistance due to the diode.)

#### STARTER RELAY VOLTAGE

Measure the voltage between the Yellow/red wire terminal (+) of the harness side 2P connector and ground (-).

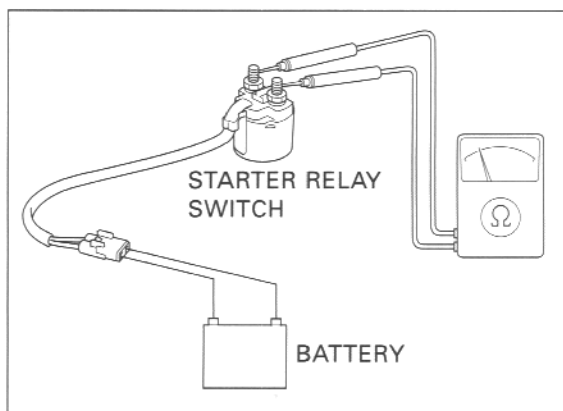
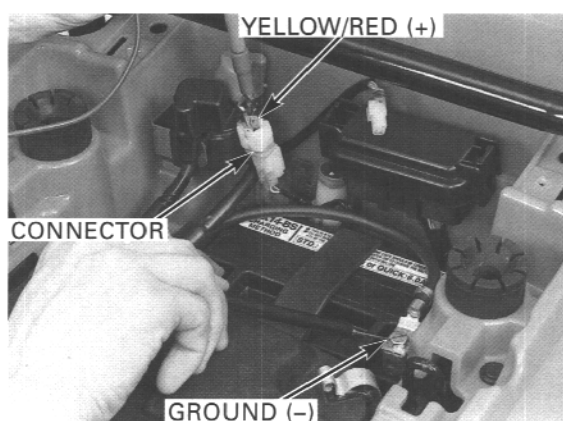
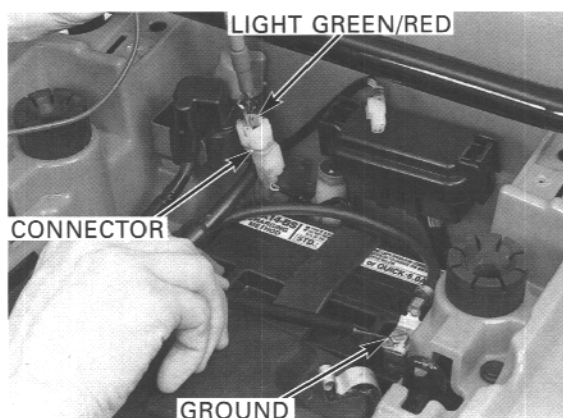
If the battery voltage appears only when the starter switch is pushed with the ignition switch ON, the circuit is normal.

#### OPERATION CHECK

Disconnect battery (+) cable and starter motor cable from the starter relay switch.

Connect the fully charged 12 V battery positive terminal to the Yellow/red wire terminal and negative terminal to the Green/red wire terminal of the relay switch side 2P connector.

There should be continuity between the cable terminals while the battery is connected, and no continuity when the battery is disconnected.

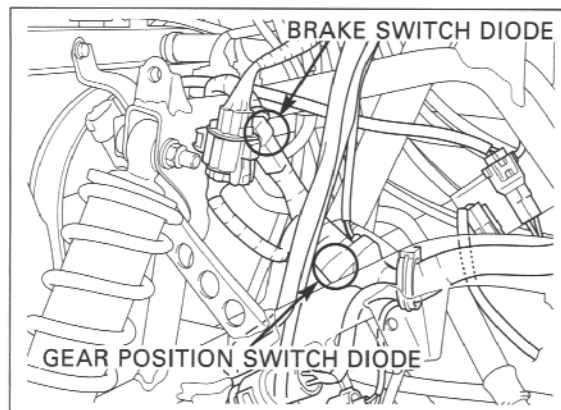




**DIODE****INSPECTION**

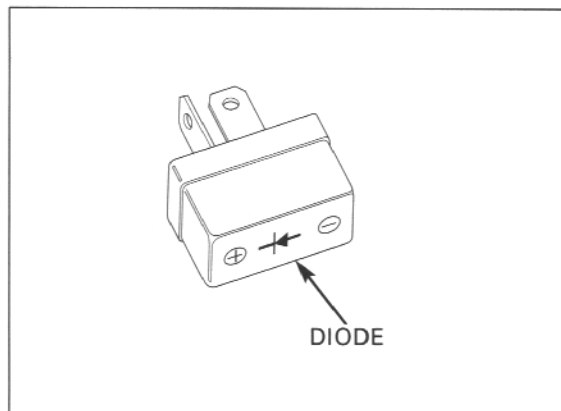
Remove the left inner fender (page 2-6).

Remove the gear position (neutral) switch diode and brake switch diode from the wire harness.



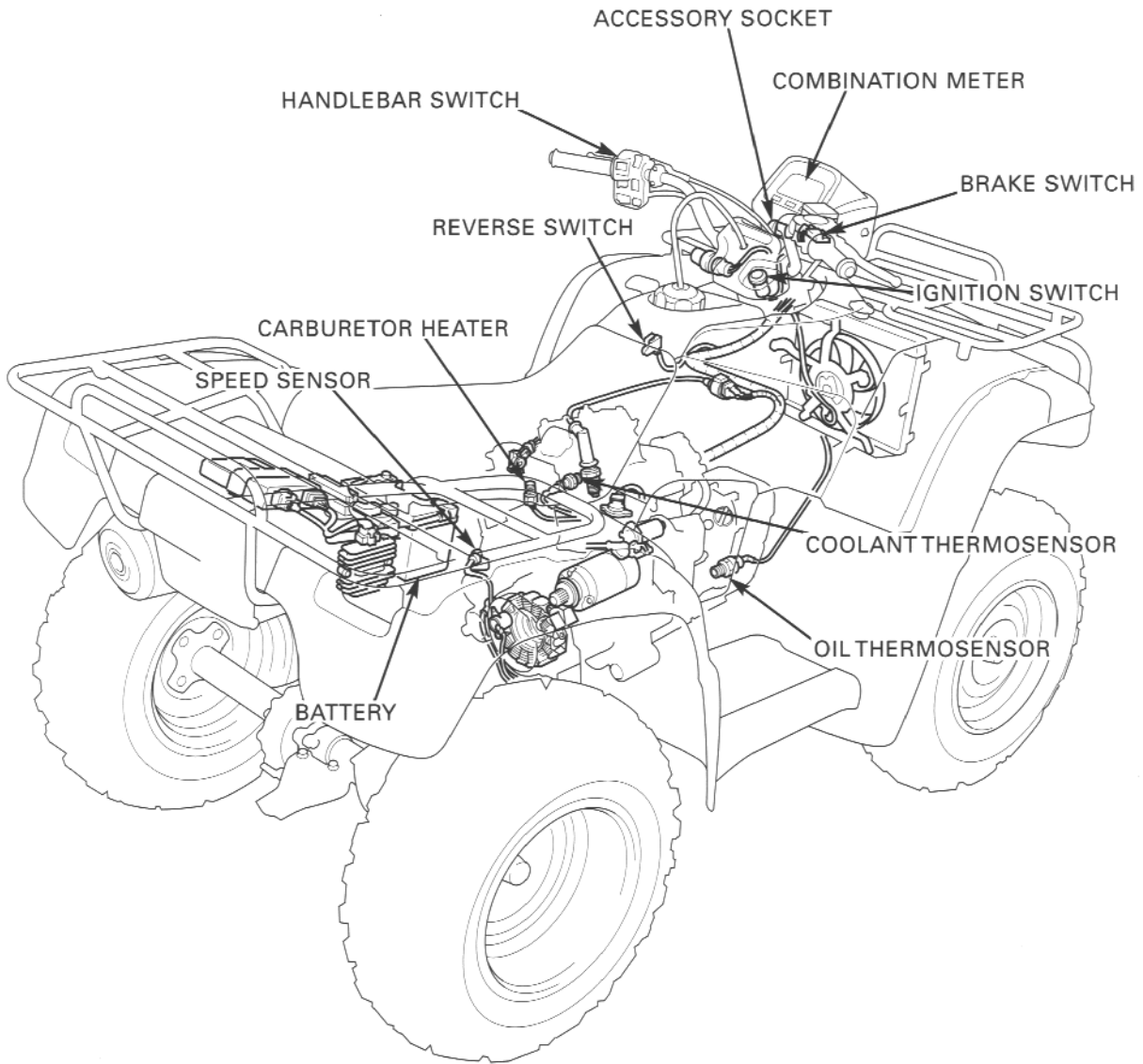
Check for continuity between the diode terminals. When there is continuity, a small resistance value will register.

If there is continuity in one direction, the diode is normal.



# LIGHTS/METER/SWITCHES

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# 22. LIGHTS/METER/SWITCHES

SERVICE INFORMATION	22-1	CARBURETOR HEATER	22-6
BULB REPLACEMENT	22-2	COMBINATION METER/SPEED SENSOR	22-6
HEADLIGHT	22-3	TEMPERATURE INDICATOR/ THERMOSENSOR	22-9
ACCESSORY SOCKET	22-4	REVERSE SWITCH	22-13
IGNITION SWITCH	22-4	FRONT BRAKE SWITCH	22-13
HANDLEBAR SWITCH	22-5		

## SERVICE INFORMATION

### GENERAL

- All plastic connectors have locking tabs that must be released before disconnecting, and must be aligned when reconnecting.
- A continuity check can usually be made without removing the part from the vehicle. Simply disconnect the connectors and connect a continuity tester to the terminals or connections.
- Check the battery condition before performing any inspection that requires proper battery voltage.
- The following color codes used are indicated throughout this section.

Bu: Blue	G: Green	Lg: Light Green	R: Red
Bl: Black	Gr: Gray	O: Orange	W: White
Br: Brown	Lb: Light Blue	P: Pink	Y: Yellow

### SPECIFICATIONS

	ITEM	SPECIFICATIONS
Bulbs	Headlight (high/low beam)	12 V - 30/30 W x 2
	Assist headlight	12 V - 45 W
	Taillight	12 V - 5 W x 2
	Neutral indicator	LED
	Reverse indicator	LED
	Coolant/oil temperature indicator	LED
	Meter light	LED x 12
Fuse	Main fuse	30 A
	Transmission control motor	30 A
	Sub-fuse	15 A x 2, 10 A x 2

### TORQUE VALUE

Coolant thermosensor	10 N·m (1.0 kgf·m, 7 lbf·ft) Apply locking agent to the threads
Oil thermosensor	18 N·m (1.8 kgf·m, 13 lbf·ft)

### TOOL

Inspection adaptor	07GMJ-ML80100
--------------------	---------------

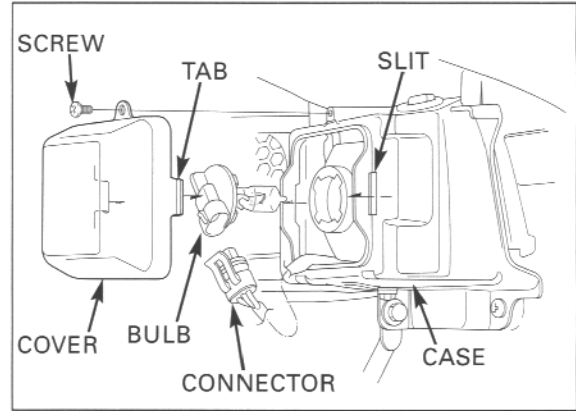
## BULB REPLACEMENT

### HEADLIGHT

Remove the screw and the headlight cover by releasing the tabs from the slits in the headlight case.

Remove the bulb socket by turning it counterclockwise. Disconnect the bulb connector and replace the bulb with a new one.

Make sure that the seal rubber on the connector is installed in the position and is in good condition.



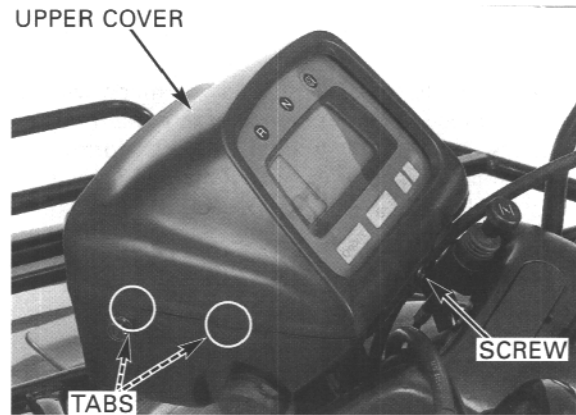
*Align the socket tabs with the headlight grooves properly.*

Install the bulb in the reverse order of removal.

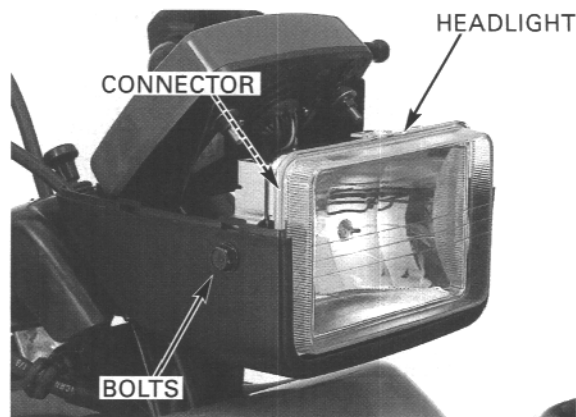
### ASSIST HEADLIGHT

*Be careful not to break the cover tabs.*

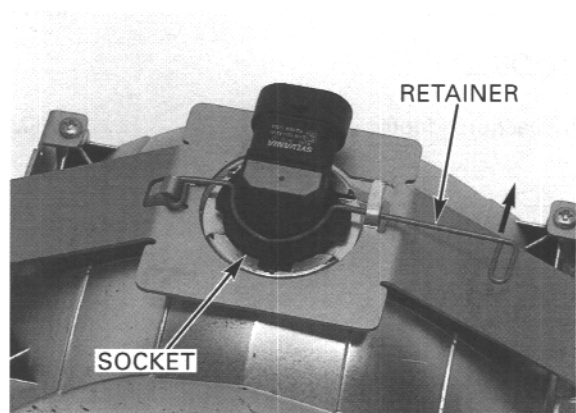
Remove the headlight cover screw. Release the four tabs of the upper cover from the slits in the lower cover while spreading the upper cover to remove it.



Remove the headlight mounting bolts and disconnect the headlight connector to remove the headlight.



Release the socket retainer and remove the headlight socket.



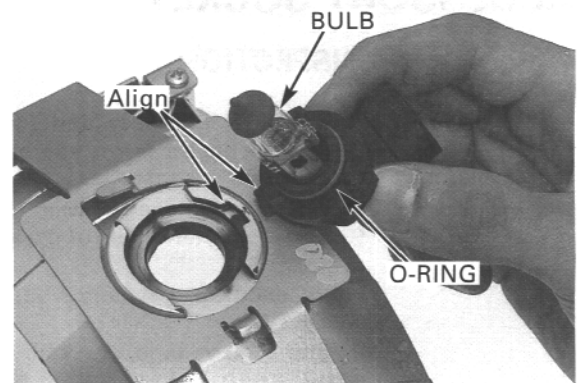
Pull the bulb out of the socket and replace it with a new one.

Make sure that the O-ring on the socket is installed in the position and is in good condition.

*Align the socket tab with the headlight groove.*

Install the bulb in the reverse order of removal.

Adjust the headlight aim.

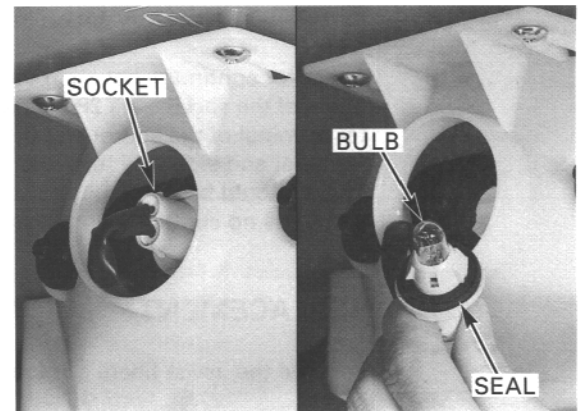


### TAILLIGHT

Turn the bulb socket counterclockwise and remove it. Pull the bulb out of the socket and replace it with a new one.

Make sure that the seal rubber is installed in position and is in good condition.

Install the bulb in the reverse order of removal.



## HEADLIGHT

### REMOVAL/INSTALLATION

Remove the headlight bulb (page 22-2).

- Remove the following fasteners:
- aim adjusting bolt and lock washer
  - mounting bolt
  - four mounting screws.

Remove the headlight assembly from the headlight grill and the headlight from the case by releasing the tabs from the slits.

Installation is in the reverse order of removal.

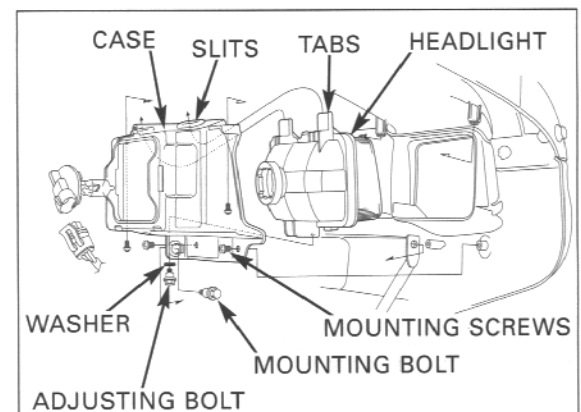
### HEADLIGHT AIM

Adjust the headlight beam vertically by loosening the adjusting bolt and moving the headlight back and forth.

Tighten the adjusting bolt.

#### NOTE:

- An improperly adjusted headlight may blind oncoming drivers, or it may fail to light the road for a safe distance.



## ACCESSORY SOCKET

### INSPECTION

Remove the right inner fender (page 2-6).  
Disconnect the accessory socket 2P (green) connector.

Measure the voltage between the White/black (+) and Green (-) wire terminals of the wire harness side connector.

There should be battery voltage with the ignition switch ON.

If there is no voltage, check for open circuit in related wires.

Remove the accessory socket cap.

Check for continuity between the White/black wire terminal of the socket side 2P connector and bottom center terminal of the socket and between the Green wire terminal and side wall terminal.

There should be continuity.

If there is no continuity, replace the accessory socket.

### REPLACEMENT

Remove the assist headlight (page 22-2).

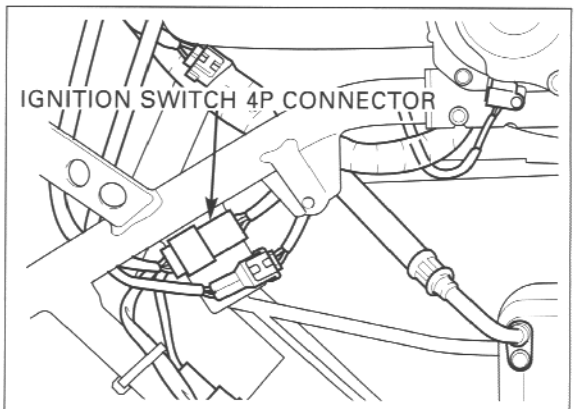
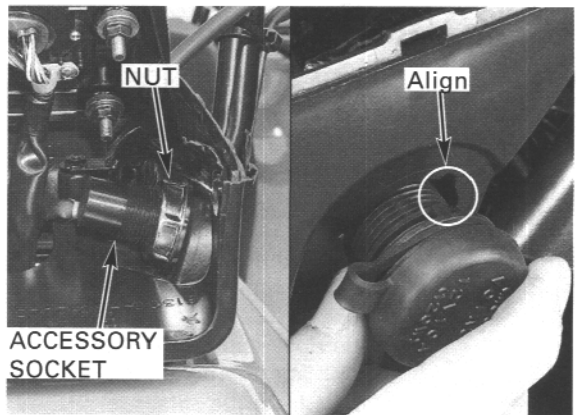
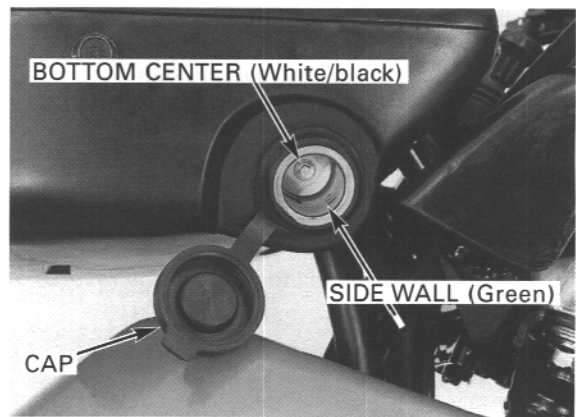
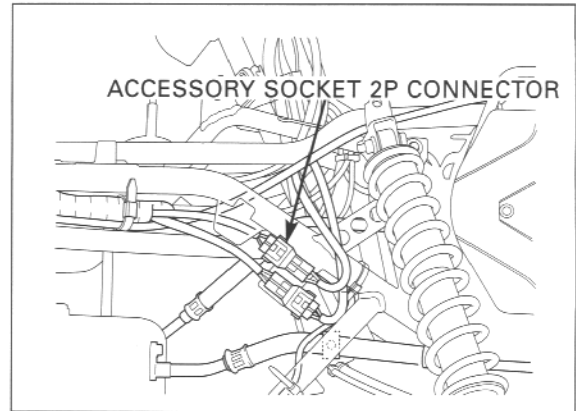
Release the accessory socket wire from wire clip on the steering shaft holder.

Loosen the lock nut and remove the accessory socket.

Install a new accessory socket by aligning the lug with the groove in the headlight cover.

Route the accessory socket wire properly (page 1-19) and connector the 2P connector.

Install the removed parts in the reverse order of removal.



## IGNITION SWITCH

### INSPECTION

Remove the left inner fender (page 2-6).  
Disconnect the ignition switch 4P connector.

Check for continuity between the switch side connector terminals in each switch position.

Continuity should exist between the color coded wires as follows:

Color Position	Red/black	Pink	Red	Black
	ON	o — o	o — o	o — o
OFF				

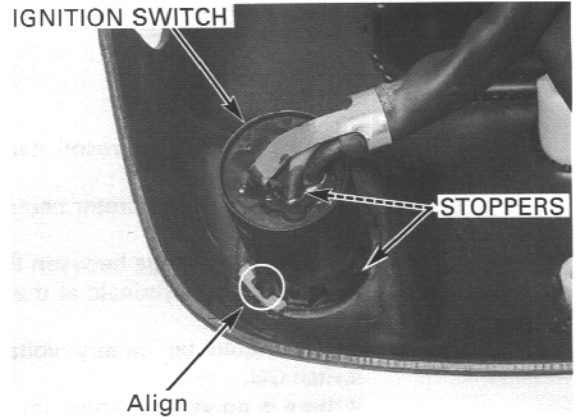
**REPLACEMENT**

Release the switch wire from the wire clips on the steering shaft holder.

Remove the handlebar cover (page 14-4).  
Remove the ignition switch from the cover while pushing in the two stoppers.

Install a new ignition switch by aligning the locating tab with the groove in the cover.  
Route the switch wire properly (page 1-19) and connect the 4P connector.

Install the removed parts in the reverse order of removal.

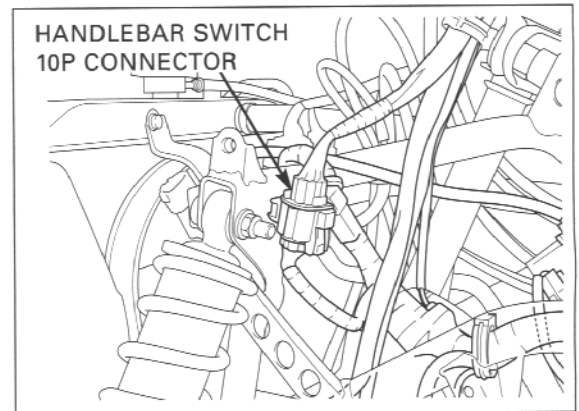


**HANDLEBAR SWITCH**

**INSPECTION**

Remove the handlebar switch 10P connector (green) from the frame and disconnect it.

Check for continuity between the switch side connector terminals in each switch position. Continuity should exist between the color coded wires as follows:



**DIMMER SWITCH**

Color Position	Bl/G	Bl/W
OFF		
RUN	o—o	
OFF		

**DIMMER SWITCH**

Color Position	•	W	Bu/Bl
Low	o—o		
(N)	o—o	o—o	
High	o—o		o—o

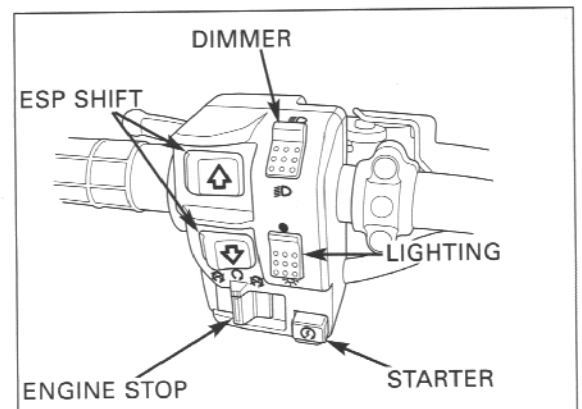
**LIGHTING SWITCH**

Color Position	Bl/Br	Br	•
ON	o—o—o		
OFF			

**STARTER SWITCH**

Color Position	Bl/Br	Y/R
FREE		
PUSH	o—o	

For ESP shift switch inspection, see section 23.



## CARBURETOR HEATER

### INSPECTION

Remove the seat and recoil starter cover (page 2-3).

Disconnect the carburetor heater 2P connector.

Measure the voltage between the Black/green (+) and Green (-) wire terminals at the harness side connector.

There should be battery voltage with the ignition switch ON.

If there is no voltage, check for open circuit in related wires.

If the wires are OK, check as follows:

Measure the resistance between the heater side connector terminals.

**STANDARD: 13—15  $\Omega$  (20°C/68°F)**

If the resistance is out of above ranges, replace the carburetor heater.

### REPLACEMENT

Remove the following:

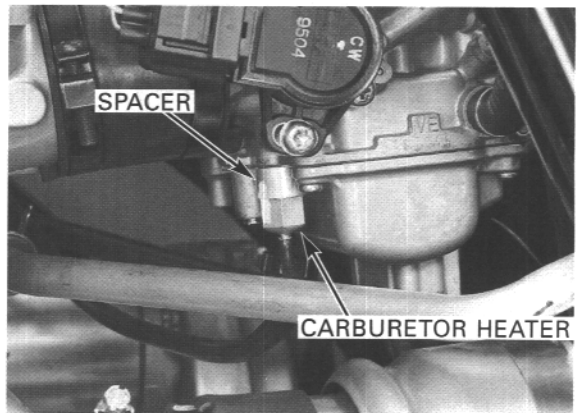
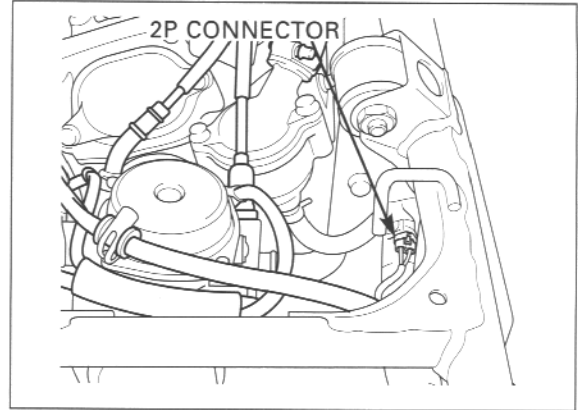
- side covers (page 2-4)
- left engine cover (page 2-10)

Release the heater wire from the wire clip.  
Remove the carburetor heater and spacer.

Install the collar and a new carburetor heater with the stepped side of the collar facing the carburetor and tighten carburetor heater.

Route the heater wire properly (page 1-19) and connect the heater 2P connector.

Install the removed parts in the reverse order of removal.

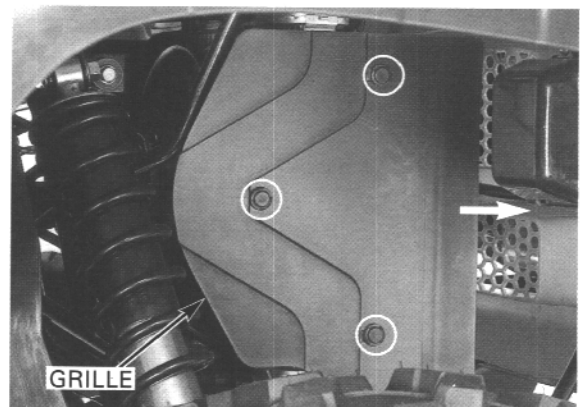


## COMBINATION METER/SPEED SENSOR

Go to the troubleshooting on page 23-25 if only the gear position indication or drive mode indication is faulty and other indications are normal.

### POWER/GROUND LINE INSPECTION

Remove the six trim clips and slide the radiator grille forward.





*Be careful not to damage the radiator fins during inspection.*

Remove the connectors from the frame and disconnect the meter 14P connector.

Check the following at the wire harness side connector.

### POWER INPUT LINE

Measure the voltage between the Black/brown wire terminal (+) and ground (-).

There should be battery voltage with the ignition switch ON.

If there is no voltage, check for open circuit in Black/brown wire.

### BACK-UP VOLTAGE LINE

Measure the voltage between the

Red/black wire terminal (+) and ground (-).

There should be battery voltage at all times.

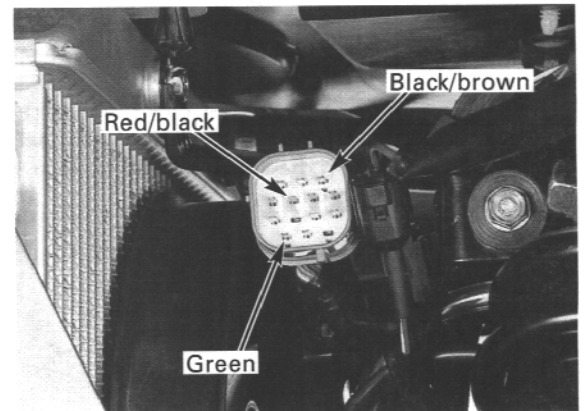
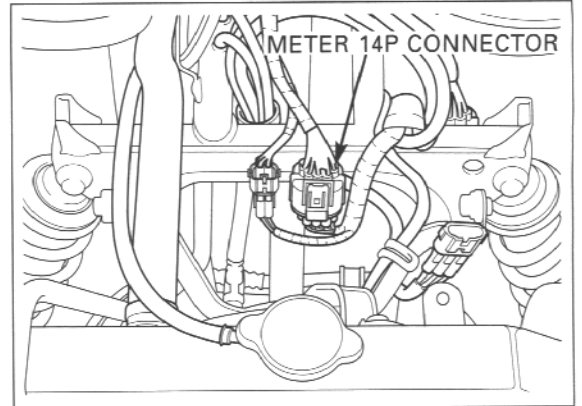
If there is no voltage, check for open circuit in Red/black wire.

### GROUND LINE

Check for continuity between the Green wire terminal and ground.

There should be continuity at all times.

If there is no continuity, check for open circuit in Green wire.



### SPEEDOMETER/SPEED SENSOR SYSTEM INSPECTION

Check that the hour meter or odometer/trip meter function properly.

- If they do not function, perform the power/ground line inspection (page 22-6).
- If they function, check the following.

Remove the recoil starter cover (page 2-3).

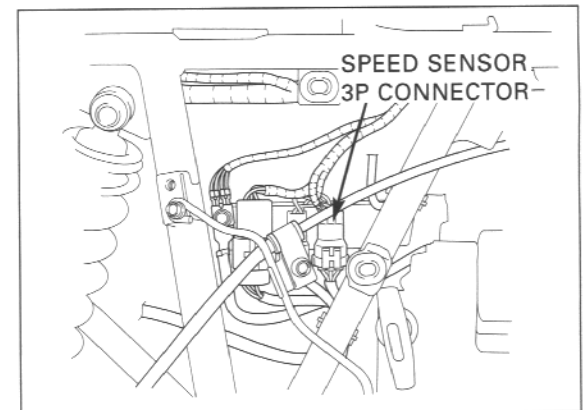
Disconnect the speed sensor 3P (black) connector.

Measure the voltage between the Black/blue (+) and Green (-) wire terminals at the harness side 3P connector.

There should be battery voltage with the ignition switch ON.

If there is no voltage, check for open circuit in related wires.

If there is voltage, check the sensor as follows.



## LIGHTS/METER/SWITCHES

Connect the inspection adaptor to the sensor 3P connectors.

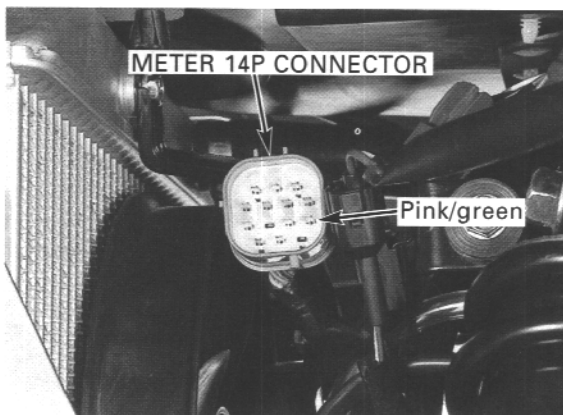
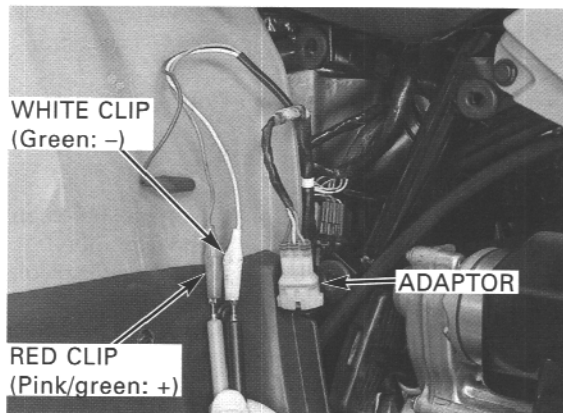
### TOOL:

Inspection adaptor

07GMJ-ML80100

Shift the sub-transmission into neutral.  
Raise the wheels off the ground and support the vehicle securely with a hoist or equivalent.  
Measure the voltage between the Red clip (+) and White clip (-).  
With the ignition switch ON, slowly turn the rear wheels by hand.  
There should be 0 to 5 V pulse voltage.

- If the pulse voltage does not appear, replace the speed sensor.
- If the pulse voltage appear, disconnect the meter 14P connector (page 22-6) and check for open or short circuit Pink/green wire between the 14P connector and sensor 3P connector.  
If the wires are OK, replace the combination meter.



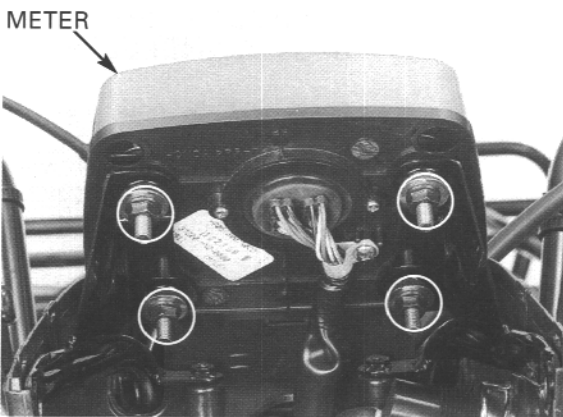
## SPEEDOMETER REMOVAL/INSTALLATION

Disconnect the meter 14P connector (page 22-6).  
Release the meter wire from the wire clip on the steering shaft holder.

Remove the assist headlight (page 22-2).  
Remove the four mounting nuts, collars and the combination meter.

Installation is in the reverse order of removal.

*Route the meter wire properly (page 1-19).*

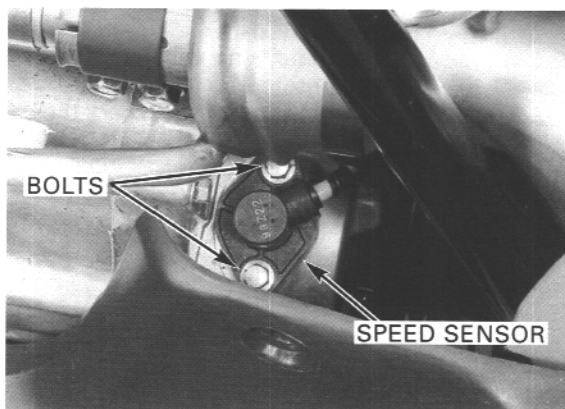


## SPEED SENSOR REPLACEMENT

Disconnect the speed sensor 3P connector (page 22-7) and release the sensor wire from the wire clips and clamp.

Remove the following:

- left side cover (page 2-4)
- left engine cover (page 2-10)
- two bolts
- speed sensor
- sensor insulator
- O-ring

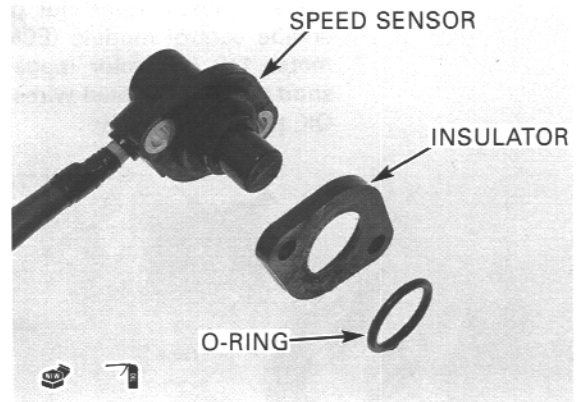


Coat new O-ring with engine oil and install it onto the crankcase.

Install a new speed sensor with the insulator and tighten the two bolts.

Route the sensor wire properly and connect the 3P connector (page 1-19).

Install the removed parts in the reverse order of removal.



## TEMPERATURE INDICATOR/THERMOSENSOR

### SYSTEM INSPECTION

#### NOTE:

- The oil/coolant temperature indicator should come on for a few seconds when the ignition switch is turned ON and the indicator should extinguish shortly.

Check that the neutral indicator or reverse indicator function properly.

- If they do not function, perform the power/ground line inspection (page 22-6).
- If they function, check the following.

#### Temperature indicator does not come on when the ignition switch turned ON

Disconnect the engine control module (ECM) 34P connector and short the Blue/red and Green wire terminals with a jumper wire.

Turn the ignition switch ON and check the temperature indicator.

- If the indicator comes on, the ECM is faulty.
- If the indicator does not come, check for open circuit in Blue/red and Green wire. If the wires are normal, the combination meter is faulty.

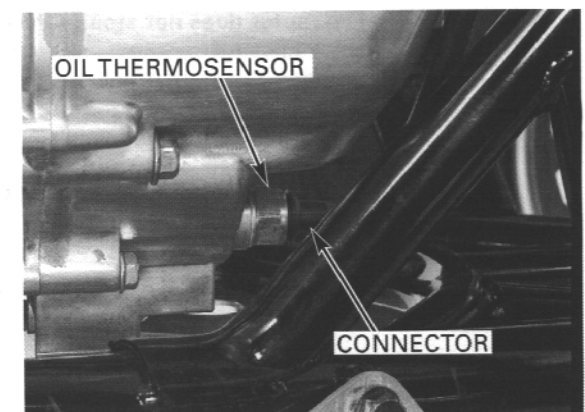
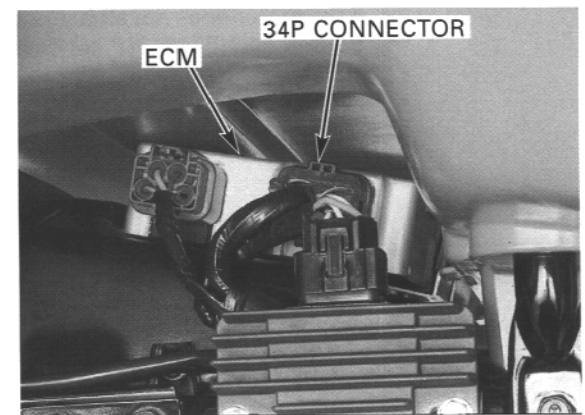
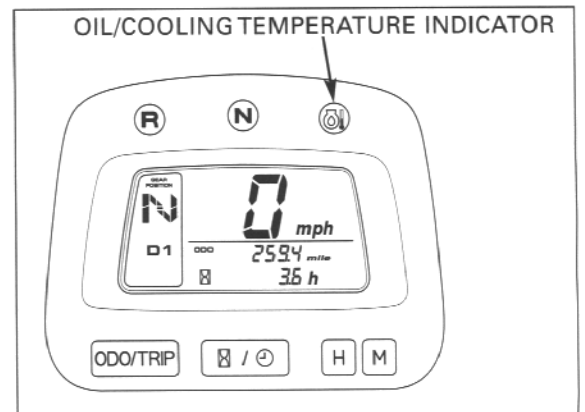
#### Temperature indicator does not go off with the fan motor stops

Remove the following:

- recoil starter cover (page 2-3)
- fuel tank cover (page 2-5)
- air intake duct (page 6-10)

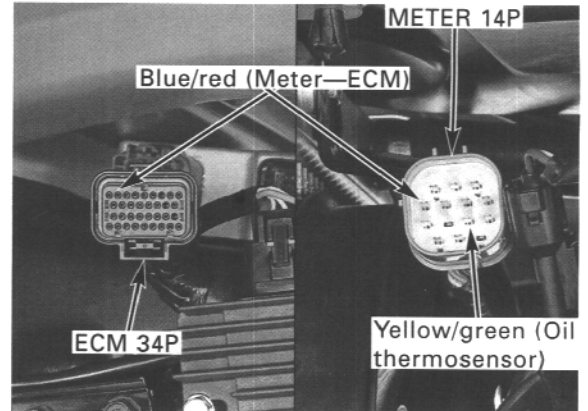
Disconnect the connector from the oil thermosensor and check the temperature indicator with the ignition switch ON.

- If the indicator goes off, check the oil thermosensor (page 22-11).



## LIGHTS/METER/SWITCHES

- If the indicator does not go off, disconnect the engine control module (ECM) 34P connector and meter 14P connector (page 22-6), and check for short circuit in related wires as shown. If they are OK, the ECM is faulty.



*Check the cooling system (section 6) before performing this inspection. If the abnormality is found when the engine is hot.*

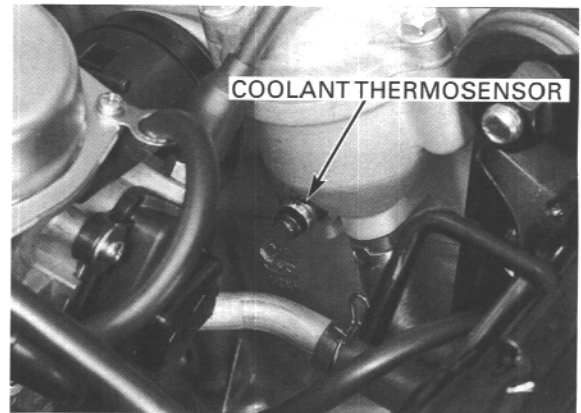
### Temperature indicator stays on and the fan motor does not stop

Remove the following:

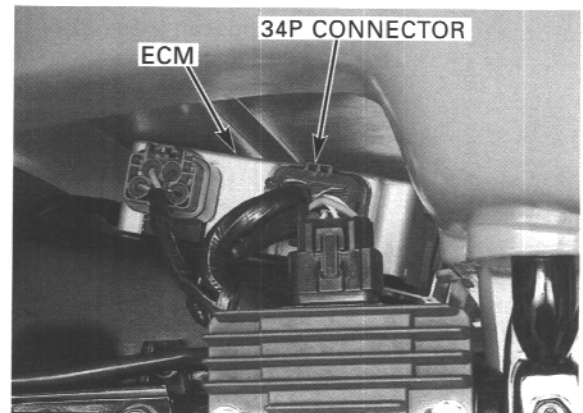
- recoil starter cover (page 2-3)
- fuel tank cover (page 2-5)
- air intake duct (page 6-10)

Disconnect the coolant thermosensor connector and check the fan motor with the ignition switch ON.

If the motor stops, check the coolant thermosensor (page 22-12).

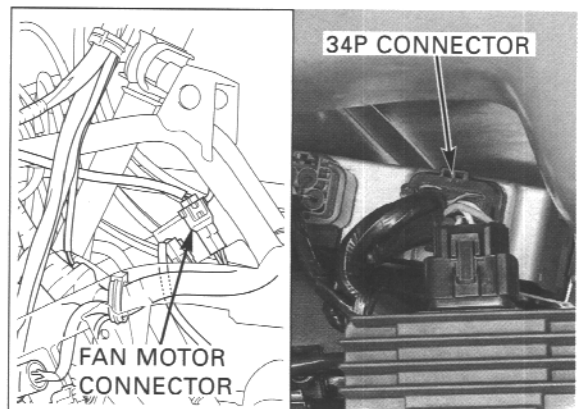


If the motor does not stop, disconnect the engine control module (ECM) 34P connector and check for short circuit in Green/blue wire between the ECM and coolant thermosensor. If it is OK, the ECM is faulty.



### Fan motor does not stop with the temperature indicator goes off

Remove the right front mud guard and right inner fender (page 2-6), and disconnect the fan motor Green/black wire connector and engine control module (ECM) 34P connector. Check for short circuit in Green/black wire between the ECM and fan motor. If it is OK, the ECM is faulty.



**Fan motor does not start**

Remove the following:

- recoil starter cover (page 2-3)
- fuel tank cover (page 2-5)
- air intake duct (page 6-10)

Disconnect the coolant thermosensor connector and ground the connector terminal (Green/blue) with a jumper wire.

Turn the ignition switch ON and check the fan motor.

If the motor starts, check the coolant thermosensor (page 22-12).

If the motor does not start, disconnect the engine control module (ECM) 34P connector and ground the Green/black wire terminal in the same manner as at the thermosensor connector.

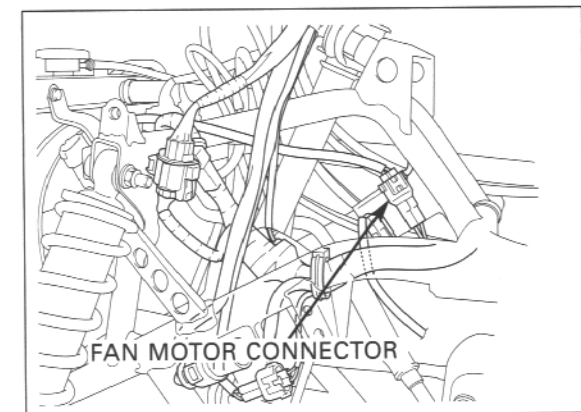
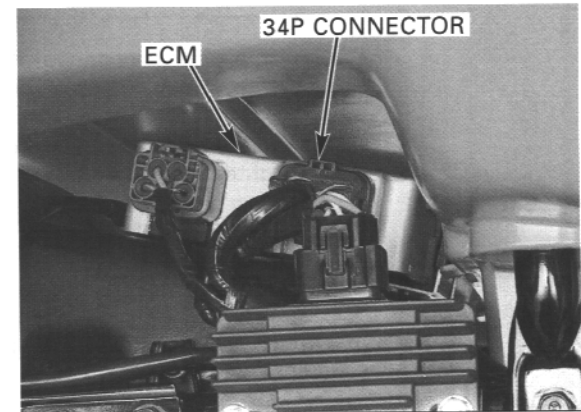
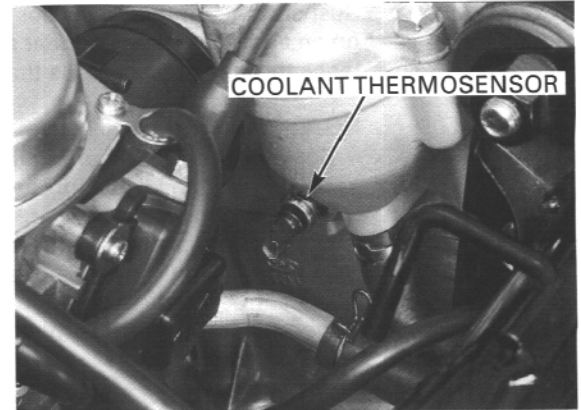
Turn the ignition switch ON and check the fan motor.

If the motor starts, check for open circuit in Green/blue wire between the thermosensor and ECM. If it is OK, the ECM is faulty.

If the motor does not start, remove the right front mud guard and right inner fender (page 2-6), and disconnect the fan motor Blue wire connector (single lead). Measure the voltage between the harness side Blue wire terminal (+) and ground (-).

There should be battery voltage with the ignition switch ON.

- If there is no voltage, check for open circuit in Blue wire.
- If there is voltage, check for open circuit in Green/black wire between the ECM and fan motor. If it is OK, the fan motor is faulty.

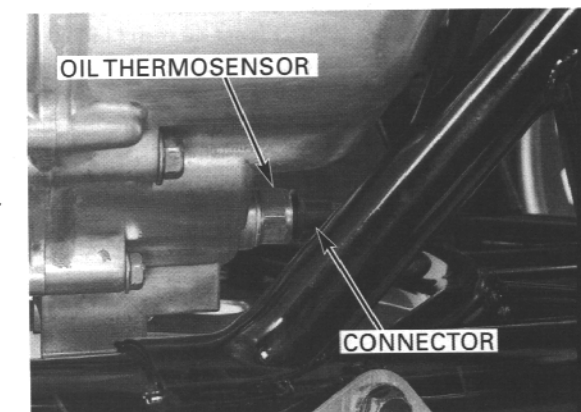


**OIL THERMOSENSOR INSPECTION**

Remove the following:

- right front mud guard (page 2-6)
- right inner fender (page 2-6)

Disconnect the connector and remove the oil thermosensor.



## LIGHTS/METER/SWITCHES

Suspend the oil thermosensor in a pan of engine oil on an electric heating element and measure the resistance through the sensor as the oil heats up.

**NOTE:**

- Soak the thermosensor in oil up to its threads with at least 40 mm (1.57 in) from the bottom of the pan to the bottom of the sensor.
- Keep the temperature constant for 3 minutes before testing. A sudden change of temperature will result in incorrect readings. Do not let the thermometer or thermosensor touch the pan.

Temperature	150°C (302°F)	170°C (338°F)
Resistance	306—340 Ω	209—231 Ω

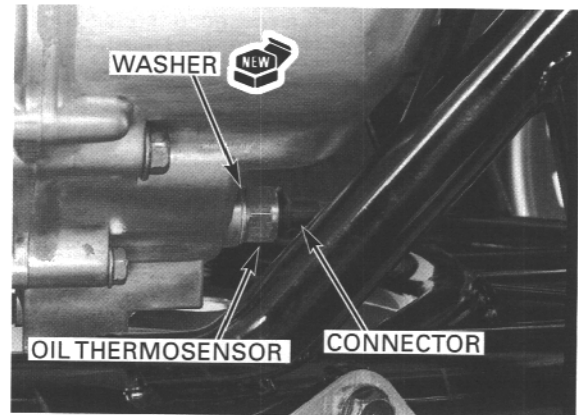
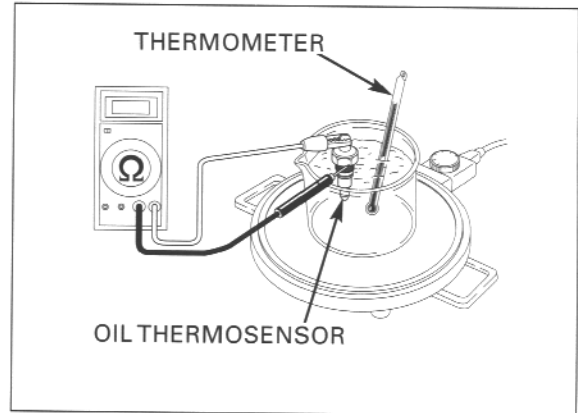
Replace the oil thermosensor if it is out of specifications by more than 10% at any temperature listed.

Install the oil thermosensor with a new sealing washer and tighten it.

**TORQUE: 18 N·m (1.8 kgf·m, 13 lbf·ft)**

Connect the thermosensor connector.

Install the removed parts in the reverse order of removal.



## COOLANT THERMOSENSOR INSPECTION

Drain the coolant from the engine (page 6-5).  
Remove the air intake duct (page 6-10).

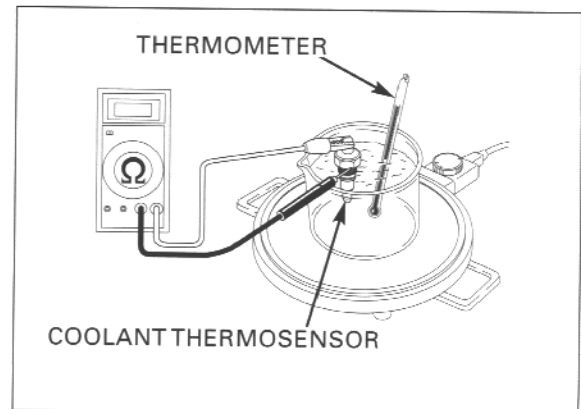
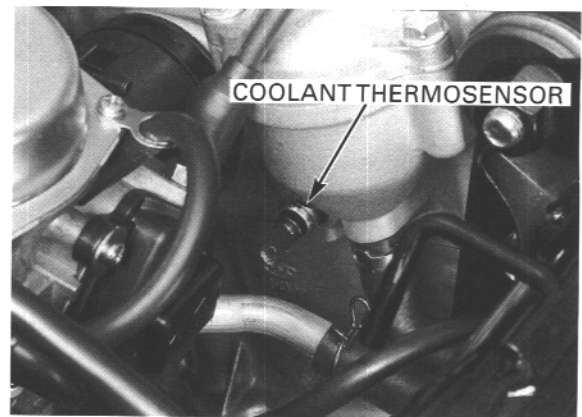
Disconnect the connector and remove the coolant thermosensor.

Suspend the thermosensor in a pan of coolant (50 – 50 mixture) on an electric heating element and measure the resistance through the sensor as the coolant heats up.

**NOTE:**

- Soak the thermosensor in coolant up to its threads with at least 40 mm (1.57 in) from the bottom of the pan to the bottom of the sensor.
- Keep the temperature constant for 3 minutes before testing. A sudden change of temperature will result in incorrect readings. Do not let the thermometer or thermosensor touch the pan.

Temperature	80°C (176°F)	120°C (248°F)
Resistance	47—57 Ω	14—18 Ω



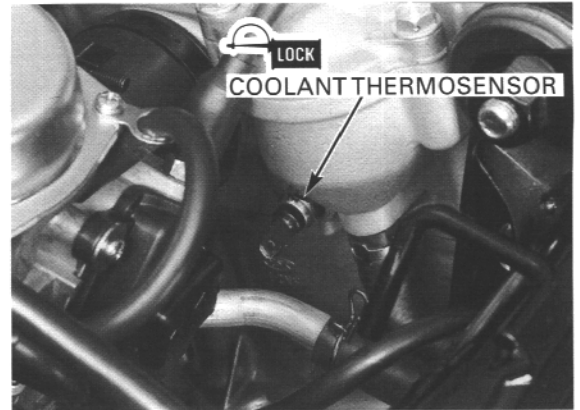
Replace the thermosensor if it is out of specifications by more than 10% at any temperature listed.

Apply locking agent to the thermosensor threads. Do not apply to the sensor head.  
Install and tighten the thermosensor.

**TORQUE: 10 N·m (1.0 kgf·m, 7 lbf·ft)**

Connect the thermosensor connector.

Install the air intake duct (page 6-12).  
Fill and bleed the cooling system (page 6-6).



## REVERSE SWITCH

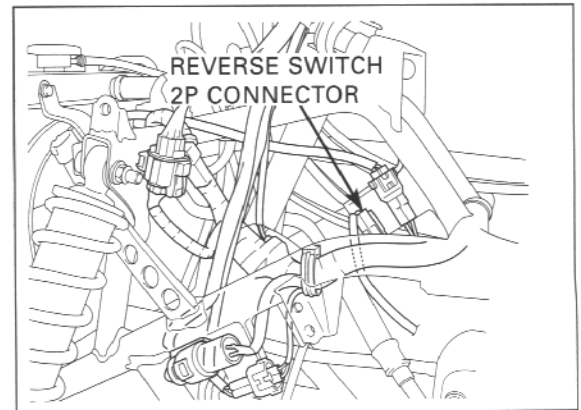
### INSPECTION

Remove the following:

- left side cover (page 2-4)
- left inner fender (page 2-6)

Disconnect the reverse switch 2P connector.  
Check for continuity between the switch side connector terminals.

There should be continuity with the gearshift lever in reverse position and no continuity with it in except reverse.



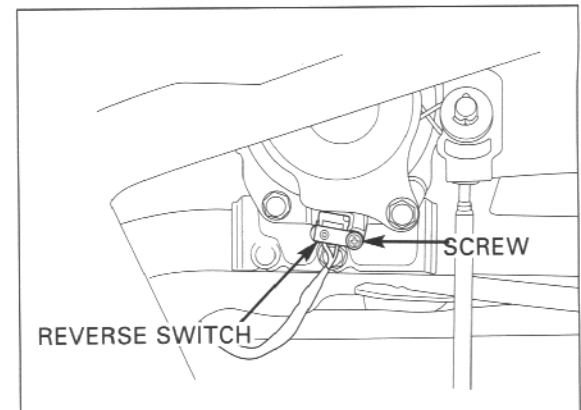
### REPLACEMENT

Remove the screw and the reverse switch.

Install a new reverse switch by aligning the locating pin with the hole in the gearshift box base.

Route the switch wire properly (page 1-19) and connect the 2P connector.

Install the removed parts in the reverse order of removal.



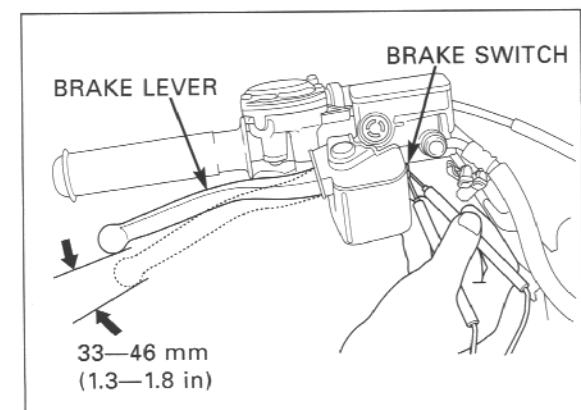
## FRONT BRAKE SWITCH

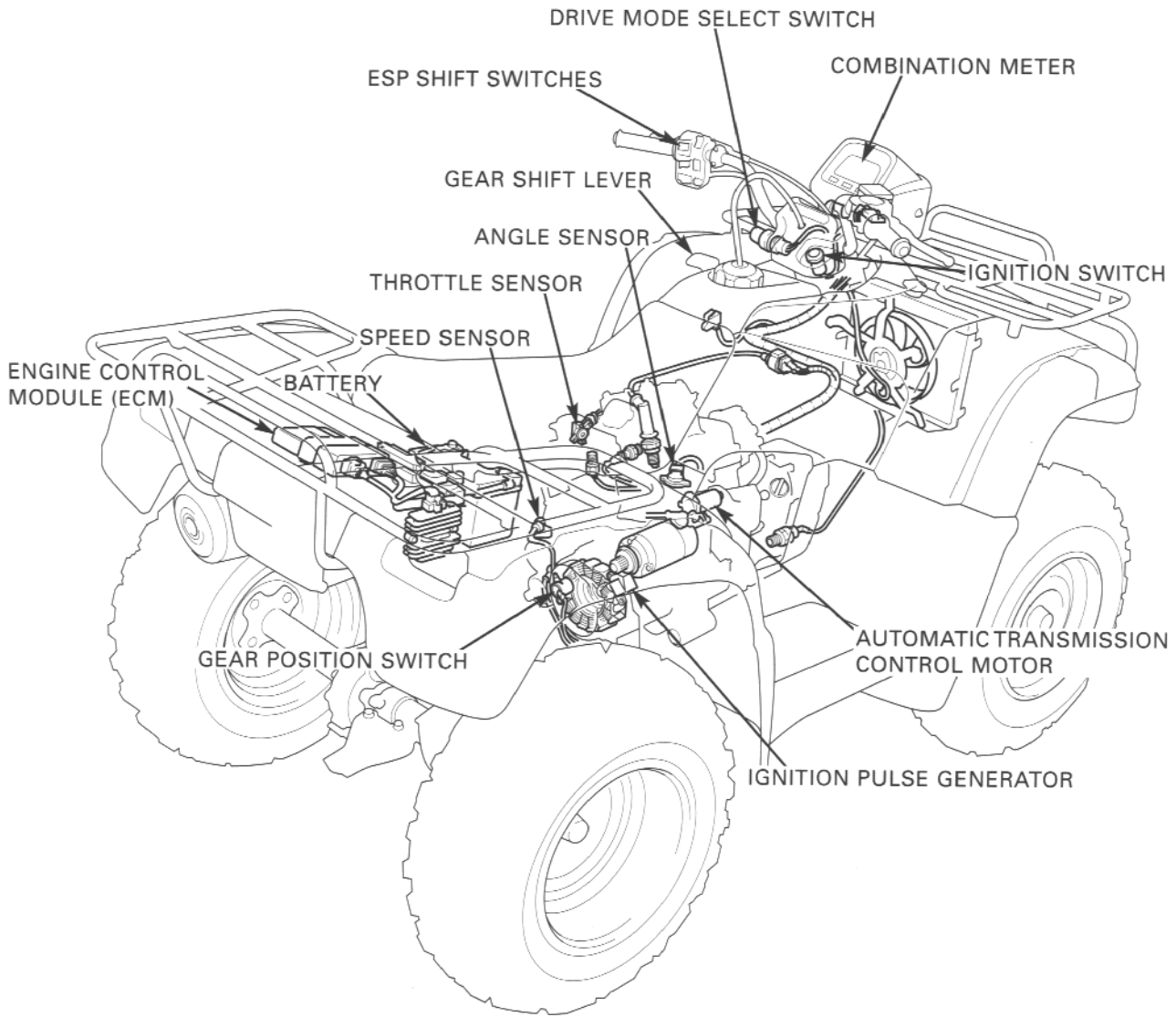
### INSPECTION

Check the front brake lever free play and adjust it if necessary (page 3-17).

Disconnect the brake switch wire connectors and check for continuity between the switch terminals.

There should be continuity with the front brake lever squeezed when the distance the brake lever stroke at the lever end is between 33—46 mm (1.3—1.8 in).  
There should be no continuity with the lever squeezed when the distance is out of above range and with the lever released.







# 23. HONDAMATIC

SERVICE INFORMATION	23-1	ESP SHIFT SWITCH	23-25
CONNECTOR LOCATION	23-2	MODE SELECT SWITCH	23-26
CIRCUIT DIAGRAM	23-3	THROTTLE SENSOR	23-27
BEFORE STARTING TROUBLESHOOTING	23-4	ANGLE SENSOR	23-29
TROUBLESHOOTING	23-8	CONTROL MOTOR	23-31
GEAR POSITION SWITCH	23-25	ENGINE CONTROL MODULE (ECM)	23-31

## SERVICE INFORMATION

### GENERAL

- This section covers service of the electrical system of the Hondamatic. The automatic transmission unit of the Hondamatic is mounted inside the crankcase. Removal/installation of the automatic transmission is accomplished by separating the crankcase (section 13). Refer to section 13 if drive performance failure is caused by the mechanical system.
- Do not disassemble the automatic transmission unit. Replace the automatic transmission unit as an assembly when it is faulty.
- Read "Before Starting Troubleshooting" carefully, and inspect and troubleshoot the Hondamatic system according to the Diagnostic Troubleshooting Flow Chart. Observe each step of the procedures one by one. Note the problem code and probable faulty part before starting diagnosis and troubleshooting.
- When the Engine Control Module (ECM) detects a problem with the Hondamatic system, it stops the automatic transmission function and the gear position indicator blinks "--".
- The ECM may be damaged if dropped. Also, if a connector is disconnected when current is flowing, the excessive voltage may damage the ECM. Always turn off the ignition switch before servicing.
- The following color codes used are indicated throughout this section.

Bu: Blue	G: Green	Lg: Light Green	R: Red
Bl: Black	Gr: Gray	O: Orange	W: White
Br: Brown	Lb: Light Blue	P: Pink	Y: Yellow

# SYSTEM WIRING CONNECTIONS/LOCATIONS

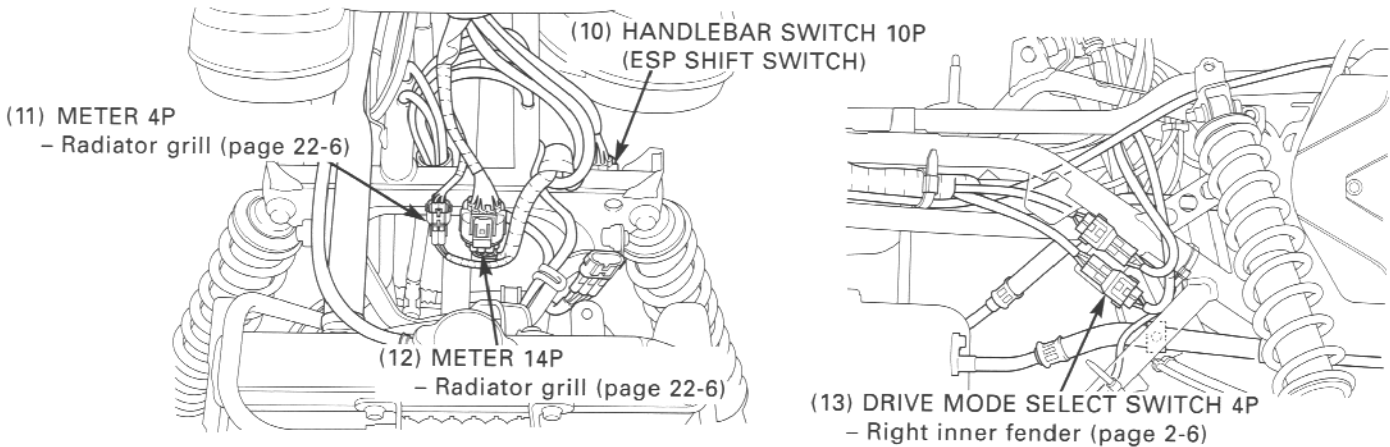
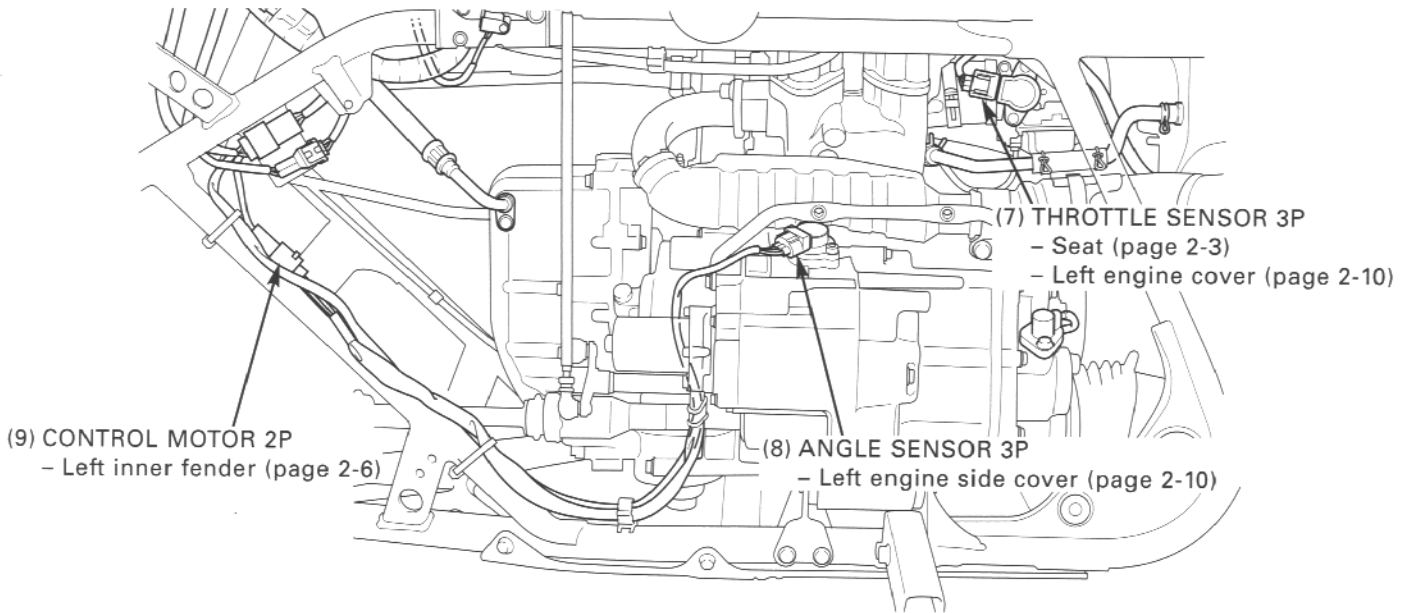
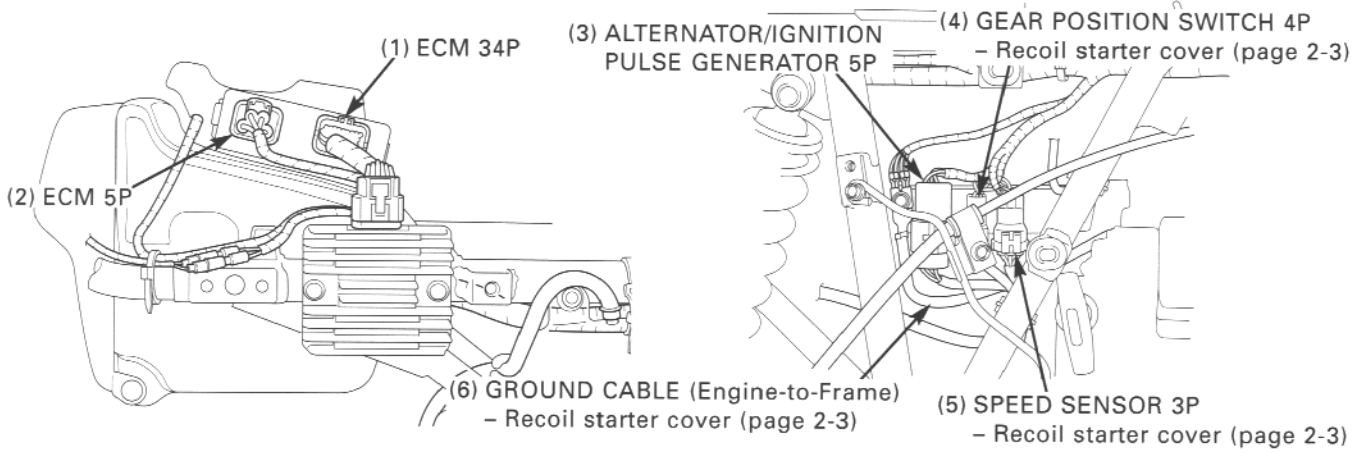
Refer to section 2 for the parts that must be removed for service.

For example: (5) SPEED SENSOR 3P

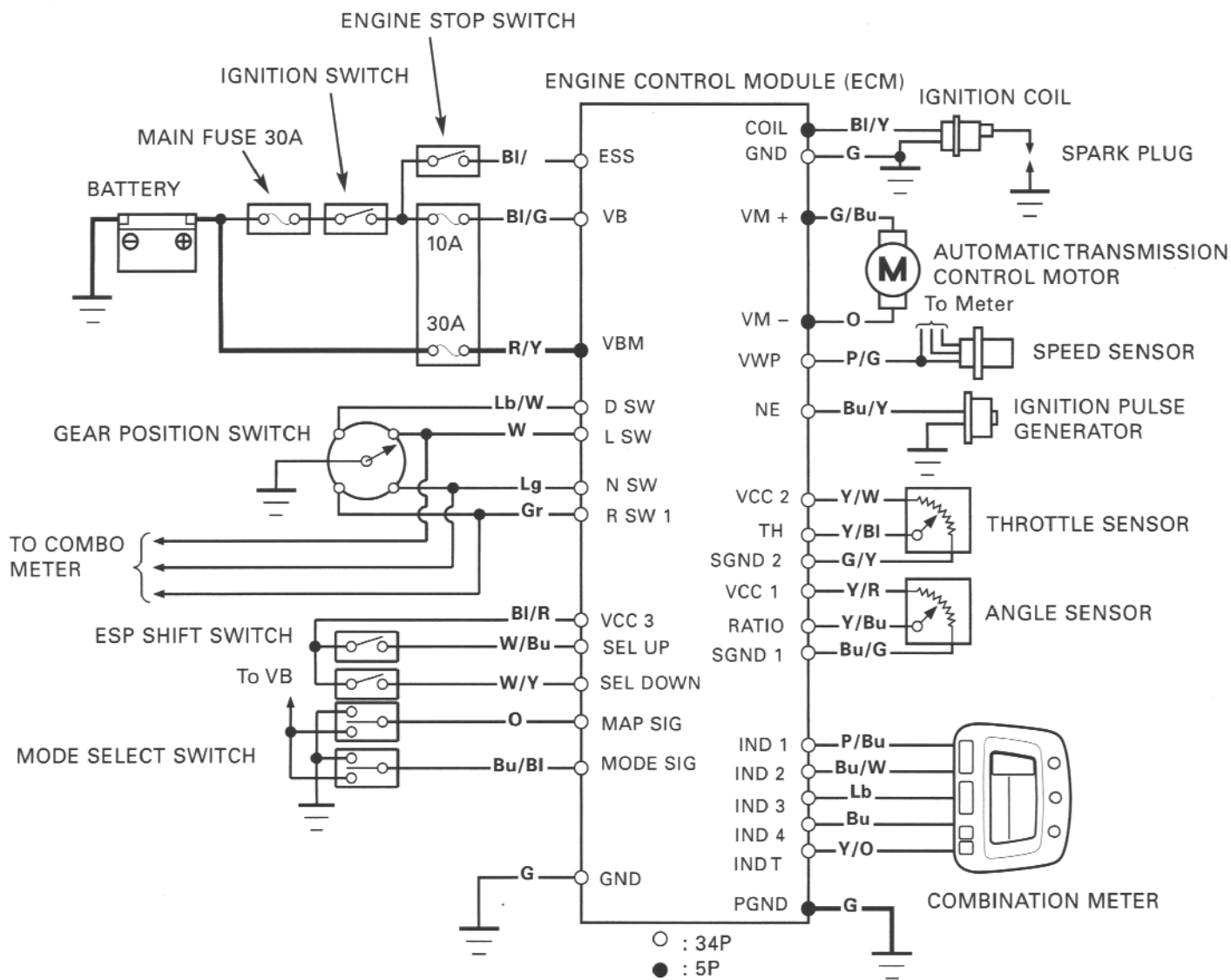
- Recoil starter cover (page 2-3)

← Electric component

← The part that must be removed for service



# CIRCUIT DIAGRAM



ESS: Engine Stop Switch  
 VB: Battery Voltage  
 VBM: Main Battery Voltage  
 DSW: Drive Switch  
 LSW: Low Switch  
 NSW: Neutral Switch  
 RSW: Reverse Switch  
 VCC3: Voltage Center Channel 3  
 SEL UP: Selector Up  
 SEL DOWN: Selector Down  
 MAP SIG: Map Signal

Mode SIG: Mode Signal  
 COIL: Ignition Coil  
 VM+: Motor Voltage +  
 VM-: Motor Voltage -  
 VWP: Wheel Pulse Voltage  
 NE: Number of Engine Revolution  
 VCC2: Voltage Center Channel 2  
 TH: Throttle  
 SGND2: Sensor Ground 2  
 VCC1: Voltage Center Channel 1  
 RATIO: RETIO (Throttle Retio)

SGND1: Sensor Ground 1  
 IND 1: Indicator 1 (Shift Indicator)  
 IND 2: Indicator 2 (Shift Indicator)  
 IND 3: Indicator 3 (Shift Indicator)  
 IND 4: Indicator 4 (Shift Indicator)  
 IND T: Indicator Top (Shift Indicator)  
 PGND: Power Ground

## BEFORE STARTING TROUBLESHOOTING

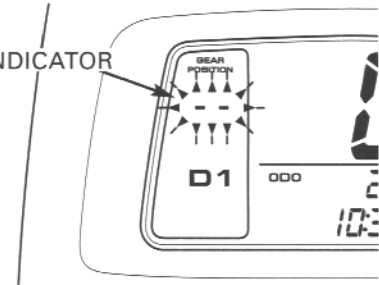
### SELF-DIAGNOSTIC FUNCTION

#### OUTLINE

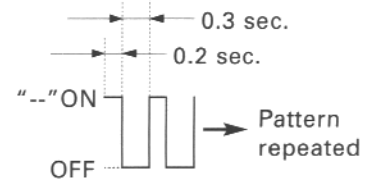
The engine control module (ECM) that controls the Hondamatic system has a self-diagnostic function to constantly monitor the system. When it detects a problem with the system, it functions as follows:

- the gear position indicator on the meter blinks to notify the rider of a problem
  - the shift control stops in a fail-safe mode
- The ECM checks the condition of the Hondamatic system by detecting the signals from each sensor, switch and control motor when the ignition switch is ON and during driving. When the ECM detects a problem, it indicates the problem by blinking "--" the gear position indicator (Indicator mode 1).
  - The Hondamatic system stops functioning when a problem occurs, but the vehicle can still drive. The shift function can be reset by turning the ignition switch OFF and ON, but the shift control stops when the ECM detects the problem again.
- The ECM stores the problem symptom as a problem code (page 23-8) in the erasable memory, but does not display it in indicator mode 1. Therefore, it is necessary to retrieve the problem code(s) before starting the diagnostic troubleshooting.

GEAR POSITION INDICATOR



INDICATOR MODE 1  
BLINK DURATION:



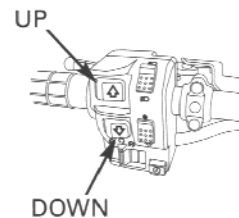
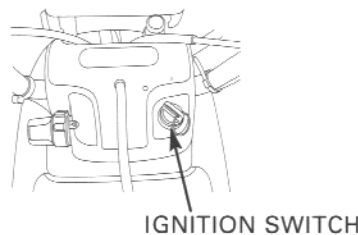
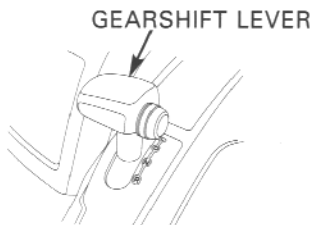
### RETRIEVAL/ERASURE OF PROBLEM CODE

#### NOTE:

- After retrieval, the problem code indicates the problem by number of blinks of "--" on the gear position indicator.
- The problem code is not erased by turning the ignition switch OFF while the problem code is being output. Note that turning the ignition switch ON again does not display the problem code. To show the problem code again, repeat the problem code retrieval procedures from the start.
- The ECM stores up to two problem codes and displays the latest problem code first, and then the earlier code alternately. When the two problem codes are displayed, begin diagnostic troubleshooting starting with the latest code (i.e, the code indicated first).
- Be sure to note the retrieval problem code(s).
- After performing diagnostic troubleshooting (including initial setting; page 23-6), erase the problem code(s) and test-drive the vehicle to be sure that the problem(s) has/have been removed.

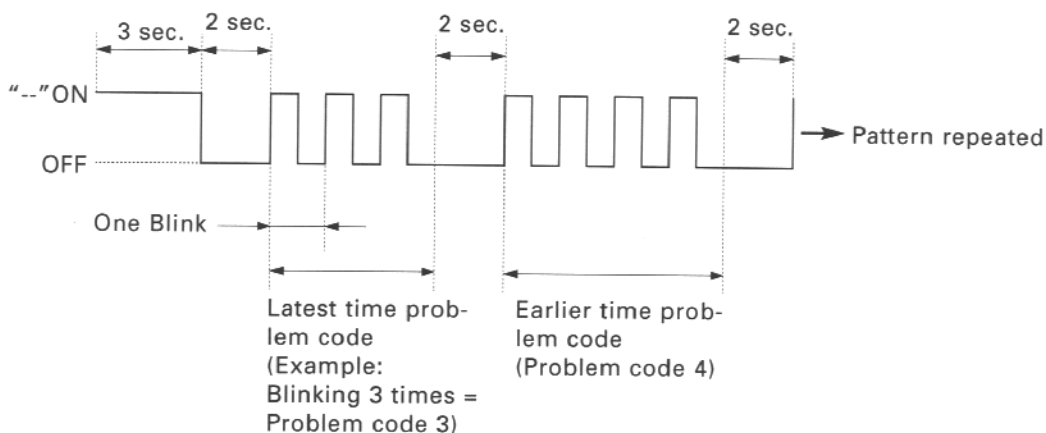
#### RETRIEVAL:

1. Put the gearshift lever in the neutral position (be sure that the neutral indicator comes on) and turn the ignition switch OFF (vehicle at a stop).
2. Turn the ignition switch ON while pushing the UP and DOWN shift switches (ESP shift switches) simultaneously.
3. Release the UP and DOWN shift switches immediately, then push the UP and DOWN shift switches simultaneously again for 2 seconds or more.
4. The problem code is displayed by a certain number of blinks "--" on the gear position indicator (see next page) which indicates the problem code by a certain number of blinks. (If "N" stays ON on the gear position indicator, the retrieval process was not correctly performed. Repeat the procedures from the step one this time)\*
5. When problem code displays, release the shift switches.



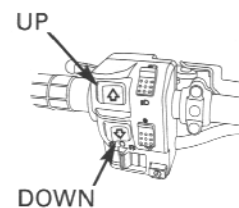
\* If the gear position indicator blinks (in mode 1), indicating a system failure before retrieving the problem code, but the problem cannot be retrieved by repeating the retrieval procedures, perform the diagnostic troubleshooting of Problem code 3 or 7 (page 23-8).

PROBLEM CODE BLINK DURATION (Indicating a problem code):

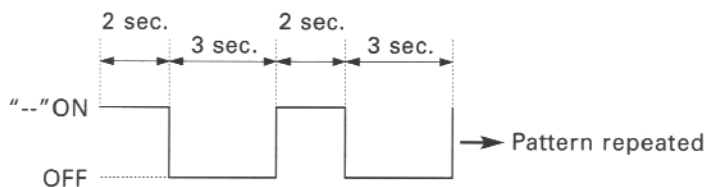


**TO ERASE THE PROBLEM CODE:**

1. Push the UP and DOWN shift switches simultaneously for 3 seconds or more while the problem code is being displayed (i.e., “---” blinking on the gear position indicator).
2. When the erasure is completed, the blinking pattern changes to the erasure confirmation blink.
3. Turn the ignition switch OFF.



ERASURE CONFIRMATION BLINK DURATION (Indicating erasure of problem code):



## INITIAL SETTING PROCEDURE

**NOTE:**

- After replacement of any of the following parts, perform the initial setting procedure below.

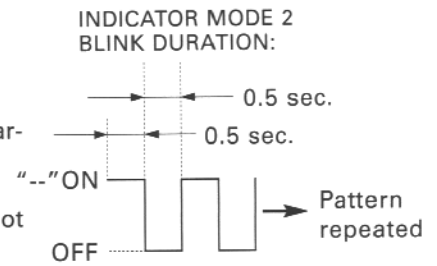
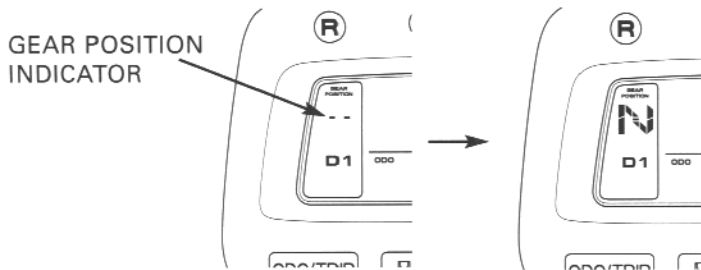
- ECM
- Throttle sensor\*
- Angle sensor

\*Also, perform the initial setting procedure if the throttle cable is disconnected (e.g., carburetor removal/installation, cable replacement etc.).

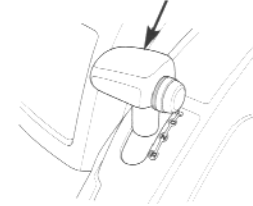
- The gear position indicator blinks in Indicator mode 2 when the initial setting was not made properly. Repeat the procedure from the step 2.
- The throttle cable freeplay must be within specification for the initialization procedure to be completed (page 3-4).

1. Start the engine and let it idle about 30 seconds with the sub-transmission in the neutral.
- Move the gear shift lever (while in the D1 mode) to the D position and check that the indicator shows D.
- Ride slowly forward for about 5 feet.
- Move the shift lever back to the neutral position (indicator shows N)
2. Make sure that the gear shift lever is in the neutral position (be sure that the neutral indicator comes on) and turn the ignition switch OFF.
3. Turn the ignition switch ON while pushing the UP and DOWN shift switches (ESP shift switch) simultaneously.
4. Release both the UP and DOWN shift switches immediately, then push and release the shift switches in the order of UP, DOWN and UP (Do not hold onto the switch).
5. A constant "--" indication stays on the gear position indicator.  
(If the gear position indicator shows the continuous lighting of "N", repeat the procedure from the step 2).
6. Move the throttle lever to the fully closed position, then to the fully opened position, and then move it to the fully closed position again immediately (10 seconds or less) after "--" appears on the gear position indicator.
7. Check the control motor operation sound (the control motor should function at this time to adjust the angle sensor).
8. When the initial setting procedure is complete, the indication on the gear position indicator changes from the continuous lighting of "--" to the continuous lighting of "N".

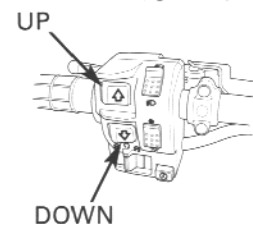
Initial setting procedure completed:



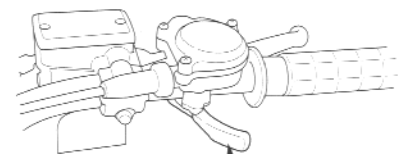
GEARSHIFT LEVER



IGNITION SWITCH



UP  
DOWN

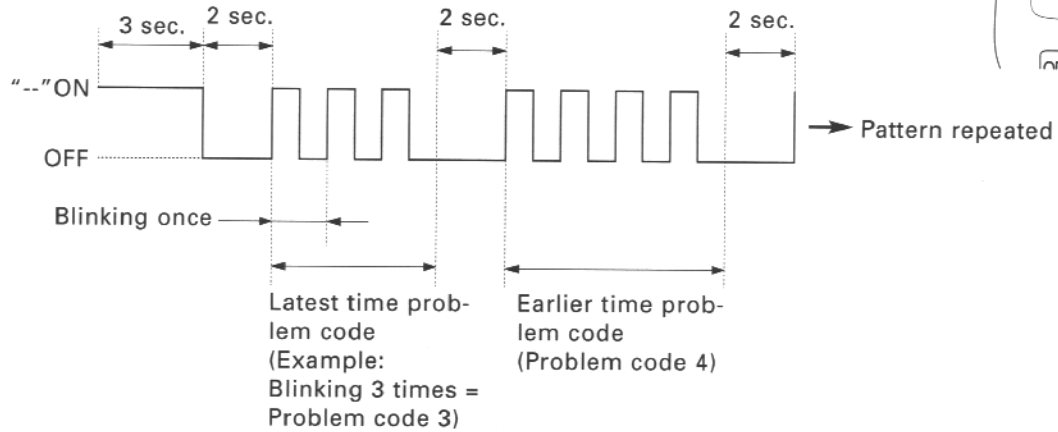


THROTTLE LEVER

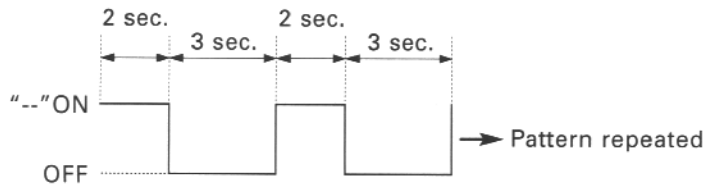
**GEAR POSITION INDICATOR BLINK PATTERNS**

**AT OUTPUT/ERASURE OF PROBLEM CODE**

Problem code blink duration (problem code display):

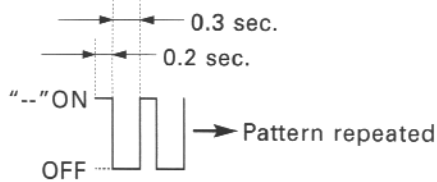


Erasure code confirmation blink duration (Indicating erasure of problem code):



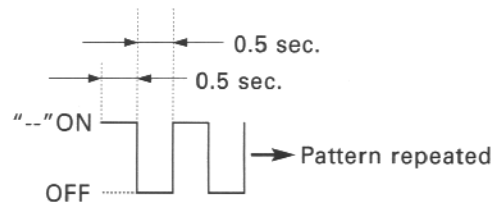
**WHEN HONDAMATIC SYSTEM FAILURE OCCURS**

Mode 1 blink duration:



**WHEN INITIAL SETTING PROCEDURE IS PERFORMED INCORRECTLY**

Mode 2 blink duration:



# TROUBLESHOOTING

## TROUBLESHOOTING CHART

Problem code	Check part and system	Probable faulty part	Reference page
1	Ignition pulse generator system (Engine speed)	<ul style="list-style-type: none"> <li>Ignition pulse generator or related wire harness</li> <li>ECM</li> </ul>	23-9
2	Speed sensor system (Vehicle speed)	<ul style="list-style-type: none"> <li>Speed sensor or related wire harness</li> <li>ECM</li> </ul>	23-10
3	Gear position switch system (L, D, N, R)	<ul style="list-style-type: none"> <li>Gear position switch or related wire harness</li> <li>ECM</li> </ul>	23-11
4	Throttle sensor system (Throttle angle)	<ul style="list-style-type: none"> <li>Throttle sensor or related wire harness</li> <li>ECM</li> </ul>	23-12
5	Angle sensor system (Motor lock)	<ul style="list-style-type: none"> <li>Angle sensor or related wire harness</li> <li>ECM</li> <li>Control motor</li> <li>Motor transmission section</li> <li>Automatic transmission unit</li> </ul>	23-14
6	Angle sensor system (Swash plate angle)	<ul style="list-style-type: none"> <li>Angle sensor or related wire harness</li> <li>ECM</li> </ul>	23-17
7	ESP shift switch system (Up and down)	<ul style="list-style-type: none"> <li>Shift switch or related wire harness</li> <li>ECM</li> </ul>	23-19
8	ECM EEPROM (Writing/Readout circuit)	<ul style="list-style-type: none"> <li>ECM</li> </ul>	23-20
9	ECM voltage converter circuit		23-20
10	ECM fail-safe relay circuit		23-20
11	ECM motor driver circuit		23-21
12	ECM CPU		23-20
Problem code not retrievable* (Same circuit as of code 3 or 7)			<ul style="list-style-type: none"> <li>Gear position switch or related wire harness</li> <li>Shift switch or related wire harness</li> </ul>
Problems not detected by ECM** (Faulty gear position or drive mode indication)		<ul style="list-style-type: none"> <li>Gear position switch or related wire harness</li> <li>Mode select switch or related wire harness</li> <li>Combination meter or related wire harness</li> <li>ECM</li> </ul>	23-23

\* See Code retrieval procedure on page 23-4: When the gear position switch neutral position is faulty or the up and down shift switch is faulty, the problem code cannot be retrieved even though the retrieval procedure is properly performed.

\*\*For mechanical performance failure of the vehicle, see Section 13 troubleshooting.

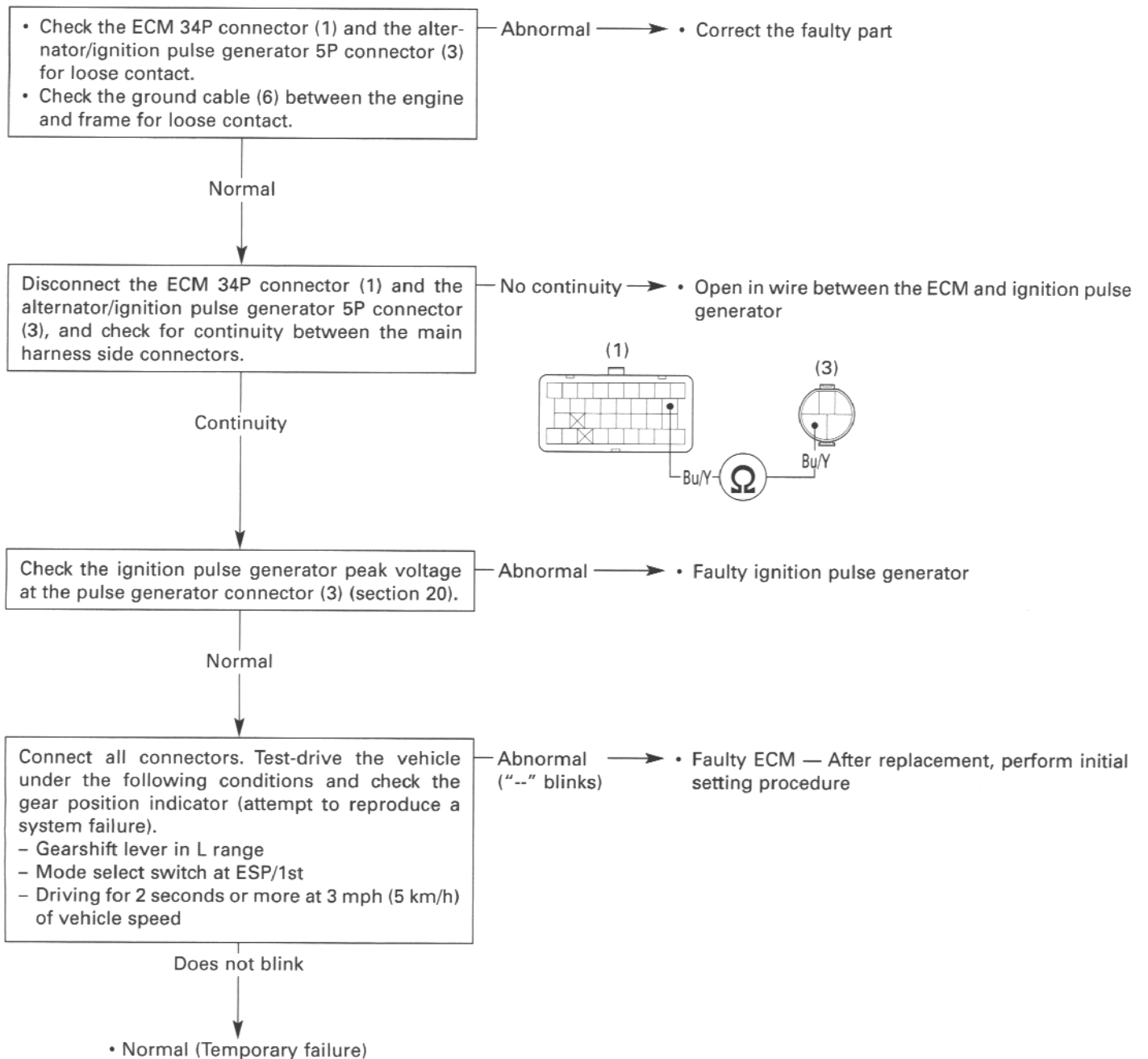


**DIAGNOSTIC TROUBLESHOOTING FLOW CHART**

NOTE:

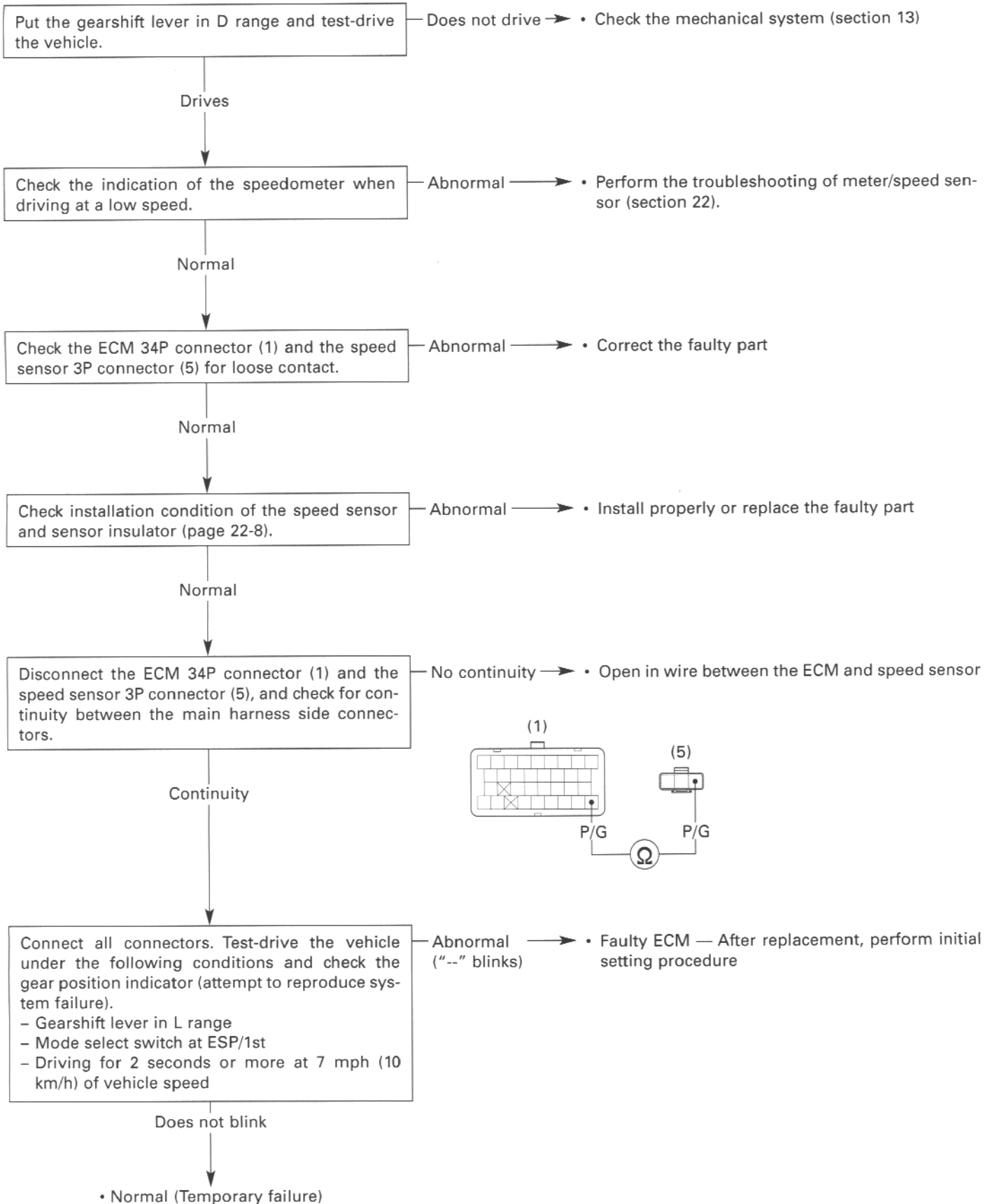
- The connector number (number in parentheses) indicates the connector location as shown on page 23-2.
- Perform inspection with the ignition switch turned OFF, unless otherwise specified.
- Check the following **before** starting troubleshooting using the flow chart.
  - Battery voltage (12.3V or more)
  - Fuses
  - Relevant connectors/components for water or loose contact.
- After troubleshooting, erase the problem code and test-drive the vehicle to be sure that the system is normal.

**Problem Code 1: Ignition pulse generator system**

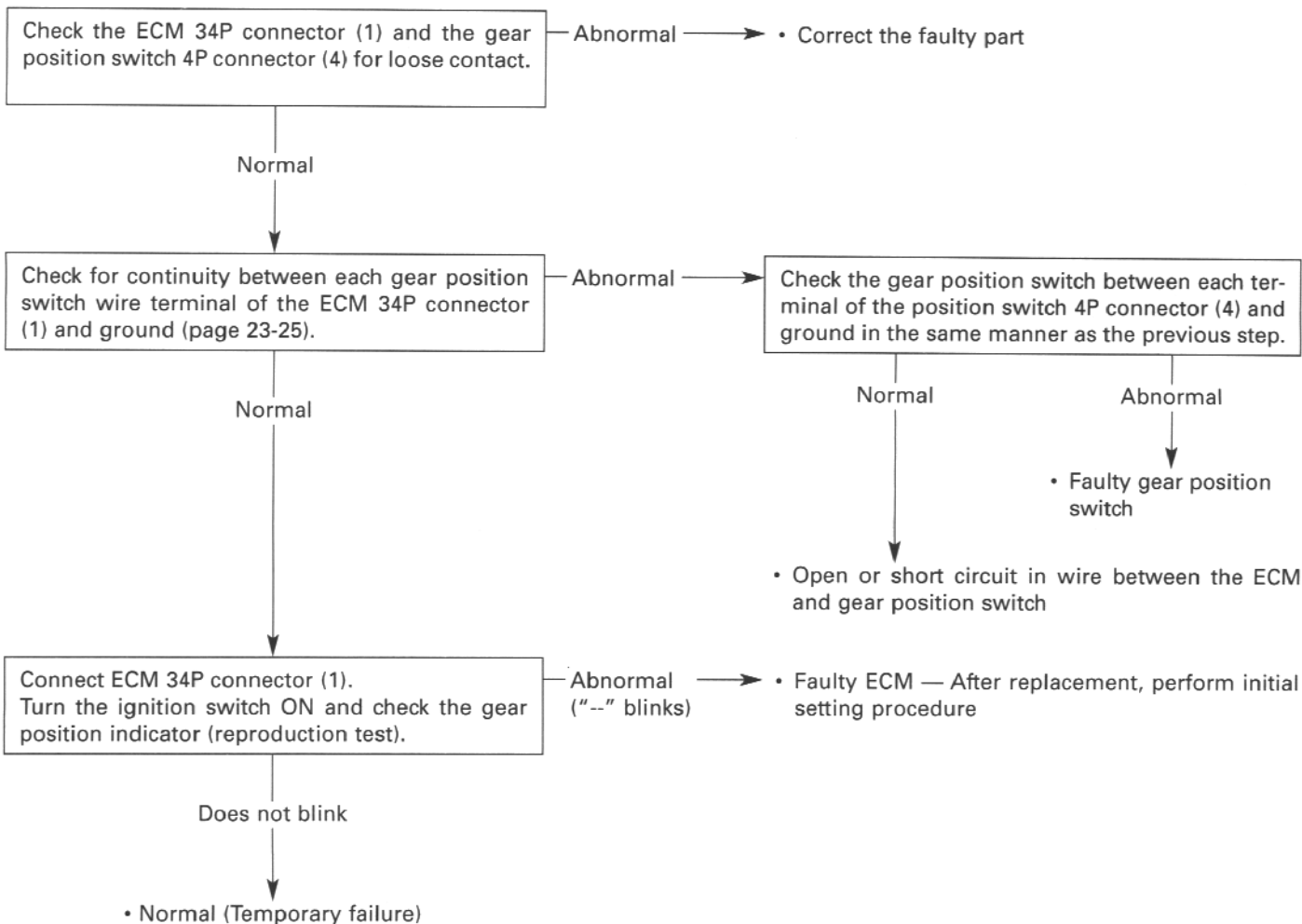


# HONDAMATIC

## Problem Code 2: Speed sensor system

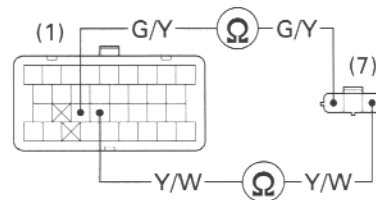
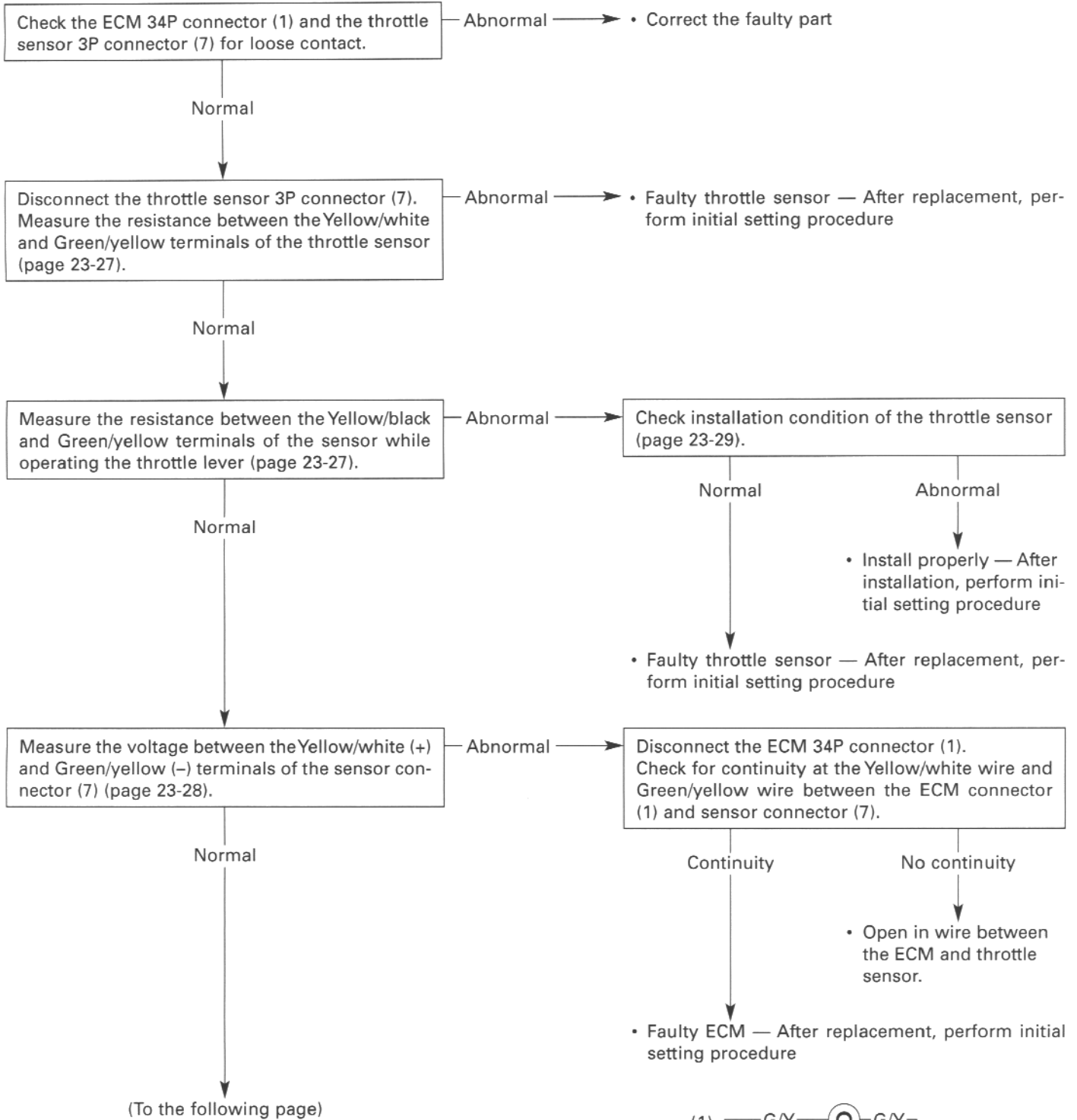


**Problem Code 3: Gear position switch system**



# HONDAMATIC

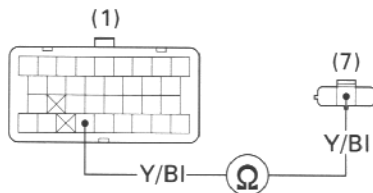
## Problem Code 4: Throttle sensor system



(From the previous page)

Disconnect the ECM 34P connector (1).  
Check for continuity on the Yellow/black wire between the ECM connector (1) and sensor connector (7) .

No continuity → • Open in wire between the ECM and speed sensor



Continuity

Connect all connectors (1)/(7).  
Turn the ignition switch ON and check the gear position indicator (attempt to reproduce a system failure).

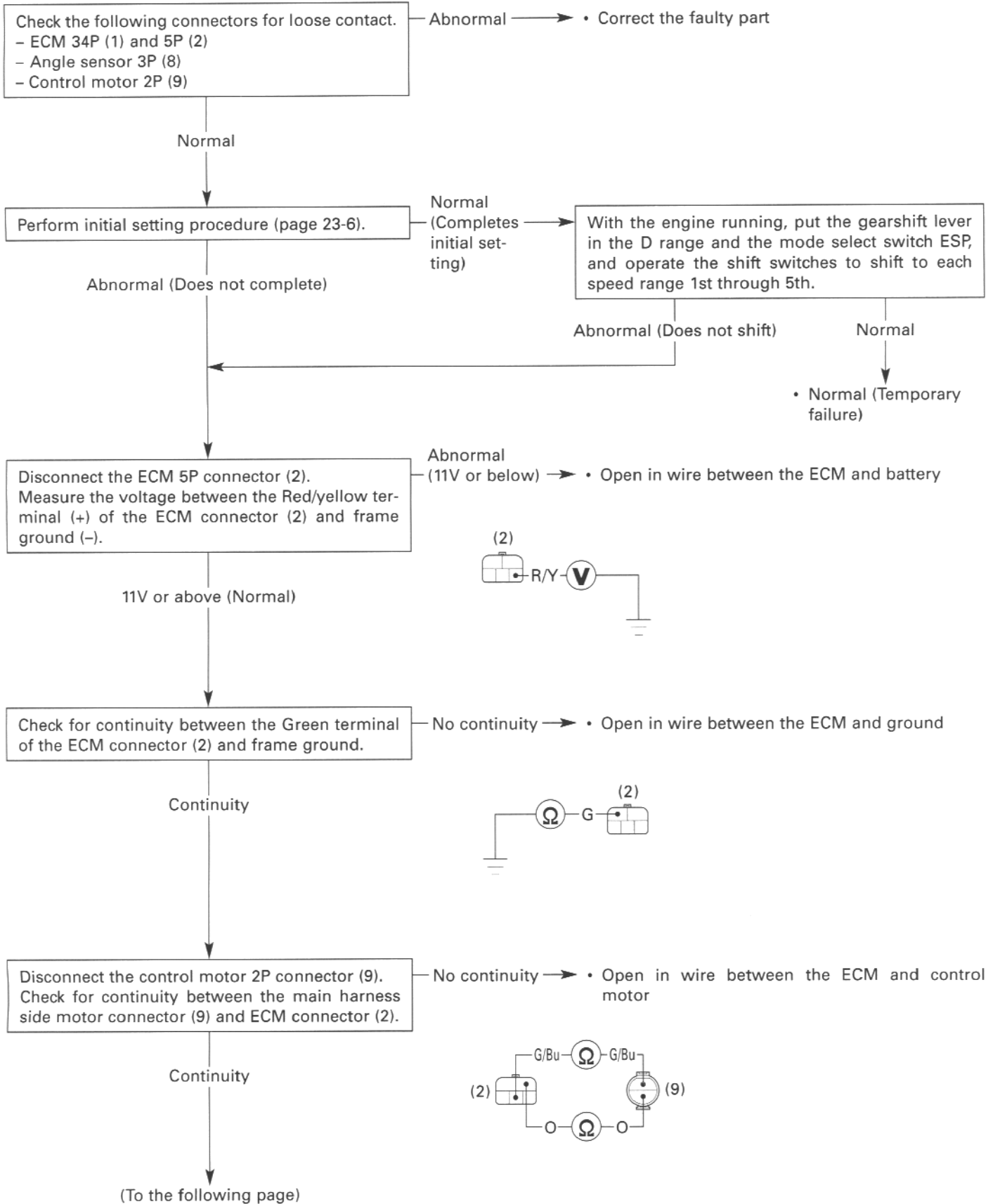
Abnormal ("--" blinks) → • Faulty ECM — After replacement, perform initial setting procedure

Does not blink

• Normal (Temporary failure)

# HONDAMATIC

## Problem Code 5: Angle sensor system (Motor lock)

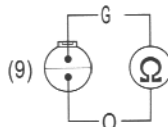


(From the previous page)

Check for continuity between the motor side connector (9) terminals.

No continuity → • Faulty control motor

Continuity

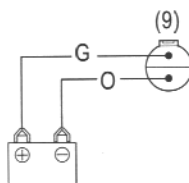


Remove the control motor from the crankcase (page 23-31).

Be extremely careful not to distort or apply force to the grommet or water may enter the engine.

Connect the battery directly to the motor side connector (9) terminal and check whether the control motor rotates. (Do not use a thin wire because a large amount of current flows)

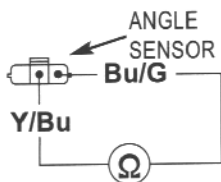
Does not rotate → Faulty control motor.



Rotates

Disconnect the angle sensor 3P connector (8). Measure the sensor resistance between the Yellow/blue and Blue/green terminals of the angle sensor with the sensor installed on the crankcase.

Released (Turns freely) → • Temporary failure (ball nut was locked)



NOTE:

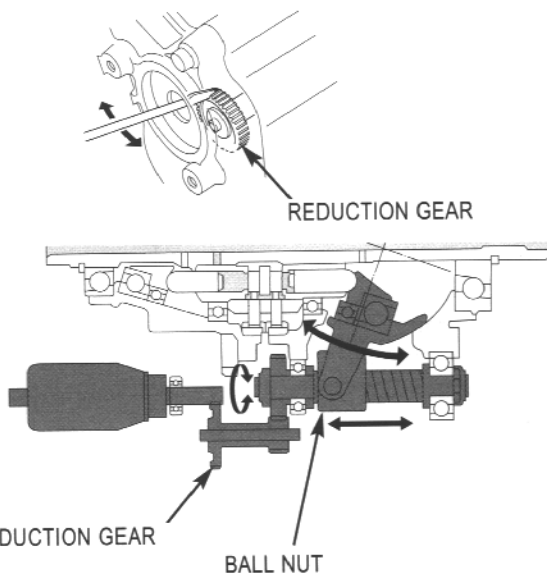
- The ball nut of the automatic transmission unit can strike the shaft end and lock up. This is just a temporary symptom. In this case, be sure that the reduction gear turns smoothly after releasing it.

Check angle sensor resistance and turn the reduction gear in the direction as follows:

- 0.8 kΩ or below (locked at lower side): Turn clockwise
- 1.2 kΩ or more (locked at high side): Turn counterclockwise

Try to move the motor reduction gear in the crankcase by inserting a screwdriver through the motor shaft hole to release the ball nut.

Cannot turn reduction gear → • Faulty transmission unit



Rotates

(To the following page)

(From the previous page)

Disconnect the ECM 34P connector (1).  
Measure the angle sensor resistance between the Yellow/red and Blue/green terminals of the ECM connector (page 23-29).

Abnormal

Disconnect the angle sensor connector (8).  
Check for continuity on both the Yellow/red wire and Blue/green wire between the sensor connector (8) and ECM connector (1).

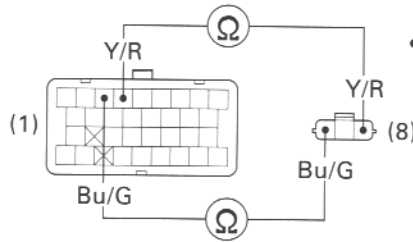
Normal

Continuity

No continuity

- Open in wire between the ECM and angle sensor

- Faulty angle sensor — After replacement, perform initial setting procedure

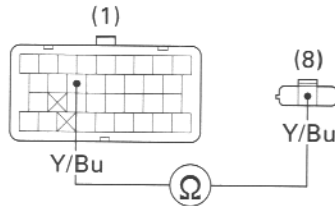


Disconnect the angle sensor 3P connector (8).  
Check for continuity on the Yellow/ blue wire between the ECM connector (1) and sensor connector (8).

No continuity

- Open in wire between the ECM and angle sensor

Continuity



Connect the ECM 34P connector (1) and ECM 5P connector (2).  
Measure the voltage between the Yellow/red terminal (+) and Blue/green (-) terminal of the angle sensor 3P connector (8) (page 23-30).

Abnormal

- Faulty ECM — After replacement, perform initial setting procedure

Normal

Measure the sensor resistance between the Yellow/blue terminal and Blue/green terminal of the angle sensor while turning the sensor shaft (page 23-31).

Abnormal

- Faulty angle sensor — After replacement, perform initial setting procedure

Normal

- Faulty ECM — After replacement, perform initial setting procedure



**Problem Code 6: Angle sensor system (Automatic transmission swash plate angle)**

Check the ECM 34P connector (1) and the angle sensor 3P connector (8) for loose contact.

Abnormal → • Correct the faulty part

Normal

Disconnect the ECM 34P connector (1). Measure the sensor resistance between the Yellow/red and Blue/green terminals of the ECM connector (page 23-29).

Abnormal →

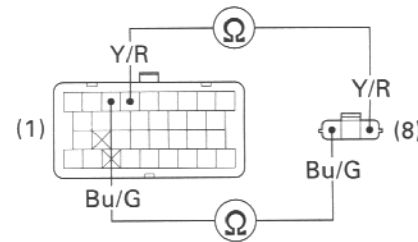
Disconnect the angle sensor connector (8). Check for continuity at the Yellow/red wire and Blue/green wire between the sensor connector (8) and ECM connector (1).

Continuity

No continuity

• Open in wire between the ECM and angle sensor

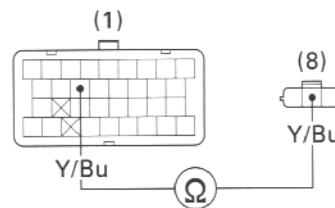
• Faulty angle sensor — After replacement, perform initial setting procedure



Disconnect the angle sensor 3P connector (8). Check for continuity between the at the Yellow/blue wire between the ECM connector (1) and sensor connector (8) .

No continuity → • Open in wire between the ECM and angle sensor

Continuity



Connect the ECM connector (1). Measure the voltage between the Yellow/red terminal (+) and Blue/green (-) terminal of the angle sensor 3P connector (8) (page 23-30).

Abnormal → • Faulty ECM — After replacement, perform initial setting procedure

Normal

(To the following page)

(From the previous page)

Check installation of the angle sensor (page 23-30).

Abnormal

• Install properly — After installation, perform initial setting procedure

Normal

Measure the angle sensor resistance between the Yellow/blue terminal and Blue/green terminal of the angle sensor while turning the sensor shaft (page 23-30).

Abnormal

• Faulty angle sensor — After replacement, perform initial setting procedure

Normal

Install the angle sensor properly (page 23-30). Turn the ignition switch ON and check the gear position indicator (attempt to reproduce a system failure).

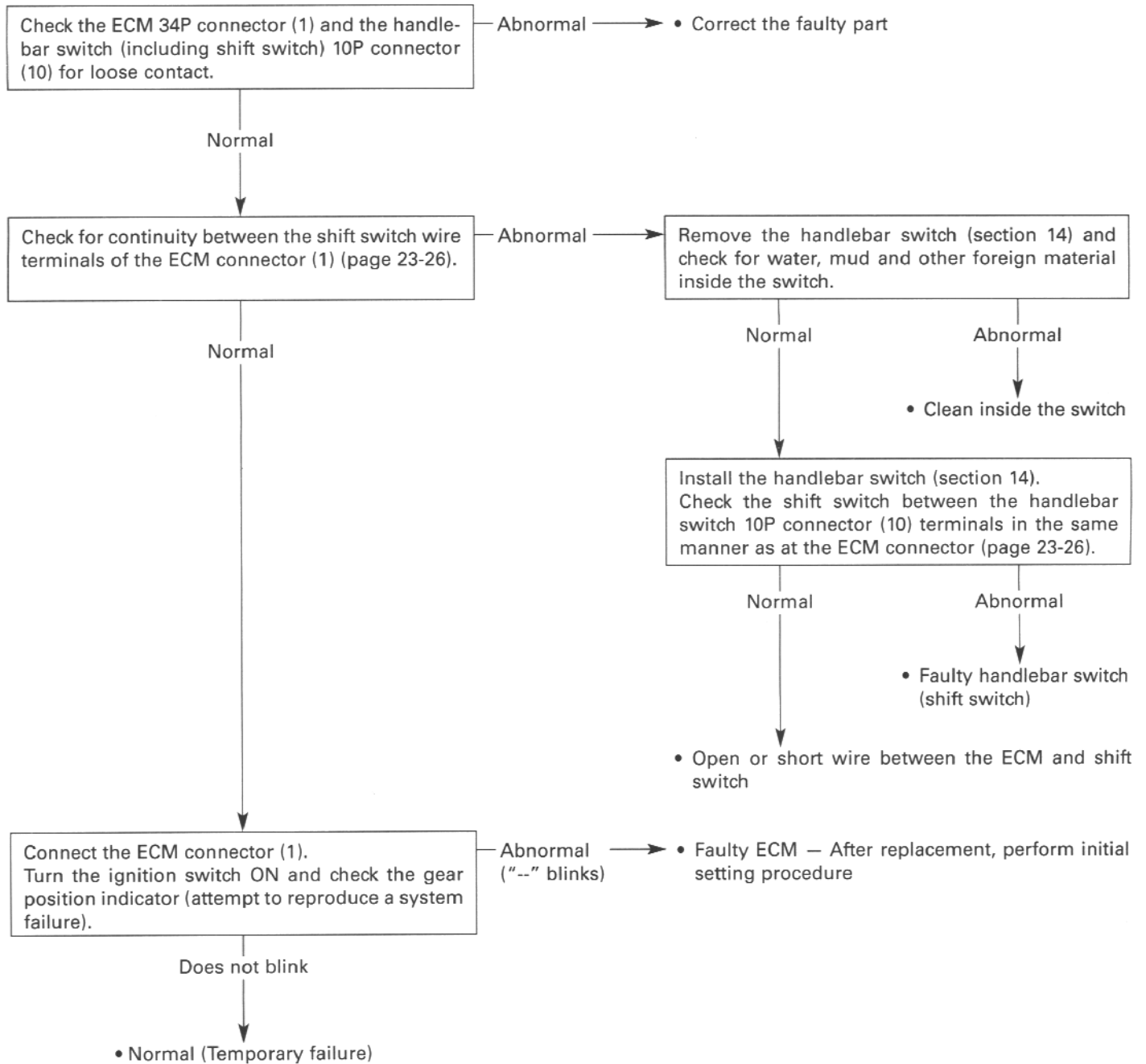
Abnormal ("--" blinks)

• Faulty ECM — After replacement, perform initial setting procedure

Does not blink

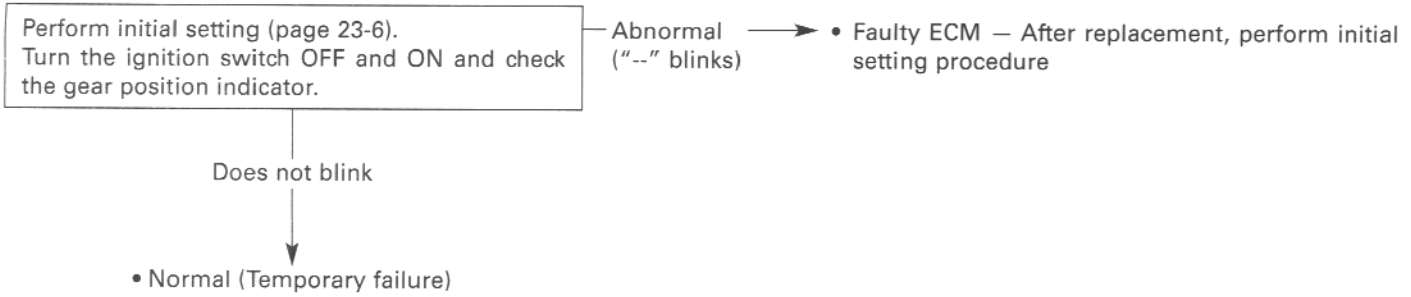
• Normal (Temporary failure)

**Problem Code 7: ESP shift switch system**

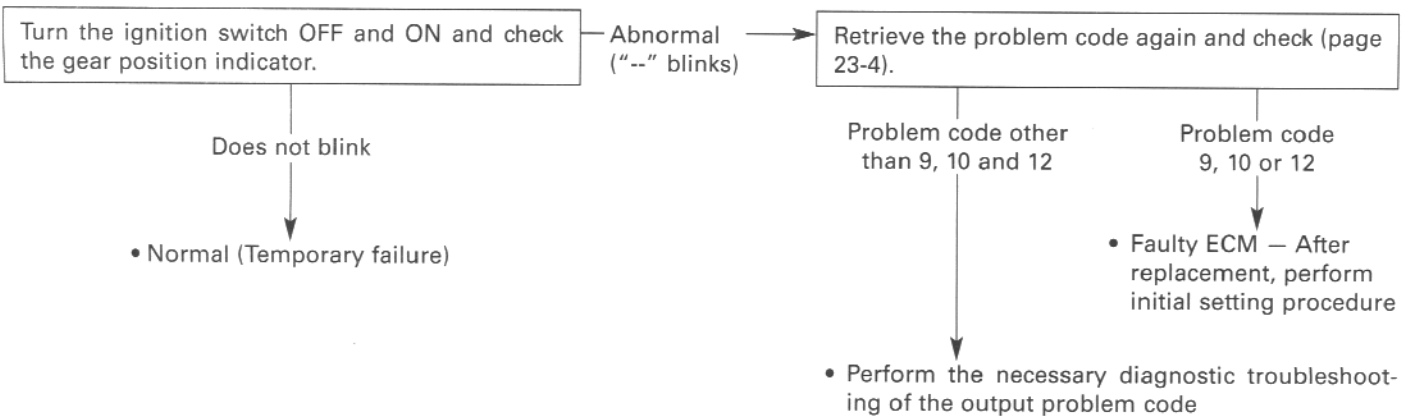


# HONDAMATIC

## Problem Code 8: ECM EEPROM (Writing/Readout circuit)



## Problem Code 9 · 10 · 12: ECM voltage converter circuit · ECM fail-safe relay circuit · ECM CPU



**Problem Code 11: ECM motor driver circuit**

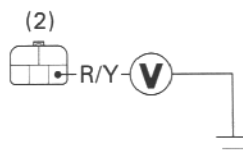
Check the ECM 5P connector (2) and the control motor 2P connector (9) for loose contact.

Abnormal → • Correct the faulty part

Normal

Disconnect the ECM 5P connector (2). Measure the voltage between the Red/yellow terminal (+) of the ECM connector (2) and frame ground (-).

Abnormal (11V or below) → • Open in wire between the ECM and battery

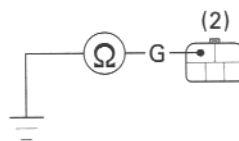


11V or above (Normal)

Check for continuity between the Green terminal of the ECM connector (2) and frame ground.

No continuity → • Open in wire between the ECM and ground

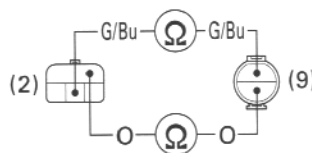
Continuity



Disconnect the control motor 2P connector (9). Check for continuity between the main harness side motor connector (9) and ECM connector (2).

No continuity → • Open in wire between the ECM and control motor

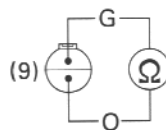
Continuity



Check for continuity between the motor side connector (9) terminals.

Abnormal → • Faulty control motor

Normal



(To the following page)

## HONDAMATIC

---

(From the previous page)

Connect all connectors (2)/(9).  
Turn the ignition switch ON and check the gear position indicator (attempt to reproduce a system failure).

Abnormal  
("--" blinks)

• Faulty ECM — After replacement, perform initial setting procedure

Does not blink

• Normal (Temporary failure)

**Problem indicated (Mode 1), but no code is retrievable** (Gear position indicator blinks indicating a problem, but the problem code is not displayed by the retrieval procedure):

### Automatic transmission does not shift (D1/D2 mode)

- Perform troubleshooting of problem code 3 (gear position switch system) (page 23-11).

### Automatic transmission does not shift (ESP mode)

Turn the ignition switch ON and check the gear position indicator.

No indication

• Perform troubleshooting of the problem code 3 (Gear position switch system) (page 23-11).

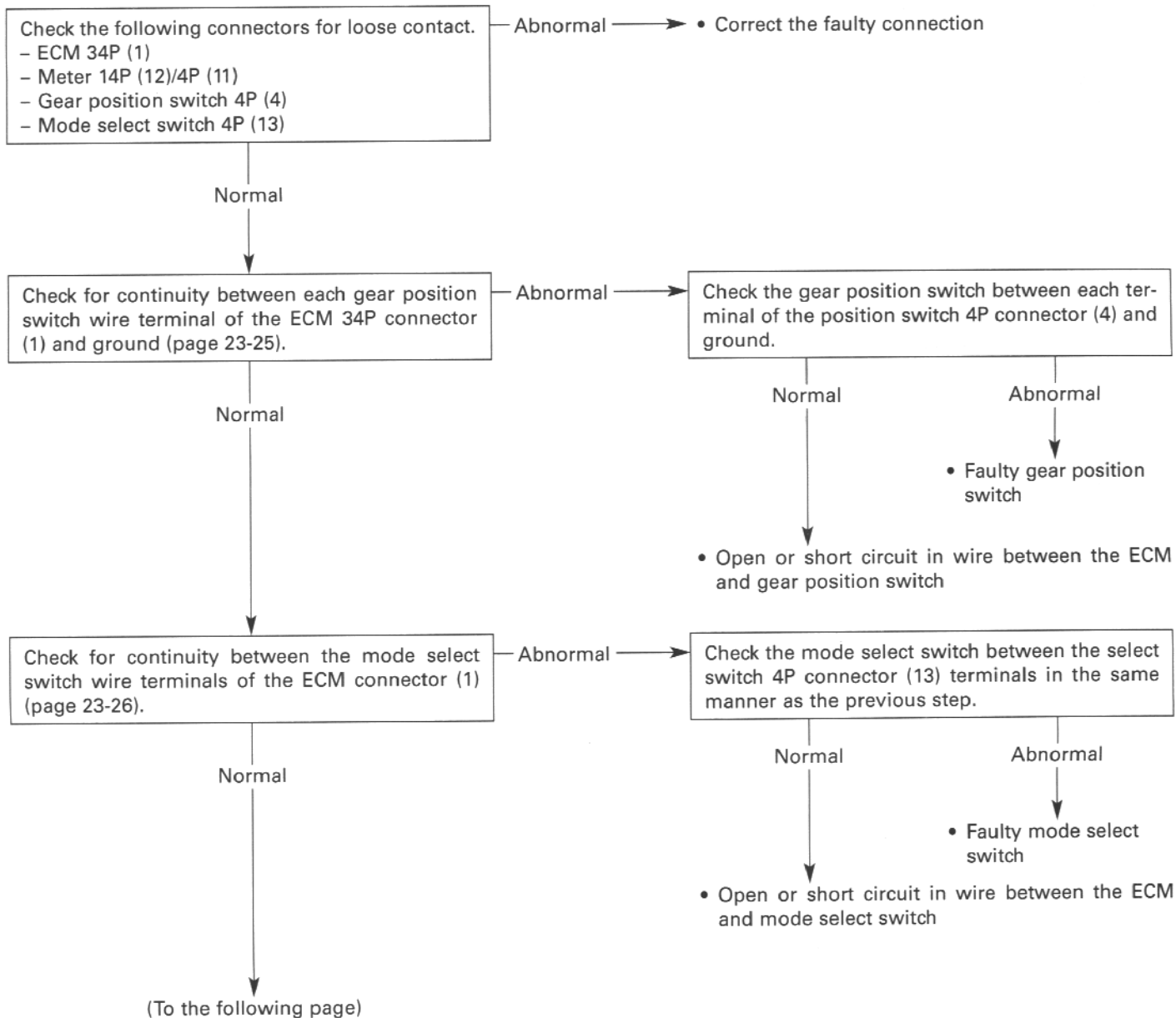
Indicates gear position (L·D·N·R)

- Perform troubleshooting of the problem code 7 (ESP shift switch system) (page 23-19).

**Problems Not Detected by ECM** (Gear position indicator does not blink to notify a problem and the problem code is not recorded):

**Faulty gear position indicator and/or drive mode indicator (No indication/Stuck indication/Incorrect indication)**

- See section 22 for the meter function problems (except for the gear position indicator and drive mode indicator).



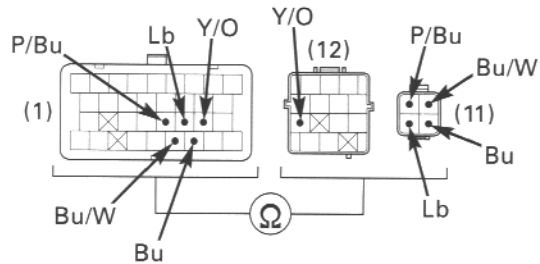
# HONDAMATIC

(From the previous page)

Disconnect the meter 14P connector (12)/4P connector (11).  
 Check for continuity at the following wires between the main harness side meter connector (12)/(11) and ECM connector (1) in the same wire color terminals.

- Yellow/orange
- Pink/blue
- Blue/white
- Light blue
- Blue

No continuity → • Open in wire between the ECM and combination meter



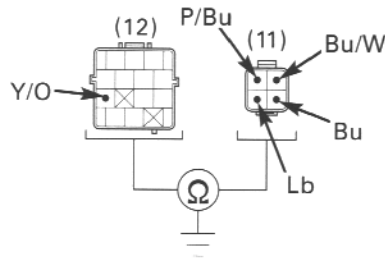
Continuity

Connect the ECM connector (1).  
 Put the gearshift lever in the L range and the mode select switch at ESP.  
 Turn the ignition switch ON, and check for continuity between each of the following wire terminals of the main harness side meter connector (12)/(11) and the frame ground.

- Yellow/orange
- Pink/blue
- Blue/white
- Light blue
- Blue

There must be continuity at the Pink/blue wire and Light blue wire only.

No continuity → • Faulty combination meter



Continuity

- Faulty ECM — After replacement, perform initial setting procedure



## GEAR POSITION SWITCH

### INSPECTION

Disconnect the ECM 34P connector.

Check for continuity between each gear position switch wire terminal of the ECM connector and ground.

There should be continuity only at the terminals that correspond to the gear positions shown below, and there should be no continuity at the other terminals. You must test each of the four wires in each gear position. Therefore, you need to make 16 tests, between each gear position switch wire terminal and ground.

GEAR POSITION	WIRE COLOR					
	W	Lb/W	Lg/R	Gr	GND	
LOW	1	2	3	4		
DRIVE	5	6	7	8		
NEUTRAL	9	10	11	12		
REVERSE	13	14	15	16		

If the continuity is abnormal, disconnect the gear position switch 4P (white) connector, and check for continuity between each terminal of the switch side 4P connector and ground in the same manner as the previous step.

- If the continuity at the ECM is abnormal and continuity at the 4P connector is normal, check for open or short circuit, or loose or poor connector contact.
- If the both continuities are abnormal, replace the gear position switch.

### REPLACEMENT

Remove the recoil starter cover (page 2-3).

Release the gear position switch wire from the clamp and clips.

Shift the sub-transmission into neutral.

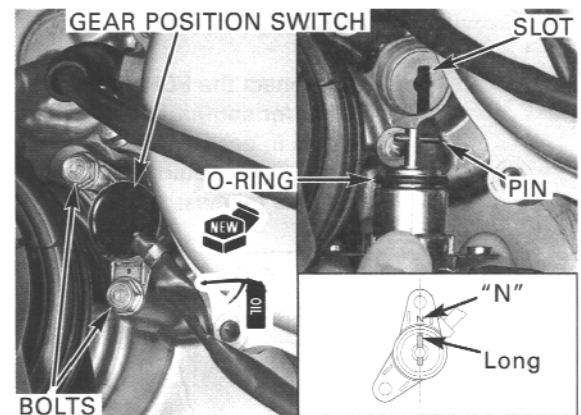
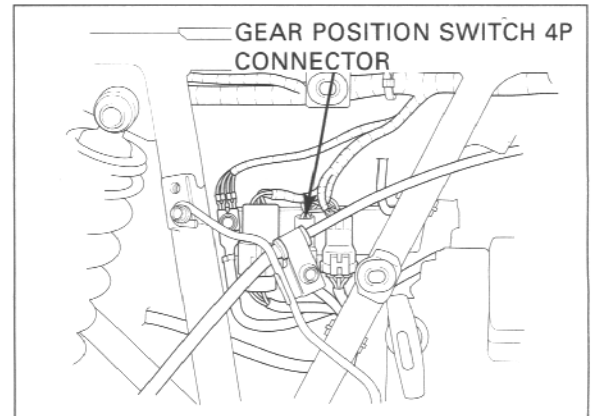
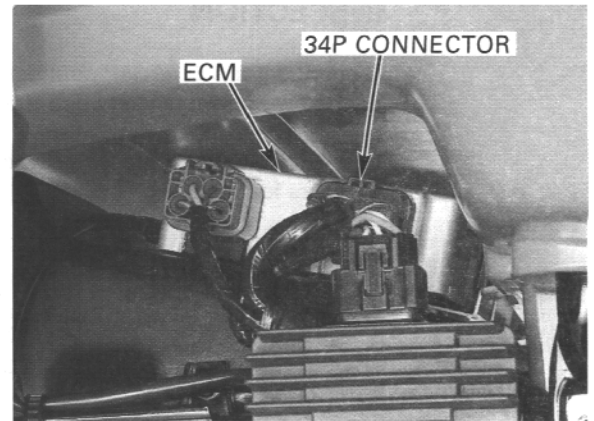
Remove the two bolts and the gear position switch from the crankcase cover.

Coat a new O-ring with engine oil and install it onto a new gear position switch.

Align the long end of the switch pin with the "N" mark. Install the gear position switch by aligning the switch pin with the slot in the crankcase cover being careful not to damage the switch pin.

Install the bolts and tighten them.

Route the wires and tube properly (page 1-19).



## ESP SHIFT SWITCH

NOTE:

- The automatic transmission can shift and the meter indicates the shift position (1 through 5) with the following conditions:
  - Mode select switch at ESP (Electric Shift Program)
  - Gearshift lever (Sub-transmission) in D or L range
  - Engine is running

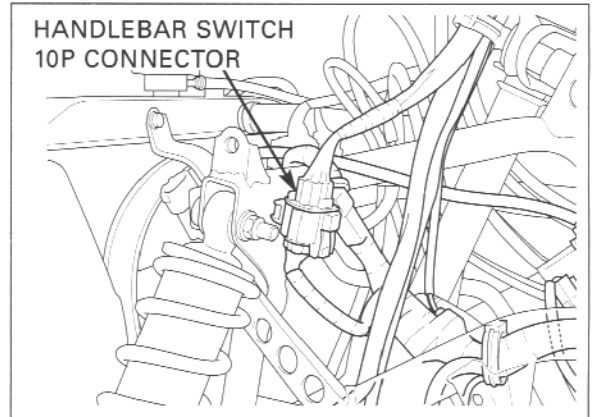
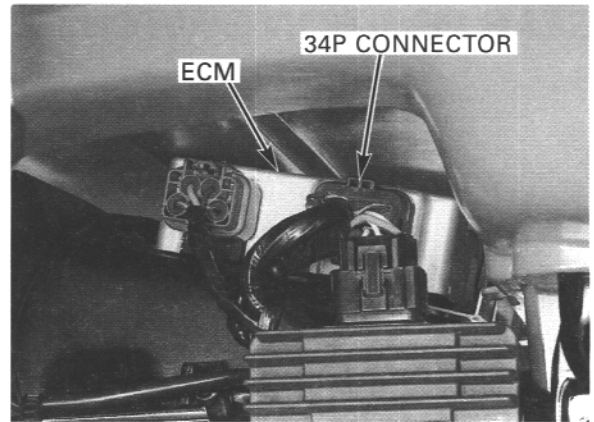
### INSPECTION

Disconnect the ECM 34P connector.  
 Check for continuity between the ECM connector terminals in each switch position.  
 Continuity should exist between the color coded wires as follows:

Color Position	White/ blue	Black/ red	White/ yellow	Black/ red
Up	○—○			
Free				
Down			○—○	

If the continuity is abnormal, remove the left inner fender (page 2-6). Remove the handlebar switch 10P (green) connector from the frame and disconnect it. Perform the inspection at the 10P connector in the same manner as the previous step.

- If the continuity at the ECM is abnormal and continuity at the 10P connector is normal, check for open or short circuit, or loose or poor connector contact.
- If the both continuities are abnormal, replace the handlebar switch (shift switch).



## MODE SELECT SWITCH

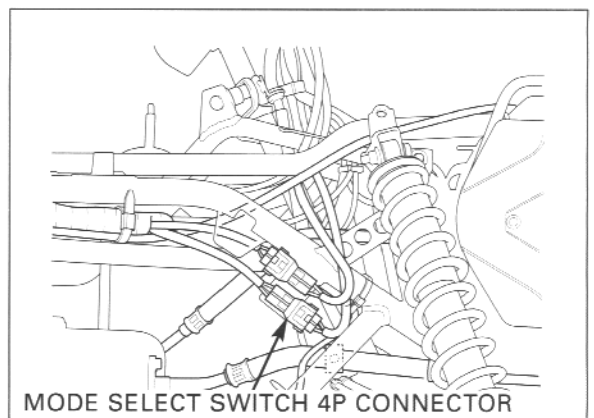
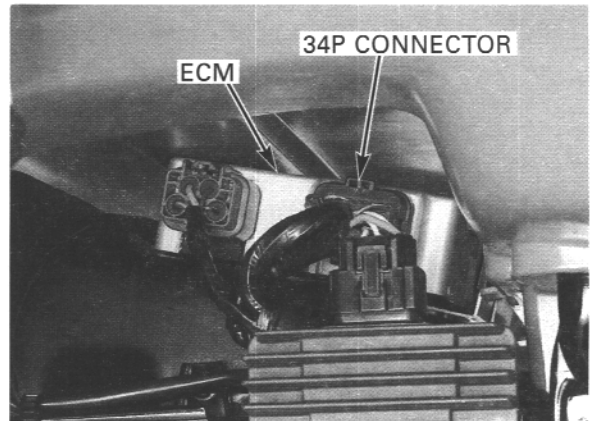
### INSPECTION

Disconnect the ECM 34P connector.  
 Check for continuity between the ECM connector terminals in each switch position.  
 Continuity should exist between the color coded wires as follows:

Color Position	Orange	Blue/ black	Black/ green	Green
D1	○—○	○—○	○—○	
D2		○—○		○—○
	○—○			
ESP	○—○		○—○	
		○—○		○—○

If the continuity is abnormal, remove the right inner fender (page 2-6) and disconnect the mode select switch 4P connector, and perform the inspection at the 4P connector in the same manner as the previous step.

- If the continuity at the ECM is abnormal and continuity at the 4P connector is normal, check for open or short circuit, or loose or poor connector contact.
- If both continuities are abnormal, replace the mode select switch.



## REPLACEMENT

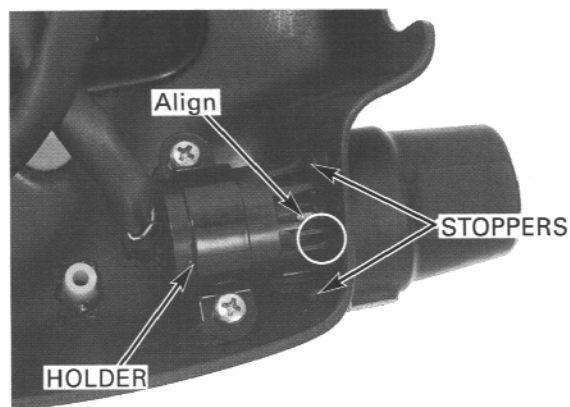
Release the switch wire from the wire clips on the steering shaft holder.

Remove the handlebar cover (page 14-4).  
Remove the two screws and switch holder.  
Remove the mode select switch from the cover while pushing in the two stoppers.

Install a new switch by aligning the locating tab with the groove in the cover.  
Install the switch holder and secure it with the screws.

Route the switch wire properly (page 1-19) and connect the 4P connector.

Install the removed parts in the reverse order of removal.



## THROTTLE SENSOR

### INSPECTION

#### SENSOR RESISTANCE

Remove the seat (page 2-3) and the left engine cover (page 2-10).

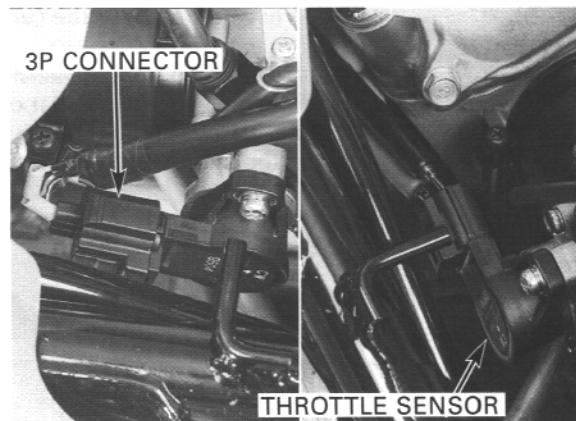
Disconnect the throttle sensor 3P connector.  
Measure the resistance between the Yellow/white and Green/yellow terminals of the throttle sensor.

**STANDARD: 3.5—5.5 k $\Omega$  (20°C/68°F)**

Check that the resistance between the Yellow/black and Green/yellow terminals of the throttle sensor varies with the throttle position while operating the throttle lever.  
The resistance should change smoothly as follows.

#### STANDARD:

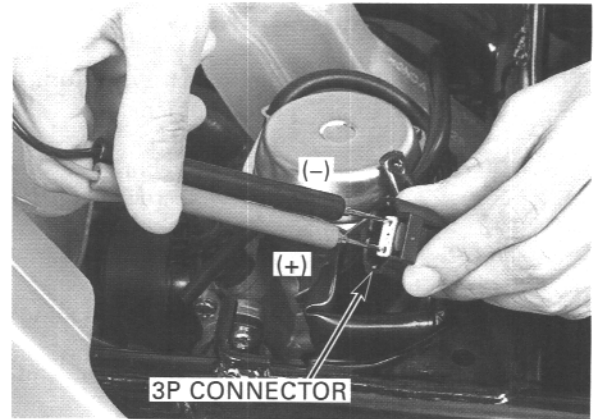
**Fully close to Fully open:  
0.5 k $\Omega$  to 3.5~5.5 k $\Omega$  (20°C/68°F)**



## INPUT VOLTAGE

Measure the input voltage between the Yellow/white (+) and Green/yellow (-) wire terminals of the throttle sensor connector with the ignition switch ON.

**STANDARD: 4.7–5.3 V**



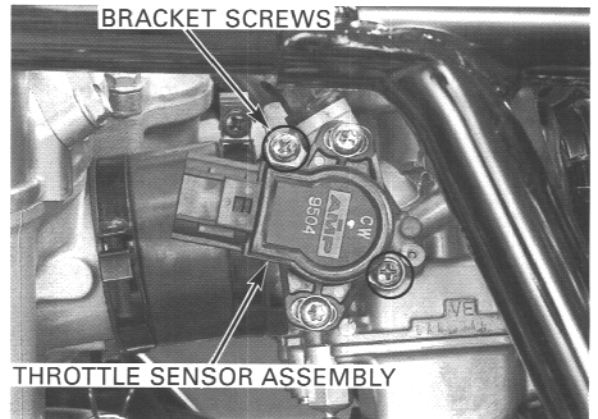
## REMOVAL/INSTALLATION

### NOTE:

- Do not loosen the throttle sensor attaching screws (torx) unless the throttle sensor requires replacement. It may cause the sensor to move out of position. For sensor replacement, see below.

Remove the left side cover (page 2-4).

Disconnect the throttle sensor connector. Remove the two sensor bracket screws, and the throttle sensor and bracket as an assembly.

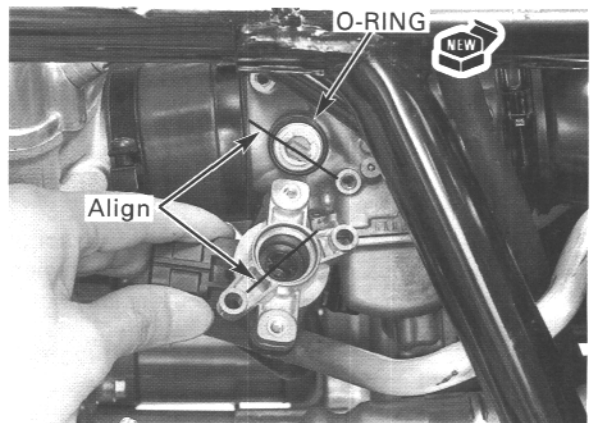


Install a new O-ring onto the carburetor body.

*Improper installation can cause damage to the throttle sensor.*

Install the throttle sensor assembly by aligning the tabs of the sensor with the flat of the shaft as shown. Install the screws and tighten them. Connect the sensor 3P connector.

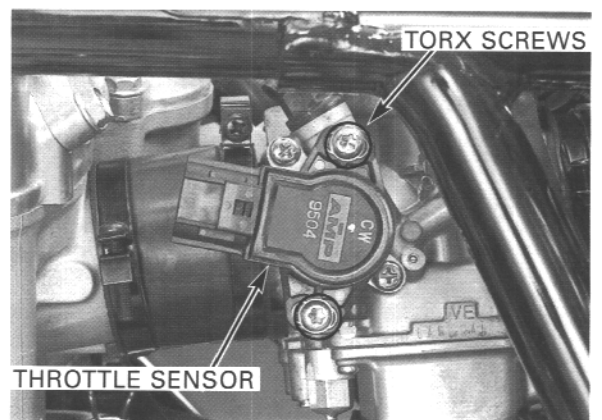
Install the removed parts in the reverse order of removal.



## REPLACEMENT

Remove the left side cover (page 2-4).

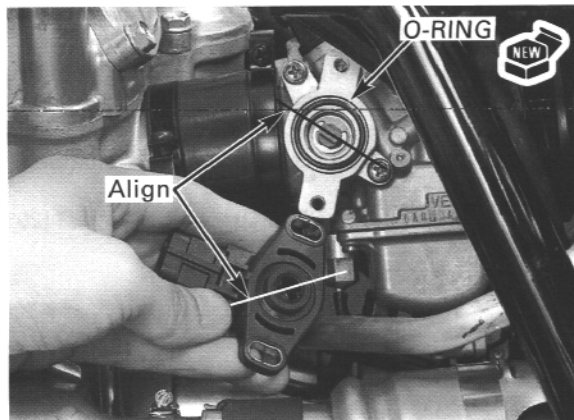
Remove the two sensor attaching screws (torx) and throttle sensor.



Install a new O-ring onto the sensor bracket groove.

*Improper installation can cause damage to the throttle sensor.*

Install a new throttle sensor by aligning the tabs of the sensor with the flat of the shaft as shown. Apply locking agent to the to the torx screw threads and loosely install them.



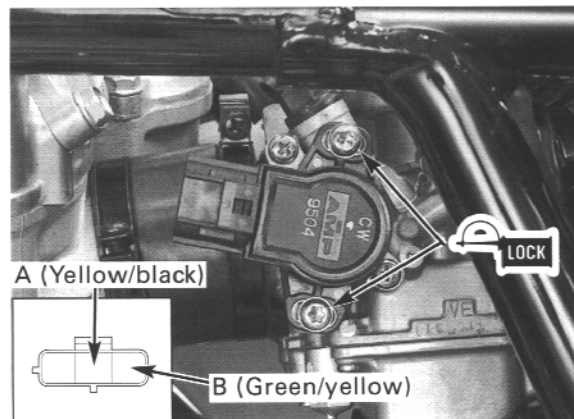
Check the engine idle speed and adjust it if necessary (page 3-12).

Adjust the throttle sensor position so that the resistance between terminals A and B is 490–510 Ω, and tighten the torx screws.

**TORQUE: 4 N·m (0.4 kgf·m, 2.9 lbf·ft)**

Connect the throttle sensor connector.  
Perform the initial setting procedure (page 23-6).

Install the removed parts in the reverse order of removal.



## ANGLE SENSOR

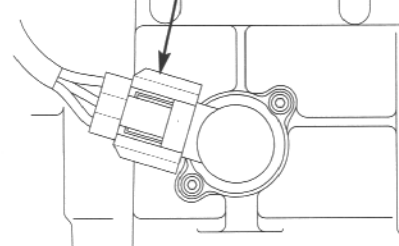
### INSPECTION

#### INPUT VOLTAGE

Remove the left engine side cover (page 2-10) and disconnect the angle sensor 3P connector. Measure the input voltage between the Yellow/red (+) and Blue/green (-) wire terminals of the wire harness side connector with the ignition switch ON.

**STANDARD: 4.7–5.3 V**

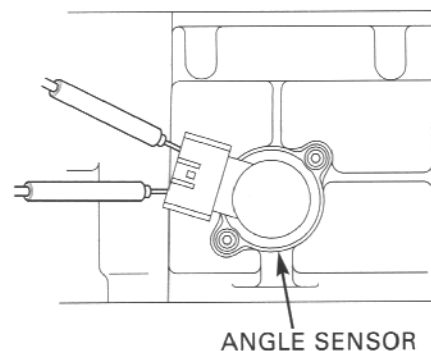
ANGLE SENSOR 3P CONNECTOR



#### SENSOR RESISTANCE

Measure the resistance between the Yellow/red and and Blue/green terminals of the angle sensor.

**STANDARD: 1.6–2.4 kΩ (20°C/68°F)**

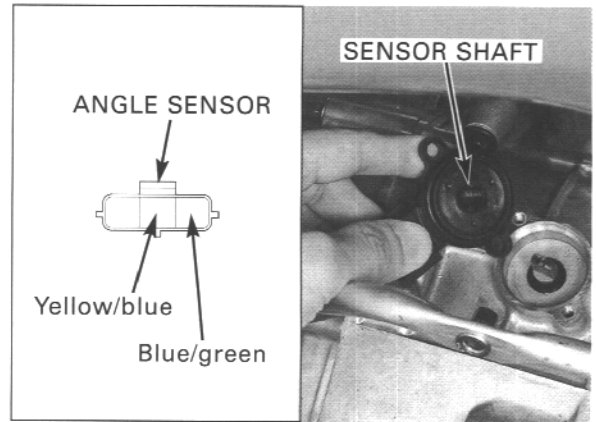


Remove the angle sensor from the crankcase (see below).

Check that the resistance between the Yellow/blue and Blue/green terminals of the angle sensor varies while turning the sensor shaft.

The resistance should change smoothly as follows.

**STANDARD: 0 to 1.6~2.4 kΩ (20°C/68°F)**

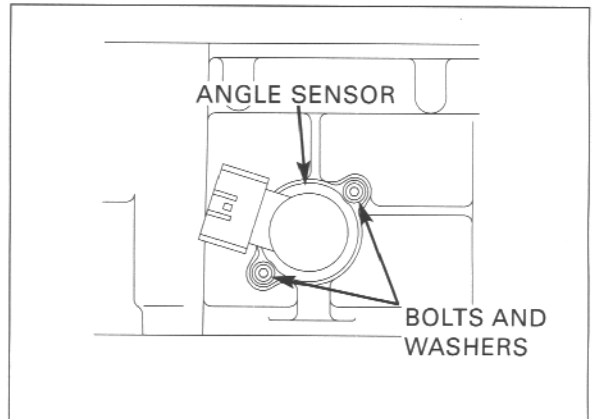


## REPLACEMENT

Remove the exhaust pipe (page 2-10).

Clean around the sensor base with compressed air before removing the angle sensor.

Remove the two bolts, washers and angle sensor from the crankcase.

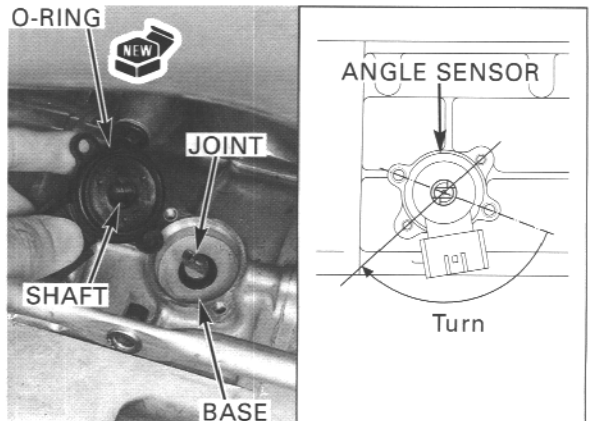


Install a new O-ring onto a new angle sensor.

*Never allow foreign materials (dust, water, oil etc.) to get into the clearance between the sensor shaft and sensor joint.*

Clean the sensor shaft, sensor joint and crankcase base cavity, and be sure that no foreign material is allowed.

Align the tabs of the sensor with the flat of the sensor joint and set the angle sensor onto the crankcase in the position as shown, then turn the sensor clockwise to align the bolt holes in the sensor body and crankcase.

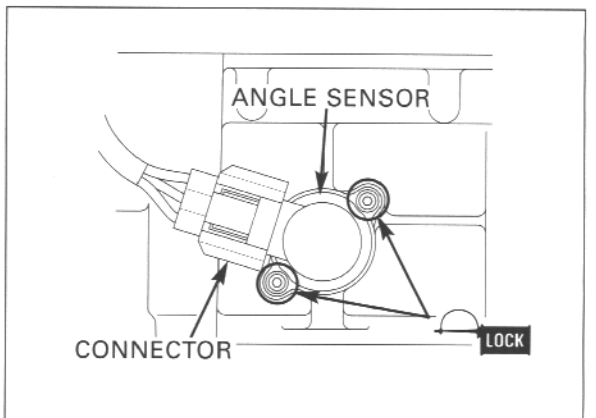


Apply locking agent to the threads of the sensor bolts. Install the washers and bolts, and tighten them.

**TORQUE: 6 N·m (0.6 kgf·m, 4.3 lbf·ft)**

Connect the sensor 3P connector. Perform the initial setting procedure if the angle sensor is replaced (page 23-6).

Install the removed parts in the reverse order of removal.



## CONTROL MOTOR

### REMOVAL/INSTALLATION

Remove the left front mud guard and left inner fender (page 2-6).

Disconnect the control motor 2P (white) connector and release the motor wire from the wire band, clip and clamp.

Remove the two mounting bolts and the control motor.

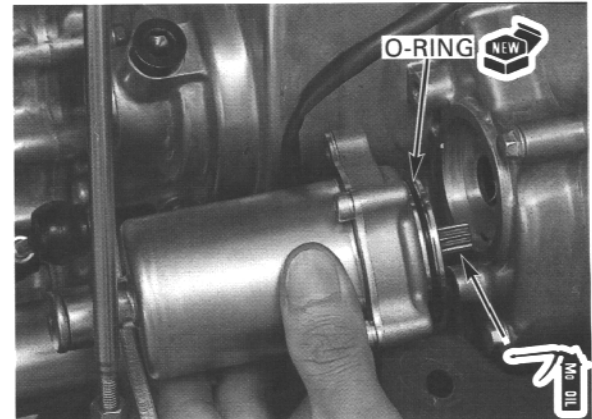
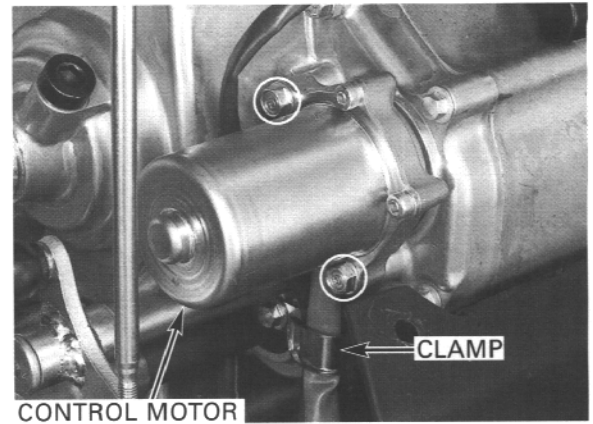
Coat a new O-ring with engine oil and install it into the groove in the motor.

Apply molybdenum disulfide solution to the motor shaft splines and install the control motor into the crankcase cover by aligning the bolt holes. Install the mounting bolts and tighten them.

*Do not forget to secure the wires with the clamp.*

Route the motor and angle sensor wires properly (page 1-19) and connect the motor 2P connector.

Install the removed parts in the reverse order of removal.



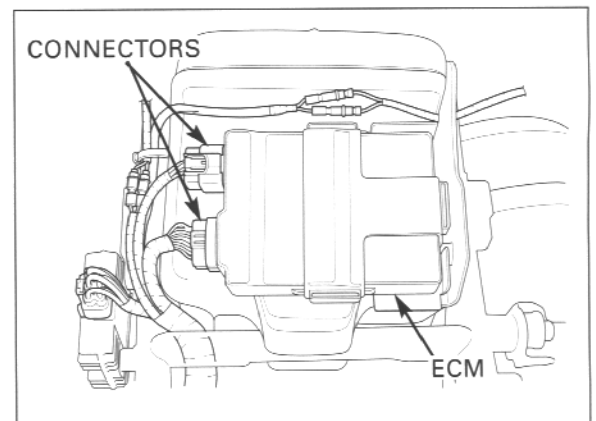
## ENGINE CONTROL MODULE (ECM)

### REMOVAL/INSTALLATION

Remove the rear fender (page 2-8).

Disconnect the ECM 34P and 5P connectors. Remove the ECM from the mounting stays on the tool box.

Installation is in the reverse order of removal.



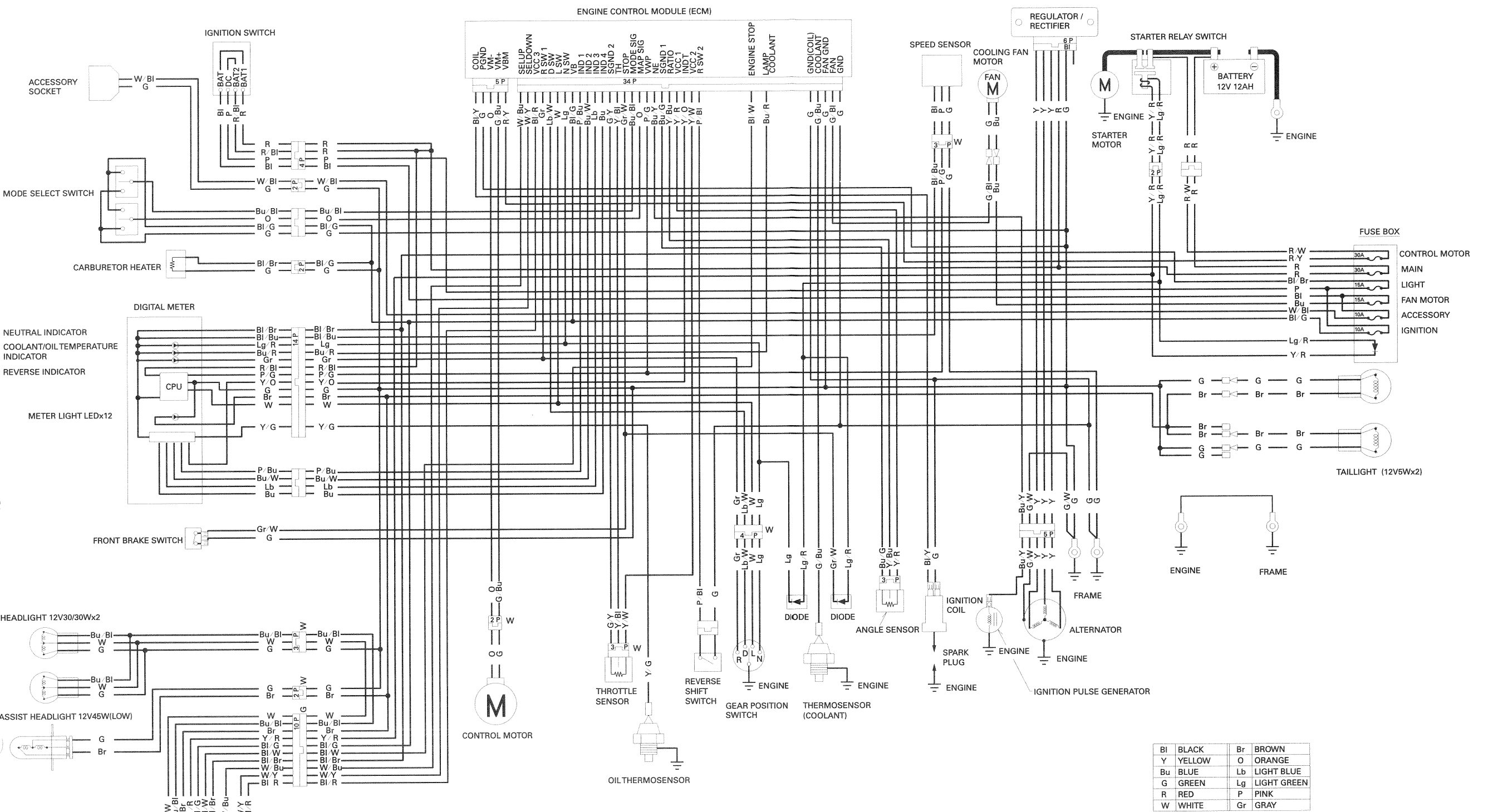
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MEMO





# 24. WIRING DIAGRAM



Bl	BLACK	Br	BROWN
Y	YELLOW	O	ORANGE
Bu	BLUE	Lb	LIGHT BLUE
G	GREEN	Lg	LIGHT GREEN
R	RED	P	PINK
W	WHITE	Gr	GRAY

LIGHTING - DIMMER - ENGINE STOP / STARTER SWITCH SHIFT SWITCH (UP/DOWN)

	MAP SIG.	MODE SIG.	VB	GND
D1	○	○	○	○
D2	○	○	○	○
ESP	○	○	○	○
CORD COLOR	O	Bu/Bl	Bl/G	G

	BAT2	DC	BAT1	BAT
ON	○	○	○	○
OFF	○	○	○	○
CORD COLOR	R/Bl	P	R	Bl

	BAT3	TL (HL)
ON	○	○
OFF	○	○
CORD COLOR	Bl/Br	Br

	(HL)	LO	HI
LO	○	○	○
(N)	○	○	○
HI	○	○	○
CORD COLOR	W	Bu/Bl	

	BAT4	IG
OFF	○	○
RUN	○	○
OFF	○	○
CORD COLOR	Bl/G	Bl/W

	BAT3	ST
FREE	○	○
PUSH	○	○
CORD COLOR	Bl/Br	Y/R

	UP	VCC down	VCC
UP	○	○	○
FREE	○	○	○
DOWN	○	○	○
CORD COLOR	W/Bu	Bl/R	W/Y

# 25. TECHNICAL FEATURES

HONDAMATIC

25-1

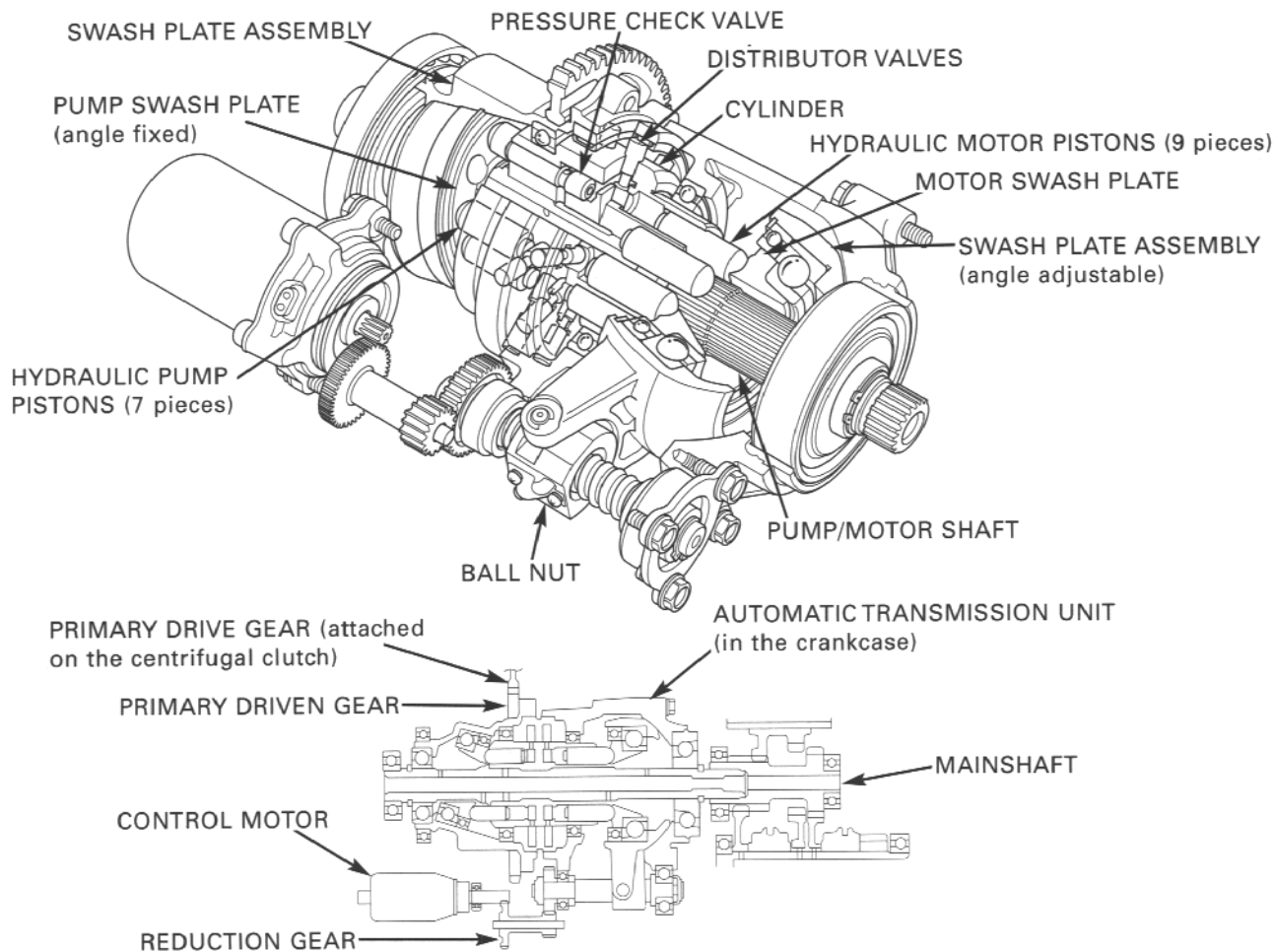
## HONDAMATIC

### SUMMARY

Conventional automatic transmissions consisting of a traditional belt drive and pulley system have been used in certain All Terrain Vehicles (ATVs).

The Hondamatic transmission, however, is a hydromechanical continuously variable transmission. Housed within a compact, fully sealed assembly, it uses the principles of hydrostatic drive and electronic controls. It is compact, quiet, maintenance-free, rugged, and features engine compression braking.

The usefulness of the Hondamatic is maximized when combined with the computer (Engine Control Module)-controlled, dual-mode continuously variable change program or the Electric Shift Program (ESP), already in use on the TRX450ES and TRX350FE/TE ATVs. The ESP allows the operator to select higher or lower output ratios, providing manual control of the Hondamatic.



This hydromechanical transmission uses the engine to drive the hydraulic pump that forces hydraulic fluid through sequential pistons (hydraulic pump side). On the other side of these pistons (hydraulic motor side), the pressurized fluid enters a second set of pistons that push against an angled plate (called a swash plate). Because the cylinder body holding the pistons is splined to the output shaft (called a pump/motor shaft), the pressure exerted on the swash plate (hydraulic motor side) causes the cylinder body to rotate. When the angle of the hydraulic motor swash plate is adjusted, the cylinder body (and, therefore, the pump/motor shaft) rotates faster or slower, resulting in higher or lower output drive ratios. When either of the two drive modes (D1-Maximum Performance or D2-Maximum Torque) is selected, the Engine Control Module (ECM) continuously monitors input from each sensor and switch to position the motor side swash plate at the optimal ratio. Using the ESP mode, the ECM instructs the control motor to move the hydraulic motor swash plate to preset angles to simulate specific gear selection.

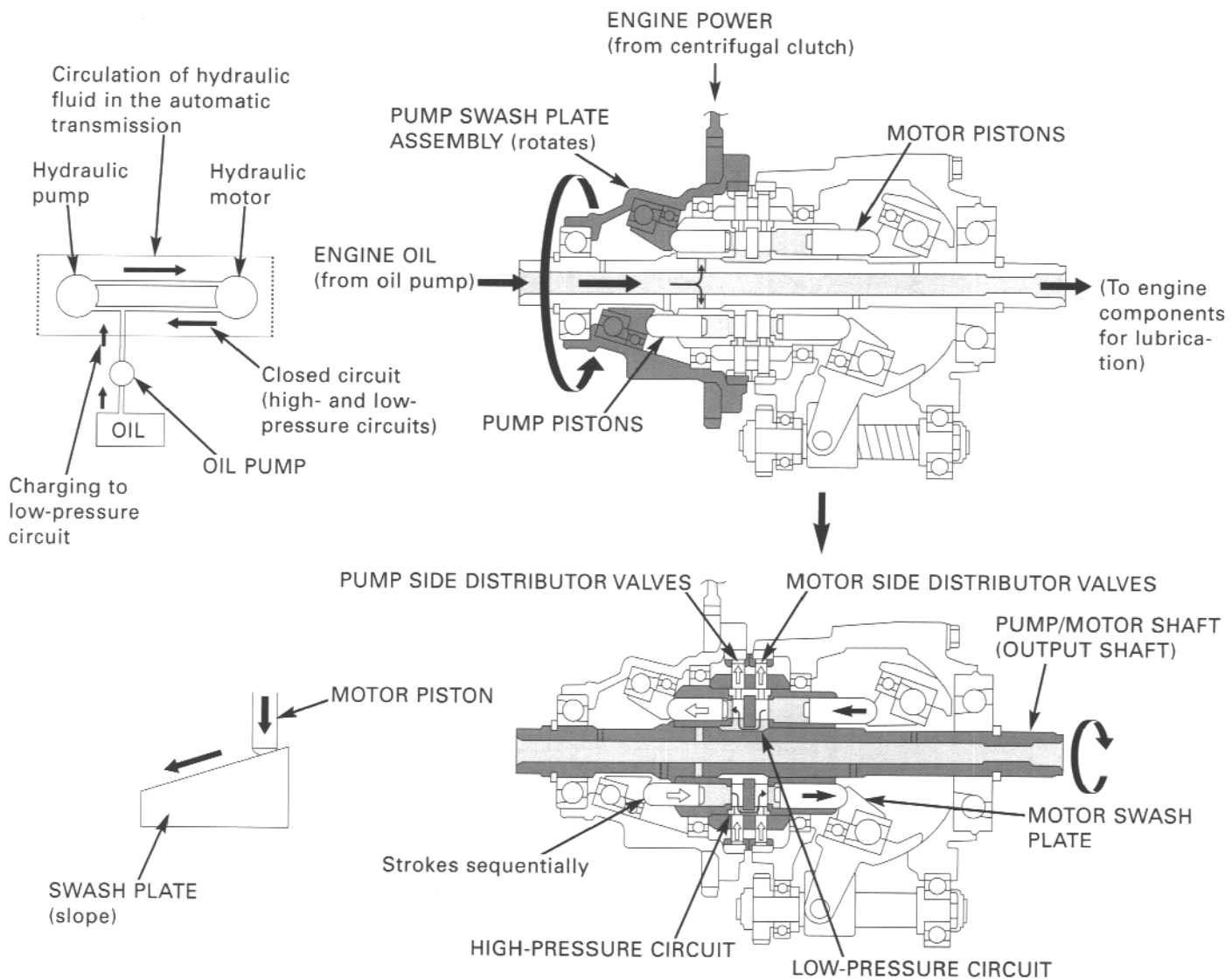
## TECHNICAL FEATURES

### AUTOMATIC TRANSMISSION UNIT CONSTRUCTION AND OPERATION

#### OPERATING PRINCIPLES

This automatic transmission unit is with a fixed-volume piston pump and a variable-volume piston motor in opposition on the same shaft (pump/motor shaft). As the automatic transmission is a closed circuit, any excess hydraulic fluid from the automatic transmission system is recirculated to the transmission using a separate charge pump (i. e. oil pump for lubrication). The automatic transmission uses standard engine oil for lubrication as hydraulic fluid.

Upon engagement by the centrifugal clutch, the engine turns the transmission's pump-side outer body (called a pump swash plate assembly), causing the fixed-angle pump-side swash plate within to rotate, sequentially stroking the pump side pistons. This action draws low-pressure fluid into the pistons, which discharge high-pressure fluid (corresponding to the input torque). The fluid is distributed to the high-pressure circuit by the distributor valve on the pump side. The distributor valve on the motor side opens and feeds the high-pressure fluid to the piston on the motor side for the suction stroke. Each distributor valve is eccentrically synchronized to the rotation of its respective swash plate, ensuring that fluid is transferred at the proper time (see next page).

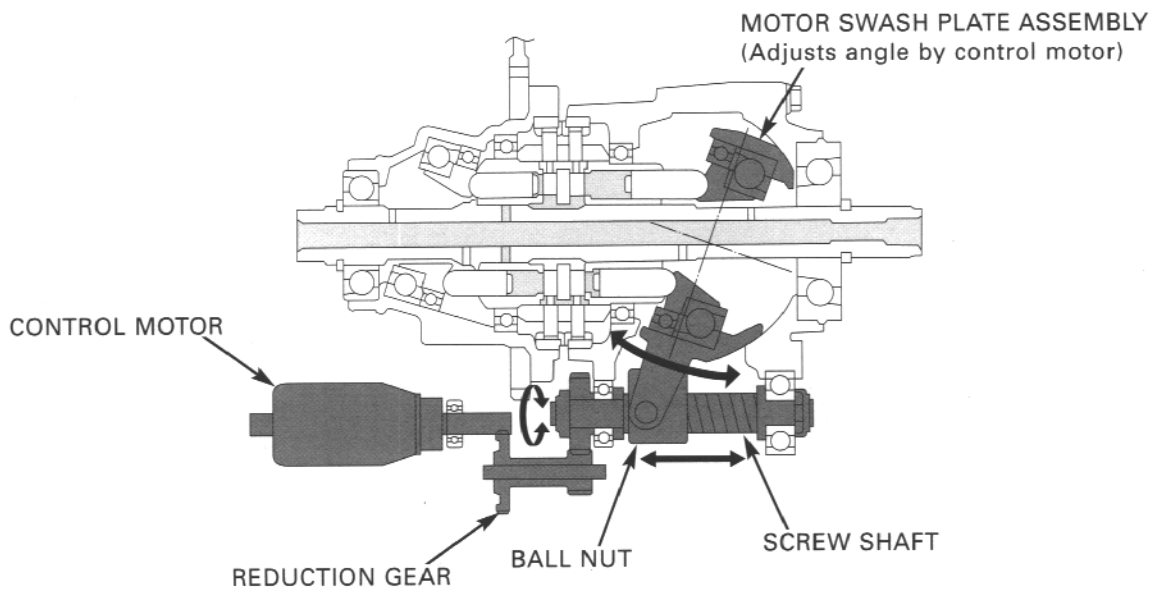


The amount of fluid discharged depends on the angle of the motor side swash plate. The greater the slant, the further the pistons move and the more fluid they transfer. This additional volume transfer makes the motor side less efficient, resulting in a differential based on the volume transferred. As the motor-side pistons travel down the slope of the motor side swash plate, the fluid pressure is drawn through the pistons and rotates the cylinder body (which houses the pistons). As the cylinder is splined to the output shaft (pump/motor shaft), the output shaft also rotates, transferring power to the drive train.

## TECHNICAL FEATURES

When the motor-side swash plate is perpendicular to the pump axis, the pistons do not stroke (therefore, oil is not discharged). In this condition, oil cannot flow between the pump and the motor, and the pump swash plate assembly and output shaft are hydraulically locked (1:1 gear ratio) to rotate them together as one body. An Overdrive is achieved by adjusting the swash plate to an angle beyond perpendicularity to the pump axis.

As the pistons begin their travel back up the motor-side swash plate, they begin their discharge stroke. The hydraulic fluid is transferred back through the motor-side distributor valve and into the low-pressure circuit of the body. The fluid then passes through the pump-side distributor valve, where it is timed to the suction stroke of the pump pistons.



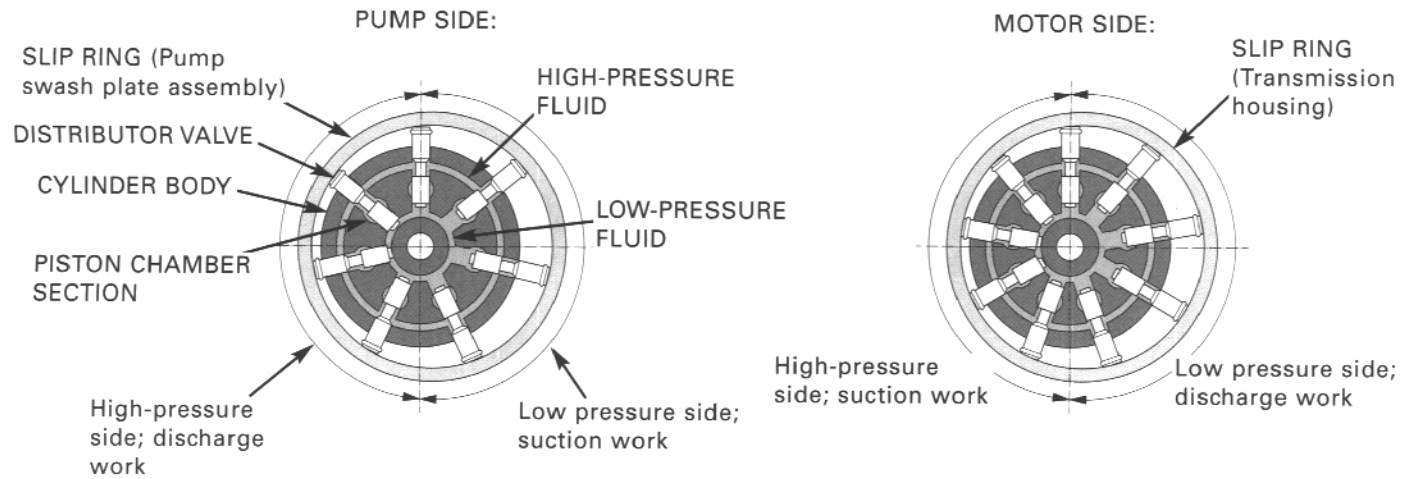
## TECHNICAL FEATURES

### TORQUE AMPLIFICATION

The input reaction force torque from the engine is transmitted to the pistons that are fixed within the rotating cylinder. This force is then transferred through the cylinder to the shaft (mechanical power train). When the ratio is 1:1 and the motor side swash plate exerts no reactive force against the motor cylinder, the input torque is transferred directly to output torque with no amplification. When the angle of the swash plate is increased, the reaction force increases, amplifying the output torque. The total output torque is the sum of the input reaction force torque and hydraulic output torque.

### DISTRIBUTOR VALVES

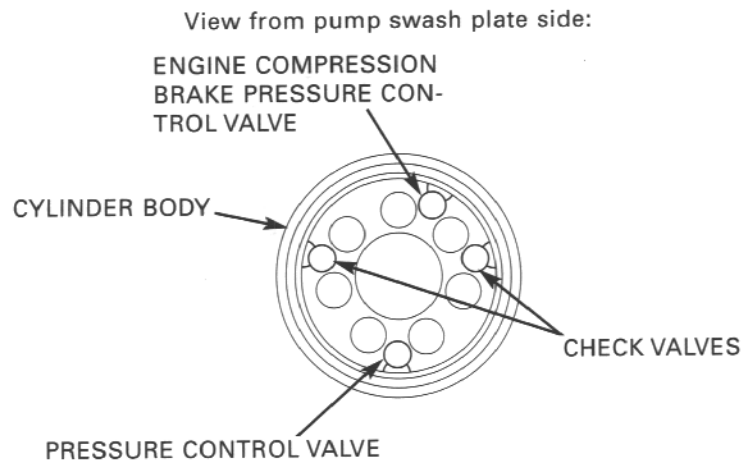
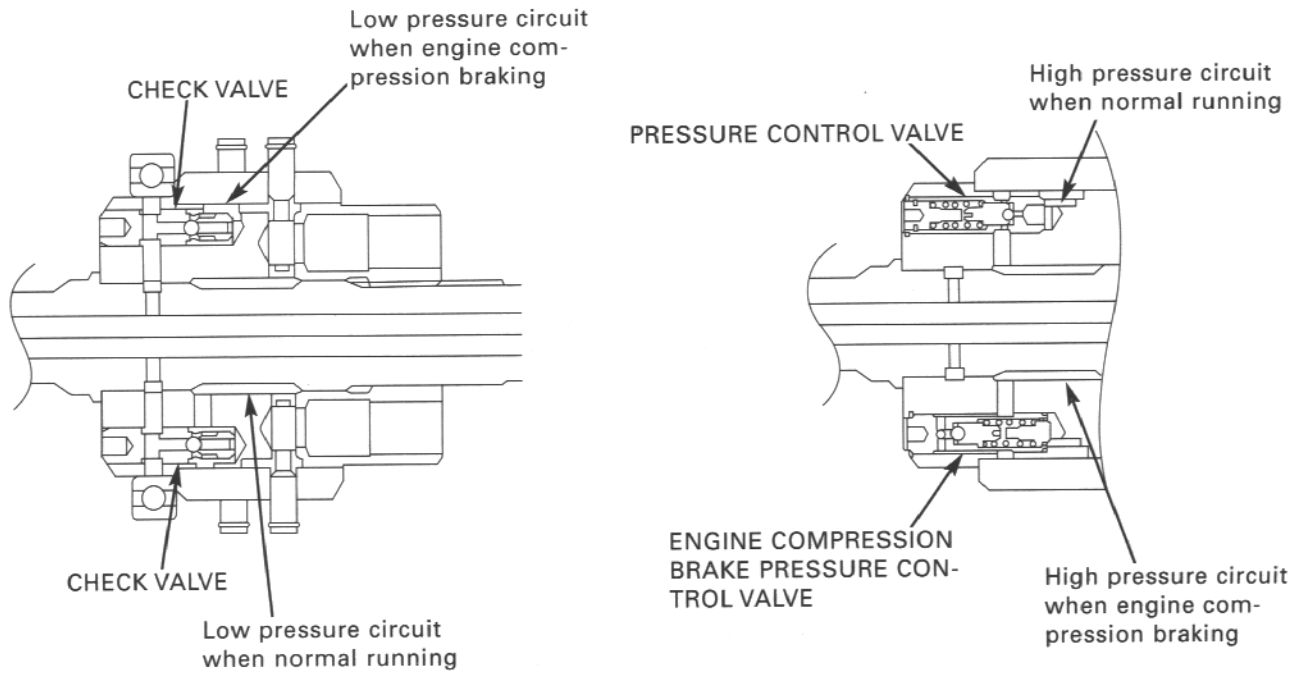
The hydraulic fluid is transferred between the pump and motor piston chambers by the sprue-type distributor valves arranged radially around the shaft. The pump-side and motor-side distributor valves are eccentrically arranged on the shaft and are aligned to time the transfer of low-pressure and high-pressure fluid in tune with the direction and inclination of the pump and motor swash plates. As the cylinder rotates, the eccentrically arranged valves slide in and out of the cylinder body, opening and closing the paths in the body.



**COMPRESSION BRAKING AND PRESSURE CONTROL**

Check Valves and Pressure Control Valves—During normal running, the check valve in the pump-side cylinder feeds hydraulic fluid into the low-pressure circuit. The check valve is open when the hydraulic pressure in the low-pressure circuit drops below a specified level and, upon achieving the proper pressure, closes to prevent backflow. Under engine compression braking conditions (where the rotational force comes from the wheels), the motor side becomes a pump (driven by the pump/motor shaft) and the pump side becomes a hydraulic motor. In this situation, the high- and low-pressure circuits in the automatic transmission unit are reversed. This transmission uses a separate check valve to feed hydraulic fluid to the engine braking low-pressure circuit.

Pressure control valves vent excessive high-pressure fluid into the low-pressure circuit during both normal running and compression braking conditions.



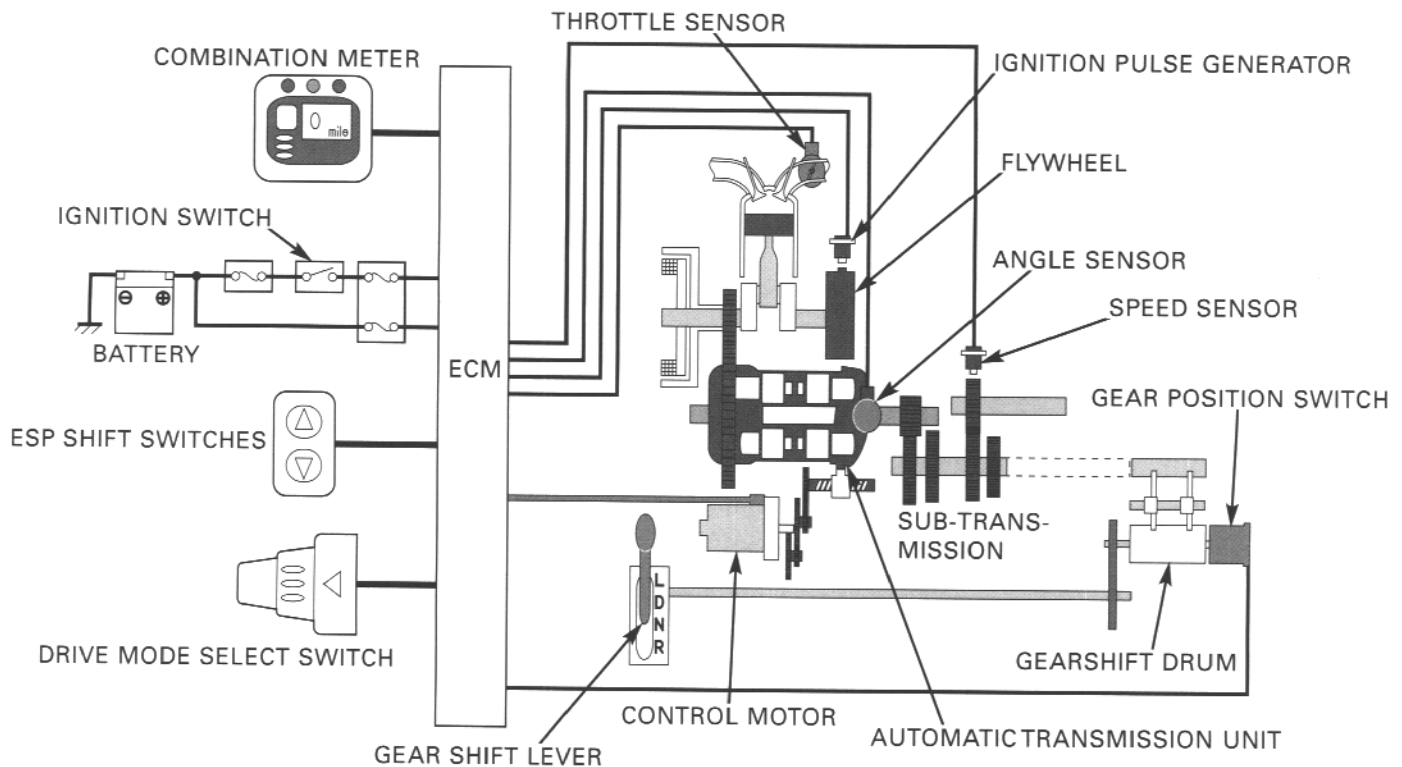
## TECHNICAL FEATURES

### HONDAMATIC ELECTRICAL SYSTEM CONSTRUCTION

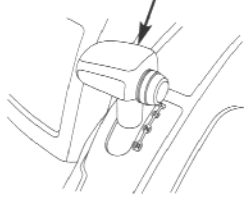
#### OUTLINE

The output speed (reduction ratio) is controlled by the angle of the hydraulic motor side swash plate. The position of this swash plate is determined by the ECM, which uses various pieces of information to send commands to the control motor that moves the swash plate arm. The signals used to determine optimal automatic transmission output are:

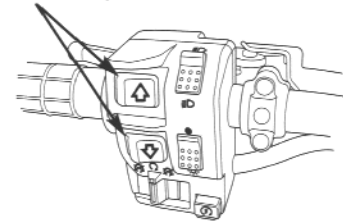
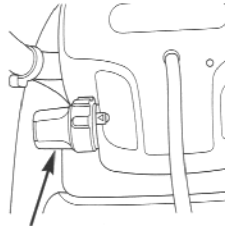
- Throttle opening (throttle sensor)
- Vehicle speed (speed sensor)
- Engine speed (rpm) (ignition pulse generator)
- Automatic transmission control motor swash plate angle (angle sensor)
- Sub-transmission gear position (gear position switch—R, N, D, L)
- Control mode and map (drive mode select switch—D1, D2, ESP)
- Manual shift range (ESP shift switch—1, 2, 3, 4, 5)



GEARSHIFT LEVER (R, N, D, L range)

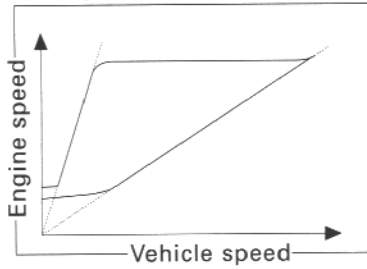


ESP SHIFT SWITCHES (Up and down)

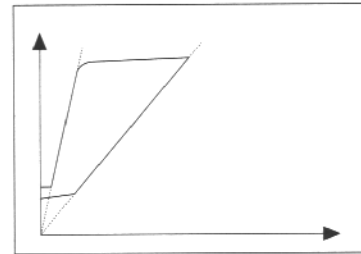


DRIVE MODE SELECT SWITCH (D1, D2, ESP mode)

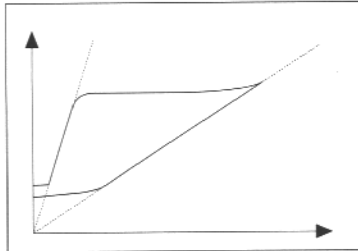
D range—D1 mode (automatic):



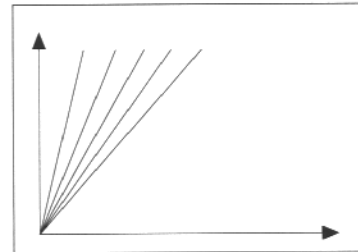
L range (automatic; D1 or D2)



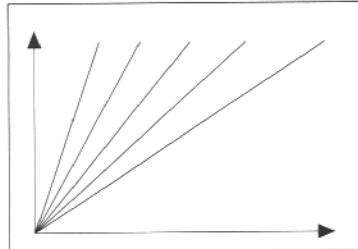
D range—D2 mode (automatic):



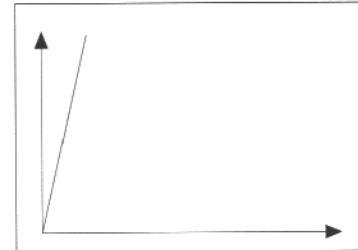
L range—ESP mode (5-speeds):



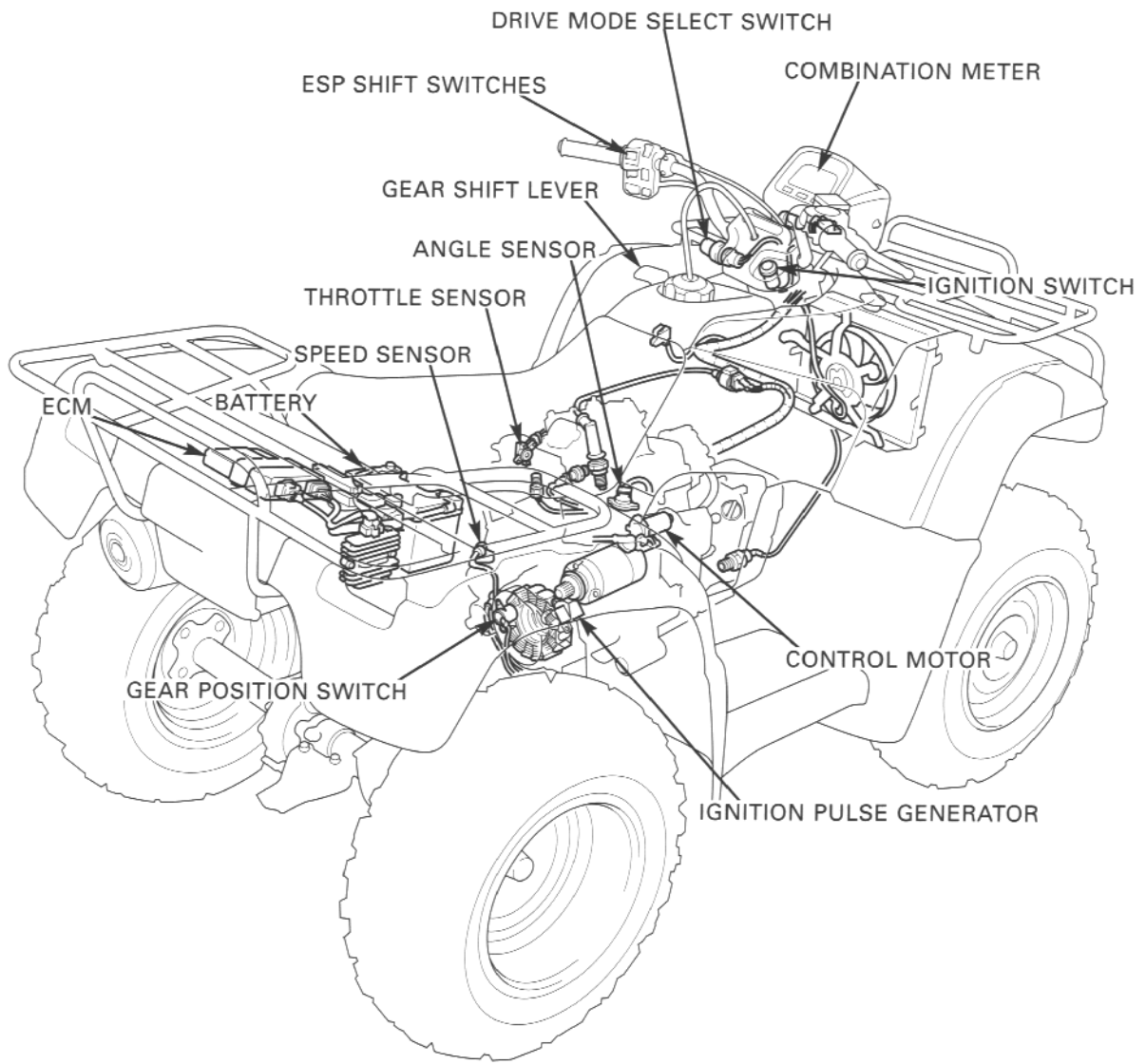
D range—ESP mode (5-speeds):



R range (fixed low ratio):





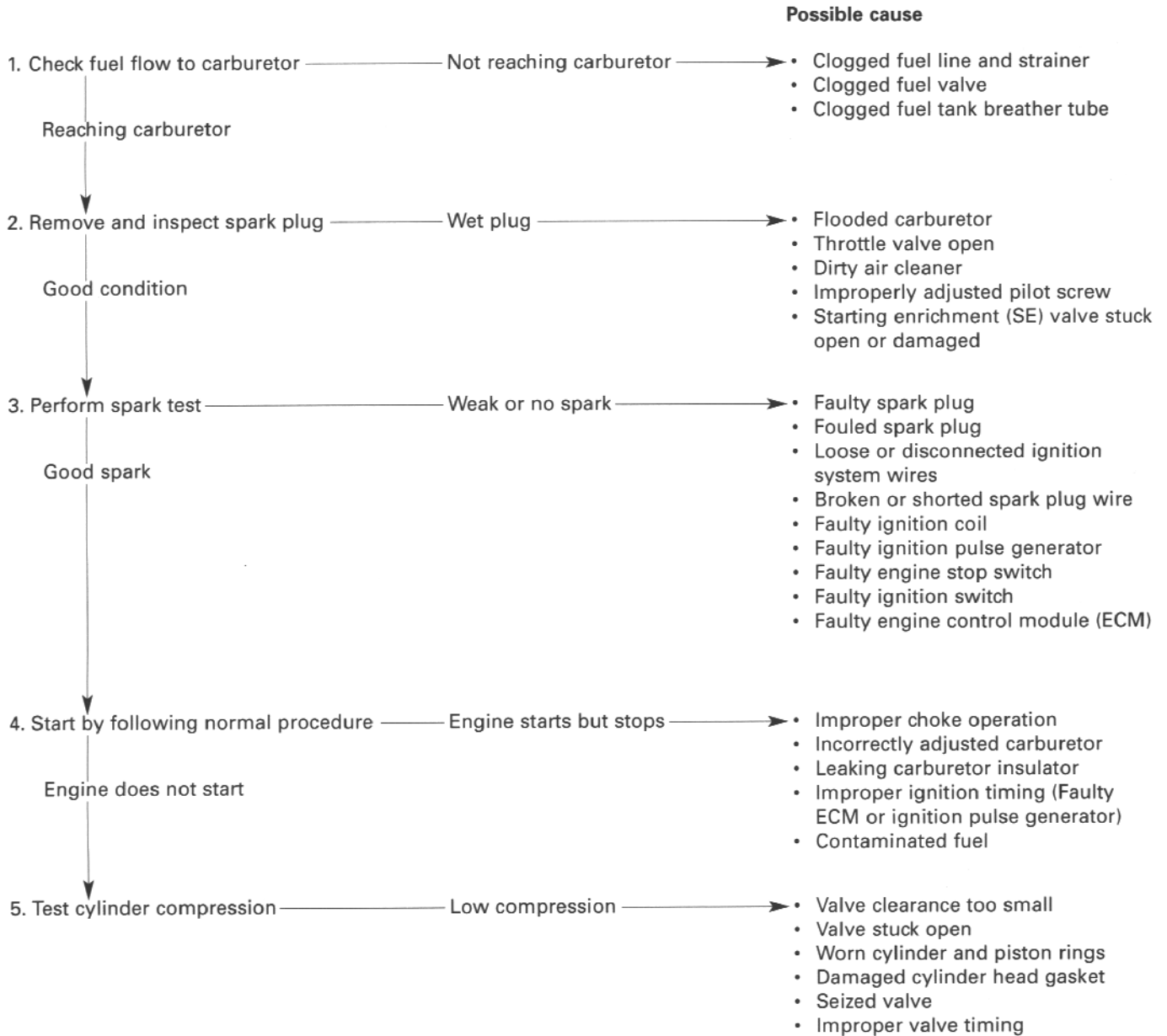


# 26. TROUBLESHOOTING

ENGINE DOES NOT START OR IS HARD TO START	26-1
ENGINE LACKS POWER	26-2
POOR PERFORMANCE AT LOW AND IDLE SPEED	26-3

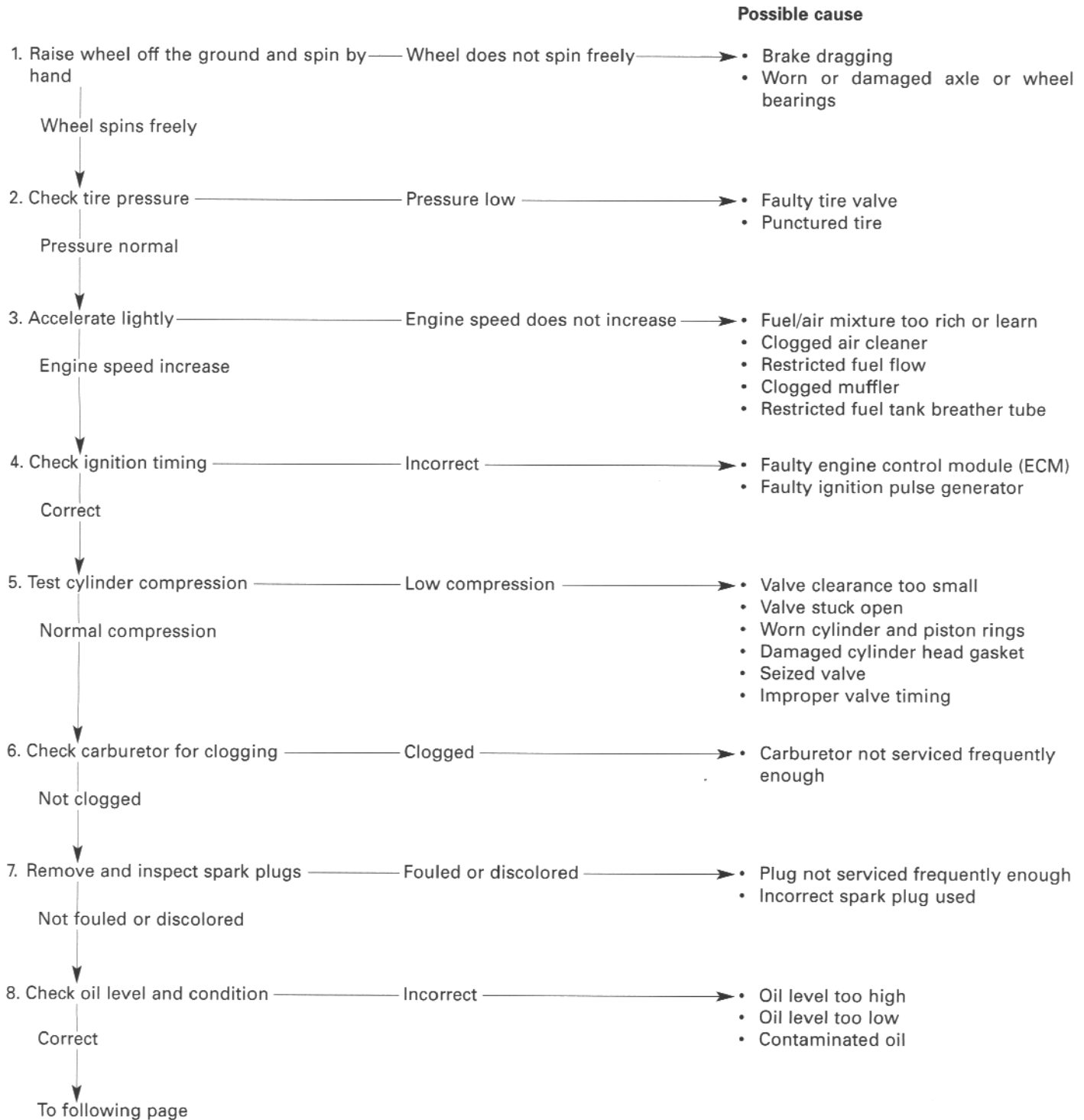
POOR PERFORMANCE AT HIGH SPEED	26-4
POOR HANDLING	26-4

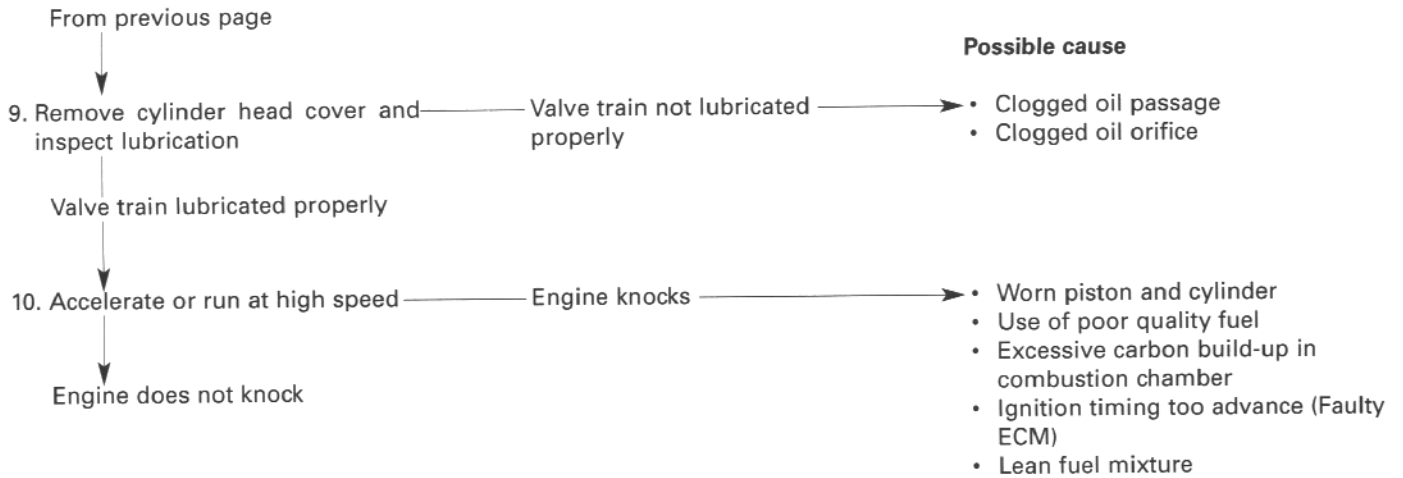
## ENGINE DOES NOT START OR IS HARD TO START



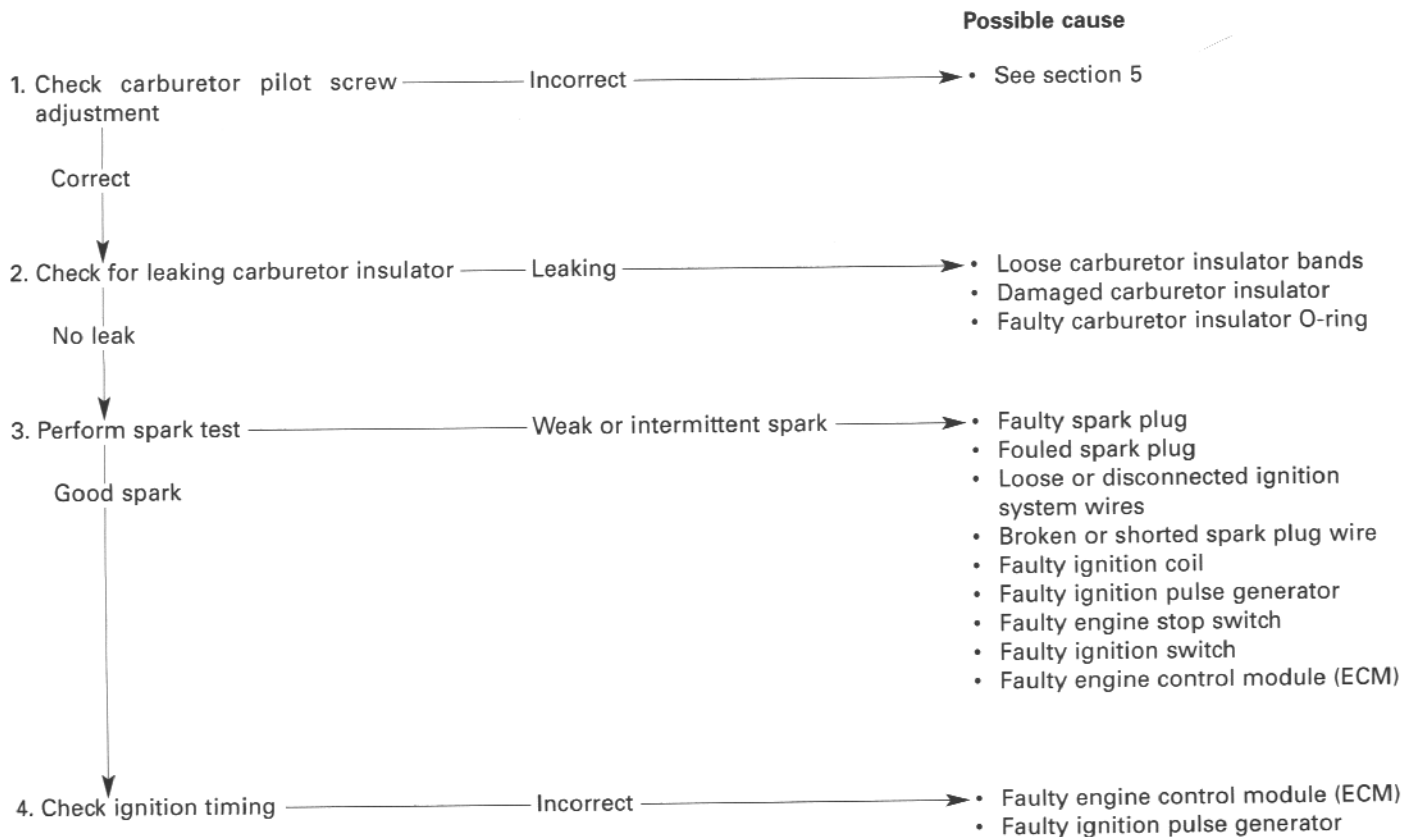
## TROUBLESHOOTING

### ENGINE LACKS POWER



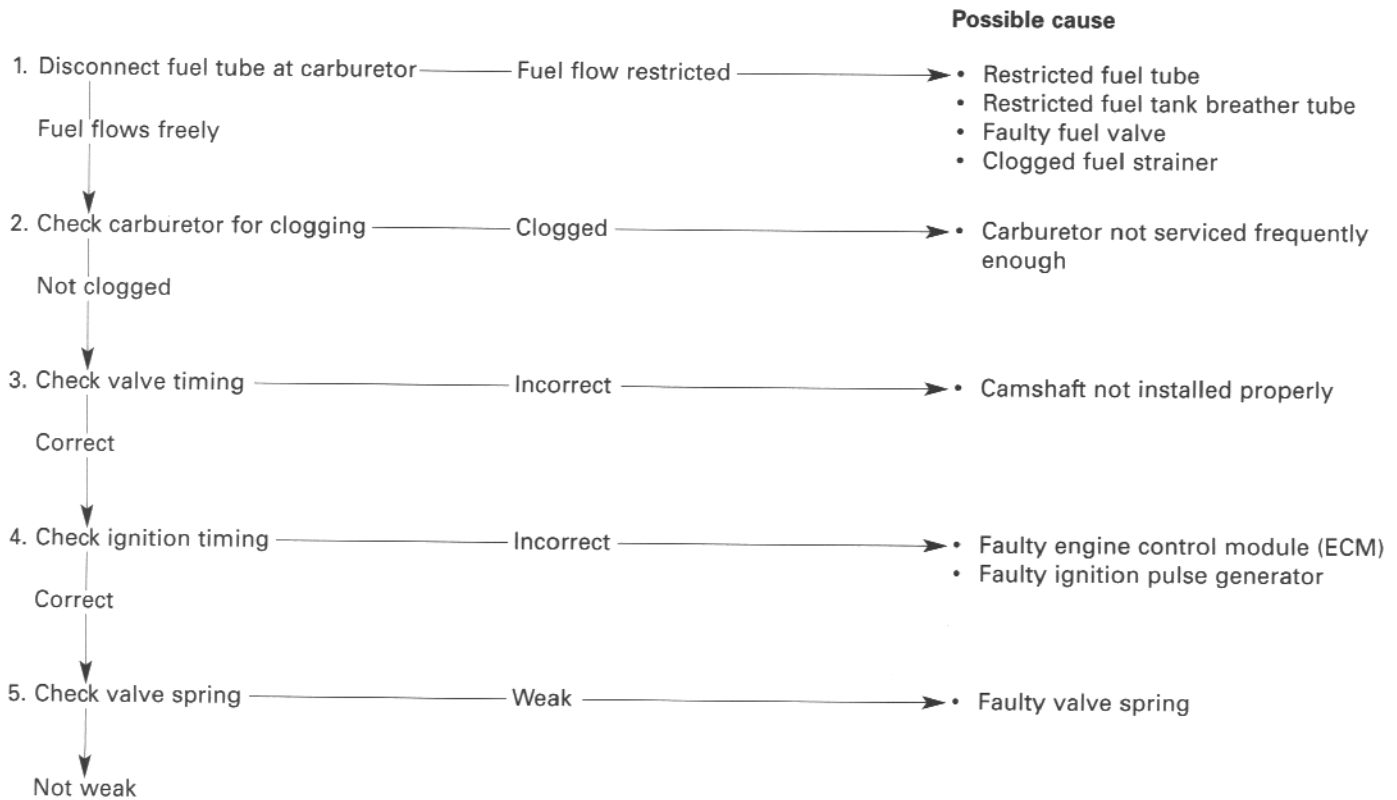


**POOR PERFORMANCE AT LOW AND IDLE SPEED**

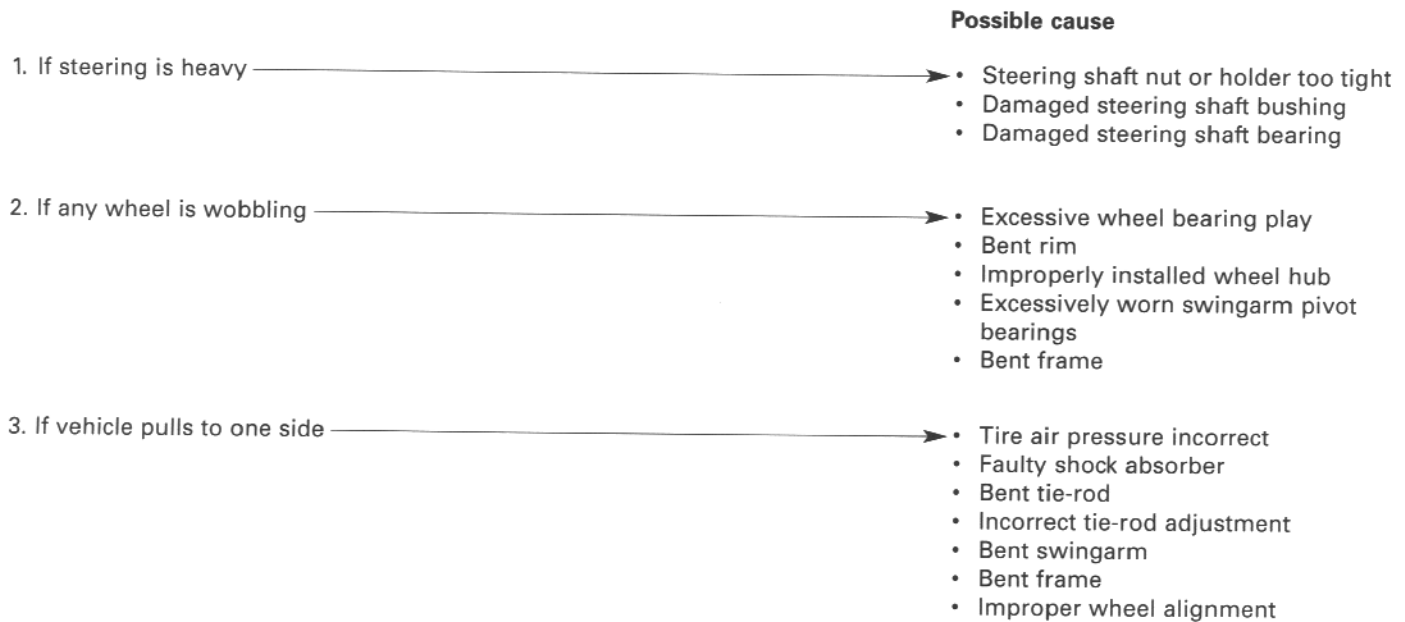


## TROUBLESHOOTING

### POOR PERFORMANCE AT HIGH SPEED



### POOR HANDLING



# 27. INDEX

ACCESSORY SOCKET .....	22-4	ENGINE IDLE SPEED .....	3-12
AIR CLEANER .....	3-5	ENGINE INSTALLATION .....	7-5
AIR CLEANER HOUSING .....	5-3	ENGINE OIL .....	3-10
AIR CLEANER HOUSING DRAINTUBE .....	3-7	ENGINE OIL FILTER.....	3-11
ALTERNATOR CHARGING COIL.....	19-6	ENGINE REMOVAL .....	7-2
ALTERNATOR STATOR.....	11-5	ESP SHIFT SWITCH .....	23-25
ANGLE SENSOR .....	23-29	EXHAUST SYSTEM.....	2-10
AUTOMATIC TRANSMISSION AND		FINAL DRIVE ASSEMBLY.....	18-14
CRANKSHAFT.....	13-7	FINAL DRIVE DISASSEMBLY/INSPECTION.....	18-6
BATTERY .....	19-4	FINAL DRIVE INSTALLATION .....	18-17
BEFORE STARTING TROUBLESHOOTING .....	23-4	FINAL DRIVE REMOVAL .....	18-5
BODY PANEL LOCATIONS.....	2-2	FLYWHEEL/STARTER CLUTCH .....	11-8
BRAKE FLUID .....	3-15	FRONT BRAKE SHOES/DRUM .....	16-7
BRAKE FLUID REPLACEMENT/AIR BLEEDING.....	16-3	FRONT BRAKE SWITCH .....	22-13
BRAKE SHOE WEAR .....	3-16	FRONT CARRIER/CARRY PIPE.....	2-7
BRAKE SYSTEM .....	3-17	FRONT CRANKCASE COVER INSTALLATION.....	10-10
BULB REPLACEMENT.....	22-2	FRONT CRANKCASE COVER REMOVAL.....	10-2
CABLE & HARNESS ROUTING .....	1-19	FRONT DRIVE SHAFT .....	17-3
CAMSHAFT INSTALLATION .....	8-14	FRONT FENDER .....	2-7
CAMSHAFT REMOVAL .....	8-12	FRONT MASTER CYLINDER.....	16-4
CARBURETOR ASSEMBLY .....	5-9	FRONT MUD GUARD.....	2-6
CARBURETOR CHOKE .....	3-5	FRONT SHOCK ABSORBER.....	14-25
CARBURETOR DISASSEMBLY/INSPECTION .....	5-5	FRONT WHEEL .....	14-7
CARBURETOR HEATER .....	22-6	FRONT WHEEL CYLINDER/BRAKE PANEL.....	16-10
CARBURETOR INSTALLATION.....	5-14	FUEL LINE.....	3-4
CARBURETOR REMOVAL.....	5-3	FUEL TANK.....	5-17
CASE BEARING REPLACEMENT.....	17-17	FUEL TANK COVER.....	2-5
CASE BEARING REPLACEMENT.....	18-12	GEAR POSITION SWITCH .....	23-25
CENTER MUD GUARD.....	2-5	GEARSHIFT LEVER LINKAGE.....	12-12
CENTRIFUGAL CLUTCH ASSEMBLY .....	10-7	GEARSHIFT LINKAGE .....	12-5
CENTRIFUGAL CLUTCH DISASSEMBLY .....	10-4	HANDLEBAR.....	14-3
CHARGING SYSTEM INSPECTION.....	19-5	HANDLEBAR SWITCH .....	22-5
CIRCUIT DIAGRAM (HONDAMATIC) .....	23-3	HEADLIGHT .....	22-3
COMBINATION METER/SPEED SENSOR.....	22-6	HEADLIGHT GRILL .....	2-9
CONTROL MOTOR .....	23-31	HIGH ALTITUDE ADJUSTMENT.....	5-16
COOLANT REPLACEMENT.....	6-4	HONDAMATIC .....	25-1
COOLING SYSTEM .....	3-13	IGNITION COIL .....	20-4
CRANKCASE ASSEMBLY.....	13-12	IGNITION SWITCH .....	22-4
CRANKCASE BEARING REPLACEMENT .....	13-11	IGNITION SYSTEM INSPECTION.....	20-3
CRANKCASE SEPARATION .....	13-6	IGNITION TIMING .....	20-5
CYLINDER COMPRESSION .....	8-3	INNER FENDER .....	2-6
CYLINDER HEAD ASSEMBLY .....	8-15	LUBRICATION & SEAL POINTS .....	1-16
CYLINDER HEAD COVER ASSEMBLY/		MAINTENANCE SCHEDULE.....	3-3
INSTALLATION .....	8-18	MODE SELECT SWITCH .....	23-27
CYLINDER HEAD COVER REMOVAL/ .....	8-3	MODEL IDENTIFICATION.....	1-2
CYLINDER HEAD DISASSEMBLY.....	8-6	NUTS, BOLTS, FASTENERS .....	3-20
CYLINDER HEAD INSTALLATION .....	8-16	OIL COOLER .....	4-4
CYLINDER HEAD REMOVAL .....	8-5	OIL PRESSURE CHECK.....	4-3
CYLINDER/PISTON REMOVAL .....	9-2	OIL PUMP .....	4-9
DIFFERENTIAL ASSEMBLY .....	17-19	OIL STRAINER .....	4-5
DIFFERENTIAL DISASSEMBLY/INSPECTION .....	17-9	OUTER FENDER .....	2-9
DIFFERENTIAL INSTALLATION .....	17-23	PILOT SCREW ADJUSTMENT .....	5-15
DIFFERENTIAL REMOVAL .....	17-8	PISTON/CYLINDER INSTALLATION .....	9-5
DIODE.....	21-11	RADIATOR COOLANT .....	3-12
DISASSEMBLY.....	8-3	RADIATOR RESERVE TANK .....	6-6
DRIVE SHAFT BOOTS.....	3-13	RADIATOR/COOLING FAN.....	6-7
EMISSION CONTROL INFORMATION LABEL		REAR AXLE INSTALLATION .....	18-18
(U.S.A. only) .....	1-33	REAR AXLE REMOVAL .....	18-3
EMISSION CONTROL SYSTEMS .....	1-32	REAR BRAKE PEDAL.....	16-19
ENGINE CONTROL MODULE (ECM) .....	23-32	REAR BRAKE SHOES/DRUM .....	16-14
ENGINE GUARD.....	2-3	REAR CARRIER.....	2-8

## INDEX

REAR CRANKCASE COVER .....	12-3	TORQUE VALUES .....	1-11
REAR FENDER .....	2-8	TROUBLESHOOTING	
REAR FINAL GEAR CASE OIL AND DIFFERENTIAL OIL .....	3-14	ALTERNATOR/STARTER CLUTCH .....	11-1
REAR SHOCK ABSORBER .....	15-3	BATTERY/CHARGING SYSTEM .....	19-3
REAR WHEEL .....	15-3	BRAKE SYSTEM .....	16-2
RECOIL STARTER .....	11-2	CENTRIFUGAL CLUTCH .....	10-1
RECOIL STARTER COVER .....	2-3	COOLING SYSTEM .....	6-2
REGULATOR/RECTIFIER .....	19-6	CRANKSHAFT/AUTOMATIC TRANSMISSION .....	13-3
REVERSE SWITCH .....	22-13	CYLINDER HEAD/VALVE .....	8-2
SEAT .....	2-3	CYLINDER/PISTON .....	9-1
SERVICE INFORMATION		ELECTRIC STARTER .....	21-2
ALTERNATOR/STARTER CLUTCH .....	11-1	ENGINE DOES NOT START OR IS HARD TO START .....	26-1
BATTERY/CHARGING SYSTEM .....	19-1	ENGINE LACKS POWER .....	26-2
BRAKE SYSTEM .....	16-1	FRAME/BODY PANELS/EXHAUST SYSTEM .....	2-1
CENTRIFUGAL CLUTCH .....	10-1	FRONT DRIVING MECHANISM .....	17-2
COOLING SYSTEM .....	6-1	FUEL SYSTEM .....	5-2
CRANKSHAFT/AUTOMATIC TRANSMISSION .....	13-1	HONDAMATIC .....	23-8
CYLINDER HEAD/VALVE .....	8-1	IGNITION SYSTEM .....	20-2
CYLINDER/PISTON .....	9-1	LUBRICATION SYSTEM .....	4-2
ELECTRIC STARTER .....	21-1	POOR HANDLING .....	26-4
ENGINE REMOVAL/INSTALLATION .....	7-1	POOR PERFORMANCE AT HIGH SPEED .....	26-4
FRAME/BODY PANELS/EXHAUST SYSTEM .....	2-1	POOR PERFORMANCE AT LOW AND IDLE SPEED .....	26-3
FRONT DRIVING MECHANISM .....	17-1	REAR DRIVING MECHANISM .....	18-2
FRONT WHEEL/SUSPENSION/STEERING .....	14-1	REAR WHEEL/SUSPENSION .....	15-2
FUEL SYSTEM .....	5-1	SUB-TRANSMISSION .....	12-2
HONDAMATIC .....	23-1	WHEEL/SUSPENSION/STEERING .....	14-2
IGNITION SYSTEM .....	20-1	VALVE CLEARANCE .....	3-8
LIGHTS/METERS/SWITCHES .....	22-1	VALVE GUIDE REPLACEMENT .....	8-9
LUBRICATION SYSTEM .....	4-1	VALVE SEAT INSPECTION/REFACING .....	8-9
MAINTENANCE .....	3-1	WATER PUMP .....	6-12
REAR DRIVING MECHANISM .....	18-1	WHEEL HUB/KNUCKLE .....	14-11
REAR WHEEL/SUSPENSION .....	15-1	WHEELS/TIRES .....	3-20
SUB-TRANSMISSION .....	12-1		
SERVICE RULES .....	1-1		
SIDE COVER .....	2-4		
SKID PLATE, ENGINE GUARD .....	3-18		
SPARK ARRESTER .....	3-19		
SPARK PLUG .....	3-7		
SPECIFICATIONS .....	1-3		
STARTER MOTOR .....	21-4		
STARTER RELAY SWITCH .....	21-10		
STEERING SHAFT .....	14-19		
STEERING SHAFT HOLDER BEARING .....	3-20		
STEERING SYSTEM .....	3-21		
SUB-TRANSMISSION .....	12-8		
SUSPENSION .....	3-18		
SUSPENSION ARM .....	14-15		
SWINGARM .....	15-5		
SYSTEM TESTING .....	6-3		
SYSTEM WIRING CONNECTIONS/LOCATIONS .....	23-2		
TEMPERATURE INDICATOR/ THERMOSENSOR .....	22-9		
THERMOSTAT .....	6-10		
THROTTLE HOUSING .....	14-6		
THROTTLE OPERATION .....	3-4		
THROTTLE SENSOR .....	23-28		
TIE-ROD .....	14-24		
TIRE .....	14-8		
TOOL BOX .....	2-9		
TOOLS .....	1-14		